MITSUBISHI

Mitsubishi Safety Programmable Logic Controller

MELSEC QS series

CC-Link Safety System Remote I/O Module

User's Manual

QS0J65BTB2-12DT

CC-Link Safety

SAFETY FA NETWORK SERIES

● SAFETY PRECAUTIONS ●

(Always read these instructions before using this equipment.)

Before using the product, please read this manual, the relevant manuals introduced in this manual, standard PLC manuals, and the safety standards carefully and pay full attention to safety to handle the product correctly.

In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

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

[Design Precautions]

DANGER

- When a safety PLC detects an error in an external power supply or a failure in PLC main module, it turns off all the outputs.
  Create an external circuit to securely stop the power of hazard by turning off the outputs.
  Incorrect configuration may result in an accident.

- Create short current protection for a safety relay, and a protection circuit such as a fuse, and breaker, outside a safety PLC.

- If load current more than the rating or overcurrent due to a short circuit in the load has flowed in the CC-Link Safety remote I/O module, the module defines it as a fault and turns off all the outputs.
  However, if overcurrent flows in the CC-Link Safety remote I/O module for a long time, it may cause smoke or a fire. To prevent it, create a safety circuit such as a fuse outside the module.

- When a safety remote I/O module has detected CC-Link Safety error, it turns off all the outputs.
  Note that the outputs in a sequence program are not automatically turned off.
  If CC-Link Safety error has been detected, create a sequence program that turns off the outputs in the program.
  If the CC-Link Safety is restored with the outputs on, it may suddenly operate and result in an accident.

- To inhibit restart without manual operation after safety functions was performed and outputs were turned OFF, create an interlock program which uses a reset button for restart.

[Design Precautions]

⚠CAUTION

● Do not bunch the wires of external devices or communication cables together with the main circuit or power lines, or install them close to each other.
They should be installed 100 mm (3.94 inch) or more from each other.
Not doing so could result in noise that would cause malfunctions.

● Select the external devices to be connected to the CC-Link Safety remote I/O module, considering the maximum inrush current with reference to the CC-Link Safety System Remote I/O Module User's Manual.

[Installation Precautions]

⚠CAUTION

● Use a safety PLC in the environment that meets the general specifications described in the QSCPU User's Manual (Hardware Design, Maintenance and Inspection).
Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.

● Make sure to fix CC-Link Safety remote I/O module with a DIN rail or mounting screws and tighten the screws with the specified torque.
If the screws are too loose, it may cause a drop of the screw or module.
Over tightening may cause a drop due to the damage of the screw or module.

● Do not directly touch the module's conductive parts or electronic components.
Doing so may cause malfunctions or a failure.

[Wiring Precautions]

⚠DANGER

● Be sure to shut off all phases of the external supply power used by the system before wiring.
Not completely turning off all power could result in electric shock or damage to the product.

● When energizing or operating the module after installation or wiring, be sure to close the attached terminal cover.
Not doing so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Ground the FG and LG terminals correctly.
  Not doing so could result in electric shock or malfunctions.

- Wire the module correctly after confirming the rated voltage and terminal layout.
  Connecting a power supply of a different rated voltage or incorrect wiring may cause a fire or failure.

- Tighten a terminal block mounting screw, terminal screw, and module mounting screw within the specified torque range.
  If the terminal block mounting screw or terminal screw is too loose, it may cause a short circuit, fire, or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a drop of the screw or module, a short circuit or malfunctions.
  If the module mounting screw is too loose, it may cause a drop of the screw or module.
  Over tightening the screw may cause a drop due to the damage of the screw or module.

- Be sure there are no foreign substances such as sawdust or wiring debris inside the module.Such debris could cause a fire, failure, or malfunctions.

- Be sure to fix the communication cables or power cables by ducts or clamps when connecting them to the module.
  Failure to do so may cause damage of the module or cables due to a wobble, unintentional shifting, or accidental pull of the cables, or malfunctions due to poor contact of the cable.

- When removing the connected communication cables or power cables, do not pull the cable with grasping the cable part.
  Remove the cable connected to the terminal block after loosening the terminal block screws.
  Pulling the cable connected to a module may result in malfunctions or damage of the module or cable.

[Startup and Maintenance precautions]

DANGER

- Do not touch the terminals while power is on.
  Doing so could result in electric shock.

- Turn off all phases of the external supply power used in the system when cleaning the module or retightening the terminal block mounting screws, terminal screws, or module mounting screws.
  Not doing so could result in electric shock.
  Tighten a terminal block mounting screw, terminal screw, and module mounting screw within the specified torque range.
  If the terminal block mounting screw or terminal screw is too loose, it may cause a short circuit, fire, or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a drop of the screw or module, a short circuit or malfunctions.
  If the module mounting screw is too loose, it may cause a drop of the screw or module.
  Over tightening the screw may cause a drop due to the damage of the screw or module.

CAUTION

- Do not disassemble or modify the modules.
  Doing so could cause a failure, malfunctions, injury, or fire.
  If the product is repaired or remodeled by other than the specified FA centers or us, the warranty is not covered.

- Restrict the mounting/removal of a module, base unit, and terminal block up to 50 times (IEC61131-2-compliant), after the first use of the product.
  Failure to do so may cause the module to malfunction due to poor contact of connector.

- Since the module case is made of resin, do not drop or apply any strong impact to the module.
  Doing so may damage the module.

- Completely turn off the externally supplied power used in the system before mounting or removing the module to/from the panel.
  Not doing so may result in 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
Sep., 2006	SH(NA)-080612ENG-A	First edition

Japanese Manual Version SH-080609-A

INTRODUCTION

Thank you for purchasing the Mitsubishi safety programmable logic controller MELSEC-QS series.

Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the QS series PLC you have purchased, so as to ensure correct use.

CONTENTS

ABOUT MANUALS

Introduction manual

Before constructing or designing the safety system, be sure to read the following manual.

Manual Name	Manual Number (Model Code)
Safety Application Guide Explains the overview and construction method of the safety system, laying and wiring examples, application programs and others. (Sold separately)	SH-080613ENG (13JR90)

Related manuals

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

Manual Name	Manual Number (Model Code)
CC-Link Safety System Master Module User's Manual QS0J61BT12 Explains the specifications, prcedurs and settings up to operation, parameter settings and trouble shootings of the QS0J61BT12 type CC-Link Safety system master module. (Sold separately)	SH-080600ENG (13JR88)
QSCPU User's Manual (Hardware Design, Maintenance and Inspection) Explains the specifications of the QSCPU, safety power supply module, safety base unit and others. (Sold separately)	SH-080626ENG (13JR92)
QSCPU User's Manual (Function Explanation, Program Fundamentals) Explains the functions, programming methods, devices and others. that are necessary to create programs with the QSCPU. (Sold separately)	SH-080627ENG (13JR93)
QSCPU Programming Manual (Common Instructions) Explains how to use the sequence instructions and application instructions. (Sold separately)	SH-080628ENG (13JW01)
GX Developer Version 8 Operating Manual Explains the online functions of the GX Developer, such as the programming, printout, monitoring, and debugging methods. (Sold separately)	SH-080373E (13JU41)
GX Developer Version 8 Operating Manual (Safety PLC) Explains the added and updated GX Developer functions to support the safety PLC. (Sold separately)	SH-080576ENG (13JU53)

REMARK

If you would like to obtain a manual individually, printed matters are available separately. Order the manual by quoting the manual number on the table above (model code).

CONFORMANCE TO THE EMC AND LOW VOLTAGE DIRECTIVES

When incorporating the Mitsubishi PLC compliant with the EMC and Low Voltage Directives into other industrial machinery and ensuring compliance with the directives, refer to Chapter 3 "EMC and Low Voltage Directives" of the QSCPU User's Manual (Hardware).
The CE logo is printed on the rating plate of the module, indicating compliance with the directives.
To conform this product to the EMC and Low Voltage Directives, refer to the QSCPU User's Manual (Hardware), "CC-Link module" in Chapter 3 "EMC and Low Voltage Directives".

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations to explain the CC-Link Safety remote I/O module QS0J65BTB2-12DT.

Generic Term/Abbreviation	Description
PLC	Abbreviation for Programmable Logic Controller.
Safety remote I/O module	Other name for QS0J65BTB2-12DT.
Safety master station	Station which controls the CC-Link Safety system. One station is required per system.
Safety remote I/O station	Remote station which handles only the informaion in bit unit. Compatible with the safety-related system.
Safety remote station	Other name for Safety remote I/O station.
Safety master module	Other name for QS0J61BT12 type CC-Link Safety system master module.
Standard remote I/O module	General name for AJ65BTB1-16D, AJ65SBTB1-16D, AJ65BT-64AD, AJ65BT-64DAV, AJ65BT-64DAI, and A852GOT.
SB	Link special relay (For CC-Link Safety system) Information of the bit unit that indicates the module operation status and data link status of the safety master station. Represented by SB expediently.
SW	Link special register (For CC-Link Safety system) Information of the 16-bit unit that indicates the module operation status and data link status of the safety master station. Represented by SW expediently.
RX	Remote input (For CC-Link Safety system) Information which is input in bit unit from the safety remote station to the safety master station. Represented by RX expediently.
RY	Remote output (For CC-Link Safety system) Information which is output in bit unit from the safety master station to the safety remote station. Represented by RY expediently.
Safety CPU module	Abbreviation for QS001CPU type safety CPU module.
Safety PLC	General name for safety CPU module, safety power supply module, safety main base unit, CC-Link safety master module and CC-Link safety remote I/O module.
Standard PLC	General name of each module for MELSEC-Q series, MELSEC-QnA series, MELSEC-A series and MELSEC-FX series. (Used for distinction from safety PLC.)
GX Developer	General product name for the models, SW8D5C-GPPW, SW8D5C-GPPW-A, SW8D5C-GPPW-V and SW8D5C-GPPW-VA.
Dark test	Outputs a pulse to turn OFF the input/output when it is ON, and performs the failure diagnostics to contacts including external equipment.

PACKING LIST

The following indicates the packing list of this product.

Item	Quantity
QS0J65BTB2-12DT	1
Holding fixtures for screw installation	2
CC-Link Safety System Remote I/O Module User's Manual (Hardware)QS0J65BTB2-12DT	1

CHAPTER1 OVERVIEW

This User's Manual describes the specifications, handling and wiring methods of the safety remote I/O module of the CC-Link Safety system.

1.1 Features

The following describes the features of the safety remote I/O module.

(1) Highest level of safety approval acquired
The safety remote I/O module is the one which has acquired the highest level of the certification for PLC (IEC61508 SIL3, EN954-1/ISO13849-1 Category 4).
The safety-related system with high security can be configured.

(2) Compatible with the safety category 3 and 4
The system corresponding to category 3 or category 4 of EN954-1 can be configured according to the combination of wiring and parameters.

(3) Space-saving system design
Compared to the system with the safety relay, this system can be configured with a smaller space.

(4) Improvement of wiring work efficiency
Adopting a 2-piece terminal block allows shortened wiring work hours so that incorrect wiring can be avoided at module replacement.
In addition, multiple COM terminals avoid the necessity to add a relay terminal block.

(5) Fail-safe function
When a failure occurs inside the module, the self-diagnostics function detects the failure and turns OFF the output.

(6) Enhanced failure diagnostics
Conducting a dark test (contact fixing diagnosis) allows an error diagnostics on the external safety devices included.
The self-diagnostics such as memory diagnostics or circuit block diagnostics is conducted.

(7) Simple settings in parameters
Using the parameter setting screen of the programming tool allows the easier settings for the safety remote I/O module.

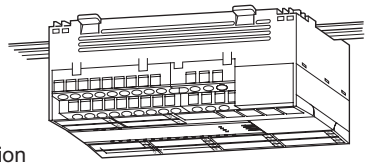
(8) Improved maintenanceability at trouble occurrence
Classifying error information into major/moderate/minor allows the easier judgment of failures/errors.

(9) Reset available for single module

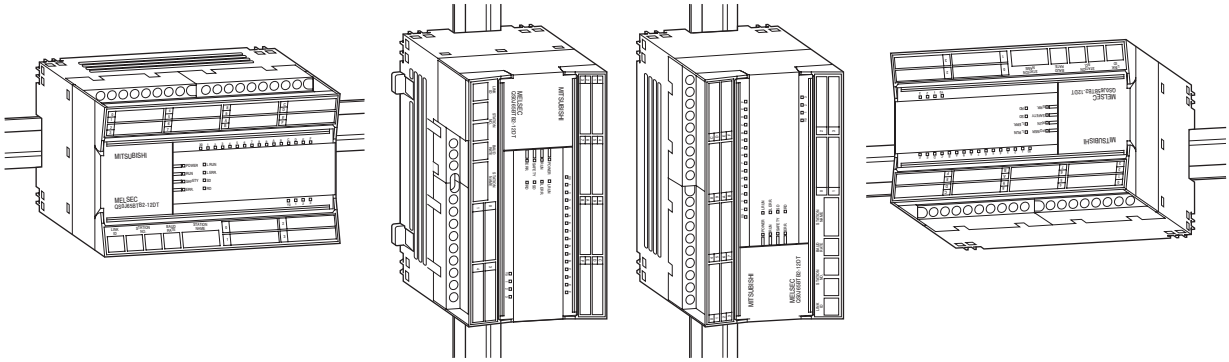
When an error occurs in the module, resetting a single module is possible without turning the power from OFF to ON.

(10)The module can be installed in six orientations

The safety remote I/O module can be installed in six different orientations.
The module can also be installed using the DIN rail.



Ceiling installation



Front installation

Horizontal installation

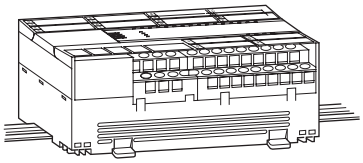


Table1.1 Module installation orientation

CHAPTER2 SYSTEM CONFIGURATION

This chapter describes the system configuration, cautions for use and system equipment of the safety remote I/O module.

2.1 Overall Configuration

The following describes the system configuration of the safety remote I/O module. The safety remote I/O module is connected to various safety devices such as an emergency stop or a light curtain, and the safety-related system is configured by combining the safety remote I/O module with a safety CPU module or safety master module.

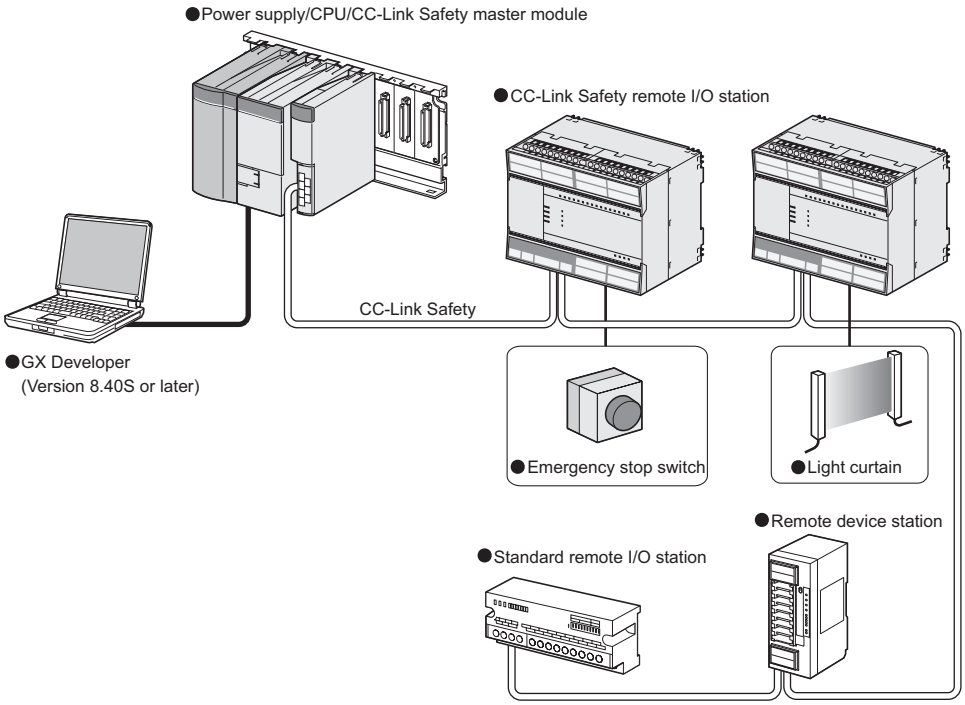


Figure 2.1 Overall Configuration

2.2 Cautions on the System Configuration

This section describes the equipment which can be configured and the available software package to use the safety remote I/O module.

(1) Applicable master module
The safety remote I/O module can connect to only the safety master module.

(2) Applicable software package
The following shows the software package compatible with the safety remote I/O module.

Product name	Model	Remark
GX Developer	SW8D5C-GPPW Version 8.40S or later	Necessary. MELSEC PLC programming software

2.3 Confirming Production Information

The production information of the QS0J65BTB2-12DT can be confirmed on the rating plate on the side face of the module.

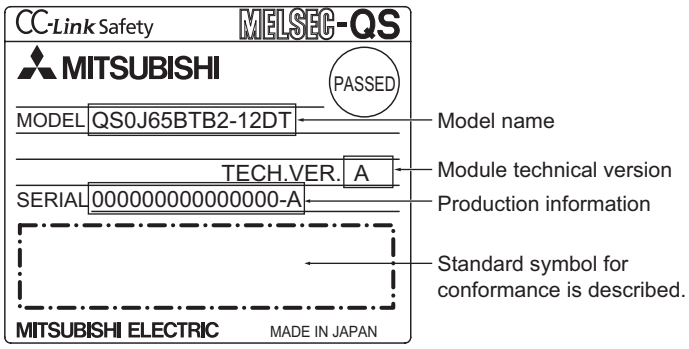


Figure 2.2 Production information confirmation

CHAPTER3 SPECIFICATIONS

This chapter describes the specifications of QS0J65BTB2-12DT.

3.1 General Specifications

The general specifications of QS0J65BTB2-12DT are shown in Table3.1.

Table3.1 General specifications

Item	Specification					
Operating ambient temperature	0 to 55°C					
Storage ambient temperature	-40 to 75°C					
Operating ambient humidity	5 to 95%RH, non-condensing					
Storage ambient humidity	5 to 95%RH, non-condensing					
Vibration resistance	Conforming to JIS B 3502, IEC 61131-2		Frequency range	Constant acceleration	Half amplitude	Sweep count
		Under intermittent vibration	5 to 9Hz	----	3.5mm (0.14inch)	10 times each in X, Y, Z directions respectively
			9 to 150Hz	9.8m/s^2	----	
		Under continuous vibration	5 to 9Hz	----	1.75mm (0.07inch)	
			9 to 150Hz	4.9m/s^2	----	
Shock resistance	Conforming to JIS B 3502, IEC 61131-2 (147 m/s^2, duration of action 11ms, three times in X, Y, Z directions respectively by sine half-wave pulse)					
Operating ambiance	No corrosive gas					
Operating altitude *3	2000 m (6562 ft.) or less					
Installation area	Within a control panel					
Overvoltage category *1	II or lower					
Equipment category	Class III					

*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 can be generated in terms of the environment where the equipment is used. In the environment corresponding to "Pollution level 2", basically only non-conductive pollution occurs, however temporary conductivity may occur due to occasional condensation.

*3: Do not operate or store the PLC in the environment where the pressure applied is equal to or greater than the atmospheric pressure at the altitude of 0m. Doing so may cause a malfunction. Please consult our branch office for more information.

3.2 Performance Specifications

The performance specifications of QS0J65BTB2-12DT are shown in Table3.2.

