

MITSUBISHI

CC-Link System Remote I/O Module

User's Manual



Mitsubishi Programmable Controller

• 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 precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the user's manual for the CPU module used.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING " and "⚠ CAUTION".

 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

 WARNING
• In the case of a communication failure in the network, the status of the error station will be as follows: (1) All inputs from remote I/O stations are turned off. (2) All outputs from remote I/O stations are turned off. Check the communication status information and configure an interlock circuit in the sequence program to ensure that the entire system will operate safely. Incorrect output or malfunction due to a communication failure may result in an accident. • Outputs may remain on or off due to a failure of a remote I/O module. Configure an external circuit for monitoring output signals that could cause a serious accident.
 CAUTION
• Use the module 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. • 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]

WARNING

- A connector must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. After that, securely connect it to the module.

CAUTION

- Do not directly touch any conductive parts and electronic components 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.
- Securely connect the cable connectors.
Poor contact may cause malfunction.

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before wiring.
Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After wiring, attach the included terminal cover to the module before turning it on for operation.
Failure to do so may result in electric shock.

CAUTION

- Ground the FG terminal to the protective ground conductor dedicated to the programmable controller.
Failure to do so may result in electric shock or malfunction.
- Tighten any unused terminal screws within the specified torque range (0.42 to 0.50N•m).
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, fire, or malfunction.
Overtightening can damage the screw and/ or module, resulting in drop, short circuit, fire, or malfunction.

[Wiring Precautions]

CAUTION

- Prevent foreign matter such as dust or wire chips from entering the module.
Such foreign matter can cause a fire, failure, or malfunction.
- 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 together with the communication cables, or bring them close to each other.
Failure to do so may cause malfunctions due to noise.
- When disconnecting the cable from the module, do not pull the cable by the cable part.
For the cable with connector, hold the connector part of the cable.
For the cable connected to the terminal block, loosen the terminal screw.
Failure to do so may result in damage to the module or cable or malfunction due to poor contact.

[Starting and Maintenance Precautions]

WARNING

- Do not touch any terminal or connector while power is on.
Doing so will cause electric shock.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws or module mounting screws.
Failure to do so may cause the module to fail or malfunction.

CAUTION

- 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 (all phases) used in the system before mounting or removing a module.
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.

• 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 left of the back cover.

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Nov., 2012	IB(NA)66728-H	Correction Section 1.3.1, Chapter 3, Section 5.1, Section 5.3, Section 8.2.1

Japanese Manual Version SH-3609-I

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INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC-A series general-purpose programmable controllers. Before using this product, please read this manual carefully and develop familiarity with the functions and performance of the MELSEC-A series programmable controller to handle the product correctly. Please make sure that the end users read this manual.

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MANUALS

The following manuals are related to this product.

Order each manual as needed, referring to the following list.

Relevant manuals

Manual name	Manual number (model code)
CC-Link System Master/Local Module Type AJ61BT11/A1SJ61BT11 User's Manual System configuration, performance specifications, functions, handling, wiring, and troubleshooting of the AJ61BT11 and A1SJ61BT11 (Sold separately)	IB-66721 (13J872)
CC-Link System Master/Local Module Type AJ61QBT11/A1SJ61QBT11 User's Manual System configuration, performance specifications, functions, handling, wiring, and troubleshooting of the AJ61QBT11 and A1SJ61QBT11 (Sold separately)	IB-66722 (13J873)
CC-Link System Master/Local Module User's Manual System configuration, performance specifications, functions, handling, wiring, and troubleshooting of the QJ61BT11N (Sold separately)	SH-080394 (13JR64)
MELSEC-L CC-Link System Master/Local Module User's Manual Settings, specifications, handling, data communication methods, and troubleshooting of the built-in CC-Link function of the CPU module or the CC-Link system master/local module (Sold separately)	SH-080895ENG (13JZ41)

COMPLIANCE WITH THE 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 the "EMC AND LOW VOLTAGE DIRECTIVES" chapter in the user's manual for the CPU module used.

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 the "CC-Link module" section in the "EMC AND LOW VOLTAGE DIRECTIVES" chapter in the user's manual for the CPU module used.

MEMO

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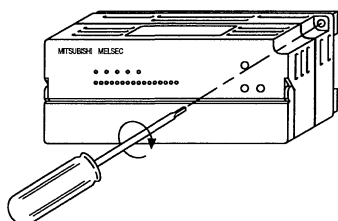
1 General Discription

This manual describes the specifications of the remote I/O module used in the CC-Link system.

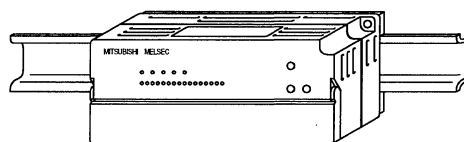
1.1 Features

- (1) A maximum of 64 remote I/O stations can be connected.
With CC-Link, a maximum of 64 remote I/O stations can be connected for one master station.
Also, one remote station is a 32-point module, so 2048 link points can be set at maximum.
- (2) Screws or DIN rail can be used for installation to the board.
Screws or DIN rail can be used to install to the remote I/O module board.

Installing with screws

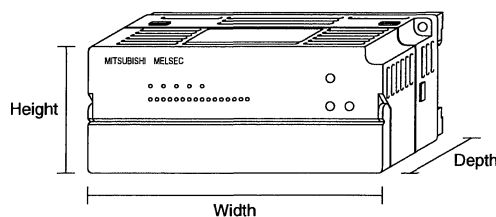


Installing with DIN rail

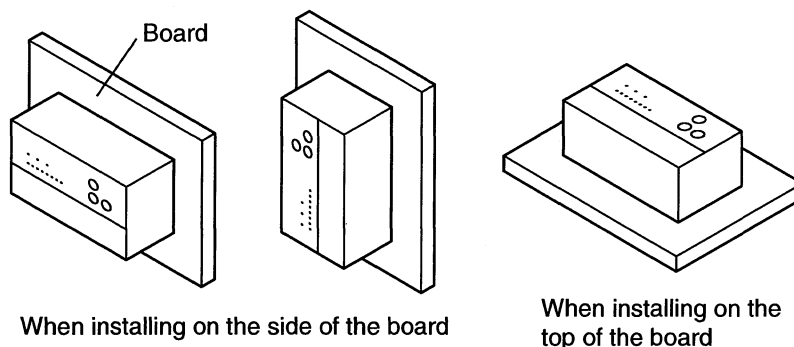


- (3) The size is compact.
The remote I/O module is compact.

Module model	Height	Width	Depth
AJ65BTB1-16□	65 mm (2.56 inch)	151.9 mm (5.98 inch)	46 mm (1.81 inch)
AJ65BTB2-16□		197.5 mm (7.77 inch)	
AJ65BTC1-32□		165.0 mm (6.49 inch)	

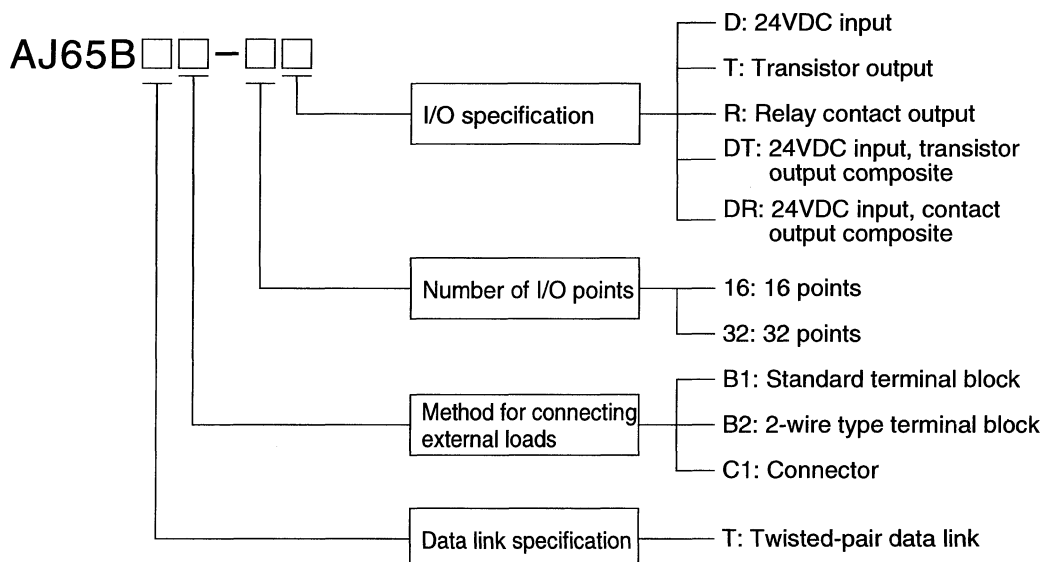


- (4) The remote I/O module can be installed in any direction.



1.2 Model Name of the Remote I/O Module

The remote I/O module's model name is indicated in the following manner:



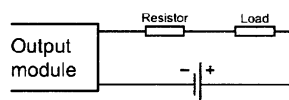
1.3 Precautions for Use

The precautions the precautions for use of remote I/O module to be used with CC-Link and the specification are described below:

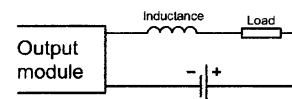
- (1) This is a remote I/O module exclusive for CC-Link.
Do not connect this module to other data link systems such as the MELSECNET/MINI data link system.
- (2) 32 points are assigned per station for a remote I/O module.
For 16-point modules the 16 points in the second half and for 8-points module the 24 points in the second half remain empty but are not usable.
- (3) When installing a sensor directly to the remote I/O module, a double-line module is recommended, since it has many common lines and a relay terminal is not necessary, enabling easy wiring.

1.3.1 Output module

- (1) Maximum switching frequency when the module drives inductive load
The output must be on for one second or longer and off for one second or longer.
- (2) Load for connection
When connecting a counter or timer that has a DC-DC converter to a transistor output module (maximum load current 0.1A) as a load, select an output module whose maximum load current is larger than inrush current of the load.
Selecting an output module by average current of the load may cause a failure of the module because inrush current flows at a constant frequency at power-on or during operation due to the connected load.
If an output module needs to be selected by average current of the load, take either of the following actions to reduce an influence from inrush current.



•Connecting a resistor to the load in series



•Connecting an inductor to the load in series

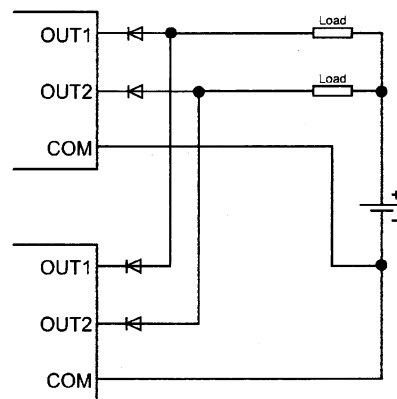
(3) Precaution for using the transistor output module

(a) Action against reverse current

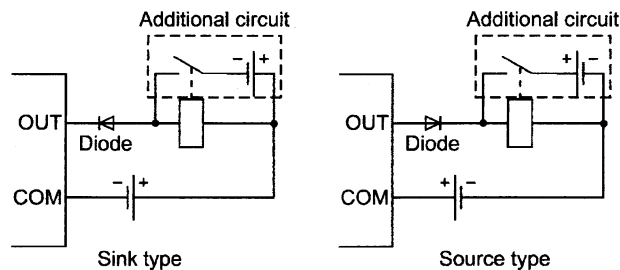
If a transistor output module is wired as shown below, reverse current flows in an output element, causing a failure of the element.

When wiring a transistor output module, connect a diode as shown below.

- When connecting transistor output modules in parallel



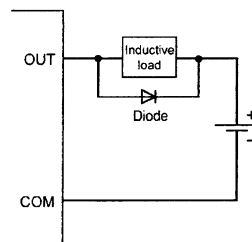
- When incorporating an additional circuit parallel to a transistor output module



(b) Measures against back EMF

When an inductive load is connected, connect a diode to the load in parallel. Use a diode that meets the following conditions.

- Reverse breakdown voltage is equal to or more than 10 times as large as the circuit voltage.
- Forward current is equal to or more than 2 times as large as the load current.



(4) Precautions for using the contact output module

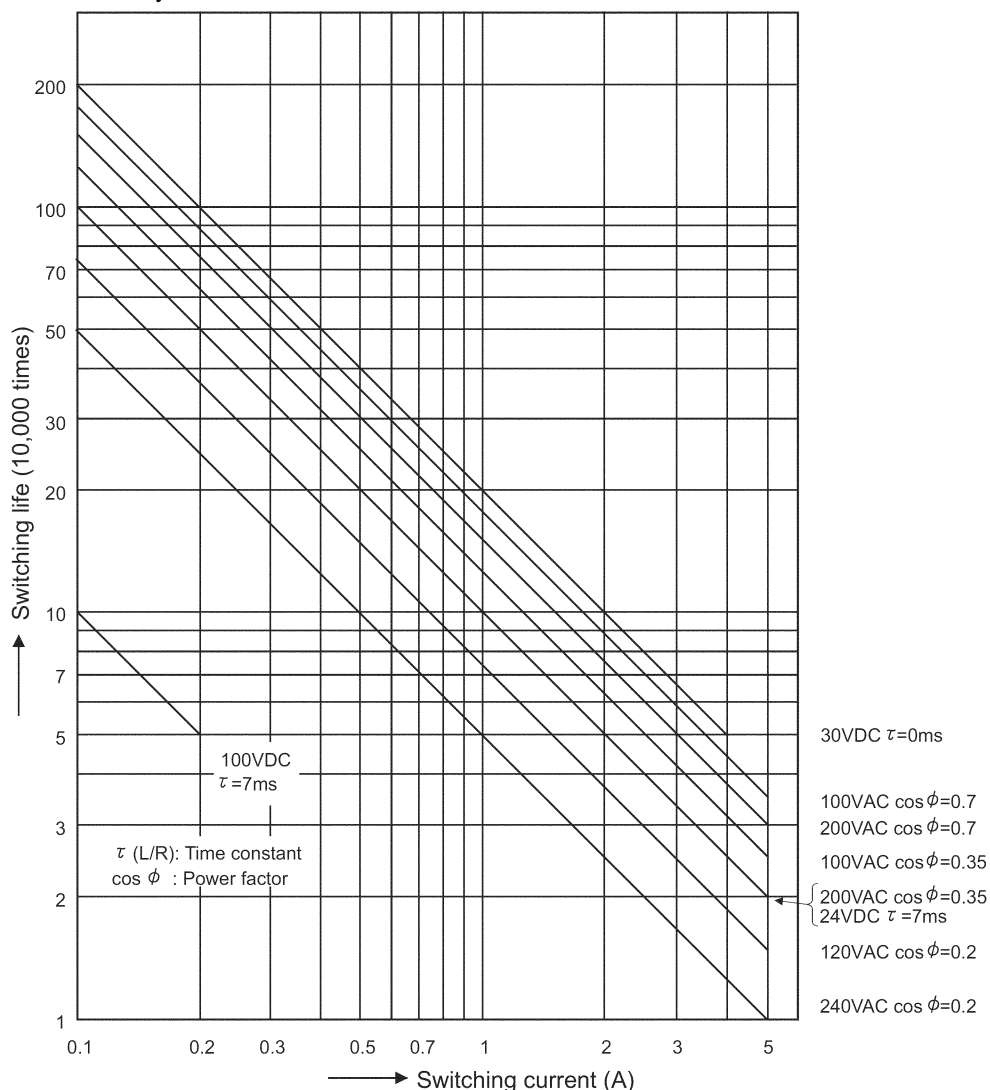
When using the contact output module, consider the following.

