MITSUBISHI

RTD Input Module Channel Isolated RTD Input Module

MITSUBISHI
General-Purpose PROGRAMMABLE LOGIC CONTROLLER

User's Manual
(Hardware)

Q64RD
Q64RD-G

Thank you for purchasing the Mitsubishi general-purpose programmable logic controller MELSEC-Q series.

Prior to use, please read this manual thoroughly and familiarize yourself with the product

MELSEC-Q

Mitsubishi Programmable
Logic Controller

MODEL	Q64RD-U-H-JE
MODEL CODE	13JT31
IB(NA)-0800156-C(0610)MEE	

● SAFETY PRECAUTIONS ●
(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.
These SAFETY PRECAUTIONS classify the safety precautions into two categories: "DANGER" and "CAUTION".

◇ DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury, if not carried out properly.
⚠ CAUTION	Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.
In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

◇ DANGER
● Do not write data into the "system area" of the buffer memory of intelligent function modules. Also, do not use any "prohibited to use" signals as an output signal to an intelligent function module from the PLC CPU. Writing data into the "system area" or outputting a signal for "prohibited to use" may cause a PLC system malfunction.

⚠ CAUTION
● Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm(3.94 inch) or more from each other. Not doing so could result in noise that may cause malfunction.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION
● Use the PLC in an environment that meets the general specifications contained in the CPU user's manual. Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product. ● When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward. Improper installation may result in malfunction, breakdown or the module coming loose and dropping. Securely fix the module with screws if it is subject to vibration during use. ● Tighten the screws within the range of specified torque. If the screws are loose, it may cause the module to fallout, short circuits, or malfunction. If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction. ● Switch all phases of the external power supply off when mounting or removing the module. Not ding so may cause electric shock or damage to the module. ● Do not directly touch the conductive area or electronic components of the module. Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

⚠ CAUTION
● Always ground the FG terminal for the PLC. There is a risk of electric shock or malfunction. ● When turning on the power and operating the module after wiring is completed, always attach the terminal cover that comes with the product. There is a risk of electric shock if the terminal cover is not attached. ● Tighten the terminal screws within the range of specified torque. If the terminal screws are loose, it may result in short circuits or malfunction.If the terminal screws are tightened too much, it may cause damage to the screw and/or the module, resulting in short circuits or malfunction. ● Be careful not to let foreign matter such as sawdust or wire chips get inside the module.They may cause fires, failure or malfunction.

[WIRING PRECAUTIONS]

⚠ CAUTION
● The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring. Do not remove this film until the wiring is complete. Before operating the system, be sure to remove the film to provide adequate ventilation.

REVISIONS

✻ The manual number is given on the bottom right of the top cover.

Print Date	✻ Manual Number	Revision
Nov., 2000	IB (NA)-0800156-A	First edition
Jun., 2003	IB (NA)-0800156-B	Added the description of the model, Q64RD-G. Addition Section 2.2 Partial correction About the Manuals, Chapter 1, Chapter 2, Section 2.1 to 2.3, Chapter 4, Section 5.1, 5.2, 5.3, Chapter 6
Oct., 2006	IB (NA)-0800156-C	Partial correction Section 5.3

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■ CONTENTS ■

About the Manuals

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

Detailed manual

Manual Name	Manual Number (Model Code)
RTD Input Module Channel Isolated RTD Input Module User's Manual Q64RD/Q64RD-G/GX Configurator-TI (SW1D5C-QTIU-E)	SH-080142 (13JR31)

Conformance to the EMC Directive/Low Voltage Directive

For details on making Mitsubishi PLC conform to the EMC directive and low voltage instruction when installing it in your product, please see Chapter 3, "EMC Directive and Low Voltage Instruction" of the User's Manual (Hardware) of the PLC CPU to use.
The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

1. OVERVIEW

This user's manual provides the specifications, handling instructions, part names and others of the Q64RD platinum RTD temperature input module (referred to as Q64RD) and the Q64RD-G channel isolated RTD temperature input module (referred to as Q64RD-G) used with the MELSEC-Q series CPU module.

