

Power Systems

Managing Operations Console

IBM

Power Systems

Managing Operations Console

IBM

Note

Before using this information and the product it supports, read the information in “Safety notices” on page v “Notices” on page 15,, the *IBM Systems Safety Notices* manual, G229-9054, and the *IBM Environmental Notices and User Guide*, Z125-5823.

This edition applies to IBM Power Systems™ servers that contain the POWER8 processor and to all associated models.

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Contents

Safety notices	v
Managing Operations Console	1
What's new in Managing Operations Console	1
Operations Console concepts	1
Local console on a network (LAN)	1
Planning for your Operations Console configuration	2
Operations Console considerations	2
General considerations for Operations Console	2
Considerations for systems not managed by an HMC	2
Considerations for systems managed by an HMC	3
Considerations for all servers	3
Adapter considerations	4
Determine the console by adapter location	4
Multiple console-capable adapters	4
External adapters	4
Configured console type	5
Dedicated adapter resource considerations	5
Console adapter placement	5
Preparing for the Operations Console environment	5
Console activation in D-mode	6
Backup console for IBM i	6
Operations Console hardware requirements	8
Operations Console default console port	8
Adapter requirements	8
PC processor and memory requirements	9
Operations Console software requirements	10
Control panel options	10
Control panel characteristics	11
Configuration information	11
Operations Console networking	11
Concepts for console networking	11
Bootstrap Protocol	12
Operations Console networking considerations for systems managed by an HMC	13
Setting up a console	13
Managing Operations Console	13
Troubleshooting Operations Console	14
Notices	15
Privacy policy considerations	16
Trademarks	17
Electronic emission notices	17
Class A Notices	17
Class B Notices	21
Terms and conditions	24

Safety notices

Safety notices may be printed throughout this guide:

- **DANGER** notices call attention to a situation that is potentially lethal or extremely hazardous to people.
- **CAUTION** notices call attention to a situation that is potentially hazardous to people because of some existing condition.
- **Attention** notices call attention to the possibility of damage to a program, device, system, or data.

World Trade safety information

Several countries require the safety information contained in product publications to be presented in their national languages. If this requirement applies to your country, safety information documentation is included in the publications package (such as in printed documentation, on DVD, or as part of the product) shipped with the product. The documentation contains the safety information in your national language with references to the U.S. English source. Before using a U.S. English publication to install, operate, or service this product, you must first become familiar with the related safety information documentation. You should also refer to the safety information documentation any time you do not clearly understand any safety information in the U.S. English publications.

Replacement or additional copies of safety information documentation can be obtained by calling the IBM Hotline at 1-800-300-8751.

German safety information

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Laser safety information

IBM® servers can use I/O cards or features that are fiber-optic based and that utilize lasers or LEDs.

Laser compliance

IBM servers may be installed inside or outside of an IT equipment rack.

DANGER: When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied the power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
 - For AC power, disconnect all power cords from their AC power source.
 - For racks with a DC power distribution panel (PDP), disconnect the customer's DC power source to the PDP.
- When connecting power to the product ensure all power cables are properly connected.

- For racks with AC power, connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- For racks with a DC power distribution panel (PDP), connect the customer's DC power source to the PDP. Ensure that the proper polarity is used when attaching the DC power and DC power return wiring.
- Connect any equipment that will be attached to this product to properly wired outlets.
- 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.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.

DANGER:

- Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

To Disconnect:

1. Turn off everything (unless instructed otherwise).
2. For AC power, remove the power cords from the outlets.
3. For racks with a DC power distribution panel (PDP), turn off the circuit breakers located in the PDP and remove the power from the Customer's DC power source.
4. Remove the signal cables from the connectors.
5. Remove all cables from the devices.

To Connect:

1. Turn off everything (unless instructed otherwise).
2. Attach all cables to the devices.
3. Attach the signal cables to the connectors.
4. For AC power, attach the power cords to the outlets.
5. For racks with a DC power distribution panel (PDP), restore the power from the Customer's DC power source and turn on the circuit breakers located in the PDP.
6. Turn on the devices.

Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

(R001 part 1 of 2):

DANGER: Observe the following precautions when working on or around your IT rack system:

- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices. In addition, do not lean on rack mounted devices and do not use them to stabilize your body position (for example, when working from a ladder).



- Each rack cabinet might have more than one power cord.
 - For AC powered racks, be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
 - For racks with a DC power distribution panel (PDP), turn off the circuit breaker that controls the power to the system unit(s), or disconnect the customer's DC power source, when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

(R001 part 2 of 2):

CAUTION:

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers.)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.



- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

CAUTION:

Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building.

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions:
 - Remove all devices in the 32U position (compliance ID RACK-001 or 22U (compliance ID RR001) and above.
 - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
 - Ensure that there are little-to-no empty U-levels between devices installed in the rack cabinet below the 32U (compliance ID RACK-001 or 22U (compliance ID RR001) level, unless the received configuration specifically allowed it.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
 - Lower the four leveling pads.
 - Install stabilizer brackets on the rack cabinet.
 - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

(L001)



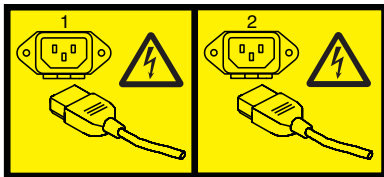
DANGER: Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label. (L001)

(L002)

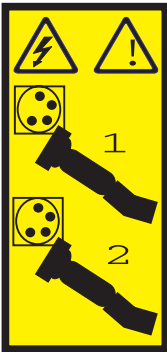


DANGER: Rack-mounted devices are not to be used as shelves or work spaces. (L002)

(L003)