Table3.2 Performance specifications

Item		DC-input transistor-output combined module QS0J65BTB2-12DT			
Input specifications			Output specifications		
No. of input points		8 points (Input terminals: 16 points*2)	No. of output points		4 points (source + sink type) 2 points (source + source type)
Isolation method		Photocoupler	Isolation method		Photocoupler
Rated input voltage		24V DC	Rated load voltage		24V DC
Rated input current		Approx. 4.6mA	Operating load voltage range		19.2V to 28.8V DC (Ripple ratio: 5% or less)
Operating voltage range		19.2V to 28.8V DC (Ripple ratio: 5% or less)	Max. load current		0.5A/point
Max. simultaneous input points		100% *1	Max. inrush current		1.0A, 10ms or less
ON voltage/ON current		15V DC/2mA or more	Leakage current at OFF		0.5mA or less
OFF voltage/OFF current		5V DC/0.5mA or less	Max. voltage drop at ON		1.0V DC or less
Input resistance		Approx.5.6kΩ	Protection function		Output overload protection function
Input type		Negative common	Output type		Source + sink type Source + source type
Response time	OFF→ON	0.4ms or less (at 24V DC)	Response time	OFF→ON	0.4ms or less (at 24V DC)
	ON→OFF	0.4ms or less (at 24V DC)		ON→OFF	0.4ms or less (at 24V DC)
Safety remote station input response time		32ms or less + filter-out time (1ms, 5ms, 10ms, 20ms, 50ms)	Safety remote station output response time		32ms or less
			Surge suppressor		Zener diode
External power supply	Voltage	19.2V to 28.8V DC (Ripple ratio: 5% or less)			
	Current	60mA (24VDC, with all points ON, excepting for external load current)			
	Protection function	External power supply overvoltage/overcurrent protection function			
	Fuse	8A (Not replaceable)			
Wiring method for common		16 input points/common, 4 output points/common (Terminal block 2-wire type)			
Common current		Max. 4A (Total of inputs and outputs)			
No. of stations occupied		1 station			
No. of access to nonvolatile memory inside module		10^{12} times			
Safety refresh response processing time		38ms			
Module power*1	Voltage	19.2V to 28.8V DC (Ripple ratio: 5% or less)			
	Current	140mA or less (24V DC, with all points ON)			
	Protection function	Module power overvoltage/overcurrent protection function			
	Fuse	0.8A (Not replaceable)			
	Momentary power failure period	10ms or less			
Noise immunity		Tested by a DC-type noise simulator with noise voltage of 500Vp-p, noise width of 1μs and frequency of 25 to 60Hz.			
Dielectric withstand voltage		500V AC between all external DC terminals and ground, for 1 minute			
Insulation resistance		10MΩ or more between all external DC terminals and ground, by a 500VDC insulation resistance tester			
Level of protection		IP2X			
Weight		0.67kg			
External connection system	Communication section, module power section	7-point detachable terminal block [Transmission circuits, module power, FG] M3 x 5.2 Tightening torque: 0.425 to 0.575N•m, 2 solderless terminals or less			
	External power supply section, I/O section	18-point detachable terminal block x 3 [External power supply, I/O signals] M3 x 5.2 Tightening torque: 0.425 to 0.575N•m, 2 solderless terminals or less			
Module fixing screw		M4 screw with polished and round flat washer (Tightening torque: 0.824 to 1.11N•m) Mountable with a DIN rail, and in 6 orientations.			

Item	DC-input transistor-output combined module
	QS0J65BTB2-12DT
Applicable DIN rail	TH35-7.5Fe, TH35-7.5Al (Compliant with JIS C 2812)
Applicable cable size	0.3 to 2.0mm
Applicable solderless terminal	• RAV1.25-3 (Compliant with JIS C 2805) [Applicable wire size: 0.3 to 1.25mm^2] • V2-MS3 (JST Mfg. Co., Ltd.), RAP2-3SL (Nippon Tanshi Co., Ltd.), TGV2-3N (Nichifu) [Applicable wire size: 1.25 to 2mm^2]

*1: The power supply connected to the QS0J65BTB2-12DT must satisfy the following conditions:

(1) Reinforced insulation

SELV (Safety Extra Low Voltage): Hazardous potential part (48V or more)

(2) Compliance with the LVD (Low Voltage Directive)

(3) Output voltage within 19.2V to 28.8V DC(Ripple ratio: 5% or less.)

*2: Two inputs terminals are assigned for each input since dual wiring is supported.

3.3 I/O Signals

The safety remote I/O module is operated as a safety remote I/O station of 1 occupied station.
Number of I/O points per station is 32 points. However, in the safety remote I/O module, only 16 input points and 4 output points of them are available.

(1) Assignment of I/O signal

Assignment of I/O signal is shown in Table3.3 and 3.4.

Table3.3 Assignment of input signal

Remote input (RX)	Description
RX0	External input signal X0 of safety remote I/O module
to	to
RXF	External input signal XF of safety remote I/O module
RX(n+1)0	Use prohibited
to	
RX(n+1)F	

Table3.4 Assignment of output signal

Remote output (RY)	Description
RY0	External output signal Y0 of safety remote I/O module
to	to
RY3	External output signal Y3 of safety remote I/O module
RY4	Use prohibited
to	
RYF	
RY(n+1)0	
to	
RY(n+1)F	

POINT

The devices of use prohibited shown in Table3.3 and 3.4 cannot be used by a user.
When used (ON/OFF) by a user, normal operation is not guaranteed.

(2) How to use I/O signal

The method of using I/O signals is described below.

(a) Relationships between I/O signals

Relationships between I/O signals are shown in Table3.5 and 3.6.

Table3.5 RX assignment

Input		Remote input		Remark
X00	X01	RXn0	RXn1	
OFF	OFF	OFF	OFF	• 1 signal for 2 inputs. *1 • When 2 inputs are mismatched, both RXn0 and RXn1 are turned OFF.
OFF	ON	OFF	OFF	
ON	OFF	OFF	OFF	
ON	ON	ON	ON	

*1: For the program, both RXn0 and RXn1 can be used.

Table3.6 RY assignment

Remote output		Output			Setting of "Method of wiring of output" parameter	Remark
RYn0	RYn1	Y0+	Y0-	Y1+		
OFF	—	OFF	OFF	—	Reserved	Output (Y0+) and (Y0-) remain OFF even if RYn0 is turned ON.
ON	—	OFF	OFF	—		
OFF	—	OFF	OFF	—	Doubling wiring (Source+Sink)	• 2 outpus for 1 signal. • Both source side output (Y0+) and sink side output (Y0-) turn ON when RYn0 is turned ON.
ON	—	ON	ON	—		
OFF	OFF	OFF	OFF	OFF	Doubling wiring (Source+Source)	• 2 outpus for 2 signals. • Source output (Y0+) and source output (Y1+) simultaneously turn ON when both RYn0 and RYn1 are turned ON.
	ON	OFF	OFF	OFF		
ON	OFF	OFF	OFF	OFF		
	ON	ON	OFF	ON		

(b) Combination of signals that can be dual
When wiring is dual, the combinations of signals are fixed as shown in Table3.7 and 3.8.

Table3.7 Combination of inputs that can be dual

Signal	Combination of inputs							
Input signal (X)	X0	X2	X4	X6	X8	XA	XC	XE
	X1	X3	X5	X7	X9	XB	XD	XF
Remote input (RX)	RXn0	RXn2	RXn4	RXn6	RXn8	RXnA	RXnC	RXnE
	RXn1	RXn3	RXn5	RXn7	RXn9	RXnB	RXnD	RXnF

Table3.8 Combination of outputs that can be dual

Signal	Combination of outputs					
	Source+Sink				Source+Source	
Remote output (RY)	RYn0	RYn1	RYn2	RYn3	RYn0 RYn1	RYn2 RYn3
Output signal (Y)	Y0+	Y1+	Y2+	Y3+	Y0+	Y2+
	Y0-	Y1-	Y2-	Y3-	Y1+	Y3+

3.4 Cable Specifications

Use dedicated CC-Link cables for the CC-Link Safety System.
The performance of the CC-Link Safety System cannot be guaranteed when any other cables are used.
For the specifications or any other inquiries, visit the following website:
CC-Link Partner Association: http://www.cc-link.org/

REMARK

For details, refer to the CC-Link Cable Wiring Manual issued by the CC-Link Partner Association.

CHAPTER4 FUNCTIONS

This chapter describes the functions of QS0J65BTB2-12DT.

4.1 Function List

The function list of QS0J65BTB2-12DT is shown in Table4.1.

Table4.1 Function list of QS0J65BTB2-12DT

Classification	Function		Description	Reference Section
Input/Output function	Input function		Function used to double the input wiring Function used to set the filter time for reducing noise of the input signal.	Section 4.2
	Output function		Function used to double the output wiring.	Section 4.3
Safety functions	I/O diagnostics function		Function used to confirm whether I/O signal is normal.	—
	Self-diagnostics function	Hardware diagnostics function	Function used to confirm whether the safety remote I/O module operates normally.	—
		Power supply diagnostics function	Function used to confirm whether an overvoltage or undervoltage occurs to the power supply which is input.	—
		CC-Link diagnostics function	Function used to confirm whether the CC-Link Safety system operates normally.	—
	Protection function		Function used to avoid the effects of overvoltage and overcurrent to other modules of the safety-related system.	Section 4.4
Error history function	Error history function		Function used to save the error description saved inside the safety remote I/O module to the inside nonvolatile memory as an error history. Function used to send the saved error history to the safety CPU module.	Section 4.5
Parameter function	Input setting function		Function used to set the input parameter.	Section 5.2.1
	Output setting function		Function used to set the output parameter.	Section 5.2.2

4.2 Input Function

The input function has input dual wiring function and noise removal filter function.

(1) Input dual wiring function

This function is used to double the input wiring.
An input error can be detected immediately after verifying input signals by doubling the wiring.

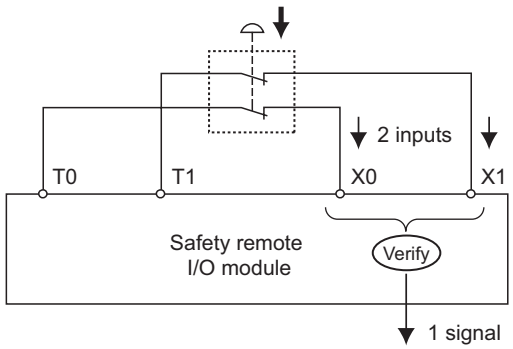


Figure 4.1 Input dual wiring

(2) Noise removal filter

This function is used to set the filter time for reducing noise of the input signal. The noise removal filter can be set to the following five stages.

- 1ms
- 5ms
- 10ms
- 20ms
- 50ms

Set the noise removal filter in the "Time of noise removal filter" parameter.
For the setting of the "Time of noise removal filter", refer to section 5.2.1(1)

The longer the noise removal filter is, the higher the durability to chattering or noise becomes. However, the response to the input signal will become slow.
On the other hand, the shorter the noise removal filter is, the faster the response to the input signal becomes. However, the durability to chattering or noise will become low.

Example) When setting "1ms" to "Time of noise removal filter."

If there is no effect of noise, the time set for "Time of noise removal filter" and the time taken from when the external input turns ON/OFF until when X input signal inside the module turns ON/OFF will be equal.

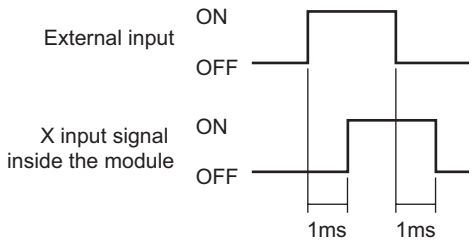


Figure 4.2 Delay of input signal

4.3 Output Function

The output function has output dual wiring function.

(1) Output dual wiring function

This function is used to double the output wiring.
An output error can be detected immediately after verifying output signals by doubling the wiring.
The following two methods are available for doubling the wiring of the safety remote I/O module output. Select either of them depending on the method for wiring with external safety devices to be connected.

- Dual wiring method for combining a source output and a sink output

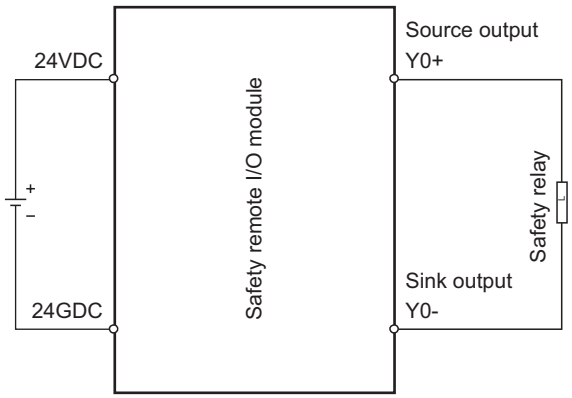


Figure 4.3 Dual wiring method for combining a source output and a sink output

- Dual wiring method for combining a source output and a source output

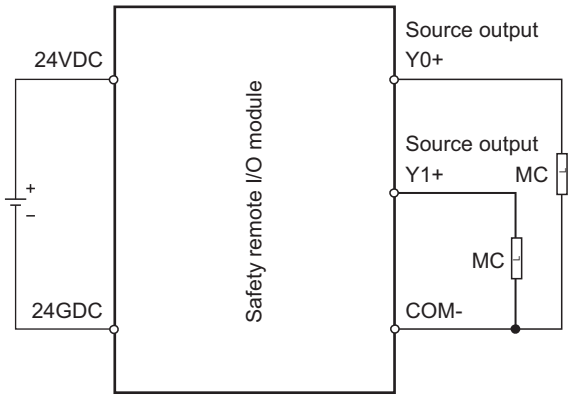


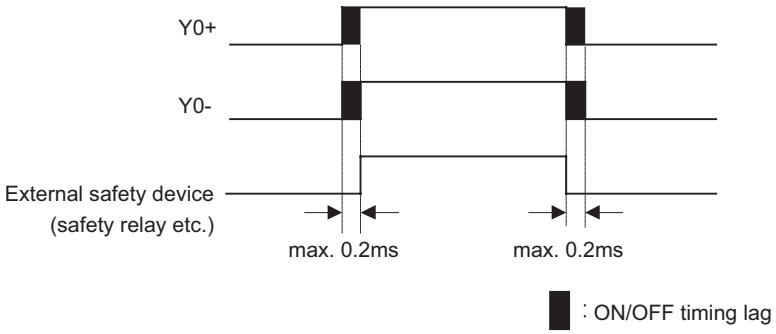
Figure 4.4 Dual wiring method for combining a source output and a source output

Set the method of output wiring in the "Method of wiring of output" parameter.
For the setting of the "Method of wiring of output", refer to Section 5.2.2(1).

POINT

(1) On the safety remote I/O module, the dual wiring method for combining a sink output and a sink output cannot be used.

(2) In case of dual wiring combining a source output and a sink output, up to 0.2ms time lag may occur between the ON/OFF timing of Y0+ and the ON/OFF timing of Y0- as shown below due to the internal processing of the safety remote I/O module.



4.4 Protection Function

The protection function has five types of functions shown in Table4.2.

Table4.2 Protection function list"

Name	Purpose	Description
Module power supply overvoltage protection function	Prevents fire or burning from the safety remote I/O module due to the primary side overvoltage.	Operates when the module internal power supply goes into the primary side overvoltage status.
Module power supply overcurrent protection function	Prevents fire or burning from the safety remote I/O module due to the primary side overcurrent.	Operates when the module internal power supply goes into the primary side overcurrent status.
I/O control power supply overvoltage protection function	Prevents fire or burning from the safety remote I/O module and load circuit due to the overvoltage.	Operates when the I/O control power supply circuit goes into the primary side overvoltage status.
I/O control power supply overcurrent protection function	Prevents fire or burning from the safety remote I/O module and load circuit due to the overcurrent.	Operates when the I/O control power supply circuit goes into the primary side overcurrent status.
Output overload protection function	Prevents fire or burning from the safety remote I/O module due to the overcurrent or overheat caused by the short-circuit of the output circuit.	Operates when 5A/1 point or more current flows. Recovers when the safety remote I/O module is reset in the condition that the load becomes the rated load.

4.5 Error History Function

The error history function has saving and reading of the error history.

(1) Saving of the error history

When an error occurs in the remote I/O module, the error description is saved to the nonvolatile memory inside the module as an error history.

(2) Reading of the error history

The description of error saved in the nonvolatile memory inside the safety remote I/O module can be read from the safety CPU module by the previous link ID switch setting and confirmed by GX Developer.
The safety CPU module reads all the error histories inside the safety remote I/O module.

By confirming the error history, the cause of the error can be identified.
For confirming errors, refer to Section 9.4.
For classification of erros, refer to Section 9.5.

The reading procedure of error history is shown in Figure 4.5.

Start

↓

Terminal block removal
Turn OFF the power supply of the safety remote I/O module and remove the terminal block part.

↓

Switch setting
Set the link ID switch of the safety remote I/O module to "EL".

↓

Safety confirmation
Confirm that the power supply of connected device is OFF.

↓

Start of reading the error history
Turn ON the power supply of the safety remote I/O module.
The safety CPU module automatically reads the error history from the safety remote I/O module.

↓

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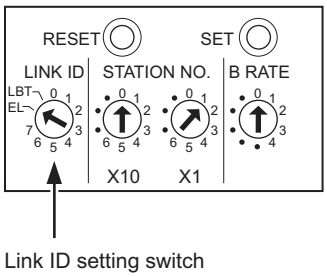

Link ID setting switch

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↓

Completion of reading the error history	
[Normal]	When "RUN" LED flashes, the reading of error history is completed normally. Turn OFF the power supply of the safety remote I/O module.
[Error]	When "ERR." LED flashes, the reading of error history is completed abnormally. Turn OFF the power supply of the safety remote I/O module and read the error history again.

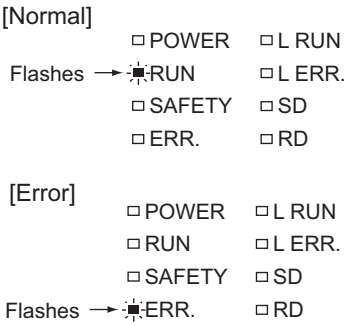


Figure 4.5 Procedure for reading error history

POINT

1) The reading of error history can be used only when the safety remote I/O module can be connected with CC-Link Safety at power-on.
When reading of error history is impossible, deal with it in accordance with troubleshooting. (☞ Section 9.2)
2) Perform the reading of error history for one safety remote I/O module per read.
When the reading of error history is simultaneously performed in the multiple safety remote I/O modules, the error histories in the multiple modules are displayed together on the PLC diagnostics display.

CHAPTER5 PARAMETER SETTING

This chapter describes the parameter setting of QS0J65BTB2-12DT.

The following must be considered for the safety remote I/O module before setting the parameter .

- Determine the level of the safety category to obtain a certification for the third-party accreditation organization.
- Determine the connecting devices selection, wiring method and diagnostics function according to the safety category to be certificated.

The parameters of the safety remote I/O module are written via the safety master module at the following operation.

- Reset operation or power-off to -on of the safety CPU module at the safety master station
- Reset operation or power-off to -on of the safety remote I/O module

(1) Parameter setting method

The parameter setting of the safety remote I/O module is made on the network parameter setting screen of GX Developer.
For the operation method of GX Developer, refer to GX Developer Version 8 Operating Manual.

The parameter setting method by GX Developer is shown below.

(a) Display of station information setting screen

Select [Parameter] → [Network parameter] → **CC-Link** button → **Station information** button to display the station information setting screen.

