

MITSUBISHI

RTD Input Module

User's Manual
(Hardware)

AJ65SBT2B-64RD3

Thank you for purchasing the Mitsubishi programmable controller .

Prior to use, please read this and relevant manuals thoroughly to fully understand the product.



MODEL	AJ65S-64RD3-U-HW
MODEL CODE	13JY77
IB(NA)-0800420-A(0805)MEE	

● SAFETY PRECAUTIONS ●

(Be sure to read these instructions before use.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.

The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.


In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".



Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Note that the  CAUTION level may lead to a serious consequence according to the circumstances.

Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Design Precautions]

DANGER

- In the case of a data link error, the master module data is backed up. Using the communication status information, create an interlock circuit on the sequence program for the system to operate safely.

CAUTION

- Do not install the control or communication cable(s) together with the main circuit or power cables.
Keep a distance of 100mm or more between them.
Failure to do so may cause malfunctions due to noise.

[Installation Precautions]

CAUTION

- Use the module in an environment that meets the general specifications given in this manual.
Operating it in any other environment may cause an electric shock, fire, malfunction, product damage or deterioration.
- For protection of the switches, do not remove the cushioning material before installation.
- Securely fix the module with the DIN rail or fixing screws. Fixing screws must be tightened within the specified torque range.
A loose screw may cause a drop of the module or malfunction.
Overtightening may damage the screw, resulting in a drop or malfunction of the module.
- Do not directly touch any conductive part of the module.
Doing so may result in a malfunction or failure of the module.

[Wiring Precautions]

CAUTION

- Be sure to shut off all phases of the external power supply used by the system before installation or wiring.
Failure to do so may cause a damage to the product and/or malfunctions.
- Always ground the FG terminal to the protective ground conductor.
Failure to do so may result in malfunctions.
- Be sure to tighten any unused terminal screws within a tightening torque range.
Failure to do so may cause a short circuit due to contact with a solderless terminal.
- Use applicable solderless terminals and tighten them with the specified torque.
If any solderless spade terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and terminal layout and then wire the module correctly.
Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.
- Tighten terminal screws within the specified torque range.
A loose terminal screw may cause a short circuit or malfunction.
Overtightening can cause a short circuit or malfunction due to damage of the screws or module.
- Take care to prevent foreign matter such as dust or wire chips from entering the module.
Failure to do so may cause a fire, failure or malfunctions.
- Place the connection wires and cables in a duct or clamp them.
If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module and/or cables or malfunctions due to poor cable connection.

[Wiring Precautions]

CAUTION

- Do not install the control cable(s) together with the communication cable(s). Doing so may cause malfunctions due to noise.
- When disconnecting the cables from the module, do not hold and pull the cable part.
Disconnect the cables after loosening the screws in the portions connected to the module.
Pulling the cable that is still connected to the module may damage the module and/or cable and cause malfunctions due to poor cable connection.

[Starting and Maintenance Precautions]

CAUTION

- Do not touch the terminals while the power is on.
Doing so may cause malfunction.
- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws.
Not doing so can cause the module to fail or malfunction.
Undertightening can cause a drop, short circuit or malfunction.
Overtightening can cause a drop, short circuit or malfunction due to damage of the screws or module.
- Never disassemble or modify the module.
This may cause breakdowns, malfunction, injury and/or fire.
- Do not drop or apply any strong impact to the module.
Doing so may damage the module.
- Be sure to shut off all phases of the external power supply used by the system before mounting or dismounting the module to or from the panel.
Not doing so can cause the module to fail or malfunction.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)
- Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body.
Failure to do so can cause the module to fail or malfunction.

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.

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About Manuals

The following manuals are also related to this product.
If necessary, place an order.

Related Manuals

Manual name	Manual Number (Model code)
RTD Input Module Type AJ65SBT2B-64RD3 User's Manual	SH-080770ENG (13JZ21)

COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES

- (1) For programmable controller system
To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to the "EMC AND LOW VOLTAGE DIRECTIVES" chapter of the User's Manual for the CPU module used.
The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.
- (2) For the product
For the compliance of this product with the EMC and Low Voltage Directives, refer to the "CC-Link module" section in the "EMC AND LOW VOLTAGE DIRECTIVES" chapter of the User's Manual for the CPU module used.

1. OVERVIEW

This user's manual explains the specifications, names of the components and wiring for the type AJ65SBT2B-64RD3 RTD Input Module (hereafter AJ65SBT2B-64RD3) which are used as a remote device station of a CC-Link system.

2. SPECIFICATIONS

2.1 General Specifications

The general specifications for the AJ65SBT2B-64RD3 are shown in the following table.

