HITACHI

S10mini

S10mini
HARDWARE MANUAL

IR.Station

SAFETY PRECAUTIONS

Be sure to read this manual and all other attached documents carefully before installing, operating inspecting or conducting maintenance on this unit.   Always use this unit properly.   Be sure to carefully read the information about the device, the safety information and precautions before using this unit.   Be sure that the person(s) responsible for maintenance receives and understands this manual completely.

This manual divides the safety precautions into DANGERs and CAUTIONs.

⚠ DANGER : Failure to observe these warnings may result in death or serious injury.

⚠ CAUTION : Failure to observe these cautions may result in injury or property damage.

Failure to observe any **⚠ CAUTION** may lead to serious consequences.

All of these DANGERs and CAUTIONs provide very important precautions and should always be observed.
Additional safety symbols representing a prohibition or a requirement are as follows:

🚫 : Prohibition.   For example, "Do not disassemble" is represented by:

: Requirement.   For example, if a ground is required, the following will be shown:

⚠ DANGER

- Devise an emergency stop circuit, interlock circuit, and other similar circuits outside the programmable controller. Disregarding this rule may result in damage to the equipment or cause an accident if the programmable controller fails.

- Keep it in mind that this hardware unit operates on a high voltage. If the user touches a high-voltage terminal inadvertently during connection or disconnection of this hardware unit or its cable, he or she may suffer from an electric shock. Also, this hardware unit may be damaged due to a short circuit or noise. Be sure to switch off the hardware unit before connecting or disconnecting it or its cable.

⚠ CAUTION

- This hardware unit may fail if the ambient temperature is too high. The hardware unit may also malfunction due to interference by electromagnetic waves from adjacent hardware. To dissipate heat and reduce electromagnetic interference, provide the specified mount of space between the cubicle and this hardware unit and between the hardware unit and other ones.

- After installing this hardware unit, measure temperatures near the in-cubicle controller and the mount base during operation, and check whether the measurements are within the limits. If the specified amount of space cannot be provided or the measured temperature is too high, use a cooling fan.

- At an extremely high temperature, this hardware unit may fail. Secure the mount base to a vertical surface. If the mount base is secured horizontally, heat does not dissipate efficiently, resulting in an extremely high temperature. This may further cause the hardware unit to fail or its parts to deteriorate.

- This hardware unit may be damaged due to static electricity. Ground yourself before setting switches or connecting or disconnecting cables or connectors with the hardware unit.

- This hardware unit may be damaged during its installation or removal unless the following rules are observed:
  - Check that the connector pins are not damaged (bent or broken), are aligned straight and are free from dust.
  - Move the hardware unit along an imaginary vertical surface to the face of the mount base. If the product is inserted or removed slantwise from the connector on the mount base, connector pins may be bent.

⏚ REQUIREMENT

- An electric shock may lead to a death or burn.   Noise may cause the system to malfunction.   Ground the line ground (LG), frame ground (FG), and shield (SHD) terminals, as described below.
  - Electrically insulate the mount base from the cubicle.   To assure this, do not remove the insulating sheet from the mount base.
  - Ground the LG and FG terminals separately to prevent mutual interference. The LG terminal is grounded to prevent intrusion of power line noise, while FG and SHD terminals are grounded to suppress intrusion of line noise into external interfaces for remote I/O modules, interface modules, and other modules.
  - Connect the FG terminal on each module to the FG terminal on the mount base.   Note, however, that the FG terminal for each remote I/O line or JPCN-1 line must be connected separately to a single place on the terminating side.

❗ REQUIREMENT

- Excessive accumulation of heat in the cubicle may cause a fire or hardware failure.   When the temperature in the cubicle reaches 48°C or higher, the maximum output current of the power supply module is limited.   At 55°C, for instance, it is limited to 5.85 A.   Where this is very likely, install a cooling fan in the cubicle or reduce the number of modules installed therein.

🚫 PROHIBITION

- If a part in a module is damaged, do not replace the part, but replace the faulty module in its entirety, except when the part is the battery for the CPU.

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 Engineering Service 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 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.

PREFACE

Thank you for purchasing the Hitachi Programmable Controller (S10mini).
This manual describes how to handle the S10mini IR.Station module.   For details on the CPU
modules, I/O modules, and optional modules, refer to each respective manuals.
Read this manual thoroughly to properly use this module.

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* Ethernet is registered trademark of Xerox, Corp.
* Autonomous Decentralize is a product name of Hitachi Ltd.
Other product names written in this manual are the trademarks of each manufacturer.

CONTENTS

FIGURES

TABLES

1   BEFORE USE

■   Installation

The Programmable Controller is not fireproof, dustproof, or dripproof.   When you install, mount the controller in a dust and dripproof iron cubicle as shown below:

Iron cubicle

CPU unit

I/O unit

Fill this opening with putty.
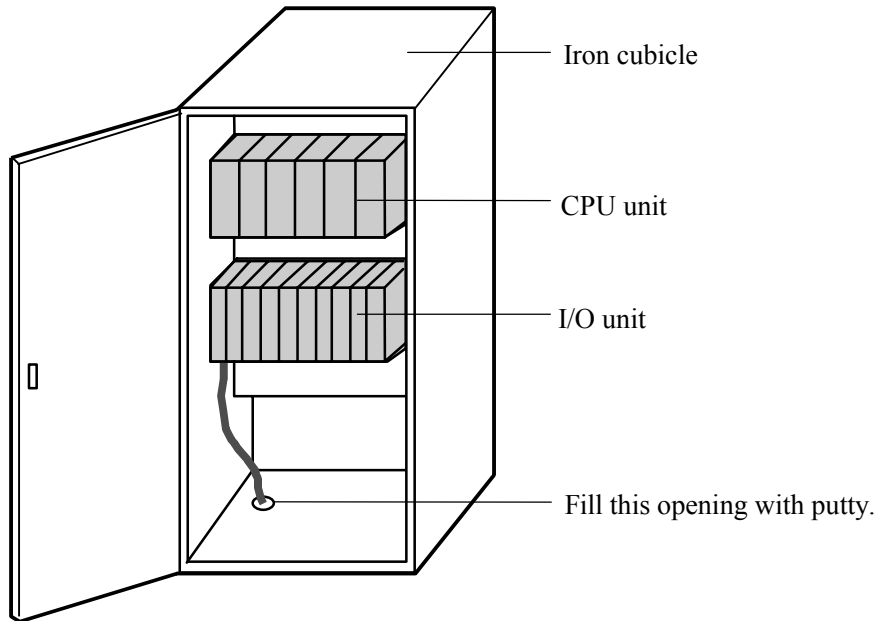
Figure 1-1   Installation Example

■ Environment

Operate the Programmable Controller in the following environment:

Table 1-1   Operating Environment

Supply voltage	100 to 120 VAC, single-phase, 50/60 Hz±4%
Amplitude range	85 to 132 VAC
Temperature	At operation: 0 to 55°C; storage: -20 to 75°C
Relative humidity	At operation: 30 to 90% RH; storage: 10 to 90% RH
Vibration resistance	0.6 G (1000 rpm)
Shock resistance	10 G
Ambient air	Dust: 0.1 mg/m^3 or less (given that there is no corrosive gas)

■ Output module

Furnish the output module load power supply with a fuse for the protection of load short-circuits.
Ensure that the employed fuse is rated to match the load.   If the employed fuse rating is higher
than specified, the printed circuit boards, case, and other items may burnout when the load is
shorted.
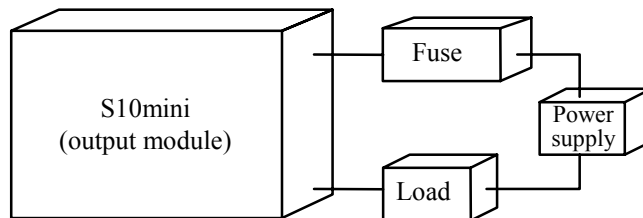
Figure 1-2   Output Module Specifications

∎ Grounding point

Provide Class D* or better independent grounding.   Do not use any other existing ground as a substitute.   It is particularly important that the grounding point for the Programmable Controller be at least 15 m away from an AC panel grounding point.

* 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 lines.

It is the best that the grounding wire be welded to the steel frame of a building.   In case when the aforesaid is impossible, bury the grounding rod in earth.
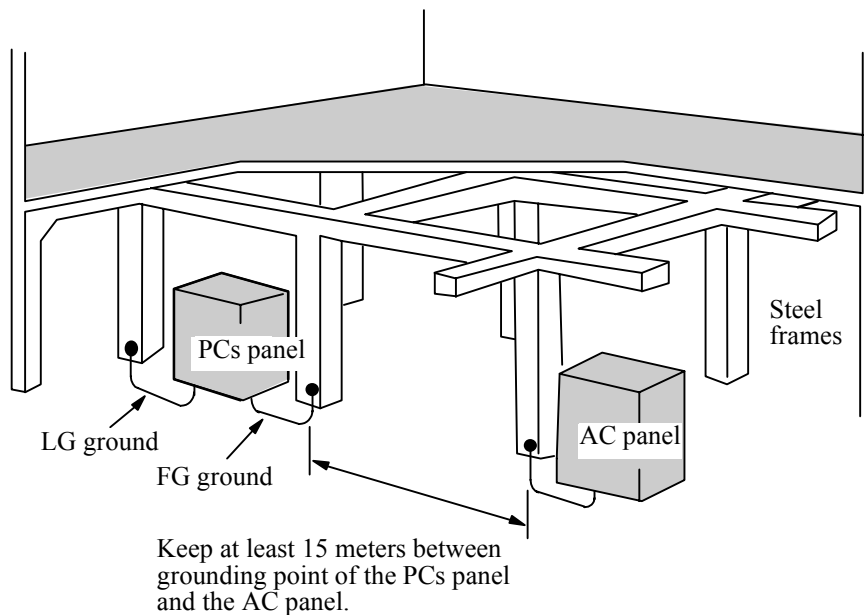
Figure 1-3   Grounding Specifications

∎ Noise

Do not install the Programmable Controller inside or near a panel on which a high-voltage device such as inverter is mounted.   Make a shielding plate to protect the CPU or I/O unit main frames and cables from electromagnetic or electrostatic induction.

∎ External circuitry

Partial damage may affect the entire circuitry of the Programmable Controller.   Ensure that the emergency stop circuit incorporated in the Programmable Controller consists of an external relay circuit.

■ Internal parts replacement

User must not replace internal parts of the Programmable Controller with anything other than the parts specified in the manual.   Replace the entire module in which a defective part is included. For details on parts replacement, contact your Hitachi maintenance personnel.

