CODE - Selected Advanced Topics
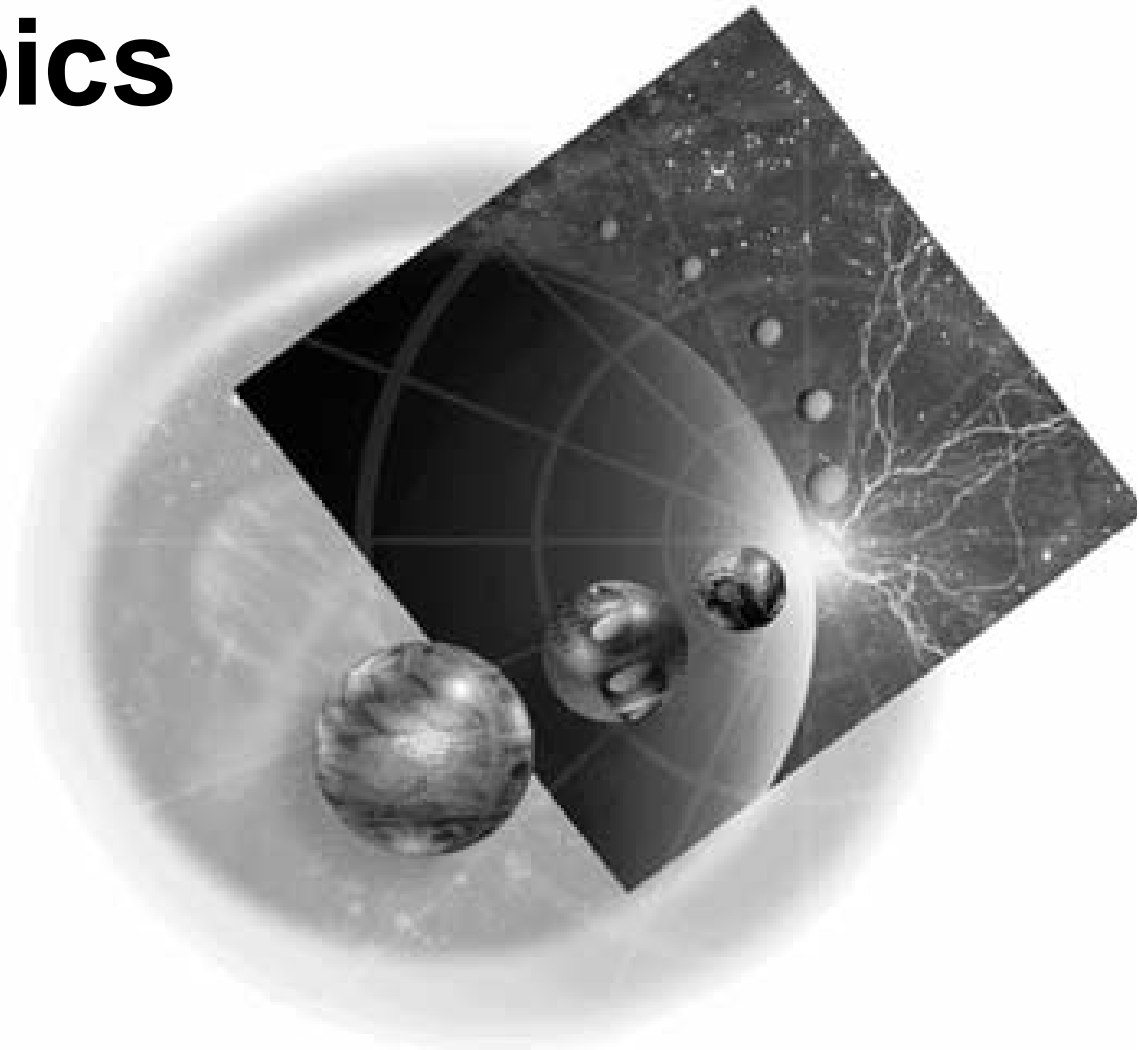
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IBM @server. For the next generation of e-business.

Acknowledgement and Disclaimer

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The Agenda

- **Remote Systems Explorer**
- **Communications Console**
- **Advanced Functions**
- **Working Disconnected**
- **Customizing the Editor**
  - REXX Macros
  - Editor profiles
  - LPEXLET
- **Demo**

WebSphere Development Studio client

WebSphere Studio Site Developer Advanced

- ✓ Web tools
- ✓ Java tools
- ✓ XML tools

  WebFacing

  iSeries tools (Remote Systems Explorer)

Classic tools

- ✓ CODE

  For RPG, COBOL, CL, C, C++, DDS
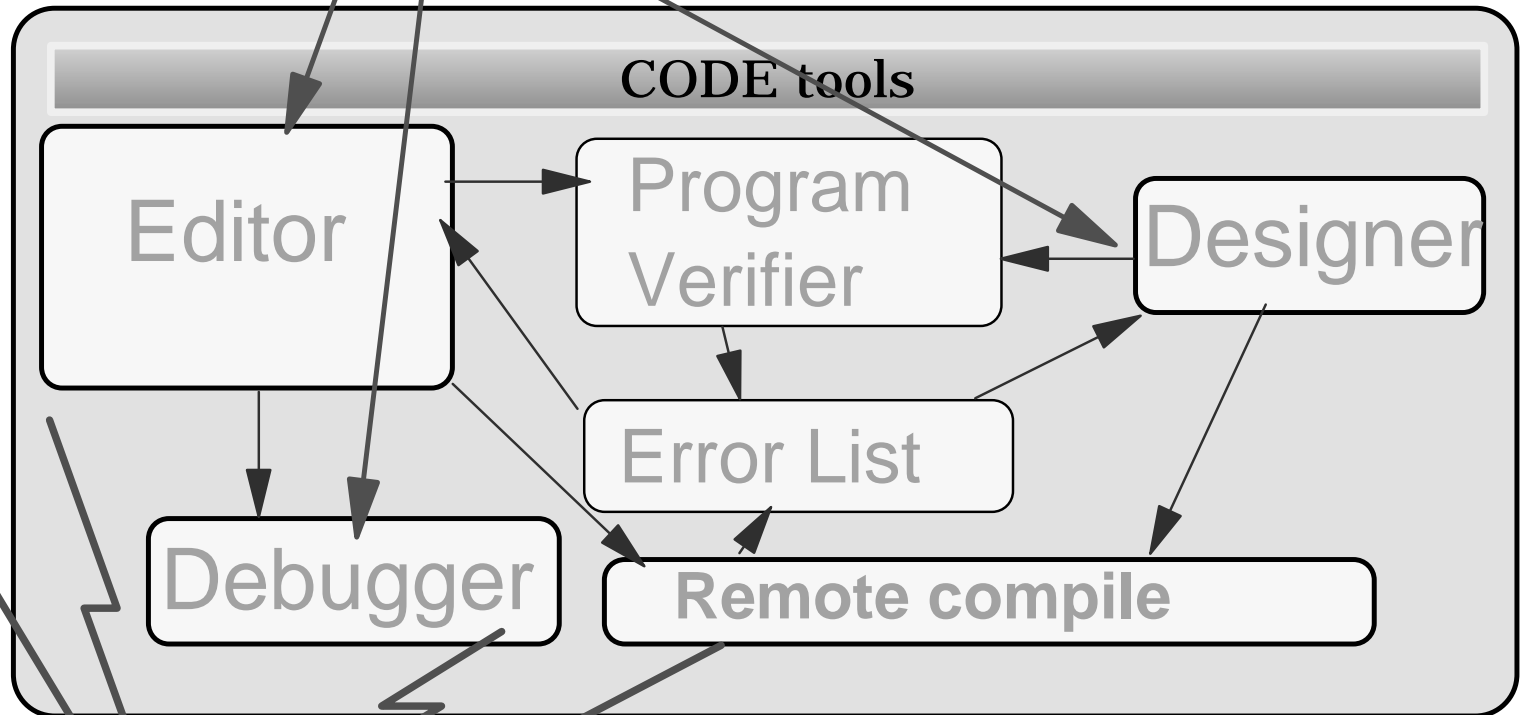
- ✓ VisualAge RPG

  For RPG GUI

CODE - integrated in WDSc

WSSDA + iSeries tools

Remote Systems Explorer (RSE)

Work with iSeries objects Invoke any iSeries command work with jobs and more ….

CODE tools

Editor

Program Verifier

Designer

Error List

Debugger

Remote compile

WDSc: RPG and Cobol Tools

✓ Remote Systems Explorer Perspective

- Drill-down or filtered access to remote:
  - ► **QSYS Libraries, Objects and Members**
  - ► **IFS Folders and Files**
  - ► **Linux, Unix, Windows and Local Folders and Files**
- Remote command execution of
  - ► **QSYS Commands and QSHELL Commands**
  - ► **Linux, Unix and Windows Commands**
- Exploration of Jobs in QSYS

✓ iSeries Projects

- For structured, project-based development
- Local team-sharable project
- Holds source files, members and save files
- Each project associated with an iSeries and library
  - ► **Push action to copy local files to associated library**

Remote Systems Explorer Perspective

✓ Manages connections to remote systems

- ► Where you create/manage connection information
- ► Connections subsequently used in all iSeries tools
- ► Start by using the 'New Connection' wizard
  - ✓ Connection appears in tree view
  - ✓ Expand it to see "subsystem" -> functional groupings

RSE Connections

New Connection

Remote System Connection
Define connection information

Parent profile: `coulthar`

Connection name: `My iSeries`

System type: `iSeries`

Host name: `toronto`

Default User ID: `coulthar`

Description:

New Connection Wizard

< Back | Next > | Finish

Remote Systems Explorer - Development Studio Client

File   Edit   Perspective   Project   Window   Help

Remote Systems

- New Connection...
- Local
- My iSeries
  - iSeries Objects
  - iSeries Commands
  - iSeries Jobs
  - IFS Files

Properties

Property	Value
Connection status	No subsystems conn
Default User ID	COULTHAR (Inherite
Description	
Host name	TORONTO
Name	My iSeries
Number of children	4
Parent profile	coulthar
Remote system type	iSeries
Type	Connection

Connection

Commands

My iSeries ▼ | iSeries Comman ▼ |

Commands | Tasks | Outline | iSeries Job Log

Remote Systems Perspective

Expand filter to see objects resulting from resolution of filter

Actions available in the context menu depend on object type

RSE Customization

✓ **Library Filters**
- To view groups of libraries.

✓ **Object Filters**
- To view one or more types of objects in one or more libraries.

✓ **Member Filters**
- To view one or more member types in one or more files in one or more libraries.

✓ **User Actions**
- Add an action to the popup menu for all objects or one specific object type.

