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

● 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.

Refer to the CPU module User's Manual for a description of the PC system safety precautions.

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. 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.

[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 alternately and also use the sets more than 1m (3.28ft.) away from each other. Not placing them alternately can cause a malfunction due to interference.

[WIRING PRECAUTIONS]

◇ 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.

[WIRING PRECAUTIONS]

⚠ CAUTION
● Be sure to ground the FG terminal to the class-D (class 3) or higher sequencer dedicated grounding 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. ● 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 the communication and power 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. ● 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. ● 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.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ 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. ● The module case is made of resin; do not drop it or subject it to strong shock. Module damage may result. ● Make sure to switch all phases of the external power supply off before installing or removing the module to/from the panel. If you do not switch off the external power supply, it will cause trouble or malfunction 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	Partial correction Change specified torque range of Display window mounting screw from 32 to 5.8N/cm on Section 4.2.1(1)

CONTENTS

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)
QJ61BT11 CC-Link System Master Local Module User's Manual (Detail version)	SH(NA)080016 (13JL91)
CC-Link System Small Type Remote I/O Module User's Manual (Detail version)	SH(NA)4007 (13JL72)

MEMO

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 Control & Communication Link (hereafter abbreviated to CC-Link) system.
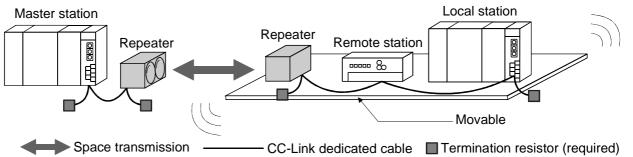
1.1 Features

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.

Space transmission ⟷ ———— CC-Link dedicated cable ■ Termination resistor (required)

[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.

Space transmission ⟷ ———— CC-Link dedicated cable ■ Termination resistor (required)
*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
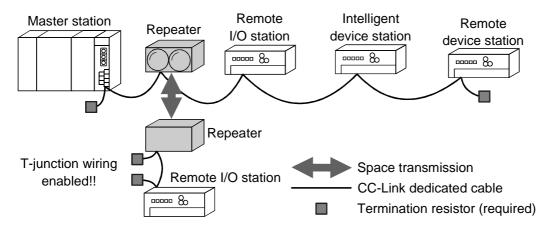   station, ensuring ease of fine adjustment of the optical axes.

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

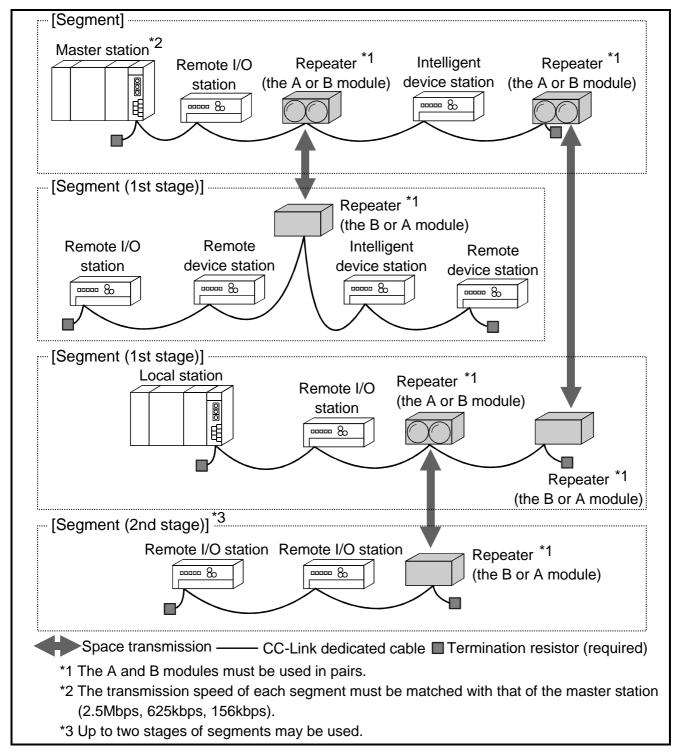| Part name	Quantity
AJ65BT-RPI-10B module	1
Terminating resistances 110 Ω 1/2W (Brown, Brown, Brown)	1
Terminating resistances 130 Ω 1/2W (Brown, Orange, Brown)	1

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 optical space repeater module
A module	Abbreviation of AJ65BT-RPI-10A type CC-Link system optical space repeater module
B module	Abbreviation of AJ65BT-RPI-10B type CC-Link system optical space 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 QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11.
Master module	Generic name of QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 when these are used as the master station.
Local module	Generic name of 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.