- Relay life
- Effects to relay life due to connected load
- Measures against back EMF

(a) Relay life

Applicable module: AJ65BTB2-16R, AJ65BTB2-16DR

The relay life depends on the operating environment. Select a module according to the operating environment. The relay lives shown below are the actual service values, not the guaranteed values. Replace the module well in advance since the actual switching life may be shorter than the one shown below.



Operating environment	Switching life
Rated switching voltage/current, rated load	100 thousand times
200VAC 1.5A, 240VAC 1A ($\cos \phi = 0.7$)	100 thousand times
200VAC 1A, 240VAC 0.5A ($\cos \phi = 0.35$)	100 thousand times
24VDC 1A, 100VDC 0.1A (L/R = 7ms)	100 thousand times

POINT

When using the module for the application in which the relay contact is frequently switched, the relay life span should be considered. Therefore, it is recommended to use a triac output module.

(b) Effects to relay life due to connected load

The actual relay life may be significantly shortened compared to the one shown above, depending on the type of a load connected and the characteristics of inrush current. Also, the inrush current may cause contact welding.

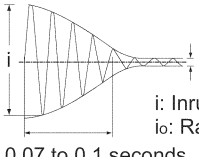
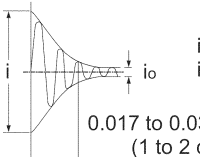
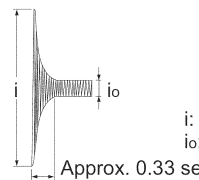
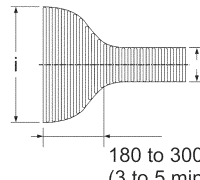
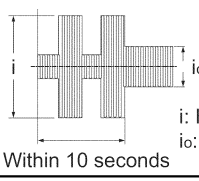
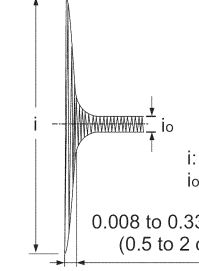
Take the following measures to prevent shortening of the relay life and the contact welding.

- Select a load so that the inrush current will be within the rated current of the module.
- Connect an external relay that can withstand the inrush current.

The following table shows the relation between the load and the inrush current.

Select a load so that the inrush current (i) and the rated current (i_o) will be within the rated switching current specified for the output module used.

The inrush current may flow for a longer time depending on the load.

Load type	Signal waveform diagram	Inrush current (i)/ rated current (i_o)	Signal waveform diagram	Inrush current (i)/ rated current (i_o)
Inductive load	Load of a solenoid  i: Inrush current i_o : Rated current 0.07 to 0.1 seconds	Approx. 10 to 20 times	Load of an electromagnetic contactor  i: Inrush current i_o : Rated current 0.017 to 0.033 seconds (1 to 2 cycles)	Approx. 3 to 10 times
	Load of an incandescent bulb  i: Inrush current i_o : Rated current Approx. 0.33 seconds		Load of a mercury lamp  i: Inrush current i_o : Rated current 180 to 300 seconds (3 to 5 minutes)	
Lamp load	Load of a fluorescent  i: Inrush current i_o : Rated current Within 10 seconds	Approx. 5 to 10 times	—	—
	Capacitive load*2  i: Inrush current i_o : Rated current 0.008 to 0.33 seconds (0.5 to 2 cycles)		—	—

*1: Typical electric-discharge lamp circuit includes discharge tubes, transformers, choke coils, and capacitors. Therefore, note that the inrush current may flow 20 to 40 times as large as the rated current in the case of high power factor and low power impedance.

*2: When the wiring of the circuit is long, take care of the wire capacity.

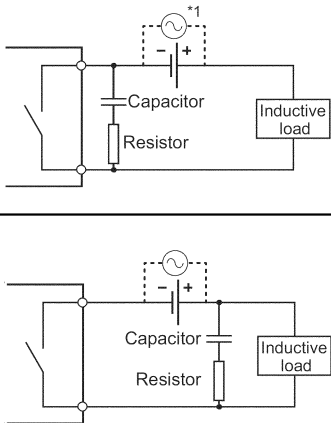
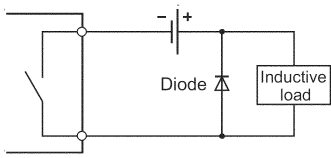
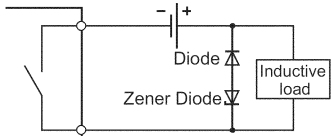
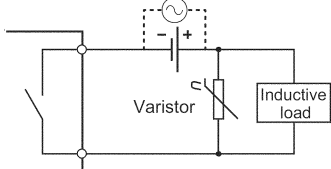
(c) Measures against back EMF

Configure a contact protection circuit for extending the contact life, preventing noise when the contact is cut off, and suppressing the generation of carbide and nitric acid due to arc discharge.

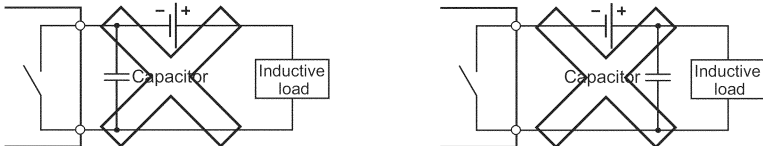
An incorrect contact protection circuit may cause contact welding.

Also, when using the contact protection circuit, the recovery time may be long.

The following table shows the representative examples of the contact protection circuit.

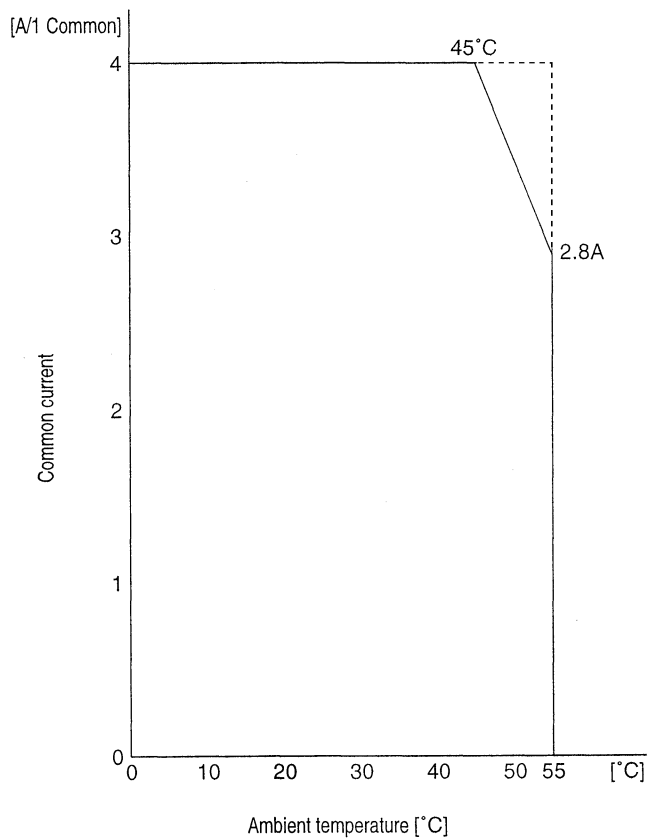
Circuit example	Method for selecting elements	Remarks
Capacitor + Resistor method (CR method) 	Refer to the following for constants of the capacitor and resistor. Note that the following values may differ depending on a nature of the load and a variation of characteristics of it. - Capacitor: 0.5 to 1 (μF) against contact current of 1A - Resistor: 0.5 to 1 (Ω) against contact voltage of 1V Use a capacitor whose withstand voltage is 200 to 300V. In AC circuit, use a capacitor having no polarity.	If a load is from a relay or solenoid, the recovery time delays. A capacitor suppresses electric discharge while a contact is off, and a resistor restricts a flow of current while a contact is on.
Diode method 	Use a diode that meets both conditions shown below. - Reverse breakdown voltage is equal to or more than 10 times as large as the circuit voltage. - The forward current is equal to or more than 2 times as large as the load current.	The recovery time is later than the CR method.
Diode + Zener diode method 	Use zener voltage for the zener diode equal to or more than the power supply voltage.	The diode method is effective when the recovery time is too late.
Varistor method 	Select a cut voltage (V_c) for the varistor to meet the following condition. $V_c > \text{power voltage} \times 1.5 \text{ (V)}$ $V_c > \text{power voltage} \times 1.5 \text{ (V)} \times \sqrt{2}$ (When AC power is used) This method is not effective when the V_c is too high.	The recovery time delays slightly.

*1: When AC power is used, impedance of CR must be larger enough than that of the load (to prevent malfunction of the module due to leak current from the CR).

Point
(1) Avoid providing contact protection circuits shown below. These circuits are effective for preventing an arc at shut-off. However, the contact welding may occur because the charge current flows to capacitor when the contact turns on or off. A DC inductive load is usually harder for switching than a resistor load, but if a proper protection circuit is configured, the performance will be similar to the resistor load.  (2) A protection circuit must be provided closely to a load or contact (module). If their distance is far, the protection circuit may not be effective. Appropriate distance is within 50cm.

- (5) When the AJ65BTB1-16T is used, the common current varies from documented specification depending on the input current and ambient temperature conditions. Determine the number of simultaneous ON points by referring to the following figure:

AJ65BTB1-16T Dilating Curve



1.4 Generic Terms and Abbreviations

- (1) Master/local module
Generic term for AJ61BT11, A1SJ61BT11, AJ61QBT11, A1SJ61QBT11, QJ61BT11, QJ61BT11N, and LJ61BT11 CC-Link system master/local module
- (2) Remote I/O module
Abbreviation for the CC-Link system remote I/O module
- (3) Input module
Generic term for AJ65BTB/C□-□D input modules
- (4) Output module
Generic term for AJ65BTB/C□-□T/R output modules
- (5) Composite module
Generic term for AJ65BTB□-16DT/DR composite modules

1.5 Tools for Wiring



WARNING • A connector must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. After that, securely connect it to the module.

A 40-pin connector provided with AJ65BTC1-32□ is a soldering type. Crimping-type and IDC-type connectors are also available.

A crimping or IDC tool needs to be prepared by a user.

(1) Connector types

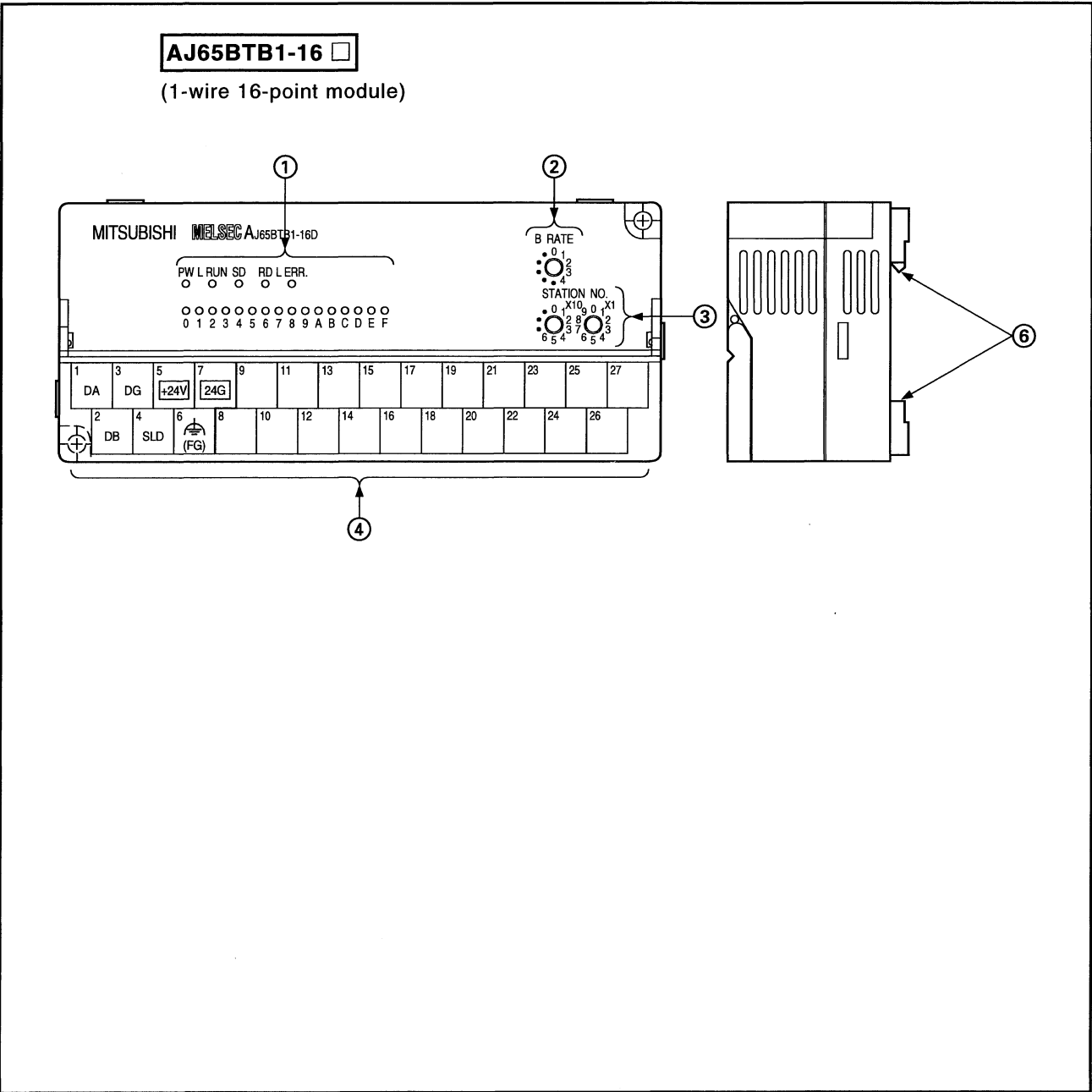
Type	Model name
Soldering type connector (Straight-out type)	A6CON1
Crimping type connector (Straight-out type)	A6CON2
IDC type connector (Flat cable type)	A6CON3
Soldering type connector (Straight-out/diagonal-out type)	A6CON4

(2) Crimping and IDC tools

Type	Model name	Cable size	Manufacturer
Crimping	FCN-363T-T005/H	24 to 28 AWG	FUJITSU COMPONENT LIMITED
IDC	FCN-367T-T012/H (locator plate)	28 AWG (stranded wire)	
	FCN-707T-T001/H (cable cutter)	30 AWG (single wire)	
	FCN-707T-T101/H (hand press)		

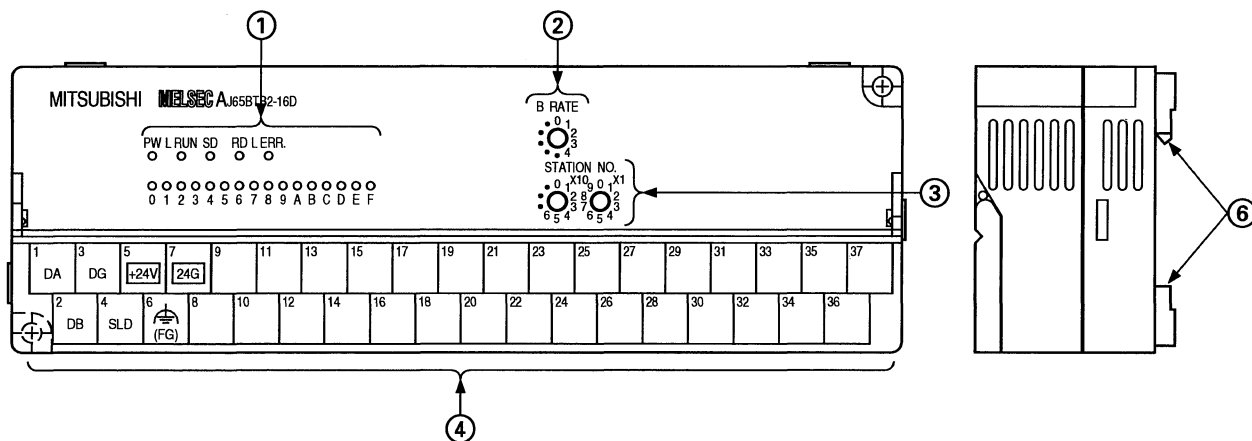
2 Part Names and Settings

The name and setting of each part of the remote I/O module are described.