2. SPECIFICATIONS

The following are the specifications of the Q64RD/Q64RD-G.

2.1 Specifications of Q64RD

Item		Specifications			
Number of channels		4 channels			
Output	Temperature conversion value	16-bit, signed binary data (-2000 to 8500: Value to the first decimal place $\times$ 10) 32-bit, signed binary data (-200000 to 850000: Value to the third decimal place $\times$ 1000)			
	Scaling value	16-bit, signed binary data			
Usable platinum temperature-measuring resistors		Pt100 (JIS C1604-1997, IEC 751 1983), JPt100 (JIS C1604-1981)			
Measured temperature range	Pt100	-200 to 850℃			
	JPt100	-180 to 600℃			
Range changing	Pt100	-20 to 120℃ / -200 to 850℃			
	JPt100	-20 to 120℃ / -180 to 600℃			
Accuracy *1	Ambient temperature 0 to 55℃	±0.25% (accuracy relative to maximum value)			
	Ambient temperature 25±5℃	±0.08% (accuracy relative to maximum value)			
Resolution		0.025℃			
Conversion speed		40ms/channel *2			
Number of analog input points		4 channels/module			
Temperature detecting output current		1mA			
E^{2}PROM write count		Max. 100,000 times			
Isolation		Specific isolated area	Isolation method	Dielectric withstand voltage	Isolation resistance
		Between platinum temperature-measuring resistor input and PLC power supply	Photocoupler isolation	1780VrmsAC/ 3 cycles (Altitude 2000m)	10MΩ or more using 500VDC isolation resistance tester
		Between platinum temperature-measuring resistor input channels	No isolation	-	
Wire break detection		Yes (Each channel independent) *3			
Number of occupied points		16 points			
Connection terminals		18-point terminal block			
Applicable wire size		0.3 to 0.75mm^2			
Applicable crimping terminals		1.25-3 R1.25-3 (Sleeved crimping terminals are unusable)			
Cables between Q64RD and platinum temperature-measuring resistor		Refer to Section 2.3.			
Internal current consumption (5VDC)		0.60A			
Weight		0.17kg			
Outline dimensions		98(H) $\times$ 27.4(W) $\times$ 90(D) mm			

*1 The selection ranges and accuracies have the following relationships.

Selection Range \ Ambient Temperature	Pt100 and JPt100: -20 to 120℃	Pt100: -200 to 850℃	JPt100: -180 to 600℃
0 to 55℃	±0.3℃	±2.125℃	±1.5℃
25±5℃	±0.096℃	±0.68℃	±0.48℃

*2 The conversion speed is a period from when a temperature is input and converted into a corresponding digital value until the value is stored into the buffer memory.
When two or more channels are used, the conversion speed is "40ms × number of conversion enabled channels".
*3 At wire break detection, the temperature conversion value right before wire break occurrence is held.

