IBM

iSeries Handbook

Version 4 Release 5

- The authority on expanding iSeries CPUs
- Provides fast facts on iSeries features and requirements
- Includes OS/400 V4R5 enhancements

Redbooks

ibm.com/redbooks

iSeries Handbook
Version 4 Release 5

Softcopy Revision GA19-5486-20A
Document Number GA19-5486-20

19 October 2000

Take Note!

Before using this information and the product it supports, be sure to read the general information in “Special Notices” on page 807.

Twenty-first Edition (May 2000)

The information in this edition was correct at the time the Handbook went to press.

This document was updated on 19 October 2000.

Readers comments may be addressed to:

IBM United States
Attention: Ms. Susan Powers
Telephone: (507) 253-5195
Facsimile: (507) 253-6408
Internal ID: Susan Powers/US/IBM or SUSAN2@IBMUSM07
Internet: SUSAN2@us.ibm.com

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

© Copyright International Business Machines Corporation 1988, 1994, 1995, 1996, 1997, 1988, 1999, 2000. All rights reserved.
Note to U.S Government Users – Documentation related to restricted rights – Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

Table of Contents

Table of Contents

Contents

Contents iii
How to Use This Handbook xxiii
Acknowledgements xxiii
Comments welcome xxvi

Introduction 1
Withdrawn Products 2
Communications (WAN) Functions No Longer Supported 9
iSeries 400 Technology in Stride 9

iSeries 400 Architecture: Underlying Strength of the iSeries 15
System Concepts 16
iSeries 400 Architecture 17
Technology-Independent Machine Interface 17
V4R5 New Technologies 18
Operating System OS/400 20
Hierarchy of Microprocessors 21
Single-Level Storage 22
Hot-plugging 23
Logical Partitioning (LPAR) 24
Capacity Upgrade on Demand (CUoD) 26
Object-Based 26
Summary 27

Workload and Performance 31
Commercial Processing Workload 31
IBM Workload Estimator for AS/400 32
Disk Arm Requirements 32
iSeries 400 Model 270 and 8xx Performance 33
AS/400e Dedicated Server for Domino Positioning 34
Model 270 Dedicated Server for Domino Processor Features 36
iSeries Model 820 Dedicated Server for Domino Processor Features 36
5250 Throughput 40
5250 Express Data Stream 40

iSeries and AS/400e Advanced Technology 45
Java 45
Web Serving 48
Lotus Domino 54
Domino for AS/400 55
AS/400e Integration with the Windows NT Server 57

© Copyright IBM Corp. 2000

Extended Adaptive Cache 58
AS/400 Portable Application Solutions Environment 61
Reliable, Managed Availability 63
Database 65
AS/400e Business Intelligence Solutions 66
e-business 68
Characteristics of a Successful e-business 69

iSeries and AS/400e Future Announcements 77
Product Previews 77
Product Previews: Fulfilled 79
Statement of Direction 80

iSeries and AS/400e servers 83
Table 1: Summary of the AS/400e server 250 84
Table 2: Summary of the iSeries 400 Model 270 85
Table 3: Summary of the iSeries 400 Model 820 88
Table 4: Summary of the iSeries 400 Model 830 92
Table 5: Summary of the iSeries 400 Model 840 95
Table 6: Summary of the iSeries 400 Models SB2 and SB3 99

AS/400e server 250 103
PCI Card Technology 104
Main Storage 105
Workstation Controllers 106
#2746 PCI Twinaxial Workstation IOA 107
#9720 Base PCI WAN/Twinaxial IOA 107
Multifunction I/O Processor (MFIOP) 107
PCI Base Multifunction IOP 107
#2824 PCI LAN/WAN/Workstation IOP 108
Communications 108
#2745 PCI Two-Line WAN IOA 108
#2750 PCI ISDN BRI U IOA 109
#2751 PCI ISDN BRI S/T IOA 109
#2761 Integrated Analog Modem 109
#9720 Base PCI WAN/Twinaxial IOA 110
#0398 Operations Console Package 110
#9771 Base PCI 2-Line WAN with Modem 110
Communication WAN Restrictions 111
Encryption 112
#4801 PCI Crypto Coprocessor 112
Local Area Networks and Asynchronous Transfer Mode 112
#2838/#9738 PCI 100/10 Mbps Ethernet IOA 113
#2724/#9724 PCI 16/4 Mbps Token-Ring IOA 113

#2723/#9723 PCI Ethernet IOA (10 Mbps) 113
#2815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA 114
#2816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA 114
#2818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 114
#2866 PCI Integrated Netfinity Server 115
9406 Model 250 System Unit 116
Power and Packaging 116
System Expansion Unit Schematics 117
#7102 System Expansion Unit 117
Power and Packaging 117
Uninterruptable Power Supply (UPS) 119
Disk Units 119
Magnetic Media Controllers 120
#2729 PCI Magnetic Media Controller SCSI 120
#2718 PCI Magnetic Media Controller 120
#2763 PCI RAID Disk Unit Controller 120
#2748 PCI RAID Disk Unit Compression Controller 120
Internal Tape, CD-ROM, and Diskette Units 120
Base CD-ROM Drive 120
Diskette Drive Support 120

iSeries server 270 123
Card Technology 125
Processor Features 126
Interactive Features 127
Main Storage 128
Power and Packaging 129
High Speed Links (HSL) on Model 270 131
Workstation Controllers 135
5250 Express Data Stream 136
System Console 136
I/O Processor and I/O Adapter Support 137
LAN/WAN/Workstation IOAs 137
Internal Disk Unit Controllers 137
Magnetic Media Controllers 138
I/O Processors 138
Internal Disk, Tape and CD-ROM Support 139
Internal Disk Units 139
Internal Tape and CD-ROM 139
CIF Features 139
Model 270 Upgrades 140

iSeries Dedicated Server for Domino 143
CIF Features 147
Main Storage 147

iSeries Model 820 151
Card Technology 153
Processor Features 154
Interactive Features 155
Main Storage 156
Power and Packaging 158
High Speed Link (HSL) on Model 820 158
I/O Processor and I/O Adapter Support 162
LAN/WAN/Workstation IOAs 162
Internal Disk Unit Controllers 162
Magnetic Media Controllers 162
I/O Processors 162
Internal Disk, Tape, and CD-ROM Support 163
Internal Disk Units 163
Internal Tape and CD-ROM 163
External Towers 163
Migration Tower Hardware 164
#2686 Optical Link Processor (266 Mbps) 164
#2688 Optical Link Processor (1063 Mbps) 164
Disk Units 164
Internal Tape and CD-ROM 164
I/O Processors 165
Magnetic Media Controllers 165
I/O Adapters 165

iSeries Model 830 169
Card Technology 171
Processor Features 172
Interactive Features 172
Main Storage 173
Power and Packaging 174
System Power 175
#0550 Rack 175
#9074 Base I/O Enclosure 175
#5101 30-Disk Expansion Feature 176
High Speed Link (HSL) on Model 830 176
I/O Processor and I/O Adapter Support 178
LAN/WAN/Workstation IOAs 178
Internal Disk Unit Controllers 179

Magnetic Media Controllers 179
I/O Processors 179
Internal Disk, Tape, and CD-ROM Support 179
Internal Disk Units 179
Internal Tape and CD-ROM 179
External Towers 180
Migration Tower Hardware 181
#2686 Optical Link Processor (266 Mbps) 181
#2688 Optical Link Processor (1063 Mbps) 181
Disk Units 181
Internal Tape and CD-ROM 181
I/O Processors 181
Magnetic Media Controllers 181
I/O Adapters 181

iSeries Model 840 185
Card Technology 187
Processor Features 188
Capacity Upgrade on Demand (CUoD) 189
Interactive Features 189
Main Storage 191
Power and Packaging 191
System Power 192
#8079 Optional Base I/O Rack 192
#9079 Base I/O Tower 193
#5101 30-Disk Expansion Feature 194
#2730 Programmable Regulator 194
#5150 Battery Backup (external) 194
High Speed Links (HSL) on Model 840 195
I/O Processor and I/O Adapter Support 199
LAN/WAN/Workstation IOAs 199
Internal Disk Unit Controllers 199
Magnetic Media Controllers 199
I/O Processors 199
Internal Disk, Tape, and CD-ROM Support 200
Internal Disk Units 200
Internal Tape and CD-ROM 200
External Towers 200
Migration Tower Hardware 201
#2686 Optical Link Processor (266 Mbps) 201
#2688 Optical Link Processor (1063 Mbps) 201
Disk Units 201
Internal Tape and CD-ROM 201

I/O Processors 201
Magnetic Media Controllers 201
I/O Adapters 201

iSeries Model SB2 205
Card Technology 206
Processor Feature 207
Main Storage 207
Power and Packaging 207
System Power 208
#9074 Base I/O Enclosure 208
I/O Processor and I/O Adapter Support 209
LAN/WAN/Workstation IOAs 209
Internal Disk Unit Controllers 209
Magnetic Media Controllers 209
I/O Processors 209
Internal Disk, Tape, and CD-ROM Support 210
Internal Disk Units 210
Internal Tape and CD-ROM 210
External Towers 210

iSeries Model SB3 213
Card Technology 215
Processor Features 216
Main Storage 216
Power and Packaging 216
System Power 216
#9079 Base I/O Tower 217
#5150 Battery Backup (external) 218
I/O Processor and I/O Adapter Support 218
LAN/WAN/Workstation IOAs 218
Internal Disk Unit Controllers 219
Magnetic Media Controllers 219
I/O Processors 219
Internal Disk, Tape, and CD-ROM Support 219
Internal Disk Units 219
Internal Tape and CD-ROM 219
External Towers 219

Towers 223
Expansion Towers 223
#5075 PCI Expansion Tower 223
#7002 HSL Enabler 224
#5156 Redundant Power and Cooling 224

#5074 PCI Expansion Tower 226
#5101 30-Disk Expansion Feature 227
#5079 1.8m I/O Tower 229
Migration Towers 232
#5033 Migration Tower I (600/S10 System Unit) 232
#5034 Migration Tower I (10 Disk S20/620, 720 System). 234
#5035 Migration Tower I (15 Disk S20/620, 720 System). 236
#5077 Migration Tower II 238
#5057 Storage Expansion Unit 240
SPD Expansion Towers 240
SPD Expansion Tower I/O Features 241

Customer Install Features (CIF) 245
V4R5 Features 245

I/O Processor 253
V4R5 System Unit Hardware (PCI) 253
Embedded 32 MB PCI IOP (CCIN 284x) 253
#2842 PCI IOP 253
#2790 PCI Integrated Netfinity Server 255
#2890 PCI Integrated Netfinity Server 257
Migration Tower Hardware PCI 258
#2809 PCI LAN/WAN/Workstation IOP. 258
#2824 PCI LAN/WAN/Workstation IOP. 258
#2851 PCI Integrated PC Server 258
#2854 PCI Integrated PC Server 258
#2865 PCI Integrated Netfinity Server 259
Migration Tower Hardware SPD. 260
#2629 SPD LAN/WAN/Workstation IOP 260
#2810 LAN/WAN IOP 260
#6616 Integrated PC Server (formerly known as FSIOP) 260
#6617 Integrated PC Server 260
#6618 Integrated Netfinity Server 260

I/O Adapter 265
V4R5 System Unit Hardware (PCI) 265
#2743 PCI 1 Gbps Ethernet IOA. 265
#2744 PCI 100 Mbps Token Ring IOA 265
#4723 PCI 10 Mbps Ethernet IOA. 265
#4745 PCI Two-Line WAN IOA. 266
#4746 PCI Twinaxial Workstation IOA 266
#4750 PCI ISDN BRI U IOA 266
#4751 PCI ISDN BRI S/T IOA. 267
#4761 Integrated Analog Modem 267

#4801 PCI Crypto Coprocessor 267
#4815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA. 268
#4816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA 268
#4818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 268
#4838 PCI 100/10 Mbps Ethernet IOA 268
#9771 Base PCI 2-Line WAN with Modem 268
#2763 PCI RAID Disk Unit Controller 269
#4748/#9748 PCI RAID Disk Unit Controller. 270
#9767 PCI Disk Unit Controller 270
#2749 PCI Ultra Magnetic Media Controller 270
#2768 PCI Magnetic Media Controller 271
Migration Tower Hardware PCI 272
#2720/#9720 PCI WAN/Twinaxial IOA 272
#2721/#9721 PCI Two-Line WAN IOA 272
#2722 PCI Twinaxial Workstation IOA 272
#2723/#9723 PCI Ethernet IOA (10 Mbps) 272
#2724/#9724 PCI 16/4 Mbps Token-Ring IOA 273
#2745/9745 PCI Two-Line WAN IOA 273
#2746 PCI Twinaxial Workstation IOA 273
#2750 PCI ISDN BRI U IOA 274
#2751 PCI ISDN BRI S/T IOA. 274
#2761 Integrated Analog Modem 274
#2815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA. 275
#2816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA 275
#2818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 275
#2838/#9738 PCI 100/10 Mbps Ethernet IOA. 275
#4802 PCI Crypto Coprocessor 275
#2718 PCI Magnetic Media Controller 276
#2726 PCI RAID Disk Unit Controller Ultra SCSI 276
#2729 PCI Magnetic Media Controller SCSI PCI 277
#2740 PCI RAID Disk Unit Controller 278
#2741 PCI RAID Disk Unit Compression Controller 278
#2748 PCI RAID Disk Unit Compression Controller 279
#9728 Base PCI Disk Unit Controller Ultra SCSI 279
Migration Tower Hardware SPD. 280
#2620 Cryptographic Processor 280
#2628 Cryptographic Processor (Commercial) 280
#2699/9699 SPD Two-Line WAN IOA 280
#2664 Integrated Fax Adapter 281
#6149 16/4 Mbps Token-Ring IOA 281
#6180/#9280 Twinaxial Workstation IOA 282
#6181/#9381 Ethernet/IEEE 802.3 IOA (10 Mbps) 283
#2621 Removable Media Device Attachment SPD. 283

#2624 Storage Device Controller SPD 284
#6501 Tape/Disk Device Controller SPD 284
#6502 High Performance Controller (2M Cache) SPD 285
#6512 High Performance Controller (4M Cache) SPD 286
#6513 Internal Tape Device Controller SPD 286
#6532 RAID Disk Unit Controller (4M Cache) Ultra SCSI SPD 287
#6533 RAID Disk Unit Controller (4M Cache) Ultra SCSI Compress. SPD288
#6534 Magnetic Media Controller SCSI SPD 288

PCI Card Placement Rules 291
Configuration Rules 291
Card Enclosure Layout 292
Card Enclosure Diagrams 293
PCI and Card Enclosure Concepts 294
Configuration Validation Procedure 295
Generating a Valid Configuration 296
Configuration Validation Form 297
IOP Capacity Table 297
Hard Rules: IOA Capabilities 298
Soft Rules: IOA Requirements 302
Integrated Netfinity Server IOP Rules 305
Concurrent Maintenance Load Source Movement 305
Configuration Validation Examples 305
Example 1: Model 270 306
Example 2: Model 820 with #5074 PCI Expansion Tower 309

Upgrades to iSeries server 8xx 321
Interactive Performance Reduction Option for 7xx Servers 321
Upgrade Scenarios 321
Migration considerations 322
RISC to RISC Data Migration (#0205) 324
Upgrades to iSeries server 820 324
Model 820 Upgrades to 820 326
Upgrades to iSeries Model 830 328
8xx Upgrades to 830 332
Upgrades to iSeries Model 840 334
Model 8xx Upgrade to 840 337
Model 270 Upgrades 340
Dedicated Server for Domino Upgrades 341

Internal Magnetic Media 345
PCI Disk Units 345
SPD Disk Units 347
Disk Units 348

Disk Storage Specifications Comparison 348
Disk Protection 354
Device Parity Protection 354
RAID-5 355
Mirroring 355
Integrated Hardware Disk Compression 356
Internal Tape and CD-ROM 356
Tape Units 357
Alternate IPL 360
Tape Unit Descriptions 360
CD-ROM. 366
Internal CD-ROM Drives 366
LPAR Support and CD-ROM 366

Removable Storage Media Devices 371
IBM 7207 Model 122 4 GB External QIC Tape Drive. 371
IBM 7208 External 8mm Tape Drive Model 342 372
IBM 7210 Model 020 External CD-ROM 372
IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, F11, and Library Model F1A. 373
IBM 3494 Tape Library Dataserver Model 375
IBM Magstar MP 3570 Tape Cassette Subsystem 378
3570 Cxx Models 380
3570 Bxx Models. 381
Magstar MP (Multipurpose) 3575 Tape Library Dataserver 381
IBM 3580 Ultrium Tape Drive Model H11 and Model L11 384
IBM 3581 Ultrium Tape Autoloader H17 and Model L17 385
IBM 3583 Ultrium Scalable Tape Library 387
IBM 3584 UltraScalable Tape Library 390
IBM 3590 High Performance Tape Subsystem Models B1A and B11 396
IBM 3590 High Performance Tape Subsystem Models E1A and E11 398
IBM 3995 Optical Library C-Models 401

Magnetic Media Controllers 407
Removable Media Devices. 407
Common Magnetic Media Controllers 409
#2621 Removable Media Device Attachment SPD. 411
#2624 Storage Device Controller SPD 412
#6501 Tape/Disk Device Controller SPD 412
#6502/#6522 High Performance Controller (2 MB Cache) SPD 413
#6512 High Performance Controller (4 MB Cache) SPD 414
#6513 Internal Tape Device Controller SPD 414
#6532 RAID Disk Unit Controller (4 MB Cache) Ultra SCSI SPD 415

#6533 RAID Disk Unit Controller (4 MB Cache) Ultra SCSI Compress. SPD. 416
#6534 Magnetic Media Controller SCSI SPD 416
#9754 MFIOP with RAID 417
#2718 PCI Magnetic Media Controller 417
#2726 PCI RAID Disk Unit Controller Ultra SCSI 418
#2729 PCI Magnetic Media Controller SCSI PCI 419
#2740 PCI RAID Disk Unit Controller 420
#2741 PCI RAID Disk Unit Compression Controller 420
#2748 PCI RAID Disk Unit Compression Controller 420
#2749 PCI Ultra Magnetic Media Controller 421
#2763 PCI RAID Disk Unit Controller 422
#2768 PCI Magnetic Media Controller 422
#4748/#9748 PCI RAID Disk Unit Controller 422
#9728 Base PCI Disk Unit Controller Ultra SCSI 423
#9740 Base PCI RAID Disk Unit Controller 424
#9767 PCI Disk Unit Controller 424
Migration Features 425

2105 Enterprise and Versatile Storage Servers 429
2105 Enterprise Storage Server 429
2105 Versatile Storage Server 430

IBM 9309 Rack Enclosures 435
#5040 Bus Extension Unit 436
#5042 and #5044 System Unit Expansion Rack 436

Peripherals 441
IBM Network Station Series 1000 441
IBM NetVista Thin Clients 443
IBM InfoWindow II Displays 447
IBM 7299 Entry Hub 448
IBM 7299 Express Multiplexer 449
IBM 5250 Express Network Kit 450
IBM 7852 Model 400 Modem 451
IBM iSeries 400 and AS/400e Printers 452
IBM iSeries 400 and AS/400e Workgroup Printers 452
IBM Infoprint Color 8 454
IBM Infoprint Color 12 454
IBM Network Printer 17 455
IBM Infoprint 20 Printer 456
IBM Infoprint 21 457
IBM Infoprint 32 Printer 458
IBM Infoprint 40 Printer 459

IBM iSeries 400 and AS/400e Departmental and Production Printers 460
IBM Infoprint 60 and 3160 Advanced Function Printers 460
IBM Infoprint 60 Advanced Function Finisher 461
IBM Infoprint 62 Continuous Forms Printer 461
IBM Infoprint 70 462
IBM Infoprint 2000 463
IBM Infoprint 3000 Advanced Function Printing System 464
IBM Infoprint 4000 Advanced Function Printing Systems 465
IBM Infoprint 4000 Hi-Lite Color Printing System and IBM Infoprint 4005 Hi-Lite Color Printer 466
IBM InfoColor 70 Full-Color Digital Printer 467
IBM iSeries 400 and AS/400e Industrial Printers 468
IBM 4230 Impact Matrix Printer 468
IBM 4232 Impact Dot Matrix Printer 469
IBM 4247 MultiForm Matrix Printer 470
IBM 4400 Thermal Label Printers 471
IBM 6400 Line Matrix Printers 472

Operating System/400, 5769-SS1 477
Operating System/400 Capabilities 477
AS/400 Internet Setup Wizard 482
Network Authentication Service 482
Virtual Private Networks 488
Homologation 488
Euro Currency 489
System Management Facilities 490
Nonchargeable Features of OS/400 492
AS/400 Client Access Express for Windows (#2603) 492
AS/400 Operations Navigator 493
Management Central 496
AS/400 Integration with Windows NT Server (Version 4.0) (#2692) 498
Integrated Services for the FSIOP (#2644) 500
Common Programming API (CPA) Toolkit (#2690) 500
Integration for Lotus Notes (#2656) 500
Application Development 501
Year 2000 Support 501
Database Support 502
Integrated File System 504
Integrated File System Enhancements 507
Improved Options and Application Products for V4R5 507
iSeries 400 and AS/400e Logical Partitioning 510
Integration with Windows NT Server 511
EZ-Setup 512

Continuous Availability Clustering 513
IBM HTTP Server for AS/400 515
Apache HTTP Server 516
Digital Certificate Manager with SSL 517
Lotus Domino Currency, Extensions, and Applications 517
IBM WebSphere for AS/400 (5769-AS1) 518
Java for AS/400 520
Net.Data Currency 520
Threadsafe Functions and Facilities 521
DB2 Universal Database for AS/400 521
Scalable TCP/IP 522
TCP/IP Protocol Stack 523
Chargeable Features of OS/400 523
IBM Print Services Facility for AS/400 (PSF/400) (#2691) 523
DB2 Multisystem for AS/400 (#2699) 525
DB2 Symmetric Multiprocessing for AS/400 (#2698) 525
Portable Application Solutions Environment (PASE) (#2648) 525
#2619 Media and Storage Extensions 527
#2646 Enhanced NetWare Integration 527
#2642 OptiConnect for AS/400 528
Programs within OS/400 528
AS/400 Toolbox for Java, 5769-SS1, 5769-JC1 528
AS/400 Developer Kit for Java, 5769-SS1, 5769-JV1 532
IBM VisualAge for Java 533
Integration for Novell NetWare, 5769-SA3 535
Performance Management/400, 5769-PM1 535
TCP/IP Connectivity Utilities for AS/400, 5769-TC1 535
Software Migration and Upgrade Paths 537
e-Jump and Single-Step Upgrades 537
Supported Upgrade Paths 537
Current Release to Previous Release Support 538
OS/400 Version 4 Change of Terms and Conditions 538
Software Subscription 539
Software Keys and Guidance for LPAR System Upgrades 540
Keyed Stamped Media Distribution 540
Changes in Accessing iSeries 400 and AS/400e Softcopy Information 542

WebSphere and e-business 545
IBM WebSphere Commerce Suite, Pro Edition for AS/400, V4.1, 5798-WC4 545
WebSphere Commerce Studio 546
IBM Net.Commerce for AS/400 Version 3, 5798-NC3 552
IBM WebSphere Payment Manager for AS/400 V2.1, 5733-PY2 555
IBM WebSphere Application Server Version 3.0.2 5769-AS3 (5769-AS2) . . 559

WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (56-bit), 5733-AS2 559
WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (128-bit), 5733-AS3 559
IBM WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (56-bit), 5733-WA2 561
IBM WebSphere Application Server Version 3.5, Advanced Edition for AS/400 (128-bit), 5733-WA3 561
WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (128-bit), 5733-WA3 561
Connect for iSeries 5733-B2B 565
IBM WebSphere Host Publisher V2.2 for AS/400 (5648-D31) 567
A Path for New e-business Projects 568
Host Publisher Studio 569
Host Publisher Server 569
Remote Integration Objects (RIO) 570
XML Gateway 570
WebSphere Studio Professional Edition 570
Enterprise-class Functionality 570
Secure Sockets Layer (SSL) Security 571
IBM WebSphere Personalization for AS/400, V3.5 (5733-A47) 571
Hardware Requirements 572
Software Requirements 573

IBM Licensed Programs: Database Products 577
IBM System/38 Utilities for AS/400 V4R4, 5769-DB1 577
IBM DB2 DataPropagator Version 7.1 for AS/400 5769-DP3 577
V7.1 Enhancements 579
IBM Query for AS/400 V4R3, 5769-QU1 581
IBM DB2 Query Manager and SQL Development Kit for AS/400 V4R4, 5769-ST1 581
IBM DB2 Intelligent Miner for Data for AS/400 V6R1, 5733-IM1 582
V6R1 Highlights 584
IBM DB2 OLAP Server for AS/400 Version 1.1, 5641-OLP 584
DB2 OLAP Server for AS/400 Products 586
IBM DB2 DataJoiner Version 2.1.1, 5801-AAR Feature #3049 588
DB2 Spatial Extender Version 2.1.1, 5801-AAR Feature #2716 588
Query Management Facility (QMF) for Windows for AS/400 Version 7, 5697-G24 595

IBM Licensed Programs: Networking Products 603
IBM Network Station Manager, Version 2 Release 1, 5648-C07/5648-C08 . 603
Network Station Manager Version 2 Release 1 Enhancements 604

Navio NC Navigator for IBM Network Station V1.0, 5648-B10 and 5648-B20 606
Cryptographic Access Provider 40-bit for AS/400 V4R3, 5769-AC1 607
Cryptographic Access Provider 56-bit for AS/400 V4R3, 5769-AC2. 607
Cryptographic Access Provider 128-bit for AS/400 V4R3, 5769-AC3. . . . 607
Client Encryption 40-bit V4R4, 5769-CE1 608
Client Encryption 56-bit V4R4, 5769-CE2. 608
Client Encryption 128-bit V4R4, 5769-CE3. 608
IBM Cryptographic Support for AS/400 V4R2, 5769-CR1 608
IBM Corepoint Telephony Version 6 Release 2, 5648-C69 609
IBM Point-of-Sale Communications Utility for AS/400 V4R3, 5769-CF1 610
IBM Communications Utilities for AS/400 V4R4, 5769-CM1 611
IBM Distributed Computing Environment (DCE) Base Services for AS/400 Version 4 Release 3, 5769-DC1 612
IBM Distributed Computing Environment (DCE) DES Library Routine V4R3, 5769-DC3. 612
IBM Firewall for AS/400 V4R4, 5769-FW1. 612
IBM MQSeries for AS/400, V5.1, 5733-A38. 614
Business Integration with the MQSeries Family 615
MQSeries for AS/400 Features at a Glance 615
The Basics of MQSeries 616
Version 5.1 Enhancements. 617
IBM MQSeries Integrator for AS/400 and DB2 Version 1.1, 5801-AAR, Feature #6002 618
IBM Wireless Connection for AS/400 V4R4, 5798-TBW 620
AS/400 Client Access Products 620
AS/400 Client Access Family for Windows (5769-XW1) 620
AS/400 Client Access Express for Windows (5769-XE1). 621
Connectivity. 622
Security 623
Network File and Print Serving 623
PC5250 Emulation 624
Data Transfer 625
Application Enablers - Middleware 626
Central Administration of PC Users 628
iSeries 400 and AS/400e Administration and Operations 629
Operations Console 629
New Enhancements in Client Access Express for Windows (V4R5M0) 630
PC5250 Display and Printer Emulation. 630
Summary. 631
iSeries 400 and AS/400e Server Requirements 632
Client Workstation Requirements 632
AS/400 Client Access for Windows 95/NT (5763-XD1) 633
AS/400 Client Access Enhanced for Windows 3.1 (5763-XK1) 634

AS/400 Client Access Family (5769-XY1) 635
Client Access Upgrade Options Are Expanded 636

IBM Licensed Programs: Lotus Products 641
Lotus Domino Server for AS/400, 5769-LNT (V4R5) 641
Domino Server Choices 641
Client Server Choices 642
Lotus Domino R5 Mail Server 642
Key Features and Benefits 642
Lotus Domino R5 Application Server 646
Key Features and Benefits 646
Lotus Domino R5 Enterprise Server 648
Key Features and Benefits 649
Lotus Domino R5 Advanced Enterprise Server 651
Domino Clients Choices 651
Notes Collaboration Client 651
R5 Domino Designer 656

Lotus Enterprise Integrator, 5769-LNP 661

IBM Licensed Programs: Systems Management Products 665
AS/400 Operations Console 665
Extreme Support Through Personalization (ESP) 667
Management Central-Pervasive 667
Easier Access to IBM Technical Support Web Sites 668
IBM Electronic Services for AS/400 668
Universal Connection 668
PM400e Integrated with Work Load Estimator 669
Physical Device Placement Assistant (PDPA) 669
Software Inventory Utility (SIU) 670
Services Network 670
iSeries 400 and AS/400 University 671
Personalize Web Page 671
Tivoli Management Agent 672
Tivoli Storage Manager Version 3.7, 5697-FRA 672
Enhancements in V3R1 673
Enhancements in V3R7 676
IBM Backup Recovery and Media Services for AS/400 V4R4, 5769-BR1 . . . 678
IBM Advanced Job Scheduler for AS/400 V4R4, 5769-JS1 681
IBM Managed System Services for AS/400 V4R2, 5769-MG1 682
IBM Performance Tools for AS/400 V4R2, 5769-PT1 683
IBM Content Manager OnDemand for AS/400 V4R5, 5769-RD1 684
Enhancements in V4R5 687
IBM System Manager for AS/400 V4R3, 5769-SM1 688

IBM Licensed Programs: Application Development Products 693
IBM AS/400 PL/I, 5763-PL1 V4R2 693
System/38 Migration Aid, 5714-MG1 693
IBM VisualAge for C++ for AS/400 V4R4, 5769-CX5. 693
IBM VisualAge Generator Server for AS/400 V4R4, 5769-VG1. 695
System/36 Migration Aid, 5727-MG1 700
IBM Integrated Language Environment COBOL for AS/400 V4R4, 5769-CB1700
IBM VisualAge RPG and Cooperative Development Environment for AS/400
V4R4, 5769-CL3. 702
IBM WebSphere Development Tools for AS/400 V4R5M1, 5769-CL3 702
VisualAge for JAVA for AS/400 (component of 5769-CL3). 703
WebSphere Studio for AS/400 (component of 5769-CL3) 704
CODE/400 (component of 5769-CL3). 704
VisualAge RPG (component of 5769-CL3) 705
Integrated Language Environment C for AS/400 V4R4, 5769-CX2 707
IBM CICS Transaction Server for AS/400 V4R4, 5769-DFH 709
V4R4 Enhancements 710
IBM Application Program Driver for AS/400 V4R3, 5769-PD1. 710
V4R3 Enhancements 710
IBM Application Development ToolSet for AS/400 V4R4, 5769-PW1 711
V4R4 Enhancements 714
IBM Integrated Languages Environment RPG for AS/400 V4R4, 5769-RG1 715
Application Development Tools 718

IBM Licensed Programs: Office and Printing Products 723
AFP Font Collection, 5648-B45 723
IBM Content Manager for AS/400 V4R3, 5769-VI1 723
IBM Advanced Function Printing Utilities for AS/400 V4R4, 5769-AF1 725
IBM Advanced Function Printing (AFP) PrintSuite for OS/400, 5798-AF2
(V3R2M1), 5798-AF3 (V3R7M1 and Later Releases) 725
Advanced Print Utility (APU) 726
Pager Printer Formatting Aid (PPFA) 726
AFP Toolbox for OS/400 726
SAP R/3 AFP Print 727
IBM Advanced DBCS Printer Support for AS/400 V4R5, 5769-AP1 727
IBM Dictionary and Linguistics Tools for AS/400 V4R5, 5769-DL1 729
IBM Business Graphics Utility for AS/400 V4R4, 5769-DS1 730
IBM Advanced Function Printing Fonts for AS/400 V4R3, 5769-FNT 730
IBM Advanced Function Printing DBCS Fonts for AS/400 V4R3, 5769-FN1 . 731
IBM OfficeVision to Lotus Notes Migration Tools for AS/400 Version 2.2,
5697-F08 732
BlueNotes Document Warehouse. 734
BlueNotes Data Merge 735

BlueNotes Document Warehouse (BNDW) for AS/400, 5620-BNY 736
IBM Facsimile Support for AS/400 V4R3, 5798-TBY 737
IBM OfficeVision for AS/400 V4R2, 5769-WP1 738
Support for AFP Print Applications and IPDS Printers 742

Summary of All Earlier AS/400 and AS/400e Models 747
Systems 747
Models P01, P02 747
9401 Model P03 and 10S 748
9402 Models C04, C06 749
9402 Models D02, D04, D06 749
9402 Models E02, E04, E06 750
9402 Models F02, F04, F06 750
9402 Model 200 751
9402 Model 236 751
9402 Model 400 752
9402 Model 436 753
9404 Models B10, B20 754
9404 Models C10, C20, C25 754
9404 Models D10, D20, D25 755
9404 Models E10, E20, E25 755
9404 Models F10, F20, F25 756
9406 Models B30, B35, B40, B45, B50, B60, B70 756
9406 Models D35, D45, D50, D60, D70, D80 757
9406 Models E35, E45, E50, E60, E70, E80, E90, E95 758
9406 Models F35, F45, F50, F60, F70, F80, F90, F95, F97 759
9406 Models 300, 310, 320 760
9406 Models 500, 510, 530 761
9406 Model 600 762
9406 Model 620 763
9406 Model 640 765
9406 Model 650 767
Servers 768
9402 Server Model 100 and 9404 Server Models 135 and 140 768
9402 Server Model 20S and 9406 Server Model 30S 769
9402 Model 40S 770
9406 Models 50S and 53S 771
9406 Model 170 772
9406 Model 170 773
9406 Model S10 775
9406 Model S20 777
9406 Model S30 779
9406 Model S40 781

9406 Model 720 783
9406 Model 730 786
9406 Model 740 788
Custom Mixed-Mode Servers 790
9406 Model S20 Custom Mixed-Mode Server 790
9406 Model S30 and S40 Custom Mixed-Mode eServers 792
9406 Model SB1 794
Packages 796
9401 Model 150 796
9402 2XX Packages 797
9402 Model 400 Packages 798
9402 Model 436 Packages 799
9402 Model 40S Packages 800
9402 Model 40S Packages 801
Table Notes for All Summary Tables 801

Special Notices 807

iSeries 400 and AS/400e Documentation 811
AS/400 Softcopy Library 811
iSeries 400 Information Center 811
V4R5 Enhancements 812
iSeries 400 and AS/400e Rochester Redbooks 812
IBM Redbooks publications 814
IBM Redbooks collections 814
Other resources 814
Referenced Web sites 815

How to Get IBM Redbooks 819
IBM Redbooks Fax Order Form 820

List of Abbreviations 823

Index 831

IBM Redbooks Review 849

How to Use This Handbook

Note

This IBM Redbook reflects the introduction of IBM @server iSeries 400. iSeries 400 servers are Models 270, 820, 830, 840, SB2, and SB3 announced in May 2000 (supported by OS/400 V4R5). Throughout this redbook, we use “iSeries 400” or simply “iSeries” to refer to these models. AS/400e servers are all RISC models announced from June 1995 onward to May 2000, as well as the Model 250. Software names and other product names remain the same at this time.

This Handbook is written for use by IBM System Specialists, Marketing Representatives, Business Partners, and IBM customers. It is designed for *guidance* only. Use this Handbook as a reference for the options available. Refer to the companion manual *iSeries and AS400e System Builder*, SG24-2155, for more detailed information and configuration rules. Refer to online IBM systems and your IBM marketing and support representative for final confirmation.

Periodically, the content of the Handbook is revised to keep readers informed about changes between hardcopy editions. Revisions are updated on the softcopy version of the Handbook, annotated as -20a, where “a” represents a level of update. This soft copy is available on the Web at `http://www.redbooks.ibm.com/index.html`

Once the incremental revision is made to the online edition, it is yet available in hardcopy by ordering a print-on-demand copy from FatBrain from the IBM Redbooks Web site. For the latest update to the *iSeries 400 Handbook,* enter the search parameter `GA19-5486` on the Web site: `http://www.redbooks.ibm.com`

The Handbook also provides much of the technical information available from the iSeries 400 home page. For up-to-date, online, search-friendly access to the Handbook, refer to the Web site at: `http://www.ibm.com/eserver/iseries`

You can also find the *iSeries 400 Handbook* on the Web at:
`http://www.ibm.com/eserver/iseries/library`

Acknowledgements

In this twenty-first edition of the *iSeries 400 Handbook*, we provide a comprehensive guide to the iSeries 400 and AS/400e hardware and software that is currently marketable by IBM representatives. Any comments or suggestions on the content, layout, and usefulness of this book are encouraged from all users of this book.

© Copyright IBM Corp. 2000

Many people contributed to the production of the May and October 2000 editions. I admire the dedication, hard work and attention to detail of each of the associated teams I have worked with. I am especially grateful to the following people:

The team that updated the May 2000 edition are pictured from left to right: Dwight Harrison, Kendall Kinnear, Jonathan Perry, Mark Huntley, Louis Cuypers, Glen McClymont

The team that updated the October 2000 softcopy edition are pictured from left to right: Dale Barrick and Miroslav Iwachow

- **Glen McClymont**, Senior AS/400 Techline Specialist with IBM in Canada. Since 1988, he has worked with the AS/400e system in customer hardware support, software support, and most recently in pre-sales marketing support. Glen has 30 years with IBM and is an alumni resident from previous Handbook and Builder residencies, providing sustained expertise between updates.
- **Louis Cuypers**, AS/400 Technical Support Specialist. He has been with IBM Belgium for 23 years. He specializes in technical support and problem determination hardware/software for the AS/400e system. His previous experience includes working

with the S32, S34, S36, S38, and AS/400 system. He has participated in several residencies in the ITSO since the release of OS/400 V4R1.

- **Dwight Harrison**, AS/400 Remote Support Specialist, working for IBM in Rochester, Minn. His IBM career of 30 years includes being a Customer Engineer in Nebraska and a lab technician developing and testing disk drives in Rochester. Dwight has spent the past seven years in the Rochester AS/400 hardware support center. He conducts remote diagnostics on the AS/400e system and interfaces with developers to resolve customer reported problems both in hardware and software support.
- **Mark Huntley**, Technical Manager for a tier one IBM Business Partner in the United Kingdom, TSF, for the past eighteen months. TSF specializes in e-business and Domino-based CRM solutions. Previously, Mark worked for IBM UK for fourteen years to provide pre-sales support and consulting. This is the second edition of the Handbook and Builder on which Mark has worked.
- **Kendall Kinnear**, System Consultant for Data Systems International in Dallas Texas. Kendall has 26 years experience in the IBM midrange solution, from the System/3, through the System/34 and System/38, to the AS/400e. Kendall brings substantial experience from his tenure at companies like IBM, EDS, StorageTek, and Jack Henry and Associates. He has experience as a System Programmer, Systems Analyst, Systems Engineer, Systems Administrator, Application Programmer, Application Designer, educator, and speaker. He also is an alumni resident from previous Handbook and Builder publications.
- **Jonathan Perry**, Associate Consultant with ASTECH, an IBM Business Partner. Jonathan has been with ASTECH for three and a half years and specializes in the areas of AS/400 System Operator, Networking, Security, and AS/400 Application Porting. His previous experience includes being a programmer in AS/400 RPG and UNIX 4GL. He holds an Honors Diploma in Computer Studies from the Keyin Technical College in St. John's Newfoundland.
- **Dale Barrick** has been with IBM since 1976 beginning as a Customer Engineer. In 1983, he became a Systems Engineer working with mid-range systems in a primarily manufacturing territory. In 1992, he joined Techline and is the Southern Area AS/400e focal point in Atlanta. He also works closely with the Rochester Technology Solutions Center for LPAR documentation, education, and systems validation.
- **Miroslav Iwachow**, AS/400 TeCenter support specialist for Avnet in Germany, a distributor of IBM. Mirek has previously worked for 6 years for IBM in the Czech Republic as the AS/400e product manager and team leader. Presently he specializes in supporting IBM Business partners, including a joint partnership between Avnet and Vision Solutions for high availability solutions. He teaches courses that prepare Business Partners for IBM certifications.

- Many developers and engineers who assisted in answering questions, providing input and validating output. Leading in this effort is Dave Wells, and his team of Jerry Allen, Teresa Barre, and Denis Nizinski for input on processors; Jeff Trachy and Jason Clegg for migration information; Bill Shaffer, Business Line Manager, AS/400e Printing Solutions, for input and validation of printer information; Jenny Wong, IBM Toronto laboratory, for input on application development products; and Carole Miner for input on Client Access features.

Susan Powers, Senior I/T Specialist
ITSO Rochester, MN

Comments welcome

Your comments are important to us!

We want our Redbooks to be as helpful as possible. Please send us your comments about this or other Redbooks in one of the following ways:

- Fax the evaluation form found in “IBM Redbooks Review” on page 849 to the fax number shown on the form.
- Use the online evaluation form found at **ibm.com**/redbooks
- Send your comments in an Internet note to redbook@us.ibm.com

Introduction

Introduction

Introduction

In the year 2000, the introduction of the IBM @server iSeries 400 Models 270 and 8xx, and AS/400e Server 250, significantly accents the evolution of the IBM server product line. The top Model 8xx offers performance increased three and a half times for both base and interactive processors. The 270 server offers thirteen times the top-to-bottom scalability. DASD capacity is over four times the DASD capacity of the largest 7XX server. Maximum main storage is more than doubled with the iSeries 400 Model 840, to boast a new powerful 24-way processor. With all of this, the price/performance is equal to, or better than, the AS/400e 7XX servers.

I/O enhancements include:

- A new Integrated xSeries Server for iSeries (formerly known as Integrated Netfinity Server)
- 1 Gbps high-speed Ethernet LAN adapter
- 100 Mbps high-speed Token-Ring adapter
- External CD-ROM device
- V.90 integrated modem in the base system

The new technologies behind the iSeries 400 Models 270 and 8xx expand the range for processor power, main storage, DASD storage, and communications speeds far beyond the current range of scalability—to extreme scalability. With this expanded range of scalability, you have the power and flexibility to integrate a variety of modern computing environments, from core business to e-business, in a very cost effective way, without concern for limits within a single server. The broad range of hardware migration support protects the investments you have with the iSeries 400 and AS/400e.

With continuing support for the bread and butter programming languages, new technologies are embraced, such as Java, business intelligence, Domino, and e-business enabler software. Integrate new applications on a single system as well as on multiple systems with the iSeries 400 8xx models.

The new AS/400e model 250 and iSeries 400 Models 270 and 8xx, including updated Dedicated Servers for Domino, enable you to minimize your costs for specific purpose application environments, such as Domino for AS/400, multiple “Application Service Provider” environments, or a mixture of multiple applications. Using Domino for AS/400 as an example, you can run Domino alongside existing applications or on processors uniquely tuned for Domino workloads.

The new V4R5 hardware completes the transition to PCI I/O architecture with the introduction of PCI architecture in all iSeries 400 270 and 8XX models. This change enables Hot-Plug PCI, to add, remove, and replace hardware without taking the server down on all 8xx and some 270 models. “Hot plugging” is made possible by power control to individual card slots.

© Copyright IBM Corp. 2000

PCI IOPs or IOAs can be added, removed, and replaced while the system remains active. In most cases, IOA configurations can be changed while other IOAs on the same IOP remain operational.

Flexible placement rules for IOPs and IOAs allow you to customize your system for performance, capacity, availability, or logical partitions.

Serviceability enhancements include extended problem determination for TCP/IP and a GUI interface in Operations Navigator for DASD management functions. The GUI interface offers both observation and maintenance of the disk and ASP configuration. Wizards are available to add and replace units, and view up to 2000 disk units in a customizable, scalable manner. Management Central offers an extensive suite of performance metrics to pinpoint details of system performance. Publications are available in PDF format for improved printing.

This Handbook provides an overview of both the hardware and software for the newly refreshed AS/400e and iSeries 400 models. This includes the 9406 250, 270, 820, 830, 840, SB2, and SB3 models. OS/400 V4R5 operating software supports these models.

This *iSeries Handbook* is designed to answer first-level questions that IBM employees, Business Partners, and customers ask about the iSeries server. For a greater depth of information than what is provided here, consult the companion manual *iSeries and AS400e System Builder*, SG24-2155, and your IBM sales representative. Also refer to the IBM online publications and systems, such as ViewBlue and PartnerInfo (or their equivalent outside of the United States).

Withdrawn Products

When products and features are withdrawn from marketing, they are removed from the *iSeries Handbook*. Information on all iSeries 400 and AS/400e products and features may be found by referencing IBM online systems. You may also reference some previous versions of the Handbook in the Online Library on the Web at: `http://as400bks.rochester.ibm.com/`

The products and features shown in the following table are not represented in this twenty-first edition of the Handbook because they *are now withdrawn* from marketing or will be in the near future. In some cases, the product to replace the given product is listed with the description.

Product or Feature	Description	Withdrawal Date
#0018	2440-xxx Local Source Rack Mount	06/30/2000
#0059	Transition Data Link	06/30/2000

Product or Feature	Description	Withdrawal Date
#0059	9401 model 150 Transition Data Link	05/31/2000
#0029	9347-xx Lcl Src Rack Mount	10/31//2000
#0034	Red Covers	10/31/2000
#0086	Optimize 3590 Performance	05/31/1999
#0185	Performance Enhancement Model 150	10/31/2000
#0200	Replacing the Release	05/31/1999
#0201	Unload/Reload	05/31/1999
#0202	Staged Upgrade Offering	05/31/1999
#0204	Staged Side-by-Side Upgrade	05/31/1999
#0295	Performance Enhancement/28WS	10/31/2000
#0336	V.36/EIA449 50-ft Cable	06/30/2000
#0337	V.36/EIA449 150-ft Cable	06/30/2000
#0340	V.35 80-ft Cable	06/30/2000
#0355	V.35 80-ft PCI Cable	06/30/2000
#0358	V.36 150-ft PCI Cable	06/30/2000
#0399	4 Port Twinaxial Expansion	06/30/2000
#0399	9401 Model 150 4 port Twinaxial Expansion	05/31/2000
#0451	RRR Preload (Test Server)	05/31/1999
#0490	Preload Baan for 9406 Model SB1	02/31/2000
#0591	Entry Twinaxial Package V4R4 (type 9401)	10/31/2000
#0592	Growth Twinaxial Package V4R4 (type 9401)	10/31/2000
#593	Entry Server Package V4R4 (type 9401)	10/31/2000
#0594	Growth Server Package V4R4 (type 9401)	10/31/2000
#1312	1-Byte 1.03 GB Disk Unit Kit	10/31/2000
#1313	1-Byte 1.96 GB Disk Unit Kit	10/31/2000
#1322	2-Byte 1.03 GB Disk Unit Kit	10/31/2000
#1323	2-Byte 1.96 GB Disk Unit Kit	10/31/2000
#1325	2-Byte 1.03 GB Disk Unit Kit	10/31/2000

Product or Feature	Description	Withdrawal Date
#1326	2-Byte 1.96 GB Disk Unit Kit	10/31/2000
#1327	2-Byte 4.19 GB Disk Unit Kit	10/31/2000
#1333	2-Byte 8.58 GB Disk Unit Kit	10/31/2000
#1334	2-Byte 17.54 GB Disk Unit Kit	10/31/2000
#1336	2-Byte 1.96 GB Disk Unit Kit	10/31/2000
#1337	2-Byte 4.19 GB Disk Unit Kit	10/31/2000
#1349	1.2 GB 1/4-inch Tape Kit	10/31/2000
#1350	2.5 GB 1/4-inch Tape Kit	10/31/2000
#1355	13.0 GB 1/4-inch Tape Kit	10/31/2000
#1360	7.0 GB 8mm Cartridge Tape Kit	10/31/2000
#2159	9406 170 Processor	02/2000
#2310	Model SB1 8-Way Processor	29/12/2000
#2311	Model SB1 128-Way Processor	29/12/2000
#2312	Model SB1 8-Way Processor	29/12/2000
#2313	Model SB1 12-Way Processor	29/12/2000
#2605	ISDN Basic Rate Adapter	12/31/1999
#2609	EIA 232/V.24 Two-Line Adapter	03/31/1999
#2610	X.21 Two-Line Adapter	03/31/1999
#2612	EIA 232/V.24 One-Line Adapter	03/31/1999
#2613	V.35 One-Line Adapter	03/31/1999
#2614	X.21 One-Line Adapter	03/31/1999
#2617	Ethernet/IEEE 802.3 CMSA/CD Adapter	03/31/1999
#2619	16/4 Mbps Token-Ring Adapter/HP	03/31/1999
#2620	Cryptographic Processor	12/31/1999
#2621	Removable Media Device Attach	06/30/2000
#2623	Six Line Communications Controller	12/31/1999
#2628	Limited Cryptographic Processor	12/31/1999
#2644	34xx Magnetic Tape Attachment	03/31/1999

Product or Feature	Description	Withdrawal Date
#2664	Integrated Fax adapter	12/31/1999
#2668	Wireless LAN Adapter	08/31/1998
#2673	Optical Bus Adapter	06/30/2000
#2674	Optical Bus Adapter	06/30/2000
#2721	PCI Two-Line WAN IOA	10/31/2000
#2726	PCI RAID Disk Unit Controller	06/30/2000
#2811	PCI 25 Mbps UTP ATM IOA	05/31/1999
#2812	PCI 45 Mbps Coax T3/DS3 ATM IOA	05/31/1999
#2819	PCI 34 Mbps Coax E3 ATM IOA	05/31/1999
#2850	Integrated PC Server 32MB	03/31/1999
#2851	Integrated PC Server	03/31/1999
#2852	PCI Integrated PC Server	06/30/2000
#2854	PCI Integrated PC Server	05/31/1999
#2857	PCI Integrated PC Server (Model 170 only)	05/31/1999
#2858	FSIOA 128 MB Memory, Keyboard and Mouse	06/30/2000
#2860	Integrated PC Server Memory	03/31/1999
#2868	PCI Integrated Netfiinity (R) Server (type 9401)	10/31/2000
#3103	32 MB Main Storage	03/31/1999
#3104	64 MB Main Storage	03/31/1999
#3117	8 MB Main Storage	03/31/1999
#3118	16 MB Main Storage	03/31/1999
#3120	8 MB Main Storage	03/31/1999
#3121	8 MB Main Storage	03/31/1999
#3122	32 MB Main Storage	03/31/1999
#3133	64 MB Main Storage	03/31/1999
#3134	128 MB Main Storage	03/31/1999
#3135	256 MB Main Storage	03/31/1999
#3136	256 MB Main Storage	03/31/1999

Product or Feature	Description	Withdrawal Date
#3138	64 MB Main Storage	03/31/1999
#3144	8 MB Main Storage	03/31/1999
#3145	16 MB Main Storage	03/31/1999
#3146	32 MB Main Storage	03/31/1999
#3147	32 MB Main Storage	03/31/1999
#3149	128 MB Main Storage	03/31/1999
#3172	32 MB Main Storage (2 SIMMS)	03/31/1999
#3520	OS/400 V3R2 and its associated 5763-xxx programs	02/25/2000
#4308	4.19 GB Disk Unit	12/29/2000
#4800	PCI Crypto Coprocessor	12/29/2000
#5023	OS/400 V4R1	05/31/1999
#5024	OS/400 V4R2 and its associated 5769-xxx programs - replacement product is V4R3, V4R4, or V4R5 level of same program	02/25/2000
#5025	OS/400 V4R3 and its associated 5769-xxx programs - replacement product is V4R4 or V4R5 level of same program	12/29/2000
#5043	Convert Primary Rack to Secondary Rack	03/31/1999
#5044	System Unit Expansion Rack	03/31/1999
#5051	8 Disk Unit Expansion	06/30/2000
#5070	266 Mbps System Unit Expansion Tower	06/30/2000
#5080	266 Mbps System Unit Expansion Tower	06/30/2000
#5082	1063 Mbps Storage Expansion Tower	06/30/2000
#5135	Feature Power Supply	06/30/2000
#5518	Alt IPL Spec 13 GB Tape	10/31/2000
#5543	Sys Console on Comm	12/29/2000
#6141	ASCII Workstation Controller	03/31/1999
#6142	ASCII 12-Port Workstation Expansion	03/31/1999
#6148	Eight-Port Twinaxial Expansion	06/30/2000
#6380	2.5 GB ¼-Inch Cartridge Tape	06/30/2000
#6381	2.5 GB ¼-Inch Cartridge Tape	12/29/2000

Product or Feature	Description	Withdrawal Date
#6385	13 GB ¼-Inch Cartridge Tape	05/31/2000
#6481	2.5 GB ¼-Inch Cartridge Tape	12/29/2000
#6485	13 GB ¼-Inch Cartridge Tape	05/31/2000
#6512	Disk Unit Controller for RAID	06/30/2000
#6522	Disk Unit Controller for RAID	06/30/2000
#6523	Storage Device Controller	06/30/2000
#6530	DASD Controller	03/31/1999
#6532	RAID Disk Unit Controller	06/30/2000
#6607	4.19 GB Disk Unit	12/29/2000
#6616	Integrated PC Server	03/31/1999
#6617	Integrated PC Server	05/31/1999
#6807	4.19 GB Disk Unit	12/29/2000
#6907	4.19 GB Disk Unit	12/29/2000
#7000	Panel Keylock	06/30/2000
#7108	Expansion Gate	06/30/2000
#7117	Integrated Expansion Unit	06/30/2000
#9240	Base 400 W Power Supply	06/30/2000
#9243	400 W Power Supply	06/30/2000
#9244	Expansion Unit 320 W Power Supply	06/30/2000
#9245	Base Battery Backup	06/30/2000
#9721	Base PCI Two-Line WAN IOA	10/31/2000
#9751	Base MFIOP with RAID (Models 640, 650, S30, S40, SB1)	05/31/1999
#9853	20.0 Meter Optical Bus Cbl	10/31/2000
#9907	Base 4.19 GB Disk Unit	12/29/2000
5716-SSP	Advanced 36 Release 7.5 programs	04/28/2000
5769-FW1	5769-FW1 Firewall: All releases	12/29/2000
5769-XY1	Client Access Family 5769-XY1: All releases	02/25/2000
9347	Tape Drive, local source rack mount	10/31/2000

Product or Feature	Description	Withdrawal Date
9401 Model 150	System and features - Replacement product is the 9406 - 250	10/31/2000
9401 Model 150	V4R1 and V4R2 9401-150 packages	12/31/1999
9402 Model 236	Model upgrades from Model 236 to Model 436	02/25/2000
9402 Model 436	Processor upgrades within the Model 436	02/25/2000
9406 Model 170	V4R2 Processor features on new systems: #2160, #2164, #2176, and #2183	02/25/2000
9406 Model 4xx	Model upgrades from 4xx to 7xx	06/30/2000
9406 Model 5xx	Model upgrades from 5xx to 7xx	06/30/2000
9406 Model 6xx	9406 600, 620, 640, and 650. See “Summary of All Earlier AS/400 and AS/400e Models” on page 747, for basic information on these models.	05/31/1999
9406 Model 6xx	Model upgrades from 6xx to 6xx and processor feature conversions within 6xx	05/31/2000
9406 Model SB1	System - Replacement product is the 9406 - SB2 or 9406 - SB3	12/29/2000
9406 Model Sxx	9406 S10, S20, S30, S40. See “Summary of All Earlier AS/400 and AS/400e Models” on page 747 for basic information on these models.	05/31/1999
9406 Model Sxx	Model upgrades from Sxx to Sxx and processor feature conversions within Sxx	05/31/2000
2480	Wireless LAN Access Point (2480-RS0)	01/13/1999
2480	Wireless LAN Access Point (2480-E00, -EB0, -TR0, -TB0)	05/24/1999
2482	PTC	05/24/1999
2483	Integrated Laser PTC	05/24/1999
2484	Industrial PTC	05/24/1999
2486	Integrated Laser PTC	05/24/1999
4330 - 4IZ	Printer - Replacement product is the 4230 - 4I3	10/31/2000
5308	ASCII to 5250 Connection	12/21/1999
5494	Remote Control Unit	12/21/1999
5500	Express IP Control Unit	12/21/1999
6299	Midrange Hub	09/01/1999
6546-0AZ	Monitor	07/25/2000
7133	IBM 7133 SSA Disk Subsystem Model 010	05/05/1997

Product or Feature	Description	Withdrawal Date
7133	IBM 7133 SSA Disk Subsystem Model 020	06/16/1999
8361 -100	Network Station series 100 Ethernet	10/14/1999
8361 - 200	Network Station series 100 Token-Ring	10/14/1999
8361 - 210	Network Station series 300 Token-Ring	12/31/1999
8361 - 341	Network Station series 300 Twinax	12/31/1999
9347	Local Source Rack Mount	10/31/2000
9348	Magnetic Tape Unit	02/26/1999

Communications (WAN) Functions No Longer Supported

The following functions are no longer supported on current iSeries 400 and AS/400e product line WAN hardware (such as the #2609 EIA 232/V.24 Two Line Adapter, the #2610 X.21 Two Line Adapter and other, older adapters). They are not supported on the #2720 PCI WAN/Twinaxial IOA, the #2721 or #2745 PCI Two-Line WAN IOA, the #2699 Two-Line WAN IOA, or the #9771 Base PCI 2-Line WAN with Modem.

- X.21 switched interface (X.21 leased support)
- X.21 Shorthold mode
- V.25 2 port autocall. This is the protocol used to auto dial on switched connections using modems that require a second port dedicated to the dial function. Do not confuse this with V.25bis, which is the current day autocall protocol that sends dial commands over the same port used for data. V.25 bis itself is supported.
- Asynchronous communication speeds of less than 300 bps.
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some, older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loopback (diagnostic functions supported by some modems).

iSeries 400 Technology in Stride

The iSeries 400 server delivers tremendous capacity growth in its product line. The iSeries 400 Layer (also known as Technology Independent Machine Interface (TIMI)) has made it possible to completely change the underlying hardware with minimum, if any, impact to

iSeries 400 applications. TIMI helps condition the iSeries 400 to bring new technology to market.

The first AS/400e models based on the 64-bit RISC PowerPC AS processors were announced in June 1995. The ease with which customers have migrated to these powerful systems is a testimony to the fundamental strength of the server's architecture.

In 1997, the 12-way AS/400e system was delivered using Power PCA35 microprocessors. Known as Apache technology, the Power PCA35 microprocessors provided a 4.6x growth.

In September 1998, the 12-way AS/400e system was delivered using the Power PCA50 microprocessor. Known as code name Northstar, the Power PCA50 microprocessors nearly doubled the high-end capacity. This set of processors provided the fourth generation since the AS/400 system's inception in 1988 with 64-bit AS/400 Power PCs microprocessors.

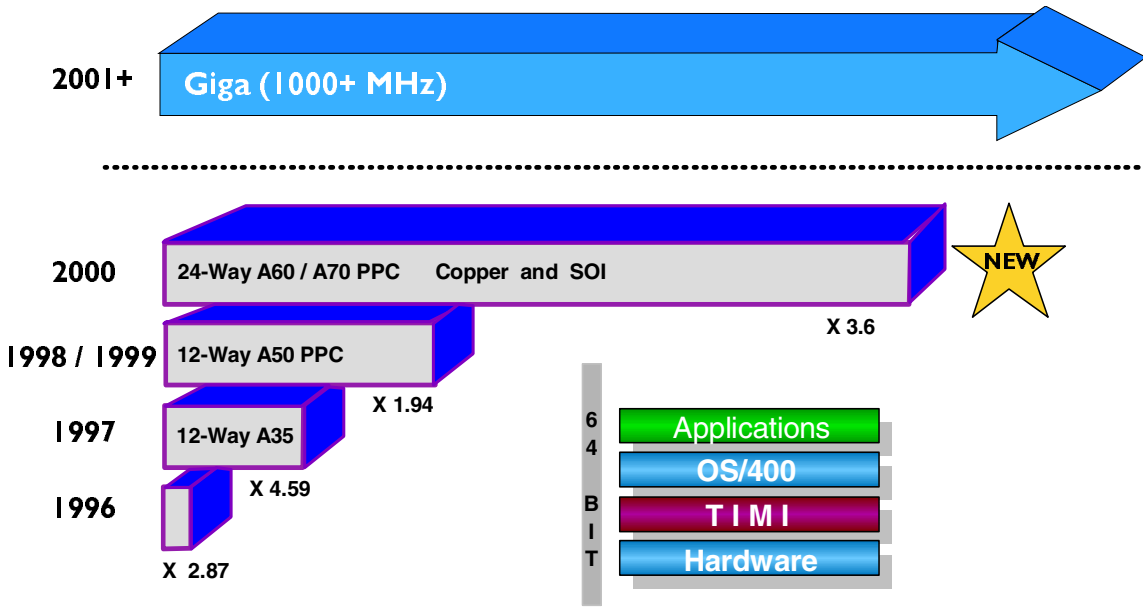
Again in 2000, the iSeries 400 is leading the industry by delivering the first server with the new "Silicon-on-Insulator" (SOI) technology. SOI represents a fundamental advance in the way chips are built. IBM's unique SOI process alters the design of transistors, essentially "turbo charging" them so they run faster and use less power. For example, a microprocessor designed to operate at a given speed can instead be built using SOI technology to achieve higher speeds. At the same time, if performance levels are held constant, SOI chips can require as little as one-third the power of today's microchips. Silicon on Insulator is technology used by the ISTAR processors, the transistors are built within and on top of a thin layer of silicon that is on top of an insulating layer. The insulating layer is fabricated by implanting a thin layer of oxide beneath the primary silicon surface of the wafer.

PULSAR and ISTAR processors use on-chip copper-wiring technology. The PULSAR processors integrate IBM CMOS7S technology. ISTAR processors integrate CMOS8S technology. Previously, Northstar technology used aluminum for on-chip wiring. Copper's better conductivity permits thinner wires to be used, which enables the transistors to be packed closer together. The denser new technology permits additional micro-architecture methods to improve performance.

Keeping multiple levels of high speed cache is still necessary to keep the processors busy. Denser processor technology permits more on-chip cache. All this new technology is implemented on the new iSeries 400 servers.

This growth and implementation of new technology is possible because of the iSeries 400 TIMI layer. TIMI allows the system to incorporate significant new hardware technology quickly and transparently.

The following figure shows this change of hardware processor technology and previews what is planned in future generations. More details can be found in "Logical Partitioning, Divide and Conquer", by IBM Chief Engineer Frank G. Soltis, in the January 1999 edition (#224) of *News400*.


2001+
Giga (1000+ MHz)
2000
24-Way A60 / A70 PPC Copper and SOI
NEW
X 3.6
1998 / 1999
12-Way A50 PPC
X 1.94
1997
12-Way A35
X 4.59
1996
X 2.87
64 BIT
Applications
OS/400
T I M I
Hardware

Concepts and Architecture

Concepts and Architecture

iSeries 400 Architecture: Underlying Strength of the iSeries

With over 650,000 systems shipped worldwide, the iSeries 400 and AS/400e systems have the highest customer satisfaction index in the industry, as measured by IBM internal studies. Eleven major factors contributing to this include:

- Was the first system to deliver 16 Mb and 64 Mb memory cards.
- Offers state-of-the-art 64-bit relational database processing.
- Leads the industry to deliver the first server with Silicon on Insulator (SOI) technology.
- Allows the deployment of Java, UNIX ported applications, Windows 2000, and Domino-based applications on a single server.
- Directly (natively) supports different file structures, such as PC files, UNIX files, NetWare files, Domino files, ASCII files, and EBCDIC files.
- Can ship with over 200 processor chips under the covers of a “single” large system.
- Can have 16 Windows NT servers in a single system while sharing the host systems disk storage, tape, and CD-ROM resources.
- Its object-based design makes it highly virus resistant.
- Has proven it can deliver over 99.9% availability.
- Its operating system can operate for more than one year without ever requiring a re-IPL, in hundreds of customer shops.
- Delivers vector coded indexes for Business Intelligence applications offering up to ten times the improvement in performance.

Why should the system architecture matter to a business person? This section helps you understand why.

Business leaders do not start by choosing a computer system. They start by choosing an application to fit their business needs. The iSeries 400 and AS/400e have tens of thousands of good business applications worldwide. Because of that, very often the computer system is considered first.

If you compared an application running on an iSeries 400 server to the same application running on a non-iSeries server, you would continue to choose the iSeries 400. Why? Because, although two systems can appear to be equivalent today, the accelerating rate of change of both hardware and software technologies necessitates that the system you select has been designed with the future in mind. The iSeries 400 accommodates inevitable, rapid, and dramatic technology changes with minimum relative effort.

© Copyright IBM Corp. 2000

Paradoxically, the characteristic of the most advanced design and technology is that you do not notice it... you are not meant to do so. It accommodates rapidly-changing hardware and software technologies in stride—permitting you to fully exploit the latest technologies.

Ask any system manufacturer: *What is future-oriented in the system? Does recovering from a failure typically involve a re-start of the hardware and operating system? What has your record been in the past few years as technologies have changed?* We believe the IBM iSeries 400 will be your number one choice.

System Concepts

The iSeries 400 and AS/400e servers are designed and built as a *total system*, fully integrating all the hardware and system software components that a business demands. As a general-purpose business and network system, it is optimized for the required environment with these unique benefits:

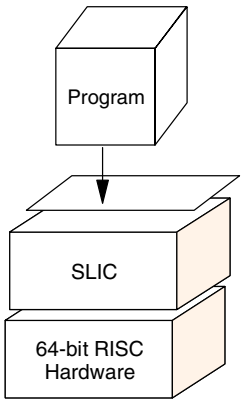
- The iSeries 400 architecture is a brilliant, technology-neutral architecture, enabling businesses to readily exploit the latest hardware and software technologies, typically without causing disruption to existing application software. iSeries 400 architecture is described in “iSeries 400 Architecture” on page 17.
- The single purpose pervading each aspect of the iSeries 400 system's architecture is to *empower a business* with the most advanced technology available, *without encumbering it* with the complexities that such technologies inevitably contain. In other words, the iSeries 400 and AS/400e allow you to rapidly deploy advanced business applications and facilitates your business growth.
- Customers typically decide on required application software first and then select an environment in which to run it. The iSeries 400 and AS/400e models have tens of thousands of business applications worldwide of which thousands are client/server applications. These applications are written by thousands of IBM Business Partners across the globe. In addition, the iSeries and AS/400e provide excellent platforms for Windows NT and Lotus Domino applications. iSeries 400 and AS/400e models have national language support for over 50 languages and is available in 140 countries. Support across the world is provided by an impressive network of global partners.

A concise and expanded explanation of the AS/400e system architecture is contained in a renowned book *Inside the AS/400,* written by the AS/400 system's Chief Architect, Dr. Frank G. Soltis.

iSeries 400 Architecture

Technology-Independent Machine Interface

The iSeries 400 and AS/400e models are atypical in that they are defined by software, not by hardware. In other words, when a program presents instructions to the machine interface for execution, it “thinks” that the interface is the system hardware. But it is not! The instructions presented to that interface pass through a layer of microcode before they are “understood” by the hardware itself. This comprehensive design insulates application programs and their users from changing hardware characteristics. When a different hardware technology is deployed, IBM rewrites sections of the microcode to absorb the fluctuations in hardware characteristics. As a result, the interface presented to the customer *remains the same*.



This interface is known as the iSeries 400 Layer, or Technology-Independent Machine Interface (TIMI). The microcode layer is known as the System Licensed Internal Code (SLIC). The brilliance of this design was dramatically illustrated when the AS/400 system changed its processor technology from Complex Instruction Set Computing (CISC) processors to 64-bit Reduced Instruction Set Computing (RISC) processors in 1995. With any other system, the move from CISC to RISC would involve recompiling (and possibly some rewriting) of programs. Even then, the programs would run in 32-bit mode on the newer 64-bit hardware. This is not so with the iSeries 400 or AS/400e system because of TIMI. Customers were able to *save* programs off their CISC AS/400 systems, *restore* them on their RISC AS/400e models, and *the programs run*. Not only do they run, but they are fully 64-bit programs.

As soon as they made this transition, customers had *64-bit application programs* that ran on a *64-bit operating system* containing a *64-bit relational database* that fully exploited the *64-bit RISC hardware*. TIMI and SLIC take 64-bit RISC processor technology in stride. These same architectural features will be exploited to fully accommodate post-RISC technologies, which may have 96-bit or 128-bit processors.

Many of the frequently-executed routines have been moved to the SLIC. On a customary system, these routines reside in the operating system. Because the SLIC is closer to the silicon, routines placed there run faster than routines placed “higher” in the machine. There is a valuable performance gain. Supervisory resource management functions in SLIC include validity and authorization checks.

V4R5 New Technologies

V4R5 incorporates several new technologies, including Silicon on Insulator (SOI), copper wiring and High Speed Links. Each is discussed in the following sections.

SOI

The Silicon on Insulator (SOI) technology was applied for the first time for the iSeries 400 with OS/400 V4R5. This technology is used by the ISTAR processors of the iSeries 400. The transistors are built within and on top of a thin layer of silicon that is on top of an insulating layer. The insulating layer is fabricated by implanting a thin layer of oxide beneath the primary silicon surface of the wafer.

On-Chip Copper-Wiring Technology

PULSAR and ISTAR processors use on-chip copper-wiring technology. PULSAR processors integrate IBM CMOS7S technology. ISTAR processors integrate IBM CMOS8S technology. Northstar technology used in prior AS/400e processors deploys aluminum for on-chip wiring.

Copper's better conductivity permits thinner wires to be used, which enables the transistors to be packed closer together. This new denser technology permits additional micro architecture methods to improve performance. Denser processor technology also permits more on-chip cache. Keeping multiple levels of high speed cache is necessary to keep the processors busy.

High Speed Links (HSL)

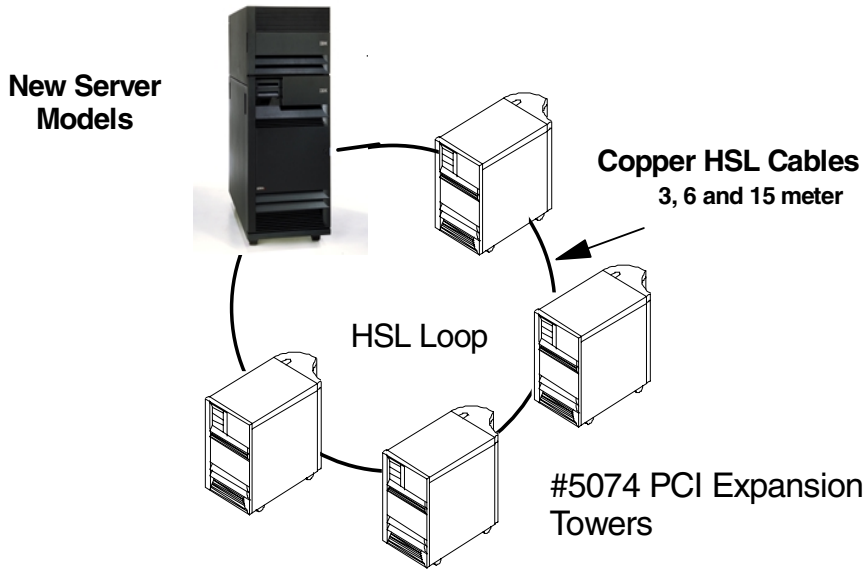
A new bus structure using High Speed Links (HSL) has been created to provide a faster data transportation mechanism for the iSeries 270 and 8XX models supported by OS/400 V4R5. These new systems have faster processors, more on-chip cache, a faster memory bus, a super fast cross-bar switch complex (with speeds up to 36 GB per second), faster DASD, and much faster IOPs and IOAs. This structure is shown in the hierarchy of processors diagram on page 21.

This new bus structure provides:

- Performance enhancement and future system growth
  - 1 GB/sec technology
  - 700 MB/sec maximum deliverable capacity running full duplex

- Simplified implementation
  - Loop technology for redundancy
  - Multiple towers per loop
  - 3m, 6m, 15m copper HSL cables
  - Migration tower attachment supports SPD I/O towers and PCI expansion Towers (#5065/#5066)

The I/O connectivity of loops is shown in the following figure.



V4R5 I/O Connectivity

HSL at OS/400 V4R5 is implemented using copper interconnect cables. There are choices of three lengths: 3, 6, and 15 meters.

Note: The iSeries Model 270 does not support the 15m HSL cable. The Model 820 has limitations on which segments of the HSL loop can be 15m.

In system complexes that contain only V4R5 hardware, the HSL implementation consists of loops containing any expansion tower (#5074/#5075/#5079s). These HSL loops provide redundancy to all attached towers. In addition, the implementation of HSL and OS/400 provide data flow balancing across the loop by assigning communication paths during an IPL to optimize loop throughput based upon loop and tower configuration.

In system complexes that contain pre-V4R5 hardware, a migration tower is needed to interface to the existing SPD and PCI towers. The migration tower has the appropriate

number of #2695 SPD Optical Bus Adapters and #2688 Optical Link Processors to support the number of towers to be attached. This connection interface uses the existing SPD fiber cables. For further details, see the product sections within this Handbook or *AS/400e to iSeries 400 Migration*, SG24-6055.

Note: *AS/400e to iSeries 400 Migration*, SG24-6055, was available as a redpiece at the time this edition of the Handbook was published. The Migration redbook is scheduled for publication in the fourth quarter of 2000.

Operating System OS/400

One of the single most dramatic points about the iSeries 400 and AS/400e system is that the operating system, OS/400, is a single entity. This section describes the meaning of this concept.

Once you buy an iSeries 400 or AS/400e server, you do not have to continue shopping for system software components before it is ready to run your business. All of the software components for a relational database, comprehensive security, communications with a broad range of diverse systems, including Internet capabilities, and many more are already there in the operating system. They are all fully integrated into OS/400. By “fully integrated”, we mean fully tested, too. All components and prerequisites for running business applications in the 2000s, work together and are fully tested together. OS/400 operates as a single entity.

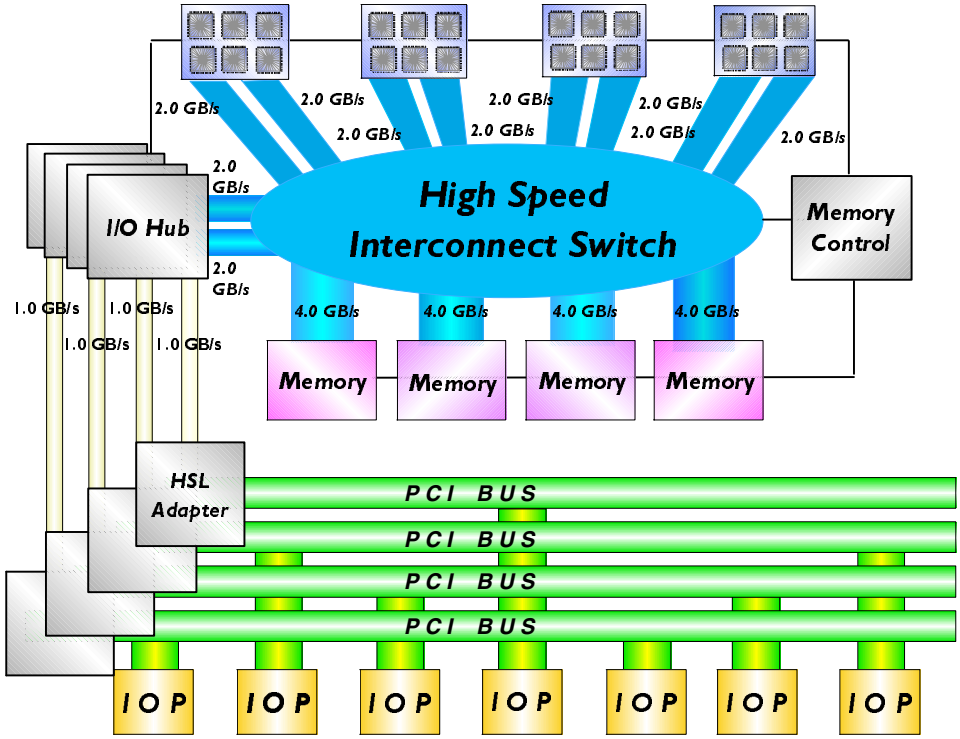
A customary machine does not have this approach to its operating system design. A customary operating system, which does the basic system housekeeping, needs to have a range of software products added to it before the environment is ready to support modern business applications. Examples of this are: software for the relational database, support for various communications environments, software for security, support for an interactive environment, for multimedia, for availability, recover ability, and so on. On a customary machine, many of these software modules are provided by third parties. A customer has to assure that someone integrate all these modules and performs the tests necessary to verify that they all function together. When one of the software components has a new release, a customer needs to again ensure that component is replaced, plus any other software modules on which it depends. The modules need to be at compatible release levels. Also, should a software malfunction occur, how do you establish precisely which modules are causing it? Can you be certain that multiple third-party software vendors will agree with your diagnosis when you blame their software?

There are none of these problems with OS/400. To achieve the functionality that is standard in OS/400, a customer would need to integrate typically between 10 and 25 different modules of software. OS/400 is installed with all these capabilities as standard. When software is updated, a new release of OS/400 is made available. OS/400 customers do not have to install individual system software components, nor do they have to check that new releases can co-exist.

More details on OS/400 are provided in “Operating System/400, 5769-SS1” on page 477.

Hierarchy of Microprocessors

The following figure shows that the iSeries 400 has a range of other processors, along with its main system processor, dedicated to a particular input/output (I/O) device type. A single large iSeries 400 configuration can have well over 200 processors.



The main system processor complex (which itself can be comprised of 24 separate processors) can encounter a request for data to be read from or written to any I/O device. That request for data is delegated to the particular microprocessor dedicated to that I/O device. Meanwhile, the main system processor continues executing another application program. Nanoseconds (10^{-9} second) is the unit of time used to measure main storage access times. I/O operations are measured in milliseconds (10^{-3} second).

The previous figure shows a high-level overview of the structure of the 840 model. Central in the figure is the extremely high speed memory-processor-I/O interconnect switch at 36 GB/sec. This allows for data transfers between components connected to the switch to proceed at a very high rate. Separate connections to the switch are provided for each group of six processors, each of four banks of memory, and two connections for I/O traffic. These

independent paths result in much superior performance than previous designs with a single common shared memory bus path, for which all components contended.

With the new design, there are many paths to the high speed switch which can operate separately. Its high bandwidth characteristics allow for connecting source and destination quickly and efficiently to allow for significant benefit in overall processor speed and system performance enhancement. This design provides the iSeries and AS/400e with their outstanding performance in the commercial, transaction-based environment.

The iSeries and AS/400e servers are designed for business computing. One of the main characteristics of that environment is that it is I/O-intensive, rather than compute-intensive. In addition to outstanding performance in the business environment, this design gives the iSeries 400 and AS/40e an elegant method of integrating diverse environments into a single, harmonious customer solution. The microprocessors that look after a particular I/O device are accommodated on I/O cards that fit into slots on the system buses. One of these cards may be the Integrated xSeries Server for iSeries. This is a PC on a card, which enables the iSeries to run a Windows NT server, for example.

Single-Level Storage

Application programs on an iSeries 400 or AS/400e server are unaware of the underlying hardware characteristics, because of the iSeries 400 Layer (or TIMI) (See “Technology-Independent Machine Interface” on page 17). They are also unaware of the characteristics of any storage devices on the system because of single-level storage.

As with TIMI, the concept of single-level storage means that the knowledge of the underlying characteristics of hardware devices (in this case, main storage and disk storage) reside in the SLIC. As a result, all of the storage is automatically managed by the system. Programs work with objects (see “Object-Based” on page 26). Objects are accessed by name, not by address. No user intervention is ever needed to take full advantage of any storage technology.

The iSeries 400 and AS/400e server address size is vast. iSeries 400 and AS/400e models can address the number of bytes that 64 bits allows it to address. The value 2^{64} is equal to 18,446,744,073,709,551,616. Therefore, the iSeries and AS/400e models can address 18,446,744,073,709,551,616 bytes, or 18.4 quintillion bytes. To put this into more meaningful terms, it is twice the number of millimeters in a light-year. Light travels approximately 6,000,000,000,000 miles in one year.

Single-level storage also enables another extremely important iSeries 400 and AS/400e benefit, *object persistence*. Object persistence means that the object continues to exist in single-level storage (unless purposely deleted by the customer). Memory access is extremely fast. A customary machine requires that information be stored in a separate file system if the information is to be shared or retained for a long time.

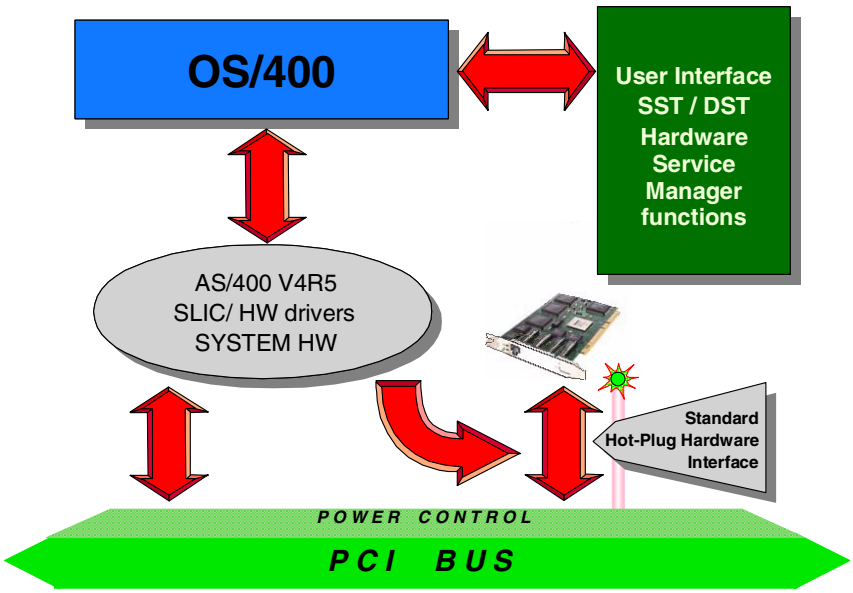
Persistence of objects is extremely important for future support of object-oriented databases. Objects need to continue to exist even after their creator goes away. The iSeries 400 and AS/400e models are uniquely positioned to exploit this characteristic of object persistence, where customary systems use a less-elegant mechanism that requires them to store their persistent objects in a separate file system, with all the attendant performance implications.

Hot-plugging

The term “hot-plug PCI” is used by the computing industry for a wide range of purposes. Primarily, hot-plug PCI refers to the technology that allows users to install and remove PCI devices while the computer is running.

A method must be in place to inform the operating system of insertion and removal events. Driven by the demand for the highest possible availability, PCI hot-plugging is available on the new iSeries 400 models with V4R5 on all 8xx and some of the 270 models. A brief description of how hot-plug is implemented on the iSeries 400 follows.

Hot-plugging in the iSeries 400 is made possible by power control to individual card slots, so that PCI IOPs or IOAs can be added, removed, or replaced while the system remains active. In most cases, IOA configurations can be changed while other IOAs on the same IOP remain operational. Hot-plug implementation for the iSeries 400 for OS/400 V4R5 is illustrated in the following figure.



In V4R5, the interface for hot-plugging actions uses the Hardware Service Manager in the System Service Tools, or a subset of Dedicated Service Tools (depending on which tool you

have started). In limited paging environment, Dedicated Service Tools communicates directly with V4R5 System Licensed Internal Code (SLIC).

Conventional SLIC and hardware control power and bus connections on the PCI slots. In V4R5, certain hot-plug iSeries 400 SLIC and hardware communicate with the Standard PCI hot-plug interface signals.

To briefly describe the events that take place, we use the previous figure to illustrate a reasonable sequence.

Using the hot-plug interface, you first identify a PCI slot. This is accomplished by a function (flow through OS/400-SLIC-HW) that makes the LED indicator that is associated with this slot blink. When the slot is physically identified, the interface allows the slot to isolate from the PCI bus and power it down. Hardware signals through SLIC and the operating system, to the hot-plug user interface, that the slot is powered off and it is now safe to remove or insert a card in this slot. At the same time, it turns off the LED indicator associated with the slot to indicate that the power is turned off.

After a card is inserted in the slot, the user notifies the system to turn the power on for this slot using the hot-plug user interface. SLIC then signals the standard hot-plug interface to power on the slot and connect it to the PCI bus. At the same time, it turns on the slot LED indicator. Through the hot-plug user interface, the user initiates the start of SLIC functions to initialize the card and prepare it for use by the operating system, including necessary resource management functions. Once an operational resource is made available by the operating system, conventional operating tasks can resume.

Hot plug adapters do not auto-configure. Redundant power and cooling fans do auto-configure. However, they are not recognized as redundant until a cold start is performed with the system. Instructions for installing hot plug adapters are found in the iSeries 400 Technical Studio located on the Web at: `http:/www.ibm.com/eserver/iseries/tstudio/`

Important

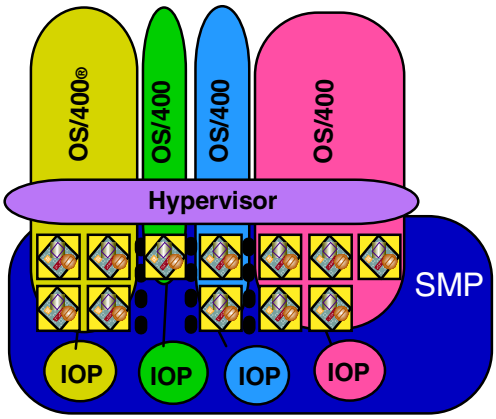
Always remember this general statement concerning hot-plugging: inserting or removing a PCI card without following the correct sequence of the procedures can lead to unpredictable results. This includes data corruption, abnormal termination of the operating system, and damage to the cards or other AS/400 hardware.

Logical Partitioning (LPAR)

As the performance of an enterprise class server grows, the requirement also grows to distribute that performance to run multiple workloads independently. Partitioning enterprise servers has become commonplace in the mainframe market since its introduction in the

mid-1980s. Typically, separate partitions are used for test releases of applications or to service multiple business units or companies from a single server.

The iSeries and AS/400e logical partition implementation introduces both the flexibility to allocate interactive performance and high-speed internal communications between partitions. The iSeries 400 and AS/400e LPAR implementation is an adaptation of the S/390 logical partitions concept with flexible and granular allocation of system resources.



Logical partitions (LPAR) enable multiple independent OS/400 instances or partitions in an n-way symmetric multiprocessing iSeries 8xx and AS/400e 7xx, 6xx, and Sxx. Each partition requires its own processors, memory, disks, system console, and access to a CD-ROM or tape drive that can be allocated to each partition. With LPAR, you can address multiple system requirements in a single machine to achieve server consolidation, business unit consolidation, mixed production, and test environments, integrated clusters, and more.

All V4R5 systems have a primary partition, with all resources initially allocated to it. Creating and managing secondary partitions is performed from the primary partition. Movement of processors, memory, and interactive performance between partitions is achieved with only an IPL of the affected partitions. Movement of IOP resources is achieved without an IPL.

It is important to understand that a failure in the primary partition affects all of the logical partitions that are created. For example, if the primary partition is powered down, all of the secondary partitions are also powered down.

OS/400 is licensed once for the entire system by its normal processor group, regardless of the number of partitions. License management across partitions is supported in V4R5.

OS/400 V4R5 must be installed on each partition for 8xx models. Previous releases are not supported on any logical partition on 8xx models. Any combination of V4R5 and V4R4 is supported on partitions for the 7xx, 6xx, and Sxx AS/400e systems and servers.

The following Web site is available for LPAR installation support and technical guidance. When planning logical partitions for an iSeries 400 or AS/400e server, rely on this Web site for information, direction, and management tips: http://www.ibm.com/eserver/iseries/lpar/

Capacity Upgrade on Demand (CUoD)

iSeries Capacity Upgrade on Demand offers the capability to non-disruptively activate one or more additional central processors of specific models of iSeries Model 840. CUoD adds capacity in increments of one processor, up to the maximum number of ON DEMAND processors built into the Model 840. CUoD has significant value for installations who want to upgrade without disruption.

There are now three Processor on Demand (POD) features (#2416, #2417, or #2419) that each offer a number of *BASE processors* that are in “active” status and a set of *ON DEMAND processors* that are in “standby” status.

ON DEMAND processors (one or more) can be permanently activated by ordering the desired quantity of feature code #1604 (MES order). Ordering feature #1604 generates a POD Activation Code, which will be posted on a Web site and mailed. This activation code must then be entered at the server console. For further details, refer to the *Planning Guide for Capacity Upgrade On Demand* at http://www.ibm.com/eserver/iseries/ondemand

Object-Based

An object is a container. Everything the system uses—user and system data structures—is packaged in one of these containers. The objects are encapsulated, which means that you cannot see inside. Inseparable from an object is the list of valid ways in which that object can be used.

There are two important consequences of an object-based design. The first is that a system built around an object model supports machine independence. This means that technology changes can be made in the environment without affecting application programs. The second consequence is that an object-based design delivers a high level of system integrity and security.

All objects are structured with a common object header and a functional portion dependent on object type. Therefore, on the iSeries 400 and AS/400e servers, instructions can only work on what they are supposed to work. You cannot have data treated as executable code (so that the processor tries, for example, to execute someone's shoe size) or executable code treated as data (by having something written into the middle of it).

Certain instructions apply to all objects, while other instructions work only on specific types of objects. It is not possible to misuse an object, unlike the situation that exists non-AS/400 systems without an object-based approach.

Summary

The iSeries 400 and AS/400e servers offer a brilliant architecture that is not found on simply any business computing system. There are many examples of where the system architecture has delivered on its promise of making the most advanced technology readily and continuously available to its customers. For example, the iSeries 400 and AS/400e have enabled their customers to:

- Provide Internet access to existing iSeries 400 and AS/400e applications. Through a product known as HTML Gateway (which resides within OS/400), Internet users can access and run iSeries 400 and AS/400e applications.
- Integrate diverse environments (such as Microsoft Windows NT and Lotus Notes/Domino) into iSeries 400 or AS/400e. All customer solutions require a range of hardware and software products from a variety of vendors. The iSeries 400 and AS/400e, through integrating these mixed environments, simplify the task of managing them.
- Change to the on-chip copper-wiring processor technology or to Silicon on Insulator technology for the medium and high end servers.
- Implement PCI hot-plugging technology for higher availability, and use other performance boosting innovations such as the High Speed Link and new high speed LAN adapters.

The future-oriented architecture of the AS/400e system has enabled us to take rapidly-changing hardware and software technologies in our stride. This same, flexible architecture will continue on the iSeries 400 to deploy the very latest technologies, with the minimum disruption to work.

Workload and Performance

Workload and Performance

Workload and Performance

Workload and performance are critical considerations in selecting an iSeries 400 or AS/400e server. This chapter discusses some of the tools and factors to take into account, including workload ratings and processor positioning. Work station character streams are Detailed performance information can be found in *AS/400 Performance Capabilities Reference - Version 4, Release 5*, SC41-0607, which is found on the Web at:

- http://www.iseries.ibm.com/developer/performance/index.html
- http://www.ibm.com/eserver/iseries/library

For sizing recommendations, also consult with your IBM marketing representative and service provider.

Commercial Processing Workload

When the AS/400 system was announced in 1988, the Relative Performance Rating (RPR) or Relative System Performance (RSP) of different models was measured using a RAMP-C workload. This workload is representative of general commercial processing. RPR figures for AS/400 models have been expressed relative to the 9404 Model B10, which was the initial entry model for the AS/400 range in 1988. It had a RPR rating of 1.0.

The AS/400e product line continues to grow in power with the PowerPC RISC processors and 24- and 12-way processors. With the increased processing power and more applications using vital technologies, such as Web serving, client/server, and multimedia, the point was reached when RAMP-C was no longer a valid means for measuring relative performance. Therefore, RAMP-C was replaced by a workload measurement called Commercial Processing Workload (CPW) in the second half of 1996.

Relative performance measurements are derived from commercial processing workload on the AS/400e. CPW is representative of commercial applications, particularly those that do significant database processing in conjunction with journaling and commitment control.

CPW contains a number of advantages over RAMP-C for measuring the iSeries and AS/400e servers, such as:

- Inclusion of a batch component
- Increased numbers of transaction types
- Support for journaling and commitment control
- Increased path lengths
- More complex file and terminal I/O

These enhancements mean that CPW exercises hardware and software paths that more closely match the paths exercised by our customers' current installations.

© Copyright IBM Corp. 2000

CPW values have been calculated for all previous AS/400e models. The summary table for most of the models, shown in “Summary of All Earlier AS/400 and AS/400e Models” on page 747, includes the CPW figures as well as RAMP-C figures. For processors announced since August 1997, CPW values are issued. No further RAMP-C figures are provided.

Note: Throughout this document both RAMP-C and CPW performance figures are described as Relative System Performance (RSP). This is done to ensure consistency and to identify what is being referred to. RAMP-C or CPW is used to identify to which RSP the figures apply.

CPW figures are not based relative to a single model, as was the case with RAMP-C. CPW values give a relative performance rating of all iSeries 400 and AS/400e processors.

CPW can be used as a quick means of comparing performance. However, a more detailed analysis should always be done using BEST/1 for OS/400. The performance users see that their AS/400 depends on many factors. Some of these factors include: the type and number of disk devices, the number of workstation controllers, the amount of memory, the system model and processor, the application being run, and other factors.

More detailed performance information is found in the *AS/400 Performance Capabilities Reference - Version 4, Release 5*, SC41-0607. This document is available on the Web at:
`http://publib.boulder.ibm.com/pubs/html/as400/online/chgfrm.htm`

IBM Workload Estimator for AS/400

The IBM Workload Estimator for AS/400 is a Web-based estimation tool that automates the manual calculations previously required from paper sizers. The Estimator tool allows the user the option to enter data for multiple workloads, from which a machine recommendation is made that best fits overall system needs.

The Workload Estimator is found on the Web at:
`http://www.ibm.com/eserver/iseries/estimator/`

Disk Arm Requirements

The disk configuration can be a major contributor of performance bottlenecks. It is important to size an iSeries 400 and AS/400e server with an appropriate number of disk arms, to provide for the best obtainable disk subsystem performance, and, therefore, improve overall system performance.

A physical disk drive (and the processing through the disk controller) performs a specific number of disk accesses each second. Newer disk arms and controllers provide better performance than previous drives. Therefore, fewer disk drives (disk arms/actuators) can typically be used, yet provide comparable performance.

To help size the minimum number of disk arms required for a given AS/400e processor, refer to the AS/400 Disk Arm Requirements based on the Processor Model Performance document at: http://www.iseries.ibm.com/developer/performance

ISV and other application solution providers also have recommendations for a minimum configuration.

iSeries 400 Model 270 and 8xx Performance

The new iSeries 400 Model 270 with four processor options extends well beyond the AS/400e Model 170. Entry performance is three times the Model 170. Top model performance is nearly doubled.

The introduction of the 8xx servers is a significant step in the evolution of the AS/400e server product line. Top model performance is increased three and a half times for base and interactive performance.

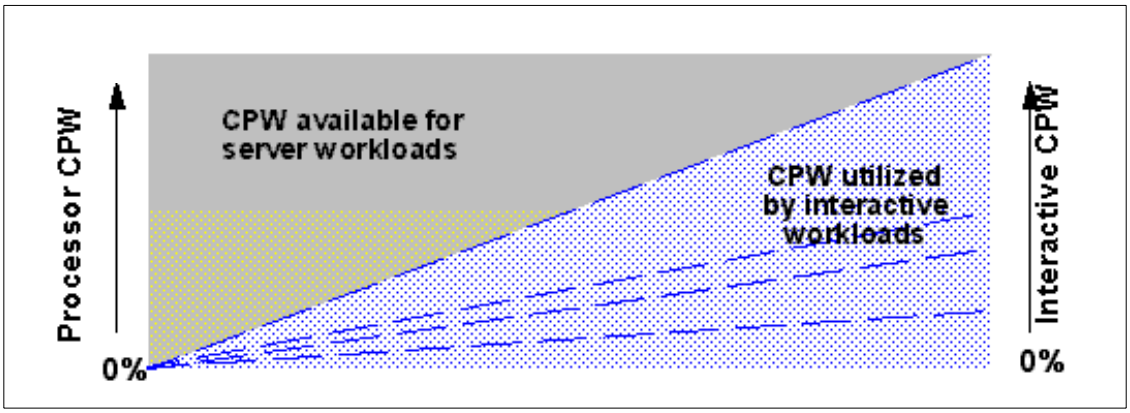
iSeries 400 server Models 270, 820, 830, and 840 are configured to meet a wide range of performance requirements. Whether the system is running mostly back-office applications, newer e-business applications, or a mixture of both, the performance can be customized on the new servers to match business needs. Each model includes a base processor and interactive performance feature. Optional processor and interactive performance features can be selected to balance the server's performance for a given workload. Increasing performance on installed servers is done simply and with little disruption.

Note: The term *Processor Feature* is used to indicate the feature code by which the processor is ordered. The term *Interactive Feature* is the feature code by which interactive performance is ordered. The term *Processor Feature Code* is used by OS/400. *System Processor Feature* is used by SLIC to indicate the same function.

The iSeries server Models 270, 820, 830, and 840 offer two CPW ratings to allow customizing of performance for a given workload:

- **Processor CPW** represents maximum relative performance running commercial processing workloads for a processor feature. Use this value to compare relative performance between various processor features. Processor CPW is known as Client/Server CPW in prior releases.
- **Interactive CPW** represents the relative performance available to perform interactive workloads. The amount of Interactive CPW consumed reduces the available Processor CPW by the same amount. Interactive CPW for a specific processor is changed through the installation of optional Interactive Features.

The interaction of the Processor CPW and Interactive CPW is illustrated in the following figure.



This chart shows the CPW available for server workloads as the interactive workload increases. On the left side of the chart, the scale runs from 0 to 100%, which represents the amount of Processor CPW available for server workloads (non 5250-type workload). On the right side of the chart, a similar scale reflects the amount of Interactive CPW used by Interactive workloads (5250 based). Each of the dotted lines dissecting the rectangle represents various levels of Interactive CPW that can be purchased when ordering an interactive feature for 270 and 8xx servers. Interactive features are not available on the 250.

At any point, the amount of CPW used to perform interactive workloads reduces the CPW available for server workloads by an equal and proportionate amount. For example, for a system with a processor CPW of 810 and an interactive feature CPW of 240, it is possible to use up to 240 CPW for an interactive workload and still have 570 CPW available for the non-interactive workload. On the other hand, if none of the AS/400e is used for interactive workloads, all of the Processor CPW is available to perform server workloads. No tuning or management is required.

For best performance, all critical system resources should be kept in balance by proper configuration. This includes processors (quantity and speed), number of disk arms, amount of memory, and more.

AS/400e Dedicated Server for Domino Positioning

AS/400e capabilities to support Lotus Domino are firmly established since the announcement of Lotus Domino for AS/400 in January 1998. In mid-1999, IBM and Lotus delivered a first in the industry—the AS/400e Dedicated Server for Domino. The iSeries and AS/400e server's reliability, robust subsystem architecture, and ease of operations provide a sound base to develop and deploy Domino solutions.

Now, in response to customer's needs, IBM extends the AS/400e Dedicated Server for Domino with two new models and six new processor features. For entry Domino environments, the Dedicated Server adds scalability and disk and memory capacity. For larger Domino environments, there is a gain in enterprise-class scalability and capacity.

iSeries and AS/400e customers extend their traditional applications and data by adding Lotus Domino solutions to their existing servers, as part of upgrades, and as stand-alone servers for e-mail, groupware applications, and Web sites. Domino customers use Domino partitioning on iSeries 400 or AS/400e servers to consolidate several Domino workloads onto one server with a simple, single footprint to deliver e-mail and applications. Server consolidation offers vertical growth within the processor. Growth is available within the model.

New customers employ the rich Web development and serving functions of Domino. When they combine these functions with the rock-solid reliability and scalability of iSeries or AS/400e servers, they achieve highly effective Web sites with intranet, extranet, and Internet capabilities.

With the availability of Dedicated Servers for Domino, customers choose to deploy Domino solutions on separate servers from other business applications for several reasons:

- Messaging and e-business servers are mission-critical assets. Reliability, maintenance, and availability requirements differ from other production systems.
- Many organizations employ specialized staff and servers to deliver messaging and groupware to their businesses, separate from those that support their line-of-business applications.
- Some organizations have remote environments, which require onsite groupware servers to provide key applications and e-mail to their users.

The improved price/performance and the increased scalability of the new processor features enhance the cost advantage for customers who want a mixed workload Domino server. The Dedicated Server for Domino is positioned to compete strongly for Domino placements compared to multiple Intel-based servers.

Consider Dedicated Server for Domino for:

- New Lotus Domino solutions on a manageable, reliable, and scalable server.
- Reliability and manageability to support mission-critical Domino applications.
- Consolidation of several servers to a single iSeries 400 or AS/400e by employing the partitioning function of the Lotus Domino Enterprise Server license. Multiple Domino servers for e-mail, Domino applications, Web serving, or a combination on segregated Intel servers.
- Groupware applications and messaging with existing system operations and skills.

- Standalone intranet, extranet, or Internet servers using Lotus Domino.
- Reliable servers to support Domino in remote locations where no administration staff is available.

Model 270 Dedicated Server for Domino Processor Features

Processor features for Model 270 Dedicated Server for Domino are:

- **#2422 Dedicated Domino Processor**: An entry solution scalable mail server or mail or application server.
- **#2423 Dedicated Domino Processor**: More scalability for mail and robust applications.
- **#2424 Dedicated Domino Processor (2-way)**: The highest level of scalability within the AS/400e server 270.

iSeries Model 820 Dedicated Server for Domino Processor Features

Processor features for Model 820 Dedicated Server for Domino are:

- **#2425 Dedicated Domino Processor**: An enterprise solution appropriate for mail and robust application. Ideal for customers who require more growth and capacity than the Model 270 provides.
- **#2426 Dedicated Domino Processor (2-way)**: More performance for mail and robust applications.
- **#2427 Dedicated Domino Processor (4-way)**: The highest level of scalability and performance within the iSeries model 820.

The iSeries Dedicated Server for Domino Model 820 should be proposed as the initial server to customers who require scalability or capacity beyond what the Model 270 Dedicated Domino processor #2424 provides.

Customers who require scalability or capacity beyond what the Dedicated Server for Domino 820 provides should plan to pursue iSeries Models 830 or 840, or to deploy multiple servers for their Domino applications.

- **Upgradability**: Processor feature conversions are supported within each Dedicated Server for Domino model. Upgrades are not available from a Model 270 to a Model 820, nor from the previous Dedicated Server for Domino Model 170.
- **Releases supported**: Support is offered for Lotus Domino Release 5.01 or later. The AS/400e Dedicated Server for Domino does not support Domino 4.6 or earlier.

The iSeries Dedicated Server for Domino is priced to be most competitive in the following situations:

- Versus multiple single-function Intel Domino servers
- When reliability, manageability, and availability are a critical requirement in new or current Domino implementations

The Dedicated Domino processors are tuned specifically for Lotus Domino workloads. They provide sufficient capacity for non-Domino workloads, such as remote DB2 access, file serving, Integrated xSeries Server for iSeries, and TCP/IP, which support a Domino environment.

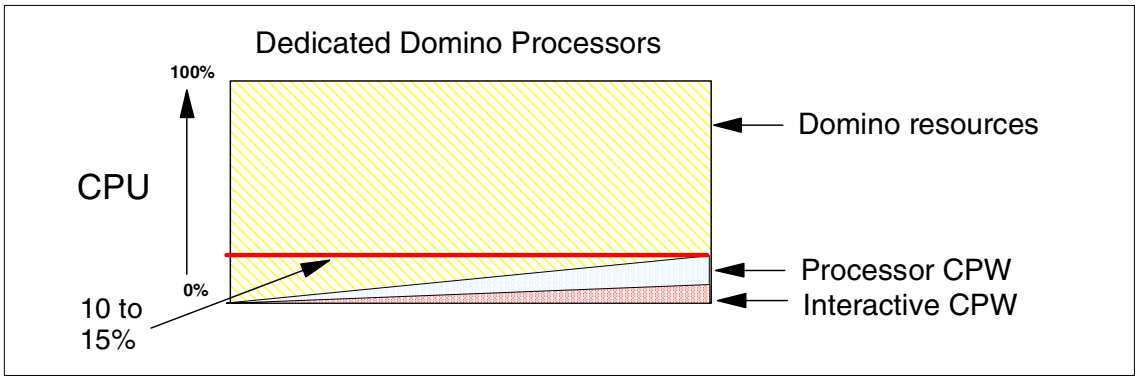
- **Lotus Domino workloads**: Defined as out-of-the-box functions such as:
  - E-mail
  - Calendars and scheduling
  - Web serving
  - Standard Lotus Domino template applications (for example, discussion database, workflow, and so on) and custom developed applications written with Domino Designer that perform no external program calls, relational database access, or Java integration.
- **Non-Domino workloads**: For customers planning significant use of non-Domino workloads, the Dedicated server for Domino should not be proposed. iSeries 400 Model 270 or 8xx with standard processor features should be considered.

  Restrictions for non-Domino workloads are as follows:
  - Any and all workloads not designated as Domino workloads are considered to be non-Domino workloads. They should be managed to a maximum of 10 to 15% of the CPU.
  - Standalone Java, RPG, COBOL, or C applications are non-Domino workloads.
  - Applications that can work alongside Domino on the same AS/400e. An example is a Domino server that uses the *MSF SMTF Services option along with the QMSF task to process Internet mail through the OS/400 SMTP server. The OS/400 SMTP server and QMSF task are non-Domino work.
  - Domino applications using application integration functions, such as DB2 Universal Database access or external program calls, are considered non-Domino workloads.
- **System administration**: iSeries 400 Dedicated server for Domino can be effectively managed when there is no Interactive CPW (Interactive CPW = 0) available for application workloads. Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250). The zero interactive CPW is intended to support a single interactive job for system administrative functions.

  - Any job started from a console (green screen) to perform system administration function is not considered interactive work if it is the *only* interactive job running (single interactive job exception).
  - Any system administration job submitted to batch is not considered interactive work.
  - Any use of Operations Navigator (GUI administration functions) is not considered interactive work.
- **Interactive workloads**: Any task started through a 5250 session (5250 device or 5250 emulation) where the user waits for a response is considered to be interactive work.
  - Application processing that uses 5250 interfaces is not supported on the iSeries 400 Dedicated server for Domino.
  - 5250 print is not supported on the iSeries 400 Dedicated server for Domino.

Relative performance measurements are derived by performing various monitored and measured workloads on iSeries and AS/400e servers. The results can be used to compare relative performance characteristics of processor features offered for servers.

- **Simple Mail Users (SMU)**: This relative performance measurement is derived by performing high-volume Lotus Domino mail workloads on Dedicated Domino processors. SMUs are representative of mail applications, particularly those that do not perform any database related tasks. SMUs represent the estimated number of concurrent light mail users for the Dedicated Domino processors. Reported values reflect 70% processor utilization.
- **Mail and Calendaring Users (MCU)**: This relative performance measurement is derived by performing mail and calendaring functions. This workload is considerably more complex than Simple Mail Users. The MCU workload represents users on a Notes client who are reading, updating, or deleting documents in an e-mail database, as well as lookups in the Domino directory and scheduling appointments and invitations. Reported values reflect 70% processor utilization.
- **Commercial Processing Workloads (CPW)**: CPWs are representative of commercial applications, particularly those that do significant database processing in conjunction with journaling and commitment control. The reported values for CPW represent the capacity of a non-Domino workload available to support a Domino environment. The reported CPW may be utilized by System Resource activities and Domino resource extensions such as database accesses and external program calls. The amount of CPW consumed reduces the available capacity to perform Domino workloads reflected as SMU or MCU.
  - Processor CPW is an approximate value reflecting the maximum amount of non-Domino workload (10 to 15% of CPU) that can be supported.
  - Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for application workloads performing interactive-based tasks.



The above figure shows the relationships of the various workloads on the Dedicated Domino Processors. Domino can take any available CPU capacity (even below the line). The CPW workload can never rise above the line, and excessive attempts to use CPW resources do not significantly affect Domino performance. If CPW exceeds its limit, the system will not redirect Domino resources to non-Domino (CPW) work, and the non-Domino performance degradation can be dramatic.

For some Domino solution scenarios, you need to work closely with an IBM, Lotus, or IBM Business Partner representative to determine whether iSeries Model 270 with standard processor features, 8xx servers, or the new Dedicated Server for Domino is most appropriate for the proposed environment. In particular, Domino applications that require some degree of integration with DB2 Universal Database for AS/400 data or use some external program calls (for example, RPG programs or Java) require careful evaluation.

The resources of Dedicated Server for Domino are focused primarily on the Domino workloads (see the following figure). Their ability to deliver superior Domino price/performance depends on running a workload very close to “pure Domino”. A small percentage of the overall processor capacity (10 to 15%) can be used for non-Domino work, such as routine system administration tasks and non-Domino programs invoked by the Domino application.

- ✓ Domino mail
- ✓ Domino applications
- ✓ Mixed Domino workload
- ✓ Domino Web serving

- ◆ DB2 database integration on same server
- ◆ DB2 database integration on another server

- ● AS/400 line of business (LOB) applications on same server
- ● Large user community

In evaluating Domino applications that access non-Domino functions, such as DB2/400 integration or program calls, ensure that the non-Domino functions represent a low percentage of the overall system utilization. Once non-Domino work reaches a maximum CPU capability on the Dedicated Server for Domino, no additional processing power will be available for non-Domino workloads. If the proposed Domino application employs any significant DB2 UDB or program integration, a standard iSeries 400 or AS/400e server model is a better choice.

5250 Throughput

The iSeries and AS/400e server supports a family of displays and emulation adapters that are known as the 5250. The supported data stream is known as a 5250 data stream. Throughput considerations for these work stations regard the flow of the character stream, as discussed below.

5250 Express Data Stream

The #2720, #2722, #2746, #4746, and #6180 twinax workstation adapter cards have three major features that can increase throughput:

- **2X Mode**: 2 Mbps versus 1 Mbps throughput of the #6050 workstation controller.
- **Optimized Mode**: The block transfer of data is improved to almost double the throughput to or from the attached device.

- **Dual Mode**: Means that two ports are polled simultaneously on the #2722, #2746, #4746 and #6180 workstation controllers. On older controllers (such as the #6050 work station controller), only one port out of eight is active at any given time.

The enhancement produces nearly four times the throughput when all of the attached devices on a port support 5250 Express Data Stream. All of the IBM devices from the original 5251 up through the 3489 support the Express Data Stream.

Refer to Informational APAR II11804 for additional details regarding workstation considerations when attached devices or cabling do not support 5250 Express Data Stream. Additional information on 5250 Express Data Stream is available on the Web at:
`http://www.networking.ibm.com/525/`

The IBM 7299 twinax-to-fiber multiplexer fully supports all the new functions of the #2720, #2722, #2746, #4746, and #6180 workstation controllers.

iSeries and AS/400e Advanced Technology

iSeries and AS/400e Advanced Technology

iSeries and AS/400e Advanced Technology

The iSeries 400 and AS/400e offer important advanced capabilities in such key areas as Java, Web serving, Lotus Domino, integration with Windows NT, managed availability, database, and Business Intelligence solutions. The iSeries 400 and AS/400e also continue to be a strong performer in such growing areas as data warehousing and the Internet. To gain an appreciation of these technologies and of the particular strength of the system in delivering them, this chapter provides a summary of each of the application segments mentioned above.

Java

Java is a key application development environment for the iSeries 400 and AS/400e. As Java technology evolves from Sun, the system takes advantage of the new functions and features of this environment.

There is an exciting future for Java on the iSeries 400 and AS/400e. The AS/400 Developer Kit for Java supports Sun's Java 2. With the concurrent Java support shipped as part of the V4R4 AS/400 Developer Kit for Java, you can install Java 2 on systems where JDK 1.1.6 or 1.17 are already installed. A Java Virtual Machine, which resides below the iSeries 400 Layer (also known as Technology Independent Machine Interface (TIMI)), enables fast interpretation and execution of Java code on the iSeries 400 and AS/400e systems. In addition, a type of static compiler is available called a *class transformer*, which generates RISC machine code from Java byte codes. This Java transformer enables the direct execution of Java on the system without the overhead of interpretation.

High-performance Garbage Collection is provided by OS/400 to improve the performance and the scalability of Java. An advanced Garbage Collection algorithm allows Java to scale to the large numbers of objects expected when running enterprise applications on the server. Over time, Java is planned to become even more integrated with, and tuned for, OS/400 to meet the requirements of performance and scalability on the server without compromising the cross-platform portability of the rich language.

Other technology included in the AS/400 Developer Kit for Java allows GUI applications to run on the system without modification. This support is called Remote Abstract Windowing Toolkit (AWT). It intercepts GUI requests coming from a Java program and re-routes the requests to an attached workstation running its own Java Virtual Machine (JVM). The workstation then interprets and displays the java.awt graphical components. This allows server programs that have graphical interfaces for configuration or tuning to run on the system without modification.

The OS/400 unique single-level-store architecture is also exploited to give Java objects on the system an advantage over other platforms. Java objects on the iSeries 400 and AS/400e

© Copyright IBM Corp. 2000

servers can be full-fledged system objects allowing them to be persistent, shared, secure, backed up, and restored. This allows the iSeries 400 and AS/400e to offer persistent Java objects with exceptional state-of-the-art performance and support. iSeries 400 and AS/400e single-level-store technology permits Java objects to be stored in their object form without the performance and maintenance overhead of two-level-store operating systems.

Java Deployment Tools provided in V4R4 are aimed at simplifying the deployment, management, and tuning of Java applications on the system. IBM has tested InstallShield's Java Edition product. InstallShield allows Java application developers to create packages that will install natively on the iSeries 400 or AS/400e. It is the common method used to package and install applications on other platforms, such as Windows NT. InstallShield on AS/400e makes it easier to port applications to the system that are currently targeted for other platforms. A number of Qshell enhancements and utilities are provided to support zip or unzip of Java packages. To aid in performance analysis and tuning of Java applications on iSeries 400 and AS/400e, support is provided to convert data collected by Performance Explorer into standard formats used by popular Java performance analysis tools such as Javation and Hyperprof.

The AS/400 Toolbox for Java is available. Java applets and applications that access iSeries 400 and AS/400e programs and data from client workstations (or a Java-enabled server) can be written using the AS/400 Toolbox for Java. Java classes on the client can be used to access existing iSeries 400 and AS/400e applications and data using low-level APIs. The classes provide easy entry into Java development while leveraging what already exists on the iSeries 400 and AS/400e today. A socket is used to connect to OS/400 servers that provide access to system resources including:

- Remote commands
- Distributed program calls
- Data queues
- Data areas
- System values
- Integrated file system data (extended in V4R4)
- Print
- Record-level access
- Database access using a JDBC on the client
- User spaces
- Digital certificates
- Jobs
- Message queues
- Message files
- Users
- Object authority
- System status

The AS/400 Toolbox for Java provides a set of GUI classes as well. These classes use the access classes discussed earlier to retrieve data for the user. The classes use Java's Swing 1.0.03 framework. When invoked, graphical APIs can display iSeries 400 and AS/400e data in the following formats:

- A **list panel** presents a list of iSeries 400 and AS/400e resources and allows selections of one or more resources.
- A **details pane** presents a list of iSeries 400 and AS/400e resources in a table where each row displays various details about a single resource. The table allows the selection of one or more resources.
- A **tree pane** presents a tree hierarchy of iSeries 400 and AS/400e resources and allows the selection of one or more resources.
- An **explorer pane** combines a tree pane and details pane so that the resource selected in the tree is presented in the details pane.

The following iSeries and AS/400e resources are available through the graphical APIs:

- Database data using the JDBC driver
- Database data using record-level database access classes
- OS/400 command call
- OS/400 program call
- OS/400 data queues
- Files in the integrated file system
- iSeries 400 or AS/400e print resources
- Active jobs on the iSeries 400 or AS/400e system
- Spooled File Viewer
- OS/400 messages and message queues
- OS/400 users and groups
- System values
- Object authority

The classes are written entirely in Java and can be run on any platform that supports JDK 1.1 or later. The AS/400 Toolbox for Java can be used on a client to access AS/400e servers running OS/400 V3R2, V3R7, or V4R1 and later. The ability to run Java applications on the AS/400e requires OS/400 V4R2 or later, V4R5 on the iSeries 400. The Toolbox requires Java Virtual Machine (JVM) 1.1.6 or later.

With V4R4, the AS/400 Toolbox for Java is enhanced to support the Java Database Connection (JDBC) 2.0 specification. Support is also added for the Secure Sockets Layer (SSL) specification so that data between the workstation and system can be encrypted and the server can be authenticated.

The AS/400 Toolbox for Java in V4R4 also includes an improved application development environment through the introduction of a new set of tools for building graphical panels.

These tools offer the following advantages:

- A User Interface Framework has been defined that automatically handles the exchange of data.
- Developers use data beans that are bound to panel components using tags defined by the Panel Definition Markup Language (PDML).
- The framework can also provide a platform and technology independent representation of graphical panels based on the Extensible Markup Language (XML). A pure Java framework for interpreting the XML and constructing user interface panels based on Java Foundation Classes (JFC) is also provided.
- A resource script converter is provided that converts Windows dialogs to equivalent Java panels defined in XML.
- A graphical user interface builder tool is provided to develop Java GUIs. This is a WYSIWYG GUI editor tool.
- The ability to call OS/400 programs is provided through a program call markup language (PCML) interface that defines the required parameters, structures, and field relationships.

Summary

Java is the environment of choice for programming in today's network computing environment. It allows true portability of applications between platforms without modification or recompilation. It is an open, cross-platform, industry standard that is being supported by all of the major players in the computer industry today.

The iSeries 400 and AS/400e servers are uniquely positioned to leverage Java as it evolves from its current Web focus to a full commercial application environment. The strengths of the iSeries 400 and AS/400e will be combined with Java's object-oriented, network computing technology to provide solutions for the new millennium.

The AS/400 Developer Kit for Java makes Java available for application deployment on the server. It is developed with a focus on scalability to support objects in the enterprise.

The AS/400 Toolbox for Java enables Java clients to access programs, commands, and data on the iSeries 400 and AS/400e servers today. It provides an easy entry into the Java world by leveraging applications and data that already exist on the system.

Web Serving

The IBM HTTP Server for AS/400 makes participating in the world of the Internet and intranets easy. This product combines the basic functions of a Web server with expanded

functionality that allows for greater flexibility in establishing a Web presence. The IBM HTTP Server performs a variety of functions:

- Acts as a repository for Web pages created with HTML
- Handles the transfer of documents requested from a browser with HTTP
- Supports SSL security protocols for data encryption and server certificate authorization (HTTPS) when combined with one of the Cryptographic Access Provider Licensed Programs
- Client authentication using SSL Version 3 through the support of digital certificates
- Allows Web serving from multiple IP addresses on a single HTTP Server
- Provides an application interface with Common Gateway Interface (CGI)
- Recognizes and presents different documents based on the Web browser used through automatic browser detection
- Allows control of access and error logs
- Provides easy-to-use HTML forms for configuring and administering the server
- Allows multiple servers within the same iSeries 400 or AS/400e to balance workload, content, production, and test
- Allows you to restrict access based on user name and password or the address of the requester
- Support for server APIs that allow the user to extend or customize how the HTTP Server handles client requests
- Integrates OS/400e security into the Web
- Socks support and SSL Tunneling to improve performance when a proxy server is used
- Add performance enhancements, so you have the functionality and security that your business needs

With the introduction of V4R4, the IBM HTTP Server for AS/400e receives several management and performance enhancements:

- SNMP Subagent support, which allows Web server statistics to be forwarded to an SNMP network manager upon request.
- Enhanced log reporting, which provides the ability to define, generate, view, and maintain reports using a graphical interface based on report templates.
- Support of the new standard Extended Log File Format has been included to allow more data to be saved in the access log files. More control over the data stored in these files is also provided.

- Web server error logs will now contain messages in the customer's language of choice.
- New APIs are provided that allow third-party management tools to query the value of certain configurations directives, as well as the Web server's mapping rules for a URL.

V4R4 also provides performance improvements in the AS/400 HTTP Server through the ability to dynamically cache HTML files in memory so that subsequent requests for the same file can be handled without the need for a file I/O. Support for multi-thread CGI programs can also provide improved performance of the HTML server with V4R4.

V4R4 provides support for Lightweight Directory Access Protocol (LDAP) in the HTTP Server, which defines a protocol to access directory services on a network. A new Domino plug-in is also provided that allows the HTTP Server to access documents stored in Notes.

The iSeries 400 and AS/400e Web serving capabilities include support for the IBM WebSphere family. There are several components in the WebSphere family:

- The IBM WebSphere Application Server provides a framework for consistent, strategic linkage between the HTTP requests and business data and logic. IBM WebSphere Application Server is intended for organizations that want to take advantage of the productivity, performance advantage, and portability that Java provides for dynamic Web sites. It includes:
  - Java runtime support for server-side Java servlets.
  - JavaServer Pages (JSP). A relatively new technology that provides a server-side scripting technique for generating Web pages. Where Java servlets typically require the skills of a Java programmer, JavaServer Pages can be created by authors who have some basic HTML programming skills.
  - High-performance connectors to many common back-end databases to reduce the coding effort required to link dynamic Web pages to real line-of-business data.
  - Application services for session and state management.
- The IBM WebSphere Studio, a set of PC-based tools to help developers create WebSphere applications. The tools currently in the WebSphere Studio are:
  - **Web Development Workbench**: A Web-site project organizer and launch platform.
  - **Servlet generation wizards**: For building Java servlets to access JDBC databases and JavaBean components.
  - **VisualAge for Java, Professional Edition V2.0**: The IBM award-winning Java application development environment for building Java applications, applets, servlets, and JavaBean components.
  - **NetObjects Fusion**: Allows Web-site developers to design and produce an entire Web site, including individual pages and all links. It features automated site building,

automatic link management, remote database access, and design and publishing capabilities.

  - **NetObjects BeanBuilder**: The visual authoring tool for combining JavaBeans and Java applets, BeanBuilder allows individuals overseeing the content of online business processes to create more compelling, highly interactive Web sites with revolutionary ease-of-use.
  - **NetObjects ScriptBuilder**: Combines a text-based script editor and development tools for creating and editing HTML, script, and JavaServer Pages.

- The IBM WebSphere Site Analysis provides Web site administration and analysis tools that can be used to administer and monitor usage of a Web site. It is a client-only product that runs on a Windows NT box. iSeries and AS/400e statistics are downloaded to the Windows NT system. Nothing runs on the iSeries 400 or AS/400e. The tools included in this package are:
  - An administration Site Visualizer
  - A report Generator
  - A report Builder
  - A section/Template Builder
  - A content Analyzer, which scans a Web site and identifies duplicates and orphans, unavailable resources, content with excessive load sizes, and so on
  - A usage Analyzer, which looks for hits, requests, visits, paths, referral, agents, etc., from the log records

IBM Net.Data allows the creation of interactive Web applications with “macros” to add logic, variables, program calls, and report writing to HTML. These macros combine the simplicity of HTML with the dynamic functionality of CGI programs, which makes it easy to add live data to static Web pages. Live data includes information stored in DB2 for AS/400e (locally or remotely), databases on other systems, REXX programs, C and C++ programs, programs in other AS/400e languages (such as CL, RPG, and COBOL), and other sources.

IBM Net.Data is enhanced with V4R4 to only parse macros once and save the results for subsequent requests for that macro. Programming for Net.Data is made easier with new trace and logging support that makes it easy to find an error in your macro. New built-in functions make it a snap to use Net.Data to send e-mail, generate browser cookies, and manipulate Net.Data tables.

The Web serving capabilities of the AS/400e have also been extended with a powerful, full-text search engine through the implementation of NetQuestion in OS/400 V4R3. NetQuestion provides the tools to build a centralized Internet search service. NetQuestion can index both plain text and text with HTMP markup. It also provides CGI scripts and HTML forms for searching and administration.

Some of the functions NetQuestion provides are:

- Boolean queries for phrase and proximity searches as well as front, middle, and end masking using wildcards
- Precise term searches optimized for Web applications in both Internet and intranet environments
- High-speed indexing and retrieval where one precise index is built
- An optimized and reduced index to about 35% to 40% of the document
- Sophisticated lexical affinities-based ranking for free-text and hybrid queries
- Advanced relevance ranking
- Detection of misspellings in documents and expanding the search requests accordingly

The iSeries 400 and AS/400e Web serving capabilities allow businesses, such as a shop, a service, or a distributor, to open an electronic storefront on the Web with Net.Commerce for AS/400e. With Net.Commerce, it is possible to build a single store or a mall that contains several stores, or even multiple malls or stores. In an electronic mall, the site and some of its functions are shared with other stores while maintaining individual identity and separate data. Net.Commerce also provides templates to create or customize your store, while incorporating legacy systems.

Net.Commerce provides an easy-to-use design tool to help create appealing screens or pages to showcase a store and its products. It is even possible to include special effects such as three-dimensional graphics, animation, sound, and Java applets.

Net.Commerce also contains task macros and application program interface (API) functions that manage shopping tasks automatically. Net.Commerce supplies Web pages for a shopping cart, registration forms, and order forms that can be customized to create a unique look and feel for each business.

It is also possible to implement simple or complex pricing schedules with ease by assigning priority values and effective dates. Several product prices for sales and for preferred shoppers can also be assigned.

With the sophisticated shipping functions of Net.Commerce, a wide variety of carriers and cost calculations can be defined. Switching shipping carriers or applying a new rate is as simple as changing a shipping code in the database. The entire inventory is updated. Shoppers are also allowed to choose different shipping methods and rates for items they order. The API functions in Net.Commerce can be used to define and apply various tax rates.

Other features of Net.Commerce include the ability to lock the database from unauthorized tampering and provide a password to only selected individuals.

Shoppers protect their information by using a logon ID and password when they register. User data, such as credit card information, is protected through Secure Sockets Layer (SSL) encryption.

Net.Commerce provides an administrator function to build and manage an electronic store or mall. The Administrator can easily enter store and product information and tailor product displays to suit merchandising requirements. Changes appear automatically on the Web.

The Net.Commerce administrator contains two data management applications: Site Manager and Store Manager. It also contains a Web page design tool called Template Designer.

Site Manager creates and manages commercial Web sites.

Store Manager develops and manages an online catalog. The Store Manager uses simple online forms to manage such information as shipping options, shopper groups, and customer numbers. Some of the information kept in the database and available in the electronic store includes:

- The store or mall name
- The logo location
- Contact information
- The mission statement
- Policies
- Types of services and products
- The currency used
- Merchandise offered (including descriptions, product number or stock keeping unit, images, prices, availability dates, dimensions, weight, and so on)
- Product categories
- Shipping options and services
- Shopper groups
- Information about the people who have access to the store's database

The Java-based Template Designer in Net.Commerce is used to design Web pages. It is possible to create static or dynamic Web pages that display up-to-date data that is linked to a DB2/400 database. Template Designer's graphic look, drag-and-drop capabilities, and quick testing functionality help create and test your pages. The design is laid out on a reusable template. Different templates can be created for different types of pages (for example, one template for regularly priced products, and another for products on sale). Template Designer can also be used to create a home page for a store or mall, category pages, product pages, and unique pages for members of shopper groups.

With V4R4, Net.Commerce V3 is available on the AS/400e. Some of the enhancements in this version are:

- Security is enhanced to allow a Site Administrator to create, modify, and delete access groups. Each access group is associated with a store and a site of commands.
- Command Security allows a Site Administrator to enable or disable SSL and authentication for commands.
- A Store Administrator can now specify store-level tax rates to override the tax rates specified at the mall level by the Site Administrator.
- Product Advisor provides an interactive environment for shoppers by allowing the merchant to create an “interactive catalog”.
- Tutorials are provided for Product Advisor (hands on experience) and East West Food Mart (general merchant tutorial using many of the functions of Net.Commerce).
- Support is provided for V1.2 of the IBM Payment Server.
- Samples for one mall and two separate stores are provided.
- Support for the Extended Data Log is provided so the Net.Commerce session ID is logged together with standard Web server access log information. The merchant can use the data to later analyze user activities.
- Shoppers and administrators can reset or change their passwords, and administrators can reset or change the passwords for shoppers.
- Euro support.

The merchant API set of the IBM Payment Server V1.2 is supported on the AS/400e with V4R4. This API set supports various payment models including credit, check, and cash. Many of the APIs are used for all risk models, while a few APIs are specific to a particular risk model. The API set allows merchants to easily handle different forms of payment. The other payment products: IBM Consumer Wallet, IBM Payment Gateway, and IBM Payment Registry are not targeted for the AS/400e servers at this time.

Lotus Domino

Lotus Domino is the world's leading workflow, messaging, groupware, and Web software. Lotus Domino enables you to communicate with colleagues, collaborate in teams, and coordinate strategic business processes on and off the Web.

Powerful, Flexible Communications

Lotus Domino gives you the power you need to communicate within and beyond your organization. If you need to communicate with suppliers, customers, and partners at other companies that use different e-mail systems, or reach them using the Internet, Lotus Domino makes it easy. Mobile Notes users can take their desktop along with them, transforming airports, hotels, and cars into work spaces complete with up-to-the-minute information. The Lotus Domino family also includes sophisticated client server e-mail, based on the market

leading cc:Mail user interface. Lotus Domino applications can be accessed from any Web browser, that extends the openness and flexibility of your network.

World-Class Collaboration and Coordination

Lotus Domino goes beyond traditional e-mail and groupware. With Lotus Domino, you can collaborate with team members using a local area network (LAN), wide area network (WAN), or the Internet. With the unique ability of Lotus Domino to integrate structured and unstructured information into coherent databases, you can organize and coordinate the most complex business processes.

Rapid Application Development

Lotus Domino allows you to create custom business applications that coordinate everyday business processes from start to finish to achieve results such as improved customer service, improved sales force productivity, and faster time-to-market for products. Lotus Domino customers consistently find significant payback on their Lotus Notes investment, whether they enable their Lotus Domino applications for the Web. According to an independent study, entitled *Lotus Notes Agent of Change: The Financial Impact of Lotus Notes on Business*, conducted by IDC, Lotus Notes users achieve an average of 179% annual return on their investment.

Portability and Interoperability

Lotus Domino is a server product that runs on a variety of platforms and provided easy-to-manage interoperability in a heterogeneous network. With the sophisticated replication capability of Domino, applications are easily distributed to multiple Domino servers in your enterprise, and just as easily deployed to end users. Replication also simplifies the job of deploying application changes. Lotus Domino applications are also available to any Notes client (such as Windows 95, Windows 3.1, OS/2, Windows NT, and Macintosh). Lotus Domino version 4.5 and later releases are fully Internet-ready. You can access Lotus Domino server functions from either a Lotus Notes client on your workstation or a browser (including a browser on a Network Station).

Domino for AS/400

Domino for AS/400 is the Lotus Domino server product running on a 64-bit AS/400e RISC processor. It requires OS/400 V4R2 or later. Domino for AS/400 provides all the functionality of the Lotus Domino server that runs on other platforms and more.

Domino for AS/400 is an application that is packaged, distributed, and supported by Lotus Development Corporation. You may purchase Domino for AS/400 from a Lotus distributor, just like you buy the Domino server product for any other platform. Beginning on 20 August 1999, you may also purchase the Lotus Domino Enterprise Server for AS/400 (5769-LNT) as a licensed program from IBM. At the same time, the Lotus Enterprise Integrator (5769-LNP),

which was formerly called NotesPump, was also made available as a licensed program for purchase from IBM. The iSeries and AS/400e servers continue to be purchased through IBM AS/400 channels.

With V4R4, the OV/400 Migration to Domino for AS/400 licensed program allows the migration of users, groups, mail, calendars, and folders to Domino from OV/400. The Lotus Calendar Connector for OfficeVision (LCCOV) allows free-time search and the distribution of meeting notices between Domino and OfficeVision/400.

Unmatched Scalability

Within a single architecture, iSeries and AS/400e span a vast performance spectrum. The smallest Domino for AS/400e server may have less than a dozen users. The largest iSeries 400 server is capable of accommodating more than 10,000 mail users on a single footprint.

Note

In a simple mail workload, each active user performs the following operations over a 15-minute period of time:

- Reads five documents
- Updates two documents
- Deletes two documents
- Views one document and scrolls through it
- Opens and closes one database
- Opens and closes one view

In addition, each user sends a mail message to an average of three people no more frequently than every 90 minutes. The 10,000 users result is based on informal tests. Actual customer results may vary.

The breakthrough price performance of the AS/400e servers and OS/400 V4R2 or later means that system configurations can support this broad range of Lotus Domino users in a cost-effective manner.

World-Class Reliability and Availability

With more than 650,000 systems shipped worldwide, the iSeries 400 and AS/400e servers have earned a reputation as a reliable, undemanding workhorse. Domino for AS/400e takes advantage of the reliability and availability features of the AS/400e system, such as RAID-5, mirrored disk units, and integrated backup capability. Each Lotus Domino server runs as an OS/400 application in its own subsystem. The unique architecture of OS/400 helps make it safe to run your Lotus Domino server and your mission-critical business applications on the same iSeries 400 or AS/400e.

Powerful Integration

Domino for AS/400 includes integration between Lotus Domino databases and DB2/400 databases. Both real-time and scheduled integration of databases is available to meet a variety of application needs.

Automatic synchronization between the Domino Public Address Book and the AS/400 System Distribution Directory provides a powerful, integrated mail server for organizations with multiple e-mail products, including OfficeVision/400, POP3, JustMail, and Internet mail.

The Lotus Enterprise Integrator option to synchronize authorizations between DB2/400 databases and Domino databases is a platform exclusive.

Proven Security

Integrated, flexible security is a long-standing strength of both Domino and AS/400e. When you consider connecting to the Internet, Domino for AS/400 and firewall products for AS/400 combine function, reliability, and value.

AS/400e Integration with the Windows NT Server

Consolidating Servers Inside an iSeries or AS/400e System

Currently, most companies deploy PC servers by function or service, with each server dedicated and tuned to an individual application such as file, print, or Web serving. Consolidating multiple Windows NT servers inside an iSeries 400 or AS/400e server keep each of your Intel-based servers separate, but houses and manages them together in a single system.

Advantages of Server Consolidation on the iSeries 400 and AS/400e

Server consolidation on the iSeries 400 or AS/400e allows you to:

- Consolidate PC server hardware and operations so you can run up to 16 Windows NT servers in a single server.
- Increase business recovery protection with high-speed backup of the combined iSeries 400 or AS/400e server and Windows NT systems.
- Improve server uptime and error recovery using highly reliable iSeries 400 and AS/400e disk drives with RAID-5 and mirroring options. You can use a spare Integrated xSeries Server for iSeries to replace a failed server without reloading Windows NT.
- Maximize I/O investments by balancing iSeries 400 or AS/400e servers and Windows NT disk resources from a single pool. Switch user data disks between servers. Share the iSeries 400 or AS/400e tape and CD-ROM drives.

AS/400 Integration with Windows NT Server

AS/400 Integration with Windows NT Server is a nonchargeable feature of OS/400. This feature provides the device drivers to enable Windows NT Server to run on the Integrated xSeries Server for iSeries and to share disk, tape, and CD-ROM drives. It also provides a variety of utilities, including integrated user administration.

Windows NT Server Requirements

The Integrated xSeries Server for iSeries is certified to run Microsoft Windows NT Server 4.0. A standard CD-ROM licensed copy should be purchased separately (with the required client licenses) from any Microsoft reseller.

Integrated xSeries Server for iSeries

The Integrated xSeries Server for iSeries (also known as the AS/400 Integrated Netfinity Server) combines the power of an Intel Pentium II processor with the high reliability and availability of iSeries 400 and AS/400e servers.

The Integrated xSeries Server is available on all iSeries 400 and AS/400e 64-bit RISC models in either PCI bus or SPD bus versions. Integrated xSeries Servers are considered features of the iSeries 400 and AS/400e system and are covered by the system warranty and maintenance contract. A standard PC display, keyboard, and mouse must be attached to the Integrated xSeries Server.

Extended Adaptive Cache

Extended Adaptive Cache is an advanced read cache technology that improves both the I/O subsystem and system response times by reducing the number of physical I/O requests that are read from disk. Extended Adaptive Cache operates at the disk subsystem controller level and does not affect the system processor. Management of the cache is performed automatically within the I/O adapter and is designed to cache data by using a predictive algorithm. The algorithm considers how recently and how frequently the host has accessed a predetermined range of data.

The design of Extended Adaptive Cache is based on specific data management strategies of the iSeries 400 or AS/400e system. Whether the disks are device parity protected, mirrored, or unprotected, the data stored on the disks has a tendency to occur in bands. This means that there are physically contiguous areas of disk storage that fall under one of the following categories:

- Areas where the data is actively read
- Areas of data that are both actively read from and written to
- Areas that are frequently written to
- Areas of storage that are not frequently accessed

This “banding” of data is accounted for in the Extended Adaptive Cache design. The goal is to cache bands characterized as read or write and read-only. A band that is characterized as write-only, while cached in the storage subsystem write cache, remains largely unaffected by Extended Adaptive Cache. Extended Adaptive Cache is designed to not harm the performance of large blocks of data that are either sequentially written or sequentially read. In this case, the pre-fetch capability of the disks, as well as other caches in the system, ensures a quick response time.

Use of Extended Adaptive Cache improves the performance of database-read actions and all read actions. This includes read actions that are generated by other system components such as the Integrated xSeries Server for iSeries. It also works effectively in storage subsystems that have Device Parity Protection or mirroring.

Extended Adaptive Cache Restrictions and Considerations

- A #2748/#4748 PCI RAID Disk Unit Controller feature and a #4331/#6831 (CCIN 6731) Read Cache Device is required for functionality. Extended Adaptive Cache is automatically enabled when these features are installed. There is no user-controlled on or off switch. The #4331/#6831 Read Cache Device (RCD) is a solid state disk optimized for use as Extended Adaptive Cache memory and may be added without system interruption through Device Concurrent Maintenance. There is a maximum of one cache per controller.
- The RCD occupies in an internal disk slot and works with all other disk types and capacities.
- Using Extended Adaptive Cache places no restrictions on the use of Device Parity Protection and mirroring for other disks under the I/O adapter. Extended Adaptive Cache cannot be used in conjunction with Integrated Hardware Disk Compression on the same I/O adapter.
- All data in the Extended Adaptive Cache is also on the disks. Therefore, in the unlikely event of a #4331/#6831 Read Cache Device failure, there will be no data loss.
- A significant decrease in I/O response time and increase in system I/O throughput can be achieved in most environments. Up to a 50% performance improvement can be gained, depending on configuration and workload.
- Extended Adaptive Cache is designed specifically to complement AS/400e Expert Cache and may be used with or without it.
- Extended Adaptive Cache is not considered a pre-fetch type of cache. Therefore, it does not interfere with the read-ahead capabilities in the disk.

Planning for Extended Adaptive Cache

As is the general case with caches, the system configuration and workload influence the effectiveness of Extended Adaptive Cache. Extended Adaptive Cache, functioning at the

storage subsystem level, caches data for the set of disks that are within that specific subsystem. Therefore, it is logical to add Extended Adaptive Cache to the most active and performance-critical storage subsystems within the system. For example, Extended Adaptive Cache is not designed to work with compressed user ASPs. This is because accessible cost-effective storage is the typical goal for compressed disks, as opposed to lightening-fast performance.

The larger the area of disk storage that is actively receiving I/O requests, the more selective Extended Adaptive Cache is about when to bring new data into cache. This adaptive ability allows Extended Adaptive Cache to be effective on many workload types and sizes. The overall cache effectiveness is best understood from this perspective by using Extended Adaptive Cache Simulator.

Extended Adaptive Cache Simulator

Extended Adaptive Cache Simulator is a performance tool that provides estimates of DASD I/O response time improvements and prediction of the number of disk reads that could be saved through the use of Extended Adaptive Cache operations. This determination is based on your system configuration and application environment and is made before you purchase a #4331/#6831 Read Cache Device.

Extended Adaptive Cache Simulator is controlled within the AS/400 Management Central collection services and is already available on V4R4 systems with #2748 PCI RAID Disk Unit Controller. Within the Simulator, flexibility exists to emulate different cache capacities to better determine the capacity that would best suit your specific system and workload needs.

Extended Adaptive Cache Simulator Restrictions and Considerations

- A storage controller (#2748/#4748) capable of supporting Extended Adaptive Cache is required for Extended Adaptive Cache Simulator.
- Extended Adaptive Cache Simulator is enabled and disabled by the user through AS/400 Operations Navigator, Management Central, or Collection Services. Performance Tools LPP (5769-PT1) is required for Extended Adaptive Cache Simulator.
- Activation of Extended Adaptive Cache Simulator will not actually improve your system's performance. It gathers statistical information to predict the performance improvement that Extended Adaptive Cache could offer.
- Extended Adaptive Cache Simulator and Extended Adaptive Cache cannot be active at the same time on the same I/O adapter.

Visit the iSeries 400 Information Center Web site at:
`http://publib.boulder.ibm.com/html/as400/infocenter.html`

Click **System Administration->Maintenance**. Or, contact your local IBM representative for further information about how this performance data will specifically benefit your overall system.

AS/400 Portable Application Solutions Environment

The AS/400 Portable Application Solutions Environment (AS/400 PASE) is a new technology designed to expand the iSeries and AS/400e solutions portfolio. AS/400 PASE is an integrated runtime that provides simplified porting of selected solution provider UNIX applications.

The broad base of iSeries 400 and AS/400e system applications are continually enhanced by new applications coming to the platform from a variety of sources. Until now, the iSeries 400 and AS/400e system's Integrated Language Environment (ILE) accounted for the majority of C or C++ applications ports, many originating on UNIX systems. While many applications continue to be ported to the iSeries 400 or AS/400e server in this manner, other applications have UNIX system-specific requirements or are designed with highly compute intensive demands that favor a UNIX runtime. With the latest addition of AS/400 PASE, ISVs have another option to rapidly port UNIX applications and take advantage of the extensive iSeries 400 and AS/400e system marketplace.

AS/400 PASE provides a broad set of AIX interfaces, in a runtime that allows selected UNIX application binaries to execute directly on the PowerPC processor of the iSeries 400 or AS/400e server. The strategy for AS/400 PASE is to use the new technology to enhance and expand its solutions portfolio in specific industry and application segment targets.

AS/400 PASE Quick Facts

- AS/400 PASE is an integrated iSeries 400 and AS/400e runtime for porting selected UNIX applications.
- It is not an operating system or an emulated environment.
- AS/400 PASE provides a broad subset of AIX libraries.
- AS/400 PASE exploits the PowerPC ability to switch runtime modes.
- AS/400 PASE applications can:
  - Use OS/400 file systems
  - Call DB2 UDB for AS/400 or Java and ILE programs
  - Exploit all aspects of the OS/400 operations environment

AS/400e and RS/6000 share a common PowerPC chip. This hardware base has the ability to switch between runtime modes by:

- Addressing tags active to execute AS/400e 64-bit applications
- Addressing tags inactive to execute 64- or 32-bit AIX applications

AS/400 PASE exploits this switching capability to execute 32-bit AIX applications on the iSeries 400 or AS/400e system within OS/400 jobs. Since AS/400 PASE applications execute directly on the hardware in PowerPC mode, computationally intensive applications use the processor without any additional layers of overhead.

AS/400 PASE is not an operating system. It uses the SLIC kernel for system services. A UNIX application is fully integrated with OS/400 system work management, security, backup, file systems, and database.

AS/400 PASE applications are created on an AIX workstation and executed on iSeries 400 and AS/400e. The current V4R5/V4R4 environment provides libraries containing more than 900 basic system APIs that are compatible with current AIX 4.2.1 releases that provide 32-bit support. Future releases will continue to add more APIs that are compatible with current AIX releases.

DB2 UDB for AS/400 is the database available on the iSeries and AS/400e systems. All applications using database in ILE or AS/400 PASE are ported to DB2 UDB for AS/400. AS/400 PASE contains the same Call Level Interface (CLI) set of APIs for DB2 UDB AS/400 that is supported for ILE. Data returned from DB2 UDB AS/400 can be presented in ASCII format, which is expected by the majority of UNIX applications. Embedded SQL is not currently available for AS/400 PASE, because PASE executables are built on AIX.

AS/400 PASE applications can be fully integrated with other applications, for example, an ERP application implemented in an ILE or a WebSphere application written in Java. A suite of applications can run together in a job mix or be separated into their own logical partitions, depending on the performance and scheduling requirements of the customer.

iSeries 400 and AS/400e customers that run applications ported using AS/400 PASE do not use UNIX system operations. AS/400 PASE applications run in iSeries 400 or AS/400e jobs using standard work management (subsystems), the OS/400 integrated file system with standard save/restore operations, and standard OS/400 security. AS/400 PASE introduces no special system operations, only new applications.

In V4R4, AS/400 PASE provides a broad subset of AIX 4.2.1 functionality, such as standard C and C++ runtime (both thread safe and non-thread safe), non-thread safe Fortran runtime, pthreads threading package, iconv services for data conversion, bsd equivalent support, X Windows client support, and a database access library.

More information can be found on the Web at:
`http://www.iseries.ibm.com/developer/factory/pase/index.html`

Reliable, Managed Availability

The AS/400e system has a long history of designing key functions into the hardware and software which add to the reliability of the system. High availability is one reason to select a managed availability approach, as is offered with the iSeries 400 and AS/400e servers. Other reasons include: minimal disruptive backup solutions, the ability to non-disruptively install and pre-test new versions, releases, or software fixes, to make optimum use of all company and system resources.

Hallmarks of iSeries 400 and AS/400e availability have included redundant internal hardware features, such as RAID-5 and mirroring. The robustness and stability of OS/400 extends into its multiple, subsystem support (batch, interactive, multi-language, applications), demonstrating the iSeries 400 and AS/400e system ability to meet your business requirements when needed. The iSeries 400 and AS/400e servers offer managed availability to ensure that it is ready to do business when you are.

iSeries 400 and AS/400e managed availability software is also called *cross-system mirroring*. It provides:

- The ability to have one system act as a “hot” backup system to one or more primary systems. The primary and secondary systems do not have to be the same size or model.
- A rapid switchover to the secondary machine in the event of an emergency.
- System backup that allows data from the primary system to be completely backed up after only a few minutes of down time. While the secondary system has a “static” copy of the “primary” system’s data, the primary system continues to operate. Changes are transmitted to the secondary system and applied when the backup has completed, therefore, providing continuous protection.
- The secondary system can be used for other activities, for example, business intelligence or application development, while it concurrently provides backup to the primary system. The secondary system can also be used to “load balance”, therefore, off loading the primary system.
- Selection of which items on the primary system need to be dynamically protected by the secondary system. This can minimize disk capacity on the secondary system or allow a smaller model to be used to “cross-system mirror” the larger system.
- Cross-protection among two or more systems, hundreds of miles apart. Data integrity is maintained in both directions. Backups can be performed at the remote site.
- New software versions and releases (OS/400 and associated software), or fixes on the secondary system can be applied while the primary system continues to function. Testing can occur on the secondary system before non-disruptively updating the primary system.

The iSeries 400 and AS/400e servers offers superior technology, service, and support in each of five critical components of availability:

- **Single system reliability**: The architecture and baseline design philosophy make the iSeries and AS/400e servers one of the most reliable servers in the world. The origin of the AS/400e and iSeries 400 serves the small business customer with minimal skill or resource to manage complex environments. From its inception, the AS/400e and iSeries 400 has an architecture with reliability and availability as equal parameters to features like processor speed, memory capability, and number of disk arms.

  AS/400e and iSeries 400 design and development resources enable high levels of availability in a single system environment. This highly reliable design has long been used for unplanned outages by the OS/400 customer. The single-system iSeries 400 and AS/400e remain the core building block to repeat and extend functions into other areas of the business.

- **Single-system availability management:** The iSeries and AS/400e servers have high-availability facilities that are fast, automated, and easy to use. Customers are more likely to use the best availability practices, which helps them reduce the length of both planned and unplanned outages. These practices include facilities such as:

  – Save-while-active
  – Parallel save and restore
  – Backup Recovery and Media Services (BRMS) for AS/400
  – ADSTAR Distributed Storage Manager for AS/400 V3R1 (ADSM)
  – RAID-5 disk parity protection
  – Disk mirroring protection
  – Automated journal management
  – Access path protection

  Note: ADSM was withdrawn from marketing on 31 December 1999. Tivoli Systems Inc., an IBM company, now offers Tivoli Storage Manager Version 3.7 to replace the ADSM product set. See Tivoli Storage Management Solutions at:
  `http://www.tivoli.com/products/solutions/storage/news.html`

  Clusters: Cluster technology is implemented on the iSeries 400 and AS/400e systems to provide availability during both planned and unplanned outages. In today's world, however, it is becoming increasingly clear that there is no time for any unplanned outages, or planned outages for that matter. In an iSeries 400 or AS/400e installation, the lion's share of downtime comes from planned outages.

  Clusters are implemented to reduce downtime due to planned outages and site disasters. Providing system availability during planned outages results in increased unplanned outage coverage as a side benefit.

  iSeries 400 and AS/400e investment in cluster technology. Significant advanced features and functions were introduced in OS/400 V4R4 that put the AS/400e system in a leadership position.

Cluster technology has been around for many years, but only recently have common terms and concepts begun to emerge. In the case of the iSeries 400 and AS/400e systems, they have adopted these concepts and integrated the infrastructure needed to achieve a level of standardization, an advance of cluster technology, and the involvement of the Solution Developer (SD) and the cluster middleware business partner in the total solution. While the system provides the basic cluster infrastructure, the cluster middleware business partner provides data resiliency and the SD provides application resiliency. Together, these three parts provide the whole solution to continuous availability.

- **Applications - Cluster Proven:** iSeries 400 and AS/400e implementation of high availability solutions involves the active participation of cluster middleware business partners who provide cluster management and data resiliency tools, and Solution Developers who must design applications that can maintain application states across an outage. Cluster management and enhanced data resilience applications, both provided by high-availability business partners, complete the total solution.

  More detail on clustering is found in “Continuous Availability Clustering” on page 513.

- **Availability services and support:** As a world leading enterprise computing vendor, IBM has a wealth of products and services to assist the customer in developing and maintaining a high availability environment. These products are reviewed and links provided to other sites.

Logical Partitioning (LPAR) enhances the role of the iSeries 400 or AS/400e as a consolidated server. With LPAR, companies have both the power and flexibility to address multiple system requirements in a single machine. LPAR is of value to customers that need server consolidation, business unit consolidation, mixed production, and a test environment, as well as integrated clusters. More detail on LPAR is found in “Continuous Availability Clustering” on page 513.

Database

While DB2 for AS/400 has long provided facilities to address most customer requirements, with V4R4, AS/400e support has been extended to support new forms of information previously stored on the AS/400e but not managed by DB2 for AS/400. With this release, DB2 Universal Database (UDB) for AS/400 now supports the storing, managing, and indexing of all forms of information including binary objects (such as spreadsheets, word processing documents, and multimedia objects) within the database. This support includes features such as Binary Large Objects (BLOBs), user-defined functions, complex objects, query by image content, and even spatial extenders. All of these features allow customers to use one database management system to store, retrieve, and manage all of their corporate information.

Performance and functional enhancements to the DB2 Universal Database for AS/400 improve the processing of business intelligence queries. These improvements include:

- The hash “group by” algorithm improves performance of grouping queries for a large number of groups.
- The performance of MIN and MAX functions is improved with a suitable index, if available, to determine the minimum or maximum value of a query.
- Derived tables and common table expression support allow complex business intelligence queries to be written without the use of views.

The following functions are available in DB2 Universal Database for AS/400 as of 29 October 1999, through the 1999 Database Enhance PAK or Group PTF SF99014:

- Large objects (LOBs) support allows DB2 UDB to store and manipulate data fields much larger than the current limits. An OS/400 record with LOB fields can hold up to 15 MB of data. With the LOB support, DB2 UDB can be used as a platform for building applications that hold new non-traditional types of data, such as image and audio as well as very large text blocks.
- The *datalink* data type extends the types of data that can be stored in database files. The data stored in the column is only a pointer to the actual object such as an image file, a voice recording, or a text file. The method used for resolving to the object is to store a uniform resource locator (URL). This means that a row in a table can be used to contain information about the object in traditional data types, and the object itself can be referenced using the datalink data type.

  Datalinks also allow the referenced object to be “linked” to the database in such a way that prevents modification or deletion of the object while it is linked to the database file. This relationship is maintained by having the database interact with the file system that contains the object.
- User-defined data types are derived from existing predefined types such as integer and character data. You can create your own data types and create functions for different types. You can call a function for each row of a result set and return a value based on the user-defined type.
- SQL now allows the user-defined functions to be used within SQL itself. User-defined functions are necessary building blocks to support database extenders (extensions to support rich text and multimedia search and manipulation) currently supported on UDB.

AS/400e Business Intelligence Solutions

What is Business Intelligence?

Business Intelligence (BI) turns corporate data into meaningful business information. It can help you understand business trends and make better forecasting decisions. It can be used to bring better products to market in a more timely manner. It can be used to analyze daily sales

information and make snap decisions that can significantly impact your company's performance. Business Intelligence provides a means to become familiar with who your customers are.

Business Intelligence turns corporate data into decision support information. Business Intelligence solutions have become much more affordable due to new innovations in software and hardware. One of these key technologies is data warehousing. Data warehouses provide the plumbing for Business Intelligence applications. The advent of data warehouse technology and industry specific Business Intelligence applications have made implementations meaningful and cost effective.

AS/400e Enabling Technology

The iSeries 400 and AS/400e servers offer state-of-the-art 64-bit relational database processing. The system has been optimized for a Business Intelligence environment with customized hardware (iSeries 400 and AS/400e servers) and optimized software (DB2/400, SMP for DB2/400, DB2 Multi-System, and Data Propagator Relational). These hardware and software functions combine to make a powerful Business Intelligence server that is easy to install, manage, and use.

With the iSeries 400 and AS/400e server open interfaces, hundreds of tools can be used to provide Business Intelligence solutions accessing DB2/400 data transparently. Such tools include desktop analysis tools (Business Objects, for example) and sophisticated multi-dimensional analysis (commonly referred to as OLAP) tools (Essbase/400, for example), with no special programming required.

SMP for DB2/400 provides parallel query processing. This allows multiple processors in a single AS/400e system to collectively work on a single query and can improve query performance by as much as 400%. *DB2 Multi-System* support provides clustering for the iSeries 400 and AS/400e and allows up to 32 servers to be “clustered” together into a single system. This clustering provides almost unlimited scalability and unparalleled performance for customers. The combination of all of these advanced features has dramatically improved system performance so much that customers using UNIX systems, PC servers, and even large specialized parallel servers have converted from these machines to the iSeries 400 or AS/400e servers.

Data replication is an important technology to facilitate the automated loading of data warehouses while cleaning up or summarizing data for integrity and performance purposes. DataPropagator/400 provides asynchronous data movement between OLTP systems and Business Intelligence systems. Data Propagator allows fields to be summarized, derived, or aggregated into the data elements necessary in your data warehouse.

Data mining is a Business Intelligence application that uses mathematical algorithms to scan potentially large amounts of data to find the golden nuggets of information. Intelligent Miner

for AS/400e provides the most advanced data mining application for iSeries 400 or AS/400e customers. It offers optimized computer models to “discover” data relationships previously unknown. The models include algorithms for clustering, information classification, predictions, associations, sequential pattern recognition, and time sequence patterns. This analysis provides executives with insight that can truly be a competitive advantage.

Business Intelligence Solutions

Industry-specific Business Intelligence solutions allow customers to implement off-the-shelf industry applications that are designed for their business. These applications provide a range of functions that are specific to an industry and generally provide users with instant functional application templates that can be customized to meet each businesses unique needs.

Business Intelligence Tools and Applications

Virtually every major Business Intelligence tool is supported on the iSeries 400 or AS/400e servers. That includes tools such as Data Mirror and ETI Extract for moving and cleansing data, and tools for organizing data into a multi-dimensional and relational format as Essbase/400 and DataTracker. It also supports such multi-dimensional analysis tools as Analyzer, Business Objects, and Cognos Powerplay. These tools allow customers unlimited flexibility in building their own Business Intelligence applications. They also allow applications to use OS/400 and non-OS/400 data.

There are many technical advantages of using the iSeries 400 or AS/400e server for your Business Intelligence server. The main reason why customers choose the AS/400e system is the combination of its power and simplicity. The system provides a full range of tools, applications, and hardware in a single integrated platform that helps to make rapid implementation a reality. Large and small businesses alike agree that this is the ideal Business Intelligence server.

The iSeries 400 and AS/400e servers provide outstanding database technology that supports rapid access to large amounts of data. OS/400 supports a wide range of Business Intelligence solutions including small departmental applications, and very large Business Intelligence environments. The benefits of this application are measured by the more informed decisions that can be made as a result of having better information and information in a format to support the decision-making processes of a company.

e-business

Success in business today depends on one thing: meeting customer needs, which are unique to each organization. To meet those needs, the best option is a computer built to do business the way each organization does. That means a server that is flexible, versatile, and can deliver customized solutions, all in a cost effective manner.

The iSeries 400 and AS/400e server have always been designed for business. By tightly integrating hardware, software, middleware, and the operating system. The iSeries 400 and AS/400e servers provide a combination of power and flexibility that organizations can rely on to help them in their business. This design also makes it possible for the system to help ensure that they move with technology as it changes.

The latest AS/400e hardware enhancements are the iSeries 270 and 8xx models. The newest version of the operating system is OS/400 V4R5. OS/400 is engineered to provide the performance and tools needed to help to obtain a quicker return on a business' investment in such critical areas as e-business, enterprise resource planning, Business Intelligence, and server consolidation.

e-businesses require hardware and software solutions with cost-effective computing power. However, more importantly, they need solutions that scale well as workloads grow larger and more complex. To scale well means the computer system grows in capacity to accommodate business growth without changing the customer's applications, hardware, or system software investment. The AS/400e has always been known for its scalability and meeting the needs of a dozen to several thousand users with the same architecture and operating system. The recent outstanding performance of AS/400e as a Domino server in an independent NotesBench audit (10,400 concurrent light mail users on a single AS/400e system) demonstrates that the AS/400e scales just as well with new, advanced e-business applications as it does with a core line-of-business applications.

Characteristics of a Successful e-business

IBM has effectively branded and marketed the term *e-business*. The market is beginning to have a general sense of what e-business means. But an expanded explanation with better examples is necessary. The topics that follow describe the *defining actions* of tomorrow's successful e-business:

- Fully exploiting the latest IT tools and techniques
- Delivering a broad spectrum of applications
- Reaching a broad spectrum of users

These defining actions sound familiar to anyone who knows the fundamentals of using information technology (IT) to achieve competitive advantage. e-business does not change the fundamental rules, but represents a dramatic shift in a typical company's ability to cost-effectively exploit IT on a broad scale. Simply stated, a wide range of affordable tools is now available to enable even the smallest organization to conduct business electronically on a world-wide scale. This allows them to achieve competitive advantage in a cost effective manner.

Fully Exploiting the Latest IT Tools and Techniques

One of the most exciting aspects of the *e-business* dream is the broad range of applications that businesses can deliver. Keep in mind that this range of applications builds on and extends the existing line-of-business (LOB) applications of an organization. Sometimes, these LOB applications are treated with less respect than they deserve and are described with somewhat negative terms (such as *legacy applications*) simply because they are not flashy and glamorous. This is particularly true for customers that have the iSeries or AS/400e server installed in their environment because the majority of their line of business applications still present text-based “green screens” instead of a graphic user interface (GUI).

An e-business needs to be properly positioned to respond quickly to new opportunities, shifts in the market, and peaks in demand for electronic services. Every organization that is looking at e-business both hopes for and fears the problem of exponential growth and an overwhelming response to its *e-presence*. To be properly positioned, both respond to both drag and drop, “point and click” graphical screens and integrate existing LOB applications that provide strong, business critical functions and data.

For the iSeries 400 and AS/400e servers, in particular, a large portfolio of robust LOB applications provides a strong base for building e-business solutions by extending and enhancing those applications with a whole new range of options.

Delivering a Broad Spectrum of Applications

The IT world is witnessing an explosion of new application possibilities centered around groupware, e-business, and the Web. Here are some examples:

- **Static Web sites**: For many organizations, the Web provides a very cost-effective method for publishing and distributing information to the world. Web sites for manufacturers and distributors, for example, typically include product catalogs with specifications, price lists, and pictures. They can present a positive, memorable image for the organization and can be updated regularly at a fraction of the cost to update printed product catalogs. Intranets (networks within an organization) can use the same Web technology to “publish and distribute” policy information, human resource practices, and company newsletters, for example. These types of sites are called *static* (they seldom change and a good Web site is updated frequently) because the contents of the Web pages do not change based on user interaction. The information is *view-only*, not dynamic.
- **E-mail**: The use of e-mail within organizations and across organizational boundaries has mushroomed in recent years. A richly featured e-mail system provides fast distribution of information, including more than just text messages, documents, spreadsheets, and images. A static Web site is often called *pull* technology. Customers need to make the effort to visit the Web site and pull information. E-mail is one method for providing the *push* counterpart. e-businesses can push information to their customers or subscribers. The push may be a teaser (“Visit our Web site for this

month's exciting new product announcements") or it may be more comprehensive. e-businesses also use e-mail, for example, to acknowledge orders and to provide customer service.

- **Bulletin boards and newsgroups**: These Web applications draw their names from counterparts outside of cyberspace. Think of a bulletin board on a college campus. It has many entries of interest to the students and professors who travel that hallway: seminar schedules, job posting, ads for professional journals, schedules of departmental events. Anyone can tack up a notice for all to view. And the department probably publishes a newsletter with contributions from the department members. Now extend that to the world and to the Web, and you have the concept of bulletin boards and newsgroups. Bulletin boards and newsgroups can use both *push* and *pull* techniques. In this case, you often subscribe to a bulletin board or newsgroup and receive an e-mail notification when new items are posted in your interest area.
- **Document management**: In the arena of LOB applications, IT has long understood the advantage (even the necessity) of storing data once, but retrieving and displaying it in multiple ways. With e-business, this need expands to storing data electronically and to storing unstructured information (such as documents, spreadsheets, images, audio, and video) electronically. This requirement goes far beyond the traditional file serving that is part of a PC network to a robust system for archiving, indexing, and retrieving diverse documents (where the term document is used in the broadest sense). Lotus Notes and Domino, with its ability to organize, store, and retrieve both structured and unstructured information, is a good example of document management capability.
- **Value-add, Web-enabled applications**: From the perspective of traditional AS/400e applications, you may think of a value-add, Web-enabled application as extending your "inquiry" applications to the Web. These applications typically give the world, or some subset of the world, the ability to view information from your LOB databases directly. Transport and distribution companies, such as United Parcel and DHL, are often-cited examples in this arena. Their Web sites offer customers the ability to track packages on their journey from the point of origin to their destination.

  This type of application provides value to the customer and differentiates the e-business from its competitors. In addition, it can reduce costs by reducing the volume of calls to the customer service organization. Usually, this type of application simply provides a new way of accessing and displaying information that is already being captured and stored for the LOB applications.

  Obviously, this type of application, which integrates Web pages, forms, and LOB databases, is more challenging than a static Web site. It is more difficult to develop, and it must meet the same demands as your LOB applications, such as security, integrity, reliability. The application provides competitive advantage only if it's available, up-to-date, responsive, and easy to use. Otherwise, your customers will pick up the phone (at best) or go to your competitors (at worst).

- **E-commerce**: E-commerce (a subset of the function implied by e-business) goes one step beyond value-add, Web-enabled applications by exchanging “value” rather than simply exchanging information (not that information isn't valuable). In an e-commerce transaction, one or both parties commit electronically to the delivery of a product or a service for a payment. Both parties accept the transaction as binding. In effect, an e-commerce transaction ultimately creates a flow of money and has the force of a letter or contract with a binding signature.

  Today, e-commerce applications typically exist in two basic forms: *loosely-coupled* and *tightly integrated*. With the loosely-coupled approach, a customer electronically requests a product or service by filling in a form on the Web site. The information from that transaction is captured and entered into the back-end LOB system (often manual). This approach is not that different from having a customer fax an order. The *tightly integrated* e-commerce application interacts directly with the backend application during the transaction. For example, the application checks stock availability and credit limits immediately, online. In other words, it behaves much like a typical, integrated, and online LOB application on the iSeries 400 and AS/400e servers.

  Clearly, a robust, integrated e-commerce application places demands that go beyond the already strenuous demands of mission-critical LOB applications. Security, availability, and auditablity become critical. In addition, the application (and the supporting infrastructure) must be able to respond to unpredictable fluctuations in transaction rates. It demands a premier server and premier tools, which the iSeries 400 and AS/400e servers provide.

Reaching a Broad Spectrum of Users

The network infrastructure and the inexpensive, pervasive tool of the Web (the browser) enable e-business to reach out globally to a variety of users around the globe, as:

- **On-site**: This group of users is housed in the same location as the system.
- **Off-site, internal**: This group of users is part of the organization, but the users themselves are in remote offices.
- **Mobile, internal**: This group of users is part of the organization, but these users work at multiple locations. A travelling sales force is a classic example of mobile users.
- **Suppliers and customers**: e-business can bring to maturity the electronic interaction between an organization and its suppliers and customers. For years, forward-looking organizations have realized the value of having information flow electronically between their systems and the systems of their suppliers and customers. Electronic Data Interchange (EDI) represents a significant step in this direction.
- **Opinion-shapers and consultants**: It seems that for every set of products or services, there is a consultant or pundit ready to evaluate and recommend for or against it. Increasingly, these opinion-shapers and consultants rely on the Web for much of their information-gathering. For an organization to have a visible, positive image with the consultants of the future, the organization must have a Web presence.

- **A greatly expanded potential market**: The reported number of Internet users seems to grow exponentially. A commonly-quoted figure today is 50 million worldwide. This represents a vast market that the savvy e-business can reach economically. Appropriate products for this marketplace are not limited to branded, retail consumer products. Many makers of niche products are using the Web to expand their customer list in the wholesale world. A glass perfume bottle manufacturer, for example, used the Web to expand its customer list 300% (from two to six). As the world of e-business matures, potential buyers and sellers (both retail and wholesale) will develop innovative methods to find each other.

Integration of e-business Tools

Today, no single e-business tool available for the iSeries 400 or AS/400e, or any other platform addresses the entire spectrum of potential e-business users and applications. It is a vast and rapidly evolving area.

IBM, Lotus, and IBM partners are working toward a set of coherent, integrated solutions that extend the iSeries 400 and AS/400e value proposition: *simplicity through integration*. By making it feasible and desirable to integrate multiple e-business applications on a single physical computer system, the system reduces both the cost and complexity of deploying and managing e-business solutions. As our customers move to address the entire range of applications, we will work to provide frameworks and design guidance in these areas:

- *Linkage between different e-business offerings*. For example, how do you tie unique or high-priority orders entered electronically through a Net.Commerce application to workflow notification and e-mail order acknowledgement applications in Domino?
- *Linkage between e-business solutions and LOB applications*. For example, how do orders entered through a Net.Commerce application flow to your back-end order entry and invoicing system?

Refer to the *AS/400e e-business Handbook*, SG24-5694, for a more complete description of products and features of the AS/400 system in the e-business world.

iSeries and AS/400e Future Announcements

iSeries and AS/400e Future Announcements

iSeries and AS/400e Future Announcements

This section outlines Product Previews and Statements of Direction. Product Previews identify specific functions IBM has committed to incorporate into future iSeries or AS/400e hardware or software releases. Statements of Direction identify IBM's commitment to direct the iSeries or AS/400e server toward a given design or technology. By communicating these future plans, IBM intends to help our customers plan for better use of their system.

Product Previews

Product previews provide insight into IBM plans and directions for future iSeries and AS/400e hardware or software releases. The information released represents IBM's current intent. It is subject to change or withdrawal. They represent goals and objectives only.

As part of the iSeries 400 announcements made in October 2000, IBM announced an intention to provide an update of OS/400 that includes the following enhancements:

- **B2B integration - iSeries Licensed Program and operating system enhancements**: IBM intends to provide additional capabilities and integration of B2B for iSeries 400 beyond the first release of Connect for iSeries.

  Specific connectors will be made available for different e-marketplaces, as well as back-end core business applications that plug into the integration framework delivered in the first release of Connect for iSeries.

  IBM intends to also integrate and provide interfaces to the Java servlets/JSP support for Apache, providing an integrated runtime environment for server applications written as Java servlets or JSPs. Also you will be able to upgrade from the base B2B, which will enable functions integrated into iSeries 400 to the functionally rich IBM WebSphere framework of products. This upgrade will provide a smooth path for growth as you continue to enhance and integrate your processes with other businesses.
- **iSeries Linux support:** IBM continues to invest in supporting Linux across all IBM servers. IBM plans to provide Linux for selected models of the iSeries 400 platform by providing native support of the Linux kernel running in a secondary logical partition of the operating system. This will enable Linux applications to run on such iSeries 400 servers with very few or no changes required. The Linux kernel will enable a new stream of e-business applications for the iSeries 400 platform that complements its strength as an integrated core business solution. Linux applications will benefit from the iSeries 400 platform's ability to provide resource flexibility, reliability and connectivity to other applications on a single server.
- **Security - Altered program objects**: Some application providers and customers alter their program objects. IBM recommends against this practice because altered

© Copyright IBM Corp. 2000

programs may bypass checks made by OS/400 that help ensure system integrity and security.

Today you cannot recreate a program object without source code on an iSeries 400 or AS/400e server if observable information, which includes program creation data, has been removed. A future enhancement to OS/400 will retain program creation data when observable information is removed, which will allow the program to be recreated at the customer's option. Recreating a program helps ensure its integrity and allows you to take advantage of new hardware or enhancements in translator technology.

However, when a program is recreated, alterations that were made to the program object are not retained. Programs that depend upon alterations may fail or behave in an unexpected manner should the customer choose to recreate them. Customers should consult their application providers regarding potential impacts of program recreation.

As part of the OS/400 V4R5 announcements made in May 2000, IBM announced an intention to provide an update of OS/400 that includes the following enhancements:

- **Electronic Customer Support (ECS), PM/400e and Service Agent over the integrated modem**: IBM intends to support Electronic Customer Support (ECS) running over a TCP/IP connection, including electronic fix retrieval, problem reporting, and inventory of hardware and software information. PM/400e and Service Agent (formerly known as Service Director) will also be modified to take advantage of the TCP/IP connection. These functions will use the V.90 integrated modem that is shipped with the 270, 250, and 8xx models.

  Over time, IBM also intends to add fax support for this integrated modem.
- **Direct Attach Netfinity Server**: As announced in February 1999, IBM intends to support direct AS/400 attachment of SMP IBM Netfinity servers using the AS/400 High Speed Link (HSL) bus, retaining the systems management and disk consolidation features of Integrated Netfinity Server.
- **HSL OptiConnect**: IBM intends to leverage the significant bandwidth, flexibility, and speed of High Speed Link (HSL) for system-to-system connectivity by offering HSL OptiConnect.
- **AS/400 Logical Partitioning (LPAR) enhancements**: IBM intends to significantly increase the flexibility of LPAR by supporting dynamic resource movement between partitions and providing support for multiple partitions assigned to a single processor.

As part of the OS/400 V4R4 announcements made in February 1999 and August 1999, IBM announced an intention to provide an update of OS/400 that includes the following enhancements. The previews listed are separated into fulfilled and non-fulfilled categories at the time this Handbook was published.

Product Previews: Fulfilled

These product previews were fulfilled at the time of the V4R5 announcement (22 May 2000).

- Customers running OS/2 Warp Server for AS/400 and Novell NetWare 4.11 on the AS/400 Integrated Netfinity Server for AS/400 will be supported with their current capabilities until 31 January 2001. However, these products will not be functionally enhanced. V4R4 is the final release of OS/400 to support OS/2 Warp Server for AS/400 and Novell NetWare 4.11 on the Integrated Netfinity Server for AS/400, the AS/400 Integrated PC Server, or the FSIOP.
- OS/400 V4R4 is the last release to offer single step CISC-to-RISC upgrade (previously referred to as e-Jump) capabilities from V2R3, V3R0.5, and V3R1 systems.
- The IBM WebSphere Application Server for AS/400 product will include Enterprise Server for Java support in the future. This product will include container and server support that is compliant with the Sun Enterprise JavaBeans (EJB) specification. The AS/400 Enterprise Server Java (ESJ) container and server will be capable of hosting EJB components. The container and server provides transaction, security, and persistence support, which makes development of server-side business logic considerably easier. EJB components are reusable, portable, server-side business logic components.

