

MITSUBISHI

CC-Link System Space Optical Repeater Module

User's Manual

AJ65BT-RPI-10A/ AJ65BT-RPI-10B

Thank you for buying the Mitsubishi general-purpose programmable logic controller MELSEC series.

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

MELSEC

Mitsubishi Programmable
Logic Controller

MODEL	AJ65BT-RPI-10AB-U
MODEL CODE	13JQ86
IB(NA)-0800090-G(0708)MEE	

© 1999 MITSUBISHI ELECTRIC CORPORATION

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using this equipment, thoroughly read this manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to this equipment.

For the safety instructions of the PLC system, please read the user's manual for the CPU module to use.

These "Safety Precautions" classify the safety precautions into two categories: "DANGER" and "CAUTION".



DANGER

Procedures which may lead to a dangerous condition and cause death or serious injury, if not carried out properly.



CAUTION

Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by  CAUTION may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECATUIONS]

DANGER

- Input/output could be switched on or off when a problem occurs in the repeater module.
So build an external monitoring circuit that will monitor any input/output signals that could cause a serious accident.

CAUTION

- Use each module in an environment as specified in the "general specification" in the CPU module User's Manual.
Usage of the module outside the general specification range may cause electric shock, fire, malfunction, product damage or deterioration.
- Do not have control cables and communication cables bundled with or placed near by the main circuit and/or power cables.
Wire those cables at least 100mm(3.94 inch) away from the main circuit and/or power cables.
It may cause malfunction due to noise interference.

[INSTALLATION PRECAUTIONS]

CAUTION

- Do not directly touch the module's conductive parts.
Doing so could cause malfunction or trouble in the module.
- Tighten the module securely using DIN rail or installation screws within the specified torque range.
Loose terminal screws may cause falling, short circuit or erroneous operation.
If the terminal screws are too tight, it may cause falling or short circuit due to damage of the screws.
- When using multiple sets of the AJ65BT-RPI-10A/10B in line, provide shields between the sets.
Not doing so can cause a malfunction due to interference.
- When using multiple sets of the AJ65BT-RPI-10A/10B in parallel, place the A and B modules alternatively and keep a distance of at least 1m (3.28ft.).
Not placing them alternately can cause a malfunction due to interference.

[WIRING PRECAUTIONS]

DANGER

- Be sure to shut off all phases of the external power supply used by the system before installation or wiring.
Not doing so can cause the product to be damaged or malfunction.

[WIRING PRECAUTIONS]

CAUTION

- Always ground the FG terminal to the protective ground conductor. Otherwise there will be an electric shock or misoperation.
- Terminal screws which are not to be used must be tightened always. Otherwise there will be a danger of short circuit against the bare solderless terminals.
- 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.
- Perform correct wiring for the module according to the product's rated voltage and terminal arrangement. Connecting to a power supply different from the rating or mis-wiring may cause fire and/or trouble.
- Fix terminal screws securely with the specified torque. Loose terminal screws may cause short circuit or malfunction. If the terminal screws are too tight, it may cause falling, short circuit or erroneous operation due to damage of the screws or module.
- Make sure foreign objects do not get inside the module, such as dirt and wire chips. It may cause fire, trouble or malfunction.
- Be sure to fix wires or cables that are connected to the module in place, either by running them through a duct or by using clamps. If the cables are not fixed in one of these ways, dispersion, movement, or careless pulling of the cables may cause damage to the module or cables, or malfunction due to cable contact faults.
- 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 a communication or power supply cable from the module, do not pull on the cable itself. Before disconnecting the cable from the terminal block, loosen off the screws of the terminal block. If you pull the cable connected to the module, the module or cable can be damaged or misoperation can occur due to cable connection fault.

[STARTUP AND MAINTENANCE PRECAUTIONS]

DANGER

- Do not touch terminals when the power is on. It may cause an electric shock or malfunction.

CAUTION

- For use in any environment where optical axis misalignment or the like is expected due to lens surface contamination, vibration, impact or the like, carry out periodic maintenance/inspection and improve the environment. Not doing so can cause a malfunction.
- Never try to disassemble or modify module. It may cause trouble, malfunction, injury or fire.

[STARTUP AND MAINTENANCE PRECAUTIONS]

 CAUTION

- The module case is made of resin; do not drop it or subject it to strong shock.
Module damage may result.
- 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.
- 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)
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions of the module.

[DISPOSAL PRECAUTIONS]

 CAUTION

- When disposing of this product, treat it as industrial waste.

REVISIONS

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

Print Date	* Manual Number	Revision
Nov., 1999	IB (NA)-0800090-A	First edition
Feb., 2001	IB (NA)-0800090-B	<u>Partial correction</u> Change specified torque range of Display window mounting screw from 32 to 5.8N/cm on Section 4.2.1(1)
June, 2003	IB (NA)-0800090-C	<u>Partial correction</u> SAFETY PRECAUTIONS, About the Manuals, Chapter 1, Section 1.3, 2.2, 3.1, 3.2, 4.2.1, 4.6
Jul., 2005	IB (NA)-0800090-D	<u>Addition</u> Conformation to the EMC Directive and Low Voltage Instruction <u>Partial correction</u> SAFETY PRECAUTIONS
Dec., 2006	IB (NA)-0800090-E	<u>Partial correction</u> SAFETY PRECAUTIONS, About the Manuals, Section 1.3, 2.2, 3.1, 3.2, 3.4, 4.2.1
Jun., 2007	IB (NA)-0800090-F	<u>Partial correction</u> Section 4.3, Contact address (Back cover)
Aug., 2007	IB (NA)-0800090-G	<u>Partial correction</u> Section 4.3

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

CONTENTS

1. OVERVIEW	1
1.1 Features	1
1.2 Packaged parts	2
1.3 Abbreviated names, generic names and terms	3
2. SYSTEM CONFIGURATION	4
2.1 Total configuration	4
2.2 Cautions on system configuration	5
3. SPECIFICATIONS	10
3.1 General specifications	10
3.2 Performance specifications	11
3.3 Specifications of connection cables	12
3.4 Max. transmission distance	13
3.5 List of I/O Signals from/to the Master Module	13
4. PROCEDURE UP TO START OF DATA LINK	14
4.1 Procedure up to start of data link	14
4.2 Mounting and installation	14
4.2.1 Cautions on handling	14
4.2.2 Installation environment	18
4.3 Names and settings of parts	18
4.4 Setting of switches	20
4.5 Connection of module through CC-Link dedicated cable	21
4.6 Optical axis adjustment	22
4.6.1 Precautions for optical axis adjustment	22
4.6.2 Optical axis adjustment method	22
4.6.3 Adjustment procedures for interference light	23
4.7 Check for state of connection (line test)	25
5. ABOUT THE MONITOR FUNCTION	26
6. TROUBLESHOOTING	26
7. EXTERNAL DIMENSIONS DIAGRAM	27

About the Manuals

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

Related manuals

Manual Name	Manual Number (Model Code)
AJ61BT11, A1SJ61BT11 CC-Link System Master/Local Module User's Manual (Detail version)	IB(NA)-66721 (13J872)
AJ61QBT11, A1SJ61QBT11 CC-Link System Master/Local Module User's Manual (Detail version)	IB(NA)-66722 (13J873)
QJ61BT11N CC-Link System Master/Local Module User's Manual (Detail version)	SH(NA)-080394E (13JR64)
CC-Link System Repeater (T-junction) Module User's Manual AJ65SBT-RPT	IB(NA)-0800078 (13JQ81)
CC-Link System Optical Repeater Module User's Manual AJ65SBT-RPS/RPG	IB(NA)-0800089 (13JQ85)
CC-Link System Low Profile Waterproof Type Repeater Hub Module User's Manual AJ65FBTA-RPH	IB(NA)-0800288 (13JP55)
CC-Link System Spring Clamp Terminal Block Type Repeater Hub Module User's Manual AJ65BTS-RPH	IB(NA)-0800346 (13JP97)

Conformation to the EMC Directive and Low Voltage Instruction

When complying with EMC Directives and Low-Voltage Directives by assembling a Mitsubishi PLC compatible with EMC Directive and Low-Voltage Directives into the user product, refer to Chapter 3 "EMC Directives and Low-Voltage Directives" in the User's Manual (Hardware) for the CPU module being used.

The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

To conform this product to the EMC Directive and Low Voltage Directive, refer to the Section of "CC-Link Modules" in Chapter 3 "EMC Directive and Low Voltage Directive" of the User's Manual (Hardware) of the CPU module used.

1. OVERVIEW

This User's Manual describes the specifications, part names, settings and others of the AJ65BT-RPI-10A/10B type CC-Link system space optical repeater module (hereafter abbreviated to the AJ65BT-RPI-10A/10B) used in a CC-Link system.

1.1 Features

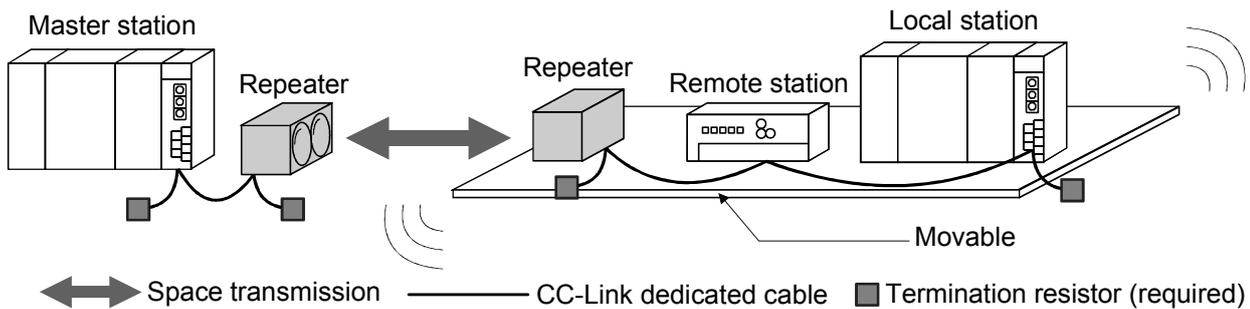
The AJ65BT-RPI-10A/10B is a module used to expand the CC-Link system. By using the AJ65BT-RPI-10A and AJ65BT-RPI-10B in combination, infrared space transmission, increased transmission distance and T-junction wiring can be achieved in a CC-Link system (at the transmission speed of 2.5Mbps, 625kbps or 156kbps only).

Also, the optical axis adjustment can be made easily because the light receiving status of the module can be transmitted to the master station.

(1) Infrared space transmission

Using these modules enables infrared space transmission of 0 to 100m (0 to 327.87ft.).

This makes a CC-Link system usable in places where cabling is difficult.



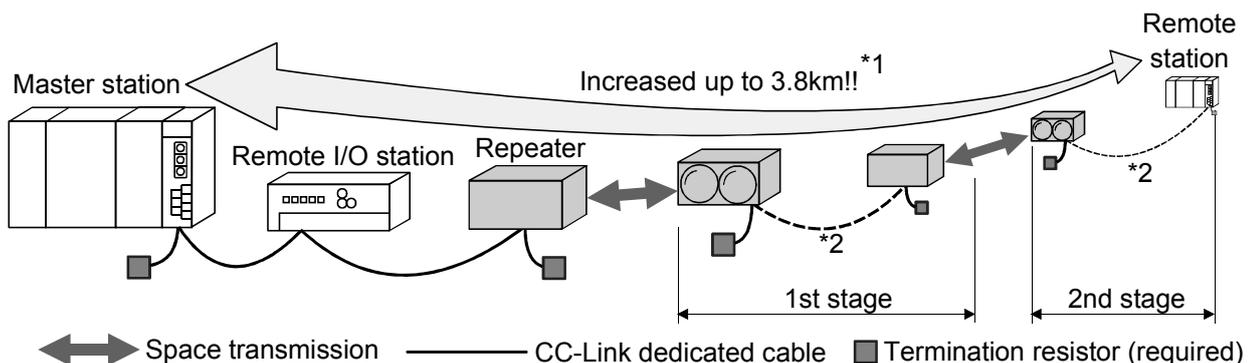
[Places where cabling is difficult]

- Place where a movable range is wide
- Place where the number of movable times is large and cables may be broken due to fatigue
- Place where you want to minimize the number of movable parts, e.g. cable bearers, for dust proof purpose (such as a clean room)

(2) Increased transmission distance

Using these modules increases the transmission distance of a CC-Link system.

