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-I(1112)MEE

A MELSEC

● 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.

●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才正确操作。

本注意事项仅记载与本产品有关的内容。关于可编程控制器系统方面的安全注意事项，请参阅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阅阅，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，可能会导致触电、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。
●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。
●模块应通过DIN导轨或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拧紧。如果螺栓拧得过松，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。

【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。
●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。
●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，端子螺栓松动可能导致脱落或故障。
●应在规定的扭矩范围内拧紧端子螺栓。否则可能导致误动作、短路。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进入模块内。否则有可能导致火灾、故障或误动作。
●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。
●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。
●在拆卸与模块相连接的电缆时，请勿用手拉扯电缆部分。应在松开与模块连接的部分的螺栓后再拆卸电缆。如果由与模块连接的状态下拉拽电缆，可能导致模块及电缆破损、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碰端子。否则可能导致误动作。
●在通电状态下请勿更改设置针脚。否则可能导致故障、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。
●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得超过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 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 EMC AND LOW VOLTAGE DIRECTIVES

(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).

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.

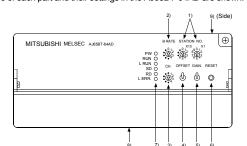| Item	Specification	
Analog input	Voltage: -10 to 0 to 10V DC (input resistance 1MΩ)	Selected by the
	Current: -20 to 0 to 20mA DC (input resistance 250Ω)	input terminal
Digital output	16-bit encoded binary (data area 12bits)	
I/O characteristics [1]	Analog input value	Digital output value
	-10 to 10V 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, TH35-7.5AI, 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

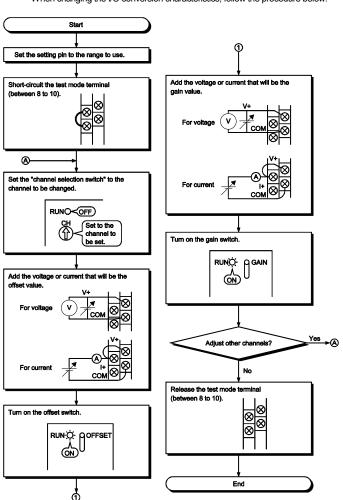The name of each part and their settings in the AJ65BT-64AD are shown.

No.	Name and appearance	Description	
1)	Station number setting switch	1) × 10	The station number for the AJ65BT-64AD is set in the range 1 to 64. (factory default: 00)
		1) × 1	
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.)

No.	Name and appearance	Description	
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	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

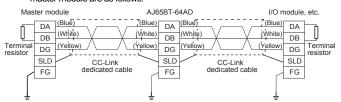Do not install the A series programmable controller in the following environments.
(1) Where the ambient temperature exceeds the 0 to 55°C range.
(2) Where the ambient humidity exceeds the 10 to 90 % RH range.
(3) Where condensation is produced by sudden temperature changes.
(4) Where corrosive or combustible 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

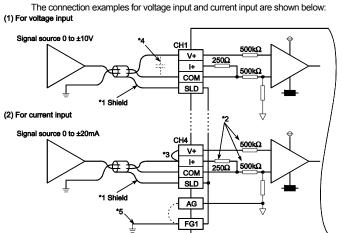The precautions and module connection example for wiring are described.

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.
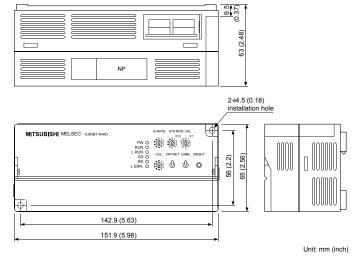
6.2 Module Connection Example

The connection examples for voltage input and current input are shown below:
(1) For voltage input

Signal source 0 to ±10V

(2) For current input

Signal source 0 to ±20mA

[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)

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.