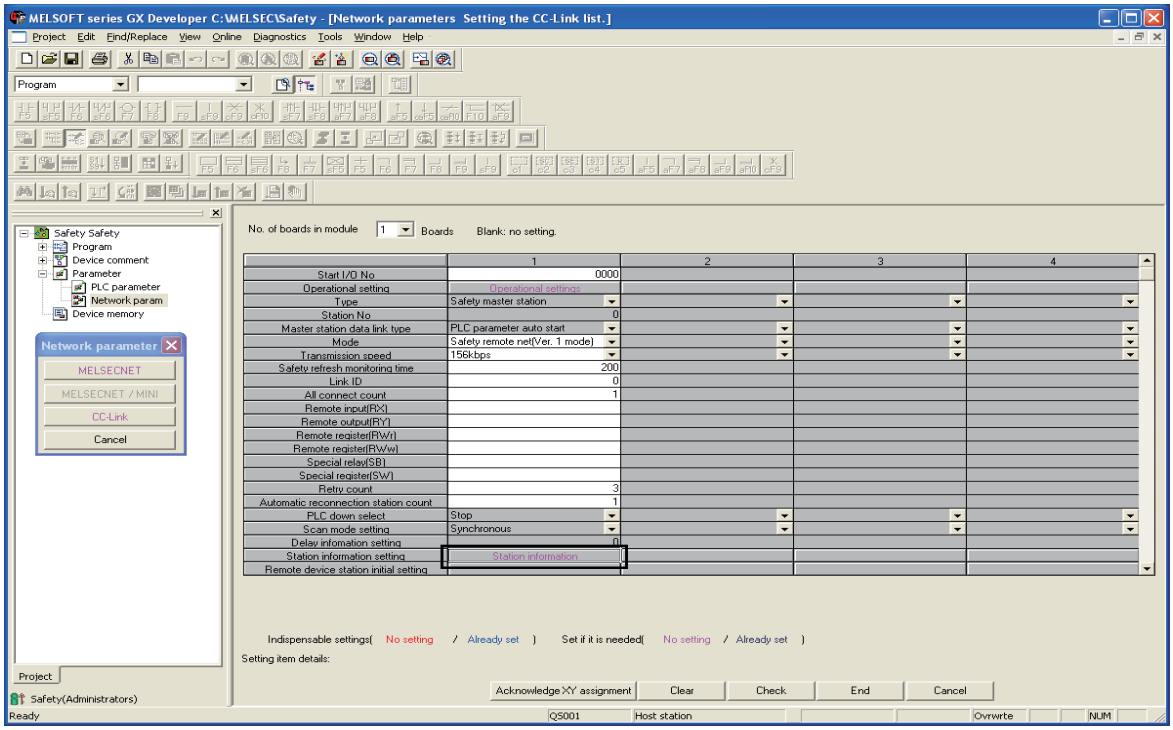


Figure 5.1 CC-Link setting screen

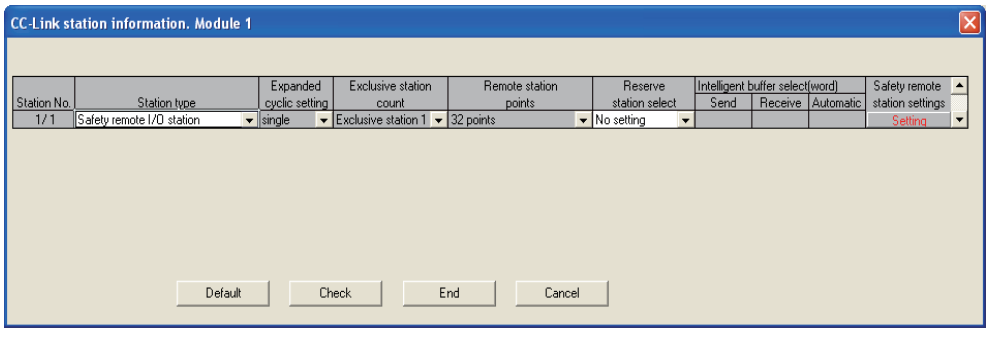


Figure 5.2 Station information setting screen

(b) Display of safety remote station setting screen

Click the **Setting** button on the station information setting screen to display the safety remote station setting screen.

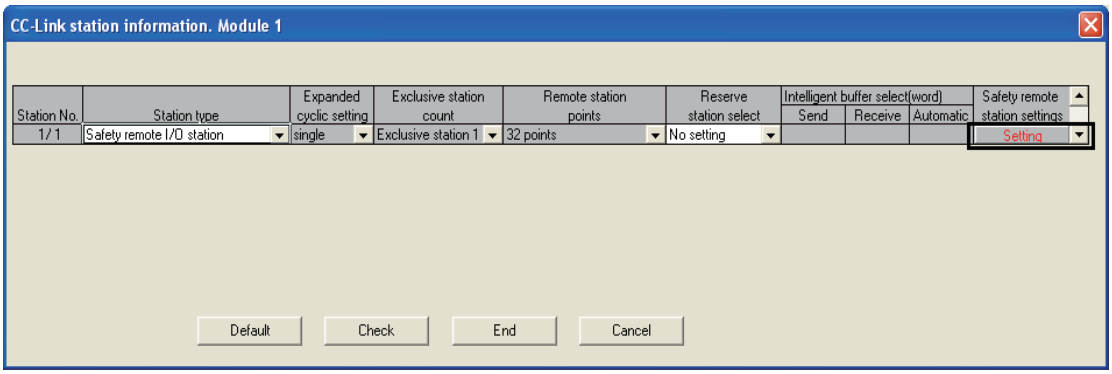


Figure 5.3 Station information setting screen

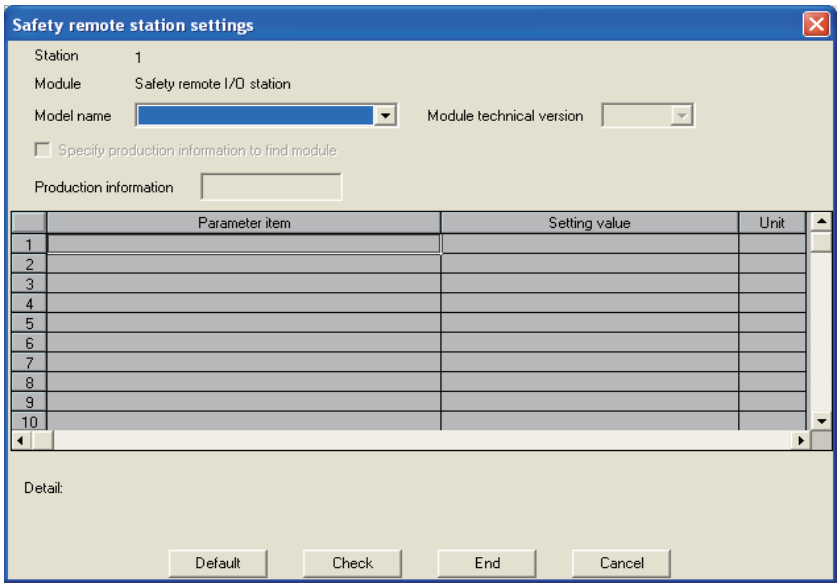


Figure 5.4 Safety remote station setting screen

(c) Model and module technical version settings

Set the model and module technical version of the safety remote I/O module.
For checking the module technical version, refer to Section 2.3.

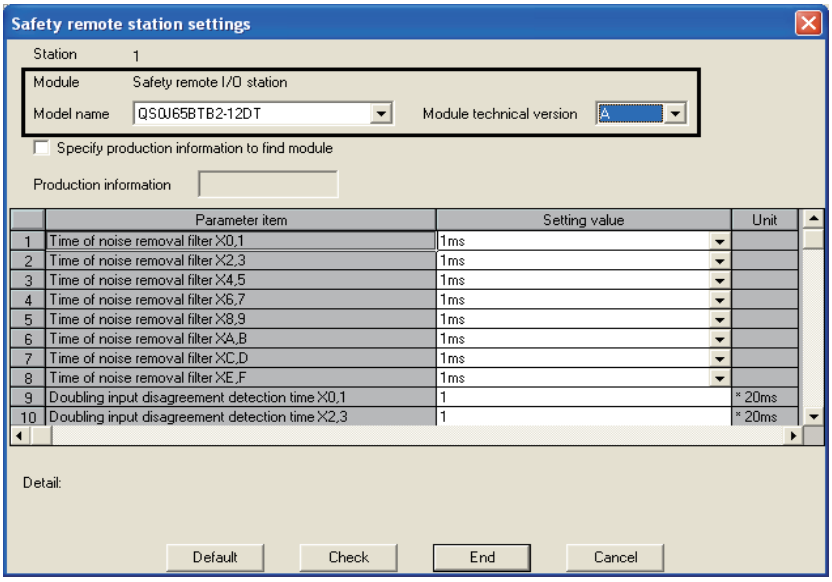


Figure 5.5 Model and module technical version settings

POINT

The “Module technical version” shows the function of the safety remote I/O module.

(d) Production information setting

To manage a system by the production information, put a check in "specify production information to find module".

When a check is put, whether the safety remote I/O module connected to the safety master station is correct can be judged.

For details of the production information management, refer to CC-Link Safety System Master Module User's Manual.

For checking the production information, refer to Section 2.3.

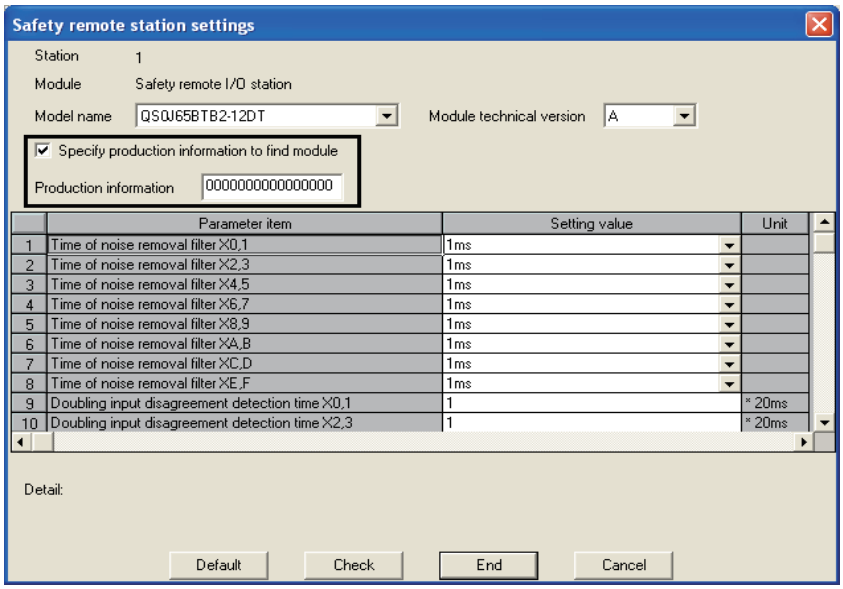


Figure 5.6 Production information setting

POINT

The “Production information” shows the management number inherent to the safety remote I/O module.

As for production information, enter the upper 15 digits out of 17 digits described in SERIAL column of the rated plate.

(e) Parameter setting

The parameter setting is made for each parameter.

For details on the parameter, refer to Section 5.2.1 and Section 5.2.2.

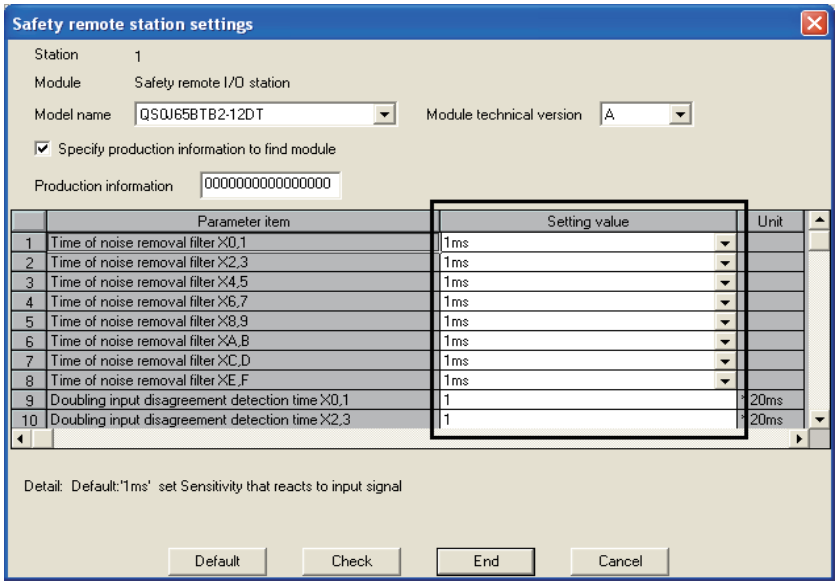


Figure 5.7 Parameter setting

(f) Settings check

Click the **check** button to confirm if the parameter setting is correct.

When the setting is incorrect, an error occurs.

For the error code, refer to Section 9.5.

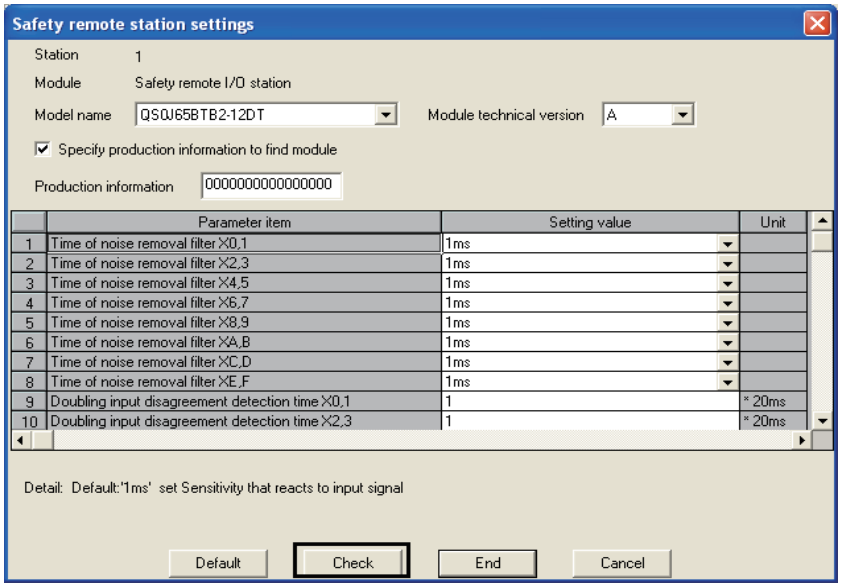


Figure 5.8 Settings check

(g) Parameter setting completion

Click the **End** button to complete each parameter setting.

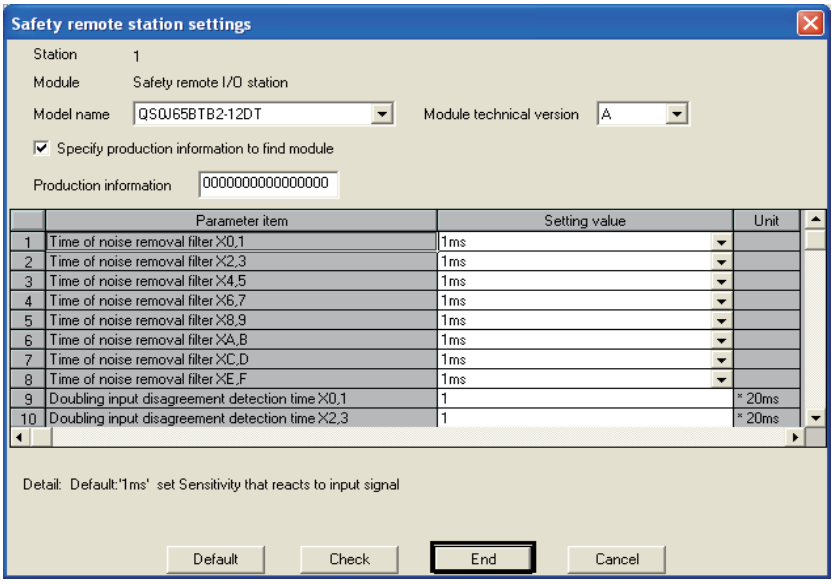


Figure 5.9 Setting completion

(2) Safety CSP file registration

The safety CSP file defines the information for setting the parameters of the safety remote station.
The parameters of the safety remote station cannot be set without safety CSP file corresponding to the technical version of the safety remote I/O module.
Obtaining/registering the safety CSP file corresponding to the technical version of the safety remote I/O module is described below.

(a) Safety CSP file download

Download the latest safety CSP file from the CC-Link Partner Association website.
For details, refer to the CC-Link Partner Association website: http://www.cc-link.org/.

(b) Safety CSP file registration

Store the downloaded safety CSP file into the "CSP" folder in the installation folder of GX Developer.

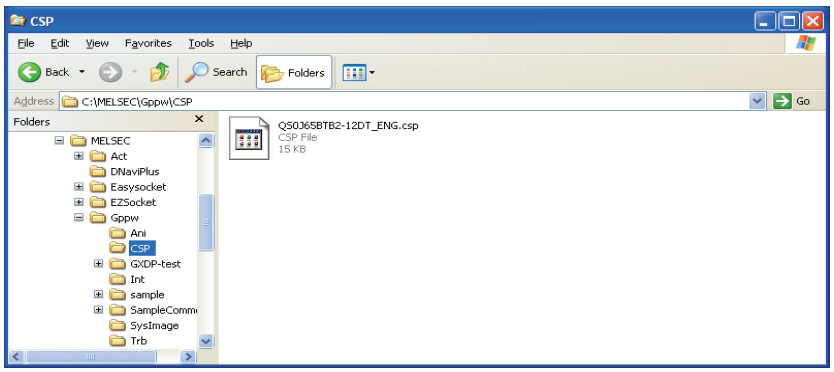


Figure 5.10 Safety CSP file storage destination

POINT

The safety CSP file of the safety remote I/O module is automatically registered when GX Developer is installed.
Therefore, when the installation of GX Developer is performed after the safety CSP file is registered, the registered CSP file may be updated with the old safety CSP file.
If updated with the old safety CSP file, register the latest safety CSP file again.

5.1 Parameter list

The parameters of the safety remote I/O module are listed in Table5.1.

Table5.1 Parameter list

Parameter name	Type	Parameter item	Description	Reference section
Time of noise removal filter	Input	1. Time of noise removal filter X0,1 to 8. Time of noise removal filter XE,F	Sets the filter time for reducing noise of the input signal. The filter time must be longer than the Input dark test pulse OFF time. Default : 1ms Setting range: 1ms, 5ms, 10ms, 20ms, 50ms	5.2.1(1)
Doubling input discrepancy detection time	Input	9. Doubling input discrepancy detection time X0,1 to 16. Doubling input discrepancy detection time XE,F	Sets the ON/OFF transient state time in 20ms unit at redurdaut wiring. If the ON/OFF disagreement state continues for more than setting time, an error occurs. Default : 1 (×20ms) Setting range: 1 to 25 (×20ms)	5.2.1(2)
Input dark test selection	Input	17. Input dark test selection X0,1 to 24. Input dark test selection XE,F	Sets whether the "Input dark test function" of the safety remote I/O module diagnostics function is executed or not. Default : Execute Setting range : Execute : Not execute	5.2.1(3)
Input dark test pulse OFF time	Input	25. Input dark test pulse OFF time	Sets the OFF pulse width that T0 and T1 terminals output. Default : 400μs Setting range: 400μs, 1ms, 2ms	5.2.1(4)
Method of wiring of output	Output	26. Method of wiring of output Y0 to 29. Method of wiring of output Y3	Sets the "Output wiring method". Default : No Use Setting range : No Use: : Dual wiring (Source+Sink) : Dual wiring (Source+Source)	5.2.2(1)
Output dark test selection	Output	30. Output dark test selection Y0 to 33. Output dark test selection Y3	Sets whether the "Output dark test function" of the safety remote I/O module diagnostics function is executed or not. Default : Execute Setting range : Execute : Not execute	5.2.2(2)
Output dark test pulse OFF time	Output	34. Output dark test pulse OFF time Y0 to 37. Output dark test pulse OFF time Y3	Sets the OFF pulse width used in the output dark test. Default : 400μs Setting range : 400μs, 1ms, 2ms	5.2.2(3)

5.2 Parameter Details

This section describes the settings of each parameter.

5.2.1 Input parameter

The combination of the input parameters for obtaining a certification of the target safety category is shown in Figure 5.11.

