

HITACHI

USER'S MANUAL

BASIC MODULES

The logo for SIOV Programmable Controller is centered on a blue rectangular background with a fine, pebbled texture. The text 'SIOV' is rendered in a large, bold, white sans-serif font. Below it, the words 'Programmable Controller' are written in a smaller, white sans-serif font.

SIOV

Programmable Controller

SVE-1-100 (K)

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SIOV
Programmable Controller

First Edition, May 2003, SVE-1-100(B) (out of print)
Second Edition, March 2004, SVE-1-100(C) (out of print)
Third Edition, May 2005, SVE-1-100(D) (out of print)
Fourth Edition, November 2006, SVE-1-100(E) (out of print)
Fifth Edition, September 2008, SVE-1-100(F) (out of print)
Sixth Edition, March 2009, SVE-1-100(G) (out of print)
Seventh Edition, March 2012, SVE-1-100(I) (out of print)
Eighth Edition, April 2013, SVE-1-100(J) (out of print)
Ninth Edition, July 2017, SVE-1-100(K)

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Printed in Japan.

BI<IC> (FL-MW2007, AI10)

SAFETY PRECAUTIONS

- Before installation, operation, maintenance, and/or inspection of this product, be sure to read through carefully this manual and other related manuals. Do not use this product until you are familiar with all the information concerning this product, safety information, and precautions provided in those manuals.
- Keep this manual in a readily accessible place so that users of this product may easily reach it.
- This manual contains information on potential hazards that is intended as a guide for safe use of this product. The potential hazards listed in the manual are divided into four hazard levels of danger, warning, caution, and notice, according to the level of their severity. The following are definitions of the safety labels containing the corresponding signal words DANGER, WARNING, CAUTION, and NOTICE.

 DANGER	: This safety label identifies precautions that, if not heeded, will result in death or serious injury.
 WARNING	: Identifies precautions that, if not heeded, could result in death or serious injury.
 CAUTION	: Identifies precautions that, if not heeded, could result in minor or moderate injury.
NOTICE	: This safety label without a safety alert symbol identifies precautions that, if not heeded, could result in property damage or loss not related to personal injury.

Failure to observe any of the  and  statements used in this manual could also lead to a serious consequence, depending on the situation in which this product is used. Therefore, be sure to observe all of those statements without fail.

The following are definitions of the phrases “serious injury,” “minor or moderate injury,” and “property damage or loss not related to personal injury” used in the above definitions of the safety labels.

Serious injury: Is an injury that requires hospitalization for medical treatment, has aftereffects, and/or requires long-term follow-up care. Examples of serious injuries are as follows: vision loss, burn (caused by dry heat or extreme cold), electric-shock injury, broken bone, poisoning, etc.

Minor or moderate injury: Is an injury that does not require either hospitalization for medical treatment or long-term follow-up care. Examples of minor or moderate injuries are as follows: burn, electric-shock injury, etc.

Property damage or loss not related to personal injury: Is a damage to or loss of personal property. Examples of property damages or losses not related to personal injury are as follows: damage to this product or other equipment or their breakdown, loss of useful data, etc.

The safety precautions stated in this manual are based on the general rules of safety applicable to this product. These safety precautions are a necessary complement to the various safety measures included in this product. Although they have been planned carefully, the safety precautions posted on this product and in the manual do not cover every possible hazard. Common sense and caution must be used when operating this product. For safe operation and maintenance of this product, establish your own safety rules and regulations according to your unique needs. A variety of industry standards are available to establish such safety rules and regulations.

1. General Safety Guidelines

Before installing, operating inspecting or conducting maintenance on this unit, read the following instructions carefully:

- Follow all the operating procedures provided in this manual.
- Pay special attention to and follow all the hazard warnings on the machine and in the manual. Failure to do so can cause injury to yourself or damage to the machine.
- Do not perform any operation or action in any way other than as provided in this manual. When in doubt, call the designated field engineer. Keep in mind that the hazard warnings in this manual or on the machine cannot cover every possible case, as it is impossible to predict and evaluate all circumstances beforehand.
Be alert and use your common sense.
- Do not install, wire, handle, modify, or use maintenance parts in any manner not described in this manual. Such a practice may result in breakdown of this equipment or peripherals, injury or even death. Hitachi will not be responsible for any accident or failure resulting from such mishandling.

Read the following safety guidelines carefully and follow them when you conduct maintenance of the machine.

Before starting maintenance

- Maintenance of the machine must be done only by trained and qualified field engineers.
- Read and follow the safety guidelines and procedures in this manual and the related manuals.
- In this manual and on the machine, hazard warnings are provided to aid you in preventing or reducing the risk of death, personal injury, or product damage. Understand and follow these hazard warnings fully.
- Keep in mind that the hazard warnings in this manual or on the machine cannot cover every possible case, as it is impossible to predict and evaluate all circumstances beforehand.
Be alert and use your common sense.

During work

- For each procedure, follow the given sequence of steps.
- Use the special tools and instruments, specified for the work in the manual or commercially available tools and instruments which fit the purpose.
- Use measurement instruments and powered tools which are properly calibrated or periodically inspected.
- Keep the maintenance area neat and tidy.
- Always put away parts, materials or tools when not in use.
- Wear an eye protector where anything may fly about.
- When using sharp objects or cutting tools, make sure that no part of your body lies in the path of the blade bit, or point.
- Before finishing your work, make sure that all parts removed during maintenance have been installed back in their original positions in the machine.
Make sure that no tool or foreign material is left in the machine.

Prevention of electric shocks

- Before starting work, make sure that, unless otherwise specifically instructed, there is no potential electric hazard in the maintenance area such as insufficient grounding or a wet floor.
- Before starting work, note where the emergency power-off switches are located and make sure you know how to operate them.
- Unless otherwise specifically instructed, cut off all power sources to the machine before starting maintenance. Just switching off the machine power supplies is usually not enough.
When power is fed from a wall or floor outlet, unplug the power supply cord, or turn off the switch on the power distribution panel or board. Attach a notice on the panel or board prohibiting the use of the switch.
If the energy isolating device such as the switch on the power distribution panel or board accepts a lockout device, turn off the power, lock out the energy isolating device, and bring the key with you. When you take over the work and the key for the lockout device if applicable, do not assume that the power is off. Make sure yourself that the above-mentioned conditions such as switches are satisfied. If necessary, use a measurement tool to ensure that the power is off.
- Do not touch any uninsulated conductor or surface, where so instructed, which remains charged for a limited time after the external power supply to the machine is disconnected.
- When working on a machine which has a grounding terminal, make sure that the terminal is properly connected to the facility's ground.
- When working close to a hazardously energized part, do not work alone; work with another person who can immediately turn off the power in an emergency.
- Do not wear any metallic item such as a wrist watch with a metallic surface, or metallic accessories.
If you wear eyeglasses with a metallic frame, take care not to let the frame touch an uninsulated surface.
- Make sure that your hands and arms are dry.
- Unless otherwise specifically instructed, use only one hand when it is necessary to work near an exposed live electric circuit.
This prevents the completion of the circuit through your heart even if you accidentally touch the circuit.
- Do not use a dental mirror near an exposed live electric circuit.
The mirror surface is conductive and can become hazardous even if it is made of plastic.
- Unless otherwise specifically instructed, do not supply power to any subassembly such as a power supply unit or a motor while it is removed from the machine.

Procedures in an emergency

For electric shock

- Do not panic. Do not become another victim through contact with the injured person.
- First, shut off the electric current passing through the victim.
Use the emergency power-off switch, if there is one, or, otherwise, a normal power-off switch. If this cannot be done, push the victim away from the source of the electric current by using a nonconductive object such as a dry wooden stick.
- Then, call an ambulance.
- If the victim is unconscious, artificial respiration may be necessary.
A proper method for performing artificial respiration or resuscitation should be learned beforehand. If the victim's heart is not beating, cardio-pulmonary resuscitation should be performed by a trained and qualified person.

For outbreak of fire

- First, shut off all the power from the machine using the emergency power-off switch, if there is one, or the normal power-off switch.
- If the fire continues burning after the power is shut off, take suitable actions including the use of a fire extinguisher or a call for the fire department.

2. Hazard Warning Statements

The following are the hazard warning statements contained in this manual.

2.1 WARNING Statements

(chapter 1, page 1-10)

 WARNING
<ul style="list-style-type: none">● If an emergency stop circuit is to be formulated, it must be positioned external to this module. If you do not observe this precaution, equipment damage or accident may occur when this module becomes defective.● Keep the input and output currents of any I/O module within the maximum permitted current values. If an overcurrent is allowed to flow in the I/O module, the component part(s) involved may be damaged, resulting an accident, fire, or product failure.● Ensure that the employed external power source has overvoltage and overcurrent protection functions.● If the module emits smoke or foreign odor, immediately switch off the power supply and investigate the problem cause.● Do not attempt any installation, wiring, handling, or product alteration not covered in this manual. The manufacturer accepts no responsibility for product/peripheral breakage or fatal accidents due to such attempts.

(chapter 4, page 4-8)

 WARNING
<p>Do not remove or install a module or cable, with the programmable controller energized. Be sure to power down the programmable controller before removing or installing them. Disregarding this rule may result in an electric shock hazard or failure of the product.</p>

(chapter 5, page 5-8)



WARNING

- Electric shock hazards exist so that you might suffer burns or become electrocuted. Further, the system might malfunction due to noise interference. Therefore, ground the line ground (LG), frame ground (FG), and shield cable (SHD).
- Do not remove or install a module or cable, with the programmable controller energized. Be sure to power down the programmable controller before removing or installing them. Disregarding this rule may result in an electric shock hazard or failure of the product.

(chapter 5, page 5-19)



WARNING

- Before performing power supply wiring, make sure that no voltage is applied to the power cable. Immediately after completion of power supply wiring, be sure to install the terminal cover.
- Do not attempt any installation, wiring, handling, or product alteration not covered in this manual. The manufacturer accepts no responsibility for product/peripheral breakage or fatal accidents due to such attempts.
- Only qualified personnel should be allowed to make cable connections. Incorrect wiring connections may cause a risk of fire, malfunction, or electric shock.

2.2 CAUTION Statements

(chapter 1, page 1-3)



CAUTION

- At installation sites where there is a risk of a water leak, be sure to install the programmable controller in a drip-proof cubicle and use it. Disregarding this rule may result in failure of the product.
- Do not touch any of the modules in the programmable controller when they are in an energized state. Touching any of the modules in an energized state may lead to a discharge of static electricity from your body to the module, resulting in malfunction or breakage of the module. If you have no choice but to touch a module, be sure to discharge the static electricity by touching the metal frame of the cubicle and then touch the module. This is also true when you perform any of the following actions on a module in its non-energized state: 1) setting a switch on the module; 2) connecting or disconnecting the cable from the module; or 3) inserting or removing the connector from the module.

(chapter 1, page 1-4)



CAUTION

If the input voltage for the power supply module is within the specified range but close to the upper or lower limit, you should conclude that an input power problem exists, and ask the power supply facility manager to conduct an inspection.

(chapter 1, page 1-10)



CAUTION

- Before supplying power to the equipment, thoroughly check the wiring connections.
- Overheating may cause a fire or unit failure. Where the ambient temperature reaches 48°C or higher, lower the maximum output current that can be drawn from the power supply module. For details, see “9.7 Output Current from the Power Supply Module.” If the ambient temperature is high install a cooling fan in the housing enclosure or reduce the number of modules mounted.
- Before changing the program, generating a forced output, or performing the RUN, STOP, or like procedure during an operation, thoroughly verify the safety because the use of an incorrect procedure may cause equipment damage or other accident.
- When you switch on the power supply, follow the specified sequence. Failure to follow the specified sequence may cause equipment damage or other accident.
- Do not insert your finger or a foreign object into any opening in a connector or the mount base. Disregarding this rule may result in bodily injury.

(chapter 4, page 4-6)



CAUTION

- Do not peel off the insulation sheets. These sheets are provided for electrical insulation of the mount base from the housing enclosure.
- Do not insert your finger or a foreign object into any opening in a connector or the mount base. Disregarding this rule may result in bodily injury.

(chapter 4, page 4-7)



CAUTION

Do not disassemble the module.

(chapter 4, page 4-8)



CAUTION

Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

(chapter 5, page 5-9)



CAUTION

- Insulate the mount base from the enclosure. To keep the mount base insulated, avoid removing the insulation sheets that are supplied with the mount base.
- The LG is a ground terminal for power supply noise. The FG and SHD are ground terminals for the noise in the remote I/O, communication module and other external interface lines. To avoid interference between the ground terminals, separately ground the LG and FG.
- Connect the FG terminal of each module to the FG terminal of the mount base. Perform class D grounding from the FG terminal of the mount base. As for the FG terminals for remote I/O lines and OPCN-1 (J.NET) lines, ground each of them at one single point (LPU unit). (In respect to the FG terminals of remote I/O station or OPCN-1 station [J.Station] modules that can be grounded at the same point as the LPU unit, ground them all, as mentioned.)

(chapter 5, page 5-10)



CAUTION

When wiring the 24 VDC INPUT positive and negative terminals of the 24 VDC input power supply module (model LQV020), be sure to wire them correctly while paying attention to their polarity. Incorrect wiring of its positive and negative terminals may result in a failure of the product.

(chapter 5, page 5-19)



CAUTION

If you touch a terminal strip or connector pin while the power is applied, you may receive an electric shock. While the power is applied, never touch a terminal strip or connector pin.

(chapter 9, page 9-20)



CAUTION

Overheating may cause a fire or unit failure. Where the ambient temperature reaches 48°C or higher, lower the maximum output current that can be drawn from the power supply module. By taking into consideration the environment where the unit is mounted, install a cooling fan in the housing enclosure or reduce the number of modules mounted.

(chapter 10, page 10-2)



CAUTION

Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

(chapter 10, page 10-4)



CAUTION

- If the input voltage for the power supply module is within the specified range but close to the upper or lower limit, you should conclude that a power problem exists, and ask the power supply facility manager to conduct an inspection.
- Be sure that the power source for supplying power to various modules is rated as specified. The use of a differently rated power source may cause a risk of fire.

(chapter 10, page 10-10)



CAUTION

Handling batteries incorrectly will invite the danger of firing or bursting. Some of used batteries may have a considerable remaining capacity. Observe the general cautions for piling-up, packing, and transportation to forward used batteries to the specialist company of waste disposal safely. Regarding concrete packing and transportation methods, make previous arrangements thoroughly with the person in charge of this specialist company.

2.4 NOTICE Statements

(chapter 1, page 1-11)

NOTICE

- To provide protection against short circuit, furnish the external power source for optional PI/O modules with a fuse or circuit protector. Ensure that the employed circuit protector is rated as specified.
- Before terminating this product (by shutting down or resetting), check that all the peripheral equipment is already stopped or will not be affected by the termination.
- Failure of an installed module may damage the contents of memory spaces. Be sure to make a backup copy of any important data in memory.
- Do not use a transceiver, cellular phone, or similar device near the module because module malfunction or system failure may occur due to noise.
- Some parts containing gallium arsenide (GaAs) in a photo coupler and LED are used in this product. GaAs is specified as a harmful object by law. Take special care when handling the product, in particular, scrapping it. Before scrapping work.
- To avoid malfunction, ensure that the power supply is switched on and off at intervals of longer than 1 second.

(chapter 3, page 3-7)

NOTICE

To avoid malfunction, ensure that the power supply is switched on and off at intervals of longer than 1 second.

(chapter 4, page 4-3)

NOTICE

- The module may become defective due to a high temperature, which may result from heat dissipation failure. It may also malfunction due to electromagnetic interference from nearby equipment. For heat dissipation and electromagnetic radiation minimization, provide the specified clearances among the module, its enclosure, and neighboring equipment.
- The degree of temperature rise varies depending on how the module is operated. The mounting intervals specified in the manual should be used as a guide only. While a test run is conducted after completion of mounting, measure the temperature near the module to check whether it is within the specified range. If the measured temperature is beyond the specified range, increase the mounting intervals or provide forced air cooling with a cooling fan.

(chapter 4, page 4-6)

NOTICE

Install the mount base to a vertical surface. Installing the mount base to a horizontal surface lessens the heat dissipation effects and allows the temperature to rise, thereby rendering the module defective or incurring component parts deterioration.

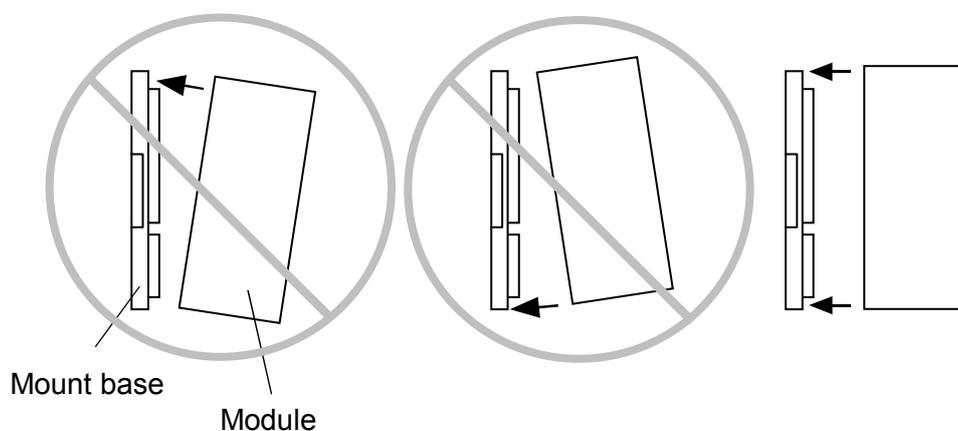
(chapter 4, page 4-8)

NOTICE

- Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.
- Dust or other foreign matter might accumulate on the connector, resulting in poor contact. When the module is unpacked, perform the mounting and wiring procedures for it immediately.
- To prevent the module from being damaged, observe the following precautions when you mount or demount the module:
 - Before mounting the module to the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled with dirt or the like.
 - When mounting a module in a slot, be sure to hold the module perpendicularly to the mount base and insert it into the slot on the mount base (see the “Good example” below). If the module is inserted aslant into the slot, the connector pins may be damaged. When removing the module from the slot, reverse the above procedure.

[Bad example]

[Good example]



(chapter 5, page 5-10)

NOTICE

The outside wiring of the 24 VDC line for the 24 VDC input power supply module (LQV020) is prohibited. The power supply module (LQV020) may be damaged by lightning, etc. if the 24 VDC line is wired outside.

(chapter 5, page 5-11)

NOTICE

A surge voltage may cause the product to malfunction or become damaged. If a relay or other coil is connected to the PCs OK output circuit, furnish a surge absorption diode or the like. Ensure that the diode has a peak reverse voltage at least 10 times the circuit voltage and a forward current larger than the load current.

(chapter 5, page 5-19)

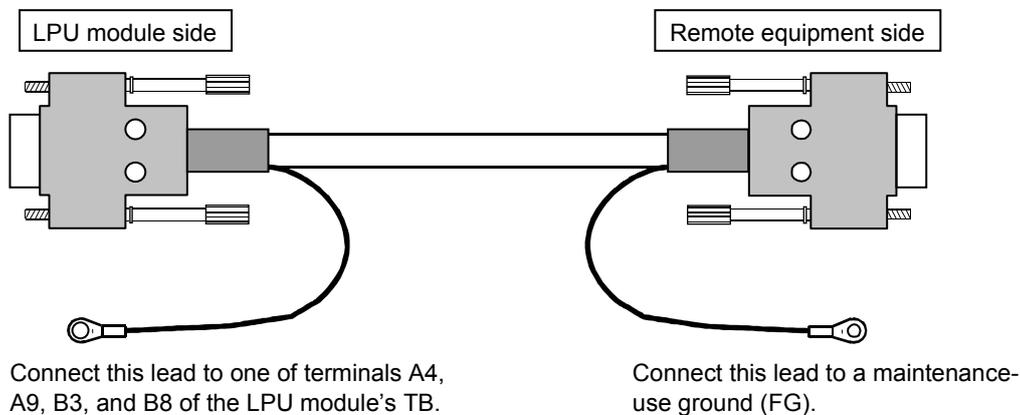
NOTICE

- To provide protection against short circuit, furnish the external power source with a fuse or circuit protector. Ensure that the employed circuit protector is rated as specified.
- Before supplying power to the equipment, thoroughly check the wiring connections.
- A surge voltage may cause the product to malfunction or become damaged. If a relay or other coil is connected to the PCs OK output circuit, furnish a surge absorption diode or the like. Ensure that the diode has a peak reverse voltage at least 10 times the circuit voltage and a forward current larger than the load current.
- When wiring communication, power supply, motive power, and other cables, group them according to their types and set the resulting groups apart from each other. The motive power cables for inverters, motors, power regulators, etc., in particular, must be set at least 300 mm away from the other types of cables. Further, the communication cables must be set in a different conduit than the conduit in which the motive power cables are set.
- Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.
- To avoid noise-induced malfunction, do not bundle the 100 VAC/100 VDC power cables and network cables together, but route the two types of cables at least 100 mm away from each other.

(chapter 5, page 5-26)

NOTICE

- Be sure to wire the signal ground (SG) terminals of both the LPU module and remote equipment by using an interface cable as shown below.
- Connect the two shield ground leads of the interface cable to the specified grounding terminals of the LPU module and remote equipment, respectively.
- Connect the LPU module-side shield ground lead of the interface cable to a shield ground (SHD) terminal (one of terminals A4, A9, B3, and B8) of the LPU module's terminal block (TB).



(chapter 6, page 6-9)

NOTICE

Before installing the Base System, shut down all Windows®-based programs running, including those resident in memory, such as a virus checker. If you install the Base System without shutting down these programs, an error might occur while installing it. If an error is encountered, uninstall the Base System once as instructed in "■ Uninstalling" to quit all Windows®-based programs and then reinstall the S10V Base System.

(chapter 6, page 6-13)

NOTICE

- If the [Remove Shared File?] window is displayed while uninstalling the Base System from Windows®, click the button not to choose to delete shared files.
- To reinstall the Base System, uninstall it first before reinstalling it.

(chapter 10, page 10-3)

NOTICE

Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.

(chapter 10, page 10-4)

NOTICE

- Ensure that the same power source is used for output module external power source (for supplying power to the +V terminal) and load power supply. The use of different power sources may cause a risk of malfunction.
- Hot-swapping of any mounted module will cause damage to the installed hardware or software. So, be sure to replace any such module in a power-off (de-energized) state.

Precautions for Migrating from an S10/2 α or S10mini Series Product to an S10V Product

The S10V product is a newly designed, easy-to-use programmable controller and is intended for those customers who use only basic capabilities of the ladder language. Compared with conventional S10/2 α and S10mini Series products, the S10V product has been increased in processing speed and size of executable programs and has the C mode and HI-FLOW capabilities provided in the form of a separate hardware module (CMU).

The S10V programmable controller is designed to allow reuse of as many functions and programs as possible from the conventional models. However, when using the S10V product, the user is advised to note the major differences from the conventional models listed in the table below. For more information on such differences, refer to the other manuals on the S10V programmable controller.

(1/2)

No.	Item	S10/2 α and S10mini Series products spec.	S10V product specification	Remarks
1	External input/output (X, Y) addresses	The addresses assigned to X000 thru XFFF and Y000 thru YFFF are as shown below. Addresses to X000 thru XFFF: Bit addresses /0A0000 thru /0A1FFF Word addresses /0E0000 thru /0E01FF Addresses to Y000 thru YFFF: Bit addresses /0A4000 thru /0A5FFF Word addresses /0E0400 thru /0E05FF	The addresses assigned to X000 thru XFFF and Y000 thru YFFF are as shown below. Addresses to X000 thru XFFF: Bit addresses /240000 thru /241FFF Word addresses /414000 thru /4141FF Addresses to Y000 thru YFFF: Bit addresses /242000 thru /243FFF Word addresses /414200 thru /4143FF	Neither external inputs nor outputs (X, Y) can be directly accessed by specifying addresses in the C mode, etc. unless the addresses are changed as shown. For details, refer to the "SOFTWARE MANUAL S10V LADDER CHART PROGRAMMING For Windows® (manual number SVE-3-121)."
2	RI/O point count settings	512, 1024, 1536, 2048	64, 128, 256, 512, 1024, 2048	The point count setting 1536 cannot be used with the S10V product and is replaced by the setting 2048.
3	Mount base	S10/2 α : Dedicated mount base. S10mini: Dedicated mount base.	Dedicated mount base (color: gray); 4/8 slots (no settings are made for two of these slots).	The mount base (black) for S10mini products cannot be used with the S10V product.

No.	Item	S10/2 α and S10mini Series products spec.	S10V product specification	Remarks
4	Optional modules	S10/2 α : Dedicated modules. S10mini: Dedicated modules or common modules (those modules whose model numbers are within 500 and 599) are usable with the S10V product.	The common modules whose model numbers are within 500 and 599 and that are usable with S10mini products are as follows: LQE500: FL.NET LQE510: OD.RING (4 km) LQE515: OD.RING (1 km) LQE520: ET.NET LQE521: SV.LINK LQE530: SD.LINK LQE540: J.NET LQE545: J.NET-INT LQE546: IR.LINK LQE550: CPU LINK LQE560: RS-232C LQE565: RS-422 LQE570: D.NET (containing a power supply) LQE575: D.NET (containing no power supply)	No modules whose model numbers are within 000 and 099 or within 100 and 199, which are specially designed for use with S10mini products, can be used with the S10V product.
5	Tools	PSE α or Windows $\text{\textcircled{R}}$ -based tools	Windows $\text{\textcircled{R}}$ -based tools specially designed for use with the S10V product.	The Windows $\text{\textcircled{R}}$ -based tools commonly used with either of the S10/2 α or the S10mini product cannot be used with the S10V product.
6	Ladder programs	Downward-sloping-rung ladder	Normal-rung ladder. Existing downward-sloping-rung ladder programs can be converted into normal-rung ladder format by using a particular tool.	
7	C mode, HI-FLOW, P-coil	These capabilities are pre-installed in the CPU module.	These capabilities are pre-installed in a specially designed optional hardware module (CMU of model LQP520/525/526/527).	The only LPU module (LQP510/511/512) cannot operate C mode, HI-FLOW, and P-coil.
8	RI/O STOP STOP/RUN	24 VDC input	100 VAC/VDC input	

WARRANTY AND SERVICING

Unless a special warranty contract has been arranged, the following warranty is applicable to this product.

1. Warranty period and scope

Warranty period

The warranty period for this product is for one year after the product has been delivered to the specified delivery site.

Scope

If a malfunction should occur during the above warranty period while using this product under normal product specification conditions as described in this manual, please deliver the malfunctioning part of the product to the dealer or Hitachi Power Solutions Co., Ltd. The malfunctioning part will be replaced or repaired free of charge. If the malfunctioning is shipped, however, the shipment charge and packaging expenses must be paid for by the customer.

This warranty is not applicable if any of the following are true.

- The malfunction was caused by handling or use of the product in a manner not specified in the product specifications.
- The malfunction was caused by a unit other than that which was delivered.
- The malfunction was caused by modifications or repairs made by a vendor other than the vendor that delivered the unit.
- The malfunction was caused by a relay or other consumable which has passed the end of its service life.
- The malfunction was caused by a disaster, natural or otherwise, for which the vendor is not responsible.

The warranty mentioned here means the warranty for the individual product that is delivered. Therefore, we cannot be held responsible for any losses or lost profits that result from the operation of this product or from malfunctions of this product. This warranty is valid only in Japan and is not transferable.

2. Range of services

The price of the delivered product does not include on-site servicing fees by engineers. Extra fees will be charged for the following:

- Instruction for installation and adjustments, and witnessing trial operations.
- Inspections, maintenance and adjustments.
- Technical instruction, technical training and training schools.
- Examinations and repairs after the warranty period is concluded.
- Even if the warranty is valid, examination of malfunctions that are caused by reasons outside the above warranty scope.

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This manual provides information on the following hardware and program product:

<Hardware product>

LPU (LQE510/511/512)

<Program product>

S-7895-38, S10V BASE SYSTEM, 01-16

Revision record

(1/3)

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
B	First edition	May 2003	
E	<p>An environmental specification for the model LQV010 is newly added to Table 1-1.</p> <p>The model LQV010 is newly added as an available power supply module and listed in Section 3.3.</p> <p>The model LQV010 is newly mentioned in the unit dimensions specification in Section 4.3(2).</p> <p>Information for the model LQV010 is newly added to the wiring information for power supply modules in Section 5.4.</p> <p>A support function for CMU battery information is newly added.</p> <p>A support function for error message listing is newly added.</p> <p>New information is added to the following tables: Table 9-3, which shows optional-module mounting limitations. Table 9-4, which shows I/O module mounting limitations. Table 9-5, which is a list of the current consumptions of available optional modules. Table 9-6, which is a list of the current consumptions of available I/O modules.</p> <p>Information for the model LQV010 is newly added to the description of power supply output current in Section 9.7, along with current-consumption information for the model LQP525.</p> <p>Information for the model LQV010 is newly added to the power supply voltages information ⑦ provided in Section 10.1, "Preventive Maintenance."</p> <p>Information on the output currents of available power supply modules and specifications of the model LQV010 are newly added to Table 11-1.</p> <p>The table number of Table 11-2 is changed to 11-3, that of Table 11-3 is changed to 11-2, and the resulting tables are re-ordered accordingly.</p>	November 2006	

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
F	Subsection 10.1.1, "Replacing the module" is newly added.	September 2008	
G	A change is made to the front panel of the LQS000 module -- an additional LED indicator is added.	March 2009	
I	<p>The LPU module models LQP511 and LQP512 are added as alternatives.</p> <p>Section 2.4, "LPU Module Models and Their Inter-Compatibility," is added.</p> <p>Information on the LPU module models LQP511 and LQP512 is added.</p> <p>The EX.RI/O system is additionally listed in Table 6-1, "Available Types of Tool Programs."</p> <p>The HS.RI/O system is additionally listed in Table 6-1, "Available Types of Tool Programs."</p> <p>The LPU module models LQP511 and LQP512 are additionally listed in Table 9-3, "Limitations on Optional-Module Mounting."</p> <p>The LPU module models LQP511 and LQP512 are additionally listed in Table 9-5, "Current Consumptions of Available Optional Modules."</p> <p>The LPU module models LQP511 and LQP512 are additionally mentioned under "Service lives of relay contact."</p> <p>The LPU module models LQP511 and LQP512 are additionally mentioned in Step ③.</p> <p>A reference to the user's manual on the model-LQE720 ET.NET module is added in Step ④.</p> <p>The LPU module models LQP511 and LQP512 are additionally listed in Table 11-1, "Common Specifications."</p> <p>Differences between the LPU module models LQP510, LQP511, and LQP512 are additionally mentioned in Table 11-3, "LPU Module Functional Specifications."</p> <p>Safety precautions are revised.</p> <p>Additional information is added concerning the service life of the relays contained in certain types of hardware modules.</p>	March 2012	

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
J	<p>The I/O module model LQS010 is added as alternatives.</p> <p>Section 2.5, “Remote I/O Station Module Models and Their Inter-Compatibility,” is added.</p> <p>Information on the Remote I/O Station Module Model LQS010 is added.</p> <p>The I/O module model LQS010 is additionally listed in Table 9-4, “Limitations on I/O-Module Mounting.”</p> <p>The I/O module model LQS010 is additionally listed in Table 9-6, “Current Consumptions of Available I/O Modules.”</p> <p>The I/O module model LQS010 is additionally listed in Table 11-1, “Common Specifications.”</p>	April 2013	
K	Windows® 7 (32-bit) or Windows® 10 (32-bit) operating system is newly supported.	July 2017	

In addition to the above changes, all the unclear descriptions and typographical errors found are also corrected without prior notice.

PREFACE

Thank you for purchasing Hitachi's programmable controller S10V.

This manual provides instructions for using the S10V programmable controller's basic modules (see Note below). Information on the I/O modules, optional modules, and software used is provided in their respective manuals or user's guides. Please read all the necessary manuals thoroughly and use the product properly.

The S10V product is available in two types: standard model and environmentally resistant model. The environmentally resistant model has thicker platings and coatings than those for the standard model.

The model number of the environmentally resistant model is marked by adding the suffix "-Z" to the model number of the standard model.

(Example) Standard model: LQP510

Environmentally resistant model: LQP510-Z

This manual is applicable to both the standard model and environmentally resistant models. Although the descriptions contained in this manual are based on the standard model, follow the instructions set forth in the manual for proper use of the product even if you use the environmentally resistant model.

Note: The basic modules of the S10V programmable controller are the power supply module, LPU module, remote I/O station module, and mount base.

<Trademarks>

- Microsoft® and Windows® are registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.
- Ethernet® is a registered trademark of Xerox Corp.

<Note for storage capacity calculations>

- Memory capacities and requirements, file sizes and storage requirements, etc. must be calculated according to the formula 2^n . The following examples show the results of such calculations by 2^n (to the right of the equals signs).

1 KB (kilobyte) = 1,024 bytes

1 MB (megabyte) = 1,048,576 bytes

1 GB (gigabyte) = 1,073,741,824 bytes

- As for disk capacities, they must be calculated using the formula 10^n . Listed below are the results of calculating the above example capacities using 10^n in place of 2^n .

1 KB (kilobyte) = 1,000 bytes

1 MB (megabyte) = 1,000² bytes

1 GB (gigabyte) = 1,000³ bytes

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1 BEFORE USE

1 BEFORE USE

■ Installation

Hitachi's programmable controllers or PCs are a product of application of electronic circuit and processor technologies. The use of the product therefore requires special attention to be given to the following:

- (1) The conditions to be met in system construction, such as maximum rated values, operating voltage ranges, heat dissipation characteristics, and mounting conditions, must all be within the warranty coverage stated in this manual. The manufacturer will not be held responsible for any damage that may be caused to the product and/or any physical injury that may be incurred as a result of using the product with conditions outside the warranty coverage. In addition to the above requirement, fail-safe measures should also be provided in any user system by taking the expected failure rate and failure mode of the product into consideration. This is the case even when the product is used with every condition within the warranty coverage. The purpose of such fail-safe measures is to prevent the user system from suffering physical injuries, fire accidents, and/or other enlarged damages, due to the operation of the product.
- (2) None of the PCs supplied to our customers is fireproof, dust-proof, and waterproof. So, please install your PCs in dust-proof and waterproof steel enclosures or cubicles as shown below.

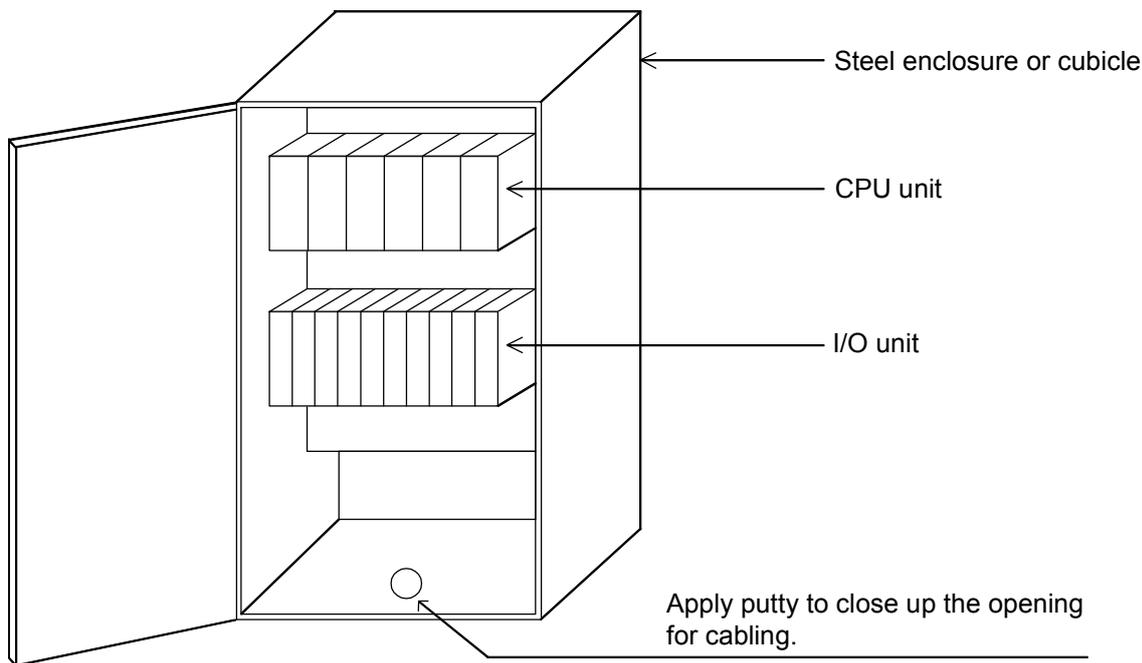


Figure 1-1 Installation -- an Example

**CAUTION**

- At installation sites where there is a risk of a water leak, be sure to install the programmable controller in a drip-proof cubicle and use it. Disregarding this rule may result in failure of the product.
- Do not touch any of the modules in the programmable controller when they are in an energized state. Touching any of the modules in an energized state may lead to a discharge of static electricity from your body to the module, resulting in malfunction or breakage of the module. If you have no choice but to touch a module, be sure to discharge the static electricity by touching the metal frame of the cubicle and then touch the module. This is also true when you perform any of the following actions on a module in its non-energized state: 1) setting a switch on the module; 2) connecting or disconnecting the cable from the module; or 3) inserting or removing the connector from the module.

1 BEFORE USE

This product must be used within the environmental specifications shown in the table below. To make the product run stably for a long period of time, users are advised to use the product at normal temperatures (15 to 35°C) and normal humidity (45 to 85%RH). If it is used in a location subject to high temperatures and high humidity or where the temperature greatly fluctuates daily, its useful life will be shortened.

Table 1-1 Environmental Specifications for the LPU Module

Power voltage	For LQV000: 100 to 120 VAC, single phase, 50/60±5 Hz For LQV010: 100 to 120 VAC, single phase, 50/60±5 Hz For LQV100: 100 to 120 VAC, single phase, 50/60±5 Hz 100 to 110 VDC For LQV020: 24 VDC For LQV200: 200 to 240 VAC, single phase, 50/60±5 Hz
Power voltage fluctuation range	For LQV000: 85 to 132 VAC For LQV010: 85 to 132 VAC For LQV100: 85 to 132 VAC 85 to 132 VDC For LQV020: 20.4 to 28.8 VDC For LQV200: 170 to 264 VAC
Temperature	Operating: 0 to 55°C; Storage: -20 to 75°C. (Temperature change rate: 10°C/hour or less)
Relative humidity	Operating: 30 to 90%RH; Storage: 10 to 90%RH (non-condensing)
Vibration resistance	Conforming to JIS C0040 standard; Frequency: 10 Hz to 150 Hz; Acceleration: 10 m/s ² ; Direction: each of X, Y, and Z; Sweep time: 8 minutes; Sweep cycles: 20.
Shock resistance	Conforming to JIS C0041 standard; Peak acceleration: 147 m/s ² ; Half-sine pulses; 3 times in each of X, Y, and Z directions.
Ambient air	Dust class: 1 million No corrosive gas (0.1 mg/mm ³ or less)



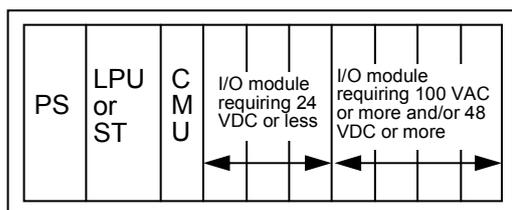
CAUTION

If the input voltage for the power supply module is within the specified range but close to the upper or lower limit, you should conclude that an input power problem exists, and ask the power supply facility manager to conduct an inspection.

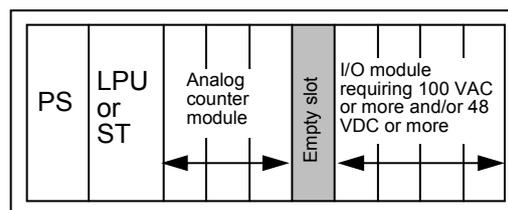
■ **Module mounting**

To mount optional modules and I/O modules in the LPU or I/O unit (mount base), observe the general rules listed below and reduce the influence of noise from the external cable wiring for I/O modules.

- Do not mount any I/O module requiring an AC voltage of 100 V or more and/or a DC voltage of 48 V or more for its operation, in a slot adjacent to the mounted LPU module or CMU module. Mount such an I/O module in a furthest possible slot from the mounted LPU or CMU module. If you have to disregard this rule for some reason, employ some means for noise reduction, such as shielded cables, surge killers, etc., and keep the cables away (100 mm or more) from the LPU or CMU module.
- Mount an I/O module requiring a DC voltage of 24 V or less and an I/O module requiring an AC voltage of 100 V or more and/or a DC voltage of 48 V or more for their operation, in furthest possible slots from each other.
- Mount in slots an analog counter module and an I/O module requiring an AC voltage of 100 V or more and/or a DC voltage of 48 V or more for its operation, leaving an empty slot in between.

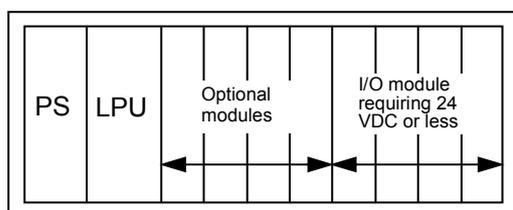


Mount I/O modules separately according to each voltage requirement.



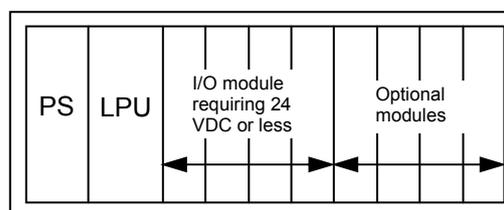
Leave an empty slot between an analog counter module and an I/O module mounted.

- Separate the cable wiring for mounted I/O modules according to each voltage requirement.
- Mount a given set of optional modules in a single sequence of slots and a given set of I/O modules in another separate sequence of slots, as exemplified below. However, mounting of the optional modules need not to be started at the next slot to the mounted LPU module, as is done in Example A.



(Example A)

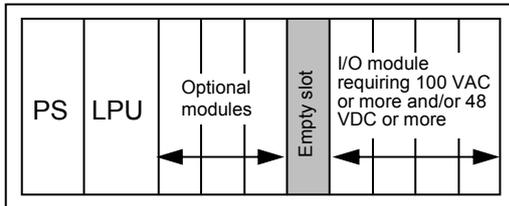
A given set of optional modules is mounted separately from a given set of I/O modules.



(Example B)

1 BEFORE USE

- Mount a given set of optional modules in a single sequence of slots and a given set of I/O modules requiring 100 VAC or more and/or 48 VDC or more in another separate sequence of slots, leaving an empty slot in between, as shown below.



Leave an empty slot between a given set of optional modules and a given set of I/O modules mounted.

- Separate the cable wiring for mounted optional modules from that of mounted I/O modules.
- **Output modules**

For each output module, connect a fuse to its power supply to the load for protection against short-circuit. The fuse must be one that matches the ratings of the load. If a non-matching fuse is connected, the printed wiring board or casing used may be damaged when the load is short-circuited.

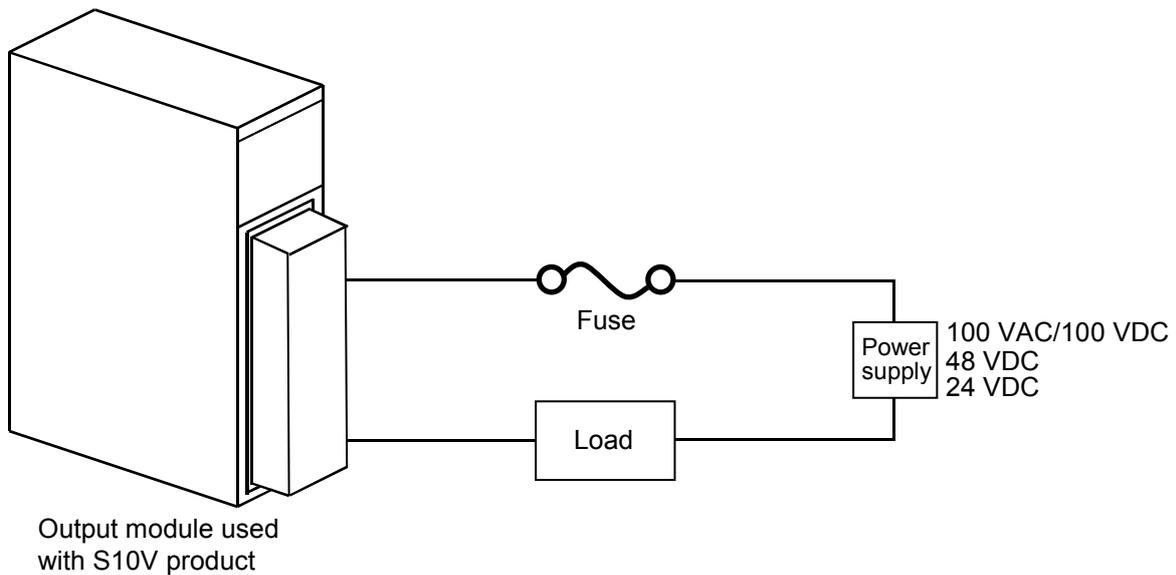


Figure 1-2 Wiring of an Output Module

■ Grounding

Each grounding point of the product must be grounded separately from the grounding points or other related equipment. The grounding point of an AC panel for distribution, in particular, must be grounded at least 15 m away from the grounding points of the product.

The best way to ground the product and other related equipment is to weld the grounding cable from each grounding terminal to the steel framework of the building. If such welding cannot be accomplished, bury a grounding bar in the earth (Class D or higher grounding) and ground the grounding terminal through the bar.

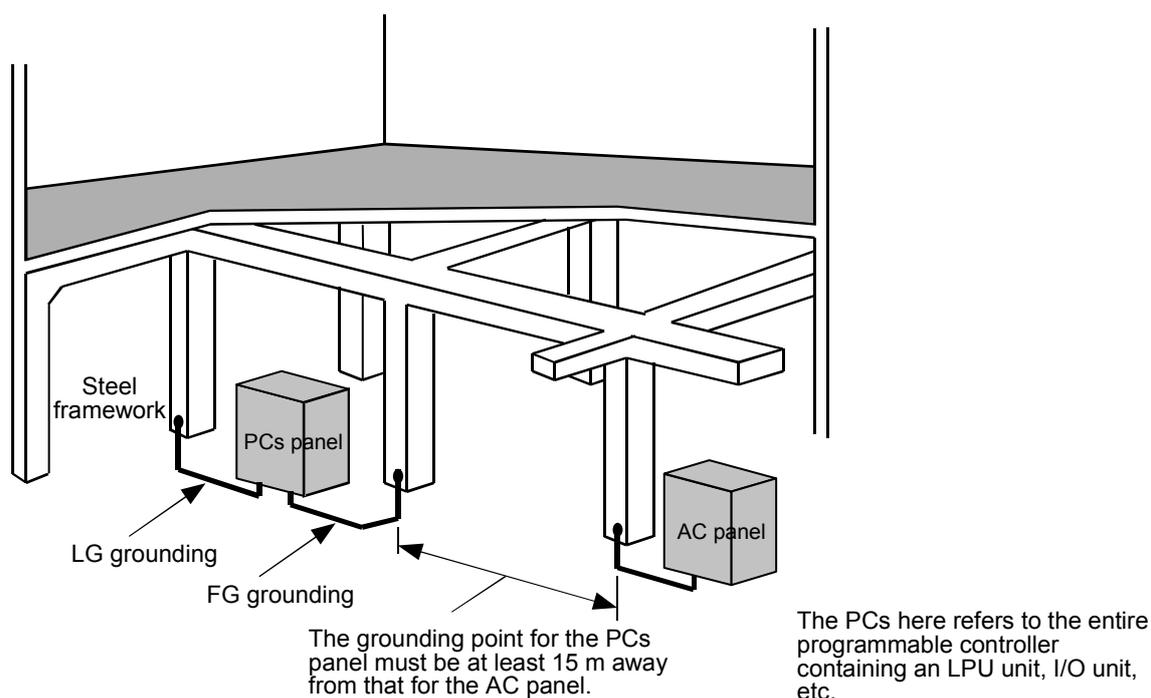


Figure 1-3 Grounding -- an Example

* Class D grounding is defined in the Technical Standard for Electrical Facilities of Japan. This standard states that the grounding resistance must be 100 ohms or less for equipment operating on 300 VAC or less, and 500 ohms or less for devices that shut down automatically within 0.5 seconds when shorting occurs in low tension line.

1 BEFORE USE

■ Noise

Do not install the product in or near to a panel in which an inverter or other high-voltage device is installed. If such installation is essential for some reason, set shielding plates to protect the LPU unit or I/O unit and the cables from the influence of electromagnetic or electrostatic induction or both.

■ Emergency stop circuit

Should a component part of the product fail, it might affect the entire product. An emergency stop circuit must therefore be constructed externally (i.e., it must not be incorporated into the programmable controller's program).

■ Replacement of component parts

Customers are not recommended to replace any component part of the product. If a faulty part is found, replace the module containing it. The replacement work should be done by Hitachi's maintenance personnel.

■ Replacement of modules

Before replacing a module, be sure to switch off the power supply. Without doing so, such replacement may result in module failure or electric shock.

■ Extension of the existing equipment

If the existing equipment surrounding the product is expanded or changed by adding additional units, check the expanded equipment for any abnormality according to "10.1 Preventive Maintenance" and make sure that the programmable controller functions normally. For the power supply and grounding used, check the following items:

● Power supply

* Check the power supply voltage and its waveform.

- Make sure that no voltage drop is caused.
- Make sure that the noise in the network power cable is not problematic.

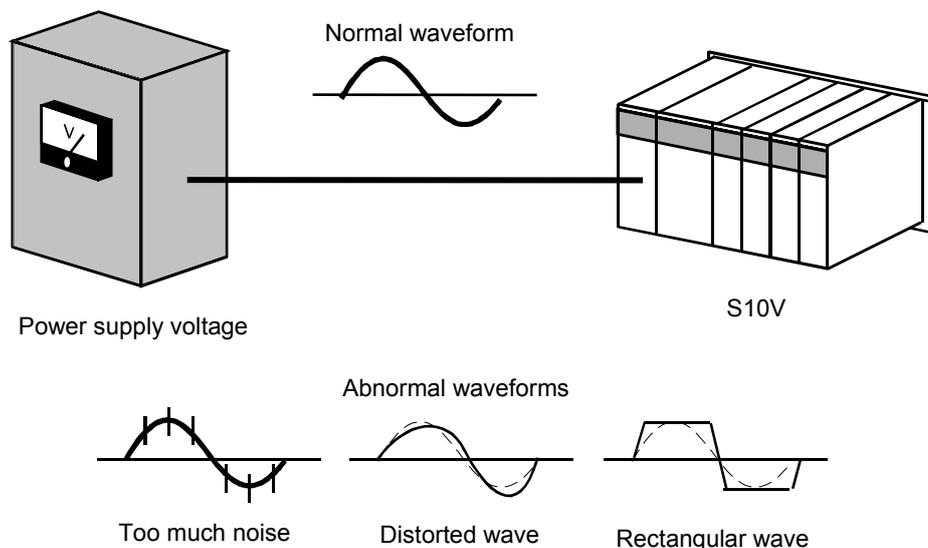


Figure 1-4 Power Supply Voltage and Waveforms

- Grounding

- * Check the wiring for grounding.

- Make sure that the ground is not shared with any other piece of equipment.
- Make sure that the grounding point is at least 15 m away from that of the AC panel.

- * Check that no high-power cable or network power cable is placed near signal cables, such as a remote I/O cable.

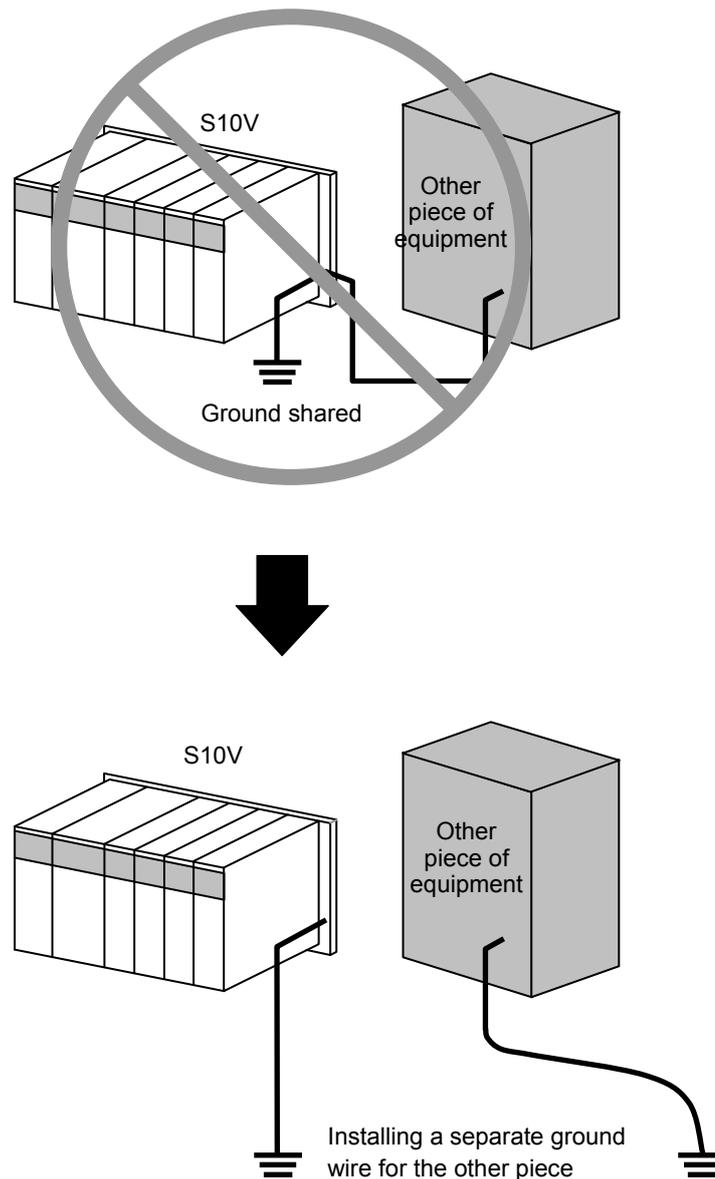


Figure 1-5 Grounding Method



WARNING

- If an emergency stop circuit is to be formulated, it must be positioned external to this module. If you do not observe this precaution, equipment damage or accident may occur when this module becomes defective.
- Keep the input and output currents of any I/O module within the maximum permitted current values. If an overcurrent is allowed to flow in the I/O module, the component part(s) involved may be damaged, resulting an accident, fire, or product failure.
- Ensure that the employed external power source has overvoltage and overcurrent protection functions.
- If the module emits smoke or foreign odor, immediately switch off the power supply and investigate the problem cause.
- Do not attempt any installation, wiring, handling, or product alteration not covered in this manual. The manufacturer accepts no responsibility for product/peripheral breakage or fatal accidents due to such attempts.



CAUTION

- Before supplying power to the equipment, thoroughly check the wiring connections.
- Overheating may cause a fire or unit failure. Where the ambient temperature reaches 48°C or higher, lower the maximum output current that can be drawn from the power supply module. For details, see “9.7 Output Current from the Power Supply Module.” If the ambient temperature is high install a cooling fan in the housing enclosure or reduce the number of modules mounted.
- Before changing the program, generating a forced output, or performing the RUN, STOP, or like procedure during an operation, thoroughly verify the safety because the use of an incorrect procedure may cause equipment damage or other accident.
- When you switch on the power supply, follow the specified sequence. Failure to follow the specified sequence may cause equipment damage or other accident.
- Do not insert your finger or a foreign object into any opening in a connector or the mount base. Disregarding this rule may result in bodily injury.

NOTICE

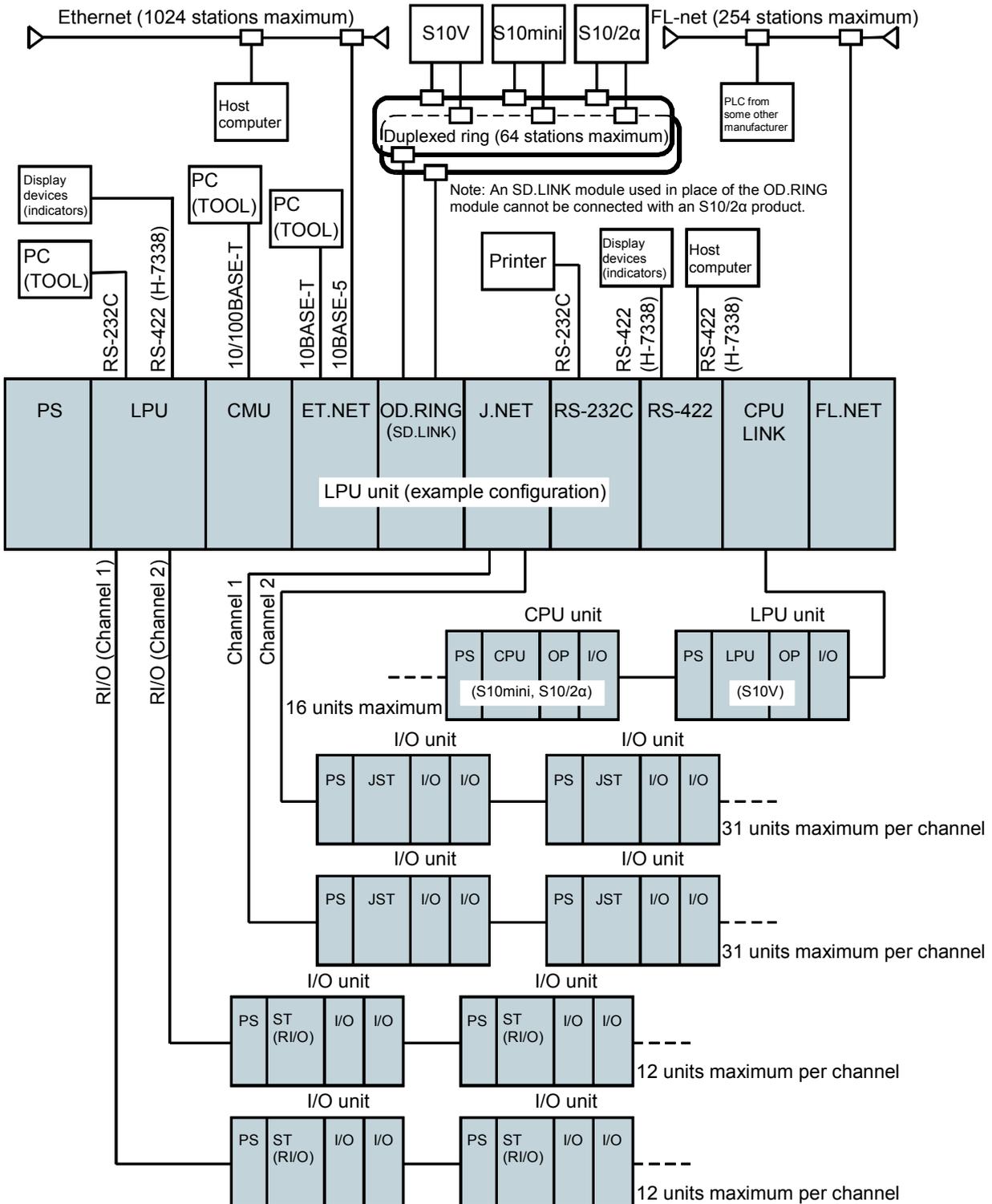
- To provide protection against short circuit, furnish the external power source for optional PI/O modules with a fuse or circuit protector. Ensure that the employed circuit protector is rated as specified.
- Before terminating this product (by shutting down or resetting), check that all the peripheral equipment is already stopped or will not be affected by the termination.
- Failure of an installed module may damage the contents of memory spaces. Be sure to make a backup copy of any important data in memory.
- Do not use a transceiver, cellular phone, or similar device near the module because module malfunction or system failure may occur due to noise.
- Some parts containing gallium arsenide (GaAs) in a photo coupler and LED are used in this product. GaAs is specified as a harmful object by law. Take special care when handling the product, in particular, scrapping it. Before scrapping work.
- To avoid malfunction, ensure that the power supply is switched on and off at intervals of longer than 1 second.

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2 OVERVIEW

2.1 System Overview

The example configuration shown below consists of an optional module (CMU) for C mode/ HI-FLOW processing, optional modules (ET.NET, OD.RING [SD.LINK], J.NET, and FL.NET) for networking, a CPU LINK module for connecting LPU and CPU units together, RI/O and JST modules for communication with I/O units. A configuration consisting of these modules plus IR.LINK and IR.ST modules is also possible.



- **Total mounting space is equal to that of S10mini product.**

The total mounting space in this product is equal to that in the S10mini product. In addition to this feature, this product achieves high-speed processing and, at the same time, handles large programs. Since the basic capabilities of the ladder language are provided in the form of a separate hardware module as with the C mode and HI-FLOW arithmetic and logical capabilities, they are easy-to-use for those customers who use the basic capabilities only.
- **I/O modules can be shared with an S10mini product.**

As with the S10mini product, I/O modules can be installed in the LPU unit of this product. In addition, the same I/O modules used with an S10mini product can also be used with this product.
- **High ladder performance has been realized with 15-nanosecond bit operations and 60-nanosecond word operations.**

High-speed ladder operations are possible only with the basic capabilities (LPU module) of the ladder language. The floating-point arithmetic that cannot be accomplished on an S10mini or S10/2 α product is supported by this product.
- **Ladder programs of up to 100k steps are handled, approximately three times as large as those executed on the S10mini product.**

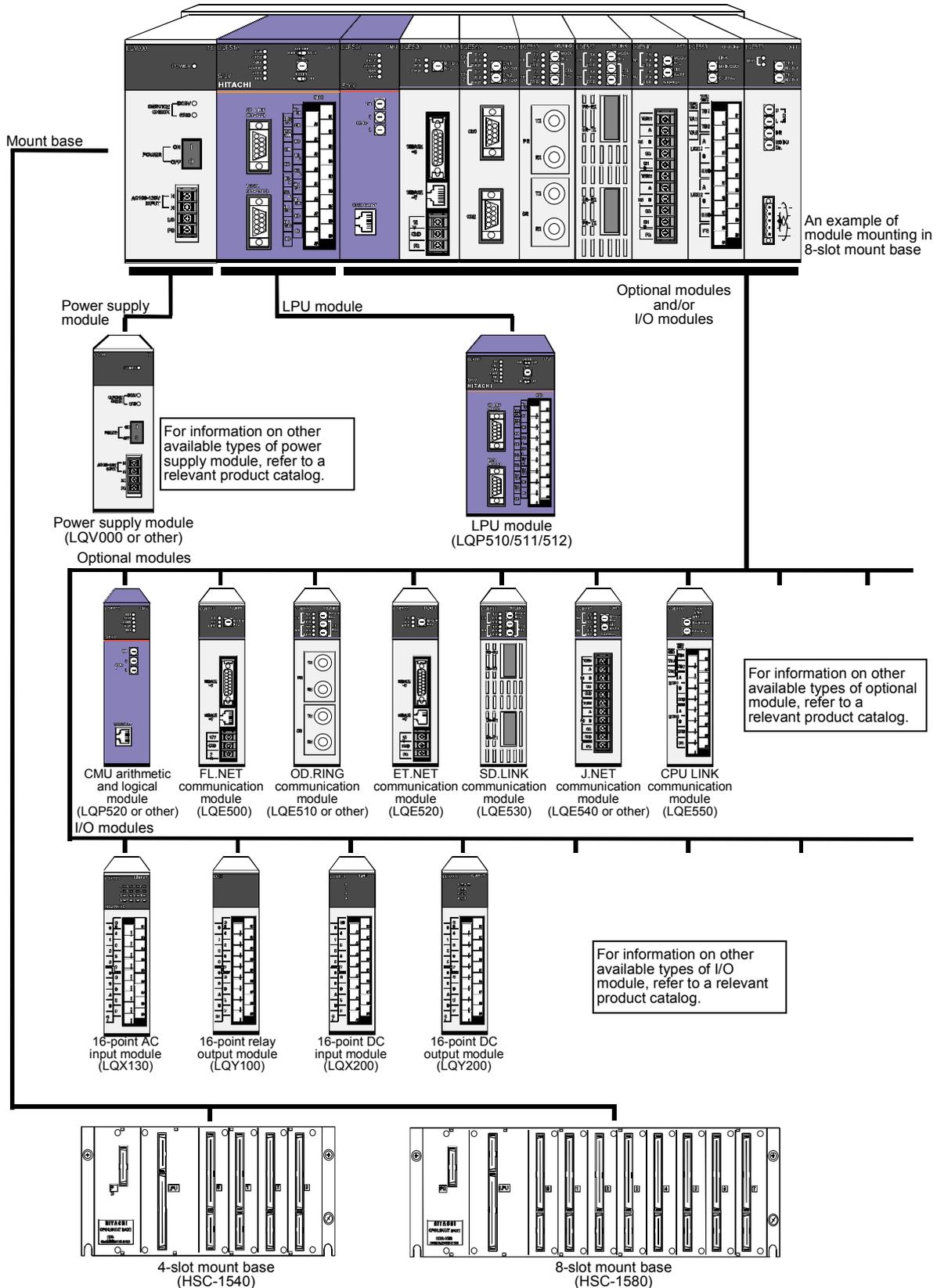
Users can produce large ladder programs without paying attention to their size in steps. Compared with the S10mini and S10/2 α products, this product is provided with large general data registers.
- **Normal-rung ladder capability is provided as standard.**

The basic capabilities (LPU module) of the ladder language execute industry-standard normal-rung ladder programs. Since the downward-sloping-rung ladder programs produced on the S10mini or S10/2 α product can be converted into normal-rung ladder format using a dedicated converter, they can also be used on this product.
- **The LPU module is provided with remote I/O and display device interfaces as standard.**

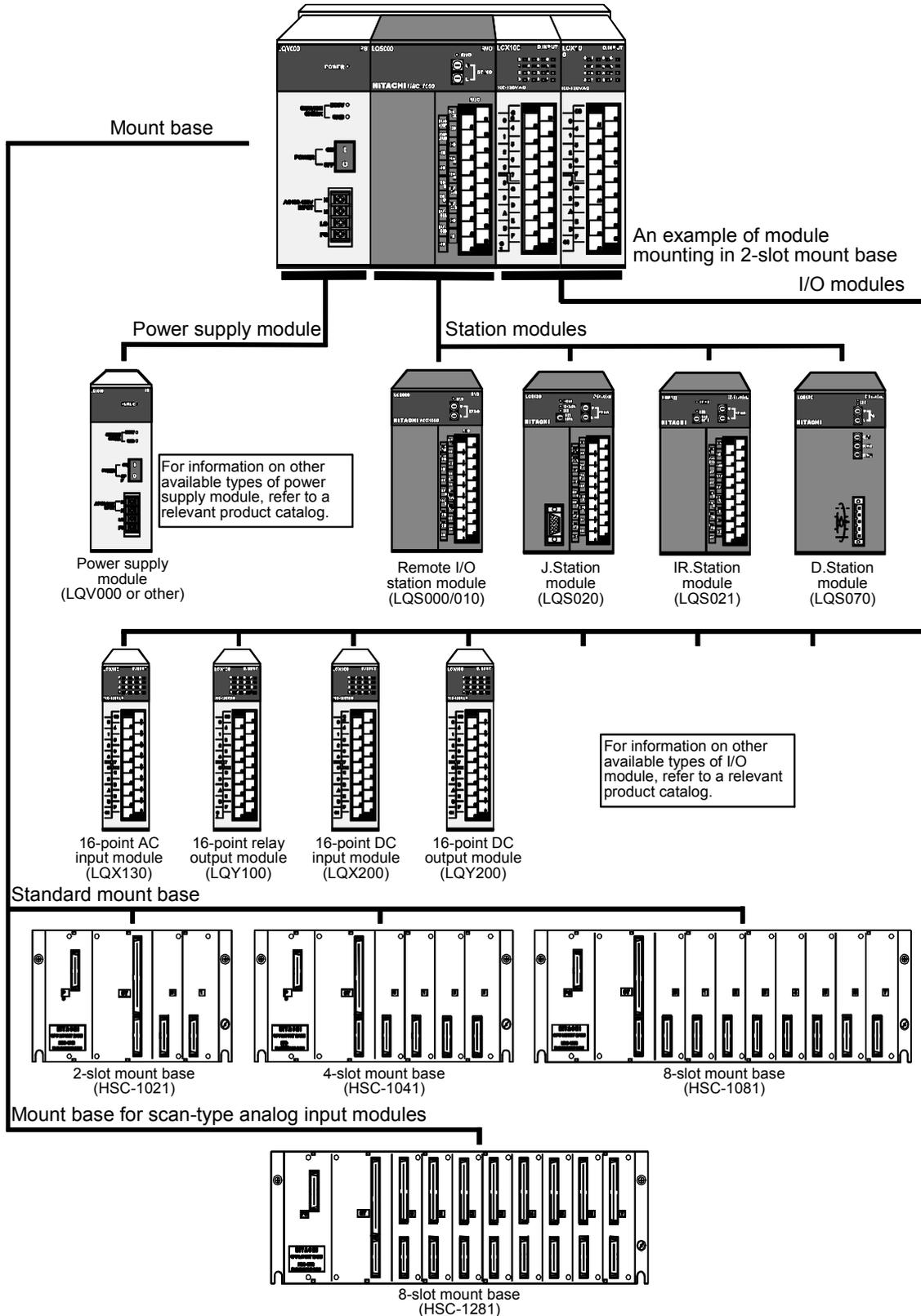
These standard interfaces make easy the distributed installation of I/O units and connection of display devices for monitoring processing status, and thus contribute to the reduction of wiring costs. The display device interface, in particular, supports the RS-422-based H-7338 protocol as standard.
- **Three types of languages -- ladder chart, C, and HI-FLOW -- are supported.**

In addition to the “ladder chart,” this product supports the readable, easy-to-understand flowchart language HI-FLOW and the general-purpose programming language C. The HI-FLOW and C languages are provided in the form of a dedicated optional module (CMU).