  This product preview is fulfilled with WebSphere Application Server Advanced Edition at OS/400 V4R5.
- V4R4 is the last OS/400 release to support AS/400 Advanced 36 System Support Program (SSP), 5716-SSP, running as a guest operating system and the associated AS/400 Advanced 36 SSP products as previously announced on 09 February 1999.

  As previously stated in announcements on 01 September 1998, and 09 February 1999, program services end on 31 May 2000, for Advanced 36 SSP and associated Advanced 36 products. Information on migration to the S/36 Environment is available at:
  `http://www.iseries.ibm.com/developer/ssp/index.html`
- IBM plans to include support for a Coded Character Set ID (CCSID) as the standard code set for the OS/400 Japanese version in a future OS/400 release. This new function will be included in a new CCSID (1399) that is a super set of CCSID 5035. This new CCSID will support the full code set of Microsoft Windows Operating System (95/98/NT) and the euro currency symbol in a Japanese environment.
- IBM provides a wide range of integration options between the AS/400e server and Microsoft Windows products. IBM intends to provide support for Windows 2000. IBM also intends to support Microsoft Windows 2000 on the Integrated xSeries Server for iSeries in a future release of OS/400.
- Support for Common Programming APIs (CPA) Toolkit will be discontinued in future OS/400 releases.

There are two components of the CPA Toolkit: the development environment and the runtime environment. The CPA Toolkit development environment allows customers to create or update a CPA application. The CPA Toolkit runtime environment allows customers to run existing CPA applications.

OS/400 V4R4 is the last release to support the CPA Toolkit development environment. The CPA Toolkit runtime environment will be supported for one additional release after V4R4. CPA applications can be modified on V4R4 and earlier releases only. Software developers and customers are encouraged to migrate CPA applications to kernel threads, the strategic OS/400 function. Information on migration from CPA to kernel threads is available at: `http://www.iseries.ibm.com/developer/threads/cpa/roadmap.doc.html`

- OS/400 V4R4 will be enhanced to provide facsimile protocol support for ISDN Communications Adapters (#2750 and #2751). With this support, the AS/400 gains high speed technology for the transmission and receipt of facsimile date from Group 3 capable fax machines, another AS/400 system with equivalent communications adapters, or PCs with appropriately programmed fax adapters.

Statement of Direction

As part of the OS/400 V4R4 announcements made in February 1999 and August 1999, IBM announced the following Statement of Direction. With the announcement of V4R5, it is a product preview status for delivery in the next release beyond V4R5.

IBM intends to extend the AS/400 Integrated Netfinity Server design to include the option for direct attachment of symmetric multi-processor Netfinity servers to the AS/400 system.

Integrated Netfinity Server for AS/400 is designed to leverage the industry leading technologies of both the IBM AS/400 and IBM Netfinity server brands. It further demonstrates IBM vision and commitment to providing cross-architecture integration options for companies deploying Microsoft Windows NT on IBM Netfinity servers in conjunction with their AS/400, RS/6000, and S/390 servers.

IBM plans to further augment Magstar 3590 Tape Drive Fibre Channel server connectivity with support for AS/400, Sun Solaris, Windows NT, and Windows 2000.

iSeries and AS/400e Server Summary

iSeries and AS/400e Server Summary

iSeries and AS/400e servers

The iSeries 400 and AS/400e product line consists of seven servers that merge AS/400e systems, servers, and middle-tier servers into a powerful, but simple, structure. Integrated servers are designed to reduce complexity and provide faster deployment of e-business applications. iSeries 400 and AS/400e servers deliver secure, Web-enabled, ready-to-run e-business solutions. This allows businesses to benefit from industry-leading usability and reliability and to save time and money. There are two custom, middle-tier servers, which are designed for dedicated, CPU-intensive processing in a multi-tier environment. This section introduces each system and summarizes the resource and performance characteristics in the tables that follow.

The AS/400e server 250 provides the power and function of the AS/400e server running in a small package with a full complement of AS/400e application support and PC file serving for small businesses and departments of larger companies. The Model 250 is an affordable entry point to the AS/400e family of products and comes with special software packaging.

The iSeries 400 Model 270 enables the reliability, scalability, and security needed for the world of e-business, where a minute of downtime can make a large difference in the success of the business. The iSeries 400 Model 270, with four processor options, expands well beyond the AS/400e server 170. It's entry performance is three times the Model 170; the top performance is nearly doubled, and it has top to bottom scalability of thirteen times. The Model 270 has optional interactive performance features, up to twenty-four arms of DASD, and a high-performance PCI bus. It supports the Integrated xSeries Server (up to three) with a 700 MHz Pentium III microprocessor, 1 Gbps high-speed Ethernet LAN adapter, and 100 Mbps high speed Token-Ring adapter.

The iSeries 400 8xx systems significantly extend the evolution of the iSeries 400 product line. The use of Copper and Silicon on Insulator (SOI) technology dramatically improves processor performance on the iSeries 400 systems. Top model performance is increased by over three and a half times for both base processor and interactive. The top-of-the-line Model 840 boasts a new 24-way symmetric multiprocessor. DASD capacity is over four times the largest 7xx server and main storage is more than doubled. The 8xx hardware completes the transition to PCI I/O architecture with the introduction of PCI adapters in all the 8xx servers. This I/O structure provides concurrent maintenance enhancements with Hot-Plug PCI adapters and DASD. The 8xx servers also support the new Integrated xSeries Server for iSeries (up to sixteen) with a 700 MHz Pentium III microprocessor, 1 Gbps high-speed Ethernet LAN adapter, and 100 Mbps high speed Token-Ring adapter.

The iSeries 400 Dedicated Server for Domino is extended to leverage the Models 270 and 820. They deliver outstanding value when combined with Lotus Domino software and are particularly effective when combined with the partitioning capabilities of Domino Enterprise Server to support multiple Lotus Domino workloads on a single physical server.

© Copyright IBM Corp. 2000

The iSeries 400 SB2 and SB3 models perform dedicated, compute-intensive processing for customers who choose ISV software targeted for a multi-tier environment. Up to 24 GB of memory can be used to satisfy CPU-intensive performance requirements in multi-tier implementations. To focus on the CPU-intensive processing objectives established for these models, a lower number of disk arms is used. Multiple SB2 and SB3 models may be used to push the database servers used in a multi-tier environment to their full potential.

Some of the capabilities of the current iSeries 400 and AS/400e servers are summarized in the tables on the following pages.

Table 1: Summary of the AS/400e server 250

Model	**250**	
Processor Feature	**#2295**	**#2296**
Relative System Performance (CPW - See Note 1 and 2)		
Processor Performance	50	75
Interactive Performance	15	20
Number of N-Way Multiprocessors	1	1
L2 Cache (MB)	0	0
Main Storage (MB) Minimum/Maximum	256-1024	256-1024
Main Storage or DIMMS Minimum/Maximum	2/8	2/8
Processor Group	PPS/P05	PPS/P05

	Base System for all processors	**System Unit Expansion #7102**	**Total Maximum**
Disk Storage (GB)			
Minimum Internal	8.58	0	8.58
Maximum Internal	70.16	105.24	175.40
System I/O Card Slots	6	9	15
Maximum Communication Lines (see Note 4)	1-12	0-26	30
ATM Adapters (see Note 6)	0	0-2	2
Maximum LAN/ATM Adapters (see Note 6)	2	4	6
Non-Integrated Server LAN Low-Speed	1	4	5
Non-Integrated Server LAN 100/10 Ethernet	1	2	3
Integrated Server LAN Low-Speed	2	2	4
Integrated Server LAN 100/10 Ethernet	1	1	2
Maximum Workstation Controllers - Twinaxial	2	5	6
Maximum Workstations - Twinaxial	28-80	200	240
Cryptographic Processors	0	2	2
¼-inch Cartridge Tape (Internal)	0-1	0	1
8mm ½-inch Cartridge (External)	0	0-2	2
Tape Libraries (see Note 5)	0	0-2	2
CD-ROM	1	0	1
Optical Libraries - direct attach	0	0-2	2

Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement.
Note 2:	Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and DASD. Interactive Performance represents the relative performance available to perform host-centric workloads. The amount of interactive capacity consumed reduces the available processor capacity by the same amount.
Note 3:	The Integrated Server is mutually exclusive with the high-speed slot for LAN in the Base System Unit.
Note 4:	One line is used by the Operations Console.
Note 5:	Total number of external tape drives does not increase.
Note 6:	Integrated Server refers to Integrated xSeries Server for iSeries.

Table 2: Summary of the iSeries 400 Model 270

Model	**270**			
Processor Feature	**#2248**	**#2250**	**#2252**	**#2253**
Relative System Performance (See Notes 1 and 2)				
Processor CPW	150	370	950	2000
Interactive CPW				
Base #1516 (Note 5)	-	0	0	0
#1517	25	-	-	-
#1518	-	30	-	-
#1519	-	-	50	-
#1520	-	-	-	70
Number of Processors/Type of Processor	1/Pulsar	1/Pulsar	1/Pulsar	2/Pulsar
L2 Cache (MB)/Processor	0	0	2	4
Main Storage (MB Minimum/Maximum)	256-4096	256-4096	256-8192	256-8192
Main Storage DIMMs or Cards (Min/Max)	2/8	2/8	2/16	2/16
Processor Group (Note 7)	P05	P10/P10	P10/P10	P20/P20

Model	270 Dedicated Server for Domino		
Processor Feature	**#2422**	**#2423**	**#2424**
Relative System Performance (CPW - Notes 1			
Processor CPW	50	100	200
Interactive Environment (Note 5)	0	0	0
Simple Mail Users	2400	3860	7580
Mail and Calendaring Users	1600	2570	5050
Number of Processors/Type of Processor	1/Pulsar	1/Pulsar	2/Pulsar
L2 Cache (MB)/Processor	0	2	4
Main Storage (MB Minimum/Maximum)	256-4096	256-8192	256-8192
Main Storage DIMMs or Cards (Min/Max)	2/8	2/16	2/16
Processor Group	P05	P05	P10

	Base System	System Unit Expansion #7104	PCI Expansion Tower-small #5075	Total Maximum
Disk Storage (GB)				
Minimum Internal	8.58	0	0	8.58
Maximum Internal	105.2	210.5	105.2	421.1
DASD Arms Max	6	12	6	24
Physical Packaging				
External HSL Ports	2	-	-	2
External HSL Loops	1	-	-	1
#5075 Towers supported	1	-	-	1
#5074 Towers supported	0	-	-	0
Embedded IOP	1	-	1	2
PCI Card Slots	7	-	8	15
Maximum PCI IOA Cards	6	-	7	13
Maximum Communication Lines (Note 4)	20	0	34	50
Maximum LAN Ports	3	-	5	8
Maximum Integrated Netfinity Servers	1	-	2	3
Twinaxial Workstation Controllers	4	0	6	6
Twinaxial Workstations	160	0	240	240
CDROM/Internal Tape (Note 6)	2	0	0	2
External Tape	3	0	3	3
Tape Libraries (Note 3)	3	-	3	3
Optical Libraries	3	0	4	4
Diskettes (5 ¼-inch or 8-inch)	0	0	0	0
Fax Adapters	0	0	0	0
Cryptographic Processor	3	0	3	3

Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement.
Note 2:	Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and DASD. Interactive Performance represents the relative performance available to perform host-centric workloads. The amount of interactive capacity consumed reduces the available processor capacity by the same amount. On the Dedicated Servers for Domino, the Processor CPW is an approximate value reflecting the maximum amount of non-Domino workload (10 to 15% of CPU) that can be supported.
Note 3:	The total number of tape drives does not increase.
Note 4:	One line is used by the Operations Console if selected.
Note 5:	This interactive CPW value of 0 represents the amount of 5250 processing capability available for customer applications. CPW=0 supports system administration functions performed by: • A single interactive job • Operations Navigator • Any job submitted to batch Multiple system administrators performing simultaneous tasks is not supported. There is no Interactive Feature Code card for the base interactive #1516. Interactive performance is included in the base. The #2248 comes with the #1517 only.
Note 6:	There must be one CD-ROM per system.
Note 7:	Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2248	#1517	#22A2	P05
#2250	#1516	#22A4	P10
	#1518	#22A5	P10
#2252	#1516	#22A7	P10
	#1519	#22A8	P10
#2253	#1516	#22AA	P20
	#1520	#22AB	P20

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

Table 3: Summary of the iSeries 400 Model 820

Model	820			
Processor Feature	**#2395**	**#2396**	**#2397**	**#2398**
Relative System Performance (Note 1)				
Processor CPW	370	950	2000	3200
Interactive CPW				
#1521	35	35	35	35
#1522	70	70	70	70
#1523	120	120	120	120
#1524	240	240	240	240
#1525	-	560	560	560
#1526	-	-	1050	1050
#1527	-	-	-	2000
Number of Processors/Type	1/Pulsar	1/Pulsar	2/IStar	4/IStar
L2 Cache (MB)/Processor	0	2	4	4
Main Storage (MB Min/Max)	256-4096	256-8192	256-16384	256-16384
Main Storage DIMMs or Cards	2/8	2/16	2/32	2/32
Processor Group (Note 10)	P10-P20	P20-P30	P20-P30	P30-P40

Model	820 Dedicated Server for Domino		
Processor Feature	**#2425**	**#2426**	**#2427**
Relative System Performance (Note 1)			
Processor CPW	100	200	300
Interactive CPW (Note 8)	0	0	0
Simple Mail Users	4250	8000	14400
Mail and Calendaring Users	2620	4950	8910
Number of Processors/Type	1/Pulsar	2/Istar	4/Istar
L2 Cache (MB)/Processor	2	4	4
Main Storage (MB Minimum/Maximum)	256-8192	256-16384	256-16384
Main Storage DIMMs or Cards	2/16	2/32	2/32
Processor Group	P05	P10	P10

Numbers are for All Processor Features	Base System	PCI Expansion Tower #5075	PCI Expansion Tower #5074	Migrated Total with #503x (Note 5,7)	New System maximum (Note 6)
Disk Storage Minimum (GB)	8.58				
Maximum Internal (GB)	210.5	105.2	789.7	1625.9	4159.1
Maximum External (GB)	0	0	0	1595.3	0
Total Maximum (GB)	210.5	105.2	789.7	1625.9	4159.1
DASD Arms maximum	12	6	45	210	237
Diskette (8 or 5 ¼-inch)	0	0	0	2	0
Communication Lines (Note 3)	44	34	52	128	160
Twinax Workstation Controllers	7	7	11	66	62
Twinaxial Devices	280	280	440	2628	2480
CD-ROM/Internal Tape (Note 4)	2	0	2	18 (Note 9)	12
External Tape	6	7	8	8	8
Tape Libraries Maximum (Note 2)	6	7	8	8	8
Optical libraries	6	7	14	14	14
Physical Packaging					
External HSL Ports	2	-	-	-	2
External HSL Loops	1	-	-	-	1
#5074/#5075 Towers Supported	5	-	-	-	5
SPD Towers Supported	-	-	-	4	-
Embedded IOPs	1	1	0	1	6
PCI Adapter Card slots	12	8	14	86	82
Maximum PCI IOA Cards	9	7	11	70	63
LAN Ports Maximum	6	5	8	24	30
Maximum Integrated xSeries Server for iSeries	2	2	2	16	12
Cryptographic Processor	3	3	3	3	3

Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement. Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and DASD. Interactive Performance represents the relative performance available to perform host-centric workloads. The amount of interactive capacity consumed reduces the available processor capacity by the same amount. On the Dedicated Servers for Domino, the Processor CPW is an approximate value reflecting the maximum amount of non-Domino workload (10 to 15% of CPU) that can be supported.
Note 2:	Total number of tape drives does not increase.
Note 3:	One line is used for Operations Console if selected.
Note 4:	There must be one CD-ROM per system.
Note 5:	Includes the #503x Migration Tower and all SPD bus towers attached to the #503x.
Note 6:	New systems only. Does not apply to migrated systems.
Note 7:	This column does not apply to Dedicated Domino Servers.
Note 8:	This interactive CPW value of 0 represents the amount of 5250 processing capability available for customer applications. CPW=0 supports system administration functions performed by: • A single interactive job • Operations Navigator • Any job submitted to batch Multiple system administrators performing simultaneous tasks is not supported.
Note 9:	Includes base CD ROM in Migration tower (no feature code).

Note 10: Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2395	#1521	#23A1	P10
	#1522	#23A2	P20
	#1523	#23A3	P20
	#1524	#23A4	P20
#2396	#1521	#23A9	P20
	#1522	#23AA	P30
	#1523	#23AB	P30
	#1524	#23AC	P30
	#1525	#23AD	P30
#2397	#1521	#23B1	P20
	#1522	#23B2	P30
	#1523	#23B3	P30
	#1524	#23B4	P30
	#1525	#23B5	P30
	#1526	#23B6	P30
#2398	#1521	#23B8	P30
	#1522	#23B9	P40
	#1523	#23BA	P40
	#1524	#23BB	P40
	#1525	#23BC	P40
	#1526	#23BD	P40
	#1527	#23BE	P40

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

Table 4: Summary of the iSeries 400 Model 830

Model	830		
Processor Feature	**#2400**	**#2402**	**#2403**
Relative System Performance (Note 1)			
Processor CPW	1850	4200	7350
Interactive CPW			
#1531 (Base)	70	70	70
#1532	120	120	120
#1533	240	240	240
#1534	560	560	560
#1535	1050	1050	1050
#1536	-	2000	2000
#1537	-	-	4550
Number of Processors/Type	2/IStar	4/IStar	8/IStar
L2 Cache (MB)/Processor	2	4	4
Main Storage (GB Minimum/Maximum)	1-32	1-32	1-32
Main Storage DIMMs or Cards (Min/Max)	8/64	8/64	8/64
Processor Group (Note 9)	P20-P30	P30-P40	P40-P50

Numbers are for All Processor Features	Base System #9074	PCI Expansion Tower #5074	Migrated Total with #5034 #5035 (Note 5)	Migrated Total with #5077 (Note 6)	New System maximum (Note 7)
Disk Storage Minimum (GB)	8.58	-	-	-	-
Maximum Internal (GB)	789.7	789.7	1625.9	2499.6	11055.8
Maximum External (GB)	0	0	1595.3	2473.9	0
Total Maximum (GB)	789.7	789.7	1625.9	2499.6	11055.8
DASD Arms Maximum	45	45	210	596	630
Diskette (8 or 5 ¼-inch)	0	0	2	2	0
Communication Lines (Note 4)	40	52	128	250	300
Twinax Workstation Controllers	9	11	66	175	152
Twinaxial Devices	360	440	2628	7000	6080
CD-ROM (Note 3)	2	2	18 (Note 8)	18 (Note 8)	18
Internal Tape	1	2	17	17	17
External Tape (Max/System)	8	10	8	10	10
Tape Libraries Maximum (Note 2)	8	10	8	10	10
Optical libraries	8	11	14	22	22
Physical Packaging					
External HSL Ports	8	-	-	-	8
External HSL Loops	4	-	-	-	4
#5074 Towers Supported	13	-	-	-	13
SPD Towers Supported	-	-	4	18	0
Embedded IOPs	-	-	2	-	-
PCI Adapter Card slots	14	14	86	270	196
Maximum PCI IOA Cards	11	11	70	216	154
LAN Ports Maximum	6	8	24	48	72
Maximum Integrated xSeries Server for iSeries	2	2	16	16	16

Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement.

Note 2:	The total number of tape drives does not increase.
Note 3:	There must be one CD-ROM per system.
Note 4:	One line is used by Operations Console if selected.
Note 5:	Includes the #5034 or #5035 tower and all the SPD bus towers attached to the #5034 or #5035.
Note 6:	Includes the #5077 tower and all the SPD bus towers attached to the #5077.
Note 7:	New systems only, does not apply to migrated towers.
Note 8:	Includes base CD-ROM in Migration tower (no feature code).
Note 9:	Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2400	#1531	#23C1	P20
	#1532	#23C2	P30
	#1533	#23C3	P30
	#1534	#23C4	P30
	#1535	#23C5	P30
#2402	#1531	#23D1	P30
	#1532	#23D2	P40
	#1533	#23D3	P40
	#1534	#23D4	P40
	#1535	#23D5	P40
	#1536	#23D6	P40
#2403	#1531	#23D8	P40
	#1532	#23D9	P50
	#1533	#23DA	P50
	#1534	#23DB	P50
	#1535	#23DC	P50
	#1536	#23DD	P50
	#1537	#23DE	P50

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

Table 5: Summary of the iSeries 400 Model 840

Model	840				
Processor Feature	**#2418**	**#2418**	**#2418**	**#2420**	**#2420**
Relative System Performance (Notes 1 and 2) Processor CPW	7800/10000	10000/13200	10000	13200/16500	16500
Interactive CPW					
#1540 (Base)	120	120	120	120	120
#1541	240	240	240	240	240
#1542	560	560	560	560	560
#1543	1050	1050	1050	1050	1050
#1544	2000	2000	2000	2000	2000
#1545	4550	4550	4550	4550	4550
#1546	10000	10000	10000	10000	10000
#1547	-	-	-	16500	16500
Number of Processors/Type	8/12/IStar	12/18/IStar	12/IStar	18/24/IStar	24/IStar
L2 Cache (MB) / Processor	8	8	8	8	8
Main Storage (GB Min/Max)	4/96	4/96	4/96	4/96	4/96
Main Storage DIMMs or Cards (Minimum/Maximum)	4/16	4/16	4/16	4/16	4/16
Processor Group (Note 8)	P40-P50	P40-P50	P40-P50	P40-P50	P40-P50

Numbers are for All Processor Features	Base System #9079	PCI Expansion Tower #5074	Migrated Total with #5077 (Note 5)	New System maximum (Note 6)
Disk Storage Minimum (GB)	8.58	-	-	
Maximum Internal (GB)	789.7	789.7	4294.9	18952.9
Maximum External (GB)	0	0	4260.6	4260.6
Total Maximum (GB)	789.7	789.7	4294.9	18952.9
DASD Arms Max	45	45	596	1080
Diskette (8 or 5 ¼-inch)	0	0	2	0
Communication Lines (Note 4)	40	52	300	400
Twinax Workstation Controllers	9	11	175	175
Twinaxial Devices	360	440	7000	7000
CD-ROM (Note 3)	2	2	18 (Note 7)	24
Internal Tape	1	2	17	26
External Tape (Max/System)	8	11	14	26
Tape Libraries Maximum (Note 2)	8	11	14	26
Optical libraries	8	11	22	26
Physical Packaging				
External HSL Ports	16	-	-	16
External HSL Loops	8	-	-	8
#5074 Towers Supported	23	-	-	23
SPD Towers Supported	-	-	18	0
PCI Adapter Card slots	14	14	270	336
Maximum PCI IOA Cards	11	11	216	264
LAN Ports Maximum	6	8	72	96
Maximum Integrated xSeries Server for iSeries	2	2	16	16
Cryptographic Processor	3	3	3	3

Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement.
Note 2:	The total number of tape drives does not increase.

Note 3:	There must be one CD-ROM per system.
Note 4:	One line is used by Operations Console if selected.
Note 5:	Includes the #5077 and all the SPD Bus towers attached to the #5077.
Note 6:	New systems only. Does not apply to migrated system.
Note 7:	Includes base CD-ROM in Migration tower (no feature code).
Note 8:	Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2416	#1540	#24C0	P40
	#1541	#24C1	P50
	#1542	#24C2	P50
	#1543	#24C3	P50
	#1544	#24C4	P50
	#1545	#24C5	P50
	#1546	#24C6	P50
#2417	#1540	#24C8	P40
	#1541	#24C9	P50
	#1542	#24CA	P50
	#1543	#24CB	P50
	#1544	#24CC	P50
	#1545	#24CD	P50
	#1546	#24CE	P50
	#1540	#24C8	P40

	#2418	#1540	#23E8	P40
		#1541	#23E9	P50
		#1542	#23EA	P50
		#1543	#23EB	P50
		#1544	#23EC	P50
		#1545	#23ED	P50
		#1546	#23EE	P50
		#1540	#23E8	P40
	#2419	#1540	#24D0	P40
		#1541	#24D1	P50
		#1542	#24D2	P50
		#1543	#24D3	P50
		#1544	#24D4	P50
		#1545	#24D5	P50
		#1546	#24D6	P50
		#1547	#24D7	P50
	#2420	#1540	#23F8	P40
		#1541	#23F9	P50
		#1542	#23FA	P50
		#1543	#23FB	P50
		#1544	#23FC	P50
		#1545	#23FD	P50
		#1546	#23FE	P50
		#1547	#23FF	P50

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

Table 6: Summary of the iSeries 400 Models SB2 and SB3

Model	SB2	SB3	
Processor Feature	**#2315**	**#2316**	**#2318**
Relative System Performance (Note 1)			
Processor CPW	7350	10000	16500
Interactive CPW	n/a	n/a	n/a
Number of Processors/Type	8/IStar	12/IStar	24/IStar
L2 Cache (MB)/Processor	8	8	8
Main Storage (GB)	12	16	24
Main Storage DIMMs or Cards (Min/Max)	48/48	8/8	12/12
Processor Group	P30	P40	P40
DASD Storage			
DASD Arms Maximum	4	6	8
Physical Minimum (GB)	34.3	34.3	34.3
Physical Maximum (GB)	70.1	105.2	140.3
Logical Maximum (Raid-5 Protection)	52.6	87.7	122.7

	SB2 Base #9074	SB3 Base #9079	Migration Tower II #5077	SB2 Total	SB3 Total
Diskette (8 or 5 ¼-inch)	0	0	2	2	2
Communication Lines (Note 3)	32	32	12	32	32
Twinax Workstation Controllers	1	1	1	1	1
Twinaxial Devices	28	28	28	28	28
CD-ROM / Internal Tape (Note 4)	2	2	3	3	3
External Tape	5	7	4	5	7
Tape Libraries Maximum (Note 2)	4	4	4	4	4
Optical libraries	2	2	2	2	2
Physical Packaging					
External HSL Ports (Note 5)	4	8	-	4	8
External HSL Loops (Note 5)	2	4	-	2	4
#5077 Migration Tower II Supported	1	1	-	1	1
Max SPD cards/PCI IOPs	3	3	2	3	3
PCI Adapter Card slots (usable)	14	14	-	14	14
Maximum PCI IOA Cards (usable)	11	11	-	11	11
Maximum LAN Ports	6	6	6	6	6
Maximum Integrated xSeries Server for iSeries	2	2	2	2	2
Cryptographic Processor	3	3	1	3	3

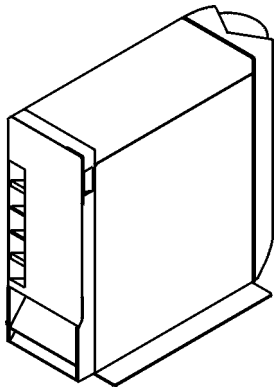
Note 1:	Commercial Processing Workload (CPW) is used to measure the performance of all iSeries 400 and AS/400e processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users is added as a performance measurement.
Note 2:	The total number of tape drives does not increase.
Note 3:	One line is used by Operations Console if selected.
Note 4:	There must be one CD-ROM per system.
Note 5	Because only three controllers and two towers are allowed on the SB3, a maximum of four HSL ports and two HSL loops are usable to attach towers. Other ports and loops are usable for clustering only.

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

AS/400e Server 250

AS/400e Server 250

AS/400e server 250



AS/400e server 250 System Unit

The Model 250 System Unit is a PCI only based unit. It has a base configuration of:

- Processor (one must be specified):

  V4R5 is required for the following processors. Processor performance CPW is provided.

  – #2295 processor (50/15 CPW) with 256M memory (2x CCIN 3022)
  – #2296 processor (75/20 CPW) with 256M memory (2x CCIN 3022)

  Performance figures shown are for client/server and interactive in an unconstrained environment. Memory and disk I/O constraints may limit the performance of some applications.

- Multifunction I/O Processor (MFIOP CCIN 6757)

  Both the processor and MFIOP are combined onto one card. The base disk controller (CCIN 9728) is embedded. Feature #9728 is not required.

- Base DASD/Tape Cage with support for four internal disk units, one internal tape and one internal CD-ROM
- One 8.58 GB Disk Unit
- #9771 Base PCI 2-Line WAN with Modem
- One CD-ROM unit
- One Console attachment (choose one of the following options):
  – #9720 Twinaxial/WAN IOA option for Twinaxial Console and ECS
  – LAN Adapter option: Select one of the following LAN features plus #0398 Operations Console package:

© Copyright IBM Corp. 2000

  - #9723 Base Ethernet IOA
  - #9724 Base PCI Token-Ring IOA
  - #9738 Base PCI 100/10 Ethernet IOA

    Note: #0398 is not included in the base system. It is a required priced feature with the base LAN option. This special package is for the Model 250 only and includes CCIN 2745 and CCIN 0367.

    Note: When #2746 is on the order, #0398 is not required with the base LAN option.
- Six PCI card slots
- The following software products are always preloaded and included with the Model 250 base system:
  - 5769-SS1 OS/400
  - 5769-QU1 Query
  - 5769-ST1 DB2 Query manager and SQL development kit for AS/400
  - 5769-XW1 AS/400 Client Access Family for Windows

  A new processor group, PPS (processor-based packaged software), supports these four programs only when ordered as part of this package. The PPS group is less than the P05 group. Upgrades to the P05 or higher groups result in an upgrade charge. Processor-based programs, other than these four, are charged at the P05 group when ordered for a Model 250.

The AS/400e Model 250 servers are Customer Setup (CSU).

OS/400 V4R5 is required to support the 250 servers.

PCI Card Technology

The Model 250 is a Peripheral Component Interconnect (PCI) based technology system. SPD cards do not attach to the Model 250.

The fundamental bus architecture of the AS/400e system remains unchanged with the implementation of PCI adapters. The AS/400e IOP architecture continues to off load cycles from the main processor, isolate the host from adapter and network errors, and manage, configure, and service the adapters. PCI architecture continues to offer advantages over other system structures.

There are several types of PCI cards, each of which requires a specialized slot on the AS/400e Model 250 backplane:

- **Low-Speed PCI Adapter Cards**: Low-speed PCI cards require a PCI card slot and a PCI controller to drive them. This PCI controller can either be included on the backplane or as a separate PCI card that attaches to the backplane.

- **High-Speed PCI Adapter Cards**: High-speed PCI cards require a higher bandwidth connection to the PCI controllers than low-speed PCI cards require. The PCI controller can be included on the backplane or as a separate PCI card that attaches to the backplane.
- **Low-Speed/High-Speed PCI Adapter Cards**: The Low-speed/High-Speed PCI cards can be installed in either a low-speed slot or high-speed slot.
- **PCI Controller Cards**: PCI controller cards support a number of low-speed PCI card slots and a number of high-speed PCI card slots depending on how the backplane is wired. They require a controller position on the backplane.
- **Integrated xSeries Server for iSeries Controller Cards**: A variant of the PCI controller cards, the Integrated xSeries Server for iSeries (formerly known as the Integrated Netfinity Server) supports a number of PCI card slots and requires a PCI controller to drive them. The Integrated xSeries Server for iSeries occupies a special reserved two-slot controller position on the backplane. One is for the Integrated xSeries Server processor card, and one is for the Integrated iSeries Server Bridge card.

Model 250 *non-CIF features* include:

- #2763 PCI Raid Disk Controller
- #2748 PCI Raid Disk Controller
- #7102 System Expansion Unit
- Processor Upgrades

Main Storage

The Model 250 #2295 and #2296 processors ship with 256 MB of base main storage. There are no features to specify the base memory. The base memory positions contain two 128 MB DIMMs (CCIN 3022). There are six additional Dual Inline Memory Modules (DIMM) slots available. These additional slots are available for DIMMs of either 128 MB or 256 MB up to a maximum of 1024 MB. Memory on both processors of the Model 250 must be added in pairs.

There are no feature exchanges when swapping memory DIMMs.

The following table shows the main storage options for the Model 250.

Processor Options (min MB/max MB)	Main Storage Supported			
	Base	Feature #3022 (128 MB)	Feature #3024 (256 MB)	Maximum
#2295 (256/1024)	256M	6	2	6
#2296 (256/1024)	256M	6	2	6

Workstation Controllers

The Model 250 supports only 5250-type workstations and LAN attachments.

A 5250 twinaxial device or 5250 emulation adapter in a PC supports a single address, multiple addresses, or shared sessions on a single address. Whenever a device is powered on or when the 5250 emulation software is started on a PC, each defined address responds to the workstation controller polls. Therefore, these addresses count as an active address even when no device description exists on the AS/400 system. This can occur when the QAUTOCFG system value is set to *NO. Further considerations include:

- When a device has multiple addresses defined for multiple sessions to support jump screen or to support an attached printer, each session counts towards the maximum active addresses supported by that workstation controller.
- When a device has a single address defined with shared sessions, that device counts as one of the maximum active addresses and up to four of the maximum shared sessions.

There is a maximum of 300 shared sessions per IOP. Refer to the Count of Active Sessions Table on page 135 for a reference of the types of sessions that count toward the maximum number of active sessions, and “5250 Express Data Stream” on page 136 for workstation considerations.

When ordered, the Multifunction I/O Processor has a selection of features that determine whether a 5250-type device (#9720) or Operations Console (#0398) is to be used as a console.

The following workstation controllers can be attached to the Model 250:

- #2746 PCI Twinaxial Workstation IOA
- #9720 Base PCI WAN/Twinaxial IOA

#2746 PCI Twinaxial Workstation IOA

The #2746 is an 8-port twinaxial workstation IOA with a 20-foot attachment cable for attaching up to 40 5250-type displays and printers. Each port supports seven attached addresses allowing for up to 56 attached addresses, of which only 40 can be active. When the attached display supports address sharing, a maximum of 120 shared sessions are supported. The #2746 is specified when additional PCI twinaxial workstation controllers are required and can be installed in either high or low speed slots.

#9720 Base PCI WAN/Twinaxial IOA

The #9720 combined twinaxial and communications adapter is a base option on the Model 250. A cable with a 4-port expansion box comes with this adapter. Each port supports seven attached addresses, for a total of 28 attached addresses per #9720. When the attached display supports address sharing, a maximum of 112 shared sessions are supported. This adapter also supports a single communication line. See “#9720 Base PCI WAN/Twinaxial IOA” on page 110.

Note: The #2720 PCI WAN/Twinaxial IOA can be ordered manually to change the console from Operations Console. The administrative sales records should be RPOed to show a #9720 Base PCI WAN/Twinaxial IOA installed.

Multifunction I/O Processor (MFIOP)

A base MFIOP is standard on all Model 250s.

Note: Other IOP cards support several functions. Therefore, the term MFIOP is not limited to designate the base MFIOP as on earlier models.

PCI Base Multifunction IOP

This MFIOP provides support for two low-speed PCI card slots and one high-speed PCI card slot. It also drives one additional card, which is either an Integrated xSeries Server for iSeries (formerly known as the Integrated Netfinity Server) or an additional high-speed slot.

Low-speed PCI Slot (C09) Supports the base #9771 Base PCI 2-Line WAN with Modem, #2745 PCI 2-Line WAN IOA, #2746 PCI Twinaxial Workstation IOA, or #9720 PCI WAN/Twinaxial IOA. C09 can also support a #2723/#9723 PCI Ethernet IOA or #2724/#9724 PCI Token-Ring IOA if C03 does not contain a #2838 100/10 Mbps Ethernet IOA.

Low-speed PCI slot (C08) Supports #0398 Operations Console Package (CCIN 2745 and CCIN 0367) or #9720 PCI WAN/Twinaxial IOA or #9771 Base PCI 2-Line WAN with Modem

High-speed slot (C07) Supports #2763 PCI RAID Disk Unit controller or #2748 PCI RAID Disk Unit Controller.

High-speed slot (C03) If no #2866 Integrated Netfinity Server is installed in slots C02/C04, then C03 may be used for a #2723/#9723 PCI Ethernet IOA, #2724/#9724 PCI Token-Ring IOA, #2838/#9738 100/10 Mbps Ethernet IOA, #2750, #2751, or #2761 Integrated Analog Modem.

Reserved Slots (C02/C04) The MFIOP supports #2866 Integrated NetfinityServer in slots C02/C04 only if no card is installed in high-speed slot C03.

Notes: The Base PCI Disk controller (CCIN 9728) is embedded on the backplane.

#2824 PCI LAN/WAN/Workstation IOP

The #2824 PCI IOP is a feature I/O processor with 32 MB of memory installed in the #7102 System Expansion Unit. The #7102 has a base controller (CCIN 2824) in slot E10.

The number of PCI cards that can be supported in a Model 250 depends on the number of controllers in the system. Use care in the selection of the controllers. Follow the configuration rules.

Communications

The following adapters support communications on the Model 250:

- #2745 PCI Two-Line WAN IOA
- #2750 PCI ISDN BRI U IOA
- #2751 PCI ISDN BRI S/T IOA
- #2761 Integrated Analog Modem
- #9720 Base PCI WAN/Twinaxial IOA
- #9771 Base PCI 2-Line WAN with Modem

#2745 PCI Two-Line WAN IOA

Supports up to two multiple protocol communications ports when one of two (in any combination) of the following cables are attached:

- #0348 V.24/EIA232 20ft/6m PCI cable
- #0349 V.24/EIA232 50ft/15m PCI cable
- #0353 V.35 20ft/6m PCI cable
- #0354 V.35 50ft/15m PCI cable
- #0356 V.36 20ft/6m PCI cable
- #0359 X.21 20ft/6m PCI cable
- #0360 X.21 50ft/15m PCI cable

- #0365 V.24/EIA232 80ft/24m PCI cable
- #0367 Operations Console cable*

*Only one #0367 Operations Console cable is allowed per system.

#2750 PCI ISDN BRI U IOA

#2750 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-sized PCI card. Based on the latest DSP technology, #2750 allows connections to fax or data modems connected to the telephone network with analog phone lines as well as to other IDSN devices. Each port consists of 2B+D configuration. The #2750 is the “U”-bus (2 wire) version IOA.

- For data mode support, B-channel supports digital data at 64 Kbps.
- For modem mode support, B-channel supports V.90 and lesser modulations.

A wrap cable/plug and four 30-ft RJ-45 to RJ-45 network cables are shipped with each card.

The #2750 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols.

It is allowed both in the Base System Unit and the System Expansion Unit. There is a maximum of one #2750 per IOP. This feature requires country certification or homologation.

#2751 PCI ISDN BRI S/T IOA

The #2751 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-size PCI card. Based on the latest DSP technology, the #2751 allows connections to fax or data modems connected to the telephone network with analog phone lines, as well as to other ISDN devices. Each port consists of 2B+D configuration. The #2751 is the “S/T”-bus (4 wire) version IOA.

- For data mode support, the B-channel supports digital data at 64 Kbps.
- For modem mode support, the B-channel supports V.90 and lesser modulations.

A wrap cable and plug and four 30-foot RJ-45 to RJ-45 network cables are shipped with each card.

The #2751 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols. It is allowed both in the Base System Unit and the System Expansion Unit. A maximum of one #2751 is allowed per IOP. This feature requires country certification or homologation.

#2761 Integrated Analog Modem

Based on the latest DSP technology, #2761 allows the modem function to be integrated into the IOA and supports multiple analog modem ports (8-phone lines). Each line supports V.90 and lesser modulations. The #2761 IOA supports full duplex mode.

A wrap cable/plug and eight 30-foot UTP phone cables are shipped with each card.

This feature supports the SLIP, PPP, SDLC and Fax protocols. An asynchronous line description is required which can only be used for fax. The #2761 is configured as a single IOA with eight individual resources available.

There is a maximum of one #2761 per IOP. The #2761 requires country certification or homologation.

#9720 Base PCI WAN/Twinaxial IOA

The #9720 feature can be included as the base MFIOP to support ECS on the communications adapter. The cable required for ECS is the #0348 V.24/EIA232 20ft/6m PCI cable. The #9720 also supports Twinaxial Workstation Controllers (see “Workstation Controllers” on page 106). The #9720 is supported for migration only.

Note: The #2720 PCI WAN/Twinaxial IOA can be ordered manually to change the console from Operations Console. The administrative sales records should be RPOed to show a #9720 Base PCI WAN/Twinaxial IOA installed.

#0398 Operations Console Package

This feature attaches to the MFIOP and supports up to two multiple protocol communication ports for ECS and Operations Console on a PC. Because the package includes a CCIN 2745 and CCIN 0367, it is not necessary to specify the #0367 Operations Console PCI cable 20ft/6m. A #0348 V.24/EIA232 20ft/6m PCI must be specified for ECS.

The #0398 is mutually exclusive with #9720.

#9771 Base PCI 2-Line WAN with Modem

#9771 is a 2-line WAN adapter, with one port supporting multiple protocol communications and the other port supporting V.90 56K Async Data on PPP using an internal modem.

Connection to the V.90 port is by way of a telephone cable.

Connection to the WAN port is through one of the following cables:

- #0348 V.24/EIA232 20-ft PCI cable
- #0349 V.24/EIA232 50-ft PCI cable
- #0353 V.35 20 ft PCI cable
- #0354 V.35 50-ft PCI cable
- #0356 V.36 20 ft PCI cable
- #0359 X.21 20 ft PCI cable
- #0360 X.21 50-ft PCI cable
- #0365 V.24/EIA232 80-ft PCI cable

ECS and fax are not supported on the V.90 port at this time. IBM intends to support ECS on the V.90 port in the next release of OS/400 and with a Group PTF for V4R5.

ECS operates on the WAN port of the #9771 by changing the *RSRCNAME parameter of the QESLINE and QTILINE line descriptions to that of the WAN port on the #9771 card.

When the #9771 is selected to support ECS, one of the following cables must be specified and connected to the WAN port:

- #0348 V.24/EIA232 20 ft PCI cable (default)
- #0349 V.24/EIA232 50-ft PCI cable
- #0365 V.24/EIA232 80-ft PCI cable

The #9771 does not support the Operations Console as the system console.

Communication WAN Restrictions

Restrictions may apply when using any of the following communications functions on a PCI system:

- Frame Relay protocol
- IPX protocol
- X.25 with more than 16 virtual circuits per line
- SDLC protocol if used to connect to more than 64 remote sites
- Communications line speeds greater than 64 Kbps and up to 2.048 Mbps for the SDLC or Frame Relay protocols (Bisync is always limited to a maximum of 64 Kbps)
- Asynchronous communications or Asynchronous PPP line speeds greater than 115.2 Kbps
- Non-Asynchronous Communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25
- No high speed communication line allowed when a feature code #2750, #2751, or #2761 is installed under the same IOP
- V.25 Autocall cable not supported
- Select standby mode not supported

In particular, this applies when using #2745 PCI Two-Line WAN IOA or the IPX protocol (IPX is used over LAN, ATM, or frame relay).

Rules for individual communication cards (adapters or processors) are found with an explanation of the applicable feature description in the *iSeries and AS400e System Builder*, SG24-2155.

For further considerations and sizing rules, refer to the feature descriptions of the specific adapters or IOPs in the Model 250 chapter of the *iSeries and AS400e System Builder*, SG24-2155, and the iSeries 400 Information Center at
`http://publib.boulder.ibm.com/pubs/html`

Select **Information Center->your language of choice->What's New**.

For general communications performance considerations, refer to the online-document *AS/400 Performance Capabilities Version 4, Release 5*, SC41-0605. It is available in softcopy only by visiting the Web site at `http://publib.boulder.ibm.com/pubs/html/`

Select **Online Library->your language of choice->What's New**.

Encryption

#4801 PCI Crypto Coprocessor

#4801 is a hardware cryptography solution. The #4801 is a half-length PC form-factor PCI card which offers rich cryptography function, secure storage of cryptographic keys, and 12 MB/s performance (at the card level) for bulk data encryption. The #4801 is available worldwide. The level of cryptographic function is determined by the Cryptographic Access Provider licensed program, which is downloaded to the adapter.

It can only be installed in a high speed slot in the System Expansion Unit (#7102). On new systems from the plant, #4801 is shipped with the system, but not installed.

Local Area Networks and Asynchronous Transfer Mode

The following adapters and controllers support LAN attachment on the Model 250. One of the following base LAN adapters is included at no charge with the LAN option:

- #9723 PCI Ethernet IOA
- #9724 PCI 16/4 Mbps Token-Ring IOA
- #9738 PCI 100/10 Mbps Ethernet IOA

Other adapters supporting LAN attachments are:

- #2723 PCI Ethernet IOA
- #2724 PCI 16/4 Mbps Token-Ring IOA
- #2838 PCI 100/10 Mbps Ethernet IOA
- #2815 PCI 155 Mbps UTP OC3 ATM IOA
- #2816 PCI 155 Mbps MMF ATM IOA
- #2818 PCI 155 Mbps SMF OC3 ATM IOA
- #2866 PCI Integrated Netfinity Server

#2838/#9738 PCI 100/10 Mbps Ethernet IOA

The #9738 is a base LAN option on the Model 250.

The 100/10 Mbps Ethernet PCI adapter feature allows the AS/400 system to attach to standardized 100 Mbps high-speed Ethernet LANs and also allows attachment to existing 10 Mbps Ethernet LANs. This adapter comes with an RJ45 connector for attachment to UTP-5 media. It requires one high-speed PCI card slot. The Ethernet /IEEE 802.3 IOA is capable of operating in half or full duplex mode. Cabling for 10 Mbps must be CAT-3 or CAT-5, and cabling for 100 Mbps must be CAT 5 that meets or exceeds Industry Standard EIA/TIA T568A or T568B.

If #2838/#9738 100/10 Mbps Ethernet is selected to be run on an Integrated xSeries Server for iSeries (Integrated Netfinity Server), then one Specify feature #0222 (100/10Mbps Ethernet on Integrated Netfinity Server) is required for each #2838/#9738 ordered.

The #9738 is mutually exclusive with #9723 and #9724 as a base LAN controller.

#2724/#9724 PCI 16/4 Mbps Token-Ring IOA

The #9724 is a base LAN option on the Model 250.

This feature provides a single attachment to either 16 Mbps or a 4 Mbps Token-Ring. The feature consists of an IOA card, internal code that supplies IEEE 802.5 Media Access Control (MAC) and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724/#9724 comes with an 2.44m Token-Ring cable, or a separately purchased twisted-pair cable to the RJ45 connection on the IOA may be attached. It occupies one PCI card slot.

If #2724/#9724 16/4 Mbps Token-Ring LAN IOA is installed on an #2866 Integrated Netfinity Server, then one Specify #0220 (Token-Ring on Integrated Netfinity Server) is required for each #2724/#9724 ordered.

The #9724 is mutually exclusive with #9723 and #9738 as a base LAN controller.

#2723/#9723 PCI Ethernet IOA (10 Mbps)

The #9723 is a base LAN option on the Model 250.

This feature provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code, which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode.

The #2723/#9723 has an RJ45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ45 twisted-pair cable must be ordered separately. RJ45 cabling for 10 Mbps must be CAT-3 or CAT-5, if CAT 5 is used, because then it meets or exceeds Industry Standard EIA/TIA T568A or T568B. It occupies one PCI card slot.

If #2723/#9723 Ethernet IOA is selected to be run on an #2866 Integrated Netfinity Server, one Specify #0221 (Ethernet on Integrated Netfinity Server) is required for each #2723/#9723 ordered.

The #9723 is mutually exclusive with #9724 and #9738 as a base LAN controller.

#2815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #2815 is typically used where 155 Mbps speeds are required over distances of less than 100 meters. It uses one high-speed slot, but cannot be placed in the Base System Unit. It attaches in slot E08 and slot E03 (where #2824 is a prerequisite) of the System Expansion Unit (#7102). The maximum is two. Technical specifications and industry standards supported are available at the ATM Forum Web site: `http://www.atmforum.com`

#2816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #2816 is typically used where 155 Mbps speeds are required over distances of less than 2 km. It uses one high-speed slot but cannot be placed in the Base System Unit. It attaches in slot E08 and E03 (where #2824 is a prerequisite) of the System Expansion Unit (#7102). The maximum is two. Technical specifications and industry standards supported are available at the ATM Forum Web site: `http://www.atmforum.com`

#2818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. The #2818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 km. It uses one high-speed slot, but cannot be placed in the Base System Unit. It can attach in slots E08 and E03 (where #2824 is a prerequisite) of the System Expansion Unit (#7102). The maximum is two. Technical specifications and industry standards supported are available at the ATM Forum Web site: `http://www.atmforum.com`

#2866 PCI Integrated Netfinity Server

The Integrated Netfinity Server contains an Intel 333 MHz Pentium II Processor, four main storage slots, and two LAN IOA slots. The adapter requires two reserved PCI card positions: one for the processor card and the second for the bridge card to interface the processor card to the AS/400e system. A maximum of two #2866 Integrated Netfinity Servers are supported: one in the Base System Unit and one in the System Expansion Unit (#7102).

The Integrated Netfinity Server provides high-performance LAN serving to LAN-attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, or Microsoft Windows NT and Windows 2000 servers are supported on the Integrated Netfinity Server.

The Integrated Netfinity Server comes with no base main memory and supports up to four of the following features:

- #2861 32M IOP Memory Card
- #2862 128M IOP Memory Card
- #2867 256M IOP Memory Card

Each LAN slot can contain either a Token-Ring or an Ethernet IOA from the following list:

- #2723/#9723 PCI Ethernet IOA
- #2724/#9724 PCI 16/4 Mbps Token Ring IOA
- #2838/#9738 PCI 100/10 Mbps Ethernet IOA

There can only be one #2838/#9738 on each #2866 Integrated Netfinity Server. An external cable is included to enable connectivity to Integrated Netfinity Server hardware (keyboard, mouse), which also allows for optional use of parallel and serial ports.

If running Microsoft Windows NT on the Integrated Netfinity Server, these additional features are required:

- #0325 IPCS Extension Cable for Windows NT (orderable)
- #1700 IPCS Keyboard/Mouse for Windows NT (default in some countries and orderable in others)
- A display unit must be connected to the Integrated Netfinity Server to support Windows NT
- A minimum of 64M IOP memory on the Integrated Netfinity Server

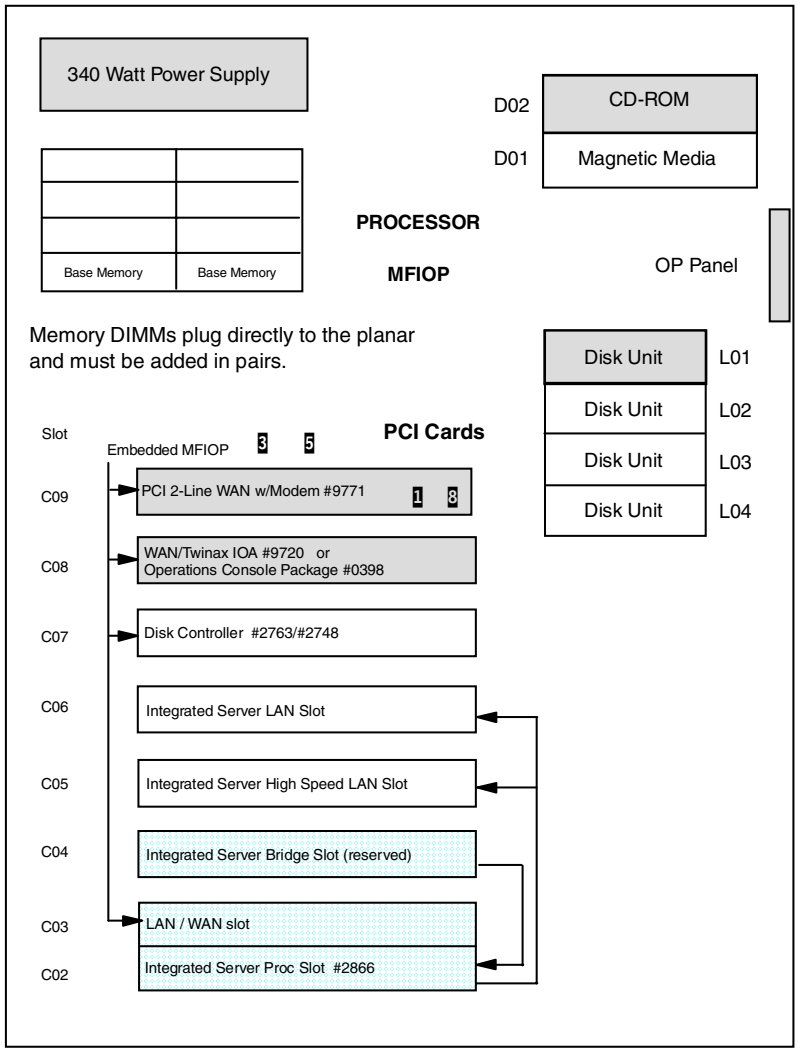
For keyboard/mouse and display support in countries outside the USA, consult the Internet at: `http://www.as400.ibm.com/windowsintegration/ntins.htm`

9406 Model 250 System Unit

Power and Packaging

The base system contains a planar, which combines both the processor and MFIOP in one card. The Base Disk Controller (CCIN 9728) is embedded on the backplane. The MFIOP provides support for two low speed PCI card slots and one high speed PCI card slot (used for the optional disk controller). It also drives one Integrated Netfinity Server (#2866) or one additional high speed slot.

9406 Model 250 System Unit and PCI Card Placement



Notes:

1. No high-speed LAN is allowed in Slot C09.
2. If any LAN is in Slot C03, no LAN card is allowed in Slot C09.
3. A maximum of three LAN cards are allowed on the MFIOP (including Integrated Server slots C05 and C06).
4. Communications cards #2750, #2751, and #2761 are *only* allowed in high-speed Slot C03.
5. The processors include an embedded base disk controller (CCIN 9728). A separate #9728 is not needed.
6. If any IPCS is in Slots C02/C04, C03 must remain empty.
7. In C03, #2723, #2724, #2745, #2746, #2750, #2751, #2761 and #2838 are supported.
8. C09 supports #2720, #2723/#9723, #2724/#9724, #2745/#9745, #2746. When the system is ordered with a base LAN, a #2746 and no #0398, the #2746 goes into C09 and the #9771 into C08.

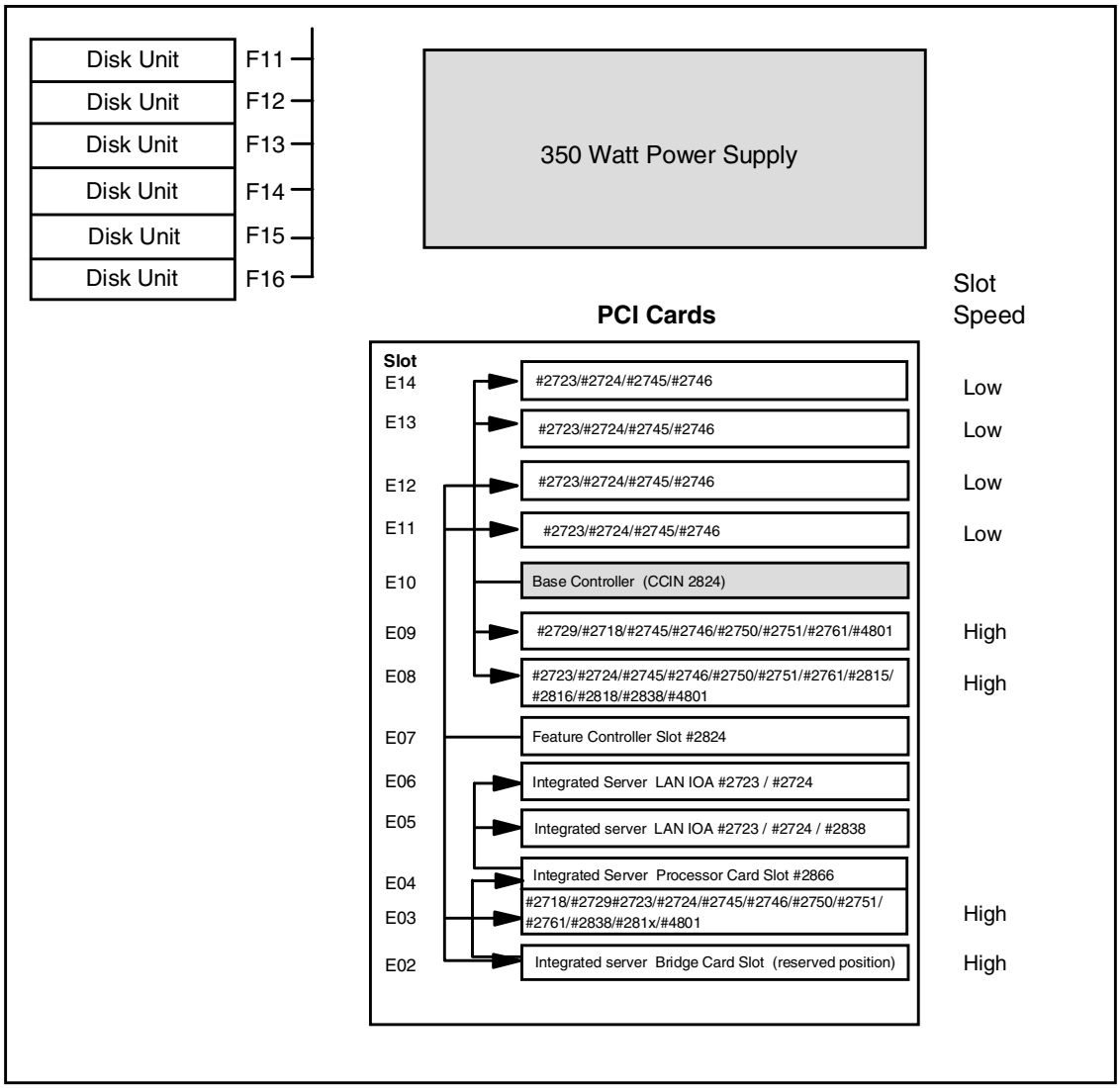
System Expansion Unit Schematics

#7102 System Expansion Unit

Power and Packaging

The System Expansion Unit supports six disk units and includes a Base controller (CCIN 2824) and further slots as illustrated in the following figure.

9406 Model 250 #7102 System Expansion Unit



Notes:

1. A maximum of one High Speed LAN/ATM or maximum of two low speed LANs per controller.
2. If an Integrated Server is in slots E02/E04, E03 must remain empty.
3. A maximum of one LAN in E11 or E12 with Integrated Server in E02/E04.

4. The disk units in the expansion unit are controlled by the #2763 or #2748 disk controller in the System Unit.
5. Communications cards #2750, #2751, and #2761 are allowed in slots E03, E08, and E09 (maximum one per IOP).
6. Cryptographic card #4801 is allowed in high-speed slots E03, E08, or E09 (maximum one per IOP).
7. Integrated Server refers to Integrated Netfinity Server, now known as the Integrated xSeries Server for iSeries or Integrated xSeries Server.

Uninterruptable Power Supply (UPS)

An external UPS is recommended since the 9406 Model 250 does not have an internal battery backup unit (BBU). The configurator adds a country-specific UPS by default. The 9910 Models 080, 140, and 180 from the 9406 Model 170 may be used although the CPM function is not supported.

Disk Units

There is a maximum of ten disk units supported on the Model 250. There is no support for an external disk on the Model 250.

#6831 1.6GB Read Cache Device

Read Cache Device feature #6831 (CCIN 6731) is a solid state disk device that provides the Large Read Cache function required by high-performance disk unit controllers. See “Extended Adaptive Cache” on page 58 for more information. There is a maximum of one per #2748 PCI RAID Disk Unit Controller IOA. Extended Adaptive Cache cannot be used with compression on the same #2748 PCI RAID Disk Unit Controller IOA. The #2748 IOA is shipped with compression disabled. Compression is enabled by moving a jumper on the IOA. Refer to “PCI Disk Units” on page 345 for detailed information.

The following table contains the maximum number of supported disk units for the Model 250.

Feature	Size	RPM	Maximum
#6813	8.58 GB	7200	9
#6817	8.58 GB	10000	9
#6818	17.54 GB	10000	9
#6824	17.54 GB	7200	9

Feature	Size	RPM	Maximum
#8917	8,58 GB	10000	1
#8918	17.54 GB	10000	1
#8924	17.54 GB	7200	1
#9313	8.58 GB	7200	1

For disk unit descriptions, refer to “PCI Disk Units” on page 345.

Magnetic Media Controllers

#2729 PCI Magnetic Media Controller SCSI

The #2729 PCI Magnetic Media Controller SCSI provides for the attachment of tape and optical devices. See “Magnetic Media Controllers” on page 407.

#2718 PCI Magnetic Media Controller

#2718 is a SCSI Tape IOA that provides attachment capabilities for the IBM 7207 Model QIC External Tape Drive. The #2718 can attach one tape drive.

#2763 PCI RAID Disk Unit Controller

See “Magnetic Media Controllers” on page 407.

#2748 PCI RAID Disk Unit Compression Controller

See “Magnetic Media Controllers” on page 407.

Internal Tape, CD-ROM, and Diskette Units

Internal tapes cannot be installed in the #7102 System Expansion Unit.

For more information, refer to “Internal Magnetic Media” on page 345.

Base CD-ROM Drive

Refer to “Internal CD-ROM Drives” on page 366.

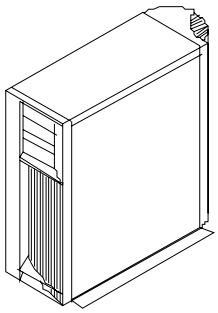
Diskette Drive Support

There is no diskette support on the Model 250.

iSeries Server 270

iSeries Server 270

iSeries server 270



iSeries server 270 System Unit

The iSeries Model 270 server delivers the performance, reliability, and security needed for applications that span from core business to e-business. With four processor options, the 270 server offers a thirteen times performance scalability from top to bottom. Processor upgrades are offered within the 270 server.

The iSeries server 270 offers up to ten times I/O infrastructure performance, up to 24 disk units, a high-performance PCI bus with Hot Plug PCI adapters (on selected processors), a High-Speed Link, and V.90 integrated modem. Options include a 1 Gbps high-speed Ethernet LAN adapter, 100 Mbps high-speed Token-Ring adapter. On selected processors, a 700 MHz Integrated Netfinity Server and interactive performance features can be selected.

The 270 servers are Customer Setup (CSU).

OS/400 V4R5 is required to support the 270 servers.

A minimum functional server consists of the base server unit and selected priced features.

The base server includes the physical package and power elements, a DASD controller, an I/O controller, and a #9771 Base PCI 2-Line WAN with Modem as follows:

- Operator panel without key stick
- Base DASD/tape cage (six Internal Disk slots, two Removable Media slots)

  The base DASD cage on #2248, #2250, and #2422 processors support non-concurrent maintenance.
- Embedded Base PCI IOP

  Provides support for a maximum of up to four IOAs including:

© Copyright IBM Corp. 2000

  - Support for base #9767 Base PCI Disk Unit Controller
  - Support for up to six Disk Units, the required CD-ROM, and either a feature Internal Tape or a feature CD-ROM.

  Provides support for base Console/Workstation IOA.

  The configurator determines which feature combinations will be on the order based on the System Console #5540 or #5544 specify code.

- Hot plug PCI capability on #2252 and #2253 processors.

The following must be purchased:

- Processor (one must be specified; processor performance CPW is listed)
  - #2248 processor (150 CPW)
  - #2250 processor (370 CPW)
  - #2252 processor (950 CPW)
  - #2253 2-way processor (2000 CPW)
- Interactive Card (one must be specified; see the following processor/interactive feature table for the 270 server)

Processor Feature	#2248	#2250	#2252	#2253
Interactive Feature				
#1516	-	0	0	0
#1517	25	-	-	-
#1518	-	30	-	-
#1519	-	-	50	-
#1520	-	-	-	70
Note: The interactive value of zero supports system administrative functions.				

- Main Storage (a minimum of two of the same capacity and technology must be selected)
  - #3022 - 128 MB Main Storage
  - #3024 - 256 MB Main Storage
  - #3025 - 512 MB Main Storage
  - #3026 - 512 MB Main Storage
- Integrated Disk Units
  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit
  - #4324 - 17.54 GB Disk Unit
- Integrated CD-ROM

  #4525—CD-ROM

- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem
- Uninterruptible Power Supply (UPS)

  An external UPS is recommended to protect the system unit and any external components against utility power outages. The AS/400 CPM/UPS Models 9910-080, 9910-140, and 9910-180, which were previously used with the 9406 Model 170, can also be used with the Model 270. The Model 270 does not include an internal battery.

  An external UPS, combined with abnormal IPL improvements in OS/400, provides an equivalent level of power protection and fast recovery in the event of power failure. Continuously Powered Main store (CPM) is not supported on the Model 270.

Card Technology

PCI architecture offers advantages in flexibility over non-AS/400e system structures. Prior AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in a particular area was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, leaving valuable slots empty.

With the implementation of new PCI technologies, the Model 270 provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, potentially resulting in a lower cost of implementation. Increased flexibility of configuration adds a degree of complexity to the configuration process. A full understanding of configuration rules associated with the various I/O features of the 270 system is required.

The fundamental bus architecture of the iSeries server is unchanged when using PCI adapters. The AS/400e IOP continues to off load the main processor; isolate the host from adapter and network errors; and manage, configure, and service the adapters.

The following functions do not have equivalent function PCI cards for the Model 270:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode

- X.21 switched WAN dialup or Shorthold Mode WAN
- Asynchronous communication speeds of less than 300 bps
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loopback (diagnostics functions supported by some modems)

Processor Features

- #2248 Model 270 Processor (PULSAR Uni) includes:
  - Eight DIMM memory positions (which plug directly onto the backplane - Direct Attach)
  - Embedded Base IOP (CCIN 284D)
  - Common Service Processor (CSP) (CCIN 2249)
- #2250 Model 270 Processor (PULSAR Uni) includes:
  - Eight DIMM memory positions (which plug directly onto the backplane - Direct Attach).
  - Embedded Base IOP (CCIN 284D)
  - Common Service Processor (CSP) (CCIN 2249)
- #2252 Model 270 Processor (PULSAR Uni), includes:
  - Eight DIMM memory positions (which plug directly onto the processor - Direct Attach).

    Optional priced #2884 Main Storage Expansion Card Feature is available which supports 16 DIMM memory positions. The customer can select *either* direct attach *or* purchase a memory riser feature, but cannot use both.
  - Base I/O Backplane (CCIN 282F)
  - Embedded Base IOP (CCIN 284E)
  - Common Service Processor (CSP) (CCIN 282F)
  - Internal flex cable for HSL enablement (tower attachment)
- #2253 Model 270 Processor (PULSAR 2-Way) includes:
  - 16 DIMM memory positions with the main storage expansion card (CCIN 2884)
  - Base I/O Backplane (CCIN 282F)
  - Embedded Base IOP (CCIN 284E)
  - Common Service Processor (CSP) (CCIN 282F)
  - Internal flex cable for HSL enablement (tower attachment)

Interactive Features

The Model 270 supports various levels of interactive performance through the installation of interactive features. See the Model 270 Processor/Interactive Feature Table on page 124.

Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250). An iSeries server 270 can be effectively managed when there is no Interactive CPW (Interactive CPW = 0) available for application workloads. The zero interactive CPW is intended to support a single interactive job for system administrative functions.

- A job started from a console (green screen) to perform a system administration function is not considered interactive work if it is the only interactive job running (single interactive job exception).
- A system administration job submitted to batch is not considered interactive work.
- The use of Operations Navigator (GUI administration functions) is not considered interactive work.

For a discussion of how these features influence system performance, see “IBM Workload Estimator for AS/400” on page 32.

The available interactive options for the Model 270 are shown in the Model 270 Processor/Interactive Feature Table on page 124.

A feature cross-reference table can be used to relate Processor Feature Code to the Processor and Interactive features visible in the AS/400e configurator. The Processor Feature Code is found by displaying the QPRCFEAT system value or in the rack configuration. The Processor Feature Code is used when ordering software license keys.

Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2248	#1517	#22A2	P05
#2250	#1516	#22A4	P10
	#1518	#22A5	P10
#2252	#1516	#22A7	P10
	#1519	#22A8	P10

#2253	#1516	#22AA	P20
	#1520	#22AB	P20

Main Storage

All main storage on the Model 270 is feature main storage. A minimum of two of the same capacity and technology must be selected.

- Processors #2248, #2250, #2422, and #2252/#2423 (without #2884 Main Storage Expansion card):
  - All main storage DIMMs on the these Model 270 processors must be added in pairs of the same capacity and technology.
  - There are eight slots available in the base system for main storage DIMMs, which plug directly onto the processor (Direct Attach) and do not use a #2884 Main Storage Expansion Card.
  - For Processors #2252/#2423, when more than eight total DIMMs are required, a #2884 Main Storage Expansion Card must be ordered as a separate priced feature. All DIMMs must plug into the #2884 Main Storage Expansion Card. When the #2884 is used, direct attach of DIMMs to the processor #2252/#2423 is not allowed.
- Processors #2252, #2253, #2423, and #2424 (all with #2884 Main Storage Expansion Card):
  - Model 270 Processors #2252, 2253, #2423, and #2424 using the #2884 Memory Expansion Feature must place DIMMs of the same capacity and technology, in sets of four (quads). A single pair of DIMMs is allowed on the initial order if they are the only two on the system. Any memory DIMMs added beyond the initial pair must be placed in quads. The initial DIMM pair must also be in a quad.
  - There are 16 slots available in the base system using a #2884 Main Storage Expansion Card for placement of main storage DIMMs.
  - For processors #2252/#2423, when more than eight total DIMMs are required, a #2884 Main Storage Expansion Card must be ordered as a separate priced feature. All DIMMs must plug into the #2884 Main Storage Expansion Card.
  - For processors #2253/#2424, a Main Storage Expansion Card (CCIN 2884) is included in the base system. It does not need to be ordered.
- #2884 Main Storage Expansion Card
  - This feature provides for mounting DIMM memory on the Model 270. It contains one riser card with 16 sockets for placement of 128 MB, 256 MB or 512 MB DIMMs.
  - Maximum: One on Processor #2252 and #2423.

– For placement, an initial pair of memory DIMMs is allowed (in slot A and slot B) without quads. After that, all DIMMs must be plugged in quads starting from the outer four corners going toward the center (A, B, C, D, then E, F, G, H, and so on). Using the same feature code number within a quad is required. Mixing quad “groups” on the same riser card is also allowed (including mixing stacked (#3025) and unstacked (#3024) memory technology).

Power and Packaging

The Model 270 does not include an internal battery. An external UPS is recommended to protect the system unit and any external components against utility power outages. The AS/400e CPM/UPS Models 9910-080, 9910-140, and 9910-180, which were previously used with the 9406 Model 170, can also be used with the Model 270. An external UPS, combined with abnormal IPL improvements in OS/400, can provide an equivalent level of power protection and fast recovery in the event of power failure. The Continuously Powered Main store (CPM) is not supported on the Model 270.

The supported power and packaging features for the Model 270 are:

- #0551 270 Rack
  - The #0551 270 Rack includes the rack and is plant installed only. The #0121 Lower Unit in Rack Specify identifies the 270 system in the lower position. The #0122 Upper Unit in Rack Specify identifies the upper position 270 in the rack. Both 270 models must have the #7104 System Unit Expansion. The two 270 models combined take up the lower part of the 1.8 m rack leaving six EIA units available at the top of the rack. The rack does not have a power distribution unit. The 270 systems report as separate units. You must ordered separate power cords for each 270 system. Upgrades from #2248 and #2250 to #2252 and #2253 are not supported. Upgrades from #2422 to #2423 or #2424 are also not supported.
- #7002 HSL Enabler
  - The #7002 is a feature High Speed Link (HSL) internal flex cable, which enables connection to a #5075 PCI Expansion Tower.
  - Can be ordered on the Model 270 with processor #2248, #2250, and #2422 only.
  - This cable connects the processor with a right angle bus connector to the back of the machine. Two HSL cables (#14XX) are required to connect the CEC to the expansion tower.

  Note: On processor upgrades from #2248, #2250, #2422 to #2252, #2253, #2423, #2424 RPO, remove the #7002. These processor upgrade paths are “roll-in/roll-out” system upgrades. The new system unit comes standard with an internal flex cable.

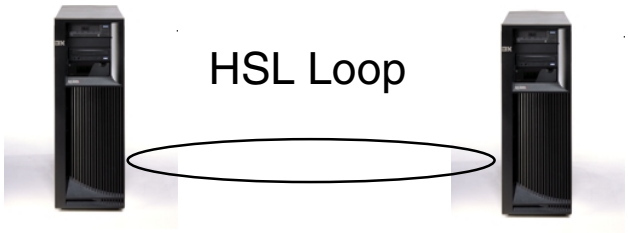
- #7104 System Unit Expansion
  - The #7104 is a feature system unit expansion that allows up to an additional 12 disk units to be added to the Model 270. The #7104 has no PCI card slots and no removable media slots.
  - The #7104 comes with support for six disk units standard and requires a #7123 when installing over six disk units.
  - The #7104 disk units are driven by a disk unit controller located in the CEC.
- #7123 DASD Expansion Unit
  - #7123 is a concurrent maintenance DASD six-position expansion feature, which may be ordered to support an additional six disk units (for a total of 12) in the #7104 on the Model 270.
  - Prerequisite: #7104 on Model 270. Two #2763s or one #4748 in Model 270 system unit.
- #7133 DASD Concurrent Maintenance Cage
  - #7133 is a DASD 6-Pack cage that may be ordered for the Model 270 with processors #2248, #2250, and #2422.
  - The #7133 enables disk unit concurrent maintenance and replaces the standard non-concurrent maintenance DASD 6-Pack cage.

  Note: On processor upgrades from #2248, #2250, #2422 to #2252, #2253, #2423, #2424, RPO, remove the #7133. These processor upgrade paths are “roll-in/roll-out” system upgrades and the new system unit comes standard with a concurrent maintenance disk unit cage.

  Note: #7133 is a prerequisite for a #7104 on processors #2248, #2250, and #2422.
- #5075 PCI Expansion Tower
  - #5156 Redundant Power and Cooling
  - See “Expansion Towers” on page 223 for detailed information.

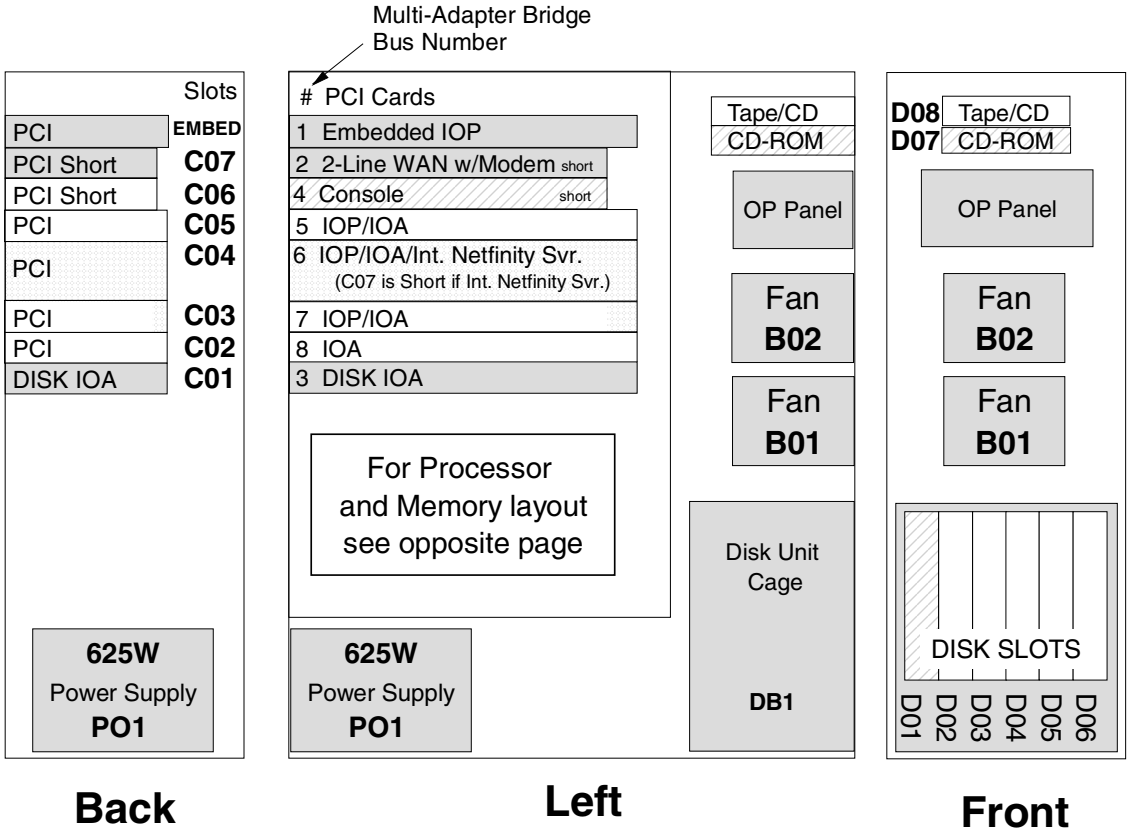
High Speed Links (HSL) on Model 270

The Model 270 has been enhanced to provide an external connection to an expansion tower as seen in the following figure. The 270's single HSL loop supports one #5075 PCI Expansion Tower and combined with the system expansion unit #7104 provides the Model 270 significant new growth capabilities. There are no migration towers supported on the Model 270 and no supported migration path exists to the Model 270.



Model 270 **#5075 PCI Expansion Tower**

Model 270 System Unit



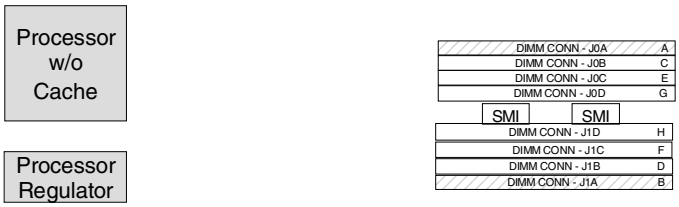
Note 1: Cards may be reversed depending on your choice of console.

Legend

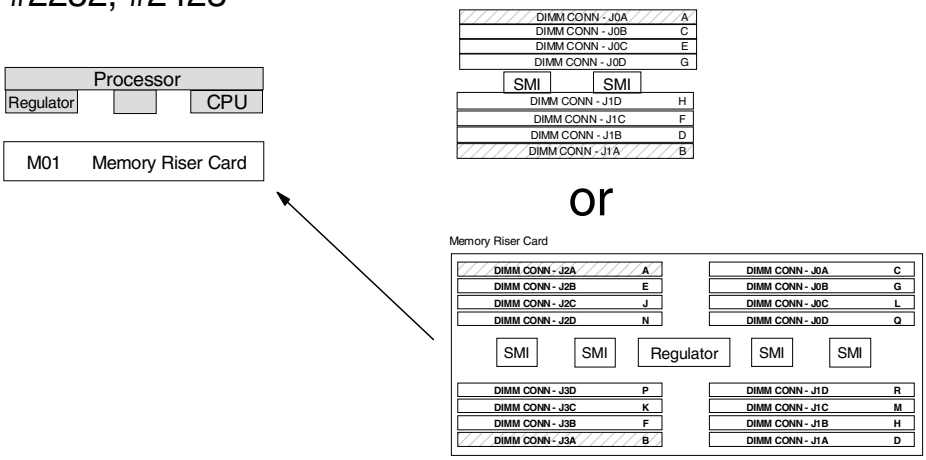
- Base Feature
- Required Feature
- Unavailable if Integrated Netfinity Server is installed

Model 270 Processor and Memory

#2248, #2250, #2422

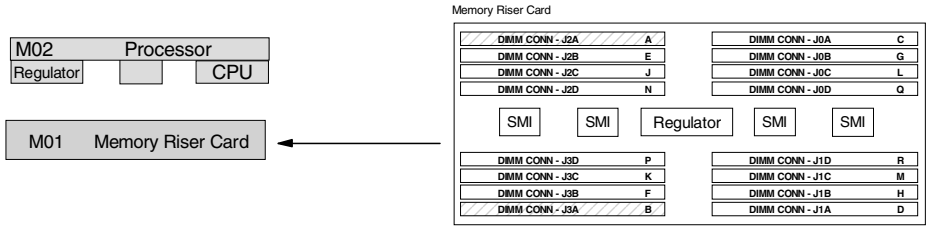


#2252, #2423

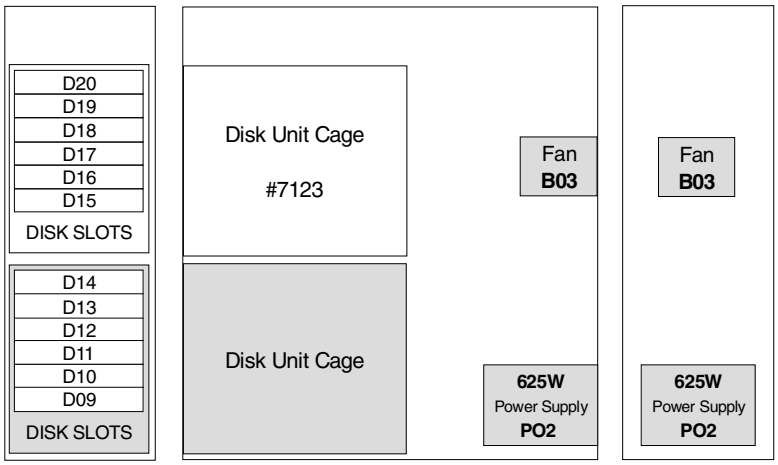


Note: all memory on motherboard once a riser card is installed is moved to the riser card

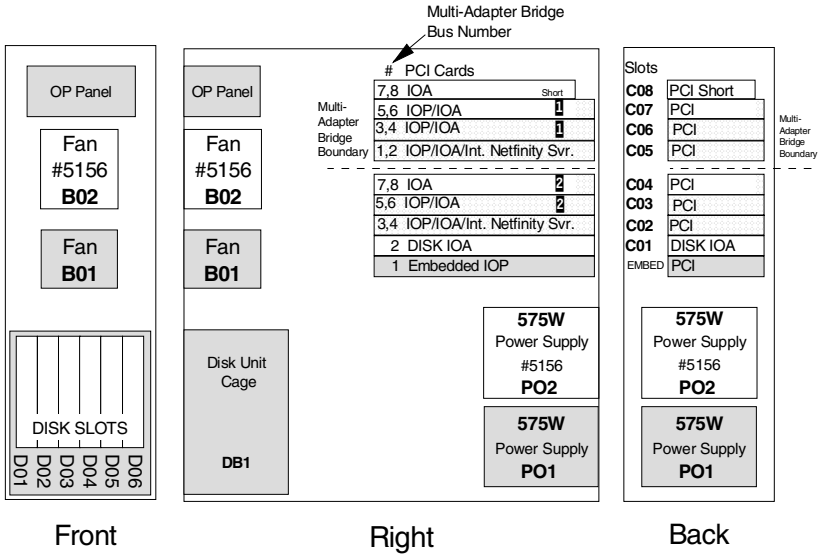
#2253, #2424



Model 270 #7104 System Unit Expansion DASD Sidecar



#5075 PCI Expansion Tower



Legend

Base Feature | Required Feature | Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C02 has an Integrated Netfinity Server, slot C03 is not available and slot C04 is available only as a short slot.

Workstation Controllers

A 5250 twinax device or 5250 emulation adapter in a PC can support a single address, multiple addresses, or shared sessions on a single address. Whenever a device is powered on or when the 5250 emulation software is started on a PC, any addresses defined respond to the workstation controller polls. These addresses count as an active address, even though no device description may exist on the iSeries server. This occurs when the system value QAUTOCFG is set to *NO.

- When a device has multiple addresses defined for multiple sessions to support jump screen or to support an attached printer, each session counts toward the maximum active addresses supported by that workstation controller.
- When a device has a single address defined with shared sessions, that device counts as one of the maximum active addresses and up to four of the maximum shared sessions.

There is a maximum of 300 shared sessions per IOP.

The following table indicates the types of sessions that count toward the maximum number of active sessions.

Counted	Description
Yes	Local display sessions
Yes	Remote display sessions
Yes	Sessions over 5x94 Controllers (including PCs emulating 5250s)
Yes	Network Routing Facility (NRF) or SPLS displays
Yes	Distributed Host Command Facility (DHCF) displays
Yes	5250 emulation
Yes	Twinaxial shared session devices (separate display devices)
No	Client Access using 5x94 (Virtual displays)
No	Client Access (APPC devices and VRT displays)
No	Retail/Finance devices
No	SNA passthru
No	TDLC (5150 type devices)
No	Port sharing (ASCII) (5150 type device)
No	TCP/IP (Telnet session) (virtual display)
No	APPC (LU 6.2) sessions (APPC or host devices)
No	Display Station Passthru/5250 Passthru/ Workstation Function (virtual displays)
No	3270 Emulation over host CDs (Host devices)
No	Apple devices attached to a LocalTalk Workstation Controller
No	Wireless devices attached to a Wireless LAN Adapter
No	Twinaxial printers

The iSeries server supports a family of displays and emulation adapters that are known as the 5250. The supported data stream is, therefore, known as a 5250 data stream. Throughput considerations are discussed here.

5250 Express Data Stream

The #2720, #2722, #2746, #4746, and #6180 twinax workstation adapter cards have three major features that can increase throughput:

- **2X Mode**: 2 Mbps versus 1 Mbps throughput of the #6050 workstation controller.
- **Optimized Mode**: The block transfer of data is improved to almost double the throughput to or from the attached device.
- **Dual Mode**: Means that two ports are polled simultaneously on the #2722, #2746, #4746 and #6180 workstation controllers. On older controllers (such as the #6050 work station controller), only one port out of eight is active at any given time.

The enhancement produces nearly four times the throughput when all of the attached devices on a port support 5250 Express Data Stream. All of the IBM devices from the original 5251 up through the 3489 support the Express Data Stream.

Refer to Informational APAR II11804 for additional details regarding workstation considerations when attached devices or cabling do not support 5250 Express Data Stream. Additional information on 5250 Express Data Stream is available on the Web at:
`http://www.networking.ibm.com/525/`

The IBM 7299 twinax-to-fiber multiplexer fully supports all the new functions of the #2720, #2722, #2746, #4746, and #6180 workstation controllers.

System Console

The system console specify code determines whether a 5250-type device (twinaxial) or a PC (Operations Console) is to be used as a console. The choices are as follows:

- #5540 System Console on Twinaxial Workstation Controller
  - #4746 PCI Twinaxial IOA
  - #9771 Base PCI 2-Line WAN with Modem
- #5544 System Console on Operations Console (default)
  - #0367 Operations Console Cable
  - #4745 PCI Two Line WAN IOA
  - #9771 Base PCI 2-Line WAN with Modem
- #0367 Operations Console Cable

  Operations Console Cable attaches to the first port (port 0) of the #4745 PCI Two Line WAN IOA. To enable use of the Remote Control Panel function with Operations Console, order feature #0382 (Remote Control Panel Cable).

  Note: The Remote Control Panel cable can be ordered with or without the #0367 Operations Console Cable.

I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. See “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for V4R5 hardware are quite flexible. See “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA
- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA
- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #4748 PCI RAID Disk Unit Controller
- #2763 PCI RAID Disk Unit Controller
- #9767 Base PCI Disk Unit Controller

Note: Internal Disk Unit Controller configuration considerations:

- The system unit supports up to two disk unit controllers to control disks in the system unit and #7104 Expansion Unit (if installed).
- The system unit supports up to six disks. The #7104 supports up to twelve disks. The #5075 PCI Expansion Tower supports up to six disks and one disk controller.
- The default controller for a #5075 is the #2763 with #4748 optional.

- Disk protection levels:
  - None: No protection
  - 0040: Mirrored – device level
  - 0041: Device parity protection (RAID) – all
  - 0042: Mirrored - IOP level
- #4748 supports the #4331 1.6 GB Read Cache Device

The following chart shows the defaults when the number of disk units and protection levels are selected.

Number of Disks	Protection	System Unit	#7104	#5075	Default Controller
1 - 6	none 0040	default	-	-	#9767
4 - 6	0041	default	-	-	#2763
7 - 12	none 0041, 0040	default	default	-	#2763
4 - 12	0042	default	default	-	1 - #9767 1 - #2763
13 - 18	none 0041, 0040	default	default	-	#4748
13 - 18	0042	default	default	default	1 - #9767 2 - #2763
19 - 24	none 0041, 0040	default	default	default	1 - #4748 1 - #2763
19 - 24	0042	default	default	default	1 - #9767 2 - #2763

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- Embedded Base 32 MB PCI IOP (CCIN 284C, CCIN 284D, CCIN 284E)
- #2842 32 MB PCI IOP
- #2890 PCI Integrated Netfinity Server

Internal Disk, Tape and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Refer to “Internal Magnetic Media” on page 345 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54 GB 10k RPM Disk Unit
- #4324 17.54 GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4525 CD-ROM
- #4582 4 GB ¼-inch Cartridge Tape
- #4583 16 GB ¼-inch Cartridge Tape
- #4586 25 GB ¼-inch Cartridge Tape

CIF Features

All features on the Model 270 are customer installable (CIF) except for the following features, which are non-CIF:

- Model 270 processors
- Processor interactive capacity cards
- #7133 DASD Concurrent Maintenance Cage

Refer to “Customer Install Features (CIF)” on page 245 for more information on CIFs.

Model 270 Upgrades

Model 270									
To		2248		2250		2252		2253	
From		1516	1517	1516	1518	1516	1519	1516	1520
2248	1516		X	X	X	XM	XM	XM	XM
	1517				X		XM		XM
2250	1516				X	XM	XM	XM	XM
	1518						XM		XM
2252	1516						X	X	X
	1519								X
2253	1516								X
	1520								

Dedicated Servers for Domino				
To		270		
From		2422	2423	2424
270	2422		XM	XM
	2423			X
	2424			

Note: XM is a Manufactured MES (Roll-in/Roll-out).

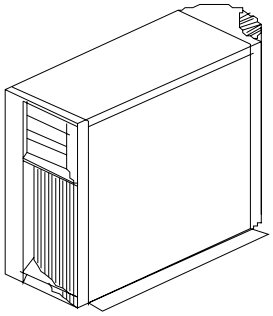
iSeries Dedicated Server for Domino

iSeries Dedicated Server for Domino

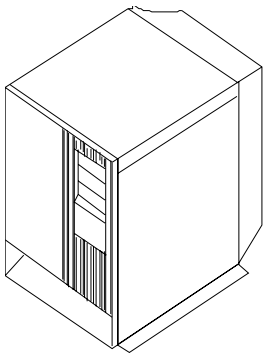
iSeries Dedicated Server for Domino

The iSeries Dedicated Server for Domino is specifically designed to deliver outstanding price performance and value when serving a variety of Lotus Domino workloads on a single server. Because the iSeries 270 and 820 models are used as the base models, the iSeries Dedicated Server for Domino is fully configured with all of the same expandability currently available on the iSeries servers 270 and 820.

This chapter describes the features unique to the Dedicated Server. All other features are common to the iSeries Models 270 or 820. Those feature descriptions can be found in “iSeries server 270” on page 123 and “iSeries Model 820” on page 151.



Model 270



Model 820

iSeries Dedicated Server for Domino System Units

The iSeries Models 270 and 820 include six new processor features for the iSeries Dedicated Server for Domino. The Dedicated Domino processor capabilities are summarized in the following tables.

Model	**270 Dedicated Server for Domino**		
Processor Feature	**#2422**	**#2423**	**#2424**
Relative System Performance			
Processor CPW	50	100	200
Interactive Environment	0	0	0
Simple Mail Users	2400	3860	7580
Mail and Calendaring Users	1600	2570	5050
Number of Processors/Type of Processor	1/Pulsar	1/Pulsar	2 /Pulsar
L2 Cache (MB)/Processor	0	2	4
Main Storage (MB Min/Max)	256-4096	256-8192	256-8192
Main Storage DIMMs or Cards (Min/Max)	2/8	2/16	2/16
Processor Group	P05	P05	P10

© Copyright IBM Corp. 2000

Model	820 Dedicated Server for Domino		
Processor Feature	**#2425**	**#2426**	**#2427**
Relative System Performance Processor CPW	100	200	300
Interactive CPW	0	0	0
Simple Mail Users	3860	8420	14840
Mail and Calendaring Users	2570	5610	9890
Number of Processors/Type	1/Pulsar	2/Istar	4/Istar
L2 Cache (MB)/Processor	2	4	4
Main Storage (MB Min/Max)	256-8192	256-16384	256-16384
Main Storage DIMMs or Cards	2/16	2/32	2/32
Processor Group	P05	P10	P10

Relative performance measurements (described in the following list) are derived by performing various monitored and measured workloads on iSeries and AS/400e servers. The results (reported values) can be used to compare relative performance characteristics of processor features offered for iSeries and AS/400e servers.

Note: The estimated number of users and performance in customer environments varies. Achieving estimated Simple Mail Users requires a fully configured server including additional memory and disk.

- **Simple Mail Users (SMU)**: This relative performance measurement is derived by performing high-volume Lotus Domino mail workloads on Dedicated Domino processors. Simple Mail Users are representative of mail applications, particularly those that do not perform any database-related tasks. Simple Mail Users represent the number of concurrent light mail users for the Dedicated Domino processors. These reported values reflect 70% processor utilization to allow for peak loads in excess of customer workload estimates.
- **Mail and Calendaring Users (MCU)**: This relative performance measurement is derived by performing mail and calendaring functions. This workload is considerably more complex than Simple Mail Users. The MCU workload represents users on a Notes client who are reading, updating, or deleting documents in an e-mail database, as well as lookups in the Domino directory and scheduling appointments and invitations. Reported values reflect 70% processor utilization.
- **Commercial Processing Workload (CPW)**: This relative performance measurement is derived by performing Commercial Processing Workloads on Dedicated Domino processors. Commercial Processing Workloads are representative of commercial applications, particularly those that do significant database processing in conjunction with journaling and commitment control. The reported values for CPW do not represent a guaranteed level of capacity to perform non-Domino workloads. The reported CPW may be used by System Resource activities and Domino Resource extensions (for example, database accesses, external program calls, and so on). The

amount of CPW consumed will reduce the available capacity to perform Simple Mail Users (SMU).

- Processor CPW is an approximate value reflecting the maximum amount of non-Domino workload (10 to 15% of CPU) that can be supported.
- Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250). AS/400e Dedicated server for Domino can be effectively managed when there is no Interactive CPW (Interactive CPW = 0) available for application workloads. Multiple system operators performing simultaneous interactive tasks is not supported.
  - Any job started from a console (green screen) to perform system administration function is not considered interactive work if it is the *only* interactive job running.
  - Any system administration job submitted to batch is not considered interactive work.
  - Any use of Operations Navigator (GUI administration functions) is not considered interactive work.

- **iSeries 400 Model 270 Dedicated Server for Domino processors**:
  - #2422 Dedicated Domino processor: Pulsar Uni Processor
    - Includes eight DIMM memory positions (which plug directly onto the backplane)
    - Includes embedded base IOP (CCIN 284D)
    - Includes Common Service Processor (CCIN 282F)
  - #2423 Dedicated Domino processor: Pulsar Uni Processor
    - Includes eight DIMM memory positions (which plug directly onto the processor—direct attach).

      An optional priced Main Storage Expansion Card feature #2884 is available that supports 16 DIMM memory positions. Either direct attach or the memory riser feature can be used, but not both. Without the #2884, the DIMMs must be paired. With the #2884, the DIMMs must be in sets of four (quads) of the same capacity. There is an exception that allows a single pair of DIMMs on a #2884 if these are the only two DIMMs on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.
    - Includes Base I/O backplane (CCIN 282F)
    - Includes embedded base IOP (CCIN 284E)
    - Includes Common Service Processor (CCIN 282F)
    - Includes internal flex cable for HSL enablement

  - #2424 Dedicated Domino processor: Pulsar 2-way
    - Includes 16 DIMM memory positions via the base main storage expansion card (CCIN 2884).

      With the main storage expansion card (CCIN 2884), the DIMMs must be in sets of four (quads) of the same capacity. There is an exception that allows a single pair of DIMMs on a main storage expansion card (CCIN 2884) if these are the only two DIMMs on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.
    - Includes Base I/O backplane (CCIN 282F)
    - Includes embedded base IOP (CCIN 284E)
    - Includes Common Service Processor (CCIN 282F)
    - Includes internal flex cable for HSL enablement

- **iSeries 400 Model 820 Dedicated Server for Domino processors**:
  - #2425 Dedicated Domino processor: Pulsar Uni Processor
    - Includes eight DIMM memory positions (which plug directly onto the processor - direct attach).

      An optional priced Main Storage Expansion Card feature #2884 is available that supports 16 DIMM memory positions. Either direct attach or main storage expansion feature can be used, but not both. Without the #2884, the DIMMs must be paired. With the #2884, the DIMMs must be in sets of four (quads) of the same capacity. There is an exception that allows a single pair of DIMMs on a #2884 if these are the only two DIMMs on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad and then only DIMM quads can subsequently be added.
    - Includes Base I/O backplane (CCIN 282D)
    - Includes Common Service Processor
  - #2426 Dedicated Domino processor: IStar 2-way
    - Includes 16 DIMM memory positions via the base main storage expansion card (CCIN 2884).

      With the main storage expansion card (CCIN 2884), the DIMMs must be in sets of four (quads) of the same capacity. There is an exception that allows a single pair of DIMMs on a main storage expansion card (CCIN 2884) if these are the only two DIMMs on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.

- Includes Base I/O backplane (CCIN 282D)
- Includes Common Service Processor

– #2427 Dedicated Domino processor: IStar 4-way

- Includes 16 DIMM memory positions via the base main storage expansion card (CCIN 2884).

  With the main storage expansion card (CCIN 2884), the DIMMs must be in sets of four (quads) of the same capacity. There is an exception that allows a single pair of DIMMs on a main storage expansion card (CCIN 2884) if these are the only two DIMMs on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.

- Includes Base I/O backplane (CCIN 282D)
- Includes Common Service Processor

CIF Features

iSeries 400 Model 270 Dedicated Server for Domino non-CIF features include:

- #2422/#2423/#2424 Dedicated Domino Processor
- #7133 DASD Concurrent maintenance Cage
- Processor Upgrades

AS/400e server 820 Dedicated Server for Domino non-CIF features include:

- #2425/#2426/#2427 Dedicated Domino Processor
- #2790 Integrated Netfinity Server
- #2795/#2796/#2797 IOP memory
- Processor Upgrades

Refer to “Customer Install Features (CIF)” on page 245 for more information on CIF.

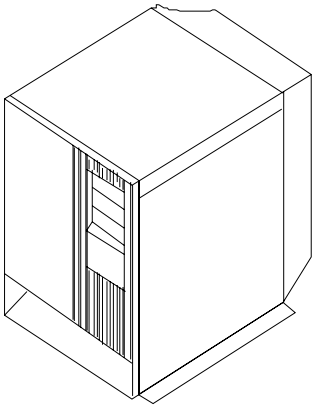
Main Storage

All the Dedicated Servers for Domino have a required minimum of 256 MB main storage. There is no base main storage included with the systems. Therefore, all main storage, including the required minimum, must be ordered as separately priced features.

iSeries Server 820

iSeries Server 820

iSeries Model 820



iSeries Model 820 System Unit

A minimum functional server consists of the base server unit and selected priced features. Included in the base server are the physical package and power elements, a DASD controller, an I/O controller, and a #9771 Base PCI 2-Line WAN with Modem as follows:

- Operator Panel without key stick
- Base DASD and Tape Cages (six Internal Disk slots, two Removable Media slots)
- Embedded Base PCI IOP (CCIN 284C)

  Provides support for maximum of up to four IOAs including:

  – Provides support for base #9767 Base PCI Disk Unit Controller

    Provides support for up to six Disk Units, the required CD-ROM, and either a feature Internal Tape or a feature CD-ROM. However, because RAID is default, the configurator will default the #4748 PCI RAID Disk Unit Controller which supports the above, and in addition, provides RAID support for up to 12 Disk Units.

  – Provides support for base Console/Workstation IOA

    - The configurator will determine which feature combinations will be on the order based on the System Console specify—#5540 or #5544
    - #5540 – System Console on Twinax WS
      – #4746 PCI Twinaxial IOA
      – #9771 Base PCI 2-Line WAN with Modem

© Copyright IBM Corp. 2000

- #5544 – System Console on Op Console (Default)
  - #4745 PCI Two Line WAN IOA (Console/ECS)
  - #0367 Operations Console PCI Cable
  - #9771 Base PCI 2-Line WAN with Modem

The following required features must be purchased:

- Processor (one must be specified)
  - #2395 processor (Pulsar) (370 CPW)
  - #2396 processor (Pulsar) (950 CPW)
  - #2397 2-way processor (IStar) (2000 CPW)
  - #2398 4-way processor (IStar) (3200 CPW)
- Interactive Card (one must be specified; see the following table)

Processor Feature	#2395	#2396	#2397	#2398
Interactive Feature				
#1521	35	35	35	35
#1522	70	70	70	70
#1523	120	120	120	120
#1524	240	240	240	240
#1525	-	560	560	560
#1526	-	-	1050	1050
#1527	-	-	-	2000

- Main Storage (a minimum of two of the same features must be selected)
  - #3002 - 128 MB Main Storage
  - #3004 - 256 MB Main Storage
  - #3005 - 512 MB Main Storage
  - #3006 - 512 MB Main Storage
- Integrated Disk Units

  Device Parity Protection: All (#0041) is the default for disk data protection. With RAID protection as the default, a minimum of four of the following disk units of equal capacity must be ordered. If RAID protection is removed from the system order, at least one of the following disks must be ordered:
  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit
  - #4324 - 17.54 GB Disk Unit
- Integrated CD-ROM

  #4425 - CD-ROM

- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem
- Uninterruptible Power Supply

  The Model 820 does not include an internal battery. We recommend that you use an external UPS to protect the system unit and any external components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model 820. An external UPS, combined with abnormal IPL improvements in OS/400, can provide an equivalent level of power protection and recovery in the event of power failure.

The Model 820 server initial installation is Customer Setup (CSU). Model upgrades are performed by IBM service representatives.

OS/400 V4R5 is required to support the 820 servers.

Card Technology

With the implementation of new PCI technologies, the Model 820 provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, which may potentially result in a lower cost of implementation.

Previous AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in particular areas was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, and valuable slots were left vacant.

This PCI I/O structure enables customer setup of the Model 820 and selected features on all models. It also enables Hot Plug PCI for adding and replacing hardware without taking the server down. A full understanding of configuration rules associated with the various I/O features of the iSeries server is required.

The following functions do not have equivalent function PCI cards for the Model 820:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode

- X.21 switched WAN dialup or Shorthold Mode WAN
- Asynchronous communication speeds of less than 300 bps
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loopback (diagnostics functions supported by some modems)

The fundamental bus architecture of the iSeries server is unchanged when using PCI adapters. The AS/400e IOP continues to off load the main processor; isolate the host from the adapter and network errors; and manage, configure, and service the adapters. PCI architecture offers advantages in flexibility over non-iSeries or non-AS/400e server structures.

Processor Features

- #2395 Model 820 Processor (PULSAR Uni)
  - Includes eight DIMM memory positions (which plug directly onto the backplane - Direct Attach)
  - Includes Base I/O Backplane with Common Service Processor (CSP) (CCIN 284C)

    Provides support for the Service Processor, nine 32-bit and three 32- or 64-bit PCI slots.
- #2396 Model 820 Processor (PULSAR Uni)
  - Includes eight DIMM memory positions (which plug directly onto the backplane - Direct Attach). If more than eight DIMMs total are required, a #2884 Main Storage Expansion Card must be used and *all* DIMMs must then reside on the #2884.
  - Includes Base I/O Backplane with Common Service Processor (CSP) (CCIN 284C)

    Provides support for the Service Processor, nine 32-bit and three 32- or 64-bit PCI slots.
- #2397 Model 820 Processor (IStar 2-way)
  - Includes 16 DIMM memory positions with the base main storage expansion card (CCIN 2884)
  - Includes Base I/O Backplane with Common Service Processor (CSP) (CCIN 284C)

    Provides support for the Service Processor, nine 32-bit and three 32- or 64-bit PCI slots.
- #2398 Model 820 Processor (IStar 4-Way)

– Includes 16 DIMM memory positions with the base main storage expansion card (CCIN 2884).

– Includes Base I/O Backplane with Common Service Processor (CSP) (CCIN 284C)

Provides support for the Service Processor, nine 32-bit and three 32- or 64-bit PCI slots.

Interactive Features

The Model 820 supports various levels of interactive performance through the installation of interactive features. Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250).

- Any job started from a console (green screen) to perform system administration function is not considered interactive work if it is the *only* interactive job running (single interactive job exception).
- Any system administration job submitted to batch is not considered interactive work.
- Any use of Operations Navigator (GUI administration functions) is not considered interactive work.

For a discussion of how these features influence system performance, see “IBM Workload Estimator for AS/400” on page 32.

The available interactive options are shown in the table on page 152.

A feature cross-reference table can be used to relate the Processor Feature Code to the Processor and Interactive features visible in the AS/400 configurator. The Processor Feature Code is found by displaying the QPRCFEAT system value or in the rack configuration. The Processor Feature Code is used when ordering software license keys.

Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2395	#1521	#23A1	P10
	#1522	#23A2	P20
	#1523	#23A3	P20
	#1524	#23A4	P20

#2396	#1521	#23A9	P20
	#1522	#23AA	P30
	#1523	#23AB	P30
	#1524	#23AC	P30
	#1525	#23AD	P30
#2397	#1521	#23B1	P20
	#1522	#23B2	P30
	#1523	#23B3	P30
	#1524	#23B4	P30
	#1525	#23B5	P30
	#1526	#23B6	P30
#2398	#1521	#23B8	P30
	#1522	#23B9	P40
	#1523	#23BA	P40
	#1524	#23BB	P40
	#1525	#23BC	P40
	#1526	#23BD	P40
	#1527	#23BE	P40

Main Storage

All main storage on the Model 820 is feature main storage and a minimum of two of the same features must be selected.

The following memory features are available on the Model 820:

- #3000 - Migrated 128 MB Main Storage (migrate base CCIN #3002s)
  - Supported only on model upgrades from 620, S20, and 720 into the 820.
  - Maximum quantity supported is two.
  - Supported in quads with #3002.

  Note: Each #3000 is to be considered as a #3002 for DIMM plugging.
- #3002: 128 MB Main Storage (DIMM - 64 Mb technology)
- #3004: 256 MB Main Storage (DIMM - 128 Mb technology) (unstacked)
- #3005: 512 MB Main Storage (DIMM - 128 Mb technology) (stacked)
- #3006: 512 MB Main Storage (replace #3005)

For the #2395 processor:

- All main storage DIMMs on the #2395 processor must be added in pairs of the same capacity and technology.
- There are eight slots available in the base system for main storage DIMMs, which plug directly onto the processor (Direct Attach) and do not use a #2884 Main Storage Expansion Card.

For the #2396 and #2425 processors:

- There are eight slots available in the base system for main storage DIMMs, which plug directly onto the processor (Direct Attach).
- If more than eight DIMMs total are required, a #2884 Main Storage Expansion Card must be ordered and *all* DIMMs must then reside on the #2884. Without the #2884, the DIMMS must be paired. With the #2884, the DIMMs must be in sets of four (quads) of the same capacity and technology. There is an exception that allows a single set of two main storage DIMMs on a #2884, if these are the only two on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.

For the #2397, #2398, #2426 and #2427 processors:

- A Base Main Storage Expansion Card (CCIN 2884) is included in the base system and does not need to be ordered
- Main storage DIMMs must be plugged onto the Base Main Storage Expansion Card (CCIN 2884) and must be added in sets of four (quads) of the same capacity and technology. There is an exception that allows a single set of two main storage DIMMs if these are the only two on the system. If any additional DIMMs are added above the initial two, the initial two must be paired up to make a quad, and then only DIMM quads can subsequently be added.
- #2884 is required when the number of DIMMs exceeds 16.

#2884 Main Storage Expansion Card

- This feature provides for mounting DIMM memory on the Model 820. It contains one riser card with 16 sockets for placement of 128 MB, 256 MB, or 512 MB DIMMs.
- Maximum: One (not supported on Processor #2395).
- For placement, an initial *pair* of memory DIMMs is allowed (in slot A and slot B) without quads. After that, all DIMMs must be plugged in quads starting from the outer four corners going toward the center (A, B, C, D, then E, F, G, H, etc). Using same feature code number within a quad is required. Mixing of quad “groups” on the same riser card is also allowed.

- For processors #2397, #2398, #2426, and #2427, a #5157 Feature Power Supply must be present or ordered when a feature #2884 Main Storage Expansion is added or ordered.

Power and Packaging

The Model 820 does not include an internal battery. An external UPS is recommended to protect the system unit and any external components against utility power outages. The Continuously Powered Mainstore (CPM) function is not supported on the 8xx servers. An external UPS, combined with abnormal IPL improvements in OS/400, provides an equivalent level of power protection and fast recovery in the event of power failure.

The supported power and packaging features are as follows:

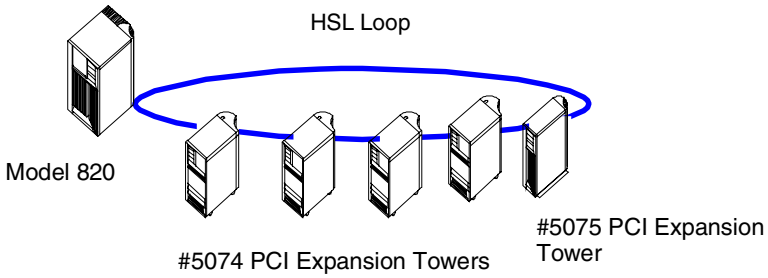
- #7127 DASD Expansion Unit
  - #7127 is a concurrent maintenance DASD 6 Position expansion feature, which may be ordered to support an additional six disk units (for a total of 12) in the Model 820 system unit/CEC.
  - Prerequisite: One #2763 or #4748 disk unit controller in the 820 CEC and the #5157 Feature Power Supply.
- #5157 Feature Power Supply
  - #5157 adds an additional 575 Watt power supply to the Model 820.
  - For processors #2397, #2398, #2426, and #2427, a #5157 Feature Power Supply must be present or ordered when a feature #2884 Main Storage Expansion is added or ordered.
  - The #5157 is required when a #7127 Disk unit cage is added to a Model 820 and is required when a #5155 Redundant Power and Cooling feature is added to a Model 820.
- #5155 Redundant Power and Cooling
  - #5155 adds an additional 575 Watt power supply for redundancy and additional cooling fans to the Model 820.
  - Prerequisite: #5157 Feature Power Supply

High Speed Link (HSL) on Model 820

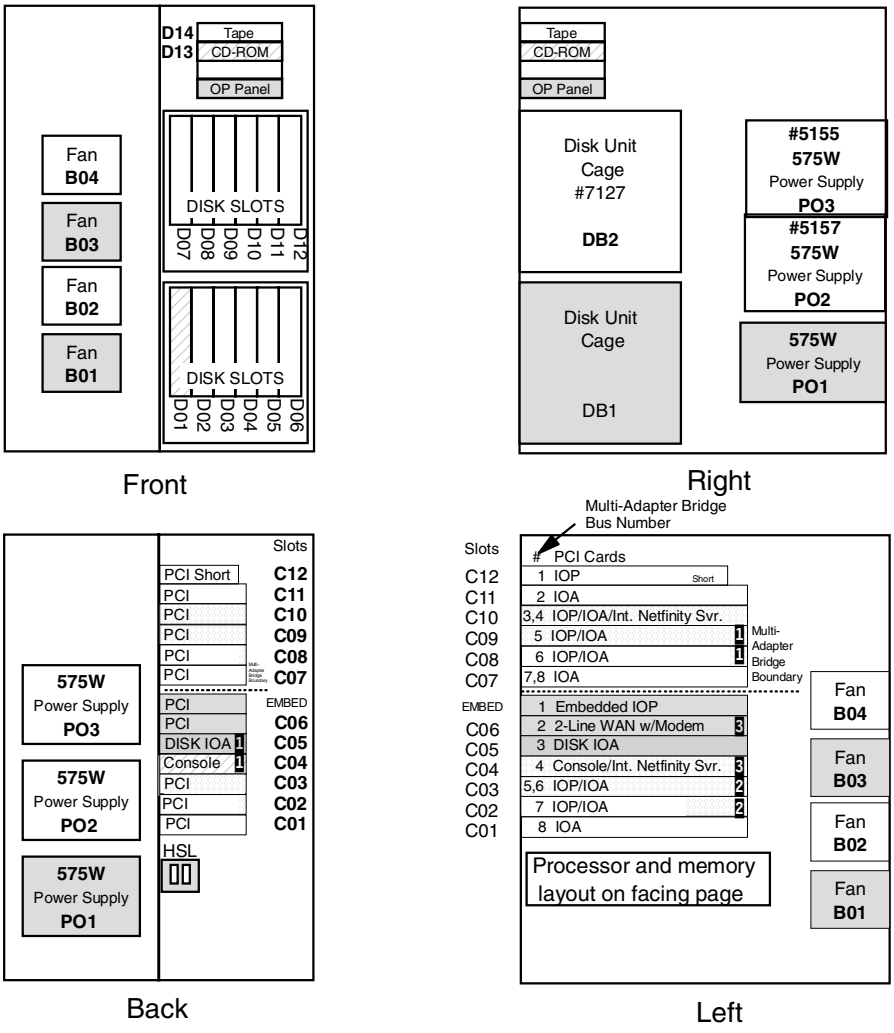
The Model 820 supports a single HSL loop. This loop supports the attachment of up to five #5074 or #5075 I/O towers, with the #5079 tower counting as two #5074s. The loop also supports either a #5034 or #5035 Migration Tower I or a #5077 Migration Tower II, both of which provide for the migration of existing #5073 SPD I/O towers or #5065/#5066 PCI Expansion Towers. The following figure provides an example of the maximum supported

tower configuration of a Model 820. For further details, see *AS/400e to iSeries 400 Migration*, SG24-6055.

Note: The attachment of a migration tower reduces the total number of new I/O towers by one.



Model 820 System Unit



Note 1: Position of cards may change depending on the console and other features selected.

Legend

Base Feature

Required Feature

Unavailable if Integrated Netfinity Server is installed

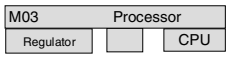
Note 1: If C10 has an Integrated Netfinity Server, slot C09 is unavailable, and slot C08 is available only as a short slot.

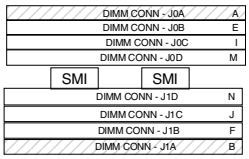
Note 2: If C04 has an Integrated Netfinity Server, slot C03 is not available, and slot C02 is available only as a short slot.

Note 3: Position of the cards may change depending on the console and other features selected. A console is a required feature.

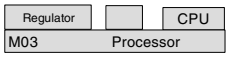
Model 820 Processor and Memory

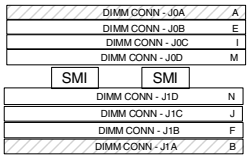
#2395

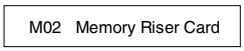




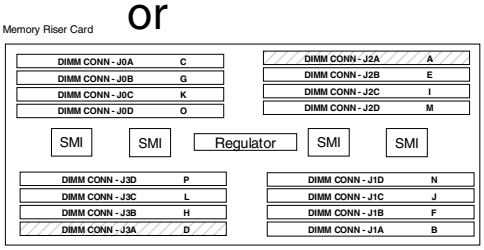
#2396, #2425





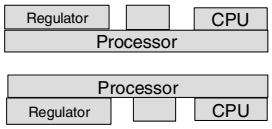


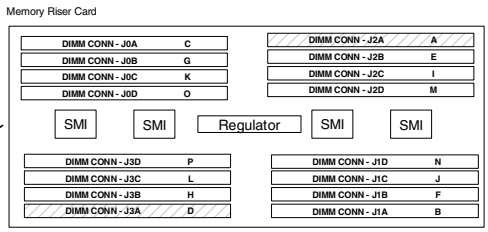
or

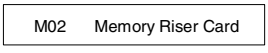


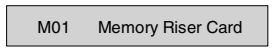
Note: all memory on motherboard once a riser card is installed is moved to the riser card

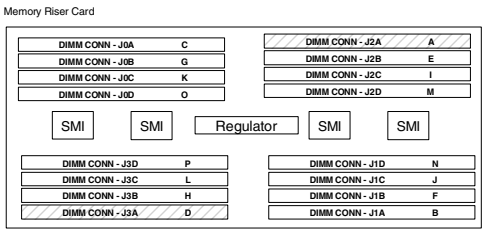
#2397, #2398, #2426, #2427











I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. Please see “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for OS/400 V4R5 hardware are quite flexible. Please see “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA
- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA
- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #4748 PCI RAID Disk Unit Controller
- #2763 PCI RAID Disk Unit Controller
- #9767 Base PCI Disk Unit Controller

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- Embedded Base 32 MB PCI IOP (CCIN 282D)
- #2843 64 MB PCI IOP
- #2790 PCI Integrated Netfinity Server

Internal Disk, Tape, and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Please see “PCI Disk Units” on page 345 and “Internal Tape and CD-ROM” on page 356 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54GB 10k RPM Disk Unit
- #4324 17.54GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4525 CD-ROM
- #4582 4 GB ¼-inch Cartridge Tape
- #4583 16 GB ¼-inch Cartridge Tape
- #4586 25 GB ¼-inch Cartridge Tape

External Towers

The following towers attach to the Model 820 using HSL (High Speed Link). Please see “Expansion Towers” on page 223 for full descriptions.

- #5033 Migration Tower I
- #5034 Migration Tower I
- #5035 Migration Tower I
- #5075 PCI Expansion Tower (small)
- #5074 PCI Expansion Tower (large)
- #5079 1.8M I/O Tower

The Expansion Towers and Units in the following table can attach to the Model 820 with the #5034 and #5035 Migration Towers.

Feature	Description	Prerequisites
#5043	Primary rack converted to secondary rack (migrated)	--
#5044	System Unit Expansion Rack (migrated)	Optical Link Processor (OLP) Card #2686
#5052	Storage Expansion Unit	#5143 and #5072 pr #5082 and one of #6502, #6512, #6530, #6532, #6533
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533
#5065	Storage/PCI Expansion Tower	One port on OLP card #2688 in System Unit Expansion #9364/#5064 or in #5077 Migration Tower
#5066	1.8 m I/O Tower	See #5065
#5072	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #9364/#5064 or in #5077 Migration Tower
#5073	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #9364/#5064 or in #5077 Migration Tower
#5082	1063M System Unit Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and one port on OLP card #2688 in System Unit Expansion #9364/#5064 or in #5077 Migration Tower
#5083	1063M System Unit Expansion	See #5082

Full details on these racks and towers can be found beginning with “Expansion Towers” on page 223.

Migration Tower Hardware

#2686 Optical Link Processor (266 Mbps)

#2688 Optical Link Processor (1063 Mbps)

Disk Units

See “PCI Disk Units” on page 345.

Internal Tape and CD-ROM

See “Internal Tape and CD-ROM” on page 356.

I/O Processors

See “Migration Tower Hardware PCI” on page 258 and “Migration Tower Hardware SPD” on page 260.

Magnetic Media Controllers

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

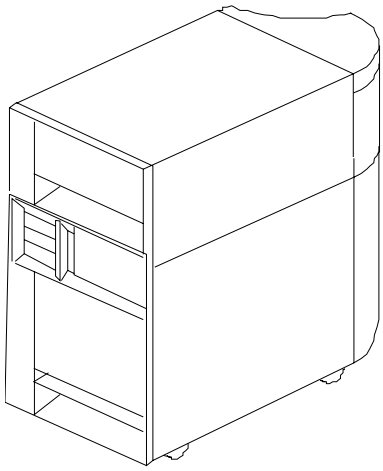
I/O Adapters

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

iSeries Server 830

iSeries Server 830

iSeries Model 830



iSeries Model 830 System Unit

A minimum functional server consists of the base server unit and selected priced features. Included in the base server are the physical package and power elements, a DASD controller, an I/O controller and a #9771 Base PCI 2-Line WAN with Modem as follows:

- System Unit (CEC) and #9074 Base I/O Tower
- Line cord Features
- Main Storage Expansion Card (slot M02) (CCIN 2881)
- #9732 Bus Expansion/Clock Card—8 HSL Ports (CCIN 25AB)

  Specify with processor #2400
- #9733 Bus Expansion/Clock Card—8 HSL Ports (CCIN 25AD)

  Specify with processors #2402 and #2403
- PCI and CSP Card (CCIN 28AA)
- Bus Adapter (CCIN 2681)
- Operator Panel with key stick (CCIN 247A)
- #9074 Base I/O Tower
- #9943 Base PCI IOP
  - Provides support for #9748 Base PCI RAID Disk Unit Controller

    Provides support for up to 15 Disk Units, the required CD-ROM, and a feature Internal Tape or a feature CD-ROM

© Copyright IBM Corp. 2000

– Provides support for base Console/Workstation IOA

The configurator will determine which feature combinations will be on the order based on the System Console specify—#5540 or #5544.

The following required features must be ordered:

- Processor (one must be specified)
  - #2400 2-way processor (IStar)(1850 CPW)
  - #2402 4-way processor (IStar)(4200 CPW)
  - #2403 8-way processor (IStar)(7350 CPW)
- Interactive Card (one must be specified; see the following table)

Processor Feature	#2400	#2402	#2403
Interactive CPW			
#1531	70	70	70
#1532	120	120	120
#1533	240	240	240
#1534	560	560	560
#1535	1050	1050	1050
#1536	-	2000	2000
#1537	-	-	4550

- Main Storage
  - #2881 Main Storage Expansion
    - Required for #2403 processor
    - Required for #2400 and #2402 processors if more than 32 main storage features are installed
    - May be selected if less than 32 main storage features
  - A minimum of one set of eight of the same features must be selected:
    - #3062 - 128 MB Main Storage
    - #3064 - 256 MB Main Storage
    - #3065 - 512 MB Main Storage
    - #3066 - 512 MB Main Storage
- Integrated Disk Units

  Device Parity Protection - All (0041) is the default for disk data protection. With RAID protection as the default, a minimum of four of the following disk units of equal capacity must be ordered. If RAID protection is removed from the system order, at least one of the following disks must be ordered:

  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit
  - #4324 - 17.54 GB Disk Unit
- Integrated CD-ROM

  #4425 - CD-ROM
- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem

The 830 server initial installation and model upgrades are performed by IBM Service representatives.

OS/400 V4R5 is required to support the 830 servers.

Card Technology

With the implementation of new PCI technologies, the Model 830 provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, potentially resulting in a lower cost of implementation.

Prior AS/400 models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in a particular area was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, leaving valuable slots empty.

This PCI I/O structure enables customer setup of selected features of the Model 830. It also enables Hot Plug PCI for adding and replacing hardware without taking the server down. A full understanding of configuration rules associated with the various I/O features of the 830 system is required.

The 830 processors support four 32-bit and ten 32/64-bit PCI slots.

The following functions do not have equivalent function PCI cards for the Model 830:

- ASCII Adapter
- V.25 Autocall cable

- Select standby mode
- X.21 switched WAN dialup or Shorthold Mode WAN
- Asynchronous communication speeds of less than 300 bps
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loopback (diagnostics functions supported by some modems)

PCI adapters also do not support X.21 switched WAN dialup or Shorthold Mode WAN.

The fundamental bus architecture of the iSeries server is unchanged when using PCI adapters. The AS/400e IOP continues to off load the main processor; isolate the host from adapter and network errors; and manage, configure, and service the adapters. PCI architecture offers advantages in flexibility over non-iSeries or non-AS/400e server structures.

Processor Features

- #2400 Model 830 Processor (IStar 2-way)
  - Processor Capacity Card (CCIN 2400)
  - Processor 0 (CCIN 245C)
- #2402 Model 830 Processor (IStar 4-way)
  - Processor Capacity Card (CCIN 2402)
  - Processor 0 (CCIN 245D)
- #2403 Model 830 Processor (IStar 8-way)
  - Processor Capacity Card (CCIN 2403)
  - Processor 0 (CCIN 245D)
  - Processor 1 (CCIN 245D)

Interactive Features

The Model 830 supports various levels of interactive performance through the installation of interactive features.

Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250).

- Any system administration job submitted to batch is not considered interactive work.
- Any use of Operations Navigator (GUI administration functions) is not considered interactive work.

For a discussion of how these features influence system performance, see “IBM Workload Estimator for AS/400” on page 32.

A feature cross-reference table provided on the AS/400 system can be used to relate the Processor Feature Code to the Processor and Interactive features visible in the AS/400 configurator. The Processor Feature Code is found by displaying the QPRCFEAT system value or in the rack configuration. The Processor Feature Code is used when ordering software license keys. Or refer to the Model 830 Processor/Interactive Feature table on page 170.

Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2400	#1531	#23C1	P20
	#1532	#23C2	P30
	#1533	#23C3	P30
	#1534	#23C4	P30
	#1535	#23C5	P30
#2402	#1531	#23D1	P30
	#1532	#23D2	P40
	#1533	#23D3	P40
	#1534	#23D4	P40
	#1535	#23D5	P40
	#1536	#23D6	P40
#2403	#1531	#23D8	P40
	#1532	#23D9	P50
	#1533	#23DA	P50
	#1534	#23DB	P50
	#1535	#23DC	P50
	#1536	#23DD	P50
	#1537	#23DE	P50

Main Storage

All main storage on the Model 830 is feature main storage. All main storage DIMMS on the Model 830 must be added in sets of eight (octals) of the same capacity and technology. There are a total of 64 DIMM slots available on the Model 830. Of the 64 lists, 32 are “base”, and an additional 32 are available with feature #2881 Main Storage Expansion installed.

The following memory features are available on the Model 830:

- #3000: Migrated 128 MB Main Storage DIMM—*Support only*
  - Available only on upgrades from Models 620/S20/720 to the Model 830
  - Only a quantity of two is supported
  - Supported in octal(s) with #3062
- #3062: 128 MB Main Storage DIMM (64 Mb technology)
- #3064: 256 MB Main Storage DIMM (128 Mb technology)
- #3065: 512 MB Main Storage DIMM (128 Mb technology)
- #3066: 512 MB Main Storage DIMM (replaces #3065)

For processors #2400 and #2402:

- For new systems without #2881 Main Storage Expansion, DIMMs are added in octals on the base Main Storage card.
- For new systems with #2881 Main Storage Expansion, DIMMs are added in octals and “spread” across the Base Main Storage card (CCIN 2881) and the #2881 Main Storage Expansion.
- For MES orders without #2881 Main Storage Expansion, DIMMs are added in octals on the Base Main Storage card (CCIN 2881).
- For MES orders with #2881 Main Storage Expansion, DIMMs are added in octals and “spread” across the Base Main Storage card and the #2881 Main Storage Expansion.
- If a #2881 Main Storage Expansion is added on an MES order, it is not required that the DIMMs (in octals) are “spread” equally between the Base Main Storage card (CCIN 2881) and the #2881 Main Storage Expansion.

For processor #2403, both the Base Main Storage card (CCIN 2881) and the #2881 Main storage Expansion are required. For both new builds and MES orders, the DIMMS (in octals) are “spread” across the base Main Storage card and the #2881 Main Storage Expansion.

Power and Packaging

The Model 830 includes an internal battery that is automatically activated in the event of a utility power loss. The battery provides full operating power for a short time to all components within the system unit, but not to any external components. This can allow the system to run uninterrupted for a short time (30 seconds or less). For longer power outages, the system will use the battery to attempt an orderly shutdown to avoid losing data in main storage that is not written to disk. An external UPS is recommended to protect the system unit and any external components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model 830. An external UPS can allow the system to run uninterrupted for longer than thirty seconds when utility power is lost. It can also maintain power long enough to ensure that the system successfully completes a shutdown to avoid losing data.

System Power

- Processor Enclosure
  - Bulks (1100 watt) (CCIN 515B) (Quantity two)
  - Regulator (CCIN 27AA with Processors #2400 and #2402, CCIN 27AB with Processor #2403)
- Base I/O Tower (#9074)
  - Bulks (765 Watt) (CCIN 515A) (Quantity two)
  - AC Input/Charger
  - Batteries (Quantity four)

#0550 Rack

The #0550 is a 1.8 m rack enclosure for the Model 830 system. When the 830 is ordered with #0550, it includes one #5101 30 Disk Expansion Unit. The 830 installs in the bottom of the rack, and 10 EIA units remain as space available at the top of the rack. The 1.8 m rack does not have a power distribution unit. The 830 CEC requires a standard power cord feature.

#9074 Base I/O Enclosure

The #9074 is the base I/O tower shipped on Models 830 and SB2. The #9074 supports up to 45 disk units, up to 11 PCI IOAs, and up to two removable media units.

One internal HSL cable is included as base. Optionally, one of the following HSL cables may be selected:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

The #1462 15m Copper HSL cable can be used on any HSL port of the Model 830.

The #9074 has a #9943 Base PCI IOP and a #9748 PCI RAID Disk Unit Controller, has PCI slots for up to 11 PCI IOAs, space for up to 45 disk units (15 are “base”, 30 additional with #5101), space for two removable media devices, one battery backup and redundant/hot swap power supplies. The #9074 is capable of controlling Ultra2 SCSI disk units. The 11 PCI IOAs are supported (driven) by the base #9943 PCI IOP and by feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

The mounting for the first 15 disk units is included in the #9074 (base). The mounting for the next 30 disk units is optional by ordering feature code #5101 30 Disk Expansion Feature.

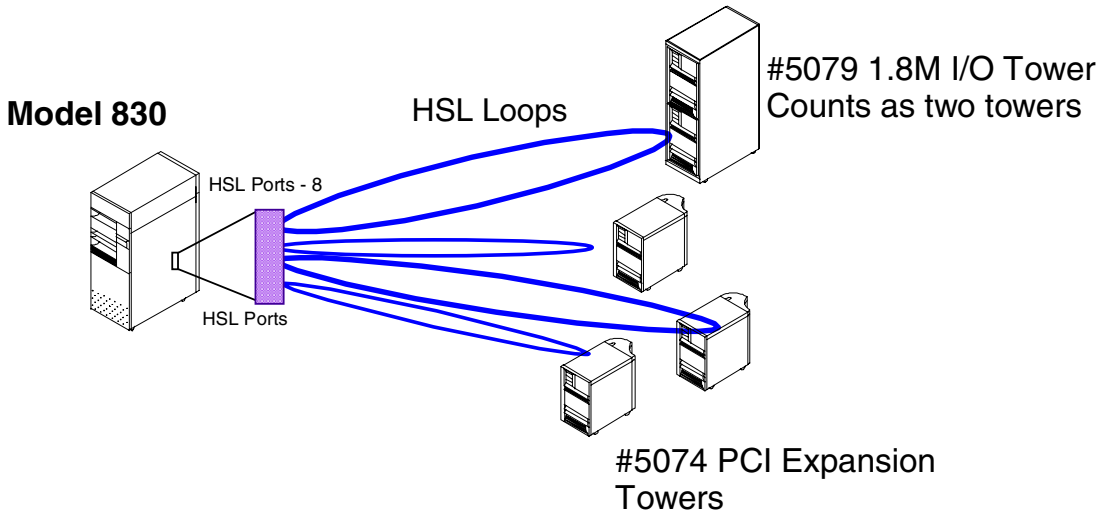
The #9074 also supports up to two removable media devices (internal tape or CD-ROM) that are supported by the #9748.

#5101 30-Disk Expansion Feature

The #5101 is a disk unit expansion enclosure feature for the #9074 Base I/O Tower. The #5101 includes two 15 disk unit enclosures, one 765-Watt power supply, backplanes, and cables. One #4748 PCI RAID Disk Unit Controller is required to support the 15 disk units in each of the two disk unit enclosures included with #5101. Two #4748 PCI RAID Disk Unit Controllers are required to support 30 disk units.

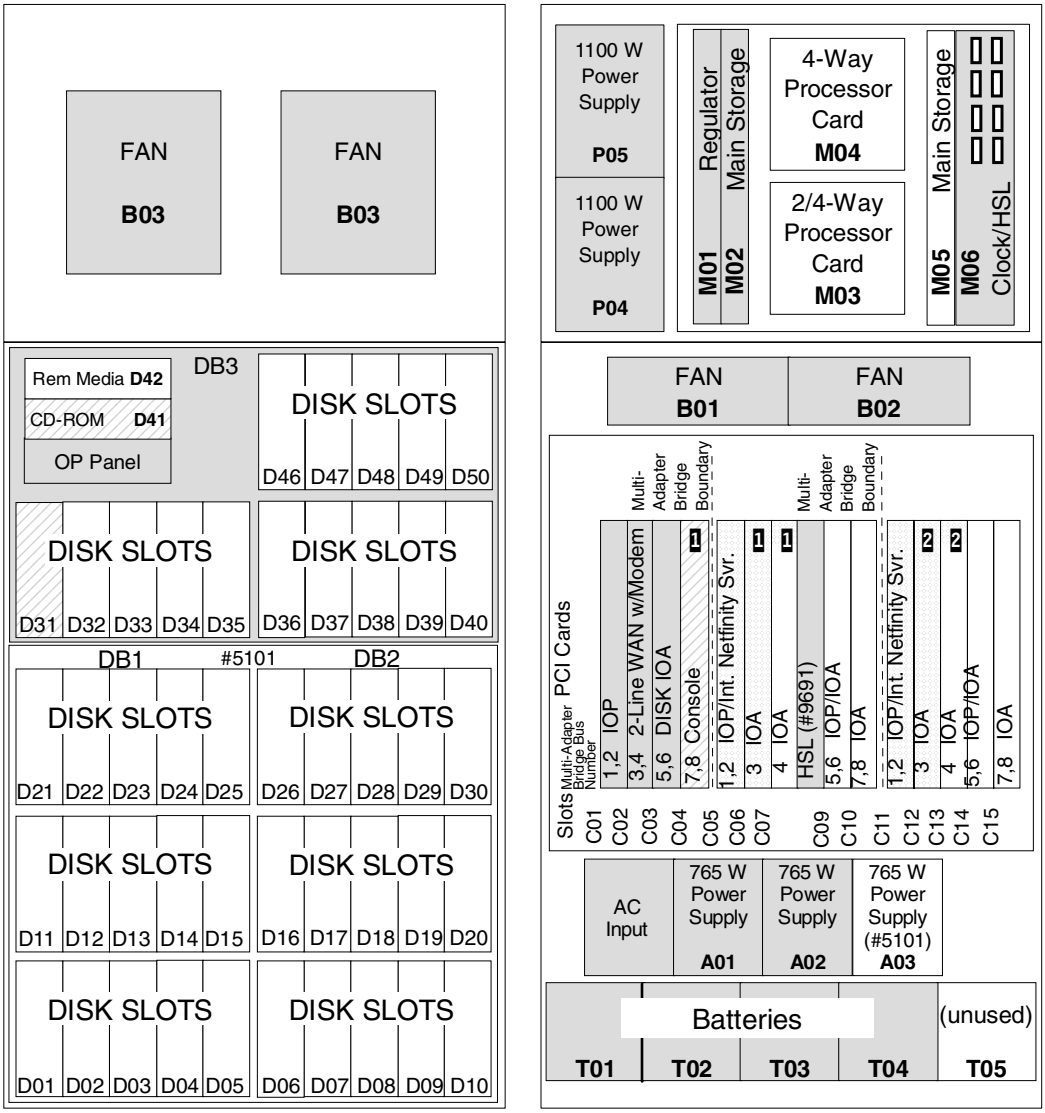
High Speed Link (HSL) on Model 830

The Model 830 supports up to four HSL loops. Each loop supports the attachment of up to four #5074 I/O towers, with the #5079 counting as two #5074s. The system is limited to a total of thirteen towers. The Model 830 supports a Migration Tower I or II, which provides for the migration of existing #5073 SPD I/O towers or #5065/#5066 PCI Expansion Towers to leverage the hardware investment in this older technology. Only one tower, *either* a Migration Tower *or* a #5074, is supported on the first loop. The following figure shows the Model 830 and five connected towers. For further details, see *AS/400e to iSeries 400 Migration*, SG24-6055.



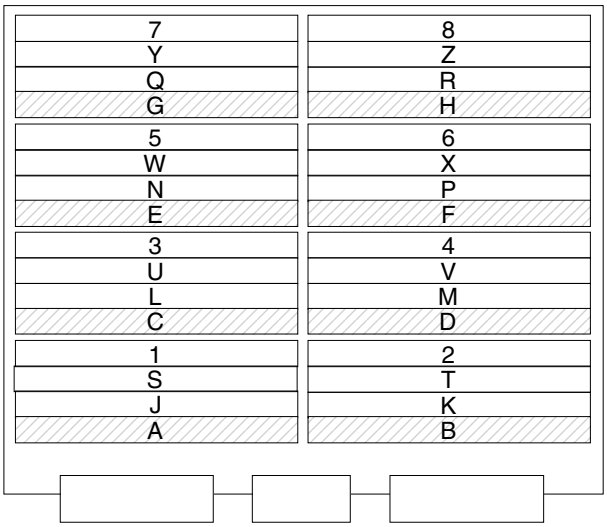
Model 830 System Unit (n - Way)

#2400, #2402, #2403 Processors



Front Back

Model 830 Main Storage Card
(CCIN 2881)



Legend

Base Feature

Required Feature

Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C11 has an Integrated Netfinity Server, slot C12 is not available, and slot C13 is available only as a short slot.

Note 3: The position of the cards may change depending on the console and other features selected.

I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. See “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for OS/400 V4R5 hardware are quite flexible. See “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA

- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA
- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #9748 Base PCI RAID Disk Unit Controller
- #4748 PCI RAID Disk Unit Controller

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- #9943 Base PCI IOP
- #2843 PCI IOP (64 MB)
- #2790 PCI Integrated Netfinity Server

Internal Disk, Tape, and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Please see “PCI Disk Units” on page 345 and “Internal Tape and CD-ROM” on page 356 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54 GB 10k RPM Disk Unit
- #4324 17.54 GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4425 CD-ROM
- #4482 4 GB ¼-inch Cartridge Tape
- #4483 16 GB ¼-inch Cartridge Tape
- #4486 25 GB ¼-inch Cartridge Tape

External Towers

The following towers attach to the Model 830 via HSL (High Speed Link). Please see “Expansion Towers” on page 223 and “Migration Towers” on page 232 for full descriptions.

- #5034 Migration Tower I
- #5035 Migration Tower I
- #5074 PCI Expansion Tower
- #5077 Migration Tower II
- #5079 1.8M I/O Tower

The Expansion Towers and Units in the following table can attach to the Model 830 via #5034, #5035, and #5077 Migration Towers.

Feature	Description	Prerequisites
#5043	Primary rack converted to secondary rack (migrated)	--
#5044	System Unit Expansion Rack (migrated)	#2686 Optical Link Processor (OLP) Card
#5052	Storage Expansion Unit	#5143 and #5072 or #5082 and one of #6502, #6512, #6530, #6532, #6533
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533
#5065	Storage/PCI Expansion Tower	One port on #2688 OLP card in #9364/#5064 System Unit Expansion or in #5077 Migration Tower
#5066	1.8M I/O Tower	See #5065
#5072	1063M System Unit Expansion Tower	One port on #2688 OLP card in #9364/#5064 System Unit Expansion or in #5077 Migration Tower
#5073	1063M System Unit Expansion Tower	One port on #2688 OLP card in #9364/#5064 System Unit Expansion or in #5077 Migration Tower
#5082	1063M System Unit Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and one port on #2688 OLP card in #9364/#5064 System Unit Expansion or in #5077 Migration Tower
#5083	1063M System Unit Expansion	See #5082

Full details on these racks and towers can be found beginning with “Expansion Towers” on page 223.

Migration Tower Hardware

#2686 Optical Link Processor (266 Mbps)

#2688 Optical Link Processor (1063 Mbps)

Disk Units

See “PCI Disk Units” on page 345.

Internal Tape and CD-ROM

See “Internal Tape and CD-ROM” on page 356.

I/O Processors

See “Migration Tower Hardware PCI” on page 258 and “Migration Tower Hardware SPD” on page 260.

Magnetic Media Controllers

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

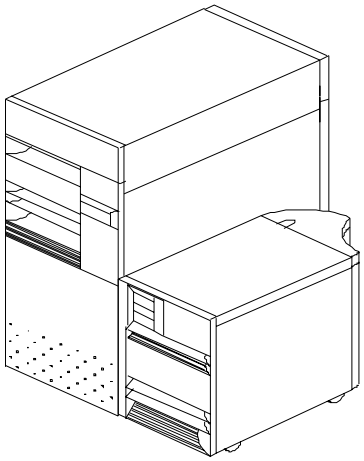
I/O Adapters

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

iSeries Server 840

iSeries Server 840

iSeries Model 840



iSeries Model 840 System Unit

A minimum functional server consists of the base server unit and selected priced features. Included in the base server are the physical package and power elements, a DASD controller, an I/O controller, and a #9771 Base PCI 2-Line WAN with Modem as follows:

- System Unit (CEC) and #9079 Base I/O Tower or #8079 Optional Base I/O Rack
- Linecord Features (one for the system unit and one for the #9079 or two for the #8079)
- Clock Card (CCIN 25AA)
- Clock Daughter Card (CCIN 25AF)
- Terminator/Filler Card (CCIN 246C) (Two on #2416 & #2418, one on #2417)
- PCI and CSP Card (CCIN 28AA)
- Operator Panel with key stick (CCIN 247C)
- #9079 Base I/O Tower or #8079 Optional Base I/O Rack
- #9737 Bus Expansion Card—16 HSL Ports
- Bus Adapter (CCIN 2691)
- #9943 Base PCI IOP
  - Provides support for #9748 Base PCI RAID Disk Unit Controller

    Provides support for up to 15 Disk Units, the required CD-ROM, and a feature Internal Tape or a feature CD-ROM
  - Provides support for base Console/Workstation IOA

    The configurator will determine which feature combinations will be on the order based on the System Console specify - #5540 or #5544

© Copyright IBM Corp. 2000

The following required features must be purchased:

- Processor (one must be specified)
  - #2416 8/12-way processor (IStar) (7800/10000 CPW)
  - #2417 12/18-way processor (IStar) 10000/13200 CPW)
  - #2418 12-way processor (IStar) (10000 CPW)
  - #2419 18/24-way processor (IStar) 13200/16500 CPW)
  - #2420 24-way processor (IStar) (16500 CPW)
- Interactive Card (one must be specified)

Processor Feature	2416	2417	#2418	2419	#2420
Interactive Feature					
#1540	120	120	120	120	120
#1541	240	240	240	240	240
#1542	560	560	560	560	560
#1543	1050	1050	1050	1050	1050
#1544	2000	2000	2000	2000	2000
#1545	4550	4550	4550	4550	4550
#1546	10000	10000	10000	10000	10000
#1547				16500	16500

- Main Storage. Main storage cards are required to be installed in groups of four (quads) of the same capacity and technology. A minimum of one set of four is required.
  - #3195 - 4096 MB Main Storage Card
  - #3196 - 8192 MB Main Storage Card
    - Requires #2730 Programmable Regulator (Quantity 2)
    - May be selected only to achieve 81920 MB and 98304 MB main storage increments)
  - #3197 - 1024 MB Main Storage Card
  - #3198 - 2048 MB Main Storage Card
  - #3612 - 1024 MB Main Storage Card (replaces #3197)
  - #3613 - 2048 MB Main Storage Card (replaces #3198)
  - #3614 - 4096 MB Main Storage Card (replaces #3195)
- Integrated Disk Units

  Device Parity Protection: All (0041) is the default for disk data protection. With RAID protection as the default, a minimum of four of the following disk units of equal capacity must be ordered. If RAID protection is removed from the system order, at least one of the following disks must be ordered:
  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit

  - #4324 - 17.54 GB Disk Unit
- Integrated CD-ROM

  #4425 - CD-ROM
- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem

The 840 server initial installation and model upgrades are performed by IBM Service representatives.

OS/400 V4R5 is required to support the 840 servers.

Card Technology

With the implementation of new PCI technologies, the Model 840 provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, potentially resulting in a lower cost of implementation.

Prior AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in a particular area was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, leaving valuable slots empty.

This PCI I/O structure enables customer setup of selected features of the Model 840. It also enables Hot Plug PCI for adding and replacing hardware without taking the server down. A full understanding of configuration rules associated with the various I/O features of the 840 system is required.

The 840 processors support four 32-bit and ten 32/64-bit PCI slots.

The following functions do not have equivalent function PCI cards for the Model 840:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode
- X.21 switched WAN dialup or Shorthold Mode WAN

- Asynchronous communication speeds of less than 300 bps
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loopback (diagnostics functions supported by some modems)

PCI adapters also do not support X.21 switched WAN dialup or Shorthold Mode WAN.

The fundamental bus architecture of the iSeries is unchanged when using PCI adapters. The AS/400e IOP continues to off load the main processor; isolate the host from adapter and network errors; and manage, configure, and service the adapters. PCI architecture offers advantages in flexibility over non-iSeries or non-AS/400e server structures.

Processor Features

- #2416 Processor on Demand (POD) Model 840 Processor (IStar 8/12-way)
  - Processor Capacity Card (CCIN 2416)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
- #2417 Processor on Demand (POD) Model 840 Processor (IStar 12/18-way)
  - Processor Capacity Card (CCIN 2417)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
  - Processor 2 (CCIN 245E)
- #2418 Model 840 Processor (IStar 12-way)
  - Processor Capacity Card (CCIN 2418)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
- #2419 Processor on Demand (POD) Model 840 Processor (IStar 18/24-way)
  - Processor Capacity Card (CCIN 2419)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
  - Processor 2 (CCIN 245E)
  - Processor 3 (CCIN 245E)
- #2420 Model 840 Processor (IStar 24-way)
  - Processor Capacity Card (CCIN 2420)
  - Processor 0 (CCIN 245F)

- Processor 1 (CCIN 245E)
- Processor 2 (CCIN 245E)
- Processor 3 (CCIN 245E)

Capacity Upgrade on Demand (CUoD)

iSeries Capacity Upgrade on Demand offers the capability to non-disruptively activate one or more additional central processors of specific models of 9406-840. CUoD adds capacity in increments of one processor, up to the maximum number of ON DEMAND processors built into the Model 840. CUoD has significant value for installations who want to upgrade without disruption.

There are now three Processor on Demand (POD) features (#2416, #2417, or #2419) that each offer a number of *BASE processors* that are in "active" status and a set of *ON DEMAND processors* that are in "standby" status.

ON DEMAND processors (one or more) can be permanently activated by ordering the desired quantity of feature code 1604 (MES order). Ordering feature 1604 generates a POD Activation Code which will be posted on a Web site and mailed. This activation code must then be entered at the server console. For further details, refer to *Planning Guide for Capacity Upgrade On Demand* at: `http://www.ibm.com/eserver/iseries/ondemand`

Interactive Features

The Model 840 supports various levels of interactive performance through the installation of interactive features.

Interactive CPW is an approximate value reflecting the portion of Processor CPW that can be used for workloads performing interactive-based tasks (5250).

- Any system administration job submitted to batch is not considered interactive work.
- Any use of Operations Navigator (GUI administration functions) is not considered interactive work.

For a discussion of how these features influence system performance, see "IBM Workload Estimator for AS/400" on page 32.

The available interactive options are shown in the table on page 186.

A feature cross-reference table can be used to relate the Processor Feature Code to the Processor and Interactive features visible in the AS/400 configurator. The Processor Feature Code is found by displaying the QPRCFEAT system value or in the rack configuration. The Processor Feature Code is used when ordering software license keys.

Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Feature	Processor Group
#2416	#1540	#24C0	P40
	#1541	#24C1	P50
	#1542	#24C2	P50
	#1543	#24C3	P50
	#1544	#24C4	P50
	#1545	#24C5	P50
	#1546	#24C6	P50
#2417	#1540	#24C8	P40
	#1541	#24C9	P50
	#1542	#24CA	P50
	#1543	#24CB	P50
	#1544	#24CC	P50
	#1545	#24CD	P50
	#1546	#24CE	P50
#2418	#1540	#23E8	P40
	#1541	#23E9	P50
	#1542	#23EA	P50
	#1543	#23EB	P50
	#1544	#23EC	P50
	#1545	#23ED	P50
	#1546	#23EE	P50
#2419	#1540	#24D0	P40
	#1541	#24D1	P50
	#1542	#24D2	P50
	#1543	#24D3	P50
	#1544	#24D4	P50
	#1545	#24D5	P50
	#1546	#24D6	P50
	#1547	#24D7	P50

#2420	#1540	#23F8	P40
	#1541	#23F9	P50
	#1542	#23FA	P50
	#1543	#23FB	P50
	#1544	#23FC	P50
	#1545	#23FD	P50
	#1546	#23FE	P50
	#1547	#23FF	P50

Main Storage

All main storage cards on the Model 840 must be added in sets of four (quads) of the same capacity and technology. There are 16 slots available for main storage cards in the Model 840. The slots are arranged in groups of four: AAAA, BBBB, CCCC, and DDDD. The plugging order for the main storage cards is AAAA, BBBB, CCCC, and then DDDD.

There are no rules regarding the placement of a particular size of main storage card quad into a card slot group. A quad of any size main storage card may be placed in any of the four groups of four slots.

The available main storage features are as follows:

- #3195 - 4096 MB Main Storage Card (128 Mb technology)
- #3196 - 8192 MB Main Storage Card (256 Mb technology)
  - Requires #2730 Programmable Regulator (Quantity 2)
  - May be selected only to achieve 81920 MB and 98304 MB main storage increments)
- #3197 - 1024 MB Main Storage Card (64 Mb technology)
- #3198 - 2048 MB Main Storage Card (64 Mb technology)
- #3612 - 1024 MB Main Storage Card (replaces #3197)
- #3613 - 2048 MB Main Storage Card (replaces #3198)
- #3614 - 4096 MB Main Storage Card (replaces #3195)

Power and Packaging

The Model 840 includes an internal battery that is automatically activated in the event of utility power loss. The battery provides full operating power for a short time to all components within the system unit, but not to any external components. This can allow the system to run uninterrupted for a short time (30 seconds or less). For longer power outages, the system will use the battery to attempt an orderly shutdown to avoid losing data in main storage that is not written to disk. An external UPS is recommended to protect the system unit and any external

components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model 840. An external UPS can allow the system to run uninterrupted for longer than thirty seconds when utility power is lost. It also maintains power long enough to ensure that the system successfully completes a shutdown to avoid losing data.

System Power

- Power
  - Processor side, 8/12-Way, 12-Way, and 12/18-Way
    - Bulks (1000 watt) (CCIN 5154) (Quantity four)
    - Programmable Regulators (CCIN 2730) (Quantity eight)
    - #2730 Programmable Regulator (Quantity two) required if #3196 8 GB Main Storage cards are installed
    - Memory Control Regulator (CCIN 2716)
    - Processor Regulators (CCIN 2714) (Quantity two)
    - Charger
    - Battery Pack
    - SPCN Card (CCIN 285E)
    - AC Power Supply Country Specific Usage
  - Processor side, 18/24 and 24-Way
    - Bulks (1000 watt) (CCIN 5154) (Quantity five)
    - Programmable Regulators (CCIN 2730) (Quantity nine)
    - #2730 Programmable Regulator (Quantity two) required if #3196 8 GB Main Storage cards are installed
    - Memory Control Regulator (CCIN 2716)
    - Processor Regulators (CCIN 2714) (Quantity two)
    - Charger
    - Battery Pack
    - SPCN Card (CCIN 285E)
    - AC Power Supply Country Specific Usage
  - Base I/O Tower (#9079)
    - Bulks (765 Watt) (CCIN 515A) (Quantity two)
    - Batteries (Quantity four)
    - AC Input/Charger

#8079 Optional Base I/O Rack

The #8079 is a optional base I/O rack shipped on the Model 840 instead of the #9079 Base I/O Tower. The #8079 supports up to 90 disk units, up to 22 PCI IOAs, and up to four removable media units. A #8079 is a #9079 Base I/O tower with a #5074 (#0574 Specify Code) tower package in a rack.

Select three or four (any combination) of the following HSL cables:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

The #1462 15m Copper HSL cable can be used on any HSL port of the Model 840. If a #5077 migration tower is included in the configuration, four HSL cables have to be ordered for the #8079 Optional Base I/O Rack.

Select two of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

Specify two line cord for the #8079 Optional Base I/O Rack. Some countries offer fewer choices of line cords and some countries are shipped a default line cord type.

The #8079 has a #9943 Base PCI IOP and a #9748 PCI RAID Disk Unit Controller. It has PCI slots for up 22 PCI IOAs, space for up to 90 disk units (#5101 is installed in both the bottom and top unit), space for four removable media devices, two battery backup, and redundant/hot swap power supplies.

The #8079 is capable of controlling Ultra2 SCSI disk units.

The 22 PCI IOAs are supported (driven) by two base #9943 PCI IOP and feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

The #8079 also supports up to four removable media devices (internal tape or CD-ROM). These removable media devices are supported by one 9748 and a feature #4748.

If the top enclosure is to be attached to a different system than initially ordered, the #0574 specify code has to RPO removed from the initially ordered machine and added to the target machine.

#9079 Base I/O Tower

The #9079 is the base I/O tower shipped on the Model 840. The #9079 supports up to 45 disk units, up to 11 PCI IOAs, and up to two removable media units.

Select two (any combination) of the following HSL cables:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

The #1462 15m Copper HSL cable can be used on any HSL port of the Model 840.

Select one of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

Specify one line cord for the #9079 Base I/O Tower. Some countries offer fewer choices of line cords and some countries are shipped a default line cord type.

The #9079 has a #9943 Base PCI IOP and a #9748 PCI RAID Disk Unit Controller. It has PCI slots for up 11 PCI IOAs, space for up to 45 disk units (15 are “base”, 30 additional with the #5101), space for two removable media devices, one battery backup, and redundant/hot swap power supplies.

The #9079 is capable of controlling Ultra2 SCSI disk units.

The 11 PCI IOAs are supported (driven) by the base #9943 PCI IOP and by feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

The mounting for the first 15 disk units is included in the #9079 (base). The mounting for the next 30 disk units is optional by ordering feature code #5101 30 Disk Expansion Feature.

The #9079 also supports up to two removable media devices (internal tape or CD-ROM). These removable media devices are supported by the #9748.

#5101 30-Disk Expansion Feature

The #5101 is a disk unit expansion enclosure feature for the #5074 Expansion Tower, the #9074 Base I/O Enclosure, and the #9079 Base I/O Tower. The #5101 includes two 15 disk unit enclosures, one 765-Watt power supply, backplanes and cables. One #4748 PCI RAID Disk Unit Controller is required to support the 15 disk units in each of the two disk unit enclosures included with #5101. Two #4748 PCI RAID Disk Unit Controllers are required to support 30 disk units.

#2730 Programmable Regulator

The #2730 Programmable Regulator (quantity two) is required if the #3196 8 GB Main Storage Card is installed in the Model 840.

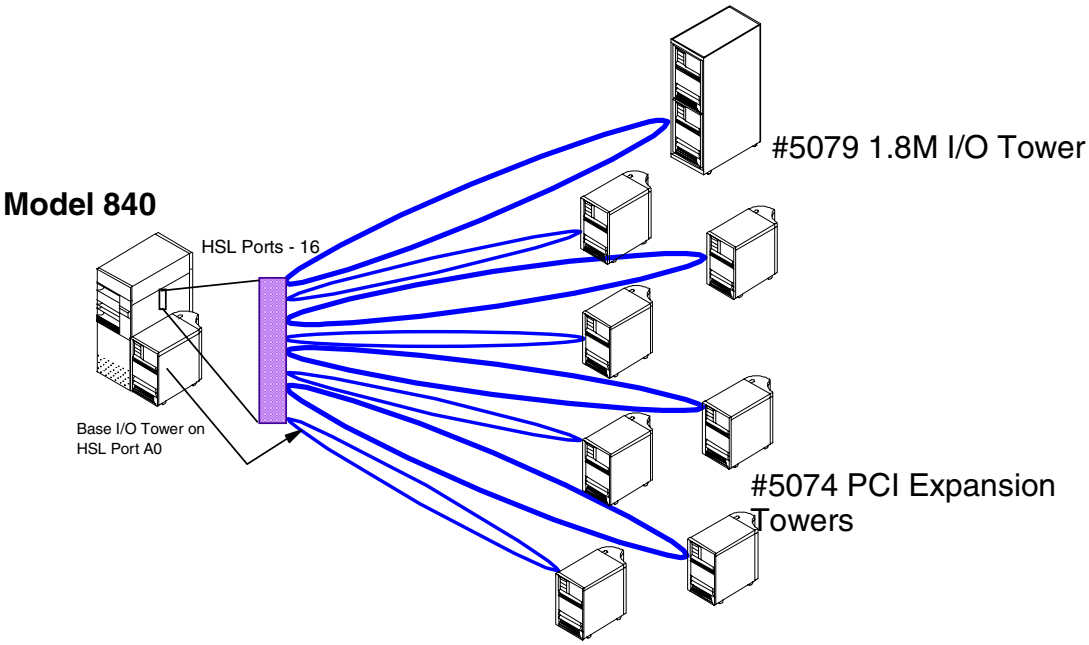
#5150 Battery Backup (external)

#5150 is an external battery backup that when used in conjunction with the internal battery backup is capable of extending the battery backup time on Models 840 and SB3.

High Speed Links (HSL) on Model 840

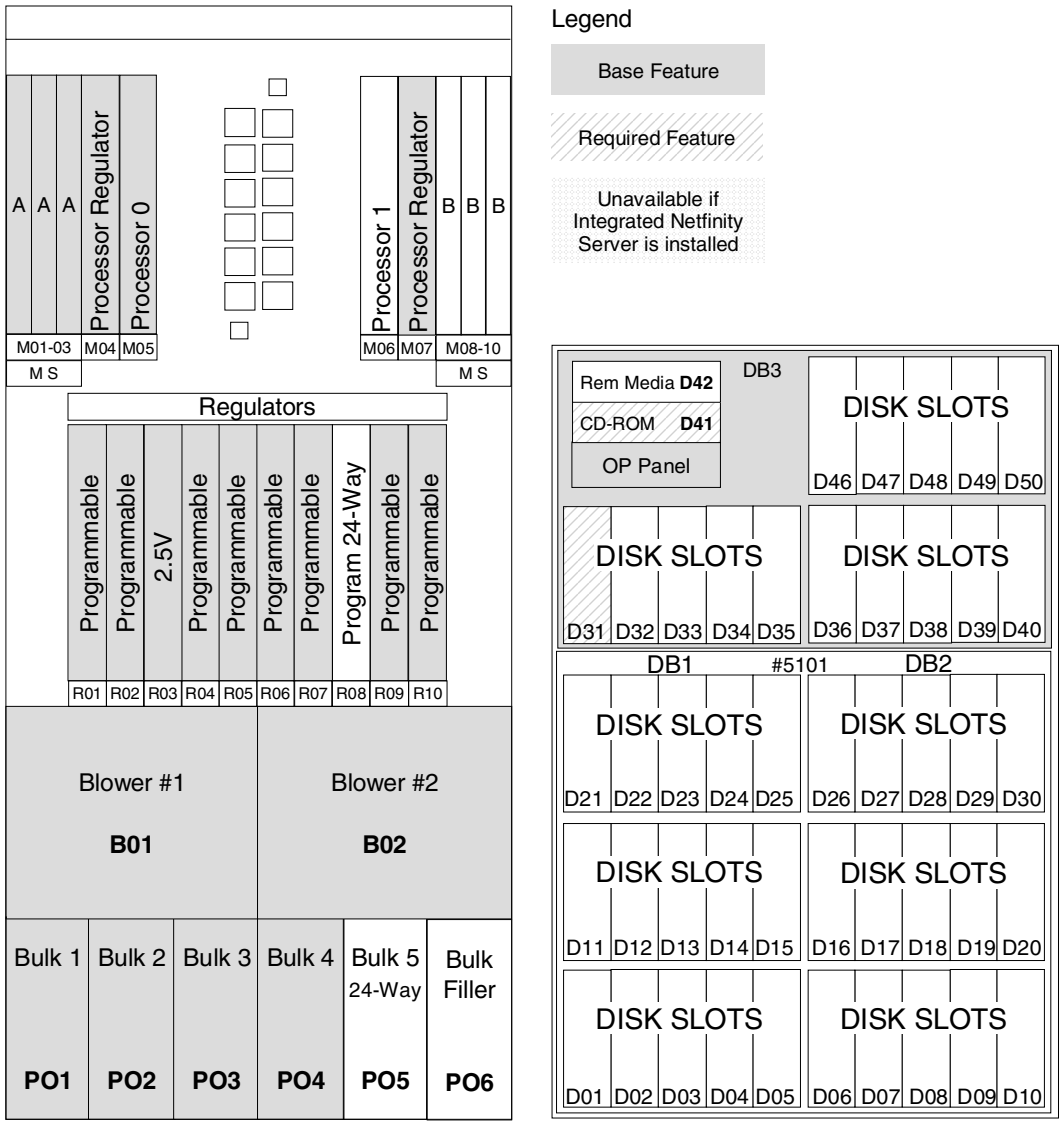
The Model 840 supports up to eight HSL loops. These loops support the attachment of up to 23 #5074 I/O towers, with the #5079 counting as two #5074s. The Model 840 supports a #5077 Migration Tower II, which provides for the migration of existing #5073 SPD I/O towers or #5065/#5066 PCI Expansion Towers to leverage the hardware investment in this older technology. For further details, see *AS/400e to iSeries 400 Migration*, SG24-6055.

Note: The base I/O Tower is on the first loop which also supports either *one* additional #5074 *or* a Migration Tower II. The following figure shows the Model 840 and nine connected towers.



Model 840 System Unit (n - Way)

#2416, #2417, #2418, #2419, #2420 Processors



Front

Model 840 System Unit (n - Way)

#2416, #2417, #2418, #2419, #2420 Processors

Legend

Base Feature

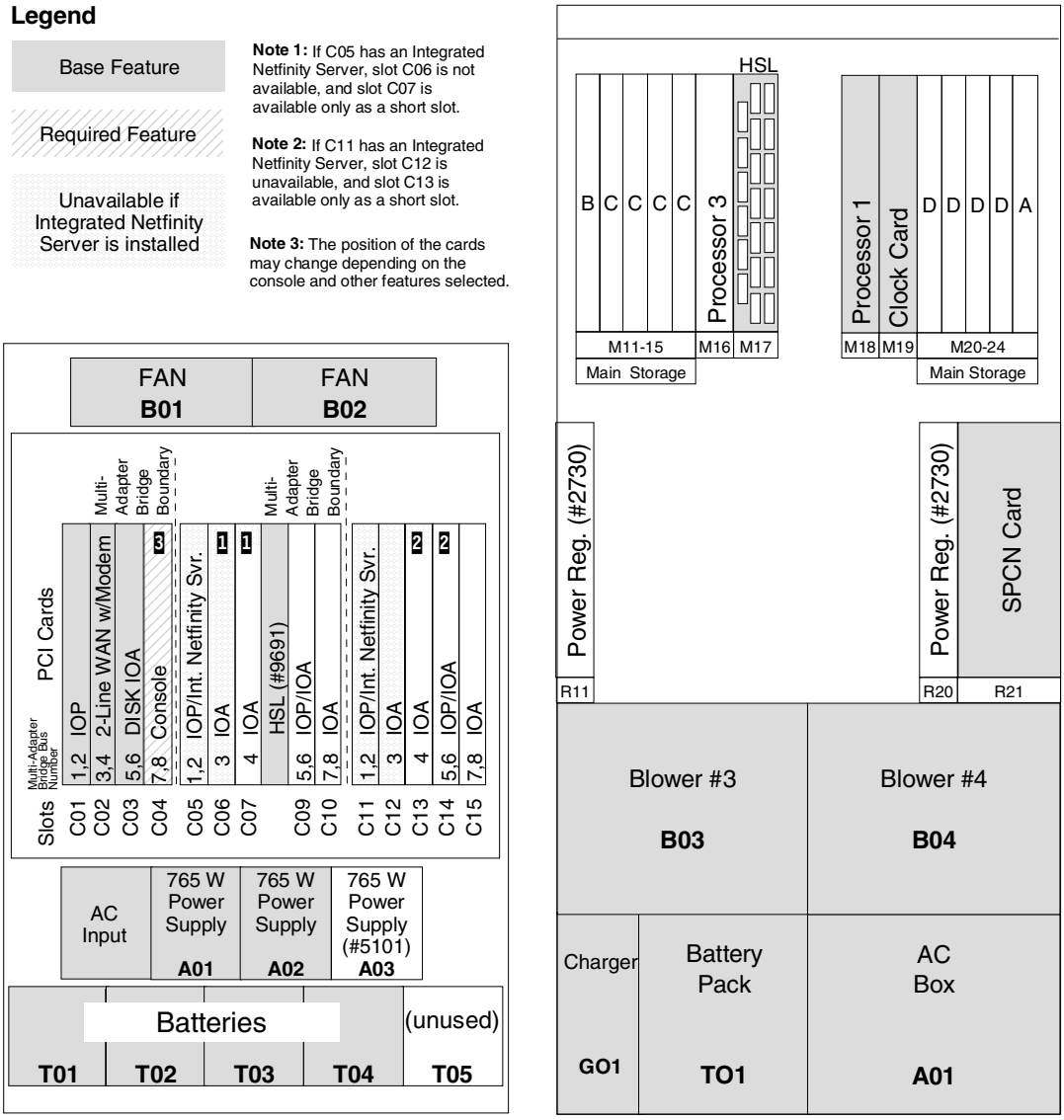
Required Feature

Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is not available, and slot C07 is available only as a short slot.

Note 2: If C11 has an Integrated Netfinity Server, slot C12 is unavailable, and slot C13 is available only as a short slot.

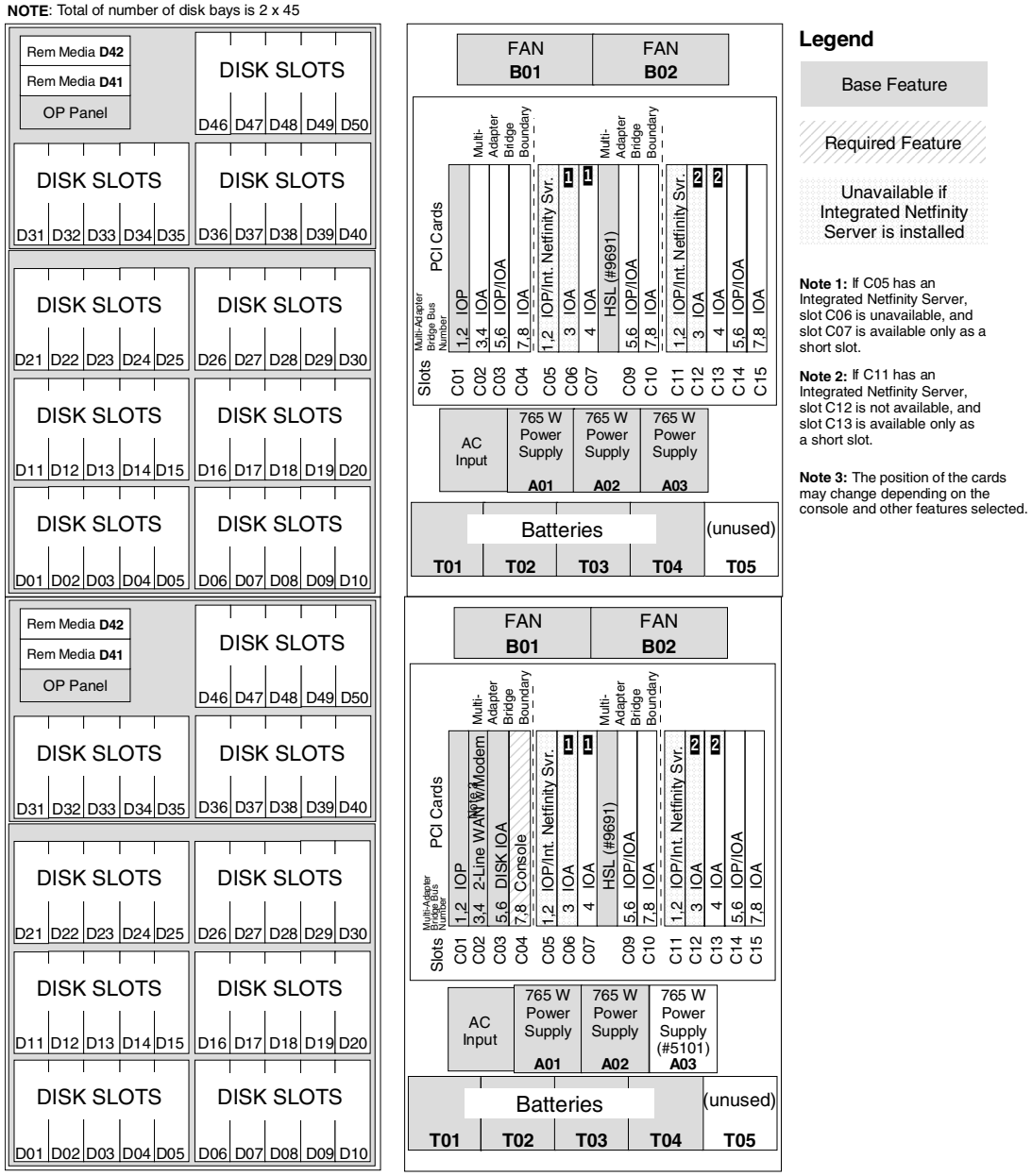
Note 3: The position of the cards may change depending on the console and other features selected.



Back

#8079 Optional Base Rack

NOTE: Total of number of disk bays is 2 x 45



Legend

Base Feature

Required Feature

Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C11 has an Integrated Netfinity Server, slot C12 is not available, and slot C13 is available only as a short slot.

Note 3: The position of the cards may change depending on the console and other features selected.

I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. Please see “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for V4R5 hardware are quite flexible. Please see “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA
- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA
- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #4748 PCI RAID Disk Unit Controller
- #9748 Base PCI RAID Disk Unit Controller

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- #2843 PCI IOP (64 MB)
- #2790 PCI Integrated Netfinity Server
- #9943 Base PCI IOP (64 MB)

Internal Disk, Tape, and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Please see “PCI Disk Units” on page 345 and “Internal Tape and CD-ROM” on page 356 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54 GB 10k RPM Disk Unit
- #4324 17.54 GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4425 CD-ROM
- #4482 4 GB ¼-inch Cartridge Tape
- #4483 16 GB ¼-inch Cartridge Tape
- #4486 25 GB ¼-inch Cartridge Tape

External Towers

The following towers attach to the Model 840 via HSL (High Speed Link). See “Expansion Towers” on page 223 for full descriptions.

- #5077 Migration Tower II
- #5074 PCI Expansion Tower (large)
- #5079 1.8 m I/O Tower

The Expansion Towers and Units in the following table can attach to the Model 840 using #5077 Migration Towers.

Feature	Description	Prerequisites
#5043	Primary rack converted to secondary rack (migrated)	--
#5044	System Unit Expansion Rack (migrated)	Optical Link Processor (OLP) Card #2686
#5052	Storage Expansion Unit	#5143 and #5072 or #5082 and one of #6502, #6512, #6530, #6532, #6533
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533

#5065	Storage/PCI Expansion Tower	One port on OLP card #2688 in the #5077 Migration Tower
#5066	1.8 m I/O Tower	See #5065
#5072	1063M System Unit Expansion Tower	One port on OLP card #2688 in the #5077 Migration Tower
#5073	1063M System Unit Expansion Tower	One port on OLP card #2688 in the #5077 Migration Tower
#5082	1063M System Unit Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and One port on OLP card #2688 in the #5077 Migration Tower
#5083	1063M System Unit Expansion	See #5082

Full details on these racks and towers can be found beginning with “Expansion Towers” on page 223.

Migration Tower Hardware

#2686 Optical Link Processor (266 Mbps)

#2688 Optical Link Processor (1063 Mbps)

Disk Units

See “PCI Disk Units” on page 345.

Internal Tape and CD-ROM

See “Internal Tape and CD-ROM” on page 356.

