

# MITSUBISHI

## AJ65BT-68TD

### Thermocouple Temperature Input Module

## Mitsubishi General-Purpose Programmable Controller

# User's Manual

(Hardware)

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

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



Type	AJ65BT68TD-U-HW-E
Type Code	13JL49
IB(NA)-66830-G(1012)MEE	

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## SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly. These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the programmable controller system safety precautions. In this manual, the safety precautions are classified into two levels: "WARNING" and "CAUTION".

- WARNING** Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
- CAUTION** Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "CAUTION" may lead to serious consequences. Observe the precautions of both levels because they are important for personal and system safety. Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

### Design Precautions

- WARNING**
  - In the case of a communication failure in the network, data in the master module are held. Check the communication status information (SB, SW) and configure an interlock circuit in the sequence program to ensure that the entire system will operate safely.
- CAUTION**
  - Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm (3.94 inches) or more between them. Failure to do so may result in malfunction due to noise.

### Installation Precautions

- CAUTION**
  - Use the programmable controller in an environment that meets the general specifications in this manual. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
  - For protection of the switches, do not remove the cushioning material before installation.
  - Securely fix the module with a DIN rail or mounting screws. Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
  - Do not directly touch any conductive part of the module. Doing so can cause malfunction or failure of the module.

### Wiring Precautions

- CAUTION**
  - Shut off the external power supply for the system in all phases before wiring. Failure to do so may result in damage to the product.
  - After installation or wiring, attach the included terminal cover to the module before turning it on for operation. Undertightening can cause short circuit or malfunction.
  - Ground the FG terminals to the protective ground conductor dedicated to the programmable controller. Failure to do so may result in malfunction.
  - Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
  - Check the rated voltage and terminal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
  - Tighten the terminal screw within the specified torque range. Undertightening can cause short circuit or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
  - Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.

### Wiring Precautions

- CAUTION**
  - Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
  - Do not install the control lines or communication cables together with the main circuit lines or power cables. Failure to do so may result in malfunction due to noise.
  - When disconnecting the cable from the module, do not pull the cable by the cable part. Loosen the screws of connector before disconnecting the cable. Failure to do so may result in damage to the module or cable or malfunction due to poor contact.

### Starting and Maintenance Precautions

- CAUTION**
  - Do not touch any terminal while power is on. Doing so may cause malfunction.
  - Shut off the external power supply for the system in all phases before cleaning the module or retightening the terminal screws. Failure to do so may cause the module to fail or malfunction. Undertightening the terminal screws can cause short circuit or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
  - Do not disassemble or modify the module. Doing so may cause failure, malfunction, injury or a fire.
  - Do not drop or apply any strong shock to the module. Doing so may damage the module.
  - Shut off the external power supply for the system in all phases before mounting or removing the module to or from the panel. Failure to do so may cause the module to fail or malfunction.
  - Mounting/removing the terminal block is limited to 50 times after using a product. (IEC61131-2 compliant)
  - Before handling the module, touch a grounded metal object to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

### Disposal Precautions

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

## CONDITIONS OF USE FOR THE PRODUCT

- Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
  - where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
  - where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.
- The PRODUCT has been designed and manufactured for the purpose of being used in general industries. MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY THE PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR THE PRODUCT. ("Prohibited Application")
 

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

  - Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
  - Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
  - Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

- 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.

## 3. Specification

### 3.1 Performance Specification

The performance specification of the AJ65BT-68TD are shown below. And, refer to master module user's manual which is used about the general specification.

