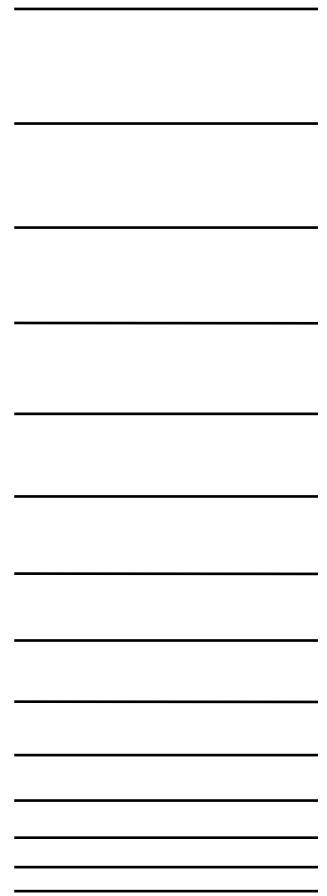


HITACHI INDUSTRIAL COMPUTER

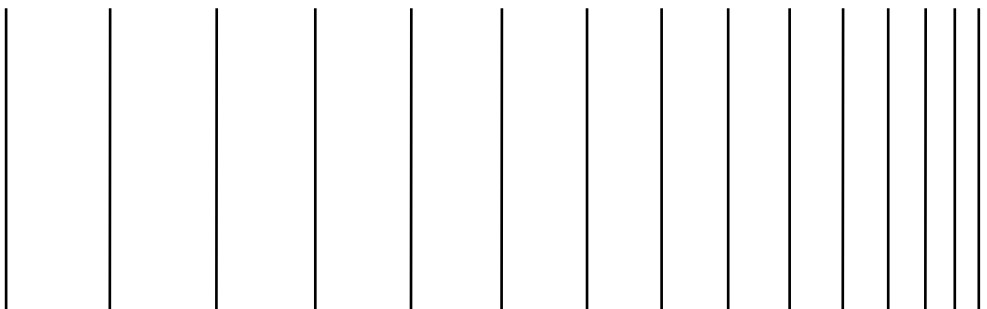
HF-W2000 Model 58/55/50

INSTRUCTION MANUAL



Read and retain this manual.

- Read safety instructions carefully, and ensure that you understand them before beginning operations.
- Keep this manual on hand for reference.



**USER'S
MANUAL**

PREFACE

This manual is intended for operators of the HITACHI INDUSTRIAL COMPUTER HF-W2000 Model 58/55/50 (abbreviated hereinafter to *this equipment*), and contains information about the operation and maintenance of various devices necessary for their routine work. This manual also describes the setup procedure for the pre-installed operating systems for this equipment:

- Windows® 10 IoT Enterprise 2016 LTSC
- Windows® 10 IoT Enterprise 2019 LTSC
- Windows Server® 2016 Standard

Hereinafter, the term *Windows® 10* is used to refer to both the Windows® 10 IoT Enterprise 2016 LTSC and Windows® 10 IoT Enterprise 2019 LTSC operating systems.

In addition, Windows® 10 IoT Enterprise 2016 LTSC is abbreviated to *Windows® 10 2016 LTSC*, Windows® 10 IoT Enterprise 2019 LTSC is abbreviated to *Windows® 10 2019 LTSC*, and Windows Server® 2016 Standard is abbreviated to *Windows Server® 2016*.

Documentation structure

The documentation for the HITACHI INDUSTRIAL COMPUTER HF-W2000 MODEL 58/55/50 consists of the following:

- SAFETY INSTRUCTIONS (appended to this manual)
- INSTRUCTION MANUAL (this manual)
- RAS FEATURES MANUAL (downloaded from the site given in the contact information on the following page)

Structure of this manual

This manual consists of the following:

PREFACE

IMPORTANT NOTIFICATIONS

SAFETY INSTRUCTIONS

PRECAUTIONS

CONTENTS

CHAPTER 1 GETTING STARTED

CHAPTER 2 OPERATION

CHAPTER 3 SETUP

CHAPTER 4 PRECAUTIONS WHILE THE OS IS RUNNING

CHAPTER 5 SPECIFICATIONS

CHAPTER 6 INSPECTION AND MAINTENANCE

CHAPTER 7 RESTORING THE FACTORY-DEFAULT SETTINGS BY USING A RECOVERY DVD

CHAPTER 8 MAINTENANCE OPERATIONS

CHAPTER 9 TROUBLESHOOTING

CHAPTER 10 SOFTWARE RAID1

APPENDIX HANDLING OF REPLACEABLE COMPONENTS

Repair Request Form and Statement of Received Goods

Revision history

- April 2020 (First Edition) WIN-62-0073 (out of print)
- February 2021 (Second Edition) WIN-62-0073-01 (out of print)
- March 2021 (Third Edition) WIN-62-0073-02 (out of print)
- April 2021 (Fourth Edition) WIN-62-0073-03

Contact information

Information related to this product is provided through the following website.

In addition, use the following website to contact us about this product.

URL: <https://www.hitachi-ip.com/products/hfw/>

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Zlib ver 1.2.3 Copyright © 1995-2005 Jean-loup Gailly and Mark Adler

IMPORTANT NOTIFICATIONS

If you plan to export this product, verify the laws and regulations that are relevant to export to foreign countries, including the Foreign Exchange and Foreign Trade Act of Japan and the export controls of the United States, and complete all required procedures. If anything is unclear, contact a sales representative.

- Do not copy the contents of this manual without permission.
- The contents of this manual are subject to change without notice.

NOTICE

Depending on the type of failure that occurs, important files might be lost when you use this equipment. Files can be lost due to power failures and human error during operations, in addition to equipment failures. In such cases, files cannot be recovered. To prevent data loss, save your files regularly and establish a systematic schedule for backing up files.

Harmonic current standards

This equipment complies with the JIS C 61000-3-2 harmonic current standard.

VCCI notice

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a household environment, electronic interference might occur. In such cases, you might need to take corrective action.

Note on storage capacity calculations

Memory capacities and requirements, file sizes and storage requirements, etc., are calculated according to the formula 2^n :

1 KB (kilobyte) = 1,024 bytes (2^{10} bytes)

1 MB (megabyte) = 1,048,576 bytes (2^{20} bytes)

1 GB (gigabyte) = 1,073,741,824 bytes (2^{30} bytes)

1 TB (terabyte) = 1,099,511,627,776 bytes (2^{40} bytes)

Disk capacities are calculated according to the formula 10^n :

1 KB (kilobyte) = 1,000 bytes (10^3 bytes)

1 MB (megabyte) = 1,000² bytes (10^6 bytes)

1 GB (gigabyte) = 1,000³ bytes (10^9 bytes)

1 TB (terabyte) = 1,000⁴ bytes (10^{12} bytes)

Terms used in this manual

Terms used in this manual are defined as follows.

- **Install:** Incorporating software programs onto a computer's hard disk
- **Setup:** Setting up an environment so that software can be used on the computer
- **Virtual machine:** A virtual hardware environment provided by Virtual PC or Hyper-V®
- **Host OS:** A base operating system that runs a virtual machine
- **Guest OS:** An operating system that runs on a virtual machine

Substituting terms

This manual describes the operating procedures for Windows®. The names of the operations *sign in* and *sign out* are interchangeable with *log on* and *log off*, respectively, depending on the type of Windows®. Substitute these terms while reading as required.

 **SAFETY INSTRUCTIONS**

Information About Safety Warnings

Carefully read and fully understand the safety precautions below before operating the equipment.

- Operate the equipment by following the instructions and procedures described in this manual.
- In particular, note the safety precautions displayed on the equipment or in this manual and follow them. Failure to do so might result in personal injury and property damage, including damage to the equipment.
- Safety precautions are indicated by one of the following headings. A heading is either a safety alert symbol; a word such as DANGER, WARNING, CAUTION, or NOTICE; or a combination of both.



This is a safety alert symbol. This symbol is used to indicate potential hazards that might result in personal injury or death. Follow the instructions in the safety messages that follow this symbol to avoid possible injury or death.



DANGER: This symbol is used to indicate imminent hazards that are highly likely to result in serious personal injury or death.



WARNING: This symbol is used to indicate potential hazards that might result in serious personal injury or death.



CAUTION: This symbol is used to indicate potential hazards that might result in minor or moderate personal injury.

NOTICE: This symbol is used to indicate hazards that might result in equipment or property damage, but not personal injury.

The heading NOTE is used to indicate a cautionary note about the handling or operation of the equipment.

- Do not attempt to perform any operations that are not described in this manual. If you encounter any problems with the equipment, contact your maintenance personnel.
- Read this manual carefully, and sufficiently understand the directions and precautions in this manual before operating the equipment.
- Keep this manual nearby so that you are able to refer to it as needed.
- Although every effort has been made in this manual to specify the most complete and relevant precautions regarding the equipment, unexpected incidents might occur. When using the equipment, use your own judgment on matters related to safety, in addition to following the instructions herein.



SAFETY INSTRUCTIONS (Continued)

Common Safety Precautions

Carefully read and sufficiently understand the following safety precautions.

WARNING

- This equipment is not designed or manufactured for use in a life-critical system that requires extreme levels of safety. If the equipment might be used for such a purpose, contact a sales representative.
- In the case of smoke, a burning smell, or a similar problem, stop the supply of power to the equipment, unplug the power cord from the outlet, and contact your supplier or maintenance personnel. Using faulty equipment without repairing it might result in a fire or an electric shock.
- This equipment contains built-in hard disk drives. Do not hit the equipment or subject the equipment to shocks or vibrations, because doing so might cause the equipment to fail. If you drop the equipment or damage its chassis, unplug the power cord from the outlet, and then contact maintenance personnel. Using faulty equipment without repairing it might result in a fire or an electric shock. Do not subject the equipment to shocks when unpacking or carrying the equipment.
- Do not modify this equipment, because doing so might result in a fire or an electric shock. The manufacturer is not responsible for any problems resulting from user modification of the equipment.
- Do not operate this equipment without using the dust filter, because doing so might cause a fire. In addition, use the Hitachi-brand dust filter.

 **SAFETY INSTRUCTIONS (Continued)**

 **CAUTION**

- If the equipment falls or tips over, personal injury might result. Use caution when transporting the equipment.
- Be careful to avoid personal injury when unpacking or carrying the equipment, such as catching or hitting your fingers.
- Before cleaning or replacing the dust filter of this equipment, shutdown the OS, unplug the power cord from the outlet, and wait for at least one minute. Failure to do so might result in injuries to the hands or fingers.



SAFETY INSTRUCTIONS (Continued)

NOTICE

- This equipment alone cannot guarantee the safety of the system. To ensure sufficient safety for your system even in the event that this equipment fails, malfunctions, or contains program bugs, you must add systemic protections such as the building of external protective and safety circuits to facilitate safety measures intended to prevent personal injury and serious accidents.
- When installing or replacing hardware, wear an antistatic wrist strap to prevent the buildup of static electricity.
- When tightening or removing a screw, use a screwdriver that fits the size and type of the head of the screw to avoid stripping the head. When tightening a screw, drive the screw along the axis of the tapped hole to avoid adding too much torque and damaging the thread.
- This equipment is evaluated assuming the use of the hardware specified in this manual. Accordingly, use only the specified hardware when upgrading options or replacing components. If any other hardware is used for upgrades or replacements, the equipment is not guaranteed to operate correctly.
- Do not use the equipment in an environment full of dust or with corrosive gases present, because doing so might cause the equipment to fail.
- Do not subject the equipment to shocks when unpacking or carrying the equipment. Doing so that might cause the equipment to fail.
- Ensure sufficient clearance for air intake and exhaust in front of and behind the equipment. Failure to do so might cause the temperature inside the equipment to rise, resulting in a failure or a shorter life span of the equipment. In addition, ensure sufficient clearance for maintenance work.



SAFETY INSTRUCTIONS (Continued)

- Use the specified operating system. If you use any other operating system, operation is not guaranteed.
- Performing an emergency shutdown (that is, unplugging the power cord from the outlet or shutting off the circuit breaker without properly shutting down the OS) might cause the OS or applications not to work properly or might cause saved data to be corrupted. Never perform an emergency shutdown unless some kind of error requires that you stop the system immediately.
- Note that if the power supply is cut, the system might not be able to recover automatically.
- If you insert or access a CD or DVD, the system load might increase, and running applications might be affected. Do not insert or access a CD or DVD during online operation (system operation).
- When you finish accessing a CD or DVD, eject the disc from the DVD drive. Leaving it in the DVD drive might result in a failure.
- Because the disc tray is thin, the slide rails are easily damaged and might cause a failure. Always use your hand to support the tray when inserting or removing CDs or DVDs.
- Leaving the disc tray open might result in a failure. Close the disc tray when it is not in use.



SAFETY INSTRUCTIONS (Continued)

Safety Warnings in This Manual

Safety warnings indicated as  WARNING

- Warning about the power supply unit (hazardous voltage):

Do not remove, disassemble, or modify the power supply unit. If you do, serious personal injury or death might result due to electric shock.

(Page 1-3)

- Use the power cord that comes with this equipment to supply power. Using another power cord might result in equipment failure, fire, or electric shock. In addition, when using this equipment at voltages over 125 V AC, prepare a power cord that is compatible with the input voltage to be used, and perform sufficient testing of equipment operation in advance.
- When plugging the power cord into an outlet, use an outlet with a ground terminal (ground pole) that is properly grounded. In addition, you must install and use an earth leakage circuit breaker. Failure to take these measures might result in fire or electric shock.
- Do not use a two-prong plug without a ground pole, because doing so might result in electric shock or equipment failure.

(Page 1-13)

- If any of the air intake and exhaust holes of the equipment are blocked, the temperature inside the equipment might rise, which might result in a fire or equipment failure. Ensure sufficient clearance around the equipment when installing the equipment. (See *1.6.2 Installation*.)

(Page 2-1)

- In the case of smoke, a burning smell, or a similar problem, unplug the power cord and contact your dealer or maintenance personnel. Using faulty equipment without repairing it might result in a fire or an electric shock.

(Page 2-4) (Page 9-1)

- Install a dust filter for use with the equipment. Not doing so allows dust into the equipment, which might result in a short circuit fire.

(Page 6-1) (Page 6-20)



SAFETY INSTRUCTIONS (Continued)

- Before starting work, shutdown the OS, unplug the power cord from the outlet, and wait for at least one minute. Failure to do so might result in an electric shock or equipment failure.

(Page 6-8)

- Before you install or remove an extension board, shutdown the OS, unplug the power cord, and wait for at least one minute. Installing or removing an extension board without shutting down the power might result in an electric shock or a fire.

(Page 6-10)

- Before you install or remove the main memory, shutdown the OS, unplug the power cord, and wait for at least one minute.
Installing or removing the main memory without shutting down the power might result in an electric shock or a fire.

(Page 6-14)



SAFETY INSTRUCTIONS (Continued)

Safety warnings indicated as  CAUTION

- Caution about the fans (rotating objects):
Only maintenance personnel are allowed to remove fans. If you remove a fan yourself, your hand or objects might be caught in the rotating parts of the operating fan, and personal injury might result.

(Page 1-3)
- If this equipment is stored at high temperatures, do not touch it with your bare hands. Doing so might result in burns.

(Page 1-12)
- The equipment might cause injury if it falls or is dropped off of a desktop when placed vertically. Use the vertical stand provided with the equipment, and place the equipment with the vertical stand on a level surface.

(Page 1-13) (Page 6-21)
- Before you clean or replace the dust filter of this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Failure to do so might result in injury to the hands or fingers.

(Page 6-1)
- When installing or removing components do not directly touch parts inside the equipment with your hands. Such parts are hot, and touching them might result in burns. In addition, touching such parts might damage the parts or result in equipment failure.

(Page 6-8)
- When installing the cover of the main unit, do not insert your fingers into the inside of the cover of the main unit. Doing so might result in your fingers getting caught, causing injury.

(Page 6-9)



SAFETY INSTRUCTIONS (Continued)

- When installing or removing an HDD or SSD, be careful not to cut your fingers on the protrusions.

(Page 6-17)

- When installing or removing a DVD drive, be careful not to cut your fingers on the protrusions.

(Page 6-19)

- This equipment uses a lithium battery. When replacing the lithium battery, use a battery specified by the manufacturer. Failure to do so might result in an explosion, a fire, a burst battery, heat generation, a liquid spill, or gas generation.

- Install the battery by using the correct polarity. Using the wrong polarity might cause an abnormal reaction, such as charging or shorting, resulting in a liquid spill, heat generation, or a burst battery.

(Page 6-22)

- When installing or removing a jumper socket, do not directly touch parts inside the equipment with your hands. Such parts are hot, and touching them might result in burns. In addition, touching such parts might damage the parts or result in equipment failure.

(Page 6-24)



SAFETY INSTRUCTIONS (Continued)

Safety warnings indicated as NOTICE

- Depending on the type of failure that occurs, important files might be lost when you use this equipment. Files can be lost due to power failures or human error during operation, in addition to equipment failures. In such cases, files cannot be recovered. To prevent data loss, save your files regularly and establish a systematic schedule for backing up files.

(Page iii) (Page C-7)

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.
- Due to the characteristics of the inrush current restraint method that is used with this equipment, inrush currents might increase more than usual if the power is turned on before the power supply unit has sufficiently and naturally cooled after the power is turned off. After turning off the power, wait at least one minute before turning on the power again. If you do not do so, inrush currents might affect the breaker connected to the equipment and the life span of the equipment itself.

(Page C-1)

- Never hot-swap HDDs or SSDs, because doing so might cause a failure in the equipment or the HDDs or SSDs. Before you replace an HDD or SSD for the A model or S model, shutdown the OS, unplug the power cord, and wait for at least one minute.
- When using a USB port, check the orientation of the USB connector, and then insert the connector slowly. Failure to do so might damage the USB port.
- Do not remove or insert a USB device during online operation (system operation), because doing so might affect applications that are running.
- If you insert or access a CD or DVD, the system load might increase, and applications that are running might be affected. Do not insert or access a CD or DVD during online operation (system operation).

(Page 1-3)



SAFETY INSTRUCTIONS (Continued)

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs, SSDs, and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.

(Page 1-13)

- Do not route interface cables and other cables (including cables for other devices, such as a PC) near the power cord. Doing so might cause a failure or malfunction in the equipment.
- Do not connect or disconnect an interface cable while the power for this equipment or for a remote device is on. If you do so, a short circuit between the power supply and the ground might cause a failure in the equipment. If an interface cable comes off while the power for the equipment is on, shutdown the OS and unplug the power cord. Unplugging the power cord without shutting down the OS might destroy internal files.
- When you connect a cable for external contacts, connect the cable to a connector for the external contacts (EXT). A voltage as high as 40 V DC might be applied to the cable through a relay load. If you connect the cable to the wrong connector, this might cause a failure in the equipment.

(Page 1-16)

- Performing an emergency shutdown (that is, unplugging the power cord or shutting off the circuit breaker without properly shutting down the OS) might cause the OS or applications not to work properly or might cause saved data to be corrupted. Never perform an emergency shutdown unless some kind of error requires that you stop the system immediately.
- Note that if the power supply is cut, the system might not be able to recover automatically.

(Page 2-4)



SAFETY INSTRUCTIONS (Continued)

- If you insert or access a CD or DVD, the system load might increase, and running applications might be affected. Do not insert or access a CD or DVD during online operation (system operation).
- When you finish accessing a CD or DVD, eject the disc from the DVD drive. Leaving it in the DVD drive might result in a failure.
- Leaving the disc tray open might result in a failure. Close the disc tray when it is not in use.
- Do not use a CD or DVD that is not balanced due to attached labels or other differences; a disc with cracks, scratches, or vertical deviation; or a disc with a non-standard shape. Using such a disc might generate an abnormal sound or vibration and might result in equipment failure.

(Page 2-5)



SAFETY INSTRUCTIONS (Continued)

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.

(Page 6-1)

- After washing a dust filter, dry it completely before re-attaching it to the equipment. Using the equipment while its dust filter is not completely dry might cause equipment failure. When using a detergent to clean a dust filter, use a neutral detergent. Using other types of detergents might cause the dust filter to lose its feature.

(Page 6-2)

- Disconnect all external cables connected to the equipment before installing or removing an extension board. Not doing so might result in equipment failure.

(Page 6-10)

- Always install a slot cover over each unused expansion slot. Not doing so might result in equipment failure.

(Page 6-13)



SAFETY INSTRUCTIONS (Continued)

- Disconnect all external cables connected to the equipment before installing or removing the main memory. Not doing so might cause equipment failure.

(Page 6-14)

- The orientation of a main memory module in a connector is fixed. When installing a main memory module, verify that the orientation is correct. An incorrect orientation might result in equipment failure.
- Do not install main memory modules that have different capacities in slots DIMM1 and DIMM2. If you do, the modules might not be recognized.

(Page 6-15)

- Place an HDD or SSD on a shock-absorbing material, such as an antistatic cushion, even for temporary tasks. Placing an HDD or SSD directly on a hard surface, such as a desktop, might result in the failure or a shorter life span of the device, or cause loss of data due to jarring or shocks.
- Never remove the screws on an HDD or SSD while the power to the device is on. Never hot-swap HDDs or SSDs. Performing these actions might result in failure of the equipment or drive.
- Before replacing an HDD or SSD, shutdown the OS, unplug the power cord, and wait for at least one minute.
- Install or remove an HDD or SSD only when necessary, for example, when you need to replace an HDD or SSD due to a failure. Performing these actions frequently might result in failure of the equipment or drive.
- Fully insert HDDs or SSDs. Loose contacts or missing screws might result in failure.
- During installation or removal, do not subject an HDD or SSD that you are installing or an HDD or SSD that is already installed to shocks. Subjecting an HDD or SSD to shocks might result in drive failure.

(Page 6-17)

- When installing or removing an HDD or SSD for the B model, verify that the drive bay number is correct. Removing an HDD or SSD and installing it in a different bay results in a configuration information mismatch, and the equipment might not start or the data stored on the HDD or SSD might be lost.

(Page 6-18)

- Do not apply excessive force to the connector of the DVD drive or to the top of the DVD drive. If you do so, the DVD drive might fail.

(Page 6-19)



SAFETY INSTRUCTIONS (Continued)

- A recovery DVD contains an image file created for the hardware configuration at the time of purchase. If the hardware configuration has changed from the time of purchase, the OS might not start after restoration work. Remove all external storage devices to restore the hardware configuration at the time of purchase before you perform restoration work by using a recovery DVD. When you use a recovery DVD, all data on the system drive is deleted. Back up your data in advance as necessary.

(Page 7-1)

- Although this equipment features RAID1 and is thus more reliable than general systems, it is still vulnerable to the loss of data stored on the HDDs. Permanent data loss is caused not only by mechanical failures, but also by unexpected power failures or operational errors. To prevent such data loss, schedule data backup operations, and protect the power source from undesirable interruptions by using a UPS or other means.
- This equipment is evaluated assuming the use of the specific HDD models authorized by the manufacturer. Replace HDDs by using only the specific items specified by the manufacturer. Failure to do so might result in existing data on the HDD being lost. In addition, always observe the recommended replacement interval for HDDs (See *APPENDIX HANDLING OF REPLACEABLE COMPONENTS*).
- Each unit of equipment has its own RAID1 configuration information (such as a serial number). As such, you cannot use HDDs by swapping them even between two different units of this equipment. If you attempt to do so, unexpected operation might result from inconsistencies in the configuration information or other reasons.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- For a replacement HDD, use a brand-new HDD (an unused HDD) or an HDD to which "Initialize Drives" has been applied (see *10.6.7 Drive initialization feature*).
- Maintaining a RAID1 system requires a high level of expertise. If users make any mistakes during their work, the data stored on the HDDs might be lost.
- The capacities of drive bay 1 and drive bay 2 must be the same. Do not install HDDs that have different capacities.

(Page 10-1)



SAFETY INSTRUCTIONS (Continued)

- Never remove an HDD when the DRIVE status lamp of the HDD is off. Doing so might corrupt the data stored on the HDD.
- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- Install HDDs securely. Loose contacts or missing screws might result in failure.
- During replacement, do not subject an HDD that you are replacing or an HDD that is already installed to shocks. Subjecting an HDD to shocks might result in drive failure.
- Until rebuilding is complete, avoid shutting off the power to this equipment or installing and removing HDDs. Performing these actions might result in data on the HDDs being lost or a failure.

(Page 10-10)

- If you apply the recovery method for an offline HDD to an HDD that was set to offline by something other than the RAS software, the HDD might not be recovered, or even if it is recovered, the HDD might not work properly.
- Use the recovery method for an offline HDD only to evaluate the equipment. If you apply the recovery method for an offline HDD to equipment actually used in the field, for example, a system in normal operation, malfunctions such as data loss might result.
- If an HDD is automatically set to offline by the equipment, the HDD might have failed. Do not apply the recovery method for an offline HDD to such an HDD.
- An HDD recovered by using the recovery method for an offline HDD must not be used for equipment actually used in the field. If it is, malfunctions such as data loss might result.

(Page 10-20)



SAFETY INSTRUCTIONS (Continued)

- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.

(Page 10-21) (Page 10-22)

- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- Do not replace two HDDs at the same time. Doing so might result in data corruption.
- When replacing an HDD, set the HDD to offline mode in the Hardware status window, and then remove the HDD and install the replacement HDD. Installing or removing an HDD when the hardware status is not verifiable, for example, immediately after the OS starts, might result in a failure.

(Page 10-23)

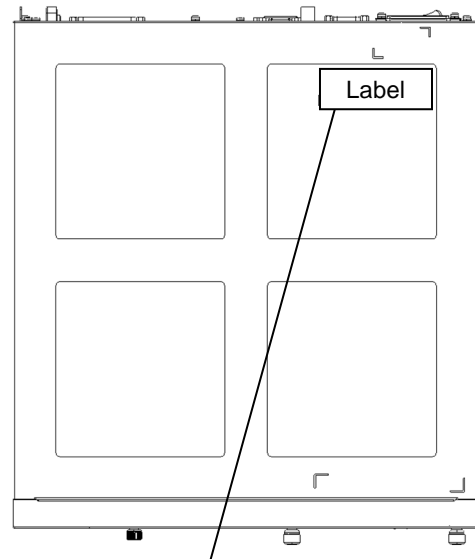
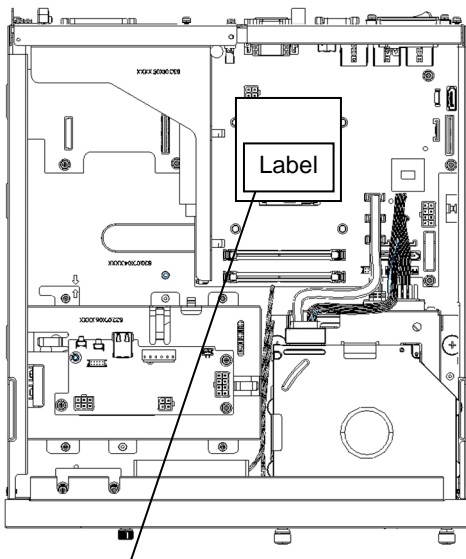
- Do not use a replaceable component for longer than the recommended replacement cycle. If you do, a deteriorating or worn-out component might cause the equipment to fail.

(Page A-1)

! SAFETY INSTRUCTIONS (Continued)

! WARNING Labels

The warning labels are attached to the following positions on the equipment.



! 警告 ! WARNING ! AVERTISSEMENT



<p>危険な運動部 危険な運動部 危険な可動部 Hazardous moving parts. Pièces mobiles dangereuses.</p>	<p>可動部位に人体の一部を近づけないでください。 Keep body parts out of the motion path. Éloignez vos doigts et toutes les autres parties de votre corps.</p>
---	--

! 警告 ! WARNING

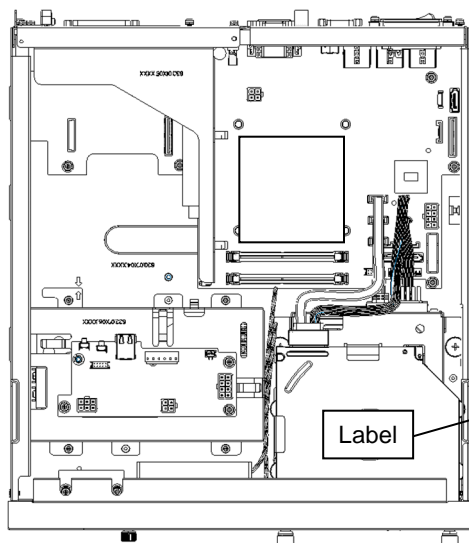


<p>危険电压 危険電壓 危険電圧 Hazardous voltage.</p>	<p>触电会导致死亡或重伤。揭开盖子前，请从插座拔掉电源线。 觸電會導致死亡或重傷。打開蓋子前，請從插座拔掉電源線。 感電による死亡または重傷の恐れがあります。カバーを 外す前に、電源ケーブルをコンセントから抜いてください。 Can cause death or severe injury. Pull out power cord from the outlet before opening the cover.</p>
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SAFETY INSTRUCTIONS (Continued)

Precautions When Using the Laser

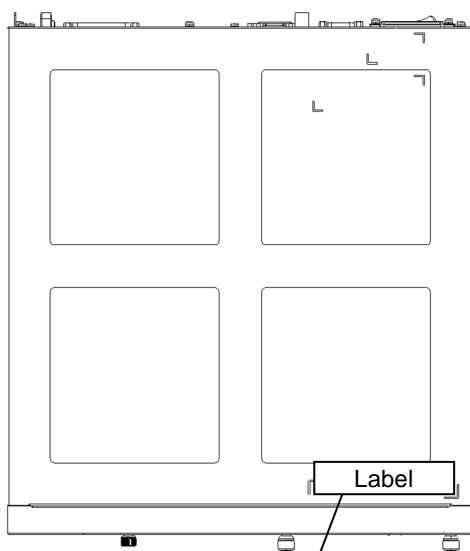
The DVD drive uses a laser. Do not look into the laser beam, whether directly or indirectly. Doing so might result in visual impairment.



CLASS 3B VISIBLE AND INVISIBLE LASER
RADIATION WHEN OPEN AND INTERLOCKS
DEFEATED AVOID EXPOSURE TO THE BEAM.

NOTICE Label


The notice label is attached to the following position on the equipment.



通知 NOTICE

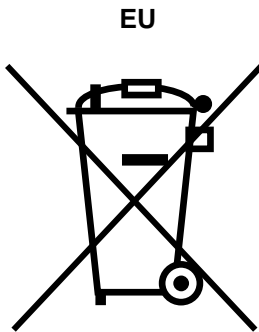
当您更换驱动器设备的启动过程中，系统数据将被销毁。请参阅用户手册。
當您更換驅動器設備的啟動過程中，系統資料將被銷毀。請參閱使用者手冊。
装置の電源が入った状態でドライブの挿抜を実施すると、システムデータ破壊にいたしますので、取扱説明書に従いドライブの交換を実施してください。
Drive replacement during startup of the device, corrupts the system data. See User's Manual.

 **SAFETY INSTRUCTIONS (Continued)**

 **Disposing of the Equipment**

This equipment contains materials that are potentially harmful to the environment if the equipment were to be improperly disposed of. When disposing of this equipment, comply with all local laws and regulations where applicable.

EU Battery Directive (2006/66/EC)



This symbol mark is valid in European Union countries. This symbol mark is specified in Article 20, "Information for end-users", and Annex II of EU Directive 2006/66/EC.

This equipment contains a lithium battery. When removing the battery, follow the instructions in *6.4 Removing the Lithium Battery*.

In the European Union, a separate collection system for used batteries and accumulators is in place. Process batteries and accumulators appropriately at a local collection or recycling center.

PRECAUTIONS

1. Precautions About the Equipment

NOTICE

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.
- Due to the characteristics of the inrush current restraint method that is used with this equipment, inrush currents might increase more than usual if the power is turned on before the power supply unit has sufficiently and naturally cooled after the power is turned off. After turning off the power, wait at least one minute before turning on the power again. If you do not do so, inrush currents might affect the breaker connected to the equipment and the life span of the equipment itself.

(1) Transporting the equipment

Required actions

- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). When transporting or carrying the equipment in a chassis, protect the equipment so that any vibrations and shocks the equipment is subjected to are within the provided specifications.
- Keep the dedicated container (the container and packing materials used when the equipment was delivered). You can use the dedicated container later when transporting or carrying the equipment.

(2) Interface cables

Precautions

- Do not pull on a cable by using excessive force.
- In order to meet EMC standards (FCC, CE, VCCI), use shielded cables for the interface cables connected to the equipment (the display interface cable, keyboard interface cable, and mouse interface cable).

Required actions

- Route the cables neatly and orderly alongside the equipment so that the cables do not catch on hands or feet. If the power cord is disconnected during operation of the equipment and power is lost, crucial data stored on the hard disk might be lost.

(3) Connectors

Precautions

- To connect a connector properly, insert it by using the proper orientation and at the proper angle. If a connector is not inserted properly, the connection might fail or malfunction.
- Verify that there are no loose I/O cable connectors on the equipment.

(4) Power supply

(a) Power voltage

Required actions

- Confirm that the voltage of the power input to the equipment is within the specified range (100 to 240 V AC). If the voltage of the power input is close to the upper or lower limit of the specified range, assume that the input voltage has been set incorrectly, and ask the manager of the power facility to inspect the voltage output by the facility.

(b) Power cord

Precautions

- The power cord that comes with the equipment is rated at an input voltage of 125 V AC. When using this equipment at voltages over 125 V AC, prepare a power cord that is compatible with the input voltage to be used.
- Install Class D grounding (previously known as Class 3 grounding) as defined in the Technical Standard for Electrical Facilities of Japan, to maintain normal operation of electronic circuits containing highly integrated LSIs and to protect devices from abnormal voltage caused by lightning strikes or other causes.
- Use a power cord with a 2-prong plug and a grounding pole. (See *1.7 Hardware Connections*.)
- When you plug the power cord into an outlet, use an outlet with a neutral pole that is properly grounded. In addition, install and use an earth leakage circuit breaker.
- If you are using a power cord clamp to prevent accidental disconnection, allow for extra length in the power cord around the connector when you secure the cord, in order to allow the cord to be disconnected in an emergency. Alternatively, install an emergency circuit breaker at the outlet.
- Do not place any objects on the power cord. In addition, do not install signal lines near the power cord.

(c) Turning the power on and off

Precautions

- After turning the power off, wait for at least one minute before turning the power on again. If you wait for less than one minute, the equipment might not operate as specified by the BIOS power settings. (See 5.6 *BIOS Setup*.)
- Do not turn off power to the equipment or press the reset switch during communication or while a CD, DVD, HDD, or SSD is being accessed.

Required actions

- When connecting or disconnecting a peripheral, verify that both the equipment and the peripheral have been turned off. If they have not been turned off, a malfunction or failure might result.
- When turning on the power, turn on the peripherals first, and then turn on the equipment. When turning off the power, turn off the equipment first, and then turn off the peripherals.
- When you are not using the equipment, turn off the power. If you do not intend to use the equipment for an extended period of time, unplug the power cord.
- Depending on the material, a rug, lap blanket, or similar material might cause static buildup and consequently cause a malfunction of the equipment. Use a conductive rug or lap blanket resistant to static buildup.
- If lightning strikes nearby or the AC power supply is not stable, an instantaneous power failure or a brownout might occur during operation or the screen might black out. In such cases, turn off the power to the equipment, and then turn the power back on.

(5) Installation environment

Precautions

- When you install a commercially available device in an extension slot, you must meet the specifications of the required environment for both the commercially available device and this equipment. (See 1.6.1 *Environment*.)
- When you install an extension board in an extension slot or use a USB device, verify that the power consumption does not exceed the maximum current rating. (See 5.1(9) *Maximum current specifications*.)
- To use this equipment without failures for an extended period of time, you must use it by using proper care and in the proper environment. Do not use the equipment in the following locations. Doing so might reduce the life span of the equipment or cause a failure in the equipment.

- In a place exposed to direct sunlight (for example, too close to a window)
- In a place subject to rapid temperature or humidity changes (for example, too close to an air conditioner)
- In a place close to a device that generates electrical noise (for example, too close to an electric motor or generator)
- In a place close to a device that generates a strong magnetic field (for example, too close to magnets or similar objects)
- In an environment full of dust
- In a place subject to vibrations
- In an environment with corrosive gasses present
- In a place with vibrations caused by loud sounds (for example, too close to a device that generates a loud buzzer or alarm)

- The following are precautions for the left, right, top, and bottom sides of the equipment:
 - Do not attach heating devices.
 - For ease of maintenance work, verify that the equipment can be moved easily. If the equipment is secured, ensure that the equipment can be removed easily.
- It is reported that zinc whiskers can cause a problem with the equipment. Do not use electrogalvanized materials near the equipment or the place where the equipment is installed.

(A quote from Technical Report of JEITA# ITR-1001 "Guideline of Facilities and Equipment for Information Systems")

Location of whiskers: Whiskers are created by electrogalvanized equipment such as floor panels, stringers, posts, and aseismatic flat steel.

Phenomenon: Hair-like zinc crystals (conductive whiskers) float into the air from the floor for some reason, go inside the device, and short-circuit a PCB or its pins. The root cause is difficult and time-consuming to determine, because the symptoms differ depending on the location of the short circuit, and often, the problem is mistakenly identified as a temporary issue.

#: JEITA: Japan Electronics and Information Technology Industries Association

Required actions

- If you mount the equipment in a chassis or on a desk, take into consideration the temperature increase around the equipment.
- The system clock and similar operations inside the equipment always operate by using a backup battery, even when the power is off. Therefore, if you store the equipment at a temperature outside the operating temperature range, you might need to reconfigure the clock settings and other system BIOS settings when you start using the equipment again. When reconfiguring system BIOS settings, follow the instructions in *5.6 BIOS Setup*.

(6) Operating conditions

Precautions

- Before moving the equipment, unplug the power cord and wait at least one minute.
- To prevent moisture condensation when moving the equipment from outside a building to the inside, wait at least four hours before using the equipment.
- The equipment is made by using precision electronics components. Do not subject the equipment to any vibrations or shocks.
- Do not sit on the equipment or place anything on the equipment.
- During normal operation, do not turn off the display. Set the display to standby mode instead.
- When you turn on the equipment, during normal operation, do not touch the keyboard or mouse until the logon screen is displayed.

Required actions

- We recommend that you remove dust that builds up near the equipment (in particular, below the equipment and to the left and right sides), in the vents on the equipment, and on the front of the equipment.

(7) Abnormal sounds

Specifications

- When turning on the power, you might hear a low-frequency humming noise. This is caused by the transient, low-frequency vibrations of the chokes for suppressing high-frequency noises or other components, and does not impact the characteristics or life span of the equipment.

(8) Warranty

Specifications

- The manufacturer offers no guarantees against damage to data or application software that is caused by hardware damage to the equipment.
- Use an operating system specified by the manufacturer. If you use an operating system not specified by the manufacturer, proper operation of the equipment is not guaranteed.
- This equipment is evaluated under the assumption that the hardware specified by the manufacturer is used. Therefore, when installing or replacing hardware, use the hardware specified by the manufacturer. The manufacturer cannot guarantee proper operation of the equipment if you use other hardware.

2. Networks

Precautions

- When you receive a Magic Packet™ frame, verify that the standby lamp of the equipment is on. If you receive a Magic Packet™ frame when the power is about to be turned off after an OS shutdown, the equipment might restart without being turned off or Wake-on-LAN (WOL) might not function at all. (See 2.7.2 *Turning on the power by using a LAN.*)

Specifications

- Depending on the status of the network, Magic Packet™ frames might be lost. To avoid this, set up the system so that Magic Packet™ frames can be propagated without loss. (See 2.7.2 *Turning on the power by using a LAN.*)
- Even if a network drive is configured to reconnect at logon, reconnection is not always possible. If such cases, log on again, or use the `net use` command to establish a connection. For details about the `net use` command, see the Windows® help.
- If the settings of a hub and a network adapter do not match, the performance of the network adapter might be compromised, or the network adapter might not work properly. (See 2.8 *Setting Up the LAN Interface.*)
- The electric potential difference between units can generate heat. Therefore, use a twisted-pair Ethernet cable (such as Category 5 or STP cable) that is specified in (1) *Motherboard (standard)* under 5.8.1 *Connector specifications* for network connections. Do not use any other cables.

3. Display Screens

Specifications

- Before setting up the screen, terminate all running application software.
- When you change the connections to switch between single- and multi-display configurations, turn off the power to the equipment, change the connections of the display cables, turn the power back on, and then set up the screen configuration.
- When you change the connection configuration for the displays, reconfigure the screen settings accordingly.
- Depending on the application software, the screen might flicker and video playback might not be smooth.
- The multi-streaming function of DisplayPort (daisy-chaining) is not supported.
- If a display connected via a DisplayPort connection is turned off, the display can no longer be detected.

Required actions

- If you want to enable Collage for multiple displays, use displays that support Display Data Channel (DDC). If you are using displays that do not support DDC, you cannot enable Collage.

4. Hard Disk Drives (HDDs) and Solid State Drives (SSDs)

NOTICE

Depending on the type of failure that occurs, important files might be lost when you use this equipment. Files can be lost due to power failures or human error during operation, in addition to equipment failures. In such cases, files cannot be recovered. To prevent data loss, save your files regularly and establish a systematic schedule for backing up files.

(1) Handling hard disk drives or solid state drives

Precautions

- The access performance of HDDs differs depending on the equipment. Also note that the performance of an HDD is lower at high or low temperatures. When using HDDs, verify that the access performance of the HDDs at normal temperatures and their degraded performance at high or low temperatures do not cause problems in user applications.

Required actions

- Do not subject HDDs or SSDs to vibrations or shocks.
- Take preventive action against static electricity due to human contact and other activities in the workplace.
- Hold the bracket or sides of an HDD or SSD. Do not touch the printed circuit board or connectors.
- When you store an HDD or SSD for an extended period of time, put the HDD or SSD into an anti-static bag, and then store it in a dedicated box.

Specifications

- When modifying existing partitions, delete the partitions first, and then re-create them.
- The capacity and performance of an HDD or SSD might change when you replace an HDD or SSD.

(2) Backing up files

Required actions

- Back up the contents of all HDDs or SSDs periodically.
- When deleting a partition, all files in the partition will be deleted. Back up any important files before deleting a partition.

5. DVDs

(1) Handling the DVD drive

Precautions

- The DVD drive is subject to damage caused by dust. Install the equipment in a place with minimal dust, and clean the areas around the equipment regularly.

When using insecticide sprays similar chemicals, cover the equipment with a protective sheet beforehand.

- Do not subject the equipment to strong shocks while the DVD drive is in use.
- Do not open the disc tray except to insert or eject a CD or DVD. Do not place foreign objects on the disc tray. If you do so, the DVD drive might be damaged or fail.
- When you put a CD or DVD on the disc tray, verify that the disc is properly set on the disc tray. If it is not, the disc tray might break.

Specifications

- Depending on the type of a CD or DVD used, you might not be able to read or write to the disc. In such cases, use another CD or DVD.
- Depending on the condition of a CD or DVD (for example, whether it has scratches or dust, is deformed, or has copy protection enabled), the equipment might not be able to read from or write to the CD or DVD properly.
- Depending on the write quality of a CD or DVD or the read characteristics of the DVD drive, data that was written by other devices might not be readable on this equipment, and data that was written by this equipment might not be readable on other devices.

(2) Handling CDs or DVDs

Precautions

- Do not apply benzene, thinners, water, record cleaner, or anti-static liquids to a CD or DVD, and do not use a silicone cloth on a CD or DVD.
- Do not use a dryer to remove dust or moisture from a CD or DVD.
- Do not store a CD or DVD in a location with high temperature or humidity.
- Store a CD or DVD in a location that is not subject to direct sunlight, strong artificial light, or other such environmental effects.
- Do not fold or bend a CD or DVD.
- Do not write on or scratch the recording surface of a CD or DVD.
- Do not insert a stick into the center hole of a CD or DVD and spin the CD or DVD.
- Do not attach stickers or other adhesive labels to a CD or DVD.

Required actions

- If a CD or DVD is dirty, wipe the disc with a soft, dry cloth, and wipe from the center to the outer edge of the disc.

6. USB Devices

Precautions

- Test a USB device before you start using it. Never use a USB device for a mission-critical purpose.
- Do not connect a USB device during OS startup, because the OS might not start normally.
- If you switch screens during OS startup when you use a CPU/USB KVM switch, the OS might not start normally depending on the type of a CPU/USB KVM switch. When using a CPU/USB KVM switch, test its operation thoroughly.
- For USB 2.0 and USB 3.0, the length of the cable that you use must be less than or equal to the length specified in the specifications. Using longer cables might compromise transfer speed. Use a USB 2.0 or USB 3.0 cable that matches the device you are using. If you do not do so, the actual transfer speed of the device might not be as high as it should be, or communication errors might occur. For information about cable specifications, ask the manufacturer of the cable. (For details about cable length, see *5.8.3 External interface cable length specifications*.)

Required actions

- When using a USB port, check the orientation of the USB connector, and then insert the connector slowly to avoid damaging the USB port.
- When a USB device is inserted, removed, or accessed, the system load might increase. If you need to use a USB device during online operation (system operation), you must confirm that using the device does not affect the currently running application software before using the device.
- After you clean a USB keyboard, check the connection between the equipment and the keyboard connector. A loose connection might cause the keyboard to be incorrectly recognized or prevent the system from starting normally.

Specifications

- Operation cannot be guaranteed in combination with all USB devices.
- Some USB devices do not conform to the USB specifications. If you turn off the main power while a non-compliant USB device is connected, the equipment might not start properly, and the clock settings might be corrupted. When selecting a USB device, test its operation thoroughly.

7. Extension Boards

Required actions

- If you supply your own extension board (a PCI Express or PCI board), you are responsible for confirming that each component on the board meets the operating temperature specifications when the components heat up.
- After installing an extension board, save the dummy bracket and store it in a safe place.

8. Lithium Batteries

Required actions

- This equipment uses a lithium battery. When disposing of the battery, observe all applicable local laws and regulations.

9. Optical Mouse

Required actions

- Due to the nature of the optical sensor in an optical mouse, an optical mouse might not work on transparent materials or light-reflecting materials (such as glass and mirrors). Avoid using an optical mouse on these materials, or purchase a commercially available optical mouse pad.
- If the optical sensor is clouded with condensation or oil mist, the optical mouse might not work properly. If you are using an optical mouse in an environment where such effects might occur, take appropriate measures to protect the equipment.

10. BIOS settings

Specifications

- As long as an AC disconnection does not occur, the BIOS settings are retained even if the backup battery runs out of power or is not installed. After an AC disconnection, the BIOS settings will return to the default settings after system startup, but the OS always starts regardless of the **After AC Power On** setting.
- If you perform an AC disconnection (such as by holding down the power switch for four or more seconds) without performing the proper shutdown processing while the equipment is operating, the behavior of the system when power is restored might differ from when the proper shutdown processing is performed.
- The purpose of the clock displayed on the BIOS setup menu screen is not to show the correct date and time, but rather to configure the time. Because of this, the date displayed on this screen does not change when the actual date changes. If the actual date changes during setup, you must update the date setting. (See 5.6 *BIOS Setup*.)
- When you are using the setup menu, the clock display might sometimes show a delay. After you are finished in the setup menu, verify that the clock is correct. (See 5.6 *BIOS Setup*.)

11. Maintenance Services

Specifications

- Microsoft® Windows®, device drivers, and commercially available application software might not be directly modifiable as a countermeasure for a particular failure. Instead, the manufacturer might offer a workaround as a countermeasure.
- Adding commercially available hardware to the equipment without notifying the manufacturer will void the warranty of the equipment as a whole.
- Some components used in the equipment (such as LSIs from Intel Corporation) cannot be disassembled for failure analyses, because the manufacturer does not have the rights to do so.
- The price of this equipment does not include maintenance and support. When ordering the equipment, clarify the desired maintenance support level in the maintenance contract, and pay the required maintenance fee as defined by the maintenance support level.

12. Windows® Settings

(1) Applying hotfixes and other updates

Specifications

- Users are responsible for applying any necessary hotfixes, Windows Update, or the latest service packs. Verify system operation thoroughly to evaluate how the system will be affected by any applied hotfixes, Windows Update, or service packs.

13. Detection of single-bit errors in memory

Restrictions

- This equipment uses ECC (error checking and correction) memory. For this reason, any single-bit errors that occur in the memory are automatically corrected, and do not impede equipment operation. In addition, the detection of single-bit errors is performed upon BIOS startup and by the RAS software. Although users are notified if single-bit errors occur frequently, in exceptionally rare cases, single-bit errors might not be detected and users might not be notified.

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CHAPTER 1 GETTING STARTED

1.1 Scope

This manual is intended for operators of the HITACHI INDUSTRIAL COMPUTER HF-W2000 Model 58/55/50, and contains information about the operation and maintenance of various devices necessary for operators' routine use.

After you unpack the equipment, examine the list of delivered items to confirm that all items have been delivered and that no items are missing or damaged. If any items are missing or damaged, contact one of our sales representatives.

For information about RAS features, see the following manual:

- *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL* (manual number WIN-63-0098)

1.2 Installing an Extension Board

Users can supply and install extension boards in this equipment.

For information about the installation procedure for and limitations on extension boards, see *6.3.4 Installing and removing an extension board*.

1.3 Role of the Operator

To use this equipment in good working order over an extended period of time, an operator must take care of the following:

(1) Setting up replaceable items

- When you set up a replaceable item (such as an HDD or a dust filter), follow the operating procedures for the device described in the relevant chapters.

(2) Taking the characteristics of the equipment into account

- See *1. Precautions About the Equipment* in *PRECAUTIONS*, and take the necessary actions considering the characteristics of the equipment.
- The instructions in this manual are the fundamental procedures that operators must follow when using the equipment. Always follow these instructions.
- For information about how to use the equipment, clean the equipment, and so on, see the relevant chapters.

(3) Keeping the equipment in good condition

When using this equipment, operators must take care of the following:

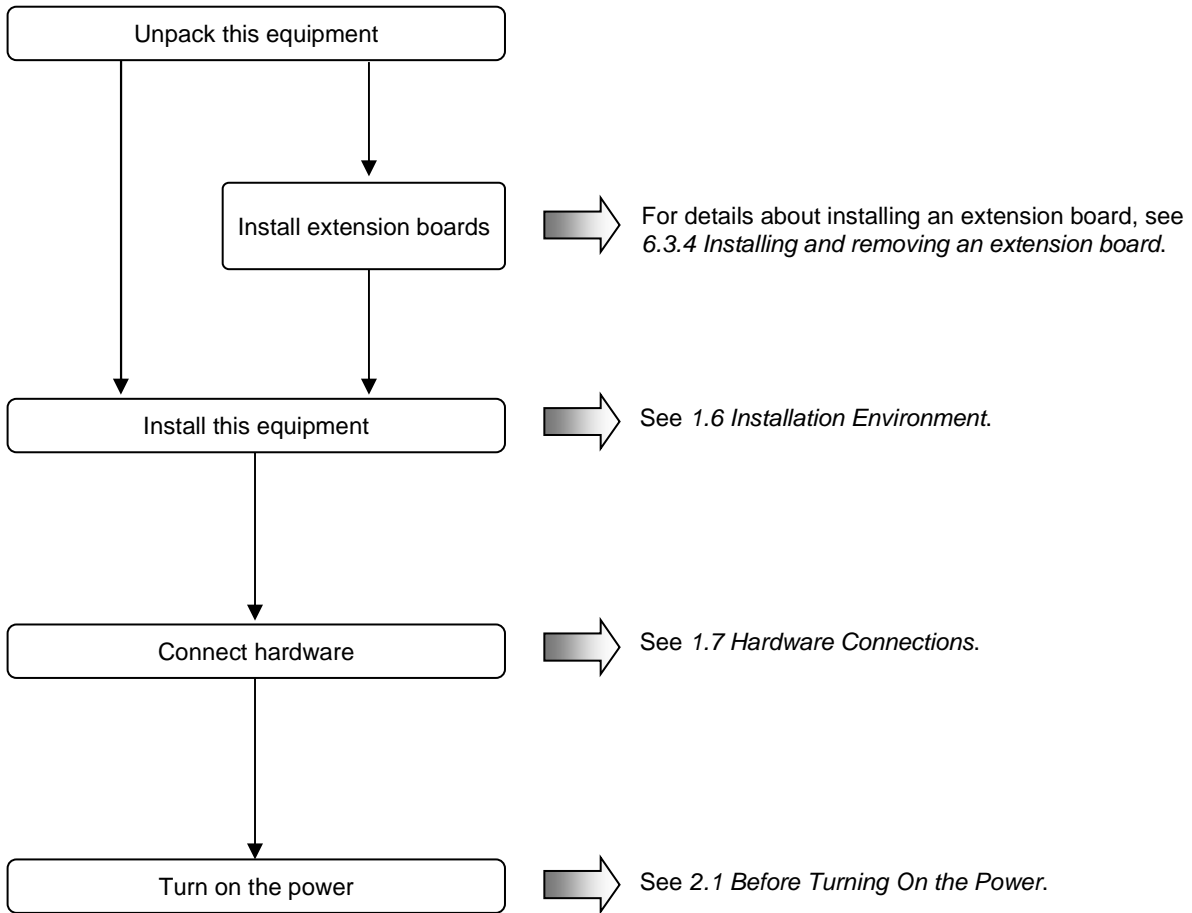
- Backing up files
See *(2) Backing up files* under *4. Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.
- Unplugging the power cord and shutting down the power
See *(4) Power supply* under *1. Precautions About the Equipment* in *PRECAUTIONS*.

(4) Maintaining the equipment

- For information about maintenance, see *6.1 Daily Inspections* and *6.2 Periodic Inspections*.

1.4 Workflow

The following is the workflow of actions required before the equipment power is turned on.



1.5 Name and Function of Each Part



WARNING

Warning about the power supply unit (hazardous voltage):

Do not remove, disassemble, or modify the power supply unit. If you do, serious personal injury or death might result due to electric shock.



CAUTION

Caution about the fans (rotating objects):

Only maintenance personnel are allowed to remove fans. If you remove a fan yourself, your hand or objects might be caught in the rotating parts of the operating fan, and personal injury might result.

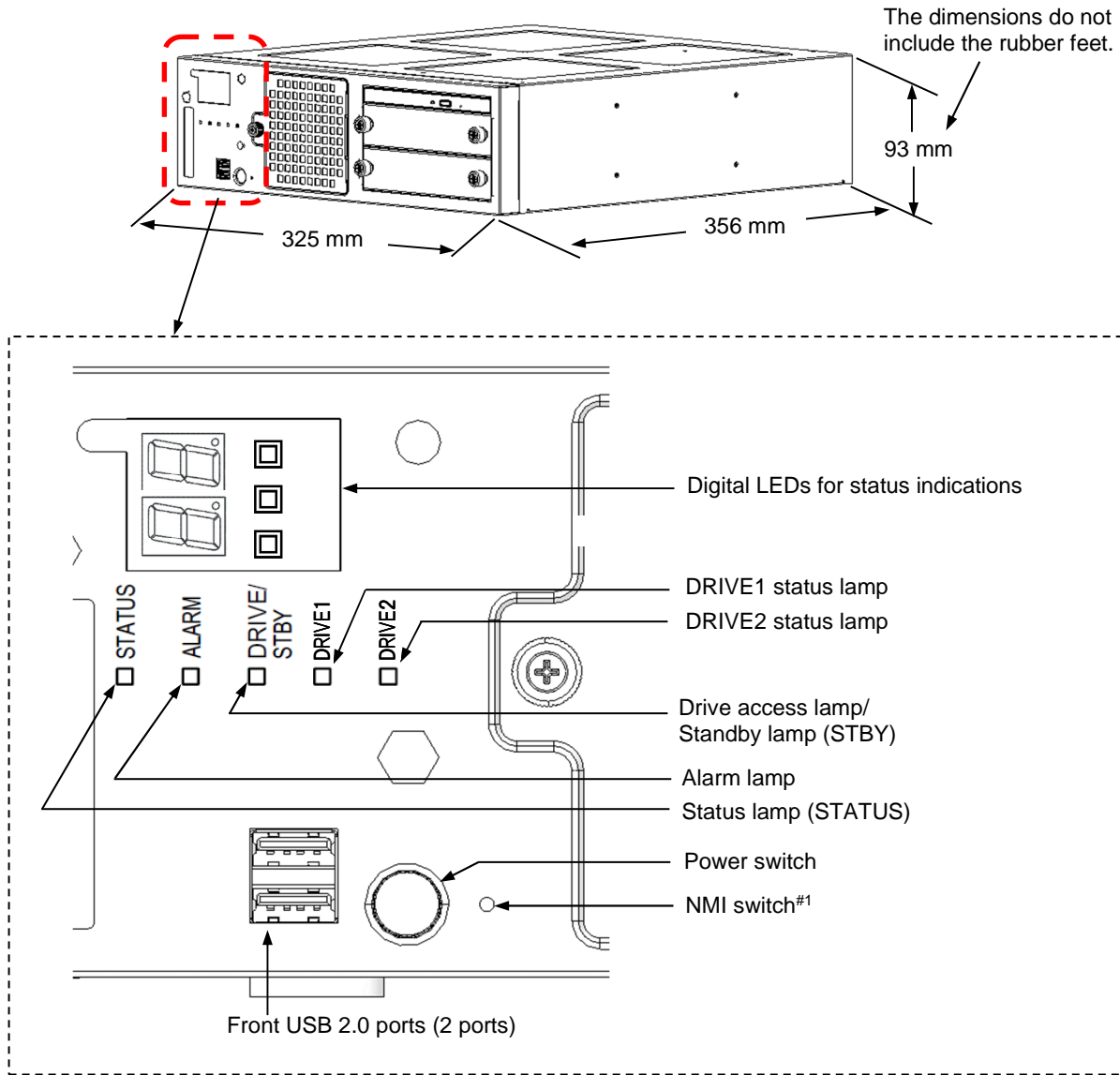
NOTICE

- Never hot-swap HDDs or SSDs, because doing so might cause a failure in the equipment or the HDDs or SSDs. Before you replace an HDD or SSD for the A model or S model, shutdown the OS, unplug the power cord, and wait for at least one minute.
- When using a USB port, check the orientation of the USB connector, and then insert the connector slowly. Failure to do so might damage the USB port.
- Do not remove or insert a USB device during online operation (system operation), because doing so might affect applications that are running.
- If you insert or access a CD or DVD, the system load might increase, and applications that are running might be affected. Do not insert or access a CD or DVD during online operation (system operation).

1. GETTING STARTED

- Parts related to the display and user operation

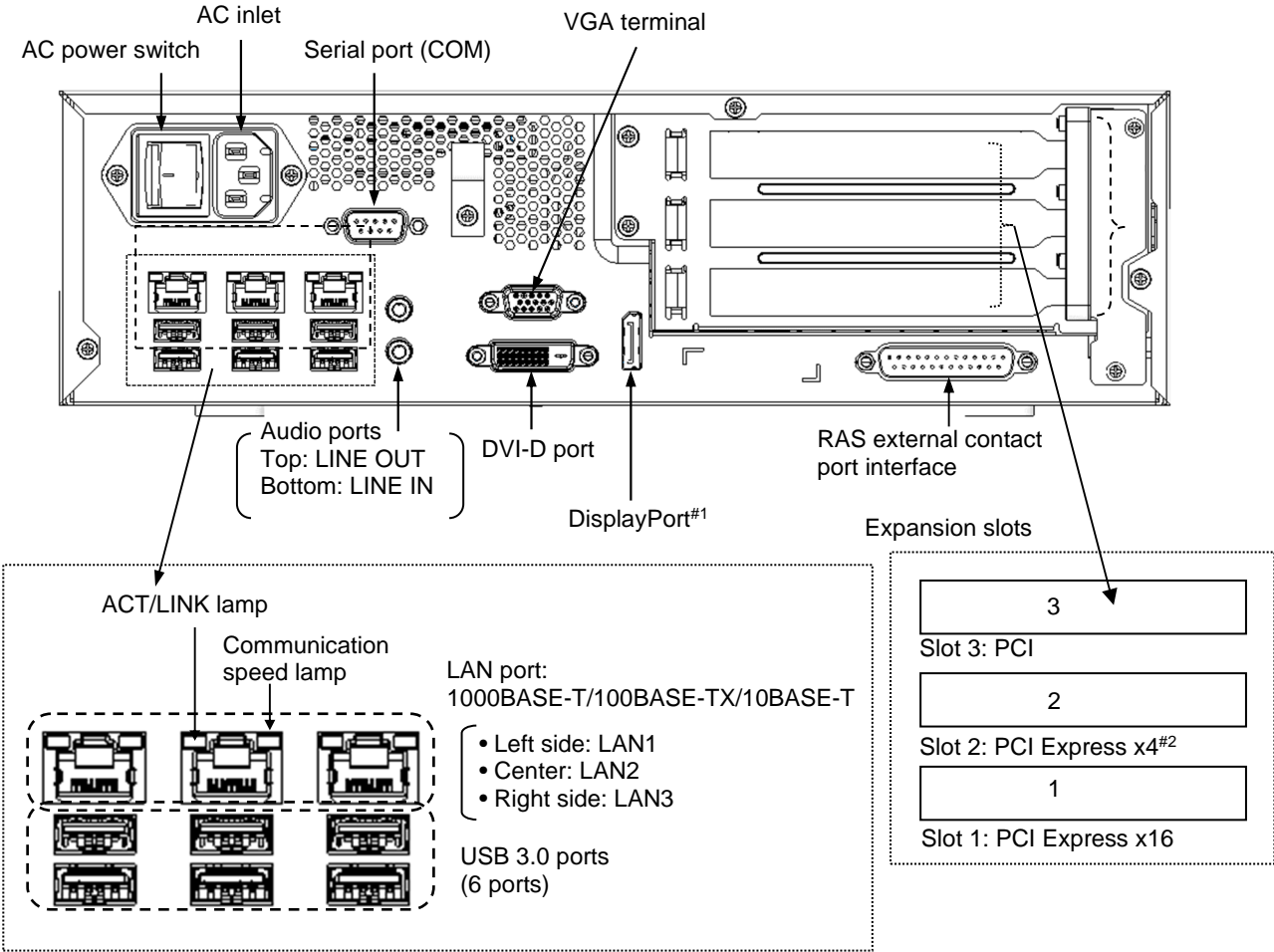
(1) Front view



#1: Press the NMI switch by inserting an eject pin. If an eject pin is not available, use a pin that fits the hole of the NMI switch instead.

