MITSUBISHI
AJ65BT-64AD
Analog-Digital Converter Module

User's Manual
(Hardware)

Thank you for buying the Mitsubishi general-purpose programmable controller MELSEC-A Series

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

MODEL	AJ65BT-64AD-U-H-E
MODEL CODE	13J892
IB(NA)- 66748-H(1009)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.
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.
- Do not directly touch any conductive part of the module.
  Doing so can cause malfunction or failure of the module.
- 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.

[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.
- Ground the FG terminals to the protective ground conductor dedicated to the programmable controller.
  Failure to do so may result in malfunction.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

[Startup and Maintenance Precautions]

⚠CAUTION

- Do not touch any terminal while power is on.
  Doing so may cause malfunction.
- Do not change the setting jumper while power is on.
  Doing so may cause failure or 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.
- Do not disassemble or modify the modules.
  Doing so may cause failure, malfunction, injury, or a fire.
- Do not drop or apply 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 result in the module to fail or malfunction.
- After the first use of the product, do not mount/remove the terminal block to/from the module more than 50 times (IEC 61131-2 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 an industrial waste.

● 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 manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

Detailed Manual

Manual Name	Manual No. (Type code)
AJ65BT-64AD Analog-Digital Converter Module User's Manual	SH-3614 (13J893)

Related Manuals

Manual Name	Manual No. (Type 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-080394E (13JR64)
MELSEC-L CC-Link System Master/Local Module User's Manual	SH-080895ENG (13JZ41)

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 describes the specification, name of each part and wiring for the AJ65BT-64AD analog-digital converter module (abbreviated as AJ65BT-64AD from here on), used as a CC-Link system remote device station.

After unpacking, confirm if the following item is included.

Item name	Numbers of item
AJ65BT-64AD main module	1

2. Performance Specifications

2.1 Performance Specifications

The AJ65BT-64AD performance specification is described below.
Refer to CPU module User's Manual to be used for general specification of AJ65BT-64AD.

Item	Specification		
Analog input	Voltage: -10 to 0 to 10V DC (input resistance 1MΩ)		Selected by the input terminal
	Current: -20 to 0 to 20mA DC (input resistance 250Ω)		
Digital output	16-bit encoded binary (data area 12bits)		
I/O characteristics [1]	Analog input value	Digital output value	
	-10 to 10V or -20 to 20mA	0 to 4000 or -2000 to 2000	
	0 to 10V or 0 to 20mA	0 to 4000 or -2000 to 2000	
	0 to 5V or 0 to 20mA	0 to 4000 or -2000 to 2000	
	1 to 5V or 4 to 20mA	0 to 4000 or -2000 to 2000	
Maximum resolution	-10 to 10V or -20 to 20mA	5mV or 20μA	
	0 to 10V or 0 to 20mA	2.5mV or 10μA	
	0 to 5V or 0 to 20mA	1.25mV or 5μA	
	1 to 5V or 4 to 20mA	1mV or 4μA	
Total precision [2]	±1% (±40)		
Maximum conversion speed	1 ms/channel		
Absolute maximum input	Voltage ±15 V, current ±30mA [3]		
Analog input points	4 channels/module		
Insulation method	Photo-coupler insulation between power supply/communication and analog input (not insulated between channels)		
CC-Link station type	Remote device station		
Number of occupied stations	2 stations		
Connection terminal	27-point terminal block		
External power supply	24VDC (18 to 30VDC)		
Supported cable size	0.75 to 2.00mm²		
Module mounting screws	M4 x 0.7 mm x 16mm or more (M4 x 0.028 inch x 0.63 inch) Can be installed with DIN rail.		
Supported DIN rail	TH35-7.5Fe, TH35-7.5Al, TH35-15Fe (conforming to JIS C 2812)		
Supported solderless terminal	RAV 1.25-3.5, RAV 2-3.5		
Internal consumption current	0.12 A (at 24VDC)		
Noise durability	By a noise simulator with the following specification: Noise voltage at 500Vp-p, Noise width at 1μs, Noise frequency at 25 to 60Hz		
Dielectric withstand voltage	Between power supply/communication system batch and analog input batch:500VAC, 1minute		
Insulation resistor	Between power supply/communication system batch and analog input batch:500VDC, more than 10MΩ on insulation resistance tester.		
Weight	0.35 (0.77) kg(lb.)		