I/O Processors

See “Migration Tower Hardware PCI” on page 258 and “Migration Tower Hardware SPD” on page 260.

Magnetic Media Controllers

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

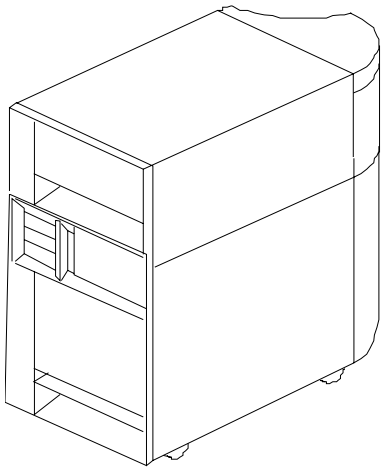
I/O Adapters

See “Migration Tower Hardware PCI” on page 272 and “Migration Tower Hardware SPD” on page 280.

iSeries Server SB2

iSeries Server SB2

iSeries Model SB2



iSeries Model SB2 System Unit

A minimum functional server consists of the base server unit and selected priced features. Included in the base server are the physical package and power elements, a DASD controller, an I/O controller, 12288 MB of Main Storage and a #9771 Base PCI 2-Line WAN with Modem as follows:

- System Unit (CEC) and #9074 Base I/O Tower
- Line cord features
- Power
- Main Storage Expansion Card (Quantity two) (CCIN 2881)
- Main Storage

  48 Main Storage DIMMs (CCIN 300F) are shipped as “base” with each SB2 (CCIN 300F) 256 MB DIMM (128 Mb technology)

- #9733 Bus Expansion/Clock Card—Eight HSL Ports (CCIN 25AD)
- PCI and CSP Card (CCIN 28AA)
- Bus Adapter (CCIN 2681)
- Operator Panel (CCIN 247A)
- #9074 Base I/O Tower
- #9943 Base PCI IOP
  - Provides support for #9748 Base PCI RAID Disk Unit Controller

    Provides support for four Disk Units, the required CD-ROM, and a feature Internal Tape or a feature CD-ROM.

© Copyright IBM Corp. 2000

  - Provides support for base Console/Workstation IOA

    The configurator will determine which feature combinations will be on the order based on the System Console specify—#5540 or #5544

The following required features must be ordered:

- Processor

  #2315 Model SB2 8-way Processor (IStar) (CCIN 2315)

- Integrated Disk Units

  Device Parity Protection: All (0041) is the default for disk data protection but may be removed from the order. Select four of the following disk units. If four 17.54 GB disk units are selected, then RAID or mirroring must also be selected to meet the maximum logical DASD capacity limit.

  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit
  - #4324 - 17.54 GB Disk Unit

- Integrated CD-ROM
  - #4425 - CD-ROM
- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem

The server SB2 is a Customer Setup system. Refer to “Customer Install Features (CIF)” on page 245.

Card Technology

The new hardware completes the transition to PCI I/O architecture with the introduction of PCI architecture in all the 8xx systems. This I/O structure enables customer setup of selected features on the SB2. It also enables Hot Plug PCI for adding and replacing hardware without taking the server down.

With the implementation of new PCI technologies in the iSeries SB2 comes the requirement for a better understanding of the configuration rules associated with the various I/O features of the system. Prior AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in particular areas was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, wasting valuable slots. The new PCI I/O architecture provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, potentially resulting in a lower cost of implementation. Increased flexibility of configuration also adds a degree of complexity to the configuration process.

The following functions do not have equivalent function PCI cards for the Model SB2:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode

PCI adapters also do not support X.21 switched WAN dialup or Shorthold Mode WAN.

The fundamental bus architecture of the iSeries and AS/400e server is unchanged when using PCI adapters. The system IOP continues to off load the main processor; isolate the host from adapter and network errors; and manage, configure, and service the adapters. PCI architecture offers advantages in flexibility over non-AS/400e system structures.

Processor Feature

#2315 Model SB2 Processor (IStar 8-way)

- Processor Capacity Card (CCIN 2315)
- Processor 0 (CCIN 245D)
- Processor 1 (CCIN 245D)

Main Storage

All main storage on the Model SB2 is base main storage. The system includes two base Main Storage Expansion Cards (CCIN 2881) and 48 256 MB Main Storage DIMMs (CCIN 300F).

Power and Packaging

The Model SB2 includes an internal battery that is automatically activated in the event of utility power loss. The battery provides full operating power for a short time to all components within the system unit, but not to any external components. This can allow the system to run uninterrupted for a short time (30 seconds or less). For longer power outages, the system will use the battery to attempt an orderly shutdown to avoid losing data in main storage that is not written to disk. An external UPS is recommended to protect the system unit and any external

components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model SB2. An external UPS can allow the system to run uninterrupted for longer than thirty seconds when utility power is lost. It can also maintain power long enough to ensure that the system successfully completes a shutdown to avoid losing data.

System Power

- Processor Enclosure
  - Power Supply (1100 Watt) (CCIN 515B)(Quantity two)
  - Regulator (CCIN 278B)
- Base I/O Tower (#9074)
  - Power Supply (765 Watt) (CCIN 515A) (Quantity two)
  - AC Input/Charger
  - Batteries (Quantity four)

#9074 Base I/O Enclosure

The #9074 is the base I/O tower shipped on Model SB2. The #9074 supports up to four disk units, up to 11 PCI IOAs and up to two removable media units.

One internal HSL cable is included as base. Optionally, one of the following HSL cables may be selected:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

The #9074 has a #9943 Base PCI IOP and a #9748 PCI RAID Disk Unit Controller. It also has PCI slots for up to 11 PCI IOAs, space for four disk units, space for two removable media devices, one battery backup, and redundant/hot swap power supplies.

The #9074 is capable of controlling Ultra2 SCSI disk units.

The 11 PCI IOAs are supported (driven) by the base #9943 PCI IOP and by feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

The #9074 also supports up to two removable media devices (internal tape or CD-ROM), which are supported by the #9748.

The Model SB2 is based on the Model 830. For system diagrams, please see “iSeries Model 830” on page 169.

I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. Please see “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for V4R5 hardware are quite flexible. Please see “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA
- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA
- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #9748 Base PCI RAID Disk Unit Controller

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- #2843 PCI IOP (64 MB)
- #2790 PCI Integrated Netfinity Server
- #9943 Base PCI IOP

Internal Disk, Tape, and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Please see “PCI Disk Units” on page 345 and “Internal Tape and CD-ROM” on page 356 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54 GB 10k RPM Disk Unit
- #4324 17.54 GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4425 CD-ROM
- #4482 4 GB ¼-inch Cartridge Tape
- #4483 16 GB ¼-inch Cartridge Tape
- #4486 25 GB ¼-inch Cartridge Tape

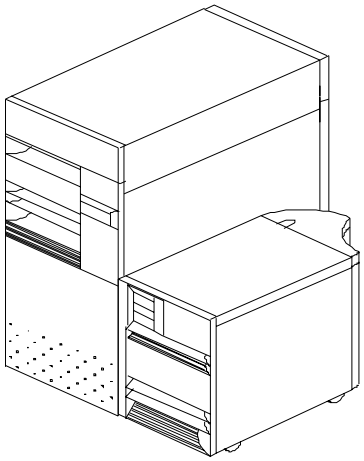
External Towers

The #5077 Migration Tower II attaches to the Model SB2 via HSL (High Speed Link). Please see “Expansion Towers” on page 223 for full descriptions.

iSeries Server SB3

iSeries Server SB3

iSeries Model SB3



iSeries Model SB3 System Unit

A minimum functional server consists of the base server unit and selected priced features. Included in the base server are the physical package and power elements, a DASD controller, an I/O controller, 16384 MB or 24576 MB of main storage and a #9771 Base PCI 2-Line WAN with Modem as follows:

- System Unit (CEC) and #9079 Base I/O Tower
- Linecord Features (one for the system unit and one for the #9079)
- Clock Card (CCIN 25AA)
- Clock Daughter Card (CCIN 25AF)
- Terminator/Filler Card (CCIN 246C) (2X)—12 way only (processor #2316)
- Power
- Main Storage
  - Main storage cards (CCIN 319A) are shipped as base with each SB3 (CCIN 319A is 128 Mb technology).
  - The number of main storage cards shipped is determined by the processor selected.
  - Processor #2316

    8X 2048 MB Main Storage Cards (CCIN 319A) installed (16384 MB total)
  - Processor #2318

    12X 2048 MB Main Storage Cards (CCIN 319A1) installed (24576 MB total)
- #9737 Bus Expansion/Clock Card—16 HSL Ports (CCIN 25AD)
- PCI and CSP Card (CCIN 28AA)

© Copyright IBM Corp. 2000

- Bus Adapter (CCIN 2681)
- Operator Panel (CCIN 247A)
- #9943 Base PCI IOP
  - Provides support for #9748 Base PCI RAID Disk Unit Controller

    Provides support for eight disk units, the required CD-ROM, and a feature internal tape or a feature CD-ROM.
  - Provides support for base Console/Workstation IOA

    The configurator will determine which feature combinations will be on the order based on the System Console specify—#5540 or #5544.

The following required features must be purchased:

- Processor (one must be specified)
  - #2316 12-way processor (IStar) (10000 CPW)
  - #2318 24-way processor (IStar) (16500 CPW)
- Integrated Disk Units

  Device Parity Protection: All (0041) is the default for disk data protection but may be removed. With processor #2316, a minimum of four and a maximum of six of the following disk units must be on the order. If six of the 17.54 GB disk units are on the order, RAID or mirroring is required to meet the maximum logical disk unit capacity limit. With processor #2318, a minimum of four and a maximum of eight of the following disk units must be on the order. If eight 17.54 GB disk units are on the order, RAID or mirroring is required to meet the maximum logical disk unit capacity limit.
  - #4314 - 8.58 GB Disk Unit
  - #4317 - 8.58 GB 10k RPM Disk Unit
  - #4318 - 17.54 GB 10k RPM Disk Unit
  - #4324 - 17.54 GB Disk Unit
- Integrated CD-ROM

  #4425 - CD-ROM
- System Console/Communications Adapter
  - #5540 System Console on twinaxial workstation controller
    - #4746 PCI Twinaxial IOA
    - #9771 Base PCI 2-Line WAN with Modem
  - #5544 System Console on Operations Console
    - #0367 Operations Console PCI Cable
    - #4745 PCI Two Line WAN IOA
    - #9771 Base PCI 2-Line WAN with Modem

- Uninterruptable Power Supply

  The Model SB3 includes an internal battery that is automatically activated in the event of utility power loss. The battery provides full operating power for a short time to all components within the system unit, but not to any external components. This can allow the system to run uninterrupted for a short time (30 seconds or less). For longer power outages, the system will use the battery to attempt an orderly shutdown to avoid losing data in main storage that is not written to disk. An external UPS is recommended to protect the system unit and any external components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model SB3. An external UPS can allow the system to run uninterrupted for longer than thirty seconds when utility power is lost. It can also maintain power long enough to ensure that the system successfully completes a shutdown to avoid losing data.

The server SB3 is a Customer Setup system. Refer to “Customer Install Features (CIF)” on page 245 for more information.

Card Technology

The new hardware completes the transition to PCI I/O architecture with the introduction of PCI architecture in all the 8xx servers. This I/O structure enables customer setup of the Model 820 and selected features on all models. It also enables Hot Plug PCI for adding and replacing hardware without taking the server down.

With the implementation of new PCI technologies in the iSeries 400 Model SB3 comes the requirement for a better understanding of the configuration rules associated with the various I/O features of the iSeries server. Prior AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. If high performance in particular areas was required, a single input/output adapter (IOA) may have been assigned to a single IOP. This resulted in unassigned slots in the tower, wasting valuable slots. The Model SB3 provides more flexibility in the placement of IOPs and IOAs. This results in more efficient use of card slots, potentially resulting in a lower cost of implementation. Increased flexibility of configuration also adds a degree of complexity to the configuration process.

The following functions do not have equivalent function PCI cards for the Model SB3:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode

PCI adapters also do not support X.21 switched WAN dialup or Shorthold Mode WAN.

The fundamental bus architecture of the iSeries server is unchanged when using PCI adapters. The AS/400 IOP continues to off load the main processor; isolate the host from

adapter and network errors; and manage, configure, and service the adapters. PCI architecture offers advantages in flexibility over non-AS/400 system structures.

Processor Features

- #2316 Model SB3 Processor (IStar 12-way)
  - Processor Capacity Card (CCIN 2316)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
- #2318 Model SB3 Processor (IStar 24-way)
  - Processor Capacity Card (CCIN 2318)
  - Processor 0 (CCIN 245F)
  - Processor 1 (CCIN 245E)
  - Processor 2 (CCIN 245E)
  - Processor 3 (CCIN 245E)

Main Storage

All main storage on the Model SB3 is base. The amount of main storage is determined by the processor option.

Power and Packaging

The Model SB3 includes an internal battery that is automatically activated in the event of utility power loss. The battery provides full operating power for a short time to all components within the system unit, but not to any external components. This can allow the system to run uninterrupted for a short time (30 seconds or less). For longer power outages, the system will use the battery to attempt an orderly shutdown to avoid losing data in main storage that is not written to disk. An external UPS is recommended to protect the system unit and any external components against utility power outages. Continuously Powered Mainstore (CPM) is not supported on the Model SB3. An external UPS can allow the system to run uninterrupted for longer than thirty seconds when utility power is lost. It can also maintain power long enough to ensure that the system successfully completes a shutdown to avoid losing data.

System Power

- Power
  - Processor side, 12 Way
    - Bulks (1000 watt) (CCIN 5154) (Quantity four)
    - Programmable Regulators (CCIN 2730) (Quantity eight)

- Memory Control Regulator (CCIN 2716)
- Processor Regulators (CCIN 2714) (Quantity two)
- Charger
- Battery Pack
- SPCN Card (CCIN 285E)
- AC Power Supply Country Specific Usage

– Processor side, 24 Way

- Bulks (1000 watt) (CCIN 5154) (Quantity five)
- Programmable Regulators (CCIN 2730) (Quantity nine)
- Memory Control Regulator (CCIN 2716)
- Processor Regulators (CCIN 2714) (Quantity two)
- Charger
- Battery Pack
- SPCN Card (CCIN 285E)
- AC Power Supply Country Specific Usage

– Base I/O Tower (#9079)

- Bulks (765 Watt) (CCIN 515A) (Quantity two)
- Batteries (Quantity four)
- AC Input/Charger

#9079 Base I/O Tower

The #9079 is the base I/O tower shipped on the Model SB3. The #9079 supports up to eight disk units, up to 11 PCI IOAs, and up to two removable media units.

Select two (any combination) of the following HSL cables:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

Select one of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

Specify one line cord for the #9079 Base I/O Tower. Some countries offer fewer choices of line cords and some countries are shipped a default line cord type.

The 9079 has a #9943 Base PCI IOP and a #9748 PCI RAID Disk Unit Controller. It also has PCI slots for up 11 PCI IOAs, space for up to 45 disk units (Maximum of eight disks on the

SB3), space for two removable media devices, one battery backup, and redundant/hot swap power supplies.

The #9079 is capable of controlling Ultra2 SCSI disk units.

The 11 PCI IOAs are supported (driven) by the base #9943 PCI IOP and by feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

The mounting for the eight disk units is included in the #9079 (base).

The #9079 also supports up to two removable media devices (internal tape or CD-ROM). These removable media devices are supported by the #9748.

#5150 Battery Backup (external)

The #5150 is an external battery backup that when used in conjunction with the internal battery backup is capable of extending the battery backup time on Models 840 and SB3.

The Model SB3 is based on the Model 840. For system diagrams, see “Power and Packaging” on page 191.

I/O Processor and I/O Adapter Support

The following list shows the supported IOPs and IOAs. Please see “I/O Processor” on page 253 and “I/O Adapter” on page 265 for full descriptions.

Note

PCI configuration rules for V4R5 hardware are quite flexible. Please see “PCI Card Placement Rules” on page 291 for complete rules.

LAN/WAN/Workstation IOAs

- #2743 PCI 1 Gbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA
- #4723 PCI 10 Mbps Ethernet IOA
- #4745 PCI Two Line WAN IOA
- #4746 PCI Twinaxial IOA
- #4750 PCI ISDN BRI U IOA
- #4751 PCI ISDN BRI S/T IOA
- #4761 PCI Integrated Analog Modem
- #4801 PCI Cryptographic Coprocessor
- #4815 PCI 155 Mbps UTP OC3 ATM IOA
- #4816 PCI 155 Mbps MMF ATM IOA

- #4818 PCI 155 Mbps SMF ATM IOA
- #4838 PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

Internal Disk Unit Controllers

- #9748 Base PCI RAID Disk Unit Controller
- #9767 Base PCI Disk Unit Controller

Magnetic Media Controllers

- #2749 PCI Ultra Magnetic Media Controller
- #2768 PCI Magnetic Media Controller

I/O Processors

- #2843 PCI IOP (64 MB)
- #2790 PCI Integrated Netfinity Server
- #9843 Base PCI IOP

Internal Disk, Tape, and CD-ROM Support

The following list shows the supported internal disks, tape drives and CD-ROMs. Please see “PCI Disk Units” on page 345 and “Internal Tape and CD-ROM” on page 356 for full descriptions.

Internal Disk Units

- #4314 8.58 GB Disk Unit
- #4317 8.58 GB 10k RPM Disk Unit
- #4318 17.54 GB 10k RPM Disk Unit
- #4324 17.54 GB Disk Unit
- #4331 1.6 GB Read Cache Device

Internal Tape and CD-ROM

- #4425 CD-ROM
- #4482 4 GB ¼-inch Cartridge Tape
- #4483 16 GB ¼-inch Cartridge Tape
- #4486 25 GB ¼-inch Cartridge Tape

External Towers

The #5077 Migration Tower II attaches to the Model SB3 via HSL (High Speed Link). Please see “Expansion Towers” on page 223 for full a description.

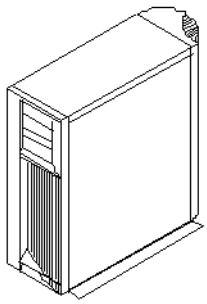
Expansion and Migration Towers

Expansion and Migration Towers

Towers

To house components beyond the capability of the system unit, towers are added. Expansion and migration towers are offered for new or migrated features respectively.

Expansion Towers



#5075 PCI Expansion Tower

#5075 PCI Expansion Tower

The #5075 is attached to Models 270 and 820 for adding up to six disk units and up to seven PCI IOAs. The #5075 has a 32 MB PCI IOP (CCIN 284B) embedded on the backplane and feature #2842 (when attached to a Model 270), or the #2843 (when attached to a Model 820) PCI IOPs may be added. A #4748 PCI RAID Disk Unit Controller or a #2763 PCI RAID Disk Unit Controller may be installed to control the disk units. The #5075 contains two buses.

For Model 270, select two (any combination) of the following High Speed Link (HSL) cables:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable

For the Model 820, if this is the first or only tower on the HSL loop, select two (any combination) of the following HSL cable features for this tower. If other towers already exist on the HSL loop, select one or two (select two if one of the existing HSL cables is too short), any combination, of the following HSL cable features per tower:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

© Copyright IBM Corp. 2000

At least one of the HSL cables for the Model 820 must be either the #1460 or #1461. The #1462 15m HSL cable can only be used on HSL port A1 of the Model 820 to directly connect Migration Towers #5033, #5034, or #5035.

Select one of the following SPCN cables (for 270 or 820):

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable

The #5075 is capable of controlling Ultra2 SCSI disk units, and a maximum of one disk unit controller is allowed within a #5075.

On new orders, specify one line cord with each #5075 PCI Expansion Tower.

Note: Some countries offer fewer choices of line cords, and some countries are shipped a default line cord type. Marketing configurators default to the line cord type of the system, if the system unit line cord type is not the #1413.

When the #5075 is attached to the Model 270, the seven PCI IOAs are supported (driven) by an embedded 32 MB PCI IOP and by feature #2842 PCI IOPs or feature #2890 Integrated Netfinity Servers.

When the #5075 is attached to the Model 820, the seven PCI IOAs are supported (driven) by an embedded 32 MB PCI IOP and by feature #2843 PCI IOPs or feature #2790 Integrated Netfinity Servers.

#5075s are not allowed to migrate on Model 820 upgrades to Model 830.

#7002 HSL Enabler

The #7002 is a feature High Speed Link (HSL) internal flex cable, which enables connection to a #5075 PCI Expansion Tower. It can be ordered only on the Model 270 with processor #2248, #2250, and #2422.

This cable connects the processor using a right angle bus connector to the back of the machine. Two HSL cables (#14XX) are required to connect the system unit to the expansion tower.

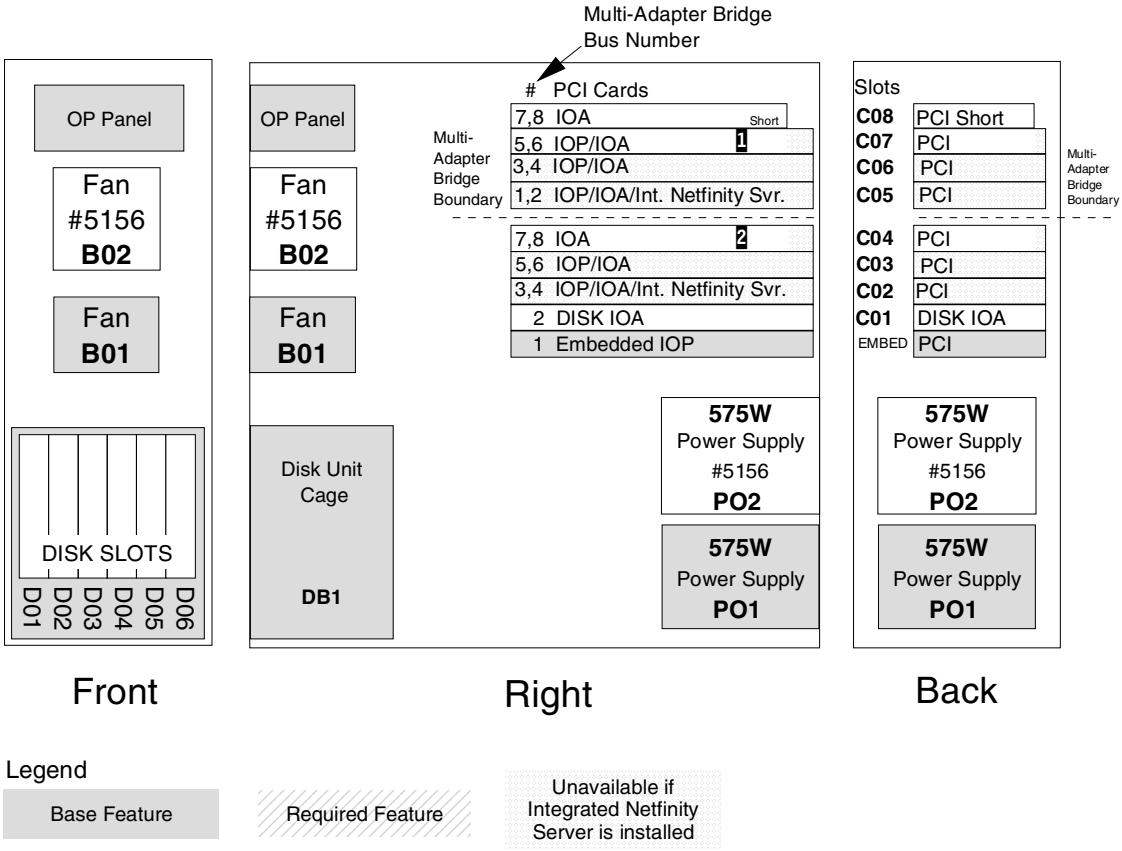
On processor upgrades from #2248, #2250, or #2422 to other processor features, marketing configurators RPO remove the #7002 to remove this feature from the inventory records.

#5156 Redundant Power and Cooling

#5156 adds an additional 575-watt power supply for redundancy and an additional cooling fan to the #5075 PCI Expansion Tower, which attaches to Models 270 and 820.

Marketing configurators default, on a Model 820, to a #5156 for any added #5075 when the system unit contains a #5155. If a #5155 (575 watt power supply) is ordered as an MES to an existing Model 820, default one #5156 for each #5075 present or ordered. The #5156s are not mandatory and can be removed from an order.

#5075 PCI Expansion Tower

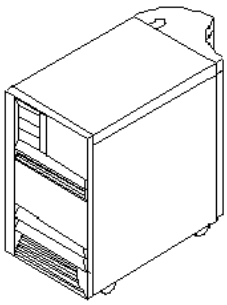


Legend

Base Feature | Required Feature | Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C02 has an Integrated Netfinity Server, slot C03 is not available and slot C04 is available only as a short slot.



#5074 PCI Expansion Tower

#5074 PCI Expansion Tower

The #5074 is attached to Models 820, 830, and 840 for adding up to 45 disk units, up to 11 PCI IOA and up to two removable media units. The #5074 includes #9691 bus adapter to provide the HSL interface to the system. Configurator adds #9691 to the order. The #5074 contains two buses.

Marketing configurators specify the #5074 over the #5075 and the #5079 when a PCI Expansion Tower is required.

Select two (any combination) of the following HSL cables for the first tower of an HSL loop. For additional towers on an HSL loop, select one HSL cable per tower.

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

Select one of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

#5074 has a #9943 Base PCI IOP. It also has PCI slots for up to 11 PCI IOAs, space for up to 45 disk units (15 are “base”, 30 additional with #5101), space for two removable media devices, one battery backup, and redundant/hot swap power supplies.

#5074 can contain Ultra2 SCSI disk units which are controlled by a #4748 PCI RAID Disk Unit Controller.

The #5074 PCI Expansion Tower supports four 32-bit and seven 32/64-bit PCI slots.

On new orders, select one line cord with each #5074 PCI Expansion Tower.

Note: Some countries offer fewer choices of line cords and some countries are shipped a default line cord type.

The 11 PCI IOAs are supported (driven) by feature #2843 PCI IOP(s), #9943 Base PCI IOP, or Feature #2790 Integrated Netfinity Servers.

The mounting for the first 15 disk units is included in the #5074 (base). The mounting for the next 30 disk units is optional by ordering a 30 Disk Expansion, feature code #5101.

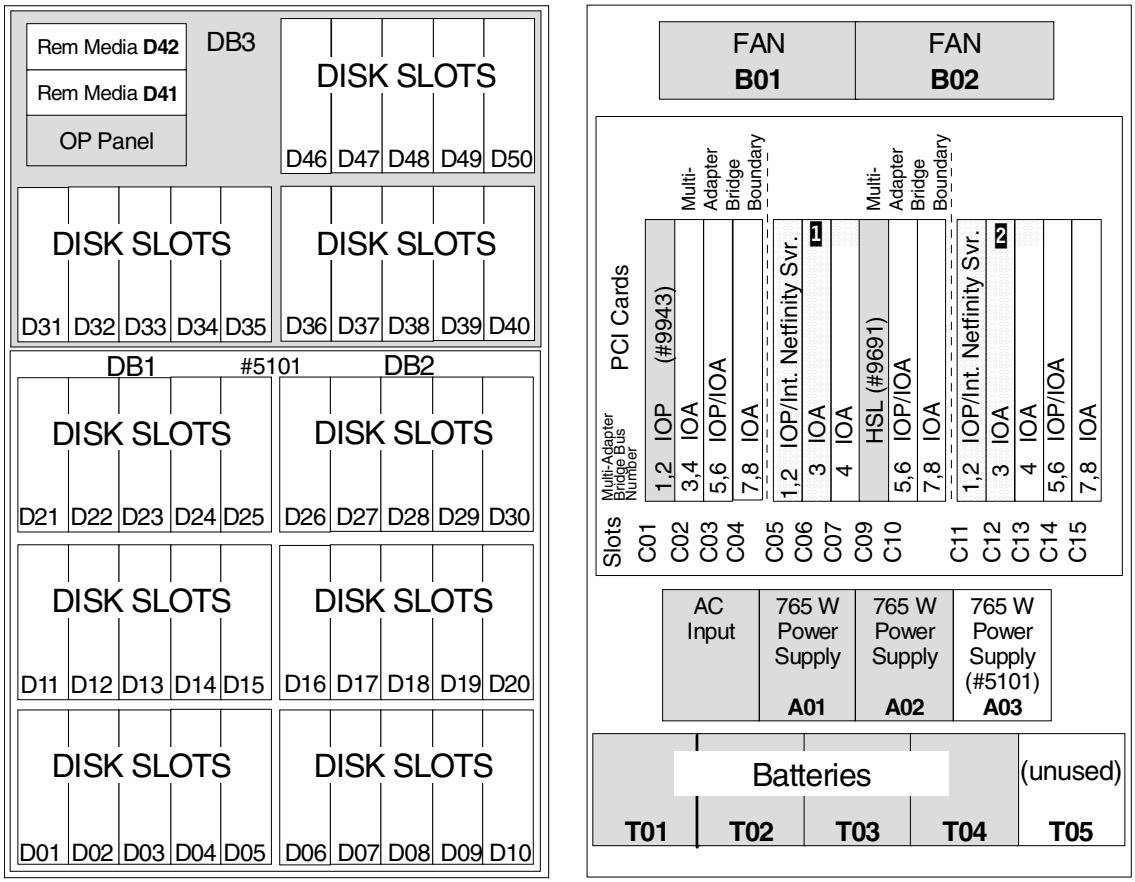
The #5074 also supports up to two removable media devices (internal tape or CD-ROM). These removable media devices are supported by the same #4748 PCI RAID Disk Unit Controller, which supports the first set of 15 disk units.

#5101 30-Disk Expansion Feature

The #5101 is a disk unit expansion enclosure feature for the #5074 Expansion Tower, the #9074 Base I/O Enclosure, and the #9079 Base I/O Tower. The #5101 includes two 15 disk unit enclosures, one 765-watt power supply, backplanes, and cables. One #4748 PCI RAID Disk Unit Controller is required to support the 15 disk units in each of the two disk unit enclosures included with #5101. Two #4748 PCI RAID Disk Unit Controllers are required to support 30 disk units.

#5074 PCI Expansion Tower

Note: Total number of disk bays is 45.

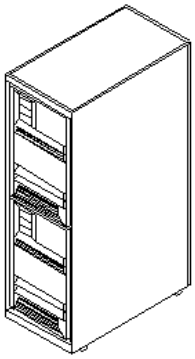


Legend

Base Feature | Required Feature | Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C11 has an Integrated Netfinity Server, slot C12 is not available, and slot C13 is available only as a short slot.



#5079 PCI Expansion Tower

#5079 1.8m I/O Tower

The #5079 is attached to Models 820, 830, and 840 for adding up to 90 disk units, up to 22 PCI IOAs, and up to four removable media units. The #5079 includes two #9691 Bus Adapters, which provide the HSL interface to the system (configurator adds two #9691s to the order). The #5079 1.8m I/O Tower reports to the system as two CCIN 5074s.

The #5079 is essentially two #5074 PCI Expansion Towers, with side covers and casters removed, placed in a 1.8m tower. Each ordered #5079 counts as two #5074s towards the system model maximums.

The upper and lower enclosures (#5074s) in the #5079 are not connected with an HSL cable. If both enclosures of the #5079 are to be placed in the same HSL loop, a #1460 3m Copper HSL cable must be ordered to connect the upper and lower enclosures.

The #5074 is the default when a PCI IOP or IOA is ordered that requires a PCI expansion unit. The #5079 may be specified on the extra controllers screen. For each #5079 ordered, a quantity of two #0574 (#5074 Equivalent) specify codes is added to the order. If a #5079 is to be shared between two systems, one #0574 must be removed from the original ordering system and added to the sharing system, using an RPO (Record Purpose Only) change.

Select two to four (any combination) of the following HSL cables for each additional tower:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

Select two of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable

- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

A #5079 has two #9943 Base PCI IOPs, PCI slots for up to 22 PCI IOAs, and space for up to 90 disk units. The #5079 is capable of controlling Ultra2 SCSI disk units.

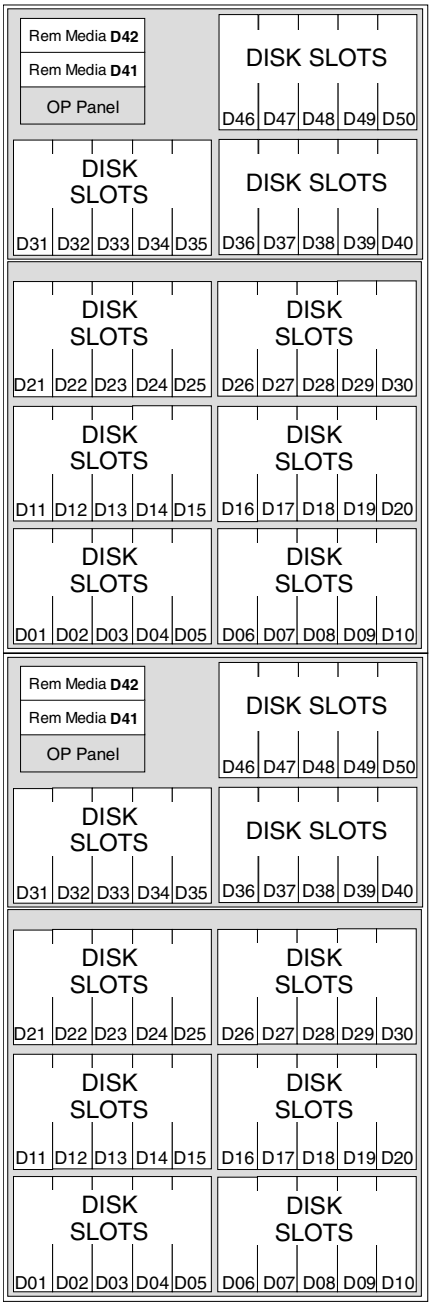
On new orders, select two line cords with each #5079 1.8 m I/O Tower. Some countries offer fewer choices of line cords, and some countries are shipped a default line cord type.

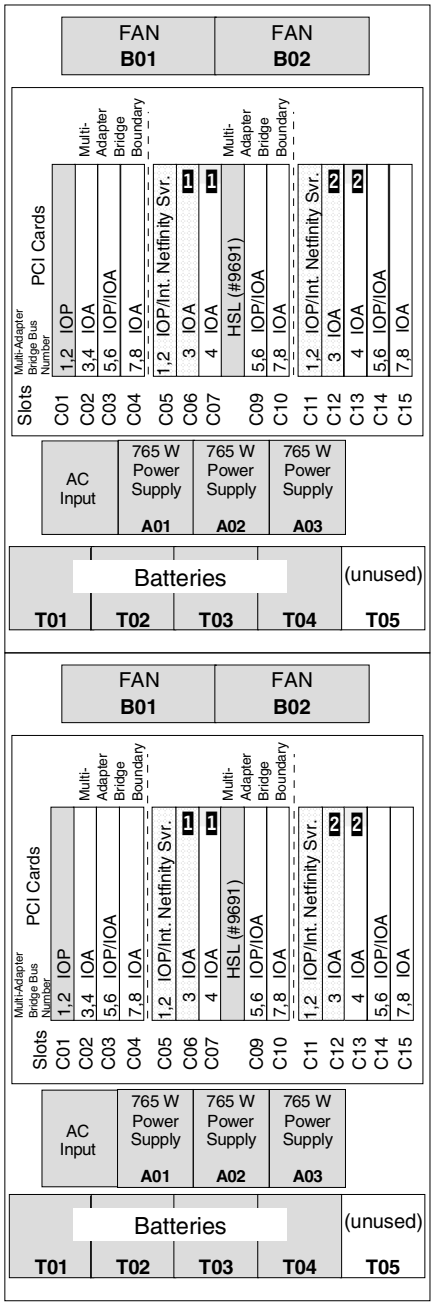
The #5079 also supports up to four removable media devices (internal tape or CD-ROM). These removable media devices are supported by the two #4748 PCI RAID Disk Unit Controllers which support the first two groups of 15 disk units.

Co-requisite: Two #0574 specify features must be ordered for the tower initial order.

#5079 PCI Expansion Tower

Note: Total of number of disk bays is 2 x 45





Legend

Base Feature

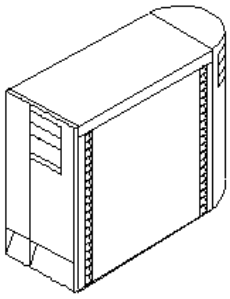
Required Feature

Unavailable if Integrated Netfinity Server is installed

Note 1: If C05 has an Integrated Netfinity Server, slot C06 is unavailable, and slot C07 is available only as a short slot.

Note 2: If C11 has an Integrated Netfinity Server, slot C12 is not available, and slot C13 is available only as a short slot.

Migration Towers



#5033 Migration Tower 1

#5033 Migration Tower I (600/S10 System Unit)

#5033 is a converted 600/S10 system unit/CEC tower used for migrating existing PCI cards, existing disk units, and existing removable media devices. Additional “pre-V4R5” features may be ordered to use vacant card/device slots in this tower. “V4R5 only” feature cards and internal devices are not allowed in this tower.

This feature is for upgrade migrate purposes only and cannot be ordered separately.

The #5033 can only attach to Models 820 and 830.

There is a maximum of one #5033 on a Model 820 and 830.

Select two of the following (any combination) cable features for this tower:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

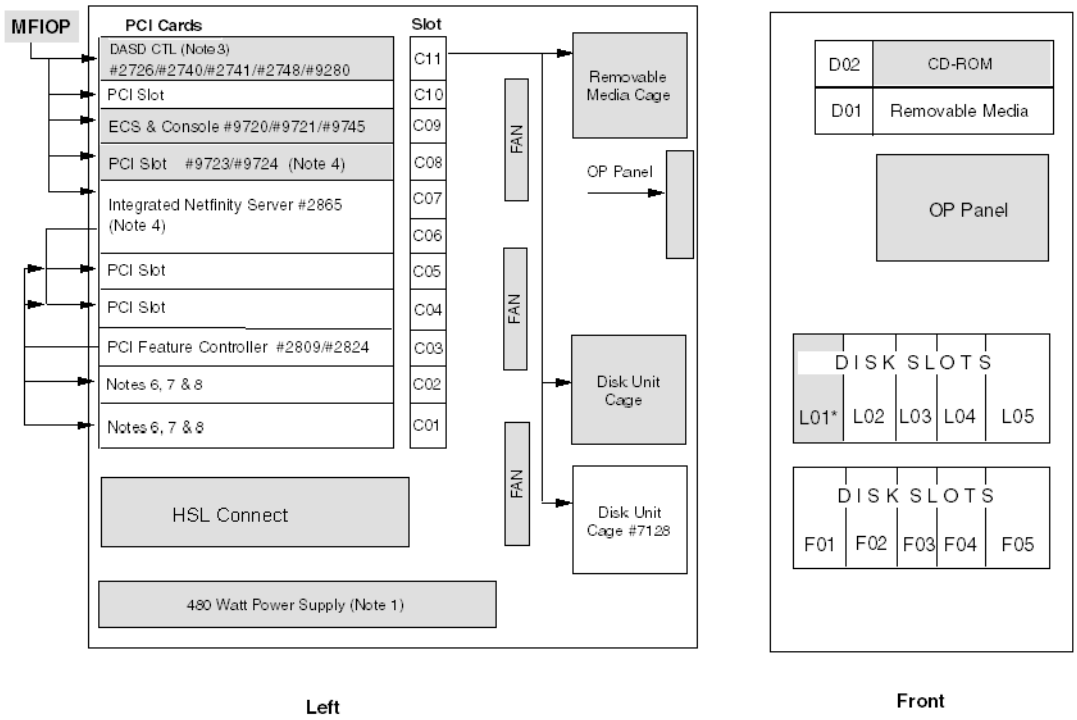
At least one of the HSL cables for the Model 820 must be either the #1460 or #1461. The #1462 15m HSL cable can only be used on HSL port A1 of the Model 820 to directly connect Migration Towers #5033, #5034, or #5035. The #1462 15m HSL cable can be used on all HSL ports of the Models 830 and 840.

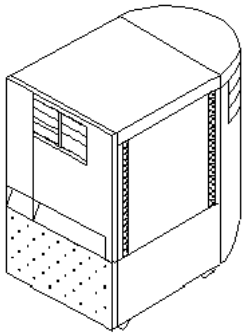
Select one of the following SPCN cables:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

The existing system unit line cord should be used. Available line cord options are identified in the *iSeries and AS400e System Builder*, SG24-2155.

#5033 is mutually exclusive with #5034, #5035, and #5077.





#5034/#5035 Migration Tower 1

#5034 Migration Tower I (10 Disk S20/620, 720 System)

The #5034 is a converted 620/S20/720 (with only 10 possible internal CEC disk unit positions) system unit tower and any existing #5064 or #9364 expansion unit, used for migration of existing PCI/SPD cards, existing disk units, and existing removable media devices, along with any attached PCI/SPD towers. Additional “pre-V4R5” features may be ordered to use vacant card or device slots in the converted CEC and expansion unit and in any attached PCI/SPD tower. “V4R5 only” feature cards and internal devices are not allowed in the converted CEC tower, the expansion unit, or any of the attached PCI/SPD towers.

This feature is for migration upgrade purposes only and cannot be ordered separately.

The #5034 can only attach to Models 820 and 830.

There is a maximum of one #5034 on a Model 820 and 830.

Attaching additional PCI/SPD towers to the #5034 after migrating to the Model 820 is not allowed.

Select two of the following (any combination) HSL cable features for this tower:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

At least one of the HSL cables for the Model 820 must be either the #1460 or #1461. The #1462 15m HSL cable can only be used on HSL port A1 of the Model 820 to directly connect

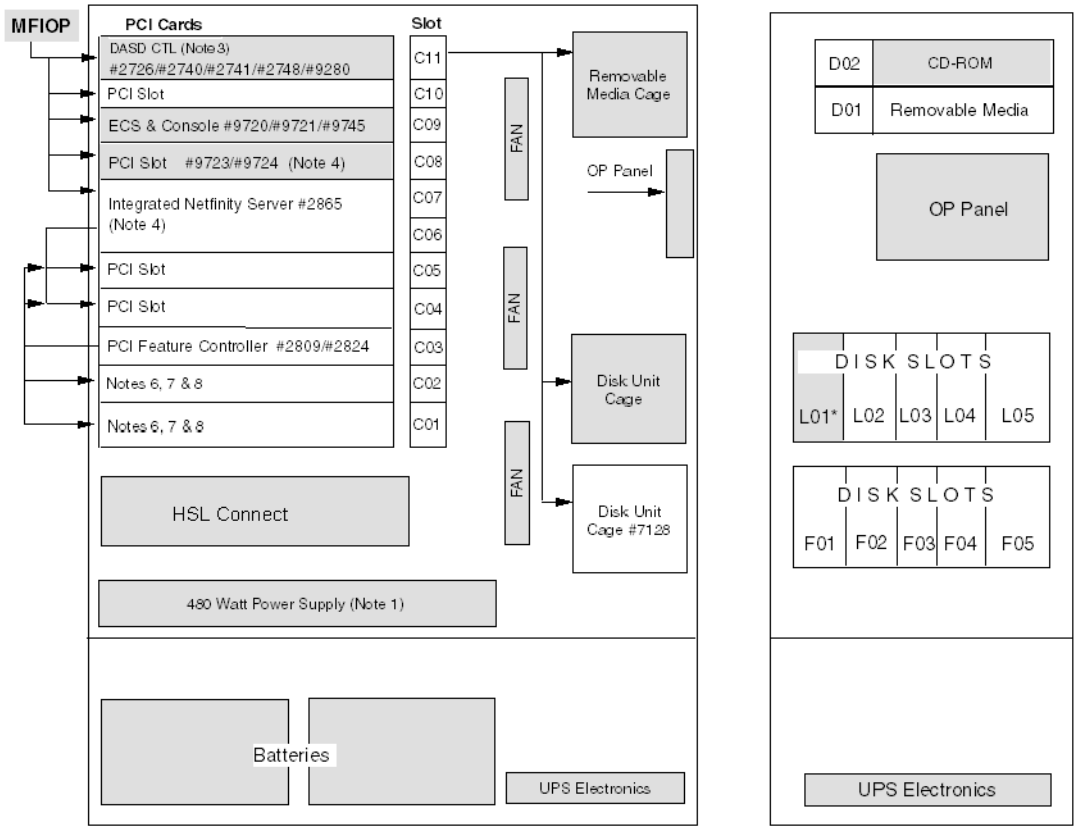
Migration Towers #5033, #5034, or #5035. The #1462 15m HSL cable can be used on all HSL ports of the Models 830 and 840.

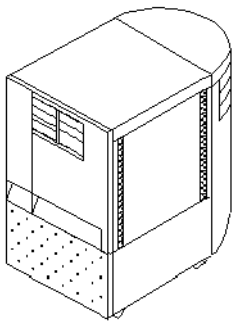
Select one of the following SPCN cables:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

The existing system unit/CEC line cord should be used. Available line cord options are identified in the *iSeries and AS400e System Builder*, SG24-2155.

The #5034 is mutually exclusive with #5033, #5035, and #5077.





#5034/#5035 Migration Tower 1

#5035 Migration Tower I (15 Disk S20/620, 720 System)

The #5035 is a converted 620, S20, or 720 (with 15 possible internal CEC disk unit positions) system unit/CEC tower and any existing #5064 or #9364 expansion unit, used for migration of existing PCI/SPD cards, existing disk units and existing removable media devices, along with any attached PCI/SPD towers. Additional “pre-V4R5” features may be ordered to use vacant card/device slots in the converted CEC and expansion unit and in any attached PCI/SPD tower. “V4R5 only” feature cards and internal devices are not allowed in the converted CEC tower, the expansion unit, or any of the attached PCI/SPD towers.

This feature is for migration upgrade purposes only and cannot be ordered separately.

The #5035 can only attach to Models 820 and 830.

There is a maximum of one #5035 on a Model 820 and 830.

Attaching additional PCI/SPD towers to the #5035 after migrating to the Model 820 is not allowed.

Select two of the following (any combination) HSL cable features for this tower:

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

At least one of the HSL cables for the Model 820 must be either the #1460 or #1461. The #1462 15m HSL cable can only be used on HSL port A1 of the Model 820 to directly connect

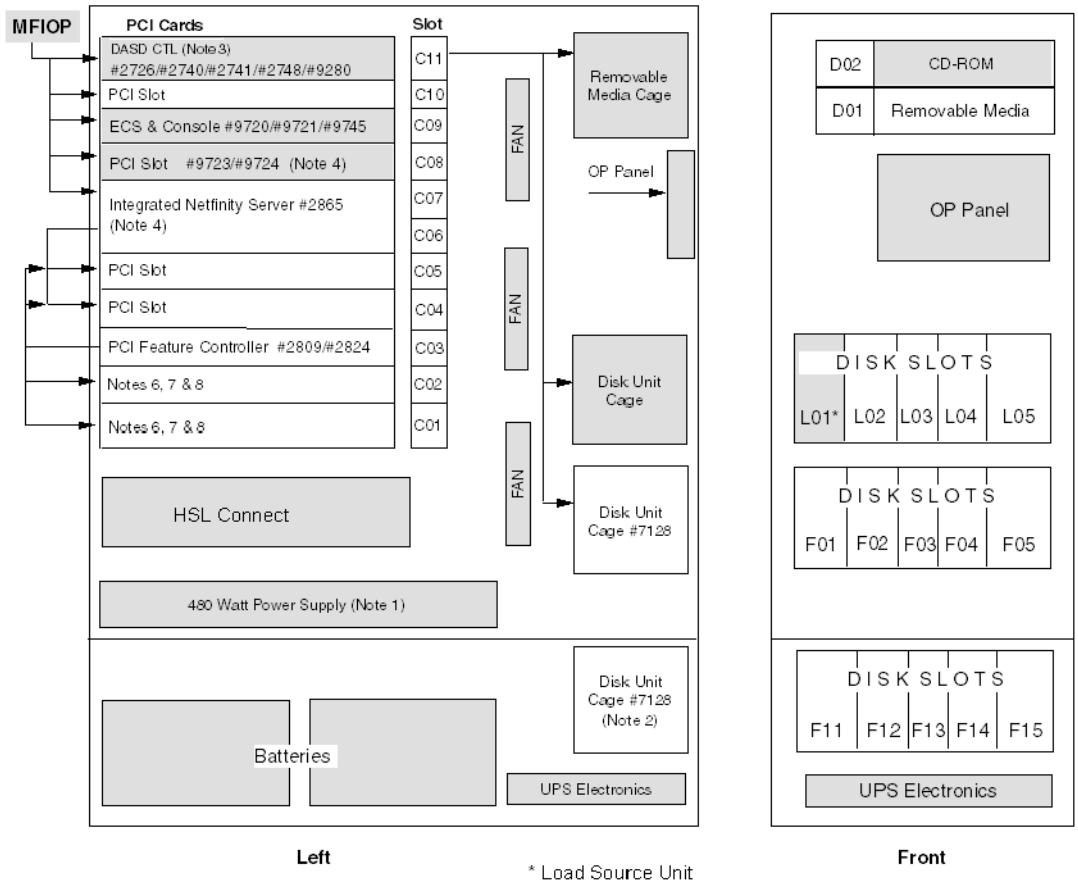
Migration Towers #5033, #5034, or #5035. The #1462 15m HSL cable can be used on all HSL ports of the Models 830 and 840.

Select one of the following SPCN cables:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

The existing system unit/CEC line cord should be used. Available line cord options are identified in the *iSeries and AS400e System Builder*, SG24-2155.

The #5035 is mutually exclusive with #5033, #5034, and #5077.



#5077 Migration Tower II

The #5077 is a feature I/O tower, which supports SPD I/O cards and attaches SPD Expansion Towers and #5065/#5066 PCI Expansion Towers. The #5077 is supported on Models 830 and 840, SB2, and SB3.

When upgrading from a Model 640, S30, or 730 to a Model 830 or 840, the #5077 is a manufactured unit and is shipped without a base CD-ROM and without a base optical link card (CCIN 2696).

If upgrading from a Model 640, S30, or 730 without a #5055 8 Disk Unit Storage Expansion Unit installed, by default the #5077 is shipped with a #5057 16 Disk Unit Storage Expansion Unit. The #5057 may be removed from the order. If upgrading from a Model 640, S30, or 730 with #5055 installed, a #5055 to #5057 conversion is performed.

When upgrading from a Model 650, S40, or 740, the #9251 Base I/O Tower on these models is converted to the #5077.

When upgrading from a Model 820 or 830 with #5034 or #5035 Migration Tower I, which has SPD cards or SPD towers attached, the #5077 is a manufactured unit and is shipped without a base CD-ROM and with a base optical link card (CCIN 2696).

One or two #2695 Optical Bus Adapters features may be ordered for the #5077.

Select one of the following HSL cables if the #5077 has just the base optical link card installed. Select one or two (any combination) of the following HSL cables if the #5077 has one or two #2695 Optical Bus Adapters installed.

- #1460 - 3m Copper HSL cable
- #1461 - 6m Copper HSL cable
- #1462 - 15m Copper HSL cable

Select one of the following SPCN cables per tower:

- #1463 - 2m SPCN cable
- #1464 - 6m SPCN cable
- #1465 - 15m SPCN cable
- #1466 - 30m SPCN cable

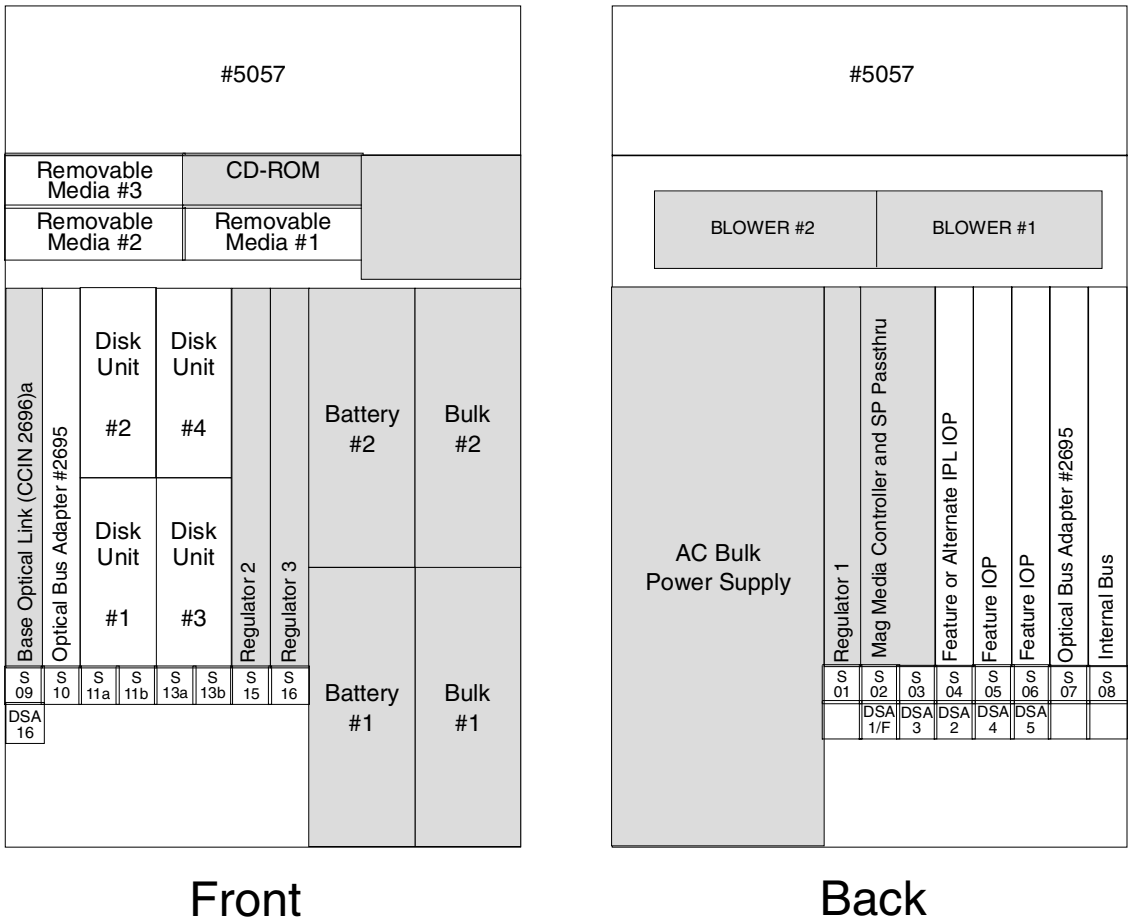
If the #5077 is a manufactured unit, select one line cord for each #5077 Migration Tower II. If the #5077 is converted from a #9251, a line cord is not required to be selected, as the line cord from the #9251 may be used. However, a line cord may be selected on a #9251 to #5077 conversion if the line cord type is to be changed. Available line cord options are identified in the *iSeries and AS400e System Builder*, SG24-2155.

The #5077 may be ordered to support clustering on Models 830, 840, SB2, and SB3. In this case the #5077 is shipped as a manufactured unit with a base CD-ROM and a base optical

link card (CCIN 2696). When ordered on a Model 830 or 840, the marketing configurator defaults a #5057 16 Disk Unit Storage Expansion Unit on the order, which may be removed if the customer does not want it. When attached to a Model SB2 or SB3, disk units may not be installed in the #5077 (or #5057).

Note: Some countries offer fewer choices of line cords, and some countries are shipped a default line cord type.

#5077 Migration Tower II



#5057 Storage Expansion Unit

The #5057 provides space for up to 16 disk units on the #5077 Migration Tower II. The #5057 is shipped on new order #5077s when migrating from a Model 640, S30, or 730, which do not have a #5055. When migrating from a Model 640, S30, or 730, which have a #5055, the #5055 is converted to a #5057.

The #5077 is mutually exclusive with #5033, #5034, and #5035.

SPD Expansion Towers

The Expansion Towers and Unit in the following table can attach to the Model 8xx via #5034 or #5035, and #5077 Migration Towers.

Feature	Description	Prerequisites
#5043	Primary rack converted to secondary rack (migrated)	--
#5044	System Unit Expansion Rack (migrated)	Optical Link Processor (OLP) Card #2686
#5052	Storage Expansion Unit	#5143 and #5072 pr #5082 and one of #6502, #6512, #6530, #6532, #6533
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533
#5065	Storage/PCI Expansion Tower	One port on #2688 OLP card in a #5077 or in #9364 System Unit Expansion
#5066	1.8m I/O Tower	See #5065
#5072	1063M System Unit Expansion Tower	One port on #2688 OLP card in a #5077 or in #9364 System Unit Expansion
#5073	1063M System Unit Expansion Tower	One port on #2688 OLP card in a #5077 or in #9364 System Unit Expansion
#5082	1063M System Unit Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and One port on #2688 OLP card in #9364 System Unit Expansion
#5083	1063M System Unit Expansion	See #5082

Full details on these racks and towers can be found beginning in “Expansion Towers” on page 223.

SPD Expansion Tower I/O Features

#2686 Optical Link Processor (266 Mbps)

This feature is used for attaching #5044. One #2686 is required per #5044. It requires an Optical Link Processor position in the #9329 or #9331.

#2688 Optical Link Processor (1063 Mbps)

This feature is used for attaching #5065, #5072, #5082, #5073, and #5083 Expansion Towers. One can attach two towers. It requires an Optical Link Processor position on the #9329/#9330, #9331, or #5077.

Customer Install Features

Customer Install Features

Customer Install Features (CIF)

Many iSeries and AS/400e models are designated as Customer Setup (CSU). Many features for the current product line are Customer Install Features (CIF). CIF/CSU designations provide the customer with flexibility in installing new AS/400e servers and adding new features to installed systems. Customers can schedule installations to minimize the disturbance to their business operations.

Miscellaneous Equipment Specification (MES) is an IBM term for IBM-supplied changes to an installed or on-order system. On MES orders that include a mixture of IBM install and CIF features, the customer may choose to have the IBM service representative install all the features (including those designated as CIF). On MES orders where all features are CIF, the customer can install all the features.

The customer is responsible for the installation of external cables, displays, printers, and modems. IBM service personnel can perform these activities for a charge.

IBM installation for CSU and CIF units is available for a charge under normal service contracts.

V4R5 Features

The following table lists commonly ordered OS/400 V4R5 feature codes and identifies which V4R5 features are CIF features. This table is to be used as a guide to identify common customer install features but does not represent a complete list.

The columns in the following table contain:

- The feature code
- The 28 character priced feature description.
- If the feature is a “Customer Install Feature” (Y) or a “Installed by IBM Feature” (N).
- The various models and how the features are supported in the Price File using the letters that are defined as follows:
  - **B**: Plant or MES installation
  - **M**: MES install only (this feature is available for field installation only)
  - **P**: Plant install only (this feature is available on new system orders only)
  - **S**: Supported only. This feature may be migrated as part of a model upgrade, but additional quantities cannot be ordered.
- Announce Release: The OS/400 version/release in which the feature code was announced.

© Copyright IBM Corp. 2000

Feat Code	Description	CIF	Model						Annc Rel
			270	820	830	840	SB2	SB3	
0120	7210-020 Attachment	-	B	B	B	B	B	B	V4R5
0223	100 Mbps Token-Ring Specify	-	B	B	B	B	B	B	V4R5
0224	100/10 Mbps Ethernet Specify	-	B	B	B	B	B	B	V4R5
0574	5074 Equivalent Specify	-		B	B	B			V4R5
1010	Modem Cable-Austria	Y	B	B	B	B	B	B	V4R5
1011	Modem Cable-Belgium	Y	B	B	B	B	B	B	V4R5
1012	Modem Cable-Africa	Y	B	B	B	B	B	B	V4R5
1013	Modem Cable-Israel	Y	B	B	B	B	B	B	V4R5
1014	Modem Cable-Italy	Y	B	B	B	B	B	B	V4R5
1015	Modem Cable-France	Y	B	B	B	B	B	B	V4R5
1016	Modem Cable-Germany	Y	B	B	B	B	B	B	V4R5
1017	Modem Cable-UK	Y	B	B	B	B	B	B	V4R5
1018	Modem Cable-Iceland/Sweden	Y	B	B	B	B	B	B	V4R5
1019	Modem Cable-Australia	Y	B	B	B	B	B	B	V4R5
1020	Modem Cable-HK/NZ	Y	B	B	B	B	B	B	V4R5
1021	Modem Cable-Fin/Nor	Y	B	B	B	B	B	B	V4R5
1022	Modem Cable-Netherlands	Y	B	B	B	B	B	B	V4R5
1023	Modem Cable-Swiss	Y	B	B	B	B	B	B	V4R5
1024	Modem Cable-Denmark	Y	B	B	B	B	B	B	V4R5
1025	Modem Cable-US/Canada	Y	B	B	B	B	B	B	V4R5
1408	4.3m 200V/16A Pwr Cd Italy	Y		B	B	B	B		V4R5
1409	4.3m 200V/16A Pwr Cd AU/NZ	Y		B	B	B	B		V4R5
1410	200V 6-ft Line Cord	Y	B	B	B	B	B	B	V4R5
1411	200V 14-ft Line Cord	Y	B	B	B	B	B	B	V4R5
1412	125V 6-ft Line Cord	Y	B	B					V4R5
1413	125V 14-ft Line Cord	Y	B	B	M				V4R5
1414	200V 6-ft Locking Line Cord	Y	B	B	B	B	B	B	V4R5

Feat Code			Model						Annc Rel
	Description	CIF	270	820	830	840	SB2	SB3	
1415	200V 6-ft Wtrtght Line Cord	Y	B	B	B	B	B	B	V4R5
1416	200V 14-ft Locking Line Cord	Y	B	B	B	B	B	B	V4R5
1417	200V 14-ft Wtrtght Line Cord	Y	B	B	B	B	B	B	V4R5
1418	4.3m 200V/16A Pwr Cd S Afric	Y		B	B	B	B		V4R5
1419	4.3m 200V/16A Pwr Cd Israel	Y		B	B	B	B		V4R5
1420	4.3m 200V/16A Pwr Cd EU/Asia	Y		B	B	B	B		V4R5
1421	4.3m 200V/16A Pwr Cd CH/DK	Y		B	B	B	B		V4R5
1423	200V 6-ft Upper Line Cord	Y		M	M	M			V4R5
1424	200V 6-ft Locking Line Cord	Y				B		B	V4R5
1425	200V 6-ft Wtrtght Line Cord	Y				B		B	V4R5
1426	200V 14-ft Locking Line Cord	Y				B		B	V4R5
1427	200V 14-ft Wtrtght Line Cord	Y				B		B	V4R5
1428	200V 6-ft Upper Locking Cord	Y		M	M	M			V4R5
1429	200V 6-ft Upper Wtrtght Cord	Y		M	M	M			V4R5
1438	4.3m 200V/10A Pwr Cd AU/NZ	Y	B	B	M				V4R5
1439	4.3m 200V/10A Pwr Cd EU/Asia	Y	B	B	M				V4R5
1440	4.3m 200V/10A Pwr Cd Denmark	Y	B	B	B				V4R5
1441	4.3m 200V/10A Pwr Cd S Afric	Y	B	B	B				V4R5
1442	4.3m 200V/10A Pwr Cd Swiss	Y	B	B	B				V4R5
1443	4.3m 200V/10A Pwr Cd UK	Y	B	B	B				V4R5
1444	4.3m 200V/10A Pwr Cd Italy	Y	B	B	B				V4R5
1445	4.3m 200V/10A Pwr Cd Israel	Y	B	B	B				V4R5
1446	4.3m 200V/30A Pwr Cd Korea	Y				B		B	V4R5
1447	4.3m 200V/24A Pwr Cd AU	Y				B		B	V4R5
1448	4.3m 200V/10A Pwr Cd NZ	Y				B		B	V4R5
1449	4.3m 200V/32A Pwr Cd EU 1-PH	Y				B		B	V4R5
1450	4.3m 200V/16A Pwr Cd EU 2-PH	Y				B		B	V4R5
1451	200V 6-ft Line Cord	Y		B	B	B	B		V4R5

Feat Code			Model						Annc Rel
	Description	CIF	270	820	830	840	SB2	SB3	
1452	200V 14-ft Line Cord	Y		B	B	B	B		V4R5
1453	200V 6-ft Locking Line Cord	Y		B	B	B	B		V4R5
1454	200V 14-ft Locking Line Cord	Y		B	B	B	B		V4R5
1455	200V 6-ft Wtrtght Line Cord	Y		B	B	B	B		V4R5
1456	200V 14-ft Wtrtght Line Cord	Y		B	B	B	B		V4R5
1457	200V 6-ft Upper Line Cord	Y		B	B	B			V4R5
1458	200V 6-ft Upper Locking Cord	Y		B	B	B			V4R5
1459	200V 6-ft Upper Wtrthgt Cord	Y		B	B	B			V4R5
1460	3m HSL Cable	Y	B	B	B	B	B	B	V4R5
1461	6m HSL Cable	Y	B	B	B	B	B	B	V4R5
1462	15m HSL Cable	Y		B	B	B	B	B	V4R5
1463	2m SPCN Cable	Y	B	B	B	B	B	B	V4R5
1464	6m SPCN Cable	Y	B	B	B	B	B	B	V4R5
1465	15m SPCN Cable	Y	B	B	B	B	B	B	V4R5
1466	30m SPCN Cable	Y	B	B	B	B	B	B	V4R5
1476	4.3m 250V/12A Pwr Cd UK	Y		B	B	B	B		V4R5
2427	Dedicated Domino 4 Way Proc	N		B					V4R5
2743	PCI 1 Gbps Ethernet IOA	Y	B	B	B	B	B	B	V4R5
2744	PCI 100 Mbps Token Ring IOA	Y	B	B	B	B	B	B	V4R5
2749	PCI Ultra Mag Media Ctlr	Y	B	B	B	B	B	B	V4R5
2763	PCI RAID Disk Unit Ctlr	Y	B	B					V4R5
2768	PCI Magnetic Media Ctlr	Y	B	B	B	B	B	B	V4R5
2842	2842 PCI IOP	Y	B						V4R5
2843	2843 PCI IOP	Y		B	B	B	B	B	V4R5
2881	Main Storage Expansion	N			B				V4R5
2884	Main Storage Expansion	Y	B	B					V4R5
2890	PCI Integ Netfinity Server	Y	B						V4R5
2895	128 MB Netfinity IOP Memory	Y	B						V4R5

Feat Code			Model						Annc Rel
	Description	CIF	270	820	830	840	SB2	SB3	
2896	256 MB Netfinity IOP Memory	Y	B						V4R5
2897	1 GB Netfinity IOP Memory	Y	B						V4R5
3000	Migrated 128 MB Main Storage	-		M	M				V4R5
3005	512 MB Main Store	Y		B					V4R5
3022	128 MB Main Storage	Y	B						V4R5
3024	256 MB Main Storage	Y	B						V4R5
3025	512 MB Main Store	Y	B						V4R5
3026	512 MB Main Store	Y	B						V4R5
4525	CD-ROM	Y	B	B					V4R5
4582	4 GB ¼-Inch Cartridge Tape	Y	B	B					V4R5
4583	16 GB ¼-Inch Cartridge Tape	Y	B	B					V4R5
4586	25 GB ¼-Inch Cartridge Tape	Y	B	B					V4R5
4723	PCI 10Mbps Ethernet IOA	Y	B	B	B	B	B	B	V4R5
4745	PCI WAN IOA	Y	B	B	B	B	B	B	V4R5
4746	PCI Twinaxial Workstn IOA	Y	B	B	B	B	B	B	V4R5
4748	PCI RAID Disk Unit Ctlr	Y	B	B	B	B			V4R5
4750	PCI ISDN BRI U IOA	Y	B	B	B	B	B	B	V4R5
4751	PCI ISDN BRI S/T IOA	Y	B	B	B	B	B	B	V4R5
4761	PCI Integrated Analog Modem	Y	B	B	B	B	B	B	V4R5
4801	PCI Crypto Coprocessor	Y	B	B	B	B	B	B	V4R5
4802	PCI Crypto Coprocessor	N		M	M	M			V4R5
4815	PCI 155 Mbps UTP OC3 ATM	Y	B	B	B	B	B	B	V4R5
4816	PCI 155 Mbps MMF ATM	Y	B	B	B	B	B	B	V4R5
4818	PCI 155 Mbps SMF OC3 ATM	Y	B	B	B	B	B	B	V4R5
4838	PCI 100/10 Mbps Ethernet IOA	Y	B	B	B	B	B	B	V4R5
5027	Software Version V4R5	-	B	B	B	B	B	B	V4R5
5033	Migration Tower I	N		M	S				V4R5
5034	Migration Tower I	N		M	M				V4R5

Feat Code			Model						Annc Rel
	Description	CIF	270	820	830	840	SB2	SB3	
5035	Migration Tower I	N		M	M				V4R5
5074	PCI Expansion Tower	Y		B	B	B			V4R5
5075	PCI Expansion Tower	Y	B	B					V4R5
5077	Migration Tower II	N			B	B	B	B	V4R5
5079	1.8m I/O tower	Y		B	B	B			V4R5
5155	Redundant Power and Cooling	Y		B					V4R5
5156	Redundant Power and Cooling	Y	B	B					V4R5
5157	Feature Power Supply	Y		B					V4R5
5599	No Save/Restore Device	-	B	B	B	B	B	B	V4R5
7002	HSL enabler	Y	B						V4R5
7104	System Unit Expansion	Y	B						V4R5
7123	DASD Expansion Unit	Y	B						V4R5
7127	DASD Expansion Unit	Y		B					V4R5
7133	DASD Concurrent Maint Cage	N	B						V4R5
7500	Quantity 150 of #4314	Y		B	B	B			V4R5
7501	Quantity 150 of #4317	Y		B	B	B			V4R5
7502	Quantity 150 of #4318	Y		B	B	B			V4R5
7503	Quantity 150 of #4324	Y		B	B	B			V4R5
9771	#9771 Base PCI 2-Line WAN with Modem		B	B	B	B	B	B	V4R5
9943	Base PCI IOP	-		B	B	B	B	B	V4R5

I/O Processor

I/O Processor

I/O Processor

System unit (PCI) and migration tower (PCI and SPD) I/O Processors for processors 270, 8xx, SB2, and SB3 and associated towers are discussed in this chapter.

V4R5 System Unit Hardware (PCI)

Note

PCI configuration rules for V4R5 hardware are quite flexible. See “PCI Card Placement Rules” on page 291 for the complete rules.

Embedded 32 MB PCI IOP (CCIN 284x)

On the Model 270, a 32 MB PCI IOP is embedded on the CEC backplane. For the #2248, #2250, and #2422 processors, the embedded IOP is CCIN 284D. For the other Model 270 processors, the embedded IOP is CCIN 284E.

On the Model 820, a 32 MB PCI IOP (CCIN 284C) is embedded on the backplane.

The #5075 contains a 32 MB PCI IOP (CCIN 284B) embedded on its backplane.

#2842 PCI IOP

The #2842 is an I/O processor with 32 MB of memory that drives PCI IOA adapters on the Model 270 and on the #5075 PCI Expansion Tower (when attached to a Model 270). Up to two feature #2842 PCI IOPs may be added to the Model 270.

The #5075 PCI Expansion Tower has a 32 MB PCI IOP (CCIN 284B) embedded on the backplane. When the #5075 is attached a Model 270, up to three feature #2842 PCI IOPs may be added to the #5075.

The following IOAs are supported by the embedded PCI IOP (Model 270 and #5075) and the #2842 PCI IOP:

- #2743 - PCI 1 Gbps Ethernet IOA
- #2744 - PCI 100 Mbps Token Ring IOA
- #2749 - PCI Ultra Magnetic Media Controller
- #2763 - PCI RAID Disk Unit Controller
- #2768 - PCI Magnetic Media Controller
- #4723 - PCI Ethernet/IEEE 802.3 Adapter
- #4745 - PCI WAN IOA
- #4746 - PCI Twinaxial IOA

© Copyright IBM Corp. 2000

- #4748 - PCI RAID Disk Unit Controller
- #4750 - PCI ISDN BRI U IOA
- #4751 - PCI ISDN BRI S/T IOA
- #4761 - PCI Integrated Analog Modem
- #4801 - PCI Crypto Coprocessor
- #4815 - PCI ATM 155 MBPS UTP OC3
- #4816 - PCI ATM 155 MBPS MMF
- #4818 - PCI ATM 155 MBPS SMF OC3
- #4838 - PCI 100/10 Mbps Ethernet IOA
- #9767 - Base PCI Disk Unit Controller
- #9771 - Base PCI 2-Line WAN w/Modem

The #2842 can drive a maximum of four IOAs, subject to further restrictions as stated in the following IOP descriptions and subject to further restrictions as stated in the preceding IOP descriptions and in “PCI Card Placement Rules” on page 291.

#2843/#9943 PCI IOP

The #2843/#9943 is an PCI I/O processor with 64 MB of memory that drives PCI IOA adapters on Models 820, 830, 840, SB2, and SB3, on the #5075 PCI Expansion Tower when attached to the Model 820, the #5074 PCI Expansion Tower, and the #5079 1.8m I/O Tower.

Up to five feature #2843 PCI IOPs may be added to the Model 820 System Unit. The #5075, when attached to a Model 820, can contain or support up to three feature #2843 PCI IOPs.

On Models 830, 840, SB2, and SB3, a PCI IOP is not embedded on the backplane, but a #9943 PCI IOP is included as “base” with the system. Up to four feature #2843 PCI IOPs may be added in the system unit of Models 830 and 840. Up to two feature #2843 PCI IOPs may be added in the system unit of Models SB2 and SB3. On the #5074 PCI Expansion Tower, a PCI IOP is not embedded but a #9943 PCI IOP is included as “base”. Up to six feature #2843 PCI IOPs may be added to a #5074.

On the #5079 1.8M I/O Tower, a PCI IOP is not embedded but two #9943 PCI IOPs are included as “base”. Up to 12 feature #2843 PCI IOPs may be added to the #5079.

Note: #9943 may only be on initial system orders or on MES orders add #5074 or #5079 towers to an installed system. The maximum number of #9943s installed on a system is one in the system unit plus one in each #5074 plus two in each #5079.

The following IOAs are supported (driven) by the embedded PCI IOP (Model 820) and the #2843/#9943 PCI IOP:

- #2743 - PCI 1 Gbps Ethernet IOA
- #2744 - PCI 100 Mbps Token Ring IOA
- #2763 - PCI RAID Disk Unit Controller 2 Port (Model 820 only)

- #2749 - PCI Ultra Magnetic Media Controller
- #2768 - PCI Magnetic Media Controller
- #4723 - PCI Ethernet/IEEE 802.3 Adapter
- #4745 - PCI WAN IOA
- #4746 - PCI Twinaxial IOA
- #4748 - PCI RAID Disk Unit Controller
- #4750 - PCI ISDN BRI U IOA
- #4751 - PCI ISDN BRI S/T IOA
- #4761 - PCI Integrated Analog Modem
- #4801 - PCI Crypto Coprocessor
- #4815 - PCI ATM 155 Mbps UTP OC3
- #4816 - PCI ATM 155 Mbps MMF
- #4818 - PCI ATM 155 Mbps SMF OC3
- #4838 - PCI 100/10 Mbps Ethernet IOA
- #9771 Base PCI 2-Line WAN with Modem

The #2843/#9943 can drive a maximum of four IOAs. Refer to “PCI Card Placement Rules” on page 291 for details.

#2790 PCI Integrated Netfinity Server

The #2790 PCI Integrated Netfinity Server contains a 700 MHz slot 1 processor and four Netfinity IOP Memory slots.

#2790 is supported in the CEC of Models 820, 830, 840, SB2, and SB3, in the #5074 PCI Expansion Tower, in the #5079 1.8M I/O Tower, and in the #5075 PCI Expansion Tower when it is attached to the Model 820.

Each memory slot can contain either a 128 MB, a 256 MB, or a 1024 MB Netfinity IOP Memory card. This provides a total memory capacity ranging from 128 MB to 4 GB.

Note: When the maximum memory is installed, only 3712 MB will be addressable.

At least one Netfinity IOP Memory card is required.

The feature numbers of the Netfinity IOP Memory cards are:

- #2795 - 128 MB Netfinity IOP Memory
- #2796 - 256 MB Netfinity IOP Memory
- #2797 - 1 GB Netfinity IOP Memory

Allowable Main Storage Increments (MB)							
128	256	384	512	640	768	896	1024
1152	1280	1408	1536	1664	1792		2048
2176	2304	2432	2560				3072
3200	3328						4096

The #2790 can support PCI #2744 100 Mbps Token Ring IOAs or #4838 100/10 Mbps Ethernet IOAs in any combination, up to a maximum of three. At least one LAN IOA is required. Refer to “PCI Card Placement Rules” on page 291 for details and limitations.

The supported LAN IOA features are as follows:

- #4838 PCI 100/10 Mbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA

One #0224 (100/10 Mbps Ethernet on Integrated Netfinity Server) is required for each #4838 selected to run on the #2790.

One #0223 (100 Mbps Token-Ring on Integrated Netfinity Server) is required for each #2744 selected to run on the #2790.

Native AS/400 functions are not supported and the #2790 Integrated Netfinity Server does not support external host LAN.

The #2790 requires three PCI card slots on the system or expansion tower backplane. Two slots are consumed by the #2790. The third slot is reduced to a short card slot, which will be used by the first LAN IOA card.

The #2790 will ship with a keyboard/mouse splitter cable.

The #2790 supports only the Window NT and Windows 2000 operating systems and the following points apply:

- #0325 IPCS Extension Cable for Windows is the default (but may be removed).
- A minimum of 128 MB Netfinity IOP Memory is required.
- #1700 (IPCS Keyboard/Mouse for Windows) is the default (in those countries offering it).
- A display must be connected to the Integrated Netfinity Server to support Windows.
- For non-US keyboard/mouse and display, see: `http://www.as400.ibm.com/nt`

#2890 PCI Integrated Netfinity Server

The #2890 PCI Integrated Netfinity Server contains a 700 MHz slot 1 processor and four Netfinity IOP Memory slots.

The #2890 is supported only in the Model 270 system unit and in the #5075 PCI Expansion Tower when it is attached to the Model 270.

Each memory slot can contain either a 128 MB, a 256 MB, or a 1024 MB Netfinity IOP Memory card. This provides a total memory capacity ranging from 128 MB to 4 GB.

Note: When the maximum memory is installed, only 3712 MB will be addressable.

At least one Netfinity IOP Memory card is required.

The feature numbers of the Netfinity IOP Memory cards are:

- #2795 - 128 MB Netfinity IOP Memory
- #2796 - 256 MB Netfinity IOP Memory
- #2797 - 1 GB Netfinity IOP Memory

Allowable Main Storage Increments (MB)							
128	256	384	512	640	768	896	1024
1152	1280	1408	1536	1664	1792		2048
2176	2304	2432	2560				3072
3200	3328						4096

The #2890 can support PCI #2744 100 Mbps Token Ring IOAs or PCI #4838 100/10 Mbps Ethernet IOAs in any combination, up to a maximum of three. At least one LAN IOA is required. Refer to “PCI Card Placement Rules” on page 291.

The supported LAN IOA features are:

- #4838 PCI 100/10 Mbps Ethernet IOA
- #2744 PCI 100 Mbps Token Ring IOA

One #0224 (100/10 Mbps Ethernet on Integrated Netfinity Server) is required for each #4838 selected to run on the #2890.

One #0223 (100 Mbps Token-Ring on Integrated Netfinity Server) is required for each #2744 selected to run on the #2890.

Native iSeries and AS/400e functions are not supported. The #2890 Integrated Netfinity Server does not support external host LAN.

The #2890 requires two PCI card slots in the Model 270 system unit. One slot is consumed, and the second slot is reduced to a short card slot, which is used by the first attached LAN IOA card.

The #2890 requires three PCI card slots on the expansion tower backplane. Two slots are consumed by the #2890, and the third slot is reduced to a short card slot, which will be used by the first LAN IOA card.

The #2890 will ship with a keyboard/mouse splitter cable.

The #2890 supports only the Window NT and Windows 2000 operating systems and the following points apply:

- #0325 IPCS Extension Cable for Windows is the default (but may be removed).
- A minimum of 128 MB Netfinity IOP Memory is required.
- #1700 (IPCS Keyboard/Mouse for Windows) is the default (in those countries offering it).
- A display must be connected to the Integrated Netfinity Server to support Windows.

For non-US keyboard/mouse and display, see `http://www.as400.ibm.com/nt`

Migration Tower Hardware PCI

#2809 PCI LAN/WAN/Workstation IOP

This feature controller IOP can be used for attaching PCI LAN, WAN, and Workstation IOAs to the system. The #2809 supports different combinations of cards depending on where it is installed in the #503x Migration Tower. It is supported for migration only in the #503x Migration Tower.

#2824 PCI LAN/WAN/Workstation IOP

This IOP is a feature I/O processor with 32 MB of memory installed in the #5034 and #5035 Migration Tower I and in the #5065 PCI Expansion Tower and the #5066 1.8M I/O Tower. It is supported for migration only in the #503x Migration Tower.

#2851 PCI Integrated PC Server

The #2851 Integrated PC Server contains a 166 MHz Pentium processor, four IOP memory slots, and two LAN IOA slots. Supported for migration only in #503x Migration Towers.

#2854 PCI Integrated PC Server

The #2854 Integrated PC Server contains a 200 MHz Pentium processor, four IOP memory slots, and two LAN IOA slots. Supported for migration only in #503x Migration Towers.

#2865 PCI Integrated Netfinity Server

The Integrated Netfinity Server contains an Intel 333 MHz Pentium II processor, four main storage slots, and two LAN IOA slots. The Integrated Netfinity Server provides high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell NetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT Server are supported on the Integrated Netfinity Server. This adapter requires two (reserved) PCI card positions. One is for the processor card, and one for a bridge card that acts as the interface to the system. The IPCS also comes with a special cable, which allows for a connection on the back of the bridge card to industry-standard keyboard, mouse, serial, and parallel connectors. Between one and four of the following memory features must be installed in the Integrated Netfinity Server and allows between 32 MB and 512 MB of main storage:

- #2861—32 MB IOP Memory
- #2862—128 MB IOP Memory
- #2867—256 MB IOP Memory

When running OS/2, a maximum of 512 MB IOP memory is supported.

One or two of the following LAN IOA features must be installed in the Integrated Netfinity Server:

- #2723—PCI Ethernet IOA
- #2724—PCI 16/4 Mbps Token-Ring IOA
- #2838—PCI 100/10 Mbps Ethernet IOA

Only one of the LAN IOAs can be a #2838 100/10 Mbps Ethernet IOA. If #2838 is run on the #2865 Integrated Netfinity Server, #0222 100/10 Mbps Ethernet on IPCS is required.

If Windows NT is running on the #2865 Integrated Netfinity Server, the following considerations apply to the Integrated Netfinity Server:

- #0325 IPCS Extension Cable for Windows NT (required).
- #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries).
- A display must be connected to the IPCS to support Windows NT.
- A minimum of 64 MB IOP memory on the Integrated Netfinity Server.

For keyboard/mouse and display support in countries outside of the USA, consult the Web site at: `http://www.as400.ibm.com`

Migration Tower Hardware SPD

#2629 SPD LAN/WAN/Workstation IOP

This adapter uses one SPD slot. It supports up to three of the following IOAs:

- #2699 Two-Line WAN IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6180 Twinaxial Workstation IOA
- #6181 Ethernet/IEEE 802.3 IOA

One #2629 supports any combination of adapters with one restriction. There is a maximum of two LAN IOAs.

Up to seven #2629s can be placed into each 1063 Mbps System Unit Expansion Tower #5072. The #2629 is not allowed in slot 14 of the #5072 tower. No restrictions apply when using #2629 with a #5073 tower.

#2810 LAN/WAN IOP

This IOP is used in SPD cages for attaching the #2838 PCI 100/10 Mbps Ethernet IOA or one of the #281x PCI ATM IOAs. It is a high workload IOP and has configuration limitations.

#6616 Integrated PC Server (formerly known as FSIOP)

The #6616 Integrated PC server contains a 166 MHz Pentium processor, two IOP memory slots, and two LAN IOA slots. Supported for migration only.

#6617 Integrated PC Server

The #6617 Integrated PC server contains a 200 MHz Pentium processor, two IOP memory slots, and three LAN IOA slots. Supported for migration only.

#6618 Integrated Netfinity Server

The Integrated Netfinity Server contains an Intel 333 MHz Pentium II processor, four main storage slots, and three LAN IOA slots. The IPCS provides high-performance LAN serving to LAN-attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Windows NT server are supported on the Integrated Netfinity Server.

The #6618 Integrated Netfinity Server requires three IOP slots. It comes with no base main memory and supports up to four of the following memory features allowing between 32 MB and 1024 MB of memory.

- #2861 32 MB IOP Memory Card
- #2862 128 MB IOP Memory Card
- #2867 256 MB IOP Memory Card

When running OS/2, the memory maximum is 512 MB.

Each LAN slot can contain either a Token-Ring or an Ethernet IOA from the following list up to a maximum of three. At least one IOA feature is required:

- #2723/#9723 PCI Ethernet IOA (10 Mbps)
- #2724/#9724 PCI 16/4 Mbps Token Ring IOA
- #2838/#9738 PCI 100/10 Mbps Ethernet IOA

If the #2724/#9724 is selected, a #0220 (Token-Ring on IPCS) is required for each #2724/#9724 selected to run on the #6618. If the #2723/#9723 is selected, a #0221 (Ethernet on IPCS) is required for each #2723/#9723 selected to run on the #6618. If the #2838/#9738 is selected, a #0222 (100/10 Mbps Ethernet on IPCS) is required for each #2838/#9738 selected to run on the #6618.

All three PCI slots can be used for the Integrated Netfinity Server with only two of the three slots supporting native AS/400 functions. A maximum of two #2838/#9738 can be used on each Integrated Netfinity Server: one native and one Windows NT dedicated. The #6618 cannot be placed in #5044.

An external cable is included to enable connectivity to IPCS hardware (keyboard or mouse), which also allows for optional use of parallel and serial ports. If running Windows NT on the #6618, the following considerations apply:

- #0325 IPCS Extension Cable for Windows NT (can be ordered).
- #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries and ordable).
- A display must be connected to the IPCS to support Windows NT.
- A minimum of 64 MB IOP memory on the Integrated Netfinity Server.

For keyboard or mouse and display support in countries outside the USA, consult the Web site at: `http://www.as400.ibm.com`

I/O Adapter

I/O Adapter

I/O Adapter

System unit (PCI) and migration tower (PCI and SPD) I/O adapters for processors 270, 8xx, SB2, and SB3 and associated towers are discussed in this chapter.

V4R5 System Unit Hardware (PCI)

Note

PCI configuration rules for V4R5 hardware are quite flexible. See “PCI Card Placement Rules” on page 291 for the complete rules.

#2743 PCI 1 Gbps Ethernet IOA

The #2743 PCI 1 Gbps Ethernet IOA feature allows the iSeries and AS/400e system to attach to IEEE standard 802.3Z high speed Ethernet LANs (1 Gbps). The adapter supports multi-mode fiber media attachment from the adapter to a Gb-capable switch with at least one port that supports a 1000BASE-SX interface with IEEE 802.3z and 802.3u compliance. The #2743 supports a 1000 MBps (1 Gbps) full duplex interface only. Cannot negotiate down to a lower speed. Stations on 10 Mb, 100 Mb, and 1000 Mb (1 Gb) switched LANs can interface with the #2743 through a switch that is capable of handling the lower speed. The #2743 *cannot* run under a #2790 or #2890 Integrated Netfinity Server. It supports TCP/IP protocol only.

#2744 PCI 100 Mbps Token Ring IOA

The #2744 PCI 100 Mbps Token-Ring IOA provides a single attachment to a 100 Mbps, 16 Mbps, or 4 Mbps IBM Token Ring network. The feature consists of an IOA card, internal code, which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The 100/16/4 Token Ring IOA is capable of operating in half or full duplex mode.

The #2724/#9724 comes standard with an 8ft/2.44m Token Ring cable. Alternately, a separately purchased twisted-pair cable to the RJ-45 connection on the IOA may be attached.

If the #2744 is selected to run on a #2790 or #2890 Integrated Netfinity Server, one #0223 (100Mbps Token-Ring on Integrated Netfinity Server) is required for each #2744 ordered.

#4723 PCI 10 Mbps Ethernet IOA

Provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code, which supplies Ethernet

© Copyright IBM Corp. 2000

Version 2 and IEEE 802.3 Media Access Control (MAC), plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode.

It has an RJ-45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ-45 twisted-pair cable must be ordered separately.

#4723 *cannot* be controlled by a #2790 or #2890 Integrated Netfinity Server.

#4745 PCI Two-Line WAN IOA

Supports up to two multiple protocol communications ports when one of two (in any combination) of the following cables are attached:

- #0348 V.24/EIA232 20ft/6m PCI cable
- #0349 V.24/EIA232 50ft/15m PCI cable
- #0353 V.35 20ft/6m PCI cable
- #0354 V.35 50ft/15m PCI cable
- #0355 V.35 80ft/24m PCI cable
- #0356 V.36 20ft/6m PCI cable
- #0358 V.36 150ft/45m PCI cable
- #0359 X.21 20ft/6m PCI cable
- #0360 X.21 50ft/15m PCI cable
- #0365 V.24/EIA232 80ft/24m PCI cable
- #0367 Operations Console cable*

*Only one #0367 Operations Console cable is allowed per #4745.

#4746 PCI Twinaxial Workstation IOA

The #4746 is an 8-port twinaxial workstation IOA with a 20-foot attachment cable for attaching up to 40 5250-type displays and printers. Each port supports seven attached devices and allows up to 56 attached addresses of which only 40 can be active. When the attached display supports address sharing, a maximum of 120 shared sessions are supported.

#4750 PCI ISDN BRI U IOA

The #4750 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-sized PCI card. Based on the latest DSP technology, the #4750 allows connections to fax or data modems connected to the telephone network with analog phone lines as well as to other IDSN devices. Each port consists of 2B+D configuration. The #4750 is the “U”-bus (2 wire) version IOA.

- For data mode support, B-channel supports digital data at 64 Kbps.
- For modem mode support, B-channel supports V.90 and lesser modulations.

Four 30-ft RJ-45 to RJ-45 network cables are shipped with each card.

The #4750 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols.

This feature requires country certification or homologation.

#4751 PCI ISDN BRI S/T IOA

The #4751 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-size PCI card. Based on the latest DSP technology, the #4751 allows connections to fax or data modems connected to the telephone network with analog phone lines, as well as to other IDSN devices. Each port consists of 2B+D configuration. The #4751 is the “S/T”-bus (4 wire) version IOA.

- For data mode support, the B-channel supports digital data at 64 Kbps.
- For modem mode support, the B-channel supports V.90 and lesser modulations.

Four 30-foot RJ-45 to RJ-45 network cables are shipped with each card.

The #4751 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols.

This feature requires country certification or homologation.

#4761 Integrated Analog Modem

Based on the latest DSP technology, #4761 allows the modem function to be integrated into the IOA and supports multiple analog modem ports (eight phone lines). Each line supports V.90 and lesser modulations. The #4761 IOA supports full duplex mode.

Eight 30-foot UTP phone cables are shipped with each card.

This feature supports the PPP, SDLC, and Fax protocols. Fax is supported on any or all modem ports and requires an asynchronous line description for each port used for fax. The #4761 is configured as a single IOA with eight individual resources available.

The feature requires and country certification or homologation.

#4801 PCI Crypto Coprocessor

The #4801 is a hardware cryptography solution based on the IBM 4758 card. The #4801 is a half-length PCI card that offers rich cryptography function, secure storage of cryptographic keys, and triple DES capability. The level of the cryptographic function is determined by the Cryptographic Access Provider Licensed Program, which is used to set the key length in the adapter.

The #4801 is available worldwide.

On new systems from the plant, the #4801 is shipped with the system, but not installed.

#4815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA

This feature allows the iSeries and AS/400e servers to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #4815 is typically used where 155 Mbps speeds are required over distances of less than 100 meters.

#4816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA

This feature allows the iSeries and AS/400e servers to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #4816 is typically used where 155 Mbps speeds are required over distances of less than 2 km.

#4818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA

This feature allows the iSeries 400 and AS/400e servers to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. The #4818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 km.

#4838 PCI 100/10 Mbps Ethernet IOA

This feature allows the iSeries 400 and AS/400e servers to attach to a standardized 100 Mbps high-speed Ethernet LAN. It also allows attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ-45 connector for attachment to UTP-5 media. Cabling for 10 Mbps must be CAT-3 or CAT-5, cabling for 100 Mbps must be CAT 5 that meets or exceeds Industry Standard EIA/TIA T568A or T568B. The maximum cable length is 100 meters. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode.

If the #4838 is selected to run on a #2790 or #2890 Integrated Netfinity Server, one #0224 (100/10Mbps Ethernet on Integrated Netfinity Server) is required for each #4838 ordered.

#9771 Base PCI 2-Line WAN with Modem

#9771 is a 2-line WAN adapter, with one port supporting multiple protocol communications and the other port supporting V.90 56K Async Data on PPP via an internal modem. Connection to the V.90 port is via telephone cable.

Connection to the WAN port is through one of the following cables:

- #0348 V.24/EIA232 20 ft PCI cable
- #0349 V.24/EIA232 50-ft PCI cable
- #0353 V.35 20 ft PCI cable
- #0354 V.35 50-ft PCI cable
- #0355 V.35 80-ft PCI cable
- #0356 V.36 20 ft PCI cable
- #0358 V.36 150-ft PCI cable
- #0359 X.21 20 ft PCI cable
- #0360 X.21 50-ft PCI cable
- #0365 V.24/EIA232 80-ft PCI cable

ECS and fax are not supported on the V.90 port at this time. IBM intends to support both on the V.90 port at the next release of OS/400 and with a Group PTF for V4R5.

ECS operates on the WAN port of the #9771 by changing the *RSRCNAME parameter of the QESLINE and QTILINE line descriptions to that of the WAN port on the #9771 card.

When the #9771 is selected to support ECS, one of the following cables must be specified and connects to the WAN port:

- #0348 V.24/EIA232 20-ft PCI cable (Default)
- #0349 V.24/EIA232 50-ft PCI cable
- #0365 V.24/EIA232 80-ft PCI cable

The #9771 does not support the Operations Console as a systems console. Remote power on is not supported.

#2763 PCI RAID Disk Unit Controller

The #2763 is an Ultra2 SCSI disk unit controller with a 10 MB write-cache that provides RAID-5 protection for internal disk units and also supports internal tape and CD-ROM units.

In addition to providing RAID-5 protection for disks, the #2763 is also designed to work as a high-performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at less cost than mirroring and with greater performance than system checksums.

The #2763 controller supports a maximum of 12 disk units and up to two removable media devices and is available on the Model 270, the Model 820, and the #5075 PCI Expansion Tower.

A minimum of four drives of the same capacity are needed for a valid RAID-5 configuration. A maximum of three arrays are allowed, with a maximum of 10 drives allowed per array. All drives in an array must be of the same capacity.

#4748/#9748 PCI RAID Disk Unit Controller

The #4748/#9748 is an Ultra2 SCSI disk unit controller with a 26 MB write-cache that provides RAID-5 protection for internal disk units and also supports internal tape and CD-ROM units. The #4748/#9748 supports both compression and non-compression modes. The mode of operation is determined by a hardware jumper, which is in the non-compression mode position when shipped. By moving the hardware jumper, the controller functions in compression mode.

In addition to providing RAID-5 protection for disks, the #4748/#9748 is also designed to work as a high-performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at less cost than mirroring and with greater performance than system checksums.

The #4748/#9748 controller supports a maximum of 18 drives. A minimum of four drives of the same capacity are needed for a valid RAID-5 configuration. A maximum of four arrays are allowed, with a maximum of ten drives allowed per array. All drives in an array must be of the same capacity.

The #4748/#9748 also supports two removable media devices. This feature supports the #4331 1.6 Gb Read Cache Drive for increased performance. The Read Cache Drive #4331 is only supported in non-compression mode.

The #4748 is supported in all 8XX processors and the 270.

#9767 PCI Disk Unit Controller

The #9767 is an Ultra2 SCSI disk unit and removable media device controller.

The #9767 is the default controller in the Model 270 and controls up to six disk units and up to two removable media devices (internal tape or CD-ROM).

The #9767 is the default controller in the Model 820 when RAID (#0041 Device Parity Protection-All) is not on the order and controls up to six disk units and up to two removable media devices (internal tape or CD-ROM).

#2749 PCI Ultra Magnetic Media Controller

The #2749 is an Ultra SCSI controller for attachment of an external tape device or an external optical device.

Devices supported by #2749:

- 3490E
  - C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
  - E01/E11 ½-inch Cartridge Tape Subsystem
  - F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494
  - L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
  - L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
  - D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
  - D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570
  - B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
  - C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 358x-Hxx/Lxx/Dxx Tape Cartridge System
- 3590-B11/B1A/E11/E1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012/222/232/234/342 8mm Cartridge Tape Unit
- 9348-001 ½-inch Reel Tape Unit–Rack Mount
- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

#2768 PCI Magnetic Media Controller

The #2768 is an Ultra SCSI controller for attachment of an external tape device or an external CD-ROM device that has a Single Ended SCSC interface.

Devices supported by #2768 are:

- 7207-122 QIC-SLR Tape Bridge Box
- 7210-020 CD-ROM Bridge Box

Migration Tower Hardware PCI

#2720/#9720 PCI WAN/Twinaxial IOA

This combined twinaxial/communication adapter supports 28 active twinaxial addresses. It ships with a cable and a 4-port expansion box, with each port supporting seven attached addresses. When the attached display supports address sharing, a maximum of 112 shared sessions are supported. It also supports a single communications line. See “#9720 Base PCI WAN/Twinaxial IOA” on page 110 for a discussion of the communications capabilities of this adapter. When the attached display supports address sharing, a maximum of 112 shared sessions are supported.

The #9720 is supported for migration only.

#2721/#9721 PCI Two-Line WAN IOA

The #2721/#9721 supports up to two multiple protocol communications ports and is supported for migration only.

#2722 PCI Twinaxial Workstation IOA

The #2722 is an 8-port twinaxial workstation IOA with a 20-foot attachment cable for attaching up to 40 5250-type displays and printers. Each port supports seven attached addresses. This allows up to 56 attached addresses of which only 40 can be active. When the attached display supports address sharing, a maximum of 120 shared sessions are supported. The #2722 is specified when additional PCI twinaxial workstations controllers are required.

#2723/#9723 PCI Ethernet IOA (10 Mbps)

This feature provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code that supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC), plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode. RJ-45 cabling for 10 Mbps must be CAT-3 or CAT-5. If CAT 5 is used, it must meet or exceed Industry Standard EIA/TIA T568A or T568B.

It has an RJ-45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ-45 twisted-pair cable must be ordered separately.

If the #2723/#9723 is selected to run on a #2866 Integrated Netfinity Server, one #0221 (Ethernet on Integrated Netfinity Server) is required for each #2723/#9723 this is ordered.

#2724/#9724 PCI 16/4 Mbps Token-Ring IOA

This feature provides a single attachment to either a 16 Mbps or 4 Mbps Token-Ring. The feature consists of an IOA card, internal code, which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724/#9724 comes standard with an 8ft/2.44m Token-Ring cable. An alternately or a separately purchased twisted-pair cable to the RJ-45 connection on the IOA may be attached.

The #2724/#9724 provides one LAN attachment for the #6618 Integrated Netfinity Server. The #6618 is a prerequisite for the #2724/#9724, and it uses one LAN IOA slot in the #6618.

If the #2724/#9724 is selected to run on a #2866 Integrated Netfinity Server, one #0220 (Token-Ring on Integrated Netfinity Server) is required for each #2724/#9724 ordered.

#2745/9745 PCI Two-Line WAN IOA

Supports up to two multiple protocol communications ports when one of two (in any combination) of the following cables are attached:

- #0348 V.24/EIA232 20ft/6m PCI cable
- #0349 V.24/EIA232 50ft/15m PCI cable
- #0353 V.35 20ft/6m PCI cable
- #0354 V.35 50ft/15m PCI cable
- #0355 V.35 80ft/24m PCI cable
- #0356 V.36 20ft/6m PCI cable
- #0358 V.36 150ft/45m PCI cable
- #0359 X.21 20ft/6m PCI cable
- #0360 X.21 50ft/15m PCI cable
- #0365 V.24/EIA232 80ft/24m PCI cable
- #0367 Operations Console cable*

*Only one #0367/9745 Operations Console cable is allowed per #2745.

#2746 PCI Twinaxial Workstation IOA

The #2746 is an 8-port twinaxial workstation IOA with a 20-foot attachment cable for attaching up to 40 5250-type displays and printers. Each port supports seven attached addresses and allows up to 56 attached addresses of which only 40 can be active. When the attached display supports address sharing, a maximum of 120 shared sessions are supported. The #2746 is specified when additional PCI twinaxial workstation controllers are required. This IOA is a direct replacement for the #2722. Feature #2746 requires V4R4 or later, and can be installed in either high or low speed slots.

#2750 PCI ISDN BRI U IOA

The #2750 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-sized PCI card. Based on the latest DSP technology, #2750 allows connections to fax or data modems connected to the telephone network with analog phone lines as well as to other IDSN devices. Each port consists of 2B+D configuration. The #2750 is the “U”-bus (2 wire) version IOA.

- For data mode support, B-channel supports digital data at 64 Kbps.
- For modem mode support, B-channel supports V.90 and lesser modulations.

A wrap cable/plug and four 30-foot RJ-45 to RJ-45 network cables are shipped with each card.

The #2750 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols.

This feature requires country certification or homologation.

#2751 PCI ISDN BRI S/T IOA

The #2751 is a 4-port (8-channel) ISDN BRI (basic rate interface) full-size PCI card. Based on the latest DSP technology, the #2751 allows connections to fax or data modems connected to the telephone network with analog phone lines, as well as to other IDSN devices. Each port consists of 2B+D configuration. The #2751 is the “S/T”-bus (4 wire) version IOA.

- For data mode support, the B-channel supports digital data at 64 Kbps.
- For modem mode support, the B-channel supports V.90 and lesser modulations.

A wrap cable and plug and four 30-foot RJ-45 to RJ-45 network cables are shipped with each card.

The #2751 IOA supports full duplex mode. It supports the PPP, IDLC, and Fax protocols.

This feature requires country certification or homologation.

#2761 Integrated Analog Modem

Based on the latest DSP technology, the #2761 allows the modem function to be integrated into the IOA and supports multiple analog modem ports (eight phone lines). Each line supports V.90 and lesser modulations. The #2761 IOA supports full duplex mode.

A wrap cable/plug and eight 30-foot UTP phone cables are shipped with each card.

This feature supports the SLIP, PPP, SDLC, and Fax protocols. An asynchronous line description is required that can only be used for fax. The #2761 is configured as a single IOA with eight individual resources available.

This feature requires country certification or homologation.

#2815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #2815 is typically used where 155 Mbps speeds are required over distances of less than 100 meters.

#2816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #2816 is typically used where 155 Mbps speeds are required over distances of less than 2 km.

#2818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA

This feature allows the AS/400 system to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. The #2818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 km.

#2838/#9738 PCI 100/10 Mbps Ethernet IOA

This feature allows the AS/400 system to attach to a standardized 100 Mbps high-speed Ethernet LAN. It also allows attachment to existing 10 Mbps Ethernet LANs. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode. The adapter comes with an RJ-45 connector for attachment to UTP-5 media. Cabling for 10 Mbps must be CAT-3 or CAT-5. Cabling for 100 Mbps must be CAT-5 that meets or exceeds Industry Standard EIA/TIA T568A or T568B.

If the #2838/#9738 is selected to run on a #2866 Integrated Netfinity Server, then one #0222 (100/10Mbps Ethernet on Integrated Netfinity Server) is required for each #2838/#9738 ordered.

#4802 PCI Crypto Coprocessor

The #4802 is a hardware cryptography solution based on the IBM 4758 card. The #4802 is a half-length PCI card that offers rich cryptography function, secure storage of cryptographic keys, and triple DES capability. The level of the cryptographic function is determined by the Cryptographic Access Provider Licensed Program, which is used to set the key length in the adapter. The #4802 provides greater security by use of 168-bit key (compared to a 56-bit key of the #4800).

The #4802 is available worldwide.

Each #4800 PCI Crypto Coprocessor installed in a Model 6XX/SXX/7XX or attached expansion towers must be converted to a #4802 PCI Crypto Coprocessor. The #4800 is not supported on the 8XX models nor in #503X/#5077 migration towers and their attached expansion towers.

Note: On new shipments from the plant, the #4802 is shipped with the system but not installed.

#2718 PCI Magnetic Media Controller

The #2718 provides SCSI External attach capability exclusively for the 7207 Model 122 4 GB External QIC Tape Drive.

#2726 PCI RAID Disk Unit Controller Ultra SCSI

The #2726 PCI RAID Disk Unit Controller provides unprotected, mirrored, or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization. The #2726 also supports one CD-ROM drive and one internal tape unit when placed in the #503x. When placed in the #5064/#9364 System Unit Expansion, the #2726 can support up to three internal tape units.

The #2726 controls Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the #503x and the #5064/#9364 System Unit Expansion with Expansion Unit for PCI cards #9329. The Ultra SCSI disks provide the best performance when attached to the #2726. These Ultra SCSI disks are 17.54 GB Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96 GB Disk Unit# 6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58 GB), #1337 (4.19 GB), and #1336 (1.96 GB) Disk Unit Migration Kits. These are all supported in the #503x and #5064/#9364 System Unit Expansion. The #2726 also controls migrated disks that are not Ultra SCSI. In that case, the disks do not perform at Ultra SCSI speeds.

The #2726 PCI RAID Disk Unit Controller supports a maximum of 15 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. A maximum of three RAID-5 arrays are supported on one #2726. Disk units not supported in a RAID-5 array can be attached to the #2726 in either unprotected or a mirrored environment.

Concurrent maintenance of disks attached to the #2726 is only supported if the disks are part of a RAID array or are mirrored.

The supported internal tape drives include:

- 1.2G ¼-inch Cartridge Tape Unit Kit, #1349
- 2.5G ¼-inch Cartridge Tape Unit Kit, #1350
- 13G ¼-inch Cartridge Tape Unit Kit, #1355
- 7G 8mm Cartridge Tape Unit Kit, #1360
- 2.5G ¼-inch Cartridge Tape Unit, #6481
- 4G ¼-inch Cartridge Tape Unit, #6482
- 13G ¼-inch Cartridge Tape Unit, #6485
- 16 G ¼-inch Cartridge Tape Unit
- 25G ¼-inch Cartridge Tape Unit, #6486
- 7G 8mm Cartridge Tape Unit, #6490

The #2726 occupies one High Speed PCI card slot. It is supported on the 9406 Model 720 only. A maximum of one #2726, #2740, #2741, or #9728 can be installed in the system unit and one #2726 or #2741 in the #5064/#9364 System Unit Expansion with the #9329 Expansion Unit for PCI cards. If RAID is to be implemented or more than five disk units are required in the system unit, the #2726 should be ordered in place of a #9728 Base PCI Disk Unit Controller.

The #2726 does not offer support for compression. The #2741 PCI Raid Disk Unit Controller supports compression when used with V4R3, and it effectively supersedes the #2726. If a maximum of only ten disks are required and there is no requirement for compression, the #2740 can be ordered as an alternative to the #2741.

#2729 PCI Magnetic Media Controller SCSI PCI

The #2729 PCI Magnetic Media Controller SCSI provides for attachment of one of the following devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 3590-B11/B1A/E11/E1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012 5.0G 8mm Cartridge Tape Unit

- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 Dual 5.0G 8mm Cartridge Tape Unit
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-342 20.0G 8mm Cartridge Tape Unit
- 9348-001 ½-inch Reel Tape Unit–Rack Mount
- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

The #2729 does not provide Hardware Data Compression (HDC).

The #2729 occupies one High-Speed PCI card slot. It requires OS/400 V4R1 or later. It is supported on the 9406 Models 170 and 720, and the #5065 Storage/PCI Expansion Tower/#5066 1.8 I/O Tower. A maximum of one #2729 can be installed in the system unit and two #2729s in the #5064/#9364 System Unit Expansion with #9329/#9330 Expansion Unit for PCI cards. Up to three #2729s can be installed in #5065 Storage/PCI Expansion Tower.

The #2809/#2824 PCI Feature Controller or the base PCI LAN/WAN Workstation IOP in the #5065 Storage/PCI Expansion Tower/#5066 1.8 I/O Tower is a prerequisite for the #2729.

OS/400 V4R2 or later is required for the #2729 to support the 3995 Optical Library Dataserver.

#2740 PCI RAID Disk Unit Controller

The #2740 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. However, the #2740 can only be located in the System Unit. It cannot be located in the System Unit Expansion #5064/#9364. The #2740 is supported on the 9406 Models 170 and 720 only. The #2740 supports a maximum of 10 one- or two-byte disk units. A maximum of two RAID-5 arrays are supported on one #2740. A maximum of one #2740, #2726, #2741, #2748, or #9728 can be installed in the system unit. The #2740 does not offer support for compression. However, if only a maximum of 10 disks are required and there is no requirement for compression, the #2740 should be ordered.

Concurrent maintenance of disks attached to the #2740 is only supported if the disks are mirrored or part of a RAID array. Otherwise, the #2740 offers the same support as the #2726. Refer to “#2726 PCI RAID Disk Unit Controller Ultra SCSI” on page 276 for more information. The #2740 requires OS/400 V4R2 or later.

#2741 PCI RAID Disk Unit Compression Controller

The #2741 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. See “#2726 PCI RAID Disk Unit Controller Ultra SCSI” on page 276 for a full description of the #2726. The #2741 supports a maximum of 15 disk units but offers an enhancement over the #2726 in that it supports data compression when used with OS/400 V4R3. The #2741 requires V4R2

or later of OS/400. For all new orders with V4R2 or later, the #2741 is ordered in place of the #2726.

Concurrent maintenance of disks attached to the #2741 is only supported if the disks are mirrored or part of a RAID array.

A maximum of one #2741, #2726, #2740, #2748, or #9728 can be installed in the system unit and one #2741 or #2726 in the #5064/#9364 System Unit Expansion with #9329 Expansion Unit for PCI cards. If only a maximum of 10 disks is required and there is no requirement for compression, the #2740 can be ordered instead of #2741.

#2748 PCI RAID Disk Unit Compression Controller

The #2748 is an Ultra2 SCSI disk and tape controller with a 26 MB write cache that provides RAID-5 protection for internal disk units. In addition to RAID, the #2748 also offers DASD compression capabilities. The #2748 IOA is shipped with compression disabled. Compression is enabled by moving a jumper on the IOA. The #2748 supports Extended Adaptive Cache with restriction that compression must not be active on the same #2748 subsystem.

The #2748 is designed to control Ultra2, Ultra, and Fast Wide SCSI disk units. It supports up to 15 disk units, one CD-ROM, and one internal tape unit. In addition to RAID-5 and compression, the #2748 is also designed to work as a high performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at a lower cost than mirroring. This feature supports Concurrent DASD Add/Maintenance. Note the following additional points:

- The #2748 is a replacement for #2741.
- High Speed PCI Card slots required: One.
- This feature is CE *installation only*.

#9728 Base PCI Disk Unit Controller Ultra SCSI

The #9728 Base PCI Disk Unit Controller is the base controller. It is an Ultra SCSI controller, which provides mirroring or unprotected support for up to five disks. The #9728 does not include any write cache, and it does not support RAID. As well as five disks, it also supports the internal CD-ROM drive and one internal tape unit.

The #9728 controls Ultra, Fast Wide, and Fast Narrow SCSI disk units. The Ultra SCSI disks provide the best performance when attached to the #9728. These Ultra SCSI disks are 17.54G Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96G Disk Unit #6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58G), #1337 (4.19G) and #1336 (1.96G) Disk Unit Migration Kits. The #9728 also controls migrated disks that are not Ultra SCSI. In that case, the disks do not perform at Ultra SCSI speeds.

The Base PCI Disk Unit Controller supports a maximum of five one- or two-byte disk units. It is represented in the rack configuration list as CCIN 2728. The #9728 is supported for migration only.

Migration Tower Hardware SPD

#2620 Cryptographic Processor

The Cryptographic Processor #2620 performs cryptographic functions based on a hardware implementation of the ANSI Data Encryption Standard (DES), and the Rivest, Shamir, and Adleman (RSA) Public Key Algorithm. Functions provided include encryption and decryption of data, authentication and verification of messages and data, creation and management of financial personal identification numbers (PINs), and management of cryptographic keys.

Distribution of #2620 is restricted for security reasons by U.S. Government export regulations when shipped to countries outside the USA or Canada.

One I/O feature card slot is required to support this adapter. The #2620 is supported for migration only.

#2628 Cryptographic Processor (Commercial)

This feature provides the same functions as the #2620 with the exception of DES (Data Encryption Standard) based data scrambling. Instead, the #2628 uses the Commercial Data Masking Facility (CDMF) for data scrambling. The #2628 is useful for providing assurance of data authentication and integrity. It is not subject to the export regulations of #2620.

One I/O feature card slot is required to support this adapter. The #2628 is supported for migration only.

#2699/9699 SPD Two-Line WAN IOA

The #2699 supports up to two multiple protocol communications ports where one or two (in any combination) of the cable features shown in the following table are attached.

Cable Length	Attachment			
	EIA232/V.24	V.35	EIA449/V.36	X.21
20ft/6m	#0330	#0338	#0335	#0341
50ft/15m	#0331	#0339	#0336	#0342
80ft/24m	N/A	#0340	N/A	N/A
150ft/45m	N/A	N/A	#0337	N/A

The following functions do not have equivalent function on the #2629 IOA:

- ASCII Adapter
- V.25 Autocall cable
- Select standby mode
- X.21 switched WAN dialup or short-hold mode WAN
- Asynchronous communication speeds of less than 300 bps
- Data Rate Select signal on the EIA 232/V.24 interface. This function is used by some older 2400 bps modems to reduce the speed to 1200 bps.
- LPDA-1 (Link Problem Determination Aids). This is a diagnostic function supported by some (primarily older IBM) modems.
- V.54 local and remote loop back (diagnostics functions supported by some modems)

The #2629 LAN/WAN/Workstation IOP is a prerequisite for the #2699. The #2699 takes up one of the three slots on the #2629.

The #9699 is supported for migration only.

#2664 Integrated Fax Adapter

This feature provides the AS/400 system with two ports capable of transmission and receipt of facsimile data to or from a Group 3 capable fax machine, another AS/400 system with an Integrated Fax Adapter, or PCs with appropriately programmed fax adapters. The #2664 consists of a card, a wrap cable (one per machine), two country-unique attachment couplers, telephone cables, and Licensed Internal Code.

The #2664 can simultaneously support two send or two receive, or one send and one receive operation. Any output that can be printed on an AS/400 Intelligent Printer Datastream (IPDS) printer can be faxed using the #2664.

The #2664 supports facsimile protocols defined in *CCITT Blue Book Volume VII, Facsimile VII.3 Recommendations T.4 and T.30*. This adapter requires one I/O feature card slot and the Facsimile Support/400 licensed program.

The #2664 is supported for migration only.

#6149 16/4 Mbps Token-Ring IOA

This feature provides a single attachment to either a 16 Mbps or a 4 Mbps IBM Token-Ring Network. The feature consists of an adapter card, internal code (supplies IEEE 802.5 Media Access Control (MAC) and IEEE 802.2 Logical Link Control (LLC) functions), and an 8 ft/2.44m Token-Ring cable. The 16/4 Mbps Token-Ring IOA is capable of operating in half or full duplex mode.

The #6149/#9249 comes standard with an 2.44 meter Token-Ring cable. Alternatively, the customer can attach a separately purchased twisted pair cable to the RJ-45 connection on the IOA.

The #2629 LAN/WAN/Workstation IOP or #9754 MFIOP is a prerequisite for the #6149. It uses one IOA slot and no I/O card slots.

#6180/#9280 Twinaxial Workstation IOA

The #6180/#9280 is an 8-port twinaxial workstation IOA with a 20-foot attachment cable for attaching up to 40 5250-type displays and printers. Each port supports seven attached addresses allowing for up to 56 attached addresses, of which only 40 can be active. When the attached display supports address sharing, a maximum of 120 shared sessions are supported. The #6180 requires a #2629 LAN/WAN/Workstation SPD IOP as a prerequisite.

One #6180/#9280 is allowed in slot C of the #5038 MFIOP unless the system console is ASCII. All other twinaxial workstation IOAs must be placed in a #2629 LAN/WAN/Workstation IOP. One IOA slot is required to support #6180/#9280.

The following table shows the feature requirements at the initial order stage.

Workstations Required		System Console Specify	Minimum Shipped Feature Codes			Other Feature Codes Based on Workstations Required
Twinaxial	ASCII		MFIOP	No Charge WSC	Required WSC	
Yes	No	#5540	#9754	#9280		#6180
Yes	Yes	#5541	#9754	#9141	#6180	#6141, #6180
No	No	#5543	#9754	(1)		
Yes or No	Yes	#5543	#9754	#9141	(1)	#6141, #6180
Yes	No	#5543	#9754	#9280	(1)	#6180
No	No	#5544	#9754	(2)		
Yes or No	Yes	#5544	#9754	#9141	(2)	#6141, #6180
Yes	No	#5544	#9754	#9280	(2)	#6180

1. When Client Access Console is selected, a #0344 cable for Attaching Client Access Console (6m) must also be ordered.
2. When Operations Console is selected, a #0328 Operations Console Cable (6m) must also be ordered.

#6181/#9381 Ethernet/IEEE 802.3 IOA (10 Mbps)

The #6181/#9381 feature provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code, which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC), plus IEEE 802.2 Logical Link Control (LLC) functions. The #6181/#9381 is capable of operating in half or full duplex mode at a speed of 10 Mbps.

This #6181/#9381 has an RJ-45 connector and a 15 pin D-shell connector for attachment of customer supplied cabling. An AUI Ethernet cable or RJ-45 twisted pair cable must be ordered separately. Cabling must meet or exceed Industry Standard EIA/TIA T568B.

The #2629 LAN/WAN/Workstation IOP or #9754 MFIOP is a prerequisite for the #6181. It uses one IOA slot and no I/O card slots.

#2621 Removable Media Device Attachment SPD

The Removable Media Device Attachment, #2621, provides for the attachment of one or two of the following devices, in any combination:

- 2440-A12 ½-inch Reel Tape Unit
- 9348-001 ½-inch Reel Tape Unit - Rack Mount
- 9348-002 ½-inch Reel Tape Unit - Table Top
- 7208-002 2.3G 8mm Cartridge Tape Unit
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 5.0G 8mm Cartridge Tape Unit (Single Drive)

The #2621 provides a hardware data compress-decompress function for these devices. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times. The #2621 requires one I/O card slot.

The #2621 also provides attachment to one of the following devices:

- 3995 Optical Library (direct attach models)
- 7208-234 Dual 7.0 GB 8mm Cartridge Tape Unit
- 7208-232 5.0 GB 8mm Cartridge Tape Unit (Dual Drive)
- 9427 8mm Tape Library
- #5032 Removable Media Cluster Box

When the #2621 is used to attach a 3995 Optical Library DataServer, a 7208-232 Dual Drive or 7208-234 8mm Cartridge Tape Unit, a 9427 8mm Tape Library, or #5032 Removable Media Cluster Box must be dedicated to it.

Certain tape devices listed above are also supported by the #6534 Magnetic Media Controller. The #6534 should be selected on new orders. For more information on #6534, see “#6534 Magnetic Media Controller SCSI SPD” on page 288.

#2624 Storage Device Controller SPD

The #2624 Storage Device Controller supports the ¼-inch cartridge and 8mm cartridge internal tape devices, 9331-011, 9331-012, or #6135 external diskette devices, and internal CD-ROM devices.

As a feature on a #5072, #5073, or #5044 System Unit Expansion Tower, the #2624 supports up to three internal tape or CD-ROM devices and one external diskette unit.

The internal tapes that are supported by the #2624 are:

- 1.2G ¼-inch Cartridge Migration Kit #1379
- 2.5G ¼-inch Cartridge Migration Kit #1380
- 2.5G ¼-inch Cartridge #6380
- 7G 8mm Cartridge #6390
- CD-ROM #6325

The #2624 does not support any other internal media.

The #2624 is not supported on the 9406 Model 170 or Model 720 with no SPD card slots. Unless the customer requires a #2624 to support a diskette drive or CD-ROM, the #6513 Internal Tape Device Controller should be selected in place of #2624. For more information on the #6513, see “#6513 Internal Tape Device Controller SPD” on page 286.

#6501 Tape/Disk Device Controller SPD

The #6501 Tape/Disk Device Controller provides a SCSI interface with a two-byte wide data path and an instantaneous data rate of 20M/sec.

The #6501 provides attachment for the following tape devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 3590-B11/B1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)

- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 9337-2xx, 4xx, 5xx Disk Array Subsystems
- 2105 Enterprise and Versatile Storage Servers

The #6501 requires one I/O card slot and can support up to two tape units per one controller. The #6501 has two ports, but can support up to four devices in total for the two ports. Tape units that have a library capability have one device for the library and one device for each tape drive. Therefore, the 3570-B02/C02 (library plus two tape drives equals three devices) and the 3575 with more than one tape drive have additional limitations when attaching to one port on the #6501 along with another tape drive on the second port. The #6501 does not support Hardware Data Compression (HDC). Tape subsystems attached to the #6501 support a compaction algorithm using their own controller.

One #6501 can support two 9337s or 2105s. The maximum number of #6501s that can attach to support the 9337s or 2105s varies by model. For details, see “iSeries and AS/400e servers” on page 83 and “Summary of All Earlier AS/400 and AS/400e Models” on page 747. One I/O card slot is required and must be accommodated in the System Unit or System Unit Expansion (#5072, #5073, or #5044).

The #6501 cannot support a tape unit and a 9337 or 2105 on the same controller. On new orders, the #6534 Magnetic Media Controller should be ordered for tape attachment.

#6502 High Performance Controller (2M Cache) SPD

The #6502 is a SCSI controller and provides unprotected, mirroring, and RAID-5 protection of internal disk units not supported by the MFIOP. The #6502 also has a 2M write cache for better performance and improved device utilization.

The #6502 provides attachment capabilities for up to eight disk units in the #5051 or #9051 Storage Expansion Unit and up to 16 disk units in the #5052, #5058, or #8052 Storage Expansion Unit, or #5061, #5082, or #5083 Storage Expansion Tower. These can be either one-byte or two-byte SCSI disk units. It requires one I/O card slot in the System Unit, System Unit Expansion Tower, or the Storage Expansion Towers.

On the #9364/#5064 System Unit Expansion, with the #9331 Expansion Unit for SPD Cards, the #6502 can support up to 15 disk units located in the System Unit Expansion and occupies one card slot.

One #6502 supports a maximum of two RAID-5 DASD arrays with a maximum of ten drives per array. All drives in an array must be of the same capacity and parity can be spread across four or eight drives. Drives not supported in a RAID-5 array can also be attached to the same #6502 in either a mirrored or unprotected environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6502.

#6512 High Performance Controller (4M Cache) SPD

The #6512 disk controller provides unprotected, mirrored, or RAID-5 protection for internal disk units and includes a 4M write cache for better performance and improved device utilization.

The #6512 controls disk units installed in the #5051, #5052, #5058, #8052, and #9051 Storage Expansion Units and the #5061, #5082, and #5083 Storage Expansion Towers.

On the #9364/#5064 System Unit Expansion and the #9331 Expansion Unit for SPD Cards, the #6512 supports up to 15 disk units within the System Unit Expansion.

The #6512 supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. Disk units not supported in a RAID-5 array can also be attached to the same #6512 in either unprotected or a mirrored environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6512. The #6512 occupies one I/O card slot position. On new orders, the #6532 should be ordered, instead of the #6512.

#6513 Internal Tape Device Controller SPD

This feature provides a two-byte wide SCSI interface for attachment of one or two internal tape drives in the 9406 Model 730, 740, and SB1 System Unit. On the 9406 Model 720 with the #9364/#5064 System Unit Expansion and the #9331 Expansion Unit for SPD Cards, the #6513 supports up to three internal tape drives located in the System Unit Expansion. It provides support for up to four internal tape drives in the #5072 and #5073 System Unit Expansion Towers. The #6513 provides attachment for the following internal tape devices:

- #1349 1.2 GB ¼-inch Cartridge Tape Unit Kit
- #1350 2.5 GB ¼-inch Cartridge Tape Unit Kit
- #1355 13 GB ¼-inch Cartridge Tape Unit Kit
- #1360 7 GB 8mm Cartridge Tape Unit Kit
- #1379 1.2 GB ¼-inch Cartridge Tape Unit Kit
- #1380 2.5 GB ¼-inch Cartridge Tape Unit Kit
- #6380 2.5 GB ¼-inch Cartridge Tape Unit
- #6381 2.5 GB ¼-inch Cartridge Tape Unit
- #6382 4 GB ¼-inch Cartridge Tape Unit
- #6385 13 GB ¼-inch Cartridge Tape Unit
- #6390 7 GB 8mm Cartridge Tape Unit

- #6481 2.5 GB ¼-inch Cartridge Tape Unit
- #6482 4 GB ¼-inch Cartridge Tape Unit
- #6485 13 GB ¼-inch Cartridge Tape Unit
- #6386 / #6486 25 GB ¼-inch Cartridge Tape Unit
- #6490 7 GB 8mm Cartridge Tape Unit

The #6513 occupies one I/O card slot position.

#6532 RAID Disk Unit Controller (4M Cache) Ultra SCSI SPD

The #6532 disk controller provides unprotected, mirrored, or RAID-5 protection for internal disk units. It includes a 4M write cache.

The #6532 controls Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the #5058 Storage Expansion Unit and #5083 Storage Expansion Tower. The Ultra SCSI disks gives best performance when attached to a #6532 in these Ultra SCSI Expansion Units or Towers. These Ultra SCSI disks are 17.54G Disk Unit #6714, 8.58G Disk Unit #6713, 4.19G Disk Unit #6907 and 1.96G Disk Unit #6906.

The #6532 also supports disks installed in the Storage Expansion Units #5051 and #5052 and in the Storage Expansion Towers #5081 and #5082. None of these are Ultra SCSI Units and Towers. Therefore, they do not provide full Ultra SCSI performance.

The #5052 and #5082 are supported for migration to the Model 7xx. For the 7xx models, the #5058 Storage Expansion Unit and #5083 Storage Expansion Towers, which are both Ultra SCSI, are offered. They provide full Ultra SCSI performance when the disks are attached to a #6532. One #5058 is supported per #5081 or #5083.

On the #9364/#5064 System Unit Expansion and #9331 Expansion Unit for SPD Cards, the #6532 supports up to 15 disk units located in the system unit expansion and occupies one card slot.

The #6532 controller supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disks units. A maximum of four RAID-5 arrays are supported on one #6532. Disk units not supported in a RAID-5 array can also be attached to the same #6532 in either unprotected or a mirrored environment.

The #6532 requires OS/400 Version 4. The #6532 is supported on PowerPC based models with SPD card slots. It is not supported on Models 170, SB1, and 720 with no SPD card slots. The #6532 offers improved performance over the #6502, #6512, and #6530, and therefore, effectively replaces them. The #6532 occupies one I/O card slot. It does not offer support for compression. The #6533 RAID Disk Unit Controller, which supports compression effectively, supersedes the #6532 when systems are ordered with V4R2 or later.

Note: OS/400 V4R3 is required for compression.

#6533 RAID Disk Unit Controller (4M Cache) Ultra SCSI Compress. SPD

The #6533 disk controller is functionally equivalent to the #6532 with the added capability to support hardware data compression. For a full description, see the #6532 section above.

The #6533 offers an enhancement over the #6532 in that it supports data compression when used with OS/400 V4R3 onward.

#6534 Magnetic Media Controller SCSI SPD

The #6534 Magnetic Media Controller SCSI provides for attachment of one of the following devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 3590-B11/B1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 Dual 5.0G 8mm Cartridge Tape Unit
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-342 20.0G 8 mm Cartridge Tape Unit
- 9348-001 ½-inch Reel Tape Unit–Rack Mount
- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

The #6534 offers improved performance over #2621 and #6501 for external tape attachment, and therefore, effectively replaces them. However, there are some devices such as the #5032 Removable Media Cluster Box, the 2440-A12 ½-inch Reel Tape Unit, and the 7208-002 2.3G 8mm Cartridge Tape Unit, that are not supported by the #6534. For these devices, the #2621 is still required.

The #6534 does not provide Hardware Data Compression (HDC).

PCI Card Placement Rules

PCI Card Placement Rules

PCI Card Placement Rules

The implementation of new PCI technologies in the iSeries 400 Model 270 and 8xx changes the configuration rules associated with the various features of the AS/400e system. Prior AS/400e models required input/output processors (IOPs) to be in specific slots in the system and expansion towers. The Model 270 and 8xx product family provides more flexibility in the placement of IOPs and IOAs. This can result in more efficient use of card slots, potentially resulting in a lower cost of implementation. For example, a specific PCI IOP may be able to support two high-performance IOAs, or four slower IOAs, but may not have the capacity to support one high-performance IOA and two slower IOAs. Increased flexibility of configuration also adds, in certain cases, an increased requirement to understand the detailed configuration rules.

This chapter applies to 270 and 8xx models only. For more detailed communications restrictions, refer to the communications chapter for communications and the feature description in the companion manual *iSeries and AS400e System Builder*, SG24-2155.

The following sections describe the configuration and card placement rules that must be understood to develop valid configurations. This chapter helps you understand when to add IOPs to avoid saturation of a present configuration.

Note: This chapter is current at the time of this publication. Refer to the iSeries Information Center at `http://publib.boulder.ibm.com/pubs/html/` for the latest level.

Configuration Rules

There are a series of “hard” and “soft” rules that define the combinations of IOPs and IOAs supported in an AS/400e system. What is meant by hard and soft rules?

- **Hard rules** are rules and restrictions automatically enforced by the AS/400 Marketing Configurators. The hard rules are documented in “Hard Rules: IOA Capabilities” on page 298, as well as with the individual feature descriptions later in this document.
- **Soft rules** are rules and restrictions on combinations of IOAs that are allowed under a single IOP based on how the IOAs are used. Since these rules are entirely usage dependent, the AS/400 Marketing Configurators cannot enforce them. The soft rules are documented in “Soft Rules: IOA Requirements” on page 302. There are only certain situations where the soft rules need to be used. Those situations are:
  - **High Speed Lines:** On the Two-Line WAN IOA (#4745) or the Two-Line WAN IOA with Modem (#9771) running synchronous PPP, SDLC, Frame Relay, or X.25 where the line speed will be greater than 64 Kbps.
  - **X.25:** On the Two-Line WAN IOA (#4745) or the Two-Line WAN IOA with Modem (#9771) if more than 64 Virtual Circuits are required per IOA.

© Copyright IBM Corp. 2000

  - **Frame Relay:** The Two-Line WAN IOA (#4745) or the Two-Line WAN IOA with Modem (#9771) are to be used for Frame Relay.
  - **SDLC:** If more than 64 controllers are to be attached per line on the Two-Line WAN IOA (#4745) or the Two-Line WAN IOA with Modem (#9771).
  - **IPX:** If IPX protocol is to be used on the Two-Line WAN IOA (#4745), the Two-Line WAN IOA with Modem (#9771), or any LAN IOA.
  - **LAN**: For best performance recommendations for the high speed LAN IOAs (#4838, #2744, or #2743).
  - **ATM:** For best performance recommendations or if there is a need to run multiple emulated LANs on an ATM IOA (#4815, 4816, or #4818).
- The **Integrated Netfinity Server** has a unique set of rules that are separate and distinct from the rules for the other IOPs and IOAs. These rules are described in “Integrated Netfinity Server IOP Rules” on page 305. These rules are automatically enforced by the configurator.

Note

If the configuration rules and restrictions are not fully understood and followed, it is possible to create a hardware configuration that will not work, marginally works, or quits working when a system is upgraded to future software releases.

The intent of this chapter is to provide guidance in configuring IOAs and IOPs so that the system is sized to meet customer expectations. “Configuration Validation Procedure” on page 295 describes a simple method of determining whether the IOAs selected and their usage will overburden a specific IOP.

It should also be noted that this section does not cover the migration towers that can be attached to the Model 8xx server. For configuration rules related to migrated hardware, see the description of the affected features to be migrated in the *iSeries and AS400e System Builder*, SG24-2155.

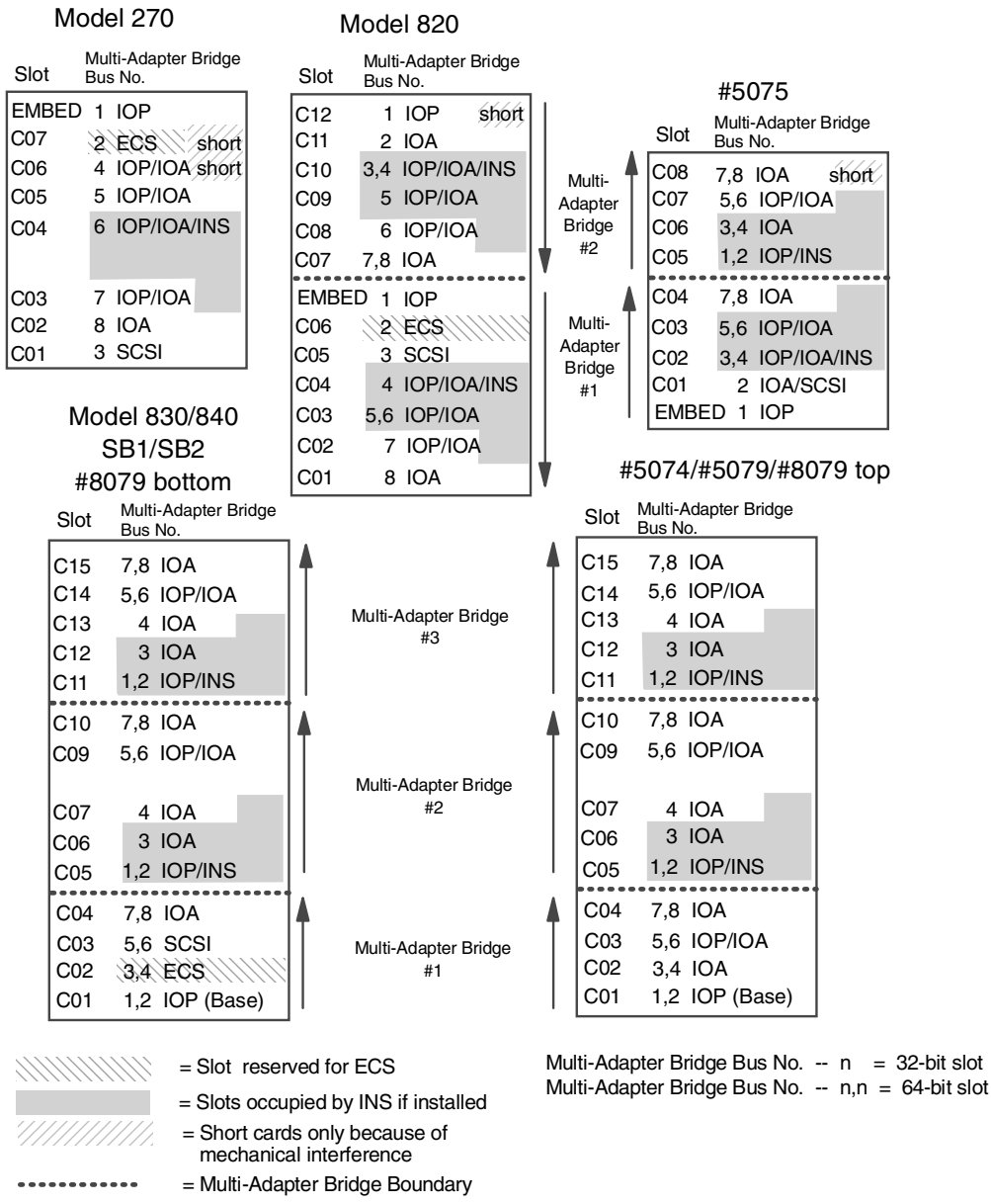
Card Enclosure Layout

This section describes the layout of the card enclosures for the various system and expansion towers. For information on the Migration Towers (#5033, #5034, #5035, and #5077), see the *iSeries and AS400e System Builder*, SG24-2155.

There are several new concepts in the 270 and 8xx systems, such as Multi-Adapter Bridge, Multi-Adapter Bridge Boundaries, and Multi-Adapter Bridge Bus Number. These terms are defined later in this section. Knowledge of these new concepts is required to understand the

card rules defined later in this chapter. All the discussions in this section refer to the following diagram containing the layouts of the various card enclosures.

Card Enclosure Diagrams



PCI and Card Enclosure Concepts

There are several concepts in the PCI implementation that are new to the AS/400e environment. These concepts need to be understood to create and install valid configurations.

For the purpose of this chapter, the term *Multi-Adapter Bridge Bus Number* is used to facilitate the explanation of PCI card plugging rules.

A Multi-Adapter Bridge defines a logical grouping of card slots in the card enclosure. Each Multi-Adapter Bridge contains eight Multi-Adapter Bridge Buses numbered 1 to 8. The sequence does not necessarily correspond with the sequence of card slots in the card enclosure. For example, in the Model 270 diagram on page 293, the embedded IOP is Multi-Adapter Bridge Bus 1, slot C07 is Multi-Adapter Bridge Bus 2, slot C01 is Multi-Adapter Bridge Bus 3, and slot C06 is Multi-Adapter Bridge Bus 4. An IOP addresses the IOAs in sequence by the Multi-Adapter Bridge Bus number, not the slot number. Using the previous example, the Model 270 Embedded IOP would control the IOAs installed in slots C07 and C01 and could control an IOA installed in slot C06 and C05. PCI card installation instructions refer to the slot number and not to the Multi-Adapter Bridge Bus number.

All card enclosures except the Model 270 contain more than one Multi-Adapter Bridge. The divide between these Multi-Adapter Bridges is called a *Multi-Adapter Bridge Boundary*. An IOP may control a maximum of four IOAs installed in higher number Multi-Adapter Bridge Buses, up to another IOP or a Multi-Adapter Bridge Boundary. An IOP must be installed in Multi-Adapter Bridge Bus 1 of a Multi-Adapter Bridge. The Model 270, Model 820, and #5075 Expansion Unit have an IOP embedded on the backplane of the card enclosure that occupies Multi-Adapter Bridge Bus 1 of the first, and in the case of the Model 270 only, Multi-Adapter Bridge.

On all card enclosures, except the Model 270, some slots are 32-bit and other slots are 64-bit. The Model 270 supports 32-bit slots only. When planning for the installation of IOPs and IOAs in the card enclosure, it is required that 64-bit cards only be installed in 64-bit slots with the exception of the Model 270. At the time this edition was published, the #2743 was the only 64-bit IOA offered for the AS/400 system. In the Card Enclosure diagrams on page 293, any card slots that have a single Multi-Adapter Bridge Bus number are 32-bit slots. Card slots that have dual Multi-Adapter Bridge Bus numbers are 64-bit slots.

Certain slots on the Model 270, Model 820, and #5075 Expansion Unit card enclosures on page 293 are labeled “short”. These slots have part of the card slot blocked in the card enclosure. Therefore, only short cards may be installed in these positions. An example is slot C07 in the Model 270 card enclosure. See “Hard Rules: IOA Capabilities” on page 298 for information on which cards are “long” cards and may not be installed in the “short” positions.

When an Integrated Netfinity Server is installed, it occupies two and a half slots except on the Model 270 where it occupies one and a half slots. This means that the card slot immediately following the Integrated Netfinity Server in Multi-Adapter Bridge Bus Number order only accepts “short” cards when the Integrated Netfinity Server is installed. The shortened slot will contain the first LAN IOA controlled by the Integrated Netfinity Server. For example, slot C07 in the Model 830 card enclosure supports “long” cards except when the Integrated Netfinity Server is installed.

One slot in each base model card enclosure shown on page 293 is reserved for an ECS connection. For example, in the Model 830 and 840 slot C02 is the ECS slot. This slot is always controlled by the embedded or base IOP. By default, a #9771 Two-Line WAN with Modem IOA will be installed in the ECS location. A #4745 will be installed in the ECS slot if feature #5544 System Console Attached to the WAN adapter is specified. The #9771 will be moved to another slot.

The RS232/V.24 Port (port 1) of the #9771 can be used for ECS. An appropriate modem and cable must be ordered. The RSRCNAME parameter of the QESLINE and QTILINE line descriptions may need to be manually changed to the resource name assigned to the WAN port of the #9771.

If a #4745 Two-Line WAN IOA is ordered for ECS usage, a modem and cable for ECS must also be ordered. If the #4745 is installed in the ECS slot, the #9771 will be moved to another slot.

One slot in each system card enclosure shown on page 293 is labeled SCSI. The first or only Disk Unit Controller will be installed in this slot and supports the Load Source Disk Unit, base internal tape (if installed), and base CD-ROM. The SCSI card slot is controlled by the embedded or base IOP in a system card enclosure. The Model 270 can, in certain cases, support a second disk unit controller when the #7104 System Unit Expansion is installed. In the #5075, the disk unit controller must be in C01. In the #5074/#5079, the first disk unit controllers must be in slot C02, C03, or C04. There are no restrictions on the placement of further disk unit controllers.

Configuration Validation Procedure

Each IOP and IOA available for the AS/400e server has a set capacity. The utilization of the IOP is affected by the line speed, number of lines, protocol, and various other factors of the selected IOAs it controls. To define a configuration for an IOP to service multiple IOAs, the demand placed on the IOP by the IOA must be accounted for to generate a valid configuration. The Marketing Configurators generate valid configurations that follow all the “hard” rules. When the “soft” rules need to be used due to line speed or protocol, the procedure defined in the following section allows for validation of the proposed customer configurations that have been created using the Marketing Configurators. This allows the

configuration to be adjusted to make allowances for the “soft” rules prior to placing an order. To completely understand this procedure, review the examples provided in “Configuration Validation Examples” on page 305.

Generating a Valid Configuration

To determine whether a specific IOP is capable of supporting the IOAs considered for attachment, use the following procedures to complete the table in “Configuration Validation Form” on page 297:

1. Identify the IOP being considered.
2. Determine the capacity values for the selected IOP using the “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.
3. Identify the IOAs to be controlled by the selected IOP.
4. Determine the capacity requirements of the selected IOAs using the “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form in “Configuration Validation Form” on page 297 on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.
5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the default value for the IOA. When determining the values to use, be sure to account for both lines if you selected the #4745 and #9771.
6. Add the IOA values in each column. Place the totals on line 5.
7. Compare the totals in line 5 with the IOP Capability in line 6.
   - If any number in line 5 is greater than the corresponding value in line 6, the selected IOAs exceed the capacity of the selected IOP. Add one or more IOPs to the configuration to support the selected IOAs.
   - If all the numbers in line 5 are less than or equal to the corresponding values in line 6, the configuration is valid as long as all card rules from “Hard Rules: IOA Capabilities” on page 298 and “Soft Rules: IOA Requirements” on page 302 have been followed.

Configuration Validation Form

Line #	Item	Memory	Performance
1	IOA #1		
2	IOA #2		
3	IOA #3		
4	IOA #4		
5	Total		
6	IOP Capability		

IOP Capacity Table

IOP	Memory Capacity	Performance Capacity
#2843/#9943 PCI IOPModel 820, 830, 840, #5074, #5075 when attached to Model 820. **See Note 1**.	211	100
#2842 PCI IOPModel 270 and #5075 when attached to Model 270 Embedded IOPModel 270 (CCINs 284D and 284E) Embedded IOPModel 820 (CCIN 284C) Embedded IOP#5075 PCI Expansion Tower (CCIN 284B) **See Note 1**.	100	100

Notes:

1. By processor, the #2842 and #2843 may not be installed in the following slots:
   - **Model 270**: C02, C07
   - **Model 820**: C01, C05, C06, C07, C11
   - **Model 830 and 840**: C02, C03, C04, C06, C07, C10, C12, C13, C15
   - **#5074 PCI Expansion Tower**: C02, C04, C06, C07, C10, C12, C13, C15
   - **#5075 PCI Expansion Tower**: C01, C04, C06, C08
2. A maximum of four IOAs are allowed on any IOP.

Hard Rules: IOA Capabilities

IOA	Card Length [8]	Memory	Performance
#2743 PCI 1Gbps Ethernet IOA [1]	Short	2	26
#2744 PCI 100 Mbps Token Ring IOA [2]	Short	25	36
#2749 PCI Ultra Magnetic Media Controller [9]	Short	22	25
#2763 PCI Raid Disk Unit Controller [4, 10, 12, 14]	Long	29	21
#2768 PCI Magnetic Media Controller [9]	Short	22	25
#4723 PCI 10Mbps Ethernet IOA	Short	25	12
#4745 PCI WAN IOA [15]	Short	15	14
#4746 PCI Twinaxial Workstation IOA [15, 16]	Short	10	6
#4748/#9748 PCI Raid Disk Unit Controller [4, 10, 11, 14]	Long	29	21
#4750/#4751 PCI ISDN IOA [6, 17]	Long	25	7
#4761 Integrated Analog Modem [6, 18]	Long	22	7
#4801 PCI Cryptographic Coprocessor [5]	Short	11	18
#4815/#4816/#4818 PCI 155Mbps ATM IOA [2, 3, 14]	Short	35	47
#4838 PCI 100/10Mbps Ethernet [2]	Short	25	36
#9767 PCI Disk Unit Controller (CCIN 2767) [10, 13]	Short	29	21
#9771 Base PCI Two-Line WAN with Modem [7, 15]	Short	15	14

Notes:

1. The #2743 PCI 1 Gbps Ethernet IOA must be placed in a 64-bit slot except on the Model 270 system unit where it is supported in a 32-bit slot. The #2743 may only be combined with a maximum of one other IOA on an IOP. TCP/IP protocol only. IPX protocol is not supported on the #2743. There may be only one #2743 per Multi-Adapter Bridge.
2. A maximum of two of these IOAs (#2744 or #4838) is allowed per IOP. Not more than one #2744 or #4838 is allowed per IOP when this IOP also drives any ATM IOA (#4815, #4816, or #4818).
3. A maximum of one of these IOAs (#4815, #4816, #4818) is allowed per IOP.
4. A maximum of three of these IOAs (#4748, #9748, #2763) is allowed per IOP.

5. #4801 is not allowed to be controlled by the embedded IOP on the Model 270 and 820 or the Base IOP on Model 830, 840, SB2, and SB3.
6. A maximum of one of these IOAs (#4750, #4751, #4761) is allowed per IOP. A maximum of three active communication traces is allowed at one time on these IOAs.
7. Only one #9771 is allowed per system.
   - On Model 270, #9771 must be placed in the ECS slot (C07) or slot C06.
   - On Model 820, #9771 must be placed in the ECS slot (C06) or slot C04.
   - On Model 830/840, #9771 must be placed in the ECS slot (C02) or slot C04.
8. "Long" cards may only be installed in the following slots:

   Model 270: Long slots are C01, C02, C03, C04, and C05. If an Integrated Netfinity Server is installed, slots C03 and C04 are not available.

   Model 820: Long slots are C01, C02, C03, C04, C07, C08, C09, C10 and C11. If Integrated Netfinity Servers are installed, slots C02, C03, and C04, or slots C08, C09, and C10 are not available. Slots C05 and C06 are also long slots but are dedicated to the ECS IOA and Disk Unit Controller IOA.

   Model 830 and 840:
   Long slots are C04, C05, C06, C07, C09, C10, C11, C12, C13, C14, and C15. If Integrated Netfinity Servers are installed, slots C06 and C07, or slots C12 and C13 are not available. Slots C01, C02, and C03 are also long slots but are dedicated to the Base MFIOP, ECS IOA, and Disk Unit Controller IOA.

   #5075 PCI Expansion Tower:
   Long slots are C01, C02, C03, C04, C06, and C07. If Integrated Netfinity Servers are installed, slots C02, C03, and C04, or slots C06 and C07 are not available.

   #5074 PCI Expansion Tower:
   Long slots are C02, C03, C04, C06, C07, C09, C10, C12, C13, C14, and C15. If Integrated Netfinity Servers are installed, slots C06 and C07, or slots C12 and C13 are not available. Slot C01 is also a long slot but it is dedicated to the Base MFIOP.
9. If an external tape device is to be used as an Alternate-IPL device and the #2749 or #2768 is not controlled by the embedded or base IOP on the system, the Dedicated Service Tools (DST) must be used to select the device as an alternate installation device.
10. Maximum disk unit controllers per tower:

    Model 270: One disk unit controller is allowed in the system card enclosure except when a #7104 Disk Enclosure is installed. When the #7104 is installed, two disk unit controllers are allowed in the system unit card enclosure. The first disk unit controller will be in slot C01. Supported controllers are #9767, #2763,

and #4748. The number of disk units ordered and RAID protection requirements will determine which controller is the default. Allowed combinations are shown in the following table.

#9767	#2763	#4748	Total in card enclosure
1	0	0	1
1	1	0	2
0	1	0	1
0	2	0	2
0	0	1	1

Model 820: One disk unit controller is allowed in the card enclosure slot C05. The supported controllers are #9767, #2763, and #4748.

Model 830 and 840:
#9748 Base Disk Unit Controller is automatically included in the card enclosure slot C03. Two additional #4748s are allowed in the card enclosure.

Model SB2/SB3:
One disk unit controller (#9748) required in the system unit slot C03. No other disk unit controllers allowed in the system unit.

#5075 PCI Expansion Tower:
One #2763 or #4748 is allowed. It must go in the card enclosure slot C01.

#5074 PCI Expansion Tower:
Three #4748s are allowed in the card enclosure. The first #4748 must be in slot C02, C03, or C04.

#5079 1.8 m I/O Tower:Functions as two #5074s.

#8079 1.8 m Optional Base I/O Tower:
Functions as one #5074 on top and one #9079 on bottom

11. A maximum of 18 disk units are supported by the #4748. Based on hardware configuration, only the Model 270 allows 18 installed disk units. All other models/towers restrict the number of attached disk units to 15 or less. A maximum of two removable media devices (internal tape or CD-ROM) are supported.
12. Available on Models 270 and 820 only. A maximum of twelve disk units and two removable media devices (internal tape or CD-ROM) are supported.
13. Available on Models 270 and 820 only. Does not support RAID. A maximum of six disk units and two removable media devices (internal tape and CD-ROM) are supported.

14. Not more than one #2763, #4748, or #9748, allowed per IOP when this IOP is also driving any ATM IOAs (#4815, #4816 or #4818).
15. A system console must be selected for each Model 270 and 8xx system unit. There are two options:

    - #5540 System Console Attached to Twinaxial Adapter
    - #5544 System Console Attached to WAN Adapter

    When #5540 is specified, the console function is provided by a twinaxial device attached to port 0 address 0 on the first #4746 encountered in the first or (if available) second Multi-Adapter Bridge in the card enclosure. The #9771 may be used for ECS. However, the #9771 is not selected by default and requires manual configuration to change the RSRCNAME parameter on the QESLINE and QTILINE line descriptions.

    When #5544 is specified, the console function requires a PC running Operations Console attached to the #4745 in the ECS slot.

    The placement of the adapters to support the system console function is defined in the following table.

    Note: #9771 is a required feature and must be controlled by the embedded or base IOP.

Model	#5540		#5544	
270	#9771	C07	#4745	C07
	#4746	C06	#9771	C06
820	#9771	C06	#4745	C06
	#4746	C04, C03 or C11	#9771	C04
830/840	#9771	C02	#4745	C02
	#4746	C04, C06, or C10	#9771	C04

16. Workstations attached to the #4746 are limited to a maximum of 40 unique device addresses per IOA. In addition, the number of active workstation sessions is limited to 120 per IOA.
17. Protocols supported on the #4750 and #4751 remote access ISDN IOAs are:

    - PPP
    - Fax
    - IDLC

18. Protocols supported on the #4761 remote access integrated modem IOA are:

    - SLIP/PPP
    - SDLC (limited to one station per port)
    - Fax

Soft Rules: IOA Requirements

Using any information from this table requires configuration validation.

IOA	Capability/Comment	Memory (per port)	Performance (per port)
#4745 PCI Two-Line WAN IOA #9771 Base PCI Two-Line WAN with Modem [8]	Async up to 115.2Kbps	3	7
	Async-PPP up to 230.4Kbps [1]	3	7
	Bisync up to 64Kbps	1	7
	Synchronous PPP up to 64Kbps	3	7
	Synchronous PPP up to 2048Kbps [1]	3	11
#4745 PCI Two-Line WAN IOA #9771 Base PCI Two-Line WAN with Modem [8]	SDLC up to 32 stations and line speed up to 64Kbps	3	7
	SDLC up to 64 stations and line speed up to 64Kbps	4	7
	SDLC up to 254 stations and line speed up to 64Kbps[12]	7	7
	SDLC up to 32 stations and line speed up to 2048Kbps [1]	3	13
	SDLC up to 64 stations an d line speed up to 2048Kbps [1]	4	13
	SDLC up to 254 stations and line speed up to 2048Kbps [1, 12]	7	13
#4745 PCI Two-Line WAN IOA #9771 Base PCI Two-Line WAN with Modem [8]	Frame Relay line speed up to 64 Kbps [3, 4]	11	7
	Frame Relay line speed up to 64 Kbps with IPX [3, 4, 5]	17	7
	Frame Relay line speed up to 2048 Kbps [1, 3, 4]	11	13
	Frame Relay line speed up to 2048 Kbps with IPX [1, 3, 4, 5]	17	13

IOA	Capability/Comment	Memory (per port)	Performance (per port)
#4745 PCI Two-Line WAN IOA #9771 Base PCI Two-Line WAN with Modem [8]	X.25 up to 32 virtual circuits and line speed up to 64 Kbps [2, 3]	8	7
	X.25 up to 64 virtual circuits and line speed up to 64 Kbps [2, 3]	11	7
	X.25 up to 32 virtual circuits and line speed up to 640 Kbps [1, 2, 3]	8	15
	X.25 up to 64 virtual circuits and line speed up to 640 Kbps [1, 2, 3]	12	15
	X.25 up to 256 virtual circuits and line speed up to 640 Kbps [1, 2, 3]	35	15
#2743 PCI 1Gbps Ethernet IOA [7, 11]	IPX Not Supported [10]	-	-
#2744 PCI 100Mbps Token Ring IOA [7]	IPX [5]	31	72
#4723 PCI 10Mbps Ethernet IOA	IPX [5]	31	24
#4746 PCI Twinaxial Workstation IOA [11]	Maximum Addresses and sessions [9]	-	-
#4838 PCI 100/10Mbps Ethernet IOA [7]	IPX [5]	31	72
#4815/#4816/#4818 PCI 155Mbps ATM IOA [7, 10]	Up to two emulated LANs [6]	89	47

Notes:

1. One High Speed Line is allowed per IOP. If there is a need to support more than one high speed line, the “Configuration Validation Procedure” on page 295 should be used to determine if enough memory and performance capacity is available on the IOP to support more lines. The following are defined as High Speed Lines:

   - Synchronous PPP above 64 Kbps to 2048 Kbps
   - SDLC above 64 Kbps to 2048 Kbps
   - Frame Relay above 64 Kbps to 2048 Kbps
   - X.25 above 64 Kbps to 640 Kbps

   Line speeds greater than 64 Kbps have the following restrictions:

   - Electrical interfaces X.21, V.35, or EIA-449/V.36 must be used
   - 20-foot (6-meter) cables must be used for the X.21 and V.35 interfaces

- "Looped" clocking is required on EIA/449/V.36 cables longer than 20-feet (6-meters)
- "Looped" or "inverted" clocking may be required for line speeds faster than 512 Kbps

Note: The following protocols have limits as noted and are always considered low speed lines:

- Bisync limited to maximum of 64 Kbps
- Async limited to maximum of 115.2 Kbps
- Async/PPP limited to maximum of 230.4 Kbps

When Async-PPP is used at speeds above 115.2Kbps, a high-speed cable must be used.

2. When using X.25 protocol, a maximum of 64 Virtual Circuits are allowed per IOA unless the "Configuration Validation Procedure" on page 295 indicates that enough memory and performance capacity is available on the IOP to support a higher number of virtual circuits.
3. Frame Relay and X.25 are not allowed on the same IOA unless the "Configuration Validation Procedure" on page 295 indicates that enough memory and performance capacity is available on the IOP to support both protocols on the IOP.
4. Frame Relay protocol has the following restrictions.
   - EIA-232/V.24 connection is not supported
   - The line speed must be 56 Kbps or greater
   - One line of Frame Relay is allowed per IOA. If there is a requirement for Frame Relay on both ports, the "Configuration Validation Procedure" on page 295 can be used to determine if enough memory and performance capacity is available on the IOP to support more lines.
5. A maximum of 1400 routes and 1400 services are allowed per line.
6. The "emulated LAN" support for ATM adapters has the following restrictions:
   - A maximum of two "emulated LANs" are supported per IOA.
   - When running two "emulated LANs", the LANs must be of a different type such as one Token Ring and one Ethernet.
7. In general, to provide best performance, we recommend that these IOAs have a dedicated IOP regardless of protocol.
8. The #9771 V.90 port supports Async-PPP protocol only.
9. Workstations attached to the #4746 are limited to a maximum of 40 unique device addresses per IOA. In addition, the number of active workstation sessions is limited to 120 per IOA.
10. IPX is not supported on the ATM IOAs (#4815, #4816, and #4818) or #2743 PCI 1 Gbps Ethernet IOA.
11. Use the Hard Rules values from "Hard Rules: IOA Capabilities" on page 298.

12. When using the SDLC protocol, a maximum of 64 controllers per line is allowed, unless the “Configuration Validation Procedure” on page 295 indicates that enough memory and performance capacity is available on this IOP to support more.

Integrated Netfinity Server IOP Rules

The #2790/2890 Integrated Netfinity Server IOP does not follow the rules for other IOPs and does not provide the same IOA attachment capabilities. The Integrated Netfinity Server has specific slot assignments as shown in “Card Enclosure Diagrams” on page 293.

When the Integrated Netfinity Server is installed, it can control up to three IOAs installed in the next three higher Multi-Adapter Bridge Bus numbers up to the next installed IOP or up to the Multi-Adapter Bridge boundary. The only IOAs supported by the Integrated Netfinity Server are:

- #2744 PCI 100 Mbps Token Ring IOA
- #4838 PCI 100/10Mbps Ethernet IOA

The supported IOAs may be installed in any combination up to a maximum of three. At least one IOA is required. However, referring to “Card Enclosure Diagrams” on page 293, there are limits to the supported IOAs based on the position of the Integrated Netfinity Server in the Multi-Adapter Bridge. For example, in the Model 270 card enclosure, the Integrated Netfinity Server is installed in slot C04. It can control slots C03 and C02 only since those slots have a higher Multi-Adapter Bridge Bus Number. Thus the Integrated Netfinity Server is limited to controlling two IOAs in the Model 270 card enclosure. Similar situations exist in the Model 820 and #5075 Card Enclosures. See “Card Enclosure Layout” on page 292 for specific locations.

Concurrent Maintenance Load Source Movement

If the load source disk unit is mirrored and the load source function is moved to a different IOP, leaving the original load source IOP without the load source function, the original IOP must be reset (reloaded) if additional functions are to be added or run on the IOP.

Configuration Validation Examples

The following examples may be used to more fully understand the Configuration Validation Procedure and the use of the hard and soft rules. Any card positions referenced are for demonstration purposes only. Systems shipped from manufacturing may have different card combinations than those that are shown in these examples.

Example 1: Model 270

In this example, the customer has requested a Model 270 with the following capabilities:

- Six disk arms with RAID-5 Disk Protection
- Electronic Customer Support (ECS)
- Attachment to a 100 Mbps Ethernet at the fastest possible throughput
- Twinax Console #5540

To provide these capabilities, the following IOP and IOA features are required:

- Embedded IOP
- #2842 PCI IOP
- #9771 Base PCI Two-Line WAN with Modem IOA (ECS will be manually configured)
- #4746 PCI Twinax Workstation IOA (provides Twinax Console)
- #2763 PCI RAID Disk Unit Controller (provides RAID-5 Disk Protection)
- #4838 PCI 100/10Mbps Ethernet (provides attachment to 100Mbps Ethernet)

Once the IOPs and IOAs are identified, you can validate the configuration using the procedure from “Generating a Valid Configuration” on page 296, as shown here.

The Embedded MFIOP is examined first:

1. Identify the IOP being considered.

   The Embedded MFIOP is to be used.

2. Determine the capacity values for the selected IOP using the “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.

   The Embedded MFIOP has a memory capacity value of 100 and a performance capacity value of 100. Those values are entered on line 6.

3. Identify the IOAs to be controlled by the selected IOP.

   Because there is a soft rule specifying to place the #4838 on a separate IOP for best performance, the #9771, #4746, and #2763 will be controlled by the Embedded MFIOP.

4. Determine the capacity requirements of the selected IOAs using the “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.

   The appropriate values were entered on lines 1 through 4. The slots that the cards will occupy have also been entered.

5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the default value for the IOA. When determining the values to use, be sure to account for both lines if you have selected the #4745 and #9771.

ECS will be the only protocol used on the #9771. None of the soft rules apply.

6. Add the IOA values in each column. Place the totals on line 5.
7. Compare the totals in line 5 with the IOP Capacity in line 6.

   All the numbers in line 5 are less than or equal to the corresponding values in line 6. Therefore, the configuration is valid.

Line #	Item		Memory	Performance
1	IOA #1	#2763 PCI RAID Disk Unit Controller (Slot C01)	29	21
2	IOA #2	#9771 Base PCI Two-Line WAN with Modem IOA (Slot C07)	15	14
3	IOA #3	#4746 PCI Twinax Workstation IOA (Slot C06)	10	6
4	IOA #4			
5	Total		54	41
6	IOP Capability	Embedded MFIOP	100	100

Now that the validity of the embedded IOP and its associated IOAs has been determined, the second IOP, a #2842, and its associated IOAs have to be checked:

1. Identify the IOP being considered.

   The #2842 PCI IOP is to be used.

2. Determine the capacity values for the selected IOP using “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.

   The #2842 PCI IOP has a memory capacity value of 100 and a performance capacity value of 100. Those values are entered on line 6.

3. Identify the IOAs to be controlled by the selected IOP.

   The #4838 PCI 100/10Mbps Ethernet will be controlled by the #2842.

4. Determine the capacity requirements of the selected IOAs using the “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.

   The appropriate values were entered on lines 1 through 4. The slots that the cards will occupy have also been entered.

5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the

default value for the IOA. When determining the values to use, be sure to account for both lines if you have selected the #4745 and #9771.

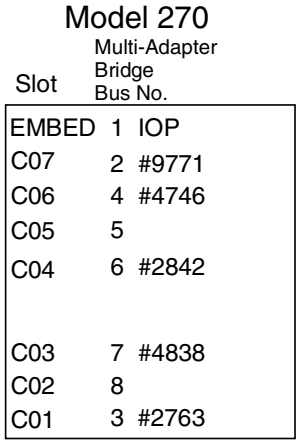
There are no soft rules that apply other than placing the #4838 on a separate IOP for best performance. This rule has been met.

6. Add the IOA values in each column. Place the totals on line 5.
7. Compare the totals in line 5 with the IOP Capacity in line 6.

   All the numbers in line 5 are less than or equal to the corresponding values in line 6, and all hard rules have been followed. Therefore, the configuration is valid.

Line #	Item		Memory	Performance
1	IOA #1	#4838 PCI 100/10Mbps Ethernet (Slot C03)	25	36
2	IOA #2			
3	IOA #3			
4	IOA #4			
5	Total		25	36
6	IOP Capability	#2842 PCI IOP (Slot C04)	100	100

The cards chosen for this example result in a card enclosure populated as shown in the following figure. Note that card slot C02 is empty. An IOA could be placed in that slot later. The table above shows ample memory and performance capability on the IOP. However, doing so would violate the soft rule concerning best performance on a #4838 100/10 Mbps Ethernet IOA.



Example 2: Model 820 with #5074 PCI Expansion Tower

In this example, the customer has requested a Model 820 with the following capabilities:

- 120 GB usable with RAID-5 Disk Protection
- Electronic Customer Support (ECS)
- Attachment to two 100Mbps Ethernet segments (one segment requires best performance)
- Twinax Console #5540
- Support for 240 Twinax Addresses
- Connection to a Frame Relay network using V.35 interface 512 Kbps
- Attachment to two 7208-342 devices, one as the Alternate IPL (Alt-IPL) device
- Connection to SDLC at less than 64 Kbps with 16 stations

To provide these capabilities, the following features are required:

- Model 820 Card Enclosure with embedded IOP
- #5074 PCI Expansion Tower with base #9943 IOP (to hold cards above those supported by the 820 Card Enclosure)
- #9771 Base PCI Two-Line WAN with Modem IOA (for ECS use): It will be manually configured
- #4745 PCI Two-Line WAN IOA Frame Relay and SDLC attachment
- Six #4746 PCI Twinax Workstation IOAs (provides attachment for 240 Twinax device addresses, including Twinax Console)
- Two #4748 PCI RAID Disk Unit Controllers (provides attachment of sixteen 8.58 GB Disk Units and RAID-5 capability)
- Two #4838 PCI 100/10 Mbps Ethernet IOAs (provides attachment to 100 Mbps Ethernet segments)
- Two #2749 Ultra Magnetic Media IOAs (provides attachment of the 7208-342 tape units and the Alt-IPL device)

After reviewing the above list and counting the IOAs (there are fourteen), we can see that at least two additional IOPs are required since an IOP can only support a maximum of four IOAs. The two additional IOPs, when combined with the embedded and base IOPs, will support a theoretical maximum of sixteen IOAs. Looking at the configuration a little closer shows that there are two #4838 100/10 Mbps Ethernet Adapters included. There is a soft rule on page 304 that recommends a separate IOP for each #4838 to achieve best performance. Since we want one #4838 at best performance, we add one more IOP to the order. If three #2843 IOPs are added instead of two, giving a total of five IOPs when combined with the embedded and base IOPs, an even distribution of the IOAs is accomplished at a minimal cost.

Once we have the IOPs and IOAs identified, we can validate the configuration using the procedure from page 296 as shown here.

The Embedded MFIOP in the Model 820 is examined first:

1. Identify the IOP being considered.

   The Embedded MFIOP is to be used.

2. Determine the capacity values for the selected IOP using “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.

   The Embedded MFIOP has a memory capacity value of 100 and a performance capacity value of 100. Those values are entered on line 6.

3. Identify the IOAs to be controlled by the selected IOP.

   The #9771, #4745, #4748, and #2749 will be controlled by the Embedded MFIOP. This is due to the rule concerning card placement when a Twinaxial Console is requested (#18 on page 301) and the requirement for placement of the Alternate-IPL device (#13 on page 299).

4. Determine the capacity requirements of the selected IOAs using the “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form below on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.

   The appropriate values were entered on lines 1 through 4. The slots that the cards will occupy have also been entered.

5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the default value for the IOA. When determining the values to use, be sure to account for both lines if you selected the #4745 and #9771.

   Since Frame Relay will be used on the #4745, the detailed values for the synchronous under 64 Kbps and Frame Relay under 2048 Kbps need to be used to account for the usage on the #4745. Synchronous under 64 Kbps has a memory requirement of 3 and a performance requirement of 7. Frame Relay under 2048 Kbps has a memory requirement of 11 and a performance requirement of 13. Since the memory requirement for the two protocols is less than the memory requirement for the card under the hard rules (11+3 or 14 versus 15), the Hard Rules value is left in the table. The combined performance requirement (7+13 or 20) is greater than the hard rules performance requirement of 14 so those values are entered in the table.

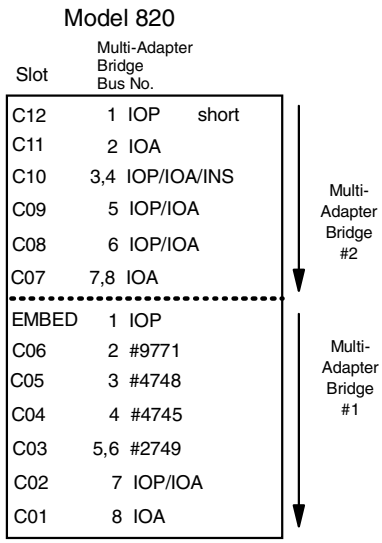
6. Add the IOA values in each column. Place the totals on line 5.

7. Compare the totals in line 5 with the IOP Capacity in line 6.

   All the numbers in line 5 are less than or equal to the corresponding values in line 6. Therefore, the configuration is valid.

Line #	Item		Memory	Performance
1	IOA #1	#4748 PCI RAID Disk Unit Controller (Slot C05)	29	21
2	IOA #2	#9771 Base PCI Two-Line WAN with Modem IOA (Slot C06) Port 1 - ECS	15	14
3	IOA #3	#2749 PCI Ultra Magnetic Media Controller (Slot C03)	22	25
4	IOA #4	#4745 PCI Two-Line WAN IOA (Slot C04) • Port 0 - SDLC • Port 1 - Frame Relay 512Kbps	15	 7 13
5	Total		81	80
6	IOP Capability	Embedded MFIOP	100	100

Once the IOAs specified for the embedded IOP are installed, the Model 820 Card Enclosure will appear as shown in the following figure.

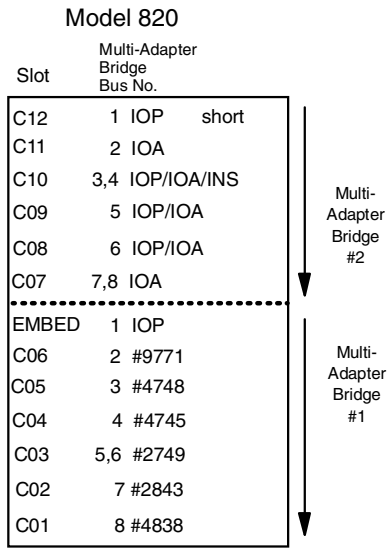


The following features still need to be added to the system:

- Three #2843 PCI IOPs
- #5074 PCI Expansion Tower with base #9943 IOP

- Six #4746 PCI Twinax Workstation IOAs (provides attachment for 240 Twinax device addresses, including the twinax console)
- One #4748 PCI RAID Disk Unit Controllers (provides attachment Disk Units and RAID-5 capability)
- Two #4838 PCI 100/10 Mbps Ethernet IOAs (provides attachment to 100 Mbps Ethernet segments)
- One #2749 Ultra Magnetic Media IOAs (provides attachment of the remaining 7208-342 tape unit)

Examining the card enclosure shown above, slots C02 and C01 are empty. This is a perfect place for a #4838 and the IOP to control it. The procedure doesn't need to be used because a simple examination of the entries for the #2843 in "IOP Capacity Table" on page 297 and the #4838 in "Hard Rules: IOA Capabilities" on page 298 shows there is ample capacity in the #2843 to support the #4838. After installing the #2843 and #4838, the Model 820 card enclosure will appear as shown in the following figure.



Now the following features need to be added to the system:

- Two #2843 PCI IOPs
- #5074 PCI Expansion Tower with base #9943 IOP
- Six #4746 PCI Twinax Workstation IOAs (provides attachment for 240 Twinax device addresses, including Twinax Console)
- One #4748 PCI RAID Disk Unit Controllers (provides attachment of Disk Units and RAID-5 capability)

- One #4838 PCI 100/10 Mbps Ethernet IOAs (provides attachment to 100 Mbps Ethernet segments)
- One #2749 Ultra Magnetic Media IOAs (provides attachment of the remaining 7208-342 tape unit)

Examination of the card enclosure shows that slots C07 through C12 are empty. At this point, the choice of cards and their placement is very flexible. The author has chosen to place three of the #4746s and a #2749 in the remaining slots in the Model 820 card enclosure. The validation of the IOP capabilities is listed here:

1. Identify the IOP being considered.

   A #2843 IOP will be used.

2. Determine the capacity values for the selected IOP using the “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.

   The #2843 IOP has a memory capacity value of 211 and a performance capacity value of 100. Those values are entered on line 6.

3. Identify the IOAs to be controlled by the selected IOP.

   Three #4746s and a #2749 will be controlled by the #2843.

4. Determine the capacity requirements of the selected IOAs using “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.