■ Module insertion/removal

Power must be turned off while a module is inserted or removed.   Insertion or removal of a module when power is ON may cause damage to the module or electric shock.

■ Equipment addition

If the peripheral equipment is added or altered, conduct an inspection as directed in Section 7.1, "Preventive Maintenance" to confirm whether the Programmable Controller is properly functioning.

Special attention must be paid to the following regarding power supply and grounding.

● Power supply

    * Inspection of the supply voltage and waveform.

       – Check for a voltage reduction.

       – Check for a significance in the amount of noise in the power supply line.
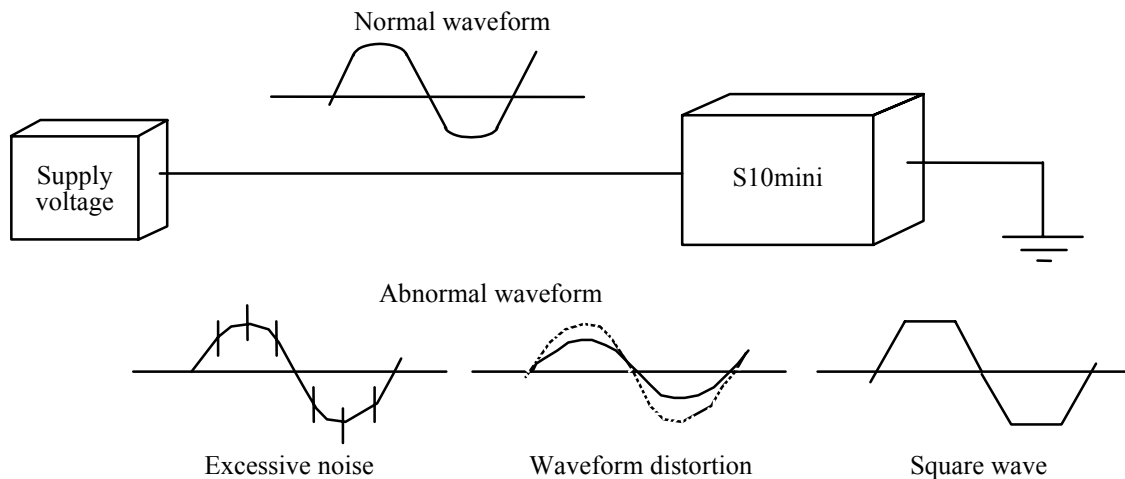
Figure 1-4   Power Supply Input Waveform

- Grounding
  - * Inspection of the ground wiring.
    - − Check if a ground wire is shared with another ground wire.
    - − Check if the grounding point is at least 15 m away from the grounding point of the AC panel.

  - * Check if any power supplies or power cables are located adjacent to the signal cables such as line.

Share of grounding wires   Isolation of grounding wires
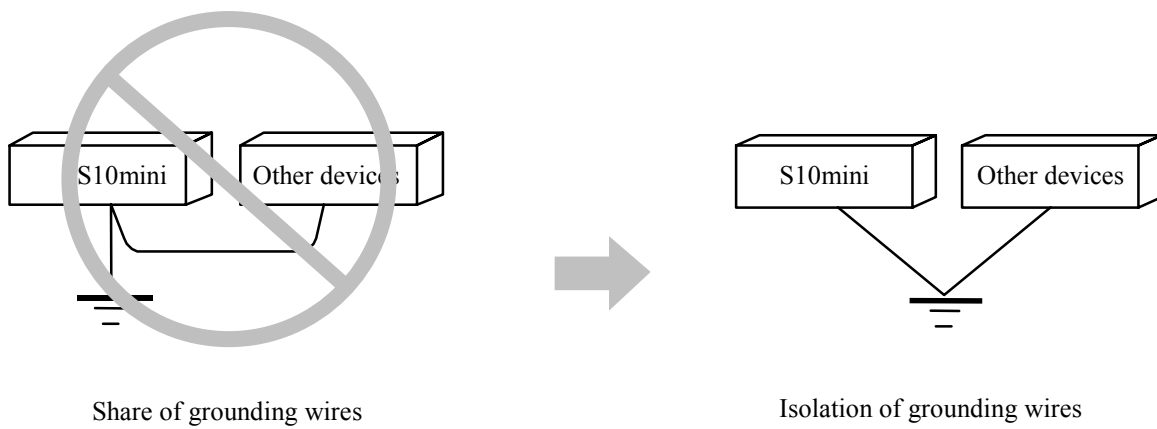
Figure 1-5   Grounding Examples

2 GENERAL INFORMATION

2.1   System Overview

System configuration of the IR.Station is shown below.   The IR.Station module (Model LQS021) communicates data between master stations (IR.LINK module, etc.).
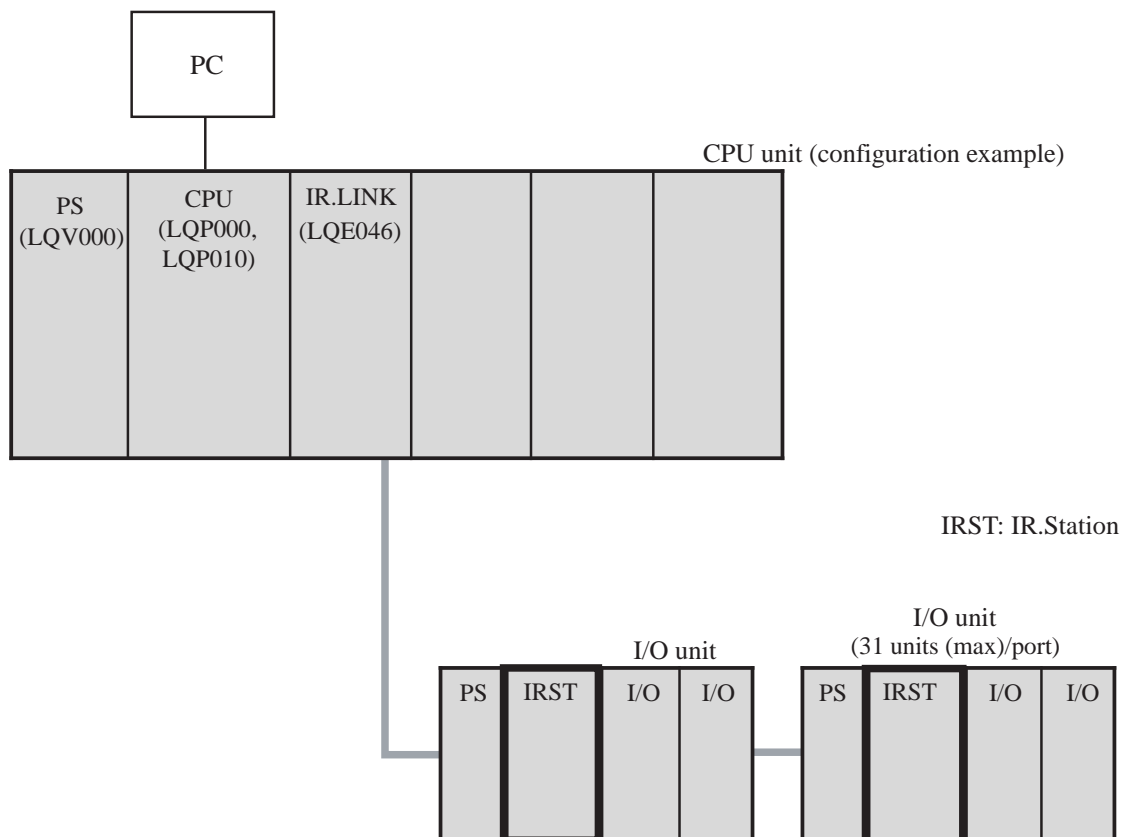
Figure 2-1   System Configuration

⚠ CAUTION

The IR.Station (LQS021) is always coupled with the IR.LINK (LQE046) module for use.   Its setting is made by the IR.LINK module.   For details of setting and handling, refer to the HARDWARE MANUAL OPTION IR.LINK (manual number SME-1-117).

2.2   I/O Unit Modules
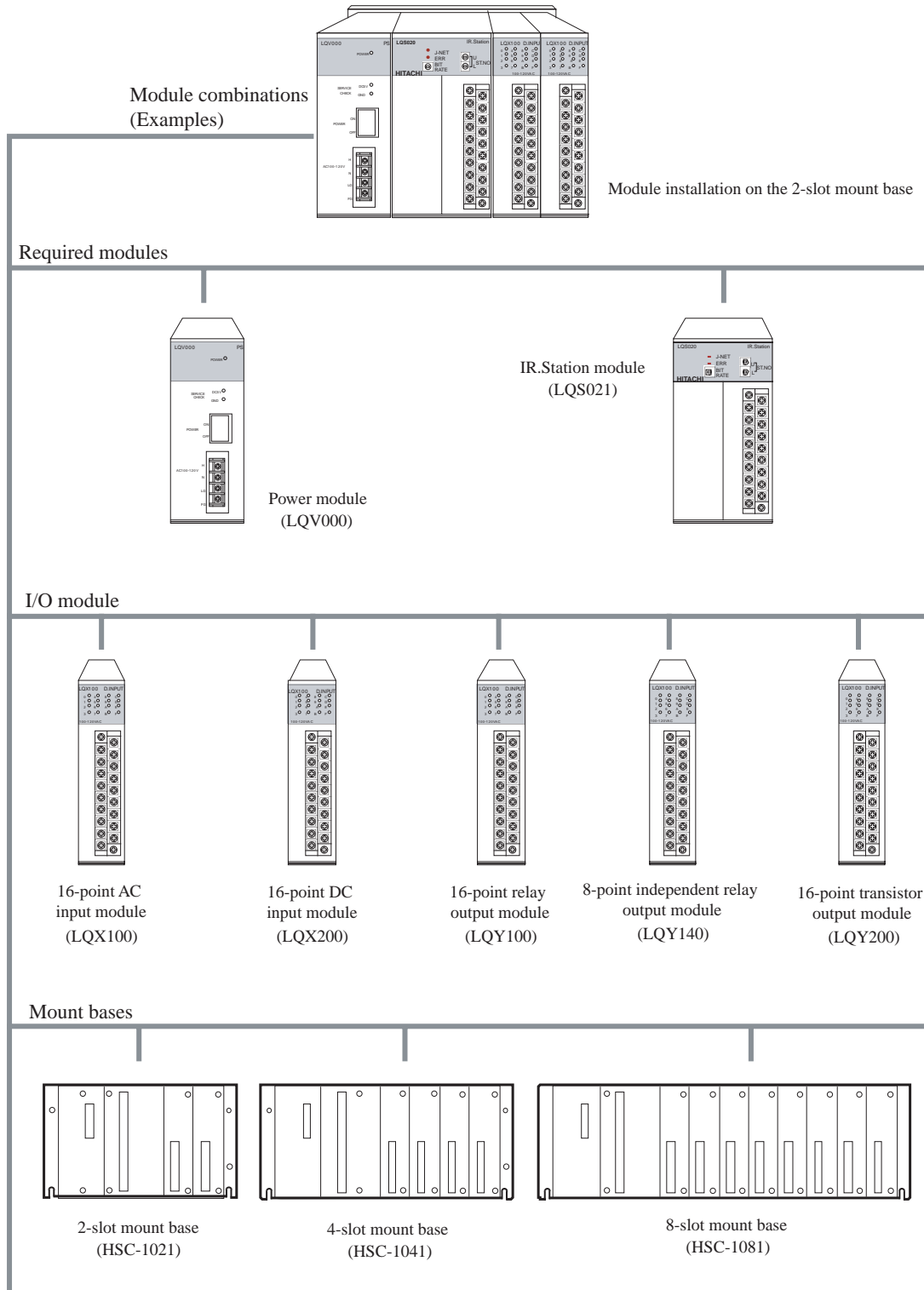
Figure 2-2   Unit Configuration

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3 NAMES AND FUNCTIONS OF EACH PART