[Segment]

Master station *2

Remote I/O station

Repeater *1 (the A or B module)

Intelligent device station

Repeater *1 (the A or B module)

[Segment (1st stage)]

Repeater *1 (the B or A module)

Remote I/O station

Remote device station

Intelligent device station

Remote device station

[Segment (1st stage)]

Local station

Remote I/O station

Repeater *1 (the A or B module)

Repeater *1 (the B or A module)

[Segment (2nd stage)] *3

Remote I/O station   Remote I/O station

Repeater *1 (the B or A module)

Space transmission ——— CC-Link dedicated cable ■ Termination resistor (required)

*1 The A and B modules must be used in pairs.
*2 The transmission speed of each segment must be matched with that of the master station (2.5Mbps, 625kbps, 156kbps).
*3 Up to two stages of segments may be used.
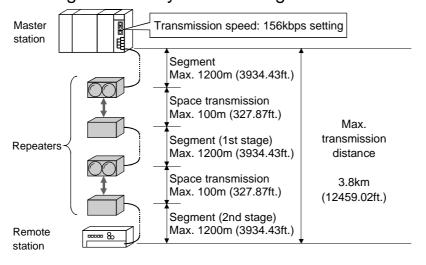
(1) What is a repeater?
   This is the module for expanding the CC-Link system by connecting the segments to each other.

(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 QJ61BT11 module is used, any module can be used irrespective of the version.
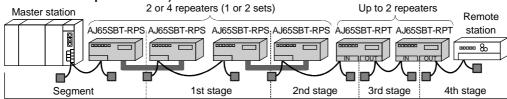

MELSEC
CE
PROGRAMMABLE CONTROLLER
DATE   9707   B
MITSUBISHI ELECTRIC CORPORATION JAPAN
BD992D013H01

Year and month of manufacture   Function version

MITSUBISHI
MODEL
DATE   9707   B
CE
MITSUBISHI ELECTRIC   BD992D008H38

Year and month of manufacture   Function version

(3) Max. number of modules connected to configure CC-Link system
Remote I/O stations, remote device stations, local stations, ready master stations, intelligent device stations and repeaters of 64 modules max. 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.

Master station

Transmission speed: 156kbps setting

Segment
Max. 1200m (3934.43ft.)

Space transmission
Max. 100m (327.87ft.)

Segment (1st stage)
Max. 1200m (3934.43ft.)

Repeaters

Space transmission
Max. 100m (327.87ft.)

Segment (2nd stage)
Max. 1200m (3934.43ft.)

Remote station

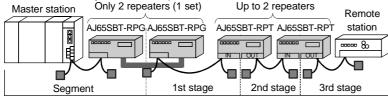Max. transmission distance

3.8km
(12459.02ft.)

5

(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.

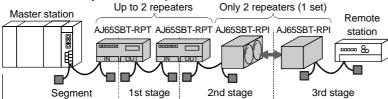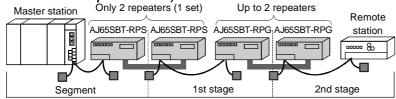| Combination pattern		Max. number of repeaters (repeaters(sets))				Max. number of stages (stages)
		AJ65SBT-RPT	AJ65SBT-RPS	AJ65SBT-RPG	AJ65SBT-RPI-10A/10B	
Pattern of using two kind models	1)	2	4(2)	——	——	4
	2)	2	——	2(1)	——	3
	3)	2	——	——	2(1)	3
	4)	——	2(1)	2(1)	——	2
	5)	——	2(1)	——	2(1)	2
	6)	——	——	2(1)	2(1)	2
Pattern of using three kind models		Must not be used.				

(a) Combination pattern 1)
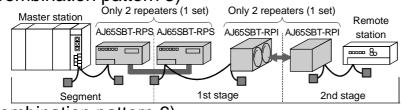

(b) Combination pattern 2)
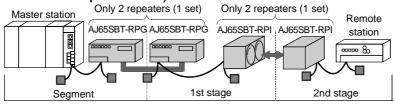

(c) Combination pattern 3)

(d) Combination pattern 4)

(e) Combination pattern 5)

(f) Combination pattern 6)

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℃					
Storage ambient temperature	-25 to 75℃					
Operating ambient humidity	10 to 90%RH, non-condensing					
Storage ambient humidity	10 to 90%RH, non-condensing					
Vibration resistance	Conforming to JIS B 3501, IEC 61131-2			Frequency	Acceleration	Amplitude	Sweep count
		Under intermittent vibration	10 to 57Hz	———	0.75mm (0.03in.)	10 times each in X, Y, Z directions (for 80 min.)
			57 to 150Hz	98m/s^2	———	
		Under continuous vibration	10 to 57Hz	———	0.35mm (0.01in.)	
			57 to 150Hz	49m/s^2	———	
Shock resistance	Conforming to JIS B 3501, 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	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 Z9110) 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 under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause a malfunction.
  When using the PLC under pressure, please contact your sales representative.