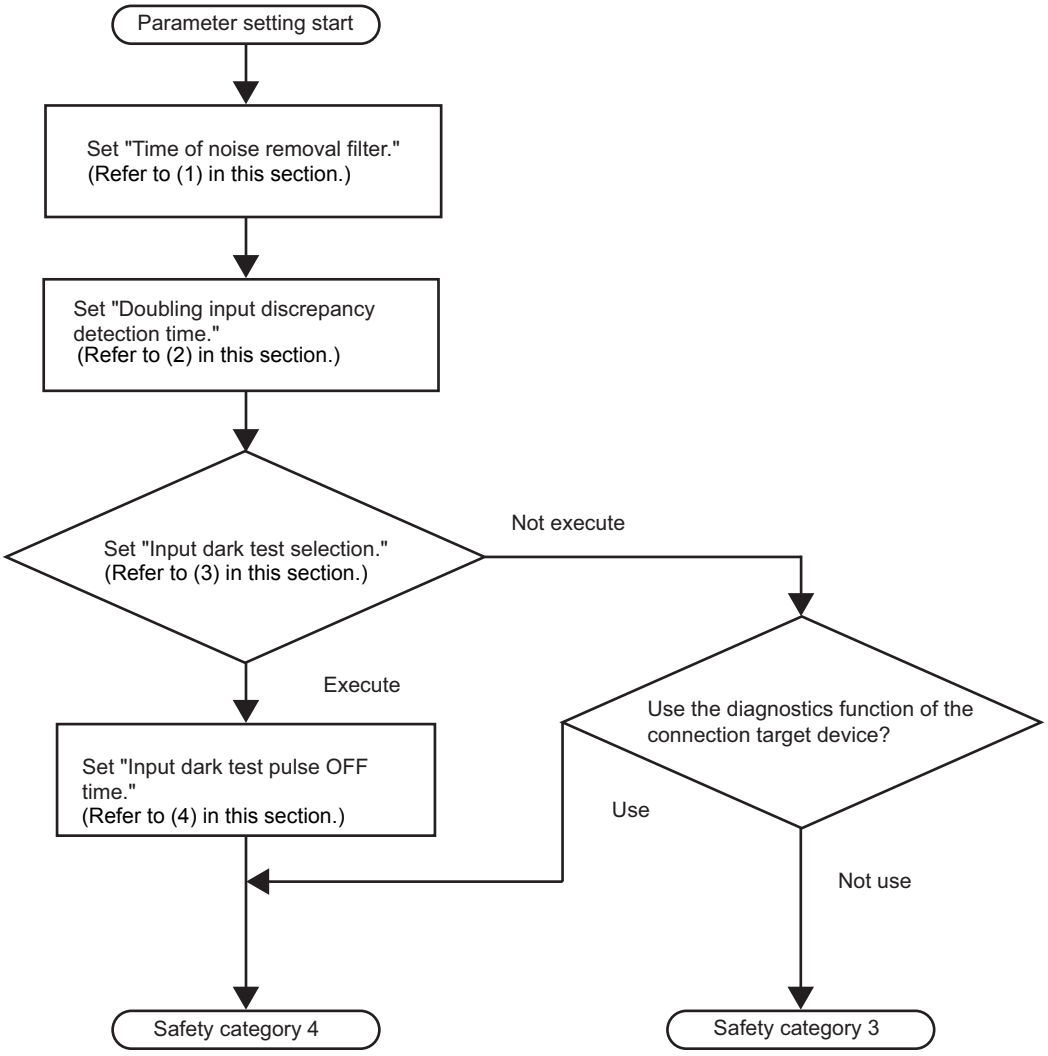


Figure 5.11 Input parameter setting flowchart

POINT

Only setting the safety remote I/O module parameters does not allow obtaining the safety category certification.
For the wiring and setting of the entire system to obtain the safety category certification as a safety-related system, refer to Safety Application Guide.

(1) Time of noise removal filter

This parameter is used to set the filter time for reducing noise of the input signal in 2 input points unit.

The settings are shown in Table5.2.

Table5.2 Settings of "Time of noise removal filter"

Parameter item	Setting range	Default
1. Time of noise removal filter X0, X1	1ms 5ms 10ms 20ms 50ms	1ms
2. Time of noise removal filter X2, X3		
3. Time of noise removal filter X4, X5		
4. Time of noise removal filter X6, X7		
5. Time of noise removal filter X8, X9		
6. Time of noise removal filter XA, XB		
7. Time of noise removal filter XC, XD		
8. Time of noise removal filter XE, XF		

The following error occurs depending on the setting value.

- Out of the setting range of "Time of noise removal filter"

For details of the error, refer to Section 9.5.

POINT

Set the "Time of noise removal filter" longer than the "Input dark test pulse OFF time". When the input dark test is not executed, the relationships between the "Time of noise removal filter" and the "Input dark test pulse OFF time" need not be considered.

For the setting of the "Input dark test pulse OFF time", refer to (4) in this section.

(2) Doubling input discrepancy detection time

This parameter is used to set the 2 inputs state disagreement tolerance time at dual wiring in 2 input points unit.

The settings are shown in Table5.3.

Table5.3 Settings of "Doubling input discrepancy detection time"

Parameter item	Setting range	Default
9. Doubling input discrepancy detection time X0,1	1 to 25 (×20ms)	1 (×20ms)
10. Doubling input discrepancy detection time X2,3		
11. Doubling input discrepancy detection time X4,5		
12. Doubling input discrepancy detection time X6,7		
13. Doubling input discrepancy detection time X8,9		
14. Doubling input discrepancy detection time XA,B		
15. Doubling input discrepancy detection time XC,D		
16. Doubling input discrepancy detection time XE,F		

If a value out of the setting range is set, an error out of the setting range of "Doubling input discrepancy detection time" occurs.

For details of the error, refer to Section 9.5.

(3) Input dark test selection

This parameter is used to set in 2 input points unit if the "Input dark test function" of the safety remote I/O module diagnostics function is executed or not.
The settings are shown in Table5.4.

Table5.4 Settings of "Input dark test selection"

Parameter item	Setting range	Default
17. Input dark test selection X0, X1	Execute Not execute	Execute
18. Input dark test selection X2, X3		
19. Input dark test selection X4, X5		
20. Input dark test selection X6, X7		
21. Input dark test selection X8, X9		
22. Input dark test selection XA, XB		
23. Input dark test selection XC, XD		
24. Input dark test selection XE, XF		

An error out of the setting range of "Input dark test selection" occurs depending on the setting value.
For details of the error, refer to Section 9.5.

(4) Input dark test pulse OFF time

This parameter is used to set the OFF pulse width that T0 and T1 terminals output in the module unit.

The settings are shown in Table5.5.

Table5.5 Settings of "Input dark test pulse OFF time"

Parameter item	Setting range	Default
25. Input dark test pulse OFF time	400μs 1ms 2ms	400μs

When a value out of the setting range is set, an error out of the setting range of "Input dark test pulse OFF time" occurs.

For details of the error, refer to Section 9.5.

5.2.2 Output parameter

The combination of the output parameters for obtaining a certification of the target safety category is shown in Figure 5.12.

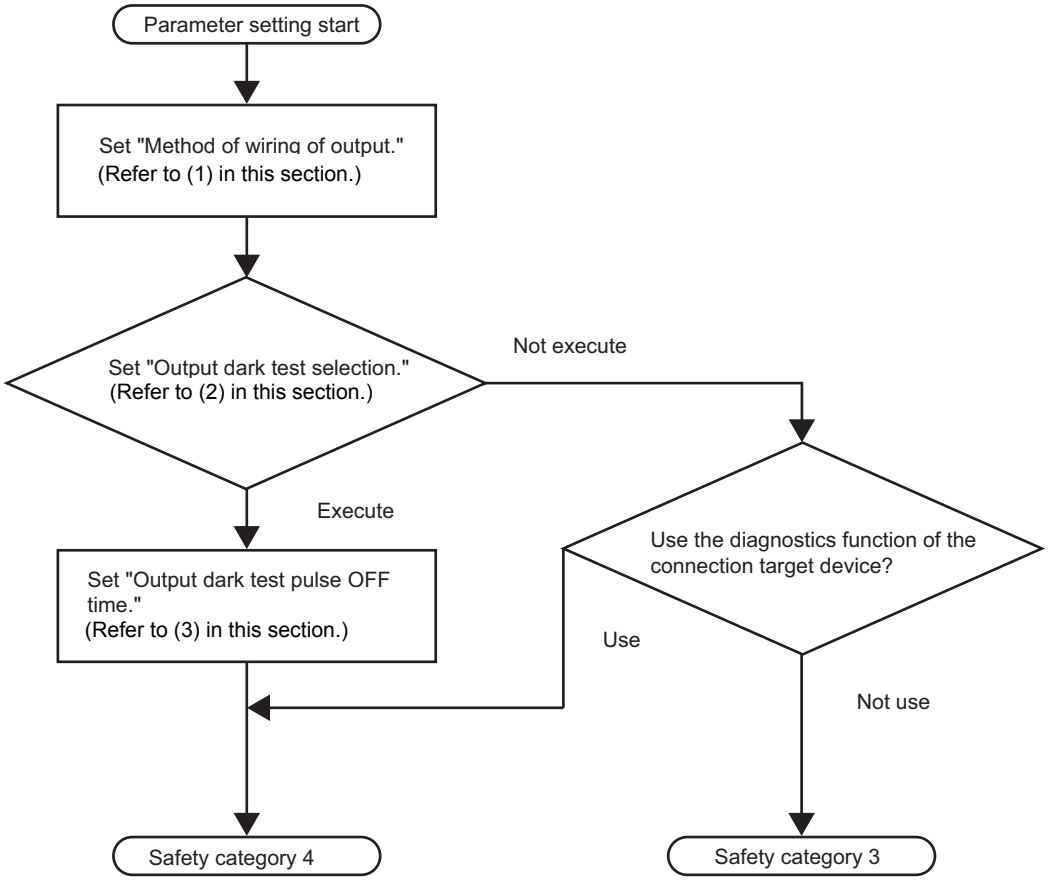


Figure 5.12 Output parameter setting flowchart

POINT

Only setting the safety remote I/O module parameters does not allow obtaining the safety category certification.
For the wiring and setting of the entire system to obtain the safety category certification as a safety-related system, refer to Safety Application Guide.

(1) Method of wiring of output

This module is used to set the "Method of wiring of output" in the output point unit. The settings are shown in Table5.6.

Table5.6 Settings of "Method of wiring of output"

Parameter item	Setting range	Default
26. Method of wiring of output Y0	No Use Dual wiring (Source+Sink) Dual wiring (Source+Source)	No Use
27. Method of wiring of output Y1		
28. Method of wiring of output Y2		
29. Method of wiring of output Y3		

When a value out of the setting range is set, the following errors occur.

- Out of the setting range of "Method of wiring of output"
- Output wiring method combination error

For details of the errors, refer to Section 9.5.

(2) Output dark test selection

This parameter is used to set in the output point unit whether the "Output dark test function" of the safety remote I/O module diagnostics function is executed or not. The settings are shown in Table5.7.

Table5.7 Settings of "Output dark test selection"

Parameter item	Setting range	Default
30. Output dark test selection Y0	Execute Not execute	Execute
31. Output dark test selection Y1		
32. Output dark test selection Y2		
33. Output dark test selection Y3		

When a value out of the setting range is set, the following errors occur.

- Out of the setting range of "Output dark test selection"
- Output dark test selection combination error

For details of the errors, refer to Section 9.5.

(3) Output dark test pulse OFF time

This parameter is used to set the OFF pulse width used in the output dark test in the output point unit.

The settings are shown in Table5.8.

Table5.8 Settings of "Output dark test pulse OFF time"

Parameter item	Setting range	Default
34. Output dark test pulse OFF time Y0	400μs 1ms 2ms	400μs
35. Output dark test pulse OFF time Y1		
36. Output dark test pulse OFF time Y2		
37. Output dark test pulse OFF time Y3		

When a value out of the setting range is set, an error out of the setting range of "Output dark test pulse OFF" occurs.

For details of the error, refer to Section 9.5.

CHAPTER6 PROCEDURES AND SETTINGS BEFORE SYSTEM OPERATION

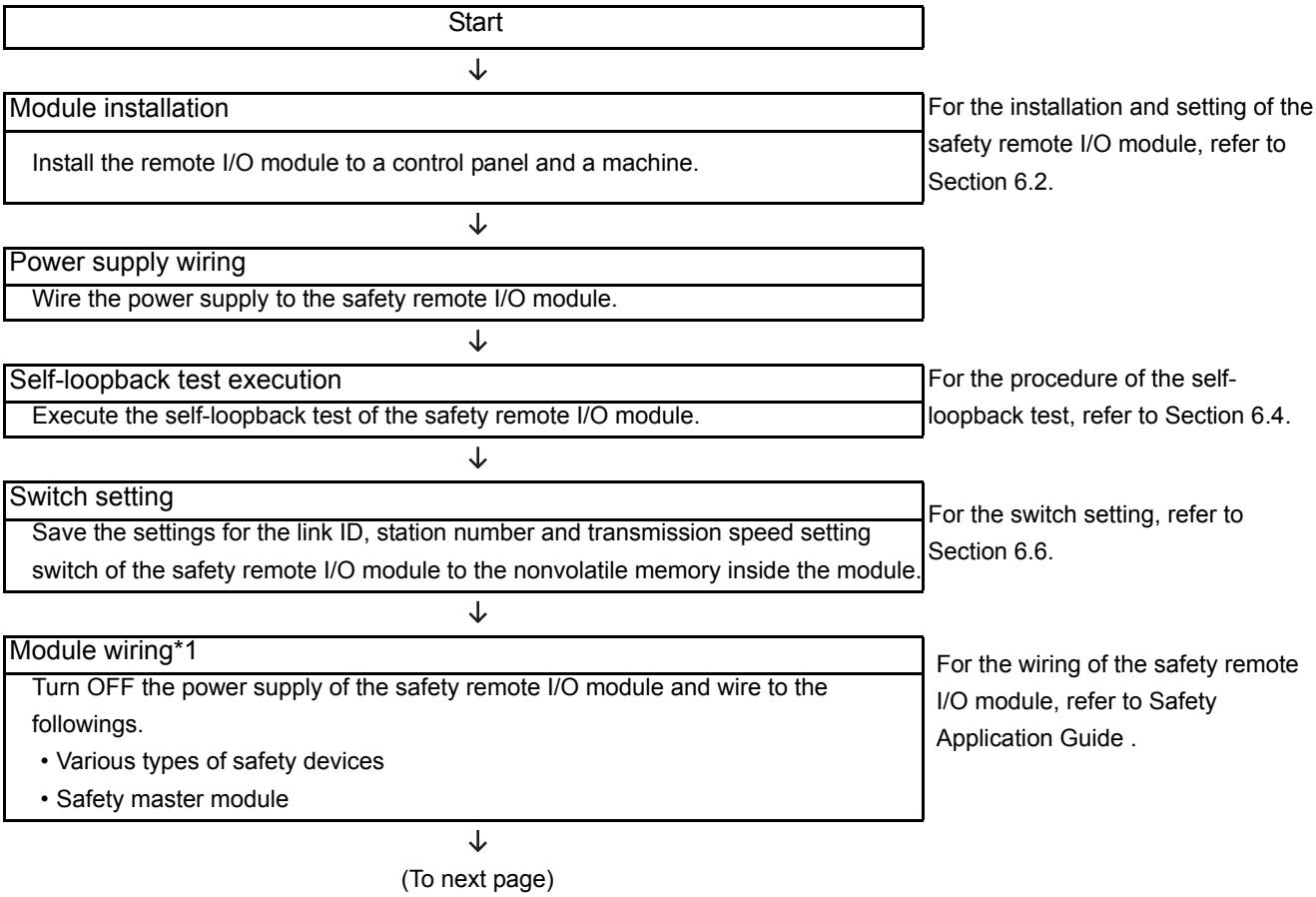
This chapter describes the procedures and settings before the operation of the safety remote I/O module.

6.1 Procedures and Settings before System Operation

This section describes the procedures before the operation of the safety remote I/O module and the replacement of the module.

6.1.1 Procedure from module installation to system operation

The procedure from the installation of the safety remote I/O module to the CC-Link Safety system operation is shown in Figure 6.1.
In addition, parameters are considered to be separately created.
For the parameter setting, refer to CHAPTER 5.
For the connection between the safety CPU module and GX Developer, refer to GX Developer Version 8 Operating Manual (Safety PLC).



*1: Even when various safety devices are not connected, perform wiring for the external supply power.
When the external supply power is not wired, an error of the external supply power occurs.
For error details, refer to Section 9.5.