3.1 IR.Station Module
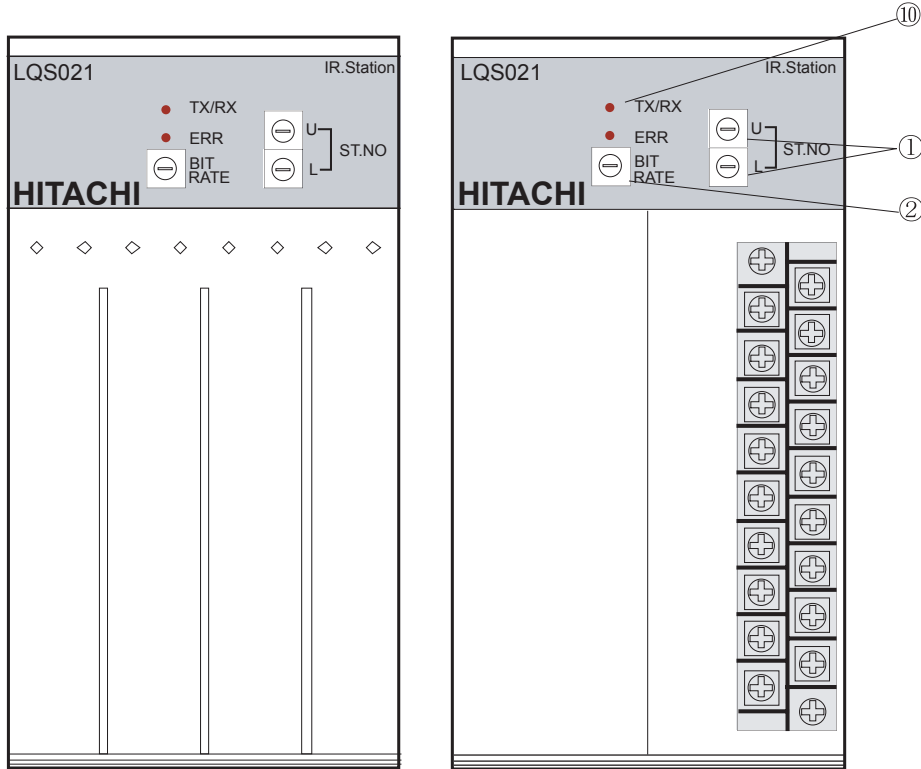
Figure 3-1 Module Front View

<Signal assignment of the terminal block>

No.	Name	Fucntion
①	Station No. setting switch	Used to specify a station number. A total of 31 stations ranging from 01 to 7F can be set. Use the U switch to set a higher-level station number or the L switch to set a lower-level station number.
②	Bit Rate setting switch	Used to set a transmission speed. 0: 1.0 Mbps, 1: 0.5 Mbps, 2: 0.25 Mbps, 3: 0.125 Mbps
③	Slot No. setting terminals	Used to set the number of I/O points (16, 32, 64, or 128 points) per slot of the mount base. If the mounted I/O modules have different numbers of I/O points, set this number to the greatest one of the I/O point numbers.
④	FIX/FREE setting	Used to set a partition (FREE or FIX) of the mount base. Usually select "FREE." If the I/O modules have a total of 2048 or more I/O points, select "FIX." When "FIX" is selected, the maximum number of input I/O points and that of output I/O points can be extended up to 2048 respectively. ● In the "FIX" mode, the slots in the left half of the mount base are for input modules and those in the right half of the mount base are for output modules. I/O numbers for the input slots are "X△△△" and those for the output slots are "Y△△△." ● In the "FREE" mode, each slot on the mount base is used for an input module or output module and an I/O number "X△△△" or "Y△△△" is assigned to the slot. The I/O number to be designated must be proper for the I/O module to be mounted. Further, the module in the slot can be switched between input and output as the slot can receive either an input module or an output module.
⑤	Output Hold setting	Used to set the output status (RESET or HOLD) of the output module in case of a line disconnection. When "RESET" is set, the output module outputs a zero output. When "HOLD" is set, the output module outputs a value just before the line is disconnected.
⑥	Terminating resistance setting	Used to terminate the station module with a built-in terminating resistor (120 ohms) when the station module is in the end of the line.
⑦	Special mode setting terminal	Reserved for future expansion. (Keep this terminal open.)
⑧	Line terminal	Connect the line cable to this terminal.
⑨	Frame ground	Connect the grounding wire to this terminal.
⑩	LED indicator	TX/RX: Lights while transmission is in progress. ERR : Lights when a hardware error occurs.

3.2 I/O Module

Monitoring LEDs
The LED lights when the corresponding external I/O is on.

Terminal block
The I/O processing devices are connected to these terminals. (Some modules have a connector type terminal block.)

Figure 3-2　I/O Module Front View

<Signal assignment of the terminal block>

For details, see the description of each I/O module.

● LQX100, LQX200, LQY100　　　● LQY140　　　● LQY200
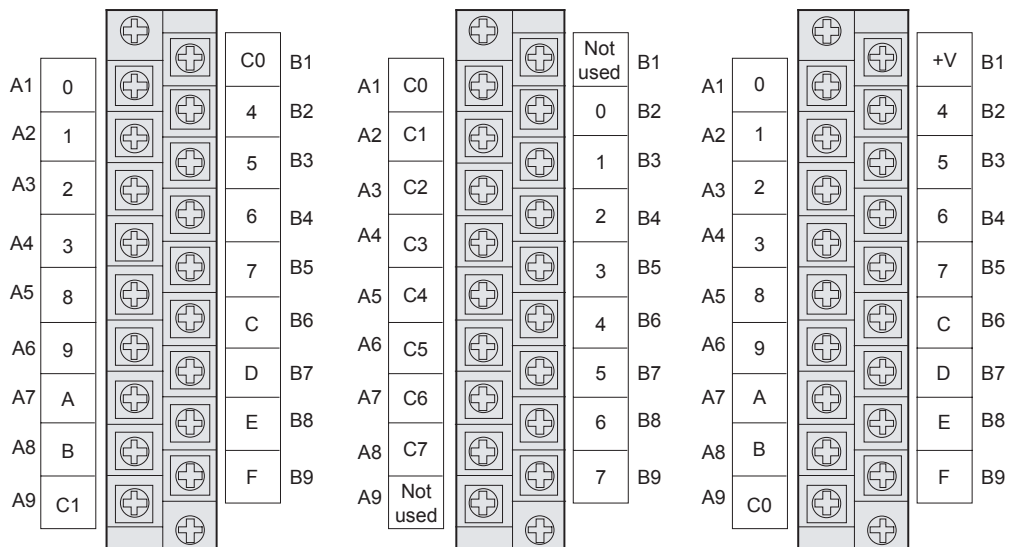
3.3   Power Supply Module

The CPU unit and I/O unit use the same power supply module model.

Example: LQV000
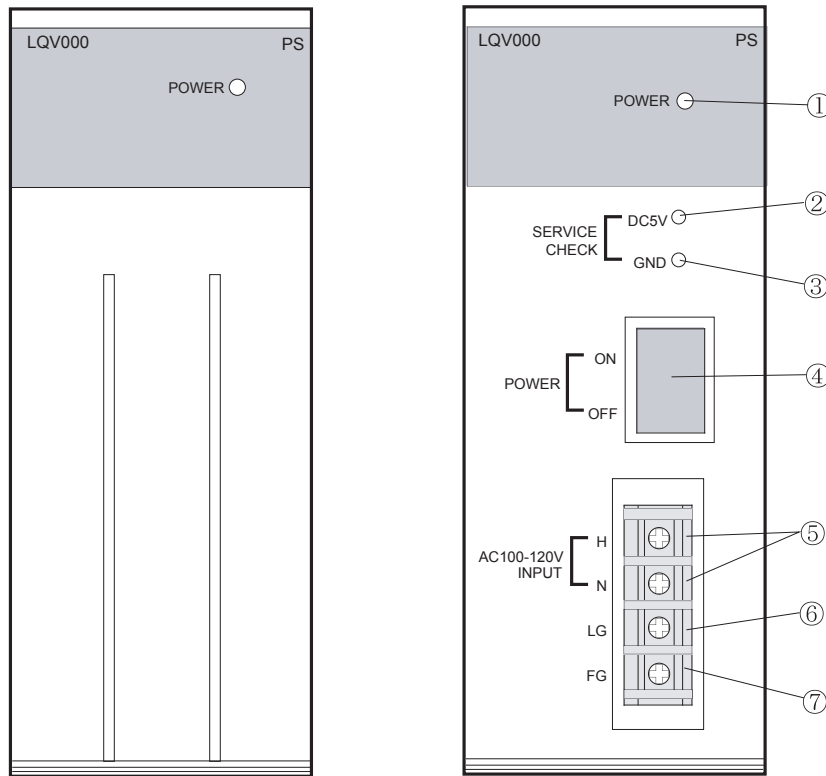
Figure 3-3   Front View: Power Supply Module

Table 3-1   List of the Power Supply Module

Name	Model	Remarks
AC input power supply	LQV000	100 VAC input power supply
DC input power supply	LQV020	24 VDC input power supply
AC/DC input power supply	LQV100	100 VAC/100 VDC input power supply

3 NAMES AND FUNCTIONS OF EACH PART

Names and Functions

No.	Name	Function	
①	Power indicator (POWER)	Lights on while the power switch is ON.	
②	Voltage check terminal (5 VDC)	Voltage check terminal for 5 V output. (Do not use this terminal for purposes other than voltage checkout.)	
③	Voltage check terminal (GND)	0 V reference terminal for voltage checkout. (Do not use this terminal for purposes other than voltage checkout.)	
④	Power switch (POWER)	Issue or cut off the input power supply of the module.	
⑤	Power supply terminal block (H, N)	LQV000	Connects the 100 VAC input power supply to the power supply module.
		LQV020	Connects the 24 VDC input power supply to the power supply module.
		LQV100	Connects the 100 VAC or 100 VDC input power supply to the power supply module.
⑥	Line filter ground terminal block (LG)	Ground terminals for the power supply line filter. Earth the unit at the power supply side.	
⑦	Frame ground terminal block (FG)	This terminal is to be connected to the frame ground (FG) of the I/O unit or ground assembly plate.	

