

MITSUBISHI

Digital-Analog Converter Module

User's Manual
(Hardware)

AJ65SBT2B-64DA

Thank you for purchasing the Mitsubishi programmable controller .

Prior to use, please read this and relevant manuals thoroughly to fully understand the product.



MODEL	AJ65S-64DA-U-HW
MODEL CODE	13JY75
IB(NA)-0800418-D(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. The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.

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.

Please save this manual to make it accessible when required and always forward it to the end user.

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

- Configure a safety circuit so that the safety of the overall system is maintained even if an external power failure or a programmable controller failure occurs.
Incorrect output or malfunction can lead to an accident.
 - (1) The status of analog output changes depending on the setting of various functions that control the analog output. Take sufficient caution when setting for those functions.
For details of analog output status, refer to Section 3.4.1 "Combinations of functions in each part" in the User's Manual.
 - (2) Normal output may not be obtained due to malfunctions of output elements or the internal circuits.
For output signals that may cause a serious accident, provide an external monitoring circuit.

CAUTION

- Do not install the control or communication cable(s) together with the main circuit or power cables.
Keep a distance of 100mm or more between them.
Failure to do so may cause malfunctions due to noise.
- At power ON/OFF, voltage or current may instantaneously be output from the output terminal of this module.
In such case, wait until the analog output becomes stable to start controlling the external device.

[Installation Precautions]

CAUTION

- Use the module in an environment that meets the general specifications given in this manual.
Operating it in any other environment may cause an electric shock, fire, malfunction, product damage or deterioration.
- 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 may result in a 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.
- Always ground the FG terminal to the protective ground conductor. Failure to do so may result in malfunctions.
- Be sure to tighten any unused terminal screws within a tightening torque range. Failure to do so may cause a short circuit due to contact with a solderless terminal.
- Use applicable solderless terminals and tighten them with the specified torque. If any solderless spade terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and terminal layout and then wire the module correctly. Connecting a power supply of a different voltage rating or incorrect wiring may cause a fire or failure.
- Tighten terminal screws within the specified torque range. A loose terminal screw may cause a short circuit or malfunction. Overtightening can cause a short circuit or malfunction due to damage of the screws or module.
- Take care to prevent foreign matter such as dust or wire chips from entering the module. Failure to do so may cause a fire, failure or malfunctions.
- Place the connection wires and cables in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module and/or cables or malfunctions due to poor cable connection.

[Wiring Precautions]

CAUTION

- 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 cables from the module, do not hold and pull the cable part.
Disconnect the cables after loosening the screws in the portions connected to the module.
Pulling the cable that is still connected to the module may damage the module and/or cable and cause malfunctions due to poor cable connection.

[Starting and Maintenance Precautions]

CAUTION

- Do not touch the terminals while the power is on.
Doing so may cause malfunction.
- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws.
Not doing so can cause the module to fail or malfunction.
- Never disassemble or modify the module.
This may cause breakdowns, malfunction, injury and/or fire.
- Do not drop or apply any strong impact to the module. Doing so may damage the module.
- Be sure to shut off all phases of the external power supply used by the system before mounting or dismounting the module to or from the panel.
Not doing so can cause the module to fail or malfunction.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)
Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body.
Failure to do so can 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 ●

- (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.

REVISIONS

*The manual number is given on the bottom right of the cover.

Print Date	*Manual Number	Revision
May, 2008	IB(NA)-0800418-A	First edition
Oct., 2010	IB(NA)-0800418-B	Correction SAFETY PRECAUTIONS, Section 2.1, 2.2, 4.1, 5.2, 6.2 Addition CONDITIONS OF USE FOR THE PRODUCT
Jun., 2011	IB(NA)-0800418-C	Correction COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, Section 2.1, 2.2
Dec., 2011	IB(NA)-0800418-D	Addition SAFETY PRECAUTIONS(Chinese) Correction Section 2.1, 4.1

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ABOUT MANUAL

The following manual is also related to this product.
If necessary, place an order.