Item	Specification	
Temperature sensor input	-200 to 1700°C	
Output	Detected temperature	16-bit signed binary (-2000 to 17000 : value to one decimal place multiplied by 10)
	Scaling value	16-bit signed binary (0 to 2000)
Applicable thermocouples and temperature measurement range accuracy *1	Refer to Table 3.1	
Cold junction compensation accuracy	± 1.0°C	
Overall accuracy	By the calculation of *2	
Maximum resolution	B, R, S : 0.3 °C K, E, J, T : 0.1 °C	
Conversion speed (sampling time)	45 ms/ch	
Absolute maximum input	± 5 V	
Number of analog input points	8-channel + Pt 100 connection channel	
CC-Link station type	Remote device station	
Number of occupied stations	4 Stations : RX/RV 128 points each RWw/RWt 16 points each	

## About Manuals

The following are manuals related to this product.

Request for the manuals as needed according to the chart below.

Detailed Manual	
Manual Name	Manual No. (Model Code)
AJ65BT-68TD Thermocouple Temperature Input Module User's Manual	SH-3304 (13JL52)
Related Manuals	
Manual Name	Manual No. (Model Code)
CC-Link System Master/Local Module Type AJ61BT11/A1SJ61BT11 User's Manual	IB-66721 (13J872)
CC-Link System Master/Local Module Type AJ61QB11/A1SJ61QB11 User's Manual	IB-66722 (13J873)
CC-Link System Master/Local Module User's Manual	SH-080394 (13JR64)
Type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions)	IB-66251 (13J742)
MELSEC-L CC-Link System Master/Local Module User's Manual	SH-080895ENG (13JZ41)

## 1. Overview

This user's manual explains the specifications, handling, programming methods, etc. of the AJ65BT-68TD Thermocouple Input Module (hereinafter referred to as AJ65BT-68TD) used as a remote device station for the CC-Link system.

The AJ65BT-68TD is a module that converts the thermocouple input values from outside the programmable controller to the temperature values or scaling values of 16-bit signed BIN data.

## 2. EMC and Low Voltage Commands

- 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.

Item	Specification
Connection cable	CC-Link dedicated cable
Noise durability	Depends on noise simulator of noise voltage at 500Vp-p, noise width at 1ms and noise frequency at 25 to 60 Hz
Dielectric withstand voltage	Between batch power supply system and ground Between batch power supply system and batch communication system Between batch communication system and batch thermocouple input Between batch thermocouple input and ground 500 V AC, 1 minute
Insulation method	Thermocouple input to CC-Link transmission : Transfer insulation Between channels : Transfer insulation
Insulation resistor	Between batch power supply system and ground Between batch power supply system and batch communication system Between batch communication system and batch thermocouple input Between batch thermocouple input and ground 500 V DC, more than 10 MΩ by the insulation resistance taster
Connected terminal block	27-point terminal blocks (M3.5 × 7 screws)
Applicable wire size	0.75 to 2.00 mm <sup>2</sup>
Applicable solderless terminal	RAV1.25-3.5, RAV2-3.5 (Conforms to JIS C 2805)
Module mounting screw	Screws M4 × 0.7 mm × 16 mm or larger (tightening torque range 78 to 118 N · cm (8 to 12 kg · cm)) May be attached using DIN rails
Applicable DIN rail	TH 35-7.5 Fe, TH 35-7.5 Al, TH 35-15 Fe (conform to JIS C 2812)
External power supply	24 V DC (18 to 30 V DC)
Internal consumption current	0.081 A (at 24VDC)
Allowable momentary power failure period	1 ms
Weight	0.40 (0.88) kg (lb.)

- \*1 : The thermocouple type can be set using the remote register RY (n + 1) 0 to RY (n + 5) 6 for each channel.
- \*2 : Overall accuracy computation method is as follows:  
(Overall accuracy) = (Conversion accuracy) + (Temperature characteristics) × (Ambient operating temperature change) + (Cold junction compensation accuracy)  
The ambient operating temperature change refers to the value that falls outside the range of 25 ± 5 °C.  
Example) The overall accuracy when using thermocouple K, measured temperature 150 °C, ambient operating temperature 35 °C will be:  
(± 0.5 °C) + (± 0.06 °C) × (5 °C) + (± 1 °C) = ± 1.8 °C