Table 2.1 General specifications

Item	Specification				
Operating ambient temperature	0 to 55°C				
Storage ambient temperature	-20 to 75°C				
Operating ambient humidity	10 to 90%RH, condensation not allowed				
Storage ambient humidity	10 to 90%RH, condensation not allowed				
Vibration resistance	Compliant with JIS B 3502, IEC 61131-2	For intermittent vibration			No. of sweeps 10 times each in X, Y and Z directions (for 80 minutes)
		Frequency	Acceleration	Amplitude	
		10 to 57Hz	-	0.075mm	
		57 to 150Hz	9.8m/s ²	-	
		For continuous vibration			
		Frequency	Acceleration	Amplitude	
10 to 57Hz	-	0.035mm			
57 to 150Hz	4.9m/s ²	-			
Shock resistance	Compliant with JIS B 3502, IEC 61131-2 (147m/s ² , 3 times each in X, Y and Z directions)				
Operating atmosphere	No corrosive gases				
Operating altitude ^{*3}	2000m or lower				
Installation location	Inside control panel				
Overvoltage category ^{*1}	II or lower				
Pollution degree ^{*2}	2 or lower				

*1 It indicates the device is to be connected to which power distribution part, within the area from the public electricity network to machinery in the premise. Category II applies to devices to which power is supplied from fixed installations.

The surge voltage withstand for devices rated up to 300V is 2500V.

*2 This is an index showing the degree of the conductive pollution that can occur in the environment where the device is used.

In Pollution degree 2, only nonconductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation can be expected.

*3 Do not operate or store the programmable controller in the environment where the pressure applied is equal to greater than the atmospheric pressure at the altitude of 0m. Doing so may cause a malfunction. Please consult our branch office when the programmable controller is to be operated under pressure.

2.2 Performance Specifications

The performance specifications for the AJ65SBT2B-64RD3 are shown in the following table.

Table 2.2 Performance specifications

Item	AJ65SBT2B-64RD3				
Measurement method	3-wire				
Measured temperature value	16-bit signed binary (-2000 to 8500)				
Usable RTD	Pt100 (JIS C 1604-1997), JPt100 (JIS C 1604-1981), Ni100 (DIN 43760 1987)				
Detecting current	1mA				
Detecting range, degree of conversion accuracy, resolution	Detecting range	Degree of conversion accuracy ^{*1*2}		Resolution	
		Ambient temperature 0 to 55°C	Ambient temperature 25±5°C		
	Pt100	-200 to 850°C	±1.4°C	±0.5°C	±0.1°C
		-20 to 120°C	±0.6°C	±0.2°C	
		0 to 200°C	±0.6°C	±0.2°C	
	JPt100	-180 to 600°C	±1.0°C	±0.4°C	
		-20 to 120°C	±0.6°C	±0.2°C	
		0 to 200°C	±0.6°C	±0.2°C	
	Ni100	-60 to 180°C	±0.5°C	±0.2°C	
Conversion speed	40ms/1channel				
Temperature input point	4 channels/1 module				
Maximum number of writes for Flash memory	MAX. 10,000 times				
CC-Link station type	Remote device station				
No. of occupied stations	1 station (RX/RX: 32 points each, RWr/RWw: 4 points each)				
Connection cable	CC-Link dedicated cable				
Withstand voltage	500 V AC for 1 minute across all power supply and communication system terminals and all RTD input terminals				
Isolation system	Between communication system and all RTD inputs: Photocoupler isolation Between power supply system and all RTD inputs: Trans isolation Between channels: No isolation				
Noise immunity	Noise voltage : 500Vp-p, tested by noise simulator of noise width of 1 μs and noise frequency of 25 to 60Hz				
Wire break detection	Capable (channels respectively)				

Table 2.2 Performance specifications

Item		AJ65SBT2B-64RD3
External wiring connection system	Communication area, module power supply area	7-point 2-piece terminal block M3 × 5.2 tightening torque: 59 to 88N•cm Applicable solderless terminals: 2 max.
	I/O area	18-point 2-piece terminal block M3 × 5.2 tightening torque: 59 to 88N•cm Applicable solderless terminals: 2 max.
Applicable wire size		0.3 to 2.0mm ²
Applicable solderless terminals		<ul style="list-style-type: none"> • RAV1.25-3 (conforming to JIS C 2805) [Applicable wire size :0.3 to 1.25mm²] • V2-MS3, RAP2-3SL, TGV2-3N [Applicable wire size: 1.25 to 2.0mm²]
Module fixing screw		M4 screw × 0.7mm × 16mm or larger (tightening torque range: 78 to 108N•cm) DIN-rail mounting is also possible.
Applicable DIN rail		TH35-7.5Fe, TH35-7.5Al (Compliant with IEC 60715)
External power supply		24V DC (20.4V to 28.8V DC)
		Inrush current: 1.7A 2.4ms Current consumption: 0.14A (24VDC)
Weight		0.25kg

*1 The accuracy does not apply when noise exists.