3.2 Performance specifications

The following table lists the performance specifications of the AJ65BT-RPI-10A/10B.
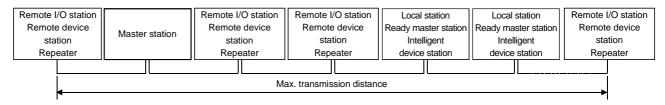
Item			Specifications
Common specifications	Power supply	Voltage (V)	DC20.4 to DC26.4
		Current (mA)	137.0 (at TYP. 24VDC)
	Noise immunity		Simulator noise of 1500Vp-p First transient/burst noise IEC801-4: 1kV, obtained by a noise simulator of $1\mu s$ noise width and 25 to 60Hz noise frequency
	Dielectric withstand voltage		500VAC for 1 minute between all DC external terminals and ground
	Insulation resistance		$10M\Omega$ or higher, measured with a 500VDC insulation resistance tester
	Weight (kg)		0.5
CC-Link communication specifications	Transmission speed (bps)		Can be selected from among 156k, 625k and 2.5M.
	Max. number of segments connected (stages)		2
	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 for the conditions of the number of modules connected.)
	Number of stations occupied (stations)		When using monitor function : 1 When not using monitor function : 0 (Refer to Chapter 5 for details of the monitor function.)
Optical communication specifications	Optical transmission distance (m (ft.))		0 to 100 (0 to 327.87)
	Orientation angle (°)		Optical transmission distance of 0 to 50m (0 to 163.94ft.) : Full angle ±3 Optical transmission distance of 50 to 100m (163.94 to 327.87ft.) : Full angle ±1
	Modulation frequency (MHz)		A module to B module: 36 ±3 B module to A module: 44 ±2.5
	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.

If you have any questions regarding the CC-Link dedicated cable, or if you wish to see its specifications, see the CC-Link Catalog L (NA) 74108143E.

3.4 Max. transmission distance

Remote I/O station Remote device station Repeater	Master station	Remote I/O station Remote device station Repeater	Remote I/O station Remote device station Repeater	Local station Ready master station Intelligent device station	Local station Ready master station Intelligent device station	Remote I/O station Remote device station Repeater

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.

```
           ┌──────────────────────────────┐
           │            Start             │
           └──────────────────────────────┘
                          ↓
  ┌────────────────────────────────────┐
  │ Install the AJ65BT-RPI-10A/10B module. │ · · · · · Refer to Section 4.2.
  └────────────────────────────────────┘
                          ↓
  ┌────────────────────────────────────┐
  │ Set the switches of the module.       │ · · · · · Refer to Section 4.4.
  └────────────────────────────────────┘
                          ↓
  ┌────────────────────────────────────┐
  │ Connect the modules using CC-Link     │
  │ dedicated cables.                     │ · · · · · Refer to Section 4.5.
  └────────────────────────────────────┘
                          ↓
  ┌────────────────────────────────────┐
  │ Make AJ65BT-RPI-10A/10B(A module⇔    │
  │ B module) adjustment of the optical axes. │ · · · · · Refer to Section 4.6.
  └────────────────────────────────────┘
                          ↓
  ┌────────────────────────────────────┐
  │ Check for the connection conditions   │
  │ of the modules (line test).           │ · · · · · Refer to Section 4.7.
  └────────────────────────────────────┘
                          ↓
           ┌──────────────────────────────┐
           │       Start the system.      │ · · · · · Refer to the User's Manual
           └──────────────────────────────┘            of the applicable master module.
                          ↓
           ┌──────────────────────────────┐
           │          Completion          │
           └──────────────────────────────┘
```

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
● Do not directly touch the module's conductive parts. Doing so could cause malfunction or trouble in the module.
● 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.
● 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.

⚠ 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. 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 alternately and also use the sets more than 1m (3.28ft.) away from each other.
  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.

● Be sure to ground the FG terminal to the class-D (class 3) or higher sequencer dedicated grounding 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.

● 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 communication and power 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.

