Quick Installation Guide

ServeRAID M5120 SAS/SATA Controller for IBM System x

Before using this information and the product it supports, read the *Important Notices* and *Warranty Information* documents that come with the ServeRAID M5120 SAS/SATA Controller for IBM® System x®.

This *Quick Installation Guide* contains information about installing and configuring the controller, the LEDs and connectors, and basic RAID levels.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Notes:

1. Record your controller serial number in a safe location in case you need to contact IBM.
2. The controller supports SAS, SATA, SATA II, and SATA III.

The controller is a PCIe 3.0 internal RAID host bus adapter (HBA) with vertical internal hard disk drive connectors. The controller offers a 6 Gbps data transfer rate and controls eight internal SAS/SATA ports through two SFF-8087 mini-SAS4i internal connectors.

Before you install the controller, you *must* attach a transportable memory module. The transportable memory module enables write-back functionality, resulting in better performance. In addition, the transportable memory module enables RAID 5, 50 and Self Encrypting Drive functionality. To enable RAID 6, 60 you *must* purchase a ServeRAID M5100 Series RAID 6 Upgrade for IBM System x option.

The following transportable memory modules are supported by the controller and must be purchased separately:

- ServeRAID M5100 Series 512 MB Cache/RAID 5 Upgrade for IBM System x

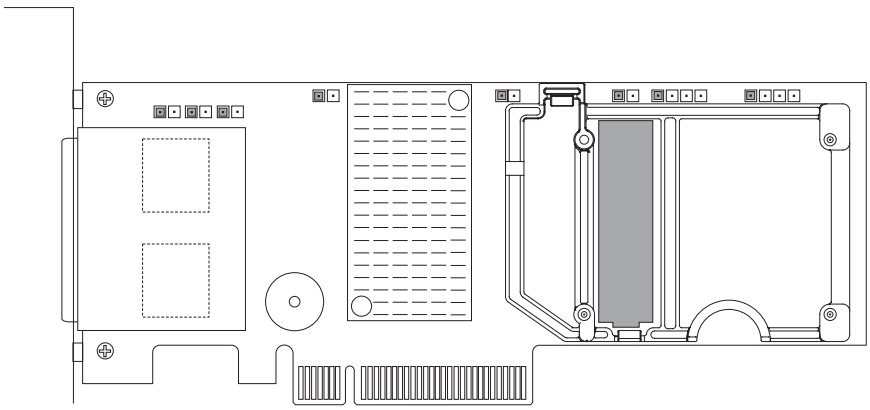
  If you purchase this cache/RAID 5 upgrade option, you can also purchase a ServeRAID M5100 Series Battery Kit for IBM System x, which provides intelligent battery backup for the controller.
- ServeRAID M5100 Series 512 MB Flash/RAID 5 Upgrade for IBM System x (comes with a ServeRAID M5100 Series Flash Power Module for IBM System x)
- ServeRAID M5100 Series 1 GB Flash/RAID 5 Upgrade for IBM System x (comes with a ServeRAID M5100 Series Flash Power Module for IBM System x)

The ServeRAID M5100 Series Flash Power Module for IBM System x connects to the transportable memory module that is attached to the controller. The flash power module protects the integrity of cached data on the controller by providing backup power during offload of the data to nonvolatile flash memory in the event of a brief or extended power outage. The flash power module comes with the transportable memory module.

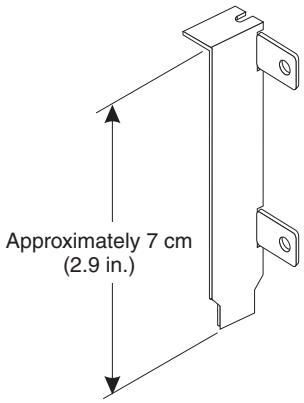
Option kit parts

The controller option kit contains the following parts:

- One ServeRAID M5120 SAS/SATA Controller for IBM System x



- One low-profile expansion-slot bracket



- IBM *ServeRAID M Documentation* CD
- IBM *Warranty Information* document
- IBM *Important Notices* document

Operating specifications

The controller operating specifications are described in the following table.