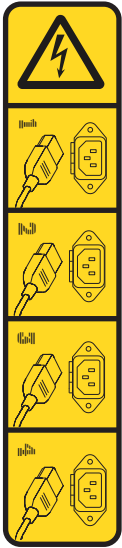
or



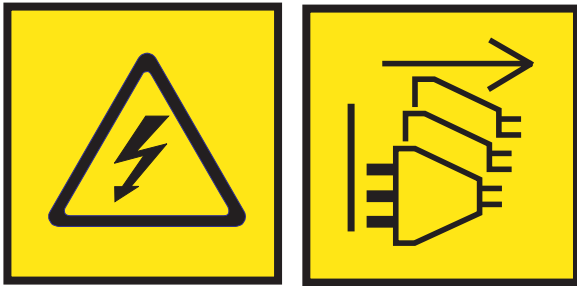
or



or



or



DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(L007)



CAUTION: A hot surface nearby. (L007)

(L008)



CAUTION: Hazardous moving parts nearby. (L008)

All lasers are certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter J for class 1 laser products. Outside the U.S., they are certified to be in compliance with IEC 60825 as a class 1 laser product. Consult the label on each part for laser certification numbers and approval information.

CAUTION:

This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

(C026)

CAUTION:

Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. Although shining light into one end and looking into the other end of a disconnected optical fiber to verify the continuity of optic fibers many not injure the eye, this procedure is potentially dangerous. Therefore, verifying the continuity of optical fibers by shining light into one end and looking at the other end is not recommended. To verify continuity of a fiber optic cable, use an optical light source and power meter. (C027)

CAUTION:

This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

CAUTION:

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following information: laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam. (C030)

CAUTION:

The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (C003)

CAUTION:

Regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only.
- LIFT TOOL intended for use to assist, lift, install, remove units (load) up into rack elevations. It is not to be used loaded transporting over major ramps nor as a replacement for such designated tools like pallet jacks, walkies, fork trucks and such related relocation practices. When this is not practicable, specially trained persons or services must be used (for instance, riggers or movers).
- Read and completely understand the contents of LIFT TOOL operator's manual before using. Failure to read, understand, obey safety rules, and follow instructions may result in property damage and/or personal injury. If there are questions, contact the vendor's service and support. Local paper manual must remain with machine in provided storage sleeve area. Latest revision manual available on vendor's web site.
- Test verify stabilizer brake function before each use. Do not over-force moving or rolling the LIFT TOOL with stabilizer brake engaged.
- Do not move LIFT TOOL while platform is raised, except for minor positioning.
- Do not exceed rated load capacity. See LOAD CAPACITY CHART regarding maximum loads at center versus edge of extended platform.
- Only raise load if properly centered on platform. Do not place more than 200 lb (91 kg) on edge of sliding platform shelf also considering the load's center of mass/gravity (CoG).
- Do not corner load the platform tilt riser accessory option. Secure platform riser tilt option to main shelf in all four (4x) locations with provided hardware only, prior to use. Load objects are designed to slide on/off smooth platforms without appreciable force, so take care not to push or lean. Keep riser tilt option flat at all times except for final minor adjustment when needed.
- Do not stand under overhanging load.
- Do not use on uneven surface, incline or decline (major ramps).
- Do not stack loads.
- Do not operate while under the influence of drugs or alcohol.
- Do not support ladder against LIFT TOOL.
- Tipping hazard. Do not push or lean against load with raised platform.
- Do not use as a personnel lifting platform or step. No riders.
- Do not stand on any part of lift. Not a step.
- Do not climb on mast.
- Do not operate a damaged or malfunctioning LIFT TOOL machine.
- Crush and pinch point hazard below platform. Only lower load in areas clear of personnel and obstructions. Keep hands and feet clear during operation.
- No Forks. Never lift or move bare LIFT TOOL MACHINE with pallet truck, jack or fork lift.
- Mast extends higher than platform. Be aware of ceiling height, cable trays, sprinklers, lights, and other overhead objects.
- Do not leave LIFT TOOL machine unattended with an elevated load.
- Watch and keep hands, fingers, and clothing clear when equipment is in motion.
- Turn Winch with hand power only. If winch handle cannot be cranked easily with one hand, it is probably over-loaded. Do not continue to turn winch past top or bottom of platform travel. Excessive unwinding will detach handle and damage cable. Always hold handle when lowering, unwinding. Always assure self that winch is holding load before releasing winch handle.
- A winch accident could cause serious injury. Not for moving humans. Make certain clicking sound is heard as the equipment is being raised. Be sure winch is locked in position before releasing handle. Read instruction page before operating this winch. Never allow winch to unwind freely. Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury. (C048)

Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The following comments apply to the IBM servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE:

The equipment is suitable for installation in the following:

- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metalically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metalically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

The dc-powered system is intended to be installed in a common bonding network (CBN) as described in GR-1089-CORE.

Managing Operations Console

Operations Console is an installable component of the IBM i licensed program. It allows you to use one or more PCs to access and control, either remotely or locally, console and control panel functions.

Related information:

 [Managing the Advanced System Management Interface \(ASMI\)](#)

What's new in Managing Operations Console

Read about new or significantly changed information in Managing Operations Console since the previous update of this topic collection.

April 2017

- Updated the “Adapter requirements” on page 8 topic to include information about the 9119 and 9080 machine type and model (MTM).

Operations Console concepts

You can use Operations Console to manage IBM i in a logically partitioned or nonpartitioned environment.

IBM i Access Client Solutions provides 5250 console and Virtual Control Panel capability for Linux, Mac, and Windows environments. For more information, see IBM i Access (<http://www-03.ibm.com/systems/power/software/i/access/solutions.html>).