*1 Gain is set to 10V/20mA and the offset is set to 0V/4mA (setting pin A) at the time of factory shipment.
However, when using for current, change the set pin B, and the RYn1 (voltage/current selection) must be turned on.
*2 This is the accuracy in respect to the maximum digital output value (+4000). The same value (+4000) applies for the current input and voltage input.
*3 Current value indicates value of instant input current that does not break module inner electrical resistance.
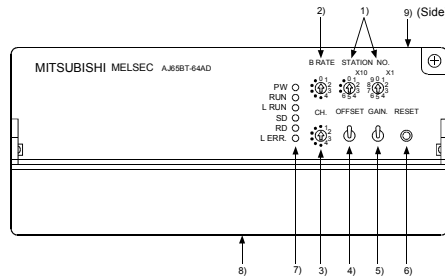
Point

The range for the analog input for conversion is as follows:
Voltage : -10 to 0 to 10V
Current : -20 to 0 to 20mA

3. Name of Each Part and their settings

3.1 Name of Each Part

The name of each part and their settings in the AJ65BT-64AD are shown.

No.	Name and appearance	Description
1)	Station number setting switch	1) × 10 / 1) × 1 — The station number for the AJ65BT-64AD is set in the range 1 to 64. (factory default: 00)
2)	Transmission baud rate setting switch	Setting number / Transmission baud rate: 0 = 156kbps (factory default); 1 = 625kbps; 2 = 2.5Mbps; 3 = 5Mbps; 4 = 10Mbps; Other than 0 to 4 = Unusable. (The L ERR. LED turns on, and results in a communication error.)
3)	Channel selection switch	Selects the channel (1 to 4) to perform the offset and gain adjustment. When a value other than 1 to 4 is selected, no processing is performed. (factory default: 1)
4)	OFFSET switch	By turning this switch on during the test mode, the analog input value at that time is stored in the AJ65BT-64AD as an offset value.
5)	GAIN switch	By turning this switch on during the test mode, the analog input value at that time is stored in the AJ65BT-64AD as a gain value.
6)	RESET switch	The initialization of the I/O signals, remote register, and operation processing is performed for the AJ65BT-64AD. By turning this switch on, the AJ65BT-64AD initial data processing request flag turns on.
7)	Operation status display LED	LED Name / Description: PW LED — ON : Power supply ON, OFF : Power supply OFF. RUN LED — Normal mode: ON : Normal operation, Flashing : Read/write data error occurred, OFF : 24VDC power supply shutoff or watchdog timer error occurred. Test mode: ON : Offset switch or gain switch is ON, OFF : Offset switch or gain switch is OFF. L RUN LED — ON : Normal communication, OFF : Communication cutoff (time expiration error). SD LED — ON during data transmission. RD LED — ON during data receive. L ERR. LED — ON : Communication data error, Flashing : Communication data error, OFF : Normal communication.
8)	Terminal module	(terminal layout diagram) Test mode setting terminal: By short-circuiting between the terminals, the test mode is started.
9)	Analog input range setting pin	Set the analog input range. Voltage / Current: A = 0 to 10V / (0 to 20mA)*; B = 1 to 5V / 4 to 20mA; C = -10 to 10V / -20 to 20mA; D = 0 to 5V / 0 to 20mA. (Factory default : A) * When using in the range 0 to 20mA, use D.