Table 1. Controller operating specifications

Operating environment temperature range	10°C to 35°C (50°F to 95°F) at 0 to 914 m (0 to 3000 ft)
	10°C to 32°C (50°F to 90°F) at 914 to 2133 m (3000 to 7000 ft)
Operating environment relative humidity	20% to 80% (noncondensing)
Altitude	0 to 2133 m (0 to 7000 ft)

Controller connectors

The following illustration shows the onnectors on the controller.

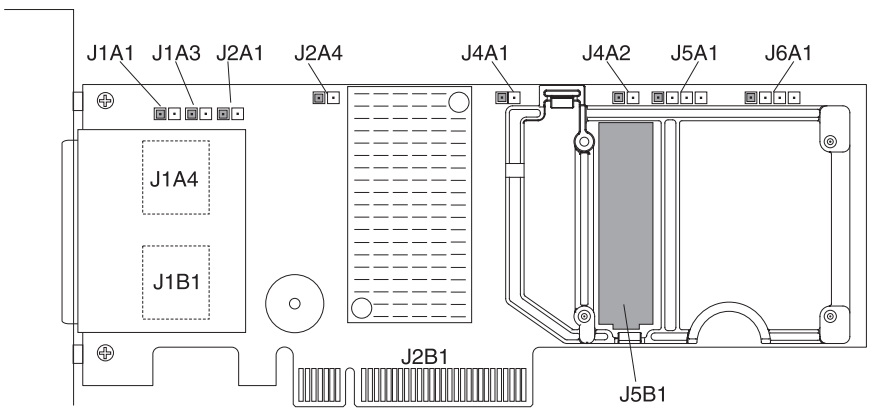
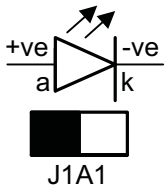
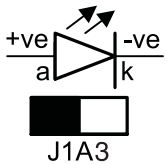


Figure 1. Controller connectors

Note: In Figure 1, pin 1 on each header and connector is shaded.

The connectors on the controller are described in Table 2 on page 4.

Table 2. Controller connectors

Jumper or connector	Type	Description
J1A1	Write pending LED header 	2-pin connector. Connects to an LED that indicates when the data in the cache is not written to the storage devices. Used when the write-back feature is enabled.
J1A3	Global drive fault LED header 	2-pin connector. Connects to an LED that indicates whether a drive is in a fault condition.
J1A4	x4 SAS ports 4 - 7 external connector	SFF-8088 x4 external mini-SAS connector. Connects the controller by cable to SAS drives or SATA III drives.
J1B1	x4 SAS ports 0 - 3 external connector	SFF-8088 x4 external mini-SAS connector. Connects the controller by cable to SAS drives or SATA III drives.
J2A1	Activity LED header	2-pin connector. Connects to an LED that indicates activity on the drives that are connected to the controller.
J2A4	I²O mode jumper	2-pin connector. Installing this jumper causes the controller to run in I²O mode. The default mode of operation is without the jumper and running in Fusion Mode.
J2B1	PCI Express standard edge connector	The controller interfaces with the host server through a standard edge connector. This interface provides power to the controller and an I²C interface that is connected to the I²C bus for IPMI.
J4A1	Serial EEPROM	2-pin connector. Provides controller information, such as the serial number, revision, and manufacturing date. The default is no jumper installed.
J4A2	Test header	2-pin connector. Reserved for IBM use.
J5A1	Serial universal asynchronous receiver/transmitter (UART) connector for the expander	4-pin connector. Reserved for IBM use.
J5B1	Transportable memory module DDR3 connector	240-pin connector. Connects the controller to the transportable memory module.
J6A1	Serial universal asynchronous receiver/transmitter (UART) connector for the expander	4-pin connector. Reserved for IBM use.

Handling the controller

Attention: Static electricity can damage the server and other electronic devices. To avoid damage, keep the controller in its static-protective package until you are ready to install it or change the bracket.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended but is not required. For example, wear an electrostatic-discharge wrist strap, if one is available.
- Handle the controller carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the controller where others can handle and damage it.
- While the controller is still in its static-protective package, touch it to an unpainted metal part of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- If you do not have to attach an expansion-slot bracket, remove the controller from its package and install it directly into the server without setting down the controller. If it is necessary to set down the controller, put it back into its static-protective package. Do not place the controller on the server cover or on a metal surface.
- If you have to attach an expansion-slot bracket, remove the controller from its package and place the controller on a flat, static-protective surface. Do not place the controller on the server cover or on a metal surface.
- Take additional care when you handle the controller during cold weather. Heating reduces indoor humidity and increases static electricity.
- To avoid damage to the server, always remove the controller from the PCIe slot before you relocate or ship the server.