3.4   Mount Base

The mount base secures the IR.Station module, power supply module, and I/O module.
Use I/O unit type for mount base.

Example: HSC1021
2-slot mount base
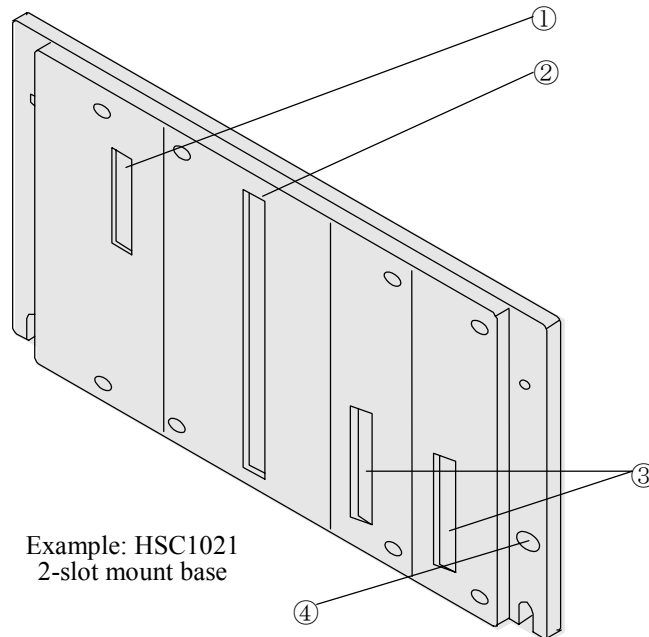
Table 3-2   List of Mount Base

Mounted Unit	Name	Model	Remarks
I/O unit	2-slot mount base	HSC1021	Power supply + station + 2 slots (I/O type)
	4-slot mount base	HSC1041	Power supply + station + 4 slots (I/O type)
	8-slot mount base	HSC1081	Power supply + station + 8 slots (I/O type)

Names and Functions

No.	Name	Function
①	PS slot	Use to mount the power supply module.
②	ST slot	Use to mount the IR.Station module.
③	I/O slot	Use to mount the I/O module.
④	FG terminal	Use to connect frame ground of each module.

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4 INSTALLATION

4.1   Mounting Clearances

For proper operation of this product, make air aperture at the top and bottom of the cubicle. This cubicle and each unit should be installed with certain spaces as indicated below.
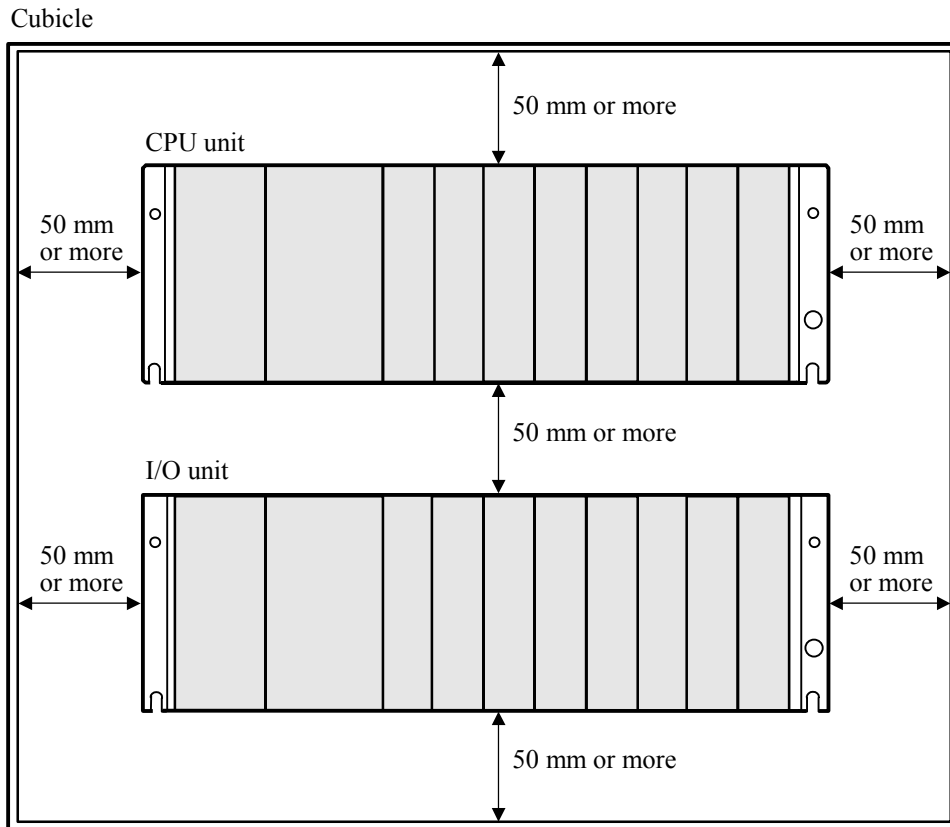
Figure 4-1   Mounting the Units

⚠ CAUTION

A high temperature inside of the cubicle may cause malfunction o f the units. The units may also make a false operation due to electromagnetic interference that is emitted by nearby devices.   To decrease heat and electromagnetic radiation, provide the specified spaces between units, its cubicle and neighboring devices.

After the installation, check the temperature inside the cubicle nearby the module while test running it to see if the level of heat is within the limit specified.   When a specified space cannot be secured or the temperature is our of the specified range (55°C or more of CPU suction air between the CPU unit and I/O unit), equip a cooling fan to forcibly cool the unit.

4.2   Outside Dimensions

The overall width (A) and diameter of screw holes (B) varies depending on the number of I/O module installed on a mount base.
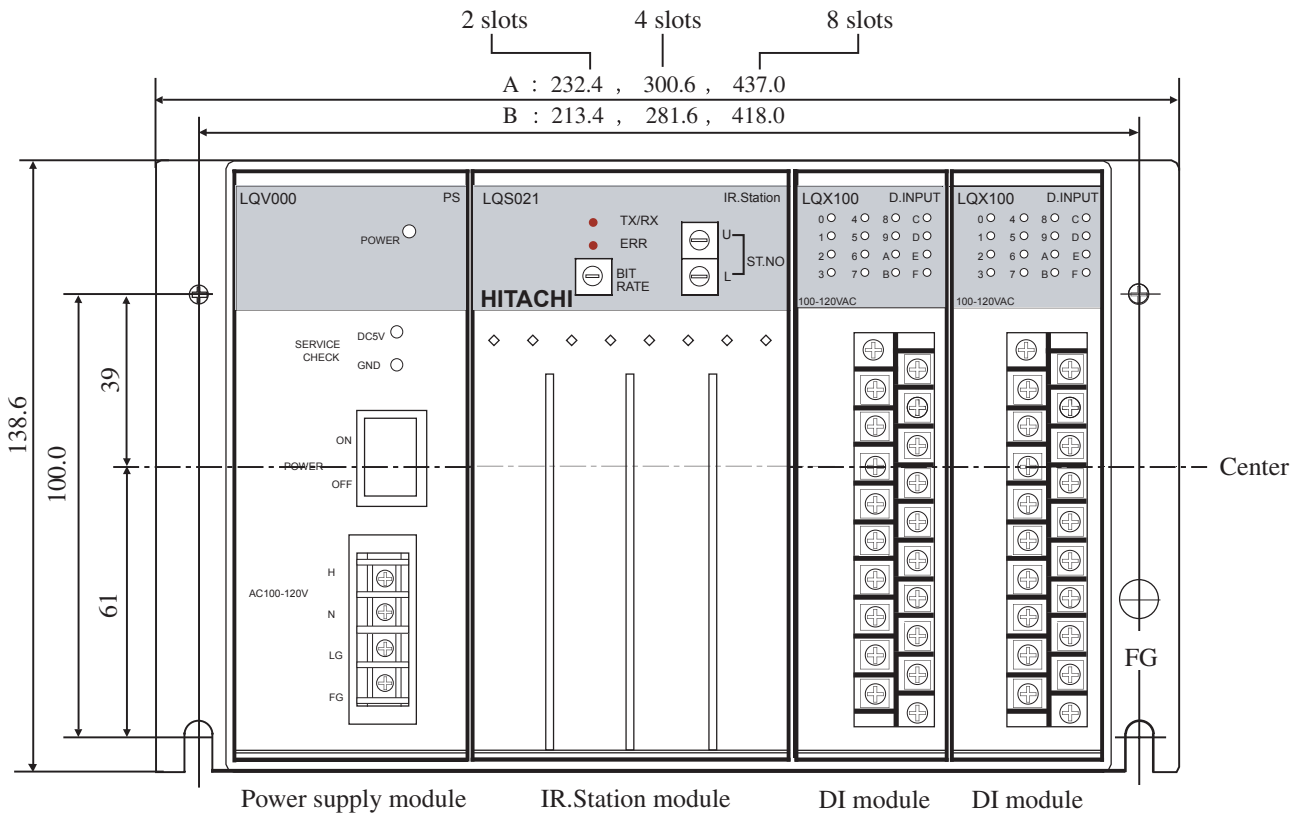
Front view (example of 2-slot mount base use)
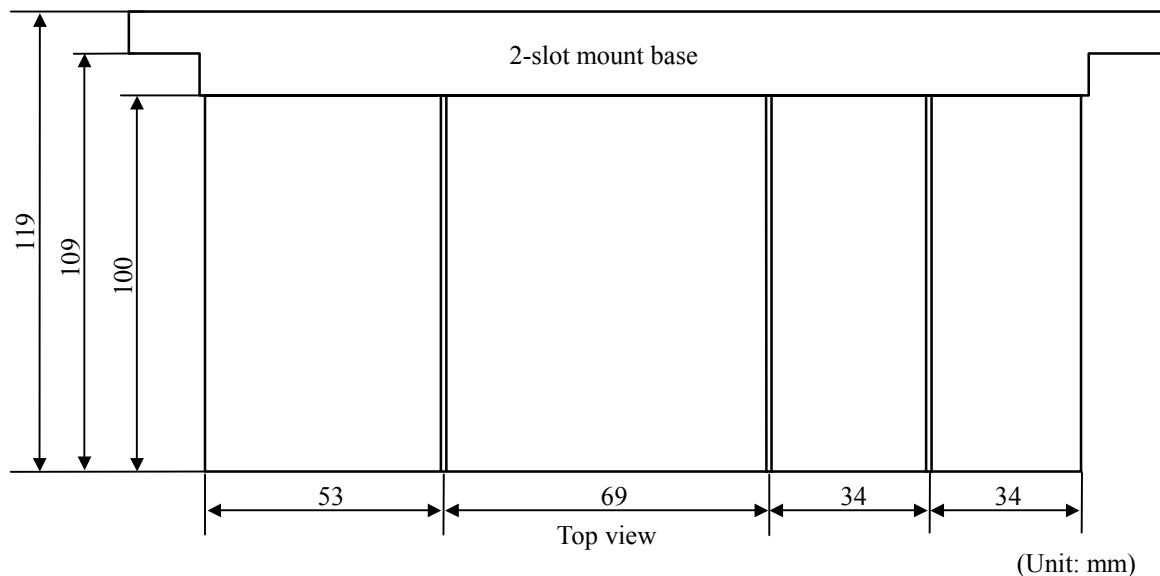
Figure 4-2   Unit Dimensions