Also, using multiple sets of these modules allows the transmission distance to be increased by up to two stages.

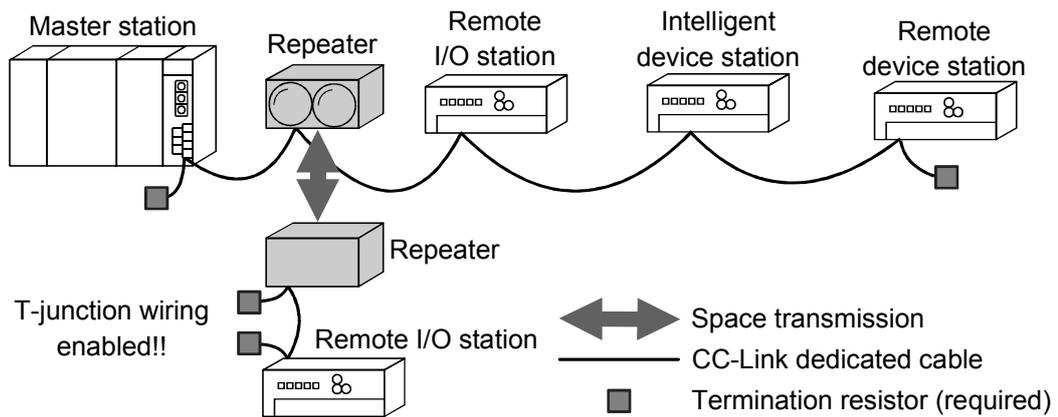


*1 Max. transmission distance at the transmission speed setting of 156kbps.

*2 Though omitted here, another remote station may be connected between repeaters.

(3) T-junction wiring enabled in CC-Link system

T-junction wiring can be performed by arrangement of these modules between the modules of a CC-Link system.



(4) Communication status of the module can be monitored

The light receiving status of the module can be monitored (imported to the master station) by setting the station numbers to these modules and also making the remote I/O station-equivalent parameter setting in the master station.

Also, the imported receiving status of the mating module can be indicated by the LEDs of the own module using the sequence program of the master station, ensuring ease of fine adjustment of the optical axes.

POINT	
	Station number and parameter settings are not needed when these modules are used as repeaters only, i.e. the light receiving status is not monitored (monitor function is not used).

1.2 Packaged parts

After unpacking, make sure that those parts listed below are packaged.

(1) AJ65BT-RPI-10A

Part name	Quantity
AJ65BT-RPI-10A module	1
Terminating resistances 110 Ω 1/2W (Brown, Brown, Brown)	1
Terminating resistances 130 Ω 1/2W (Brown, Orange, Brown)	1

(1) AJ65BT-RPI-10B

Part name	Quantity
AJ65BT-RPI-10B module	1
Terminating resistances 110 Ω 1/2W (Brown, Brown, Brown)	1
Terminating resistances 130 Ω 1/2W (Brown, Orange, Brown)	1

1.3 Abbreviated names, generic names and terms

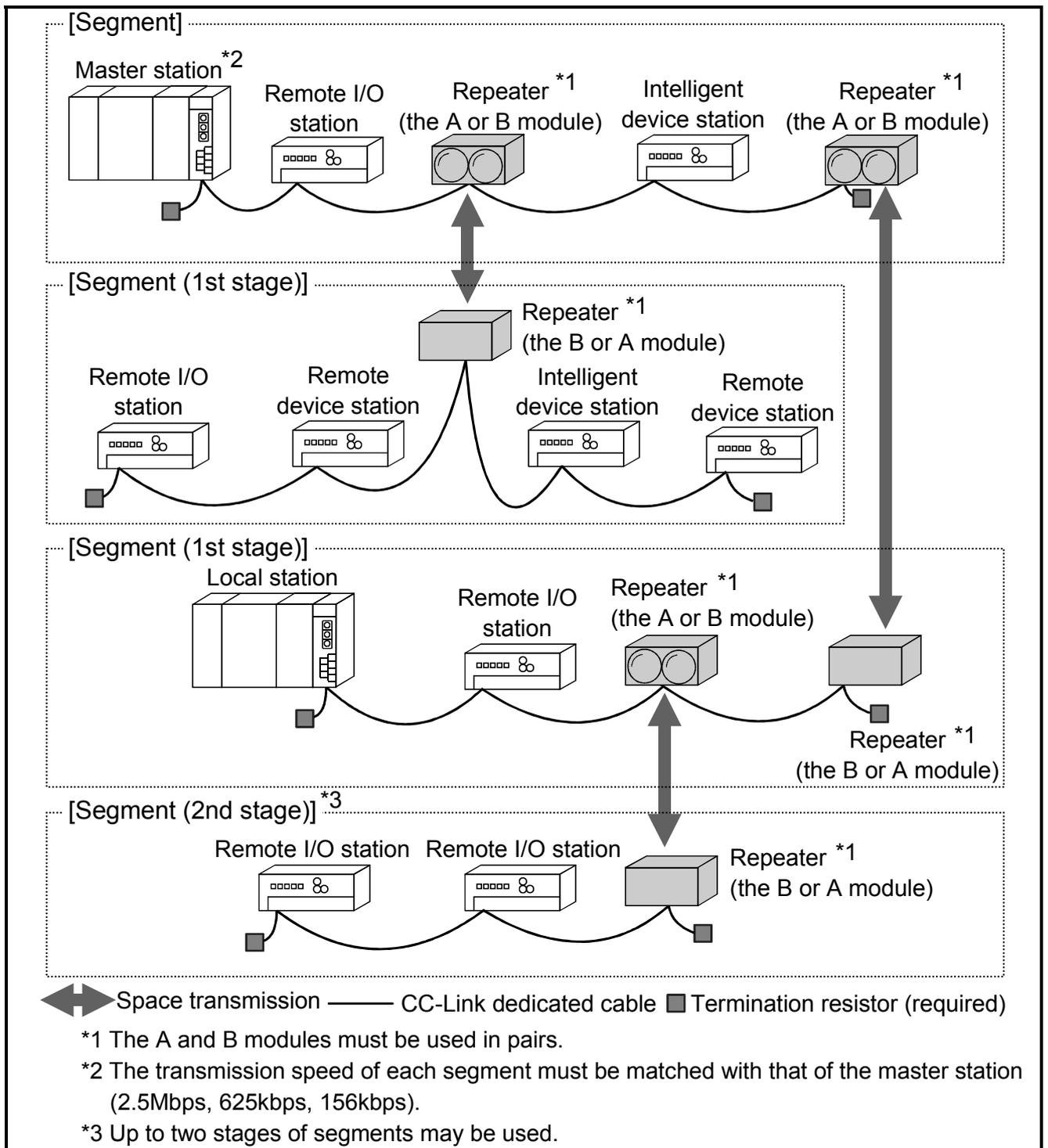
Abbreviated names, generic names and terms Description

Abbreviated names, generic names and terms	Description
AJ65BT-RPI-10A/10B	Abbreviation of AJ65BT-RPI-10A/AJ65BT-RPI-10B type CC-Link system space optical repeater module
AJ65SBT-RPT	Abbreviation of AJ65SBT-RPT type CC-Link system repeater (T-junction) module.
AJ65SBT-RPS/RPG	Abbreviation of AJ65SBT-RPS/AJ65SBT-RPG type CC-Link system optical repeater module.
AJ65FBTA-RPH	Abbreviation of AJ65FBTA-RPH type CC-Link system low profile waterproof type repeater hub module.
AJ65BTS-RPH	Abbreviation of AJ65BTS-RPH type CC-Link system spring clamp terminal block type repeater hub module.
A module	Abbreviation of AJ65BT-RPI-10A type CC-Link system space optical repeater module
B module	Abbreviation of AJ65BT-RPI-10B type CC-Link system space optical repeater module
Segment	System between terminating resistances connected to each other through cross-over cables. The conventional CC-Link system can be said to be configured with one segment (See Section 2.1.).
Master station	Station to control the data link system. One station is required for each system.
Local station	Station which has a sequencer CPU and can communicate with the master station and the other local stations.
Remote I/O station	Remote station processing only information in unit of bit. (AJ65BTB1-16D, AJ65SBTB1-16D, AJ65SBTB1-8□, etc.)
Remote device station	Remote station processing only information in unit of bit and in unit of word. (AJ65BT-64AD, AJ65BT-64DAV, AJ65BT-64DAI, etc.)
Remote station	Generic name of remote I/O station and remote device station. Controlled by the master station.
Intelligent device station	Station allowing transient transmission such as AJ65BT-R2. (Including local stations)
Repeater	Module for expanding the CC-Link system by connecting the segments to each other.
Ready master station	Backup station which inherits data link control when the master station comes off parallel due to error.
Master local module	Generic name of QJ61BT11N, QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11.
Master module	Generic name of QJ61BT11N, QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 when these are used as the master station.
Local module	Generic name of QJ61BT11N, QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 when these are used as the local station.
Remote module	Generic name of AJ65BTB1-16D, AJ65SBTB1-16D, AJ65BT-64AD, AJ65BT-64DAV, AJ65BT-64DAI and A852GOT.
Intelligent device module	Module allowing transient transmission such as AJ65BT-R2.

2. SYSTEM CONFIGURATION

2.1 Total configuration

The total configuration employed when the AJ65BT-RPI-10A/10B module is used is as shown below.



(1) What is a repeater?

This is the module for expanding the CC-Link system by connecting the segments to each other.

(2) What is a segment?

In the CC-Link system where repeaters are used, the equipment included between terminating resistances connected to each other through cross-over cables is generally called the segment.

2.2 Cautions on system configuration

(1) About the combination of modules used

Always use the AJ65BT-RPI-10A/10B in such a configuration that the lens surfaces of the A and B modules are opposed.

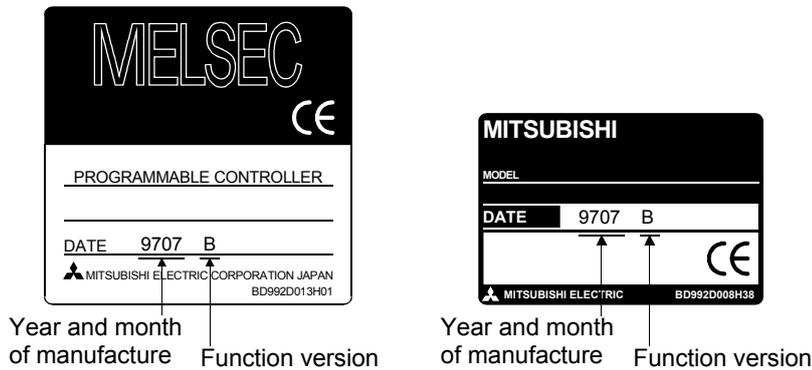
There are no restrictions on the sequence of connections.

(Either the A or B module may be placed on the master station side.)

(2) Conditions of usable master module

When the AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 modules are used, those of the functional version B or later must be employed. Use the master module bearing the version 9707 B or later in the DATE column of the name plate as shown in the figure below.

When the QJ61BT11N and QJ61BT11 module is used, any module can be used irrespective of the version.



(3) Max. number of modules connected to configure CC-Link system

Up to 64 modules of repeaters can be connected in one segment.