2.2 Specifications of Q64RD-G

Item			Specifications			
Number of channels			4 channels			
Output	Temperature conversion value		16-bit, signed binary data (-2000 to 8500: Value to the first decimal place × 10 times) 32-bit, signed binary data (-200000 to 850000: Value to the third decimal place × 1000 times)			
	Scaling value		16-bit, signed binary data			
Usable temperature-measuring resistors			Pt100 (JIS C1604-1997, IEC 751 1983), JPt100 (JIS C1604-1981), Ni100Ω (DIN43760 1987)			
Measured temperature range	Pt100		-200 to 850℃			
	JPt100		-180 to 600℃			
	Ni100Ω		-60 to 180℃			
Range changing	Pt100		-20 to 120℃ /0 to -200℃ / -200 to 850℃			
	JPt100		-20 to 120℃ /0 to -200℃ / -180 to 600℃			
	Ni100Ω		-			
Accuracy *1 (Accuracy relative to maximum value of selection range)	Reference accuracy *2		Within ±0.04%			
	Temperature coefficient *3	Pt100/JPt100 (-20 to 120℃)	±70ppm/℃ (±0.0070%/℃)			
		Pt100/JPt100 (0 to 200℃)	±65ppm/℃ (±0.0065%/℃)			
		Pt100/JPt100 (-200 to 850℃)	±50ppm/℃ (±0.0050%/℃)			
		Pt100/JPt100 (-60 to 180℃)	±70ppm/℃ (±0.0070%/℃)			
Resolution			0.025℃			
Conversion speed			40ms/channel *4			
Number of analog input points			4 channels/module			
Temperature detecting output current			1mA			
E²PROM write count			Max. 100000 times			
Isolation				Specific isolated area	Isolation method	Dielectric withstand voltage	Isolation resistance
			Between temperature-measuring resistor input and PLC power supply	Photocoupler isolation	1780VrmsAC/ 3 cycles (Altitude 2000m)	10MΩ or more using 500VDC isolation resistance tester
			Between temperature-measuring resistor input channels	Transformer isolation		
Wire break detection			Yes (Each channel independent) *5			
Number of occupied points			16 points			
Connection terminals			18-point terminal block			
Applicable wire size			0.3 to 0.75mm²			
Applicable crimping terminals			1.25-3 R1.25-3 (Sleeved crimping terminals are not usable.)			
Cables between Q64RD-G and temperature-measuring resistor			Refer to Section 2.3.			
Internal current consumption (5VDC)			0.62A			
Weight			0.20kg			
Outline dimensions			98(H) × 27.4(W) × 112(D) mm			

*1 The selection ranges and accuracies have the following relationships.

Ambient Temperature / Selection Range	Pt100 and JPt100: -20 to 120°C	Pt100: -200 to 850°C	JPt100: -180 to 600°C
0 to 55°C	±0.300°C	±1.615°C	±1.140°C
25±5°C	±0.090°C	±0.553°C	±0.390°C

Ambient Temperature / Selection Range	Pt100 and JPt100: 0 to 200°C	Pt100: -60 to 180°C
0 to 55°C	±0.470°C	±0.450°C
25±5°C	±0.145°C	±0.135°C

*2 Accuracy in ambient temperature and wire resistance when the offset/gain setting is set.
*3 Accuracy per 1-degree temperature change
    Example) Accuracy for the case of changing from 25 to 30°C
            0.04% (Reference accuracy) + 0.0070%/°C (Temperature coefficient) $\times$ 5°C
            (Temperature difference) = 0.075%
*4 The conversion speed is a period from when a temperature is input and converted into a
    corresponding digital value until the value is stored into the buffer memory.
    When two or more channels are used, the conversion speed is "40ms $\times$ number of conversion
    enabled channels".
*5 At wire break detection, the temperature conversion value right before wire break occurrence is
    held.

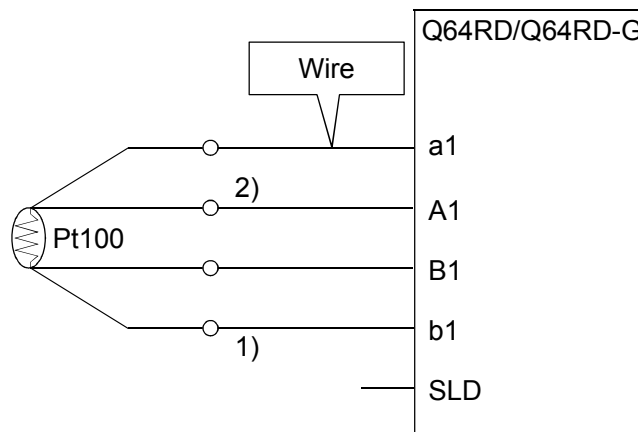## 2.3 Specifications for Connection of Temperature-Measuring Resistor