STRCODE vs TCP/IP auto-connect servers

STRCODE	TCP/IP
Started from 5250 emulation	**Defined in Properties dialog or generated by RSE** **Started at first use**
Libraries defined in Communication Properties are added to the ones set from user profile	**Libraries defined in Communication Properties are added to the ones set from user profile**
Shutdown for single session from Communication Properties **Shutdown all from Editor, Action bar, Daemon context menu**	**Deleted from Properties** **RSE servers deleted at shut down**
Use whenever iSeries screen I/O is required: Prompting for iSeries commands or CL , CL Help **Program Generator** **Debugging pgms with screen I/O**	**Edit sessions, Program Verifier, Designer, etc.** **Debugging programs without screen I/O**

Communication Console
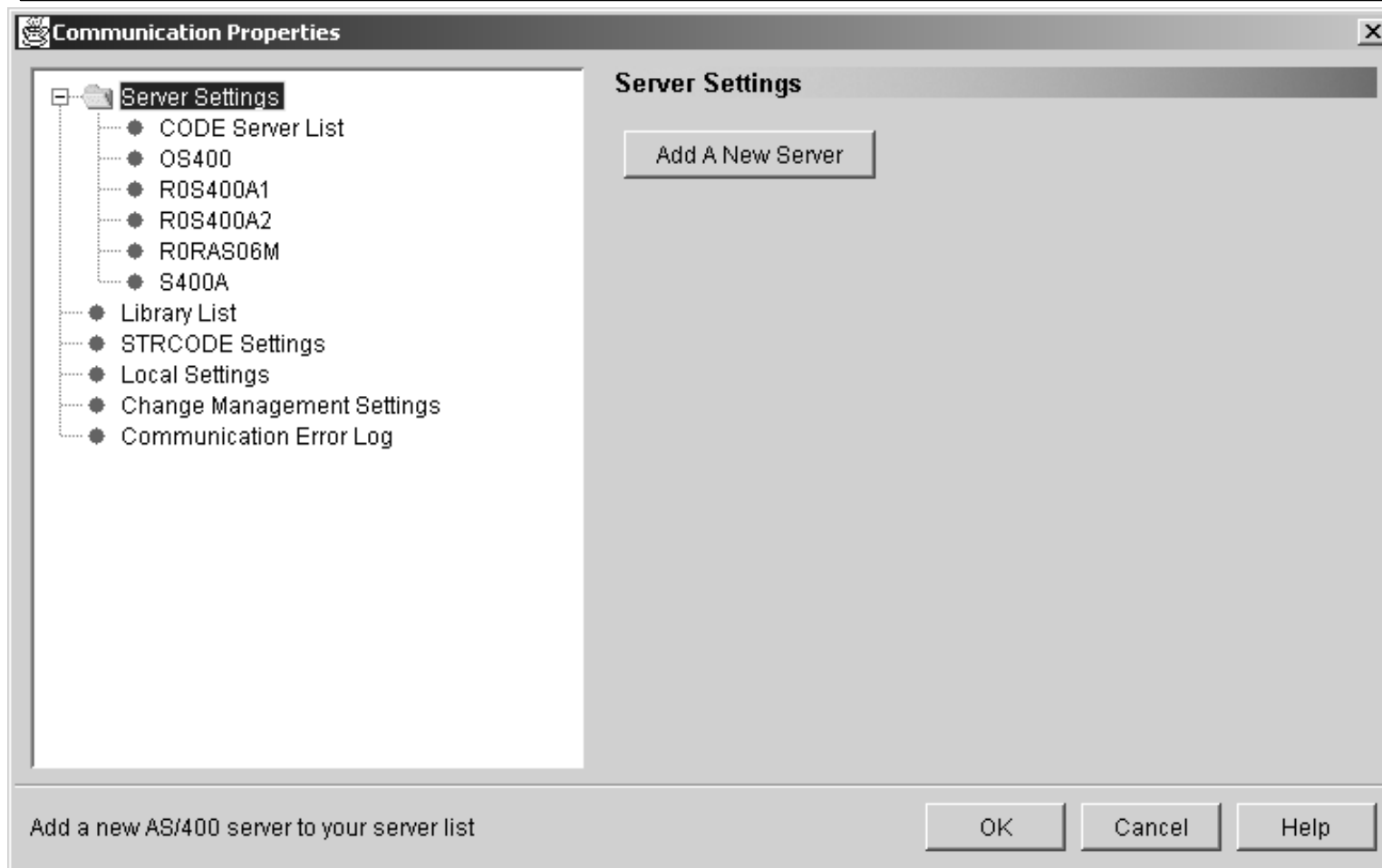
Available from:

Start menu -> Programs -> IBM WebSphere Development Tools for iSeries ->
Communications -> Communications Console

Editor -> Windows -> Communications -> Properties

CODE Daemon context menu -> Properties

Comm. Properties - CODE Server List
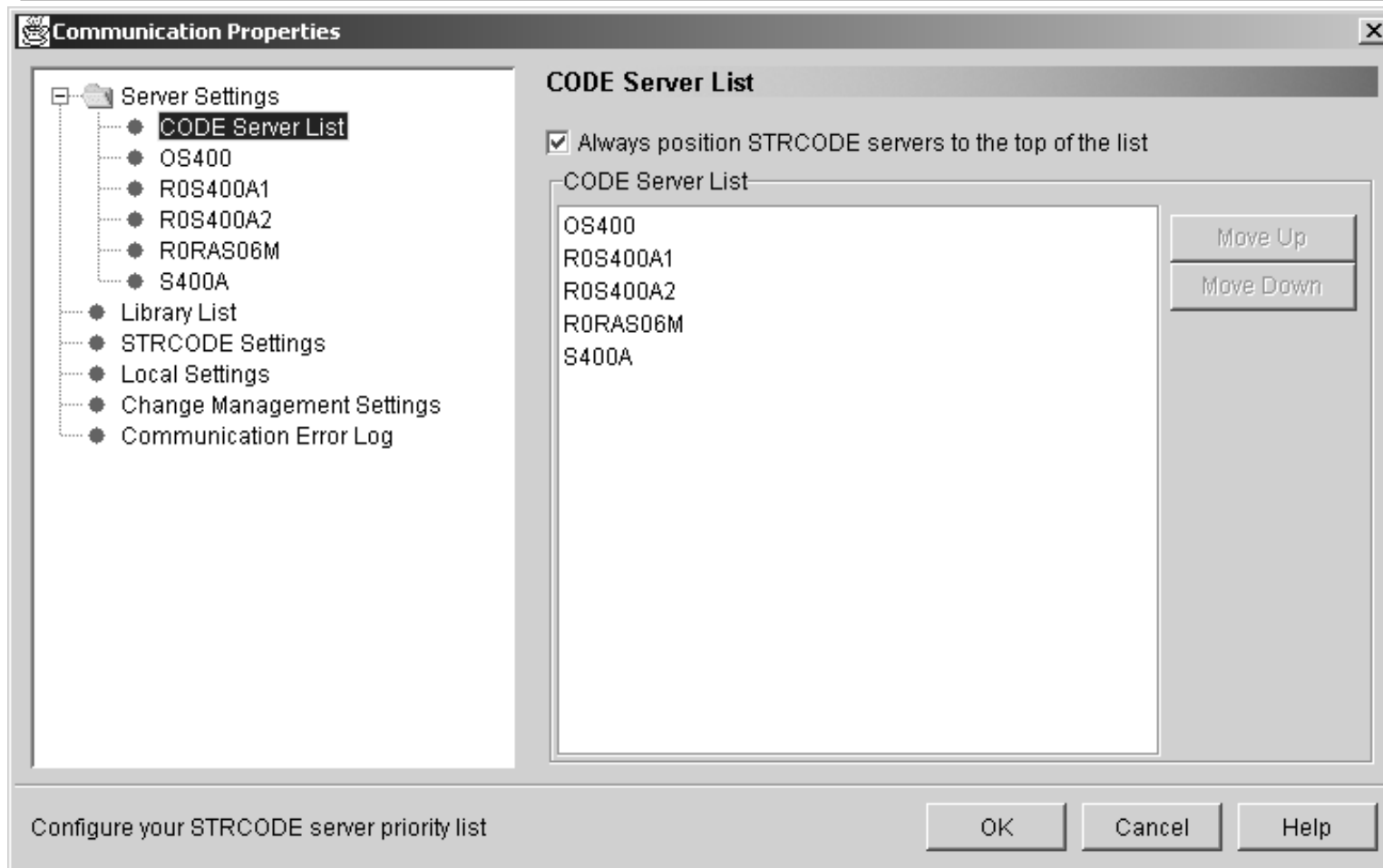
Used to:

select to have STRCODE servers first in the list

reorder the servers - some functions like Verifier use first available server

Communication Properties - Server Info

Used to:

add, modify or delete TCP/IP auto-connect servers

Shutdown the selected STRCODE or RSE server

Check PTFs for all installed components of WDS

Communication Properties

- ## Library List

  - ► Set or change the library list for one specific server or all servers (*ALL).

  - ► Use Move Up and Move Down buttons to change the order.

- ## Change Management Settings

  - ► *NONE or Application Development Manager/400

- ## Communication Error Log

HTML Support

CODE - H:\ADTSWIN\JAVA\readme.htm

File Edit View **Actions** Options Windows Help Extras

Issue edit command... Esc
Compare...

H:\ADTSWIN

Row 27

Keystroke recorder ▸

Launch browser...

Create tag ▸

```
00011 TABLE                              rgin-right: 3% }
00012 H1 { f                             imes roman, sa
00013 H2 { font-family: garamond         imes roman, sa
00014 TH { font-family: garamond         imes roman, sa
00015 --></STYLE>
00016<BODY>
00017
00018<H1>Welcome to Java!</H1>
00019
00020<p>
00021Welcome to the Java subdire
00022extending the CODE and Visu
00023your own functionality -> w
00024using LpexLets, which are s
00025REXX macros for the editor.        ctory you wil
00026find two JAR (Java Archive)
00027</p>
00028<ul>
00029<li><tt>classes.jar</tt>
00030<li><tt>sample.jar</tt>
00031</ul>
```

Bold
Italic
Underline
Center

Heading ▸
Paragraph
List ▸
  List element
  Unordered list
  Ordered list
  Simple list
Line break
Horizontal line

Image
Link

New file

Java README File - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Guide Print

Bookmarks Location: /HI/ADTSWIN/JAVA/readme.htm

Welcome to Java!

Welcome to the Java subdirectory! This is dedicated to
extending the CODE and VisualAge for RPG editor
with your own functionality -> written in Java. This is
done using LpexLets, which are simply the Java
equivalent of REXX macros for the editor. In this
directory you will find two JAR (Java Archive) files:

- ○ classes.jar
- ○ sample.jar

NOTE: To write Java extensions to CODE or
VisualAge for RPG, you must have your own JDK at
level 1.2 or higher. To get this, go to www.javasoft.com
and follow the links for "JDK"

Document: Done

➡ **Token highlighting**
➡ **Ctrl+M, Ctrl+Shift+M to select matching tag**
➡ **Create tags from Actions menu**

Launch browser from Actions menu

CODE Editor - Filters

Various Text Filters

To filter by text, select
'View'->'Filter'

To filter by line type, select
'View'->'Show'

```
CODE - <TORAS209>QCODELAB/QRPGLESRC(RUPDAT...
File  Edit  View  Actions  Options  Windows  Help  Extras

<TORAS209>QCODELAB/QRPGLESRC(RUPDATELE)

Row 43          Column 1          Replace
     .....CL0N01Factor1+++++++Opcode(E)+Factor2++++
002200      C                  MOVE      *BLANKS
002300      C                  MOVE      '0'
002400      C                  MOVE      'FIRST'
002500      C                  MOVE      'SECOND'
004300      C                  MOVE      'SUBR1'
004400      C                  MOVE      '1'
004900      C                  MOVE      'SUBR2'
005000      C                  MOVE      '0'
```

```
CODE - <TORAS209>QCODELAB/QRPGLESRC(RUPDAT...
File  Edit  View  Actions  Options  Windows  Help  Extras

<TORAS209>QCODELAB/QRPGLESRC(RUPDATELE Compare ments

Row 46          Column 1          Replace
     ..... *..1....+....2....+....3....+....4....+.
001200      H*   same or similar results will be obt
001300      H*   Customers attempting to adapt these
001400      H*   to their environments do so at thei
001500      H*------------------------------------
002100      C* BEGINNING OF DEMO CODE *******
002800      C* END OF DEMO CODE *******
004100      C* THIS IS A COMMENT LINE - FIRST SUBRO
004600      C* THIS IS A COMMENT LINE - SECOND SUBR
```