2.2 Module Arrangement in the LPU Unit



2.3 Module Arrangement in the I/O Unit



2.4 LPU Module Models and Their Inter-Compatibility

Table 2-1 shows the inter-compatibility of available LPU models.

Table 2-1 LPU Module Models and Their Inter-Compatibility

Model	Compatibility with the model LQP510
LQP510	–
LQP511	This model is upward-compatible with the model LQP510. It has the functionality of the model LQP510 and offers additional support functionality for extended remote I/O (model LQE220).
LQP512	This model is upward-compatible with the model LQP510. It has the functionality of the model LQP511 and offers additional support functionality for high-speed remote I/O (model LQE230).

2.5 Remote I/O Station Module Models and Their Inter-Compatibility

Table 2-2 shows the inter-compatibility of remote I/O station modules.

Table 2-2 Remote I/O Station Module Models and Their Inter-Compatibility

Model	Compatibility with the model LQS000
LQS000	–
LQS010	An upward compatible product for the model LQS000. It provides connectivity with extended remote I/O (model LQE220) and high-speed remote I/O (model LQE230).

3 NAMES AND FUNCTIONS OF EACH PART

3 NAMES AND FUNCTIONS OF EACH PART

3.1 LPU Module

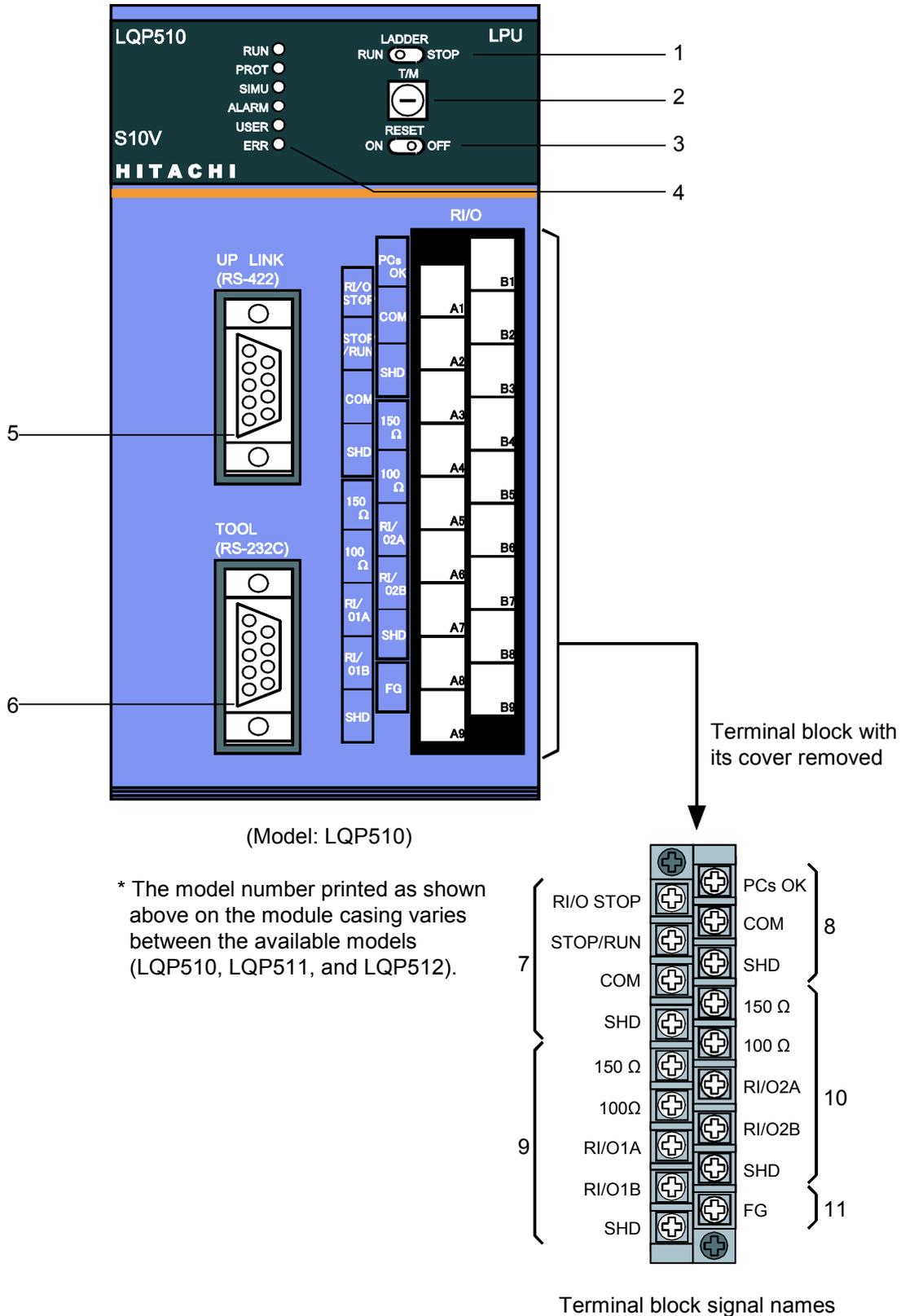


Figure 3-1 Names of the Major LPU Module (LQP510/511/512) Parts

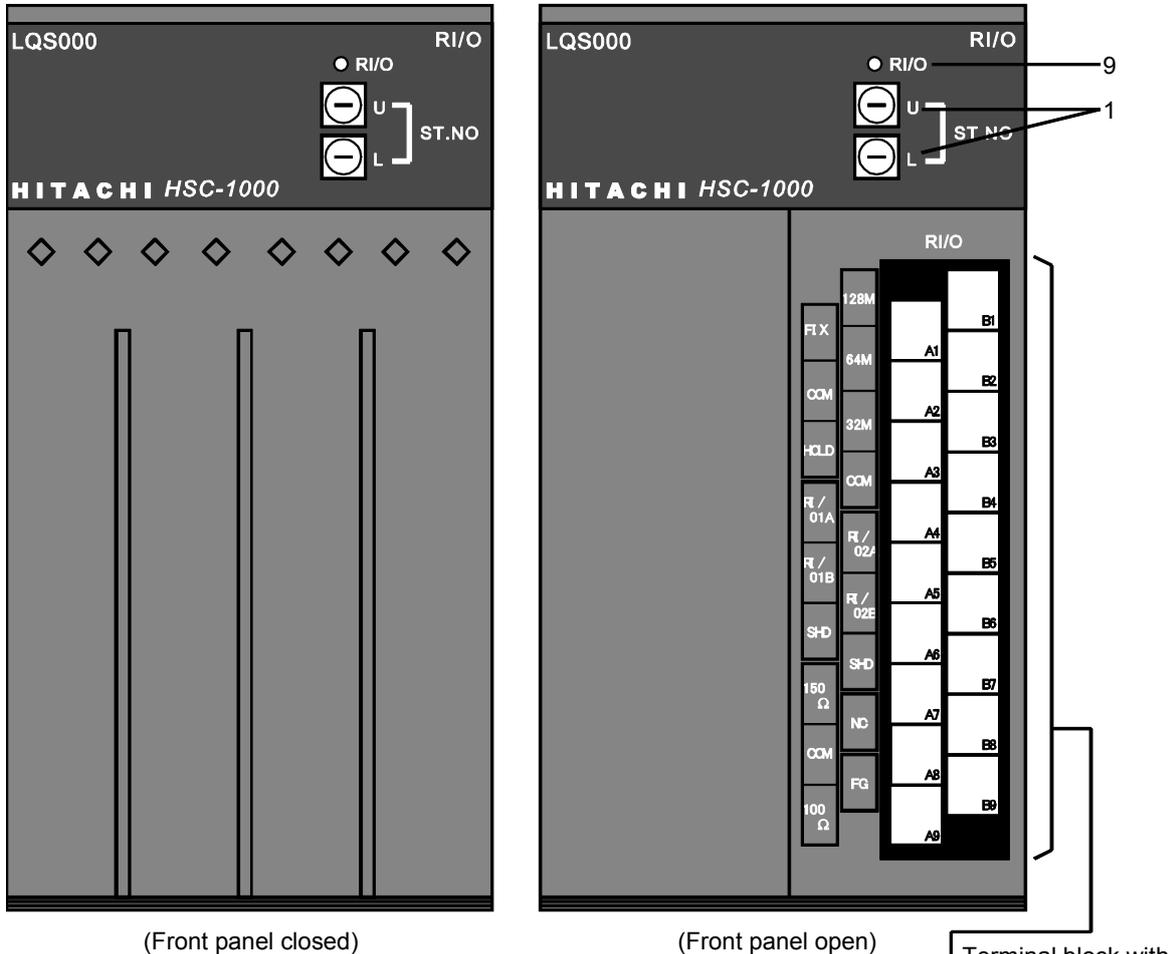
Table 3-1 Functions of the Major LPU Module (LQP510/511/512) Parts

No.	Name	Function
1	Ladder program operation switch (LADDER RUN/STOP)	Switches the operational status of a ladder program between two states --- RUN: Initiates the ladder program. STOP: Terminates the running ladder program.
2	T/M and operational setting switch (T/M)	If this switch is set to one of the following values before switching on the power supply, one of the operations below will take place when the power supply is switched on. 0: Normal operation 1 to 7: Prohibited settings (Do not use these settings.) 8: T/M (Reserved for maintenance purposes. Do not use this setting.) 9 to B: Prohibited settings (Do not use these settings.) C: Optical power measurement mode. (Before measuring the optical power of the OD.RING module, set this switch to "C", switch on the power supply, and then set the reset switch in ON position. On completion of the measurement, set the reset switch in OFF position and then switch off the power supply.) D: Prohibited setting (Do not use this setting.) E, F: Full initialization (to the condition at shipment) (Set this switch to "E" and then switch on the power supply. Three seconds later, switch off the power supply. Then, set this switch to "F" and switch on the power supply again. About 20 seconds later, all the six indicator lights will come on, indicating the initialization has been completed.)
3	Reset switch (RESET ON/OFF)	Resets the modules mounted in the LPU unit. Usually, this switch is manually set back in OFF position right after it has been set in ON position. When the optical power measurement mode is selected with the T/M and operational setting switch described above, leave this switch in ON position during the measurement and set it back in OFF position right after completion of the measurement.
4	Indicator lights (RUN, PROT, SIMU, ALARM, USER, ERR)	Each indicates the operational status of the LPU module: RUN: (Green) indicates that a ladder program is running. PROT: (Green) indicates that all memory other than the ON/OFF status memory (PIO memory) for a ladder program is currently write-protected (For details, see Subsections 8.2.6 and 8.2.7.) SIMU: (Green) indicates that the execution of a ladder program is being simulated without any I/O transfer in progress (For details, see Subsection 8.2.4.) ALARM: (Red) indicates that the backup battery is low or an error has been detected in an optional-module startup check. USER: (Green) indicates that a value of "1" has been output to an E-coil (000 to 1FF.) ERR: (Red) indicates that the LPU module cannot continue its operation because of a hardware fault, a serious component failure, etc.
5	UP LINK connector (UP LINK [RS-422])	An interface (H-7338) used to connect the host computer (Hitachi's control computer). This interface can also be used to connect a display unit or similar hardware unit (RS-422-based).
6	TOOL connector (RS-232C)	An interface (RS-232C) used to connect the dedicated tools for the S10V product, which runs on a Windows® PC.
7	RI/O STOP contact input (RI/O STOP)	A contact input (100 VAC or 100 VDC) for remotely controlling remote I/O transfers externally. For details, see Subsection 5.5.2.
	STOP/RUN contact input	A contact input (100 VAC or 100 VDC) for remotely controlling the operation of a ladder program externally. For details, see Subsection 5.5.2.
8	PCs OK contact output (PCs OK)	A contact output used to inform external devices that the LPU module is running normally. The contacts become open when an error, stop, reset, or power-off condition is detected during the run.
9	RI/O line (port 1) terminals	Terminals for connecting a remote I/O (1 to 1024 points) line.
10	RI/O line (port 2) terminals	Terminals for connecting a remote I/O (1025 to 2048 points) line.
11	Frame ground terminal	A terminal for connection with the FG terminal of the mount base.

(Note) For details on the connections mentioned above, see "5 CABLING." For details on each setting, see "7 SETTINGS."

3 NAMES AND FUNCTIONS OF EACH PART

3.2 Remote I/O Station Module



(Front panel closed)

(Front panel open)

(Model: LQS000)

* The model-LQS000 remote I/O station module has the same front view and features as the model LQS010, except its model number printed on its front.

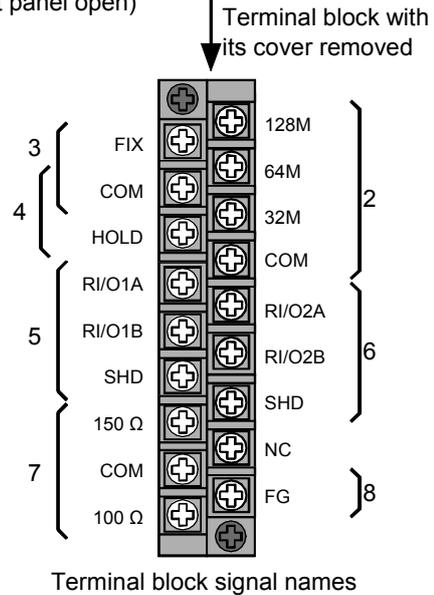


Figure 3-2 Names of the Major Remote I/O Station Module (LQS000/010) Parts

Table 3-2 Functions of the Major Remote I/O Station Module Parts

No.	Name	Function
1	Station number setting switches (ST.NO U/L)	Used to set a station number, which is the starting two digits (address) of the I/O number. The starting digit of the two is set with the “U” switch and the second is set with the “L” switch.
2	I/O point count setting terminals	Terminals to set a count of the number of exclusively used I/O points per mount base slot, which is one of the four: 16, 32, 64, and 128.
3	FIX/FREE setting terminals	Terminals to specify the partition status (FIX or FREE) for the mount base.
4	Output hold setting terminals	Terminals to specify the output status (RESET or HOLD) into which the output modules will enter when a remote I/O line is disconnected.
5	RI/O line reception terminals	Terminals to connect the remote I/O line cable closer to the LPU unit. (Terminals A4 and B5 are internally connected together. The same is true with terminals A5 and B6.)
6	RI/O line branch terminals	Terminals to connect a branch cable of the remote I/O line cable closer to the LPU unit. (Terminals A4 and B5 are internally connected together. The same is true with terminals A5 and B6.)
7	Terminating resistor setting terminals	If this station module is connected to the furthest end of a remote I/O line from the LPU unit, it needs to be terminated with an internal terminating resistor (100 Ω or 150 Ω). When you are using any remote I/O cable other than specified, see “5.6.3 Terminating with terminating resistors.”
8	Frame ground terminal	When you are grounding a remote I/O line cable, connect it to the FG terminal on the mount base.
9	RI/O communication LED indicator	Is lit when remote I/O communication is in progress.

(Note) For details on the connections mentioned above, see “5 CABLING.” For details on each setting, see “7 SETTINGS.”

3.3 Power Supply Module

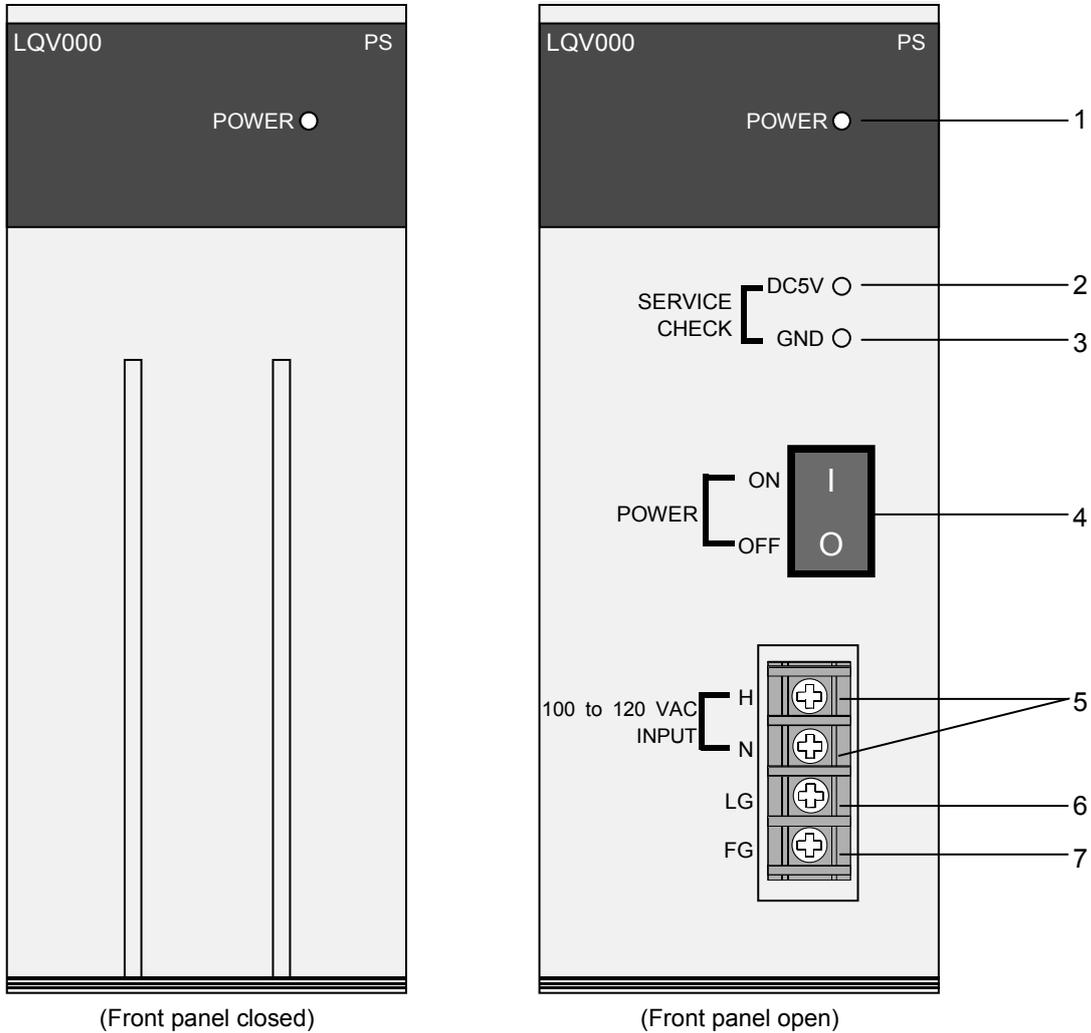


Figure 3-3 Names of the Major Power Supply Module (LQV000) Parts (common to all power supply models)

Table 3-3 Available Types of Power Supply Module

Name	Model	Remarks
AC-input power supply	LQV000	100 to 120 VAC-input power supply
AC-input power supply	LQV010	100 to 120 VAC-input power supply
DC-input power supply	LQV020	24 VDC-input power supply
AC/DC-input power supply	LQV100	100 to 120 VAC-/ 100 to 110 VDC-input power supply
AC-input power supply	LQV200	200 to 240 VAC-input power supply

(Note) For details on the specifications, see “11 SPECIFICATIONS.”

Table 3-4 Functions of the Major Power Supply Module Parts

No.	Name	Function
1	Power status indicator light (POWER)	Lit up when the power supply is switched on, and remains illuminated while the power is being supplied.
2	Voltage check terminal (DC5V)	A terminal used when checking the current value of the 5 V output voltage (normal values are within 4.75 V and 5.25 V).
3	Voltage check terminal (GND)	0 V reference voltage terminal for voltage checking. This terminal may be used only for voltage checking purposes.
4	Power supply switch (POWER)	Used to switch on or off the power supply module.
5	Power supply terminals (H, N)	Terminals for connecting the input power cable to the power supply module. The value of the input voltage varies with the type of power supply module used.
6	Line filter ground terminal (LG)	A terminal for grounding the power supply line filter. This terminal needs to be connected with the grounding terminal in the unit enclosure.
7	Frame ground terminal (FG)	Needs to be connected with the FG terminal in the mount base or with an installed grounding terminal block.

(Note) For details on the connections mentioned above, see “5 CABLING.”

NOTICE

To avoid malfunction, ensure that the power supply is switched on and off at intervals of longer than 1 second.

3 NAMES AND FUNCTIONS OF EACH PART

3.4 Mount Base

The mount base provides a means of fixing the LPU module (or remote I/O station module), power supply module, and I/O modules into place. Two types of mount base are available, one for an LPU unit and one for an I/O unit.

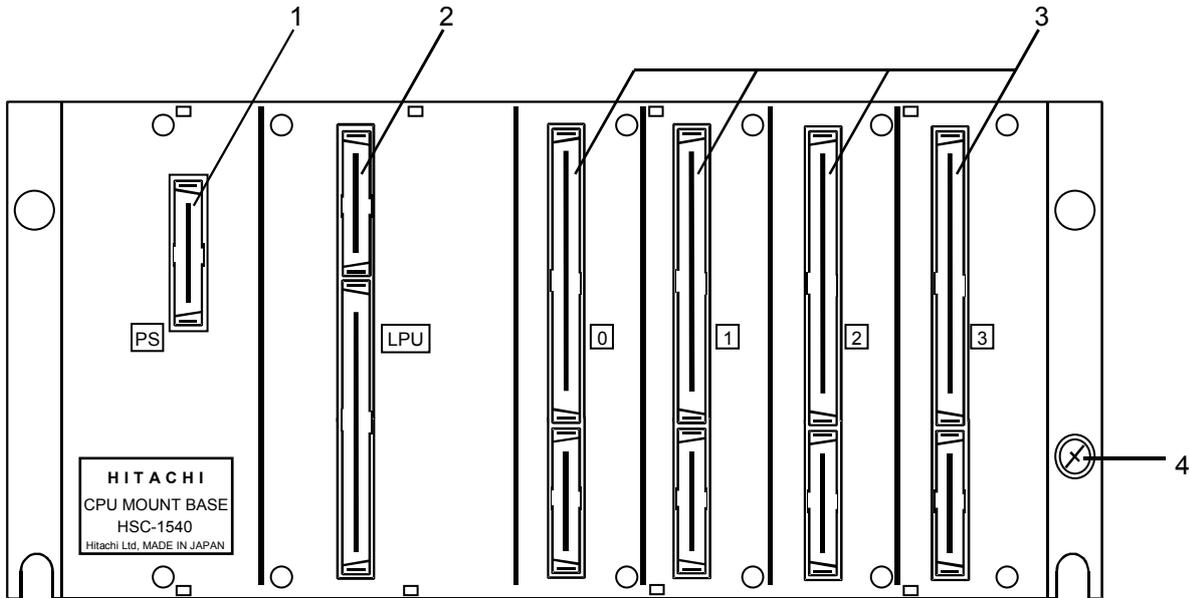


Figure 3-4 Names of the Major Mount Base (HSC-1540) Parts (common to all mount base models)

Table 3-5 Available Types of Mount Base

Unit where mounted	Name	Model	Remarks
LPU unit	4-slot mount base	HSC-1540	Power supply and LPU slots, and 4 slots for optional and I/O modules
	8-slot mount base	HSC-1580	Power supply and LPU slots, and 8 slots for optional and I/O modules
I/O unit	Standard 2-slot mount base	HSC-1021	Power supply and station slots, and 2 slots for I/O modules
	Standard 4-slot mount base	HSC-1041	Power supply and station slots, and 4 slots for I/O modules
	Standard 8-slot mount base	HSC-1081	Power supply and station slots, and 8 slots for I/O modules
	Scan-type analog input-use 8-slot mount base	HSC-1281	Power supply and station slots, and 8 slots for scan-type analog input modules

Table 3-6 Functions of the Major Mount Base Parts

No.	Name	Function
1	PS slot	Used for mounting a power supply module.
2	LPU (or ST) slot	Used for mounting an LPU (or station) module. (No station modules can be mounted in the LPU unit, and no LPU modules can be mounted in the I/O unit.)
3	Option and I/O slots (or I/O slots only)	Optional and/or I/O modules are mounted in the LPU unit, and only I/O modules are mounted in the I/O unit.
4	FG terminal	Connected with the frame ground (FG) terminal of each module.

4 INSTALLATION

4.1 Installation

The LPU module has an interface for connecting I/O units. This interface consists of two remote I/O ports (RI/O-1 and RI/O-2) and allows the connection of remote I/O cables. Up to 12 I/O units can be connected in a series (daisy chain) to each such port, provided the following rules are observed:

- Limit the distance between the LPU unit and the terminal connected I/O unit to 300 m or less.
- Three types of remote I/O cable are available: long-distance cable (at most 300 m long), medium-distance cable (at most 200 m long), and short-distance cable (at most 100 m long). Select the cable type best suited to your needs by taking the total distance into consideration between the two units located at both ends of a planned remote I/O line.
- Avoid the mixed use of the three types of remote I/O cable for the same line. Use only one type.
- Set a unique station number for each unit.

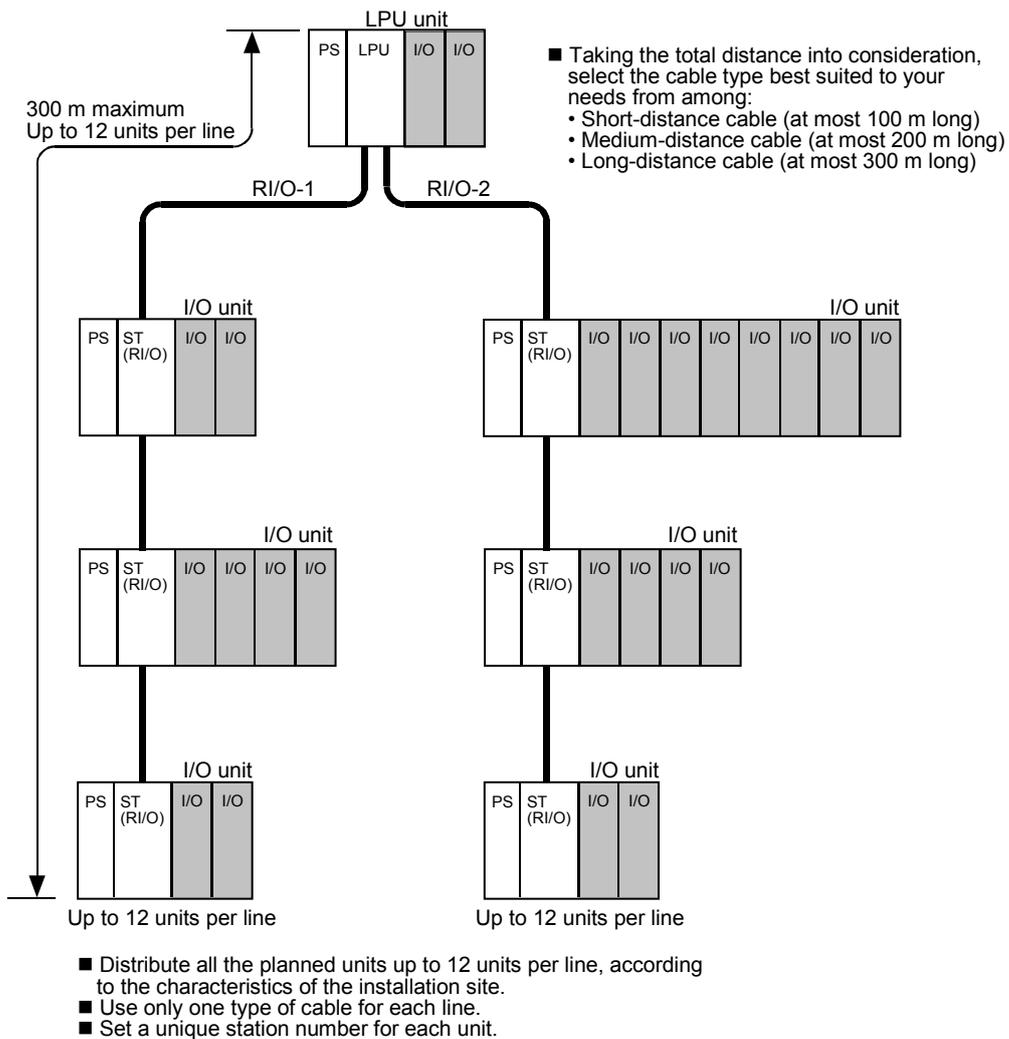


Figure 4-1 Connection of I/O Units for Remote I/O Operations

4.2 Clearances around Mounted Units

In order for this product to function normally, provide an air intake and an outlet in the bottom and top panels of the housing enclosure and cover both openings with an air filter. In addition to this, as shown below, be sure to leave clearances between the enclosure and mounted units and between the mounted units. These clearances are a rough standard and may be increased or decreased depending on the result of a check that is made in a test run to see if the ambient temperature around the units is within the specification set forth in this manual.

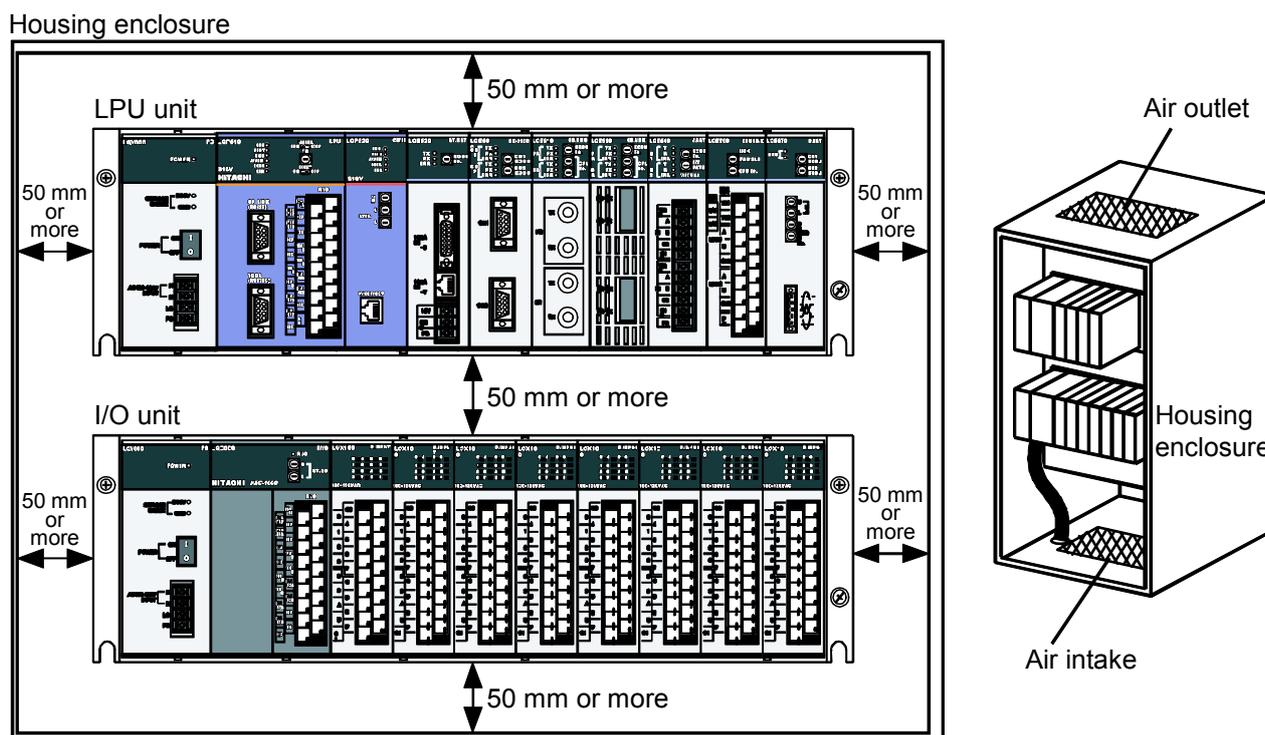


Figure 4-2 Clearances around Mounted Units

NOTICE

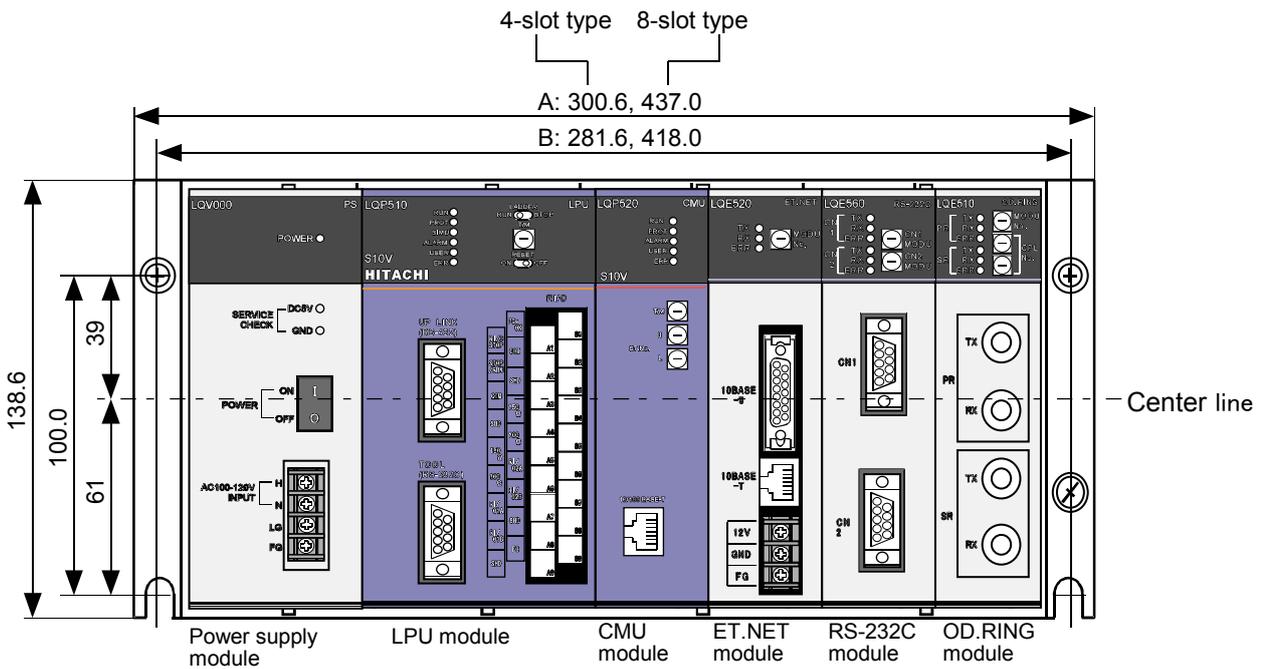
- The module may become defective due to a high temperature, which may result from heat dissipation failure. It may also malfunction due to electromagnetic interference from nearby equipment. For heat dissipation and electromagnetic radiation minimization, provide the specified clearances among the module, its enclosure, and neighboring equipment.
- The degree of temperature rise varies depending on how the module is operated. The mounting intervals specified in the manual should be used as a guide only. While a test run is conducted after completion of mounting, measure the temperature near the module to check whether it is within the specified range. If the measured temperature is beyond the specified range, increase the mounting intervals or provide forced air cooling with a cooling fan.

4 INSTALLATION

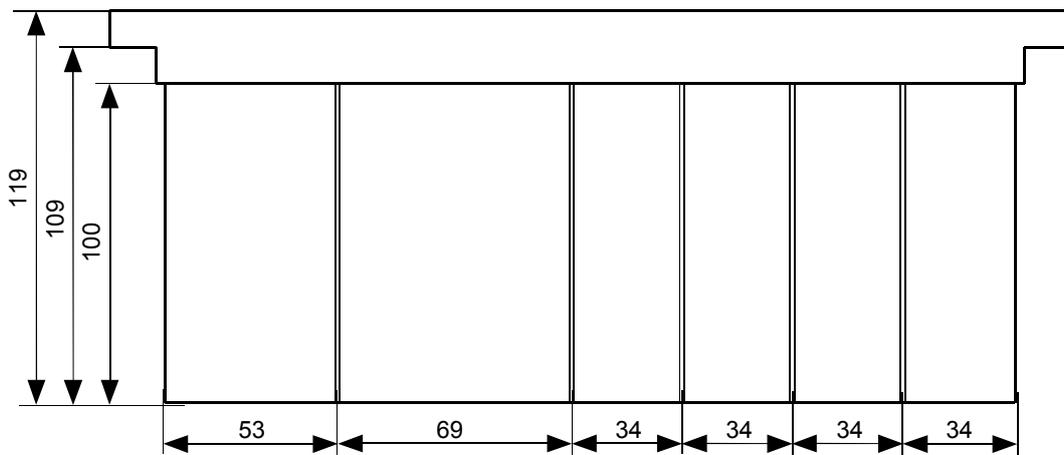
4.3 External Dimensions

The LPU unit has the same external dimensions as the I/O unit. However, as shown below, the mount bases used differ in width (A) and distance (B) between the left- and right-end screw holes, according to the number of slots provided on the mount base. Two-slot mount bases are not available for the LPU unit; only 4- and 8-slot mount bases are available.

(1) Unit dimensions when the power supply module is LQV000, LQV020, or LQV100.



Front view (a 4-slot mount base with mounted modules)

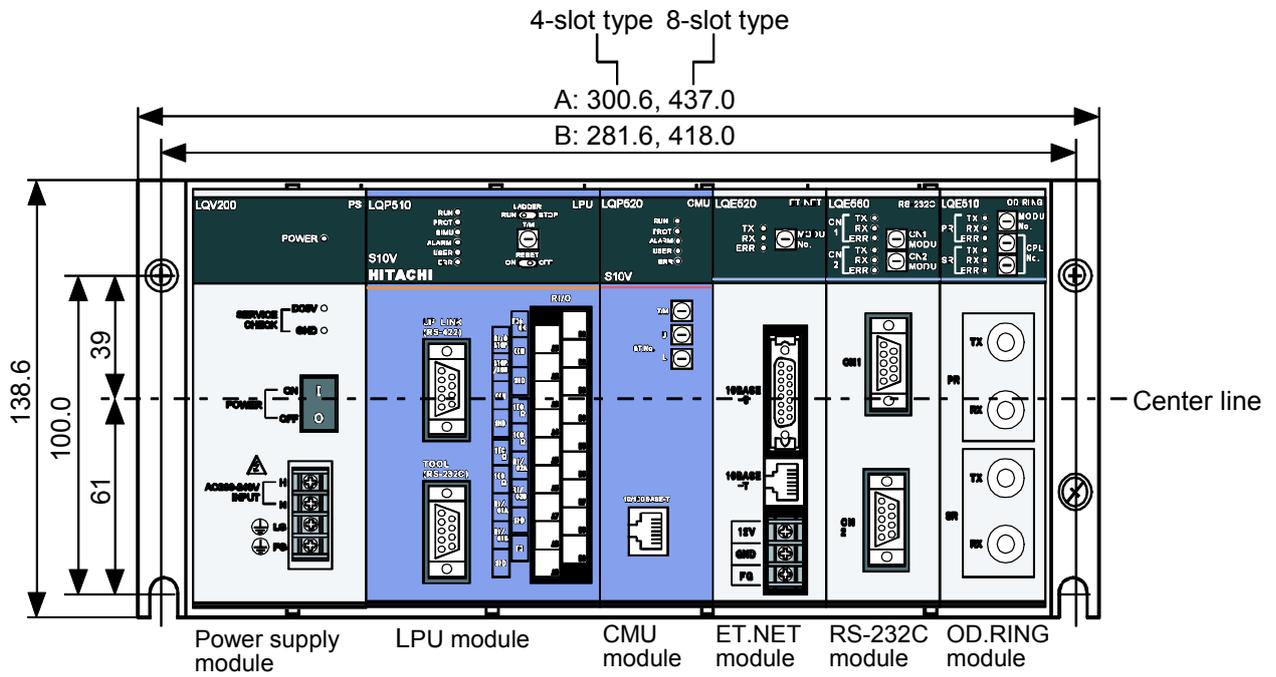


Top view

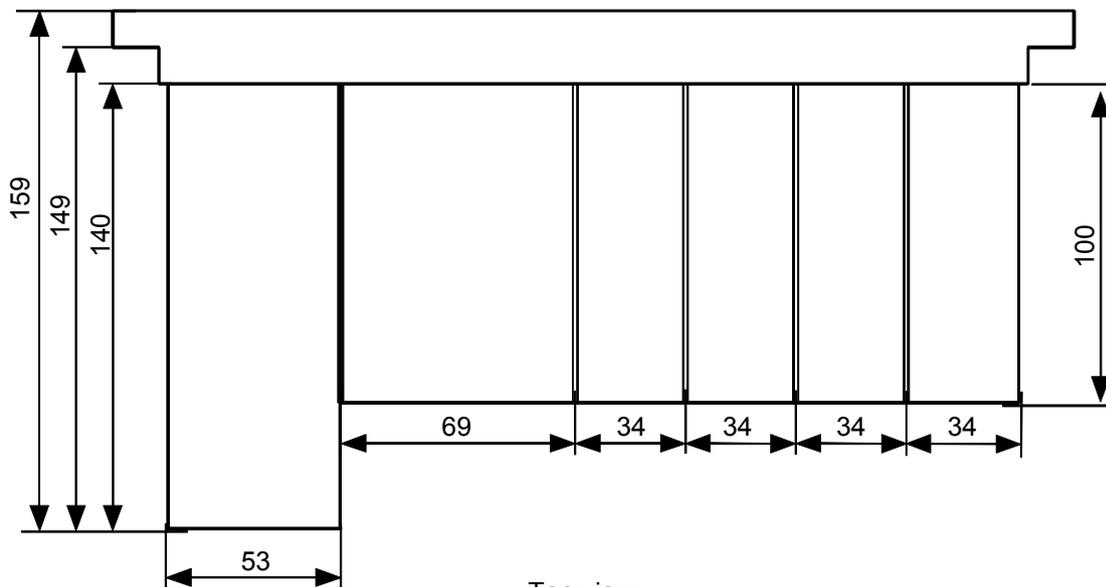
(Unit: mm)

Figure 4-3 External Dimensions of the Units 1

(2) Unit dimensions when the power supply module is LQV010 or LQV200.



Front view (a 4-slot mount base with mounted modules)



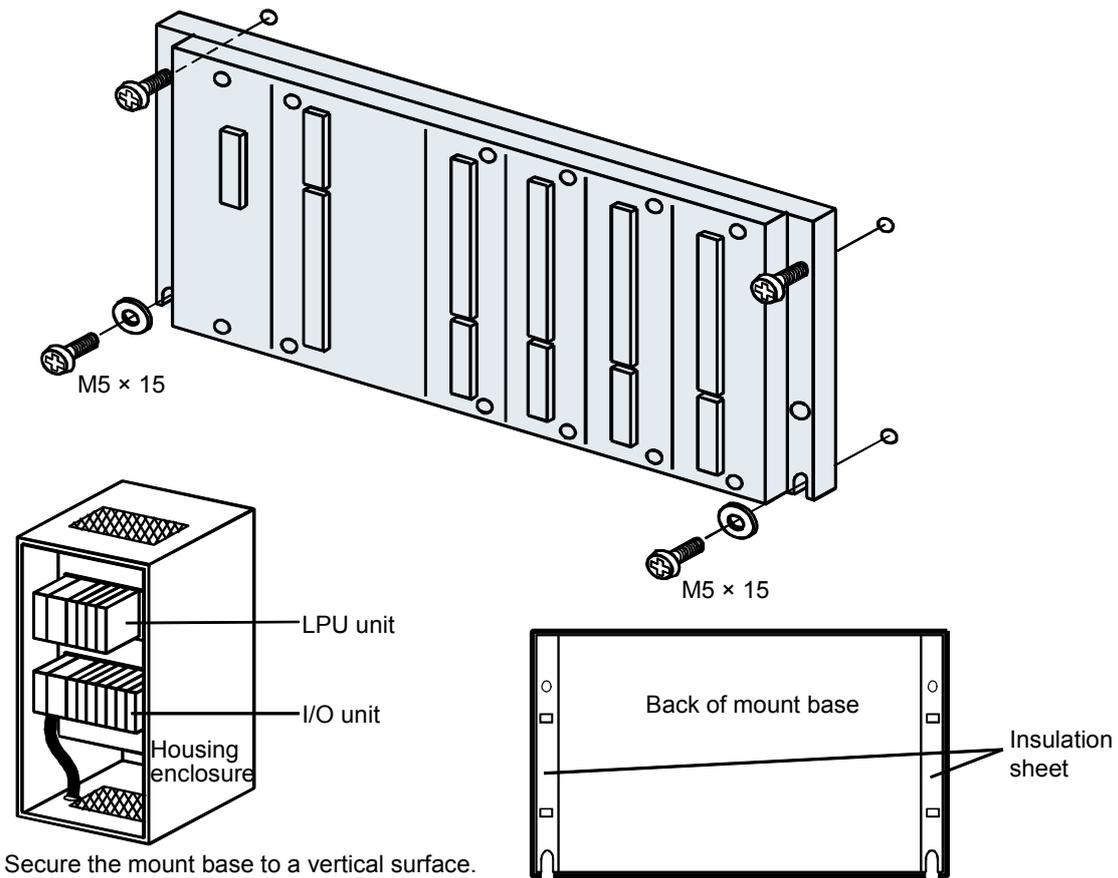
Top view

(Unit: mm)

Figure 4-4 External Dimensions of the Units 2

4.4 Securing the Mount Base

Be sure to secure the mount base to a vertical surface in the housing enclosure. Do not install it in any other orientation, such as upward, downward, or sideward. The modules are designed to dissipate produced heat most efficiently when the mount base on which they are mounted is secured to a vertical surface.



Secure the mount base to a vertical surface.

Figure 4-5 Securing the Mount Base



CAUTION

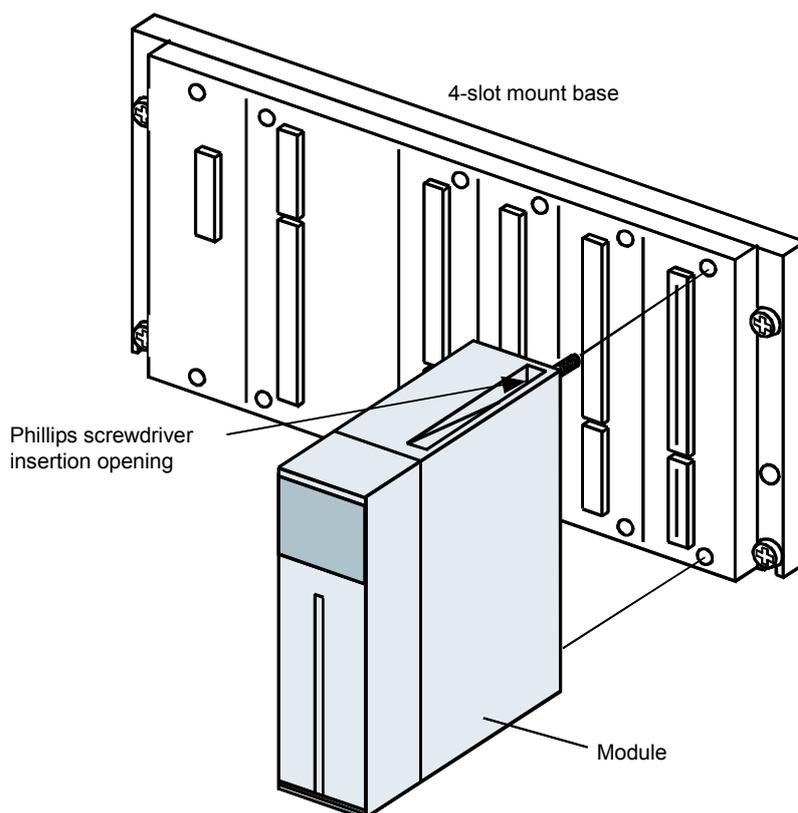
- Do not peel off the insulation sheets. These sheets are provided for electrical insulation of the mount base from the housing enclosure.
- Do not insert your finger or a foreign object into any opening in a connector or the mount base. Disregarding this rule may result in bodily injury.

NOTICE

Install the mount base to a vertical surface. Installing the mount base to a horizontal surface lessens the heat dissipation effects and allows the temperature to rise, thereby rendering the module defective or incurring component parts deterioration.

4.5 Securing the Module

When you initially secure a module to the mount base, remove the dust cover from a socket on the mount module and then insert the module into the socket. If the module is demounted, do not leave the socket uncovered for a long period of time, otherwise dust will collect in the socket. Dust in the socket may result in malfunction or product failure.



When you secure the module, insert the Phillips screwdriver into each insertion opening, as shown below, and tighten the screw.

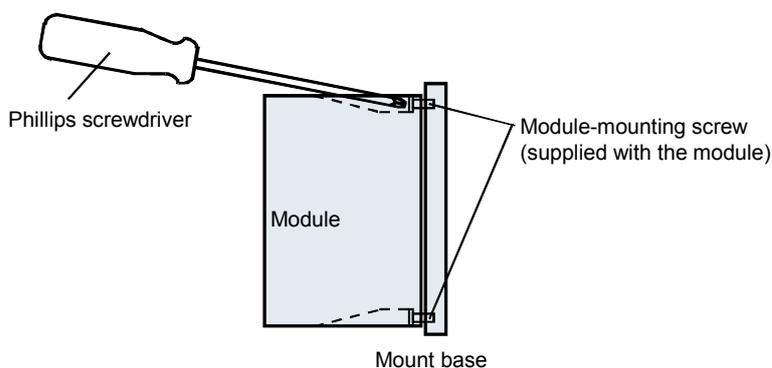


Figure 4-6 Securing the Module



CAUTION

Do not disassemble the module.

 **WARNING**

Do not remove or install a module or cable, with the programmable controller energized. Be sure to power down the programmable controller before removing or installing them. Disregarding this rule may result in an electric shock hazard or failure of the product.

 **CAUTION**

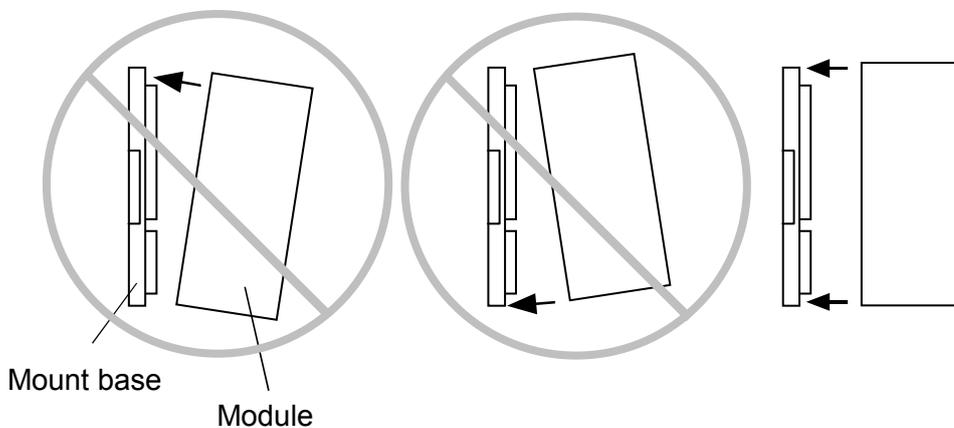
Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

NOTICE

- Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.
- Dust or other foreign matter might accumulate on the connector, resulting in poor contact. When the module is unpacked, perform the mounting and wiring procedures for it immediately.
- To prevent the module from being damaged, observe the following precautions when you mount or demount the module:
 - Before mounting the module to the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled with dirt or the like.
 - When mounting a module in a slot, be sure to hold the module perpendicularly to the mount base and insert it into the slot on the mount base (see the “Good example” below). If the module is inserted aslant into the slot, the connector pins may be damaged. When removing the module from the slot, reverse the above procedure.

[Bad example]

[Good example]



5 CABLING

5 CABLING

5.1 Cable Specifications

Use only communication cables, power cables, and grounding cables that conform to the following specifications:

Table 5-1 Cable Specifications

Item		Specification	Remarks
Remote I/O	Long-distance type (300 m or less per line)	Characteristic impedance	150 Ω
		Attenuation factor	10 dB/km
		Cable diameter	• 0.75 mm ² (CO-EV-SX-1P×0.75SQ) • 0.3 mm ² (CO-EV-SB-1P×0.3SQ)
		Recommended cable type	• CO-EV-SX-1P×0.75SQ • CO-EV-SB-1P×0.3SQ
		Terminating resistance	150 Ω
	Medium-distance type (200 m or less per line)	Characteristic impedance	150 Ω
		Attenuation factor	12 dB/km
		Cable diameter	0.18 mm ²
		Recommended cable type	CO-EV-SB-1P×0.18SQ
	Short-distance type (100 m or less per line)	Characteristic impedance	100 Ω
		Attenuation factor	21 dB/km
		Cable diameter	0.3 mm ²
Recommended cable type		CO-SPEV-SB-1P 0.3 mm ²	
Terminating resistance		100 Ω	
PCs OK		Cable type	Shielded twisted-pair cable
		Cable length	100 m or less
		Cable diameter	0.5 mm ²
LPU STOP/RUN, RI/O STOP		Cable type	Shielded twisted-pair cable
		Cable length	100 m or less
		Cable diameter	0.5 mm ²
Power supply		Cable type	Shielded twisted-pair cable or twisted-triple cable
		Cable diameter	2 mm ² or more
			Varies depending on the load and cable used.
Grounding		Cable diameter	2 mm ² or more
RS-232C		Cable type	Shielded twisted-pair cable
		Cable length	15 m or less
		Cable diameter	0.08 mm ² or more
		Resistance	229 Ω/km or less
		Recommended cable type	CO-VV-SB (MA) 13P×28AWG (7/0.127)
			Manufactured by Hitachi Metals, Ltd.
RS-422		Cable type	Shielded twisted-pair cable
		Cable length	500 m or less
		Cable diameter	0.3 mm ² or more
		Resistance	54.4 Ω/km or less
		Recommended cable type	CO-SPEV-SB-5P 0.3 mm ²
			Manufactured by Hitachi Metals, Ltd.

- Except for the RS-232C and RS-422 cables, connect all the above cables by means of solderless terminals.

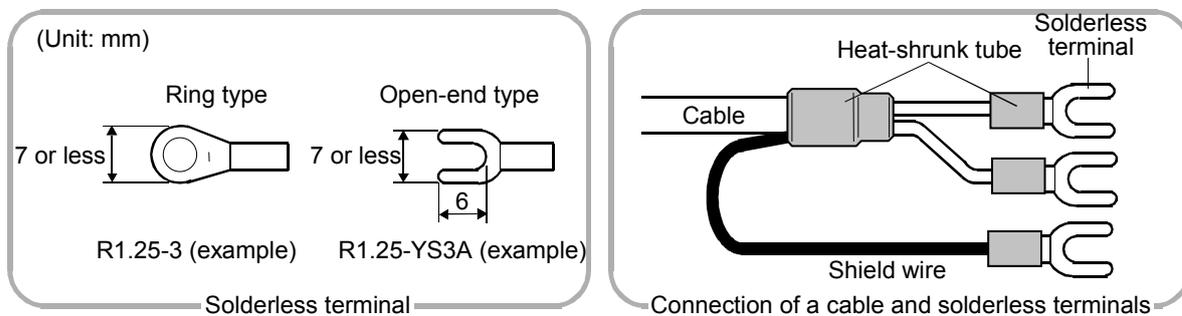


Figure 5-1 Types of Solderless Terminals and Their Connection to Cable

5.2 Wiring for the Power Supply

Electrically isolate the input power to the S10V product from the control power by means of an electrostatic-shielded insulating transformer. The two figures below diagrammatically show the wirings used when the insulating transformer is installed in the power distribution panel or S10V panel (PCs panel).

■ Wiring used when installed in the power distribution panel

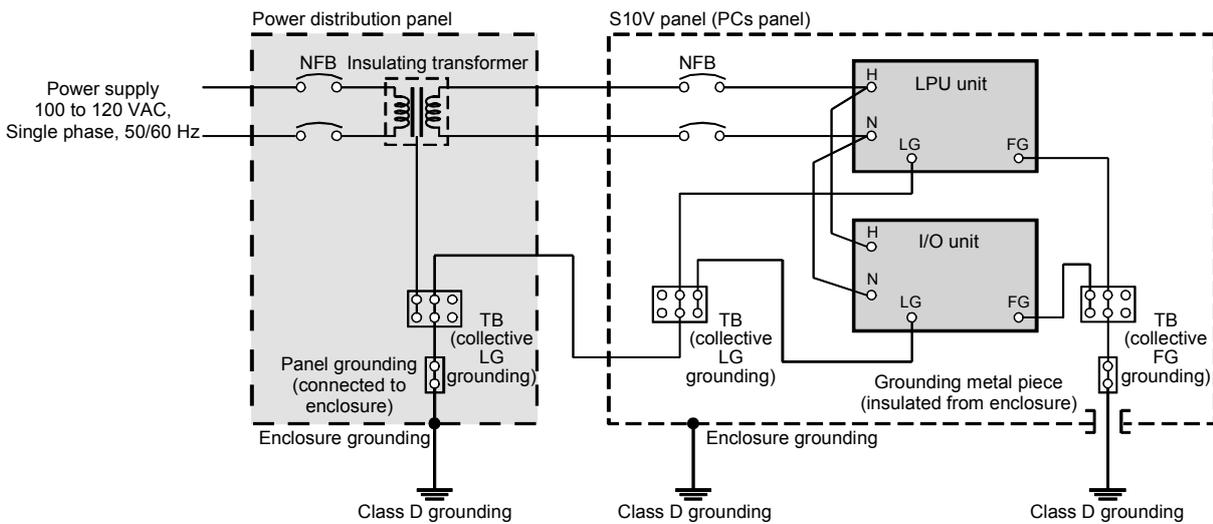


Figure 5-2 Wiring for the Power Supply (the wiring used when the insulating transformer is installed in the power distribution panel)

■ Wiring used when installed in the S10V panel (PCs panel)

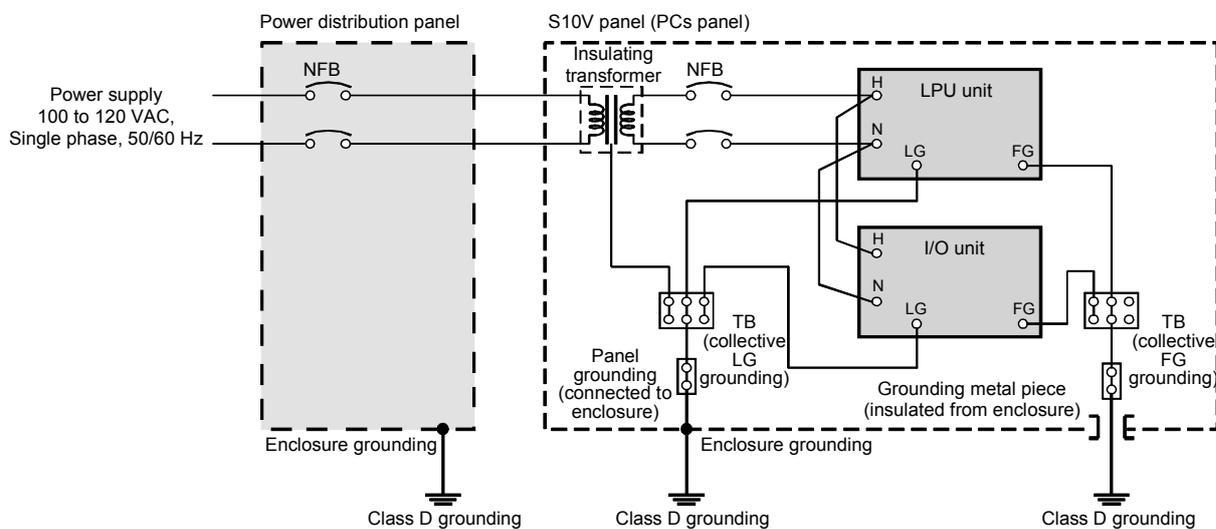


Figure 5-3 Wiring for the Power Supply (the wiring used when the insulating transformer is installed in the PCs panel)

- Insulate the grounding metal piece of the S10V product from the housing enclosure.
- Insulate the mount bases from the housing enclosure.
- Use cables with the following wire sizes:
 - Power supply cable: 2 mm² or more.
 - Grounding cable: 2 mm² or more in the enclosure; 5.5 mm² or more outside the enclosure.

■ An example of wiring in the panel

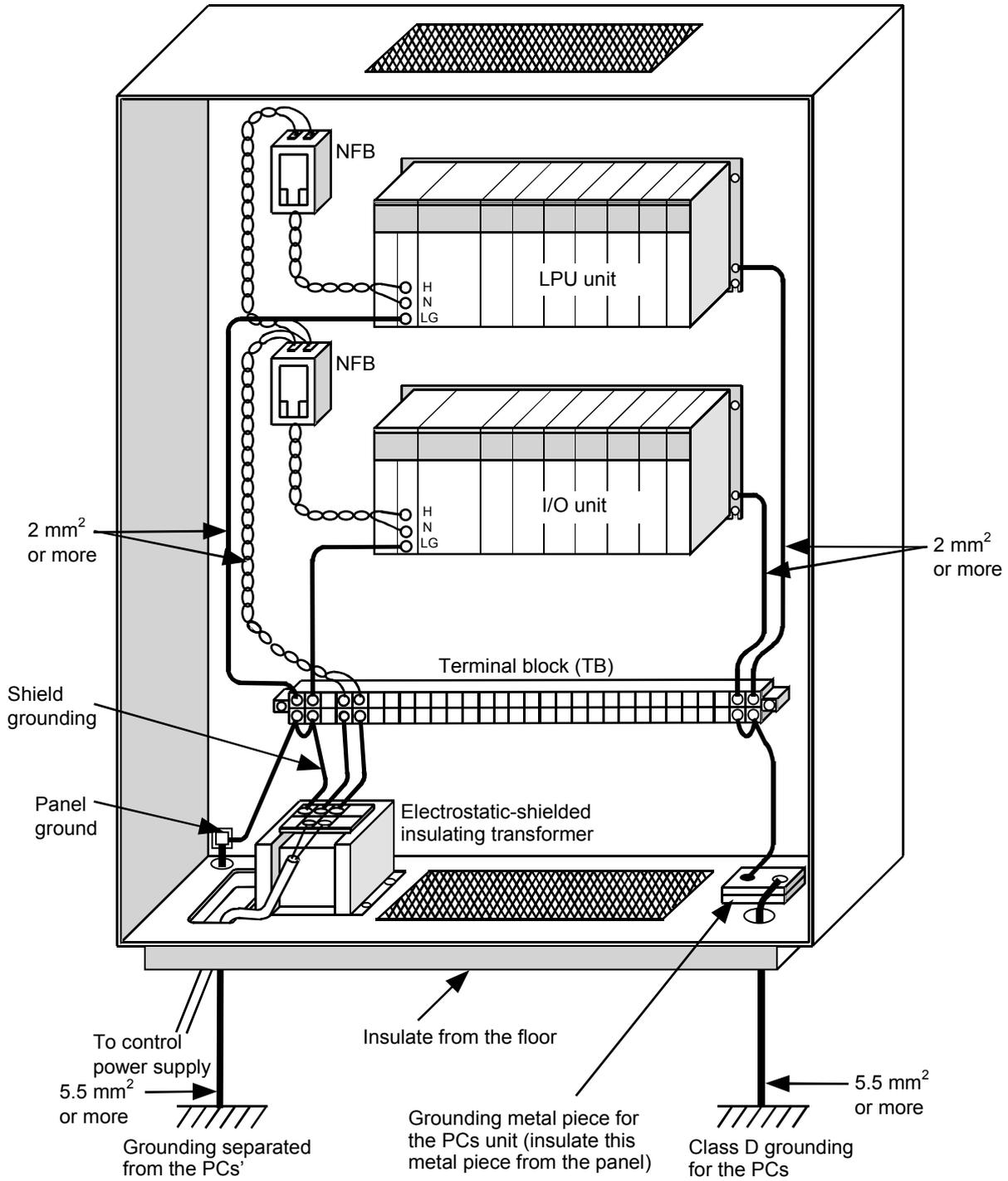


Figure 5-4 Example of a Wiring in the Panel

5.3 Wiring for Grounding

- Ground the LG (line grounding) and FG (frame grounding) terminals separately, in order to prevent both types of terminal from interfering with each other. The LG terminal is a grounding terminal for power supply noise control and the FG terminal a grounding terminal for network circuit noise control.
- Connect the FG terminal of the power supply to the mount base's FG terminal via a shortest possible route.
- Insulate the FG terminal of the mount base from the housing enclosure and ground it by Class D grounding (with a grounding resistance of 100 Ω or less).