(1) For 3-wire type

The wire resistance value should satisfy the condition of 1) + 2) $\leqq$ 2Ω max.
In addition, the difference of the wire resistance value between 1) and 2)
should be 10Ω max.
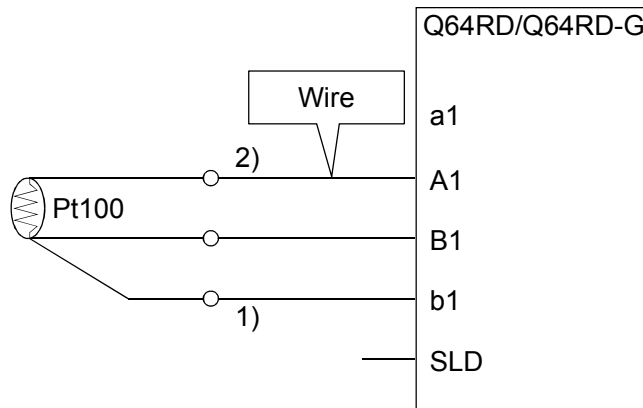
(2) For 4-wire type

The wire resistance value should satisfy the condition of 1) + 2) $\leqq$ 2Ω max.

3

> **POINT**
>
> Wire resistance values may be an error factor in the temperature measurement.
>
> The error arisen between the Q64RD/Q64RD-G and the temperature-measuring resistor (between the wire resistance value 1) + 2) and measured temperature value) is Max. 0.007°C/2Ω (Q64RD) or Max. 0.003°C/2Ω (Q64RD-G).
>
> This error can be corrected by the offset/gain setting.
>
> When making offset/gain adjustment, set the wire resistance value actually used.

3. LOADING AND INSTALLATION

3.1 Handling Instructions

(1) Do not drop the case and connectors of the module and subject them to hard impact.

(2) Do not remove the printed circuit boards of the module from the case. Doing so can cause a failure.

(3) Be careful to prevent wire-offcuts and other foreign matter from entering the module. They can cause a fire, failure or malfunction.

(4) To prevent wire-offcuts and other foreign matter from entering the module during wiring, the module carries a foreign matter ingress prevention label at its top. During wiring, do not remove this label. For system operation, always remove this label to ensure adequate heat dissipation.

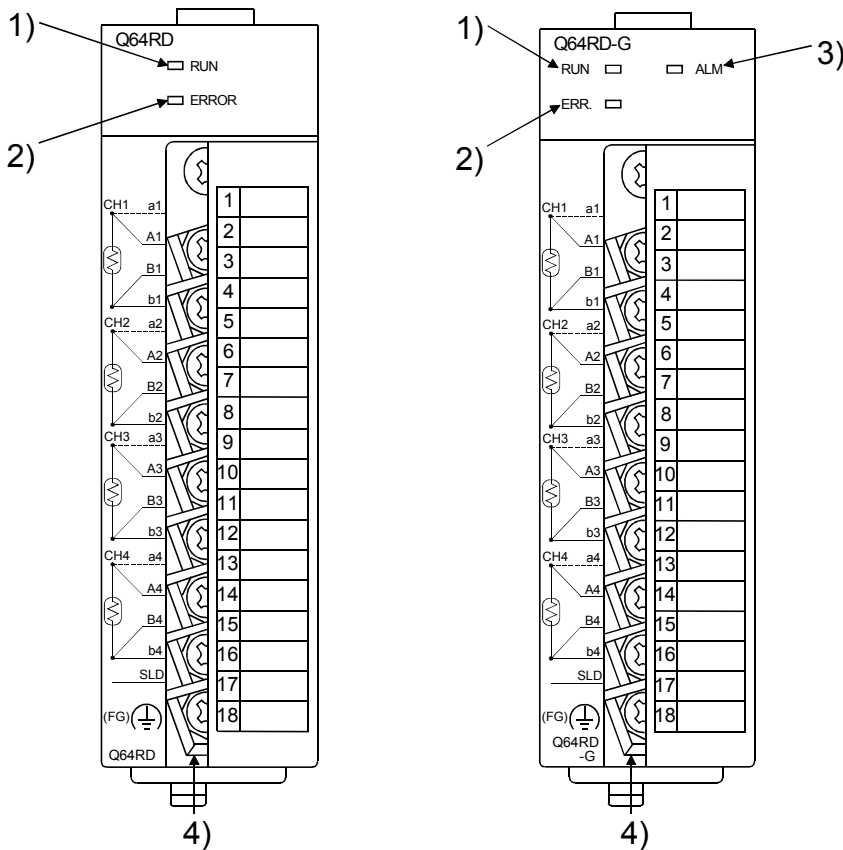(5) Tighten the mounting and terminal screws of the module within the following ranges.