To filter by date, select
'View'->'Filter date'

Ctrl+A to show everything

CODE Editor - SET DEFAULT.EXPANDHIDE ON


```
CODE - <TORAS94M>CODELAB01/QRPGLESRC(PAYROLLG)
File  Edit  View  Actions  Options  Windows  Help

<TORAS94M>CODELAB01/QRPGLESRC(PAYROLLG)
Row 398        Column 1        Replace
.... *..1....+....2....+....3....+....4....+....5....+....6....
000396   C     ACDESR        BEGSR
000397   C*
000398   C*  Housekeeping, clear display fields and reset indicators
000399   C*
000400   C                   MOVE      *BLANKS      EMESS
000401   C                   MOVE      '0'          *IN60
000402   C                   MOVE      '0'          *IN90
000403   C*
000404   C*  The following compare and branch (CABEQ) statements per
000405   C*  two functions.  First it determines the type of mainten

SET DEFAULT.EXPANDHIDE ON
```

```
Filter                                          X
Include all lines with this string
begsr                                       ▼
   ☐ Case sensitive
   ☐ Pattern match

   Filter      Cancel      Help
```

```
<TORAS94M>CODELAB01/QRPGLESRC(PAYROLLG)
Row 450        Column 1        Replace
.....CL0N01Factor1+++++++Opcode(E)+Factor2++++++Result++++++++Len++D+HiLoEq
+
+  000050   C     MAIN          BEGSR
+  000339   C     EDITSL        BEGSR
+  000396   C     ACDESR        BEGSR
+  000418   C     ADDCDE        BEGSR
+  000433   C     CHGCDE        BEGSR
+  000450   C     DELCDE        BEGSR
   000451   C                   MOVE      '1'          *IN90
   000452   C     *IN50         IFEQ      '1'
   000453   C                   MOVE      '1'          *IN60
```

Stays on until explicitly switched off. SET DEFAULT.EXPANDHIDE OFF

Field Cross Reference

CODE - d:\adtswin\sample.irp *

File Edit View Actions Options Windows Help

RPG Cross Re...

d:\adtswin\sample.irp

d:\adtswin\sample.irp *

Row 6   Column 1   Replace   17 changes.

```
.....DName++++++++++ETDsFrom+++To/L+++IDc.Keywords+++
00002     FQSYSPRT    O    F  132          PRINTER
00                                    8      DIM(3)
0                                           CTDATA PERR
0                                           CONST('INST.
0
00008     D   OK                    1       8      INZ('VERIFI
00009
00010     C                         EVAL        OK = 'FAILED'
00011     C                         MOVE        ARRAY(2)      ARRAY
00012     C                         RESET                     OK
00013     C                         SETON
00014     OQSYSPRT    T    LR                        1   1
```

- Identifiers
  - ARRAY
  - ARRAY(2)
  - ARRAY(3)
  - DS
  - INSTALL
    - 6
    - 15
  - OK
  - QSYSPR
- Indicators
  - LR

List of fields

Select line # in list
Line positioned, highlighted in editor

Line #s where referenced

List of indicators

Refresh

available for RPG and COBOL

CODE Editor - RPG Conversion

- Convert RPG III to ILE RPG

  Actions -> Convert RPG Source

  - ▶ Converted RPG gets stored locally
  - ▶ Same result as iSeries command
    CVTRPGSRC

- Convert ILE RPG free-form

  Actions -> Convert selection to C Free-Form

  Actions -> Convert all to C Free-Form

The Navigator

To create a file that lists the called and calling functions, select **'Services' ->'Topology'**.
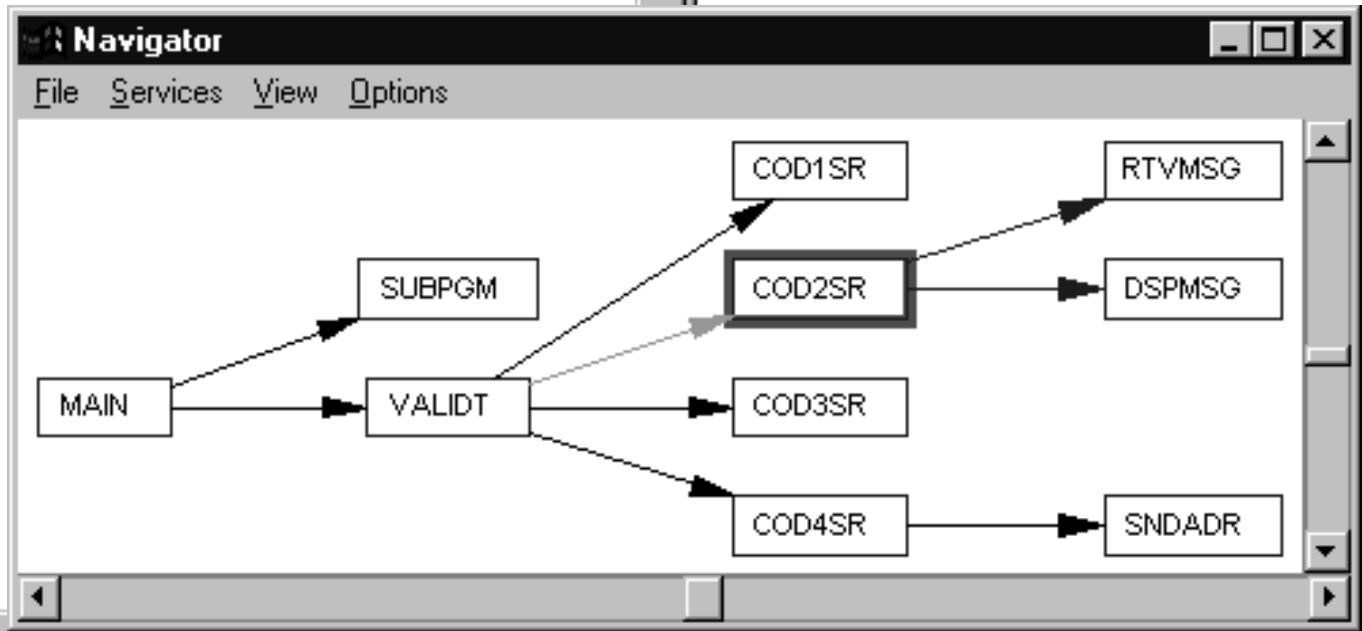
CODE Program Generator

Command

ILE RPG - Create RPG Module Options

| Module | Compile | Data | Listing/Generation | Binding |

Debug view parameter *ALL

CODE Program Generator

Options Tools Help

Server
TORAS209

Source
EW37TEST/QRPGLESRC(DBGDEMO)

Action

Label
CRTRPGMOD Debuggable

BLDPART
CRTBNDC
CRTBNDCBL
CRTBNDCL
CRTBNDRPG
CRTCBLMOD
CRTCBLPGM
CRTCLMOD
CRTCLPGM
CRTCMD

Command
CRTRPGMOD

Associated profile
ILE RPG Compile

Add   Change   Remove

Options...

Compiler Options

Debugging views	*ALL
Authority	*CMDDFT
Target release	*CMDDFT
Optimize	*NONE
Enable performance collection	*CMDDFT
☑ Profiling data	*CMDDFT
Define condition names	*CMDDFT

Add
Delete

CRTRPGMOD SRCFILE(&L/&F) SRCMBR(&M) MODULE(&L/&M)
DBGVIEW(*ALL) OPTIMIZE(*NONE) OPTION(*EVENTF)

OK   Cancel   Default   Help

New label
Create Debuggable ILE RPG module

Command parameters

Debugging batch jobs

Attach

Compiled | Interpreted | AS/400

TCP/IP name of AS/400 host

Host: TORAS644

Job to debug

/iweiss/036538

Specify the name of the program to add to debug:

codelabxx/testbatch

☑ Use program profile

☑ Step into

☐ Debug Java

Debugger Settings...

Attach | Cancel | Help

Session B - [24 x 80]

File Edit Transfer Appearance Communication Assist Window Help

```
MAJOR                          Major Command Groups
                                                    System:   TORAS015
Select one of the following:

           1.  Select Command by Name                      SLTCMD
           2.  Verb Commands                               VERB
           3.  Subject Commands                            SUBJECT
           4.  Object Management Commands                  CMDOBJMGT
           5.  File Commands                               CMDFILE
           6.  Save and Restore Commands                   CMDSAVRST
           7.  Work Management Commands                    CMDWRKMGT
           8.  Data Management Commands                    CMDDTAMGT
           9.  Security Commands                           CMDSEC
          10.  Print Commands                              CMDPRT
          11.  Spooling Commands                           CMDSPL
          12.  System Control Commands                     CMDSYSCTL
          13.  Program Commands                            CMDPGM
                                                              More...
Selection or command
===> SBMJOB CMD(CALL PGM(CODELAB01/TESTBATCH)) JOBQ(CODELAB01/JOBQ)

F3=Exit    F4=P
F16=AS/400 Mai
Job 001079/WEI
MA     b
```

→ **Submit job to the Jobq with the HOLD option set to *YES:**

→ SBMJOB CMD(CALL PGM(CODELAB01/TESTBATCH)) HOLD(*YES)

→ **Start debugger from the Start menu or command line or the CODE editor as Running application.**

→ **Get job info of submitted job**

→ **Start debug session**

→ **Debugger will release the job and display the source when the program starts running.**
Note: If you start from the CODE editor, you will have to release the job yourself.

Debugger Settings - Session Settings

Debugger Settings are per host
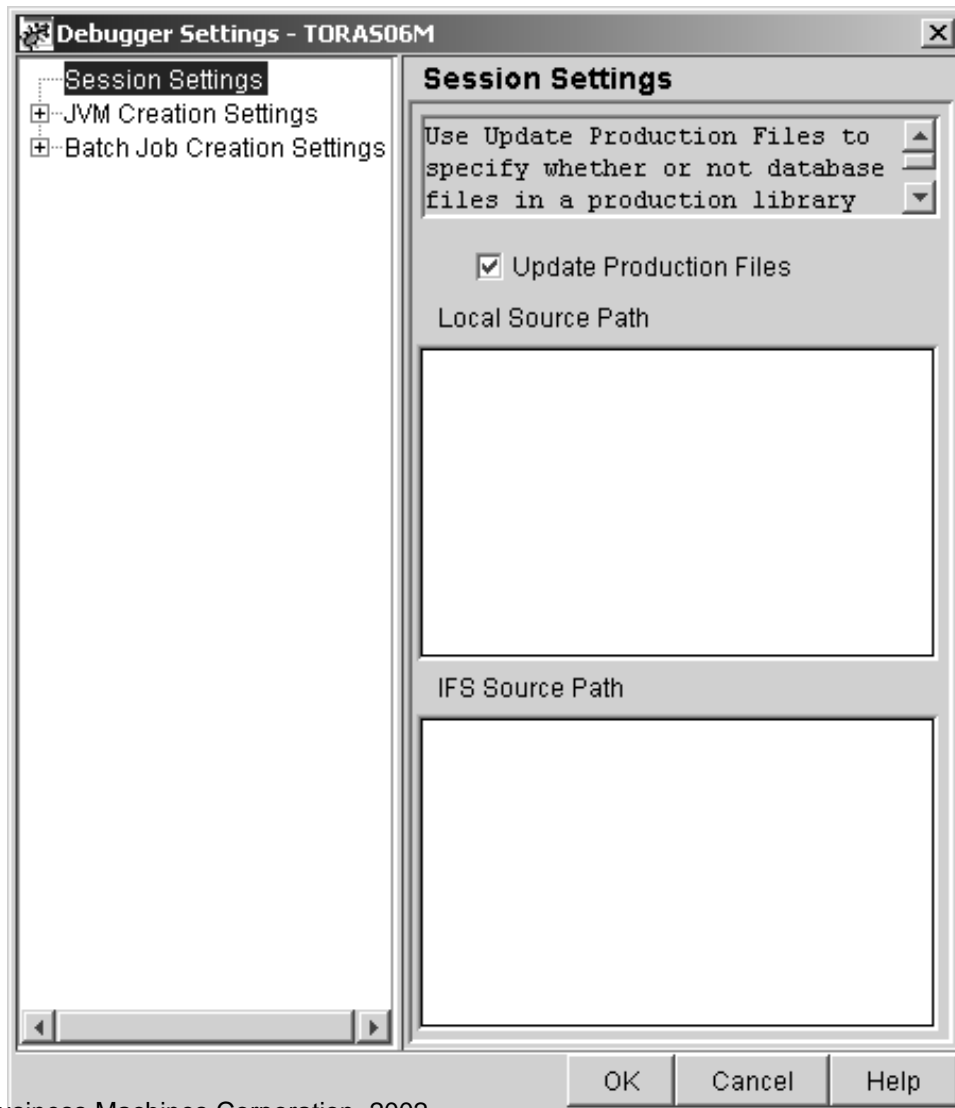
- Debugger Settings are available from the Load Program or Attach dialog.