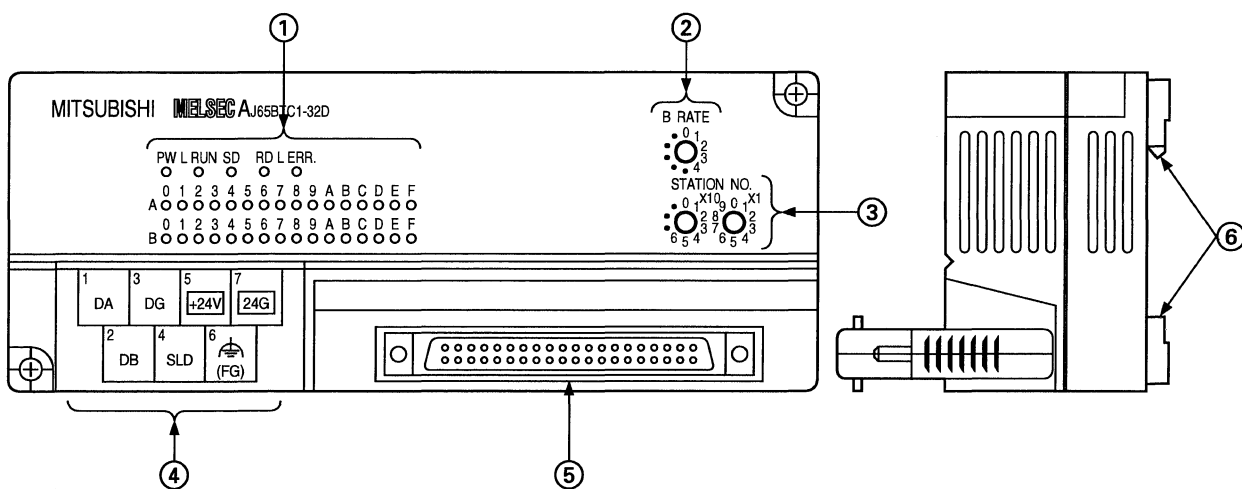


AJ65BTB2-16 □

(2-wire 16-point module)

**AJ65BTC1-32** □

(1-wire 32-point module)



①	Operation display LED PW L RUN SD RD L ERR. 0 1 2 3 4 5 6 7 8 9 A B C D E F	<table><tr><th>LED</th><th>Description</th></tr><tr><td>PW</td><td>Turns on when I/O module power supply is on.</td></tr><tr><td>L RUN</td><td>Check if the remote I/O station is data communicating with the master station normally. Turns on when receiving normal data from the master station and turns off at time out. (Turned on by receiving normal data.)</td></tr><tr><td>SD</td><td>Turns on when sending data.</td></tr><tr><td>RD</td><td>Turns on when receiving data.</td></tr><tr><td>L ERR.</td><td>Turns on when transmission error (CRC error) occurred. Turns off at time out. (RUN also turns off.) Turns on when incorrect station number or transmission speed is set. (Turns off when the error is corrected and power supply is restarted.) ERR flashes when station number setting or transmission speed setting is changed since startup. (RUN remains on. The module keeps operating with the same station number and transmission speed settings when the power was turned on.)</td></tr><tr><td>0 to F</td><td>Indicates I/O ON/OFF status. Turns on when ON, and turns off when OFF.</td></tr></table>	LED	Description	PW	Turns on when I/O module power supply is on.	L RUN	Check if the remote I/O station is data communicating with the master station normally. Turns on when receiving normal data from the master station and turns off at time out. (Turned on by receiving normal data.)	SD	Turns on when sending data.	RD	Turns on when receiving data.	L ERR.	Turns on when transmission error (CRC error) occurred. Turns off at time out. (RUN also turns off.) Turns on when incorrect station number or transmission speed is set. (Turns off when the error is corrected and power supply is restarted.) ERR flashes when station number setting or transmission speed setting is changed since startup. (RUN remains on. The module keeps operating with the same station number and transmission speed settings when the power was turned on.)	0 to F	Indicates I/O ON/OFF status. Turns on when ON, and turns off when OFF.
LED	Description															
PW	Turns on when I/O module power supply is on.															
L RUN	Check if the remote I/O station is data communicating with the master station normally. Turns on when receiving normal data from the master station and turns off at time out. (Turned on by receiving normal data.)															
SD	Turns on when sending data.															
RD	Turns on when receiving data.															
L ERR.	Turns on when transmission error (CRC error) occurred. Turns off at time out. (RUN also turns off.) Turns on when incorrect station number or transmission speed is set. (Turns off when the error is corrected and power supply is restarted.) ERR flashes when station number setting or transmission speed setting is changed since startup. (RUN remains on. The module keeps operating with the same station number and transmission speed settings when the power was turned on.)															
0 to F	Indicates I/O ON/OFF status. Turns on when ON, and turns off when OFF.															
②	Transmission speed setting switch B RATE 0 1 2 3 4	<table><tr><th>Setting</th><th>Transmission speed</th></tr><tr><td>0</td><td>156 kbps</td></tr><tr><td>1</td><td>625 kbps</td></tr><tr><td>2</td><td>2.5 Mbps</td></tr><tr><td>3</td><td>5 Mbps</td></tr><tr><td>4</td><td>10 Mbps</td></tr></table> The transmission speed setting switch must be set in the range of 0 to 4.	Setting	Transmission speed	0	156 kbps	1	625 kbps	2	2.5 Mbps	3	5 Mbps	4	10 Mbps		
Setting	Transmission speed															
0	156 kbps															
1	625 kbps															
2	2.5 Mbps															
3	5 Mbps															
4	10 Mbps															
③	Station number setting switch STATION NO. 0 1 2 3 4 5 6 7 8 9 X10 X1	The station numbers for the remote I/O module must be set in the range of 01 to 64. (*1) The "X10" sets the tens digit of the station number. The "X1" sets the units digit of the station number.														
④	Terminal block for external wiring	A terminal block for connection to the I/O module power supply, transmission and I/O signals.														
⑤	Connector	For connecting I/O signals. The connector is attached to the main module.														
⑥	Hook for DIN rail	For DIN rail installation.														

* 1 Duplicate station number cannot be set.

3 General Specification

The specification common to each module is described.

Item	Specifications					
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
		Under continuous vibration	8.4 to 150Hz	9.8m/s ²	—	—
			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 (147m/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 ^{*4}					
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.
In pollution degree 2, 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.

*4: It can also be used in an environment other than on the control panel if the conditions such as usage ambient temperature and humidity are satisfied.

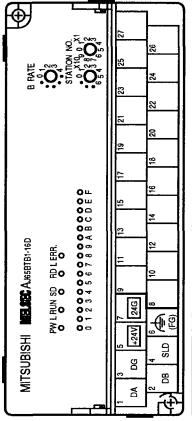
REMARK

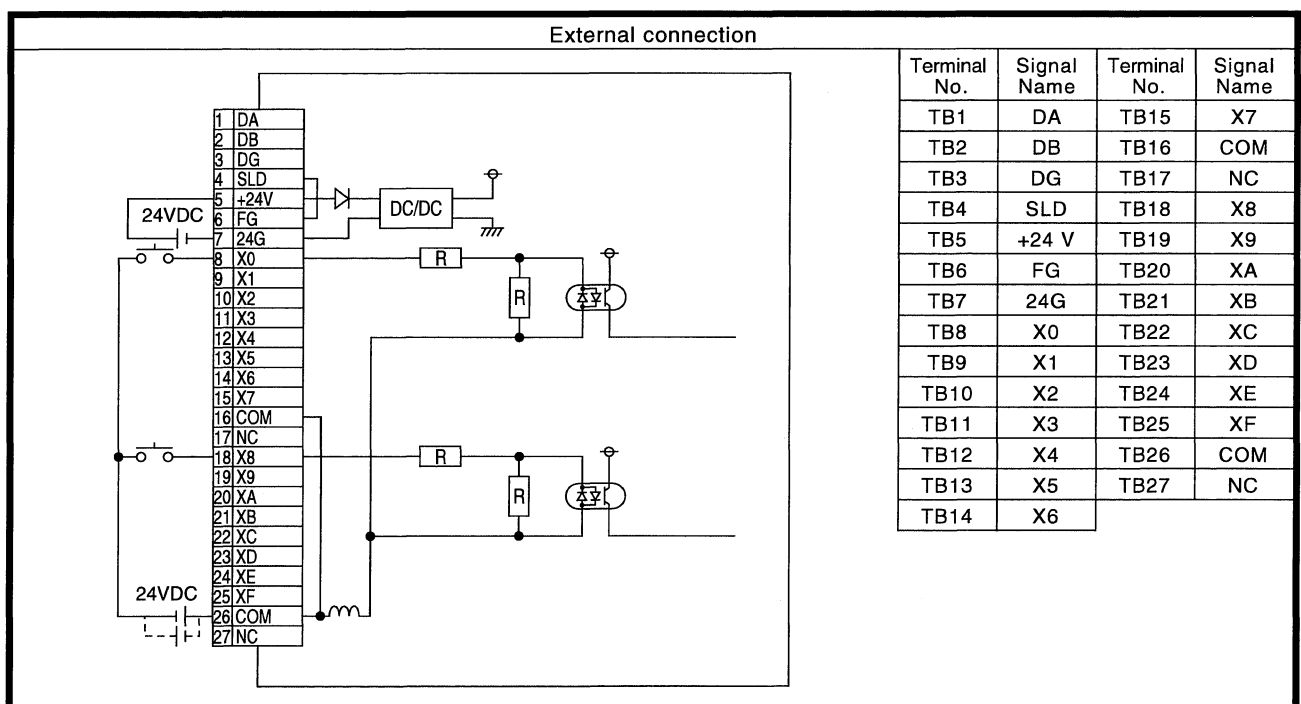
To ensure that the programmable controller maintains EMC and Low Voltage Directives, please refer to the user's manual for the CPU module used.

4 Input Module Specification

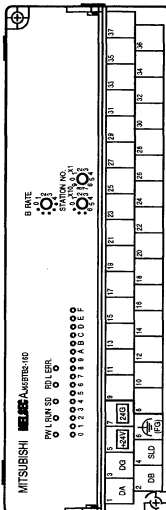
The specification for the input module that can be connected to the CC-Link is described.

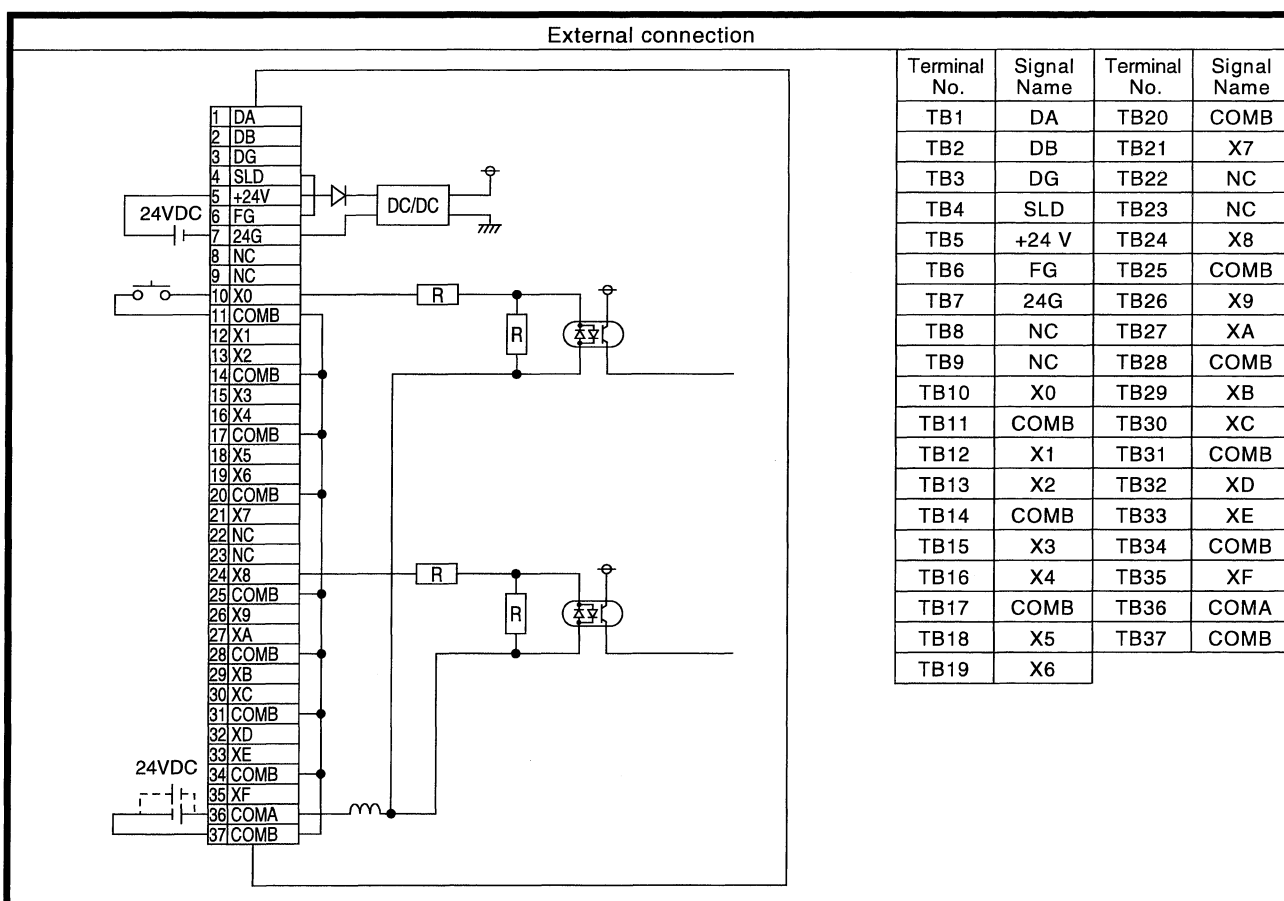
4.1 AJ65BTB1-16D Input Module

Model		DC input module	
Specification		AJ65BTB1-16D	Appearance
Number of input points		16 points	
Isolation method		Photocoupler	
Rated input voltage		24VDC	
Rated input current		Approx. 7 mA	
Operating voltage range		19.2 to 28.8 VDC (ripple rate within 5%)	
Max. simultaneous on input points		100 %	
ON voltage/ON current		14V or higher/3.5mA or higher	
OFF voltage/OFF current		6V or lower/1.7mA or lower	
Input resistance		Approx. 3.3 kΩ	
Response time	OFF → ON	10 msec or lower	
	ON → OFF	10 msec or lower	
Common method		16 points/ common (1-wire terminal block)	
Input form		Sink/source loading shared type	
Number of stations occupied		1 station	
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)	
	Current	60 mA or lower (when TYP. 24VDC)	
Noise durability		DC type's noise voltage 500V _{P-P} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.	
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1 minute	
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester	
Weight		320 g (0.7lb)	
External wiring system		27-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal	
Applicable wire size		0.75 to 2 mm ²	
Applicable solderless terminal		RAV 1.25 to 3.5 (JIS C 2805 conforming) RAV 2 to 3.5	