In a logically partitioned environment, you might want to use the Hardware Management Console (HMC) or the Advanced System Management Interface (ASMI) to access your hardware.

You can configure a 5250 console emulator using either IBM i Access Client Solutions, IBM i Access for Windows, or IBM Personal Communications. You can also configure a virtual control panel to emulate the servers control panel on a PC.

Operations Console works well when the system has several logical partitions and requires high availability. The Operations Console is able to distribute the consoles for these partitions over multiple PCs. If a problem occurs with Operations Console or console-related hardware, the HMC can be made the backup console to quickly retrieve a console.

Local console on a network (LAN)

Use a local console on a network (LAN) to manage multiple servers or logical partitions from one console. For this configuration, you will need a secured network that you can configure your console on. Advantages include the following items:

- You can configure a single PC to be the console for several different servers or logical partitions, as long as they are connected to the network.
- The administrator will not need to be located near the server to manage Operations Console.
- Security features are available to protect your Operations Console connections.

Note: Multiple PCs can be configured as the Operations Console to a server or logical partition, but only one can be active at a time.

Related concepts:

“Backup console for IBM i” on page 6

To quickly recover from the unexpected loss of the console that manages the IBM i operating system, you might want to consider a backup console.

Related reference:

“Operations Console hardware requirements” on page 8

For correct Operations Console configurations, verify that you have satisfied the server, adapter, cable, and PC requirements.

Planning for your Operations Console configuration

You can make important planning decisions to enable your Operations Console to effectively manage one or more servers.

Operations Console considerations

If you plan ahead, you can include additional features in your Operations Console configuration.

General considerations for Operations Console

Whether or not you have an HMC, there are several important factors to consider when planning to use Operations Console for one or more servers.

Important: Systems running the IBM i operating system start counting logical partitions with the number 1 (even if it is the only logical partition) instead of a 0. For the console to connect correctly, your client configuration must match the logical partition number. This is important if you rely on the BOOTP process to configure the server with its network data.

Considerations for systems not managed by an HMC:

If your system is not managed by an HMC, consider some important factors where you are planning to use Operations Console to manage one or more servers.

Review the following list for important considerations:

- Operations Console now defaults to the first embedded Ethernet port as the default console port, which includes the Host Ethernet Adapter (HEA). This includes the PCIe adapters 5899, 5260, 5767 and 5768 PCIe 1000/100/10 Mbps Ethernet IOAs. The default port, on the embedded port or HEA is always the first port. This is usually the top, or right-most port. However, the server will not check for the external adapter unless support for the default embedded Ethernet port has been disabled. You can disable support for the default embedded Ethernet port or external Ethernet adapters. For more information about external Ethernet adapters, see external Ethernet adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm).
- Servers without an enabled embedded Ethernet port use the location of the console's adapter to determine the eligibility for a console.
- When a LAN adapter is available for use as a console when another console connectivity has been configured by location, and the LAN adapter has a valid configuration, then the system will activate this adapter for console or service tools server use.

Related concepts:

“Determine the console by adapter location” on page 4

If your system is not managed by a Hardware Management Console (HMC), and the embedded Ethernet port is disabled, the console-supporting hardware must be located in specific slot locations based on your server model.

“Multiple console-capable adapters” on page 4

For systems that are not managed by an HMC, multiple I/O adapters (IOAs) capable of supporting a console workstation can interfere with the selection of the LAN adapter that you want.

Considerations for systems managed by an HMC:

If your system is managed by an HMC, a Host Ethernet Adapter logical port or an input/output adapter (IOA) must be tagged for the console to work properly.

Important: Systems running the IBM i operating system start counting logical partitions with the number 1 (even if it is the only logical partition) instead of a 0. For the console to connect correctly, your client configuration must match the logical partition number. This is important if you rely on the BOOTP process to configure the server with its network data.

Considerations for all servers:

Whether or not your system is managed by an HMC, consider some important factors when you are planning to use Operations Console to manage one or more servers.

Review the following list for important considerations:

- The external adapters are available for use with the Operations Console. For more information about external Ethernet adapters, see external Ethernet adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm).
- Only the configured console type is supported.
- A dedicated adapter resource is no longer required to support a console.
- When planning for multiple LAN-connected PCs, designate one PC to be used as the console to your server or logical partition during a recovery installation. If the console takeover and recovery is enabled, you do not need to designate a separate recovery PC.
- The service tools server interface is automatically configured when Operations Console (LAN) is configured.
- Only Operations Console (LAN) and HMC console can perform a takeover.
- When Operations Console (LAN) is used in an environment with multiple LAN-connected PCs attempting to connect at the same time, the PC that successfully connects first will be the console.
- Coexistence between different console types is allowed.
- A maximum of 26 emulator sessions is available for each PC.
- Multiple consoles and multiple servers can be used.
- Console activation is determined differently in D-mode.
- The supported console options for IBM i are LAN and HMC.

Related concepts:

“External adapters” on page 4

The 2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter (5767), 2-Port Gigabit Ethernet-SX PCI Express Adapter (5768), PCIe2 LP 4-port 1GbE Adapter (5260) and PCIe2 4-port 1GbE Adapter (5899) do not require an IOP and are available for use with the Operations Console.

“Configured console type” on page 5

How a console type is specified depends on whether the system is managed by a Hardware Management Console (HMC) or not.

“Dedicated adapter resource considerations” on page 5

The service interface is a single adapter used for the service tools server.

“Console adapter placement” on page 5

You can use a dedicated IOP for the console adapter and a dedicated IOP for the storage devices to reduce possible connectivity problems on systems where an IOP is needed to support the LAN adapter.

“General considerations for Operations Console” on page 2

Whether or not you have an HMC, there are several important factors to consider when planning to use Operations Console for one or more servers.