  ◆

- Check 'Update Production Files' to allow access to production libraries while debugging.

  ◆

- Set Local and IFS Source Path for Java and C++.

Debugger - Monitor Expression dialog

IBM Distributed Debugger

File View Selected Debug Source Stacks **Monitors** Window Help

Monitor Expression...   Shift+F9
Collapse All
Copy View to Clipboard

EW37TEST/EWIRPG05:0

Stacks | Breakpoints | Pro

Stacks

⊞ ▷ Thread 1

Monitor Expression

Enter the expression to be evaluated:

AR1(5)|

○ Program monitor
○ Storage monitor

File: *PGM   EW37TEST/EWIRPG05
Line: 1
View: *Text
Thread: 1

OK   Monitor   Cancel   Help

Monitors | Locals

Expression ...

⊞ ◆ AR1
    ◆ AR1(5) = 025.

monitored variables

Source

DIM(10) CT
DIM(10) CT
DIM(10) CT
----
ns.
2 and SFLD
----

25   D*   STRUC2 has 10 occurrences.
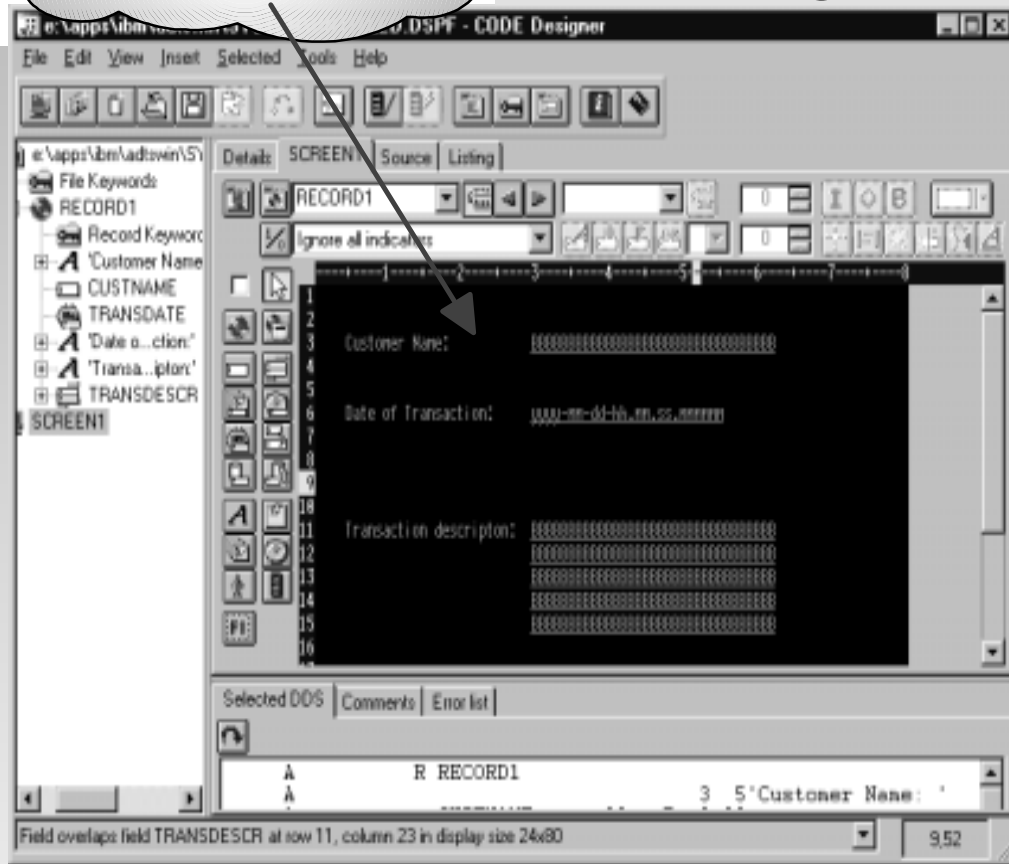26   D*---------
27
28
29
30
31
32

Monitor variables:

Select Monitors -->
Monitor Expression
Type the variable name and optionally
add occurrence
Note: The dialog gets prefilled with any
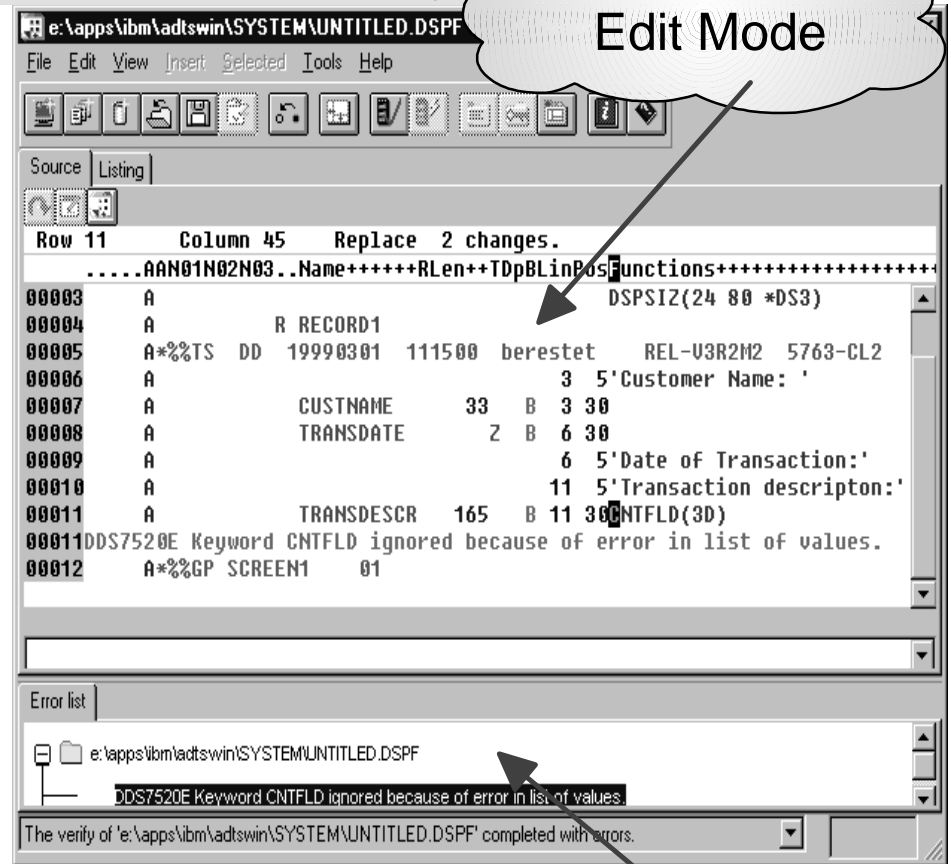**selected variable.**

CODE Designer - Editing DDS

You can switch between 'Design' and 'Edit' modes. Use '*File*'->'*Edit DDS source*' and '*File*' -> '*Design DDS source*' respectively

Design Mode

Edit Mode

NOTE: Some of the changes made in the 'Edit Mode' may cause problems going back to the 'Design Mode'!!!
e.g. Deleting the record line

When you verify DDS source in the 'Edit Mode', all errors go to the integrated 'Error List' window.
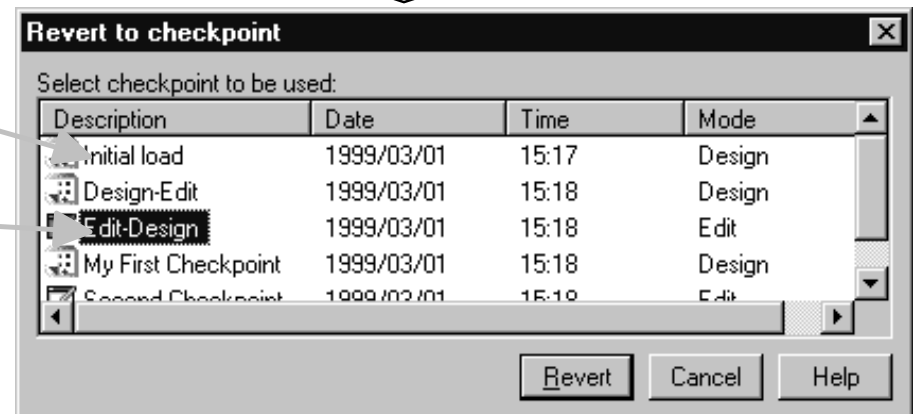
CODE Designer - Checkpoints

- ## Checkpoints
    - ▸ Snapshot of the entire DDS source at a given point in time.
    - ▸ Two types: automatic and user-defined
    - ▸ User-defined checkpoints are saved between sessions.
    - ▸ You can 'revert' back to a checkpoint.

