MITSUBISHI

Analog-Digital Converter Module

User's Manual

(Hardware)

AJ65SBT-64AD

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

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

MODEL	AJ65S-64AD-U-H-JE
MODEL CODE	13JT09
IB(NA)-0800138-G(0810)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 this equipment.
Refer to the user's manual of the CPU module to use for a description of the programmable controller system safety precautions.
In this manual, the safety precautions are classified into two levels: "DANGER" and "CAUTION".

⚠DANGER	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]

⚠DANGER

- 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.
- Ground the FG and FG1 terminals to the protective ground conductor dedicated to the programmable controller.
  Failure to do so may result in malfunction.
- Tighten any unused terminal screws within the specified torque range (42 to 50N·cm).
  Failure to do so may cause a short circuit due to contact with a solderless terminal.
- 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.

[Startup 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 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 cause 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 industrial waste.

Revisions

* The manual number is noted at the lower left of the back cover.

Print Date	*Manual Number	Revision
Sep.,2000	IB(NA)-0800138-A	First printing
July, 2002	IB(NA)-0800138-B	Partial correction Contact address (Back cover)
Mar., 2005	IB(NA)-0800138-C	Addition Section 2.3 Correction SAFETY PRECAUTIONS, Conformation to the EMC Directive and Low Voltage Instruction, Chapter 1, Section 2.1, 2.2, 5.2, Chapter 7
Mar., 2006	IB(NA)-0800138-D	Partial correction Section 2.3
Sep., 2006	IB(NA)-0800138-E	Partial correction SAFETY PRECAUTIONS, Chapter 3, Chapter 7
Dec., 2006	IB(NA)-0800138-F	Partial correction Chapter 6
Oct., 2008	IB(NA)-0800138-G	Partial correction SAFETY PRECAUTIONS, Compliance with the EMC and Low Voltage Directives Section 2.1, 2.2, 4.1, 6.1 Delection Section 5.1

CONTENTS

About Manuals

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

Related Manual

Manual name	Manual No. (Model code)
Analog-Digital Converter Module Type AJ65SBT-64AD User's Manual	SH-080106 (13JR18)

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 and setting of parts, wiring and others of Type AJ65SBT-64AD analog-digital converter module (hereafter abbreviated to the “AJ65SBT-64AD”) which is used as a remote device station of a CC-Link system.

2. Specification

2.1 General specifications

The general specifications of the AJ65SBT-64AD are shown below.

<table>
<tr><th>Item</th><th colspan="5">Specification</th></tr>
<tr><td>Usage ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">-20 to 75°C</td></tr>
<tr><td>Usage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td rowspan="8">Vibration durability</td><td rowspan="8">Conforming to JIS B 3502, IEC 61131-2</td><td colspan="4">When there is intermittent vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.075mm (0.0030inch)</td><td rowspan="2">10 times in each direction X, Y, Z</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>—</td></tr>
<tr><td colspan="4">When there is continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.035mm (0.0014inch)</td><td rowspan="2">—</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>—</td></tr>
<tr><td>Shock durability</td><td colspan="5">Conforming to JIS B 3502, IEC 61131-2
(147m/s^2, 3 times each in 3 directions)</td></tr>
<tr><td>Usage environment</td><td colspan="5">No corrosive gas</td></tr>
<tr><td>Usage height *3</td><td colspan="5">Less than 2000m (less than 6562ft.)</td></tr>
<tr><td>Installation area</td><td colspan="5">Within the control board</td></tr>
<tr><td>Over-voltage category *1</td><td colspan="5">Less than II</td></tr>
<tr><td>Pollution level *2</td><td colspan="5">Less than 2</td></tr>
</table>

*1 Indicates the location where the device is connected from the public cable network to the device structure wiring area.
Category II applies to the devices to which the power is supplied from a fixed equipment. Surge withstand voltage for devices with up to 300V of rated voltage is 2500V.

*2 This is an index which indicates the degree of conductive object generation in the environment Pollution level 2 is when only non-conductive pollution occurs.
A temporary conductivity caused by condensation must be expected occasionally.