4.3   Securing the Mount Base

Fasten the mount base to a vertical surface of the enclosure.   Do not install mount base upward, downward, or sideways.   The modules are designed to produce optimum heat dissipation effects when they are fastened to a vertical plane of the cubicle.

Fasten the mount base to a
vertical plane of the cubicle.
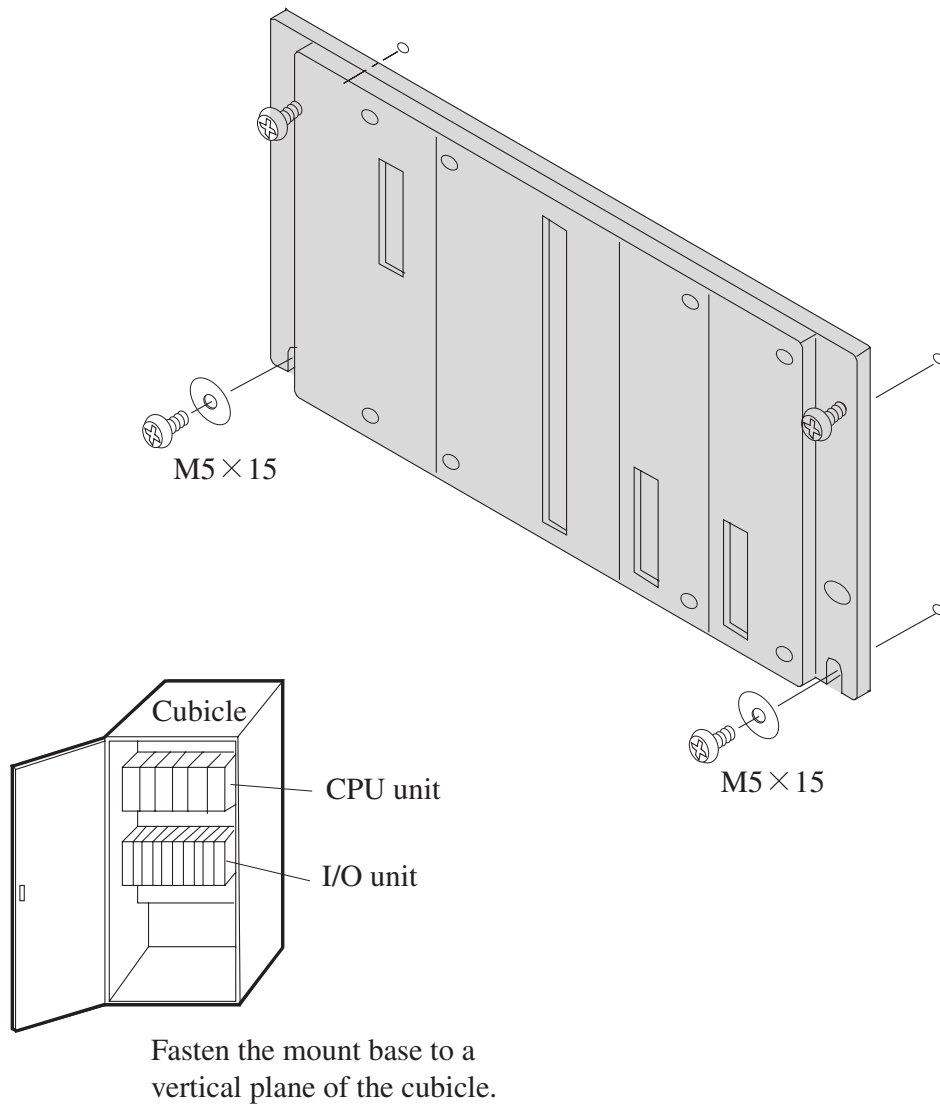
Figure 4-3   Securing the Mount Base

⚠ CAUTION

Fasten the mount base to a vertical plane of the cubicle.   If mount base is fastened to a horizontal plane, the heat dissipation effects lowers thereby it may cause a defection and incur deterioration in component parts.

4.4   Securing the Module
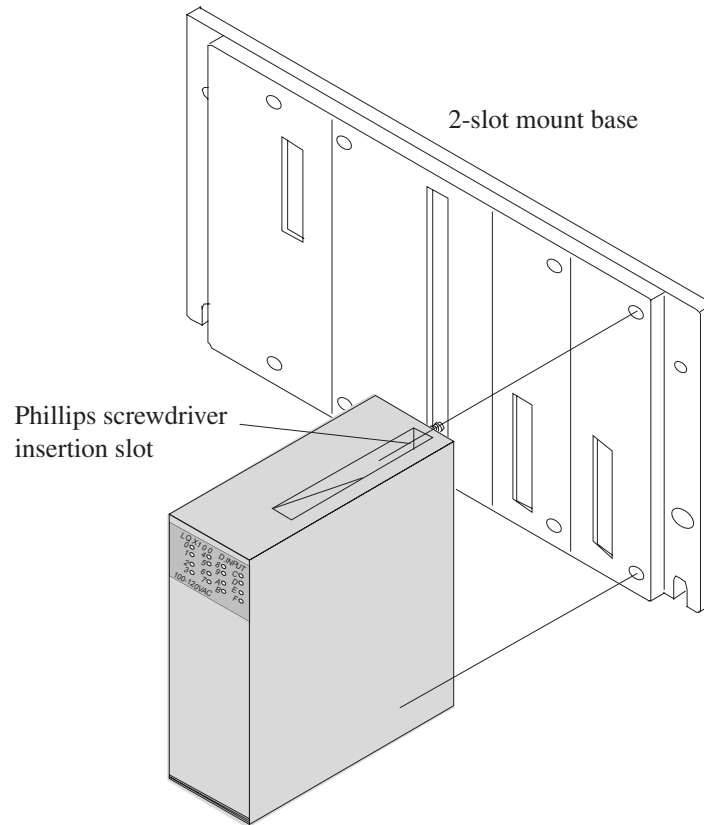
Figure 4-4   Mounting the Module

Insert a screwdriver from an insertion groove to tighten the screws to fix the module.
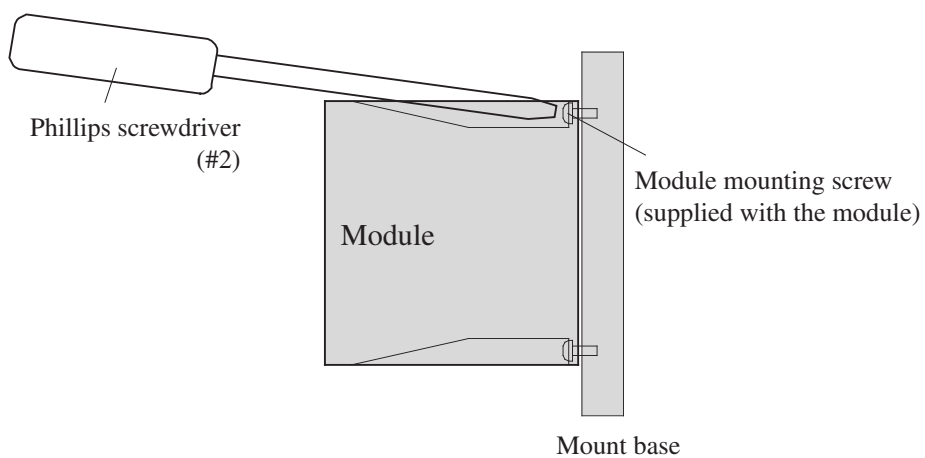
Figure 4-5   Securing the Module

⚠ DANGER

You may be electrified if you install/remove a module or connect/disconnect a cable when power is ON by inadvertently touching a power supply terminal due to the presence of a high voltage.   Also, note that a short circuit or noise may render the machine defective.   To avoid these problems, make sure to turn OFF the power before install/removing a module or connect/disconnecting a cable.

⚠ CAUTION

● Static electricity may damage the modules.   Remove static electricity from your body before setting various switches, connecting or disconnecting cables or connectors.

● When insert or remove a module, observe the following precautions to prevent the module from being damaged:

  • Before inserting a module into the slot of the mount base, be sure to check and make sure the pins of the connector are clean, straight and well lined up.

  • When insert/remove a module, ensure that it is vertical to the mount base as shown below.   If you insert/remove a module while it is tilted, the connector may be damaged.