   The appropriate values were entered on lines 1 through 4. The slots that the cards will occupy have also been entered.

5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the default value for the IOA. When determining the values to use, be sure to account for both lines if you have selected the #4745 and #9771.

   There are no soft rules that apply to the selected cards.

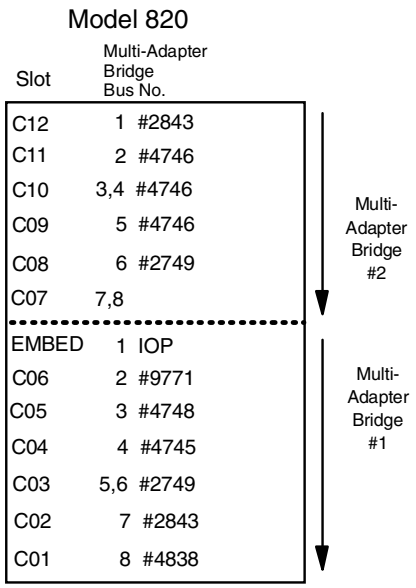
6. Add the IOA values in each column. Place the totals on line 5.

7. Compare the totals in line 5 with the IOP Capacity in line 6.

   All the numbers in line 5 are less than or equal to the corresponding values in line 6. Therefore, the configuration is valid.

Line #	Item		Memory	Performance
1	IOA #1	#4746 Twinaxial Workstation IOA (Slot C11)	10	6
2	IOA #2	#4746 Twinaxial Workstation IOA (Slot C10)	10	6
3	IOA #3	#4746 Twinaxial Workstation IOA (Slot C09)	10	6
4	IOA #4	#2749 Ultra Magnetic Media Controller (Slot C07)	22	25
5	Total		52	43
6	IOP Capability	#2843 IOP (Slot C12)	211	100

Once the IOAs specified for the embedded IOP are installed, the Model 820 Card Enclosure will appear as shown in the following figure.

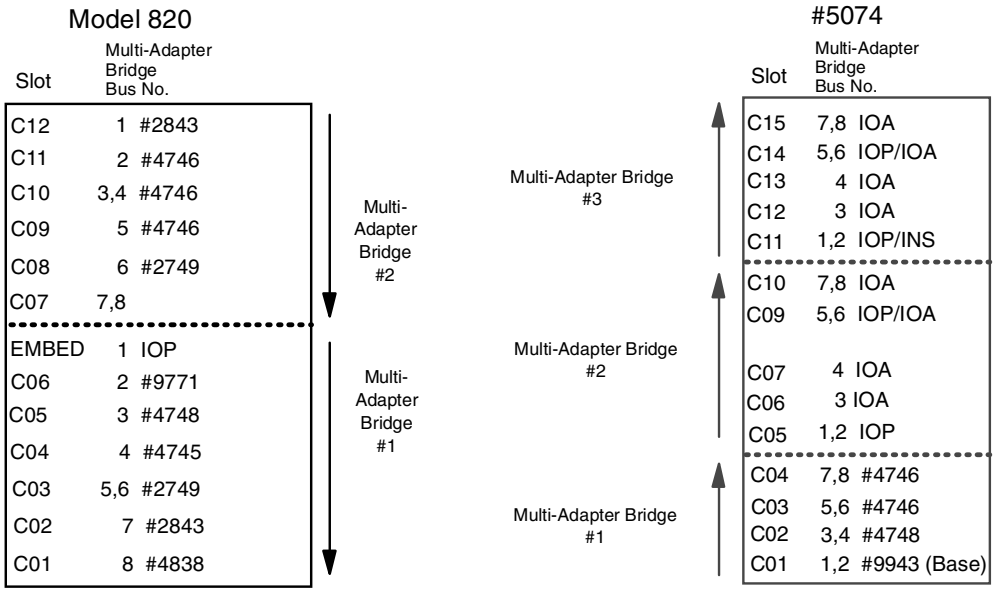


The following features still need to be added to the system:

- One #2843 PCI IOPs
- #5074 PCI Expansion Tower with base #9943 IOP
- Three #4746 PCI Twinax Workstation IOAs (provides attachment for Twinax device addresses)

- One #4848 PCI RAID Disk Unit Controllers (provides attachment Disk Units and RAID-5 capability)
- One #4838 PCI 100/10 Mbps Ethernet IOAs (provides attachment to 100 Mbps Ethernet segment)

At this point, the Model 820 processor cannot support any more cards so the remaining cards have to be placed in the #5074 Expansion Tower. Since a separate IOP is needed for the #4838 and there is a limit to the number of IOAs in the first Multi-Adapter Bridge in the #5074, the #4838 will be placed on the #9943 Base IOP in the #5074. As demonstrated earlier, there is more than enough capacity on the #2843/#9943 for the #4838, the complete validation procedure will not be used. After installation, the configuration will appear as shown in the following figure.



The following features still need to be added to the system:

- One #2843 PCI IOP
- One #4746 PCI Twinax Workstation IOA (provides attachment for Twinax device addresses)
- One #4838 PCI 100/10 Mbps Ethernet IOA

The remaining IOA features will be controlled by the #2843 IOP on in the #5074. The verification that the Base IOP has the capability to support the chosen cards is shown here:

1. Identify the IOP being considered.

   The #2843 Base IOP will be used.

2. Determine the capacity values for the selected IOP using the “IOP Capacity Table” on page 297. Enter the values on line 6 of the Configuration Validation Form.

   The #2843 IOP has a memory capacity value of 211 and a performance capacity value of 100. Those values are entered on line 6.

3. Identify the IOAs to be controlled by the selected IOP.

   One #4746 and one #4838 will be controlled by the #2843 (since one #4838 does not require best performance, it can also be controlled by this #2843).

4. Determine the capacity requirements of the selected IOAs using “Hard Rules: IOA Capabilities” on page 298. Enter the values in the form below on lines 1 through 4, one IOA per line. Remember that an IOP supports a maximum of four IOAs.

   The appropriate values were entered on lines 1 through 4. The slots that the cards will occupy have also been entered.

5. Review “Soft Rules: IOA Requirements” on page 302. If any of the restrictions described apply to the selected IOAs, use the values from the table to replace the values in the Configuration Validation Form unless the value in a particular column is less than the default value for the IOA. When determining the values to use, be sure to account for both lines if you have selected the #4745 and #9771.

   There are no soft rules that apply to the selected cards.

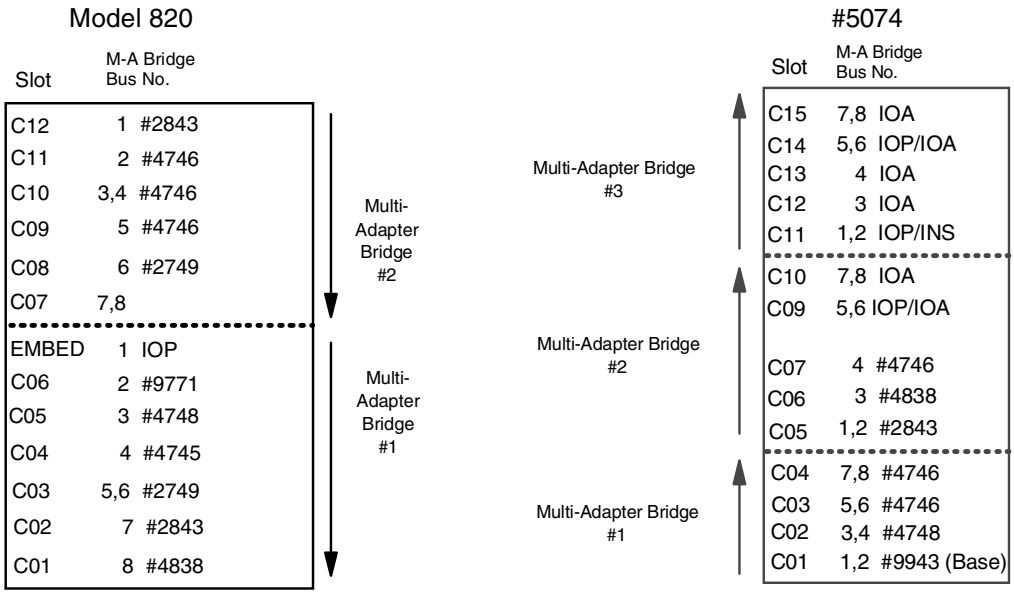
6. Add the IOA values in each column. Place the totals on line 5.

7. Compare the totals in line 5 with the IOP Capacity in line 6.

   All the numbers in line 5 are less than or equal to the corresponding values in line 6. Therefore, the configuration is valid.

Line #	Item		Memory	Performance
1	IOA #1	#4746 Twinaxial Workstation IOA (Slot C06)	10	6
2	IOA #2	#4838 100/10 Mbps Ethernet IOA (Slot C07)	25	36
3	IOA #3			
4	IOA #4			
5	Total		35	42
6	IOP Capability	#2843 PCI IOP (Slot C05)	211	100

Once the IOAs specified for the embedded IOP are installed, the Model 820 Card Enclosure appears as shown in the following figure.



At this point, all the selected features have been added to the system.

Upgrades to iSeries Server 8xx

Upgrades to iSeries Server 8xx

Upgrades to iSeries server 8xx

Upgrades to the 8xx servers can involve a housing change from a CEC to a tower. In some cases, an existing system CEC (on a 7xx system, for example) is converted into an 8xx I/O tower. All towers attached to the existing system CEC remain untouched.

Customers with AS/400e 6xx, 7xx, and Sxx servers (excluding the SB1) can upgrade to the iSeries 400 8xx models. CISC models and RISC systems prior to 6xx models cannot be upgraded to the 8xx models.

No upgrades are offered into the Model 270 from any earlier models, nor can the Model 270 be upgraded into the 8xx models.

AS/400e to iSeries 400 Migration, SG24-6055, provides guidance for upgrading to the iSeries server 8xx.

For software considerations, refer to “Supported Upgrade Paths” on page 537 and “Current Release to Previous Release Support” on page 538.

Interactive Performance Reduction Option for 7xx Servers

In some cases, a supported upgrade path involves a reduction in Interactive CPW ratings. 7xx customers who do not want to keep their current interactive card may reduce their interactive capacity by one level when upgrading to a new 8xx server. This can lower the price paid for the upgrade.

For example, a customer with 1050 Interactive CPW (Interactive Feature #1510) upgrading to an 8xx system can choose a model with a lower Interactive CPW level (for example, 560). Customers choosing this reduction option will be required to repurchase (at full price) any additional Interactive CPW in the future.

Customers are encouraged to review current Interactive CPW utilization with PM/400, Management Central, or other AS/400 Performance Tools prior to exercising this interactive performance reduction option.

The Interactive Performance Reduction Option is available beginning third quarter 2000 for 7xx to 8xx server upgrades.

Upgrade Scenarios

To help you understand what is involved in upgrading to the 8xx servers, this section lists the overall steps involved for selected scenarios.

© Copyright IBM Corp. 2000

From Models 600, 620, 640, and 650

1. Perform a model upgrade.
2. Buy processor feature on the “to” 8xx server.
3. Do a feature conversion from the current processor to an interactive card on the “to” 8xx server.

From Models S10, S20, S30, and S40

1. Perform a model upgrade.
2. Buy an interactive card feature on the “to” 8xx server.
3. Do a processor feature conversion.

From Model S20, S30, and S40 Mixed-mode servers

1. Perform a model upgrade.
2. Do a processor feature conversion.
3. Do an interactive card feature conversion. The configurator will generate an RPO order to add a zero-priced interactive feature specify code to the installed mixed-mode server prior to the upgrade.

From 7xx servers

1. Perform a model upgrade.
2. Do a processor feature conversion.
3. Do an interactive card feature conversion.

From another 8xx server

1. Perform a model upgrade.
2. Do a processor feature conversion.
3. Depending on the “from” and “to” models, an interactive card feature conversion may also be required.

Once within an 8xx server, performance upgrades are simply made through processor or interactive feature conversions.

Migration considerations

- Most I/O supported on V4R1 or later is also supported on the 8xx models
  - Features currently supported in 6xx/7xx systems remain valid on 8xx systems by using a migration tower. Some of these features cannot be ordered on new 8xx systems.
  - Features unique to 8xx servers are installed only in 8xx server system units and expansion units.

  - Features unique to “upgrade from” models are installed in migration and expansion towers attached to 8xx servers.

- No Model 600, 640, 650, S10, S30, S40, 730, or 740 main storage features migrate.
- Some Model 620, S20, and 720 main storage features will migrate to 820 and 830 servers.

Example Model 620, S20, and 720 to Model 820 Upgrade

When upgrading from a Model 620, S20, or 720 to a Model 820, the following rules apply:

- Ship the new 820 system
- Remove the existing processor from the 620 CEC.
- Convert the old system to the #5034 or #5035 Migration Tower I
  - Convert to #5034 if the 620, S20, or 720 has 10 DASD positions
  - Convert to #5035 if 620, S20, or 720 has 15 DASD positions
  - Existing power supply used on #5034/#5035
  - Existing Line cord used on #5034/#5035
  - Replace the existing planar with a new planar
  - Modify the operator panel
  - Add new microcode to the operator panel.
  - Add internal HSL, J-TAG, and ISO cables/assemblies
- Memory
  - Main Storage DIMMs migrate (32 MB DIMMs do not migrate) from an old CEC to an 820 CEC.
  - Base CCIN 3001 (64 MB) does not migrate and is property of the customer.
  - Base CCIN 3002 (256 MB) migrates to 820 CEC. Marketing configurator will add a quantity of two #3000 specify codes to the model upgrade order for administrative purposes. Each #3000 represents one #3002 DIMM.
  - #3001 features do not migrate and belong to the customer.
  - #3002 and #3004 features migrate to the new 820 CEC.
- New power supply shipped with the 820 system.
- New line cord shipped with the 820 system.
- Ship HSL and SPCN cables (must be ordered since they are not included in migration tower conversion)
- Existing DASD remains with and in the #5034/#5035.
- Existing workstation adapters remain with and in the #5034/#5035.
- Existing LAN adapters remain with and in the #5034/#5035.
- Existing expansion towers remain attached (if desired) to the #5034/#5035.
- The modem is not changed.
- If any mirroring specify codes exist, they are migrated and apply to the entire 820 system (“old” side and new).

- If #0044 exists, it is migrated but is treated as #0044 on the “old side” and is treated as #0041 on the new side.

RISC to RISC Data Migration (#0205)

This specify code is used when a customer orders a new (RISC) AS/400e server to replace an existing (RISC) AS/400e. The #0205 is orderable on any initial order iSeries 270 or 8xx model. Preloading Licensed Programs, by manufacturing, is not allowed with the #0205. Manufacturing only loads SLIC up through QSYS of OS/400 when #0205 is ordered.

The #0205 and #5000 are mutually exclusive.

Upgrades to iSeries server 820

Supported upgrades to the 820 models from 6xx, Sxx and 7xx servers are identified here.

Model 820																								
To		2395				2396					2397						2398							
From		1521	1522	1523	1524	1521	1522	1523	1524	1525	1521	1522	1523	1524	1525	1526	1521	1522	1523	1524	1525	1526	1527
600	2129	X	X	X	X																			
	2134	X	X	X	X																			
	2135		X	X	X		X	X	X	X														
	2136		X	X	X		X	X	X	X														
620	2175		X	X	X		X	X	X	X														
	2179			X	X			X	X	X			X	X	X									
	2180			X	X			X	X	X			X	X	X	X								
	2181				X				X	X				X	X	X				X	X	X	X	
	2182									X					X	X					X	X	X	
S10	2118	X	X	X																				
	2119	X	X	X	X	X	X	X	X															

Model 820																								
To		2395				2396					2397						2398							
From		1521	1522	1523	1524	1521	1522	1523	1524	1525	1521	1522	1523	1524	1525	1526	1521	1522	1523	1524	1525	1526	1527
S20																								
2161		X	X	X	X	X	X	X	X															
2163		X	X	X	X	X	X	X	X		X	X	X	X										
2165						X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			
2166											X	X	X	X	X		X	X	X	X	X			
2170	1490						X	X	X	X		X	X	X	X			X	X	X	X			
2177	1491												X	X	X	X			X	X	X	X		
2178	1492													X	X	X				X	X	X	X	X
720																								
2061	1500	X	X	X	X	X	X	X	X		X	X	X	X			X	X	X	X				
	1501	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			
	1502		X	X	X		X	X	X	X		X	X	X	X	X		X	X	X	X	X		
2062	1500					X	X	X	X		X	X	X	X			X	X	X	X				
	1501					X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			
	1502						X	X	X	X		X	X	X	X	X		X	X	X	X	X		
	1503							X	X	X			X	X	X	X			X	X	X	X	X	
2063	1500										X	X	X	X			X	X	X	X				
	1502											X	X	X	X	X		X	X	X	X	X		
	1503												X	X	X	X			X	X	X	X	X	
	1504													X	X	X				X	X	X	X	

Model 820																								
To		2395				2396					2397						2398							
From		1521	1522	1523	1524	1521	1522	1523	1524	1525	1521	1522	1523	1524	1525	1526	1521	1522	1523	1524	1525	1526	1527
2064	1500																X	X	X	X			
	1502																	X	X	X	X	X	
	1503																		X	X	X	X	X
	1504																			X	X	X	X
	1505																				X	X	X

Model 820 Upgrades to 820

Supported model upgrades within the 820 server series are identified here.

To		2395			2396					2397						2398						
From		1522	1523	1524	1521	1522	1523	1524	1525	1521	1522	1523	1524	1525	1526	1521	1522	1523	1524	1525	1526	1527
2395	1521	X	X	X	X	X	X	X		X	X	X	X			X	X	X	X			
	1522		X	X		X	X	X	X		X	X	X	X			X	X	X	X		
	1523			X			X	X	X			X	X	X	X			X	X	X	X	
	1524							X	X				X	X	X				X	X	X	X
2396	1521					X	X	X		X	X	X	X			X	X	X	X			
	1522						X	X	X		X	X	X	X			X	X	X	X		
	1523							X	X			X	X	X	X			X	X	X	X	
	1524								X				X	X	X				X	X	X	X
	1525													X	X					X	X	X

From \ To		2395			2396					2397						2398						
		1522	1523	1524	1521	1522	1523	1524	1525	1521	1522	1523	1524	1525	1526	1521	1522	1523	1524	1525	1526	1527
2397	1521										X	X	X			X	X	X	X			
	1522											X	X	X			X	X	X	X		
	1523												X	X	X			X	X	X	X	
	1524													X	X				X	X	X	X
	1525														X					X	X	X
	1526																				X	X
2398	1521																X	X	X			
	1522																	X	X	X		
	1523																		X	X	X	
	1524																			X	X	X
	1525																				X	X
	1526																					X

Upgrades to iSeries Model 830

Supported upgrades to the 830 servers from 6xx, Sxx, and 7xx systems are identified here.

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
620	2175	X	X	X	X														
	2179		X	X	X														
	2180		X	X	X	X													
	2181			X	X	X													
	2182				X	X				X	X	X				X	X	X	X
640	2237				X	X				X	X	X				X	X	X	
	2238				X	X				X	X	X				X	X	X	X
	2239					X					X	X					X	X	X
650	2188																		X
	2189																		X
S20																			
2161		X	X	X															
2163		X	X	X															
2165		X	X	X	X		X	X	X	X									
2166		X	X	X	X		X	X	X	X			X	X	X	X			
2170	1490	X	X	X	X		X	X	X	X									
2177	1491		X	X	X	X		X	X	X	X			X	X	X	X		
2178	1492			X	X	X			X	X	X	X			X	X	X	X	

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
S30																			
2257		X	X	X	X		X	X	X	X			X	X	X	X			
2258		X	X	X	X		X	X	X	X			X	X	X	X			
2259		X	X	X	X		X	X	X	X			X	X	X	X			
2260							X	X	X	X			X	X	X	X			
2320	1492			X	X	X			X	X	X	X			X	X	X	X	
2321	1493									X	X	X				X	X	X	X
2322	1494									X	X	X				X	X	X	X
S40																			
2207														X	X	X	X		
2208														X	X	X	X		
2340	1495																X	X	X
2341	1496																	X	X
720																			
2061	1500	X	X	X			X	X	X				X	X	X				
	1501	X	X	X	X		X	X	X	X			X	X	X	X			
	1502	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
2062	1500	X	X	X			X	X	X				X	X	X				
	1501	X	X	X	X		X	X	X	X			X	X	X	X			
	1502	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
	1503		X	X	X	X		X	X	X	X	X		X	X	X	X	X	

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
2063	1500	X	X	X			X	X	X				X	X	X				
	1502	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
	1503		X	X	X	X		X	X	X	X	X		X	X	X	X	X	
	1504			X	X	X			X	X	X	X			X	X	X	X	X
2064	1500						X	X	X				X	X	X				
	1502						X	X	X	X	X		X	X	X	X	X		
	1503							X	X	X	X	X		X	X	X	X	X	
	1504								X	X	X	X			X	X	X	X	X
	1505									X	X	X				X	X	X	X
730																			
2065	1506	X	X	X	X		X	X	X	X			X	X	X	X			
	1507	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
	1508		X	X	X	X		X	X	X	X	X		X	X	X	X	X	
	1509			X	X	X			X	X	X	X			X	X	X	X	X
2066	1506	X	X	X	X		X	X	X	X			X	X	X	X			
	1507	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		
	1508		X	X	X	X		X	X	X	X	X		X	X	X	X	X	
	1509			X	X	X			X	X	X	X			X	X	X	X	X
	1510				X	X				X	X	X				X	X	X	X

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
2067	1506						X	X	X	X			X	X	X	X			
	1508							X	X	X	X	X		X	X	X	X	X	
	1509								X	X	X	X			X	X	X	X	X
	1510									X	X	X				X	X	X	X
	1511										X	X					X	X	X
2068	1506						X	X	X	X			X	X	X	X			
	1508							X	X	X	X	X		X	X	X	X	X	
	1509								X	X	X	X			X	X	X	X	X
	1510									X	X	X				X	X	X	X
	1511										X	X					X	X	X
740																			
2069	1514												X	X	X	X	X		
	1510															X	X	X	X
	1511																X	X	X
	1512																	X	X
2070	1514												X	X	X	X	X		
	1510															X	X	X	X
	1511																X	X	X
	1512																	X	X
	1513																	X	X

8xx Upgrades to 830

Supported model upgrades within the 830 servers are identified here.

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
2395	1521	X	X	X			X	X	X										
	1522	X	X	X	X		X	X	X	X									
	1523		X	X	X	X		X	X	X	X								
	1524			X	X	X			X	X	X	X							
2396	1521	X	X	X			X	X	X				X	X	X				
	1522	X	X	X	X		X	X	X	X			X	X	X	X			
	1523		X	X	X	X		X	X	X	X			X	X	X	X		
	1524			X	X	X			X	X	X	X			X	X	X	X	
	1525				X	X				X	X	X				X	X	X	X
2397	1521						X	X	X				X	X	X				
	1522						X	X	X	X			X	X	X	X			
	1523							X	X	X	X			X	X	X	X		
	1524								X	X	X	X			X	X	X	X	
	1525									X	X	X				X	X	X	X
	1526										X	X					X	X	X

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
2398	1521												X	X	X				
	1522												X	X	X	X			
	1523													X	X	X	X		
	1524														X	X	X	X	
	1525															X	X	X	X
	1526																X	X	X
	1527																	X	X
830																			
2400	1531		X	X	X		X	X	X	X			X	X	X	X			
	1532			X	X	X		X	X	X	X			X	X	X	X		
	1533				X	X			X	X	X	X			X	X	X	X	
	1534					X				X	X	X				X	X	X	X
	1535										X	X					X	X	X
2402	1531							X	X	X			X	X	X	X			
	1532								X	X	X			X	X	X	X		
	1533									X	X	X			X	X	X	X	
	1534										X	X				X	X	X	X
	1535											X					X	X	X
	1536																	X	X

Model 830																			
To		2400					2402						2403						
From		1531	1532	1533	1534	1535	1531	1532	1533	1534	1535	1536	1531	1532	1533	1534	1535	1536	1537
2403	1531													X	X	X			
	1532														X	X	X		
	1533															X	X	X	
	1534																X	X	X
	1535																	X	X
	1536																		X
	1537																		

Upgrades to iSeries Model 840

Supported upgrades to the 840 servers from 6xx, Sxx, and 7xx systems are identified here.

Model 840																	
To		2418							2420								
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
640	2237			X	X	X										
	2238				X	X	X									
	2239					X	X	X								
650	2240					X	X	X					X	X	X	X
	2243						X	X						X	X	X
	2288						X	X						X	X	X
	2289						X	X						X	X	X

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
S30																
2257		X	X	X												
2258		X	X	X												
2259		X	X	X												
2260		X	X	X					X	X	X					
2320	1492		X	X	X	X										
2321	1493			X	X	X	X				X	X	X	X		
2322	1494			X	X	X	X				X	X	X	X		
S40																
2256		X	X	X					X	X	X					
2261		X	X	X					X	X	X					
2207		X	X	X	X				X	X	X	X				
2208		X	X	X	X				X	X	X	X				
2340	1495				X	X	X	X				X	X	X	X	X
2341	1496					X	X	X					X	X	X	X
730																
2065	1506	X	X	X					X	X	X					
	1507	X	X	X	X				X	X	X	X				
	1508	X	X	X	X	X			X	X	X	X	X			
	1509		X	X	X	X	X			X	X	X	X	X		

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
2066	1506	X	X	X					X	X	X					
	1507	X	X	X	X				X	X	X	X				
	1508	X	X	X	X	X			X	X	X	X	X			
	1509		X	X	X	X	X			X	X	X	X	X		
	1510			X	X	X	X	X			X	X	X	X	X	X
2067	1506	X	X	X					X	X	X					
	1508	X	X	X	X	X			X	X	X	X	X			
	1509		X	X	X	X	X			X	X	X	X	X		
	1510			X	X	X	X	X			X	X	X	X	X	X
	1511				X	X	X	X				X	X	X	X	X
2068	1506	X	X	X					X	X	X					
	1508	X	X	X	X	X			X	X	X	X	X			
	1509		X	X	X	X	X			X	X	X	X	X		
	1510			X	X	X	X	X			X	X	X	X	X	X
	151				X	X	X	X				X	X	X	X	X
740																
2069	1514	X	X	X	X				X	X	X	X				
	1510			X	X	X	X	X			X	X	X	X	X	X
	1511				X	X	X	X				X	X	X	X	X
	1512					X	X	X					X	X	X	X

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
2070	1514	X	X	X	X				X	X	X	X				
	1510			X	X	X	X	X			X	X	X	X	X	X
	1511				X	X	X	X				X	X	X	X	X
	1512					X	X	X					X	X	X	X
	1513					X	X	X					X	X	X	X

Model 8xx Upgrade to 840

Supported model upgrades within the 8xx systems are identified here.

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
820																
2397	1521	X	X						X	X						
	1522	X	X	X					X	X	X					
	1523	X	X	X	X				X	X	X	X				
	1524		X	X	X	X				X	X	X	X			
	1525			X	X	X	X				X	X	X	X		
	1526				X	X	X	X				X	X	X	X	X

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
2398	1521	X	X						X	X						
	1522	X	X	X					X	X	X					
	1523	X	X	X	X				X	X	X	X				
	1524		X	X	X	X				X	X	X	X			
	1525			X	X	X	X				X	X	X	X		
	1526				X	X	X	X				X	X	X	X	X
	1527					X	X	X					X	X	X	X
830																
2400	1531	X	X	X					X	X	X					
	1532	X	X	X	X				X	X	X	X				
	1533		X	X	X	X				X	X	X	X			
	1534			X	X	X	X				X	X	X	X		
	1535				X	X	X	X				X	X	X	X	X
2402	1531	X	X	X					X	X	X					
	1532	X	X	X	X				X	X	X	X				
	1533		X	X	X	X				X	X	X	X			
	1534			X	X	X	X				X	X	X	X		
	1535				X	X	X	X				X	X	X	X	X
	1536					X	X	X					X	X	X	X

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
2403	1531	X	X	X					X	X	X					
	1532	X	X	X	X				X	X	X	X				
	1533		X	X	X	X				X	X	X	X			
	1534			X	X	X	X				X	X	X	X		
	1535				X	X	X	X				X	X	X	X	X
	1536					X	X	X					X	X	X	X
	1537						X	X						X	X	X
840																
2418	1540		X	X	X				X	X	X	X				
	1541			X	X	X				X	X	X	X			
	1542				X	X	X				X	X	X	X		
	1543					X	X	X				X	X	X	X	X
	1544						X	X					X	X	X	X
	1545							X						X	X	X
	1546														X	X

Model 840																
To		2418							2420							
From		1540	1541	1542	1543	1544	1545	1546	1540	1541	1542	1543	1544	1545	1546	1547
2420	1540									X	X	X				
	1541										X	X	X			
	1542											X	X	X		
	1543												X	X	X	X
	1544													X	X	X
	1545														X	X
	1546															X
	1547															

Model 270 Upgrades

Model 270								
To		2248	2250		2252		2253	
From		1517	1516	1518	1516	1519	1516	1520
2248	1517			X		X		X
2250	1516			X	X	X	X	X
	1518					X		X
2252	1516					X	X	X
	1519							X
2253	1516							X
	1520							

Dedicated Server for Domino Upgrades

Dedicated Servers for Domino							
	To	270			820		
From		2422	2423	2424	2425	2426	2427
270	2422		X	X			
	2423			X			
	2424						
820	2425					X	X
	2426						X
	2427						

Internal Storage

Internal Storage

Internal Magnetic Media

PCI Disk Units

PCI disk support is summarized in the following table.

PCI Internal Disks			System and Expansion Units Supported						RAID/ Mirror [1]
Feature	Description	Bytes	250	270	8xx	#5074 #5075 #5079	#503x	#5065 #5066	
#1312	1.03 GB Disk Kit	1					S		B / 5
#1313	1.96 GB Disk Kit	1					S		A / 4
#1322	1.03 GB Disk Kit	2					S		B / 5
#1323	1.96 GB Disk Kit	2					S		A / 4
#1325	1.03 GB Disk Kit	2					S		B / 5
#1326	1.96 GB Disk Kit	2					S		A / 4
#1327	4.19 GB Disk Kit	2					S		C / 6
#1333	8.53 GB Disk Kit	2					S		D / 7
#1334	17.54 GB Disk Kit	2					S		E / 8
#1336	1.96 GB Disk Kit	2					S		A / 4
#1337	4.19 GB Disk Kit	2					S		C / 6
#4308	4.19 GB Disk Unit	2						S	F / 6
#4314	8.58 GB Disk Unit	2		N	N	N		M	G / 7
#4317	8.58 GB Disk Unit	2		N	N	N		M	G / 7
#4318	17.54 GB Disk Unit	2		N	N	N		M	H / 8
#4324	17.54 GB Disk Unit	2		N	N	N		M	H / 8
#4331	1.6 Gb Read Cache Device	2		N	N	N		M	

© Copyright IBM Corp. 2000

#6806	1.96 GB Disk Unit	2					S		A / 4
#6807	4.19 GB Disk Unit	2					S		C / 6
#6813	8.58 GB Disk Unit	2	N				M		D / 7
#6817	8.58 GB 10K RPM Disk Unit	2	N				M		D / 7
#6818	17.54 GB 10K RPM Disk Unit	2	N				M		E / 8
#6824	17.54 GB Disk Unit	2	N				M		E / 8
#6831	1.6 Gb Read cache Device	2	N				M		
#8813	Opt. Base 8.58 GB Disk Unit	2					S		D / 7
#8817	Opt. Base 8.58 GB Disk Unit	2					S		D / 7
#8818	Opt. Base 17.54 GB Disk Unit	2					S		E / 8
#8824	Opt. Base 17.54 GB Disk Unit	2					S		E / 8
#8917	Opt. Base 8.58 GB Disk Unit	2	N						D / 7
#8918	Opt. Base 17.54 GB Disk Unit	2	N						E / 8
#8924	Opt. Base 17.54 GB Disk Unit	2	N						E / 8
#9313	Base 8.58 GB Disk Unit	2	N						D / 7

Notes:

1. Like lettered disks can be part of the same RAID array, and like numbered disks can mirror each other.

N Available as a new disk.
M Available via MES only.
S Supported but not orderable.

SPD Disk Units

SPD internal disk support is summarized in the following table.

SPD Internal Disks			System and Expansion Units Supported					RAID / Mirror[1]
Feature	Description	Bytes	#5077	#5052	#5057 #5058	#5082	#5055 #5083	
#1602	1.03 GB Single Disk Kit	1	S	S [2]	S[2]	S	S	B / 5
#1603	1.96 GB Single Disk Kit	1	S	S [2]	S[2]	S	S	A / 4
#6605 #6652	1.03 GB Disk Unit	2	S	S	S	S	S	B / 5
#6606 #6650	1.96 GB Disk Unit	2	S	S	S	S	S	A / 4
#6607	4.19 GB Disk Unit	2	S	S	S	S	S	C / 6
#6713	8.85 GB Disk Unit	2	N	X [3]	X	X [3]	X	D / 7
#6714	17.54 GB Disk Unit	2	N	X [3]	X	X [3]	X	E / 8
#6717	8.58 GB Disk Unit	2	N	X [3]	X	X [3]	X	D / 7
#6718	17.54 GB Disk Unit	2	N	X [3]	X	X [3]	X	E / 8
#6906	1.96 GB Disk Unit	2	S	S [3]	S	S [3]	S	B / 5
#6907	4.19 GB Disk Unit	2	S	S [3]	S	S [3]	S	C / 6
#7607	Base 4.19 GB Disk Unit	2	S	S	S	S	S	C / 6
#7713	Base 8.85 GB Disk Unit	2	S	S [3]	S	S [3]	S	D / 7
#8617	Base 8.58 GB Disk unit	2	S	S [3]	S	S [3]	S	D / 7
#8618	Base 17.54 GB Disk Unit	2	S	S [3]	S	S [3]	S	E / 8
#8713	Base 8.85 GB Disk Unit	2	S	S [3]	S	S [3]	S	D / 7
#8714	Base 17.54 GB Disk Unit	2	S	S [3]	S	S [3]	S	E / 8
#9606	Base 1.96 GB Disk Unit	2	S	S	S	S	S	A / 4
#9707	Base 4.19 GB Disk Unit	2	S	S	S	S	S	C / 6
#9907	Base 4.19 GB Disk Unit	2	S	S [3]	S	S [3]	S	C / 6

Notes:

1. Like lettered disks can be part of the same RAID array, and like numbered disks can mirror each other.
2. Single-byte disks cannot be placed into slots K8 through K16. In the case of the #5055 System Expansion Unit, single-byte disks cannot be placed into any slots.
3. Not Ultra-SCSI or Ultra2 SCSI when attached to this storage expansion unit.

N Available as a new disk.

S Supported but not orderable.

X Available as a migrated disk.

Disk Units

This section outlines a comparison of disk storage specifications and provides disk unit descriptions.

Disk Storage Specifications Comparison

The following tables show the specifications of both the earlier and current IBM internal disk technologies that are supported on the iSeries and AS/400e servers.

Disk Type	Disk Diameter	Capacity	Avg. Seek Time	Average Latency	RPM	Data-Rate (Burst)	Areal Density (M/inch)	Read Ahead Cache
#4308	3.5"	4190 MB	R 6.5 ms W 8.0 ms	4.17 ms	7200	40 MB/s	1109 to 1253	1 MB
#4314	3.5"	8580 MB	R 6.5 ms W 7.5 ms	4.17 ms	7200	40 MB/s	1109 to 1253	1 MB
#4317	3.5"	8580 MB	R 5.3 ms W 6.3 ms	2.99 ms	10 K	80 MB/s	1353 to 2024	4 MB
#4318	3.5"	17548 MB	R 4.9 ms W 5.9 ms	2.99 ms	10 K	80 MB/s	3197 to 3535	2 MB
#4324	3.5"	17548 MB	R 7.0 ms W 8.0 ms	4.17 ms	7200	40 MB/s	3025	1.79 MB
#6605	3.5"	1031 MB	7.8ms	4.17 ms	7200	20 MB/s	562	512 KB
#6606	3.5"	1967 MB	7.8ms	4.17 ms	7200	20 MB/s	532	512 KB
#6607	3.5"	4194 MB	8.3ms	4.17 ms	7200	20 MB/s	829	512 KB
#6650	3.5"	1967 MB	9.5ms	5.56 ms	5400	20 MB/s	354	512 KB
#6652	3.5"	1031 MB	8.9ms	5.56 ms	5400	20 MB/s	354	512 KB

Disk Type	Disk Diameter	Capacity	Avg. Seek Time	Average Latency	RPM	Data-Rate (Burst)	Areal Density (M/inch)	Read Ahead Cache
#6713	3.5"	8589 MB	8.3ms	4.17 ms	7200	40 MB/s	829	1024 KB
#6714	3.5"	17548 MB	8.5ms	4.17 ms	7200	40 MB/s	1253	1024 KB
#6717	3.5"	8580 MB	R 5.3 ms W 6.3 ms	2.99 ms	10 K	40 MB/s	1353 to 2024	4 MB
#6718	3.5"	17548 MB	R 4.9 ms W 5.9 ms	2.99 ms	10 K	40 MB/s	3197 to 3535	2 MB
#6806	3.5"	1967 MB	7.8ms	4.17ms	7200	40 MB/s	532	512 KB
#6807	3.5"	4194 MB	8.3ms	4.17ms	7200	40 MB/s	829	512 KB
#6813	3.5"	8589 MB	8.3ms	4.17ms	7200	40 MB/s	829	1024 KB
#6817	3.5"	8580 MB	R 5.3 ms W 6.3 ms	2.99 ms	10 K	40 MB/s	1353 to 2024	4 MB
#6818	3.5"	17548 MB	R 4.9 ms W 5.9 ms	2.99 ms	10 K	40 MB/s	3197 to 3535	2 MB
#6824	3.5"	17548 MB	8.5ms	4.17ms	7200	40 MB/s	1253	1024 KB
#6906	3.5"	1967 MB	7.8ms	4.17ms	7200	40 MB/s	532	512 KB
#6907	3.5"	4194 MB	8.3ms	4.17ms	7200	40 MB/s	829	512 KB
#8617	3.5"	8580 MB	R 5.3 ms W 6.3 ms	2.99 ms	10 K	40MB/s	1353 to 2024	4M
#8618	3.5"	17548 MB	R 4.9 ms W 5.9 ms	2.99 ms	10 K	40 MB/s	3197 to 3535	2 MB
#8813	3.5"	8589 MB	8.3ms	4.17ms	7200	40 MB/s	829	1024 KB
#8817	3.5"	8580 MB	R 5.3 ms W 6.3 ms	2.99 ms	10 K	40 MB/s	1353 to 2024	4MB
#8818	3.5"	17548 MB	R 4.9 ms W 5.9 ms	2.99 ms	10 K	40 MB/s	3197 to 3535	2 MB
#8824	3.5"	17548 MB	8.5ms	4.17ms	7200	40 MB/s	1253	1024 KB
#9707	3.5"	4194 MB	8.3ms	4.17ms	7200	40 MB/s	829	512 KB

Disk Unit Descriptions

#1312 One-Byte 1.03 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.03 GB one-byte SCSI disk unit to 7xx systems.

#1313 One-Byte 1.96 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.96 GB one-byte SCSI disk unit to 7xx systems.

#1322 Two-Byte 1.03 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.03 GB two-byte SCSI disk unit to 7xx systems.

#1323 Two-Byte 1.96 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.96 GB two-byte SCSI disk unit to 7xx systems.

#1325 Two-Byte 1.03 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.03 GB two-byte SCSI disk unit to 7xx systems.

#1326 Two-Byte 1.96 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.96 GB two-byte SCSI disk unit to 7xx systems.

#1327 Two-Byte 4.19 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 4.19 GB two-byte SCSI disk unit to 7xx systems.

#1333 Two-Byte 8.58 GB Disk Unit Conversion Kit (Ultra SCSI)

Provides the hardware for migrating one 8.58 GB two-byte SCSI disk unit to 7xx systems.

#1334 Two-Byte 17.54 GB Disk Unit Conversion Kit (Ultra SCSI)

Provides the hardware for migrating one 17.54 GB two-byte SCSI disk unit to 7xx systems.

#1336 Two-Byte 1.96 GB Disk Unit Conversion Kit (Ultra SCSI)

Provides the hardware for migrating one 1.96 GB two-byte SCSI disk unit to 7xx systems.

#1337 Two-Byte 4.19 GB Disk Unit Conversion Kit (Ultra SCSI)

Provides the hardware for migrating one 4.19 GB two-byte SCSI disk unit to 7xx systems.

#1602 One-Byte 1.03 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.03 GB one-byte SCSI disk unit to 7xx systems,

#1603 One-Byte 1.96 GB Disk Unit Conversion Kit

Provides the hardware for migrating one 1.96 GB one-byte SCSI disk unit to 7xx systems.

#4308 Two-Byte 4.19 GB Disk Unit Ultra SCSI

This feature provides 4.19 GB of disk capacity and an Ultra SCSI interface. Supported in migration towers only. This is a CIF.

#4314 Two-Byte 8.58 GB Disk Unit Ultra

This feature provides 8.58 GB of disk capacity and an Ultra SCSI interface. This is a CIF.

#4317 Two-Byte 8.58 GB 10k RPM Disk Unit Ultra2

This feature provides 8.58 GB of disk capacity and an Ultra2 SCSI interface. This is a CIF.

#4318 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra2

This feature provides 17.54 GB of disk capacity and an Ultra2 SCSI interface. This is a CIF.

#4324 Two-Byte 17.54 GB Disk Unit Ultra

This feature provides 17.54 GB of disk capacity and an Ultra SCSI interface. This is a CIF.

#4331 1.6 Gb Read Cache Device

The #4331 is a 1.6-inch high solid state disk device that provides 1.6 Gb of capacity for Large Read Cache function required by high performance disk unit controllers. This #4331 feature has CCIN number 6731 and is a CIF.

#6605 1.03 GB Two-Byte Disk Unit

Provides a 3 ½-inch single disk unit with 1.03 GB capacity for additional disk storage.

#6606 1.96 GB Two-Byte Disk Unit

Provides a 3 ½-inch single disk unit with 1.96 GB capacity for additional disk storage.

#6607 4.19 GB Two-Byte Disk Unit

Provides a 3 ½-inch single disk unit with 4.19 GB capacity for additional disk storage.

#6650 1.96 GB Two-Byte Disk Unit

Provides a 3 ½-inch single disk unit with 1.96 GB capacity for additional disk storage.

#6652 1.03 GB Two-Byte Disk Unit

Provides a 3 ½-inch single disk unit with 1.03 GB capacity for additional disk storage.

#6713 8.58 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 8.58 GB capacity for additional disk storage.

#6714 17.54 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 17.54 GB capacity for additional disk storage.

#6717 Two-Byte 8.58 GB 10k RPM Disk Unit Ultra

These features provide 8.58 GB of disk capacity and Ultra SCSI interface. Requires an Ultra2 SCSI storage slot for best performance. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#6718 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra

These features provide 17.54 GB of disk capacity and Ultra SCSI interface. Requires an Ultra2 SCSI storage slot for best performance. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#6806 1.96 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 1.96 GB capacity for additional disk storage.

#6807 4.19 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 4.19 GB capacity for additional disk storage.

#6813 8.58 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 8.58 GB capacity for additional disk storage.

#6817 Two-Byte 8.58 GB 10k RPM Disk Unit Ultra

This feature provides 8.58 GB of high performance (10k RPM) disk capacity with an Ultra SCSI (LVD) interface. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#6818 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra

This feature provides 17.54 GB of high performance (10k RPM) disk capacity with a Ultra SCSI (LVD) interface. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#6824 17.54 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 17.54 GB capacity for additional disk storage.

#6831 1.6 Gb Read Cache Device

The #6831 is a 1.6-inch high solid state disk device which provides 1.6 Gb of capacity for Large Read Cache function required by high performance disk unit controllers. This #6831 feature has CCIN number 6731.

#6906 1.96 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 1.96 GB capacity for additional disk storage.

#6907 4.19 GB Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 4.19 GB capacity for additional disk storage.

#8617 Optional Base Two-Byte 8.58 GB 10k RPM Disk Unit Ultra

Provides 8.58 GB of disk capacity and an Ultra SCSI interface. Requires an Ultra2 SCSI storage slot for best performance. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#8618 Optional Base Two-Byte 17.54 GB 10k RPM Disk Unit Ultra

Provides 17.54 GB of disk capacity and an Ultra SCSI interface. Requires an Ultra2 SCSI storage slot for best performance. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#8713 8.58 GB Optional Base Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 8.58 GB capacity as an optional base disk.

#8714 17.54 GB Optional Base Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 17.54 GB capacity as an optional base disk unit.

#8813 8.58 GB Optional Base Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 8.58 GB capacity as an optional base disk unit.

#8817 Optional Base Two-Byte Disk Unit 8.58 GB 10k RPM Disk Unit Ultra

This feature provides 8.589 GB of high performance (10k RPM) disk capacity with an Ultra SCSI (LVD) interface. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#8818 Optional Base Two-Byte Disk Unit 17.54 GB 10k RPM Disk Unit Ultra

This feature provides 17.54 GB of high performance (10k RPM) disk capacity with an Ultra SCSI (LVD) interface. This disk unit is not supported on disk controllers #6502/#6512/#6530.

#8824 17.54 GB Optional Base Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 17.54 GB capacity as an optional base disk.

#9606 1.967 GB Base Disk Unit

Provides a 3 ½-inch single disk unit with 1.967 GB capacity as base disk unit.

#9707 4.19 GB Base Two-Byte Disk Unit (Ultra SCSI)

Provides a 3 ½-inch single disk unit with 4.19 GB capacity as a PCI base disk unit.

#9907 4.19 GB Base Two-Byte Disk Unit (Ultra SCSI)

The default SPD base disk unit provides a 3 ½-inch single disk unit with 4.19 GB capacity.

Disk Protection

AS/400e disk drives can be protected by using several functions, which are discussed in the following section.

Device Parity Protection

Device parity protection is a hardware function that protects data from being lost because of a disk unit failure or damage to a disk. Calculating and saving a parity value for each bit of data protects data. Conceptually, the parity value is computed from the data at the same location on each of the other disk units in the device parity set. When a disk failure occurs, the data on the failing unit can be reconstructed by using the saved parity value and the values of the bits in the same locations on the other disk.

Device parity protection is a high-availability function. It allows the AS/400 system to continue to operate when a single disk failure has occurred. The system continues to run in an exposed mode until the repair operation is complete and the data is rebuilt. If a failure occurs, you should correct the problem quickly. In the unlikely event that another disk fails, you can lose data.

The base disk unit controller in the 9406 Model 250, Model 270, and Model 820 does not support Device Parity Protection.

The disk array subsystems that are supplied by IBM enhance the selection of recovery options available on the AS/400e server. This method of protection is based on the

Redundant Array of Independent Disks (RAID) specifications that were published by the University of California in 1987. The high-availability models with Device Parity Protection use a technique similar to RAID-5 data-redundancy technology to protect data. Throughout this documentation, RAID and RAID-5 are often referenced, and are for the most part, synonymous with Device Parity Protection.

RAID-5

A minimum of four disk units of the same capacity are required for a valid RAID-5 configuration. Parity information can be spread across four or eight of the disk units in an array and is automatically maintained as part of the RAID-5 protection feature. Internal disk units of different technology (that is, different feature numbers), but of the same capacity, can be either mirrored or RAID-5 protected.

Having parity spread across eight disk units gives better performance in the event of a disk unit failure since the data required to dynamically rebuild the data on the failed disk is accessed from an eighth of the disk units as opposed to a quarter. If one disk unit fails, it cannot be used to read or write data. The disk unit controller then reads the parity and data from the same data areas as the other disk units to dynamically rebuild the original data from the failed disk unit to satisfy ongoing read requests. When data needs to be written, the controller generates the parity information for the failed disk unit as if it were still operating. As far as the AS/400 system is concerned, the disk units continues to respond to I/O even though a single disk unit has failed.

RAID-5 protection is supported for all internal disks provided that it is supported by the disk controller.

A RAID controller is necessary when concurrent maintenance support is required.

Mirroring

Mirrored protection is a function that increases the availability of iSeries and AS/400e servers in the event of a failure of a disk-related hardware component. It can be used on all models of the iSeries and AS/400e servers. Software support is a part of the Licensed Internal Code. Different levels of mirrored protection are possible, depending on the hardware that is duplicated. Mirroring involves duplicating disk-related hardware, such as a disk unit, disk controller, disk input/output processor (IOP), bus, or, on Models 820, 830 and 840, a tower. In these three 8XX models, there are two buses per tower. Therefore, tower level mirroring would be used in place of bus level mirroring because a tower comprises a single point of failure. When a disk-related mirrored component fails, the system remains available.

Integrated Hardware Disk Compression

Data is dynamically compressed or uncompressed by the DASD controller as data is written to and read from disk. Disk compression has no affect on the main CPU utilization since compression is performed by the DASD controller input/output processor (IOP).

Support for Integrated Hardware Disk Compression is provided by DASD controllers #2741, #2748, #4748/#9748, #6533, and CCIN 671A MFIOP. Compression is limited to user ASPs.

The compression ratio results of DASD varies. The compression ratio achieved and the impact on DASD performance depends on the data and how it is accessed.

Internal Tape and CD-ROM

The following table shows which tape units are supported in the 250, 270, and 8xx systems, expansion towers, and migration towers.

Internal Tape Media		System and Expansion Unit Supported								
Fea-ture	**Size**	**250**	**270**	**820**	**830/ 840**	**#5077**	**#5072/ #5073**	**#5074/ #5079**	**#503x**	**#5065/ #5066**
#5032	N/A					S[1]	S[1]		S[1]	
#1349	1.2 GB ¼"								S	
#1350	2.5 GB ¼"								S	
#1355	13 GB ¼"								S	
#1360	7 GB 8mm								S	
#1379	1.2 GB ¼"					S	S			
#1380	2.5 GB ¼"					S	S			
#4425	CD-ROM				N			N		M
#4482	4 GB ¼"				N			N		M
#4483	16 GB ¼"				N			N		M
#4486	25 GB ¼"				N			N		M
#4525	CD-ROM		N	N						
#4582	4 GB ¼"		N	N						
#4583	16 GB ¼"		N	N						
#4586	25 GB ¼"		N	N						

#6325	CD-ROM					N	M			
#6368	1.2 GB ¼"					S[1]	S[1]			
#6369	2.5 GB ¼"					S[1]	S[1]			
#6380	2.5 GB ¼"					S	S			
#6381	2.5 GB ¼"	N				N	M			
#6382	4 GB ¼"	N				N	M			
#6383	16 GB ¼"	N				N	M			
#6385	13 GB ¼"	S				S	S			
#6386	25 GB ¼"	N				N	M			
#6390	7 GB 8mm					S	S			
#6425	CD-ROM								M	
#6480	2.5 GB ¼"								M	
#6481	2.5 GB ¼"								M	
#6482	4 GB ¼"								M	
#6483	16 GB ¼"								M	
#6485	13 GB ¼"								S	
#6486	25 GB ¼"								M	
#6490	7GB 8mm								S	

Notes:

1. The #6368 1.2 GB and #6369 2.5 GB Tape Units are installed in the #5032 Removable Media Device Cluster Box. This is a rack-mounted unit. The #5032 is supported for migration only.

- All tape features #44xx and #45xx are Customer Install Features (CIF). Orders for these devices are installed by the customer. The IBM Customer Engineer (CE) can install these CIF as a billable service.

N Available as a new tape.
S Supported but not orderable.
M Available via MES.

Tape Units

Through optional tape compaction or compression, the #6381/#6481 2.5 GB, #4482/#4582/#6382/#6482 4 GB, #4483/#4583/#6383/#6483 16 GB, #6385/#6485 13 GB, and #4486/#4586/#6386/#6486 25 GB tape drives can double the storage capacities. However, the tape compression used by the #6381/#6481 2.5 GB and #4482/#4582/#6382/#6482 4 GB tape drives is not compatible with the compaction on the #4483/#4583/#6383/#6483 16 GB, #6385/#6485 13 GB, and #4486/#4586/#6386/#6486

25 GB tape drives. Uncompacted or uncompressed tapes are compatible within each device's format limitations.

The following table shows the current internal tape read/write compatibilities.

Format	Capacity	Media	#6380	#6381 #6481	#4482 #4582 #6382 #6482	#4483 #4583 #6383 #6483	#6385 #6485	#4486 #4586 #6386 #6486
MLR3 [1]	25 GB	MLR3-25GB	--	--	--	--	--	R/W
QIC5010 [1]	16 GB	MLR1-16GB	--	--	--	R/W	R/W	R/W
QIC5010 [1]	13 GB	DC5010	--	--	--	R/W	R/W	R/W
QIC4DC [2]	8 GB	SLR5-4GB	--	--	R/W	R	--	R
QIC4GB	4 GB	SLR5-4GB	--	--	R/W	R	--	R
QIC2DC [2]	5 GB	DC9250	--	R/W	R/W	R	--	R
QIC2GB	2.5 GB	DC9250	R/W	R/W	R/W	R	R/W	R
QIC1000	1.2 GB	DC9120	R/W	R/W	R/W	--	R/W	--
QIC525	525 MB	DC6525	R/W	R/W	R/W	--	R/W	--
QIC525	320 MB	DC6320	R/W	R/W	R/W	--	R/W	--
QIC120	120 MB	DC6150	R/W	R/W	R/W	--	R/W	--
QIC24 [3]	60 MB	DC6150	R	R	--	--	--	--

1. Indicates that the capacity can typically double when the compression option is selected.
2. QIC-2DC and QIC-4DC are compression formats. Cartridge capacity is data dependent. Capacities shown are typical.
3. QIC24 format is written by S/36.

The following table shows the current internal tape speeds.

Feature	Description	Format	Speed
#6381 #6481	2.5GB QIC	QIC2DC	600 K/sec
		QIC2GB	300 K/sec
		QIC-1000	300 K/sec
		QIC-525	200 K/sec
		QIC-120	120 K/sec

Feature	Description	Format	Speed
#4482 #4582 #6382 #6482	4GB QIC	QIC-4DC	760 K/sec
		QIC4GB	380 K/sec
		QIC2DC	600 K/sec
		QIC2GB	300 K/sec
		QIC1000	300 K/sec
		QIC525	200 K/sec
		QIC120	120 K/sec
#6385 #6485	13GB QIC	QIC-5010 Compacted	3 M/sec
		QIC-5010	1.5 M/sec
		QIC2GB	300 K/sec
		QIC1000	300 K/sec
		QIC525	200 K/sec
		QIC120	120 K/sec
#4483 #4583 #6383 #6483	16GB QIC	QIC-5010 Compacted	3 M/sec
		QIC-5010	1.5 M/sec
		QIC-4DC	760 K/sec
		QIC4GB	380 K/sec
		QIC2DC	600 K/sec
		QIC2GB	300 K/sec
#4486 #4586 #6386 #6486	25GB QIC	MLR3 Compacted	4 M/sec
		MLR3	2 M/sec
		QIC-5010 Compacted	3 M/sec
		QIC-5010	1.5 M/sec
		QIC-4DC	760 K/sec
		QIC4GB	380 K/sec
		QIC2DC	600 K/sec
		QIC2GB	300 K/sec

Alternate IPL

Throughout this book and in the *iSeries and AS400e System Builder*, SG24-2155, the term *Alternate IPL* (ALT-IPL) is used to describe both Alternate IPL devices and Alternate Installation Devices. It is important to understand the differences.

Important

An Alternate IPL device must be attached to an IOA adapter card that is controlled by the base IOP in the system. Any other tape drive can be an Alternate Installation Device.

Alternate Installation Device support allows you to perform installation and recovery procedures using a combination of devices. Prior to V4R1, these types of activities could only be performed using devices attached to the first system bus. The first system bus connects to the service processor IOP. Typically this is where the optical device or tape devices used for installations are attached. On OS/400 V4 systems, you can use a combination of devices that are attached on the first system bus and on additional buses. The alternate installation device is not attached to the first system bus.

On the Model 270 and Model 8xx V4R5 systems, the Alternate IPL device is attached to an I/O adapter that is controlled by the base IOP in the system.

If you use the alternate installation function, the system uses existing support (a device on the first system bus) to install or recover enough of the Licensed Internal Code required to perform an IPL with an IPL-type D. When using the alternate installation device support, the system continues the operation using media in the alternate installation device. This function supports installation and recovery from tape media, such as SAVSYS tapes or distribution tapes which you created, that contain Licensed Internal Code and may contain the operating system, licensed programs, and data.

See the *Backup and Recovery Manual*, SC41-5304, for more information.

Tape Unit Descriptions

For general tape read and write compatibility, refer to the first table that appears in “Tape Units” on page 357.

#1349 1.2 GB ¼-Inch Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a #6368 1.2 GB ¼-inch Cartridge Tape Unit to 7xx systems.

#1350 2.5 GB ¼-Inch Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a #6369 and #6380 2.5 GB ¼-inch Cartridge Tape Unit to 7xx systems.

#1355 13 GB ¼-Inch Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a #6385 13 GB ¼-inch Cartridge Tape Unit to 7xx systems.

#1360 7 GB 8mm Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a #6390 7 GB 8mm Cartridge Tape Unit to 7xx systems.

#1379 1.2 GB ¼-Inch Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a 1.2 GB ¼-inch Cartridge Tape Units to 7xx systems.

#1380 2.5 GB ¼-Inch Cartridge Tape Unit Conversion Kit

Provides the hardware for migrating a 2.5 GB ¼-inch Cartridge Tape Units to 7xx systems.

#4482 4 GB ¼-Inch Cartridge Tape Unit

The #4482 is not compatible with System/36 tape units.

The #4482 may be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. Backward read/write capability to previous generations of QIC drives protects the customers investment in QIC technology. This is a CIF.

#4483 16 GB ¼-Inch Cartridge Tape Unit

The #4483 is not compatible with System/36 tape units.

The #4483 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. Backward read/write capability to the previous MLR1-S (Fjord) format and backward read capability to the last three QIC (Fjeld) formats protects the customer's investment in QIC technology. This is a CIF.

The #4483 provides 16 GB capacity native and 32 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge tape.

The #4483 provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

#4486 25 GB ¼-Inch Cartridge Tape Unit

The #4486 is not compatible with System/36 tape units.

The #4486 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch Cartridge tape exchange. This is a CIF.

#4582 4 GB ¼-Inch Cartridge Tape Unit

The #4582 is not compatible with System/36 tape units.

The #4582 may be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. Backward read/write capability to previous generations of QIC drives protects the customers investment in QIC technology. This is a CIF.

#4583 16 GB ¼-Inch Cartridge Tape Unit

The #4583 is not compatible with System/36 tape units.

The #4583 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. Backward read/write capability to the previous MLR1-S (Fjord) format and backward read capability to the last three QIC (Fjeld) formats protects the customer's investment in QIC technology. This is a CIF.

The #4583 provides 16 GB capacity native and 32 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge tape.

The #4583 provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

#4586 25 GB ¼-Inch Cartridge Tape Unit

The #4586 is not compatible with System/36 tape units.

The #4586 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. This is a CIF.

#5032 Removable Media Cluster Box

The #5032 requires a 9309 rack. This is a rack-mounted box that allows the attachment between one and four #6368 1.2G QIC or #6369 2.5G QIC Tape Units. The #5032 is supported for migration only and cannot be ordered as a new feature. It attaches to the #2621 Removable Media Device Attachment.

#6368 1.2 GB ¼-inch Cartridge Tape Unit

The #6368 can be used for save/restore, Alternate IPL, migration, and ¼-inch cartridge tape exchange using appropriate media and density.

#6369 2.5 GB ¼-inch Cartridge Tape Unit

The #6369 can be used for save/restore, Alternate IPL, migration, and ¼-inch cartridge tape exchange using appropriate media and density.

#6380 2.5 GB ¼-inch Cartridge Tape Unit

The #6380 can be used for save/restore, Alternate IPL, migration, and ¼-inch cartridge tape exchange using appropriate media and density.

#6381 2.5 GB ¼-Inch Cartridge (QIC)

The standard ¼-inch cartridge is the #6382. Therefore, the #6381 should only be ordered when compatibility with System/36 tape is required.

With special compaction using LZ1 (Lempel Ziv 1), the #6381 tape unit supports up to 5 GB. The #6381 may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange. For read and write compatibility, refer to the internal tape read/write compatibilities table on page 358.

#6382 4 GB ¼-Inch Cartridge (QIC)

The #6382 is not compatible with System/36 tape units.

With special compaction using LZ1 (Lempel Ziv 1), the #6382 tape unit supports up to 8 GB. It may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange. For read and write compatibility, refer to internal tape read/write compatibilities table on page 358.

#6383 16 GB ¼-Inch Cartridge Tape Unit

The #6383 is not compatible with System/36 tape units.

The #6383 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch cartridge tape exchange. One #6383 can be controlled by the MFIOP. Extra #6383s must be controlled by the #6513. It requires V4R1.

The #6383 provides 16 GB capacity native and 32GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge tape.

The #6383 provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

#6385 13 GB ¼-Inch Cartridge (QIC)

The #6385 is not compatible with System/36 tape units.

Tape tensioning control improvements in the #6385 tape unit eliminate the need for an auto-retension pass during the data cartridge load sequence. This is a major time saving since the auto-retension pass on earlier QIC tape units can take up to five minutes. The #6385 Tape Unit retensions the data cartridge only when a loss of tension is detected. For typical operating conditions, this should be very infrequent.

The #6385 may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange.

The #6385 provides 16 GB capacity native and 32 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge tape.

The #6385 provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

#6386 25 GB ¼-Inch Cartridge (QIC)

The #6386 is not compatible with System/36 tape units.

Tape tensioning control improvements in the tape unit eliminate the need for an auto-retension pass during the data cartridge load sequence. This is a major time saving since the auto-retension pass on earlier QIC tape units can take up to five minutes. The #6386 Tape Unit retensions the data cartridge only when a loss of tension is detected. For typical operating conditions, this is expected to happen infrequently.

The #6386 may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange.

#6390 7 GB 8mm Cartridge Tape Unit

The #6390 can be used for save/restore, Alternate IPL, migration, and 8mm cartridge tape exchange using appropriate media and density.

#6480 2.5 GB ¼-Inch Cartridge Tape Unit

The #6480 can be used for save/restore, Alternate IPL, migration, and ¼-inch cartridge tape exchange using appropriate media and density.

#6481 2.5 GB ¼-Inch Cartridge (QIC)

The compatibility standard ¼-inch cartridge is the #6482. Therefore, the #6481 should only be ordered when compatibility with System/36 tape is required.

With special compaction using Lempel Ziv 1 (LZ1), the #6481 tape unit supports up to 5 GB. It may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange.

#6482 4 GB ¼-Inch Cartridge (QIC)

The #6482 is not compatible with System/36 tape units.

With special compaction using LZ1, the #6482 tape unit supports up to 8 GB. It may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange.

#6483 16 GB ¼-Inch Cartridge Tape Unit

The #6483 is not compatible with System/36 tape units.

The #6483 can be used for save/restore, Alternate IPL, program distribution, migration, and ¼-inch Cartridge tape exchange. Backward read capability to three previous generations of QIC drives protects the customers investment in QIC technology.

Note that this tape contains different mounting parts when ordered for a 620, 720, or S20 model that supports tape concurrent maintenance, than when ordered for a 600 or S10 model that does not support tape concurrent maintenance.

The #6483 provides 16 GB capacity native and 32 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge tape.

The #6483 provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

#6485 13 GB ¼-Inch Cartridge (QIC)

The #6485 is not compatible with System/36 tape units.

The #6485 provides 16 GB capacity native and 32 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1500-foot cartridge

tape. The #6485 also provides 13 GB capacity native and 26 GB capacity compressed with a data transfer rate of 1.5 MB/s (native) and 3 MB/s (with compression) using a 1200-foot cartridge tape.

Tape tensioning control improvements in the tape unit eliminate the need for an auto-retension pass during the data cartridge load sequence. This is a major time saving since the auto-retension pass on earlier QIC tape units can take up to five minutes. The #6485 Tape Unit retensions the data cartridge only when a loss of tension is detected. For typical operating conditions, this is infrequent.

It may be used for save/restore, Alternate IPL, program distribution, migration, and QIC tape exchange.

#6486 25 GB ¼-Inch Cartridge (QIC)

The #6486 is not compatible with System/36 tape units.

Tape tensioning control improvements in the tape unit eliminate the need for an auto-retension pass during the data cartridge load sequence. This is a major time saving since the auto-retension pass on earlier QIC tape units can take up to five minutes. The #6386 Tape Unit retensions the date cartridge only when a loss of tension is detected. For typical operating conditions, this should be very infrequent.

It may be used for save/restore, Alternate IPL, program distribution, migration, and QIC cartridge tape exchange.

#6490 7 GB 8mm Cartridge Tape Unit

Can be used for save/restore, Alternate IPL, migration, and 8mm cartridge tape exchange using appropriate media and density.

CD-ROM

Internal CD-ROM Drives

AS/400e server code is distributed on CD-ROM media. One CD-ROM drive is required on all 270 and 8xx models and must be ordered as a separate feature on the system unit. It can also be used for Alternate IPL but not as a save/restore device for the system.

LPAR Support and CD-ROM

For information pertaining to LPAR and CD-ROM feature requirements, see
http://www.ibm.com/eserver/iseries/lpar/

#4425 CD-ROM

The #4425 is a feature CD-ROM device that can be mounted in the system unit of Models 830, 840, SB2, and SB3 and in the #5074/#5079 PCI Expansion Towers.

The #4425 is used for Alternate IPL (IBM distributed CD-ROM media only) and program distribution.

This is a CIF.

#4525 CD-ROM

The #4525 is a feature CD-ROM that can be mounted in the system unit of Models 270 and 820.

The #4525 can be used for Alternate IPL (IBM distributed CD-ROM media only) and program distribution.

This is a CIF.

#6325 Optional CD-ROM Feature

Available on System Unit Expansion Towers #5072 and #5073 for Models Sxx, 6xx, and 7xx.

Prerequisite: #2624 Storage Device Controller.

Maximum one per I/O tower and Model 740 System Unit, one per Model 730 System Unit.

Limits the use of tape in the same tower to #6380 and #6390.

#6425 Optional CD-ROM Feature

Available on Models S20, 620, and 720 or #9329 PCI Integrated Expansion Unit.

Prerequisite: #2726/#2740/#2741/#2748 PCI RAID Disk Unit Controller and #9728 Base PCI RAID Disk Unit Controller.

Not supported in #9331 Expansion Unit for SPD Cards.

Removable Storage

Removable Storage

Removable Storage Media Devices

IBM 7207 Model 122 4 GB External QIC Tape Drive

The 7207 Model 122 is a standalone QIC ¼-inch streaming linear tape drive with a capacity of 4 GB per cartridge that incorporates the most recent Single Channel Linear Recording (SLR5) QIC technology. The 7207 Model 122 uses the QIC-4DC format. It attaches to the system by the #2768/#2718 PCI Magnetic Media Controller. For a description of the #2768 and #2718, see “Magnetic Media Controllers” on page 407.

The 7207 Model 122 requires OS/400 V4R2 with PTFs as released in Informational APAR II11671.

The Model 122 provides media capacity up to 4 GB (8 GB with a 2:1 compression ratio) data storage per cartridge. It has a sustained data transfer rate of 380 KB per second (760 KB per second with a 2:1 compression ratio). It is read and write backward compatible with QIC-120, QIC-525, QIC-1000 and QIC-2GB, QIC-2DC and QIC-4GB tape data formats. It is fully compatible with cartridges used by the AS/400 feature #6382.

One SCSI cable should be specified with any order to attach the tape drive to its controller card. For the SCSI cable, only feature #9224 or #5224 (2.4 m) is available. The maximum cable length is 3 m.

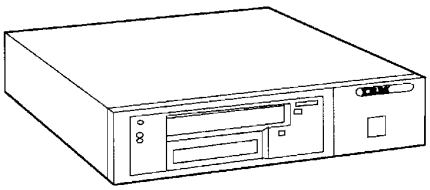
A media feature must also be ordered, either #9501 consisting of one 4 GB cartridge, one cleaning cartridge, and one test cartridge for the 7207 Model 122, or #7501, which includes an additional four 4 GB cartridges over the #9501 package.

Additional cartridges (#2503) and cleaning cartridges (#2504) can be ordered by MES.

The 7207 Model 122 is available in black only.

© Copyright IBM Corp. 2000

IBM 7208 External 8mm Tape Drive Model 342



The 7208 Model 342 is a standalone SCSI 8mm streaming tape drive with a capacity of 20 GB per cartridge. It supports the 170-meter advanced metal-evaporated (AME) data cartridge and attaches to the iSeries 400 or AS/400e server in the following ways:

- #6534 Magnetic Media Controller
- #2729 PCI Magnetic Media Controller

For a description of the #6534 and #2729, see “Magnetic Media Controllers” on page 407.

The 7208 Model 342 requires OS/400 V4R1 or later and can be used for save/restore or archiving. The Model 342 can provide media capacity of up to 40 GB of data storage per cartridge using the Improved Data Recording Capability (IDRC) algorithm for compression. It has a sustained data rate of 3 M per second (6 M per second with a 2:1 compression ratio). This gives four times the capacity and six times the date rate of the 7208 Model 012.

It has the ability to read (but not write) earlier 7 GB, 5 GB, and 2.3 GB 8 mm metal particle tape formats. A cable must be specified with any order to attach the tape drive to its controller card. Options are the #9245 (4.5m/15ft), the # 9212 (12m/39ft), and the #9218 (18m/59ft). A media feature must also be ordered, either #9019 consisting of one 8mm AME cartridge, one cleaning cartridge, and one test cartridge for the 7208 Model 342, or the #7019 which includes an additional four 8 mm AME cartridges over the #9019 package. Additional cartridges (#2019) and cleaning cartridges (#2016) can be ordered by MES.

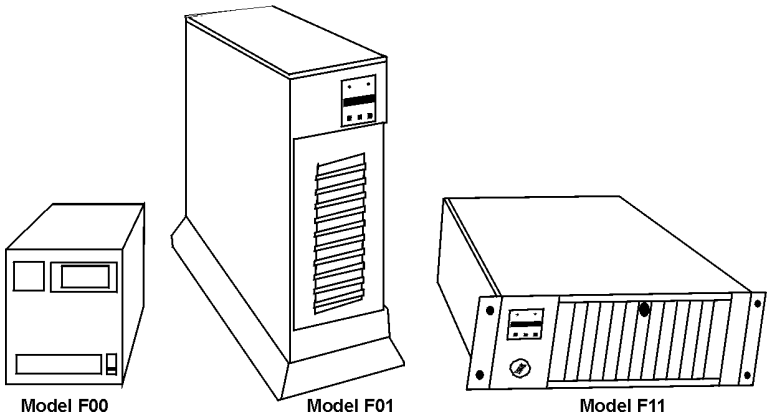
The 7208 Model 342 is available in black only.

IBM 7210 Model 020 External CD-ROM

The 7210-020 CD-ROM bridge box is an external 32x CD-ROM bridge box that attaches to the #2718 PCI Magnetic Media Controller or to the #2768 PCI Magnetic Media Controller (270 and 8xx). The device reports as a 6321 (same as an internal CD-ROM). SLIC determines to which IOA the device is attached. When it sees a PCI IOA #2718 or #2768, it reports this device as an external CD-ROM. There can be only one 7210-020 CD Bridge Box device per IOA.

The 7210-020 CD-ROM bridge box is primarily intended for use with LPAR, but it is not limited to LPAR. Since the PCI IOAs #2718 and #2768 serve as adapters for the tape bridge box 7207-122, there can be such a device attached to the same IOA as the 7210-010 CD-ROM bridge box. If the 7210-020 CD-ROM bridge box is daisy chained to the tape bridge box 7207-122, the tape bridge box 7207-122 must be the first physical device. Requires OS/400 V4R5.

IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, F11, and Library Model F1A



The IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, and F11 are reduced size single-drive tabletop, desk-side, or rack-mounted versions of the 3490E family of tape drives. They are compatible with the 3490 E01, E11, C10, C11, and C22 models. They can be used as the Alternate IPL device.

The Model F00 is the tabletop version. The Model F01 is a desk-side version. The Model F11 is a rack-mountable version. Each uses ½-inch tape cartridges as the storage media. The F1A is the model used in the 3494 Tape Library.

The F01 and F11 models include a ten-cartridge Cartridge Stack Loader. All three models offer a 16-bit fast-and-wide SCSI-differential interface, a 3490E tape transport, and an integrated control unit. All 3490E Fxxs have a sustained data transfer rate of up to 3 M/sec. With Improved Data Recording Capability (IDRC) enabled, sustained data transfer rates of up to 6.8 M/sec can be achieved. The actual throughput is a function of many factors and can vary. With the ten-cartridge Cartridge Stack Loader, the F01 and F11 models provide an automated, unattended backup capacity of up to 24G compressed. The standard capacity is up to 8 GB. Maximum capacity is provided by the 3490Es Improved Data Recording Capability (IDRC), which is standard on Models F00, F01, F11, and F1A.

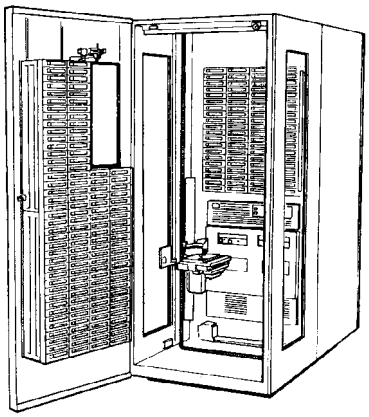
Models F00, F01, and F11 are intended for iSeries 400 or AS/400e servers where limited time for system backup or large amounts of data require high performance tape. The standard cartridge stack loaders on the Models F01 and F11 automatically load and unload cartridges as they are filled. This improves efficiency by reducing the need for operator handling.

The 3490E Models F00, F01, and F11 can be used to create tapes for archive files for backup and restore in the event of system or disk storage problems, for off-site data storage for disaster recovery, and for data interchange with other systems. In addition to reading and writing 36-track tape, Models F00, F01, and F11 can also read the older 18-track, ½-inch cartridge tape. There is write support for the 18-track cartridge tape at OS/400 V4R2 or later when the 3490 is configured in F-mode. This also allows the random mode to be selected for the ACL and the USEOPTBLK performance parameter.

The 3490E Models F00, F01, and F11 attach to all models of iSeries 400 or AS/400e servers and to traditional (CISC) 9404/6 Models D, E, or F. They attach using the Tape Device Controller #6501, which can support up to two 3490E Models F00, F01, and F11. These 3490E Models cannot be shared between iSeries 400 or AS/400e servers, and must be located within 25 meters (82 feet) of the #6501 I/O card. The 3490E Models F00, F01, and F11 are also supported by the newer Magnetic Media Controllers (#6534 or #2729). One 3490E is supported per #6534 or #2729. For more information, see “Magnetic Media Controllers” on page 407.

The 3490 F1A is the tape component of the 3494 library. It can be installed in any new 3494-L10 or in any new or existing 3494-D10. The 3490 F1A can be upgraded to or from the 3490 F11. The Model F1A cannot be intermixed with a Model CxA within a 3494. There is no 18-track write support or USEOPTBLK support on the Model F1A. Attachment to the iSeries 400 or AS/400e server is as for the other 3490E F models (#6501, #6534, #2729). For further details, see “IBM 3494 Tape Library Dataserver Model” on page 375.

IBM 3494 Tape Library Dataserver Model



The 3494 Tape Library Dataserver is a stand-alone automated tape storage subsystem for ½-inch cartridges available for attachment to the iSeries 400 or AS/400e server. It provides an automated tape solution for automating tape operations such as save and restore, migration of data between disk and tape, and other mass data applications.

It is comprised of a base unit called the Library Control Unit, which is available in two models. The Model L10 has space for a 3490-C1A, 3490-C2A drive, or a 3490-F1A. The Model L12 has space for two 3590-B1A or 3590-E1A drives. Both models contain the accessor (robotic arm that accesses the tape cartridges), the Library Manager, and storage cells for the ½-inch tape cartridges. The storage cell capacity is 240 cartridges. If the #5210 Convenience I/O Station is installed (allows the operator to add or remove up to 10 cartridges without interrupting normal operations), the storage cell capacity is reduced to 210 cartridges. If the 30-cartridge Convenience I/O Station, #5230, is installed, the storage cell capacity is reduced to 160 cartridges. Currently installed 3490-C10, C11, and C22 Tape Subsystems can be field upgraded to a 3490-C1A or C2A. The 3490-E11 can be field upgraded to a 3590-E1A. The 3490-F11 can be field upgraded to 3490 F1A. The 3590 Model B11 may also be field upgraded to a Model B1A for attachment in the 3494 Tape Library.

The storage capacity and the number of tape drives can be increased on the 3494 Tape Library by adding either drive units or storage units. There are two drive unit models available. The 3494 Model D10 Drive Unit provides space for either a 3490-C1A, 3490-C2A, or a 3490-F1A Drive Unit and space for up to 300 ½-inch cartridges. The 3494 Model D12 Drive Unit provides space for up to six 3590-B1A drives and 250 ½-inch cartridges. If no tape drives are installed in the D10 or D12, they can hold up to 400 ½-inch cartridges. The Model D10 or D12 Drive Units attach to either a Model L10 or Model L12 Library Control Unit. The 3494 Model S10 is the only storage unit model that can contain up to 400 ½-inch cartridges. The 3494 Model S10 has no support for tape drives.

Previously available storage units and drive units were denoted by feature number (#5400 and #5300 respectively), then later denoted by model types 3494-S10 and D10. The #5300 Drive Unit can be field upgraded to a 3494-D12, which can support 3590-B1A tape drives by specifying #5302. Both #5400 and #5300 units are supported on the 3494-L10 and L12 Library Control Units.

Additional frames can be attached to the 3494 Model L10 or L12 in any combination of drive units and storage units, as long as the maximum of seven additional frames is not exceeded. This provides storage capacity for up to 3,040 ½-inch cartridges (7.3T if 3490E cartridges or 91.2T with 3590-B1A cartridges), and support for up to sixteen 3490-CxA tape drives, or up to sixteen 3590-B1A tape drives. Both 3490 and 3590 tape drives can be used in the same 3494 Tape Library Dataserver.

The 3494 Tape Library Dataserver Models L10 and L12 attach to the iSeries 400 or AS/400e server using an RS 232 Host Attachment (#5211 for a 50-foot attachment or #5213 for a 400-foot attachment) or using a LAN attachment (#5219 for Token Ring or #5220 for Ethernet). Each system attached to a 3494 Tape Library Dataserver must have an RS232 Host Attachment specified to obtain the licensed code for the Media Library Device Driver (MLDD). The 3494 Tape Library Dataserver can also attach to the IBM RISC System/6000, the IBM ES/9000, Power parallel SP2, and Sun processors.

An Expansion Attachment Card (#5229) is required to support the fifth to eighth RS232 connections or the fifth to eighth tape control unit. The number of tape control units that can be attached to the 3494 Model L10 or L12 has been doubled to support up to 16 tape control units.

Beginning with V4R4, the 3494 Model HA1 is supported by the iSeries 400 or AS/400e server. The 3494 Model HA1 includes a second library manager and accessor, two service bays, and required hardware, and is designed for concurrent maintenance. The Model HA1 operates in standby mode to provide a redundant library manager and accessor or improved availability. With the Dual Active Accessor (DAA) feature active on the 3494 Models L10, L12, or L14, both accessors can operate simultaneously to increase mount performance of the library. With two library managers and dual accessors, and each containing two disk drives for duplication of the library databases, maintenance can now be performed in most situations on the failing library control unit component while the 3494 is still available for customer production. The Model HA1 contains no storage cells for tape cartridges. The 3494-HA1 can be installed on 3, 4, 6, 8, 10, 12, and 16 frame configurations

To expand the number of tape control units that can be attached to the Library Manager, the Tape Control Unit Expansion feature, #5228, should be specified. One feature can convert four RS232 host processor connections into four tape control unit connections in either the Library Manager or the Expansion Attachment Card (#5229). When combined with other interface features (see the following table), up to 16 tape control units can be connected to the Library Manager. If all RS232 host processor connections are converted to tape control

unit connections, a LAN adapter card is required to provide the host processor connection as shown in the following table.

No. of #5228 Features	Available RS232 Ports (for Direct Host Attach)	Available Tape Control Unit Connections	Additional Features Required
0	4	4	None
0	8	8	#5229
1	0	8	#5219 or #5220
1	4	12	#5229
2	0	16	#5229 and #5219 or #5220

This allows up to 32 systems to attach to the 3494 using the 3590 High Performance tape drives. A Remote Console Feature (#5226) is required when attaching the 3494 using a LAN that provides the capability of controlling and monitoring the status of up to eight 3494 Tape Library Dataservers from a remote location. The console can be password protected.

The Tape Subsystems installed in either the Library Control Units (3494 Models L10 and L12) or in the Drive Units (3494 Models D10 and D12) are attached to the iSeries 400 or AS/400e system using the Magnetic Tape Subsystem Attachment Controller, #2644, if they are a 3490 Model C1A or C2A using a channel adapter. However, if they attach using the SCSI adapter (#5040), they are attached to the system using the #6501 Magnetic Media Controller. The 3590 Model B1A also attaches to the iSeries 400 or AS/400e server using this #6501. These attachment controllers allow the data transmission and tape commands to pass to the tape subsystems. The newer Magnetic Media Controllers, #6534 and #2729, also support attachment of the 3494 Tape Library Dataserver. See “Magnetic Media Controllers” on page 407 for descriptions of these controllers.

The 3494 Tape Library Dataserver uses the *Media Library Device Driver* (MLDD) and *Backup Recovery and Media Services for AS/400*. The MLDD is shipped with the 3494. It provides interfaces to the 3494 for configuration, control, and service. It handles 3494 errors, providing error recovery and problem isolation. It maintains the inventory of cartridges in the library. It also schedules cleaning of drive units using a cleaning cartridge in the library. Users can write their own media management package using this software and OS/400 APIs. MLDD is only required for IMPI (CISC) models of AS/400. For PowerPC-based models, it is not required.

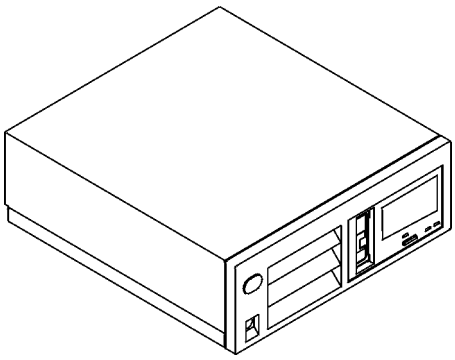
The *Backup Recovery and Media Services for AS/400* program (5769-BR1 or 5716-BR1) product supports the 3494. It provides a common directory for multiple iSeries 400 or AS/400e servers. It also provides management for archive, backup, and recovery facilities,

based on customer policies; scheduled unattended system backup capability; and archival facilities to control the movement of seldom-used data from disk to tape.

The cartridges on the 3494 must have human- and machine-readable external labels. These are read by the accessor, which travels on a linear rail (extended when additional units are added). The accessor uses a barcode reader. Its movement is horizontal, vertical, and 180 degree pivot.

Other optional features of the 3494 Tape Library Dataserver include a second Library Manager Disk Drive (#5214), which allows mirroring of the Library Manager (basically a PC) database. It also provides the capability to recover the Library Manager database in the event of a failure on the primary disk drive. The Dual Gripper option (#5215) provides the accessor with a second tape cartridge gripper for better performance in the Library.

IBM Magstar MP 3570 Tape Cassette Subsystem



The 3570 Tape Subsystem is based on the same technology as the IBM 3590 High Performance Tape Subsystem. It functionally expands the capability of tape to perform both write and read-intensive operations. It provides a faster data access than other tape technologies with a drive time to read/write data of eight seconds from cassette insertion. The 3570 also incorporates a high-speed search function.

The 3570 uses a unique, robust, heavy usage tape cassette that is approximately half the size of the IBM 3490/3590 cartridge tapes. The tape cassette capacity is 5G uncompressed and up to 15G per cassette with LZ1 data compaction. The tape drive reads and writes data in a 128-track format, reading and writing four tracks at a time. Data is written using an interleaved serpentine longitudinal recording format starting at the center of the tape (mid-tape load point) and continuing to near the end of the tape. The head is indexed to the next set of four tracks and data is written back to the mid-tape load point. This process continues in the other direction until the tape is full.

This tape cassette provides fast access to data by having two tape spools with the load point in the middle of the tape. It is made from advanced metal particle media with servo tracks to ensure high data integrity. The tape never leaves the cassette and maintains a self-enclosed tape path. This unique path eliminates tape thread time and ensures higher reliability.

The 3570 has a combination of read/write technology. Data write is provided by an exclusive thin-film write module and data read is provided by the IBM Magneto-Resistive (MR) head technology based on the IBM 3590. In addition, the 4-track 3570 head provides data redundancy and servo tracking support.

The integrated control unit contains the electronics and microcode for reading and writing data. The control unit functions include management of the data buffer, error recovery procedures, and the control of all the tape drive operations.

The library models offer both a random mode or sequential data access mode. They support two 10-cassette magazines providing from 150 GB (uncompressed) to 300 GB (compressed) of data on 20 cassettes.

The library models use a cassette loading and transport mechanism to automatically transport the tape cassettes to and from the cassette magazines and the tape drive. An LCD operator panel provides the primary method of displaying information and allows the selection of various menu options. These models also have a security key lock, which physically locks the cassettes in the library for additional security.

The 3570 Multipurpose Tape Subsystem attaches to all iSeries 400 and AS/400e servers (except the D02, E02, F02, and the 9401) using feature #6501, #6534, or #2729. Each #6501 can support up to two 3570 models and requires an AS/400 interposer, feature #2895 for each SCSI cable. Each #6534 or #2729 supports one 3570 and does not require an interposer. See “Magnetic Media Controllers” on page 407 for a description of these controllers.

The 3570 rack-mounted Models C11 and C12 require an AS/400 9309 Rack Enclosure. Multiple systems may be attached to the 3570, and the 3570 Cx2 models may be varied online to two systems at a time, with each drive allocated to one system.

OS/400 V3R1 or later is required to support the 3570. OS/400 also provides support for the library models in random mode. Content Manager OnDemand (5769-R01) is an application that stores and retrieves data on disk, optical, or tape media. It supports the 3570 providing record level access to data.

Note: Content Manager OnDemand was formerly known as EDMSuite OnDemand for AS/400, as well as Report/Data Archive and Retrieval System (R/DARS).

The 3570 is supported as an Alternate IPL device, but AS/400 IMPI (CISC) models require RPQ 843945. This RPQ is required because IBM software, PTFs, and MULIC/FULIC tapes

are not distributed on 3570 media. A second tape drive, in addition to the 3570, must be specified as a valid Alternate IPL device. The RPQ ships IBM service instructions for attaching the 3570 as an Alternate IPL device and a license to make a copy of the MULIC/FULIC tape on 3570 tape media.

The 3570 brings a new dimension of functionality to tape storage because of its revolutionary data recall performance allowing new applications to be enabled in addition to traditional tape applications. This includes applications where:

- Fast access to data is required such as storage management, network serving, mixed digital libraries, and image processing.
- High I/O-intensive operations with multi-user access is required.
- Automated backup and restore or automated archive storage and retrieval are required.

In addition, the IBM 3570 offers connectivity to other systems through the support of storage management offerings such as the IBM ADSTAR Distributed Storage Manager for AS/400 Version 3.1 (ADSM), IBM Backup Recovery and Media Services (BRMS), and third-party products.

Note: ADSM was withdrawn from marketing on 31 December 1999. Tivoli Systems Inc., an IBM company, now offers Tivoli Storage Manager Version 3.7 to replace the ADSM product set. See Tivoli Storage Management Solutions at: `http://www.tivoli.com/storage`

3570 Cxx Models

The 3570-Cxx is available in five models, which are shown in the following table.

Model	Description	No. of Drives	Cassette Slots
C00	Table-Top Unit	1	1
C01	Standalone Library	1	20
C02	Standalone Library	2	20
C11	Rack-Mounted Library	1	20
C12	Rack-Mounted Library	2	20

The Cxx models can read/write both B-format and C-format cartridges. The drive data transfer rate is 7 MB/sec (uncompressed) with up to 15 MB/sec (compressed) using C-format cartridges. For B-format cartridges, the rates are 3.5 MB/sec and 10.5 MB/sec. The drive burst data rate is 20 MB/sec. Automatic caching of data enables balancing system read/write performance. Note that the actual throughput achieved is a function of many factors and can vary.

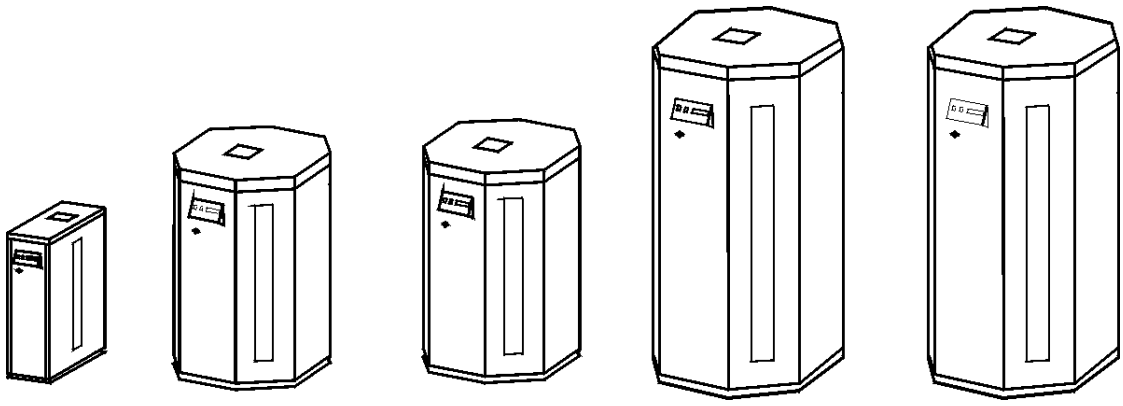
3570 Bxx Models

The 3570-Bxx model is the first generation of 3570s. The 3570-Bxx is available in five models, which are shown in the following table.

Model	Description	No. of Drives	Cassette Slots
B00	Table-Top Unit	1	1
B01	Standalone Library	1	20
B02	Standalone Library	2	20
B11	Rack-Mounted Library	1	20
B12	Rack-Mounted Library	2	20

The 3570-Bxx provides fast access with a drive time to read/write data of eight seconds. The 3570-Bxx can only read/write B-format cartridges. The drive data transfer rate is 2.2 MB/sec (uncompressed) with up to 14 MB/sec compacted burst data transfer rate. The actual throughput achieved is a function of many factors and can vary.

Magstar MP (Multipurpose) 3575 Tape Library Dataserver



Highlights

- Offers five models for the SCSI systems environment
- Includes Magstar MP tape drives that provide fast data access for current and emerging applications such as save/restore, network storage management, data warehousing, and digital libraries
- Increases the amount of data that can be accessed with near-online performance for up to 4.8 TB of storage capacity (with a 3:1 compression ratio)

- Delivers an aggregate sustained data rate of 50 to 300 GB/hour with a maximum compression on Model C tape drives
- Provides a rich multihost attachment for library sharing: up to six iSeries 400 or AS/400e hosts or any three heterogeneous hosts
- Supports industry-leading storage management offerings to provide enterprise-wide backup/restore and archive/retrieval

Overview

The IBM Magstar MP 3575 Tape Library Dataserver is a family of automated tape storage solutions designed for the growing unattended storage requirements of today's midrange systems and network servers. These compact, integrated tape storage libraries expand the capability of tape processing by optimizing both read- and write-intensive operations. A dual-gripper picker can provide fast cartridge exchange times between the library slots and the Magstar MP tape drives in the library. The Magstar MP 3575 tape library attaches to iSeries 400 or AS/400e, RS/6000, HP, Windows NT, Sun, and other SCSI-attached open systems in a single or multihost configurations. The patented new multipath architecture enables multiple homogeneous or heterogeneous hosts to share library resources. You can configure up to three user-defined logical libraries to optimize host library sharing.

Unattended Tape Operations and Higher Storage Capacity

There are five models of the Magstar MP 3575 tape library, ranging in size from 30G to 4.8 TB of compressed online storage capacity and from one to six tape drives. This spectrum of choices provides the high granularity required for a wide range of enterprise solutions. In addition, two of the models are expandable. With these capacities, the Magstar MP 3575 tape library can provide unattended tape handling for tape save/restore and can evolve into an advanced storage management solution to enable a more efficient and cost-effective combined use of disk and tape. Applications that previously required disk or optical technology can now benefit from the high capacities and fast data access characteristics of the Magstar MP 3575 tape library. These applications include:

- Automated save/restore
- Automated migrate/recall
- Backup/archive
- Large sequential files
- Records management
- Multimedia applications

Industry-leading software solutions for Magstar MP 3575 Tape Libraries are available from IBM, IBM Business Partners, and third-party solution providers. This broad range of applications enables you to select the solution that best meets your storage needs. Data-intensive applications used for heavy tape processing, backup/restore, and

archive/retrieval can especially benefit from the high performance of the Magstar MP 3575 tape libraries.

Exceptional Performance

Magstar MP technology is an industry leader in retrieval performance. Average cartridge move times in the Magstar MP 3575 tape library are less than 4.0 seconds, which complements the fast load/search time of the Magstar MP drive. Sustained data rates of 7 M/sec (native) and 15 M/sec (maximum compression) per Model C tape drive make the Magstar MP 3575 tape library ideal for time-sensitive applications that require fast access to data, highly I/O-intensive operations by multiple users, and traditional save/restore operations. In addition, a barcode reader enables rapid inventory management by optically scanning the barcodes on the cartridges.

Outstanding Data Integrity

Based on popular and proven Magstar MP technology, the Magstar MP 3575 tape library brings a new level of reliability and data integrity to the midrange environment and is specifically designed for:

- Repeated tape load/unloads
- Higher tape drive duty cycles
- Increased overall mechanical reliability
- Increased overall media reliability

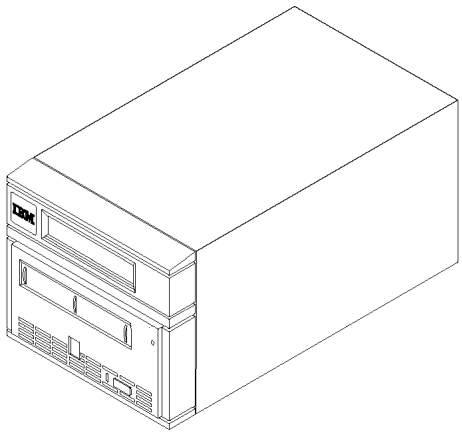
The Magstar MP 3575 tape library uses Magstar MP Fast Access Linear Tape Cartridges, which are designed to provide several enhancements over previous tape technologies. The cartridges are specially designed for repeated handling and used in automated libraries. The tape media is contained in a self-enclosed tape path within a rugged cartridge case, remaining protected at all times from outside environmental factors. The media itself is an advanced metal particle tape developed for high durability and capacity.

Software Considerations

Device drivers are available from IBM for AIX, HP-UX, NT, and Sun. Supported software for the Magstar MP 3575 tape library includes IBM ADSTAR Distributed Storage Manager for AS/400 Version 3.1 (ADSM), BRMS/400, and NetTAPE, as well as products from Cheyenne, Legato, Spectra Logic, SCH Technologies, and Veritas.

Note: ADSM was withdrawn from marketing on 31 December 1999. Tivoli Systems Inc., an IBM company, now offers Tivoli Storage Manager Version 3.7 to replace the ADSM product set. See Tivoli Storage Management Solutions at: `http://www.tivoli.com/storage`

IBM 3580 Ultrium Tape Drive Model H11 and Model L11



The IBM 3580 Ultrium Tape Drive is a stand-alone, high-capacity, SCSI attached tape drive that offers up to 200 GB of capacity assuming a 2:1 compression ratio (100 GB native). It has a data transfer rate of 15 MB per second uncompressed, with up to 30 MB per second with 2:1 compression.

The IBM 3580 Ultrium Tape Drive is built on Linear Tape Open (LTO) technology. It offers a powerful open tape architecture, setting the stage for a new generation of tape storage products expected to surpass current tape capacity and performance benchmarks while maintaining the highest data integrity. LTO technology combines the advantages of linear multi-channel bi-directional formats with enhancements in servo technology, data compression, track layout, and error correction code to maximize capacity, performance, and reliability.

The 3580 is supported with OS/400 V4R4 by the #2729, #6501, #6534, and by V4R5 with the #2749 adapters. A #6501 attach requires an interposer #2895. Model H11 features an Ultra/Wide SCSI High Voltage Differential (HVD) interface and model L11 features an Ultra2/Wide SCSI Low Voltage Differential (LVD) interface.

For performance reasons, we recommend that there be only one IBM LTO Ultrium tape drive per IOP/IOA. Installing more than one Ultrium drive on a SCSI bus may impact system performance.

For capacity requirements beyond one IBM Ultrium drive and one 100 GB (uncompressed) cartridge, consider other products in the IBM Ultrium family including the IBM 3581 Ultrium Tape Autoloader, the IBM 3583 Ultrium Scalable Tape Library, and the IBM 3584 UltraScalable Tape Library.

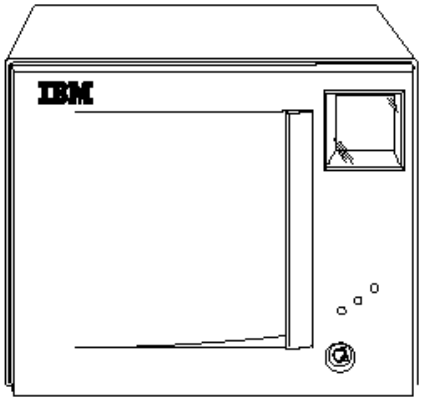
Cable features: SCSI cables and appropriate interposers, as required, should be ordered.

- #9705 - 5.0m SCSI cable (HD68 connectors on both ends)
- #5302 - 2.5m SCSI cable (HD68 connectors on both ends)
- #5305 - 5.0m SCSI cable (HD68 connectors on both ends)
- #5310 - 10.0m SCSI cable (HD68 connectors on both ends)
- #5318 - 18.0m SCSI cable (HD68 connectors on both ends)
- #5325 - 25.0m SCSI cable (HD68 connectors on both ends)

Cartridges: IBM Ultrium data and cleaning cartridges available only with the initial order:

- #8001 - Data cartridge - 100GB
- #8002 - Cleaning cartridge

IBM 3581 Ultrium Tape Autoloader H17 and Model L17



The IBM 3581 Ultrium Tape Autoloader is an Ultra2 SCSI stand-alone or rack-mounted autoloader that incorporates the IBM Ultrium Tape Drives. It has a capacity of seven tape cartridges, providing a media capacity of up to 1.4 TB (with 2:1 compression) data storage per library and a data rate of up to 15 MB per second (un-compressed). The 3581 is designed for easy, unattended operation and can be operated in sequential or random-access modes. In sequential mode, the 3581 manages cartridge access. In random-access mode, the 3581 relies on application software for cartridge management.

The IBM 3581 Ultrium Tape Autoloader is built on Linear Tape Open (LTO) technology, a powerful open tape architecture, setting the stage for a new generation of tape storage products expected to surpass current tape capacity and performance benchmarks while maintaining the highest data integrity. LTO technology combines the advantages of linear multi-channel bi-directional formats with enhancements in servo technology, data

compression, track layout, and error correction code to maximize capacity, performance, and reliability.

The 3581 is supported with OS/400 V4R4 by the #2729, #6501, and #6534, and V4R5 by the #2749 adapters. The #6501 attach requires interposer #2895.

The 3581 Model H17 features a High-Voltage Differential (HVD) Ultra2 SCSI interface and appears as two drives on the on the SCSI bus.

The 3581 Model L17 features a Low-Voltage Differential (LVD) Ultra2 SCSI interface and appears as two drives on the on the SCSI bus.

Both models feature an operator's panel, which provides status on power. autoloader and drive activity, error status, and message information. The panel also has controls for display, mode, and power.

For performance reasons, we recommend that there be only one IBM LTO Ultrium tape drive per IOP/IOA. Installing more than one Ultrium drive on a SCSI bus may impact system performance.

For capacity requirements beyond seven 100 GB (uncompressed) cartridges, consider other products in the IBM Ultrium family including the IBM 3583 Ultrium Scalable Tape Library, and the IBM 3584 UltraScalable Tape Library.

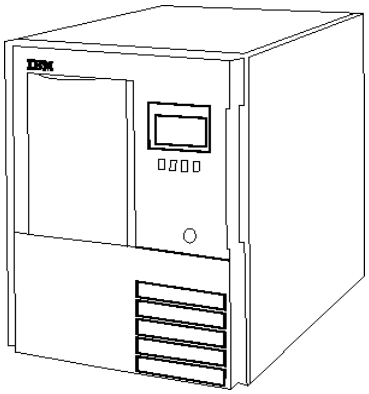
Cable features: SCSI cables and appropriate interposers, as required, should be ordered.

- #9705 - 5.0m SCSI cable (HD68 connectors on both ends)
- #5302 - 2.5m SCSI cable (HD68 connectors on both ends)
- #5305 - 5.0m SCSI cable (HD68 connectors on both ends)
- #5310 - 10.0m SCSI cable (HD68 connectors on both ends)
- #5318 - 18.0m SCSI cable (HD68 connectors on both ends)
- #5325 - 25.0m SCSI cable (HD68 connectors on both ends)

Cartridges: IBM Ultrium data and cleaning cartridges available only with the initial order.

- #8001 - Data cartridge - 100GB
- #8002 - Cleaning cartridge

IBM 3583 Ultrium Scalable Tape Library



The IBM 3583 Ultrium Scalable Tape Library is an automated tape library that incorporates IBM LTO Ultrium tape drives. It attaches to iSeries 400i and AS/400 e, RS/6000, RS/6000 SP, Netfinity, and other UNIX and PC servers supporting OS/400, AIX, Sun Solaris, HP-UX, Microsoft Windows NT, and Windows 2000 open systems with a Small Computer Systems Interface (SCSI).

The IBM 3583 Ultrium Scalable Tape Library automates the latest IBM Ultrium tape drives. The library can be configured with one to six IBM Ultrium tape drives. Multiple drives offer enhanced functions such as faster transfer of data, simultaneous backup, concurrent read/write operations, and fault tolerance.

The IBM 3583 Ultrium Scalable Tape Library is a stand-alone unit. With an optional feature, the 3583 can be mounted in an industry-standard EIA-310-D 19-inch rack. The IBM 3583 Ultrium Scalable Tape Library uses IBM Ultrium tape cartridges that provide 100 GB native capacity and up to 200 GB with 2:1 hardware controlled data compression, giving the 3583 typical storage capacities of 3.6 TB, 7.2 TB, and 14.4TB (with 2:1 compression) for Models L18, L36, and L72 respectively. The 3583 has a native data rate up to 15 MB per second and up to 30 MB per second with 2:1 compression. A barcode reader, which allows for positive tape cartridge identification and inventory, and an operator display are included.

The IBM 3583 Ultrium Scalable Tape Library can be used for save/restore, program distribution, migration, data interchange, automatic migration of data between disk storage and tape, and mass storage for data archive.

Full interchange of data is supported with the Ultrium tape drive. In addition to reading and writing IBM Ultrium tape cartridges, the 3583 Scalable Tape Library provides an enhanced functional alternative to DLT, ¼-inch, 4mm, or 8mm tape drives. Storage and tape

management for the 3583 is provided by software such as Tivoli Storage Manager and other industry-leading compatible software offerings.

Product Preview

Future features and capabilities of the 3583 Ultrium Scalable Tape Library that provide additional attachment and functional capabilities will include *Fibre Channel - Arbitrated Loop* (FC-AL) attachment.

Each IBM Ultrium 3583 Scalable Tape Library has a display on the front panel that is used for displaying status and error codes. An operator control panel with an LCD display is on the front of the machine and provides status information and menu options. From this panel, the operator can initiate actions such as moving and loading tape cartridges or invoking diagnostics. A key lock provides front door locking.

The IBM Ultrium 3583 Scalable Tape Library is designed for desktop operation, but an optional rack mounting kit allows installation into an ANSI/EIA standard 19-inch rack with 14 EIA units of space. For customers requiring extra redundancy in their storage operations, an additional DC power supply option is available.

The IBM Ultrium tape drive supports the new Ultrium High Capacity Tape Cartridge, designed for increased tape speeds and high-density data recording.

The IBM 3583 Ultrium Scalable Tape Library contains a maximum of six LTO Ultrium Tape Drives, each with an Ultra/Wide SCSI High Voltage Differential (HVD) or an Ultra2/Wide SCSI Low Voltage Differential (LVD) interface. The IBM Ultrium Tape Drive with the desired SCSI interface is chosen by selecting at least one of the following features:

- **#8003 - LTO Ultrium LVD Drive Sled**: Includes one IBM Ultrium Tape Drive with theUltra2/Wide SCSI Low Voltage Differential (LVD) interface
- **#8004 - LTO Ultrium HVD Drive Sled**: Includes one IBM Ultrium Tape Drive with the Ultra/Wide SCSI High Voltage Differential (HVD) interface

A terminator is included with each tape drive. A SCSI cable is required to attach the 3583 to the server SCSI adapter. A cable (features #9704 or #9705) can be included with the initial plant shipment or another cable can be ordered. A power cord feature number, if applicable, should also be specified.

The 3583 Scalable Tape Library has Raven Black covers.

The 3583 Scalable Tape Library can be attached to iSeries 400 and AS/400e models that support OS/400 V4R4, and HVD adapters #2729, #2749 (V4R5), #6501, and #6534. The #6501 attach requires interposer #2895.

Total HVD SCSI cable lengths are limited to 25 m (81 ft.) using point-to-point or multi-drop interconnection. Stub length at each device must not exceed 0.2 m (0.66 ft).

All drives installed at the plant are Ultrium tape drives and are installed sequentially beginning at position 1.

Data transfer rates on the SCSI bus can be affected by the amount of IBM Ultrium drives attached to the bus. For optimal performance, we recommend that no more than two IBM Ultrium drives be attached to an individual SCSI bus.

The weight of the 3583 Scalable Tape Library is over 200 pounds. When several 3583s are mounted in a rack enclosure, a tipping hazard could be created. Take necessary safety pre-cautions when mounting multiple 3583 libraries.

Compression technology can increase the amount of data stored on the media. The actual degree of compression achieved is highly sensitive to the characteristics of the data being compressed.

For performance reasons, the iSeries 400 configurator limits the attachment to one device per adapter (IOP/IOA). Installing more than one IBM LTO Ultrium Tape Drive on an IOP/IOA may have an impact on tape performance. Installing more than one Ultrium drive on a SCSI bus may impact system performance. Intermixing of other SCSI devices on the same SCSI bus as the 3583 Scalable Tape Library may impact performance of those devices.

Library features:

- #8006 - Rack mount option: Allows mounting in standard EIA 19-inch rack
- #8007 - 18 Slot Tape Storage Column
- #8012 - 12 Cartridge I/O Station
- #8008 - Redundant Power Module

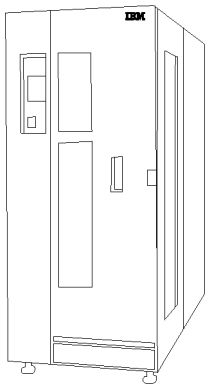
Cable features: A SCSI cable is available as a no-charge specify feature for each IBM Ultrium Tape Drive included on the initial order. At least one SCSI cable must be specified with each tape drive ordered, either the no-charge feature #9705 or one of the following options. A short 0.5 meter drive-to-drive cable is included with the shipment of each Ultrium tape drive. Each of the following cables has a HD68 connector on each end.

- #5300 - 0.5m additional drive-to-drive SCSI cable
- #9705 - 5.0m SCSI cable
- #5302 - 2.5m SCSI cable
- #5305 - 5.0m SCSI cable
- #5310 - 10.0m SCSI cable
- #5318 - 18.0m SCSI cable
- #5325 - 25.0m SCSI cable
- #9400 - Attached to AS/400

Cartridge features (available only with initial order):

- #8001 - 1 data cartridge
- #8002 - 1 cleaning cartridge
- #8010 - 20 data cartridges
- #8013 - 6 cartridge magazine

IBM 3584 UltraScalable Tape Library



The IBM 3584 UltraScalable Tape Library provides a mid-range, open systems, and network server tape storage solution combining reliable, automated tape handling and storage with reliable, high-performance IBM LTO Ultrium tape drives. The 3584 offers outstanding retrieval performance with typical cartridge move times of less than 3.0 seconds for a single-frame library. Customers can tailor the library to match their system capacity and performance needs from 14 TB to 248.1 TB (28 TB to 496.2 TB with 2:1 compression), using up to seventy-two IBM LTO Ultrium tape drives.

- **Multi-Path architecture**

  The patented Multi-Path architecture, first introduced by IBM in 1998, supports sharing by homogeneous and heterogeneous open systems servers. The 3584 can be partitioned into two to seventy-two logical libraries.

- **Scalable capacity**

  The library frame and robotics is based on field-proven IBM Tape Library technology, with scalability from one to six frames, providing a broad range of drive and storage capacities.

- **IBM LTO Ultrium tape drives**

  IBM LTO Ultrium tape drives offer data rates up to 30 MB/second per drive using 2:1 data compression. Aggregate sustained data rates of up to 7.8 TB/hour with 2:1 compression

allow extremely high data transfer performance. Data cartridge capacity is 100 GB in native mode and 200 GB in compressed mode.

- **Open systems server support**

  Native device driver support is included for iSeries 400 and AS/400e, IBM AIX, Sun Solaris, HP-UX, Microsoft Windows NT, and Microsoft Windows 2000.

- **Product preview**

  Future features and capabilities of the IBM 3584 UltraScalable Tape Library that provide additional attachment and expansion capabilities will include:

  – Fibre Channel - Arbitrated Loop (FC-AL) attachment
  – Expanded Input/Output Station
  – Support for Digital Linear Tape technology

- **Designed for automated tape handling**

  The IBM 3584 UltraScalable Tape Library is part of a new family of tape library storage solutions designed for the large, unattended storage requirements from today's mid-range systems up to high-end network servers. Each aspect of the subsystem is designed to optimize access to data and reliability. IBM LTO Ultrium tape drives are compact storage devices that support the highly intensive read and write operations required by today's network servers.

- **High performance**

  Cartridge move time within the 3584 UltraScalable Tape Library is typically less than 3.0 seconds. A dual-gripper accessor can retrieve the next cartridge to be mounted, unload the current cartridge, and load the next cartridge, providing the following benefits:

  – Saves complete move operations
  – Further improves overall library performance
  – Offers increased redundancy and higher reliability.

  The average drive search time to first byte of data is 60 seconds. Sustained data rates during reads and writes are 30 MB/second using 2:1 compression and 15 MB/second in native mode. The IBM LTO Ultrium tape drives are designed for high performance in a streaming mode of operation. Automatic data caching, using an expanded cache memory and read/write buffering, enhances performance even further. Aggregate sustained data rates for the library are 108 GB to 7.8 TB/hour with 2:1 compression (six-frame library).

- **High reliability**

  Leading-edge technology positions the IBM LTO Ultrium tape drives as industry leaders. Highly accurate recording is provided by an exclusive thin-film write module designed by IBM with read after write data verification. Data read is managed by IBM industry-leading magneto-resistive (MR) heads, designed for accuracy, high reliability, and durability. High-availability redundant servo readers also ensure consistent data integrity.

Drive cleaning is an automatic function performed by the library when required by the drive, without requiring operator intervention.

- **High granularity in library configurations**

  Features and capacities are designed to match the wide variety of customer requirements.

- **Model L32 (base frame)**

  The base library, the Model L32, has 141 to 281 cartridge slots and support for up to twelve IBMLTO Ultrium tape drives with an incremental reduction of storage slots for more than four drives. Data capacity for the Model L32 is up to 14 TB native and up to 28 TB using LTO Data Compression (LTO-DC) (2:1) compression. The aggregate sustained data rate is from 108 GB to 1.3 TB/hour with 2:1 compression. Up to twelve logical libraries or up to twelve SCSI control paths can be configured.

  Each Model L32 library has a standard 10-slot cartridge input/output station for importing or exporting cartridges from the library without requiring a re-inventory. For bulk-loading of IBM LTO Ultrium tape cartridges the library door can be opened. Each time the library door is closed, a barcode reader mounted on the auto changer scans the cartridge labels enabling a re-inventory of the cartridges in the library frame in less than 60 seconds. A door lock is included to restrict physical access to cartridges in the library. Customers can expand library capacity and number of drives to meet their changing needs.

- **Model D32 (expansion frame)**

  Five expansion frames (Model D32) may be added to the base frame (Model L32) to add storage and/or drive capacity. Each 3584 Model D32 frame supports up to 440 storage slots and up to twelve drives, with incremental reduction of storage slots for each set of four of drives installed. A fully configured 3584 with one Model L32 frame and five Model D32 frames will support up to seventy-two drives with an aggregate data rate of 7.8 TB per hour (2:1 compression) or up to 2481 storage slots with a total capacity of 248.1 TB native or 496.2 TB with 2:1 compression.

- **Multi-path support for heterogeneous server platforms with up to seventy-two logical libraries**

  The heterogeneous sharing provided by the Multi-Path feature of the 3584 UltraScalable Tape Library is a sharing of the library robotics. This is accomplished by partitioning the library into multiple logical SCSI libraries, up to the number of drives installed. Each logical library has its own separate and distinct drives, storage slots, and control paths. I/O slots are shared on a first-come-first-served basis. This type of partitioning allows heterogeneous applications to share the library robotics independent of each other. Cartridges under library control are not shared between logical libraries, nor are they allowed to be moved between logical libraries. An example of heterogeneous sharing is a Microsoft Windows NT application using the drive and storage slots of one logical library, while a UNIX application uses the drive and slots of another logical library.

Logical libraries can also be used for scalable application performance, such as up to seventy-two Tivoli Storage Manager servers.

The 3584 UltraScalable Tape Library can also be configured to support multiple SCSI control paths to a common logical library, up to the number of drives installed. Multiple control paths allow maximum flexibility in multi-server support and control path redundancy.

- **High-performance tape cartridge**

  The IBM LTO Ultrium tape cartridge has been designed to provide several enhancements over previous tape technologies. The case is specially designed for use in automated libraries and is designed for repeated, unattended, trouble-free handling. The tape itself is an advanced metal particle tape developed for durability and capacity.

  The IBM LTO Ultrium tape drive supports the new IBM LTO Ultrium High Capacity Tape Cartridge. Designed for increased tape speeds and high-density data recording, data is recorded eight tracks at a time for increased performance.

- **Hardware requirements**

  The IBM 3584 UltraScalable Tape Library can be attached to the iSeries 400 and AS/400e, RS/6000, RS/6000 SP, Netfinity systems, and non-IBM servers, workstations, and personal computers that support Ultra/Wide SCSI HVD and Ultra2/Wide SCSI LVD interface specifications.

  One #9003 Drive Frame Attachment feature must be added to the 3584 Model L32 for each Model D32 frame that is attached. This is to assure that the proper cables are shipped and configuration records are correct.

  The capacity of the base Model L32 can be expanded by enabling an additional four columns in that frame with the addition of the #1603 Capacity Expansion feature. This feature is also required to enable the use of IBM LTO Ultrium drives and storage elements in the optional Model D32 Expansion Frame.

  The 3584 UltraScalable Tape Library contains a maximum of 12 LTO Ultrium Tape Drives per frame (total of 72 tape drives), each with an Ultra/Wide SCSI High Voltage Differential (HVD) or an Ultra2/Wide SCSI Low Voltage Differential (LVD) interface. The IBM LTO Ultrium Tape Drive with the desired SCSI interface is chosen by selecting at least one of the following features:

  – **#1454 - LTO Ultrium LVD Drive Sled**: Includes one IBM LTO Ultrium Tape Drive with the Ultra2/Wide SCSI Low Voltage Differential (LVD) interface

  – **#1455 - LTO Ultrium HVD Drive Sled**: Includes one IBM LTO Ultrium Tape Drive with the Ultra/Wide SCSI High Voltage Differential (HVD) interface

  A minimum of one of feature #1454 or #1455 must be specified on the Model L32. If one of these features is not ordered on a Model D32, the #9001 (driveless frame) feature must be specified on that Model D32.

A terminator is included with each tape drive. SCSI cables and appropriate interposers, as required, should be ordered for attachment to a server. A power cord feature number, if applicable, should also be specified.

The 3584 UltraScalable Tape Library has Raven Black covers.

The 3584 UltraScalable Tape Library can be attached to iSeries400 and AS/400e models that support OS/400 V4R4, and the #2729, #2749 (V4R5), #6501, and #6534 adapters. The #6501 attach requires interposer #2895.

- **Software requirements**

  The 3584 UltraScalable Tape Library is supported on various operating systems. Native device driver support is included for the following minimum operating system levels:

  – OS/400 V4R4 or later
  – AIX 4.3.2 or later
  – Sun Solaris 2.6 or later
  – Windows NT 4.0 with Service Pack 6
  – Windows 2000
  – HP-UX 11.0

  Support for the 3584 UltraScalable Tape Library is planned for the following products:

  – Tivoli Storage Manager for AS/400, AIX, Sun, Hewlett-Packard, Windows 2000, and Windows NT supports the IBM 3584. Tivoli Storage Manager offers highly automated, centrally-scheduled, policy-managed backup and archive facilities to protect data in distributed enterprises using iSeries 400 or AS/400e, AIX/6000, Sun, Hewlett-Packard, Windows NT, and Windows 2000 systems as servers.
  – Backup Recovery and Media Management for AS/400 (BRMS)
  – Computer Associates ARCserveIT
  – Legato Systems NetWorker
  – Sterling Alexandria
  – SCH Technologies REELlibrarian and REELbackup
  – Veritas NetBackup and Backup Exec
  – Help/Systems

  IBM intends to work together with the ISV product manufacturers listed above to support the 3584 UltraScalable Tape Library. Individual application vendors should be contacted for specific information and availability dates. The list represents our best knowledge at the time of publication and does not imply completeness.

  Additional software support is available through library management software products. The software to manage the 3584 UltraScalable Tape Library is not provided with the libraries. Supporting software and applications must be obtained separately from IBM, IBM Business Partners, or independent software providers. A list of compatible software is available from your IBM representative or at:
  `http://www.ibm.com/storage/techsup/tapetech/tapetech.html`

- **Limitations**

  For performance reasons, the iSeries 400 configurator limits the attachment to one device per adapter (IOP/IOA). Installing more than one IBM LTO Ultrium Tape Drive on an IOP/IOA may have an impact on tape performance.

  Installing more than one IBM LTO Ultrium drive on a SCSI bus may impact system performance. Intermixing other SCSI devices on the same SCSI bus as the 3584 UltraScalable Tape Library may impact performance of those devices.

  Each IBM 3584 UltraScalable Tape Library can be divided into logical libraries (up to the number of drives). Each logical library must contain at least one IBM LTO Ultrium tape drive and one cartridge slot.

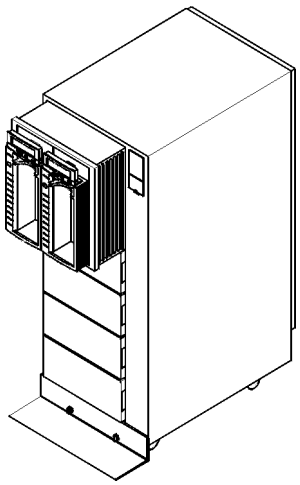
  – **Cable features:** A SCSI cable is available as a no-charge specify feature for each IBM Ultrium Tape Drive included on the initial order. At least one SCSI cable must be specified with each tape drive ordered. A short 0.5 meter drive-to-drive cable is included with the shipment of each Ultrium tape drive. Each of the following cables has an HD68 connector on each end:

    - #5300 - 0.5m additional drive-to-drive SCSI cable
    - #5302 - 2.5m SCSI cable
    - #5305 - 5.0m SCSI cable
    - #5310 - 10.0m SCSI cable
    - #5318 - 18.0m SCSI cable
    - #5325 - 25.0m SCSI cable
    - #9400 - Attached to AS/400

  – **Cartridge features** (only available with initial order):

    - #8750 - 1 cleaning cartridge
    - #8757 - 20 data cartridges

IBM 3590 High Performance Tape Subsystem Models B1A and B11



The 3590 High Performance Tape Subsystem Model B11 is a rack-mountable unit using high performance ½-inch tape cartridges as the storage media. The figure above shows two 3590 Model B11s side-by-side in a 9309 rack.

These cartridges use metal particle media, providing a capacity of up to 10 GB. With the enhanced LZ1 compaction technique of the 3590, this capacity can be increased up to 30 GB per cartridge.

The tape cartridges used by the 3590 are the same physical size as those used in the 3480 and 3490E but cannot be interchanged between the tape subsystems. Only the high performance and extended length ½-inch tape cartridges are supported in the 3590.

The 3590 incorporates an advanced longitudinal recording technique that makes eight passes along the tape media. It writes 16 data tracks at a time to the end of the tape. Then, it switches to the next 16 different interleaved tracks and writes back to the beginning of the tape cartridge. The heads then move down to the next set of tracks and repeat the process. This provides a total of 128 data tracks.

For greater reliability and data integrity, the 3590 has improved Error Correction Code (ECC) combined with servo tracks on each tape cartridge. A portion of each tape cartridge is reserved for error history, which is updated after each use to aid early identification of potential media problems.

The 3590 Model B11 provides one tape drive and includes an integrated control unit with two SCSI ports. 3590s shipped prior to 29 January 1999, support a 16-bit fast and wide SCSI-2

interface on the SCSI ports. 3590s shipped on or after 29 January 1999, or with feature #5790 have an Ultra SCSI interface.

Both interfaces allow attachment to the iSeries 400 or AS/400e system using one of the following controllers:

- #6501 Tape/Disk Device Controller (requires #9410 Interposer for AS/400)
- #6534 Magnetic Media Controller (SPD)
- #2729 Magnetic Media Controller (PCI)

The 3590 has an instantaneous data transfer rate of 9 M/sec when attached using fast and wide SCSI-2. Performance is further enhanced by a 4M buffer. When attached using Ultra SCSI to a #6501 or #6534, the instantaneous data transfer rate is 17 MB/sec. When attached using Ultra SCSI to a #2729, the instantaneous data transfer rate is 13 MB/sec. The actual throughput achieved is a function of many components and can vary. A maximum of two 3590s may be attached per #6501, but if run concurrently, 3590 performance may be reduced. The maximum distance between the iSeries 400 or AS/400e system and the 3590 is 25 meters (82 feet). The #6534 and #2729 Magnetic Media Controller can support a maximum of one 3590 Model B11. For more information on these controllers, see “Magnetic Media Controllers” on page 407.

The 3590 Model B11 also includes the Advanced Cartridge Function (ACF), which has the same operational function of an Automatic Cartridge Loader (ACL) but also allows random access of cartridge tapes. The ACF supports the 10-cartridge magazine that has 10 slots for the high-performance ½-inch cartridge tapes and a spare slot for a cleaning cartridge. Each 3590 Model B11 is shipped with the ACF, a high performance cartridge tape, a cleaning tape, and a 10-cartridge magazine. Additional 3590 cartridge magazines can be ordered using RPQ 8B3184.

The 3590 Model B11 is supported on all iSeries 400 and AS/400e models except for 9401, D02, E02, and F02. For PowerPC-based models, the 3590 is supported as an Alternate IPL device. For AS/400 CISC models, the 3590 requires OS/400 V3R1 or V3R2. It is supported as an Alternate IPL device on CISC models only with RPQ 843945, but is not supported for Alternate IPL on 9404 Models D10 and D20. Refer to the introduction in “Operating System/400, 5769-SS1” on page 477 for a listing of CISC models.

This RPQ is required because IBM software, PTFs, and MULIC/FULIC tapes will not be distributed on 3590 media. A second tape drive, in addition to the 3590, must be specified as a valid Alternate IPL device. The RPQ includes IBM service instructions for attaching the 3590 as an Alternate IPL device, and a license to make a copy of the MULIC/FULIC tape on 3590 tape media.

The 3590 is also supported in the 3494 Tape Library Dataserver as the Model B1A. The 3590 Model B11 can be field upgraded to a Model B1A.

IBM 3590 High Performance Tape Subsystem Models E1A and E11

The IBM Magstar 3590 High Performance Subsystem Model E11 tape drive is a rack-mountable model using high performance ½-inch tape cartridges. The 3590 E Models can read or write twice as much data as the B1X Models on the 3590 High Performance Cartridge Tape. With the E1X Models, the cartridge can contain up to 20 GB of native/uncompressed data per cartridge (60 GB with a 3:1 compression ratio).

The 3590 E Models use an advanced serpentine recording technique, which makes sixteen passes along the tape to provide greater capacity and performance. The head element is composed of two groups of 16-track read/write heads. The 3590 writes 16 data tracks at a time to the end of the tape. Then, it electronically switches heads to write 16 different interleaved tracks and records back on the tape to the beginning. The head is indexed (physically moved) slightly to record the next set of tracks. A total of 256 tracks are recorded on the 3590 cartridge. Fully written tapes are positioned back at the load point, virtually eliminating the rewind operation as with 3490E tape drives. The “locate” function has been enhanced to position the drive on the proper track and location without having to sequentially search the entire recorded tape. The 3590 cartridge tape has servo tracks written on it. These tracks enable the 3590 drive to accurately position the read and write head, with respect to the media while the tape is in motion.

The Model E11 includes a ten-cartridge Automatic Cartridge Facility (ACF) with a cartridge magazine. This magazine has a random mode operation feature that allows random access to any cartridge in the ACF. Status indicators on each cell of the ACF alert the operator to conditions that may need to be addressed. The ten-cartridge ACF, coupled with increased capacity of the 3590 cartridge, reduces the frequency for operator interaction with the tape subsystem. The increased capacity of the 3590 cartridges allows the ACF to typically contain from 200 GB native to 600 GB with a 3:1 compression ratio of data. Other standard features include a 16 MB dynamic data buffer, an improved data compression, auto-blocking of small records, and one-pass-read-after write. Drive reliability includes the use of an enhanced error correction code and the use of servo tracks for read and write.

The IBM 3590 Exx models have a 14 MBps device data rate, which is 50% faster than IBM 3590 Model B11/B1A Tape Drives. With compression, the 3590 drive on the iSeries 400 or AS/400e server may achieve a sustained data rate of up to 17 MB/sec with compression or 60 GB per hour for large files. The actual throughput achieved in a system environment is a function of many components, such as system processor, disk data rate, data block size, data compressibility, I/O attachments, and the system or application software used. Other operating characteristics are:

- **Tape speed**: 3.14 meters per second (124 inches per second)
- **Search/Rewind speed**: 5 meters per second (198 inches per second)
- **Full cartridge rewind time**: 2 seconds
- **Maximum rewind time per cartridge**: 60 seconds

Up to four Model E11s can be installed in a rack, which, therefore, reduces the floor space required. Each drive has an operator panel with a display and menu control switches for use by the operator. This model includes an integrated SCSI-3 controller with two ports. The Magstar 3590 Model E11 Tape Drive can be attached to all iSeries 400 or AS/400e servers capable of running OS/400 V4R1 and later software and supporting the following attachments:

- AS/400 Magnetic Media Subsystem Controller (#6501)
- AS/400 Magnetic Media Controller (#6534)
- PCI External Tape Controller (#2729)

Each AS/400 Magnetic Media Subsystem Controller (#6501) has two SCSI ports that support one tape subsystem per SCSI port. Tape and DASD cannot be attached to the same feature #6501. Each Magstar 3590 tape drive has two SCSI ports, so each port can be connected to a different iSeries 400 or AS/400e servers and the 3590 can be shared between two systems. The iSeries 400 and AS/400e servers do not support two or more systems connected to the same SCSI path.

The required software includes:

- Device support of the IBM 3590 Model E11 and E1A Tape Drives, including support for the ACF in random mode, is provided by OS/400 V4R1 and beyond.
- PTFs are required to attach the 3590 Model E11 or E1A Tape Drive to iSeries 400 or AS/400e systems. Refer to Informational APAR II11472 for the required PTFs.

  Support is also provided under the following products:

  – Backup Recovery and Media Services for OS/400 (BRMS)
  – ADSTAR Distributed Storage Manager (ADSM) for AS/400 Version 3.1
  – IBM Content Manager OnDemand (5769-RD1)

  Note: ADSM was withdrawn from marketing on 31 December 1999. Tivoli Systems Inc., an IBM company, now offers Tivoli Storage Manager Version 3.7 to replace the ADSM product set. See Tivoli Storage Management Solutions at: `http://www.tivoli.com/storage`

Each E Model tape drive has two Ultra SCSI ports for attachment to multiple systems or a single host processor for redundancy. The supported environments include:

- One cartridge magazine is shipped with each Model E11. A cartridge magazine must be in the E11 for the ACF to be operated. It is suggested that an empty spare magazine be ordered and kept on hand in case the original magazine is misplaced or accidentally damaged.
- One SCSI cable feature should be specified for each 3590 drive port attached to an iSeries 400 or AS/400e system adapter. Each AS/400 Magnetic Media Subsystem Controller (#6501) requires one Interposer for AS/400 (feature #9410 on the 3590) for the cables to connect correctly. The interposer (#9410) is not required for attachment

to the #2729 or #6534 iSeries 400 or AS/400e adapters. The maximum SCSI cable length is 25 meters. For more information, see the *Introduction and Planning Guide,* GA32-0329.

Model Abstract 3590-E1A

The Magstar 3590 Model E1A Tape Drive comes without the ACF and is designed to go into the Magstar IBM 3494 Tape Library.

IBM 3590 Model B11 and B1A Tape Drives (B Models) can be field upgraded to the new E Models, providing investment protection.

IBM 3590 Model E11 Tape Drive can be field upgraded to Model E1A.

The new models will write on existing cartridges. Data written on cartridges with current 3590 Tape Drives can be read by the new models.

The 3590 E11/E1A models look identical to the B11/B1A Models. It is really only the inside that is different (for example, a different tape head, takeup reel, and electronic card packs).

3590 Extended High Performance Cartridge

The IBM Magstar 3590 Tape Drive supports the 3590 Extended High Performance Cartridge Tape (Extended Length Cartridge). This tape has a native capacity of 40 GB on the 3590 Model E11 and E1A tape drives and 20 GB on the 3590 Model B11 and B1A tape drives. All 3590 B and E Models shipped on or after 04 February 2000 support the Extended Length Cartridge. The 3590 Extended Media Support is also available as an MES upgrade feature for installed 3590 B and E Model tape drives.

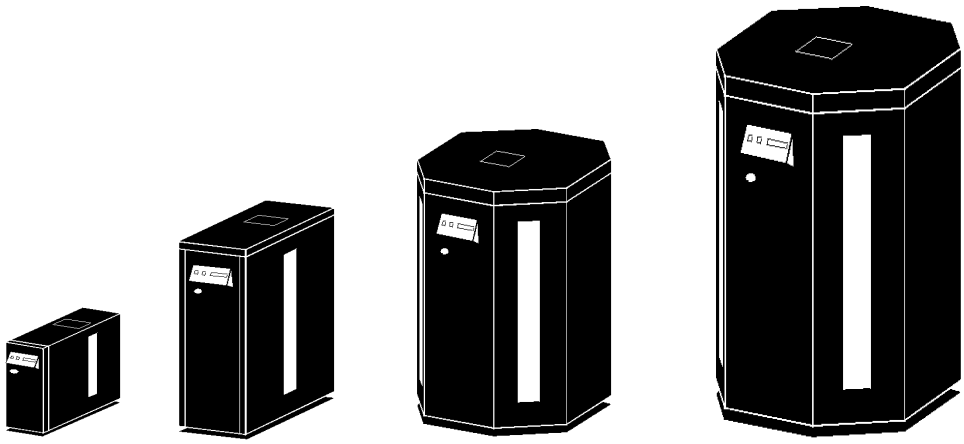
Doubling cartridge capacity benefits customers that use such applications as system backup and restore, which utilize full tape cartridges. This can result in a significant cost savings from less tape cartridge handling, floor space, and improved automation slot utilization.

All models of the Magstar 3590 Tape Drive continue to support the 3590 High Performance Cartridge Tape Cartridge (Standard Length Cartridge).

Statement of Direction

IBM plans to further augment Magstar 3590 Tape Drive Fibre Channel server connectivity with support for iSeries 400, Sun Solaris, Windows NT, and Windows 2000.

IBM 3995 Optical Library C-Models



3995 Optical Library Models C40, C42, C46, and C48

The IBM 3995 Optical Library C-Models feature high capacity 5.2G or Extended Multifunction optical drives, known as 8X technology. It is eight times the capacity of the first generation optical technology.

The drives use industry standard 5.25-inch optical cartridges, supporting the following optical technologies:

- Magneto-Optical (MO) rewritable, which allows data on the cartridge
- Permanent Write-Once-Read-Many (WORM), which provides a permanent and unalterable copy of the data by physically ablating (burning) holes into the recording layer
- Continuous Composite Worm (CCW), which provides an unalterable copy of data through a software implementation of WORM, using rewritable media

Rewritable, permanent (ablative) WORM and CCW optical cartridges can be mixed within the same library.

The 5.2G (8X) optical drives in the C models can read and write to 5.2G (8X) and 2.6G (4X) optical cartridges and read only 1.3G (2X) and 650M (1X) optical cartridges. The 2.6G (4X) optical drives in the C models can read and write to 2.6G (4X) and 1.3G (2X) optical cartridges and read only 650M (1X) optical cartridges.

Each library has an auto changer, which is used to move the optical cartridges between the optical drives, the cartridge storage cells, and the entry/exit slot located on the top of the libraries. Certain models feature a dual-gripper cartridge picker on this auto changer for

improved performance. All models have a viewing window through which the auto changer can be seen.

The following table summarizes the 3995 C-Models supported on the iSeries 400 or AS/400e server.

3995 Model	Capacity		Number of Drives	Attachment	Number of Auto Changer Grippers
	G	Disks			
C40	104	20	1-2	Direct	1
C42	270	52	2	Direct	2
C44	540	104	2 or 4	Direct	2
C46	811	156	4 or 6	Direct	2
C48	1341	258	4 or 6	Direct	2
C20	104	20	1-2	LAN	1
C22	270	52	2	LAN	2
C24	540	104	2 or 4	LAN	2
C26	811	156	4 or 6	LAN	2
C28	1341	258	4 or 6	LAN	2

Only two model upgrades are supported. These are for the 3995 Model C24 to Model C26 and for the Model C44 to Model C46.

The iSeries 400 and AS/400e direct attach 3995 C-Models (C40, C42, C44, C46, and C48) can attach using the following features:

- #2621 Removable Media Device Attachment support on OS/400 V3R2 only with a maximum of four internal drives or less (for example, does not support the optional 6 drive configurations available for the model C46 and the model C48)
- #6534 Magnetic Media Controller (SPD) when using V4R2 or later
- #2729 Magnetic Media Controller (PCI) when using V4R2 or later

See “Magnetic Media Controllers” on page 407 for a description of these controllers.

The following OS/400 software is required to support 3995-C4x 8X optical drives:

- OS/400 V4R4
- OS/400 V4R3 with Group PTF SF99089 for 8X Support
- OS/400 V4R2 with Group PTF SF99088 for 8X Support
- OS/400 V3R2 with 5755-AS3 #1979 and PRPQ 5799-XBW #3520 with Group PTF SF99079 for 8X Support

The iSeries 400 and AS/400e integrated file system provides UNIX-type access to optical files through commands and APIs. It also provides workstation-to-iSeries 400 and iSeries 400-to-iSeries 400 access to optical byte-stream files.

The LAN-attached 3995 C-Models (C20, C22, C24, C26, and C28) require either an IBM Token-Ring LAN or an Ethernet LAN conforming to IEEE 802-3 protocol. Ethernet is available with an Ethernet 10/100 Mbps adapter. The LAN models include a desktop controller that provides command processing, auto changer control, and optical drive controls for the library. An operator keyboard, display, and mouse are also included.

The IBM High Performance Optical File System (HPOFS) is also included in the controller, which provides additional data protection in the event of power interruptions.

The IBM 5.2G Optical Disk Cartridges can be ordered in packs of 10 or 52 as a feature of the 3995 cartridge and are available in rewritable, worm, and CCW technology. See the announcement letter dated 01 September 1998 (198-202 in the United States) for details.

With the support of save and restore to optical storage in OS/400 V3R7 and Version 4, the 3995 models can be used to archive and restore libraries and objects. Applications can also be used to archive and retrieve records and objects to optical storage by using many applications, including the IBM Content Manager OnDemand (5769-RD1). Refer to “IBM Content Manager OnDemand for AS/400 V4R5, 5769-RD1” on page 684 for further information.

The maximum number of LAN-attached 3995 Optical Libraries supported on a single LAN is 24. The maximum number of iSeries 400 or AS/400e direct-attached 3995 Optical Libraries supported on a system depends on the system model. Refer to “iSeries and AS/400e servers” on page 83 for these numbers.

Magnetic Media Controllers

Magnetic Media Controllers

Magnetic Media Controllers

Removable Media Devices

The following table compares tape subsystems that can attach to the iSeries or AS/400e server. It indicates whether the attachment IOP supports Hardware Data Compression (HDC) and whether the tape subsystem controller supports a compaction algorithm, either Improved Data Recording Capability (IDRC) or Lempel Ziv 1 (LZ1). These algorithms enable more data to be written to tape up to the maximum shown.

Storage Subsystem	IOP	OS/400 Version (min)	HDC	IDRC	LZ1	Max. Capacity (Compressed)	Data Transfer Rate (Native)
¼-inch Cartridge Tape							
QIC-Mini	MFIOP	3.1	x			1.6 GB	300 KB/Sec
120 MB	MFIOP	1.1	x			200 MB	90 KB/Sec
525 MB	MFIOP/#2624	1.3	x			1 GB	200 KB/Sec
1.2 GB	MFIOP/#2624/#6513/#	2.2	x			2 GB	300 KB/Sec
*2.5 GB	#2726/#2740/#2741/#9728 MFIOP/#2624/#6513	3.0.5	x		x	4.5 GB	300 KB/Sec
*4 GB	MFIOP/#6513/#2726/ #2740/#2741/#9728	4.1			x	8 GB	380 KB/Sec
*4 GB external	#2718/#2768	4.2			x	8 GB	320 KB/Sec
*13 GB	#2726/#2740/#2741/#9728 MFIOP/#6513	3.7			x	32 GB	1.5 MB/Sec
*16 GB	#2726/#2740/#2741/#9728 MFIOP/#6513	4.1			x	32 GB	1.5 MB/Sec
*25 GB	#2726/#2740/#2741/#9728 MFIOP/#6513	4.3			x	50 GB	2.0 MB/Sec
CD-ROM							
#6325 / #6425	MFIOP/#2624	4.4				650 MB	-
7210-020	#2718/#2768	4.5					
½-inch Reel							
2440	#2621	1.1	x			200 MB	918 KB/Sec
3422	#2644	1.1	x			200 MB	780 KB/Sec
3430	#2644	1.1	x			200 MB	312 KB/Sec
9347	#6112	1.1	x			100 MB	160 KB/Sec
9348*	#2621/#6534/#2729/#2749	1.2	x			200 MB	781 KB/Sec

© Copyright IBM Corp. 2000

Storage Subsystem	IOP	OS/400 Version (min)	HDC	IDRC	LZ1	Max. Capacity (Compressed)	Data Transfer Rate (Native)
8mm Cartridge							
7208-002	#2621	2.2	x	x		5 GB	245 KB/Sec
7208-012	#2621/#6534/#2729/#2749	2.2	x	x		10 GB	500 KB/Sec
7208-222	#2621/#6534/#2729/#2749	3.1	x	x		14 GB	500 KB/Sec
7208-232	#2621/#6534/#2729/#2749	2.2	x	x		20 GB	500 KB/Sec
7208-234	#2621/#6534/#2729/#2749	2.2	x	x		28 GB	500 KB/Sec
*7208-342	#6534/##2729/#2749	4.1		x		40 GB	3 MB/Sec
#6390/#1261	MFIOP/#2624/#6513	3.0.5	x	x		14 GB	500 KB/Sec
#6490	#2726/#2740/#2741/ #9728/#6513	4.1		x		14 GB	500 KB/Sec
½-inch Cartridge							
3490-D31	#2644	1.3	x	x		3.6 GB	3 MB/Sec
3490-D32	#2644	1.3	x	x		7.2 GB	3 MB/Sec
3490E-D41	#2644	2.1	x	x		14.4 GB	3 MB/Sec
3490E-D42	#2644	2.1	x	x		28.8 GB	3 MB/Sec
*3490E-C10	#2644	2.1.1	x	x		2.4 GB	3 MB/Sec
*3490E-C11	#6534/#6501/#2644 #2729/#2749	2.1.1	x	x		14.4 GB	3 MB/Sec
*3490E-C22	#6534/#6501/#2644 #2729/#2749	2.1.1	x	x		28.8 GB	3 MB/Sec
3490E-E01/E11	#6501/#6534/#2729/#2749	2.3		x		16.8 GB	3 MB/Sec
*3490E-F00	#6501/#6534/#2729/#2749	3.1		x		2.4 GB	3 MB/Sec
*3490E-F01/F11	#6501/#6534/#2729/#2749	3.1		x		24 GB	3 MB/Sec
*3590-B11[1]	#6501/#6534/#2729/#2749	3.1			x	300 GB	9 MB/Sec
*3590-B11[2]	#6501/#6534/#2729#2749	3.2			x	300 GB	9 MB/Sec
*3590-E11	#6501/#6534/#2729/#2749	4.1			x	600 GB	14 MB/Sec
MagstarMP Cassette							
*3570-B00/C00	#6501/#6534/#2729#2749	3.1			x	15 GB	2.2 MB/Sec 7 MB/Sec
Libraries							
*9427	#2621/#6534/#2729/#2749	3.1	x	x		280 GB	500 KB/Sec
*3494	#2621/#6534/#2729/#2749	2.3		x	x	374 TB[3]	14 MB/Sec
*3570-Bxx	#2621/#6534/#2729/#2749	3.1			x	300 GB[3]	2.2 MB/Sec
*3570-Cxx	#2621/#6534/#2729/#2749	3.1			x	300 GB[3]	7 MB/Sec
*3575	#2621/#6534/#2729/#2749	3.1			x	4.8 TB[3]	2.2 MB/Sec
*3584	#2749	4.5				496.2 TB[3]	15 MB/Sec

Notes:

***** Tape models available. The others have been withdrawn from Marketing.

1. Models shipped prior to 29 January 1999 and without feature #5790.
2. Models shipped after 29 January 1999 or with feature #5790.
3. Capacity and transfer rates vary depending on the tape drives used.

Features #2729 and #6534 require OS/400 V4R1 or later. Feature #2749 requires OS/400 V4R5

Common Magnetic Media Controllers

The iSeries and AS/400e servers have common magnetic media controllers for disk, tape units, optical libraries, and diskettes. The following table indicates what can be attached to each model. The following pages describe these controllers in more depth.

Feature Function	270	820[1]	830[1]	840[1]	SB2[1] SB3[1]	Migration Towers
#2621 Removable Media Device Attachment SPD		x	x	x	x	x
#2624 Storage Device Controller SPD[2]		x	x	x	x	x
#2644 34xx Magnetic Tape Attachment SPD[3]		x	x	x		x
#6112 Magnetic Storage Device Controller[3]		x	x	x		x
#6501 Tape/Disk Device Control SPD	x	x	x	x	x	x
#6502 High Performance Control (2M) SPD[3]		x	x	x		x
#6512 High Performance Control (4M) SPD[3]		x	x	x		x
#6513 Internal Tape Device Control SPD		x	x	x		x
#6530 Disk Unit Control (No Cache) SPD[3]		x	x	x		x
#6532 RAID Disk Unit Control Ultra (4M) SPD[3]		x	x	x		x
#6533 RAID Disk Unit Control Ultra (4M) Compression SPD		x	x	x		x
#6534 Magnetic Media Control SPD	x	x	x	x	x	x
#2718 PCI Magnetic Media Controller		x	x	x		x
#2726 RAID Disk Unit Control Ultra (4M) PCI[3]		x	x			x
#2729 Magnetic Media Control PCI		x	x	x		x
#2740 RAID Disk Unit Control Ultra (4M) PCI		x	x			x
#2741 RAID Disk Unit Control Ultra (4M) Compression PCI[3]		x	x			x
#2748 PCI RAID Disk Unit Controller		x	x	x		x
#2749 PCI Ultra Magnetic Media Controller	x	x	x	x	x	
#2763 PCI RAID Disk Unit (10M) Controller	x	x	x	x	x	
#2768 PCI Magnetic Media Controller	x	x	x	x	x	
#4748 PCI RAID Disk Unit (26M) Controller	x	x	x	x	x	
#9728 Base Disk Unit Control Ultra PCI[3]		x	x			x

Feature Function	270	820[1]	830[1]	840[1]	SB2[1] SB3[1]	Migration Towers
#9748 Base PCI Disk Unit (26M) Controller			x	x	x	
#9767 Base PCI Disk Unit Controller	x	x				
#6146 (on #2624) 9331-01X Diskette Controller SPD[3]		x	x	x		x

Notes:

1. SPD cards in 8xx and SBx models are only supported in migration towers and towers attached to these migration towers via the SPD Bus.
2. #2624 can support internal tape and diskette devices only.
3. No longer available, but is supported during migrations to these systems.
4. Supported in the #5065 Storage/PCI Expansion Tower only.

None of the above magnetic media controllers are supported on the 9401 models.

IOP workload and bus data traffic may need to be considered for Tape, DASD, and LAN subsystems.

If you are placing any of the following IOPs in combination on the same SPD bus, follow the rules provided in the table. Refer to the *iSeries and AS400e System Builder*, SG24-2155, for additional details.

Limitations to Combinations of High Workload IOPs (SPD Type)		
Subsystem	**High Workload IOP**	**Bus Capacity**
DASD	#6112, #6500	Non streaming
Tape	#2621, #2624, #2644, #6112	Non streaming
DASD	#2748, #6501, #6530, #6502, #6512, #6532, #6533	Streaming
Tape	#6501, #6513, #6534, #2718	Streaming
Tape IOP with 3590 Tape	#6502, #6534	Streaming
Tape	#2621	Non streaming
Optical	#2621	Non streaming
Optical	#6534	Streaming
LAN	#2810	Streaming

Limitations to Combinations of High Workload IOPs (SPD Type)		
Subsystem	**High Workload IOP**	**Bus Capacity**
Limitations on combinations • Maximum of five high workload IOPs per bus. • Maximum of three nonsectarian high workload IOPs per bus. • In #5044 System Unit Expansion Rack, no DASD controllers are allowed on the same bus with a 3590 tape controller.		
Note: • These guidelines are for all system buses and include the first system bus. • Exceeding these guidelines will cause performance degradation.		

#2621 Removable Media Device Attachment SPD

The Removable Media Device Attachment, the #2621, provides for the attachment of one or two of the following devices, in any combination:

- 2440-A12 ½-inch Reel Tape Unit
- 9348-001 ½-inch Reel Tape Unit - Rack Mount
- 9348-002 ½-inch Reel Tape Unit - Table Top
- 7208-002 2.3G 8mm Cartridge Tape Unit
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 5.0G 8mm Cartridge Tape Unit (Single Drive)

The #2621 provides a hardware data compress-decompress function for these devices. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times. The #2621 requires one I/O card slot.

The #2621 also provides attachment to one of the following devices:

- 3995 Optical Library (direct attach models)
- 7208-234 Dual 7.0 GB 8mm Cartridge Tape Unit
- 7208-232 5.0 GB 8mm Cartridge Tape Unit (Dual Drive)
- 9427 8mm Tape Library
- #5032 Removable Media Cluster Box

When the #2621 is used to attach a 3995 Optical Library DataServer, a 7208-232 Dual Drive or 7208-234 8mm Cartridge Tape Unit, a 9427 8mm Tape Library, or #5032 Removable Media Cluster Box must be dedicated to it.

Certain tape devices listed above are also supported by the #6534 Magnetic Media Controller. The #6534 should be selected on new orders. For more information on the #6534, see “#6534 Magnetic Media Controller SCSI SPD” on page 416.

#2624 Storage Device Controller SPD

The #2624 Storage Device Controller supports the ¼-inch cartridge and 8mm cartridge internal tape devices, 9331-011, 9331-012, or #6135 external diskette devices, and internal CD-ROM devices. CD-ROM device support requires V4R4.

As a feature on the 9406 Model 740 and SB1, the #2624 controls up to two media devices installed in the system unit and one external diskette unit. For 9406 Models 170 and 720, the MFIOP or base PCI Disk Unit Controller supports the base CD-ROM and one internal tape in the system unit.

As a feature on a #5072, #5073, or #5044 System Unit Expansion Tower, the #2624 supports up to three internal tape or CD-ROM devices and one external diskette unit.

The internal tapes that are supported by the #2624 are:

- 1.2G ¼-inch Cartridge Migration Kit #1379
- 2.5G ¼-inch Cartridge Migration Kit #1380
- 2.5G ¼-inch Cartridge #6380
- 7G 8mm Cartridge #6390
- CD-ROM #6325

The #2624 does not support any other internal media.

The #2624 is not supported on the 9406 Model 170 or Model 720 with no SPD card slots. Unless the customer requires a #2624 to support a diskette drive or CD-ROM, the #6513 Internal Tape Device Controller should be selected in place of #2624. For more information on the #6513, see “#6513 Internal Tape Device Controller SPD” on page 414.

#6501 Tape/Disk Device Controller SPD

The #6501 Tape/Disk Device Controller provides a SCSI interface with a two-byte wide data path and an instantaneous data rate of 20M/sec.

The #6501 provides attachment for the following tape devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 3590-B11/B1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)

- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 9337-2xx, 4xx, 5xx Disk Array Subsystems
- 2105 Enterprise and Versatile Storage Servers

The #6501 requires one I/O card slot and can support up to two tape units per one controller. The #6501 has two ports, but can support up to four devices in total for the two ports. Tape units which have library capability have one device for the library and one device for each tape drive. Therefore, the 3570-B02/C02 (library plus two tape drives equals three devices) and the 3575 with more than one tape drive have additional limitations when attaching to one port on the #6501 along with another tape drive on the second port. The #6501 does not support Hardware Data Compression (HDC). Tape subsystems attached to the #6501 support a compaction algorithm using their own controller.

One #6501 can support two 9337s or 2105s. The maximum number of #6501s that can attach to support the 9337s or 2105s varies by model. For details, see “iSeries and AS/400e servers” on page 83 and “Summary of All Earlier AS/400 and AS/400e Models” on page 747. One I/O card slot is required and must be accommodated in the System Unit or System Unit Expansion (#5072, #5073, or #5044).

The #6501 cannot support a tape unit and a 9337 or 2105 on the same controller. On new orders, the #6534 Magnetic Media Controller should be ordered for tape attachment.

#6502/#6522 High Performance Controller (2 MB Cache) SPD

The #6502 is a SCSI controller and provides unprotected, mirroring, and RAID-5 protection of internal disk units not supported by the MFIOP. The #6502 also has a 2 MB write cache for better performance and improved device utilization.

In the 9406 models that support SPD card slots, the #6502 provides attachment capabilities for up to eight disk units in the #5051 or #9051 Storage Expansion Unit and up to 16 disk units in the #5052, #5058, or #8052 Storage Expansion Unit, or #5061, #5082, or #5083 Storage Expansion Tower. These can be either one-byte or two-byte SCSI disk units. It requires one I/O card slot in the System Unit, System Unit Expansion Tower, or the Storage Expansion Towers.

On the 9406 Model 720 with the #9364/#5064 System Unit Expansion, with the #9331 Expansion Unit for SPD Cards, the #6502 can support up to 15 disk units located in the System Unit Expansion and occupies one card slot.

One #6502 supports a maximum of two RAID-5 DASD arrays with a maximum of ten drives per array. All drives in an array must be of the same capacity and parity can be spread across four or eight drives. Drives not supported in a RAID-5 array can also be attached to the same #6502 in either a mirrored or unprotected environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6502.

The #6522 High Performance Controller, which was available on 9402 Models 2xx and 4xx, is functionally equivalent to #6502 and will be converted to #6502 if upgrading to a 7xx model. New orders should include the #6532 or #6533 instead of the #6502.

#6512 High Performance Controller (4 MB Cache) SPD

The #6512 disk controller provides unprotected, mirrored, or RAID-5 protection for internal disk units and includes a 4 MB write cache for better performance and improved device utilization.

The #6512 is supported on the 9406 models that have SPD card slots. The #6512 controls disk units installed in the #5051, #5052, #5058, #8052, and #9051 Storage Expansion Units and the #5061, #5082, and #5083 Storage Expansion Towers.

On the 9406 Model 720 with the #9364/#5064 System Unit Expansion and the #9331 Expansion Unit for SPD Cards, the #6512 supports up to 15 disk units within the System Unit Expansion.

The #6512 supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. Disk units not supported in a RAID-5 array can also be attached to the same #6512 in either unprotected or a mirrored environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6512. The #6512 occupies one I/O card slot position. On new orders, the #6532 should be ordered, instead of the #6512.

#6513 Internal Tape Device Controller SPD

This feature provides a two-byte wide SCSI interface for attachment of one or two internal tape drives in the 9406 Model 730, 740, and SB1 System Unit. On the 9406 Model 720 with the #9364/#5064 System Unit Expansion and the #9331 Expansion Unit for SPD Cards, the #6513 supports up to three internal tape drives located in the System Unit Expansion. Provides support for up to four internal tape drives in the #5072 and #5073 System Unit Expansion Towers. The #6513 provides attachment for the following internal tape devices:

- #1349 1.2 GB ¼-inch Cartridge Tape Unit Kit
- #1350 2.5 GB ¼-inch Cartridge Tape Unit Kit
- #1355 13 GB ¼-inch Cartridge Tape Unit Kit
- #1360 7 GB 8mm Cartridge Tape Unit Kit
- #1379 1.2 GB ¼-inch Cartridge Tape Unit Kit

- #1380 2.5 GB ¼-inch Cartridge Tape Unit Kit
- #6380 2.5 GB ¼-inch Cartridge Tape Unit
- #6381 2.5 GB ¼-inch Cartridge Tape Unit
- #6382 4 GB ¼-inch Cartridge Tape Unit
- #6385 13 GB ¼-inch Cartridge Tape Unit
- #6390 7 GB 8mm Cartridge Tape Unit
- #6481 2.5 GB ¼-inch Cartridge Tape Unit
- #6482 4 GB ¼-inch Cartridge Tape Unit
- #6485 13 GB ¼-inch Cartridge Tape Unit
- #6386/#6486 25 GB ¼-inch Cartridge Tape Unit
- #6490 7 GB 8mm Cartridge Tape Unit

The #6513 occupies one I/O card slot position.

#6532 RAID Disk Unit Controller (4 MB Cache) Ultra SCSI SPD

The #6532 disk controller provides unprotected, mirrored, or RAID-5 protection for internal disk units. It includes a 4 MB write cache for better performance and improved device utilization.

The #6532 will control Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the #5058 Storage Expansion Unit and #5083 Storage Expansion Tower. The Ultra SCSI disks will give best performance when attached to a #6532 in these Ultra SCSI Expansion Units or Towers. These Ultra SCSI disks are 17.54G Disk Unit #6714, 8.58G Disk Unit #6713, 4.19G Disk Unit #6907, and 1.96G Disk Unit #6906.

The #6532 also supports disks installed in the Storage Expansion Units #5051 and #5052 and in the Storage Expansion Towers #5081 and #5082. None of these are Ultra SCSI Units and Towers, Therefore, they do not provide full Ultra SCSI performance.

The #5052 and #5082 are supported for migration to the Model 7xx. For the 7xx models, the #5058 Storage Expansion Unit and #5083 Storage Expansion Towers, which are both Ultra SCSI, are offered. They provide full Ultra SCSI performance when the disks are attached to a #6532. One #5058 is supported per #5081 or #5083.

On the 9406 Model 720 with the #9364/#5064 System Unit Expansion and #9331 Expansion Unit for SPD Cards, the #6532 supports up to 15 disk units located in the system unit expansion and occupies one card slot.

The #6532 controller supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disks units. A maximum of four RAID-5 arrays are supported on one #6532. Disk units not supported in a RAID-5 array can also be attached to the same #6532 in either unprotected or a mirrored environment.

The #6532 requires OS/400 Version 4. The #6532 is supported on PowerPC based models with SPD card slots. It is not supported on Models 170, SB1, and 720 with no SPD card slots.

The #6532 offers improved performance over the #6502, #6512, and #6530, and therefore, effectively replaces them. The #6532 occupies one I/O card slot. It does not offer support for compression. The #6533 RAID Disk Unit Controller, which supports compression effectively, supersedes #6532 when systems are ordered with V4R2 or later although V4R3 is required for compression.

#6533 RAID Disk Unit Controller (4 MB Cache) Ultra SCSI Compress. SPD

The #6533 disk controller is functionally equivalent to the #6532. For a full description, see the #6532 section above.

The #6533 offers an enhancement over the #6532 in that it supports data compression when used with OS/400 V4R3 onward.

The #6533 requires OS/400 V4R2 or later. For all new orders with that release or later, the #6533 will be ordered in place of the #6532.

#6534 Magnetic Media Controller SCSI SPD

The Magnetic Media Controller SCSI, the #6534, provides for attachment of one of the following devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½-inch Cartridge Tape Subsystem
- 3590-B11/B1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 Dual 5.0G 8mm Cartridge Tape Unit
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-342 20.0G 8 mm Cartridge Tape Unit
- 9348-001 ½-inch Reel Tape Unit–Rack Mount

- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

The #6534 offers improved performance over #2621 and #6501 for external tape attachment, and therefore, effectively replaces them. However, there are some devices such as the #5032 Removable Media Cluster Box, the 2440-A12 ½-inch Reel Tape Unit, and the 7208-002 2.3G 8mm Cartridge Tape Unit, that are not supported by the #6534. For these devices, the #2621 is still required.

The #6534 does not provide Hardware Data Compression (HDC).

V4R2 or later is required for #6534 to support 3995 Optical Library Dataserver.

#9754 MFIOP with RAID

The #9754 MFIOP with RAID is a SCSI controller that provides unprotected, mirrored, or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization. The #9754 also controls the internal CD-ROM drive and one internal tape unit and contains three IOA slots for communications, LAN, and twinaxial I/O adapters.

The #9754 will control Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the system unit and the #5055 Storage Expansion Unit (Model 730) or the #5057 (Model 740). The Ultra SCSI disks give the best performance when attached to the #9751. These Ultra SCSI disks are 17.54 GB Disk Unit #6714, 8.58 GB Disk Unit #6713, 4.19 GB Disk Unit #6907, 1.96 GB Disk Unit #6906, and their base disk equivalents.

The #9754 also controls disks that are not Ultra SCSI. However, in that case, the disks do not perform at Ultra SCSI speeds.

The #9754 MFIOP with RAID supports a maximum of 20 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. A maximum of four RAID-5 arrays are supported on one #9754. Disk units not supported in a RAID-5 array can also be attached to the #9754 in either an unprotected or a mirrored environment.

The #9754 supports data compression when combined with OS/400 V4R3. The #9754 itself requires V4R2 of OS/400. The CCIN number for this feature is 6754.

#2718 PCI Magnetic Media Controller

The #2718 provides SCSI External attach capability exclusively for the 7207 Model 122 4 GB External QIC Tape Drive.

This feature requires OS/400 V4R2 or later.

#2726 PCI RAID Disk Unit Controller Ultra SCSI

The #2726 PCI RAID Disk Unit Controller provides unprotected, mirrored, or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization. The #2726 also supports one CD-ROM drive and one internal tape unit when placed in the system unit. When placed in the #5064/#9364 System Unit Expansion, the #2726 can support up to three internal tape units.

The #2726 controls Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the System Unit and the #5064/#9364 System Unit Expansion with Expansion Unit for PCI cards #9329. The Ultra SCSI disks provide the best performance when attached to the #2726. These Ultra SCSI disks are 17.54 GB Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96 GB Disk Unit# 6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58 GB), #1337 (4.19 GB), and #1336 (1.96 GB) Disk Unit Migration Kits. These are all supported in the System Unit and #5064/#9364 System Unit Expansion. The #2726 also controls migrated disks that are not Ultra SCSI. In that case, the disks do not perform at Ultra SCSI speeds.

The #2726 PCI RAID Disk Unit Controller supports a maximum of 15 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. A maximum of three RAID-5 arrays are supported on one #2726. Disk units not supported in a RAID-5 array can be attached to the #2726 in either unprotected or a mirrored environment.

Concurrent maintenance of disks attached to the #2726 is only supported if the disks are part of a RAID array or are mirrored.

The supported internal tape drives include:

- 1.2G ¼-inch Cartridge Tape Unit Kit, #1349
- 2.5G ¼-inch Cartridge Tape Unit Kit, #1350
- 13G ¼-inch Cartridge Tape Unit Kit, #1355
- 7G 8mm Cartridge Tape Unit Kit, #1360
- 2.5G ¼-inch Cartridge Tape Unit, #6481
- 4G ¼-inch Cartridge Tape Unit, #6482
- 13G ¼-inch Cartridge Tape Unit, #6485
- 16 G ¼-inch Cartridge Tape Unit
- 25G ¼-inch Cartridge Tape Unit, #6486
- 7G 8mm Cartridge Tape Unit, #6490

The #2726 requires OS/400 V4R1 or later. It occupies one High Speed PCI card slot. It is supported on the 9406 Model 720 only. A maximum of one #2726, #2740, #2741, or #9728

can be installed in the system unit and one #2726 or #2741 in the #5064/#9364 System Unit Expansion with #9329 Expansion Unit for PCI cards. If RAID is to be implemented or more than five disk units are required in the system unit, the #2726 should be ordered in place of #9728 Base PCI Disk Unit Controller.

The #2726 does not offer support for compression. The #2741 PCI Raid Disk Unit Controller supports compression when used with V4R3 and it effectively supersedes the #2726 when systems are ordered with V4R2 or later. If only a maximum of 10 disks are required and there is no requirement for compression, the #2740 can be ordered as an alternative to the #2741.

#2729 PCI Magnetic Media Controller SCSI PCI

The #2729 PCI Magnetic Media Controller SCSI provides for attachment of one of the following devices:

- 3490E-C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½-inch Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494-L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 0.31-inch Cartridge Tape Subsystem
- 3590-B11/B1A/E11/E1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 Dual 5.0G 8mm Cartridge Tape Unit
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-342 20.0G 8mm Cartridge Tape Unit
- 9348-001 ½-inch Reel Tape Unit–Rack Mount
- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

The #2729 does not provide Hardware Data Compression (HDC).

The #2729 occupies one High-Speed PCI card slot. It requires OS/400 V4R1 or later. It is supported on the 9406 Models 170 and 720, and the #5065 Storage/PCI Expansion Tower/#5066 1.8 I/O Tower. A maximum of one #2729 can be installed in the system unit and two #2729s in the #5064/#9364 System Unit Expansion with #9329/#9330 Expansion Unit for PCI cards. Up to three #2729s can be installed in #5065 Storage/PCI Expansion Tower.

The #2809/#2824 PCI Feature Controller or the base PCI LAN/WAN Workstation IOP in the #5065 Storage/PCI Expansion Tower/#5066 1.8 I/O Tower is a prerequisite for the #2729.

OS/400 V4R2 or later is required for the #2729 to support the 3995 Optical Library Dataserver.

#2740 PCI RAID Disk Unit Controller

The #2740 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. However, the #2740 can only be located in the System Unit. It cannot be located in the System Unit Expansion #5064/#9364. The #2740 is supported on the 9406 Models 170 and 720 only. The #2740 supports a maximum of 10 one- or two-byte disk units. A maximum of two RAID-5 arrays are supported on one #2740. A maximum of one #2740, #2726, #2741, or #9728 can be installed in the system unit. The #2740 does not offer support for compression. However, if only a maximum of 10 disks are required and there is no requirement for compression, the #2740 should be ordered.

Concurrent maintenance of disks attached to the #2740 is only supported if the disks are mirrored or part of a RAID array. Otherwise, the #2740 offers the same support as the #2726. Refer to “#2726 PCI RAID Disk Unit Controller Ultra SCSI” on page 418 for more information. The #2740 requires OS/400 V4R2 or later.

#2741 PCI RAID Disk Unit Compression Controller

The #2741 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. See “#2726 PCI RAID Disk Unit Controller Ultra SCSI” on page 418 for a full description of #2726. The #2741 supports a maximum of 15 disk units but offers an enhancement over the #2726 in that it supports data compression when used with OS/400 V4R3. The #2741 requires V4R2 or later of OS/400. For all new orders with V4R2 or later, the #2741 will be ordered in place of the #2726.

Concurrent maintenance of disks attached to the #2741 is only supported if the disks are mirrored or part of a RAID array.

The #2741 is supported on the 9406 Model 170 and 720 only. A maximum of one #2741, #2726, #2740, or #9728 can be installed in the system unit and one #2741 or #2726 in the #5064/#9364 System Unit Expansion with #9329 Expansion Unit for PCI cards. If only a maximum of 10 disks is required and there is no requirement for compression, the #2740 can be ordered instead of #2741.

#2748 PCI RAID Disk Unit Compression Controller

The #2748 is an Ultra2 SCSI disk and tape controller with a 26 MB write-cache that provides RAID-5 protection for internal disk units. In addition to RAID, the #2748 also offers DASD compression capabilities. The #2748 IOA is shipped with compression disabled. Compression is

enabled by moving a jumper on the IOA. The #2748 supports Extended Adaptive Cache with restriction that compression must not be active on the same #2748 subsystem.

The #2748 is designed to control Ultra2, Ultra, and Fast Wide SCSI disk units. It supports up to 15 disk units (10 if installed on a model 170), one CD-ROM, and one internal tape unit. In addition to RAID-5 and compression, the #2748 is also designed to work as a high performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at a lower cost than mirroring. This feature supports Concurrent DASD Add/Maintenance. Note the following additional points:

- The #2748 is a replacement for the #2741.
- The #2748 requires a V4R4 or later operating system.
- High Speed PCI Card slots required: One.
- This feature is CE *installation only*.

#2749 PCI Ultra Magnetic Media Controller

The #2749 is an Ultra SCSI controller for attachment of an external tape device or an external optical device.

Devices supported by #2749:

- 3490E
  - C11/C22/C1A/C2A ½-inch Cartridge Tape Subsystem with #5040
  - E01/E11 ½-inch Cartridge Tape Subsystem
  - F00/F01/F11/F1A ½-inch Cartridge Tape Subsystem
- 3494
  - L10 ½-inch Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
  - L12 ½-inch Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
  - D10 ½-inch Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
  - D12 ½-inch Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570
  - B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
  - C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 0.31-inch Cartridge Tape Subsystem
- 358x-Hxx Tape Cartridge System
- 3590-B11/B1A/E11/E1A ½-inch Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012/222/232/243/342 8mm Cartridge Tape Unit

- 9348-001 ½-inch Reel Tape Unit–Rack Mount
- 9348-002 ½-inch Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

This feature also supports hot pluggable.

Refer to the card placement rules for supported systems and valid slots.

#2763 PCI RAID Disk Unit Controller

The #2763 is an Ultra2 SCSI disk unit controller with a 10 MB write-cache that provides RAID-5 protection for internal disk units and also supports internal tape and CD-ROM units.

In addition to providing RAID-5 protection for disks, the #2763 is also designed to work as a high-performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at less cost than mirroring and with greater performance than system checksums.

The #2763 controller supports a maximum of 12 disk units. A minimum of four drives of the same capacity are needed for a valid RAID-5 configuration. A maximum of three arrays are allowed with a maximum of 10 drive allowed per array. All drives in an array must be of the same capacity.

The #2763 supports two removable media devices.

This feature also supports hot pluggable.

Refer to card placement rules for supported systems and valid slots.

#2768 PCI Magnetic Media Controller

The #2768 is an Ultra SCSI controller for attachment of an external tape device or an external CD-ROM device that has a Single Ended SCSC interface.

Devices supported by the #2768 are:

- 7207-122 QIC-SLR Tape Bridge Box
- 7210-020 CD-ROM Bridge Box

This feature also supports hot pluggable.

Refer to the card placement rules for supported systems and valid slots.

#4748/#9748 PCI RAID Disk Unit Controller

The #4758/#9748 is an Ultra2 SCSI disk unit controller with a 26 MB write-cache that provides RAID-5 protection for internal disk units and also supports internal tape and

CD-ROM units. The #4758/#9748 supports both compression and non-compression modes. The mode of operation is determined by a hardware jumper, which is in the non-compression mode position when shipped. By moving the hardware jumper, the controller will function in compression mode.

In addition to providing RAID-5 protection for disks, the #4748/#9748 is also designed to work as a high-performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at less cost than mirroring and with greater performance than system checksums.

The #4748/#9748 controller supports a maximum of 18 drives. A minimum of four drives of the same capacity are needed for a valid RAID-5 configuration. A maximum of four arrays are allowed with a maximum of 10 drive allowed per array. All drives in an array must be of the same capacity.

The #4748/#9748 also supports two removable media devices. This feature supports the #4331 1.6 Gb Read Cache Drive for increased performance. The Read Cache Drive #4331 is only supported in non-compression mode.

This feature also supports hot pluggable.

Refer to the card placement rules for supported systems and valid slots.

#9728 Base PCI Disk Unit Controller Ultra SCSI

The #9728 Base PCI Disk Unit Controller is the base controller for the system unit. It is an Ultra SCSI controller, which provides mirroring or unprotected support for up to five disks (four on the Model 170) located in the system unit. The #9728 does not include any write cache and it does not support RAID. As well as five disks, it also supports the internal CD-ROM drive and one internal tape unit.

The #9728 controls Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the system unit. The Ultra SCSI disks provide the best performance when attached to the #9728. These Ultra SCSI disks are 17.54G Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96G Disk Unit #6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58G), #1337 (4.19G) and #1336 (1.96G) Disk Unit Migration Kits. The #9728 also controls migrated disks that are not Ultra SCSI. In that case, the disks do not perform at Ultra SCSI speeds.

The Base PCI Disk Unit Controller supports a maximum of five one- or two-byte disk units. It requires OS/400 V4R1 or later, and occupies one High Speed PCI card slot. It is supported on the 9406 Models 170 and 720 only. It is represented in the rack configuration list as CCIN 2728. A maximum of one #2726, #2740, #2741, or #9728 can be installed in the system unit. If RAID is to be implemented or more than five disk units are required in the system unit,

#2726, #2740, or #2741 PCI RAID Disk Unit Controller should be ordered in place of the #9728.

The #9728 does not offer support for compression. If compression is required, the #2741 should be ordered in its place. The #2741 is only supported on Models 170 and 720.

#9740 Base PCI RAID Disk Unit Controller

The #9740 is an Ultra SCSI disk and tape controller with a 4 MB write-cache that provides RAID-5 protection for internal disk units. The #9740 is designed to control Ultra, Fast Wide, and Fast Narrow SCSI disk and tape units that are installed in the base system unit and the System Expansion Unit #7102. In addition to providing RAID-5 protection for disks, the #9740 is also designed to work as a high-performance controller for disks protected by system mirroring or disks with no protection. In the RAID-5 configuration, disk unit protection is provided at less cost than mirroring and with greater performance than system checksums.

The #9740 controller supports a maximum of 10 drives. A minimum of four drives of the same capacity are needed for a valid RAID-5 configuration. A maximum of two arrays are allowed with a maximum of 10 drive allowed per array. All drives in an array must be of the same capacity.

The #9740 also supports one CD-ROM and one internal tape unit. This feature supports Concurrent DASD Add/Maintenance, but does not support compression. If compression is desired, the #2748 PCI RAID Disk Unit Controller may be substituted (without credit) for the #9740 Base controller.

The #9740 is *only* available on the #2407, #2408, and #2409 Dedicated Domino Server Processors. A RAID controller does *not* need to be added on these processors when five or more DASD files are ordered. Note the following additional points:

- **High Speed PCI card slots required**: One.
- **Maximum**: One. Requires V4R4.

#9767 PCI Disk Unit Controller

The #9767 is an Ultra2 SCSI disk unit and removable medial device controller.