Figure 1-1 Name of each part (front view)

(2) Rear view



#1: If a display unit connected with DisplayPort is turned off, the display can no longer be detected.
#2: Although a PCI Express x16 connectors is used, the internal connection is equivalent to PCI Express x4.

Figure 1-2 Name of each part (rear view)

1. GETTING STARTED

(3) Physical configuration inside the equipment

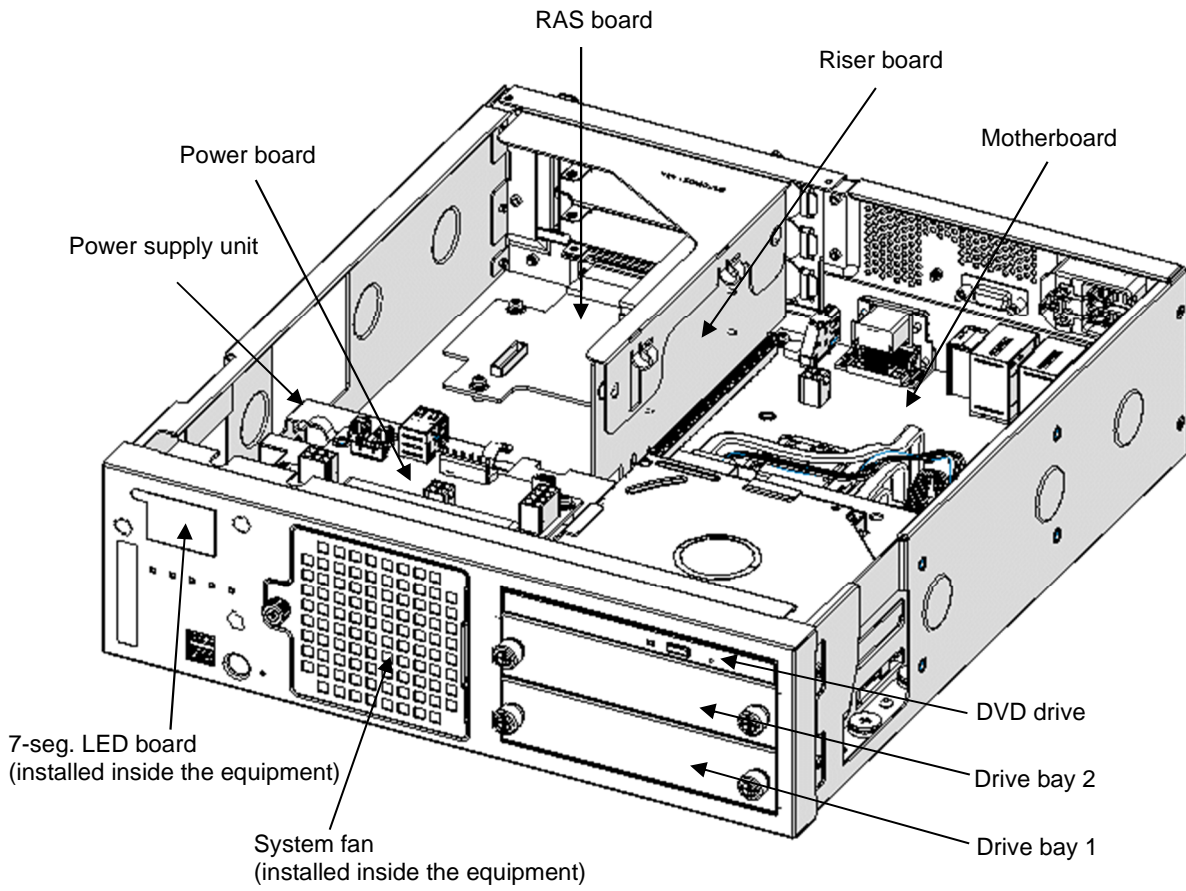


Figure 1-3 Physical configuration inside the equipment

Table 1-1 Function of each part (1/5)

Name	Function										
Power switch (POWER)	Pressing this switch turns the power on. If you press the switch for four seconds or more, the power turns off, and the system goes into standby mode (for emergencies only).										
NMI switch	This switch is used to collect memory dumps. If you press the switch while the OS is running, a memory dump is performed. If you press the switch again after the memory dump is performed, the hardware is reset.										
Status lamp (STATUS)	<table border="1"> <thead> <tr> <th>Lamp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Lit in green</td> <td>The equipment is operating (RUN status).</td> </tr> <tr> <td>Lit in red</td> <td>The equipment is not operating (STOP status): <ul style="list-style-type: none"> The equipment is starting up. An equipment shutdown has started or an error stop occurred. The equipment has stopped abnormally due to an error. RAS software is not installed. </td> </tr> <tr> <td>Off</td> <td>The main power is off or the system is in standby mode.</td> </tr> </tbody> </table>	Lamp	Status	Lit in green	The equipment is operating (RUN status).	Lit in red	The equipment is not operating (STOP status): <ul style="list-style-type: none"> The equipment is starting up. An equipment shutdown has started or an error stop occurred. The equipment has stopped abnormally due to an error. RAS software is not installed. 	Off	The main power is off or the system is in standby mode.		
Lamp	Status										
Lit in green	The equipment is operating (RUN status).										
Lit in red	The equipment is not operating (STOP status): <ul style="list-style-type: none"> The equipment is starting up. An equipment shutdown has started or an error stop occurred. The equipment has stopped abnormally due to an error. RAS software is not installed. 										
Off	The main power is off or the system is in standby mode.										
Alarm lamp (ALARM)	This lamp is lit in red if one of the following abnormalities is detected: <ul style="list-style-type: none"> A fan inside the equipment has stopped. The inside of the equipment is at an abnormal temperature. A failure occurred in one of the mirrored disks (B model only). 										
Drive access lamp (DRIVE)	This lamp is lit in green while an HDD, SSD, or DVD drive is being accessed.										
Standby lamp (STBY)	<table border="1"> <thead> <tr> <th>Lamp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Lit in orange</td> <td>The equipment is in standby mode (only the auxiliary power is on).</td> </tr> <tr> <td>Off</td> <td>The power is shutdown or the equipment is operating.</td> </tr> </tbody> </table>	Lamp	Status	Lit in orange	The equipment is in standby mode (only the auxiliary power is on).	Off	The power is shutdown or the equipment is operating.				
Lamp	Status										
Lit in orange	The equipment is in standby mode (only the auxiliary power is on).										
Off	The power is shutdown or the equipment is operating.										
DRIVE status lamps (DRIVE1: For drive bay 1 DRIVE2: For drive bay 2 (B model only)	<table border="1"> <thead> <tr> <th>Lamp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>No problems are detected.</td> </tr> <tr> <td>Lit in red</td> <td>An HDD is offline (the power of the HDD is off).</td> </tr> <tr> <td>Blinking red (either one)</td> <td>A rebuild (copy) is in progress. Only the lamp of the copy destination HDD blinks.</td> </tr> <tr> <td>Blinking red (both)</td> <td>Both HDDs are offline.</td> </tr> </tbody> </table>	Lamp	Status	Off	No problems are detected.	Lit in red	An HDD is offline (the power of the HDD is off).	Blinking red (either one)	A rebuild (copy) is in progress. Only the lamp of the copy destination HDD blinks.	Blinking red (both)	Both HDDs are offline.
Lamp	Status										
Off	No problems are detected.										
Lit in red	An HDD is offline (the power of the HDD is off).										
Blinking red (either one)	A rebuild (copy) is in progress. Only the lamp of the copy destination HDD blinks.										
Blinking red (both)	Both HDDs are offline.										

1. GETTING STARTED

Table 1-1 Function of each part (2/5)

Name	Function
AC inlet	This is used when connecting a power cord.
Power supply unit	This is a power supply module with a wide-range input voltage (100 to 240 V AC).
Audio port (LINE IN)	This is the audio line input.
Audio port (LINE OUT)	This is the audio line output.
Serial port (COM) (9 pins: RS-232C)	You can use this connector to connect a device that uses a serial interface, such as a modem. (See 5.8.1 <i>Connector specifications.</i>)
RAS external contact port (25 pins: EXT)	This connector is used to connect external contacts. (See 5.8.1 <i>Connector specifications.</i>)
VGA terminal	This is used to connect a cable from the analog interface of a display. (See 5.8.1 <i>Connector specifications.</i>)
DVI-D port	This is used to connect a cable from the digital interface of a display. (See 5.8.1 <i>Connector specifications.</i>)
DisplayPort	This is used to connect a cable from the digital interface of a display. (See 5.8.1 <i>Connector specifications.</i>)
PCI bus slot	This is a slot for inserting a PCI board.
PCI Express x16 bus slot	The PCI Express x16 board slot can be used to insert any PCI Express x1, x2, x4, x8, or x16 board.
PCI Express x4 bus slot	This is a slot for inserting a PCI Express x4 board. Note that the connector is a PCI Express x16 connector.
USB ports (USB 2.0/USB 3.0)	These ports are used to connect USB devices.

Table 1-1 Function of each part (3/5)

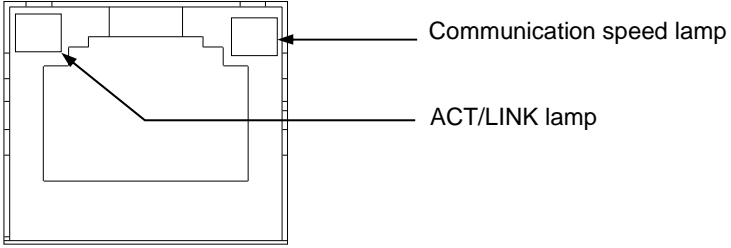
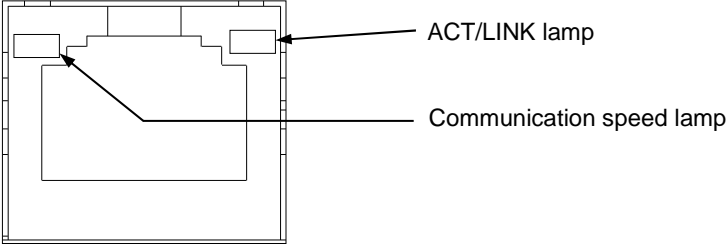
Name	Function																				
LAN port (1000BASE-T/100BASE-TX/ 10BASE-T)	<p>You can connect a LAN cable to the LAN port. (See 5.8.1 Connector specifications.)</p> <ul style="list-style-type: none"> ● Onboard LAN <div style="text-align: center;">  </div> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">ACT/LINK lamp</th> </tr> <tr> <th style="text-align: center;">Lamp</th> <th style="text-align: center;">Status</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lit in green</td> <td>A link is established. Both the equipment and the remote device are powered up and the connection over the twisted-pair Ethernet cable is stable.</td> </tr> <tr> <td style="text-align: center;">Off</td> <td>No link is established: <ul style="list-style-type: none"> • The equipment is not physically connected to the network. • The switching hub is not powered up. • The connection over the twisted-pair Ethernet cable is not stable. • The driver settings contain one or more errors. </td> </tr> <tr> <td style="text-align: center;">Blinking green</td> <td>Network data is being transmitted or received. The blink interval changes depending on network traffic.</td> </tr> </tbody> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">Communication speed lamp</th> </tr> <tr> <th style="text-align: center;">Lamp</th> <th style="text-align: center;">Status</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Lit in orange</td> <td>The link is established at 1000 Mbps.</td> </tr> <tr> <td style="text-align: center;">Lit in green</td> <td>The link is established at 100 Mbps.</td> </tr> <tr> <td style="text-align: center;">Off</td> <td>The link is established at 10 Mbps, or no link is established.</td> </tr> </tbody> </table>	ACT/LINK lamp		Lamp	Status	Lit in green	A link is established. Both the equipment and the remote device are powered up and the connection over the twisted-pair Ethernet cable is stable.	Off	No link is established: <ul style="list-style-type: none"> • The equipment is not physically connected to the network. • The switching hub is not powered up. • The connection over the twisted-pair Ethernet cable is not stable. • The driver settings contain one or more errors. 	Blinking green	Network data is being transmitted or received. The blink interval changes depending on network traffic.	Communication speed lamp		Lamp	Status	Lit in orange	The link is established at 1000 Mbps.	Lit in green	The link is established at 100 Mbps.	Off	The link is established at 10 Mbps, or no link is established.
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Communication speed lamp																					
Lamp	Status																				
Lit in orange	The link is established at 1000 Mbps.																				
Lit in green	The link is established at 100 Mbps.																				
Off	The link is established at 10 Mbps, or no link is established.																				

Table 1-1 Function of each part (4/5)

Name	Function																				
LAN port (1000BASE-T/100BASE-TX/ 10BASE-T)	<ul style="list-style-type: none"> Optional LAN adapter (HJ-F2050-20)  <table border="1" data-bbox="555 622 1417 1066"> <thead> <tr> <th colspan="2">ACT/LINK lamp</th> </tr> <tr> <th>Lamp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Lit in green</td> <td>A link is established. Both the equipment and the remote device are powered up and the connection over the twisted-pair Ethernet cable is stable.</td> </tr> <tr> <td>Off</td> <td>No link is established: <ul style="list-style-type: none"> The equipment is not physically connected to the network. The switching hub is not powered up. The connection over the twisted-pair Ethernet cable is not stable. The driver settings contain one or more errors. </td> </tr> <tr> <td>Blinking green</td> <td>Network data is being transmitted or received. The blink interval changes depending on network traffic.</td> </tr> </tbody> </table> <table border="1" data-bbox="555 1097 1417 1294"> <thead> <tr> <th colspan="2">Communication speed lamp</th> </tr> <tr> <th>Lamp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Lit in orange</td> <td>The link is established at 1000 Mbps.</td> </tr> <tr> <td>Lit in green</td> <td>The link is established at 100 Mbps.</td> </tr> <tr> <td>Off</td> <td>The link is established at 10 Mbps, or no link is established.</td> </tr> </tbody> </table>	ACT/LINK lamp		Lamp	Status	Lit in green	A link is established. Both the equipment and the remote device are powered up and the connection over the twisted-pair Ethernet cable is stable.	Off	No link is established: <ul style="list-style-type: none"> The equipment is not physically connected to the network. The switching hub is not powered up. The connection over the twisted-pair Ethernet cable is not stable. The driver settings contain one or more errors. 	Blinking green	Network data is being transmitted or received. The blink interval changes depending on network traffic.	Communication speed lamp		Lamp	Status	Lit in orange	The link is established at 1000 Mbps.	Lit in green	The link is established at 100 Mbps.	Off	The link is established at 10 Mbps, or no link is established.
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Lit in orange	The link is established at 1000 Mbps.																				
Lit in green	The link is established at 100 Mbps.																				
Off	The link is established at 10 Mbps, or no link is established.																				

Note 1: The locations of the ACT/LINK lamp and the communication speed lamp differ between the optional LAN adapter and the onboard LAN.

Note 2: HJ-F2050-20 has two LAN ports. Looking from the back side of this equipment in a horizontal installation, the port A is on your left and the port B is on your right.

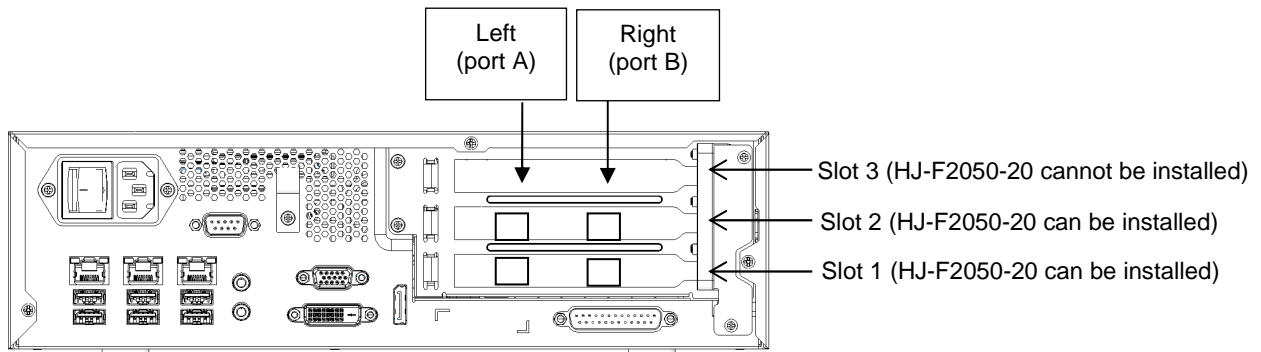
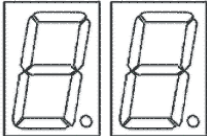
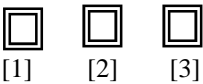


Table 1-1 Function of each part (5/5)

Name	Function
<p>Digital LEDs for status indications</p>   <p>[1] [2] [3]</p> <p>Status indication LEDs</p>	<p>Various states of this equipment are indicated as a two-digit code in hexadecimal and the states of the status indication LEDs.</p> <p>The digital LED for status indication and the status indication LEDs might remain lit even after the equipment shutdowns or enters standby mode. This condition remains until the power is turned on again.</p> <p>Status indication LEDs: [1] Hardware status (red) [2] Application status (green) [3] BIOS status (orange)</p> <p>(For information about how to display arbitrary status data on the digital LED for status indication from a user application, see the <i>HF-W2000 Model 58/55/50 RAS FEATURES MANUAL</i>.)</p>

NOTE

- For information about the precautions for USB devices, see 6. *USB Devices* in *PRECAUTIONS*.

1.6 Installation Environment

1.6.1 Environment



CAUTION

If this equipment is stored at high temperatures, do not touch it with your bare hands. Doing so might result in burns.

This equipment must be used in the following environment.

Item	Requirement
Ambient temperature (operation)	Model 58: 5°C to 35°C Model 55/50: 5°C to 40°C (or 5°C to 35°C at altitudes of 1,000 m or higher)
Ambient temperature (storage)	-10 to 60°C
Temperature gradient	±10 K/h or less
Humidity	20% to 80% RH (non-condensing)
Humidity gradient	±10% RH/h or less
Dust ^{#1}	No heavy dust (0.3 mg/m ³ or less [JEITA IT-1004A Class B])
Corrosive gas	None JEITA IT-1004A Class A (temperature: 25°C, humidity: 50% RH) ^{#2}
Vibration resistance	5.9 m/s ² (10 Hz, 5 s; excluding the DVD drive)
Shock resistance	Operation: 19.6 m/s ² (while not powered on: 98 m/s ²)
Power voltage	100 to 240 V AC ±10%
Power frequency	50/60 Hz ±3 Hz
Power supply noise	2.0 kV (fast transient/burst wave)
Electrostatic noise contact discharge	4 kV (air: 8 kV)
Insulation resistance	500 V DC, 20 MΩ
Dielectric strength	1.5 kV AC, one minute
Transient power fault	20 ms or less
Altitude	Model 58: Less than 1000 m Model 55/50: Less than 2000 m

#1: This equipment cannot be used in an environment where conductive dust or similar substances are airborne.

#2: JEITA: Japan Electronics and Information Technology Industries Association

NOTE

- For information about the precautions for the environment, see (5) *Installation environment* under 1. *Precautions About the Environment* in *PRECAUTIONS*.

1.6.2 Installation



WARNING

- Use the power cord that comes with this equipment to supply power. Using another power cord might result in equipment failure, fire, or electric shock. In addition, when using this equipment at voltages over 125 V AC, prepare a power cord that is compatible with the input voltage to be used, and perform sufficient testing of equipment operation in advance.
- When plugging the power cord into an outlet, use an outlet with a ground terminal (ground pole) that is properly grounded. In addition, you must install and use an earth leakage circuit breaker. Failure to take these measures might result in fire or electric shock.
- Do not use a two-prong plug without a ground pole, because doing so might result in electric shock or equipment failure.



CAUTION

The equipment might cause injury if it falls or is dropped off of a desktop when placed vertically. Use the vertical stand provided with the equipment, and place the equipment with the vertical stand on a level surface.

NOTICE

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs, SSDs, and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.

NOTE

- For information about precautions concerning the installation requirements, see (5) *Installation environment* under 1. *Precautions About the Equipment* in *PRECAUTIONS*.

1. GETTING STARTED

Table 1-2 Dimensions, operation and service clearance, and installation clearance

Dimensions (mm)			Operation and service clearance (mm)				Installation clearance (mm)			
Height	Width	Depth	Front	Rear	Left	Right	Front	Rear	Left	Right
93	325	356	500	600	200	200	50	100	10	10

- When you operate the equipment or do maintenance work, provide sufficient clearance, as shown in Figure 1-4.
- The equipment is cooled by fans. The intake holes are on the front and the exhaust holes are on the rear and sides. Ensure that air flow is not blocked. In particular, leave sufficient clearance in the front (50 mm) and in the rear (100 mm). (This includes the clearance required for routing cable connectors for the rear side.)

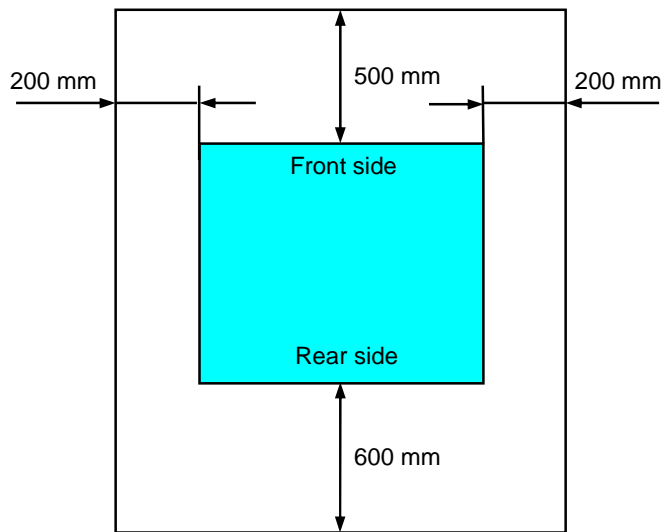


Figure 1-4 Operation and service clearance (top view)

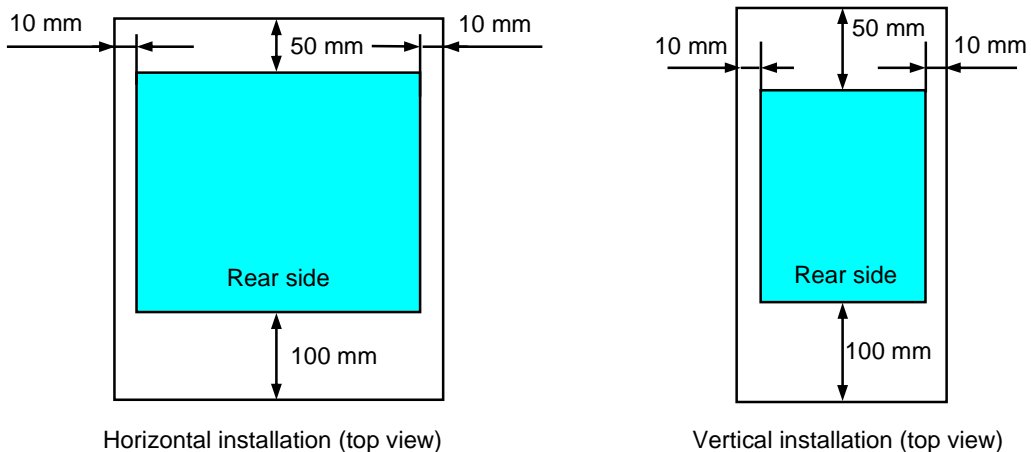


Figure 1-5 Installation clearance

(a) Horizontal installation

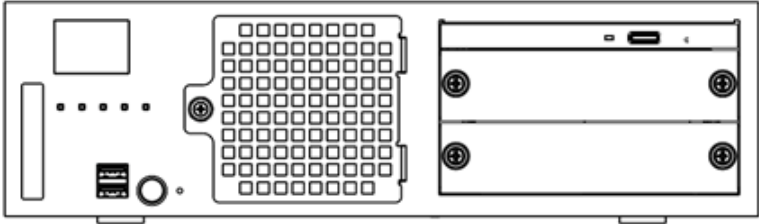


Figure 1-6 Exterior view (horizontal installation on a desktop)

(b) Vertical installation

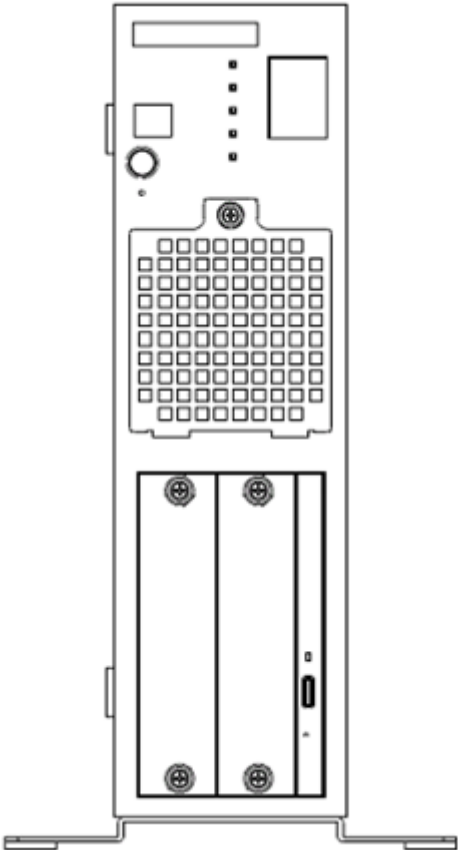


Figure 1-7 Exterior view (vertical installation on a desktop)

1.7 Hardware Connections

NOTICE

- Do not route interface cables and other cables (including cables for other devices, such as a PC) near the power cord. Doing so might cause a failure or malfunction in the equipment.
- Do not connect or disconnect an interface cable while the power for this equipment or for a remote device is on. If you do so, a short circuit between the power supply and the ground might cause a failure in the equipment. If an interface cable comes off while the power for the equipment is on, shutdown the OS and unplug the power cord. Unplugging the power cord without shutting down the OS might destroy internal files.
- When you connect a cable for external contacts, connect the cable to a connector for the external contacts (EXT). A voltage as high as 40 V DC might be applied to the cable through a relay load. If you connect the cable to the wrong connector, this might cause a failure in the equipment.

Before connecting any hardware, carefully read and ensure that you understand the content of the *SAFETY INSTRUCTIONS* section of this document.

Connect hardware based on the connection example shown in the following figure.

Connect the display, keyboard, and mouse to this equipment, and then plug the power cord into an outlet.

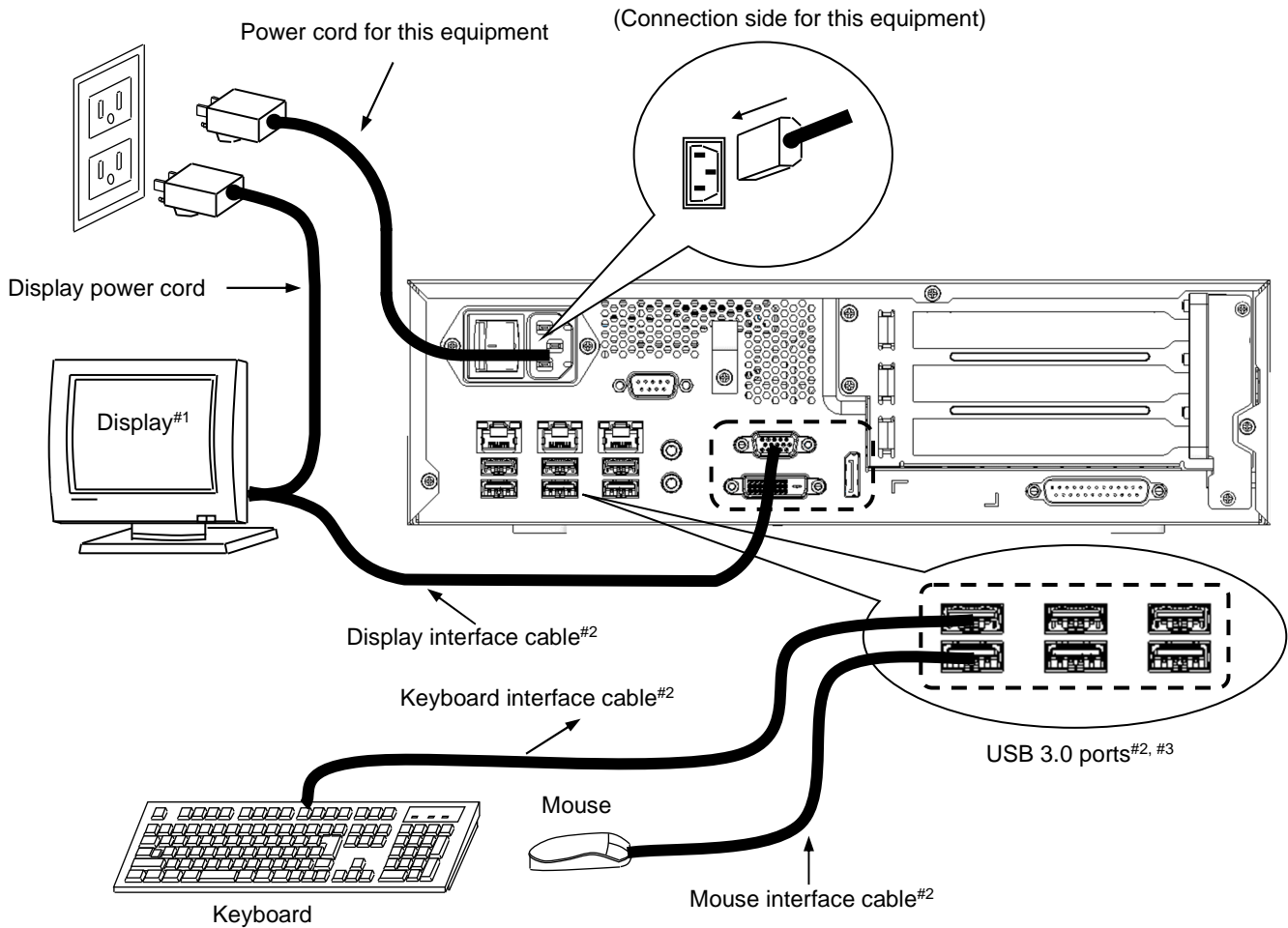


Figure 1-8 Hardware connections

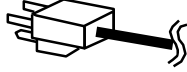
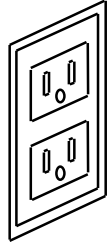
- #1: For information about the naming of the user input module and how to operate and adjust the device, see the user's manual that comes with the device.
- #2: For information about the length of each connection cable, see 5.8.3 *External interface cable length specifications*. The mouse and keyboard interface cables must be directly connected to this equipment. Do not use extension cables for these cables. If you use extension cables, the mouse or keyboard might not work properly.
- #3: When connecting USB devices to the USB connectors, note the orientation of the connectors. In addition, note that a USB cable might disengage from the connector if the cable comes into contact with an object unexpectedly, because USB ports do not typically feature a mechanism to secure the cable in the port. Secure USB cables as necessary when installing this equipment.

Note: To ensure conformity with EMC standards (VCCI, FCC, and CE), use shielded cables for the interface cables connected to the equipment (the display interface cable, keyboard interface cable, and mouse interface cable).

1. GETTING STARTED

- Connecting to an outlet

Fully and securely insert the plug of the power cord of this equipment into an outlet with a grounding pole that is properly grounded.^{#1}



Use a power cord with a 2-pole plug with a grounding pole.

#1: If you have no choice other than to use an outlet without a grounding pole that is properly grounded, use a 3-pole to 2-pole conversion adapter and connect the green ground line from the adapter to the ground of the outlet. Verify the proper functionality of the 3-pole to 2-pole conversion adapter before using it.

NOTE

- The power cord that comes with the equipment is rated at an input voltage of 125 V AC. When using this equipment at voltages over 125 V AC, prepare a power cord that is compatible with the input voltage to be used.
- If you are using a power cord clamp to prevent accidental disconnection, allow for extra length in the power cord around the connector when you secure the cord, in order to allow the cord to be disconnected in an emergency. Alternatively, install an emergency circuit breaker at the outlet.

CHAPTER 2 OPERATION

2.1 Before Turning On the Power



WARNING

If any of the air intake and exhaust holes of the equipment are blocked, the temperature inside the equipment might rise, which might result in a fire or equipment failure. Ensure sufficient clearance around the equipment when installing the equipment. (See 1.6.2 *Installation*.)

NOTE

When turning on the power, see the following:

- (2) *Interface cables* under 1. *Precautions About the Equipment* in *PRECAUTIONS*
- (4) *Power supply* under 1. *Precautions About the Equipment* in *PRECAUTIONS*
- (5) *Installation environment* under 1. *Precautions About the Equipment* in *PRECAUTIONS*

2.2 Starting the Equipment

To start the equipment:

1. Plug the power cord into an outlet.

When the power cord is plugged into an outlet, the standby lamp (STBY) will turn on.

2. Turn on the power to the display.
3. Press the power switch. (See *1.5 Name and Function of Each Part*.)

When the power is turned on, the standby lamp (STBY) turns off and the status lamp (STATUS) lights. The status lamp turns red when the power is turned on and green when the OS starts and the equipment is operating.

4. After the OS starts, set up the equipment as described in *3.1 Setup Procedure When Turning On the Power for the First Time*. (This procedure is required only once, the first time you start the equipment after purchasing the equipment.)

NOTE

- When RAS software is not installed or during the recovery process, the status lamp (STATUS) does not turn green and remains red.

After these steps are complete, the equipment automatically performs the startup process until the sign-in screen appears.

For information about controlling the power by using a LAN, see *2.7 Controlling the Power By Using a LAN*.

2.3 Shutting Down the Equipment

When shutting down the equipment, first verify that no other users are using the equipment and that no background programs are running. Then perform the following actions:

- Stop application programs.
- Shutdown the OS.

The specific procedure for stopping an application program differs depending on the application. For more information, see the manual of the relevant application.

If the OS is Windows® 10 or Windows Server® 2016:

To shutdown the OS, click the **Start** button at the bottom-left corner of the screen to open the **Start** menu. Then, click **Power** and **Shutdown**. After the OS shutdown, the power automatically turns off, and only the auxiliary power supply remains on (standby mode). (In this mode, the status lamp (STATUS) is off and the standby lamp (STBY) is on.)

If the OS is Windows® 10 or Windows Server® 2016:

If the normal shutdown process cannot be performed (for example, a shutdown request cannot be accepted due to a system deadlock), open the protective cover on the upper-right part of the front panel, and then press and hold the power switch for at least four seconds. The power turns off and the equipment goes into standby mode. If you turn off the power by pressing and holding the power switch for at least four seconds, you cannot turn on the power via a LAN the next time that you turn the power on. Do not turn off the power this way except in emergencies. (See *2.7 Controlling the Power By Using a LAN.*) For information about how to collect a memory dump, see *8.2 Collecting Memory Dumps.*

2.4 Shutting Down the Power

1. Verify that the equipment is shutdown. (See 2.3 *Shutting Down the Equipment*.)
2. Turn off the AC power switch on the rear side of the main unit.
3. When the AC power is off due to the operation described in step 2, the standby lamp (STBY) turns off.
4. Unplug the power cord of the equipment.

2.5 Emergency Shutdown



WARNING

In the case of smoke, a burning smell, or a similar problem, unplug the power cord and contact your dealer or maintenance personnel. Using faulty equipment without repairing it might result in a fire or an electric shock.

NOTICE

- Performing an emergency shutdown (that is, unplugging the power cord or shutting off the circuit breaker without properly shutting down the OS) might cause the OS or applications not to work properly or might cause saved data to be corrupted. Never perform an emergency shutdown unless some kind of error requires that you stop the system immediately.
- Note that if the power supply is cut, the system might not be able to recover automatically.

In the following cases, turn off the power at the source of the AC power:

- When the equipment exhibits an abnormal condition, and you must shutdown the power immediately (for example, when you detect a burning smell)
- When you cannot shutdown the equipment due to some error
- When the power is turned off repeatedly, or only the auxiliary power supply is on due to excess current or overheating

In the following cases, unplug the power cord of this equipment or turn off the power at the source of the AC power:

- If the fan is stopped and the temperature becomes too high or too low, and consequently the power turns off automatically to protect the equipment while leaving only the auxiliary power supply on.

Before the OS starts, the BIOS can detect a stopped fan during BIOS startup. If a stopped fan is detected, the power turns off automatically.

After the OS starts, when the RAS software detects that a fan is stopped, the OS automatically shutdown and the power turns off (this applies when RAS software is already installed).

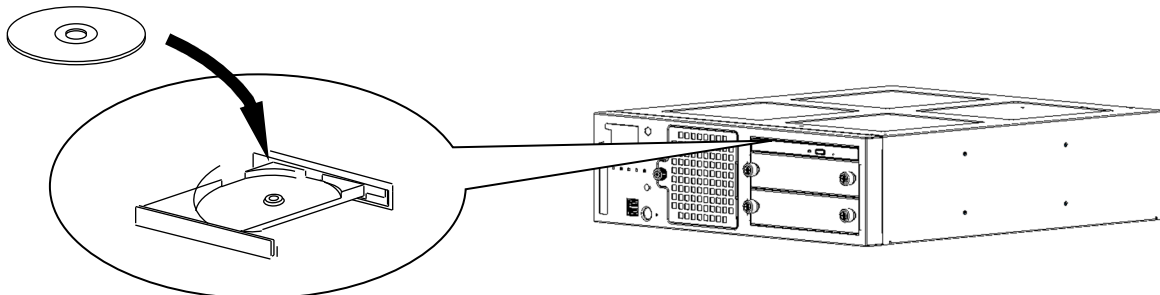
2.6 DVD Drive

NOTICE

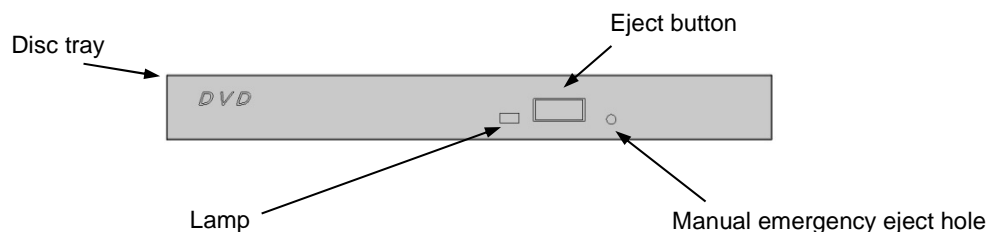
- If you insert or access a CD or DVD, the system load might increase, and running applications might be affected. Do not insert or access a CD or DVD during online operation (system operation).
- When you finish accessing a CD or DVD, eject the disc from the DVD drive. Leaving it in the DVD drive might result in a failure.
- Leaving the disc tray open might result in a failure. Close the disc tray when it is not in use.
- Do not use a CD or DVD that is not balanced due to attached labels or other differences; a disc with cracks, scratches, or vertical deviation; or a disc with a non-standard shape. Using such a disc might generate an abnormal sound or vibration and might result in equipment failure.

2.6.1 Inserting an optical disc (CD or DVD)

1. Gently press the eject button to open the disc tray.
2. While supporting the disc tray with one hand, place the CD or DVD on the disc tray with the top (the side with the printed text) facing up.
3. Push the disc tray to load the disc into the DVD drive.



Front view when the disc tray is open



Front view of the DVD drive

Figure 2-1 DVD drive (front view)

NOTE

- For information about precautions that apply to the DVD drive, see 5. *DVDs* in *PRECAUTIONS*.

2.6.2 Ejecting an optical disc (CD or DVD)

1. Confirm that the lamp is not on or flashing (the drive is operating).
2. Press the eject button gently to open the disc tray.
3. Pick up the CD or DVD.

NOTE

- When writing to a CD or DVD, use the OS to eject the disc. If you press the eject button, writing to the disc might fail.

2.6.3 Using the DVD drive when the equipment is installed vertically

1. Press the eject button to eject the disc tray from the DVD drive.
2. While holding the disc tray with your left hand, set a CD or DVD on the disc tray with your right hand.
3. Remove your left hand from the disc tray.
4. Push the disc tray to load the disc into the DVD drive.
5. When you remove the CD or DVD, remove the disc without applying excessive force to the disc.

2.7 Controlling the Power By Using a LAN

The power for this equipment can be turned on via a remote device by using a LAN.

This section explains Wake-on-Lan (WOL), which is used to turn on power to the equipment via a LAN. When you use WOL to turn on the power, the equipment is started through the transmission of a Magic Packet™ frame to the LAN interface when the standby lamp (STBY) is on.

This feature is disabled by default. To use this feature, follow steps 1 through 3 in *2.7.1 Enabling the Wake-on-LAN (WOL) feature* to enable the WOL feature, and then perform the following procedure.

NOTE

- For information about the precautions that apply to a network, see *2. Networks* in *PRECAUTIONS*.

2.7.1 Enabling the Wake-on-LAN (WOL) feature

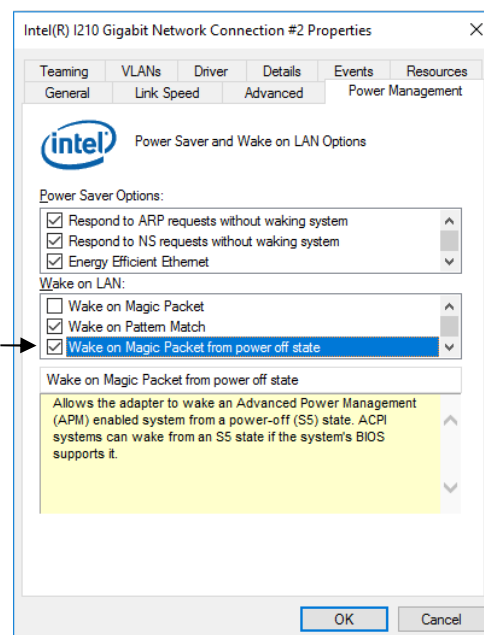
Perform the following procedure to specify whether to start WOL when a Magic Packet™ frame is received. The WOL feature is disabled by default.

(The displayed images are of Windows® 10, but are similar to other OSs.)

1. Perform steps 1 through 5 in *Setting the network transfer speed* under *2.8 Setting Up the LAN Interface*.
2. Click the **Power Management** tab. If you want to enable WOL, select the **Wake on Magic Packet from power off state** check box under **Wake on LAN**.

When using Windows® 10 2019 LTSC, click the **Advanced** tab, and then under **Property**, set both **Wake on Magic Packet** and **Enable PME** to **Enabled**.

3. Click **OK** and restart the system.



2.7.2 Turning on the power by using a LAN

1. Plug the power cord into an outlet, and then turn on the main power. The standby lamp (STBY) lights.
2. Send a Magic Packet™ frame to the built-in LAN adapter of the equipment. When the built-in LAN adapter receives a Magic Packet™ frame, the equipment power turns on.

You must turn on the standby lamp (STBY) to start the equipment via the LAN (that is, by using WOL). If you start the equipment and you want to use WOL again at the next startup, perform the shutdown process when turning the power off.

The built-in LAN adapter of the equipment is compliant with WfM 2.0^{#1} to support the Magic Packet™ technology^{#2}. Because of this, the equipment power can be turned on when a special data packet called a *Magic Packet™ frame*^{#2} is received by the built-in LAN adapter.

The equipment does not come with a program for transmitting Magic Packet™ frames. Use a commercially available program to transmit Magic Packet™ frames.

#1: Wired for Management (WfM) is a guideline regarding the hardware specifications proposed by Intel Corporation for managing PCs on a network.

#2: Magic Packet™ technology has been developed by Advanced Micro Devices, Inc., and can be used to start a PC over a network from a remote device.

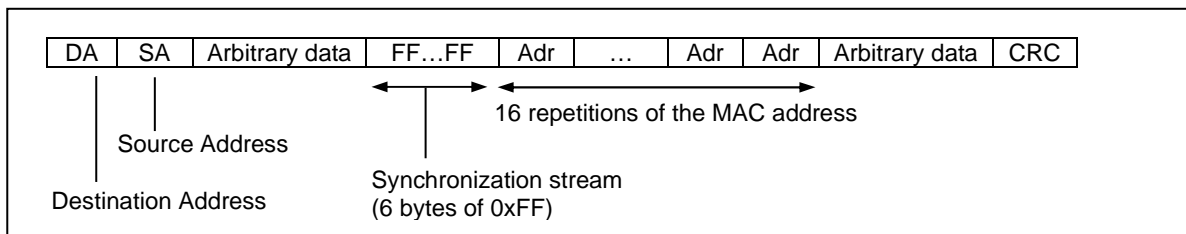
NOTE

- When you transmit a Magic Packet™ frame to the equipment, transmit the frame to the built-in LAN adapter of the equipment. (For information about the location of the connector, see *1.5 Name and Function of Each Part*.) You cannot use WOL if you send a Magic Packet™ frame to an optional LAN adapter.
- If you turn off the power by pressing and holding the power switch for at least four seconds, you cannot turn the power on by using WOL the next time that you turn the power on. When you turn off the power by pressing and holding the power switch for at least four seconds, turn on the equipment by pressing the power switch, and then perform the shutdown process to turn off the power again.

About Magic Packet™ frames

In a Magic Packet™ frame, the SOURCE ADDRESS, DESTINATION ADDRESS (the MAC address of the receiver or the MULTICAST ADDRESS including the BROADCAST ADDRESS), CRC, and the like must meet the basic requirements of the LAN in use. The data in a Magic Packet™ frame consists of a sequence of 16 repetitions of the MAC address of the node. This sequence can be anywhere in the packet but it must follow a synchronization stream. The synchronization stream is defined as 6 bytes of 0xFF. As long as the MAC address that repeats itself 16 times targets the address of the equipment to be started, the device can receive a BROADCAST frame.

The following figure is an illustration of a Magic Packet™ frame:



2.8 Setting Up the LAN Interface

This equipment has three built-in 1000BASE-T/100BASE-TX/10BASE-T LAN ports. For information about the location of the LAN port connectors (1000BASE-T/100BASE-TX/10BASE-T), see *1.5 Name and Function of Each Part*.

NOTE

- For information about the precautions for the network, see *2. Networks* in *PRECAUTIONS*.
- Automatic recognition of the network transfer speed and transfer mode
 The LAN port has an auto-negotiation feature that automatically recognizes the network transfer speed and transfer mode. During normal use, enable the auto-negotiation feature. (Use the auto-negotiation feature when using the WOL feature. Note that if the speed is fixed to 1000 Mbps, the WOL feature cannot be used.)
 If there is a compatibility issue with a connected hub, the auto-negotiation feature might not work properly, which might affect communications with other terminals.
 If the auto-negotiation feature does not work properly, configure the LAN interface as follows:

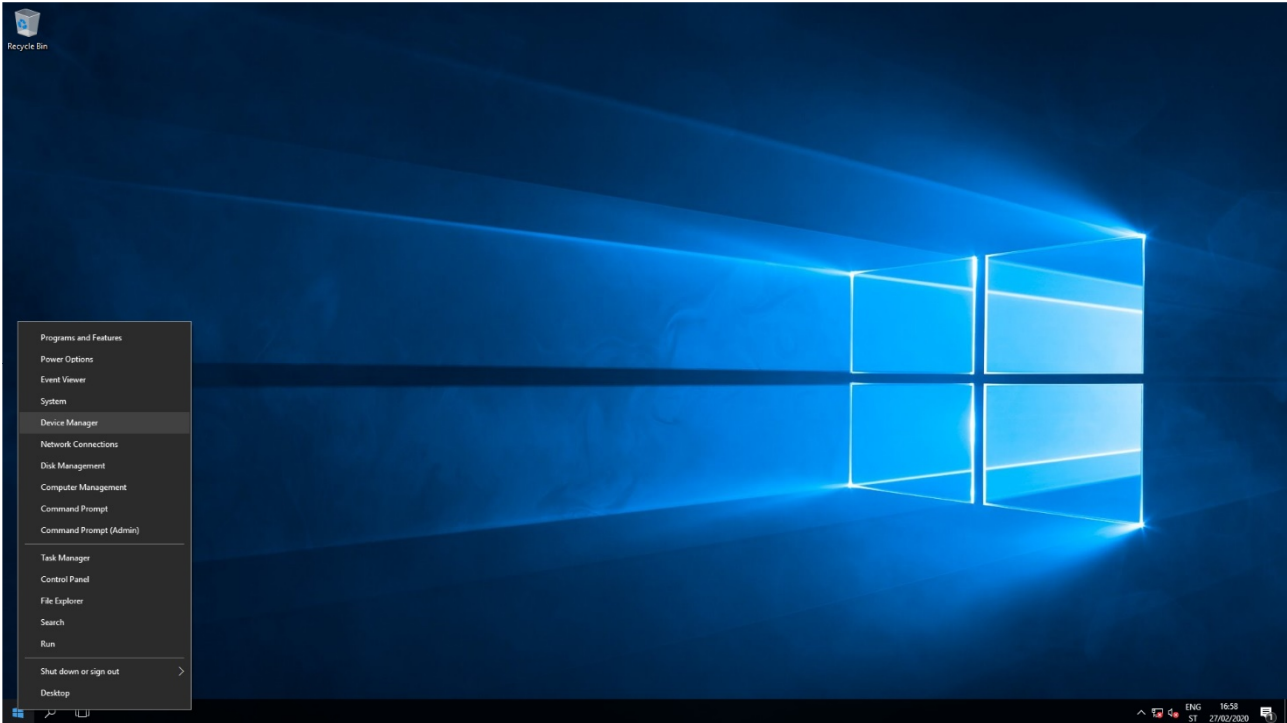
Specification of the hub	LAN setting specifications [#]	
	Speed	Duplex
10 Mbps, half-duplex	10 Mbps	Half duplex
10 Mbps, full-duplex	10 Mbps	Full duplex
100 Mbps, half-duplex	100 Mbps	Half duplex
100 Mbps, full-duplex	100 Mbps	Full duplex
1000 Mbps	1000 Mbps (1.0 Gbps)	Full duplex

[#]: Settings are displayed differently depending on the OS and LAN port (including the optional LAN adapter) being used.

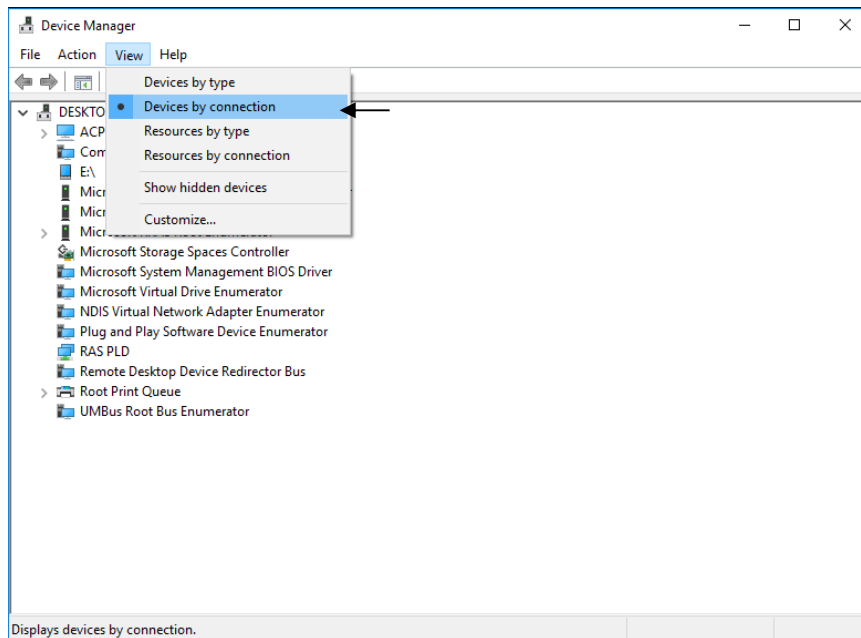
- Setting the network transfer speed

(The displayed images are of Windows® 10, but are similar to other OSs.)

1. Log on to the computer by using an administrator account.
2. Right-click the **Start** menu, and then click **Device Manager**. The Device Manager window appears.

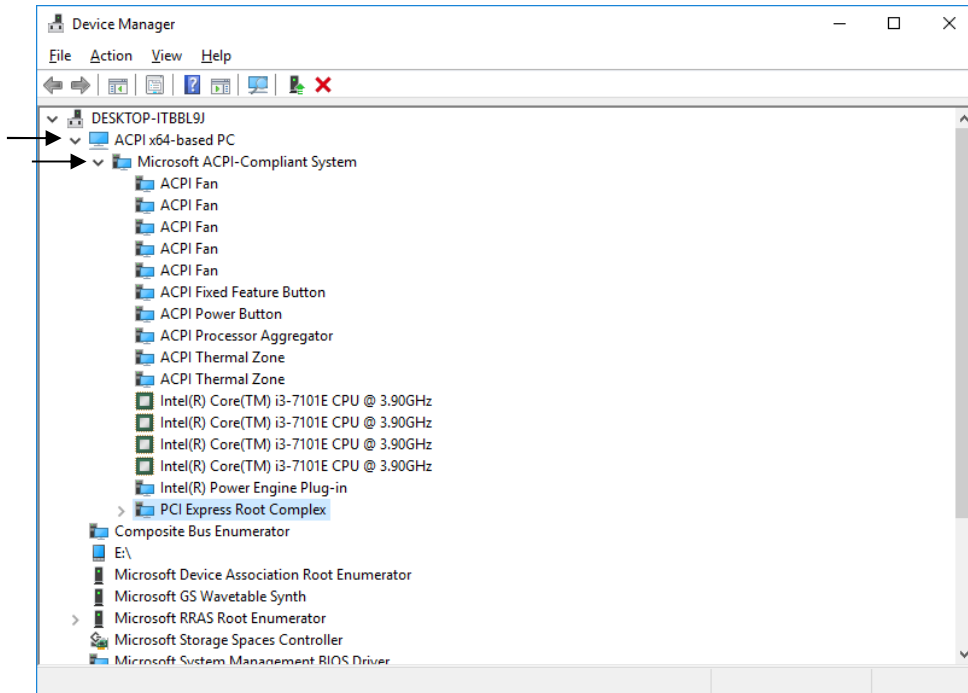


3. Click the **View** menu, and then select **Devices by connection**.



2. OPERATION

4. Click **ACPI x64-based PC**, **Microsoft ACPI-Compliant System**, and **PCI Express Root Complex**.



5. Refer to the following, and double-click the network adapter that you want to configure to open the **Network Connection Properties** window.

To configure the built-in LAN (LAN1):

Click **Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #6 – A115**.

Then, double-click the network adapter under it (in the example in the following figure, the network adapter is **Intel(R) I210 Gigabit Network Connection #2**).

To configure the built-in LAN (LAN2):

Click **Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #7 – A116**.

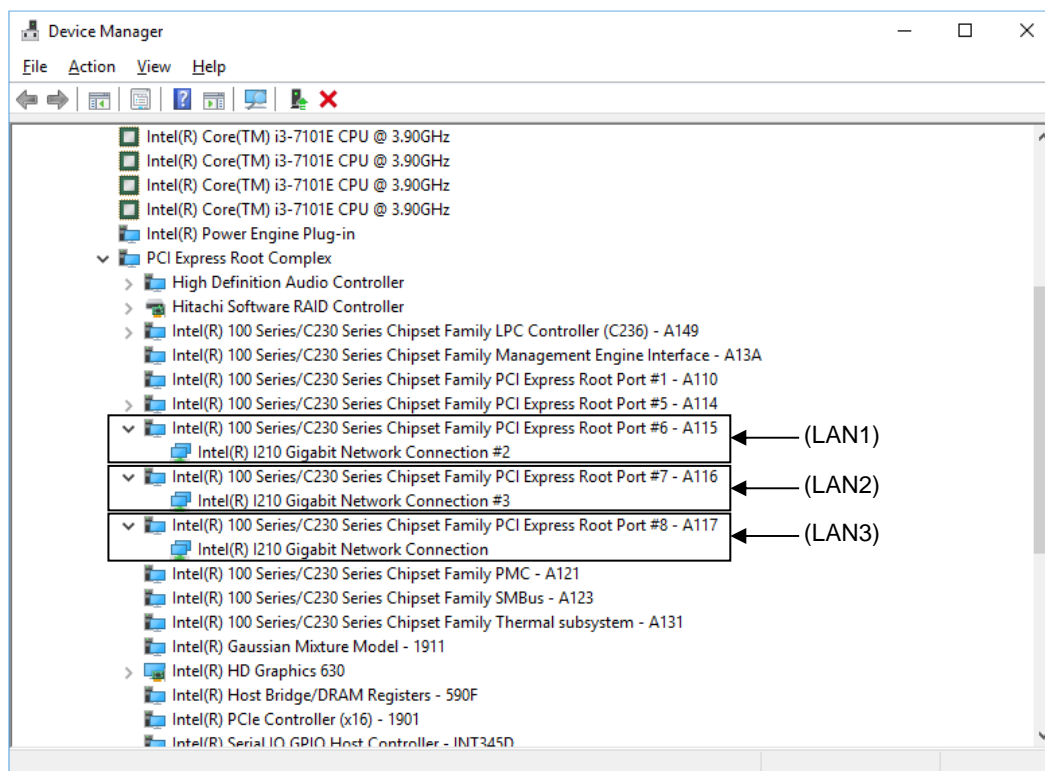
Then, double-click the network adapter under it (in the example in the following figure, the network adapter is **Intel(R) I210 Gigabit Network Connection #3**).

To configure the built-in LAN (LAN3):

Click **Intel(R) 100 Series/C230 Series Chipset Family PCI Express Root Port #8 – A117**.

Then, double-click the network adapter under it (in the example in the following figure, the network adapter is **Intel(R) I210 Gigabit Network Connection**).

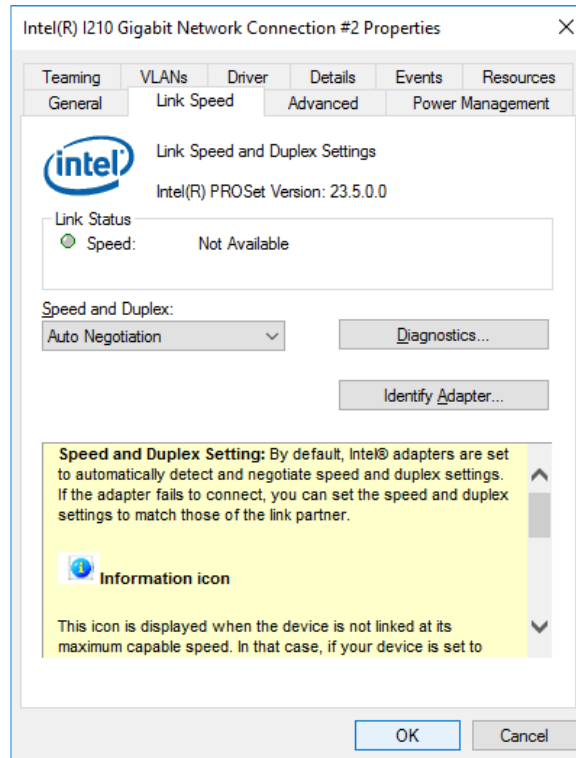
Follow a similar procedure when you update the settings for the network adapter mounted in an extension slot.



2. OPERATION

6 Click the **Link Speed** tab.

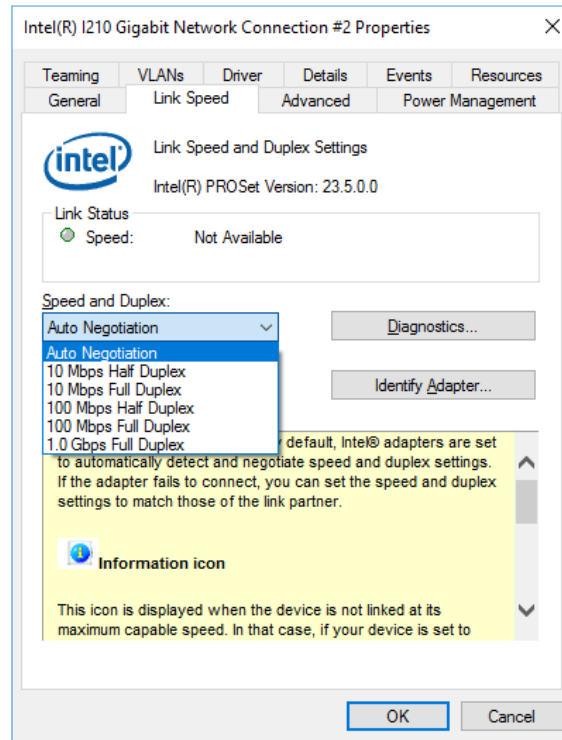
If you are using Windows® 10 2019 LTSC, click the **Advanced** tab.



7. From the **Speed and Duplex** drop-down list, select the transfer speed and the transfer mode you want to use. If you are using Windows® 10 2019 LTSC, select the transfer speed and transfer mode by using the **Speed & Duplex** item under **Property**.

- **Auto Negotiation:** Auto-negotiation setting
- **10 Mbps Half Duplex:** 10 Mbps, half-duplex setting
- **10 Mbps Full Duplex:** 10 Mbps, full-duplex setting
- **100 Mbps Half Duplex:** 100 Mbps, half-duplex setting
- **100 Mbps Full Duplex:** 100 Mbps, full-duplex setting
- **1.0 Gbps Full Duplex:** 1.0 Gbps, full-duplex setting

If you do not need to configure the transfer speed or transfer mode, select **Auto Negotiation** to enable the auto-negotiation setting.



8. Click **OK**.
9. Close the **Device Manager** window.

NOTE

- For information about precautions that apply to the network, see 2. *Networks* in *PRECAUTIONS*.