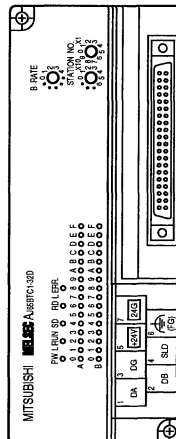


4.2 AJ65BTB2-16D Input Module

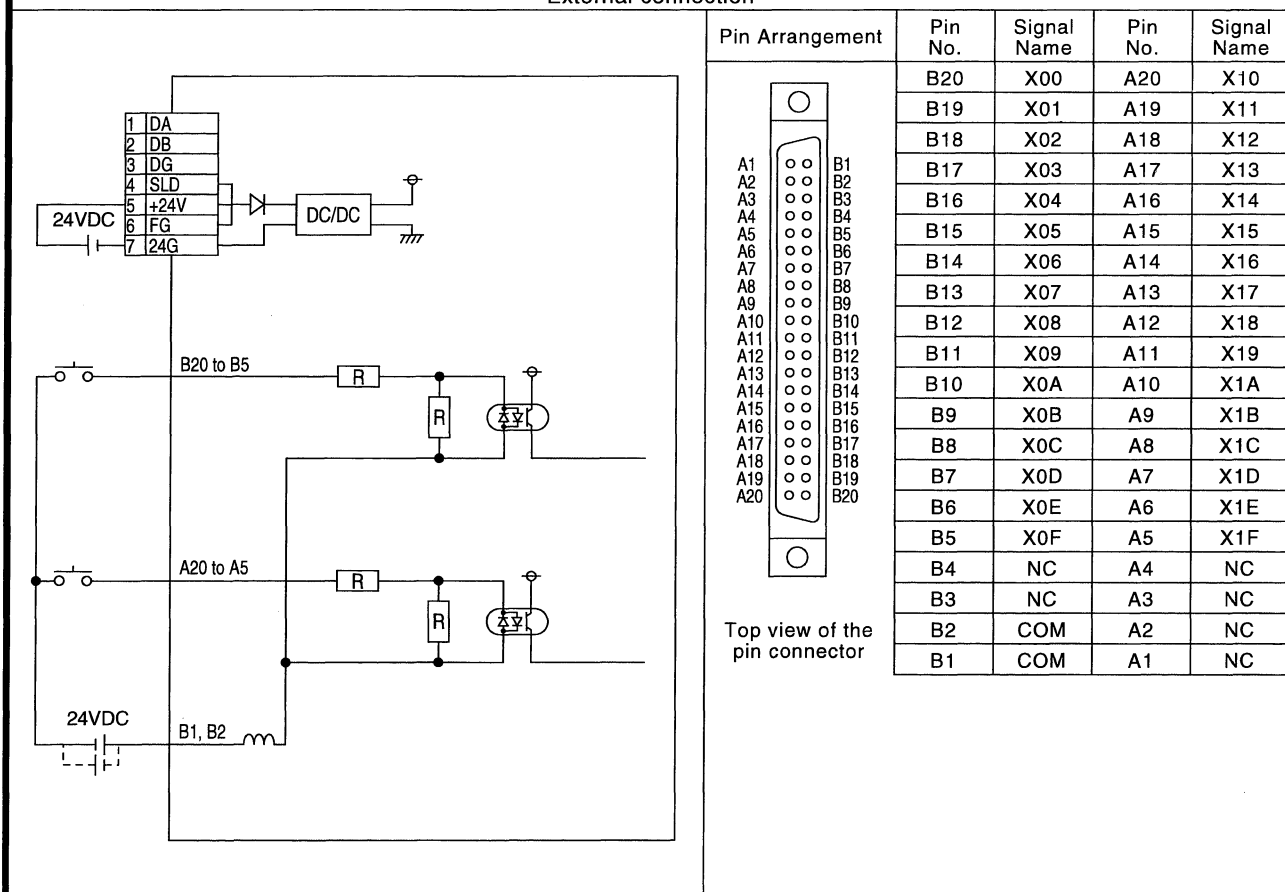
Model		DC input module		Appearance
Specification		AJ65BTB2-16D		
Number of input points		16 points		
Isolation method		Photocoupler		
Rated input voltage		24VDC		
Rated input current		Approx. 7 mA		
Operating voltage range		19.2 to 28.8 VDC (ripple rate within 5%)		
Max. simultaneous on input points		100 %		
ON voltage/ON current		14V or higher/3.5mA or higher		
OFF voltage/OFF current		6V or lower/1.7mA or lower		
Input resistance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 msec or lower		
	ON → OFF	10 msec or lower		
Common method		16 points/ common (2-wire terminal block)		
Input form		Sink/source loading shared type		
Number of stations occupied		1 station		
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)		
	Current	60 mA or lower (when TYP. 24VDC)		
Noise durability		DC type's noise voltage 500V _{P-P} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.		
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1 minute		
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester		
Weight		400 g (0.9lb)		
External wiring system		37-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal		
Applicable wire size		0.75 to 2 mm ²		
Applicable solderless terminal		RAV 1.25 to 3.5 (JIS C 2805 conforming) RAV 2 to 3.5		



4.3 AJ65BTC1-32D Input Module

Model		DC input module		Appearance
Specification		AJ65BTC1-32D		
Number of input points		32 points		
Isolation method		Photocoupler		
Rated input voltage		24VDC		
Rated input current		Approx. 7 mA		
Operating voltage range		19.2 to 28.8 VDC (ripple rate within 5%)		
Max. simultaneous on input points		100 %		
ON voltage/ON current		14V or higher/3.5mA or higher		
OFF voltage/OFF current		6V or lower/1.7mA or lower		
Input resistance		Approx. 3.3 kΩ		
Response time	OFF → ON	10 msec. or lower		
	ON → OFF	10 msec. or lower		
Common method		32 points/ common		
Input form		Sink/source loading shared type		
Number of stations occupied		1 station		
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)		
	Current	70 mA or lower (when TYP. 24VDC)		
Noise durability		DC type's noise voltage 500V _{P-P} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.		
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1 minute		
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester		
Weight		270 g (0.6lb)		
External wiring system		40 pin connector (I/O area), 7-point terminal block (M3.5 screw, transmission and module power supply)		
Applicable wire size		0.3 mm ² (I/O area), 0.75 to 2 mm ² (transmission and module power supply)		

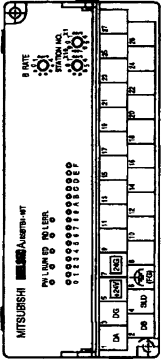
External connection

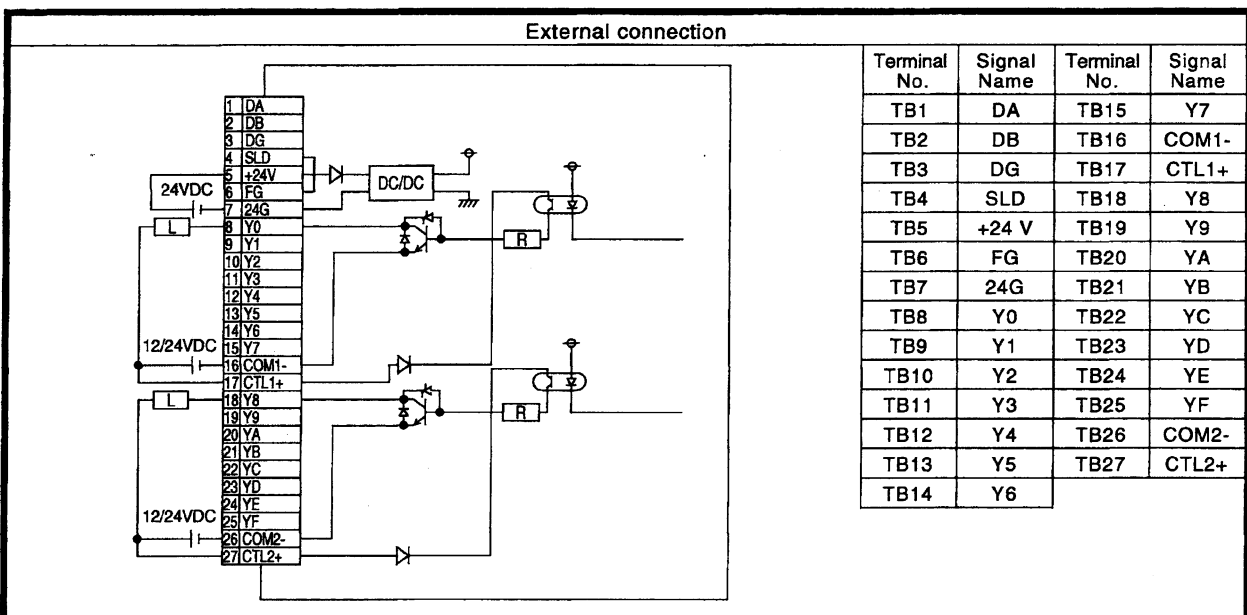


5 Output Module Specification

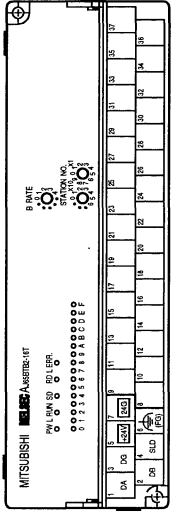
The specification for the output module that can be connected to the CC-Link is described.

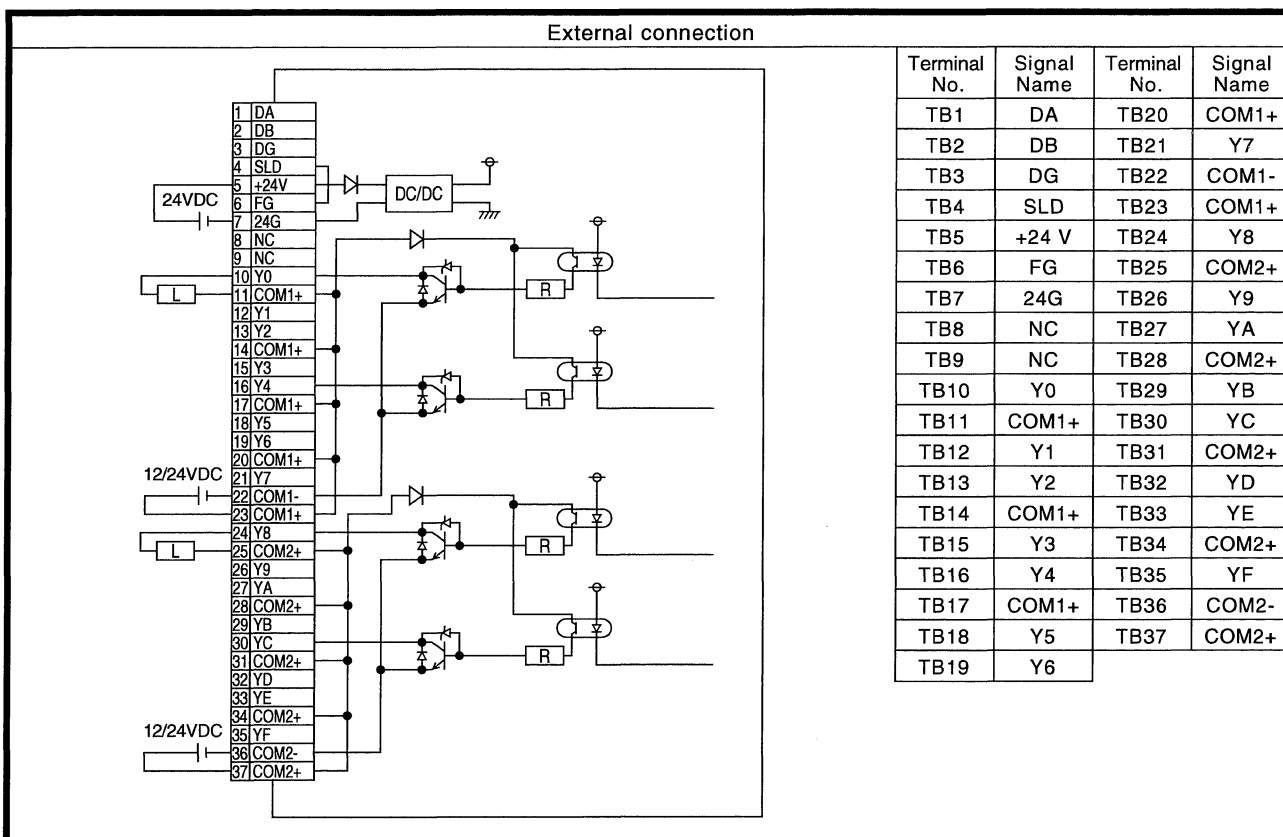
5.1 AJ65BTB1-16T Output Module

Model		Transistor output module	Appearance
Specification		AJ65BTB1-16T	
Number of output points		16 points	
Isolation method		Photocoupler	
Rated load voltage		12/24VDC	
Operating load voltage range		10.2 to 28.8 VDC (ripple rate within 5%)	
Max. load current		0.5A/point, 4A/ common (Ta=45°C) 2.8A/1 common (Ta=55°C)	
Max. inrush current		4A 10msec or lower	
Leakage current at OFF		0.1mA or lower	
Max. voltage drop at ON		0.9V or lower (TYP) 0.5A, 1.5V or lower (MAX) 0.5A	
Output form		Sink type	
Response time	OFF → ON	2 msec or lower	
	ON → OFF	2 msec or lower (Resistive load)	
External power supply for output	Voltage	10.2 to 28.8VDC (ripple rate within 5%)	
	Current	100 mA or lower (TYP. 24VDC/ common), Not including external load current.	
Surge suppression		Zener diode	
Common method		8 point/ common (1-wire terminal block)	
Number of stations occupied		1 station	
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)	
	Current	80 mA or lower (at TYP. 24VDC)	
Noise durability		DC type's noise voltage 500V _{p-p} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.	
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1minute	
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester	
Weight		340 g (0.7lb)	
External wiring system		27-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal	
Applicable wire size		0.75 to 2 mm ²	
Applicable solderless terminal		RAV 1.25 to 3.5 (JIS C 2805 conforming) RAV 2 to 3.5	