Adapter considerations

There are many considerations to plan for regarding adapters for your Operations Console environment.

Determine the console by adapter location:

If your system is not managed by a Hardware Management Console (HMC), and the embedded Ethernet port is disabled, the console-supporting hardware must be located in specific slot locations based on your server model.

For Operations Console (LAN), there might be more than one location that can support a console. When more than one location is available for a server model, the locations are listed from highest priority to lowest priority when the console searches for console-capable hardware resources.

The console service functions (65+21) and the OPSCONSOLE macro have support to designate a particular adapter.

Also, the external Ethernet adapters are able to run without an IOP. You can also use the OPSCONSOLE macro or the console service functions (65+21) to disable this support. For more information about external Ethernet adapters, see external Ethernet adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm).

To know about using the OPSCONSOLE macro or the console service functions (65+21), complete the following steps:

1. Go to IBM i and System i® Information Center (<http://www.ibm.com/systems/i/infocenter>) and select from the following options:
 - If you select **i 7.2**, expand **IBM i 7.2 Information Center**.
 - If you select **i 7.1**, expand **IBM i 7.1 Information Center**.
2. Select the required IBM i version:
 - If you select **i 7.2**, expand **Connecting to your system > IBM i Access > IBM i Access Client Solutions > Console Advanced Topics > Managing Operations Console > Managing your local console on a network**.
 - If you select **i 7.1**, expand **Connecting to your system > IBM i Access > IBM i Access for Windows > Operations Console > Managing Operations Console > Managing your local console on a network**.

Multiple console-capable adapters:

For systems that are not managed by an HMC, multiple I/O adapters (IOAs) capable of supporting a console workstation can interfere with the selection of the LAN adapter that you want.

Consider the following:

- The server attempts to use the first, or only, console IOA based on the current console type value.
- If your server model supports a second adapter location for LAN and has a LAN adapter installed, a problem with the first adapter might cause the server to use the second LAN adapter for the console, making it unavailable for use by IBM i.

The console service functions (65+21) and the **OPSCONSOLE** macro have support to designate a particular adapter which solves these issues.

External adapters:

The 2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter (5767), 2-Port Gigabit Ethernet-SX PCI Express Adapter (5768), PCIe2 LP 4-port 1GbE Adapter (5260) and PCIe2 4-port 1GbE Adapter (5899) do not require an IOP and are available for use with the Operations Console.

If your system is managed by an HMC, the external adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm) can be located in any of the remaining slots specific to the adapter. This assumes that your sever supports this type of operation.

If your system is not managed by an HMC, the external adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm) must be located in one of the designated card locations that supports a local console on a network (LAN). Only the first port of this adapter can be used for the console.

If you elect to use this adapter instead of the default embedded Ethernet port, you must disable the embedded port before the system can use the adapter.

Configured console type:

How a console type is specified depends on whether the system is managed by a Hardware Management Console (HMC) or not.

If a console type is not specified, such as when a new logical partition is being created, the supporting hardware tagged by the HMC is used. If the system is not managed by an HMC, then the console is determined by any eligible adapters by location. If more than one eligible adapter is found, then the first connected device determines the console.

If a LAN is the only available connectivity, you must use the console service functions (65+21) of the control panel to change the console type value. The console type value 03-LAN set by the control panel overrides the console type that is set by the first connected device.

Dedicated adapter resource considerations:

The service interface is a single adapter used for the service tools server.

The service interface adapter is a network adapter that supports either a local console on a network (LAN operations console) or the service tools server (STS). It can support a LAN console, the service tools server, or both.

Occasionally the adapter is not used for the LAN console but only used to support the System i Navigator interface for hard disk drive configuration or similar functions. With IBM i 6.1, the service interface can be shared with an IBM i line description, therefore sharing the same interface. LAN console and *SRVLAN adapter can share the same physical interface.

Console adapter placement:

You can use a dedicated IOP for the console adapter and a dedicated IOP for the storage devices to reduce possible connectivity problems on systems where an IOP is needed to support the LAN adapter.

If possible, do not place your console adapter on the same IOP as storage devices. During heavy use of storage devices, the console might appear to temporarily stop working. If this happens, it should resume operation shortly. If you must place the console adapter on shared resources, keep the other uses to a minimum for better console reliability. Also, enable the console option, **Allow console recovery and console can be taken over by another console** so that the console automatically reconnects.

Note: IOPs are not supported on POWER8® processor-based servers.

Preparing for the Operations Console environment

There are many ways that you can optimize your Operations Console environment.

Console activation in D-mode:

When a logical partition is initially set up, you must tag a Host Ethernet Adapter logical port or an IOA for **console**, and in the case of local consoles that are directly attached, the **Operations Console** tag.

The system uses this information to search for a console. Only this resource is activated and the system uses the first connected device as the console to restore the Licensed Internal Code (LIC). You might also see a window where you are asked for confirmation for selecting the console type value. If needed, you can use this console to change to another console.

If the console fails to connect, you can use the HMC command window to tag another resource.

Consider the following based on the configuration of your server:

Servers without an HMC


Any scenario where the console type (value) is not read from the load-source, Example: A new system which isn't pre-loaded or a hard-disk-drive replacement without a good copy from old to new. If this is the case, then all eligible adapters, by location, can support a console, except LAN. If LAN is the only available connectivity, then you need to use the control panel to perform the console service functions (65+21) to change the console type value to 03 LAN console. Also, if there isn't an embedded Ethernet adapter, you will need to disable it. And if there are multiple LAN adapter you will need to select the correct slot using the console service function (65+21)+Bn for card selection.