3.2 Offset/Gain Setting

When changing the I/O conversion characteristics, follow the procedure below.
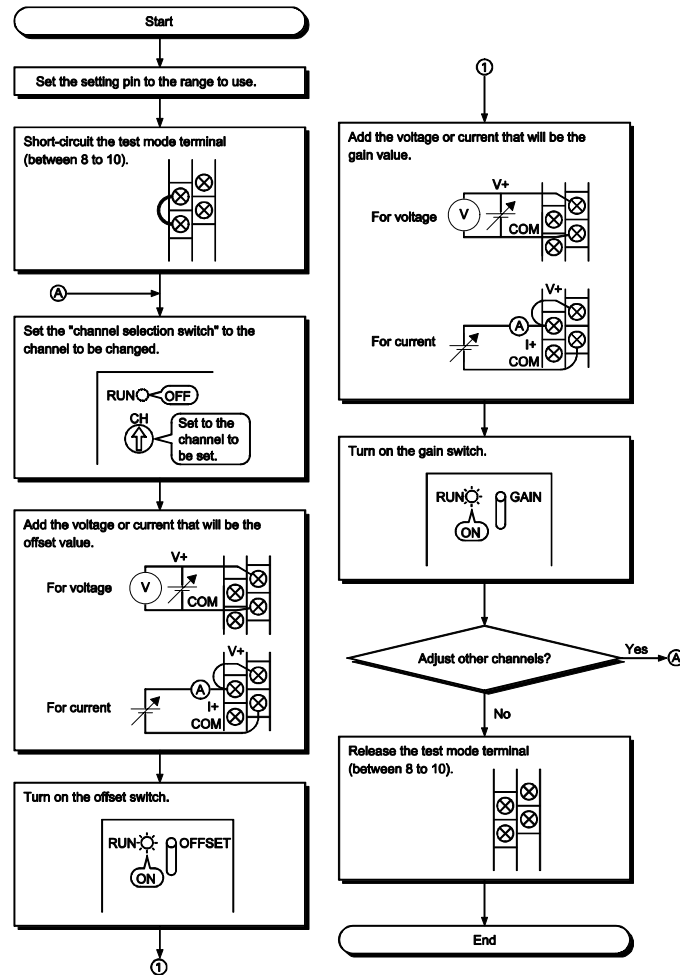
Remark

The offset value and gain value are as follows.
(a) The offset value is the analog input value (voltage or current) which a minimum digital output value.
(b) The gain value is the analog input value (voltage or current) which a maximum digital output value.

4. Loading and Installation

The following is explanations of the handling precautions and installation environment which is common to modules when handling AJ65BT-64AD from unpacking to installation.
For the details of loading and installation of the module, refer to User's Manual of programmable controller CPU module to be used.

4.1 Handing Precautions

The precautions when handling the AJ65BT-64AD are described below:
(1) Because the case of the module is mad of resin, be careful not to drop it or expose it to strong impact.
(2) Perform the tightening of the module mounting screws in the folowing range.

| Screw position	Tightening torque range
Module mounting screw (M4 screw)	0.78 to 1.18N•m
Terminal block terminal screw (M3.5 screw)	0.59 to 0.88N•m
Terminal block mounting screw (M4 screw)	0.78 to 1.18N•m

4.2 Installation Environment

Do not install the A series programmable controller in the following environments.
(1) Where the ambient temperature exceeds the 0 to 55°C range.
(2) Where the ambient humidity exceeds the 10 to 90 % RH range.
(3) Where condensation is produced by sudden temperature changes.
(4) Where corrosive or combustible gas is present.
(5) Where dust, iron powder and other conductive powder, oil mist, salt, or organic solvents are prevalent.
(6) In direct sunlight.
(7) Where a strong electric or magnetic field is generated.
(8) Where vibration and shock may be applied directly to the module.

5. Data Link Cable Wiring

The wiring of the CC-Link dedicated cable which connects the AJ65BT-64AD and the master module is described.

5.1 CC-Link dedicated cable connections

The CC-Link dedicated cable connections between the AJ65BT-64AD and master module are as follows:
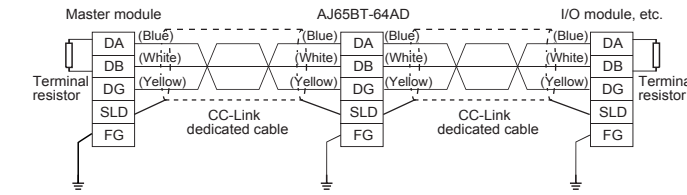

6. Wiring

The precautions and module connection example for wiring are described.