Certain 'drastic' changes in 'Edit Mode' (e.g. delete a record line) may get you in trouble!
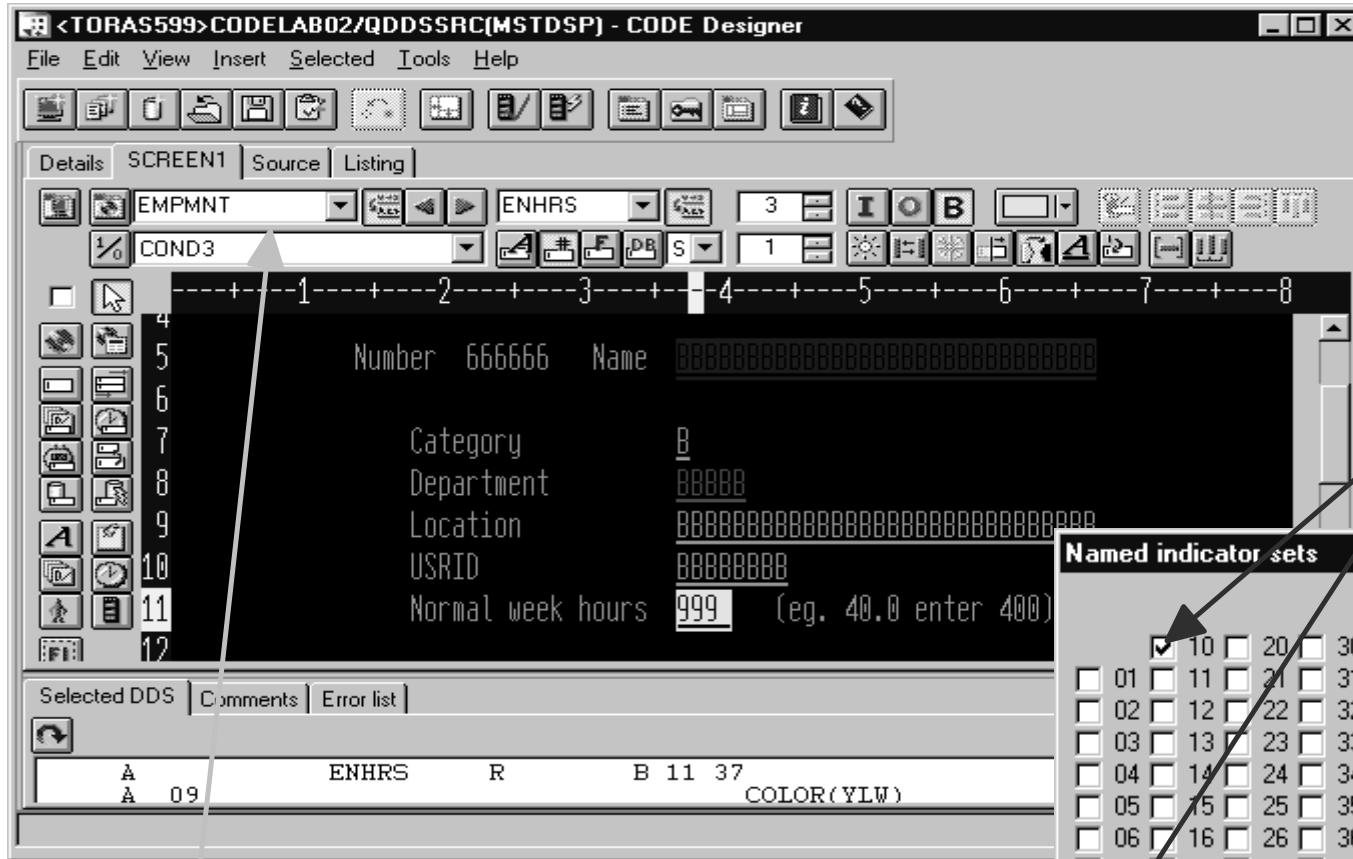Revert to previous checkpoint in such cases.

Checkpoints taken in 'Design Mode'

Checkpoints taken in 'Edit Mode'

Revert to checkpoint

Select checkpoint to be used:

Description	Date	Time	Mode
Initial load	1999/03/01	15:17	Design
Design-Edit	1999/03/01	15:18	Design
Edit-Design	1999/03/01	15:18	Edit
My First Checkpoint	1999/03/01	15:18	Design
Second Checkpoint	1999/03/01	15:18	Edit

Revert   Cancel   Help

CODE Designer, Named Indicators sets

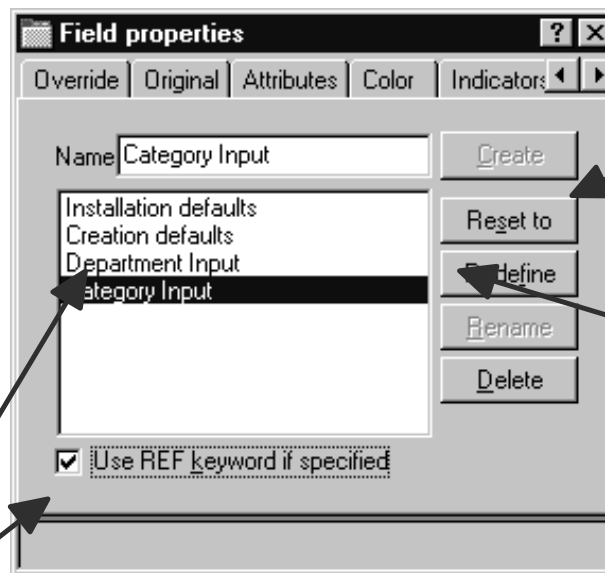'F7' brings up the dialog

Check which Indicators are in set
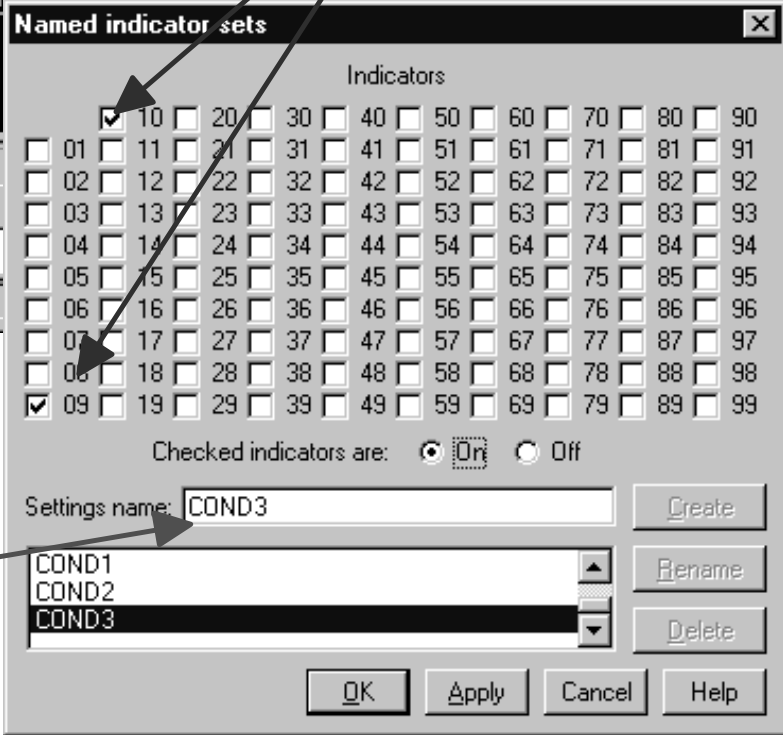
Select which set is in effect

Name of set

CODE Designer, Styles page

- ▶ Save the settings of an object as a style and then reset other objects of the same type to that style.
- ▶ Change creation defaults of objects.
- ▶ Alternatively can use REF keyword for DB Reference fields

Field properties

Override | Original | Attributes | Color | Indicators ◀ ▶

Name Category Input   Create

Installation defaults
Creation defaults   Reset to
Department Input
ategory Input   Redefine

Rename

Delete

☑ Use REF keyword if specified

Change the DDS object (record/field) to be like selected style

Change style to be like the current DDS object

New fields are created using:
REF keyword if checked
Otherwise Creation defaults

CODE Designer, Convert to Field

- **Convert text constant to field with F11.**
- **All appropriate editing codes are created.**
  - ◆ **$999,999.99**
- **Allows SDA syntax.**
  - ◆ **+B(10)**

Before conversion

After conversion

Start CODE tools from PDM

- You can create user-defined options in PDM to invoke CODE tools.
- To invoke the CODE Editor on a source member you would use the following syntax:

CALL QDEVTOOLS/EVFCFDBK PARM('37' 'Y' 'OS400' '<LOCAL> CODEEDIT "<server>&L/&F(&N)" ')

- For V4R5 iSeries use:

CALL QCODE/EVFCFDBK PARM('37' 'Y' 'OS400' '<LOCAL> CODEEDIT "<server>&L/&F(&N)" ')

Working disconnected

What You CAN DO while disconnected

- Work with local source.
- Syntax check RPG, ILE COBOL, and DDS
- Prompt RPG, COBOL, and DDS.
- Access language reference help for RPG, COBOL, and DDS.
- Verify RPG, COBOL, and DDS (without caching, copy members and information on database fields will not be available).
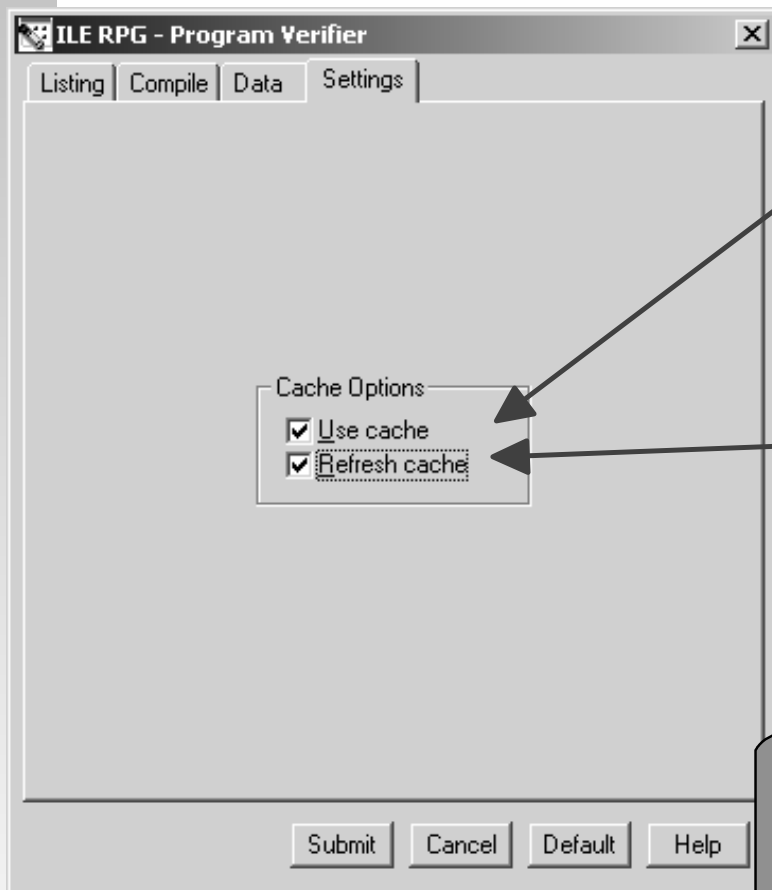
What You CAN NOT DO while disconnected

Edit, design, or compile host source.

Debug host programs.

Execute host commands.

Prompt CL statements.
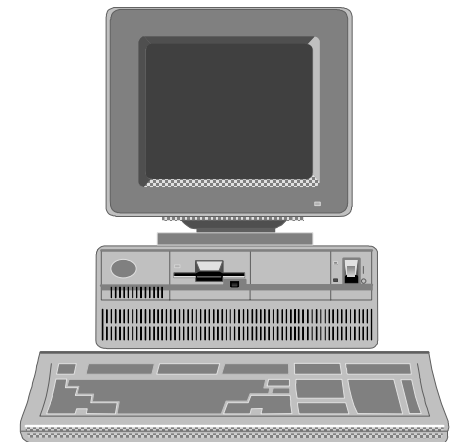
Caching

Information retrieved from the iSeries during your session is saved locally. CODE searches locally for the host information. If all the necessary information is cached, no host connection is needed.

In Program Verifiers, select '**Verify program'**->'**Prompt'**, in Settings tab select "Use cache".

Shortens verify times, since subsequent verifies do not need to access the host.

If host information changes, you have to "refresh" the contents of the cache. In verifiers, select "Refresh cache".

The local files are saved in the WDSC\CACHE directory
(Occasionally, you will want to clean up this directory to free up space)

Editor Programming

✓ Why program it?

- ▶ Need for a new editor function
- ▶ Repetitive task, fastpath key for heavily used function
- ▶ Tailor the editing environment for your shop

✓ What can you do?