Logical partitions

When a logical partition is initially set up, you have to tag an IOA for **console**. The system uses this information to search for a console. Only this resource is activated and the system uses the first connected device as the console to restore the Licensed Internal Code (LIC). The data used to restore the LIC determines if you need to set the console type value following the restoration of the code. You can also get a display asking for confirmation for selecting the console type value. If needed, you can use this console to change to another console.

If the console fails to connect, you can use the HMC command window to tag another resource. Tagging the IOA in the partition profile automatically sets the console type during the next activation following the partition profile update. An initial program load (IPL) will not read the changed partition profile.

Related information:

 Changing consoles

Backup console for IBM i:

To quickly recover from the unexpected loss of the console that manages the IBM i operating system, you might want to consider a backup console.

Considerations for a backup console:

Many system plans include a level of redundancy to allow for hardware failures, but some do not consider the console in those plans.

Consider the following items when planning for a backup console.

- Consider using the takeover and recovery function as part of your backup console strategy. However, the hardware used for the Operations Console must be installed prior to the recovery.
- If your system is managed by a Hardware Management Console (HMC), you can tag a Host Ethernet Adapter logical port or an IOA as the console device.
- On large multi-partitioned systems or high-availability systems, use Operations Console (LAN) as the system console for each system or logical partition. In the event of a console failure, you can switch to

the HMC 5250 console without having to verify you have additional hardware in place. Most changes of a console to HMC are performed without the need for an IPL.

Related concepts:

“Operations Console considerations” on page 2

If you plan ahead, you can include additional features in your Operations Console configuration.

Verify your system is ready for a backup console:

Recovering from the loss of a console depends on many factors, some of which include the model, the hardware resources available, the previous console type, and the intended console type.

Recovery might consist of repairing the currently failed console or temporarily replacing it with another console type. Most changes of a console type can be performed without the need for an initial program load (IPL), but there might be circumstances in which an IPL is necessary. Before you use the console service functions (65+21), verify the following:

- For systems that are not managed by an HMC, verify that the console hardware is installed and available.
- For systems managed by an HMC, verify that the appropriate console resources are tagged in the partition profile.

If you plan to use a local console on a network (for example, a LAN) as a backup for another console type, verify that a network adapter, or the Host Ethernet Adapter logical port, is available for console use. You can still configure the service tool server on an adapter. Then if you need the LAN console, you can just connect the Operation Console to the IP that is configured.

Related concepts:

“Operations Console networking” on page 11

Learn about the minimum network configuration requirements for setting up a local console on a network (LAN).

Possible backup console configurations:

It is important to consider as much redundancy as possible for your console needs.

If you consider "what if this fails?" and you have another method to provide a console, you can reduce your exposure to an unrecoverable console failure condition. You might need to make adjustments to your hardware requirements to address a potential console failure.

Several backup console configurations can fit your environment. The following table lists possible solutions.

Table 1. Possible backup console configurations

If	Then
If your server is accessed remotely	consider an off-site console capability or another connectivity for the console. A local console on a network (LAN) can be backed up with additional local console on a network (LAN) PC's.
If your system is configured with an HMC, but you are running Operations Console	you can quickly switch to the HMC 5250 console if Operations Console fails, without having to change hardware.
If you are using multiple local consoles on a network (LAN) on a single PC	consider additional PC's using this same type of configuration. Important: The PC resources can become overwhelmed when supporting multiple consoles and remote control panels.

Table 1. Possible backup console configurations (continued)

If	Then
If you are using multiple local consoles on a network (LAN) on multiple PC's	<ul style="list-style-type: none"> • consider assigning each PC a core set of console responsibilities and then overlap coverage of backup configurations with each other. For example, if you have a PC that supports 10 local consoles on a network (LAN) and another PC with the same number of primary consoles for another 10 logical partitions, instead of backing up each PC with the other's configuration, you add a third PC and distribute the 20 consoles so that two PC's back up a portion of each PC's primary console configurations. • consider having a dedicated PC to be the backup of a certain number of consoles, but not connect it until necessary.

Note: If more than one local console on a network (LAN) is planned, you no longer need to create additional service tools device ID's on the server before you start configuring the Operations Console PC. Each PC connecting to the same target server or logical partition must have a unique service tools device ID and will be given an auto-created service tools device ID upon connecting. A device ID is not required when you are using the IBM i Access Client Solutions to connect the Operations Console PC. If you are using Client Access Operations Console, then a device ID is required. The Client Access Operations Console is supported up to version 7.1. From version 7.2 onwards, IBM i Access Client Solutions is recommended.

Operations Console hardware requirements

For correct Operations Console configurations, verify that you have satisfied the server, adapter, cable, and PC requirements.

Important: Systems running the IBM i operating system start counting logical partitions with the number 1 (even if it is the only logical partition) instead of a 0. For the console to connect correctly, your client configuration must match the logical partition number. This is important if you rely on the BOOTP process to configure the server with its network data.

Operations Console default console port

Operations Console defaults to the first embedded Ethernet port or the first port of an Ethernet adapter as the default console port in systems that are not managed by a Hardware Management Console (HMC) if your system has an embedded Ethernet port.

The Operations Console default console port is usually the top or right-most physical port and includes the I/O adapters (IOA) adapters.

Preloaded systems without an embedded Ethernet port have the embedded Ethernet disabled. If the logical server is replaced and the server is without a working Operation Console, the console service function (65+21) must be used to disable the embedded port.

Adapter requirements

Depending on your configuration, there are many different adapters you can use.

If your system is managed by a Hardware Management Console (HMC), use the HMC to designate hardware resources.

Operations Console (LAN) supports the following adapters:

- PCIe2 2-port 1GbE Adapter (FCs 5767 and 5768)

- PCIe2 4-port 1GbE Adapter (FCs 5260 and 5899)
- PCIe3 4-port 10GbE SR Adapter (FCs EN15 and EN16)
- PCIe3 4-port 10GbE SFP+ Adapter (FCs EN17 and EN18)

These adapters can be filled in the PCI Express (PCIe) slots.