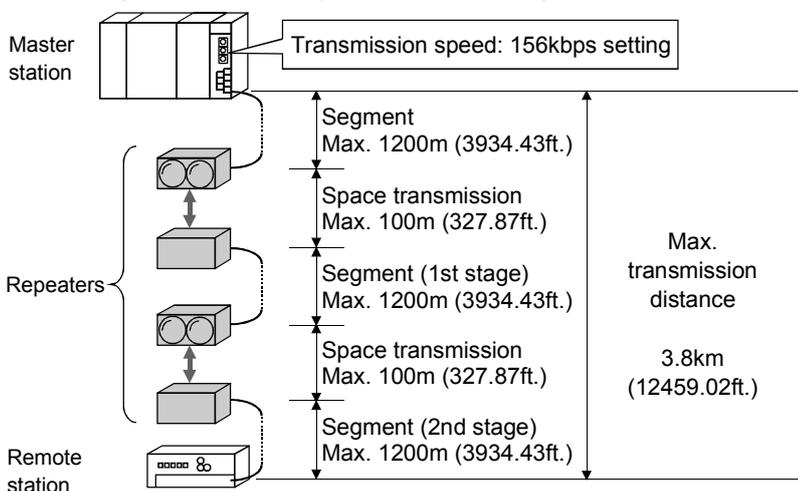
In the CC-Link system where repeaters are used, also the number of remote stations capable of being controlled by one master station is the same as in the other systems.

For details, refer to the User's Manual of the applicable master module.

(When the monitor function is used in these modules, they must be counted not as repeaters but as remote I/O stations.)

(4) Max. number of stages connected to configure segment

These modules may be used to communicate with a remote station up to two segments away from the segment of the master station.



- (5) Instructions for using different models of repeaters in combination
 Note that when combining the repeaters of different models, there are the following restrictions on the number of connectable repeaters and the number of connected stages.

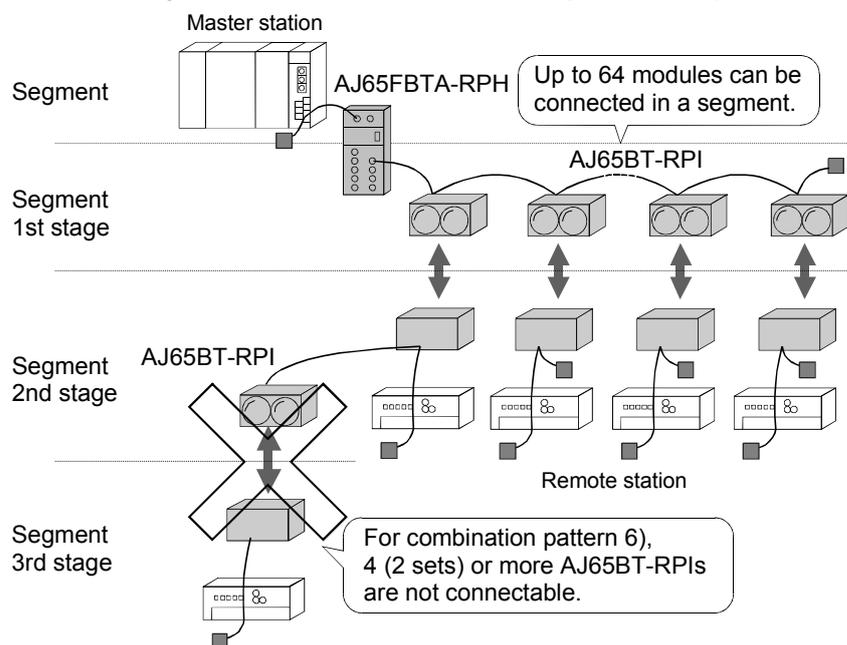
Combination pattern	Max. number of repeaters						Max. number of stages
	AJ65BTS-RPH	AJ65FBT A-RPH	AJ65SBT-RPH	AJ65SBT-RPS	AJ65SBT-RPG	AJ65BT-RPI-10A/10B	
1)	1	—	2	—	—	—	3
	—	1	2	—	—	—	
2)	1	—	—	2(1set)	—	—	2
	1	—	—	—	2(1 set)	—	
	—	1	—	2(1 set)	—	—	
3)	1	—	—	—	—	2(1 set)	4
	—	1	—	—	—	2(1 set)	
4)	—	—	2	4(2 set)	—	—	4
5)	—	—	2	—	2(1 set)	—	3
6)	—	—	2	—	—	2(1 set)	3
7)	—	—	—	2(1 set)	2(1 set)	—	2
8)	—	—	—	2(1 set)	—	2(1 set)	
	—	—	—	—	2(1 set)	2(1 set)	
9)	1	1	—	—	—	—	2

POINT

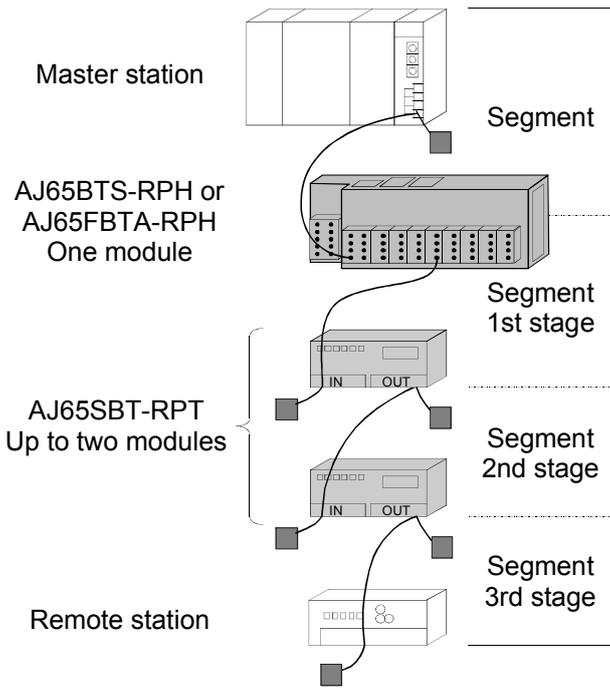
- For the CC-Link system, up to 2 repeater types can be used in combination. Using 3 models or more is not allowed.
- When repeaters are connected in the same segment by link wiring, up to 64 modules can be connected.

For details, refer to the user's manual of the master module used.

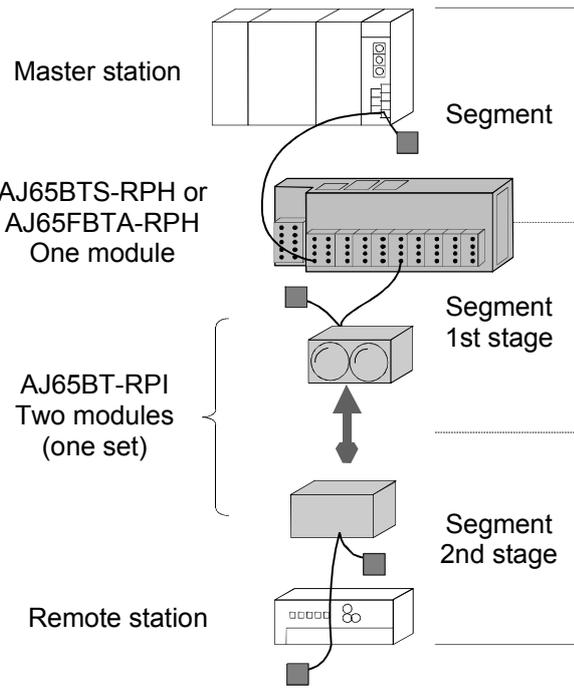
Ex.) A CC-Link system with combination pattern 7) is built



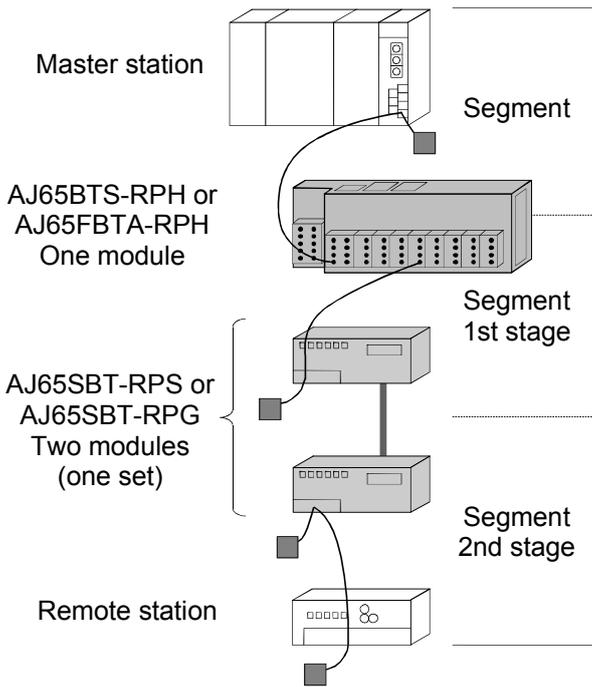
(a) Combination pattern 1)



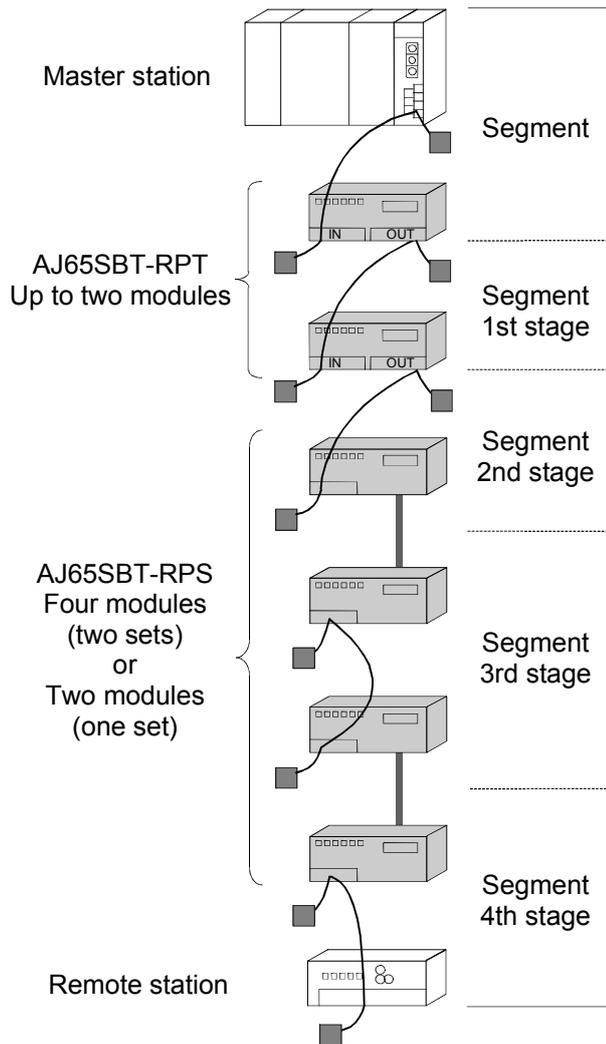
(c) Combination pattern 3)



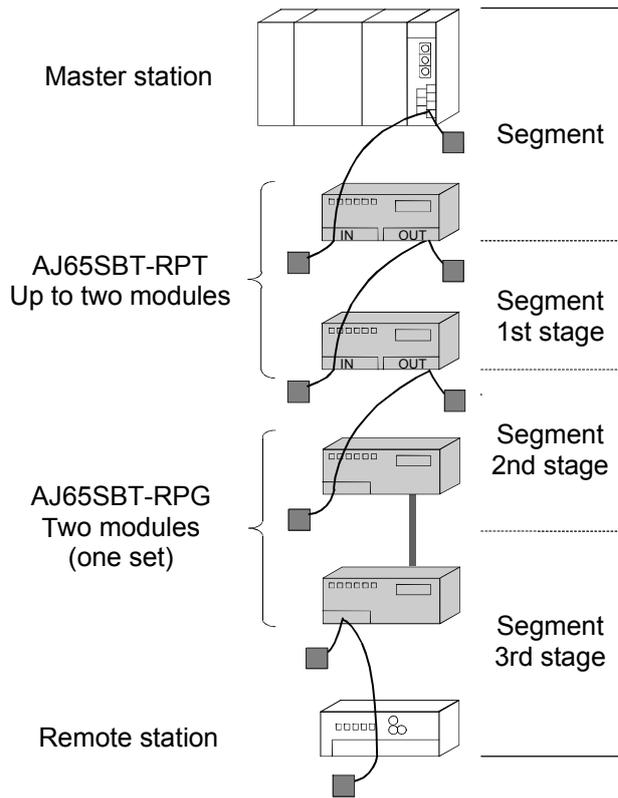
(b) Combination pattern 2)