Bad examples   Good example
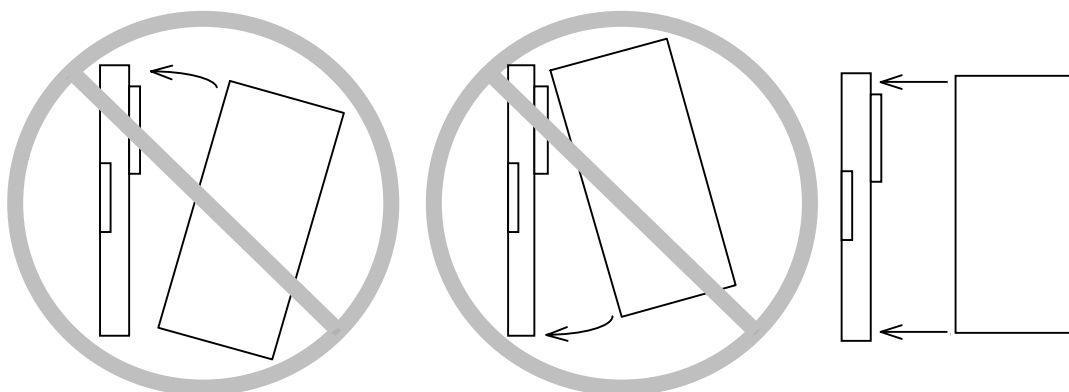
Figure 4-6   Module Mounting Examples

5 CABLING

5.1   Grounding and Wiring the Power Module

LG lines and FG lines must be grounded separately to prevent their mutual interference.   The LG terminals are provided to eliminate power noises and the FG terminals are to eliminate line noises.

Ground them as short as possible with thick cables (2 mm^2 or more in the casing and 5.5 mm^2 or more outside the casing).

● An example of wiring when a mount base contains a CPU unit and an I/O unit
  When mounting a CPU unit and an I/O unit on a mount base, connect the FG terminal of the IR.LINK module of the CPU unit to the FG terminal of the CPU unit mount base and the FG terminal of the IR.Station module of the I/O unit to the FG terminal of the I/O unit mount base respectively.   This connection puts their grounding potentials at the same level, makes the grounding performance higher, and consequently increases the noise resistance.
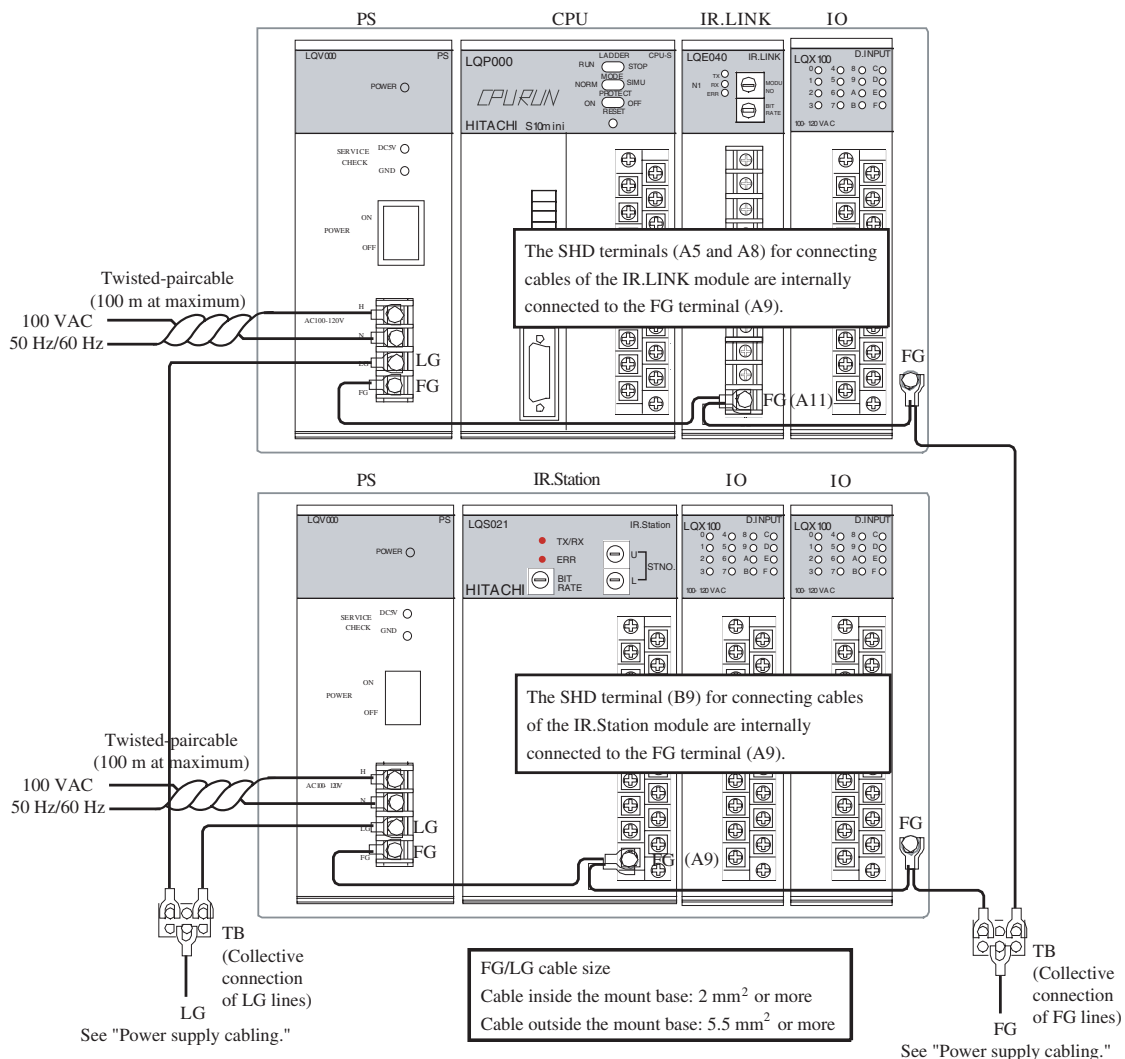
● An example of wiring when modules in different I/O units are connected
When connecting modules in different I/O units, leave the FG terminal of the IR.Station module open.   If connected, the noise resistance will decrease because of different grounding potentials.
Ground the FG terminal of one of the terminating units only.
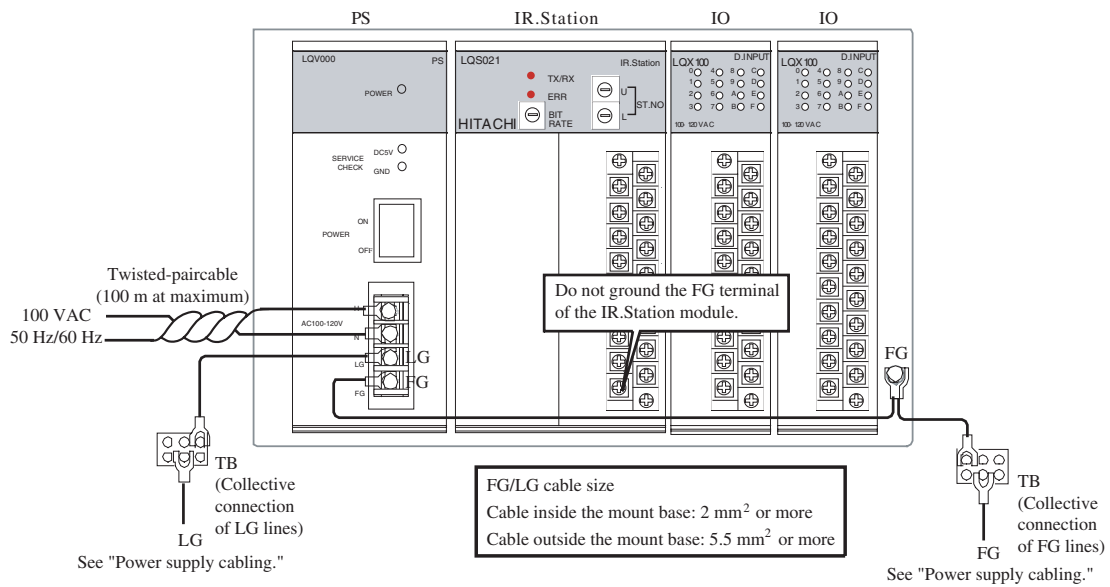
REQUIREMENT

If grounding is not perfect, you may get an electric shock and be injured.   In an extreme case, you will be put to death.   Improper grounding may allow noises to disturb the system.
Follow instructions below to ground the LG (Line Ground), FG (Frame Ground), and SHD (Shield) terminals.
● Ground the body of the mount base.   Do not remove the insulation sheet from the mount base to insulate the mount base.
● Ground the LG and FG terminals separately (with different grounding wires).   The LG terminal is to eliminate power noises.   The FG and SHD terminals are to eliminate line noises.   Be sure to ground them separately to prevent their mutual interference.
● Ground one FG terminal of the IR.Station module for each line.

DANGER

Always turn off power to the system before mounting or demounting the modules and cables.   Otherwise, you may get an electric shock when you involuntarily touch the power terminal or the system may be damaged by a short-circuiting or noises.   Be sure to turn off and make sure power is not alive before starting the job.

5.2   Connecting the Line Cables

● Always terminate the CPU module (master station) and the IR.Station module which are at both ends of the line.   The terminating resistance is 120 ohms (built-in) or any (externally connected).   When using an external terminating resistor, select it according to the characteristic impedance of the cable.

● Always follow the cabling instructions to connect cables correctly.   If the cable connection is wrong, the module communication may be disabled.   For details, see 5.2.1.

● Ground one SHD terminal per cable.   Do not ground the FG terminal of every unit.

● The cable lengths are dependent upon transmission speeds: 240 m or shorter at 1.0 Mbps, 480 m shorter at 0.5 Mbps, 800 m or shorter at 0.25 Mbps, and 1000 m or shorter at 0.125 Mbps.   Select optimum cable lengths according to the transmission speeds of the system.

● Use the cables of the same size and ampacity on an identical line.   If the sizes and ampacities of the cables are not the same, the system operation cannot be assured.

● Assign unique station numbers to the units.

CPU unit   I/O unit-1   I/O unit-2   I/O unit-N

$N \leqq 31$

IR.LINK (LQE046)   Must be terminated here.   IR.Station (LQS021)   IR.Station (LQS021)   IR.Station (LQS021)

Must be terminated here.
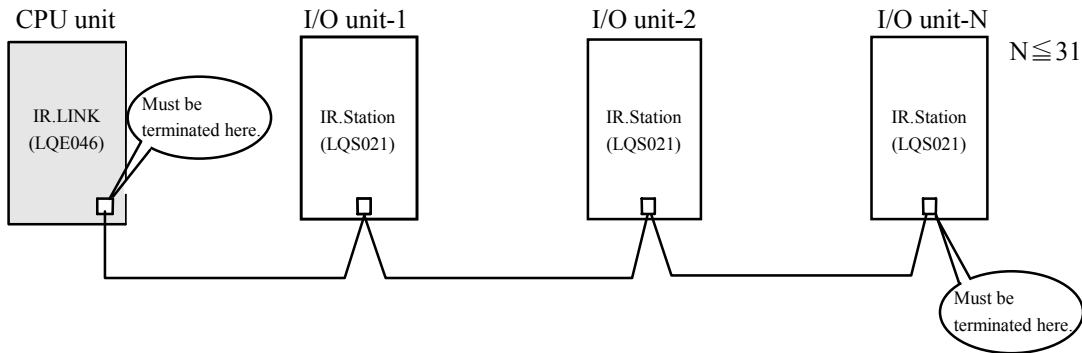
5.2.1 Inhibited wiring

Improper wiring may cause signal waveforms on the line to be disturbed and a transmission error.