The #9767 controller supports a maximum of six disk units and two removable media.

This feature also supports hot pluggable.

Refer to the card placement rules for supported systems and valid slots.

Migration Features

The following are also supported as migration features:

- #2644 34xx Magnetic Tape Attachment Adapter
  - Supported on Model 720 with SPD card slots, 730, and 740
  - Supports parallel-attached 34xx Tape devices
- #6112 Magnetic Storage Device Controller SPD
  - Supported on Model 720 with SPD card slots, 730 and 740
  - Supports 9331 Diskette Unit Models 001 and 002 and 9347 Tape Unit
- #6500 Direct Access Storage Device Controller SPD
  - Supported on Model 720 with SPD card slots, 730 and 740
  - Supports 9337 Disk Array Subsystem Models 0xx and 1xx
- #6530 Disk Unit Controller (No Cache) SPD

  Supported on Model 720 with SPD card slots, 730 and 740
- #9751 MFIOP with RAID SPD

  Supported on Model 730 and 740

External Disk Storage

External Disk Storage

2105 Enterprise and Versatile Storage Servers

2105 Enterprise Storage Server

The Enterprise Storage Server (ESS) is a superior Storage Area Network (SAN) storage solution that supports critical requirements for strategic business initiatives. Such initiatives include e-business, enterprise resource planning, business intelligence, service consolidation, and other mission-critical applications. The Enterprise Storage Server deploys the IBM Seascape principles as a powerful storage server with snap-in building blocks and with universal data access.

ESS builds on the rich legacy of IBM storage system solutions across the major operating system platforms. It introduces new innovations to deliver substantial, unique business advantages. Heterogeneous attachment is provided to all major server platforms, including the iSeries and AS/400e server, S/390, Windows NT, and many varieties of UNIX.

The Enterprise Storage Server incorporates the capabilities of the Versatile Storage Server, such as:

- Supports a wide variety of UNIX and Windows NT servers, as well as iSeries, AS/400e, and Novell NetWare
- Remote management using a secure intranet connection and the StorWatch Versatile Storage Specialist

The ESS also incorporates many improvements, including StorWatch usability and management breadth. Plus, it extends an investment protection through the capability to reserve resources for the later incorporation of existing IBM 7133 Serial Disk capacity in IBM 2105 Model B09 and 100 frames into an Enterprise Storage Server configuration.

The Enterprise Storage Server supports fiber-channel attachment. Capacity ranges from 400 GB to over eleven terabytes to provide excellent scalability. Sixteen standard configurations are offered to meet your capacity and performance needs. Superior performance can be optimized to meet your changing heterogeneous environment needs, such as bandwidth and advanced transaction processing capabilities for both online and batch applications. Resource contention reduction and performance improvement is provided by the parallel access of volumes and I/O priority queuing.

The ESS architecture supports high availability requirements with redundant components. Data replication services extend access to data, while using a concurrent copy. Rapid data duplication provides extensive capabilities to exploit, manage, and protect your information in a 7-by-24 (7x24) environment.

© Copyright IBM Corp. 2000

The Enterprise Storage Server works in conjunction with the IBM StorWatch ESS Specialist and ESS Expert. These are comprehensive Web-based tools for configuration, performance, asset, and capacity management and to facilitate storage area network operations.

Availability is maximized through redundancy and non-disruptive service with a design to virtually eliminate single points-of-failure or repair.

The ESS is Year 2000 ready. When used in accordance with associated documentation, it is capable of correctly processing, providing and receiving date data within and between the twentieth and twenty-first centuries. This holds true provided that all products involved properly exchange accurate date data (for example, hardware, software, and firmware).

The Enterprise Storage Server is the storage of choice for users wanting comprehensive enterprise disk storage consolidation and data sharing on multiple, heterogeneous server platforms with combined storage requirements of more than 400 GB. It provides high-performance RAID-5, read and write cache, or the flexibility of common storage for multiple servers with differing channel attachments.

Product Preview

To provide investment protection for existing IBM 7133 Serial Disk and IBM Versatile Storage Server capacity, IBM plans for the Enterprise Storage Server to support the reuse of 7133 Model 020 and D40 drawers in the 2105 Model B09 and 100 frames in an Enterprise Storage Server configuration.

More information about the Enterprise Storage Server can be found on the Storage Systems Division home page on the Web at: `http://www.storage.ibm.com/`

2105 Versatile Storage Server

The IBM 2105 Versatile Storage Server is designed to provide a flexible approach to storage centralization in support of server consolidation. By using the IBM 7133 Serial Disk Subsystem as its storage building block, Versatile Storage Server provides investment protection. With the IBM Versatile Storage Server, disk storage can be consolidated into a single, powerful system that offers many levels of advanced function. Examples include remote Web-based management, true data sharing for like servers, and dynamic capacity allocation.

IBM Versatile Storage Server delivers centralized management of stored data. It also provides sharing of disk storage for a variety of UNIX, Windows NT, and iSeries and AS/400e servers. As requirements change, you can assign unallocated storage capacity dynamically to any of your attached servers without disruption.

Centralized management is simplified by using IBM StorWatch. Versatile Storage Specialist (part of StorWatch) is a Web-enabled, integrated storage management tool. Versatile Storage Specialist enables local or remote storage administrators to monitor and manage the Versatile Storage Server using a Java-compliant Internet browser. This enables growing volumes of data to be managed more cost effectively than ever before.

Based on the IBM Seascape storage enterprise architecture, Versatile Storage Server combines technology building blocks, including powerful storage servers, rich software function, high-performance adapters, and serial disk technology. Seascape solutions take advantage of technological advancements in various components without making entire systems obsolete, which protects existing storage investments. Versatile Storage Server is designed to grow with your organization. You can add capacity, terabytes of usable storage, as you need it. Mixed capacity hard disk drives are supported concurrently and Versatile Storage Server is designed to allow additional capacities and new generation serial disks to be easily incorporated.

Data center operations are enhanced by the many advanced features designed to protect data and deliver high availability, even in the event of a failure. Dual active processing clusters with automatic failover, hot spares, hot swappable disk drives, and redundant power and cooling provide high availability. Data protection and integrity are provided by a high-performance RAID-5 implementation that includes mirrored, nonvolatile fast-write cache. The IBM Versatile Storage Server provides further protection by verifying data accuracy at every operational step, even down to the disk level. This is an important safeguard for environments such as e-business.

The Versatile Storage Server supports 7133 Models 010 and 020 and D40 Serial Disk Subsystem containing 4.5 GB, 9.1 GB, and 18.2 GB disk drives. When attached to the AS/400 system, disk units must be grouped by four like units or eight like units. These groups of drives then emulate the 9337 Model 580 for the 4.5 GB (4.1 GB usable) disk units or 9337 Model 590 for the 9.1 GB (8.5 GB usable) disk units. No other disk units can be emulated.

The Versatile Storage Server is attached to the iSeries or AS/400e server using the #6501 Tape/Disk Device Controller. Due to the capabilities of the VSS for a maximum of 16 SCSI Interfaces and the #6501, when the Versatile Storage Server is attached to the AS/400 system, the maximum capacity is 536.3 GB when using the 4.5 GB Disk Units and 1099.5 GB when using the 9.1 GB Disk Units.

IBM 7133 Model 10 and Model 20 are for migration only. They are withdrawn from marketing.

More information about the Versatile Storage Server and 7133 Serial Storage Subsystem can be found on the Storage Systems Division home page on the Web at:
`http://www.storage.ibm.com/`

Enclosures

Enclosures

IBM 9309 Rack Enclosures

AS/400 9406 models support the 9309 Rack Enclosures. External I/O devices such as DASD, magnetic tapes, and diskette units can be accommodated in these 1.6 M racks.

The 9309 Rack Enclosures provide operator control panels, acoustic noise reduction, power control to all units within the rack (under the control of the System Unit), and power control to the next rack. All additional racks attached to the System Unit are termed “secondary” racks.

The following 9309 Rack and System Unit Rack Enclosures are supported:

- **9309 #9171**: General Purpose I/O Rack with SPCN
- **9309 #9141**: General Purpose Expansion Rack without SPCN
- **9406 #5040**: Bus Extension Unit Rack (9406-3X0 models only)
- **9406 #5042**: System Unit Expansion Rack (9406-3X0 models only)
- **9406 #5043**: Primary to Secondary Rack (for example, 9406 D, E, or F System Unit Rack conversion to a #9171 type rack)
- **9406 #5044**: System Unit Expansion Rack (9406-5X0, 620, 640, and 650 models only)

The 9309 #9141 must be connected to either a 9309 #9171 rack, a 9406 #5044 rack, or a 9406 #5043 rack for power control. However, if the 9309 #9141 rack is only going to support tape or diskette devices, it may attach directly to the 9406 System Unit using a wrap-around connector (part number 93X0167) and an EPO jumper (part number 6462413). Rack power control in this case is performed manually.

The following table shows which racks can upgrade when upgrading to an AS/400 9406 model or AS/400e server model.

9309/9406 Rack	Description	Upgrade to
#9177	9332 Disk Unit Rack w/SPCN	#9171
#9128	9335 Disk Unit Rack	#9141
#9129	I/O Expansion Rack	#9141
#9130	I/O Card Unit Rack	#9141
#9277	9335 Disk Unit Rack	#9141
#5040*	9406 Extension Unit	#5043/#5044
#5042*	9406 System Unit Expansion	#5044
System Unit Rack	9406 System Unit Rack	#5043 (#9171 type rack)
*9406 #5040 and #5042 are supported on 9406-3XX Models. When upgrading to 9406-5X0, 620, 640, and 650 models, they are converted to a #5044 System Unit Expansion Rack.		

© Copyright IBM Corp. 2000

#5040 Bus Extension Unit

The Bus Extension Unit provides 11 additional I/O card slots to an existing I/O bus. It can attach to an existing I/O bus on 9406 Models 300 (with #5142), 310, and 320. It also supports external DASD, tape, and diskette devices.

If replacing a Model 3xx with a Model 7xx, a #5040 must be converted to a #5044 in order to be used on the Model 7xx. It requires an Optical Bus Adapter Card (#2673, #2674, #2695, or a spare slot on the Base Optical Bus Adapter) and an Optical Link Processor Card (#2686) for attachment.

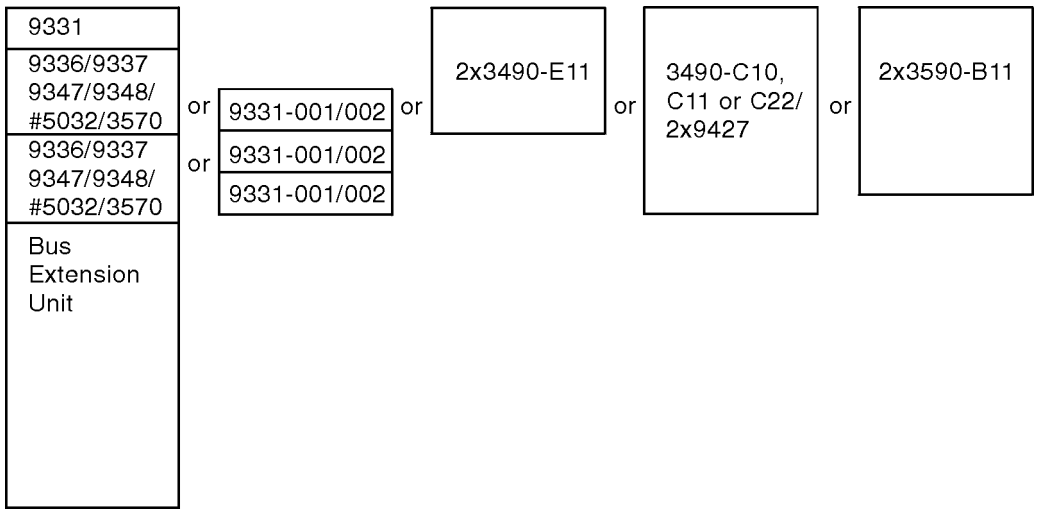
#5042 and #5044 System Unit Expansion Rack

The System Unit Expansion Rack is a 12-card slot expansion rack, which can also support external DASD, tape, and diskette devices. This feature provides two additional I/O buses with six I/O card slots per bus. The #5042 attaches to the 9406 Model 310 and 320 using a #5042 fiber optic attachment cable.

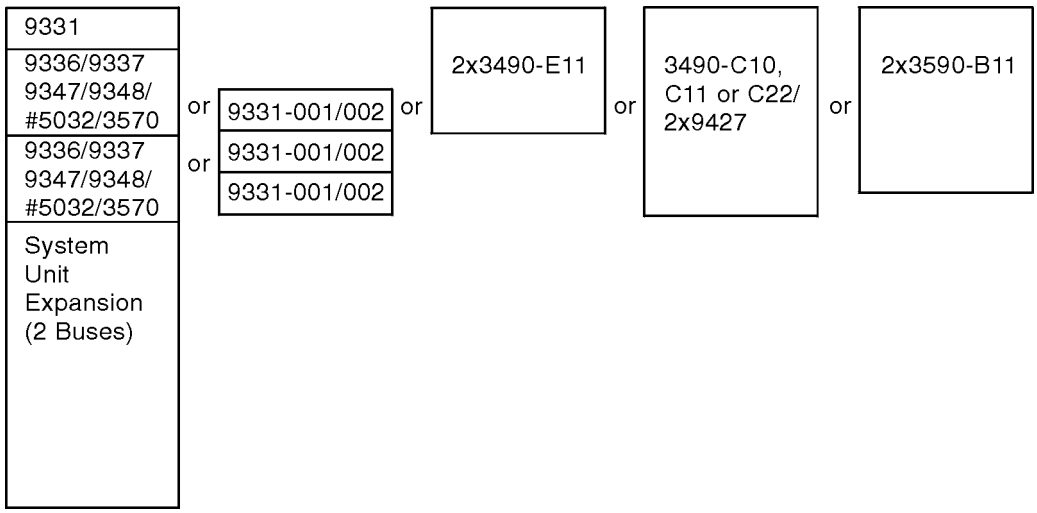
If replacing a Model 3xx with a Model 7xx, the #5042 is converted to a #5044 to be used on the Model 7xx. It requires an Optical Bus Adapter Card (#2673, #2674, #2695, or a spare slot on the Base Optical Bus Adapter) and an Optical Link Processor Card (#2686) for attachment.

The following diagrams illustrate the rack configurations and detail where devices will be installed.

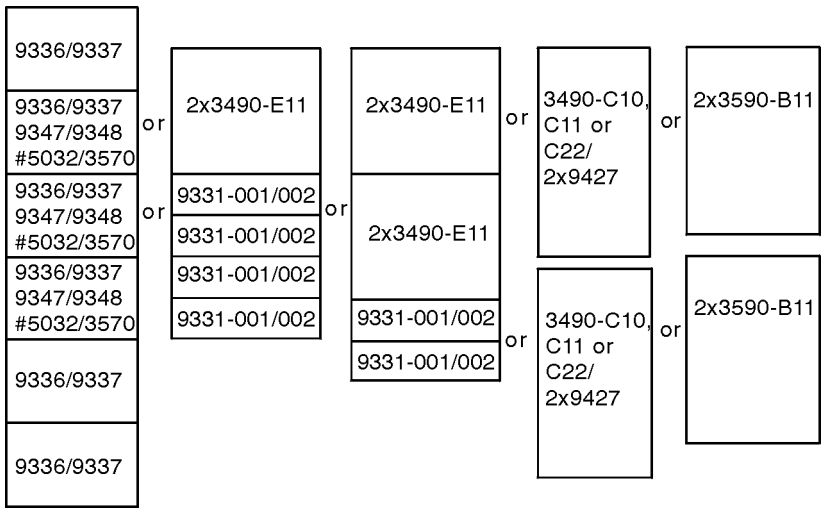
#5040 Bus Extension



#5042 or #5044 System Unit Expansion Rack

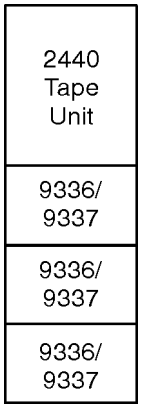


#9171, #9141, or #5043 General Purpose I/O Rack



#5032 is not supported in a #9141 rack.

2440 Rack



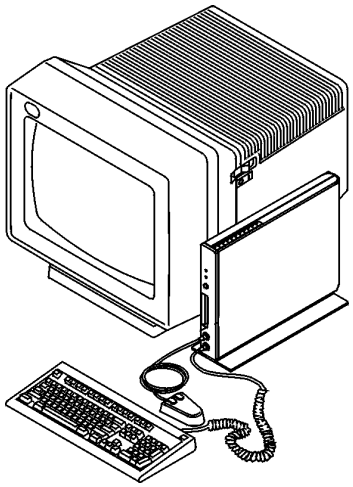
A 2440 rack supports the 2440 Tape Subsystem and can accommodate up to three DASD units (#3907 for 9336s or #3908 for 9337s). If external DASD is installed in the 2440, a wrap-around connector (part number 93X0167) and an EPO jumper (part number 6462413) are required if attaching it directly to a 9406 System Unit.

Peripherals

Peripherals

Peripherals

IBM Network Station Series 1000



The IBM Network Station is a compact desktop network computer that offers low-cost network computing. It does this by taking advantage of leading-edge application technologies like corporate intranets, the Internet, and Java, while benefiting from the simplicity and cost effectiveness of non-programmable terminals.

The small logic unit (1.8 lbs/0.8 Kg) is supplied with base memory (expandable to 64 MB), 1 MB of video memory (expandable to 2 MB), mouse, standard 102-character PC keyboard, power unit and cable, and monitor support for VGA/SVGA monitors (which are orderable separately). The keyboard shipped with the Network Station includes the euro currency symbol.

IBM Network Stations are best suited for such situations that include:

- Users need multi-system sign-ons
- Green-screen applications exist but there is a requirement for intranet capability
- Back office clerical applications
- Areas using secure data that is best held centrally on a server rather than on individual PCs
- Green screens and old PCs are being replaced where terminal emulation is the prime use

© Copyright IBM Corp. 2000

IBM Network Stations comply with the U.S. EPA “Energy Star” program for energy efficient office technology.

The cabling requirements depend on the model: Token-Ring or Ethernet. For Token-Ring, a Telephone Twisted Pair (TTP) cable with an RJ45 8-position connector is required. The cable type is generally describe as STP, UTP, or TTP RJ45 Category 3 (4 MB) or Category 4 (16 Mb) depending on the ring speed.

For Ethernet, a TTP cable with an RJ45 8-position connector is required, being an industry standard 10baseT cable. The cable type is generally described as Unshielded Twisted Pair (UTP) Category 3.

All models of the IBM Network Station use an operating system program kernel, which is downloaded from the iSeries 400 or AS/400e server over a TCP/IP LAN. The kernel and other Network Station programs are loaded using the IBM Network Station manager residing on the system. The Network Station operates without disk storage. When powered on, it performs initial diagnostics and then contacts the system requesting the Network Station Manager to download the kernel. The OS/400 software requirement is V3R2 or V3R7 or higher with the appropriate IBM Network Station Manager software (see “IBM Network Station Manager, Version 2 Release 1, 5648-C07/5648-C08” on page 603). This provides simultaneous window access to iSeries 400 and AS/400e, RS/6000, and S/390 applications, as well as Windows applications (using third-party multiuser Windows NT software) from a PC server. It also encompasses multiple server access with browser access to applications and services from the Internet, intranet, and extranets.

Series	Machine Type	Model	Connection	Base Memory	Processor (PowerPC)
1000	8362	A22	Token-Ring	32	200 MHz
1000	8362	A23	Token-Ring	64	200 MHz
1000	8362	A52	Ethernet	32	200 MHz
1000	8362	A53	Ethernet	64	200 MHz

The Series 1000 models are also designed to use eSuite, a comprehensive set of tools and applications written in Java, with a desktop environment called eSuite WorkPlace and a set of Web development tools called eSuite DevPack. eSuite WorkPlace provides a comprehensive set of applets, including calendar, mail, address book, word processor, spreadsheet, and presentation graphics. eSuite Workplace was withdrawn from marketing on 09 September 1999. Further information on eSuite can be found on the Web at: `http://www.esuite.lotus.com`

For further information on network stations, see the Web site at:
`http://www.pc.ibm.com/ww/networkstation/`

IBM NetVista Thin Clients

Connect. Compute. Communicate.

IBM NetVista Thin Clients makes it easy. These exciting, innovative products are easy to connect, with their advanced network, wireless, and Internet technologies. Because they feature a range of solutions and designs that complement and enhance your environment, IBM NetVista Thin Clients are easy to compute and live with. They are simpler to manage, because they employ industry standard manageability and leading security for trusted communications.

The NetVista name unifies two key elements of optimized computing. NetVista is network optimized for intranet, extranet, or Internet use to help users get their work done faster, better, and with greater ease and security. Plus, NetVista opens new vistas to users by helping them realize their visions and goals through technology. NetVista harnesses the power of the network to deliver focused, secure information that is optimized for the user.

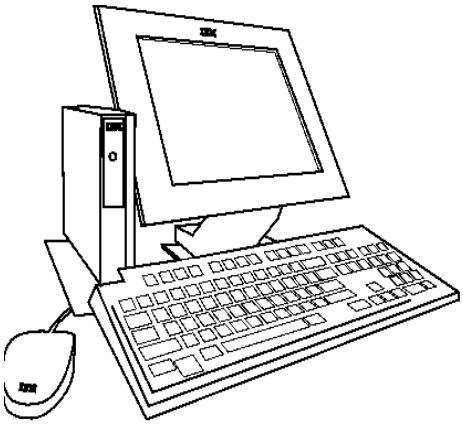
NetVista is built upon the IBM Edge of Network (EoN) initiative, which is designed to help you take advantage of e-business solutions and to simplify your hectic lifestyle with complementary tools that are easy to use.

All models of the IBM NetVista Thin Clients use an operating system program kernel, which is downloaded from the boot server over a TCP/IP LAN. The kernel and other thin client programs are loaded using the IBM Network Station Manager residing on the boot server. The thin client operates without disk storage. When powered on, it performs initial diagnostics and then contacts the boot server requesting the Network Station Manager to download the kernel. The boot server must be running one of the following operating systems: OS/400 (V4R2, V4R3, or V4R4), Windows NT 4.0 TSE, or AIX (4.3 or 4.2.1). The appropriate level of IBM Network Station Manager software (see “IBM Network Station Manager, Version 2 Release 1, 5648-C07/5648-C08” on page 603) is required on the boot server.

See the following sections for a description of the available models.

For further information on NetVista, see the Web site at:
`http://www.pc.ibm.com/ww/netvista/index.html`

IBM NetVista N2200 Thin Client



The NetVista N2200 Thin Client addresses customer environments where space, ease-of-use, reliability, and cost are serious concerns. The NetVista N2200 connects and boots via a LAN attachment to an AIX, OS/400, and Windows NT server. It can run applications from those servers or from an S/390 that is network-connected to a boot server. The NetVista N2200 allows access to Windows applications plus concurrent access to multiple terminal sessions. The user can also run small Java applications and take advantage of the emerging class of applications that use a thin Java GUI to transform existing character-based applications into easy-to-use graphical ones. Both direct attachment of USB devices and attachment via a cable adapter for devices that require serial or parallel ports are supported. The NetVista N2200 is an excellent solution for such applications as:

- Front counter applications (such as POS systems linked to back-office and production applications)
- Walk-up or kiosk environments (such as warehouses or lobbies)

The Series 2200 can easily replace aging or under-used PCs or outdated terminals. Consider it your low-cost, secure access to:

- E-mail
- The Internet
- Stored information
- 5250/3270 applications

The IBM NetVista Zero-Footprint option is available. It allows any NetVista N2200 Thin Client to be attached to the back of an IBM T55 or F56 Flat Panel Display to reduce the amount of desktop “real estate” needed.

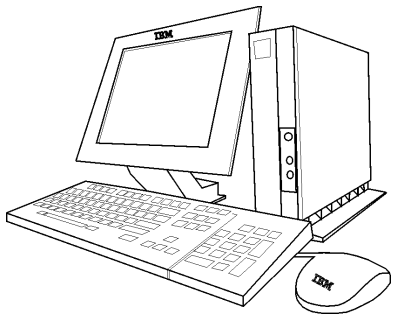
To use NetVista N2200, you must have these requirements:

- OS/400 (V4R2, V4R3, or V4R4), Windows NT 4.0 TSE, or AIX (4.3 or 4.2.1) boot server
- Network Station Manager V2R1

NetVista N2200 is a low priced, full-featured thin client that provides:

- A small form factor within today's NetVista family
- 233 MHz National Geode Enhanced Processor
- Keyboard and mouse
- Complete package when combined with Network Station Manager for V2R1 software
  - Management tools
  - Terminal emulators
  - Browser
  - Java Virtual Machine
- 16-bit audio and jacks for headphones or speakers and microphone
- 10/100 Mbps Ethernet or 4/16 Mbps Token-Ring network attachment
- Memory expansion up to 288 MB
- Two Universal Serial Bus (USB) ports
  - One dedicated to a keyboard and mouse combination
  - One available to support a standard parallel or serial device with a third-party cable converter
- Optional Compact Flash memory (24 MB up to 64 MB)
- VGA, SVGA, and XGA video support at up to 1024 x 768 with 16-bit color
- Low power usage
- Three-year warranty

IBM NetVista N2800 Thin Client



The combination of NetVista N2800 Thin Client hardware and Network Station Manager V2R1 software gives you the versatility of a single, powerful, thin client desktop with access to a full range of applications in diverse Java, the Internet, and server-based, for example, environments. NetVista N2800 provides outstanding performance across network-oriented business computing tasks whether the user is:

- Using Windows applications through the network
- Gathering Web-based information
- Accessing database information across a variety of servers

NetVista N2800 offers flexible expansion through multiple I/O attachment options and memory capacity. It also provides high quality audio and color video support for robust multimedia applications and online training programs. Support for centralized configuration and task management provides for fast application deployment and outstanding reliability for:

- Data
- Processing
- Storage
- Backup

There is also an enhanced ICA client that provides improved Windows application performance and audio and security features.

To use NetVista N2800, you must have the following requirements:

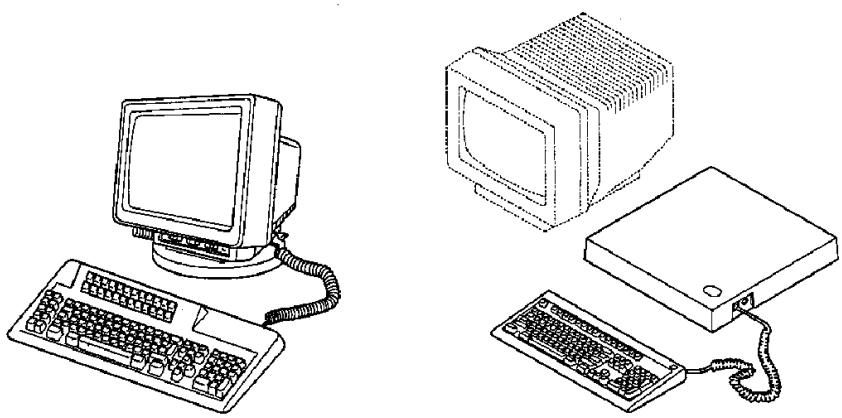
- OS/400 (V4R2, V4R3, or V4R4), Windows NT 4.0 TSE, or AIX (4.3 or 4.2.1) boot server
- Network Station Manager V2R1

The NetVista N2800 Thin Client comes with system unit, keyboard, mouse, and installation publications. The unit and peripherals are stealth black. You can order either a 4 MB/16 MB Token-Ring model or a 10/100 Ethernet model. The system integrates:

- 266 MHz Intel Pentium MMX Processor
- 512 KB Integrated Cache
- System support for up to 256 MB memory
- Advanced video graphics
  - Accelerated drawing support
  - 4 MB of video memory for high resolution and greater than 256 colors
  - Video resolution up to 1600 x 1200 at 85 Hz refresh rate are supported. Applications that require high resolution should be verified with your IBM or Business Partner technical marketing representative.
- 16-bit business-level audio
  - Built-in speaker with good quality monophonic audio
  - Stereo headphone or speaker connect
  - Mono microphone connector
- Other Standard System I/O
  - One parallel port
  - Two serial ports

- System functional expansion (located inside the system)
  - Two slots for additional Half-High PCI Adapters
  - One slot with a connector supporting an optional removable Compact Flash card (operates like an Advanced Technology Attach (ATA) hard file)
- Three-year warranty
- Software
  - Navigator 4.5 with:
    - Two-way e-mail
    - News Reader
    - .AU and .WAV audio
    - Live Connect
  - PDF viewer and Real Audio/Video
  - Enhanced ICA support
  - Boot from flash, remote flash boot storage management
  - Enhanced GUI desktop

IBM InfoWindow II Displays



The InfoWindow Models II 3486, 3487, 3488, and 3489 provide a graphical user interface (GUI)-like capability. They also incorporate a variable split screen, calculator, expansion cartridge to enable future IBM product enhancements or unique customer requirements to be added to the display, and both a mouse port and printer port as standard.

The InfoWindow IIs have screen-front characteristics, which meet the VDT section of the ISO Standard 9241 Part 3. They also meet the Swedish requirement of MPR-2 for low emissions, and the US EPA “Energy Star” Program for energy efficient office technology.

The 3486 and 3487 are integrated in design with a 122-key or enhanced keyboard, a lift, tilt, and swivel stand, and a monitor, with a choice of green, amber-gold, or color screens. They support up to two host display sessions, operator selectable horizontal or vertical split screen, and additional support for additional printers.

The 3488 and 3489 are modular in design with a 122-key or enhanced keyboard and Modular Logic Unit, which supports the attachment of most IBM monitors. They support up to four host display sessions; have a 6,000 keystroke record, play, and pause facility, a 262,000 color palette, and extended foreground and background colors; and support a lightpen.

The G54 and G74 color monitor models limit emissions below MPR-II guidelines and are capable of ENERGY STAR and NUTEK power management using DPMS, monitor Plug and Play using DDC, and ISO 9241-3 image quality.

The 3489 supports the Image/Fax-View and print facility and one PC/TV attachment, which allows end users to control audio and motion video using a cable, antenna, or external video source in a sizable pop-up window. The 348n displays connect to the iSeries 400 and AS/400e system using twinaxial attachment.

The InfoWindow II 3153 is a family of displays that has an ASCII attachment to the system and also to the RS/6000, a PC, or the ES/9000 using a 3174 controller. The 3153 emulates a variety of the most widely used ASCII displays. It has two RS232 ports and a parallel printer port. There are different models of the 3153 offering green, amber, or white monitors. The 3153 meets recognized international standards and guidelines on ergonomics, emissions, safety, and power consumption.

IBM 7299 Entry Hub

The IBM 7299-2EN Entry Hub is a low-cost traditional 1 Mbps-active UTP hub that can be upgraded to 2 Mbps. It connects traditional 5250-type devices to the iSeries 400 and AS/400e, System/3x, and 5x94 Remote Controller. This enables devices to take advantage of the cost savings of twisted-pair cabling over twinax, as well as the ability to use it for voice and other data connections.

The 7299-2EN connects two twinaxial workstation controller ports to up to fourteen 5250-type devices. Each device is connected directly to the hub using star topology and a patch panel, removing the need for daisy chaining twinaxial devices. Advanced noise suppression and load (impedance) matching ensure 5250 device performance and reliability.

The IBM 7299 Entry Hub can be upgraded to 2 Mbps, which makes it a versatile solution for connecting any twinax device to any twinax host.

Model 2EN has two host LEDs per host port and 14 device LEDs. One LED and the device LEDs indicate host and device port activity useful in debugging connection problems. The

other host port LED, inactive until the 2 Mbps Upgrade Kit is installed, indicates when attached devices are running at the faster 2 Mbps data rate. It is also useful in debugging network problems.

The 7299 Entry Hub supports shielded or unshielded RJ-45 at 1 Mbps or shielded RJ-45 when the 2 Mbps Upgrade kit is installed. The valid cable lengths are shown in the following table.

Connection	UTP Cat 3 at 1Mbps	UTP Cat 5 at 1 Mbps	UTP Cat 5 at 2 Mbps*
Host to 7299 7299 to Device	2000-ft/610m 1800-ft/548m	2000-ft/610m 2200-ft/671m	1000-ft/305m 1500-ft/457m
* Requires installation of 2 Mbps Upgrade Kit in the 7299-2EN.			

The 7299 supports the 5250 Express Data Stream providing speed improvements of up to four times. There are PTFs for V3R7 (or higher). The 5250 Express Data Stream also requires an IBM 5250 Express ISA, PCI, or PC adapter card in a supported PC. The 7299 supports dual mode operation when attached to the iSeries 400 and AS/400e workstation controllers 2722 or 6180. Dual mode operation means that a port between 0 and 3 and a port between 4 and 7 are being poled at the same time on these eight port workstation controllers.

IBM 7299 Express Multiplexer

The IBM 7299-8MX Express Multiplexer allows the connection of up to 56 5250-type devices to iSeries 400 and AS/400e servers using low-cost Category 5 or FTP cabling. The Express Multiplexer enables all 5250-type devices to realize up to a 200% increased throughput when attached to any of the faster PCI twinax workstation controllers. The 5250 Express Adapters and twinax Network Stations can realize nearly 400% additional increased throughput for a total of nearly 800% greater throughput (as compared to other fiber multiplexers like the IBM 6299 Host Port Multiplexer).

This enables devices to take advantage of the cost savings of twisted-pair cabling over twinax, as well as the ability to use it for voice and other data connections.

The 7299 Express multiplexer connects up to eight host ports over fiber optic cabling. The IBM 7299 Express Multiplexer is a time domain multiplexer. It can send data from two different twinax WSCs over the same set of fiber optic cabling. You can mix input from twinax WSCs from different iSeries 400 and AS/400e, System/36, or 5394/5494 Remote Controller hosts over the same fiber optic cable. This isn't possible with many other twinax multiplexer products.

The IBM 7299 Express Multiplexer fully supports the 5494 Remote Controller by sending all 56 devices over one pair of fiber cables.

Each device can be connected directly to the multiplexer using star topology and a patch panel, removing the need for daisy chaining twinaxial devices. Hubs may also be connected to the multiplexer that are then connected to the devices.

The 7299 Express Multiplexer supports connectivity options of shielded or unshielded twisted pair, optical fiber, and a high-speed DB25 cable. The various distance limitations are described in the following table.

Connection	UTP Cat 3 at 1 Mbps	UTP Cat 5 at 1 Mbps	UTP Cat 5 at 2 Mbps	Optical Fibre	High-Speed DB25 Cable
Host to Mux	2000-ft/610m	2000-ft/610m	1500-ft/457m		90-ft/27.3m
Mux to Mux				6600-ft/2012m	
Mux to Device	1800-ft/548m	2200-ft/671m	1650-ft/503m		
Mux to Hub	1000-ft/305m	1200-ft/365m	900-ft/274m	900-ft/270m	

The 7299 supports the 5250 Express Data Stream providing speed improvements of up to four times. The 5250 Express Data Stream also requires an IBM 5250 Express ISA, PCI, or PC adapter card in a supported PC. The 7299 supports dual mode operation when attached to the iSeries 400 and AS/400e workstation controllers #2722 or #6180. Dual mode operation means that a port between 0 and 3 and a port between 4 and 7 are being poled at the same time on these eight port workstation controllers.

IBM 5250 Express Network Kit

Using the V4R2 enhancement of TCP/IP over twinax cabling, it is possible to have non-LAN PCs access the World Wide Web, share printers, and files, and to use workgroup applications such as Lotus Notes using Express 5250 Adapters.

It is intended for customers with PCs attached to twinax workstation controllers, sites with large investments in twinax cabling, or twinax to NTP hubs, or sites with nonprogrammable workstations intending to migrate to PCs. One of the benefits of running TCP/IP over twinax is that it supports cable distances of up to 5,000 feet of twinax without any kind of repeater or 4,200 feet using one active 7299 Express Hub. This is longer than many LAN types that require additional hubs to attain this distance.

The prerequisites to running TCP/IP over twinax include any model of AS/400e running OS/400 V4R2 or later, or iSeries 400 with OS/400 V4R5; all 5250 Express ISA, PCI, or PC adapter cards, or certain specific Enhanced 5250 Display Station Adapters (part numbers 92G5364 or 884H0240); and a PC with a card slot running Microsoft Windows 95 (with the latest updates) or Windows NT Version 4.0 or later.

The adapters can be attached to the iSeries 400 and AS/400e server using twinax, Unshielded Twisted Pair (UTP), Foiled Twisted Pair (FTP), or the IBM Cabling System (ICS).

The twinax workstation controllers on the system that support TCP/IP are the #2720, #2722, #6180, and #9280. There are two 5250 TCP/IP transport drivers, which allow TCP/IP to use twinax cabling, now included with the 5250 Express Adapters: one for Microsoft Windows 95 and one for Windows NT. The transport drivers are also available for downloading from the Web at: `http://www.networking.ibm.com/525/525home.html`

The 5250 Express Network Kit includes everything needed to enable TCP/IP applications for five PCs:

- Five 5250 Express ISA adapters with the 5250 TCP/IP Transport Drivers
- Five DB15 to UTP RJ45 Baluns
- One Twinax-to-UTP Baluns
- One 7299 Express 400 Model 2EX

Six 10-foot UTP patch cables are included with the kit. Additional UTP cables may be required depending on the size of the customer site.

The 7299 2EX has a distance limitation of Legacy 1 Mbps transmission speed (where nonprogrammable workstations are included on a port) host to 7299 is 610m (2,000 feet), while 7299 to device is 671m (2,200 feet).

IBM 7852 Model 400 Modem

The 7852 Model 400 is an externally attached data/fax modem capable of full duplex transmission speeds of up to 33.6 Kbps. It operates in either synchronous or asynchronous mode and supports electronic mode switching using V.25bis AT commands. Connections can be made on Public Switched Telephone Networks (PSTNs) and point-to-point two-wire leased telephone type circuits. Other features include enhanced V.34 standards, callback security, remote configuration, and automatic rate negotiation between modems. The modem is factory set for Electronic Customer Support communications, with custom application settings available through the use of dip switches.

ITU V.42 error correction and V.42bis data compression provide 100% error-free data transmission. It offers interactive automatic dialing, as well as command mode option configuration. You can store up to 10 command line or telephone numbers of up to 60 characters each in the non-volatile memory. The modem pulse or tone dials and recognizes dial tones and busy signals for reliable call-progress detection. The modem can detect AT&T calling card tones. It is FCC-Registered for connection to telephone networks without any Data Access Arrangements (DAAs).

It offers Callback Security to protect networks from unauthorized use and to help manage phone line costs. By using the modem's phone number and password directory, a host site can, upon receipt of a call, call back to a remote site at a predetermined number. Remote

configuration provides support for users at remote sites, saving the time and trouble of site visits and preventing misinterpretation of configuration instructions.

The 7852-400 includes dial back-up with automatic lease line restore, adaptive protocol enhancing used in typical UNIX batch file transfers, and support for the iSeries 400, AS/400e, and System 3X environment.

The 7852-400 meets the ITU V.17 standard for sending and receiving faxes. When linked to a compatible fax machine or modem, it can transmit faxes at 14.4 Kbps. It also meets ITU Group 3 Designation for 9.6 Kbps and Group 2 for 4.8 Kbps. It is downward compatible with modems to speeds as low as 300 bps, making it compatible with virtually any fax machine in the world.

Support for this modem varies depending upon approved standards and other country-specific telecommunications regulations. For further information, contact your local IBM representative.

IBM iSeries 400 and AS/400e Printers

IBM iSeries 400 and AS/400e printers are designed, built, tested, and supported as an integrated component of the system. Printer options are scalable from desktop to production, impact to laser, and 375 characters per second to 1002 impressions per minute. The printer section is divided into three general areas:

- Workgroup Printers
- Departmental and Production Printers
- Industrial Printers

iSeries 400 and AS/400e print application information is found on the iSeries printing Web site at: `http://www.printers.ibm.com/r5psc.nsf/web/as400overview`

IBM iSeries 400 and AS/400e Workgroup Printers

IBM Infoprint and IBM Network Printers are a family of high-performance laser printers designed for iSeries 400 and AS/400e and network printing environments. These printers include the Network 12, Network 17, Infoprint 20, Infoprint 21, Infoprint 32, and the Infoprint 40 advanced network printers. As a group, they provide 600 dots-per-inch (dpi) quality, multiple concurrent connections, support for multiple print datastreams (IPDS, Postscript, PCL), and a wide range of paper handling options. In addition, the Infoprint Color 8 provides high-fidelity, full-color printing for iSeries 400, AS/400e, and workgroup applications.

To create an Intelligent Printer Data Stream (IPDS) printer on the system, you must (after specifying the device type as IPDS) specify AFP(*YES) in the printer device description. Any printer defined as Type (*IPDS) and AFP (*YES) needs the Print Services Facility (PSF) of

OS/400. Twinax connected IPDS printers may be defined as AFP (*NO) and, therefore, would not require PSF. Regardless of connection type, AFP (*NO) means that there will be no AFP resource management for fonts, images, or overlays.

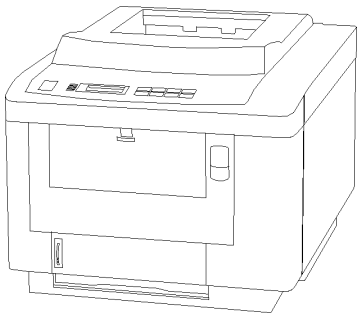
The PSF feature of OS/400 that is required is based on the speed of the fastest printer measured in Impressions per Minute (IPM) or pages per minute (ppm).

Machine Type	Description	Print Speed (maximum)	Maximum Monthly Usage (pages)
4308	Infoprint Color 8	8 ppm	35,000
4312	Network Printer 12	12 ppm	35,000
4317	Network Printer 17	17 ppm	65,000
4320	Infoprint 20	20 ppm	75,000
4322	Infoprint 21	21 ppm	75,000
4332	Infoprint 32	32 ppm	150,000
4340	Infoprint 40	40 ppm	200,000

Key features shared by these IBM Infoprint and Network Printers include:

- Connections to three systems, with automatic switching and automatic print data stream sensing, enable maximum productivity by handling iSeries 400 and AS/400e, network, and client print applications concurrently.
  - iSeries 400, AS/400e and LAN connectivity, including Token-Ring, EtherNet, twinax, and parallel.
  - Integrated Network Interface Card (NIC) eliminates the need for a separate network attachment box.
- Complete integrated IPDS printer featuring:
  - True IPDS controller (in contrast to an IPDS protocol convertor) for system-managed printing with page-level error recovery
  - Edge-to-edge printing
  - Full range of AFP fonts: iSeries 400 and AS/400e-resident and printer-resident, raster, and outline formats
  - Same printing and printer management function over TCP/IP network connection as with direct-attached (Twinax) connection
- IPDS connection over TCP/IP provides the same level of application and print management support as twinax-connected iSeries 400 and AS/400e printers.
- Crisp, high-quality 600 dpi output using TruRes image enhancement technology.
- TonerMiser technology that can reduce toner use by 50% and save supply costs.

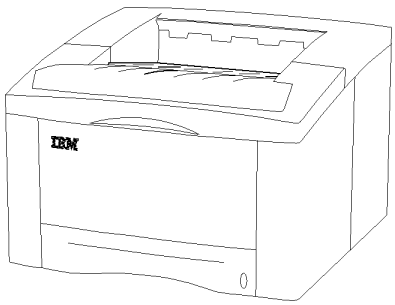
IBM Infoprint Color 8



IBM Infoprint 8 is a high fidelity, high-performance full-color network printer. Designed for reliability and speed, it features a straight single-path through four consecutive color printing stations. This design also expands the range of media (transparencies, card stock, labels) that can be used. IBM Infoprint Color 8 is integrated as a PCL printer on the iSeries 400 and AS/400e server, enabling line-of-business applications. Its features include:

- Superb 600-by-600 dpi print quality in color or monochrome at up to eight pages per minute
- Industry-standard color-matching support
- Ready for the e-output environment, with remote printer management and printer access via the Internet
- Easily network integrated with Ethernet, Token-Ring, and serial/parallel attachments

IBM Infoprint Color 12

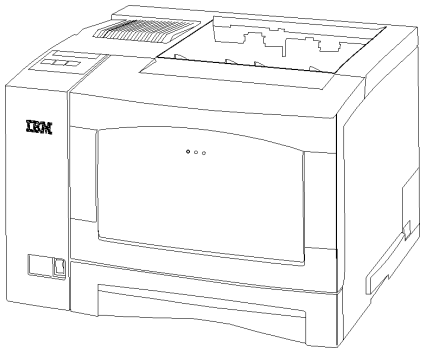


The IBM Infoprint 12 is designed for those who demand high-speed, high-resolution, and reliable printing for a desktop or small workgroup environment. The Infoprint 12 is great for printing professional reports, proposals, letters, spreadsheets, and transparencies. The ideal

printer for small workgroups and individual desktop use, this latest addition to the Infoprint line of printers offers:

- Up to 12 ppm
- 1,200 dpi print quality
- 250-sheet tray and a 100-sheet auxiliary tray standard
- Reduced power (Powersaver mode)
- Supports both Windows and Macintosh platforms
- 66 MHz, 32-bit processor with up to 68 MB of memory
- Ability to switch between print languages and interfaces
- Two US letter/A4/legal paper trays
- Manual Duplex printing capability via the auxiliary tray
- Fast Ethernet 10/100BaseTX network adapter

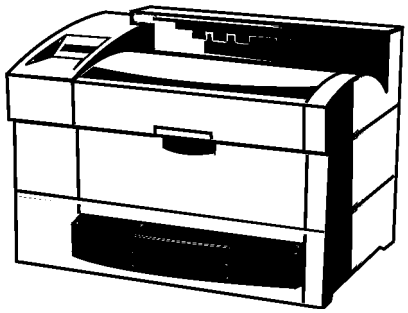
IBM Network Printer 17



The IBM Network Printer 17 is a 17-pages per minute (ppm) printer designed for small to medium workgroups. It delivers the following features:

- Superb 600-by-600 dpi print quality with TrueRes image enhancement
- HP PCL 5e standard, with optional IPDS and true Adobe Postscript Level 3
- Toner Saving technology to reduce toner usage and expense
- Network interface cards standardized across the entire IBM network printer line
- Duplex as a standard feature
- Optional secure mailbox feature for the Network Printer 17

IBM Infoprint 20 Printer



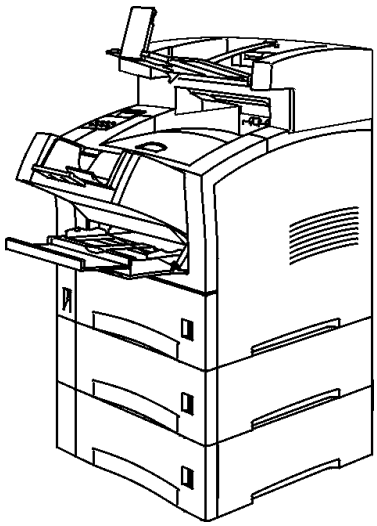
IBM Infoprint 20 is a high performance network laser printer for iSeries 400, AS/400e, and network applications. It provides large-format printing and high-capacity paper input/output at a low cost. Ideal for medium-to-large workgroups, the Infoprint 20 provides standard support for Postscript 3 and PCL, 5e, speeds up to 20 pages-per-minute, and monthly volumes to 75,000 impressions.

The Infoprint 20 is a full-function IPDS printer that gives the system complete print management capabilities with full error recovery to the page level. When the Infoprint 20 is placed in a TCP/IP network, its true IBM IPDS delivers the same level of application function and print management as direct-attach iSeries 400 and AS/400e printers.

It delivers the following features:

- 13-inch by 20-inch support for full-bleed printing on 11-inch by 17-inch paper
- 650-sheet dual-tray input standard, with maximum input capacity of 3,150 sheets
- TonerMiser to reduce supply costs
- Edge-to-edge printing
- Network interface cards standardized across the entire IBM network printer line, including Fast EtherNet 10/100 Base Tx

IBM Infoprint 21



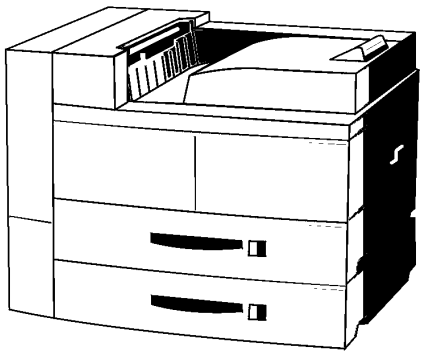
The IBM Infoprint 21 is a monochrome iSeries 400 and AS/400e laser printer designed to deliver the best in printing capabilities for iSeries 400, AS/400e and network environments. The focus for this new printer is on system integration and “e-output”. As with all IBM iSeries 400 and AS/400e printers, the Infoprint 21 is designed, built, tested, and supported as an integral part of the system. This includes full-function AFP and IPDS capabilities, as well as integration with the new SNMP network print drivers. E-output support includes an embedded Web server that provides for Web-based printer management and support of Internet Print Protocol (IPP). The key design elements of the iSeries 400 and AS/400e server, including integration, reliability, scalability, ease of use, and designed for e-business, are reflected in the IBM Infoprint 21.

The features of Infoprint 21 include:

- Print speeds up to 21 pages per minute
- New high-performance IBM controller supports the rich menu of system integration and network functionality
- IBM controller also ensures high-performance rendering of complex applications and complete integration and compatibility with the system on a release-by-release basis
- True 1200-by-1200 dpi resolution
- The new iSeries 400 and AS/400e print kit provides Ethernet and IPDS as a highly-affordable package

- On-board Web server includes an internal Web site for remote set up, configuration, printer status, and direct IPP-based print job submission
- Rich data stream support includes IBM AFP/IPDS, PCL 5e/6, and Postscript 3
- Flexible paper handling that combines standard input/output capacities for a network printer with special support for labels, card stock, and custom size forms
- One-stop technical support from IBM Service, the experts in iSeries 400 and AS/400e printing

IBM Infoprint 32 Printer



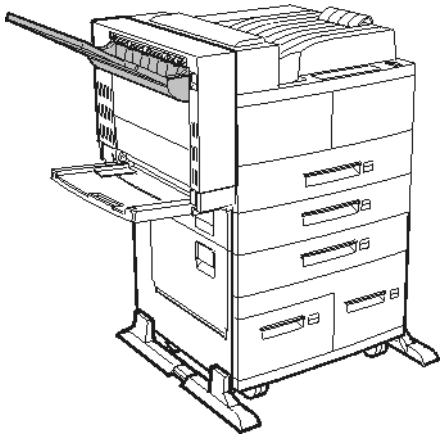
High-speed, large volume, network printing solution for mission critical applications where document delivery, control, and printing management are essential. The Infoprint 32 is a high-function iSeries 400 and AS/400e printer that delivers printing speeds up to 32 ppm and monthly volumes of 150,000 impressions. The crisp 600-by-600 dpi output with edge smoothing rivals 1200 dpi quality, while a 300 dpi mode provides the highest performance on complex jobs. The Infoprint 32 fully supports network environments with simultaneous server and workstation connections and complete print datastream support (IPDS, Adobe PostScript, PCL 5e).

Additional specifications include:

- True Adobe Postscript 3 and PCL 5e datastream support are standard, and AFP/IPDS and SCS datastream support are available.
- Maximum input capacity of 3,550 sheets, plus 100 envelopes
- An optional finisher feature provides offset jogging, stapling, and collating
- RePro increases productivity by sending a job over the network and printing multiple copies

- Full application and print management functionality of system-integrated AFP/IPDS
- Fast Ethernet 10/100 Base Tx

IBM Infoprint 40 Printer



High-speed, large volume, network printing solution for mission-critical applications where document delivery, control, and printing management are essential. The newest member of the IBM Infoprint family of iSeries 400 and AS/400e printers, the Infoprint 40 delivers printing speeds up to 40 pages per minute with monthly volumes up to 200,000 impressions. Output is printed at 600-by-600 dpi with edge smoothing, plus a high quality image mode that approaches 1200 dpi.

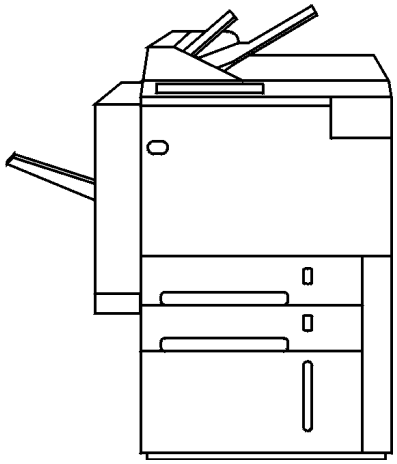
Additional specifications include:

- True Adobe Postscript Level 3 and PCL 5e datastream support are standard, and AFP/IPDS and SCS datastream support are available
- Optional large input feeder that increases total input capacity to 3,550 sheets from six input sources
- Optional 100 envelope feeder
- Optional high-capacity finisher that provides 2000-sheet stacking to three bins and program control for job offset jogging and stapling functions
- Prints on multiple paper sizes, including 11-inch by 17-inch or A3 for large format documents
- One year, on-site warranty with world-class IBM service

IBM iSeries 400 and AS/400e Departmental and Production Printers

In the same manner that the iSeries 400 and AS/400e server scales up in performance, IBM system printers provide a wide range of choices at departmental and production printing speeds (generally 60 pages per minute and up). These include both cut sheet and continuous form options, currently topping out at 1,002 impressions per minute (with the IBM Infoprint 4000). All of the departmental and production printers feature the Advanced Function Common Control Unit (AFCCU), a high-performance controller using the same processor technology as the iSeries 400 and AS/400e systems. Printers in this class include the IBM Infoprint 60, IBM Infoprint 62, IBM Infoprint 3000, and IBM Infoprint 4000 printer systems.

IBM Infoprint 60 and 3160 Advanced Function Printers



The Infoprint 60 Advanced Function Printer and 3160 Advanced Function Printer provides duplex production printing at up to 60 impressions per minute. The Infoprint 60 (3160 Model 2) provides 600 dpi resolution. The 3160 provides a 240 dpi resolution. These printers are designed for high-speed printing in host, host distributed, and LAN printing environments. iSeries 400 and AS/400e attachment is supported by SNA, TCP/IP Token-Ring, or Ethernet.

The key features include:

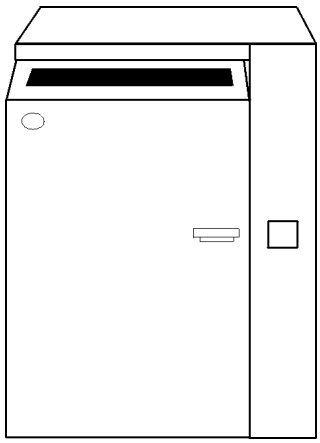
- Monthly duty cycle of 750,000 pages
- Driven by the IBM Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents and comprehensive connectivity
- Paper handling capabilities include up to 5,000 pages from four input bins, up to 3,500 pages in output stackers

- Optional high-capacity finisher provides for finishing operations such as stapling, insertion, and z-fold, all under iSeries 400 and AS/400e program control
- Paper sizes include letter, legal, ledger, A3, A4, B4, and B5 (up to 11 inches by 17 inches)
- IPDS integration with iSeries 400 and AS/400e delivers “industrial strength” print management with full page-level error recovery over SNA and TCP/IP connections
- Support for PCL (Infoprint 60)

IBM Infoprint 60 Advanced Function Finisher

Optional Infoprint 60 Finisher is fully integrated into the Infoprint 60 printer and fully supported by the iSeries 400 and AS/400e server. The finisher provides the capability to completely finish jobs, including stapling, z-folding, inserting, and booklet operations, all in production mode.

IBM Infoprint 62 Continuous Forms Printer

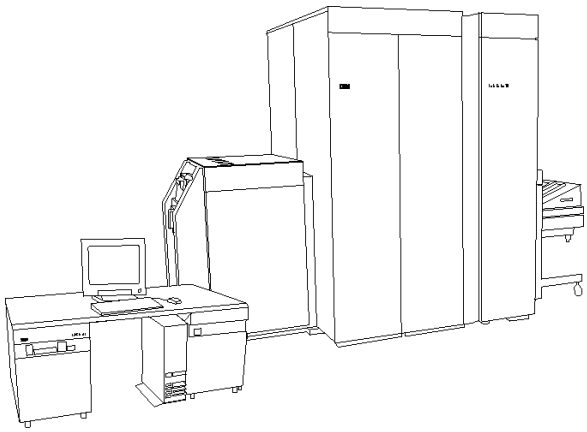


The IBM Infoprint 62 is a high-performance production printer with the versatility to print special forms and labels. It offers high-volume, cost-effective, continuous-forms printing while providing exceptional reliability and excellent print quality on a wide range of media types, sizes, and weights. Driven by IBM's Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents, complete AFP/IPDS function, and comprehensive connectivity, the Infoprint 62 attaches to the system by Token-Ring or Ethernet. The features include:

- Speeds up to 62 ppm
- Designed for both general purpose and special forms printing

- Full-function AFP printer handles complex AFP applications with electronic forms, image, fonts, barcode, graphics, and multi-up printing
- Straight paper path and unique flash fusing technology for printing on a wide variety of paper types and sizes, including difficult-to-print forms
- Unique cutting design eliminates paper waste

IBM Infoprint 70

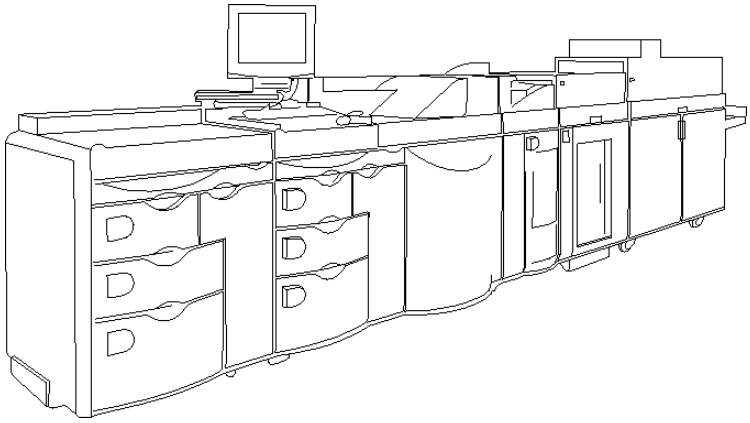


Today's e-business applications require a fast, reliable, high-quality output solution that is accessible from virtually any location at any time. The IBM Infoprint 70, when combined with Infoprint Manager, provides Internet-ready output capabilities that allow you to keep pace in an e-business world. The IBM Infoprint 70 offers high-quality, high-volume cut-sheet printer with a compact footprint. With advanced IBM controller and imaging technology, the Infoprint 70 supports:

- Up to 70 impressions per minute with excellent 600 dpi print quality.
- Automated conversion of 240, 300 or 600 dpi AFP/IPDS applications
- 10/100 BaseTX Ethernet or Token-Ring attachment
- PCL and Adobe PostScript support through Infoprint Manager
- Flexible finishing capabilities
- Input capacity up to 6,150 sheets

With the Infoprint 70, you can produce up to 400,000 impressions per month. Even complex jobs can run at or near the rated speed of 70 impressions per minute. Advanced controller technology ensures native support for IBM Advanced Function Printing (AFP) and Intelligent Printer Data Stream (IPDS). Page level error detection and recovery capabilities help prevent job resends, minimize human intervention and streamline printing. Software support is provided with PSF/400 and AFP Utilities for AS/400.

IBM Infoprint 2000



Infoprint 2000 printers bring cut-sheet printer capabilities to address the output needs of an e-business. This high-speed cut sheet print combines advanced hardware and software technologies to provide exceptional performance, flexibility and control. The integration with Infoprint Manager brings the Infoprint 2000 into heterogeneous environments, converting PostScript and PCL jobs to AFP/IPDS. The software creates a central point for managing all print jobs through the enterprise and provides workload balancing to help ensure printers are always printing.

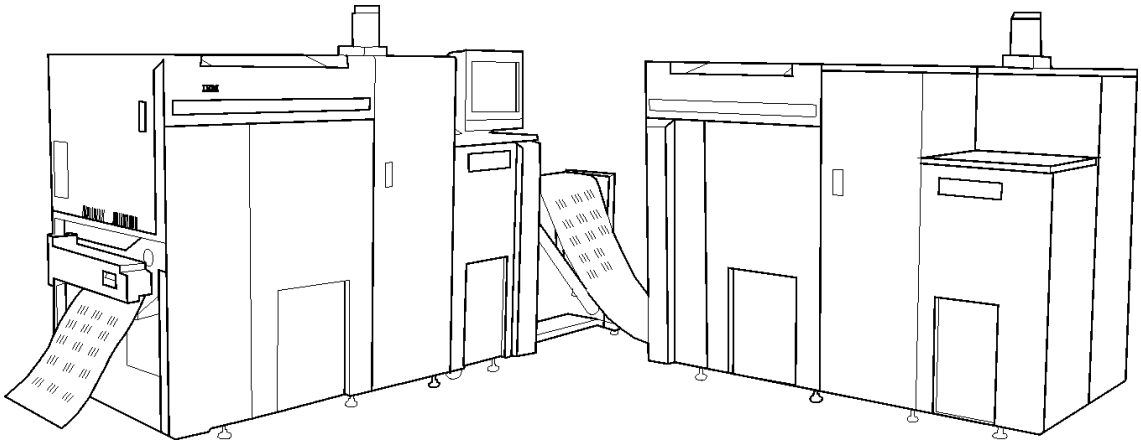
Inherent with this solution, the Infoprint 2000 supports IPP (Internet Printing Protocol) and is ready for e-business. IPP provides mobile users the means to address a printer from anywhere, allows companies to provide their clients with direct access to their printer and provides notifications to communicate printer status.

Powered by an advanced imaging technology, the Infoprint 2000 is designed to monitor and self-adjust print quality as needed. Establishing new AFP/IPDS benchmark print quality, the Infoprint 2000 produces fine lines and offset-like halftones. To ensure user-friendly paper support and reliability, the system has a straight paper path, as well as three standard and three optional vacuum fed paper drawers for preventing paper mis-feeds. Additionally, the IBM Infoprint 2000 with AFCCU offers

- Support for native AFP/IPDS printing
- Support for resident and downloadable raster fonts and resident outline fonts
- Up to 110 pages-per-minute print speed at 600 dpi resolution
- Supports 240, 300, 600 dpi and automatic conversion
- Customizable high-volume production solution
- Up to 8,000 sheets on board, six input bins
- User friendly Java console with keyboard and mouse support

Software Support is provided by PSF/400 V4 R3, 4, 5 for the iSeries 400 and AS/400e servers.

IBM Infoprint 3000 Advanced Function Printing System



IBM Infoprint 3000 is a high-speed, high-resolution, continuous-form production printing system designed and integrated for high-volume iSeries 400 and AS/400e printing. The IBM Infoprint 3000 Advanced Function Printing System is an intermediate production printing family that fits between iSeries 400 and AS/400e midrange printers (Infoprint 60 and Infoprint 62) and the high-end production printing systems (Infoprint 4000). The IBM Infoprint 3000 printers deliver print speeds from 112 to 344 impressions per minute, with the ability to perform two-up printing (8.5 by 11 inch pages) using the new 17-inch print-head technology. Monthly print volumes can go up to 4.4 million impressions.

This new printing system not only prints at high speeds, but also prints high quality. Print fidelity is at 480 dpi or 600 dpi, and the print resolution is switchable. Existing iSeries 400 and AS/400e applications developed at 240 dpi or 300 dpi are automatically enhanced to either 480 dpi or 600 dpi.

The IBM Infoprint 3000 is directly attached to the iSeries 400 and AS/400e server (using EtherNet or Token-Ring) and is fully supported by Print Services Facility/400, the full-function print management subsystem of OS/400. Full application enablement includes system printer file function, DDS, AFP Utilities, Advanced Print Utility (APU), Page Printer Formatting Aid (PPFA/400), AFP Toolbox, and many other IBM and third-party document composition products.

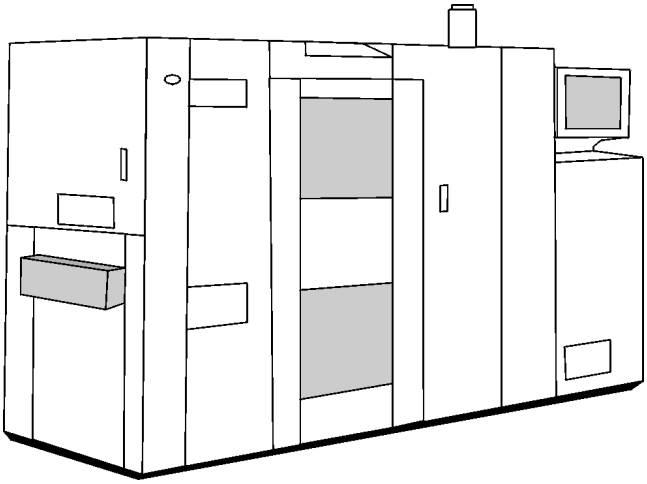
With high-volume applications such as reports, statements, documents, and direct mail, continuous-forms printing ensures high reliability. They also ensure the attachment of a wide

variety of pre- and post-processing devices (paper roll input, cutters, inserters, and so on) for a smooth end-to-end process. This is an intelligent process that starts with blank paper and can end up a complete package ready for mailing.

Additional features include:

- Simplex and duplex configurations. Duplex configurations (two Infoprint 3000 printers in tandem) can also be run in dual simplex mode when required.
- RISC-based Advanced Function Controller provides comprehensive print and document functionality, as well as high performance for even the most complex jobs.
- Smallest footprint (up to 25% smaller) in its class.

IBM Infoprint 4000 Advanced Function Printing Systems



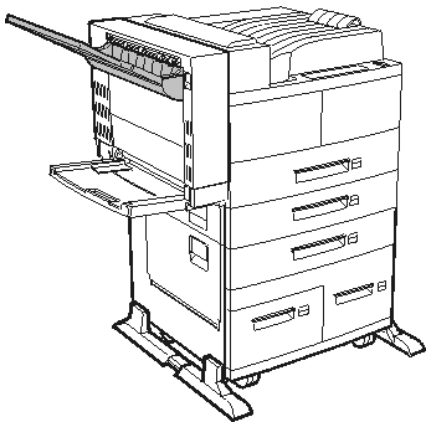
Infoprint 4000 is the family that follows the 3900 for high-speed, continuous-form production printing. Speeds range up to 1002 impressions (8.5 by 11 inches) per minute. Models include simplex, wide, and duplex with resolutions of 240, 480, and 600 dpi.

Infoprint architecture provides higher resolutions and support for PostScript data streams to meet far more wide-ranging organizational document requirements, including replacement of applications that traditionally went to offset printing. The Infoprint 4000 attaches to the iSeries 400 and AS/400e system over a Token-Ring or Ethernet network.

The key features include:

- Maximum usage of up to 17.4 million impressions per month
- Driven by IBM Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents, full IPDS function, and comprehensive connectivity
- Wide models provide 17-inch wide platen for two-up printing of 8.5 by 11-inch output
- Designed for production print environments with appropriate intelligent preprocessing (such as roll paper input) and postprocessing (for example, cutters and collators) equipment
- Optional pinless drive replaces traditional tractor-fed paper
- Optional Infoprint Hi-lite Color post processor enables variable data in color, up to three colors per page

IBM Infoprint 4000 Hi-Lite Color Printing System and IBM Infoprint 4005 Hi-Lite Color Printer



Infoprint 4000 offers high-speed, high-quality color post-processor to complement IBM 3900 and IBM Infoprint 4000 production printing systems. Highlight variable or constant information, up to three colors anywhere on the page at speeds from 150 to 480 impressions per minute. It also offers integrated print management with Print Services Facility/400 (PSF/400) and direct color support with DDS and other iSeries 400 and AS/400e document application enablers (see printing software).

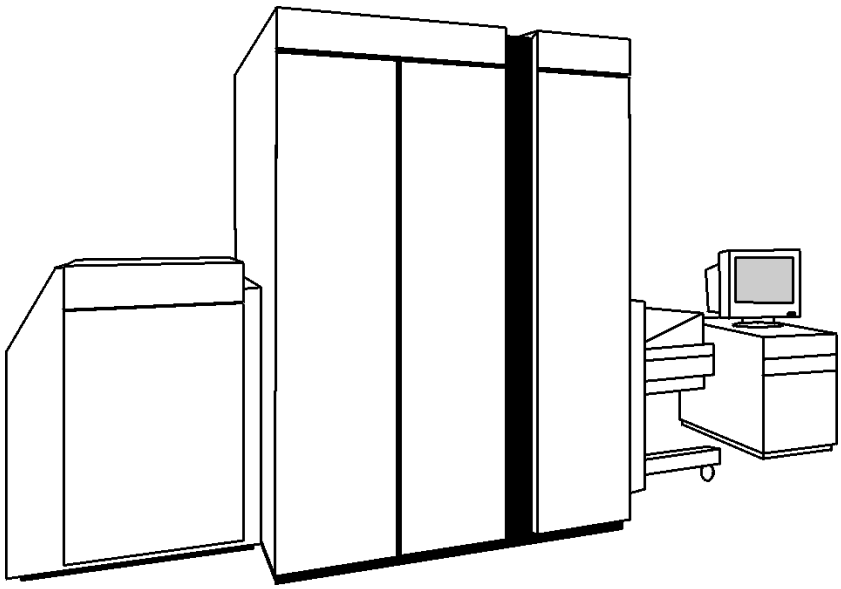
The IBM Infoprint Hi-Lite Color Printer communicates with the IBM host printer using the IBM exclusive Advanced Function Post-Processing Interface. This ensures accurate color printing

in the precise location specified. In addition, the Advanced Function Presentation (AFP) software, together with the lead printer's Advanced Function Common Control Unit (AFCCU), enables rapid error recovery and ensures data integrity through the entire printing process.

The model available is HC1. The specifications include:

- Both fixed and variable data can be printed in color (up to three highlight colors per page)
- Speeds up to 480 two-up impressions per minute
- Application selection of color with printer file DDS, Advanced Print Utility, iSeries 400 and AS/400e page and form definitions, AFP Toolbox, and third-party products

IBM InfoColor 70 Full-Color Digital Printer



The IBM 3170 Full-Color Digital Printer is a 70 impressions-per minute, high-quality color printer that provides an on-demand alternative to offset printing. It is designed for any organization that prints color brochures, personalized mailings, documentation, reports, directories, books, and newsletters now as an efficient way to print short runs and customize the text, images, and customer data on each document. Designed as a standalone printing system, which accepts variable data from the iSeries 400 and AS/400e server to customize each document.

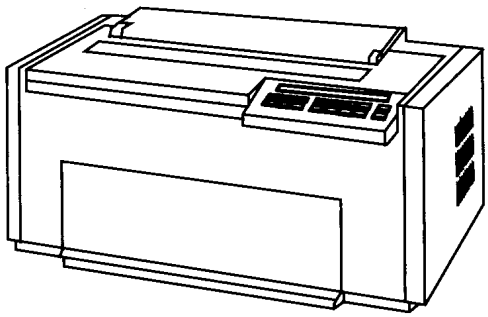
The highlights of the IBM 3170 Full-Color Digital Printer include:

- Monthly duty cycle of 700,000 impressions
- 600 dpi, with variable gray levels per dot, per color Color sensing technology ensures color match prior to production runs
- PowerPC-based controller ensures print quality, ease of operations, and performance
- True Adobe PostScript Level 2

IBM iSeries 400 and AS/400e Industrial Printers

Central to today's supply chain environments, IBM iSeries 400 and AS/400e industrial printers are designed for harsh environments and multi-part form applications. The printer technology is either dot matrix or line matrix. Intelligent Printer Data Stream (IPDS) is supported throughout, both for complete print management and graphics function (for example, bar codes). This category includes the IBM 4230, IBM 4232, IBM 4247, and IBM 6400 printer families.

IBM 4230 Impact Matrix Printer



The 4230 range of printers provides heavy-duty, impact matrix printing. The six models of 4230, the 101, 1S2, 4S3, 1I1, 102, and 4I3 can all be twinaxial attached to an iSeries 400 and AS/400e system using the twinax workstation controller. The Model 4S3 and 4I3 also offer serial and parallel attach.

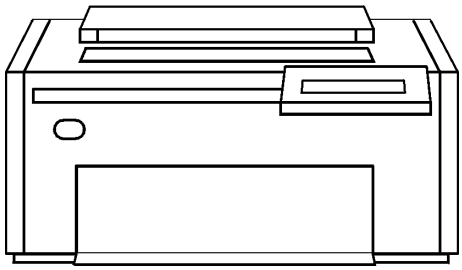
All 4230s have an LCD display providing prompts and menu selections in a choice of eight languages. They also have forms handling modules for continuous forms and document insertion. One of these forms modules is supplied with the initial order, as selected by the customer. The others are available as options.

Models 101 and 1S2 have 32K memory as standard and support the IBM 4214 data stream SCS (SNA Character String). Models 1I1 and 102 have 128K memory as standard and

support the IBM Intelligent Printer Data Stream (IPDS). Memory on the 1I1 and 102 can be increased to 512K as an option. Models 4S3 and 4I3 have 128K memory as standard. Model 4S3 supports the SCS data stream, while Model 4I3 supports IPDS. The following table shows each model's print speeds.

Model	Mode			
	Fast Draft	DP	DP Text	NLQ
101, 1I1	375 cps	300 cps	150 cps	75 cps
1S2, 102	480 cps	400 cps	200 cps	100 cps
4S3, 4I3	600 cps	400 cps	200 cps	100 cps

IBM 4232 Impact Dot Matrix Printer

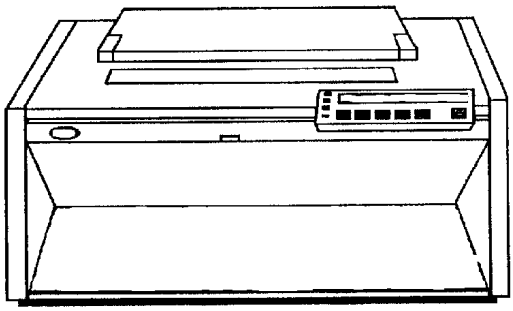


The 4232 is a heavy-duty, unattended impact dot matrix printer, capable of printing 600 characters per second (cps). It is designed for workstation printing or shared printer applications using an ASCII datastream.

The 4232 Model 302 can be used for printing data processing, office and business documents, as well as barcode labels and multipart forms.

The 4232 has an LCD display that provides prompts and menu selections in a choice of eight languages. It also has forms handling modules for continuous forms and document insertion.

IBM 4247 MultiForm Matrix Printer



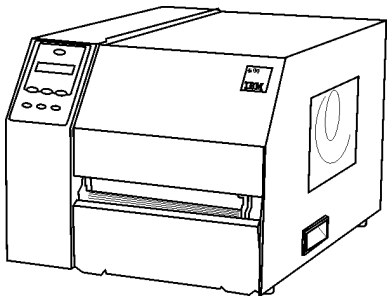
The 4247 range of printers are desktop model impact printers. They are capable of printing up to 700 cps in its fastest data processing (DP) mode. They include two continuous paper paths and a standard manual cut-sheet input.

The 4727 can be used as a directly attached workstation printer, as a system printer, remote or distributed, or for departmental printing. Supported applications include word processing and spreadsheets, business graphics such as pie charts, barcode printing, line drawing from CAD/CAM applications, and special forms for checks, labels, and mailers.

The 4247 models have a duty cycle of up to 20 million characters-per-month and print qualities include DP, DP Text, and NLQ (Near Letter Quality).

- Attachment to the system can be Twinax, Serial/Parallel, Ethernet, and Token-Ring. Coax and attachment to LAN using ASCII interface are also available.
- IPDS support for the full range of electronic printing capabilities (barcode, electronic forms, image, graphics, and variable fonts), as well as full printing error recovery

IBM 4400 Thermal Label Printers



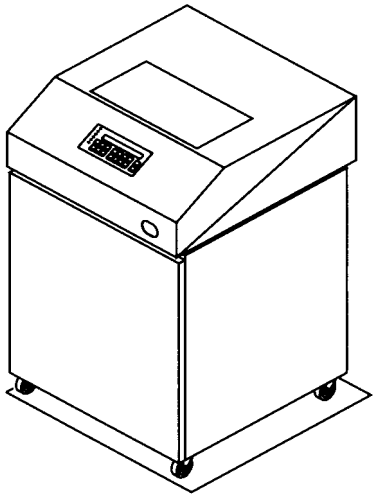
The IBM 4400 Thermal Label printers provide high-performance, high-quality thermal printing geared to the iSeries 400 and AS/400e, network, and Supply Chain industrial environments in which they must operate. This is an environment where iSeries 400 and AS/400e application integration, reliable output management, and network deployment and administration are essential.

The key design elements of the system—integration, reliability, scalability, ease of use, and designed for e-business—are reflected in the IBM 4400 Thermal Laser printers. Support for IPDS (Intelligent Printer Data Stream) means that any AFP (Advanced Function Presentation) application interface can be used. IPDS also means industrial-strength printing management, even when the printer is deployed in a TCP/IP network. Support for additional thermal data streams ensures compatibility with existing applications.

Features of the IBM 4400 series include:

- Print resolution up to 300 dots per inch, print speeds up to 10 inches per second and media widths of 6.8 inches or 8.75 inches
- Ideal for barcode and graphics applications; compatible with IBM 6400 Line Matrix Printer label applications; supports existing Code V and IGP applications
- Supported by IBM Printer Management Utility for remote administration
- Rugged footprint and construction designed for tough industrial environments

IBM 6400 Line Matrix Printers



The dependable IBM 6400 line matrix printer family is designed for heavy-duty, continuous use in both system and network environments. Extensive datastream support (SCS, IPDS, ASCII, Code V, IGP) ensures application compatibility. Speeds range from a low-cost 500 line-per-minute pedestal model to models supporting print speeds up to 1,500 lines per minute (1125 lpm in data processing mode and 600 lpm in near-letter-quality mode). The new, integrated EtherNet IPDS enables the IBM 6400 to be placed in an IP network yet retain all the application function and print management control of a direct-attached iSeries 400 and AS/400e printer.

The 6400 family of line matrix printers provides heavy-duty, continuous-form impact line printing with low total cost of operation. A variety of emulations, options, and speeds address just about any print requirements. IPDS is available (as well as IGP and Code V) to support graphical print applications (for example, barcoding or image).

There are five models of the 6400 family, which are shown in the following table.

Model	Speed (Lines per Minute)	Package
6400-005	500	Cabinet
6400-05P	500	Pedestal
6400-010	1,000	Cabinet
6400-10P	1,000	Pedestal
6400-015	1,500	Cabinet

Connection options include direct attachment to the system using twinax or serial/parallel cabling, ASCII LAN attachment using the Network Print Server (NPS) feature or integrated EtherNet feature, or IPDS LAN attachment using the 7913 LAN attachment.

This family of printers also offers standard data stream support for IBM Proprinter III XL, Epson FX 1050, Printronix P-series, Printronix P-series XQ Variant, and Printronix Serial Matrix emulations.

An optional feature for Intelligent Printer Data Stream (IPDS) support enables full graphical applications with electronic forms, barcodes, graphics, scalable fonts, and optical character recognition. Optional features are also available for Code V and IGP emulations.

Web access to operator panel enables remote control of network-connected 6400 models.

OS/400

OS/400

Operating System/400, 5769-SS1

The iSeries 400 and AS/400e operating system, OS/400, is architected as a *single entity*. This means that facilities such as relational database, communications and networking capabilities, online help, and much more, are fully integrated into the operating system and the machine. The user communicates with all components of OS/400 using a single command language Control Language (CL).

The computing industry is moving rapidly toward a network-centric world made up of global networks. The newest release, OS/400 V4R5, builds on this to make the iSeries 400 and AS/400e servers key players in this vibrant and vital area. These enhancements to the iSeries and AS/400e capabilities as a network-centric system are described in this chapter. Associated licensed programs and enhancements are described in the following chapters.

For the *iSeries 400* and *AS/400e servers*, with OS/400 Version 4, the system price includes OS/400 at no additional charge. OS/400 user charges have been eliminated.

Version 4 Release 5 (V4R5) of OS/400 runs on all iSeries 400. These are the Models 270, 820, 830, 840, SB2, SB3, and several models of the Dedicated Server for Domino. OS/400 V4R4 runs on all AS/400e systems with *PowerPC processors*, which includes the 9401 Model 150; the 9402 Models 400, 40S, 436, and packages based on the 400 and 40S; and 9406 Models 170, 500, 510, 530, 50S, 53S, 600, 620, 640, 650, S10, S20, S30, S40, SB1, and the 170 Dedicated Server for Domino. Version 4 of OS/400 does not run on earlier models of the AS/400 system based on *IMPI processors* (CISC models). These include the Bxx, Cxx, Dxx, Exx, Fxx, 100, 135, 140, 2xx, and 3xx models.

OS/400 Version 4 is delivered on CD-ROM to speed loading and to reduce the risk of media errors. Manuals are also delivered in softcopy form on CD-ROM.

Operating System/400 Capabilities

OS/400 is designed to be comprehensive and scalable. Some of its features are described in this section. They help to make OS/400 the most complete operating system on the market today.

- **Ease of installation and use**

  New iSeries and AS/400e systems can be delivered with OS/400 (and sometimes Business Partner software as well) fully installed. System-supplied menus are provided so that the system can be set up by someone unfamiliar with the control language. Fastpath commands exist for those who are familiar. Local devices can be automatically configured.

  The online help text is context sensitive and can be browsed through an index search facility where the user requests help text in their own words. A Copy Screen Image

© Copyright IBM Corp. 2000

function allows an image from a workstation to be displayed on another. This can be used when a departmental user requires support from a help desk or in conjunction with IBM Electronic Customer Support (ECS). Other assist menus, such as the Operational Assistant, help in day-to-day tasks and clean-ups.

A standard communications line is included with all systems. When supplied as a V.24 standard, the line is intended for Electronic Customer Support to enable customers to sign on to remote systems for support from Business Partners or IBM. On some systems, a V.90 adapter is supplied with a second WAN port, which supports traditional ECS connections. In either case, a chargeable cable and modem are also required.

If a hardware or software problem arises, PTFs can be downloaded to the system to assist in problem determination and resolution. The line can also be used for IBM Electronic Service Agent for AS/400 (previously known as IBM Service Director), where the iSeries 400 or AS/400e server initiates a call to an IBM service center at a prearranged time for its error logs to be checked and to enable service actions to be taken, often before the customer is aware of the existence of a problem.

PTFs can be downloaded from the Internet using a PC with Windows 95, 98, or NT that is connected to a system through TCP/IP and the Internet. Configuration and setup information is documented at the Web site: `http://as400service.ibm.com`

Except for the medium of transport (Internet), the functionality of Internet delivery is the same as the ECS method of transport. The user selects the PTFs and options using a Web browser and submits the order. At the referenced Web site above, the user can also search on PTF cover letters and read them before the order is placed.

The same entitlement rules that apply on an ECS connection are enforced for the Internet transport. In other words, if a user can acquire PTFs electronically over the ECS, they can acquire PTFs over the Internet.

- **Security**

Within OS/400, a level of security can be chosen to meet a customer's need. These levels range through:

  - **Minimal security:** Where no passwords are used and any user can perform any function.
  - **Password security**: Where passwords are used to provide access to the system, but any user can perform any function once they are signed on.
  - **Resource security**: Where passwords are required and object usage can be controlled. Users can be restricted to specific functions.
  - **Resource security** and **operating system integrity**: Passwords are required and object usage can be controlled. Users can be restricted to specific functions, and using unsupported interfaces is restricted.

A security journal is provided that logs all security violations. The highest level of security (Level 50) enables the iSeries 400 and AS/400e servers to operate at the C2 level of trust as defined by the U.S. government.

For departments where several members have the same duties or requirements, group profiles can be used. There are numerous system values that can be implemented controlling passwords and their expiration dates, as well as what is and not allowable for a password. Shipped with OS/400 is the publication *Tips and Tools for Securing Your AS/400*, SC41-5300, which provides report generation tools to assist administrators in assessing their implementation of security. Within communications, further security is possible by implementing LU6.2 Session Level Encryption (SLE) for iSeries 400 and AS/400e applications, which use LU6.2 communications.

- **Connectivity**

  OS/400 offers a wide range of communication capabilities and functions that enable the iSeries 400 and AS/400e to communicate with most IBM and non-IBM systems.

  The iSeries 400 and AS/400e servers supports the following protocols and networks:

  - 1 Gigabit/second Ethernet
  - ISDN Data Link Control (IDLC)
  - IBM Token-Ring Network (IEEE 802.5 and 802.2)
  - T1/E1/J1 and Fractional T1 Networks (high bandwidth)
  - Asynchronous
  - Binary Synchronous
  - Synchronous Data Link Control (SDLC)
  - X.21
  - X.25
  - Ethernet Version 2 or IEEE 802.3
  - FDDI LANs
  - ATM LANs

  OS/400 offers the following facilities:

  - Simple Network Management Protocol (SNMP) in TCP/IP Networks
  - Alerts support to NetView, iSeries 400 and AS/400e, System/36, System/38
  - IBM Token-Ring Network Management Support
  - Distributed Host Command Facility (DHCF)
  - Link Problem Determination Aid (LPDA)
  - Distributed System Node Executive (DSNX)

  OS/400 includes the following communication facilities:

  - TCP/IP Support
  - X.21 Short Hold Mode (SHM) and Multiple Port Sharing (MPS)
  - Remote Workstation Support
  - 3x74 Remote Attach

- 5x94 Remote Attach
- Intersystem Communications Function
- Advanced Peer-to-Peer Networking (APPN)
- Dependent Logical Unit Requester (DLUR)
- Advanced Program-to-Program Communication (APPC)
- SNA Upline Facility to System/370 IMS and CICS Hosts
- Binary Synchronous Communications Equivalence Link (BSCEL)
- ICF Retail Communications Support
- ICF Finance Communications Support
- Non-ICF Finance Communications Support
- SNA Distribution Services (SNADS)
- SNA Primary Logical Unit 2 Support
- SNA/Management Services Transport
- Distributed Relational Database Support
- Object Distribution Facility (ODF)
- Display Station Pass-through
- Distributed Data Management (DDM)
- SNA Pass-through
- IBM Network Routing Facility (NRF) Support/400
- Autodial Support
- 3270 Device Emulation
- 3270 SNA API Support for IBM 3278 Model 3, 4, and 5
- ISDN Support
- 5394/5494 SNA Backbone Support
- File Transfer Support
- Interactive Terminal Facility (ITF)
- SAA Common Programming Interface for Communications (CPI-C)
- IPX/SPX Communications
- ATM LAN Emulation

All of these facilities are part of OS/400. Other communication facilities are available as licensed programs, such as Communications Utilities for AS/400 (see “IBM Communications Utilities for AS/400 V4R4, 5769-CM1” on page 611) and Client Access Family for AS/400. See “AS/400 Client Access Family (5769-XY1)” on page 635.

TCP/IP Utilities is included with OS/400 (although not part of OS/400) since V3R1. The TCP/IP communication protocol function, along with related administration and configurations, is packaged with OS/400. TCP/IP applications, such as TELNET, Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Routing Information Protocol 1 and 2 (RIP), and LPR/LPD (remote print support) remain part of the TCP/IP Utilities along with the Pascal-based API. These TCP/IP Utilities are automatically shipped to all customers that order OS/400, although they are not a part of OS/400.

TCP/IP, as part of the OS/400, supports:

- Packet Internet Groper (PING)
- Network Status (NETSTAT)
- Sockets API
- Simple Network Management Protocol (SNMP)

NETSTAT, the network status function on the iSeries 400 and AS/400e server, provides information about the status of TCP/IP network interfaces, routes, and connections on a local iSeries 400 and AS/400e server.

Sockets API allows unrelated processes to exchange data locally and over networks. Both connection-oriented and connectionless communication are provided for TCP/IP.

SNMP is the protocol for systems management used in TCP/IP networks. Simple Network Management Protocol is the industry standard for managing networks in the worldwide TCP/IP Internet environment.

Elements provided with OS/400 include SNMP agent, SNMP framework, and TCP/IP protocol support. The TCP/IP communications protocol is enhanced with network management capabilities to support SNMP control.

The SNMP management function is split between two kinds of entities: the “manager” and the “agent.” The SNMP agent function runs on the iSeries 400 and AS/400e servers and allows it to be managed by network management stations that have implemented the SNMP manager function. The SNMP framework provides the ability to write SNMP applications on the iSeries 400 and AS/400e servers.

The APIs for SNMP managing applications have the ability to manipulate SNMP management data using SNMP agents either locally or remotely. By using Anynet/400 support, SNMP information can be retrieved from Anynet-configured systems on SNA or TCP/IP networks. This makes it easier to discover and manage potential problems anywhere within the network.

SNMP Enhancements at V4R5

Placing printers in a TCP/IP network on a LAN is common practice today. OS/400 V4R5 gives you the option to send print files to those printers and manage responses from those printers in this network. This option is configured in the OS/400 print device description and is based on the industry-standard Simple Network Management Protocol (SNMP). It supports SNMP printers that support the printer message information block (MIB).

Prior to V4R5, to print to ASCII printers with the output from the Host Print Transform, either the current Printer Job Language (PJL) driver or Line Print Requestor (LPR) is used. At V4R5, the new SNMP driver allows more printers to be accessed from an iSeries 400 and AS/400e server with the same capabilities seen with direct attached printers or those using the PJL driver.

AS/400 Internet Setup Wizard

Simplify the steps required to connect your AS/400 or iSeries 400 server to the Internet and use application and Web serving. The wizard allows you to connect your AS/400 or iSeries 400 server to an ISP over a dial-up connection or directly through a LAN connection. It can also connect your intranet AS/400 or iSeries 400 server to the Internet through a firewall or router and allow for Web and application serving by the AS/400 or iSeries 400 server over that connection. The wizard is organized around three common scenarios:

- Connect your AS/400 or iSeries 400 server as a Web and application server behind a firewall and allow access to it from the Internet
- Connect your AS/400 or iSeries 400 server as a Web and application server to a DMZ outside a firewall and allow access to it from the Internet
- Directly connect your AS/400 or iSeries 400 to the Internet through a dial-up connection

To use all of the wizard's features, install the following options shipped with the operating system (5769-SS1):

- WebSphere 2.02 Standard Edition or WebSphere Standard Edition 3.02 (5733-AS2 or 5733-AS3)
- IBM HTTP Server

The wizard is available now for V4R4 or V4R5 via download at:
`http://www.ibm.com/iseries400/tcpip/iwizard.htm`

It will be available in a V4R5 Client Access Service Pack on 17 November 2000.

Network Authentication Service

Network Authentication Service provides APIs to verify the identity of a user in a network. Application programs can use these APIs to authenticate a user and securely pass on its identity to other services on the network. Once a user is known, separate functions are needed to verify the user's authorization to use the network resources.

Network Authentication Service is an implementation of:

- Kerberos Version 5 protocol as defined by RFC 1510
- Generic Security Service (GSS) application program interface (API) defined in RFCs1509, 1964, and 2078
- Many of the de facto standard Kerberos protocol APIs that are prevalent in the industry today

The OS/400 implementation is designed for interoperability with authentication, delegation, and data confidentiality services compliant with these RFCs such as Microsoft Windows 2000 Security Service Provider Interface (SSPI) APIs.

The component is available now on V4R5 and is delivered via a series of PTFs. Refer to the following Web site for information on which PTFs are needed:
`http://www.ibm.com/eserver/iseries`

- **HTTP Server for AS/400**

  For the iSeries 400 and AS/400e servers, network computing is supported with HTTP Server for AS/400, formerly known as Internet Connection Server. An iSeries 400 and AS/400e server can access a vast network of computers as if they were a single entity. Everyone and everything can access and distribute information, applications, and services provided by the network.

  HTTP Servers are the core foundation of technology at the heart of all e-business applications. They handle the communication with the client (typically browsers or XML-rendering devices such as palm pilots) and provide the entry point into server resources. These resources can range from simple HTML and GIF files, to e-business and e-commerce applications, all the way to full-blown business-to-business, collaborative enterprises.

  HTTP server for the AS/400 system provides:

  – iSeries 400 and AS/400e HTTP support including the Apache HTTP server. Apache, a freeware HTTP server, is open-source software that implements the industry standard HTTP/1.1 protocol with a focus on being highly configure capable and easily extendable. It is built and distributed under the Apache Software License by the Apache Software Foundation. It is available at: `http://www.apache.org`

  – Web connection support for OS/400, providing a common protocol for support of multiple vendor products on the World Wide Web. Highlights include:

    - Digital ID authentication (certificate support) Socks and SSL tunneling
    - 5250/Hypertext Markup Language (HTML) Workstation Gateway (WSG)
    - Server automatically transforms current iSeries 400 and AS/400e 5250 applications to HTML for display on Web browsers
    - Logging of World Wide Web server access for tracking activity. This allows iSeries 400 and AS/400e owners to obtain feedback on who accesses their servers and what parts are accessed
    - Automatic browser detection
    - Support for Platform for Internet Content Selection (PICS)
    - Access to documents stored in Notes with a Domino plug-in
    - Use LDAP to store configuration and user authentication information

- Support for CGI programs, including multi-thread support
- Dynamic caching of Web pages
- Support for the Secure Sockets Layer (SSL) is provided by one of the following cryptographic products:
  - 5769-AC1 Cryptographic Access Provider 40-bit for AS/400*
  - 5769-AC2 Cryptographic Access Provider 56-bit for AS/400*
  - 5769-AC3** Cryptographic Access Provider 128-bit for AS/400
  - 5769-CE1 Client Encryption 40-bit for AS/400
  - 5769-CE2 Client Encryption 56-bit*
  - 5769-CE3 Client Encryption 128-bit

  * Approved for export by U.S government

  ** Available in the USA and Canada only

– TCP/IP support

- Point-to-Point Protocol (PPP) synchronous and asynchronous communication connections spanning low to high bandwidth connections to the World Wide Web
- Serial Line Internet Protocol (SLIP) asynchronous communication connections allows inexpensive, limited bandwidth access to the World Wide Web
- Anonymous FTP support provides access to a restricted area of data on the iSeries 400 and AS/400e system that the public can access without a password or user identification
- Support for popular graphical FTP clients and Web server development tools
- Direct database serving to Web browsers, which allows DB2 for OS/400 data to be queried and served (with graphics, if desired) to a Web browser using HTTP Server for AS/400
- Additional network security, flexibility, and manageability are included in OS/400. All of these features are configured with the Operations Navigator GUI. Some of these technologies are also found in such firewall products as Firewall for AS/400. Although the iSeries 400 and AS/400e servers by themselves are not intended to be a firewall (the Firewall for AS/400 product requires a separate Integrated Netfinity Server), the addition of these functions may eliminate the need for a separate a firewall product in some cases:
  - *TCP/IP Packet Security*: Selectively limits or journals network access to applications and services with additional protection for iSeries 400 and AS/400e servers that run sensitive applications or act as Web servers. TCP/IP packet security also helps protect an entire subnetwork when the system acts as casual router.

- *TCP/IP Address Mapping and Hiding*: When the TCP/IP addressing schemes or networks conflict, or you need to hide all or part of the network topology, network address translation (NAT) capabilities provide a solution. In addition, TCP/IP masquerading allows all of the computers on one network to access servers on another network by sharing a single TCP/IP address. Masquerading is particularly useful when connecting to another network, such as the Internet, using a dial-up link.
- *TCP/IP Dial-on-Demand (DOD) Networking*: Connections are made only when there is a need to communicate. Dial-on-Demand is supported on all switched network types and is particularly well-suited to ISDN with its fast call setup time. It is also valuable for burst and infrequent traffic patterns, especially if you have more remote locations than physical lines. With Dial-on-Demand, modem and telephone line resources are not committed until an application attempts to communicate with a remote site. Therefore, a small number of physical resources can dynamically serve a large number of remote networks.
- *TCP/IP Integrated Load Balancing*: Virtual IP Addressing (VIPA) creates a virtual TCP/IP address that is not associated with a physical network interface. This virtual address exists on the system and can be reached from the network through all installed physical interfaces. VIPA can dramatically increase capacity for high-volume e-business servers.

– Sockets and SSL support

  • Sockets

    Sockets programming uses the socket application program interface (API) to establish communication links between remote and local processes.

    The sockets API is located in the communications model between the application and the transport layers. The sockets API that allows applications to interface with the transport or networking layers on the typical communications model. It is shipped as part of OS/400.

    The sockets API is part of the open environment on the iSeries 400 and AS/400e system. The sockets API, along with the integrated file system, eases the effort that is required to move UNIX applications to iSeries 400 and AS/400e servers. Sockets on the system are based on and are compatible with Berkeley Software Distributions (BSD) 4.3 sockets. Application programs written in the Integrated Language Environment (ILE) C/400 language can use the sockets API.

  • SSL

    Secure Sockets Layer (SSL) is a security protocol that provides privacy over an open communications network (for example, the Internet). SSL protocol allows client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

Many applications on the iSeries 400 and AS/400e servers are SSL enabled in V4R4, including TELNET, HTTP server, CA/400 host servers, systems management, and LDAP. Also, OS/400 SSL support includes a set of APIs, which, when used in addition to the existing OS/400 sockets APIs, provide the functions required for applications to establish secure communications.

Transport Layer Security Support on iSeries 400 and AS/400e

V4R5 includes support for Transport Layer Security (TLS), the latest protocol update to the industry accepted Secure Sockets layer (SSL) support. TLS is the industry-standard definition of Secure Sockets Layer (SSL). The TLS protocol is defined as part of Request for Comments (RFC) 2246, *The TLS Protocol*, by the Internet Engineering Task Force (IETF). The AS/400 Secure Sockets layer support fully supports this approved standard specification.

The TLS protocol, as defined in RFC 2246, is an evolutionary upgrade of the SSL Version 3.0 protocol. OS/400 V4R1 and later supports SSL Version 3.0 and previous SSL protocol versions.

TLS Version 1 and SSL Version 3 share the same basic record construction and line flows. TLS provides the same function as SSL and is compatible with SSL, but includes some new features and clarifications for protocol flows.

TLS helps standardize the SSL definition and implementation, makes the SSL protocol more secure, and makes the specification of the protocol more concise and complete.

Supporting TLS on the iSeries 400 and AS/400e servers allows customers and business partners to continue to have access to and take advantage of the latest technology implementation of Internet application security enablement in the industry. TLS support is automatically part of any SSL-enabled application, such as the HTTP and TELNET servers. Parameter values on the SSL APIs enable TLS for business partner and customer-provided SSL applications.

– LDAP

  - An LDAP-accessible directory server and corresponding APIs that communicate with other LDAP directory servers are provided in OS/400. APIs are provided for both OS/400 and Windows applications written in Java, C, and C++. LDAP-enabled applications, such as Internet mail clients, can access, update, and manage the system directory.
  - OS/400 applications can be developed to use LDAP for managing distributed information across the Internet and intranets using LDAP directories for both IBM and non-IBM platforms. iSeries 400 and AS/400e user information, such as e-mail addresses, is accessible to mail clients and other LDAP applications.

Directory Services LDAP V3 Enhancements

Enhancements in V3 Directory Services LDAP include:

– Support of the latest version of LDAP

  Directory Services implements SecureWay Directory V3.1.1 for OS/400. This provides support for LDAP v3. LDAP V3 includes support for internal characters (Utf-8), which supports national language data and is a mixed, multibyte codepage. LDAP V3 also provides support for dynamic schema where the schema is stored in the directory and is managed by the LDAP server. The schemas can be updated using the new Directory Management Tool, importing from an LDIF file, or from LDAP command line utilities.

– Directory Management Tool (DMT) to administer directory contents and schema. DMT is a GUI tool used to manage LDAP directory content. It is part of the Windows LDAP client, which is included with AS/400 Directory Services. Use the Directory Management Tool to:

  • Browse the directory schema
  • Add, edit, and delete object classes and attributes
  • Browse and search the directory tree

– SecureWay directory schemas support the IBM standard object classes and attributes to enable your LDAP directory for applications using the IBM schema.

– Simple Authentication and Security Layer (SASL) is supported and is a method for adding authentication support to connection-based protocols. The SASL External mechanism can be used to establish secure client connections that utilize SSL client authentication. The SASL CRAM-MD5 mechanism provides a one-way encryption mechanism to securely authenticate clients without incurring the overhead associated with SSL.

- **NetQuestion**

  NetQuestion is a powerful, full-text search engine that builds a global Internet or centralized intranet search service. It can handle the large amounts of information that are typically stored on Web sites. Documents to be indexed by NetQuestion need to be provided in either plain text or text with HTML markup. CGI scripts and HTML forms are provided for search and administration. Administration can also be done by using command-line functions.

  For all single-byte character languages, NetQuestion features:

  – Boolean queries for phrase and proximity searches, as well as for front-, middle-, and end-masking using wildcards

  – Precise term searches optimized for Web applications in both Internet and intranet environments

  – High-speed performance for indexing and retrieval where one precise index is built

  – An optimized and reduced index to about 35% to 40% of the document size

- Sophisticated lexical affinities-based ranking for free-text and hybrid queries
- Advanced relevance ranking
- Detection of misspellings in documents and expanding the search request accordingly

Virtual Private Networks

With V4R4, VPN support is supplied natively on the iSeries 400 and AS/400e server providing a mechanism to establish secure “tunnels” through the Internet backbone to allow secure TCP/IP communications with consumers and other businesses.

iSeries 400 and AS/400e virtual private networking support is based on industry standards that include:

- IP Security Protocol (IPSec)
- Internet Key Exchange (IKE)
- Layer 2 Tunneling Protocol (L2TP)

Homologation

Homologation is the process to obtain country government approval to ship a device and connect it to the country telecommunication network. It is similar to the Federal Communications Commission (FCC) approval in the United States.

There are features on the system that require homologation by country government organizations, usually the Post Telephone and Telegram departments (PTTs). The following features are a sample of those that must meet specific homologation regulations in each country before they can be ordered and delivered.

Feature Code	Description
#0032	High speed modem
#2750	PCI ISDN Bri U IOA - 2-wire
#2751	PCI ISDN Bri S/T IOA - 4-wire
#2761	Integrated Analog Modem
#4750	PCI ISDN Bri U IOA - 2-wire
#4751	PCI ISDN Bri S/T IOA 4-wire
#4761	Integrated Analog Modem
#9771	Base PCI Two-Line WAN with Modem

Euro Currency

IBM considers an IBM product to be EuroReady if the product, when used in accordance with its associated documentation, is capable of correctly processing monetary data in the euro denomination and of respecting the euro currency formatting conventions (including the euro sign). This assumes all other products (for example hardware, software, firmware, etc.) used with the IBM product are also EuroReady.

IBM considers a solution to be EuroReady when the solution providers have analyzed the euro requirements, including the need to comply with relevant EC rules and built-in appropriate function.

iSeries 400 and AS/400e support for euro currency includes updates to input, display, print, and process the euro currency sign for both the host and PC client computing environments. This support includes:

- Underlying operating system and Licensed Program Product (LPP) changes that are transparent to the user
- The addition of euro country extended code pages (CECPs) and CCSIDs
- The addition of euro keyboard types, including device configuration and device controller changes
- The addition of euro font and glyph support

For the latest available information and a roadmap to euro currency sign support on the iSeries 400 and AS/400e servers, refer to the following Web site:
`http://www.as400.ibm.com/euro`

All current IBM iSeries 400 and AS/400e printers and many withdrawn IBM system printers have been enhanced to support the euro currency symbol. Updates to external display, print, and client functions may need to be obtained from other vendors.

This phase of euro support is only for those countries that use the “Latin 1”-based alphabet. This includes those countries initially participating in the European Monetary Union and other select countries.

Euro Currency Sign Support Enhancements in V4R5

V4R5 includes Phase II of euro currency sign support. Phase I of euro currency sign support was included in V4R4 and previous releases. Phase I is for countries that use a Latin 1-based alphabet, which primarily included the countries in the European Monetary Union (EMU). Phase II is for those countries currently supported in the iSeries 400 and AS/400e national language structure who are outside the EMU and whose national standards bodies have approved the appropriate standards. Examples are Japan, Poland, and Turkey.

As part of continuing globalization enhancements to facilitate data interchange with other industry-standard operating systems and link to current technologies like XML and LDAP, the API QlgTransformUCSData was added to convert data from the Unicode encoding form UCS-2 to Unicode encoding for UTF-8 and vice versa. A Code Character Set ID (CCSID) of 1208 is added to support UTF-8.

For the latest available information and a roadmap to euro currency sign support on the iSeries 400 and AS/400e system, visit the iSeries Web site at: `http://www.as400.ibm.com/euro`

System Management Facilities

A variety of tools and functions are available to provide system availability and management. Some are discussed in this section:

- **System Managed Access Path Protection (SMAPP)**

  SMAPP supports and automates the process of selecting which access paths should be protected. The system uses the EDTRCYAP value to estimate the amount of journaling to perform. The shorter the time in this value, the more journaling takes place, which impedes system performance, but it leads to shorter IPLs. The longer the value is, the longer the IPLs are. However, the impact of journaling on CPU and DASD utilization is less.

- **Expert Cache**

  Expert Cache provides a disk cache tuner option, which allows the iSeries 400 and AS/400e system to take advantage of available main storage capacity. It dynamically responds to system jobs to cache pages of data in main storage to reduce the time to process disk I/O.

- **Integrated Hardware Disk Compression**

  Beginning with OS/400, V4R3 compression of data on disk is supported by OS/400. Data is dynamically compressed and uncompressed by the DASD controller as data is written to and read from disk. Disk compression does not effect the main CPU utilization since this function is performed by the DASD controller IOP.

  Support for Integrated Hardware Disk Compression is provided by #2741, #2748, #4748/#9748 PCI DASD controllers, #6533 and #9754 SPD DASD controllers, and the #9754 MFIOP with RAID adapter. Compression is limited to the fifteen user ASPs.

  The resulting compression ratio varies, with most data compressing at a 20 to 40% reduction. The compression rates achieved and the subsequent impact on DASD performance depends on the data.

- **Hierarchical Storage Management**

  OS/400 includes Hierarchical Storage Management (HSM) APIs used by Backup and Recovery Media Services (BRMS), 5769-BR1, to provide HSM functions. These APIs can also be used to develop custom HSM applications. The APIs are documented in *AS/400*

Hierarchical Storage Management, SC41-4450. Refer to the following Web site for more information on BRMS and HSM: `http://www.ibm.com/eserver/iseries/hsmcomp`

- **Internet PTFs**

  iSeries 400 and AS/400e customers can download PTFs over the Internet. The client hardware needed is a PC with Windows 95 or Windows NT, a TCP connection to the system over a LAN, and access to the Internet. Selected configurations and set up information is documented on the Web at: `http://as400service.ibm.com`

  Except for the medium of transport, the functionality of PTF download over the Internet is the same as the ECS method of transport. The user selects the PTFs and options using a Web browser and submits the order. At the iSeries 400 and AS/400e service Web site, the user can also search for and read PTF cover letters before the order is placed. The same entitlement rules that apply on the ECS connection are enforced. In other words, if a user can acquire PTFs electronically with ECS, they can acquire PTFs over the Internet.

- **System availability**

  Various functions are available to help maintain the availability of an iSeries 400 and AS/400e system. These include:

  – iSeries 400 and AS/400e servers support an optional Uninterruptable Power Supply (UPS) to maintain power to the system during a site power loss.

  – Disk mirroring for the entire system or one individual auxiliary storage pool. If the entire system is mirrored, double the disk capacity is needed. Additional disk controllers and placement of these controllers on separate buses can give even higher protection.

  – Disk mirroring for the entire system or one Large capacity disk load balancing. The ability to balance data across disk arms in an ASP, based on performance, is provided in V4R4. The disk load balancing function identifies hot data versus cold data and spreads data across the disk arms to balance utilization accordingly.

    Disk load balancing provides the ability to balance data across disk arms in an ASP, based on capacity. Data is spread across arms so each arm has the same percentage of usage. This is especially useful when disk arms are added.

    The ability to move low access data to slower, high capacity disk arms within an ASP (for example, compressed disk) is provided as well. This involves identifying hot versus cold data and moving the cold data to slower disk. Specific data can also be targeted to move to a slower disk.

    These functions are controlled with CL commands (no GUI interface).

  – Journaling provides the capability to record all changes to records in a file as they occur. These journaled changes are applied to the file if the system is lost. With the implementation of remote journals, this protection can be extended to cover access

paths to provide faster recovery of access paths in the event of an abnormal system termination.

- Commitment Control ensures that if a transaction requires multiple database changes, all of them (or none of them) are made.
- Auxiliary Storage Pools (ASPs) are individual disks reserved for particular objects (like individual libraries), which can be used to isolate those objects to assist in their recovery. Up to 15 user ASPS allowed. All systems ship with one system ASP configured.
- Save While Active function allows customers to continue to use applications while data is backed up. This reduces the time that the applications are unavailable and the time to save.
- Many save and restore commands, and the QSRSAVO API support concurrent (in parallel) save and restore to multiple tape devices or multiple resources in a tape library. The maximum save rate for large objects is no longer limited to the maximum throughput capabilities of a single tape device. By using multiple tapes in parallel (from 2 to 32), the maximum throughput can be increased and time-to-save and time-to-restore is reduced, especially for very large objects.
- Concurrent maintenance of I/O cards, power, expansion towers, and other components is supported to reduce down time due to the failure of components in the system.

  For example, regarding concurrent maintenance of expansion towers, Hardware Service Manager screens automatically correlate with an I/O card selected for an MES or repair action to the expansion tower where the I/O card exists. The user interface calculates and displays the other hardware resources in the expansion tower that are affected when the expansion tower is powered off. Configuration objects associated with affected resources are shown, which facilitates the process of ending jobs or applications using the affected resources.

  Concurrent maintenance is available for most IOAs.
- RAID-5 disk protection can be implemented with the use of a disk controller and at least four disks to make up an array. Refer to “RAID-5” on page 355 for information on how this is implemented.

Nonchargeable Features of OS/400

Nonchargeable features of OS/400 are offered with the operating system for no extra charge.

AS/400 Client Access Express for Windows (#2603)

AS/400 Client Access Express for Windows (5769-XE1) is shipped at no charge with OS/400 V4R5 and V4R4 if customers have not acquired the AS/400 Client Access Family for

Windows product (5769-XW1). All functions of the Express client, with the exception of PC5250 Display and Print Emulation and Data Transfer, can be used with the need for a license for the AS/400 Client Access Family for Windows product.

Since Client Access delivers the OS/400 graphical user interface, it is necessary for system administrators and operators to use its Operations Navigator functions for working with OS/400 setup, configuration, and day-to-day operations. A few frequently used operations provided by Operations Navigator are:

- Management Central functions for distributing PTFs
- GUI for setting up Virtual Private Networks or the Integrated xSeries Server for iSeries (Integrated Netfinity Server)
- Working with large objects
- Using the new datalinks command or the SQL Performance monitors that aid developers in fine-tuning database applications.

Also included in Client Access is the Operations Console function, which enables operators and administrators to perform system console functions from a Windows environment, either locally or remotely. Highlights of these administrative capabilities are described in the following sections.

To learn about other functions in Client Access Express for Windows, see “IBM Licensed Programs: Networking Products” on page 603. Operations Console is further described in “AS/400 Operations Console” on page 665.

AS/400 Operations Navigator

Operations Navigator is the name of the graphical interface for administering and operating iSeries 400 and AS/400e servers. Its highly productive and easy-to-use interface also simplifies the abilities of end users to work with system resources. With each release, Navigator continues to expand its capabilities to meet the needs of system administrators and operators. It provides many wizards to simplify operations such as configuring network communications, managing user profiles, setting up security, database administration, and much more. It provides easy-to-use tools such as a “find” function for searching within Operations Navigator windows lists.

Operations Navigator runs on Microsoft Windows 32-bit operating systems (Windows 95, 98, Me, NT 4.0, and 2000), and is designed to be highly integrated with Windows to allow users to easily perform system tasks and work with system resources. Windows can be set to refresh their content automatically. Multiple windows can be opened to monitor specific items of interest. Desktop shortcuts may be created for items within Operations Navigator.

There are several facilities within Operations Navigator that enhance the ability of the operator to manage the system. Some of the facilities are:

- **Managing jobs facility**: Enables users to perform actions against or change the properties of jobs on iSeries 400 and AS/400e servers. Selected server software can now run in customer-defined subsystems. In addition a simplified interface for working with server jobs has been provided.
- **Messages facility**: Enables users to send, view, and manipulate messages on iSeries 400 and AS/400e servers. Properties of a message can be displayed and replied to.
- **File system**: Enables users to work with file system properties, filtering, and open system objects using PC programs. Folders in the integrated file system (IFS) can be created, deleted, and renamed. File system objects can be cut, copied, pasted, and dragged or dropped between systems and PCs. User Defined File Systems (UDFS) are also included.
- **Printer output**: Allows users to work with printer output that is waiting to be printed (for example, actions include open, hold, release, move, and delete). Users can also change the properties of the output (such as, the printer, number of copies, priority, and the form type). A drag-and-drop interface is supported to move output between various printers or to the PC.
- **AFP Viewer**: Includes the full functionality of the AFP Workbench product that was previously available as a priced upgrade to CA/400. With AFP Viewer, CA/400 users can view any document that is in AFP, ASCII, TIFF, PCX, DCX, or DIB data format. The viewer allows users to view the contents of system printer output from the Printer Output list.
- **User and User Group Administration**: User profiles can be created, changed, or deleted with the click of a mouse and easy-to-use dialog boxes. Users can be added to a group through drag-and-drop operations.
- **Security wizard**: Generates an administrator and user report. The administrator report shows recommended settings and how those settings affect the behavior of the system. The user report contains the information the users need to know about the system, such as password composition rules.
- **Backup**: Allows users to schedule daily, weekly, and monthly backups of remote iSeries 400 and AS/400e servers. It offers easy-to-use panels so users can select what should be backed up, when to schedule it, and where to save it.
- **Database administration**: Users can create and modify DB2/400 table definitions with the use of a wizard. Administrators can easily set up ODBC configurations for other PCs in the network, create and change database object definitions, control access to database objects, back up database objects, organize file data to enhance performance, copy object definitions and data, display data in tables and views, update table contents, manage remote journals, manage aliases, and copy or move tables between systems. Operations Navigator also provides interfaces to work with large objects (LOBs) in the database, use the DATALINK data type to extend the types of data that can exist in the database, and create user-defined SQL functions. Support

is also provided for creating procedures, managing SQL indexes, and capturing and viewing SQL performance information. A utility for running SQL statements on the iSeries 400 and AS/400e is significantly enhanced to allow sets of statements to be easily entered, run, and saved as SQL script documents.

- **Resource security and security policy**: Enables resource information such as user's authority, public authority, owner, primary group, authorization list, default public authority for newly created objects (libraries only), sensitivity level (QDLS objects only), and security policy information to be changed easily. Access to specific Operations Navigator functions can also be controlled.

  There is also a Security Wizard that asks questions about your system and then recommends how to configure base system security. You can apply some or all of the recommendations or save them. If you save them, the next time you run the wizard, you can apply the changes from the first screen. If you apply changes, the next time you start the wizard, a “reset changes” option appears on the first page to change the security configuration back to what it was before the changes were applied.

  The security wizard also generates an administrator and a user report. The administrator report shows the recommended settings and how those settings affect the behavior of the system. The user report contains the information that users need to know about the system, including password composition rules and job timeout intervals.

- **Hardware and software inventory**: Can be displayed through a Windows, shell-based user interface.
- **Plug-in support:** Now allows anyone to extend their capabilities. Plug-ins can be written in Java or Visual Basic. Additional enhancements have been made for plug-ins to attach anywhere in the Operations Navigator function tree and be controlled by Application Administration.
- **TCP/IP security**: Allows control of Network Address Translation (NAT) and IP Packet filtering to accept or reject IP packets based on criteria. Operations Navigator provides the graphical interface for system TCP/IP capabilities. Virtual Private Networks (VPNs) can be set up for secure connections across a public network. Point-to-Point configuration is enhanced to support ISDN and L2TP.
- **Network File System (NFS) management**: Controls an iSeries 400 or AS/400e NFS server and the exports and netgroups set up for that server.
- **NetServer**: View server statistics with optional automatic refreshing, shared objects being used by a session, and sessions using a shared object.
- **DCE**: Allows you to set up and manage iSeries 400 or AS/400e DCE services.
- **LDAP**: Allows you to set up and manage an AS/400 Directory server and publish user information to an LDAP directory.

AS/400 Operations Navigator Enhancements for V4R5

Operations Navigator graphical interfaces for AS/400e servers are improved at V4R5M0 for administration and operation functions. Operators and administrators connecting to iSeries 400 and AS/400e servers running OS/400 V4R5 should increase their productivity when performing the following tasks at V4R5M0:

- **DASD Management**

  Users can view and manipulate large DASD configurations. This includes the ability to view subsets of all disk units, view disk units in a physical and logical hierarchical layout, and sort the disk units by various criteria such as size, resource name, or associated controller. Performing disk maintenance, such as adding and replacing disk units, has been simplified since Operations Navigator provides wizards to do these tasks.

- **Working with the iSeries 400 and AS/400e database**

  A number of enhancements have been added to Operations Navigator for database programmers and administrators:

  – Visual Explain is a new function that provides a pictorial view of query optimization and allows users to easily get information for improving query performance.

  – A new function has been added to display currently executing SQL statements for a job.

  – Tables, views, and indexes have been enhanced with a description window that displays and, in some cases, allows changing the attributes of these important objects.

  - Display row lock

- **Integrated xSeries Server for iSeries Administration**

  The Integrated xSeries Server for iSeries can be managed through the Operations Navigator. These Windows servers can be stopped, started, changed, and listed to view their status, and their attributes can be managed.

  The Client Access Express for Windows client (V4R5M0), which includes the above Operations Navigator enhancements, is shipped with OS/400 V4R5 and can be downloaded from the iSeries 400 and AS/400e NetServer to PC Windows desktops. Client Access Express runs on Microsoft Windows 95, 98, NT 4.0, and Windows 2000 operating systems and can be used to connect to AS/400 systems running OS/400 V4R2 or later. See the Licensed Program Offering (LPO) announcement for other enhancements which are available in the Express client.

Management Central

Management Central allows easy management of multiple iSeries 400 and AS/400e servers by sending single requests through one system acting as a central server to other systems. Execute commands on one or multiple systems with a single request. Management Central is

integrated into the main Operations Navigator window. Similarly, utilities for defining, verifying, and changing system connections, formerly launched from the Client Access folder, are now available through Operations Navigator. OS/400 V4R4 or later is required. Management Central includes:

- **Collection Services**

  This tool for collecting and managing performance data replaces the traditional performance monitor function with a low-overhead, automated, and on-going data collector in a network. This function can be scheduled to occur when most convenient for the customer, either as a one-time operation or regularly on set dates and times. Additionally, Collection Services lets you control what data is collected and how that data is managed.

  Each type of data supported by collection services can be controlled individually without data loss or affecting the collection of other data.

  A compatible performance monitor database is created based on the data in the management collection object. However, you can defer the creation of the database until a later time.

  Collecting performance sample data is enhanced by:

  – Reducing the impact of collecting performance data, especially on large systems
  – Allowing flexibility in the data collected
  – Simplifying the management of performance data
  – Promoting automated, continuous data collection

- **Object packaging**

  The object packaging and distribution graphical interface provides an easy way to send objects from any file system to one or more iSeries 400 and AS/400e servers in a network. You can also restore objects, take snapshots of the objects, version packages of objects, and post execution of commands. All of these functions can be performed on a group or network of systems and be scheduled to occur at a time most convenient for your staff.

  Select objects in an iSeries 400 and AS/400e file system and create packages that can then be distributed to systems throughout the network, with one request to a single system or groups of systems.

- **PTF management for a distributed environment**

  If managing PTFs among several iSeries 400 or AS/400e servers is too complicated, the new PTF management wizards are for you. Distribute and install OS/400 software fixes (PTF) throughout the network. The easy-to-use wizards walk you through and compares the PTF levels of multiple iSeries 400 and AS/400e servers to a model system that has a proven set of PTFs already installed. You then distribute and install any missing PTFs on the remote systems by simply identifying the system or group of systems to be updated.

You can run system commands as part of completing PTF installations or as part of normal day-to-day operations.

- **Inventory for multiple systems**

  With the new graphical interface, you can schedule regular inventory collections of hardware, software, and PTF information for a group or network of iSeries 400 and AS/400e servers and access it from a central server. From the data collected, you can search for a specific piece of information, export the information to a PC application for analysis, or just compare information in multiple systems.

Management Central Enhancements with V4R5

For system management, Management Central at V4R5 adds two new CPU utilization metrics to help target detailed data about the system performance. By designing CPU utilization metrics that specific target your type of workload, IBM helps you gain an accurate understanding of how your system is performing given its unique workloads and demands.

- **CPU Utilization (Interactive Feature)**: This metric is designed to help you monitor and mange your use of interactive capability. It determines whether a particular job is doing interactive work and measures the system's overall interactive workload.

  This new metric was designed especially with the new AS/400 Interactive Feature in mind but can be used with earlier AS/400 models where interactive capability is of interest. It complements the existing Management Central metrics such as CPU Utilization (Interactive Jobs0 and CPU Utilization (Average). The new metric shows you when your iSeries 400 and AS/400e system is approaching its interactive thresholds, helping you to get optimal performance and throughput on your server.

- **CPU Utilization - Secondary Workloads**: This metric is used on Dedicated Servers. For example, this metric can be used on the Dedicated Server for Domino to see how much non-Domino work is being performed. Because the Dedicated Server for Domino is used as a server devoted to Domino work, this metric helps you identify and manage those workloads not directly contributing to that primary workload. As with interactive utilization, managing secondary workloads helps you maintain optimal system performance.

Each of the new metrics can be used independently or in combination with any of the other monitoring metrics provided with Management Central. Use varies according to the needs of your business environment.

AS/400 Integration with Windows NT Server (Version 4.0) (#2692)

AS/400 Integration with Windows NT Server enables Microsoft Windows NT Server Version 4.0 to be installed on the Integrated xSeries Server for iSeries and AS/400e. In a single combination server, customers can run their mission critical business applications on the iSeries 400 or AS/400e server, while also running Windows NT Server for file, print, personal

productivity, and other applications. Some advantages of running Windows NT Server on the Integrated xSeries Server for iSeries and AS/400e are:

- Flexibility for iSeries 400 and AS/400e applications and Windows NT services in a combination server
- Improved hardware control and availability with reduced maintenance costs
- Simplified user administration and server operations

An AS/400e Integrated xSeries Server for iSeries, Integrated PC Server (IPCS) with a Pentium Pro processor or an Integrated Netfinity Server and a minimum of 64 MB of memory is required to install Windows NT Server. A PC screen, keyboard, and mouse must be attached to the Integrated xSeries Server for iSeries (AS/400 IPCS or Integrated Netfinity Server) to provide a console for the Windows NT Server.

The iSeries 400 and AS/400e operator can start and stop the Windows NT Server, improving server management in remote branch office and dealership installations. The system operator can also manage Windows NT disk resources, allocating disk space from the system's disk pool. The system operator can also better manage server operations since hardware error messages and event logs from the Windows NT Server are sent to the system message queue. Maintenance costs are reduced compared to a PC-based server, since Integrated xSeries Server for iSeries maintenance charges are included in the iSeries 400 and AS/400e server maintenance offering.

iSeries 400 and AS/400e integration with the Windows NT Server allows customers to share hardware resources between the iSeries 400 and AS/400e system and Windows NT Server. The iSeries 400 and AS/400e CD-ROM drive and tape drives can be allocated to Windows NT for installing an application or for data backup. The CD-ROM drive can be concurrently switched among multiple Integrated xSeries Server for iSeries and the iSeries 400 and AS/400e servers. Multiple applications can access a CD.

Tape backup utilities written for Windows NT can back up data to the system tape drive. Both Windows NT Backup and Seagate Backup Exec Version 6.11 have been tested. Other backup utilities written for Windows NT are being tested. For the latest information on product testing, visit: `http://www.ibm.com/eserver/iseries/windowsintegration/`

AS/400 Integration with Windows NT Server provides simplified user administration of a combined network environment. Network operators can create both iSeries 400 or AS/400e, and Windows NT user profiles in a single step. Users can change their password on the iSeries 400 and AS/400e system and have it automatically updated on the Windows NT Server. An iSeries 400 and AS/400e administrator can submit Windows NT commands directly to the Windows NT IPCS from the iSeries 400 and AS/400e server with output returned to a job log, integrated file system, or spooled file. This saves the administrator from switching back and forth between the two systems.

AS/400 integration with Windows NT Server provides an internal connection between the iSeries 400 or AS/400e, and Windows NT Server. This internal TCP/IP link provides a reliable and secure connection for applications and database integration utilities between the two systems, protecting the application from local area network hub failures.

Windows NT Server (Version 4.0) is packaged, priced, and supported by Microsoft and must be purchased through a Microsoft dealer.

Integrated Services for the FSIOP (#2644)

The File Server I/O Processor (FSIOP) is the name for some of the older models of what later became the Integrated PC Server (IPCS). It provides enabling of the LAN cards as well as an OS/2 WARP base for the Notes Release 4 when running on a FSIOP/IPCS. It is required for LAN Server/WARP Server for AS/400 for OS/400 V4R1 and later. After installation, it should be possible to vary on an IPCS so that it can be used as a LAN adapter to run APPC, TCP/IP, or IPX protocols. To obtain the full function of the IPCS as a file server or groupware application server, the appropriate server or groupware application must be installed.

Common Programming API (CPA) Toolkit (#2690)

This provides iSeries 400 and AS/400e C application developers the ability to build applications using additional system interfaces and C runtime functions compatible with OS/2, DOS, NT, POSIX, XPG, and UNIX. It was further enhanced to support additional Spec 1170 APIs to reduce the cost of porting applications and improve iSeries 400 and AS/400e architecture for client server applications.

Integration for Lotus Notes (#2656)

Integration for Lotus Notes is required for using Lotus Notes from an Integrated xSeries Server for iSeries and provides the following functions:

- Installation support of the Lotus Notes Release 4 OS/2 server from a LAN-attached PC to a dedicated Integrated PC Server environment.
- Administrative capability to manage the Notes server on the Integrated PC Server by executing Notes server commands from an OS/400 command line.
- Shadowing of the AS/400 System Distribution Directory (SDD) entries to the Notes Name and Address Book residing on the Integrated PC Server provides enhanced user-profile management.
- Remote PC dial-in access to Notes applications through supported iSeries 400 and AS/400e communications adapters and connection with an Integrated PC Server-based Notes server. This is provided with TCP/IP SLIP and appropriate communications hardware support installed. Using iSeries 400 and AS/400e remote PC capabilities replaces the need to have dedicated communication ports on the

Integrated PC Server for Notes' users, therefore, consolidating remote and mobile configurations on the system.

- Lotus Domino (Notes Server) 4.5 and Lotus Notes 4.1 are supported on the Integrated PC Server.

Statement of Direction:

Customers running OS/2 Warp Server for AS/400 and Novell 4.11 on the AS/400 Integrated Netfinity Server is supported with their current capabilities until 31 January 2001. However, these products will not be functionally enhanced. It is also recommended that customers with Domino on the OS/2 based AS/400 Integrated Netfinity Server plan to migrate to the native Domino for AS/400 product, which provides enhanced scalability, reliability, and integration. V4R3 is the last release of OS/400 to support Lotus Domino running on the OS/2 based AS/400 Integrated Netfinity Server. Future releases of OS/400 will not be capable of running Lotus Domino on the OS/2 based AS/400 Integrated Netfinity Server.

Application Development

Application development features and functions include:

- OS/400 Control Language

  The Control Language (CL) provides a consistent single interface to all system functions. Most commands can be executed both interactively and in a compiled CL program. CL programs provide a high degree of function in that they allow the use of variables, error handling, and access to the database.

- Runtime support is provided for languages such as ILE RPG/400, ILE COBOL/400, ILE C for OS/400, AS/400 PL/1, AS/400 Pascal, and AS/400 Basic.

- Pthread APIs allow IBM Business Partners or iSeries 400 and AS/400e application developers to take advantage of new system support for kernel threads. With APIs based on industry-standard POSIX APIs, the task of creating or porting applications becomes faster and more cost effective. Even more, the Pthread APIs significantly increase the ability to write large server or high performance parallel applications.

- Procedures Language 400/REXX is implemented within OS/400. REXX is designed to facilitate the writing of clear, structured, and interpreted procedures.

Refer to “IBM Licensed Programs: Application Development Products” on page 693 for more information on products available for application development.

Year 2000 Support

The Year 2000 problem exists because the practice of using only two digits in system and application programs yields incorrect results on arithmetic operations, comparisons, or the

sorting of date fields for years outside the range 1900 to 1999. With Year 2000 enablers, OS/400 is an operationally safe environment for further application enabling. The enablers also facilitate the making of existing customer programs Year 2000 safe. OS/400 V3R7 and later handle dates and date fields for the Year 2000 and beyond.

For further information on this topic, visit the Web site: `http://www.ibm.com/year2000/`

Database Support

The integrated database, DB2 for OS/400, provides stability and compatibility of previous releases of the AS/400e database with the standards-based technology required for a heterogeneous computing environment. DB2 for OS/400 provides compliance in the area of standards compliance coupled with advanced function, distributed capabilities, and performance. DB2 for OS/400 provides support for:

- Structured Query Language (SQL) standards conformance. Supplies the industry standard database access language conforming to the IBM SQL Version 1, ANSI X3.135.1992, ISO 9075-1992, and FIPS 127-2 standards. Support is provided for embedded static, dynamic, and extended dynamic SQL, together with IBM's Distributed Relational Database Architecture (DRDA), Microsoft's Open Database Connection (ODBC), and Apple's Data Access Language (DAL). A Call Level Interface (CLI) server mode is also provided that allows developers to write applications that do database serving for multiple users.
- Encoded Vector Indexes (EVI) can be created using SQL. EVIs cannot be used to order records, but in many cases, they can improve query performance.
- Declarative referential integrity preventing conflicting data from being entered in the database.
- Stored procedures allowing the distribution of application workloads between a client and an application server.
- Triggers that cause automatic program execution before and after database modifications.
- Two-phase commit transaction management to allow access to multiple heterogeneous databases simultaneously.
- Data replication automatically in distributed DB2 family environment.
- System-wide database catalog allowing applications to query information concerning all objects on a system using a single system catalog.
- Multiple-level concurrency control providing read stability, cursor stability, uncommitted read, and no commit isolation levels.
- National language support to store data in a preferred language, character set (single and double byte), and a sort sequence.

- Security up to Level 50: Level 50 provides C2 level of trust as defined by the U.S. Government publication DOD 5200.28-STD, *Department of Defense Trusted Computer System Evaluation Criteria.*

  Application Development facilities are provided in the optional DB2 Query Manager and SQL Development Kit for AS/400 (5769-ST1) and the Application Developer's Toolset (5769-PW1) in Licensed Programs section.

- Multiple Operating Environments:

  In addition to the creation of native iSeries 400 and AS/400e applications, OS/400 allows the execution of applications or programs migrated from the System/36 and System/38 with few or no modifications required, or applications with a mixture of native and System/36 or System/38 function. This means that applications can be migrated into completely native iSeries 400 and AS/400e applications at a pace that suits the customer. See “System/36 Migration Aid, 5727-MG1” on page 700 and “System/38 Migration Aid, 5714-MG1” on page 693.

  In addition, on all PowerPC-based models of the AS/400e system, it is possible to run System/36 Operation System SSP Release 7.5 under OS/400, which allows System/36 applications to run unchanged on an AS/400e system.

  Note: V4R4 is the last OS/400 release to support AS/400 Advanced 36 System Support Program (SSP) running as a guest operating system and the associated AS/400 Advanced SSP products.

- Support for Central Site Maintenance:

  OS/400 provides many capabilities to assist in the maintenance of a network of iSeries 400 and AS/400e systems from one central site. These include:

  – Most application objects can be saved on a system and restored to another AS/400e system at the prior release level. Typically, the support is from the current release to two release levels back.

  – Screen copy image allows the image on one screen to be sent through a network of iSeries 400 and AS/400e systems to another screen.

  – Programs developed under Cross System Product/Application Development (CSP/AD) on an IBM S/390 can be run under CSP/Application Execution (CSP/AE) on an iSeries 400 and AS/400e server.

  – Operations management functions can be performed using remote commands and display station passthrough (within OS/400) for iSeries 400 and AS/400e controlled networks and Host Command Facility (on S/370) to Distributed Host Command Facility (on an iSeries 400 and AS/400e server within OS/400) on S/370-controlled networks.

Database Journaling enhancements in V4R5

Database journaling is enhanced at V4R5 in several key areas:

- Maximum size of a single journal receive is increased by a factor of over 500 times to accommodate customer's growing environments.
- Maximum journal sequence number is increased by a factor of five.
- Number of disk drives that can be simultaneously accessed by a journal is increased by an order of magnitude to 100.
- These enhancements reduce the hands-on operations requirements needed to manage journals while providing greater capacity with consistent performance.
- With V4R5, it is easier to manage files logged to different journals. A single application may access files logged to multiple journals. If the transaction adjusts data in several journal receivers, two-phase commitment control is employed to synchronize the information located in all receivers. If only files from a single receiver are used during the execution of the transaction, the commitment cycle focuses only on that journal with a single-phase commitment.

Integrated File System

The integrated file system is a part of OS/400 that lets you support stream input, output, and storage management similar to personal computer and UNIX operating systems, while providing structure for all information stored in the iSeries 400 and AS/400e server.

The key features of the integrated file system are:

- Support for storing information in stream files that can contain long continuous strings of data
- A hierarchical directory structure
- A common interface that allows users and applications to access not only the stream files, but also database files, documents, and other objects that are stored in the iSeries 400 and AS/400e server
- A common view of stream files that are stored locally on the iSeries 400 and AS/400e server, an Integrated xSeries Server for iSeries for AS/400, or a remote Windows NT server

Why use the integrated file system

The integrated file system offers the following benefits:

- Fast access to OS/400 data
- Efficient handling of stream data, including images, audio, and video

- A file system and directory base for supporting UNIX-based open system standards such as POSIX and XPG
- File system support that lets you manage files through a common interface
- Consistent use of object names and associated object information across national languages

A file system provides the support to access specific segments of storage that are organized as logical units. These logical units on the iSeries 400 and AS/400e server are files, directories, libraries, and objects.

Each file system has a set of logical structures and rules for interacting with information in storage. These structures and rules may be different from one file system to another. In fact, from the perspective of structures and rules, the OS/400 support for accessing database files and various other object types through libraries can be thought of as a file system. Similarly, the OS/400 support for accessing documents (which are really stream files) through the folders structure may be thought of as a separate file system.

The integrated file system treats the library and folders support as separate file systems. Other types of file management support that have differing capabilities are also treated as separate file systems. The file systems are:

- **NFS**

  Network File System. This file system provides the user with access to data and objects that are stored on a remote NFS server. An NFS server can export a network file system that NFS clients then mount dynamically.

- **QDLS**

  The document library services file system. This file system provides access to documents and folders.

- **QFileSvr.400**

  This file system provides access to other file systems that reside on remote systems.

- **QLANSrv**

  OS/2 Warp Server for AS/400 file system. This file system provides access to the same directories and files that are accessible through the OS/2 Warp Server for AS/400 licensed program. It allows users of the OS/2 Warp Server for AS/400 applications to use the same data as OS/2 Warp Server for AS/400 clients.

- **QNetWare**

  The QNetWare file system. This file system provides access to local or remote data and objects that are stored on a server that runs Novell NetWare 4.10 or 4.11 or to standalone PC Servers running Novell NetWare 3.12, 4.10, 4.11, or 5.0. A user can dynamically mount NetWare file systems over existing local file systems.

- **QNTC**

  Windows NT Server file system. This file system provides access to data and objects that are stored on a server running Windows NT 4.0 or higher. It allows iSeries 400 and AS/400e applications to use the same data as Windows NT clients. This includes access to the data on a Windows NT Server that is running on an integrated PC Server.

  Note: The QNTC file system lets you share data with servers that can communicate using the Windows NT LM 0.12 dialect. The SMB server (AS/400 support for Windows Network Neighborhood) does not use the Windows NT LM 0.12 dialect. The QNTC file system can communicate with Windows NT servers. This includes a standalone server and any NTAP servers running in the domain.

  See *OS/400-AS/400 Integration with Windows NT Server*, SC41-5439, for details.

- **QOpenSys**

  The open systems file system. This file system is compatible with UNIX-based open system standards, such as POSIX and XPG. Like the root file system, this file system takes advantage of the stream file and directory support that is provided by the integrated file system. In addition, it supports case-sensitive object names.

- **QOPT**

  The optical file system. This file system provides access to stream data that is stored on optical media.

- **QSYS.LIB**

  The library file system. This file system supports the iSeries 400 and AS/400e library structure. This file system provides access to database files and all of the other iSeries 400 and AS/400e object types that the library support manages.

- **“root”** (/)

  The / file system. This file system takes full advantage of the stream file support and hierarchical directory structure of the integrated file system. The root file system has the characteristics of the Disk Operating System (DOS) and OS/2 file systems.

- **UDFS**

  The user-defined file system. This file system resides on the auxiliary storage pool (ASP) of the user's choice. The user creates and manages this file system.

You can interact with any of the file systems through a common interface. This interface is optimized for the input/output of stream data, in contrast to the record input/output that is provided through the data management interfaces. The provided commands, menus and displays, and application program interfaces (APIs) allow interaction with the file systems through this common interface.

Note: The QNTC file system lets you share data with servers that can communicate using the Windows NT LM 0.12 dialect. The SMB server (AS/400 support for Windows Network Neighborhood) does not use the Windows NT LM 0.12 dialect. The QNTC file system can communicate with Windows NT servers. This includes a standalone server and any NTAP servers running in the domain.

Integrated File System Enhancements

The integrated file system has been enhanced to include:

- **Large file enablement**

  User applications can store and manipulate very large files in the integrated file system, including:

  – Stream file sizes up to 256 GB in the root (/), QOpenSys, and user-defined file systems

  – A new set of 64-bit UNIX-type APIs and easy mapping of existing 32-bit UNIX-type APIs to 64-bit APIs. A user application can access large file sizes, offsets, and data using 64-bit APIs.

- **Thread-enablement**

  The threadsafe integrated file system API interfaces can access objects in the following file systems in a multi-threaded job:

  – QSYS.LIB
  – QOPT
  – QLANSrv

- **Write performance improvements**

  Significant improved response time and capacity when performing write operations in the root (/), QOpenSys, and user-defined file systems.

  – *NFS Version 3 support*: Support is added to the NFS client and server for large file access.

  – *Stream file capability*: Stream files in the integrated file system can be edited through the 5250 interface (using the new EDTSTMF command) and through Operations Navigator.

Improved Options and Application Products for V4R5

AS/400 Integration for Windows Server

AS/400 Integration for Windows Server ships automatically with OS/400 at V4R5. The software previously included in OS/400 option 29, Integration with Windows NT Server, at V4R5 is titled AS/400 Integration for Windows Server.

AS/400 Integration for Windows Server contains as base program with two options to allow an AS/400 with multiple Integrated xSeries Server for iSeries installed to have a combination of servers with either Windows NT Version 4.0 or Microsoft Windows 2000. Option 1 contains the support for Integrated xSeries Server for iSeries to run Microsoft Windows NT Server Version 4.0 or Microsoft Windows NT Server Terminal Server Edition Version 4.0. Option 2 contains the support for the Integrated xSeries Server for iSeries to run Microsoft Windows 2000 Server and Terminal Server Services.

Highlights of AS/400 Integration for Windows Server enhancements at V4R5 include:

- Integrated save/restore of Windows files from the iSeries 400 and AS/400e server. Save and restore capabilities of Windows servers enable individual file backup and recovery through the iSeries 400 and AS/400e server. This support is enabled through the iSeries 400 and AS/400e NetClient file system (QNTC) of the integrated file system. Incremental saving of files and the Windows registry associated with an Integrated xSeries Server for iSeries can be incorporated into an existing system backup procedure. The registry and files saved through this method can be individually restored if needed. Saving Windows server files in this manner can be used with full system save procedures for disaster recovery.
- Operations Navigator Support for Windows Server Management. Operations Navigator, the GUI for managing the iSeries 400 and AS/400e server, is enhanced to manage Windows servers installed on Integrated xSeries Server for iSeries. You can start, stop, and display the status and properties of the server, which is installed with either Windows NT Version 4.0 or Windows 2000.
- Increased drive size. iSeries 400 and AS/400e storage availability to the Integrated xSeries Server for iSeries (Integrated Netfinity Server) is increased from 8 GB per drive to 64 GB per drive. The system drive remains at a maximum of 8 GB. The increase in storage size enables almost 1 TB of storage available per Windows server.
- System drive installation. The Windows server installation is enhanced to enable the system disk to reside on the C drive.
- Shared LAN adapter support not available. For the iSeries 400 Models 8xx, 270, SB2, and SB3 servers, LAN adapters cannot be shared between iSeries 400 and Windows servers on the Integrated xSeries Server for iSeries. The iSeries 400 server and the Integrated xSeries Server each require their own LAN adapters if LAN connectivity is required for both environments.
- Integrated xSeries Server for iSeries hardware: The new Integrated xSeries Server for iSeries includes an Intel 700 MHz Pentium III processor and support for up to 4 GB of memory. The faster processor and increased memory capacity provides increased performance and capacity for Windows applications. This version of the Integrated xSeries Server (Integrated Netfinity Server) is supported on the iSeries 400 models.

DB2 UDB for AS/400

DB2 UDB for AS/400 adds Java to the list of languages that stored procedures can be written in. Stored procedures are an efficient method of performing SQL processing across a network since one procedure can run multiple statements and logic to control statement flow with minimal network traffic. Stored procedures written in Java are methods in Java classes. Once a stored procedure is created and registered, and the Java classes are placed in the correct file location, they can be called from any language that can execute SQL statements. This includes running from remote systems with ODBC or DRDA. DB2 UDB for AS/400 performs the necessary setup to enable a Java virtual machine to run the methods and performs the conversion between SQL types and Java objects.

DB2 CLI, the call level interface for running SQL statements from ILE programming languages, is more compatible in V4R5 with the ODBC standard. This makes porting applications written to the popular ODBC standard much easier.

DB2 UDB for AS/400 adds support for big integers. A big integer is a binary number composed of eight bytes (64 bits) with a precision of 19 digits.

SQL procedure and SQL function language enhancements at V4R5 include: SIGNAL, RESIGNAL, and GOTO. The scalar functions that are added include:

- Allow word sounds to be compared (SOUNDEX and DIFFERENCE)
- Return random numbers (RAND)
- Perform geometric operations (RADIANS and ATAN2)
- Perform numeric rounding and truncation (ROUND, TRUNCATE, and CEILING)
- Evaluate the sign of numeric data (SIGN)
- The number of rows in a single non-distributed table is doubled to more than four billion. The number of tables in an SQL statement is increased to 256.

Asynchronous I/O Completion Port Support and APIs for OS/400 Sockets at V4R5

V4R5 includes support for Asynchronous I/O Completion Ports (Async IOCP) as part of the OS/400 sockets APIs implementation. These new socket APIs provide scalable, efficient, and powerful method for multi-threaded Internet and e-business server applications to process client data.

Internet, e-business, and other network server applications utilizing Async IOCP design models and APIs should allow a much smaller pool of threads to process work from clients when compared to other design models and APIs. In the typical threaded server application design model, there is usually one thread per client connection. Each thread, especially in applications where there is intermittent data flow being exchanged, such as an interactive application like TELNET, spends much of its time waiting for data. This means each thread expends CPU cycles going to sleep when no data is available or waking up when data finally becomes available. Applications using Async IOCP designs and APIs should allow any of the

applications threads to service any client. This means fewer threads are needed per server application, and each thread is constantly kept busy. Therefore, little or no system resource is consumed by the server application's threads either waiting for data, going to sleep, or waking up.

This means that for many Internet or e-business applications designed and written to use Async IOCP APIs, there can be a drastic and dramatic reduction in CPU utilization rates. In general, less system CPU resource, less paging resource, less system memory, and less system storage is needed by Async IOPCP-enabled applications.

iSeries 400 and AS/400e Logical Partitioning

Logical partitioning (LPAR) lets you run multiple independent OS/400 instances or partitions (each with its own processors, memory, and disks) in an N-way symmetric multiprocessing iSeries 400 8xx models and AS/400e Model 6xx, Sxx, and 7xx models. You can address multiple system requirements in a single machine to achieve server consolidation, business unit consolidation, mixed production and test environments, and integrated clusters.

Each partition's system values can be set independently. Partitions have different system names and may have a different primary or secondary national language, or they may be operated using different time zones. This flexibility is ideal for banks and other multinational companies that want to centralize operations in a single location, yet retain the national characteristics of each system. Logical partitioning is also ideal for companies that want to run mixed interactive and server workloads in a single iSeries 400 and AS/400e system. Logical partitioning allows the interactive performance of an iSeries 400 and AS/400e system to be flexibly allocated between partitions.

All V4R4 systems have a primary partition with all resources initially allocated to it. Creating and managing secondary partitions is performed from the primary partition. Movement of processors, memory, and interactive performance between partitions can be achieved with only an IPL of the affected partitions. The movement of IOP resources can be achieved without IPL.

Logical partitions operate independently. Communication between partitions is achieved with standard LAN/WAN facilities. OptiConnect software can be installed for high-performance communications between partitions without the need for additional OptiConnect hardware.

OS/400 is licensed once for the entire system by its normal processor group, regardless of the number of partitions. License management across partitions is not supported. OS/400 V4R4 must be installed on each partition. Previous releases are not supported on a logical partition.

The Web site `http://www.ibm.com/eserver/iseries/lpar/` is available for installation support and technical guidance. Early adopters of logical partitioning on the iSeries 400 and AS/400e

server should rely on this Web site for information regarding the installation and management of LPAR on the iSeries 400 and AS/400e server.

LPAR Enhancements with V4R5

LPAR allows for the simultaneous running of multiple independent servers — each with its own processors, memory, and disk — within a single symmetric multiprocessing iSeries 400 and AS/400e. This capability was first introduced in V4R4 and is enhanced with V4R5 to include:

- Multiple OS/400 versions (V4R4 and V4R5) within a partitioned environment (for 6xx, Sx0, and 7xx servers only. 8xx systems must run all partitions at V4R5).
- Updates to Software Licensed Management (SLM) APIs allowing customers and business partners to monitor usage counts across the system rather than each partition.
- An increase in the maximum number of partitions from 12 to 24 on the 8xx server models.
- Improvements in power management to minimize abnormal IPLs of secondary partitions when the primary partition initiates a system power down.

For terms and conditions regarding software license keys for LPAR systems, refer to “Software Keys and Guidance for LPAR System Upgrades” on page 540.

For additional information on logical partitioning, visit:
`http://www.ibm.com/eserver/iseries/lpar/`

Integration with Windows NT Server

Integrated xSeries Server for iSeries (Integrated Netfinity Server for AS/400) includes an Intel 333 MHz Pentium II processor and support for up to 1 GB of memory. The faster processor and larger memory size help to provide increased performance and capacity for Windows NT applications. This integration features:

- System drive for Integrated Netfinity Server for AS/400 increase

  Support for a larger system drive for the Integrated Netfinity Server for AS/400 is included in V4R4. The system drive can be increased from 2 to 8 GB.

- Client storage spaces in user auxiliary storage pools

  You can use a different auxiliary storage pool (ASP) and assign Integrated xSeries Server for iSeries (Integrated Netfinity Server) drives to it. Users gain greater control of their DASD, restricting which iSeries 400 and AS/400e server drives handle Windows NT Integrated PC Server operations.

- Internal LAN address

  You can choose a restricted IP address, which eliminates the possibility of conflicts.

- Windows NT installation from an integrated file system directory

  In addition to installing Windows NT Server from the iSeries 400 and AS/400e CD-ROM drive, you can install it from an integrated file system directory on the iSeries 400 and AS/400e system. This capability increases the robustness of the installation process on the server. The installation image of a licensed copy of Windows NT Server can be electronically transported to the target system, stored into the integrated file system directory, and the operating system that is installed on the target Integrated xSeries Server for iSeries. This eliminates sending CDs to remote branch locations and requiring non-administrators to ensure that the CD is properly inserted into the iSeries 400 and AS/400e system.

EZ-Setup simplifies your iSeries 400 and AS/400e setup by providing a browser-like GUI interface and an easy-to-follow sequence of dialogs on a PC attached to an iSeries 400 and AS/400e system using the Operations Console cable. The dialogs step you through the setup process and minimize decisions where possible. After you have completed initial setup, you continue with *The Next Step*, or launch Operations Navigator. The Next Step resides on the same CD-ROM as EZ-Setup.

EZ-Setup

EZ-Setup makes setting up your iSeries 400 and AS/400e even easier and faster. EZ-Setup code is delivered on a CD-ROM shipped with the system hardware. The code runs on a PC under Windows 95, 98, NT 4.0/2000 and requires the Operations Console cable connected to the host iSeries 400 and AS/400e server.

EZ-Setup has two components:

- EZ-Setup Wizard
- The Next Step

EZ-Setup Wizard reduces the number of decisions needed during setup and reduces the amount of installation information required by the user. The interface is all graphical. No green screens are presented to the user. Additional tasks performed with the EZ-Wizard are:

- Installs Client Access Express and components of Operations Navigator needed by EZ-Setup
- Sets the system name, date, time, and security values
- Creates security officer and system operator profiles
- Defines LAN connection for Token-Ring, Ethernet, or Integrated xSeries Server for iSeries adapter

- Starts TCP/IP and selected servers
- Creates Internet shortcuts on the desktop for: iSeries 400 Information Center, Technical Studio, iSeries Home Page, AS/400 Client Access, and AS/400e Technical Support
- Installs Netscape Navigator browser, if needed
- Configures the Operations Console to be ready to use when EZ-Setup completes
- Performs initial NetServer configuration for Client Access, includes starting TCP/IP and setting the System and Domain names for NetServer
- Gives the user the option to launch Operations Navigator by using a radio button
- Upgrade the path from twinax to Operations Console

Next Step is a set of HTML pages that the user reads and then performs the task. The topics on these pages include Exploring Operations Navigator, Setup Printing, Create User Profiles, Install Additional Software, Define System Cleanup Options, Create a System Backup, and more. Next Step is used after the EZ-Setup Wizard or Guided Setup has completed.

Continuous Availability Clustering

Prior to V4R4, the AS/400e system offered multi-system coupling that provided peer or tiered node clusters, constructed by ISVs using distributed data management and journaling. The customer separately managed the systems in the cluster. Database replication was provided by high-availability business partner solutions.

V4R4 introduces AS/400 Logical Partitioning (LPAR), which enhances the role of the AS/400e as a consolidated server (V4R5 for the iSeries 400). With LPAR, companies have both the power and flexibility to address multiple system requirements in a single machine. LPAR is of value to customers that need server consolidation, business unit consolidation, mixed production, and a test environment, as well as integrated clusters.

AS/400e clustering is taking a major step forward with the introduction of Cluster Resource Services as part of OS/400 V4R4 (APIs). The complexity of managing systems in a cluster and keeping track of data and applications is handled by OS/400 V4R4. Protecting your business from unplanned and planned outages, as well as site loss disasters, is easier than ever before. Cluster management and enhanced data resilience applications, both provided by high-availability business partners, complete the total solution.

iSeries 400 and AS/400e clusters enable you to set up an environment that provides availability approaching 100% for your critical applications and your critical data. iSeries 400 and AS/400e system high availability business partners and ISVs complete the solution with easy-to-use cluster management, robust data resiliency, and resilient applications that take advantage of the new technology.

Cluster Resource Services consists of an open set of APIs that provide cluster facilities. iSeries 400 and AS/400e application providers and customers use the APIs to enhance their application availability and to create, configure, and administer the cluster. Systems are defined into the cluster as cluster nodes. Communication interface addresses are defined to form the cluster node-to-node interconnection links. Resilient resources (objects replicated to one or more nodes) are associated with a Cluster Resource Group (CRG) so they can be managed as a single unit.

Two types of CRGs are supported: one for data resilience and one for application resilience. Data CRGs provide the control to switch the point of access for a set of data to a backup node that maintains an exact replica of that data. Application CRGs control switching an IP address representing the application server to a backup node and restart the application in the event of a primary node failure.

Cluster Resource Services includes integrated facilities such as heartbeat monitoring, reliable message delivery, switch-over administration, and distributed activities. The services are built on a robust cluster topology and messaging functions that keep track of each node in the cluster and ensure that all nodes have consistent information about the state of cluster resources. Heartbeat monitoring ensures that each node is active. When the heartbeat for a node fails, the condition is reported so that the cluster can automatically failover to the resilient resources on the backup node. System Services for high availability solutions are enhanced with real-time recording of IFS stream file changes into journals. Data resiliency applications can use this function to provide enhanced support for this class of objects.

IBM has worked closely with the high availability business partners to provide easy-to-use cluster management applications. DataMirror, Lakeview Technology, and Vision Solutions intend to announce their own initiatives for products that take advantage of the cluster resource services and integrated file system stream file support.

iSeries 400 and AS/400e clusters support up to 128 nodes, using any combination of the existing OptiConnect WAN and LAN connectivity options to build the cluster:

- OptiConnect hardware, fully supported as an orderable system feature, is an attractive connectivity method for high-end and mid-range models.
- ATM provides a high-performance connection to remote systems in the cluster.
- Ethernet and Token-Ring LANs are ideal for connecting low-end iSeries 400 and AS/400e models into the cluster.

All systems are managed from a single workstation containing the high-availability business partner cluster management application.

OS/400 V4R4 must be installed on each node in the cluster.

IBM HTTP Server for AS/400

The IBM HTTP Server for AS/400 offers the following features:

- SNMP Subagent support is being added to allow Web server statistics to be placed in a Management Information Base (MIB) and forwarded to an SNMP network manager, such as Tivoli TME 10, on request.
- Log reporting provides the ability to define access reports, generate reports, view reports and maintain report files using a graphical interface based on report templates.
- The new standard extended log file format is supported. This extended format allows more data to be saved in the access log files and allows more control over which data is stored in these files. Numerous analysis tools are available that use this new log format.
- Web server error logs contains messages presented in the customer's language of choice.
- Serviceability of the Web server is improved with additional trace points, additional information in service traces, and improved first-failure-data-capture (FFDC) information.
- HTML files are dynamically cached in memory when a URL request for that file is processed. Subsequent requests for that file are handled without the need to perform file I/O.
- Multi-threaded CGI programs are supported. Multi-thread programs can often be more efficient than single threaded programs.
- New APIs to the HTTP server are provided that allow third-party management tools to query the value of certain configuration directives, as well as use the Web server's mapping rules for a URL.
- The following additional HTTP methods are supported:
  - **PUT:** Allows a resource identified in a URL to be stored on the iSeries 400 and AS/400e system
  - **DELETE:** Allows a resource identified by a URL to be deleted from iSeries 400 and AS/400e system
  - **User Defined methods:** Additional methods with user-defined behavior may be implemented
- The HTTP server uses LDAP to store configuration information and user authentication information.
- A new Domino plug-in is provided that allows the HTTP server to access documents stored in Notes.

- Platform for Internet Content Selection (PICS) support is added to the integrated IBM HTTP server. The PICS specification enables labels (metadata) to be associated with Internet content. It was originally designed to help parents and teachers control what children access on the Internet, but it also facilitates other uses for labels, including code signing and privacy. The PICS platform is one on which many rating services and filtering software have been built.
- Web Server Search engine is integrated in the AS/400 HTTP Server. This search engine is NLS enabled and includes DBCS languages. It is very easy to use and separate from NetQuestion.

HTTP Server Enhancements in V4R5

Enhancements to HTTP Server for AS/400 in V4R5 include:

- The ability to index and search specific fields in title and meta tags in a group of documents.
- A command to search administrative functions from a batch job
- APIs for working with configuration, Web server instances, and groups
- A vehicle to test how your Web server processes URLs
- Configuration directive to control upper/lower case behavior during request processing

Apache HTTP Server

IBM HTTP Server for AS/400 incorporates Apache 2.0. This version includes an update comprised of several new enhancements, including the Apache Portable Run-Time and the multiprocessing modules.

In addition, the following enhancements are added to the IBM iSeries 400 and AS/400e version of the Apache HTTP Server:

- Full-function, task-oriented, Web-based user interface
- Authentication using LDAP, iSeries 400 and AS/400e user profiles and validation lists
- Full native SSL support, including client authentication and association between client certificates and validation lists or iSeries 400 and AS/400e user profiles
- Logging rollover and archiving
- Logging in DDS format 1
- NLS enablement
- Static and dynamic local file caching
- Denial of Service detection and prevention
- SNMP subagent
- CGI support for RPG, COBOL, REXX, CL, and Java languages
- Persistent CGI support
- Support for CGIs running in named activation groups
- Configuration, instance, and groupfile APIs
- Global server and instance parameters

- Webserver search engine support
- Support for all iSeries 400 and AS/400e file system types
- Support for configuration files stored in LDAP
- CGI codepage conversion modes
- Support for TRCTCPAPP
- Additional serviceability and tracing

Support for Apache is added so that server instances built using the original AS/400 HTTP server can co-exist with Apache-based server instances.

Refer to the following Web site for information on which PTFs are needed to run the Apache HTTP server in co-existence with the AS/400 HTTP server:
`http://www.ibm.com/eserver/iseries`

Digital Certificate Manager with SSL

The Digital Certificate Manager with SSL offers these features:

- Support for X.509 certificates can be used by the Web Server, Secure Sockets Layer, IPSec, AS/400 Client Access, and other applications. The user interface is easier to use.
- Global Server Certificate support is added to the certificate services available on the iSeries 400 and AS/400e system. The Web Server and other applications use certificates for network and Web-based security.
- The following services support SSL:
  - HTTP Server
  - LDAP Server
  - Telnet Server
  - Management Central
  - DDM and DRDA
  - Client Access Servers
  - Operations Navigator

  With SSL support, these services can establish secure communication sessions with their corresponding clients. Data exchanged between the clients and servers are encrypted, and, therefore, not subject to eavesdropping.

Lotus Domino Currency, Extensions, and Applications

V4R4 supports the enhanced functions of Lotus Domino 5.0, which include:

- Enhanced scalability
- Web clustering
- Easier administration
- CORBA/IIOP support

- Native SMTP support
- Improved Web application development support
- Enhancements to the directory support, including LDAP V3 support and a lightweight directory
- Built-in, real-time access to relational databases with no programming required by the Domino Enterprise Connection Services (DECS)

Domino for AS/400 supports up to thirty partitioned servers on a single iSeries 400 and AS/400e system.

Lotus NotesPump is renamed to Lotus Enterprise Integrator. This version supports connectors to ERP applications from companies such as J.D. Edwards and SAP. Lotus Domino.Doc (2.0) is available through Lotus Resellers.

OV/400 Migration to Domino for AS/400 allows migration of users, groups, mail, calendars, and folders to Domino from OV/400. The Lotus Calendar Connector for OfficeVision (LCCOV) allows free-time search and the distribution of meeting notices between Domino and OfficeVision/400.

Applications can use the integrated file system to create stream files that are much larger than the current limitation. OS/400 V4R4 supports 64-bit integers and 64-bit APIs to work with the file system. Stream files in the root, QOpenSys, and user-defined file systems support files up to approximately 250 GB, over 100 times the size supported in V4R2.

Note: All Lotus products are available through Lotus Resellers. Lotus Domino Enterprise Server for AS/400 and Lotus Enterprise Integrator are also available as licensed programs from IBM.

IBM WebSphere for AS/400 (5769-AS1)

Version 1.1 of the Java-based environment for development and deployment of dynamic, e-business Web sites, known as WebSphere, is a feature of OS/400 with V4R4.

WebSphere Application Server for AS/400, previously included with IBM HTTP Server for AS/400, is the IBM premiere Web application server. It provides a framework for consistent, architected linkage between the HTTP requests and the business data and logic. IBM WebSphere Application Server is intended for organizations that want to take advantage of the productivity, performance advantage, and portability that Java provides for dynamic Web sites. It includes:

- Java runtime support for server-side Java servlets.
- Industry-standard object-request brokers to handle requests for data and other services for client/server applications.

- High-performance connectors to many common back-end database to reduce the coding effort required to link dynamic Web pages to real line-of-business data.
- Application services for session and state management.
- The IBM WebSphere Performance Pack is a set of services that runs on one server and provides load balancing services for multiple other servers. It also consists of caching services and Web site replication services. The load balancing services do not run on an iSeries 400 and AS/400e server, but some of the advanced caching and Web site replication services do run on an iSeries 400 and AS/400e server.
- The IBM WebSphere Studio, a set of PC-based tools that are designed to help developers create WebSphere applications. The tools currently in the WebSphere Studio are:
  - **Web Development Workbench**: A Web site project organizer and launch platform.
  - **Servlet generation wizard:** For building Java servlets to access JDBC databases and JavaBean components.
  - **VisualAge for Java, Professional Edition V2.0:** The IBM award-winning Java application development environment for building Java applications, applets, servlets, and JavaBean components.
  - **NetObjects Fusion:** Allows Web site developers to design and produce an entire Web site, including individual pages and all links. It features automated site building, automatic link management, remote database access, and design and publishing capabilities.
  - **NetObjects BeanBuilder**: The visual authoring tool for combining JavaBeans and Java applets, BeanBuilder allows individuals overseeing the content of online business processes to create more compelling, highly interactive Web sites with revolutionary ease-of-use.
  - **NetObjects ScriptBuilder:** Combines a text-based script editor and development tools for creating and editing HTML, script, and JavaServer Pages.
- The IBM WebSphere Site Analysis, provides Web site administration and analysis tools that can be used to administer and monitor the usage of a Web site. The tools included in this package are:
  - An administration site visualizer
  - A report generator
  - A report builder
  - A section and template builder
  - A content analyzer that scans a Web site and identifies duplicates and orphans, unavailable resources, content with excessive load sizes, and so on.

- A usage analyzer that looks for hits, requests, visits, paths, referral, agents, and so on from the log records. This analysis can be scheduled, and the results can be placed in a database for further analysis.

Java for AS/400

A Java SSL package is included with OS/400 to leverage the integrated SSL function built into the iSeries 400 and AS/400e system. You can easily build more secure client/server applications using Java. All data exchanged between the client and the server can be encrypted using the SSL protocol.

V4R4 includes support for SQLJ, which is SQL, embedded in the Java programming language. Supported SQL statements include queries (SELECT), data-manipulation statements (INSERT, UPDATE, DELETE), and others that operate on data stored in tables in relational databases.

You can run multiple versions of Java Developer Kit (JDK) on a single iSeries 400 and AS/400e system. Java Developer Kit performance improvements are available through the PTFs issued on 29 October 1999. Java 2 can co-reside on the system with Java 1.1.6 and 1.1.7 if so desired.

Note: For additional JDK support information, including service requirements, refer to the online publication *AS/400 Developer Kit for Java*, which is available through the following iSeries Information Center at: `http://publib.boulder.ibm.com/html/as400/infocenter.htm`

Net.Data Currency

With the enhancements provided in V4R4, Net.Data continues to be one of the easiest and most flexible way of building dynamic applications for the Web. These enhancements include:

- Net.Data supports the new DB2 for AS/400 data types introduced in this release (LOB and DATALINK).
- You can call SQL stored procedures and handle multiple result sets returned by those procedures.
- Direct program calls to iSeries 400 and AS/400e ILE programs use input and output parameters.
- You can access Java applications or generate Java applets from Net.Data.
- Macros are parsed only once and the results are saved for subsequent requests for that macro.
- New trace and logging support makes it easy to find errors in your macro.
- New built-in functions make it a snap to use Net.Data to send e-mail, generate browser cookies, and manipulate Net.Data tables.

Threadsafe Functions and Facilities

Multi-threaded programming support continues to be enhanced in V4R4. The database definition language (DDL) APIs, CL commands, and SQL DDL are threadsafe. With this support, you can create or delete tables and add or remove members in a multi-threaded program. DDM files using TCP/IP are also threadsafe. User-defined functions (UDF), a new database function for V4R4, use threads as part of their implementation.

The QSYS.LIB, QOPT, and QLANSRV file systems are threadsafe. All objects that reside in those file systems can be accessed from within a multi-threaded application. ILE COBOL runtime is threadsafe.

DB2 Universal Database for AS/400

With the introduction of V4R4, DB2 for AS/400 is renamed DB2 Universal Database for AS/400. Performance and functional enhancements to DB2 Universal Database for AS/400 improve the processing of business intelligence queries. Here are some of these improvements:

- The hash group by algorithm improves the performance of grouping queries for a large number of groups.
- The performance of grouping MIN and MAX functions is improved with a suitable index, if available, to determine the minimum or maximum value of a query.
- The hash join algorithm is enhanced to implement some types of subqueries resulting in improved performance.
- Derived tables and common table expression support allow complex business intelligence queries to be written without the use of views.
- Support for expressions in the GROUP BY and ORDER BY is also added.
- The QAQQINI file support allows the system administrator to set query specific options (query time limit and query degree) in a source file similar to QAQQINI file support used by PC applications. This aids in setting query options for client/server-based applications.

The following enhancements to DB2 Universal Database for AS/400 were added on 29 October 1999, by installing the 1999 Database Enhance Pak or Group PTF SF99104.

- **Large Object Support**

  With the addition of large objects (LOBs), DB2 Universal Database for AS/400 can store and manipulate data fields much larger than the current limits. An iSeries 400 and AS/400e record with LOB fields can hold up to 15 MB of data. With the new LOB support, you can look to DB2 Universal Database for AS/400 as a platform for building applications that hold new data such as very large text, image, and audio data.

- **Datalink Data Type**

  The DATALINK data type extends the types of data that can be stored in database files. The actual data stored in the column is only a pointer to the object such as an image file, a voice recording, or a text file. The method used for resolving to the object is to store a Uniform Resource Locator (URL). This means that a row in a table can be used to contain information about the object in traditional data types, and the object itself can be referenced using the DATALINK data type.

  Datalinks also allow the referenced object to be “linked” to the database in such a way as to prevent modification or deletion of the object while it is linked to the database file. This relationship is maintained by having the database interact with the file system that contains the object.

- **User-Defined Types**

  User-defined types are derived from existing predefined types such as integer and character. You can create your own types for strong typing and creating functions for different types. You can call a function for each row of a result set and return a value based on the user-defined type.

- **User-Defined Functions**

  SQL lets you define your own functions to use within SQL itself. This saves you time in reusing common building blocks that you develop yourself. User-defined functions are necessary building blocks to support the database extenders (extensions to support rich text and multimedia search and manipulation) currently supported on UDB.

Scalable TCP/IP

Extended scalability and security capabilities are added to three AS/400e Internet and intranet servers in V4R4.

AS/400 FTP is enhanced with the following features:

- Support for popular graphical FTP clients and Web server development tools. This enhancement includes support for UNIX format file listings from the AS/400 FTP server.
- Ability to use directories other than database libraries as the initial working directory for the AS/400 FTP server.
- Options to create new database files using the system or user default CCSID.
- Ability to transfer files larger than 2 GB in all file systems that support these file sizes.
- Ability to transfer database files containing null field data.

AS/400 SMTP is enhanced with the following features:

- Increased simultaneous connection support. AS/400 SMTP is no longer restricted to a maximum of 16 inbound and 16 outbound simultaneous mail connections. You can tune SMTP depending on the mail load on your system, therefore enabling greater scalability.
- Enhanced domain name system resolver support. The AS/400 SMTP client processes all mail exchanger (MX) records returned by a domain name server query. This means that there is less undeliverable mail when sending to large Internet Service Providers.
- New option to enable journaling for mail delivery status tracking and mail statistics.
- New option to require all mail received by AS/400 SMTP to be processed by the AS/400 Mail Services Framework (MSF) to improve security.
- Enhancements for the automated retry of mail when dial-up connections are established and finer granularity of mail delivery retry timing.

AS/400 TELNET enhancements allow TELNET to support secure TELNET sessions using SSL.

Improved serviceability characteristics for TELNET, SMTP, and FTP reduce the impact to your business when service is required.

TCP/IP Protocol Stack

In V4R4, performance of the TCP/IP protocol stack on the AS/400 system continues to be improved. The result is significant improvements in capacity for TCP/IP users.

In addition, the AS/400 TCP/IP protocol stack contains two additional performance-related TCP/IP Request for Comments (RFCs):

- RFC 1191: Path MTU Discovery
- RFC 1323: TCP Extensions for High Performance.

The implementation of these RFCs improves TCP/IP performance in many environments.

Chargeable Features of OS/400

IBM Print Services Facility for AS/400 (PSF/400) (#2691)

Print Services Facility for AS/400 (PSF/400), a feature of OS/400, provides support for high-function Advanced Function Presentation (AFP), electronic printing and Intelligent Printer Data Stream (IPDS) print management. With AFP, application output can be transformed into fully graphical documents when electronic forms, image, graphics, barcoding, lines, boxes, and text in a wide variety of fonts. This flexibility enables the production of electronic documents that are more effective and enable the re-engineering of business processes. Documents can be produced using a variety of enabling tools, including

printer file keywords (for example: front and back overlays, N-Up, and duplex), DDS output keywords, page and form definitions, the applications within AFP PrintSuite (for example: Advanced Print Utility, AFP Toolbox), and a variety of third-party products. Output created by network clients, as well as Postscript and image files, can also be handled by PSF/400 and sent to IPDS printers.

PSF/400 is the OS/400 subsystem driving the interactive management of IPDS printers. IPDS is a bi-directional print architecture that ensures that the printing process can be managed every step of the way. When an iSeries 400 or AS/400e writer is started to an IPDS printer, PSF/400 provides the following services:

- Establish communication and query printer capabilities and status
- Manage overlay, image, and font resources required in the printer
- Transform the iSeries 400 and AS/400e spooled file (from AFP, IPDS, or SCS) into a printer-specific IPDS data stream.
- Manage the print process, including handling error conditions and managing error recovery down to the page level

The net effect of this level of print management is to ensure each page of each spooled file is printed completely and accurately. PSF/400 enables all parameters of the printer file and all DDS print keywords (subject to printer limitations).

To create an Intelligent Printer Data Stream (IPDS) printer on the iSeries 400 and AS/400e system, you must (after specifying the device type as IPDS) specify AFP(*YES) in the printer device description. Any printer defined as Type (*IPDS) and AFP (*YES) needs the Print Services Facility (PSF) of OS/400. Twinax connected IPDS printers may be defined as AFP (*NO) and therefore would not require PSF. Regardless of connection type, AFP (*NO) means that there are no AFP resource management for fonts, images, or overlays.

The PSF feature of OS/400 that is required is based on the speed of the fastest printer measured in Impressions per Minute (IPM).

IPDS printing takes on added significance across the network. TCP/IP print support is much more limited than traditional iSeries 400 and AS/400e print management. SNDNETSPLF (LPR in TCP/IP terminology) simply sends a spooled file with limited instructions and no feedback as to whether it was received and printed correctly. Applying IPDS to a TCP/IP network restores the same level of print support (as described above) as twinax-connected printers. This includes sending standard SCS spooled files across the network.

Enhancements to PSF/400 for V4R4 include:

- New keywords have been added to DDS support that allow you to:
  - Switch between simplex and duplex printing within a spooled file
  - Force printing on a new sheet of paper anywhere in a spooled file

  - Print constant text at any position on a page
  - Direct pages of a spooled file to a specific output bin
  - Include tabbed insert pages from a finisher anywhere in the spooled file
  - Specify z-fold options for any page within a spooled file
  - Include an overlay and specify the orientation (rotation) at which the overlay should be printed
- The Printer File has been enhanced with new parameters that allow you to:
  - Print overlays on the back side of pages without any variable data
  - Specify that output should be corner-stapled, edge-stitched, or saddle-stitched
- User control of iSeries 400 and AS/400e font mapping table enables greater control and flexibility with print applications
- New finishing options enable inline document finishing, including stapling, stitching, inserting, and z-folding operations
- Support for all new IBM iSeries 400 and AS/400e printers (Infoprint 60 with Finisher, 6400 Series, Infoprint 3000, Infoprint 32)

DB2 Multisystem for AS/400 (#2699)

Allows multiple iSeries 400 and AS/400e servers to be connected so the processing power and storage capacity of all the systems can be used. From a database perspective, these interconnected iSeries 400 and AS/400e servers appears as a single large system. It is intended for use when iSeries 400 and AS/400e servers are being used for large data warehouse installations.