Table 3.1 Applicable thermocouples and temperature measurement range accuracy

Applicable thermocouple type	Temperature measurement range [°C]	Conversion accuracy (When ambient operating 25 ± 5 °C)	Temperature characteristic (Per 1 °C of ambient operating temperature change)
B	600 to 1700	± 2.5 °C	± 0.4 °C
R	0 to 200	± 2.0 °C	± 0.4 °C
	200 to 1600		± 0.3 °C
S	0 to 200	± 2.0 °C	± 0.4 °C
	200 to 1600		± 0.3 °C
K	-200 to 0	± 0.5 °C or ± 0.25 % of the measured temperature, whichever is greater	± 0.06 °C or ± 0.3 % of the measured temperature, whichever is greater
	0 to 1200		± 0.06 °C or ± 0.02 % of the measured temperature, whichever is greater
E	-200 to 0	± 0.5 °C or ± 0.25 % of the measured temperature, whichever is greater	± 0.06 °C or ± 0.3 % of the measured temperature, whichever is greater
	0 to 800		± 0.06 °C or ± 0.02 % of the measured temperature, whichever is greater
J	0 to 750	± 0.5 °C or ± 0.25 % of the measured temperature, whichever is greater	± 0.06 °C or ± 0.02 % of the measured temperature, whichever is greater
T	-200 to 0	± 0.5 °C or ± 0.25 % of the measured temperature, whichever is greater	± 0.06 °C or ± 0.3 % of the measured temperature, whichever is greater
	0 to 350		± 0.06 °C or ± 0.02 % of the measured temperature, whichever is greater

## 5. Handling

### 5.1 Handling Precautions

- Because it is made of resin, do not drop or given a strong shock to the module case and the terminal block.
- Do not take the printed circuit board of the module out of the case. It may result in a failure.
- Be careful not to let foreign matter such as filings or wire chips get inside the module while wiring. Remove all foreign matters if any get inside.
- Tighten the module mounting screws within the following torque range.

Screw area	Tightening torque range
Module mounting screws (M4 screw)	0.78 to 1.18 N · m
Terminal block terminal screws (M3.5 screw)	0.59 to 0.88 N · m
Terminal block mounting screws (M3.5 screw)	0.98 to 1.37 N · m

- When using a DIN rail adapter, install the DIN rail considering the precautions described below.
  - Applicable DIN rail types (conform to JIS C 2812)
    - TH 35-7.5 Fe
    - TH 35-7.5 Al
    - TH 35-15 Fe
  - Space between DIN rail mounting screws
    - When installing a DIN rail, tighten the screws with a space of less than 200 mm (7.9 in.).

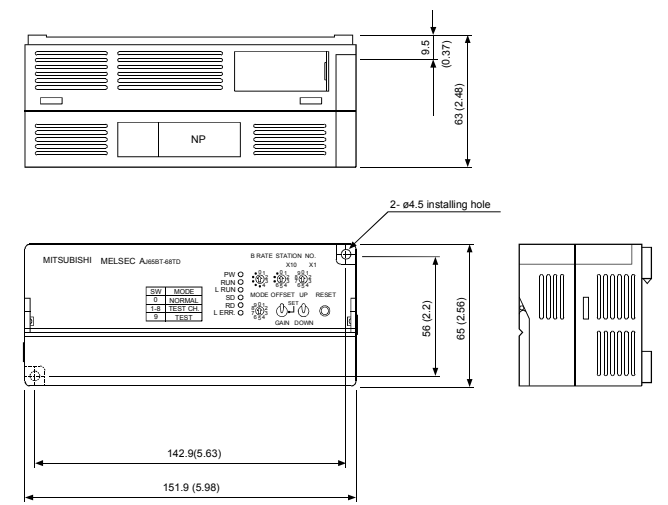
### 6.2 Precautions when Wiring

To obtain maximum performance from the functions of AJ65BT-68TD and improve the system reliability, a wiring with high durability against noise is required.