Screw Location	Tightening Torque Range
Module mounting screw (M3 screw)	0.36 to 0.48N • m
Terminal block terminal screw (M3 screw)	0.42 to 0.58N • m
Terminal block mounting screw (M3.5 screw)	0.66 to 0.89N • m

(6) To mount the module on the base, securely insert the module fastening latch into the fastening hole on the base. Improper installation may result in a module malfunction, or may cause the module to fall off.

(7) Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions of the module.

3.2 Installation Environment

Refer to the user's manual of the CPU module used.

Terminal Block Layout		
Terminal number	Signal name	
1	CH1	a1
2		A1
3		B1
4		b1
5	CH2	a2
6		A2
7		B2
8		b2
9	CH3	a3
10		A3
11		B3
12		b3
13	CH4	a4
14		A4
15		B4
16		b4
17	SLD	
18	FG	

Number	Name and Appearance	Description
1)	RUN LED	Indicates the Q64RD/Q64RD-G operation status. ON : Normally operating Flicker : Offset/gain setting mode OFF : 5V power-off, watchdog timer error occurrence or status available for module replacement during online module replacement
2)	ERROR LED ERR. LED	Indicates the Q64RD/Q64RD-G error status. ON : Error occurrence Flicker : Switch setting error In intelligent function module switch setting of GX Developer, other than 0 was set to Switch 5. OFF : Normally operating
3)	ALM LED (Q64RD-G only)	Indicates the Q64RD/Q64RD-G alarm status. ON : Alarm occurrence Flicker : Input signal fault occurrence OFF : Normally operating
4)	Terminal block	Used for wiring of the temperature-measuring resistor, etc.

5.1 Wiring Instructions

(1) Use separate cables for the AC control circuit and Q64RD/Q64RD-G's external input signals to avoid the influence of AC side surges and inductions.

(2) Do not run the module cables near, or bundle them with, the main circuit and high-voltage cables and the load cables from other than the PLC. Not doing so will make the module more susceptible to noises, surges and inductions.

(3) Ground the shield of the shielded cable at one end on the PLC side. However, depending on the external noise conditions, grounding on the sensor side may be advisable.

(4) Insulation-sleeved crimping terminals cannot be used with the terminal block.
It is recommended to fit mark tubes or insulation tubes to the wire connection parts of the crimping terminals.

5.2 External Wiring

(1) For 4-wire type

CH1
a1
A1
B1
b1

*1

Bare crimping sleeve for copper wire
(JIS C 2806 or equivalent)