■ An example of wiring used when the LPU and I/O units are both mounted in the same enclosure

Where both the LPU and I/O units are mounted in the same enclosure, connect the FG terminals for the LPU module and I/O station modules to the FG terminals of their respective mount bases and ground the terminals at one point. This will equalize their grounding potentials, resulting in an improved grounding and an increased noise resistance.

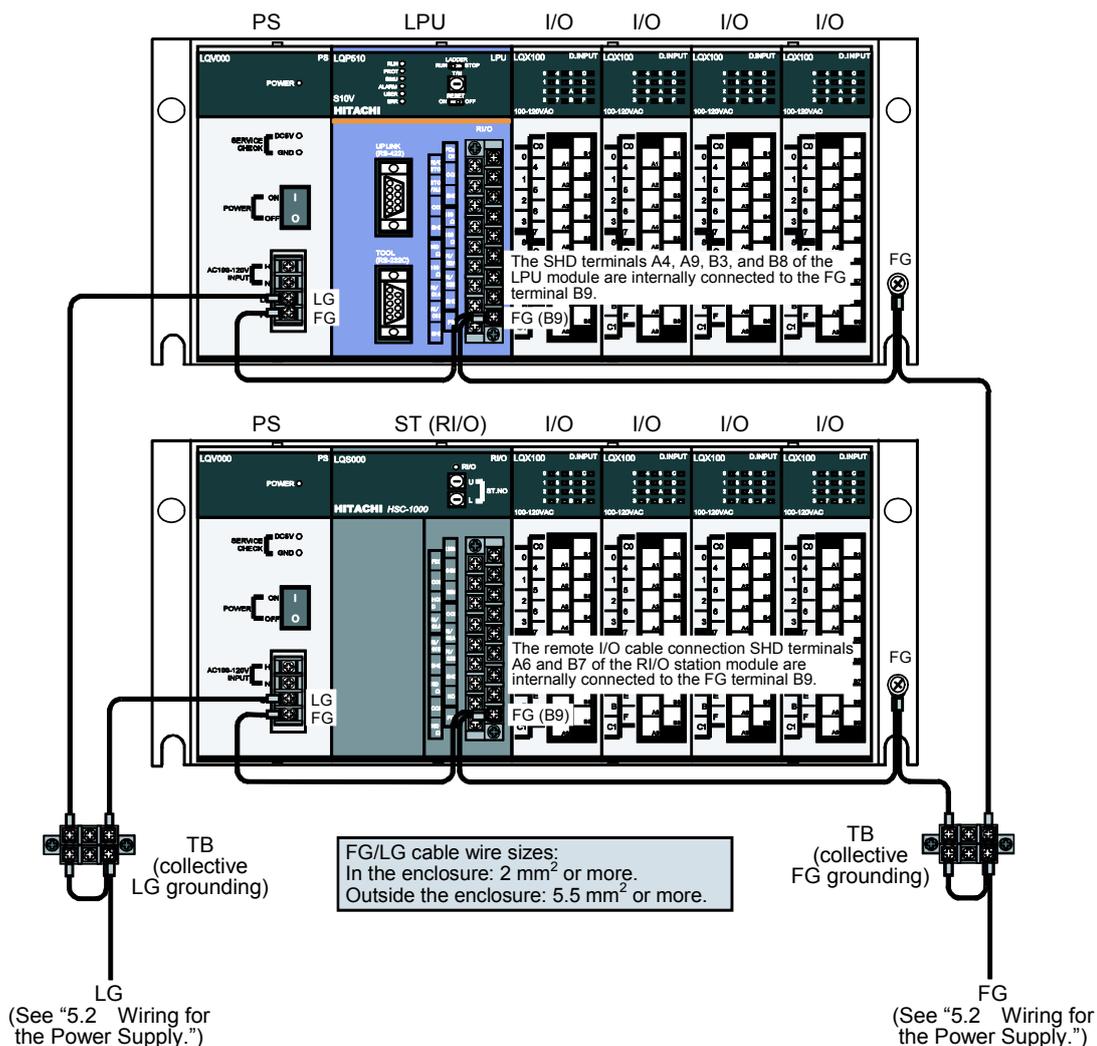


Figure 5-5 Example of a Wiring for Grounding

5 CABLING

■ Example of a wiring used when the I/O unit is mounted separately

If the I/O unit is mounted in a different panel than the one where the LPU unit is mounted, and remote I/O cabling is used to connect the two panels together, then it may happen that the I/O unit cannot be grounded at the same point as the LPU unit. In such a case, leave the FG terminal for the remote I/O station modules unconnected. If it is connected, the grounding potential will be made unequal to the LPU unit's, resulting in a decreased noise resistance. Ground only the FG terminal of the LPU unit.

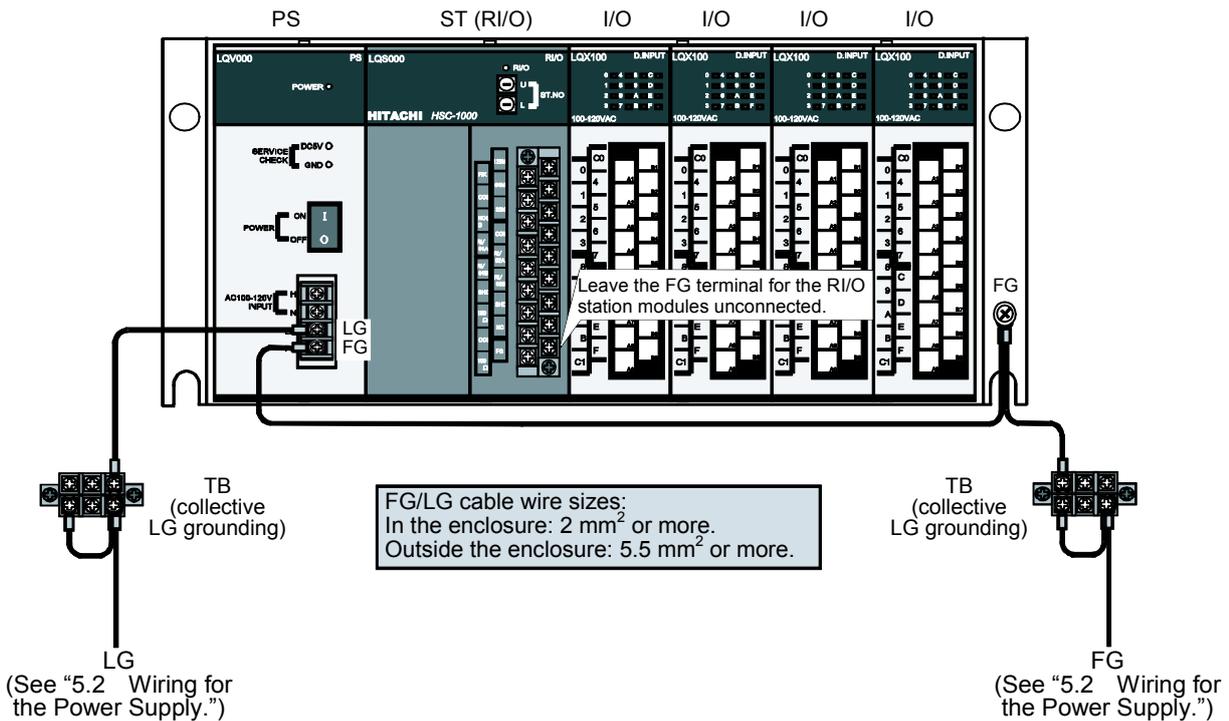


Figure 5-6 Example of a Wiring for I/O Unit Grounding



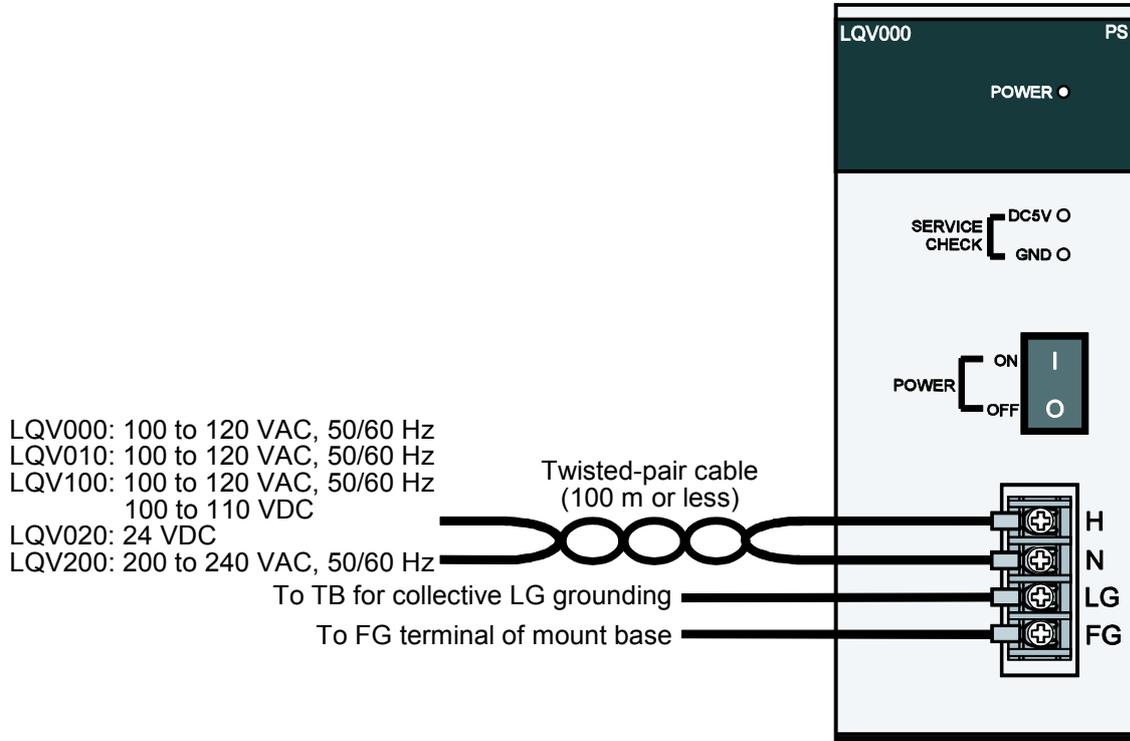
WARNING

- Electric shock hazards exist so that you might suffer burns or become electrocuted. Further, the system might malfunction due to noise interference. Therefore, ground the line ground (LG), frame ground (FG), and shield cable (SHD).
- Do not remove or install a module or cable, with the programmable controller energized. Be sure to power down the programmable controller before removing or installing them. Disregarding this rule may result in an electric shock hazard or failure of the product.

**CAUTION**

- Insulate the mount base from the enclosure. To keep the mount base insulated, avoid removing the insulation sheets that are supplied with the mount base.
- The LG is a ground terminal for power supply noise. The FG and SHD are ground terminals for the noise in the remote I/O, communication module and other external interface lines. To avoid interference between the ground terminals, separately ground the LG and FG.
- Connect the FG terminal of each module to the FG terminal of the mount base. Perform class D grounding from the FG terminal of the mount base. As for the FG terminals for remote I/O lines and OPCN-1 (J.NET) lines, ground each of them at one single point (LPU unit). (In respect to the FG terminals of remote I/O station or OPCN-1 station [J.Station] modules that can be grounded at the same point as the LPU unit, ground them all, as mentioned.)

5.4 Wiring of the Power Supply Module



CAUTION

When wiring the 24 VDC INPUT positive and negative terminals of the 24 VDC input power supply module (model LQV020), be sure to wire them correctly while paying attention to their polarity. Incorrect wiring of its positive and negative terminals may result in a failure of the product.

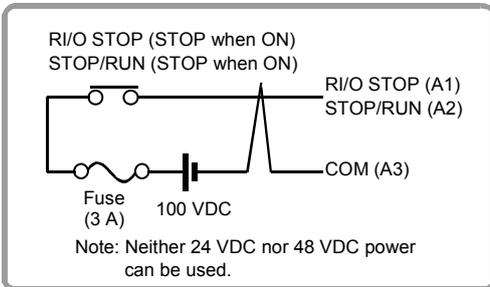
NOTICE

The outside wiring of the 24 VDC line for the 24 VDC input power supply module (LQV020) is prohibited. The power supply module (LQV020) may be damaged by lightning, etc. if the 24 VDC line is wired outside.

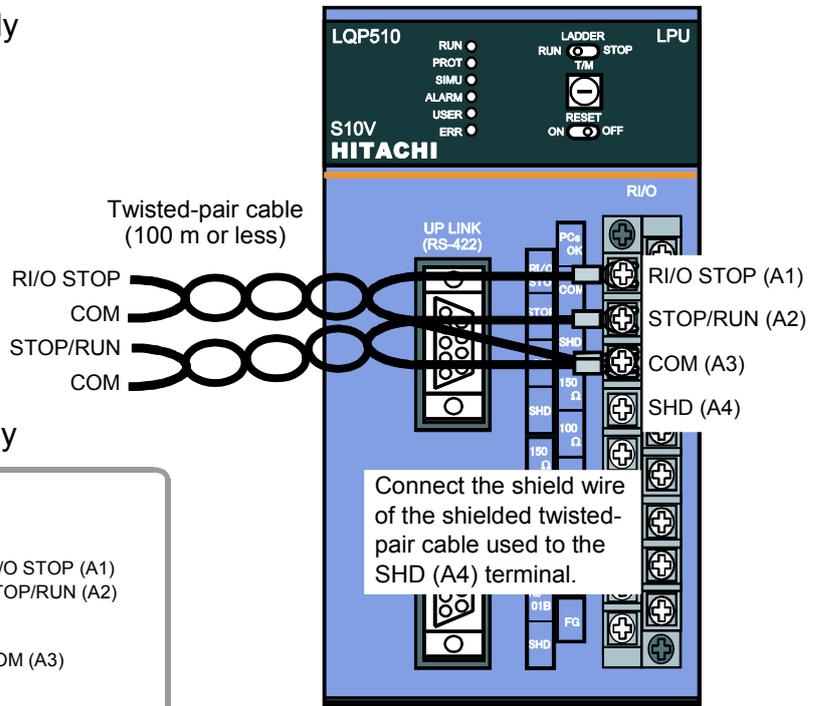
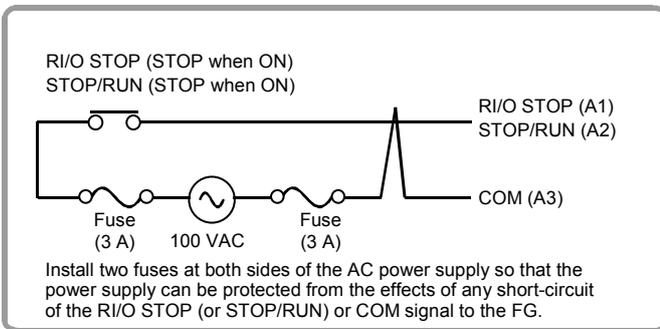
5 CABLING

5.5.2 Wiring for the RI/O STOP and LPU STOP/RUN signals

■ Wiring to 100 VDC power supply



■ Wiring to 100 VAC power supply



5.6 Wiring of Remote I/O Cable

- The LPU unit is provided with two remote I/O cable connection ports (RI/O-1 and RI/O-2), each of which can connect up to 12 I/O units in a series.
- The remote I/O cable connection ports, RI/O-1 and RI/O-2, of the I/O unit are internally connected together and have no relationship with the port numbers of the LPU module. When you connect a remote I/O cable to the RI/O-1 port of the LPU module, select a station number from among 00 through 3F. When you connect a remote I/O cable to the RI/O-2 port, select a station number from among 40 through 7F.
- Terminate the LPU and remote I/O station modules connected to both ends of a remote I/O line. The terminating resistor can be selected from between the internal 100 Ω and 150 Ω resistances or may be any resistance value selected by external connection. When you select a terminating resistance, find the characteristic impedance of the remote I/O cable to be wired. For more information, see “5.6.3 Terminating with terminating resistors.”
- Wire the remote I/O cable according to the wiring instructions set forth in this document; otherwise, the resulting wiring may be incomplete, resulting in communication failure. For details, see “5.6.1 Examples of prohibited wirings.”
- After completion of cable wiring, the connected LPU and remote I/O station modules need settings. For details, see “7 SETTINGS.”
- If the FG terminal of a remote I/O station is located in the same housing enclosure where an LPU unit is mounted, and can be grounded at the same grounding point as the LPU unit, then be sure to ground them at that grounding point. If the FG terminal is located in a different enclosure than the mounted LPU unit, and cannot be grounded at the same grounding point as the LPU unit, then leave the FG terminal unconnected (ungrounded). In this case, grounding can be made only at the LPU unit.

5 CABLING

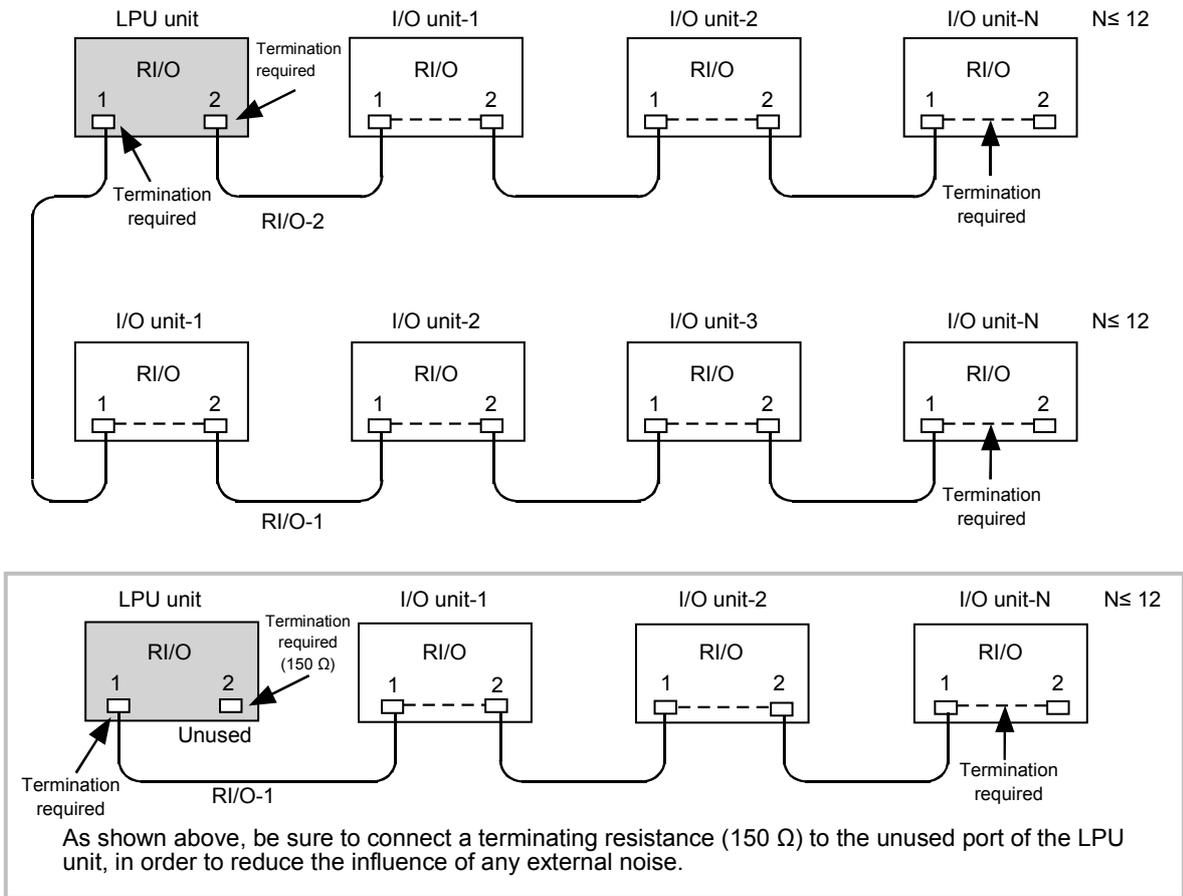


Figure 5-7 Remote I/O Cable Wiring

5.6.1 Examples of prohibited wirings

If any prohibited wiring as shown below is made, the waveform of a signal current flowing in the circuit will be distorted, resulting in a communication error.

Table 5-2 Permitted and Prohibited Remote I/O Cable Wirings

Permitted wirings	<p> LPU unit I/O unit I/O unit I/O unit R/I/O R/I/O R/I/O R/I/O 1 2 1 2 1 2 1 2 Terminated Unused Terminated (by 150 Ω) R/I/O-1 R/I/O-2 </p> <p> ■ Keep the number of units connected per line within 12, inclusive, and terminate both ends of the line. Even when one of the ports of the LPU unit is unused, terminate it with a 150 Ω resistance. </p>
	<p> I/O unit LPU unit I/O unit I/O unit R/I/O R/I/O R/I/O R/I/O 1 2 1 2 1 2 1 2 Terminated Terminated Terminated R/I/O-1 R/I/O-2 </p> <p> ■ There are no restrictions imposed on the location of the LPU unit installed. </p>
Prohibited wirings	<p> LPU unit I/O unit I/O unit I/O unit R/I/O R/I/O R/I/O R/I/O 1 2 1 2 1 2 1 2 R/I/O-1 </p> <p> ■ Do not make a branch. </p>
	<p> LPU unit I/O unit I/O unit I/O unit R/I/O R/I/O R/I/O R/I/O 1 2 1 2 1 2 1 2 R/I/O-1 R/I/O-2 </p> <p> ■ Do not make a closed loop. </p>
	<p> LPU unit I/O unit I/O unit R/I/O R/I/O R/I/O 1 2 1 2 1 2 R/I/O-1 TB TB </p> <p> ■ Directly connect the cable to the two units without using a terminal block. </p>
	<p> LPU unit I/O unit I/O unit R/I/O R/I/O R/I/O 1 2 1 2 1 2 R/I/O-1 </p> <p> ■ Use the same type of cable for any single line. </p>

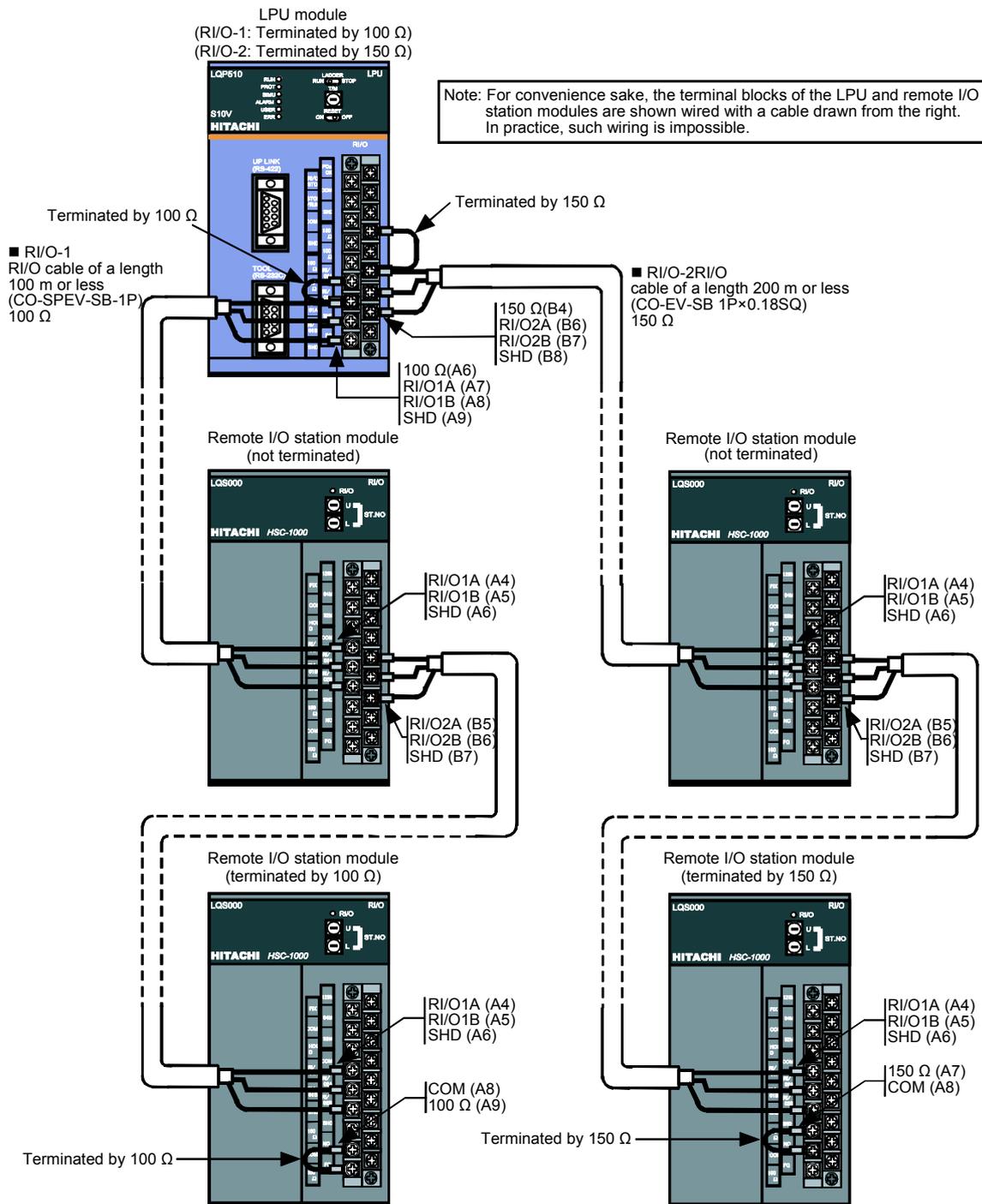
5 CABLING

5.6.2 Example of a remote I/O cable wiring

■ Cables of unlike characteristics and their wiring to RI/O-1 and RI/O-2 ports

The schematic below shows a cable wiring using two different types of cable, one connected to the RI/O-1 port of the LPU unit and the other to the RI/O-2 port, and these two types are identified by their unique characteristics.

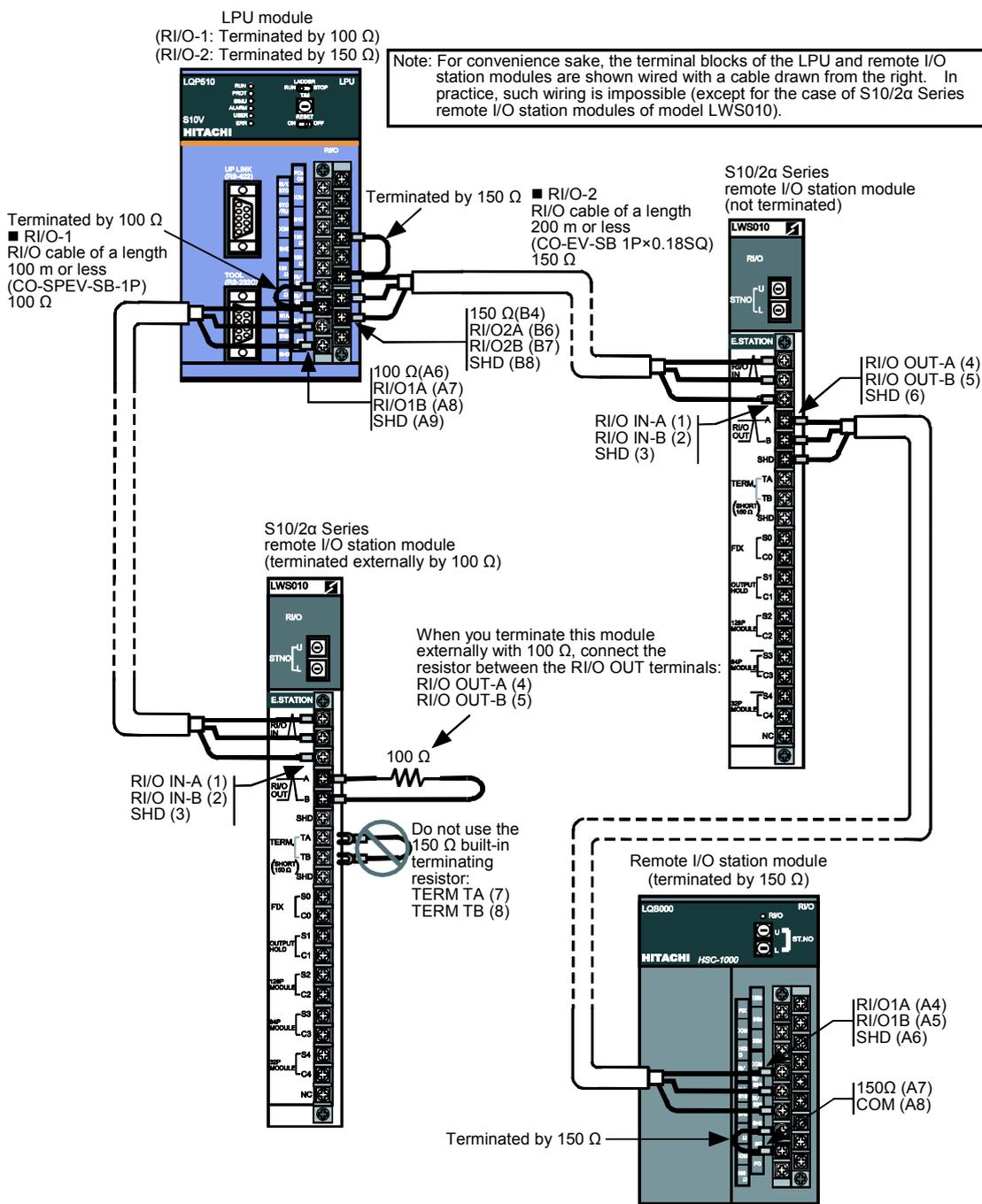
- For information on how to terminate the connected cable, see “5.6.3 Terminating with terminating resistors.”
- For information on how to ground the grounding terminals, see “5.3 Wiring for Grounding.”



■ Wiring used when S10/2α Series remote I/O stations (E.STATION: LWS010) are also mounted

As with the S10mini product, the S10V product can be connected with S10/2α Series remote I/O stations. In addition, the S10V product can also be used in conjunction with such remote I/O stations as common to the S10V and S10mini products. The schematic below shows a cable wiring necessary for the combined use of unlike models of programmable controller.

- For details on how to connect the S10/2α and S10V products together, refer to the “S10/2α, 4α Series WIRING MANUAL (manual number SAE-4-001).”
- For information on how to terminate the connected cable, see “5.6.3 Terminating with terminating resistors.”
- For information on how to ground the grounding terminals, see “5.3 Wiring for Grounding.”



5 CABLING

5.6.3 Terminating with terminating resistors

When you use specified cables, terminate them with one of the built-in terminating resistances 100 Ω or 150 Ω by short-circuiting the terminals shown below. If you use cables other than specified and terminate them with a terminating resistance other than 100 Ω and 150 Ω , connect the resistance between the signal input terminals A and B. (For information on how to terminate S10/2 α Series remote I/O station modules of model LWS010, refer to the “S10/2 α , 4 α Series WIRING MANUAL (manual number SAE-4-001).”)

Table 5-3 Terminating with Terminating Resistors

	Terminating with 100 Ω	Terminating with 150 Ω	Terminating with an arbitrary resistance
LPU module	<p>Terminal block</p> <p>R/I/O-2 side</p> <p>R/I/O-1 side</p> <p>100 Ω (A6)</p> <p>A (A7)</p> <p>A (B6)</p> <p>A: Secured together with the signal wire end</p>	<p>Terminal block</p> <p>R/I/O-2 side</p> <p>R/I/O-1 side</p> <p>150 Ω (A5)</p> <p>A (A7)</p> <p>A (B6)</p> <p>A: Secured together with the signal wire end</p> <p>Note: Connect a 150 Ω terminating resistance between the terminals of any unused port. In this case, one end of the terminating resistance jumper need not be secured together with the signal wire end.</p>	<p>Terminal block</p> <p>R/I/O-2 side</p> <p>R/I/O-1 side</p> <p>A (A7)</p> <p>B (A8)</p> <p>A (B6)</p> <p>R: Characteristic impedance of remote I/O cable</p> <p>A, B: Secured together with the signal wire end</p>
Remote I/O station module	<p>Terminal block</p> <p>COM (A8)</p> <p>100 Ω (A9)</p>	<p>Terminal block</p> <p>150 Ω (A7)</p> <p>COM (A8)</p>	<p>Terminal block</p> <p>R/I/O-1 side</p> <p>A (A4)</p> <p>B (A5)</p> <p>R: Characteristic impedance of remote I/O cable</p> <p>A, B: Secured together with the signal wire end</p>

- Recommended specifications of terminating resistor R
 Material: Metal oxide film
 Resistance value: Same as cable impedance value
 Precision: $\pm 10\%$
 Capacity: 0.5 W (1/2 W)

**WARNING**

- Before performing power supply wiring, make sure that no voltage is applied to the power cable. Immediately after completion of power supply wiring, be sure to install the terminal cover.
- Do not attempt any installation, wiring, handling, or product alteration not covered in this manual. The manufacturer accepts no responsibility for product/peripheral breakage or fatal accidents due to such attempts.
- Only qualified personnel should be allowed to make cable connections. Incorrect wiring connections may cause a risk of fire, malfunction, or electric shock.

**CAUTION**

If you touch a terminal strip or connector pin while the power is applied, you may receive an electric shock. While the power is applied, never touch a terminal strip or connector pin.

NOTICE

- To provide protection against short circuit, furnish the external power source with a fuse or circuit protector. Ensure that the employed circuit protector is rated as specified.
- Before supplying power to the equipment, thoroughly check the wiring connections.
- A surge voltage may cause the product to malfunction or become damaged. If a relay or other coil is connected to the PCs OK output circuit, furnish a surge absorption diode or the like. Ensure that the diode has a peak reverse voltage at least 10 times the circuit voltage and a forward current larger than the load current.
- When wiring communication, power supply, motive power, and other cables, group them according to their types and set the resulting groups apart from each other. The motive power cables for inverters, motors, power regulators, etc., in particular, must be set at least 300 mm away from the other types of cables. Further, the communication cables must be set in a different conduit than the conduit in which the motive power cables are set.
- Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.
- To avoid noise-induced malfunction, do not bundle the 100 VAC/100 VDC power cables and network cables together, but route the two types of cables at least 100 mm away from each other.

5.7 Wiring of RS-232C Cable

5.7.1 Pin locations and signals

■ Pin locations

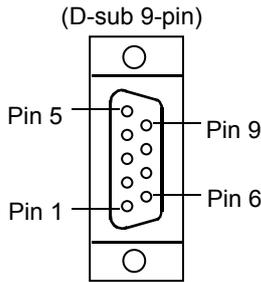


Figure 5-8 RS-232C Connector Pin Locations

Table 5-4 RS-232C Connector Pin Assignment

Pin No.	Signal name	Classification (input or output)	Description
1	Reserved	——	Leave this pin unconnected.
2	RD (Receive Data)	Input	On: Space as receive data Off: Mark as receive data
3	SD (Send Data)	Output	On: Space as send data Off: Mark as send data
4	Reserved	——	Leave this pin unconnected.
5	SG (Signal Ground)	——	(self-explanatory)
6	Reserved	——	Leave this pin unconnected.
7	Reserved	——	Leave this pin unconnected.
8	Reserved	——	Leave this pin unconnected.
9	Unused	——	Leave this pin unconnected.

Table 5-5 RS-232C Signal Voltage Levels

	Mark	Space
Interpretation	1 (off)	0 (on)
Output conditions	-5 to -15 V	+5 to +15 V
Input conditions	≤-3 V	+3 V≤

■ Signals

SD: Send data wire from the LPU module to the remote equipment.

RD: Receive data wire from the remote equipment to the LPU module.

5.7.2 Wiring method

Table 5-6 RS-232C Cable Wiring Method

Wiring style	Name	Wiring method (logical connection)			Example of remote equipment
		LPU module	Cable	Remote equipment	
Direct wiring	Data only Data is sent or received without any check of the status of the LPU module and remote equipment.				Tool system (personal computer)

Note: The marking "(P)" above denotes that the request for send (RS) is always present and that the data terminal ready (ER) is always true.

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5.7.3 Wiring example

An example of an RS-232C cable wiring is schematically shown below.

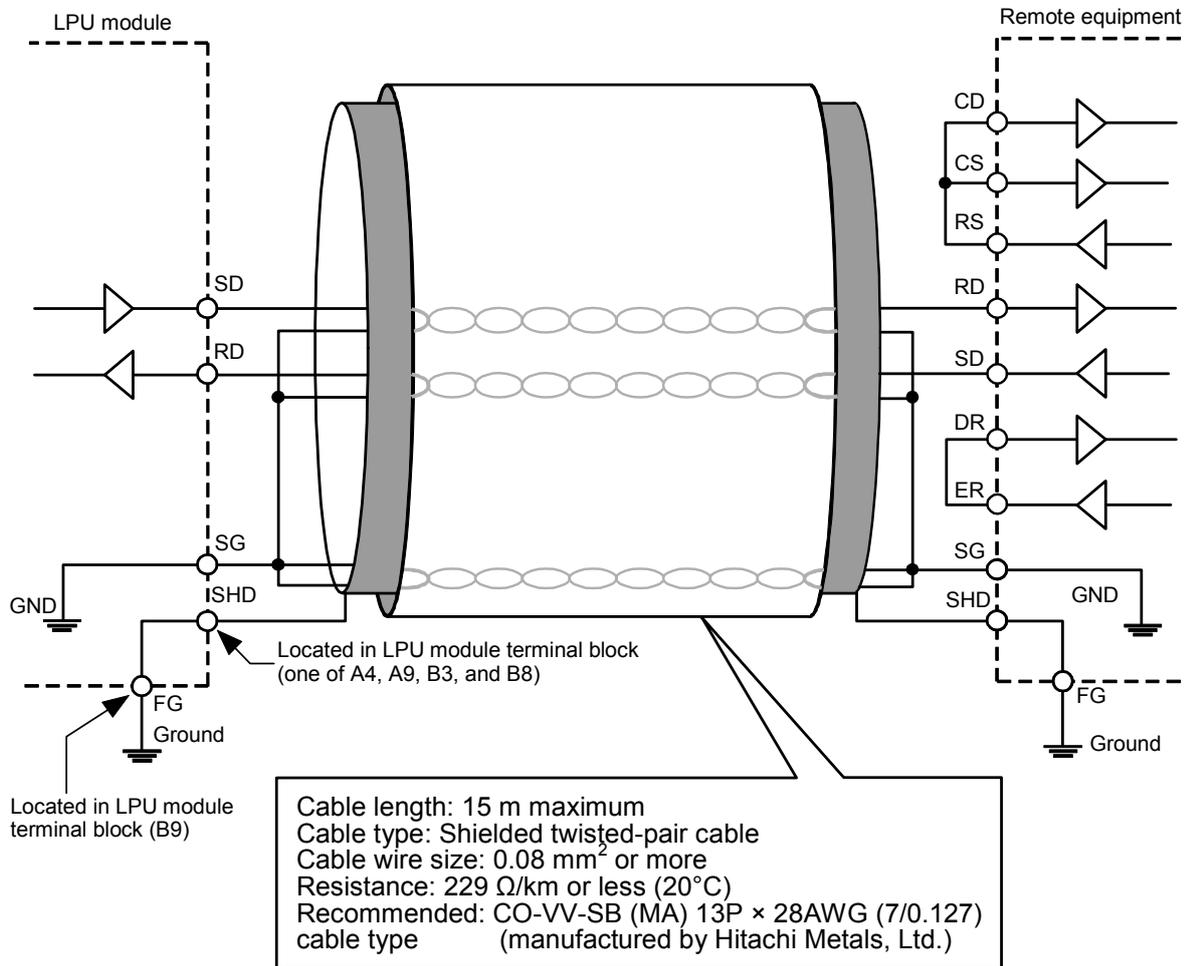


Figure 5-9 Example of an RS-232C Cable Wiring

5.8 Wiring of RS-422 Cable

5.8.1 Pin locations and signals

■ Pin locations

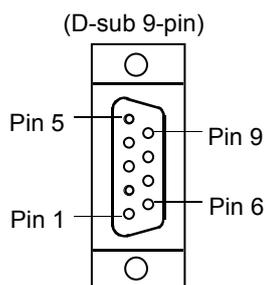


Figure 5-10 RS-422 Connector Pin Locations

Table 5-7 RS-422 Connector Pin Assignment

Pin No.	Signal name	Classification (input or output)	Description
1	RD-L (Receive Data Low)	Input	Receive data reference level
2	RD-H (Receive Data High)	Input	On: Space as receive data Off: Mark as receive data
3	SD-H (Send Data High)	Output	On: Space as send data Off: Mark as send data
4	SD-L (Send Data Low)	Output	Send data reference level
5	SG (Signal Ground)	———	
6	Unused	———	
7	ATT-H (Attention-int High)	Output	On: No interrupt request issued. Off: Interrupt request issued.
8	Unused	———	
9	ATT-L (Attention-int Low)	Output	Interrupt signal reference level

Table 5-8 RS-422 Signal Voltage Levels

	Mark	Space
Interpretation	1 (off)	0 (on)
Output conditions	-3 to -6 V	+3 to +6 V
Input conditions	≤ -0.2 V	$+0.2$ V \leq

■ Signals

SD: Send data wire from the LPU module to the remote equipment.

RD: Receive data wire from the remote equipment to the LPU module.

ATT: Where the remote equipment is LINK-PCS, this is an interrupt signal wire from the LPU module to the LINK-PCS.

SG: Ground between the local and remote equipment.

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5.8.2 Wiring method

Table 5-9 RS-422 Cable Wiring Method

Wiring style	Name	Wiring method (logical connection)			Example of remote equipment
		LPU module	Cable	Remote equipment	
Direct wiring	Data only				Display unit or similar hardware unit
	Data and attention interrupt				LINK-PCS or similar hardware unit

5.8.3 Wiring example

An example of an RS-422 cable wiring is schematically shown below.

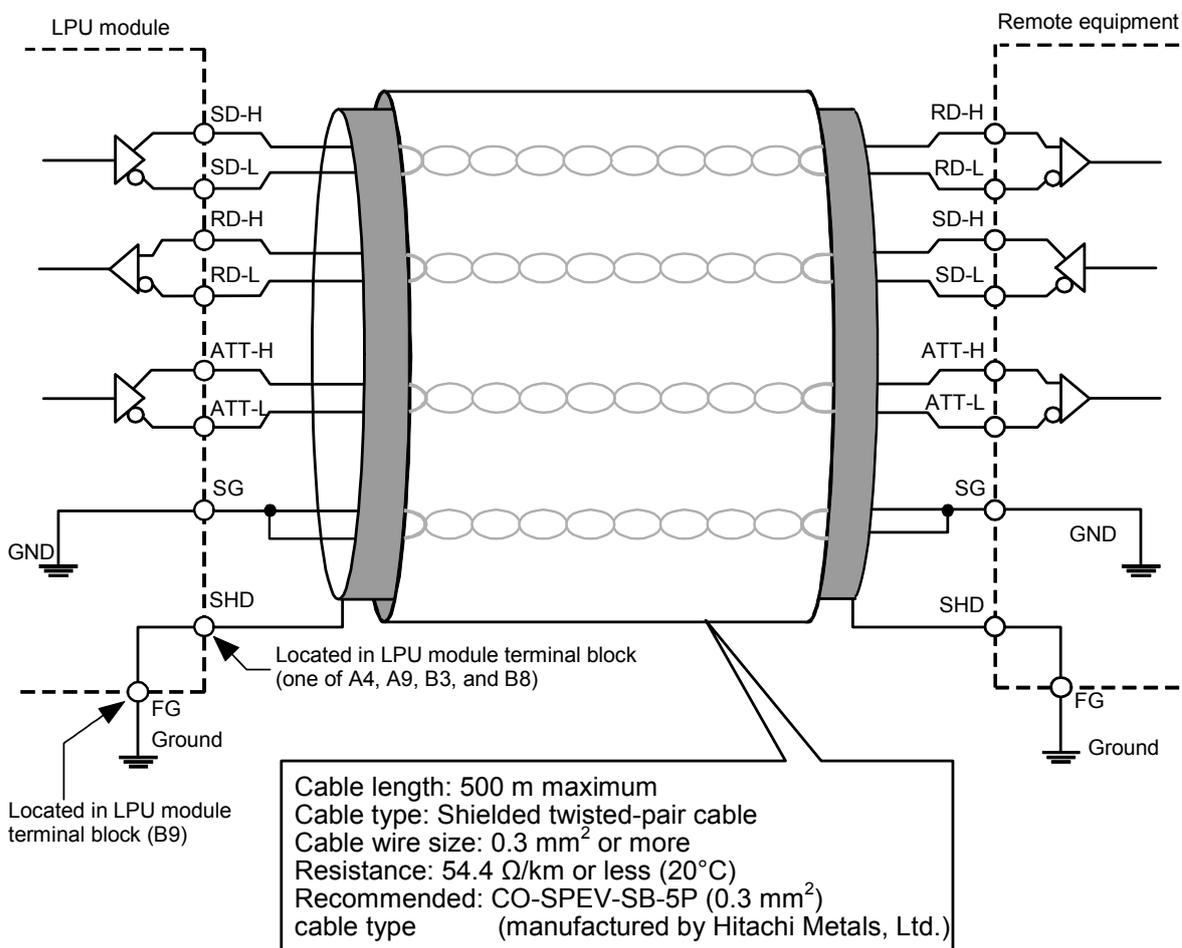
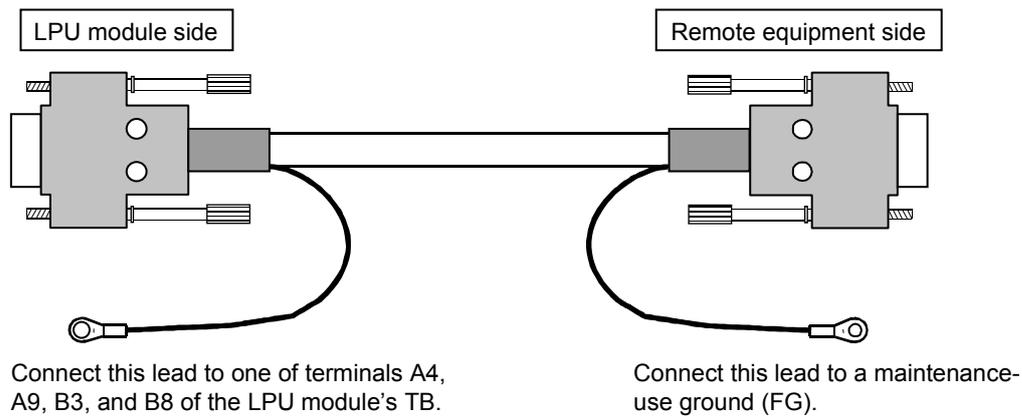


Figure 5-11 Example of an RS-422 Cable Wiring

NOTICE

- Be sure to wire the signal ground (SG) terminals of both the LPU module and remote equipment by using an interface cable as shown below.
- Connect the two shield ground leads of the interface cable to the specified grounding terminals of the LPU module and remote equipment, respectively.
- Connect the LPU module-side shield ground lead of the interface cable to a shield ground (SHD) terminal (one of terminals A4, A9, B3, and B8) of the LPU module's terminal block (TB).



6 TOOLS

6.1 Overview of the Tools

The tools mentioned earlier in this document are supplied as a collection of programs that help users manage the S10V system in a unified manner. The functions of these tool programs include setting up the S10V system, creating programs, saving and loading programs, fetching status information for operations, and displaying error logs.

The tool programs can be used on a personal computer running Microsoft® Windows® 2000, Windows® XP, Windows® 7 (32-bit), or Windows® 10 (32-bit) operating system. Before using the programs, the personal computer needs to be connected to the S10V system.

■ Available types of tool programs

All the types of tool programs provided in the S10V system are listed in the table below. A functional outline of each tool is given in the Planning Guide <Initial Installation> or in the Planning Guide <Windows® Software>. For details on each tool, refer to the software manual coming with each tool program or a user's manual coming with each optional module.

Table 6-1 Available Types of Tool Programs (1/2)

No.	Tool program name	Model	Remarks
1	S10V S10Tools SYSTEM	S-7895-01	A package consisting of items numbered 2 and 3 below.
2	S10V LADDER CHART SYSTEM	S-7895-02	Contains the downward-sloping-rung-to-normal-rung ladder format converter.
3	S10V HI-FLOW SYSTEM	S-7895-03	
4	S10V CPMS DEBUGGER SYSTEM	S-7895-07	
5	S10V BACKUP RESTORE SYSTEM	S-7895-09	
6	S10V RPDP/S10V SYSTEM	S-7895-10	Requires the compiler numbered 41.
7	NX/ACP-S10V	S-7895-11	Requires the item numbered 6 (RPDP/S10V system).
8	NX/Ladder-S10V	S-7895-12	Requires the item numbered 6 (RPDP/S10V system).
9	NX/Tools-S10V SYSTEM	S-7895-13	A tool provided for use with the item numbered 10 (NX/HOST-S10V).
10	NX/HOST-S10V SYSTEM	S-7895-14	A simplified combination of the items numbered 7 and 8.
11	S10V CPU LINK SYSTEM	S-7895-22	
12	S10V EXTERNAL SERIAL LINK SYSTEM	S-7895-24	
13	S10V J.NET SYSTEM	S-7895-27	Shared with the J.NET-INT system.
14	S10V OD.RING/SD.LINK SYSTEM	S-7895-28	
15	S10V ET.NET SYSTEM	S-7895-29	Shared with the SV.LINK system.
16	S10V FL.NET SYSTEM	S-7895-30	
17	S10V D.NET SYSTEM	S-7895-31	
18	S10V IR.LINK SYSTEM	S-7895-36	
19	S10V BASE SYSTEM	S-7895-38	Indispensable (for error info display, P.P. listing display, and other basic functions).
20	S10V EQ.LINK SYSTEM	S-7895-41	
21	EX.RI/O SYSTEM	S-7895-42	
22	HS.RI/O SYSTEM	S-7895-43	
23	S10V IP.LINK SETTING SYSTEM	S-7895-44	
24	OPTET SYSTEM	S-7895-46	
25	S10V PB.LINK SYSTEM	S-7895-48	
26	S10V BASE SET	S-7895-50	Set package of Nos. 2, 5, 11 to 25, and 37

Table 6-1 Available Types of Tool Programs (2/2)

No.	Tool program name	Model	Remarks
27	S10V HI-FLOW SET	S-7895-51	Set package of Nos. 2, 3, 5, 11 to 25, and 37
28	S10V C Language SET	S-7895-52	Set package for Windows® 2000/XP of Nos. 2, 4 to 6, 11 to 25, and 37
29	RCTLNET/S10V	S-7895-60	
30	S10V CPMS DEBUGGER SYSTEM	S-7895-62	Tool for Windows® 7/10 (32bit) of No. 4
31	RPDP/S10V SYSTEM	S-7895-63	Tool for Windows® 7/10 (32bit) of No. 6
32	NX/ACP-S10V	S-7895-64	Tool for Windows® 7/10 (32bit) of No. 7 The RPDP/S10V system of No. 31 is required.
33	NX/Ladder-S10V	S-7895-65	Tool for Windows® 7/10 (32bit) of No. 8 The RPDP/S10V system of No. 31 is required.
34	NX/HOST-S10V	S-7895-66	This tool is a combined and simplified version of Nos. 32 and 33.
35	RCTLNET/S10V	S-7895-67	Tool for Windows® 7/10 (32bit) of No. 29
36	S10V C Language SET	S-7895-72	Set package for Windows® 7/10 (32bit) of Nos. 2, 4 to 5, 11 to 25, 30, and 31
37	S10V BACKUP RESTORE CONVERT SYSTEM	S-7895-73	
38	SuperH RISC engine C/C++ compiler Ver 7.0	–	Required when the RPDP/S10V system numbered 6 is used. Ask us for further information.
39	SuperH RISC engine C/C++ compiler Ver 9.0	–	Required when the RPDP/S10V system numbered 31 is used. Ask us for further information.

Note: The BASE SYSTEM (No. 19) and LADDER CHART SYSTEM (No. 2) above are the minimum requirement for operating the LPU module. In addition, if you want to mount optional modules on the LPU unit, each optional tool (Nos. 11 to 18, and 20 to 25) will be required.

■ Execution environment for the tool programs

An execution environment as described below is required for running the tool programs on the tool system connected to the LPU unit. (The tool system here means a personal computer in which the tool programs are installed and that satisfies the execution environment requirements listed below.)

- The personal computer must be one which runs Microsoft® Windows® 2000, Windows® XP, Windows® 7 (32-bit), or Windows® 10 (32-bit) operating system.
- It must be provided with a built-in RS-232C interface* as fast as 115.2 kbps.
- It requires an RS-232C cable (D-sub 9-pin connector cross cable).

(Note) Where the LPU unit has such an optional module as CMU or ET.NET installed in it, the tool system can be connected to the CMU or ET.NET via a 10BASE-T network (Ethernet®) if provided with a built-in 10BASE-T port. In these cases, the RS-232C port of the LPU module is left open.

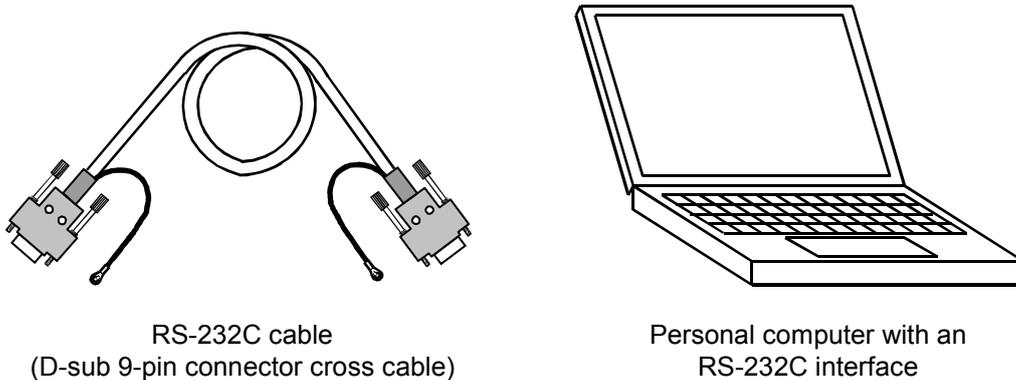


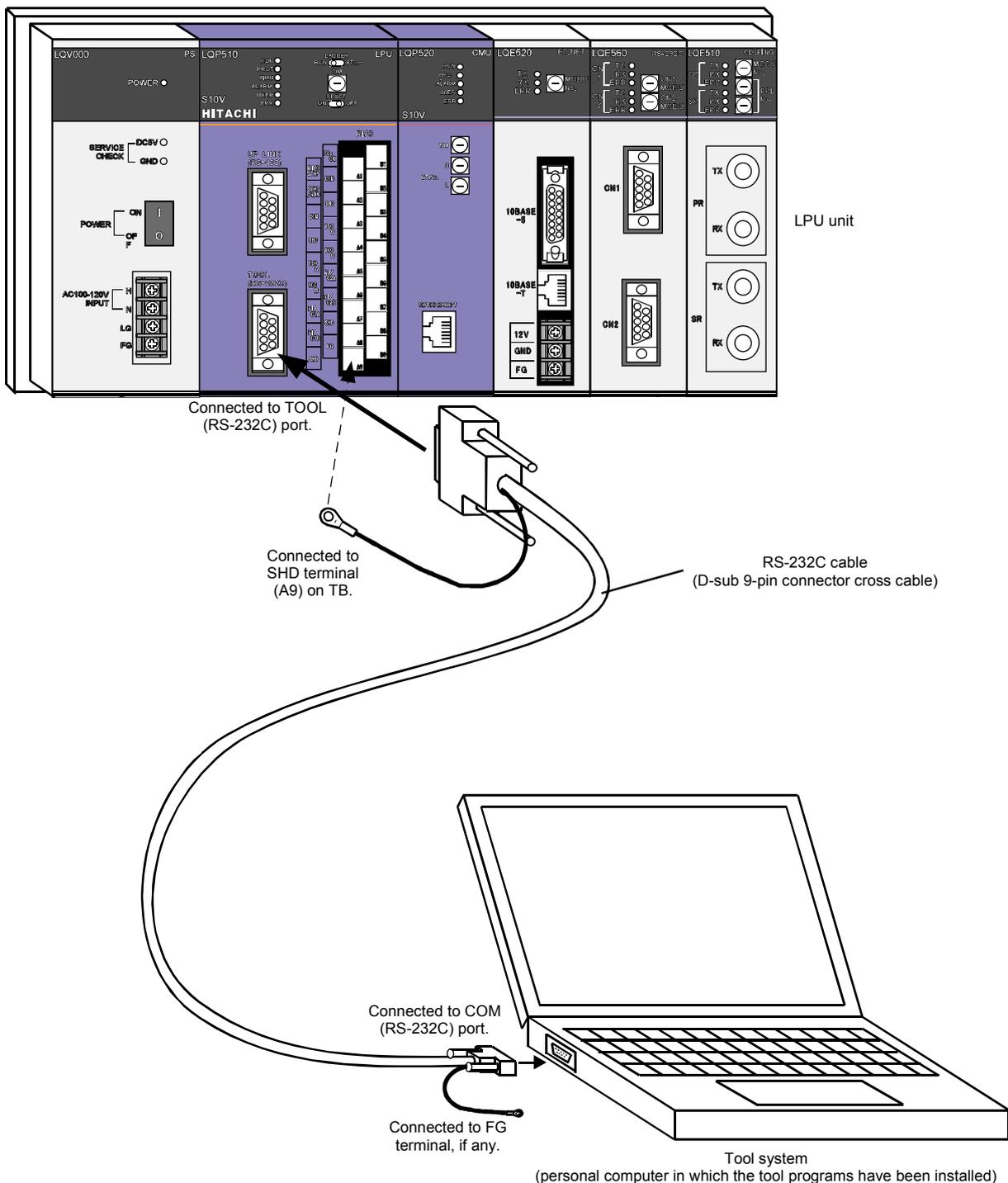
Figure 6-1 Tool Programs Execution Environment

For information on how to install the tool programs in a personal computer, see the following:

- For the basic tool ---- “6.4 Using the Base System.”
- For the ladder chart system ---- “SOFTWARE MANUAL OPERATION S10V LADDER CHART For Windows® (manual number SVE-3-131).”

6.2 Connecting the Tool System

The tool system can be connected with the LPU unit either by connecting the tool system and the LPU module together with an RS-232C cable or by connecting them via a 10BASE-T network (Ethernet). The figure below shows a standard connection method using an RS-232C cable. For information on how to connect the tool system to one of the optional modules CMU or ET.NET, refer to the “USER’S MANUAL OPTION CMU (LQP520/525/527, LQZ500) (manual number SVE-1-110)”, “USER’S MANUAL OPTION ET.NET (LQE520) (manual number SVE-1-103)” or the “USER’S MANUAL OPTION ET.NET (LQE720) (manual number SVE-1-128).”

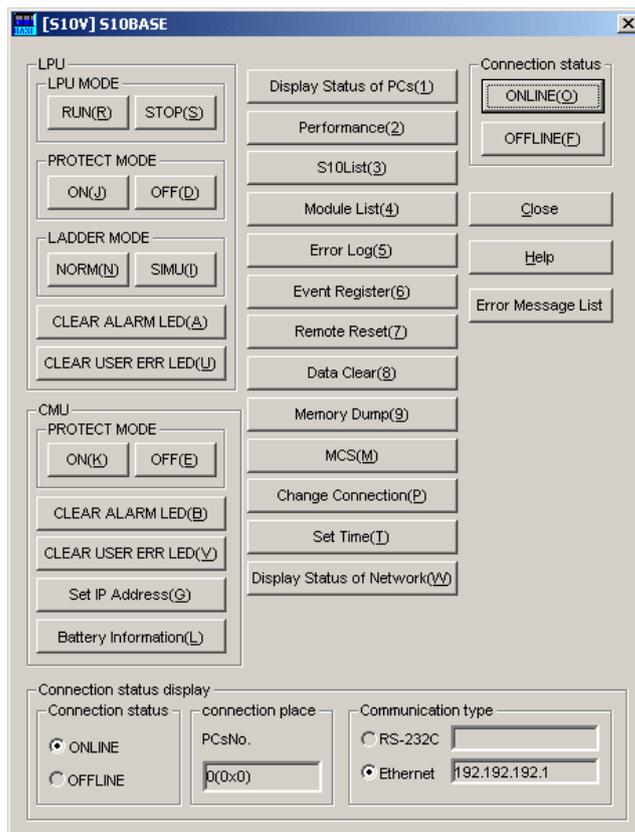


6.3 Initiating the Tool Programs

This section explains how to start the tool programs. As listed under “Available types of tool programs” in “6.1 Overview of the Tools,” the available program types are many. Hence, the discussion will be limited to the two types of tool programs: the basic tool and ladder chart system, which are treated in the subsequent sections on their usage. For information on how to initiate the other tool programs, refer to the manuals coming with the individual programs or to the user’s manuals on the optional modules used.

■ Initiating the “basic tool” program

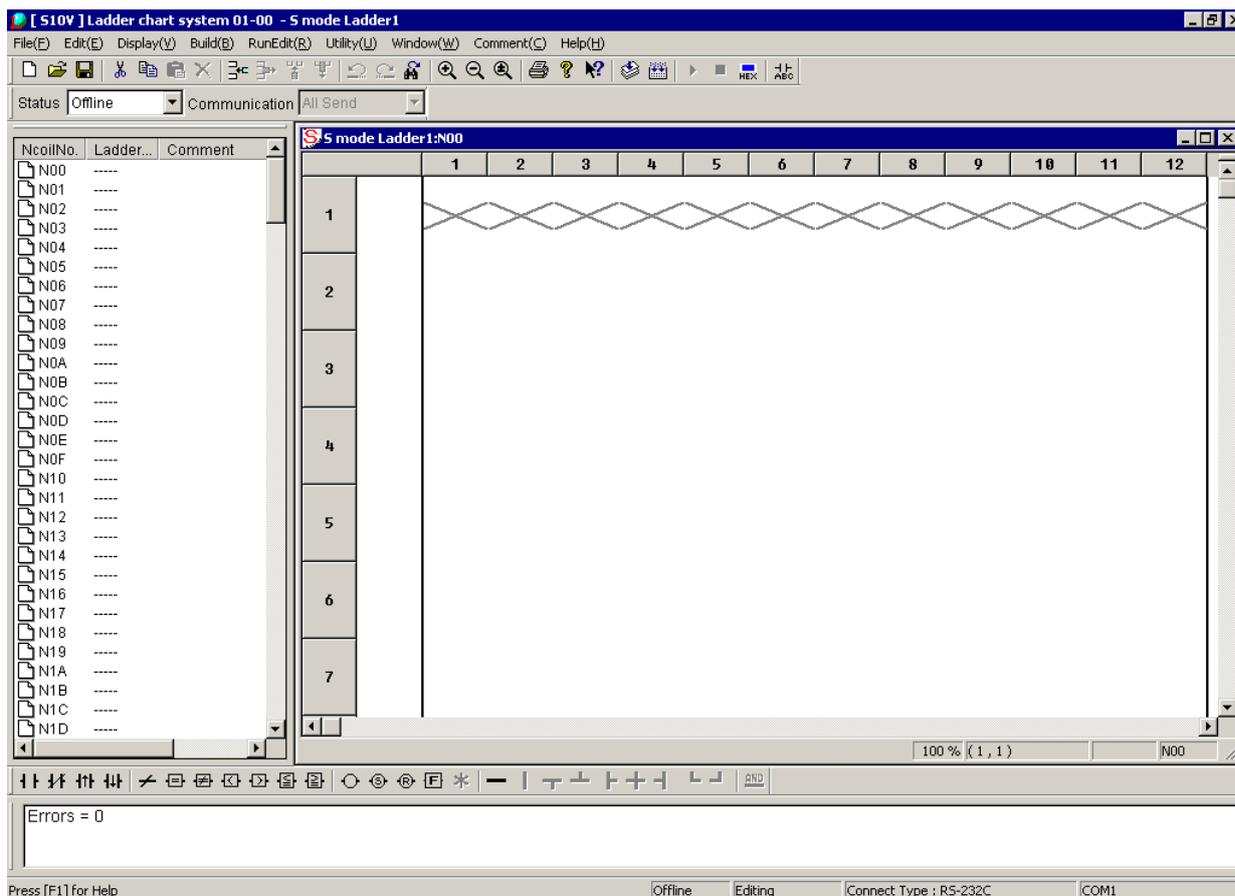
- (1) Double-click the [S10V BASE SYSTEM] icon at the [Windows®] desktop, or click the [Start] menu and select the program.
- (2) The [basic tool] program will be started and the [[S10V] S10BASE] window as shown on the right will appear that offers a variety of options, including those for setting values and displaying error logs.