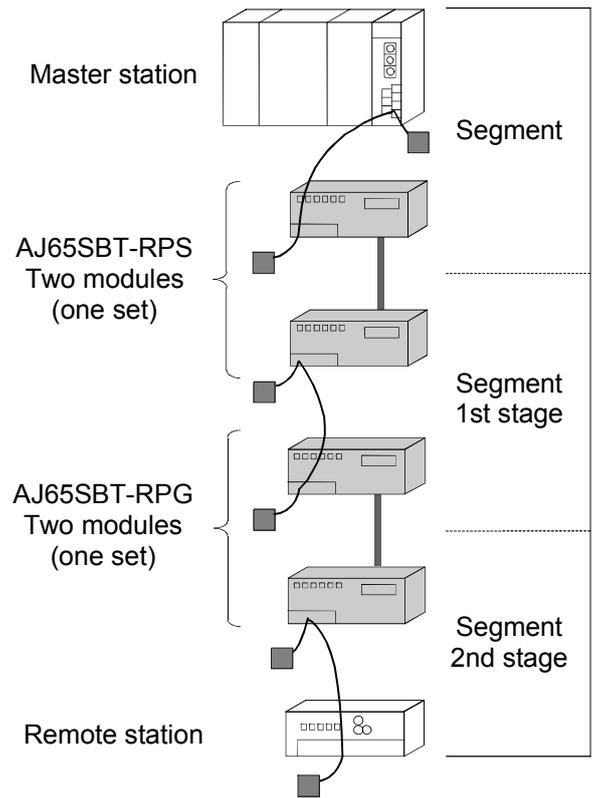
(d) Combination pattern 4)



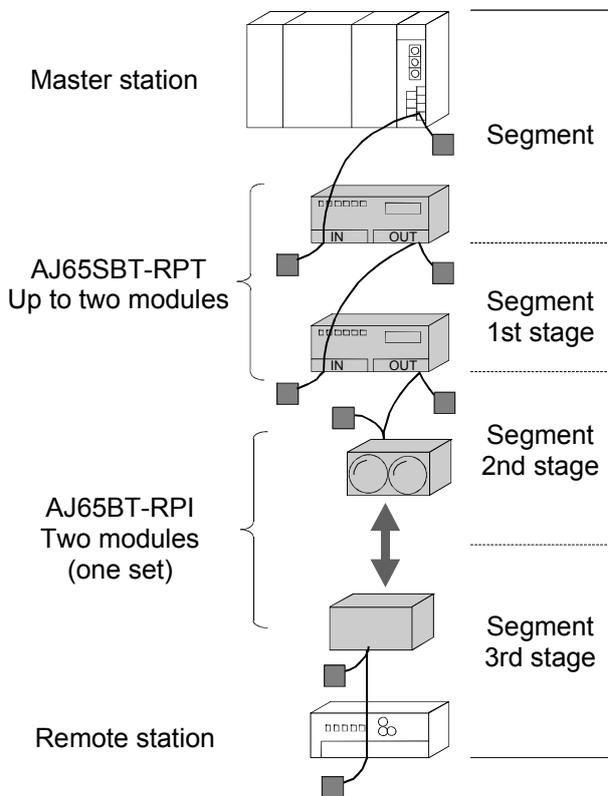
(e) Combination pattern 1)



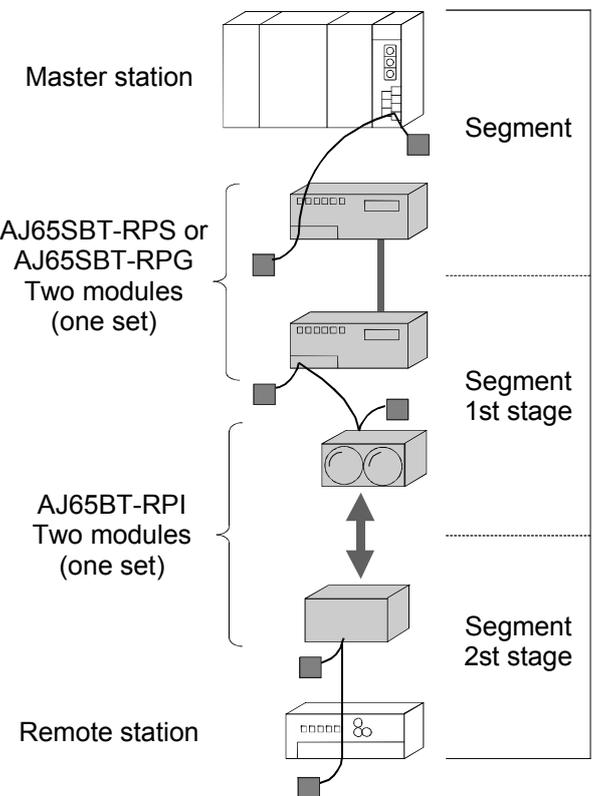
(g) Combination pattern 3)



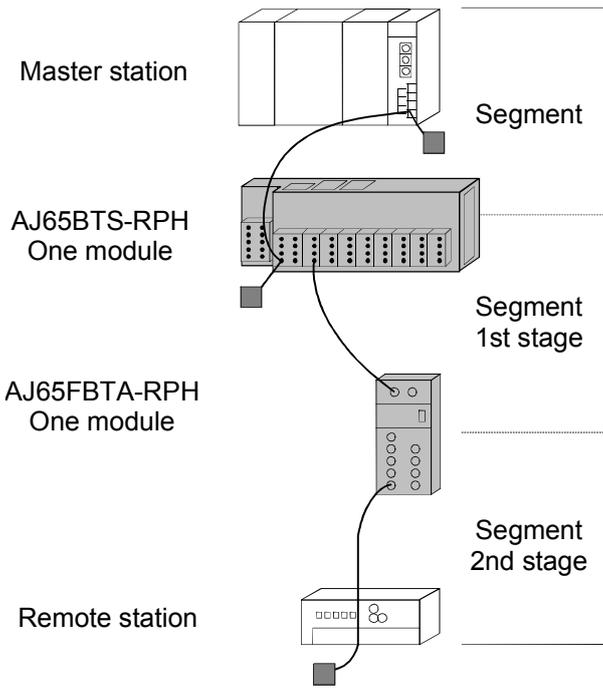
(f) Combination pattern 2)



(h) Combination pattern 4)



(h) Combination pattern 1)



3. SPECIFICATIONS

3.1 General specifications

This section provides specifications of the AJ65BT-RPI-10A/10B module used.

Item	Specifications					
Operating ambient temperature	0 to 50°C					
Storage ambient temperature	-25 to 75°C					
Operating ambient humidity	10 to 90%RH, non-condensing					
Storage ambient humidity	10 to 90%RH, non-condensing					
Vibration resistance	Conforming to JIS B 3502, IEC 61131-2	Under intermittent vibration	Frequency	Acceleration	Amplitude	Sweep count
			10 to 57Hz	————	0.75mm (0.03in.)	
		Under continuous vibration	57 to 150Hz	98m/s ²	————	10 times each in X, Y, Z directions (for 80 min.)
			10 to 57Hz	————	0.35mm (0.01in.)	
57 to 150Hz	49m/s ²	————				
Shock resistance	Conforming to JIS B 3502, IEC 61131-2 (490 m/s ² , 10 times in each of 3 directions X, Y, Z)					
Operating ambience	No corrosive gases					
Ambient illumination*3	10000 lx max. (no exposure to direct sunlight)					
Cooling method	Self-cooling method					
Operating altitude*4	2000m (6562ft.) max.					
Installation location	Indoor					
Overvoltage category *1	II max.					
Pollution level *2	2 max.					

*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 300 V is 2500 V.

*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 : The reference values of ambient illumination (in JIS Z 9110) are indicated below.

- Illumination needed for fine visual work in factories : 3000 to 1500 lx
- Illumination needed for work in offices : 2000 to 750 lx

*4 : Do not use or store the PLC in the environment where the pressure is higher than the atmospheric pressure at sea level. Otherwise, malfunction may result. To use the PLC in a high-pressure environment, contact your local Mitsubishi representative.

3.2 Performance specifications

The following table lists the performance specifications of the AJ65BT-RPI-10A/10B.

Item		Specifications	
Common specifications	Power supply	Voltage 20.4 to 26.4VDC	
		Current 137mA (at TYP. 24VDC)	
	Noise immunity	Simulator noise of 500Vp-p, obtained by a noise simulator of 1μs noise width and 25 to 60Hz noise frequency	
	Dielectric withstand voltage	500VAC for 1 minute between all DC external terminals and ground	
	Insulation resistance	10MΩ or higher, measured with a 500VDC insulation resistance tester	
	Weight	0.5kg	
CC-Link communication specifications	Transmission speed	Can be selected from among 156kbps, 625kbps and 2.5Mbps.	
	Max. number of segments connected	AJ65BT-RPI only (Refer to Section 2.2(4))	2stages
		Combination of AJ65BT-RPI and AJ65SBT-RPT (Refer to Section 2.2(5))	3stages
		Combination of AJ65BT-RPI and one of AJ65SBT-RPS, AJ65SBT-RPG, AJ65FBTA-RPH, Or AJ65BTS-RPH.(Refer to Section 2.2 (5))	2stages
	Max. transmission distance of each segment	Depending on the transmission speed. (Refer to the user's manual of the master module used.)	
	Max. number of connected modules	64 (Refer to Section 2.2(3) for the conditions of the number of modules connected.)	
Number of stations occupied	When using monitor function : 1station When not using monitor function : 0station (Refer to Chapter 5 for details of the monitor function.)		
Optical communication specifications	Optical transmission distance	0 to 100m (0 to 327.87ft.)	
	Orientation angle	Optical transmission distance of 0 to 50m (0 to 163.94ft.) : Full angle 2°	
		Optical transmission distance of 50 to 100m (163.94 to 327.87ft.) : Full angle 1°	
	Modulation frequency	A module to B module: 36 ±3MHz B module to A module: 44 ±2.5MHz	
Modulation system	FSK		

3.3 Specifications of connection cables

Use the CC-Link dedicated cable for the CC-Link system. If a cable other than the CC-Link dedicated cable is used, the performance of the CC-Link system cannot be guaranteed.

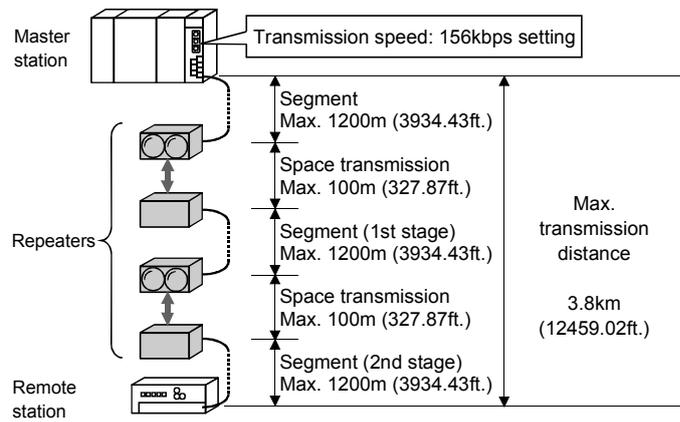
For the specifications of the CC-Link dedicated cables or any other inquiries, visit the following site:

CC-Link Partner Association website: <http://www.cc-link.org/>

REMARK

For details, refer to the CC-Link cable wiring manual issued by the CC-Link Partner Association.