2. OPERATION

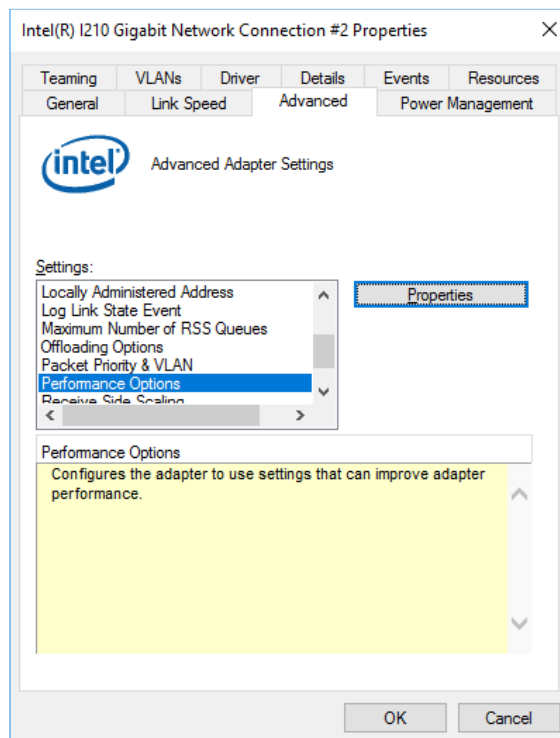
- Actions to take if the link is unstable at 1000 Mbps

Depending on the type of connected hub, the link might not be stable at 1000 Mbps. If you want to use the network at 1000 Mbps, verify the connection with the hub in advance. If the link is unstable at 1000 Mbps, you can stabilize it as follows:

- Use a cable that is 20 to 100 meters long (UTP Category 5e or better).
- Set the master/slave mode setting to Master (valid only in the 1000 Mbps settings).

Perform the following procedure to set the mater/slave mode to Master. The link might not function depending on the type of the hub. In this case, change the setting to **Auto Detect**.

1. Perform steps 1 through 5 in *Setting the network transfer speed* under *2.8 Setting Up the LAN Interface*.
2. Click the **Advanced** tab. In the **Settings** list, select **Gigabit Master Slave Mode**.
3. From the **Value** drop-down list, select **Force Master Mode**.
4. Click **OK** to restart the equipment.



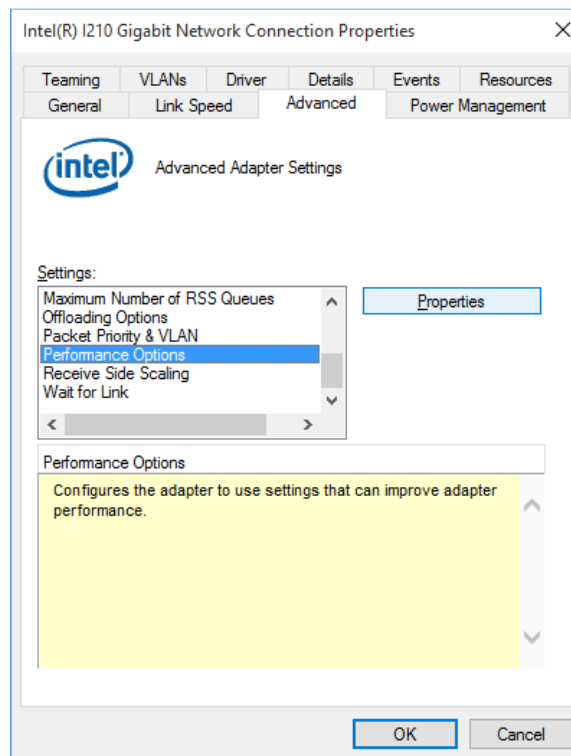
- Precautions related to mounting and using multiple LAN adapters

If multiple LAN adapters are mounted, interrupt requests from either of the adapters occur frequently or the amount of processed data is too large, the performance of the adapters might not be as high as expected. (This is because an interrupt request from a LAN adapter requires a higher CPU load compared to the amount of processed data, and if multiple LAN adapters are mounted and used, it takes a very long time for the CPU to process all interrupt requests from the LAN adapters.)

If you mount and use multiple LAN adapters, confirm that each built-in LAN adapter and optional adapter is capable of achieving the expected level of performance. If any are not, adjust the network load or change the LAN adapter settings by performing the following procedure. For details about each configuration item, see the description at the bottom of the corresponding setup window.

(The displayed images are of Windows® 10, but are similar to other OSs.)

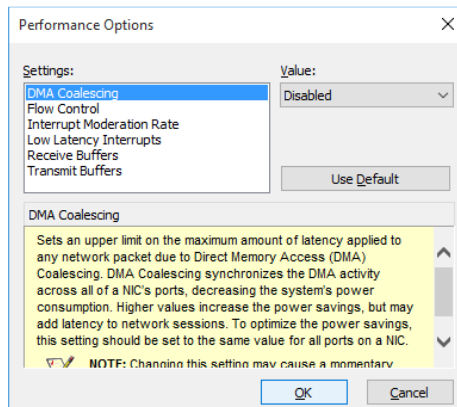
1. Perform steps 1 through 5 in *Setting the network transfer speed* under *2.8 Setting Up the LAN Interface*.
2. Click the **Advanced** tab. In the **Settings** list, select **Performance Options**, and then click **Properties**.
The **Performance Options** dialog box appears.



2. OPERATION

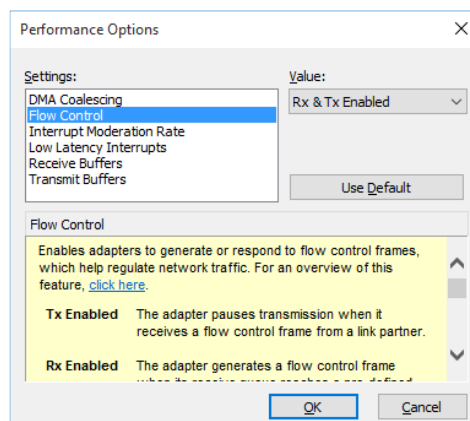
- DMA Coalescing

Sets an upper limit on the maximum amount of latency applied to any network packet due to Direct Memory Access (DMA) Coalescing.



- Flow Control

Enables adapters to generate or respond to flow control frames, which help regulate network traffic. The default setting for flow control differs depending on the OS and the type of LAN adapter being used. You must configure the flow control setting according to the network you are using.

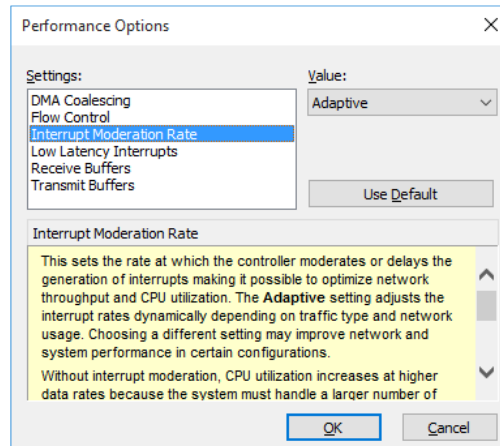


NOTE

- If the LAN driver stops due to a system failure such as an OS deadlock, broadcast frames from other devices might not be processed, and the receive queue might become full.
If **Rx Enabled** or **Rx & Tx Enabled** is specified for **Flow Control**, flow control frames are continuously sent from this equipment under such conditions. If this happens, the entire network connected to the equipment might be affected. Specify **Disabled** for **Flow Control** for this equipment or at the connected hub as required.
- If **Disabled** is specified for **Flow Control** and the device receives frames faster than it can process them, the device becomes overloaded, and the received frames are discarded until the device recovers from the overload condition. Design the network appropriately to avoid such overload conditions.

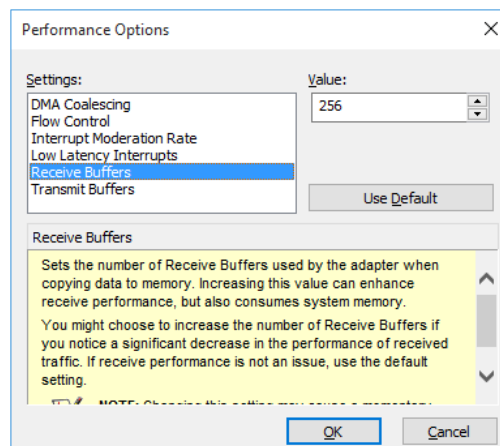
- Interrupt Moderation Rate

This sets the rate at which the controller moderates or delays the generation of interrupts.



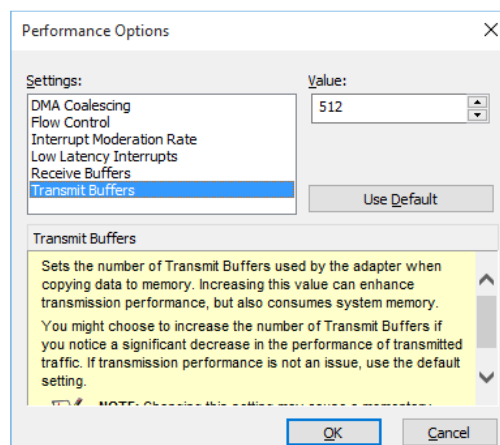
- Receive Buffers

Sets the number of Receive Buffers used by the adapter when copying data to memory.



- Transmit Buffers

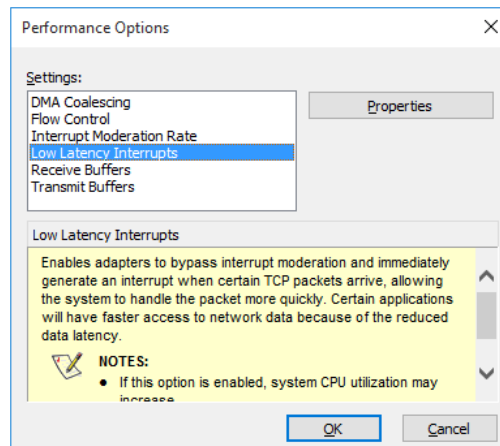
Sets the number of Transmit Buffers used by the adapter when copying data to memory.



2. OPERATION

- Low Latency Interrupts

Enables adapters to bypass interrupt moderation and immediately generate an interrupt when certain TCP packets arrive, allowing the system to handle the packets more quickly.



- Notes about cases where a link-down is recorded in the log during OS startup

While Windows® is starting, the following warnings might be displayed in the event log. These warnings are recorded by the initialization process of the LAN driver at Windows® startup, and do not affect system operation.

Event ID	Source	Type	Category	Description
27	e1repress	Warning	None	Intel(R) I210 Gigabit Network Connection ^{#1} Network link is disconnected. ^{#2}

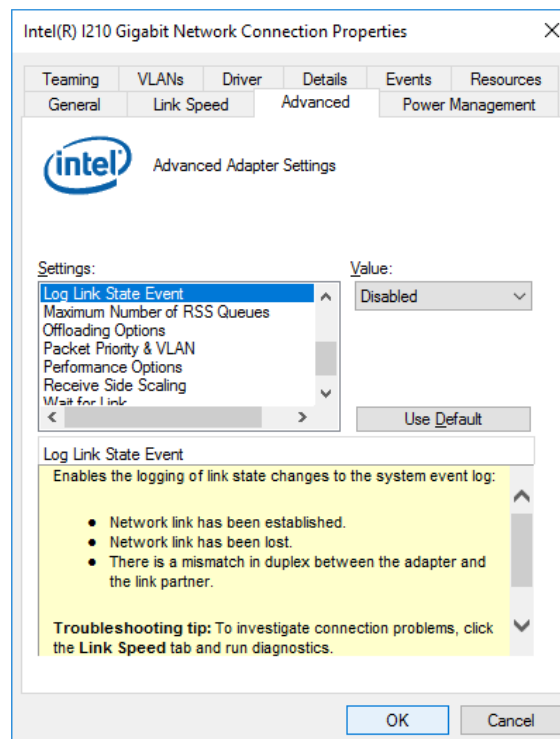
#1: The displayed name differs depending on the LAN adapter.

#2: The displayed content differs depending on the OS.

You can prevent these warnings from being displayed in the event log by changing the LAN adapter settings as follows.

Note that if you change the following settings, log entries such as those for LAN connections and disconnections during system operation are also not recorded, which might complicate failure analysis when a problem occurs. (The displayed images are of Windows® 10, but are similar to other OSs.)

1. Perform steps 1 through 5 in *Setting the network transfer speed* in 2.8 *Setting Up the LAN Interface*.
2. Click the **Advanced** tab. In the **Settings** list, select **Log Link State Event**.
3. From the **Value** drop-down list, select **Disabled**.



2.9 Setting Up the Screen

For the screen settings, you can configure the color depth (the number of colors that the screen can produce at the same time), the resolution (the number of pixels that make up the screen), the refresh rate (the number of screen refreshes per second), and the single-display and multiple-display settings.

(The displayed images are of Windows® 10, but are similar to other OSs.)

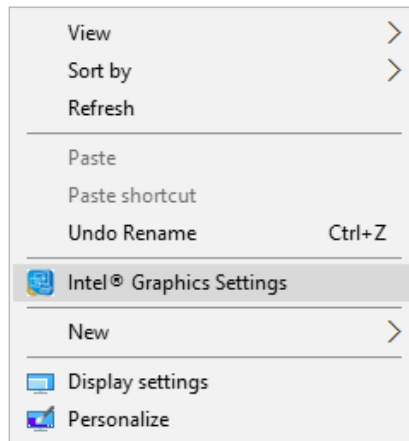
NOTE

- For information about the precautions that apply to the screen, see 3. *Display Screens* in *PRECAUTIONS*.
- If you want to change the screen settings, use **Intel® HD Graphics Control Panel**.

(1) Configuring screen settings for a single display

When a single display is connected, perform the following procedure to configure the screen settings:

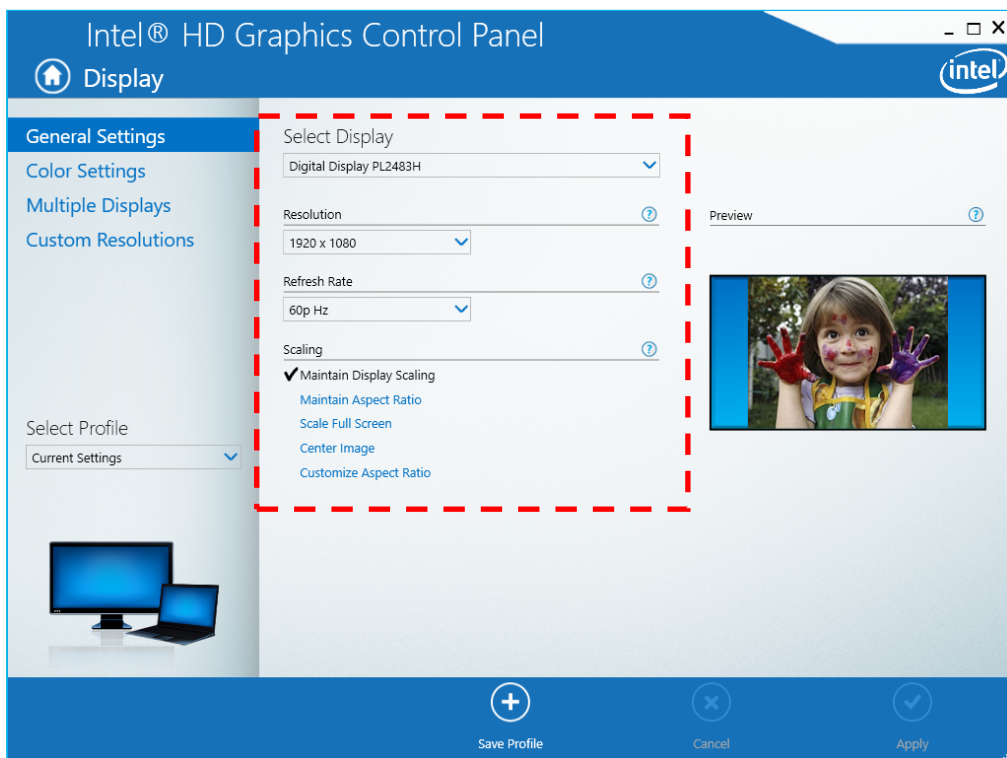
1. Right-click on the desktop. From the displayed menu, click **Graphics Properties** to open **Intel® HD Graphics Control Panel**.



2. In the Intel® HD Graphics Control Panel window, click **Display**.



3. Configure the setting items for the screen that are displayed in the middle of the window.



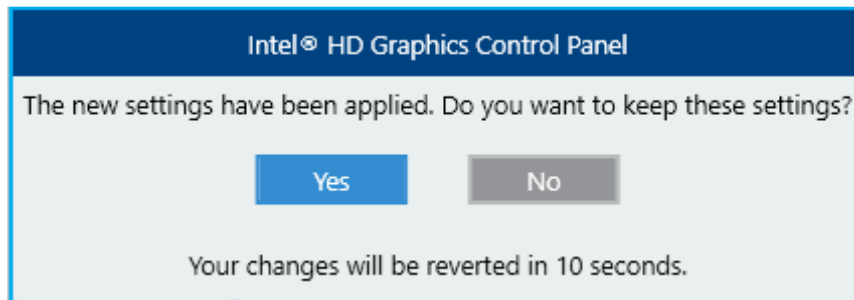
Setting item	Description
Resolution	This allows you to select the resolution.
Refresh Rate	This allows you to select the refresh rate.

2. OPERATION

NOTE

- Do not change the **Rotation** and **Scaling** settings.
- When configuring the resolution and refresh rate, you must choose from the options described in (6) *Supported resolutions* under 5.1 *Equipment Specifications*.

4. When you finish configuring the setting items, click **Apply**. If you changed the resolution or refresh rate, the following confirmation screen for the configuration changes appears. Click **Yes**.



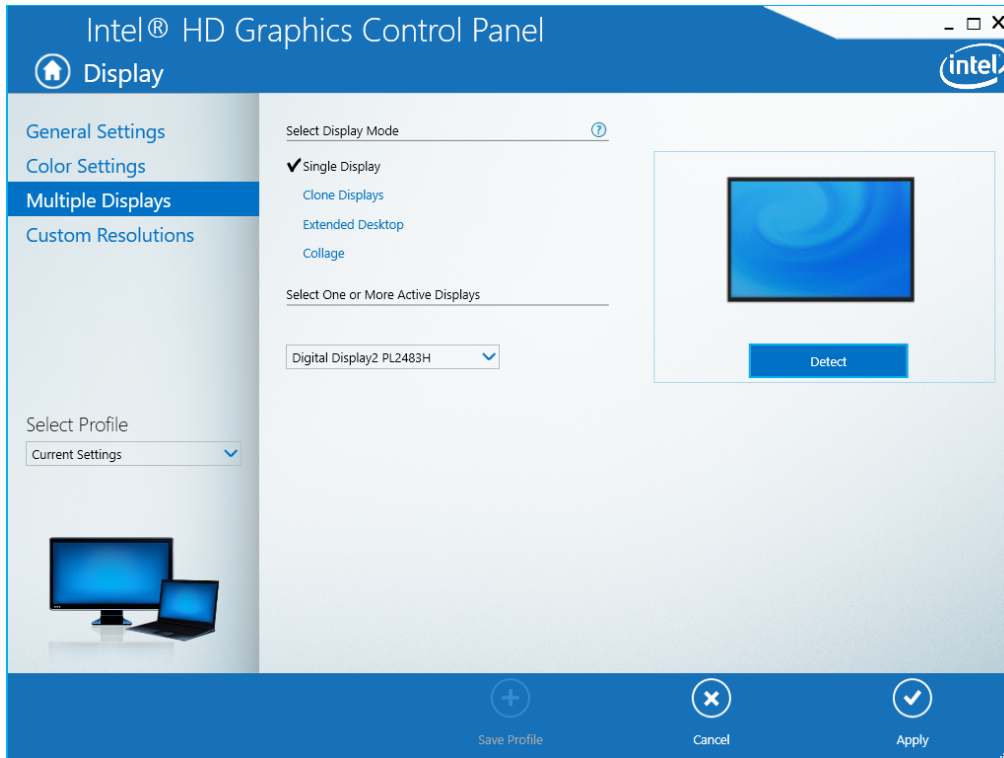
NOTE

- The resolution options might include resolutions larger than the resolutions supported by the connected display.
- If you select a resolution larger than the maximum resolution supported by the display, the display will black out.
- After the display driver is installed, the resolution is automatically set to the maximum resolution supported by the connected display. When changing the resolution, select a resolution smaller than the maximum resolution.

(2) Configuring screen settings for multiple displays

This equipment supports output to multiple displays. If you connect two displays, the two displays can be used simultaneously. The following shows how to set up output to multiple displays.

1. As described in **(1) Configuring screen settings for a single display**, start **Intel® HD Graphics Control Panel** and click **Display**.
2. Click **Multiple Displays**. Then, configure the settings for multiple displays.



The following shows how to set up **Clone Displays**, **Extended Desktop**, and **Collage**.

NOTE

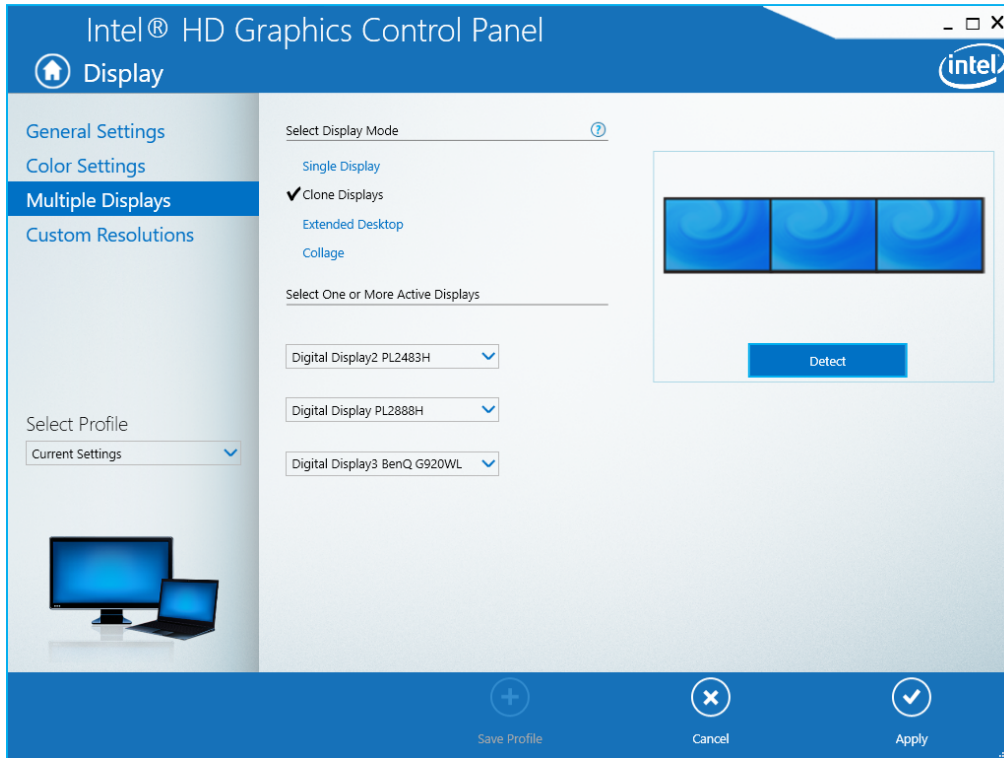
- The multi-streaming feature DisplayPort (daisy-chaining) is not supported.

2. OPERATION

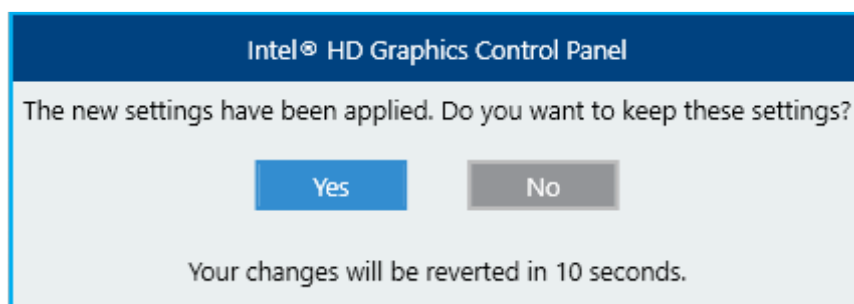
(a) Clone Displays

If you select this mode, both displays show the same screen and have the same resolution, color depth, and refresh rate. Before connecting displays, check the capabilities of the displays (such as their maximum resolution and maximum refresh rate).

1. In the Intel® HD Graphics Control Panel window, select **Display** and then **Multiple Displays**.
2. Under **Select Display Mode**, select **Clone Displays**.



3. When you finish configuring the settings, click **Apply**. If the following confirmation screen for the setting changes appears, click **Yes**.



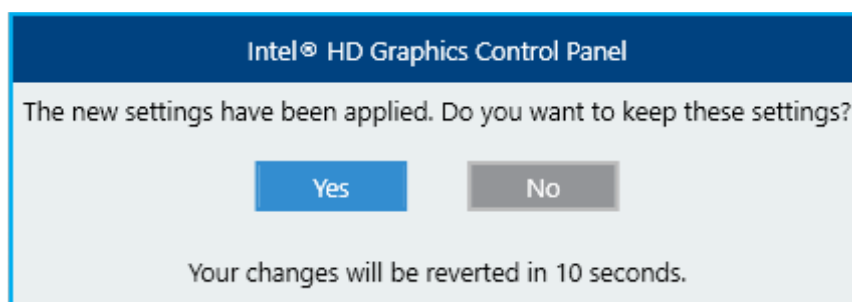
(b) Extended Desktop

If you select this mode, one screen is divided into two and displayed on two displays. The resolution, color depth, and refresh rate can be configured independently. The task bar is not displayed on display 2. The selectable resolutions, color depths, and refresh rates depend on the capabilities of the connected displays.

1. In the Intel® HD Graphics Control Panel window, select **Display** and then **Multiple Displays**.
2. Under **Select Display Mode**, select **Extended Desktop**.



3. When you finish configuring the settings, click **Apply**. If the following confirmation screen for the setting changes appears, click **Yes**.



2. OPERATION

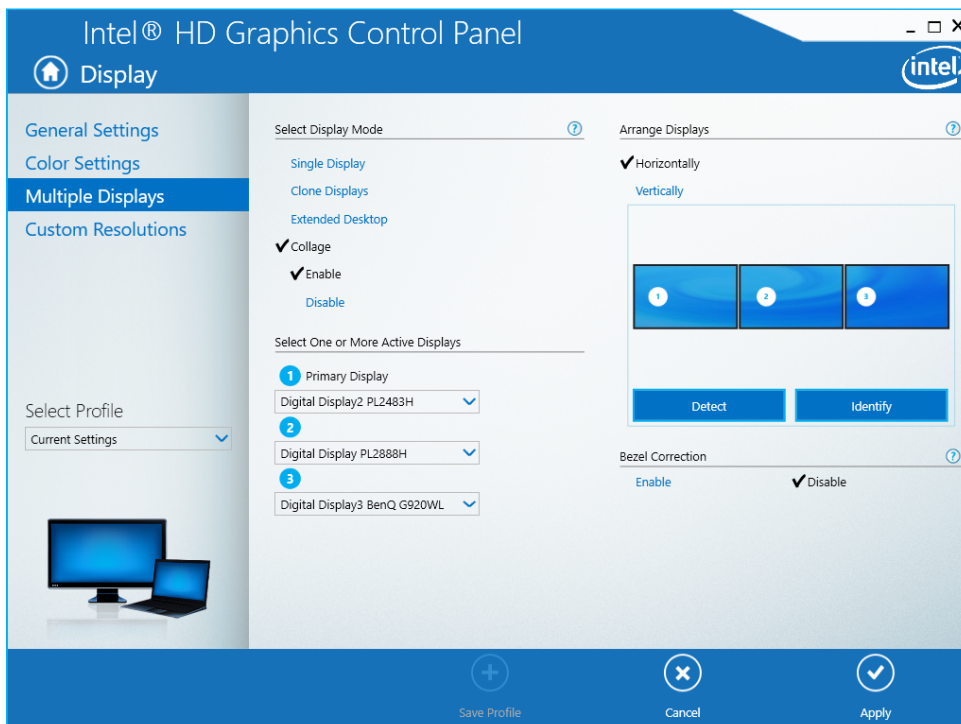
(c) Collage

This feature allows one screen to be divided and displayed on multiple displays. The screen resolution is the sum of the resolutions of all displays. For example, if you enable Collage with two displays placed side by side, the horizontal resolution becomes the sum of the horizontal resolutions of the two displays. The resolution, color depth, and refresh rate settings are the same for all displays. The task bar appears only on the primary display. The selectable resolutions, color depths, and refresh rates depend on the capabilities of the connected displays.

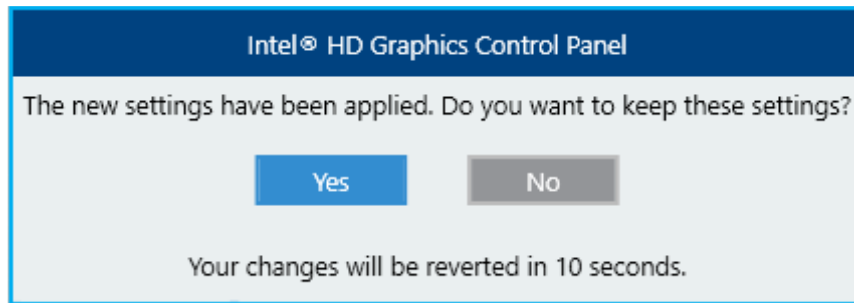
1. In the Intel® HD Graphics Control Panel window, select **Display** and then **Multiple Displays**.
2. Under **Select Display Mode**, select **Collage**.



3. Select **Enable**.



4. When you finish configuring the settings, click **Apply**. If the following confirmation screen for the setting changes appears, click **Yes**.



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CHAPTER 3 SETUP

3.1 Setup Procedure When Turning On the Power for the First Time

3.1.1 Setting up Windows® 10 2016 LTSB

This section describes the procedure for setting up the preinstalled Windows® 10 2016 LTSB operating system.

- This procedure covers setup for the basic items of Windows® 10 2016 LTSB.
- RAS features are automatically set up.
- The setup procedure takes about 20 minutes.

- Preparing for setup

The following items are required during the setup procedure. Prepare or check them before starting the setup procedure. In addition, perform the setup procedure indicated in this section by using the hardware configuration from the time that the equipment was shipped.

License certificate	Verify that the license certificate is attached to the body of the computer.
User name	The user name for the administrator account of the computer. This can be changed later from the Control Panel.
Password	The user password. This can be changed later from the Control Panel.

3. SETUP

- Windows® 10 2016 LTSB setup procedure

To set up Windows® 10 2016 LTSB:

1. Turn on this equipment.

Windows® starts and prepares setup.

The message “Setup is installing devices. Please wait...” then appears, indicating that device drivers are being installed.

- This processing might take several minutes. Wait until it is complete.
- Setup continues after the system restarts.

2. The **Hi there** window appears.

- Select a language to use and the setting items, and then click **Next**.

NOTE

The default time zone setting for this equipment is **Osaka, Sapporo, Tokyo**.

If you change the time zone, the system time of this equipment changes by the number of hours difference from the **Osaka, Sapporo, Tokyo** time zone.

3. The **Here's the legal stuff** window appears.

- Check the contents, and then click **Accept**.

4. The **Get going fast** window appears.

- Click **Customize**.
- Select on or off for the settings as required, and then click **Next**.
- Setup continues after the system restarts.

5. The **Create an account for this PC** window appears.

- When **Who's going to use this PC?** appears, enter a user name.
- In **Enter password** under **Make it secure**, enter a password.
- In **Re-enter password**, re-enter the password.
- In **Password hint**, enter a password hint.
- Click **Next**.

NOTE

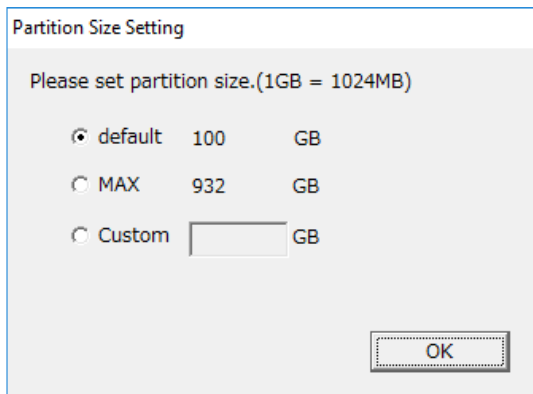
In the **Create an account for this PC** window, even if you select Japanese as the language to use, the Windows keyboard layout is set to the English keyboard by default.

For this reason, you will not be able to enter Japanese text even when using a Japanese keyboard, and symbols and special characters will be entered from keys other than the ones that are marked as such on a Japanese keyboard.

If you want to use Japanese text, as well as symbols and special characters, in the user name, password, or password hint, first enter values in alphanumeric characters only, and then specify the values you want to use after setup is complete.

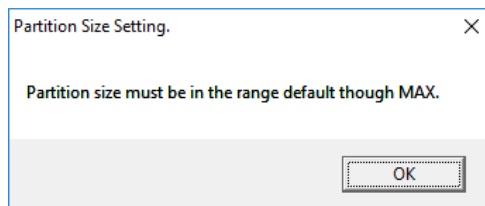
6. After setup is complete, the sign-in operation is performed automatically.

7. The Partition Size Setting window appears.



- The minimum possible size that can be created (**default**) and the maximum possible size that can be created (**MAX**) are displayed. Select the size that you want to create, and then click **OK**. The minimum possible size that can be created (**default**) is the size that is displayed when the product is shipped.
- To enter a size value directly, select **Custom**, enter a value for the partition size in GB (where 1 GB = 1,073,741,824 bytes), and then click **OK**.

If you select **Custom** and click **OK** and the entered value is outside the range of values that can be entered, the following message appears. Click **OK**, and then re-enter the partition size.

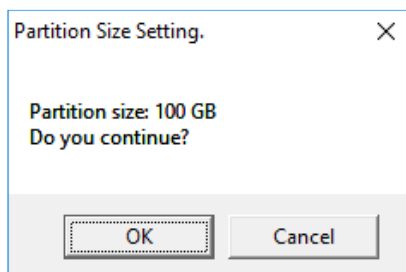


NOTE

If you are using a recovery DVD to return the system to its factory-shipped condition and you select **Only the system and boot partition**, the Partition Size Setting window does not appear, and setup proceeds to the point at which the dialog box in step 9 closes.

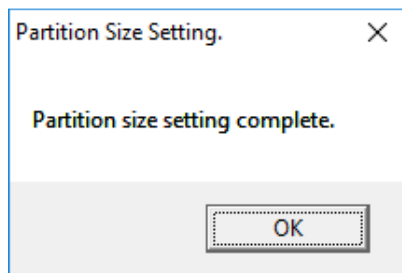
8. The Partition Size Setting confirmation window appears.

If the displayed partition size is acceptable, click **OK**.



3. SETUP

9. If the partition size settings succeed, the following message appears. Click **OK** to close the dialog box.



Setup then continues. A message about the Windows System Assessment Tool and the message “Please wait. The system will restart automatically.” will appear in that order. Wait until the system restarts. This processing takes several minutes.

NOTE

If you select Japanese during setup, the system might restart without displaying the message “Please wait. The system will restart automatically.”, but this does not indicate a problem with system operation.

The Windows® 10 2016 LTSB setup procedure is now complete. Now, configure the basic OS settings according to the procedure described in *3.2 Configuring Basic Settings After OS Setup*.

3.1.2 Setting up Windows® 10 2019 LTSC

This section describes the procedure for setting up the preinstalled Windows® 10 2019 LTSC operating system.

- This procedure covers setup for the basic items of Windows® 10 2019 LTSC.
- RAS features are automatically set up.
- The setup procedure takes about 20 minutes.

- **Preparing for setup**

The following items are required during the setup procedure. Prepare or check them before starting the setup procedure. In addition, perform the setup procedure indicated in this section by using the hardware configuration from the time that the equipment was shipped.

License certificate	Verify that the license certificate is attached to the body of the computer.
User name	The user name for the administrator account of the computer. This can be changed later from the Control Panel.
Password	The user password. This can be changed later from the Control Panel.

3. SETUP

- Windows® 10 2019 LTSC setup procedure

To set up Windows® 10 2019 LTSC:

1. Turn on this equipment.

Windows® starts and prepares setup.

The message “Setup is installing devices. Please wait...” then appears, indicating that device drivers are being installed.

- This process might take several minutes. Wait until it is complete.
 - Setup continues after the system restarts.
2. The window for selecting the language to use appears.
Select the language to use, and then click **Yes**.
 3. The window for selecting the region in which you reside appears.
 - Select the region in which you reside, and then click **Yes**.
 4. The window for confirming the keyboard layout appears.
 - Check the displayed keyboard layout and then click **Yes**.
 5. The window for adding a second keyboard layout appears.
 - To add a layout, click **Add layout**, select the keyboard layout to use, and then click **Next**.
 - If you do not want to add a layout, click **Skip**.
 6. The window for connecting to a network appears.
 - **Click Skip for now**.
 - The window changes. Click **No**.
 - Setup continues after the system restarts.
 7. After the system restarts, the window for connecting to a network appears again.
 - **Click Skip for now**.
 - The window changes. Click **No**.
 - Click **No**.
 8. The **Windows 10 License Agreement** window appears.
 - Verify the displayed content, and then click **Accept**.
 9. The **Who's going to use this PC?** window appears.
 - In the **Name** field, enter a user name, and then click **Next**.
 10. The **Create a super memorable password** window appears.
 - In the **Password** field, enter a password, and then click **Next**.
 - The **Confirm your password** window appears. In the **Confirm password** field, enter your password, and then click **Next**.

NOTE

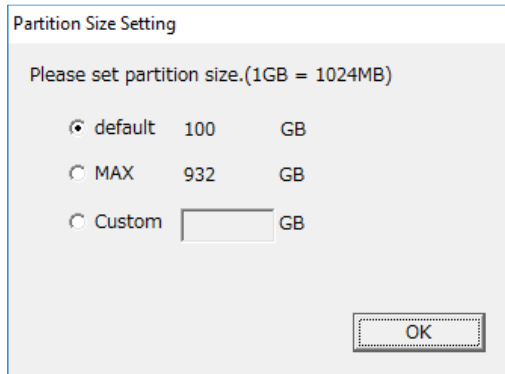
In the **Create an account for this PC** window, even if you select Japanese as the language to use, the Windows keyboard layout is set to the English keyboard by default.

For this reason, you will not be able to enter Japanese text even when using a Japanese keyboard, and symbols and special characters will be entered from keys other than the ones that are marked as such on a Japanese keyboard.

If you want to use Japanese text, as well as symbols and special characters, in the user name, password, or password hint, first enter values in alphanumeric characters only, and then specify the values you want to use after setup is complete.

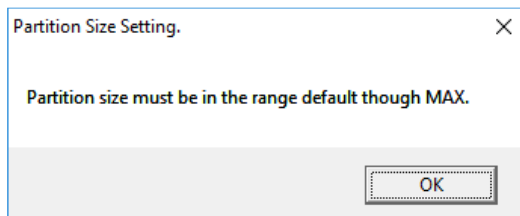
11. The **Create security questions for this account** window appears.
 - From **Security question**, select a question, and then enter your answer in **Your answer**. You can set three security questions.
 - Click **Next**.

12. The **Do more across devices with activity history** window appears.
 - Click **Yes** or **No** as required.
13. The **Choose privacy settings for your device** window appears.
 - Turn the settings on or off as required, and then click **Accept**.
14. After setup is complete, the sign-in operation is performed automatically.
15. The Partition Size Setting window appears.



- The minimum possible size that can be created (**default**) and the maximum possible size that can be created (**MAX**) are displayed. Select the size that you want to create, and then click **OK**. The minimum possible size that can be created (**default**) is the size that is displayed when the product is shipped.
- To enter a size value directly, select **Custom**, enter a value for the partition size in GB (where 1 GB = 1,073,741,824 bytes), and then click **OK**.

If you select **Custom** and click **OK** and the entered value is outside the range of values that can be entered, the following message appears. Click **OK**, and then re-enter the partition size.

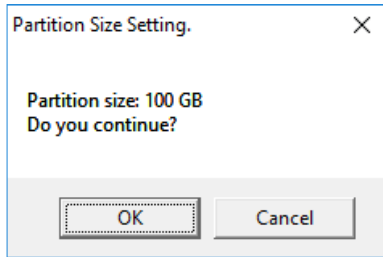


NOTE

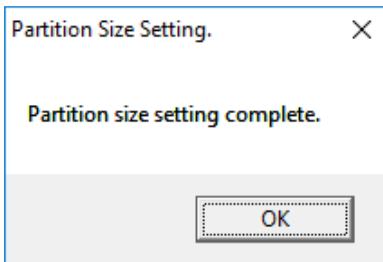
If you are using a recovery DVD to return the system to its factory-shipped condition and you select **Only the system and boot partition**, the Partition Size Setting window does not appear, and setup proceeds to the point at which the dialog box in step 17 closes.

3. SETUP

16. The Partition Size Setting confirmation window appears.
If the displayed partition size is acceptable, click **OK**.



17. If the partition size settings succeed, the following message appears. Click **OK** to close the dialog box.



Setup then continues. A message about the Windows System Assessment Tool and the message "Please wait. The system will restart automatically." will appear in that order. Wait until the system restarts. This processing takes several minutes.

The Windows® 10 2019 LTSC setup procedure is now complete. Now, configure the basic OS settings according to the procedure described in *3.2 Configuring Basic Settings After OS Setup*.

3.1.3 Setting up Windows Server® 2016

This section describes the procedure for setting up the preinstalled Windows Server® 2016 operating system.

- This procedure covers setup for the basic items of Windows Server® 2016.
- RAS features are automatically set up.
- The setup procedure takes about 20 minutes.

- **Preparing for setup**

The following items are required during the setup procedure. Prepare or check them before starting the setup procedure. In addition, perform the setup procedure indicated in this section by using the hardware configuration from the time that the equipment was shipped.

License certificate	Verify that the license certificate is attached to the body of the computer.
User name	The user name for the administrator account of the computer. This can be changed later from the Control Panel.
Password	The user password. This can be changed later from the Control Panel.

3. SETUP

- Windows Server® 2016 setup procedure

To set up Windows Server® 2016:

1. Turn on this equipment.

Windows® starts and prepares setup.

The message “Setup is installing devices. Please wait...” then appears, indicating that device drivers are being installed.

- This processing might take several minutes. Wait until it is complete.
- Setup continues after the system restarts.

2. The **Hi there** window appears.

- Select a language to use and the setting items, and then click **Next**.

NOTE

The default time zone setting for this equipment is **Osaka, Sapporo, Tokyo**.

If you change the time zone, the system time of this equipment changes by the number of hours difference from the **Osaka, Sapporo, Tokyo** time zone.

3. The **License terms** window appears.

- Check the contents, and then click **Accept**.

4. The **Customize settings** window appears.

- In **Password**, enter a password.
- In **Re-enter password**, re-enter the password.
- Click **Finish**.
- The system restarts.

NOTE

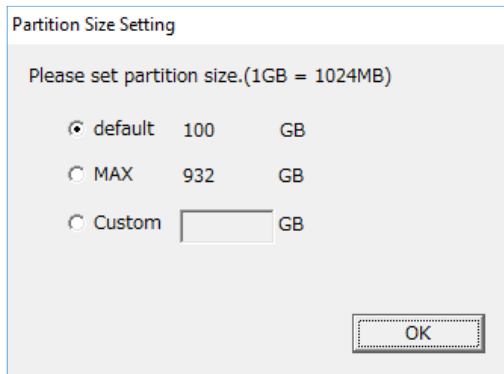
In the **Customize settings** window, even if you select Japanese as the language to use, the Windows keyboard layout is set to the English keyboard by default.

For this reason, you will not be able to enter Japanese text even when using a Japanese keyboard, and symbols and special characters will be entered from keys other than the ones that are marked as such on a Japanese keyboard.

If you want to use Japanese text, as well as symbols and special characters, in the password, first enter the value in alphanumeric characters only, and then specify the value you want to use after setup is complete.

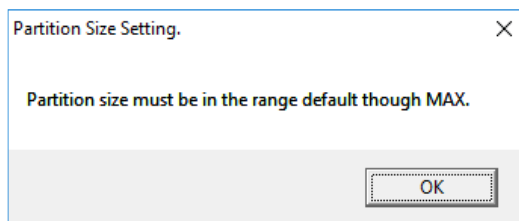
5. Sign in.

6. The Partition Size Setting window appears.



- The minimum possible size that can be created (**default**) and the maximum possible size that can be created (**MAX**) are displayed. Select the size that you want to create, and then click **OK**. The minimum possible size that can be created (**default**) is the size that is displayed when the product is shipped.
- To enter a size value directly, select **Custom**, enter a value for the partition size in GB (where 1 GB = 1,073,741,824 bytes), and then click **OK**.

If you select **Custom** and click **OK** and the entered value is outside the range of values that can be entered, the following message appears. Click **OK**, and then re-enter the partition size.

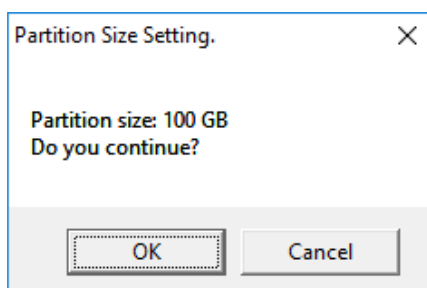


NOTE

If you are using a recovery DVD to return the system to its factory-shipped condition and you select **Only the system and boot partition**, the Partition Size Setting window does not appear, and setup proceeds to the point at which the dialog box in step 8 closes.

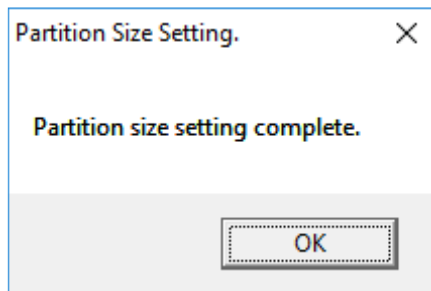
7. The Partition Size Setting confirmation window appears.

If the displayed partition size is acceptable, click **OK**.



3. SETUP

8. If the partition size settings succeed, the following message appears. Click **OK** to close the dialog box.



Setup then continues. A message about the Windows System Assessment Tool and the message "Please wait. The system will restart automatically." will appear in that order. Wait until the system restarts. This processing takes several minutes.

NOTE

If you select Japanese during setup, the system might restart without displaying the message "Please wait. The system will restart automatically.", but this does not indicate a problem with system operation.

The Windows Server® 2016 setup procedure is now complete. Now, configure the basic OS settings according to the procedure described in *3.2 Configuring Basic Settings After OS Setup*.

3.2 Configuring Basic Settings After OS Setup

3.2.1 Basic Settings for Windows® 10 and Windows Server® 2016

This section describes the basic settings procedure for the preinstalled Windows® 10 and Windows Server® 2016 operating systems.

Perform this procedure as required after setting up the OS as described in *3.1 Setup Procedure When Turning On the Power for the First Time*.

3.2.1.1 Overview of the basic settings procedure

Setting up the LAN interface



See 2.8 *Setting Up the LAN Interface*.

Setting up the screen



See 2.9 *Setting Up the Screen*.

Setting up automatic updates



See 3.2.1.2 *Setting up automatic updates*.
• This procedure takes about 5 minutes.

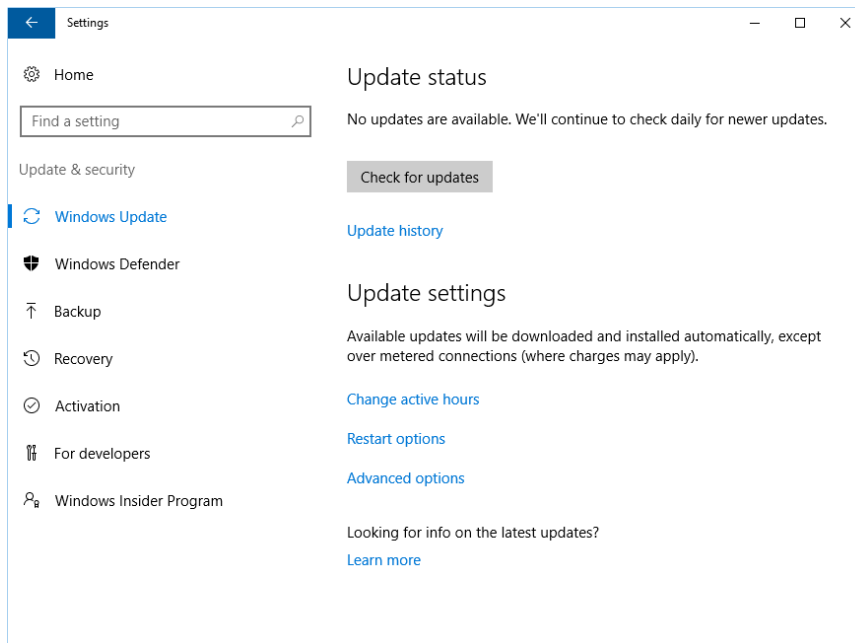
3. SETUP

3.2.1.2 Setting up automatic updates

Windows® 10 and Windows Server® 2016 settings allow update programs delivered from Windows Update to be applied automatically. Update programs for the system and applications are regularly checked, and are automatically downloaded and installed.

To set up automatic updates:

1. Click **Start**, and from the displayed menu, click **Settings**.
2. Click **Update & security**. The Windows Update window appears.
(The following figure is an example from Windows® 10 2016 LTSB.)

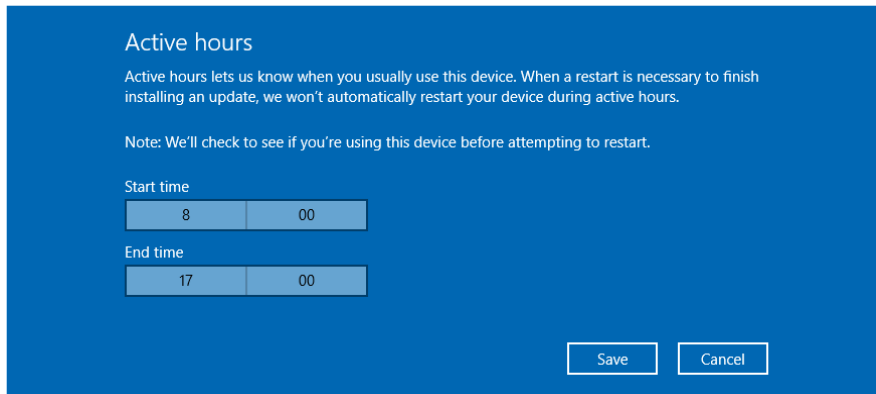


The automatic update settings in Windows® 10 include the following items.

(1) Changing the active hours

Downloads and installation will be performed automatically, but the system will not restart during active hours. Rather, restarts will be scheduled outside of active hours. Configure this setting according to the needs of the customer environment.

(The following figure is an example from Windows® 10 2016 LTSB.)

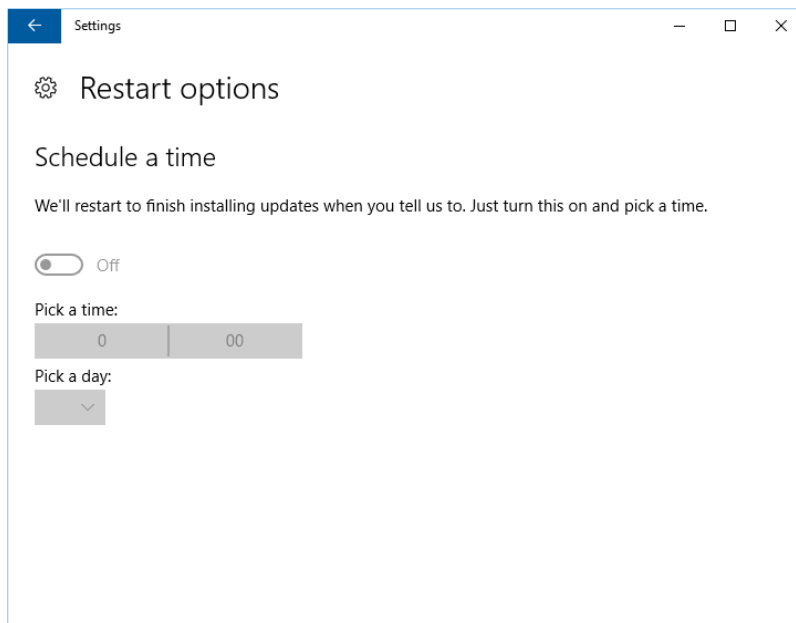


(Active hours are set for 8:00 a.m. to 5:00 p.m. by default.)

(2) Restart options (Windows® 10 2016 LTSB and Windows Server® 2016)

If automatic updates are installed and the system is restarted on a schedule, you can specify a temporary date and time at which to restart the system. This setting takes priority over the active hours setting.

(The following figure is an example from Windows® 10 2016 LTSB.)

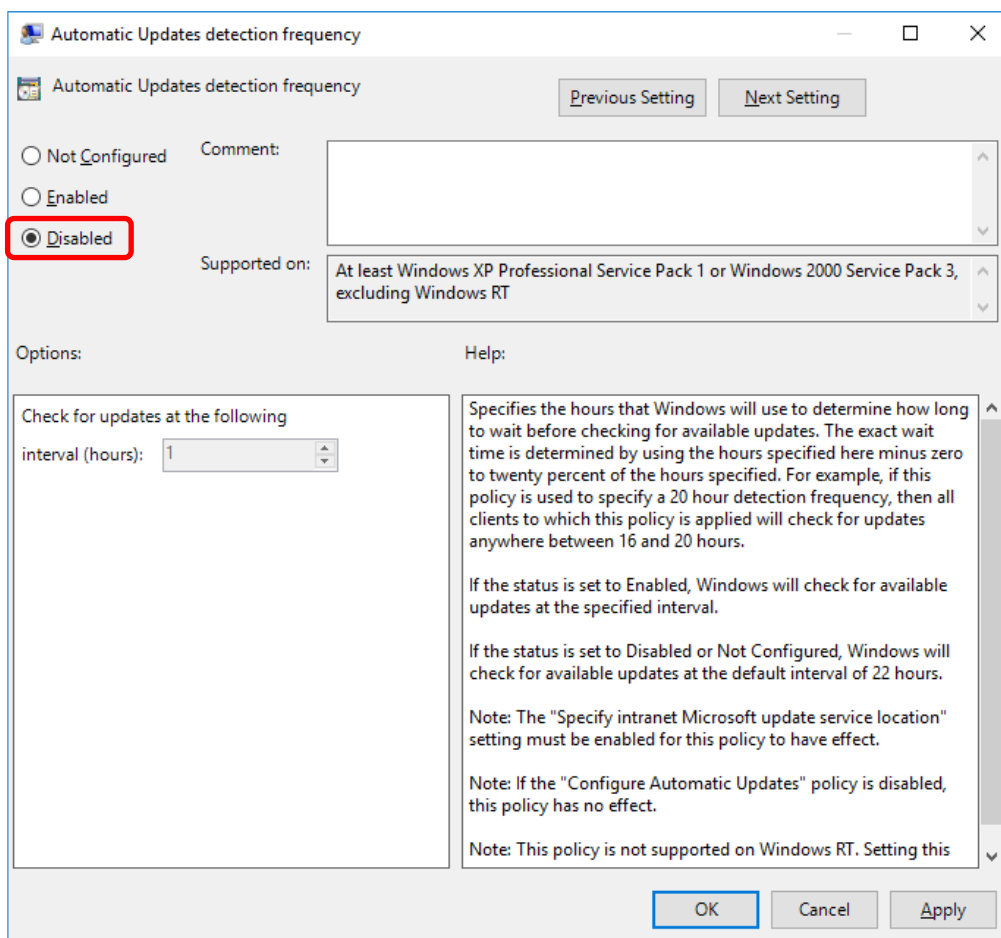


3. SETUP

Enabling manual updates via Windows Update

If you do not want to automatically download and install update programs, you can set Windows Update to manual updates by using the Local Group Policy Editor (`gpedit.msc`). The following describes the procedure for setting Windows Update to manual updates.

1. Sign in to the computer as an administrator.
2. Right-click **Start**, and then click **Run**.
3. In the **Run** window, enter `gpedit.msc` to open the Local Group Policy Editor.
4. In the **Local Group Policy Editor** window, click **Computer Configuration, Administrative Templates, Windows components, Windows Update, and Configure Automatic Updates**.
5. In the **Configure Automatic Updates** window, select **Disabled**, and then click **OK**.



CHAPTER 4 PRECAUTIONS WHILE THE OS IS RUNNING

4.1 Event Log Entries During Setup

This equipment might record the following events in the event log during OS setup, but these events do not affect system operation.

Table 4-1 Error and warning event logs (during setup)

Source	Event ID	Type
Search-ProfileNotify	2	Error
SecurityCenter	16	Error
volmgr	46, 49	Error
Service Control Manager	7000, 7009, 7022, 7023, 7024, 7043	Error
Bits-Client	16392	Error
SideBySide	33	Error
Search	1008	Warning
e1repress	27	Warning
Kernel-PnP	219	Warning
User Profiles Service	1534	Warning
Winlogon	6005, 6006	Warning

Event IDs 7009 and 7023 might be recorded in the event log even during situations other than OS setup, but this does not indicate a problem as long as the event logs are not recorded intermittently.

Event ID 33 might be recorded due to installation processing for the RAS software during setup, but this does not indicate an operational problem. This event log might also be recorded when the RAS software is re-installed.

No problems are present only when both event IDs 6005 and 6006 are recorded.

4. PRECAUTIONS WHILE THE OS IS RUNNING

4.2 Event Log Entries While the OS is Running

This equipment might record the following events in the event log while the OS is running, but these events do not affect system operation.

Table 4-2 Error and warning event logs (1 of 2)

Source	Event ID	Type
DistributedCOM	10010	Error
Search	3104	Error
Security-SPP	1014, 8198, 8200	Error
iANSMiniport	11, 16	Error
elrexpress	27	Warning
Time-Service	134	Warning
Search	3036	Warning
Windows Remote Management	10149	Warning
Service Control Manager	7023	Warning

When the OS is running on this equipment, the following event logs might be recorded.

Table 4-3 Error and warning event logs (2 of 2)

Source	Event ID	Type
DistributedCOM	10016	Error

Source: DistributedCOM (event ID 10016) does not indicate a problem if the content of the event log matches the following.

Event log content

For Windows® 10 2016 LTSB and Windows Server® 2016

The application-specific permission settings do not grant Local Activation permission for the COM Server application with CLSID {*****} and APPID {*****} to the user ***** SID (*****) from address LocalHost (using LRPC) running in the application container ***** SID (*****). This security permission can be modified.

Verify that the CLSID and APPID recorded in the event log are one of the following:

CLSID	D63B10C5-BB46-4990-A94F-E40B9D520160
APPID	9CA88EE3-ACB7-47C8-AFC4-AB702511C276

CLSID	260EB9DE-5CBE-4BFF-A99A-3710AF55BF1E
APPID	260EB9DE-5CBE-4BFF-A99A-3710AF55BF1E

For Windows® 10 2019 LTSC

The application-specific permission settings do not grant Local Activation permission for the COM Server application with CLSID {*****} and APPID {*****} to the user ***** SID (*****) from address LocalHost (using LRPC) running in the application container ***** SID (*****). This security permission can be modified.

Verify that the CLSID and APPID recorded in the event log are one of the following:

CLSID	Windows.SecurityCenter.WscBrokerManager
	Windows.SecurityCenter.WscDataProtection
	Windows.SecurityCenter.SecurityAppBroker
APPID	Unavailable

4. PRECAUTIONS WHILE THE OS IS RUNNING

4.3 Functions Scheduled by Default

In Windows®, various functions are scheduled by default and executed periodically in the background. Among these functions, Windows Defender (anti-spyware functionality) and the disk defragmenter (or drive optimization) might significantly increase system load when they run, and might affect the operation of business applications.

(1) Drive optimization

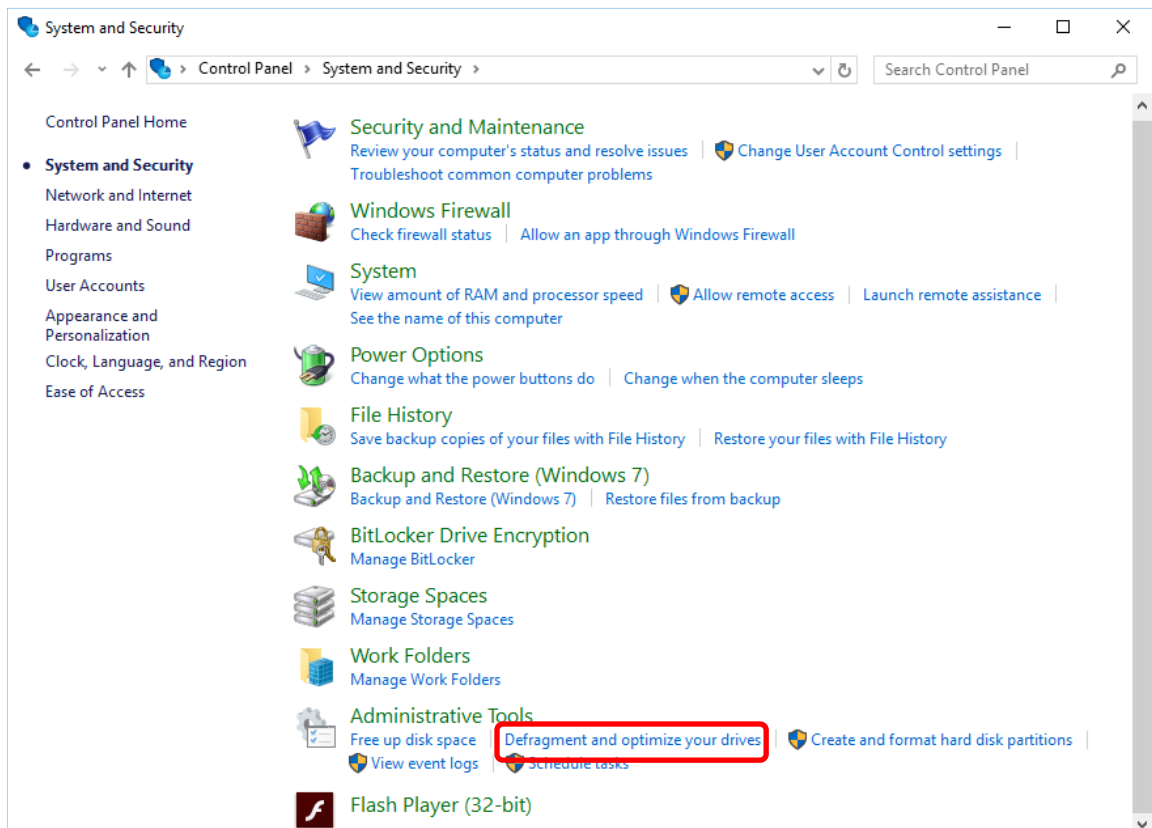
On this equipment, the drive optimization schedule is turned off by default. To optimize drives, use either of the following methods:

- (a) Turning on the drive optimization schedule
- (b) Optimizing drives manually

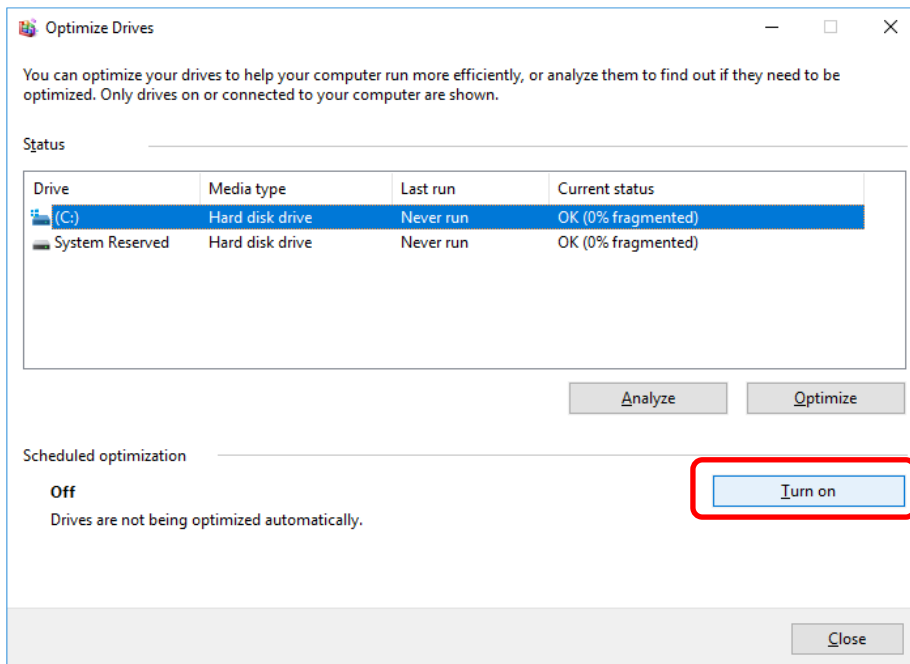
The following describes the procedure for each method.