CH2
a2
A2
B2
b2

CH3
a3
A3
B3
b3

CH4
a4
A4
B4
b4

To "SLD"
terminal

Detail

SLD
Connected inside
module

FG

*2
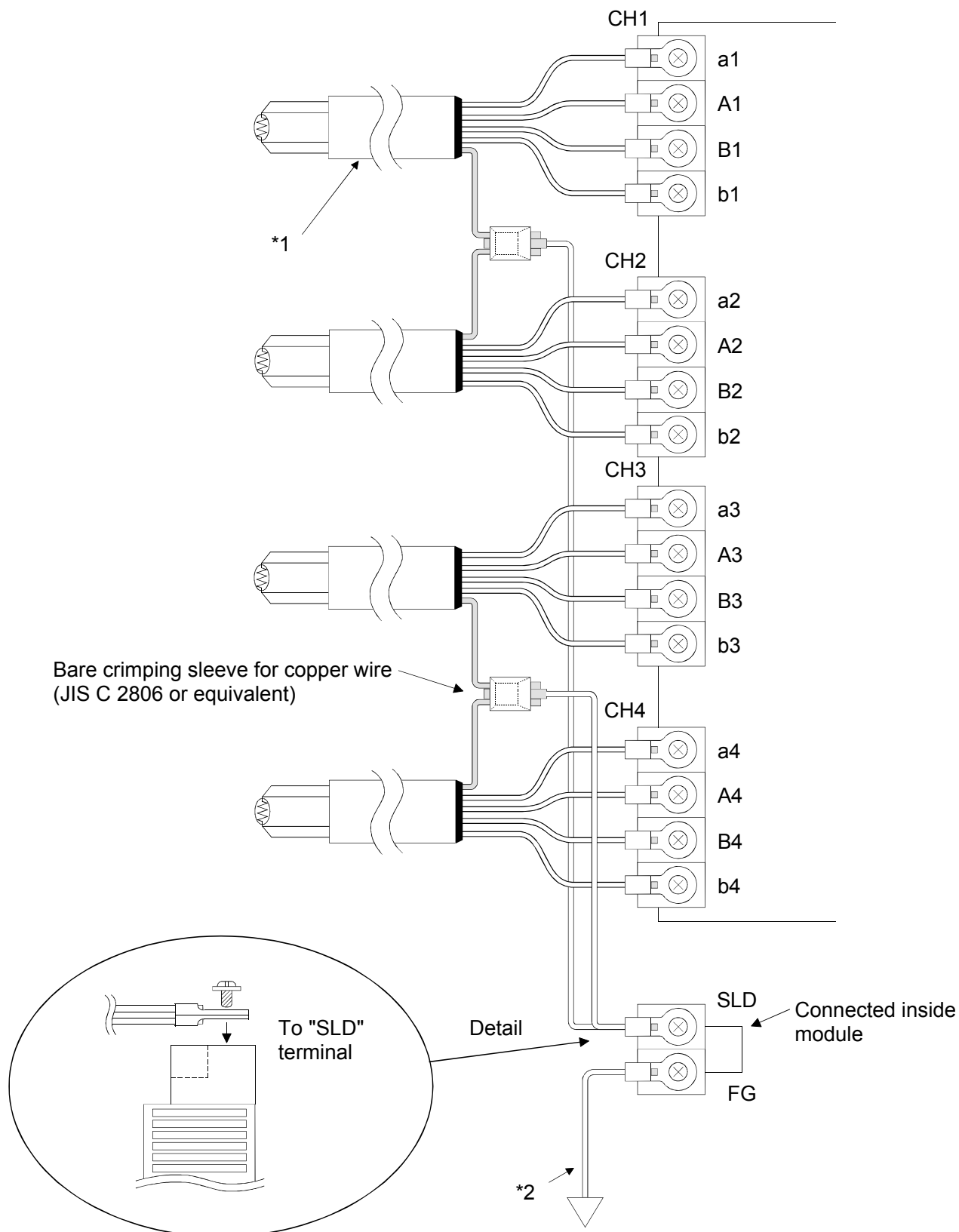
*1 Use the conducting cable with shield and make the wiring length as short as possible.
*2 Ground it to the ground terminal on the control panel.