*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 of the AJ65SBT-64AD are shown below.

<table>
<tr><td colspan="2">Item</td><td>Specification</td></tr>
<tr><td rowspan="2">Analog input</td><td>Voltage</td><td>-10 to +10V DC (input resistance 1MΩ)</td></tr>
<tr><td>Current</td><td>0 to +20mA DC (input resistance 250Ω)</td></tr>
<tr><td colspan="2">Digital output</td><td>16-bit signed binary (-4096 to +4095)</td></tr>
<tr><td colspan="2">I/O characteristics, maximum resolution, accuracy (accuracy relative to maximum value of digital output value)</td><td>
<table>
<tr><th rowspan="2"></th><th rowspan="2">Analog input range</th><th rowspan="2">Digital output</th><th colspan="2">Accuracy</th><th rowspan="2">Max. Resolution</th></tr>
<tr><th>Ambient temperature 0 to 55°C</th><th>Ambient temperature 25±5°C</th></tr>
<tr><td rowspan="5">Voltage</td><td>-10 to +10V</td><td rowspan="2">-4000 to +4000</td><td rowspan="7">±0.4% (±16 digit*1)</td><td rowspan="7">±0.2% (±8 digit*1)</td><td rowspan="2">2.5mV</td></tr>
<tr><td>User range setting 1 (-10 to +10V)</td></tr>
<tr><td>0 to 5V</td><td rowspan="3">0 to 4000</td><td>1.25mV</td></tr>
<tr><td>1 to 5V</td><td rowspan="2">1.0mV</td></tr>
<tr><td>User range setting 2 (0 to 5V)</td></tr>
<tr><td rowspan="3">Current</td><td>0 to 20mA</td><td rowspan="3">0 to 4000</td><td>5μA</td></tr>
<tr><td>4 to 20mA</td><td rowspan="2">4μA</td></tr>
<tr><td>User range setting 3 (0 to 20mA)</td></tr>
</table>
Factory setting is -10 to +10V.
</td></tr>
<tr><td colspan="2">Maximum conversion speed</td><td>1ms/channel</td></tr>
<tr><td colspan="2">Absolute maximum input</td><td>Voltage ±15 V, current ±30mA*2</td></tr>
<tr><td colspan="2">Analog input points</td><td>4 channels/module</td></tr>
<tr><td colspan="2">CC-Link station type</td><td>Remote device station</td></tr>
<tr><td colspan="2">Number of occupied stations</td><td>1 station (RX/RY: 32 points each, RWr/RWw: 4 points each)</td></tr>
<tr><td colspan="2">Communication cable</td><td>CC-Link dedicated cable</td></tr>
<tr><td colspan="2">Dielectric withstand voltage</td><td>Between power supply/communication system batch and analog input batch: 500VAC, 1 minute</td></tr>
<tr><td colspan="2">Isolation system</td><td>Across communication system terminals and all analog input terminals: Photocoupler isolated
Across power supply system terminals and all analog input terminals: Photocoupler isolated
Across channels: Non-isolated</td></tr>
<tr><td colspan="2">Noise immunity</td><td>By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency</td></tr>
<tr><td rowspan="2">External connection</td><td>Communication area, module power supply</td><td>7-point 2-piece terminal block
[transmission circuit, module power supply, FG]
M3 × 5.2 Tightening torque: 59 to 88N·cm
Applicable solderless terminals: 2 max.</td></tr>
<tr><td>I/O area</td><td>Direct-coupled, 18-point terminal block [analog output area]
M3 × 5.2 Tightening torque: 59 to 88N·cm
Applicable solderless terminals: 2 max.</td></tr>
<tr><td colspan="2">Applicable wire size</td><td>0.3 to 0.75mm^2</td></tr>
<tr><td colspan="2">Applicable solderless terminals</td><td>• RAV1.25-3 (conforming to JIS C 2805)
[Applicable wire size: 0.3 to 1.25mm^2]
• V2-MS3, RAP2-3SL, TGV2-3N
[Applicable wire size: 1.25 to 2.0mm^2]</td></tr>
<tr><td colspan="2">Module mounting screw</td><td>M4 screw × 0.7mm × 16mm or more
(tightening torque range: 78 to 108N•cm)
Can also be mounted to DIN rail</td></tr>
</table>