Good wiring	CPU unit · I/O unit · I/O unit · I/O unit — IR.LINK (Termination) IR.Station IR.Station IR.Station (Termination). A maximum of 31 units can be connected to one line and units at both ends of the line must be terminated.
Inhibited wiring (Examples)	CPU unit · I/O unit · I/O unit · I/O unit — IR.LINK IR.Station IR.Station IR.Station. Do not branch the line.
	CPU unit · I/O unit · I/O unit — IR.LINK IR.Station IR.Station. TB TB TB TB. Connect cables directly. Do not use a terminal block (TB).
	CPU unit · I/O unit · I/O unit — IR.LINK IR.Station IR.Station. Do not use cables of different sizes and ampacities on an identical line.

5.2.2 Example of connecting line cables

An example below shows a cable connection of the IR.LINK module (LQE046) and IR.Station modules.
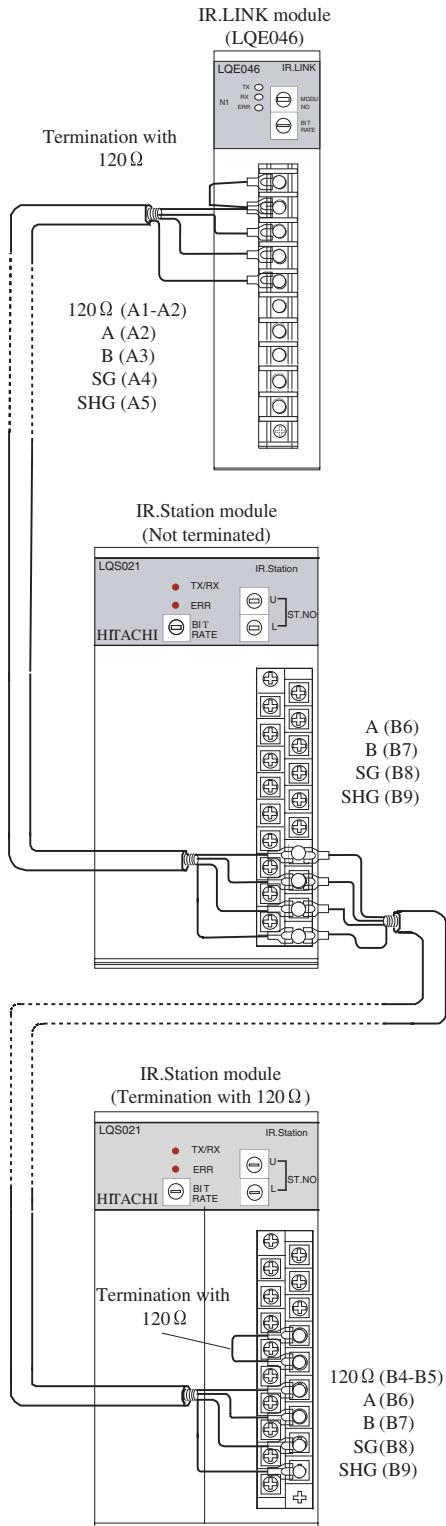
Field net terminals

Terminal number	Signal name		
	Symbol		Name
B6	LINK	A	Send/receive data
B7		B	LINKage data
B8	SG		Signal Ground
B9	SHD		SHielD ground
B4	TERM		Transmission/reception terminating resistor
B5			TERMinal resistor

Others

Pin number	Signal name	
	Symbol	Name
A9	FG	Frame Ground

Interface signal voltage levels

Name	Mark	Space
Meanings	1/OFF	0/ON
Output condition	-6 to -1.5 V	1.5 to 6 V
Input condition	-0.2 V or less	0.2 V or more

5.3   Cable Specifications

The transmission cables, power cables, and grounding cables should satisfy the following:

Item		Specifications	Remarks
Transmission cable	Characteristic impedance	100 Ω	
	Wire size	0.5 mm^2	
	Maximum conductor resistance	34.0 Ω/km	20℃
	Withstanding voltage	1000 VAC/1 minute	
	Minimum insulation resistance	2500 MΩ・km	20℃
	Static capacity	50 pF/m	1 kHz
	Recommended cable type	KPEV-SB 2P 0.5 mm^2	Made by Hitachi Cable, Ltd.
Power supply cable	Wire type	Shielded twisted-pair cable or 3-core twisted cable	
	Wire size	2 mm^2 or more	Depending upon loads and cable lengths
Grounding cable	Wire size	2 mm^2 or more	

Use the solderless terminals to connect cables.

<Solderless terminals>

Example: R1.25-3   Example: 1.25-YS3A

(Unit: mm)

<Connecting cable wires to Solderless terminals>
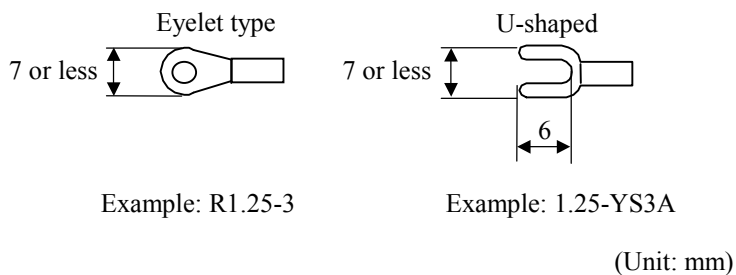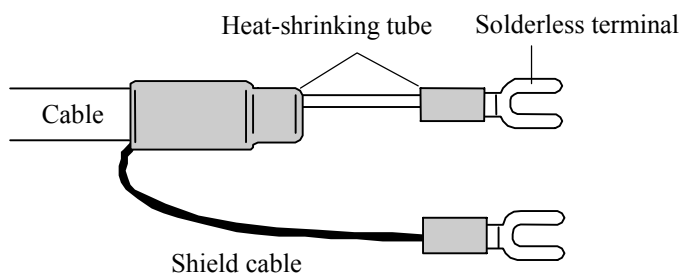
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6　SETTING

6.1 I/O Address Setting

(1) Input and output modules can be mounted any place in the mount base (free location).
A module in a slot always has the same I/O address whether the module is an input module or an output module.
For example, when a DI module in slot 0 has an I/O address X140 to X14F, a DO module in the slot 0 has an I/O address of Y140 to Y14F.

(2) The user can specify an address and a data size for each I/O slot.
For details of setting, refer to the HARDWARE MANUAL OPTION IR.LINK (manual number SME-1-117) and SOFTWARE MANUAL OPTION IR.LINK For Windows® (manual number SAE-3-155).

⚠ CAUTION

Short-circuit the slot number setting terminals according to the type of the DI/DO module to be mounted.   For example, connect between 32M and COM terminals when a 32-point module is mounted.

6.2   Startup Procedure

```
                    ┌───────────────┐
                    │     Start     │
                    └───────┬───────┘
                            │
                            ▼
            ╱───────────────────────────────╲
           ╱  Check wiring (particularly the  ╲
           ╲     power supply wiring).        ╱
            ╲───────────────┬───────────────╱
                   OK        │◄──────────────────────────┐
                            ▼                            │
            ╱───────────────────────────────╲    NG   ┌──────────────────────────┐
           ╱   Check the rotary switch        ╲──────►│ Set the rotary switch     │
           ╲     setting.                     ╱        │ correctly.               │
            ╲───────────────┬───────────────╱         └──────────────────────────┘
                   OK        │◄──────────────────────────┐
                            ▼                            │
            ╱───────────────────────────────╲    NG   ┌──────────────────────────┐
           ╱   Check the number of points     ╲──────►│ Set the number of points  │
           ╲     of the I/O module.           ╱        │ of the I/O module         │
            ╲───────────────┬───────────────╱         │ correctly.               │
                   OK        │                          └──────────────────────────┘
                            ▼
                    ┌───────────────┐
                    │ Turn on power.│
                    └───────┬───────┘
                            │◄────────────────────────────────────────┐
                            ▼                                          │
            ╱───────────────────────────────╲    NO                   │
           ╱   TX/RX indicator ON?            ╲──────────┐            │
           ╲                                  ╱          │            │
            ╲───────────────┬───────────────╱           │            │
                  YES        │                           ▼            │
                            ▼              ╱───────────────────────────────╲
                    ┌───────────────┐      ╱  Check the setting of the       ╲
                    │     End       │  NG ╱     station information table.     ╲
                    └───────────────┘ ◄───╲                                   ╱
                                           ╲───────────────┬───────────────╱
                                                  OK        │
                            ┌──────────────────────┐        ▼
                            │ Set the station      │   ┌──────────────────────┐
                            │ information table     │   │ Reset the CPU module.│
                            │ correctly.           │   └──────────────────────┘
                            └──────────┬───────────┘
                                       └────────────────────►
```

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7 MAINTENANCE

7.1   Preventive Maintenance

For optimum use of the S10mini, it is essential that you carry out the following maintenance ever now and then (at least 2 times a year).

Preventive maintenance items
Module appearance check
Screw/terminal strip screw looseness check
Cable/wire coating check
Dust adhesion check
AC supply voltage check (85 to 132 V)
Indicator devices check
5 V supply voltage check

● Module appearance check
 Check to see whether the module case is cracked or otherwise broken.   If the case is damaged, the internal circuit may also be damaged which may due in malfunction of the system.
● Condition of the indicators – lights and contents
 Check the indicators for abnormalities.
● Screw/terminal strip screw looseness check
 Check that the module mounting screws and terminal strip screws are loose.
 Any loose screws must be tightened because this may cause the system to malfunction or end up with the components to burn out due to generated heat.
● Module replacement
 If you replace the module while the power is ON, the hardware and software may be damaged.   Before replacing the module, be sure to turn OFF the power.
● Cable coating check
 Check whether the cable coating is in good condition.   If the cable coating is peeled or damaged, system malfunction, electric shock, or shorting-induced component burnout may result.