Related Manual

Manual name	Manual Number (Model code)
Digital-Analog Converter Module Type AJ65SBT2B-64DA User's Manual	SH-080768ENG (13JZ19)

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 explains the specifications, names of the components and wiring for the type AJ65SBT2B-64DA digital-analog converter module (hereafter AJ65SBT2B-64DA) which are used as a remote device station of a CC-Link system.

2. SPECIFICATIONS

2.1 General Specifications

The general specifications for the AJ65SBT2B-64DA are shown in the following table.

Table 2.1 General specifications

Item	Specification					
Operating ambient temperature	0 to 55°C					
Storage ambient temperature	-20 to 75°C					
Operating ambient humidity	10 to 90%RH, non-condensing					
Storage ambient humidity						
Vibration resistance	Compliant with JIS B 3502 and IEC 61131-2	Under intermittent vibration	Frequency	Constant acceleration	Half amplitude	Sweep count
			5 to 8.4Hz	-	3.5mm	10 times each in X, Y, Z directions
		8.4 to 150Hz	9.8m/s ²	-	-	
		Under continuous vibration	5 to 8.4Hz	-		1.75mm
8.4 to 150Hz	4.9m/s ²	-				
Shock resistance	Compliant with JIS B 3502 and IEC 61131-2 (147 m/s ² , 3 times each in 3 directions X, Y, Z)					
Operating atmosphere	No corrosive gases					
Operating altitude *3	0 to 2000m					
Installation location	Inside a control panel					
Overvoltage category *1	II or less					
Pollution degree *2	2 or less					

- *1 This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.
Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2500V.
- *2 This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.
Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.
- *3 Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause malfunction.
When using the programmable controller under pressure, please consult your local Mitsubishi Electric representative.

2.2 Performance Specifications

The performance specifications for the AJ65SBT2B-64DA are shown in the following table.

Table 2.2 Performance specifications

Item		AJ65SBT2B-64DA				
Digital input value	Voltage	16-bit signed binary (-12288 to 12287, -16384 to 16383, -288 to 12287)				
	Current	16-bit signed binary(-288 to 12287)				
Analog output value	Voltage	-10 to 10VDC (External load resistance: 1k to 1M Ω)				
	Current	0 to 20mADC (External load resistance: 0 to 600 Ω)				
I/O characteristics, maximum resolution, accuracy (accuracy relative to maximum analog output value)	Voltage	-16000 to 16000	-10 to 10V	Ambient temperature 0 to 55 $^{\circ}$ C	Ambient temperature 25 \pm 5 $^{\circ}$ C	Maximum resolution
		0 to 12000	0 to 5V	\pm 0.3% (\pm 30mV)	\pm 0.2% (\pm 20mV)	0.625mV
			1 to 5V	\pm 0.3% (\pm 15mV)	\pm 0.2% (\pm 10mV)	0.416mV 0.333mV
	-12000 to 12000	User range setting 2 (-10 to 10V)	\pm 0.3% (\pm 30mV)	\pm 0.2% (\pm 20mV)	0.333mV	
	Current	0 to 12000	0 to 20mA	\pm 0.3% (\pm 60 μ A)	\pm 0.2% (\pm 40 μ A)	1.66 μ A
			4 to 20mA			1.33 μ A
			User range setting 1 (0 to 20mA)			0.95 μ A
conversion speed	200 μ s/1channels					
Output short-circuit protection	Available					
Number of analog output points	4 channels/1 module					
Maximum number of writes for Flash memory	MAX. 10,000 times					
CC-Link station type	Remote device station					
No. of occupied stations	1 station					
Connection cable	CC-Link dedicated cable					
Withstand voltage	500V AC for 1 minute across all power supply and communication system terminals and all analog output terminals					
Isolation system	Between communication system terminals and all analog output terminals: Photocoupler isolated Between power supply system terminals and all analog output terminals: Transformer isolated Between channels: Non-isolated					