DB2 Symmetric Multiprocessing for AS/400 (#2698)

This enables a single database operation to run on multiple processors at the same time. Typically, this would be used for queries run through Query, DB2 Query Manager, or a PC-based query or report writing tool. Both SQL and native database interfaces are supported. The SMP function takes advantage of the N-way processor capability of the iSeries 400 and AS/400e system, which supports up to 12 N-way processors on the high-end models. The query sees performance improvements by being run in parallel across these multiple processors.

Portable Application Solutions Environment (PASE) (#2648)

The AS/400 Portable Application Solutions Environment (AS/400 PASE) complements and expands iSeries 400 and AS/400e solution portfolio by focusing on rapidly porting UNIX applications to the iSeries 400 and AS/400e platform AS/400 PASE is an integrated runtime that provides simplified porting of selected solution provider UNIX applications. PASE is an integrated component of OS/400.

AS/400 PASE is a separately priced feature in V4R4. It provides a subset of AIX V4.3.3 functionality to support running 32-bit UNIX applications directly on iSeries 400 and AS/400e hardware. AS/400 PASE applications are created on an AIX workstation and executed on AS/400 e-series hardware (September 1997 and systems that follow). The V4R4 environment provides libraries containing more than 900 basic system APIs that are compatible with current AIX 4.2.1 releases that provide 32-bit support. Future releases will continue to add more APIs that are compatible with current AIX releases.

AS/400 PASE exploits the iSeries 400 and AS/400e processor's capability to switch between OS/400 and AIX runtime modes within an OS/400 job. This allows applications deployed using AS/400 PASE to run directly on iSeries 400 and AS/400e hardware and take full advantage of OS/400 services such as file systems, security, and DB2 Universal Database for AS/400.

AS/400 PASE is not an operating system and does not provide support for developing UNIX applications. Any changes or additions required to port UNIX applications to AS/400 PASE are compiled and linked on an RS/6000 workstation running a level of AIX supported by AS/400 PASE.

Applications deployed using AS/400 PASE run in a normal OS/400 job and are managed using standard OS/400 operations. Serviceability, backup and restore, and other administrative tasks are performed using standard OS/400 operations and system management facilities.

DB2 UDB for AS/400 and PASE

DB2 UDB for AS/400 is the database available on the iSeries 400 and AS/400e servers. All applications using databases in ILE or AS/400 PASE are ported to DB2 UDB AS/400. AS/400 PASE contains the same Call Level Interface (CLI) set of APIs for DB2 UDB AS/400 that is supported for ILE. Data returned from DB2 UDB AS/400 can be presented in ASCII format, which is expected by the majority of UNIX applications. Embedded SQL is not currently available for AS/400 PASE, because PASE executable code is built on AIX.

AS/400 PASE applications can be fully integrated with other iSeries 400 and AS/400e applications, for example, an ERP application implemented in ILE, a WebSphere application written in Java, or Lotus Domino. A suite of applications can run together in a job mix or be separated into their own logical partitions, depending on the performance and scheduling requirements of the customer.

In V4R4, AS/400 PASE provides a broad subset of AIX 4.2.1 functionality, such as standard C and C++ runtime (both thread safe and non-thread safe), non-thread safe Fortran runtime, pthreads threading package, iconv services for data conversion, bsd equivalent support, XWindows client support, and a database access library.

Note: In V4R5, PASE installs as Private Address Space Environment (option 33) and displays as that when displaying licensed programs or software resources.

#2619 Media and Storage Extensions

This prerequisite feature for using the Backup Recovery and Media Services/400 (BRMS/400) (5769-BR1). It is also required for developing Hierarchical Storage Management (HSM) dynamic retrieval functions. APIs provide for using or building applications to manage tape usage and the recall of data from offline media to DASD.

For software developers who want to customize their own storage management applications, Media and Storage Extensions provides an API that enables application monitoring and control of media usage, including volumes to be selected and volume expiration dates. The API also enables fast search for IBM 3480, 3490, 3490E, and 3575 tape drives.

An API is also provided to handle the interruption that occurs when an application tries to open a database file that has been migrated to off-line media. The API enables on-demand recall of a database file from offline media to DASD and resumption of the application without requiring changes to the application.

#2646 Enhanced NetWare Integration

OS/400 Enhanced Integration for Novell NetWare provides NetWare client and integration services for iSeries 400 and AS/400e users, operators, and applications. This is achieved using a Network Loadable Module (NLM) that runs on either NetWare 3.12 or 4.1x servers. It supports the NetWare servers whether there is an IPCS installed on the system or not. A license is required for each NetWare server. IPX support in OS/400 is used to connect the system using a LAN adapter or a communications adapter using X.25 or frame relay services.

It provides user profile and password integration from the iSeries 400 and AS/400e to NetWare. The user or group profiles can be propagated to multiple NetWare Directory Services (NDS) trees or NetWare 3.12 servers. When iSeries 400 and AS/400e users change their passwords, the change is propagated to NetWare. Other facilities include iSeries 400 and AS/400e to NetWare printing support so that iSeries 400 and AS/400e user output is sent from the iSeries 400 and AS/400e output queue to a printer queue managed by the NetWare server. OS/400 host print transform services are used to translate the output to print on common PC printers.

Integrated file system support is provided allowing iSeries 400 and AS/400e users and applications to access files and directories in multiple NDS trees or NetWare 3.12 servers throughout the network. Therefore, a Client Access user can access files on a NetWare server throughout the iSeries 400 and AS/400e network. Full integration with NetWare security ensures that each iSeries 400 and AS/400e user of these services is fully authenticated in NetWare Directory Services or the NetWare 3.12 binders.

There is also a set of server configuration and management tasks operated from iSeries 400 and AS/400e interfaces. Although this is not intended to be full management and operations of a NetWare server, system operators can manage user connections and disk resources. Facilities are provided for creating, extending, and mounting/dismounting volumes on NetWare servers.

#2642 OptiConnect for AS/400

Provides high-speed transparent access to data through fiber optic bus connections and performance enhancements to AS/400 Distributed Data Management (DDM). This allows customers who are reaching the capacity limits of a large iSeries 400 and AS/400e servers to offload database application CPU cycles to other iSeries 400 and AS/400e servers within a local environment. DB2 Multisystem for AS/400 environments can be connected on a shared bus with OptiConnect for AS/400 to increase the efficiency of parallel database operations. Two-phase commitment control allowing distributing units of work is supported on OptiConnect for AS/400 networks. Because OptiConnect for AS/400 operates only among systems sharing the same bus (connected with fiber optic cables), it can achieve transport efficiencies not possible with more general purpose wide-area communication protocols.

Programs within OS/400

The following programs are part of OS/400 and all ship with OS/400. They do not need to be ordered separately. However, they each appear within the AS/400 Software Resources and Licensed Program menus as separate products:

- 5769-JC1 Java Toolbox for AS/400 (#2585)
- 5769-JV1 AS/400 Developer Kit for Java (#2586)
- 5769-PM1 Performance Management/400 (#2556)
- 5769-SA3 Integration for Novell NetWare (#2645)
- 5769-TC1 IBM TCP/IP Connectivity Utility (#2529)

The feature quoted is the code that must appear on the 5755-AS5 software programs order for these programs to be shipped.

AS/400 Toolbox for Java, 5769-SS1, 5769-JC1

The AS/400 Toolbox for Java is a set of Java classes that is delivered as a Java package. The classes can be used by Java applets and applications to easily access iSeries 400 and AS/400e data and resources and require no additional support over the inherent OS/400 support of Java Virtual Machine and the AS/400 Developer Kit for Java.

The Toolbox for Java provides support for similar functions to that provided by Client Access APIs. It uses the OS/400 host servers (part of OS/400) to access the iSeries 400 and AS/400e data and resources. Each of these servers run in a separate job on the iSeries 400

and AS/400e system, communicating with a Java client program using architected data streams on a socket connection. The socket interfaces are hidden from the Java programmer by the Toolbox classes. JavaBeans are provided for most public interfaces. They provide access to these iSeries 400 and AS/400e resources:

- Database using JDBC driver.
- Database using Record-Level file access using the interface of the classes.
- Integrated file system.
- Programs: Any iSeries 400 and AS/400e program can be called, parameters are passed to the iSeries 400 and AS/400e program, and data is returned to the Java program.
- Commands: Any iSeries 400 and AS/400e batch command that is not interactive can be run.
- Data Queues: Access to both keyed and sequential data queues.
- Print: Using the print classes lists of spooled files, output queues printers, and other print resources can be retrieved.
- User spaces: Create, read from, write to, and delete iSeries 400 and AS/400e user spaces.
- Digital Certificates: Manage digital certificates stored on the system.
- Jobs: List active jobs on the iSeries 400 and AS/400e and retrieve information about those jobs, including the messages in the job log of a job.
- Message Queues: List, delete, and answer messages in a message queue. The ability to send messages is also provided.
- Users: List users on the iSeries 400 and AS/400e server and retrieve information about those users.

Additional classes provide the infrastructure needed to manage signon information, create and maintain sockets connections to the iSeries 400 and AS/400e services, and send and receive data. Data description classes for numeric and character data are provided to allow the Java program to describe the record format of a buffer of data with an object.

The Toolbox provides a set of Graphical Access classes. These classes use the access classes described previously to retrieve data, and then present the data to the user. The classes use Java's Swing 1.0 (JFC 1.1) framework. Graphical APIs are available to access various iSeries 400 and AS/400e resources, such as the database, integrated file system, command call, and data queues. The iSeries 400 and AS/400e data is then displayed in various pane formats.

Toolbox for Java V4R5 Enhancements

In V4R5, AS/400 Toolbox for Java is enhanced to give you:

- Easy access to additional iSeries 400 and AS/400e resources, to work better in a three-tier environment, and to make it easier to write servlets and write GUI applications with improvements to the GUI builder tool.
- Additional Java APIs for accessing iSeries 400 and AS/400e resources. APIs are added to call iSeries 400 and AS/400e service programs, call iSeries 400 and AS/400e Java programs, interact with the iSeries 400 and AS/400e FTP server, and work with profile tokens.
- Ability to run many Toolbox classes with a proxy server running on a middle tier. In V4R5, the Toolbox separates interface classes from implementation classes. These two parts can be run in the same JVM (traditional two-tier model) or can be run on different machines (three-tier model). By running in a three-tier model, the Toolbox package on the end tier is smaller. In an applet environment, this makes the download faster, and a thinner client can be used on the end tier. Since much of the processing is done on the middle tier, the Toolbox uses less resources on the end tier.
- Servlet/HTTP components that were added to the Toolbox to help developers write applications for a Web environment. As in the other Toolbox components, these are not complete applications but are building blocks for application developers. Two sets of components are provided. HTML classes provide a set of generic HTML components. Servlet classes provide components that use the Toolbox access classes to retrieve data, and then convert the results to an HTML table or form.
- Enhanced GUI Builder tool of the Graphical Toolbox with an improved, easier to use interface and additional editing capabilities. Some of the highlights of the new V4R5 enhancements include support to generate Java source for event handlers and the capability for editing panes in other resources. Runtime and tools support are enhanced to include context menus, menu bars, and toolbars. Panels are resizable, so when the end user resizes a panel, the controls on that panel can also resize to show more data. Support for handicapped accessibility, including user-settable fonts and colors, and fully-functional keyboard navigation has been added.
- Support for Toolbox to run on a Linux workstation, run in Java 2, and implement GUI components using Swing 1.1. The Toolbox connects to AS/400 systems running OS/400 V4R2 or later (V4R5 for iSeries 400).

AS/400 Toolbox for Java V4R4 Enhancements

Enhancements delivered with V4R4 include:

- **Access to additional AS/400 resources**, which include:
  - The JDBC Driver shipped with the Toolbox supports the JDBC 2.0 specification.

  - The Toolbox contains a spooled file viewer class. This GUI class shows print output.
  - A new integrated file system class extends Java's java.io.file class. This class can be used in applications that currently use java.io.file so the application acts on files in the integrated file system of the iSeries 400 and AS/400e system.
  - Improved access to information about users and jobs running on the iSeries 400 and AS/400e system.
  - Access to iSeries 400 and AS/400e message files.
  - Access to system data areas.
  - Access to system values (both low level and GUI classes).
  - Access to iSeries 400 and AS/400e authority on an object (both low level and GUI classes).
  - Improved access to information about jobs running on the iSeries 400 and AS/400e system.
  - Improved access to information on users on the iSeries 400 and AS/400e system.
  - Access to system status.

- **Improved security**

  The Toolbox supports the Secure Sockets Layer (SSL) specification. Data flowing between the workstation and an AS/400e system running OS/400 V4R4 (or iSeries 400 with V4R5) can run across an SSL connection providing data encryption and server authentication.

- **Performance improvements**

  A new tool reduces the size of the jt400.jar file by removing classes from the jt400.jar file that are not used by an application. The result is a smaller jt400.jar file, which improves download performance.

- **Improved application development**
  - The Toolbox includes a user interface framework to provide a productive development environment for building graphical panels. The framework automatically handles the exchange of data. The developer only needs to create one or more data beans and bind them to the panel components using tags defined by the Panel Definition Markup Language (PDML).
  - A user interface framework is provided to create a platform and technology independent representation of graphical panels based on the Extensible Markup Language (XML). A pure Java framework for interpreting the XML and constructing user interface panels based on the Java Foundation Classes (JFC) is also provided.
  - A resource script converter is provided that converts Windows dialogs to equivalent Java panels defined in XML.

- A graphical user interface builder tool is provided to develop Java GUIs. This is a WYSIWYG GUI editor tool.
- A program called “framework” is provided as a program call markup language (PCML), a tag language used for supporting the program call function of the Toolbox. The language fully describes all parameters, structures, and field relationships that are necessary to call an iSeries 400 and AS/400e program.

Note: When a Java program using the Toolbox is running on a workstation, the Toolbox can connect to V4R4, V4R3, and V4R2 versions of OS/400. OS/400 V4R4 is required when a Java program using the Toolbox is running on the iSeries 400 or AS/400e server. The Toolbox requires JVM 1.1.6 or later, and Swing 1.0.3 or later.

AS/400 Developer Kit for Java, 5769-SS1, 5769-JV1

The AS/400 Developer Kit for Java is optimized for use in an iSeries 400 and AS/400e server environment. It uses the compatibility of Java programming and user interfaces, so you can develop your own applications for iSeries 400 and AS/400e server. The AS/400 Developer Kit for Java allows you to create and run Java programs on the system. The AS/400 Developer Kit for Java is a compatible implementation of the Sun Microsystems, Inc. Java Technology. Unique aspects of the AS/400 Developer Kit for Java design include:

- The integration of critical Java Virtual Machine components below the Technology Independent Machine Interface (TIMI)
- A Java transformer for the conversion of Java bytecodes to RISC machine instructions
- Advanced, scalable implementations of garbage collection, object allocation, and synchronization
- The Remote Abstract Window Toolkit implementation that supports the java.awt APIs

The AS/400 Developer Kit for Java is not an integrated language environment (ILE) language. It introduces a new language environment on iSeries 400 and AS/400e that is built on Java, American National Standard Code for Information Interchange (ASCII), integrated file system, and other industry standards.

The AS/400 Developer Kit for Java supports the common JDK tools, such as javac, javadoc, and jar. There are also CL commands and Operations Navigator interfaces to the AS/400 Developer Kit for Java.

Beginning with V4R3, JDK 1.1.6 was supported. Support for JDK 1.1.7 was added with V4R4 in February 1999.

AS/400 Developer Kit for Java V4R5 Enhancements

Options for Java 1.1.8 and Java2 Standard Edition (J2SE) 1.2.2 are shipped with the AS/400 Developer Kit for Java. Options for Java 1.1.6 and 1.1.7 can be enabled on V4R5 by installing

the Developer Kit over the V4R4 version. The concurrent JDK support enables different versions of Java to be used for application development and deployment on the iSeries 400 and AS/400e server. This support should also permit future installation of additional JDK versions as they become available. Option 5 includes support for J2SE 1.3 and is added to OS/400 V4R5 and V4R4. You gain concurrent support for all three major versions of Java (1.1, 1.2, and 1.3) on these releases.

This updated version of AS/400 Developer Kit for Java includes additional performance improvements, including an upgrade to the IBM 3.6 Just in Time (JIT) compiler.

JTOpen 2.0 (AS/400 Toolbox for JAVA) is now available and can be found at:
`http://www.iseries.ibm.com/toolbox`

New and enhanced support allows you to build Java applications for the AS/400 or iSeries 400 servers. Enhanced function includes:

- JDBC Standard Extension support
- Bidirectional CCSID support
- Environment variable wrappers
- Additional SSL encryption and key support
- Graphical enhancements to the GUI builder, wizards, and help utilities

New function includes improved classes for handling lists of iSeries 400 and AS/400e objects (users, jobs) including list buffering, data faulting, and lazy data conversions

Performance improvements include:

- Command and program call optimizations
- Text conversion improvements
- Connection pooling
- Improved list handling of files in the integrated file system

JTOpen 2.0 (Toolbox) connects to AS/400e systems running OS/400 V4R3, or later, and iSeries 400 server running OS/400 V4R5.

For additional Java support information, including service requirements, refer to the online publication *AS/400 Developer Kit for Java* at:
`http://publib.boulder.ibm.com/pubs/html/as400/infocenter.htm`

IBM VisualAge for Java

Enterprise Toolkit for AS/400 (ET/400)

IBM VisualAge for Java is a client product, separately priced from OS/400. It is a powerful, rapid application development tool for building Java-compatible applications, applets, and

JavaBean components supporting IBM's Visual Construction from parts. Delta changes are compiled automatically and incrementally using VisualAge for Java.

VisualAge for Java comes in two packages: the Professional Edition and the Enterprise Edition. ET/400 is part of the Enterprise Edition Version 2.0 of VisualAge for Java only. ET/400, formerly known as AS/400 feature in Version 1.0.1 of VisualAge for Java, is enhanced and fully integrated into the IBM VisualAge for Java Version 2.0.

In addition to the advanced integrated development environment (IDE) of VisualAge for Java, ET/400 makes the job of developing Java client and server programs targeting AS/400 much easier.

VisualAge for Java offers these functions:

- Create Java graphical user interface (GUI) for existing 5250 displays.
- Convert your existing Data Description Specifications (DDS) display files of your current RPG or COBOL program to Java AWT files using the Convert Display File SmartGuide feature in OS/400.
- Call your iSeries 400 and AS/400e program in Java programs.
- With the Create AS/400 Program Call SmartGuide, the code is generated for you. Data conversion between iSeries 400 and AS/400e system and the Java data type is also handled for you.
- Deploy your Java program to the iSeries 400 and AS/400e system.

  After developing Java code using VisualAge for Java, you can export the files to the AS/400 Integrated File System and compile them for better performance. This can be done using the Export Java Files and Compile AS/400 Java Class SmartGuides. You can then use the graphical debugger available in Code/400.
- IBM AS/400 Toolbox for Java classes available inside VisualAge for Java IDE.

  All of the IBM AS/400 Toolbox for Java classes are loaded into the VisualAge for Java IDE at installation time. Therefore, you can use them inside the workbench, as well as in the Visual Composition Editor, without downloading. Toolbox for Java is a set of Java programs that enables the Internet programming model. These can be used to access iSeries 400 and AS/400e resources.

Version 2.0 Enhancements

In Version 2.0 of VisualAge for Java, all the AS/400 SmartGuides are fully integrated with the IDE. SmartGuides are launched from within IDE and generated classes are placed automatically inside the repository. New functions for Version 2.0 include:

- JDK 1.1.6 and JFC support
- Team capability

- Data Access Beans
- High performance compiler for Java

Integration for Novell NetWare, 5769-SA3

This feature provides support to run Novell NetWare 4.10 on the Integrated PC Server. It does not include the NetWare server software or license, which must still be purchased from a NetWare distributor.

The support allows the ability to install Novell NetWare on the Integrated PC Server. It also allows the iSeries 400 and AS/400e disk to be used for NetWare file serving and enables the file, print, and application serving functions of Novell NetWare.

Statement of Direction:

Customers running OS/2 Warp Server for AS/400 and Novell 4. 1 1 on the AS/400 IPCS is supported with their current capabilities until 31 January 2001. However, these products will not be functionally enhanced. We recommend that customers using Domino on the OS/2-based AS/400 Integrated PC Server migrate to the Domino for AS/400 product, which provides enhanced scalability, reliability, and integration. V4R3 is the last release of OS/400 to support Lotus Domino running on the OS/2 based AS/400 IPCS. Future releases of OS/400 will not be capable of running Lotus Domino on the OS/2-based AS/400 Integrated PC Server.

Performance Management/400, 5769-PM1

Performance Management/400 (PM/400) ships with OS/400. At the first IPL, the customer is asked if they want PM/400 activated. The activation causes summary performance data to be collected that is transmitted using the ECS line to an IBM service center. The customer then receives easily understood capacity and performance reports and graphs to assist in running their iSeries 400 or AS/400e server and to plan for future growth.

PM/400 is intended for long-term systems management planning with regard to CPU utilization, memory utilization, DASD utilization, and individual disk arm utilizations, which can enable a consistent level of service. For further information, visit the Web site at:
`http://www.ibm.com/eserver/iseries/pm400`

TCP/IP Connectivity Utilities for AS/400, 5769-TC1

TCP/IP is fundamental to the new network computing paradigm. Much of the new iSeries 400 and AS/400e e-business infrastructure runs exclusively on TCP/IP including Lotus Domino, Java, Web serving, and IBM Network Stations. The iSeries 400 and AS/400e servers have excellent TCP/IP support built into their operating system. Recent TCP/IP enhancements make the system an even more powerful e-business server. TCP/IP has become an extremely popular protocol and can be regarded as the de facto standard for computer networking.

The iSeries 400 and AS/400e servers ships with a complete and robust suite of TCP/IP protocols, servers, and services. TCP/IP is an internationally standardized protocol. TCP/IP and its constituent protocols are standardized by the Internet Architecture Board. The standards specifications are provided in documents called Request for Comments (RFCs). There are hundreds of RFCs available today. The system conforms to the appropriate RFCs.

TCP/IP Connectivity Utilities for AS/400 is shipped with each OS/400 licence from V3R1 and is non-chargeable. It is installed as 5769-TC1. TCP/IP Connectivity Utilities has a rich suite of servers and services including:

- GUI configuration support
- File Transfer Protocol (FTP) client and server
- Simple Mail Transfer Protocol (SMTP)
- Post Office Protocol (POP) Version 3 server
- Internet Connection Server (HTTP)
- Internet Connection Secure Server (ICCS)
- Web-based Administration server
- Network File System (NFS) client and server
- Domain Name System (DNS) server
- Dynamic Host Configuration Protocol (DHCP) server
- IP Printing to HP-compatible network printers
- Line printer requester (LPR) and line printer daemon (LPD)
- 5250/HTML Work station Gateway (WSG) server
- TELNET client and server
- Remote EXECution (REXEC) client and server
- Remote IPL support
- BOOT-P server
- TFTP server

The iSeries 400 and AS/400e servers support a wide range of physical interfaces including:

- IBM Token-Ring LAN
- Ethernet LAN
- Ethernet 100 Mb LAN
- 1 Gbps Ethernet
- Frame relay
- Wireless (LAN)
- X.25 (PVC and SVC)
- X.25 over ISDN
- Integrated PC Server LAN
- Asynchronous support
- Synchronous support
- ATM (LAN emulation)
- Twinax

The base protocols are implemented within OS/400 and OS/400 microcode for excellent performance, security, and stability. The base protocols include:

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)
- Internet Protocol (IP)
- Internet Control Message Protocol (ICMP)
- Address Resolution Protocol (ARP)

Software Migration and Upgrade Paths

e-Jump and Single-Step Upgrades

e-Jump, in conjunction with the Enhanced Upgrade Assistant Tool, upgrades to OS/400 V4R4 in one step.

OS/400 V4R5 is the last release to offer single step CISC-to-RISC upgrade capabilities from V3R2. OS/400 V4R4 is the last release to offer single step CISC-to-RISC upgrade (previously referred to as e-Jump) capabilities from V2R3, V3R0.5, and V3R1 systems.

For single step CISC-to-RISC upgrades from V3R2 to V4R5, use the Enhanced Upgrade Assistant (5798-TBU). For single step CISC-to-RISC upgrades from V2R3, V3R0.5, V3R1, and V3R2 to V4R4, use the Enhanced Upgrade Assistant (5798-TBU).

Single step RISC-to-RISC upgrades from V4R1, V4R2, V4R3, and V4R4 to V4R5 are supported using a normal upgrade procedures and are documented in the software installation manual. If a new RISC AS/400 server replaces an existing RISC AS/400 server, feature #0205 may be ordered against the hardware to restrict the preload of all software except SLIC and the basic functions of OS/400. This allows the remaining libraries to be migrated from the existing system to the new system.

Refer to the following section to identify the supported upgrade paths for RISC systems.

Supported Upgrade Paths

Software upgrade paths supported on OS/400 are outlined in the following table. This table also indicates which target release can be specified when compiling or saving objects on a given OS/400 system.

To: From:	V3R05	V3R1	V3R2	V3R6	V3R7	V4R1	V4R2	V4R3	V4R4	V4R5
V2R3	X	X	X	X	-	-	e-Jump*	e-Jump*	e-Jump*	-
V3R05		X	X	X	e-Jump*	-	-	e-Jump*	e-Jump*	-
V3R1			X	X	e-Jump*	e-Jump*	-	e-Jump*	e-Jump*	-
V3R2				-	e-Jump*	e-Jump*	e-Jump*	e-Jump*	e-Jump*	X
V3R6					X	X	-	-	-	-
V3R7						X	X	X	-	-
V4R1							X	X	X	X
V4R2								X	X	X
V4R3									X	X
V4R4										X

Note: For single step CISC-to-RISC upgrades (previously known as e-Jump) from V2R3, V3R0M5, V3R1 and V3R2, use the Enhanced Upgrade Assistant 5798-TBU. Single step RISC-to-RISC upgrades are supported as normal upgrade procedures. Instructions are found in the appropriate software installation manual.

Current Release to Previous Release Support

Values for TGTRLS Parameter			
Current OS/400 Release	***Current**	***PRV**	**Other Valid Values**
V4R5	V4R5	V4R4	V4R3 V4R2 V3R2
V4R4	V4R4	V4R3	V4R2 V3R2
V4R3	V4R3	V4R2	V4R1 V3R7 V3R2
V4R2	V4R2	V4R1	V3R7 V3R2
V4R1	V4R1	V3R7	V3R6 V3R2 V3R1
V3R7	V3R7	V3R6	V3R2 V3R1 V3R0M5

OS/400 Version 4 Change of Terms and Conditions

OS/400 is included in the AS/400 Model 270, 8xx, 170, 6xx, 7xx, and Sxx systems price and licensed under the International Program License Agreement (IPLA). OS/400 Version 4 is software keyed to the designated serial number of the machine where it is initially installed.

OS400 Version 4 is licensed to operate on only that serial number machine and may not be moved from one machine to another except in an emergency backup situation.

Four documents, *Proof of Entitlement (POE)*, *License Information Document (LID)*, *International Program License Agreement (IPLA)*, and *Software License Key Sheet* are provided with the OS/400 software as proof of a valid license. In the event that the designated machine is transferred (or sold), OS/400 must transfer with it, notify the receiving party of the program's terms, and provide the *POE*, *LID*, *IPLA*, and *Software License Key Sheet* documents for OS/400 to the purchaser. IBM licenses the receiving party when that party accepts the program's license terms by initial use of the program. Your OS/400 license is then terminated.

When ordering upgrades to software licensed under the IPLA, such as OS/400, a copy of the POE should be provided to your IBM representative or IBM Business Partner to validate the license to the software.

To operate on the designated serial number machine, OS/400 Version 4 requires a unique OS/400 license authorization code supplied by IBM. The OS/400 License Authorization Code is preloaded by IBM on new iSeries 400 and AS/400e system purchases. In the case of a hardware upgrade to a Version 4 system or a software-only upgrade to OS/400 Version 4, the OS/400 License Authorization Code provided by IBM must be entered at the time of installation. OS/400 Version 4 operates for 70 days without the License Authorization Code. During those 70 days, the system generates daily warning messages requesting that the customer obtain an OS/400 License Authorization Code from IBM. After 70 days, users are not permitted to sign on to the system. A valid OS/400 License Authorization Code is required to reset the 70-day period. For software-only OS/400 Version 4 orders, the OS/400 License Authorization Code is ordered from IBM. Contact your IBM representative or IBM Business Partner for ordering information.

Software Subscription

Software Subscription changes the way customers pay for upgrading to new versions or releases of iSeries 400 and AS/400e software. Customers must purchase Software Subscription when they move to Version 4 to upgrade to new versions or releases. Software Subscription is available at a monthly charge (billed quarterly) or with prepayment options for between one and five years.

The price of Software Subscription is the same, regardless of the software that has been licensed to a system. Most iSeries 400 and AS/400e stacked software is covered by Software Subscription. Customers who do not take out Software Subscription when they install Version 4 must either re-license the software or pay the Currency Access Fee of Software Subscription in order to upgrade to a new version or release.

For further information on Software Subscription, contact your IBM Sales Representative or refer to the appropriate announcement letter. You can also refer to:
http://www.as400.ibm.com/sftsol/subscript.htm

A current list of program products covered by Software Subscription is found at:
http://www.as400.ibm.com/sftsol/subscription2.htm

Software Keys and Guidance for LPAR System Upgrades

Customers running logical partitioning may have more than one version or release of a software product on the same iSeries 400 and AS/400e server. Version upgrades are acquired for customers running in LPAR via software subscription just as they are for customers without LPAR.

For customers performing both a processor group upgrade and a release upgrade at the same time, perform the processor group upgrade for the V4R4 products, and then upgrade the release to V4R5. The necessary keys are sent automatically with this method.

For customers performing a processor group upgrade following the V4R5 release upgrade, contact the key center to request necessary V4R4 keys at the higher processor group level.

When a processor group upgrade is performed, all processor-based products are priced according to the Software Machine Group of the underlying iSeries 400 and AS/400e hardware model.

Keyed Stamped Media Distribution

Many OS/400 product features are available on AS/400 Keyed Stamped Media and shipped with OS/400, beginning with V4R4. This provides on-demand delivery of these products and features and allows a 70-day evaluation period for any of the provided products or features. To use the software distributed on the keyed stamped media after the 70-day evaluation period, a Software License Key must be ordered. Contact your IBM representative or IBM Business Partner for ordering information.

New Software License Keys are required when the Version, Release, or Modifications Level of the software changes. If the software is transferred to a different system, a new software key is also required. Some software is keyed, based on the processor group. A new software key must be obtained when the processor group changes.

Note: When ordering Software License Keys for the AS/400e server 7xx models, the Processor Feature Code that is used is displayed in the QPRCFEAT system value or in the system rack configuration.

If a Keyed Stamped Media product or feature is to be upgraded, the current Software License Key Sheet for the product must be provided to your IBM representative or IBM Business

Partner as proof of license. The products shipped on the Keyed Stamped Media for V4R5 are:

- **5769-SS1** OS/400
  Option 17 Print Services Facility Fax Support
  Option 18 Media and Storage Extensions
  Option 36 Print Services Facility 1-20 IPM printer support
  Option 37 Print Services Facility 1-45 IPM printer support
  Option 38 Print Services Facility any speed printer support
- **5769-AF1** Advanced Function Printing Utilities for AS/400
- **5769-AP1** Advanced DBCS Printer Support for AS/400
  Option 1 Advanced DBCS Printer Support for AS/400 IPDS
- **5769-BR1** Backup and Recovery Media Services (BRMS) for AS/400
  Option 1 Network
  Option 2 Advanced
- **5769-CB1** ILE COBOL for AS/400
- **5769-CM1** Communications Utilities for AS/400
- **5769-CX2** ILE C for AS/400
- **5769-DP3** DB2 DataPropagator for AS/400 Version 7.1
- **5769-JS1** Job Scheduler for AS/400
- **5769-PT1** Performance Tools for AS/400
  Option 1 Manager
  Option 2 Agent
- **5769-PW1** Application Development ToolSet for AS/400
  Option 2 Application Development Manager
  Option 3 Application Dictionary Services
- **5769-QU1** Query for AS/400
- **5769-RD1** Content Manager OnDemand
  Option 1 Spooled File Archive
  Option 2 Object Archive
  Option 3 Record Archive
  Option 4 Anystore
  Option 9 Content Manager OnDemand/400 Server trial feature
- **5769-RG1** ILE RPG for AS/400
- **5769-ST1** DB2 Query Manager and SQL Development Kit

Changes in Accessing iSeries 400 and AS/400e Softcopy Information

- In V4R4, using InfoSeeker to access the AS/400 Softcopy Library CD-ROM (SK3T-0118) is no longer supported. To access iSeries 400 and AS/400e softcopy information, you can:
  - Use the new iSeries 400 Information Center instead. The Information Center is the next generation for information delivery and retrieval. You can access the Information Center from CD-ROM (SK3T-2027) or from one of these Web sites:
    - `http://www.ibm.com/eserver/iseries/infocenter`
    - `http://www.ibm.com/eserver/iseries/library/`
  - Use the IBM online library readers on your PC workstation to read the iSeries 400 and AS/400e Softcopy Library CD-ROM. The IBM online library readers are provided on the CD-ROM. The readme.txt file on the CD-ROM contains information to help you install and use the readers.
  - Access iSeries and AS/400e books from the Internet. You can use your Web browser to view or print the iSeries 400 and AS/400e softcopy books from the Web at:
    `http://publib.boulder.ibm.com/pubs/html/as400/infocenter.htm`

WebSphere

WebSphere

WebSphere and e-business

OS/400 contains a complete set of products and features that can be used to create a Web presence. These include TCP/IP, Java, VPN, Cryptographic Services, SSL, Certificate Management, HTTP Server, Apache Server, and many others (refer to the “Operating System/400, 5769-SS1” on page 477 for details). In addition to these base features, a set of e-business products is available that allows you to build a complete e-business Web Site that is secure, easy to develop and maintain, and scale based on your needs. These products belong to the WebSphere family of products offered by IBM for the iSeries 400 and AS/400e. They include:

- IBM WebSphere Commerce Suite 3.5 (5798-WC4)
- IBM WebSphere Payment Manager for AS/400 V2.1 (5733-PY2)
- IBM WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (128-bit**)** (5769-AS3)
- IBM WebSphere Application Server Version 3.5, Advanced Edition for AS/400 (128-bit), (5769-WA3)
- Connect for iSeries (5733-B2B) for business to business transactions
- IBM WebSphere Host Publisher V2.2 for AS/400 (5648-D31)
- IBM WebSphere Personalization for AS/400, V3.5 (5733-A47)
- IBM WebSphere Development tools (5769-CL3; described in Application Development Products)

Each of these products addresses specific customer requirements in building e-business applications quickly and easily often including GUI based PC development and management tools. These products are described in further detail in the following section.

IBM WebSphere Commerce Suite, Pro Edition for AS/400, V4.1, 5798-WC4

WebSphere Commerce Suite, Pro Edition for AS/400, Version 4.1, provides more function, power, flexibility, and scalability than Net.Commerce. An upgrade from Net.Commerce for AS/400, V3.2 5798-NC3 to WebSphere Commerce Suite, Pro Edition for AS/400, V4.1 is available. Establish or enhance your current e-commerce Web site quickly, easily, and affordably.

Use WebSphere Commerce Suite, Pro Edition to:

- Create an online store
- Conduct business-to-business or business-to-consumer transactions
- Ensure secure online purchasing
- Customize the look, feel, and flow of your site

© Copyright IBM Corp. 2000

Features include:

- Low entry price
- Payment Manager with SET Secure Electronic Transaction support
- WebSphere Application Server Advanced Edition
- Advanced relationship marketing, including rules-based personalization
- Product Advisor for creating intelligent catalogs
- Auctions (open cry, sealed bid, Dutch bid)
- MQSeries Adapter for back-end integration

WebSphere Commerce Studio

This product is the new design and development environment for the WebSphere Commerce Suite. Based on the award-winning WebSphere Studio, V3, the Commerce Studio is available in two versions: the Developer and Professional Developer Editions. Use one of these to develop your WebSphere Commerce Suite site. Each includes the features of the WebSphere Studio with additional commerce tools to support the WebSphere Commerce Suite.

- Developer Edition
- Developer's kit for WebSphere Commerce Suite, Pro Edition for the AS/400
- Professional Developer Edition

Developer's kit for WebSphere Commerce Suite, Pro Edition for the AS/400 includes these additional features:

- WebSphere Catalog Architect, V4.1
  - Create, import, and update product information
  - Reduce the time for traditional catalog information management
  - Selectively publish information into production
  - Automated validation of catalog information
  - Familiar spreadsheet and drag-and-drop interfaces
- Tools and support for rules-based personalization
- Tools for setting up auctions
- Product Advisor tools

Increase profitability:

- Reduce the cost of sales transactions
- Extend your reach with business-to-business capability
- Attract and retain customers with easy-to-use advanced catalog tools
- Create a compelling shopping experience through customizing storefronts
- Provide personalization for powerful one-on-one marketing

Improve efficiency:

- Accelerate setup time with a store-creation wizard
- Provide data interchange by integrating with existing back-end systems
- Track shoppers' past purchasing activities for a more streamlined customer service

WebSphere Commerce Suite, Pro Edition for AS/400, V4.1 provides a wide range of easy-to-use features and functions for content management, relationship marketing, order management, and payment management for total business transformation, integration, and growth. WebSphere Commerce Suite supports a wide range of business models including business-to-consumer, business-to-business, and e-marketplaces. Commerce sites built with WebSphere Commerce Suite can easily integrate with internal and external systems and grow with the changing need of an e-business. Benefit from the power of the WebSphere family, which integrates Web commerce, Web server, Web application development, transaction processing, and distributed component software.

The WebSphere Commerce Suite consists of:

- A server that manages the interface to the buyers, who can browse, save, query, and order items in the interactive catalog.
- A powerful authoring and administration environment, allowing store personnel to design the buying process and create an interactive product catalog.
- A wide range of new features and functions including:
  - Industry-leading e-commerce platform
  - New Commerce Studio supporting developers, designers, and marketing professionals in creating, operating, and updating dynamic e-commerce Web sites
  - Improved relationship marketing capabilities to drive site traffic and sales, including new rules-based personalization
  - Enhanced business integration with support for XML messages Industry-Leading E-commerce Platform

These enhancements make WebSphere Commerce Suite the industry's leading e-commerce product. WebSphere Commerce Suite is built on the industry-leading application server WebSphere Advanced Server, V3. JavaServer Page (JSP) enablement provides support for all catalog and product display. This is a significant step in the evolution to a full Java environment.

Integration with IBM Payment Manager, V2.1, provides more payment options with cassettes for SET Secure Electronic Transaction and CyberCash.

Lightweight Directory Access Protocol (LDAP) for shopper registry allows sharing of user registry information among subscribers. LDAP servers supported are Netscape Directory Server, Domino, and IBM SecureWay Directory.

Order notification lets merchants notify customers via e-mail to confirm an order.

Domino Integration with WebSphere Commerce Suite provides single sign-on, allowing all shoppers to be managed by Domino with a simplified and familiar management process. X.509 certificate support allows automatic recognition and authentication of customers whose browsers are enabled with these certificates.

New Commerce Studio Tool Set

WebSphere Commerce Studio is built on WebSphere Studio V3, providing an easy-to-use toolset that can reduce time and effort when creating, managing, and debugging Web applications. Significant improvements in usability and functionality of site creation and management with:

- Page Designer to hide the complexity of Web-page creation
- Workbench to assist in managing the content and version of site pages
- Store Creator Wizard and Store Profile Editor to help you create and modify store information

Improved Relationship Management

Merchants can provide a unique and satisfying shopping experience to customers by personalizing each customer's visit to their Web site. This can lead to improved site traffic and sales. New functions include:

Business Rules Engine enabling administrators or business analysts to specify a set of rules resulting in a personalized experience for the customer. The system can recommend products based on shopper information such as demographics. It can also cross-sell or up-sell products based on items that the shopper intends to purchase.

Associations, packages, and bundles can be incorporated into the merchant's system. Associations relate one product with complementary products, which is similar to a belt that goes with a pair of pants. Packages are the creation of a unit that cannot be broken up, but may be sold separately for more money, such as a computer system. A bundle is several items that can be sold separately but may be grouped (such as a complete ski outfit) to entice the customer to buy related items.

Auctions are offered as an additional selling model for businesses. Three common types of auctions are supported:

- Open cry (price is bid up)
- Dutch bid (price starts high and is bid down)
- Sealed bid (bid is confidential and viewable only by the seller)

Product Advisor enables e-businesses to provide its customers with several methods to help them quickly find the right products based on features, or a friendly question-and-answer process using parametric searching. The Product Advisor feature supports WebSphere Studio and JSP.

WebSphere Catalog Architect Content Management

Catalog Architect (CA) is more powerful in creating and managing catalogs.

Client-Server Database Support enables centralized data with improved data sharing and access. CA can have the client and server running separate machines as well as supporting local databases.

Enhanced Extensible Markup Language (XML) supports adding, modifying, and deleting catalog objects or create/update information in batch mode. CA supports a superset of the common Commerce Suite XML DTD.

Merchandising Support includes aggregation of items in kits, bundles, sets, and packages, and product or item associations with cross-sells, up-sells, or substitutions.

Field Values SQL Access simplifies data entry and increases validity of data.

Users can create a drop-down list of pick values for populating CA. They have the ability to disable or enable show or hide fields that are not to be managed by CA. This enables certain fields that are sourced from inventory, availability, or other back-end ERP systems to be “turned off” so that they are not populated or validated by CA. This avoids any conflict between CA and these disabled or hidden fields.

Improved migration for existing Commerce Suite stores. Migration retains existing reference numbers in Commerce Suite and avoids disabling any macros or orders that reference these numbers.

Support for WebSphere Studio Store Creator for creating a store and the products contained within it.

National language support is provided for CA in nine major non-English languages.

Enhancements to business-to-business and business-management include:

- Batch user registration allows one person to register up to tens of thousands of users in a single update rather than having to register them individually. This allows centralized control for access privileges and authorization levels.
- Core business-to-business messages are provided in XML format so that the exchange of data using emerging industry standards can facilitate universal exchange of business information. Order processing is improved with a quick order capability

that bypasses many current steps, orders based on previous orders, and processes regularly scheduled orders automatically.

Developer Edition, Professional Developer Edition, and Catalog Architect Both Developer Editions include WebSphere Studio. However, only the Professional Developer Edition includes Catalog Architect and the tools to create a personalized Web experience for your customers. Developer Edition customers can order Catalog Architect separately.

The Developer Edition, Professional Developer Edition, and Catalog Architect are available only on a Windows NT platform. These products can be used to develop your site for an iSeries 400 or AS/400e server.

The benefits of WebSphere Commerce Suite are:

- Supports e-commerce applications in both the business-to-consumer and business-to-business environments.
- Supports customizing and standardization of product or service displays to help increase the impact of online catalogs.
- Provides dynamic Hypertext Markup Language (HTML) pages which can be customized for each product or buyer group.
- Provides powerful search and navigational aids to help buyers quickly retrieve product information.
- Provides Payment Manager with SET implementation.
- Allows sellers to readily make use of their existing catalog Web sites.
- Allows sellers to easily update product and pricing information so buyers can always see the most current information.
- Allows sellers to target pricing and catalog information for buyer groups, especially useful in business-to-business applications.
- Supports a high volume of transactions through the use of DB2.
- Allows database to be secured behind a firewall.
- Supports a scalable configuration with multiple front-end servers and back-end database.
- Provides a staging capability to allow the seller to test changes before implementation.
- Provides a TAXWARE International interface for sales tax calculations in the U.S. and Canada. In addition, an API is available for the seller to provide their own sales tax calculations.
- Provides a data import capability to allow the seller to integrate existing data.

- Provides dynamic page caching for product and category pages resulting in near Web server performance.
- Provides sellers with usage statistics and logs to analyze activity.

WebSphere Commerce Suite, Pro Edition for AS/400 requires:

- OS/400, V4R4 (5769-SS1)
- DB2 UDB for AS/400, Version 4.4
- HTTP Server for AS/400, V4R4 (5769-DG1) and Crypto Access Provider for AS/400, V4R4 (5769-AC2 (56-bit) or 5769-AC3 (128-bit)), and Crypto Service Provider for AS/400 (56 bit or 128 bit).
- The HTTP server also includes:
  - Net.Data for AS/400, V4R4
  - Digital Certificate Manager
  - QShell Interpreter
- MQSeries for AS/400
- AS/400 Development Kit for Java, V4R4 (5769-JV1) including Java Developer Kit 1.1.7
- AS/400 Toolbox for Java (5769-JC1)
- TCP/IP Connectivity Utilities for AS/400 (5769-TC1)
- Lotus Domino for AS/400 (5769-LNT), V4.6.2, to use Domino e-mail and discussion database from WebSphere Commerce Suite
- WebSphere Commerce Suite Administrator requires the use of a standard Internet browser, such as Netscape Communicator V4.7, that supports Java, JavaScript, cookies, and frames
- AS/400 Client Access Family (5769-XW1 and 5769-XD1) is recommended
- Payment Manager for AS/400 (5733-PY2), V2.1 and WebSphere Application Server, 56 bit (5733-WA2), or 128 bit (5733-WA3), V3.0.2 is included
- WebSphere Commerce Studio requires Microsoft Windows NT Server, Version 4.0, with Service Pack 4 and Netscape Communicator 4.61.
- WebSphere Catalog Architect requires Microsoft Windows NT Server with Service Pack 5.

Programming skills are necessary for customizing work.

IBM Net.Commerce for AS/400 Version 3, 5798-NC3

Note: This product will be withdrawn from marketing 31 October 2000.

Net.Commerce for AS/400 Version 3 is a merchant solution that provides a framework to conduct business on the Internet in a secure and scalable manner. It supports business-to-consumer and business-to-business environments.

Net.Commerce for AS/400 Version 3 provides a complete e-commerce solution from catalog and storefront creation to payment procession and integration into backend systems (for example, order fulfillment, tax, and shipping). It uses the power of DB2 on the iSeries 400 and AS/400e system.

Net.Commerce consists of two components:

- **Net.Commerce Server**: Manages the interface to the buyers, which enables them to browse, save, query, and order items in the interactive catalog.
- **Net.Commerce Administrator:** Provides a powerful authoring and administration environment, which allows store personnel to design the buying process and create an interactive product catalog. It includes the Site Manager, Store Manager, and Template Designer.

The key strengths of Net.Commerce for AS/400, Version 3, include:

- **Scalability**: From single to multiple iSeries 400 and AS/400e servers
- **Flexibility**: Can be used to extend an existing online catalog site or to create a store or an entire mall
- **Dynamic capabilities**: Information is dynamically pulled from the database and populated into the Web pages

Net.Commerce is designed to provide flexibility so that the site look, feel, and flow can be customized to meet individual preferences. Unlike other merchant servers, users are not limited to a standardized storefront template. The creation of a unique and compelling shopping experience helps drive traffic on your site.

Net.Commerce includes a Template Designer to let you design your own Web pages. Its graphical look, drag-and-drop capabilities, and quick testing functions help you create and test your pages. It can be used to create:

- A home page for a store or mall
- Prototype category pages
- Product pages
- Unique pages for members of shopper groups

In Net.Commerce, dynamic pages are cached for improved performance. In addition, all updates to the template design and catalog content can be tested on the staging server before going live. Application program interfaces (APIs) are also provided with Net.Commerce to customize functions related to payment, shipping and handling costs, inventory check, and the calculation of taxes.

With Net.Commerce Version 3, IBM has added further capability. It can be used by companies who want to set up an e-commerce site quickly at a reasonable cost. In addition, it is designed for second generation customers who want greater flexibility, additional function, and the ability to integrate with their legacy systems.

The Net.Commerce server has also been redesigned to further improve security, scalability, and extensibility. This end-to-end e-commerce offering lets you start quickly by decreasing the amount of custom coding needed as set-up time. It comes with full Version 2 functionality. Functions provided include:

- **Starter stores**: Three pre-built stores (sample stores). They have end-to-end shopping flows with predefined catalog templates, registration, shopping cart/order form, check-out, and payment components. They provide both business-to-business and business-to-customer capability.
- **Store Creation Smart Guide**: A wizard (Smart Guide) guides the user through the creation of a store. It is browser accessible and walks the user through each aspect of store creation. It covers pages, templates, graphical elements, catalog navigation, store flow, pricing, shipping, applying tax, and payment. Panels within the wizard include a home page, store information, store type, store administration, store layout and style, buyer groups, discount information, and shipping and handling. After going through the smart guide, the appropriate templates, macros, APIs, and assets are created or assigned, and sample data is used to demonstrate the newly generated store.
- **WebSphere Payment Manager integration**: WebSphere Payment Manager enables sellers to process payments easily and securely from their consumers. It manages the payment process, from communication with the buyer to drafts with financial institutions. Records of transactions are automatically maintained to facilitate later reconciliation and reporting.

  WebSphere Payment Manager includes Configuration Tools that let the seller configure:

  – Net.Commerce to communicate with one or more acquiring gateways
  – Authorization and capture
  – Auto or manual capture of payment

  WebSphere Payment Manager also includes Administration Tools that allow the seller to query orders to view payment status, process payment once the order is shipped, and process reversals. For more information, see “IBM WebSphere Payment Manager for AS/400 V2.1, 5733-PY2” on page 555.

- **Lotus Domino integration**: Support for messaging and collaboration through Lotus Domino integration is included. This provides a generic e-mail function to allow Lotus Notes e-mail (such as an order confirmation to the buyer) to be sent from Net.Commerce. It also provides a discussion group and bulletin board capabilities.

Net.Commerce for AS/400 Version 3 also contains:

- **Advanced Catalog Tools**: Advanced Catalog Tools can be used to create intelligent catalogs. Now sellers and catalog providers can cater to the various shopping styles and buying behaviors of their customers through their smart electronic catalogs. These intelligent catalogs can provide quick and easy search methods and also acknowledge that a buyer can need extra guidance in making a product selection. A virtual sales assistant can reside in the catalog to help shoppers through the product selection process. Buyers can browse a smart catalog and become more knowledgeable of the product before making their purchase decision or simply find the right product quickly.

  The foundation for building an intelligent catalog is provided by the *Advanced Catalog Tools*. This foundation combines knowledge engineering and a parameter search method. Knowledge engineering allows the catalog provider to embed knowledge of their best sales and marketing personnel into the catalog. The parameter search feature provides quick access to products meeting the criteria specified by the parameters. This foundation includes a comparison function to allow comparing a desired set of products and their features. At any level within the intelligent search process, a side-by-side product features comparison can occur.

  The Advanced Catalog Tools enable buyers to create and integrate shopping metaphors. These shopping metaphors enable buyers to explore product features, obtain assistance from a virtual salesperson, and compare product information.

  The product exploration mode of shopping is a parametric search. Buyers select the features or specifications to identify the desired products. The feature can be equal to a specific value or be within a given range. Exploration occurs as the buyer is allowed to select and “deselect” specifications throughout the process. This parametric search quickly narrows the search from thousands of products to only a handful.

  The sales assistance metaphor provides a question and answer dialog to identify the best product. This dialog can be tailored to help in gift selection and can service the buyer who knows very little about the product area. A buyer can use this virtual sales assistant to cover all areas prior to making a purchase decision.

  The product comparison function complements the parametric search and sales assistant. At any point within the intelligent catalog, the buyer can decide to compare the products meeting criteria specified from the search process.

  The Advance Catalog Tools customize each mode of shopping. For product exploration, the tool is used to select the attributes for the search criteria. This tool lets attributes vary by category, allowing for additional features to be searched at sub-category levels. The

sales assistance tool is used to easily create a question and answer hierarchy. Each answer refines the search and its association to selected product specifications.

All of the tools are easy to use, and do not require any programming or HTML knowledge. The format and look-and-feel for all of the intelligent search methods can be customized and tailored to fit the design criteria of the catalog. The shopping metaphors can also be tailored to specific shopper or buying groups.

- **Backend integration**: The Net.Commerce MQSeries Adapter is a component of Net.Commerce that enables integration with back-end systems, using MQSeries as middleware. This adapter supports sending and receiving messages using MQSeries, works with a set of defined outbound and inbound messages to help integrate Net.Commerce business processing with backend system business processing, and supports message extension and new messages.

Net.Commerce is Year 2000 ready and supports the euro currency. This product is supported with OS/400 V4R3 or later.

IBM WebSphere Payment Manager for AS/400 V2.1, 5733-PY2

WebSphere Payment Manager provides similar levels of functionality and capability for the iSeries 400 and AS/400e platform as the product available on AIX, Solaris, and Windows NT. It replaces IBM Payment Server 5733-PY1.

The WebSphere Payment Manager Version 2.1 program empowers merchants to securely manage Internet payments. As the successor to the Payment Server product, this new release is ideally suited to integrate payments into business processes and software such as online catalogs and accounting packages. It can also manage credit card, debit card, stored value smart cards, and emerging Internet payment methods. Support is provided for Multipayment Framework (MPF), the ability to add new payment methods (cassettes) to the system. The capability to host a payment service for multiple remote merchants is also provided.

Every business needs to receive payment for their goods or services. Individual merchants can benefit from a browser-based GUI for remotely managing payments and remote product administration functions. There is also the ability to select specific payment types (cassettes) from all cassettes made available by a Payment Manager administrator. The merchant can also search, with parameters and criteria, for customer transaction and batch data history. There are role-based access controls for granting privilege levels to merchant's employees. The merchant can also enable and disable event notification service.

Merchants who integrate WebSphere Payment Manager into their business software and business process can deploy multiple Payment Manager instances as needed to support

multiple merchant instances. This allows communication using HTTP command requests and receive XML responses—an industry standard.

A hosting service, or Payment Service Provider (PSP), is ideal for any business with low payment transaction volumes. PSP customers are typically:

- Companies that do not want to manage onsite software and hardware
- Merchants needing a service to handle the complexity of clearing payments with credit card associations, such as Visa, MasterCard, and Europay
- Businesses new to e-commerce, or that have low payment transaction volumes browser-based, familiar cash register user interface

Becoming a Payment Service Provider (PSP) is a natural extension for financial institutions that process credit card transactions for retail stores, mail or telephone order companies, or small Internet-based businesses. This allows retention of and increase in the financial institution's customer base. Payment services can also be outsourced to a third-party such as a business partner. Some Internet service providers (ISPs) are also adding payment services to their business customer offerings. PSPs are positioned to easily help secure and develop merchant relationships. They quickly can be profitable by collecting revenue from an increasing volume of transaction fees and through value-add services.

A PSP that uses WebSphere Payment Manager values the ease of adding, modifying, removing, and provisioning remote merchants, including the ability to deploy separately multiple Payment Manager instances in support of multiple merchants. Also valuable is the Multipayment Framework (MPF), which offers the ability to add new payment methods (cassettes) to the system and deploy for merchant use. Dynamic configuration updating without system disruptions is also supported to reduce downtime. A browser-based GUI is provided to securely manage multiple merchants with individual business data privacy, protection, and integrity. A basic network management support, certified Tivoli ready, is provided. There is a multilevel trace capability to enhance serviceability.

WebSphere Payment Server allows only designated employees who administer merchant accounts to:

- Add new merchant customers
- Remove existing ones
- View or edit sensitive customer business data stored on the system
- Modify the system, such as adding new payment types or cassettes
- Set the privileges or restrictions for other employees or customers

There is an exported data model that can secure customer-critical business data. This assures that access to merchant financial information is protected. This function also assures that access to merchant data is restricted. It also provides a secure method to allow access to merchant data from business applications.

Medium, large, and enterprise companies can process business-to-consumer and business-to-business payment by connecting to a suitable gateway and using SET, an industry-standard protocol, or a proprietary protocol such as CyberCash, or other protocols served through use of independently developed and installed cassettes. Combined with IT services (in-house or contracted), Payment Manager can integrate existing frontend or backoffice business systems to:

- Manage sophisticated payment options demanded by ERP systems.
- Solve payment needs for corporations with multiple distant branch locations.

Payment processing management means that catalog and order management applications are integrated using APIs to perform functions such as:

- Securing credit authorization while the customer is still present
- Charging the customer only after the product is shipped
- Collecting payment when a back-ordered product is shipped at a later date
- Crediting a customer account when an item is returned

Flexibility allows the exploitation of the multipayment framework to choose the financial institution that fits business needs. Additional payment choices can be created when needed.

WebSphere Payment Manager manages Internet payment transactions for e-commerce. It includes:

- MPF application
- Cassette for SET
- Test cassette to verify installation and setup
- Cassette for CyberCash CashRegister Service, Version 3 (available separately, initially only in the U.S. and Canada)
- Hosting service for businesses that outsource payments
- Integration of payments into catalog software and business processes
- Processing of credit card and other Internet payment methods
- Straightforward, automated installation
- Connection to credit card processor gateways using SET, the industry-standard protocol
- Designate capabilities by user and function:
  - User authentication
  - Role-based access control
- Deliver exceptional service:
  - MPF: Add current or emerging payments types using cassettes
  - Secure, browser-based, cash register user interface
  - Access to tools and utilities to remotely assist your customers
  - Continuous up time, even when adding new users or changing system configuration
- Secure communications between remote customers and the product through data encryption
- Help secure critical business data, protected access, and validation for access control

- Ability to delete an open batch or prune outdated payment information
- Order cancellation (used mostly for time-sensitive pricing)
- Ability to customize your application interface with client API library in Java or HTTP
- Network management support:
  - Enabled for use by network management systems
  - Tivoli base support built-in
  - Broadcast of system events to external applications
  - Full-function trace utility with:
    - Multiple concurrent trace levels
    - Logical controls for trace starting and stopping

The WebSphere Payment Manager Cassette for CyberCash is built to communicate with the CyberCash CashRegister Service, Version 3. The protocol between the Payment Manager and the CyberCash CashRegister is the secure protocol defined by the CyberCash Merchant Connection Kit, (MCK) Version 3.2. Currently, only the North American CashRegister service supports the MCK Version 3.2 protocol. This service enables merchant access to the set of North American participating financial institutions listed at: `http://www.cybercash.com/partners`

Note: While CyberCash CashRegister services may be available in other countries, they may not support the Version 3 interface.

WebSphere Payment Manager requires the following software components on the iSeries 400 and AS/400e system:

- OS/400 Version 4 Release 4 (5769-SS1) (V4R5 for iSeries) including:
  - Option 30, QShell Interpreter
  - Option 34, Digital Certificate Manager
- WebSphere Application Server for AS/400, Version 3.0.2
  - Standard Edition (5733-AS2 for 56-bit encryption, 5733-AS3 for 128-bit encryption)
  - Advanced Edition (5733-WA2 for 56-bit encryption, 5733-WA3 for 128-bit encryption)
- IBM Cryptographic Access Provider
  - IBM Cryptographic Access Provider 40-bit for AS/400, Version 4 Release 4 (5769-AC1)
  - IBM Cryptographic Access Provider 56-bit for AS/400, Version 4 Release 4 (5769-AC2)
  - IBM Cryptographic Access Provider 128-bit for AS/400, Version 4 Release 4 (5769-AC3)
- AS/400 Application Developer Kit for Java, Version 4 Release 4 (5769-JV1)
- IBM HTTP Server for AS/400, Version 4 Release 4 (5769-DG1)

IBM WebSphere Application Server Version 3.0.2 5769-AS3 (5769-AS2)

iSeries 400 and AS/400e customers have two WebSphere options from which they can choose. The base option is WebSphere Application Server, Standard Edition. The more advanced option is WebSphere Application Server, Advanced Edition.

- **WebSphere Application Server, Standard Edition**, is a Java application server that is based on a servlet-based engine that turns the existing Web server (IBM HTTP Server for AS/400) into a Java Web application server. As the core element of the IBM Application Framework for e-business, WebSphere Application Server, Standard Edition, forms the foundation of the WebSphere application server family and offers application developers a solution to build, deploy and manage e-business Web sites. WebSphere Application Server, Standard Edition, provides companies with an open, standards-based Web server deployment platform and supports servlets as well as JSP components. WebSphere Application Server, Standard Edition, provides an excellent way to initially get a business on the Web.
- **WebSphere Application Server, Advanced Edition**, is a more advanced Java application server for iSeries 400 and AS/400e. WebSphere Advanced Edition builds on and enhances the Standard edition to provide additional support for scaling Web sites into security-enhanced, transactional e-business application sites. WebSphere Advanced edition provides EJB support for host-based transactions, and offers sophisticated tools to simplify distributed, component-based application development. The EJB architecture is component-based for the development and deployment of server-based business applications. It allows the separation of business applications from underlying system services.

WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (56-bit), 5733-AS2

WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (128-bit), 5733-AS3

The WebSphere Application Server, Standard Edition, program is a powerful deployment environment for e-business applications. Its components provide the ability to build and deploy personalized, dynamic Web content quickly and easily. Using open Java-based technologies and APIs and the latest Extensible Markup Language (XML) technologies, the Standard Edition allows existing resources to be leveraged, cycles shortened, and administrative burdens eased.

Its features include:

- Improved deployment of Java servlets, JavaServer Pages (JSP) technology, and XML
- Improved deployment manager interface and application execution services

- Additional protocol and application adapter interface support
- Improved security controls and management
- Comprehensive Web site content and usage analyzers and reporting tools
- Improved IBM HTTP Server features

The WebSphere Application Server, Standard Edition, is a strong cross-platform, Java-based Web application platform supporting deployment of e-business applications and components for transactions, enterprise system access, and dynamic content generation, including:

- Java servlets
- JSP technology
- XML

It also integrates and connects to enterprise applications and systems to enable powerful interactions with:

- Enterprise databases
- Transaction systems
- Applications

The Standard Edition integrates new XML/XSL features to enable sites to take advantage of the latest technology to define and share data, while allowing data to be separated from its presentation. These updates include:

- An XML parser utilizing the latest W3 XML 1.0, DOM 1.0, and SAX 1.0 recommendations
- W3 name spaces recommending a DTD library for local validation
- A new, enhanced XSL processor

Also included are tools to enable sites to tailor data to specific devices including initial support for the Wireless Markup Language.

Included in the Standard Edition is full support for levels .91 and 1.0 of the JSP specification. Two additional tags, including a Query Tag for rapid building of a database connection and a Connection Tag for building and maintaining stateful connections, increase Web site builders productivity without requiring the team write code, but simply use tags similar to building a page in HTML today.

The administrative client helps create and deploy servlets. JSP components focus on ease-of-use and flexibility as well as control of the execution and monitoring of these e-business applications. See “IBM WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (56-bit), 5733-WA2” on page 561 for a more complete description of the administrative client.

Security controls and application access protection are significantly enhanced with V3. The secure access control lists can be established at a more granular level than in the past. In addition to setting up security at the user and group levels, control and policies can be

established for specific calls or methods within the applications themselves. A greater depth of control and protection is available within the server deployment environments. Support is also provided for LDAP-based user registries.

WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (128-bit), 5733-AS3, supports 128-bit data encryption capability and cannot be exported outside the USA and Canada except to selected customers who meet certain standards set by the United States Government. WebSphere Application Server Version 3.0.2, Standard Edition for AS/400 (56-bit), 5733-AS2, supports 56-bit data encryption. It is not restricted to the USA and Canada.

The WebSphere Application Server, Standard Edition, is available for iSeries 400 systems running OS/400 V4R5 and AS/400e systems running V4R4 or later.

IBM WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (56-bit), 5733-WA2

IBM WebSphere Application Server Version 3.5, Advanced Edition for AS/400 (128-bit), 5733-WA3

WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (128-bit), 5733-WA3

WebSphere Application Server Version 3.5 Advanced Edition for AS/400 features:

- Enhanced support for Java 2 SDK V1.2.2 across operating systems
- Improved product integration with other key application offerings in IBM e-business platform, including VisualAge for Java and WebSphere Commerce Suite
- Improved usability for administration

WebSphere Application Server V3.5 Advanced Edition for AS/400 maintains the functions of the previous version 3.0.2, including:

- Rich e-business application deployment environment with a comprehensive set of application services for transaction management, security, clustering, performance, availability, connectivity, and scalability
- Leading-edge implementations of the most up-to-date Java-based technologies and APIs

- Comprehensive connectivity support for interacting with relational databases, object databases, transaction processing systems, MQ-enabled applications, and hierarchical databases
- Migration path to a more scalable and transactional environment from WebSphere Standard Edition for a complete Java-based Web application platform
- Focus on medium- to high-level transactional environments used in conjunction with dynamic Web content generation and Web-initiated transactions
- Performance and scaling attributes that support bean-managed and container-managed persistence for entity beans and session beans with transaction management and monitoring
- Container management and persistent storage within a transactional environment for servlets and Enterprise JavaBean components
- Rich XML parsing and configuration environment
- Tivoli-ready modules that can be managed by Tivoli-based tools

WebSphere Application Server, Advanced Edition, enables powerful Web transactions and interactions with a robust deployment environment for e-business applications. With a portable, Java-based Web application deployment platform focused on supporting and executing Java servlets, and JavaBeans, JavaServer Page (JSP), and Enterprise JavaBean (EJB) components, this edition interacts with enterprise databases, transaction processing systems, and other applications for dynamic Web content. It builds on the Standard Edition to provide the portability and control of server-side business applications along with the performance and manageability of EJB technology. It extends the value and versatility of this platform with:

- Complete Java and Enterprise Java support, including a server for applications built to the EJB specification. The focus is on medium- to high-level transactional environments used in conjunction with dynamic Web content generation and Web-initiated transactions.
- Performance and scaling attributes with support for bean-managed and container-managed persistence, for entity beans and session beans, with transaction management and monitoring. Container management and persistent storage helps provide a high-performance transactional environment using servlets and EJB technology.

This WebSphere product is integral to managing and integrating enterprise-wide applications while leveraging open Java-based technologies and APIs. It enables powerful interactions with relational databases, transaction processing systems, and other applications. It is built using Common Object Request Broker Architecture (CORBA) IIOP protocol. This Web application server provides deployment and management of Java and EJB applications.

Integration and connectivity to enterprise applications and systems is core to WebSphere. It enables powerful interaction with enterprise databases, transaction systems, and applications. This WebSphere edition focuses on extensive performance, scaling, and security control improvements to its premium and complete implementation of an EJB server. This edition continues to provide a strong, Java-based Web application platform supporting deployment of e-business applications and components. This includes Java servlets, and JavaBean, Enterprise JavaBean, and JSP technology for transactions, enterprise system access, and dynamic content generation.

This version focuses on higher performance and scalability across the deployment environment. It addresses load balancing, application partitioning, and workload management for EJB components. This involves enhanced and added “container” deployment environment services for servlets, and EJB and JSP technology. The improved transaction management has intelligence on the type of applications executing and can deploy and execute across multiple applications and components accordingly. Object management and performance are optimized.

The EJB server provides better monitoring and control of containers used within the server. It offers enhanced Java Transaction Service (JTS) support within the EJB server, better inter operability, and a major rewrite of the deployment environment.

The single, robust server engine provides more control, better performance, more flexibility, and better serviceability.

The administrative client helps easily deploy and manage servlets. EJB, JSP, and JavaBean components focus on ease-of-use, flexibility, and greater control in executing and monitoring these e-business applications. The administrative client can be installed in the following environments:

- Windows NT
  - Any Intel-based PC running Windows NT Server or Workstation 4.0
  - IBM Enhanced Java Development Kit 1.1.7
  - Web browser that supports HTML 4 and Cascading Style Sheets (CSS)
  - A communications adapter or network interface
  - Minimum of 40 MB free disk space
  - Minimum of 96 MB of memory
  - CD-ROM
- Sun Solaris
  - Any workstation running Solaris V2.6 at the latest maintenance level
  - IBM Java Development Kit 1.1.6
  - Web browser that supports HTML 4 and Cascading Style Sheets (CSS)
  - A communications adapter or network interface
  - Minimum of 40 MB free disk space

  - Minimum of 96 MB of memory
  - CD-ROM
- AIX
  - RS/6000 or RS/6000SP running AIX V4.3.2 or later
  - IBM Java Development Kit 1.1.6
  - Web browser that supports HTML 4 and Cascading Style Sheets (CSS)
  - A network interface
  - Minimum of 40 MB free disk space
  - Minimum of 96 MB of memory
  - CD-ROM

Enhanced protocol and API support is integral to dynamic content access, generation, and presentation within the applications being deployed. Integration of an enhanced Java-based Object Request Broker (ORB) within the EJB server allows for enhanced Internet Inter-ORB Protocol (IIOP) support and true Remote Method Invocation (RMI) over IIOP support.

Security controls and application access protection are significantly enhanced with this new version of WebSphere. The secure access control lists can be established at a more granular level than in the past.

Security can be set up at the user and group levels, and establish control and policies for specific calls or methods within the applications. This provides greater depth of control and protection within the server deployment environments. WebSphere Application Server V3.0.2, Advanced Edition for AS/400, now has first class support for Lightweight Directory Access Protocol (LDAP)-based user registries to leverage existing directories.

A completely new and exciting package of site usage and analysis tools are included with WebSphere Application Server, Advanced Edition. Site analysis focuses on developing basic traffic measurement functions, while allowing the user to gauge traffic volume (hits, visits), identify traffic sources (domains, subdomains, referrers), and manage site integrity (link verification, site conformance). These are the key features enabling the user to enhance and improve the Web site content and performance, making Web sites more enticing, informative, and ultimately beneficial to the “bottom line” of the business.

The new “server” contains the analyzers whose responsibility is to transform the raw data into valuable information and store it into the provided UDB DB2 database. The client provides administrative, visualizing, and report-generating functions. From the client, the user can schedule analysis tasks to run at a specific time or time interval. Progress status is broadcast to interested clients and displayed as appropriate and necessary. Once the analysis is completed, users can generate reports or view the data.

The system offers many predefined, ready-to-use reports. General features include:

- Detailed analysis of Web content integrity, site performance, and usage statistics
- Flexible client/server architecture supporting a team environment
- A database that is scalable and trending with historical data
- Fully-customizing and configuring to suit end-users
- Remote administration and report capabilities from the client

WebSphere Application Server continues to provide the following features as part of its Web deployment environment:

- Full support for Java across multiple operating platforms
- Quick and easy installation
- Easy-to-use application deployment management and control support for dynamic Web content generation, including usage of Java servlets and JSP and JavaBean technology within a common runtime environment
- Services and support using bean-managed and container-managed transaction persistence
- Server capability for applications built to the EJB specification providing transaction management and monitoring
- Tivoli-ready modules that can be managed by Tivoli-based tools
- Enhanced administration for application deployment and server administration
- XML Documents Structure Services, which enable e-business applications that interchange data using eXtended Markup Language
- XML to parse, generate, manipulate, and validate XML and XSL-based content

WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (128-bit), 5733-WA3, supports 128-bit data encryption capability and cannot be exported outside the USA and Canada except to selected customers who meet certain standards set by the United States Government. WebSphere Application Server Version 3.0.2, Advanced Edition for AS/400 (56-bit), 5733-WA2, supports 56-bit data encryption. It is not restricted to the USA and Canada.

Connect for iSeries 5733-B2B

Connection for iSeries integration framework for business to business (B2B) enables seamless and secure integration of your existing core business applications with the business applications of your trading partners. Connect for iSeries helps you achieve low-cost, high-function business integration previously only available with expensive EDI solutions.

The Internet and XML standards enable open, cost-effective, quickly deployed solutions. It's easy to connect your business to a trading service such as the Ariba Network or Intellisys. You can also save expenses as you automate transactions such as purchase orders. Tools, samples, and runtime software aid your B2B integration efforts. Connect is built on industry standards, such a Java and XML, but requires neither Java nor XML skills to use. It works with both Domino and WebSphere platform technologies. In addition, MQSeries provides reliable handling of business transactions. It provides basic tools, connectivity, and catalog functions to help implement B2B solutions effectively and affordably.

With Connect for iSeries, you extend your processes and products to other businesses. You can take advantage of low-cost and pervasive Internet access and widespread use of XML-based business transactions to automate business transactions with your customers and suppliers. Support is built in for some popular Internet business transaction dialects including Ariba's cXML.

Samples and tools help you create connectors to pass these transactions to your existing business applications for processing. It accommodates a variety of integration interfaces including MQSeries messages and mapping the XML transactions to API calls. Not only does this product make it easier and faster to implement your solution, it also insulates your business applications from the likely changes to these XML-based business transactions as technologies mature. Start simple at a very low cost…then grow at your own pace.

Components of Connect iSeries B2B include:

- **Plug-n-Connect**

  An easy integration between an e-marketplace and your business office data or applications. Integration methods supported include program call and queuing mechanisms. With these mappings, optional IBM products could be used to extend the solution:

  – WebSphere Commerce Suite to provide a full-function Internet shopping experience
  – Lotus Domino to add notification and approval automation
  – MQSeries Adapter Offering for added integration with existing business systems

  For more details, see: `http://www.iseries.ibm.com/btob`

- **Electronic Catalog**

  An electronic version of a supplier's catalog usually described in XML. An electronic catalog is often required for a supplier to sell to buyers using e-procurement software or to e-2 marketplaces. The electronic catalog feature enables you to publish catalog information from a variety of sources including integrated file system (IFS) files and DB2 UDB databases. You can render the gathered information into an appropriate e-catalog format for the various eMarketplaces. The electronic catalog feature avoids manual rekeying and dual maintenance of catalog information. You can publish directly from files

where information is maintained. This is especially useful where the catalog is not hosted at the supplier's site.

- **Tools**

  Intuitive tools and wizards enable you to easily install, configure, and deploy Connect components. These tools and wizards simplify the task of setting up a B2B infrastructure when plugging into an e-marketplace and when connecting to your business applications and data. You can generate a catalog from existing databases.

- **MQSeries**

  A specially integrated version of MQSeries messaging is a core technology licensed for use with Connect for iSeries. MQSeries messaging provides the robust and reliable inter application communication necessary for business-critical processes. The use of MQSeries messaging in the Connect for iSeries product provides the flexibility of distributing the solution across multiple systems. Also, the use of MQSeries messaging makes it easy to extend the solution for the future using additional IBM software products such as MQSeries Adapter Offering (MQAO) or MQSeries Integrator.

  Hardware requirements recommended for iSeries 400 servers are 512 MB of memory and one of the following system processors or better:

  – iSeries 400 Model 270 with processor feature #2250
  – iSeries 400 Model 820 with processor feature #2395

  This program also operates with all earlier RISC hardware models of comparable performance specifications, running OS/400 Version 4 Release 5.

  For V4R5, OS/400 has the following install options:

  – IBM HTTP Server for AS/400 or Domino
  – Java Developer Kit 1.1.8 (JDK)
  – AS/400 Toolbox for Java
  – Digital Certificate Manager (5769-SS1 Option 34)
  – Application Server - Domino (5769-LNT) or WebSphere Standard Edition (5733-AS2 or 5733-AS3) or WebSphere Advanced Edition (5733-WA2 or 5733-WA3)
  – Cryptographic Access Provider for AS/400 (5769-AC2 or5769-AC3)

The objective of business-to-business operations is to reduce costs, increase responsiveness, and increase communications between businesses. With Connect for iSeries, you extend your processes and products to other businesses.

IBM WebSphere Host Publisher V2.2 for AS/400 (5648-D31)

WebSphere Host Publisher V2.2 for AS/400 provides a quick and easy way for you to implement e-business applications. With this software, you can extend the reach of mission-critical applications to new users across the intranet and Internet without changing

the existing applications. WebSphere Host Publisher allows you to integrate multiple sources of host data into a single Web page, giving end users the appearance of a single new application.

WebSphere Host Publisher supports applications written for 3270, 5250, VT, Java, and databases that provide a Java Database Connectivity (JDBC) interface such as IBM DB2 Universal Database, Oracle, and Sybase. It supports any HTML-based browser and does not require any specific Java-enabled browser.

The benefits are:

- Provides a quick and easy way to implement e-business by extending your current applications to the Internet
- Requires no change to existing applications
- Consolidates multiple sources of host data into a single Web page
- Extends the reach of your business by allowing you to contact new customers and enabling inter-company projects
- Enables you to gain a competitive advantage by extending your sales channels and providing new Web self services
- Helps improve the productivity of your workforce by enhancing aging applications with new front ends and extending real-time access to your mobile workforce

A Path for New e-business Projects

You can use Host Publisher Integration Objects in new WebSphere applications to provide legacy access to those applications. Therefore, the investment you make in Host Publisher legacy extension today can be leveraged in the new WebSphere applications that you'll create in the future.

Host Publisher can be used to provide host access for new e-business applications and significantly reduce the time and expense that would otherwise be incurred to complete these new e-business application projects. WebSphere Host Publisher V2.2 enables you to extend your current applications to the Internet, providing the quickest and easiest way to implement e-business.

The enhancements in V2.2 are:

- Supports WebSphere V3
- Enables you to extend Host Publisher to remote Java applications and applets with the new Remote Integration Objects (RIO) support
- Provides an XML Gateway that allows program access to 3270 and 5250 application data in an XML format

- Includes an HTML Mapper that provides an HTML entry-level emulator for 3270 and 5250 application access
- Includes WebSphere Studio Professional Edition
- Uses a new licensing method that bases usage on concurrent sessions or connections

Host Publisher Studio

The Host Publisher Studio is a collection of task-oriented, easy-to-use graphical user interfaces that assist the Web application builder in managing and creating Web-to-host projects. It uses task-oriented prompts to guide the user through the creation process, including:

- Recording host and database interactions
- Identifying desired data
- Labeling that data for retrieval

The Studio automatically generates a Java bean, called an Integration Object, which encapsulates the interactions and data retrieval. You can use the Studio to generate a fully customizing HTML Web page for modeling interaction with the Integration Objects and presenting the resulting data. The HTML Web page can be enhanced with Web authoring tools such as, WebSphere Studio, to meet corporate guidelines on style and image. Once the Web page is completed, you can publish it to a Host Publisher Server for production access by end users.

The Host Publisher Studio is provided on a separate CD assembly and runs on Windows 95, Windows 98, Windows NT, and Windows 2000 operating systems.

Host Publisher Server

The Host Publisher Server provides the runtime environment for supporting Web applications created with the Host Publisher Studio. Host Publisher is on a separate CD assembly and works with the IBM WebSphere Standard Edition and other runtime components such as:

- Connection management
- License monitoring
- Run-time administration
- Log and trace management

The Host Publisher product also includes a separate CD assembly for IBM Network Dispatcher to provide load balancing across multiple Host Publisher Servers. The Network Dispatcher can only be used for the load balancing function for Host Publisher. If you require load balancing for other applications or servers, you must purchase these additional copies separately.

Remote Integration Objects (RIO)

WebSphere Host Publisher Remote Integration Object support provides a standard interface for program access to Integration Object data in an XML format. It also provides remote access to Host Publisher server Integration Objects. This enables remote Java applications or applets running on a remote client or server to execute Host Publisher Integration Objects for existing application access as though they were physically running on the Host Publisher server machine. The interface to the Host Publisher Integration Objects is unchanged regardless of whether the customers Java application is calling it from a remote client or is running on the Host Publisher server.

XML Gateway

WebSphere Host Publisher provides an XML Gateway for accessing legacy 3270 and 5250 applications and making that application data available to programs in an XML format.

The Host Publisher XML Gateway also provides an HTML Mapper capability that provides a load-and-go HTML entry-level emulator for 3270 or 5250 application access. Without any customizing, existing 3270 and 5250 applications can be extended to Web users. This capability is targeted at end users who:

- Need occasional access to the host application
- Consider a native terminal screen look and feel to be acceptable
- Do not yet have Java-capable desktops

For Java-enabled users, IBM Host On-Demand should be considered to meet their emulation needs.

WebSphere Studio Professional Edition

The WebSphere Studio Professional Edition is now included as part of WebSphere Host Publisher V2.2. The WebSphere Studio provides all the tools needed for a complete Host Publisher e-business implementation, such as:

- HTML/JSP editing
- New business logic creation
- Site deployment enhancement

You are authorized to install and use up to five copies of WebSphere Studio Professional Edition for every WebSphere Host Publisher purchased. If you require additional copies of WebSphere Studio Professional Edition, you must purchase these additional copies separately.

Enterprise-class Functionality

To enhance performance, WebSphere Host Publisher provides connection pools, which are defined in the Host Publisher Studio. Connection pools are used during runtime to cache

connected, logged on, and ready connections to improve response time to end users. A user-defined number of connections will be started on demand, and remain active in the pool for subsequent requests from any user. This eliminates the overhead of establishing a connection, and connecting and disconnecting each host request.

WebSphere Host Publisher supports object chaining. Object chaining allows you to break a complex task into logical subtasks to improve performance and flexibility, and reduce the administration of creating complex Web pages. For example, you might use chaining in a typical 3270 application that uses multilevel menus. A corporate phone directory might have several menus to take you step-by-step to the point where you can list everyone in a particular department. At this point, you want to display the office location of someone in the list, return to the department list, select a new name, and then display the second person's office location. Object chaining enables you to break the task into several reusable Integration Objects so that the end user does not have to navigate back down through the several menus to reach the department list again.

Secure Sockets Layer (SSL) Security

Host Publisher provides SSL V3 for helping to secure the connections for TN3270E and TN5250 communications with hosts and iSeries 400 and AS/400e servers. The SSL support provides data encryption and server authentication using signed certificates.

The SSL support is now available on a worldwide basis with 128-bit encryption. The encryption level can negotiate to the specific encryption level of the clients (either 128-bit or 40-bit). You should have your IBM representative contact the importing country's Export Regulation Coordinator (ERC) for details.

IBM WebSphere Personalization for AS/400, V3.5 (5733-A47)

WebSphere Personalization provides the run-time extension to WebSphere Application Server (Advanced and Enterprise Editions) that allows deployment of personalized sites developed using WebSphere Studio Advanced Edition.

Customizing a site's content for each site visitor makes the site easier to use, more interesting, and more useful for the site visitor. More visitors can be attracted to a site while also improving the service to each site visitor.

WebSphere Personalization contains the following run-time extensions to WebSphere Application Server that support rules-based personalization of sites:

- **Rules Engine**: Executes the site's business rules. Business rules determine what content is displayed to each site visitor. A site's business rules are defined by the site owner and entered using the graphical rule editor in WebSphere Studio Advanced Edition.

- **Recommendation Engine**: Makes recommendations regarding the content or products to show a site visitor. WebSphere Personalization's Recommendation engine is the LikeMinds collaborative filtering product from Macromedia. Site designers can use LikeMinds multiple approaches (such as individual clickstream data analysis, transaction history analysis, and content similarities) to make recommendations based on the site visitor's interests.
- **Resource Engine**: Allows the site owner to define and manage the users and content on which the rules and recommendation engines operate. An HTML management interface is provided for categorizing users and content into groups and associating dynamic properties with those groups.

The combination of rules-based personalization with collaborative filtering allows a business to choose the mix of personalization strategies that are optimum for their business objectives.

Recommendation Engine

WebSphere Personalization also contains the LikeMinds collaborative filtering product from Macromedia. LikeMinds can use multiple inputs such as individual clickstream data, purchase history, explicit preferences, and product similarities to make product recommendations that help customers decide what to buy. An example of usage for collaborative filtering is in making product recommendations on a business-to-consumer site.

The copy of LikeMinds supplied with WebSphere Personalization is licensed for the storage of 25,000 profiles. This can be expanded by purchasing WebSphere Collaborative Profiles. Each license of WebSphere Collaborative Profiles authorizes a customer to expand the storage capacity of LikeMinds by additional 250,000 profiles. There is no licensing limitation on the number of profiles that can be stored and utilized with WebSphere Personalization rules and resource engines. These run-time extensions can be used with WebSphere Application Server Advanced and Enterprise Editions to deploy rules-based personalization sites with an unlimited number of stored profiles.

Hardware Requirements

For WebSphere Personalization for AS/400, V3.5 Resource and Rules Engines, you need one of the following processors:

- Model AS/400e Server 170 with processor feature number 2385 or Model AS/400e Server 720 with processor feature number 2062 (recommended minimum)
- iSeries 400 Model 270 with processor feature 2252 or iSeries 400 Model 820 with processor feature 2396 (recommended minimum)
- 1 GB of memory (recommended minimum)
- *BASE (client application development software only):
- 500 MB (during install)

- 250 MB (after)
- Option 1 (includes *BASE and WebSphere Application Server environment):
- 650 MB (during installation)
- 450 MB (after installation)
- Communications adapter that supports TCP/IP

Use the AS/400 Workload Estimator for help with sizing all system configurations. Visit the site at: `http://as400service.ibm.com/estimator`

For WebSphere Personalization V3.5 for AS/400 Recommendation Engine, you need:

- For Windows NT
  - A dual Pentium PC running Windows NT Server V4.0
  - Support for a communications adapter
  - 1 GB of disk space
  - 1 GB memory
  - CD-ROM drive
- For Windows 2000
  - A dual Pentium PC running Windows 2000 Advanced Server
  - Support for a communications adapter
  - 1 GB of disk space
  - 1 GB memory
  - CD-ROM drive
- For Sun Solaris
  - A workstation running Sun Solaris V2.6 or V2.7 at the latest available maintenance level
  - Support for a communications adapter
  - 1 GB of disk space
  - 1 GB memory
  - CD-ROM drive

Software Requirements

For WebSphere Personalization V3.5, for AS/400 Resource and Rules Engines, you need:

- WebSphere Application Server V3.5, Advanced Edition or Enterprise Edition for AS/400 (uses the services of the Advanced Edition server included with Enterprise Edition)
- OS/400 V4R4 or later (in an unrestricted state) is needed to install and run:
- Latest Database Group PTF SF99104

- Java Development Kit 1.2.2 provided via the AS/400 Developer Kit for Java (5769-JV1)
- OS/400 Host Servers (5769-SS1 Option 12) for remote installation from the CD-ROM of another workstation
- OS/400 QShell Interpreter (5769-SS1 Option 30) for local installation from the CD-ROM
- AS/400 TCP/IP Connectivity Utilities/400 (5769-TC1) for remote installation from the CD-ROM of another workstation
- DB2 Universal Database (UDB) for AS/400

For WebSphere Personalization V3.5 for AS/400 Recommendation Engine, you need:

- For Windows NT or Windows 2000
  - A Relational Database Management System (RDBMS):
  - DB2 V6.1
  - Microsoft SQL Server V7.0
  - Oracle 8 or 8I
  - Any Open Database Connectivity (ODBC)-compliant RDBMS
- For Sun Solaris
  - An RDBMS
  - DB2
  - Oracle 8 or 8I
  - Any ODBC-compliant RDBMS
  - Any CGI- or JSP-compliant Web server

Database

Database

IBM Licensed Programs: Database Products

IBM System/38 Utilities for AS/400 V4R4, 5769-DB1

The System/38 Utilities is used for running applications written using System/38 Data File Utility or System/38 Query that have been migrated from the System/38. The alternative is to rewrite all these existing System/38 applications. The Text Management/38 component of System/38 Utilities for AS/400 is for use by migrators whose word processing and data processing personnel use the Text Management/38 component of System/38 Personal Services.

IBM DB2 DataPropagator Version 7.1 for AS/400 5769-DP3

DB2 DataPropagator Version 7.1 provides read-only, update-anywhere, and on-Demand replication between relational sources and targets. It defines the architecture for the comprehensive IBM Data Replication solution.

The IBM DataPropagator Relational consists of the following autonomous components:

- Administration
  - Control Center: Included in *DB2 Connect Personal Edition*.
  - Command Line: Commands can be used to create DataPropagator Version 1 registrations and subscriptions. The Control Center or DPRTOOLS must be used for administration of DB2 DataPropagator Version 7.1.
- Capture: Captures changes made to data on replication sources.
- Apply: Reads previously captured changed data and applies it to target tables.

The Administration component for the DB2 DataPropagator Version 7.1 is called the *Control Center*. The Control Center is the integrated administration tool for DB2 Universal Database Version 7.1 and includes replication administration. The Control Center runs on OS/2, Windows NT, Windows 95, and Windows 98 platforms and does not require a local DB2 database. The Control Center is included in the *DB2 Connect Personal Edition* box. A single user license of DB2 Connect Personal Edition is shipped with DB2 DataPropagator Version 7.1.

The Control Center is used to:

- Define tables as sources, called *replication sources*
- Define views and join views as replication sources
- Define target table definitions, called *replication subscriptions*
- Clone replication subscriptions to other servers
- Remove replication sources or subscriptions no longer needed

© Copyright IBM Corp. 2000

Whenever a replication request is submitted from the Control Center, such as defining a replication source, the processing information is generated as SQL statements. Statements can be run immediately or saved to a plain ASCII file. The statements can be edited and run at a later time from a replication folder object in the Control Center.

Deferred SQL files customization of the replication tasks and provides the flexibility as to when and how the SQL files are run.

The *Capture* component captures changes made to data in tables defined as replication sources by reading the database log or journal, without any changes, and asynchronously to business applications. The captured changes are placed in staging tables.

IBM DataPropagator Relational Capture for AS/400 supports the Remote Journal Function, which is available with OS/400 V4R2 and later. This function can significantly reduce the CPU and DASD consumption on the primary production system, by making it possible to off load the data capturing process to a different system. Capture for AS/400 also supports the *ALIAS* feature in SQL which is available beginning with V4R5 of OS/400.

The *Apply* component reads the changed data, previously captured and stored in a staging table, and applies it to the target tables. Apply components can also read data directly from source tables, for example, for a full refresh. Supporting update and refresh copying provides greater flexibility and automation in a replication environment.

The Apply component also enhances the data to your specifications as it copies data to the targets. The full power of SQL can be exploited to:

- Create new columns
- Summarize data
- Translate data
- Join data

Run-time processing statements can be defined using SQL statements and stored procedures before and after the Apply program processes the replication subscription. The run-time processing statements can be run at the source server before the answer set is retrieved and at the target server before and after the answer set is applied. The stored procedures use the SQL CALL statement, newly supported by IBM Replication, without parameters. The run-time procedures are executed together in a single unit-of-work. Acceptable SQLSTATEs can be defined for each processing statement as well.

The Apply component allows the creation of:

- Read-only copies
  - User copy tables, which represent source data at a particular point in time
  - Point-in-time tables, which represent source data at a particular point in time plus some overhead columns

  - History tables
  - Staging tables, which can be used as a source for further copies without recapturing changes, supporting a consistent data environment, and providing flexibility in data distribution across the network

- Updatable copies
  - Replica tables: Updates to a Replica table are automatically applied to the original source table of the Replica, provided no conflicts are detected.

    The Apply component running at the replica site, detects update conflicts after they occur during the subscription cycle. When transactions are rejected, the Apply compensates the transactions at the replica site. During this process, the Apply inserts rejection codes for every rejected transaction in the control table. Conflict detection is provided at three levels: no detection, standard detection, and enhanced detection, specified while defining the replication source. When a conflict is detected and compensated, the replication subscription is considered failed. All related transactions are checked for conflicts and are also rejected.

    After the Apply completes the subscription cycle, the ASNDONE exit indicates that the cycle is complete and whether there were conflicts. An ASNDONE user exit can be used to manage recovery from conflicts.

Data can be a subset for distribution through column and row specifications, replicating only the data needed. Unique to DataPropagator Relational is the ability to subselect for joins and unions, allowing a subset according to a value not in the table being replicated. This can be a key requirement when replicating to mobile laptops from normalized databases where most values are not redundantly stored.

An Apply instance can process many subscriptions at a single site. Multiple Apply instances can run concurrently at different sites/platforms, each processing different numbers and types of subscriptions from the same source. Each subscription can have different definitions, refresh criteria, and timing.

The On-Demand replication capability offers a solution to the challenge of infrequent and unpredictable connections present in the mobile computing community. Data transfers are initiated from the mobile unit where control should be based. This implementation allows downloading from a central server (pulling) or uploading for consolidated processing (pushing).

V7.1 Enhancements

Replicating Large Objects

DB2 Universal Database supports large object (LOB) data types, which include binary LOB (BLOB), character LOB (CLOB), and double-byte character LOB (DBCLOB). This section refers to all of these types as LOB data.

The Capture program reads the LOB descriptor to determine if any data in the LOB column has changed and thus should be replicated, but does not copy the LOB data to the CD tables. When a LOB column changes, the Capture program sets an indicator in the CD tables. When the Apply program reads this indicator, it then copies the entire LOB column (not just the changed portions of LOB columns) directly from the source table to the target table.

To allow the Capture program to detect changes to LOB data, include the DATA CAPTURE CHANGES keywords when you create (or alter) the source table.

Because a LOB column can contain up to two gigabytes of data, ensure that you have sufficient network bandwidth for the Apply program. Likewise, your target tables must have sufficient disk space to accommodate LOB data.

BIGINT Data Type

This new supported data type allows replication of big 8-byte integer data types. This permits the storage and replication of integers larger than 2.1 GB for specialized application needs.

Replicating DATALINK Values

Accessing large files (such as multimedia data) over a remote network can be inefficient and costly. If these files do not change, or change infrequently, faster access to the files and reduced network traffic can be provided by replicating these files to remote sites. DB2 Universal Database provides a DATALINK data type that allows the database to control access, integrity, and recovery for these kinds of files. DB2 Universal Database supports DATALINK values on all platforms except OS/390.

Because external files can be very large, there must be sufficient network bandwidth for both the Apply program and whatever file-transfer mechanism is used to copy these files. Likewise, the target system must have sufficient disk space to accommodate these files.

Features Added to Improve Performance

- The DPRVSN parameter allows the specification of which version of the control tables to create: Version 5 or Version 7.
- The STRDPRCAP command has a new parameter, GENCDROW. The GENCDROW parameter is equivalent to the CHGONLY parameter that is used on the other platforms. It provides the ability to specify that only changed columns are replicated.
- The STRDPRAPY command has two new parameters: DELAY and RTYWAIT. The DELAY parameter specifies the time delay (in seconds) at the end of each Apply program cycle when continuous replication is used. RTYWAIT specifies in seconds how long the Apply program should wait after it encounters an error before it retries the operation that failed. This allows operators to fix a problem encountered before continuous replication is resumed.

- For replication scenarios where the target tables reside on the same system as the Change Data tables, the Version 7.1 Apply/400 code no longer resorts to the use of spill files. This results in a significant performance gain. Users of the remote journal set-up are the primary beneficiaries of this performance enhancement.

iSeries 400 Replication Extensions

- **Remote Journal**: DB2 DataPropagator Version 7.1 can now use the remote journal function. The *Capture* component can now capture changes from a journal setup for remote journal. Journal receivers are replicated to another system by the operating system function of the remote journal. The *Apply* component is modified to access the actual source to a staging area that eliminates work file processing.
- **Relative Record Number Support**: This function is added to DB2 DataPropagator Version 7.1 to address the problem where a unique key could not be found for a copy table. It allows a user to have a unique key for CCD and Point-in-time target tables when no combination of target columns is unique.
- **Additional new iSeries 400 functions**:
  - A new CRTDPRPKG command is added to more easily bind DPropR SQL packages to the appropriate databases.
  - The GRTDPRAUT command is enhanced to allow for granting different DPropR categories of authority to users.
  - Sample ASNDONE and ASNLOAD programs written in C, RPG, and COBOL are provided to help users customize these parts of the Apply process.

IBM Query for AS/400 V4R3, 5769-QU1

Query for AS/400 is an interactive query definition, management, and execution facility allowing users to extract and analyze data from their databases. Queries can be created and modified using a variety of record selection criteria, without programming knowledge. Users can control the formatting of the extracted data for display upon a workstation or printer or save the data in a database file. This program also enables a variety of text-data merge functions in OfficeVision for AS/400.

Query for AS/400 supports two expression operators in the Define Result Field function. These contain similar function for character and graphic data as the SQL Development Kit.

IBM DB2 Query Manager and SQL Development Kit for AS/400 V4R4, 5769-ST1

The DB2 Query Manager and SQL Development Kit for AS/400 provides an interactive query and report writing interface. It also provides precompilers and tools to assist in writing

Structured Query Language (SQL) application programs in high-level programming languages.

DB2 Query Manager and SQL Development Kit for AS/400 contain the following functions to assist in writing SQL queries and application programs for the DB2 for OS/400 database manager:

- **Query Manager**

  The Query Manager program is an interactive query and report generator that allows users to define and run queries accessing DB2 for OS/400 databases. Data edit and report format capabilities are also provided. Multi-system subquery allows subqueries to be performed over a distributed environment.

- **SQL Development Kit**

  The SQL Development Kit provides precompilers for processing embedded SQL statements in the C++, RPG, and COBOL programming languages. Support is provided for the following DB2 for OS/400 functions:

  – IBM SQL Version 1, ANSI X3.135.1992, ISO 9075-1992, and FIPS 127-2 SQL conformance
  – Embedded static, dynamic, and extended dynamic SQL
  – Declarative referential integrity
  – Stored procedures
  – Triggers
  – Two-phase commit transaction management
  – Explain function
  – Long names supported for SQL objects
  – Multisystem subquery
  – ALIAS support
  – Host variables for Large Object (LOB) data types
  – Scalar subselect in the UPDATE statement
  – ALIAS use for database files or members

A significant advantage of the DB2 for OS/400 database manager along with Query Manager and SQL Development Kit is that DB2 for OS/400 SQL objects are compatible with OS/400 objects.

The interactive SQL program allows users and programmers to enter SQL statements and queries interactively. Full syntax prompting is available to assist in defining SQL statements.

IBM DB2 Intelligent Miner for Data for AS/400 V6R1, 5733-IM1

IBM DB2 Intelligent Miner for Data for AS/400 enables knowledge workers to identify and extract high-value business intelligence from large amounts of enterprise data. Version 6

Release 1 (V6R1) offers new analysis and data exploration options to enhance core data mining capability, while making critical data more accessible to those who need it most. Business analysts and managers are empowered to make better informed decisions to improve customer relations, maximize profits, and reduce the risk of fraud and abuse.

DB2 Intelligent Miner for Data for AS/400 V6R1 places increased focus on bringing the value of data mining to more business intelligence users. Enhancements include integration with warehouse and business intelligence tools. Integrated business intelligence offerings leverage product enhancements to deliver end-to-end mining solutions to the business analyst:

- **SAP Business Warehouse:** Joint SAP and IBM technology pilots are underway to enable SAP users to use Intelligent Miner to mine data sourced from their SAP Business Warehouse. Generated models are applied and ported back to the warehouse. As both data and metadata are imported and exported, users define data once.
- **SPSS:** SPSS integration can provide Intelligent Miner for Data users with additional statistical analysis and data exploration capabilities. Other recent SPSS announcements—Version 10 client-server implementation and intent to develop a direct interface for DB2 access—further complement the solution.
- **IBM GBIS:** Global Business Intelligence Solutions continues to offer data mining consulting, recognized as the best in the industry
- **Enhancements targeted to the data mining analyst:** DB2 extended column names are used by the Intelligent Miner. DB2 DataJoiner can be used by the Intelligent Miner to mine non-DB2 databases, including both read and write operations.
- **Enhancements targeted to the business analyst:** A powerful new visualizer is provided for interpreting the mining results created by the Associations Discovery algorithm. Actually comprised of a linked set of textual and graphical representations, the visualizer is aimed at facilitating business communication.

Enablement features of the DB2 Intelligent Miner for Data provide the mechanisms for the integration of business intelligence tools. Applying model results to the database enriches the information available to business analysts through familiar business intelligence tools they use every day. Seamless tool integration at the glass facilitates the iterative analysis process. The first tools targeted for integration will offer additional statistical analysis and data exploration options to analysts.

DB2 Intelligent Miner for Data for AS/400 is based on a client/server architecture and mines data directly from DB2 as well as from other data sources using DB2 DataJoiner (see “IBM DB2 DataJoiner Version 2.1.1, 5801-AAR Feature #3049” on page 588). Data and metadata can be exchanged with warehouses and business intelligence tools and applications. Supported clients are Windows 95, Windows 98, Windows NT, AIX, and OS/2.

V6R1 Highlights

- A highly interactive Associations Visualizer facilitates interpretation of mining results produced by Associations Discovery. A variety of textual and graphical representations are provided with user customization and filtering options.
- DB2 extended column names are supported.
- DB2 DataJoiner can be used to mine non-DB2 relational data, including both read and write operations, thereby increasing Intelligent Miner's reach to enterprise data.
- Print support is provided directly to printers, including network printers, for most visualizations, thereby improving communication capability.
- Support for exporting to a comma separated variable (CSV) data format allows users of other business intelligence tools (for example, spreadsheet tools) to further drill down and interpret the significance of mining results. The import of CSV data into Intelligent Miner is supported by additional tools.
- A new “copy to clipboard” capability allows users to copy selected output, with its graphical characteristics, to other business intelligence tools (such as spreadsheet products). This further increases communication to analysts downstream from the actual mining run.
- Usability improvements to the user interface provide more intuitive usage, easier navigation, and better performance.
- Some Intelligent Miner models can be exported to self-contained sample C code. This allows further deployment of models in any user application on any platform.
- A fully documented example is provided to illustrate how some Intelligent Miner models can be exported to self-contained C code. This allows further deployment of models in any user application on any platform.
- SAP Business Warehouse integration allows SAP users to mine Business Warehouse data using the Intelligent Miner for Data products.
- SPSS and SPlus integration improve productivity during the data preparation stage by increasing data exploration and analysis functions available to Intelligent Miner users through one of these statistics packages. The implementation also provides an example of how other business intelligence tools might be seamlessly integrated.

IBM DB2 OLAP Server for AS/400 Version 1.1, 5641-OLP

The DB2 OLAP Server for AS/400 licensed program provides a fast path to turn your warehouse data into business insight. It is built for e-business with tools to help you quickly deploy Web-based analytical applications.

DB2 OLAP Server employs the widely accepted Essbase OLAP technology supported by over 350 business partners and over 50 tools and applications. DB2 OLAP Server for AS/400 delivers results of joint development by IBM and ShowCase Corporation.

DB2 OLAP Server for AS/400 is currently in a beta program.

With DB2 OLAP Server for AS/400, you have:

- A choice of data storage for the server. You can use either:
  - The relational database for SQL access and system management convenience
  - The Essbase integrated multidimensional storage for simplicity and performance
- Performance and scalability support for clients:
  - 32-bit Lotus 1-2-3 and Microsoft Excel support
  - 32-bit Application Manager

DB2 OLAP Server for AS/400 is a strategic member of the IBM Business Intelligence family. It integrates the powerful online analytical processing (OLAP) engine and the application programming interfaces of Hyperion Essbase with the IBM DB2 family of relational databases.

DB2 OLAP Server features the same functional capabilities and interfaces as ShowCase Essbase/400 Version 3.0 including:

- Multi-user read and write access
- Large-scale data capacity
- Analytical calculations
- Flexible data navigation
- Consistent and rapid response
- Dynamic calculation
- OLAP partitioning and replication
- Time series
- Linked reporting objects

The relational storage manager option of DB2 OLAP Server integrates the powerful DB2 relational technology and offers a number of functional characteristics that augment and complement those it inherits from Hyperion Essbase. These include managing data using standard tools and techniques familiar to any IT professional, accessing data using the widely adopted Essbase interface, and industry-standard SQL. These attributes greatly enhance the ability of a business to manage its information, and access it using whatever tools are standard and popular among its business professionals.

DB2 OLAP Server for AS/400 can access iSeries 400 and AS/400e servers across all TCP/IP networks connected to Windows and UNIX clients. It maintains and analyzes data stored in the scalable DB2 Universal Database. DB2 OLAP Server for AS/400 Builder Version 1.1

assists in moving enterprise data to the iSeries 400 or AS/400e server by transforming and simplifying online transaction data into meaningful information. It easily builds data warehouses or data marts using full SQL support. It selects specific data from one or more tables in an OLTP database and moves them to existing tables or new tables created “on-the-fly”. It cleanses data by calling user programs or by entering any SQL statement before or after the distribution.

DB2 OLAP Server for AS/400 includes a comprehensive set of graphical tools for database management, security, and administration for deploying industrial-strength OLAP applications. DB2 OLAP Server for AS/400 includes Hyperion Essbase Spreadsheet Add-in and Hyperion Essbase Application Manager. The Spreadsheet Add-in is desktop software that merges seamlessly with Microsoft Excel or Lotus 1-2-3, turning familiar spreadsheet programs into a tightly integrated OLAP client for DB2 OLAP Server for AS/400. The Builder Add-On program includes the Application Manager that lets the user easily build, modify, and maintain analytical models, calculations, data access security, data loading rules, dimension building, and system management functions.

DB2 OLAP Server for AS/400 operates on OS/400 operating systems over all leading networks and can create and manage star schemas automatically in DB2 databases.

DB2 OLAP Server for AS/400 Products

DB2 OLAP Server for AS/400, Version 1.1 comes with a full-function DB2 OLAP Server.

DB2 OLAP Server for AS/400, Version 1.1 Developer's Edition is licensed for one developer for development only. It contains a full-function DB2 OLAP Server for AS/400.

DB2 OLAP Server for AS/400, Version 1.1 Add-on Programs

DB2 OLAP Server for AS/400 Tools Bundle Version 1.1 contains a copy of the following tools:

- **SQL Interface**: Provides direct access to more than 20 PC and SQL relational databases (DB2, Oracle, Sybase, Informix, and Microsoft SQL Server) and many leading middleware packages such as the IBM and MDI gateways. The SQL Interface moves data and business structures from diverse sources into the DB2 OLAP Server for AS/400 for access and analysis.
- **SQL Drill-Through**: Provides tight links between summary data in DB2 OLAP Server for AS/400 and detail data in Online Transaction Processing (OLTP) and data warehouse relational databases. SQL Drill-Through creates automatically an SQL query that corresponds with the DB2 OLAP Server for AS/400 data in a spreadsheet, executes the query on the relational database, and transparently returns the detailed information.
- **Currency Conversion**: Converts financial data using any currency exchange rate scenario. The Currency Conversion module allows modeling of the impact of exchange

rates and performs ad hoc conversions directly from a spreadsheet or custom application.

- **Application Programming Interface**: Allows the use of standard tools to create custom DB2 OLAP Server for AS/400 applications that take advantage of the powerful data storage, retrieval, and analytical capabilities of DB2 OLAP Server for AS/400. The Application Programming Interface supports Visual Basic, C, C++, and other application development environments and works with Windows 95/98, Windows NT, and UNIX.
- **Extended Spreadsheet Toolkit**: Includes more than 20 macros and Visual Basic (VBA) functions, allowing the user to build custom Lotus 1-2-3 or Microsoft Excel applications that tightly integrate with DB2 OLAP Server for AS/400.

DB2 OLAP Server for AS/400 for AS/400 Partitioning Option Version 1.1 provides a collection of powerful features that makes it easy to design and administer multidimensional databases (cubes or star schemas) that span OLAP applications or servers. Functions can:

- Integrate multiple physical cubes or stars into a single logical cube
- Centrally administer and share metadata
- Allow the connection of cubes and stars with varying dimensionality
- Allow partition replication between centralized and distributed cubes and stars

DB2 OLAP Server for AS/400 for AS/400 Builder Version 1.1 assists in moving enterprise data to the iSeries 400 or AS/400e system by transforming and simplifying online transaction data into meaningful information. Features include:

- Easily builds a data warehouse or data marts using full SQL support. Selects specific data from one or more tables in your OLTP database and moves them to existing tables or new tables created “on-the-fly” by Warehouse Builder.
- Cleanses data by calling user programs or by entering any SQL statement before or after the distribution.
- Implements business rules, such as profit margin formulas or inventory reorder thresholds, using Warehouse Builder's ability to create result columns and assign them meaningful names and descriptions.
- Manages metadata by pre-joining multiple tables, renaming files and fields when transforming the data, and maintaining a metadata repository for information about how the warehouse was created.
- Presets the timing of data transformations, or can be called from applications, which may determine the data transformation schedules.
- Distributes data from DB2 Distributed Relational Database Access (DRDA) data sources other than the iSeries 400 or AS/400e system, including DB2 Universal Database running on OS/390, AIX, and Windows NT.

IBM DB2 DataJoiner Version 2.1.1, 5801-AAR Feature #3049

DB2 Spatial Extender Version 2.1.1, 5801-AAR Feature #2716

DB2 DataJoiner Version 2.1.1 allows access to and the joining of data from different data sources with a single Structured Query Language (SQL) statement and a single interface. That single interface hides all the differences that cause problems when accessing information from different vendor databases on different vendor platforms. With DataJoiner, there is one interface to one database image. It's like having one big database.

DB2 DataJoiner Version 2.1.1 is available on two platforms: AIX and Windows NT.

With DB2 DataJoiner Version 2.1.1, you only need to send one query to get the answer from different data sources. These sources include DB2, IMS, VSAM, Oracle, Oracle Rdb, Sybase, Sybase SQL Anywhere, Microsoft SQL Server, Informix, and others. Global schema allows the creation of joins or views across all of these data sources, easily and transparently. There is only one SQL interface to deal with.

SQL dialects, protocols, operating systems, data types, error codes, and functional differences are all transparent to the application. Similarly, client workstations attached to DB2 DataJoiner only need one client interface to DataJoiner and all other supported data sources are then available. This eliminates the need for each workstation to have client code for each data source and is very efficient and cost effective.

One way DataJoiner provides data transparency is with compensation. DataJoiner can provide functions not available at a data source, enriching the native SQL of the data source. For example, a client can submit a query using DataJoiner to a data source. If that function is not supported (such as Recursive SQL) at the data source, but is supported by DataJoiner, the query can complete successfully. DataJoiner compensates by simulating the function, thus preserving transparent access.

Version 2.1.1 includes a new DataJoiner SQL statement for creating tables in different types of data sources. If the native SQL for creating tables in these data sources includes a unique option, for example, the option in DB2 for OS/390 for specifying the database in which you want a table to reside, it is possible to code this option in the new DataJoiner statement. When a data source table is created with this new statement, it can also be altered or deleted with DataJoiner SQL.

DataJoiner supports Geographic Information System (GIS) data (also known as spatial or geographic data). New data types, spatially-enabled columns, and spatial join capability allow the user to take advantage of geographic data in applications. Powerful two-dimensional functions are included that allow the creation of specific relationships among the defined geographic objects. The following components are included with the DB2 Spatial Extender:

- A set of spatial data types
- A set of spatial operations and predicates
- A set of spatial index data types

DB2 DataJoiner Version 2.1.1 and DB2 Spatial Extender allow the integration of “location or geographic” information with traditional business data and enable the creation of a new breed of business applications, Geographic-Business. Geographic-Business applications employ queries based on proximity, distance, and driving times and provide the option to present the results as maps.

The DB2 DataJoiner base offering includes free of charge a 60-day trial license for the DB2 Spatial Extender. The DB2 Spatial Extender may be installed and used on a trail basis for 60 days from the date of first use of the feature. The DB2 Spatial Extender feature includes a time disabling service, which prevents its use upon expiration of the 60-day trail period. To permanently install and use this feature, purchase the DB2 Spatial Extender License Pack (31L1137).

This DB2 Spatial Extender was jointly developed by IBM and Environmental Systems Research Institute, Inc. (ESRI), a leading GIS company.

Many users of RDBMSs are moving toward nontraditional, object applications, requiring support for a wider variety of real-world data. Examples include more effective handling of text, voice, and image data within RDBMSs. This trend has been accelerated by client/server tools and fourth-generation languages (4GLs) with powerful user interfaces for nontraditional data.

DB2 DataJoiner offers extensive support for nontraditional applications as described in the following list in addition to providing traditional application support that is fully integrated within the database architecture:

- **Large Objects (LOBs)**: Large object support allows multimedia objects such as documents, video clips, images, and sound recordings to be stored in any data source (which support LOBs, like DB2 UDB) and manipulated like other database objects. The size of any one LOB can range up to 2 GB.

  A powerful set of built-in functions, such as search, substring, and concatenation, are supported for LOBs. Additional functions can be defined any time by means of user-defined functions (UDFs).

- **Global User-Defined Types (UDTs)**: Global UDTs allow users to define new data types across multi-vendor data sources, which are represented in the DB2 DataJoiner database using built-in types. For example, a user can define two currency types: CDOLLAR data type for Canadian dollars and USDOLLAR data type for U.S. dollars. These types are distinct in the sense that they should not be directly compared to one another or to the DECIMAL type, although the DECIMAL type might be chosen for the internal representation of both UDTs in the database.

Using DB2 DataJoiner in the above example with the CDOLLAR data type on DB2 and USDOLLAR data type on Oracle, DataJoiner would invoke strong type checking to alert the program to a type mismatch, that is, that the two currency types are of conflicting types without the proper exchange rate conversion.

UDTs, like built-in types, can be used for columns of tables as well as function parameters, including user-defined functions (UDFs). For example, a user can define a data type such as ANGLE (which varies between 1 and 360) and a set of UDFs to act on it, such as SINE, COSINE, and TANGENT.

- **Global User-Defined Functions (UDFs)**: Application developers often want to create their own suite of functions specific to their application or domain. Global UDFs make this possible, expanding the scope of DB2 DataJoiner to include customized business or scientific functions that span multi-vendor data.

  For example, a retail store could define a PRICE data type for tracking the cost of items it sells. This store might also want to define a SALES_TAX function, which would use a given price value as input, compute the applicable sales tax, and return this data to the application.

  These functions can operate over all global database types, including LOBs and UDTs. UDFs allow queries to contain powerful computation and search predicates to filter irrelevant data close to the source of the data. The global SQL optimizer treats global UDFs exactly like built-in functions, such as SUBSTR and LENGTH.

Recursive Global SQL Queries: DataJoiner supports not only multi-vendor bills-of-material queries but also the more powerful forms of recursive queries such as path expressions. Examples of queries that become possible with recursion are:

- Global bills-of-material queries, where a user wants to return subparts of parts, and subparts of subparts, and so on.
- Global path expression queries, where a user wants to calculate the lowest-cost plane fares on multi-hop routes. For example, the following query can be formulated using recursive SQL: Return all possible flights from San Jose to Perth without making a stopover in London or Chicago and with no more than three plane changes.

The global optimizer function of DB2 DataJoiner is capable of making sophisticated transformations for multi-vendor recursive queries and nonrecursive queries, resulting in the selection of better access plans for improved performance.

The combination of global user-defined types and functions can mask the multi-vendor representation of the data and the definition of a set of functions that interpret the multi-vendor data. The global types and functions enable the creation of global function libraries, which can be developed outside of the database and then added to it, thereby extending database functionality.

Stored Procedures: DB2 DataJoiner now supports the invocation of stored procedures. The SQL92 level of function for stored procedure calls is supported. Stored procedures can greatly improve the performance of applications by minimizing network traffic. A stored procedure is an executable module stored on the database server that is comprised of SQL statements and application logic that are performed frequently. When a call to a stored procedure is made, only the instruction to invoke a procedure is passed to the database server instead of passing individual SQL statements.

DB2 DataJoiner compensates for those data sources that do not support stored procedures. In these situations, DB2 DataJoiner runs the stored procedure locally and creates the instructions and SQL necessary for the remote data source to complete the work.

DB2 DataJoiner can be used to invoke stored procedures on database servers that support them such as DB2 for MVS Version 4 and DB2 for OS/400 Version 3.

DB2 DataJoiner can “cascade” stored procedures. This powerful feature means that a stored procedure could start on DataJoiner and call another stored procedure on Oracle, which in turn could cascade others.

With DB2 DataJoiner, application developers and database administrators have greater flexibility in distributing data and applications across various platforms:

DRDA Application Server: The Distributed Relational Database Architecture (DRDA) Application Server (AS) capability allows DB2 for MVS, DB2 for VSE and VM (SQL/DS), and DB2 for OS/400 applications (or any other application that implements the DRDA Application Requestor functionality) to access data located in any of the supported data sources (Oracle, Sybase, and so forth). The DRDA AR support can function across SNA or TCP/IP, and DRDA AS support can function across SNA. With this capability, thousands of existing database applications running on the MVS, VSE, VM, and OS/400 platforms can access data stored in workstation databases. As an example, QMF, in conjunction with DB2 DataJoiner, can now provide access to DB2 and non-DB2 data sources.

Distributed Unit of Work: Distributed Unit Of Work (DUOW) functionality, also known as Two-Phase Commit, provides the capability for an application to read or update tables in more than one database from within a single unit of work with full data integrity.

For example, it is possible to query tax tables in a DB2 for MVS database and concurrently update an Oracle for HP-UX payroll database. Or, money withdrawn from a bank account in one country can be deposited into an account in another during the same transaction. Because these multiple units of work are performed during the scope of a single global transaction, the integrity of the data is assured via Two-Phase Commit feature, even in the case of equipment failure.

Note: On DB2 DataJoiner, Two-Phase Commit is only be supported on those data sources that natively support Two-Phase Commit.

The replication features of DB2 DataJoiner are fully compatible with the DataPropagator log-CAPTURE and APPLY components for the DB2 Family as well as DataPropagator Non-Relational for IMS.

IBM's replication offers transaction consistency, condensing of hot spot updates to minimize network traffic, change propagation through DB2 views (including join views), and update anywhere replication between DB2 databases with transaction conflict detection and automatic compensation.

DB2 DataJoiner extends this capability with database transparency and automatic generation of change capture triggers for Oracle, Microsoft SQL Server, Informix, Sybase, and Sybase SQL Anywhere.

Where triggers are used to capture changes, the tables used to process these changes can be in different distributed tables to avoid a single point of failure. The processes that apply changes to targets can execute locally or on a remote system, offering the same rich function regardless of their location in the network. For example, one such process executing on a Windows NT system provides the same function as it would executing on an MVS system!

A lightweight, update-anywhere capability with row conflict detection, designed for the Microsoft Office environment, lets Microsoft Jet and Microsoft Access desktop database applications interoperate with corporate applications through database replication with DB2, Oracle, Microsoft SQL Server, Informix, Sybase, and Sybase SQL Anwhere. Microsoft Jet is supported for heterogeneous replication only.

DataJoiner also provides a graphical user interface administration tool for defining data sources and targets. The Replication Administration tool runs on Windows NT and Windows 95, and in DB2 DataJoiner Version 2.1.1, it will be available only in English.

Users and administrators of DB2 DataJoiner can benefit from significant performance improvements in a variety of scenarios:

- **Global SQL Optimizer with Global Query Rewrite Capability:** Major enhancements to the Global SQL optimizer strengthen DB2 DataJoiner's leadership position in global query optimization for traditional applications. This new global optimization technology provides the function and performance needed by customers to analyze and exploit vast amounts of valuable information stored in their multi-vendor databases.

  The increasing importance of decision support applications represents an important customer trend that can result in very complex, multi-vendor database queries. These global queries can be written by end users, generated by automatic tools, or produced as a result of many point-and-click application interfaces popular in today's DOS, Windows, OS/2, and UNIX environments. The optimizer incorporates a very sophisticated query rewrite phase that automatically transforms a complex query into a simpler query that matches the capabilities of the data source.

The global optimizer also looks at a great number of alternatives in its search for the best query execution plan while employing sophisticated cost modeling techniques.

There are two key steps for improving query performance:

  - **Pushdown Analysis:** The major task of this DB2 DataJoiner function is to make a recommendation to the DataJoiner optimizer about whether an operation can be remotely evaluated. It is just a recommendation because the DataJoiner Optimizer may choose not to perform an operation directly on a remote data source because it is less cost effective. This recommendation is based on the capabilities known to DataJoiner about this data source, which may include data types, supported functions, the data source specifics known to DataJoiner, and additional server options that a user may have created.
  - **Remote SQL Generation:** The final plan selected by the DataJoiner global optimizer might consist of a set of steps that can operate on the remote data source. For those operations that are to be performed by each data source, Remote SQL Generation is called to generate an efficient SQL statement based on the SQL dialect supported at the data source.

- **Global Explain Facility:** The global explain facility offers detailed information about the access plans chosen by DB2 DataJoiner to process multi-vendor SQL statements. This explain information helps users in their database design by allowing them to:
  - Create more efficient database designs to achieve desired performance objectives
  - Model the impact of environment changes on SQL statements
  - Determine ways in which the performance of applications can be improved (adding indexes or updating table statistics)
- **Global Visual Explain:** Global visual explain is an easy-to-use and robust tool for analyzing and tuning multi-vendor SQL statements. This tool provides an intuitive graphical view of the access plan chosen by the DB2 DataJoiner global optimizer for an SQL statement.

Additional functions include:

- **Full Local Database Functionality:** DataJoiner provides a full-function, industrial-strength relational database. It can be used to store query results, develop and manage snapshots of data from different data sources, and support concurrent transaction processing. The local database offers full backup and recovery, logging, and locking subsystems. DataJoiner also includes a global visual explanation facility and a global performance monitor.
- **Extensive Tool and Application Support:** DataJoiner is designed to support the 1000+ IBM and non-IBM query tools and application development tools that presently support the IBM DB2 family. A complete list of these products is provided in the IBM DB2 solutions directory. These tools include Decision Support tools like Microsoft

Access, Crystal Reports, and Lotus Approach. DB2 DataJoiner can also work with such application builders as Power Builder, VisualAge, and VisualGen.

- **Access to Non-Relational and Relational Data through 3rd Party Gateways:** DataJoiner is designed to support all the relational and non-relational data sources supported by CROSS ACCESS Corporation's CrossAccess Data Delivery System, Information Builders, Incorporated EDA/SQL, and the DB2 DataJoiner generic application programming Interface.

The following licensed products are currently included in the DB2 DataJoiner product box.

- **Net.Data:** OS/2, AIX, and Windows NT platforms. Businesses today want to harness the power of the Web to reach the global marketplace. With IBM Net.Data, it is possible to build interactive Web-sites with data from the sources that are available today such as relational data, file data, or even Lotus Notes data. Whether building interactive catalogs of products, allowing customers to track orders, or conducting electronic commerce, Net.Data-driven applications can make data available to (and from) a worldwide audience.

  It is also possible to leverage existing client/server applications to the Web using existing business logic. Embed dynamic SQL, Java applets and JavaScripts, Perl, and REXX programming in your Net.Data applications, or call DLLs written in C/C++. By exploiting existing business applications, Web applications are up and running quickly with Net.Data.

- **Domino GO Webserver:** A complimentary licensed copy of Domino GO Webserver is included. Domino GO Webserver is a scalable high-performance Web server that runs on a broad range of platforms. Domino GO Webserver provides all the features and functions found in the IBM Internet Connection Secure Server product, plus more! It includes state-of-the-art security, site indexing capabilities, and advanced server statistics reporting.

  With Domino Go, the user can speed beyond your competition by exploiting the latest advances in technology, such as Java, HTTP 1.1, and Web site content rating. Domino GO can communicate through Net.Data to DB2 DataJoiner to access multi-vendor databases and provide real-time access and tremendous power to your Web applications.

The Lotus Approach database is not included within IBM DB2 DataJoiner Version 2.1.1. Lotus Approach, as a component of Lotus SmartSuite, is a powerful tool to analyze and report on DB2 data in dynamic applications for desktop and Web client access. Lotus SmartSuite is available across multiple platforms: SmartSuite Millennium Edition for Windows 95, NT, and 98; Lotus SmartSuite for OS/2 Warp 4; and Lotus SmartSuite 4.5 for Windows 3.1.

For more information on Lotus SmartSuite products, see the following Web site:
`http://www.lotus.com/smartsuite`

For specific hardware and software requirements as well as data sources, see the DataJoiner Web page at: http://www.ibm.com/software/data/datajoiner/

Query Management Facility (QMF) for Windows for AS/400 Version 7, 5697-G24

Query Management Facility (QMF) for Windows is a multipurpose, scalable enterprise query environment for business reporting, data sharing, server resource protection, robust application development, and native connectivity to DB2 for AS/400.

As a general-purpose query environment for DB2 datamarts, data warehouses, and enterprise operational data, QMF for Windows is, in many ways, more powerful and more versatile than special-purpose database front ends and single-user query tools. This is because QMF for Windows is designed for multi-user, production level data access where the broadest base of business operations must be satisfied.

QMF for Windows strategically excels at the most commonly required data access and reporting functions, providing a range of capabilities fundamental to corporate-wide productivity. Building upon the fifteen-plus year history of the QMF family's development in parallel with DB2, QMF for Windows allows you to bring the same standards of performance, security, and reliability to Windows and the Web that you might have traditionally expected only from entirely host-based technologies.

32-bit Windows users (Windows 95, Windows 98, and Windows NT) may explore data within the point-and-click QMF for Windows query interface, build robust reports, automate even the most complex tasks with procedures, and automatically store the resulting QMF “objects” in a common object space shared by other QMF users across the enterprise. Alternatively, the QMF application programming interface (API) allows the user to stay entirely within their favorite Windows applications (such as Lotus 1-2-3, Microsoft Excel, or Microsoft Access) as they execute QMF objects, query multiple DB2 databases, and merge the resulting data into the spreadsheet, database, or other desktop application of choice. The user can quickly convert an unlimited number of existing QMF reports for publishing to the Web server of choice and schedule unattended refreshes, rapidly creating “warehouses” of business reports accessible to all through a Web browser.

These robust data distribution and integration capabilities are packaged with advanced administrative controls, accessible only to authorized database administrators, that prevent waste or abuse of database server resources. Administrators have a wealth of options available, from closing access to a database server altogether, restricting groups of users to a “read only” status (disallowing ad hoc query access), to finely-tuned limits on rows fetched and re-use of connections to the database. Database access techniques such as static structured query language (SQL), uncommitted read, and DB2 stored procedures are supported to minimize contention for database resources and maximize the value obtained

from any given database server. In addition, detailed object use tracking helps locate heavily used (or unused) queries and forms and identify every object ever executed by a user, including how often.

A summary of benefits to users, application developers, database administrators, and the enterprise follows.

User benefits:

- Run queries directly to DB2 from Windows applications
- Integrate QMF objects (queries, forms, and procedures) and commands into Windows applications
- Run ad hoc queries or stored queries
- Save new queries to a local drive, network drive, or as shared QMF queries
- Select existing QMF for Windows objects from drop-down lists
- Run more than one query at a time in the foreground or background
- Query more than one DB2 for AS/400 database server at a time
- Limit size of the query results
- View resource limits in effect
- Access information about queries, such as remarks and tracking
- Use the QMF for Windows interface or your favorite application interface
- Integrate with Excel, Visual Basic, PowerBuilder (all OLE 2.0 compliant applications) using simple application macros or developer environments such as Visual Age for Basic or Visual Basic

Developer benefits:

- Eliminate database gateways, middleware, or ODBC drivers
- Integrate with any Windows OLE 2.0 automation client application
- Call on QMF for Windows services with its API
- Use HELP for supplied sample API code as templates
- Bring industrial strength to ordinary desktop languages
- Leverage skills of the desktop development community
- Query in native DB2 syntax (the server's SQL)
- Get the reliability, performance, and security of DB2
- Let QMF for Windows automatically manage DB2 resources (threads, conversations, states) in the background
- Use performance enhancing technologies, such as static SQL, directly in your Windows applications
- Shield users from the complexity of connections
- Retrieve QMF for Windows objects stored on servers and launch than from within Windows applications
- Eliminate manual export and import procedures from the host to PC

Administrator benefits:

- Protect DB2 from runaway queries and novice users with robust governing
- Use existing DB2 security
- Safely store Windows user resource limits at the DB2 database server
- Supports different limits for different users, groups, and schedules
- Temporarily suspend a user's limits
- Use many governing criteria, including:
  - Schedule by time of day, day of week
  - Maximum rows or bytes to fetch
  - Amount of time a cursor can remain open without being used
  - Amount of time to wait for a response from the DB2 database server
  - Amount of time a connection to a DB2 database server can remain unused
  - Set query isolation level
  - Allow or disallow running static SQL or stored procedures
  - Allow or disallow ad hoc query capability
  - Allow or disallow SQL verbs including:

    ALTER, CALL, CREATE, DELETE, DROP, GRANT, INSERT, REVOKE, UPDATE, COMMENT, EXPLAIN, LABEL, LOCK, SELECT, SET

Enterprise benefits:

QMF for Windows is built for the networked enterprise with the understanding of the need to connect and protect your data sources. QMF for Windows is a unique Windows querying tool, providing:

- Top performance
- Extensive control
- Features for optimizing access to large databases

Governor settings are controlled from the QMF for Windows Administrator, which is included with the product. It is easy to add to the list of servers available to users, bind database packages, grant authority, and administer resource limits by groups and schedules. This gives you control over user actions and resource consumption that can automatically change by day-of-week and by time-of-day.

In addition, QMF for Windows allows the specification of whether it will track usage and execution of QMF for Windows objects.

Now the enterprise can:

- Centralize control over server resources
- Eliminate runaway queries
- Eliminate extended open cursors
- Track user access to queries

- Maintain full security, standard authorizations
- Exploit DB2 performance, system integrity
- Support a variety of DB2 database servers

Centralized installation options:

Administrators can centralize the installation, configuration, and day-to-day client operation of QMF for Windows by opting to contain configuration settings (Server Definition Files (SDFs)), pre-configured client installation packages, or the QMF for Windows product itself on a networked Windows NT server. This allows each user to run the product from the server, have their own SDF or you can create a single SDF that is shared by multiple users over a file-sharing network.

The advantage to these approaches is that they dramatically reduce the installation and configuration of individual client PCs, reduce the total cost of ownership, and allow for a “thin client” installation at each Windows workstation wherever desired.

Connectivity:

QMF for Windows V7 implements distributed relational database architecture (DRDA) and provides native support for TCP/IP connectivity to DB2 for AS/400 V4R3 (or later). For connectivity to SNA environments, it employs the Advanced Program-to-Program Communication (APPC) language and the Common Programming Interface-Communications (CPI-C) interface. By using the CPI-C interface, QMF for Windows operates with the SNA connectivity solution of your choice, such as, IBM eNetwork Personal Communications, Microsoft SNA Server, Novell NetWare for SAA, and others.

QMF for Windows features include:

- DB2 stored procedures.
- Creating and running QMF linear procedures.
- Command line parameters, which allow you to more easily automate start-up procedures and integration with other applications, such as Visual Warehouse.
- Enhanced object tracking, which allows you to view a detailed run history for all QMF objects to locate unused objects, determine frequently accessed data sources (tables/columns), and spot potential problem areas.
- Web publishing, which allows you to convert a standard QMF form to an HTML format.
- Specialized form variables for HTML publishing, which lets you build advanced Web features into your QMF report, such as hyperlink, e-mail link, and embedding images in reports. Includes report preview feature.
- Global Variables for use in QMF for Windows procedures, forms, queries, and session variables.

- QMF Form calculations (requires 32-bit QMF for Windows and IBM Object REXX).
- The most commonly used attributes of form components, now grouped together on a new form dialog for ease of use.
- Custom edit codes can be added to QMF (requires 32-bit QMF for Windows and IBM Object REXX). A sample user edit code routine is supplied that formats U.S. social security numbers, telephone numbers, and ZIP codes.
- Euro currency symbol.
- Control formatting of date and time values in your QMF reports.
- Multiple formatted reports displayed on your desktop at the same time, while performing other application functions.
- Control over the tables and QMF objects that are displayed when users view lists.
- Import/Export data, using the IXF format, that allows you to use your QMF query results to create new (or append to existing) DB2 tables.

Note: QMF for Windows V7 “Try and Buy” can be obtained at general availability of the product from the QMF Web site at: `http://www.ibm.com/qmf`

Note: QMF for Windows has been orderable on other DB2 platforms for several years. The current release of QMF for Windows across platforms is Version 6.1 Refresh. QMF for Windows access to DB2 for AS/400 was initially available in June 1999, via a S/390 license.

Networking

Networking

IBM Licensed Programs: Networking Products

IBM Network Station Manager, Version 2 Release 1, 5648-C07/5648-C08

The IBM Network Station Manager (5648-C07) is available on CD-ROM from IBM Publications. An IBM Network Station Manager with strong encryption (5648-C08) is available in the U.S. and Canada.

Cross-platform network connectivity is supported using the IBM Network Station Browser and Java applets. Applets are similar to applications. They are small applications that load and execute quickly.

The configuration and administration of IBM Network Stations are Web browser-based, so that a central site administrator can configure and manage all IBM Network Stations. A client data and program repository is maintained on the iSeries 400 and AS/400e server. The iSeries 400 and AS/400e file system supports all data management and storage through normal server mechanisms.

Printing support is controlled by the server. The user has a choice of printing on a printer directly attached to an IBM Network Station or on a system printer using supported iSeries 400 and AS/400e printer transforms. The IBM Network Station Manager uses the OS/400 Host Print Transform (HPT) to print to ASCII parallel-interface-attached printers connected to the IBM Network Station. There are over 100 printers that support the Host Print Transform that can be selected from the configuration option of the IBM Network Station.

The IBM Network Station operates without local disk storage. When powered on, IBM Network Station performs initial diagnostics and then contacts the server requesting the IBM Network Station Manager to download the IBM Network Station's program. After the server connection and successful entry of the user ID and password, the predefined user preferences are returned to the IBM Network Station. Various software environments (3270 or 5250 terminal sessions, NC Navigator for Network Station browser, Java, and applets) are downloaded and initiated. User preferences are stored on the IBM Network Station server, providing the user with a personalized network computer on any IBM Network Station the user would select within the network.

The IBM Network Station can also act as an X-Windows terminal, permitting AIX and other UNIX applications to use the IBM Network Station. The IBM Network Station is X11 Release 6 compliant.

Network Station Manager V2R1 can be used on Network Station Series 300, 1000, 2200, or 2800, with 32 MB RAM or higher, connected to the AS/400 system running OS/400 V4R2, or later, and the iSeries 400 servers. For more information on Network Stations, see “IBM Network Station Series 1000” on page 441 and “IBM NetVista Thin Clients” on page 443.

© Copyright IBM Corp. 2000

The IBM Network Station Manager allows the IBM Network Station to execute Windows applications on an Intel-based server, with third-party software such as WinCenter Pro for IBM Network Station, available from Network Computing Devices, Inc. The entire program runs on the Intel server. However, the monitor, keyboard, and mouse functions are redirected across the network to an IBM Network Station. Users can access the entire suite of Windows personal productivity applications and eliminate the demand for occasional users to install Windows-based clients at their desktop. It is not expected that a large number of concurrent users would be supported on an Intel server in this manner. Contact the third-party software supplier with questions regarding Windows applications. Further information on the IBM Network Station can be found on the Web at: `http://www.iseries.ibm.com/periph/network.htm`

Network Station Manager Version 2 Release 1 Enhancements

- New desktop
- New GUI with user-configuration options
- Year 200 ready
- Euro ready
- Security and encryption
- SSL in emulators and browser
- ICA encryption using Data Encryption Standard (DES)
- 16-bit color (Series 1000, 2200, and 2800)
- Broadcast boot for AS/400
- Local Boot (Series 1000, 2200, and 2800)
  - Boot from compact flash (Series 2200 and 2800)
  - Boot from linear flash (Series 1000)
  - Flash memory management
  - Peer boot
- Remote Management (Series 1000, 2200, and 2800)
- X-Client X11R6 X-Windows
- ICA Support
  - ICA Remote Application Manager (Secure ICA 40-bit encryption)
  - Client serial port mapping
  - Audio support (Series 1000, 2200, and 2800)
  - Graphics cut and paste between ICA and X-Windows
  - Protocol compression
- Emulator enhancements (5250/3270/VTxxx)
  - Secure Network transactions (SSL)
  - Full-screen coverage (scalable fonts)
  - Integrated keyboard remapper (VTxxx)
  - Improved NSM management (VTxxx)
  - Converged 5250/3270 UI (VTxxx)
  - Integrated help text (VTxxx)

- Java (Series 1000, 2200, and 2800)
  - Java Virtual Machine (JVM) 1.1.8
  - Javax.com
  - Java Plug-In
- SNMP MIB support
- NLS Enablement
- USB Support (Series 2200)
  - Keyboard
  - Two-button mouse
  - Serial and parallel printers with a cable adapter
- External LAN modem support (Series 1000, 2200, and 2800)
- Browser
  - Netscape Communicator 4.5
  - Netscape JVM
- Browser helper applications
  - PDF Viewer
  - RealNetworks Audio/Video
  - AU and WAV audio
- Manage preferences and configurations using Network Station Manager
- Multiple serial port card support (Series 1000, 2200, and 2800)
- Touch screen support
- Light pen support

IBM Network Station Manager V2R1 is supported on Series 300 (except 8361-341), 1000, 2200, and 2800. Network Station Series 300 requires 48 MB RAM for strong encryption and 64 MB RAM for limited Netscape Navigator 4.5 in conjunction with ICA support. If native JVM support is required on the Series 300, Network Station Manager V3, 5648-C05, must be used. There is limited support for Network Station Model 8361-110 and 8361-210 with at least 48 MB RAM for SBCS NLS.

IBM Network Station Manager V2R1 can co-exist with earlier versions Network Station Manager on the same server.

For a list of devices supported by client serial port mapping, refer to
http://www.pc.ibm.com/ww/networkstation/

Network Programmable Terminal (NPT) 3270 and 5250 client functions are enhanced with V2R1 to offer these features:

- Support of keystroke record and playback, with automated sign-on assistance
- Multi-session capability with an option to disable the creation of additional sessions using Network Station Manager (NSM)

- Include customizable keypads
- Enable local screen copy that supports ASCII, Printer Control Language (PCL), and PostScript printer data streams

Session screen sizes and locations can be specified using Network Station Manager to preserve them between uses. NLS, with over 30 different locales, includes host session window content and help text, menus, and buttons. Additional improvements to client functions include 3489 fax/image display and print and 3270 local server print.

In addition to the Local Boot features, administrators can further balance loads and reduce congestion by using multiple servers. For example, Network Station executables can be spread across more than one server for downloading. This reduces the time needed to boot large numbers of Network Stations and maintains central administration of the Network Stations from a single server.

Navio NC Navigator for IBM Network Station V1.0, 5648-B10 and 5648-B20

NC Navigator for IBM Network Station (5648-B10) with 40-bit encryption is a fully compatible subset of the popular Netscape Navigator 3.0 browser. The currently available Navio NC Navigator (5648-B10) product does not run on Release 3 or later of the Network Station.

NC Navigator for Network Station 5648-B20 (128-bit) can be used to replace the browser included with Network Station Manager (5648-C05) to support the stronger 128-bit encryption available in the United States and Canada. All other functions of the browser are identical to those provided with Network Station Manager.

Key features of NC Navigator are:

- User interface compatible with Netscape Navigator 3.0
- Ability to display Web pages that contain text, HTML, GIF images (including animated GIFS), and JPEG images in a manner compatible with Netscape Navigator 3.0
- JavaScript 1. 1 (same as in Navigator 3.0)
- SSL 2 and SSL 3 encryption at 40-bit level (128-bit available in NC Navigator for Network Station (5648-B20) for the U.S. and Canada or for export), with server and client certificates
- Ability to execute Java applets using the Network Station's Java Virtual Machine (JVM), including those that require authentication. The auto-proxy feature can be used when JVM runs applets from the browser
- Mail client function enables a user to send and receive e-mail using a Post Office Protocol (POP3) server

- News Reader function enables a user to read news items on a NetNews Transfer Protocol (NNTP) server
- Print can be directed to remote printers
- Localized versions in French, German, Japanese, and other languages (in addition to English)
- Ability to invoke the 3270 emulator and Telnet applications from the browser.

Cryptographic Access Provider 40-bit for AS/400 V4R3, 5769-AC1

Cryptographic Access Provider 56-bit for AS/400 V4R3, 5769-AC2

Cryptographic Access Provider 128-bit for AS/400 V4R3, 5769-AC3

The Cryptographic Access Provider products provide the support to secure e-business transactions by implementing the security needed to send proprietary or confidential information over the Internet and corporate intranets. They enable encryption in the iSeries 400 and AS/400e server for use by other products such as HTTP Server for AS/400. One of these Cryptographic Access Provider products must be installed on the iSeries 400 and AS/400e server to enable the secure sockets layer (SSL) function of the HTTP Server for AS/400. SSL is used to enable sensitive online transactions to be performed by providing end-to-end security.

SSL is a security protocol that is widely used to enable secure communications between servers and clients on the World Wide Web. Data transferred between the server and client is encrypted to ensure the data remains private. In addition, the identity of the server is authenticated by the client, through the use of a certificate (or digital ID). Most popular Web browsers support SSL. This means that SSL-enabled Web browsers can establish a secure communications session with the iSeries 400 and AS/400e server, where the browser authenticates the identity of the iSeries 400 and AS/400e server and the data transferred is encrypted.

Cryptographic Access Provider 128-bit for AS/400 (5769-AC3) supports 128-bit data encryption capability and cannot be exported outside the USA and Canada except to selected customers who meet certain standards set by the United States Government. Cryptographic Access Provider 40-bit for AS/400 (5769-AC1) supports 40-bit data encryption and is not restricted to the USA and Canada. Cryptographic Access Provider 56-bit for AS/400 (5769-AC2) supports 56-bit data encryption. It is also not restricted to the USA and Canada.

When Firewall for AS/400 is used in conjunction with the HTTP Server for AS/400 and one of the Cryptographic Access Providers products, AS/400 systems attached to the Internet can send and receive information from Internet users in a secure fashion. The firewall prohibits

unwanted traffic from entering a secure network while the Cryptographic Access Provider encrypts data exchanged over the Internet.

Client Encryption 40-bit V4R4, 5769-CE1

Client Encryption 56-bit V4R4, 5769-CE2

Client Encryption 128-bit V4R4, 5769-CE3

Client Encryption provides Secure Socket Layer (SSL) for use by the Client Access Express for Windows clients (5769-XW1) and the AS/400 Toolbox for Java (5769-JC1). The Client Encryption products include an SSL for Windows 95/NT and an SSL for Java. The 5769-CE1 provides 40-bit encryption, the 5769-CE2 provides 56-bit encryption, and the 5769-CE3 provides 128-bit encryption. The 5769-CE3 is available in the U.S. and Canada only except for selected customers who meet certain standards set by the United States Government.

Note: The Java portion of the 5769-CE2 56-bit product supports 40-bit encryption only.

IBM Cryptographic Support for AS/400 V4R2, 5769-CR1

The main purpose of Cryptographic Support for AS/400 is to provide a means to protect information that is moved outside the perimeter of the protection already provided by the IBM iSeries 400 or AS/400e server and your physical security measures. Additionally, Cryptographic Support for AS/400 can be used to add a level of protection to sensitive data stored within your system's protected environment.

The encryption/decrypting function is performed in accordance with the ANSI Data Encryption Algorithm/Data Encryption Standard (ANSI X3.92). The application-level cryptographic functions include:

- Data Encryption/Decrypting
- Message Authentication Code Generation and Verification
- Key Management
- Personal Identification Number Management

Cryptographic Support for AS/400 can be used to protect information travelling across a communication line or stored in a file on tape, diskette, or other recorded media. It also provides enhanced protection for data in the system’s database.

A main focus for Cryptographic Support for AS/400 is communications security within a financial environment. To accomplish this, Cryptographic Support for AS/400 is compatible with the 4700 Finance Communications Subsystem. The Cryptographic Support for AS/400 licensed program includes the Data Encryption Algorithm microcode for the system.

IBM Corepoint Telephony Version 6 Release 2, 5648-C69

Corepoint Telephony replaces and integrates the Callpath Server for AS/400 (5769-CP4) to provide a comprehensive Computer Telephony Integration (CTI) solution. Corepoint Telephony provides the following features:

- Inbound Call Processing using customer information from business applications, agent information (such as skills and availability), and load balancing information (such as call center volumes) to route an incoming call to an agent best able to serve the caller
- Reporting to generate information to allow managers to measure the effectiveness of their call centers
- Desktop Tools that include a softphone integrated with the PBX/ACD system and integration tools such as JavaBeans and Dynamic Data Exchange (DDE)
- Access Channels that provide computer telephony features such as screen pop, linking calls with data, and intelligent call routing across different customer access channels, including PBX/ACD systems, voice response units (VRU), and Web self-service systems
- Outbound Call Processing to automate the placement of outbound calls by preview, power, or predictive dialing from customer lists

The Corepoint Telephony Base Option for AS/400 (previously named CallPath Server for AS/400 (5769-CP4)) provides an API to the iSeries 400 and AS/400e server application developer and end user, integrating the power of the iSeries 400 and AS/400e server with a telephone system.

The Corepoint Telephony Base Option for AS/400 program enables communication between an iSeries 400 and AS/400e server and a telephone switch allowing the application program to monitor and influence the actions of the switch. The switch might be a private branch exchange (PBX) on the same premises, a central office (CO) switch at the network supplier's premises, or some other type of specialized telecommunication equipment.

Corepoint Telephony Base Option for AS/400 consists of two major components:

- The Telephony API, which installs on the iSeries 400 and AS/400e server as program ID 5769-CP4
- The Corepoint Telephony Base Version 6 Release 2, which installs on the Integrated xSeries Server for iSeries (Integrated Netfinity Server) running Windows NT, or optionally is installed on a network attached Personal Computer running OS/2 or Windows NT, or on an RS/6000 running AIX.

The Corepoint Telephony Base Option for AS/400 program is based on the IBM Corepoint Telephony Services Base Architecture (CSA). CSA provides an API that defines a set of

platform-independent services. These services allow communication between an iSeries 400 and AS/400e server and a telephone switch using Corepoint Telephony. For further information, refer to the *Corepoint Telephony Base Option for AS/400 Planning, Installation and Migration Guide,* GC34-5347.

IBM Point-of-Sale Communications Utility for AS/400 V4R3, 5769-CF1

This product provides the necessary connectivity to allow the iSeries 400 and AS/400e server to be used as an in-store processor (store-and-forward) or as a host system in the retail distribution and supermarket industries. Its menus and display screens follow IBM's Systems Application Architecture (SAA) guidelines.

AS/400 Point-of-Sale Utility provides the following three major subsystems:

- Advanced Data Communications for Stores (ADCS) Emulation
- Host Command Processor (HCP) Emulation
- Point-of-Sale Translation System

The program utilizes the iSeries 400 and AS/400e retail communications support and the Intersystem Communications Facility (ICF) SNA Upline Facility support available in the OS/400 to provide support for IBM programmable POS controllers, but not for fixed-function POS controllers.

The IBM Point-of-Sale Communications Utility for AS/400 program enhances the productivity of the end-user and programmer by providing file translation for data files received from the POS controller. The POS file translation system provides a menu-driven user interface to assist the user in translating the different types of POS files. Sample translation templates for the IBM General Sales application files and the IBM Supermarket application files are provided. The customer can modify or add unique file translation templates to those provided.

By providing the capability for HCP emulation and ADCS emulation, the IBM Point-of-Sale Communications Utility for AS/400 program enables the iSeries 400 and AS/400e server to receive ADCS commands from a host system without operator interaction and enables the user to send ADCS commands to the POS controller. Both an interactive menu interface and a command language interface for unattended operation are provided.

The translation support and archival scheme provided by the IBM Point-of-Sale Communications Utility for AS/400 program improves the capability to manage and access data from a network of retail stores. The translation system provides the option to generate source statements that describe the retail files after conversion to the iSeries 400 and AS/400e database format for inclusion in user application programs. The program also provides an optional archival scheme for POS data retrieved from retail stores. The POS data can be stored on the iSeries 400 and AS/400e server with store number and date as part of the file member name. Options are provided to retrieve data by a specific store and date from

the main memory or to merge data from all stores into a single iSeries 400 and AS/400e database file.

IBM Communications Utilities for AS/400 V4R4, 5769-CM1

The Communications Utilities for AS/400 comprises the MVS/VM bridge and Remote Job Entry (RJE) functions. These capabilities provide interchange of mail and files and the submitting or receiving jobs between connected systems.

The MVS/VM bridge provides support to allow the movement of mail and files to and from a System/370 host system (VM PROFS and RSCS) using the BSC protocol or SNA over SDLC lines, over an X.25 network, or over an IBM Token-Ring Network. The SDLC and X.25 lines can connect through an X.21 interface. This support also includes direct connection to VM/RSCS or MVS using JES2 or JES3. Other operating systems can be reached indirectly through the RSCS or JES network including DOS/VSE using VSE/POWER. Other iSeries 400 and AS/400e servers, System/36s, and System/38s that are connected to an AS/400 system MVS/VM bridge system using SNADS can also exchange mail and files with systems in the network.

An iSeries 400 or AS/400e server with the MVS/VM bridge can act as a bridge between PROFS users and users of OfficeVision for AS/400, Personal Services/36, Personal Services/38, 5520 systems, and DISOSS software. Users can exchange Document Content Architecture (DCA) Final Form Text (FFT) or DCA Revisable Form Text (RFT) documents, notes, and messages with PROFS users.

The MVS/VM bridge capability enables the iSeries 400 or AS/400e server to exchange RSCS files, spooled output, and messages generated using SNA Distribution Services (SNADS) on the iSeries 400 and AS/400e system, the System/36, or the System/38 with VM systems. Other files, such as job streams, generated on an iSeries 400 and AS/400e server, a System/36, or a System/38 can be stored on the VM system and forwarded to the appropriate iSeries 400 and AS/400e, System/36, or System/38 using the MVS/VM bridge.

The RJE portion of the Communications Utilities for AS/400 allows the iSeries 400 or AS/400e server to function as an RJE workstation for the submission of jobs or receipt of output from a host IBM 308x, 3090, 937x, or 43xx using BSC, SNA over SDLC lines, over an X.25 network, or over IBM Token-Ring Network. The SDLC and X.25 lines can connect through an X.21 interface. RJE supports communication with host systems running MVS/SP JES2, MVS/SP JES3, VM RSCS Networking, and VSE/AF POWER.

IBM Distributed Computing Environment (DCE) Base Services for AS/400 Version 4 Release 3, 5769-DC1

Distributed Computing Environment (DCE) Base Services for OS/400 increases distributed computing in the open systems environment for the iSeries 400 and AS/400e server. It includes these basic DCE services:

- Remote Procedure Call
- Cell Directory Client function
- Security Client function
- Time Services

DCE is an integrated set of distributed computing technologies provided by the Open Software Foundation (OSF) Specification Version 1.2.2. The components of DCE form a layer that lies between the operating system and network and the distributed application. DCE enables application programmers to implement an open distributed computing environment, to allow interoperability among distributed applications within a network of multi-vendor systems.

Support of these functions on the iSeries 400 and AS/400e server enables OS/400 to participate in a heterogeneous distributed environment by interoperating with other systems that also support the OSF/DCE standard. OSF/DCE has its origins in UNIX. It is enhanced by the DCE Base Services for OS/400 product to provide the familiar look and feel of the iSeries 400 and AS/400e server with support for system messages, menus, prompts, and help text. iSeries 400 and AS/400e customers can comfortably proceed along a familiar path that leads ultimately into the world of open systems.

IBM Distributed Computing Environment (DCE) DES Library Routine V4R3, 5769-DC3

The DCE DES Library Routine provides data encryption support for the Distributed Computing Environment (DCE) Base Services on the iSeries 400 and AS/400e server. If secure communications are required when using DCE services on the iSeries 400 and AS/400e server, this product must be installed on the system.

IBM Firewall for AS/400 V4R4, 5769-FW1

On 15 February 2000, IBM announced that the IBM Firewall for AS/400 (5769-FW1) product will be supported with its current capability until 31 May 2001. This product will not be enhanced beyond its current V4R4 capability and will be withdrawn from marketing on 29 December 2000. We recommend that customers running the IBM Firewall for AS/400 should plan to implement an alternative solution. V4R5 of AS/400 will be the final release to

support the IBM Firewall for AS/400. See the white paper at http://www.ibm.com/eserver/iseries/firewall for more information about network security and alternative firewall solutions.

A firewall is a blockade between a secure, internal private network, and another non-secure network such as the Internet. A firewall has two jobs:

- It lets users in the internal network use authorized resources that are located on the outside network.
- It keeps unauthorized users who are outside the internal network from using resources on the network.

IBM Firewall for AS/400 enables an Integrated Netfinity Server to function as a firewall on OS/400 V4 systems. This application-proxy-based firewall, enables the Web server and other functions on the main AS/400 processor to be used safely. Since the firewall runs on a separate processor, attacks against the firewall do not affect the AS/400 server's performance. Since the firewall has separate storage, attackers cannot access AS/400 data. The OS/400 TCP/IP stack is completely independent of the TCP/IP stack on the Integrated Netfinity Server.

Firewall for AS/400 helps protect the company's internal network in the following ways:

- It allows authorized users to move through the firewall to the unsecured network while keeping unauthorized users from crossing the firewall into the secured network.
- It prevents the outside world from seeing the structure of the internal network.
- It allows mail to flow in and out of the internal secure network while hiding the network address.
- It allows the establishment of Virtual Private Networks (VPN) that allow encrypted data to flow between firewalls to safeguard data transported across the Internet.

The Internet Protocol (IP) packet filter provides the basic protection mechanism for the firewall. The packet filter is a set of rules that limits IP packet flow into or out of the secure network. It is possible to filter on any of the following fields in the IP packet header:

- Server IP address and mask
- Destination IP address and mask
- TCP/UDP source port
- TCP/UDP destination port
- TCP/IP ack flag
- Secure or nonsecure port

There is a separate proxy server for each server application, such as Telnet, FTP, or HTTP server. The support is provided in the firewall with no software change required on the client. This is an implementation for “hiding internal information”.

SOCKS is implemented in the firewall but requires cooperative SOCKS software on the client, a “Socksified client”. The SOCKS Server provides common support for all server applications using it. This is the newer implementation for “hiding internal information” because it does not require the overhead used by a proxy server, which should improve performance.

After installing a firewall to protect the internal secure network, isolate the Domain Name Services that are accessible inside the secure network so that the internal network structure is not visible from the outside.

The Mail Server works with the domain name server to relay mail between the internal or secure mail server and other mail servers on the Internet using SMTP or SafeMail. The secure mail server is isolated so that the internal network is not visible from the outside.

SafeMail Mail Relay allows secure access to multiple mail servers behind the firewall. Beginning with OS/400 V4R4, mail is not stored on the firewall as it was with the previous implementation of SafeMail. Mail is forwarded directly to the mail server responsible for handling it. Internal mail addresses remain hidden from the Internet. SafeMail provides anti-spamming capabilities.

When Firewall for AS/400 is used in conjunction with HTTP Server for AS/400 and one of the Cryptographic Access Providers Licensed Programs, AS/400 systems attached to the Internet can send and receive information from Internet users in a secure manner. The firewall prohibits unwanted traffic from entering the internal secure network while the Cryptographic Access Provider encrypts data that is exchanged on the Internet.

Several logging facilities are available with the Firewall. Also included is the capability to export the log files to database tables for analysis using SQL queries.

For more information on the IBM Firewall for AS/400, access the firewall home page at:
`http://www.iseries.ibm.com/products/firewall/index.htm`

IBM MQSeries for AS/400, V5.1, 5733-A38

The IBM MQSeries family provides an open, scalable, industrial-strength messaging and information infrastructure, enabling tighter integration of business processes, dynamic workload distribution to form an efficient enterprise- or community-wide system. The MQSeries family consists of three products:

- **MQSeries messaging**: Provides robust middleware for secure and reliable communications across 35-plus platforms (5733-A38)
- **MQSeries Integrator**: Centralizes and applies the rules for transformation and routing of application messaging contents as transmitted by MQSeries (5801-AAR, Feature #6002)

- **MQSeries Workflow**: Enables the capture, visualization, and automation business processes using predefined workflow modules (5801-AAR, #3604)

Business Integration with the MQSeries Family

Business integration means that different computer systems, employees, business partners and suppliers work together to provide the best and most innovative service to the enterprise and its customers. The barriers of diverse computer systems, geographic boundaries, time differences, language and format differences, and different methods of working can all be overcome with the MQSeries family.

Business integration means that it is possible to:

- Connect customers, suppliers, partners, and service providers, while maintaining security and control, to enable newly built and re-engineered applications for more effective business processes (for example, supply-chain management).
- Make mergers and acquisitions a success by integrating dissimilar IT infrastructures from two or more companies so they can work as a single entity.
- React more quickly to market trends and opportunities because IT systems are flexible and dependable, and no longer constraining.

Different hardware and software platforms can behave as if they were designed to work together.

MQSeries for AS/400 Features at a Glance

- Heterogeneous any-to-any connectivity from desktop to mainframe (over 35 platforms supported)
- A single consistent API, shielding developers from networking complexity
- Allows a business to integrate disparate islands of automation
- Time-independent communication
- Guaranteed one-time delivery
- Retains close integration with OS/400
- Makes full use of built-in iSeries 400 and AS/400e features (for example, journaling and CL command interface)
- Enhances work management and security for greater ease-of-use
- An interactive interface to MQ commands to make administration easier for users familiar with other MQSeries platforms.
- Support for remote administration through the MQ Explorer, an element of MQSeries for Windows NT, V5.1

- Improved scalability of MQSeries applications on the iSeries 400 and AS/400e server by increased maximum message and message queue sizes (100 MB and 2 GB respectively)
- MQSeries Bindings for Java and support for multithreaded programs to assist in integrating MQSeries into advanced e-business applications
- The most widely used message-queuing software on the market, with more than 66% market share
- A copy of Candle Command Center Admin Pac for MQSeries is included with MQSeries at no additional charge. Candle Command Center Admin Pac for MQSeries is a selection of Candle Corporation solutions for testing MQSeries applications, configuring MQSeries networks, and managing MQ-based computing enterprises.
- Used by more than 5,000 customers to solve their business integration issues, operating in two-thirds of the top 100 North American and European banks, and installed in 350 out of the top 500 IBM customers.
- EuroReady and Year 2000 ready

Prerequisites include OS/400 V4R5 or V4R4.

The Basics of MQSeries

Supported programming languages and compilers for application development include:

- ILE C/400
- ILE COBOL/400
- ILE RPG/400
- ILE C ++ for AS/400
- AS/400 Developers Kit for Java
- Visual Age for C++ for AS/400

Application Programs and Messaging

The IBM MQSeries range of products provides application programming services that enable application programs to communicate with each other using messages and queues. This form of communication is referred to as *commercial messaging*. It provides assured, one-time-only delivery of messages. Using MQSeries means application programs can be, so that the program sending a message, continues processing without having to wait for a reply from the receiver. If the receiver, or the communication channel to it, is temporarily unavailable, the message can be forwarded at a later time. MQSeries also provides mechanisms for providing acknowledgements of messages received.

The programs that comprise an MQSeries application can be running on different computers, on different operating systems, and at different locations. The applications are written using a common programming interface known as the Message Queue Interface (MQI), so that

applications developed on one platform can be transferred to another. When two applications communicate using messages and queues, one application puts a message on a queue, and the other application retrieves that message from the queue.

Queue Managers

In MQSeries, queues are managed by a component called a *queue manager*. The queue manager provides messaging services for the applications and processes that the MQI calls and the programs issue. The queue manager ensures that messages are put on the correct queue or that they are routed to another queue manager.

Before applications can send any messages, you create a queue manager and queues. MQSeries for Windows provides the utilities to assist with this and to create other MQSeries objects that needed by applications.

Supported Platforms

MQSeries/400 supports a message exchange with other users of the MQSeries on over 35 IBM and non-IBM platforms. A complete list of supported platforms can be found on the Web at: `http://www-4.ibm.com/software/ts/mqseries/platforms/`

Client software provides a remote interface to a MQSeries server. There is no MQSeries client of iSeries 400 and AS/400e currently available. If CICS for OS/400 is installed, MQSeries can interoperate with CICS transactions and can link them with non-CICS environments.

For more information on MQSeries, go to the site on the Web at:
`http://www-4.ibm.com/software/ts/mqseries/plstforms/os400/`

Version 5.1 Enhancements

The enhancements for Version 5.1 of MQSeries include:

- Support for multiple queue managers
- Cluster (or groups) of queue managers
  - Dynamically share workload
  - Balance workload
  - Reroute workload if a system component fails or network path becomes unavailable
- Administration of clusters of queue managers is easier and quicker
- Queue managers in the same cluster can be on different platforms or physically remote from one another

- MQSeries jobs now run in their own subsystem and job attributes can be set by the user (for example, priority)
- Multi-threaded application support assists in integrating MQSeries into advanced e-business applications.

Migration and Upgrade

Technical guidance on migrating from downlevel MQSeries for AS/400 to the V5.1 offering is provided by an Instruction Document SupportPac, obtainable prior to new product availability. Download it free from the MQSeries SupportPac library at:

`http://www-4.ibm.com/software/ts/mqseries/txppacs`

A valid Software Subscription entitles the user to new level MQSeries products at no charge.

MQSeries for AS/400, V5.1, is also available in a shrink-wrapped format as product 5798-AAR, feature #5610.

IBM MQSeries Integrator for AS/400 and DB2 Version 1.1, 5801-AAR, Feature #6002

MQSeries Integrator is powerful message-brokering software to provide real-time, intelligent rules-based message routing, and content transformation and formatting. It seamlessly integrates applications, databases, and networks. MQSeries Integrator is optimized for high volume, in-storage transformation of messages.

The iSeries 400 and AS/400e platform joins the other key platforms on which MQSeries Integrator is available. The refresh level of product at V1.1 is consistent across the MQSeries Integrator offerings on all distributed platforms and is available concurrently for all platforms. Usability, serviceability, and GUI improvements help the user:

- Be more selective when viewing the components that make up a format
- Use a find option
- Browse relationships between components at different levels
- Use import or export functions to extract from a database into a file to edit or import into other systems
- Try out formats and definitions using a visual tester

MQSeries Integrator offers these advantages:

- Makes it easier to integrate applications and data enterprise-wide
- Provides faster access to information
- Shortens time to market

- Improves customer service and reduces overall costs
- Opens up the information in IT systems to suppliers and customers
- Helps leverage the value chain to improve quality and accelerate responsiveness to change
- Relieves the burden of modifying applications every time they are integrated, that is, connected in new ways
- Transforms and routes data outside the application, without the need for valuable programming and communications skills

Messages pass through a central connection point, the hub, that acts as the core for holding enterprise intelligence. It is designed to handle any volume of traffic, no matter how heavy or complex. The hub maintains two types of knowledge:

- Knowledge of the applications to enable transformation of message formats. If packaged applications are involved, application templates enable a quick start to integrating those applications with the rest of the enterprise.
- Knowledge of business rules and information requirements to enable intelligent routing of information to where it is needed. Rules, whether complex or simple, can be defined to tailor information flow.

Transformation
The knowledge of each application is stored just once in the hub and, while intelligent routing (see below) decides where each message is to go. It is translated into the appropriate format. Supplied with the information definition of each application, the transformation engine supplies data in the right format to any receiving application, without the sending application being modified.

Intelligent Routing
Intelligent routing encapsulates business knowledge of how information should be distributed between message-sending and receiving applications throughout the enterprise. This knowledge is stored in the hub as a set of rules that are applied to each message that passes through the hub. Messages are distributed according to criteria applied to the values of fields within the message.

Supported Platforms

MQSeries Integrator supports message exchange with other users of the MQSeries on over 35 IBM and non-IBM platforms. A complete list of supported platforms can be found on the Web at: `http://www-4.ibm.com/software/ts/mqseries/platforms/`

Additional information on MQSeries is available on the Web at:
`http://www-4ibm.com/software/ts/mqseries`

IBM Wireless Connection for AS/400 V4R4, 5798-TBW

IBM Wireless Connection for AS/400 connects iSeries 400 and AS/400e Wireless LAN barcode scanning devices to the iSeries 400 or AS/400e server through a wireless LAN network. This allows support of application requirements such as wireless data collection and wireless barcode scanning. Wireless Connection for AS/400 eliminates the need for a separate controller for wireless barcode scanning applications.

Functions provided include wireless network management, centralized configuration of radio frequency (RF) data collection devices and direct connection to Ethernet and Token-Ring LANs. IBM Wireless Connection for AS/400 supports the IBM 2480 family of wireless LAN products.

A separate feature for the V4R4 offering supports multiple instances of 5798-TBW running on the same system. This is useful to consolidate smaller iSeries 400 and AS/400e servers into one or more larger iSeries 400 and AS/400e data centers. With multiple instances of 5798-TBW, you can manage 5250 mobile devices anywhere in the world. Improved user interface panels, messages, and menus make it simple for IT administrators to manage 5798-TBW.

IBM Wireless Connection for AS/400 supports IBM 248x Portable Transaction Computers (PTCs) configured with 5250 emulation and communications technology. Data transmitted by the PTCs is routed using IP.

For information on mobile devices that work with Wireless Connection for AS/400, refer to this site: `http://www.iseries.ibm.com/wireless/main.htm`

AS/400 Client Access Products

In today's business environment, personal computers prevail as standalone solutions providing networking to a host. As such, the AS/400 Client Access products are closely affiliated with OS/400 operating system functions. In fact, some components of Client Access are provided at no additional charge with OS/400. The Client Access product content is described here.

For more information on Client Access, refer to this Web site:
`http://www.as400.ibm.com/clientaccess`

AS/400 Client Access Family for Windows (5769-XW1)

AS/400 Client Access is the leading PC-to-AS/400 connectivity product for integrating iSeries 400 and AS/400e services with the PC so customers can optimize their investments in both

environments. For example, the Client Access family for Windows product provides connectivity options for all the popular Microsoft Windows operating systems, such as Windows 2000, NT 4.0 (server and workstation), Terminal Server Edition (TSE), 98, 95, 3.1, and 3.11. The following clients are included in the Client Access Family for Windows product:

- AS/400 Client Access Express for Windows client (5769-XE1)
- AS/400 Client Access for Windows 95/NT client (5763-XD1)
- AS/400 Client Access Enhanced for Windows 3.1 client (5763-XK1)

The key functions that are included in Client Access are:

- 5250 display emulation for working with iSeries 400 and AS/400e programs (such as RPG applications, OS/400 screens, using the command line, etc.)
- 5250 print emulation so iSeries 400 and AS/400e output can be directed and printed on PC printers upload PC data to iSeries 400 and AS/400e database
- Download iSeries 400 and AS/400e database information to PC file
- Ability to print PC output on iSeries 400 and AS/400e printers
- Ability to save and share PC files in the iSeries 400 and AS/400e Integrated File System
- ODBC driver for iSeries 400 and AS/400e database access from PC program
- Other middleware (such as remote commands, data queues, etc.)
- Operations Navigator for working with OS/400 resources (only in XE1 and XD1)

AS/400 Client Access Express for Windows (5769-XE1)

This 32-bit Windows client is designed to take advantage of the latest technologies in the iSeries 400 and AS/400e system and Microsoft operating systems. Client Access Express uses the built-in functions of the Windows desktop to enable users to quickly and easily connect to iSeries 400 and AS/400e servers. It also uses recent iSeries 400 and AS/400e advancements, such as NetServer, to provide PC users network print and file serving capabilities. Some highlights of the Express client content are:

- Runs on PCs having Microsoft Windows 2000, NT 4.0 (Workstation or Server), 98, 95, and Terminal Server Edition (TSE) operating systems installed. See Information APAR II11853 on the Client Access Web page for details on Windows 2000 support.
- Supports TCP/IP connectivity.
- Provides enhanced network security through Secure Sockets Layer (SSL) for client functions.
- Utilizes AS/400 NetServer for PC file serving and network print support.

- Contains 32-bit client/server application enablers for iSeries 400 and AS/400e (such as OLE DB provider, ODBC driver, ActiveX Automation Objects, Remote Command, and Data Queues).
- Delivers the latest GUI for new OS/400 (R) V4R4 functions through its Operations Navigator function.
- Improves administration of PC users from a central iSeries 400 and AS/400e through improvements to Microsoft System Policy support and Operations Navigator Application Administration.
- Can be used to connect to AS/400e systems using OS/400 V4R2 or later, or iSeries 400 with V4R5.

Customers are beginning to take a closer look at PC alternatives that are easy to administer centrally (such as something that can be downloaded into a browser or JVM at each use, but can be maintained on the iSeries 400 and AS/400e server). Client Access Express has central administration built into its design. When customers installed the previous Client Access clients, they probably did this by getting the Client Access PC CD-ROM (or creating diskettes) and going to each PC and installing the client code. Since the Express client is exploiting the capabilities of the AS/400 NetServer, any PC running TCP/IP can directly connect to the AS/400 NetServer folder where the Express client is installed and start the installation/migration from there. Furthermore, by combining the use of Client Access options (such as, Silent Install, CWBBACK, CWBREST), iSeries 400 and AS/400e administrators can set up the Express client, selecting only those functions they want their users to have. Then users simply make a TCP/IP connection to the system, start a command, and go the Express client installed on their PCs. Once Express is installed on a PC, it periodically checks the system to see if newer code (service packs or new releases) is in the Express NetServer folder. If there is, it automatically updates the end user's PC. Although Client Access still ships a PC CD-ROM with the family, you will have little use for it when installing the Express client.

The Express client has evolved from the AS/400 Client Access for Windows 95/NT client. A built-in Migration Wizard makes it easy to replace the Windows 95/NT client with the Express client. The following sections describe the additional capabilities the Express client provides to desktop users.

Connectivity

The Express client supports TCP/IP connectivity and uses the standard TCP/IP program shipped with the Microsoft 32-bit operating systems (other Winsock-compatible stacks can also be used). Communications program improvements (significant streamlining and more efficient use of buffers) result in increased stability and better performance. Additionally, the Express client provides:

- Easier communications setup since configuration of your communications link is no longer required. Simply select the Express client application you want to run and then enter the iSeries 400 and AS/400e server name you want to connect to and your user ID and password. The Express client then initiates a TCP/IP session, and the application is connected to the system.
- Multiple user ID support using a single copy of Client Access. This is valuable when using the Windows NT 4.0 server in a multiuser environment, where each is using a different application.
- The following environments, which do not actually need Client Access installed on the user desktop, are also supported:
  - Microsoft Windows NT 4.0 Terminal Server Edition (TSE): This environment enables the Windows NT server to be used as a gateway between end users and the system. This capability is particularly advantageous to Network Station users who want to use Client Access functions such as PC5250 and ODBC. For detailed information on environments and functions supported, refer to Information APAR II11373 on the Client Access Web page.
  - Microsoft Windows NT 4.0 Server with Microsoft Internet Information Server (or IIS) and Microsoft NT 4.0 Workstation with a version of IIS called Peer Web Services. This support provides iSeries 400 and AS/400e database access from Web pages. Refer to “Web Publishing with the Client Access ODBC Driver and IIS” in the Developers Corner of the Client Access Web page for examples on how to access an iSeries 400 and AS/400e database using the Internet Data Connection (IDC) component of IIS or by using Active Server Pages (ASP) scripts.

Security

The iSeries 400 and AS/400e system is designed to protect its resources and data by requiring users to provide a valid user ID and password. The Express client uses TCP/IP Secure Sockets Layer (SSL) Version 3.0 to encrypt information sent between the system and the desktop. It also uses AS/400 Server Authentication to assure connection to the intended iSeries 400 or AS/400e server thus diminishing the risk of unauthorized access in an Internet environment. SSL encrypts the user ID and password plus any other information sent between the iSeries 400 desktop. The Express client offers the flexibility to choose what is encrypted. For example, you may want to encrypt data transmitted via Data Transfer but find it unnecessary to encrypt data sent to your PC printer via PC5250 printer emulation. SSL requires being connected to OS/400 V4R4 or later.

Network File and Print Serving

AS/400 NetServer is being used to satisfy file and print serving needs for end users. NetServer unites integrated file system and iSeries 400 and AS/400e printers into the Microsoft Network Neighborhood. User benefits include increased stability at startup and

shutdown of the PC and better control of user visibility to resources. The only directories or printers that can be seen by end users are those set up as “shared” by an administrator or resource owner. NetServer brings the following additional benefits versus using built-in PC file and print serving functions, including:

- No background tasks (such as cwbuitsk, cwbnpred, cwbsvd, cwbbs), which previously used extra battery power on laptops.
- When using network drives to access integrated file system information or Network Printers to use iSeries 400 and AS/400e network printers, these resources were visible to all end users on the iSeries 400 and AS/400e server. NetServer allows the administrator or owner of a resource to control its visibility to end users. Creating a “share” enables viewing of that resource. If no share exists, users will not see the directories or printers.

Desktop users can now fully satisfy their file and print serving needs through the AS/400 NetServer function. Therefore, all the file and print serving functions currently existing in the other AS/400 Client Access clients have been removed from the Express client. To use the AS/400 NetServer, only the Client for Microsoft Networks (shipped with Microsoft 32-bit operating systems) with file sharing enabled needs to be installed on the PC.