Item	Specification
Supported DIN rail	TH35-7.5Fe, TH35-7.5Al (conforming to IEC 60715)
External supply power	24V DC (20.4 to 26.4V DC)
	Inrush current: 8.5A, within 2.3ms
	Current consumption: 0.090A (at 24VDC)
Weight	0.20kg

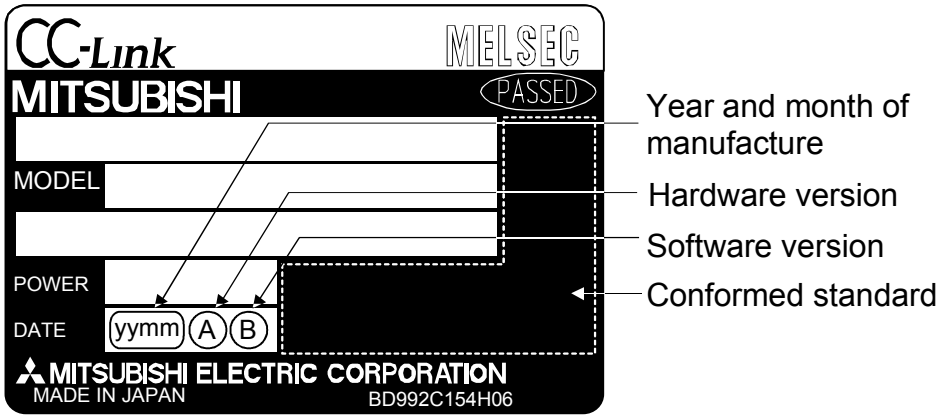
Point
A/D conversion values are fluctuated by self-heating within approx. 30 minutes after power is turned ON.

*1 Digit indicates digital value

*2 Current value indicates value of instant input current that does not break module inner electrical resistance.

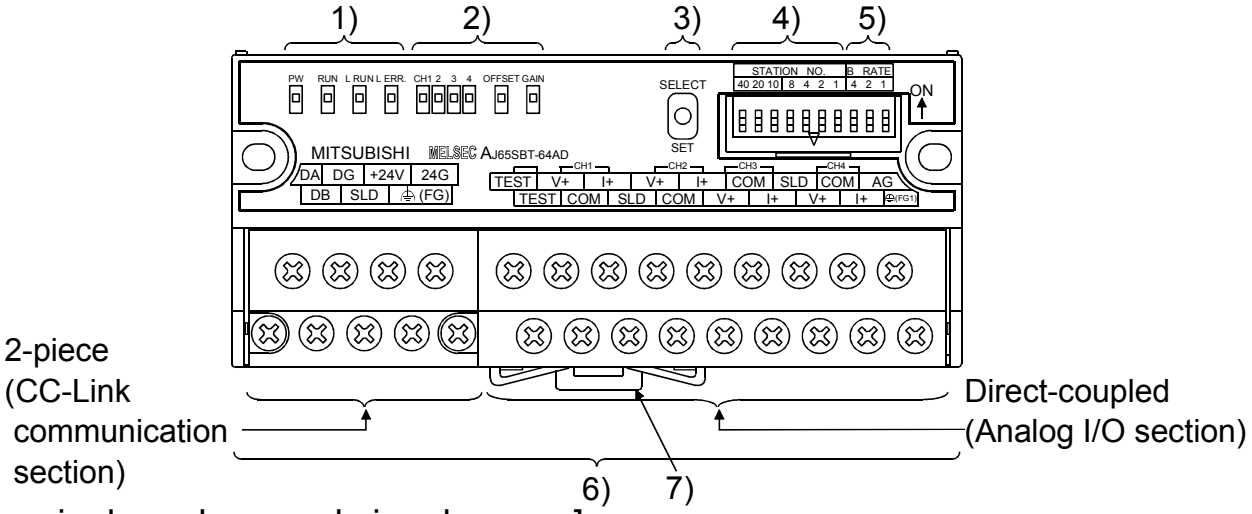
2.3 Checking hardware versions

The hardware versions of the AJ65SBT-64AD can be checked on the DATE section on the rating plate, which is situated on the side of the module.