For details on how to use the basic tool, see “6.4 Using the Base System.”

■ Initiating the [ladder chart system] program

- (1) Double-click the [S10V LADDER CHART SYSTEM] icon at the [Windows®] desktop, or click the [Start] menu and select the program.
- (2) The [ladder chart system] program will be started and the window shown below will appear that offers a variety of options, including those for setting values and creating a program.



For details on how to use the ladder chart system, refer to the “SOFTWARE MANUAL OPERATION S10V LADDER CHART For Windows® (manual number SVE-3-131).”

- **Initiating the other tool programs**

Refer to the manuals coming with the individual programs or to the user's manuals on the optional modules used.

6.4 Using the Base System

This section provides instruction on using the Base System.

6.4.1 Installing and starting the system

■ Installing

First check that the correct CD is on hand.

To install the Base System, you must execute the setup program that is stored in the Base System DISK1 folder on the CD.

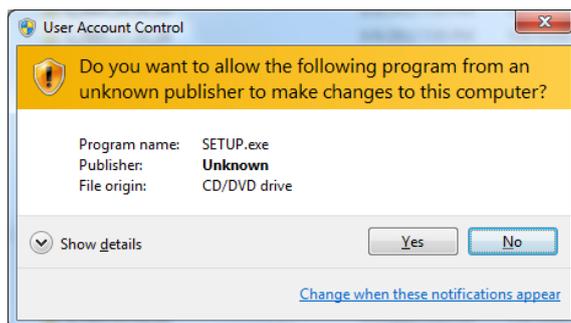
Double-click “setup.exe” that is stored in the DISK1 folder on the Base System CD. Since no window opens upon completion of installation, attach a shortcut to the desktop as needed.

NOTICE

Before installing the Base System, shut down all Windows®-based programs running, including those resident in memory, such as a virus checker. If you install the Base System without shutting down these programs, an error might occur while installing it. If an error is encountered, uninstall the Base System once as instructed in “■ Uninstalling” to quit all Windows®-based programs and then reinstall the S10V Base System.

<Notes on installing in Windows® 7 (32-bit) or Windows® 10 (32-bit)>

Installing the Base System in Windows® 7 (32-bit) or Windows® 10 (32-bit) operating system requires prior logging onto the operating system with an appropriate Administrator account, which is the Administrator account first created in the initial condition of your personal computer. When you have so logged on, you can then double-click “setup.exe” that is stored in the DISK 1 folder on the Base System CD. When you start “setup.exe”, the following dialog box might be displayed. In this case, click the **Yes** button to run the setup program.



The Base System cannot be installed on a per-user basis. To install the Base System successfully, the user must first log onto the operating system with an appropriate Administrator account, which is the Administrator account first created in the initial condition of your personal computer.

The Base System may not be installed properly in any of the following cases: 1) administrator permission is acquired by using User Account Control(*) with a standard user account and 2) logon is made with an Administrator account that has been created using User Account Control with a standard user account. If you make a logon with a user account that is different from the one you have used for the installation of the Base System, the installed program may be missing from the program menu displayed. In this case, you should perform the following series of steps: 1) make a logon again with the Administrator account first created in the initial condition of your personal computer; 2) uninstall the installed program; and 3) install the program again.

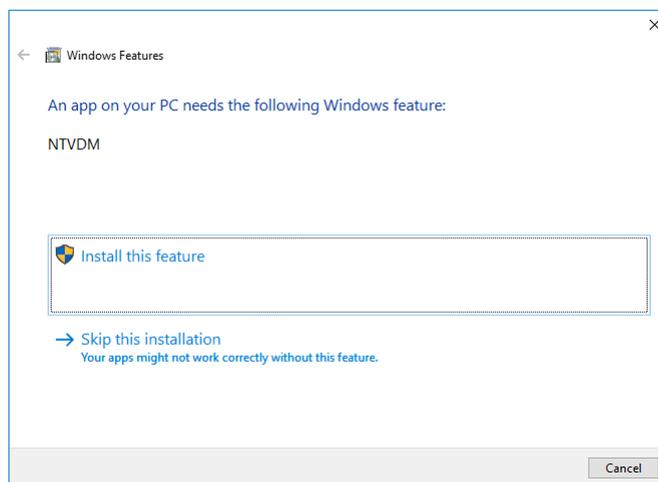
When you want to create a new account, be sure to make a logon with an Administrator account. Do not use User Account Control at that time.

(*) User Account Control is a Microsoft Windows feature that temporarily grants administrative rights to standard user accounts.

A message reporting a read-only file detected may be displayed during the reinstallation of the Base System. In this case, click the **Yes** button to set off overwriting.

<Notes on installing in Windows® 10 (32-bit)>

When executing the setup program with Windows® 10 (32-bit), the following dialog box might be displayed. In this case, click **Install this feature** to install Windows® NTVDM functions.



If you do not see the setup program after executing “setup.exe”, there is a possibility that the NTVDM functions of Windows® are stopped due to another process. Follow the steps below to specify another process that causes a stop.

- ① Start the task manager in Windows®. If the Task Manager is displayed as a simplified display, select [More details] to switch to the detailed display.
- ② Select “ntvdm.exe” from the process list on the [Details] tab in the Task Manager, and select [Analyze wait chain] from the right-click menu.
- ③ The [Analyze wait chain] dialog box will be displayed. Specify the other process that causes a stop. Make sure there is no problem even if the process is finished. Then, complete the process specified by using the **End process** button.

If you forcibly terminate the process in the [Analyze wait chain] dialog box, restart Windows® after installing programs.

In Windows® 10, the programs which was installed with the administrator account created first from the initial state of the personal computer are not displayed in the program menu of another user account. If you want to use the program with another user account, follow the steps below to register programs in the program menu of all user accounts.

- ① Log on with the administrator account created first from the initial state of a personal computer.
- ② Install all S10V programs you use.
- ③ Open the installation folder of the basic tool (the default installation folder is “C:\Hitachi\S10V\S10BASE”).
- ④ Right-click the “win10inst.bat” file and select [Run as administrator]. [Hitachi S10V] in the program menu of the S10V program will be registered in the program menu of all user accounts.
- ⑤ If the [User Account Control] dialog box appears, click the button.

Also, to add or delete programs, add or delete the programs to the program menu of all user accounts in the above procedure.

■ Uninstalling

The existing Base System needs to be uninstalled when, for instance, you want to upgrade it. The procedure required for uninstalling it is as follows:

(1) Uninstalling from Windows® 2000

Open [Control Panel] in Windows®. When the Control Panel opens, double-click on [Add/Remove Programs]. Then, choose “S10V BASE SYSTEM” in the [Change or Remove Programs] tab and click the button. When the [Confirm File Deletion] dialog box appears, click the button.

(2) Uninstalling from Windows® XP

Open [Control Panel] in Windows®. When the Control Panel opens, double-click on [Add/Remove Programs]. Then, choose “S10V BASE SYSTEM” in the [Change or Remove Programs] tab and click the button. When the [Confirm File Deletion] dialog box appears, click the button.

(3) Uninstalling from Windows® 7 (32-bit) or Windows® 10 (32-bit)

Open [Control Panel] in Windows®. When the Control Panel opens, click [Programs and features]. Then, select “S10V BASE SYSTEM” and click button. When the [Confirm File Deletion] dialog box appears, click the button.

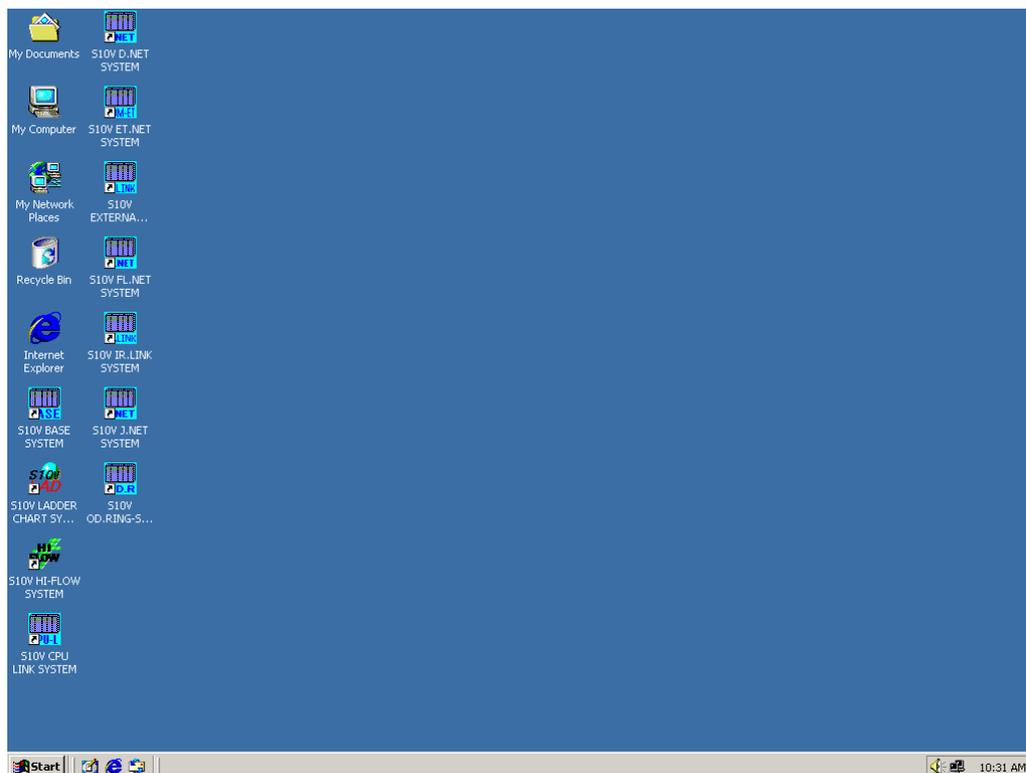
NOTICE

- If the [Remove Shared File?] window is displayed while uninstalling the Base System from Windows®, click the button not to choose to delete shared files.
- To reinstall the Base System, uninstall it first before reinstalling it.

■ Starting the basic tool

The installed basic tool can initially be started by performing the following procedure:

- (1) Double-click the [S10V BASE SYSTEM] icon at the [Windows®] desktop. Or select [Start] menu – [Hitachi S10V] – [S10V BASE SYSTEM].

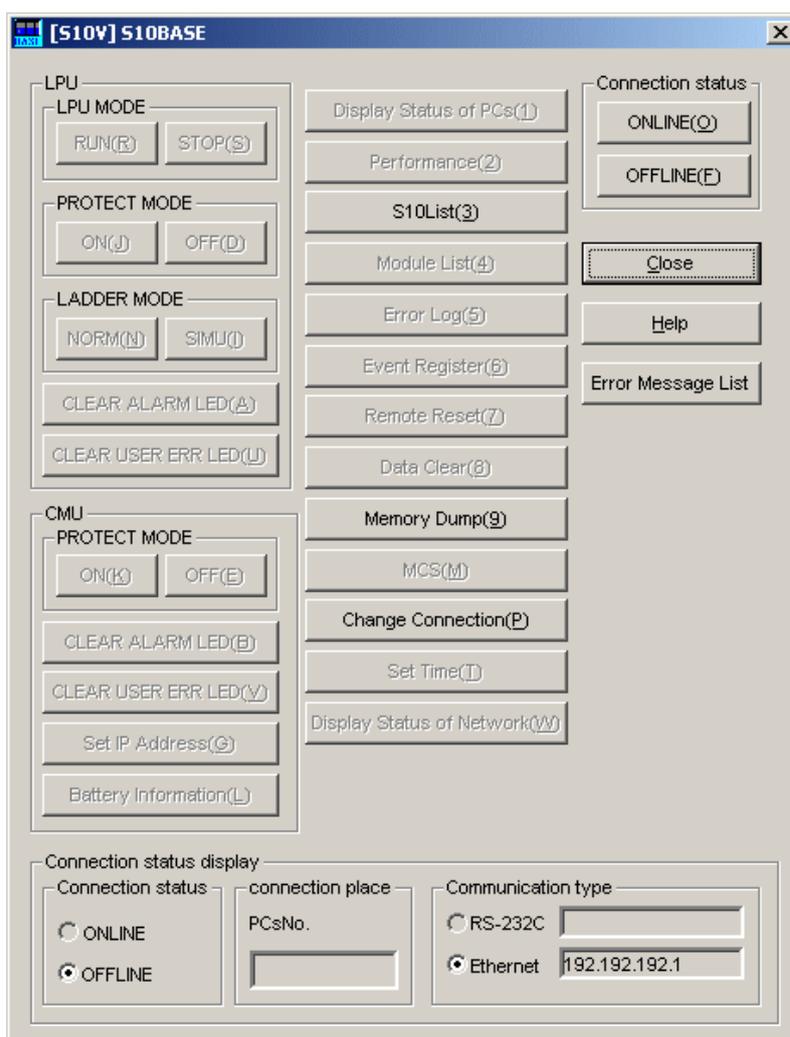


- (2) The [[S10V] S10BASE] Windows is displayed.

At startup, the “Connection status” is set to OFFLINE so that the available functionality is limited.

To change the “Connection status” to ONLINE, click the **Change Connection** button to open the [Communication type] window, specify the connection destination, and then click the **OK** button (see “6.4.23 Connected PCs changing”).

Click the **ONLINE** button to connect to the PCs (see “6.4.32 ONLINE/OFFLINE setting”).



Then, click the button corresponding to the function of your choosing.

■ Exiting the basic tool

In the [[S10V] S10BASE] window, click the **X** or **Close** button.

6.4.2 Functions of the basic tool

Table 6-2 is a list of the basic tool’s functions corresponding to the functional units offered in the [[S10V] S10BASE] window displayed as shown in Figure 6-2 (the functional units in Figure 6-2 are keyed to the functions listed in Table 6-2).

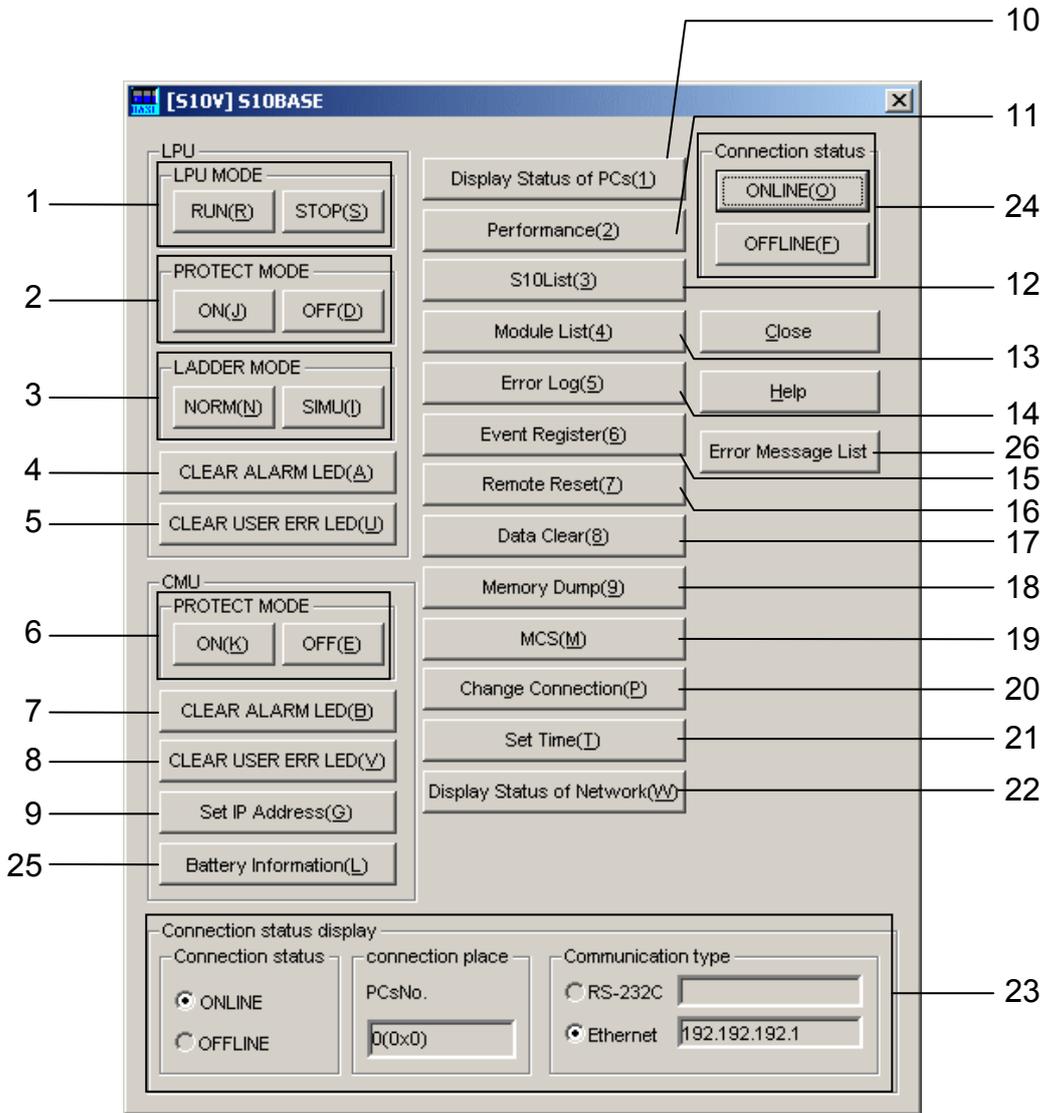


Figure 6-2 [[S10V] S10BASE] Window

Table 6-2 Functions of the Basic Tool

No.	Function	Description
1	LPU RUN/STOP setting	Places the LPU either into RUN state or STOP state.
2	LPU PROTECT MODE setting	Places the LPU's memory protection mechanism either into ON state or OFF state.
3	LPU LADDER MODE setting	Switches the LPU's or the CMU's ladder mode support between NORM and SIMU states.
4	LPU ALARM LED extinguishing	Switches off the LPU's ALARM indicator light.
5	LPU USER ERR LED extinguishing	Switches off the LPU's USER indicator light.
6	CMU PROTECT MODE setting	Switches the CMU's protection mode support between ON and OFF states.
7	CMU ALARM LED extinguishing	Switches off the LPU's ALARM indicator light.
8	CMU USER ERR LED extinguishing	Switches off the LPU's USER indicator light.
9	CMU IP address setting	Defines a CMU-side IP address.
10	PCs status displaying	Displays the current state of the PCs.
11	Performance displaying	Displays the Sequence Cycle and the CMU Load percentage.
12	S10List displaying	Displays a list of all the program products (P.P.) currently installed.
13	Module List	Displays Ver-Rev information for all the modules installed.
14	Error log displaying	Presents information on any logged errors.
15	Event register monitoring	Displays the current states of the event registers.
16	Remote resetting	Resets the PCs.
17	Clearing of data	Fills the battery backup memory with 0s.
18	Memory dump	Dumps the entire memory or a specified area of memory.
19	MCS data displaying	Displays MCS (memory read/write) data.
20	Connected PCs changing	Changes the current communication settings used for communication between the personal computer and PCs.
21	Time setting	Changes the present time of day maintained in the PCs.
22	Display Status of Network	Display Status of Network Displays the RAS information of CMU and ET.NET.
23	Connection status displaying	Displays the current connection state of the basic tool and PCs.
24	ONLINE/OFFLINE setting	Places the basic tool either into ONLINE state or OFFLINE state.
25	CMU battery information	Displays existing battery information or sets new such information.
26	Error message list	Displays a list of various error messages that have been generated.
27	Operation history recording	Records a history of basic-tool operations.

Note: Item numbered 24 is not displayed on the screen.

6.4.3 LPU RUN/STOP setting

The LPU RUN/STOP setting function places the LPU either into RUN state or STOP state. To place it into RUN state, click the button. To place it into STOP state, click the button.

Switching the LPU between RUN and STOP states can be accomplished only when the LPU's LADDER switch is set in RUN position and the STOP/RUN contact input described in Section 3.1 is OFF. If the LPU's LADDER switch is set in STOP position and the STOP/RUN contact input is ON, then clicking the button has no effect on the current state of the LPU.

Once the LPU is placed into STOP state by this tool, it remains in the same state until the module has been reset or until the power to the module has been switched off and then back on again.

After the resetting or powering down and then up again of the module, the LPU operates according to the LADDER switch setting.

For more information on how to operate the LPU, see "8 OPERATION."

6.4.4 LPU PROTECT MODE setting

The LPU PROTECT MODE setting function switches the LPU's memory protection mechanism between the protection mode and non-protection mode in which to run arithmetic/logical functions. If you wish to run such functions in the protection mode, click the button; otherwise, click the button. The memory protection mechanism is factory-set to OFF state. It is usually set to ON state before operations, in order to prevent any malfunction due to an application programming error.

For more information on how to operate the LPU, see "8 OPERATION."

6.4.5 LPU LADDER MODE setting

The LPU LADDER MODE setting function switches the LPU's ladder mode support between the normal mode and simulation mode in which to run a ladder program. If you wish to run the ladder in the normal mode, click the button. If you wish to run it the simulation mode, click the button.

Switching the ladder mode support between the NORM and SIMU modes can be accomplished only when the LPU is in RUN state.

For more information on how to operate the LPU, see "8 OPERATION."

6.4.6 LPU ALARM LED extinguishing

The LPU ALARM LED extinguishing function switches off the ALARM indicator light if it has been lit up due to a detected minor error not making the continuation of operation impossible.

6.4.7 LPU USER ERR LED extinguishing

The LPU USER ERR LED extinguishing function clears all the E-coils E000 through E1FF by filling them with 0s and switches off the USER indicator light. If, however, the condition of switching on the above E-coils is satisfied in the user ladder program, this function does not switch off the USER indicator light.

6.4.8 CMU PROTECT MODE setting

The CMU PROTECT MODE setting function switches the CMU's protection mode support between ON and OFF states before execution of a task. Any task executing in the ON state of the protection mode cannot write data to the SEQ-RAM.

If you wish to run a task in the ON state of the protection mode, click the button. If you wish to run it in the OFF state, click the button.

6.4.9 CMU ALARM LED extinguishing

The CMU ALARM LED extinguishing function switches off the ALARM indicator light if it has been lit up as a result of detection of such a minor error as not making the continuation of operation impossible.

6.4.10 CMU USER ERR LED extinguishing

The CMU USER ERR LED extinguishing function switches off the USER indicator light if it has been lit up as a result of detection of a user setting error.

6.4.11 CMU IP address setting

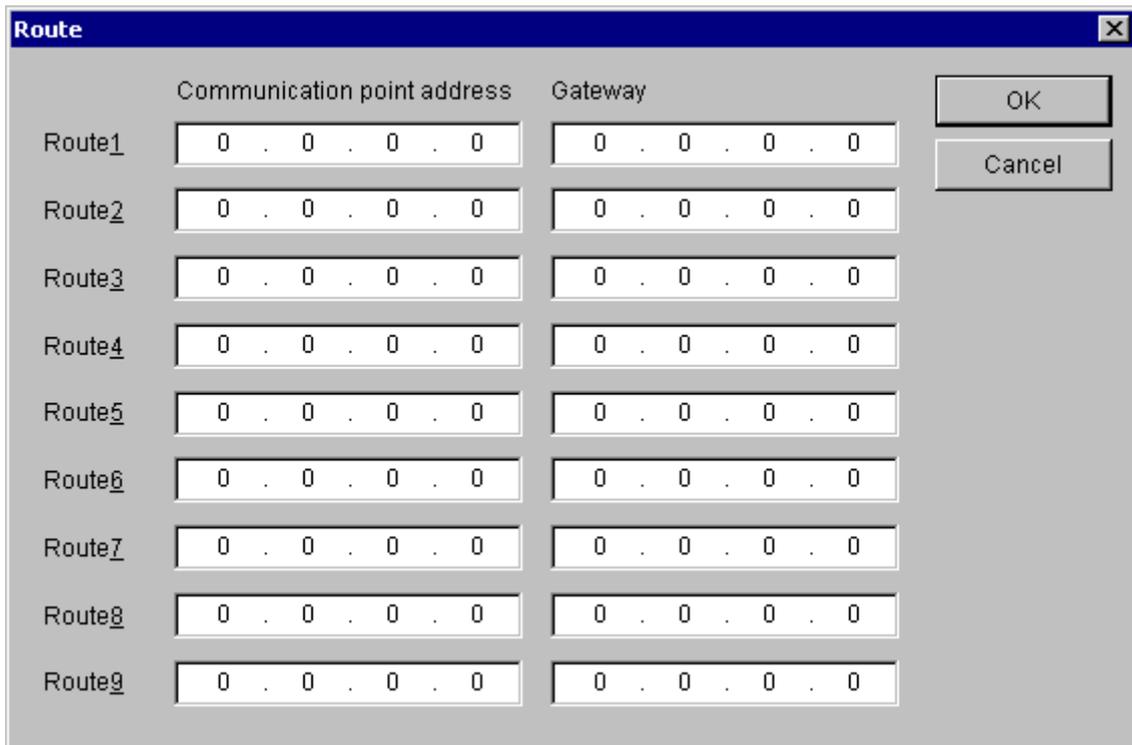
(1) [Set CMU IP Address] window

The [Set CMU IP Address] window opens, prompting you to set the IP address, subnet mask, broadcast address, and route for the CMU's built-in Ethernet device. To validate the information setup, restart the PCs. You must also make sure that the CMU rotary switches are both set to "0".

- "IP Address" box
Specifies the IP address.
- "Subnet Mask" box
Specifies the subnet mask.
- "Broadcast Address" box
Specifies the broadcast address.
- button
Accepts the newly entered IP address, subnet mask, broadcast address, and route, and closes the [Set CMU IP Address] window.

- **Cancel** button
Discards the newly entered IP address, subnet mask, broadcast address, and route, and closes the [Set CMU IP Address] window.
- **Route** button
Opens the [Route] window for routing table setup.

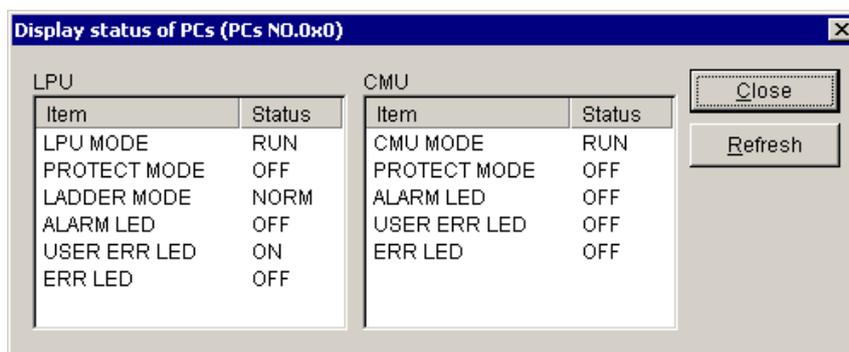
(2) [Route] window
Sets the communication point address and gateway IP address.



- “Communication point address” box
Specifies the communication point network address or IP address.
- “Gateway” box
Specifies the gateway IP address. When the box reads “0.0.0.0”, it means that no IP address is entered.
- **OK** button
Accepts the newly entered information and closes the [Route] window. The accepted information is written into the PCs when you click the **OK** button in the [Set CMU IP Address] window.
- **Cancel** button
Discards the newly entered information and closes the [Route] window.

6.4.12 PCs status displaying

- (1) The PCs status displaying function displays the [Display status of PCs] window as shown below that presents information on the current operation condition of the PCs.



- (2) As shown, the [Display status of PCs] window presents itemized status information for the LPU and CMU. Each item of information presented is described below.

Table 6-3 Items Presented by the [Display status of PCs] Window

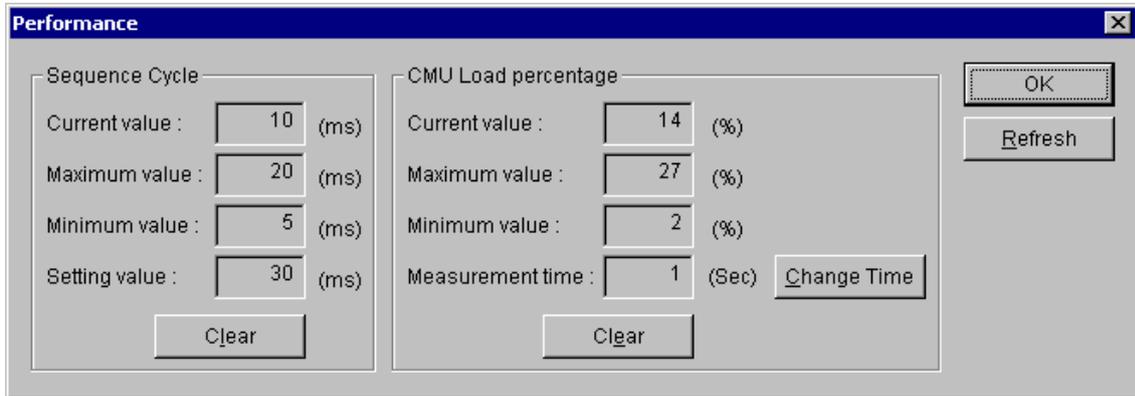
No.	Item	Status	Meaning
1	LPU/CMU MODE	RUN	The LPU/CMU is currently running.
		STOP	The LPU/CMU is currently stopped.
2	PROTECT MODE	ON	The LPU/CMU is running in protection mode.
		OFF	The LPU/CMU is running in non-protection mode.
3	LADDER MODE	NORM	The LPU is running in normal mode.
		SIMU	The LPU is running in simulation mode.
4	ALARM LED	ON	The ALARM indicator light is currently ON.
		OFF	The ALARM indicator light is currently OFF.
5	USER ERR LED	ON	The USER indicator light is currently ON.
		OFF	The USER indicator light is currently OFF.
6	ERR LED	ON	The ERR indicator light is currently ON.
		OFF	The ERR indicator light is currently OFF.

Note: Where no CMU is installed, the status of each item under “Status” is indicated by the symbol “-”.

- (3) If you wish to obtain up-to-date status information for the PCs, click the button.
- (4) When you wish to exit this function, click the button.

6.4.13 Performance displaying

(1) The performance displaying function first displays the [Performance] window as shown below that presents information on the Sequence Cycle and the CMU Load percentage.



The items of information presented by the [Performance] window have the following meanings:

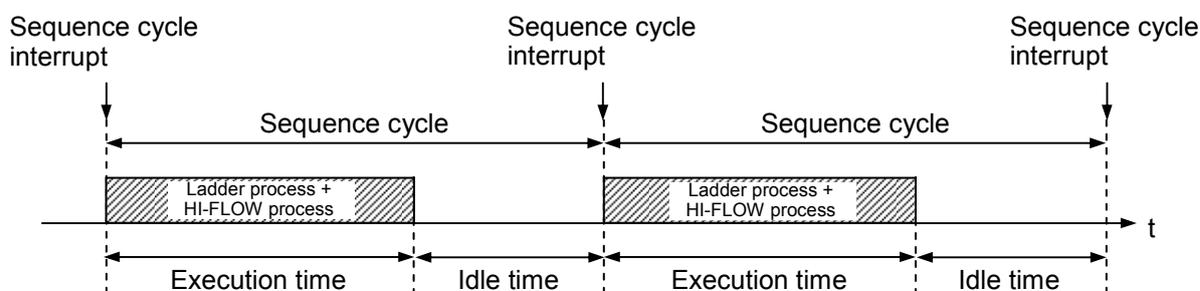
Table 6-4 Items Presented by the [Performance] Window

Group	Item	Unit	Description
Sequence Cycle	Current value	ms	Current value of the total time required for execution of ladder programs and HI-FLOW processes. (*)
	Maximum value	ms	Maximum value of the total time required for execution of ladder programs and HI-FLOW processes. (*)
	Minimum value	ms	Minimum value of the total time required for execution of ladder programs and HI-FLOW processes. (*)
	Setting value	ms	Set value of the sequence cycle timer.
CMU Load percentage	Current value	%	Current value of the CMU load percentage.
	Maximum value	%	Maximum value of the CMU load percentage.
	Minimum value	%	Minimum value of the CMU load percentage.
	Measurement time	Sec	Measurement time of the CMU load percentage.

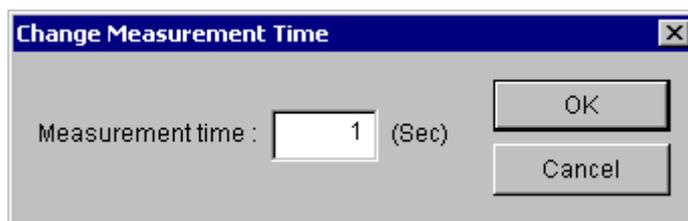
- **Clear** button (sequence cycle)
Clears the sequence cycle current value, maximum value, and minimum value, and restarts a measurement process. After the values are cleared, the current value, maximum value, and minimum value fields in the Sequence Cycle area read "0".
- **Clear** button (CMU load percentage)
Clears the CMU load percentage current value, maximum value, and minimum value, and restarts a measurement process. After the values are cleared, the current value, maximum value, and minimum value fields in the CMU Load percentage area read "0".

- **Change Time** button
Opens the [Change Measurement Time] window, which allows you to change the measurement time. The measurement time setting entered from the [Change Measurement Time] window appears in the “Measurement time” box in the [Performance] window. This button also clears the current value, maximum value, and minimum value from the “CMU Load percentage” area, and restarts a CMU load percentage measurement process at the changed measurement time setting.
- **Refresh** button
Displays the current values.
- **OK** button
Closes the [Performance] window.

(*) The total time required for execution of ladder programs and HI-FLOW processes is shown shaded in the figure below.



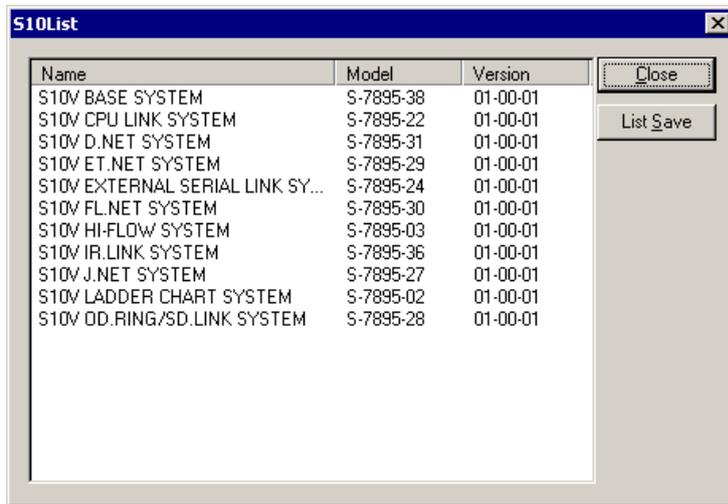
- (2) [Change Measurement Time] window
Changes the CMU load percentage measurement time.



- “Measurement time” box
Changes the CMU load percentage measurement time setting in 1-second units. The setting range is from 1 to 60 seconds. The default setting is 1 second. When the measurement time setting is changed from the [Change Measurement Time] window, the new setting becomes the default value the next time the window opens.
- **OK** button
Acquires the value in the “Measurement time” box and closes the [Change Measurement Time] window.
- **Cancel** button
Closes the [Change Measurement Time] window without changing the measurement time.

6.4.14 S10List displaying

- (1) The S10List displaying function displays the [S10List] window as shown below that presents a list of the program products (P.P.) installed in the personal computer.



- (2) The items of information presented by the [S10List] window have the following meanings:

Table 6-5 Items Presented by the [S10List] Window

No.	Item	Description
1	Name	Name of a P.P. installed.
2	Model	Model of a P.P. installed.
3	Version	Version number of a P.P. installed.

- (3) When you wish to save the presented P.P. information in a file, click the [List Save] button. The [Save As] window as shown below appears. Select the desired folder and enter the name of a file in which you are saving the information.

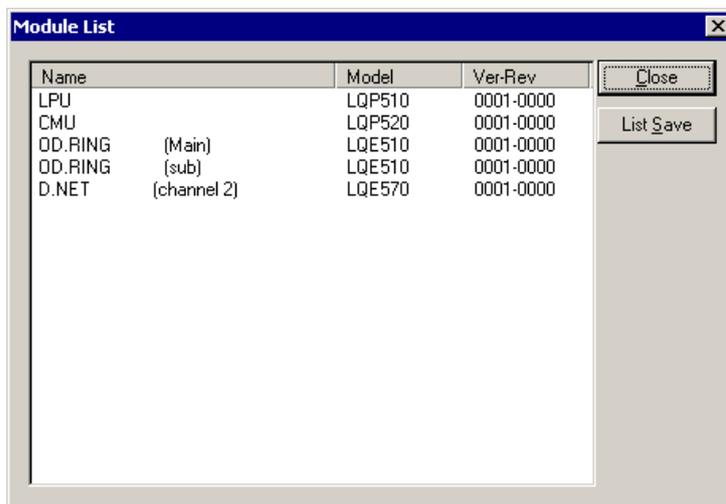


- (4) After a file has been specified, click the [Save] button. The P.P. information will then be saved in the specified file. If the information need not be saved, click the [Cancel] button.

- (5) When you wish to exit this function, click the [Close] button.

6.4.15 Module list displaying

- (1) The module list displaying function displays the [Module List] window as shown below that presents a list of the modules installed in the system, along with Ver-Rev information for the related micro programs.

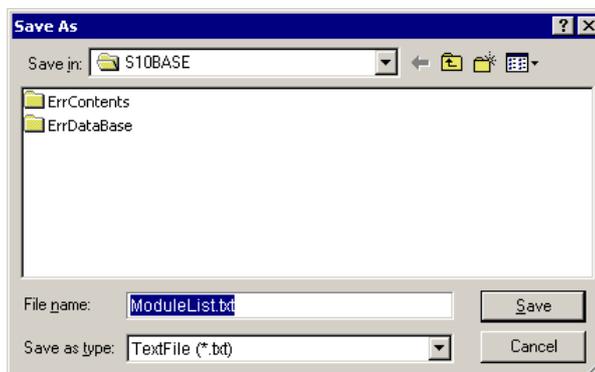


- (2) The items of information presented by the [Module List] window have the following meanings:

Table 6-6 Items Presented by the [Module List] Window

No.	Item	Description
1	Name	Name of a module installed.
2	Model	Model of a module installed.
3	Ver-Rev	Version and revision numbers (in the form Ver-Rev) of the micro program installed in each module.

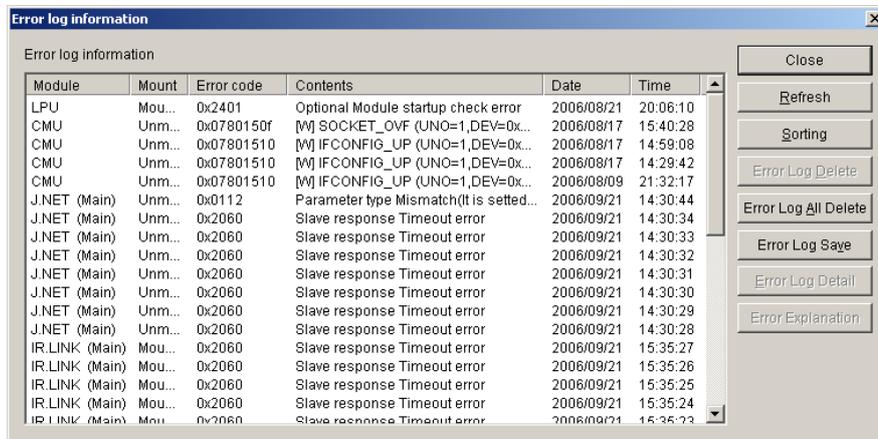
- (3) If you wish to save the presented module information in a file, click the [List Save] button. The [Save As] window as shown below appears. Select the desired folder and enter the name of a file in which you are saving the information.



- (4) After a file has been specified, click the [Save] button. The module information will then be saved in the specified file. If the information need not be saved, click the [Cancel] button.
- (5) When you wish to exit this function, click the [Close] button.

6.4.16 Error log information

(1) The error log displaying function displays the [Error log information] window as shown below that presents an error log for any errors that have occurred in the modules supported by the S10V product. Up to eight errors that may have occurred in each module in the past are reported in the [Error log information] window. The CMU error log information window shows up to 2 panic log error events and up to 32 non-panic log error events. The ET.NET (LQE720) error log information window shows up to 2 panic log error events and up to 8 non-panic log error events. For the meaning of each error code presented, see “10 MAINTENANCE,” if the module involved is the LPU, or refer to the manual coming with the module if it is other than the LPU.



(2) The items of information presented by the [Error log information] window have the following meanings:

Table 6-7 Items Presented by the [Error log information] Window

No.	Item	Description
1	Module	Name of an optional module for which error log information is maintained.
2	Mount	Indication of whether an optional module for which error log information is maintained is mounted or not.
3	Error code	Error code for an error that occurred.
4	Contents	Meaning of an error code presented.
5	Date	Date on which an error occurred.
6	Time	Time at which an error occurred.

The contents of CMU and ET.NET (LQE720) error log information are displayed in the following format.

<Panic log>

[*]	*****	(PC=0x*****)	(FADR=0x*****)
①	②	③	④

- ① Fault severity classification
[F] : Fatal error
[FU]: Built-in sub-error
- ② Error message
- ③ Program counter
- ④ Fault Address

<Non-panic log>

(Pattern 1)

[*]	*****	(UNO=**, DEV=0x*****)	(TN=***)	(SLOT=**)
①	②	③	④	⑤

- ① Fault severity classification
[F]: Fatal error [W]: Warning
[E]: Error [I] : Information
- ② Error message
- ③ Unit number and device number
Unit range : 1 to 24
Device range: 0x00000000 to 0xFFFFFFFF
- ④ Task number
Task range: 1 to 255
- ⑤ Slot number
Slot range: 0 to 7

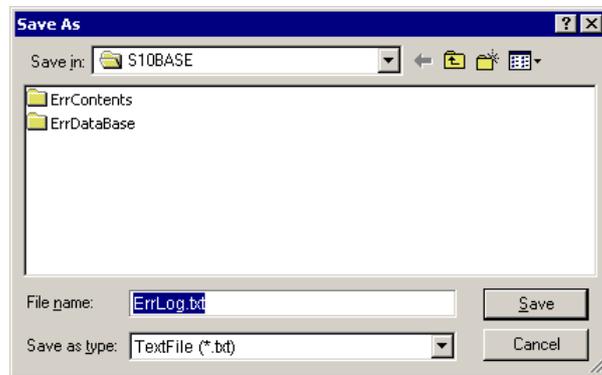
Note: Information ③ to ⑤ except the panic log may not be displayed depending on the error type.

(Pattern 2)

%****_*_****_****
① ② ③ ④

- ① System where an error detected
CPMS: CPMS (basic OS)
LNET : RCTLNET (network driver)
 Tslib-R600 (communication server support library)
NX : NXACP (autonomous distributed platform)
MSxx : Middleware (xx: 01 to 16)
USxx : Application software (xx: 01 to 16)
- ② Fault severity classification
F : Fatal error E: Error
W: Warning I : Information
? : Other fault
- ③ Fault type
HARD: Hardware
CPMS: CPMS
SOFT: Software other than CPMS
- ④ Code
This code represents the type of error log in 4 hexadecimal digits.

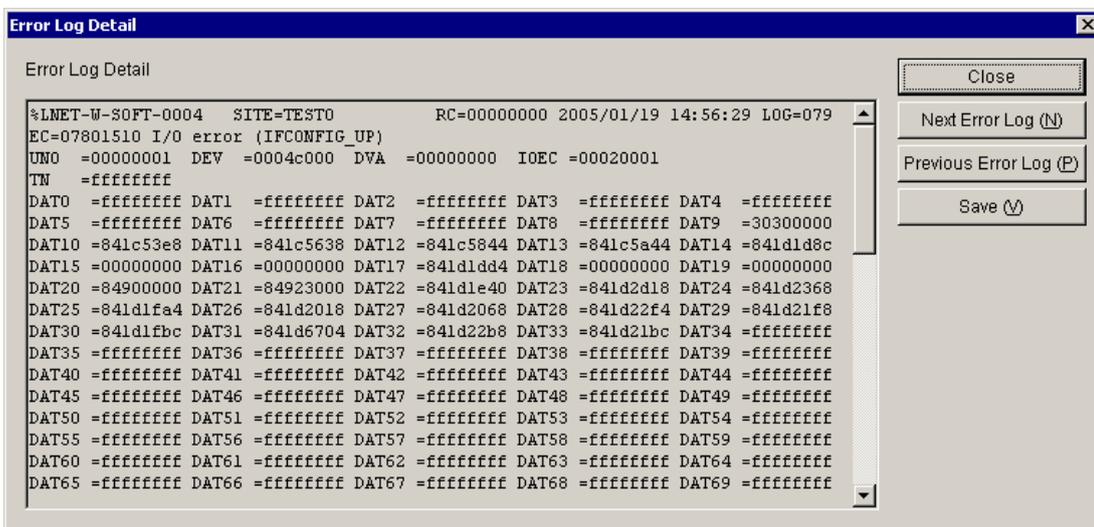
- (3) Click the **Error Log Detail** button and open the [Error Log Detail] window to display detailed information of the errors in CMU and ET.NET (LQE720).
- (4) If you wish to obtain the up-to-date error information maintained in the log, click the **Refresh** button.
- (5) You can rearrange the presented error information in the order of time by clicking the **Sorting** button. Each time the **Sorting** button is clicked, the order of time used is switched between ascending order and descending order. To rearrange the sorted information in the order of the modules, click the **Refresh** button.
- (6) The error log information presented can be deleted for each individual module. This can be accomplished by selecting from the list box the module whose error information is to be deleted, and then clicking the **Error Log Delete** button.
- (7) The error log information presented can be deleted all at once by clicking the **Error Log All Delete** button.
- (8) The error log information presented can be saved in a file. This can be done in the following way. First, click the **Error Log Save** button. When the [Save As] window as shown below appears, select the desired folder and specify the name of a file in which you wish to save the information.



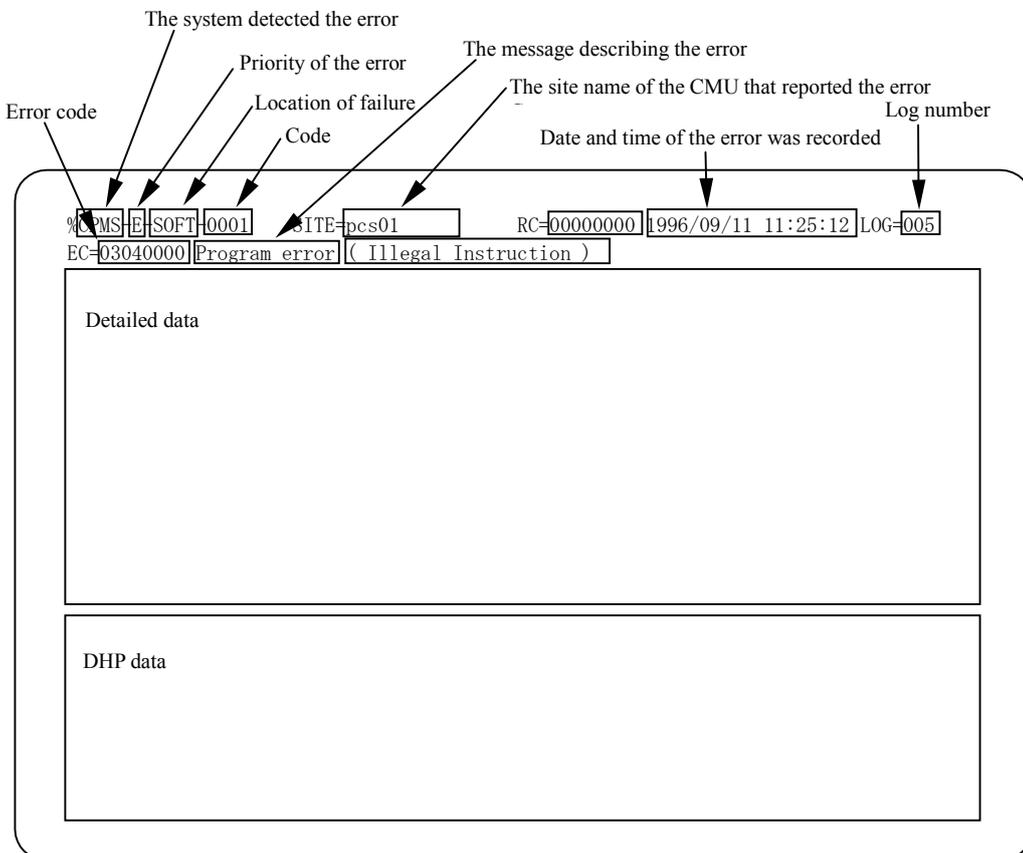
- (9) After a file has been specified, click the **Save** button. The error log information will then be saved in the specified file. If the information need not be saved, click the **Cancel** button.
- (10) If you want to view descriptions of the detected errors on screen, click the **Error Explanation** button in the [Error log information] window. A help window containing error descriptions will then be displayed.
- (11) When you wish to exit displaying the error log information, click the **OK** button.

6.4.17 Error log detail

- (1) The [Error Log Detail] window that presents the detailed information of the errors in CMU and ET.NET (LQE720) opens.



- (2) The items displayed in the [Display DHP trace] window are described below. See “6.4.16 Error log information” for details displayed in “detailed data” and “6.4.29 Display DHP trace” for details displayed in “DHP data.”



- **The system detected the error.**

- CPMS: CPMS (basic OS)

- LNET: RCTLNET (network driver)

- NX: NXACP (decentralized autonomous platform)

- MSxx: middleware (xx will be 01 to 16)

- USxx: application software (xx will be 01 to 16)

- **The message describing the error**

- Program error: The error that disables the execution of the program

- Macro parameter check error: The parameter error of the macroinstructions of the OS

- WDT timeout error: The monitoring timeout error of the WDT (WatchDog Timer)

- I/O error: The errors related to input and output

- Module error: Mostly hardware errors

- PI/O error: The errors related to process input and output

- Refer to the manual of each module for further details.

- **Priority of the error**

- F: Fatal Error

- E: Error

- W: Warning

- I: Information

- **Location of failure**

- HARD: Hardware

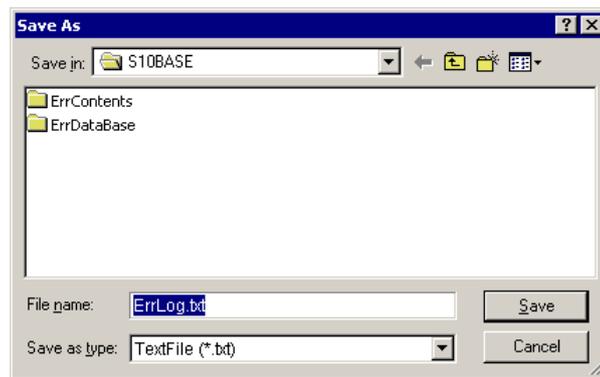
- CPMS: CPMS

- SOFT: Software other than CPMS

- **Code**

- The code representing the type of the error log

- (3) Click the **Next Error Log** button to display the detailed information for the next error log following the error log currently specified in the [Error Log Information] window.
- (4) Click the **Previous Error Log** button to display the detailed information for the error log prior to the error log currently specified in the [Error Log Information] window.
- (5) The error log detailed information that has been presented can be saved in a file. This can be done in the following way. Click the **Save** button. The [Save as] window opens. Specify the desired folder and file in which you wish to save the information.



After you have specified a file, click the **Save** button. The error log information will be saved in the specified file. If the information need not be saved, click the **Cancel** button.

6.4.18 Event register monitor

If the USER indicator of the LPU module is ON, the event register monitoring function checks which event registers (E-coils) are ON. The USER indicator light comes on when any one of the event registers (E-coils) E000 through E1FF is ON.

- (1) This function first displays the [Event Register Monitor] window for monitoring the event registers:



- (2) If you wish to begin monitoring of the event registers, click the **Start Monitoring** button. Then, the **Start Monitoring** button icon is replaced by the **Stop Monitoring** button icon. After the monitoring has been started, each event register will have its displayed bit positions changed in color according to the set value of each bit ----
- When the bit is set to 0: the corresponding bit position is displayed in white color.
 - When the bit is set to 1: the corresponding bit position is displayed in red color.
- (3) When you wish to stop the monitoring, click the **Stop Monitoring** button.
- (4) When you wish to exit this function, click the **Close** button.

6.4.19 Remote resetting

The remote resetting function resets the PCs. Since the PCs can be reset during operation, sufficient care should be taken when you use this function.

6.4.20 Clearing of data

The clearing of data function fills the battery backup memory with 0s. Clearing of data can be accomplished only when the LPU is in STOP state. If the LPU is in RUN state, enter it into STOP state before you use this function.

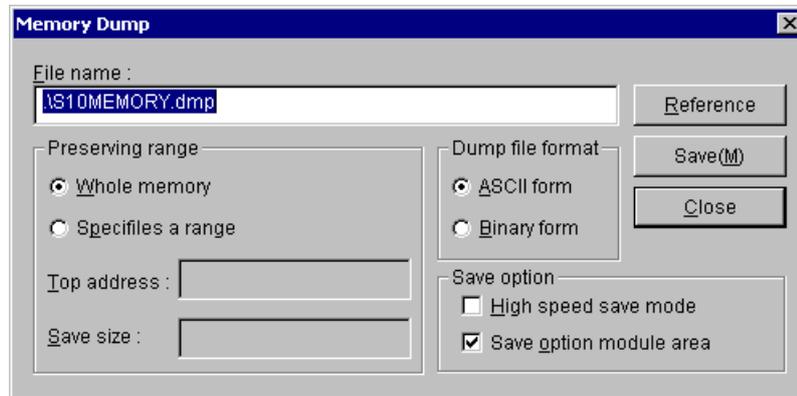
The battery backup memory is an address space ranging from /480000 to /4FFFFFF. Only those locations in this address space that are currently used are cleared of data. The locations subjected to the clearing of data are as shown below.

Table 6-8 Locations Subjected to the Clearing of Data

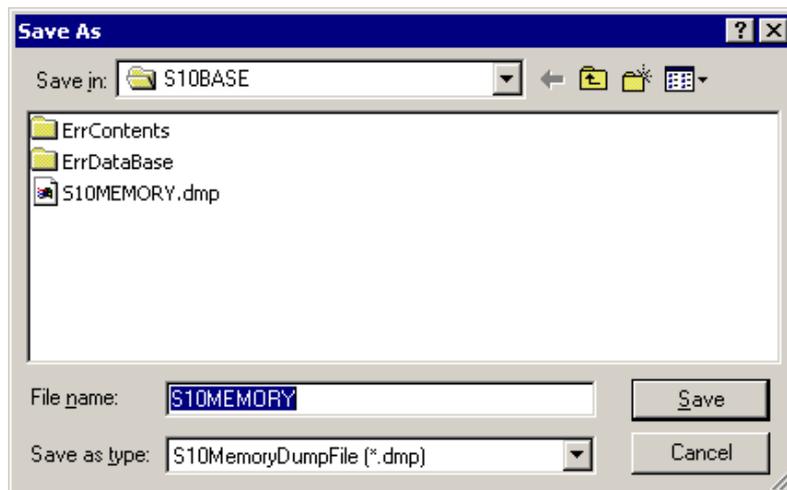
No.	Address	Use
1	/480600 to /4807FF	C-count values
2	/481000 to /4811FF	Keep-relays (KW000 to FF0)
3	/481700 to /48171F	U/D counters (CW000 to 0F0)
4	/482000 to /4837FF	Work registers (FW000 to BFF)
5	/483800 to /483FFF	Long-word registers (BD000 to 1FE)
6	/490000 to /497FFF	Long-word registers (LML0000 to 1FFF)
7	/498000 to /49FFFF	Floating-point registers (LG0000 to 1FFF)
8	/4A0000 to /4A7FFF	Word registers (LXW0000 to 3FFF)
9	/4F0000 to /4F1FFF	Data registers (DW000 to FFF)

6.4.21 Memory dump

- (1) The memory dump function first displays the [Memory Dump] window as shown below with which you can interact for saving a memory dump in a specified file.

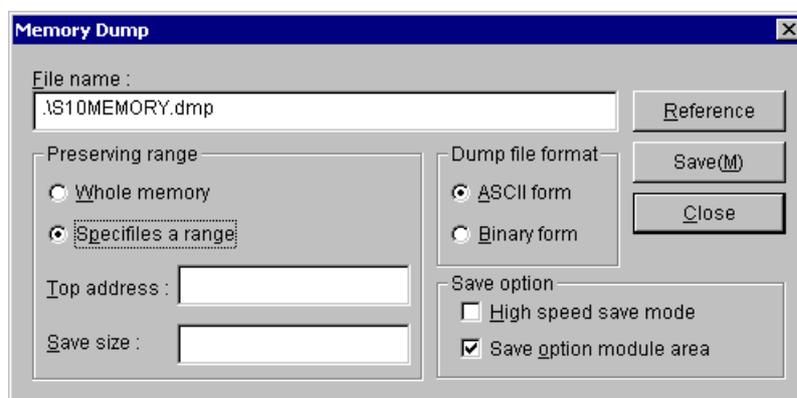


- (2) The default file name above can be changed either by directly entering a new file name into the "File name" box or by clicking the **Reference** button and then specifying the desired folder and file in the [Save As] window displayed:



- (3) After a file has been specified, click the **Save** button. The specified file name appears in the "File name" box of the [Memory Dump] window. If the default folder and file need not be changed, click the **Cancel** button.

- (4) If you wish to change the default preserving range shown in the window, select either “Whole memory” or “Specifies a range” in the “Preserving range” box. If you have selected “Specifies a range,” you can enter the starting address of the desired range of memory for dumping and the range itself into the “Top address” and the “Save size” box, respectively.



- (5) If you wish to change the default dump file format shown in the window, select either “ASCII form” or “Binary form” in the “Dump file format” box. If you have selected “ASCII form,” a produced memory dump will be converted to ASCII format and saved. If “Binary form” has been selected, a produced memory dump will be saved in the format shown below, where each numeric value is represented two characters per byte.

■ Binary file format

In this file format, a 4 KB file header containing 16 bytes of information per area is added to the beginning of the file. If the selected preserving range includes an area not subjected to memory dumps, information on that area will be excluded from the area information stored in the header. The excluded portion will be indicated by a sequence of dots (“.”).

The area information in the header consists of units of four bytes and has the format shown below.

- Offset in file (i.e., the number of lines counted from the start line in which memory content is stored)
- Top address of area subjected to dump operations
- Save size of area subjected to dump operations
- Unused

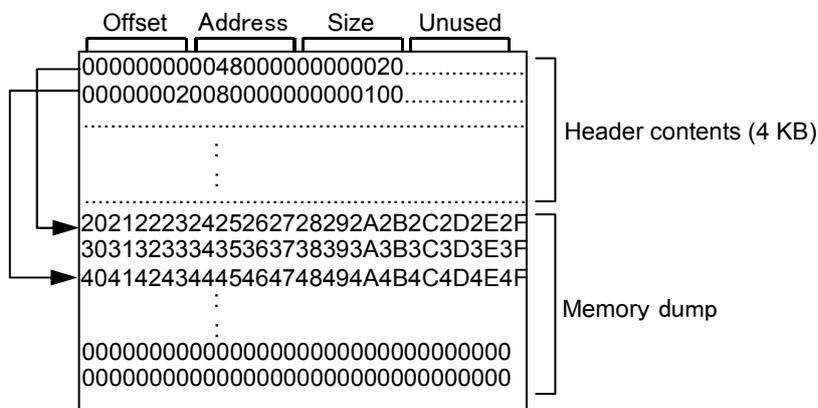


Figure 6-3 Binary File Format for Memory Dumps

- (6) If you wish to carry out a memory dump operation at high speed, check the “High speed save mode” check box. If you are performing a memory dump operation at standard speed, this checking is not necessary so that deselect the check box.
- (7) If you wish to save the contents of the optional-module area (/0080 0000 to /00FF FFFF), check the “Save option module area” check box. The contents of the only optional-module area mounted in the option module area are saved. If not, this checking is not necessary so that deselect the check box. This deselected check box may not be used in conjunction with a specification of the optional-module area’s top address in the “Top address” box under the “Specifies a range” option. If it is so used, an address specification error will result in this function.
- (8) If you are saving a produced memory dump in the specified file in the specified format, click the button.
- (9) When you wish to exit this function, click the button.

If you execute a memory dump in the high-speed saving mode when the LPU tool interface (RS-232C) is connected, the CPU load factor of the S10V system may considerably increase.

If a ladder or task is operated, this may have an effect on the operation. When executing a memory dump in the high-speed saving mode, confirm beforehand that nothing is in operation.

When connected to an Ethernet® network, the system always runs in the high-speed saving mode and the check box of the high-speed saving mode remains in the checked status and you cannot change it.

■ Areas subjected to memory dump operations

The areas subjected to memory dump operations are diagrammatically shown below. If the “Whole memory” option is selected as a preserving range, all the areas subjected to memory dump operations will be dumped.

If the “Specifies a range” option is selected instead, the starting address specified may not be that of any area not subjected to memory dump operations. If a specified range includes an area not subjected to memory dump operations, only the areas subjected will be dumped.

Where the S10V product is connected to an Ethernet® network via an RS-232C or ET.NET module, the CMU area will not be dumped, because it cannot be accessed via the modules.

The memory dump range of task space, GLBR, GLBW, and IRSUB can be made variable by defining the area in the RPDP. The definition range is 4 areas starting from byte 0 and its total size is up to 16 MB.

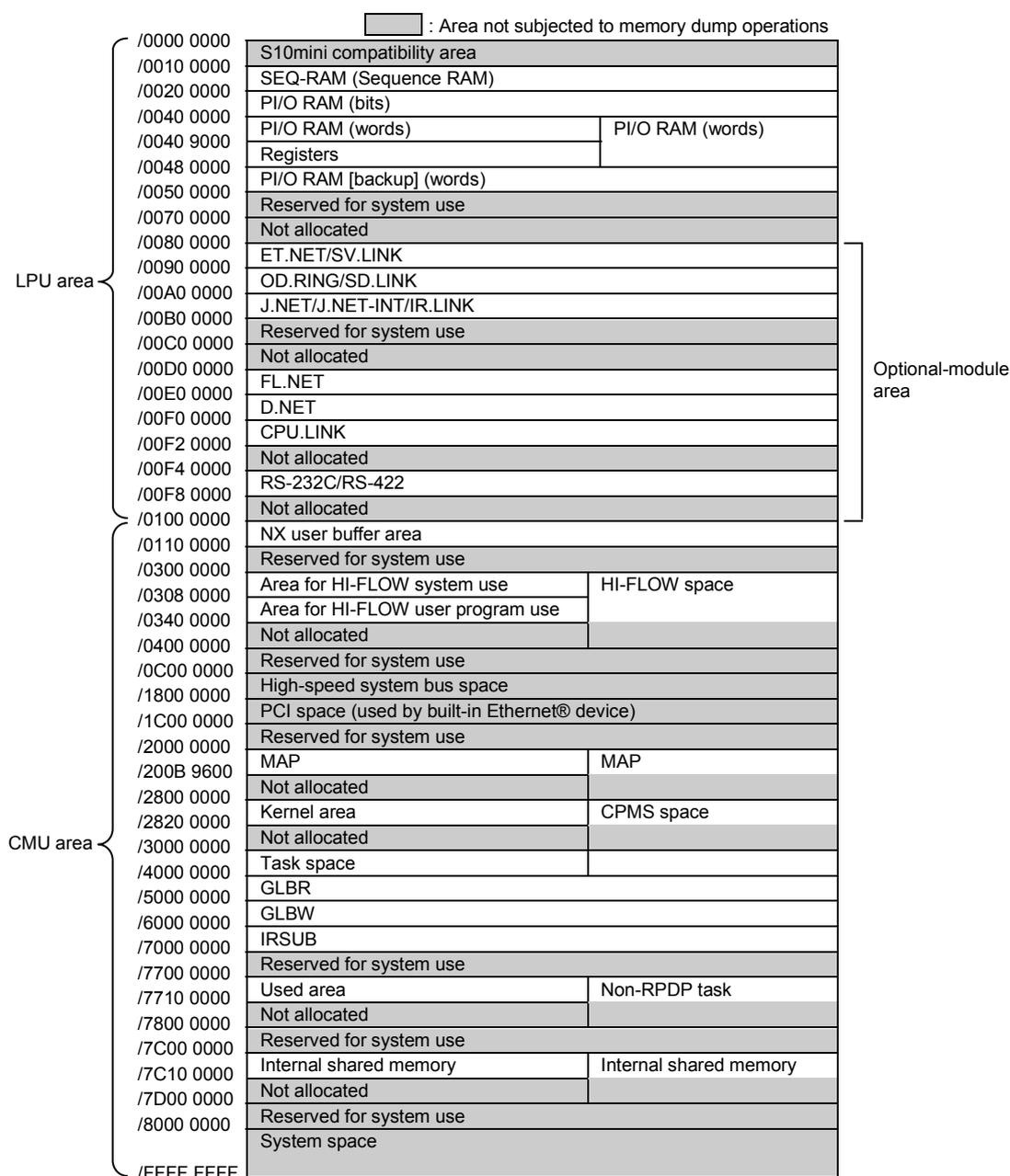
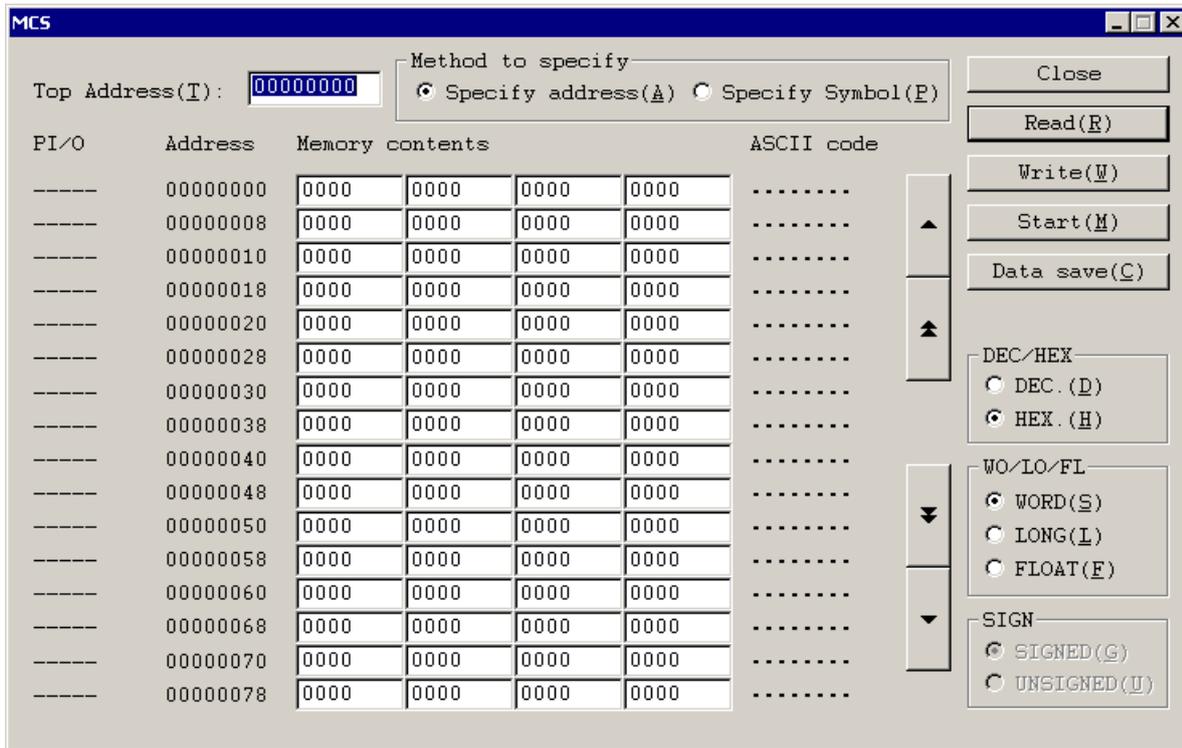


Figure 6-4 Areas Subjected to Memory Dump Operations

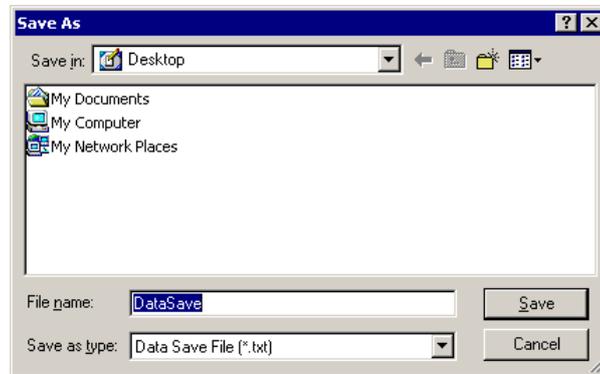
6.4.22 MCS data displaying

- (1) The MCS data displaying function starting displays the [MCS] window as shown below that presents MCS (memory read/write) data. Select a method of specifying the starting point of reading or writing, and enter the desired starting address or PI/O symbol as the starting point.