(a) Turning on the drive optimization schedule

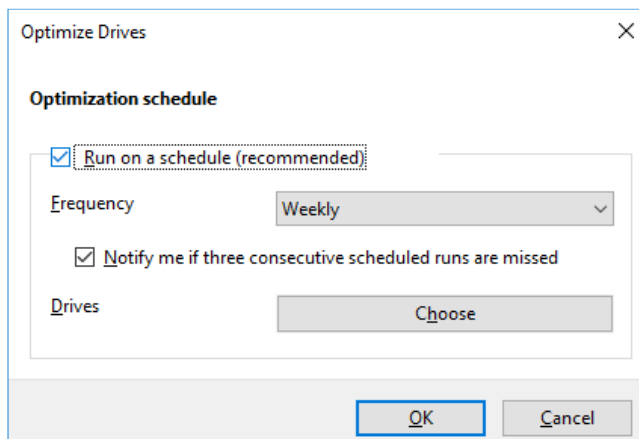
1. Sign in to the computer as an administrator and open the **Control Panel**.
2. Click **System and Security**.
3. Under **Administrative Tools**, click **Defragment and optimize your drives**.



4. The **Optimize Drives** window appears.
 - Under **Scheduled optimization**, click **Turn on**.



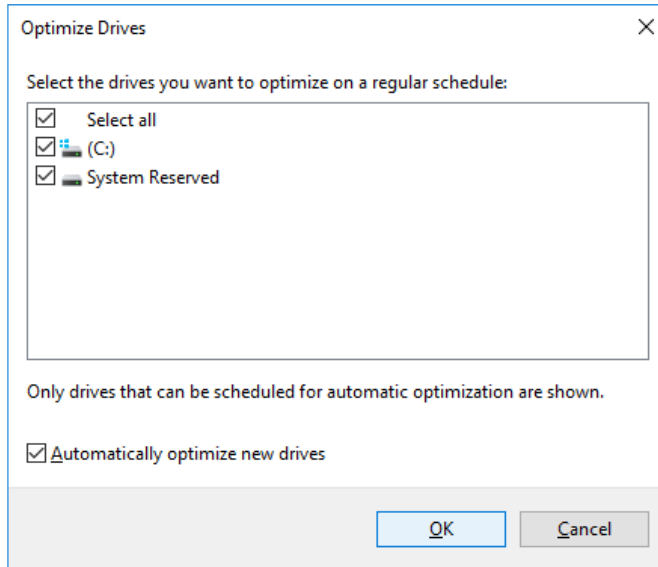
5. The **Optimization schedule** window appears. Select the **Run on a schedule (recommended)** check box.



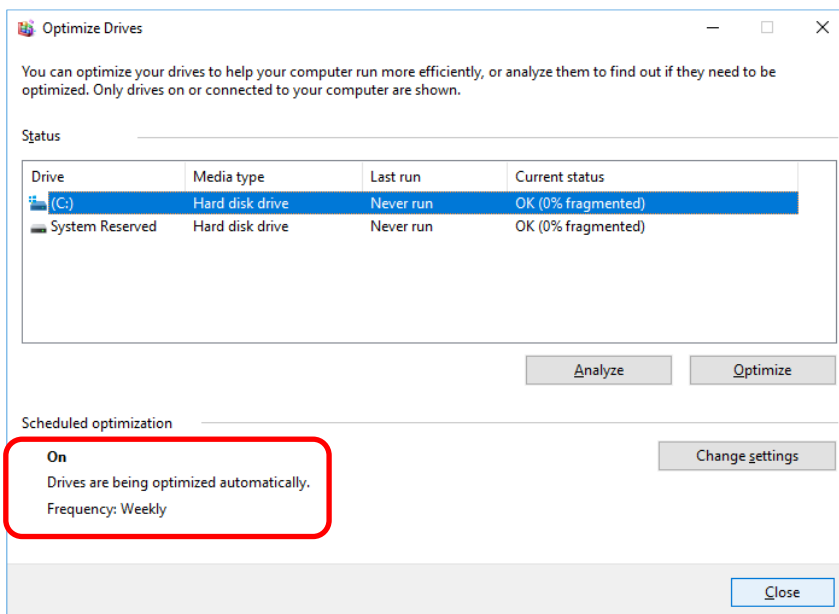
6. As required, configure the frequency of defragmentation. The initial schedule of defragmentation is as follows.
 - Frequency: Weekly**
7. Click **Choose**.

4. PRECAUTIONS WHILE THE OS IS RUNNING

8. The **Select the drives you want to optimize on a regular schedule** window appears.
As required, select the drives that you want to defragment.
 - Click **OK**.

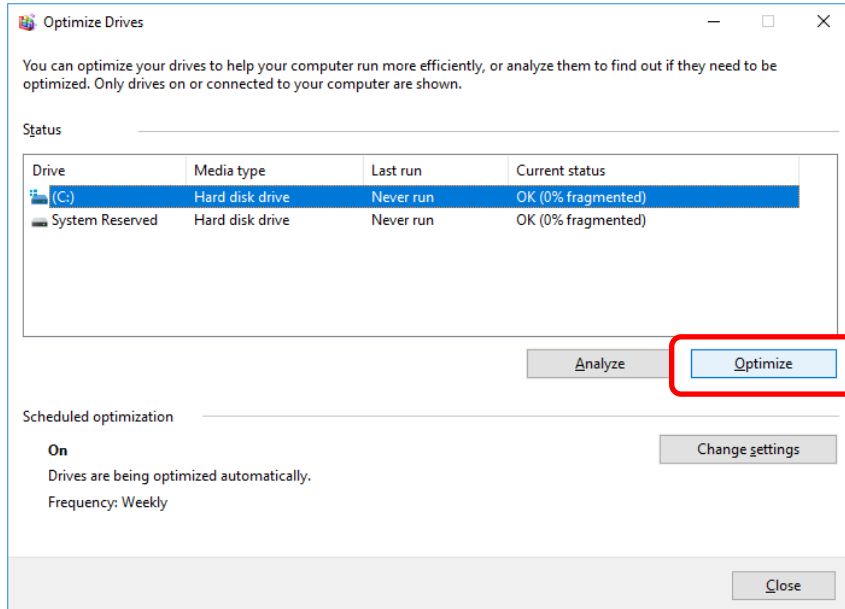


9. The **Optimization schedule** window appears. Click **OK**.
10. The configured schedules are displayed under **Scheduled optimization**. Check the contents, and click **Close** to close the window.



(b) Optimizing drives manually

1. Perform steps 1 through 3 under (a) *Turning on the drive optimization schedule*.
2. The **Optimize Drives** window appears.
 - Under **Status**, select the drive that you want to defragment, and click **Optimize**.



- When the disk optimization process is complete, the date and time of the optimization is displayed in the **Last run** column.
3. Click **Close** to close the window.

4.4 Security Enhancement Functionality

Windows® 10 enables Windows Defender, a function that offers anti-spyware functionality. Windows Defender also includes antivirus functionality. In some cases, this antivirus functionality might adversely impact application performance compared to using Windows® 7.

4.5 Factory Default Network Settings

- Turning off SNP (Scalable Networking Pack)

SNP is intended to reduce processor load by delegating TCP-related processing to the network adapter. SNP consists of the following three features:

- TCP Chimney Offload
- Receive Side Scaling (RSS)
- Network Direct Memory Access (NetDMA)

Unfortunately, if the system is used in Windows® with SNP turned on, network processing might become unstable, or network performance might be reduced when you use the network in specific ways. For these reasons, SNP is disabled in this equipment.

Windows® 10 disables TCP Chimney Offload and Network Direct Memory Access (NetDMA) by default, so users need only disable Receive Side Scaling (RSS).

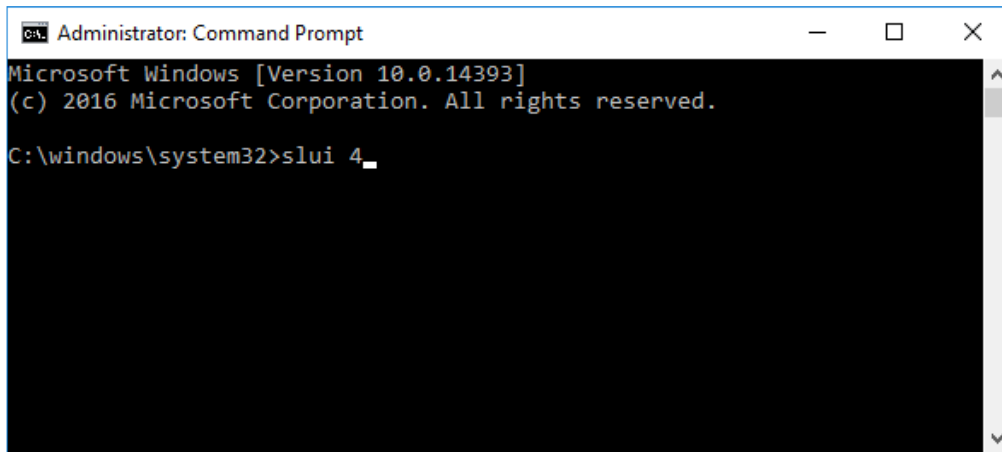
4.6 License Activation

Windows® 10 is activated automatically when the equipment is connected to the internet.

For this reason, if Windows has not been activated in an environment that is not connected to the internet, the message Connect to the internet to activate Windows appears in **System** in the **System and Security** section of the Control Panel. Even so, you can continue to use the equipment.

To activate Windows offline over the phone, perform the following procedure:

1. Open command prompt as an administrator, and then run the following command:
C:\windows\system32>slui 4



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\windows\system32>slui 4_
```

2. When the **Select your country or region** window appears, select a country, and then click **Next**.
3. The **Call and provide your installation ID** window appears. Call the displayed phone number, and then verify the confirmation ID. After verifying the confirmation ID, click **Enter confirmation ID**.
4. The **Enter your confirmation ID** window appears. Enter your confirmation ID, and then click **Activate Windows**.
5. The **Windows is activated** window appears. Click the **Close** button.
Windows is now activated.

4.7 Unresponsive Mouse in the Sign-In Window

In Windows® 10 2019 LTSC, if a message for verifying the settings for the collection of memory dumps appears when a user with a set password is signing in, the window might be displayed only in the background and the mouse might become unresponsive.

In such cases, the sign-in window can be displayed by using the keyboard. Press the **Enter** key to correct the problem.

CHAPTER 5 SPECIFICATIONS

5.1 Equipment Specifications

(1) Common specifications

Item		Specifications
Model		See (2) <i>Individual specifications.</i>
Processor		See (2) <i>Individual specifications.</i>
Main memory		4 GB, 8 GB, 16 GB
Display resolution and color depth		See (6) <i>Supported resolutions.</i>
Built-in file device	DVD	DVD drive ^{#1}
	HDD or SSD	See (2) <i>Individual specifications.</i>
Expansion slots	PCI	See (2) <i>Individual specifications.</i>
	PCI Express	See (2) <i>Individual specifications.</i>
13	Display	Analog (RGB Mini D-sub 15 pins)
		Digital (DVI-D 24 pins)
		Digital (DisplayPort 20 pins) ^{#2, #3}
	USB ports	USB 2.0 × 2 (front)
		USB 3.0 × 6 (rear)
	Serial port	RS-232C (D-sub 9 pins) × 1
	LAN ports	1000BASE-T/100BASE-TX/10BASE-T by auto-negotiation × 3 (RJ45, Wake-on-LAN TM supported)
Audio	LINE IN × 1, LINE OUT × 1	
External contact	Connector shape: D-sub 25 pins Type C: DI2 point, DO3 point, A contact point Note: Specifications can be changed at the time of purchase.	
External Dimensions (Width × Depth × Height)		93 × 356 × 325 mm (rubber feet and vertical stand not included)
RAS features		Hardware status monitoring (fan failure, temperature failure, SMART, drive operating time, and more), OS deadlock monitoring, watchdog monitoring, alarm notification when failures are detected (pop-up notifications, digital LEDs for status indication, remote notifications, and more), memory dump collection, maintenance operation support commands, simulation functions
Weight		Approx. 8 kg
Inrush current		50 A or less (115 V AC), 100A or less (230 V AC)
Leakage current		3.5 mA or less
Consumption current (max.) 100 V AC /240 V AC		2.4 A/1.0 A
Power	Voltage	100 - 240 V AC ± 10% (wide range input)
	Frequency	50/60 Hz ± 3 Hz
Keyboard and mouse		Optional

5. SPECIFICATIONS

(2) Individual specifications

Item		Specifications		
		HF-W2000 model 58	HF-W2000 model 55	HF-W2000 model 50
Model ^{#4}		A model: HJ-2058-xxMA B model: HJ-2058-xxMB S model: HJ-2058-xxMS	A model: HJ-2055-xxMA B model: HJ-2055-xxMB S model: HJ-2055-xxMS	A model: HJ-2050-xxMA B model: HJ-2050-xxMB S model: HJ-2050-xxMS
Processor		Intel® Xeon® Processor E3-1275 v6 (3.8 GHz)	Intel® Core™ i3-7101E Processor (3.9 GHz)	Intel® Celeron® Processor G3930E (2.9 GHz)
Built-in file device ^{#5, #6}	DRIVE1 ^{#7}	SATA HDD 1 TB or SATA SSD 512 GB		
	DRIVE2 ^{#8}	SATA HDD 1 TB (optional) SATA SSD 512 GB (optional)		
Expansion slots	PCI	Full height short size × 1		
	PCI Express	Full height short size PCI Express x16 × 1 Full height short size PCI Express x4 × 1 ^{#9}		

#1: The DVD drive in this equipment supports the following types of media:

Read supported: CD-ROM, DVD-ROM

Read/write supported: DVD-R

Depending on the type of CD or DVD used, you might not be able to read from or write to the disc. In such cases, use another CD or DVD.

#2: When outputting to three screens, if you are using the DisplayPort-DVI conversion connector, select from an active DisplayPort-DVI conversion connector, and use it after a preliminary evaluation.

#3: For details about the output resolution when using a DisplayPort-DVI conversion connector, see the specifications of the DisplayPort-DVI conversion connector.

#4: The xx parts of the name indicate the OS type. For details about OS types, see (3) *Pre-installed OS model specifications* in 5.1 *Equipment Specifications*.

If xx is "NO", no OS is installed.

The letter at the end of the name denotes the model:

A: A model (single HDD model), B: B model (software RAID1 hot-swap model), S: S model (SATA SSD)

#5: For details about the precautions for hard disks, see 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.

#6: or the A model and B model, when DRIVE1 and DRIVE2 are installed, their capacities must be the same. For the S model, use in combination with an HDD is not supported.

#7: or the A model or the B model, the factory default of the capacity of the C drive partition is 100 GB, and other space is unallocated. For the S model, the factory default of the capacity of the C drive partition is fixed as the maximum capacity of the SSD.

#8: RIVE2 is an option for the A model, but is part of the standard configuration for the B model. In addition, SSD2 is an option for the S model.

#9: lthough the connector is PCI Express x16, the internal connection is PCI Express x4.

(3) re-installed OS model specifications

OS type	Pre-installed OS
WE	Microsoft® Windows® 10 IoT Enterprise 2016 LTSC (64-bit) (Embedded licensing version)
WF	Microsoft® Windows® 10 IoT Enterprise 2019 LTSC (64-bit) (Embedded licensing version)
SD	Microsoft® Windows Server® 2016 Standard (64-bit) (Embedded licensing version) ^{#1, #2}

#1: The client access licenses (CAL) are to be prepared by customers.

#2: Only HF-W2000 model 58 and model 55 are supported.

(4) Accessories

Item	Specifications
Power cord	7 A 125 V two-prong plug with ground pole
Manual	<i>SAFETY INSTRUCTIONS</i> (manual number WIN-B-0011)

(5) Option specifications

Item	Specifications
LAN adapter	1000BASE-T/100BASE-TX/10BASE-T by auto-negotiation × 1 (For details, see (8) <i>Optional LAN adapter specifications (HJ-F2050-20).</i>)
External contact port	Type B (For details, see 5.8.2 <i>External contact specifications.</i>)
	Type A (For details, see 5.8.2 <i>External contact specifications.</i>)
Service menu	Failure Analysis Support Service (as-needed contract)
	Failure Analysis Support Plus (included with purchase of main unit)

5. SPECIFICATIONS

(6) Supported resolutions

Screen settings			
Resolution	Refresh rate ^{#1}		
	Analog RGB	DVI-D	DisplayPort
	Analog	Digital	Digital
640 × 480	60 Hz	60 Hz	60 Hz
800 × 600	60 Hz	60 Hz	60 Hz
1,024 × 768	60 Hz	60 Hz	60 Hz
1,280 × 1,024	60 Hz	60 Hz	60 Hz
1,600 × 1,200	60 Hz	60 Hz	60 Hz
1,920 × 1,080	60 Hz	60 Hz	60 Hz
1,920 × 1,200	60 Hz	60 Hz	60 Hz
2,560 × 1,440	--	--	60 Hz
2,560 × 1,600	--	--	60 Hz
3,840 × 2,160	--	--	60 Hz

#1: All refresh rate settings indicated in the table have been confirmed to work in the test environment provided by Hitachi. Supported resolutions and refresh rates differ by display. Consequently, some settings might not be usable for a specific display.

(7) Main memory specifications

Only the following combinations can be used for the configuration of the main memory of this equipment.

DIMM1	DIMM2	Total capacity
4 GB	--	4 GB
4 GB	4 GB	8 GB
8 GB	8 GB	16 GB

(8) Optional LAN adapter specifications (HJ-F2050-20)

Item	Specifications
Interface	1000BASE-T/100BASE-TX/10BASE-T by auto-negotiation × 2 (RJ45, Wake-on-LAN™ not supported)
Installed slot	PCI Express x1
Dimensions	120.7 mm × 67 mm (including full height bracket)
Weight	About 40 g

5. SPECIFICATIONS

(9) Maximum current specifications (USB ports, extension boards, DisplayPort)

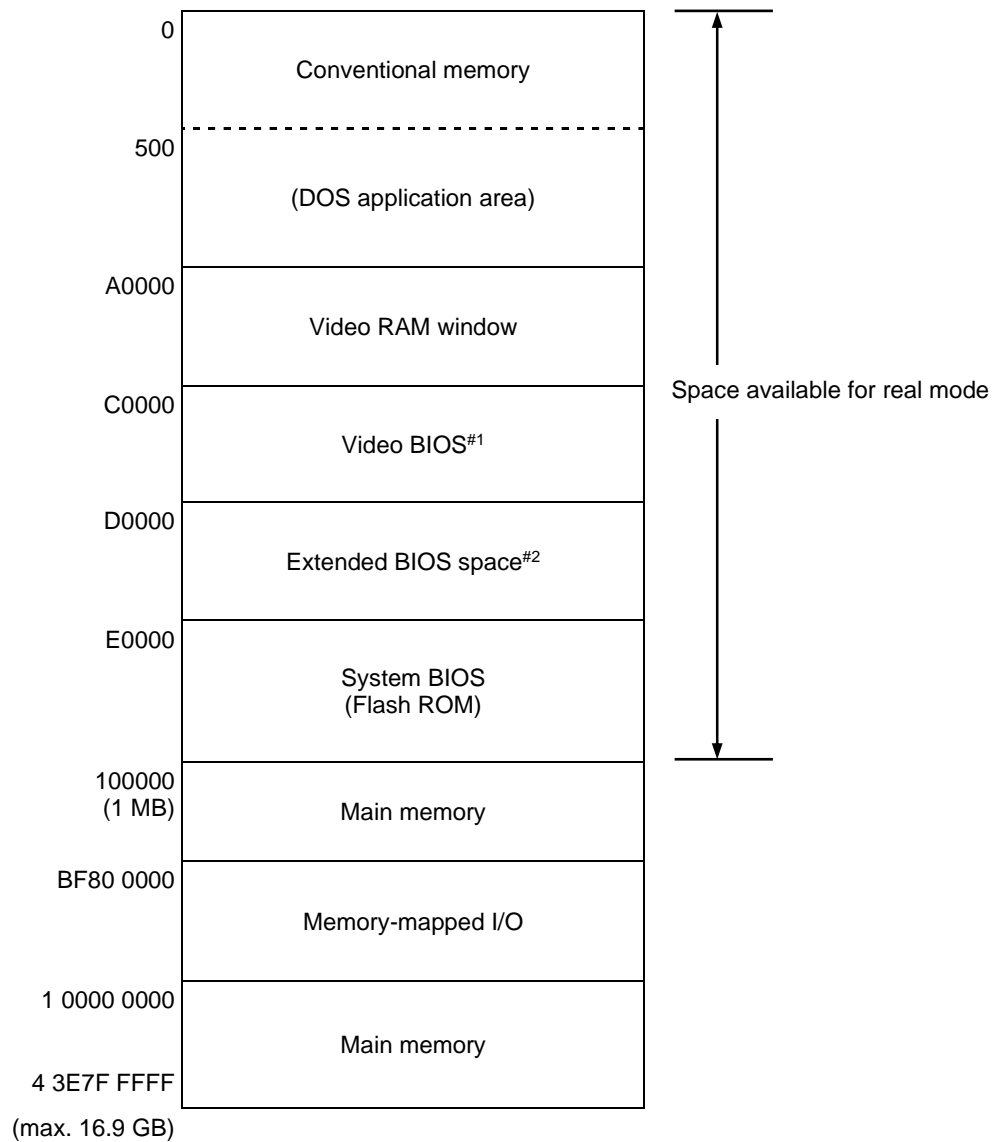
The following table shows the maximum total current consumption for the USB ports, expansion slots (PCI Express/PCI) and DisplayPort.

DC Output	Maximum total current consumption for USB port × 8 ports/ Extension board × 3 slots/ DisplayPort × 1 port
3.3 V	3.5 A
5 V	7.5 A
12 V	2.1 A
-12 V	0 A (No Power Supply)

The following table shows the maximum current consumption for each of the USB ports, expansion slots (PCI Express/PCI) and DisplayPort. Make sure that the inrush current when a device is connected does not exceed the specified maximum current. If the inrush current exceeds the specified maximum current, the surge protection circuit might activate, and the connected device might not be recognized.

Item	Voltage	Maximum current
USB 2.0 port	5 V	0.5 A/port
USB 3.0 port	5 V	0.9 A/port
PCI Express x16 slot	3.3 V	3.0 A/slot
	12 V	2.1 A/slot
PCI Express x4 slot	3.3 V	3.0 A/slot
	12 V	2.1 A/slot
PCI slot	3.3 V	6.0 A/slot
	5 V	5.0 A/slot
	12 V	0.5 A/slot
	-12 V	0A (No Power Supply)
Analog RGB	5 V	1.0 A/port
DVI-D	5 V	0.5 A/port
DisplayPort	3.3 V	0.5 A/port

5.2 Memory Space



#1: The size of the video BIOS might change in future versions.

#2: The extended BIOS space is a narrow space between D0000 and DFFFF, and might already be in use by other devices. In addition, the size of the BIOS of the standard built-in adapters might change in future versions. If possible, we recommend not using the BIOS space when designing a new device. If you do, a conflict might occur between devices, resulting in device malfunctions.

5.3 I/O Spaces

List of I/O spaces

I/O address	Device name
0000-001F	DMA controller
0020-002D	Interrupt controller
002E-002F	Super I/O configuration
0030-003D	Interrupt controller
0040-0043	System timer
004E-004F	Super I/O configuration
0050-0053	System timer
0060, 0062, 0064, 0066	Keyboard controller
0061	NMI controller
0070-0077	RTC controller
0080	DMA and POST code
0081-0091	DMA controller
0092	Reset controller
0093-009F	DMA controller
00A0-00B1	Interrupt controller
00B2-00B3	Power management controller
00B4-00BD	Interrupt controller
00C0-00DF	DMA controller
0000-00FF	Reserved (domain other than the preceding)
0240-025F	RAS LSI register
02E8-02EF	Serial port
02F8-02FF	Serial port
03B0-03DF	VGA controller
02E8-02EF	Serial port
03F8-03FF	Serial port 1 (COM1): A
04D0-04D1	Interrupt controller
0CF8-0CFB	PCI configuration (address)
0CF9	Reset controller
0CFC-0CFF	PCI configuration (data)
1800-189F	Power management controller
F000-F03F	VGA controller
F040-F05F	SMBus controller
F060-F07F	AHCI controller
F080-F083	AHCI controller
F090-F097	AHCI controller

5.4 List of Interrupts

Interrupt pin	Description
IRQ0	System timer
IRQ1	Not used
IRQ2	Not used
IRQ3	Not used
IRQ4	Serial port 1 (COM1)
IRQ5	Not used
IRQ6	Not used
IRQ7	Not used
IRQ8	Real-time clock
IRQ9	Not used
IRQ10	Not used
IRQ11	SMBus
IRQ12	Not used
IRQ13	Coprocessor
IRQ14	Not used
IRQ15	Not used
IRQ16	PCI Express slot 1, PCI slot 3
IRQ17	PCI Express slot 2
IRQ18	Not used
IRQ19	Not used
IRQ20	Not used
IRQ21	Not used
IRQ22	Not used
IRQ23	Not used
MSI	xHCI, onboard video, LAN1, LAN2, LAN3, SATA controller

NOTE

- This list is valid when the APIC is enabled (default settings).
- The IRQ numbers of PCI slots are valid when the INT A terminal is used.
- The IRQ numbers are fixed, and you cannot change the settings shown here.
- Even in an APIC-capable OS, APIC-enabled IRQ numbers are assigned only while the corresponding devices are active. In other cases, APIC-disabled IRQ numbers are assigned (see the next page).

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IRQ assignment when the APIC is disabled

Interrupt pin	Description
IRQ0	System timer
IRQ1	Not used
IRQ2	Not used
IRQ3	Not used
IRQ4	Serial port 1 (COM1)
IRQ5	Not used
IRQ6	Not used
IRQ7	Not used
IRQ8	Real-time clock
IRQ9	Not used
IRQ10	LAN1
IRQ11	SMBus controller, onboard video, xHCI, SATA controller, LAN2, LAN3, all PCI devices
IRQ12	Not used
IRQ13	Coprocessor
IRQ14	Not used
IRQ15	Not used

5.5 Serial Port Settings

The factory default settings for the serial ports are as follows. Do not change these settings. If you do, the equipment might not work properly.

Name recognized by the BIOS	I/O address#	IRQ assignment#	Name recognized by the OS	Note
Serial port A	3F8h	IRQ 4	COM1	Standard feature

#: Automatically assigned by the BIOS

5.6 BIOS Setup

The BIOS stores the system configuration information in the SPI-ROM. If you modify the system configuration, you might also need to change the BIOS settings.

For cautions on usage when changing the BIOS settings, see *10. BIOS SETTINGS*.

NOTE

The BIOS is configured to match the system configuration when the equipment was shipped.

If the BIOS settings are changed, the system might not operate stably or start properly. Use sufficient care when changing the BIOS settings.

(1) Starting the setup menu

When you set up the BIOS, start the setup menu.

Turn on the power switch (see *1.5 Name and Function of Each Part*). Messages related to system initialization will be displayed. Press the F2 key to launch the setup menu.

(2) Navigating the setup menu

Use the following keys to navigate the menu.

Key name	Description
Esc	Used to exit setup or return from a lower menu to a higher menu.
← or →	Used to select a menu or a menu group displayed at the top of the screen.
↑ or ↓	Used to select an item or a sub-item under a menu group.
+ or -	Used to select a value for the setting. By pressing these keys, settings cycle through the available options.
Space	Used to select a value for the setting. If there are only two available options, this key toggles the setting.
Tab	When you are configuring the date and time, pressing this key shifts the focus among setting items, for example, from month to day and from hour to minute.
Enter	Used to move from a higher menu to a lower menu, to exit setup (saving data to the SPI-ROM), and for various other purposes.

(3) Overview of the setup menu

The setup menu consists of the following items:

Main: This is the screen displayed when the menu starts. You can configure basic system settings such as the date and time.

Advanced: You can configure detailed system settings such as interrupt ports and I/O address settings.

Chipset: You can configure ECC support settings and whether to enable or disable a LAN.

Boot: You can configure the priority order of devices from which an OS is booted.

Save&Exit: You can save modified configuration information to the SPI-ROM, reset configuration information to the default settings, and make other changes.

5. SPECIFICATIONS

(4) Details of the setup menu

The following tables show the details of the items you can set in each menu.

(1/5)

Top menu	Setting item		Default value	Notes
Main	System Date		--	When you set the system up for the first time, be sure to configure these items.
	System Time		--	
Advanced	Beep on Boot		Disabled	Specifies whether to turn the beep sound on or off at startup. Options: Disabled, Enabled
	Correctable ECC Error		Pause	Specifies whether to display a message and pause startup, or to ignore errors and proceed with startup when a Correctable ECC Error is detected. Options: Pause, Pass
	Memory Testing	Memory Testing	Enabled	Specifies whether to test the memory during startup. Options: Enabled, Disabled
		Mode of Testing	Normal Test	Specifies the test mode for the memory test during startup. Options: Normal Test, Fast Test
	CPU Configuration	Core Multi Processing	Enabled	Specifies whether to use a single core or multiple cores. Options: Enabled, Disabled
		Hyper-Threading	Enabled	Specifies whether to enable or disable Hyper-Threading Technology. Options: Enabled, Disabled This item does not appear for processors that do not support Hyper-Threading.
		EIST	Enabled	Specifies whether to enable or disable EIST. Options: Enabled, Disabled
		MMIO Range	Dynamic	Specifies whether MMIO is dynamic or fixed (2 GB). Options: Dynamic, 2 GB

(2/5)

Top menu	Setting item		Default value	Notes
Advanced	SATA Configuration	SATA Mode Selection	AHCI	Do not change the setting to the left.
		Drive 1 Slot	Enabled	Specifies whether to enable or disable the applicable slot. Options: Enabled, Disabled
		Drive 2 Slot	Enabled	Specifies whether to enable or disable the applicable slot. Options: Enabled, Disabled
		Drive 3 Slot	Enabled	Specifies whether to enable or disable the applicable slot. Options: Enabled, Disabled
	USB Configuration	Legacy USB Support	Enabled	Specifies whether to activate USB devices. If you disable this setting, you can use a USB keyboard only for the setup menu and after Windows® starts. Options: Enabled, Disabled
		Front USB Port	Enabled	Specifies whether to enable or disable the front USB ports. Options: Enabled, Disabled

Top menu	Setting item		Default value	Notes
Advanced	Power Configuration	After AC Power On	Auto	<p>Specifies settings that govern the behavior when power is restored after power is lost.</p> <p>Stay Off: When the power is turned on, the system goes into the soft power off mode.</p> <p>Power On: When the power is turned on, the OS starts automatically.</p> <p>Auto: If the OS was running the last time the power was turned off, the OS starts as in the case of Power On. If the OS was not running the last time the power was turned off, the system goes into the soft power off mode as in the case of Stay Off.</p> <p>If the backup battery runs out of power or if the battery is not connected, the settings operate the same way as Stay Off when the power is turned off. If the backup battery runs out of power or the battery is replaced, the applicable settings value reverts to the default (Auto).</p>
		Fan Failure Detection	Enabled	<p>Specifies whether to detect fan failures when the power is turned on.</p> <p>Option: Enabled, Disabled</p>
		Fan Speed Control	Auto	<p>Specifies the rotational speed of the fan.</p> <p>Auto: The fan speed changes automatically according to the CPU temperature.</p> <p>Full: Fan speed is always at maximum.</p>
		Cx State Enable	Disabled	<p>Changes the behavior of the processor power state (Cx).</p> <p>Options: Disabled, Enabled</p>

(4/5)

Top menu	Setting item		Default value	Notes	
Advanced	PCI Configuration	PCI-Express Device Slot #1	Enable Master	Enabled	Specifies whether to enable or disable mastering for the device connected in Slot #1. Options: Enabled, Disabled
			Link Speed	Auto	Specifies the link speed of the device installed in the applicable slot. Options: Auto, Gen1, Gen2, Gen3
		PCI-Express Device Slot #2	Enable Master	Enabled	Specifies whether to enable or disable mastering for the device connected in Slot #2. Options: Enabled, Disabled
			Link Speed	Auto	Specifies the link speed of the device installed in the applicable slot. Options: Auto, Gen1, Gen2, Gen3
		PCI-Express Device Slot #3	Enable Master	Enabled	Specifies whether to enable or disable mastering for the device connected in Slot #3. Options: Enabled, Disabled
			Link Speed	Auto	Specifies the link speed of the device installed in the applicable slot. Options: Auto, Gen1, Gen2, Gen3
		PCI Parity Error Detection	Enabled	Specifies whether to enable or disable PCI Bus Parity Error. Options: Enabled, Disabled	
	I/O Device Configuration	Serial Port A		Enabled	Do not change the settings to the left.
		Base I/O Address		3F8h	
		Interrupt		IRQ4	

Top menu	Setting item	Default value	Note
Chipset	ECC Support	Enabled	Specifies whether to enable or disable the ECC function of the memory. Options: Enabled, Disabled
	LAN 1	Enabled	Specifies whether to enable or disable the applicable LAN port. Options: Enabled, Disabled
	LAN 2	Enabled	Specifies whether to enable or disable the applicable LAN port. Options: Enabled, Disabled
	LAN 3	Enabled	Specifies whether to enable or disable the applicable LAN port. Options: Enabled, Disabled
Boot	Bootup NumLock State	On	Specifies whether to turn Num Lock on for the keyboard upon startup. Options: On, Off
	UEFI Boot	Disabled	Specifies whether to enable or disable UEFI. Options: Disabled, Enabled
	Boot Option Priorities	1. USB FDD 2. SATA CD/DVD 3. USB CD 4. DRIVE1 5. DRIVE2 6. PCI SCSI 7. USB HDD 8. Internal Shell	Specifies the priority for devices that start the OS, and whether to start the OS from a particular device.
Save&Exit	Exit Saving Changes	--	Saves the changes you made in setup to the SPI-ROM, and then reboots the system.
	Exit Discarding Changes		Discards the changes you made in setup, and reboots the system by using the configuration that was saved to the SPI-ROM last.
	Load Setup Defaults		Loads the BIOS default settings. Default values are loaded but not saved in the SPI-ROM. If you want to save the default settings in the SPI-ROM, use Exit Saving Changes .

(5) Restoring the default settings

To restore all items in the setup menu to the default settings:

1. Start the setup menu. (See *(1) Starting the setup menu.*)
2. Open **Save&Exit** in the top menu. Move the cursor to **Load Setup Defaults** and press **Enter**.
The message `Load Optimized Defaults?` is displayed.
3. Select **Yes** and press **Enter**.
4. Open **Save&Exit** in the top menu again. Move the cursor to **Exit Saving Changes**. Press **Enter**. The message `Save configuration and reset?` is displayed.
5. Select **Yes** and press **Enter**.

This completes the procedure.

5. SPECIFICATION

5.7 Hardware System Clock

This equipment has a hardware system clock that uses an RTC (real-time clock) IC.

The clock has a built-in calendar and continues to work by using a backup battery, even when the system power is off.

Table 5-1 Hardware system clock specifications

Item	Specifications
Time function	Hour/minute/second (24-hour clock)
Date function	Year/month/day
Precision	± 4 seconds per day [#]
Battery backup	Lithium battery

[#]: Rough estimates when the ambient temperature is 25°C.

The system regularly updates the internal clock by using a periodic timer. The internal clock is adjusted by reading the time and date from the hardware clock when, for example, the system starts.

5.8 Interface Specifications

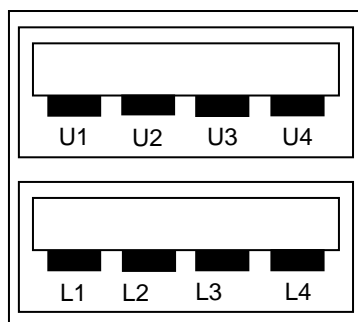
5.8.1 Connector specifications

The following shows the specifications of the interfaces from this equipment to external devices.

For information about the location of the ports, see *Parts related to the display and user operation* in 1.5 *Name and Function of Each Part*.

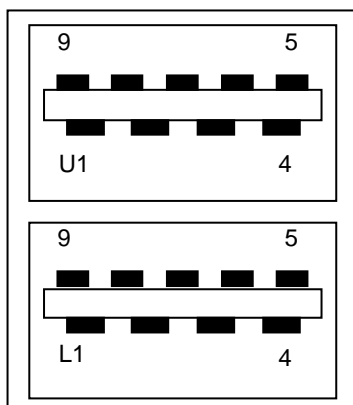
(1) Motherboard (standard)

- USB 2.0 port (front)



Pin no.	Signal name
U1	+5V
U2	USBD1-
U3	USBD1+
U4	GND
L1	+5V
L2	USBD0-
L3	USBD0+
L4	GND

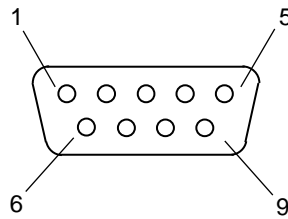
- USB3.0 port (rear)



Pin no.	Signal name	Pin no.	Signal name
L1(1)	+5V	U1(10)	+5V
L2(2)	USBD0-	U2(11)	USBD1-
L3(3)	USBD0+	U3(12)	USBD1+
L4(4)	GND	U4(13)	GND
L5(5)	SSRX1-	U5(14)	SSRX2-
L6(6)	SSRX1+	U6(15)	SSRX2+
L7(7)	GND	U7(16)	GND
L8(8)	SSTX1-	U8(17)	SSTX2-
L9(9)	SSTX1+	U9(18)	SSTX2+

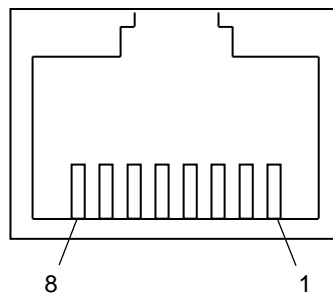
5. SPECIFICATION

- Serial port (male connector, inch screws) (COM1)



Pin no.	Signal name	Pin no.	Signal name
1	CD	6	DSR
2	RD	7	RTS
3	TD	8	CTS
4	DTR	9	RI
5	GND		

- Built-in LAN port (RJ45 modular port 8 pins)

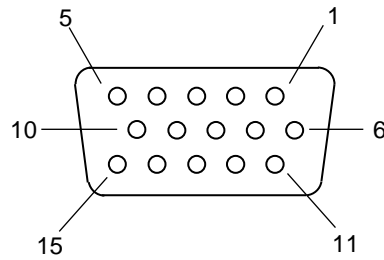


Pin no.	Signal name
1	TRD0+
2	TRD0-
3	TRD1+
4	TRD2+
5	TRD2-
6	TRD1-
7	TRD3+
8	TRD3-

For network connections, use the following specified cable.

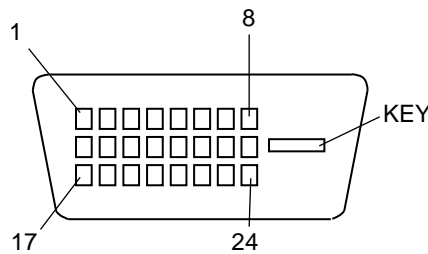
Cable specification: UTP cable (twisted-pair cable without shielding), Category 5e or 6

- Video port (VGA terminal Mini D-sub 15 pins, inch screws)



Pin no.	Signal name	Pin no.	Signal name
1	RED	9	+5V
2	GREEN	10	GND
3	BLUE	11	NC
4	NC	12	SDA
5	GND	13	HSYNC
6	RED-RTN	14	VSYNC
7	GREEN-RTN	15	SCL
8	BLUE-RTN		

- Video port (DVI-D 24 pins, inch screws)

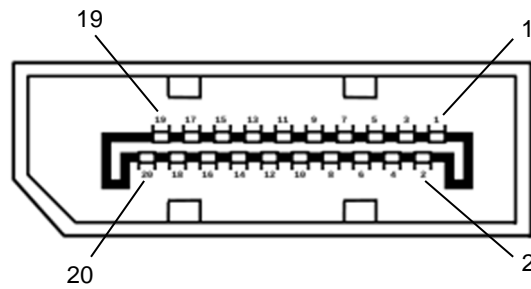


Pin no.	Signal name	Pin no.	Signal name	Pin no.	Signal name
1	TX2M	9	TX1M	17	TX0M
2	TX2P	10	TX1P	18	TX0P
3	SGND	11	SGND	19	SGND
4	NC(TX4M)	12	NC	20	NC
5	NC(TX4P)	13	NC	21	NC
6	DDCCLK2	14	P5DFP	22	SGND
7	DDCDAT2	15	PGND	23	TXCP
8	NC	16	NC	24	TXCM

Note: This video port supports single-link connections only.

5. SPECIFICATION

- Video port (DisplayPort 20 pins)

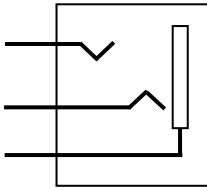


Pin no.	Signal name	Pin no.	Signal name
1	MainLane0+	11	GND
2	GND	12	MainLane3-
3	MainLane0-	13	GND
4	MainLane1+	14	GND
5	GND	15	Aux+
6	MainLane1-	16	GND
7	MainLane2+	17	Aux-
8	GND	18	HotplugDetect
9	MainLane2-	19	GND
10	MainLane3+	20	+3.3V

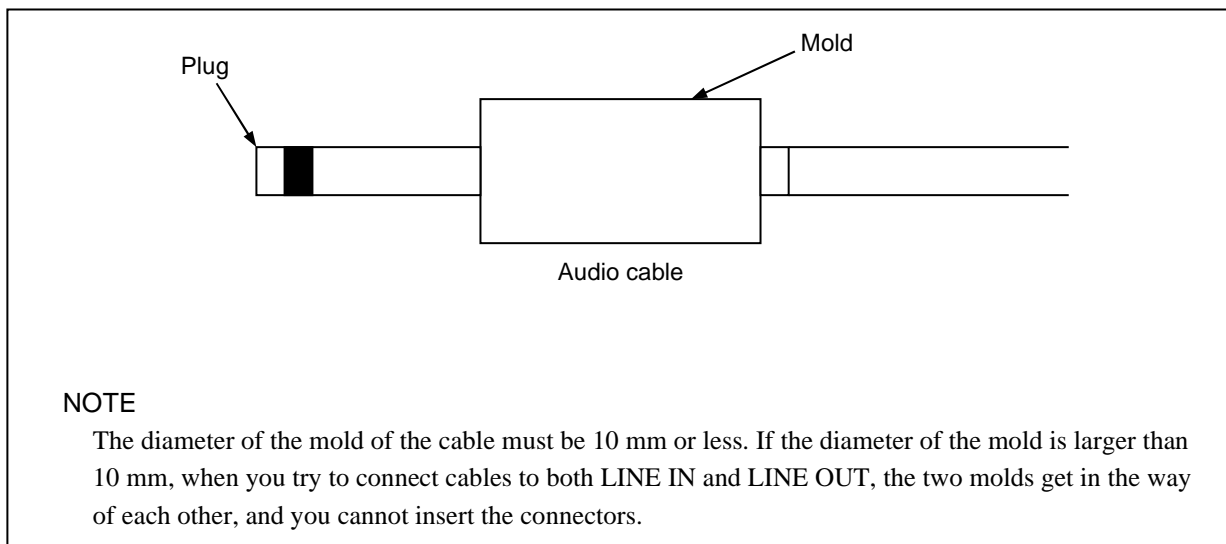
Note 1: If you use a DisplayPort-DVI conversion connector for triple display, you must select the active conversion connector and perform a preliminary evaluation.

Note 2: If you use a DisplayPort-DVI conversion connector, you must confirm the output resolution specifications of the DisplayPort-DVI conversion connector.

- Audio port: LIN and LOOUT (3.5φ stereo audio port)



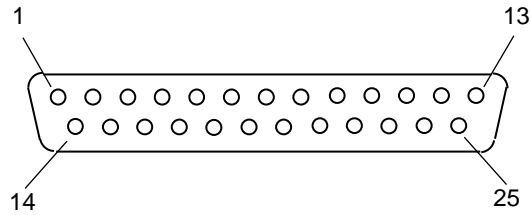
LIN		LOUT	
Pin no.	Signal name	Pin no.	Signal name
1	AGND	1	AGND
2	LIN_L	2	LOUT_L
3	LIN_R	3	LOUT_R



5. SPECIFICATION

(2) RAS external contact interface (EXT)

- External contact I/O port (male connector, inch screws)



Type C

Pin no.	Signal name	Pin no.	Signal name
1	NC	14	NC
2	GENDO0_1	15	GENDO0_2
3	NC	16	NC
4	GENDO1_1	17	GENDO1_2
5	PSDOWN_1	18	PSDOWN_2
6	NI_RMTPWRON_1/NI_GENDI2_1	19	GND(NI_RMTPWRON_1/NI_GENDI2_2)
7	NI_GENDI1_1	20	GENDI1_2
8	NC	21	RMTPWRON_2/GENDI2_2
9	NC	22	GND(NI_GENDI1_2)
10	NC	23	NC
11	NC	24	NC
12	GENDI1_1	25	NC
13	RMTPWRON_1/GENDI2_1		

Type A, B

Pin no.	Signal name	Pin no.	Signal name
1	MCALL_1	14	MCALL_2
2	GENDO0_1	15	GENDO0_2
3	GENDO1_1	16	GENDO1_2
4	WDTTO_1	17	WDTTO_2
5	PSDOWN_1	18	PSDOWN_2
6	GENDI0_1	19	GND(RMTPWRON_2/GENDI2_2)
7	RMTSTDN_1/GENDI_1	20	GND(RMTSTDN_2/GENDI_2)
8	GND(RMTRESET_2)	21	GND(GENDI1_2)
9	CPUSTOP_2	22	GND(GENDI0_2)
10	RMTPWRON_1/GENDO2_2	23	CPUSTOP_1
11	RMTRESET_1	24	GENDO2_1
12	GENDI1_1	25	GND
13	GENDI2_1		

5.8.2 External contact specifications

Type C is the standard for external contact I/O. Users can change to Type A or Type B at the time of purchase. (This cannot be changed after purchasing the equipment.)

(1) List of external contact I/O signals

	Signal line	Meaning
Output	PSDOWN	Activated when the OS is shutdown (standby or the main power is off) or when power is not supplied to the equipment.
	CPUSTOP	Activated when the OS, application, device driver, or similar cannot run properly due to an abnormally high system load or crash.
	WDTTO	Activated when a timeout is detected by the watchdog timer. A timeout is also detected when the OS is shutdown (standby or the main power is off) or when power is not supplied to the equipment.
	MCALL	This is a maintenance request signal. This contact is activated when the temperature, the fan status, or one side of the mirrored disks (B model only) is abnormal.
	GENDO0 GENDO1 GENDO2	These are general-purpose contact output signals. A user can assign a task to each of the contacts GENDO0 through GENDO2.
Input	RMTSHTDN (GENDI)	This is a shutdown request signal or a general-purpose input signal. When this contact is closed, the OS will be shutdown. The user can select which signal to use.
	RMTREST	This is a reset request signal. When this contact is closed, the equipment is hard-reset.
	GENDI0 GENDI1	These are general-purpose input signals. A user can assign a task to each one of the contacts GENDI0 and GENDI1.
	GENDI2 (RMPWRON)	This is a general-purpose input signal. A user can assign a task to contact GENDI2. This input can also be used for the remote power-on function.

5. SPECIFICATION

(2) External contact I/O port specifications

Item	Output#1						Input					
	PS DOWN	CPU STOP	WDTTO	MCALL	GEN DOO	GEN DO1	GEN DO2	RMTSHTDN/ GENDI#2	RMT RESET	GEN DI0	GEN DI1	GENDI2/ RMTPWON#3
Type C (standard)	A contact	--	--	--	A contact		--	--	--	Yes	Yes	Yes
Type B (option)	B contact			A contact			Yes	Yes	Yes	Yes	Yes	Yes
Type A (option)	A contact						Yes	Yes	Yes	Yes	Yes	Yes
Specifications	Contact specifications: PhotoMOS relay contact Load voltage: Max. 40 V DC Load current: Max. 0.1 A/point (steady state) Max. 0.6 A/point (inrush) Dielectric strength: 250 V AC, 1 minute						Contact specifications: Non-voltage transistor contact Contact current: 1 mA/point					
Contact diagrams	<p>40 V DC 0.1 A Contact specifications</p> <p>HF-W side Cable User side</p>						Type A/B: Non-isolated Type C: Support for two types of input, non-isolated and isolated (not usable simultaneously) Non-isolated: <p>5 V (VCC)</p> <p>Contact input</p> <p>HF-W side Cable User side</p> Isolated: DC 24 V 5 mA <p>Fuse</p> <p>HF-W side Cable User side</p>					

PS DOWN: Power supply down

CPU STOP: CPU stopped (OS freeze monitoring)

WDTTO: Watchdog time out

MCALL: Maintenance technician call

RMTPWON: Remote power on

RMTSHTDN: Remote shutdown

RMTRESET: Remote reset

GENDI*: General input

GENDO*: General output

#1: The operation of the A contact and B contact are as follows:

A contact (MCALL):

Open when normal, closed when abnormal, open when power is cut.

A contact (PSDOWN,CPUSTOP,WDTTO):

Closed when normal, open when abnormal, open when power is cut.

A contact (GENDO*):

The contact state depends on the user program instruction. Open when power is cut or without program instruction.

B contact (PSDOWN,CPUSTOP,WDTTO):

Open when normal, closed when abnormal, closed when power is cut.

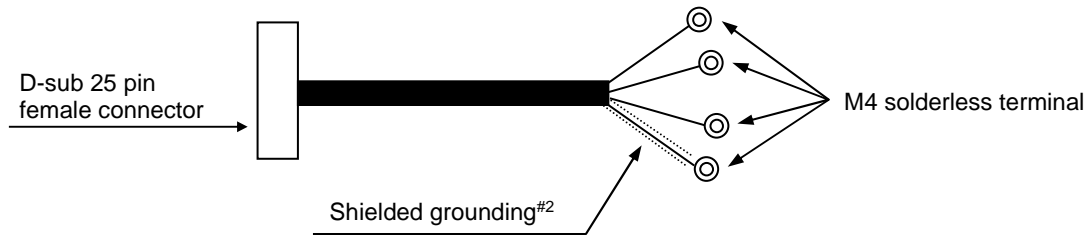
#2: RMTSHTDN and GENDI use the same contact (switched by the RAS software setting). RMTPWON and GENDI2 use the same contact (switched by the jumper pin setting). For details, see *6.6 Enabling the Remote Power-On Function*.

#3: When you use the RMTPWON function, ensure that no noise is added to the external contact. If the contact closes for 15 ms or more during the soft power-off mode due to noise or other reasons, the power might turn on unexpectedly. Note that when the OS or BIOS is running after the power turns on, the RMTPWON function is disabled, and the contact can be used as a GENDI2 input.

5. SPECIFICATION

(3) Recommended EXT cable specifications

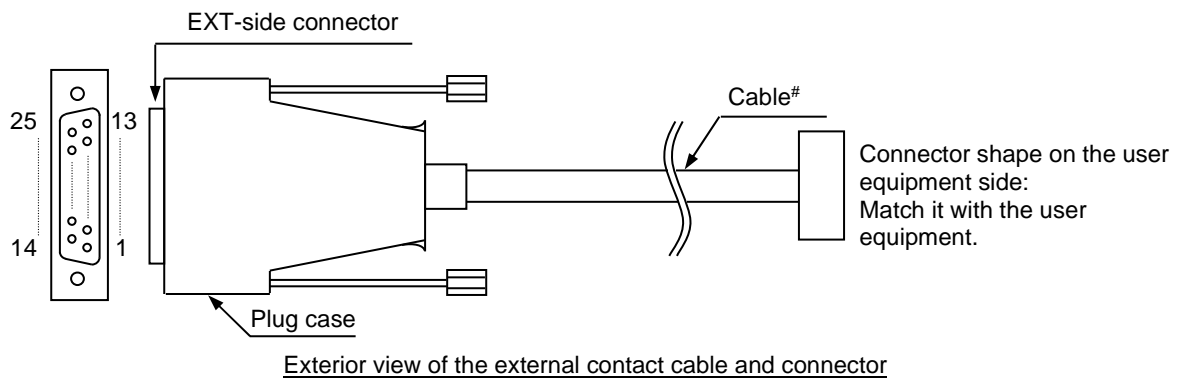
- The following cable is required for connections.^{#1}



#1: The maximum cable length is 30 m.

#2: To connect a cable shield, in addition to the cable, you must provide a shielded grounding bar for dedicated use with shielded wire connections.

- User-made cables must meet the following specifications:



#: The shielded grounding of the cable must firmly contact the conductor of the plug case (frame ground). (Do not connect a GND pin of the EXT port to the shielded grounding, because all GND pins are signal ground. If you do so, the equipment might malfunction.)

- EXT side connector specifications (recommended connector)

Connector shape: D-sub 25 pin female connector (two lines)

Part name	Model	Manufacturer
Plug case	HDB-CTH1(4-40)(10)	Hirose Electric Co., Ltd.
Female connector	HDBB-25S	Hirose Electric Co., Ltd.

- Cable specifications (recommended cable)

Item	Specifications	Notes
Maximum cable length	30 m	
Electric shield of the cable	Required	Connected to the frame ground
Recommended cable	UL2464SB 13P × 24AWG	Hitachi Metals, Ltd.

5.8.3 External interface cable length specifications

(1) External interface cable length specifications

The recommended maximum cable length for each interface of this equipment is as follows:

No.	Connector name	Maximum cable length (m)	Notes
1	Analog RGB port	3	
2	DVI-D port	3	
3	DisplayPort	3	
4	LAN port	100	UTP Category 5e or better
5	External contact port	30	For information about the cable specifications, see 5.8.2 (3).
6	Serial port (COM)	15	Use a shielded cable.
7	Front USB 2.0 (2 ports)	3	Use a USB 2.0 compliant shielded cable. If you use an extension cable, connected USB devices might not work properly.
8	Rear USB 3.0 (6 ports)	2	Depending on the connected device, use a USB 3.0 compliant shielded cable or a USB 2.0 compliant shielded cable. If you use an extension cable, connected USB devices might not work properly.
9	Audio (LINE IN/LINE OUT)	2	

Connected devices might not work properly depending on the device. Verify proper operation of the device before using it.

Equipment operation cannot be guaranteed when used in combination with extension or switching devices. Verify the correct operation of the equipment in advance.

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CHAPTER 6 INSPECTION AND MAINTENANCE

6.1 Daily Inspections



WARNING

Install a dust filter for use with the equipment. Not doing so allows dust into the equipment, which might result in a short circuit fire.



CAUTION

Before you clean or replace the dust filter of this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Failure to do so might result in injury to the hands or fingers.

NOTICE

- Before moving this equipment, shutdown the OS, unplug the power cord, and wait for at least one minute. Not doing so might cause HDDs and other devices to fail.
- When transporting or carrying the equipment, pack it by using the dedicated container (the container and packing materials used when the equipment was delivered). Using another container or other packing materials might damage the equipment.
- Do not use the dedicated container to transport or carry the equipment if the container has been damaged or broken. Doing so might damage the equipment.

6. INSPECTION AND MAINTENANCE

(1) Cleaning the dust filter

NOTICE

After washing a dust filter, dry it completely before re-attaching it to the equipment. Using the equipment while its dust filter is not completely dry might cause equipment failure. When using a detergent to clean a dust filter, use a neutral detergent. Using other types of detergents might cause the dust filter to lose its feature.

(a) Frequency

Clean the dust filter at a frequency in the range from once a month to once every three months, depending on the amount of dust in the environment.

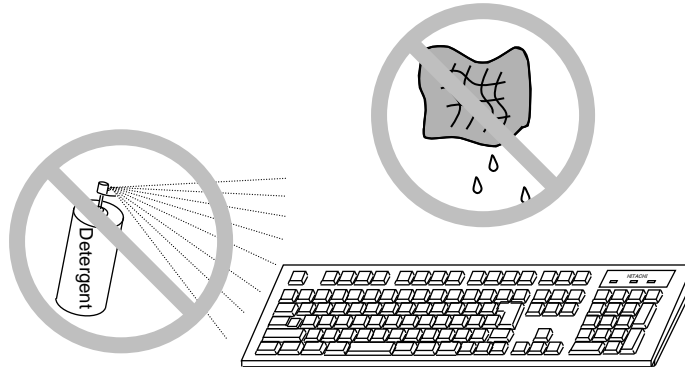
(b) Procedure

1. Shutdown the OS.
2. Unplug the power cord. Wait for at least one minute before you start cleaning.
3. Take out the dust filter located on the front panel, and then dust or wash the filter. If you wash the filter, wait until the filter is completely dry, and then re-attach the filter to the equipment. For details about how to install or remove the dust filter, see *6.3.8 Installing and removing a dust filter*.

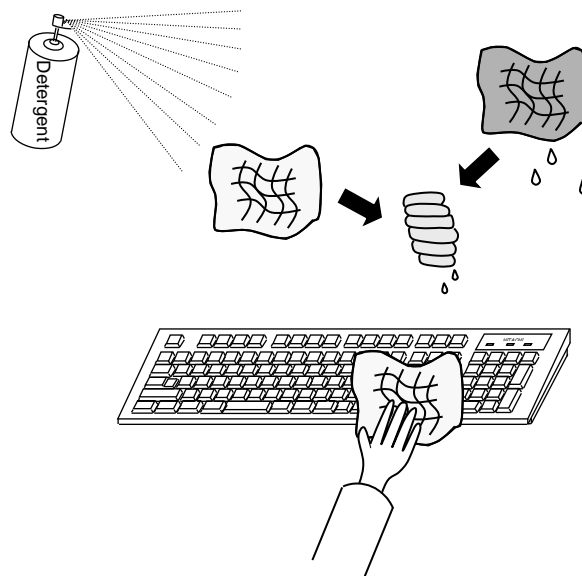
(2) Cleaning the optional keyboard

When cleaning the keyboard, note the following:

- Do not spray detergent directly onto the keyboard or spill liquid detergent on it.
- Do not wipe the keyboard with a wet cloth. If you do so, the equipment might fail.



- When using detergent, spray a minimum amount of detergent on a cloth.
- Before wiping the keyboard with a wet cloth, wring out the cloth well.
- Use a soft cloth, such as gauze.
- Before using detergent, carefully read the instructions on how to use the detergent.
- Cover the entire keyboard with gauze, spray detergent over it, allow it to stand for several minutes, and then wipe off the keyboard.



NOTE

For information about the precautions for USB devices, see 6. *USB Devices* in *PRECAUTIONS*.

6.2 Periodic Inspections

The following table shows how to perform periodic inspections of the equipment. Periodic inspections are available through a maintenance contract with Hitachi, and are performed by Hitachi maintenance personnel (with the exception of daily inspections). Periodic inspections must be performed only by qualified maintenance personnel. Include the inspection plan in the system operation schedule.

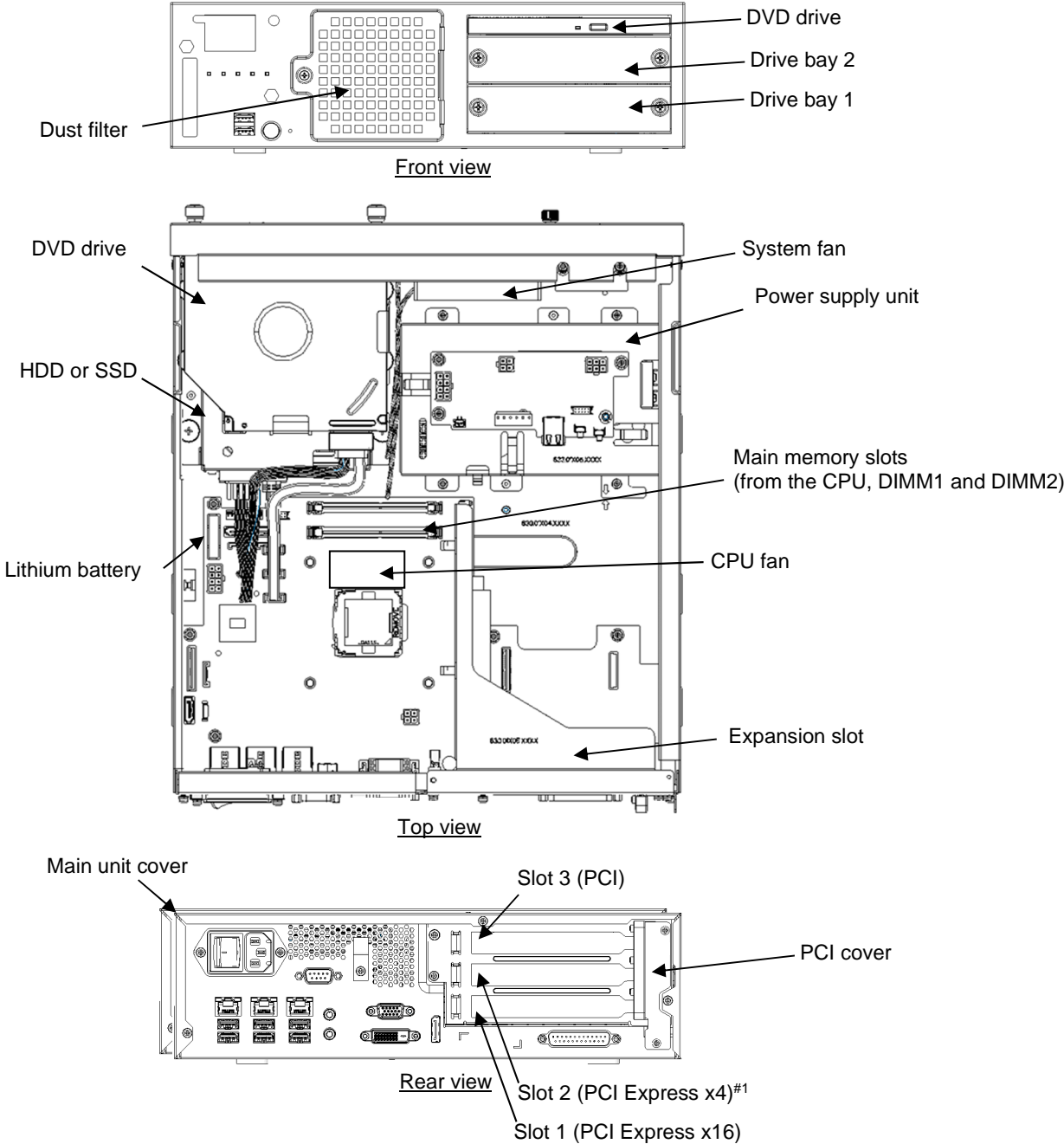
Inspection item	Frequency	Note
Collection of logging information	Annually	
Inspection and cleaning of components <ul style="list-style-type: none"> • Inspection and cleaning for the inside and outside of the equipment • Inspection of fan rotation and removal of dust • Removal of foreign objects that have entered the equipment • Other general inspection items 	Annually	
Replacing dust filters	Annually	
Measuring the power voltage	Annually	
Operational checks <ul style="list-style-type: none"> • Operational checks of switches and lamps • Operational checks by using test programs 	Annually	
Periodic replacement of replaceable components [#]	As required	
Routine inspection <ul style="list-style-type: none"> • Cleaning the keyboard • Cleaning dust filters 	From once a month to once every three months	For details, see <i>6.1 Daily Inspections</i> .

[#]: For details about how to handle replaceable components, see *APPENDIX HANDLING OF REPLACEABLE COMPONENTS*.

6.3 Installing and Removing Components

6.3.1 Types and locations of installed components

The following figure shows the types and locations of the components installed in this equipment.





#1: Although the connector is for PCI Express x16, the connection internally is PCI Express x4.

Figure 6-1 Types and locations of installed components

6.3.2 Before installing or removing components

When installing or removing components, comply with the following instructions.

 WARNING
Before starting work, shutdown the OS, unplug the power cord from the outlet, and wait for at least one minute. Failure to do so might result in an electric shock or equipment failure.

 CAUTION
When installing or removing components, do not directly touch parts inside the equipment with your hands. Such parts are hot, and touching them might result in burns. In addition, touching such parts might damage the parts or result in equipment failure.

- Ensure sufficient clearance for maintenance work. Work on a flat surface. (See 1.6.2 *Installation*.)
- Wear cotton gloves when installing or removing components.
- When tightening or removing screws, use a Phillips screwdriver (JIS #1 or JIS #2) to avoid stripping the heads.
- To avoid damaging the threads when tightening screws, drive the screw along the axis of the tapped hole without adding too much torque.

In addition, each work item has individual instructions. Comply with these instructions as well.

6.3.3 Installing and removing the cover of the main unit

CAUTION

When installing the cover of the main unit, do not insert your fingers into the inside of the cover of the main unit. Doing so might result in your fingers getting caught, causing injury.

Before starting work, see 6.3.2 *Before installing or removing components*.

(1) Removing the cover of the main unit

- [1] Remove the three screws on the rear of the equipment.
- [2] Slide the cover towards the rear of the equipment.
- [3] Pull the sides of the cover apart slightly from the body of the equipment, and then lift the cover up and away.

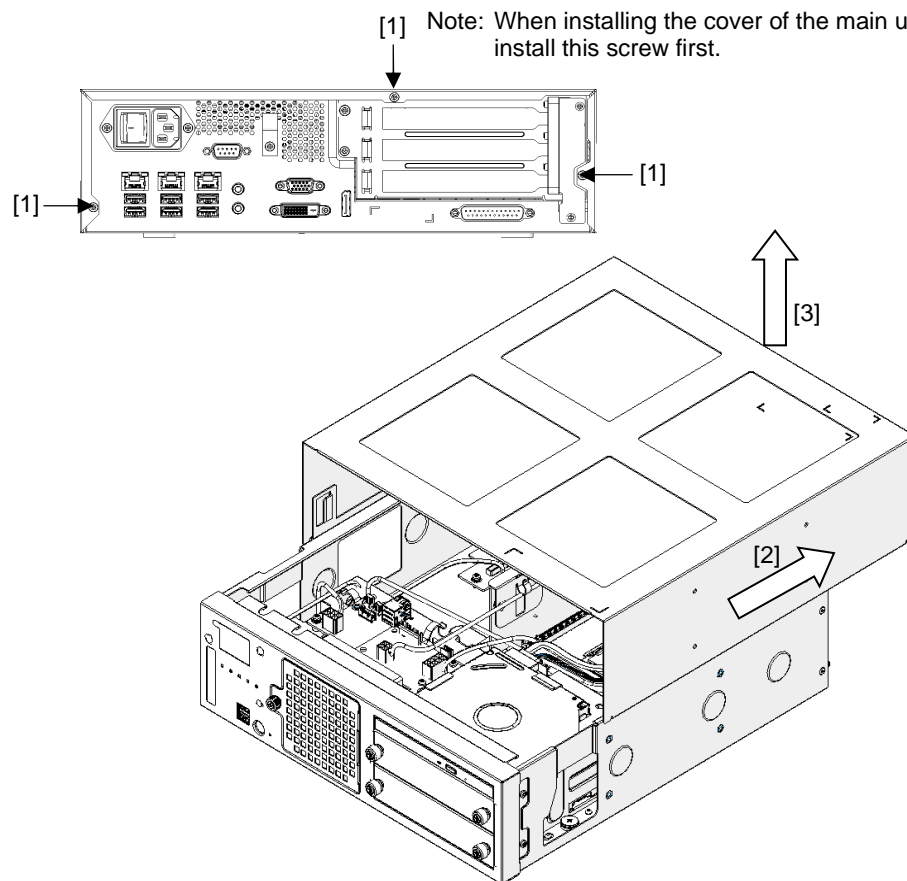


Figure 6-2 Removing the cover of the main unit

(2) Installing the cover of the main unit

When installing the cover of the main unit, reverse the procedure described in (1) *Removing the cover of the main unit*. Then, install the center screw first, as shown in Figure 6-2.

6.3.4 Installing and removing an extension board



WARNING

Before you install or remove an extension board, shutdown the OS, unplug the power cord, and wait for at least one minute. Installing or removing an extension board without shutting down the power might result in an electric shock or a fire.

NOTICE

Disconnect all external cables connected to the equipment before installing or removing an extension board. Not doing so might result in equipment failure.

(1) Before installing or removing an extension board

- Before starting work, see 6.3.2 *Before installing or removing components*.
- If extension boards have been already installed in the slots, remove the extension boards from lower-number slots before installing or removing extension boards from higher-number slots.
- When installing multiple extension boards at the same time, install them beginning from the lower-number slots.
- For details about the locations of extension boards, see *Figure 6-1 Types and locations of installed components*.

NOTE

For information about the precautions for extension boards, see 7. *Extension Boards* in *PRECAUTIONS*.

(2) Information about extension boards

(a) Types of extension boards

This equipment has a total of three expansion slots (two PCI Express slots and a PCI slot).

- The PCI Express slots are compliant with PCI Express Base Specification Revision 2.0.
- The PCI slot is compliant with PCI Local Bus Specification Revision 2.1.

Expansion slot	Supported extension boards
Slot 3	PCI short size
Slot 2	PCI Express x4, full height, short size ^{#1}
Slot 1	PCI Express x16, full height, short size

#1: Although a PCI Express x16 connector is used, the internal connection is equivalent to PCI Express x4.

(b) Size of extension boards

The board sizes (length × height) in the PCI Express and PCI specifications are as follows (heights include the connectors):

- Do not spray detergent directly onto the keyboard or spill liquid detergent on it.
- PCI Express specifications:
 - Short size: 167.65 × 111.15 mm
- PCI specifications:
 - Short size: 174.63 × 106.68 mm

(3) Installing an extension board

- [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit.
- [2] Remove the two screws on the rear of the equipment, and then remove the PCI cover.

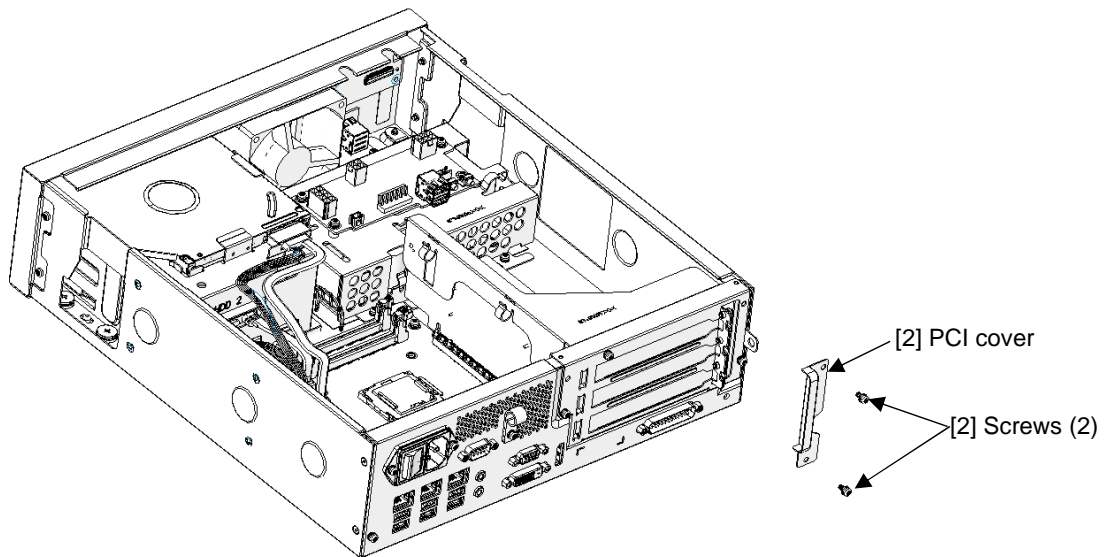


Figure 6-3 Removing the PCI cover

6. INSPECTION AND MAINTENANCE

- [3] Remove the cable from the cable clips, and move it to the side.
- [4] Remove the two screws that are securing the expansion slot.
- [5] Remove the expansion slot by lifting it directly upward.
- [6] Remove the screw securing the extension board, and then remove the slot cover. (Store the slot cover so that it will not become lost.)
- [7] While pressing on both ends of the extension board, insert the extension board horizontally into the expansion slot connector.
- [8] Press directly above the extension board connector to fully insert the extension board into the expansion slot connector.
- [9] Restore the equipment by following the procedure in reverse, and then install the PCI cover.
- [10] Install the cover of the main unit for the equipment.

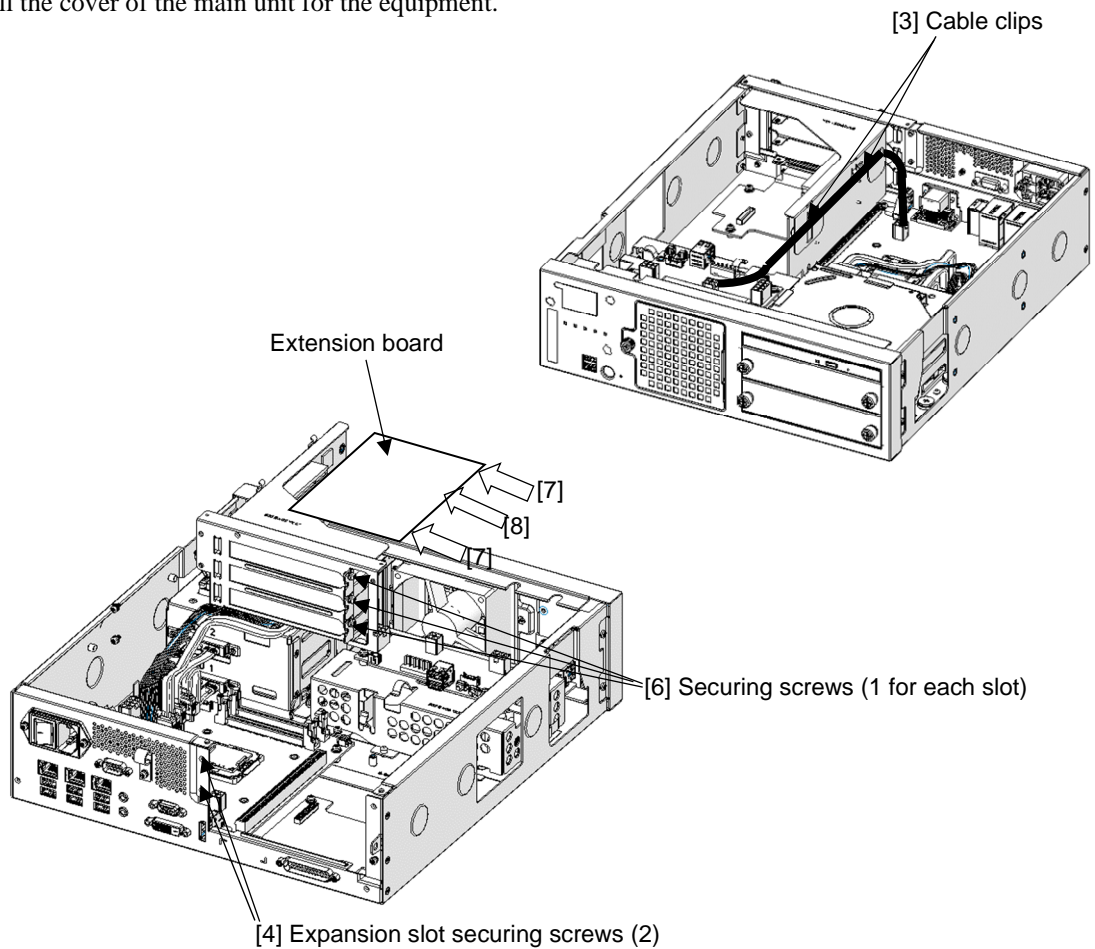


Figure 6-4 Installing an extension board

NOTE

When you install an extension board, adjacent boards might become loose. Verify that all adjacent board are fully inserted.

(4) Removing an extension board

- [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit and the PCI cover.
- [2] Remove the cable from the cable clips, and move it to the side.
- [3] Remove the two screws that are securing the expansion slot.
- [4] Remove the expansion slot by lifting it directly upward.
- [5] Remove the screw securing the extension board, and then remove the slot cover.
- [6] While holding the top of the extension board connector, pull out the extension board horizontally from the expansion slot connector.
- [7] Use a screw to secure the stored slot cover over the empty expansion slot.
- [8] Restore the equipment by following the procedure in reverse, and then install the PCI cover.
- [9] Install the cover of the main unit for the equipment.

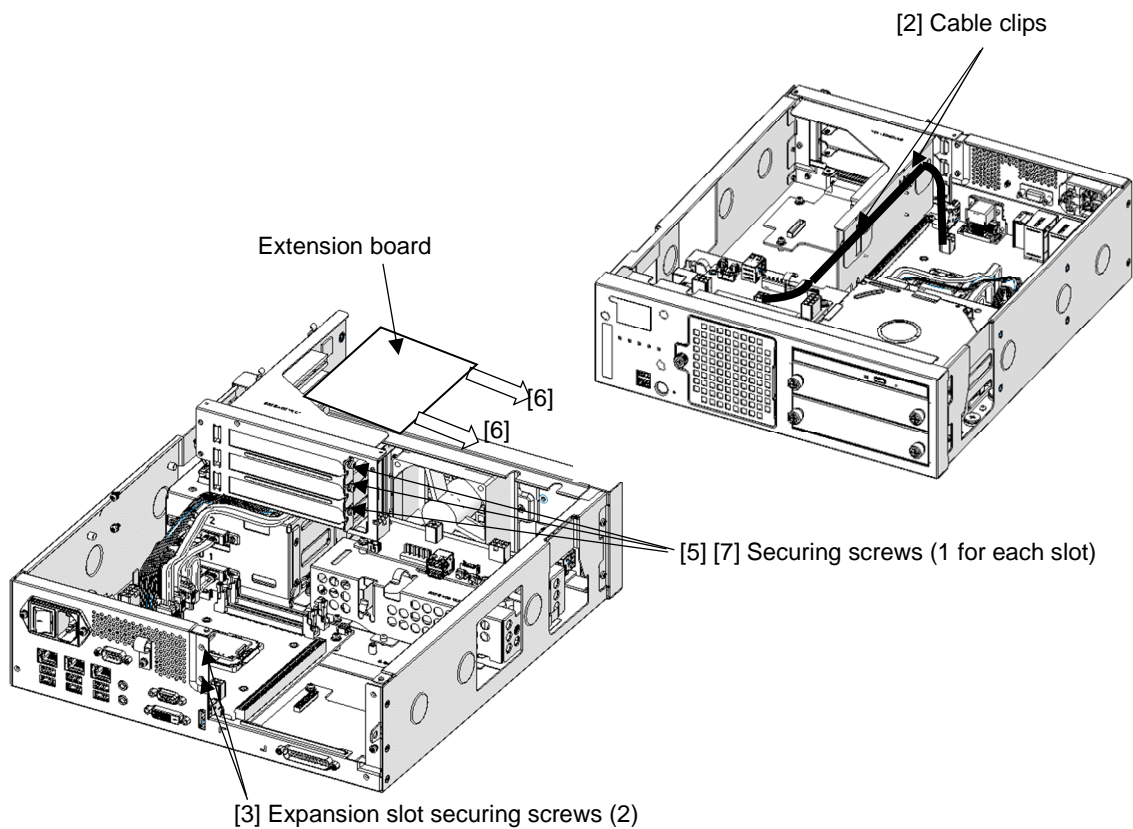


Figure 6-5 Removing an extension board

NOTICE

Always install a slot cover over each unused expansion slot. Not doing so might result in equipment failure.

6.3.5 Installing and removing the main memory



WARNING

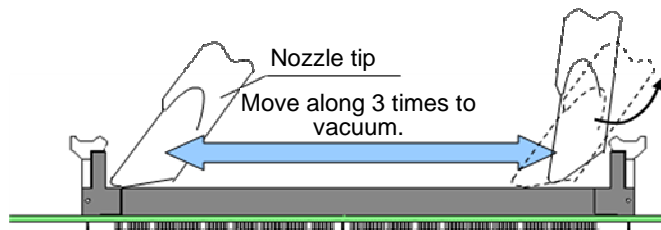
Before you install or remove the main memory, shutdown the OS, unplug the power cord, and wait for at least one minute. Installing or removing the main memory without shutting down the power might result in an electric shock or a fire.

NOTICE

Disconnect all external cables connected to the equipment before installing or removing the main memory. Not doing so might cause equipment failure.

(1) Before installing or removing the main memory

- Before starting work, see 6.3.2 *Before installing or removing components*.
- For information about the location of the main memory slots, see *Figure 6-6 Installing the main memory*.
- Before installing or after removing the main memory, place the tip of a vacuum cleaner nozzle on top of the connectors where the main memory modules were installed, and then clean the connectors three times along the connection parts.



(2) Installing the main memory

NOTICE
<ul style="list-style-type: none"> • The orientation of a main memory module in a connector is fixed. When installing a main memory module, verify that the orientation is correct. An incorrect orientation might result in equipment failure. • Do not install main memory modules that have different capacities in slots DIMM1 and DIMM2. If you do, the modules might not be recognized.

- [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit.
- [2] Insert the main memory module into the connector from directly above the connector. When the module is fully inserted, you will hear a click. If an extension unit is interfering with the installation of the main memory module, first remove the extension unit by referring to 6.3.3 *Installing and removing the cover of the main unit*.

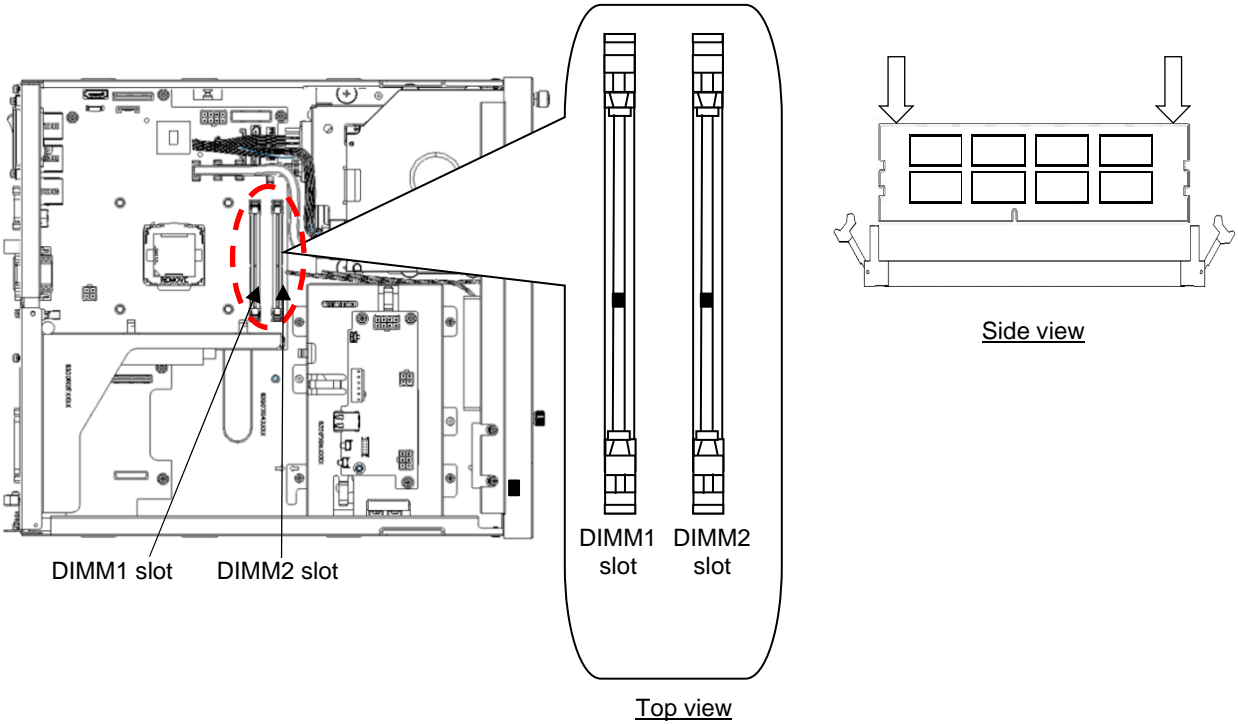


Figure 6-6 Installing the main memory

Only the following combinations of main memory modules are allowed with this equipment.

Main memory modules	DIMM1 slot	DIMM2 slot	Total capacity
1	4 GB	--	4 GB
2	4 GB	4 GB	8 GB
2	8 GB	8 GB	16 GB

6. INSPECTION AND MAINTENANCE

(3) Removing the main memory

Follow the procedure described in (2) *Installing the main memory* in reverse to remove the main memory.

(4) Reconfiguring the memory dump file settings

When you change the capacity of the main memory, you must reconfigure the memory dump collection settings.

For details about reconfiguring the memory dump collection settings, see *8.2.1 Memory dump confirmation message*.

6.3.6 Installing and removing an HDD or SSD



CAUTION

When installing or removing an HDD or SSD, be careful not to cut your fingers on the protrusions.

NOTICE

- Place an HDD or SSD on a shock-absorbing material, such as an antistatic cushion, even for temporary tasks. Placing an HDD or SSD directly on a hard surface, such as a desktop, might result in the failure or a shorter life span of the device, or cause loss of data due to jarring or shocks.
- Never remove the screws on an HDD or SSD while the power to the device is on. Never hot-swap HDDs or SSDs. Performing these actions might result in failure of the equipment or drive.
- Before replacing an HDD or SSD, shutdown the OS, unplug the power cord, and wait for at least one minute.
- Install or remove an HDD or SSD only when necessary, for example, when you need to replace an HDD or SSD due to a failure. Performing these actions frequently might result in failure of the equipment or drive.
- Fully insert HDDs or SSDs. Loose contacts or missing screws might result in failure.
- During installation or removal, do not subject an HDD or SSD that you are installing or an HDD or SSD that is already installed to shocks. Subjecting an HDD or SSD to shocks might result in drive failure.

(1) Before installing or removing an HDD or SSD

- Before starting work, see 6.3.2 *Before installing or removing components*.

NOTE

For information about the precautions for HDDs or SSDs, see 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.

6. INSPECTION AND MAINTENANCE

(2) Removing an HDD or SSD

NOTICE

When installing or removing an HDD or SSD for the B model, verify that the drive bay number is correct. Removing an HDD or SSD and installing it in a different bay results in a configuration information mismatch, and the equipment might not start or the data stored on the HDD or SSD might be lost.

[1] Loosen the two set screws for the HDD or SSD case.

[2] Use both hands to pull on the two set screws for the HDD or SSD case to remove the HDD or SSD case.

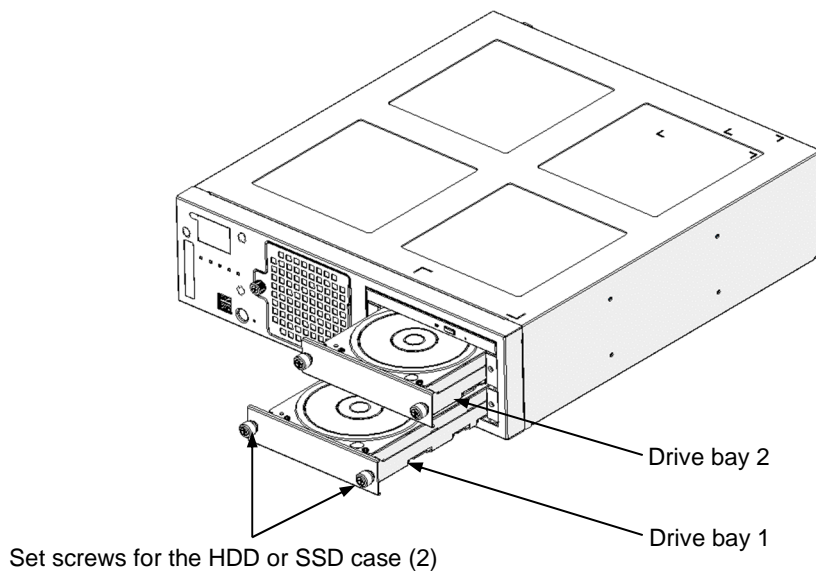


Figure 6-7 Removing an HDD or SSD

NOTE

- When pulling out an HDD or SSD, be careful not to apply too much force to the connector. Slowly pull out the drive to avoid subjecting the HDD or SSD to shocks.
- When connecting an HDD or SSD to a connector, do not subject the HDD or SSD to shocks or jarring.
- For the B model (the software RAID1 model), the HDDs that are installed in drive bay 1 and drive bay 2 must have the same capacity. Do not mix HDDs that have different capacities. In addition, do not install an SSD in the B model.

(3) Installing an HDD or SSD

Follow the procedure described in (2) *Removing an HDD or SSD* in reverse to install an HDD or SSD.

NOTE

When installing an HDD or SSD in drive bay 1, be careful not to catch on the internal grounding spring.

6.3.7 Installing or removing a DVD drive

CAUTION

When installing or removing a DVD drive, be careful not to cut your fingers on the protrusions.

NOTICE

Do not apply excessive force to the connector of the DVD drive or to the top of the DVD drive. If you do so, the DVD drive might fail.

(1) Before installing or removing a DVD drive

- Before starting work, see 6.3.2 *Before installing or removing components*.

(2) Removing a DVD drive

- [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit.
- [2] Remove the two screws securing the DVD drive to the equipment. When removing the screws, be careful to avoid dropping them.
- [3] Push the DVD drive gently towards the front of the equipment, and remove the DVD drive connector from the DVD drive.
- [4] Remove the DVD drive from the equipment.

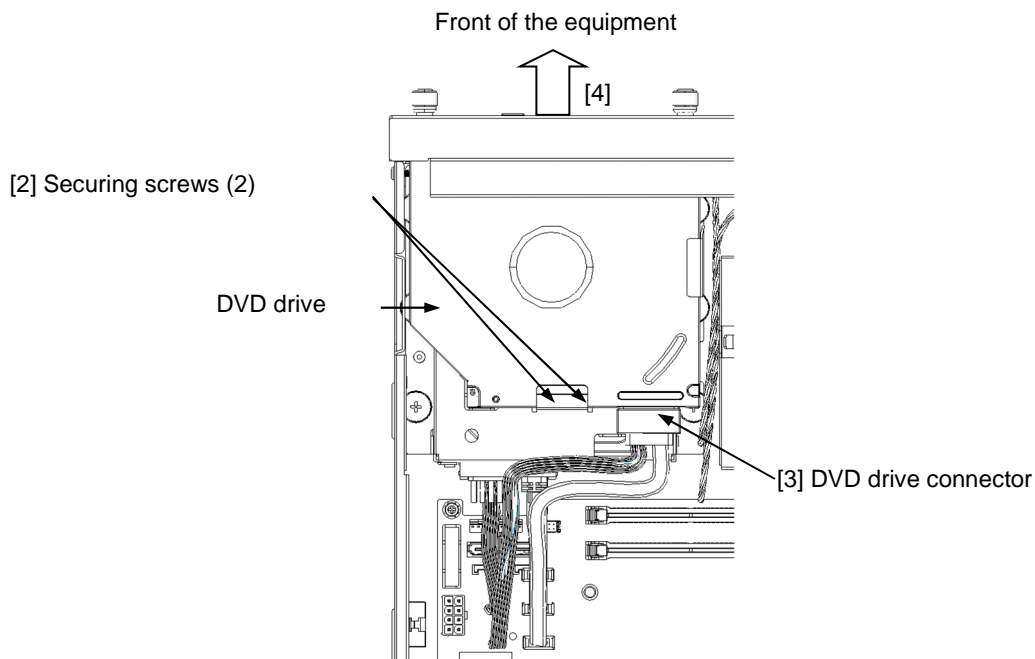


Figure 6-8 Removing the DVD drive

(3) Installing a DVD drive

Follow the procedure described in (2) *Removing a DVD drive* in reverse to install a DVD drive.

6.3.8 Installing and removing a dust filter



WARNING

Install a dust filter for use with the equipment. Not doing so allows dust into the equipment, which might result in a short circuit fire.

- (1) Before installing or removing a dust filter
 - Before starting work, see 6.3.2 *Before installing or removing components*.

- (2) Removing a dust filter
 - [1] Loosen the screw for the dust filter cover.
 - [2] Remove the dust filter cover from the equipment.
 - [3] Remove the dust filter from the dust filter cover.

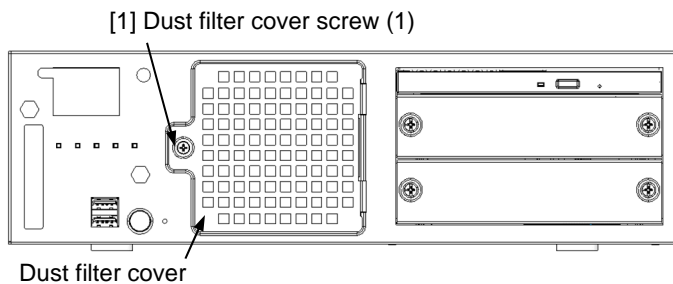


Figure 6-9 Removing the dust filter

- (3) Installing a dust filter

Follow the procedure described in (2) *Removing a dust filter* in reverse to install a dust filter. Insert the protrusions on the dust filter cover into the slits as shown in the following figure.

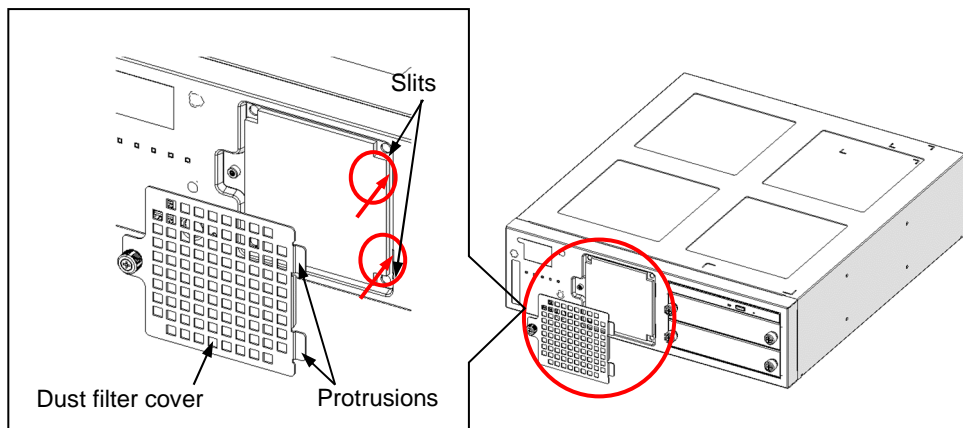


Figure 6-10 Installing a dust filter

6.3.9 Installing and removing the vertical stand



CAUTION

The equipment might cause injury if it falls or is dropped off of a desktop when placed vertically. Use the vertical stand provided with the equipment, and place the equipment with the vertical stand on a level surface.

- (1) Before installing and removing the vertical stand
 - Before starting work, see 6.3.2 *Before installing or removing components*.
 - Disconnect all cables connected to the equipment.
 - Do not subject the equipment to shocks.

- (2) Installing the vertical stand

Install the vertical stand to the equipment securely by using the screws provided for the vertical stand.

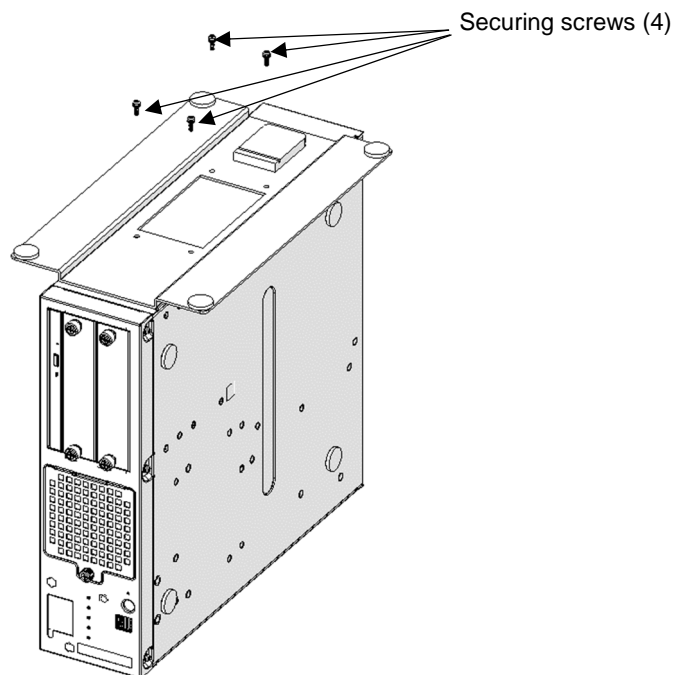


Figure 6-11 Installing the vertical stand

- (3) Removing the vertical stand

Follow the procedure described in (2) *Installing the vertical stand* in reverse to remove the vertical stand. Store the removed vertical stand and screws in a location where they will not become lost.

6.4 Removing and installing the lithium battery



CAUTION

- This equipment uses a lithium battery. When replacing the lithium battery, use a battery specified by the manufacturer. Failure to do so might result in an explosion, a fire, a burst battery, heat generation, a liquid spill, or gas generation.
- Install the battery by using the correct polarity. Using the wrong polarity might cause an abnormal reaction, such as charging or shorting, resulting in a liquid spill, heat generation, or a burst battery.

(1) Before removing the lithium battery

- Before starting work, see 6.3.2 *Before installing or removing components*.

(2) Removing and installing the lithium battery

- [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit.
- [2] If the connection connector (DCIN2) is interfering with your ability to remove the lithium battery, remove the connection connector before removing the lithium battery.
- [3] Pick up both ends of the battery cover with your thumb and forefinger, and lift one end of the battery cover.

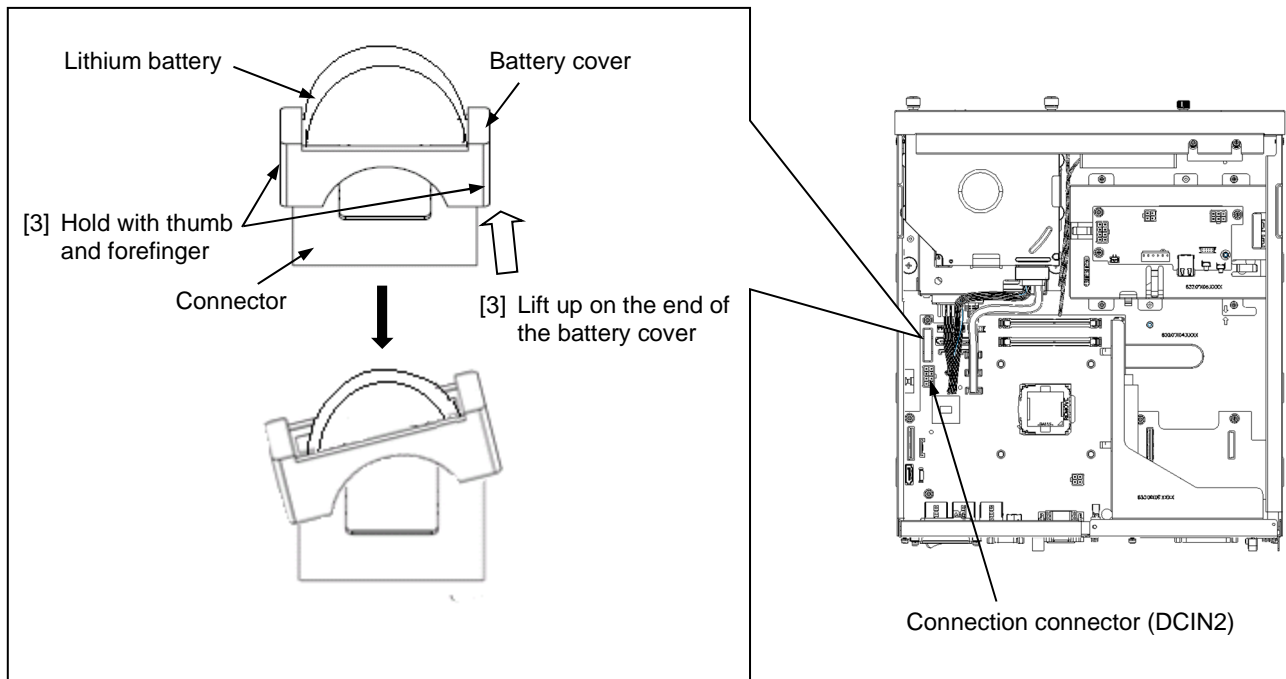


Figure 6-12(1) Removing the lithium battery

- [4] Lift the other edge of the battery cover which you lifted in step [3], and remove the battery cover from the battery connector.
- [5] Pick up the lithium battery and remove it from the battery connector.
- [6] Install the replacement battery by confirming the polarity in the following figure.
- [7] Restore the equipment by performing the procedure in reverse, and then install the cover of the main unit.

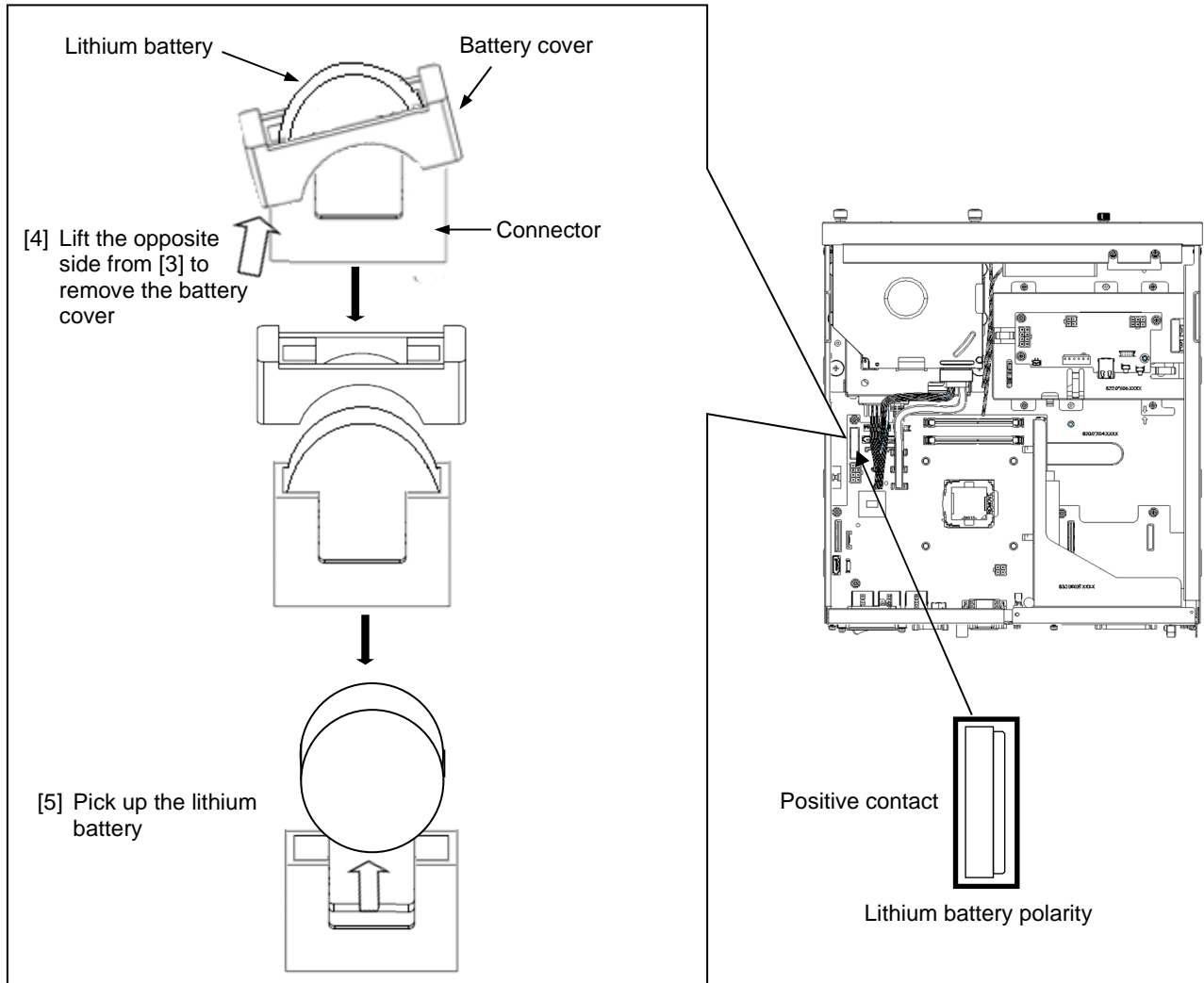


Figure 6-12(2) Removing the lithium battery

NOTE

When disposing of a battery, observe local laws and regulations whenever applicable. In a foreign country, dispose of the battery in accordance with the laws and regulations of that country.

6.5 Enabling the Remote Power On Feature



CAUTION

When installing or removing a jumper socket, do not directly touch parts inside the equipment with your hands. Such parts are hot, and touching them might result in burns. In addition, touching such parts might damage the parts or result in equipment failure.

When you use the remote power on feature of the RAS external contact port, perform the following procedure to remove the jumper socket installed to the JP1 pin of the RAS external contact board. Whether a jumper socket is installed determines whether the feature of the external contact GENDI2 is a general-purpose digital input signal or the remote power on signal. (See 5.8.2 *External contact specifications*.)

Jumper socket	GENDI2 setting
Installed	General-purpose digital input signal
Not installed	Remote power on signal

- (1) Before installing or removing the jumper socket
 - Before starting work, see 6.3.2 *Before installing or removing components*.
- (2) Removing the jumper socket
 - [1] Follow the instructions in 6.3.3 *Installing and removing the cover of the main unit* to remove the cover of the main unit.
 - [2] If an extension board is interfering with the removal of the jumper socket, follow the instructions in 6.3.4 *Installing and removing an extension board*.
 - [3] Remove the jumper socket from the JP1 pin.

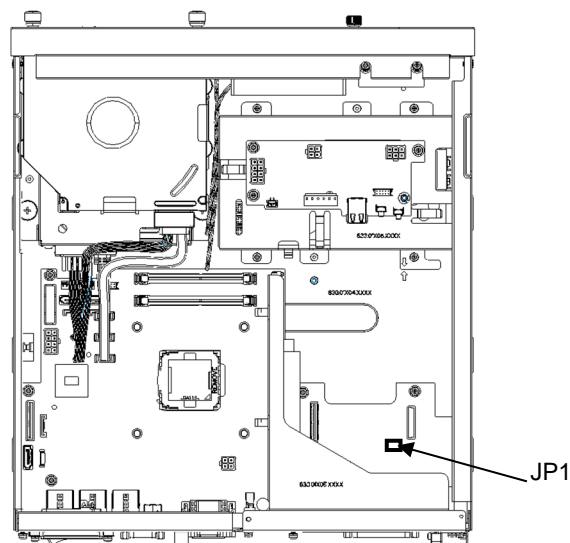


Figure 6-13 Removing the jumper socket

(3) Installing the jumper socket

Follow the procedure described in (2) *Removing the jumper socket* in reverse to install the JP socket.

NOTE

Save the removed jumper socket in a safe place for when you want to restore the original settings later.

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CHAPTER 7 RESTORING THE FACTORY-SHIPED CONDITION BY USING A RECOVERY DVD

NOTICE

A recovery DVD contains an image file created for the hardware configuration at the time of purchase. If the hardware configuration has changed from the time of purchase, the OS might not start after restoration work. Remove all external storage devices to restore the hardware configuration at the time of purchase before you perform restoration work by using a recovery DVD. When you use a recovery DVD, all data on the system drive is deleted. Back up your data in advance as necessary.

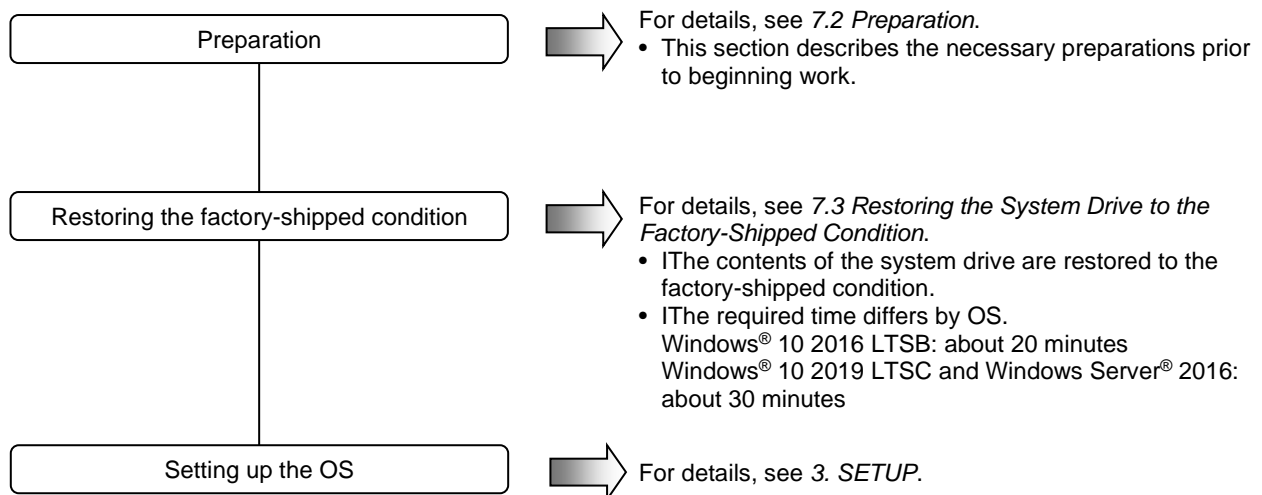
This chapter describes the following procedure:

- Restoring the system drive to its condition at the time of purchase, when you discontinue a system that you have built.

7.1 Overview of the Restoration Procedure

This section describes an overview of the procedure to restore the system drive to its factory-shipped condition, when you discontinue a system that you have built. After you restore the contents of the system drive to its factory-shipped condition by using a recovery DVD, follow the procedure described in 3. *SETUP* to set up the OS.

The following is a rough flowchart of the procedure.



7.2 Preparation

Before you start work to restore the system to the factory-shipped condition by using a recovery DVD, have the following recovery DVD ready.

Recovery DVD for HF-W	HITACHI <u>HJ-205x-****</u> Product Recovery DVD (The underlined part is the model number of the equipment you purchased.)
-----------------------	---

7.3 Restoring the System Drive to the Factory-Shipped Condition

7.3.1 Procedure for restoring the system drive to the factory-shipped condition

Perform the following procedure to restore the system drive of an HF-W2000 Model 58/55/50 to its factory-shipped condition by using a recovery DVD.

1. Turn on the power to the equipment, and insert the recovery DVD "HITACHI HJ-205x-**** Product Recovery DVD" into the DVD drive. If you have multiple recovery DVDs, insert the first disc (for example, if you have two recovery DVDs, insert the disc numbered 1/2).

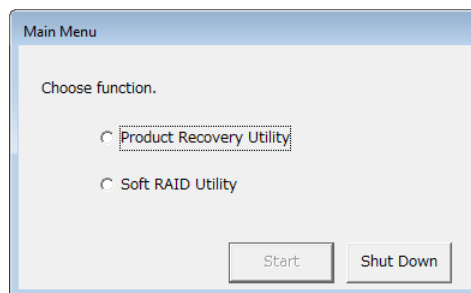
Note: The underlined part is the model number of the equipment you purchased, and therefore the part indicated as * differs depending on the model. In the following procedure, substitute the "HJ-205x-****" with the actual model number of the equipment you purchased.

2. When you boot from the recovery DVD, a confirmation message appears.

Note 1: If you cannot boot from the recovery DVD, turn off the equipment, and then turn it back on.

Note 2: For the B model, the following screen appears. Select **Product Recovery Utility**, and then click the **Start** button.

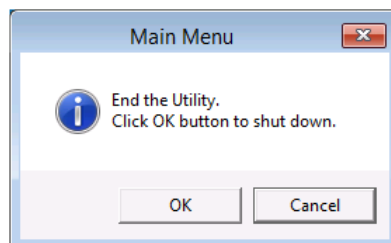
Note 3: For the B model, install drives in both drive bays.



If you click **Shut Down**, the following message dialog box appears. Click **OK**.

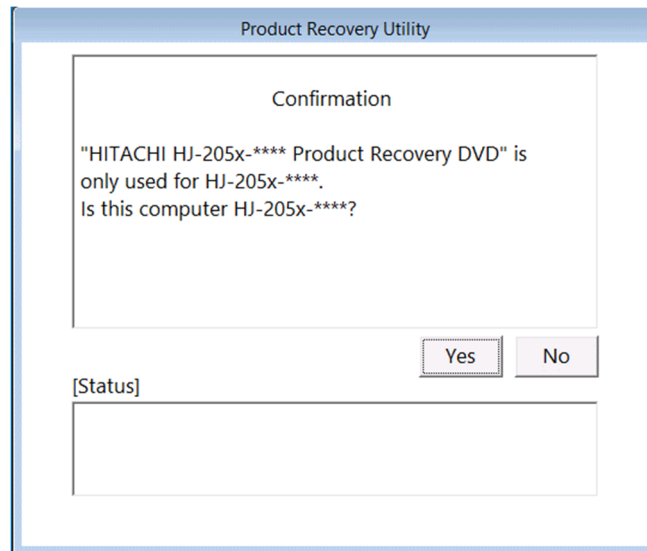
The recovery DVD is automatically ejected, and then the equipment automatically shutdown.

To return to the confirmation message window, click **Cancel**.

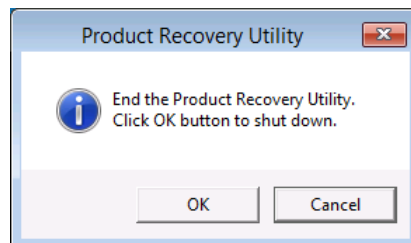


7. RESTORING THE FACTORY-SHIPED CONDITION USING A RECOVERY DVD

- If the model name displayed in the confirmation message is the same as the model name of the equipment you use, click **Yes**.
- If the model name displayed in the confirmation message differs from the model name of the equipment you use, click **No**.

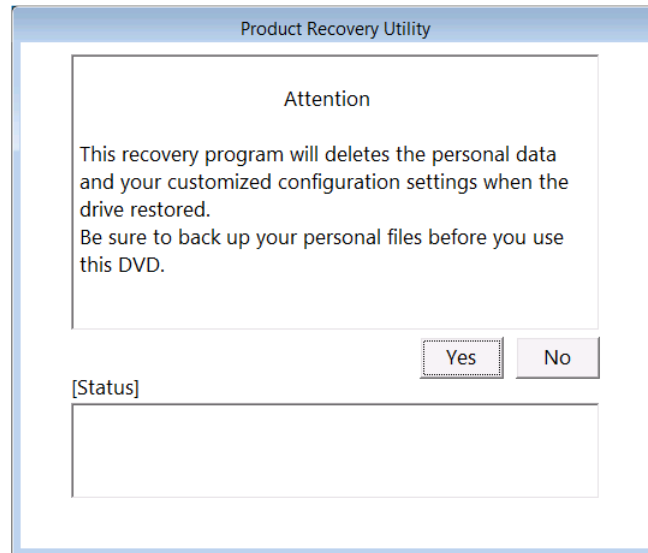


If you click **No**, the following message dialog box is displayed. Click **OK**.
The recovery DVD is automatically ejected, and then the equipment automatically shutdown.
To return the confirmation message window, click **Cancel**.



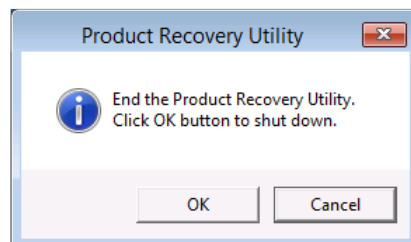
7. RESTORING THE FACTORY-SHIPED CONDITION USING A RECOVERY DVD

3. If you click **Yes** in the confirmation message window, the following confirmation window appears.
 - If the situation described in the message is acceptable, click **Yes**.
 - If it is not, click **No**.



If you click **No**, the following message dialog box is displayed. Click **OK**. The recovery DVD is automatically ejected, and then the equipment automatically shutdown.

To return to the confirmation message window, click **Cancel**.



7. RESTORING THE FACTORY-SHIPPED CONDITION USING A RECOVERY DVD

4. If you click **Yes** in the confirmation window, the selection window for the drive restoration options appears.
 - To restore the system drive to the factory-shipped condition, select a restoration option, and then click **Next**.
 - To cancel restoration of the system drive to the factory-shipped condition, click **Cancel**.

- Entire drive:

Select this option if you want to restore the entire system drive to the factory-shipped condition, or if you want to configure a new drive to the factory-shipped condition after you replace the system drive.

If you select this option and click **Next**, proceed to step 5.

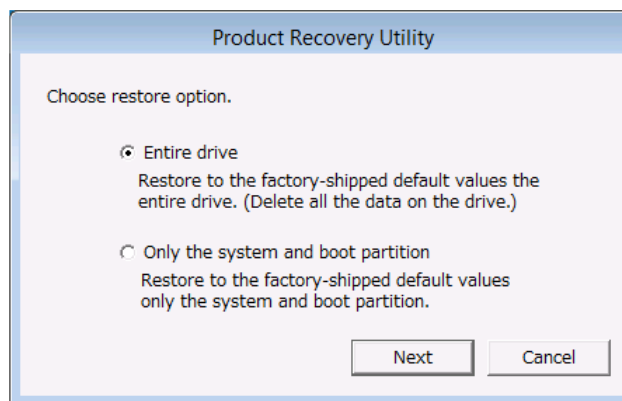
- Only the system and boot partition:

Select this option if the system drive has partitions other than the boot partition (the partition on which Windows is installed) for data storage or other purposes, and you want to restore the system drive to the factory-shipped condition while keeping these partitions. If you select this option, only the boot partition is restored to the factory-shipped condition.

If you select this option and click **Next**, proceed to step 6.

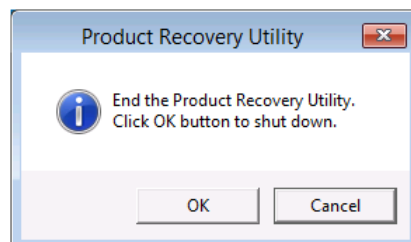
You cannot select this option in the following cases:

- The system drive has no boot partitions.
- The system drive has more than one boot partition.
- The size of the boot partition is less than the minimum boot partition size defined for the equipment. (For the HF-W2000 Model 58/55/50, the minimum size is 100 GB.)
- No array is built (for the B model only).



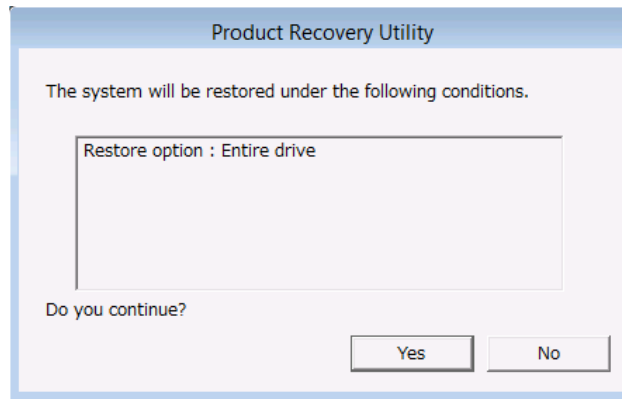
If you click **Cancel**, the following message appears. Click **OK**. The recovery DVD is automatically ejected, and then the equipment automatically shutdown.

To return the selection window for the drive restoration options, click **Cancel**.



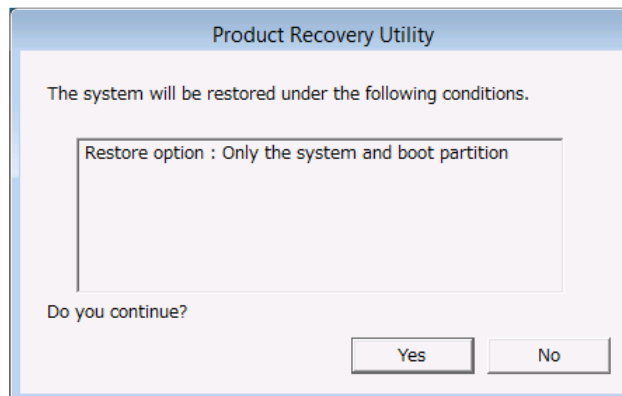
If you select **Entire drive** in the selection window for the drive restoration option:

5. If you select **Entire drive** in the selection window for the drive restoration option, the confirmation window for the settings of the drive restoration appears.
 - If the displayed partition size to be restored is acceptable, click **Yes**. Proceed to step 7.
 - If the displayed partition size to be restored is not acceptable, click **No**. The selection window for the drive restoration option returns.



If you select **Only the system and boot partition** in the selection window for the drive restoration option:

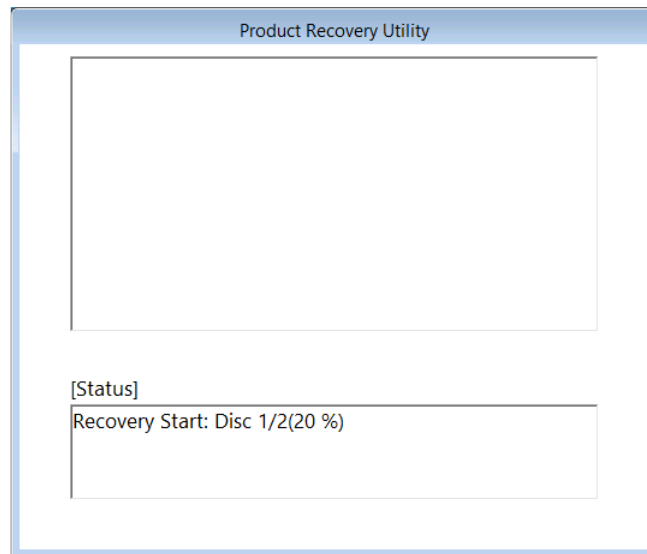
6. If you select **Only the system and boot partition** in the selection window for the drive restoration option, the confirmation window for the settings of the drive restoration appears.
 - If restoration of only the boot partition is acceptable, click **Yes**. Proceed to step 7.
 - If restoration of only the boot partition is not acceptable, click **No**. The selection window for the drive restoration options returns.



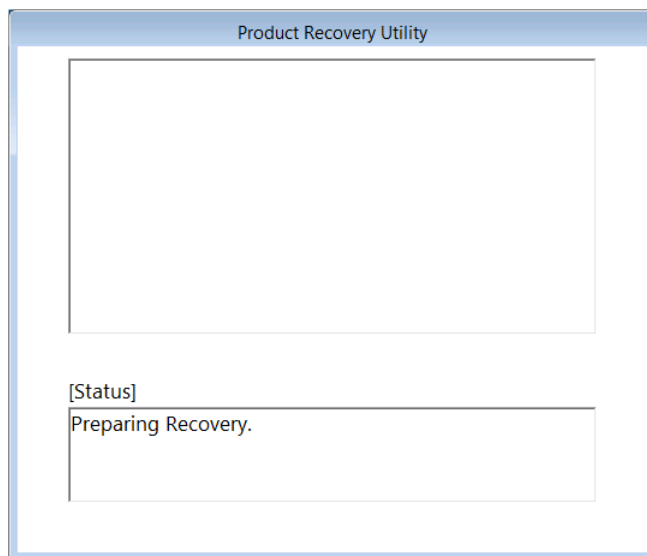
7. RESTORING THE FACTORY-SHIPED CONDITION USING A RECOVERY DVD

7. If you click **Yes** in the confirmation window for the settings of the drive restoration, the drive restoration process starts. Progress appears in the **[Status]** box.

The following figure is an example when using two recovery DVDs.

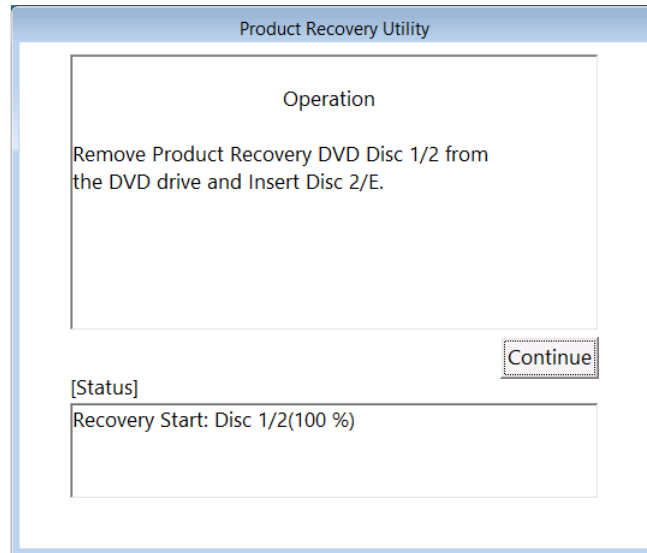


Note: If you select **Only the system and boot partition** in the selection window for the drive restoration option, the boot partition is formatted before the restoration process begins. Formatting the partition might take several minutes. (The time required for formatting depends on the size of the boot partition.) During the formatting process, *Preparing Recovery* appears in the **[Status]** box.

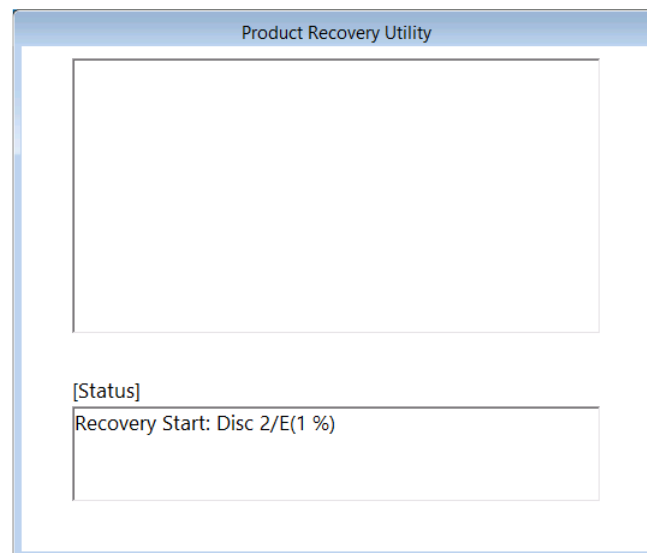


7. RESTORING THE FACTORY-SHIPED CONDITION USING A RECOVERY DVD

8. If you are using multiple recovery DVDs, when the restoration process to the factory-shipped condition performed by the current recovery DVD is complete, the following message appears, and the recovery DVD is automatically ejected. Remove the recovery DVD from the DVD drive, and insert the next recovery DVD. The following figure is an example when using two recovery DVDs.



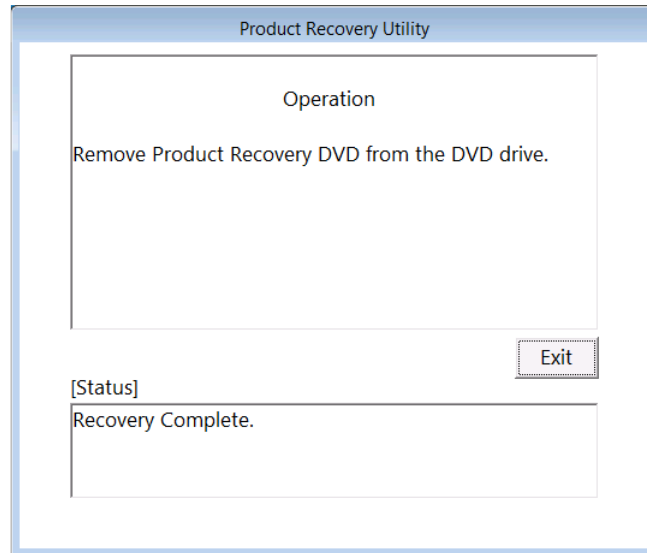
9. If you click **Continue**, the message *Preparing Recovery . Please wait a few minutes .* appears in the **[Status]** box. The restoration process to the factory-shipped condition then resumes, and the progress appears in the **[Status]** box.



10. If you are using multiple recovery DVDs, repeat steps 8 and 9 for each of the DVDs.

7. RESTORING THE FACTORY-SHIPED CONDITION USING A RECOVERY DVD

11. When the restoration process to the factory-shipped condition performed by the final recovery DVD is completely finished, the message `Recovery Complete.` appears in the **[Status]** box, and the recovery DVD is automatically ejected. Remove the recovery DVD from the DVD drive, and then click **Exit**. The equipment shutdown.



The system drive of the HF-W2000 Model 58/55/50 is now successfully restored to the factory-shipped condition by using a recovery DVD. After you finish this procedure, follow the procedure described in 3. *SETUP* to set up the OS.

7.3.2 Errors generated during the recovery process and corrective actions

When an error occurs during the recovery process, record the error message and the error code displayed in the window, and take action as shown in the following table. If you take action accordingly but are still unable to proceed with the recovery process, or if the no. 8 error message appears, contact our sales representative.

Table 7-1 Error messages generated during the recovery process

No.	Error message	Action
1	Retry time out. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Check the integrity of the system drive, such as by performing read and write tests.
2	Image file is not found. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Retry the recovery process. • Check the integrity of the recovery DVD, such as by performing read tests. • Verify that the DVD drive works properly, such as by performing read tests.
3	Drive failed or not connected. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Verify that the system drive is connected correctly. • Check the integrity of the system drive, such as by performing read and write tests.
4	Failed to access the drive. Please refer to the INSTRUCTION MANUAL.	
5	Failed to assign drive letter. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Verify that no devices that are not required for the recovery process are connected. If any such devices are connected, disconnect them.
6	Failed to read from Product Recovery DVD. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Verify that the DVD drive is connected correctly. • Check the integrity of the recovery DVD, such as by performing read tests. • Verify that the DVD drive works properly, such as by performing read tests.
7	Recovery failed. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Retry the recovery process.
8	Recovery invalid. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Contact one of our sales representatives.
9	Drive capacity is not enough. Please refer to the INSTRUCTION MANUAL.	<ul style="list-style-type: none"> • Check the size of the system drive.
10	The capacity of drive is not equal.	<ul style="list-style-type: none"> • Install drives with equivalent capacities.

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CHAPTER 8 MAINTENANCE OPERATIONS

This chapter describes maintenance operations that use the Reliability, Availability, and Serviceability (RAS) features of this equipment.

8.1 Overview

RAS features are designed to provide highly reliable functionality for the equipment. The following table shows an overview of the RAS features of this equipment.

Table 8-1 Overview of RAS features

Category		Item
Monitoring		Hardware status monitoring
		OS deadlock monitoring
		Watchdog timer monitoring
GUI features setting		RAS Setup window
Status checks	GUI display	Hardware status window
	Notifications	Event notifications
		Pop-up notifications
		Digital LEDs for status indications
		Remote notifications
		Status acquisition by using library functions
Control	Shutdown/startup suppression	Automatic shutdown
		Shutdown via library functions
		Startup suppression when serious failures occur
		Controlling general-purpose external contacts
		Controlling digital LEDs for status indications
Library functions		RAS library
Maintenance/ failure analysis	Memory dumps	Memory dump collection
		Bug check (blue screen) cause notifications
		Log information collection window
		Maintenance operation support commands
		Logging trends of the temperature inside the chassis
Simulation		Hardware status simulation

Monitoring

(1) Hardware status monitoring

This feature monitors the hardware status of this equipment, including fan status, drive status, and the temperature inside the chassis.

8. MAINTENANCE OPERATIONS

(2) OS deadlock monitoring

This feature monitors the operational state of the OS by using the dedicated timer implemented within this equipment. As long as the process with the highest priority (real-time priority class) can run properly, the status lamp on the front of this equipment is lit in green.

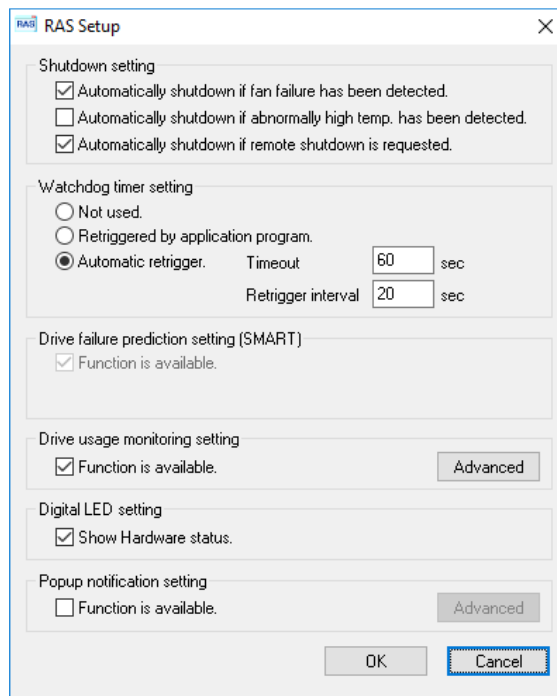
(3) Watchdog timer monitoring

This feature monitors whether processes are scheduled properly by using the watchdog timer implemented within this equipment. This feature also offers a library for using the watchdog timer.

GUI features settings

(4) RAS Setup window

This window provides a graphical user interface for configuring RAS feature settings, including the conditions on automatic shutdown and the watchdog timer settings.



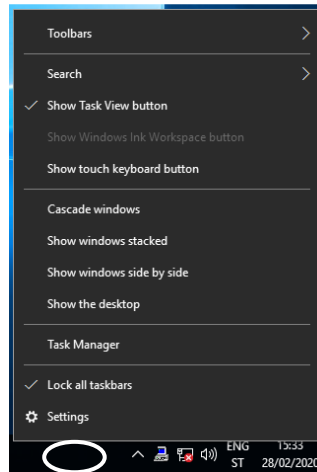
Status checks

(5) Hardware status window

This window displays the hardware status of this equipment via a graphical interface. An icon in the notification area of the taskbar displays the hardware status at all times.



This icon is not shown when using the default settings at the time that the equipment is shipped, but if you click the arrow to the side of the notification area, the icon will appear. In addition, if you want this icon to be displayed in the notification area of the taskbar, right-click the taskbar and, in the displayed menu, click **Settings** (in Windows® 10 2019 LTSC, click **Taskbar settings**). In the displayed window, click **Select which icons appear on the taskbar**, (in Windows® 10 2019 LTSC, click **Select which icons appear on the taskbar**), and then set the icon for **envdisp MFC Application** to on.



Right-clicking the taskbar displays a menu.

(6) Event notifications

This feature allows user applications to check the hardware status of this equipment by monitoring the status of event objects.

(7) Pop-up notifications

This feature displays pop-up messages to notify users that errors have occurred in the equipment hardware.

(8) Digital LEDs for status indications

The digital LEDs for status indications are on the front of this equipment, and notify users when errors occur in the equipment hardware. These LEDs can be used by a user application to, for example, notify the user of application failures.

(9) Remote notifications

This feature enables a remote device to check the hardware status of the equipment. It also notifies the remote device whenever the hardware status changes.

(10) Status acquisition by using library functions

This feature allows user applications to obtain the hardware status of this equipment by using the RAS library.

8. MAINTENANCE OPERATIONS

Control

(11) Automatic shutdown

This feature automatically shutdown the equipment when it detects a fan failure, an abnormal temperature inside the chassis, or a remote shutdown signal input. Configure the settings shown in (4) *RAS Setup window* to enable or disable the automatic shutdown feature.

(12) Shutdown via library functions

You can shutdown the equipment from a user application by using the RAS library.

(13) Startup suppression when serious failures occur

This feature suppresses startup of this equipment to protect the hardware when a failure, such as a fan failure, is detected during OS startup.

(14) Controlling general-purpose external contacts (HJ-F2050-11 and HJ-F2050-12) and digital LEDs for status indications

This feature allows users to control the general-purpose external contacts and the digital LEDs for status indications by using the RAS library.

Four input and three output general-purpose external contacts are available. If you use these contacts, signals can be input from an external device to this equipment, and signals can be output from this equipment to an external device.

(15) Controlling general-purpose external contacts (HJ-F2050-13) and digital LEDs for status indications

This feature allows users to control the general-purpose external contacts and the digital LEDs for status indications by using the RAS library.

Two input and two output general-purpose external contacts are available. If you use these contacts, signals can be input from an external device to this equipment, and signals can be output from this equipment to an external device.

Library functions

(16) RAS library interface

This interface offers library functions for recording log information, in addition to the library functions offered by item (10) under *Status checks* and items (12) and (14) under *Control*.

Maintenance/failure analysis

(17) Memory dump collection

This feature records the contents of the system memory in a file (a memory dump file) when the reset switch is pressed after a failure occurs, for example, after the equipment stops unexpectedly. By analyzing the data in this memory dump, you can investigate the cause of the failure.

(18) Bug check (blue screen) cause notifications

This feature detects a bug check (blue screen), and records the cause in the event log.

(19) Log information collection window

In this window you can use a graphical user interface to collect log data and memory dump files for this equipment.

(20) Maintenance operation support commands

These commands include a command used for saving failure information, such as memory dump files and event log files, to external media.

(21) Logging trends of the temperature inside the chassis

This feature periodically measures the temperature inside the chassis of this equipment and records the data in a file.

Simulation

(22) Hardware status simulation

This feature simulates the hardware status of this equipment, including the fan status, drive status, and temperature inside the chassis. You can use this feature to test user applications or check the notifications interface of the RAS software without an actual hardware failure having occurred.

This manual explains the features in (13), (17), and (20). For details about other features, refer to the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*. For more information about the POST message functionality of the digital LEDs for status indications described in (8) under *Status checks*, see *9.6.1 POST messages*.

8.2 Collecting Memory Dumps

When one of the errors in Table 8-2 occurs, this equipment records the contents of the system memory in a file (a memory dump file). A blue screen then appears. By analyzing the data in the memory dump file, you can investigate the cause of the failure.

Table 8-2 Errors that trigger memory dumps

Cause	Description
Forced recovery from the OS hanging	When the OS hangs, press the NMI switch or input a remote reset signal to the external contact RMTRESET ^{#1} . This causes the collection of the memory dump.
Hardware NMI	When a serious failure (such as an uncorrectable memory error or a PIC bus parity check error) occurs in the equipment hardware, a non-maskable interrupt (NMI) is generated, and a memory dump is collected.
Windows [®] bug check	When a fatal error occurs in the Windows [®] kernel, a memory dump is collected.

#1: Do not input a remote reset signal continuously to the external contact RMTRESET.

Doing so prevents this equipment from collecting a memory dump.

To select the memory dump file type, from the **Control Panel**, open **System**. You can select from the following five types of memory dump file defined below. Because the memory dump file type determines the extent to which you can analyze failures by using the dump file, we recommend selecting **Complete memory dump** whenever possible. The factory default setting is **Complete memory dump**.

- **Complete memory dump:** The entire contents of the system memory are recorded. The boot volume^{#2} must have enough free space to hold a paging file equal to the size of the physical memory plus 1 MB.
- **Kernel memory dump:** The kernel memory is recorded. The boot volume^{#2} must have a paging file that is at least the size of the kernel memory.
- **Minimum memory dump:** The minimum information necessary to identify what caused the equipment to stop is recorded. The boot volume^{#2} must have enough free space to hold a paging file greater than 2 MB in size.
- **Automatic memory dump:** Similarly to the kernel memory dump, the kernel memory is recorded. The difference from the kernel memory dump is that the automatic memory dump can create an initial paging file that is smaller than the physical memory size.
- **Active memory dump:** The contents of the memory assigned to virtual machines are filtered, and only the contents of the memory used in Hyper-V hosts are recorded. Active memory dumps can record memory dump files that are smaller than with a complete memory dump.

#2: The boot volume is a volume that contains the Windows[®] files and Windows[®] support files.

To collect a complete memory dump file, you need a memory dump file of a size comparable to the capacity of the physical memory. In addition, the virtual memory (page file) and memory dump settings must be the ones that are recommended for this equipment^{#3}.

#3: The recommended settings are the settings in **Advanced system settings** in the Control Panel configured as follows. These are the default settings when this equipment is shipped from the factory.

- In **Startup and Recovery**, **Complete memory dump** is selected as the memory dump type.
- In **Startup and Recovery**, **Overwrite any existing file** is selected.
- In **Performance**, the **Initial size** and **Maximum size** settings for the virtual memory are the physical memory size plus 300 MB.

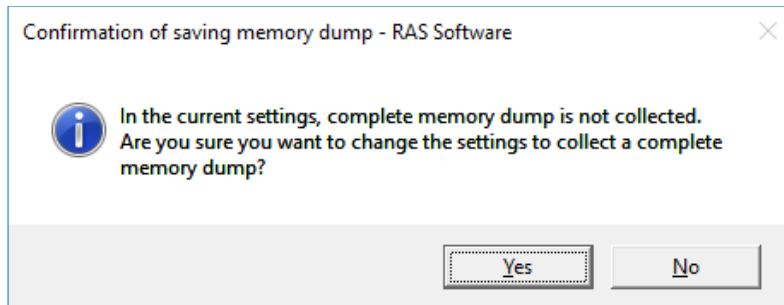
When an incident occurs that triggers a memory dump or when the NMI switch is pressed, the window called the *blue screen* appears, and the processing that triggers a memory dump is then started.

NOTE

- The time required to collect a memory dump depends on the type of dump file collected, the configuration of the installed drives, and the memory capacity. Note that when using the recommended setting for this equipment, **Complete memory dump**, for the memory dump file type, the time required might be extremely long.
- After the message `Beginning dump of physical memory` is displayed on the blue screen, the count on the screen that shows the progress of the memory dump sometimes stops being updated. This occurs when the collection of the memory dump fails due to an error in the file system or on a hard disk. If this occurs, record the first five lines of the STOP message screen. Then press the NMI switch or turn the power off and then back on to restart the equipment.

8.2.1 Memory dump confirmation messages

If the capacity of the physical memory exceeds the capacity of the memory dump file or the virtual memory due to, for example, newly added physical memory, or if a complete memory dump cannot be collected because the memory dump settings have changed, this equipment displays the following message and records an event in the event log:

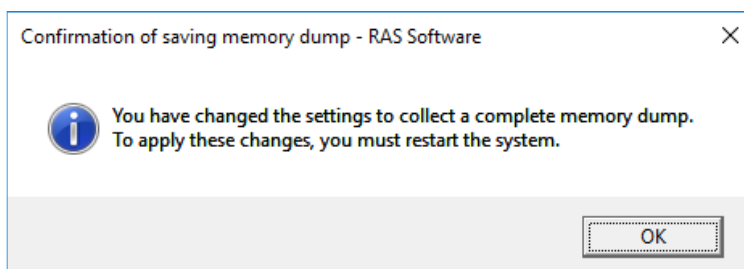


If you want to use the system with the memory dump setting recommended for this equipment, click **Yes** to close the message box. The memory dump and virtual memory settings are updated and an area for saving the memory dump is allocated automatically as required.

NOTE

- When the message box above is displayed, sometimes an information log entry with Event ID 26 is recorded in the event log.
- If you do not want to use the system with the memory dump setting recommended for this equipment, click **No** to close the message box. This message box will then no longer be displayed.

If the following message is displayed thereafter to prompt you to restart the system, click **OK** to close the message box, and then restart the system.



8.2.2 Configuring the settings related to memory dumps

This section describes how to configure the settings related to a memory dump.

Use the following procedure when you want change the memory dump settings to the settings recommended for this equipment. If you are already using the memory dump settings recommended for this equipment (for example, you are using the equipment immediately after it has been shipped from the factory, or you click **Yes** in the dialog box described in *8.2.1 Memory dump confirmation messages*, you do not have to perform this procedure.

NOTE

Before starting a procedure in this section, you must sign in to the local computer as an administrator registered on that computer (as a member of the Administrators group).

(1) Configuring virtual memory

1. Click the **Start** menu, and then open the **Control Panel** and **System and Security**. Then, click **System**.
2. Under **Task** on the left side of the window, click **Advanced system settings**.
3. In the **Advanced** tab, under **Performance**, click **Settings**.
4. In the **Performance Options** window, click the **Advanced** tab.
5. Under **Virtual memory**, click **Change**.
6. Clear the **Automatically manage paging file size for all drives** check box.
7. In the **Drive** list, select the drive that stores the paging file that you want to change. For the sake of explanation, assume **C:** (the system drive) here.
8. Select **Custom size**. In the **Initial size (MB)** or **Maximum size (MB)** box, enter the new size of the paging file in megabytes. Then, click **Set**.

Specify the following value for both the initial size and the maximum size based on the physical memory size:

- If the physical memory size is 4 GB: 4277
- If the physical memory size is 8 GB: 8373
- If the physical memory size is 16 GB: 16565

You can check the physical memory size as follows:

- a. Click **Start** menu, and then open the **Control Panel** and **System and Security**.
 - b. Click **System**, and then check the value of **Memory (RAM)**.
9. Click **OK**.

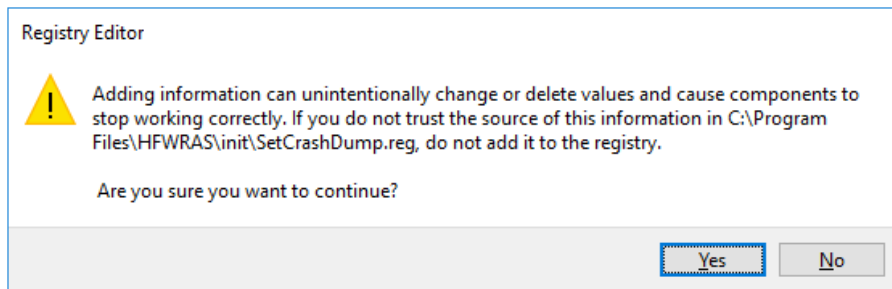
8. MAINTENANCE OPERATIONS

(2) Specifying a memory dump file

1. Open the **Start** menu, and then click **Control Panel** and **System and Security**. Then, click **System**.
2. Under **Task** on the left side of the window, click **Advanced system settings**.
3. In the **Advanced** tab, under **Startup and Recovery**, click **Settings**.
4. In the **Dump file** box, enter a memory dump file name.
By default, %SystemRoot%\MEMORY.DMP is specified.
If no changes are required, you do not need to enter another name in this box.
5. Select the **Overwrite any existing file** check box.
6. Click **OK**.

To enable the **Complete memory dump** setting that is recommended for this equipment, perform the procedure below:

1. In the C:\Program Files\HFWRAS\init folder, double-click the SetCrashDump.reg file.
2. The following message box appears. Click **Yes**.



3. A message box appears, indicating that information has been added successfully. Click **OK**.
4. The setting is applied after the system restarts.

(3) Reserve the area for saving a memory dump

Reserve the area to be used for saving a memory dump by using the `createdmp` command.

For details, see *8.4 Maintenance Operation Commands*.

8.3 Suppressing Startup Upon Detection of a Serious Failure

To protect the equipment hardware, this equipment suppresses startup of the equipment when one of the following incidents is detected during Windows® startup:

1. Fan failure
2. Remote shutdown signal input

NOTE

In the case of a remote shutdown signal input, startup is suppressed only when **Enable automatic shutdown at remote shutdown input** is selected in the RAS Setup window. If the automatic shutdown setting is not selected, startup is not suppressed. For details about how to use the RAS Setup window, see the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*.

When a remote shutdown signal input is detected, the equipment displays a blue screen and then stops. For information about the LED codes in this case, see *9.3 Bug Check Causes*.

8.4 Maintenance Operation Commands

This section explains how to use the maintenance operation commands. These commands are used when problems occur in the equipment and during preventive maintenance. When using these commands, run them from the command prompt.

Table 8-3 shows a list of maintenance operation commands.

Table 8-3 Maintenance operation commands

Command name	Feature
logsave	Used to collect data for preventive maintenance or data for post-failure analysis during preventive maintenance, or when problems occur.
mdump	Used to copy a memory dump file to portable media when a memory dump is collected due to a bug check.
createdmp	Used to reserve disk space for a memory dump file when a message is displayed indicating that the space available for the memory dump file is insufficient.
getrasinfo	Used for checking the status of the equipment, such as the status of the fan and the temperature inside the chassis.

The manufacturer provides services to analyze the data collected by these maintenance operation commands, such as memory dump files and data for failure analysis, for a fee.

8.4.1 Log information collection command (logsave)

Name

logsave - Collects log information

Syntax

logsave [-e *file-name*][*directory*]

Functionality

The `logsave` command saves data used for preventive maintenance and post-failure analysis of problems. The data is compressed and recorded as a single file with the file name `logsave.zip`.

The following options are available for this command. If no option is specified, the `logsave` directory is created directly under the system drive (usually `C:\`), and data is saved in that directory.

-e *file-name*: Data previously saved by the `logsave` command will be decompressed. For the file name, specify the absolute path of the file that you want to decompress. If you do not use this option, the `logsave` command will save the data.

***directory*:** When you are not using the -e option, specify the directory in which you want to store the saved data. If this option is not used the `logsave` directory is created directly under the system drive (usually `C:\`), and data is saved in that directory.

When you are using the -e option, specify the directory where you want to store the decompressed data. If you do not use this option, the data is decompressed in the current directory.

Table 8-4 shows the information collected by the `logsave` command.

Table 8-4 Information saved by the logsave command

Item	Description
Windows® event log file	Backup of the event log file
RAS software log data	RAS software operation log
RAS software user settings information	User settings definition file for pop-up notifications
Windows® version information	Version information for Windows® system files and driver files
Minimum memory dump	Files in the directory used for storing a minimum memory dump
System information	System information that includes hardware resources and the software environment
Output of the RAS information display command	Status of the equipment, such as the status of the fan and the temperature inside the chassis, as well as configuration information about the RAS software
Output of the <code>ipconfig</code> command	Network that sets information
RAID log data	RAID operational logs (for the B model only)
Windows® setup log	Log files from Windows® setup

8. MAINTENANCE OPERATIONS

Diagnosis

When this command terminates with an error, the following error message appears. If a directory for saving data does not exist, an error message from the Windows® `xcopy` command is displayed.

Table 8-5 Error messages of the `logsave` command

Error message	Meaning
You do not have the privilege to run this command. Please run this command again on "Administrator: Command Prompt".	You do not have administrator privileges. Sign in to the computer as an administrator, and then run the command again. If User Account Control (UAC) is enabled, open a command prompt as an administrator, and then run the command.

NOTE

- When you run the `logsave` command, sign in to the computer as an administrator registered on the computer (as a member of the Administrators group). You cannot run multiple instances of the `logsave` command simultaneously.
- Open a command prompt as an administrator to run the command.
- Log information can also be collected by using a program in the **Start** menu. For details, see the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*.
- Double-click the saved `logsave.zip` file, and then verify that you can view the contents of the ZIP file. If you are unable to view the contents of the file, the ZIP file might be corrupted, so try running the command again.

8.4.2 Memory dump file copy command (mdump)

Name

mdump - Copies a memory dump file

Syntax

mdump [-n | -e *file-name*] *copy-(decompression)-destination-path*

Functionality

The mdump command compresses a memory dump file collected by Microsoft® Windows® when the equipment stops unexpectedly. The command then copies the compressed memory dump file to portable media. The dump file, which is specified in the **Startup and Recovery** window that is displayed by selecting the **Control Panel** and then **System and Security, System, and Advanced system settings** and then clicking **Settings** under **Startup and Recovery**, as well as all files under the minimum dump directory, are saved. The memory dump file is compressed and stored as a file with the file name MEMORY.zip.

If you use the -e option, the compressed file is decompressed.

The following options are available for this command:

-n: Files are copied without compression.

-e *file-name*: A file compressed by the mdump command is decompressed. You must specify the file name.

Copy destination path name: When you are not using the -e option, specify the drive of the copy destination. If you want to copy files to a subdirectory, specify the full path, including the directory name.

When you are using the -e option, specify the directory where you want to store the decompressed files.

- A memory dump file is copied (decompressed) to the copy destination specified by this command.
- If a file with the same name as the copy (decompression) destination already exists in the same location, the file is overwritten.
- When you run the mdump command by typing mdump /? or mdump -? at the command prompt or when there is an error in the specified parameters, a help message appears, indicating how to use the command.

8. MAINTENANCE OPERATIONS

Diagnosis

When this command terminates with an error, the following error message appears.

Table 8-6 Error messages of the `mdump` command

Message	Description
You do not have the privilege to run this command. Please run this command again on "Administrator: Command Prompt".	You do not have administrator privileges. Sign in to the computer as an administrator, and then run the command again. If User Account Control (UAC) is enabled, open a command prompt as an administrator, and then run the command.

NOTE

- When you run the `mdump` command, sign in to the computer as an administrator registered on the computer (as a member of the Administrators group). You cannot run multiple instances of the `mdump` command simultaneously.
- Open a command prompt as an administrator to run the command.
- If you run the `mdump` command and there is not enough free space at the copy destination, the Compressed Folders Error occurs. Ensure that there is sufficient free space comparable to the capacity of the physical memory before running the `mdump` command.
- Do not run the `mdump` command immediately after the OS starts after the blue screen appears. If you do so, the Compressed Folders Error occurs. For details, see the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*.
- Double-click the saved `MEMORY.zip` file, and then verify that you can view the contents of the ZIP file. If you are unable to view the contents of the file, the ZIP file might be corrupted, so try running the command again.

8.4.3 Disk space allocation command for saving a memory dump (createdmp)

Name

`createdmp` - Reserves disk space for a memory dump file

Syntax

`createdmp`

Functionality

The `createdmp` command creates an empty memory dump file beforehand, and reserves disk space for a memory dump to prevent situations where collecting a memory dump fails because of insufficient disk space. By using this command, you can avoid failures when collecting memory dumps that are caused by insufficient disk space.

The `createdmp` command reserves disk space if the following conditions are met. If these conditions are not met, the command terminates with an error. Ensure that the memory dump settings are appropriate, and then retry this command. For information about how to set up the memory dump settings, see *8.2.2 Configuring the settings related to memory dumps*.

- The **Complete memory dump** setting is specified.
- The file name of the memory dump is entered correctly.
- The memory dump file can be overwritten.
- After the space for the memory dump file is allocated, the partition used for allocation still has free space totaling at least 10% of the disk capacity.

The size of the allocated disk space is as follows:

- The size of the physical memory size plus 10 MB

NOTE

- When you run the `createdmp` command, sign in to the computer as an administrator registered on the computer (as a member of the Administrators group). You cannot run multiple instances of the `createdmp` command simultaneously.
- If User Account Control (UAC) is enabled, open a command prompt as an administrator to run the command.

8. MAINTENANCE OPERATIONS

Diagnosis

When this command ends normally, it does not output anything in the command prompt window. When the command terminates with an error, the following error message appears.

Table 8-7 Error messages of the `createdmp` command

Error message	Meaning
Error: In the current settings, memory dump file won't be saved.	A memory dump cannot be collected by using the current settings. In the memory dump settings, select the Complete memory dump option.
Error: Free disk space is too low.	The free space on the disk is insufficient. Increase the free space on the disk, and then try again.
Error: Systemcall failed. (%s, %x) %s: Name of the Windows API function where the error occurred %x: Error code from the Windows API	An internal error occurred.
You do not have the privilege to run this command. Please run this command again on "Administrator: Command Prompt".	You do not have administrator privileges. Sign in to the computer as an administrator, and then run the command again. If User Account Control (UAC) is enabled, open a command prompt as an administrator, and then run the command.

8.4.4 RAS information display command (getrasinfo)

Name

`getrasinfo` - Displays the status of the equipment, such as the status of the fan and the temperature inside the chassis, as well as the configuration information of the RAS software

Syntax