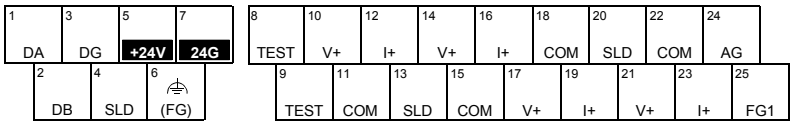


3. Name of Each Part

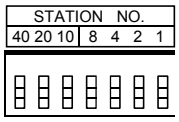
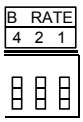
The name of each part in the AJ65SBT-64AD is shown.



[Terminal numbers and signal names]



Number	Name and appearance	Description		
1)	Operation status display LED	PW LED	ON : Power supply on OFF : Power supply off	
		RUN LED	Normal mode	On : Normal operation Flashing : 0.1s intervals indicate an input range error. Off : 24VDC power supply shutoff or watchdog timer error occurred.
			Test mode	On : Indicates that the SELECT/SET switch is in the SET position. Flashing : 0.1s intervals indicate that the input range setting is not any of "user range settings 1 to 3". 0.5s intervals indicate that you attempted to make offset/gain setting outside the setting range. 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 transmission speed setting or station number setting is outside the range. Flicker at fixed intervals : Indicates that transmission speed setting or station number setting was changed from that at power-on. Flicker at unfixed intervals : Indicates that you forgot fitting the termination resistor or the module or CC-Link dedicated cable is affected by noise. Off : Indicates normal communications.	

<table>
<tr><th>Number</th><th>Name and appearance</th><th colspan="3">Description</th></tr>
<tr><td rowspan="2">2)</td><td rowspan="2">Offset/gain adjusting LEDs</td><td rowspan="2">CH□
OFFSET
GAIN</td><td>Normal mode</td><td>Normally OFF.</td></tr>
<tr><td>Test mode</td><td>The LEDs lit change every time the SELECT/SET switch is moved to SELECT.</td></tr>
<tr><td>3)</td><td>SELECT/SET switch</td><td colspan="3">Used to make offset/gain setting in the test mode.</td></tr>
<tr><td>4)</td><td>Station number setting switches
 
</td><td colspan="3">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.
Setting any other number than 1 to 64 will result in an error, flickering the "L ERR." LED.
You cannot set the same station number to two or more stations.
<table>
<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>
<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>
</table>
(Example) To set the station number to "32", set the switches as indicated below.
<table>
<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>
<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>
</table></td></tr>
<tr><td>5)</td><td>Transmission speed setting switches
 
</td><td colspan="3">
<table>
<tr><th rowspan="2">Set value</th><th colspan="3">Setting switches</th><th rowspan="2">Transmission speed</th></tr>
<tr><th>4</th><th>2</th><th>1</th></tr>
<tr><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td><td>156kbps</td></tr>
<tr><td>1</td><td>OFF</td><td>OFF</td><td>ON</td><td>625kbps</td></tr>
<tr><td>2</td><td>OFF</td><td>ON</td><td>OFF</td><td>2.5Mbps</td></tr>
<tr><td>3</td><td>OFF</td><td>ON</td><td>ON</td><td>5.0Mbps</td></tr>
<tr><td>4</td><td>ON</td><td>OFF</td><td>OFF</td><td>10Mbps</td></tr>
</table>
Always set the transmission speed within the above range.
The switches are all factory-set to OFF.
Making any other setting than the above will result in an error flickering the "L ERR." LED.</td></tr>
<tr><td>6)</td><td>Terminal block</td><td colspan="3">Used to connect the module power supply, transmission and I/O signals.</td></tr>
<tr><td>7)</td><td>DIN rail hook</td><td colspan="3">Used to mount the module to the DIN rail.</td></tr>
</table>

4. Loading and Installation

4.1 Precautions when handling

The following is an explanation of handling precautions of the module.