*2 Accuracy of measured temperature value is calculated by the total of degree of conversion accuracy and degree of tolerance of RTD (Refer to Table 2.3).

(Example)

RTD to be used: Pt100, Class A

Detecting range: From -200 to 850°C

Ambient temperature: 40°C (0 to 55°C)

The degree of accuracy for measured temperature value at 800°C as follows.

$$\begin{aligned} \left(\begin{array}{c} \text{Accuracy of measured} \\ \text{temperature value} \end{array} \right) &= \left(\begin{array}{c} \text{Degree of} \\ \text{conversion} \\ \text{accuracy} \end{array} \right) + \left(\begin{array}{c} \text{Degree of tolerance of RTD} \\ \text{(Refer to Table 2.3.)} \end{array} \right) \\ &= (\pm 1.40^{\circ}\text{C}) + ((\pm(0.15^{\circ}\text{C} + 0.002 \times 800^{\circ}\text{C}))) \\ &= \pm 3.15^{\circ}\text{C} \end{aligned}$$

Because the resolution is $\pm 0.1^{\circ}\text{C}$ = $\pm 3.2^{\circ}\text{C}$

Table 2.3 Degree of tolerance of RTD

Resistance thermometer detector	Class	Tolerance
Pt100 (JIS C 1604-1997)	A	$\pm(0.15+0.002 t)^{\circ}\text{C}$
	B	$\pm(0.3+0.005 t)^{\circ}\text{C}$
JPt100 (JIS C 1604-1981)	0.15	$\pm(0.15+0.0015 t)^{\circ}\text{C}$
	0.2	$\pm(0.15+0.002 t)^{\circ}\text{C}$
	0.5	$\pm(0.3+0.005 t)^{\circ}\text{C}$
Ni100 (DIN 43760 1987)	0 to 250°C	$\pm(0.4+0.007 t)^{\circ}\text{C}$
	-60 to 0°C	$\pm(0.4+0.0028 t)^{\circ}\text{C}$

t: Measured temperature

3. PART NAMES AND SETTINGS

3.1 Part Names

This section explains the names of the components for the AJ65SBT2B-64RD3.

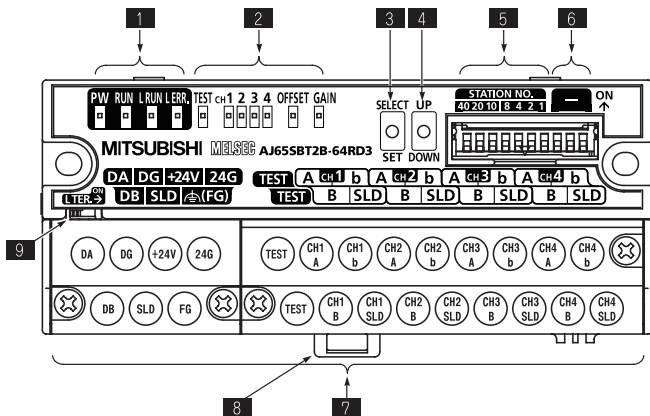


Figure 3.1 Appearance of the AJ65SBT2B-64RD3

Table 3.1 Part names

No.	Name	Description		
1	Operation status display LED	PW LED	On: Power supply on Off: Power supply off	
		RUN LED	Normal mode	On: Normal operation Flashing: 0.1-second interval: CH□ measurement range error occurs. 0.5-second interval: Out of average processing setting range error occurs. Off: Indicates that 24VDC power supply interrupted, watchdog timer error occurred, write error for flash memory occurred.
			Test mode	On: Indicate that the SELECT/SET switch is in the SET position. Flashing: The offset value is during correction, or the gain value is out of the setting range. (The gain value is out of range of the measurement temperature or less than 10°C when the offset value is subtracted from the gain value.) Off: Indicates that the SELECT/SET switch is in the SELECT or center position.
		L RUN LED	On: Normal communication Off: Communication cutoff (time expiration error)	
		L ERR. LED	On: Indicates that station number setting is outside the range. Flicker at fixed intervals: Indicates that station number setting was changed from that at power-on. Flicker at unfixed intervals: Indicates that you forgot fitting the terminating resistor or the module or CC-Link dedicated cable is affected by noise. Off: Indicates normal communications.	
2	Offset/gain adjusting LEDs	V I	Normal mode	Normally OFF.
		CH□ OFFSET GAIN	Test mode	The LEDs lit change every time the SELECT/SET switch is moved to SELECT.
3	SELECT/SET switch	Used to make offset/gain setting in the test mode.		
4	UP/DOWN switch	Used to adjust the offset value and gain value of the channel specified by the SELECT/SET switch.		