The following table contains console-supporting adapter locations when the system is not managed by an HMC.

Table 2. Console-supporting adapter locations when the system is not managed by an HMC

System type	System model	Local console on a network (LAN)
8284	21A	C6, C7, C9, C10, C11, and C12
8286	41A	C6, C7, C8, C9, C10, C11, and C12 ¹
8286	42A	C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, and C12 ¹
9119	MHE MME	<ul style="list-style-type: none"> • System node drawers - C1, C2, C3, C4, C5, C6, C7, and C8¹ • I/O expansion drawers - C1, C2, C3, C4, C5, and C6^{1, 2}
9080	MHE MME	<ul style="list-style-type: none"> • System node drawers - C1, C2, C3, C4, C5, C6, C7, and C8¹ • I/O expansion drawers - C1, C2, C3, C4, C5, and C6^{1, 2}
Note:		
<ol style="list-style-type: none"> 1. Use local macro or console service function (65+21) +Bn for card selection, where the value of <i>n</i> can be 1 - 9 or A - Z. 2. The I/O expansion drawers have 6 PCI slots in each of the two modules. 		

These systems do not support a remote control panel that is directly attached to the server. However, you can use the virtual control panel connected over LAN for most control panel functions.

For the 9119 or 9080 systems, the location of the PCI slots can be represented as *Py-Cx*, where:

- *Py* is the planar location label of the system node backplane or the expansion drawer PCI module.
- *Cx* is the slot location label in the system node or in the expansion drawer PCI module.

For more information on placement rules, see **PCIe adapter placement rules and slot priorities for the 9080-MHE, 9080-MME, 9119-MHE, or 9119-MME system** (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_87x_88x_slot_details.htm).

When the system is not managed by an HMC, the LAN console IOA must be in the same system node drawer or in the same I/O expansion drawer PCI module (same *Py* location value) as the alternate load source (ALS) IOA. The LAN console IOA can be in any of the available system drawer or expansion drawer slots listed in the above table for this system type.

PC processor and memory requirements

Depending on your operating system, the processor and memory requirements for your console PC can vary.

Use the following table to ensure that your PC is ready for Operations Console.

Table 3. Processor and memory requirements

Operating system	Operations Console PC
Microsoft Windows Vista (Local console on a network (LAN) configuration only)	<ul style="list-style-type: none"> • Pentium 800 MHz • 512 MB memory minimum
Microsoft Windows 7	No specific requirements

Operations Console software requirements

Review the supported operating systems and other software requirements to correctly run your Operations Console.

IBM i Access Client Solutions supports 5250 console and virtual control panel connections from a PC running Linux, Mac, and Windows environments. Java™ 6, or later must be pre-installed.

Microsoft Windows environments can use PC5250 in IBM i Access for Windows (7.1) or IBM Personal Communications (V5.7 CSD1, or later) to make a 5250 console connection from a PC running Windows 7.

Note: If you use software that enables Sockets Secure (SOCKS) on your PC (the PC accesses the Internet through a firewall, such as Microsoft Proxy Client, Hummingbird SOCKS Client, NEC SOCKS 5, or others), you cannot route the subnet for 192.168.0.0 to the firewall. Operations Console uses addresses 192.168.0.0 - 192.168.0.255. Incorrect routing causes Operations Console to fail. Check your SOCKS configuration and verify that the entry is:

```
Direct 192.168.0.0 255.255.255.0
```

Use the Operations Console properties window to change the IP base address from 192.168.0.2. For example, you can use 192.168.1.2.

Data encryption for a local console on a network (LAN)

Operations Console network connections use a version of Secure Sockets Layer (SSL), which supports device and user authentication without using certificates. By default, Operations Console uses the strongest encryption possible for authentication and data.

Related reference:

“Operations Console hardware requirements” on page 8

For correct Operations Console configurations, verify that you have satisfied the server, adapter, cable, and PC requirements.

Control panel options

Use the IBM Virtual or Remote Control Panel to use control panel functions through a PC.

There are two control panel options available:

- Virtual Control Panel that is available in IBM i Access Client Solutions.
- Remote Control Panel that is available as part of the Operations Console feature in IBM i Access for Windows.

You can perform most of the control panel functions available on a physical IBM i control panel from a local or remote PC using one of the above options. Virtual Control Panel is capable of connecting to a LAN or to an HMC-configured console. The Remote Control Panel option is only available for LAN-configured consoles.

All user IDs that require access must be given the appropriate authority. The user must be granted access to the control panel of a logical partition and access to the functions to use the partition control panel

key. The partition control key controls the operation mode of a control panel. If the control panel is in manual mode, the user-privilege operator-panel function is required to perform a function or operation. To change the mode, you must authenticate the connection and you must have the authority to the respective logical partition's keylock.

The Remote control panel option uses device IDs. Automatically created device IDs do not have access to the remote control panel. You must manually grant access to users and service tools device IDs for the remote control panel and the logical partition. By default, user-created device IDs have these permissions. All user IDs that require access must be given the appropriate authority and device IDs.

The default access to the remote control panel for the automatically created device IDs can be changed in the Dedicated Service Tools (DST) (<http://www.ibm.com/support/knowledgecenter/POWER8/p8eaj/dst.htm>). Log in to DST by using the service tools user ID. For more information, see *Work with service tools user IDs* (<http://www.ibm.com/support/knowledgecenter/POWER8/p8eaj/chgdst.htm>) or the DST can also be activated by using the operation panel function 21. For more information, see *Selecting function 21 from the control panel* (http://www.ibm.com/support/knowledgecenter/POWER8/p8eaj/pxect_x21.htm).