Installing the controller

Before you install the controller, make sure that the preinstalled expansion-slot bracket is the correct size for the server PCI Express slot in which you are installing the controller.

Note: The expansion-slot opening is measured along the longest dimension and might be oriented horizontally in some servers.

The controller comes with a preinstalled expansion-slot bracket that is approximately 11 cm (4.3 in.) long. If the opening for the PCIe expansion slot is approximately 10 cm (4.0 in.) long, you will use the preinstalled bracket.

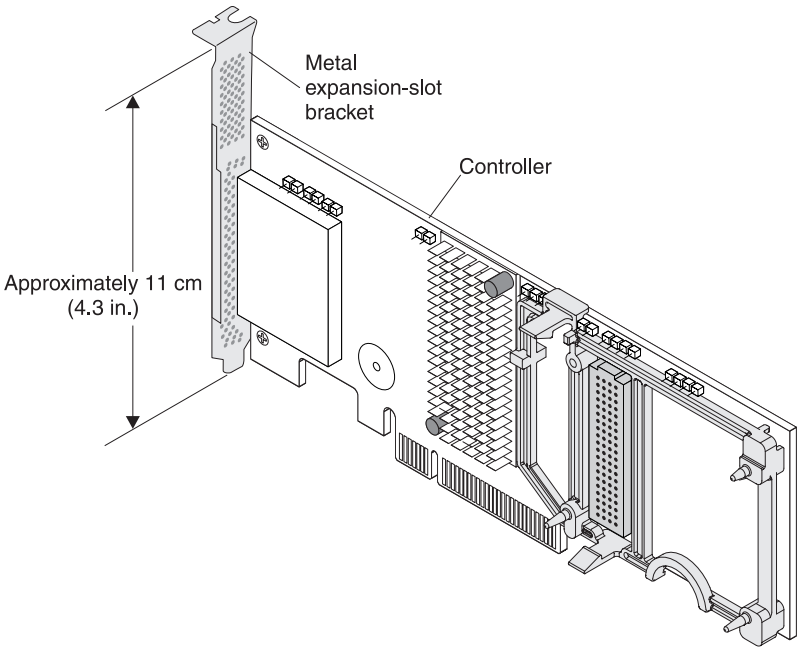
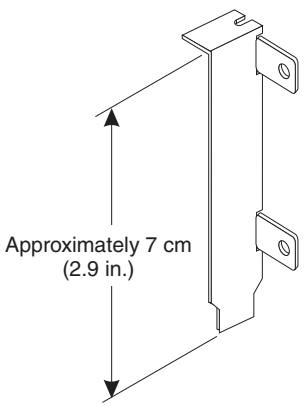


Figure 2. Controller with full-height expansion-slot bracket

The controller also comes with a low-profile expansion-slot bracket that is approximately 7 cm (2.9 in.) long. If the opening for the PCIe expansion slot is approximately 6 cm (2.3 in.) long, you must replace the preinstalled bracket with the low-profile bracket. You will do this in step 4 on page 7 in the following procedure.



To install the controller in a server, complete the following steps:

1. Read the safety information that comes with the controller.
2. Turn off the server and peripheral devices and disconnect the power cords. Remove the server cover. For more information, see the installation instructions that come with the server.
3. Touch the static-protective package that contains the controller to any unpainted surface on the outside of the server; then, grasp the controller by the top edge or upper corners, remove it from the package, and inspect it for damage. Contact your IBM marketing representative or authorized reseller if the controller appears to be damaged.
4. If you have to remove the preinstalled expansion-slot bracket and replace it with the low-profile bracket, complete the following steps; otherwise, go to step 6 on page 8.
   a. Orient the controller so that the gold-edge connector is on the bottom and the SAS ports are on the left, as shown in the following illustration.