Table 3.1 Part names

No.	Name	Description																																																																																																														
5	Station number setting switches	<p>Use the switches in STATION NO. "10", "20" and "40" to set the tens of the station number. Use the switches in STATION NO. "1", "2", "4" and "8" to set the units of the station number. The switches are all factory-set to OFF. Always set the station number within the range 1 to 64. Cannot set the same station number to two or more stations. Setting any other number than 1 to 64 will result in an error, flickering the "L ERR." LED.</p> <table border="1"> <thead> <tr> <th rowspan="2">Station Number</th> <th colspan="3">Tens</th> <th colspan="4">Units</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>4</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>10</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>11</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>64</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <p>(Example) To set the station number to "32", set the switches as indicated below.</p> <table border="1"> <thead> <tr> <th rowspan="2">Station Number</th> <th colspan="3">Tens</th> <th colspan="4">Units</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>32</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> </tbody> </table>	Station Number	Tens			Units				40	20	10	8	4	2	1	1	OFF	OFF	OFF	OFF	OFF	OFF	ON	2	OFF	OFF	OFF	OFF	OFF	ON	OFF	3	OFF	OFF	OFF	OFF	OFF	ON	ON	4	OFF	OFF	OFF	OFF	ON	OFF	OFF	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	10	OFF	OFF	ON	OFF	OFF	OFF	OFF	11	OFF	OFF	ON	OFF	OFF	OFF	ON	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	64	ON	ON	OFF	OFF	ON	OFF	OFF	Station Number	Tens			Units				40	20	10	8	4	2	1	32	OFF	ON	ON	OFF	OFF	ON	OFF
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6	Use prohibited	Set all station number to OFF.																																																																																																														
7	Terminal block	Used to connect the module power supply, transmission and analog I/O signals.																																																																																																														
8	DIN rail hook	Used to mount the module to the DIN rail.																																																																																																														
9	L TER. (Line Termination) switch	Turned ON to validate the terminating resistor stored in the AJ65SBT2B-64RD3. Used to when the AJ65SBT2B-64RD3 is used on the network edge.																																																																																																														

* The transmission speed is automatically set depending on the setting of the master module.

4. LOADING AND INSTALLATION

4.1 Handling Precautions

The following is an explanation of handling precautions of the AJ65SBT2B-64RD3.

CAUTION

- Do not touch the terminals while the power is on. Doing so may cause malfunction.
- Take care to prevent foreign matter such as dust or wire chips from entering the module. Failure to do so may cause a fire, failure or malfunctions.
- Never disassemble or modify the module. This may cause breakdowns, malfunctioning, injury and/or fire.
- Do not directly touch the conductive area or electronic components of the module. Doing so may cause malfunction or failure in the module.
- Because it is made of resin, do not drop or apply any strong impact to the module. Doing so may damage the module.
- Tighten terminal screws within the specified torque range.
A loose terminal screw may cause a short circuit or malfunction.
Overtightening a terminal screw may damage the screw, resulting in a short circuit or malfunction.
- When disposing of this product, treat it as industrial waste.
- Use the module in an environment that meets the general specifications given in this manual. Operating it in any other environment may cause an electric shock, fire, malfunction, product damage or deterioration.
- For protection of the switches, do not remove the cushioning material before installation.
- Securely fix the module with the DIN rail or installation screws. Installation screws must be tighten within the specified torque range.
A loose screw may cause a drop of the module or malfunction.
Overtightening may damage the screw, resulting in a drop of the module or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before mounting or dismounting the module to or from the panel.
Not doing so can cause the module to fail or malfunction.
- 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.

- (1) Tighten the module fixing screws and terminal block screws within the following ranges.

Table 4.1 Tightening torque range

Screw location	Tightening torque range
Module fixing screw (M4 screw)	78 to 108N•cm
Terminal block terminal screw (M3 screw)	59 to 88N•cm
Terminal block installation screw (M3.5 screw)	68 to 98N•cm

- (2) When using the DIN rail, pay attention to the followings.
- (a) Applicable DIN rail type (Compliant with IEC 60715)
TH35-7.5Fe
TH35-7.5Al
 - (b) DIN rail installation screw pitch
When installing a DIN rail, tighten the screws at a pitch of 200mm or less.
- (3) When mounting the AJ65SBT2B-64RD3 to the DIN rail, press with your finger the centerline of the DIN rail hook at the bottom of the module until it clicks.