```
getrasinfo [/status | /setting] [/e file-name]
```

Functionality

The `getrasinfo` command displays the current status of the equipment, such as the status of the fan and the temperature inside the chassis, as well as the configuration information of the RAS software, at the command prompt. This command can also store the output to a specified file in text format.

The following options are available for this command. If neither the `/status` nor the `/setting` option is used, the command displays both information about the equipment and the settings of the RAS software.

`/status`: Displays the current status of the equipment, including the status of the fan and the temperature inside the chassis.

`/setting`: Displays the configuration information of the RAS software.

`/e file-name`: The output is not displayed at the command prompt, but is instead stored in the file specified by the file name, in text format.

Table 8-8 shows the information displayed by the `getrasinfo` command.

Table 8-8 Information displayed by the `getrasinfo` command

Item	Description
Status of the equipment	<ul style="list-style-type: none"> • Fan status • Temperature status • RAID status (B model only) • Drive status • Memory status
RAS software settings	<ul style="list-style-type: none"> • Automatic shutdown settings • Watchdog timer settings • Self-Monitoring, Analysis and Reporting Technology (SMART) settings • Drive usage monitoring settings • Digital LEDs for status indications settings • Pop-up display settings

8. MAINTENANCE OPERATIONS

Displayed output

The following is an example of the displayed output when the `gettrinfo` command is executed without options.

```
<<gettrinfo result>>
Date: 2016/01/30 17:28:30
Model Name: HJ-205x

[Hardware Status]
[Fan condition]
System fan status:          Normal
CPU fan status:            Normal

[Temperature condition]
Internal temperature status: Normal
Internal temperature value: 28 deg C

[RAID condition] #1
Array1
Status:                    Optimal
RAID level:                1

[Drive condition]
Drive bay1
Type:                      HDD
Status:                    Healthy
Used hours:                2000 hours
Drive bay2
Type:                      HDD
Status:                    Healthy
Used hours:                2000 hours

[Memory condition]
DIMM1 status:              Normal
DIMM2 status:              Normal
```

Header

Hardware status section
(Status of the equipment)

(Continued on the next page)

[RAS Setting]		} RAS settings section (RAS software settings)
[Automatic shutdown setting]		
Fan:	ON	
Temperature:	OFF	
Remote shutdown:	ON	
[Watchdog timer setting]		
Retrigger type:	Automatic	
Timeout:	60 sec	
Interval:	20 sec	
[Drive failure prediction setting]		
Function is available:	Enable	
[Drive used hours monitoring setting]		
Function is available:	Enable	
Drive bay1:	Enable	
Drive bay2:	Enable	
[Advanced]		
Time limit of drive bay1:	20000 hours	
Time limit of drive bay2:	20000 hours	
[Digital LED setting]		
Show Hardware status:	ON	
[Popup setting]		
Function is available:	Disable	
[Advanced]		
Fan:	Enable	
Temperature:	Disable	
SMART:	Disable	
Used hours:	Enable	
RAID:	Enable ^{#1}	
Memory:	Disable	
Memory Failure:	Disable	

#1: This appears only when using the B model.

8. MAINTENANCE OPERATIONS

Explanation of the displayed output

■ Header

This section shows the date and time when the `getrasinfo` command is executed and the model name.

The following is the format of the header.