6.1 Wiring Precautions

To obtain maximum performance from the functions of AJ65BT-64AD and improve the system reliability, an external wiring with high durability against noise is required.
The precautions when performing external wiring are as follows:
(1) Use separate cables for the AC and AJ65BT-64AD external input signals, in order not to be affected by the AC side surge or conductivity.
(2) Do not bundle or place with load carrying wires other than the main circuit line, hight voltage line, or programmable controller. Noises, surges, or conductivity may affect the system.
(3) Place a one-point grounding on the programmable controller side for the shielded line or shielded cable. However, depending on the external noise conditions, it may be better have a grounding externally.
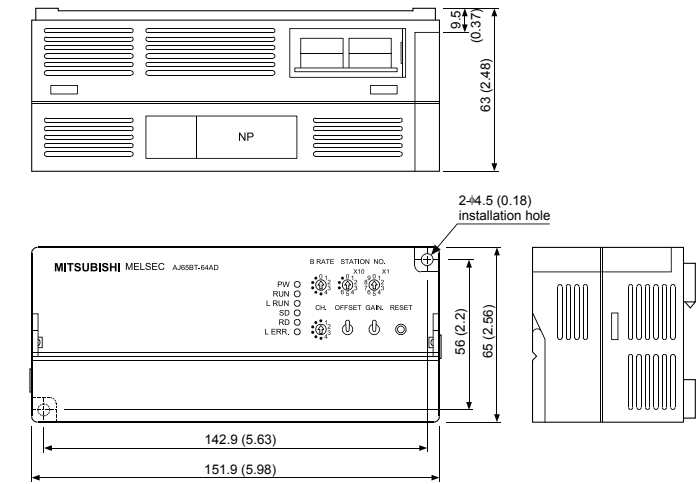
6.2 Module Connection Example

The connection examples for voltage input and current input are shown below:

(1) For voltage input

(2) For current input
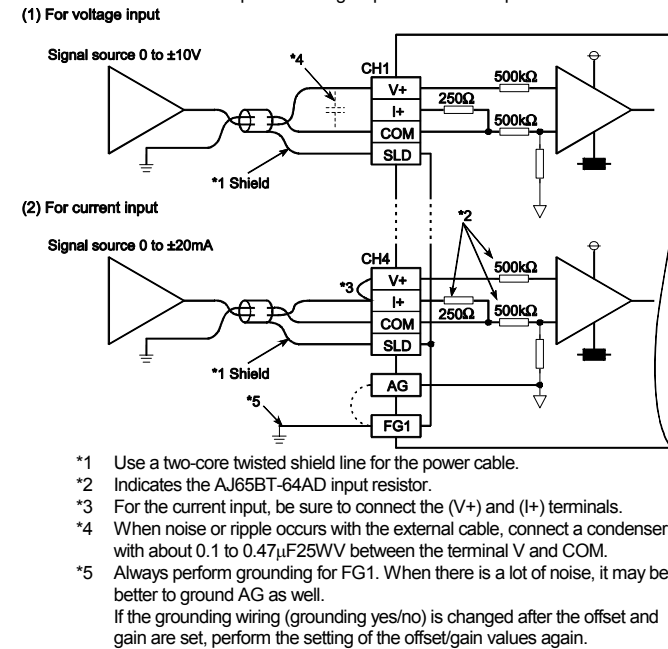
*1 Use a two-core twisted shield line for the power cable.
*2 Indicates the AJ65BT-64AD input resistor.
*3 For the current input, be sure to connect the (V+) and (I+) terminals.
*4 When noise or ripple occurs with the external cable, connect a condenser with about 0.1 to 0.47μF25WV between the terminal V and COM.
*5 Always perform grounding for FG1. When there is a lot of noise, it may be better to ground AG as well.
If the grounding wiring (grounding yes/no) is changed after the offset and gain are set, perform the setting of the offset/gain values again.

7. External Dimension Diagram

Unit: mm (inch)

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