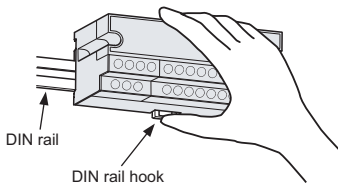


Figure 4.1 Installation to DIN rail

- (4) Refer to the Master Module user's manual for the name, specification, and manufacturers of supported cables for the use with AJ65SBT2B-64RD3.

5. DATA LINK CABLE WIRING

5.1 Wiring Precautions

When using existing CC-Link dedicated cables, rewire the system using communication terminal block for the AJ65SBT2B-64RD3.

5.2 CC-Link Dedicated Cable Connection Method

The following shows how to connect the AJ65SBT2B-64RD3 to a master module and a remote module with CC-Link dedicated cables.

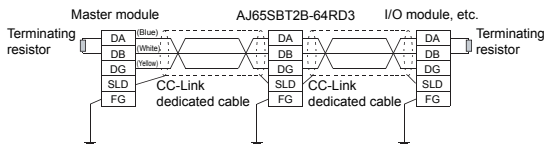


Figure 5.1 Connection of the CC-Link dedicated cables

5.3 Connection of Terminating Resistor

The AJ65SBT2B-64RD3 stores the terminating resistor of 110Ω , so there is no need the external wiring

(1) Precautions

- (a) Move the L TER. switch until it clicks.



- (b) Make sure that between DA and DB is high resistance (when the L TER. switch is off) or is 110Ω (When the L TER. switch is on) with a tester before wiring the system with CC-Link dedicated cables.
- (c) The built-in terminating resistor cannot be used in the following cases. Wire a terminating resistor (110 or 130Ω).
 - A CC-Link system is configured using CC-Link cables of 130Ω .
 - The AJ65SBT2B-64RD3 may be replaced during data link.

6. WIRING

6.1 Wiring Precautions

External wiring that is less susceptible to noise is required as a condition of enabling a highly reliable system and making full use of the capabilities of AJ65SBT2B-64RD3.

The precautions when performing external wiring are as follows:

- (1) Use separate cables for the AC control circuit and the external input signals of the AJ65SBT2B-64RD3 to avoid the influence of the AC side surges and inductions.
- (2) Always place the RTD at least 10cm away from the main circuit cables and AC control circuit lines. Fully keep it away from high-voltage cables and circuits, which include high frequency waves, such as an inverter's load circuit. Not doing so will cause the module more susceptible to noises, surges and inductions.
- (3) The shield wire or the shield of the shielded cable must be grounded at one end. However, Grounding outside may be suitable depending on the noise circumstances.

6.2 Wiring with RTD

The method for connecting between the AJ65SBT2B-64RD3 and the RTD. is shown in figure 6.1.

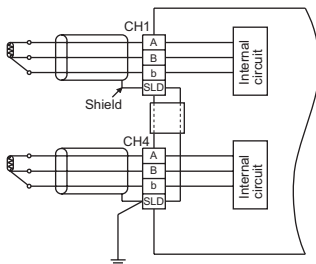
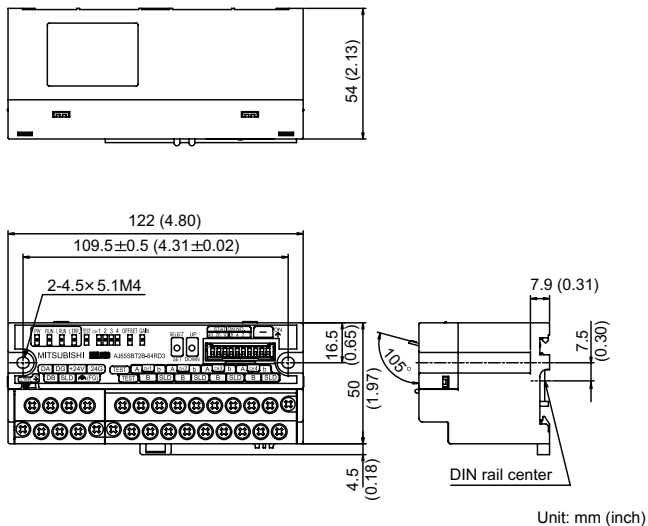


Figure 6.1 wiring of RTD

7. EXTERNAL DIMENSIONS

The external dimensions of the AJ65SBT2B-64RD3 is shown below.



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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Specifications subject to change without notice.