- ▶ Specify editor default settings
- ▶ Add editor functions and your own macros to the menus and toolbar
- ▶ Assign/re-assign keys and/or line commands to editor functions and your own macros
- ▶ Interact with the host via the CODESRV command

✓ How do you do it?

- ▶ Write macros in REXX or Java + editor commands
- ▶ Use the 'profiles' to load in the macros.

Text manipulation example:
Ctrl+ Backspace - delete entire line
Ctrl+Delete -- delete to end of line

Unlimited undo and redo
Ctrl+Z   Ctrl+Shift+Z

Block marking of lines, characters,
or rectangles with copy, move,
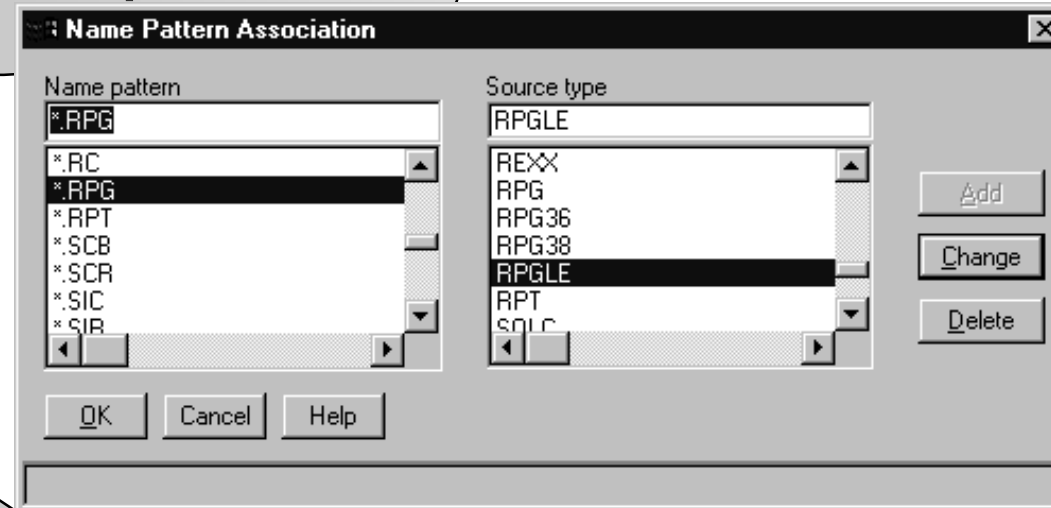overlay, and delete operations
example: Alt+U -- unmark text

For more info select:
'**Help**' -> '**Keys help**'

Editor Shortcut Keys - Ne...

File Edit View Go Communicator Help

Back   Forward   Reload   Home   Search   Guide

Bookmarks   Location: http://localhost:4921...

Ctrl+Right	Move cursor to...
Ctrl+Left	Move cursor to beginning of word or previous word
Ctrl+C	Copy selected text to clipboard.
Ctrl+X	Cut selected text to the clipboard
Ctrl+V	Paste text from the clipboard.
Alt+L	Select a line of text, or extend selected text by additional lines for copying, moving, or deleting (and deselect any text selected from any other file view).
Ctrl+T	Select word/token
Alt+U	Unmark text selected with Alt+L (applies to any file view opened).
Alt+B	Select a block of text.
Alt+R	Select a rectangular block of text.
Alt+K	Convert selected text to uppercase.

Document: Done

CODE Editor - Associations

To map file name to source types select:
Options -> Associations -> Name patterns

Name Pattern Association

Name pattern	Source type	
*.RPG	RPGLE	
*.RC	REXX	Add
*.RPG	RPG	
*.RPT	RPG36	Change
*.SCB	RPG38	
*.SCR	RPGLE	Delete
*.SIC	RPT	
*.SIB	SQLC	

OK   Cancel   Help

To map source type to a specific language profile select:
Options -> Associations -> Source types

Source Type Association

Source type	Language profile	
RPGLE	RPGLE400	
RPGLE	RC	Add
RPT	RCI	
SQLC	RCV	Change
SQLCBL	RPG400	
SQLCBLLE	RPGLE400	Delete
SQLRPG	SHL	

OK   Cancel   Help
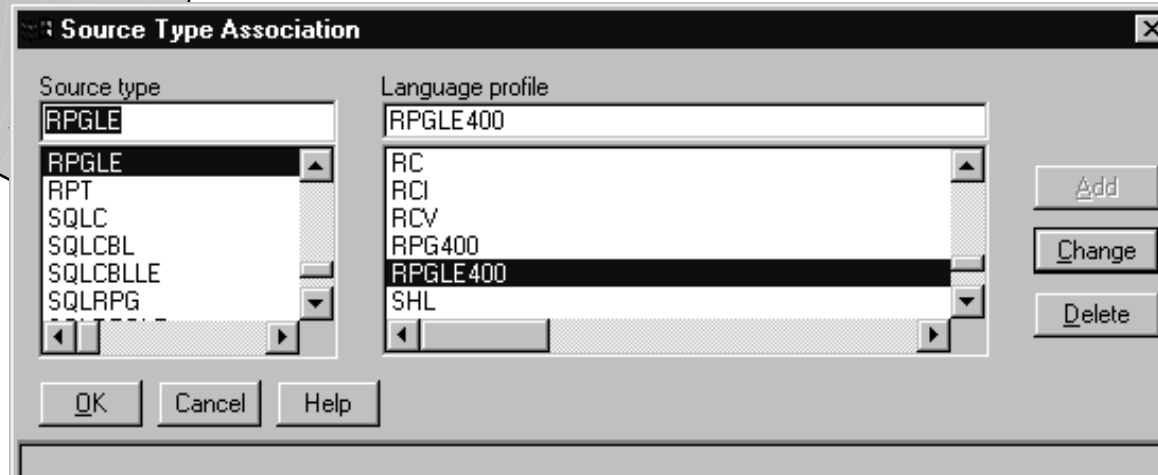
Editor Programming - commands

- ## Editor Commands
  - ▶ To issue a command, press ESC and enter the command.
    - ▶ To position to line number 12.
      FIND LINE 12
    - ▶ To insert a new line.
      INSERT
    - ▶ To change the current line's text.
      SET CONTENT this is new
    - ▶ To display message on message line.
      MSG this is a message

Editor Source Editing Area

Editor Command Line

```
CODE - <TORAS599>CODELAB02/QRPGLESRC(PAYROLLG)
File  Edit  View  Actions  Options  Windows  Help

<TORAS599>CODELAB02/QRPGLESRC(PAYROLLG)
Row 51        Column 1       Replace
    .....CL0N01Factor1+++++++Opcode(E)+Factor2+++++++
000490    * MAIN SUBROUTINE
000500    C    MAIN        BEGSR
000510    C    BEGIN       TAG
000520    C                MOVE      '0'
000530    C                MOVE      *BLANKS
000540    C                MOVE      *BLANKS
000550    C                MOVE      *BLANKS
000560    C                MOVE      *BLANKS
000570    C*
000580    C*  Write the SELECT format to display.
000590    C*  branch to END TAG; ELSE edit SELECT f
000600    C*
000610    C    SELTAG      TAG
000620    C                EXFMT     SELECT

FIND LINE 12
```

Editor Programming - commands

- **Add function to the menubar**

  SET ACTIONBAR.pulldown.item command

- **Add function to the toolbar**

  SET TOOLBAR.button_text position command

- **Assign keyboard shortcut**

  SET ACTION.key command

- **Add function to the popup menu**

  SET POPUPMENU.menuitem command

- **Get help when editor command fails**
  - **Windows->Macro log** to view messages.

Editor Programming - Reference

'Editor Reference' online documentation contains help for all editor commands, sorted alphabetically!

'Editor Reference' is available from the 'Help' pulldown.

This information is invaluable when writing editor macros!

Parameters Summary - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Guide Print Security Stop

Bookmarks Location: http://localhost:49213/cgi-bin/vahwebx.exe/vahelp/va400/Extract/0/lpex/ref/rlparref.htm#top

group   Specifies the conditions by which a menu item will be enabled or disabled (Query only)

help   Specifies the help information associated with menu item (Query only)

hex   Returns the hexadecimal ASCII code of the current cursor position. (Query only)

highlight   Sets the classes to be highlighted.

horizscroll   Sets the increment for the horizontal scroll

hoverhelp   Enable or disable hoverhelp for the toolbar

idletime   Sets the idle seconds required before auto

impmacro   Processes unknown commands as macros.

impset   Processes unknown commands as **set** query

include   Specifies the list of classes for which member lines are to be

Document: Done

Editor Programming - Macros

- Text files with extension .**LX**

- Contain **REXX** statements and embedded editor commands

- Query and set attributes of the editor

- Use **CODESRV** command to invoke iSeries commands, retrieve lists, etc.

- Invoked from editor by
  "MACRO macro_name parameters"

- EXTRAS macro updates path the editor searches when macros are executed.
  - ▸ Default is WDSC\MACROS
- Add WDSC\EXTRAS (which contains many example macros) to path

  Actions -> Enable EXTRAS

- Add your own directory to path

  EXTRAS ON d:\mymacros

  - ▸ Use **d:\mymacros** to store your own macros and profiles. This helps prevent changes being lost on release upgrades.

Editor Programming - EXTRAS

- **Remains on until disabled**

  EXTRAS OFF or **EXTRAS -> Disable Extras**

- **Change at any time**

  EXTRAS ON d:\myothermacros

- **Specify multiple directories**

  EXTRAS ON d:\mymacros;e:\workmacros

- **Open local files**

  ► The LX editor command used to open files uses same search path for local files.

Writing a REXX macro

1 **Open a new ILE RPG file:**
              'testfile.rpg'

3 **Prompt for the name of the new procedure.**
User enters name and clicks OK.

```
CODE - testfile.rpg                                    _ □ ✕
 File  Edit  View  Actions  Options  Windows  Help  Extras
 [toolbar icons]
testfile.rpg                                              ▼
 Row 1         Column 1        Replace
       _.... *..1....+....2....+....3....+....4..
00001
```

```
RPG Procedure name                              ✕
Enter the name of the procedure:
MyProc|

   OK        Cancel       Help
```

```
File "testfile.rpg" has been created.
macro rpgproc|                                          ▼
```

Execute macro rpgproc

2

4

Create a template for the
procedure **MyProc** (name,
entered by the user...)

```
CODE - testfile.rpg  *                                 _ □ ✕
 File  Edit  View  Actions  Options  Windows  Help  Extras
 [toolbar icons]
testfile.rpg  *                                           ▼
 Row 11        Column 1        Replace  1 change.
       _....PName++++++++++..B.................Keywords++
00002      D* ---------------------------------------  ▲
00003      D* Prototype for procedure: MyProc
00004      D* ---------------------------------------
00005      D MyProc            PR
00006
00007      P* ---------------------------------------
00008      P* Procedure Name: MyProc
00009      P* Purpose:
00010      P* ---------------------------------------
00011      P MyProc            B
           D MyProc            PI
00013
00014      C* Your calculation code goes here
00015
00016      C                       RETURN
00017      P MyProc            E                       ▼
```

REXX macros - creating prompts

```
CODE - H:\adtswin\codelab\rpgproc.lx                        _ □ ✕

File  Edit  View  Actions  Options  Windows  Help  Extras

H:\adtswin\codelab\rpgproc.lx                                    ▼

Row 1          Column 1        Insert
    ■---+----1----+----2----+----3----+----4----+----5----+----6---
00001/*************************************************/
00002/* RPGPROC.LX                              */
00003/*                                          */
00004/* This macro builds an RPG procedure template */
00005/*                                          */
00006/*************************************************/
00007
00008'set lineread.title RPG Procedure name'        /* S
00009'set lineread.prompt Enter the name of the procedure: '  /* Prompt
00010'lineread 10 '                                  /* Create
00011'extract lastline'                              /* Read te
00012'extract lastkey'                               /* What ke
00013
00014if ((lastline = '') | (lastkey = 'ESC')) then do
00015    'msg Request cancelled'
00016    exit
00017end

H:\adtswin\codelab\rpgproc.lx saved
```

Every REXX program starts with a comment. It is customary to explain what the macro is doing...