(1) Do not drop or apply any strong impact to the module.

(2) Tighten the mounting screws of the module within the following ranges.

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

4.2 Installation environment

Never install the A series programmable controller in the following environments:

(1) Locations where the ambient temperature is outside the range of 0 to 55°C.

(2) Locations where the ambient humidity is outside the range of 10 to 90%RH.

(3) Locations where dew condensation takes place due to sudden temperature changes.

(4) Locations where there are corrosive and/or combustible gasses.

(5) Locations where there is a high level of conductive power (such as dust and iron filings, oil mist, salt, and organic solvents).

(6) Locations exposed to the direct rays of the sun.

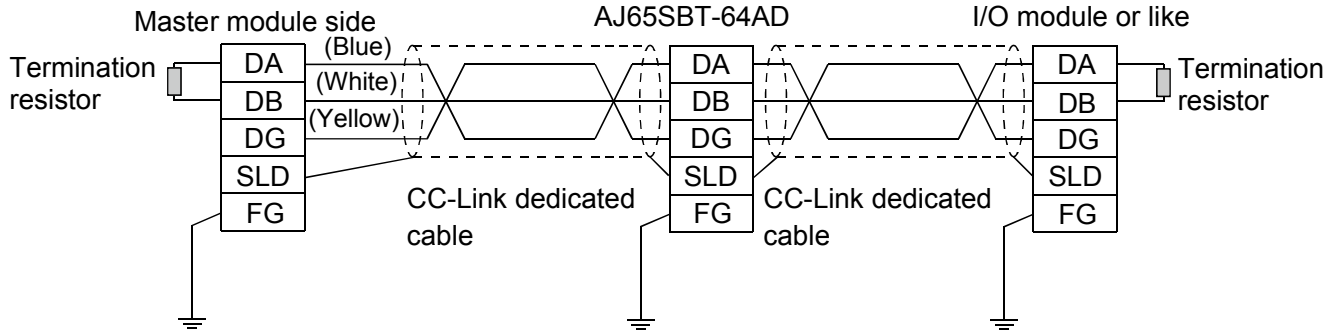
(7) Locations where strong power and magnetic fields are generated.

(8) Locations where vibration and shock are directly transmitted to the main module.

5. Data Link Cable Wiring

5.1 Connection of the CC-Link dedicated cables

Connect the CC-Link dedicated cable between the AJ65SBT-64AD and master module as shown below.



6. Wiring

6.1 Wiring precautions

To obtain maximum performance from the functions of AJ65SBT-64AD and improve the system reliability, an external wiring with high durability against noise is required.

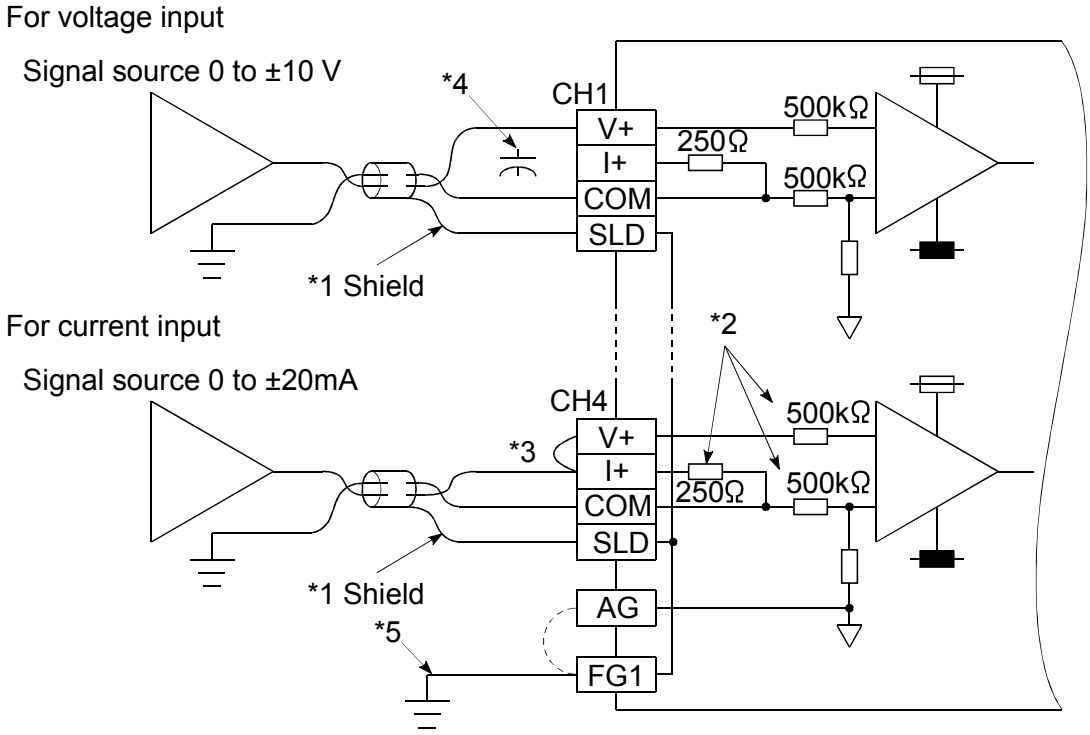
The precautions when performing external wiring are as follows:

(1) Use separate cables for the AC and AJ65SBT-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, high 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



*1 Use a two-core twisted shield line for the power cable.

*2 Indicates the AJ65SBT-64AD input resistor.

*3 For the current input, be sure to connect the (V+) and (I+) terminals.

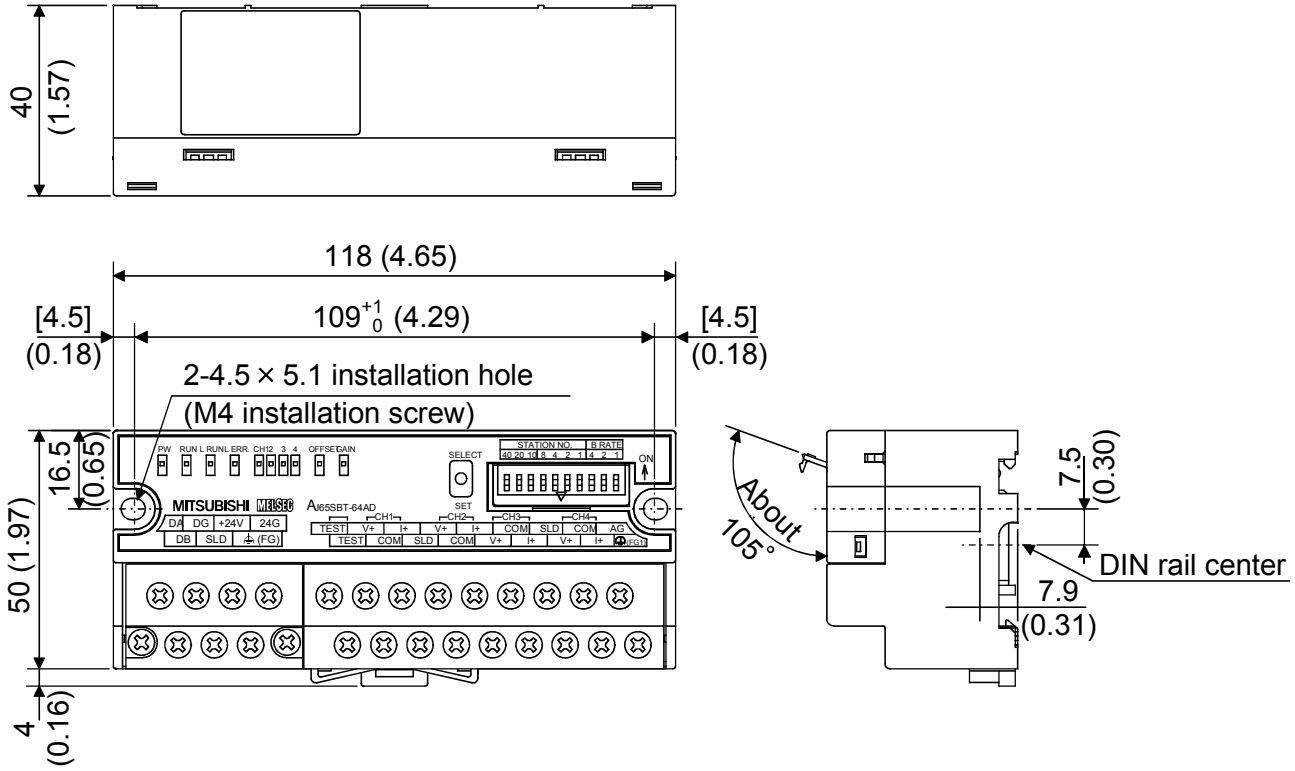
*4 When noise or ripple occurs with the external cable, connect a condenser with about 0.1 to 0.47μF (25V or higher voltage-resistant product) between the terminal V and COM.