7
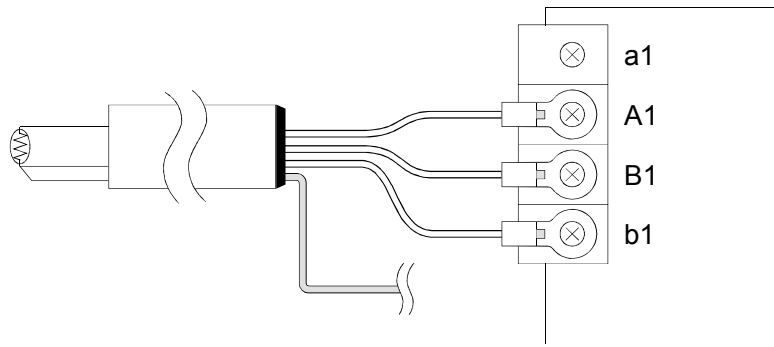
(2) For 3-wire type

(3) For 2-wire type

When 4-wire type is selected in switch 3
of intelligent function module switch setting
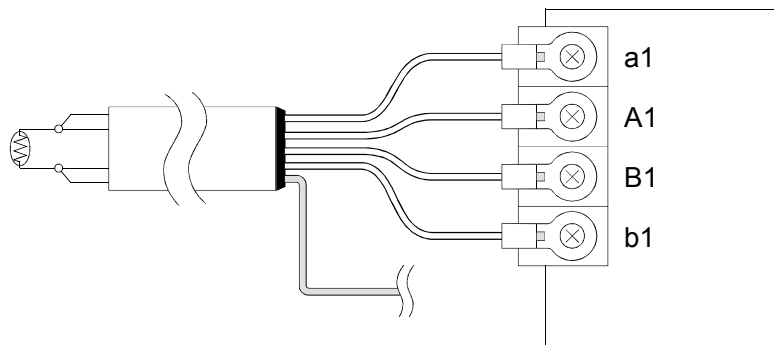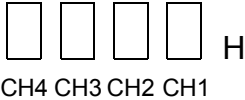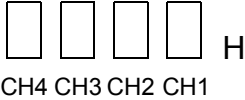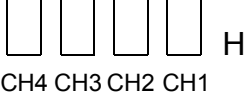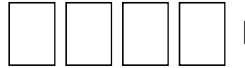
When 3-wire type is selected in switch 3
of intelligent function module switch setting
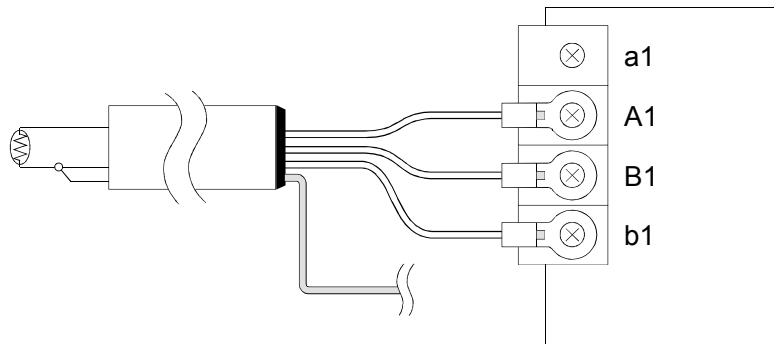
5.3 Intelligent Function Module Switch Setting

Make the intelligent function module switch setting using the I/O assignment setting of GX Developer.
You can make setting easily by entering hexadecimal numbers into 4 digits.

	Setting Item			
Switch 1	Measurement range setting □□□□ H CH4 CH3 CH2 CH1	**Measurement mode** / **Measurement range** / **Set value *1**		

Switch 1 — Measurement range setting:

Measurement mode	Measurement range	Set value *1
New JIS (Pt 100)	-200 to 850℃	0
	-20 to 120℃	1
	0 to 200℃	4
Old JIS (JPt100)	-180 to 600℃	2
	-20 to 120℃	3
	0 to 200℃	5
Ni100Ω	-60 to 180℃	8

Switch 2 — Offset/gain setting:
□□□□ H   CH4 CH3 CH2 CH1

Offset/gain setting	Set value
Factory-set	0
User range setting	1

Switch 3 — Wiring type setting:
□□□□ H   CH4 CH3 CH2 CH1

Wiring type setting	Set value
3-wire type	0
4-wire type	1

Switch 4

□□□□ H

0H : Normal mode (temperature conversion processing)
1 to FH *2 : Offset/gain setting mode

Switch 5 — 0: Fixed

*1 The setting range 0 to 3 is available for the Q64RD/Q64RD-G. Setting of 4, 5 and 8 is available for the Q64RD-G only. Setting other than these setting values will output an error.