● 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.
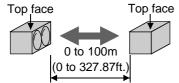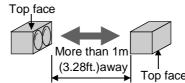
⚠ CAUTION
● For use in any environment where optical axis misalignment or the like is expected due to lens surface contamination, vibration, impact or the like, carry out periodic maintenance/inspection and improve the environment. Not doing so can cause a malfunction. ● Never try to disassemble or modify the module. It may cause trouble, malfunction, injury or fire. ● The module case is made of resin; do not drop it or subject it to strong shock. A module damage may result. ● Make sure to switch all phases of the external power supply off before installing or removing the module to/from the panel. If you do not switch off the external power supply, it will cause trouble or malfunction 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.

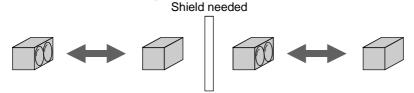| Screw location	Specified torque range (N/cm)
Module mounting screw (M6 thread with finished circular flat washer)	120
Display window mounting screw (M2.6 thread)	5.8
Terminal block screw (M3 thread)	59 to 88
Terminal block mounting screw (M3.5 thread)	68 to 98

(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.

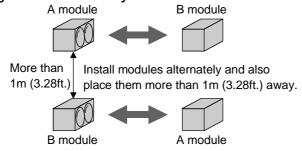[Top faces set in the same orientation]   [Top faces set in the opposite orientations]

Top face   Top face   Top face

0 to 100m   More than 1m
(0 to 327.87ft.)   (3.28ft.)away   Top face

(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.

Shield needed

(4) When using multiple sets of the AJ65BT-RPI-10A/10B in parallel, place the A and B modules alternately and also use the sets more than 1m(3.28ft.) away from each other.Not placing them alternately can cause a malfunction due to interference.
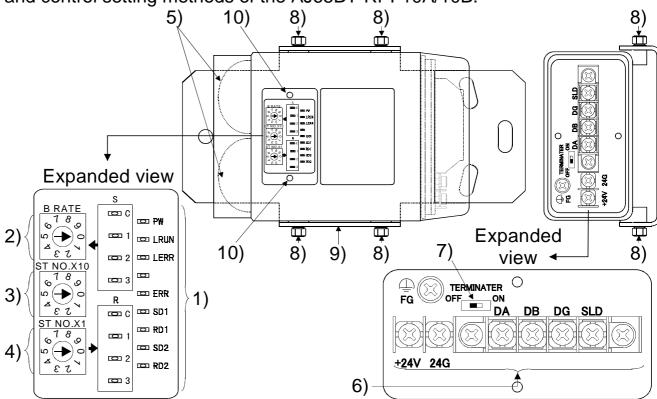
A module   B module

More than   Install modules alternately and also
1m (3.28ft.)   place them more than 1m (3.28ft.) away.

B module   A module

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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.

Expanded view

Expanded view

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.	

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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 01 to 64 : Station number when monitor function is used 65 to 99 : Must not be set.		
4)	Station number setting switch (Units)			
5)	Lens surfaces	Used to make optical communication.		
6)	Terminal block	Used to connect the power supply 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.

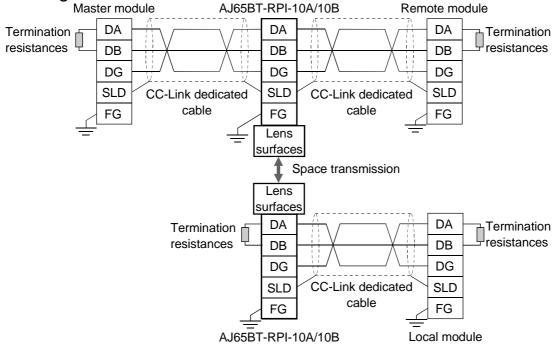| POINT |
|---|
| The setting of the station number setting switches is made valid when the module power is switched from OFF to ON. If the setting has been changed with the module power ON, perform the above operation again. |

(3) Termination resistor switch

The termination resistor switch is used to set whether the built-in termination resistor (110 Ω) 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 Ω) of the AJ65BT-RPI-10A/10B but use the accessory termination resistor.
  1) When the 130 Ω 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