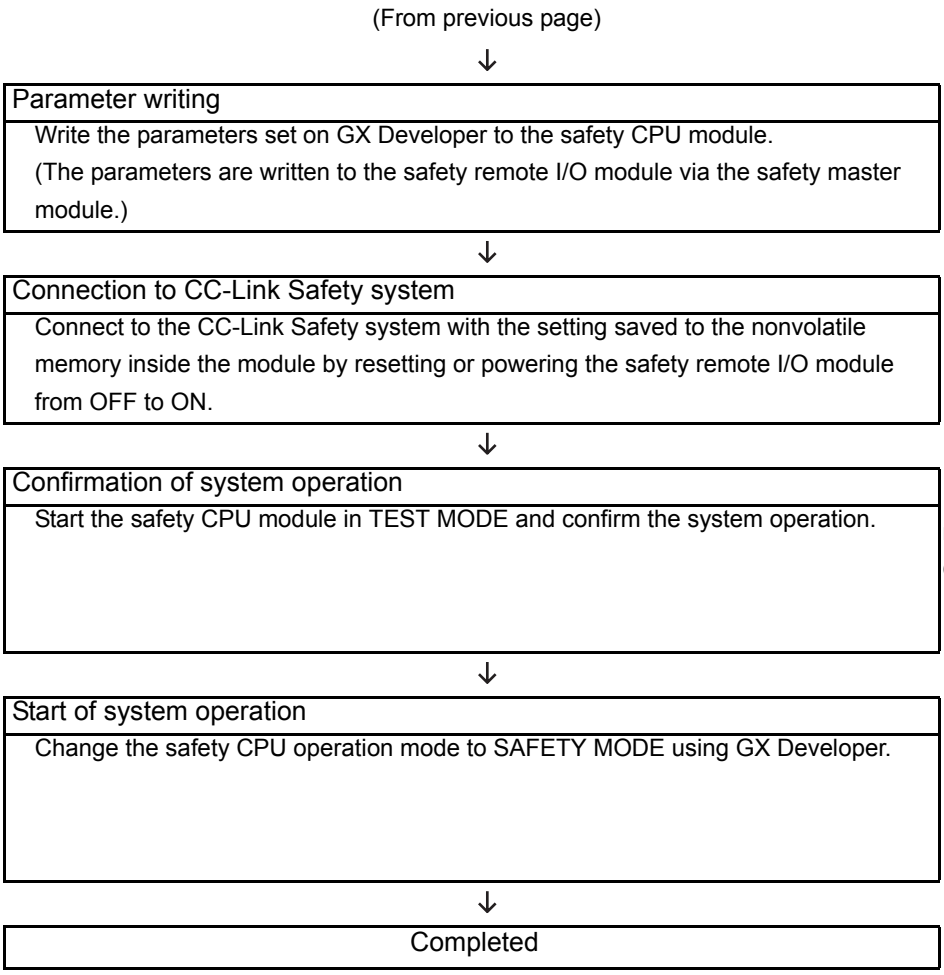


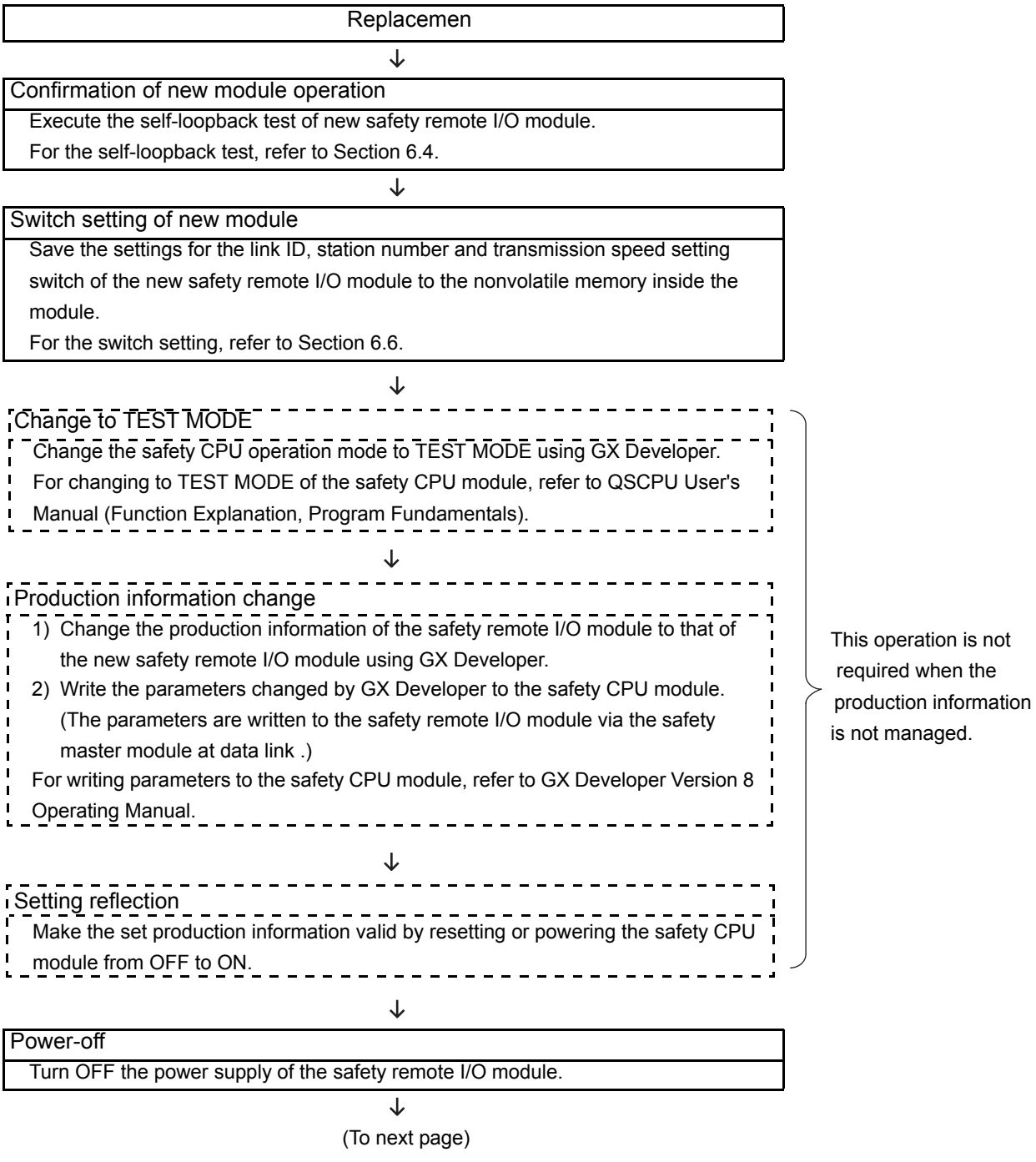
Figure 6.1 Procedure from module installation to system operation

6.1.2 Replacement procedure of the module

The replacement procedure of the safety remote I/O module is shown in Figure 6.2.
- - - in Figure 6.2 indicates the operation for managing the production information.

For the function differences between managing and not managing the production information, refer to CHAPTER 5(1).

For the connection between the safety CPU module and GX Developer, refer to GX Developer Version 8 Operating Manual (Safety PLC).



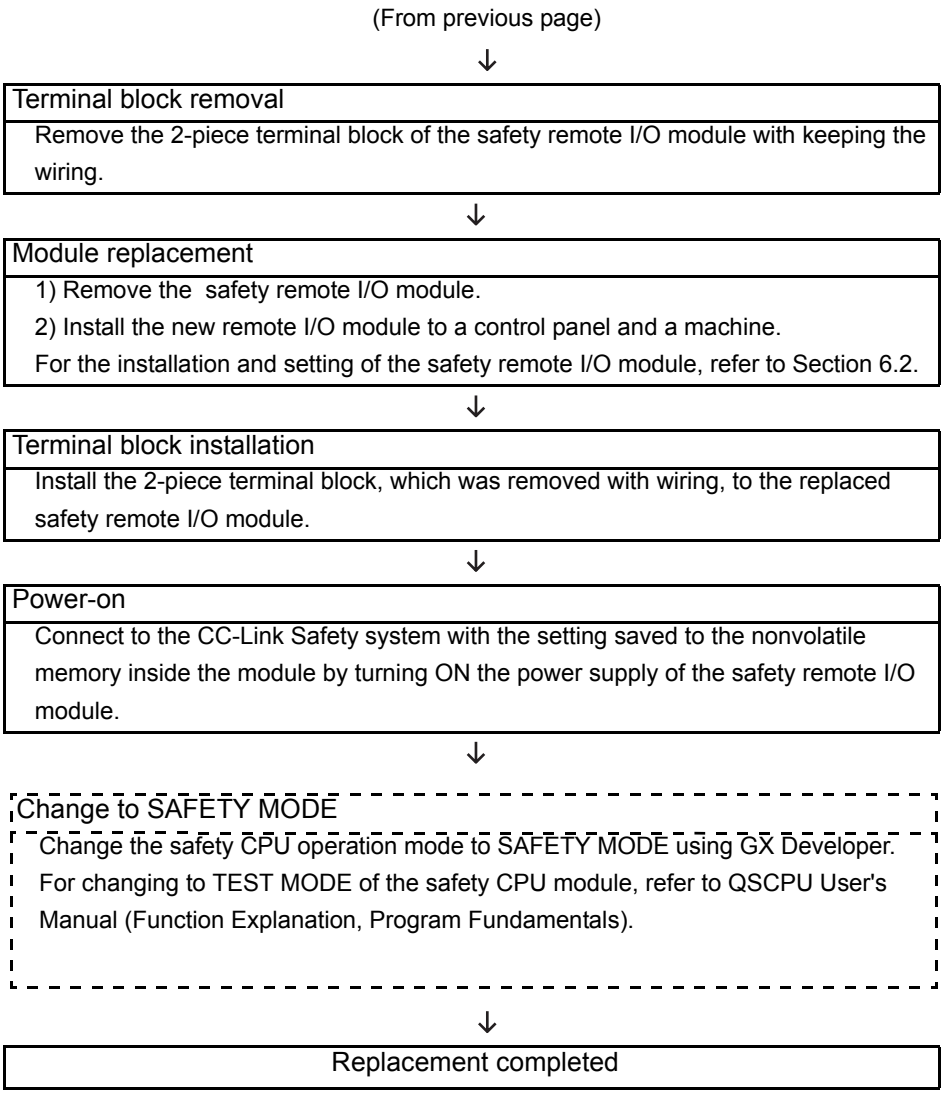


Figure 6.2 Replacement procedure of safety remote I/O module

POINT

1) When managing the production information, change the production information to the number of the new safety remote I/O module.
   If not doing so, production information mismatch error occurs.
   For product information mismatch error, refer to CC-Link Safety System Master Module User's Manual.
2) When changing the production information, change the safety CPU operation mode to TEST MODE.
   In SAFETY MODE, the production information cannot be changed.

6.2 Mounting and Installation

In order to increase the reliability of the system and exploit the maximum performance of its functions, this section describes the methods and precautions for the mounting and installation of the system.

6.2.1 Handling Precautions

This section provides handling precautions for use of the safety remote I/O module.

DANGER	● Do not touch the terminals while power is on. Doing so could cause shock or erroneous operation.

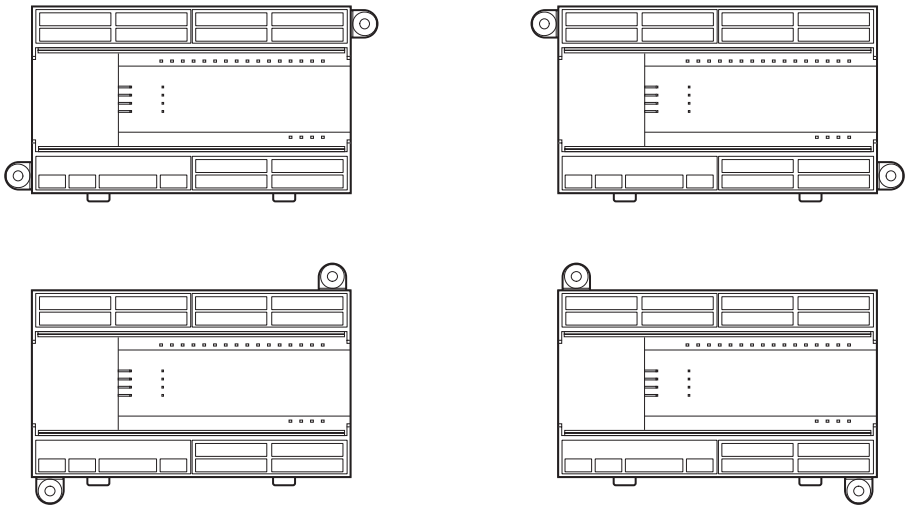
CAUTION	● Be sure there are no foreign substances such as sawdust or wiring debris inside the module. Such debris could cause fires, damage, or erroneous operation. ● Do not disassemble or modify the modules. Doing so could cause trouble, erroneous operation, injury, or fire. If the product is repaired or remodeled by other than the specified FA centers or us, the warranty is not covered. ● Do not directly touch the module's conductive parts or electronic components. Touching the conductive parts could cause an operation failure or give damage to the module. ● Since the module case is made of resin, do not drop or apply any strong impact to the module. Doing so may damage the module. ● Tighten a terminal block mounting screw, terminal screw, and module mounting screw within the specified torque range.If the terminal block mounting screw or terminal screw is too loose, it may cause a short circuit, fire, or malfunctions. If too tight, it may damage the screw and/or the module, resulting in a drop of the screw or module, a short circuit or malfunctions. If the module mounting screw is too loose, it may cause a drop of the screw or module. Over tightening the screw may cause a drop due to the damage of the screw or module. ● When disposing of this product, treat it as industrial waste. ● Make sure to fix a CC-Link Safety remote I/O module with a DIN rail or mounting screws and tighten the screws with the specified torque. If the screws are too loose, it may cause a drop of the screw or module. Over tightening may cause a drop due to the damage of the screw or module. ● Completely turn off the externally supplied power used in the system before mounting or removing the module to/from the panel. Not doing so may result in a fault or malfunctions of the module.

- Do not drop the safety remote I/O module or apply any strong impact to it.
- Do not remove the printed circuit board (PCB) of the safety remote I/O module from the case.
  Doing so may cause failure.
- Carefully prevent any dust or wiring chips from entering the safety remote I/O module.
  Failure to do so may cause a fire, failure, or malfunction.
- When installing the safety remote I/O module to a control panel, provide clearance of at least 60mm between the module's top/bottom and any other structure or component to ensure proper airflow and to make module replacement easy.
- Install the safety remote I/O module to a flat surface.
  If it is not flat, an excess force may be applied to the PCB, causing failure.
- Tighten the module fixing screws and terminal block screws within the following torque range.
  Overtightening may result in damage to the screws or the module case.

Table6.1 Specified torque range

Screw	Specified torque range
Module fixing screw (M4 screw with polished and round flat washer)	0.824 to 1.11N•m
Terminal block screw (M3 screw)	0.425 to 0.525N•m
2-piece terminal block screw (M3.5 screw)	0.680 to 0.920N•m

- Attach four holding fixtures as shown in Figure 6.3.



Note: Do not attach them in any positions other than the above.

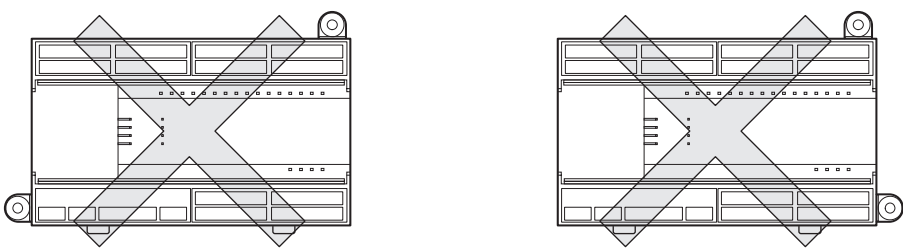
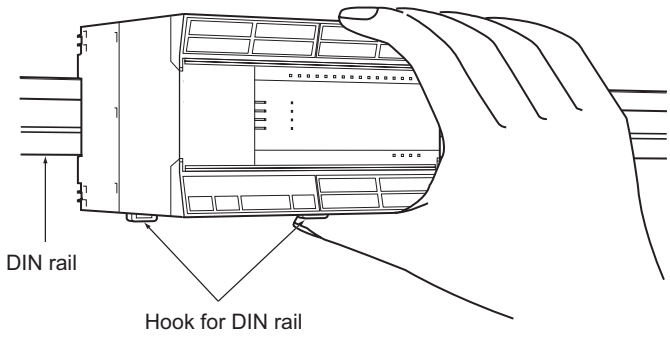


Figure 6.3 Attachment of holding fixtures

- To remove the safety remote I/O module mounted with module fixing screws, remove the screws first and then the holding fixtures from the module. Attempting to remove the module from the holding fixtures with the screws still attached may damage the module and/or holding fixtures.
- When using a DIN rail, pay attention to the following:

1) Applicable DIN rail model (conforming to JIS C 2812)
   TH35-7.5Fe
   TH35-7.5Al
2) Installation screw intervals
   Tighten the screws at pitches of 20mm or less.

- When installing the safety remote I/O module to the DIN rail, press the center part of the hook located on the bottom of the module until a click is heard.



Note: Do not press the front face as shown below. Doing so may cause failure.

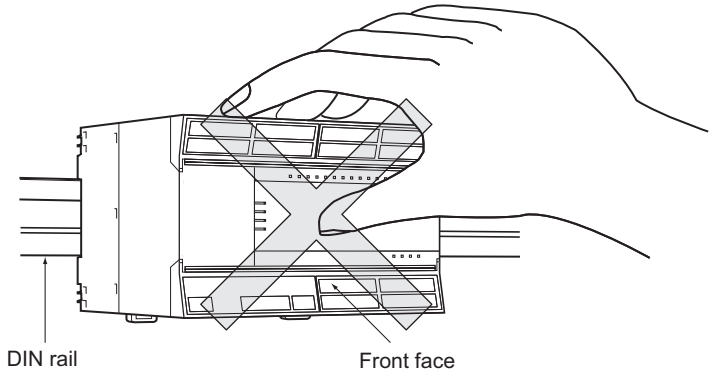


Figure 6.4 Installation to DIN rail

- If the mechanical power supply switch is used for the safety remote I/O module, in rare cases it does not operate, when the excessive chattering is generated at power-on, and safety diagnostics function operates due to the unstable status of the input power supply voltage.
  In this case, turn on power supply again.

6.2.2 Installation Environment

For installation environment, refer to "3.1 General Specifications".

6.3 Part Names and Settings

This chapter describes the part names and settings of the safety remote I/O module.

[Terminal numbers and signal names]

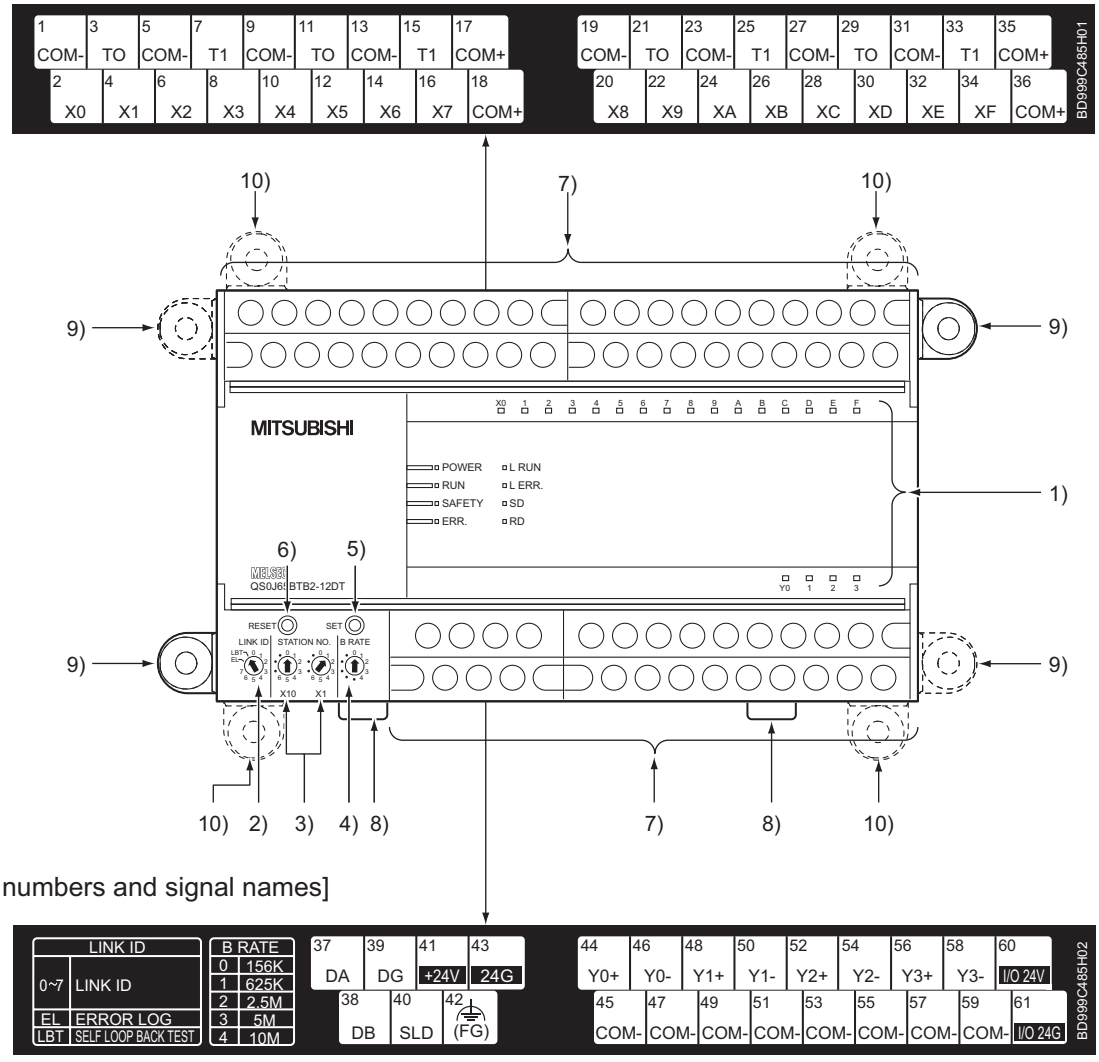


Figure 6.5 Part names and settings

Table6.2 Part names and settings

No.	Name		Description
1)	Indicator LEDs	LED name	Indication
		"POWER"	Indicates the power status of the safety remote I/O module. ON (green) : Normally powered OFF : Powered off or error occurred (blown fuse)
		"RUN"*1	Indicates the operating status of the safety remote I/O module. ON (green) : Normally operating, or moderate error occurred Flash (green) : Saving switch setting OFF : Serious error occurred
		"SAFETY"*1	Indicates the CC-Link Safety System connection status of the safety remote I/O module. ON (green) : Connected to CC-Link Safety System*2, or self-loopback test completed normally Flash (green) : Self-loopback test in execution OFF : Not connected to CC-Link Safety System, or self-loopback test completed in error
		"ERR."*1	Indicates failure or error status of the safety remote I/O module. ON (red) : Serious error occurred, or self-loopback test completed in error "RUN" LED OFF: Serious error occurred Flash (red) : Moderate error occurred OFF : Normally operating
		"L RUN"	Indicates the communication status of the safety remote I/O module in the CC-Link Safety System. ON (green) : Normally communicating in the CC-Link Safety System OFF : Communication failure in the CC-Link Safety System (Timeout error)
		"L ERR."	Indicates the communication error status of the safety remote I/O module in the CC-Link Safety System. ON (red) : Value set by Link ID, Station number, or Transmission setting switch is out of range Flash regularly (red) : Setting of Link ID, Station number, and/or Transmission setting switch is different from that of the internal nonvolatile memory Flash irregularly (red) : Wrong terminal resistor setting, or noise influence OFF : Normally operating