Setup the following parameters:
→ **Prompt box title**
→ **Prompt box label**
→ **Size of the entry field**

Retrieve the following
→ **Text typed in the entry field**
→ **Which button was pressed**

NOTE:The 'Cancel' button is equivalent to 'ESC' key...

If the user did not enter any text, or pressed 'Cancel', put up an error message and bail out...

REXX macros - creating template

```
CODE - e:\apps\ibm\adtswin\Extras\rpgproc.lx   *
File  Edit  View  Actions  Options  Windows  Help  Extras

e:\apps\ibm\adtswin\Extras\rpgproc.lx     *

Row 38          Column 51      Insert    2 changes.
    ----+----1----+----2----+----3----+----4----+----5 ---+----6----
00019procName = lastline
00020/* Pad procName with blanks to make it 10 characters long */
00021do procLength = length(lastline) to 9
00022  procName = procName' '
00023  end
00024
00025/* The procName is 10 characters long including blanks */
00026'insert        D* ------------------------------------------'
00027'insert        D* Prototype for procedure: 'procName
00028'insert        D* ------------------------------------------'
00029'insert        D 'procName'        PR'
00030'insert                                     '
00031'insert        P* ------------------------------------------'
00032'insert        P* Procedure Name: 'procName
00033'insert        P* Purpose: '
00034'insert        P* ------------------------------------------'
00035'insert        P 'procName'        B'
00036'insert        D 'procName'        PI'
00037'insert                                     '
00038'insert        C* Your calculation code goes here' |
00039'insert                          '
00040'insert        C                 RETURN'
00041'insert        P 'procName'        E'
```

Pad procName with blanks if needed to make sure it is 10 characters long!!!

Substitution variables are placed outside the quotes!

Setup procedure beginning

Setup Procedure declaration part.

Setup procedure end

The C specs of your procedure will be inserted here!

Setting up toolbar and menus
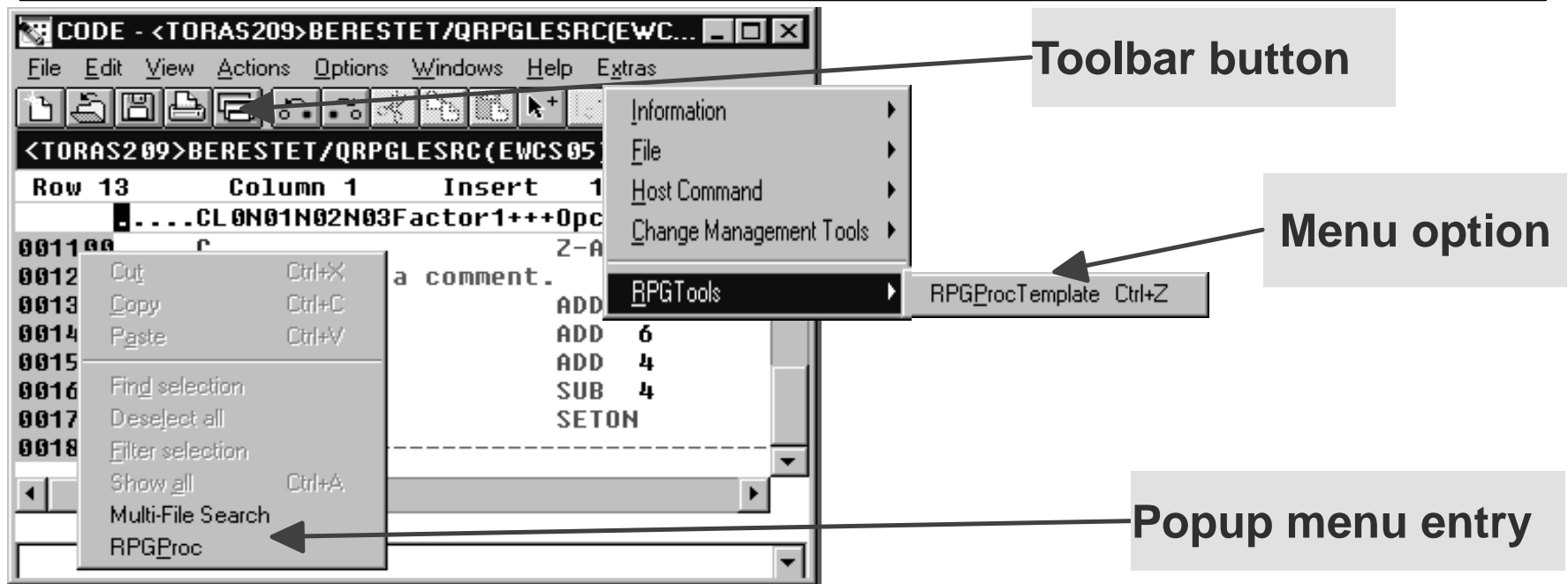
- ## Add rpgproc macro to the toolbar

  SET TOOLBAR.RPGProc BITMAP _33 HELP "Proc template" 4 macro rpgproc

- ## Add rpgproc macro to the 'Extras' menu

  SET ACTIONBAR.E~xtras.~RPGTools.RPG~ProcTemplate\tCtrl+Z macro rpgproc

- ## Add rpgproc macro to the popup menu

  SET POPUPMENU.RPG~Proc rpgproc

Editor Profiles

Special editor macros run at specific times

Profile	When does it run?	Can I change it?
PROFINIT.LXU	When the editor starts.	Yes
PROFSYS.LXU	Just before each file is loaded.	Yes
xxx.LXL xxx = cbl,rpgle400, etc.	After PROFSYS.LXU, but before a file of type xxx is loaded.	No
xxx.LXU	After xxx.LXL but before the file is loaded.	Yes. Add your own xxx specific commands here.
PROFILE.LX	The last profile run before each file is loaded.	Yes
xxx.LXS	Whenever a file of type xxx is saved.	Yes

Editor Profiles: RPGLE400

```
'SET ACTIONBAR.LP_VIEW.Inden~t RPGIND '
'SET HELP. 12451'

/* Add Navigator */
'LXR NAVIG.LX'

'SET ACTIONBAR.LP_VIEW.~Match.~Select MACRO MATCH '
'SET HELP. 16154'
'SET ACCELERATOR. C-M'
'SET ACTIONBAR.LP_VIEW.~Match.~Jump MACRO MATCH JUMP'
'SET HELP. 16155'
'SET ACCELERATOR. C-S-M'

'SET ACTIONBAR.LP_VIEW.~Cross_reference macro runjava RPGXReference'
'SET HELP. 16196'

'SET ACTIONBAR.LP_VIEW.~/COPY_member_(SEE) MACRO RPGINC'

'SET ACTIONBAR.LP_ACTIONS.SEPARATOR ;'
'SET ACTIONBAR.LP_ACTIONS.Smart~Guides.Create_~procedure... macro runjava LpexRPGProcSG'
'SET GROUP. WRITEABLE'
'SET HELP. 16197'
```

Sample of the RPGLE400.LXL

User defined sample of the **RPGLE400.LXU**

```
/* Setup the menu, tollbar, and pop-up menu item */
'SET ACTIONBAR.E~xtras.~RPGTools.RPG~ProcTemplate\tCtrl+Z macro rpgproc'
'SET TOOLBAR.RPGProc  BITMAP _33 HELP "Create RPG proc template" 4  macro rpgproc'
'SET POPUPMENU.RPG~Proc rpgproc'
```

CODESRV command

- **CODESRV is a workstation command that can be used to:**
  - ▶ Get a list of active host CODE servers.

    CODESRV SERVER

  - ▶ Shutdown all or specific servers.

    CODESRV SHUTDOWN

    CODESRV /S OS400

  - ▶ Send commands to the iSeries.

    **CODESRV EXEC OS400 STRSEU OPTION(6)
    SRCFILE(CODELAB01/QDDSSRC)
    SRCMBR(MSTDSP)**

CODESRV command, cont'd

- ► **Download source**

   CODESRV GET OS400
   "CODELAB01/QDDSSRC(MSTDSP)" c:\mstdsp.dspf

- ► **Upload source**

   CODESRV PUT OS400 c:\mstdsp.dspf
   "CODELAB01/QDDSSRC(MSTDSP)"

- ► **Get lists of objects that match a filter**

   CODESRV LIST OS400 "CODELAB01/QDDSSRC(*)"

- ■ You can imbed the command in your macros.

Using CODESRV in a macro

SEUPRINT macro prints the current member being edited on the host. It is shipped with CODE.

```
/* SEUPRINT - a macro to print the current member being edited on the host. It uses the  */
/*         SEU print option.                                                    */

/* Blank out the message line */
'msg' '   '
/* Get full name of file being edited */
'extract name'
/* Get the name of the server, file and member */
parse var name '<' server '>' fn '(' mn ')'
/* Drop /ADM from server name if it exists */
parse var server host '/' junk
/* Issue error if this is a LOCAL file... */
if host = 'LOCAL' then do
  'msg Host Print is not valid for local files.'
  'ALARM'
  exit
end
```

/* Prompt user to save source, then print it on host... */
'SAVEALL PROMPT START CODESRV EXEC 'host' STRSEU SRCFILE('fn')
SRCMBR('mn') OPTION(6) (LOG'

'msg Member printed using STRSEU. See Command Shell for status.'

Use the CODESRV command to save the source and print it using SEU print option.

Editor Programming - Lpexlets

Lpexlets

- Use Java to customize the editor. Same capability as REXX but with power to create graphical-user-interfaces

- Classes that can access the editor inherit from the LpexCommand class, the LPEX Java Programming Interface. These classes are called "Lpexlets".

- Invoke from editor by "RUNJAVA class_name". The class file must be in the CLASSPATH and the class name is case-sensitive.

- Many samples in sample.jar in WDSC\JAVA.

- The Java Development Kit (JDK1.2.2) is required to develop Lpexlets. The JDK or Java Runtime Environment (JRE) is required to run them. Both are available from JavaSoft's web site www.javasoft.com.

Editor Programming - Lpexlets

We will enhance our RPGPROC macro with the dialog written in Java - an Lpexlet

Vadim RPG Procedure Template

Procedure Name

Programmer Name

Ok   Cancel   Clear

We are going to ask for the
→ **Procedure Name**
→ **Programmer Name**

In addition to 'OK' and 'Cancel' we will add a 'Clear' button

Editor Programming - Lpexlets

Every Lpexlet must inherit from the *LpexCommand* class.
You will implement *lpexEntry( )*, main entry function.