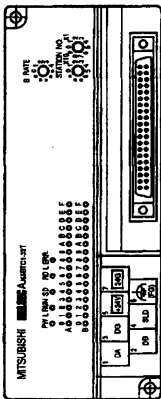


5.2 AJ65BTB2-16T Output Module

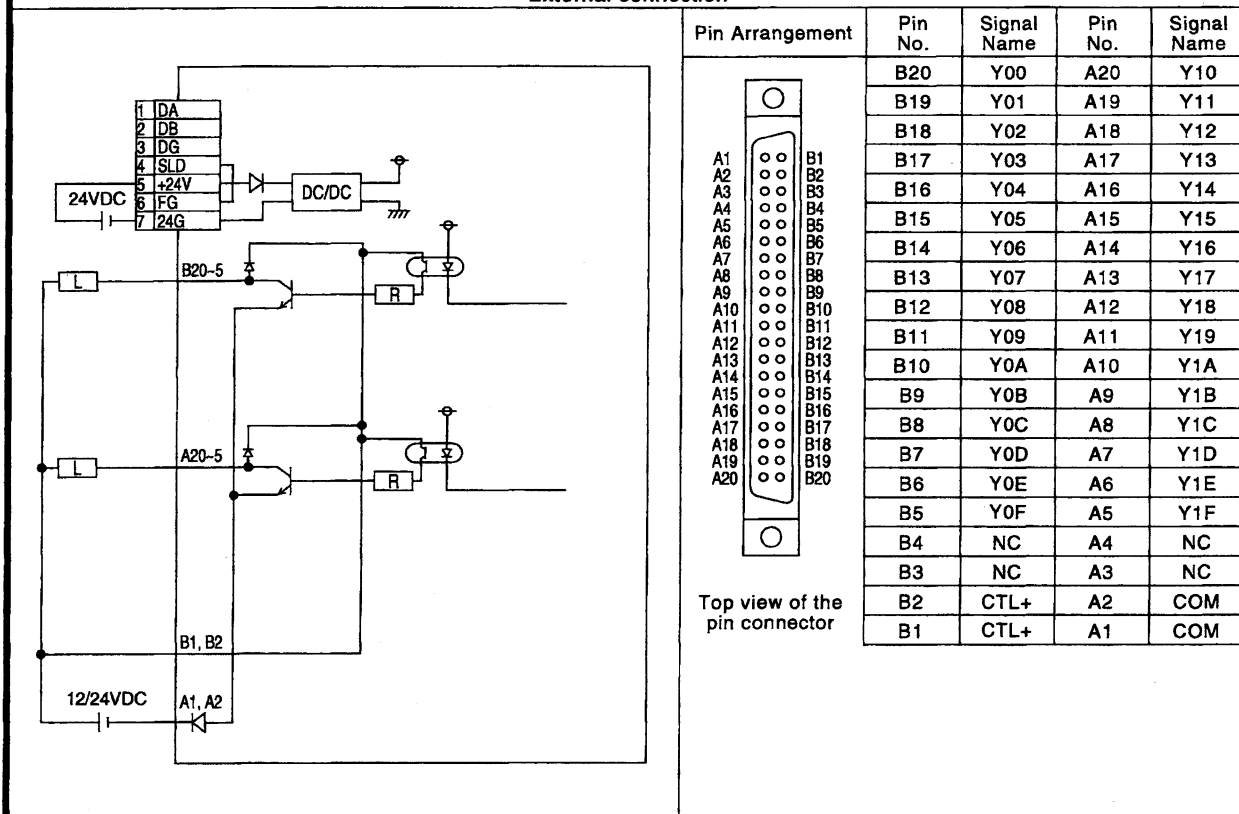
Model		Transistor output module	Appearance
Specification		AJ65BTB2-16T	
Number of output points		16 points	
Isolation method		Photocoupler	
Rated load voltage		12/24VDC	
Operating load voltage range		10.2 to 28.8 VDC (ripple rate within 5%)	
Max. load current		0.5A/ point 4A/ common	
Max. inrush current		4A 10msec or lower	
Leakage current at OFF		0.1mA or lower	
Max. voltage drop at ON		0.9V or lower (TYP) 0.5A, 1.5V or lower (MAX) 0.5A	
Output form		Sink type	
Response time	OFF → ON	2 msec or lower	
	ON → OFF	2 msec or lower (Resistive load)	
External power supply for output	Voltage	10.2 to 28.8VDC (ripple rate within 5%)	
	Current	100 mA or lower (TYP. 24VDC/ common), Not including external load current.	
Surge suppression		Zener diode	
Common method		8 point/ common (2-wire terminal block)	
Occupied station number		1 station	
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)	
	Current	80 mA (at TYP. 24VDC)	
Noise durability		DC type's noise voltage 500V _{P-P} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.	
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1minute	
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester	
Weight		410 g (0.9lb)	
External wiring system		37-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal	
Applicable wire size		0.75 to 2 mm ²	
Applicable solderless terminal		RAV 1.25 to 3.5 (JIS C 2805 conforming) RAV 2 to 3.5	



5.3 AJ65BTC1-32T Output Module

Model		Transistor output module	Appearance
Specification		AJ65BTC1-32T	
Number of output points		32 points	
Isolation method		Photocoupler	
Rated load voltage		12/24VDC	
Operating load voltage range		10.2 to 28.8 VDC (ripple rate within 5%)	
Max. load current		0.1A/1 point, 2A/1 common	
Max. inrush current		0.4A, 10msec or lower	
Leakage current at OFF		0.1mA or lower	
Max. voltage drop at ON		2.5V or lower (MAX) 0.1A	
Output type		Sink type	
Response time	OFF → ON	2 msec or lower	
	ON → OFF	2 msec or lower (Resistive load)	
External power supply for output	Voltage	10.2 to 28.8VDC (ripple rate within 5%)	
	Current	50 mA or lower (TYP. 24VDC/ common), Not including external load current.	
Surge suppression		Clamp diode	
Common method		32 points/ common	
Number of stations occupied		1 station	
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5%)	
	Current	115 mA or lower (at TYP. 24VDC)	
Noise durability		DC type's noise voltage 500Vp-p According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.	
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1minute	
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester	
Weight		280 g (0.6lb)	
External wiring system		40 pin connector (I/O area), 7-point terminal block (M3.5 screws), transmission circuit and module power supply	
Applicable wire size		0.3 mm ² (I/O area) 0.75 to 2 mm ² (transmission and module power supply)	

External connection



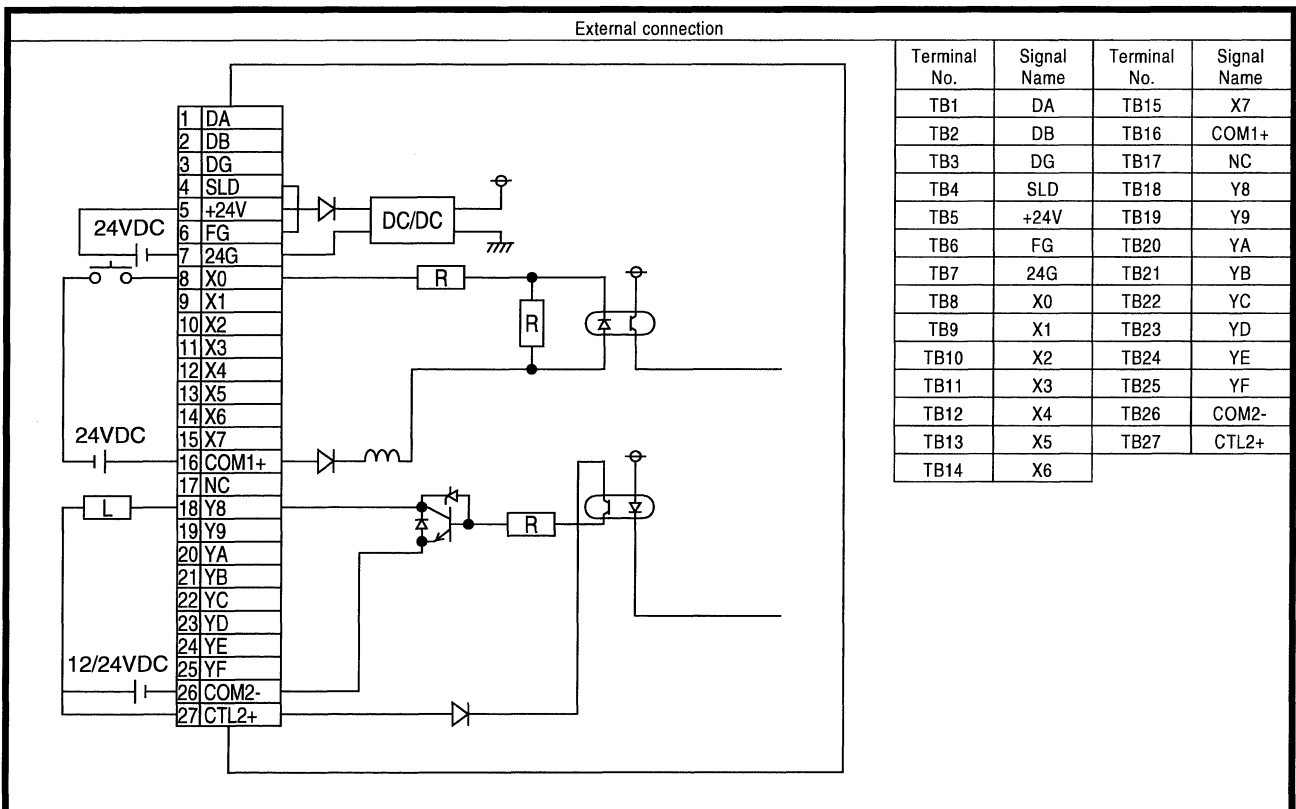
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6 Composite Module Specification

The specification for the composite module that can be connected to the CC-Link is described.

6.1 AJ65BTB1-16 DT Composite Module

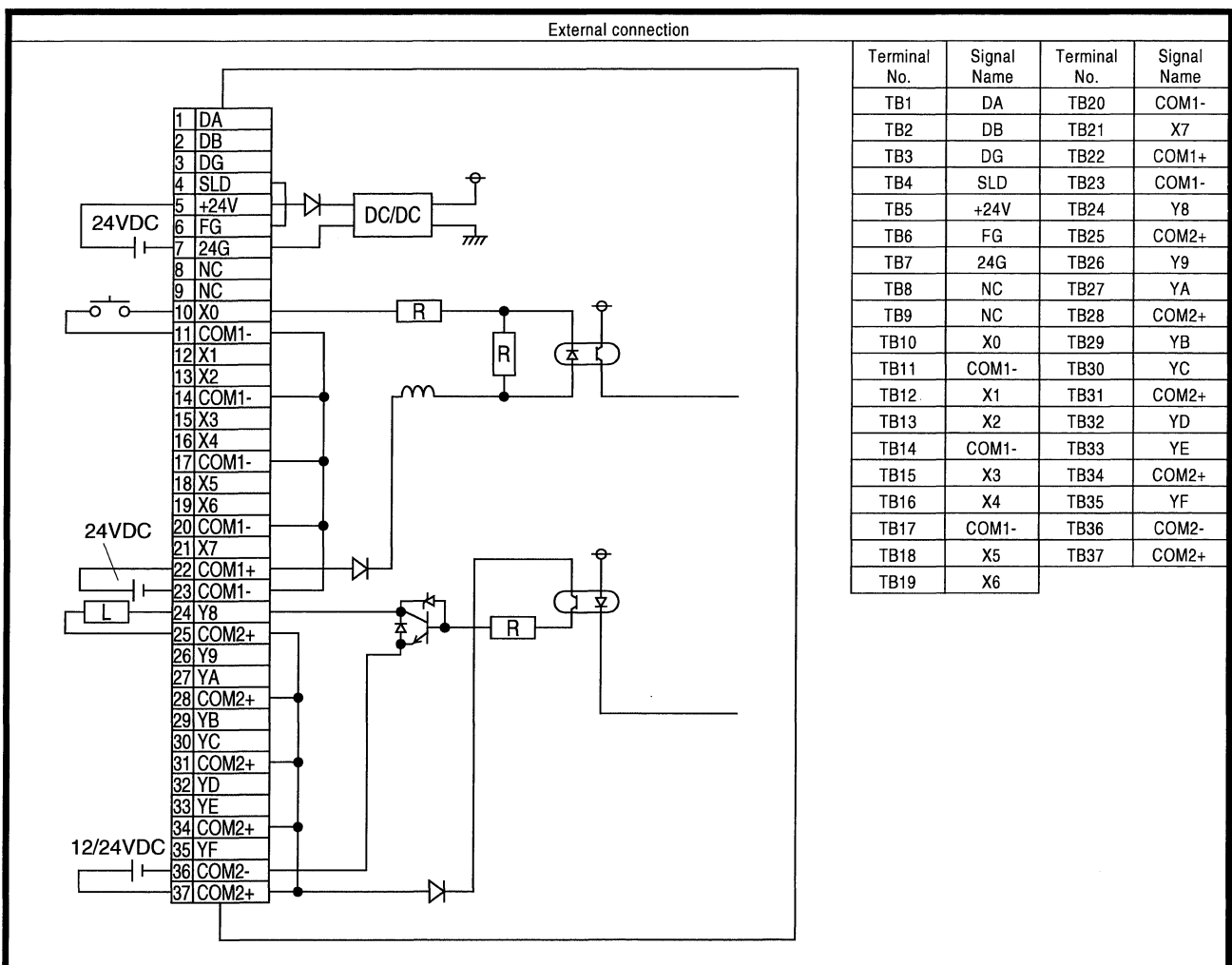
Model		DC input transistor output composite module				Appearance
Specification		AJ65BTB1-16DT				
Input specification		Output specification				
Number of input points	8 points	Number of output points	8 points			
Isolation method	Photocoupler	Isolation method	Photocoupler			
Rated input voltage	24VDC	Rated load voltage	12/24VDC			
Rated input current	Approx. 7 mA	Operating load voltage range	10.2 to 28.8VDC (ripple rate within 5%)			
Operating voltage range	19.2 to 28.8VDC (ripple rate within 5%)	Max. load current	0.5A/ point, 4A/ common			
Max. simultaneous on input points	100 %	Max. inrush current	4A 10 msec or lower			
ON voltage/ON current	14V or higher/3.5 mA or higher	Leakage current at OFF	0.1 mA or lower			
OFF voltage/OFF current	6V or lower/1.7 mA or lower	Max. voltage drop at ON	0.9VDC or lower (TYP) 0.5A, 1.5VDC or lower (TYP) 0.5A			
Input resistance		Approx. 3.3kΩ		Output form		
Response time	OFF → ON	10 msec or lower		Sink type		
	ON → OFF	10 msec or lower		Response time		
Input form	Sink type		OFF → ON		2 msec or lower	
	8 points/ common		ON → OFF		2 msec or lower (Resistive load)	
Common method	8 points/ common		Voltage		10.2 to 28.8VDC (ripple rate within 5%)	
			Current		50 mA or lower (TYP. 24VDC/ common), Not including external load current	
		Surge suppression		Zener diode		
		Common method		8 points/ common		
Number of stations occupied		1 station				
I/O module power supply for output	Voltage	15.6 to 28.8VDC (ripple rate within 5 %)				
	Current	70 mA or lower (at TYP. 24VDC)				
Noise durability		DC type's noise voltage 500V _{p-p} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.				
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1 minute				
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester				
Weight		330 g (0.7lb)				
External wiring system		27-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal				
Applicable wire size		0.75 to 2 mm ²				
Applicable solderless terminal		RAV 1.25 to 3.5 RAV2 to 3.5 (JIS C 2805 conforming)				