Control panel characteristics

The graphical user interface of the control panel offers similar functions as the physical control panel.

The control panel has the following characteristics:

- You can use the control panel interface to perform most of the functions as the physical control panel.
- You can use the control panel interface to restart and power off the server.

Note: Control panel interface cannot be used to power up the server.

Configuration information

Determine the control panel configuration for your environment.


Use the following information while configuring your control panel environment:

- Consider using IBM i Access Client Solutions for connecting a 5250 console and or a Virtual Control Panel to a LAN or HMC configured console.
- If you want to use the control panel option in IBM i Access for Windows to connect to a LAN based console, you will need to use *Properties* to select the control panel option.
- You must use a Hardware Management Console (HMC) to manage logical partitions. To work with logical partitions remotely, see *Logical partition overview* (http://www.ibm.com/support/knowledgecenter/POWER8/p8hat/p8hat_lpchoices.htm).

Note: You cannot use the control panel to activate a logical partition and you cannot directly connect a control panel cable to the server.

- Remote control panel is unavailable in a configuration where the device ID is not authorized. After the configuration is authorized, it is displayed in the **Properties** screen the next time you connect.

Related information:

 [Logical partitioning overview](#)

Operations Console networking

Learn about the minimum network configuration requirements for setting up a local console on a network (LAN).

Concepts for console networking

Consider configuring a local console on a network (LAN) in a network that is separate from the main network or the company intranet. Also consider strictly controlling access to the console.

You also might want to restrict LAN topologies for LAN-attached local consoles to a single, physical router environment. This could be accomplished in several ways, including connecting the PC and server using an inexpensive hub or router, using an Ethernet crossover cable (when using a 2849) or any Ethernet cable if you are using the Host Ethernet Adapter or the external network adapters (http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzajr/rzajrhardwarereq.htm). If you only have a single PC or small number of devices connected to the server using a router, switch, or hub, and these devices do not connect to another network or the Internet, you can then use any numeric numbers for addresses. For example, use 1.1.1.x or 10.220.215.x (where x can be 2 through 255).

Note: Avoid x.x.x.1, which might cause problems in some networks.

If the local console on a network (LAN) is used in a larger network topology, or the devices go to the Internet, use DHCP packet filtering and consult a network administrator for addresses.

Bootstrap Protocol

Starting with IBM i 7.1, Operations Console includes the automatic discovery of a connection between the system and a PC. However, you can still perform a standard BOOTP operation on the system and PC.

The automatic discovery function is referred to as VSDISCOVER, and is unique to Operations Console. Both the system and PC detect a special broadcast frame from the network and when received, there is a negotiation using ports 67 and 68. The system and PC can use the data exchanged to configure itself, if needed. In addition, the PC creates a configured connection that you can use to start a console session. The VSDISCOVER function is the default mechanism for configuring a connection. The BOOTP process is still used when VSDISCOVER is not necessary, such as when you already have a configured connection and the network data needs to be reset.

A local Operations Console on a network uses the Bootstrap Protocol (BOOTP) to configure the server service IP communications stack. The IP stack configuration, plus server serial number and partition ID, is requested in the Operations Console configuration wizard. The server broadcasts a BOOTP request. The Operations Console PC replies with the information submitted during the configuration wizard. The server then stores and uses the configuration information for the service IP communications stack.

The Operations Console PC must be placed on a network that is accessible by the server. This can be the same physical network or a network that permits broadcast packets to flow. This is an initial setup requirement; typical Operations Console operation does not require this. This setup should occur on the same physical network.

The BOOTP request carries the server serial number and partition ID. The server serial number and partition ID are used to assign the IP configuration information. If you are having problems configuring the service IP communications stack, check that the Operations Console PC is on the same physical network and the server serial number and partition ID are correct in the configuration.

Important: Systems running the IBM i operating system start counting logical partitions with the number 1 (even if it is the only logical partition) instead of a 0. For the console to connect correctly, your client configuration must match the logical partition number. This is important if you rely on the BOOTP process to configure the server with its network data.

A local console on a network (LAN) uses ports 2323, 3001, and 3002. To use Operations Console in a different physical network, the router and firewall must allow IP traffic on these ports. BOOTP uses UDP ports 67 and 68 per RFC 951. For more information, see the Bootstrap protocol RFC website at RFC 951 - Bootstrap Protocol (RFC951) (<http://www.faqs.org/rfcs/rfc951.html>).

The success of BOOTP is dependent on the network hardware used to connect the server and the PC. In some cases, you might need a different console device to configure the connection in DST. To use BOOTP, the network hardware used must be capable of autonegotiation of speed and duplex for the Operations Console connection.

To force the system to perform a BOOTP, you must deallocate the current LAN console resource or set the IP address to 0.0.0.0 and perform a function to force the system to reset the console device, such as 65+21+21.

Related reference:

“Operations Console hardware requirements” on page 8

For correct Operations Console configurations, verify that you have satisfied the server, adapter, cable, and PC requirements.

Operations Console networking considerations for systems managed by an HMC

If your system is managed by a Hardware Management Console (HMC), your network and network security are configured differently. You will need to take this into consideration.

When you set up your HMC, determine whether you want to configure a private or open network. If it is the first HMC in your network, configure that HMC as a DHCP server.

Related information:

➤ [Types of HMC network connections](#)

➤ [Preparing for HMC configuration](#)

Setting up a console

Complete the required setup tasks for your console configuration.