Other *LpexCommand* members to be implemented include *lpexNotify( )* and *lpexExit( )*

```
import RPGProcFrame;

public class RPGProc extends LpexCommand
{
    static RPGProcFrame rpgProcFrame = null;

    /* lpexEntry() - main entry point from LPEX.  Overrides LpexCommand's. */
    public static int lpexEntry (String arg)
    {
        if( rpgProcFrame == null )
            rpgProcFrame = new RPGProcFrame();
        rpgProcFrame.setVisible(true);
        return 0;
    } // end lpexEntry()

    // Once the Ok button is pressed, need to set DOCVARs
    public static int setDocVars(String procName, String pgmrName)
    {
        lpexCommand("SET DOCVAR.PROCNAME " + procName);
        lpexCommand("SET DOCVAR.PGMRNAME   - pgmrName);

        lpexCommand("MACRO RPGPROCJAVA");
        return 0;
    } // end setDocVars()
} // end class RPGProc
```

Create an RPGProcFrame object and show the dialog box...

***lpexCommand()* function executes editor commands.**
We need to <u>SET DOCVARs</u> so that these values can be read later by the REXX macro.

Our Lpexlet will call REXX macro to generate the procedure template code

Editor Programming - Lpexlets

Data definitions for the RPGProcFrame class.

Every GUI control has a _private_ data member associated with it.

It is a good programming practice to initialize all data members to **_null_**.

```
import javax.swing.*;
import javax.swing.event.*;
import java.awt.*;
import java.awt.event.*;

public class RPGProcFrame extends JFrame implements ActionListener
{
    private JPanel contentPane = null

    private JButton cancelButton = null;
    private JButton clearButton  = null;
    private JButton okButton     = null;

    private JLabel pgmrNameLabel = null;
    private JLabel procNameLabel = null;
    private JTextField pgmrNameTextField = null;
    private JTextField procNameTextField = null;
            .............................
            .............................
} // end class RPGProcFrame
```

RPGProcFrame class _extends_ _JFrame_ class and _implements_ _ActionListener_ interface.

Java's ideas of _multiple inheritance_!

JPanel object provides a 'home' for all other GUI controls. In the literature, people may call it a _client canvas_.

Editor Programming - Lpexlets

```
/* Class constructor */
 public RPGProcFrame()
{
    super();
    setSize(426, 240);
    setTitle("Vadim RPG Procedure Template");

    // Create Ok button object
    okButton = new JButton("Ok");
    okButton.setBounds(42, 170, 85, 25);
    okButton.addActionListener(this);

    // Create text label for procedure nanme
    procNameLabel = new JLabel("Procedure Name");
    procNameLabel.setBounds(35, 27, 146, 20);
    // Creating an entry field for procedure name
    procNameTextField = new JTextField();
    procNameTextField.setBounds(218, 27, 169, 19);

    // Construct the JPanel object - client canvas and add all controls
    contentPane = new JPanel();
    contentPane.setLayout(null);

    // Add all entry controls and corresponding Labels to the client pane
    contentPane.add(procNameLabel, procNameLabel.getName());
    contentPane.add(procNameTextField, procNameTextField.getName());
    contentPane.add(okButton, okButton.getName());

    // Now that everything is constructed, set the client pane to contentPane
    setContentPane(contentPane);
            ..........
            ..........
} // end constructor()
```

Every class needs a constructor!

Creating an 'OK' button and making the *JFrame* object listen to the button clicks.

Creating a label and an entry field for the Procedure Name

A *JPanel* object that resides inside the *JFrame!*

Adding freshly created GUI controls to the *JFrame*.

actionPerformed() **is defined by the *ActionListener* interface. It has to be implemented by any class that implements this interface!**

Usually used for processing button and menu events...

Figure which button was pressed.

```
/**
 * Overwrite actionPerformed() method of the ActionListner interface
 * If any registered button is pressed, this method gets invoked
 */
public void actionPerformed(ActionEvent evt)
{
  // First of all figure which button was just pressed
  String arg = evt.getActionCommand();

  if( arg.equals("Ok") )
  {
    RPGProc.setDocVars(procNameTextField.getText(), pgmrNameTextField.getText());
    dispose();
  } // end if(Ok button is pressed)
  else if( arg.equals("Cancel") )
  {
    dispose();
  } // end if(Cancel button is pressed)
  else if( arg.equals("Clear") )
  {
    procNameTextField.setText("");
    pgmrNameTextField.setText("");
  } // end if(Help button is pressed)
} // end actionPerformed()
```

In the case of 'OK' button, call into the RPGProc class to set the DOCVARS.

On 'Cancel' just dispose( ) of the dialog...

'Clear' button was pressed - clear up all entry fields.

Editor Programming - Lpexlets

Lpexlet has set the DOCVARs. That is how we retrieve the values of the Procedure and Programmer Name

```
/* Read in the DOCVARs that are set by the Lpexlet */
'EXTRACT DOCVAR.PROCNAME INTO 'procName
'EXTRACT DOCVAR.PGMRNAME INTO 'pgmrName

/* Pad procName with blanks to make it 10 characters long */
do procLength = length(procName) to 9
  procName = procName' '
  end

/* The procName is 10 characters long including blanks */
'insert     D* ----------------------------------------'
'insert     D* Prototype for procedure: 'procName
'insert     D* ----------------------------------------'
'insert     D 'procName'      PR'
'insert                            '
'insert     P* ----------------------------------------'
'insert     P* Procedure Name: 'procName
'insert     P* Purpose:        '
'insert     P* Written by:     'pgmrName
'insert     P* ----------------------------------------'
'insert     P 'procName'      B'
'insert     D 'procName'      PI'
'insert                            '
'insert     C* Your calculation code goes here'
'insert                            '
'insert     C             RETURN'
'insert     P 'procName'      E'

'trigger fullparse'
```

We will re-use the template generation code from the already written REXX macro RPGPROC.LX
(Just add Programmer's name)

The Prompt

The generated template

Vadim RPG Procedure Template

| Procedure Name | MyProc |
| Programmer Name | Vadim Berestetsky |

Ok   Cancel   Clear

CODE - one.rpg *

File Edit View Actions Options Windows Help Extras

one.rpg   *

Row 1   Column 1   Replace   2 changes.

```
.... *..1....+....2....+....3....+....4....+....5....+
00001    D* -------------------------------------------
00002    D* Prototype for procedure: MyProc
00003    D* -------------------------------------------
00004    D MyProc          PR
00005
00006    P* -------------------------------------------
00007    P* Procedure Name: MyProc
00008    P* Purpose:
00009    P* Written by:     Vadim Berestetsky
00010    P* -------------------------------------------
00011    P MyProc          B
00012    D MyProc          PI
00013
00014    C* Your calculation code goes here
00015
00016    C                       RETURN
00017    P MyProc          E
```

Compare to the template generated by the REXX macro.
We added the Programmer's Name

Creating Smart Guides

The ultimate RPG procedure template Lpexlet. It is written based on the Java Smart Guide Framework that is shipped with CODE/400.

Creating Smart Guides

The resulting template

To get help for the CODE SmartGuide Framework, select '**Java help**' -> '**SmartGuid framework**' from the Help menu.

NOTE: The '**Java help**' option is only availabl when editing Java source.

Suggestion

To unpack SmartGuide Framework examples, read '**LPEX Java readme**'. It is available from: '**Help**' -> '**Java help**'.

Summary

- **IBM's follow-on to SEU, PDM, RLU, SDA**
- **New world, new servers, new tools!**
  - ► Much higher productivity
  - ► Much more fun programming again
  - ► Much easier to attract/retain talent
  - ► Much more flexibility
    - **Working disconnected, at home, on the road**
    - Tailor extensively to suit your needs
  - ► Much easier transition to future
    - **Today: host applications, new tools**
    - **Tomorrow: Web applications!**
      - RPG IV, ILE, GUI, VisualAge, Java, WebSphere. . .

Additional Information

- homepage
  - ► www.ibm.com/software/ad/iseries

- Education
  - ► S6186 CODE/400 for iSeries -- Basic (2 days)
  - ► S6205 CODE/400 for iSeries -- Advanced (1 day)

  - ► S6286 iSeries Application Development using WDSc for iSeries -- Basic (2 days)

- Newsgroup
  - ► news://news.software.ibm.com/ibm.software.code400

iSeries & WebSphere Resources & Deliverables

WebSphere Development Studio for iSeries
http://www-3.ibm.com/software/ad/wds400/

iSeries site
www.iseries.ibm.com/

iSeries WebSphere Application Server
http://www-1.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/

PartnerWorld for Developers, iSeries & WebSphere
http://www.iseries.ibm.com/developer/websphere/

IBM eServer Solutions
http://www-1.ibm.com/servers/eserver/iseries/solutions/

iSeries e-business Solutions
http://www-1.ibm.com/servers/eserver/iseries/ebusiness/

iSeries B2B Solutions
http://www-1.ibm.com/servers/eserver/iseries/btob/

Connect for iSeries
http://www-1.ibm.com/servers/eserver/iseries/btob/connect/v11high.html

WebSphere Commerce Suite for iSeries
http://www-1.ibm.com/servers/eserver/iseries/ebusiness/wcs51.html

iSeries and e-commerce
http://www-1.ibm.com/servers/eserver/iseries/ebusiness/ecommerce.htm

iSeries HTTP Server
http://www-1.ibm.com/servers/eserver/iseries/software/http/index.html

iSeries and WebSphere References
http://www.as400.ibm.com/developer/java/solutions/jjem.html
http://www2.software.ibm.com/casestudies/swcsweb.nsf/platform

iSeries Solution Finder
http://www.iseries.ibm.com/btobpartner/

iSeries & Domino
http://www-1.ibm.com/servers/eserver/iseries/domino/

Dedicated Server for Domino
http://www-1.ibm.com/servers/eserver/iseries/domino/dsd.htm

Workload Estimator for iSeries, WAS, WCS & Domino, HTTP Server, Java, etc.
http://as400service.ibm.com/estimator/

iSeries Custom Technology Center
http://www-1.ibm.com/servers/eserver/iseries/service/ctc/

iSeries Technical Support
http://as400service.ibm.com/

iSeries Technical Studio
http://www.as400.ibm.com/tstudio/

1st Install for iSeries & WebSphere Application Server
http://www.iseries.ibm.com/developer/websphere/assistance.html

iSeries ToolsNet (Tools & Middleware)
http://www.iseries.ibm.com/developer/tools/

iSeries & Services Network
http://as400service.ibm.com/supporthome.nsf/document/19251245

iSeries e-business Handbook (SG24-5694-01)
http://www.redbooks.ibm.com/abstracts/sg245694.html

WebSphere Commerce Suite With Back-End Order Mgmt.
http://ibm.com/redbooks

iSeries Technology Center
http://www.iseries.ibm.com/service/itc/ebiz.htm

iSeries University
http://www-3.ibm.com/services/learning/community/as400/

iSeries & WebSphere Resources & Deliverables

WebSphere Application Server Overview
http://www-4.ibm.com/software/webservers/appserv/

WebSphere Commerce Suite
www-4.ibm.com/software/webservers/commerce/

WebSphere Payment Manager
www-4.ibm.com/software/webservers/paymgr/

MQSeries
www.ibm.com/software/ts/mqseries

iSeries & WebSphere Documentation

Redbooks & Red Pieces   **Form Numbers/Web Sites**
    Building iSeries Applications for WebSphere Advanced Edition   **SG24-5691**
    Building Java Applications for the iSeries with VisualAge for Java   **SG24-6245**
    Integrating WCS with Domino Back-End Applications
·   **http://ibm.com/redbooks (search for REDP0141)**

Java & WebSphere Performance on iSeries
·   **http://publib-b.boulder.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg246256.html?Open**
    iSeries Application Development Directions white paper is now available
·   **http://www.iseries.ibm.com/developer/tools/documents/addir/index.html**
    Connect for iSeries with WebSphere Commerce Suite Red Paper
·   **http://www.redbooks.ibm.com/redpapers/pdfs/redp0127.pdf**

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