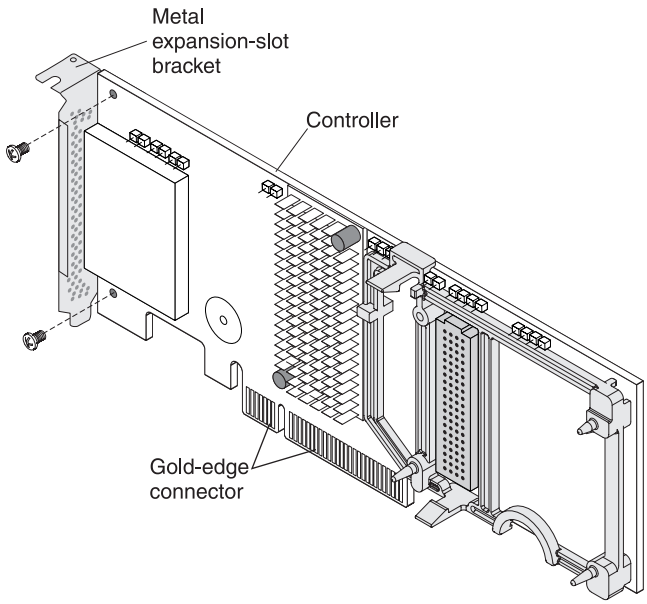


Figure 3. Attaching a low-profile expansion-slot bracket to the controller

   b. Remove the two screws that hold the bracket onto the controller.
   c. Lift the bracket from the controller and store the bracket in a safe place for possible reuse.
   d. Align the low-profile bracket so that the tabs are on the back side of the controller and the holes on the tabs align with the holes on the controller.
   e. From the front side of the controller, attach the bracket to the controller, using the two screws that you removed in step 4b.

5. Attach the transportable memory module to the controller. For detailed instructions, see the *Quick Installation Guide* that comes with the transportable memory module.
6. Depending on the server model, you might have to remove the expansion-slot cover for the selected PCIe slot. To remove the expansion-slot cover, you might have to remove the expansion-slot bracket screw. For detailed instructions for installing the controller in the server, see the *Installation and User's Guide* that comes with the server.
7. Position the controller by aligning the PCIe x8 connector (gold-edge connector) with the PCIe x8 slot on the system board. Insert the controller firmly into the connector. Replace the expansion-slot bracket screw if you removed it in step 6.

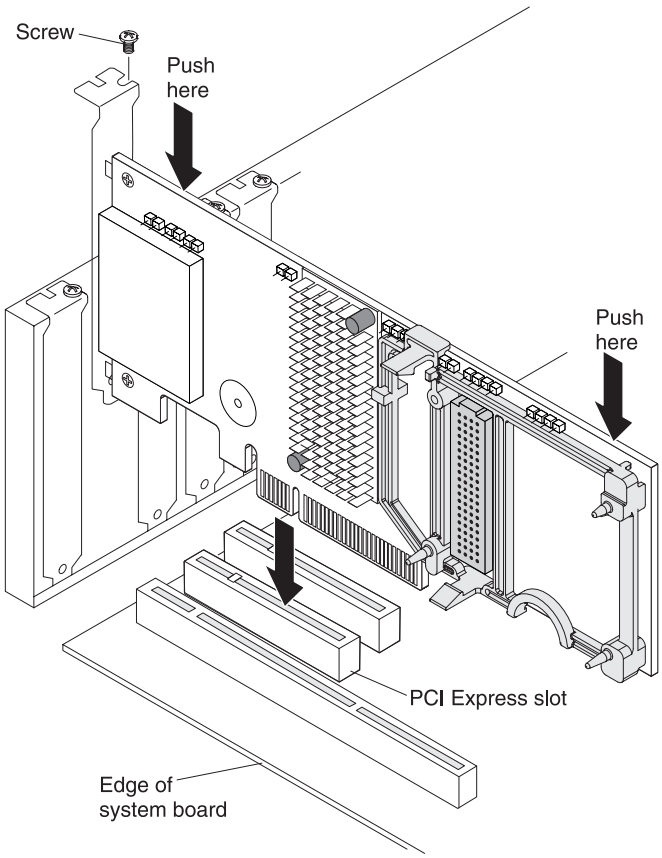


Figure 4. Installing the controller in the server

8. Configure and install the SAS, SATA, SATA II, and SATA III devices in the server. For preinstallation configuration requirements, see the documentation that comes with each device.
9. Connect the controller to the SAS, SATA, SATA II, and SATA III devices in the server. Use SAS cables to connect the controller to SAS and SATA devices. See Figure 1 on page 3 for the connector locations.
10. Replace the server cover, reconnect the power cords, and turn on the server.