To learn more about setting up a console, perform the following steps:

1. Go to the IBM i Knowledge Center website (https://www.ibm.com/support/knowledgecenter/ssw_ibm_i) and select from the following versions to access the specific knowledge center:
 - **Version 7.3**
 - **Version 7.2**
 - **Version 7.1**
2. Follow one of the navigation options depending on the version of the IBM i operating system:
 - If you are accessing IBM i **Version 7.2** or IBM i **Version 7.3** information, click **IBM i overview and what's new > Connecting to your system > IBM i Access > IBM i Access Client Solutions > Getting started with IBM i Access Client Solutions**.

Note: In the product Getting Started document, see section "9.9 Establishing a Console Connection to IBM i". For additional information about obtaining IBM i Access Client Solutions, see: IBM i Access Client Solutions (<http://www-03.ibm.com/systems/power/software/i/access/solutions.html>).

- If you are accessing IBM i **Version 7.1** information, click **Overview and what's new > Connecting to your system > IBM i Access > IBM i Access for Windows > Operations Console > PC preparations for Operations Console**.

After you have completed the prerequisite tasks, complete the following sections in order as they pertain to your configuration.

Managing Operations Console

After you have successfully set up Operations Console, options are available to maintain and operate Operations Console.

To learn more about managing Operations Console, perform the following steps:

1. Go to the IBM i Knowledge Center website (<http://www.ibm.com/systems/i/infocenter>) and select from the following options:

- **Version 7.3**
 - **Version 7.2**
 - **Version 7.1**
2. Select the required IBM i version:
 - If you are accessing IBM i **Version 7.2** or IBM i **Version 7.3** information, click **IBM i overview and what's new > Connecting to your system > IBM i Access > IBM i Access Client Solutions > Console Advanced Topics > Managing Operations Console**.
 - If you are accessing IBM i **Version 7.1** information, click **Overview and what's new > Connecting to your system > IBM i Access > IBM i Access for Windows > Operations Console > Managing Operations Console**.

Troubleshooting Operations Console


Find possible solutions to connection, authentication, emulator, and other problems when using the Operations Console.

Problems can occur during an Operations Console session, either during initial setup or while managing the configuration. If you have a console problem that you can not resolve, you might need to change the console type. For details, see [Changing consoles, interfaces, and terminals](#).

To learn more about troubleshooting Operations Console, perform the following steps:

1. Go to the IBM i Knowledge Center website (https://www.ibm.com/support/knowledgecenter/ssw_ibm_i) and select from the following versions to access the specific knowledge center:
 - **Version 7.3**
 - **Version 7.2**
 - **Version 7.1**
2. Follow one of the navigation options depending on the version of the IBM i operating system:
 - If you are accessing IBM i **Version 7.2** or IBM i **Version 7.3** information, click **IBM i overview and what's new > Connecting to your system > IBM i Access > IBM i Access Client Solution > Console Advanced Topics > Troubleshooting Operations Consoles connection**.
 - If you are accessing IBM i **Version 7.1** information, click **Overview and what's new > Connecting to your system > IBM i Access > IBM i Access for Windows > Operations Console > Troubleshooting Operations Consoles connection**.

Related information:

 [Changing consoles](#)

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The following Class A statements apply to the IBM servers that contain the POWER8 processor and its features unless designated as electromagnetic compatibility (EMC) Class B in the feature information.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

CAN ICES-3 (A)/NMB-3(A)

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

European Community contact:
IBM Deutschland GmbH

Technical Regulations, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
email: halloibm@de.ibm.com

Warning: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

VCCI Statement - Japan

この装置は、クラスA 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The following is a summary of the VCCI Japanese statement in the box above:

This is a Class A product based on the standard of the VCCI Council. If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

(一社) 電子情報技術産業協会 高調波電流抑制対策実施
要領に基づく定格入力電力値 : Knowledge Centerの各製品の
仕様ページ参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類 : 6 (単相、PFC回路付)
- 換算係数 : 0

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類 : 5 (3相、PFC回路付)
- 換算係数 : 0

Electromagnetic Interference (EMI) Statement - People's Republic of China

声 明

此为 A 级产品,在生活环境中,
该产品可能会造成无线电干扰。
在这种情况下,可能需要用户对其
干扰采取切实可行的措施。

Declaration: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may need to perform practical action.

Electromagnetic Interference (EMI) Statement - Taiwan

警告使用者：

這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在
這種情況下，使用者會被
要求採取某些適當的對策。

The following is a summary of the EMI Taiwan statement above.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user will be required to take adequate measures.

IBM Taiwan Contact Information:

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Electromagnetic Interference (EMI) Statement - Korea

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

Germany Compliance Statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 / EN 55032 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

EN 55022 / EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:
"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
International Business Machines Corp.
New Orchard Road

Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 (0) 800 225 5426
email: HalloIBM@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 / EN 55032 Klasse A.

Electromagnetic Interference (EMI) Statement - Russia

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать
радиопомехи, для снижения которых необходимы
дополнительные меры

Class B Notices

The following Class B statements apply to features designated as electromagnetic compatibility (EMC) Class B in the feature installation information.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM-authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM-authorized dealers. IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

CAN ICES-3 (B)/NMB-3(B)

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

European Community contact:
IBM Deutschland GmbH
Technical Regulations, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
email: halloibm@de.ibm.com

VCCI Statement - Japan

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取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

(一社) 電子情報技術産業協会 高調波電流抑制対策実施
要領に基づく定格入力電力値 : Knowledge Centerの各製品の
仕様ページ参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類 : 6 (単相、PFC回路付)
- 換算係数 : 0

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類 : 5 (3相、PFC回路付)
- 換算係数 : 0

IBM Taiwan Contact Information

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Germany Compliance Statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022/ EN 55032 Klasse B ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse B

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 (0) 800 225 5426
email: HalloIBM@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022/ EN 55032 Klasse B.

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