The following describes the external wiring precautions.

- Use separate cables for the AC and the external input signals of the AJ65BT-68TD, in order not to be affected by the AC side surge or conductivity.
- Always place a thermocouple at least 10 cm (3.94 in.) apart from the main circuit line and AC control circuit line. Place a thermocouple sufficiently apart from circuits with high frequency, such as high-voltage lines and inverter load main circuits. If they are placed close to each other, the thermocouple is influenced more easily by the noise, surge, or conductivity.

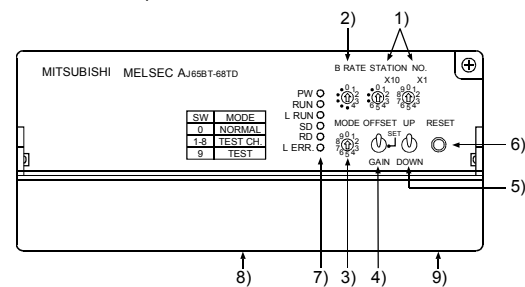
## 7. External Dimensions Diagram



Unit: mm (in.)

## 4. Name of Each Part

The name of each part in the AJ65BT-68TD is described.

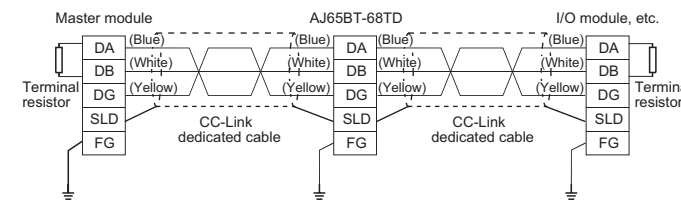


Number	Name	
1)	Station setting switch	
2)	Transmission baud rate setting switch	
3)	Mode switch	
4)	Offset/gain setting switch	
5)	UP/DOWN switch	
6)	Reset switch	
7)	LED display	PW
		RUN
		L.RUN
		SD
		RD
8)	Terminal block	L.ERR.
9)	Temperature-measuring resistor Pt 100	

## 6. Wiring

### 6.1 Wiring Example with Each CC-Link Modules

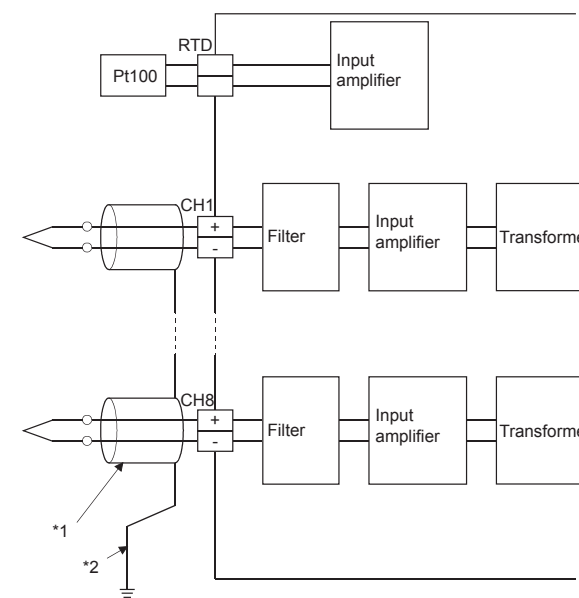
The following shows the connection between the AJ65BT-68TD and master module using twisted cables.



**Point**  
For the modules at both ends of the data link, make sure to connect the "terminal resistor" that is attached to a master module (connect between DA and DB).

### 6.3 Example of Connecting Module

The following shows the wiring example between AJ65BT-68TD and thermocouple.



- \*1 Be sure to use the shielded compensating conductor for the cable.
- \*2 Be sure to ground.

### 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.

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Specifications subject to change without notice.