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-H(1112)MEE	

● 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

●安全注意事项●

（使用之前请务必阅读）

在使用本产品之前，应仔细阅读本手册以及本手册中所介绍的相关手册，同时在充分注意安全的前提下正确操作。
本手册中的注意事项仅记载与本产品有关的内容。
关于使用本产品的系统方面的安全注意事项，请参阅所使用的CPU模块的用户手册。
在“安全注意事项”中，安全注意事项被分为“⚠警告”和“⚠注意”两个等级。

⚠警告	表示错误操作可能造成危险后果，导致死亡或重伤事故。
⚠注意	表示错误操作可能造成危险后果，导致中度伤害、轻伤或财产损失。

此外，根据情况不同，即使标注为“⚠注意”的事项也有可能会引发严重后果。
这两个等级的注意事项记载的均为重要内容，请务必遵守。
请妥善保管本手册以备需要时取阅，并将本手册交给最终用户。

【设计注意事项】

⚠警告

- 数据链接出现通信异常时，将保持主站模块的数据。应使用通信状态信息，在顺控程序上配置互锁电路，以保证系统能安全运行。

⚠注意

- 请勿将控制线及通信电缆与主电路及动力线等捆扎在一起或相互靠得太近。应相距大约100mm以上距离。
  因为噪声有可能导致误动作。

【安装注意事项】

⚠注意

- 应在详细手册记载的一般规格环境下使用模块。
  如果在一般规格范围以外的环境中使用模块，可能导致触电、火灾、误动作、产品损坏或性能劣化。
- 为保护开关，在安装前请勿拆除缓冲材料。

【安装注意事项】

⚠注意

- 模块应通过DIN导轨或者安装螺栓切实地加以固定，安装螺栓应在规定的扭矩范围内切实地扭紧。
  如果螺栓拧得过松，有可能导致掉落、短路或误动作。
  如果螺栓拧得过紧，有可能造成螺栓及模块破损从而导致掉落、短路或误动作。
- 请勿直接触碰模块的导电部分。
  否则可能导致模块误动作、故障。

【配线注意事项】

⚠注意

- 在配线作业等时，必须将系统使用的外部供应电源全部断开后再进行操作。
  如果未全部断开，有可能导致产品损坏。
- 安装、配线作业等之后进行通电、运行时，必须安装产品附带的端子盖。
  如果未安装端子盖，有可能导致短路或故障。
- 必须将FG端子与可编程控制器的专用接地线连接。否则有可能导致误动作。
- 应使用合适的压装端子，并按规定扭矩拧紧。
  如果使用Y型压装端子，端子螺栓松动时可能导致脱落或故障。
- 进行模块配线作业时，应在确认产品的额定电压及端子排列的基础上正确进行操作。
  如果连接了与额定值不符的电源或配线错误，可能导致火灾或故障。
- 应在规定的扭矩范围内拧紧端子螺栓。
  如果端子螺栓拧得过松，有可能导致短路或误动作。
  如果端子螺栓拧得过紧，有可能造成螺栓及模块破损从而导致掉落、短路或误动作。
- 应注意防止切屑及配线头等异物掉入模块内。
  否则有可能导致火灾、故障或误动作。
- 与模块相连接的电线及电缆必须收入套管中，或者用夹具进行固定处理。
  如果未将电缆收入套管或用夹具进行固定处理，可能由于电缆的晃动及移动、不经意的拉拽等造成模块及电缆破损、电缆接触不良而导致误动作。
- 请勿将控制线及通信电缆与主电路及动力线等捆扎在一起或相互靠得太近。因为噪声有可能导致误动作。
- 在拆卸与模块相连接的电缆时，请勿用手拉扯电缆部分。请在松开与模块连接的部分的螺栓后再拆卸电缆。
  如果在与模块连接的状态下拉扯电缆，可能造成模块及电缆破损、电缆接触不良而导致误动作。

【启动／维护注意事项】

⚠注意

- 在通电状态下请勿触摸端子。否则可能导致误动作。
- 在清洁模块或重新紧固端子螺栓时，必须将系统使用的外部供应电源全部断开后再进行操作。
  如果未全部断开，有可能导致模块故障或误动作。
  如果端子螺栓拧得过松，有可能导致掉落、短路或误动作。如果螺栓拧得过紧，有可能造成螺栓及模块破损从而导致掉落、短路或误动作。
- 请勿拆解或改造模块。
  否则可能导致故障、误动作、人身伤害或火灾。
- 请勿使模块的壳体掉落或受到强烈撞击。
  否则可能导致模块破损。
- 在控制盘内拆装模块时,必须将系统使用的外部供应电源全部断开后再进行操作。
  如果未全部断开，有可能导致模块故障或误动作。
- 产品投入使用后，端子排的拆装次数不应超过50次。（根据IEC61131-2规范）
- 在触碰模块之前，必须先触碰已接地的金属等，释放掉人体等所携带的静电。如果不释放掉静电，有可能导致模块故障或误动作。

【报废处理注意事项】

⚠注意

- 本产品报废时，应当作工业废物处理。

● CONDITIONS OF USE FOR THE PRODUCT ●

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) 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.