- (2) If you wish to read data from the specified starting point, click the **Read** button. If you wish to write data to the specified starting point, click the **Write** button. If you are monitoring the specified starting point, click the **Start** button. When you wish to exit this function, click the **Close** button.

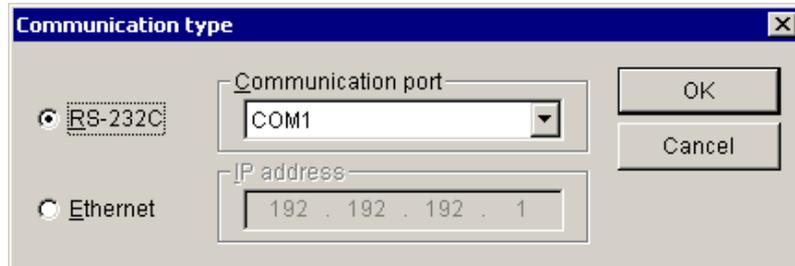
- (3) The data presented in the [MCS] window can be saved in a file. To accomplish this, click the **Data save** button. The [Save As] window appears. Specify the desired folder and file in which to save the data.



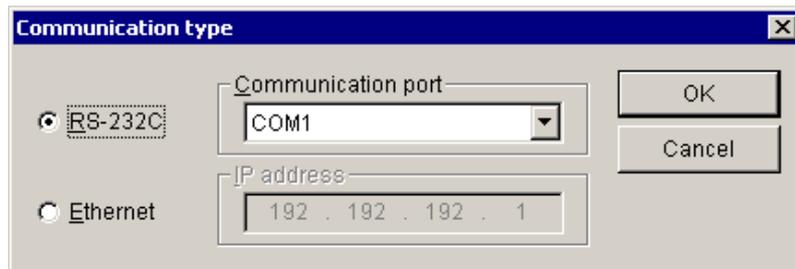
- (4) After you have specified a file, click the **Save** button. The data in the [MCS] window will then be saved in the specified file. If it need not be saved, click the **Cancel** button.

6.4.23 Connected PCs changing

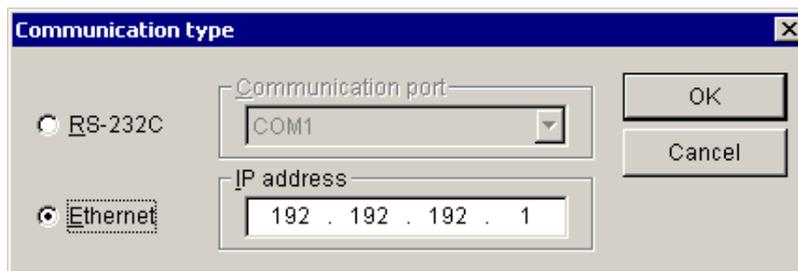
- (1) The connected PCs changing function displays the [Communication type] window as shown below that allows you to select a communication type you need.



- (2) If the communication type you need is RS-232C, check the “RS-232C” radio button and select the communication port to be used.



- (3) If the communication type you need is Ethernet, check the “Ethernet” radio button and enter the IP address to be used.



- (4) When the selection of a communication type is completed, click the **OK** button. If the displayed communication type need not be changed, click the **Cancel** button.

6.4.24 Time setting

- (1) The time setting function displays the [Time of day] window as shown below that allows you to change the present time of day maintained in the PCs. Enter a new date and/or time.

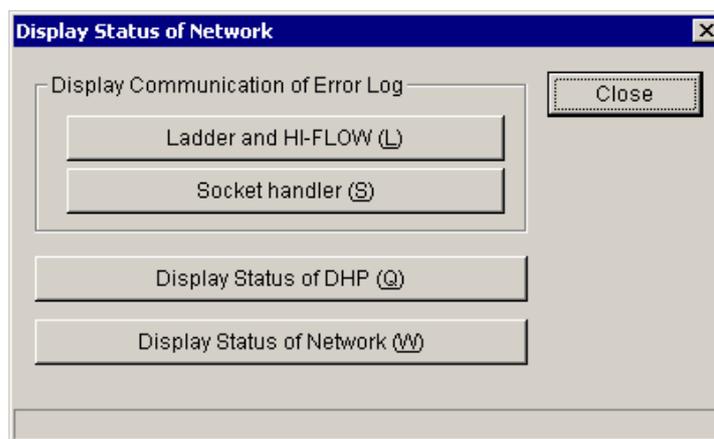


- (2) When the input of a new date and/or time is completed, click the **Time renewal** button. If the present time of day maintained need not be changed, click the **Cancel** button.

Functions described in 6.4.25 to 6.4.30 are not available for ET.NET (LQE520).

6.4.25 Display status of network (menu)

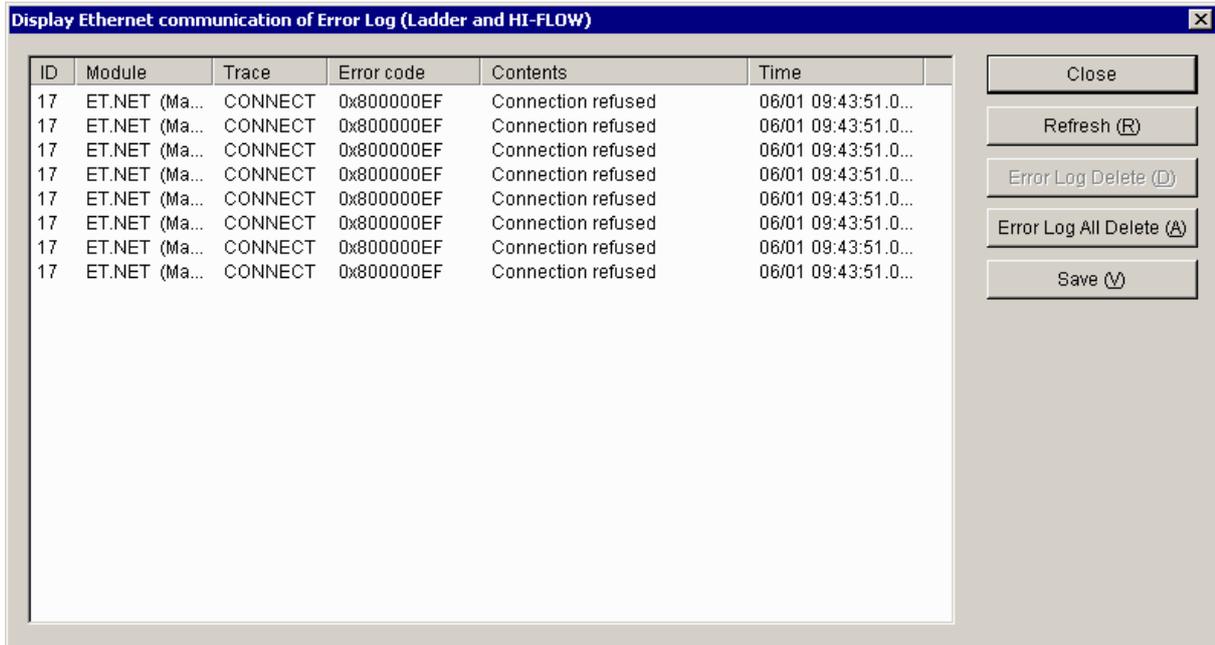
- (1) The [Display Status of Network] window that presents the RAS information of CMU/ET.NET opens.



- (2) Click the **Ladder and HI-FLOW** button to display the error log information of the errors that occurred in the Ethernet communication of the Ladder and HI-FLOW. Click the **Socket handler** button to display the error log information of the errors that occurred in the Ethernet communication of the Socket handler.
- (3) Click the **Display Status of DHP** button to display the current DHP logging mode or DHP trace.
- (4) Click the **Display Status of Network** button to the display network status and the [addition] of CMU/ET.NET.

6.4.26 Display ethernet communication of the error log (Ladder and HI-FLOW)

- (1) The [Display Ethernet communication of the Error Log (Ladder and HI-FLOW)] window that presents the trace logs of errors that occurred in the Ethernet communication of the Ladder and HI-FLOW opens.

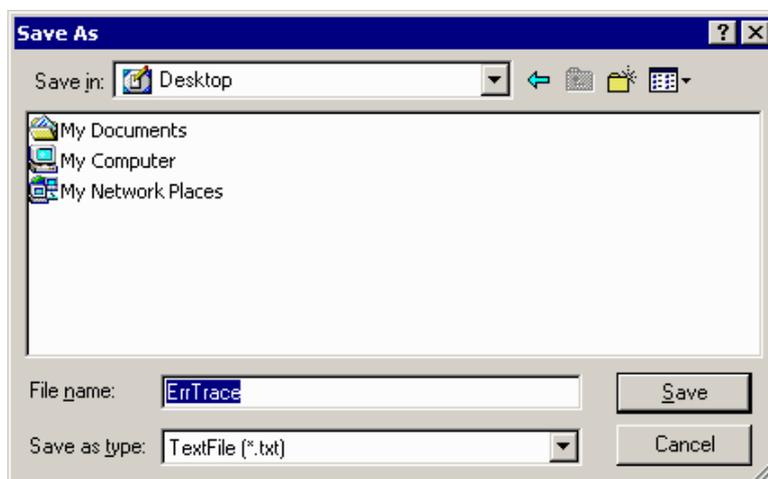


- (2) The content of the error log displayed is as follows:

Item	Content
ID	Table number of Ladder and HI-FLOW Ethernet communications management table
Module	Module name
Trace	Meaning of trace code in trace information
Error code	Error code for the error detected
Contents	Meaning of error code for the error detected
Time	Time the error occurred

- (3) If you want to display the latest error information on screen, click the **Refresh** button.
- (4) If you want to delete the error log information for a specified ID, click the **Error Log Delete** button. If you want to delete all the displayed error log information at once, click the **Error Log All Delete** button.

- (5) If you want to save the displayed error log information in a text file, click the **Save** button. When the [Save As] window appears, choose the folder in which to store the text file, and enter its file name.

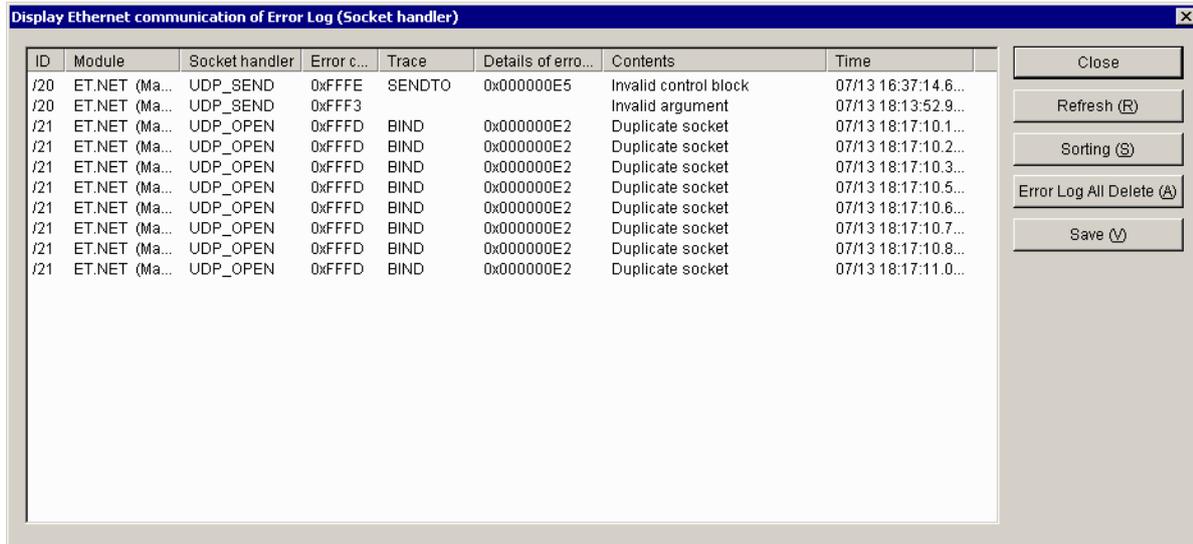


Then, click the **Save** button. The error log information will then be saved in the text file.

- (6) If you want to exit the [Display Ethernet communication of Error Log (Ladder and HI-FLOW)] window, click the **Close** button.

6.4.27 Display ethernet communication of the error log (socket handler)

- (1) The [Display Ethernet communication of the Error Log (Socket handler)] window that presents the trace logs of errors that occurred in the Ethernet communication of the Socket handler opens.

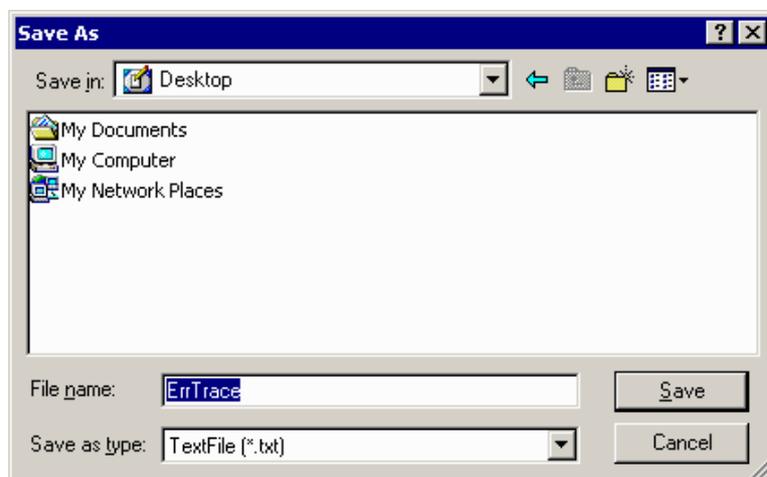


- (2) The content of the error log displayed is as follows:

Item	Content
ID	Socket ID of socket handler
Module	Module name
Socket handler	Name of socket handler
Error code	Error code from socket handler
Trace	Place at which the error was detected
Details of error code	Details of error code when the error was detected
Contents	Meaning of error code for the error detected
Time	Time the error occurred

- (3) If you want to display the latest error information on screen, click the **Refresh** button.
- (4) If you want to delete all the displayed error log information at once, click the **Error Log All Delete** button.

- (5) If you want to save the displayed error log information in a text file, click the **Save** button. When the [Save As] window appears, choose the folder in which to store the text file, and enter its file name.

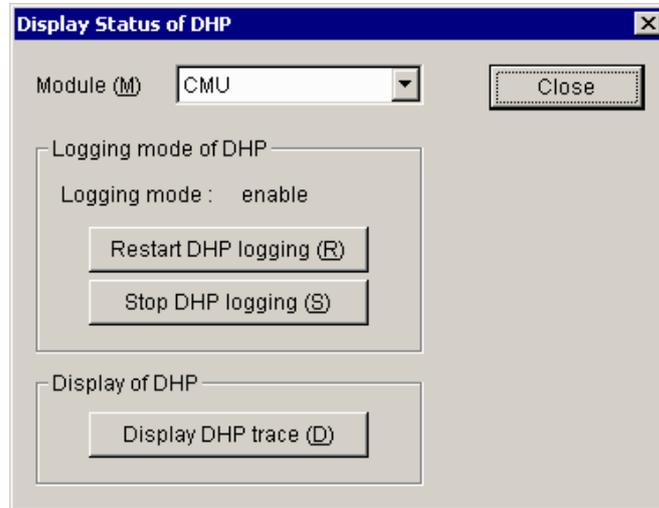


Then, click the **Save** button. The error log information will then be saved in the text file.

- (6) If you want to exit the [Display Ethernet communication of Error Log (Socket handler)] window, click the **Close** button.

6.4.28 Display status of DHP

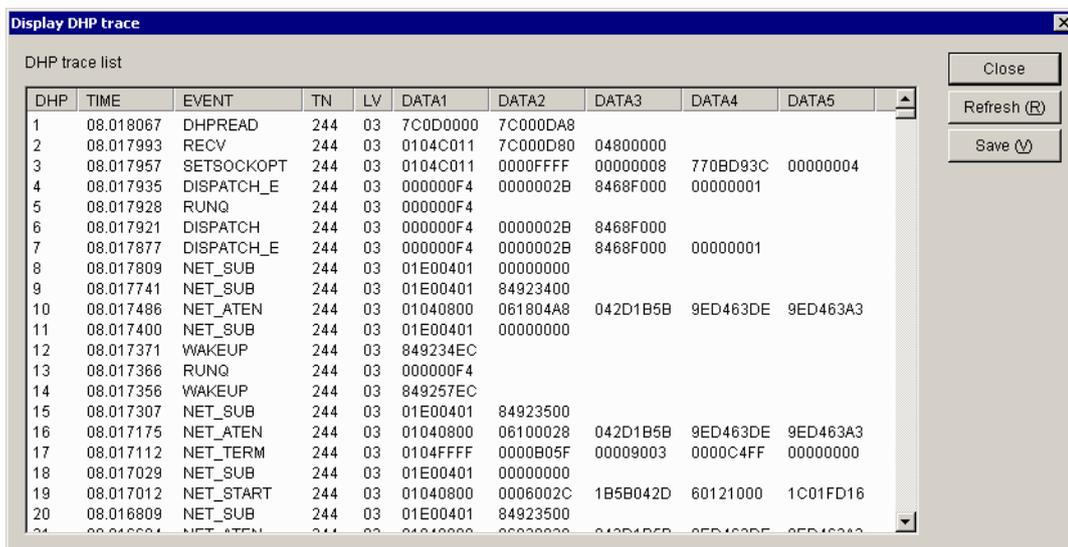
(1) The [Display Status of DHP] window to specify the logging mode of DHP opens.



- (2) The [Module] box in the window presents the names of the CMU and ET.NET modules installed in the PCs. Choose in the [Module] box the module for which you want to display DHP information or make a necessary setting.
- (3) The current logging mode status of DHP is displayed to the right of the label “Logging mode”. To enable the logging mode, click the **Restart DHP logging** button. To disable it, click the **Stop DHP logging** button.
- (4) If you want to display DHP’s trace information, click the **Display DHP trace** button.
- (5) If you want to exit the [Display Status of DHP] window, click the **Close** button.

6.4.29 Display DHP trace

- (1) The [Display DHP trace] window that presents DHP trace opens. Refer to the manual of each module for the details that are displayed in the window.



The screenshot shows a window titled "Display DHP trace" with a table of DHP trace data. The table has columns for DHP, TIME, EVENT, TN, LV, DATA1, DATA2, DATA3, DATA4, and DATA5. The data is as follows:

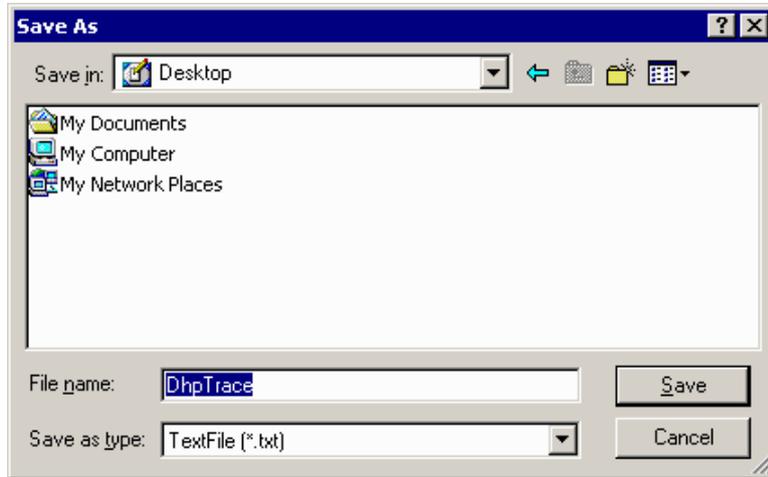
DHP	TIME	EVENT	TN	LV	DATA1	DATA2	DATA3	DATA4	DATA5
1	08.018067	DHPREAD	244	03	7C0D0000	7C000DA8			
2	08.017993	RECV	244	03	0104C011	7C000D80	04800000		
3	08.017957	SETSOCKOPT	244	03	0104C011	0000FFFF	00000008	770BD93C	00000004
4	08.017935	DISPATCH_E	244	03	000000F4	0000002B	8468F000	00000001	
5	08.017928	RUNQ	244	03	000000F4				
6	08.017921	DISPATCH	244	03	000000F4	0000002B	8468F000		
7	08.017877	DISPATCH_E	244	03	000000F4	0000002B	8468F000	00000001	
8	08.017809	NET_SUB	244	03	01E00401	00000000			
9	08.017741	NET_SUB	244	03	01E00401	84923400			
10	08.017486	NET_ATEN	244	03	01040800	061804A8	042D1B5B	9ED463DE	9ED463A3
11	08.017400	NET_SUB	244	03	01E00401	00000000			
12	08.017371	WAKEUP	244	03	849234EC				
13	08.017366	RUNQ	244	03	000000F4				
14	08.017356	WAKEUP	244	03	849257EC				
15	08.017307	NET_SUB	244	03	01E00401	84923500			
16	08.017175	NET_ATEN	244	03	01040800	06100028	042D1B5B	9ED463DE	9ED463A3
17	08.017112	NET_TERM	244	03	0104FFFF	0000B05F	00009003	0000C4FF	00000000
18	08.017029	NET_SUB	244	03	01E00401	00000000			
19	08.017012	NET_START	244	03	01040800	0006002C	1B5B042D	60121000	1C01FD16
20	08.016809	NET_SUB	244	03	01E00401	84923500			

- (2) The content of the displayed list is as follows:

Item	Content
DHP	DHP trace number displayed
TIME	Time the tracing was made: <u>tt.tttttt</u> where tt is seconds and tttttt microseconds.
EVENT	Type of trace point
TN	Task number
LV	Priority level
DATA1 to DATA5	Each is a piece of trace data (output in hexadecimal format).

- (3) If you want to display the latest DHP trace information on screen, click the button.

- (4) If you want to save the displayed trace information in a text file, click the **Save** button. When the [Save As] window appears, choose the folder in which to store the text file, and enter its file name.

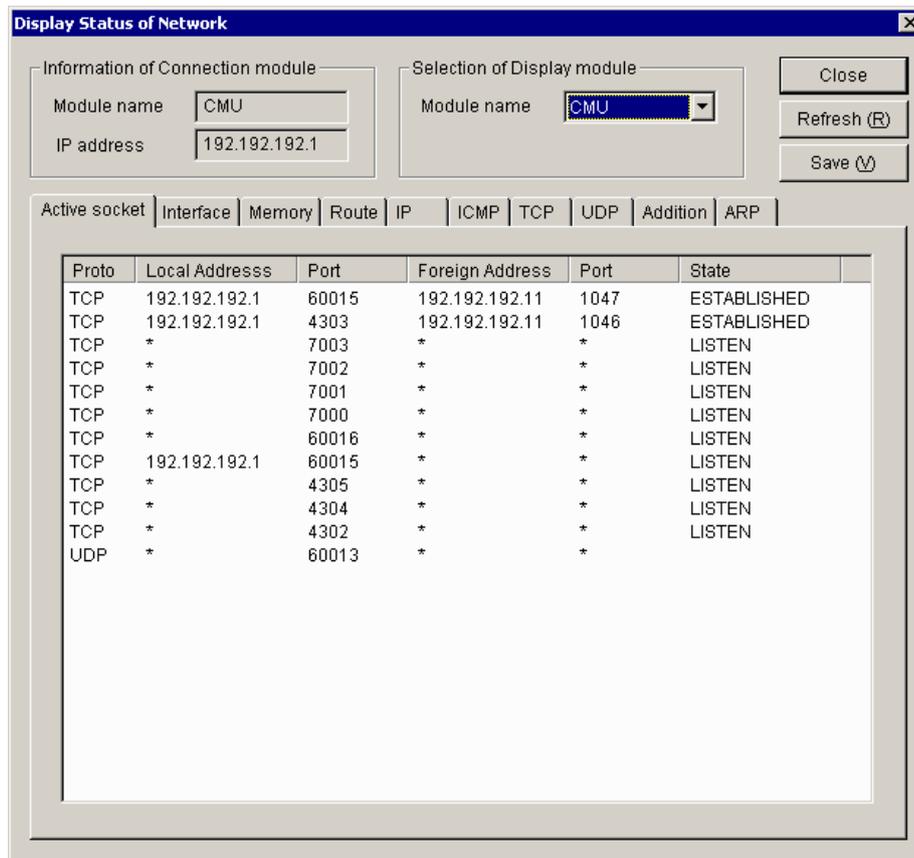


Then, click the **Save** button. The trace information will then be saved in the text file.

- (5) If you want to exit the [Display DHP trace] window, click the **Close** button.

6.4.30 Display status of network

- (1) The [Display Status of Network] window that presents the status of the network of CMU and ET.NET opens.

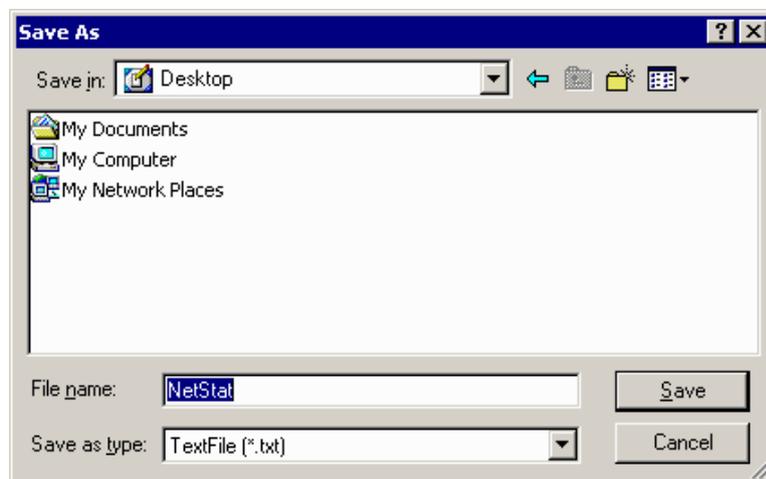


- (2) Choose in the [Selection of Display module/Module name] box the module for which you want to display network status information.

- (3) Click the desired tab to display the associated network status information. The types of network status information that can be displayed are as follows:

Item	Type of information displayed
Active socket	Socket information
Interface	Currently running network interfaces information
Memory	Send/receive buffer management information
Route	Routing information
IP	IP protocol statistics
ICMP	ICMP protocol statistics
TCP	TCP protocol statistics
UDP	UDP protocol statistics
Addition	Interface cumulative information
ARP	ARP table information

- (4) The specified type of status of network will be displayed by clicking the **Refresh** button. Refer to the manual of each module for details displayed in the tab.
- (5) If you want to save the displayed network status information in a text file, click the **Save** button. When the [Save As] window appears, choose the folder in which to store the text file, and enter its file name.



Then, click the **Save** button. The network status information will then be saved in the text file.

- (6) If you want to exit the [Display Status of Network] window, click the **Close** button.

6.4.31 Connection status displaying

The connection status displaying function displays the current connection state of the basic tool and PCs. The items of information presented as the current connection state are listed below.

Table 6-9 Items Presented as the Connection Status

No.	Item	Description
1	Connection status	Indicates whether the connection of the basic tool and PCs is ONLINE or OFFLINE.
2	Connection destination	Indicates the PCs number of the PCs product with which the basic tool is connected.
3	Communication type	Indicates the communication type currently used.

6.4.32 ONLINE/OFFLINE setting

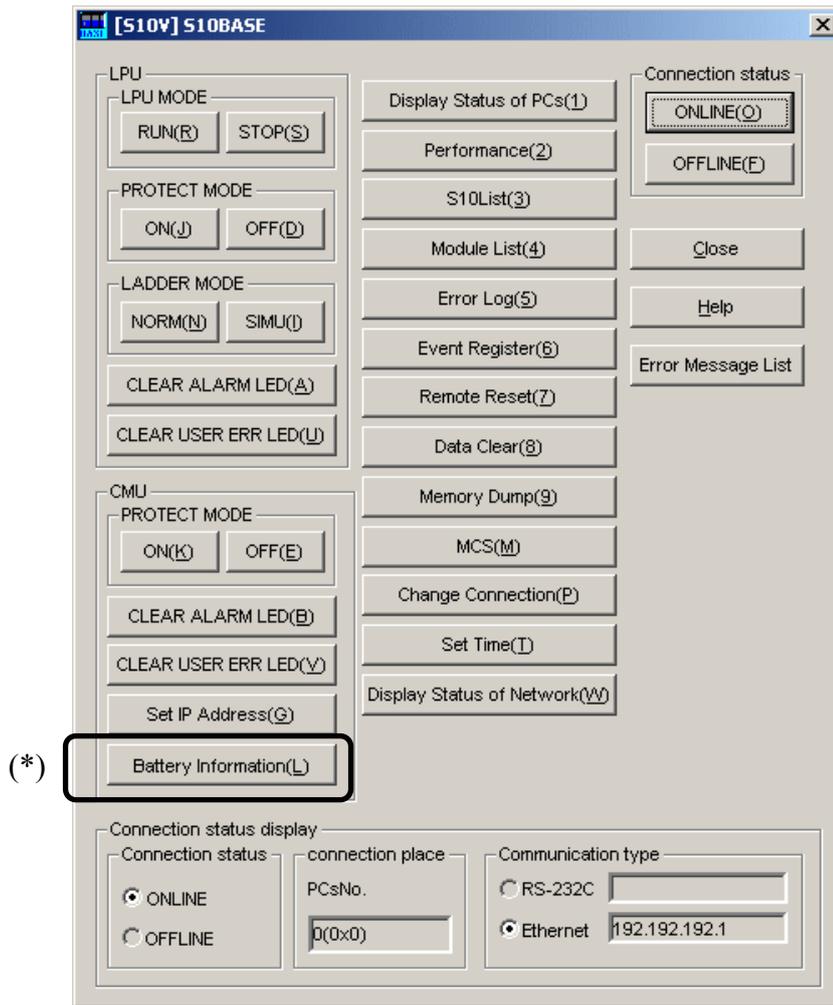
The ONLINE/OFFLINE setting function places the basic tool either into ONLINE state or OFFLINE state with the PCs. If you wish to connect the basic tool with the PCs, click the

button. If you wish to disconnect the basic tool from the PCs, click the button.

6.4.33 CMU battery information

The CMU battery information support function displays the [CMU battery information] window containing a guide for battery replacement of the battery-backed CMU module. The rest of this subsection shows how to use this function.

- (1) Launch the Base System and click the **Battery Information** button in the [[S10V] S10BASE] window displayed.

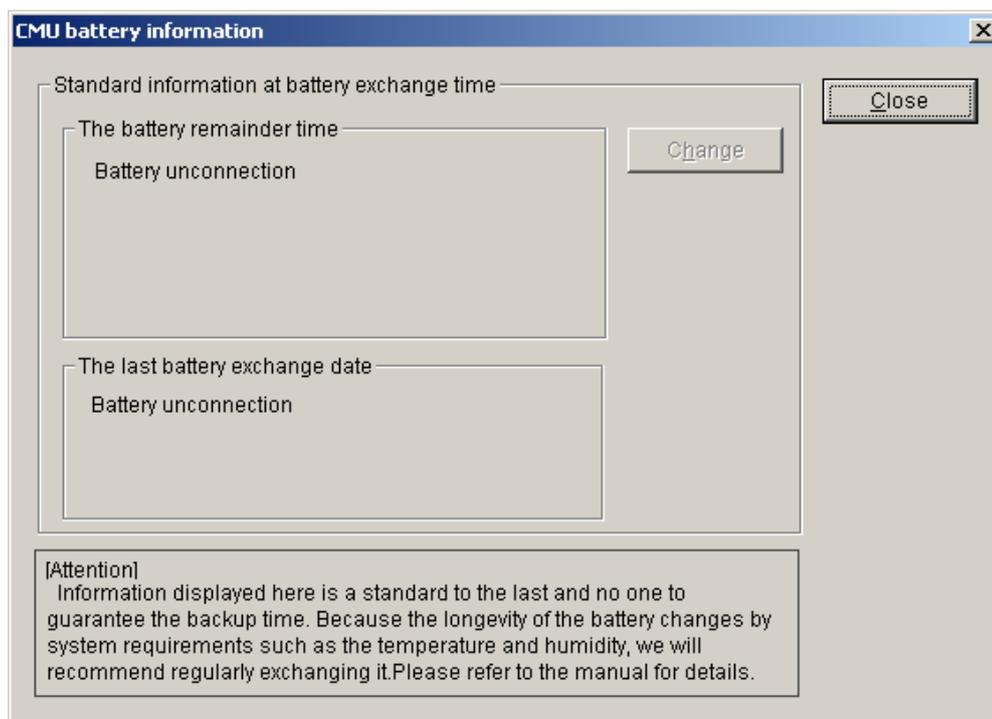


- (*) This function is usable only when the CMU module used is of model LQP525 and its battery use/non-use selection is set to “battery use” (by setting the BATT.SEL switch at the front of the module to “0”).

The battery’s remaining life displayed in the [CMU battery information] window is merely a rough estimate and does not guarantee the backup duration. The battery’s useful service life is affected by its operating environment (temperature, humidity, etc.). For this reason, the user is advised to replace the battery periodically.

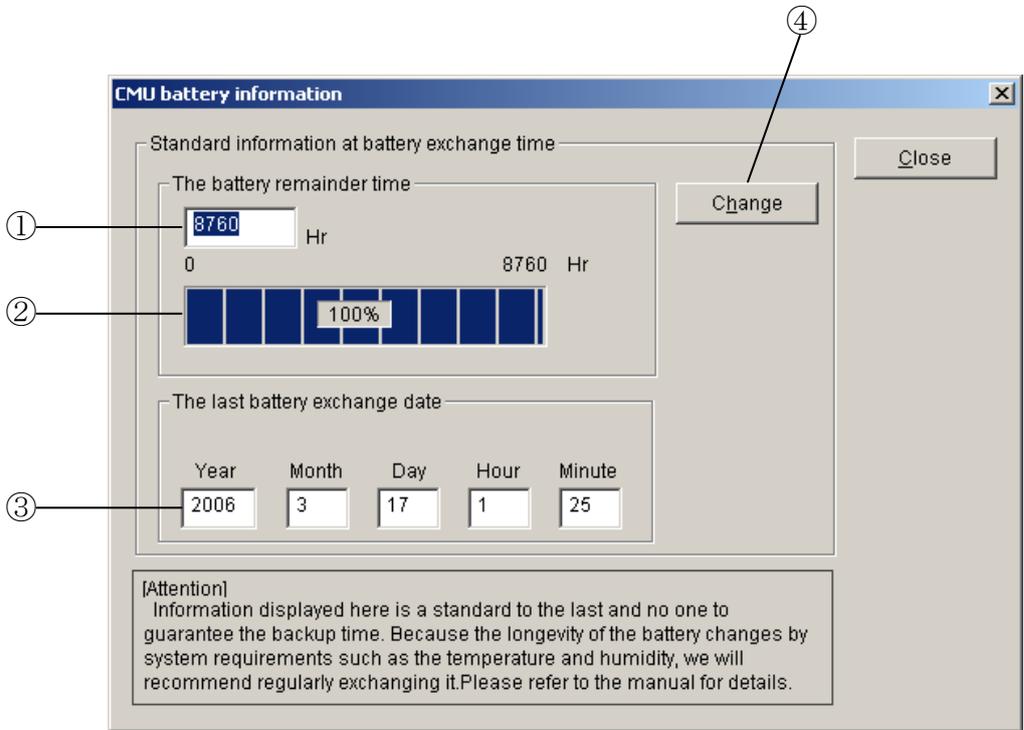
(2) One of the [CMU battery information] windows as shown below appears on screen.

<A case when the battery is not connected>



<A case when the battery is connected>

When the battery is connected to the CMU module, the [CMU battery information] window as shown below appears on screen. In this window, you can change the current indications of the battery’s remaining life and the last date when the battery was replaced.

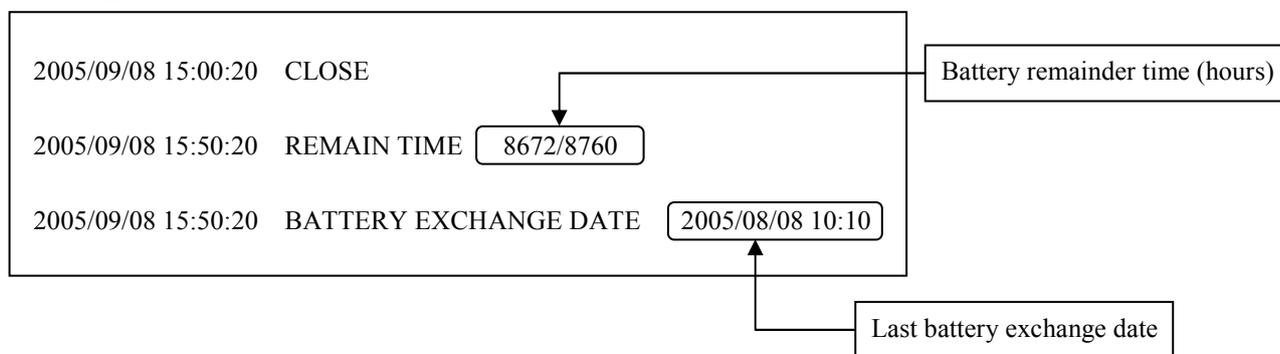


where:

- ① The battery remainder time:
Is the battery’s remaining life (see Note below). If the battery is not connected to the CMU module, the string “Battery unconnection” is displayed instead of the remaining life. If you need to replace the CMU module rather than its battery, be sure to take a note of the displayed remaining life before replacement. Then, after replacement, enter the noted remaining life in the “remainder time” input box and click the **Change** button ④ to set the entered value in the system. Then, push the CMU module’s BATT.SET switch to set the cumulative power-outage time retained in the CMU module to 0. This cumulative power-outage time is the elapsed duration of power outage that has been measured since the last time the BATT.SET switch was pushed.
- ② Battery remaining-capacity bar indicator:
Indicates the battery’s remaining capacity (hours) in percent (of its service life in hours). This indicator is not displayed when the battery is not connected to the CMU module.

- ③ The last battery exchange date:
Is the last date and time when the battery was replaced. This piece of information is read out from the CMU module and displayed on screen.
The date and time when the CMU module's BATT.SET switch is pushed is recorded in the CMU module's internal memory as the last battery exchange date. If the last date and time when the battery was replaced is not recorded in the CMU module's memory, the string "The exchange date is not set." is displayed in the "last battery exchange date" box.
If you have replaced the CMU module rather than its battery, enter the replacement date in the input boxes and then click the button ④ to update the old replacement date.
- ④ Change
The button is used when you are changing the "battery remainder time" and "last battery exchange date" to your desired values without using the CMU module's BATT.SET switch.
The "battery remainder time" (see Note) and "last battery exchange date" are both recorded in the CMU module. However, if you have replaced only the CMU module with a new one, this makes it impossible to calculate the battery's remaining life. Therefore, the remaining life needs to be set again by operating this button. Clicking the button records changes to the "battery remainder time" and "last battery exchange date" in the S10V Base System's operation history ('S10log.txt'), which is created in the folder in which the Base System is installed.

<S10log.txt>



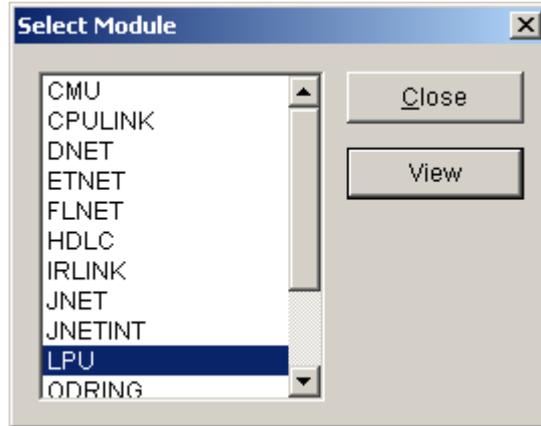
Note: The battery remainder time is calculated as follows:

Battery remainder time = battery's service life (365 [days] × 24 [hours]) - cumulative power-outage time

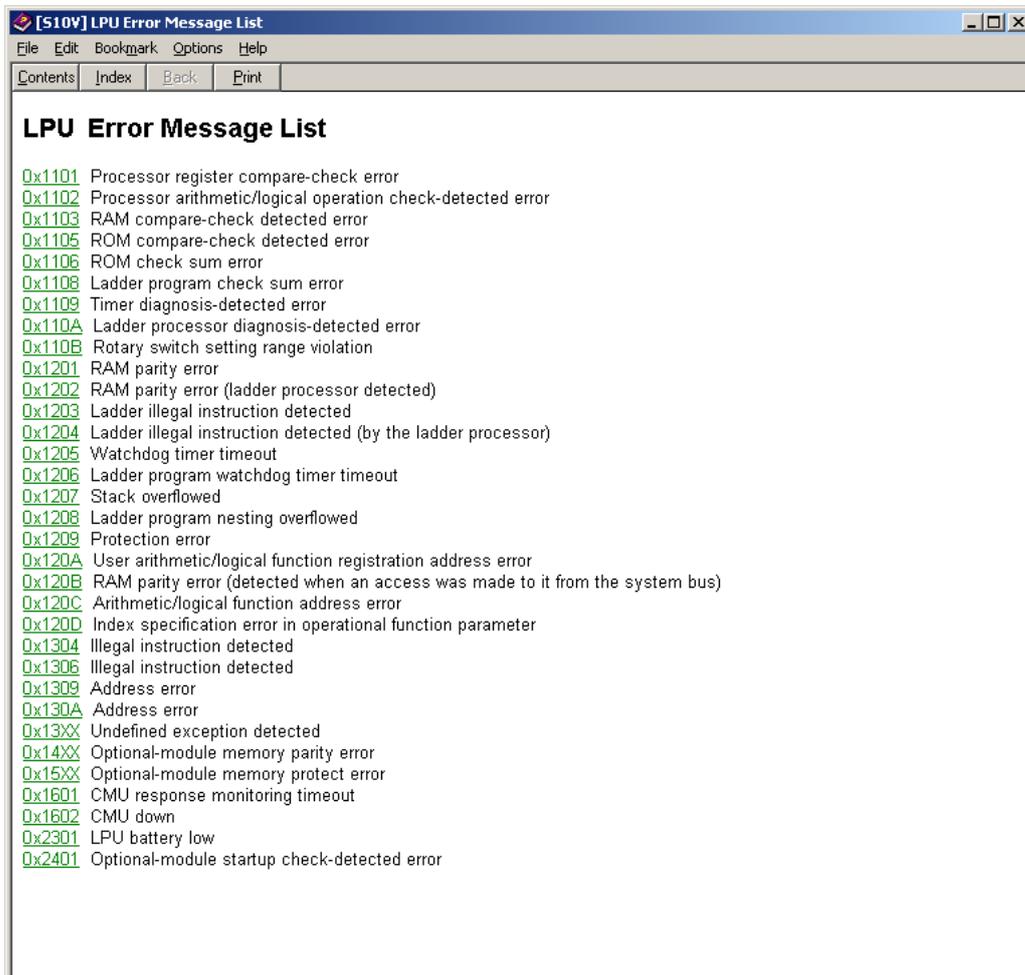
The above cumulative power-outage time is one that is retained in the CMU module's internal memory. This enables the tool to calculate the battery remainder time and displays the result on screen.

6.4.34 Error message listing

- (1) The error message listing function first displays the [Select Module] window. In this window, select the desired entry for which to display error descriptions, and then click the **View** button. The same result can be obtained by simply double-clicking the desired entry.



- (2) Error descriptions for the selected entry are displayed in an error message list, as shown below.



6.4.35 Operation history recording

The operation history recording function keeps a historical record of such operations as causing the transition of the LPU/CMU from one state to another. Up to 256 such operations can be recorded in the operation history, and any such operation exceeding the limit will be recorded cyclically in the history, with the oldest piece of information being overwritten with the new piece.

The updated operation history is automatically saved in a file when you exit the basic tool. The file used for this purpose is named “10log.txt” and is stored in the same folder as the executable file of the basic tool.

The following shows the format of the operation history file.

Date	Time	Operation
2002/01/01	12:00:00	ONLINE
2002/01/01	12:01:00	LPU RUN
2002/01/01	12:02:00	LPU PROT ON
2002/01/01	12:05:00	LPU STOP
	⋮	

Figure 6-5 Operation History File Format

■ Types of operations recorded

Table 6-10 lists all the types of operations that are recorded in the operation history when they cause a state transition of the LPU/CMU.

Table 6-10 Types of Operations Recorded

√: Recorded

nr: Not recorded

● Operation types presented in [[S10V] 10BASE] window

Button		Record	Displayed characters representing operation
LPU	LPU MODE	RUN	√ LPU RUN
		STOP	√ LPU STOP
	PROTECT MODE	ON	√ LPU PROT ON
		OFF	√ LPU PROT OFF
	LADDER MODE	NORM	√ LPU MODE NORM
		SIMU	√ LPU MODE SIMU
	CLEAR ALARM LED		√ LPU ALARM ERASE
CLEAR USER ERR LED		√ LPU USER ERR ERASE	
CMU	PROTECT MODE	ON	√ CMU PROT ON
		OFF	√ CMU PROT OFF
	CLEAR ALARM LED		√ CMU ALARM ERASE
	CLEAR USER ERR LED		√ CMU USER ERR ERASE
	Set IP Address		nr -
Display Status of PCs		nr -	
Performance		nr -	
S10List		nr -	
Module List		nr -	
Error Log		nr -	
Event Register		nr -	
Remote Reset		√ REMOTE RESET	
Data Clear		√ DATA CLEAR	
Memory Dump		nr -	
MCS		nr -	
Chang Connection		nr -	
Set Time		nr -	
Display Status of Network		nr -	
Connection status	ONLINE	√ ONLINE	
	OFFLINE	√ OFFLINE	
Close		√ CLOSE	

● Operation types presented in [Time of day] window

Button	Record	Displayed characters representing operation
OK	√	SET TIME YYYY/MM/DD HH:mm:SS (*1)
Cancel	nr	-

(*1) YYYY, MM, DD, HH, mm, and SS in the format YYYY/MM/DD HH:mm:SS are the year, month of the year, day of the month, hours, minutes, and seconds, respectively.

● Operation types recorded at startup and when the connected PCs is changed

Button	Record	Displayed characters representing operation
-	√	PCsNo. PPPP Port COM?, IP ADDRESS XX.XX.XX.XX (*2)

(*2) PPPP: PCs number; ?: Port number; XX.XX.XX.XX: IP address.

7 SETTINGS

7.1 Overview of the PI/O and RI/O Settings

The LPU and I/O units require the following PI/O and RI/O settings.

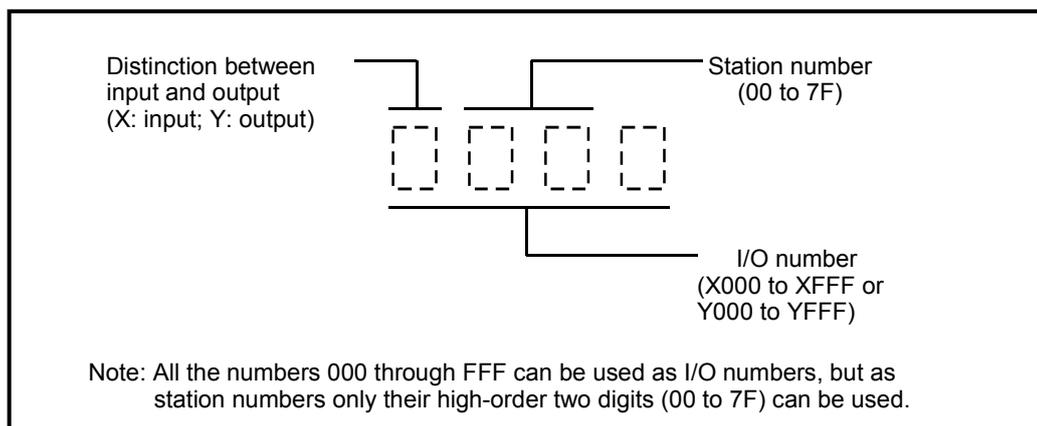
Table 7-1 Required PI/O and RI/O Settings

Unit name	Setup item	Description
LPU unit	PI/O-used-or-not setting	If an I/O module(s) are mounted on the mount base, provide a setting to indicate that PI/O is to be used, from the tool system. This setting will assign the station number "00" to the LPU unit.
	Partition setting	This item can be set from the tool system and is usually set to "FREE." If all the I/O units connected in a series by remote I/O cable wiring contain a total of more than 2048 I/O points in the I/O modules mounted in them, set this item to "FIX". With this setting, you can use a total of up to 2048 I/O points for input or output. <ul style="list-style-type: none"> ● If this item is set to "FREE", each I/O slot on the LPU mount base can be used for both input and output, and is assigned two sets of I/O numbers in the form X△△△ or Y△△△, one for input and one for output. A set of I/O numbers can be selected so that it will match each mounted I/O module. In addition, installed I/O modules can be easily replaced with a new one because the slots in which they are mounted can be used for both input and output. ● If this item is set to "FIX", the left half of the I/O slots provided on the LPU mount base can be used only for input modules and the right half, only for output modules. A set of I/O numbers of the form X△△△ is assigned to each input slot, and a set of I/O numbers of the form Y△△△, to each output slot.
	I/O point count setting	This item can be set from the tool system. Set this item to a count of the number of I/O points exclusively used for each slot provided on the LPU mount base. If two or more I/O modules with different I/O point counts are mounted on the same mount base, set this item to the larger or largest count among the I/O modules'.
	Digital output hold setting	This item can be set from the tool system. Depending on its set value, this item causes each digital output (DO) module mounted on the LPU mount base to enter a RESET or HOLD state when an abnormality occurs in the LPU module. If this item is set to "RESET", the digital output will be switched off at such a moment. If it is set to "HOLD", the value output right before the occurrence of such an abnormality will be retained.
I/O unit	Station number setting	This item can be set with one of the rotary switches provided on a remote I/O station module. Set this item to the high-order two digits of the I/O numbers to be assigned to the I/O module mounted in slot 0 on the I/O mount base on which that remote I/O station module is mounted. In reference to the set value of this item, a set of I/O numbers will be automatically assigned to each mounted I/O module in the remote I/O station unit, according to the partition and I/O point count settings provided and to the number of slots provided on the mount base. A set of I/O numbers will also be assigned to any empty slot on the mount base.
	Partition setting	This item can be set by wiring to the terminal block of a remote I/O station module. The effects of setting this item are the same as those of the partition setting for an LPU unit described above, except that the effects are on the modules mounted on the I/O mount base.
	I/O point count setting	This item can be set by wiring to the terminal block of a remote I/O station module. Set this item to a count of the number of I/O points exclusively used for each slot provided on the I/O mount base. If two or more I/O modules with different I/O point counts are mounted on the same mount base, set this item to the larger or largest count among the I/O modules'.
	Digital output hold setting	This item can be set by wiring to the terminal block of a remote I/O station module. Depending on its set value, this item causes each digital output (DO) module mounted on the I/O mount base to enter a RESET or HOLD state when an abnormality occurs in the remote I/O line. If this item is set to "RESET", the digital output will be switched off at such a moment. If it is set to "HOLD", the value output right before the occurrence of such an abnormality will be retained.

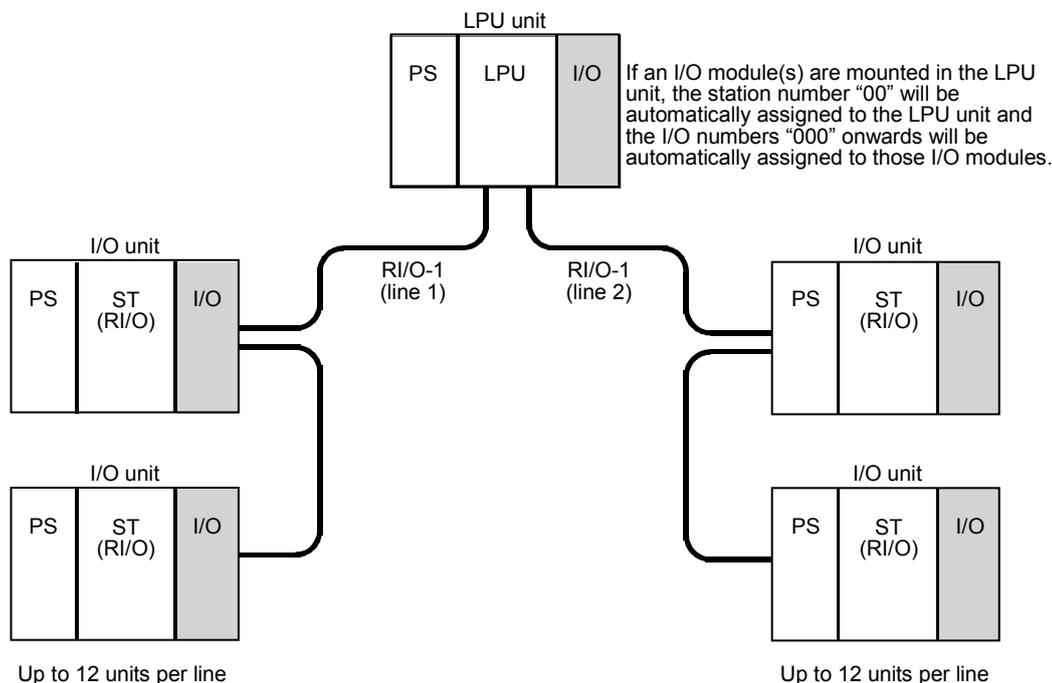
7.2 Composition of Assigned I/O Numbers and Their Range

Every I/O number consists of four characters. The function of each of these characters is illustrated below.

■ Composition



■ Range



Number of I/O slots on I/O unit mount base	Station numbers that can be set	
	RI/O-1 (Note)	RI/O-2
2	00 to 3E	40 to 7E
4	00 to 3C	40 to 7C
8	00 to 38	40 to 78

Note: If an I/O module(s) are mounted in the LPU unit, the station number "00" will be automatically assigned to the LPU unit. Keeping this in mind, care should be taken so as not to set any duplicate station numbers for the I/O units connected to RI/O-1 (line 1).

7 SETTINGS

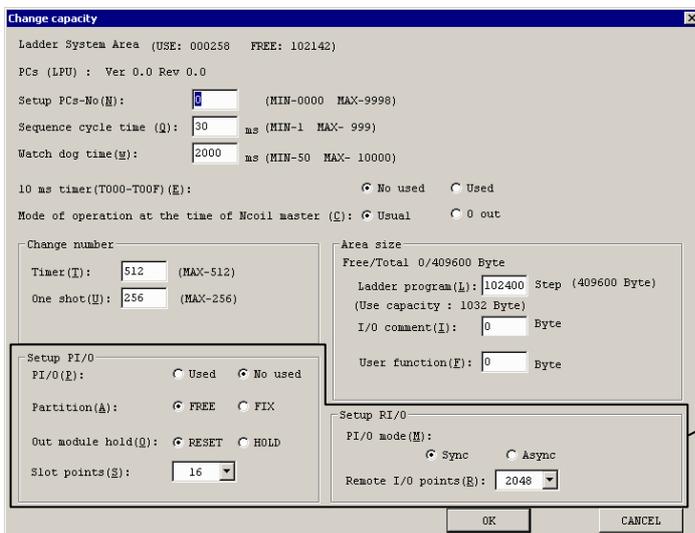
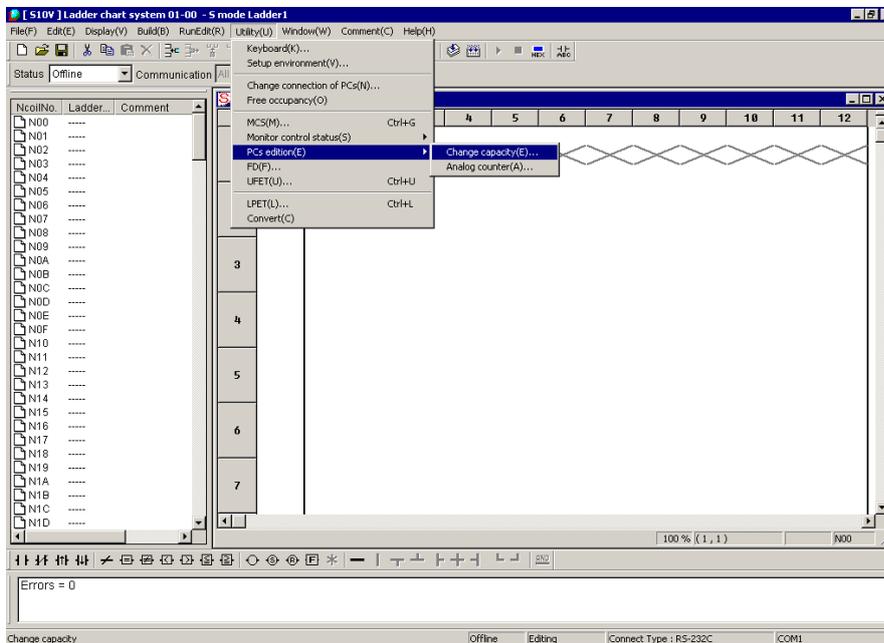
7.3 PI/O and RI/O Settings

This section explains how to set all necessary PI/O- and RI/O-related items for LPU modules and remote I/O station modules.

■ Setting PI/O- and RI/O-related items for LPU module

The PI/O- and RI/O-related items for an LPU module can be set with the tool system. For information on how to connect the tool system to the LPU unit and start up the system, see “6 TOOLS.”

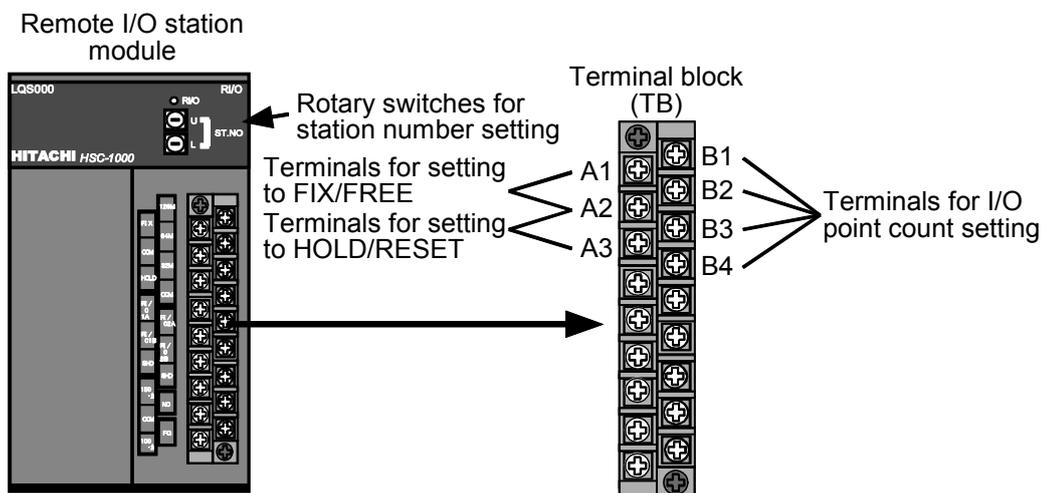
By selection from among the tools, initiate the ladder chart system. The [Ladder chart system] window as shown below appears. To set the PI/O- and RI/O-related items, choose [Utility] – [PCs edition] – [Change capacity.]



Set the PI/O- and RI/O-related items through the “Setup PI/O” and “Setup RI/O” boxes.

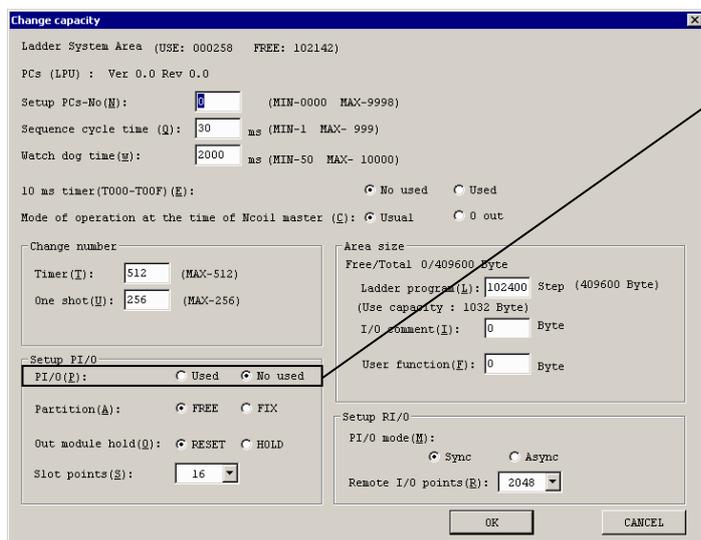
■ Setting I/O numbers for a remote I/O station module

A set of I/O numbers can be set for a remote I/O station module by operating the rotary switches provided on the front panel of that module and wiring to the terminal block (TB) provided on the same front panel.



7.3.1 PI/O-used-or-not setting

After you have mounted an I/O module(s) in an LPU unit, open the [Change capacity] window on the tool system and choose “PI/O (P)” “Used” or “No used” in the “Setup PI/O” box.



Choose “PI/O (P)” “Used” or “No used.”

Setup item	PI/O-used-or-not setting	
	No used	Used
Station number	Not assigned	00
I/O numbers	Not assigned	000 to XXX

The largest I/O number “XXX” assigned depends on the partition and I/O point count settings given and the number of I/O slots provided on the mount base.

When a selection is made between “PI/O (P)” “Used” or “No used,” a station number and I/O numbers will be automatically assigned to the LPU unit:

- As the station number, the value “00” is assigned.
- I/O numbers are automatically assigned in the appropriate range that is determined from the number of slots provided on the mount base, and partition and I/O point count settings given.

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7.3.2 Partition setting (FIX/FREE)

This item is usually set to “FREE”. If all the I/O units connected in a series by a remote I/O cable wiring contain a total of more than 2048 I/O points in the I/O modules mounted in them, set this item to “FIX”. With this setting, you can use a total of up to 2048 I/O points for input and a total of up to 2048 I/O points for output.

- If this item is set to “FREE”, each I/O slot on the LPU or I/O mount base can be used for both input and output, and is assigned two sets of I/O numbers in the form X△△△ or Y△△△, one (X△△△) for input and one (Y△△△) for output. A set of I/O numbers can be selected so that it will match each mounted I/O module.
- If this item is set to “FIX”, the left half of the I/O slots provided on the LPU or I/O mount base can be used only for input modules and the right half, only for output modules. A set of I/O numbers of the form X△△△ is assigned to each input slot, and a set of I/O numbers of the form Y△△△, to each output slot.