3.4 Max. transmission distance



Conditions	Description
Transmission speed	The maximum transmission distance in each segment is the same as that in normal CC-Link system (system configured with one segment only). The maximum transmission distance in each segment varies according to the transmission speed. For details, refer to the User's Manual of the applicable master module. (The length of the cables between repeater stations is treated in the same manner as in the remote I/O station.)
Max. number of stages connected to configure segment	When one connection stage is added, the maximum transmission distance is added by an amount equivalent to one segment.

3.5 List of I/O Signals from/to the Master Module

The following tables provide the I/O signals transferred from/to the master module when the monitor function is used in the AJ65BT-RPI-10A/10B.

Refer to Chapter 5 for details of the monitor function.

Refer to Section 4.3 for the definitions of the operation indicator LEDs used to explain the signals.

(1) Input signals (AJ65BT-RPI-10A/10B to master module)

Input Signal	Signal Name	Description
RXn0	RC status	ON indicates that the module is ready to receive data.
RXn1	R1 status	ON indicates that the allowance of the light receiving level is 1.5 times or higher *.
RXn2	R2 status	ON indicates that the allowance of the light receiving level is 2.0 times or higher *.
RXn3	R3 status	ON indicates that the allowance of the light receiving level is 2.5 times or higher *.
RXn4 to RX(n+1)F	—	Must not be used.

*Value based on the RC status signal (1 time).

(2) Output signals (Master module to AJ65BT-RPI-10A/10B)

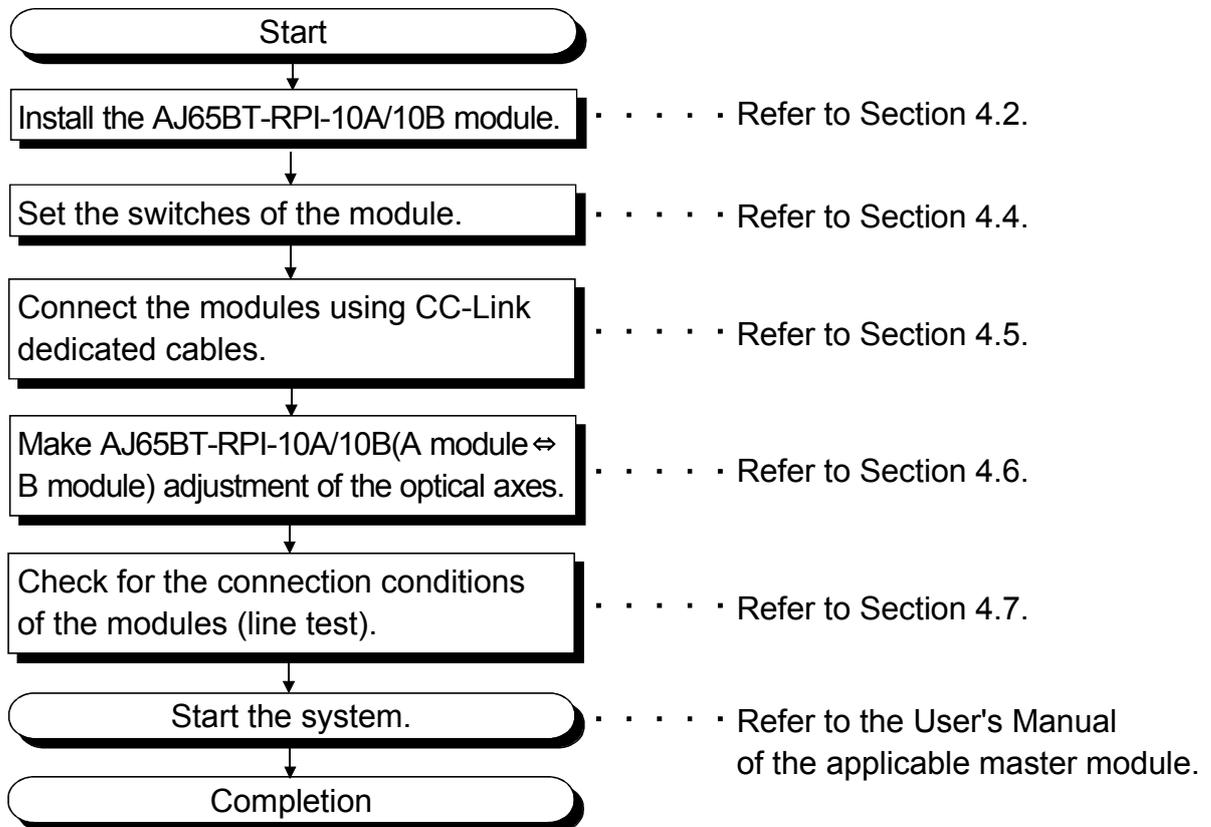
Output Signal	Signal Name	Description
Ryn0 to RYnF	—	Must not be used.
RY(n+1)0	SC ON	Lights up the "SC" operation indicator LED.*
RY(n+1)1	S1 ON	Lights up the "S1" operation indicator LED.*
RY(n+1)2	S2 ON	Lights up the "S2" operation indicator LED.*
RY(n+1)3	S2 ON	Lights up the "S3" operation indicator LED.*
RY(n+1)4 to RX(n+1)F	—	Must not be used.

* The RC, R1, R2 and R3 status signals of the mating module can be indicated by the operation indicator LEDs of the own module using the sequence program of the master station, ensuring ease of optical axis adjustment.

4. PROCEDURE UP TO START OF DATA LINK

4.1 Procedure up to start of data link

The procedure ranging from the installation of the AJ65BT-RPI-10A/10B module to the start of data link is described below.



POINT

The procedure described here is for the AJ65BT-RPI-10A/10B module only. In order for you to understand the procedure of the entire CC-Link system, refer to the User's Manual of the applicable master module.

4.2 Mounting and installation

4.2.1 Cautions on handling

Cautions on handling the AJ65BT-RPI-10A/10B module are described below.

⚠ DANGER

- Perform installation and wiring after disconnecting the power supply at all phases externally. If the power is not disconnected at all phases an electric shock or product damage may result.
- Do not touch terminals when the power is on. It may cause an electric shock or malfunction.

 CAUTION

- Do not have control cables and communication cables bundled with or placed near by the main circuit and/or power cables. It may cause malfunction due to noise interference. Wire those cables at least 100mm(3.94 inch) away from the main circuit and/or power cables.
- Do not directly touch the module's conductive parts.
Doing so could cause malfunction or trouble in the module.
- Tighten the module securely using DIN rail or installation screws within the specified torque range.
Loose terminal screws may cause falling, short circuit or erroneous operation.
If the terminal screws are too tight, it may cause falling or short circuit due to damage of the screws.
- When using multiple sets of the AJ65BT-RPI-10A/10B in line, provide shields between the sets.
Not doing so can cause a malfunction due to interference.
- When using multiple sets of the AJ65BT-RPI-10A/10B in parallel, place the A and B modules alternatively and keep a distance of at least 1m (3.28ft.).
Not placing them alternately can cause a malfunction due to interference.
- Fix terminal screws securely with the specified torque.
Loose terminal screws may cause short circuit or erroneous operation.
If the terminal screws are too tight, it may cause falling, short circuit or erroneous operation due to damage of the screws or module.
- Always ground the FG terminal to the protective ground conductor.
Otherwise there will be an electric shock or misoperation.
- Terminal screws which are not to be used must be tightened always.
Otherwise there will be a danger of short circuit against the bare solderless terminals.
- 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.
- Perform correct wiring for the module according to the product's rated voltage and terminal arrangement. Connecting to a power supply different from the rating or mis-wiring may cause fire and/or trouble.
- Make sure foreign objects do not get inside the module, such as dirt and wire chips.
It may cause fire, trouble or malfunction.
- Be sure to fix the wires or cables by ducts or clamps when connecting them to the module. If the cables are not fixed in one of these ways, dispersion, movement, or careless pulling of the cables may cause damage to the module or cables, or malfunction due to cable contact faults.
- 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 a communication or power supply cable from the module, do not pull on the cable itself.
Before disconnecting the cable from the terminal block, loosen off the screws of the terminal block.
If you pull the cable connected to the module, the module or cable can be damaged or misoperation can occur due to cable connection fault.

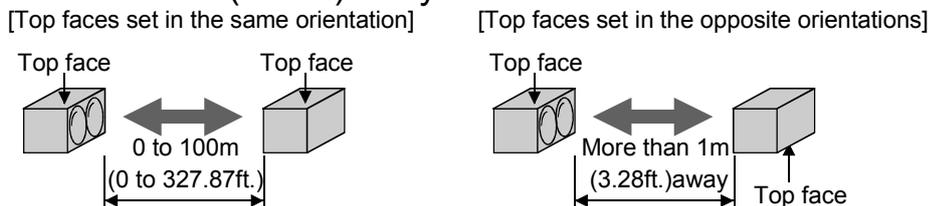
⚠ CAUTION

- For use in any environment where optical axis misalignment or the like is expected due to lens surface contamination, vibration, impact or the like, carry out periodic maintenance/inspection and improve the environment. Not doing so can cause a malfunction.
- Never try to disassemble or modify the module.
- The module case is made of resin; do not drop it or subject it to strong shock. A module damage may result.
- Perform cleaning the module or re-tightening of terminal screws after making sure to turn off the external power supply. If you do not switch off the external power supply, it will cause trouble or malfunction of 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. If you do not switch off the external power supply, it will cause trouble or malfunction of the module.
- Do not install/remove the terminal block more than 50 times after the first use of the product. (IEC 61131-2 compliant)
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module. Failure to do so may cause a failure or malfunctions of the module.
- When disposing of this product, treat it as industrial waste.

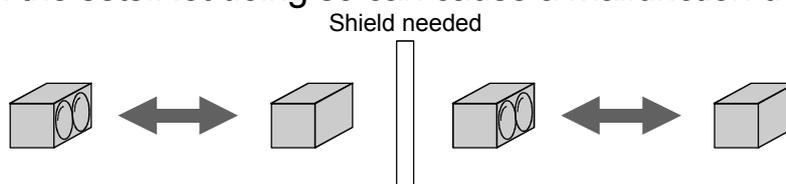
- (1) Tighten the module fixing screws and terminal block screws to those torques specified below. Do not over-tighten these screws. The screws and module case may be damaged.

Screw location	Specified torque range (N/cm)
Module mounting screw (M6 thread with finished circular flat washer)	120
Display window mounting screw (M2.6 thread)	5.8
Terminal block screw (M3 thread)	59 to 88
Terminal block mounting screw (M3.5 thread)	68 to 98

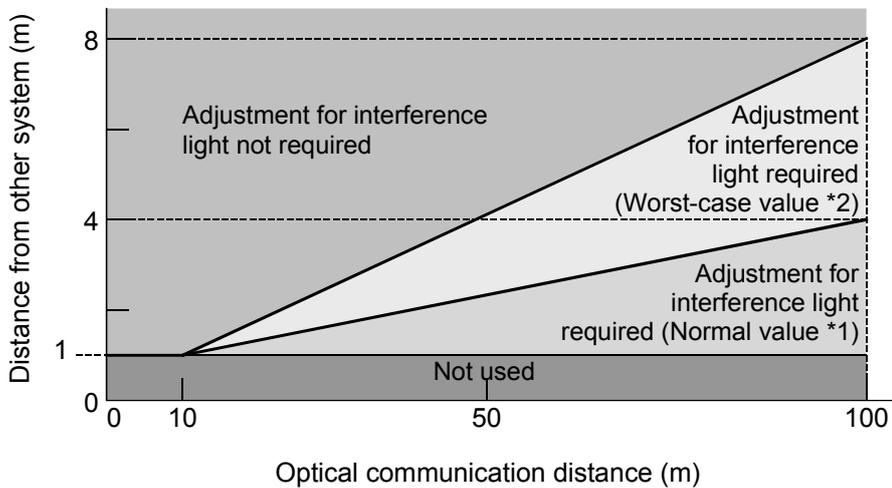
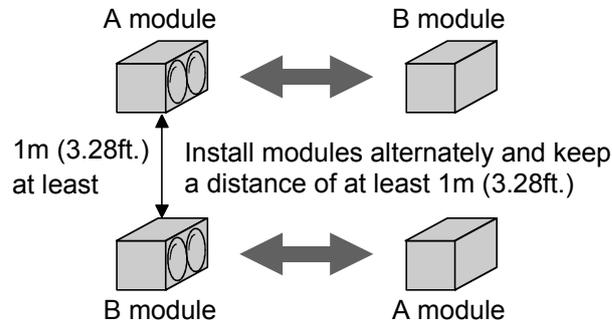
- (2) When mounting the AJ65BT-RPI-10A/10B, it has no specific mounting orientation as a module alone. However, it should be mounted with its top face placed in the same orientation as that of the mating module with which optical communication is made. When these modules are mounted in opposite orientations, they must be mounted more than 1m(3.28ft.) away from each other.