⚠ CAUTION

Static electricity may damage the module.   Before starting the work, discharge all electrostatic charge from your body.

● Dust adhesion check

Check if dust or other foreign matter adhered on the module.   If any dust/foreign matter buildup is found, remove it with a vacuum cleaner.   If you allow dust or other foreign matter to build up, the internal circuitry may be shorted or to cause a component burnout.

● Supply voltage check

Check that the voltages of the module power supply and externally supplied power are within the specified ranges.   If the supply voltage is out of the range, the system may malfunction.   (For the modules' operating supply voltages and externally supplied voltage, refer to the respective manuals.)

● Life expectancy of the relay

As regards the LQY100, LQY140, and other I/O modules having a built-in relay, you must pay attention to the life expectancy of the relay.

If the relay opens/closes at frequent intervals or is incorporated in a system having a high output voltage or current, you should consider a module replacement.
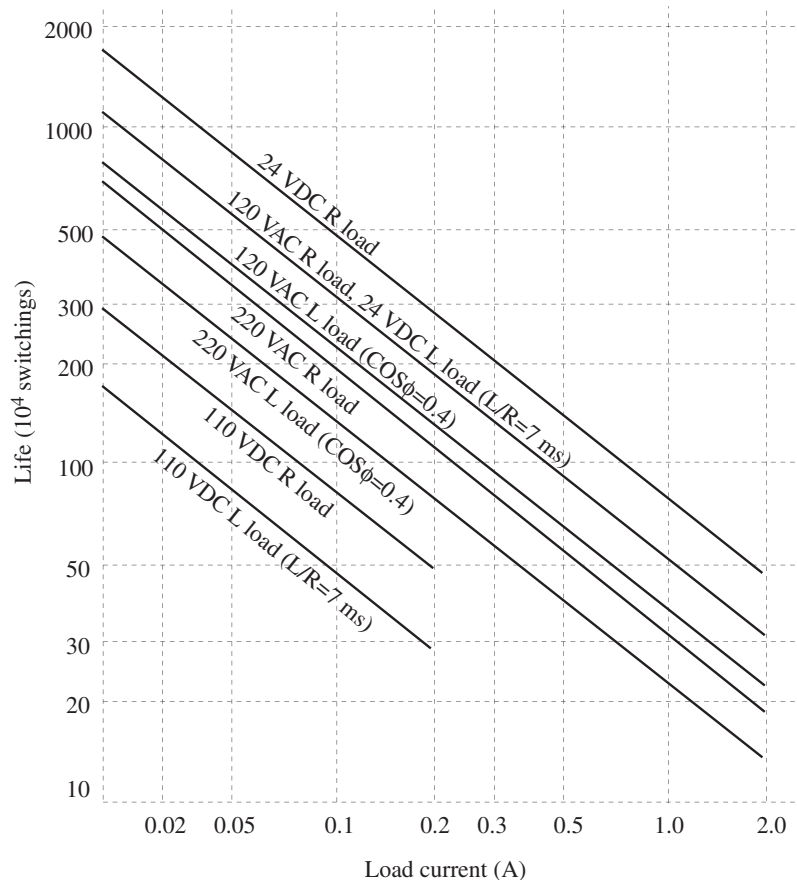
The L load contains a rush current.

Figure 7-1   Life Expectancy of Relay

7.2   Troubleshooting

7.2.1   Procedure

```
        ┌──────────────────────┐
        │   Trouble occurred.   │
        └──────────┬───────────┘
                   │
                   ▼
   ┌───────────────────────────────────┐
   │ Perform checks according to the   │
   │ instructions given in section 7.2.2, │
   │ "Preliminary checks to be          │
   │ completed before troubleshooting". │
   └────────────────┬──────────────────┘
                    │
                    ▼
              ╱───────────╲        YES
             ╱ All items OK? ╲──────────────────────┐
             ╲               ╱                       │
              ╲─────┬───────╱                        │
                   │ NO                              │
                   ▼                                 │
   ┌───────────────────────────────┐                │
   │ Take proper action against the │               │
   │ wrong items.                   │               │
   └───────────────┬───────────────┘               │
                   │                                 │
                   ▼                                 │
             ╱───────────╲        NO                 │
            ╱  Recovered   ╲───────────────────────►│
            ╲  normally?   ╱                         │
             ╲─────┬──────╱                          ▼
                   │ YES         ┌──────────────────────────────┐
                   │             │ Check the contents of the ERR │
                   │             │ indicator, S register, and S table. │
                   │             └───────────────┬──────────────┘
                   │                             │
                   │                             ▼
                   │    YES               ╱───────────╲
                   │◄─────────────────────╲  Recovered ╱
                   │                       ╲ normally? ╱
                   │                        ╲────┬────╱
                   │                             │ NO
                   ▼                             ▼
        ┌──────────────────────┐   ┌──────────────────────────┐
        │ Troubleshooting ended │   │ Contact your nearest Hitachi │
        └──────────────────────┘   │ Service Center.          │
                                    └──────────────────────────┘
```
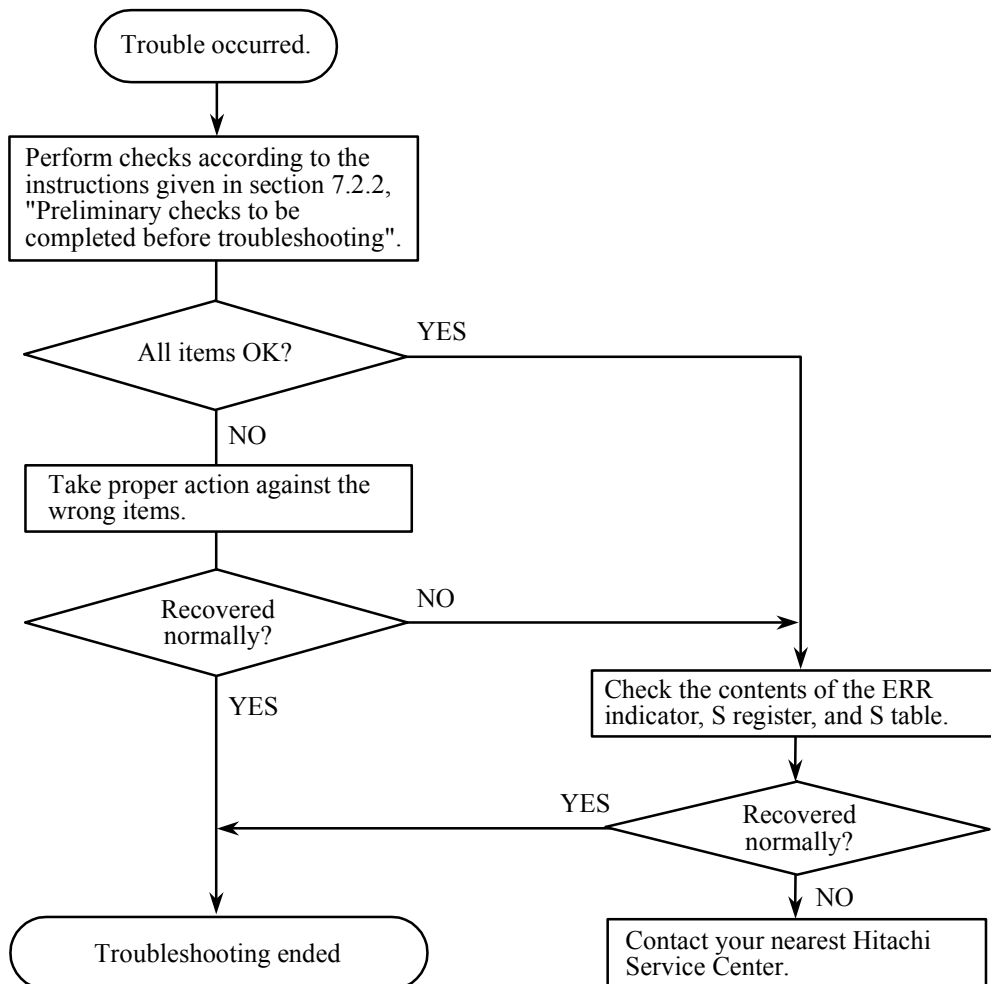
7.2.2   Preliminary checks to be completed before troubleshooting

● Is the communication cable terminated normally?
  • Always terminate both ends of the communication cable with terminating resistors (120 ohms each).   (For the IR.Station module, connect TERM and COM terminals to terminate with a 120-ohm built-in resistance.
● Is the wiring OK?
  • Check whether the cables are connected correctly and firmly.
● Is the IR.Station module mounted correctly?
  • Check whether the IR.Station module is mounted correctly and mounting screws are tightened firmly.
● Is the terminal block fit for the module?
  • Use a 18-point terminal block fit for the IR.Station module.
● Is the module grounded correctly?
  • Ground the module away from the grounding point of high power units.
  • Use the grounding of Class D or higher.
● Are the LG and FG terminals grounded separately?
  • Be sure to ground the LG and FG terminals separately to prevent malfunction due to power noises to the FG via the LG.
  • Ground the LG terminal at the power supply side.

7.3   Error Indication

When detecting a hardware error, the IR.Station module turns on (or blinks) the ERR indicator. Turn off the power, turn it on again and make sure the ERR indicator is off.   If the ERR indicator is on (or blinking) again, replace the IR.Station module.   The ERR indicator turns on or blinks to indicate errors as follows:

Hardware error	ERR indicator status
ROM checksum error	ON
Watch-dog-timer error	ON
RAM read/write check error	Blinks

8 SPECIFICATIONS

8 SPECIFICATIONS

8.1 Specifications

8.1.1 IR.Station module specifications

Table 8-1 Module Specifications

Item	Specifications
Model	LQS021
Module size	$130 \times 69 \times 100$ mm (including the terminal block)
Current consumption	5 V: 700 mA
Weight	320 g

8.1.2 Line specifications

Table 8-2 Line Specifications

Item		Specifications
Transmission		Serial transmission (Bit-serial transmission)
Electric interface		RS-485
Cable	Type	2 shielded twisted-pair cables Recommended cable: KPEV-SB, 2P, 0.5 mm^2 (made by Hitachi Cable, Ltd.)
	Length	Dependent upon the transmission speed as shown below. Transmission speed $\leqq$ 1.0 Mbps 240 m (maximum) Transmission speed $\leqq$ 0.5 Mbps 480 m (maximum) Transmission speed $\leqq$ 0.25 Mbps 800 m (maximum) Transmission speed $\leqq$ 0.125 Mbps 1000 m (maximum)
	Terminal block	18-point terminal block (M3$\times$6)