6.2 AJ65BTB2-16DT Composite Module

Model		DC input transistor output composite module				Appearance
Specification		AJ65BTB2-16DT				
Input specification		Output specification				
Number of input points		8 points		Number of output points		8 points
Isolation method		Photocoupler		Isolation method		Photocoupler
Rated input voltage		24VDC		Rated load voltage		12/24VDC
Rated input current		Approx. 7 mA		Operating load voltage range		10.2 to 28.8VDC (ripple rate within 5%)
Operating voltage range		19.2 to 28.8VDC (ripple rate within 5%)		Max. load current		0.5A/ point, 4A/ common
Max. simultaneous on input points		100 %		Max. inrush current		4A 10 msec or lower
ON voltage/ON current		14V or higher/3.5 mA or higher		Leakage current at OFF		0.1 mA or lower
OFF voltage/OFF current		6V or lower/1.7 mA or lower		Max. voltage during at ON		0.9VDC or lower (TYP) 0.5A, 1.5VDC or lower (TYP) 0.5A
Input resistance		Approx. 3.3kΩ		Output form		Sink type
Response time	OFF → ON	10 msec or lower		Response time	OFF → ON	2 msec or lower
	ON → OFF	10 msec or lower			ON → OFF	2 msec or lower (Resistor load)
Input form		Sink type		External power supply for output	Voltage	10.2 to 28.8VDC (ripple rate within 5%)
Common method		8 points/ common			Current	50 mA or lower (TYP. 24VDC/ common), Not including external load current
				Surge suppression		Zener diode
				Common method		8 points/ common
Number of stations occupied		1 station				
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5 %)				
	Current	70 mA or lower (at TYP. 24VDC)				
Noise durability		DC type's noise voltage 500V _{p-p} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.				
Dielectric withstand voltage		DC external terminal batch 500VAC between grounding, 1 minute				
Insulation resistor		DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester				
Weight		410 g (0.9lb)				
External wiring system		37-point terminal block (M3.5 screw) including transmission circuit and module power supply terminal				
Applicable wire size		0.75 to 2 mm ²				
Applicable solderless terminal		RAV 1.25 to 3.5 RAV2 to 3.5 (JIS C 2805 conforming)				

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6.3 AJ65BTB2-16DR Composite Module

Model		DC input transistor output composite module			Appearance
Specification		AJ65BTB2-16DR			
Input specification		Output specification			
Number of input points	8 points	Number of output points	8 points		
Isolation method	Photocoupler	Isolation method	Photocoupler		
Rated input voltage	24VDC	Rated switching voltage/ current	24VDC (Resistor load) 2A/1 point 240VAC (COSφ=1) 8A/1 common		
Rated input current	Approx. 7 mA	Min. switching load	5VDC 1mA		
Operating voltage range	19.2 to 28.8VDC (ripple rate within 5%)	Max. switching voltage	250VAC 110VDC		
Max. simultaneous on input points	100 %	Response time	OFF → ON	10 msec or lower	
ON voltage/ON current	14V or higher/3.5 mA or higher	ON → OFF	12 msec or lower		
OFF voltage/OFF current	6V or lower/1.7 mA or lower	Service life	Mechanical	20 million times or higher	
Input resistance	Approx. 3.3kΩ		Electrical	Rated switching voltage/current loads more than 100,000 times 200VAC 1.5A, 240VAC 1A (COSφ=0.7): more than 100,000 times 200VAC 1A, 240VAC 5A (COSφ=0.35): more than 100,000 times 200VAC 1A, 100VAC 0.1A (L/R=7 msec.): more than 100,000 times	
Response time	OFF → ON				
	ON → OFF				
Input form	Sink/source loading shared type				
Common method	8 points/ common				
		Max. switching frequency	3600 times/hour		
		External power supply for output	Voltage	24VDC ±10% (ripple rate 4V p-p or lower)	
			Current	45 mA or lower (TYP. 24VDC all points ON)	
		Surge suppression	None		
		Common method	8 points/ common		
Number of stations occupied		1 station			
I/O module power supply	Voltage	15.6 to 28.8VDC (ripple rate within 5 %)			
	Current	70 mA or lower (at TYP. 24VDC)			
Noise durability		AC type's noise voltage 1500V _{P-P} , DC type's noise voltage 500V _{P-P} According to the noise simulator of noise frequency 25 to 60Hz, noise width 1μs.			
Dielectric withstand voltage		AC external terminal batch 1500VAC between grounding, 1 minute DC external terminal batch 500VAC between grounding, 1 minute			
Insulation resistor		AC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester DC external terminal batch 500VDC between grounding, 10MΩ or more indication on the insulation resistance tester			
Weight		430 g (0.9lb)			
External wiring system		37 point terminal block (M3.5 screw) including transmission circuit and module power-supply terminal			
Applicable wire size		0.75 to 2 mm ²			
Applicable solderless terminal		RAV 1.25 to 3.5 RAV2 to 3.5 (JIS C 2805 conforming)			

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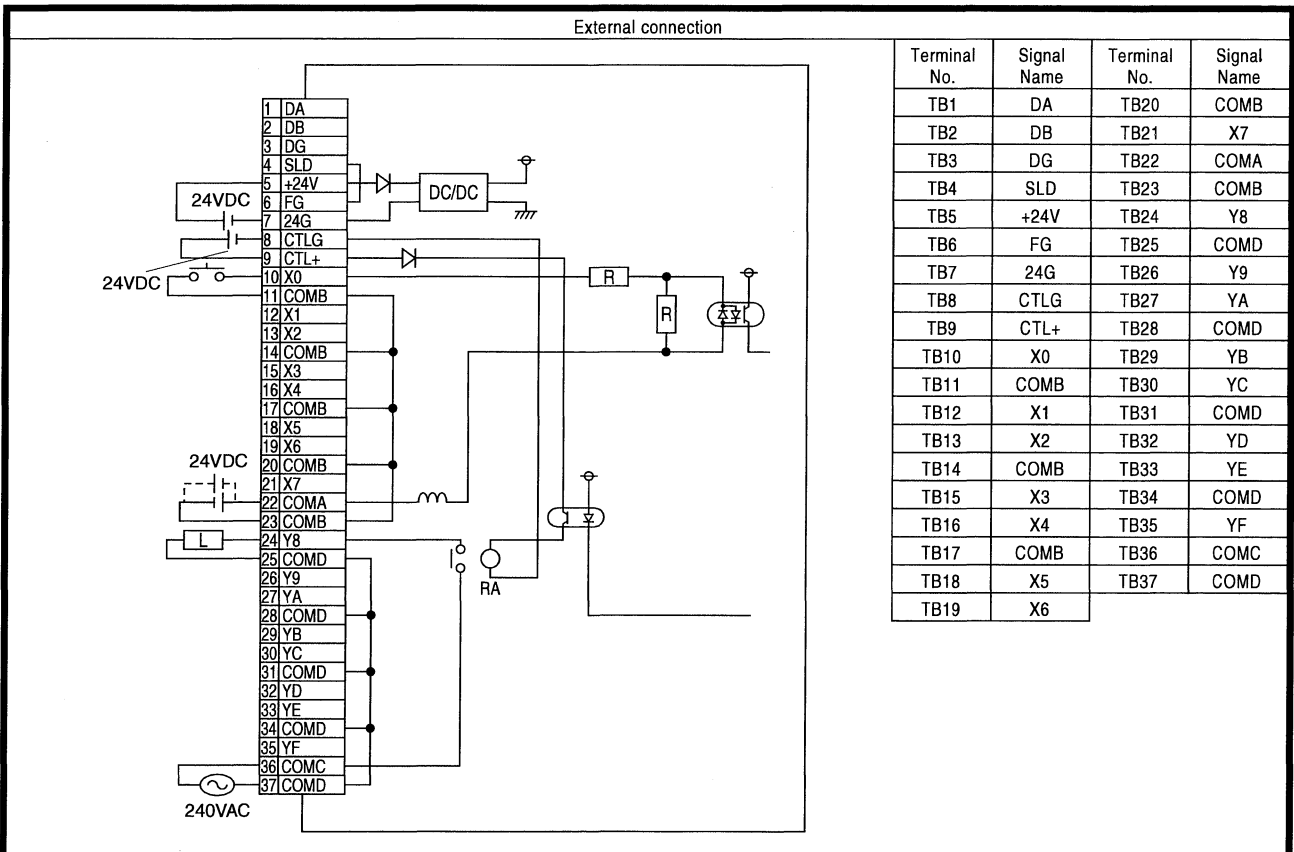
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7 Handling the Remote I/O Module

7.1 Precautions When Handling and Installing Remote I/O Module

This section lists the precautions for handling and installing the CC-Link remote I/O module.



WARNING

- Do not touch any terminal or connector while power is on.
Doing so will cause electric shock.



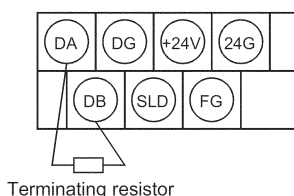
CAUTION

- 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 disassemble or modify the module.
Doing so may cause failure, malfunction, injury, or a fire.
- Do not directly touch any conductive part of the module.
Doing so can cause malfunction or failure of the module.
- Do not drop or apply any strong shock to the module. Doing so may damage the module.
- 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, fire, or malfunction.
Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disposing of this product, treat it as industrial waste.
- Use the module 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.
- 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.
- Shut off the external power supply (all phases) used in the system before mounting or removing a module to/from a control panel.
Failure to do so may cause the module to fail or malfunction.

- (1) Tighten the module mounting screw or terminal block screw within the following torque range.

Screw	Tightening torque range
Module mounting screw (M4)	0.78 to 1.18N·m
Terminal block screw (M3.5)	0.68 to 0.92N·m
Terminal block installation screw (M4)	0.78 to 1.18N·m
Connector screw (M2.6)	0.20 to 0.29N·m

- (2) Observe the following points when installing a module to a control panel using a DIN rail.
 - (a) Applicable DIN rail (compliant with IEC 60715)
TH35-7.5Fe
TH35-7.5Al
TH35-15Fe
 - (b) Mounting pitch
When installing a DIN rail to a control panel, keep mounting pitches 200mm (7.87 inches) or less.
- (3) For the types, specifications, and manufacturers of cables applicable to the remote I/O module, refer to the user's manual for the CC-Link system master module used.
- (4) Do not install the compact remote I/O module to the place where:
 - (a) an ambient temperature is outside the range of 0 to 55°C (0 to 45°C for the waterproof remote I/O module),
 - (b) ambient humidity is outside the range of 10 to 90%RH,
 - (c) condensation occurs due to a sudden temperature change,
 - (d) corrosive gas or combustible gas is present,
 - (e) conductive powder (such as dust and iron powder), oil mist, salinity, or organic solvent is filled,
 - (f) the module is exposed to direct sunlight,
 - (g) a strong electric field or strong magnetic field is generated, and
 - (h) the module is subject to vibration or shock.
- (5) When installing the remote I/O module into a panel, etc., provide 80mm (3.15 inches) or more of space between the top and bottom of the module and other structures or parts so that good ventilation and ease of operation when exchanging modules can be secured.
- (6) Install the remote I/O module on a level surface.
If the surface is uneven, unnecessary force is applied to the printed circuit board, causing malfunction.
- (7) Connect a terminating resistor as shown below to the remote I/O module connected as the last station. (Terminating resistors are provided with a master module.)



7.2 Connection Method

This section describes how to connect the remote I/O module to the master module or local module using twisted cables.

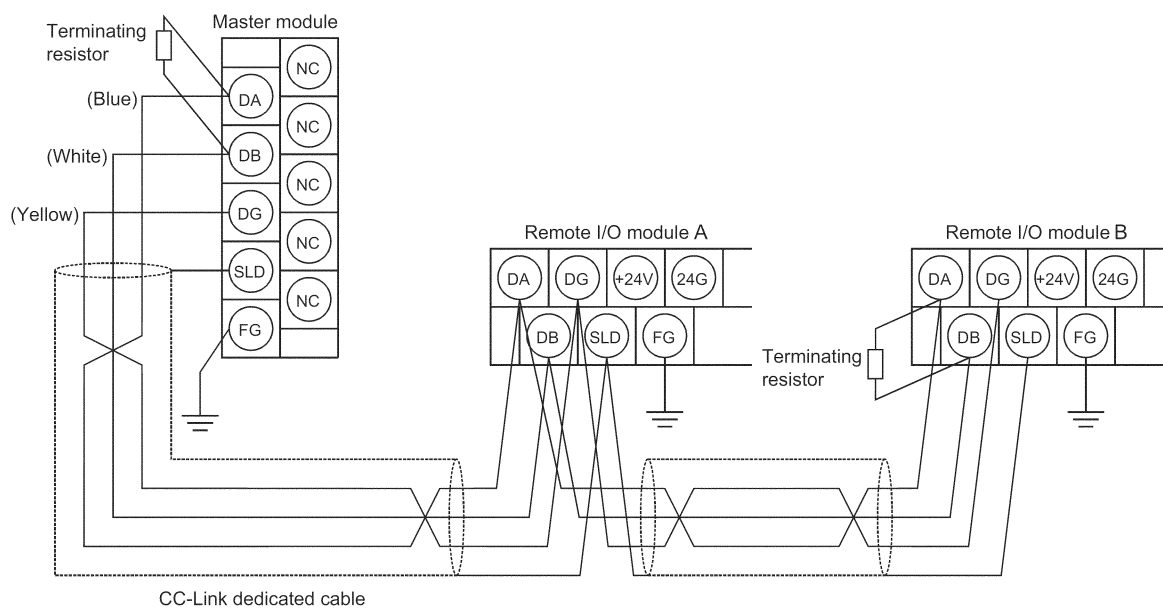
WARNING

- Shut off the external power supply (all phases) used in the system before wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal block screws or module mounting screws. Failure to do so may cause the module to fail or malfunction.