• 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

Adjust the optical axes with power on (with the "PW" operation indicator LED lit) after completion of module connection. Move the oppositely installed A and B modules up/down or side-to-side, respectively.
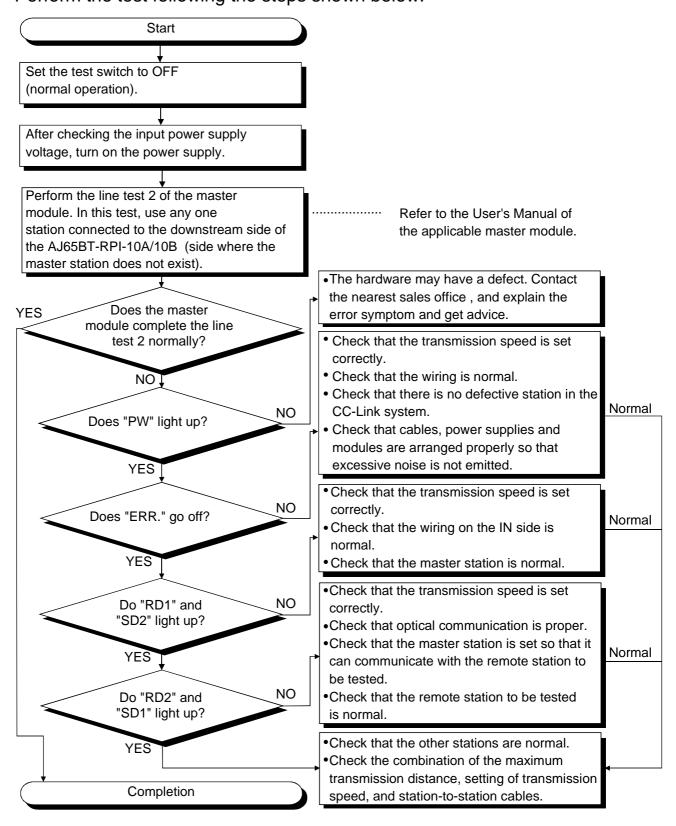Fix the respective modules in the center of the range where they are ready to receive data (the "RC, R1, R2 and R3" operation indicator LEDs are all lit).

POINT
• The "RL1, RL2 and RL3" operation indicator LEDs are barometers which indicate the allowance of the light receiving level.   The allowance increases in order of RL1, RL2 and RL3. • If the AJ65BT-RPI-10A/10B is within the specification range, all the operation indication LEDs are lit.

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.
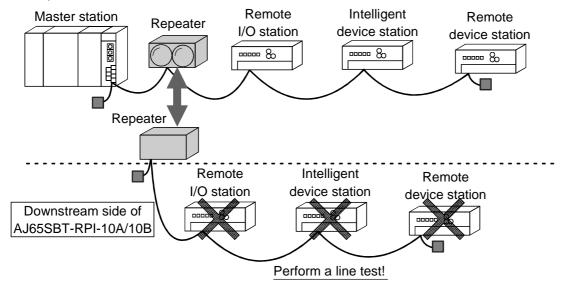
> **POINT**
>
> * Make fine adjustment of the optical axes by adjusting the orientation of the own module until the receiving status of the mating module is maximized.
>   Using the monitor function allows the receiving status of the mating module to be checked on the own module, ensuring ease of fine 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.
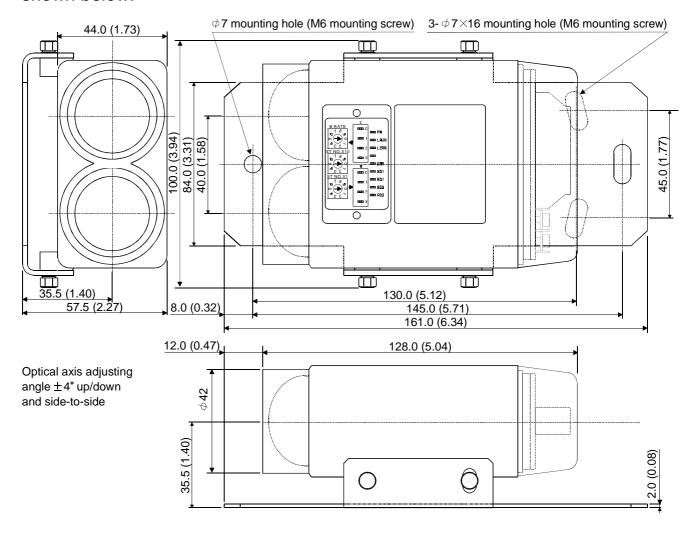If the ERR. LED of the master station is lit or flickers due to a data link error, first refer to the user's manual of the master module used and check the data link states of the other stations in the CC-Link system.

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.

Optical axis adjusting angle ±4° up/down and side-to-side

φ7 mounting hole (M6 mounting screw)

3- φ7×16 mounting hole (M6 mounting screw)

44.0 (1.73)

100.0 (3.94)
84.0 (3.31)
40.0 (1.58)

35.5 (1.40)
57.5 (2.27)
8.0 (0.32)

130.0 (5.12)
145.0 (5.71)
161.0 (6.34)

45.0 (1.77)

12.0 (0.47)
128.0 (5.04)

φ42
35.5 (1.40)
2.0 (0.08)

Unit : mm (inch)

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Warranty

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

⚠ For safe use

• This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.

• Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.

• This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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