```
<<getrasinfo result>>
Date: YYYY/MM/DD hh:mm:ss
Model Name: HJ-205x
```

YYYY: Year, MM: Month, DD: Day, hh: hour (24-hour clock), mm: minute, ss: second

■ [Hardware Status] section

This section shows the status of the equipment. The Hardware Status section has the following sections.

• [Fan condition] section

This section shows the status of fans. The following table describes the items in this section.

Output item	Description	
<code>xx fan status: yy</code>	<code>xx</code>	Shows the name of the fan. System: System fan CPU: CPU fan
	<code>yy</code>	Shows the status. Normal: The fan is operating normally. Error: The fan is not operating normally.

• [Temperature condition] section

This section shows the various statuses related to temperature. The following table describes the items in this section.

Output item	Description	
<code>xx Temperature status: yy</code>	<code>xx</code>	Shows the type of temperature. Internal: Inside the chassis
	<code>yy</code>	Shows the status. Normal: The temperature is normal. Error: The temperature is not normal.
<code>xx Temperature value: zz</code>	<code>xx</code>	Shows the type of temperature. Internal: Inside the chassis
	<code>zz</code>	Shows the temperature value.

- [RAID condition] section

This section shows the RAID status. The following table describes the items in this section. This section is available only when using the B model.

Output item	Description	
Array <u>xx</u>	<u>xx</u>	Shows the number of the RAID array.
Status: <u>yy</u> (<u>zz</u> <u>ww</u> , Media Error)	<u>YY</u>	Shows the RAID status Optimal: Normal status Degrade: Abnormal status Unknown: Unknown status
	<u>zz</u>	Indicates that a task has started and is in progress. Rebuild: Rebuilding
	<u>ww</u>	Completion rate of a task in progress. Shown only when the task has started.
	Media Error	Shown only when a media error is detected during a task.
RAID level: <u>yy</u>	<u>vv</u>	Displays the RAID level as follows: 1: RAID1

- [Drive condition] section

This section shows the status of a drive. The following table describes the items in this section.

Display item	Description	
Drive bay <u>xx</u>	<u>xx</u>	Shows the drive bay number.
Type: <u>ww</u>	<u>ww</u>	Shows the drive type.
Status: <u>yy</u>	<u>yy</u>	Shows the status of the drive. Healthy: Normal Not Connected: No disks are installed. Smart Detected: SMART is detected. Offline: Offline (B model only) Rebuild: Rebuilding (B model only) Incomplete data: Data mismatch (B model only) Overrun: Power-on (used) hours exceeded the threshold. Unknown: Unknown status Smart Detected, Overrun: SMART is detected, and the power-on hours exceeded the threshold.
Used hours: <u>zz</u>	<u>zz</u>	Shows the drive power-on (used) hours.

8. MAINTENANCE OPERATIONS

- [Memory condition] section

This section shows the status of the main memory. The following table describes the items in this section.

Output item	Description	
<u>xx</u> status: <u>yy</u>	<u>xx</u>	Shows the memory slot name. DIMM1: DIMM1 DIMM2: DIMM2
	<u>yy</u>	Shows the status of the memory. Normal: Normal Error: Error correction occurs frequently. Not Mounted: No memory modules are installed.

- [RAS Setting] section

This section shows the settings of the RAS software. The RAS Setting section has the following sections.

- [Automatic shutdown setting] section

This section shows the automatic shutdown setting. The following table describes the items in this section.

Output item	Description	
Fan: <u>xx</u>	<u>xx</u>	Shows whether the system automatically shutdown when a fan failure occurs. ON: Automatically shutdown. OFF: Not automatically shutdown.
Temperature: <u>yy</u>	<u>yy</u>	Shows whether the system is automatically shutdown when the temperature is abnormal. ON: Automatically shutdown. OFF: Not automatically shutdown.
Remote shutdown: <u>zz</u>	<u>zz</u>	Shows whether the system automatically shutdown when the remote shutdown signal is input to the contact. ON: Automatically shutdown. OFF: Not automatically shutdown.

- [Watchdog timer setting] section

This section shows the watchdog timer setting. The following table describes the items in this section.

Output item	Description	
Retrigger type: <u>xx</u>	xx	Shows the retrigger type. Automatic: Automatically retriggered. Application: Retriggered by an application. Not used: Not used.
Timeout: <u>yy</u>	yy	Shows the timeout when the watchdog timer is automatically retriggered.
Interval: <u>zz</u>	zz	Shows the interval of retriggering when the watchdog timer is automatically retriggered.

- [Drive failure prediction setting] section

This section shows the Self-Monitoring, Analysis and Reporting Technology (SMART) setting. The following table describes the items in this section.

Output item	Description	
Function is available: <u>xx</u>	xx	Shows whether the Self-Monitoring, Analysis and Reporting Technology (SMART) is enabled or disabled. Enable: Enabled For the HJ-205x, this setting is always set to Enable.

- [Drive used hours monitoring setting] section

This section shows the drive usage monitoring setting. The following table describes the items in this section.

Output item	Description	
Function is available: <u>xx</u>	xx	Shows whether the drive usage monitoring feature is enabled or disabled. Enable: Enabled Disable: Disabled
Drive bay1: <u>yy</u>	yy	Shows whether the monitoring feature for the usage time of drive bay 1 is enabled or disabled. Enable: Enabled Disable: Disabled
Drive bay2: <u>ww</u>	ww	Shows whether the monitoring feature for the usage time of drive bay 2 is enabled or disabled. Enable: Enabled Disable: Disabled
[Advanced]	--	Shows the advanced settings.
Time limit of drive bay <u>yy</u> : <u>zz</u>	yy	Shows the drive bay number.
	zz	Shows the threshold used for the drive usage monitoring feature.

8. MAINTENANCE OPERATIONS

- [Digital LED setting] section

This section shows the setting of the digital LEDs for status indications. The following table describes the items in this section.

Output item	Description	
Show Hardware status: <u>xx</u>	xx	Shows whether the hardware status display is enabled or disabled. ON: Enabled OFF: Disabled

- [Popup setting] section:

This section shows the pop-up notification settings. The following table describes the items in this section.

Output item	Description	
Function is available: <u>xx</u>	xx	Shows whether the pop-up notifications feature is enabled or disabled. Enable: Enabled Disable: Disabled
[Advanced]	--	Shows the advanced settings.
Fan: <u>yy</u>	yy	Shows whether pop-up notifications are displayed for fan failures. Enable: Displayed Disable: Not displayed
Temperature: <u>zz</u>	zz	Shows whether pop-up notifications are displayed when the temperature is abnormal. Enable: Displayed Disable: Not displayed
SMART: <u>aa</u>	aa	Shows whether pop-up notifications are displayed when SMART is detected. Enable: Displayed Disable: Not displayed
Used hours: <u>bb</u>	bb	Shows whether pop-up notifications are displayed when the drive power-on (used) hours exceed the threshold. Enable: Displayed Disable: Not displayed
RAID: <u>cc</u> (B model only)	cc	Shows whether pop-up notifications are displayed when an abnormal RAID status is detected. Enable: Displayed Disable: Not displayed
Memory: <u>dd</u>	dd	Shows whether pop-up notifications are displayed when frequent memory error corrections are detected. Enable: Displayed Disable: Not displayed
Memory Failure: <u>ee</u>	ee	Shows the display settings for when a potential memory failure is detected. Enable: Displayed Disable: Not displayed

Diagnosis

When the `getrasinfo` command ends normally, it returns exit code 0. When the command terminates with an error, one of the following error messages appears, and the command returns exit code 1.

Table 8-9 Error messages of the `getrasinfo` command

Error message	Meaning
Usage: <code>getrasinfo [/status /setting] [/e File]</code>	There is an error in the specified options. Specify the options correctly.
An error occurred in %s. errorcode=%x %s: Function name or internal function name of error Windows API %x: Error code of Windows API or internal function	An internal error occurred. Re-execute the command.
You do not have the privilege to run this command. Please run this command again on "Administrator: Command Prompt".	You do not have administrator privileges. Sign in to the computer as an administrator, and run the command again. If User Account Control (UAC) is enabled, open a command prompt as an administrator, and then run the command.

NOTE

- When you run the `getrasinfo` command, sign in to the computer as an administrator registered on the computer (as a member of the Administrators group). You cannot run multiple instances of the `getrasinfo` command simultaneously.
- Open a command prompt as an administrator to run the command.
- When you are using the `/e` option, if a file with the same name as the output file already exists at the same output location, the file is overwritten.
- If the command fails to acquire some of the information required for the output, it is possible that only a section name appears in a section, or part of the information is replaced with `---`. In this case, re-execute the command.
- When a drive is newly connected or replaced during maintenance, recognition of the drive may take some time upon the first startup after it is connected, and `Not Connected` might appear for `Status of the Drive` condition section. In this case, restart the computer.

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CHAPTER 9 TROUBLESHOOTING

This chapter describes the possible causes of common problems and the actions to take to address them. First select the relevant symptom from the list in *9.1 List of Problems*. Then, see the references to other sections *9.2 Causes and Countermeasures* through *9.6 Digital LEDs for Status Indications*) and take action according to the instructions. If following the instructions in *9.2 Causes and Countermeasures* does not resolve the problem, contact the system administrator or maintenance personnel.



WARNING

In the case of smoke, a burning smell, or a similar problem, unplug the power cord and contact your dealer or maintenance personnel. Using faulty equipment without repairing it might result in a fire or an electric shock.

9.1 List of Problems

The following is a list of problems that can occur in the equipment. Search for the relevant item in the following list, perform a root cause analysis, and then take action as appropriate.

9.1.1 Problems that occur before OS startup

The following is a list of problems that occur before the desktop appears (before the OS starts up). For information about the names of the lamps on the front panel, see *1.5 Name and Function of Each Part*.

- (1) The equipment does not start.

Plug in the power cord, and then check the operation of the equipment in the order of the following steps 1 through 7. If any of the items in the steps apply, follow the appropriate reference. (If multiple items apply, the one appearing first takes precedence.)

 1. When the power cord is plugged in, the standby lamp does not turn on. (See page 9-3.)
 2. When the power switch is turned on, fans rotate and the status lamp is lit, but the status indication LEDs and the digital LEDs for status indications do not display anything. (See page 9-3.)
 3. The digital LEDs for status indications show alphanumeric characters, and the system stops. (See page 9-3.)
 4. The screen is blank. (See page 9-4.)
 5. The screen shows an error message, and the system stops. (See page 9-4.)
 6. The system stops when the Windows® logo is displayed. (See page 9-5.)
 7. The system stops when a blue screen is displayed. (See page 9-5.)
- (2) Beeping sounds are generated. (See page 9-5.)
- (3) The BIOS setup menu cannot be opened. (See page 9-6.)
- (4) The remote power-on feature cannot be activated through the RAS external contact. (See page 9-6.)
- (5) Wake-on-Lan (WOL) cannot be used. (See page 9-6.)
- (6) If an extension board is installed, the equipment does not start. (See page 9-6.)

9.1.2 Problems that occur after OS startup

The following is a list of problems that occur after the desktop appears (after the OS starts up).

- (1) The alarm lamp is lit and the digital LEDs for status indications show alphanumeric characters. Alternatively, only the digital LEDs for status indications show alphanumeric characters. (See page 9-7.)
- (2) The processing speed of the equipment is slow. (See page 9-9.)
- (3) The equipment is unresponsive. (See page 9-9.)
- (4) The equipment automatically goes into standby mode or restarts. (See page 9-10.)
- (5) The screen flickers, nothing is displayed, or the display is incorrect. (See page 9-11.)
- (6) In the screen resolution settings, an unconnected display appears. (See page 9-11.)
- (7) The screen display blinks, or in some cases the contents of the screen are displayed again after blacking out. (See page 9-12.)
- (8) A blue screen appears. (See page 9-12.)
- (9) The equipment is unable to connect to the network. (See page 9-13.)
- (10) The network connection is unstable, or the connection speed is slow. (See page 9-13.)
- (11) A disc (CD or DVD) cannot be recognized or cannot be read or written to. (See page 9-14.)
- (12) Writing to a disc (CD or DVD) fails. (See page 9-14.)
- (13) A disc (CD or DVD) cannot be ejected. (See page 9-15.)
- (14) Keyboard input is not accepted. (See page 9-15.)
- (15) Mouse input is not accepted, or the cursor or a button does not work normally. (See page 9-16.)
- (16) A USB device (other than a keyboard or a mouse) cannot be recognized or does not operate properly. (See page 9-16.)
- (17) No sound is generated, or the sound is extremely faint. (See page 9-17.)
- (18) A serial port does not operate properly. (See page 9-17.)
- (19) The RAS external contact port does not operate properly. (See page 9-17.)
- (20) The equipment cannot be shutdown. (See page 9-18.)

9.2 Causes and Countermeasures

9.2.1 Problems that occur before OS startup

(1) The equipment does not start.

1. When the power cord is plugged in, the standby lamp does not turn on.

Possible cause

Power is not being supplied to the equipment.

Action

1. Make sure that the power cord is plugged in.
2. Make sure that the circuit breaker on the power distribution panel is on.
3. If the standby lamp is on after steps 1 and 2, turn on the power switch.
→ When the equipment starts, fans rotate and the status lamp turns on.

2. When the power switch is turned on, fans rotate and the status lamp is lit, but the status indication LEDs and the digital LEDs for status indications do not display anything.

Possible cause

The equipment has failed.

Action

1. Contact your system administrator or maintenance personnel.

3. The digital LEDs for status indications show alphanumeric characters, and the system stops.

Possible cause

An error was detected during POST.

Action

1. See 9.6.1 *POST* messages and take appropriate action.
→ When the equipment recovers, the alphanumeric characters on the digital LEDs for status indications disappear, and the OS starts.

9. TROUBLESHOOTING

4. The screen is blank.

Possible cause

The display has a problem.

Action

1. Make sure that the power switch of the display is on.
2. Make sure that the power cord for the display is plugged in.
3. Make sure that the equipment and the display are connected through a display interface cable.
4. Review the display settings. For information about the display settings, see the display manual.

5. The screen shows an error message, and the system stops.

Possible cause

The battery is dead, no HDDs are installed, or the OS is corrupted.

Action

1. If one of the following error messages is displayed, take the corresponding action:
 - `Error: Remove Battery or Clear CMOS, Load default value`
 - If this message is displayed each time the equipment starts, the battery is dead. Contact your system administrator or maintenance personnel.
 - `Operating System not found`
 - There is an error in an HDD or the OS. Check the following items:
 - i) Check whether a USB CD, USB FD, or USB boot device is connected to the equipment.
 - If a USB CD, USB FD, or USB boot device is connected, disconnect it.
 - ii) Make sure that an HDD is fully inserted into drive bay 1 and is secured by screws.
 - If the HDD is okay, the HDD is recognized on the BIOS screen. (See 5.6 *BIOS Setup*.)
 - iii) If you have a recovery DVD, use the recovery DVD to restore the system drive to its factory default settings.

6. The system stops when the Windows® logo is displayed.

Possible cause

There is an error in the hardware or the OS is corrupted.

Action

1. Unplug the power cord and remove all USB devices and extension boards except for the keyboard and mouse. Then, plug the power cord in again and start the equipment. (For details about removing extension boards, see *6.3.4 Installing and removing an extension board.*)
2. If the symptom persists after step 1, the OS might be corrupted. If you have a recovery DVD, use the recovery DVD to restore the system drive to its factory default settings.

NOTE

- Do not connect a USB device during OS startup, because the OS might not start normally.
- When you change screens during OS startup, the OS does not start normally in some CPU switching devices. If you use a CPU switching device, sufficiently verify operation.

7. The system stops when a blue screen is displayed.

Possible cause

The equipment received an active remote shutdown signal.

Action

1. Take appropriate action by referring to *8.3 Suppressing Startup Upon Detection of a Serious Failure* and *9.3 Bug Check Causes*.

- (2) Beeping sounds are generated.

- a) One beep is generated.

Possible cause

This sound indicates a power-on. This is not an error.

- b) Two or more beeps are generated.

Possible cause

A hardware error was detected.

Action

1. Check the information displayed by the digital LEDs for status indications, and then take appropriate action by referring to *9.6.1 POST messages*.

9. TROUBLESHOOTING

- (3) The BIOS setup menu cannot be opened.

Possible cause

Keyboard input is not accepted.

Action

1. Disconnect the keyboard cable and securely reconnect it to ensure a stable connection.
2. Connect the keyboard cable to another port.

- (4) The remote power-on feature cannot be activated through the RAS external contact.

Possible cause

The remote power-on feature is disabled.

Action

1. Enable the remote power-on feature by referring to *6.6 Enabling the Remote Power-On Feature*.

- (5) Wake-on-Lan (WOL) cannot be used.

Possible cause

The WOL feature is not enabled.

Action

1. Check which OS is being used. If the OS specifications do not support the WOL feature, the WOL feature is unavailable.
2. Enable the WOL feature by referring to *2.7.1 Enabling the Wake-on-LAN (WOL) feature*.

- (6) If an extension board is installed, the equipment does not start.

Possible cause

A connection failure of an extension board or an address space conflict with an onboard device is possible.

Action

1. Turn off the power, remove the extension board, and then reinstall the extension board.
2. If the problem cannot be resolved by performing step 1, a failure on the extension board possible. In this case, take action by referring to the documentation of the extension board.

9.2.2 Problems that occur after OS startup

- (1) The alarm lamp is lit and the digital LEDs for status indications show alphanumeric characters. Alternatively, only the digital LEDs for status indications show alphanumeric characters.

Possible cause

This is a hardware error notification from the RAS software, or is being displayed by a user application.

Action

1. If one of the status indication LEDs is lit in red, this is a hardware error notification from the RAS software.
 - Check the characters displayed on the digital LEDs for status indications.
 - If 12 or 13 is displayed on the digital LEDs for status indications:
 - The rotation of a fan is abnormal. (12 indicates a system fan failure, and 13 indicates a CPU fan failure.)
 - Check the following items:
 - i) Make sure that no foreign objects are attached to the fan.
 - If any foreign objects are attached, the cooling efficiency inside the equipment becomes is reduced.
 - Remove any foreign objects.
 - ii) Make sure that the power cord for the fan is connected to a power connector.
 - A loose connection might have caused the symptom. Remove the power cord for the fan from the power connector, and then reconnect it.
 - If 21 is displayed on the digital LEDs for status indications:
 - The temperature is abnormal. Check the following items:
 - i) Make sure that the dust filter at the front of the equipment and the exhaust outlet at the rear are not clogged.
 - If they are clogged, clean the dust filter and the air intake and exhaust holes. If necessary, replace the dust filter.
 - ii) Make sure that sufficient clearance is provided around the equipment. (See *1.6.2 Installation*.)
 - If clearance is insufficient, provide sufficient clearance around the equipment.
 - iii) Make sure that the temperature of the installation environment (the ambient temperature) is less than 40°C.
 - Remove obstacles to airflow or use air-conditioning to keep the ambient temperature lower than 40°C.
 - If 31 or 32 is displayed on the digital LEDs for status indications:
 - A failure is predicted for the drive in drive bay. (31 indicates drive bay 1 and 32 indicates the drive bay 2.)
 - We recommend that you back up the data on the drive and replace the drive.

Action

- If 41 or 42 is displayed on the digital LEDs for status indications:
 - The HDD is abnormal. (41 indicates drive bay 1 and 42 indicates drive bay 2.)
Read the description in *10.4.2 Recovery from a failure in one HDD* and replace the HDD.
- If 4C is displayed on the digital LEDs for status indications:
 - The RAID status is unknown. (The RAS software cannot acquire the RAID status.) Contact your system administrator or maintenance personnel.
- If 4D is displayed on the digital LEDs for status indications#:
 - A media error occurred in the RAID. See 2.8.2 *Note about media errors* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*, and take action accordingly.

#: This code is not displayed when you are using the default settings. For details about displaying this code, see 2.8.2 *Note about media errors* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*.

NOTE

If one of the status indication LEDs is lit in green, a user application is using the LEDs to display characters. Contact your system administrator or maintenance personnel.

- (2) The processing speed of the equipment is slow.

Possible cause

The capacity of the memory or the HDDs or SSDs is not sufficient.

Action

1. Close any unnecessary applications to increase the available memory.
 - To check the CPU and memory usage, follow the instructions in *9.5 Checking the System Load by Using Performance Monitor*.
2. Delete any unnecessary files to increase free space on the HDDs or SSDs.

- (3) The equipment is unresponsive.

Possible cause

There is an error in the hardware or software.

Action

1. The screen can appear to be frozen when an application freezes. If the equipment responds when you press **Alt+Tab** or **Ctrl+Alt+Delete**, try performing the following procedure:
 - i) Switch applications by pressing **Alt+Tab**, and identify which application is frozen.
 - ii) After you identify the frozen application, use Task Manager to terminate the application. To open Task Manager, press **Ctrl+Alt+Delete**. The Windows Security window opens. Click **Task Manager**.
 - iii) Restart the equipment.
2. Press the NMI switch to collect a memory dump. If you want to have an analysis performed on the memory dump (a service provided for a fee), restart the equipment and save the log (see *8.4 Maintenance Operation Commands*), and then contact one of our sales representatives. If the restart is not performed automatically, turn off the power of the equipment by referring to the following section *Forcibly terminating the equipment*.
3. If you are unable to collect a memory dump after following the instructions in step 2, turn off the power of the equipment by referring to the following section *Forcibly terminating the equipment*.
4. If performing the actions described in steps 1 and 2 does not resolve the symptom, turn off the power, remove all USB devices and extension boards except for the keyboard and mouse, and then start the equipment.

Forcibly terminating the equipment

If a shutdown fails, press the power switch for at least four seconds. The power turns off and the equipment goes into standby mode.

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(4) The equipment automatically goes into standby mode or restarts.

a) The digital LEDs for status indications show alphanumeric characters and the system goes into standby mode.

Possible cause

This is a hardware error notification from the RAS software or is being displayed by a user application.

Action

1. Check the characters displayed on the digital LEDs for status indications.
 - If one of the status indication LEDs is lit in red, this is a hardware error notification from the RAS software. See *9.6.1 POST messages* and take appropriate action.
 - If one of the status indication LEDs is lit in green, a user application is using the LEDs to display characters. Contact your system administrator or maintenance personnel.

b) A warning or error message is recorded in the event log.

Possible cause

There is an error in the hardware or software.

Action

1. Check the description of the messages in the *System* or *Application* category in the event log and take action accordingly. (See *9.4 Event Log*.)
2. If the source of the message is a component purchased by the user, contact the supplier.

c) Neither a nor b

Possible cause

There is a problem with a cable connection, or the AC power supply is unstable.

Action

1. Make sure that the power cord is securely plugged in.
2. If the symptom persists after step 1, the AC power supply might be unstable. Verify that the AC power voltage is appropriate.

- (5) The screen flickers, nothing is displayed, or the display is incorrect.

Possible cause

There is an error in the display or in the video card.

Action

1. Make sure that the power cord for the display is plugged in.
2. Make sure that the equipment and the display are securely connected through a display interface cable. (Verify that the cable connection is not loose.)
3. Replace the display interface cable with a new one. (Check whether the cable is broken.)
4. Review the display settings. For information about how to adjust the display, see the display manual.
5. If you are using a video card, check the following items:
 - i) Make sure that the settings of the video card are correct. (For information about how to set up the video card, see the manual for the video card.)
 - ii) Turn off the main power switch. Replace the video card with another and check whether the new video card works.
6. If you are using a display that supports the MST (Multi Stream Transport) technology of DisplayPort, check the following items. (See the display manual for these settings.)
 - i) If the display can switch between DisplayPort 1.1 and DisplayPort 1.2, select DisplayPort 1.2.
 - ii) If the display can change the MST setting, set it to **Primary**.

NOTE

If MST is enabled, the **DisplayPort topology** item appears when you right-click the desktop window.

- (6) In the screen resolution settings, an unconnected display appears.

Possible cause

It is possible that an unconnected display is shown due to the specifications of the OS.

Action

1. Right-click the desktop to display the pop-up menu. Click **Screen resolution**.
2. In the screen resolution setting window, select the unconnected display.
3. Under **Multiple Displays**, select **Delete this display**. If this setting change is not applied automatically, click **Apply** to delete the unconnected display.
4. If multiple unconnected displays are shown, repeat steps 2 and 3.

9. TROUBLESHOOTING

- (7) The screen display blinks, or in some cases the contents of the screen are displayed again after blacking out.

Possible cause

Windows® is performing a process to correctly recover the graphics feature if the graphics driver is taking time in response to a high load on the system.

Action

1. If this phenomenon occurs, when the message *Response stop and recovery of display driver* appears or when a warning log of event ID 4101 is recorded in the event log, reduce the system load, and use the system under a load that does not cause this kind of indication or recording.

- (8) A blue screen appears.

Possible cause

There is an error in the OS or in the equipment.

Action

1. If the blue screen is still being displayed, record the cause code (0x00000080 or similar) or distinguishable name (NMI_HARDWARE_FAILURE or similar).
2. If you cannot record the cause code, search the *System* category in the event log for the cause code.
3. Check the description in *9.3 Bug Check Causes* to determine what caused the memory dump to be collected.
4. To request an analysis of the memory dump (a service provided for a fee), save the log after you restart the equipment (see *8.4 Maintenance Operation Commands*) and contact one of our sales representatives.

(9) The equipment is unable to connect to the network.

Possible cause

There is an error in the settings of the LAN or the network device (the hub or another device), or there is a problem with the cable connection.

Action

1. Review the network settings by referring to the instructions in *2.8 Setting Up the LAN Interface*.
2. Disconnect the LAN cable and securely reconnect it to ensure a stable connection.
3. Make sure that the LAN cable is connected to the correct port.
4. Replace the LAN cable with another LAN cable.
5. When you use the network device, check the following items:
 - i) Make sure that the power of the network device is on.
 - ii) Turn on the power of the network device before turning on the power of this equipment.
 - iii) Replace the network device with another to check whether the latter works.

(10) The network connection is unstable, or the connection speed is slow.

Possible cause

There is an error in the settings of the LAN or the network device, or there is a problem with the cable connection.

Action

1. Review the network settings by referring to the instructions in *2.8 Setting Up the LAN Interface*.
2. Disconnect the LAN cable and securely reconnect it to ensure a stable connection.
3. Make sure that the LAN cable is connected to the correct port.
4. Replace the LAN cable with another LAN cable.
5. When you use the network device, check the following items:
 - i) Turn on the power of the network device before turning on the power of this equipment.
 - ii) Replace the network device with another to check whether the latter works.

9. TROUBLESHOOTING

(11) A disc (CD or DVD) cannot be recognized or cannot be read or written to.

Possible cause

An unsupported or bad CD or DVD is used.

Action

1. See *5.1 Equipment Specifications* and verify that the CD or DVD you want to use is supported.
2. Check that there are no scratches or dirt on the CD or DVD. If the disc is dirty, clean the disc.
3. Select **Start** and then **Computer**, and check whether the DVD drive is recognized.
 - If the DVD drive is not recognized, restart the equipment.
4. Use another CD or DVD.

NOTE

If you use a USB DVD drive, depending on the DVD drive, it might take around 10 minutes to read a disc (CD or DVD) when the equipment starts up. If this situation occurs, you might be able to resolve the problem by selecting **disable** for **Legacy USB Support** in the **Advanced** tab in the BIOS settings.

(12) Writing to a disc (CD or DVD) fails.

Possible cause

The capacity of the HDDs is not sufficient, or a bad CD or DVD is being used.

Action

1. Check that the CD or DVD is writable.
2. If not enough free space is available for the work area on an HDD, clean up files and increase the free space on the HDD.
3. Verify that there are no scratches or dirt on the CD or DVD. If the disc is dirty, clean the disc.
4. Use another CD or DVD.

(13) A disc (CD or DVD) cannot be ejected.

Possible cause

Writing to a disc is in progress, or there is an error in the DVD drive.

Action

1. Check whether writing to a disc is in progress (the drive access lamp is on or flashing). You cannot eject a disc when writing to it.
2. Press the eject button at least five times.
3. Insert an eject pin into the manual emergency ejection hole. (See 2.6.1 *Inserting an optical disc (CD or DVD)*.)
When the disc tray opens slightly, hold it and pull it out by hand.

NOTE

- Turn off the main power of the equipment before attempting to eject a disc by using the manual emergency ejection hole. Do not insert an eject pin at an angle or apply too much force.
- No eject pin comes with the equipment. If an eject pin is not available, use another pin that fits the ejection hole.

(14) Keyboard input is not accepted.

Possible cause

An application has frozen, there is a problem with the cable connection, or the keyboard has failed.

Action

1. Keyboard input might not be accepted temporarily due to a frozen application.
If the equipment responds to **Alt+Tab** or **Ctrl+Alt+Delete**, try the following procedure:
 - i) Switch applications by pressing **Alt+Tab** and identify which application has frozen.
 - ii) After you identify the frozen application, use Task Manager to terminate the application. To start Task Manager, press **Ctrl+Alt+Delete**. The **Windows Security** window will open. Click **Task Manager**.
 - iii) Restart the equipment.
2. Disconnect the keyboard interface cable and securely reconnect it to ensure a stable connection.
3. Connect the keyboard interface cable to another port.
4. Replace the keyboard with another keyboard to check whether the latter works.
5. Restart the equipment.

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(15) Mouse input is not accepted, or the cursor or a button does not work normally.

Possible cause

The mouse does not work properly due to dust or dirt on the mouse, there is a problem with the cable connection, or the mouse has failed.

Action

1. If you are using an optical mouse, check the following items:
 - i) Check whether dust or dirt is clinging to the optical sensor. If dust or dirt is present, clean it off.
 - ii) Do not use an optical mouse on glass, a mirror, or a shiny material. (We recommend using a mouse pad designed for use with an optical mouse.)
2. If you are using a mouse that is not an optional component provided by the manufacturer, see the manual for the mouse for information about how to use it.
3. Disconnect the mouse interface cable and securely reconnect it to ensure a stable connection.
4. Replace the mouse with another mouse to check whether the latter works.
5. If you are using a USB KVM switch, read the user's manual that comes with the USB KVM switch. The problem might be alleviated if you change settings such as emulation settings.
6. If the OS starts while a serial port is receiving data, use the serial port after the OS starts instead, and check whether the problem goes away.

(16) A USB device (other than a keyboard or a mouse) cannot be recognized or does not operate properly.

Possible cause

There is a problem with the cable connection, or the device driver for the USB device has not been installed.

Action

1. Disconnect the cable for the USB device and securely reconnect it to ensure a stable connection.
2. Replace the cable for the USB device with another cable.
3. If the USB device requires the installation of a device driver, install the device driver by referring to the manual of the USB device, and then restart the equipment.
4. If the USB device requires an external power supply, make sure that the power cord of the USB device is plugged in.
5. If the USB device uses USB bus power, make sure that the current consumption of the USB device does not exceed the specified maximum current for the USB port of the equipment. (See 5.1 (9) *Maximum current specifications*.) If the USB device can accept an external power supply, connect the device to an external power supply.
6. If steps 1 through 5 do not resolve the symptom, a failure of the USB device might be the cause. Take action by referring to the manual of the USB device.

(17) No sound is generated, or the sound is extremely faint.

Possible cause

There is an error in the settings of the equipment and the speakers, there is a problem with the cable connection, or the speakers have failed.

Action

1. Adjust the volume of the equipment to an appropriate level. (See *Setting the volume*.)
2. When you use speakers, check the following items:
 - i) Make sure that the speakers have built-in amplifiers.
(If the speakers do not have amplifiers, you cannot hear sound.)
 - ii) Make sure that the power cord of the speakers is plugged in.
 - iii) Turn on the power of the speakers.
 - iv) Make sure that the volume level of the speakers is adequately adjusted.
 - v) Make sure that the cable from the speakers is connected to LINE OUT.
 - vi) When you record an audio signal from an audio device, connect LINE OUT of the audio device to LINE IN of the equipment by using a cable. (LINE IN cannot be used as a MIC input.)
 - vii) Disconnect the cable from the speakers and securely reconnect it to ensure a stable connection.
 - viii) Use another pair of speakers.

Setting the volume

1. Click **Start** and then **Control Panel**, and then click **Hardware and Sound**.
2. Click **Adjust system volume** to adjust the volume.

(18) A serial port does not operate properly.

Possible cause

There is a problem with the cable connection, or the applicable device has failed.

Action

1. Disconnect the cable and securely reconnect it to ensure a stable connection.
2. Check to see if the target device has failed.
3. If the OS starts while a serial port is receiving data, use the serial port after the OS starts instead to check whether the problem goes away.

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(19) The RAS external contact port does not operate properly.

Possible cause

There is a problem with the cable connection or the interface with the applicable device.

Action

1. Disconnect the cable and securely reconnect it to ensure a stable connection.
2. See 5.8.2 *External contact specifications* and confirm that the external contact specifications are met.

(20) The equipment cannot be shutdown.

a) The drive access lamp is on or is flashing.

Possible cause

The shutdown process is simply taking a long time.

Action

1. Wait until the shutdown process finishes.

b) Something other than a

Possible cause

The OS has frozen.

Action

1. Press the NMI switch to collect a memory dump. If you want to have an analysis performed on the memory dump (a service provided for a fee), restart the equipment and save the log (see 8.4 *Maintenance Operation Commands*), and then contact one of our sales representatives. If the restart is not performed automatically, turn off the power of the equipment by referring to the following section *Forcibly terminating the equipment*.
2. If you are unable to collect a memory dump after following the instructions in step 1, turn off the power of the equipment by referring to the following section *Forcibly terminating the equipment*.
3. If performing step 1 does not resolve the problem, turn off the power, remove all USB devices and extension boards except for the keyboard and mouse, and then start the equipment.

Forcibly terminating the equipment

If the shutdown fails, press and hold the power switch for at least four seconds. The power turns off and the product goes into standby mode.

9.3 Bug Check Causes

Bug check causes are the causes of occurrence when a bug check (blue screen) occurs.

These values are logged to a memory dump file when a blue screen occurs, and a distinguishable name (NMI_HARDWARE_FAILURE or WHEA_UNCORRECTABLE_ERROR) appears on the screen.

In addition, the digital LEDs for status indications that are installed in this equipment show codes that correspond to the causes of occurrence for bug checks (blue screens).

Although multiple bug check causes exist, you can determine the detailed information by checking the event log (event ID: 800, source: HFWRAS_SYS).

Table 9-1 List of codes for bug check (blue screen) causes

No.	Code	Cause	Action
1	Fb	An NMI occurred because the NMI switch was pressed.	The cause is recorded in the event log. Take action by referring to <i>Table 9-2 List of actions for bug checks (blue screens)</i> . If nothing is recorded in the event log, contact the system administrator or maintenance personnel.
2	F8 or F9	An NMI occurred due to a parity error in a location such as the PCI or LPC bus.	
3	FA	An uncorrectable memory error occurred.	
4	80	<ul style="list-style-type: none"> • When Windows® started, a remote shutdown input was detected. • Another problem occurred. 	For causes related to remote shutdowns, contact the system administrator or maintenance personnel.

Table 9-2 List of actions for bug checks (blue screens)

Contents logged in the event log (event ID: 800, source: HFWRAS_SYS)	Cause	Action
A reset signal was input. Detailed code = 0x9201	Forced recovery from CPU lock	Before a message appears, check whether the NMI switch is pressed.
A PCI bus parity error occurred. Detailed code = 0x9202.	Hardware NMI	Remove the extension board and replace it with another board, and then recheck operation. For the replacement work, see 6.3 <i>Installing and Removing Components</i> .
An uncorrectable error occurred at DIMM2. Detailed code = 0x9217	Uncorrectable memory error	Verify that the main memory is correctly installed. If this error still occurs with the main memory correctly installed, the error might be due to a main memory failure. Contact the system administrator or maintenance personnel.
An uncorrectable error occurred at DIMM1. Detailed code = 0x9218		

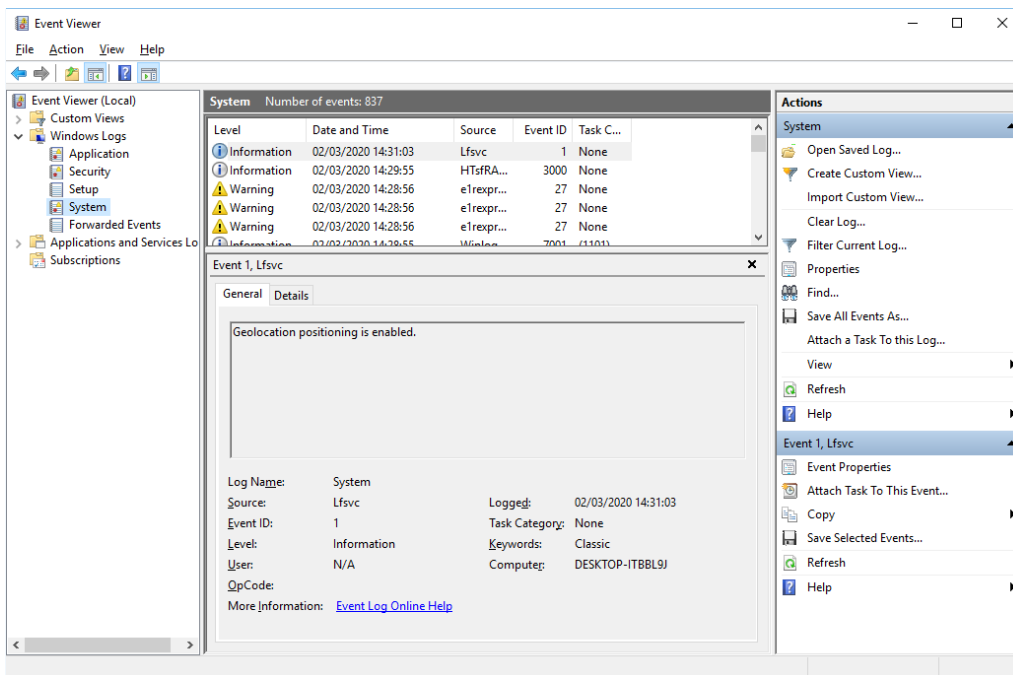
9.4 Event Log

When a critical event occurs, for example, when the environment information changes or when a remote shutdown request is generated, this equipment collects logs by using the Windows® event log service.

The following procedure shows how to check the event log.

(The displayed image is of Windows® 10, but is similar in other OSs.)

1. Open the **Control Panel** and click **System and Security** and **View event logs**.
2. The **Event Viewer** window opens. Select **Windows Logs** and then select **System** or **Application** to check the system log or application log.



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Table 9-3 lists the event log entries that are unique to the equipment. Nos. 1 through 15 and Nos. 18 through 31 are collected in the system log, and Nos. 16 and 17 are collected in the application log.

Table 9-3 Event log entries unique to the equipment (1/3)

No.	Event ID	Source	Type	Description	Action
1	259	HFWRAS_SYS	Warning	The temperature exceeded the specified value.	Read the description of abnormal temperature in 9.2.2 (1) and take action accordingly.
2	260	HFWRAS_SYS	Information	A remote shutdown request occurred.	No action required.
3	263	HFWRAS_SYS	Information	The temperature returned the specified value.	No action required.
4	265	HFWRAS_SYS	Warning	A failure might be imminent on the drive in drive bay %1 (%2).	We recommend that you back up the data and replace the drive.
5	266	HFWRAS_SYS	Error	The revolutions of the CPU fan deteriorated significantly.	Read the description of fan failure in 9.2.2 (1) and take action accordingly.
6	267	HFWRAS_SYS	Information	The revolutions of the CPU fan returned to the normal value.	No action required.
7	268	HFWRAS_SYS	Error	The computer shutdown, because the temperature became dangerous.	Read the description of abnormal temperature in 9.2.2 (1) and take action accordingly.
8	270	HFWRAS_SYS	Information	The used hours on the drive in drive bay %1 exceeded the specified value.	We recommend that you back up the data and replace the drive.
9	277	HFWRAS_SYS	Error	The revolutions of the system fan deteriorated significantly.	Read the description of fan failure in 9.2.2 (1) and take action accordingly.
10	278	HFWRAS_SYS	Information	The revolutions of the system fan returned to the normal value.	No action required.
11	524	HFWRAS_SYS	Information	Under the current settings, the memory dump file is not saved. %1	See 8.2.1 and take action, or see 8.2.2 and change the settings manually.

Table 9-3 Event log entries unique to the equipment (2/3)

No.	Event ID	Source	Type	Description	Action
12	525	HFWRAS_SYS	Information	In DIMM%1, error corrections have been occurring at a high frequency.	The DIMM might have failed. Contact your system administrator or maintenance personnel.
13	539	HFWRAS_SYS	Error	The %1 monitor finished.	Hardware monitoring of the RAS software has been terminated. If restarting the equipment does not resolve the error, contact the system administrator or maintenance personnel.
14	540	HFWRAS_SYS	Information	In DIMM%1, the number of single-bit errors that have been corrected since the OS started is %2 (comparison with last time: %3).	No action required.
15	541	HFWRAS_SYS	Warning	DIMM%1 might have failed.	The DIMM might have failed. Contact the system administrator or maintenance personnel.
16	769	HFWRAS_APP	Error	An error occurred in %1. Error code = %2.	An error was generated by the RAS software while the software was running. If restarting the equipment does not resolve the error, contact the system administrator or maintenance personnel.
17	771	HFWRAS_APP	Error	Because an incorrect value is specified in the registry value %1, the default value %2 is set.	If restarting the equipment does not resolve the error, contact the system administrator or maintenance personnel.
18	800	HFWRAS_SYS	Information	%1 Detailed code = %2.	A STOP error occurred. Check the error and contact the system administrator or maintenance personnel.
19	900	HFWRAS_SYS	Information	The power shutdown factor code is %1.	A power shutdown occurred. Contact the system administrator or maintenance personnel.
20	2001	HFWRAS_SYS	Error	The drive in drive bay %1 is offline because of a failure.	Read the description of abnormal temperature in 10.4.2 and take action accordingly.
21	2002	HFWRAS_SYS	Information	The RAID status is optimal.	No action required.
22	2003	HFWRAS_SYS	Error	RAS could not acquire the RAID status. The RAID status is unknown.	Contact the system administrator or maintenance personnel.
23	2004	HFWRAS_SYS	Information	The RAID status was revealed.	No action required.
24	2009	HFWRAS_SYS	Information	The drive in drive bay %1 is offline because of manual operation.	No action required.

Table 9-3 Event log entries unique to the equipment (3/3)

No.	Event ID	Source	Type	Description	Action
25	2011	HFWRAS_SYS	Information	Rebuilding of the RAID is complete, but unreadable sectors were detected on the source drive (drive bay %I). (Media error)	Read the description in 10.4.2 and take action accordingly.
26	2012	HFWRAS_SYS	Error	Rebuilding of the RAID failed due to an error on the destination drive (drive bay %I).	Read the description in 10.2.2 and build a RAID again.
27	2019	HFWRAS_SYS	Information	A media error occurred in the RAID.	See 2.8.2 <i>Note about media errors</i> in the <i>HF-W2000 Model 58/55/50 RAS FEATURES MANUAL</i> and take action accordingly.
28	2021	HFWRAS_SYS	Error	The drive on drive bay %I is offline because of mismatched data.	Read the description of 10.4.3 and take action.
29	3000	HTsfRAID_SYS	Information	The RAID status changed. (ARRAY = %I, DRIVE1 = %2, DRIVE2 = %3)	No action required.
30	3001	HTsfRAID_SYS	Information	The rebuilding process stopped. Reason: %I.	Read the description in 10.4.4 and take action. If the error code is not written in 10.4.4, contact the system administrator or maintenance personnel.
31	3010	HTsfRAID_SYS	Error	Service internal error. Reason: %I.	Contact the system administrator or maintenance personnel.

- No. 4 %1 denotes the drive bay number. %2 denotes the manufacturer and the model name of the drive.
 No. 8 %1 denotes the drive bay number.
 No.11 %1 indicates the cause of the record in message format. One of the following is recorded.

%1
The writing of debug information is not a complete memory dump.
Overwriting to an existing file is disabled.
The size of the paging file is insufficient.
No memory dump file exists or the size of the memory dump file is insufficient.

- No. 12 %1 denotes the slot number of the DIMM.
 No. 13 %1 records one of the following:
 FAN, TEMP, RMTSTDN, MEM, CPU, TEMPLOG, WDT, RAID1, RAID SMART, SMART,
 USETIME, RASLOG, INTERNAL - LOGD
 No. 14 %1 indicates the DIMM slot number. %2 indicates the total number of times that a single-bit error has been detected.
 %3 indicates the difference compared to the last time that the total number of times that a single-bit error has been detected was recorded.
 No. 15 %1 indicates the DIMM slot number.
 No. 16 %1 indicates that the feature terminated with an error. %2 denotes the error code.
 No. 17 %1 indicates that a registry key has an illegal value. %2 denotes the default value of the registry key.
 No. 18 %1 and %2 record one of the following combinations:

%1	%2
A reset signal was input.	0x9201
A PCI bus parity error occurred.	0x9202
An uncorrectable error occurred in DIMM2.	0x9217
An uncorrectable error occurred in DIMM1.	0x9218


- No. 19 %1 denotes the power shutdown factor code.
 No. 20, No. 24, No. 25, No. 26, No. 28 %1 denotes the drive bay number.
 No. 29 %1 records one of the following:
 OPTIMAL, OPTIMAL(MEDIA ERROR), DEGRADE, DEGRADE(MEDIA ERROR),
 DEGRADE(REBUILD), DEGRADE(REBUILD MEDIA ERROR)
 %2 and %3 record one of the following:
 ONLINE, OFFLINE, REBUILD, INCOMPLETE DATA, NOT CONNECTED
 No. 30 %1 denotes the rebuilding interruption factor code.
 No. 31 %1 denotes the error code.

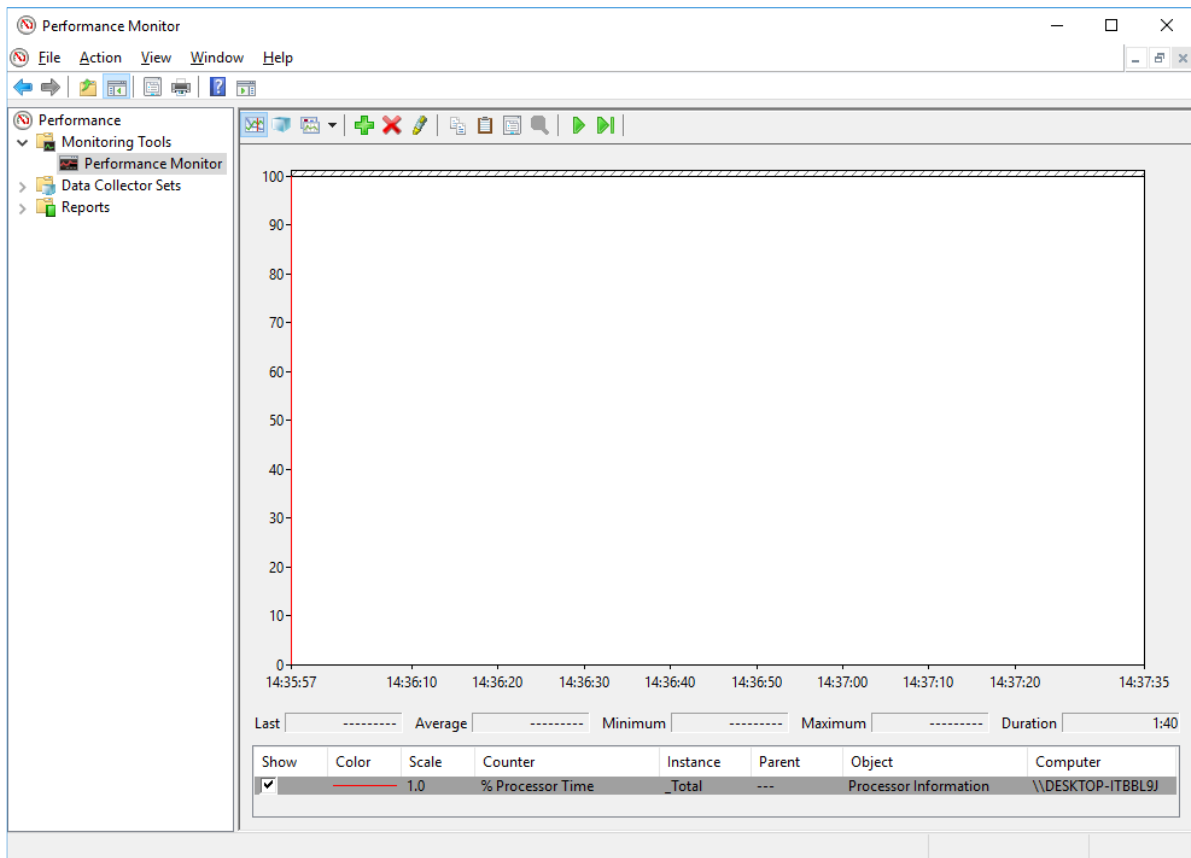
9.5 Checking the System Load by Using Performance Monitor

The Performance Monitor tool that comes with Windows® is used to monitor the usage of the CPU and memory. Use this tool when, for example, you want to analyze the system load.

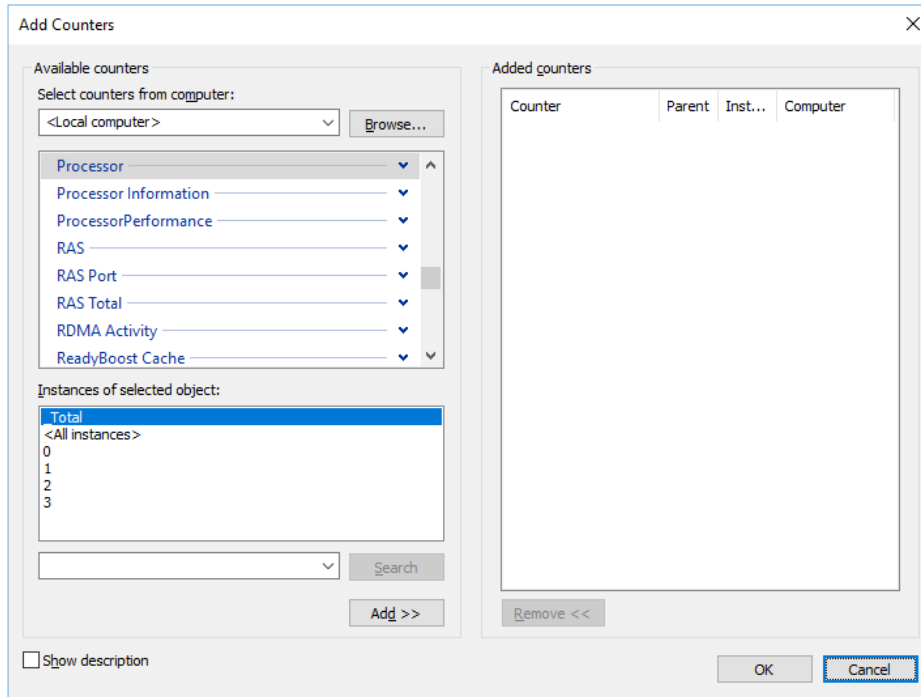
The following shows how to start Performance Monitor.

(The displayed image is Windows® 10, but is similar to other OSs.)

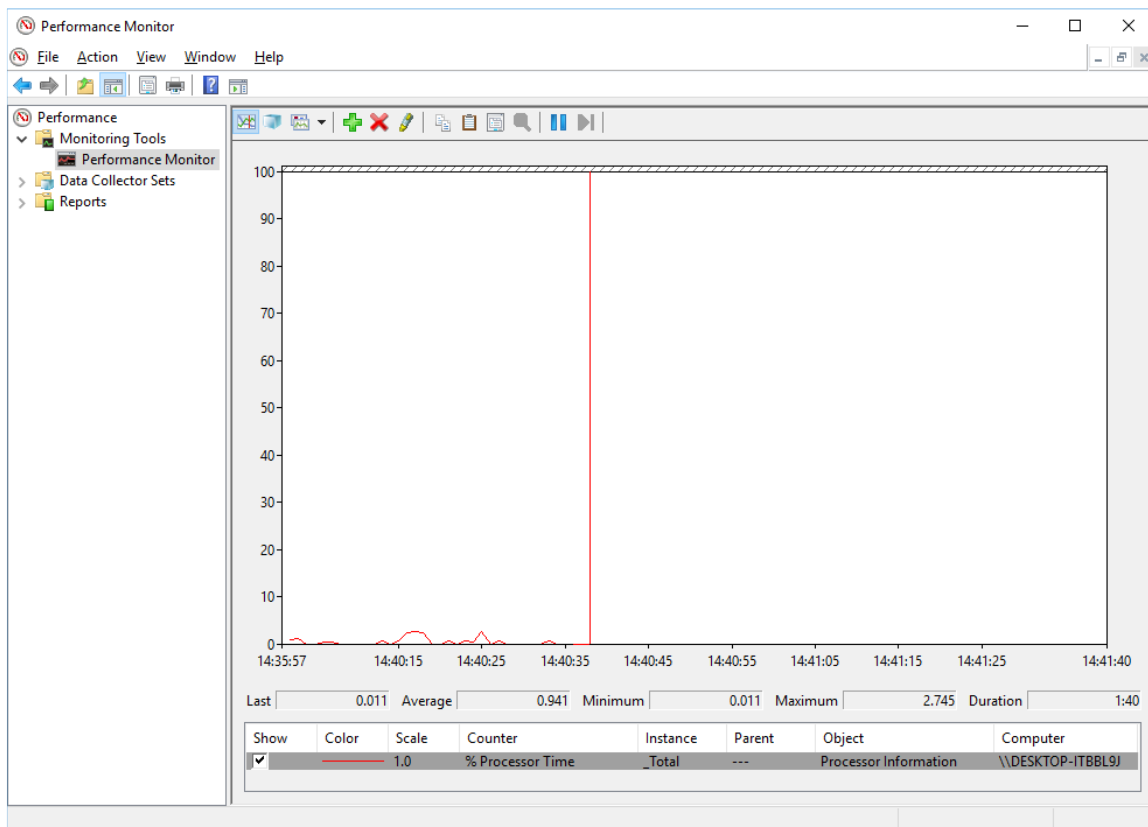
1. Click **Start, Control Panel, System and Security, and Administrative Tools.**
2. Double-click **Performance Monitor.**
3. The Performance Monitor window opens. Click **Performance Monitor** and then click .



- The **Add Counters** window opens. If you select items such as **Processor**, **Memory**, **PhysicalDisk**, or **Network Interface**, and then click **Add >>**, the performance of the selected items will be monitored. Click **OK**.



- In the Performance Monitor window, you can check the performance of the items you selected.



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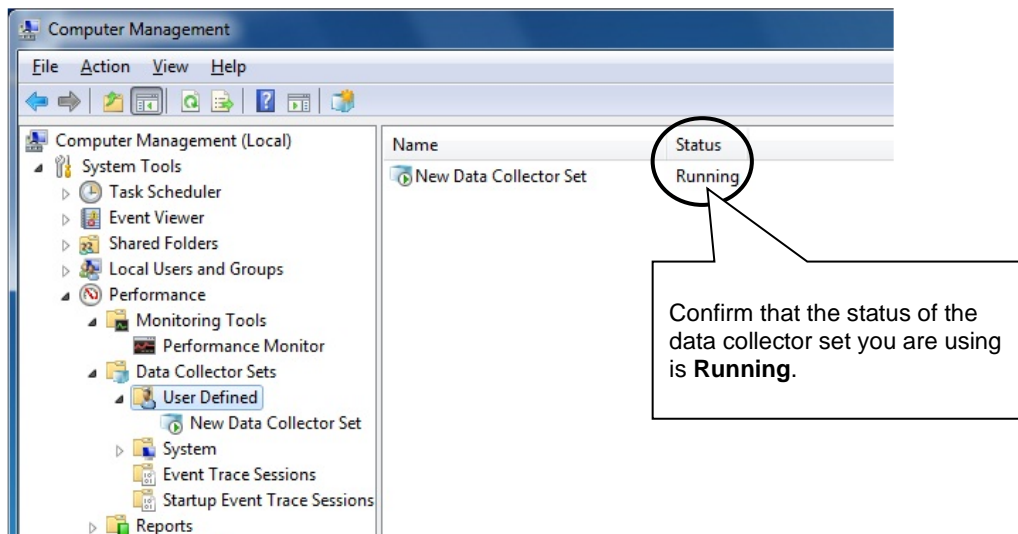
The following table shows a list of performance counters most closely related to the performance of the equipment.

Table 9-4 Performance counters related to the performance of the equipment

No.	Performance object	Counter	Description
1	Processor	%Processor Time	Shows the CPU usage. If this value is continuously high, the CPU processing power is likely to be a bottleneck.
2	Memory	Pages/sec	Indicates the number of pages per second that are read from or written to the disk to resolve page faults. If this value is high, it is likely that the amount of memory is insufficient. The closer this value is to 0, the better.
3		Available Bytes	Indicates the size of the physical memory available for processes. If this value indicates a decreasing trend, it is likely that there is a memory leak.
4		Pool Nonpaged Bytes	Indicates the size of the memory area that will never be paged out to the disk and that stays in the physical memory as long as it is allocated. If this value indicates an increasing trend, it is likely that there is a memory leak.
5	PhysicalDisk	%Disk Time	Indicates the percentage of time that the disk is busy reading and writing. If this value is continuously high, the disk performance is likely to be a bottleneck.
6	Network Interface	Bytes Total/sec	Indicates the number of bytes per second that are sent and received by the network adapter. If this value is continuously high compared to the value of No. 7, the network is likely to be a bottleneck.
7		CurrentBandwidth	Shows the network bandwidth.

NOTE

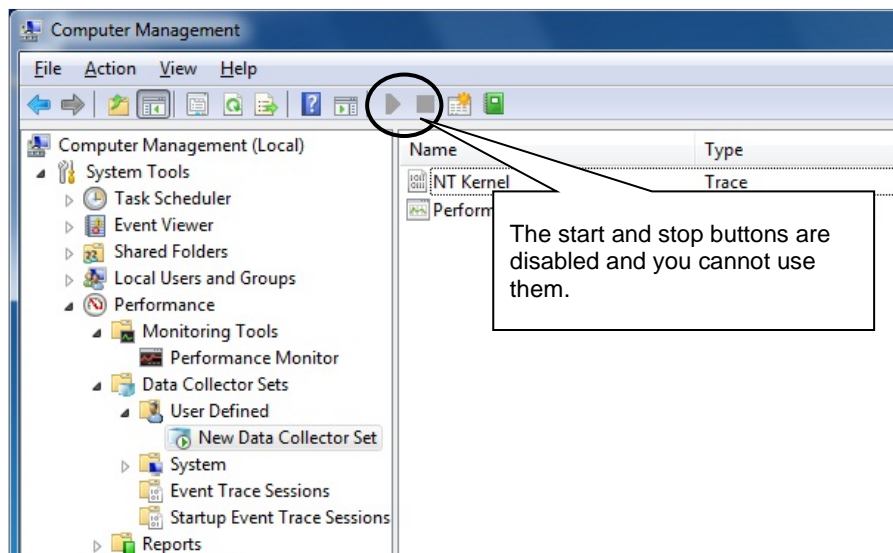
You might not be able to start collecting performance counter data when the system load is high. After you start collecting performance counter data, confirm that the status of the data collector set you are using is **Running**.



Confirm that the Performance Counter data collection has started properly.

In addition, if the system load is high or if you repeatedly start and stop collecting performance counter data, sometimes you cannot start or stop collecting performance counter data.

If this situation happens, terminate Performance Monitor, wait for a while, restart Performance Monitor, and then start collecting data again.



Performance Counter data cannot be collected.

If you cannot start collecting performance counter data even after you have restarted Performance Monitor, restart the system.

9.6 Digital LEDs for Status Indications

The digital LEDs for status indications are used to display POST codes at system startup (for the period of time from when the BIOS starts to when the OS starts). They are also used to display a hardware status code when an error occurs in the hardware during system operation.

The digital LEDs for status indications and the status indication LEDs might remain lit even after the equipment is shutdown and put into standby mode. They remain lit until the main power is shutdown or the power is turned on again.

It should be noted that the digital LEDs for status indications might display a code even when there is no error. (For example, when the BIOS screen is displayed (1F) or when the POST code is displayed from turning on the power supply unit to OS startup.)

As shown here, the numerical value lamp shows the digits from 0 to F in hexadecimal.



9.6.1 POST messages

Power On Self Test (POST) is a feature whereby the system BIOS makes routine checks for hardware failures when the power of the computer system is turned on. If any failure is found, the POST code corresponding to the location of the failure is displayed on the digital LEDs for status indications on the front of the equipment. The user is then notified via means such as having a message appear on the display or sounding a beep several times.

When a POST code is displayed, the BIOS status lamp in the status indication LEDs is lit in orange.

The following table shows the POST codes that are indicated when the system stops during startup and the respective actions for resolving them.

Table 9-5 POST codes, reasons for stopping, and actions (1/2)

POST code	Reasons for stopping and actions	POST code	Reasons for stopping and actions
A3 A5	There might be a problem with the main memory or CPU. Verify that the main memory is installed properly.	1E 21 57 F8	There might be a problem with the main memory. Verify that the main memory is installed properly.
61 83	There might be a problem with the keyboard or mouse. Verify that the cables are connected correctly and the keyboard and mouse are operating properly.		

Table 9-5 POST codes, reasons for stopping, and actions (2/2)

POST code	Reasons for stopping and actions	POST code	Reasons for stopping and actions
39 88	The video feature is not working properly. When a video card is installed in an expansion slot, make sure that the video card is installed properly.	A0 C2	The CPU might not be working properly.
5C 5E 82 F8 F9	There might be a problem with an extension board. Remove the extension board from the slot and install the board in another slot. Then, check if the extension board operates properly.	5C	There might be a problem with the boot device. Verify that the HDDs and the DVD drive are installed properly. If they are installed properly, the boot device might not be working properly.
93	There might be a problem with a serial device. Verify that serial devices are connected correctly and that the connected devices work properly.	25 38	There might be a problem with a storage medium (HDDs, USB memory, or similar). Verify that they are installed properly. If they are installed properly, the storage medium might have failed.
34 53 83 84	There might be a problem with a USB device. Verify that USB devices are connected correctly and that the connected devices work properly.	E1	The rotation of system fan 1 is abnormal. Read the description of fan failure in 9.2.2 (1) and take action accordingly.
		E2	The rotation of the CPU fan 2 is abnormal. Read the description of fan failure in 9.2.2 (1) and take action accordingly.

9.6.2 Display of hardware status codes

A hardware status code is displayed when an error occurs in the hardware during system operation.

When a hardware status code is displayed, the RAS status lamp in the status indication LEDs is lit in red.

Table 9-6 Hardware status codes and related causes and actions

Status code	Cause	Action
12	The rotation of the system fan is abnormal.	Read the description in 9.2.2 (1) and take action accordingly.
13	The rotation of the CPU fan is abnormal.	
21	The temperature is abnormal.	Read the description in 9.2.2 (1) and take action accordingly.
31	A failure is predicted for the drive in drive bay 1.	We recommend that you back up the data and replace the drive.
32	A failure is predicted for the drive in drive bay 2.	
41 ^{#1}	The drive in drive bay 1 is offline.	Replace the drive by referring to 10.4.2.
42 ^{#1}	The drive in drive bay 2 is offline.	
4C	The RAID status is unknown (the RAS software could not acquire the RAID status).	Contact your system administrator or maintenance personnel.
4D ^{#2}	A media error occurred in the RAID.	See 2.8.2 <i>Note about media errors</i> in the <i>HF-W2000 Model 58/55/50 RAS FEATURES MANUAL</i> , and take action accordingly.

#1: This code is also displayed during rebuilding.

#2: This code is not displayed when you are using the default settings. To display this code, see 2.8.2 *Note about media errors* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL*.

NOTE

If a code other than one of preceding codes is displayed, contact the system administrator or maintenance personnel.

CHAPTER 10 SOFTWARE RAID1

10.1 Overview of Software RAID1

10.1.1 What is software RAID1?

This chapter describes how to manage the software RAID1 feature of the B model.

In this chapter, *this equipment* denotes the B model. Note that only HDDs (hard disk drives) are used as a drive for this equipment. A drive is denoted simply as *HDD* in the following explanations. In addition, software RAID1 is denoted simply as *RAID1* in the following explanations.

The screenshots shown in this chapter show Windows® 10 2016 LTSC, but the displayed content is essentially the same in other OSs. In addition, the models and the capacities of HDDs might be different from those in actual implementations.

NOTICE

- Although this equipment features RAID1 and is thus more reliable than general systems, it is still vulnerable to the loss of data stored on the HDDs. Permanent data loss is caused not only by mechanical failures, but also by unexpected power failures or operational errors. To prevent such data loss, schedule data backup operations, and protect the power source from undesirable interruptions by using a UPS or other means.
- This equipment is evaluated assuming the use of the specific HDD models authorized by the manufacturer. Replace HDDs by using only the specific items specified by the manufacturer. Failure to do so might result in existing data on the HDD being lost. In addition, always observe the recommended replacement interval for HDDs (see *APPENDIX HANDLING OF REPLACEABLE COMPONENTS*).
- Each unit of equipment has its own RAID1 configuration information (such as a serial number). As such, you cannot use HDDs by swapping them even between two different units of this equipment. If you attempt to do so, unexpected operation might result from inconsistencies in the configuration information or other reasons.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- For a replacement HDD, use a brand-new HDD (an unused HDD) or an HDD to which "Initialize Drives" has been applied (see *10.6.7 Drive initialization feature*).
- Maintaining a RAID1 system requires a high level of expertise. If users make any mistakes during their work, the data stored on the HDDs might be lost.
- The capacities of drive bay 1 and drive bay 2 must be the same. Do not install HDDs that have different capacities.

10. SOFTWARE RAID1

RAID1 (Redundant Array of Inexpensive Disks Level 1) is a technology generally referred to as *disk mirroring*. RAID1 is not disk mirroring that is accomplished by the RAID controller (hardware). RAID1 constructs a system where two HDDs are combined and managed as one RAID1 system (array) by software. Should one HDD fail, you can read the correct data from the other HDD. RAID1 uses two HDDs, but the capacity available is only equal to the capacity of one HDD.

10.1.2 Features of RAID1

The RAID1 installed in this equipment has the following features.

Hot swap

This equipment supports hot swap (replacement of an HDD with the power turned on), which makes it possible to replace HDDs without stopping the system.

Rebuilding feature

This equipment can automatically or manually start rebuilding via the execution of a command after the replacement of HDDs. This equipment can also change the load of writing data to HDDs, which is applied to the system during rebuilding. These settings can be modified by the RAS software. For details about how to modify these settings, see *5.3 RAID Configuration Control Command (raidctrl) (B Model Only)* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL (WIN-63-0098)*.

Data mismatch detection feature

When a data mismatch between HDDs might have occurred due to an unexpected power interruption or for another reason, this equipment can be set to isolate or continue to operate the HDD in drive bay 2. This setting can be modified by the RAS software. For details about how to modify this setting, see *5.3 RAID Configuration Control Command (raidctrl) (B Model Only)* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL (WIN-63-0098)*.

GUI features

This equipment can graphically display the HDD status of RAID1 by using the RAS software. For details about how to use the RAS software, see *4.1 Hardware Status Window* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL (WIN-63-0098)*.

Offline rebuilding feature

This equipment can rebuild RAID1 while the OS is deactivated through the use of a dedicated tool. Because rebuilding is possible with the OS deactivated, the system can be recovered more quickly than by rebuilding with the OS running.

10.2 Setup

10.2.1 Overview of Setup

The RAID1 device driver used for RAID1 on this equipment enables the OS to recognize two HDDs connected to this equipment as one HDD, and is responsible for data processing associated with mirroring. The RAID1 device driver is already installed when the product is shipped, and you do not need to install it when you set up RAID1.

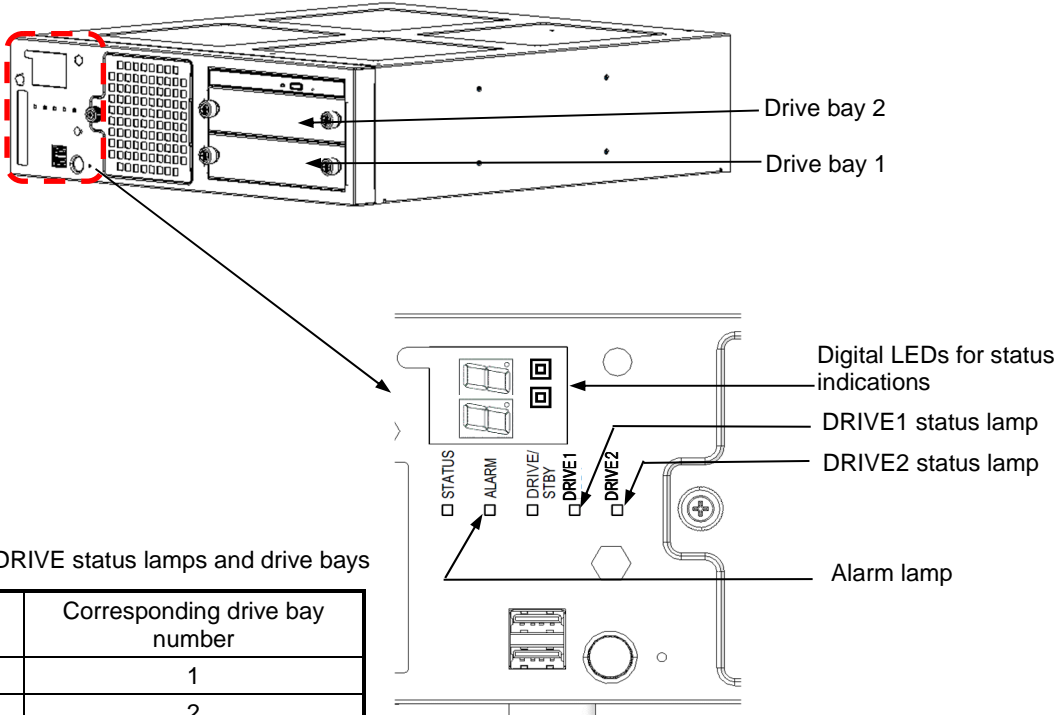
10.2.2 Setting up a new RAID1 configuration

To set up a new RAID1 configuration, you need to restore the shipping status of the system by using the recovery DVD. Restore the shipping status by referring to *CHAPTER 7 RESTORING THE FACTORY-SHIPPED CONDITION BY USING A RECOVERY DVD*.

10.3 Checking the RAID1 Status

10.3.1 Checking by using the status lamps

This equipment has drive status lamps (a DRIVE1 status lamp and a DRIVE2 status lamp) as shown in the following figure. These lamps show the status of each HDD in the RAID1 system.



Correspondence between DRIVE status lamps and drive bays

Lamp name	Corresponding drive bay number
DRIVE1 STATUS	1
DRIVE2 STATUS	2

Meaning of the DRIVE status lamps

DRIVE status lamp display (red)	Status of the HDDs
Off (both)	Both HDDs are operating normally.
On (either one)	One HDD has an error. (The power of the HDD with an error is off.)
Blinking (either one)	Rebuilding (copying) is ongoing. (Only the lamp of the copy destination HDD blinks.)
Blinking (both)	Both HDDs have errors (including errors in the configuration information).

Figure 10-1 DRIVE status lamps

10.3.2 Checking by using the Hardware status window

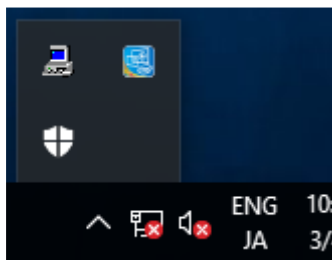
The HDD status of RAID1 can be checked in the Hardware status window of this equipment. To open the Hardware status window, double-click the hardware status icon in the notification area of the task bar.



Note: This icon is not shown in the notification area of the task bar by default, but rather appears when a user clicks the arrow next to the notification area.

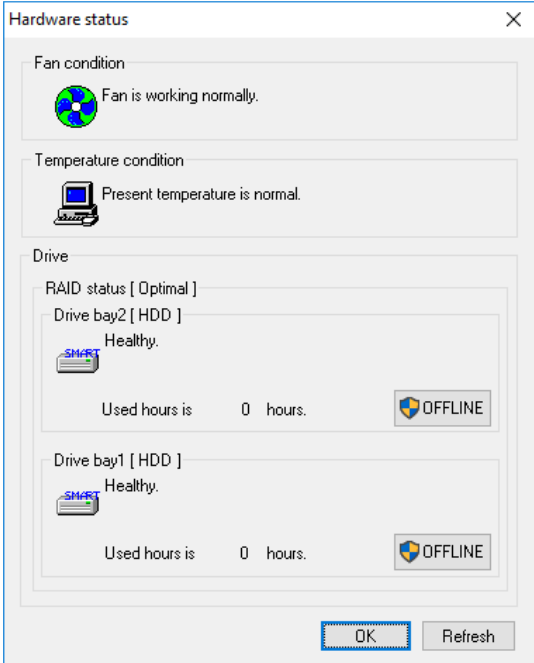
You can furthermore perform the following procedure to specify settings to show the icon in the notification area of the task bar.

1. Right-click the task bar.
2. From the displayed menu, click **Settings** (in Windows® 10 2019 LTSC, click **Taskbar settings**).
3. Click **Select which icons appears on the taskbar** (in Windows® 10 2019 LTSC, click **Select which icons appear on the taskbar**).
4. Set the icon for **envdisp MFC Application** to on.



When both HDDs are normal, the hardware status appears as follows.

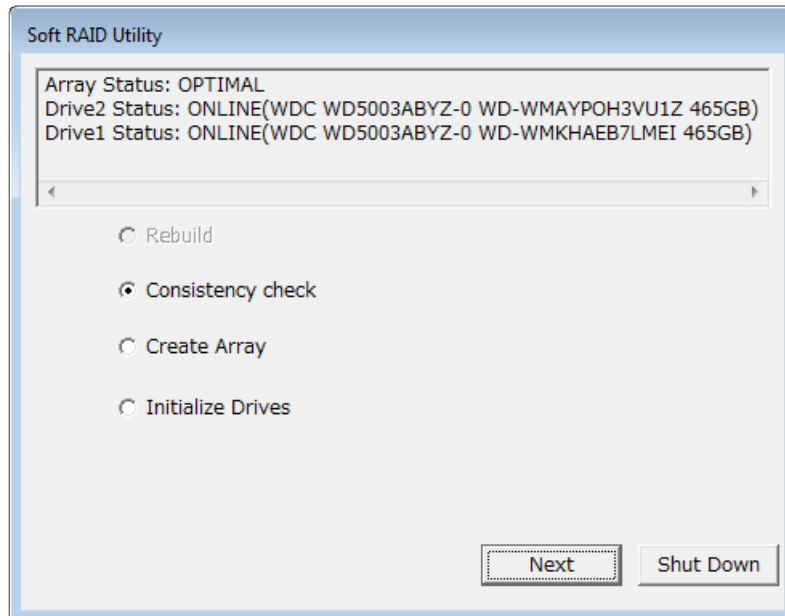
Hardware status window



Note: In the RAS software, the HDD and other auxiliary storage devices are generally called *drives*.

10.3.3 Checking by using the software RAID utility

You can check the RAID status by using the software RAID utility, which is attached this equipment.
For details about how to use the software RAID utility, see *10.6 Software RAID Utility*.



10.4 Recovering from a Failure

10.4.1 Detecting a failure

When a failure is detected in the RAID1, the following actions are executed by this equipment.

Table 10-1 List of actions when a RAID1 failure is detected

No.	Action	Cause
1	The DRIVE status lamp lights in red.	HDD failure (either in one or both drives)
2	The digital LEDs for status indications indicate an output message. (See 9.6.1 <i>POST messages</i> and the <i>HF-W2000 Model 58/55/50 RAS FEATURES MANUAL</i> .)	
3	The alarm lamp lights in red.	HDD failure (either drive)
4	The MCALL external contact (maintenance personnel call signal) is closed. (See 5.8.2 <i>External contact specifications</i> .)	
5	Data is recorded by using the event log. (See 9.4 <i>Event Log</i> .)	
6	The HDD status of RAID1 is displayed in the Hardware status window. (See 4.1.3 <i>Hardware status window</i> in the <i>HF-W2000 Model 58/55/50 RAS FEATURES MANUAL</i> .)	

NOTE

If a RAID1 failure is detected in this equipment, degradation operations are performed for one of the HDDs. When the equipment starts up for the first time after this migration to degradation operations, you might need to restart the equipment again to fully ensure that startup from the failed HDD is suppressed.

The following describes how to recover from each type of failure and how to handle problems that occur during recovery work.

10.4.2 Recovery from a failure in one HDD

NOTICE

- Never remove an HDD when the DRIVE status lamp of the HDD is off. Doing so might corrupt the data stored on the HDD.
- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- Install HDDs securely. Loose contacts or missing screws might result in failure.
- During replacement, do not subject an HDD that you are replacing or an HDD that is already installed to shocks. Subjecting an HDD to shocks might result in drive failure.
- Until rebuilding is complete, avoid shutting off the power to this equipment or installing and removing HDDs. Performing these actions might result in data on the HDDs being lost or a failure.

To recover from a failure in one HDD, perform the following procedure.

To recover from the backup HDD, see *10.5.2 Recovery by using a backup HDD*.

(1) Rebuilding with the OS running

NOTE

- This equipment can change the load on HDDs when writing data, which is applied to the system during rebuilding. When changing these settings, consider the effect on system operations during rebuilding. The default setting is HIGH, which enables the rebuilding process with a high load. Specifying a lower writing load requires more time for rebuilding. The following are guidelines for the rebuilding time required for a 1 TB HDD with no load.
 - When the load is set to HIGH: 3 hours
 - When the load is set to MIDDLE: 13 hours and 30 minutes
 - When the load is set to LOW: 30 hours
- The default setting allows rebuilding to start automatically when an HDD is replaced. If you want to manually start rebuilding, change the setting in advance before starting work.

For details about changing the default settings, see *5.3 RAID Configuration Control Command (raidctrl) (B Model Only)* in the *HF-W2000 Model 58/55/50 RAS FEATURES MANUAL (WIN-63-0098)*.

(a) Replacing an HDD with the equipment turned on

1. Back up your data.

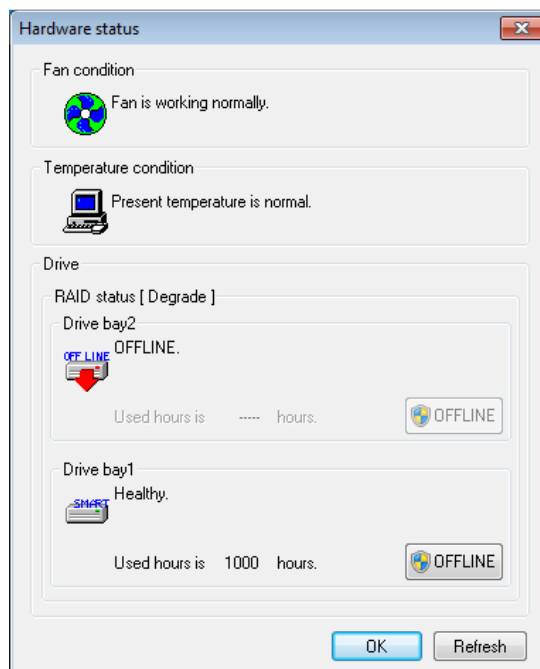
(See (2) *Backing up files* in 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.)

2. Close all running applications.

3. Double-click the hardware status icon shown in the notification area of the taskbar to open the Hardware status window. In the Hardware status window, check for defective HDDs.



Hardware status window



Verify that the DRIVE1 status lamp is lit.

Note that the DRIVE1 status lamp might take 20-30 seconds or more to light up.

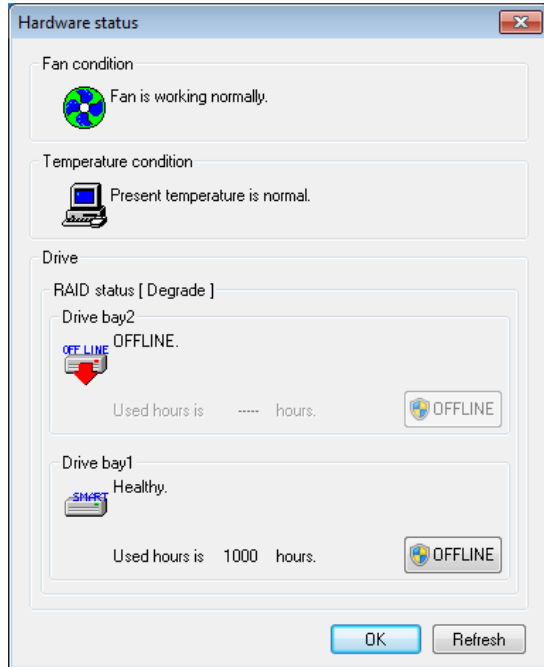
4. Remove the defective HDD from the equipment.

(See 6.3.6 *Installing and removing an HDD or SSD*.)

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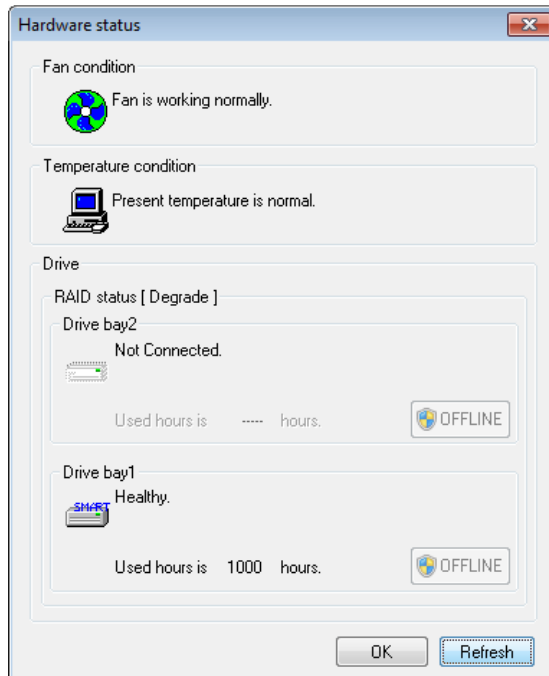
5. In the Hardware status window, click **Refresh** and verify that the HDD status of the drive bay from which the HDD was removed appears as **Not mounted**. If **Not mounted** is not shown, wait a while, and then click **Refresh** again and check whether **Not mounted** appears.

Hardware status window



Click **Refresh**.

Hardware status window



NOTE

If an HDD for replacement is installed in the equipment before **Not mounted** appears, the HDD might not be recognized. Wait until **Not mounted** appears.

6. Install the replacement HDD in the equipment.

(See 6.3.6 *Installing and removing an HDD or SSD*.)

The DRIVE status lamp blinks after a while and RAID1 rebuilding starts.

Starting the rebuilding manually

When the drive bay in which the replacement HDD is installed appears as **OFFLINE** in the Hardware status window, enter the following command at the command prompt as an administrator:

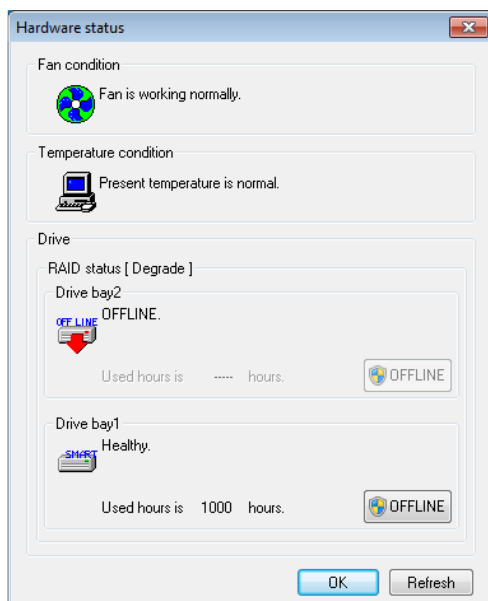
```
C:\> raidctrl /REBUILD
```

The DRIVE status lamp blinks after a while, and RAID1 rebuilding starts.

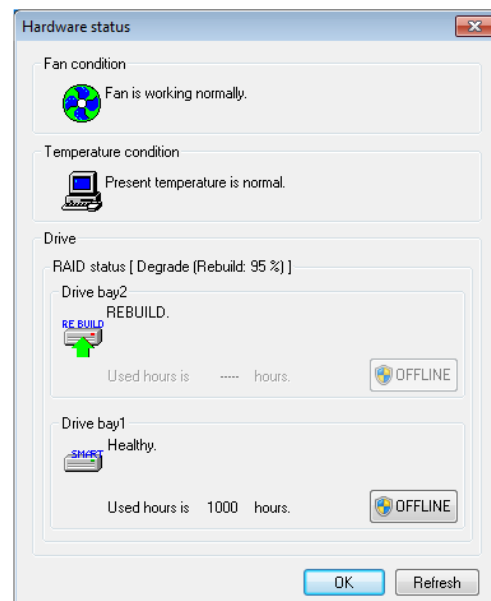
NOTE

- If rebuilding does not start after about three minutes, the HDD or the equipment might be defective, or an HDD that was used as a RAID1 array in other equipment might be installed. See 10.4.4 *When a problem occurs during recovery*.
- After the HDD has been installed in the equipment, the drive bay status in the Hardware status window is as follows until rebuilding is complete.

However, **OFFLINE** might not appear immediately after the HDD is installed.



Immediately after the HDD is installed

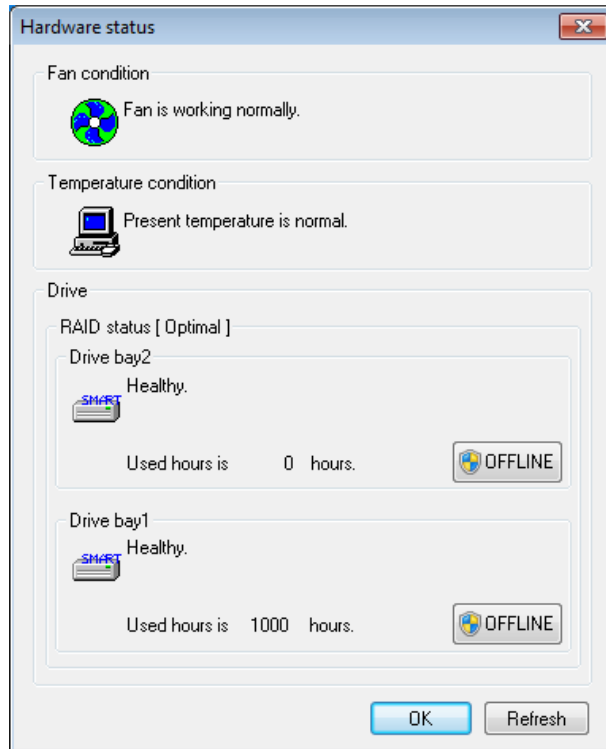


Rebuilding in progress

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- When rebuilding is complete, the HDD status lamp turns off and RAID1 is restored. In the Hardware status window, click **Refresh** and verify that the RAID status is shown as **Optimal** and the HDD status of the drive bay where the HDD was replaced is shown as **Healthy**.

Hardware status window (Normal)



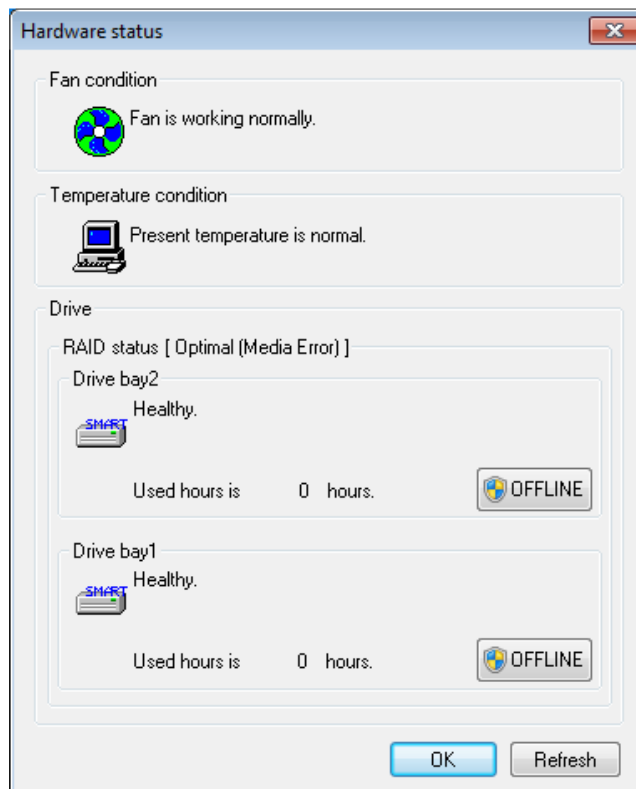
NOTE

- If the RAID status is shown as **Optimal (Media Error)** after rebuilding is complete, we recommend that you back up the data and then also replace the copy source HDD with a new one. (For the replacement procedure, see 6.3.6 *Installing and removing an HDD or SSD.*)

After both HDDs have been replaced, set up the equipment again and restore data from the backup file. (For details about how to set up the equipment again, see 10.2.2 *Setting up a new RAID1 configuration.*)

Alternatively, recover the equipment by using a backup HDD. (See 10.5.2 *Recovery by using a backup HDD.*)

Hardware status window (Media Error)



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(b) Replacing an HDD with the equipment turned off

1. Back up your data.

(See (2) *Backing up files* in 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.)

2. Shutdown the OS and unplug the power cord. Wait for at least one minute, and then replace the defective HDD with a new one.

(See 6.3.6 *Installing and removing an HDD or SSD*.)

3. After the equipment turns on and the OS starts running, installation of the replacement HDD is automatically detected and rebuilding starts. Verify that the DRIVE status lamp of the replaced HDD is blinking.

Starting the rebuilding manually

When the drive bay in which the replacement HDD is installed is shown as **OFFLINE** in the Hardware status window, enter the following command at the command prompt as an administrator.