    Notes:

    a. Make sure that the power is turned on to the SAS and SATA devices before or at the same time that the power is turned on to the server. If the power is turned on to the server before it is turned on to the devices, the server might not recognize the devices.

    b. The firmware takes several seconds to initialize. During this time, the controller scans the ports.

11. Use the Human Infrastructure Interface (HII) to configure the controller. To open the HII, turn on the server and when the prompt `<F1> Setup` is displayed, press F1. Select the HII from the menu.

    You can also run the WebBIOS Configuration Utility to configure the drive groups and the virtual drives. To run the utility, turn on the server and when the message `Press <Ctrl><H> for WebBIOS` is displayed on the screen, immediately press Ctrl+H.

    For detailed information about configuring drive groups and virtual drives, see the *ServeRAID M Software User's Guide* on the *ServeRAID M Documentation* CD.

12. Install the operating-system device driver.

    To view the operating systems that support the controller and to download the latest device drivers, go to http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/. For updates, go to http://www.ibm.com/supportportal/.

    Be sure to use the latest service pack for the operating system and review the readme file that accompanies the device driver. Be sure to install the software device drivers before you operate the controller.

Supported RAID levels

The controller supports drive groups by using the following RAID levels:

- **RAID 0 (data striping):** Data is striped across all drives in the group, enabling very fast data throughput. There is no data redundancy. All data is lost if any drive fails.
- **RAID 1 (drive mirroring):** Data is written simultaneously to both drives in the drive group, providing complete data redundancy if one drive fails. RAID 1 supports an even number of drives from 2 to 32 in a single span.
- **RAID 5 (drive striping with distributed parity):** Data is striped across all drives in the group. Part of the capacity of each drive stores parity information that reconstructs data if a drive fails. RAID 5 provides good data throughput for applications with high read request rates.
- **RAID 6 (drive striping with distributed parity across two drives):** Data is striped across all drives in the group, and two parity drives are used to provide protection against the failure of up to two drives. In each row of data blocks, two sets of parity data are stored.

  Note: To enable RAID 6 (or RAID 60) on the controller, you must purchase the ServeRAID M5100 Series RAID 6 Upgrade for IBM System x (IBM Features on Demand option).
- **RAID 10 (RAID 1 and RAID 0 in spanned groups):** Mirrored pairs of drives provide complete data redundancy. RAID 10 provides high data throughput rates.
- **RAID 50 (RAID 5 and RAID 0 in spanned groups):** Parity and drive striping across multiple drives provide complete data redundancy. RAID 50 provides high data throughput rates.

  For the requirements for enabling RAID 50, see the requirements for RAID 5.
- **RAID 60 (RAID 6 and RAID 0 in spanned groups):** Distributed parity across two parity drives and drive striping across multiple drives provide complete data redundancy and high fault tolerance.

  For the requirements for enabling RAID 60, see the requirements for RAID 6.

Note: For more information about RAID levels, see the *ServeRAID M Software User's Guide* on the *ServeRAID M Documentation* CD.

Replaceable components

Field replaceable units (FRUs) must be replaced only by a trained service technician, unless they are classified as customer replaceable units (CRUs).

Tier 1 CRU: Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request without a service contract, you will be charged for the installation.

Tier 2 CRU: You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your product.

For more information about the terms of the warranty and getting service and assistance, see the *Warranty Information* document that comes with the controller.

Table 3. Field replaceable units for the ServeRAID M5120 SAS/SATA Controller for IBM System x

Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number (trained service technician only)
ServeRAID M5120 SAS/SATA Controller for IBM System x	81Y4479		

Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/ to make sure that the hardware and software is supported by your IBM product.
- Go to http://www.ibm.com/supportportal/ to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (IBM 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs

- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at http://www.ibm.com/supportportal/. The address for IBM System x information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/systems/intellistation/.

How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

At http://www.ibm.com/support/mynotifications/, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
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