Table 2.2 Performance specifications

Item		AJ65SBT2B-64DA
Noise immunity		Noise voltage : 500Vp-p, tested by noise simulator of noise width of 1 μ s and noise frequency of 25 to 60Hz
External wiring connection system	Communication area, module power supply area	7-point 2-piece terminal block M3 \times 5.2 Tightening torque: 0.59 to 0.88N•m Applicable solderless terminals: 2 max.
	I/O area	Direct-coupled, 18-point terminal block M3 \times 5.2 Tightening torque: 0.59 to 0.88N•m Applicable solderless terminals: 2 max.
Applicable wire size		0.3 to 2.0mm ²
Applicable solderless terminals		<ul style="list-style-type: none"> • RAV1.25-3 (conforming to JIS C 2805) [Applicable wire size :0.3 to 1.25mm²] • V2-MS3, RAP2-3SL, TGV2-3N [Applicable wire size: 1.25 to 2.0mm²]
Module fixing screw		M4 screw \times 0.7mm \times 16mm or larger (tightening torque range: 0.78 to 1.08N•m) DIN-rail mounting is also possible.
Applicable DIN rail		TH35-7.5Fe, TH35-7.5Al (Compliant with IEC 60715)
External power supply		24V DC (20.4 to 28.8V DC)
		Inrush current: 2.6A, 3.2ms or shorter
		Current consumption: 0.24A (24V DC)
Weight		0.25kg

*1 Factory setting is -10 to 10V.

*2 The accuracy does not apply when noise exists.

3. PART NAMES AND SETTINGS

3.1 Part names

This section explains the names of the components for the AJ65SBT2B-64DA.

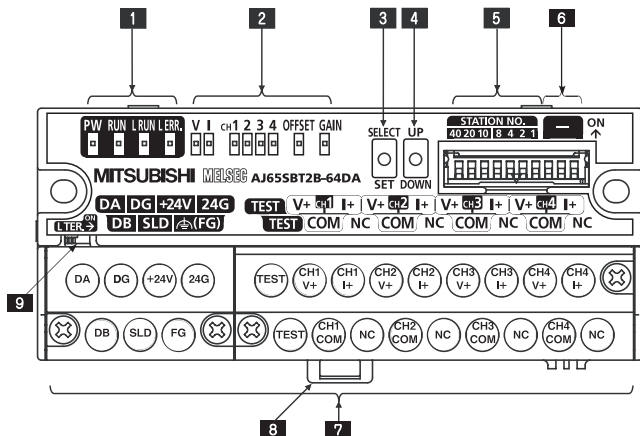


Figure 3.1 Appearance of the AJ65SBT2B-64DA

Table 3.1 Part names

No.	Name	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 output range setting error. 0.5s intervals indicate a digital value setting error. Off: Indicates that 24V DC power supply interrupted, watchdog timer error occurred, write error for flash memory occurred.
			Test mode	On: Indicate that the SELECT/SET switch is in the SET position. Flashing: Indicates that making offset/gain setting was attempted 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 station number setting is outside the range. Flicker at fixed intervals: Indicates that station number setting was changed from that at power-on. Flicker at unfixed intervals: Indicates that you forgot fitting the terminating resistor or the module or CC-Link dedicated cable is affected by noise. Off: Indicates normal communications.	
2	Offset/gain adjusting LEDs	V I	Normal mode	Normally OFF.
		CH OFFSET GAIN	Test mode	The LEDs lit change every time the SELECT/SET switch is moved to SELECT.
3	SELECT/SET switch	Used to make offset/gain setting in the test mode.		
4	UP/DOWN switch	Used to adjust the offset value and gain value of the channel specified by the SELECT/SET switch.		