```
C:\> raidctrl /REBUILD
```

The DRIVE status lamp blinks after a while and RAID1 rebuilding starts.

4. When the DRIVE status lamp turns off, rebuilding is complete. In the Hardware status window, verify that the status of both HDDs is normal.

NOTE

If the RAID status is shown as **Optimal (Media Error)** after rebuilding is complete, we recommend that you back up your data and then also replace the copy source HDD with a new one. (For the replacement procedure, see 6.3.6 *Installing and removing an HDD or SSD*.)

After both HDDs have been replaced, set up the equipment again and restore the data from the backup files. (For details about how to set up the equipment again, see 10.2.2 *Setting up a new RAID1 configuration*.)

Alternatively, recover the equipment by using a backup HDD. (See 10.5.2 *Recovery by using a backup HDD*.)

(2) Rebuilding with the OS deactivated

NOTE

Use the recovery DVD "HITACHI HJ-205x-***B Product Recovery DVD" to enable rebuilding with the OS deactivated. Prepare this DVD before starting your work.

(The text indicated by the underlined asterisks (***) in the name of the DVD varies depending on the equipment you are using.)

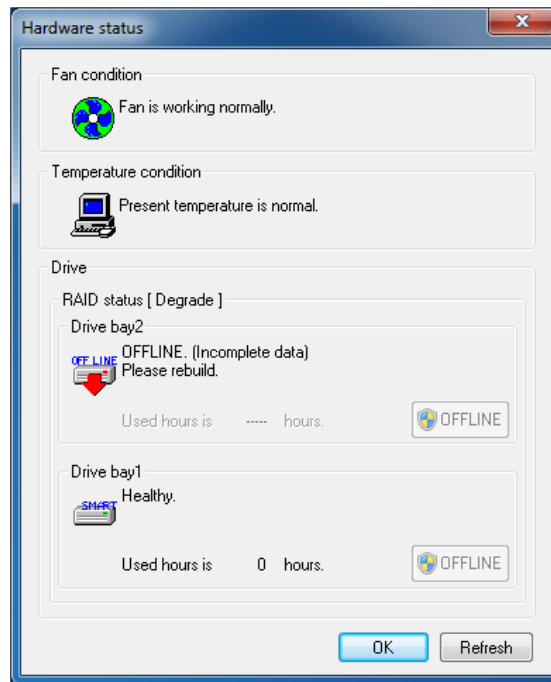
1. Back up your data.
(See (2) *Backing up files* in 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.)
2. Shutdown the OS and unplug the power cord. Wait for at least one minute, and then replace the defective HDD with a new one.
(See 6.3.6 *Installing and removing an HDD or SSD*.)
3. Perform rebuilding by using the software RAID utility by referring to 10.6.2 *Starting and exiting the software RAID utility* and 10.6.4 *Rebuilding feature*.
4. After rebuilding is complete, run the OS and verify that the status of both HDDs is normal in the Hardware status window.

10.4.3 Recovery from a power failure while the system is operating

NOTE

Use the following procedure only to disconnect the HDD in drive bay 2 in consideration of possible data inconsistency between HDDs.

If a power failure occurs while the system is operating, the possibility of a data inconsistency between HDDs is detected and the drive bay status in the Hardware status window appears as follows:



In this case, the HDD in drive bay 2 can be used continuously without being replaced.

Perform the following procedure to recover from this state:

1. Back up your data.
(See (2) *Backing up files* in 4. *Hard Disk Drives (HDDs) and Solid State Drives (SSDs)* in *PRECAUTIONS*.)
2. Execute the following command at the command prompt as an administrator:
C:\> raidctrl /REBUILD
3. The HDD status lamp blinks after a while and RAID1 rebuilding starts.
4. When the DRIVE status lamp turns off, rebuilding is complete. In the Hardware status window, verify that the status of both HDDs is normal.

NOTE

Rebuilding is also enabled by using the software RAID utility. To rebuild RAID1 by using the software RAID utility, see 10.6.4 *Rebuilding feature*.

10.4.4 When a problem occurs during recovery

(1) Rebuilding does not start

Possible causes of this problem are as follows:

- The RAID1 does not detect the connection of the HDD.
- The setting to start manual rebuilding is specified.
- A used HDD was installed as the replacement HDD.

1. In the Hardware status window, verify that the status of the installed HDD is shown as **OFFLINE**. If a replacement HDD is installed before **Not Connected** appears, remove the HDD and verify that **Not Connected** appears. Then, install the replacement HDD again.

2. Enter the following command at the command prompt as an administrator, and check the settings to see if manual rebuilding is able to start:

```
C:\> raidctrl /MANUAL
```

If Manual Rebuild:ON appears, enter the following command to start rebuilding:

```
C:\> raidctrl /REBUILD
```

3. Check whether the event log (event ID: 3001, source: HTsfRaid_SYS) of the RAID1 is recorded by referring to the System category of the event log. If information was recorded in the event log, take the following actions according to the error codes given in the event log.

- Error code = 0x0504310* (where * is an arbitrary value)

An HDD that was used for RAID1 might be installed. Check whether a defective HDD is installed. If an HDD that was used as a backup HDD is installed, replace the backup HDD with a new one, and then restart recovery in the same way as described in *10.4.6 Recovering a normal HDD that was set to offline by mistake*.

- Error code = other than 0x0504310* (where * is an arbitrary value)

Access to the installed HDD might have failed. Check the status of the HDD.

(2) A blue screen (0x9502) occurs during OS startup after an HDD is replaced

The HDD might have been used as a RAID1 array in other equipment. Use a brand new or new HDD.

10.4.5 Recovery from a failure in both HDDs

After you replace both HDDs, set up the equipment again (see *10.2.2 Setting up a new RAID1 configuration*), and then recover the data from the backup files.

Alternatively, recover the equipment by using a backup HDD. (See *10.5.2 Recovery by using a backup HDD.*)

10.4.6 Recovering a normal HDD that was set to offline by mistake

On this equipment, RAID1 keeps track of all HDDs that have been set to offline (hereinafter referred to as *offline HDDs*) for any reason. Therefore, an offline HDD cannot be used within equipment that sets the HDD to offline. As an exception, however, if a normal HDD is set to offline by mistake or if an HDD is set to offline by the RAS software for evaluation of the equipment, the following action can restore the offline HDD, and allow it to be used as a new HDD again.

NOTICE

- If you apply the recovery method for an offline HDD to an HDD that was set to offline by something other than the RAS software, the HDD might not be recovered, or even if it is recovered, the HDD might not work properly.
- Use the recovery method for an offline HDD only to evaluate the equipment. If you apply the recovery method for an offline HDD to equipment actually used in the field, for example, a system in normal operation, malfunctions such as data loss might result.
- If an HDD is automatically set to offline by the equipment, the HDD might have failed. Do not apply the recovery method for an offline HDD to such an HDD.
- An HDD recovered by using the recovery method for an offline HDD must not be used for equipment actually used in the field. If it is, malfunctions such as data loss might result.

1. Shutdown the OS and unplug the power cord. Then, wait for at least one minute and remove the normal HDD. Record the drive bay number of the removed HDD.
2. Install only the offline HDD.
3. Initialize the offline HDD by using the software RAID utility. See *10.6.2 Starting and exiting the software RAID utility* and *10.6.7 Drive initialization feature*.
4. Wait for about one minute, and then install the offline HDD and the normal HDD removed in step 1 in the original HDD drive bay. (Check the recorded drive bay number to ensure that the installation location is correct.)

The offline HDD can now be used as a new HDD again.

10.5 Preventive Maintenance

10.5.1 Creating a backup HDD

NOTICE

- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.

RAID1 is more reliable compared to a system with a conventional configuration. Even so, the data stored on the HDDs might be lost due to human error or other reasons.

If you create a backup HDD, you can recover from such data losses.

(Note that you can only restore to the point of the backup.) We recommend that you prepare a brand-new HDD or another properly prepared HDD for the backup, and use it to back up data periodically. To create a backup HDD, perform the following procedure:

NOTE

- If you want to reuse a previously used backup HDD as a replacement HDD, you must apply "Initialize Drives" to the used backup HDD. (See *10.6.7 Drive initialization feature*.)
- When a replacement HDD is installed, its capacity must be the same as the capacity of the drive in backup HDD.
- The following is the procedure for the HDD installed in drive bay 1. If you are making a backup HDD from the HDD installed in drive bay 2, interpret "drive bay 1" as "drive bay 2".

1. Shutdown the OS and unplug the power cord, and then wait for at least one minute. Then, replace the HDD installed in drive bay 1 with a replacement HDD.
(See *6.3.6 Installing and removing an HDD or SSD*.)
2. Store the removed HDD in a safe place as a backup HDD.
3. Turn on power to the equipment. RAID1 automatically detects that a brand-new HDD is installed and starts the rebuilding process. Verify that the DRIVE1 status lamp is blinking.
4. The OS starts while the rebuilding process continues. The time required for the rebuilding process depends on what applications are executed during this period.
If you do not want to start the OS, rebuild the system by using the software RAID utility.
5. When the DRIVE1 status lamp turns off, the rebuilding process is complete. In the Hardware status window, verify that the status of both HDDs is normal.

10.5.2 Recovery by using a backup HDD

NOTICE

- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.

Prepare a backup HDD and a brand-new HDD, or a new HDD on which "Initialize Drives" has been performed. Then, recover the array by performing the following procedure. For details about installing or removing an HDD, see *6.3.6 Installing and removing an HDD or SSD*.

NOTE

- The following is the procedure for the HDD installed in drive bay 1. If you are making a backup HDD from the HDD installed in drive bay 2, interpret "drive bay 1" as "drive bay 2".
 - When a brand-new HDD or a new HDD is installed, its capacity must be the same as the capacity of the backup HDD.
1. Shutdown the OS and unplug the power cord. If HDDs are installed, remove both HDDs.
 2. Install a backup HDD in drive bay 1 and install a brand-new HDD or a new HDD in drive bay 2.
 3. Turn on power to the equipment. The RAID1 automatically detects a brand-new HDD or a new HDD, and starts rebuilding the system.
When the rebuilding starts, the DRIVE2 status lamp blinks.
 4. The OS starts while the rebuilding process continues. The time required for the rebuilding process depends on what applications are executed during this period.
If you do not want to start the OS, start the rebuilding process by using the software RAID utility.
 5. When the DRIVE2 status lamp turns off, the rebuilding process is complete. In the Hardware status window, verify that the status of both HDDs is normal.

10.5.3 Periodically replacing HDDs

NOTICE

- Wear cotton gloves when replacing an HDD to prevent problems caused by static electricity. Not doing so might result in corruption of the data stored on the HDD.
- Verify correct procedures before starting work. Failure to follow the correct procedures might result in data stored on an HDD being lost.
- Do not use an HDD previously used in any model as a replacement HDD. If you do, this equipment might not operate properly or the data on the HDDs might be lost because of configuration information mismatches or other reasons.
- Do not replace two HDDs at the same time. Doing so might result in data corruption.
- When replacing an HDD, set the HDD to offline mode in the Hardware status window, and then remove the HDD and install the replacement HDD. Installing or removing an HDD when the hardware status is not verifiable, for example, immediately after the OS starts, might result in a failure.

An HDD must be replaced periodically. (For information about the recommended replacement cycle, see *APPENDIX HANDLING OF REPLACEABLE COMPONENTS*.)

Perform the following procedure for periodic replacement.

Note: The following is the procedure for replacing the HDD installed in drive bay 1. When you are replacing the HDD installed in drive bay 2, interpret "drive bay 1" as "drive bay 2" and the "DRIVE1 status lamp" as the "DRIVE2 status lamp" when following the procedure.

(1) Replacing the HDD while the power to the equipment is turned off

1. Back up the data.
2. Shutdown the OS. Unplug the power cord, and wait for at least one minute. Then, replace the HDD installed in drive bay 1 with a replacement HDD. (See *6.3.6 Installing and removing an HDD or SSD*.)
3. Turn on power to the equipment. The RAID1 automatically detects that the replacement HDD is installed and starts the rebuilding process. Verify that the DRIVE1 status lamp is blinking.
4. The OS starts while the rebuilding process continues. The time required for the rebuilding process depends on what applications are executed during this period.
If you do not want to start the OS, start the rebuilding process by using the software RAID utility.
5. When the DRIVE1 status lamp turns off, the rebuilding process is complete. In the Hardware status window, verify that the status of both HDDs is normal.

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- (2) Replacing the HDD while the power to the equipment is turned on

NOTE

You need to have administrator privileges to execute step 3. Log on to the equipment as an administrator account and click **OFFLINE**. If User Account Control (UAC) is enabled, in a confirmation message, click **Yes**. The User Account Control window is displayed. Then click **Continue**.

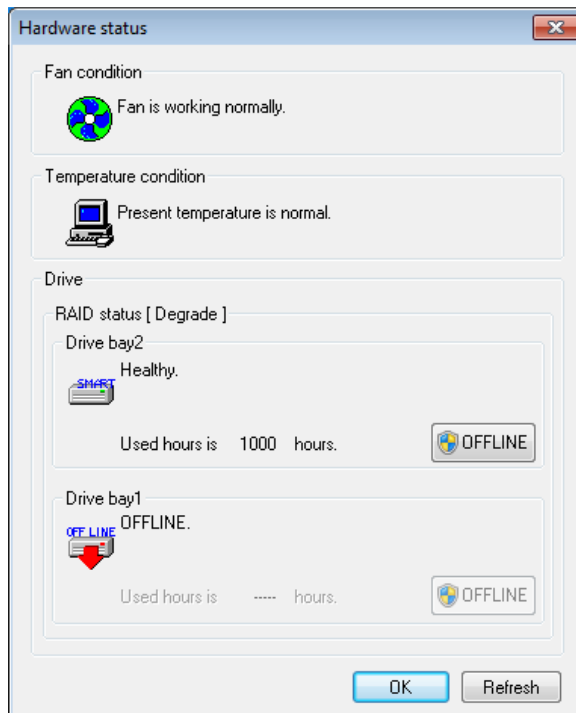
Note that if User Account Control (UAC) is disabled and a user without administrator privileges clicks **OFFLINE**, the HDD is not disconnected.

1. Back up your data.
2. Close all running applications.
3. Double-click the hardware status icon on the notification area of the taskbar.

The Hardware status window appears. In the Hardware status window, under **Drive bay1**, click **OFFLINE** to set the HDD to offline mode.



Hardware status window



Verify that the DRIVE1 status lamp is on.

It might take 20-30 seconds or more for the DRIVE1 status lamp to turn on.

4. Execute steps 4 through 7 in *10.4.2(1)(a) Replacing an HDD with the equipment turned on* to rebuild the array.

10.5.4 Data matching

As a result of HDD deterioration over time or another reason, defective blocks are generated that might cause some data on the HDD to become unreadable. Potential failures in the rebuilding process when recovering the system from degradation can be reduced by regularly performing HDD matching (HDD data consistency checks). Use the software RAID utility to perform HDD matching. Perform HDD matching by referring to *10.6.5 Consistency check feature*.

10.6 Software RAID Utility

10.6.1 Overview of the software RAID utility

The software RAID utility is used to check the RAID1 status while the OS is not running, and to rebuild RAID1.

The software RAID utility is included as one of the recovery DVD features.

The software RAID utility provides the following features.

(1) RAID1 status display

This feature displays the current RAID1 status. The RAID1 status is shown in the menu window in the software RAID utility startup process.

(2) RAID1 rebuilding feature

This feature rebuilds RAID1. Rebuilding with the OS inactive can be completed earlier than rebuilding with the OS running. Use this feature when you do not want to run the OS or to reduce the maintenance time.

(3) Consistency check feature

This feature checks the consistency of the data in all areas of the HDDs in drive bay 1 and drive bay 2. Use this feature for periodic inspection to enhance the availability of the equipment.

(4) Array creation feature

This feature edits the RAID1 management information of the HDDs, and creates an array by using two HDDs. Use this feature to restore backup data by using commercially available backup software.

(5) Drive initialization feature

This feature initializes the configuration information of the HDD that was used in RAID1, effectively creating a new HDD. Use this feature when reusing an HDD that has been used as a backup HDD, when a normal HDD is set to offline by mistake, and for other purposes.

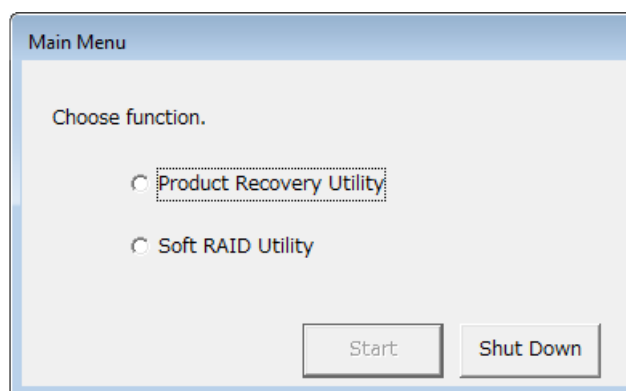
10.6.2 Starting and exiting the software RAID utility

Perform the following procedures to start and exit the software RAID utility.

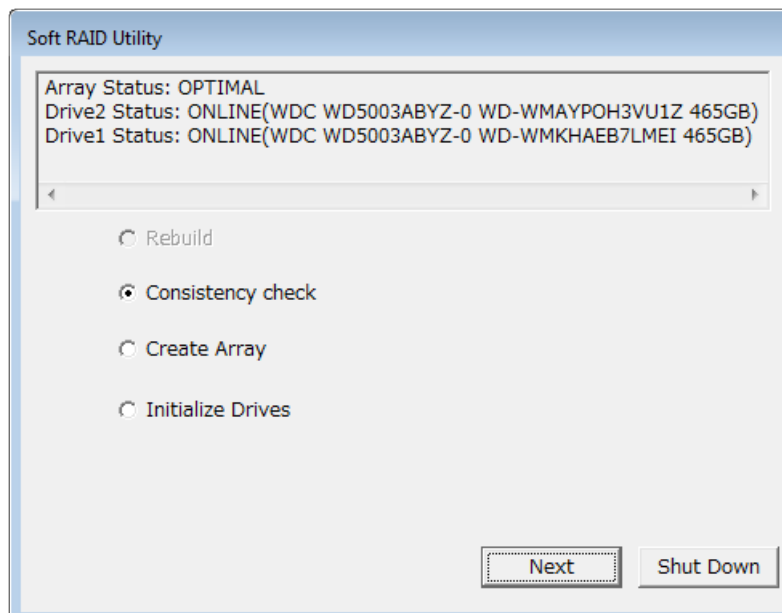
(1) To start the software RAID utility:

1. Turn on the equipment and place the first disc (disc number: 1/2) of the supplied HITACHI HJ-205x-***B Product Recovery DVD in the DVD drive before the OS starts running. (The text indicated by the underlined asterisks (***) in the name of the DVD varies depending on the equipment you are using.)
2. After the software RAID utility runs from the recovery DVD, the following window opens.

Note: If this utility fails to run from the recovery DVD, turn off the equipment, and then turn the equipment on again.

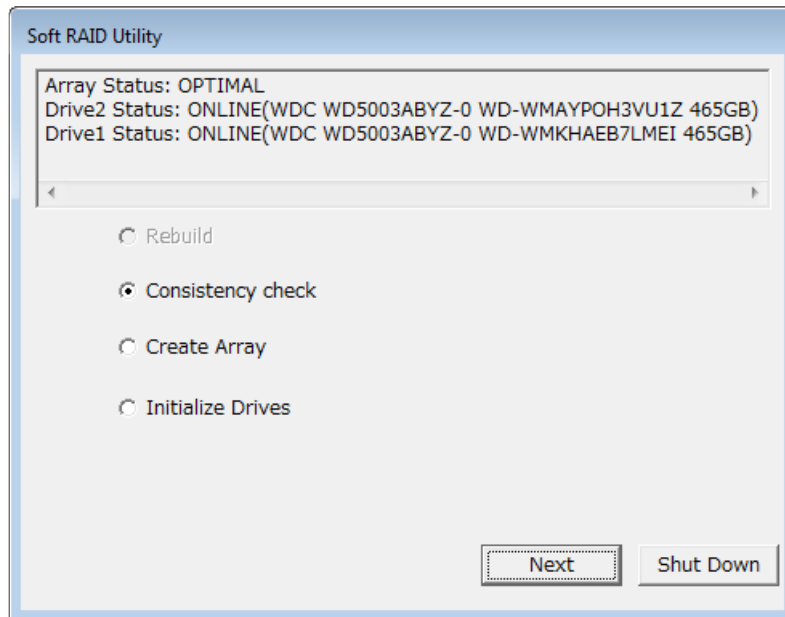


3. Select the **Soft RAID Utility** radio button, and then click **Start**. The Soft RAID Utility menu window opens.

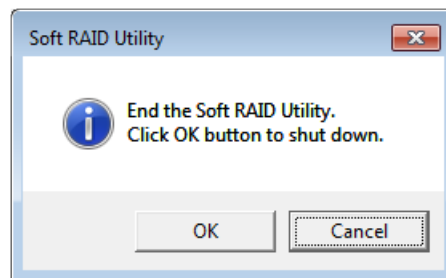


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- (2) To exit the software RAID utility:
 1. Display the Soft RAID Utility menu window.



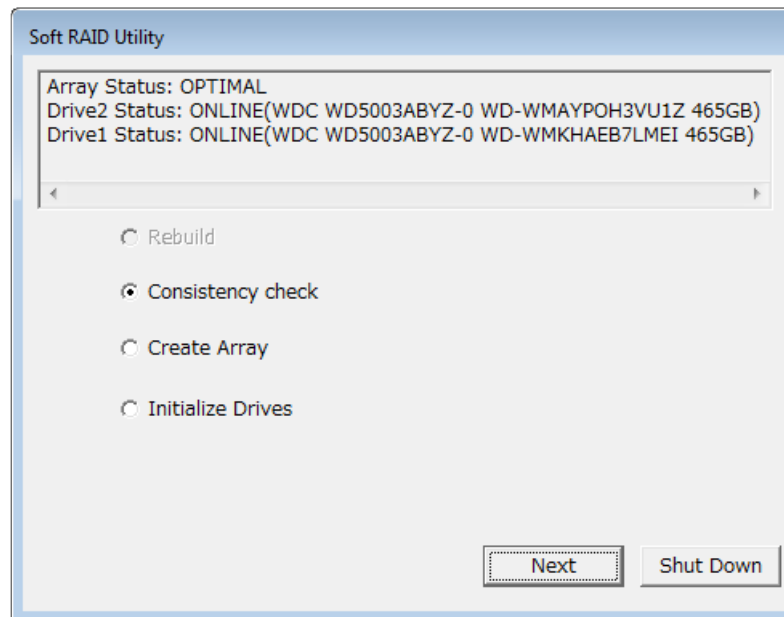
2. Click **Shut Down**. The following confirmation dialog box appears:



3. Click **OK**. The disc is ejected from the DVD drive and the equipment shutdown.

10.6.3 Status display feature

The status display feature displays the current RAID1 status. The RAID1 status is shown in the menu window of the software RAID utility startup process.



This feature displays the information shown in the following table.

Table 10-2 Array status and drive status

Item	Value	Meaning
Array Status	OPTIMAL	The array has redundancy and both drives are working in the ONLINE state.
	OPTIMAL (MEDIA ERROR)	A media error is present in the OPTIMAL state.
	DEGRADE	The array does not have redundancy and is in degraded operation. One of the drives is working in the ONLINE state.
	DEGRADE (MEDIA ERROR)	A media error is present in the DEGRADE state.
	UNKNOWN	The array status is unknown. The drive status is unknown, or no array has been created.
Drive1 Status Drive2 Status	ONLINE	Drives are working normally.
	OFFLINE	Disconnection occurred (due to an HDD failure).
	NOT CONNECTED	No drive is installed in the drive bay.
	NEW	A new drive that has not been used with the B model is installed.
	REBUILD	Rebuilding is in progress.
	INCOMPLETE DATA	A disconnection occurred as a result of a data mismatch due to a power failure or reset.
	ERROR	A drive failed during access.

10.6.4 Rebuilding feature

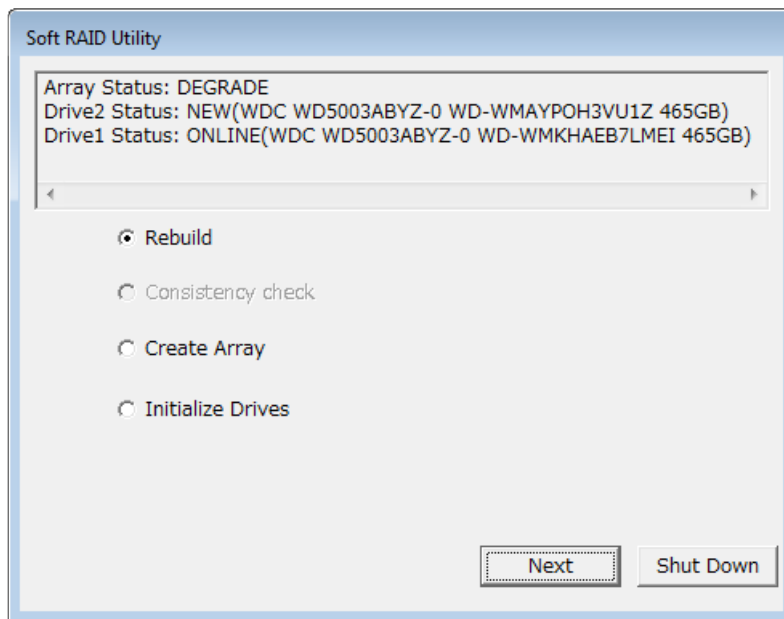
The rebuilding feature rebuilds RAID1. Rebuilding with the OS inactive can be completed earlier than rebuilding with the OS running. Use this feature when you do not want to run the OS or to reduce maintenance time.

NOTE

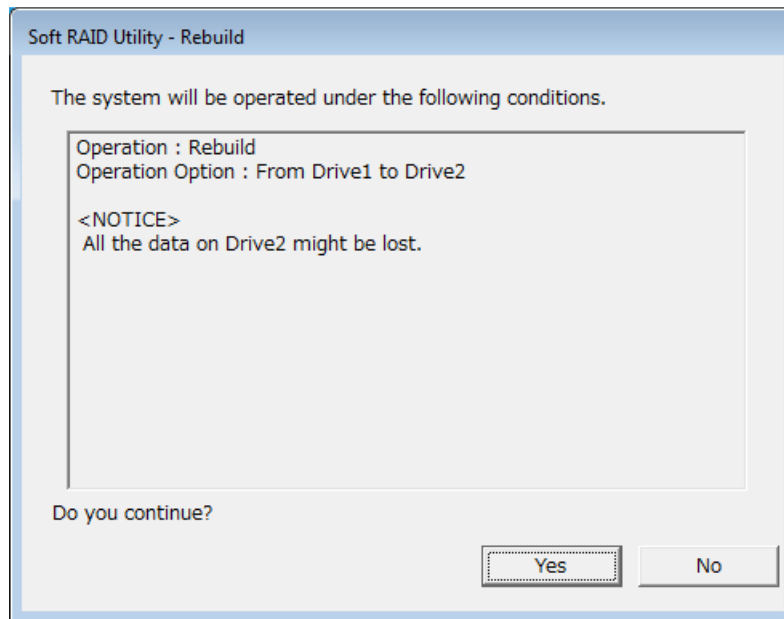
- Before using this feature, complete other necessary work, such as replacing defective HDDs.
- Rebuilding is enabled only in a combination of an ONLINE drive and a NEW, INCOMPLETE DATA, or REBUILD drive. In other states, rebuilding is disabled, and this feature cannot be selected in the menu window.
- If rebuilding is suspended for any reason after rebuilding has started, reuse the HDDs that are being rebuilt as new HDDs by using the drive initialization feature. (See 10.6.7 *Drive initialization feature*.) If the equipment restarts with rebuilding suspended, the equipment might not start, or HDD data might be lost.
- The rebuilding process takes about 90 minutes.

Use the rebuilding feature as follows:

1. Use the procedure described in 10.6.2(1) to display the **Soft RAID Utility** menu window.

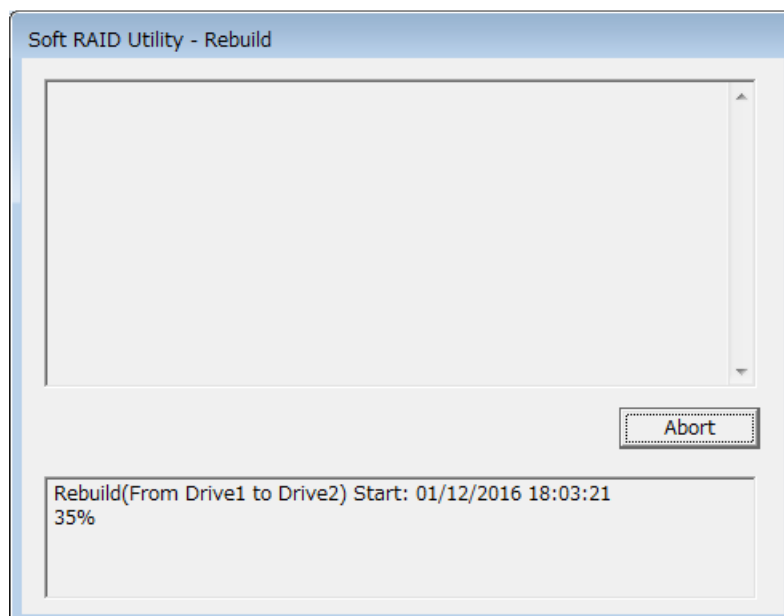


2. Select the **Rebuild** radio button, and then click **Next**. The execution confirmation window opens.
 - To start rebuilding, click **Yes**.
 - To cancel rebuilding, click **No**.



Clicking **No** redisplay the menu window.

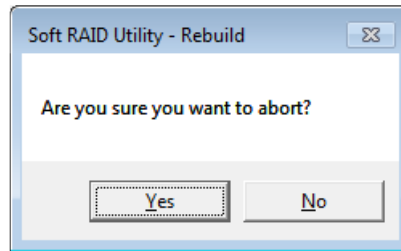
3. In the execution confirmation window, click **Yes**. Rebuilding starts and the status of rebuilding progress appears.



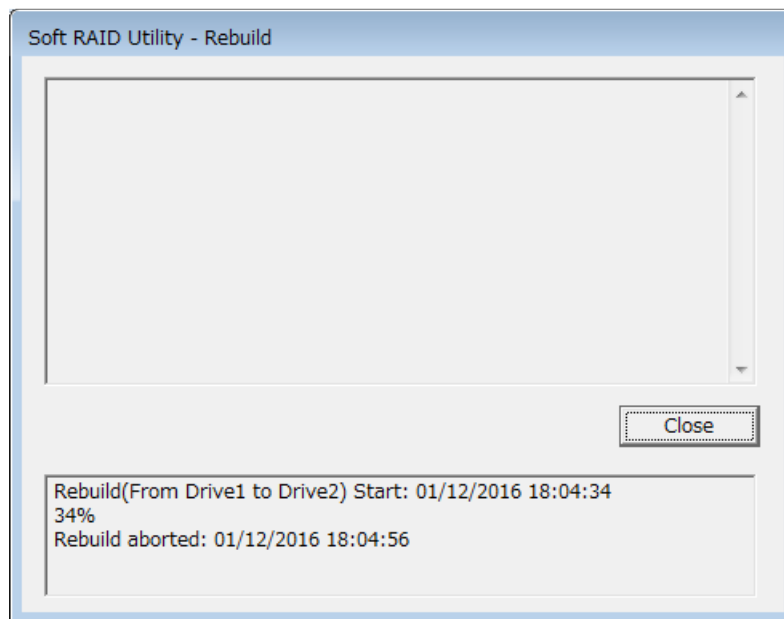
10. SOFTWARE RAID1

To abort the ongoing rebuilding, click **Abort**. The following confirmation message appears.

- To abort rebuilding, click **Yes**.
- To continue rebuilding, click **No**.



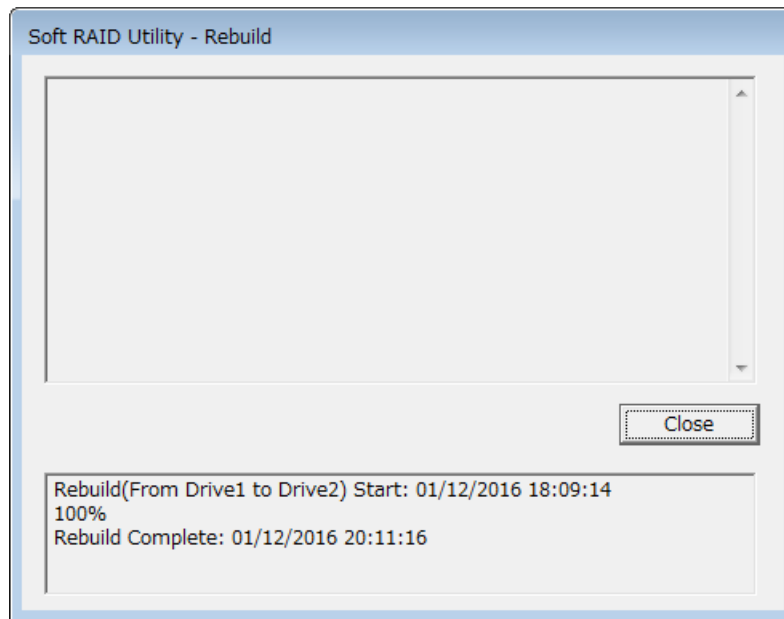
- Clicking **Yes** aborts rebuilding and displays the following message:



Clicking **Close** redisplay the menu window.

- Clicking **No** redisplay the progress status display window.

4. When rebuilding is complete, a rebuilding completion message appears.



Clicking **Close** redisplay the menu window.

If an error message appears during the rebuilding process, take action to correct the relevant error as described in *10.6.8 List of error messages*.

10.6.5 Consistency check feature

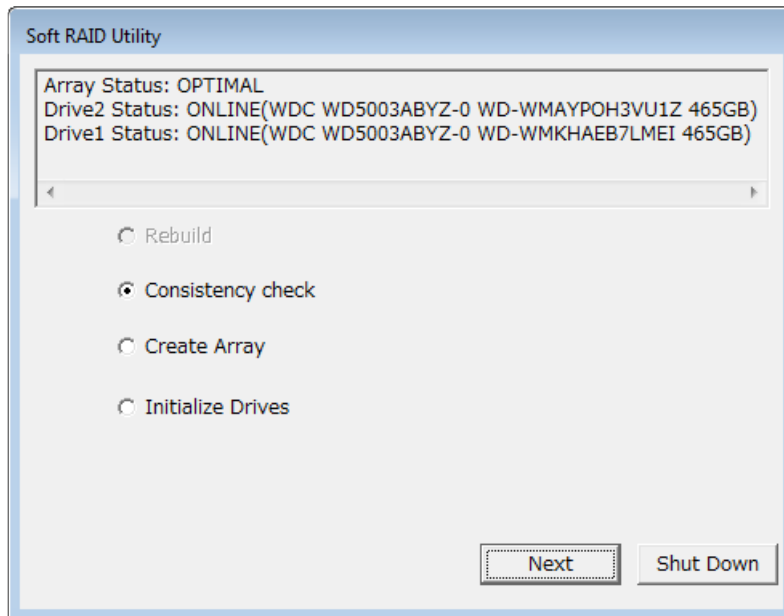
The consistency check feature checks the consistency of data in all areas of the HDDs in drive bay 1 and drive bay 2. Use this feature for periodic inspection to enhance the availability of the equipment.

NOTE

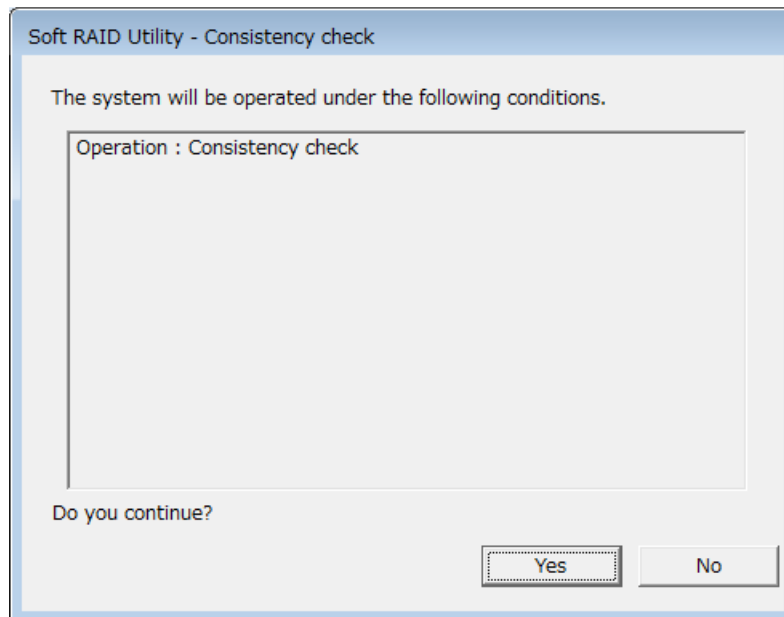
- The consistency check feature is enabled only while both drives are in the ONLINE state. In other states, this feature is disabled and cannot be selected in the menu window.
- The consistency check takes about 90 minutes. However, the checking time increases if many mismatches of data are found and many sectors must be corrected.

Use the consistency check feature as follows:

1. Use the procedure described in 10.6.2(1) to display the **Soft RAID Utility** menu window.



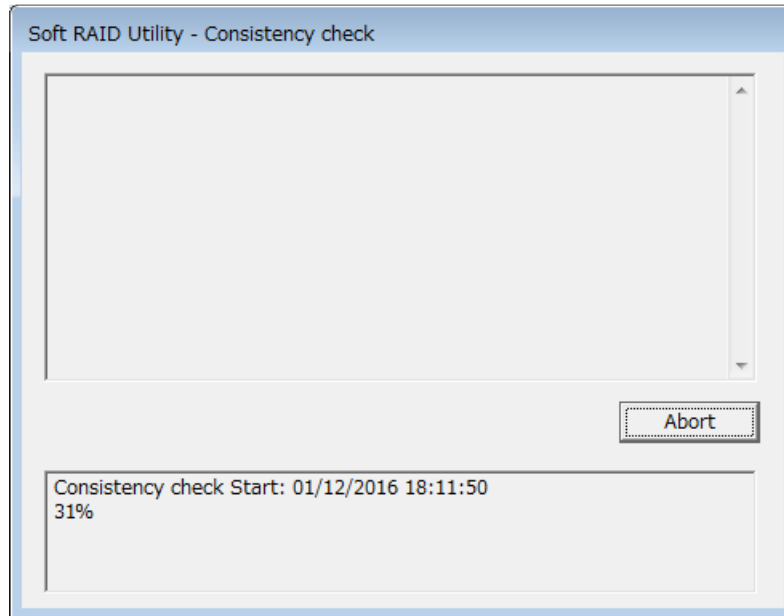
2. Select the **Consistency check** radio button, and then click **Next**. The execution confirmation window opens.
 - To start the consistency check, click **Yes**.
 - To cancel the consistency check, click **No**.



Clicking **No** redisplay the menu window.

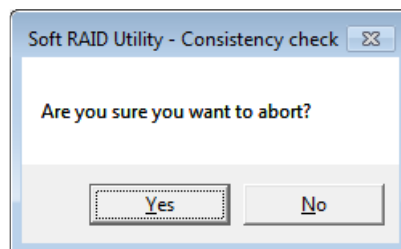
10. SOFTWARE RAID1

3. Clicking **Yes** on the execution confirmation window starts the consistency check and displays the progress status.

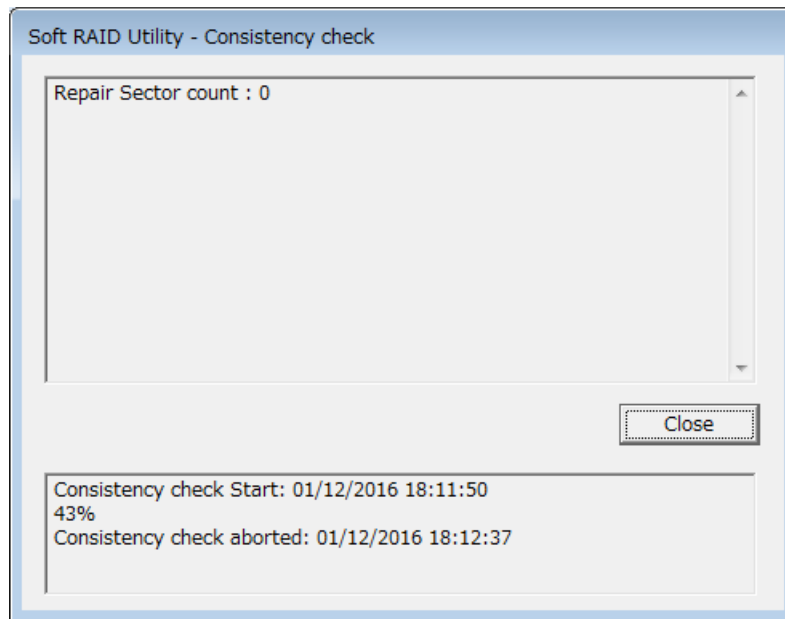


To abort a consistency check, click **Abort**. The following message appears, confirming that you want to abort the consistency check.

- To abort the consistency check, click **Yes**.
- To continue the consistency check, click **No**.



- Clicking **Yes** aborts the consistency check and displays the following message:

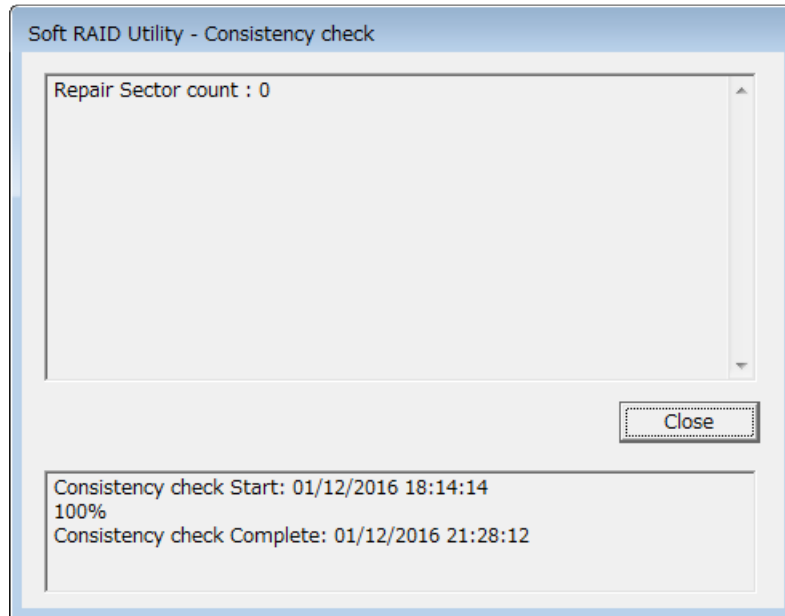


Clicking **Close** redisplay the menu window.

- Clicking **No** redisplay the progress status display window.

10. SOFTWARE RAID1

4. When the consistency check is complete, the number of corrected sectors is shown as reference information, and a consistency check completion message appears.



Clicking **Close** redisplay the menu window.

If an error message appears during the consistency check, take action to correct the relevant error as describe in *10.6.8 List of error messages*.

10.6.6 Array creation feature

The array creation feature edits RAID1 management information of HDDs and creates an array by using two HDDs. Use this feature to restore backup data in an offline environment by using commercially available backup software. An offline environment as described here is an environment that is activated by Windows PE. HDDs that configure RAID1 are individually recognized in the offline environment because the device driver for RAID1 that runs on the OS performs mirroring processing in this equipment. For this reason, the backup data of RAID1 can be restored by applying the RAID1 device driver to the offline environment and by using this feature.

This equipment supports the 32-bit Windows PE 3.0 and the 64-bit Windows PE 5.0 as RAID1 device drivers for offline environments. These RAID1 device drivers are stored in the following folders. Apply these drivers as instructed in the procedures for the backup software.

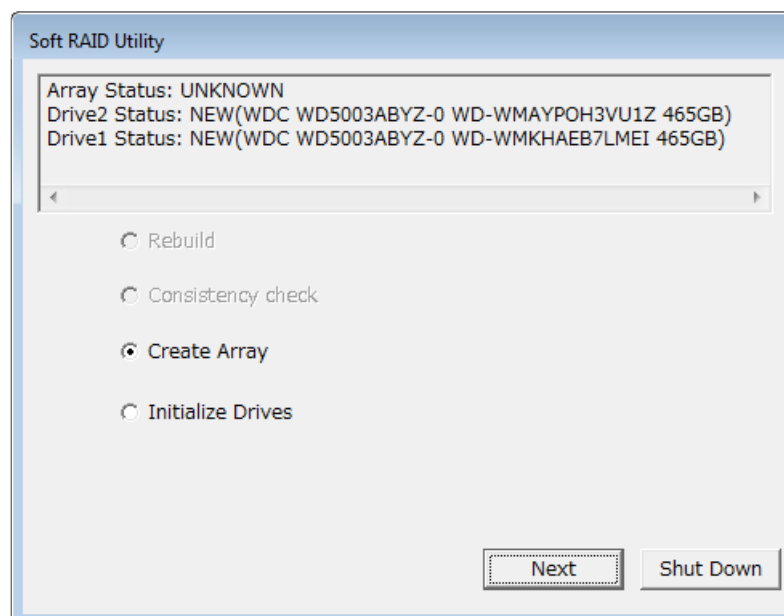
32-bit Windows PE 3.0	C:\Drivers\SoftwareRAID1\x86\PE3
64-bit Windows PE 5.0	C:\Drivers\SoftwareRAID1\x64\PE5

NOTE

- An array is created by writing the software RAID1 management information to the drive installed in the equipment in a state where an array must be created. Note that if this feature is used for a drive that was operated normally, the drive can no longer be used as the previous RAID1.
- Create an array with both drives installed.
- After an array is created, restore the backup data by using commercially available backup software.

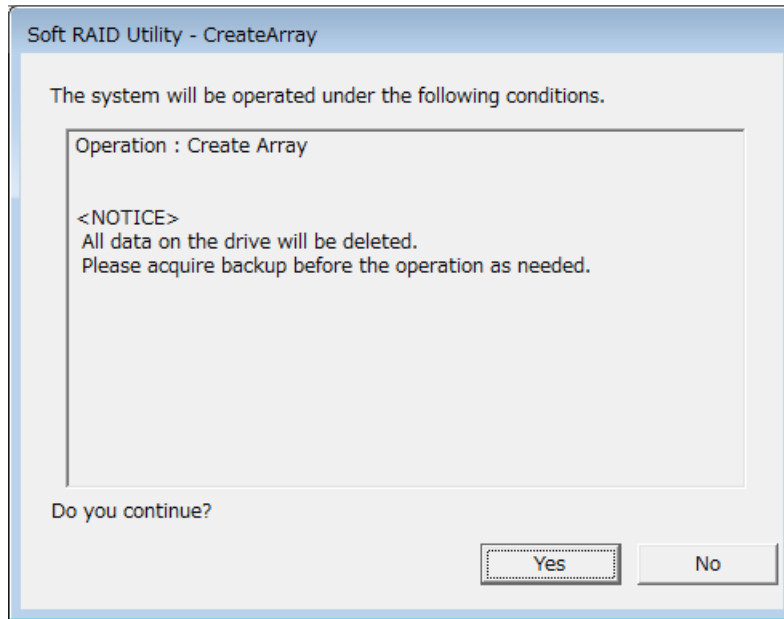
Use the array creation feature as follows:

1. Use the procedure described in 10.6.2(1) to display the **Soft RAID Utility** menu window.



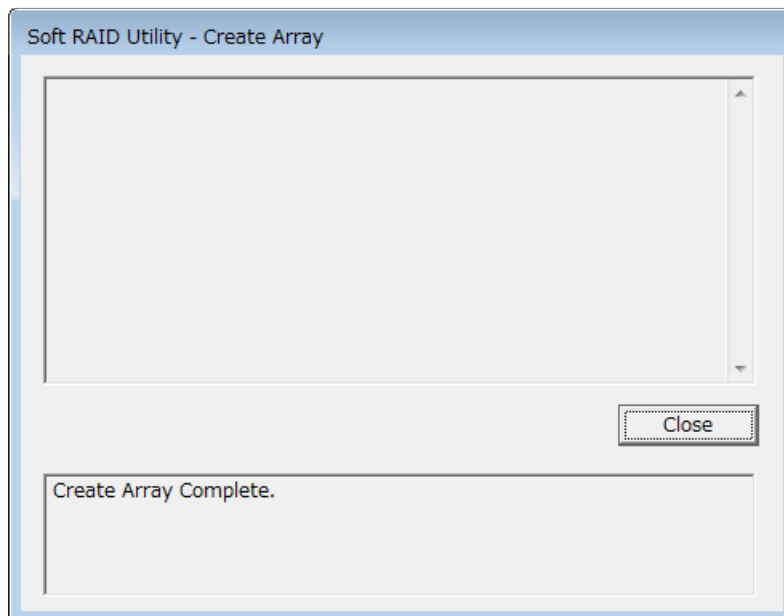
10. SOFTWARE RAID1

2. Select the **Create Array** radio button, and then click **Next**. The execution confirmation window opens.
 - To create an array, click **Yes**.
 - To cancel creation of an array, click **No**.



Clicking **No** redispays the menu window.

3. Clicking **Yes** on the execution confirmation window displays an array creation completion message.



Clicking **Close** redispays the menu window.

10.6.7 Drive initialization feature

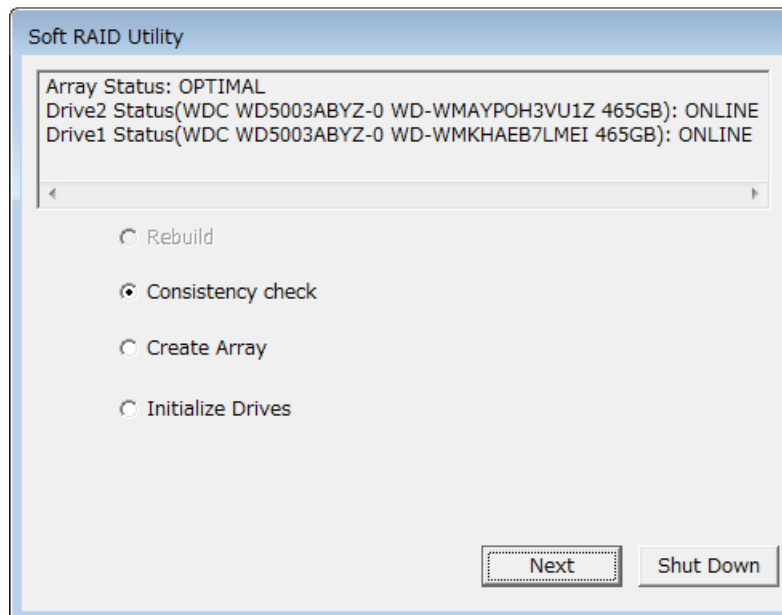
The drive initialization feature initializes the configuration information of an HDD that was used in RAID1, effectively creating a new HDD. Use this feature in the following cases:

- You are reusing an HDD that was used as a backup HDD.
- You are reusing a normal HDD that was set to offline by mistake.
- You are reusing an HDD that was set to offline by the RAS software for evaluating the equipment.

NOTE

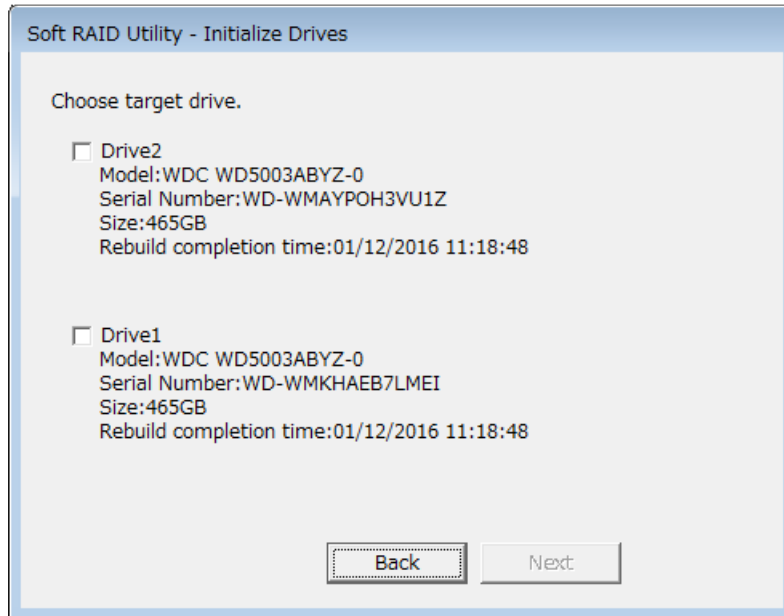
- If an HDD is reused by using the drive initialization feature in a state that is not described in this manual, the system might not be recoverable or might not operate correctly even after recovery.
- An HDD that was automatically set to offline by the equipment might be defective. Do not use the drive initialization feature for such HDDs.

1. Use the procedure described in 10.6.2(1) to display the **Soft RAID Utility** menu window.



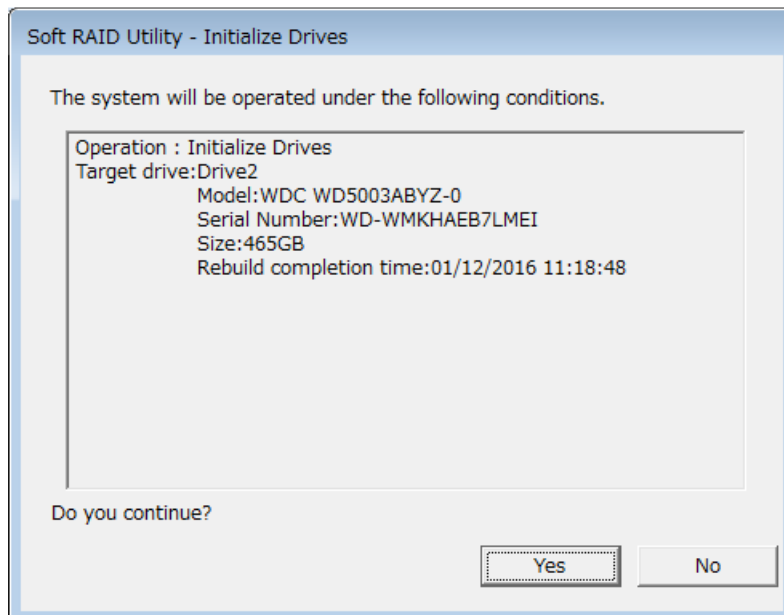
10. SOFTWARE RAID1

2. Select the **Initialize Drives** radio button, and then click **Next**. The window to select an HDD to be initialized opens.



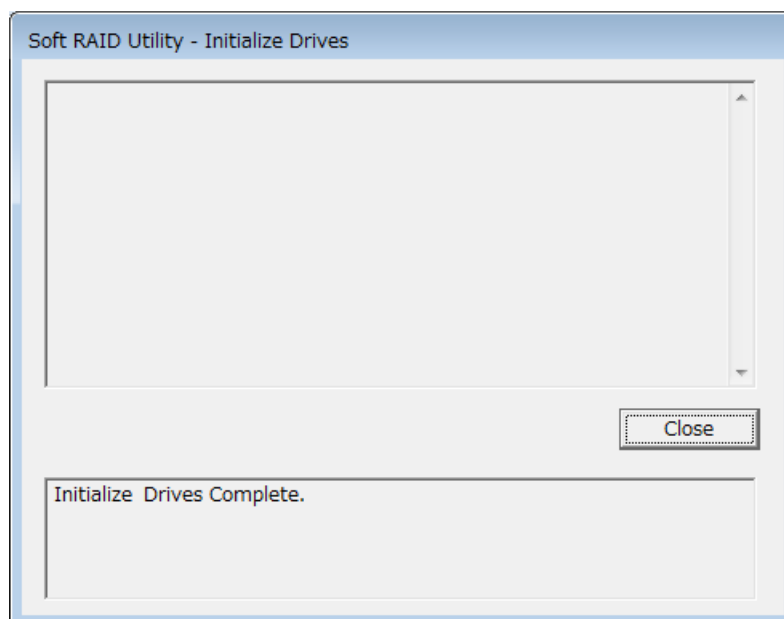
To cancel the initialization of the drive, click **Back**. The menu window reopens.

3. Select an HDD to be initialized, and then click **Next**. The initialization confirmation window opens.
 - To initialize the drive, click **Yes**.
 - To cancel initialization of the drive, click **No**.



Clicking **No** redisplay the menu window.

4. Clicking **Yes** on the initialization confirmation window displays a drive initialization completion message.



Clicking **Close** redisplay the menu window.

10.6.8 List of error messages

This section lists the error messages displayed by the software RAID utility and the corrective actions to take for each of them.

Table 10-3 Error messages displayed by the software RAID utility

No.	Error Message	Meaning	Remedial action
1	Unreadable sector was detected on the Master . (Media error) (Mirrored)	An unreadable sector was detected on the Master (or Mirrored). This is a media error.	When the sector in which a read error was detected is read, the system might not operate correctly because information about the sector is not rebuilt. Back up your data and replace the drive that contains the error, and then rebuild the RAID. After the RAID is rebuilt, restore the backup data.
2	Media error was occurred on RAID.	An unreadable sector was detected on both drives during the consistency check. This is a media error.	Back up your data and replace one drive, and then rebuild the RAID. Then, replace the other drive and rebuild the RAID, and then restore the backup data.
3	Unwritable sector was detected on the Master . Operation aborted. (Mirrored)	An unwritable sector was detected on the Master (or Mirrored). Operation was aborted.	Replace the drive that contains the error, and then rebuild the RAID.
4	The capacity of drive is not equal.	The capacities of the installed drives are different.	Install drives that have the same capacity.
5	Operation failed. (EC=0xXXXXYYYYZZZZZZ)	An internal error occurred. XXXX: Error module YYYY: Error processing ZZZZZZZZ: Detailed error code	Contact one of our sales representatives.
6	Operation failed. (EC=0xXXXXYYYYZZZZZZ) Click OK button to shut down.	An internal error occurred (before the Main Menu window appears). XXXX: Error module YYYY: Error processing ZZZZZZZZ: Detailed error code	

APPENDIX HANDLING OF REPLACEABLE COMPONENTS

NOTICE

Do not use a replaceable component for longer than the recommended replacement cycle. If you do, a deteriorating or worn-out component might cause the equipment to fail.

- Components gradually deteriorate as they are used and become subject to wear and tear. The following components must be replaced at fixed intervals:
- Replacement of these components is available for a fee.
- The recommended replacement cycle in the following table assumes that the average ambient temperature of the system unit is maintained at 25°C or less.

Note that when the average ambient temperature exceeds 25°C, the replacement cycle might be shortened in some cases.

In addition, note that the recommended replacement period is a simple guideline based on the usage status assumed under the design of the equipment. In some cases, the replacement cycle might be shorter than what is indicated here for reasons such as the conditions in the environment surrounding usage and the usage conditions (for example, the frequency at which disks are accessed when using magnetic disk devices). Conduct regular inspections and replace parts early as appropriate when considering the usage in your particular environment.

Replaceable component	Recommended replacement cycle	Note
HDD	2 years	If the equipment is running 24 hours a day, 7 days a week, the replacement cycle is two years. If the equipment is not running 24 hours a day, 7 days a week, the HDD must be replaced every four years or when the power-on hours exceed 20,000 hours, whichever comes first. To ensure the quick recovery of corrupted files, routinely back up your files.
SSD	7 years or the expected life, whichever comes first	The expected life (in years) is calculated by using the following formula and is based on the TBW (total bytes written) to the drive. The SSD must be replaced before reaching its expected life (in years). $\text{Expected life (years)} = \frac{200 \text{ TBW} \times 1,000 \text{ GB}}{\text{Volume (in GB) written to drive daily} \times 365 \text{ days}}$ To ensure the quick recovery of corrupted files, routinely back up your files.
DVD drive	4 years	
Dust filter	1 year	If you do not replace the filter regularly, failure or shorter life span of the equipment might result.
Keyboard (optional)	4 years	
Mouse (optional)	4 years	

APPENDIX HANDLING PERISHABLE COMPONENTS

NOTE

- When you replace a component to, for example, repair equipment, you might need to replace the component with a functionally compatible one.
- If you repair a component in a manner not recommended by the manufacturer, proper operation of the component is not guaranteed.