■ Partition setting for LPU unit

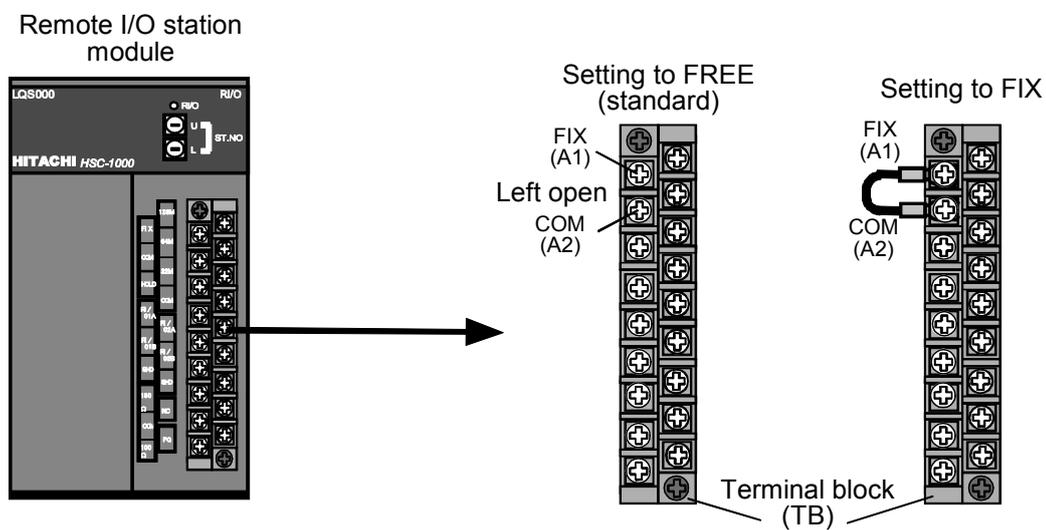
On the tool system, open the [Capacity change] window as shown below. Choose between “FREE” and “FIX” for the “Partition” in the “Setup PI/O” box.

The screenshot shows the 'Change capacity' dialog box with the following details:

- Ladder System Area** (USE: 000258 FREE: 102142)
- PCs (LPU) : Ver 0.0 Rev 0.0
- Setup PCs-No(N): 0 (MIN-0000 MAX-9998)
- Sequence cycle time (Q): 30 ms (MIN-1 MAX- 999)
- Watch dog time(w): 2000 ms (MIN-50 MAX- 10000)
- 10 ms timer(T000-T00F) (E): No used Used
- Mode of operation at the time of Ncoil master (E): Usual 0 out
- Change number**
 - Timer (T): 512 (MAX-512)
 - One shot (U): 256 (MAX-256)
- Area size**
 - Free/Total 0/409600 Byte
 - Ladder program (L): 102400 Step (409600 Byte)
 - (Use capacity : 1032 Byte)
 - I/O comment (I): 0 Byte
 - User function (F): 0 Byte
- Setup PI/O**
 - PI/O (E): Used No used
 - Partition (A):** FREE FIX
 - Out module hold (Q): RESET HOLD
 - Slot points (S): 16
- Setup RI/O**
 - PI/O mode (H): Sync Async
 - Remote I/O points (R): 2048

■ Partition setting for I/O unit

On the terminal block of a remote I/O station module, short-circuit the two terminals FIX (A1) and COM (A2) or leave them open.



■ Differences between set values FIX and FREE

Table 7-2 Differences between Set Values FIX and FREE

Setup item	FREE	FIX
<p>I/O module-mounting slots</p>	<p>If no I/O module(s) are mounted in the LPU unit, X□□□ and Y□□□ are X000 and Y000.</p>	<p>If no I/O module(s) are mounted in the LPU unit, X□□□ and Y□□□ are X000 and Y000.</p>
<p>I/O number assignment</p>	<p>Both the I/O numbers for input:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>X000 to X△△△ (for LPU unit) X□□□ to X○○○ (for I/O unit)</p> </div> <p>and the I/O numbers for output:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>Y000 to Y△△△ (for LPU unit) Y□□□ to Y○○○ (for I/O unit)</p> </div> <p>are assigned.</p>	<p>The I/O numbers for input:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>X000 to X△△△ (for LPU unit) X□□□ to X○○○ (for I/O unit)</p> </div> <p>are assigned to the left half of the I/O module slots, and the I/O numbers for output:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>Y000 to Y△△△ (for LPU unit) Y□□□ to Y○○○ (for I/O unit)</p> </div> <p>are assigned to the right half.</p>
<p>Characteristics</p>	<ul style="list-style-type: none"> • Input or output modules can be mounted in any of the I/O module slots. • The I/O numbers assigned to mounted input modules can be exchanged with those assigned to mounted output modules. 	<ul style="list-style-type: none"> • There is a restriction imposed on the use of slots for input modules and output modules to be mounted.

7.3.3 I/O point count setting

Set I/O point counts for mounted I/O modules or for I/O modules to be mounted as an extension. If two or more I/O modules with different I/O point counts are mounted or to be mounted on the same mount base, set this item to the larger or largest count value among the I/O modules'. For example, if two modules are mounted, one with 16 points and the other with 32 points, then set the I/O point count to 32. In this case, although as many I/O numbers as the specified 32 points are assigned to each of the modules, only the starting 16 I/O numbers assigned are used on the 16-point module, the last 16 I/O numbers assigned being left idle. In contrast, if the I/O point count is set to 16 instead, only as many I/O numbers as the specified 16 points are assigned to the starting 16 points of the 32-point module.

■ I/O point count setting for LPU unit

On the tool system, open the [Change capacity] window as shown below. Choose one of the values 16, 32, 64, and 128 for the “Slot points” in the “Setup PI/O” box.

The screenshot shows the 'Change capacity' dialog box with the following fields and options:

- Ladder System Area (USE: 000258 FREE: 102142)
- PCs (LPU) : Ver 0.0 Rev 0.0
- Setup PCs-No(N): (MIN-0000 MAX-9998)
- Sequence cycle time (Q): ms (MIN-1 MAX- 999)
- Watch dog time(W): ms (MIN-50 MAX- 10000)
- 10 ms timer(T000-T00F) (E): No used Used
- Mode of operation at the time of No coil master (E): Usual 0 out
- Change number:
 - Timer (I): (MAX-512)
 - One shot (U): (MAX-256)
- Area size:
 - Free/Total 0/409600 Byte
 - Ladder program (L): Step (409600 Byte)
 - (Use capacity : 1032 Byte)
 - I/O comment (I): Byte
 - User function (E): Byte
- Setup PI/O:
 - PI/O (E): Used No used
 - Partition (A): FREE FIX
 - Out module hold (Q): RESET HOLD
 - Slot points (S):
- Setup RI/O:
 - PI/O mode (H): Sync Async
 - Remote I/O points (R):

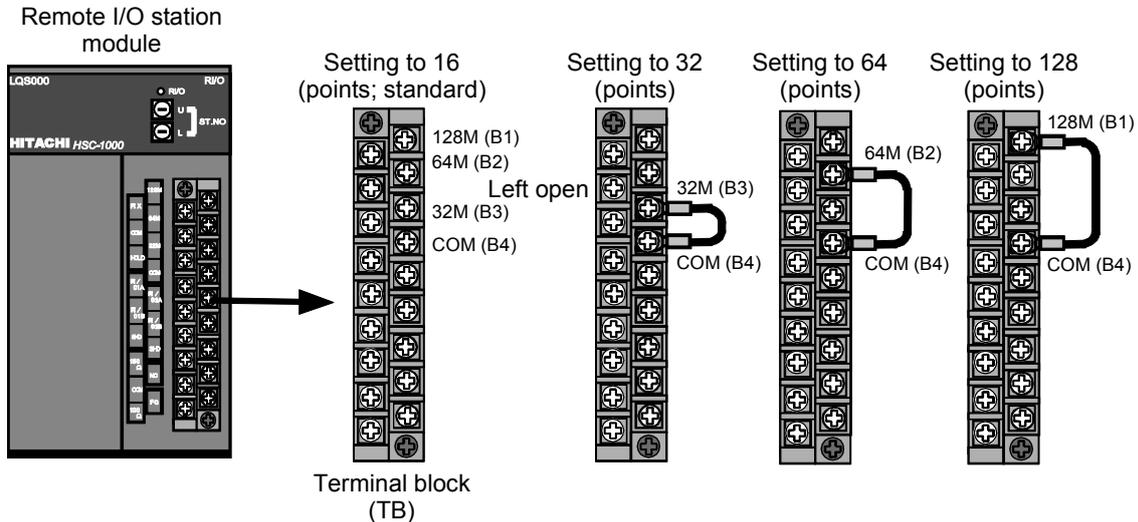
Buttons: OK, CANCEL

Choose one from among
16, 32, 64, and 128.

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■ I/O point count setting for I/O unit

On the terminal block of a remote I/O station module, short-circuit one of the three pairs of terminals 32M (B3) and COM (B4), 64M (B2) and COM, 128M (B1) and COM, or leave them open.



■ I/O point counts and I/O numbers

- The starting two digits of each I/O number, as well as the range of I/O numbers assigned, are determined from the following settings:
 Starting two digits: Determined from the station number setting provided.
 Range: Automatically assigned according to the number of I/O slots provided on the mount base, and I/O point count and partition settings provided.
- I/O numbers are assigned to all the slots provided, regardless of whether any slot among them is empty. These assigned I/O numbers will not change even if an additional module is mounted in an empty slot or an occupied slot is made empty by removing the mounted module from it.
- The I/O number assigned to each input or output point is determined from the partition setting (FREE or FIX) provided and has the following value:
 - With FREE: Both I/O numbers for input (X△△△) and I/O numbers for output (Y△△△) are assigned, so that an appropriate set of I/O numbers (X△△△ or Y△△△) matching the I/O module mounted can be selected from among the sets (see Table 7-3).
 - With FIX: Since the I/O slots provided are divided into two groups, one for input modules and the other for output modules, an appropriate set of I/O numbers matching each slot for input or output (X△△△ for input or Y△△△ for output) is assigned to the module mounted in that slot (see Table 7-4).

Table 7-3 I/O Number Assignment and I/O Point Usage When the Starting I/O Number is 000 and the Partition Setting Provided is FREE

Slot number	I/O unit		LPU unit or I/O unit			
	2 slots		4 slots		8 slots	
	I/O number	I/O points used	I/O number	I/O points used	I/O number	I/O points used
I/O point count setting	16 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 00F</div> <div style="border: 1px solid black; padding: 2px;">1 010 to 01F</div> </div> 32 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 00F</div> <div style="border: 1px solid black; padding: 2px;">1 010 to 01F</div> <div style="border: 1px solid black; padding: 2px;">2 020 to 02F</div> <div style="border: 1px solid black; padding: 2px;">3 030 to 03F</div> </div> 64 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 00F</div> <div style="border: 1px solid black; padding: 2px;">1 010 to 01F</div> <div style="border: 1px solid black; padding: 2px;">2 020 to 02F</div> <div style="border: 1px solid black; padding: 2px;">3 030 to 03F</div> <div style="border: 1px solid black; padding: 2px;">4 040 to 04F</div> <div style="border: 1px solid black; padding: 2px;">5 050 to 05F</div> <div style="border: 1px solid black; padding: 2px;">6 060 to 06F</div> <div style="border: 1px solid black; padding: 2px;">7 070 to 07F</div> </div> 128 points		
	32 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 01F</div> <div style="border: 1px solid black; padding: 2px;">1 020 to 03F</div> </div> 64 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 01F</div> <div style="border: 1px solid black; padding: 2px;">1 020 to 03F</div> <div style="border: 1px solid black; padding: 2px;">2 040 to 05F</div> <div style="border: 1px solid black; padding: 2px;">3 060 to 07F</div> </div> 128 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 00F</div> <div style="border: 1px solid black; padding: 2px;">1 020 to 03F</div> <div style="border: 1px solid black; padding: 2px;">2 040 to 05F</div> <div style="border: 1px solid black; padding: 2px;">3 060 to 07F</div> <div style="border: 1px solid black; padding: 2px;">4 080 to 09F</div> <div style="border: 1px solid black; padding: 2px;">5 0A0 to 0BF</div> <div style="border: 1px solid black; padding: 2px;">6 0C0 to 0DF</div> <div style="border: 1px solid black; padding: 2px;">7 0E0 to 0FF</div> </div> 256 points		
	64 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 03F</div> <div style="border: 1px solid black; padding: 2px;">1 040 to 07F</div> </div> 128 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 03F</div> <div style="border: 1px solid black; padding: 2px;">1 040 to 07F</div> <div style="border: 1px solid black; padding: 2px;">2 080 to 0BF</div> <div style="border: 1px solid black; padding: 2px;">3 0C0 to 0FF</div> </div> 256 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 03F</div> <div style="border: 1px solid black; padding: 2px;">1 040 to 07F</div> <div style="border: 1px solid black; padding: 2px;">2 080 to 0BF</div> <div style="border: 1px solid black; padding: 2px;">3 0C0 to 0FF</div> <div style="border: 1px solid black; padding: 2px;">4 100 to 13F</div> <div style="border: 1px solid black; padding: 2px;">5 140 to 17F</div> <div style="border: 1px solid black; padding: 2px;">6 180 to 1BF</div> <div style="border: 1px solid black; padding: 2px;">7 1C0 to 1FF</div> </div> 512 points		
	128 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 07F</div> <div style="border: 1px solid black; padding: 2px;">1 080 to 0FF</div> </div> 256 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 07F</div> <div style="border: 1px solid black; padding: 2px;">1 080 to 0FF</div> <div style="border: 1px solid black; padding: 2px;">2 100 to 17F</div> <div style="border: 1px solid black; padding: 2px;">3 180 to 1FF</div> </div> 512 points	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">0 000 to 07F</div> <div style="border: 1px solid black; padding: 2px;">1 080 to 0FF</div> <div style="border: 1px solid black; padding: 2px;">2 100 to 17F</div> <div style="border: 1px solid black; padding: 2px;">3 180 to 1FF</div> <div style="border: 1px solid black; padding: 2px;">4 200 to 27F</div> <div style="border: 1px solid black; padding: 2px;">5 280 to 2FF</div> <div style="border: 1px solid black; padding: 2px;">6 300 to 37F</div> <div style="border: 1px solid black; padding: 2px;">7 380 to 3FF</div> </div> 1024 points		

Note: Although both a set of I/O numbers for input (X△△△) and a set of I/O numbers for output (Y△△△) are assigned to the module mounted in each slot, the letters “X” and “Y” are omitted from each I/O number shown above and only the number △△△ is shown. For example, a number in the range 000 to 00F stands for an I/O number in the range X000 to X00F or Y000 to Y00F.

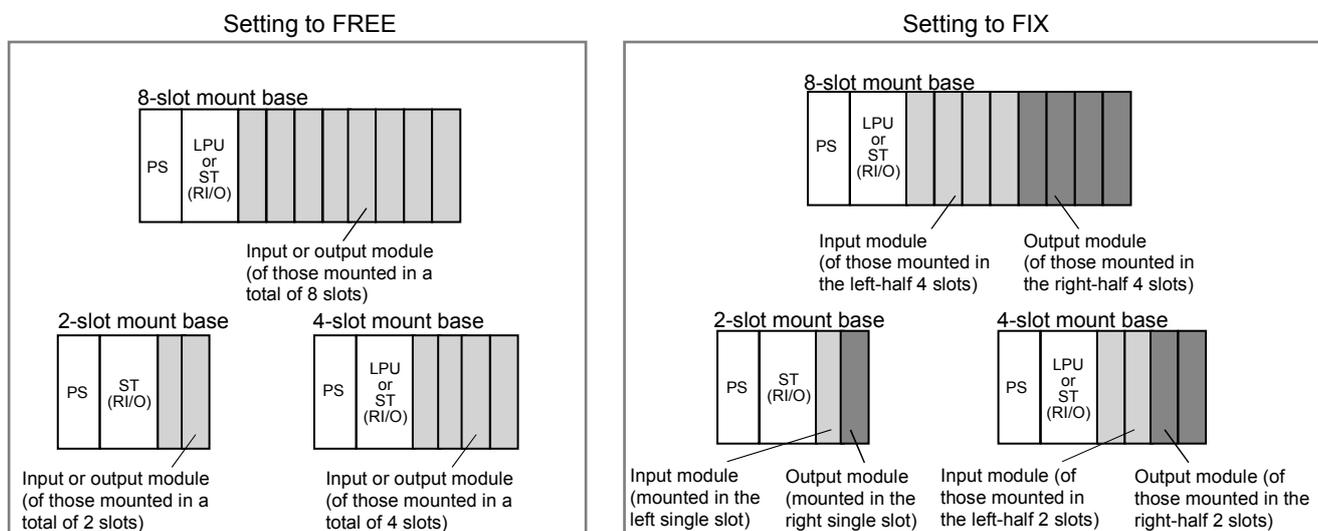
7 SETTINGS

Table 7-4 I/O Number Assignment and I/O Point Usage When the Starting I/O Number is 000 and the Partition Setting Provided is FIX

Slot number	I/O unit		LPU unit or I/O unit					
	2 slots		4 slots		8 slots			
	I/O number	I/O points used	I/O number	I/O points used	I/O number			
I/O point count setting	16 points	X000 to X00F Y000 to Y00F	32 points	X000 to X00F X010 to X01F Y000 to Y00F Y010 to Y01F	64 points	X000 to X00F X010 to X01F X020 to X02F X030 to X03F Y000 to Y00F Y010 to Y01F Y020 to Y02F Y030 to Y03F	128 points	
	32 points	X000 to X01F Y000 to Y01F	64 points	X000 to X01F X020 to X03F Y000 to Y01F Y020 to Y03F	128 points	X000 to X01F X020 to X03F X040 to X05F X060 to X07F Y000 to Y01F Y020 to Y03F Y040 to Y05F Y060 to Y07F	256 points	
	64 points	X000 to X03F Y000 to Y03F	128 points	X000 to X03F X040 to X07F Y000 to Y03F Y040 to Y07F	256 points	X000 to X03F X040 to X07F X080 to X0BF X0C0 to X0FF Y000 to Y03F Y040 to Y07F Y080 to Y0BF Y0C0 to Y0FF	512 points	
	128 points	X000 to X07F Y000 to Y07F	256 points	X000 to X07F X080 to X0FF Y000 to Y07F Y080 to Y0FF	512 points	X000 to X07F X080 to X0FF X100 to X17F X180 to X1FF Y000 to Y07F Y080 to Y0FF Y100 to Y17F Y180 to Y1FF	1024 points	

Each dashed line above indicates the boundary between input and output established by the partition setting provided. The I/O numbers listed for each I/O point count setting are divided into two groups, those (preceded by X) assigned to the input modules mounted in the first half of the slots and those (preceded by Y) assigned to the output modules mounted in the last half.

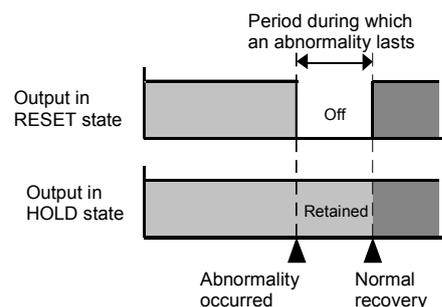
■ I/O module-mounting slots



7.3.4 Digital output hold setting

Depending on its set value, this item causes the digital output (DO) modules mounted in the LPU unit and its connected I/O unit(s) to enter a RESET or HOLD state when an abnormality, such as a ladder operation unable to proceed, occurs in the LPU module, or when an abnormality, such as a remote I/O line disconnection, occurs in the I/O units. If this item is set to “RESET”, the digital output will be switched off at such a moment. If it is set to “HOLD”, the value output right before the occurrence of such an abnormality will be retained.

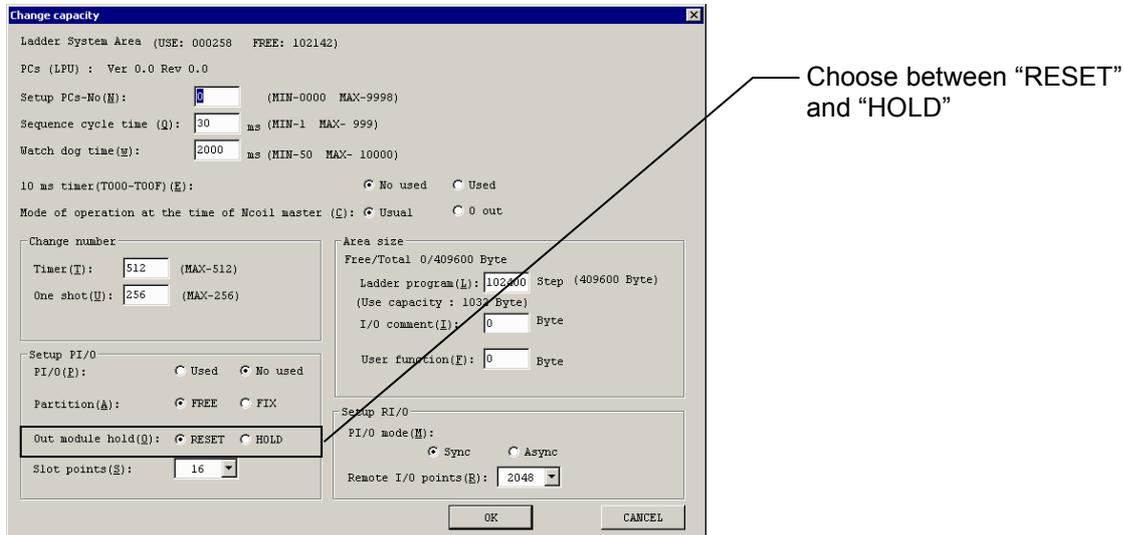
Note: The digital output hold setting has effect only on digital output (DO) modules; it has no effect on analog output (AO) modules, which always perform output hold operations when such an abnormality occurs.



7 SETTINGS

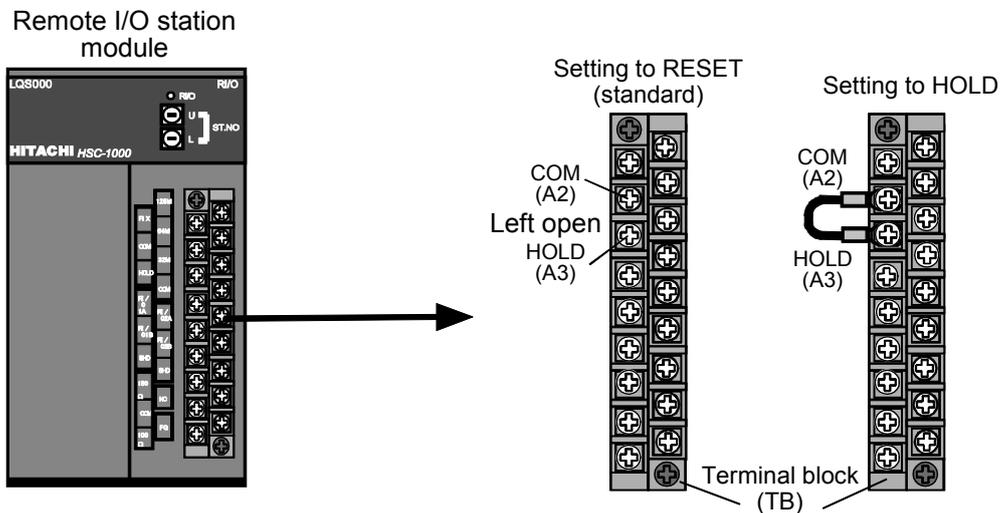
■ Digital output hold setting for LPU unit

On the tool system, open the [Change capacity] window as shown below. Choose between “RESET” and “HOLD” for the “Out module hold” in the “Setup PI/O” box.



■ Digital output hold setting for I/O unit

On the terminal block of a remote I/O station module, short-circuit the two terminals HOLD (A3) and COM (A2) or leave them open.



7.3.5 Station number setting

The station number of an I/O unit can be defined by setting the high-order two digits of the first I/O number to be assigned to that I/O unit, by operating the rotary switches provided on the remote I/O station module mounted in that I/O unit. When you are setting a station number, observe the following rules:

- Do not set any duplicate station number. If an I/O module(s) are mounted in the LPU unit, and a “PI/O-used-or-not” setting is provided as explained earlier, then the start station number “00” is automatically assigned to the LPU unit. In this case, as the I/O numbers to be assigned to the LPU unit, the numbers “000” onwards are assigned to the modules mounted in the four or eight slots. None of these I/O numbers should be used for any connected I/O unit. If more than one I/O unit is connected to the LPU unit, none of the I/O numbers to be assigned to the I/O units should be duplicated between those I/O units.
- Station numbers may be assigned in any order to the I/O units connected to the LPU unit; they need not be assigned in the order in which they are connected by cable wiring.
- For the I/O units connected in a series to the LPU unit via RI/O-1 (line 1), set station numbers in the range 00 to 3E for the 2-slot mount base, 00 to 3C for the 4-slot mount base, or 00 to 38 for the 8-slot mount base. For the I/O units connected in a series to the LPU unit via RI/O-2 (line 2), set station numbers in the range 40 to 7E for the 2-slot mount base, 40 to 7C for the 4-slot mount base, or 40 to 78 for the 8-slot mount base.

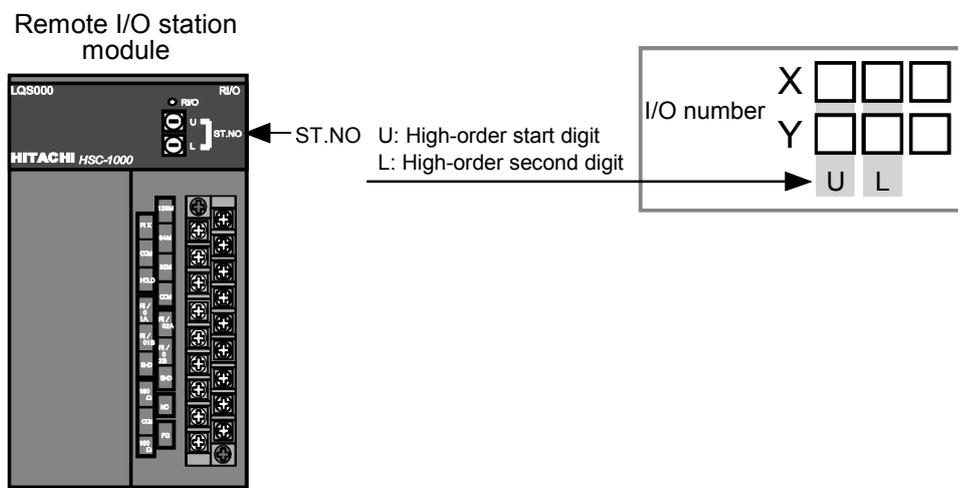


Table 7-5 Station Number Settings

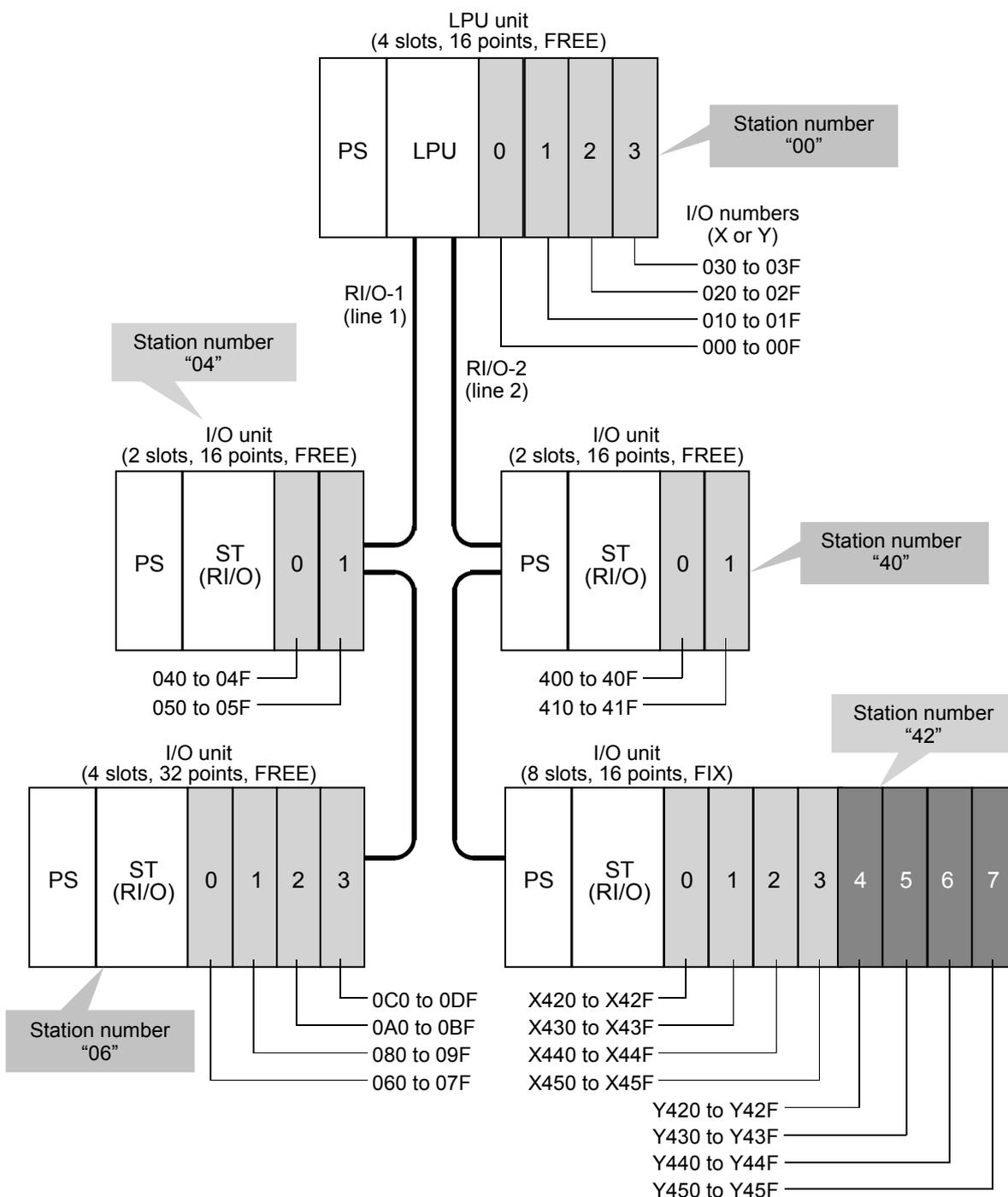
Line	ST.NO setting		Starting I/O No. assigned	Remarks
	U	L		
RI/O-1 (Note)	0	0	000	
	0	1	010	
	0	2	020	
	∅	∅	∅	
	3	8	380	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 8-slot mount base.
	3	C	3C0	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 4-slot mount base.
	3	E	3E0	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 2-slot mount base.
RI/O-2	4	0	400	
	4	1	410	
	4	2	420	
	∅	∅	∅	
	7	8	780	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 8-slot mount base.
	7	C	7C0	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 4-slot mount base.
	7	E	7E0	The last starting-I/O-number that can be assigned to enable use of all the slots provided on the 2-slot mount base.

Note: If an I/O module(s) are mounted in the LPU unit, the I/O numbers “000” onwards are automatically assigned to the LPU unit. In such a case, care should be taken so as not to assign any I/O numbers identical to the automatically assigned I/O numbers to the connected I/O unit(s). For example, if the LPU unit is provided with eight slots, 128 points, and the set value FREE, then it is assigned the I/O numbers 000 through 3FF, in which case no I/O units can be connected to RI/O-1 (line 1).

■ Example of an I/O-numbers setup

In the example shown below, one LPU unit and four I/O units located at distributed sites are assigned station numbers and I/O numbers.

Note: In a network as shown, a communication timeout would occur with every non-assigned I/O number in the range 0E0 to 3FF or 460 to 7FF. The remote I/O feature tries to perform data transfers with stations, regardless whether the station is hooked up to the line used and, if no response is returned from an existing I/O number, generates a timeout. Information on these timeouts is stored in the trace area, provided that no timeout communication is made to the S-register. Such a timeout communication is made only when three successive attempts to transfer data with the same assigned I/O number have been timed out.



7 SETTINGS

7.3.6 Remote I/O point count setting

The remote I/O feature can handle up to 2048 data points for input and up to 2048 data points for output. However, if the number of data points actually used for input or output is much smaller than 2048, scanning of all the 2048 points every time a communication is to be made would make the required communication time unnecessarily long. In addition, since any non-assigned I/O numbers causing a timeout require additional time for detecting the timeout, the total communication time would become much longer. To alleviate this disadvantage, the remote I/O capabilities of the LPU module allow you to specify the number of required remote I/O points by selecting a closest possible number from among the preset values. With this feature, you can reduce the otherwise unnecessarily long communication time required to a minimum and thereby improve the overall operational efficiency.

■ Remote I/O point count setting

On the tool system, open the [Change capacity] window as shown below. Choose one of the values 64, 128, 256, 512, 1024, and 2048 for the “Remote I/O points” in the “Setup RI/O” box.

The screenshot shows the 'Change capacity' dialog box with the following settings:

- Ladder System Area (USE: 000258 FREE: 102142)
- PCs (LPU) : Ver 0.0 Rev 0.0
- Setup PCs-No (N): 0 (MIN-0000 MAX-9998)
- Sequence cycle time (Q): 30 ms (MIN-1 MAX- 999)
- Watch dog time (W): 2000 ms (MIN-50 MAX- 10000)
- 10 ms timer (T000-T00F) (E): No used Used
- Mode of operation at the time of Ncoil master (E): Usual 0 out
- Change number:
 - Timer (T): 512 (MAX-512)
 - One shot (U): 256 (MAX-256)
- Area size:
 - Free/Total 0/409600 Byte
 - Ladder program (L): 102400 Step (409600 Byte)
 - (Use capacity : 1032 Byte)
 - I/O comment (I): 0 Byte
 - User function (F): 0 Byte
- Setup PI/O:
 - PI/O (E): Used No used
 - Partition (A): FREE FIX
 - Out module hold (Q): RESET HOLD
 - Slot points (S): 16
- Setup RI/O:
 - PI/O mode (H): Sync Async
 - Remote I/O points (E): 2048

Note: When a set of I/O units connected in a series is also wired to RI/O-2 (line 2), be sure to select the value 2048. In this case, the set value in the range 64 to 1024 has effect only on RI/O-1 (line 1).

Table 7-6 Estimates of the Communication Time Required for One Complete Scan

Remote I/O point count	Communication time estimate	Remarks
64	0.8 ms	It is assumed that no communication timeout occurs.
128	1.5 ms	
256	2.8 ms	
512	5.5 ms	
1024	11 ms	
2048	22 ms	
Communication timeout (per 16 points)	+ 0.085 ms (+ 85 μ s)	This estimate is a value that is added to the required communication time whenever a communication timeout occurs per 16 points.

Note: In the synchronous mode of operation synchronizing with ladder processing, the communication time required is the same as above, but the time required for one complete scan depends on the execution time required for the ladder.

7.3.7 Mode setting (Sync/Async)

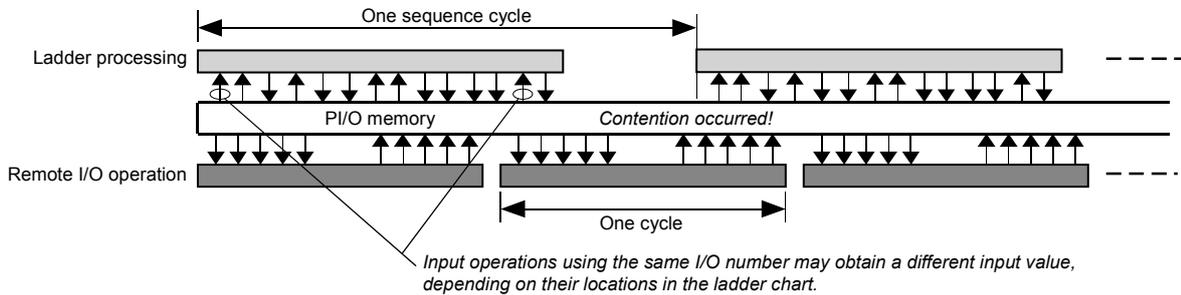
As one of its remote I/O capabilities, the LPU module can synchronize remote I/O operations with ladder processing.

With the conventional S10/2 α and S10mini product models, remote I/O operations are performed asynchronously with ladder processing. With the S10V product model, such I/O operations can be made to wait for the completion of ladder processing.

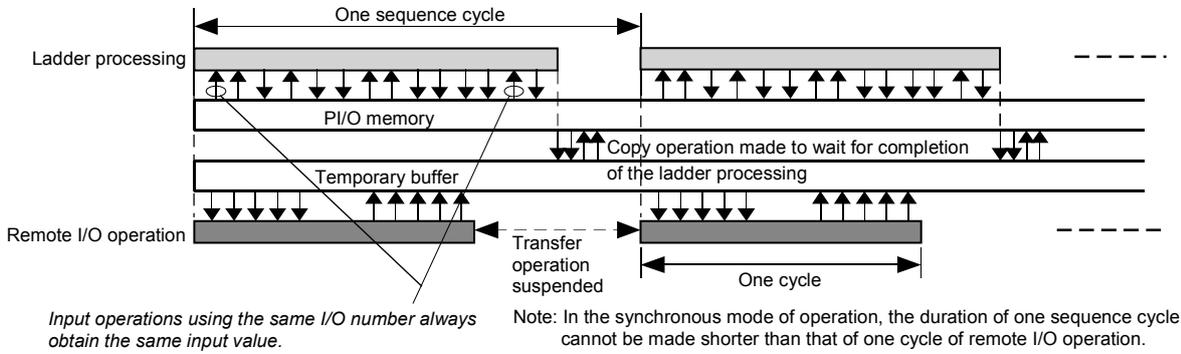
In the synchronous mode of operation, input values do not change during one sequence cycle of ladder processing, so the ladder processing will become stable. In addition, since remote I/O operations in this mode are intended to transfer data to or from a temporary buffer outside the PI/O memory being used for ladder processing, no contention occurs between requests for securing memory, thus enabling high-speed ladder processing.

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■ Operation in asynchronous mode

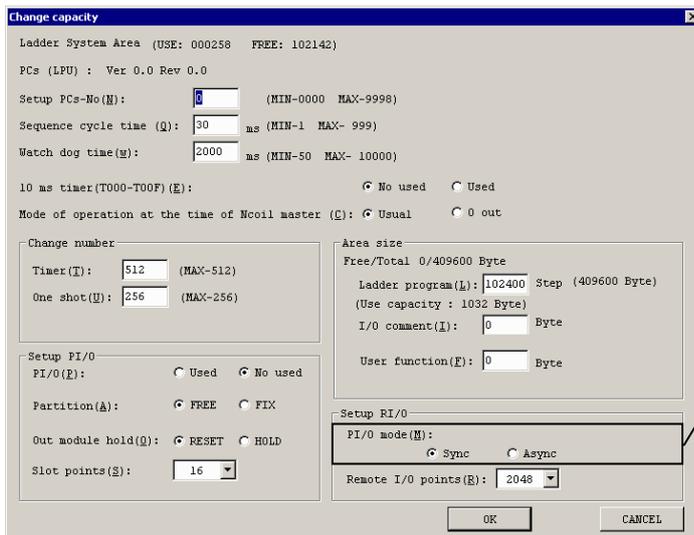


■ Operation in synchronous mode



■ Mode setting

On the tool system, open the [Change capacity] window as shown below. Choose between “Sync” and “Async” for the “PI/O mode” in the “Setup RI/O” box.



Choose between “Sync” and “Async”

7.4 Analog Module and Pulse Counter Module Setting

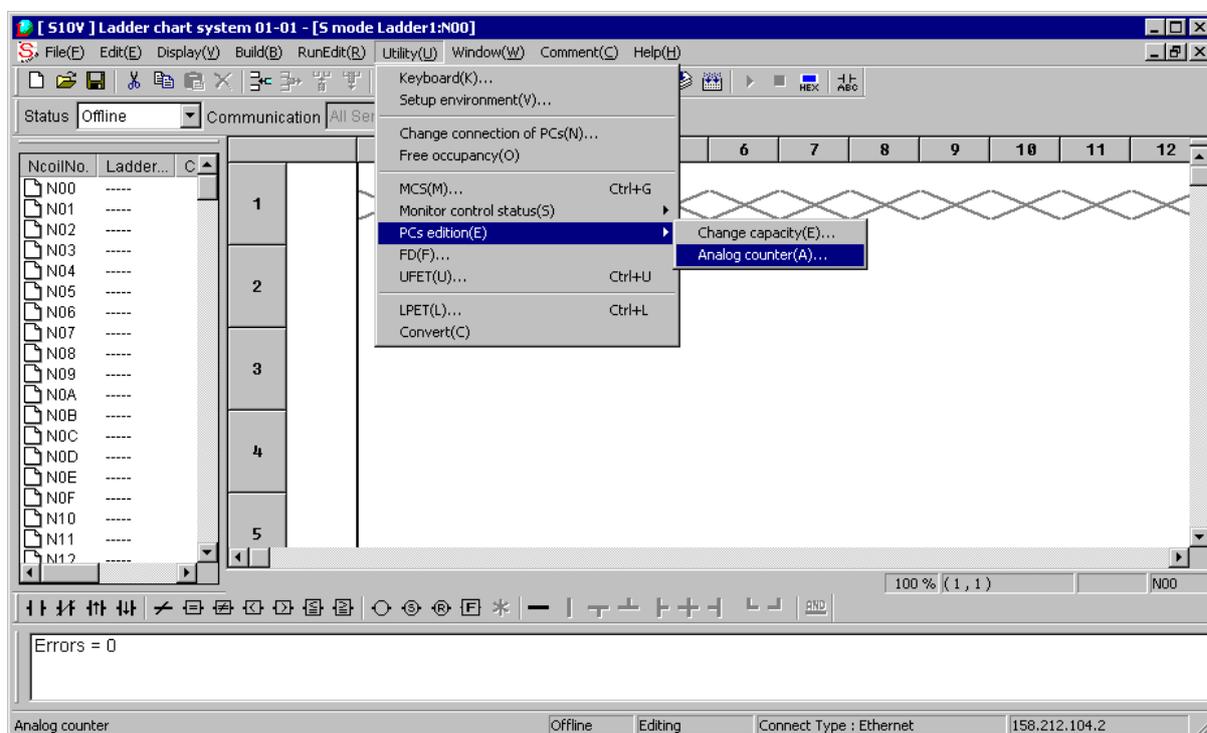
When you use an analog module by MODE2 setting or a pulse counter module, set it by using the Ladder chart system tools. When you use an analog module by MODE1 setting, do not set it.

■ Setting method

For this setting, use the Ladder chart system tools. For connecting and starting tools, see “6 TOOLS.”

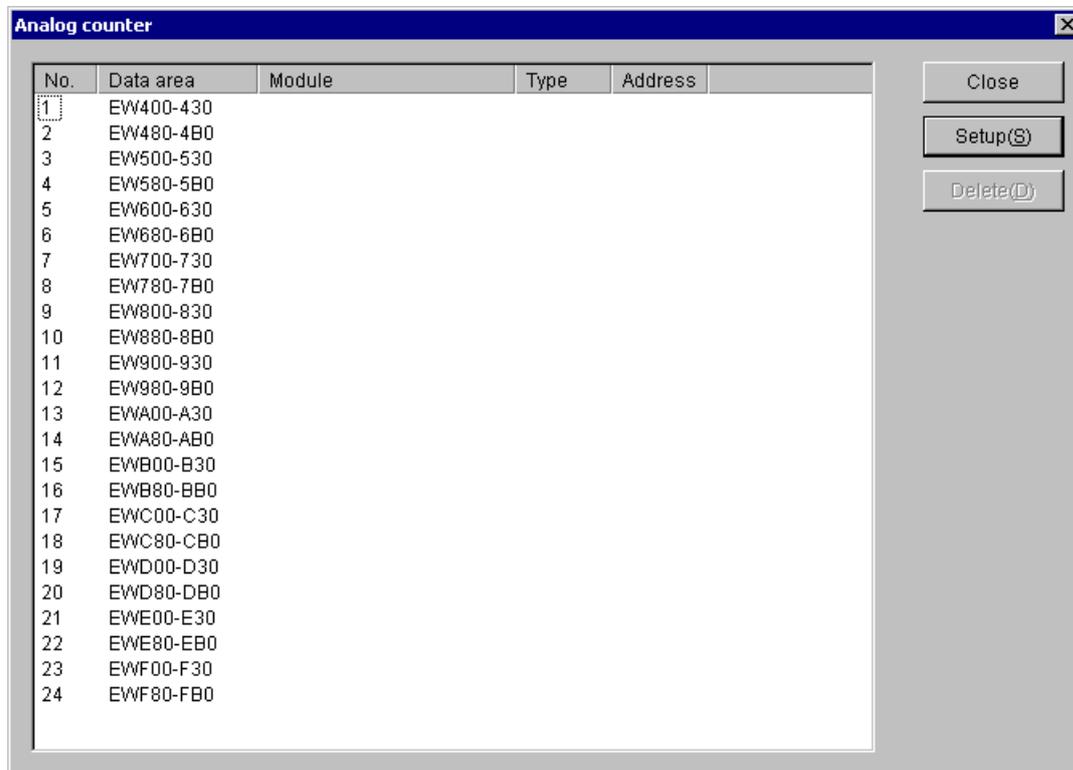
When you start the Ladder chart system tools, the following window appears. Select [Utility] – [PCs edition] – [Analog counter]

Note: If you execute the above operation in the offline mode, settings are written into the area related to the ladder program in the personal computer. If you execute it in the online mode, settings are written into the PCs.



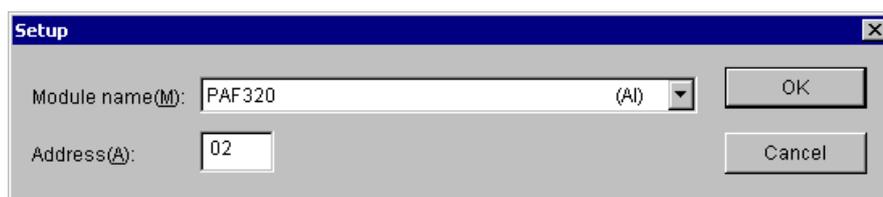
7 SETTINGS

The [Analog counter] window appears. Click No. that you want to set, then click the **Setup** button.



When the [Setup] window appears, enter a module name and address. Select a module name in the displayed module type table. Specify the address related to the corresponding external input/output (X, Y) of each module as shown below.

Address	Corresponding external input/output
00	X000 to X00F / Y000 to Y00F
01	X010 to X01F / Y010 to Y01F
02	X020 to X02F / Y020 to Y02F
⋮	⋮
7F	X7F0 to X7FF / Y7F0 to Y7FF



8 OPERATION

8.1 Overview of the General Operation

The S10V product can be operated by performing the general procedure flowcharted below. A user program (ladder program) needs to be loaded into memory only when the power to the programmable controller is initially switched on. Once it is loaded in, it is backed up in flash memory for subsequent operations. For more information, refer to the “SOFTWARE MANUAL OPERATON S10V LADDER CHART For Windows® (manual number SVE-3-131).”

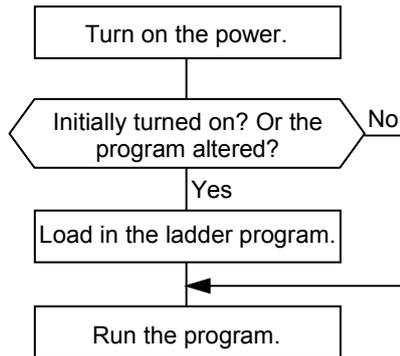


Figure 8-1 Timing of Loading in of a Ladder Program

Note 1: The LPU module cannot run any of HI-FLOW processes, application tasks (C-mode), and P-coils in a ladder chart on its own. Running these items requires an optional CMU module. For information on how to operate the CMU module, refer to the “USER’S MANUAL OPTION CMU (LQP520/525/527, LQZ500) (manual number SVE-1-110)” or “USER’S MANUAL OPTION CMU (LQP526-Z, LQZ500-Z) (manual number SVE-1-145).”

Note 2: Application tasks (C-mode) will not stop their execution even when the LADDER switch of the LPU module is in STOP position.

8.2 Operating the S10V Product

8.2.1 Operations after power is switched on

After the power to the S10V product has been switched on, specify a mode of operation in which the LPU module is to run by operating the tool system (basic tool). To accomplish this, initiate the tool when the LPU module is in a STOP state (i.e., the ladder is not running), provide all necessary settings, and then run the ladder. The table below lists all possible modes of operation in which a ladder program executes after the power to the S10V product has been switched on.

Table 8-1 All Possible Modes of Operation After Power is Tuned On and Indications on the Related Indicator Lights

Operations of the ladder program	Settings provided for LPU module				Display of the indicators		
	LADDER	LPU MODE	LADDER MODE	PROTECT MODE	RUN	SIMU	PROT
Preparation for loading in	STOP/RUN	STOP	NORM/SIMU	OFF	○	○/☀	○
Stopped (STOP)	STOP/RUN	STOP	NORM/SIMU	OFF/ON	○	○/☀	○/☀
Running (RUN)	RUN	RUN	NORM	OFF/ON	☀	○	○/☀
Simulating (SIMU)	RUN	RUN	SIMU	OFF/ON	☀	☀	○/☀

☀ Lit up ○ Extinguished

Set by switch
Set by tool (basic tool)

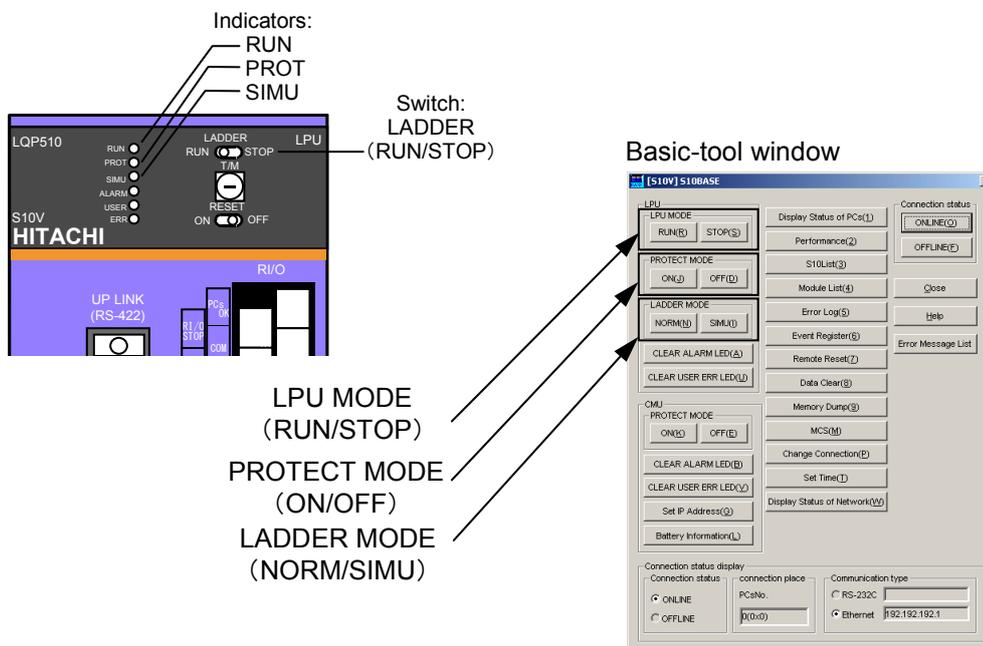


Figure 8-2 Mode Setting Switch and Indicators

For information on how to connect the tool system to the LPU module and how to start it up, see “6 TOOLS.”

8 OPERATION

8.2.2 Placing in STOP mode

■ Method of placing

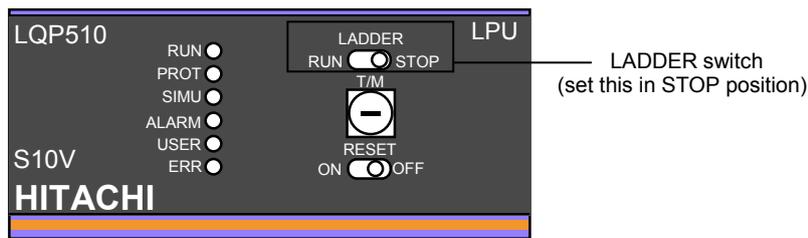
Set the LADDER switch provided on the front panel of the LPU module in STOP position, or set the “LPU MODE” to STOP in the tool. The LPU module can also be placed in STOP mode by applying a 100 VAC/VDC between the STOP (A2) and COM (A3) terminals on the terminal block. For details, see “5.5.2 Wiring for the RI/O STOP and LPU STOP/RUN signals.”

■ Condition of LPU

- The user program (ladder program) currently running is stopped (on completion of the sequence cycle).
- The contents of PI/O memory reflect the operational condition that was prevailing before the stoppage.
- The remote I/O capabilities start their operation.

Note: The application task (C-mode) running on the CMU module will not stop.

● Stopping by LADDER switch setting



Upper portion of the LPU module's front panel

● Stopping by “LPU MODE” setting provided by the tool

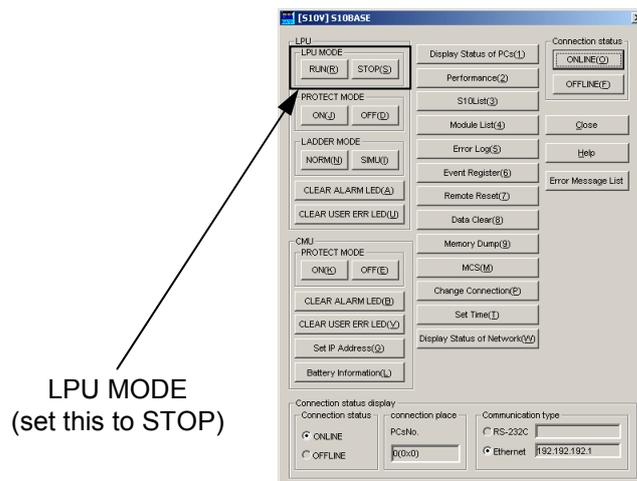


Figure 8-3 Placing in STOP Mode

8.2.3 Placing in RUN (ladder program execution) mode

■ Method of placing

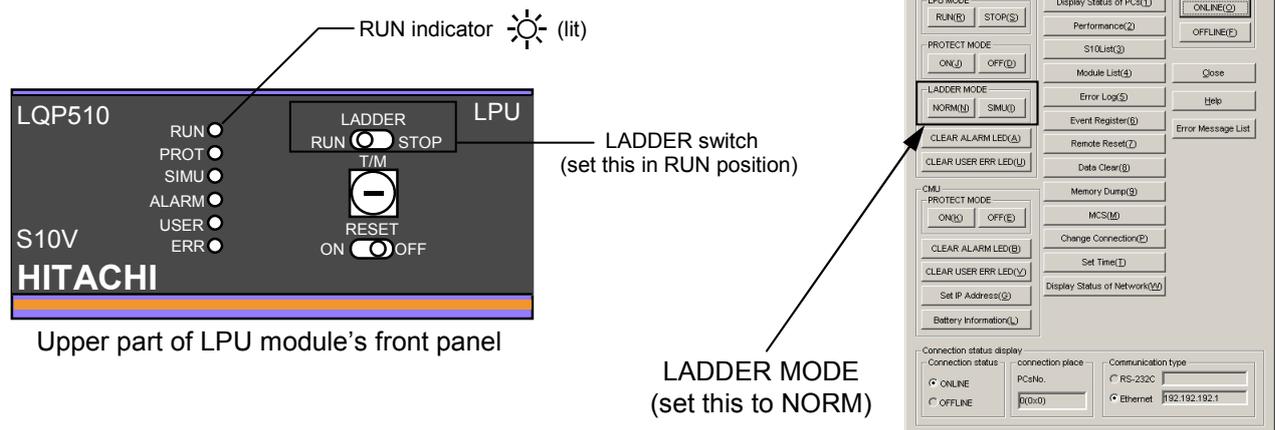
- (1) Set the “LADDER MODE” to NORM in the tool.
- (2) Set the LADDER switch provided on the front panel of the LPU module in RUN position. Then, if the “LPU MODE” has been set to STOP, set it to RUN (this cannot be accomplished if the LADDER switch is in STOP position). It should be noticed that the STOP (A2) and COM (A3) terminals of the terminal block should be open (i.e., no 100 VAC/VDC is being applied to them) at that time. For details, see “5.5.2 Wiring for the RI/O STOP and LPU STOP/RUN signals.”

■ Condition of LPU

- The user program (ladder program) is executed and the RUN indicator light is lit up.
- The remote I/O capabilities start their operation.

Note: The application task (C-mode) in a stopped state on the CMU module will not start to run.

● Running by LADDER switch setting



● Running by “LPU MODE” setting provided by the tool

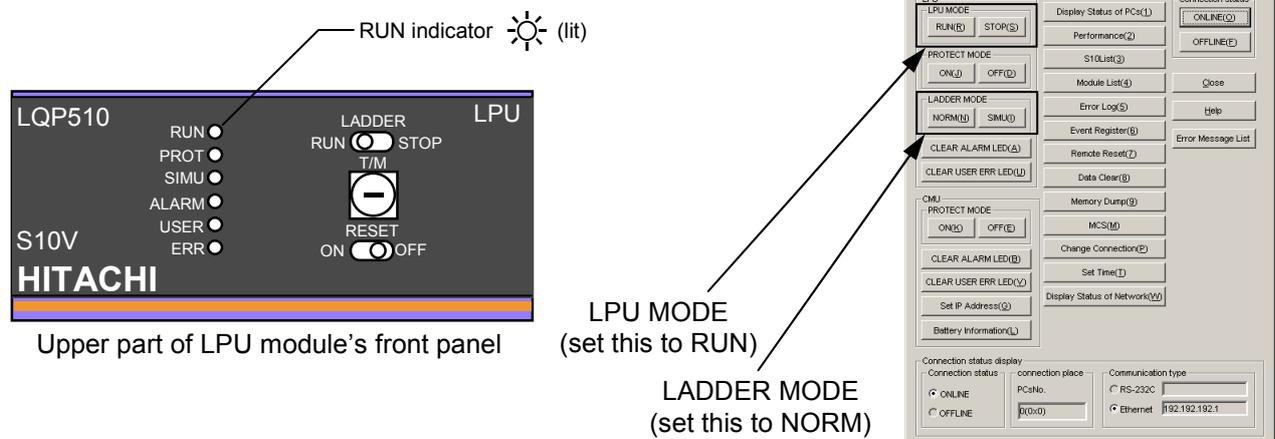


Figure 8-4 Placing in RUN Mode

8.2.4 Placing in SIMU (ladder program simulation) mode

Method of placing

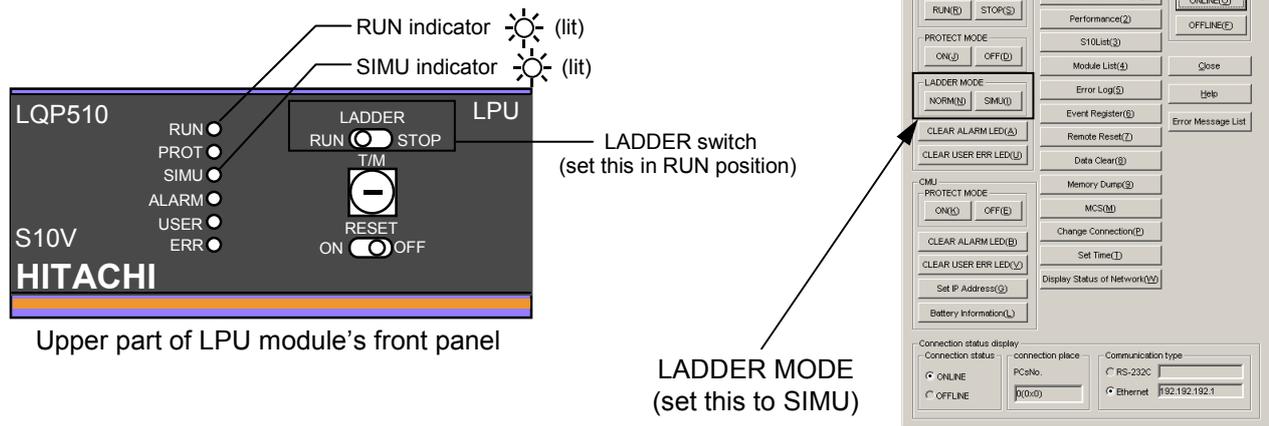
- (1) Set the “LADDER MODE” to SIMU in the tool.
- (2) Set the LADDER switch provided on the front panel of the LPU module in RUN position. Then, if the “LPU MODE” has been set to STOP, set it to RUN (this cannot be accomplished if the LADDER switch is in STOP position). It should be noticed that the STOP (A2) and COM (A3) terminals of the terminal block should be open (i.e., no 100 VAC/VDC is being applied to them) at that time. For details, see “5.5.2 Wiring for the R/I/O STOP and LPU STOP/RUN signals.”

Condition of LPU

- The user program (ladder program) is executed in the condition that the PI/O memory updating by RI/O operations is stopped.
- The RUN and SIMU indicator lights are lit up.
- The remote I/O capabilities stop their operation.

Note: The application task (C-mode) running on the CMU module will not be affected at all.

Simulating by LADDER switch setting



Simulating by “LPU MODE” setting provided by the tool

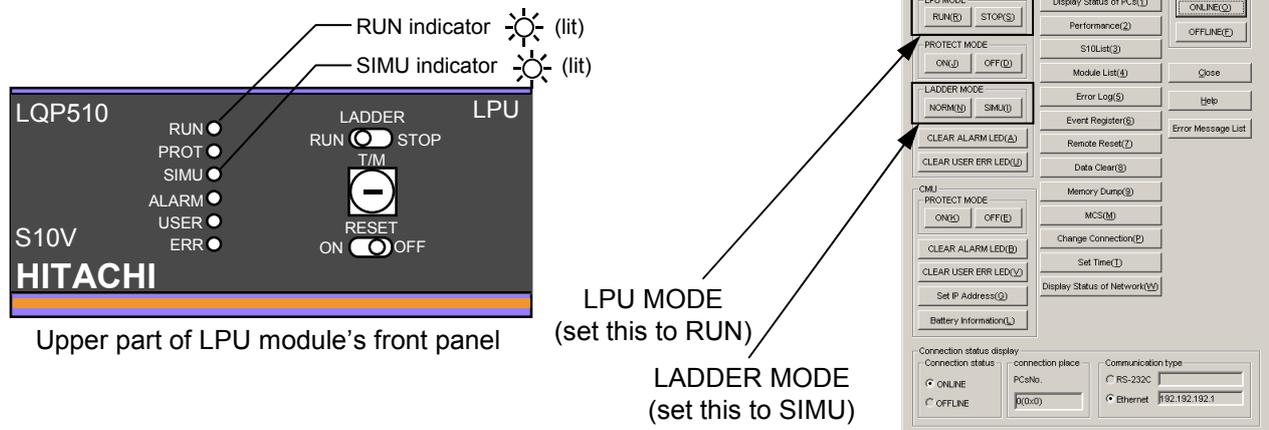


Figure 8-5 Placing in SIMU Mode

8.2.5 Placing in RESET mode

There are two types of reset mode available: the ordinary reset mode and the optical-power measurement reset mode. The ordinary reset mode is used for resetting the LPU unit, while the optical-measurement reset mode is used for measuring the optical power of an OD.RING module.

■ Method of placing in ordinary reset mode

Ensure that the T/M and operational setting switch provided on the front panel of the LPU module is set to the value “0”. Hold the RESET switch provided on the same front panel in ON position for one second or more and then set it back in OFF position.

■ Condition of LPU in ordinary reset mode

When the RESET switch is held in ON position for one second or more and then set back in OFF position, the LPU enters the following condition:

- The user program (ladder program) currently running, and the HI-FLOW process and application task (C-mode) running on the CMU module, all stop.
- The remote I/O capabilities stop their operation.
- All the optional modules mounted in the LPU unit stop their operation.
- The LPU is restarted according to the LADDER switch setting provided on the LPU module and to the LADDER MODE and PROTECT MODE settings provided by the tool. The LADDER MODE and PROTECT MODE settings provided remain unchanged after completion of the resetting.
- The contents of PI/O memory, such as input and output values (X, Y) and values of the internal registers (R, T, U, G, N, P, etc.), are all cleared, except for the keep relays (K), counter contacts (C), counter values (CC), and constant values (BD, DW, FW, LM, and LG), which remain unchanged after the resetting.

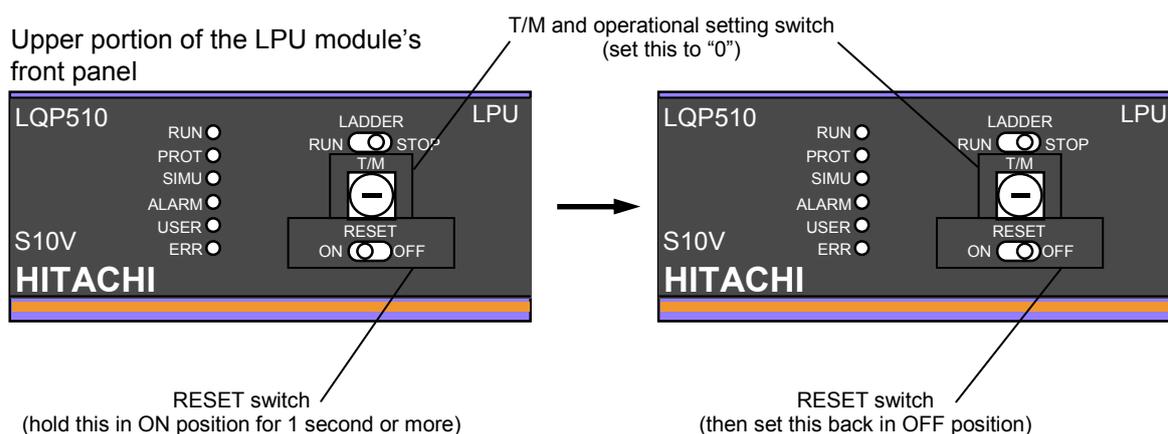


Figure 8-6 Placing in Ordinary Reset Mode

■ Method of placing in optical-power measurement reset mode

- (1) Ensure that the power to the LPU unit is OFF.
- (2) Set the T/M and operational setting switch provided on the front panel of the LPU module to the value “C”.
- (3) Switch on the power to the LPU unit.
- (4) Set the RESET switch provided on the front panel of the LPU module in ON position.
- (5) Measure the optical power of the OD.RING module. For details, refer to the “USER’S MANUAL OPTION OD.RING (LQE510/515) (manual number SVE-1-102).”
- (6) Set the RESET switch provided on the front panel of the LPU module in OFF position.
- (7) Switch off the power to the LPU module.
- (8) Set the T/M and operational setting switch provided on the front panel of the LPU module back to the value “0”.

■ Condition of LPU in optical-power measurement reset mode

The LPU stays in the following condition during a RESET state (while the switch is in ON position):

- The LPU stays in the same optical-power measurement reset mode as the OD.RING module.
- No user programs (ladder programs), and no HI-FLOW processes and application tasks (C-mode) on the CMU module can run.