Table 3.1 Part names

No.	Name	Description																																																																																																														
5	Station number setting switches	<p>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. Cannot set the same station number to two or more stations. Setting any other number than 1 to 64 will result in an error, flickering the "L ERR." LED.</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p>(Example) To set the station number to "32", set the switches as indicated below.</p> <table border="1"> <thead> <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> </thead> <tbody> <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> </tbody> </table>	Station number	Tens			Units				40	20	10	8	4	2	1	1	OFF	OFF	OFF	OFF	OFF	OFF	ON	2	OFF	OFF	OFF	OFF	OFF	ON	OFF	3	OFF	OFF	OFF	OFF	OFF	ON	ON	4	OFF	OFF	OFF	OFF	ON	OFF	OFF	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	10	OFF	OFF	ON	OFF	OFF	OFF	OFF	11	OFF	OFF	ON	OFF	OFF	OFF	ON	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	64	ON	ON	OFF	OFF	ON	OFF	OFF	Station number	Tens			Units				40	20	10	8	4	2	1	32	OFF	ON	ON	OFF	OFF	ON	OFF
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6	Use prohibited	Set all switches to off.																																																																																																														
7	Terminal block	Used to connect the module power supply, transmission and analog I/O signals.																																																																																																														
8	DIN rail hook	Used to mount the module to the DIN rail.																																																																																																														
9	L TER. (Line Termination) switch	Turned ON to validate the terminating resistor stored in the AJ65SBT2B-64DA. Used when the AJ65SBT2B-64DA is used on the network edge.																																																																																																														

* The transmission speed is automatically set depending on the setting of the master module.

4. LOADING AND INSTALLATION

4.1 Handling Precautions

The following is an explanation of handling precautions of the AJ65SBT2B-64DA.

- (1) Tighten screws (such as a module fixing screw) within the tightening torque range specified in the table below.

Table 4.1 Tightening torque range

Screw location	Tightening torque range
Module fixing screw (M4 screw)	0.78 to 1.08N•m
Terminal block terminal screw (M3 screw)	0.59 to 0.88N•m
Terminal block installation screw (M3.5 screw)	0.68 to 0.98N•m

- (2) When using the DIN rail, pay attention to the followings.
 - (a) Applicable DIN rail type (Compliant with IEC 60715)
TH35-7.5Fe
TH35-7.5Al
 - (b) DIN rail installation screw pitch
When installing a DIN rail, tighten the screws at a pitch of 200mm or less.
- (3) When mounting the AJ65SBT2B-64DA to the DIN rail, press with your finger the centerline of the DIN rail hook at the bottom of the module until it clicks.

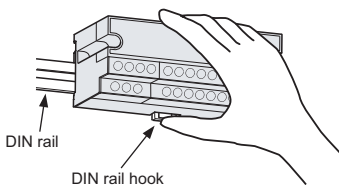


Figure 4.1 Installation to DIN rail

- (4) Refer to the Master Module user's manual for the name, specification, and manufacturers of supported cables for the use with AJ65SBT2B-64DA.

5. DATA LINK CABLE WIRING

5.1 Wiring Precautions

When replacing existing AJ65SBT-62DA with the AJ65SBT2B-64DA, since their communication terminal blocks differ, rewire the system using communication terminal block for the AJ65SBT2B-64DA.

5.2 CC-Link Dedicated Cable Connection Method

The following shows how to connect the AJ65SBT2B-64DA to a master module and a remote module with CC-Link dedicated cables.

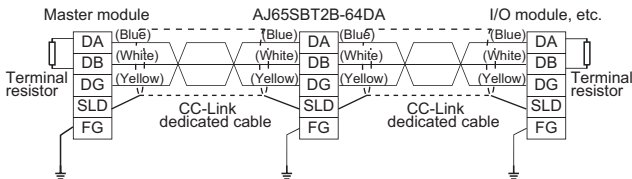


Figure 5.1 Connection of the CC-Link dedicated cables

5.3 Connection of Terminating Resistor

The AJ65SBT2B-64DA stores the terminating resistor of 110Ω , so there is no need the external wiring

(1) Precautions

- Move the L TER. switch until it clicks.



- Make sure that between DA and DB is high resistance (when the L TER. switch is off) or is 110Ω (When the L TER. switch is on) with a tester before wiring the system with CC-Link dedicated cables.
- The built-in terminating resistor cannot be used in the following cases. Wire a terminating resistor (110 or 130Ω).
 - A CC-Link system is configured using CC-Link cables of 130Ω .
 - The AJ65SBT2B-64DA may be replaced during data link.