*5 Always perform grounding for FG1. When there is a lot of noise, it may be better 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 Dimensions

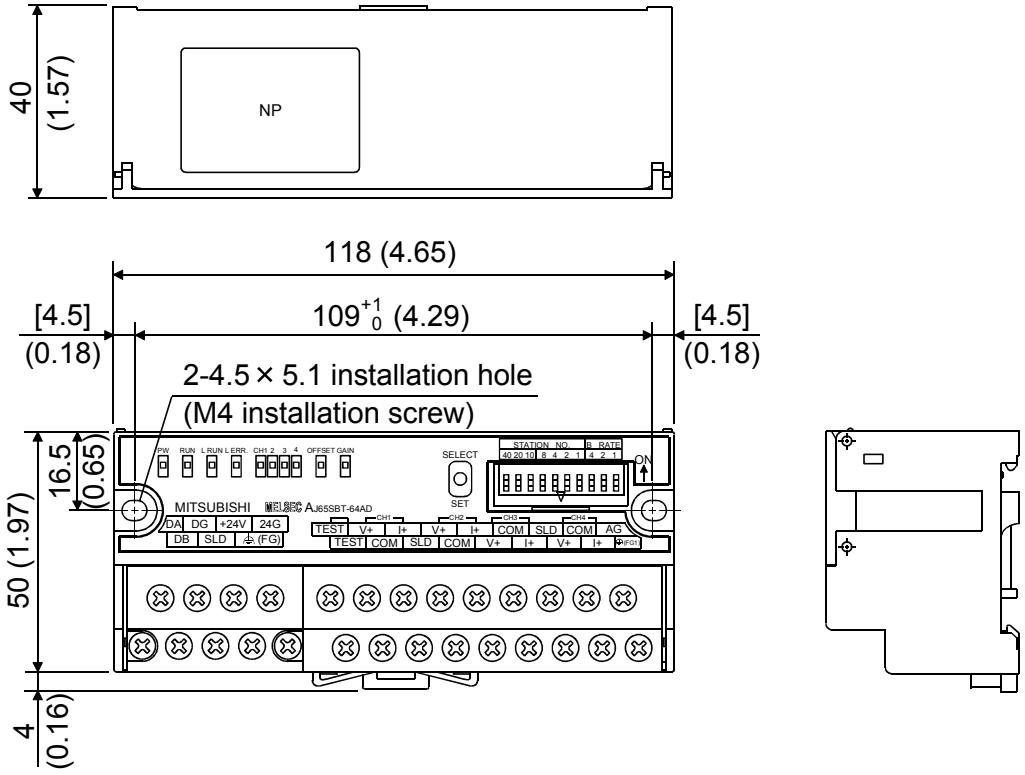
The external dimensions of the AJ65SBT-64AD are shown below.
The appearance of the AJ65SBT-64AD varies depending on the hardware version.
For checking method of the hardware version, refer to Section 2.3.

(1) Hardware version F or later



Unit: mm (inch)

(2) Hardware version E or earlier



Unit: mm (inch)

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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