AS/400 NetServer file and printer “shares” are easy to create, locate, and manage by using the Operations Navigator printer list and IFS list. The current file shares can be listed separately to make it easy to quickly explore the contents of a file share or map a drive to it. File shares now support EBCDIC to ASCII conversion.

The AFP Workbench Viewer is also provided so iSeries 400 and AS/400e spooled files (AFP and SCS) or PC files (such as GIF, TIFF, and JPEG formats) can be viewed directly by a PC user. The AFP Viewer provides many end-user productivity aids such as ability to zoom in or search for specific portions of a stored document.

PC5250 Emulation

PC5250 enables users to run iSeries 400 and AS/400e programs, work with OS/400 screens, and send system output to PC printers. PC5250 display emulation provides many capabilities such as customizable keyboard and display support, hotspots, keypad, playback recording, and customizable toolbar—to name a few. The Express client contains PC5250 Version 4.3 has many enhancements not available in the previous Client Access clients, such as:

- Compatibility improvements to the Express client and eNetwork Communications Suite (Version 4.3, or later) so that 5250 emulation uses the Express client functions (such as Data Transfer and configuration) while 3270 emulation uses the Personal Communications functions. These enhancements are handled by the install programs and require no user intervention to set up.

- Connection status messages are displayed on a Windows status bar to provide better visual feedback of the activities occurring when the emulator is connecting, such as establishing a link, connection, and logging on.
- To enable more flexibility and ease-of-use, PC5250 can be started via many options such as from the Start or Configure Session icon, Multiple Session icon, New Menu option from a single click on Client Access desktop, Operations Navigator option, PC5250 icon, and the Client Access System icon.
- The Copy/Cut function now includes a ClipOnlyWhenMarked parameter. Previously, if no area was marked when the copy icon was selected, the entire screen contents would be saved to the clipboard. When ClipOnlyWhenMarked is set to “Y”, PC5250 will ignore the copy/cut operation of the unmarked area.
- To handle scaling and COR, parameters previously had to be set in the .WS or .INI file. Now the Printer Control Panel, under the file menu, is enhanced to give users an easier interface for customizing.
- Configuration options have been added to the Column Separator function to enable non-display and non-print options. This provides consistency to system users doing print screen functions from either color terminals or PCs.
- Euro currency support: Eleven new host code pages (924, 1140 to 1149) and two new PC code pages (923 and 858) are added to support the euro currency sign.
- Code pages were added for ANSI 1252 (Latin 1), ANSI 1254 (Turkish), and Japanese 943 (New JIS support). Support has also been added for Polish 457 keyboards.
- Japan recently implemented a new postal bar code to include an enhanced ZIP code that enables customers to get discounts on bulk mailing. The iSeries 400 and AS/400e SCS and AFP datastreams are enhanced to support the Japanese postal barcode, and PC5250 print emulation is enhanced to support this for PC-attached printers.

Data Transfer

Data Transfer provides an extensive array of graphical interfaces for desktop users and programming enablers for application programmers to retrieve data from an iSeries 400 and AS/400e database or to quickly store PC file data in the iSeries 400 and AS/400e database. Up to 32 iSeries 400 and AS/400e files can be selected and data transferred with one request to a desktop display, PC printer, PC file, HTML file, or directly into an Excel spreadsheet. Specified records or fields of records can also be selected and transferred. Wizards are provided so users can create, modify, and run transfer requests, then save them for later use. Batch transfers are also supported (via the RTOPCB and RFROMPCB commands). The following options are available only in the Express client:

- Users no longer need to set up a system connection through a Client Access connection program because the system name or TCP/IP address can be entered directly into the Data Transfer GUI.

- The Data Transfer GUI now supports an “auto-run” option. This enables a user to create a transfer request, and perhaps place an icon on the desktop for this request. Then they can simply double-click the icon, and the transfer will “auto-run” without additional user intervention. This transfer can also be placed in a start-up session.
- For PC file upload requests, a wizard (on the toolbar icon and on the Data Transfer Tools menu) can be used to: interrogate the PC file layout, present the user with a recommended iSeries 400 and AS/400e file layout (that the user can modify), and create the new iSeries 400 and AS/400e database file definition to receive the uploaded file. Previously, users had to determine and create the iSeries 400 and AS/400e database file definitions on the iSeries 400 and AS/400e before using Data Transfer.
- Database information can now be inserted directly into a section of an existing HTML file. This enables a user who has a Web page of text containing a section with database data to “update” the data while leaving the rest of the Web page text intact. Previously, the entire HTML file was replaced with a table containing the database data.
- Lotus 123.WK4 file formats are now supported.
- Row sizes up to 32 KB are now supported. Previously the limit was 4 KB
- The ability to control truncation of trailing spaces when transferring ASCII text files is now provided. Previously, Data Transfer truncated automatically trailing spaces
- Support for new AS/400 DATALINK commands for linking to HTML tables is now available.
- New transfer profile types (.DTF and .DTT) have been created that are .INI-file based and easier to use and service. The previous file types (.TTO, .TFR, .DT, and .RTO) are also supported.
- Other usability enhancements (such as ability to sort field details, adding various check boxes to Data Transfer GUI) and performance improvements (most noticeably when transferring CSV or BIFF5 files) are also provided.

Application Enablers - Middleware

To assist programmers in the development of client/server applications, Client Access provides significant middleware to enable application development for PC-to-iSeries 400 and AS/400e programming. A variety of key enablers is provided for accessing iSeries 400 and AS/400e resources, such as:

- **AS/400 ODBC Driver (Version 2.5)**: An industry-standard database access interface for Windows users provides SQL access to iSeries 400 and AS/400e database information.

- **AS/400 OLE DB Provider**: OLE DB is part of Microsoft's universal data access standard for 32-bit Windows users. OLE DB is defined as a multiplatform access method for relational and non-relational data. Client Access provides an OLE DB provider (driver) so any client/server application written to this interface can be used to access iSeries 400 and AS/400e resources. The OLE DB provider can be used for record level, SQL calls, Data queues, Remote commands, Stored procedures, CL Commands, and Distributed program calls. The AS/400 SDK for OLE DB and ActiveX, for use with the AS/400 OLE DB provider, is provided as part of the Client Access Express Toolkit.
- **ActiveX automation objects**: Designed for developing client/server applications between the PC and the iSeries 400 and AS/400e server. Objects are provided for working with iSeries 400 and AS/400e servers using Client Access data queues, remote commands, and distributed program calls. Many popular client languages, such as Visual Basic, Delphi, PowerBuilder, and Visual C++ support ActiveX automation objects. Data manipulation objects are also included to make it easy to handle code page conversions. Online help (including example code) is provided and can be accessed from object browsers.
- **PC5250**: Enables programmers to add a PC interface to existing iSeries 400 and AS/400e applications. PC5250 enablers include:
  - Industry-standard emulation EHLLAPI enables programmers to add a graphical interface to applications written to a 5250 interface to perform functions such as host data access, screen scraping, and host automation. This 32-bit support also enables applications currently written to the EHLLAPI of another emulation product to migrate and run unchanged using PC5250.
  - WinHLLAPI support is implemented so customers who have WOSA-compliant applications can migrate to PC5250.
  - PC5250 DDE now includes code conversion support. This provides a more consistent set of DDE APIs thus making it easier to migrate applications across different platforms.
  - Enhanced Non-Programmable Terminal User Interface (ENPTUI) provides 5250 datastream functions such as the ability to show radio buttons and check boxes on end-user desktops that can support these functions (such as a PC versus a 5250 terminal). Users have requested the ability to enable/disable this function to complete certain actions. The PC5250 workstation profile now enables ENPTUI to be turned on or off.
  - PC5250 ActiveX Controls have been added and can be used in any application that supports ActiveX controls (such as Visual Basic and C++). These controls enable host applications to use a list box or button.
  - Recording can now be done in Visual Basic (VB) scripts or a macro. A tool or utility is also included that can convert a macro to VB Script.

- **AS/400 Toolbox for Java**: Includes a series of low-level APIs for accessing iSeries 400 and AS/400e data and resources from a Java program. It also includes a set of GUI classes to present iSeries 400 and AS/400e data to the user from a Java program. The GUI classes use the Java Swing 1.0 (JFC 1.1) framework. The AS/400 Toolbox for Java is a separately installed option of Client Access install. Once installed through Client Access, future updates to the Java Toolbox will be delivered to PC users through the Client Access directory update function
- **Client Access Express Toolkit**: Contains Visual Basic Wizards (for use with the OLE DB provider). The toolkit help file contains useful links to PC files and URLs where sample programs, documentation, headers, libraries, and a variety of sample programs are provided using Visual Basic, Delphi, PowerBuilder, Visual C++, Lotus 1-2-3, and Internet Explorer so programmers can easily start building applications using the Express client APIs. The Express toolkit is shipped on the Client Access Family for Windows PC CD-ROM and is also accessible from the Client Access Web page.

Central Administration of PC Users

Client Access Express was designed with administration in mind. iSeries 400 and AS/400e administrators want to make PC installation easier, control which functions users may install, control which functions users may run, and be able to pre-configure Client Access connections so unskilled users do not need to do configuration. Client Access Express meets these needs by delivering:

- **Microsoft System Policy Support**: Each time a PC is started, system policies are downloaded from a server to the PC and enforced through Microsoft System Policies. Client Access provides policy templates for use with the Microsoft System Policy Editor. The Client Access for Windows 95/NT added support for Microsoft policies in its last refresh (V3R2M0), and the Express client has built onto this support to enable system administrators more control over which Client Access functions are available to PC users. Administrators can create, edit, and change policy information and could, for example:
  - Prevent a specific user from running the Client Access Data Transfer to upload or download data. Users can be restricted from creating a new file but allowing them to append data to an existing file, or they can use only predefined transfer requests. Additionally you could restrict users from running batch uploads/downloads, GUI uploads/downloads, autostart uploads/downloads, use of the Excel add-in, or restrict which iSeries 400 and AS/400e a request may be run against in networks with multiple iSeries 400 and AS/400e systems
  - Restrict the use of Operations Navigator
  - Limit the number of PC5250 sessions a user can start on a per-system basis

  - Restrict iSeries 400 and AS/400e ODBC driver or OLE DB usage on a per-system basis
  - Disable users from changing their passwords or modifying the password expiration warning time frame
  - Pre-configure a user's system connectivity; then when the user starts a Client Access function only pre-configured systems would be available for use
  - Define policies by connection environment. For example, when a user is connecting from the "home" environment, SSL is required. However when using an "office" environment, SSL is not needed.

  Each time a PC is started, the system policies are downloaded from the server to the PC. Policy restrictions can be enforced on a per-user or per-PC basis. This function can be used with any supported OS/400 release.

- **Operations Navigator Application Administration**: Operations Navigator provides an Application Administration function that can be used rather than System Policies for administering the network. Whereas System Policy restrictions are downloaded to the desktop and managed through the Microsoft Windows registry, Application Administration restrictions are maintained in the iSeries 400 and AS/400e user profile. This customizing then "roams" with the user. Administrators can identify:
  - The Operations Navigator functions that can be used
  - The first-level and most second-level folders that can be accessed
  - Control the use of other applications registered to Operations Navigator
  - Restrict or control usage of PC5250, Data Transfer, ODBC, OLE DB, and Remote Command functions similar to what is provided via System Policies
  - Access to third-party plug-ins can be controlled through Application Administration

Each time a PC user connects to an iSeries 400 and AS/400e server, Application Administration checks the iSeries 400 or AS/400e user profile to determine what Client Access functions can be used. This function requires connectivity to OS/400 V4R3 or later.

iSeries 400 and AS/400e Administration and Operations

Operations Navigator is the graphical interface for administering and operating iSeries 400 and AS/400e systems, and is packaged with Client Access Express for Windows. See page 466 for a description of the Operations Navigator functions.

Operations Console

Operations Console enables PC workstations to locally or remotely perform iSeries 400 and AS/400e system operations and services (system console functions), and is packaged with

Client Access Express for Windows. See page 619 for a description of the Operations Console functions.

New Enhancements in Client Access Express for Windows (V4R5M0)

PC5250 Display and Printer Emulation

Information about a PC5250 session is maintained in a .WS profile. This profile can be stored on each PC user's desktop. Or, a system administrator can maintain it on an iSeries 400 or AS/400e server, and all PC5250 sessions can share its use. This enables an administrator to standardize the keyboard, display, etc., settings that are being used. The following new options are now available to PC5250 users.

When PC5250 was first enabled to run natively over TCP/IP protocols, it did not provide the ability to specify a unique workstation device ID. Subsequently it was enhanced to provide this capability. However, the device ID had to be separately defined for each session. Now several methods and capabilities are available for assigning workstation device IDs, for example:

- Part of the device ID could be assigned a generic name (for example “WS1”, or the Windows Computer Name, or the Windows User Name). It could also be prefaced with a “P” for a printer session or a “S” for a display session. And, it could be appended with the session ID (for example, A, B, C) or an auto-incrementing ID (for example, 1, 2, 3).
- Multiple 5250 sessions can share the same .WS profile.
- Users can paste data from a spreadsheet into successive unprotected fields in a 5250 session since the PC5250 paste function now advances the text data from one field to the next whenever it encounters a Tab key.
- A VBScript command has been created to allow other programs to be called from within a PC5250 VBScript Macro.
- When starting a Telnet 5250 session, the PC code page and character set were ignored when creating the device description for the emulation session, and the OS/400 primary language settings were used. Now, PC5250 uses the PC code page and character set (such as keyboard type, code page, and character set) to define the device description to the AS/400 Telnet server when starting an emulation session. This prevents certain types of national language problems.
- Users can enter lower case letters by pressing the shift key when the keyboard is set in Caps Lock mode.
- Users can request to use a different Font file with a particular printer session.
- Users can get either the Enter key or any function (F*n*) keys to repeat when held down.

- Users can eliminate the “no printer selected” message when using the default Windows printer, therefore, eliminating the need for users to handle the “no printer selected” message.
- Users can have a colored blinking cursor.

See Information APAR II12112 on the Client Access Web page for additional details on the above enhancements. The site is located at: http://www.as400.ibm.com/clientaccess

Client Access Express for Windows supports Secure Sockets Layer (SSL) to enable users to encrypt any or all of the functions and information flowing over the network (for example, PC5250, Data Transfer, ODBC, etc.). For those users preferring not to use SSL, their OS/400 signon password will be encrypted over TCP/IP if PC5250 is configured to use “Bypass Signon”.

IBM SecureWay Screen Customizer for Host Integration (with CSD 1.0.2) can be used with Client Access Express PC5250. SecureWay Screen Customizer is a separately ordered license program product that automatically converts PC5250 host screens into an easy-to-use graphical presentation. A default GUI is automatically presented for each 5250 screen at the client and features automatic menu buttons, defined input fields and hot spots. It also includes a Customization Studio that enables an administrator to customize 5250 screens by adding new objects, changing fonts and colors, hiding host fields, reordering workflow, combining data or automatically navigating the user through screens. This product instantly transforms iSeries 400 and AS/400e and mainframe green screens without any programming or host component counterpart. See http://www-4.ibm.com/software/network/screencustomizer/ for additional information.

Summary

With the new Express client, AS/400 Client Access continues to provide desktop users with highly functional frameworks and easy-to-use interfaces to:

- Access network printers
- Work with DB2 Universal Database or other data stored on the iSeries 400 and AS/400e
- Run 5250 applications
- Manage PCs connected to iSeries 400 and AS/400e systems as well as providing a fully graphical interface for administrators and operators who are managing iSeries 400 and AS/400e systems

All future enhancements for the 32-bit environment will be provided in this client. This client should be used if you need any of the following functions:

- TCP/IP connectivity
- Quick start-up time, better overall performance, and reduced PC disk space usage
- A secure network session (for example, encryption)
- Continued enhancements in 5250 emulation and Data Transfer
- Up-to-date Operations Navigator interfaces for administering and operating iSeries 400 and AS/400e systems
- Use of the built-in AS/400 NetServer function for file and print serving
- Improved middleware to make it easier to develop 32-bit client/server applications
- Connection to AS/400e systems running OS/400 V4R2 or later and iSeries 400 with V4R5

You can find more information on Client Access Express at:
`http://www.as400.ibm.com/clientaccess`

iSeries 400 and AS/400e Server Requirements

The Express client can be installed on any AS/400e system running OS/400 V4R2 or later and iSeries 400 with V4R5. iSeries 400 and AS/400e disk storage requirements for the Express client are:

- 65 MB for base code
- Minimum of 10 MB for each national language version (NLV)

Client Workstation Requirements

The Express client supports PCs compatible with Microsoft Windows 2000, NT 4.0 (Workstation or Server), 98, and 95 operating systems. PC memory requirements will vary depending on the workstation operating system, the amount of memory available on the PC, and the number of other Windows applications being used. Some guidelines for determining memory requirements are shown in the following table.

	Windows 95/98	**Windows NT/2000**
Minimum PC Memory	16 MB	24 MB (1)
Minimum PC	80486 DX2 (2)	Pentium (TM)
Processor	66 MHz	100 MHz

1. 32 MB is recommended for Windows NT.
2. Pentium processor is recommended for Windows 95/98.

PC disk space requirements are:

- Typical Install: 58 MB
- Custom Install: Depends upon what is installed; dialog shows space required
- Full Install: 103.5 MB

AS/400 Client Access for Windows 95/NT (5763-XD1)

The 32-bit Windows client called AS/400 Client Access for Windows 95/NT client (5763-XD1) was initially introduced into the Client Access family in June 1996. Enhanced releases of this client were made available in November 1996, February 1997, February 1998, and September 1998. On 07 March 2000, IBM announced that the Client Access Family for Windows (product number 5769-XW1) plans to remove the AS/400 Client Access for Windows 95/NT client (5763-XD1) and the AS/400 Client Access Enhanced for Windows 3.1 client (5763-XK1) from the family in releases following OS/400 V4R5. This information was published in Announcement Letter 200-035 entitled “IBM AS/400 Software Updates and Planning Information”. Technical support will continue to be available for the Windows 95/NT client and the Enhanced Windows 3.1 client until 31 July 2002. Therefore, customers currently using these clients should start formulating plans to migrate to the strategic 32-bit Express client within the next two years.

The Windows 95/NT client has many of the same capabilities as the Express client. However, it has not been enhanced since OS/400 V4R3 so it does not have many of the new capabilities in PC5250, Data Transfer, Operations Navigator, nor does it support Windows 2000 or Me, as the Express client does. Here is a high-level view of the differences of these two clients.

Capabilities	**AS/400 Client Access Express for Windows (5769-XE1, V4R5M0)**	**AS/400 Client Access for Windows 95/NT (5769-XD1, V3R2M0)**
Operating Systems Supported	Microsoft Windows 95, 98, Me, NT4.0 (WS, Server, TSE),2000	Microsoft Windows 95, 98, NT4.0 (WS, Server, TSE)
Connectivity Supported	TCP/IP	TCP/IP, APPC over TCP/IP (AnyNet), SNA/APPC, IPX/SPX
Emulation Included	PC5250 display/print (V4R3)	PC5250 display/print (V4R2), Graphical Access
OS/400 Releases Support: New Capabilities:	OS/400 V4R2 or later OS/400 V4R4	OS/400 V3R2 pr later OS/400 V4R3
Network Security	Secure Sockets Layer (SSL)	

Capabilities	AS/400 Client Access Express for Windows (5769-XE1, V4R5M0)	AS/400 Client Access for Windows 95/NT (5769-XD1, V3R2M0)
AS/400 File and Print Serving	Uses OS/400 built in support (NetServer)	Support bundled in client
Last Enhanced	July 2000S	September 1998
Future Direction	Strategic, ongoing enhancements/ improvements	Stabilized, on end-of-life path

The Windows 95/NT client should be recommended to customers who have any of the following requirements:

- Need SNA/APPC or IPX connectivity
- Need to run an SNA/APPC application over AnyNet (SNA over TCP/IP)
- Graphical Access (PC5250 can be used in place of this)
- Need to run 16-bit PC applications
- Need to connect to a variety of OS/400 system levels (such as V3R2, V4R1, and later)

AS/400 Client Access Enhanced for Windows 3.1 (5763-XK1)

Client Access Enhanced for Windows 3.1 is a 16-bit Windows client that runs on Windows 3.1 and Windows for Workgroups 3.11, and is a replacement for the original Client Access for Windows 3.1 client that was shipped in the AS/400 Client Access Family (5769-XY1). This client has all the capabilities of the original client (except for the RUMBA/400 emulator) plus additional enhancements, such as native TCP/IP support, ability to specify a workstation ID name over native TCP/IP, and to use printer emulation over native TCP/IP. This client is a good migration path for PC users still running on a 16-bit machine. However, it should be noted that this client will be withdrawn from the Client Access Family for Windows product in the release following OS/400 V4R5. Therefore, customers should start formulating plans to migrate to the strategic 32-bit Express client within the next two years. Here is a high-level view of the differences between the original Windows 3.1 client and the Enhanced Windows 3.1 client.

Function	Enhanced Windows 3.1 Client 5763-XK1	Windows 3.1 Client 5763-XC1
Emulation	PC5250 V4.1+	Rumba/400 PC5250 V4.0
Database Query	Yes	Yes
File transfer	Yes	Yes
Communications		
SNA	IBM Router	IBM Router
TCP/IP	Native TCP/IP, AnyNet	AnyNet
Hayes Autosync	Yes	No
Autostart connections	Yes	No
Set up Multiple configurations	Yes	No
Installation /Administration	Yes	No
Silent install		
Install/run from server	Yes	No
Uninstall	Yes	No
Graphical Interfaces	Yes	No
Graphical Access		
System Object Access	Yes	Yes
Graphical Operations	Yes	Yes
AFP Workbench (subset) Client	Yes	Yes
language	Yes	Yes
	Multiple, switchable	Single

AS/400 Client Access Family (5769-XY1)

In keeping with iSeries 400 and AS/400e's direction toward e-business and Internet solutions, and the fact that end users are rapidly embracing 32-bit Windows for their desktops and TCP/IP for their connectivity, Client Access has been gradually retiring its non-strategic clients so that it can focus its development on the platforms important to iSeries 400 and AS/400e customers. The Client Access Family (product number 5769-XY1) was withdrawn on 25 February 2000, and end-of-service occurred on 31 May 2000. This family contained two DOS clients, two OS/2 clients, and the original Windows 3.1 client. This withdrawal was first announced on 10 February 1998 for OS/400 V3R2 customers and on 01 September 1998 for OS/400 V4 customers. Client Access must periodically expire products that have reached their end-of-life cycle so that it can apply its resources to current and future leading technologies in the marketplace. In most cases, there is a replacement or substitute solution with similar or advanced functionality.

In all cases, we recommend that customers move directly to Client Access Express for Windows (5769-XE1):

- If PC hardware or software is an immediate cost issue, Client Access Express for Windows does support a gateway solution using Microsoft Windows Terminal Server Edition. If the Citrix Metaframe software is also installed on the PC server, then DOS, OS/2, and Windows 3.1 users could connect to the PC server and run Client Access Express without having to change their PC hardware or software operating systems. See Information APAR II11373 on Client Access Web page (`http://www.as400.ibm.com/clientaccess`) for more information.
- If customers are running an application using middleware provided in these withdrawn 16-bit clients, then the alternatives below might provide a solution until customers are ready to move their PC users to 32-bit Windows operating systems.

Client in XY1 Family	Migration Path	Considerations
Client Access for Windows 3.1 (5763-XC1)	Client Access Enhanced for Windows 3.1 (5763-XK1)	The Enhanced Windows 3.1 client has all similar capabilities, and provides a Migration Utility to aid the migration
Client Access for DOS Extended (5763-XB1) Client Access for Base DOS (5763-XL1)	Client Access Enhanced for Windows 3.1 (5763-XK1)	Customers would be required to install a 16-bit Windows O/S. They can continue to run their batch transfers and emulation with this client. The Migration Utility aids this migration
Client Access for OS/2 (5763-XF1) Client Access Optimized for OS/2 (5763-XG1)	Personal Communications Host On-Demand	• Personal communications provides an OS/2 solution for emulation and connectivity. However, it is not being enhanced and does not provide identical capabilities to the Client Access solution. • Host On-Demand would be an alternative that could be used in a JVM. It also does not have the same capabilities as the Client Access solution

Client Access Upgrade Options Are Expanded

An upgrade path from AS/400 Client Access Family (5769-XY1) to Client Access Family for Windows (5769-XW1) now exists. Client Access Family was withdrawn from marketing on 25 February 2000 and customers that have licenses of Client Access Family, can now receive a reduced-priced upgrade to Client Access Family for Windows (5769-XW1).

Customers are entitled to an upgrade price for user based 5769-XY1 licenses that they want to upgrade to 5769-XW1 on a one to one basis. If a customer has a license for the processor-based option of 5769-XY1, they are entitled to upgrade to 5769-XW1 user-based

licenses for up to a maximum number of licences allowed by the software processor group. No processor based licence option upgrade is available.

Client Access Family for Windows (5769-XW1) continues to have both user based and processor-based pricing options.

Lotus

Lotus

IBM Licensed Programs: Lotus Products

Domino for AS/400 is the leading groupware solution available for the iSeries 400 and AS/400e server. It provides unparalleled capability for iSeries 400 and AS/400e customers to use their business data in collaborative e-business solutions, both within their organizations and with their partners over the Internet. Domino for AS/400 provides a critical foundation as companies begin to move from “information overload” into organizational learning and knowledge management. No competitive product offers the ease of use, low cost of ownership, tight integration, and positioning for the future that Domino for AS/400 delivers. Domino for AS/400 is offered with familiar iSeries 400 and AS/400e terms and conditions for purchase, services, and support.

OS/400 V4R5 supports R5 or later versions of the Lotus Domino Server for AS/400 only.

Lotus Domino Server for AS/400, 5769-LNT (V4R5)

Lotus Domino Server for AS/400 has been updated to offer you more options for choosing Domino servers and clients for your iSeries 400 or AS/400e server. You can select the function and capability you need in the Domino server without paying for something you don't need.

Domino Server Choices

Mail Server

The Mail Server license gives you the right to use Domino server for mail on systems with up to four CPUs with no Domino partitioning.

Application Server

The Application Server license gives you the same functions as the Mail Server plus the ability to host custom applications including:

- Lotus Quick Place
- IBM WebSphere Application Server
- Domino Enterprise Connection Services on systems with up to four CPUs with no Domino partitioning

Enterprise Server

The Enterprise Server license gives you the same functions as the Application Server plus:

- Notes clustering
- Browser clustering

© Copyright IBM Corp. 2000

- Partitioning
- SMP on systems with one to nine CPUs with Domino partitioning

Advanced Enterprise Server

The Advanced Enterprise Server license gives you the Enterprise Server capabilities on systems with more than eight CPUs with Domino partitioning.

Client Server Choices

iNotes

The iNotes Client allows you to have one Mail CAL (Client Access License) cc:Mail license.

Notes for Collaboration

The Note for Collaboration Client gives you access to iNotes and Collaboration, cc:Mail, CALs for mail, and on-mail usage.

Domino Designer

The Domino Designer Client includes a development environment for building rapid applications, Notes client, and Client Access Licenses.

Lotus Domino R5 Mail Server

The Domino Mail Server is supported on OS/400 V4R3, or later. It can be licensed for deployment on systems with one to four CPUs with no Domino Partitioning. For larger systems, see “Lotus Domino R5 Application Server” on page 646, “Lotus Domino R5 Enterprise Server” on page 648, and “Lotus Domino R5 Advanced Enterprise Server” on page 651.

To find out more about the Domino Mail Server Messaging Solution, visit the Lotus Web sites:

- `http://www.lotus.com/domino`
- `http://www.lotus.com/messaging`

Key Features and Benefits

- Go Home on Time: Unequaled reliability, manageability, and performance
- Integrated, Collaborative Services
  - World-class e-mail
  - Web access
  - Calendaring
  - Group scheduling

  - Bulletin boards
  - News groups
- Internet Messaging, Only Better:
  - Native Internet addressing
  - SMTP routing
  - MIME content
  - S/MIME
  - SSL
  - POP3
  - IMAP4
  - LDAP
  - HTTP
  - HTML
  - SNMP
- Built-in Upgrade Tools: Automatically upgrade users without disrupting service or losing valuable data:
  - Lotus cc:Mail
  - Microsoft Exchange
  - Lotus Organizer
  - Other systems
- Pick a Client - Any Client: Access Domino mail with the industry leading Lotus Notes client, or use single-purpose clients like:
  - Eudora
  - Microsoft Outlook Express
  - Netscape Mail

The Power to Connect People — Easily, Securely, Reliably

The Lotus Domino Mail Server is the most powerful messaging server for corporate intranets and the Internet. Its integrated services deliver proven reliability, superior administration capabilities, and unbeatable performance for any size organization.

One Infrastructure to Deploy and Manage

Domino Mail provides a unified architecture for e-mail, Web access, online calendaring and group scheduling, collaborative work spaces, bulletin boards, and news groups. Unmatched mobile capabilities and support for the widest array of clients, from Lotus Notes clients to Web browsers, gives users secure messaging anytime, anywhere.

More Choices, Less Cost

Domino Mail runs on your existing hardware, software, and networks. It operates seamlessly with other messaging systems using open standards. Centralized desktop control, message tracking and monitoring, and remote server management enable consistent IT support for field offices, further reducing cost of ownership. Optimized add-on products, such as desktop fax and integrated document management, make it easy to add value and extend your messaging infrastructure.

The Domino Server Family

The Domino Server Family is an integrated messaging and Web application software platform that can help you:

- Improve customer responsiveness
- Streamline business processes

You can rely on the top-rated, global service and support of Lotus, IBM, and our worldwide network of Business Partners to help you maximize the return on your Domino infrastructure investment.

Domino Mail Leads the Industry in Reliability and Manageability

- **Easy installation and configuration**: Default settings let you get Domino Mail up and running in minutes.
- **Message tracking and monitoring**
  - Track all messages, even across Domino domains
  - Check the status of any message
  - Proactively monitor the status of mail server tasks such as SMTP, IMAP, and LDAP
- **Cross-domain administration**: Centrally administer all servers in the organization:
  - Change user names
  - Add and delete users
  - Move users
  - Upgrade servers
- **Automated mail server usage reporting**: Proactively manage the messaging environment via direct statistical analysis of server performance and connectivity (for example, track the number of mail users versus HTTP users connected to a server).
- **Expert analysis tools**: Analyze server functions over time, for performance tuning, capacity planning, and trend prediction. Set and track service level agreements, correlate performance statistics, and more.
- **ISpy**: Obtain service level statistics on any IP service running on a Domino server. Automatically probe your entire mail infrastructure to proactively isolate potential problems.

- **Centralized control of Notes Desktops**: Organizations that use the powerful Lotus Notes client for mail can centrally configure desktop settings like home server and UI preferences.

Domino Mail Offers the Industry's Leading Messaging Services

- **The most flexible security model**: Integrated X.509 support lets you register new users with Notes or X.509 certificates. S/MIME support ensures message integrity for all client types. SSL V3 is available for IIOP and LDAP clients. Authentication via trusted third-party directories reduces complexity and duplication of information.
- **More control over routing**: Gives you the flexibility you need to increase performance and reduce transmission costs, thwart spammers, filter junk e-mail, and easily enforce quotas on message and mail file size.
- **An enterprise-scale, LDAP directory**: Supports a multi-enterprise infrastructure of any size. Integrates with other directories via full support for LDAP V3, the open standard for directory access. Extensible schema allows you to store any information you choose. Synchronizes user accounts with the Windows NT directory.

The World's Best Mobile Support — Now Better than Ever

Just-in-time encryption enhances mobile security. The highly compressed Directory Catalog lets you put the entire corporate directory on mobile desktops.

Integrated Collaborative Services

Access the Web, integrated calendar, and group scheduling features, newsgroups, bulletin boards, and shared online work areas with any standards-based mail client.

Domino Mail Offers Administrators More Choices

Domino now offers simple, flexible administration, and Web-based administration.

With the Domino Administrator, you can manage every aspect of your entire Domino deployment (even across domains) with one intuitive, task-oriented interface.

Authorized administrators can perform tasks like creating users and groups and monitoring mail from anywhere, via a Web browser.

Domino Mail Easy to Extend

Domino Mail provides you with an easy upgrade path to other servers in the Domino family, with complete investment protection. Other Lotus products that extend and add value to your Domino Mail investment include:

- Lotus Fax for Domino for network-based fax capabilities from Notes
- Lotus mobile and wireless products for data synchronizing, wireless messaging, and remote access
- Lotus Domino.Doc for integrated document management

Lotus Domino R5 Application Server

The Domino Application Server is supported on OS/400 V4R3 or later. It can be licensed for deployment on systems with one to four CPUs with no Domino Partitioning. For larger systems, see “Lotus Domino R5 Enterprise Server” on page 648 and “Lotus Domino R5 Advanced Enterprise Server” on page 651.

To find out more about the Domino Application Server and other Domino server products, visit the Lotus Web site: `http://www.lotus.com/domino`

Key Features and Benefits

- **Integration with Enterprise Systems**: Leverage current information assets with built-in connection services for live access to relational databases, transaction systems, and ERP applications.
- **Optimized for collaboration**: Provides comprehensive application services like workflow and messaging, so you can easily build and manage integrated, collaborative solutions.
- **Simplified deployment and maintenance**: Integrated development tools, standards support, and unmatched server-to-server replication simplify rollout, maintenance, and rollback of applications.
- **Open for more choices**: Use your favorite HTML authoring tools, Java IDEs, and scripting tools to create Domino applications.

The Power to Connect People — Easily, Securely, Reliably

The Lotus Domino Application Server is an open, secure platform optimized to support rapid delivery of collaborative Web applications that integrate your enterprise systems with dynamic business processes.

Increase the Return on Current Investments

Domino Application Server enables you to further leverage current Web investments. Domino Enterprise Connection Services (DECS) provides rapid connectivity to enterprise data. CORBA/IIOP support lets you integrate Domino with your applications architecture.

Create Higher-value Applications

A comprehensive development environment, the Domino Application Server lets you move beyond static Web sites to create high-value business solutions that include workflow, content management, and highly flexible security. No platform makes it easier to create self-service applications like e-commerce and customer care, and connect them to backend systems.

The Domino Application Server Is a World-class Web Application Server

CORBA/IIOP support extends Domino application services to Web clients, for integration with your existing applications architecture. Serve Lotus Notes clients and Web browsers with the same applications.

With flexible and pervasive security, you can personalize access to data and applications based on individual and group roles. Extend Domino security to HTML files and other data for pervasive security, no matter how or where Web content is stored.

With an enhanced HTTP stack, the Domino R5 HTTP engine delivers outstanding performance and Java servlet support.

The Domino Application Server Offers the Industry's Most Comprehensive Array of Services

- **The most flexible security model**: Integrated X.509 support lets you register new users with Notes and/or X.509 certificates. S/MIME support ensures message integrity for all client types. SSL V3 for IIOP and LDAP clients. Authentication via trusted third-party directories reduces complexity and duplication of information.
- **An enterprise-scale, LDAP directory**: Supports a multi-enterprise infrastructure of any size. Integrates with other directories via full support for LDAP V3, the open standard for directory access. Extensible schema allows you to store any information you choose. Synchronizes user accounts with the Windows NT directory.
- **The world's best workflow**: Easily define processes to route and track documents and to coordinate activities both within and beyond your organization.
- **Enhanced search services**: Domain-wide searching across all your Domino applications and the file system, built-in search security, universal filters, and more.
- **An Integrated Development Environment**: Domino Designer is optimized to work with Domino and features a complete set of visual tools for rapid development and deployment of secure, e-business solutions. It supports your favorite tools for HTML authoring, Java development, and scripting.

DECS for Live Access to Enterprise Systems

- **Comprehensive connectivity**: Domino Enterprise Connection Services (DECS) supports a wide range of enterprise systems, including DB2, ODBC, EDA/SQL, SAP, and more. The connectors for relational databases are included with Domino. Connectors for ERP applications and transaction processing monitors are sold separately.
- **The most efficient integration available**: Access or update enterprise data from your Web applications in real-time, via persistent, parallel, pooled connections.
- **Your choice of development options**: Connect to enterprise data non-programmatically via the easy-to-use DECS interface or programmatically from Java or LotusScript.

Domino Application Server Delivers Unmatched Reliability and Manageability

- **Transaction logging for Domino databases**: The industry standard for reliable data storage. Ensures complete data integrity for updates and facilitates incremental database backup and fast restart after system failures.
- **Remote server management options**: Improve convenience for administrators and provide consistent IT support for field offices with remote server management via the Domino Administrator, optimized administrative tools, Web-based administration, batch console commands and more.
- **Centralized control of Notes Desktops**: Organizations that use the powerful Lotus Notes client for mail and applications can centrally configure desktop settings like home server and UI preferences.
- **Mail server capabilities**: The Domino Application Server also delivers powerful administration and the unmatched Internet messaging functionality found in the Domino Mail Server such as e-mail, calendaring and group scheduling, bulletin board and news groups.

Lotus Domino R5 Enterprise Server

The Domino Enterprise Server is supported on OS/400 V4R3 or later. It can be licensed for deployment on systems with one to eight CPUs with Domino Partitioning. For larger systems, see “Lotus Domino R5 Advanced Enterprise Server” on page 651.

To find out more about the Domino Enterprise Server, visit the Lotus Web site:
`http://www.lotus.com/dominoenterpriseserver`

Key Features and Benefits

- **Failover for mail and applications**: Ensure continuous access to your Domino messaging system and applications. If a system fails, users can keep working with minimal disruption, from the point of their last replicated transaction.
- **Dynamic load balancing**: Automatically maximize performance and scalability, even at times of peak usage.
- **Server consolidation**: Consolidate servers enterprise-wide, while distributing ownership of server resources through unlimited partitioning. Cluster any combination of Domino platforms, across any LAN or high-speed WAN. Use a built-in analysis tool to consolidate systems easily.
- **Billing services**: Track, report, and analyze system usage for billing, charge back, and capacity planning.

Maximum Up-time for Applications

The Domino Enterprise Server delivers the industry's highest level of availability for applications. Within a Domino cluster, replicas of applications, including Web applications, remain continuously synchronized on a per-transaction basis. If a clustered server goes down, users are immediately transferred to another, fully updated instance of the application.

Server Consolidation Choices

You can configure Domino clusters independent of the hardware platform, operating system, or location of individual servers. And you can partition individual systems to support an unlimited number of Domino servers. This unparalleled flexibility lowers cost of ownership and maximizes utilization of resources, across any size deployment.

Only Domino Enterprise Server Offers These Unique Benefits

- **Highest availability for applications**: If a server or application goes down, users are immediately redirected to another server in the cluster. Domino replication synchronizes application replicas up to the last transaction performed. Events are cached for later delivery to unavailable servers.
- **Most efficient use of server resources**: Within a cluster, dynamic load balancing guarantees optimal resource usage, and optimal response times, under all load conditions.
- **Maximum scalability**: To increase capacity, simply add servers to the cluster as workload increases. Use partitioning to deliver hosting capabilities, by running an unlimited number of Domino servers on a single system.
- **Disaster recovery**: Keep an emergency backup server up-to-date with your production mail and application environment. You can even cluster Domino Enterprise Servers across multiple locations over a WAN.

- **Support for consolidation and upgrading**: Cluster new Domino Enterprise Servers in parallel with systems to be replaced, and then “fail over” to the new servers with no disruption of service. Cluster Domino R4.6 and R5 servers together to maximize reliability during your upgrade.

Domino Enterprise Server Offers Total Flexibility to Meet Any Organization's Requirements

- Cluster up to six servers, even mix Domino platforms
- Cluster any combination of Domino R5 and Domino R4.6 servers
- Deploy multiple clusters in a Domino domain
- Include partitioned servers within clusters
- Span multiple LAN segments to create campus-wide clusters

Domino Enterprise Server Delivers Unequaled Availability in Even the Largest Deployments

- **Web clustering**: The new Internet Cluster Manager (ICM) extends failover and load balancing capabilities to Web browsers, offering enhanced reliability for Web applications.
- **Unlimited numbers of partitions per server**: Maximize your investment in massively scalable platforms like UNIX, iSeries 400 and AS/400e, and S/390.
- **Transactional logging for Domino databases**: The industry standard for reliable data storage. Ensures complete data integrity for updates and facilitates incremental database backup and fast restart after system failures.
- **Enhanced backup support**: APIs allow tight integration with third-party backup tools on all Domino platforms.

Domino Enterprise Server Delivers Enterprise-scale Manageability

- **Simple, flexible administration**: Intuitive, task-oriented support for remote server administration, cross-domain administration, security management, and much more.
- **Centralized control of Notes Desktops**: Organizations that use the powerful Lotus Notes client can centrally configure such desktop settings as home server and UI preferences.
- **Integration with enterprise management frameworks**: The Domino Enterprise Server integrates with a wide range of industry-leading management frameworks, including all products that support SNMP. It is certified as Tivoli-Ready.
- **Support for multinational deployments**: Native SMTP routing supports all major languages, simplifying the configuration of multilingual mail routing environments. The

Domino Directory implements LDAP V3, which supports a multilingual directory implementation.

- **Comprehensive functionality and services**: The Domino Enterprise Server delivers all the unmatched Internet messaging functionality and robust application services found in the Domino Mail and Domino Application Servers.

Lotus Domino R5 Advanced Enterprise Server

The Domino Advanced Enterprise Server is supported on OS/400 V4R3 or later. It can be licensed for deployment on systems with eight or more CPUs with Domino partitioning.

To find out more about the Domino Advanced Enterprise Server, visit the Lotus Web site:
`http://www.lotus.com/dominoenterpriseserver`

The Domino Advanced Enterprise Server is functionally the same as the Domino Enterprise Server. For features and details, please refer to “Lotus Domino R5 Enterprise Server” on page 648.

Domino Clients Choices

Notes Collaboration Client

Lotus Notes is an innovative and integrated e-mail and document collaboration client for the Internet. This latest release of Notes is enhanced. Perhaps most significantly, it is an easier-to-use environment and can be customized and easily personalized. You can work the way you want and retain all the power of Notes. You will find that the user experience in Notes R5 is like using a simple Web browser that allows you to group links to Web pages, news group discussions, and Notes documents all in one location.

In R5, the power of Notes is combined with the ease of the Internet. Enhancements are built on features from previous releases such as Portfolios in Notes R4.6. Notes R5 combines Internet-standards support with the features of other Lotus products like cc:Mail and Organizer in a single, integrated state-of-the-art e-mail, calendar, group scheduling, and Web information management tool. All of this is offered without the requirement of a Domino-based infrastructure. The enhancements are reflected in the design goals for Notes R5.

- Works with any server
- Easiest Internet client to use
- Industry-leading applications
- Mobile support and ease of deployment
- Innovation in collaboration, knowledge management

Works with Any Server

Notes R5 offers full standards support of protocols (Mail: POP3, IMAP4, SMTP; Discussion: NNTP; Directory: LDAP v3) and content (MIME, S/MIME, HTML, Native image formats, Java, JavaScript, X.509 certificates). This means that users with ISP-hosted mail accounts can use Notes R5 to send, receive, and manage their Internet mail. Notes R5 can also access other Web servers, for full-fidelity access to intranet or Internet applications.

When you launch Notes R5 for the first time, you are asked whether you want to use Notes to access your ISP-hosted mail. Notes acquires as much information as it can from the operating environment to set up your client for access to that mail account. Multiple accounts can be set within one location so that multiple mail accounts can be securely handled without changing Notes locations. With a universal inbox and support for native Web formats, Internet mail content has full fidelity.

Its features include:

- POP3 and IMAP4 support
- Native MIME support
- S/MIME support: For years, Notes has delivered a superior Public Key Infrastructure (PKI) very much like that provided by S/MIME security. S/MIME extends Notes native security to include secure messaging to non-Notes mail recipients.
- Fully-integrated X.509 Certificates: X.509 is the open-standard certificate format for inter-application authentication. Notes users can now take advantage of either the traditional Notes certificates or X.509 v3 certificates.
- LDAP support
- Native address support: Means that Notes R5 users can address mail using either the Internet address format or the Notes hierarchical address format. It also means that both the Internet and Notes hierarchical address of senders and recipients is included in an R5 mail message.

Easiest Internet Client to Use

The goal for Notes R5 was to create an environment that increases productivity by providing one consistent environment for access to all of the sources of information you need to do your job. Unlike some competing products, Notes R5 is not a bundle of products; it stands alone.

The tightest-integrated Internet client in the industry benefits you with the combination of the best features in one seamless, easy-to-use mail, calendar, and Web client.

New productivity features in R5:

- **The Welcome page**: Notes R5 introduces the concept of a Welcome page—the first page you see when you start the client. The default welcome page for the client is a

basic page with a simple, easy-to-learn user interface. Users can access mail, a calendar, and their personal contacts. You can change the Welcome page to one of the styles provided by the client or customize your own Welcome page.

- **The Headlines page**: This provides a user-customizing environment to navigate, filter, access and act on information, regardless of where that information originates: your inbox, a Web site, or a news group.
- **Subscriptions**: The ability to monitor Domino databases for documents that match your specific criteria is an major innovation in R5.
- **The navigation bar**: This contains tools very similar to the “forward” and “back” buttons browser users would recognize. In addition, there is a stop and refresh button (works to refresh all applications including mail), a search button, and the ability to enter a URL address to invoke Web browsing in Notes.
- **Bookmark bar with bookmark buttons**: Using these buttons, you can access such core Notes applications as Mail and Calendar that were previously located on the R4 Notes desktop. These new Notes R5 bookmark buttons and folders allow you to create links to a wide variety of information whether they are part of a Domino application or from some other source.
- **Window tabs**: This way of working adds to the Web-like feel of the Notes R5 client and provides a much richer information management tool than simple browsers can provide.
- **HTML editing**: With support for HTML 4, the Notes editor becomes an excellent Web content creation source. With control over items like images and tables, users can instantly create great-looking pages, in full-fidelity HTML, with support for native formats such as animated GIFs and JPEGs.
- **Enhanced table features**: An enhanced properties box provides access to all these additional controls over tables:
  - Paragraph-like alignment
  - Style templates
  - “Shadow” effect
  - “Stackable” tables
  - Recursive tables (tables within tables)
  - Tabs in tables
  - Multicolumn text (text flows from one column to the next)
  - Table cell backgrounds
  - Fixed- and variable-width columns in the same table
- **Print preview**: From the print dialog, you can preview your documents before printing.

Industry-leading Applications

Since Notes R4, more and more cc:Mail features are built into Notes. The new mail application in Notes R5 includes a separate address header in messages, type-down addressing, faster type-ahead addressing, an inbox view that can display new messages at the top, and a simple setup of mail rules.

IBM has incorporated many of the enhanced PIM features of Lotus Organizer into the Lotus Notes calendar, scheduling, and task management functions. The addition of a group calendar view makes it easier than ever for you to stay on top of multiple schedules, and to plan your time and work so that individuals and groups are more productive.

New Mail Features and Enhancements

- **Separation of message header**: Message recipients are now kept in a separate pane from the message body.
- **Type-ahead addressing performance increase**
- **Type-down addressing**: As type-ahead addressing begins to match names in the address dialog, you can use the up and down arrows on your keyboard to cycle through “like” names.
- **Mail rules**: English language syntax for developing automated tasks with multiple conditions for filtering mail automatically.
- **MAPI support**: Notes now registers itself as the default mail application.
- **Notes Minder**: This utility loads automatically into the Windows 95, 98, and NT system tray and informs via flashing icon, sound, or dialog of the arrival of new items.
- **Notification of sent view behavior**: Users are notified that messages deleted from the Sent view will be deleted from every folder as well.
- **Mail preferences**: Option for automatic spell check on send, delivery priority, automatic message signature and signature files, message content options (HTML only, plain text only, or both), message importance, security options, delegation options, and reply separator definition.
- **Inbox sorting**: A new preference option allows users to choose to have new mail arrive at either the top or bottom of the inbox.

Calendar and Scheduling Features

- Enhanced Calendar printing with multiple styles.
- Group Calendar View showing multiple colleagues' free and busy time.
- International Holiday support
- Improved invitation form and invitation management

- Resource management

  Resources are an important part of how meetings are scheduled. With the ability to schedule resources across domains and greater access control for resources, you can be sure you'll have everything you need for your important meetings.

- Enhanced alarm support

  Support sound (such as .WAV files) for alarms. Alarms can now be set for tasks as well as appointments and alarms can be sent to invitees.

- Owner actions and participant actions buttons
- Enhanced integrated task management

Mobile Support and Ease of Deployment

Notes has always offered superior offline use. Wherever you are, you can access and control a wide variety of information. With Notes R5, additional offline capabilities give you greater control over the information you're working with and sharing, whether it's Internet mail or Web pages that can be updated from a site to reflect changes when you reconnect.

In addition, mobile enhancements such as the Mobile Directory Catalog, a single database that contains all of the directories in an enterprise, were created for the road warrior. It contains partial replica information in a compressed form, with each user entry measuring about 100 bytes in size, instead of the 10 Kb per user in earlier versions of Notes. There is enough data in this compressed “catalog” of directories to yield information about the entire directory object if needed, automatically and invisibly to the user. This new directory occupies minimal disk space, so that mobile users can easily maintain a copy on their local hard disks.

- Disconnected use

  Offline browsing and management of mail, Web pages, and news. Simplified mobile configuration and setup. Easier replica management with bookmarks.

- Remote, connected use

  Use Notes with your existing Internet service provider.

- Mobile directory catalog

  Storing an optimized local copy of your enterprise directory means fast response time as you access critical information about the people in your company, regardless of whether you are connected and the size of your organization.

- Mobile location enhancements

  Connection documents and Dialup Networking entries are created for new users automatically as they complete the Location document dialog. We now provide end-users with a Connection Configuration Wizard to facilitate setting up Remote Access Connection documents. The Wizard can configure connections to servers on an Intranet

over Dial-up Networking, to servers on the Internet, or to remote Domino servers using Notes Direct Dialup over X.PC.

- Native PDA support
- User input during async script execution

  A scripting command, Promptuser, allows Notes to pop up a password dialog box during a connection call, so that users do not have to redial when their passwords expire.

- Passwords hidden in connection documents and dial dialogs

  Passwords (such as HTTP) are now hidden in the Server Connection documents and dial dialog boxes, which provides users with an additional level of security.

- Network dial-up connection document enhancements

  Users can enter area codes, country codes, and calling card numbers in network dial-up connection documents. This leverages the extensive dialing support for network dial-up currently available for X.PC.

Innovations in Collaboration: Knowledge Management

In Notes R5, enhancements such as the headlines page, bookmarks, and enhanced search capabilities are examples of the knowledge management applications possible with Notes and Domino. Some of the new R5 features that support the analysis and discovery of important information to do your job include:

- **Search engine and UI changes**: The engine is the Global Text Retriever from IBM Japan and includes many new enhancements, such as a fuzzy search.
- **Full-text index of the file system**
- **Summarization of the search results**: Each document returned can have several sentences displayed describing its contents selected by a special algorithm that finds the most meaningful sentences.
- **Additional file filters**: R5 indexes the entire document by using Inso filters to translate the attachments into something that can be indexed. Supported formats are Acrobat PDF, Word, WordPerfect, Word Pro, 1-2-3, Excel, Freelance, PowerPoint, and HTML.

R5 Domino Designer

Designer is an integrated application development environment that lets developers and Web site designers create, manage, and deploy secure, interactive applications for the Domino Application Server.

Domino applications let people share, collect, track, and organize information, using Lotus Notes or the Web. Domino applications can cover a wide range of business solutions, including:

- **Workflow**: Route information
- **Tracking**: Monitor processes, projects, performance, or tasks
- **Collaboration**: Create a forum for discussion and collaboration
- **Data Integration**: Integrate with relational databases and transactional systems
- **Personalized**: Produce dynamic content based on, for example, user name, user profile, access rights, or time of day
- **Globalization**: Use Domino Global Workbench to produce global sites

Domino Designer, with the Domino Application Server, is optimized to enable developers to build applications that facilitate the flow of information between an organization's enterprise systems and front-end business processes.

Improvements to Development Environment

- Comprehensive development environment
- Intuitive visual environment

  The new Designer look-and-feel lets developers optimize their work environment by creating project bookmarks.
- Improved programming environment

  The Programmer's pane provides access to all application objects and reference information on the Domino objects and languages. New and updated tools enable easier access, use, and reuse of code and objects.
- Multiple-browser preview

  Preview your work in all of the browsers that your end-users demand, including Notes, the Notes browser, Microsoft Internet Explorer, and Netscape Navigator.
- Context-sensitive Help on integrated tools and highlighted functions

New Site Layout and Presentation Tools

- **Outline Designer**: The Outline Designer is a visual tool for designing the structure and navigation of an application. You can design and display links to URLs, design elements, and actions in a hierarchical layout. The Outline is fully programmable, enabling a customized navigational structure based on user, time, or other criteria. You can embed the outline in pages or forms and add graphics and mouseover effects.
- **Frameset Designer**: The Frameset Designer allows developers to create multipane interfaces to their applications. It includes a step-by-step process to allow developers to start designing Web sites with frames quickly with no HTML knowledge required.

- **Page Designer**: Page designer is a WYSIWYG HTML authoring tool allowing designers to add styled text, images, image maps, tables, HTML, Java, ActiveX components, and multimedia objects to applications.
- **Domino applets**: You can use these Java-based components to add unique features to your Web site not previously available to browsers. Applets included are View, Action bar, Outline, and Text Editor.
- **HTML 4 support**
- **Table enhancements**: Enhancements include style templates, nested tables, fixed- and variable-width columns in the same table, and cell background images, among many others. The improvements enable more control over page layout. You no longer have to work with raw HTML code to obtain necessary control over the page layout and table characteristics.
- **Shared resources**: Images, applets, shared actions, and Java libraries are added to existing shared code resources.
- **Image maps**: You can create image maps by adding in-line hotspots to pictures.
- **Picture properties**: HTML attributes, such as vertical alignment, text wrap, and float options, are available in the properties box.

Enterprise Integration

- **Domino Enterprise Connection Services (DECS)**: Domino Enterprise Connection Services (DECS) is a visual tool and high performance server environment you can use to create Web applications that provide live, native access to enterprise data and applications. The visual tool includes an application wizard and online help to assist you to define external data source connections, for example, DB2, Oracle, Sybase, File directory, EDA/SQL, or ODBC, and fields within your application that automatically update with external connector data.
- **Lotus Connector LSX classes (LC LSX)**: Lotus Connector LSX Classes (LC LSX) allow for programmatic access via LotusScript to Lotus Domino Connectors' native connectivity to relational databases, transaction processing systems, and enterprise resource planning (ERP) applications. Lotus Domino Connectors supplied with this release include: DB2/UDB, EDA/SQL, ODBC, Oracle, Sybase, and Text and File. Additional Lotus Domino Connectors for ERP and Transaction System Connectors are available separately from Lotus. For product information, visit the Lotus Domino Enterprise Integration Web page at: `http://www.eicentral.lotus.com`
- **DB2 LSX Classes**: Native Programmatic access via LotusScript to DB2 UDB on Windows 95, 98, and NT platforms.
- **Java Database Connectivity (JDBC)**: Access from Java agents to relational data via industry-standard JDBC. A JDBC-to-ODBC bridge is also part of Domino.

Support for Web-standard Languages

- **Support HTML 4**: Designer supports features defined in the W3C HTML specification.
- **Mix-and-match Coded HTML on pages and forms**: You can mix and match WYSIWYG and native HTML code.
- **Import HTML Pages**: You can import existing HTML pages that are automatically rendered as pages in Designer.
- **Upgrade Existing HTML**: Import existing HTML files into Designer so you can take advantage of Domino features.
- **Leverage Web programmability and scripting options**: Web standards (Java, JavaScript, HTML 4.0) are supported in Designer R5 so you can use standard Web design languages and tools in Designer.
- **CORBA/IIOP support**: The Common Object Request Broker Architecture and Internet InterORB Protocol permits remote access to Domino services. CORBA/IIOP enables the creation of applets and applications that communicate with the server more efficiently than HTTP alone.
- **Additional Domino objects**: An integrated set of application objects that can be accessed from a number of industry-standard languages. New application objects are added to one of the richest object models for application development.
- **Java enhancements**: Designer supports Java as an alternative to other programming options. Compile and edit Java code directly in the Agent Builder. There is support for shared Java libraries.
- **JavaScript**: Direct support in Designer for JavaScript development. JavaScript events, such as onMouseOver and onBlur, are added to the event list for Domino Form and Page elements. Enables client-side scripting for both Notes and browsers.

Localization Features

- **Domino Global Workbench**: Create the design of an application in more than one language with the Domino Global WorkBench. Developers can quickly localize applications into multiple languages and keep them up-to-date as the structure and content of the application changes.
- **Multiple language support**: Generate and maintain different language versions of design elements and documents via database and design properties. Allows the creation of local, global and translatable content in any supported language. Facilitate review and approval of localized documents through workflow process. “Switchbar” lets Web users switch between languages across synchronized pages in a multilingual Web site. Content appears accurately and simultaneously to all users worldwide. Access to appropriate information in appropriate and respective language in a timely

fashion. Developers can build the translation process into applications to facilitate the rapid translation of Web content.

- **Multiple currency support**: Ability to store and use calculations involving multiple currencies within a form or view. The currency indicator is stored with the field so that it remains consistent and doesn't change based on the user's local computer system preferences. Developers can more easily create applications that involve calculation and display of different currencies. Users can immediately understand the currency being used by the symbol and no longer need to do mental calculations to determine whether financial figures are correct.
- **Euro support**: Full euro support including euro symbol input and display and rounding. Developers can easily create applications that use the new euro currency. Users can immediately view financial figures calculated into euros without doing mental or manual calculations. Combined with the multiple currency support feature listed above, developers have all the tools they need to develop truly global applications.
- **Long dates**: Ability to specify a long-date format in a date field: for example, 01-January-1999. Developers can use long-date format to remove the ambiguity between the MM/DD/YY and DD/MM/YY date formats.

Lotus Enterprise Integrator, 5769-LNP

The Lotus Enterprise Integrator (LEI) is a server-based product providing data movement between DB2 Universal Data Base (UDB) for AS/400 and Domino, with no programming required. Domino forms-based interfaces are used to map fields in a Domino database to columns in a DB2 table. Lotus Enterprise Integrator takes care of the movement and conversion of data between the data sources.

The iSeries 400 and AS/400e implementation of the Enterprise Integrator adds unique capabilities to LEI. iSeries 400 and AS/400e access rights are mapped to Domino access rights for an unprecedented security implementation. An exclusive of the iSeries 400 and AS/400e implementation of LEI is the propagation of deleted records so that any operations (update, insert, or delete) can be synchronized between your Domino databases and DB2 UDB for iSeries 400 and AS/400e tables.

LEI also allows the exchange of data with the integrated file system of the iSeries 400 and AS/400e system and ERP applications.

© Copyright IBM Corp. 2000

Systems Management

Systems Management

IBM Licensed Programs: Systems Management Products

This chapter describes the programs and functions that are available for managing the iSeries 400 and AS/400e server, including a discussion of the AS/400 Operations Console. Operations Console is not a software or program offering. It is the strategic interface involved in systems management for operations.

AS/400 Operations Console

The iSeries 400 and AS/400e servers support integrated remote console and control panel capabilities to simplify remote systems management tasks. AS/400 Operations Console support allows a personal computer (PC) to be a local or remote console of the iSeries 400 and AS/400e servers. This eliminates the need for a twinaxial connection and allows a system administrator to monitor the system from another location. The remote console application is a full-function 5250 PC console session. The remote control panel application complements the remote console and provides a graphical user interface that resembles its hardware counterpart. Both applications, in general, make it possible to perform the majority of system operations tasks, for example backup and recovery, when the iSeries 400 and AS/400e servers and the operations staff are in physically separate locations.

Operations Console and Remote Control Panel are installed and used from PCs using the Windows NT Workstation 4.0 (required for local console when remote PC access is desired) or Windows 9x operating systems. The console and control panel applications can be used together or separately. Each requires its own direct cable attachment. The cables are purchased separately and are unique to the system being used.

The iSeries 400 Model 270 and 8xx systems use a parallel interface, Enhanced Parallel Port (EPP), to connect the Remote Control Panel. The PC used must have an EPP-capable port.

Operations Navigator can be enabled from the Operations Console. These enhancements include:

- Centralizing all your system management functions through a single ASYNC connection to the iSeries 400 or AS/400e server using the AS/400 console and remote AS/400 Control Panel capabilities and Operations Navigator on one PC.
- Writing Windows 95 and Windows NT applications to perform AS/400 Control Panel functions with a published AS/400 Control Panel sockets API.
- Dial-up local controlling system (LCS) for Operations Console allows you to remotely connect an LCS through your ECS modem. It is activated from the system control panel by an onsite operator. There is no support for Remote Control Panel with this feature.

© Copyright IBM Corp. 2000

Operations Console is a follow-on to AS/400 Client Access Communications console. For Windows 95/NT clients, it is packaged with the AS/400 Client Access Family software. Operations Console is an AS/400 Client Access installation option, but ordering Client Access is not required to use Operations Console. It is packaged with Operations Navigator, which comes with OS/400.

Operations Console supports three types of local controlling system configurations:

- **Stand-alone local controlling system**: A PC locally attached to an iSeries 400 or AS/400e server through the Operations Console cable. Remote users are unable to connect to this PC.
- **Local controlling system with dial-in support**: A PC locally attached to an iSeries 400 or AS/400e server through the Operations Console cable. Remote users are able to connect to this PC, with or without the intervention of an operator.
- **Dial-up local controlling system**: A PC that dials into an iSeries 400 and AS/400e server. This iSeries 400 and AS/400e server runs without a locally attached console device. This locally controlling system does not support the remote control panel. Remote controlling systems are not allowed to attach to this PC.

Remote controlling systems

Remote controlling systems are PCs that dial into a local controlled iSeries or AS/400e server for access. The PC dialing in remotely becomes the console. If the remote control panel is installed and configured on the local controlling iSeries or AS/400e server, you can also use the remote control panel at the remote control system.

Client Access Express must be installed to use AS/400 Operations Console. During the installation of Client Access Express, AS/400 Operations Console support is installed. Also during the Client Access Express installation, a 5250 emulator is installed (if PC5250 or IBM Personal Communications Version 4.2 or later is not already installed). The Operations Console Cable is required to use the console function. The remote control panel cable is required to use the remote control panel function (a graphical control panel to operate as the iSeries 400 and AS/400e control panel). The console and remote control panel applications can be used together or separately. To use both the console and the remote control panel function, both cables are required.

Note: Operations panel cable part number is 04N5592 (CCIN is 0382).

AS/400 Operations Console support is available for OS/400 V4R3 and later. For V4R5, it is the only type of PC console supported by the iSeries 400 Model 270, 820, 830, and 840 systems.

Refer to *AS/400e to iSeries 400 Migration*, SG24-6055, at `http://www.redbooks.ibm.com` for Operations Console requirements. Please note, this book was available as a redpiece at the time this edition of the Handbook was published. The Migration redbook is scheduled for publication in the fourth quarter of 2000.

Setup information is found in *Operations Console Setup*, SC41-5508, and in the Information Center at `http://www.ibm.com/eserver/iseries/infocenter`

Select the **Operations Console** topic under **Client Access Express**.

Extreme Support Through Personalization (ESP)

An important aspect of technology is technical support that helps make that technology work for us as people. In our increasingly Web-based world, you're looking for easier access to total solutions. IBM has expanded its Extreme Support through Personalization (ESP) initiative to include more easy-to-use, proactive and personalized tools.

ESP features and functions for the AS/400 and iSeries include:

- Management Central-Pervasive for remote management of servers
- Easier access to IBM e-Server technical support Web sites
- IBM Electronic Services for AS/400
- Universal Connection - ECS over TCP/IP
- PM400e Integrated with Work Load Estimator
- Physical Device Placement Assistant (PDPA)
- Software Inventory Utility (SIU)
- iSeries 400 and AS/400 University
- Personalized Web Pages

The following section describes each of these features in detail.

Management Central-Pervasive

Management Central-Pervasive has more flexibility to access Management Central information and monitor the AS/400e and iSeries servers they support. Management Central Pervasive is a support function that allows network administrators remotely monitor system performance and status using a cellular phone, a Personal Digital Assistant (PDA) with a wireless modem, or a Web browser on a PC or Network Station.

Once a Web server and WebSphere Standard Edition as well as Management Central-Pervasive is set up on the system to host Management Central information, the URL can be simply added into your Web phone, PDA, or browser to check the availability of the AS/400e or iSeries server. For example, you can check the availability of your systems to find out if a reboot completed or check if the system exceeded any thresholds for CPU, disk

utilization, etc. during night-time job runs. This function is available now. Refer to the following Web site for information on which PTFs are needed:
http://www.ibm.com/eserver/iseries/services

Easier Access to IBM Technical Support Web Sites

Interlinked Technical Support Web sites with other IBM Technical Support Sites. Easy access simplifies support. You get what you need, whenever you need it. Access what you need using: http://www.ibm.com/eserver/iseries/services

Web links include:

- IBM installation planning for IBM servers. This lets you easily plan the physical installation of your hardware to ensure an easy installation. A click takes you to what you need.
- Easy access to all IBM education and training, all in one place. This provides links to applicable Learning Services Offerings. It allows you to easily browse, enroll in, and pay for all the IBM education you need. You can even find out about certification programs and events. A click takes you to all the education and training information you need for the IBM server.
- Technical support for alerts, fixes, troubleshooting information, and more collaboration sites like Services Network.
- Web-based libraries of technical information.

Access all technical information sites from iSeries Web sites. This gives you easy access to the most current versions of the information you need, regardless of the IBM platform.

IBM Electronic Services for AS/400

IBM Electronic Services for AS/400 now supports selected European markets as well as the US. It is an enhancement to existing IBM hardware and software support and provides a secure Web-based electronic interface, to help you proactively manage your iSeries and AS/400e servers. Its comprehensive and customizable support includes:

- 24-hour proactive system monitoring
- Access to personalized problem status and management
- Electronic notification of required fixes, plus the actual fixes
- Performance management data
- Additional support information

Universal Connection

The ability to run Electronic Customer Support (ECS) over TCP/IP is available 29 December 2000 using the integrated high-speed V.90 modem. This includes electronic fix retrieval and problem reporting. In addition, the ability for IBM to provide remote support over

a dial-up connection using the integrated high-speed V.90 modem is enabled. This includes making available CL commands for creating simple point-to-point configurations to aid in connecting to IBM Support and for customer use as well.

The ability to run PM/400e and Service Agent over TCP/IP is available 30 March 2001 using the integrated high-speed V.90 modem. In addition, the ability to inventory multiple systems hardware and software information is enabled over this connection.

Go to the following Web site for the PTFs required to enable these functions:
`http://www.ibm.com/eserver/iseries/services`

PM400e Integrated with Work Load Estimator

PM/400e is a personalized tool shipped with OS/400 that gives you easy-to-use reports about the performance of your systems. You simply turn the tool on and access your reports on the Web. These reports automate many of the functions associated with capacity planning and performance analysis. The personalized Web-based reports help identify potential resource constraints as well as help you plan future growth.

PM/400e is a personalized tool shipped with OS/400 that gives you easy-to-use reports about the performance of your systems. Simply turn the tool on and access your reports on the Web. These reports automate many of the functions associated with capacity planning and performance analysis. The personalized Web-based reports help identify potential resource constraints and help you plan future growth.

The Workload Estimator currently helps you size system needs based on estimated workloads for specific workload types. The Workload Estimator and PM/400e now work with one another. Through a Web-based application, the enhancements helps you size upgrades to your existing system based on PM/400e reported utilization, performance, and growth data. Plan your future system requirements based on existing utilization data.

Sizing for additional workload types supported by the Workload Estimator (for example, Domino, WebSphere, Java, and others) can also be included in the sizing. With the flexibility to adjust growth rates and time horizons, the output will include an AS/400 and iSeries 400 summary level recommendation for your consideration. It includes a suggested upgrade for your processor, processor features, memory, disk arms, and disk capacity. This support will be available via the Internet is planned to be available 29 December 2000. This application does not support an LPAR environment.

Find out more about PM/400e at: `http://www.ibm.com/iseries400/support/`

Physical Device Placement Assistant (PDPA)

The Web-based Physical Device Placement Assistant (PDPA) can save time and increase accuracy of feature installations for Customer Setup (CSU) installations. PDPA helps iSeries

and AS/400e customers quickly identify where to install Customer Install Features (CIFs) as features are added to the system.

The PDPA tool works by retrieving Machine Reported Data (Vital Product Data or VPD) information from your system using a secure Internet connection. The CCIN and description of all installed cards is reported. PDPA analyzes this information to identify where to install CIFs. With VPD or user-defined card configuration, PDPA users can do a "what-if" analysis of card placement.

The PDPA tool is available for no additional charge. To access the tool, simply register the tool and have a copy of Netscape Version 4.07 or higher or Internet Explorer Version 5.0 or higher. To learn more or to register, visit the site at: http://www.ibm.com/eserver/iseries/cif

Note: PDPA provides support for CSU feature placement for models 170, 270, 8xx, 7xx, 6xx, S20, S30, S40, SB2, SB3, and #5065/#5066 Storage PCI Expansion Towers. Support for Logical Partitioned systems (LPAR) and model upgrades are not addressed by the tool.

Software Inventory Utility (SIU)

This AS/400 and iSeries software upgrade tool can help IBM customers and Business Partner sales teams save time and improve the accuracy of their iSeries and AS/400e software upgrades. SIU also enables customers to easily manage their iSeries and AS/400e installed software inventory. Features of SIU include:

- "Auto-sense" of release level
- Printed report of installed software
- Categorization of installed software to indicate how the software can be updated

SIU suggests which software may be ordered based on your system and software. Responsibility for verifying entitlement of any customer installed software, for which a software upgrade (via software subscription) has been requested, remains with the marketing representative. The SIU is available only in English and can be downloaded from the Web site: http://www.ibm.com/eserver/iseries/configure

After the customer submits their request to upgrade, an appropriate ibm.com center will directly contact the customer in local language to place their order. When the ibm.com center calls the customer, the customer may be asked to verify entitlement for those software products they are requesting to be ordered.

Services Network

Sales channels and customers can quickly identify Business Partners and IBM groups (for example, IBM Global Services) who can provide a broad range of services for the AS/400 and iSeries. Service providers can be found at: http://www.ibm.com/as400/service/

Select the general type of services you need, and you are presented with companies who can provide those services. For companies who provide iSeries and AS/400e services, the Network is a forum for promoting their services capabilities on the Web site and a method to collaborate with other Network members. The Network expands continually to reflect the worldwide reach of the iSeries and AS/400e marketplace.

iSeries 400 and AS/400 University

IBM customers and Business Partners can access iSeries and AS/400e education offerings available through a single new Web site. A variety of training methods are available to accommodate individual learning styles (for example, classroom, online, shipped media, download and play, IBM Redbooks, and events). You can search by education segment, such as e-business, Domino, Java. Further information can be found at:
`http://www-3.ibm.com/services/learning/community/as400/`

Personalize Web Page

Personalized Web Page assists in facilitating e-relationships between IBM or Business Partner representatives and iSeries and AS/400e customers. The personalized page allows users to view information relevant to their needs and interests in a user-friendly format. Easy-to-view content abstracts and highlighted links provide a fast path to important information including:

- Offers and special promotions
- Recent news and events
- Product update information
- Industry information
- Key links to related sites

Refer to the following Web site for information: `http://www.as400.ibm.com/myas400/` or `http://www.iseries.ibm.com/myiseries/`

The IBM ESP initiative offers total server support that you need for today's e-business world. You get great support that is personalized and flexible, and in the form you need it. What counts is keeping your business running and helping you drive your business to the next level. We anticipate your needs with ESP. ESP is our total solutions focus for iSeries and AS/400e servers. It involves voice and Web-based technical support and support that's integrated into the product. Emphasis is on a collaborative approach to technical support that helps to ensure a personal touch. More information on ESP can be found at:
`http://www.as400.ibm.com/support/`

Tivoli Management Agent

Tivoli Management Agent (TMA) is the enabling component of the Tivoli Enterprise product set. It now resides on the AS/400 in V4R5. When the TMA is started on your AS/400, it can report into your Tivoli Management Framework environment as an end point. TMA enables the AS/400 system to be managed by the Tivoli Enterprise product set, like any other platform in a Tivoli-based, centrally managed, heterogeneous IT environment.

Tivoli Management integrates its IT management processes across the board, creating a powerful combination that delivers superior, business-relevant services to your customers within and outside of your organization. Tivoli Enterprise-based solutions are platform-independent.

Tivoli Storage Manager Version 3.7, 5697-FRA

ADSTAR Distributed Storage Manager (ADSM) for AS/400 V3R1 was withdrawn from marketing on 31 December 1999. ADSTAR Distributed Storage Manager (ADSM) for AS/400 V3R1 is supported on OS/400 V4R3.

Tivoli Systems Inc., an IBM company, now offers Tivoli Storage Manager Version 3.7, which replaces the Adstar Distributed Storage Manager product set. See Tivoli Storage Management Solutions at: `http://www.tivoli.com/storage`

Tivoli Storage Manager provides an enterprise-wide backup and archive facility for a wide variety of both LAN file servers and individual workstations by allowing the AS/400 system to act as the backup and recovery server. It provides operational flexibility by allowing users to define their backup and archive needs and provides productivity gains by automating the system operations. Tivoli Storage Manager is designed to:

- Protect data stored on workstations and LAN file servers
- Reduce workstation and LAN administrator time
- Reduce the necessity for additional workstation storage devices
- Access data for local or remote OS/2 Version 2 applications

Tivoli Storage Manager for AS/400 handles data backup and archiving for a wide array of workstations and file servers including clients from different vendors:

- Lotus Notes
- Apple Macintosh PowerPC
- Macintosh System 6.02 or System 7
- Hewlett Packard HP-UX for System 700 and System 800
- IBM AIX for RISC System/6000
- IBM or MS-DOS
- IBM OS/2

- Microsoft Windows
- Windows NT
- Windows 95
- Novell NetWare
- Sun Microsystems SunOS, SPARC/Solaris
- OpenEdition MVX
- Bull DPX/2
- Digital UNIX
- DEC ULTRIX for DECstation
- SCO UNIX 386, Open Desktop

Administrator usability has been improved with an updated GUI for OS/2, AIX, HP-UX, and Sun Microsystem Sun OS or Solaris administrative clients, and an automated scheduling capability for the server and client commands.

Tivoli Storage Manager allows workstation users to backup or archive files to an ADSM server. It also enables the implementation of disaster recovery solutions for LANs, workstation disks, and diskettes.

Tivoli Storage Manager servers store data within system managed, administrator controlled storage hierarchies. Hierarchical Storage Management for the AIX client platform is included as an optional feature to provide automated migrate and recall support for local file systems. The administrator can define backup schedules, levels of administration, and grouping of file servers or workstations with common requirements.

The Storage Manager server supports automated policies to store data on AS/400 system disk or directly to supported tape devices. Once stored on the system disk, ADSM data can be automatically migrated to supported tape devices. Stored Storage Manager data can be retrieved by the supported file servers or individual workstations when needed. Optical devices are not supported in this release.

The Storage Manager server supports many communication protocols, including TCP/IP and APPC (LU 6.2). The communications capability also supports the OS/400 Internetwork Packet Exchange (IPX) communications.

Enhancements in V3R1

There are many enhancements in V3R1 to handle the explosive growth in the client/server distributed environment. These enhancements include:

- V3R1 backs up data from any ADSM Version 2 client. In addition, V3R1 backup-archive clients are available for the following platforms:
  - IBM AIX
  - Apple Macintosh
  - Data General LTNIX

  - Digital UNIX
  - Hewlett-Packard HP-UX
  - NCR UNIX SVR4
  - NEC EWS-UXN
  - Novell NetWare
  - IBM OS/2
  - SCO
  - Sequent PTX
  - Siemens Nixdorf SINIX Reliant
  - Silicon Graphics IRIX
  - Sun Microsystems Solaris
  - Windows 32-bit (Windows NT, Windows 95, and Windows 98)
  - Windows 32-bit DEC Alpha

- An AS/400 Application client for ADSM is available as part of Backup and Recovery Media Services (BRMS) for the AS/400 system (5769-BR1).
  - Positioning BRMS Application Client to ADSM

    The AS/400 Application client to ADSM was introduced as a niche BRMS function to help customers in an enterprise ADSM environment, who need to manage small, remote systems where there is no skilled resource to handle the backups. The AS/400 Application Client to ADSM should not be used as the backup solution for mainstream, central site AS/400 system. Native BRMS saves to traditional tape drives continue to be the recommended IBM strategic solution for AS/400 backups.

    Customers interested in using the AS/400 Application client to ADSM should be aware of the following considerations related to performance, automation with ADSM servers, and user data:

    - **Performance**

      The performance of the Application Client to ADSM is significantly less than what can be achieved when saving directly to tape media. AS/400 save/restore operations to tape are managed by hardware-controlled direct memory access operations, which have been optimized for maximum performance. Application Client save/restore operations use a software process that intercepts the normal AS/400 save/restore data stream so that the data can be passed to the ADSM APIs for transmittal to or from the ADSM server.

    - **Automation**

      ADSM servers do *not* currently support central scheduling of operations to Application Clients (those that use the ADSM Application Programming Interface), as well as several other functions available with ADSM Backup/Archive clients. AS/400 Application Client operations can be scheduled only on the client using AS/400 job schedulers. There is no automated logging of these scheduled events at the ADSM server.

- **User Data**

  Recovery of an AS/400 requires “system” objects (SAVSYS, IBM Libraries, configuration data, security data, and so on) to be saved to an Alternate IPL device. Therefore, only “user” data can be saved to ADSM servers. Also, BRMS recovery information needs to be saved to tape so it is available to guide the recovery, including connection to the ADSM server. By the time these “system” and “recovery” objects are saved to tape, many customers may find there seems to be little advantage to excluding the “user” objects when considering the complexity the ADSM operations add to the overall AS/400 backup and recovery process.

- There are a several enhancements in V3R1 related to the control or management of clients. Some of those enhancements are:
  - The ability to support centralized logging of operations information allows client and server events to be made available from a central point.
  - Most client options can be stored at the server, providing additional administrator control for setting options to relieve clients of this operational requirement.
  - An optional Server-to-Server Communication feature is available to support enterprises deploying multiple servers. This allows the movement of information between storage pools on multiple servers.
  - An SQL and ODBC interface to the Storage Manager database and real-time server information is provided. This allows the user to build queries that satisfy their business requirements in a format to suit their specific needs.
- Storage Manager V3R1 provides enhancements to provide substantially improved performance over prior versions of ADSM. Due to the increase in around-the-clock operations and the high growth of network data, backup and restore throughput has become a vital concern. Some of the enhancements are:
  - Larger buffers in and between selected clients and the server are implemented. Storage Manager groups multiple small files together as a single object on the server, which reduces the number of data pointers and storage pool entries. This is transparent to the end user and does not prevent the retrieval of individual files.
  - There is a new algorithm for the restore function that enhances the restoration of directory trees to consume less client resources.
  - Storage Manager V3R1 provides new fault-tolerant features that allow intelligent resumption of interrupted file system restores.
- Storage Manager V3R1 features an interface that masks the complexity of the network environment and enables faster navigation and movement through the screens, such as:
  - An initial client GUI panel provides an easy, intuitive way of selecting the primary functions.

  - The main backup, archive, restore, and retrieve panels are re-designed to allow more flexibility in making choices.
  - Selection techniques allow an entire directory tree to be easily selected.
  - Support for collapsible directory trees eliminates excessive scrolling.
- A Disaster Recovery Manager function has been added to Storage Manager V3R1 to assist with the development and maintenance of a disaster recovery plan for a Storage Manager server. Disaster Recovery Manager is delivered as an optional license feature of the Server code. Some of the functions provided are:
  - Inventory management
  - Offsite copy and media management
  - Customized server recovery plan
  - Bare metal restore images for Intel clients

Enhancements in V3R7

Performance Improvements

The Tivoli Storage Manager AS/400 server, at the Version 3.1 level, is now using the AS/400 “root” file system to enhance performance. The “root” file system takes full advantage of the AS/400 stream file support and hierarchical directory structure of the integrated file system. The Tivoli Storage Manager AS/400 server database, log, and disk storage pool volumes can be located in the “root” file system. The AS/400 server is modified to support both the legacy file system and the “root” file system. This permits you to install the enhancement without affecting an existing server, providing a much easier transition path. You can even convert your files in steps.

Enterprise Management Enhancements

The Tivoli Storage Manager enterprise management enhancements are now available for the Tivoli Storage Manager AS/400 server. These functions now compare to those implemented for the AIX, Windows NT, HP-UX, Solaris, OS/390-MVS, and VM/ESA server platforms, include:

- The user-friendly enterprise console functions that enable the administrator to manage Tivoli Storage Manager from any platform in the enterprise with a Web-based interface. This allows the administrator to navigate, logon, and perform functions on any Tivoli Storage Manager server or Web backup-archive client from a supported Web browser.
- Enterprise reporting mechanisms that provide the ability for the administrator to obtain information about the Tivoli Storage Manager enterprise as a whole. Enhanced automation functions that eliminate or reduce staff-intensive manual procedures by the use of:

  - Server scripts to automate server management operations
  - Policy constructs that allow the automatic extension of the server database or recovery log when administrator-defined thresholds are reached
- Enterprise configuration and policy management that allows Tivoli Storage Manager configuration and policy information to be defined one time at a Tivoli Storage Manager configuration server and then propagated to any number of managed Tivoli Storage Manager servers.
- The enterprise command routing functions that lets an administrator use a single command to perform such tasks as queries on groups of networking Tivoli Storage Manager servers as well as a single server. Results of the routed commands are returned to the origin of the request.
- The enterprise logging function that allows Tivoli Storage Manager servers in an organization to forward their events and those of their clients to a server designated as the event server, thereby consolidating events from groups of Tivoli Storage Manager servers and clients.

Supported Clients

Tivoli Storage Manager backs up data from systems running the following operating systems:

- AIX
- Apple Macintosh
- HP-UX
- NetWare
- OS/390 UNIX System Services
- OS/2
- SCO UnixWare
- Sequent PTX
- SGI IRIX
- Sun Solaris
- Tru64 UNIX (formerly Digital UNIX)
- Windows 32-bit Intel (Windows NT, Windows 95, Windows 98, and Windows 2000)
- Windows 32-bit DEC Alpha (Windows NT)
- AS/400

The following specialized clients are also available:

- Tivoli Space Manager, which provides HSM capabilities for AIX and Sun Solaris platforms
- Tivoli Data Protection for Lotus Domino provides storage management for Lotus Domino R5 databases on AIX and Windows NT platforms.

- Tivoli Data Protection for Informix provides storage management for Informix 7 Dynamic Server and Informix 9 Universal Data option on AIX and Sun Solaris platforms.
- Tivoli Data Protection for Oracle provides storage management for Oracle Databases on AIX, Sun Solaris, HP-UX, and Intel-based Windows NT platforms.
- Tivoli Data Protection for MS SQL Server provides storage management for MS SQL Server databases on Windows NT platforms.
- Tivoli Data Protection or MS Exchange Server provides storage management for MS Exchange Server databases on Windows NT platforms.
- Tivoli Data Protection for Lotus Notes provides storage management for Lotus Notes databases on AIX and Windows NT platforms.

IBM Backup Recovery and Media Services for AS/400 V4R4, 5769-BR1

The IBM Backup Recovery and Media Services for AS/400 (BRMS/400) is a licensed program offering. BRMS/400 provides the AS/400 system with support for policy-oriented setup and execution of archive, backup, recovery, and other removable-media-related operations. BRMS/400 uses a consistent set of intuitive concepts and operations. The user interface is menu-driven, with list-supported windows and cursor-sensitive help consistent with OS/400. BRMS/400 facilitates centralized management of media by maintaining a consistent view of removable media, its contents, location, and availability across multiple AS/400 systems. Available tapes are eligible for use by any participating AS/400 system that provides a common scratch pool. When a tape is used, that usage is known by all participating AS/400 systems.

The *automatic database file recall (Dynamic Retrieval)* facility enables archived files to be restored automatically when they are opened by a program. This means that the user does not need to be concerned about the data being accessed, whether it is on disk or tape. *Dynamic Retrieval* can be implemented without any changes to application code, which enables users to archive hierarchical storage management with ease of implementation. This function, combined with tape automation, provides for unattended operations and can help reduce DASD space.

The *fast search* facility for files on tape improves the tape performance by positioning the tape to the start block, rather than having to ship a file at a time. Fast search is supported on IBM 3480, 3490, 3490E, 3590, and 3570 tape drives.

The *archive, backup, and recovery* facilities enable the customer to establish how these operations are to be performed. Media, whether used for backup or other operations, can be managed and tracked in various ways (by volume ID, type, content, location, container, quality, and so on).

Operation planning facilities assist the customer in anticipating resources (devices, media, operational steps, and so on). Operations are guided, making them less error-prone.

Policy support enables the customer to define a hierarchical system of defaults, which makes setup fast, easy, and consistent.

Hierarchical Storage Management (HSM) provides the ability to reduce storage costs by storing objects that are infrequently accessed on less costly storage media. Some of the functions provided by HSM are:

- Automatic, transparent management of data across a storage hierarchy consisting of high-performance disk, compressed disk, tape, and ADSM server storage based on user defined policies
- Migration of user libraries, folders, and spooled files between ASPs
- Archival of database files, database file members, or documents
- Migration of stream files between various storage media
- Transparent access to migrated or archived data from applications
- Automatic movement of data, based on system policies
- Support for tape automation and ADSM server storage to provide unattended operations

AS/400 Application Client for ADSM allows BRMS to backup or archive low-volume AS/400 user data on any ADSM server, including another AS/400, RS/6000, S/390, or 3466 Network Storage Manager. BRMS can also be used on multiple AS/400 systems with shared inventory support, which allows objects saved from one system onto ADSM server storage to be restored to another AS/400 system managed by the same ADSM server. For information related to Client to ADSM, see “Positioning BRMS Application Client to ADSM” on page 674.

BRMS/400 provides interfaces that enable the customer to use it with other facilities that provide scheduling, distribution, and verification services.

Backup Recovery and Media Services for AS/400 supports the backup, recovery, and archiving of integrated file system data. This allows users to specify directories on their PCs and other systems, as well as on their AS/400 system. BRMS/400 can recover from media-related errors while using tape automation, improving unattended operations. Hot-site recovery allows the replication of media content information on one or more systems in a BRMS/400 shared inventory network that enables those systems to act as data recovery centers.

BRMS is structured to allow the addition of functions and features incrementally as business needs change and grow. There are three options to build a full function BRMS system:

- **BRMS Standard**

  BRMS Standard offers many of the base functions that AS/400 users need to implement a fully automated, single system, backup, recovery, and media management strategy at a lower cost. The Standard product offers an unlimited number of media, using shared tape devices, automated taped libraries, and ADSM servers.

  The standard BRMS product backs up a single library or single QSYS.LIB object in parallel across any number of tape devices. Parallel backup with its easy-to-use interface, lets you shorten backup windows by simply using more tape devices. Using parallel backup, with an automated tape library device, you can save a large library, for example, to all currently available tape resources. This function reduces the administration involved in setting up a backup strategy by eliminating the need for an administrator to design a strategy based on the current number of devices and independent of the current objects.

  With BRMS Standard, you can control BRMS interfaces. The interface allows administrators to secure the setup and function of BRMS from users not skilled in the administration or use of BRMS. The functional usage model can secure the following types of functions from specific users. Each user can be allowed to use a particular function and not the others:

  – Backup
  – Archive
  – Recovery
  – Movement
  – Media

  The administrator controls specific setup such as a control group or policy. Users can use and view a policy, for example, but not change its contents.

  The standard product does not support archive, dynamic retrieval, automated migration operations, or shared media.

- **BRMS Network Feature**

  With BRMS Network Feature, a BRMS system is interconnected using a network to other BRMS systems in the network. A BRMS network system shares the inventory and policies associated with media managed by a central BRMS system.

- **BRMS Advanced Functions Feature**

  BRMS Advanced Functions Feature enables HSM archive with HSM dynamic retrieval and automated Auxiliary Storage Pool (ASP) data migration.

  Parallel backup also works with the BRMS Advanced Functions feature to allow for parallel archive and parallel dynamic retrieval of a single object. The ability to dynamically retrieve a large database file in parallel helps to reduce the window of the retrieval process, therefore increasing the rewards for using HSM archive and dynamic retrieval support.

The BRMS Advanced Functions feature allows archive capabilities of database files, stream files, and documents based on a frequency of use. Prior to this enhancement, for example, archive rules allow the archiving of a file that has not been changed in six months. The archive based on frequency support allows the archiving of a file, for example, that has been used less than twice a month over a specified period. The frequency of use is based on the number of days used and is calculated on a monthly basis. You can enter the specified value into the archive control group that drives the archive operation.

The BRMS Advanced Function feature includes an easy-to-use interface to archive old QHST files. QHST files can also be dynamically retrieved.

IBM Advanced Job Scheduler for AS/400 V4R4, 5769-JS1

IBM Advanced Job Scheduler for AS/400 is a part of the IBM SystemView family of offerings. It facilitates unattended operations, which can reduce the cost of ownership and help improve efficiency and accuracy in managing batch applications. It provides a highly comprehensive, full-function job scheduler and report distribution system on the AS/400 system, enhanced with graphical user interface capabilities.

Leading-edge scheduling functions include:

- Automation
- Batch Job Stream Management
- Forward Planning and Production Forecasting
- Full Calendaring of Operations
- Dependency Scheduling

Overall this allows any batch-capable function to be scheduled on a single AS/400 system or across a network, allowing complete user control of how, when, and where a job is submitted.

Job Scheduler is enhanced in V4R4 with the following functions:

- A full integration with Operations Navigator and specifically the Management Central functions that are part of Operations Navigator. The user interface provides a full graphical user interface and inter-operates with users choosing to continue to use the existing interfaces. The graphical interface provides:
  - An easy-to-use way to define and control batch job operations based on successor or predecessor jobs
  - A full set of multiple calendars
  - Systems and resource conditions

- V4R4 Management Central added a number of capabilities that can be scheduled using the Advanced Job Scheduler. These include cross-system group functions such as:
  - PTF distribution and management
  - Hardware, software, and PTF inventory collections
  - Distribution of objects and files
  - Schedule remote operations

  Once installed, the user interface is seamless between Management Central and the Advanced Job Scheduler.

  You can easily manage your job automation across multiple systems running the Advanced Job Scheduler. For example, with the Advanced Job Scheduler on multiple systems, you can condition jobs on one system to only start when a job on another system is successful or ends in error. In addition to the previously supported SNA network environments, the Advanced Job Scheduler now supports TCP/IP as well. In either network environment, you can support cross-system scheduling between systems.

IBM Managed System Services for AS/400 V4R2, 5769-MG1

The Managed System Services for AS/400 (MSS/400) licensed program is part of Operation Center/400, which includes System Manager for OS/400. MSS/400 enables an AS/400 to be managed from a central site running either:

- S/390 NetView Distribution Manager for MVS (Release 5 or later) for MVS-based networks
- System Manager for AS/400 (V3R1 or later) for AS/400-based networks

The central site defines, schedules, and tracks software distribution (change management) requests sent to an AS/400 system with Managed System Services for AS/400 installed. These change management requests include sending, receiving, and deleting AS/400 files, programs, and other objects (libraries, save files, message files, documents, folders, PTFs, and so on).

AS/400 objects can be sent directly to or received from AS/400 libraries or through the local AS/400 distribution repository.

Running programs, installing products, applying PTFs and re-IPLing can be scheduled to run automatically under MSS/400 control. MSS/400 forwards the results of all change requests to the central site for tracking.

The capability for the central site to define, schedule, and run these change requests one time or repetitively significantly enhances the unattended operation of remote AS/400 systems. While MSS/400, together with central site control and tracking, provides a

significant set of automated operations, it does not provide real-time monitoring and automated action for the entire AS/400 operating environment.

MSS/400 supports unscheduled running of AS/400 commands issued by the central site, without having to first sign on to the AS/400 system with MSS/400. Printed output from these commands can optionally be returned to the central site that issued the command.

The system manager function automates the tracking and management of co-requisite PTFs. This reduces the risks and complexities of managing such relationships.

IBM Performance Tools for AS/400 V4R2, 5769-PT1

Performance Tools for AS/400 is a program product that provides a set of reporting, analysis and modeling functions to assist an AS/400 administrator to manage the performance of the system. It provides printed and on-line reports. These can be in graphic or tabular form. A Performance Advisor function assists the user in analyzing system performance and provides recommendations. Performance Tools for AS/400, through its modeling facility, can be used to help predict probable system performance before changes are made.

Performance Tools for AS/400 uses an easy-to-use menu interface. From this menu interface, users can initiate requests for performance reports and enter the results into a capacity planning session.

The Performance Advisor component of Performance Tools for AS/400 makes recommendations to improve system performance and can implement tuning recommendations, if specified by the user. The knowledge-based Advisor also provides detailed explanations of its analysis, which is of great benefit to novice and experienced users.

A capacity-planning product, the *BEST/1-400 Capacity Planner* is integrated into Performance Tools for AS/400. BEST/1-400 is written by BGS Systems.

Performance Tools for AS/400 is divided into three elements: Enabler, Manager, and Agent. The Enabler is the base code onto which you must add Manager *or* Agent. Adding Manager to the Enabler gives full Performance Tools functionality as described above. Adding Agent to the Enabler gives the equivalent of Performance Tools Subset functionality for those customers who do not require all of the tools contained with Manager and Enabler. Key functions such as Collect Performance Data, Delete/Copy/Convert Data, Display Performance Data, Work with Historical Data, and the Performance Advisor are included in the Agent. Functions not contained are Select Status Type, Performance Reports, Capacity Planning, Programmer Performance Utilities, System Activity, and Performance Graphics. Manager and Agent elements are mutually exclusive.

Performance Tools for AS/400 includes the Performance Explorer, which is the primary detailed analysis tool for AS/400 based on PowerPC technology.

IBM Content Manager OnDemand for AS/400 V4R5, 5769-RD1

IBM Content Manager OnDemand for AS/400 V4R4 provides computer output to laser disk (COLD) and extended archiving functions on disk, optical, or tape storage media.

Note: The two prior names for Content Manager were EDMSuite OnDemand for AS/400 (5733-218) and Report/Data Archive and Retrieval System (R/DARS) for AS/400 (5763-RD1, 5716-RD1). The name change reflects the commitment by IBM to further align these products as part of the Content Manager family.

Graphical administration functions are provided through Operations Navigator, making OnDemand easy to setup, administer, and manage. ContentConnect and client-based integration with ImagePlus VisualInfo allow for a flexible, customized environment for document management.

You can use the viewer of your choice to view OnDemand documents. Additional integration is possible with the ability to launch the OnDemand client from a 5250-type application.

Functions of OnDemand include:

- **Spool File Archive:** Provides rich capture and archive management functions for large volumes of spooled print data and retrieval capability on demand.
- **Record Archive:** Allows existing applications to be enhanced to store and retrieve selected data records from optical storage for users who require occasional access to historical data.
- **Object Archive:** Allows efficient storage of versions or “generations” of AS/400 objects on tape or optical storage.
- **AnyStore:** Allows archive and retrieval of binary large objects (BLOBs) such as PC files and small scanned images. AnyStore requires that the Spool File Archive feature also be ordered.

OnDemand includes a client for Windows 3.1, Windows 95, Windows NT, and OS/2 that delivers specialized functions for report and document retrieval.

OnDemand features can be ordered separately with the exception of AnyStore, which requires the Spool File Archive feature.

Spool File Archive

Organizations can store large volumes of spooled print data from current applications on disk, optical, or tape storage media as a cost-effective solution. Users can easily retrieve selected pages or documents on demand.

Powerful processing and management of spooled print data provides fast, automated capture, auto indexing, immediate compression, and unattended storage migration. This means that:

- Users can retrieve individual segments such as invoices or statements within minutes after current applications generate reports.
- Multiple document types (including groups of related reports) and multiple data types (including AFPDS) can be processed and indexed automatically using pre-defined criteria.
- Compressing reports from one-half to one-seventeenth of the original size immediately increases effective magnetic storage space.
- Magnetic disk storage becomes affordable for extended high-access periods before compressed reports are automatically migrated to optical or tape. Migration to optical libraries takes less time using OnDemand compression and multiple report management cycles that allow writing to multiple drives at the same time.

OnDemand for AS/400 report definition is fast and easy with the Graphical Report Definition tool, included as part of Spool File Archive. The graphical report definition tool enables report administrators to easily define reports, using a visual mouse-driven point-and-click approach. Using the tool, AS/400 spooled files are selected directly from the workstation. Reports are then defined to OnDemand by highlighting the location of data such as key fields and report date. Other characteristics of the report are also defined using the tool, such as the report's printer file and collection name.

Report definitions can be exported to OnDemand for AS/400 servers with the Report Definition Import/Export Utility.

The graphical report definition tool is an alternative to the 5250-based Work with Report Definition screens, which are available to administrators who do not have access to a programmable workstation. The graphical report definition tool reduces the time required to get reports into production for end-users and requires less time to learn report definition.

The graphical report definition tool runs on a Windows 95 or OS/2 or workstation and requires Client Access.

Spool File Archive APIs are available to add advanced integration function to application programs. The APIs enable functions to:

- Retrieve a list of archived document segments that match specific search criteria
- Retrieve specific archived document segments from the document hit list
- Retrieve a set of archived index records
- Retrieve a specific set of archived resources

Reports and documents can include electronic “sticky” notes with the document annotation feature of Spool File Archive. Annotations allow end-users to attach notes to individual archived documents or segments. Viewing annotations can be limited to the user who created the note or made it available to all OnDemand users. Annotations are stored separately from the archived document, maintaining the integrity of the original spooled file.

OnDemand provides support for the integrated file system. Spool File Archive reports and Object Archive objects which have been archived to disk are stored using the integrated file system. Using integrated file systems can provide faster data retrieval times and an easier way to save OnDemand data, while excluding other data stored in Integrated File Systems files or folders.

New security enhancements for OnDemand include tighter report data security, group profile for administration security, and document selection lists that shows only authorized reports.

Spool File Archive supports AFP index fields, which can be defined in Data Description Specifications (DDS).

Record Archive

Organizations can use IBM 3995 optical libraries to cost-effectively store aged data records, such as historical sales or customer data. Users can continue to use existing applications, which are functionally rich and familiar, with the added capability of retrieving historical data from optical files and more current data from magnetic disk. Record Archive maximizes the savings using optical (instead of magnetic) media for long data retention periods and offers faster retrieval than tape archival.

Note: Although performance for optical retrieval is good, it should not be expected to be a replacement for quick retrieval from disk.

OnDemand Record Archive is designed to minimize the magnetic storage space required to keep track of these data records on optical:

- For quicker access, only pointers to the data are stored on magnetic disk.
- Actual data is stored on optical.

Using OnDemand Record Archive Application Programming Interfaces (APIs), existing applications can be enhanced to store and retrieve records to and from optical files. Programmers can avoid dealing with the internal details of creating, reading, writing, and securing data on optical.

Object Archive

Organizations can compress and archive a variety of AS/400 objects, such as program source files, database files, or entire application libraries, on tape or optical media. A common use is to store monthly versions of purged detail records such as general ledger transactions. Later, an individual version (called a “generation”) can easily be restored from optical or tape media for research as needed. Note these points:

- Objects are compressed with more efficient disk space utilization than with standard OS/400 save commands.
- Multiple generations of archived objects, such as monthly or annual detail files, can be managed. Users simply specify which generation is to be retrieved and let OnDemand manage the multiple copies.

AnyStore

AnyStore extends the archive and storage management capabilities of Spool File Archive to binary large objects (BLOBs). For example, PC files such as spreadsheets, technical images (MRIs or x-rays), and small scanned images (remittance slips, insurance cards) can be archived with AnyStore. AnyStore is a programmer's toolkit of APIs, which can be used to create an archive/retrieval application or to enhance an existing application with archive functions.

The application passes the index data and BLOB to OnDemand Spool File Archive to manage the data. OnDemand archives and manages the data regardless of content. Your application does the segmentation and extraction of indices. OnDemand provides storage, migration, and retrieval capabilities to and from disk, optical, or tape media.

Useful applications include adding AnyStore to an existing bank item scanning, and OCR application to pass bank item indices and images to OnDemand Spool File Archive for management and subsequent retrieval. AnyStore requires the Spool File Archive feature of OnDemand for AS/400 as a prerequisite.

Enhancements in V4R5

- Additional search capabilities for the OnDemand client
- Support for user-defined data types to allow you to retrieve many different kinds of data from the OnDemand repository
- e-mail capability to send archived documents electronically
- Additional OnDemand Operations Navigator functions

- OnDemand Server Trial feature on the keyed stamped media for evaluation purposes (at the end of the evaluation period, the actual OnDemand Server feature must be ordered)
- The OnDemand client, available with the OnDemand Server feature, on a PC CD-ROM for ease of installation

IBM System Manager for AS/400 V4R3, 5769-SM1

The System Manager for AS/400 (SM/400) licensed program is part of the integrated offering Operations Control Center/400, which includes MSS/400 (IBM Managed System Services for AS/400).

SM/400 integrates with Simple Network Management Protocol (SNMP) management products, such as NetView for AIX. An SNMP manager can monitor for alerts, obtain system information, and execute remote commands if the AS/400 system is to be managed from an SNMP platform. The central site system does not need to have all software that a remote site has installed to service the remote site. This allows savings on DASD, management, and time at the central site.

System Manager for OS/400 provides central site control for:

- Remote AS/400 problem management

  This includes remote problem analysis, comparison of existing available PTFs, automatic distribution of selected PTFs, and a single connection to IBM electronic support for new problem reporting, to IBM or Independent Software Vendor (ISV) for processing.
- Central site packaging of ISV applications for AS/400 Licensed Program management support

  This enables ISV applications to receive the same system support as IBM licensed programs.
- Central site distribution and change management support for remote AS/400 systems using MSS/400, remote RISC/6000 systems using NetView DM/6000, remote PS/2 systems using NetView DM/2, and remote Novell NetWare Servers using NVDM for NetWare

  SM/400 permits the central site AS/400 system to define, schedule, and track software distribution (change management) requests sent to AS/400 systems with Managed System Services/400, NetView DM/2, or NetView DM/6000 installed or Novell NetWare. These change management requests include sending, receiving, and deleting files, programs, other AS/400 objects (libraries, save files, message files, documents, folders, PTFs), and non-AS/400 (OS/2 and RISC/6000) files, programs and software. The change management functions support the integrated file system.

AS/400 objects can be sent directly to or received from AS/400 libraries or through the local AS/400 distribution repository. Non-AS/400 objects can be received into, stored, and distributed from the AS/400 distribution directory.

Running programs, installing software, applying PTFs, and re-IPLing can be scheduled to run automatically on the remote system. The remote system running MSS/400, NetView DM/2, NetView DM/6000 or Novell NetWare forwards the results of all change requests to the central site SM/400 system for tracking.

The capability for the central site AS/400 to define, schedule, run these change requests one time or repetitively, and track their status significantly enhances unattended operation of the remote systems supported by SM/400.

Sending AS/400 commands to remote AS/400 systems using MSS/400 without signing on is intended for unplanned operations to be performed on one or more remote AS/400 systems. For example, deleting a particular file or library that has been found to no longer be in use. The support is generally equivalent to the NetView Remote Operations Manager MVS support and works with either NetView Remote Operations Agent/400 or MSS/400.

SystemView System Manager for AS/400 includes a graphical interface for a network operator to graphically monitor and manage a network of systems. The change management functions provide support for the Integrated Netfinity Server.

Application Development

Application Development

IBM Licensed Programs: Application Development Products

IBM AS/400 PL/I, 5763-PL1 V4R2

PL/I is not offered as a licensed program. Customers are encouraged to migrate to ILE languages to take advantage of their compile technology and enriched functions. However, as an interim solution, PRPQ P10131 (5799-GCG) is available, which offers a PL/I compiler for OS/400 V4R5, V4R4, V4R3 or V4R2.

Runtime support for PLI is provided in OS/400 (5769-SS1) for PL/I programs developed using the PL/I compiler on earlier releases of OS/400.

System/38 Migration Aid, 5714-MG1

System/38 Migration Aid provides facilities and functions to select and migrate System/38 objects to the AS/400 system. System/38 programs can be transported in object format and re-encapsulated automatically on the AS/400 system.

For further details, see *Migration from System/38 Planning Guide*.

IBM VisualAge for C++ for AS/400 V4R4, 5769-CX5

VisualAge for C++ for AS/400 provides a comprehensive application development environment for one of the most commonly used object-oriented programming languages, C++. It provides a powerful, Windows work station based development environment. It includes VisualAge for C++ for Windows so developers have access to productive integrated editing, compilation, and client debugging facilities.

The VisualAge for C++ for AS/400 development environment and compiler run on Windows 95/NT-based workstations. Applications developed using VisualAge for C++ run on Windows, OS/400, or both in a client/server environment.

IBM VisualAge for C++ for AS/400 offers an extensive set of integrated programming tools including:

- **Visual Application Builder**: An object-oriented visual application development environment to rapidly prototype and build windows applications.
- **Data Access Class Builder**: Quickly brings existing database data into the object world by visually mapping a DB2 table into class objects with a single click.
- **VisualAge C++ Editor**: A highly customizable and extensible editor, which, as well as normal editor functions, also provides language sensitive support for C++.

© Copyright IBM Corp. 2000

- **IBM Open Class Library**: A comprehensive set of building blocks for Windows and AS/400 environment consisting of:
  - *Standard Class Library:* Lets you manipulate complex numbers and also lets you easily write C++ input and output statements.
  - *Collection Class Library*: A complete set of abstract data types such as trees, stacks, queues, and link lists.
  - *User Interface Class Library:* Includes extensive windows control support so you can easily build PM applications.
  - *Application Support Class Library:* Includes classes, such as buffers and string classes for single-byte and multi-byte character set objects, date and time classes, error classes to retrieve error information, and text and trace class is for module tracing.
  - *Access Class Library:* Provides access to OS/400 resources such as OS/400 database, data queues, user spaces, commands and programs commonly used to construct client/server applications for an AS/400, and a PC.
  - *Binary Coded Decimal Class Library:* Corresponds to the packed decimal type on the AS/400 system and allows you to represent numerical quantities accurately.
- **Browser**: A new windows static analysis tool that lets you look at C++ source code in many different ways.
- **Highly Optimized C++ Compilers**:
  - *C/C++ Windows Compiler:* Generates industry standard C and C++ code allowing applications the full potential of Windows.
  - *C++ AS/400 Cooperative Compiler:* Takes C++ source code on Windows 95 or NT and creates executable code that runs on the AS/400 system.
- **Performance Execution Trace Analyzer**: A unique analyzer enables you to time and tune your Windows applications, analyze program hangs and deadlocks, view multi-thread interactions, and improve program code.
- **Debuggers**:
  - *Source-Level Debugger:* Helps you analyze your Windows C++ program by displaying the code using windows services.
  - *AS/400 C++ Cooperative Debugger:* Looks, feels, and functions like a windows debugger, cooperative with the AS/400 host.
  - *AS/400 ILE System Debugger:* Allows you to debug ILE applications from a non-programmable terminal.
- **Disconnected Mode**: Allows you to edit, compile, and browse C++ code without being connected to an AS/400 system—a fast way to remove compile time bugs.

- **Workframe**: Provides a fully configurable and open integration environment allowing you to mix and match your favorite tools with ones from VisualAge C++ to create a personal development environment.

All functions are available in the DBCS environment. In addition to providing integrated tools, VisualAge for C++ for AS/400 enables future growth, increases productivity, and protects investment in data and software applications.

Recent Enhancements

VisualAge for C++ for AS/400 includes the following highlights:

- Support for UCS-2 (Unicode CCSID 13488)
- New 64-bit long integer data type
- Support for Integrated File System files larger than 2 GB
- Support for teraspace: A memory model that allows more than 16 MB of contiguous storage in one allocation
- Integer-to-pointer conversion
- New #pragma convert directive to specify the Coded Character Set Identifier (CCSID) used for converting string literals

IBM VisualAge Generator Server for AS/400 V4R4, 5769-VG1

VisualAge Generator is IBM's VisualAge offering focused on bringing productivity to organizations. It is a powerful, integrated development workbench used by programmers to fully define, test, build, and deploy traditional as well as Web-ready enterprise level systems on a variety of platforms in record time.

With VisualAge Generator, applications are defined from a productive desktop environment, using easy to learn, powerful, and high level specifications. The application definition is completely independent from the target runtime environment. The complexity of the system software infrastructure (transactional and DBMS APIs, Web server complexity, and communications protocols) is also hidden.

A powerful simulation and test environment enables the programmer to fully test the system without ever compiling or deploying to the final target system. This environment, built and integrated into the development workbench, allows rapid iteration between specification and verification. Once the application is fully verified, a code generation facility can be invoked to transform the high level environment-neutral specifications into native 3GL source code. The resulting source is optimized for the compilation and deployment to the selected execution systems.

This product was previously named VisualGen Host Services for OS/400.

This solution combines the best of both worlds: the productivity of an iterative desktop development environment with the scalability and he performance of a compiled and optimized 3GL production application.

To fully understand the power of VisualAge Generator, the rest of this description reviews the primary design points of this technology to:

- Provide the highest level of programmer productivity
- Fulfill the demands of an enterprise environment
- Enable rapid deployment of Web-enabled e-business solutions

Programmer Productivity

To address the first primary design point of programmer productivity, VisualAge Generator is equipped with four core facilities:

- Data model driven automatic code generation

  Industry research shows that the majority of the code written to implement business applications has nothing to do with the business problem. However this code is necessary to establish the “mechanical” infrastructure of the system providing functions such as handling error conditions, and keeping track of positioning within an array of data.

  Using the VisualAge Generator Templates facility, developers can have the application infrastructure (framework) automatically generated by the system. This dramatically reduces the coding requirements and allows the developer to build a fully functional database manipulation application in a matter of minutes.

  Programmers will build the bulk of their application by simply defining instances of the template's *Information Model*. The definition consists of choosing the data to be manipulated (tables, views and columns), and selecting how the data will be displayed. This set of intuitive, and seemingly simple specifications, allows VisualAge Generator Templates to automatically generate surprisingly comprehensive application code to:

  – Access and manipulate database (Create, Read, Update, Delete)
  – Present the data to the end user in different ways (Java or traditional GUI, JSP or TUI)
  – Manage navigation among multiple windows and session state
  – Manage multi-user data access concurrency
  – Manage paging when data result set is larger than page size
  – Manage error conditions
  – Provide window and field level online help

  Once this application framework is generated, developers simply add the business logic using the standard VisualAge Generator specification facilities to complete the creation of the system.

- Visual construction from components

  VisualAge Generator includes IBM's award winning visual, component-based construction architecture. This facility is much more than a User Interface (UI) layout builder. Programmers can build their own components and make them available for reuse, or they can take advantage of pre-built, pre-tested components sold by IBM or third parties, visually assembling them to meet their system specifications.

  Hundreds of reusable components are already available. With the growth of popularity of JavaBean and Enterprise JavaBean component models, thousands more will become available, allowing IT shops to implement a “Buy and Integrate” application development strategy instead of the traditional “develop from scratch” approach.

- High level 4GL specification facility

  VisualAge Generator provides a simple and yet powerful specification language. This language includes a set of high-level and polymorphic constructs, such as I/O verbs, Unit of Work (UOW) management verbs, and Remote Procedure Call (RPC), and hides the complexity of underlying target execution environment. The programmer, therefore, can focus on the business problem rather than on writing to a complex API. An example of the power of the abstraction level of such a specification is the Web Transaction Rapid Development facility. Using a logical data structure definition and simple logical verbs, such as CONVERSE, programmers can build and test without needing to learn and master complex Web technologies such as Java servlets and JSP, fully functional multi-tiered e-business systems.

  Beyond the abstraction provided in the language, VisualAge Generator includes many aides to make 4GL programming even more productive. These include powerful utilities such as language sensitive editors, wizards, and graphical assistants. Each is fully integrated and designed to speed the programming effort and help to prevent or eliminate errors.

- Interactive Test Facility (ITF) integrated with the development facilities

  The most powerful feature of the development workbench is the ITF. This facility is tightly integrated with the specification environment, allowing programmers to easily specify, animate and verify the application without leaving the development environment. This rapid iteration between specification and verification frees the developers from costly generation (compilation) and deployment steps, and facilitates an evolutionary development approach for prototyping.

Fulfilling the Enterprise Requirements

An “enterprise class” application development solution must be capable of fulfilling the following key requirements:

- Provide a robust development workbench that can scale up to large development teams

  VisualAge Generator is equipped with integrated repository services that facilitate software configuration management and version control. In addition, it is possible to transfer VisualAge Generator source specifications between the integrated repository and external Software Configuration Management (SCM) tools, such as VisualAge TeamConnection, to be managed along with other application development artifacts participating in the enterprise-wide problem and change tracking and development process management.

- Deliver systems that can scale up to the highest transactional throughputs

  VisualAge Generator generates COBOL and C++ source that can be compiled and run under the control of TXSeries, CICS/ESA, and IMS/TM transaction managers. This native support of the most proven TP monitors in the industry assures the transactional scalability required by the most demanding business critical systems.

- Produce systems that can run on a wide variety of platforms

  The code generated by VisualAge Generator can run on a variety of client and server platforms, including Windows 95/98, Windows NT, Sun Solaris, OS/2, AIX, HP/UX, OS/390, OS/400, as well as other 390 systems such as VSE and VM.

- Ease the integration with existing legacy systems, allow access to legacy data

  VisualAge Generator systems can easily reuse existing legacy programs through a simple CALL API, and can also be invoked by hand-crafted existing COBOL or other 3GL programs. In addition, VisualAge Generator programs can access not only the most popular relational DBMS, DB2/UDB family, Oracle and others, but can easily manipulate legacy file systems, such as VSAM, and non relational IBM databases, such as IMS/DB and DL/I. The integration allows easy integration of new applications into existing IT infrastructures maximizing the protection of the previous investments.

- Deliver enterprise IT assets to the Web

  As explained in more detail in “Delivering e-business Solutions” on page 699, VisualAge Generator allows to develop end-to-end multi-tier systems with Java servlet/JSP component dynamic HTML front-ends, transparently connected to transactional servers running on any of the supported server platforms and transactional systems mentioned earlier in this paper.

- Be usable by traditionally skilled programmers

  Although VisualAge Generator is tightly integrated with a pure Object Oriented (OO) programming environment (Smalltalk or Java), the programmer can exploit these technologies without needing to learn OO programming and simply use the procedural 4GL specifications. However, the power of the underlying OO technology can be gradually unleashed as the developer becomes more familiar with the component architecture and begins to explore and exploit the additional facilities.

Delivering e-business Solutions

Developing e-business solutions is quickly becoming the next strategic direction as companies see the potential for cost savings, better customer service, and streamlined business processes. This is possible only if the enormous value of the existing IT assets can be easily brought into a Web-centric world. But the Web is an unforgiving new market, where your competitor is just one click away. Building self-serve systems that do not provide adequate response and availability can be more damaging than not entering the market at all!

IBM is leveraging its experience in delivering highly available, scalable, and secure systems to equip this new world with the correct infrastructure and tools. The result is a set of products and architectures to support the creation and deployment of end-to-end multi-tiered e-business systems. If we think of an e-business system as a logical 3-tier solution, IBM WebSphere Application Server provides the runtime environment for tier-2, WebSphere Studio provides the tools for Web-site management and page composition, and the VisualAge products allow professional programmers to rapidly create transactional data servers and business logic. In this context, VisualAge Generator plays a central role for the development of new third-tier transactional servers. These servers must guarantee high performance and transaction volumes. The servers must also reach a variety of legacy platforms and data. To do this, the servers automatically generate the code necessary to use their services in a servlet/JSP component dynamic HTML context. This is possible today through three facilities:

- Web Transaction Rapid Application Development (RAD)

  The Web Transaction RAD facility is an innovative and simple methodology that allows traditionally skilled programmers to develop, test, and deploy multi-tiered Web systems without having to deal with the complexities of tier-2, such as designing and developing servlets and JSP that manage and contain data provided by tier-3 servers (mapping data between Java objects and flat data structures, understanding API for host connectivity, and so forth), and manage sessions and state. Using this approach, developers can specify their system at a logical level and let VisualAge generate both tier-2 (Java and JSP component) and tier-3 (C++ or Cobol) code that implements those specifications.

- Integration with VisualAge for Java

  The VisualAge Generator Developer workbench is seamlessly integrated with the award winning VisualAge for Java workbench to provide the most powerful e-business Integrated Development Environment (IDE) in the industry. Programmers can develop and test Java clients (applications, applets, or servlets) using either Java or 4GL specifications, or a mix of both, easily exchange data content between Java variables and VAGen data items, cross invoke business logic implemented in the two languages, and animate both source definitions in a seamless interactive debugging environment. Tier-3 server logic, specified in 4GL, can be defined and tested together and seamlessly with the client prior to the generation of C++ or COBOL for the target runtime. A full end-to-end multi-tiered Java-to-any-server solution can easily be developed, rapidly and without necessarily

having to learn deep Java skills, in an iterative and dynamic environment that does not require lengthy runtime software setup.

- Generation of JavaBean and Enterprise JavaBean components

  This facility allows you to automatically generate, from VisualAge Generator server program specifications, JavaBean and Enterprise JavaBean components that can be used within any Java program (applet, application, or servlet) to connect to and exchange data with a VisualAge Generator server program. Selecting the EJB component generation option allows you to reach tier-3 VisualAge Generator programs within a EJS (Enterprise Server for Java) runtime environment, such as that provided by IBM WebSphere Application Server Enterprise Edition. The generated bean and the gateway program automatically perform all the data marshalling and conversion necessary to map Java to traditional back-end transactions.

The software requirements are:

- OS/400 V4R4 or later (5769-SS1).
- For compiling generated programs, ILE COBOL for AS/400, V4R4 or later (5769-CB1).
- For compilation with relational tables, DB2/400(TM) Query Manager and SQL Development Kit V4R4, or later (5769-ST1).

System/36 Migration Aid, 5727-MG1

System/36 Migration Aid provides the facilities on System/36 to analyze data, libraries, files and programs prior to saving them for migration to the AS/400e system. Files and data providing system-related information, for example, security, configuration information, and document folders, can also be migrated.

Once saved using a choice of media, facilities are provided on the AS/400e system to load and reformat the data as required. These facilities are part of OS/400.

The migration process is clearly defined by a menu-driven interface. For further details, see *AS/400 Migration from System/36 Planning Guide,* GC21-9623.

IBM Integrated Language Environment COBOL for AS/400 V4R4, 5769-CB1

ILE COBOL for AS/400 is a programming language that is used in the processing of business problems. COBOL can be used to manipulate DB2 for OS/400 database files in a relatively simple way. COBOL uses English-like syntax, to assist the programmer in generating self-documenting, structured programming constructs.

Through ANSI-85 high-level functions of ILE COBOL for AS/400, such as nested source programs, it is easier to port code to the iSeries 400 and AS/400e system from other platforms. Programmer productivity is increased with ILE COBOL for AS/400, through its extensive database and workstation support, static, inter language calls, interactive syntax checking, debug facilities, and a full complement of compile-time error diagnostics.

ILE COBOL for AS/400 consists of the following COBOL components:

ILE COBOL for AS/400
OPM COBOL for AS/400
System/36-Compatible COBOL for AS/400
System/38-Compatible COBOL for AS/400
PRV ILE COBOL for AS/400

- COBOL/400 provides American National Standards (ANS) COBOL X3.23-1985, Intermediate Level function. COBOL/400 also conforms to the 1986 FIPS COBOL Language Standard and the IBM C-S3-9025-02 standard.
- COBOL/400 supports embedded SQL statements and interactive communication facilities functions.
- Interactive syntax checking provided by the Source Entry Utility (SEU) component of the AS/400 Application Development Tools.
- Full-screen processing for formatting display screens.
- System/36 and System/38 COBOL source programs can be created on the AS/400 system using SEU. These can be compiled on the System/36 and on the System/38 to generate executable object code.
- The AS/400 System/36-Compatible COBOL and AS/400 System/38-Compatible COBOL compiler options of the COBOL/400 accept and compile COBOL programs written in accordance with the ANS COBOL X3.23-1974 standard.

The following enhancements are included in ILE COBOL for AS/400:

- **Support for Double-Byte Character Set (DBCS)**

  ILE COBOL for AS/400 allows you to define and work with a new double-byte character type (that is PIC G(nn)). It also allows you to work with DBCS literals. This DBCS support improves inter language communications in an ILE environment.

- **Support for four-digit years**

  The ACCEPT statement accepts four-digit year dates in support of the Year 2000.

- **Support for floating point data**

  Users can use floating-point formats to represent numeric data in a COBOL program.

- **Additional compiler support**

  Enables users to collect statistics to aid performance analysis on applications.

- **Support of library qualified calls**

  Allows a user to associate programs referenced in the COBOL program with a specific library.

V4R4 Enhancements

The following enhancements are available in ILE COBOL V4R4:

- Ability to run ILE COBOL programs safely in a multi-threaded environment
- PIC 9(31): 31-digit numeric support
- Euro currency support
- Ability to tolerate pointers in teraspace: A memory model that allows more than 16 MB of contiguous storage in one allocation

IBM VisualAge RPG and Cooperative Development Environment for AS/400 V4R4, 5769-CL3

Note: See WebSphere Development Tools for AS/400 V4R5, which is the follow on product, in the following section.

IBM WebSphere Development Tools for AS/400 V4R5M1, 5769-CL3

Note: IBM VisualAge RPG and Cooperative Development Environment for AS/400 has been renamed to IBM WebSphere Development Tools for AS/400.

WebSphere Development Tools for AS/400 V4R5M1 consists of the following workstation components:

- VisualAge RPG
- CODE/400
- VisualAge for Java for AS/400
- WebSphere Studio for AS/400

WebSphere Development Tools for AS/400 contains four components. The first two are VisualAge RPG and CODE/400, which are already offered as an iSeries 400 and AS/400e program (5769-CL3). Plus, there are two new components VisualAge for Java for AS/400 and WebSphere Studio for AS/400. Now you can easily develop new client/server applications or convert old applications to client/server for iSeries 400 and AS/400e with VisualAge RPG. Point and click the visual parts to build screens and develop the logic behind your screens in

RPG. Generate Java to Web enable your applications written in RPG. Write host or server code with the CODE/400 client/server development environment. You can also develop and maintain applications in many iSeries 400 and AS/400e languages, including RPG and Java. CODE/400 is the most productive way to work with iSeries 400 and AS/400e host applications on a Windows 95/98/NT workstation. VisualAge for Java for AS/400 and WebSphere Studio for AS/400 are based on the latest V3.5 versions. WebSphere Application Server now provides Java 2 support.

This new package of workstation tools will assist customers to move into the world of e-business to:

- Create new e-business applications
- Port e-business applications from other sources
- Web enable existing host applications

If you already have VisualAge RPG and CODE/400 with software subscription, you are eligible for an upgrade to WebSphere Development Tools for AS/400 at no additional charge.

VisualAge for JAVA for AS/400 (component of 5769-CL3)

VisualAge for Java for AS/400 is the IBM award-winning Java IDE. It is coupled with the wizards and Enterprise Toolkit for AS/400 (ET/400) that provide easy access to iSeries 400 and AS/400e data, applications, and system capabilities.

In VisualAge for Java for AS/400, the editor offers improved code formatting and easier and better exception handling. The editor now provides full file editing to ease the learning curve for 3 GL and C++ developers.

The enhanced browser filters by packages and classes and provides full file browse mode.

The debugger now has more types of breakpoints, including conditional breakpoints and breakpoints for inner classes. You can now debug classes external to the IDE. JDK migration enhancements are added along with global find/replace with a one-button global replace and component by-component migration guide.

Solution maps added to the IDE allow projects, packages, and classes to be swapped in and out of the IDE. The developer can focus at the task at hand by having a single set of projects, packages, and classes. IDE performance improves because there are fewer classes “hot” inside the IDE. Solution templates improve the usability of the product. Precoded Customer Relationship Management (CRM) templates show how to build and customize solutions. These templates can be used to teach e-business application development.

The servlet builder is replaced with a new servlet wizard that generates tighter code and improved performance. The wizard generates HTML, servlet, and JSP prototypes for

WebSphere Studio for AS/400. Improved integration is possible because both tools support the same JDK level.

A WebSphere unit test environment (WebSphere Control Center) assists to rapidly test servlets and JSPs. By using this WebSphere control center, you can iteratively test your code without deploying it. This WebSphere unit test environment is supported on Windows 98, Windows NT, and Windows 2000.

VisualAge for Java is acknowledged as being the best Java IDE for creating Java applications for the AS/400 and iSeries. It has a powerful sophisticated Java Integrated Development environment with an advanced Visual Composition Editor (VCE) for assembling components and objects into an application. In this release, the focus is on improved usability. More wizards and templates make it easier to generate code to access enterprise applications and enterprise data. The VCE can easily and quickly assemble these generated components into an application. Improved integration with WebSphere Studio makes it easy to create attractive Web sites for advanced e-business applications.

WebSphere Studio for AS/400 (component of 5769-CL3)

WebSphere Studio for AS/400 is an IBM Web development tool, based on WebSphere Studio V3.5 level. It now includes iSeries 400 and AS/400e GUI elements for the browser, easy-to-use deployment tools, productivity-enhancing wizards, and templates. You can use any language to develop Web applications that access iSeries 400 and AS/400e data and applications easily. In WebSphere Studio V3.5, new built-in support for the creation, management, and deployment of content for pervasive computing devices, is added. There is new automatic generation of page-at-a-time navigation for large result sets. The visual JSP/HTML layout tool, Page Designer, has improved integration and ease-of-use content. Support to publish to the Web Application structure of WebSphere Application Server is new in the V3.5 release.

WebSphere Studio for AS/400 is still the only product with a complete and easy-to-use Visual Page Designer for JSP, HTML, and DHTML that includes round-trip raw edit ability.

The market-leading site management workbench provides easy, powerful, team-enabled, site creation, and management capabilities. WebSphere Studio for AS/400 is a complete tools solution with integrated support for visual applet creation, GIF animation, and image creation.

CODE/400 (component of 5769-CL3)

CODE/400 is the preferred development environment for developing host/server applications for AS/400 and iSeries. The edit, compile, and debug capabilities support RPG, COBOL, C, C++, CL, DDS, and Java. CODE Designer is a WYSIWYG DDS tool for creating workstation, printer, and database files for iSeries 400 and AS/400e. Enhanced debug capabilities allow you to debug multitier e-business applications.

CODE/400 gives you:

- CODE Project Organizer
- CODE Editor
- CODE Designer
- Distributed Debugger
- Seamless access to iSeries 400 and AS/400e
- Host offload, work-at-home option

The latest CODE/400 enhancements include:

- Distributed Debugger:
  - Single debugger UI across various platforms
  - Multiple new invocation modes such as attaching to running JVM
  - WebSphere support
- Editor:
  - Token highlighting for HTML files
  - Compiling iSeries 400 and AS/400e C++ source accessed from a mounted drive
  - Quiet exit option when closing the Command Shell
  - New tips and techniques about extracting the source type of the current document, compiling files on an iSeries 400 and AS/400e integrated file system, and using the CODE tools with the Operations Navigator
  - New macro support documentation
- Program Generator:

  New C/C++ compile option dialogs for the CRTCMOD, CRTBNDC, CRTCPPMOD, and CRTBNDCPP commands
- Operations Navigator Plug-in:

  Invocation of the CODE editor, compiler, debugger, and designer from within the Operations Navigator
- New HTML Help for CODE/400

VisualAge RPG (component of 5769-CL3)

This Visual Development Environment allows you to build client RPG applications with Windows GUI and transparent access to iSeries 400 and AS/400e resources. You edit, compile, debug, and execute RPG on the client. The VisualAge RPG compiler is the same code base as the host ILE RPG compiler so you can easily move logic between the client and server.

You can now generate Java applications and Java applets from the VisualAge RPG source so that RPG becomes an e-business language.

VisualAge RPG offers:

- A Visual Development Environment
- An RPG compiler on the workstation
- A programmable language-sensitive editor
- A display file import facility
- Transparent PC-to-iSeries 400 and AS/400e connectivity
- Source-level debugger

The latest VisualAge RPG enhancements include:

- Subfile fields support for VALUE keyword
- Subfile StartAt attribute forces READC operation to start at the record specified
- Label substitution character (^) supported for subfile column headings
- Tab stop can be set for the subfile part
- Auto format and auto validation for entry fields
- Subfile, container, and list box parts support KeyPress and VKeyPress events
- Notebook page TabLabel attribute is now gettable
- Notebook part attribute ShowTabs allows you to show all tabs
- Options dialog setting determines if all tabs should be shown in properties notebooks
- Additional spacing capabilities for parts relative to a bounding area are supported
- Canvas part supports the Enabled attribute
- Component part attribute, platform, returns the environment in which the application is running (Java or Windows)
- Specifying a part's size and position in the part's settings notebook
- Invocation of user commands as the last build step
- Personal Communications (PCOMM) for Windows support
- The “Who Am I” dialog in the GUI Designer provides project and VisualAge RPG information
- JavaBean part for adding JavaBean components
- Menu items support for “What's This?” help for Java applications
- Entry Field and Multiline Edit parts retains text selection setting even if the window they are on loses focus
- Component Package dialog has a Find button
- TEST directory can be specified for each project
- New HTML Help for VisualAge RPG

WebSphere Development Tools for AS/400 is the strategic package of tools for developing e-business, traditional, and client/server applications. It is based on Application Framework for e-business architecture.

Integrated Language Environment C for AS/400 V4R4, 5769-CX2

The IBM ILE C compiler is a full-function compiler for the iSeries 400 and AS/400e system, compliant with the American National Standards Institute (ANSI) programming Language C (ANSI/ISO 9899-1990).

IBM ILE C for AS/400 provides a high-performance, 100% ANSI-compliant compiler. IBM ILE C for AS/400 replaces SAA C/400, the System C/400 PRPQ, and the APTA PRPQ. The primary benefits of using IBM ILE C for AS/400 are performance and easier code reuse. IBM ILE C for AS/400 simplifies and encourages programmers to migrate their C applications written on other platforms to the iSeries 400 and AS/400e system.

IBM ILE C for AS/400 and IBM VisualAge for C++ for AS/400 can bind to components written in any ILE language. With its rich set of functions, IBM VisualAge C++ for AS/400 and the IBM ILE C for AS/400 languages complement other languages, such as RPG/400 and COBOL/400, providing better support for string and bit manipulation, numerical computation, floating point data, dynamic memory allocation, and system programming functions.

Highlights of the existing product include:

- Ability to compile C source from an integrated file system file using the Source Stream File (SRCSTMF)
- 64-bit keyword integer support
- Native thread enabling of ILE C run time (V4R2)
- More XPG4/ANSI functions for POSIX locale (V4R2)
- Argument Optimization support
- PRFDTA support on CRTCMOD/CRTBNDC commands (V4R2)
- ILE C runtime locale is enabled for the new system locale support
- Supports single-byte, pure double-byte, and mixed-byte character data
- Stream I/O enabling on the integrated file system
- TCP/IP Sockets
- Faster exception handling
- Function inlining
- Compile to previous release
- CICS enablement
- Faster compile runtime
- Module replacement
- Mutex support
- 100% ANSI compliant
- MAKE utility
- Imbedded SQL support
- Packed Decimal data type
- Machine Interface (MI) access
- Excellent documentation

- Source level debugger
- ASCII data support
- 64-bit, long integer type (V4R3)
- Static binder
- National language support
- Dynamic Screen Manager (DSM)
- DDS support
- Extensive example library
- Sophisticated optimizer
- iSeries 400 and AS/400e Pointer support
- Migration support
- Source Code Checker

ILE C runtime functions are thread-safe in a multi-threaded environment. In addition, the runtime provides full support for wide-character functions that are either sensitive or non-sensitive to POSIX locale. Combined with a strong tradition of 100% ANSI compliance, customers with applications written in C on other platforms can easily migrate these applications to the iSeries 400 and AS/400e system.

Programmer Productivity

The ILE C compiler provides a number of tools to make more efficient use of time and resources. The CHECKOUT compile option identifies possible programming errors that can otherwise be difficult to find at runtime. The CVTCSRC tool assists in migrating EPM and System C/400 code to ILE C code. The tool scans the source and recommends changes. It is located in the example source files in the QCLE library. The ILE source Debugger provides interactive source level debugging. It provides capabilities such as viewing source programs, setting break-points by cursor position, stepping through source statements, and displaying or changing values of program variables.

IBM ILE C for AS/400 continues to support industry standards, such as ANSI, enabling applications written in ANSI C on other platforms to be easily ported to the iSeries 400 and AS/400e system.

V4R4 Enhancements

- Support for integrated file system files larger than 2 GB
- Support for UCS-2 (Unicode CCSID 13488)
- Support for teraspace: A memory model that allows more than 16 MB of contiguous storage in one allocation
- Integer-to-pointer conversion

IBM CICS Transaction Server for AS/400 V4R4, 5769-DFH

The CICS platform is widely-used as a basis for implementing business solutions. CICS for AS/400 enables many of these existing applications to be made available on the iSeries 400 and AS/400e system without excessive costs of code conversion. iSeries 400 and AS/400e applications can coexist with CICS applications.

CICS for AS/400 supports CICS COBOL Command-Level or C applications on the iSeries 400 and AS/400e system. It is based on a major subset of the CICS/ESA Application Programming Interface (API) and supports Minimal Function Basic Mapping Support (BMS).

If a user wants to write an application program using the CICS for AS/400 API, then ILE COBOL for AS/400 (see “IBM Integrated Language Environment COBOL for AS/400 V4R4, 5769-CB1” on page 700) or ILE C for AS/400 (see “Integrated Language Environment C for AS/400 V4R4, 5769-CX2” on page 707) is required. COBOL or C applications developed for CICS/DOS/VS, CICS/OS/VS, CICS/ESA, CICS/MVS, CICS/VM, CICS OS/2, and CICS/6000 are generally source-compatible with CICS for AS/400 if they use only the CICS command-level API. Application support is available for both single-byte and double-byte character-set based applications.

Basic Mapping Support (BMS) maps are source-compatible, provided they use only CICS family base level BMS when ported to CICS Transaction Server for AS/400. The CICS macro-level API is not supported by CICS for AS/400.

CICS for AS/400 offers server support for direct communication with workstation-based CICS clients over SNA APPC links, without the need for an intermediate CICS OS/2 server.

Improved data integrity is ensured with CICS for AS/400 exploiting the OS/400 two-phase commit capability. When a CICS for AS/400 application updates multiple systems, it ensures successful updates of all files and backs out partial updates if the full transaction is not completed. CICS for AS/400 two-phase commit support provides a backward recovery facility.

The Inter-Systems Communications (ISC) facilities of CICS for AS/400 allows connectivity to other CICS platforms, giving access to both applications and data on those systems. CICS for AS/400 supports ISC functions on the following products:

- CICS for AS/400 (other iSeries 400 and AS/400e systems running CICS for AS/400)
- CICS/ESA V3R2 and V3R3
- CICS/MVS V2R1
- CICS/VSE V2R1
- CICS OS/2 V1R2 and V2R0
- CICS/6000 V1R1

CICS for AS/400 InterSystem Communications (ISC) capabilities allow OS/400 users to share data and applications with other CICS systems. Enhancements include a binary call interface from other languages and more simplified OS/400-based administration.

V4R4 Enhancements

Formerly called CICS/400, this product not only has a new name, CICS Transaction Server for AS/400, it also comes packaged with two other products. CICS Universal Clients, and CICS Transaction Gateway are delivered with the CICS Transaction Server allowing you to enable your e-business right away.

IBM Application Program Driver for AS/400 V4R3, 5769-PD1

The Application Program Driver for AS/400 (APD/400) allows customers to standardize a number of functions, which are nearly always present in every application, and to present a standardized interface to the user.

APD/400 includes the following features:

- **Menu driver:** Allows interactive creation and modification of menus
- **Access control:** Access control functions (which can be granted and revoked interactively by the administrator) are available for menus and menu options
- **Fastpath**: Supports fastpath jumps to other menus, programs, or applications
- **Conflict management:** Control of mutually exclusive programs (the choice of one menu option can disallow one or more other options)
- **Save/restore**: Allows the user to define save intervals, number of generations, restore sequences, and backup volume IDs
- **Batch scheduling function**

All APD/400 administrative programs offer help text for screens and input fields.

V4R3 Enhancements

A GUI makes the iSeries 400 and AS/400e system easier to use, particularly for those companies working in a graphical environment. Graphical Access from Client Access is required for this function. The enhancements include:

- Point and click
- Fastpath commands
- iSeries 400 and AS/400e connectivity
- Detailed help
- A consistent GUI to reduce the learning curve

IBM Application Development ToolSet for AS/400 V4R4, 5769-PW1

The IBM Application Development ToolSet for AS/400 (ADTS/400) consists of seven components and two features. ADTS/400 also serves as the prerequisite licensed program for client/server application development tools. It contains the server access programs for the three client/server products: CODE for OS/400, VRPG Client, and ADTSCS for OS/400.

The AS/400 Application Development ToolSet (ADTS) provides an integrated set of application development tools usable by analysts, programmers, and support personnel in the design, development, and maintenance of applications. ADTS takes advantage of the rich function in the IBM OS/400 and its relational database. It enhances productivity in the tasks performed to develop interactive, transaction batch, and client/server applications.

The Application Development ToolSet contains five utilities:

- **ADT: Programming Development Manager (PDM)**

  The Programming Development Manager provides the focal point of this integrated application development environment by managing lists of items to be developed or maintained. By easily subsetting and selecting from lists, the user can manipulate any number of objects. This enhances the productivity of analysts, programmers, and support personnel in managing programs, data and systems information, by focusing activities on a grouping of objects or items to be worked on. The other tools are fully integrated; the user always returns to the PDM list when use of a tool is complete. Also, by automatically invoking the appropriate command with correct parameters and syntax, keying and errors are reduced.

  This integration is further enhanced by user-definable options to extend this environment with the user's own tools.

- **ADT: Source Entry Utility (SEU)**

  SEU is a full-screen editor providing syntax checking of compiler source statements. Commands have a strong affinity with those provided by the System/370 Program Development Facility (PDF) editor as well as the System/36 Development Support Utility (DSU) editor, and the System/38 SEU.

  The following are key characteristics and functions of SEU:

  – Syntax checking of entered statements is affected through interfaces to language syntax checkers.

  – 30-line commands are provided, for example: copy, delete, move, and insert.

  – SEU commands provide "fastpath" access to many functions.

  – Editor profiles are created for each user for storing of parameter values.

  – The editor is interactively accessed from Programming Development Manager lists.

  - Scan functions facilitate locating text within a member, for example, date, and character string.
  - Predefined high-level language prompts and format lines are provided.
  - User-defined prompts to allow programmers to define their own language prompts for use while editing.
  - A split screen capability allows the browse, scan, and copy of:
    - Other source members
    - Spooled compilation listings
  - System/36 and System/38, and iSeries 400 and AS/400e system source types are supported.

    Enhancements to System/38 SEU are provided through the addition of System/36 DSU line commands with other new line commands, the editor profiles, and interface with PDM.

- **ADT: Screen Design Aid (SDA)**

  SDA is used to interactively design, create, and maintain customer application screens (displays and menus).

  Changes to the attributes and colors of fields can be made and immediately displayed using the testing facility of SDA. This also provides a useful application prototyping capability to allow application end users of the application to participate in the design phase.

  SDA allows the programmer to:

  - Define fields and constants for the screen format
  - Select a database file and fields from that database file
  - Add or remove attributes and colors to or from the fields and constants
  - Change positions (move, copy, or shift) of, or remove, a field
  - Display or change work display field conditioning
  - Display or change ruler where the cursor is positioned

  In addition to testing the display being worked on, a print facility is also provided to assist with the documentation of an application.

  Screen Design Aid also provides support in System/36 and System/38 environments.

- **ADT: Report Layout Utility (RLU)**

  The Report Layout Utility (RLU) allows a programmer to define the layout of a printed report on the screen. RLU has a full-screen editing capability and allows the programmer to review report prototypes easily. After the report image is final, the programmer uses RLU line commands and function keys to define record formats and fields.

- **ADT: Data File Utility/Application Development (DFU/AD)**

Data File Utility/Application Development can be used to define, create, and maintain database applications that are primarily oriented to data entry, inquiry, or file maintenance. It is especially useful for creating test data for an application being developed.

DFU/AD can use any of three file definitions:

- RPG II File and Input specifications (F & I specs)
- Interactive Data Definition Utility (IDDU) definitions
- File definition stored with a database file

All iSeries 400 and AS/400e system file access methods are supported: sequential, indexed, and direct. Applications created take advantage of the Data File Utility/Application Execution (DFU/AE) support provided within the IBM OS/400 to allow validation of database fields and additional fields as well as scrolling forward and backward when browsing database records.

Two additional components in ADTS/400 are:

- **File Compose and Merge Utility (FCMU)**

  FCMU is a compare function that performs a comparison on two or more source physical files and locates the differences. When synchronization of multiple versions of a source file is required, the merge function takes the output of the compare and integrates it into the base file automatically. This can also be done through the interactive session with a split-screen merge facility similar to the browse and copy split screen in SEU.

- **Interactive Source Debugger (ISDB)**

  ISDB helps in testing and debugging the programs. It is a tool that displays the source of the program while the program is under the debug mode. Problems and program bugs can be easily identified by displaying variables and reviewing the source statements. Interactive Source Debugger speeds debugging and moves the applications into production faster.

The two features of ADTS/400 are:

- **Application Dictionary Services**

  The IBM Application Dictionary Services feature is a programmer development tool to assist in program development and maintenance. It is a dictionary on the iSeries 400 and AS/400e system that provides references and cross-references of data on the system. It can generate a complete inventory of all the software components on the iSeries 400 and AS/400e system, regardless of programming language. This inventory is stored in the dictionary and can be updated while an application is being modified.

  Application Dictionary Services can analyze impacts due to changes. It provides lists of files and programs that will be affected by a potential change to a field. This reduces the time spent in identifying and understanding all of the components of an application.

A synchronization capability, known as the Notify function, allows Application Dictionary Services to monitor for user domain object changes (create, delete, rename, and so on) to keep its dictionary and the system synchronized. This is based on a centralized system facility (the System Audit Journal) that can be set to record any operation on an object in the user's domain of the system.

Application Dictionary Services can be accessed from CODE/400.

- **Application Development Manager**

  The IBM Application Development Manager feature provides version control and software configuration management functions. It allows a group of application developers to create, manage, and organize multiple versions of their application. The application manager maintains the integrity of the application by not allowing one developer to overwrite another developer's source changes. Application Development Manager helps to automate the process of building, or compiling, source code. Application developers no longer have to analyze relationships between pieces of code. The build process does it for them. Application Development Manager provides developers with a mechanism for efficiently managing application objects throughout the life of an application.

  Application Development Manager supports applications written in these programming languages: ILE C for AS/400, ILE COBOL for AS/400, and ILE RPG for AS/400. It also supports CL, SQL, and DDS (Data Description Specifications).

  Application Development Manager contains security, auditability, and administrative functions, which facilitate the management of an application development environment:

  – *Application Development Manager security functions*: Limits access to appropriate users
  – *Audit trail*: Keeps the dates and times of changes and user IDs of the person making changes
  – *Report facility*: Shows the impact of the change to an application component
  – *Administrative functions*: For enrolling users to a project or application, defining projects, and defining a project hierarchy

  These Application Development Manager facilities help developers to work efficiently and effectively in a well-organized and controlled application development environment. ADM functions are available through CODE/400.

V4R4 Enhancements

The Application Development Toolset for AS/400 has been enhanced with:

- Support for distribution of applications from a development machine to target production machines.
- Support on the large production system to copy the needed programs.

- A new value *DIRCHAIN on the BLDSCOPE parameter of the BLDPART command to allow building the parts that directly depend on the part being built.
- Template of compile commands used by CODE/400 in the build option port.
- A self-study guide for quick orientation of product concept and functions.
- ADM/400 is enhanced to allow for libraries outside ADM/400 environment to be supported.
- Support for VRPG and System/36 ports so programmers can take advantage of the ADM/400 checkin-checkout mechanism to manage multiple versions of these applications.
- PDM support for ADM/400 distribution, VRPG, and System/36 port types.

IBM Integrated Languages Environment RPG for AS/400 V4R4, 5769-RG1

ILE RPG for AS/400 is designed for writing various types of application programs. This language is easy to learn, yet offers many advanced functions for experienced programmers.

ILE RPG for AS/400 delivers RPG IV, the next evolution of the programming language. The RPG IV compiler offers improved programmer productivity and application growth and quality.

A number of functions have been incorporated in the RPG IV language definition which include:

- **New definition capabilities:** The new definition specification in RPG IV consolidates and expands definition capabilities. Added functions include:
  - Standalone fields
  - Pointer-based structures
  - Parameter lists (call prototypes)
  - Relative positioning of fields within data structures (OVERLAY keyword)
- **Support for longer names:** This greatly enhances the readability of RPG programs and reduces the requirement for renaming fields defined in DDS to RPG field names. Earlier versions of RPG IV allowed ten-character names. Later versions allow names up to 4096 characters.
- **Name prefixing:** Users can globally rename all the fields in an externally-described file, or all the subfields in an externally-described data structure by using the PREFIX keyword on a file or data structure definition.
- **Expression support:** New operation codes provide to support character, arithmetic, logical, and relational expressions. The user is not required to break up complex expressions into individual RPG statements. Many built-in functions provide an aid in string operations, numeric editing, data conversion, and feedback for I/O and other operations. Procedures that return values can be called within expressions.

- **Date and time data type support:** RPG users now have the capability to deal directly with the DB2 for OS/400 date, time, and timestamp fields and perform date arithmetic operations.
- **Pointer support:** RPG users now have the capability to operate on pointer-based structures, pass pointers to applications written in other programming languages, and call-system functions requiring pointers.
- **Dynamic memory allocation:** New operation codes allow pointer-based storage to be dynamically allocated, resized, and destroyed.
- **NLS support:** RPG has improved the portability of applications, across systems with different national language requirements. The user can specify numeric editing functions, date and time editing functions, and national language sort sequence tables to be retrieved from the job attributes at program runtime or to be defined at program compile time.
- **Full graphic data type support:** RPG supports a graphic (2-byte) data type. Character operations and string manipulations have been enhanced to recognize and handle graphic data according to its 2-byte character length.
- **Static call:** Users can develop their applications in smaller, better maintainable modules, and link them together as one program, without incurring the penalty of dynamic call overhead. This facility, together with the Integrated Language Environment provided by the system, improves the user's ability to write mixed-language applications. The Integrated Language Environment programming languages permits the binding of C, RPG, COBOL, and CL into a single program regardless of the mix of source languages.
- **Prototype calls:** Programmers can code a prototype for a call in their definition specifications. The prototype includes the name of the program or procedure, as well as the information about the parameters.
- **Multiple procedures per module:** Programmers can write more than one procedure in each module. Additional procedures, called subprocedures, have the following characteristics:
  - No RPG cycle
  - They can declare automatic storage (storage that is not allocated until the procedure is called)
  - They can be called recursively
  - Local variables and structures can be declared within the subprocedure
  - The subprocedure can return a value, allowing the procedure to be called within an expression
  - Parameters can be passed by value, allow literals and expressions to be coded as parameters, rather than the caller having to declare a variable to hold the parameter

- **New data types:** Several data types have been added to RPG IV. These include:
  - **Floating point:** This data type provides the ability to have a single field that can hold both extremely small and extremely large numbers. It improves integration with OS/400 database and improves inter-language communications in an ILE environment, specifically with C and C++ languages.
  - **Signed and unsigned integer:** These data types allow numeric data to be stored in binary format, while avoiding the conversions to and from packed format required with the binary data type, and allowing the full range of data that can be stored in an integer or unsigned field. They improve inter-language communication in an ILE environment, specifically with the C and C++ languages.
- **Freedom from indicators:** Programmers can define individual data structures to hold the indicators used with externally-described WORKSTN and PRINTER files. In addition, most operation codes formerly requiring resulting indicators now allow resulting indicators to be omitted, with the information formerly provided by the indicators now provided through built-in functions like %EOF and %ERROR.

ILE RPG/400 consists of the following RPG compilers:

- ILE RPG-IV
- RPG/400
- IBM System/36-Compatible RPG II
- IBM System/38-Compatible RPG III
- ILE RPG-IV Previous Release Compilers

V4R4 Enhancements

RPG IV is enhanced in V4R4 with the following functions:

- Ability to run ILE RPG programs in a multi-threaded environment
- Support for the UCS-2 (Unicode) data type
- Compiler options OPTION(*SRCSTMT) and OPTION(*NODEBUGIO) for debug capabilities
- A EVALR operation code
- Support for 8-byte and 1-byte integer and unsigned integer
- Enhancements to integer fields
- Free-form FOR loop
- OVERLAY(*NEXT) keyword
- A LEAVESR operation code
- A control specification keyword OPENOPT(*NOINZOFL|*INZOFL)
- Ability to initialize character variables by INZ(*USER)

- Initialization of externally-described data structures
- Ability to tolerate pointers in teraspace; a memory model that allows more than 16 MB of contiguous storage in one allocation

Application Development Tools

There are a wide range of Application Development tools available to customers and ISVs who choose to develop applications on the iSeries 400 and AS/400e system. IBM's direction is to provide tools, as well as embrace other tool vendors that support the iSeries 400 and AS/400e system. Some non-IBM tools are even included with OS/400 as complementary, no charge software.

The PartnerWorld for Developers organization works with a variety of technology and tools partners for the iSeries 400 and AS/400e system. In particular, the Application Development Tools Network for AS/400 serves as a focal point to identify and recruit application development tools partners to the iSeries 400 and AS/400e platform. Today, there are over 100 tool partners endorsed as part of the AS/400 Tools Network.

The AS/400 Tools Network Web site at `http://www.ibm.com/eserver/iseries/developer/tools` describes the many high quality tools. The categories are:

- Application Reface and Redesign
- Business Intelligence Extensions
- e-business and e-commerce Extensions
- Heterogeneous server Integration
- Lotus Notes Integration
- Application Creation and Management
- Systems Management

Each category is further discussed below.

Application Reface and ReDesign tools can be used to modernize existing applications to:

- Migrate RPGIII code to ILE and RPG IV
- Modularize and partition applications to better prepare for future programming models
- Integrate the use of triggers, stored procedures, and other new DB2 UDB features
- Transform the 5250 data stream from existing applications to a Web or PC GUI
- Provide graphical tools for the developer to create host based RPG/COBOL applications
- Build GUI front ends for end-user query and report writing
- Add workflow to existing applications
- Integrate existing applications with advanced iSeries 400 and AS/400e technologies, such as image and fax

Business Intelligence Extensions typically:

- Extract data from legacy databases; summarize, cleanse, and move data to dedicated servers
- Create specialized data “cubes” or warehouses and marts from legacy data
- Provide graphical query and report writing tools to access the data marts and warehouses
- Assist in tuning and designing the large scale queries common in Business Intelligence
- Provide OnLine Analytical Processing (OLAP) and Relational OLAP tools to view the data in the warehouses or marts

e-business and e-commerce extensions cover a wide range of functions in the area of creating customer and supplier facing applications on the intranet, Internet, or extranet, such as:

- Java application servers that run on the iSeries 400 and AS/400e system and interoperate with a variety of both server and client-based applications
- Interactive Development Environments for creating browser based applets as well as server-based servlets in Java, XML, or other technologies
- Map existing relational data to formats more easily used by browser applications
- View host print in a client neutral browser
- Process payments for Web transactions by credit card
- Access DB2 UDB tables from a browser

Heterogeneous Server Integration tools are used to:

- Access data across multiple heterogeneous (different platforms/different vendors) servers
- Allow applications from heterogeneous systems to interact with each other
- Make it easier for a wide variety of client devices to access data and applications on the iSeries 400 and AS/400e system
- Assist in basic connectivity between heterogeneous systems
- Move data from one system to another regardless of platform or database product
- Handle transactions generated on multiple platforms as a single application
- Assist with mail integration issues

Lotus Notes Integration tools:

- Provide connectors between Lotus Notes applications and legacy data or legacy applications
- Allow for Lotus Notes mail interoperabilty with OfficeVision and other mail sources
- Provide development environments to create Lotus Notes applications

Application Creation and Management tools:

- Provide protected development environments for creation, testing, and deploying applications on iSeries 400 and AS/400e or attached clients
- Help with extracting data and testing applications before they are put into production

- Manage version control and allow developers to check in and check out pieces of code
- Provide for a team development environment
- Assist with application optimization and tuning
- Handle application distribution across local or wide area networks, including the remote installation process

Systems Management Tools:

- Manage the I/T assets of a company
- Allow the system to react to specific conditions and notify the appropriate staff
- Handle basic backup and recovery
- Assist in securing the system from both unintentional application errors and attack by unauthorized users
- Help control menus and access for green-screen attached users
- Provide graphical interfaces for day-to-day iSeries 400 and AS/400e systems management functions

In addition, the PartnerWorld for Developers, AS/400 Application Development Web site contains a DH Andrews report on iSeries 400 and AS/400e application modernization strategies and predominant approaches to modernize.

Office and Printing

Office and Printing

IBM Licensed Programs: Office and Printing Products

AFP Font Collection, 5648-B45

The AFP Font Collection program provides a comprehensive set of AFP fonts with over 1,000 fonts from the most popular type families—such as Times New Roman, Helvetica, and Courier—in a full range of sizes, resolutions (240, 300, and outlines), and languages (over 48). The fonts and utilities give you consistent printout on AFP printers at 240 or 300 dpi, or to any printer that uses AFP outline fonts. Compatible Type 1 and CID keyed outlines allow you to view AFP documents in Windows 95 and NT, OS/2 systems or using Netscape or Internet Explorer browsers with WYSIWYG fidelity. AFP Font Collection includes support for the euro currency symbol.

An optional feature of AFP Font Collection, *International Fonts and Programs*, provides a comprehensive set of double-byte fonts and font design programs, including:

- Outlines for Chinese, Japanese, and Korean DBCS fonts
- Type Transformer to convert any Adobe Type1 outline to an AFP font
- Fontlab for creating your own font designs
- Code page and coded font editor to set up your new fonts for use on the iSeries 400 and AS/400e system

IBM Content Manager for AS/400 V4R3, 5769-VI1

IBM Content Manager for AS/400 is a document imaging and work management system that can be implemented in a client/server or host environment. It changes the way paper documents are processed.

A graphical user interface is provided so the client or user can develop a customized document management solution that includes library and information processing capabilities. One can create image, workflow, and other applications to automate and gain control of the information the enterprise processes each day, building a work process and automatically routing documents and folders through a business.

VisualInfo for AS/400 controls the capture, indexing, storage, and retrieval of documents as images. Initially, documents are stored on iSeries 400 and AS/400e DASD and can be migrated to an optical storage system. VisualInfo for AS/400 also provides both production and ad-hoc work management functions. Processing documents as images helps you manage work more efficiently, reliably, and securely. It can help dramatically reduce the storage space required for paper documentation.

© Copyright IBM Corp. 2000

ImagePlus VI for AS/400 provides flexibility for controlling access to index classes (types of documents), workbaskets, and advanced workflow processes. With access lists, the ImagePlus VI for AS/400 administrator controls access to all these resources by user or by group.

The ImagePlus VI for AS/400 API set, initially implemented on Windows 95 and Windows NT is available on OS/400. The set of APIs are supported from ILE C, ILE COBOL, and ILE RPG languages.

ImagePlus VI for AS/400 continues to support all of the capabilities of Workfolder Application Facility (WAF) V4R1.

Workfolder Application Facility V4R1 is the host feature of VisualInfo for AS/400. Workfolder Application Facility offers two interfaces, either traditional iSeries 400 and AS/400e 5250 emulation or application programming interfaces (APIs).

VisualInfo for AS/400 can serve the needs of a small departmental organization or serve as an enterprise solution for a large corporation.

This document imaging and work management system saves you money in many ways. VisualInfo stores large quantities of documents and makes them available throughout your organization in seconds, leading to a dramatic increase in productivity. Even in geographically dispersed enterprises, mission-critical information can be delivered to users when they need it, in the form they need. And, multiple users can view the same documents simultaneously.

Functions include:

- Desktop integration with VisualInfo for AS/400 through workstation-based APIs
- GUI
- Content class support that you can use to capture, store, and retrieve documents containing information other than Mixed Object Document Content Architecture (MODCA), for example, work processing or spread sheets
- Integrated file system support
- Additional user exits such as work with file cabinet documents and review case documents
- Year 2000 enablement

For additional information on VisualInfo, visit the IBM Image Web site:
`http://www-4.ibm.com/software/data/imageplus`

IBM Advanced Function Printing Utilities for AS/400 V4R4, 5769-AF1

Advanced Function Printing (AFP) Utilities consists of three integrated utilities that support AFP print applications. Included are Overlay Utility for electronic forms, Resource Management Utility for managing document resources, and Print Format Utility, a "Query/AFP" tool to help you build advanced electronic output directly from iSeries 400 and AS/400e database files. Elements within a record layout can be coded to print based on certain conditions. Selection is determined by values of one to five variable fields in the database file.

Additional features include:

- Color can be specified in the overlay and print application design for lines and boxes.
- IOCA and IM1 image formats can be specified in the same manner with similar results.
- Australian, Japanese, and Royal Mail barcodes are supported.
- **Overlay Utility**: Enables design of AFP electronic forms through an iSeries 400 and AS/400e interface. The design interface includes all elements of typical electronic forms such as lines, boxes, text, images, graphics, and barcodes. Overlay Utility provides both an interactive, near-graphical design interface, and a command interface. iSeries 400 and AS/400e-resident, and printer-resident fonts are supported. Complete facilities are included to compile, print, and manage an organization's electronic forms.
- **Print Format Utility**: Enables the interactive creation of special electronic printing applications, directly from the iSeries 400 and AS/400e database. PFU is well suited for producing packing lists, shipping labels, or similar applications that require graphical output. Both tumble and standard duplex is supported. Print Format Utility produces complex output that features overlays, image, and barcodes.
- **Resource Management Utility:** A "workbench" for AFP resources that enables you to create, print, copy, and maintain overlays and images.

IBM Advanced Function Printing (AFP) PrintSuite for OS/400, 5798-AF2 (V3R2M1), 5798-AF3 (V3R7M1 and Later Releases)

AFP PrintSuite for AS/400 is a family of products to create electronic printing applications (output with enhanced application data, electronic forms, barcoding, image and graphics, and so on). The AFP PrintSuite for AS/400 solutions—Advanced Print Utility, Page Printer Formatting Aid, AFP Toolbox, and SAP R/3 AFP Print—are generally designed to enable iSeries 400 and AS/400e customers to transform application output without changes to the line-of-business application.

The AFP PrintSuite for OS/400 family of advanced printing solutions are separately orderable. The iSeries 400 and AS/400e customer (or developer) selects the product to meet their requirements. Versions of all four AFP PrintSuite solutions were released March 1998 for V3R2, V3R7, and later OS/400 versions.

Advanced Print Utility (APU)

APU allows end users to design how existing line output is blended with new fonts, electronic forms, image, and barcode, and how each page and copy appears. When complete, the existing application is automatically monitored and transformed, using the APU design.

- End-user design of advanced electronic output.
- Application-independent, no changes to the application program are required.
- Supports complex document requirements, such as multiple page formats and copies, each with customized layouts.
- APU production monitor provides the capability to customize precisely how transformed application output is produced and distributed. User exits enable changes to output. Full control is provided over where output pages, including different copies, are directed.

Pager Printer Formatting Aid (PPFA)

PPFA is a compiler for page and form definitions, formatting objects for iSeries 400 and AS/400e printing applications. These definitions, a standard in electronic printing, separate the formatting of electronic documents from the application data. Once PPFA creates these formatting objects, they are referenced in the printer file. Unlike spool reformatting systems, page and form definitions are integrated within the iSeries 400 and AS/400e printer file. Once created and specified in the application printer file, the application is automatically transformed, producing new electronic output in one high-performance pass:

- Programmer approach to document design (there are also graphical Windows front-ends to PPFA available)
- Application-independent, no changes to application program
- With V4R3, page and form definitions can be used in conjunction with DDS-defined output
- Consistency with page and form definitions on other systems

AFP Toolbox for OS/400

AFP Toolbox for OS/400 contains a rich set of APIs that provide complete control over the Advanced Function Printing (AFP) data stream. It is designed for applications that require documents precisely tailored to each customer, dynamic integration of image, or similar function, such as:

- A developers tool for advanced printing requirements such as variable placed boxes, images, overlays, and formatted text in customized, complex documents
- Invoked from C, COBOL, and RPG programs
- Also available for MVS, OS/2, AIX, and Windows

SAP R/3 AFP Print

SAP R/3 provides enhanced application output and support of AFP/IPDS printing for SAP R/3 customers. SAP output is transformed dynamically into AFP while adding document elements such as electronic forms, typographic fonts, and barcoding. This enhanced output can then be routed to system-managed IPDS printers.

IBM Advanced DBCS Printer Support for AS/400 V4R5, 5769-AP1

Advanced DBCS Printer Support for AS/400 is a set of the following utilities:

- APW (Advanced Print Writer)
- APPW (Advanced Page Printer Writer)
- KPF (Kanji Print Function)
- PFC (Printer Function Control)
- S/36 Resource Migration

APW, APPW, and KPF provide a user interface to print DBCS text with various print functions. The typical operation flow is:

1. Specify form description statements on the source file defining the format with which user text data should be printed, such as changing character size or pitch and adding header text and grid lines.
2. Create a form description object from the source file.
3. Generate print data from user text data and the form description.

The difference in these utilities is the supported printers and the print functions described below.

APW

The printers supported include DBCS line impact printers (54xx, 5317. 5327), PC printers (557x, 558x), and AFP printers.

Note: 5769-AP1 option 1 is required to print on AFP DBCS printers.

The print functions include:

- CPI (Characters Per Inch): 10, 12, 13.4, 15, and 18
- IGCCPI (DBCS Characters Per Inch): 5, 6, 6.7, and 7.5
- LPI (Lines Per Inch): 4, 6, 7.5, and 8
- Character Magnification: 1/2Hx1/2V, 1Hx2V, 2Hx1V, 2Hx2V, 2Hx4V, 4Hx2V, 4Hx4V, and 3Hx3V
- Grid line: Thin solid, thick solid, pair solid, thin dotted, bold dotted, and pair thin dotted
- Character rotation
- Barcode
- Superscript and subscript
- Shade
- User-defined dot pattern image
- SBCS font selection

APPW

The printer supported is the 5337-01 printer. The print functions include:

- CPI: 10, 12, 13.4, 15, and 20
- IGCCPI: 5, 6, 6.7, 7.5, 10, and 15
- LPI: 2, 3, 4, 6, 7.5, 8, 10, and 15
- Character Magnification: 1/2Hx1/2V, 1Hx2V, 2Hx1V, 2Hx2V, 2Hx4V, 4Hx2V, and 4Hx4V
- Grid line: Thin solid, thick solid, pair solid, and thin dotted
- Character rotation
- Barcode
- User defined dot pattern image
- SBCS font selection
- DBCS font selection
- Download user-defined DBCS characters

KPF

The printer supported is the 5583-200 printer. The print functions include:

- CPI: 10, 12, and 15
- IGCCPI: 5, 6, 6.7, and 7.5
- LPI: 4, 6, 7.5, 8, and 9
- Character Magnification: 2Hx1V and 2Hx2V
- Grid line: Thin solid, thick solid, and pair solid
- Character rotation

PFC

PFC supports the capability to print user-defined SBCS characters on DBCS printers configured as a 5553 type. It is mainly used to print OCR fonts on DBCS printers. Since the recent printers support OCR fonts, PFC may be required only for old printers.

System/36 Resource Migration

The equivalent functions of APW, KPF, and PFC were provided on an IBM System/36 as a PRPQ. This utility migrates the resources of those System/36 PRPQs to the iSeries 400 and AS/400e servers.

Prior to OS/400 V4R5, Advanced DBCS Printer Support for AS/400 was available in Asia Pacific only. It is now available in all geographies and is included on the Keyed Stamped Media.

IBM Dictionary and Linguistics Tools for AS/400 V4R5, 5769-DL1

Dictionary and Linguistics Tools provide improvements in the 24 dictionaries previously available as Language Dictionaries (5716-DCT) and add support for several additional languages. Also included is the set of dictionary access methods in the form of APIs, to allow customers to write applications to access the dictionaries directly, making use of the advanced linguistic information built into each dictionary, such as hyphenation, synonyms, spell aid, morphological identification, and tokenization.

The following languages are available:

Afrikaans	Italian	Australian English
Brazilian Portuguese	Norwegian	Czech
Catalan	Norwegian Nynorsk	Hungarian
Danish	Portuguese	Polish
Dutch	Russian	Turkey
Dutch Modern	Spanish	Arabic
Finnish (hyphenation support only)	Swedish	Hebrew
French National	Swiss German	Simplified Chinese
French Canadian	U.K. English	Traditional Chinese
German	U.S. English	Japanese
Greek	U.S. English Legal	Korean
Icelandic	U.S. English Medical	Thai

IBM Business Graphics Utility for AS/400 V4R4, 5769-DS1

The Business Graphics Utility (BGU) for AS/400 licensed program provides a very flexible and powerful business graphics function through a menu-driven interface. Users can create, modify, store, display, print, and plot business graphics using data from a keyboard or database file.

Extensive options provided by BGU offer users considerable flexibility in creating computer-generated charts. Font style, font size, font color, line styles, legend type, legend position, annotation, and grid line construction are a few of the many options.

Exercise and tutorial materials have been supplied in the BGU User's Guide to provide the necessary familiarization.

IBM Advanced Function Printing Fonts for AS/400 V4R3, 5769-FNT

Advanced Function Printing Fonts for AS/400 (AFP Fonts for AS/400) is a rich selection of font families for use on 240 dots-per-inch, non-impact printers supported by AFP software integrated in OS/400. This licensed program includes the following fonts:

- Sonoran Serif
- Sonoran Serif Headliner
- Sonoran Sans Serif
- Sonoran Sans Serif Headliner
- Sonoran Sans Serif Condensed
- Sonoran Sans Serif Expanded
- Monotype Garamond
- Century Schoolbook
- Pi and Specials
- ITC Souvenir
- ITC Avant Garde Gothic
- Mathematics and Science
- DATA1
- APL2
- OCR-A and OCR-B

The Sonoran Serif, Sonoran Sans Serif, Monotype Garamond, Century Schoolbook, ITC Avant Garde Gothic, and ITC Souvenir type families provide a rich offering of point sizes and typefaces that can be used in a variety of applications, particularly in printing text. Using different point sizes and typefaces produces varied and aesthetically pleasing results. These text-type families also include characters to support various national language groups. Some of the popular uses for these families are for printing books, brochures, business plans,

handbooks, magazines, manuals, operating schedules, price lists, presentation materials, headlines, subtitles, and reports.

APL2 and Mathematics and Science complement the text fonts by providing symbols required for scientific publications.

Pi and Specials contains several commonly used special symbols in several point sizes. In addition, Pi and Specials contains Sonoran Petite (7), a 4-point font, and Sonoran Display (8), an Old English style font, for special publishing requirements.

DATA1 provides 13.3 pitch fonts, which satisfy data processing requirements such as printing job logs and program listings.

Optical Character Recognition, which contains OCR-A and OCR-B, allows the IBM customer to produce machine-readable documents in postal, manufacturing, and distribution applications.

Fonts consist of digitized alphabetic and other character forms in sizes ranging from 4 to 72 points (approximately one-eighteenth inch to 1 inch in height). Character patterns are designed for printers with a resolution of 240 x 240 dots (picture elements or pels) per square inch.

Typically each font feature is provided in four typefaces: Roman medium, Roman bold, Italic medium, and Italic bold. Sonoran Serif, Sonoran Serif Headliner, Sonoran Sans Serif, Sonoran Sans Serif Headliner, Monotype Garamond, Century Schoolbook, Pi and Specials, ITC Souvenir, and ITC Avant Garde Gothic contain all four typefaces. The remaining features contain less than four typefaces.

Typically, each typeface is provided in 14 point sizes: 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 24, 30, and 36. Sonoran Serif, Sonoran Sans Serif, Sonoran Sans Serif Condensed, Sonoran Sans Serif Expanded, Monotype Garamond, Century Schoolbook, ITC Souvenir, and ITC Avant Garde Gothic contain all 14 point sizes. The remaining features contain other combinations of point sizes.

IBM Advanced Function Printing DBCS Fonts for AS/400 V4R3, 5769-FN1

IBM Advanced Function Printing (AFP) Double-Byte Character Set (DBCS) Fonts for AS/400 is a rich selection of DBCS font families for use on 240 dots-per-inch, non-impact printers supported by AFP software integrated in the OS/400. This program includes:

- Japanese fonts
- Korean fonts
- Traditional Chinese fonts

- Simplified Chinese fonts
- Thai fonts

This program is designed to allow printing on Page Printers. These fonts allow customers more flexibility in printing. Some common uses for these families are for printing books, brochures, business plans, handbooks, magazines, manuals, operating schedules, price lists, presentation materials, headlines, subtitles, and reports.

Some of the features of this product are:

- Expands customer business solutions by providing a System/370 equivalent double-byte font library for use with 240 dots-per-inch, non-impact printers attached to an iSeries 400 and AS/400e system.
- Enhances system management flexibility with AFP resources transfer.
- Allows for growth and flexibility in the use of AFP printers.
- Enhances user productivity by printing the same object on AFP printers attached to an S/370 or iSeries 400 or AS/400e server.
- Enhances the customer's investment protection by taking advantage of AFP printers.

IBM OfficeVision to Lotus Notes Migration Tools for AS/400 Version 2.2, 5697-F08

OV/400 to Notes Migration Tools for AS/400 Version 2.2 provides a comprehensive set of tools to assist OfficeVision/400 users to migrate mail, calendars, and personal user documents to Lotus Notes mail databases. It includes an iSeries 400 and AS/400e-specific version of the Lotus Calendar Connector for OfficeVision and an optional, specially priced copy of BlueNotes Document Warehouse (BNDW) for AS/400 for document migration and coexistence.

With OfficeVision to Lotus Notes Migration Tools for AS/400 Version 2.2, you can upgrade to Lotus Notes and take advantage of the e-business solutions available for Lotus Domino. The Migration Tools enable you to move your OfficeVision/400 user mail, calendar, and document management data smoothly into Lotus Notes, and exploit Lotus Domino for AS/400.

The OfficeVision to Lotus Notes Migration Tools of AS/400 contain the coexistence tools necessary to allow users who have upgraded to a Notes environment to seamlessly exchange mail and schedule meetings with OV/400 users. All of the components of the Migration Tools run natively on iSeries 400 and AS/400e servers and protect your investment in existing hardware and software.

The base Migration Tools include the ability to:

- Migrate mail, calendar data, distribution lists, and nicknames
- Migrate user documents stored in folders to the mail database
- Upgrade document management capabilities to Lotus Domino.Doc, including the batch load of documents from folders and subfolders into Domino.Doc
- Exchange calendar and mail information seamlessly between OfficeVision/400 users and Lotus Notes users

BNDW for AS/400 provides additional coexistence and migration capabilities by allowing Lotus Notes and OV/400 users to share and migrate documents stored in iSeries 400 and AS/400e shared folders.

Additional software from IBM Business Partners is available separately and can improve your OV/400 and Lotus Notes migration and coexistence environment, for example, to provide the ability to use Lotus Notes mail (including MIME attachments) and calendar from a 5250 terminal or emulation session. IBM and many IBM Business Partners are available to provide assistance and customizing so that upgrades are smooth and seamless. This ensures that customers attain the greatest benefits from the power of Lotus Notes, while leveraging their existing investment in iSeries 400 and AS/400e systems.

With OfficeVision to Lotus Notes Migration Tools for AS/400, you can:

- Migrate users from OfficeVision/400 to Lotus Notes and Lotus Domino.
- Take advantage of e-business solutions available for Lotus Domino.
- Perform batch upgrades of OV/400 document management data to Lotus Domino.Doc.
- Seamlessly exchange mail and calendar data between OV/400 users and Lotus Notes users.