<table>
<tr><th>No.</th><th colspan="2">Name</th><th>Description</th></tr>
<tr><td rowspan="3">1)</td><td rowspan="3">Indicator LEDs</td><td>"SD"</td><td>Indicates the sending status of the safety remote I/O module in the CC-Link Safety System.
ON (green) : Data being sent</td></tr>
<tr><td>"RD"</td><td>Indicates the receiving status of the safety remote I/O module in the CC-Link Safety System.
ON (green) : Data being received</td></tr>
<tr><td>"X0" to "XF"
"Y0" to "Y3"</td><td>Indicates the I/O status of the safety remote I/O module.
ON (red) : I/O ON
OFF : I/O OFF</td></tr>
<tr><td>2)</td><td colspan="2">Link ID setting switch</td><td><table><tr><th>Setting</th><th>Description</th></tr><tr><td>0 to 7</td><td>Link ID setting</td></tr><tr><td>EL</td><td>Setting for reading error logs
(For error logs, refer to Section 4.5.)</td></tr><tr><td>LBT</td><td>Setting for self-loopback test
(For Setting for self-loopback test, refer to Section 6.4.)</td></tr></table>To update the changed switch setting, reset or power OFF and ON the safety remote I/O module.</td></tr>
<tr><td>3)</td><td colspan="2">Station No. setting switch</td><td>Set station No. of the safety remote I/O module within a range from 0 to 64.*3
• Tens place of station No. is set by ⇧ X10.
• Units place of station No. is set by ⇧ X1.</td></tr>
<tr><td>4)</td><td colspan="2">Transmission speed setting switch</td><td><table><tr><th>Setting</th><th>Transmission speed</th></tr><tr><td>0</td><td>156kbps</td></tr><tr><td>1</td><td>625kbps</td></tr><tr><td>2</td><td>2.5Mbps</td></tr><tr><td>3</td><td>5Mbps</td></tr><tr><td>4</td><td>10Mbps</td></tr></table>Always set this switch within a range of 0 to 4.</td></tr>
<tr><td>5)</td><td colspan="2">Setting saving switch</td><td>Saves the values set by switches 2) to 4) into the nonvolatile memory inside the safety remote I/O module.</td></tr>
<tr><td>6)</td><td colspan="2">Reset switch</td><td>Resets the hardware of the safety remote I/O module.</td></tr>
<tr><td>7)</td><td colspan="2">2-piece terminal block</td><td>Two-piece terminal block for connection of I/O module power, transmissions, and I/O signals.</td></tr>
<tr><td>8)</td><td colspan="2">Hook for DIN rail</td><td>Hook used for installing the module to a DIN rail.
Press the center part of the hook until a click is heard.</td></tr>
<tr><td>9)10)</td><td colspan="2">Holding fixtures for screw installation (Accessories)</td><td>Attached to the module when installing the module to a panel.
(Available in two ways, 9) and 10).)</td></tr>
</table>

*1: Although the "RUN", "SAFETY" and "ERR." LEDs momentarily light up immediately after power-up or reset, it does not mean any fault.

*2: The "SAFETY" LED is off when no safety remote I/O station parameters have been received during connection to the CC-Link Safety System.

*3: Duplicate station number setting is not allowed.

6.4 Check of Module Status (Self-Loopback Test)

The self-loopback test checks whether the safety remote I/O module operates correctly in stand-alone.
Be sure to execute the self-loopback test before connecting the system.
The self-loopback test cannot be performed properly in the condition that the communication cables and I/O wires are connected.

Execute the self-loopback test in the following procedure.

Start

↓

Power supply wiring
Wire the power supply to the safety remote I/O module.

↓

Link ID switch change
Set the link ID switch of the safety remote I/O module to "LBT".

↓

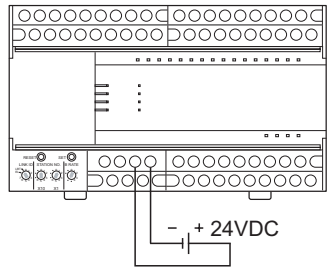
Power-on
Turn ON the power supply of the safety remote I/O module.

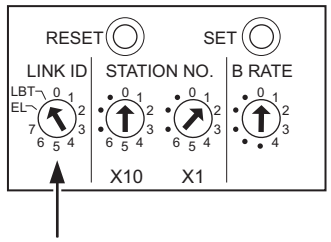
↓

Start of self-loopback test
Press the setting saving switch of the safety remote I/O module once to start the self-loopback test.
"SAFETY" LED flashes during the self-loopback test, and the test completes in approximately five seconds.

↓

Completion of self-loopback test
[Normal]
When "SAFETY" LED turns ON and "ERR." LED turns OFF, the reading of error history is completed normally.
[Error]
When "SAFETY" LED turns OFF and "ERR." LED turns ON, the reading of error history is completed abnormally.
Replace the module for a hardware error of the safety remote I/O module.





Link ID setting switch

POWER L RUN
RUN L ERR.
Flashes → SAFETY SD
ERR. RD

[Normal]
POWER L RUN
RUN L ERR.
Turns ON → SAFETY SD
Turns OFF → ERR. RD

[Error]
POWER L RUN
RUN L ERR.
Turns OFF → SAFETY SD
Turns ON → ERR. RD

Figure 6.6 Execution procedure of self-loopback test

POINT

When the self-loopback test is not started, reexecute the procedure shown in Figure 6.6 with attention to the following points.

1) Is the power supply of the safety remote I/O module turned ON? (Is "POWER" LED ON?)
2) Is the power supply turned ON after the link ID setting switch of the safety remote I/O module is set to "LBT" (setting at self-loopback test) in the power-off status?
3) Is the setting saving switch pressed after 2)?

When the self-loopback test is not started again, replace the module.

6.5 Wiring

This section describes the wiring precautions and wiring examples of the safety remote I/O module.

6.5.1 Precautions for Handling CC-Link Cables

This section explains how to handle dedicated CC-Link cables.
Do not perform any of the following, as each of them will damage CC-Link cables:

- Compressing the cable with a sharp object
- Twisting the cable excessively
- Pulling the cable too hard (exceeding the allowable tension)
- Stepping on the cable
- Placing an object on the cable
- Scratching the cable sheath

6.5.2 Connecting CC-Link Cables

The following figure shows how safety remote I/O modules are connected with dedicated CC-Link cables.

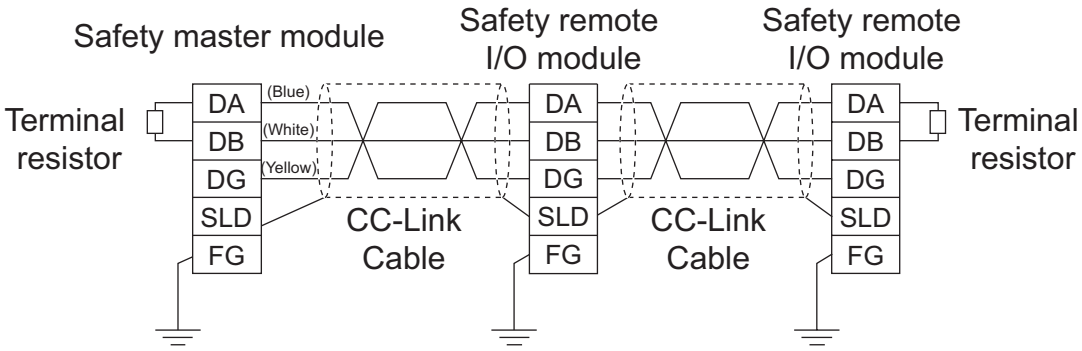


Figure 6.7 Connecting CC-Link cables

POINT

1) Connect the shielded wire of the CC-Link cable to SLD terminal of each module, and ground both ends to the protective ground connectors via FG terminals.
   The SLD and FG terminals are connected inside the module.
2) Always connect terminal resistors to the modules located on both ends of the data link network.
   Connect a terminating resistor between DA and DB terminals.

6.5.3 Precautions for Wiring Module Power Supply

When wiring the module power supply of the safety remote I/O module, note the following.

- Cable length of the module power supply must be within10m

6.5.4 Precautions for Wiring Safety Devices

This section describes precautions for wiring to each safety device.

(1) Wiring of the input terminal section

(a) Combinations of input terminals
Input terminals can be used in the following combinations only.
Using them in any other combination will result in a medium failure.

•X0 and X1	•X2 and X3	•X4 and X5	•X6 and X7
•X8 and X9	•XA and XB	•XC and XD	•XE and XF

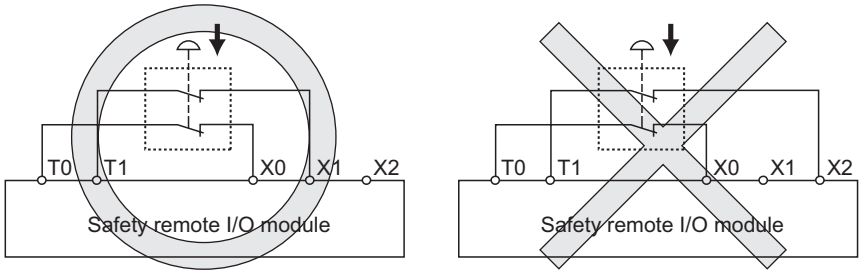


Figure 6.8 Combination example of input terminals

(b) Combinations of the test pulse output terminals
Using the same test pulse for one device is not allowed.
If the same test pulse is used in combinations such as X0 + T0 and X1 + T0, a medium failure will occur.

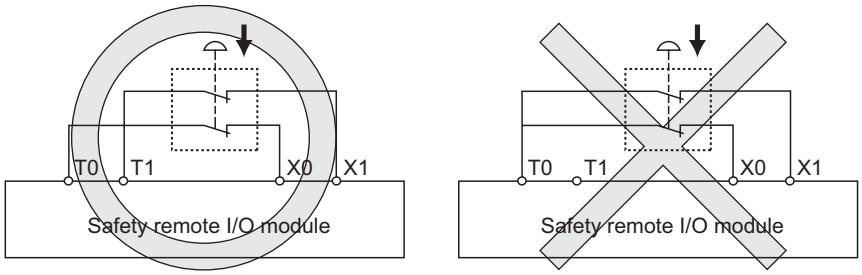


Figure 6.9 Combination example of test pulse terminals

(2) Wiring of the output terminal section

Use sink outputs in combination with source outputs.

Combinations of two sink outputs or single use of sink output is not allowed.

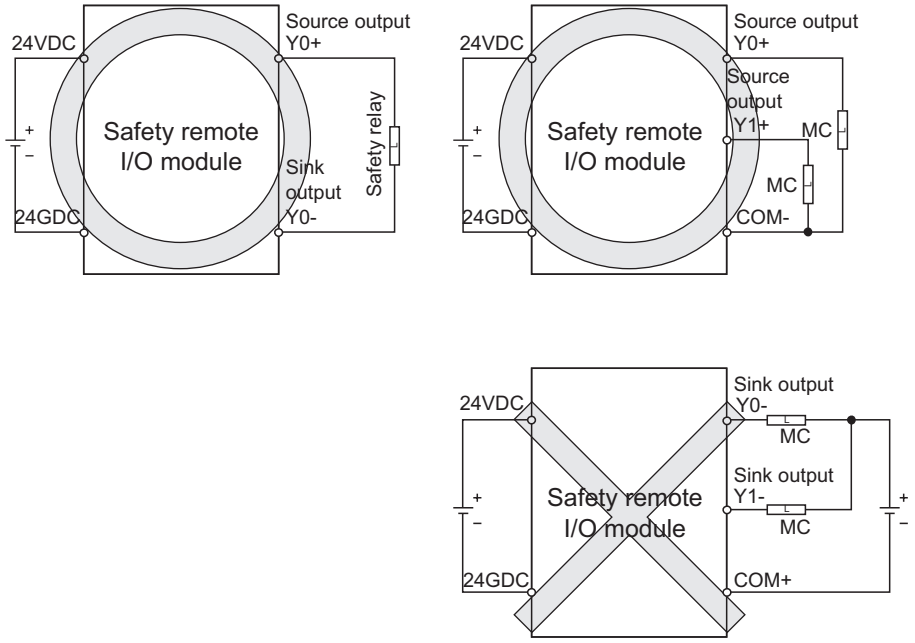


Figure 6.10 Combination example of output terminals

6.5.5 Safety devices and wiring example

This section describes the wiring between the safety remote I/O module and safety devices.

To make the wiring specified in category 4, the following two points must be executed in the safety remote I/O module.

- Redundant input / output wiring
- Execution of the self-diagnostics function (dark test)

For the wiring example between the safety remote I/O module and safety devices which meets the above points, refer to Safety Application Guide .

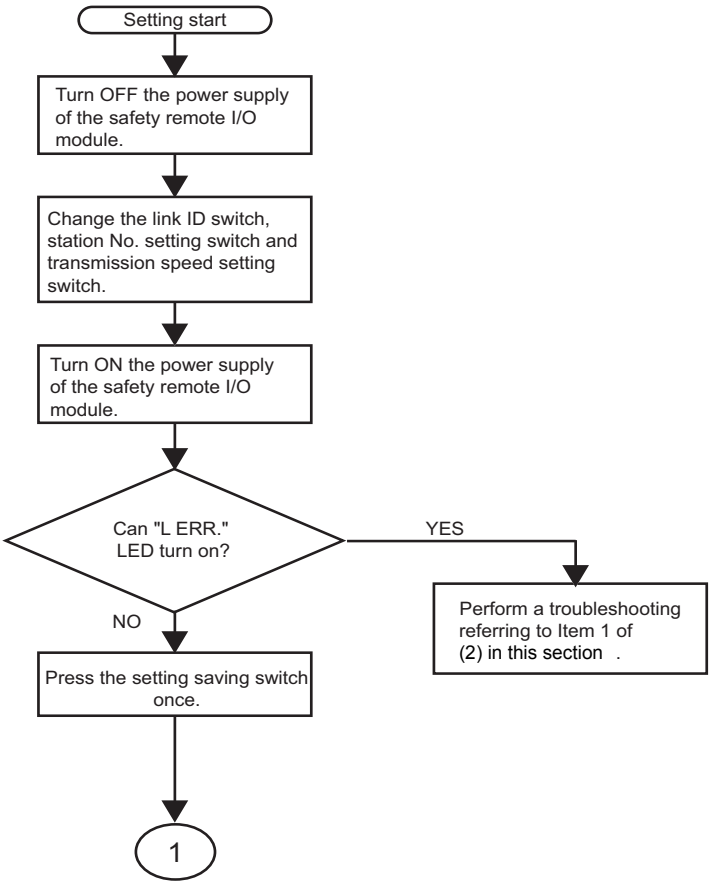
6.6 Switch setting

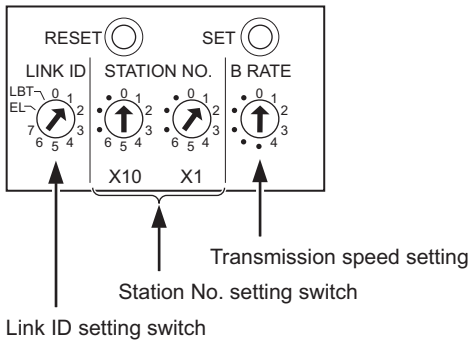
This section describes the procedure before starting the data link with the settings of the link ID setting switch, station No. setting switch and transmission speed setting switch of the safety remote I/O module.

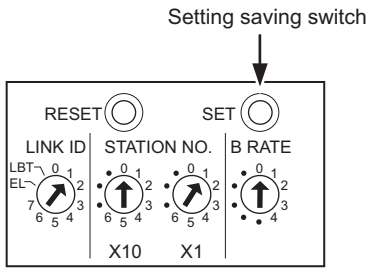
(1) Switch setting procedure

Switch setting must be made in the power-off status of the safety remote I/O module. If the switch setting is made in the power-on status, it may result in an accident due to incorrect output or malfunction.
In the power-on status, make the switch setting after fully confirming the safety.

To return to the CC-Link Safety system with the changed switch setting, performing reset operation or power OFF to ON of the safety remote I/O module is required. After making or canceling the switch setting, be sure to perform reset operation or power OFF to ON of the safety remote I/O module.







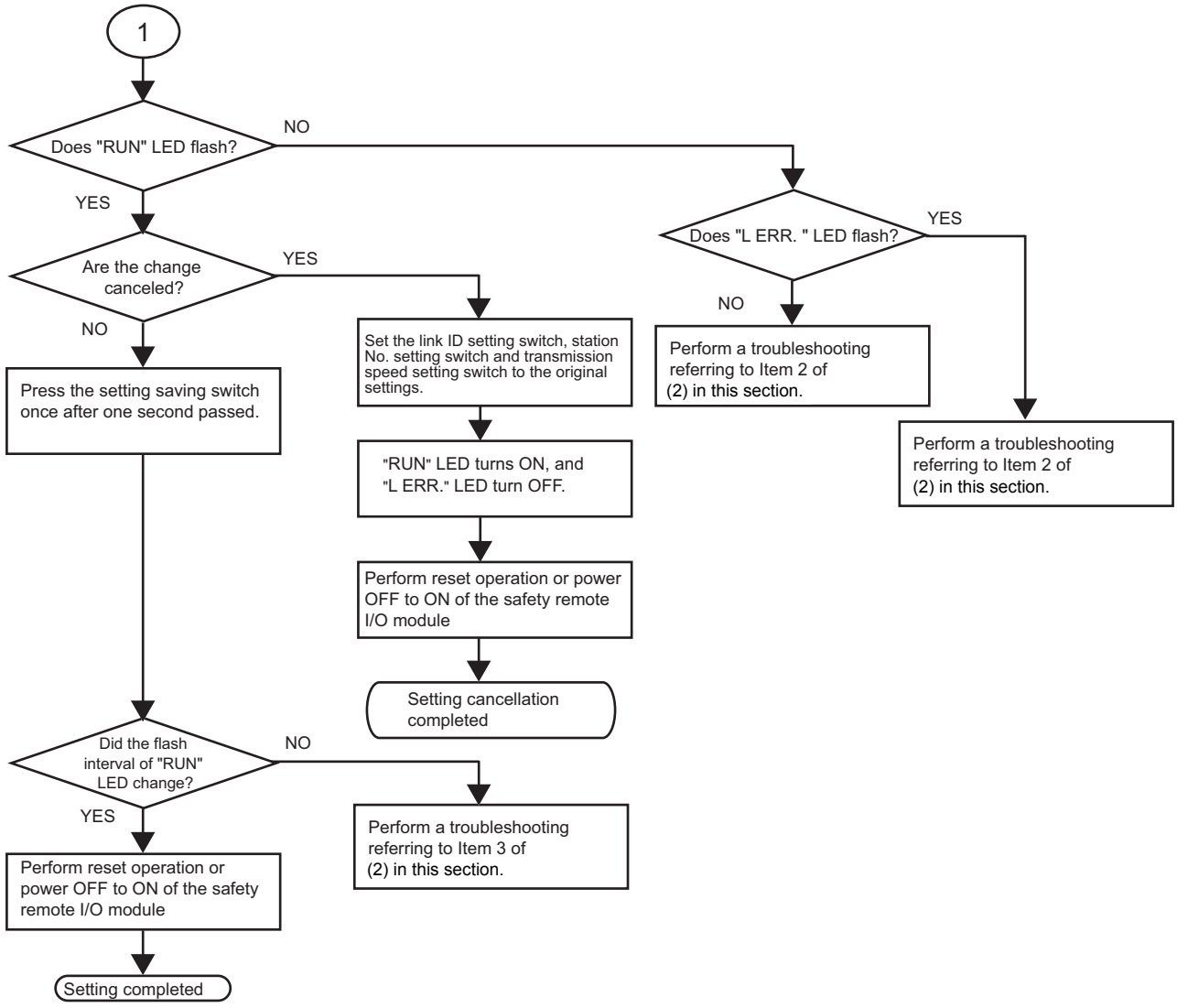


Figure 6.11 Switch setting

(2) Troubleshooting for switch setting

Corrective actions for the invalid LED operation at switch setting are shown in Table6.3.