On completion of the resetting (i.e., switching off the power to the LPU unit, setting the T/M and operational setting switch back to “0”, and then switching on the power to it again), the LPU enters the following condition:

- The LPU is restarted according to the LADDER switch setting provided on the LPU module and to the LADDER MODE and PROTECT MODE settings provided by the tool. The LADDER MODE and PROTECT MODE settings provided remain unchanged after completion of the resetting.
- The contents of PI/O memory, such as input and output values (X, Y) and values of the internal registers (R, T, U, G, N, P, etc.), are all cleared, except for the keep relays (K), counter contacts (C), counter values (CC), and constant values (BD, DW, FW, LM, and LG), which remain unchanged after the resetting.

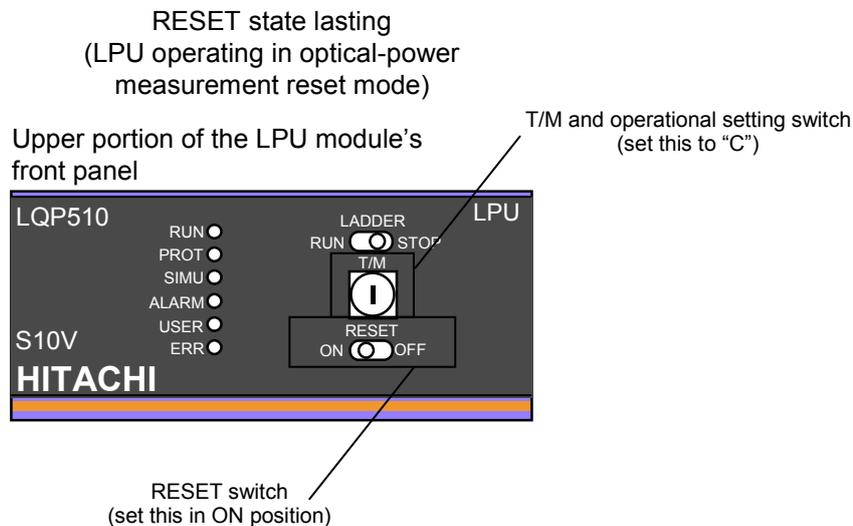


Figure 8-7 Placing in Optical-Power Measurement Reset Mode

8.2.6 Placing in PROTECT ON (memory protection on) mode

■ Method of placing

Set the “PROTECT MODE” to ON in the tool. The “PROTECT MODE” is usually set to ON.

■ Condition of LPU

- The LPU monitors any accesses to a protected area that the tool cannot check, such as accesses using an index in the user program (ladder program). If such an access is attempted, the LPU prohibits the access, terminates the ladder program, and protect the system.
- If an access to a protected area is attempted, the LPU issues a warning of “system down” by lighting up the ERR indicator light.
- This protection mode has no effect on the application task (C-mode) running on the CMU module and attempting to access a protected area. Such an attempt can be checked by the CMU module operating in protection mode. For details, refer to the “USER’S MANUAL OPTION CMU (LQP520/525/527, LQZ500) (manual number SVE-1-110).”

8.2.7 Placing in PROTECT OFF (memory protection off) mode

■ Method of placing

Set the “PROTECT MODE” to OFF in the tool.

■ Condition of LPU

Even when the user program (ladder program) attempts to access a protected area, the LPU allows the ladder program to continue its execution.

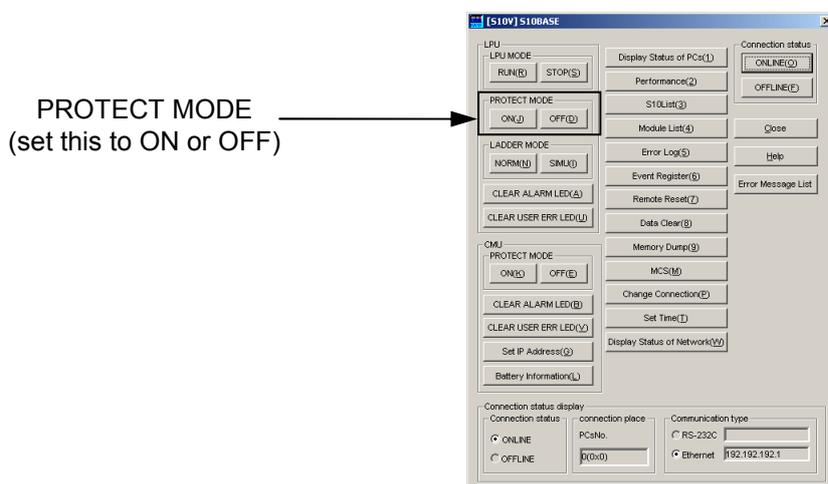


Figure 8-8 Placing in PROTECT ON/OFF Mode

■ Protected areas

The PROTECT ON mode is intended for blocking any access to a protected area that cannot be detected by the tool during programming, such as an access using an index in a user program (ladder program). In the PROTECT ON mode, when an access to any of the protected areas shown below is attempted, it is blocked and the ladder program is terminated immediately.

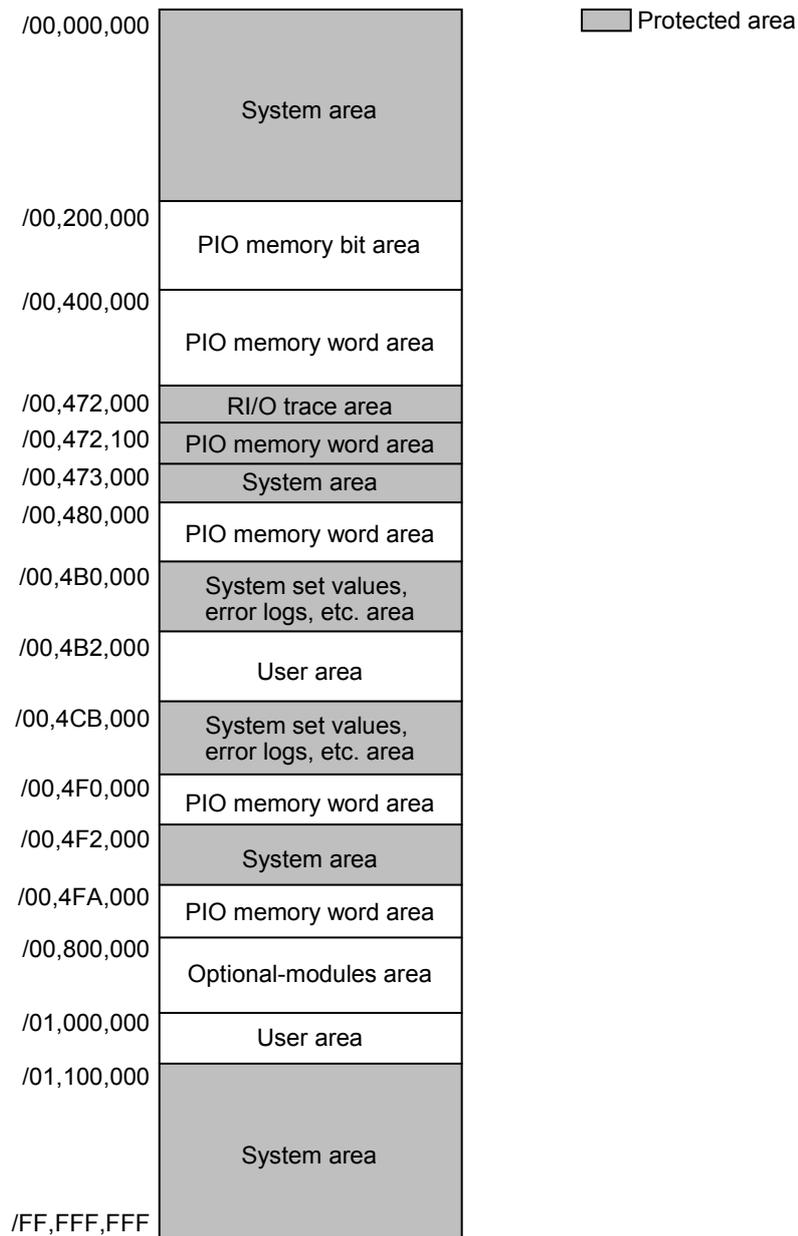


Figure 8-9 Protected Areas

9 PROGRAM RUN

9.1 Ladder Chart Program

The ladder chart programs running on the S10V product’s LPU module are created according to the industry-standard normal-rung ladder charting system. The downward-sloping-rung ladder chart programs created on the conventional S10mini and S10/2α products can also be converted into normal-rung ladder format by using a dedicated converter. For information on the dedicated converter, refer to the “SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121).”

9.1.1 Execution of a ladder chart program

■ **Conditions for execution**

- LADDER switch setting: RUN
- LADDER MODE setting: NORM or SIMU
(In the SIMU mode, any PI/O memory updating by remote I/O operations is stopped and only the ladder is executed.)

■ **Initiating a ladder chart program**

A ladder chart program can be initiated either cyclically or repeatedly:

• **Cyclical initiation**

This is a commonly used initiation method. The ladder chart programs started in this method are designed so as to complete their processing tasks within a time interval shorter than a specified sequence cycle time. These programs are automatically initiated at regular intervals determined by the specified sequence cycle time. When such a ladder chart program completes its processing task within the specified sequence cycle time, it is made to wait until the beginning of the next time interval. If the program takes a longer time than the specified sequence cycle time to complete its processing task, it is initiated by the repeated initiation method described below.

• **Repeated initiation**

The ladder chart programs started in this method do not complete their processing tasks within a specified sequence cycle time, because the sequence cycle time has been selected so that it is shorter than their execution times. When such a ladder chart program has completed its processing task, it automatically repeats from its beginning. The execution times of ladder chart programs initiated in this method can be checked out through the “Performance” function of the basic tool.

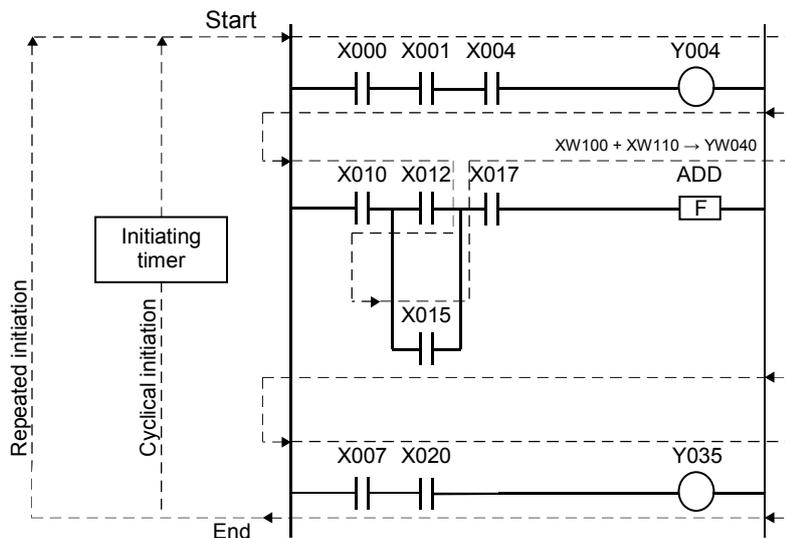


Figure 9-1 Cyclical Initiation and Repeated Initiation

9.1.2 Normal-rung ladder and downward-sloping-rung ladder

This section explains the operational differences between a normal-rung ladder and a downward-sloping-rung ladder. Every downward-sloping-rung ladder running on conventional S10mini or S10/2a products operates according to its ladder chart that contains contacts and/or coils interconnected by means of diodes. By contrast, every normal-rung ladder running on the S10V product operates according to its ladder chart that contains contacts and/or coils interconnected by means of conducting wires. That is, the normal-rung ladder enables the operation of interconnected contacts and/or coils to take place according to their wiring diagram. It should be noted that, as shown below, a normal-rung ladder and a downward-sloping-rung ladder produce different results although they are represented in similar ladder charts.

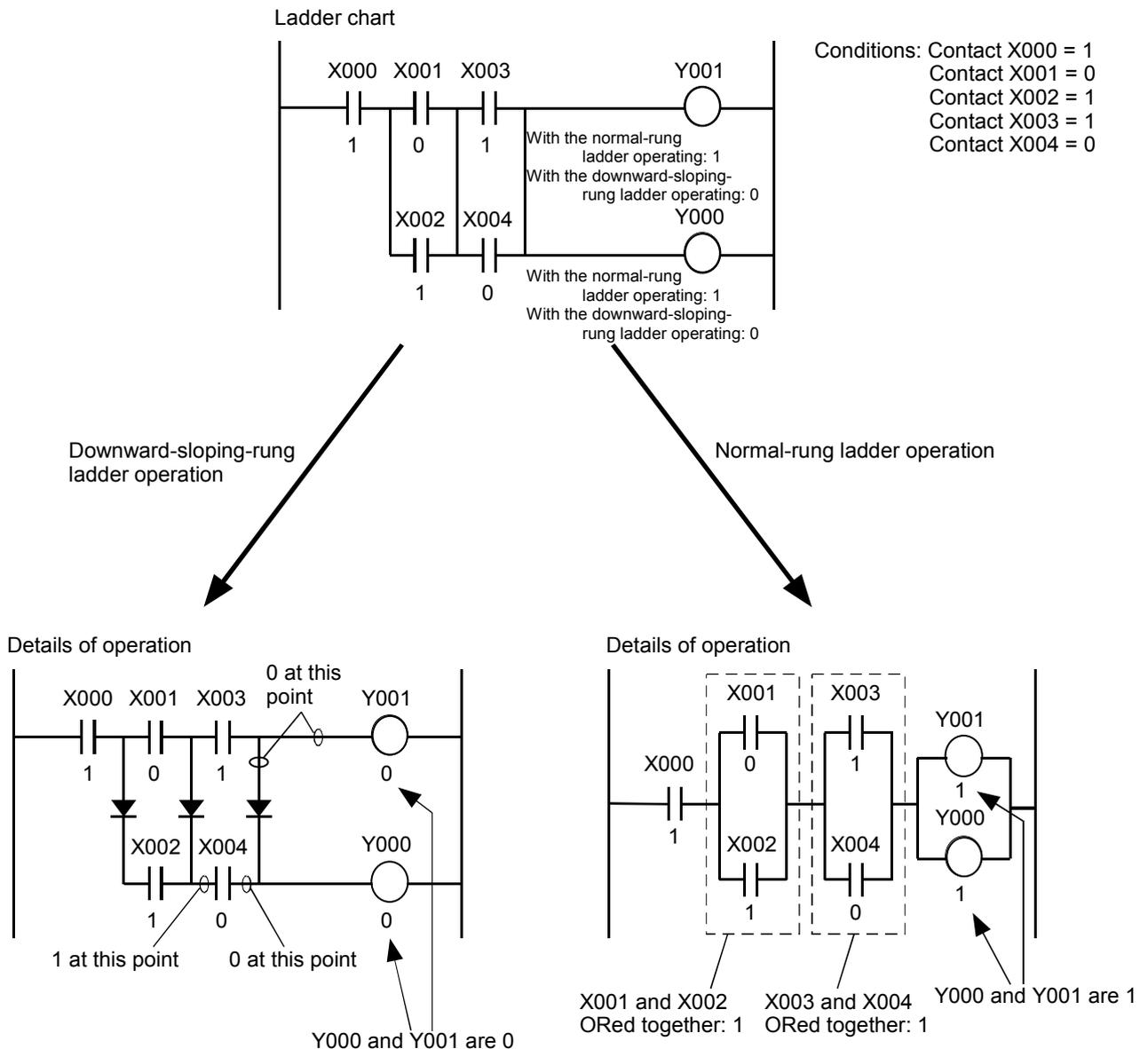


Figure 9-2 Operational Differences between the Normal-Rung Ladder and Downward-Sloping-Rung Ladder

9.1.3 Program execution sequence

A ladder program should be designed so as to faithfully represent the work flow of a process being programmed, beginning with the first process step at the top of the ladder and ending with the last at the bottom. If a ladder program is designed awkwardly, it will run inefficiently and require a longer execution time than would otherwise be needed.

■ Example of an efficient ladder chart program

The following simple ladder logic is programmed according to the work flow of a process, so that the processing required for outputting the value 1 to the coil Y000 can be completed within one single interval determined by the specified sequence cycle time.

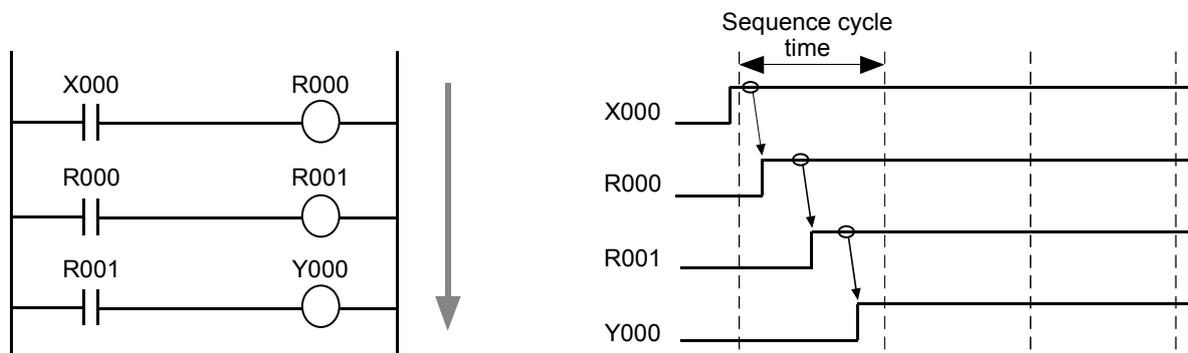


Figure 9-3 Example of an Efficient Ladder Chart Program

■ Example of an Inefficient Ladder Chart Program

If ladder logic is programmed in such a way that the activating condition coming first in a work flow is placed somewhere after activating conditions usually coming subsequently in the same work flow, more than one interval may be required to complete all the logic. For example, if the efficient ladder logic shown above was altered as shown below, three intervals would be required for outputting the value 1 to the coil Y000.

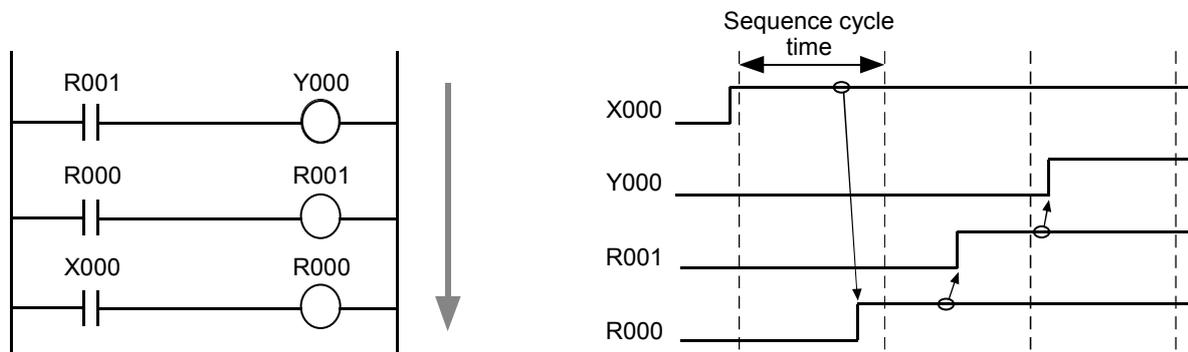


Figure 9-4 Example of an Inefficient Ladder Chart Program

9.1.4 Execution of arithmetic/logical functions

A arithmetic/logical function is executed only when the value 1 is input to its symbol in a ladder chart program. When the input value is 0, the function is skipped without being executed. In addition, similar to coils, a arithmetic/logical function cannot be followed by any symbols, such as contacts and coils, in the same rung.

■ Execution

A arithmetic/logical function is executed only when the value 1 (ON) is input to its symbol. In the example (left) shown below, the arithmetic function ADD adds the value of XW100 to XW110 and outputs the result to YW040.

■ Skipping without execution

An arithmetic/logical function is skipped without being executed when the value 0 (OFF) is input to its symbol. In the example (right) shown below, the arithmetic function ADD is skipped without being executed.

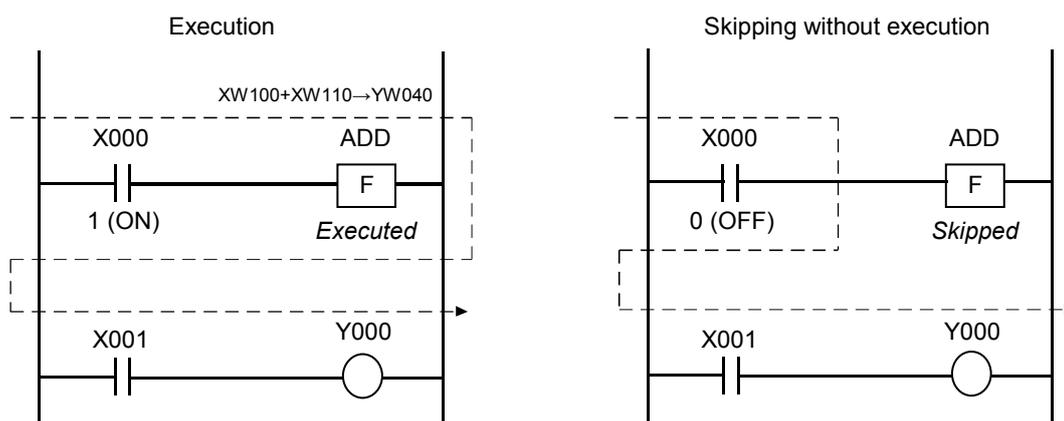


Figure 9-5 Execution and Skip of a Arithmetic Function

9.1.5 Timing of arithmetic/logical operations

In the example (left) shown above, the arithmetic operation of the function is performed at fixed intervals as long as the contact X000 is ON (1). This arithmetic operation could be performed only once, i.e., independently from fixed intervals of the specified sequence cycle time. The examples shown below accomplish this, where the arithmetic operation is performed only once in the fixed interval in which the contact X000 changes its status from OFF (0) to ON (1) or from ON (1) to OFF (0). This is made possible by introducing a contact for edge detection (V000).

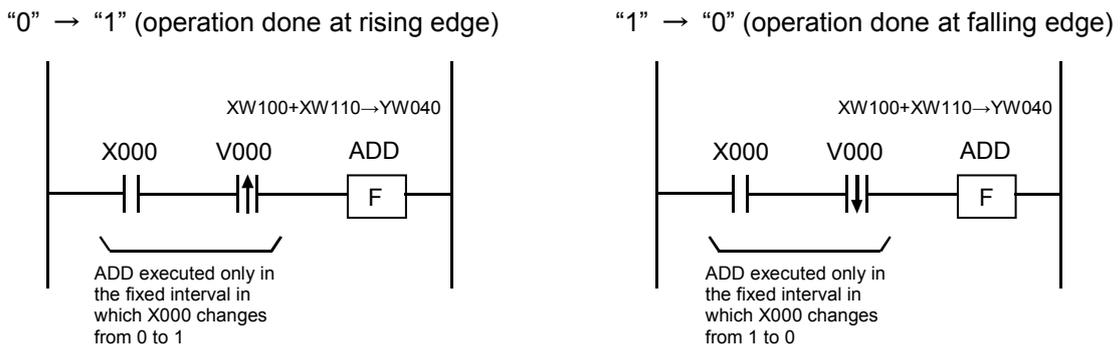


Figure 9-6 Operations Performed at Rising Edge and Falling Edge

9.2 Remote I/O Operation

9.2.1 Remote I/O transfer

The table below shows the modes in which remote I/O transfers are performed by the LPU module and those in which they are not.

Table 9-1 LPU Module Settings and Remote I/O Transfers

Power supply module	LPU module settings			RI/O transfer
Power switch	RESET switch	LADDER switch	LADDER MODE setting	
OFF	—	—	—	Stopped
ON	—	—	—	Stopped
ON	ON	—	—	Stopped
ON	OFF	STOP	—	Performed
ON	OFF	RUN	NORM	Performed
ON	OFF	RUN	SIMU	Stopped

Note: This table shows the relationships between LPU module settings and remote I/O transfers performed when the RI/O STOP (A1) terminal on the terminal block is left open. When the terminal is short-circuited with COM (A3), any RI/O transfers in process will be stopped in each state listed above.

9.2.2 Digital output mode setting when a remote I/O transfer is stopped

When a remote I/O transfer is stopped due to a transfer error detected, the output of a digital output (DO) module mounted in an I/O unit can be reset (made equal to zero) or made to remain unchanged after the stoppage. For details, see “7.3.4 Digital output hold setting.”

9.3 Processing Time

The processing time beginning with an external input signal input to an input module and ending with the input signal output as an external output signal to an output module can be diagrammatically shown below. Since, as shown, an external input signal, transfers over the remote I/O line, and ladder processing, all occur asynchronously with each other, the simple summation of all the durations (1) through (4) above cannot find the correct value. Such a summation can produce a rough estimate, however. If the remote I/O operation shown above is performed in synchronism with the ladder processing (sync mode), the duration (3) is invariably equal to the specified sequence cycle time.

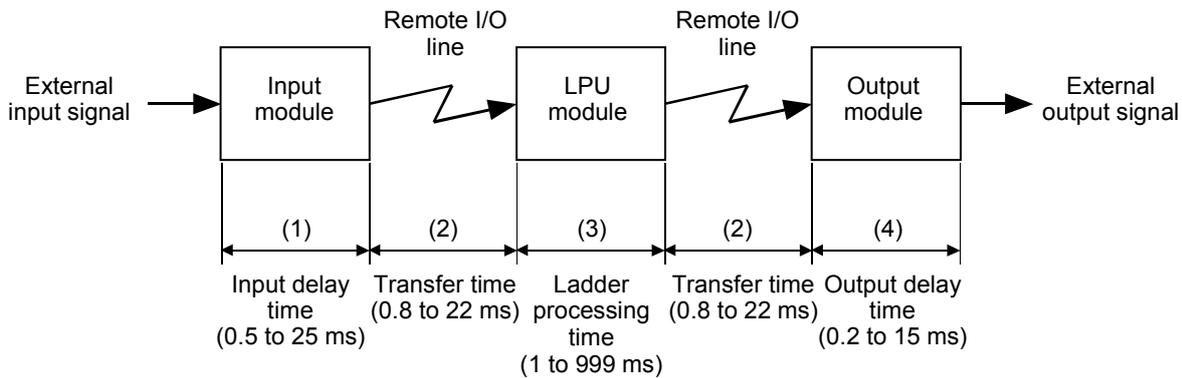


Figure 9-7 Processing Times

(1) Input delay time

The input delay time is a time period required for an input module to produce a response. This response time depends on the types of input modules used. For example, it is approximately 0.5 ms for transistor-type input modules and 10 to 25 ms for relay-type input modules. For more information, refer to the “HARDWARE MANUAL I/O MODULES (manual number SME-1-114).”

(2) Remote I/O transfer time

The remote I/O transfer time is a time period required for a data transfer to be completed over a remote I/O line. This transfer time depends on the I/O point count setting provided and on whether a communication over the line is timed out or not. The transfer times in milliseconds determined from I/O point counts are as follows: 0.8 for the count 64; 1.5 for 128; 2.8 for 256; 5.5 for 512; 11 for 1024; and 22 for 2048. To compute the transfer time required when a communication is timed out, see “7.3.6 Remote I/O point count setting.”

As regards input transfers, an external input signal and a remote input transfer occur asynchronously from each other, so it may sometimes be the case that the input value of the input module becomes determinate right after the transfer has been started. In these cases, the correct input value is not communicated to the LPU module until a next transfer cycle has been started. The resulting transfer time in such a case is 1.6 to 44 ms, about two times as long as the otherwise required transfer time.

In output transfers, if a remote I/O operation is being performed asynchronously with ladder processing, it may sometimes be the case that the result of the ladder processing comes out right after a transfer has been started. In these cases, similar to the case described above, the correct processing result is not communicated to the output module until a next transfer cycle has been started. The resulting transfer time in such a case is also 1.6 to 44 ms, about two times as long as the otherwise required transfer time. If a remote I/O operation is being performed synchronously with ladder processing, the resulting transfer time is certainly 0.8 to 22 ms, which is within one single cycle.

(3) Ladder processing time

The ladder processing time is a time period required for a ladder program to complete its processing. Where a ladder program is started by cyclical initiation, its ladder processing time is from 1 to 999 ms and is equal to the specified sequence cycle time. However, if such a ladder program requires a longer time period than the specified sequence cycle time for completing its processing, its ladder processing time is equal to the time period actually required. Where a ladder program is started by repeated initiation, its ladder processing time is also equal to the time period actually required.

In input transfers, when a remote I/O operation is being performed asynchronously with the ladder program, it may sometimes be the case that the input value of the input module is communicated to the LPU module right after one sequence cycle of the ladder has been started. In these cases, the correct processing result cannot be obtained until a next transfer cycle has been started. The resulting ladder processing time in such a case is about two times as long as the otherwise required ladder processing time. When a remote I/O operation is being performed synchronously with the ladder, the ladder processing time is certainly equal to the specified sequence cycle time.

(4) Output delay time

The output delay time is a time period required for an output module to produce a response. This response time depends on the types of output modules used. For example, it is approximately 0.2 ms for transistor-type output modules and 10 to 15 ms for relay-type output modules. For more information, refer to the "HARDWARE MANUAL I/O MODULES (manual number SME-1-114)."

Although the correct value cannot be computed for any total amount of processing time, a rough estimate and the maximum possible total amount can be computed in the following way:

Rough estimate of the total amount of processing time

$$= (1) + (2) + (3) + (2) + (4)$$

$$= (\text{input delay time}) + (\text{remote input transfer time}) + (\text{ladder processing time}) + (\text{remote output transfer time}) + (\text{output delay time})$$

Maximum possible total amount (when RI/O is not synchronized with the ladder)

$$= (1) + (2) \times 2 + (3) \times 2 + (2) \times 2 + (4)$$

$$= (\text{input delay time}) + (\text{remote input transfer time}) \times 2 + (\text{ladder processing time}) \times 2 + (\text{remote output transfer time}) \times 2 + (\text{output delay time})$$

Maximum possible total amount (when RI/O is synchronized with the ladder)

$$= (1) + (2) \times 2 + (3) + (2) + (4)$$

$$= (\text{input delay time}) + (\text{remote input transfer time}) \times 2 + (\text{ladder processing time}) + (\text{remote output transfer time}) + (\text{output delay time})$$

9.4 Clock and Related Facilities

This section describes the S10V product’s internal clock and related facilities and explains how to set the clock.

9.4.1 System registers for controlling the clock

These system registers are provided for use in real-time control of ladder chart programs. They may be classified into the following two types: the time data register and the time control register.

(1) Time data registers

A set of system registers, called the time data registers, are used to store the following time information: the year, month of the year, day of the month, hours, minutes, and seconds. When you are setting the clock, store these values in the registers. Only binary values (specified in hexadecimal) can be stored in the registers.

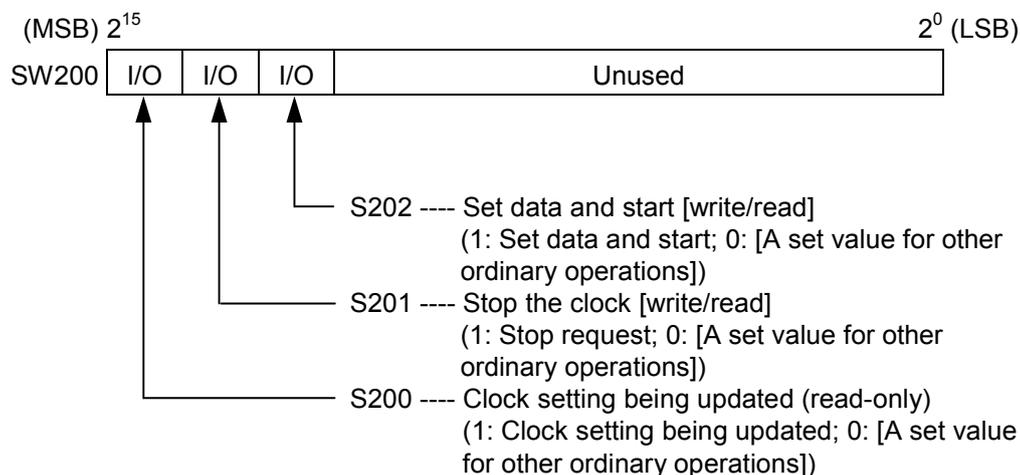
	(MSB) 2^{15}	2^8 2^7	2^0 (LSB)
SW280	Unused		Seconds
SW290	Unused		Minutes
SW2A0	Unused		Hours
SW2B0	Unused		Day of month
SW2C0	Unused		Month of year
SW2D0	Year		
SW2E0	Unused		Day of week

<Notes on clock setting>

- When you specify a day of the week, use its corresponding predetermined numeric value: 1 for Sunday; 2 for Monday; 3 for Tuesday; 4 for Wednesday; 5 for Thursday; 6 for Friday; and 7 for Saturday.
- If a non-existing date or time value, such as the month values 0 and 13, day values 0 and 35, hours value 25, minutes value 60, and seconds value 60, is specified, it will be ignored and the current clock setting will remain unchanged.
- The hour can be specified with a value in the range 1 to 24.

(2) Time control register

A single system register, called the time control register, is used to control the setting of a new present time of the day and has the following format:



<Time-setting procedure>

A new present time of the day can be set by performing the following procedure:

- ① Set 1 to the S201 bit of the time control register. This setting stops the clock.
- ② Store time values (seconds, minutes, hours, day of month, month of year, year, day of week) in the time data registers SW280 through SW2E0.
- ③ Set 1 to the S202 bit of the time control register. This setting starts the clock from the specified time.
- ④ Reset 0 to the S201 and S202 bits of the time control register. This resetting returns the clock to its ordinary time-measuring operation.

9.4.2 Setting times through a ladder chart program

The ladder program shown below moves the time data stored in the F-registers FW100 through FW106 to the time data registers SW280 through SW2E0 when X000 is switched ON (1). It should be noticed that the example below shows only the items necessary for creating a ladder program.

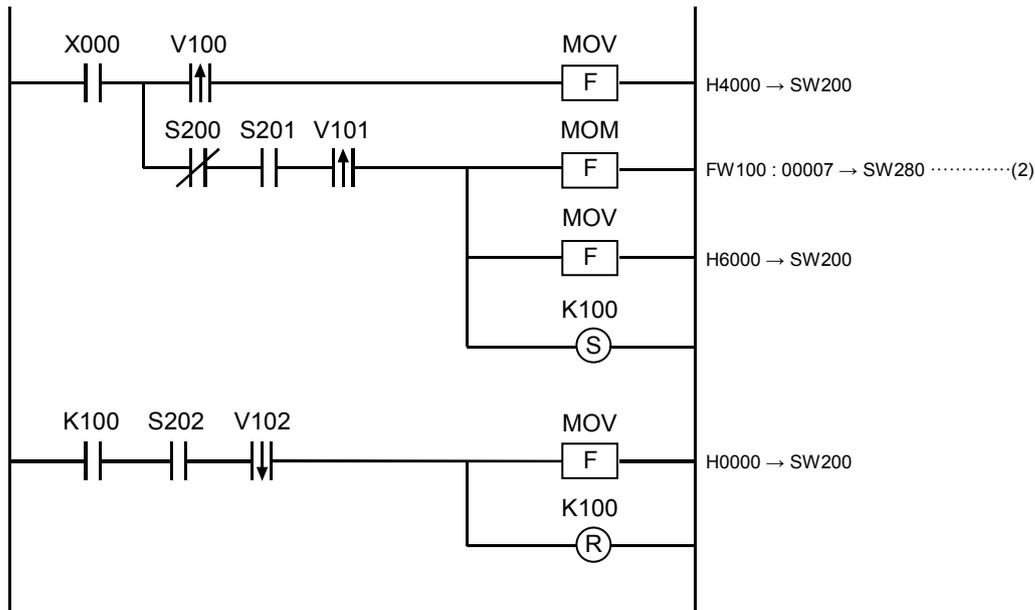


Figure 9-8 Example of a Ladder Chart Program Through Which Times Are Set

Operational outline:

- (1) When X000 is switched ON (1), the program sets 1 to S201 and thereby issues a request for stopping the clock.
- (2) The program ensures that the clock is currently stopped, and then moves the time data (seconds, minutes, hours, day of month, month of year, year, and day of week) stored in the F-registers (FW100 through FW106) to the time data registers (SW280 through SW2E0).

F-registers			Time data registers	
FW100	Seconds	→	SW280	Seconds
FW101	Minutes		SW290	Minutes
FW102	Hours		SW2A0	Hours
FW103	Day of month		SW2B0	Day of month
FW104	Month of year		SW2C0	Month of year
FW105	Year		SW2D0	Year
FW106	Day of week		SW2E0	Day of week

- (3) The program sets 1 to S202 and thereby issues a “Set Data and Start” request.
- (4) The program ensures that the time data has been moved successfully, and sets S201 and S202 to 0. The time setting is completed.

9.4.3 Updating the date

The date is automatically updated in the following way:

- (1) Automatically distinguishing between odd months and even months ---- The date is updated from the 31st day of each of January, March, May, July, August, October, and December to the 1st day of the next month, and from the 30th day of each of April, June, September, and November to the 1st day of the next month.
- (2) Automatically distinguishing between common years and leap years ---- The date is updated from the 29th day of February of every leap year (2004, 2008, 2012, 2016, etc.) to the 1st day of March. For common years, the date is updated from the 28th day of February to the 1st day of March.

9.4.4 Clock accuracy

The accuracy of the internal clock fluctuates by approximately 160 seconds per month regardless of the ambient temperature. The fluctuation range increases in relation to the ambient temperature. “Figure 9-9 Clock Accuracy” shows the fluctuation range of the clock in relation to the ambient temperature.

Generally, the clock accuracy depends on the product used and does not follow the same curve as shown below. Hence, the curve should be used as a guideline.

Note: When precise clock accuracy is required, be sure to adjust the clock from time to time.

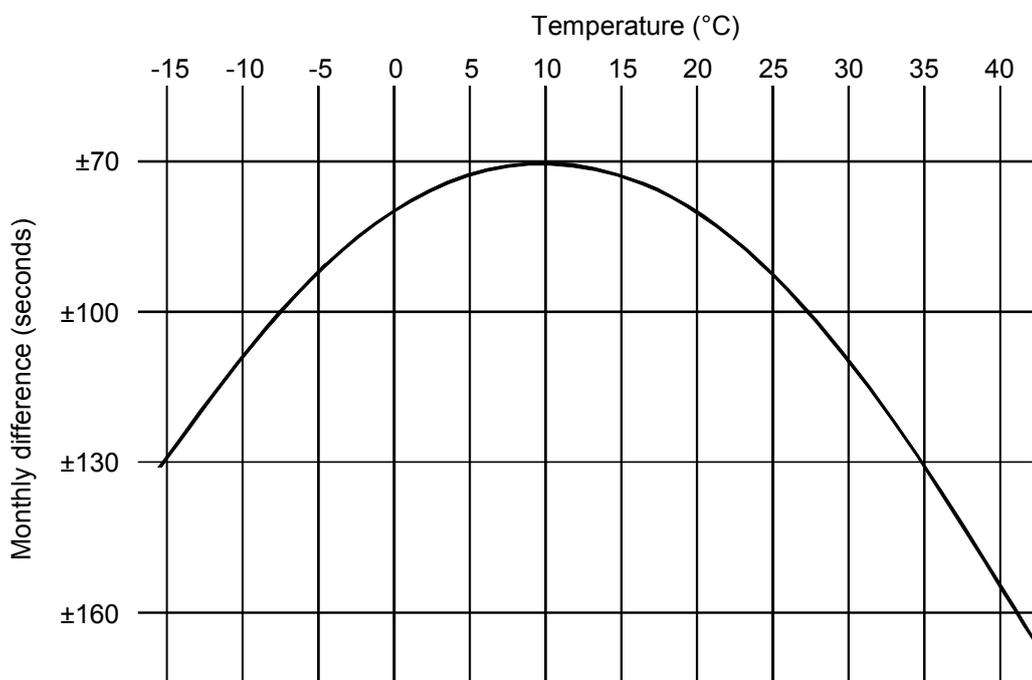


Figure 9-9 Clock Accuracy

9.5 Input/Output on the Occurrence of Errors and the Status of Internal Registers

Table 9-2 Status of Internal Registers

Operation and Status Name			In a condition as at shipment:	In ordinary operation:			On an error, such as:			
			Right after powering up:	Right after resetting or powering up:	RUN (NORM)	RUN (SIMU)	STOP	I/O error (*1)	Battery low	LPU down (*2)
Input/Output	External input	X	Input after cleared (filled with 0s)	Input after cleared (filled with 0s)	Input	Input stopped	Input	Input	Input	Input stopped
	External output	Y	Output after cleared (filled with 0s)	Output after cleared (filled with 0s)	Output	Output stopped	Output	Output	Output	Output stopped
	HS.R/I/O input (*4)	LI	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated (*3)	Updated (*3)	Updated (*3)	Updated (*3)	Updated (*3)	Update stopped (*3)
	HS.R/I/O output (*4)	LO	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated (*3)	Updated (*3)	Updated (*3)	Updated (*3)	Updated (*3)	Update stopped (*3)
Internal registers	Internal register	R	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Keep relay	K	Cleared (filled with 0s)	Held	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	On-delay timer	T	Cleared (filled with 0s)	Cleared (filled with 0s)	Running	Running	Temporarily stopped	Running	Running	Temporarily stopped
	One-shot timer	U	Cleared (filled with 0s)	Cleared (filled with 0s)	Running	Running	Temporarily stopped	Running	Running	Temporarily stopped
	Up-down counter	CU CD CR CO	Cleared (filled with 0s)	Held	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Global link register	G	G-input after cleared (filled with 0s)	G-input after cleared (filled with 0s)	G-input, G-output	G-input, G-output	G-input	G-input, G-output	G-input, G-output	G-input
	Nesting coil	NM NZ NO	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Process register	P	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Event register	E	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Edge contact	V	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Z-register	Z	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	System register	S	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Internal work register	A J Q M	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Data register	DW BD	Cleared (filled with 0s)	Held	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Work register	FW	Cleared (filled with 0s)	Held	Updated	Updated	Update stopped	Updated	Updated	Update stopped
	Data register 2	LB LL LF LW	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped
Data register 3	LM LG LX	Cleared (filled with 0s)	Held	Updated	Updated	Update stopped	Updated	Updated	Update stopped	
Ladder converter register	LR LV	Cleared (filled with 0s)	Cleared (filled with 0s)	Updated	Updated	Update stopped	Updated	Updated	Update stopped	
Ladder program			Cleared (filled with 0s)	Held	Running	Running	Stopped	Running	Running	Stopped
PCs OK			OFF	OFF	ON	OFF	OFF	ON	ON	OFF

- (*1) This I/O error is a fuse error or timeout error.
- (*2) This "LPU down" is such an error as "nesting too deep," "CS pointer value too large," "BS pointer value too large," WDT error, ladder program memory parity error, ladder program illegal instruction detected, and memory protection error.
- (*3) Each of these states occurs when the arithmetic function HIO for ladder programming or the INITS() function used in a C-language task is started. The state prior to the start of HIO or INITS() is "update stopped".
- (*4) Any input/output area for which no high-speed RI/O (HS.RI/O) module is installed is filled up with 1s (or Fs).

9.6 Limitations on Optional- and I/O-Module Mountings

■ Limitations on optional-module mounting

Table 9-3 shows the maximum number of optional modules that can be mounted in an LPU or I/O unit. These numbers are also limited by the maximum total amount of current (7 A at an ambient temperature of 48°C or lower) that can be consumed by the modules (LPU, optional, and/or I/O modules) mounted in the unit. For more information, see “9.7 Output Current from the Power Supply Module.”

Table 9-3 Limitations on Optional-Module Mounting

Module name	Model	LPU unit	I/O unit	Remarks
PS (AC power supply)	LQV000	1	1	This module can be mounted either in an LPU unit or an I/O unit and the power supply slot in the unit is predetermined.
LPU	LQP510/511/512	1	–	The LPU module slot in the unit is predetermined.
CMU	LQP520/525/526/527	1 (*1)	–	
FL.NET	LQE500/502	2 (*2)	–	
OD.RING	LQE510/515	2 (*3)	–	
ET.NET	LQE520/720	2 (*4)	–	
SV.LINK	LQE521	1 (*4)	–	
SD.LINK	LQE530	2 (*3)	–	
J.NET	LQE540/541	2 (*5)	–	
J.NET-INT	LQE545/547	2 (*5)	–	
IR.LINK	LQE546/548	1 (*5)	–	
CPU.LINK	LQE550	2	–	
RS-232C	LQE560	2 (*6)	–	
RS-422	LQE565	2 (*6)	–	
D.NET	LQE570/575/770/775	4 (*7)	–	
HDLC	LQE590	4	–	
EQ.LINK	LQE701	2	–	
OPTET	LQE710	4	–	
FR.LINK	LQE740	4	–	
SYS.SW	LQZ700	1	–	
EX.R/O	LQE220	1	–	
HS.R/O	LQE230	4	–	
OPT.R/O	LQZ410	2	–	

(*1) Only one LQP520, LQP525, LQP526 or LQP527 module can be mounted in the LPU unit.

(*2) Up to two LQE520 and/or LQE502 modules can be mounted in the LPU unit.

(*3) Up to two LQE510, LQE515 and/or LQE530 modules can be mounted in the LPU unit.

(*4) Up to two LQE520, LQE521 and/or LQE720 modules can be mounted in the LPU unit, provided that only one LQE521 module can be mounted in any LPU unit.

(*5) Up to two LQE540, LQE541, LQE545, LQE546, LQE547 and/or LQE548 modules can be mounted in the LPU unit, provided that only one LQE546 and/or LQE548 module can be mounted in any LPU unit. When an LQE546 module is mounted in conjunction with an LQE540, LQE541, LQE545 or LQE547 module, the LQE546 or LQE548 module should be set up as a submodule.

(*6) Up to two LQE560 and/or LQE565 modules can be mounted in the LPU unit.

(*7) Up to four LQE570, LQE575, LQE705 and/or LQE775 modules can be mounted in the LPU unit.

■ Limitations on I/O-module mounting

Table 9-4 shows the maximum number of I/O modules that can be mounted in an LPU or I/O unit. These numbers are also limited by the maximum total amount of current (7 A at an ambient temperature of 48°C or lower) that can be consumed by the modules (LPU, optional, and/or I/O modules) mounted in the unit. For more information, see “9.7 Output Current from the Power Supply Module.”

Table 9-4 Limitations on I/O-Module Mounting

Module name	Model	LPU unit	I/O unit	Remarks
RI/O (remote I/O station)	LQS000/010	–	1	This module can be mounted only in the ST slot.
J.Station (J-station)	LQS020	–	1	This module can be mounted only in the ST slot.
IR.Station (IR station)	LQS021	–	1	This module can be mounted only in the ST slot.
D.Station (D-station)	LQS070	–	1	This module can be mounted only in the ST slot.
Digital input modules	LQX110	8	8	
	LQX130	8	8	
	LQX200	8	8	
	LQX201	8	8	
	LQX210	8	8	
	LQX211	8	8	
	LQX220	8	8	
	LQX240	8	8	
	LQX250	8	8	
	LQX300	8	8	
	LQX310	8	8	
LQX350	8	8	(*1)	
LQX360	8	8	(*1)	
Digital output modules	LQY100	8	8	
	LQY140	8	8	
	LQY160	8	8	
	LQY200	8	8	
	LQY300	8	8	(*2)
	LQY310	8	8	(*2)
	LQY350	8	8	(*2)
LQY360	8	8	(*2)	
Digital I/O module	LQZ300	8	8	
Analog input modules	LQA000	8	8	
	LQA050	8	8	
	LQA055	8	8	
	LQA100	8	8	
	LQA150	8	8	
	LQA155	8	8	
	LQA200	8	8	
LQA201	8	8		
Analog output modules	LQA500	8	8	
	LQA600	8	8	
	LQA610	8	8	
Pulse counter module	LQC000	8	8	

(*1) The maximum number of data points that can be switched on at the same time depends on the ambient temperature.

(*2) The maximum number of data points that can be switched on at the same time depends on the ambient temperature and load current.

9.7 Output Current from the Power Supply Module

When the power supply module is LQV000, LQV020, or LQV100 and the ambient temperature is high, output current is restricted as shown below. Before using the module, make sure that its current consumption is less than output current. (As for the LQV010 and LQV200, they have no restrictions placed on their use. The maximum output current that can be drawn from these modules is 10 A at 55°C for the LQV010 and 7.0 A at 55°C for the LQV200.)

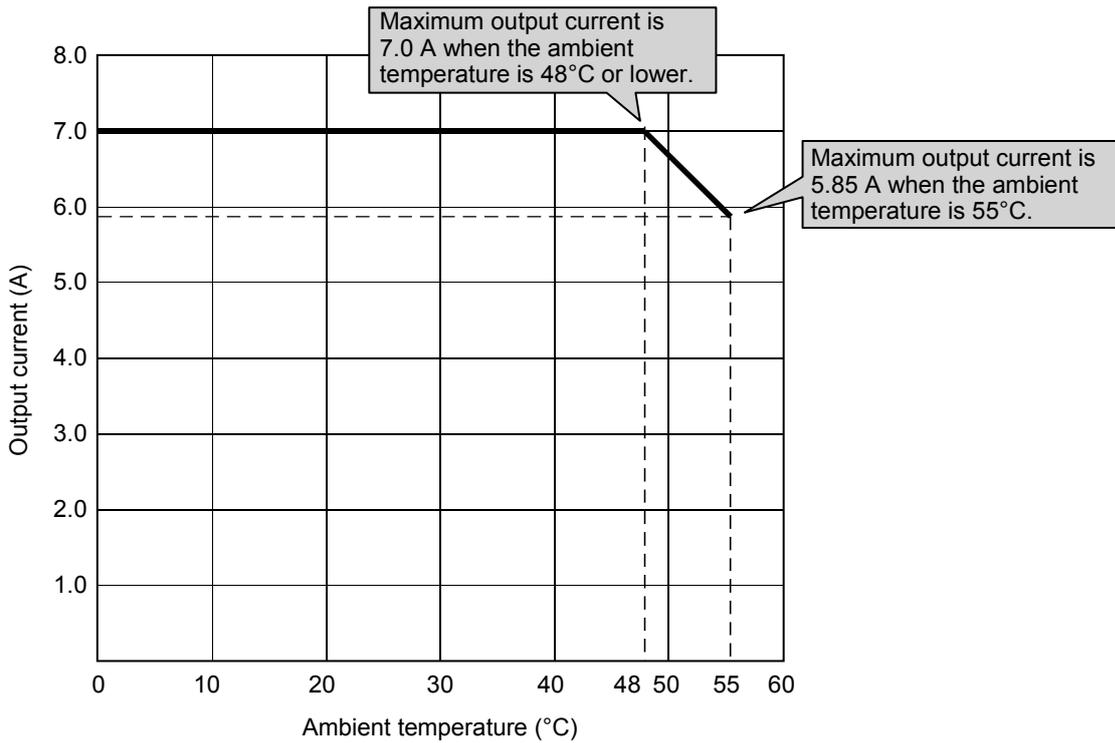


Figure 9-10 Output Current from the Power Supply Module

Table 9-5 Current Consumptions of Available Optional Modules

Module name	Model	Current consumption
LPU	LQP510/511/512	1000 mA or less
CMU	LQP520/525/527	850 mA or less
CMU	LQP526	850 mA or less
FL.NET	LQE500	725 mA or less
FL.NET (VER.2)	LQE502	725 mA or less
OD.RING (4 km)	LQE510	695 mA or less
OD.RING (1 km)	LQE515	680 mA or less
ET.NET (10M)	LQE520	725 mA or less
SV.LINK	LQE521	725 mA or less
SD.LINK	LQE530	1050 mA or less
J.NET	LQE540	715 mA or less
	LQE541	660 mA or less
J.NET-INT	LQE545	715 mA or less
	LQE546	660 mA or less
IR.LINK	LQE546	715 mA or less
	LQE548	660 mA or less
CPU.LINK	LQE550	445 mA or less
RS-232C	LQE560	410 mA or less
RS-422	LQE565	420 mA or less
D.NET	LQE570	510 mA or less
D.NET (power supplied from an external source)	LQE575	460 mA or less
HDLC	LQE590	700 mA or less
EQ.LINK	LQE701	725 mA or less
OPTET	LQE710	1350 mA or less
ET.NET (100M)	LQE720	1300 mA or less
FR.LINK	LQE740	1300 mA or less
D.NET (2-channel)	LQE770	700 mA or less
D.NET (2-channel, power supplied from an external source)	LQE775	700 mA or less
SYS.SW	LQZ700	150 mA or less
EX.RI/O	LQE220	665 mA or less
HS.RI/O	LQE230	675 mA or less
OPT.RI/O	LQZ410	410 mA or less

Table 9-6 Current Consumptions of Available I/O Modules

Module name	Model	Current consumption
RI/O (remote I/O station)	LQS000	150 mA or less
	LQS010	150 mA or less
J.STATION (J-station)	LQS020	700 mA or less
IR.STATION (IR station)	LQS021	700 mA or less
D.STATION (D-station)	LQS070	300 mA or less
Digital input modules	LQX110	110 mA or less
	LQX130	70 mA or less
	LQX150	110 mA or less
	LQX151	110 mA or less
	LQX200	80 mA or less
	LQX201	80 mA or less
	LQX210	110 mA or less
	LQX211	170 mA or less
	LQX220	110 mA or less
	LQX240	110 mA or less
	LQX250	110 mA or less
	LQX300	150 mA or less
	LQX310	150 mA or less
	LQX350	170 mA or less
	LQX360	170 mA or less
Digital output modules	LQY100	780 mA or less
	LQY140	400 mA or less
	LQY150	800 mA or less
	LQY160	320 mA or less
	LQY170	320 mA or less
	LQY200	120 mA or less
	LQY300	260 mA or less
	LQY310	260 mA or less
	LQY350	400 mA or less
LQY360	400 mA or less	
Digital I/O module	LQZ300	300 mA or less
Analog input modules	LQA000	Module REV.A: 500 mA or less Module REV.B: 580 mA or less
	LQA050	550 mA or less
	LQA055	550 mA or less
	LQA100	Module REV.A: 500 mA or less Module REV.B: 580 mA or less
	LQA150	550 mA or less
	LQA155	550 mA or less
	LQA200	Module REV.A: 500 mA or less Module REV.B: 580 mA or less
LQA201	Module REV.A: 500 mA or less Module REV.B: 580 mA or less	
Analog output modules	LQA500	Module REV.A: 500 mA or less Module REV.B: 530 mA or less
	LQA600	Module REV.A: 500 mA or less Module REV.B: 530 mA or less
	LQA610	Module REV.A: 500 mA or less Module REV.B: 530 mA or less
Pulse counter module	LQC000	150 mA or less

**CAUTION**

Overheating may cause a fire or unit failure. Where the ambient temperature reaches 48°C or higher, lower the maximum output current that can be drawn from the power supply module. By taking into consideration the environment where the unit is mounted, install a cooling fan in the housing enclosure or reduce the number of modules mounted.

9.8 PCs OK Signal Output Timing

Figure 9-11 shows the changes in PCs OK signal output level that occur when the LADDER switch of an LPU module is set in RUN position or back in STOP position.

■ When set in RUN position

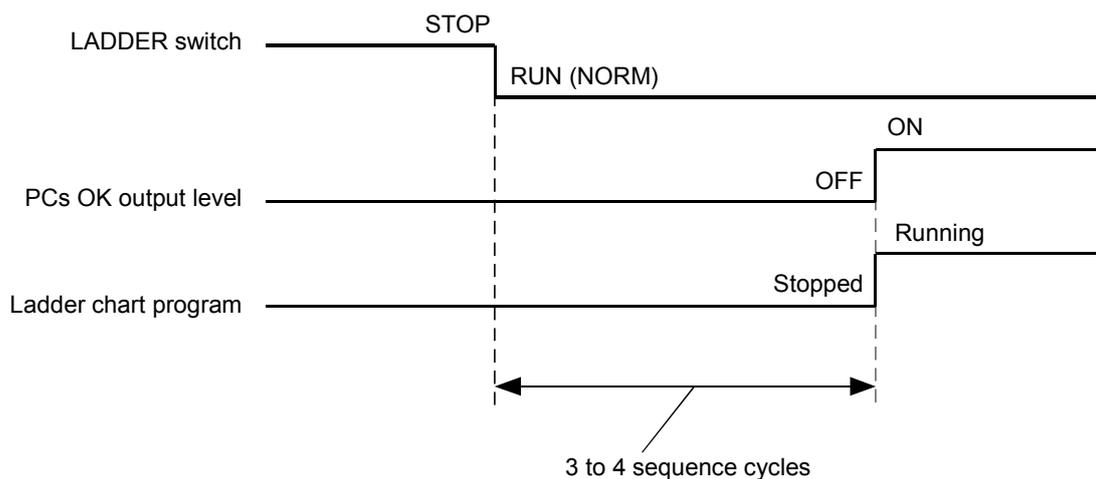


Figure 9-11 Change in PCs OK Signal Output Level When the LADDER Switch is Set in RUN Position

Note: If the LADDER MODE is set to "SIMU", the PCs OK signal will not be switched on when the LADDER switch is set in RUN (SIMU) position.

■ When set in STOP position

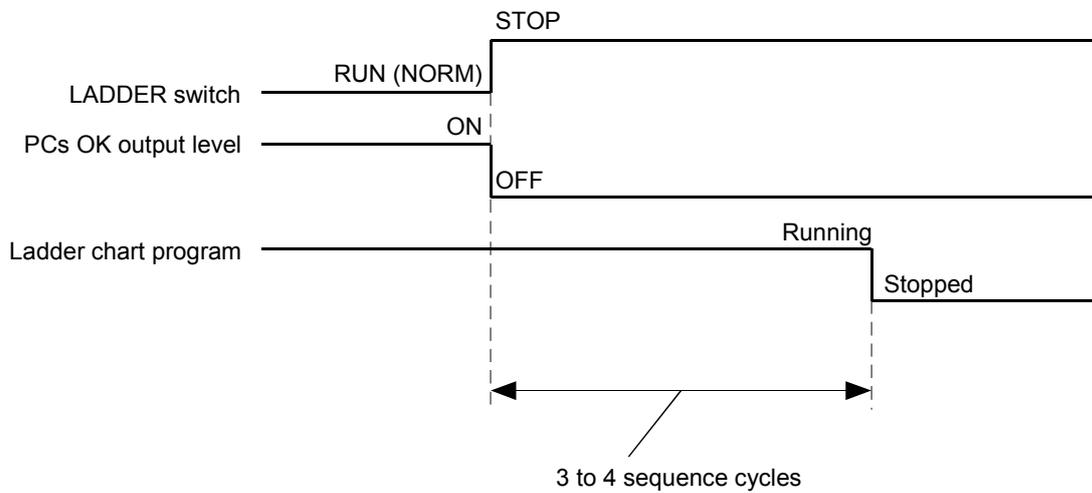


Figure 9-12 Change in PCs OK Signal Output Level When the LADDER Switch is Set in STOP Position

PCs OK signal specification ----

Output form: Relay output (relay-insulated)

Rated outputs: 100 VAC, 12 to 24 VDC/2 A, 48 VDC/0.5 A, 100 VDC/0.1 A

Minimum output: 10 VDC/20 mA

Response time: 15 ms or less

Service life (electrical) of relay: approx. 70,000 cycles of make-and-break operation (2 A at 100 VAC [COS ϕ = 0.4], 2 A at 24 VDC [L/R = 7 ms], make-and-break operation frequency of 1,800 cycles per hour, normal temperature and normal humidity)

Cable spec: Twisted-pair cable, 100 m or less

For more information, see “5.5.1 Wiring for the PCs OK signal.”