6. WIRING

6.1 Wiring Precautions

External wiring that is less susceptible to noise is required as a condition of enabling a highly reliable system and making full use of the capabilities of AJ65SBT2B-64DA.

The precautions when performing external wiring are as follows:

- (1) Use separate cables for the AC control circuit and the external output signals of the AJ65SBT2B-64DA or the external power supply to avoid the influence of the AC side surges and induction.
- (2) Do not mount the cables close to or bundle them with the main circuit line, a high-voltage cable or a load cable from other than the programmable controller .
This may increase the effects of noise, surges and induction.
- (3) The shield wire or the shielded cable must be grounded at one end.

6.2 Wiring with External Devices

- (1) For voltage output

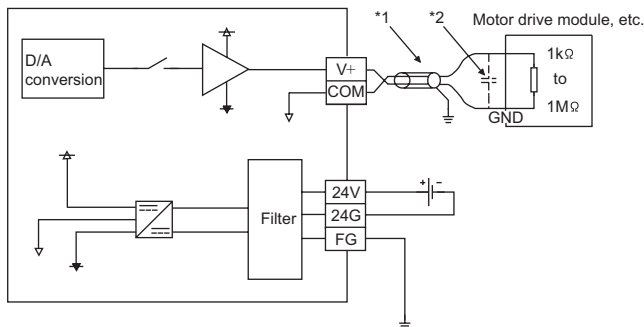


Figure 6.1 Wiring for voltage output

- *1 Use a twisted two core shielded wire for the power wire.
- *2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 μF capacitor (25V or higher voltage-resistant product) to the input terminals of the external device.

(2) For current output

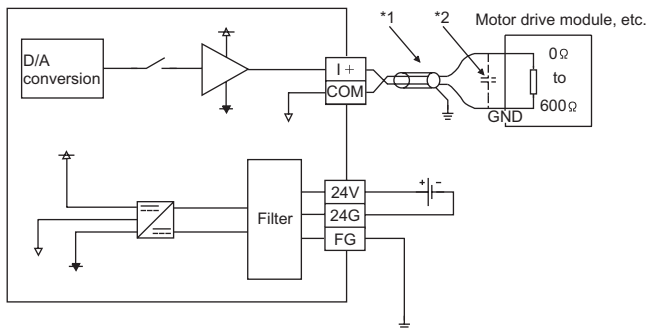
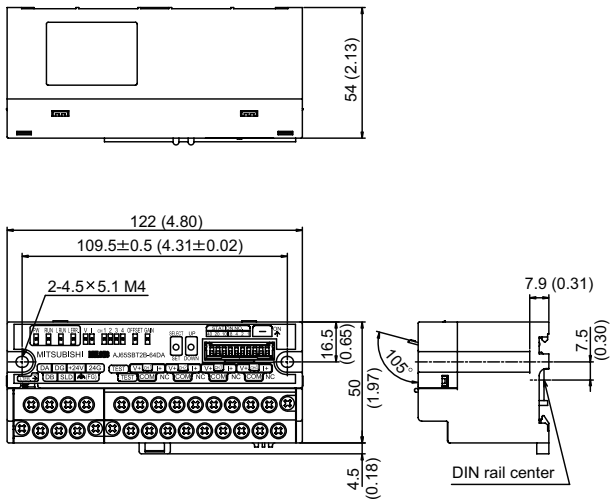


Figure 6.2 Wiring for current output

- *1 Use a twisted two core shielded wire for the power wire.
- *2 If there is noise or ripples in the external wiring, connect a 0.1 to 0.47 μF capacitor (25V or higher voltage-resistant product) to the input terminals of the external device.

7. EXTERNAL DIMENSIONS

The external dimensions of the AJ65SBT2B-64DA is shown below.



Unit: mm (inch)

WARRANTY

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