Table6.3 Troubleshooting for switch setting

Item	LED status	Check description	Corrective action
1	After power-on or during switch setting, "L ERR." LED turns ON.	Check if the link ID setting switch, station No. setting switch and transmission speed setting switch are pointing positions outside the setting range or not.	• Set the positions of the link ID setting switch, station No. setting switch and transmission speed setting switch within the setting range. • If the position each setting switch is set is within the setting range, replace the safety remote I/O module.
2	After the first setting saving switch is pressed, "RUN" LED does not flash.	Check if the link ID setting switch, station No. setting switch and transmission speed setting switch is changed or not after the setting saving switch is pressed.	• Make the switch setting again from the beginning of the procedure. • If each setting switch is not changed after the setting saving switch is pressed, replace the safety remote I/O module.
3	After the second setting saving switch is pressed, the flash interval of "RUN" LED is not changed.	Check if the second setting saving switch is pressed or not within one second after the first one was pressed.	• Press the setting saving switch after one or more seconds passed. • If the flash interval of "RUN" LED does not change when the second setting saving switch is pressed after one or more seconds passed, replace the safety remote I/O module.

CHAPTER7 PROGRAMMING

For precautions on creating a program and program examples, refer to Safety Application Guide.

Memo

CHAPTER8 MAINTENANCE AND INSPECTION

DANGER

- Do not touch the terminals while power is on.
  Doing so could cause shock or erroneous operation.
- Turn off all phases of the external supply power used in the system when cleaning the module or retightening the terminal block mounting screws, terminal screws, or module mounting screws.
  Not doing so could result in electric shock.
  Tighten a terminal block mounting screw, terminal screw, and module mounting screw within the specified torque range.
  If the terminal block mounting screw or terminal screw is too loose, it may cause a short circuit, fire, or malfunctions.
  If too tight, it may damage the screw and/or the module, resulting in a drop of the screw or module, a short circuit or malfunctions.
  If the module mounting screw is too loose, it may cause a drop of the screw or module.
  Over tightening the screw may cause a drop due to the damage of the screw or module.

CAUTION

- Do not disassemble or modify the modules.
  Doing so could cause trouble, erroneous operation, injury, or fire.
  If the product is repaired or remodeled by other than the specified FA centers or us, the warranty is not covered.
- Restrict the mounting/removal of a module, base unit, and terminal block up to 50 times (IEC61131-2-compliant), after the first use of the product.
  Failure to do so may cause the module to malfunction due to poor contact of connector.
- Since the module case is made of resin, do not drop or apply any strong impact to the module.
  Doing so may damage the module.
- Completely turn off the externally supplied power used in the system before mounting or removing the module to/from the panel.
  Not doing so may result in a fault or malfunctions of the module.

In order that you can use the safety PLC in normal and optimal condition at all times, this section describes those items that must be maintained or inspected daily or at regular intervals.

8.1 Daily Inspection

The items that must be inspected daily are listed in Table8.1.

Table8.1 Daily inspection

Item		Inspection item	Inspection	Judgment	Remedy
1	Installation	Installation to DIN rail	Check that the safety remote I/O module is stable.	The safety remote I/O module must be stable.	Reinstall the safety remote I/O module to the DIN rail.
		Looseness and instability of module fixing screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the module fixing screws.
		Looseness and instability of 2-piece terminal block mounting screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the 2-piece terminal block mounting screws.
		Adhesion of dirt or foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.
2	Connection	Looseness of terminal screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the terminal screws.
		Proximity of solderless terminals to each other	Check visually.	Solderless terminals must be positioned at proper intervals.	Correct.
3	Module indication LED at power-on/reset	"POWER" LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	☞ Section 9.2.
		"RUN" LED	Check that the LED is momentarily ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	Replace the module.
		"SAFETY" LED	Check that the LED is momentarily ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	
		"ERR." LED	Check that the LED is momentarily ON.	The LED must be ON (red). (Abnormal if the LED is OFF.)	

Table8.1 Daily inspection (Continued)

Item	Inspection item		Inspection	Judgment	Remedy
4	Module indication LED during operation	"POWER" LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	☞ Section 9.2.
		"RUN" LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	
		"SAFETY" LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	
		"ERR." LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flashing (red).)	
		"L RUN" LED	Check that the LED is ON.	The LED must be ON (green). (Abnormal if the LED is OFF.)	
		"L ERR." LED	Check that the LED is OFF.	The LED must be OFF. (Abnormal if the LED is ON or flashing (red).)	
		"SD" LED	Check that the LED is dimly ON.	The LED must be dimly ON (green). (Abnormal if the LED is OFF.)	
		"RD" LED	Check that the LED is dimly ON.	The LED must be dimly ON (green). (Abnormal if the LED is OFF.)	
		Input LED	Check that the LED turns ON and OFF.	The LED must be ON (red) when the input power is turned ON. The LED must be extinguished when the input power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	Replace the module.
		Output LED	Check that the LED turns ON and OFF.	The LED must be ON (red) when the output power is turned ON. The LED must be extinguished when the output power is turned OFF. (Abnormal if the LED does not turn ON or turn OFF as indicated above.)	

8.2 Periodic Inspection

The items that must be inspected one or two times every 6 months to 1 year are listed below.
When the equipment is moved or modified, or layout of the wiring is changed, also perform this inspection.

Table8.2 Periodic inspection

Item	Inspection item		Inspection	Judgment	Remedy
1	Ambient environment *1	Ambient temperature	Measure with a temperature and a hygrometer.	0 to 55 ℃	Change the ambient environment according to the judgment.
		Ambient humidity		5 to 95%RH	
		Atmosphere	Measure corrosive gasses.	Corrosive gasses must not be present.	
2	Line voltage check		Measure a voltage across the terminals of 24VDC.	19.2 to 28.8VDC	Change the supply power according to the judgment.
3	Installation	Looseness and instability of module fixing screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the module fixing screws.
		Looseness and instability of 2-piece terminal block mounting screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the 2-piece terminal block mounting screws.
		Adhesion of dirt or foreign matter	Check visually.	Dirt and foreign matter must not be present.	Remove and clean.
4	Connection	Looseness of terminal screws	Try to further tighten screws with a screw driver.	Screws must not be loose.	Retighten the terminal screws.
		Proximity of solderless terminals to each other	Check visually.	Solderless terminals must be positioned at proper intervals.	Correct.

*1: When the PLC is used in the board, the environment in the board becomes the ambient environment.

CHAPTER9 TROUBLESHOOTING

This section describes the various types of trouble that occur when the the safety remote I/O module is operated, and causes and remedies of these troubles.

9.1 Troubleshooting Basics

In order to increase the reliability of the system, not only highly reliable devices are used but also the speedy startup of the system after the occurrence of trouble becomes an important factor.
To start up the system speedily, the cause of the trouble must be located and eliminated correctly. The basic three points that must be followed in the troubleshooting are as follows.

(1) Visual inspection

Visually check the following.

1) Movement of PLC (stop status and operation status)
2) Power supply status of the safety remote I/O module
3) Status of extenal devices
4) Installation condition of the safety power supply module, safety CPU module and safety master module
5) Status of wiring (I/O wires, power cables, CC-Link dedcated cables)
6) Display status of various types of indicators ("POWER" LED, "RUN" LED, "ERR." LED, etc.)
7) Status of setting of various types of set switches

After 1) to 7), connect GX Developer to the safety CPU module, and conduct PLC diagnostics or monitor the operating condition and program contents of the safety CPU module.

(2) Check of trouble

Check to see how the operating condition of the PLC varies while the PLC is operated as follows.

1) Set the safety CPU module RUN/STOP/RESET switch to "STOP".
2) Reset the trouble with the safety CPU module RUN/STOP/RESET switch.
3) Turn ON and OFF the power supply of the safety remote I/O module.
4) Reset the trouble with the safety remote I/O module reset switch.

(3) Narrowing down the range of trouble occurrence causes

Estimate the troubled part in accordance with items (1) and (2) above.

1) Safety remote I/O module or external devices
2) Safety master module or others
3) Safety CPU module
4) Sequence program

9.1.1 Precautions for Troubleshooting

The safety remote I/O module is designed to have various diagnostics circuits and detect an error.
When an error occurs, the CPU stops operation due to the error that is detected first.
In addition, the error code to be stored is the one that is detected first.

9.2 Troubleshooting with LEDs

This section classifies the error definitions by the LED staus and describes them.

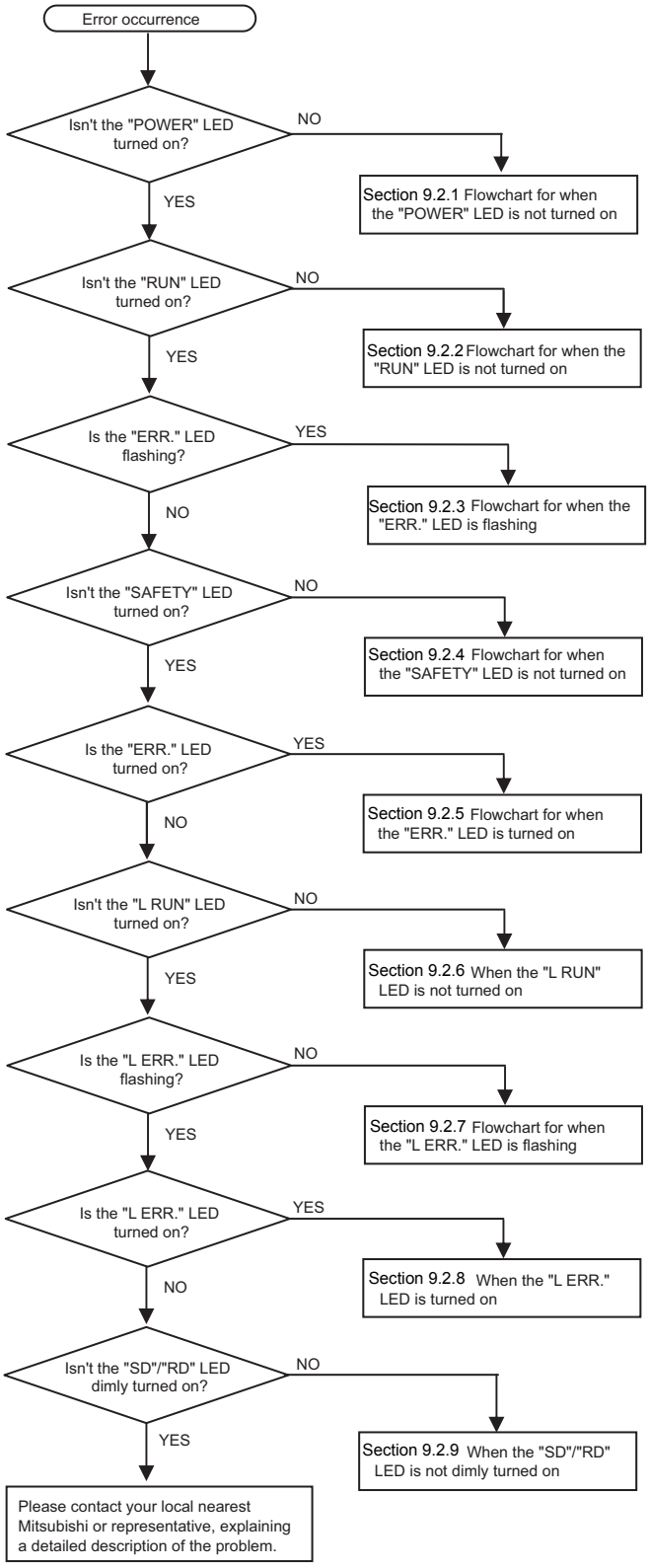


Figure 9.1 Troubleshooting flowchart

9.2.1 Flowchart for when the "POWER" LED is not turned on

The following shows the flowchart for when the "POWER" LED is not turned on at power-on of the safety remote I/O module or during operation of the PLC.

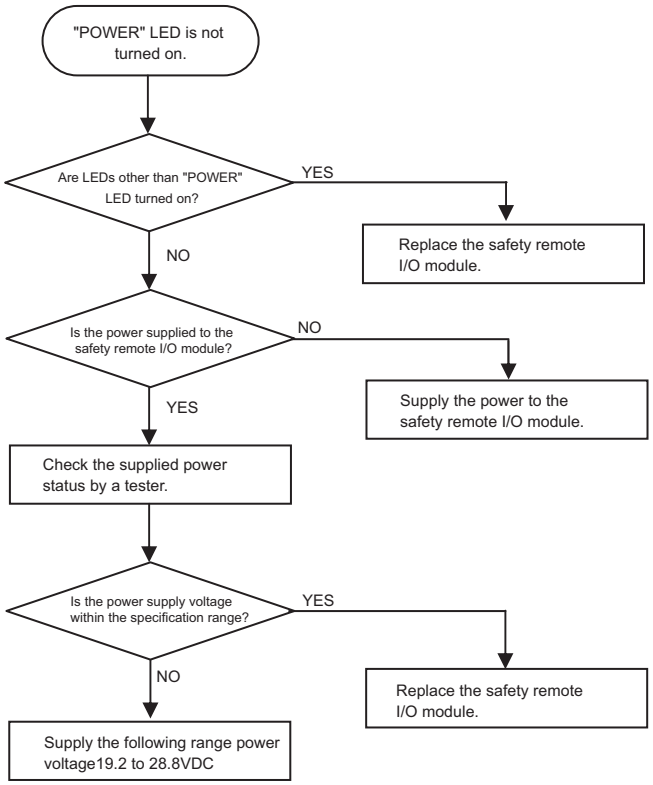


Figure 9.2 Flowchart for when the "POWER" LED is not turned on

9.2.2 Flowchart for when the "RUN" LED is not turned on

The following shows the flowchart for when the "RUN" LED is not turned on at power-on of the safety remote I/O module or during operation of the PLC.

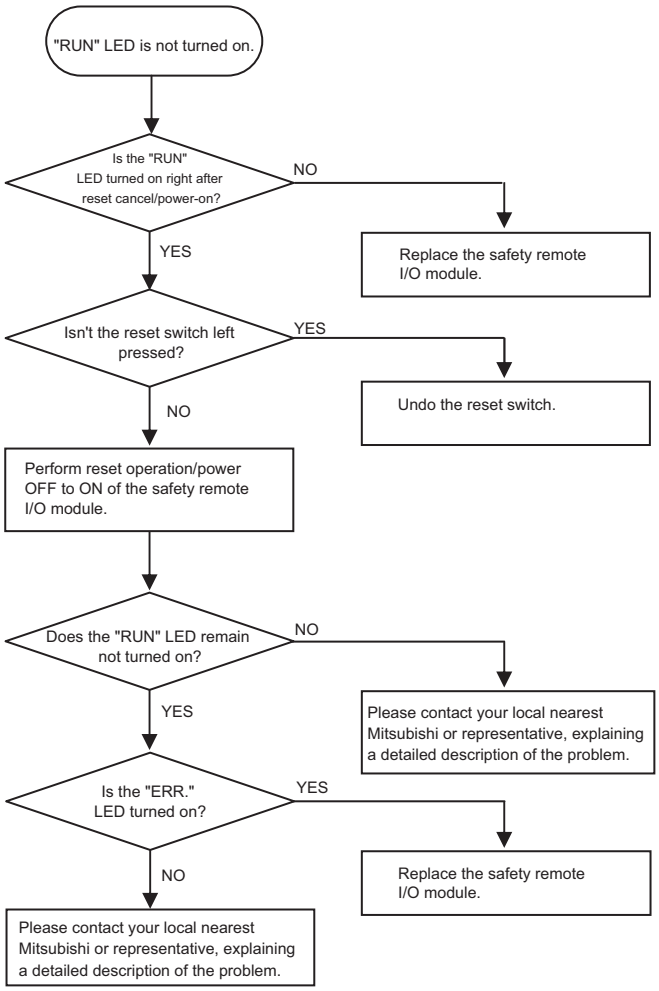


Figure 9.3 Flowchart for when the "RUN" LED is not turned on

9.2.3 Flowchart for when the "ERR." LED is flashing

The following shows the flowchart for when the "ERR." LED is flashing at power-on of the safety remote I/O module or during operation of the PLC.