9.9 Address Space

■ LPU unit address space

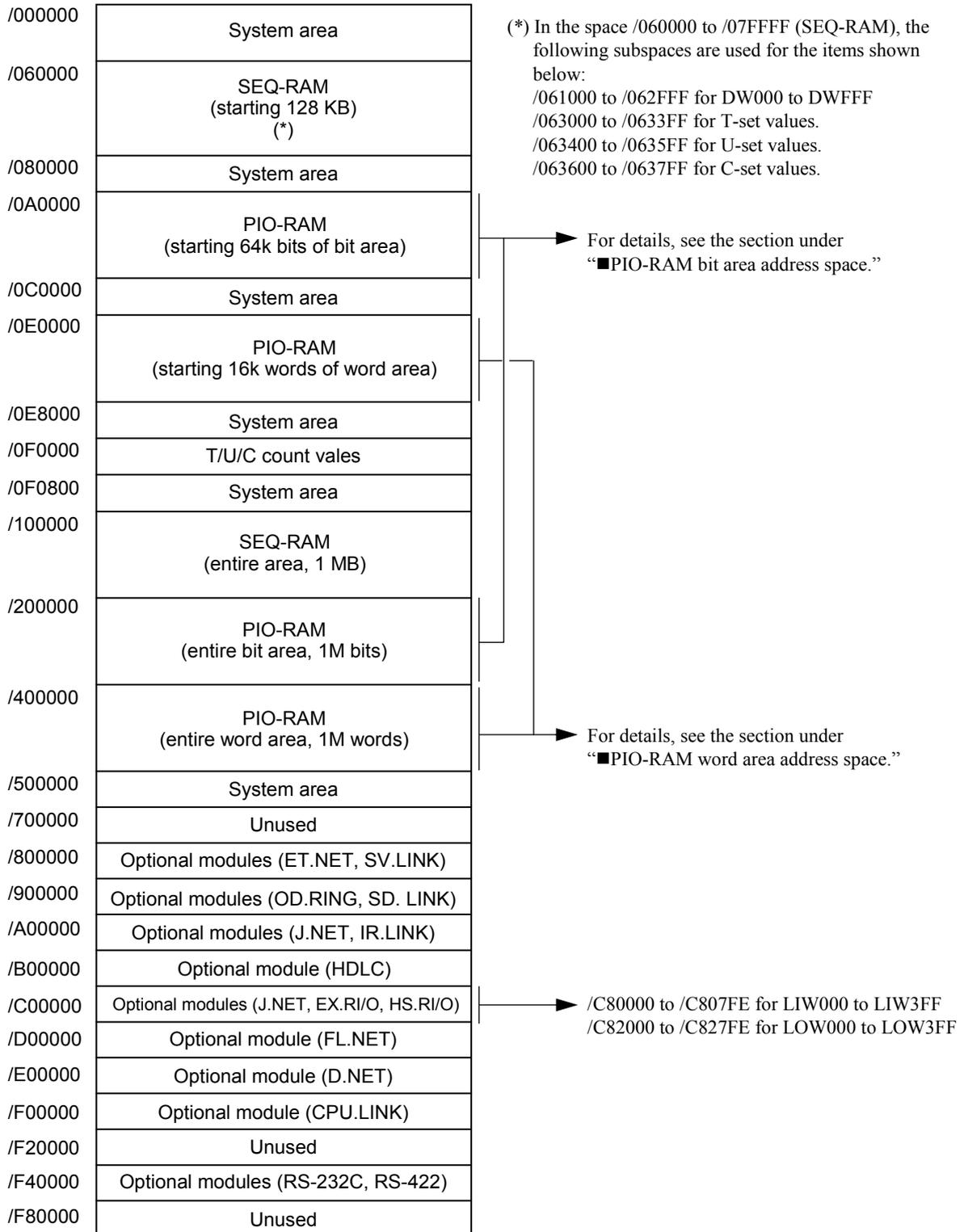


Figure 9-13 LPU Unit Address Space

■ PIO-RAM bit area address space

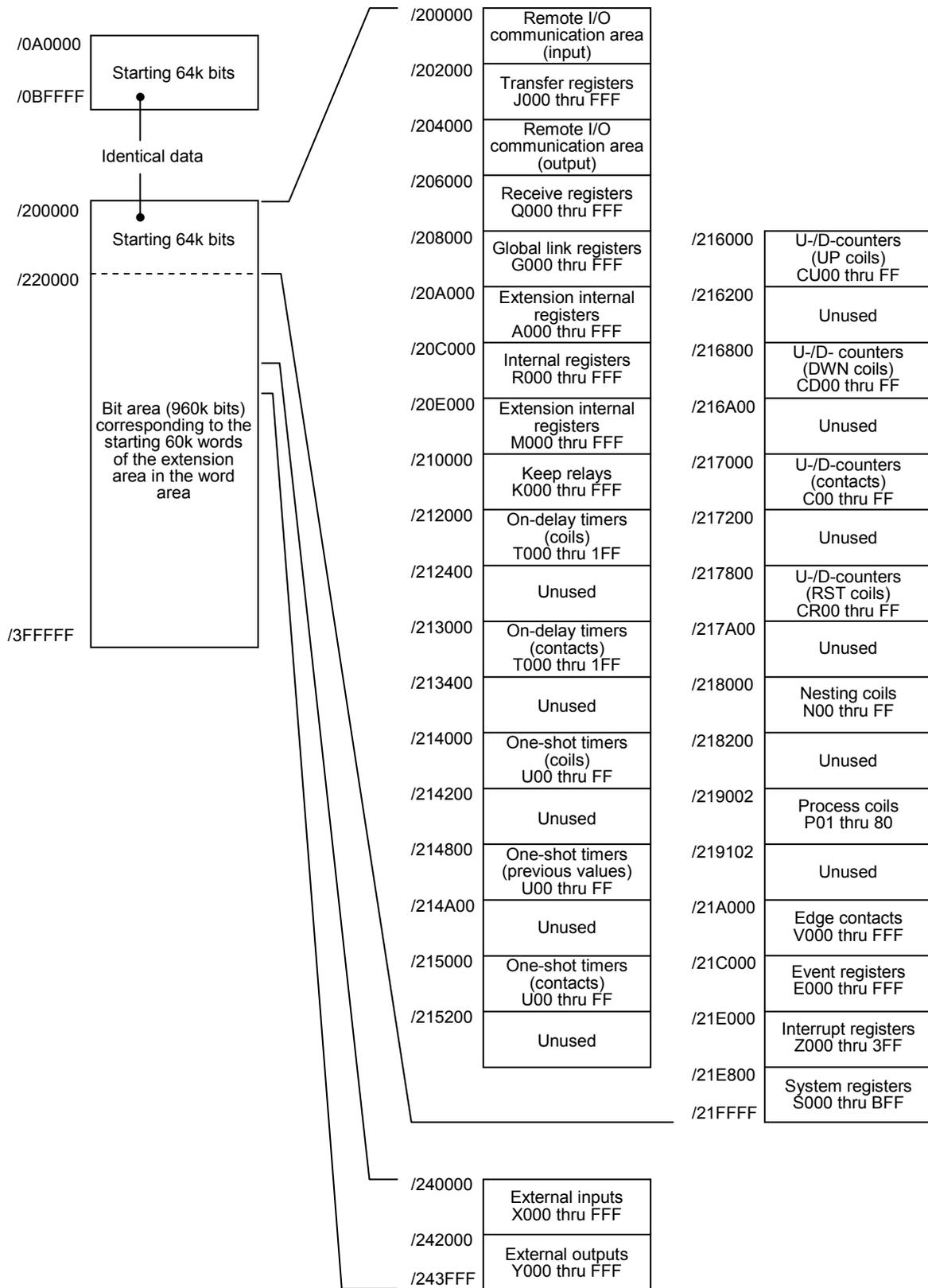


Figure 9-14 PIO-RAM Bit Area Address Space

■ PIO-RAM word area address space

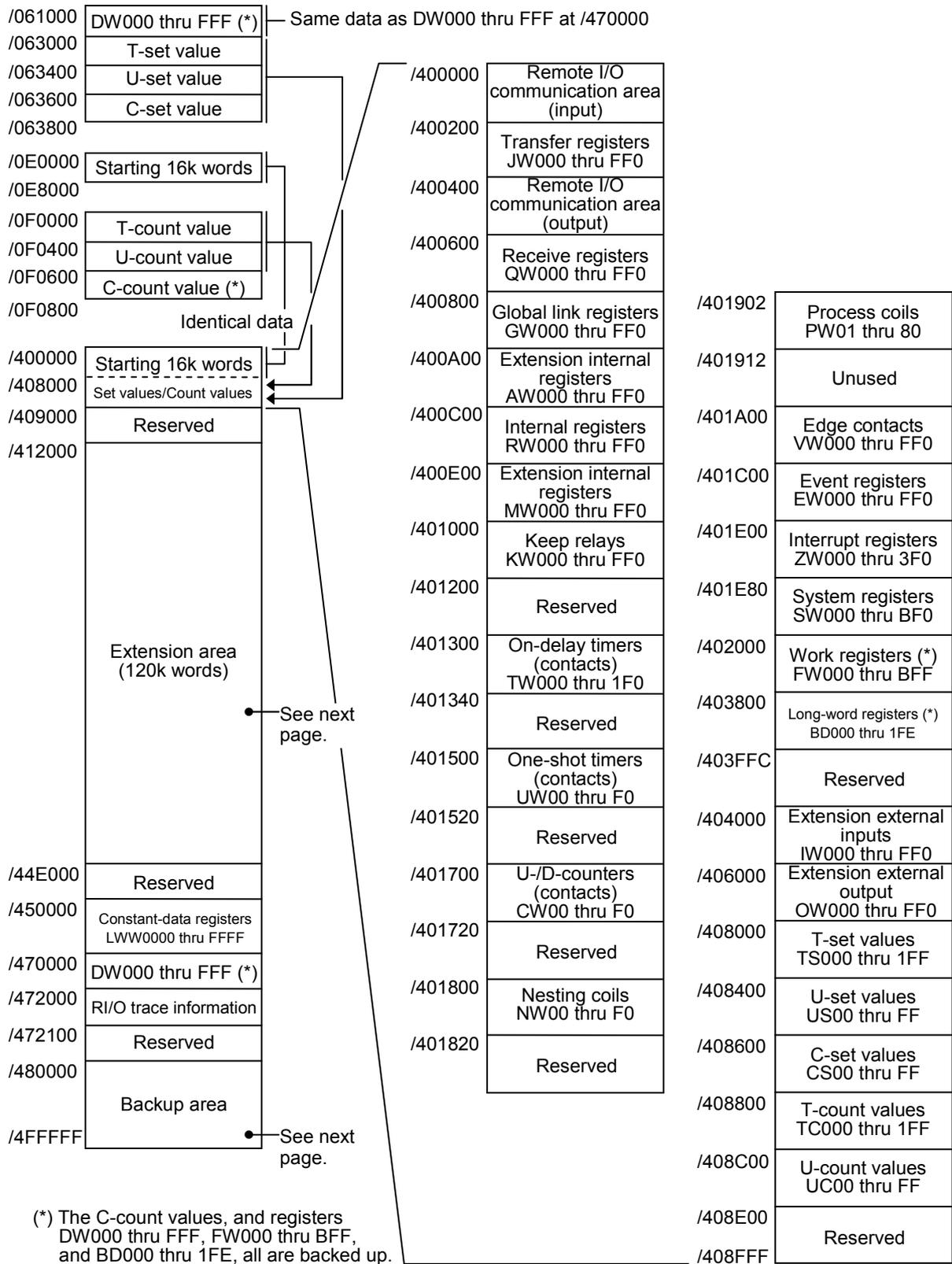


Figure 9-15 PIO-RAM Word Area Address Space (1)

■ PIO-RAM word area address space (continued from previous page)

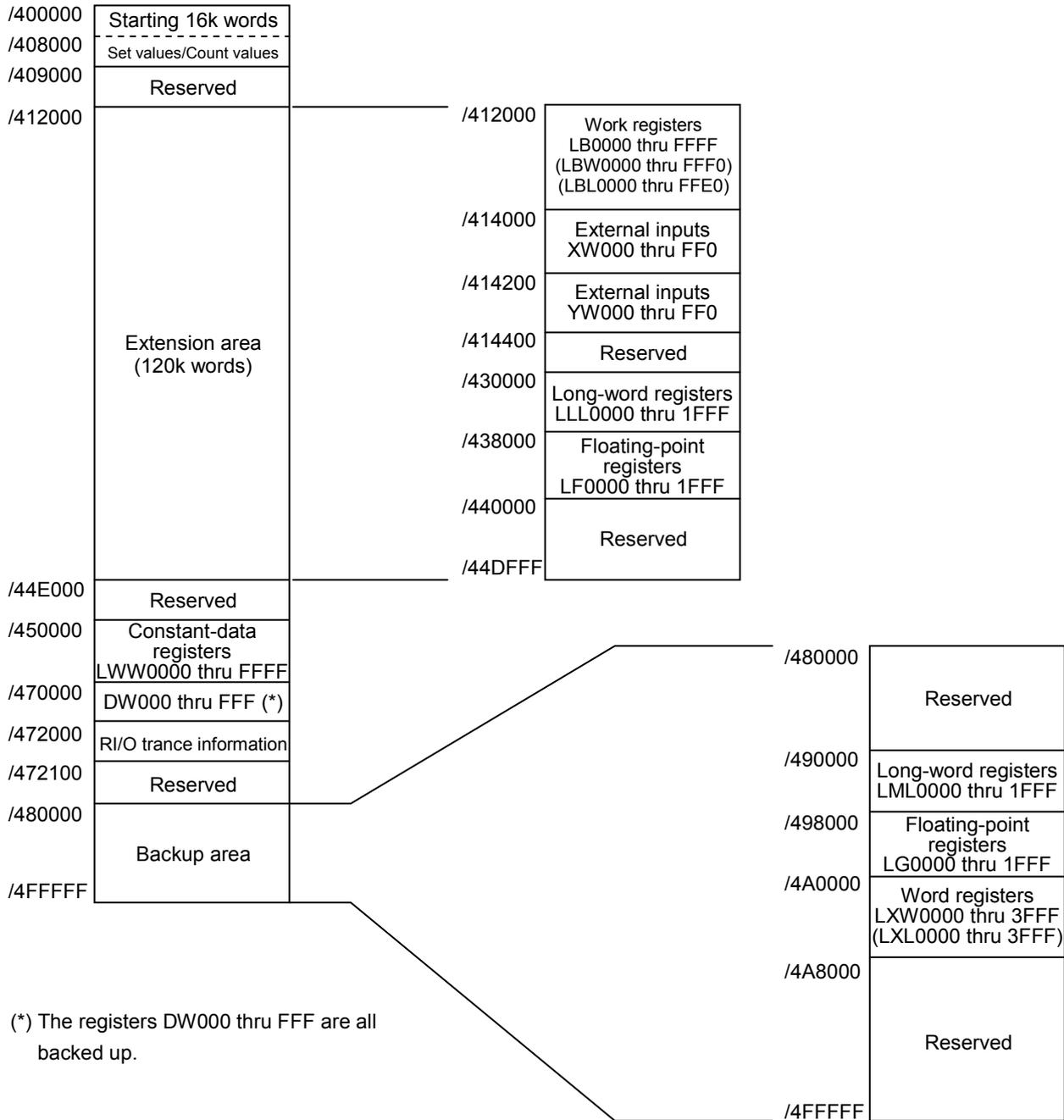


Figure 9-16 PIO-RAM Word Area Address Space (2)

10 MAINTENANCE

10.1 Preventive Maintenance

In order to use the S10V product in an optimal condition, check the following items daily or periodically (two times or more per year).

Table 10-1 Check Items

No.	Item
①	External appearances of modules
②	Indications on display devices (indicators)
③	Mounting screws, terminal block screws, and connector holders (checked for any looseness)
④	Plastic jackets of cables and cords
⑤	Collection of dust and dirt
⑥	Power supply input voltages
⑦	Power supply voltages (of power supply modules and external power supplies)

- ① **External appearances of modules**
Check each mounted module for any crack or break in its casing. Any crack in the casing may be a sign of breakage in the internal circuitry and may result in a system malfunction.
- ② **Indications on display devices (indicators)**
Check the indications on each display device for any sign of abnormality.
- ③ **Mounting screws, terminal block screws, and connector holders**
Before you check these items, be sure to switch off the power to the system. Then, check all the module-mounting screws, terminal block screws, and cable connector holders used in the system for any looseness. If any loose screw or connector holder is found, retighten it. A loose screw may result in a system malfunction or a component burnout due to overheating.
- ④ **Plastic jackets of cables and cords**
Check the plastic jackets of all the cables and cords used in the system for any damage or heat. If the plastic jacket of such a cable or cord is damaged or heated, it may lead to a system malfunction, electric shock, or a component burnout due to short-circuiting.
- ⑤ **Collection of dust and dirt**
Check all the modules used in the system for any collection of dust and dirt. If dust and dirt are collected on a module, switch off the power to the system and clean the module with a vacuum cleaner. Dust and dirt on a module may cause a short circuit in the internal circuitry, resulting in a component burnout.



CAUTION

Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

NOTICE

Before installing the module, discharge any static buildup from your body because static electricity may render the module defective.

- ⑥ Power supply input voltages
 ⑦ Power supply voltages (of power supply modules and external power supplies)
 Check that the input/output voltages of all the power supply modules and external power supplies used in the system are within the specified ranges. Any under- or over-voltage may result in a system malfunction.

The prescribed voltage ranges for the power supply modules are as follows:

Input voltage fluctuation range ---- LQV000: 85 to 132 VAC
 LQV010: 85 to 132 VAC
 LQV100: 85 to 132 VAC, 85 to 132 VDC
 LQV020: 20.4 to 28.8 VDC
 LQV200: 170 to 264 VAC

Output voltage fluctuation range ---- 5 VDC \pm 5% (common to all the three: LQV000, LQV100, LQV020, LQV200)

The output voltage of a power supply module should be checked at the SERVICE CHECK terminals shown below. (For information on operating voltages of optional and I/O modules and voltages of external power supplies, refer to the manuals supplied with those product items.)

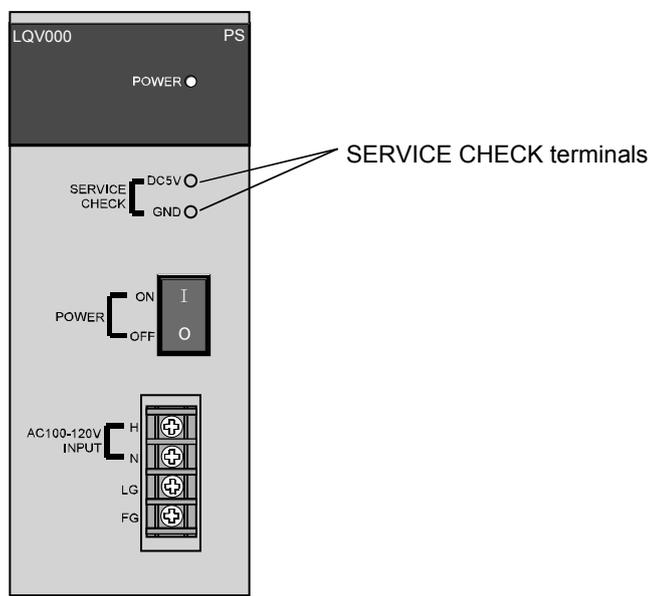


Figure 10-1 SERVICE CHECK Terminals of the Power Supply Modules



CAUTION

- If the input voltage for the power supply module is within the specified range but close to the upper or lower limit, you should conclude that a power problem exists, and ask the power supply facility manager to conduct an inspection.
- Be sure that the power source for supplying power to various modules is rated as specified. The use of a differently rated power source may cause a risk of fire.

NOTICE

- Ensure that the same power source is used for output module external power source (for supplying power to the +V terminal) and load power supply. The use of different power sources may cause a risk of malfunction.
- Hot-swapping of any mounted module will cause damage to the installed hardware or software. So, be sure to replace any such module in a power-off (de-energized) state.

■ Service lives of relay contact

The relays contained in certain types of hardware modules, such as LPU modules (model LQP510, LQP511, or LQP512) and relay digital output (DO) modules (model LQY100, LQY140, or LQY160) have a limited service life due to the wear of their contacts.

If these relays are intended to be operated at rated voltage and rated current, their expected service life is approximately 70,000 switching operations(*) (1,800 cycles per hour). However, if the relays are operated at a higher voltage and a higher current level than the rated, their useful service life will be shorter than expected. The other factors that will make the service life shorter than expected are the following: ambient operating environment, type of the load connected, in-rush current, and surge. So, pay special attention to those factors when installing any of the above-mentioned hardware modules. As a rule, each of those factors should be checked before using the hardware module to which a load is actually connected, or the hardware module should be replaced regularly before its service life is over. It is recommended that, where a long service life is required of a hardware module, the hardware module should be a transistor output module or triac output module, not a hardware module containing a relay for output.

(*) The expected service life of the model LQY160 relay DO module is approximately 100,000 switching operations.

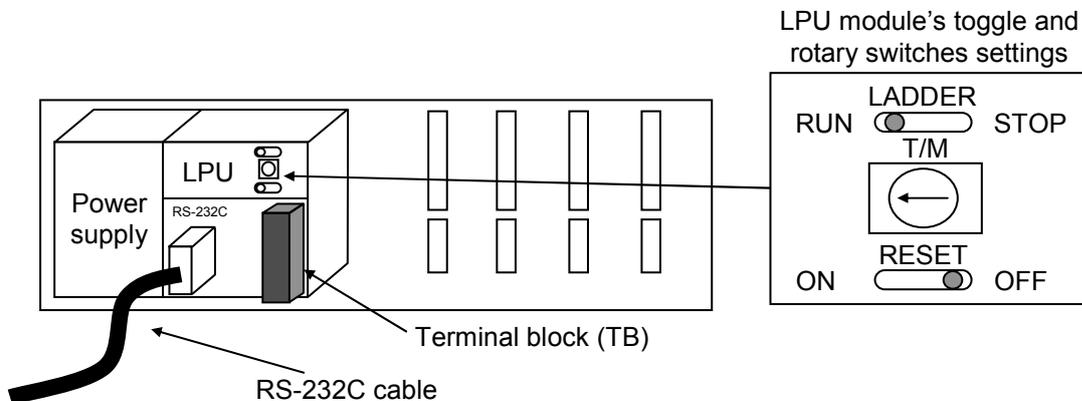
10.1.1 Replacing the module

- What you should get in preparation
 - ① Personal computer (with the S10V BASE SYSTEM installed in it)
 - ② RS-232C cable (or 10BASE-T cable if the communication module used is an ET.NET module)
 - ③ New LPU module (model LQP510/511/512)
 - ④ The above-mentioned ET.NET module is an optional module and, if it is mounted in place, may be selected as the type of communication module to be used. For more information, refer to Section 2.1, “Names and Functions of Each Part,” and Section 3.3, “Mounting the Module,” in the USER’S MANUAL OPTION ET.NET (LQE520) (manual number SVE-1-103) or the USER’S MANUAL OPTION ET.NET (LQE720) (manual number SVE-1-128).

The same is the case for the CMU module, another optional module that is functionally similar to the ET.NET module. For more information, refer to Section 2.1, “Names and Functions of Each Part,” and Section 3.2, “Mounting the Module,” in the USER’S MANUAL OPTION CMU (LQP520/525/527, LQZ500) (manual number SVE-1-110).

- Replacement procedure

- ① Write down, on a piece of paper, the current settings of two switches, labeled LADDER (toggle switch) and T/M (rotary switch), respectively, that are, as shown below, accessible at the front side of the existing LPU module to be replaced.



- ② Ensure that your application system has been shut down. Then, set the existing LPU module’s LADDER switch in STOP position. Next, if any of the optional modules listed in a table on the next page is installed in the controller unit, back up the setup information for each such module, either according to backup instructions given in the accompanying manual or by using the Backup Restore System (model S-7895-09). For information on how to use the Backup Restore System, refer to Section 3.2, “Backup,” of the SOFTWARE MANUAL OPERATION BACKUP RESTORE SYSTEM For Windows® (manual number SVE-3-127).
- ③ Turn off the power supply of the controller unit.
- ④ Remove the terminal block or TB from the existing LPU module.
- ⑤ Replace the existing LPU module with the new one.

- ⑥ Set the new LPU module's T/M switch in the same position as you wrote down in Step ① and set its LADDER switch in STOP position.
- ⑦ Turn on the power supply of the controller unit.
- ⑧ Connect the personal computer and the new LPU module together with the RS-232C cable. Then, start the S10V Base System and load all necessary application programs to the controller's LPU module.
If the setup information for the above-mentioned optionally-installed module(s) was backed up in Step ② above, restore it to the optionally installed module(s). For information on how to restore it, refer to Section 3.3, "Restore," of the SOFTWARE MANUAL OPERATION BACKUP RESTORE SYSTEM For Windows® (manual number SVE-3-127).
- ⑨ Reset the new LPU module by setting the RESET switch in ON position and then in OFF position at its front.
- ⑩ Turn off the power supply of the controller unit.
- ⑪ Attach the TB that you removed in Step ④ to the new LPU module.
- ⑫ Set the new LPU module's LADDER switch in the same position as you wrote down in Step ①.
- ⑬ Turn on the power supply of the controller unit and check that the new LPU module is running normally.

Module model	LPU setup information	Reference
LQE220	Extended-R/I/O settings (all required)	"4.2.5 F/D function" in the USER'S MANUAL OPTION EX.R/I/O (LQE220) (manual number SVE-1-148)
LQE230	High-speed R/I/O settings (all required)	"4.2.5 F/D function" in the USER'S MANUAL OPTION HS.R/I/O (LQE230) (manual number SVE-1-149)
LQE500/LQE502	IP address, subnet mask, and node name	"5.6.8 Saving setups" and "5.6.9 Sending setups" in the USER'S MANUAL OPTION FL.NET (LQE500/LQE502) (manual number SVE-1-101)
LQE520	IP address, subnet mask, and routing information (all required)	"4.4.5 Load IP address setup information in from file" and "4.4.6 Save IP address setup information in file" in the USER'S MANUAL OPTION ET.NET (LQE520) (manual number SVE-1-103)
LQE545	Interrupt input-started task definition	"6.2 Task Start by Interrupt Input" in the USER'S MANUAL OPTION J.NET-INT (LQE545) (manual number SVE-1-107)
LQE546	Interrupt input-started task definition	"4.3.2 F/D function" in the USER'S MANUAL OPTION IR.LINK (LQE546) (manual number SVE-1-117)
LQE550	Inter-CPU link settings (all required)	"4.8.5 Saving CPU link parameters in file (for S10V controllers only)" and "4.8.6 Loading CPU link parameters in from file (for S10V controllers only)" in the USER'S MANUAL OPTION CPU LINK (LQE550) (manual number SVE-1-109)
LQE702	IP address, subnet mask, and node name	"5.5.8 Saving setups" and "5.5.9 Sending setups" in the USER'S MANUAL OPTION FL.NET (LQE702) (manual number SVE-1-130)
LQE710	IP address, subnet mask, and routing information (all required)	"4.3.12 Load IP address setup information in from file" and "4.3.13 Save IP address setup information in file" in the USER'S MANUAL OPTION OPTET (LQE710) (manual number SVE-1-136)
LQE720	IP address, subnet mask, and routing information (all required)	"4.3.10 Load IP address setup information in from file" and "4.3.11 Save IP address setup information in file" in the USER'S MANUAL OPTION ET.NET (LQE720) (manual number SVE-1-128)
LQP520/LQP525/ LQP527	IP address, subnet mask, and routing information	"4.2 Using the Base System" in the USER'S MANUAL OPTION CMU (LQP520/525/527, LQZ500) (manual number SVE-1-110)

10.2 Replacing the Backup Battery

When the backup battery capacity lowers, the “ALARM” indicator of the LPU module comes on. Confirm the drop of the battery capacity with the error log information. When the battery capacity has lowered, the contents of the backup memory may be destructed if the power-off time exceeds 5 minutes. To prevent this, save the programs by the collective saving system beforehand.

The life of the battery is 7 years. Replace it within 7 years because a liquid leak may occur.

When the operating environment is severe (high temperature or high humidity), replace the battery earlier (5 to 6 years) than the end of this period.

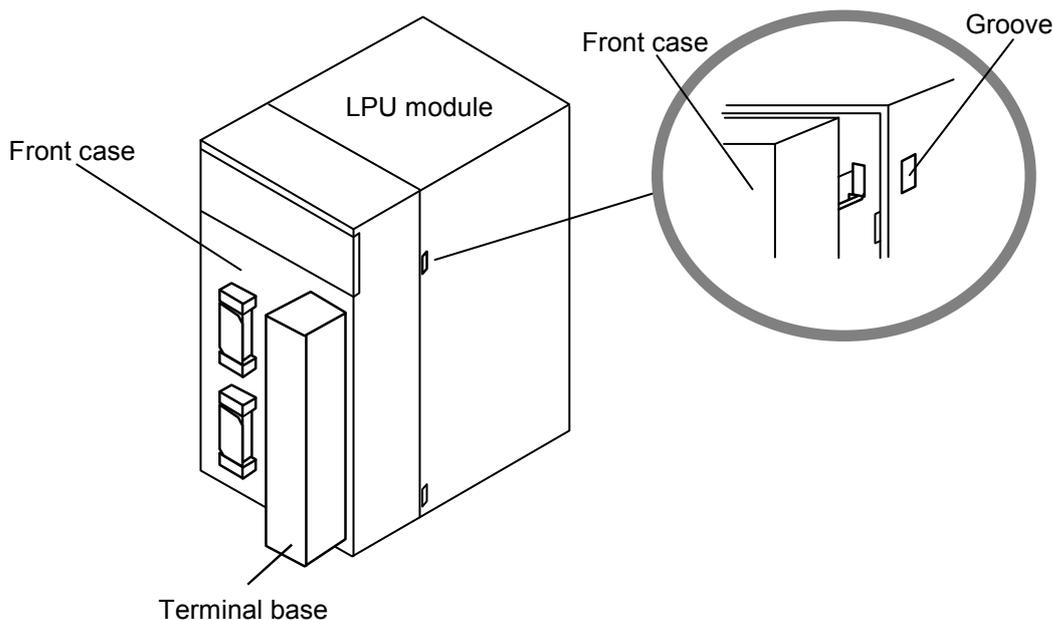
When you want to ask us for the replacement work, contact our sales section or distributor. The battery is replaced by maintenance engineer with charge.

■ Precautions on battery replacement

- When the “ALARM” indicator of the LPU module lights up, check the error log information. If the alarm is due to a drop of the battery capacity, replace the battery. However, save the programs against program destruction beforehand by the collective saving system.
- Finish the battery replacement within 5 minutes. When the battery is disconnected, the clock and the contents of the memory can be held for a maximum period of 5 minutes.
- The clock may stop. Check the time after the battery is replaced.

10.2.1 Replacing procedure

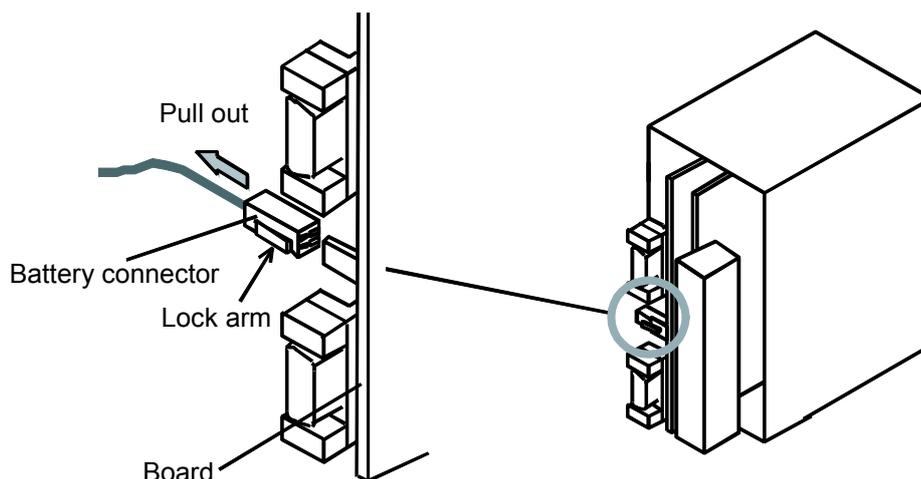
- ① Discharge the static electricity charged on the human body before starting the replacement work.
- ② Switch off the power switch of the power supply module and remove the LPU module.
- ③ Remove the claws provided at 2 positions each on the left and right side of the front case shown in the figure below by drawing these claws while pushing them.
- ④ Remove the front case.



■ Notice

To finish the operations of the following steps ⑤ to ⑧ within 5 minutes, prepare a battery for replacement (model: BR6T-3WK41-Z manufactured by Hitachi Maxcell, Ltd.) at hand.

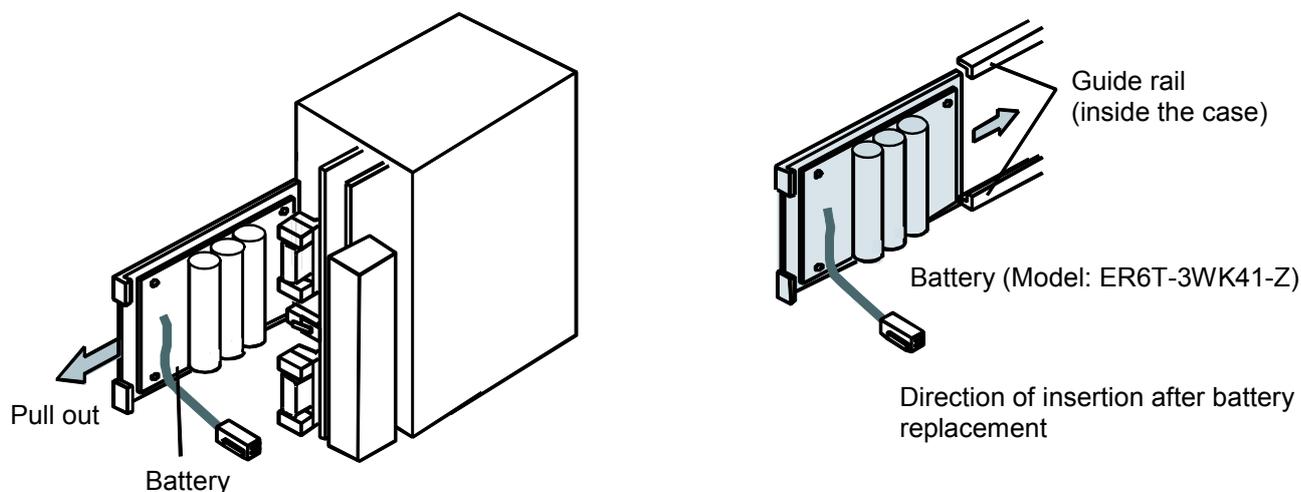
- ⑤ Remove the lock arm of the battery connector shown in the figure below and pull out the battery connector from the board by pulling it slowly in the direction of the arrow.



- ⑥ Remove the battery shown in the figure below (at left) by pulling it slowly.
 ⑦ Insert the battery for replacement (model: BR6T-3WK41-Z) along the guide rails provided on the left side inside the LPU module shown in the figure below (at right).
 ⑧ Insert the battery connector into the board.
 ⑨ Check the time. If the time is wrong, set it anew.

■ Notice

If the battery connector gets out of place or causes a contact fault, the backup data may be lost. Insert the battery connector securely into the plug of the board until a “click” may be heard.



10.2.2 Scrapping a used battery

■ **General cautions when asking for disposal of a used lithium battery.**

1. Pile-up method and pile-up container

Pile up batteries so as not to form a short circuit, charge or overdischarge circuit among the batteries. Pile them up in the following way.

- Use an insulating material for the pile-up container.
- Put batteries in line in good order according to each type and size. When piling up the batteries in multiple steps, insert an insulating material between the steps to completely prevent terminals from making contact with one another.
- Do not mix different types of battery and other metal materials (wires, nails, etc.) when piling up batteries.
- Batteries having an offensive smell are hazardous, being flammable. Do not put such batteries together with other batteries but put each of them in a vinyl bag and then pile it up in good order. As a rule, the batteries having an offensive smell need to be disposed of individually.

2. Pile-up place

- Pile up batteries in a place where no open fire exists nearby.
- Pile up batteries in a place near which there is not any hazardous substance specified in the Fire Service Law.
- Pile up batteries in a place that is not exposed to rain and water.

3. Packing method

- Perform packing by taking a measure to avoid mixing batteries during transportation, for example, by putting cushioning materials in a package.
- Put batteries in pile-up containers and put these containers in a corrugated fiberboard case or wooden case using cushioning materials in a packing unit of 10 kg or less.
- Indicate the following contents on the packing case:
Used lithium battery, battery type (ER), prohibition of mixing with hazardous substances, where to contact in an emergency, prohibition of water leak.

4. Transport method

- Do not mix batteries with the hazardous substances specified in the Fire Service Law.
- Put the goods in such a place as may go to a high temperature, for example, near a radiator.
- Fix the goods against collapse of cargo.
- Take a measure so that the goods may not get wet in the rain or water.

■ **Manifest information**

Ask the specialist company of industrial waste disposal to dispose of used lithium batteries.



CAUTION

Handling batteries incorrectly will invite the danger of firing or bursting. Some of used batteries may have a considerable remaining capacity. Observe the general cautions for piling-up, packing, and transportation to forward used batteries to the specialist company of waste disposal safely. Regarding concrete packing and transportation methods, make previous arrangements thoroughly with the person in charge of this specialist company.

10.3 Troubleshooting

If a problem arises during operation of the S10V product, perform troubleshooting according to the following procedure:

- ① Diagnose the problem from indications on the operation-condition indicators provided on such modules as the power supply, LPU, optional, and I/O modules in the LPU or I/O unit.
- ② Diagnose the problem from an error log displayed on the tool system.
- ③ Replace the faulty module.

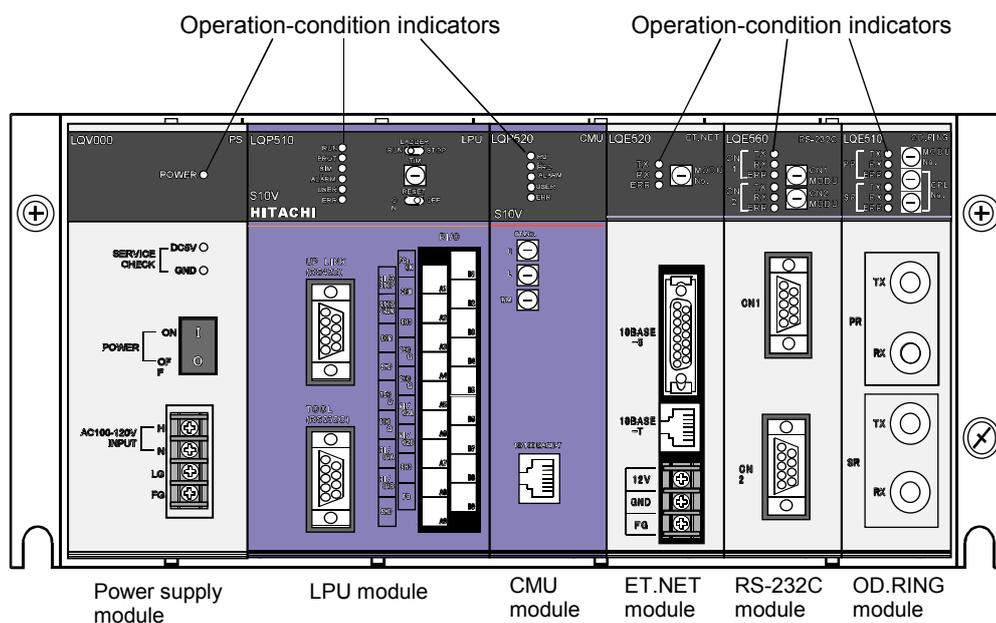


Figure 10-2 Operation Condition Indicators in an LPU Unit (4-Slot Mount Base)

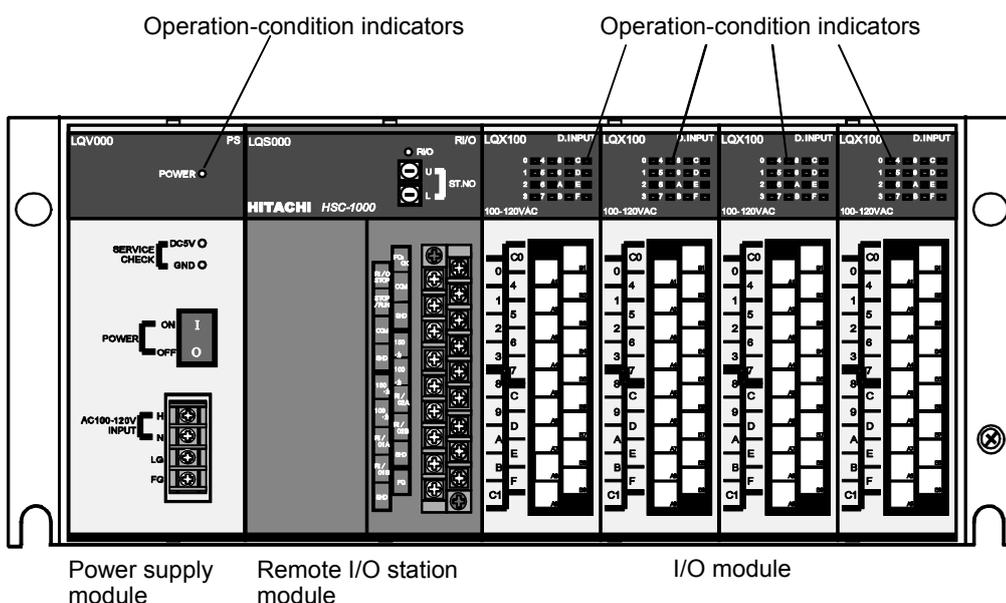


Figure 10-3 Operation Condition Indicators in an I/O Unit (4-Slot Mount Base)

■ Diagnosing from indicator indications

① Power supply module

If the operation condition indicator of the power supply module is OFF during operation, an abnormal operating voltage may be being applied to the module. Check the power supply voltage. If it is an AC power supply, also check the waveform.

② Optional modules

The operation condition indicators of an optional module provide an indication whose meaning depends on its module type. For details, refer to a description of maintenance and troubleshooting in the user’s manual supplied with the optional module.

③ I/O modules

The operation condition indicators of an I/O module provide an indication whose meaning depends on its module type. For details, refer to a description of “7 MAINTENANCE” in the “HARDWARE MANUAL I/O MODULES (manual number SME-1-114).”

④ LPU modules

The operation condition indicators of an LPU module are the six: RUN, PROT, SIMU, ALARM, USER, and ERR. Of these, the indicators indicating an abnormal condition are the two: ALARM and ERR. If any of the two goes out during operation, perform troubleshooting by taking a remedial action as described below.

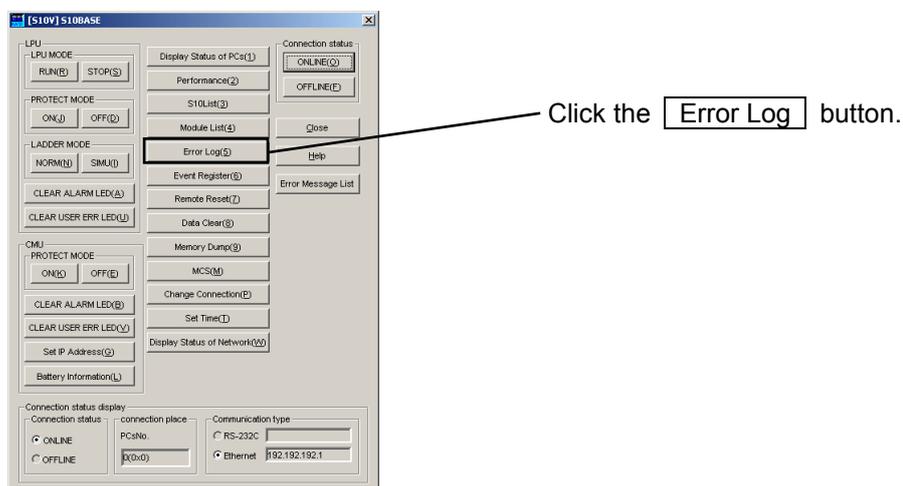
Table 10-2 Indications on LPU Module Indicators and Remedial Actions

Indicator	Remedial Action
ALARM indicator lit up	<p>This indication indicates a “backup battery low” condition or an error detected by a startup check of a mounted optional module.</p> <ul style="list-style-type: none"> ● “Battery low” condition Replace the battery. For more information, see “10.2 Replacing the Backup Battery.” An “ALARM” log can be viewed on the tool system. By performing the procedure described on the next page, start up the tool system and view the log. ● Error detected by a startup check of an optional module By performing the procedure described on the next page, start up the tool system and view an error log on the optional module. For a description of the error and a required action, refer to a description of maintenance and troubleshooting in the user’s manual supplied with the optional module.
ERR lit up	<p>A serious fault has occurred in the LPU module, making the continuation of its operation impossible. By performing the procedure described on the next page, start up the tool system, view an “ERR” log, and find the cause of the fault. Serious faults include a hardware fault such that fault recovery is impossible unless the module is replaced. Since such faults also include a software error, the program involved may need to be checked.</p>

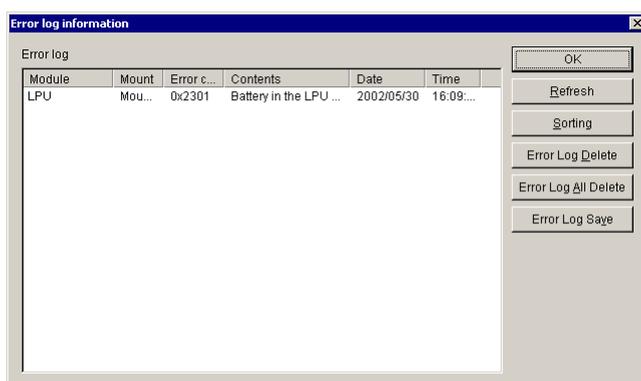
■ Viewing logs on the tool system

For information on how to start up the tool system, see “6 TOOLS.”

Initiate the basic tool and click the **Error Log** button.



The [Error log information] window appears, presenting such information as faulty modules and their mounting slots, error codes and their meanings, and dates and times at which an error occurred.



← Example of an error log reporting a “battery low” condition

Find the meanings of relevant error codes in the presented error information and take an appropriate action. For the meanings of all possible error codes, see the “Error codes” listed on the next page.

■ Error codes

Table 10-3 is a list of all error codes for an LPU module that may appear in an error log presented by the basic tool and of required actions.

Table 10-3 Possible Error Codes for an LPU Module and Required Actions (1/2)

Error code	Meaning	Additional information and required action
0x1101	Processor register compare-check error	At startup, the self-diagnosis capability detected an error. Reset the LPU module and then check if the same error persists. If so, replace the LPU module.
0x1102	Processor arithmetic/logical operation check-detected error	
0x1103	RAM compare-check detected error	
0x1105	ROM compare-check detected error	
0x1106	ROM check sum error	
0x1108	Ladder program check sum error	
0x1109	Timer diagnosis-detected error	
0x110A	Ladder processor diagnosis-detected error	
0x110B	Rotary switch setting range violation	A setting of the T/M or operation setting switch is outside the permitted range. See “3 NAMES AND FUNCTIONS OF EACH PART,” set the switch again, and reset the LPU module.
0x1201	RAM parity error	Reset the LPU module. Then, if the same error persists, replace the module.
0x1202	RAM parity error (ladder processor detected)	
0x1203	Ladder illegal instruction detected	
0x1204	Ladder illegal instruction detected (by the ladder processor)	
0x1205	Watchdog timer timeout	
0x1206	Ladder program watchdog timer timeout	The processing time required by a ladder program exceeded the set time value of the watchdog timer. Set a larger value for the set time value of the watchdog timer, or reduce the required processing time of the ladder program.
0x1207	Stack overflowed	Reset the LPU module. Then, if the same error persists, replace the module.
0x1208	Ladder program nesting overflowed	The depth of a nesting in a ladder program is five levels or more. Reduce the nesting depth to four levels or less.
0x1209	Protection error	An attempt to write data to a protected area in a ladder program was detected. Review the ladder program. For information on the protected area, see “8 OPERATION.”
0x120A	User arithmetic/logical function registration address error	A registration address for a ladder program is set outside SEQ-RAM. Review the setting.
0x120B	RAM parity error (detected when an access was made to it from the system bus)	Reset the LPU module. Then, if the same error persists, replace the module.
0x120C	Arithmetic/logical function address error	An attempt to access a long word was made from a word boundary during execution of an arithmetic/logical function. Review the user program so that it will access a long word from a long-word boundary.

Table 10-3 Possible Error Codes for an LPU Module and Required Actions (2/2)

Error code	Meaning	Additional information and required action
0x120D	Index specification error in operational function parameter	An index was specified in an operational function parameter (for example, operational function for option module) in which specifying an index was disabled. Reconsider the user ladder program.
0x1304	Illegal instruction detected	Reset the LPU module. Then, if the same error persists, replace the module.
0x1306	Illegal instruction detected	
0x1309	Address error	
0x130A	Address error	
0x13XX (*1)	Undefined exception detected	
0x1480 to FF (*2)	Optional-module memory parity error	A parity error occurred during accessing an optional module's internal RAM from the LPU module. Reset the LPU module. Then, if the same error persists, replace the optional module.
0x1601	CMU response monitoring timeout	No response was received from the CMU module. Reset the LPU module. Then, if the same error persists, the CMU module may contain a failed component. Replace the CMU module.
0x1602	CMU down	The CMU module is down. Reset the LPU module. Then, if the same error persists, the CMU module may contain a failed component. Replace the CMU module.
0x2301	LPU battery low	The backup battery is low. Replace the battery. For more information, see "10.2 Replacing the Backup Battery."
0x2401	Optional-module startup check-detected error	One of the mounted optional modules is not up and running. View an error log on the optional module and remove the cause of the error.

(*1) XX is a value in the range 00 to FF, except 04, 06, 09, and 0A.

(*2) The low-order two digits of each of these error codes represent the optional module. For information on these error codes and the corresponding optional modules, see "Optional-module memory parity errors and the corresponding optional modules."

■ Optional-module memory parity errors and the corresponding optional modules

Low-order 2 digits of error code	Corresponding optional module
80/81	CPU link (80: Main module; 81: Submodule)
82/83	OD.RING (82: Main module; 83: Submodule)
92/93	J.NET/J.NET-INT/IR.LINK (92: Main module; 93: Submodule)
A0 to A3	RS-232C/RS-422 (A0: Channel 0; A1: Channel 1; A2: Channel 2; A3: Channel 3)
D2/D3	ET.NET/SV.LINK (D2: Main module; D3: Submodule)
E2/E3	FL.NET (E2: Main module; E3: Submodule)
F0 to F3	D.NET (F0: Channel 0; F1: Channel 1; F2: Channel 2; F3: Channel 3)

■ Detailed error information table for LPU errors

When an error occurs in an LPU module, detailed error information is stored in the internal RAM of the LPU. By looking up this table, users can conduct a more accurate diagnosis of the error than with the error information that can be viewed using the basic tool. The table can be looked up using the MCS data displaying function of the basic tool.

The detailed error information table is capable of storing up to eight cases of error information. When the table becomes full, the oldest case of error information is overwritten with a new one. The contents of this table are backed up by battery, so they will not be lost if the power to the LPU module is switched off.

(1) Table structure

Address		
/004D D000	Effective-data flag	Effective-data flag: Indicates whether or not effective data is present in the detailed error information table. When this flag is set to the value /0000 0001, it indicates that effective data is present.
/004D D004	Case pointer	
/004D D008	Case 0 (512 bytes)	Case pointer: By case number, indicates the location (case) at which to store a next case of error information. The initial value of this pointer is /0000 0000 and is incremented every time an error occurs. If the pointer exceeds the value /0000 0007, it is set to /0000 0000. For example, if the pointer value is currently /0000 0002, the latest case of error information stored is case 1. Cases 0 thru 7: Each is an area for storing a case of error information.
/004D D208	Case 1 (512 bytes)	
/004D D408	Case 2 (512 bytes)	
/004D D608	Case 3 (512 bytes)	
/004D D808	Case 4 (512 bytes)	
/004D DA08	Case 5 (512 bytes)	
/004D DC08	Case 6 (512 bytes)	
/004D DE08	Case 7 (512 bytes)	

(2) Case format

Offset from
the beginning
of case

+ /0000 0000	Error code
+ /0000 0002	Time an error occurred: Seconds
+ /0000 0004	Minutes
+ /0000 0006	Hours
+ /0000 0008	Day of month
+ /0000 000A	Month of year
+ /0000 000C	Year
+ /0000 000E	Day of week (Note)
+ /0000 0010	Detailed-information word count
+ /0000 0014	Detailed information
+ /0000 01FF	

Error code: Error code for an error that occurred. For the meaning of this error code, see Table 10-3, "Possible Error Codes for an LPU Module and Required Actions."

Time an error occurred:
Time at which an error occurred. The information stored in this area is the time maintained by the LPU module. Hence, the information may or may not be correct, depending on the time setting for the LPU module.

Detailed-information word count:
A count of the number of effective data bytes of the detailed information provided. As many effective data bytes as indicated that are stored from the beginning (offset + /0000 0014) of the detailed-information storage area are used as the detailed information.

Detailed information:
Information on an error that occurred. The format in which the detailed information is stored depends on the type of the error. For details, see item (3), "Detailed information," that follows.

Note: The day of week is represented by one of the numeric values /0001 through /0007. For example, the value /0001 signifies Sunday, and /0007 Saturday.

(3) Detailed information

• Error codes 0x1101 and 0x1102 and their format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0000 (detailed info word count)	
+/0000 0014	0x0000 0000	

• Error code 0x1105 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 000C (detailed info word count)	
+/0000 0014	Address at which an error occurred	
+/0000 0018	Read data	
+/0000 001C	Read data	

• Error code 0x1108 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0008 (detailed info word count)	
+/0000 0014	Starting address of area	
+/0000 0018	Sum value	

• Error code 0x110A and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 000C (detailed info word count)	
+/0000 0014	Address at which an error occurred	
+/0000 0018	Write data	
+/0000 001C	Read data	

• Error code 0x2301 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0000 (detailed info word count)	
+/0000 0014	0x0000 0000	

• Error code 0x2401 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0040 (detailed info word count)	
+/0000 0014	I/F register address 1	
	:	
+/0000 0050	I/F register address 16	

(*2)

• Error code 0x120D and their format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 002C (detailed info word count)	
+/0000 0014	N coil number	
+/0000 0018	Ladder program counter (SPC)	
+/0000 001C	0x0000 0000	
+/0000 0020	Error occurrence ladder instruction	
+/0000 0024	0x0000 0000	
+/0000 0028	0x0000 0000	
+/0000 002C	0x0000 0000	
+/0000 0030	0x0000 0000	
+/0000 0034	0x0000 0000	
+/0000 0038	0x0000 0000	
+/0000 003C	0x0000 0000	

• Error code 0x1103 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 000C (detailed info word count)	
+/0000 0014	Address at which an error occurred	
+/0000 0018	Write data	
+/0000 001C	Read data	

• Error code 0x1106 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0008 (detailed info word count)	
+/0000 0014	Starting address of ROM area	
+/0000 0018	Sum value	

• Error code 0x1109 and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0004 (detailed info word count)	
+/0000 0014	Error No. (*1)	

• Error code 0x110B and its format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 0004 (detailed info word count)	
+/0000 0014	Value of switch setting	

• Error codes 0x1209 and 0x120C and their format

Offset from the beginning of case

	2^{31}	2^0
+/0000 0010	0x0000 002C (detailed info word count)	
+/0000 0014	N coil number	
+/0000 0018	Ladder program counter (SPC)	
+/0000 001C	0x0000 0000	
+/0000 0020	Error occurrence access address 1	
+/0000 0024	Error occurrence access address 2	
+/0000 0028	Error occurrence access address 3	
+/0000 002C	Error occurrence access address 4	
+/0000 0030	Error occurrence access address 5	
+/0000 0034	Error occurrence access address 6	
+/0000 0038	Error occurrence access address 7	
+/0000 003C	Error occurrence access address 8	

(*1) Error No. = 0x0000 0001:

Time limit is reached earlier than specified.

0x0000 0002:

Time limit is reached later than specified.

(*2) I/F register addresses and the corresponding optional modules at which the error occurred

I/F register address	Corresponding optional module
/41F800, F810	CPU link (/41F800: Main module; /41F810: Submodule)
/41F820, F830	OD.RING (/41F820: Main module; /41F830: Submodule)
/41F920, F930	J.NET/J.NET-INT/IR.LINK (/41F920: Main module; /41F930: Submodule)
/41FA00, FA10, FA20, FA30	RS-232C/RS-422 (/41FA00: Channel 0; /41FA10: Channel 1; /41FA20: Channel 2; /41FA30: Channel 3)
/41FD20, FD30	ET.NET/SV.LINK (/41FD20: Main module; /41FD30: Submodule)
/41FE20, FE30	FL.NET (/41FE20: Main module; /41FE30: Submodule)
/41FF00, FF10, FF20, FF30	D.NET (/41F00: Channel 0; /41F10: Channel 1; /41F20: Channel 2; /41F30: Channel 3)

10 MAINTENANCE

• Error codes other than listed on the previous page

Offset from the beginning of case	2 ³¹	2 ⁰	Offset from the beginning of case	2 ³¹	2 ¹⁶	2 ¹⁵	2 ⁰
+/0000 0010	0x000001EC(detailed-info word count)		+/0000 00C4	BCR1			BCR2
+/0000 0014	N-coil No. (*1)		+/0000 00C8	WCR1			RAMER
+/0000 0018	Ladder program counter (SPC) (*2)		+/0000 00CC	PADR			PBDR
+/0000 001C	HI-FLOW execution process No. (*3)		+/0000 00D0	PCDR			PDDR
+/0000 0020	R0 register	MPU internal registers	+/0000 00D4	PEDR			PFDR
+/0000 0024	R1 register		+/0000 00D8	PGDR			PHDR
+/0000 0028	R2 register		+/0000 00DC	PJDR			PKDR
+/0000 002C	R3 register		+/0000 00E0	PLDR			/0000
+/0000 0030	R4 register		+/0000 00E4	IRQSEL			IRQSTS
+/0000 0034	R5 register		+/0000 00E8	REV			BUSTOUT
+/0000 0038	R6 register		+/0000 00EC	BTOADRH			BTOADRL
+/0000 003C	R7 register		+/0000 00F0	RIOMODE			RIOSTART
+/0000 0040	R8 register		+/0000 00F4	RIOSTS			RIOINTMASK
+/0000 0044	R9 register		+/0000 00F8	RIOFIFOADR			ROPFIFODT
+/0000 0048	R10 register		+/0000 00FC	IOMODE			STSCHK
+/0000 004C	R11 register		+/0000 0100	IOSTS			STATUS0
+/0000 0050	R12 register		+/0000 0104	STATUS1			STATUS2
+/0000 0054	R13 register		+/0000 0108	STATUS3			PIOSTS
+/0000 0058	R14 register		+/0000 010C	PERRADRH			PERRADRL
+/0000 005C	Stack pointer	+/0000 0110	PERRDATAH			PERRDATAL	
+/0000 0060	Program counter	+/0000 0114	PRTYMODE			SEQREG0	
+/0000 0064	Status register	+/0000 0118	SEQREG1			SEQREG2	
+/0000 0068	GBR	+/0000 011C	SEQREG3			SEQREG4	
+/0000 006C	VBR	+/0000 0120	SEQREG5			SEQREG6	
+/0000 0070	MACH	+/0000 0124	SEQREG7			SEQREG8	
+/0000 0074	MACL	+/0000 0128	SEQREG9			SEQREG10	
+/0000 0078	PR	+/0000 012C	SEQREG11			SEQREG12	
+/0000 007C	FR0 register	+/0000 0130	SEQREG13			SEQREG14	
+/0000 0080	FR1 register	+/0000 0134	SEQREG15			SEQPCH	
+/0000 0084	FR2 register	+/0000 0138	SEQPCL			RESET	
+/0000 0088	FR3 register	+/0000 013C	SEQSTS			SEQINTSTS	
+/0000 008C	FR4 register	+/0000 0140	SEQINTMSK			SEQRUN	
+/0000 0090	FR5 register	+/0000 0144	SPERRADRH			SPERRADRL	
+/0000 0094	FR6 register	+/0000 0148	SPERRDATAH			SPERRDATAL	
+/0000 0098	FR7 register	+/0000 014C	SEQMODE			SEQSHADRH	
+/0000 009C	FR8 register	+/0000 0150	SEQSHADRL			/0000	
+/0000 00A0	FR9 register	+/0000 0154				MSW0	
+/0000 00A4	FR10 register	+/0000 0158				MSW1	
+/0000 00A8	FR11 register	+/0000 015C				MSW2	
+/0000 00AC	FR12 register	+/0000 0160				MSW3	
+/0000 00B0	FR13 register	+/0000 0164				MSW4	
+/0000 00B4	FR14 register	+/0000 0168				MSW5	
+/0000 00B8	FR15 register	+/0000 016C				MSW6	
+/0000 00BC	FPUL	+/0000 0170				MSW7	
+/0000 00C0	FPSCR	+/0000 0174				MSW8	

- (*1) This is a nesting coil number that was being used in the running ladder program when the error occurred. If the ladder program is not running at such a moment, the nesting coil number /0000 0000 is stored in that location.
- (*2) This is a program counter value that was being maintained for the running ladder program when the error occurred. The program counter value stored is an address in the ladder processor. The actual address that was involved when the error occurred can be determined from the following equation:

$$\text{Address when an error occurred} = \text{ladder program counter (SPC)} \times 4 + /10\ 0000$$
- (*3) This is the process number of a HI-FLOW process that was running when the error occurred. If the HI-FLOW process is not running at such a moment, or if the HI-FLOW process has not been loaded in at such a moment, the value 0x0000 0000 or 0x0000 00FF is stored in that location.

(Continued from the previous page)

Offset from the beginning of case	2 ³¹	2 ¹⁶	2 ¹⁵	2 ⁰
+/0000 0178	MCW0			
+/0000 017C	MCW1			
+/0000 0180	MCW3			
+/0000 0184	MCW4			
+/0000 0188	IRW0			
+/0000 018C	IRW1			
+/0000 0190	IRW2			
+/0000 0194	IRW3			
+/0000 0198	IRW4			
+/0000 019C	RERRLOG			
+/0000 01A0	RSBACR			
+/0000 01A4	RERRSTATSLV	RERRENSLV		
+/0000 01A8	RERRSTATCP	RERRENCP		
+/0000 01AC	RLERRSTAT	RLERREN		
+/0000 01B0	RBUSMNT	RBRQTMR		
+/0000 01B4	RTRANSTMR	RACYCTMER		
+/0000 01B8	RACKBUSYTMR	RNOACKTMR		
+/0000 01BC	RSTDACKTMR	RSBACR		
+/0000 01C0	PARBMODE	RINTSTAT		
+/0000 01C4	RINTEN	/0000		
+/0000 01C8	/0000 0000			
+/0000 01CC	/0000 0000			
+/0000 01D0	Content of location addressed by SPC-20			
+/0000 01D4	Content of location addressed by SPC-16			
+/0000 01D8	Content of location addressed by SPC-12			
+/0000 01DC	Content of location addressed by SPC-8			
+/0000 01E0	Content of location addressed by SPC-4			
+/0000 01E4	Content of location addressed by SPC			
+/0000 01E8	Content of location addressed by SPC+4			
+/0000 01EC	Content of location addressed by SPC+8			
+/0000 01F0	Content of location addressed by SPC+12			
+/0000 01F4	Content of location addressed by SPC+16			
+/0000 01F8	/0000 0000			
+/0000 01FC	/0000 0000			
+/0000 0200				

LPU
internal
registers

■ Troubleshooting by replacing the faulty module

If the cause of the problem cannot be found by “Diagnosing from indicator indications,” check if any of the fault conditions listed below exists.

Table 10-4 Diagnoses by Module Type

Module type	Fault condition	Remedial action
Power supply module	The operation-condition indicator does not light up.	Replace the module.
Optional module	None of the optional modules mounted are functioning.	Replace the LPU module involved.
	A particular optional module mounted is not functioning.	Replace the optional module.
I/O module	None of the I/O modules mounted in an LPU unit are functioning.	Replace the LPU module involved.
	None of the I/O modules mounted in a particular I/O unit are functioning.	Replace the remote I/O station involved.
	A particular I/O module is not functioning.	Replace the module.

11 SPECIFICATIONS

11 SPECIFICATIONS

Table 11-1 Common Specifications (1/2)

Item		Specification	Remarks
Environmental specification	Temperature	Operating	0 to 55°C
		Storage	-20 to 75°C
	Relative humidity	Operating	30 to 90%RH
		Storage	10 to 90%RH
	Vibration resistance	Frequency: 10 to 150 Hz; Acceleration: 10 m/s ² ; Direction: each of X, Y, Z; Sweep time: 8 minutes; Sweep cycles: 20.	Conforming to JIS C0040 standard.
	Shock resistance	Peak acceleration: 147 m/s ² ; Half-sine pulses; 3 times in each of X, Y, and Z directions.	Conforming to JIS C0041 standard.
	Dielectric strength	1500 VAC for 1 minute	Between all the external AC terminals connected together and the casing.
Grounding	Class D grounding		
Ambient air	Dust: 0.1 mg/m ³ or less	No corrosive gases	
Power supply specification	Power voltage	LQV000	100 to 120 VAC
		LQV010	100 to 120 VAC
		LQV100	100 to 120 VAC 100 to 110 VDC
		LQV020	24 VDC
		LQV200	200 to 240 VAC
	Power voltage fluctuation range	LQV000	85 to 132 VAC
		LQV010	85 to 132 VAC
		LQV100	85 to 132 VAC 85 to 132 VDC
		LQV020	20.4 to 28.8 VDC
		LQV200	170 to 264 VAC
	Allowable instantaneous power failure duration	LQV000	10 ms or shorter
		LQV010	10 ms or shorter
		LQV100	10 ms or shorter (in AC input) 5 ms or shorter (in DC input)
		LQV020	5 ms or shorter
		LQV200	10 ms or shorter
	Power consumption	LQV000	80 VA maximum
		LQV010	130 VA maximum
		LQV100	80 VA maximum (in AC input) 50 W maximum (in DC input)
		LQV020	50 W maximum
		LQV200	120 VA maximum
Rush current	LQV000	15 A or less	
	LQV010	13 A or less	
	LQV100	15 A or less (common to both AC and DC power inputs)	
	LQV020	12 A or less	
	LQV200	15 A or less	
Output current	LQV000	7 A or less (at 48°C or below)	
	LQV010	10 A or less	
	LQV100	7 A or less (for both AC and DC; at 48°C or below)	
	LQV020	7 A or less (at 48°C or below)	
	LQV200	7 A or less	

Table 11-1 Common Specifications (2/2)

	Item	Specification	Remarks
Mass	4-slot LPU mount base (HSC-1540)	770 g	
	8-slot LPU mount base (HSC-1580)	1150 g	
	2-slot I/O mount base (HSC-1021)	570 g	
	4-slot I/O mount base (HSC-1041)	740 g	
	8-slot I/O mount base (HSC-1081)	1090 g	
	Power supply module (LQV000/100)	320 g	
	Power supply module (LQV020)	390 g	
	Power supply module (LQV010)	440 g	
	Power supply module (LQV200)	480 g	
	LPU module (LQP510/511/512)	450 g	
	RI/O station module (LQS000/010)	270 g	

Table 11-2 External Input/Output Specifications

Item	Specification	Remarks
Remote I/O	Line speed	768kbps
	Available lines	2 line
	Connected units	12 maximum per line
	Transferred words	64 maximum (1024 points) per line
	Insulation	Transformer insulation
	Error detection	Loop checking with inverted 2 bits data transmission
	Modulation	Bipolar modulation
	Interconnection	Daisy-chain connection
	Terminating resistance	100 Ω or 150 Ω
	Total cabling length	300 m
PCs OK	Output form	Relay output (relay-insulated)
	Rated output	100 VAC, 12 to 24 VDC/2 A 48 VDC/0.5 A 100 VDC/0.1 A
	Minimum output	12 VDC/20 mA
	Response time	15 ms or less
	Service life (electrical) of relay	Approx. 70,000 cycles of make-and-break operation (2 A at 100 VAC [COS φ = 0.4], 2 A at 24 VDC [L/R = 7 ms], make-and-break operation frequency of 1,800 cycles per hour, normal temperature and normal humidity)
	Cable specification	Twisted-pair cable, 100 m or less
CPU STOP/ RUN, R/O STOP	Input form	Contact input (photocoupler-insulated)
	Rated input	100 VAC, 100 VDC/5 mA
	Input voltage range	85 to 121 VAC, 85 to 110 VDC
	ON-voltage/current	85 VAC or higher/3.8 mA or more 85 VDC or higher/3.8 mA or more
	OFF-voltage/current	25 VAC or lower/1.0 mA or less 25 VDC or lower/1.0 mA or less
	Impedance	Approx. 22 kΩ
	Response time	15 ms or less
	Cable specification	Twisted-pair cable, 100 m or less

Table 11-3 LPU Module Functional Specifications

Item		Specification			Remarks
LPU model		LQP510	LQP511	LQP512	
Number of input/output points		When FREE: 2048 maximum; When FIX: 4096 maximum			
Programming language	Ladder chart	HI-FLOW			
	HI-FLOW	Not executable on the LPU (it becomes executable with an installed CMU module)			
	C language	Not executable on the LPU (it becomes executable with an installed CMU module)			
Instructions	Ladder instructions	77 types			
	Applied instructions	141 types			
PIO memory	Backup	Possible (backup by battery)			
	Battery	Lithium battery (model: ER6T-3WK41-Z, backup duration: 7 years)			
Ladder program memory	Backup	Possible (with flash memory)			
	Capacity	100k steps			
Processing speed	Ladder instructions	0.015 μ s/step or higher (LD or AND instruction, peak capacity at pipeline processing)			100-instruction continuation: 0.0166 μ s/step
	Applied instructions	0.045 μ s/instruction or higher (INC, DEC, MOVE or NOT instruction, peak capacity at pipeline processing)			100-instruction continuation: 0.0467 μ s/instruction
	Scan time	Approx. 1 ms/50k steps			This figure is the case when only ladder instructions are used.
Ladder facilities	Internal registers (R)	4096 points			
	Keep relays (K)	4096 points			
	Timers (T)	512 points, on-delay type, set time of 0.1 to 999.9 s.			
	One-shot timers (U)	256 points, one-shot multi-type, set time of 0.1 to 999.9 s.			
	Counters (C)	256 points, up-down type, set time of 1 to 9999 counts.			
	Global link registers (G)	4096 points			Support of inter-CPU(LPU) linking.
	Nesting coils (N)	256 points			Selectable between master control and zone control.
	Process registers (P)	128 points			Provided for initiation of C-mode programs.
	Event registers (E)	256 points			Provided for lighting up the USER indicator.
	Edge contacts (V)	4096 points			Selectable between rising edge and falling edge.
	Z-registers (Z)	1024 points			Provided for use in tracing.
	System registers (S)	3072 points			Operation result flags, fuse blow-outs, timeouts, etc.
	Internal work registers (A, J, Q, M)	4096 points each			
	Data registers (DW)	4096 points			1 point = 1 word (16 bits)
	Data registers (BD)	512 points			1 point = 1 long word (32 bits)
	Data registers (FW)	3072 points			1 point = 1 word (16 bits)
	Data registers (LB)	65536 points			
	Data registers (LL)	8192 points			1 point = 1 long word (32 bits)
	Data registers (LF)	8192 points			1 point = single-precision floating-point (32 bits)
	Data registers (LW)	65536 points			1 point = 1 word (16 bits)
Data registers (LM)	8192 points			1 point = 1 long word (32 bits)	
Data registers (LG)	8192 points			1 point = single-precision floating-point (32 bits)	
Data registers (LX)	16384 points			1 point = 1 word (16 bits)	
Data registers (LR)	4096 points			Dedicated to ladder converter.	
Data registers (LV)	4096 points			Dedicated to ladder converter.	
Floating-point arithmetic in applied instructions		Possible			
Abnormality detection capabilities	Overall monitoring	Watchdog timer			
	Memory monitoring	Parity checking for ladder program memory			
	Ladder processing	Checking for illegal instructions			
	Backup	Checking for battery-low conditions			
	Input/output Communication	Checking for fuse errors and remote I/O timeouts			
Tool interface		RS-232C, 115.2 kbps			
Host computer interface		H-7338 (RS-422), 9600 bps			Allows connection of display devices.
Hot swapping		Not allowed			
Current consumption		1000 mA or less			
Extended remote I/O		Not supported	Supported		
High-speed remote I/O		Not supported		Supported	

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