- (3) When using multiple sets of the AJ65BT-RPI-10A/10B in line, provide shields between the sets. Not doing so can cause a malfunction due to interference.



(4) When using multiple sets of the AJ65BT-RPI-10A/10B in parallel, place the A and B modules alternately and keep a distance of at least 1m (3.28ft.). Not placing them alternately can cause a malfunction due to interference. Referring to the figure showing the relation between the optical communication distance and the distance from the other system, adjust the optical axis to remove the influence of interference light. (Refer to Section 4.6.3.)



*1 A value obtained when the optical axis of each system is adjusted to nearly the center of the area in which the operation indicator LED, R3 turns on.

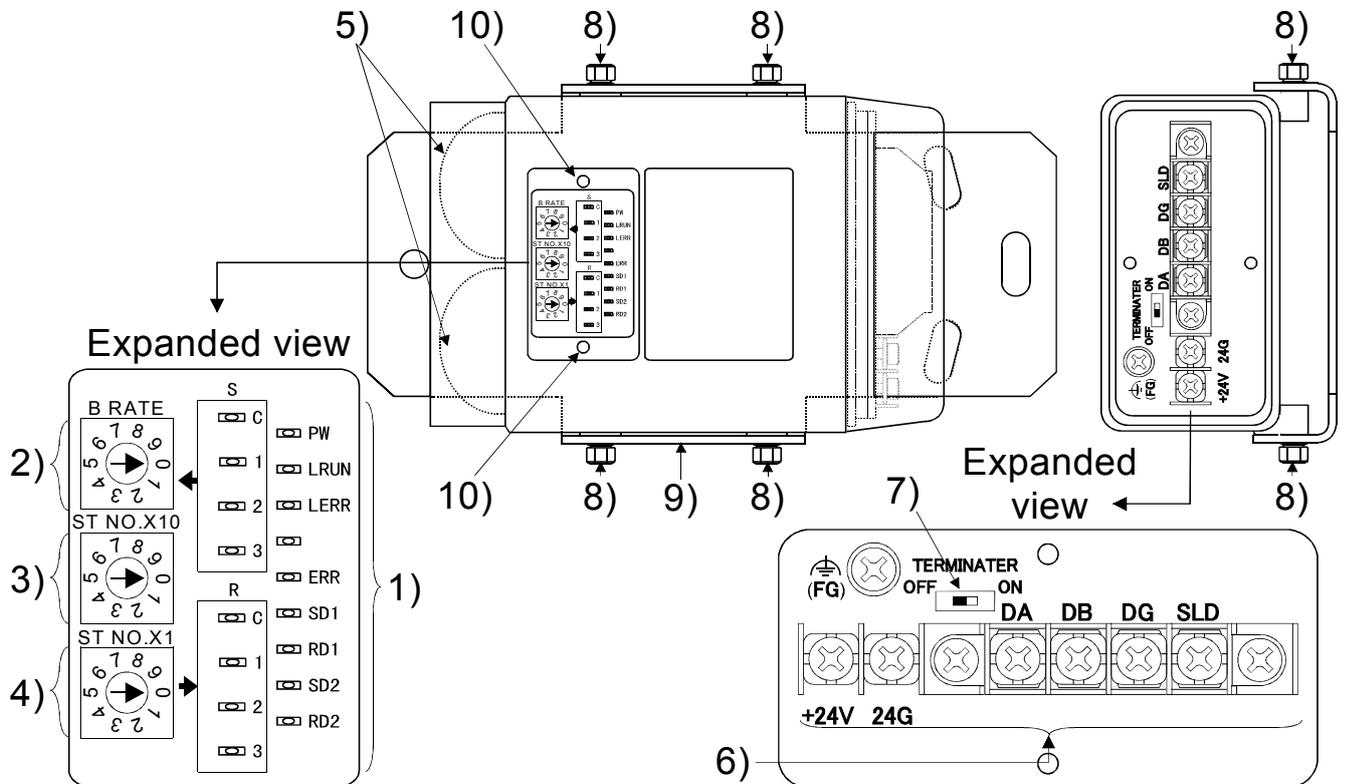
*2 A value obtained when the optical axis of the system is slanted toward the other system.

4.2.2 Installation environment

For installation environment, refer to Section 3.1 (General Specifications).

4.3 Names and settings of parts

This section explains the part names, LED indication definitions, and switch and control setting methods of the AJ65BT-RPI-10A/10B.



No.	Name	Application	
1)	Operation indicator LEDs	Check for the module condition by observing the state of lighting of the LED.	
		LED Name	Application
		PW	ON : Indicates that power is ON. OFF: Indicates that power is OFF.
		LRUN	ON : Indicates normal communication when the monitor function is used. OFF: Indicates that a communication error occurred when the monitor function is used or that the monitor function is not used.
		LERR	ON : Indicates that a communication error occurred when the monitor function is used or that the monitor function is not used. OFF: Indicates normal communication when the monitor function is used.
		ERR	ON : Indicates a communication error. OFF: Indicates a normal status.
		SD1	ON : Indicates that data is being sent to the connection cable side. OFF: Indicates that data is not sent to the connection cable side.
		SD2	ON : Indicates that data is being sent to the light output side. OFF: Indicates that data is not sent to the light output side.
		RD1	ON : Indicates that data is being received from the connection cable side. OFF: Indicates that data is not received from the connection cable side.
RD2	ON : Indicates that data is being received from the light input side. OFF: Indicates that data is not received from the light input side.		

No.	Name	Application		
1)	Operation indicator LEDs	Check for the module condition by observing the state of lighting of the LED.		
		LED Name	Application	
		SC	ON : Indicates that RY(n+1)0 is ON. OFF: Indicates that RY(n+1)0 is OFF.	Lit only when the monitor function is used. Refer to Chapter 5 for details of the monitor function.
		S1	ON : Indicates that RY(n+1)1 is ON. OFF: Indicates that RY(n+1)1 is OFF.	
		S2	ON: Indicates that RY(n+1)2 is ON. OFF: Indicates that RY(n+1)2 is OFF.	
		S3	ON: Indicates that RY(n+1)3 is ON. OFF: Indicates that RY(n+1)3 is OFF.	
		RC	ON : Indicates that the own module is enabled for light receiving. OFF: Indicates that the own module is disabled for light receiving.	
		R1	ON : Indicates that the light receiving level allowance of the own module is 1.5 times or more. OFF: Indicates that the light receiving level allowance of the own module is less than 1.5 times (based on RC).	
		R2	ON : Indicates that the light receiving level allowance of the own module is 2.0 times or more. OFF: Indicates that the light receiving level allowance of the own module is less than 2.0 times (based on RC).	
		R3	ON : Indicates that the light receiving level allowance of the own module is 2.5 times or more. OFF: Indicates that the light receiving level allowance of the own module is less than 2.5 times (based on RC).	
2)	Transmission speed setting switch	Used to set the transmission speed of the module. (Factory setting: 0) 0 : 156kbps 1 : 625kbps 2 : 2.5Mbps 3 to 9 : Must not be set.		
3)	Station number setting switch (Tens)	Used to set the station number of the module. Also used to set whether the monitor function is used or not. (Factory setting: 0) 00 : Monitor function is not used		
4)	Station number setting switch (Units)	01 to 64 : Station number when monitor function is used 65 to 99 : Must not be set.		
5)	Lens surfaces	Used to make optical communication.		
6)	Terminal block	Used to connect the power supply cable and CC-Link dedicated cables.		
7)	Termination resistor switch	Used to set whether the built-in termination resistor (110 Ω) of the module is used or not. (Factory setting: OFF) ON : Used OFF: Not used		
8)	Module mounting screws	Used to fix the module to the mounting bracket. Mounting bracket		
9)	Mounting bracket	Used to mount the module.		
10)	Display window mounting screws	Used to fix the display window to the module. The display window is removed when switch setting is to be made.		

POINT

The settings of the transmission speed setting switch and station number setting switches are made valid when the module power is switched from OFF to ON. If any switch setting has been changed with the module power ON, perform the above operation again.

4.4 Setting of switches

The setting of the switches on the AJ65BT-RPI-10A/10B module is described below.

(1) Transmission speed setting switch

This switch is used to set the transmission speed of the AJ65BT-RPI-10A/10B module.

For detail of the setting, see Section 4.3.

POINT

- Set to the same state of setting as set in the master station.
- The states of setting of the transmission speed setting switch obtained when the module power supply is set from OFF to ON or the reset switch is set to OFF become effective. When the states of setting are changed with the module power supply turned ON, perform the above operations again.

(2) Station number setting switches

The station number setting switches are used to set the station number of the AJ65BT-RPI-10A/10B. It is also used to set whether the monitor function is used or not. For full information on the setting, refer to Section 4.3. For full information on the monitor function, refer to Chapter 5.

POINT

The setting of the station number setting switches is made valid when the module power is switched from OFF to ON. If the setting has been changed with the module power ON, perform the above operation again.

(3) Termination resistor switch

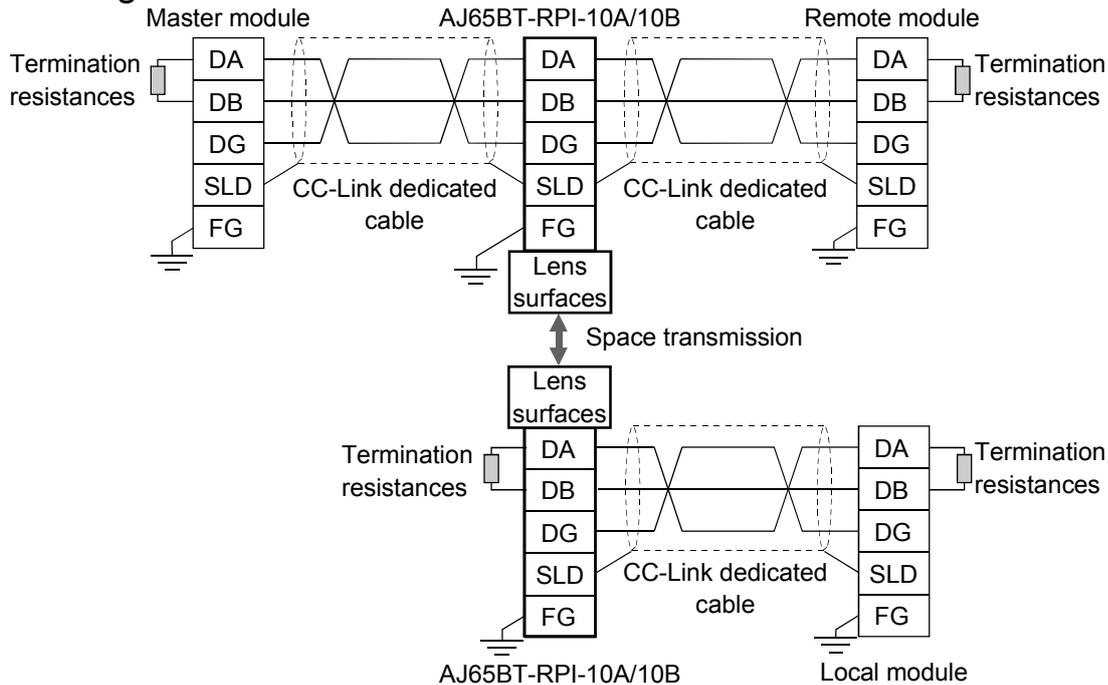
The termination resistor switch is used to set whether the built-in termination resistor ($110\ \Omega$) of the AJ65BT-RPI-10A/10B is used (ON) or not (OFF). Set this switch to the ON (used) position when the AJ65BT-RPI-10A/10B is located on either side of the segment and the accessory termination resistor is not used.