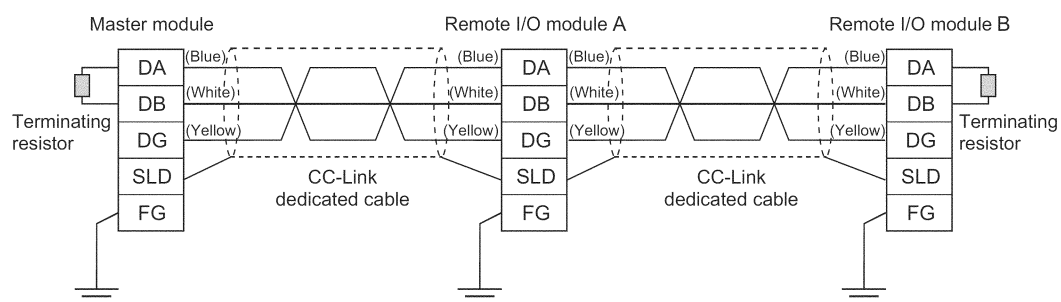
CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.
Keep a distance of 100mm (3.9 inches) or more between them.
Failure to do so may result in malfunction due to noise.
- Ground the FG terminal to the protective ground conductor dedicated to the programmable controller.
Failure to do so may result in electric shock or malfunction.
- Tighten any unused terminal screws within the specified torque range (0.42 to 0.50N·m).
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 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 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.
- Securely connect the cable connectors.
Poor contact may cause malfunction.
- 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.
For the cable with connector, hold the connector part of the cable.
For the cable without connector, loosen the screw first and remove it.
Pulling the cable connected to the module may result in malfunction or damage to the module or cable.

The following figure shows how to connect remote I/O modules to a master module.



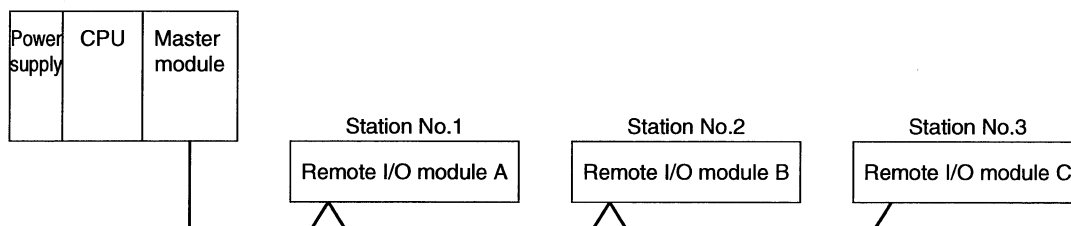
[Simplified diagram]



8 Troubleshooting

8.1 Confirming Errors on the LED Display

The causes of errors and necessary corrective actions that can be determined from the LED status on the remote I/O module are shown in the following table, when the system configuration is assumed as shown in the figure below and the master module's SW, M/S, PRM LEDs are turned off (that is, the master module is set normally).



Master module		LED status						Cause	Corrective action				
		Remote I/O module											
		A		B		C							
TIME LINE or TIME LINE	○	PW ●	L RUN ●	SD ●	RD ●	L ERR. ○	PW ●	L RUN ●	SD ●	RD ●	L ERR. ○	Normal	—
	○	PW ○	L RUN ○	SD ○	RD ○	L ERR. ○	PW ●	L RUN ●	SD ●	RD ●	L ERR. ○	All LEDs on remote I/O module A are turned off, indicating that the 24V power is not supplied or the voltage is insufficient.	Check the voltage of the 24V power, then supply correct power to the remote I/O module.
	○	PW *	L RUN *	SD *	RD *	L ERR. *	PW ●	L RUN ●	SD ●	RD ●	L ERR. ○	Remote I/O module A is defective and LEDs have been unstable. (In most cases, all LEDs are turned off.)	Replace the remote I/O module.
	●	PW ●	L RUN ●	SD ●	RD ●	L ERR. ○	PW ●	L RUN ○	SD *	RD *	L ERR. ○	L RUNs on and after remote I/O module B are turned off, indicating that the transmission cable between remote I/O modules A and B is disconnected or has come off from terminal block.	Find out the disconnected position by referring to the LED status, then repair it.
	○	PW ●	L RUN ○	SD *	RD *	L ERR. ○	PW ●	L RUN ○	SD *	RD *	L ERR. ○	A short-circuit has occurred in the transmission cable.	Find out the shorted cable in the three transmission cables, then repair it.
	○	PW ●	L RUN ○	SD *	RD *	L ERR. *	PW ●	L RUN ○	SD *	RD *	L ERR. *	The transmission cable is miswired.	Check the connection for the I/O module on the terminal block and correct the miswiring.

● :LED on, ○:LED off, ◎:Flashing, *:On, off or flashing

LED status				Cause	Corrective action
Master module	Remote I/O module				
	A	B	C		
TIME LINE or TIME LINE	PW ● L RUN ○ SD ERR.* RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ○ SD * RD ● L ERR. ○	L RUNs on remote I/O module A and C are turned off, indicating that duplicate station number is set for A and C.	Correct the duplicated station number and restart the power.
	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ○ SD ○ RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ○	L RUN and SD on remote I/O module B are turned off, indicating that transmission speed of module B is incorrect within the setting range (0 to 4).	Set the transmission speed correctly and restart the power of the remote I/O module.
	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ◎	L ERR on remote I/O module C is flashing, indicating that the setting switch of module C was changed during normal operation.	Return the remote I/O module's setting switch to its original position.
	PW ● L RUN ○ SD ○ RD ● L ERR. ●	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ○	L RUN and SD on remote I/O module A are turned off and the L ERR is on, indicating that the setting switch of module B is set outside the setting range (transmission speed: 5 to 9, station number: 65 or larger).	Restart the power after correcting the setting switch of the remote I/O module.
TIME LINE or TIME LINE	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ●	PW ● L RUN ● SD ● RD ● L ERR. ○	L ERR on remote I/O module B is turned on, indicating that module B is affected by noise. (L RUN may be turned off.)	Securely perform grounding of FG for each remote I/O module and master module.
	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ●	PW ● L RUN ● SD ● RD ● L ERR. ●	L ERRs on and after remote I/O module B are turned on, indicating that the transmission cable between modules A and B is affected by noise. (L RUN may be turned off.)	Check the SLD connection of the transmission cable. Arrange the cable apart from the power line as much as possible. (100 mm or more)
	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ○	PW ● L RUN ● SD ● RD ● L ERR. ●	Terminal resistor has not been attached. (L RUN may be turned off.)	Check if a terminal resistor is attached.

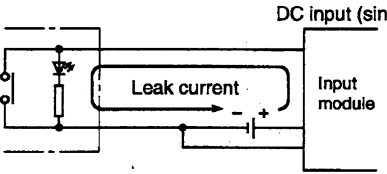
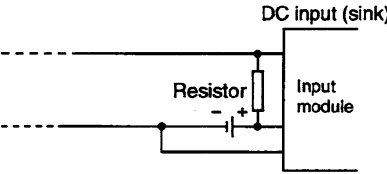
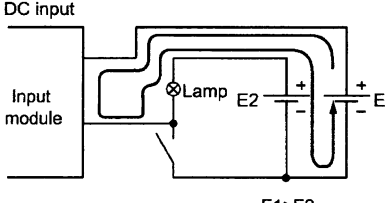
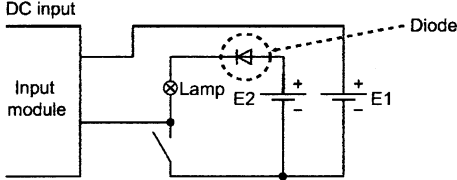
● :LED on, ○:LED off, ◎ :Flashing, *:On, off or flashing

8.2 Examples of the Remote I/O Module Troubles

Examples of troubles with the I/O circuit troubles and the solutions are described below.

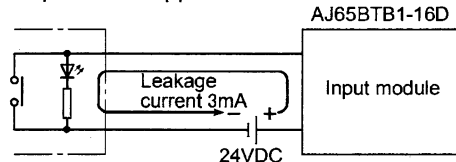
8.2.1 Input circuit troubles and solutions

The input circuit trouble examples and solutions are described.

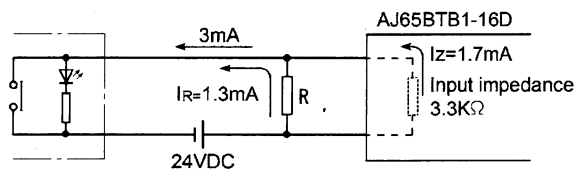
	Condition	Cause	Solution
Example 1	Input signal does not turn OFF.	Drive with LED display switch 	- Connect the appropriate resistors as shown below to have the voltage between the input terminal and COM 1 above the OFF voltage.  - The calculation example of the resistor value to be connected is shown on the next page.
Example 2	Input signal does not turn OFF.	Revolving path due to the use of two power supplies 	- Reduce the number of power supplies from two to one. - Connect the revolving-path prevention diode. (See diagram below.) 

<Sample calculation for Example 1>

When a switch with LED indicator, giving leakage current of 3mA at maximum when 24VDC power is supplied to the AJ65BTB1-16D



- (1) 1.7mA or less OFF current of the AJ65BTB1-16D is not satisfied. Hence, connect a resistor as shown below.



- (2) Calculate the resistance value R as shown below.

To satisfy 1.7mA or less OFF current of the AJ65BTB1-16D, connect a resistor which flows 1.3mA or more.

$I_R: I_Z = Z$ (Input impedance): R

$$R \leq \frac{I_Z}{I_R} \times Z \text{ (Input impedance)} = \frac{1.7}{1.3} \times 3.3 = 4.31 [\text{k}\Omega]$$

Supposing that the resistance R is 3.9kΩ, the power capacity W of resistor R is:

$$W = (\text{Input voltage})^2 \div R = 28.8^2 \div 3900 = 0.213 (\text{W})$$

(3) Connect a resistor of 3.9 (kΩ) and 1 to 2 (W) to a terminal which may cause an error, since the power capacity of a resistor is selected so that it will be 3 to 5 times greater than the actual power consumption.

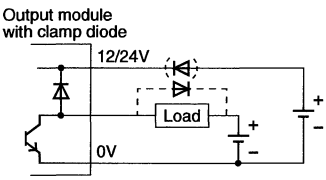
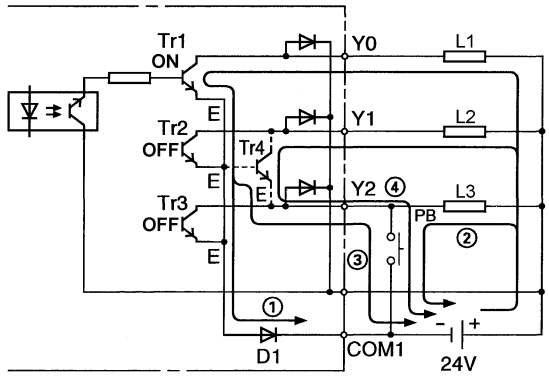
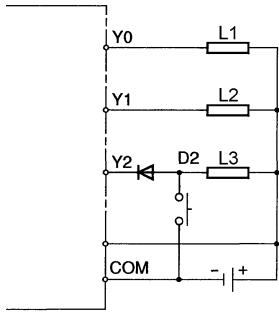
(4) Also, OFF voltage when resistor R is connected will be as follows.

$$\frac{1}{\frac{1}{3.9[\text{k}\Omega]} + \frac{1}{3.3[\text{k}\Omega]}} \times 3[\text{mA}] = 5.36[\text{V}]$$

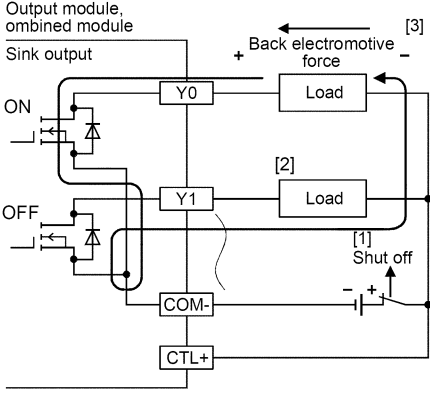
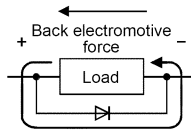
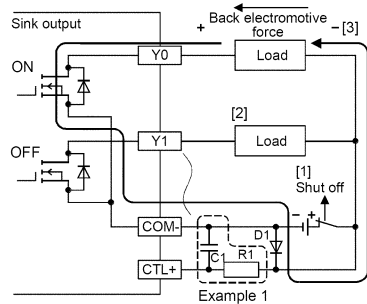
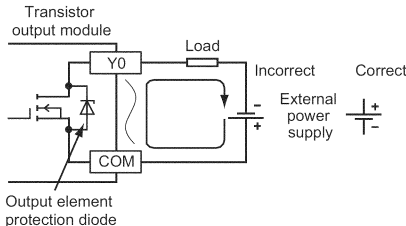
This satisfies 6V or less OFF voltage of AJ65BTB1-16D.

8.2.2 Output circuit troubles and solutions

Trouble examples and the solutions of the output circuit are described below.

	Condition	Cause	Solution
Example 1	Load does not turn OFF. (for direct flow)	Revolving path due to the use of two power supplies  Revolving path occurs when E1 < E2.	- Reduce the number of power supplies from two to one. - Connect revolving-path prevention diode. (If the load is relay, etc., a free wheel diode must be connected to the load.) (Dotted line on the diagram on the left.)
Example 2	When using the external switch with parallel connection between output and common, the voltage between COM1 and Y1 will not have load voltage of 24V even though the output (Y1) without the external switch connection is OFF. The voltage then declines to 0 to 24V. The output decline problem occurs especially when the L2 load is light from the LED lamp and photo coupler (load current is a few mA).	Incorrect output from parasitic transistor (Tr4)  Y2 can turn on the L3 load from both PC and PB. When PB is on, Y0 is on by PC and Y1 is off: (1) L1 (current ①) and L3 (current ②) are turned on. (2) Each emitter E for Tr 1 through 3 has diode D1 connected between COM1, and potential difference occurs against COM1. (3) Transistors AJ65BTC1-32T, etc. has parasitic transistor (Tr4). (4) The potential difference in (2) is supplied between Tr4 base (B) and emitter (E), so the base current flows as shown in ③. (Tr4 is turned on.) (5) The collector current ④ flows from (4), and the Y1 voltage declines to the range 0 to 24 V.	 Add a diode D2 equivalent to IF = 1A class to the output (Y2) connected to the external switch as shown above. (Prevent the current ③ and ④ shown in the left diagram.) However, the Y2 voltage decline during power-on increases by 0.6 to 1V, so check the L3 operation voltage.