In addition, BNDW for AS/400, an optional feature of the Migration Tools, allows you to migrate and share documents between Notes users and OV/400 users.

The OfficeVision to Lotus Notes Migration Tools for AS/400 require:

- OfficeVision/400
- A Lotus Domino Server Release 4.6.3
- TCP/IP connectivity between the above requirements

V2R2 of the OfficeVision to Lotus Notes Migration Tools supports:

- Lotus Domino Server Release 5.0
- Improved integration with Directory Synchronization
- Remote Notes client time zone support for OfficeVision meeting notices
- A method to set the iSeries 400 and AS/400e server priority at which the jobs run

The functions included with OfficeVision to Lotus Notes Migration Tools for AS/400 Version 2.2 enable customers to migrate user information including mail, nicknames, distribution lists, personal and resource calendars, and personal documents to Lotus Notes. Personal documents are migrated as part of mail.

During the migration period, integration between Lotus Notes users and OV/400 users is provided by:

- Lotus Calendar Connector for OfficeVision/400 (LCCOV for OV/400), which enables OV/400 users and Lotus Notes users to exchange meeting notices, perform free-time searches and view calendar details. LCCOV for OV/400 is included in the Migration Tools.
- Directory synchronization between Domino for AS/400 and OV/400, which provides mail and calendar addressing that is simple and seamless. The directory synchronization function is included with the Domino server on the iSeries 400 and AS/400e system.

Customers who want to implement document management solutions in Domino can capitalize on the migration functions provided. The Migration Tools can move documents stored in iSeries 400 and AS/400e folders or subfolders to Lotus Domino.Doc libraries, providing you with the enhanced security and workflow of Domino.Doc. When migrated to Domino.Doc, documents retain the security and access control information originally assigned in OV/400. Documents in the RFTAS400 or FFTAS400 format are converted automatically to the RFTDCA and FFTDCA formats, respectively. They can then be easily imported into most common text editing products, retaining document formatting elements such as bold text and underlining. Note that once migrated to Domino.doc, documents must be reindexed, since the iSeries 400 and AS/400e document details are not migrated.

BlueNotes Document Warehouse

BNDW for AS/400 is available at a special price as an optional feature of the Migration Tools. This feature provides additional co-existence and migration capabilities by allowing Lotus Notes and OV/400 users to share and migrate documents and PC files stored in iSeries 400 and AS/400e shared folders. The coexistence function allows documents to remain in iSeries 400 and AS/400e folders and subfolders, making them available to OV/400 users in the traditional manner. In addition, Lotus Notes users can access these same documents through the native Notes interface using a selection of editors and viewers. A special Lotus Notes document database provides this access with Notes views based on iSeries 400 and AS/400e document details. These views also allow greater flexibility for OV/400 administrators who want to clean up old or out-of-date documentation prior to migration. The migration function allows customers to migrate selected documents individually or in batch from iSeries 400 and AS/400e folders to Notes attachments for use on other systems, including (with prior HTML conversion) for Web serving. BNDW for AS/400 also provides an

archiving facility for OV/400 documents. For more information about BNDW for AS/400, refer to this Web site: http://www.bluenotes.com

Office Conversion Services

To complement the office product offerings, IBM and many IBM Business Partners provide complete services to ensure that the transition to Lotus Notes and the e-business opportunities offered by Domino for AS/400 is smooth and comprehensive. These services include everything from project planning to product installation and customizing and can even include user migration. Using services in addition to the Migration Tools makes it possible for customers to focus on the goals and the future and be confident that the upgrade to Lotus Notes is effective and efficient. For more information and resources concerning OV/400 to Lotus Notes migration and coexistence, refer to the site at: http://www.dominodotoffice.com

BlueNotes is available from IBM in most geographies as 5620-BNY. This product is selectable by module. Alternatively, the CORE and OV/400 modules together are available as a specially priced feature of the IBM OV/400 to Notes Migration Tools V2, 5697-F08.

BlueNotes Data Merge

BlueNotes Data Merge (BNDM) is an application for data and text merge in a Lotus Notes Domino environment using iSeries 400 and AS/400e data. It is primarily of benefit to customers using OfficeVision/400 data and text merge who want to modernize applications to exploit the power of Lotus Notes.

BNDM functions include file and record selection and field prompting. Merged output is to multiple Notes documents which can then be printed or reused in a Notes application, for example, to file a record of correspondence in a client database.

Two environments are addressed:

- The notes user producing multiple letters from a DB2/400 file who requires complete control over the output
- The Notes application where the developer requires similar capability, but in the form of middleware, which allows the definition of structured Notes forms where the user has no control over the output but may add free-format text

BNDM V1R1 is available *as is,* free of charge with IBM BNDW for AS/400 (formerly BlueNotes Document Warehouse), a specially priced feature of IBM 5697-F08 OV/400 to Notes Migration Tools.

For product details, see: http://www.bluenotes.com

BlueNotes Document Warehouse (BNDW) for AS/400, 5620-BNY

BNDW is also known as BlueNotes Document Warehouse. It is a three-tier client/server solution that provides a Notes-based client to the iSeries 400 and AS/400e server as a file server. It builds a Notes index of documents, PC files, and other objects stored on the iSeries 400 and AS/400e server that can be used to create views of those files. A single view of documents, sorted by author, for example, can include OV/400 documents, spreadsheets, faxes, images, and other objects. This index includes support of existing document libraries such as OfficeVision BlueNotes, and then launches PC-based editors and viewers appropriate to the file type. It includes an option to migrate selected documents to Notes attachments.

BlueNotes is the standard solution for OV/400 document migration and coexistence. It provides the basis for Notes-based applications to access the iSeries 400 and AS/400e document library. Its view and edit launch capability replaces the Application Enabler user feature of OV/400.

With BlueNotes, you can access and index all your existing iSeries 400 and AS/400e documents and files. These objects then become accessible from a Lotus Notes environment on networked PCs and network stations, while remaining equally accessible to traditional iSeries 400 and AS/400e users. Intranet and Internet availability is achieved by using Lotus Domino. It allows you to work with the information, either in Notes itself or in our preferred PC software applications.

BlueNotes allows your iSeries 400 and AS/400e users and Lotus Notes users to both have access to the same objects stored on the same iSeries 400 or AS/400e server with no duplication. There are two orderable options of BNDW for AS/400:

- The Core Module (optional)
- The OV/400 Module (prerequisite for other modules)

The Core Module provides the Lotus Notes index of iSeries 400 and AS/400e documents and PC files using system-based descriptions of shared folder objects. It then builds *logical folder views* and provides a full text search facility open that indexes data, thus enabling users to locate an object. From a Notes view, users can then view, edit, copy, or delete the object. Access to the objects is through Client Access/400 or OS/400 NetServer and therefore is subject to iSeries 400 and AS/400e object security. The launch of the appropriate viewers and editors is administrator controlled, based on document and user profiles. A function to select documents and migrate to Notes attachment (no content conversion) is also provided. Selection is by standard Notes methods. A flag is set for optional batch deletion of the original objects if required.

The Core Module extends Notes to the file system giving iSeries 400 and AS/400e file serving an edge. It can be used as the basis for:

- Server consolidation (consolidated view of many servers)
- Knowledge management (find it first and then know it)
- Application moderinization (launch files to a Notes interface)

The Core Module includes a Bonus Pack and a Developer's Toolkit (which is comprised of SmartSuite for AS/400 and MS Office for AS/400).

The OV/400 Module is used alongside the Core Module. It adds OfficeVision/400 user-created descriptions to the index. Therefore, it becomes an OV/400 to Notes coexistence tool enabling the OV/400 user to be migrated to Notes while sharing documents with Notes and non-Notes users.

It is also an enabler for OV/400-to-Notes document content migration tools, which require access to the iSeries 400 and AS/400e file system and also need the index to be migrated alongside of the text content.

The main benefit of the OV/400 Module is that documents can stay where they are, in shared folders. OV/400 users have normal access and function. PC users access them as a file system. Lotus Notes users have normal Notes Views of the document list and use PC-based editors and viewers.

The developers of BlueNotes have announced their intention to make available two further modules. The Spool module enables iSeries 400 and AS/400e spooled files to be converted to documents in TIFF or PDF format and accessed from Lotus Notes. It also enables OV/400 documents to be resolved to these formats before OV/400 is removed from the system. The Domino.Doc module enables the migration of document details to a Domino.Doc profile along with the document content. For further details see `http://www.bluenotes.com`

IBM Facsimile Support for AS/400 V4R3, 5798-TBY

Facsimile Support for AS/400 provides complete support for sending and receiving a fax to or from an existing AS/400 Integrated Printer Data Steam (IPDS) print spool support, using industry-standard facsimile node service. Facsimile Support for AS/400 uses either the AS/400 Integrated Fax Adapter or a dedicated PS/2 controller for the fax telephone lines. Output capabilities include text, image, graphics, and multiple fonts.

With Facsimile Support for AS/400, fax support can be integrated into either existing or new applications. Potential outbound users of integrated fax include order confirmation, purchase orders, and shipment notices. The File Fax (FILFAX) command is enhanced in V4R4 to file received faxes as Class F TIFF objects. This improves your ability to view faxes using viewing products such as those provided with Lotus Domino, the SAP AL viewer, and other image viewers.

Facsimile Support for AS/400 is integrated with the AnyMail/400 Mail Server Framework, which is included with OS/400. It allows users of various electronic mail services to exchange mail from many sources, including OfficeVision for AS/400 notes and documents and spooled files that can be sent using the Send Network Spooled File command. If you have more than one AS/400e in a network, electronic mail may be sent as a fax. There is also now more flexibility for inbound fax routing through Dual Tone Multi-Frequency (DTMF) codes. The DTMF capabilities of IBM's Fax Concentrator Adapter/A and some models of GammaLink programmable fax boards are now supported.

Facsimile Support for AS/400 supports:

- IBM 7852-400 fax/data modem (see “IBM 7852 Model 400 Modem” on page 451 for more details)
- Integrated Analog Modem (#2761)
- Integrated Fax Adapter (#2664)
- PCI ISDN BRI Adapters (#4750, #4751)
- Integrated Analog Modem (#4761)

Client Access for AS/400 supports faxing through the 7852-400 modem, which allows PC users to fax directly from OS/2 and Windows 3.1 applications.

Note: V4R4 of Facsimile Support for OS/400 is the last release to support an external PC as a fax controller. V4R5 is the last release to support the #2664 SPD Integrated Fax Adapter.

IBM OfficeVision for AS/400 V4R2, 5769-WP1

Note: *OS/400 V4R5 is the last release where OfficeVision/400 is supported. This is one release later than stated in the 20 July 1999, announcement. IBM does not plan to enhance OV/400 to support any future version or release. Customers are encouraged to migrate to Lotus Notes clients and the native AS/400 Domino server. The OfficeVision to Lotus Notes Migration Tools for AS/400 licensed program (5697-F08) can assist in automating this process. Software defect support will be discontinued effective 31 May 2001. This date is unchanged by the extension of OS/400 release compatibility.*

OfficeVision for AS/400 provides extensive office system functions for both non-programmable terminals and Personal Computers attached to the AS/400 system as part of AS/400 business communications support. These include electronic mail, document processing, calendar services, information storage, and document retrieval. AS/400 communications support allows users to participate in IBM office networks to exchange documents and notes. Customer business applications can be integrated with these office functions to provide a single “desktop” for the user.

OfficeVision for OS/400 has ad hoc Internet Addressing. This is an alternative mail addressing panel added to OfficeVision/400 into which an Internet address or a regular

OV/400 address can be entered. The POSTNET barcode support allows businesses to save money on postage by taking advantage of the Post Office discounts given when ZIP codes are printed in the POSTNET barcode on mailing envelopes.

These are the main features of OfficeVision for AS/400:

- **Installation flexibility**
  - Modular product
  - Document library services is the base
  - Three optional installable features calendar, electronic mail, and editor
  - Direct access to other editors from OfficeVision for AS/400. It can process objects created by other applications such as editors and forms packages.
- **Easy-to-use operating characteristics**:
  - Simple point-and-click graphical user interface for PC users running OS/2, Windows 3.1, or Windows 95 clients
  - Nine additional main menu options that allow more applications to be directly accessed from OfficeVision for OS/400
  - Menu-driven, prompted interface to all functions
  - System-guided operation for the novice user
  - Novice Mail mode giving a simplified way of dealing with mail
  - Optional menu bypass and line commands in word processing for experienced users
  - Documentation for beginners and experienced users
  - Administration Assist for automatically enrolling users
  - Novice Administrator mode for a quick and simple way to add and change users

  OfficeVision for AS/400 has an “unopened mail” indicator, which displays on the main menu when a user has opened their in-basket but has not handled all the new mail.
- **Full-function word processing**

  The word processing functions of OfficeVision address the needs of users whether they require simple or advanced editing capabilities on the AS/400 system. The editor is available to enrolled users on both non-programmable AS/400 displays and IBM PCs.

  Data from files and queries can be included in documents to automatically produce mass mailings, multiple copy documents with unique information in each copy, or multiple line reports.

  Graphics, images, and PC files also can be embedded in documents.

- **Proofreading aids**

  Language dictionaries are provided in 23 languages, including medical and legal. A document can be checked against up to eight dictionaries in one pass, plus user-created and system supplemental dictionaries. These dictionaries are ordered as 5716-DCT or 5769-DL1 and are optionally installable.

  Language dictionaries offer:

  – Spelling verification
  – Spell aid and correction assistance
  – Automatic hyphenation
  – Synonym aid (certain languages only)

  Support for the Russian language is provided through the use of the enhanced IBM linguistics engine, which has been added to OS/400. As new dictionaries are released for the linguistics engine, OfficeVision for AS/400 can use them with minimal impact.

- **Word Processing in the Client Access family environment**

  The Client Access Family licensed program provides enhanced word processing support through the Text Assist and Organizer functions. Documents can be prepared using the most appropriate editor. This can be the OfficeVision for AS/400 editor, DW4/DW5, or any non-IBM editor (PC-based).

  Users can run multiple editor sessions concurrently.

- **Calendar services**

  The calendar module of OfficeVision allows users to easily manage their day-to-day activities. These activities range from the simple daily reminder or to-do list, to scheduling meetings for a large group across a network, or starting a job on the system. Users can access other applications directly from the calendar using function codes, allowing the calendar to be used as a base or “desktop” for all applications.

  The resource calendar option (available only for OfficeVision for AS/400) specifies whether a calendar is a resource or a user calendar. Overlapping meetings is not allowed to be scheduled on a resource calendar. In addition, this option prevents single or recurring meetings, events, or meeting entries from being added, changed, or copied to resource calendars when conflicts exist.

  Also, when scheduling recurring meetings, notification of all scheduling conflicts is displayed for all invitees and all dates. Again, this function is only available for OfficeVision for AS/400 and not for OfficeVision JustMail for OS/400.

- **Electronic mail**

  The OfficeVision for AS/400 electronic mail module provides the user with menu-driven access to mail handling functions. Mail functions allow the user to:

  - Work in “Novice” mode, which provides base mail functions with simplified mail handling functions and pop-up help facilities. A function key allows users to switch to normal mail mode and more advanced functions.
  - Send, receive, forward, and reply to notes, messages, and documents.
  - Delegate mail to be opened by another user.
  - Interchange documents, PC files, and notes between OfficeVision for AS/400 users and other OfficeVision environments. Notes and documents can also be exchanged through TCP/IP and X.400.

  Mail handling functions provide the ability to send to and receive from users on their own AS/400 or other IBM and non-IBM systems in the network.

- **Administration**

  Support is provided for ongoing administration and maintenance of office objects. Administration assist provides a method of automatically enrolling office users when they first request office services. The novice administrator mode provides a subset of administrative functions to allow a quick and easy way to create and tailor user profiles.

  Some administration functions are available only for the designated security officer and administrator, such as:

  - Deleting and changing the owner on public nicknames and distribution lists
  - Enrolling office users
  - Creating and maintaining access codes for document library services distribution lists and system directory entries
  - Backup and securing office objects

- **Access to office services**

  Application programming interfaces (APIs), specific to OfficeVision for AS/400, allow programmers to integrate office functions into applications and access office services on AS/400 systems.

  Examples are:

  - Document distribution services that allow the user interface to send, receive, cancel, and query
  - Distribution directory services that allow the user interface to:
    - Manage and display the directory
    - Add, change, and delete directory entries
    - Automatically propagate changes throughout an AS/400 network
    - Manage and display distribution lists
    - Retrieve, add, remove, and change office enrollment

  - Document library services that allow the user interface to:
    - File a document
    - Query document library
    - Retrieve a document
    - Replace a document
    - Delete a document
    - Change document library owner
    - Change document details
    - Retrieve a DLO name
  - Calendar services that allow the user to:
    - Create and delete calendars
    - Change calendar authority
    - Query, add, remove, and display calendar entries
  - Perform housekeeping on calendars

Support for AFP Print Applications and IPDS Printers

Print Services Facility/400 and associated native OS/400 print support (printer file and DDS) include the following application functions for printing:

- DDS keyword support that allows you to:
  - Switch between simplex and duplex printing within a spooled file
  - Force printing on a new sheet of paper anywhere in a spooled file
  - Print constant text at any position on a page
  - Direct pages of a spooled file to a specific output bin
  - Include tabbed insert pages from a finisher anywhere in the spooled file
  - Specify z-fold options for any page within a spooled file
  - Include an overlay and specify the orientation (rotation) at which the overlay should be printed
- The Printer File has parameters that allow you to:
  - Print overlays on the back side of pages without any variable data
  - Specify that output should be corner-stapled, edge-stitched, or saddle-stitched
- User control of AS/400 font mapping table enables greater control and flexibility with print applications
- Added finishing options enable inline document finishing, including stapling, stitching, inserting, and z-folding operations
- All new IBM AS/400 printers (for example, Infoprint 43, Infoprint 60 with Finisher, and Infoprint 3000) are fully supported

- Print Services Facility

  Enhancements to data description specifications (DDS), the printer file, and the optional Print Services Facility/400 feature are included for added flexibility in managing your printer environment, and in formatting and finishing print applications.

  Keywords are included in DDS and the printer file to increase your flexibility in formatting and finishing printed output:

  – Switch between simplex and duplex printing within a spooled file
  – Force printing on a new sheet of paper anywhere in a spooled file
  – Direct pages of a spooled file to a specific output bin
  – Include tabbed insert pages from a finisher anywhere in the spooled file available through the DRAWER keyword
  – Specify z-fold options for any page within a spooled file
  – Include an overlay and specify the orientation in which the overlay is printed

  The printer file has parameters to:

  – Print overlays on the back side of pages without any variable data
  – Specify that output can now be saddled-stitched, or as previously announced, corner-stapled or edge-stitched

  The mapping table that substitutes one printer resident font for another when a particular printer does not support the requested font can be modified through a parameter in the PSF configuration object. You control font fidelity for your applications across a variety of different printers with greater flexibility and precision.

  With these finishing options, you can exploit the inline finishing capabilities of IBM Infoprint 60 and Infoprint 32 printers. The Infoprint 32 has an optional high-capacity output stacker with three additional output bins. With this stacker, you choose finishing options such as offset jogging and stapling. Infoprint 60, with its optional finisher, provides true reprographics capabilities, including stapling and stitching, inserting, and z-fold finishing on 11-by-17-inch forms.

  Together these new print capabilities allow you to create output from your critical applications that is consistent in appearance, easy to distribute and read, and communicates more effectively with your customers.

- Bidirectional languages support

  AS/400 support includes updates for the bidirectional (BiDi) languages. The enhancements are:

  – A series of transformation routines for support of logical versus visual ordering. Culturally correct BiDi language support requires that the flow of text, left to right or right to left, be determined by the character entered or displayed at the workstation or

printer device. The data must be stored in DB2/400 (or any file system) in the sequence the characters were entered and not how they were displayed.

– Additional BiDi CCSIDs

Print Services Facility/400 Enhancements in V4R5

At V4R5, Print Services Facility/400 (PSF/400) includes a CD-ROM kit at no additional cost that provides consistent fonts for printing on 240 dpi or 300 dpi printers using raster fonts, or on any AFP printer that supports outline fonts. Included on the CD-ROM are the Helvetica and Times New Roman typographic typefaces. The typefaces provide support for high-quality printing with international language capabilities, including support for the euro currency sign. Double-byte fonts for printing Japanese, Korean, Simplified and Traditional Chinese are not on the CD-ROM.

Earlier Model Summary

Earlier Model Summary

Summary of All Earlier AS/400 and AS/400e Models

This chapter identifies resources such as hardware and performance characteristics for all AS/400, AS/400e, and iSeries models, including maximum capacities for main storage, disk storage, LAN, and communications.

Operating system limits, such as the maximum members in a database file, maximum objects in a library, and jobs on the system for both V4R5 and V4R4 systems, can be viewed on the Web at: `http://www.redbooks.ibm.com/redbooks/`

When you arrive at this site, click on the **Additional Materials** link, and select **GA19-5486-20** from the list.

Systems

Models P01, P02

9401 Model	P01	P02
Relative System Performance (CPW) [1]	N/A	7.3
Relative System Performance (RAMP-C) [2]	2.5	2.5
Main Storage (MB)	8	8-16
Disk Storage (GB) (Maximum)	0.98	2.06
Maximum Number of Twinax Workstations	3	7
Communication Lines (Maximum)	1	1
LAN Adapters (Maximum)	0	0
Available Card Slots (for I/O Adapters)	0	0
Number of System I/O Buses	1	1
Version 3 Processor Group	P05	P05

© Copyright IBM Corp. 2000

9401 Model P03 and 10S

Package ID	Twinax T01	Twinax T02	Twinax T03	Twinax T11	Twinax T12	LAN L01	LAN L02	LAN L03	Server S01
Relative System Performance (CPW) [1]	7.3	9.6	16.8	9.6	7.3	7.3	9.6	16.8	5.5/ 17.1[4]
Relative System Performance (RAMP-C) [2]	2.5	3.3	3.9	3.3	2.5	2.5	3.3	3.9	1.9/ 5.9[4]
Main Storage (MB)	8-24	8-40	8-56	8-40	8-24	8-24	8-40	8-56	8-56
Disk Storage (GB) (Maximum)	2.99	3.93	3.93	2.99	3.93	2.99	3.93	3.93	3.93
Maximum Number of Workstations Twinax LAN Attached	 7 --	 14 --	 14 --	 14 --	 7 --	 -- 16	 -- 16	 -- 16	 -- 16
Communication Lines (Maximum)	1	2	2	2	1	2	2	2	2
Version 3 Processor Group	P05	P05	P05	P05	P05	P05	P05	P05	P05

9402 Models C04, C06

9402 Model	C04	C06
Relative System Performance (CPW Value) [1]	3.1	3.6
Relative System Performance (RAMP-C) [2]	1.1	1.3
Main Storage (MB)	8-12	8-16
Disk Storage (GB) (Maximum)	1.28	1.28
Maximum Number of Workstations Twinax ASCII	 14 6	 54 24
Communication Lines (Maximum)	5	5
LAN Adapters (Maximum)	1	1
Available Card Slots (for I/O Adapters)	3	3
Number of System I/O Buses	1	1
Version 3 Processor Group	P10	P10

9402 Models D02, D04, D06

9402 Model	D02	D04	D06
Relative System Performance (CPW Value) [1]	3.8	4.4	5.5
Relative System Performance (RAMP-C) [2]	1.3	1.5	1.9
Main Storage (MB)	8-16	8-16	8-20
Disk Storage (GB) (Maximum)	1.20	1.60	1.60
Maximum Number of Workstations Twinax ASCII LocalTalk	 14 12 31	 28 12 31	 54 24 31
Communication Lines (Maximum)	3	8	8
LAN Adapters (Maximum)	1	1	1
Available Card Slots (for I/O Adapters)	1	3	3
Number of System I/O Buses	1	1	1
Version 3 Processor Group	P10	P10	P10

9402 Models E02, E04, E06

9402 Model	E02	E04	E06
Relative System Performance (CPW Value) [1]	4.5	5.5	7.3
Relative System Performance (RAMP-C) [2]	1.5	1.9	2.6
Main Storage (MB)	8-24	8-24	8-40
Disk Storage (GB) (Maximum)	2.01	4.08	4.08
Maximum Number of Workstations Twinax ASCII LocalTalk	 14 12 31	 42 48 31	 68 66 62
Communication Lines (Maximum)	3	8	14
LAN Adapters (Maximum)	1	1	2
Available Card Slots (for I/O Adapters)	1	3	7
Number of System I/O Buses	1	1	1-2
Version 3 Processor Group	P10	P10	P10

9402 Models F02, F04, F06

9402 Model	F02	F04	F06
Relative System Performance (CPW Value) [1]	5.5	7.3	9.6
Relative System Performance (RAMP-C) [2]	1.9	2.5	3.3
Main Storage (MB)	8-24	8-24	8-40
Disk Storage (GB) (Maximum)	2.06	4.12	8.24
Maximum Number of Workstations Twinax ASCII LocalTalk	 28 18 31	 68 66 62	 108 102 93
Communication Lines (Maximum)	8	8	14
LAN Adapters (Maximum)	1	1	2
Available Card Slots (for I/O Adapters)	1	3	7
Number of System I/O Buses	1	1	1-2
Version 3 Processor Group	P05	P10	P10

9402 Model 200

9402 Model	#2030	#2031	#2032
Relative System Performance (CPW Value) [1]	7.3	11.6	16.8
Relative System Performance (RAMP-C) [2]	2.5	4.0	6.2
Main Storage (MB)	8-24	8-56	16-128
Disk Storage (GB) (Maximum) V3R1 (Maximum) V3R2	 23.6 50.3	 23.6 50.6	 23.6 50.6
Maximum Number of Workstations Twinax ASCII LocalTalk	 280 126 217	 280 126 217	 280 126 217
Communication Lines (Maximum)	20	20	20
LAN Adapters (Maximum)	2	2	2
Available Card Slots (for I/O Adapters)	6	6	6
Number of System I/O Buses	1	1	1
Version 3 Processor Group	P05	P10	P10

9402 Model 236

9402 Model	236
Main Storage (MB)	32-96
Disk Storage (GB)	4.12
Maximum Number of Workstations Twinax	 80
Communication Lines (Maximum)	8
LAN Adapters (Maximum)	2
Available Card Slots (for I/O Adapters)	6
Number of System I/O Buses	1

9402 Model 400

9402 Model 400 Processor	#2130	#2131	#2132	#2133
Relative System Performance (CPW Value) [1] Version 3 Release 6	12.3	18.3	24.5	30.6
Relative System Performance (CPW Value) [1] Version 3 Release 7	13.8	20.6	27.0	33.3
Relative System Performance (CPW Value) [1] Version 4	13.8	20.6	27.0	35.0
Relative System Performance (RAMP-C) [2]	4.1	6.1	8.7	10.8
Main Storage (MB)	32-160	32-224	32-224	32-224
Disk Storage (GB) (Maximum) V3R6 (Maximum) V3R7 and later	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number of Workstations Twinax ASCII LocalTalk	 280 126 217	 280 126 217	 280 126 217	 280 126 217
Communication Lines (Maximum)	20	20	20	20
LAN Adapters (Maximum)	2^5	2^5	2^5	2^5
ATM Adapters (Maximum)	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6
Number of System I/O Buses	1	1	1	1
Processor Group	P05	P10	P10	P10

9402 Model 436

9402 Model 436 Processor	SSP Only			SSP and OS/400		
	#2102	#2104	#2106	#2102	#2104	#2106
Relative System Performance (CPW) [1] V3R6	N/A	N/A	N/A	14.4	18.3	24.5
Relative System Performance (CPW) [1] V3R7 and later	N/A	N/A	N/A	16.3	20.6	27.4
Relative System Performance (RAMP-C) [2]	1.0	1.3	2.4	4.8	6.1	8.7
Main Storage (MB) [3]	32-224	32-224	32-256	64-224	64-224	64-256
Disk Storage (GB) [3] (Maximum) V3R6 (Maximum) V3R7 and later	 4 4	 4 4	 4 4	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number of Workstations Twinax Devices ASCII Devices LocalTalk	 160 0 0	 160 0 0	 160 0 0	 280 108 0	 280 108 0	 280 108 0
Communications Lines (Maximum)	8	8	8	20	20	20
LAN Adapters (Maximum) [3, 5]	2	2	2	2	2	2
ATM Adapters (Maximum)	0	0	0	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6	6	6
Number of System I/O Buses	1	1	1	1	1	1
Processor Group	N/A	N/A	N/A	P05	P10	P10

9404 Models B10, B20

9404 Model	B10	B20
Relative System Performance (CPW Value) [1]	2.9	5.1
Relative System Performance (RAMP-C) [2]	1.0	1.7
Main Storage (MB)	4-16	4-28
Disk Storage (GB) (Maximum)	2.40	4.80
Maximum Number of Workstations Twinax ASCII	 40 36	 80 72
Communication Lines (Maximum)	8	14
LAN Adapters (Maximum)	1	2
Available Card Slots (for I/O Adapters)	4	9
Number of System I/O Buses	1	1-2
Version 3 Processor Group	P10	P10

9404 Models C10, C20, C25

9404 Model	C10	C20	C25
Relative System Performance (CPW Value) [1]	3.9	5.3	6.1
Relative System Performance (RAMP-C) [2]	1.3	1.8	2.2
Main Storage (MB)	8-20	8-32	8-40
Disk Storage (GB) (Maximum)	2.40	4.80	6.40
Maximum Number of Workstations Twinax ASCII	 40 36	 80 72	 80 72
Communication Lines (Maximum)	8	14	14
LAN Adapters (Maximum)	1	2	2
Available Card Slots (for I/O Adapters)	4	9	9
Number of System I/O Buses	1	1-2	1-2
Version 3 Processor Group	P10	P10	P10

9404 Models D10, D20, D25

9404 Model	D10	D20	D25
Relative System Performance (CPW Value) [1]	5.3	6.8	9.7
Relative System Performance (RAMP-C) [2]	1.9	2.4	3.4
Main Storage (MB)	8-32	8-40	16-64
Disk Storage (GB) (Maximum)	9.50	9.50	15.80
Maximum Number of Workstations Twinax ASCII LocalTalk	 80 72 62	 80 72 62	 160 108 124
Communication Lines (Maximum)	14	14	14
LAN Adapters (Maximum)	2	2	2
Available Card Slots (for I/O Adapters)	9	9	9
Number of System I/O Buses	1-2	1-2	1-2
Version 3 Processor Group	P10	P10	P10

9404 Models E10, E20, E25

9404 Model	E10	E20	E25
Relative System Performance (CPW Value) [1]	7.6	9.7	11.8
Relative System Performance (RAMP-C) [2]	2.6	3.5	4.2
Main Storage (MB)	8-40	8-72	16-80
Disk Storage (GB) (Maximum)	19.67	19.67	19.67
Maximum Number Workstations Twinax ASCII LocalTalk	 160 162 124	 160 162 124	 240 162 184
Communication Lines (Maximum)	14	20	20
LAN Adapters (Maximum)	2	2	2
Available Card Slots (for I/O Adapters)	9	9	9
Number of System I/O Buses	1-2	1-2	1-2
Version 3 Processor Group	P10	P10	P20

9404 Models F10, F20, F25

9404 Model	F10	F20	F25
Relative System Performance (CPW Value) [1]	9.6	11.6	13.7
Relative System Performance (RAMP-C) [2]	3.4	4.2	4.8
Main Storage (MB)	8-72	16-80	16-80
Disk Storage (GB) (Maximum)	20.62	20.62	20.62
Maximum Number of Workstations Twinax ASCII LocalTalk	 360 162 279	 360 162 279	 360 162 279
Communication Lines (Maximum)	14	20	26
LAN Adapters (Maximum)	2	4	4
Available Card Slots (for I/O Adapters)	9	9	9
Number of System I/O Buses	1-2	1-2	1-2
Version 3 Processor Group	P10	P20	P20

9406 Models B30, B35, B40, B45, B50, B60, B70

9406 Model	B30	B35	B40	B45	B50	B60	B70
Relative System Performance (CPW Value) [1]	3.8	4.6	5.2	6.5	9.3	15.1	20.0
Relative System Performance (RAMP-C) [2]	1.4	1.6	2.0	2.3	3.2	5.2	7.0
Main Storage (MB)	4-36	8-40	8-40	8-40	16-48	32-96	32-192
Disk Storage (GB) (Maximum)	13.7	13.7	13.7	13.7	27.4	54.8	54.8
Maximum Number of Workstations Twinax ASCII	 160 72	 160 72	 240 108	 240 108	 400 180	 600 270	 800 360
Communication Lines (Maximum)	16	16	32	32	32	32	48
LAN Adapters (Maximum)	4	4	4	4	4	4	4
Main Storage Feature Card Slots	2	2	2	2	2	4	5
Available Card Slots (for I/O Adapters)	5	5	5	5	10	13	13
Maximum System I/O Card Slots	14	14	24	24	39	71	71
Number of System I/O Buses	1	1	1	1	2	3	3
Version 3 Processor Group	P10	P10	P10	P10	P10	P20	P20

9406 Models D35, D45, D50, D60, D70, D80

9406 Model	D35	D45	D50	D60	D70	D80
Relative System Performance (CPW Value) [1]	7.4	10.8	13.3	23.9	32.3	56.6
Relative System Performance (RAMP-C) [2]	2.6	3.7	4.8	8.3	11.2	19.8
Number of Processors	1	1	1	1	1	2
Main Storage (MB)	8-72	16-80	32-128	64-192	64-256	64-384
External Disk Storage (GB) (Maximum)	63.0	63.0	94.3	141.7	141.7	251.8
Maximum Number of Workstations						
Twinax	240	400	600	800	1200	2000
ASCII	108	180	270	360	540	900
LocalTalk	186	310	465	620	930	1550
Communication Lines (Maximum)	17	33	33	33	49	64
LAN Adapters (Maximum)	4	4	4	4	4	4
Main Storage Feature Card Slots	2	2	5	5	5	5
Available Card Slots (for I/O Adapters)	55	55	84	140	140	196
Number System I/O Buses	2	2	3	3-5	3-5	3-7
Version 3 Processor Group	P10	P10	P20	P20	P30	P30

9406 Models E35, E45, E50, E60, E70, E80, E90, E95

9406 Model	E35	E45	E50	E60	E70	E80	E90	E95
Relative System Performance (CPW) [1]	9.7	13.8	18.1	28.1	39.2	69.4	96.7	116.6
Relative System Performance (RAMP-C) [2]	3.4	4.8	6.4	10.2	14.2	25.2	34.4	42.1
Number of Processors	1	1	1	1	1	2	3	4
Main Storage (MB)	8-72	16-80	32-128	64-192	64-256	64-512	64-1024	64-1152
Maximum External Disk Storage (GB)	63.0	63.0	94.3	141.7	141.7	251.8	251.8	251.8
Maximum Number of Workstations								
Twinax	360	480	720	1000	1400	2400	2400	2400
ASCII	162	216	324	450	630	1080	1080	1080
LocalTalk	279	372	558	775	1085	1860	1860	1860
Maximum Communication Lines	20	33	33	33	49	64	64	64
Maximum LAN Adapters	4	4	4	4	4	6	6	6
Main Storage Feature Card Slots	2	2	5	5	5	5	5	5
Available Card Slots (for I/O Adapters)	55	55	84	140	140	196	196	196
Number of System I/O Buses	2	2	3	3-5	3-5	3-7	3-7	3-7
Version 3 Processor Group	P10	P20	P20	P30	P30	P40	P40	P40

9406 Models F35, F45, F50, F60, F70, F80, F90, F95, F97

9406 Model	F35	F45	F50	F60	F70	F80	F90	F95	F97
Relative System Performance (CPW) [1]	13.7	17.1	27.8	40.0	57.0	97.1	127.7	148.8	177.4
Relative System Performance (RAMP-C) [2]	4.8	6.0	10.2	14.7	21.0	36.5	50.5	59.0	71.5
Number of Processors	1	1	1	1	1	2	3	4	4
Main Storage (MB)	16-80	16-80	64-192	128-384	128-512	128-768	128-1024	128-1280	128-1536
Maximum External Disk Storage (GB)	63.0	63.0	110.2	141.7	251.8	251.8	251.8	251.8	251.8
Maximum Number of Workstations									
Twinax	480	720	1000	1400	2400	2400	2400	2400	4800
ASCII	216	324	450	630	1080	1080	1080	1080	2160
LocalTalk	372	558	775	1085	1860	1860	1860	1860	3720
Maximum Communication Lines	20	33	33	33	64	64	64	64	96
Maximum LAN Adapters	4	4	4	4	6	6	6	6	8
Main Storage Feature Card Slots	2	2	5	5	5	5	5	5	5
Available Card Slots (for I/O Adapters)	55	55	140	140	195	195	195	195	195
Number of System I/O Buses	2	2	3-5	3-5	3-7	3-7	3-7	3-7	3-7
Version 3 Processor Group	P20	P20	P30	P30	P30	P40	P40	P40	P40

9406 Models 300, 310, 320

9406 Models 300, 310, 320 Processor	300 #2040	300 #2041	300 #2042	310 #2043	310 #2044	320 #2050	320 #2051	320 #2052
Relative System Perf. (CPW) [1]	11.6	16.8	21.1	33.8	56.5	67.5	120.3	177.4
Relative System Perf (RAMP-C) [2]	4.2	6.0	7.5	12.0	20.2	25.7	45.8	71.5
Number of Processors	1	1	1	1	2	1	2	4
Main Storage (MB)	8-72	16-80	32-128	64-832	64-832	128-1536	128-1536	128-1536
Max External Disk Storage (GB)	117.4	117.4	117.4	159.3	159.3	259.6	259.6	259.6
Maximum Number of Workstations Twinax ASCII LocalTalk	 1000 450 775	 1000 450 775	 1000 450 775	 2400 1080 1860	 2400 1080 1860	 4800 2160 3720	 4800 2160 3720	 4800 2160 3720
Maximum Communication Lines	33	33	33	64	64	96	96	96
Maximum LAN Adapters	4	4	4	8	8	8	8	8
Available Card Slots (for I/O Adapters)	45	45	45	115	115	151	151	151
Number of System I/O Buses	1-2	1-2	1-2	1-5	1-5	1-7	1-7	1-7
Processor Group	P20	P20	P20	P30	P30	P40	P40	P40

9406 Models 500, 510, 530

9406 Models 500, 510, 530	500 #2140	500 #2141	500 #2142	510 #2143	510 #2144	530 #2150	530 #2151	530 #2152	530 #2153	530 #2162
Relative System Perf (CPW) [1] V3R6	18.7	26.9	38.3	66.7	85.0	107.1	132.5	198.7	299.0	349.8
Relative System Perf (CPW) [1] V3R7	21.4	30.7	43.9	77.7	104.2	131.1	162.7	278.8	459.3	509.9
Relative System Perf (CPW) [1] V4Rx	21.4	30.7	43.9	81.6	111.5	148.0	188.2	319.0	598.0	650.0
Relative System Perf (RAMP-C) [2]	6.4	9.3	12.6	21.6	28.5	37.4	48.9	74.0	119.2	†
Number of Processors	1	1	1	1	1	1	1	2	4	4
Main Storage (MB)	64-768	64-768	64-1024	256-1024	256-1024	512-4096	512-4096	512-4096	512-4096	512-4096
Disk Storage (GB) V3R6/V3R7 (Max) V4 (Max)	150.9 652.8	150.9 652.8	150.9 652.8	318.7 652.8	318.7 652.8	520.0 996.4	520.0 996.4	520.0 996.4	520.0 996.4	520.0 996.4
Maximum Workstations Twinax ASCII LocalTalk	1400 630 1085	1400 630 1085	1400 630 1085	2400 1080 1860	2400 1080 1860	7000 3150 5425	7000 3150 5425	7000 3150 5425	7000 3150 5425	7000 3150 5425
Max Comm. Lines	33	33	33	96	96	200	200	200	200	200
Max LAN Ports	16	16	16	16	16	32	32	32	32	32
Max ATM Ports	8	8	8	8	8	16	16	16	16	16
Available Card Slots (for I/O Adapters)	6-83	6-83	6-83	6-83	6-83	4-238	4-238	4-238	4-238	4-238
System I/O Buses	1-7	1-7	1-7	1-7	1-7	1-19	1-19	1-19	1-19	1-19
Processor Group	P20	P20	P20	P30	P30	P40	P40	P40	P40	P40

9406 Model 600

Processor Features	#2129	#2134	#2135	#2136
Relative System Performance Metric (CPW) [1]	22.7	32.5	45.4	73.1
Number of Processors	1	1	1	1
Main Storage (MB) Min/Max	64-384	64-384	64-384	128-512
Processor Group	P05	P10	P10	P20
Disk Unit Capacity (GB)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
V4R1	85.8	85.8	85.8	85.8
V4R2/V4R3	175.4	175.4	175.4	175.4
Maximum External	--	--	--	--
Total Maximum				
V4R1	85.8	85.8	85.8	85.8
V4R2/V4R3	175.4	175.4	175.4	175.4
Disk Controllers	1	1	1	1
Diskette (8 or 5 ¼ inch)	0	0	0	0
Tape Attachment [6]				
¼-inch and/or 8mm Cartridge	0-1	0-1	0-1	0-1
(Internal)	0-1	0-1	0-1	0-1
8mm Cartridge (External)	0-1	0-1	0-1	0-1
½-inch Reel 9348	0-1	0-1	0-1	0-1
½-inch Cartridge 34XX, 35XX				
Physical Packaging				
SPD I/O Bus	0	0	0	0
I/O Card Slots—SPD	0	0	0	0
I/O Card Slots—PCI	8	8	8	8
Workstation Attachment				
Controllers Min/Max	0-5	0-5	0-5	0-5
Twinax Devices	188	188	188	188
ASCII Devices	0	0	0	0
Local Talk Devices	0	0	0	0
Communications Lines [7]	1-9	1-9	1-9	1-9
Fax Adapters	0	0	0	0
Cryptographic Processor	0	0	0	0
LAN Ports	0-3	0-3	0-3	0-3
ATM Ports	0-1	0-1	0-1	0-1
Integrated PC Servers [8]	0-1	0-1	0-1	0-1
PCI LAN/ATM Adapters	0-3	0-3	0-3	0-3
Optical Libraries [9]	0-1	0-1	0-1	0-1

9406 Model 620

Processor Features	#2175	#2179	#2180	#2181	#2182
Relative System Performance (CPW) [1]	50.0	85.6	113.8	210.0	464.3
Number of Processors	1	1	1	1	2
Main Storage (MB) Min/Max	64-1856[19]	256-2048	256-2048	256-2048	256-4096
Processor Group	P20	P20	P30	P30	P40
Summary for All Processors	**Base System**	**#9364 with #9329[10]**	**#9364 with #9311[10]**	**#507x, #508x**	**System Maximum**
Disk Unit Capacity (GB)					
Base	4.19	--	--	--	4.19
Maximum Internal					
V4R1	85.8/128.81	128.8	128.8	274.8	704.3
V4R2/V4R3	1	236.2	236.2	561.5	944.8
Maximum External	175.4/236.21				
V4R1	1	--	(12)	(12)	652.8
V4R2/V4R3		--	(12)	(12)	893.3
Total Maximum	--				
V4R1	--				704.3
V4R2/V4R3					944.8
Disk Controllers	1	1	(13)	(13)	20
CD-ROM	1	0-1	0	0-1	5
Diskette (8 or 5 ¼ inch)	0	0	0-2	0-2	2
Tape Attachment [6]					
¼-inch and/or 8mm Cartridge (Internal)	0-1	0-3	0-3	0-4	17
8mm Cartridge (External)	0-1	0-2	0-4	0-4	4
½-inch Reel 9348	0-1	0-2	0-4	0-4	4
½-inch Reel 2440	0	0	0-4	0-4	4
½-inch Reel 9347	0	0	0-2	0-2	2
½-inch Cartridge 34XX, 35XX	0-1	0-2	0-4	0-4	4
Physical Packaging					
SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots—SPD	0	0	6	13	58
I/O Card Slots—PCI	8	14	0	0	22
Workstation Attachment					
Controllers Min/Max	0-5	0-9	0-18	0-39	0-60
Twinax Devices	188	360	720	1560	2388
ASCII Devices	0	0	108	234	1044
Local Talk Devices	0	0	0	0	0

Communications Lines [7]	1-9	0-18	0-36	0-78	96
Fax Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	0-3	0-5	0-12	0-16	16
ATM Ports	0-1	0-3	0-5	0-5	16
Integrated PC Server (SPD) [8]	0	0	0-3[21]	0-6[22]	16
Integrated PC Server (PCI) [8]	0-1	0-1	0	0	2
PCI LAN/ATM Adapters	0-3	0-5	0	0	8
Optical Libraries	0-1	0-2	0-12	0-14	14

9406 Model 640

Processor Features	#2237	#2238	#2239
Relative System Performance (CPW) [1]	319.0	583.3	998.6
Number of Processors	1	2	4
Main Storage (MB) Min/Max			
V4R1/V4R2	512-12288	512-12288	512-12288
V4R3	512-12288	512-16384	512-16384
Processor Group	P40	P40	P40
Disk Unit Capacity (GB)			
Base	4.19	4.19	4.19
Maximum Internal			
V4R1	927.7	927.7	927.7
V4R2/V4R3	1340.0	1340.0	1340.0
Maximum External			
V4R1	893.3	893.3	893.3
V4R2/V4R3	1305.6	1305.6	1305.6
Total Maximum			
V4R1	927.7	927.7	927.7
V4R2/V4R3	1340.0	1340.0	1340.0
Disk Controllers	1-37	1-37	1-37
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2
CD-ROM	1-18	1-18	1-18
Tape Attachment [6]			
¼-inch and/or 8mm Cartridge	0-17	0-17	0-17
(Internal)	0-4	0-4	0-4
8mm Cartridge (External)	0-4	0-4	0-4
½-inch Reel 9348, 2440	0-2	0-2	0-2
½-inch Reel 9347	0-8	0-8	0-8
½-inch Cartridge 34XX, 35XX			
Physical Packaging			
SPD I/O Bus	1-19	1-19	1-19
I/O Card Slots—SPD	3-235	3-235	3-235
I/O Card Slots—PCI	0	0	0
System Expansion			
(#5072/#5073/#5082/#5083)	0-18	0-18	0-18
Bus Expansion (#5044)	0-9	0-9	0-9
Storage Expansion (#5055)	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18
Workstation Attachment			
Controllers Min/Max	1-175	1-175	1-175
Twinax Devices	7000	7000	7000
ASCII Devices	3150	3150	3150
Local Talk Devices	0	0	0

Communications Lines	1-200	1-200	1-200
Fax Adapters	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1
LAN/ATM Ports	0-32	0-32	0-32
Integrated PC Servers [8]	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22

9406 Model 650

Processor Features	#2240	#2243	#2188	#2189
Relative System Performance (CPW) [1]	1794.0	2340.0	3660.0	4550-0
Number of Processors	8	12	8	12
Main Storage (MB) Min/Max				
V4R1/V4R2	1024-20480	1024-20480	--	--
V4R3	1024-32768	1024-32768	1024-40960	1024-40960
Processor Group	P40	P40	P50	P50
Disk Unit Capacity (GB)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
V4R1	996.4	996.4	--	--
V4R2	1546.1	1546.1	--	--
V4R3	2095.9	2095.9	2095.9	2095.9
Maximum External				
V4R1	962.0	962.0	--	--
V4R2	1511.8	1511.8	--	--
V4R3	2061.3	2061.3	2061.3	2061.3
Total Maximum				
V4R1	996.4	996.4	--	--
V4R2	1546.1	1546.1	--	--
V4R3	2095.9	2095.9	2095.9	2095.9
Disk Controllers	1-37	1-37	1-37	1-37
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2	0-2
CD-ROM	1-18	1-18	1-18	1-18
Tape Attachment [6]				
¼-inch and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½-inch Reel 9348, 2440	0-4	0-4	0-4	0-4
½-inch Reel 9347	0-2	0-2	0-2	0-2
½-inch Cartridge 34XX, 35XX	0-8	0-8	0-8	0-8
Physical Packaging				
SPD I/O Bus	1-19	1-19	1-19	1-19
I/O Card Slots—SPD	3-237	3-237	3-237	3-237
I/O Card Slots—PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18
Bus Expansion (#5044)	0-9	0-9	0-9	0-9
Storage Expansion (#5055)	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18

Workstation Attachment				
Controllers Min/Max	1-175	1-175	1-175	1-175
Twinax Devices	7000	7000	7000	7000
ASCII Devices	3150	3150	3150	3150
Local Talk Devices	0	0	0	0
Communications Lines				
V4R1/V4R2	1-250	1-250	-	-
V4R3	1-300	1-300	1-300	1-300
Fax Adapters	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports				
V4R1/V4R2	0-48	0-48	--	--
V4R3	0-72	0-72	0-72	0-72
Wireless LANs	0-3	0-3	0-3	0-3
Integrated PC Servers [8]	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22

Servers

9402 Server Model 100 and 9404 Server Models 135 and 140

9402/4 Model	100	135	140
Relative System Perf (CPW) Interactive [1]	5.5	9.6	11.6
Relative System Perf (CPW Value) Client/Server [1]	17.1	32.3	65.6
Relative System Perf (RAMP-C) Interactive [2]	1.9	3.3	4.0
Relative System Perf (RAMP-C) Client/Server [2]	5.9	10.9	22.5
Main Storage (MB)	16-56	32-384	64-512
Disk Storage (GB) (Maximum)	8.2	27.5	86.5
Max. Number Workstations			
Twinax	7	7	7
ASCII	6	6	6
LocalTalk	31	62	62
Communication Lines (Maximum)	8	14	20
LAN Adapters (Maximum)	2	4	6
Available Card Slots (for I/O Adapters)	6	6	21
Number of System I/O Buses	1-2	1-2	1-5
Version 3 Processor Group	P10	P20	P20

9402 Server Model 20S and 9406 Server Model 30S

9402/6 Model 20S, 30S Processor	20S #2010	30S #2411	30S #2412
Relative System Perf (CPW Value) Interactive [1] Relative System Per (CPW Value) Client/Server [1]	5.5 17.1	9.6 32.3	11.6 68.5
Relative System Perf (RAMP-C) Interactive [2] Relative System Perf (RAMP-C) Client/Server [2]	1.9 5.9	3.3 10.9	4.0 23.5
N-Way Multiprocessors	1	1	2
Main Storage (MB)	16-128	32-384	64-832
Disk Storage (GB) Max V3R1 Max V3R2	 23.6 50.3	 86.5 86.5	 86.5 86.5
Maximum Number of Workstations Twinax ASCII LocalTalk	 7 6 31	 7 6 62	 7 6 62
Maximum Communication Lines	20	33	33
Maximum LAN Adapters	2	8	8
Available Card Slots (for I/O Adapters)	5	64	114
Number of System I/O Buses	1	1-3	1-5
Processor Group	P05	P10	P10

9402 Model 40S

9402 Model 40S Processor	#2109	#2110	#2111	#2112
Relative System Perf (CPW) [1] V3R6				
Client/Server Environment	24.5	30.6	52.9	77.3
Interactive Environment	8.4	12.3	18.3	26.9
Relative System Perf (CPW) [1] V3R7				
Client/Server Environment	27.0	33.3	59.8	87.3
Interactive Environment	9.4	13.8	20.6	30.7
Relative System Perf (CPW) [1] V4				
Client/Server Environment	27.0	35.0	63.0	91.0
Interactive Environment	9.4	14.5	21.6	32.2
Relative System Perf (RAMP-C) [2]				
Client/Server Environment	8.3	10.6	†	†
Interactive Environment	2.6	3.8		
Main Storage (MB)	32-224	32-224	64-512	64-512
Disk Storage (GB)				
(Maximum) V3R6	23.6	23.6	23.6	23.6
(Maximum) V3R7 and later	50.3	50.3	50.3	50.3
Maximum Number of Workstations				
Twinax	7	7	7	7
ASCII	6	6	6	6
Local Talk	31	31	31	31
Maximum Communication Lines	20	20	20	20
Maximum LAN Adapters	2^5	2^5	2^5	2^5
Maximum ATM Adapters	1	1	1	1
Available Card Slots (for I/O Adapters)	5	5	5	5
Number of System I/O Buses	1	1	1	1
Processor Group	P05	P05	P05	P10

9406 Models 50S and 53S

Processor Features	50S #2120	50S #2121	50S #2122	53S #2154	53S #2155	53S #2156	53S #2157
Relative System Perf (CPW) [1] V3R6							
Client/Server Environment	66.7	85.0	106.8	132.5	198.7	299.0	349.8
Interactive Environment	18.7	26.9	26.9	26.9	26.9	26.9	26.9
Relative System Perf (CPW) [1] V3R7							
Client/Server Environment	77.7	104.2	130.7	162.7	278.8	459.3	509.9
Interactive Environment	21.4	30.7	30.7	30.7	30.7	30.7	30.7
Relative System Perf (CPW) [1] V4							
Client/Server Environment	81.6	111.5	138.0	188.2	319.0	598.0	650.0
Interactive Environment	22.5	32.8	32.8	32.8	32.8	32.8	32.8
Relative System Perf (RAMP-C) [2]							
Client/Server Environment	19.7	26.6	†	43.4	66.6	101.4	†
Interactive Environment	5.7	8.3		8.3	8.3	8.3	
N-Way Multiprocessors	1	1	1	1	2	4	4
Main Storage (MB)	64-1024	64-1024	64-1024	256-4096	256-4096	256-4096	512-4096
Disk Storage (GB)							
V3R6/V3R7 (Maximum)	318.7	318.7	318.7	520.0	520.0-	520.0	512-
V4 (Maximum)	652.8	652.8	652.8	996.4	996.4	996.4	4096
Maximum Communication Lines	96	96	96	200	200	200	200
Maximum LAN Ports	16	16	16	16	32	32	32
Maximum ATM Ports	8	8	8	16	16	16	16
Available Card Slots (for I/O Adapters)	5-82	5-82	5-82	4-237	4-237	4-237	4-237
Number of System I/O Buses	1-7	1-7	1-7	1-19	1-19	1-19	1-19
Processor Group	P10	P10	P10	P20	P20	P20	P20

9406 Model 170

Processor Features	#2159	#2160	#2164	#2176	#2183
Relative System Performance (CPW) [1]					
Constrained					
Client/Server Environment	73.0	114.0	125.0	125.0	125.0
Interactive Environment	16.0	23.0	29.0	40.0	67.0
Unconstrained					
Client/Server Environment	73.0	114.0	210.0	319.0	319.0
Interactive Environment	16.0	23.0	29.00	40.0	67.0
Number of Processors	1	1	1	1	1
Main Storage (MB)	64-832	64-832	256-1024	256-1024	256-1024
Disk Storage (GB)					
V4R2 (Maximum)	85.8	85.8	85.8	85.8	85.8-
V4R3 (Maximum)	175.4	175.4	175.4	175.4	175.4
Maximum Communication Lines	12	12	12	12	12
Maximum LAN Ports	6	6	6	6	6
Maximum ATM Ports	3	3	3	3	3
Available Card Slots (for I/O Adapters)	6-15	6-15	6-15	6-15	6-15
Number of System I/O Buses	1	1	1	1	1
Processor Group	P05	P05	P10	P10	P20

9406 Model 170

Model	170 (September 1998 / February 1999)						
Processor Feature	**#2289**	**#2290**	**#2291**	**#2292**	**#2385**	**#2386**	**#2388**
Relative System Performance [1, 2]							
Processor CPW	50	73	115	220	460	460	1090
Interactive CPW	15	20	25	30	50	70	70
Number of Processors	1	1	1	1	1	1	2
Main Storage (MB)	64-832	64-832	64-832	256-1024	256-3584	256-3584	256-3584
Processor Group	P05	P05	P05	P10	P10	P20	P20

Model	Dedicated Server for Domino (August 1999)		
Processor Feature	**#2407**	**#2408**	**#2409**
Relative System Performance (CPW - See			
Client/Server Environment	30	60	120
Interactive Environment	10	15	20
Simple Mail Users	1300	2300	4300
Number of N-Way Multiprocessors	1	1	2
Main Storage (MB)	256-1024	512-4096	512-4096
Processor Group	P05	P05	P10

	Base System for all processors (see Note 5)	**System Unit Expansion #7102 (see Note 5)**	**Total Maximum (see Note 5)**
Disk Storage (GB)			
Minimum Internal	4.19	4.19	4.19
Maximum Internal (V4R2)	34.32	51.48	85.80
Maximum Internal (V4R3 and later)	70.16	105.24	175.40
System I/O Card Slots (PCI)			
Low Speed PCI	2	4	6
Low Speed Integrated Server PCI	2	2	4
High Speed DASD IOA PCI	1	0	1
High Speed Tape IOA PCI	0	1	1
High Speed Ethernet or ATM (See Note 3)	1	2	3
Maximum Communication Lines (see Note 4)	1-12	0-18	30
ATM adapters (see note 6)	0-1	0-2	0-3
Maximum LAN Adapters (see note 6)	3	4	7
Non-Integrated Server LAN Low Speed	1	4	5
Non-Integrated Server LAN 100/10 Ethernet	1	2	3
Integrated Server LAN Low-Speed	2	2	4
Integrated Server LAN 100/10 Ethernet	1	1	2
Maximum Workstation Controllers			
Twinaxial	3	5	6

	Base System for all processors (see Note 5)	System Unit Expansion #7102 (see Note 5)	Total Maximum (see Note 5)
ASCII	0	0	0
Maximum Workstations			
Twinaxial	108	200	228
¼-inch Cartridge Tape (Internal)	0-1	0	1
½-inch Tape			
Reel 9348	0	0-2	2
Reel 2440, 9347	0	0	0
Cartridge 34xx, 35xx	0	0-2	2
8mm Cartridge (External)	0	0-2	2
Optical Libraries	0	0-2	2
Diskettes (5 ½-inch or 8-inch)	0	0	0
Fax Adapters	0	0	0
Cryptographic Processor	0	2	2

Note 1:	CPW is the Commercial Processing Workload that is now being used to measure the performance of all iSeries 400 and AS/400e processors. The CPW value is measured on all maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine the performance that is achievable. With the introduction of the Dedicated Servers for Domino, Simple Mail Users has been added as a performance measurement.
Note 2:	Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and DASD. Interactive Performance represents the relative performance available to perform host-centric workloads. The amount of interactive capacity consumed will reduce the available processor capacity by the same amount.
Note 3:	The Integrated Netfinity Server is mutually exclusive with the high speed slot for LAN and ATM in the Base System Unit.
Note 4:	One line is used by the Operations Console or Client Access Console if selected. The total is reduced by one if a Twinaxial Console is selected. To reach the maximum of 30 communication lines using the #2745/#9745 in slot C03, the base LAN adapter needs to be removed.
Note 5:	Base System is the maximum total for #2289 processor. The #2289 processor does not support the attachment of the #7101 System Unit Expansion.
Note 6:	The Integrated Server is mutually exclusive with the high speed slot for LAN and ATM.

9406 Model S10

Processor Features	#2118	#2119
Relative System Performance Metric (CPW) [1]		
Client/Server Environment	45.4	73.1
Interactive Environment	16.2	24.4
Number of Processors	1	1
Main Storage (MB) Minimum/Maximum	64-384	128-512
Processor Group	P05	P05
Disk Unit Capacity (GB)		
Base	4.19	4.19
Maximum Internal		
V4R1	85.8	85.8
V4R2/V4R3	175.4	175.4
Maximum External	--	--
Total Maximum		
V4R1	85.8	85.8
V4R2/V4R3	175.4	175.4
Disk Controllers	1	1
Diskette (8 or 5 ¼ inch)	0	0
Tape Attachment [6]		
¼-inch and/or 8mm Cartridge (Internal)	0-1	0-1
8mm Cartridge (External)	0-1	0-1
½-inch Reel 9348	0-1	0-1
½-inch Cartridge 34XX, 35XX	0-1	0-1
Physical Packaging		
SPD I/O Bus	0	0
I/O Card Slots—SPD	0	0
I/O Card Slots—PCI	8	8
Workstation Attachment		
Controllers Minimum/Maximum [17]	0-1	0-1
Twinax Devices		
V4R1	7	7
V4R2/V4R3	28	28
ASCII Devices	0	0
LocalTalk Devices	0	0

Communications Lines [18]	1-10	1-10
Fax Adapters	0	0
Cryptographic Processor	0	0
LAN Ports	1-3	1-3
ATM Ports	0-1	0-1
Integrated PC Servers [8]	0-1	0-1
PCI LAN/ATM Adapters	1-3	1-3
Optical Libraries [9]	0-1	0-1

9406 Model S20

Processor Features	#2161	#2163	#2165	#2166
Relative System Performance (CPW) [1]				
Client/Server Environment	113.8	210.0	464.3	759.0
Interactive Environment	31.0	35.8	49.7	56.9
Number of Processors	1	1	2	4
Main Storage (MB) Min/Max	256-2048	256-2048	256-4096	256-4096
Processor Group	P05	P10	P10	P20

Summary for All Processors	Base System	#5604 with #9329 (PCI Card Expansion) [10]	#5064 with #9331 (SPD Card Expansion) [10]	#507x, #508x (External Tower)	System Maximum
Disk Unit Capacity (GB)					
Base	4.19	--	--	--	4.19
Internal					
V4R1	85.8/128.8[12]	128.8	128.8	274.8	704.3
V4R2/V4R3	175.4/263.2[1] [2]	263.2	263.2	561.5	944.8
Maximum External					
V4R1		--	([12])	([12])	652.8
V4R2/V4R3	--	--	([12])	([12])	893.3
Total Maximum	--				
V4R1					704.3
V4R2/V4R3					944.8
Disk Controllers	1	1	([13])	([13])	20
Diskette (8 or 5 ¼ inch)	0	0	0-2	0-2	2
CD-ROM	1	0-1	0	0-1	5
Tape Attachment [4]					
¼ inch and/or 8mm Cartridge (Internal)	0-1	0-2	0-4	0-4	17
8mm Cartridge (External)	0-1	0-3	0-3	0-4	4
½-inch Reel 9348	0-1	0-2	0-4	0-4	4
½-inch Reel 2440	0	0	0-4	0-4	4
½-inch Reel 9347	0	0	0-4	0-4	4
½-inch Cartridge 34xx, 35xx	0-1	0-2	0-4	0-4	4
Physical Packaging					
SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots—SPD	0	0	6	13	58
I/O Card Slots—PCI	8	14	0	0	22

Workstation Attachment					
Controllers Min/Max[17]	0-1	0-1	0-1	0-1	1
Twinax Devices					
V4R1	7	0	7	7	7
V4R2/V4R3	28	0	28	28	28
ASCII Devices					
V4R1	0	0	6	6	6
V4R2/V4R3	0	0	28	28	28
LocalTalk Devices	0	0	0	0	0
Communications Lines	1-10[18]	0-18	0-36	0-78	96
Fax Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	1-3	0-5	0-6	0-13	16
ATM Ports	0-1	0-3	0-6	0-13	16
Integrated PC Server (SPD) [8]	0-1	0	0-3	0-6	16
Integrated PC Server (PCI) [8]	1-3	0-1	0	0	2
PCI LAN/ATM Adapters	0-1	0-5	0	0	8
Optical Libraries [9]	0-1	0-1	0-12	0-14	14

9406 Model S30

Processor Features	#2257	#2258	#2259	#2260
Relative System Performance (CPW) [1]				
Client/Server Environment	319.0	583.3	998.6	1794.0
Interactive Environment	51.5	64.0	64.0	64.0
Number of Processors	1	2	4	8
Main Storage (MB) Min/Max				
V4R1/V4R2	512-12288	512-12288	512-12288	1024-12288
V4R3	512-12288	512-12288	512-16384	512-16384
Processor Group	P20	P20	P20	P30
Disk Unit Capacity (GB)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
V4R1	927.7	927.7	927.7	927.7
V4R2/V4R3	1340.0	1340.0	1340.0	1340.0
Maximum External				
V4R1	893.3	893.3	893.3	893.3
V4R2/V4R3	1305.6	1305.6	1305.6	1305.6
Total Maximum				
V4R1	927.7	927.7	927.7	927.7
V4R2/V4R3	1340.0	1340.0	1340.0	1340.0
Disk Controllers	1-37	1-37	1-37	1-37
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2	0-2
CD-ROM	1-18	1-18	1-18	1-18
Tape Attachment [6]				
¼-inch and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½-inch Reel 9348, 2440	0-4	0-4	0-4	0-4
½-inch Cartridge 34xx, 35xx	0-8	0-8	0-8	0-8
Physical Packaging				
SPD I/O Bus	1-19	1-19	1-19	1-19
I/O Card Slots—SPD	3-325	3-325	3-325	3-325
I/O Card Slots—PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18

Workstation Attachment				
Controllers Minimum/Maximum [14]	3	3	3	3
Twinax Devices [15]				
V4R1	7	7	7	7
V4R2/V4R3	28	28	28	28
ASCII Devices [15]				
V4R1	6	6	6	6
V4R2/V4R3	28	28	28	28
LocalTalk Devices	0	0	0	0
Communications Lines	1-200	1-200	1-200	1-200
Fax Adapters	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports	1-32	1-32	1-32	1-32
Integrated PC Servers [8]	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22

9406 Model S40

Processor Features	#2256	#2261	#2207	#2208
Relative System Performance (CPW) [1]				
Client/Server Environment	1794.0	2340.0	3660.0	4550.0
Interactive Environment	64.0	64.0	120.0	120.0
Number of Processors	8	12	8	12
Main Storage (MB) Minimum/Maximum				
V4R1/V4R2	1024-20480	1024-20480	--	--
V4R3	1024-32768	1024-32768	1024-40960	1024-40960
Processor Group	P30	P40	P40	P40
Disk Unit Capacity (GB)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
V4R1	--	996.4	--	--
V4R2	1546.1	1546.1	--	--
V4R3	2095.9	2095.9	2095.9	2095.9
Maximum External				
V4R1	--	962.0	--	--
V4R2	1511.8	1511.8	--	--
V4R3	2061.3	2061.3	2061.3	2061.3
Total Maximum				
V4R1	--	996.4	--	--
V4R2	1546.1	1546.1	--	--
V4R3	2095.9	2095.9	2095.9	2095.9
Disk Controllers	1-37	1-37	1-37	1-37
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2	0-2
CD-ROM	1-18	1-18	1-18	1-18
Tape Attachment [6]				
¼ inch and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½ inch Reel 9348, 2440	0-4	0-4	0-4	0-4
½ inch Cartridge 34xx, 35xx	0-8	0-8	0-8	0-8
Physical Packaging				
SPD I/O Bus	1-19	1-19	1-19	1-19
I/O Card Slots—SPD	3-327	3-327	3-327	3-327
I/O Card Slots—PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18

Workstation Attachment				
Controllers Minimum/Maximum [14]	3	3	3	
Twinax Devices [15]				
V4R1	--	7	--	
V4R2/V4R3	28	28	28	28
ASCII Devices [15]				
V4R1	--	6	--	
V4R2/V4R3	28	28	28	28
LocalTalk Devices	0	0	0	0
Communications Lines				
V4R1/V4R2	1-250	1-250	1-250	1-250
V4R33	1-300	1-300	1-300	1-300
Fax Adapters	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports				
V4R1/V4R2	1-48	1-48	1-48	1-48
V4R3	1-72	1-72	1-72	1-72
Integrated PC Servers [8]	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22

9406 Model 720

Model	720			
Processor Feature	**#2061**	**#2062**	**#2063**	**#2064**
Relative System Performance (Note 1)				
Processor CPW	240	420	810	1600
Interactive CPW				
#1500 (Base)	35	35	35	35
#1501	70	70	-	-
#1502	120	120	120	120
#1503	-	240	240	240
#1504	-	-	560	560
#1505	-	-	-	1050
Number of Processors	1	1	2	4
Main Storage (MB)	256-2048	256-4096	256-8192	256-8192
Processor Group (Note 7)	P10-P20	P10-P20	P20-P30	P20-P30

Numbers are for All Processor Features	Base System	SUE #9364 PCI (#9329) PCI (#9330)	SUE #9364 SPD (#9331)	#5065 Stg/PCI Exp Tower	Expansion Tower	System Maximum
		(Note 4)	(Note 4)			
Disk Storage Base (G)						
Maximum Internal (G)	4.194	263.2	263.2	386.5	561.5	1625.9
Maximum External (G)	263.2		(Note 2)		(Note 2)	1595.3
Total Maximum (G)	(Note 5)					1625.9
External SPD Bus		4	4		0	4
Maximum Card Slots-SPD	0	0	6	0	13	58
Maximum Card Slots-PCI	8	14	0	12	0	70
Communication Lines (Note 3)	18	0-40	0-36	0-42	0-78	128
LAN/ATM Adapters	1-3	0-6	0-6	0-6	0-13	24
Maximum Workstation						
Controllers	5	11	18	12	39	66
Twinaxial (Note 6)	0	0	6	0	13	58
ASCII (Note 6)						
Maximum workstations	188	440	720	480	1560	2628
Twinaxial	0	0	108	0	234	1044
ASCII	1	3	3	3	4	17
¼-inch/8mm Cartridge Tape	1	0-1	0	0-1	0-1	6
(int)	1	2	8	3	8	8
CD-ROM	1	2	4	3	4	4
½-inch Tape	0	0	4	0	4	4
Reel 9348	0	0	2	0	2	2
Reel 2440	1	2	8	3	8	8
Reel 9347						
Cartridge 34xx, 35xx	1	2	8	3	8	8
Tape Libraries Maximum	1	2	4	3	4	4
½-inch Cartridge	1	2	4	3	4	4
8mm	1	2	12	3	14	14
8mm Cartridge (External)	0	0	2	0	2	2
Optical Libraries	3	6	12	6	24	24
Diskettes (5 ¼-inch or 8-inch)	0	0	3	0	3	3
LAN Ports Maximum	0	0	3	0	6	16
Wireless IOP Maximum	1	1	0	0	0	2
FSIOP Maximum	3	6	0	6	0	9
FSIOA (IPCS) Maximum	1	3	1	3	1	6
PCI LAN Maximum	0	0	6	0	13	32
Cryptographic Processors						
Fax Adapters						

Note 1:	CPW is the Commercial Processing Workload that is now being used to measure the performance of all iSeries 400 and AS/400e processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine the performance that is achievable. All iSeries 400 and AS/400e processors announced from September 1996 onward have only CPW performance measurements.
Note 2:	External DASD can be attached using a SPD card in the Expansion Unit.

Note 3:	One line is used for Client Access Console or Operations Console if selected. The maximum is nine if Twinaxial Console is selected.
Note 4:	The #9364 must be configured with #9329 /#9330 (PCI) or #9331 (SPD). Therefore, these columns are mutually exclusive.
Note 5:	Maximum is 175.4 GB on #2061 Processor.
Note 6:	Any combination of Twinax or ASCII workstation controllers up to either maximum shown is allowed, maximums are not additive.
Note 7:	Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Group
#2061	#1500	P10
	#1501	P20
	#1502	P20
#2062	#1500	P10
	#1501	P20
	#1502	P20
	#1503	P20
#2063	#1500	P20
	#1502	P30
	#1503	P30
	#1504	P30
#2064	#1500	P20
	#1502	P30
	#1503	P30
	#1504	P30
	#1505	P30

Note 8:	The total number of internal tapes and CD-ROM per tower cannot exceed the maximum quantity shown for internal tapes. The system maximum for internal tapes and CD-ROMs is 18.

9406 Model 730

Model	730			
Processor Feature	**#2065**	**#2066**	**#2067**	**#2068**
Relative System Perf. (Note 1)				
Processor CPW	560	1050	2000	2890
Interactive CPW				
#1506 (Base)	70	70	70	70
#1507	120	120	-	-
#1508	240	240	240	240
#1509	560	560	560	560
#1510	-	1050	1050	1050
#1511	-	-	2000	2000
Number of Processors	1	2	4	8
Main Storage (MB)	512-24576	512-24576	512-24576	1024-24576
Processor Group (Note 4)	P20-P30	P20-P30	P30-P40	P30-P40

Numbers are for all processor features	System Maximum
Disk Storage	
Base (GB)	4.19
Maximum Internal (GB)	1683.6 / 2499.6 (V4R3 / V4R4)
Maximum External (GB)	1649.2 / 2473.9 (V4R3 / V4R4)
Total Maximum (GB)	1683.6 / 2499.6 (V4R3 / V4R4)
Disk unit IOPs (Note2)	1-37
Communication Lines	1-250
Maximum Workstation Controllers	1-175
Maximum workstations	
Twinaxial	7000
ASCII	3150
¼-inch/8mm Cartridge Tape (Internal) (Note 5)	0-18
CD-ROM (Internal) (Note 5)	1-18
½-inch Tape (Note 3)	
Reel 9348	4
Reel 2440	4
Reel 9347	2
Cartridge 34XX, 35XX	8
Tape Libraries Maximum	10
½-inch Cartridge	4
8mm	4
8mm Cartridge (External)	4
Optical Libraries	14
Diskettes (5 ¼-inch or 8-inch)	2
LAN/ATM Ports Maximum	1-48
Wireless IOP Maximum	3
IPCS Maximum	16
Cryptographic Processors	6
Fax IOPs (2 lines/IOP)	32

Note 1:	CPW is the Commercial Processing Workload that is now being used to measure the performance of all iSeries 400 and AS/400e processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine the performance that is achievable. All iSeries 400 and AS/400e processors announced from September 1996 onward have only CPW performance measurements.
Note 2:	This total includes the MFIOP. The combination of internal and external IOPs cannot exceed this number.
Note 3:	The maximum combination of 2440, 7208 or 9348 and Tape Libraries may not exceed four.
Note 4:	The Processor Group is determined by a combination of Processor and Interactive Feature. The following table provides a cross reference.

Processor	Interactive Feature	Processor Group
#2065	#1506	P20
	#1507	P30
	#1508	P30
	#1509	P30
#2066	#1506	P20
	#1507	P30
	#1508	P30
	#1509	P30
	#1510	P30
#2067	#1506	P30
	#1508	P40
	#1509	P40
	#1510	P40
	#1511	P40
#2068	#1506	P30
	#1508	P40
	#1509	P40
	#1510	P40
	#1511	P40

Note 5:	The system maximum for internal tapes and CD-ROMs is 18.

9406 Model 740

Model	740	
Processor Feature	**#2069**	**#2070**
Relative System Perf (Note 1 and 2)		
Processor CPW	3660	4550
Interactive CPW		
#1514 (Base)	120	120
#1510	1050	1050
#1511	2000	2000
#1512	3660	3660
#1513	-	4550
Number of Processors	8	12
Main Storage (MB)	1024-40960	1020-40960
Processor Group (Note 4)	P40-P50	P40-P50

Numbers are for all processor features	System Maximum
Disk Storage	
Base (GB)	4.19
Maximum Internal (GB)	2095.9 / 4294.9 (V4R3 / V4R4)
Maximum External (GB)	2061.3 / 4260.6 (V4R3 / V4R4)
Total Maximum (GB)	2095.9 / 4294.9 (V4R3 / V4R4)
Disk unit IOPs (Note2)	1-37
SPD I/O Bus	1-19
I/O card slots	3-237
Communication Lines	1-300
Maximum Workstation Controllers	1-175
Maximum workstations	
Twinaxial	7000
ASCII	3150
¼-inch/8mm Cartridge Tape (Internal) (Note 5)	0-18
CD-ROM (Internal) (Note 5)	1-18
½-inch Tape (Note 3)	
Reel 9348	4
Reel 2440	4
Reel 9347	2
Cartridge 34XX, 35XX	8
Tape Libraries Maximum	14
½-inch Cartridge	4
8mm	4
8mm Cartridge (External)	4
Optical Libraries	22
Diskettes (5 ¼-inch or 8-inch)	2
LAN/ATM Ports Maximum	1-72
Wireless IOP Maximum	3
IPCS Maximum	16
Cryptographic Processors	6
Fax IOPs (2 lines/IOP)	32

<table>
<tr><td>Note 1:</td><td>CPW is the Commercial Processing Workload that is now being used to measure the performance of all iSeries 400 and AS/400e processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine the performance that is achievable. All iSeries 400 and AS/400e processors announced from September 1996 onward have only CPW performance measurements.</td></tr>
<tr><td>Note 2:</td><td>This total includes the MFIOP. The combination of internal and external IOPs cannot exceed this number.</td></tr>
<tr><td>Note 3:</td><td>The maximum combination of 2440, 7208 or 9348 and Tape Libraries may not exceed four.</td></tr>
<tr><td>Note 4:</td><td>Processor Group is determined by a combination of the Processor and Interactive Feature. The following table provides a cross reference.
<table>
<tr><th>Processor</th><th>Interactive Feature</th><th>Processor Group</th></tr>
<tr><td rowspan="4">#2069</td><td>#1514</td><td>P40</td></tr>
<tr><td>#1510</td><td>P50</td></tr>
<tr><td>#1511</td><td>P50</td></tr>
<tr><td>#1512</td><td>P50</td></tr>
<tr><td rowspan="5">#2070</td><td>#1514</td><td>P40</td></tr>
<tr><td>#1510</td><td>P50</td></tr>
<tr><td>#1511</td><td>P50</td></tr>
<tr><td>#1512</td><td>P50</td></tr>
<tr><td>#1513</td><td>P50</td></tr>
</table></td></tr>
<tr><td>Note 5:</td><td>The system maximum for internal tapes and CD-ROMs is 18.</td></tr>
</table>

Custom Mixed-Mode Servers

9406 Model S20 Custom Mixed-Mode Server

Model	S20		
Processor Feature	#2170 [23]	#2177	#2178
Relative System Performance (CPW) [1]			
Client/Server Environment	464.3	759.0	759.0
Interactive Environment	49.7	110.7	221.4
Number of Processors	2	4	4
Main Storage (MB) Minimum/Maximum	256-4096	256-4096	256-4096
Processor Group	P20	P20	P20

Summary for All Processors	Base System	#5064 with #9329 (PCI Card Expansion)	#5064 with #9311 (SPD Card Expansion)	#5073, #5083 (External Tower)	System Maximum
Disk Unit Capacity (GB)					
Base	4.19	--	--	--	4.19
Maximum Internal					
V4R1	85.8/128.8 [12]	128.8	128.8	274.8	704.3
V4R2	175.4/263.2 [12]	263.2	263.2	561.5	944.8
Maximum External					
V4R1	--	--	([12])	([12])	652.8
V4R2	--	--	([12])	([12])	893.3
Total Maximum					
V4R1					704.3
V4R2					944.8
Disk Controllers	1	1	([13])	([13])	20
Diskette (8 or 5 ¼ inch)	0	0	2	2	2
CD-ROM	1	0-1	0	0-1	5
Tape Attachment [6]					
¼-inch and/or 8mm Cartridge (Internal)	0-1	0-3	0-3	0-4	17
8mm Cartridge (External)	0-1	0-2	0-4	0-4	4
½-inch Reel 9348	0-1	0-2	0-4	0-4	4
½-inch Reel 2440	0	0	0-4	0-4	4
½-inch Reel 9347	0	0	0	0	0
½-inch Cartridge 34xx, 35xx	0-1	0-2	0-4	0-4	4
Physical Packaging					
SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots—SPD	0	0	6	13	58
I/O Card Slots—PCI	8	14	0	0	22

Workstation Attachment					
Controllers Min/Max	1-5	0-9	0-18	0-39	60
Twinax Devices	188	360	720	1560	2392
ASCII Devices	0	0	108	234	1044
LocalTalk Devices	0	0	0	0	0
Communications Lines	1-10[18]	0-18	0-36	0-78	96
Fax Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	1-3	0-5	0-12	0-16	16
ATM Ports	0-1	0-3	0-5	0-5	16
Integrated PC Server (SPD) [8]	0	0	0-3[22]	0-6[23]	16
Integrated PC Server (PCI) [8]	1-3	0-1	0	0	2
PCI LAN/ATM Adapters	0-1	0-5	0	0	8
Optical Libraries [9]	0-1	0-2	0-12	0-14	14

9406 Model S30 and S40 Custom Mixed-Mode eServers

Processor Model	S30			S40	
Feature	**#2320**	**#2321**	**#2322**	**#2340**	**#2341**
Relative System Performance (CPW) [1]					
Client/Server Environment	998.6	1794.0	1794.0	3660.0	4550.0
Interactive Environment	215.1	386.4	579.6	1050.0	2050.0
Number of Processors	4	8	8	8	12
Main Storage (MB) Minimum/Maximum	512-12288	1024-12288	1024-12288	1024-12288	1024-12288
Processor Group	P20	P30	P30	P40	P40
Disk Unit Capacity (GB)					
Base	4.19	4.19	4.19	4.19	4.19
Maximum Internal					
V4R1	927.7	927.7	927.7	--	--
V4R2	1340.0	1340.0	1340.0	--	--
V4R3	1340.0	1340.0	1340.0	2095.9	2095.9
Maximum External					
V4R1	893.3	893.3	893.3	--	--
V4R2	1305.6	1305.6	1305.6	--	--
V4R3	1305.6	1305.6	1305.6	2061.3	2061.3
Total Maximum					
V4R1	927.7	927.7	927.7	--	--
V4R2	1340.0	1340.0	1340.0	--	--
V4R3	1340.0	1340.0	1340.0	2095.9	2095.9
Disk Controllers	1-37	1-37	1-37	1-37	1-37
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2	0-2	0-2
CD-ROM	1-18	1-18	1-18	1-18	1-18
Tape Attachment [6]					
¼-inch and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4	0-4
½-inch Reel 9348, 2440	0-4	0-4	0-4	0-4	0-4
½-inch Cartridge 34xx, 35xx	0-8	0-8	0-8	0-8	0-8
Physical Packaging					
SPD I/O Bus	1-19	1-19	1-19	1-19	1-19
I/O Card Slots—SPD	3-235	3-235	3-235	3-235	3-235
I/O Card Slots—PCI	0	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18	0-18

Workstation Attachment					
Controllers Minimum/Maximum	1-175	1-175	1-175	1-175	1-175
Twinax Devices	7000	7000	7000	7000	7000
ASCII Devices	3150	3150	3150	3150	3150
LocalTalk Devices	0	0	0	0	0
Communications Lines					
V4R1/V4R2	1-200	1-200	1-200	--	--
V4R3	1-300	1-300	1-300	1-300	1-300
Fax Adapters	0-32	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1	0-1
LAN/ATM Ports					
V4R1/V4R2	1-32	1-32	1-32	--	--
V4R3	1-72	1-72	1-72	1-72	1-72
Integrated PC Servers	0-16	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22	0-22

9406 Model SB1

Model	SB1			
Feature	**#2310**	**#2311**	**#2312**	**#2313**
Relative System Performance	†	†	†	†
Number of Processors	8	12	8	12
Main Storage (M) Minimum/Maximum	4096	4096	8192	8192
Software Charge Group	P30	P40	P40	P40
Disk Unit Capacity (G)				
Base	16.77	16.77	16.77	16.77
Maximum Internal	34.35	34.35	34.35	34.35
Maximum External	--	--	--	--
Total Maximum	34.35[1]	34.35[1]	34.35[1]	34.35[1]
Disk Controllers	1	1	1	1
Diskette (8 or 5 ¼ inch)	0-2	0-2	0-2	0-2
CD-ROM	1	1	1	1
Tape Attachment [2]				
¼-inch and/or 8mm Cartridge (Internal)	0-3	0-3	0-3	0-3
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½-inch Reel 9348, 2440	0-4	0-4	0-4	0-4
½-inch Cartridge 34xx, 35xx	0-4	0-4	0-4	0-4
Physical Packaging				
SPD I/O Bus	1-5	1-5	1-5	1-5
I/O Card Slots—SPD	3-29[3]	3-29[3]	3-29[3]	3-29[3]
I/O Card Slots—PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-2(#5073)	0-2(#5073)	0-2(#5073)	0-2(#5073)
Storage Expansion (#5055/#5057)	0	0	0	0
Storage Expansion (#5052/#5058)	0	0	0	0
Workstation Attachment				
Controllers Minimum/Maximum	1-3[4]	1-3[4]	1-3[4]	1-3[4]
Twinax Devices				
V4R1	7	7	7	7
V4R2/V4R3	28	28	28	28
ASCII Devices				
V4R1	6	6	6	6
V4R2/V4R3	28	28	28	28
LocalTalk Devices	0	0	0	0
Communications Lines	1-16	1-16	1-16	1-16
Fax Adapters	0-2	0-2	0-2	0-2
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports	1-5	1-5	1-5	1-5
Wireless LANs	0-2	0-2	0-2	0-2
Integrated PC Servers	0-2	0-2	0-2	0-2
Optical Libraries	0-2	0-2	0-2	0-2

Note 1:	There is a logical limit of 17.16 GB if mirrored or 25.76 GB if RAID is used for performance measurements.
Note 2:	It is required to have one tape.
Note 3:	Two logical features are supported on the base system.
Note 4:	With V4R1, a maximum of two workstation controllers is supported.
†	AS/400e server SB1 performance data is based on standard benchmarks. Specific performance data may be found at the following vendor Web sites: **BAAN** — `http://www.baan.com` **SAP** — `http://www.sap.com`

Packages

9401 Model 150

Package	Twinax Entry	Twinax Growth	Server Entry	Server Growth
Package ID	**#0591**	**#0592**	**#0593**	**#0594**
Relative System Performance (CPW)				
Client/Server Environment[24,25]	20.2	20.2	20.2	20.2
Interactive Environment[24,25]	13.8	20.2	13.8	20.2
Number of Processors	1	1	1	1
Main Storage (M) Minimum/Maximum	64-192	128-192	64-192	128-192
Software Charge Group [26]	P05	P05	P05	P05
Disk Unit Capacity (GB)				
Base	4.19	4.19	4.19	4.19
Total Disk	29.9	29.9	29.9	29.9
Disk Controllers	0	0	0	0
Diskette	0	0	0	0
Tape Attachment				
¼" Internal [27]	1	1	1	1
External and Tape Libraries	0	0	0	0
System I/O Card Slots (PCI)				
PCI I/O Card Slots [28]	5	5	5	5
Int Netfinity Server & Bridge Card Slots	2	2	2	2
Workstation Attachment				
Controllers Minimum/Maximum	1	1	0-1	0-1
Twinax Devices	1-7	1-28	0-7	0-28
ASCII Devices	0	0	0	0
Local Talk Devices	0	0	0	0
Communications Lines	1-5	1-5	1-6[29]	1-6[29]
Cryptographic Processors	0	0	0	0
Fax Adapters	0	0	0	0
LAN Ports [30]	0-2	0-2	1-2	1-2
Wireless Adapters	0	0	0	0
Integrated Netfinity Servers	0-1	0-1	0-1	1
100/10 Mbps Ethernet Adapters	0-1	0-1	0-1	0-1
ATM Adapters	0	0	0	0

9402 2XX Packages

Models 2FS, 2SS, 2SG	Twinax Server 2FS	LAN Server 2FS	Starter Server 2SS	Growth Server 2SG
Relative System Performance (CPW) [1]				
Client/Server Environment	17.1	17.1	17.1	17.1
Interactive Environment	5.5	5.5	5.5	5.5
Relative System Performance (RAMP-C) [2]				
Client/Server Environment	5.9	5.9	5.9	5.9
Interactive Environment	1.9	1.9	1.9	1.9
Main Storage (MB)	16-128	16-128	16-128	32-128
Maximum Disk Storage (GB)	7.86	7.86	7.86	7.86
Maximum Number of Workstations				
Twinax	7	0	0	0
ASCII	0	0	0	0
Local Talk	0	0	0	0
Maximum Communication Lines	3	2	2	2
Maximum LAN Adapters	2	2	1	1
Available Card Slots (for I/O Adapters)	0	0	0	0
Number of System I/O Buses	1	1	1	1
Processor Group	P05	P05	P05	P05
Software	O/S 400 Query for AS/400 Client Access for O/S 400 Novell NetWare Support LAN Server for AS/400 (Includes 10 LAN Requesters)		O/S400 Query for AS/400 Client Access for A/S 400 DB2 for OS/400 Query Manager and SQL Novell NetWare Support ADSM for AS/400 (10 Clients with 25G Maximum) LAN Server for AS/400 (Includes One LAN Requester)	

9402 Model 400 Packages

Model 400 Package	Entry 40E	Entry 41E	Growth 40G	Growth 41G	Large 40L	Large 41L	Entry 42E	Growth 42G	Large 42L
Relative System Perf (CPW) [1] V3R6	12.3	18.3-30.6	12.3	18.3-30.6	12.3	18.3-30.6	12.3-30.6	12.3-30.6	12.3-30.6
Relative System Perf (CPW) [1] V3R7	13.8	20.6-33.3	13.8	20.6-33.3	13.8	20.6-33.3	13.8-35.0	13.8-33.3	13.8-33.3
Relative System Perf (CPW) [1] V4	13.8	20.6-35.0	13.8	20.6-35.0	13.8	20.6-35.0	13.8-35.0	13.8-35.0	13.8-35.0
Main Storage (MB)	64-180	64-224	96-160	96-224	160	160-224	64-224	96-224	160-224
Disk Storage (GB) (Maximum) V3R6 (Maximum) V3R7	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number of Workstations Twinax ASCII LocalTalk	 280 108 186	 280 108 186	 280 108 186	 280 108 186	 280 108 186	 280 90 155	 280 108 186	 280 108 186	 280 90 155
Maximum Communication Lines	20	20	20	20	20	20	20	20	20
Maximum Line Adapters	2^5	2^5	2^5	2^5	2^5	2^5	2^5	2^5	2^5
Maximum ATM Ports	1	1	1	1	1	1	1	1	1
Available Card Slots	6	6	6	6	6	6	6	6	6
System I/O Buses	1	1	1	1	1	1	1	1	1
Processor Group	P05	P10	P05	P10	P05	P10	Processor #2130 (P05) Processor #2131/#2132 #2133 (P10)		
Software Included	O/S 400 Client Access for AS/400 Query for AS/400 DB2 Query Manager and SQL Development Kit for AS/400						Hardware Only		

9402 Model 436 Packages

Model 436 Package	Entry #0114	Growth #0115	Large #0116
Relative System Performance (CPW) [1] V3R6	14.4-24.5	14.4-24.5	14.4-24.5
Relative System Performance (CPW) [1] V3R7/V4	16.3-27.4	16.3-27.4	16.3-27.4
Relative System Performance (RAMP-C) [2] O/S 400	4.8-8.7	4.8-8.7	4.8-8.7
Relative System Performance (RAMP-C) [2] SSP	1.0-2.4	1.0-2.4	1.0-2.4
Main Storage (MB) [3]	32-256	32-256	32-256
Disk Storage (GB) [3] (Maximum) V3R6 (Maximum) V3R7 and later	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number Workstations [3] Twinax Devices ASCII LocalTalk Devices	 280 108 0	 280 108 0	 280 108 0
Maximum Communication Lines [3]	20	20	20
Maximum LAN Adapters [3]	2^5	2^5	2^5
Maximum ATM Adapters [3]	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6
System I/O Buses	1	1	1
Processor Group	Processor #2102 (P05) Processor #2104/#2106 (P10)		

9402 Model 40S Packages

Model 40S Hardware/Software Packages	Small Server 4SS	Entry Server 4SE	Growth Server 4SG	Growth Server 4TG	Large Server 4SL	Large Server 4TL
Relative System Perf (CPW) [1] V3R6 Client/Server Environment Interactive Environment	 24.5-52.9 8.4-18.3	 24.5-52.9 8.4-18.3	 24.5-52.9 8.4-18.3	 77.3 26.9	 24.5-52.9 8.4-18.3	 77.3 26.9
Relative System Perf (CPW) [1] V3R7 Client/Server Environment Interactive Environment	 27.0-59.8 9.4-20.6	 27.0-59.8 9.4-20.6	 27.0-59.8 9.4-20.6	 87.3 30.7	 27.0-59.8 9.4-20.6	 87.3 30.7
Relative System Perf (CPW) [1] V4 Client/Server Environment Interactive Environment	 27.0-63.0 9.4-21.6	 27.0-63.0 9.4-21.6	 27.0-63.0 9.4-21.6	 91.0 32.2	 27.0-63.0 9.4-21.6	 91.0 32.2
Main Storage (MB)	32-224/ 64-512	32-224/ 64-512	64-224/ 64-512	128-512	96-224/1 28-512	128-512
Disk Storage (GB) (Maximum) V3R6 (Maximum) V3R7	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number of Workstations Twinax Devices ASCII LocalTalk Devices	 7 6 31	 7 6 31	 7 6 31	 7 6 31	 7 6 31	 7 6 31
Maximum Communication Lines	23	20	20	20	20	20
Maximum LAN Adapters	2^5	2^5	2^5	2^5	2^5	2^5
Maximum ATM Adapters	1	1	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6	6	6
System I/O Buses	1	1	1	1	1	1
Processor Charge Group	P05	P05	P05	P10	P05	P10
Software	OS/400 Client Access for AS/400 Query for AS/400 DB2 Query and SQL Development Kit for AS/400					

9402 Model 40S Packages

Model 40S Hardware Packages	Small Server 4HS	Entry Server 4HE	Growth Server 4HG	Large Server 4HL
Relative System Performance (CPW) [1] V3R6 Client/Server Environment Interactive Environment	 24.5-77.3 8.4-26.9	 24.5-77.3 8.4-26.9	 24.5-77.3 8.4-26.9	 24.5-77.3 8.4-26.9
Relative System Performance (CPW) [1] V3R7 Client/Server Environment Interactive Environment	 27.0-87.3 9.4-30.7	 27.0-87.3 9.4-30.7	 27.0-87.3 9.4-30.7	 27.0-87.3 9.4-30.7
Relative System Performance (CPW) [1] V4 Client/Server Environment Interactive Environment	 27.0-91.0 9.4-32.2	 27.0-91.0 9.4-32.2	 27.0-91.0 9.4-32.2	 27.0-91.0 9.4-32.2
Main Storage (MB)	32-224/ 64-512	32-224/ 64-512	64-224/ 128-512	96-224/ 128-512
Disk Storage (GB) Maximum V3R6 Maximum V3R7	 23.6 50.3	 23.6 50.3	 23.6 50.3	 23.6 50.3
Maximum Number of Workstations Twinax Devices ASCII LocalTalk Devices	 7 6 31	 7 6 31	 7 6 31	 7 6 31
Maximum Communication Lines	20	20	20	20
Maximum LAN Adapters	2^5	2^5	2^5	2^5
Maximum ATM Adapters	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6
System I/O Buses	1	1	1	1
Processor Group	Processor #2109/#2110/#2111 (P05) Processor #2112 (P10)			

Table Notes for All Summary Tables

1. CPW is the Commercial Processing Workload that is used to measure the performance of all iSeries and AS/400e processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. With the introduction of Dedicated Servers for Domino, the Simple Mail Users has been added as a performance measurement. For more details, see “Commercial Processing Workload” on page 31.

2. 9404 Model B10 with 16M Main Storage and 945M of Disk assigned value of 1.0. All data for 70% system utilization and maximum configurations. IBM RAMP-C workload. Customer results may vary.
3. There are particular limitations within SSP which means that quoted minimums and maximums are often with OS/400 installed.
4. RSP CPW 5.5/17.1 refers to interactive and client/server environments respectively on the 9401 Server 10S. RSP RAMP-C of 1.9/5.9 also refers to these two environments in the same order.
5. Three LANs are allowed when running IBM Firewall for AS/400 (5769-FW1).
6. One tape is required.
7. Does not include Operations Console.
8. These cards may have one or two LAN ports. The #6617 SPD Integrated PC Server can have up to three ports.
9. V4R2 or later is a prerequisite for Optical Library support.
10. Either #9329 (PCI cards) or #9331 (SPD cards) must be chosen on a #5064/#9364. Therefore, columns two and three below this point are mutually exclusive.
11. The lower figure is for #2175, #2179, and #2180 processors. The higher number is for the #2181 and #2182 processors.
12. External DASD can be attached through an SPD disk controller in this unit.
13. Maximums are:

    12 of #6500
    20 of #6501
     9 of #6502, #6512, #6530, #6532, #6533

    These maximums may be limited when used in combination with other disk controllers.
14. With V4R1, a maximum of two workstation controllers is supported.
15. The combined maximum of local and remote displays attached to ASCII and Twinax is seven with V4R1 and 28 with V4R2 and V4R3.
16. The lower number is for the #2161 processor. The higher number is for #2163, #2165, and #2166 processors.
17. If there is no workstation controller specified, the console must be specified by #9721.
18. One line is used for Operations Console. The maximum is nine if there is a Twinaxial System Console.
19. For systems shipped between October 1997 and February 1998, maximum storage is 2048M.

21. The maximum reflects the usage of two slot wide IPCS. If using a three slot wide IPCS, Integrated Netfinity Server, or Integrated xSeries Server for iSeries, the maximum is two.
22. The maximum reflects the usage of two slot wide IPCS. If using a three slot wide IPCS, Integrated Netfinity Server, or Integrated xSeries Server for iSeries, the maximum is four.
23. Requires V4R2 or later.
24. On the 9401 Model 150, the processor is the same on both the Twinaxial and Server Models, therefore, the performance figures are the same.
25. The performance figures shown are for a “constrained” workload due to memory and disk limitations on the 9401 Model 150. If these limitations are lifted, the “unconstrained” CPW measurements in the following table apply.

Processor	Interactive	Client/Server
#0591 and #0593	13.8	27.0
#0592 and #0592	20.6	35.0

26. The system also includes CD-ROM for IBM software.
27. The 9401 Model 150 includes BasePak software in the hardware cost. This includes OS/400, Client Access Family for Windows, Query, SQL, Facsimile Support, and PSF/400. Additional programs have to be purchased.
28. Two of these PCI I/O card slots are reserved for the Integrated Netfinity Server. Three are driven by the Multi-Function I/O Processor.
29. Six lines in total, but one is reserved for Operations Console.
30. A maximum of one LAN can be driven off the Multi-Function I/O Processor. If Integrated Netfinity Server is installed, no LANs are supported on the MFIOP.

† This processor was announced in September 1996 when IBM introduced CPW as the new method of measuring the performance of AS/400e processors. For this and future processor announcements, CPW values only will be quoted.

General note: Capacities shown may require prerequisites. Some combinations of features may not be valid.

Special Notices and Publications

Special Notices and Publications

Special Notices

This publication is intended to help IBM System Specialists, Sales Representatives, Business Partners, and IBM customers to use this Handbook as a reference for the options available with the iSeries 400 and AS/400e system. It is designed for *guidance* only. It is *not* a detailed configurator since it does not contain full lists of prerequisites that a feature *may* need. Nor does it always list features that *may* be mutually exclusive. The information in this publication is not intended as the specification of any programming interfaces that are provided by the iSeries 400 and AS/400e system. See the PUBLICATIONS section of the IBM Programming Announcement for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact IBM Corporation, Dept. 600A, Mail Drop 1329, Somers, NY 10589 USA.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM ("vendor") products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

© Copyright IBM Corp. 2000

Any pointers in this publication to external Web sites are provided for convenience only and do not in any manner serve as an endorsement of these Web sites.

Any performance data contained in this document was determined in a controlled environment, and therefore, the results that may be obtained in other operating environments may vary significantly. Users of this document should verify the applicable data for their specific environment.

Reference to PTF numbers that have not been released through the normal distribution process does not imply general availability. The purpose of including these reference numbers is to alert IBM customers to specific information relative to the implementation of the PTF when it becomes available to each customer according to the normal IBM PTF distribution process.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

IBM ®	Redbooks
e(logo)	Redbooks Logo
ADSTAR	Advanced Function Printing
Advanced Peer-to-Peer Networking	AFCCU
AFP	AIX
AnyNet	APPN
AS/400	AT
BookManager	C/400
CallPath	CallPath/400
CICS	CICS OS/2
CICS/ESA	CICS/MVS
CICS/VM	CICS/VSE
CICS/400	CICS/6000
Client Series	COBOL/400
CommercePOINT	CT
DataJoiner	DataPropogator
DB2	Distributed Relational Database
DRDA	Architecture
eNetwork	ES/9000
FaxConcentrator	GDDM
IBM ®	IBMLink
IBM Consumer Wallet	IBM Payment Gateway
IBM Payment Registry	IBM Payment Server
IMS	InfoColor
Infoprint	InfoWindow
Integrated Language Environment	Intelligent Miner
Intelligent Printer Data Stream	IPDS
KnowledgeTool	Language Environment
Library Reader	LPDA
Magstar	MQ
MQSeries	MVS/ESA
MVS/SP	Net.Data

Netfinity	NetView
Network Station	Nways
OfficeVision	OfficeVision/400
Open Class	OpenEdition
Operating System/400	OS/2
OS/400	Presentation Manager
Print Services Facility	PROFS
Proprinter	RISC System/6000
RPG/400	RS/6000
S/370	S/390
Seascape	SP
SP2	StorWatch
System/36	System 370
System/38	SystemView
Versatile Storage Server	VisualAge
VisualGen	VisualInfo
VSE/ESA	WebSphere
WorkPlace	XT
3090	400

The following terms are trademarks of other companies:

Tivoli, Manage. Anything. Anywhere.,The Power To Manage., Anything. Anywhere.,TME, NetView, Cross-Site, Tivoli Ready, Tivoli Certified, Planet Tivoli, and Tivoli Enterprise are trademarks or registered trademarks of Tivoli Systems Inc., an IBM company, in the United States, other countries, or both. In Denmark, Tivoli is a trademark licensed from Kjøbenhavns Sommer - Tivoli A/S.

C-bus is a trademark of Corollary, Inc. in the United States and/or other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and/or other countries.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States and/or other countries.

PC Direct is a trademark of Ziff Communications Company in the United States and/or other countries and is used by IBM Corporation under license.

ActionMedia, LANDesk, MMX, Pentium and ProShare are trademarks of Intel Corporation in the United States and/or other countries.

UNIX is a registered trademark in the United States and other countries licensed exclusively through The Open Group.

SET, SET Secure Electronic Transaction, and the SET Logo are trademarks owned by SET Secure Electronic Transaction LLC.

Other company, product, and service names may be trademarks or service marks of others.

iSeries 400 and AS/400e Documentation

Documentation for the iSeries 400 and AS/400e is delivered in softcopy on CDs and on the Web. Manuals are available for viewing, printing, or downloading from the Internet, or distributed on CDs, as discussed in this section.

AS/400 Softcopy Library

Softcopy publications are shipped on machine-readable CD-ROM. For Version 4, a CD-ROM containing the softcopy books is shipped automatically. Additional copies are available for a fee.

These softcopy manuals can be displayed, printed and searched using the Library Reader or BookManager READ family of licensed programs.The Library Readers are provided on the CD-ROM.

iSeries 400 and AS/400e publications can also be displayed and ordered from the iSeries and AS/400e On-line Library on the Internet. Portable Data Format (PDF) files are available for most V4R4 and V4R3 publications also. For more information, see the following site:
`http://as400bks.rochester.ibm.com`

iSeries 400 Information Center

The iSeries 400 Information Center is the next generation for information retrieval. It offers a new path to iSeries 400 and AS/400e technical information using the power of browsers and new technology. The Information Center gives fast, easy access to how-to information, example scenarios and program code, reference lookups, and background conceptual information. The Information Center is the starting point for all technical information needs. Access if provided to over 6,000 pages within the Information Center, as well as link to a wide variety of Internet sites with crucial technical content. Access to the Information Center is also provided from the CD-ROM that arrives with your system software (CD-ROM order number: SK3T-2027).

For more information, visit the Information Center home page at any of the following sites:

- `http://www.as400.ibm.com/infocenter`
- `http://publib.boulder.ibm.com/pubs/html/as400/infocenter.html`
- `http://publib.boulder.ibm.com/html/as400/infocenter.html`

© Copyright IBM Corp. 2000

V4R5 Enhancements

You can access the Information Center directly from the Operations Navigator Help panels. Enhanced functions include the ability to:

- In addition to printing the information through your browser, print Information Center topics using separate print files. The print files are included in the Information Center
- Find information faster on the Information Center Web site. Use the keyword search (English Internet only) to quickly find what you need. It even searches for synonyms of the keywords you enter.

New information is contained in the Information Center on:

- Logical partitioning
- Clustering
- Java
- TCP/IP
- Web serving
- Internet security

iSeries 400 and AS/400e Rochester Redbooks

iSeries 400 and AS/400e redbooks are the publications produced by the International Technical Support Organization (ITSO) in Rochester. They provide practical advice on how to implement and integrate iSeries 400 and AS/400e products. They are written by iSeries 400 and AS/400e professionals from around the world.

Where to get more information:

- To find the latest information on IBM redbooks including ordering information, visit the site at: `http://www.redbooks.ibm.com/index.html`
- To view redbooks on the AS/400 Softcopy Library CD-ROM and the latest iSeries 400 and AS/400e related redbooks not yet on the current CD-ROM, see the site at: `http://as400bks.rochester.ibm.com`
- To learn more about ITSO and how to become a part of our residency program, visit our internal Web site at: `http://w3.itso.ibm.com`
- For telephone information call:
  (800) IBM-4FAX (United States) or
  (+1) (415) 855-4329 (Outside U.S.A.)
  and ask for:
  - Index #4420 Redbooks for the last six months
  - Index #4421 Abstract for new redbooks
  - Index #4422 IBM redbooks

Some of the latest iSeries 400 and AS/400e redbooks are:

- *AS/400e e-business Handbook*, SG24-5694
- *AS/400 Net.Commerce*, SG24-2129
- *AS/400 Internet Connection Servers*, SG24-2150
- *AS/400 Printing V*, SG24-2160
- *The System Administrator's Companion to AS/400 Availability and Recovery*, SG24-2161
- *AS/400 Internet Security: IBM Firewall for AS/400*, SG24-2162
- *AS/400—Implementing Windows NT on the Integrated PC Server*, SG24-2164
- *Complementing AS/400 Storage Management Using Hierarchical Storage Management APIs,* SG24-4450
- *IBM Magstar 3494 Tape Libraries: A Practical Guide*, SG24-4632
- *Unleashing AS/400 Applications on the Internet*, SG24-4935
- *AS/400 TCP/IP Autoconfiguration: DNS and DHCP Support*, SG24-5147
- *AS/400, IBM Network Station: Techniques for Deployment in a WAN,* SG24-5187
- *AS/400 Client Access Express for Windows: Implementing V4R4M0,* SG24-5191

IBM Redbooks can be ordered individually or you can choose to set up a subscription to all AS/400 Redbooks in a general interest area (including future publications) by ordering the following numbers:

- SBOF-7271 - Commonly Used Redbooks
- SBOF-7272 - Office and Decision Support Redbooks
- SBOF-7273 - General Systems and Publications Redbooks
- SBOF-7274 - Client/Server Redbooks
- SBOF-7275 - System Management and Operations Redbooks
- SBOF-7276 - Communications and Networking Redbooks
- SBOF-7277 - Application and Development Tools Redbooks
- SBOF-7278 - Database and Files Redbooks
- SBOF-7279 - Application and System Support Redbooks
- SBOF-7280 - Planning, Installation, and Migration Redbooks

Note that some redbooks are included in more than one of the previous categories.

IBM Redbooks publications

For information on ordering these publications see “How to Get IBM Redbooks” on page 819.

- *iSeries and AS400 System Builder*, SG24-2155
- *AS/400e to iSeries 400 Migration*, SG24-6055

  At the time this edition of the Handbook was published, the Migration book was only available as a redpiece through the IBM intranet site: `http://w3.itso.ibm.com`

  The Migration redbook is scheduled for final publication at the beginning of fourth quarter 2000.
- *AS/400e e-business Handbook*, SG24-5694

IBM Redbooks collections

Redbooks are also available on the following CD-ROMs. Click the CD-ROMs button at `http://www.redbooks.ibm.com/` for information about all the CD-ROMs offered, updates and formats.

CD-ROM Title	Collection Kit Number
System/390 Redbooks Collection	SK2T-2177
Networking and Systems Management Redbooks Collection	SK2T-6022
Transaction Processing and Data Management Redbooks Collection	SK2T-8038
Lotus Redbooks Collection	SK2T-8039
Tivoli Redbooks Collection	SK2T-8044
AS/400 Redbooks Collection	SK2T-2849
Netfinity Hardware and Software Redbooks Collection	SK2T-8046
RS/6000 Redbooks Collection (BkMgr)	SK2T-8040
RS/6000 Redbooks Collection (PDF Format)	SK2T-8043
Application Development Redbooks Collection	SK2T-8037
IBM Enterprise Storage and Systems Management Solutions	SK3T-3694

Other resources

These publications are also relevant as further information sources:

- Soltis, Frank G. “Logical Partitioning, Divide and Conquer”, *NEWS400*, January 1999 (volume 224).
- Soltis, Frank G. *Inside the AS/400*. 29th Street Press, 1997 (ISBN: 1-882419-66-9).
- *3590 Introduction and Planning Guide*, GA32-0329
- *V4R4 AS/400 RISC-to-RISC System Upgrade Road Map (RISC to RISC),* SA41-5155

- *Messaging and Queuing Technical Reference*, SC33-0850
- *Tips and Tools for Securing Your AS/400*, SC41-5300
- *Backup and Recovery Manual*, SC41-5304
- *OS/400-AS/400 Integration with Windows NT Server*, SC41-5439
- *AS/400 Performance Capabilities Reference - Version 4, Release 5*, SC41-0607

  This publication is available in soft copy only by visiting the Web site at: `http://www.ibm.com/eserver/iseries/library/`

  At the site, select **AS/400 Online Library**. Then, select the appropriate language, and click **GO!**. Click **V4R4**, and then click **Search or view all V4R4 books**. Finally, in the "Find books with titles, names, or doc numbers containing" field, enter the publication number, and click **Find**.
- *Operations Console Setup*, SC41-5508
- The following publications are available in soft copy only on the CD-ROM *AS/400 Information Center*, SK3T-2027:
  - *AS/400 Migration from System/36 Planning Guide*
  - *Migration from System/38 Planning Guide*
- *CCITT Blue Book Volume VII, Facsimile VII.3 Recommendations T.4 and T.30*
- *Physical Planning Quick Reference* on the Web at: `http://www.as400.ibm.com/tstudio/planning/index_rf.htm`
- *AS/400 Developer Kit for Java* is available through the AS/400 book server Web site at: `http://publib.boulder.ibm.com/html/as400/infocenter.htm`

Referenced Web sites

These Web sites are also relevant as further information sources:

- `http://www.ibm.com/eserver/iseries`
- `http://www-1.ibm.com/servers/eserver/iseries`
- `http://www.ibm.com/eserver/iseries/library`
- `http://as400bks.rochester.ibm.com`
- `http://publib.boulder.ibm.com/pubs/html`
- `http://publib.boulder.ibm.com/html/as400/infocenter.html`
- `http://www.ibm.com/eserver/iseries/infocenter`
- `http://www.ibm.com/eserver/iseries/lpar`
- `http://www.ibm.com/eserver/iseries/ondemand`

- http://www.iseries.ibm.com/developer/performance/index.htm
- http://publib.boulder.ibm.com/pubs/html/as400/online/chgfrm.htm
- http://www.ibm.com/eserver/iseries/estimator
- http://www.networking.ibm.com/525
- http://www.iseries.ibm.com/developer/factory/pase/index.html
- http://www.tivoli.com/products/solutions/storage/news.html
- http://www.iseries.ibm.com/developer/ssp/index.html
- http://www.iseries.ibm.com/developer/threads/cpa/roadmap.doc.html
- http://www.atmforum.com
- http://www.as400.ibm.com/windowsintegration/ntins.htm
- http://www.as400.ibm.com/nt
- http://www.tivoli.com/storage
- http://www.ibm.com/storage/techsup/tapetech/tapetech.html
- http://www.storage.ibm.com
- http://www.esuite.lotus.com
- http://www.pc.ibm.com/ww/networkstation
- http://www.pc.ibm.com/ww/netvista/index.html
- http://www.printers.ibm.com/r5psc.nsf/web/as400overview
- http://www.networking.ibm.com/525/525home.html
- http://www.ibm.com/iseries400/tcpip/iwizard.htm
- http://www.apache.org
- http://www.as400.ibm.com/euro
- http://www.ibm.com/eserver/iseries/hsmcomp
- http://www.ibm.com/eserver/iseries/windowsintegration
- http://www.ibm.com/year2000
- http://www.iseries.ibm.com/toolbox
- http://www.ibm.com/eserver/iseries/pm400
- http://www.as400.ibm.com/sftsol/subscript.htm
- http://www.as400.ibm.com/sftsol/subscription2.htm
- http://www.cybercash.com/partners
- http://www.iseries.ibm.com/btob

- http://as400service.ibm.com/estimator
- http://www.lotus.com/smartsuite
- http://www.ibm.com/software/data/datajoiner
- http://www.ibm.com/qmf
- http://www.iseries.ibm.com/periph/network.htm
- http://www.ibm.com/eserver/iseries/firewall
- http://www.iseries.ibm.com/products/firewall/index.htm
- http://www-4.ibm.com/software/ts/mqseries/plstforms/os400
- http://www-4.ibm.com/software/ts/mqseries/txppacs
- http://www-4.ibm.com/software/ts/mqseries/platforms
- http://www-4ibm.com/software/ts/mqseries
- http://www.iseries.ibm.com/wireless/main.htm
- http://www.as400.ibm.com/clientaccess
- http://www-4.ibm.com/software/network/screencustomizer
- http://www.lotus.com/domino
- http://www.lotus.com/messaging
- http://www.lotus.com/dominoenterpriseserver
- http://www.eicentral.lotus.com
- http://www.ibm.com/eserver/iseries/services
- http://www.ibm.com/iseries400/support
- http://www.ibm.com/eserver/iseries/cif
- http://www.ibm.com/as400/service
- http://www-3.ibm.com/services/learning/community/as400
- http://www.as400.ibm.com/myas400
- http://www.iseries.ibm.com/myiseries
- http://www.as400.ibm.com/support
- http://www.ibm.com/eserver/iseries/developer/tools
- http://www-4.ibm.com/software/data/imageplus
- http://www.bluenotes.com
- http://www.dominodotoffice.com
- http://www.baan.com

- http://www.sap.com
- http://www.redbooks.ibm.com
- http://www.redbooks.ibm.com/index.html
- http://publib.boulder.ibm.com/pubs/html/as400/infocenter.htm
- http://www.redbooks.ibm.com/redbooks
- http://www.as400.ibm.com/infocenter
- http://w3.itso.ibm.com
- http://www.as400.ibm.com/tstudio

How to Get IBM Redbooks

This section explains how both customers and IBM employees can find out about IBM Redbooks, redpieces, and CD-ROMs. A form for ordering books and CD-ROMs by fax or e-mail is also provided.

- **Redbooks Web Site** http://www.redbooks.ibm.com/

  Search for, view, download, or order hardcopy/CD-ROM Redbooks from the Redbooks Web site. Also read redpieces and download additional materials (code samples or diskette/CD-ROM images) from this Redbooks site.

  Redpieces are Redbooks in progress; not all Redbooks become redpieces and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

- **E-mail Orders**

  Send orders by e-mail including information from the IBM Redbooks fax order form to:

	e-mail address
In United States	usib6fpl@ibmmail.com
Outside North America	Contact information is in the “How to Order” section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl

- **Telephone Orders**

United States (toll free)	1-800-879-2755
Canada (toll free)	1-800-IBM-4YOU
Outside North America	Country coordinator phone number is in the “How to Order” section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl

- **Fax Orders**

United States (toll free)	1-800-445-9269
Canada	1-403-267-4455
Outside North America	Fax phone number is in the “How to Order” section at this site: http://www.elink.ibmlink.ibm.com/pbl/pbl

This information was current at the time of publication, but is continually subject to change. The latest information may be found at the Redbooks Web site.

IBM Intranet for Employees

IBM employees may register for information on workshops, residencies, and Redbooks by accessing the IBM Intranet Web site at http://w3.itso.ibm.com/ and clicking the ITSO Mailing List button. Look in the Materials repository for workshops, presentations, papers, and Web pages developed and written by the ITSO technical professionals; click the Additional Materials button. Employees may access MyNews at http://w3.ibm.com/ for redbook, residency, and workshop announcements.

© Copyright IBM Corp. 2000

IBM Redbooks Fax Order Form

Please send me the following:

Title	Order Number	Quantity

First name	Last name	
Company		
Address		
City	Postal code	Country
Telephone number	Telefax number	VAT number

☐ Invoice to customer number _____

☐ Credit card number _____

Credit card expiration date	Card issued to	Signature

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.

Abbreviations

Abbreviations

List of Abbreviations

Measurements

K	1,024 bytes
M	1,000,000 bytes
M	1,048,576 bytes
G	1,000*M* bytes
T	1,000G bytes

bps	bits per second
Kbps	1,024 bps
Mbps	1,048,576 bps
lpm	lines per minute
lpi	lines per inch
cps	characters per second
cpi	characters per inch
bpi	bits per inch
cpl	characters per line
ips	inches per second
dpi	dots per inch

Keywords

ACD	Automated Call Director
ADCS	Advanced Data Communications for Stores
ADSM	Adstar Distributed Storage Manager
AFP	Advanced Function Printing
AFP	Advanced Function Printing
APAR	Authorized Program Analysis Report
API	Application Program Interface
APPC	Advanced Program to Program Communication
APPN	Advanced Peer to Peer Network
ARP	Address Resolution Protocol
ASP	Auxiliary Storage Pool
ASP	Application Solution Provider
ATM	Asynchronous Transfer mode
AWT	Abstract Windowing Toolkit
B2B	Business to business
B2C	Business to Consumer
BBU	Battery Backup Unit
BI	Business Intelligence
BIOS	Basic Input Output System
BLOB	Binary Large Object
BRI	Basic Rate Interface
BRMS	Backup and Recovery Media services
BSC	Bisynchronous
CBX	Computerized
CDMF	Commercial Data Masking Facility
CCIN	Custom Card Identification Number
CCSID	Coded Character Set ID
CCW	Continuous Composite Worm
CEC	Central Electronics Complex
CGI	Common Gateway Interface
CICS	Customer Information Control System
CIF	Customer Install Feature
CISC	Complex Instruction Set Computing
CL	Control Language
CLOB	Character Large Object
CODE	Cooperative Development Environment
COLD	Computer Output to Laser Disk
CORBA	Common Object Request Broker Architecture
CPA	Common Programming APIs
CPM	Continuously Powered Main Storage
CPW	Commercial Processing Workload

© Copyright IBM Corp. 2000

CRG Cluster Resource Group

CSA Callpath Services Architecture

CSU Customer Setup

CSV Comma Separated Variable

CUoD Capacity Upgrade on Demand

DASD Direct Access Storage Device

DBCS Double Byte Character Set

DBLOB Double-byte Large object

DCA Document Content Architecture

DCE Distributed Computing Environment

DDE Dynamic Data Exchange

DDL Database Definition Language

DDM Data Directory Manager

DECS Domino Enterprise Connection Services

DES Data Encryption Standard

DFU Data File Utility

DHCF Distributed Host Command Facility

DIMM Dual Inline Memory Module

DLL Dynamic Link Library

DMZ Demilitarized Zone

DOM Document Object Model

DRDA Distributed Relational Database Architecture

DSD Dedicated Server Domino

DSNX Distributed System Node Executive

DSP Digital Signal processing

DST Dedicated Service Tools

DTD Document Type Definition

DUOW Distributed Unit of Work

ECS Electronic Customer Support

EJB Enterprise JavaBeans

ERP Enterprise Resource Planning

ESJ Enterprise Server Java

ESP Extreme Support Through Personalization

ESS Enterprise Storage Server

EVI Encoded Vector Indexes

FCMU File Compose and Merge Utility

FIPS Federal Information Processing Standard

FFDC First failure Data Capture

FFT Final Form Text

FSIOP File Serving Input Output Processor

FTP File Transfer Protocol

FULIC Featured User Licensed Internal Complex

GUI Graphical User Interface

HCP Host Command Processor

HPT Host Print Transform

HSL High Speed Link

HSM Hierarchical Storage Manager

HTML Hypertext Markup Language

HTTP Hypertext Transfer Protocol

HPOFS High Performance Optical File System

HSL High Speed Link

HVD High Voltage Differential

IBM International Business Machines

ICA Integrated Computing Architecture

ICSS Internet Connection Secure Server

ICMP Internet Control Message Protocol

IDLC ISDN Datalink Control

IDRC Improved Data Recording capability

IIOP Internet Inter-ORB Protocol

IKE Internet Key Exchange

ILE Integrated Language Environment

IMPI Internal Machine Program Instruction

INS Integrated Netfinity Server

IOA Input Output Adapter

IOP Input Output Processor

IPCS Integrated PC Server

IPDS Intelligent Printer Data Stream

IPL Initial Program Load

IPLA International Program License Agreement

IPM Impressions Per Minute

IPS IP over SNA Snackets

IPSec IP Security Protocol

IPX Internet Packet exchange

ISA Industry Standard Architecture

ISDB Interactive Source Debugger

ISDN Integrated Services Digital Network

ISV Independent Software Vendor

ITF Interactive Terminal Facility

ITU International Telecommunication Union

IXS Integrated xSeries Server for iSeries

IMPI Internal microprogram instruction

JDBC Java Database Connectivity

JDBC Java Database Connection

JDK Java Developer Kit

JFC Java Foundation Classes

JIT Just in Time (Java compiler)

JSP Javaserver Pages

JVM Java Virtual Machine

L2TP Level 2 Tunneling protocol

LAN Local Area Network

LDAP Lightweight Directory Access Protocol

LEI Lotus Enterprise Integrator

LID License Information Document

LLC Logical Link Control

LOB Large Object

LOB Line of Business

LPAR Logical Partition

LPDA Link Problem Determination Aid

LPD Line Printer Daemon

LPR Line Printer Requester

LVD Low Voltage Differential

LTO Linear Tape Open

LZ1 Lempel Ziv 1

MAC Media Access Control

MBPS Mega Bytes Per Second

MCU Mail and Calendaring Users

MDI Microsoft Data Interchange

MES Miscellaneous Equipment Specification

MFIOP Multi Function Input Output Processor

MIB Management Information Base

MMF Multi Mode Fiber

MO Magneto-Optical

MQI Message Queue Interface

MRI Machine Readable Instruction

MSF Mail Services Framework

MULIC Machine User License Internal Code

MVS Multiple Virtual Storage

NC Network Computer

NLS National Language Support

NNTP Net News Transfer Protocol

NRF Network Routing Facility

NSM Network Station Manager

ODBC Open Database Connectivity

ODF Object Distribution Facility

OLAP Online Asynchronous Processing

OLP Optical link Processor

OLTP Online transaction Processing

ORB Object Request Broker

OSF Open Software Foundation

PASE Portable Application Solutions Environment

PBX Private Branch Exchange

PCI Peripheral Component Interconnect

PCL Printer Control Language

PCML Panel Call Markup Language

PDF Portable Document Format

PDM Programming Development Manager

PDML Panel Definition Markup Language

PDPA Physical Device Placement Aid

PICS Platform for Internet Content Selection

PIN Personal Identification Number

PING Packet Internet Groper

POD Processor on Demand

POP Post Office Protocol

PPP Point to Point Protocol

PRPQ Programming Request for Price Quotation

PSF Printing Support Facility

PTF Program Temporary Fix

PVC Private Virtual Circuit

QIC Quarter Inch Cartridge

QMF Query Management Facility

R/DARS Report Data Archive and Retrieval System

RAD Rapid Aplication Development

RAID Redundant Array of Independent Disks

RCD Read Cache Device

RDBMS Relational Database Management System

RF Radio Frequency

RFC Request for Comments

RFT Revisable Form Text

RIP Routing Information Protocol

RISC Reduced Instruction Set Computing

RJE Remote Job Entry

RLU Report Layout Utility

RMI Remote Method Invocation

RPG Report Program Generator

RPQ Request for Price Quotation

RPR Relative Performance Rating

RSP Relative System Performance

SAN Storage Area Network

SCSI Small Computer System Interface

SDA Screen Design Aid

SDF Server Definition File

SDLC Synchronous Datalink Control

SEU System Expansion Unit
Source Entry Utility

SCM Software Confguration Management

SHM Short Hold Mode

SIMM Single On-line Memory Module

SIU Software Inventory Utility

SLIC System Licensed Internal Code

SLIP Serial Line Internet Protocol

SMAPP System Managed Access Path Protection

SMF Single Mode Fiber

SMP Symmetric Multi Processing

SMTP Simple Mail Transfer Protocol

SMU Simple Mail Users

SNA Systems Network Architecture

SNADS SNA Distribution Services

SNMP Simple Network Management Protocol

SOI Silicon-on-Insulator

SPCN System Power Control Network

SPD System Products Division

SQL Structured Query Language

SSL Secure Sockets Layer

SSP System Support Program

SST System Service Tools

SUE System Unit Expansion

SVC Switched Virtual Circuit

TCP/IP Transmission Control Protocol/Internet Protocol

TIMI Technology Independent Machine Interface

TMA Tivoli Management Agent

UDB Universal Database

UDF User Defined Functions

UDP User datagram Protocol

UDT User Defined Types

UOW Unit of Work

UPS Uninterruptible Power Supply

URL Universal Resource Locator

URL Uniform Resource Locator

UTP Unshielded Twisted Pair

VM Virtual Machine

VPN Virtual Private Network

VRU Voice Response Unit

VSE Virtual Storage Extended

WAF Workfolder Application Facility

WAN Wide Area Network

WML Wireless Markup Language

WORM Write-Once-Read-Many

WWW World Wide Web

W3 World Wide Web

XSL Extensible Stylesheet Language

XML Extensible Markup Language

Index

Index

Index

Symbols

#0121 Lower Unit 129
#0122 Upper Unit 129
#0220 113
#0222 113
#0348 108, 266, 273
#0349 108, 266, 273
#0353 108, 266, 273
#0354 108, 266, 273
#0355 266, 273
#0356 108, 266, 273
#0358 266, 273
#0359 108, 266, 273
#0360 108, 266, 273
#0365 109, 266, 273
#0367 109, 266, 273
#0382 136
#0398 110
#0398 Operations Console Package 110
#0550 Rack 175
#0551 270 Rack 129
#0591 796
#0592 796
#0593 796
#0594 796
#1312 350
#1313 350
#1322 350
#1323 350
#1325 350
#1326 350
#1327 350
#1333 350
#1334 350
#1336 350
#1337 350
#1349 277, 287, 360, 415, 418
#1350 277, 287, 361, 415, 418
#1355 277, 287, 361, 415, 418
#1360 277, 287, 361, 415, 418
#1379 287, 361, 415
#1380 287, 361, 415
#1500 783
#1501 783
#1502 783
#1503 783
#1504 783
#1505 783
#1506 786
#1507 786
#1508 786
#1509 786
#1510 786, 788
#1511 786, 788
#1512 788
#1513 788
#1514 788
#1521 88, 152
#1522 88, 152
#1523 88, 152
#1524 88, 152
#1525 88, 152
#1526 88, 152
#1527 88, 152
#1531 92, 170
#1532 92, 170
#1533 92, 170
#1534 92, 170
#1535 92, 170
#1536 92, 170
#1537 92, 170
#1540 95, 186
#1541 95, 186
#1542 95, 186
#1543 95, 186
#1544 95, 186
#1545 95, 186
#1546 95, 186
#1547 95, 186
#1602 350
#1603 351
#2016 372
#2019 372
#2061 783
#2062 783
#2063 783
#2064 783
#2065 786
#2066 786
#2067 786
#2068 786
#2069 788

© Copyright IBM Corp. 2000

#2070 788
#2248 85, 124, 126
#2250 85, 124, 126
#2252 85, 124, 126
#2253 85, 124, 126
#2289 773
#2290 773
#2291 773
#2292 103, 773
#2310 794
#2311 794
#2312 794
#2313 794
#2315 99, 207
#2316 99, 214, 216
#2318 99, 214, 216
#2385 103, 773
#2386 773
#2388 773
#2395 88, 152, 154
#2396 88, 152, 154
#2397 88, 152, 154
#2398 88, 152, 154
#2400 92, 170
#2402 92, 170
#2403 92, 170
#2418 95, 186, 188
#2420 95, 186, 188
#2422 86, 143
#2423 86, 143
#2424 86, 143
#2425 88, 144
#2426 88, 144
#2427 88, 144
#2503 371
#2504 371
#2619 527
#2620 281
#2621 283, 411
#2621 Removable Media Device Attachment SPD 283
#2624 284, 412
#2624 Storage Device Controller SPD 284
#2629 260
#2642 528
#2644 500
#2646 527
#2656 500
#2664 281
#2664 Integrated Fax Adapter 281
#2686 164, 181, 201, 241
#2688 164, 181, 201, 241
#2698 525
#2699 525
#2699/9699 SPD Two-Line WAN IOA'#2699 280
#2716 588
#2718 120, 276, 417
#2718 PCI Magnetic Media Controller 276
#2720 272
#2720 PCI WAN/Twinaxial IOA 272
#2721 272
#2721/#9721 PCI Two-Line WAN IOA 272
#2722 107, 272
#2722 PCI Twinaxial Workstation IOA 272
#2723 113, 272
#2723 PCI Ethernet IOA (10 Mbps) 272
#2724 113, 273
#2724 PCI 16/4 Mbps Token-Ring IOA 273
#2726 276, 418
#2726 PCI RAID Disk Unit Controller Ultra SCSI 276
#2729 120, 277, 419
#2729 PCI Magnetic Media Controller SCSI PCI 277
#2740 278, 420
#2741 120, 278, 420, 490
#2741 PCI RAID Disk Unit Compression Controller 278
#2743 265
#2743 PCI 1 Gbps Ethernet IOA 265
#2744 265
#2744 PCI Token Ring IOA 265
#2745 108, 273
#2745/9745 PCI Two-Line WAN IOA 273
#2746 107, 273
#2746 PCI Twinaxial Workstation IOA 273
#2748 120, 279, 420, 490
#2749 270
#2749 PCI Ultra Magnetic Media Controller 270
#2750 109, 274
#2750 PCI ISDN BRI U IOA 274
#2751 109, 274
#2751 PCI ISDN BRI S/T IOA 274
#2761 109, 274
#2761 Integrated Analog Modem 274
#2763 269
#2763 PCI RAID Disk Unit Controller 120, 269
#2768 271

#2768 PCI Magnetic Media Controller 271
#2790 255
#2790 PCI Integrated Netfinity Server 255
#2809 258
#2810 260
#2815 114, 275
#2815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA 275
#2816 114, 275
#2816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA 275
#2818 114, 275
#2818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 275
#2824 108
#2838 113, 268, 275
#2848 PCI 100/10 Mbps Ethernet IOA 268
#2861 115, 259, 261
#2862 115, 259, 261
#2865 259
#2866 115
#2867 115, 259, 261
#2890 257
#2890 PCI Integrated Netfinity Server 257
#2895 379
#3001 106
#3002 106, 152
#3004 152
#3005 152
#3022 124
#3024 124
#3025 124
#3026 124
#3049 588
#4308 351
#4314 351
#4317 351
#4318 351
#4318 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra-2 351
#4324 351
#4324 Two-Byte 17.54 GB Disk Unit Ultra 351
#4331 351, 352
#4425 367
#4482 361
#4483 361
#4486 362
#4525 367
#4582 362
#4583 362
#4586 362
#4723 265
#4723 PCI 10 Mbps Ethernet IOA 265
#4745 266
#4745 PCI Two-Line WAN IOA 266
#4746 266
#4746 PCI Twinaxial Workstation IOA 266
#4748 270
#4748/#9748 PCI RAID Disk Unit Controller 270
#4750 266
#4750 PCI ISDN BRI U IOA 266
#4751 267
#4751 PCI ISDN BRI S/T IOA 267
#4761 267
#4761 Integrated Analog Modem 267
#4801 112, 267
#4801 PCI Crypto Coprocessor 267
#4802 275
#4802 PCI Crypto Coprocessor 275
#4815 268
#4815 PCI 155 Mbps Unshielded Twisted Pair ATM IOA 268
#4816 268
#4816 PCI 155 Mbps Multi-Mode Fiber OC3 ATM IOA 268
#4818 268
#4818 PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 268
#4838 PCI 100/10 Mbps Ethernet IOA 268
#5032 283, 362, 411
#5033 Migration Tower I 232
#5040 377, 436, 437
#5042 436, 437
#5043 164, 180, 200, 240, 438
#5044 164, 180, 200, 240, 436, 437
#5052 164, 180, 200, 240
#5057 PCI Expansion Tower 223
#5058 164, 180, 200, 240
#5065 164, 180, 201, 240
#5066 164, 180, 201, 240
#5072 164, 180, 201, 240
#5073 164, 180, 201, 240
#5074 PCI Expansion Tower 226
#5075 PCI Expansion Tower 223
#5077 Migration Tower II 238
#5082 164, 180, 201, 240
#5083 164, 180, 201, 240
#5101 30-Disk Expansion Feature 227

#5156 Redundant Power and Cooling 224
#5210 375
#5211 376
#5213 376
#5214 378
#5215 378
#5219 376
#5220 376
#5226 377
#5228 376
#5229 376
#5230 375
#5300 376
#5302 376
#5400 376
#5790 397
#6149 281
#6149 16/4 Mbps Token-Ring IOA 281
#6180 281, 282
#6180 SPD Twinaxial Workstation IOA 281
#6180/#9280 Twinaxial Workstation IOA 282
#6181 283
#6181/#9381 Ethernet/IEEE 802.3 IOA 283
#6325 367
#6368 363
#6369 363
#6380 363
#6381 363
#6382 363
#6383 363
#6385 364
#6386 364
#6390 364
#6425 367
#6480 365
#6481 365
#6482 365
#6483 365
#6485 365
#6486 366
#6490 366
#6501 284, 412
#6501 Tape/Disk Device Controller SPD 284
#6502 285, 413
#6502 High Performance Controller (2M Cache) SPD 285
#6512 286, 414
#6512 High Performance Controller (4M Cache) SPD 286
#6513 286, 287, 414, 415
#6522 285, 413
#6532 287, 415
#6532 RAID Disk Unit Controller (4M Cache) Ultra SCSI SPD 287
#6533 288, 416, 490
#6533 RAID Disk Unit Controller (4M Cache) Ultra SCSI Compression SPD 288
#6534 288, 416
#6534 Magnetic Media Controller SCSI SPD 288
#6605 351
#6606 351
#6607 351
#6616 260
#6618 260
#6650 351
#6652 352
#6713 352
#6714 352
#6717 352
#6718 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra 352
#6806 352
#6807 352
#6813 352
#6817 352
#6818 353
#6818 Two-Byte 17.54 GB 10k RPM Disk Unit Ultra 352
#6824 353
#6831 353
#6906 353
#6907 353
#7002 HSL Enabler 129, 232
#7102 117
#8079 Optional Base I/O Rack 192
#8617 353
#8618 353
#8618 Optional Base Two-Byte 17.54 GB 10k RPM Disk Unit Ultra 353
#8713 353
#8714 353
#8813 353
#8817 353
#8818 354
#8824 354
#9141 438
#9171 438
#9606 354

#9707 354
#9720 103, 107, 110, 272
#9720 PCI WAN/Twinaxial IOA 272
#9721 272
#9723 113, 272
#9724 113
#9728 279, 423
#9728 Base PCI Disk Unit Controller Ultra SCSI 279
#9738 113, 268, 275
#9745 273
#9748 270
#9754 417, 490
#9767 270
#9767 PCI Disk Unit Controller 270
#9771 268
#9771 Base PCI 2-Line WAN with Modem 268
#9831 283
#9907 354

Numerics

1.03GB Two-byte Disk Unit 351, 352
1.2GB ¼-inch Cartridge Tape Unit 363
1.6 GB Extended Adaptive Cache 351, 352, 353
1.967GB Base Disk Unit 354
1.96GB Two-byte Disk Unit 351, 352, 353
1.96GB Two-byte Disk Unit (Ultra SCSI) 352
1000 441
13GB ¼-inch Cartridge 364, 365
16/4 Mbps Token-Ring IOA 281
16GB ¼-inch Cartridge Tape Unit 361, 363, 365
17.54GB Two-Byte Disk Unit 352, 353, 354
170 103
2.5GB ¼-inch Cartridge 363, 365
2.5GB ¼-inch Cartridge Tape Unit 363, 365
2105 429, 430
2105 Enterprise Storage Server 429
2105 Versatile Storage Server 430
2200 444
2440 283, 411, 438
2440 Rack 438
250 84
250 System Unit 103
25GB ¼-inch Cartridge 364, 366
25GB ¼-inch Cartridge Tape Unit 362
270 85
270 System Unit 123
2728 280, 423
2800 445
3153 448
3160 460
3270 444
3486 448
3487 448
3488 448
3489 448
3490 373
3490E
  Library Model F1A 373
  Models F00, F01 and F11 373
3494 Tape Library Dataserver 375
3570 378
  Bxx Models 381
  Cxx Models 380
  tape cassette 378
3570 Magstar Tape Subsystem 378
3575 Tape Library Dataserver 381
3580 384
3580 Ultrium Tape Drive 384
3581 385
3581 Ultrium Tape Autoloader 385
3583 387
3583 Ultrium Scalable Tape Library 387
3584 390
3584 UltraScalable Tape Library 390
3590 Extended High Performance Cartridge 400
3590 High Performance Tape Subsystem 396, 398
3995 283, 411
3995 Optical Library 401
4.19GB Two-byte Disk Unit 351, 352, 353, 354
4230 468
4232 469
4247 470
4GB ¼-inch Cartridge 363, 365
4GB ¼-inch Cartridge Tape Unit 361
4GB External QIC Tape Drive 371
5250 444, 448, 449
5250 Express Data Stream 40, 136, 449, 450
5250 Expresss Network Kit 450
5250 Sessions 135
5394 448, 449
5494 448, 449
5620-BNY 736
5648-B45 AFP Font Collection 723
5648-C05 see Network Station Manager 603
5648-C20 see Navio NC Navigator for IBM Network Station 606

5648-C69 see Corepoint Telephony 609
5697-FRA see Tivoli Storage Manager 672
5714-MG1 see System/38 Migration Aid 693, 700
5716-DCT 740
5716-SSP 79
5733-A81 see MQSeries for AS/400 614
5733-IM1 see DB2 Intelligent Miner for AS/400 582
5733-PY1 614
5733-PY2 see WebSphere Payment Server for AS/400 545, 555
5748-B45 723
5763-PL1 693
5763-PL1 see AS/400 PL/I 693
5769-AC1 see Cryptographic Access Provider 607
5769-AC2 see Client Encryption 608
5769-AC2 see Cryptographic Access Provider 607
5769-AC3 see Client Encryption 608
5769-AC3 see Cryptographic Access Provider 607
5769-AF1 725
5769-AF1 Advanced Function Printing Utilities 725
5769-AP1 Advanced DBCS Printer Support 727
5769-BR1 490, 678
5769-BR1 Backup and Recovery Media Services for AS/400 490
5769-BR1 Backup Recovery and Media Services 678
5769-CB1 see ILE COBOL 700
5769-CE1 see Client Encryption 608
5769-CF1 see Point-of-Sale Communications Utility 610
5769-CL3 see Application Development ToolSet 702
5769-CM1 see Communications Utilities for AS/400 611
5769-CR1 see Cryptographic Support for AS/400 608
5769-CX2 see ILE C for AS/400 707
5769-CX5 see VisualAge C++ 693
5769-DB1 see System/38 Utilities 577
5769-DC1 see Distributed Computing Environment 612
5769-DC3 see Distributed Computing Environment 612
5769-DFH see CICS for AS/400 709
5769-DP2 see DataPropagator Relational 5.1 for AS/400 577
5769-DS1 Business Graphics Utiliy 730
5769-FNT 730
5769-FNT AFP Fonts for AS/400 730
5769-FW1 see Firewall for AS/400 612
5769-JC1 528
5769-JS1 see Advanced Job Scheduler for AS/400 681
5769-JV1 532
5769-MG1 see Managed System Services for AS/400 682
5769-PD1 see Application Program Driver 710
5769-PM1 see Performance Management/400 535
5769-PT1 see Performance Tools for AS/400 683
5769-PW1 see Application Development ToolSet 711
5769-QU1 see Query for AS/400 581
5769-RG1 see ILE RPG 715
5769-SA3 See Novell NetWare 535
5769-SM1 see SystemView Manager for AS/400 688
5769-SS1 528, 532
5769-SS1 see Operating System/400 477
5769-ST1 DB2 see Query Manager and SQL Development Kit 581
5769-TC1 See TCP/IP 535
5769-VG1
see VisualAge Generator Server for AS/400 695
5769-VI1 723
5769-WP1 738
5769-WP1 OfficeVision for AS/400 738
5769-XD1 637
5769-XY1 636
5798-AF3 (V3R7M1 and later) AFP PrintSuite 725
5798-BTW see Wireless Connection for AS/400 620
5798-NC3 see Net.Commerce 552
5798-TBU see Enhanced Upgrade Assistant 537
5798-TBW 620
5798-TBY Facsimile Support for AS/400 737
5799-GCG 693
5801-AAR 588
5801-AAR MQ Series Integrator for AS/400 and DB2 Version 1.1 618
6400 472
6731 351, 353
6754 417
720 123, 151, 169, 185, 205, 213, 783
7207 Model 122 371
7208 Model 342 283, 372, 411
7210 372
7210-020 372

7299 449
7299-8MX 449
730 786
740 788
7852 451
7GB 8mm Cartridge Tape Unit 364, 366
8.58GB Two-byte Disk Unit 352, 353
820 88
830 92
840 95
8mm Cartridge Tape 372
9309 435
9348 283, 411
9401 150 796
9401 Model 150 796
9401 Models P01 and P02 747
9401 Models P03 and 10S 748
9402 Model 100 768
9402 Model 200 751
9402 Model 20S 769
9402 Model 236 751
9402 Model 400 752
9402 Model 400 Packages 798
9402 Model 40S 770
9402 Model 436 753
9402 Model 436 Packages 799
9402 Models C04 and C06 749
9402 Models D02, D04 and D06 749
9402 Models E02, E04 and E06 750
9402 Models F02, F04, F06 750
9404 Models 135 and 140 768
9404 Models B10, B20 754
9404 Models C10, C20, C25 754
9404 Models D10, D20, D25 755
9404 Models E10, E20, E25 755
9404 Models F10, F20, F25 756
9406 116
9406 Model 170 103, 772
9406 Model 30S 769
9406 Model 600 762
9406 Model 620 763, 765
9406 Model 640 765
9406 Model 650 767
9406 Model 720 123, 151, 169, 185, 205, 213, 783
9406 Model 730 786
9406 Model 740 788
9406 Model S10 775
9406 Model S20 777
9406 Model S20 Custom Mixed-Mode Server 790
9406 Model S30 779
9406 Model S30 and S40 Custom Mixed-Mode e-servers 792
9406 Model S40 781
9406 Model SB1 794
9406 Models 300, 310 and 320 760
9406 Models 500, 510, 530 761
9406 Models 50S and 53S 771
9406 Models B30, B35, B40, B45, B50, B60 and B70 756
9406 Models D35, D45, D50, D60, D70 and D80 757
9406 Models E35, E45, E50, E60, E70, E80, E90 and E95 758
9406 Models F35, F45, F50, F60, F70, F80, F90, F95 and F97 759
9427 283, 411
9724 273

A

adapter 281
ADSM 672
ADSM (ADSTAR Distributed Storage Manager) 672
ADSTAR 672
ADSTAR Distributed Storage Manager (ADSM) 672
ADTS (AS/400 Application Development ToolSet) 711
ADTS CS 702
ADTS/400 711
Advanced 36 79
Advanced Application Architecture 17
Advanced DBCS Printer Support for AS/400 727
Advanced Function Printer
  3160 460
Advanced Function Printing 742
  Utilities for AS/400 541
Advanced Function Printing (AFP) for OS/400
  Pager Printer Formatting Aid 726
Advanced Function Printing (AFP) PrintSuite
  5798-AF2 (V3R2M1) 725
  5798-AF3 (V3R7M1 and later)
    5798-AF2 (V3R2M1) AFP PrintSuite 725
Advanced Function Printing (AFP) PrintSuite for OS/400
  Advanced Print Utility 726
  AFP Toolbox 726

SAP R/3 AFP Print 727
Advanced Function Printing DBCS Fonts for AS/400 731
Advanced Function Printing Fonts for AS/400 730
Advanced Function Printing Utilities for AS/400 725
Overlay Utility 725
Print Format Utility 725
Resource Management Utility 725
Advanced Job Scheduler for AS/400 681
AFP 723, 725, 730
AFP Font Collection 723
AIX 444, 446
alerts 479
Alternate IPL 360
ALT-IPL 360
Analog Modem 267
Apache HTTP Server 516
Apache HTTP server 483
APD/400 710
API 741
Application Development ToolSet
Client Server 702
for AS/400 541, 711
Application Development Manager 714
Application Dictionary Services 713
Data File Utility/Application Development 713
File Compose and Merge Utility 713
Interactive Source Debugger 713
Programming Development Manager 711
Report Layout Utility 712
Screen Design Aid 712
Source Entry Utility 711
Application Program Driver 710
V4R3 enhancements 710
APU 726
APW 727
AS/400 448, 449
AS/400 Application Development ToolSet (ADTS) 711
AS/400 Client Access Express for Windows 621
AS/400 Client Access Family 636
AS/400 Client Access Family for Windows 620
As/400 Client Access products 620
AS/400 Operations Console 665
AS/400 Operations Navigator 493
AS/400 PASE (AS/400 Portable Application Solutions Environment) 61
AS/400 Portable Application Solutions Environment (AS/400 PASE) 61
AS/400 Toolbox for Java 528
AS/400e server 270 123
AS/400e server 820 151
AS/400e server 830 169
AS/400e server 840 185
asynchronous 479
Asynchronous Transfer Mode
Model 170 112
ATM 479
ATM IOA (155 Mbps Unshielded Twisted Pair OC3) 268, 275
availability 58, 63, 354, 355, 429, 430, 431, 491, 513

B

Backup and Recovery Media Services for AS/400 490
Backup Recovery and Media Services for AS/400 541, 678
BRMS Advanced Functions Feature 680
BRMS Network Feature 680
BRMS Standard 680
Base PCI WAN/Twinaxial IOA 107, 110
BEST/1 32, 683
BGU 730
Binary Large Objects (BLOBs) 65
Binary Synchronous 479
BLOBs (Binary Large Objects) 65
BlueNotes Document Warehouse (BNDW) for AS/400 736
BRMS/400 678
Bus Extension 437
Bus Extension Unit 436
Business Graphics Utility for AS/400 730
Business Intelligence 66
business partners 514

C

C++ 693
calendar 740
card technology, Model 720 125, 153, 171, 187, 207, 215
CCSID 79
CCW 401
CCW (continuous composite worm) 401
CD-ROM 356, 366, 372, 811
Model 170 120

CICS for AS/400 709
V4R4 enhancements 710
CICS Transaction Server for AS/400 709
CIF (Customer Intstall Feature) 245
CIF features 139, 147
CL 477
cleaning cartridges 371, 372
Client Access Express 666
Client Access Express for Windows 492
Client Access Family for Windows
Client Access for Windows 95/NT 637
Client Access upgrade 636
Client Encryption 608
Client/Server CPW 33
Cluster Resource Services 513
clustering 513
CMOS7S technology 18
CMOS8S technology 18
CODE/400 714
COLD 684
Commercial Processing Workload 31
Client/Server CPW 33
Interactive CPW 33
Interactive Feature 34
performance 33
Processor CPW 33
Commercial Processing Workload (CPW) 31
Common Programming API 500
Common Programming API (CPA) 79
communications
Model 170 108
Model 720 281
communications restrictions
Model 170 111
Communications Utilities for AS/400 541, 611
compatibility tape 356, 357, 358
compression 278, 288, 356
concurrent maintenance 492
connectivity 479
Content Manager OnDemand 684
Content Manager OnDemand for AS/400
AnyStore 687
Object Archive 687
Record Archive 686
Spool File Archive 685
V4R4 enhancements 687
continuous availability clustering 513
continuous composite worm (CCW) 401
Control Language 477
convenience I/O station 375
conversion kits 360
Corepoint Telephony Version 6 Release 2 609
Count of Active Sessions 135
CPA 500
CPA (Common Programming API) 79
CPW 31
CPW (Commercial Processing Workload) 31
Cryptographic Access Provider 607
Cryptographic Processor 281
Cryptographic Support for AS/400 608
Cryptography 267, 275
Customer Install Feature (CIF) 245

D

database 65, 502, 521
database support 502
DataPropagator Relational 5.1 for AS/400 577
DB2 521
DB2 for OS/400 582
DB2 Intelligent Miner for AS/400 582
DB2 Multisystem for AS/400 525
DB2 Multisystem for AS/400 (#2699) 525
DB2 Query Manager and SQL Development Kit 541, 581
V4R4 enhancements 582
DB2 Spatial Extender Version 2.1.1, 5801-AAR Feature #2716 588
DB2 Symmetric Multiprocessing for AS/400 525
DB2 Symmetric Multiprocessing for AS/400 (#2698) 525
Dedicated Server for Domino 34, 36, 143
Developer Kit for Java 532
Device Parity Protection 354
DFU/AD 713
DHCF 479
Digital Certificate Manager 516
Digital Certificate Manager with SSL 517
Directory Services LDAP V3 486
Disk Arm Requirements 32
disk compression 356, 490
disk load balancing 491
Disk Storage Specifications Comparison 348
Disk Unit Controller Ultra SCSI 279, 423
disk units 348
conversion kits 350
descriptions 350
Model 170 119

diskette units
Model 170 120
Distributed Computing Environment 612
Distributed Host Command Facility 479
Distributed System Node Executive 479
Domino for AS/400 55
DSNX 479
Dual Active Accessor 376
Dual Gripper 378

E

EAC (Extended Adaptive Cache) 58
e-business 68
Edge of Network (EoN) 443
EDMSuite OnDemand for AS/400 541, 684
e-Jump 79, 537
Electronic Customer Support 451, 478
Electronic Service Agent for AS/400 478
Encrytpion 112
Enhanced NetWare Integration (#2646) 527
Enhanced Upgrade Assistant 537
Enterprise Server for Java 79
Enterprise Toolkit for AS/400 533
EoN (Edge of Network) 443
ESP (Extreme Support Through Personalization) 667
ESS 429
Ethernet 265, 272, 283, 479
Ethernet IOA
10 Mbps 265
100/10 Mbps 268, 275
euro currency 79, 489
euro currency sign support 489
express data stream 136
Express Multiplexer 449
Express Network Kit 450
Extended Adaptive Cache (EAC) 58
Extended High Performance C artridge 400
Extended Length Cartridge 400
External 8mm Tape Drive 372
Extreme Support Through Personalization (ESP) 667
EZ-Setup 512

F

Facsimile Support for AS/400 737
fax 281
FCMU 713
FCMU (File Compose and Merge Utility) 713
FDDI 479
Fiber ATM IOA (155 Mbps Multi-Mode) 268, 275
Fiber IOA (155 Mbps Multi-Mode ATM)) 268, 275
Fiber OC3 ATM IOA (155 Mbps Single-Mode)
ATM IOA (Fiber OC3 155 Mbps Single-Mode) 268, 275
File Compose and Merge Utility (FCMU) 713
Firewall for AS/400 612
FSIOP 79, 260
FTP 449, 522
functions no longer supported 9

G

General Purpose I/O Rack 438

H

HAV 514
Hierarchical Storage Management 490
hierarchy of microprocessors 21
high availability 429, 431, 514
High Performance Controller
2M Cache 285, 413
4M Cache 286, 414
4M Cache SPD 286, 414
High Performance Optical File System 403
High Performance Tape Subsystem
Models E1A and E11 398
High Performance Tape Subsystem 3590
Models B1A and B11 396
High Speed Link (HSL) 158, 176
high-availability 354, 355
homologation 488
HSL (High Speed Link) 158, 176
HTTP Server for AS/400 48, 483, 515, 607

I

I/O Processor Features 223, 245, 253, 265
IBM 32
IBM 3580 Ultrium Tape Drive 384
IBM 3581 Ultrium Tape Autoloader 385
IBM 3583 Ultrium Scalable Tape Library 387
IBM 3584 UltraScalable Tape Library 390
IBM 7133 Serial Disk Subsystem 430
IBM 7210 Model 020 External CD-ROM 372
IBM Content Manager for AS/400 V4R3 723
IBM DB2 DataJoiner Version 2.1.1, 5801-AAR Fea-

ture #3049 588
IBM e(logo)server Technical Support Web Sites 668
IBM LTO Ultrium tape drive 384
IBM LTO Ultrium tape drives 387
IBM Payment Server for AS/400 V2.1 614
IBM Service Director 478
IBM VisualAge for Java 533
IDLC 479
IEEE 802.3 479
IEEE 802.5 and 802.2 479
ILE C for AS/400 541, 707
ILE COBOL 700
ILE COBOL for AS/400 541
ILE RPG 715
ILE RPG for AS/400 541
V4R4 enhancements 717
ImagePlus VI for AS/400 724
Impact Dot Matrix Printer 469
Impact Matrix Printer 468
InfoColor 70 467
Infoprint 20 456
Infoprint 3000 464
Infoprint 32 458
Infoprint 40 459
Infoprint 4000
Advanced Function Printing Systems 465
Hi-Lite Color Printing System 466
Infoprint 4005 Hi-Lite Color Printer 466
Infoprint 60 460, 461
Infoprint 62 461
Information Center 811
InfoWindow 447
INS 115
Integrated Analog Modem 109, 267, 274
Integrated Fax Adapter 281
integrated file system 488, 504, 507
Backup Recovery and Media Services for AS/400 679
Integrated Hardware Disk Compression 356, 490
integrated hardware disk compression 356
Integrated Netfinity Server 79, 80, 115, 260
Integrated PC Server 260, 500
Integrated Services for the FSIOP (#2644) 500
Integration for Lotus Notes (#2656) 500
Integration for Novell NetWare, 5769-SA3 535
Intelligent Printer Data Stream 452, 469
Interactive CPW 33
Interactive Feature 34
Model 720 127, 155, 172, 189
Interactive Performance Reduction Option for 7xx Servers 321
internal CD-ROM drives 366
Internal Magnetic Media 345
internal tape 356
Model 170 120
Internal Tape Device Controller 286, 414
Internal Tape Device Controller SPD 286, 414
International Fonts and Programs 723
IPDS 452, 524, 727
ISDB 713
ISDN 274, 479
ISDN BRI S/T IOA 267
ISDN BRI U IOA 266
ISTAR 18

J

Java 45, 441, 444, 445, 520, 528, 533
Toolbox for Java 47
JavaBeans 79
Job Scheduler for AS/400 541
V4R4 enhancements 681
journaling 504

K

Keyed Stamped Media distribution 540

L

LAN/WAN IOP 260
LAN/WAN/Workstation IOP 260
LDAP 486
Line Matrix Printers 472
Linear Tape Open 384
Linear Tape Open (LTO) 385
Link Problem Determination Aid
LPDA 479
local area networks
Model 170 112
logical partitioning 24, 65, 510, 513
Lotus Domino 54, 517, 554
Lotus Notes 500
LPAR 24, 366, 510
LTO 384
LTO (Linear Tape Open) 385

M

Magnetic Media Controller SCSI 277, 288, 416, 419
Magnetic Media Controllers 425
Magnetic Media Controllers migration features 425
Magnetic Tape Subsystem 3490E 373
Magneto Optical (MO) 401
Magstar MP
  3570 378
  3575 381
main storage
  Model 170 105, 147
  Model 720 128, 156, 173, 191, 207, 216
Managed System Services for AS/400 682
Management Central 496
Manager Disk Drive 378
maximum capacities 747
maximum number of sessions 135
maximum sessions 135
Media and Storage Extensions 525, 527, 541
Media and Storage Extensions (#2619) 527
Media Library Device Driver 376
MFIOP with RAID 417
Migrated Internal Tape Units 357
migration features 425
minimum number of disk arms 32
mirroring 355
MO (Magneto Optical) 401
Model 100 768
Model 170 103, 772
  Asynchronous Transfer Mode 112
  CD-ROM 120
  communications 108
  communications restrictions 111
  disk units 119
  diskette units 120
  internal tape 120
  local area networks 112
  main storage 105, 147
  multifunction 107
  non-CIF features 105
  power and packaging 116
  Twinaxial Workstation Controllers 106
Model 200 751
Model 20S 769
Model 236 751
Model 270 upgrades 140
Model 30S 769
Model 400 752
Model 40S 770
Model 436 753
Model 600 762
Model 620 763
Model 640 765
Model 650 767
Model 720 123, 151, 169, 185, 205, 213
  card technology 125, 153, 171, 187, 207, 215
  communications 281
  Interactive Feature 127, 155, 172, 189
  main storage 128, 156, 173, 191, 207, 216
Model 820 158
Model 830 176
Model 830 Processor/Interactive feature table 170
Model 840 Processor/Interactive feature table 186
Model P03 and 10S 748
Model S10 775
Model S20 777
Model S20 Custom Mixed-Mode Server 790
Model S30 779
Model S40 781
Models 135 and 140 768
Models 300, 310 and 320 760
Models 500, 510 and 530 761
Models 50S and 53S 771
Models B10 and B20 754
Models B30, B35, B40, B50, B60 and B70 756
Models C04 and C06 749
Models C10, C20, and C25 754
Models D02, D04 and D06 749
Models D10, D20 and D25 755
Models D35, D45, D50, D60, D70 and D80 757
Models E02, E04 and E06 750
Models E10, E20 and E25 755
Models E35, E45, E50, E60, E70, E80, E90 and E95 758
Models F02, F04 and F06 750
Models F10, F20 and F25 756
Models F35, F45, F50, F60, F70, F80, F90 and F95 759
Models P01 and P02 747
Models S30 and S40 Custorm Mixed-Mode Servers 792
modem 451
  Integrated Analog 267
MQSeries for AS/400 614
  V4R2 enhancements 617
  V5R1 enhancements 617
  Version 5.1 enhancements 617

MQSeries Integrator for AS/400 and DB2 Version 1.1 618
MultiForm Matrix Printer 470
multifunction, Model 170 107

N

N2200 444
N2800 445
Navio NC Navigator for IBM Network Station 606
Net.Commerce 52, 552
  Administrator 552
  Advanced Catalog Tools 554
  back-end integration 555
  Lotus Domino Integration 554
  Server 552
  Starter Stores 553
  Store Creation Smart Guide 553
Net.Data 51, 520
NetQuestion 487
NetVista N2200 Thin Client 444
NetVista N2800 Thin Client 445
NetVista Thin Clients 443
NetVista Zero-Footprint Option 444
NetWare Integration 527
Network Authentication Service 482
Network Printer 17 455
Network Station Manager 445, 446, 603
  New in Release 3 604
Network Station Series 1000 441
Northstar technology 18
Novell NetWare 79, 535

O

object-based 26
OfficeVision for AS/400 581, 738
OfficeVision to Lotus Notes Migration Tools for AS/400, 5697-F08 732
OLAP 67
Operating System/400 18, 477, 541, 545
  capabilities 477
  connectivity 479
  ease of installation and use 477
  Keyed Stamped Media distribution 540
  security 478
  Software Subscription 539
Operations Console 110, 665
Operations Navigator 493
Ops Console 665
Optical Cartridges
  CCW 401
  WORM 401
optical fiber 449
Optical Link Processor (1063Mps) 164, 181, 201, 241
Optical Link Processor (266Mps) 164, 181, 201, 241
OptiConnect 528
OptiConnect for AS/400 (#2642) 528
Optional Base Two-Byte Disk Unit 17.54 GB 10k RPM Disk Unit Ultra 354
Optional CD-ROM Feature 367
OS/2 694
OS/2 Warp Server for AS/400 79
OS/400 444, 446

P

packages
  9402 400 798
  9402 436 799
PASE 61, 525
PASE (Portable Application Solutions Environment) 525
PCI 10 Mbps Ethernet IOA 265
PCI 100/10 Mbps Ethernet IOA 113, 268, 275
PCI 155 Mbps Multi-Mode Fiber ATM IOA 114, 268, 275
PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA 114, 268, 275
PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA 114, 268, 275
PCI 16/4 Mbps Token-Ring IOA 113, 273
PCI Card Technology 104
PCI Cryptographic Coprocessor 112
PCI Disk Units 345
PCI Ethernet IOA 113, 272
PCI Integrated Netfinity Server 259
PCI ISDN BRI S/T IOA 109, 267, 274
PCI ISDN BRI U IOA 109, 266
PCI LAN/WAN/Workstation IOP 108, 258
PCI Magnetic Media Controller 120, 276, 417
PCI Magnetic Media Controller SCSI 120
PCI RAID Disk Unit Compression Controller 120, 278, 279, 420
PCI RAID Disk Unit Controller 276, 278, 418, 420
PCI Twinaxial Workstation IOA 107, 266, 272
PCI Two-Line WAN IOA 108, 266

PCI WAN/Twinaxial IOA 272
PDM 711
performance 32, 33
Performance Management/400 535
Performance Management/400, 5769-PM1 535
Performance Reduction Option 321
Performance Tools for AS/400 541, 683
  BEST/1-400 Capacity Planner 683
  Performance Advisor 683
Peripheral Component Interconnect 104
Permanent Write-Once-Read-Many 401
Physical Device Placement Assistant (PDPA) 669
PL/I 693
PM/400 535
Point-of-Sale Communications Utility 610
Portable Application Solutions Environment 61
Portable Application Solutions Environment (PASE) 525
  #2648 525
power and packaging 129, 158, 174, 191, 207, 216
  #7102 117
  Model 170 116
PPFA 726
print driver support 481
Print Services Facility 452, 541
Print Services Facility Fax Support 541
Print Services Facility for AS/400 (PSF/400) 523
Print Services Facility/400 523
Private Address Space Environment 525, 527
Processor CPW 33
Processor Feature 155, 173, 189
processors
  #2292 103
  #2385 103
product previews 77
protocol 486
PRPQ P10131 693
PSF/400 (Print Services Facility for AS/400) 523
PTFs 491
Pthread APIs 501
PULSAR 18

Q

QPRCFEAT system value 127, 155, 173, 189
Query for AS/400 541, 581

R

Rack Enclosures 435
RAID Disk Unit Controller 276, 287, 288, 415, 416, 418
RAID-5 285, 286, 355, 413, 414
RAMP-C 31
redbooks 812
Relative Performance Rating (RPR) 31
Relative System Performance (RSP) 31
Remote controlling system 666
Removable Media Cluster Box 362
Removable Media Device Attachment 283, 411
Removable Media Devices 407
Report Layout Utility (RLU) 712
Report/Data Archive and Retrieval System (R/DARS) for AS/400 684
Retail Distribution 610
RISC to RISC Data Migration (#0205) 324
RLU 712
RLU (Report Layout Utility) 712
RPR (Relative Performance Rating) 31
RSP (Relative System Performance) 31

S

S/390 444
SB1 794
SB2 99
SB3 99
Screen Design Aid (SDA) 712
SDA 712
SDA (Screen Design Aid) 712
SDLC 479
security 478
Service Director 78, 478
Services Network 670
sessions, maximum number of 135
SEU 711
SEU (Source Entry Utility) 711
Silicon on Insulator (SOI) 18
Simple Network Management Protocol (SNMP) 479
single-level storage 22
SMTP 522
SNMP 481
SNMP (Simple Network Management Protocol) 479
SNMP enhancements at V4R5 481
SNMP print driver 481
sockets 485
SOD 80, 400

softcopy information 542
softcopy library 811
Software Inventory Utility (SIU) 670
Software Subscription 539
SOI 18
Source Entry Utility (SEU) 711
SPD Disk Units 347
SPD Expansion Towers 240
SPD Twinaxial Workstation IOA 281
SQL 581
SSL 485
SSL support 485
SSP 79
Statement of Direction 80, 400
statements of direction 77
Storage Device Controller 284, 412
Summary 781
  Model 100 768
  Model 170 772
  Model 200 751
  Model 20S 769
  Model 236 751
  Model 30S 769
  Model 400 752
  Model 40S 770
  Model 436 753
  Model 600 762
  Model 620 763
  Model 640 765
  Model 650 767
  Model D35, D45, D50, D60, D70 and D80 757
  Model S10 775
  Model S20 777
  Model S20 Custom Mixed-Mode Server 790
  Model S30 779
  Models 135 and 140 768
  Models 300, 310 and 320 760
  Models 500, 510 and 530 761
  Models 50S and 53S 771
  Models B10,B20 754
  Models B30, B35, B40, B50, B60 and B70 756
  Models C04 and C06 749
  Models C10, C20 and C25 754
  Models D02, D04 and D06 749
  Models D10, D20 and D25 755
  Models E02, E04 and E06 750
  Models E10, E20 and E25 755
  Models E35, E45, E50, E60, E70, E80, E90 and E95 758
  Models F02, F04 and F06 750
  Models F10, F20 and F25 756
  Models F35, F45, F50, F60, F70, F80, F90, and F95 759
  Models P01 and P02 747
  Models P03 and 10S 748
  Models S30 and S40 Custom Mixed-Mode Servers 792
Synchronous Data Link Control 479
system availability 491
system concepts 16
system concepts and architecture 15
  hierarchy of microprocessors 21
  logical partitioning (LPAR) 24
  object-based 26
  Operating System/400 18
  single-level storage 22
  Technology-Independent Machine Interface 17
System Console 136
System Expansion Unit
  #7102 117
System Managed Access Path Protection (SMAPP) 490
System Management 490
System Unit Expansion Rack 436, 437
System/36 448, 449
System/38 448, 449
System/38 Migration Aid 693, 700
System/38 Utilities for AS/400 577
SystemView System Manager for AS/400 688

T

T1/E1/J1 and Fractional T1 479
tape cassette 378
tape compatibility 356, 357, 358
Tape Library Dataserver
  3494 375
  3575 381
tape speeds 358
tape units 357
Tape/Disk Device Controller 284, 412
TCP/IP 484, 522, 535, 741
Technology Independent Machine Interface (TIMI) 17
TELNET 523
terms and conditions 538
threadsafe 521
TIMI (Technology Independent Machine Interface)

17
Tivoli Management Agent 672
Tivoli Storage Manager 672
TLS 486
Token-Ring 265, 273, 479
Toolbox for Java 528
Toolbox for Java V4R5 530
Transport Layer Security (TLS) 486
twinax 448
Twinaxial Sessions 135
Twinaxial Workstation Controllers for the Model 170 106
Twinaxial Workstation IOA 266
Twinaxial Workstation IOA (SPD) 281
twisted-pair 448, 449
Two-Byte 17.54GB 10k RPM Disk Unit Ultra2 353
Two-Byte 4.19GB Disk Unit Ultra2 351
Two-Byte 8.58GB 10k RPM Disk Unit Ultra2 351, 352, 353
Two-Byte 8.58GB Disk Unit Ultra2 351
Two-Byte Disk Unit 8.58GB 10k RPM Disk Unit Ultra2 353

U

Ultrium Tape AutoLoader 385
upgrade paths 537
upgrades
  to server 720 324
  to server 730 328
UTP 448, 449

V

V3R1 enhancements for ADSTAR Distributed Storage Manager 673
V3R7 enhancements for Tivoli Storage Manager 676
V4R2 enhancements for MQSeries for AS/400 617
V4R3 enhancements
  Application Program Driver for AS/400 710
V4R4 enhancements 618
  CICS for AS/400 710
  Content Manager OnDemand for AS/400 687
  DB2 Query Manager and SQL Development Kit 582
  ILE RPG for AS/400 717
  Job Scheduler for AS/400 681
  MQSeries Integrator for AS/400 618
  VisualAge C++ for AS/400 695
V4R5 enhancements 481
V5R1 enhancements for MQSeries for AS/400 617
Versatile Storage Server 429, 430
Virtual Private Networks 488
VisualAge C++
  Browser 694
  Data Access Class Builder 693
  Debuggers 694
  Disconnected Mode 694
  Editor 693
  for AS/400 693
  Highly Optimized C++ Compilers 694
  Open Class Library 694
  Performance Execution Trace Analyzer 694
  V4R4 enhancements 695
  Visual Application Builder 693
  Workframe 695
VisualAge for Java 533
  Enterprise Toolkit for AS/400 533
  Version 2.0 Enhancements 534
VisualAge Generator Server for AS/400 695
VisualAge RPG and Cooperative Development Environment for AS/400 702
VisualGen Host Services for OS/400 696
VisualInfo for AS/400 723
VPN (Virtual Private Networks) 488
VSS 430

W

WAN Communications (no longer supported) 9
WAN IOA (Two-Line) 266
WebSphere 50, 518
  Application Server 50, 79
  Site Analysis 51
  Studio 50
WebSphere Application Server 50
WebSphere Development Tools for AS/400 702
WebSphere Payment Manager 553
WebSphere Payment Server for AS/400 545, 555
what's new in V4R3
  e-Jump 537
what's new in V4R4
  additional enhancements 743
  Advanced Function Printing 742
  Client Access Express for Windows 492
  concurrent maintenance 492
  database 521
  Digital Certificate Manager 516

disk load balancing 491
EZ-Setup 512
HTTP Server for AS/400 515
integrated file system 488
integration with Windows NT server 511
Java 520
logical partitioning 510
Lotus Domino 517
Management Central 496
Net.Data currency 520
TCP/IP 522
threadsafe functions and facilities 521
Virtual Private Networks (VPN) 488
WebSphere 518
Windows 2000 79
Windows NT 57, 444, 446, 498, 511
Wireless Connection for AS/400 620
withdrawn products 2
work station throughput 136
Workfolder Application Facility 724
Workload Estimator for AS/400 32
WORM 401

X

X.21 479
X.25 479
X.400 741

Y

Year 2000 501, 502

IBM Redbooks Review

Your feedback is valued by the Redbook authors. In particular we are interested in situations where a Redbook "made the difference" in a task or problem you encountered. Using one of the following methods, **please review the Redbook, addressing value, subject matter, structure, depth and quality as appropriate.**

- Use the online **Contact us** review redbook form found at **ibm.com**/redbooks
- Fax this form to: USA International Access Code + 1 914 432 8264
- Send your comments in an Internet note to redbook@us.ibm.com

Document Number **Redbook Title**	GA19-5486-20 Softcopy Revision GA19-5486-20A iSeries Handbook Version 4 Release 5
Review	
What other subjects would you like to see IBM Redbooks address?	
Please rate your overall satisfaction:	O Very Good O Good O Average O Poor
Please identify yourself as belonging to one of the following groups:	O Customer O Business Partner O Solution Developer O IBM, Lotus or Tivoli Employee O None of the above
Your email address: The data you provide here may be used to provide you with information from IBM or our business partners about our products, services or activities.	O Please do not use the information collected here for future marketing or promotional contacts or other communications beyond the scope of this transaction.
Questions about IBM's privacy policy?	The following link explains how we protect your personal information. **ibm.com**/privacy/yourprivacy/

© Copyright IBM Corp. 2000

Redbooks

iSeries Handbook Version 4 Release 5

(1.5” spine)
1.5”<-> 1.998”
789 <->1051 pages

iSeries Handbook

Version 4 Release 5

The authority on expanding iSeries CPUs

Provides fast facts on iSeries features and requirements

Includes OS/400 V4R5 enhancements

This twenty-first worldwide-distributed edition of the *iSeries Handbook* offers you a comprehensive guide to the AS/400e RISC-based and iSeries 400 processor hardware, related hardware, and AS/400 software currently marketed by IBM representatives. This edition provides a product and feature overview of the new hardware and software announced 22 May 2000 and updated 03 October 2000. It includes the new 8xx range, the Models 250, 270, SB2, and SB3, and a new release of OS/400 software, Version 4 Release 5.

The *iSeries Handbook* is written for use by IBM System Specialists, Marketing Representatives, Business Partners, and IBM customers. It is one of two books produced by IBM to highlight the iSeries 400 product line. Use this Handbook as a reference for the options available. Then, refer to the companion manual, *iSeries and AS/400e System Builder,* SG24-2155, for more detailed information and configuration rules.

INTERNATIONAL TECHNICAL SUPPORT ORGANIZATION

BUILDING TECHNICAL INFORMATION BASED ON PRACTICAL EXPERIENCE

IBM Redbooks are developed by the IBM International Technical Support Organization. Experts from IBM, Customers and Partners from around the world create timely technical information based on realistic scenarios. Specific recommendations are provided to help you implement IT solutions more effectively in your environment.

For more information:
ibm.com/redbooks

GA19-5486-20 ISBN 0738419192