*2 The same operation is activated with any value within the setting range. For the range of 1 to FH, for example, set 1.
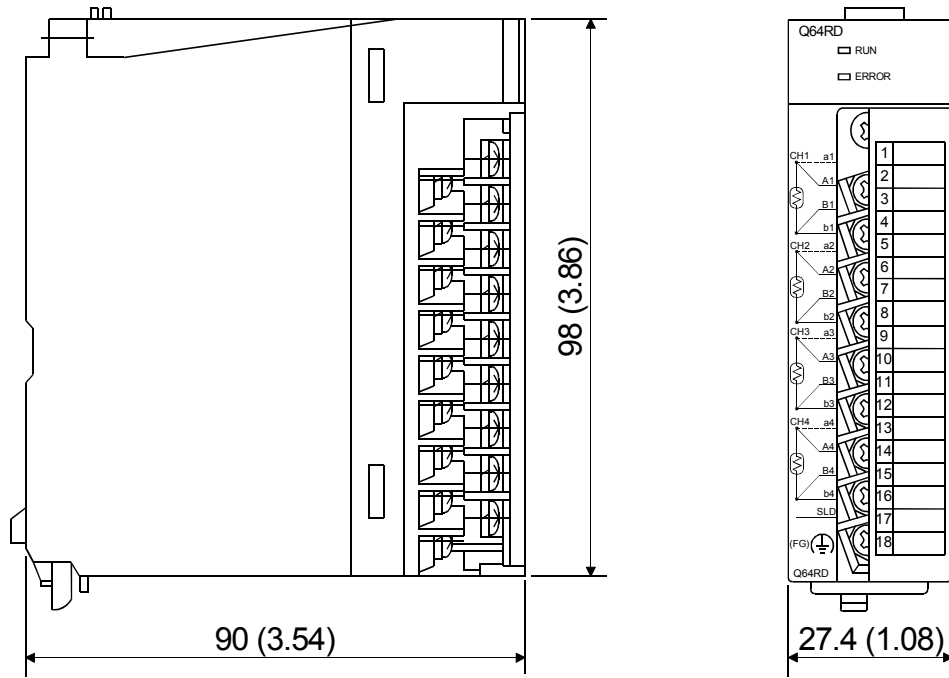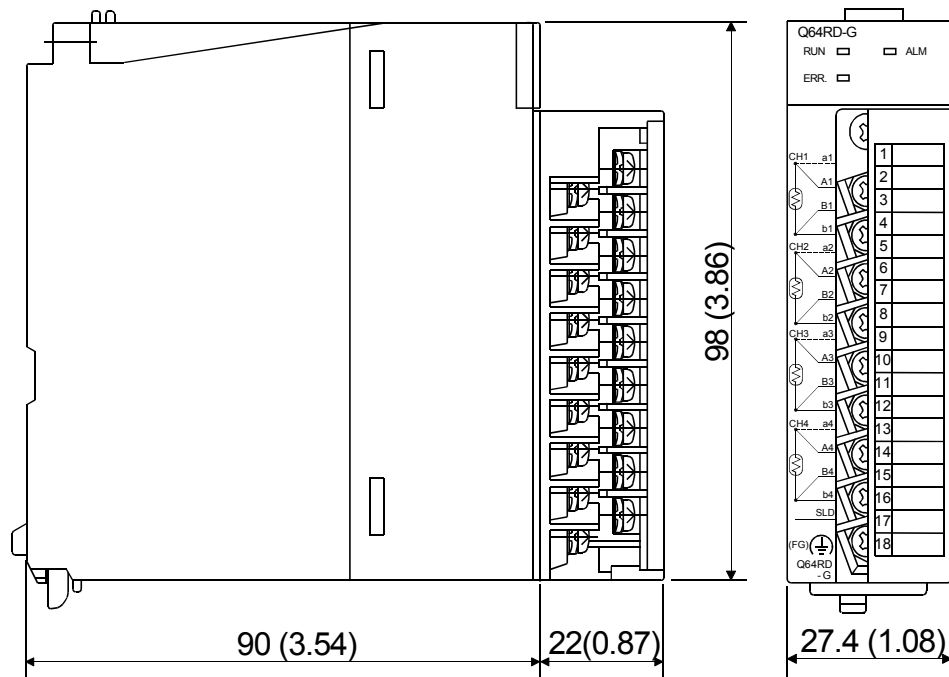
(1) Q64RD

Unit: mm (in.)

(2) Q64RD-G

Unit: mm (in.)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠ For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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