(2) 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.

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 AJ61QBT11/A1SJ61QBT11 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

(1) Method of ensuring compliance
To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.
• User's manual for the CPU module or head module used
• Safety Guidelines (this manual is included with the CPU module, base unit, or head module)
The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.
(2) Additional measures
To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the manuals listed under (1).

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/RY 128 points each RWw/RWr 16 points each
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^2
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.

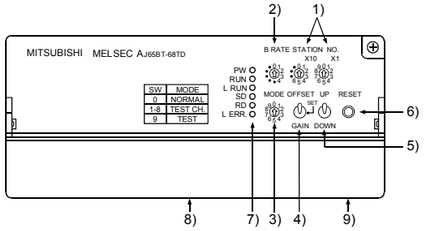
*2 : Overall accuracy computation method is as follows:
(Overall accuracy) = (Conversion accuracy) + (Temperature characteristics) × (Ambient operating temperature change) + (Cold junction compensation accuracy)
The ambient operating temperature change refers to the value that falls outside the range 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		±0.06 °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		±0.06 °C or ±0.02 % of the measured temperature, whichever is greater
T	– 200 to 0		±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

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
		L ERR.
8)	Terminal block	
9)	Temperature-measuring resistor Pt 100	

5. Handling

5.1 Handling Precautions

(1) Because it is made of resin, do not drop or given a strong shock to the module case and the terminal block.
(2) Do not take the printed circuit board of the module out of the case. It may result in a failure.
(3) 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.
(4) Tighten the module mounting screws within the following torque range.

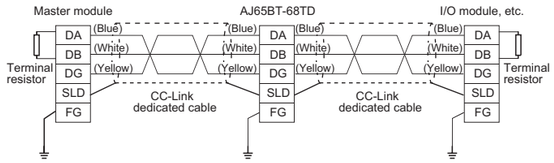
Screw area	Tightening torque range
Module mounting screws (M4 screw)	0.78 to 1.18 N · m
Terminal block terminal screws (M3.5 screw)	0.59 to 0.88 N · m
Terminal block mounting screws (M3.5 screw)	0.98 to 1.37 N · m

(5) When using a DIN rail adapter, install the DIN rail considering the precautions described below.
(a) Applicable DIN rail types (conform to JIS C 2812)
TH 35-7.5 Fe
TH 35-7.5 Al
TH 35-15 Fe
(b) 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. 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).

6.2 Precautions when Wiring

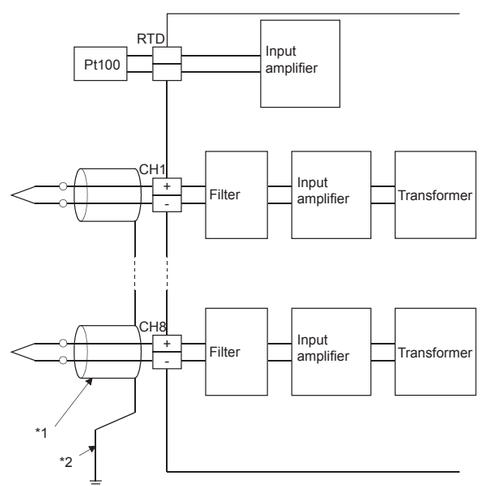
To obtain maximum performance from the functions of AJ65BT-68TD and improve the system reliability, a wiring with high durability against noise is required.

The following describes the external wiring precautions.

(1) 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.
(2) 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.

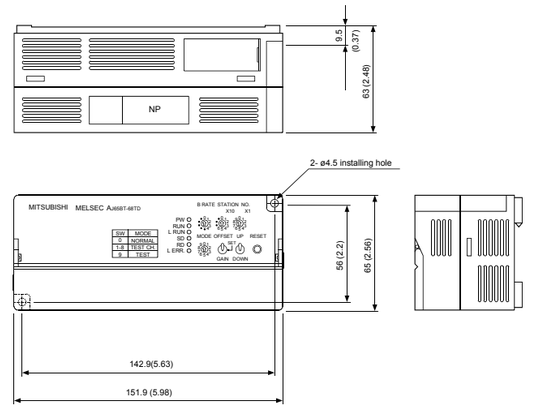
6.3 Example of Connecting Module

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.

7. External Dimensions Diagram



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.

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