POINT

- In either of the following cases, do not use the built-in termination resistor ($110\ \Omega$) of the AJ65BT-RPI-10A/10B but use the accessory termination resistor.
 - 1) When the $130\ \Omega$ termination resistor is needed.
 - 2) There is a possibility of removing the AJ65BT-RPI-10A/10B without affecting the other stations for maintenance or other purpose.
When the built-in termination resistor is used, removing the terminal block from the module makes the termination resistor disconnected, disabling the other stations from making normal communication.
- Do not use the built-in termination resistor and accessory termination resistor of the AJ65BT-RPI-10A/10B at the same time.
Doing so makes the module doubly provided with the termination resistors, disabling normal communication.

4.5 Connection of module through CC-Link dedicated cable

The method of connecting the AJ65BT-RPI-10A/10B module to the CC-Link system through the CC-Link dedicated cable is shown below.



Important
In each segment, ensure to use the same type of CC-Link dedicated cables. If different types of cables are used, normal data transmission will not be assured.

POINT
<ul style="list-style-type: none"> • Ensure to connect the terminating resistances to both end modules of each segment. In addition, connect them between DA and DB (DA1-DB1 and DA2-DB2 for AJ65BT-RPI-10A/10B). (The terminating resistances are furnished with the module.) • The terminating resistances vary according to the type of cables in use. For detail, refer to the User's Manual of the applicable master module. • Connect the shield cable of the CC-Link dedicated cable to "SLD" of each module, and ground both ends of the cable through "FG" to a class-D (class 3) ground. SLD and FG are wired to each other inside the module.

4.6 Optical axis adjustment

4.6.1 Precautions for optical axis adjustment

For the optical axis adjustment, pay attention to the following.

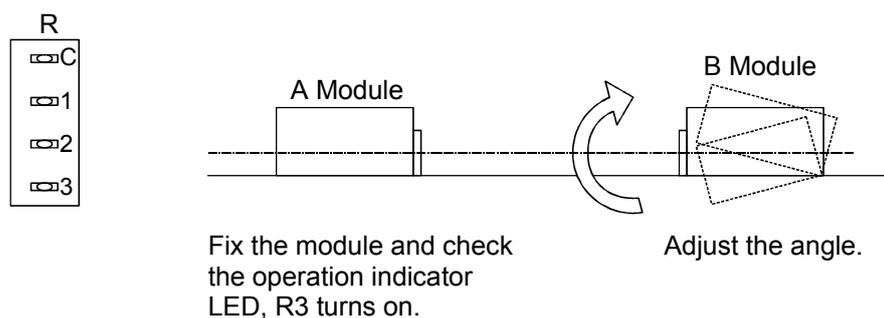
- (1) Adjust the optical axis of each system to the center of the light receiving level area as much as possible. (Refer to Section 4.6.2.)
When multiple sets of the AJ65BT-RPI-10A/10B are used in parallel, turn off the other system(s) before starting the optical axis adjustment.
- (2) When the AJ65BT-RPI-10A/10B is installed to a movable body, check that the adjusted position in the light receiving level is not lowered during movement.
- (3) When multiple sets of the AJ65BT-RPI-10A/10B are used in parallel, check that the individual system is not affected by interference light from the other system. (Refer to Section 4.6.3.)

4.6.2 Optical axis adjustment method

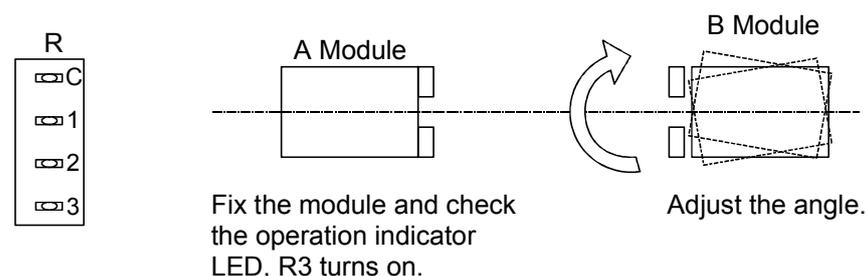
The optical axis is adjusted in the following steps.

- (1) Place the modules face-to-face and align the module axes approximately.
- (2) While observing the operation indicator LEDs of the module (A module), change the angle of the other module (B module) in vertical or horizontal directions to obtain a proper angular range in which the operation indicator LED, R3 turns on.
Note that, if A module is moved at this time, the reference axis cannot be fixed and proper adjustment will be difficult.
- (3) Check the operation indicator LEDs on both modules.
Confirming the LEDs on one module only may not adjust the other optical axis.

(a) Vertical angle adjustment



(b) Horizontal angle adjustment



4.6.3 Adjustment procedures for interference light

The following is the adjustment procedures for interference light emitted from the other system.

(1) Influence of interference light between module A1 and A2

(a) Turn on the module A1 and A2 only and turn off the module B1 and B2.

(b) Check for influence of interference light emitted from A1 to A2

1) When the operation indicator LED, R1 of A2 is off:

No influence of interference light is identified.

2) When the operation indicator LED, R1 of A2 is on:

The influence of interference light is identified.

Readjust the optical axis of module A1 by making it away from the system (2).

(c) Check for influence of interference light emitted from A2 to A1

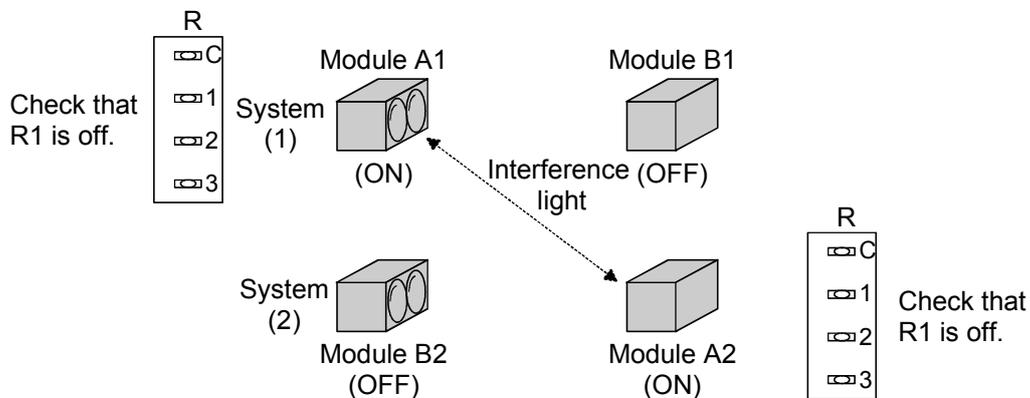
1) When the operation indicator LED, R1 of A1 is off:

No influence of interference light is identified.

2) When the operation indicator LED, R1 of A1 is on:

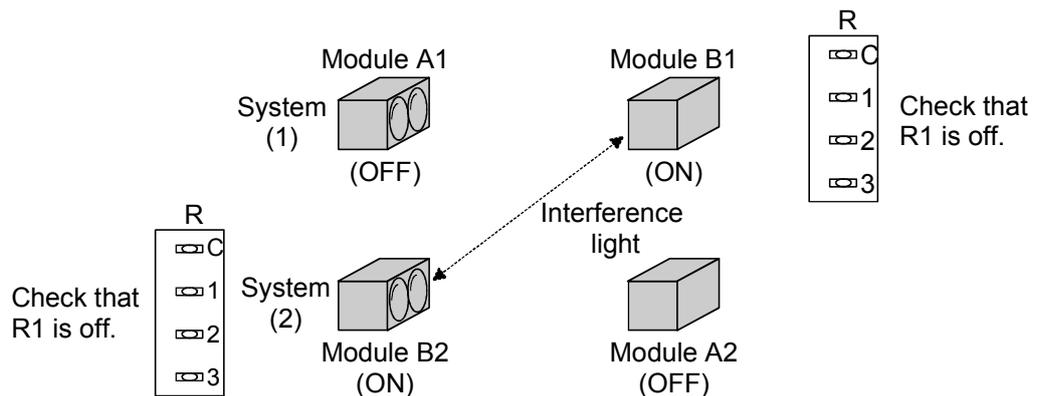
Influence of interference light is identified.

Readjust the optical axis of module A2 by making it away from the system (1).



(2) Influence of interference light between module B1 and B2

- (a) Turn on the module B1 and B2 only and turn off the module A1 and A2.
- (b) Check for influence of interference light emitted from B1 to B2
 - 1) When the operation indicator LED, R1 of B2 is off:
No influence of interference light is identified.
 - 2) When the operation indicator LED, R1 of B2 is on:
The influence of interference light is identified.
Readjust the optical axis of module B1 by making it away from the system (2).
- (c) Check for influence of interference light emitted from B2 to B1
 - 1) When the operation indicator LED, R1 of B1 is off:
No influence of interference light is identified.
 - 2) When the operation indicator LED, R1 of B1 is on:
The influence of interference light is identified.
Readjust the optical axis of module B2 by making it away from the system (1).

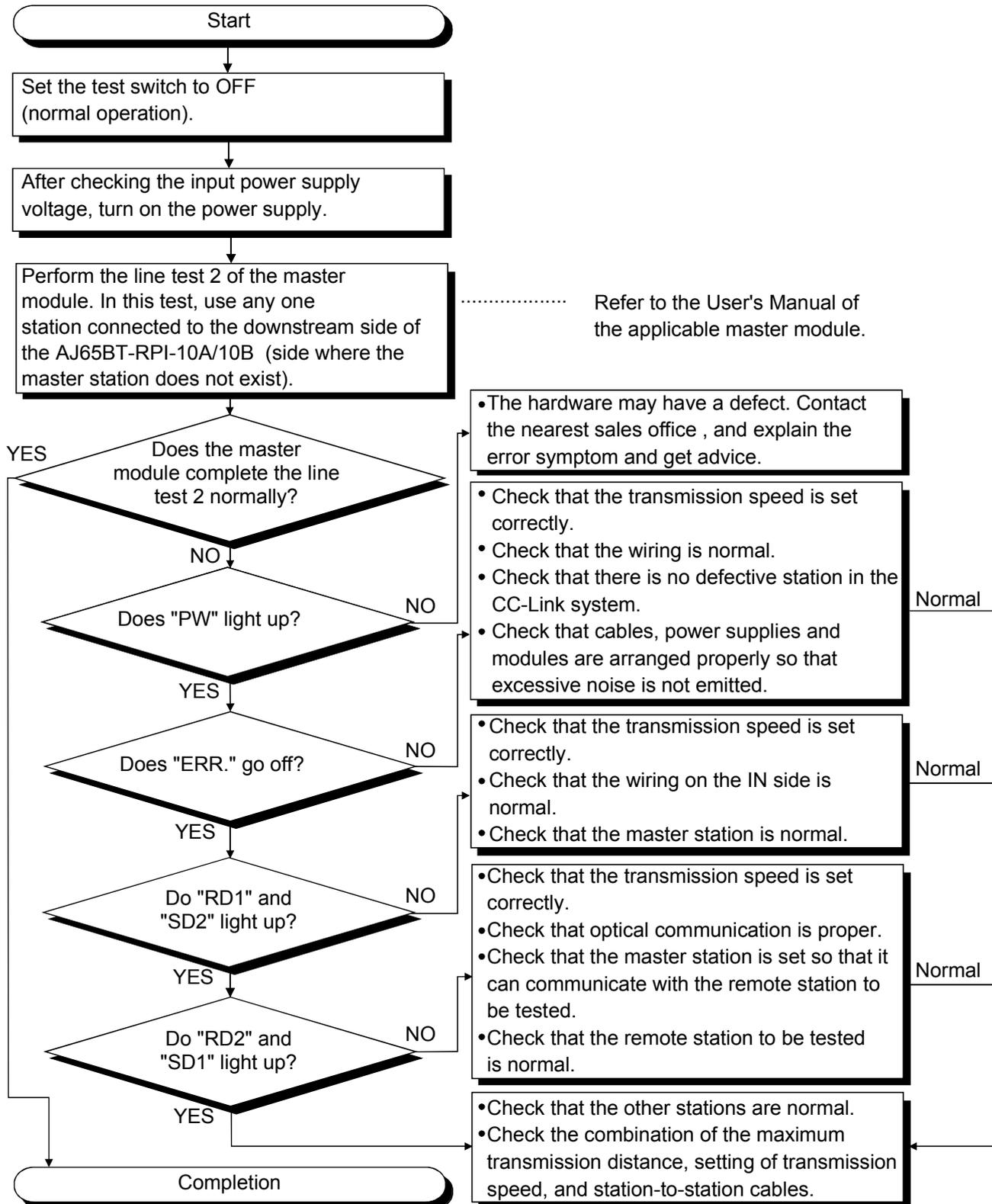


4.7 Check for state of connection (line test)

After connecting all modules including the AJ65BT-RPI-10A/10B, check whether the CC-Link system can establish proper data links or not.