Condition	Cause	Solution
Example 3 When the external power supply turns on, the load turns on for a moment.	Erroneous output due to the stray capacitance (C) between collector and emitter of photocoupler. (There is no erroneous output at normal road. An erroneous output may occur at high sensitivity load (such as solid state relay).) Output module, Combined module (1) If the external power supply is turned on precipitously, Ic current flows due to the stray capacitance (C) between collector and emitter of photocoupler (2) Ic current flows to the next stage of transistor Tr1 base and Y0 output turns on by 100 μs. SW: External power supply (24V) at On	When the external power supply turns ON/OFF, check that the external power supply rising edge must be 10ms or more, and switch the SW1 to the primary side of external power supply. When switching to the secondary side of the external power supply is required, the external power supply rising edge connected a condenser must be slow, and measured 10ms or more. R1: several tens of ohms Power capacity $\geq (\text{external power supply current}^{*1})^2 \times \text{resistance value} \times (3 \text{ to } 5)^{*2}$ C1: several hundred of micro farads 50mV *1 Refer to consumption current of the external power supply for modules used in this manual. *2 Select the power capacity of resistance to be 3 to 5 times larger than the actual power consumption. (Example) R1=40 Ω, C1=300 μF Use the below expression to calculated a time constant $C1 \times R1 = 300 \times 10^{-6} \times 40$$= 12 \times 10^{-3} \text{s}$$= 12 \text{ms}$

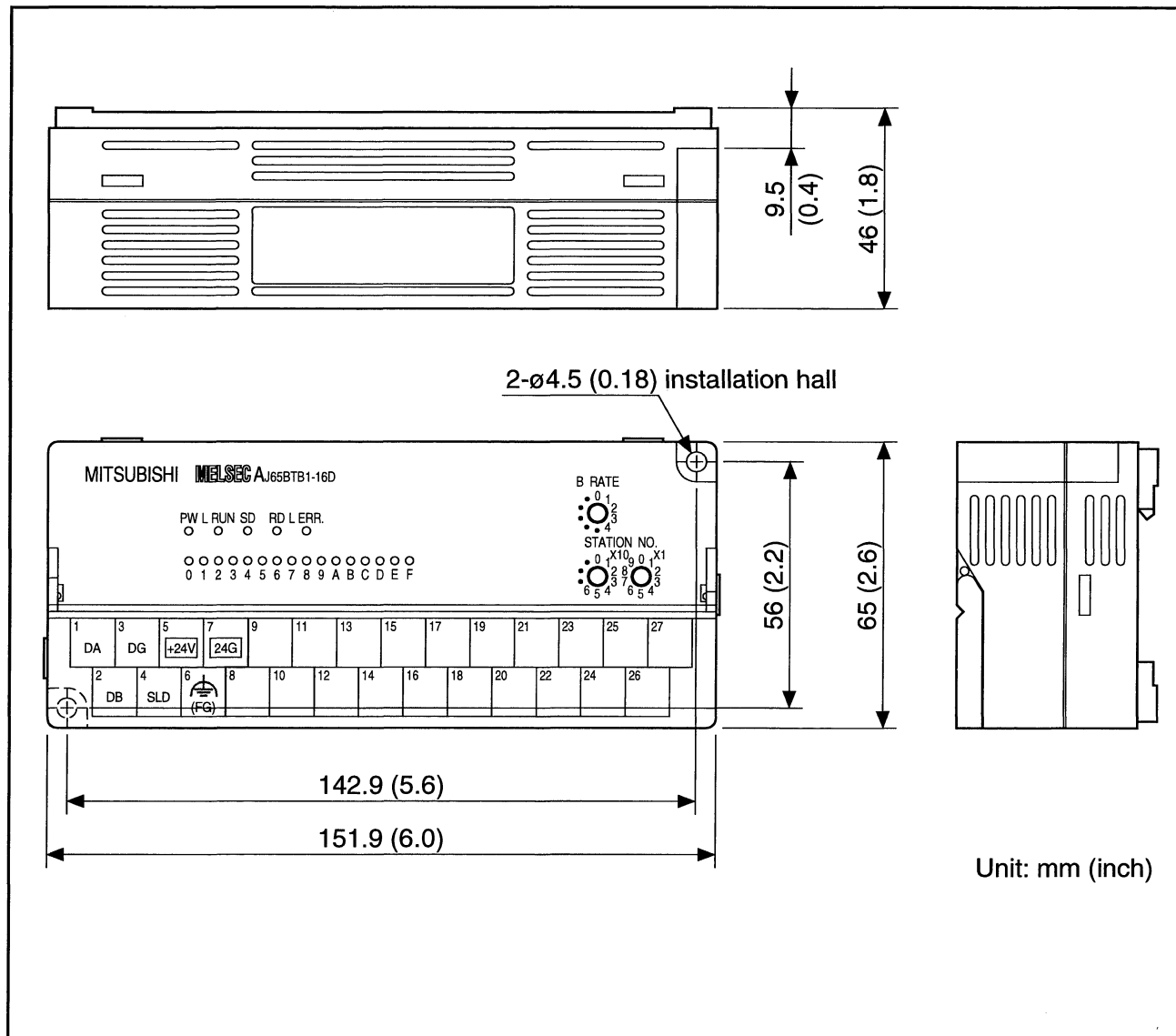
	Condition	Cause	Corrective action
Example 4	The load which was turned OFF is turned ON for a moment at power-off. (Transistor output)	The load [2] which was turned OFF may be turned ON due to back electromotive force at the time of power-off [1] if an inductive load is used. 	Take action in the following (1) or (2). (1) To prevent the generation of the back electromotive force, connect diode in parallel with load where the back electromotive force has been generated. Sink output [3]  (2) Install a diode between the positive and negative external power supply to allow an electric current to pass another current path. When the corrective action shown in the example 1 is taken simultaneously, the diode must be installed in parallel with the C1 and R1.  Example 1 D1: Reverse voltage VR (VRM)...*1, Forward current IF (IFM)...*2 *1 Approximately 10times higher than the rated voltage in the specifications Example: 24 VDC→Approximately 200V *2 More than twice as much as the maximum load current (common) in the specifications Example: 2A/1 common→4A or more
Example 5	The load operates due to powering on the external power supply. (Transistor output)	The polarity of the external power supply is connected in reverse.  When the polarity is connected in reverse, current may flow across an output element protection diode.	Connect the polarity correctly.

Appendix

Appendix 1 External Dimensions

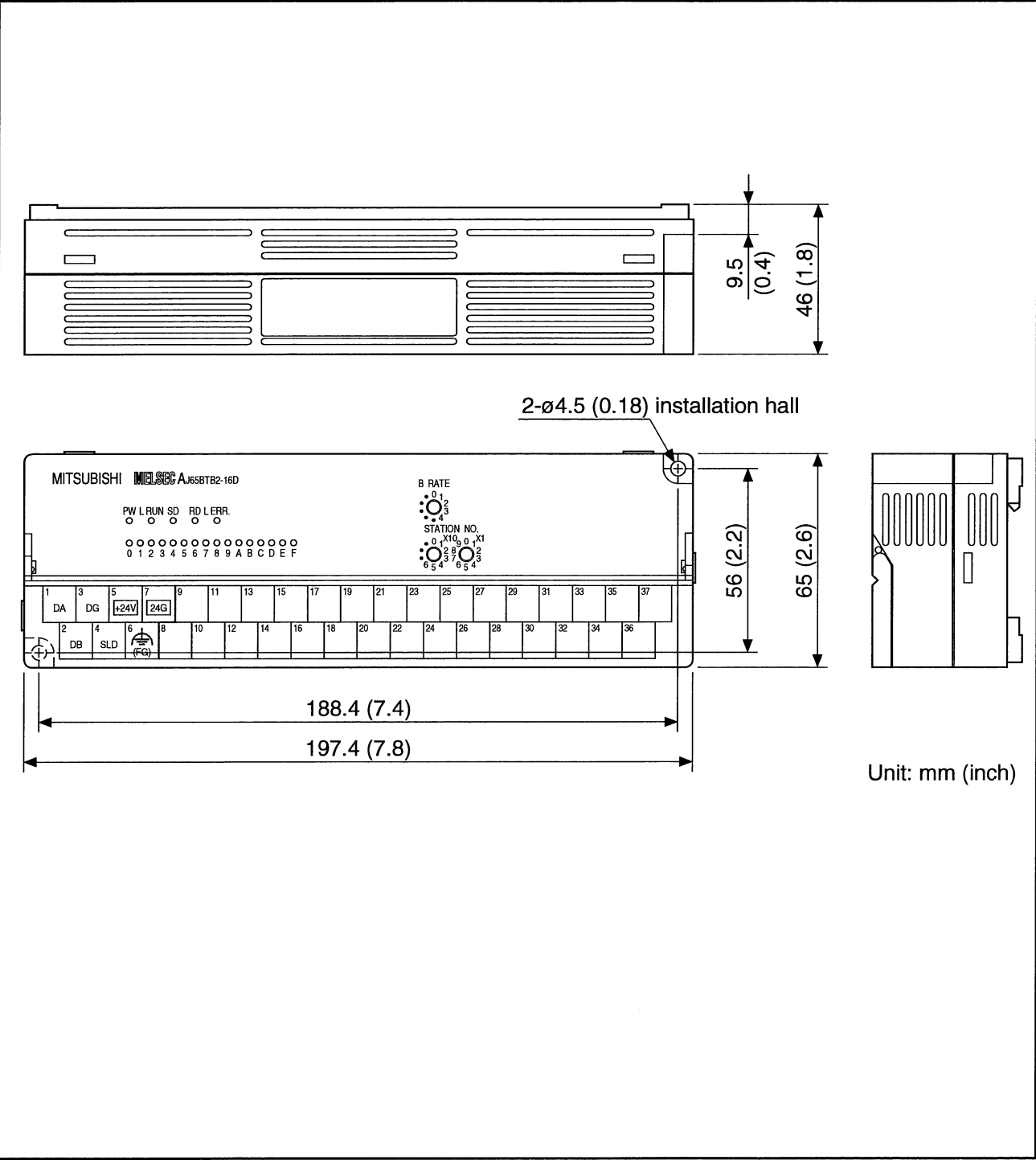
1.1 AJ65BTB1-16 □ module

The AJ65BTB1-16 □ module external dimensions are shown below.



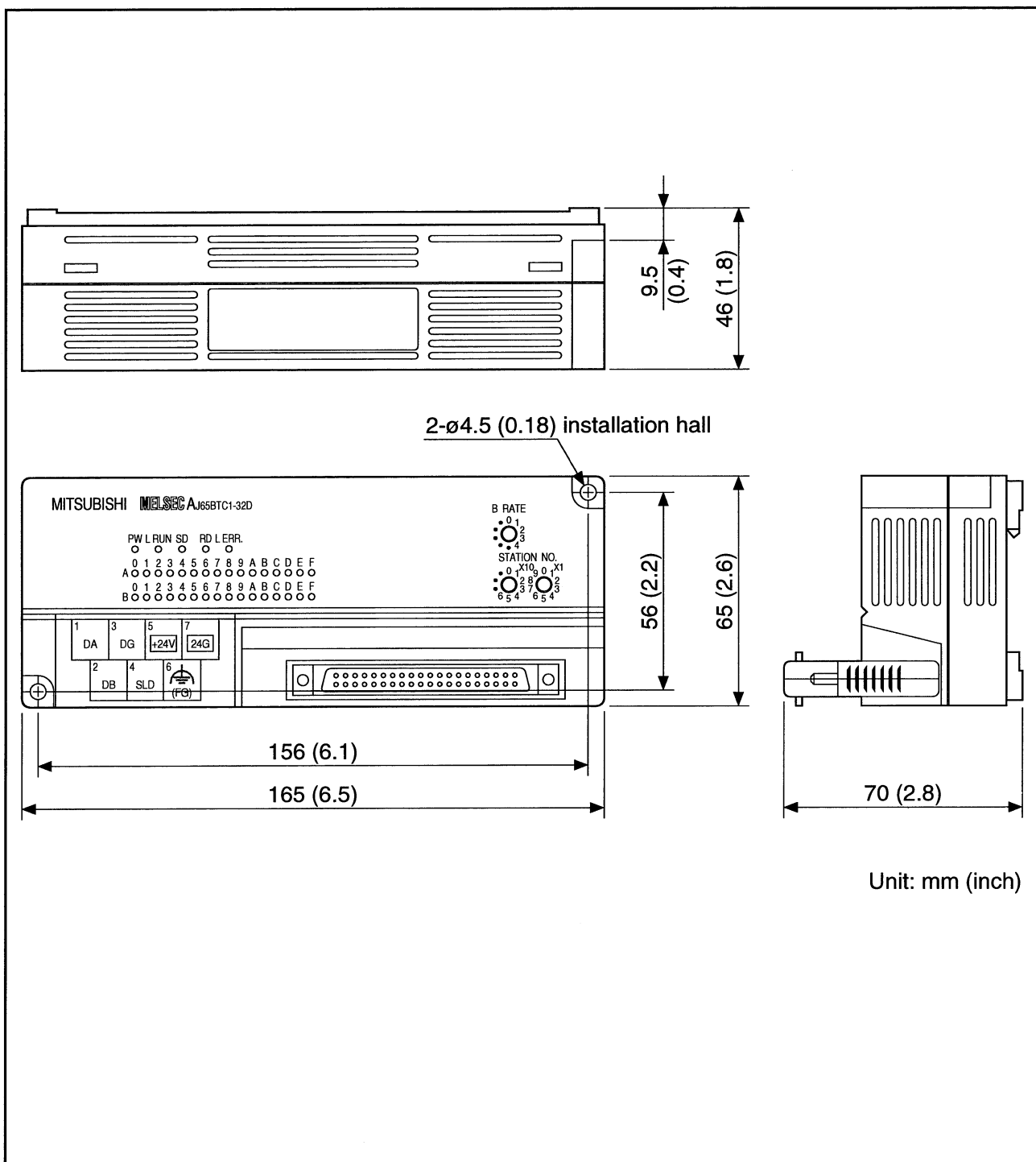
1.2 AJ65BTB2-16 □ module

The AJ65BTB2-16 □ module external dimensions are shown below.



1.3 AJ65BTC1-32 □ module

The AJ65BTC1-32 □ module external dimensions are shown below.



MEMO

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
 1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
 2. Failure caused by unapproved modifications, etc., to the product by the user.
 3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
 4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
 5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
 6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
 7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

CC-Link System Remote I/O Module

User's Manual

MODEL	CC-LINK-I/O-SHO-E
MODEL CODE	13J878
IB(NA)-66728-H(1211)MEE	



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Specifications subject to change without notice.