To perform the line test of the AJ65BT-RPI-10A/10B module, use the line test 2 of the master module. For the line test 2 of the master module, refer to the User's Manual of the applicable master module.

Perform the test following the steps shown below.



5. ABOUT THE MONITOR FUNCTION

The monitor function allows the receiving status (RC, R1, R2, R3) indicated by the operation indicator LEDs of the AJ65BT-RPI-10A/10B to be monitored (imported to the master station). To use the monitor function, the station numbers must be set and parameter setting to the master station must also be made as remote I/O stations. For the way to make parameter setting, refer to the user's manual of the master module used.

Also, the imported receiving status of the mating module can be indicated by the "SC, S1, S2, S3" operation indicator LEDs of the own module using the sequence program of the master station, ensuring ease of optical axis adjustment. Refer to Section 3.5 for the I/O signals transferred to/from the master module.

POINT

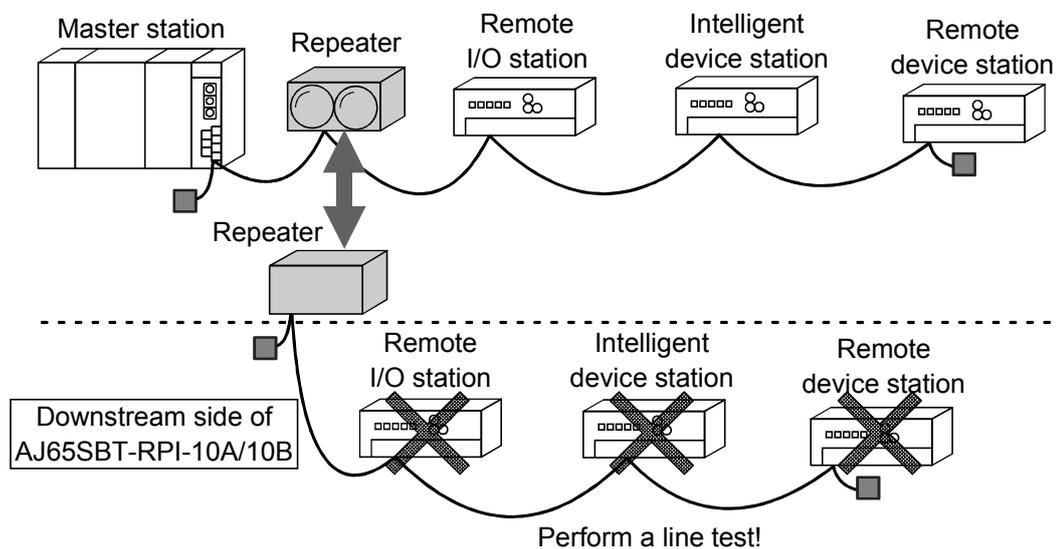
- Make fine adjustment of the optical axes by adjusting the orientation of the own module until the receiving status of the mating module is maximized. Using the monitor function allows the receiving status of the mating module to be checked on the own module, ensuring ease of fine adjustment of the optical axes.
- Since the monitor function transmits the receiving status through CC-Link data link, the modules must at least be ready to receive lights (the "RC" operation indicator LEDs are lit) each other.

6. TROUBLESHOOTING

Any error during data link can be checked by the ERR. LED of the master station.

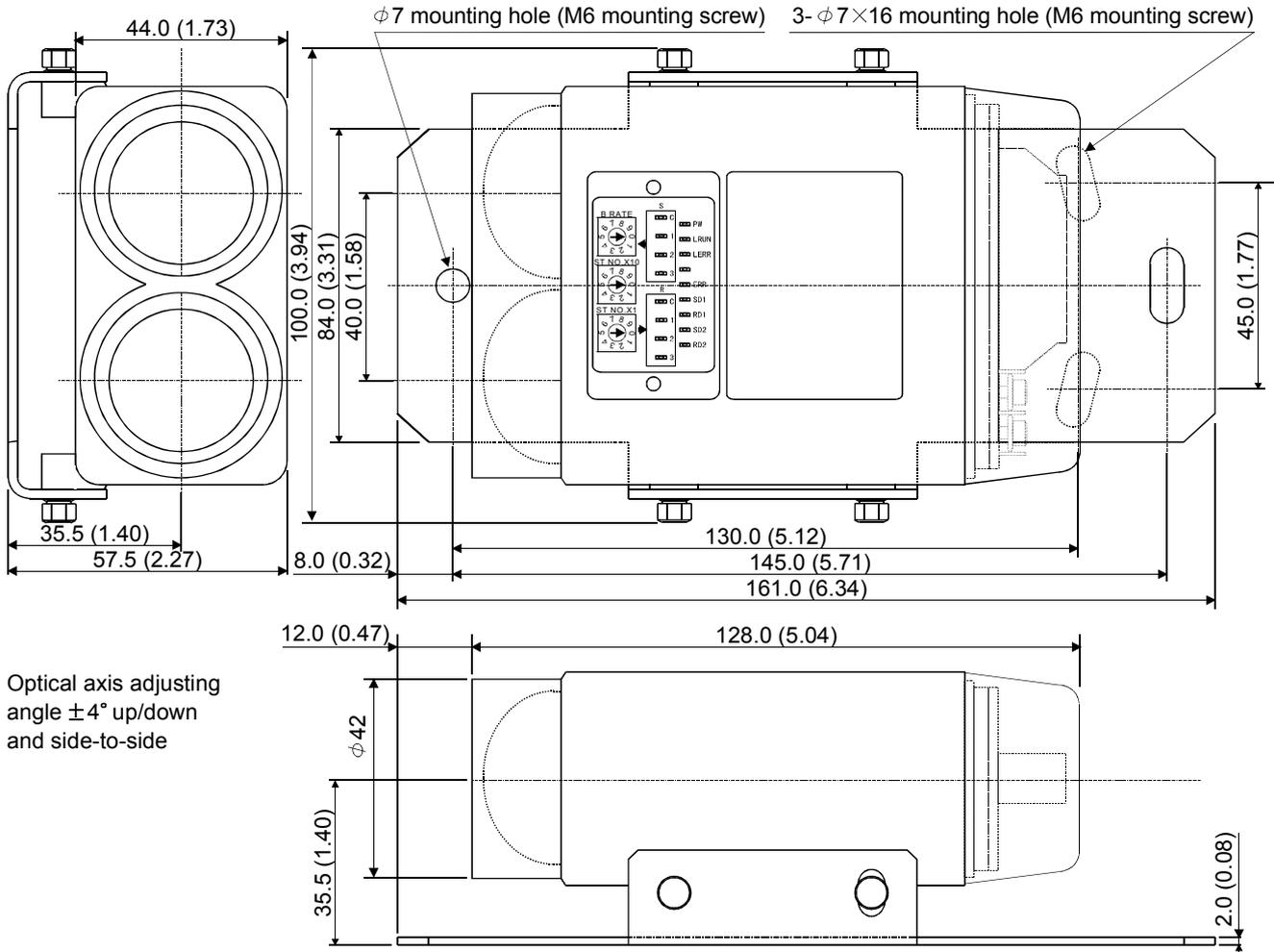
If the ERR. LED of the master station is lit or flickers due to a data link error, first refer to the user's manual of the master module used and check the data link states of the other stations in the CC-Link system.

If there are many stations in data link error on the downstream side of the AJ65BT-RPI-10A/10B (the side on which the master station does not exist), the AJ65BT-RPI-10A/10B may be faulty. Therefore, make a line test again (refer to Section 4.7).



7. EXTERNAL DIMENSIONS DIAGRAM

The external dimensions diagram of the AJ65BT-RPI-10A/10B module is shown below.



Unit : mm (inch)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠ For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

Country/Region	Sales office/Tel	Country/Region	Sales office/Tel
U.S.A	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway Vernon Hills, IL 60061, U.S.A. Tel : +1-847-478-2100	Hong Kong	Mitsubishi Electric Automation (Hong Kong) Ltd. 10th Floor, Manulife Tower, 169 Electric Road, North Point, Hong Kong Tel : +852-2887-8870
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Rua Correia Dias, 184, Edificio Paraiso Trade Center-8 andar Paraiso, Sao Paulo, SP Brazil Tel : +55-11-5908-8331	China	Mitsubishi Electric Automation (Shanghai) Ltd. 4/F Zhi Fu Plazz, No.80 Xin Chang Road, Shanghai 200003, China Tel : +86-21-6120-0808
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8 D-40880 Ratingen, GERMANY Tel : +49-2102-486-0	Taiwan	Setsuyo Enterprise Co., Ltd. 6F No.105 Wu-Kung 3rd.Rd, Wu-Ku Hsiang, Taipei Hsine, Taiwan Tel : +886-2-2299-2499
U.K	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire., AL10 8XB, U.K. Tel : +44-1707-276100	Korea	Mitsubishi Electric Automation Korea Co., Ltd. 1480-6, Gayang-dong, Gangseo-ku Seoul 157-200, Korea Tel : +82-2-3660-9552
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Dir. Colleoni, Pal. Perseo-Ingr.2 Via Paracelso 12, I-20041 Agrate Brianza., Milano, Italy Tel : +39-039-60531	Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building, Singapore 159943 Tel : +65-6470-2460
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80, E-08190 Sant Cugat del Valles, Barcelona, Spain Tel : +34-93-565-3131	Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111 Moo 4, Serithai Rd, T.Kannayao, A.Kannayao, Bangkok 10230 Thailand Tel : +66-2-517-1326
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, F-92741 Nanterre Cedex, France TEL: +33-1-5568-5568	Indonesia	P.T. Autoteknindo Sumber Makmur Muara Karang Selatan, Block A/Utara No.1 Kav. No.11 Kawasan Industri Pergudangan Jakarta - Utara 14440, P.O.Box 5045 Jakarta, 11050 Indonesia Tel : +62-21-6630833
South Africa	Circuit Breaker Industries Ltd. Private Bag 2016, ZA-1600 Isando, South Africa Tel : +27-11-928-2000	India	Messung Systems Pvt, Ltd. Electronic Sadan NO:III Unit No15, M.I.D.C Bhosari, Pune-411026, India Tel : +91-20-2712-3130
		Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, Rydalmere, N.S.W 2116, Australia Tel : +61-2-9684-7777

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14, YADA-MINAMI 5-CHOME, HIGASHI-KU, NAGOYA, JAPAN

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

Specifications subject to change without notice.
Printed in Japan on recycled paper.