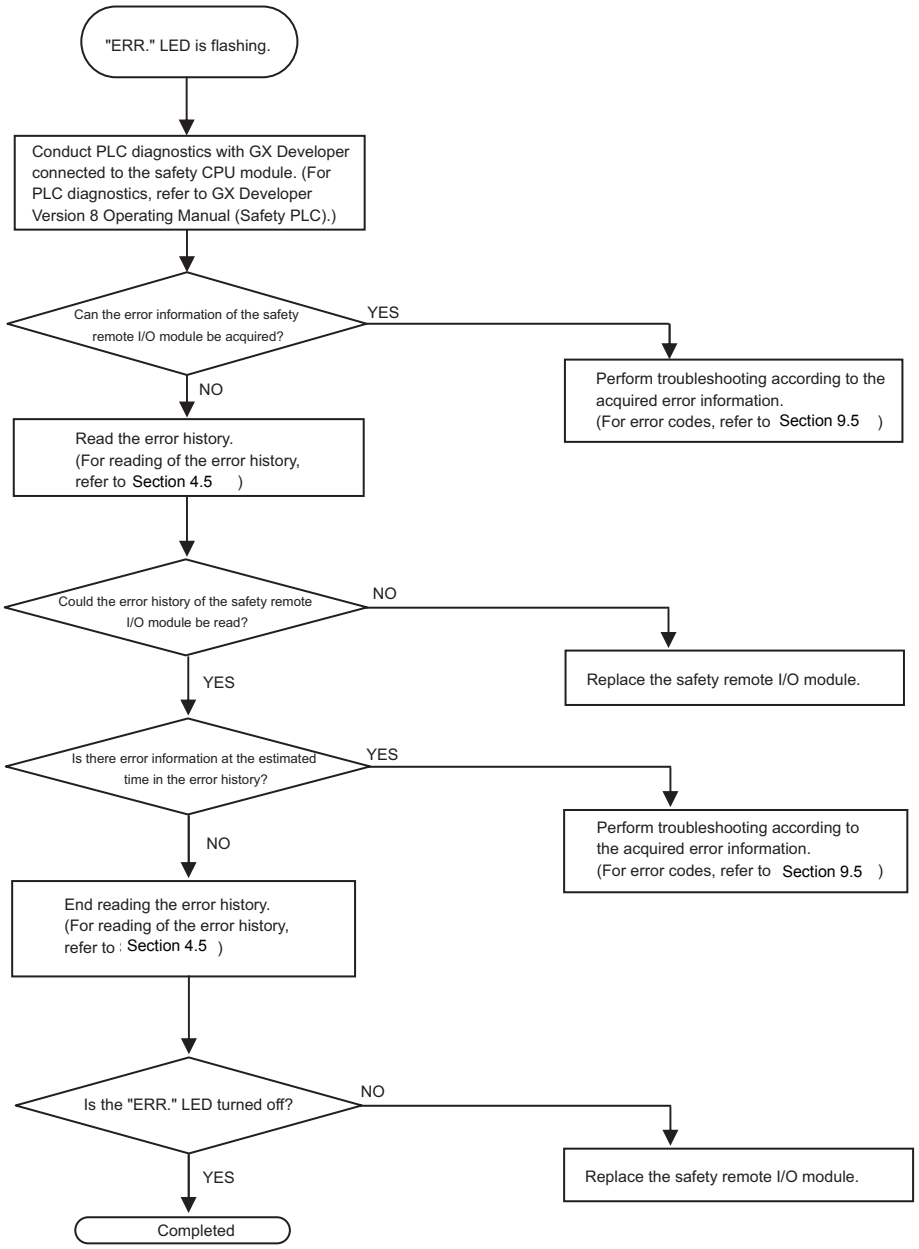
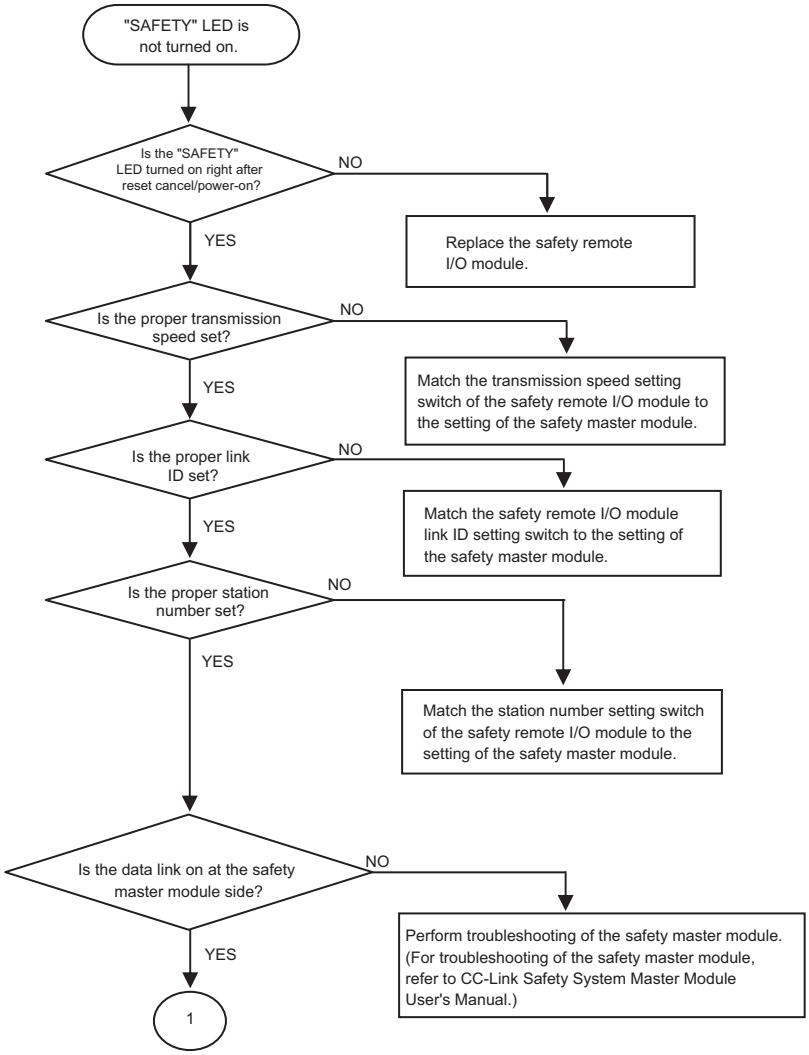


Figure 9.4 Flowchart for when the "ERR." LED is flashing

9.2.4 Flowchart for when the "SAFETY" LED is not turned on

The following shows the flowchart for when the "SAFETY" LED is not turned on at power-on of the safety remote I/O module or during operation of the PLC.



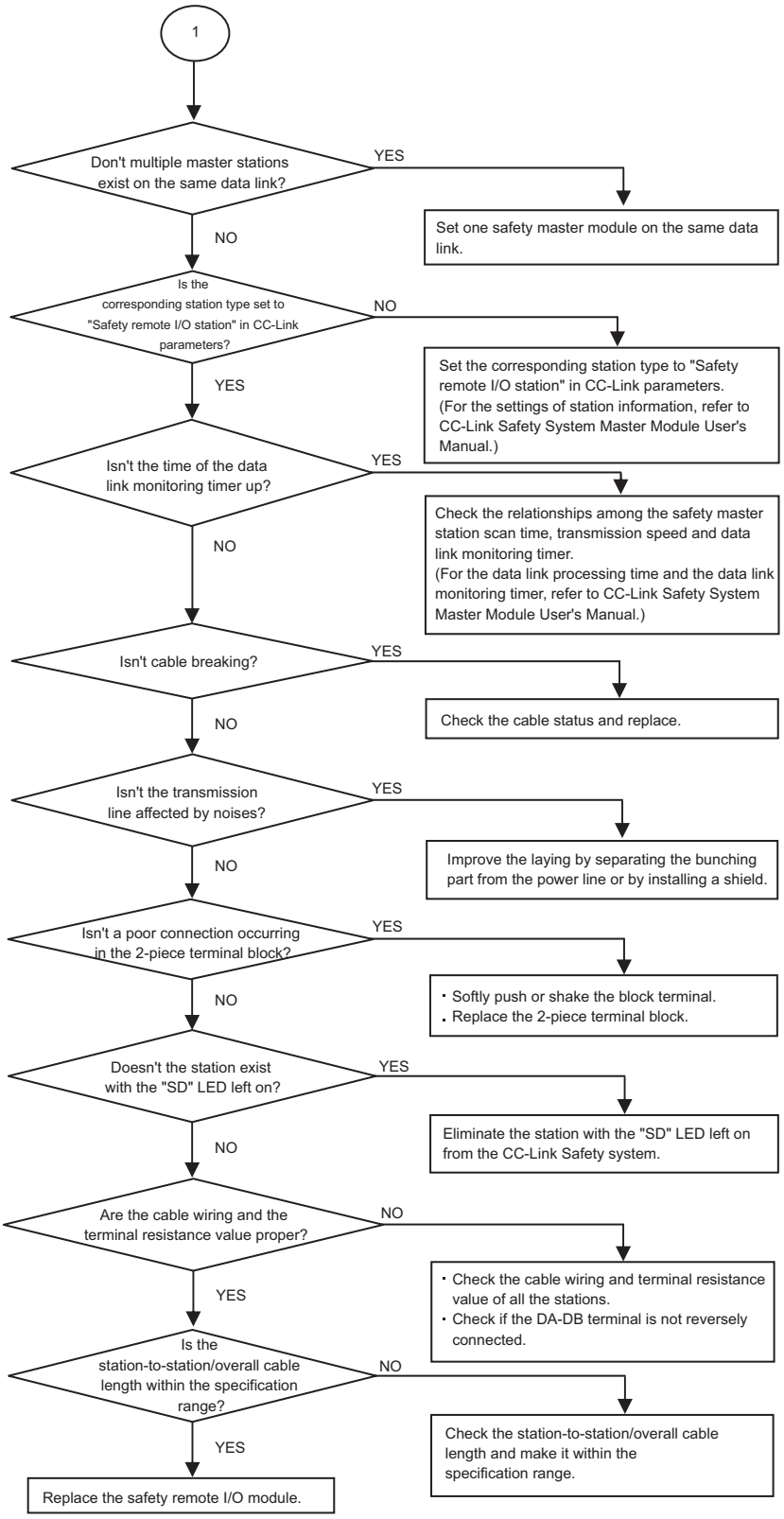


Figure 9.5 Flowchart for actions when the "SAFETY" LED is not turned on

9.2.5 Flowchart for when the "ERR." LED is turned on

The following shows the flowchart for when the "ERR." LED is turned on at power-on of the safety remote I/O module or during operation of the PLC.

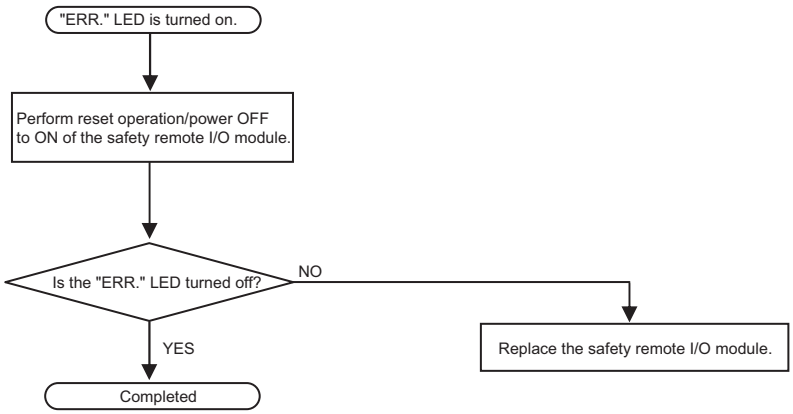


Figure 9.6 Flowchart for when the "ERR." LED is turned on

9.2.6 When the "L RUN" LED is not turned on

The following shows the case when the "L RUN" LED is not turned on at power-on of the safety remote I/O module or during operation of the PLC.

If the "L RUN" LED is not turned on when the "SAFETY" LED is turned on, replace the safety remote I/O module.
When the "SAFETY" LED is not turned on, refer to the flowchart of Section 9.2.4.

9.2.7 Flowchart for when the "L ERR." LED is flashing

The following shows the flowchart for when the "L ERR." LED is flashing at power-on of the safety remote I/O module or during operation of the PLC.

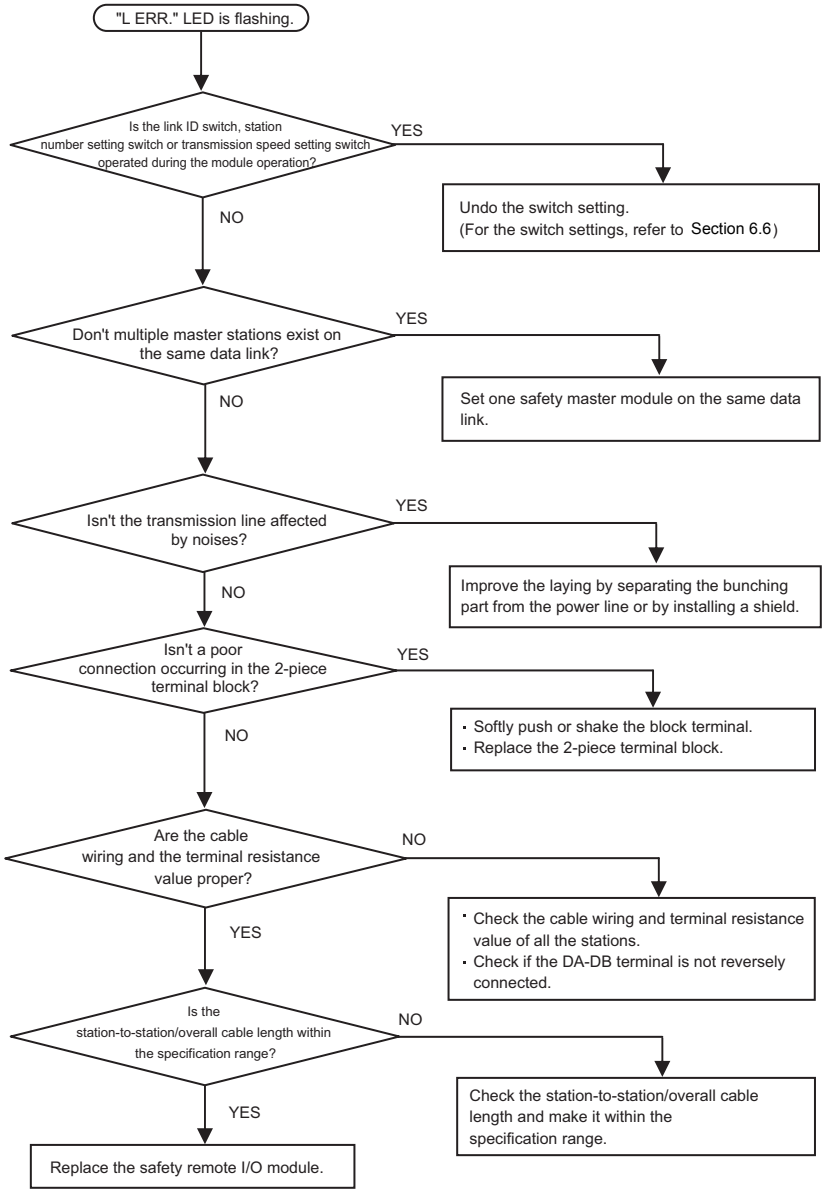


Figure 9.7 Flowchart for when the "L ERR." LED is flashing

9.2.8 When the "L ERR." LED is turned on

The following explains the case when the "L ERR." LED is turned on at power-on of the safety remote I/O module or during operation of the PLC.

If the "L ERR." LED is turned on when the "ERR." LED is turned off, replace the safety remote I/O module.
When the "ERR." LED is flashing, refer to the flowchart of Section 9.2.3.
When the "ERR." LED is turned on, refer to the flowchart of Section 9.2.5.

9.2.9 When the "SD"/"RD" LED is not dimly turned on

The following explains the case when the "SD"/"RD" LED is not dimly turned on at power-on of the safety remote I/O module or during operation of the PLC.

If the "SD"/"RD" LED is not dimly turned on when the "SAFETY" LED is turned on, replace the safety remote I/O module.
When the "SAFETY" LED is not turned on, refer to the flowchart of Section 9.2.4.

9.3 Verifying Errors from LED Status

The following table lists causes and corrective actions for errors indicated by LEDs on the safety remote I/O module when the network parameters are properly set and also the "MST" LED of the safety master module is on (i.e. under data link control) in the system configuration example shown below.

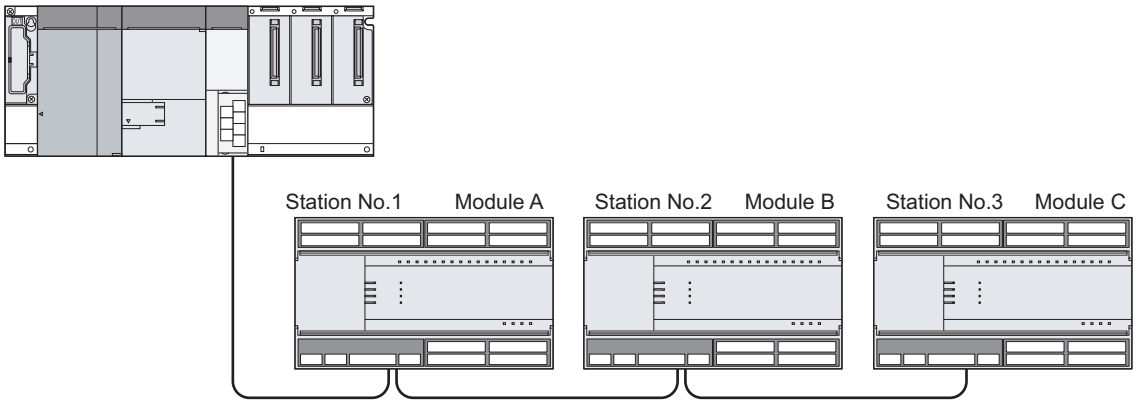


Figure 9.8 Configuration example for error verification

Table9.1 Verifying errors from LED status

LED status				Cause	Corrective action
Safety master module	Safety remote I/O module				
	A	B	C		
ERR. ○ or ERR. ●	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	Normal	-
	POWER ○ L RUN ○ L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	Since the LEDs on the safety remote I/O module are all off, the 24V power is not supplied or voltage is low.	Check the voltage of the 24V power supply, and supply the proper power to the safety remote I/O module.
	POWER ✻ L RUN ✻ L ERR. ✻	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	The safety remote I/O module A is malfunctioning and the LEDs are unstable(all lights are off, in many cases).	Replace the safety remote I/O module.
	POWER ● L RUN ○ L ERR. ✻	POWER ● L RUN ○ L ERR. ✻	POWER ● L RUN ○ L ERR. ✻	The transmission cable is shorted.	Find the shorted cable among the three transmission cables and repair it.
				The transmission cable is wired incorrectly.	Verify wiring in the terminal box of the safety remote I/O module and correct.

●: lit, ○: unlit, ✻: lit, flashing or unlit

Table9.2 Verifying errors from LED status (When the "L RUN" LED is not turned on)

LED status				Cause	Corrective action
Safety master module	Safety remote I/O module				
	A	B	C		
ERR. ○ or ERR. ●	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ○ L ERR. ○	POWER ● L RUN ○ L ERR. ○	• A line failure such as a cable failure/ terminal resister failure/cable or terminal block poor connection is occurring between the safety remote I/O modules A and B. • The line failure (terminal block poor connection, cable disconnection, etc.) is occurring between the safety remote I/O module B and C. • The safety remote I/O modules B and C are affected by noises.	• Check the SLD grounding status of the transmission cable. • Confirm that cables are laid out as far as possible from the power line (100mm or more). • Narrow down the line failure part using bisection algorithm or a tester.
	POWER ● L RUN ○ L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ○ L ERR. ○	The "L RUN" lights on the safety remote I/O modules A and C are off, indicating the station numbers for A and C are overlapping.	Restart the power supply after the overlapped station numbers for the safety remote I/O modules are corrected.
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ○ L ERR. ○	POWER ● L RUN ● L ERR. ○	The "L RUN" lights on the safety remote I/O modules B is off, indicating the transmission speed setting for module B is invalid within the setting range (0 to 4).	Restart the power supply after the transmission speed is set correctly.

●: lit, ○: unlit, ✻: lit, flashing or unlit

Table9.3 Verifying errors from LED status (When the "L ERR." LED is turned on)

LED status				Cause	Corrective action
Safety master module	Safety remote I/O module				
	A	B	C		
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	POWER ● L RUN ● L ERR. ○	The "L ERR." of the safety remote I/O module B is turned on, indicating that the module B is being affected by noises. ("L RUN" may be off.)	Correctly perform grounding of the FGs for the master module and all safety remote I/O modules.
ERR. ○ or ERR. ●	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	POWER ● L RUN ● L ERR. ●	• A line failure such as a cable failure/terminal resister failure/cable or terminal block poor connection is occurring. • The line failure (terminal block poor connection, cable disconnection, etc.) is occurring between the safety remote I/O modules B and C. • The safety remote I/O modules B and C are affected by noises.	• Check the SLD grounding status of the transmission cable. • Confirm that cables are laid out as far as possible from the power line (100mm or more). • Narrow down the line failure part using bisection algorithm or a tester.
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	A terminal resistor is not attached. ("L RUN" may be off.))	Check if a terminal resistor is attached.

●: lit, ○: unli, ✻: lit, flashing or unlit

9.4 Troubleshooting with GX Developer

Errors which occur in the safety remote I/O module can be verified on the PLC diagnostics screen of GX Developer.

(1) Reading an error code

When an error occurs, its error code, error message, etc. can be read using the PLC diagnostics of GX Developer.
Errors of the safety remote I/O module are registered as remote I/O station error information in "Operation/error history".
The error history of the safety remote I/O module must be sent to the safety CPU module beforehand.
For sending the error history of the safety remote I/O module, refer to Section 4.5.

The following shows the procedure for reading the error code from GX Developer.

1) Start GX Developer.
2) Connect the CPU module and personal computer.
3) On GX Developer, choose the [Online] → [Read from PLC] menu and read the project from the safety CPU module.
4) Choose the [Diagnostic] → [PLC diagnostic] menu.
5) If the error display part in "Present error" or "Operation/error log" is double-clicked, the error details dialog box appears.

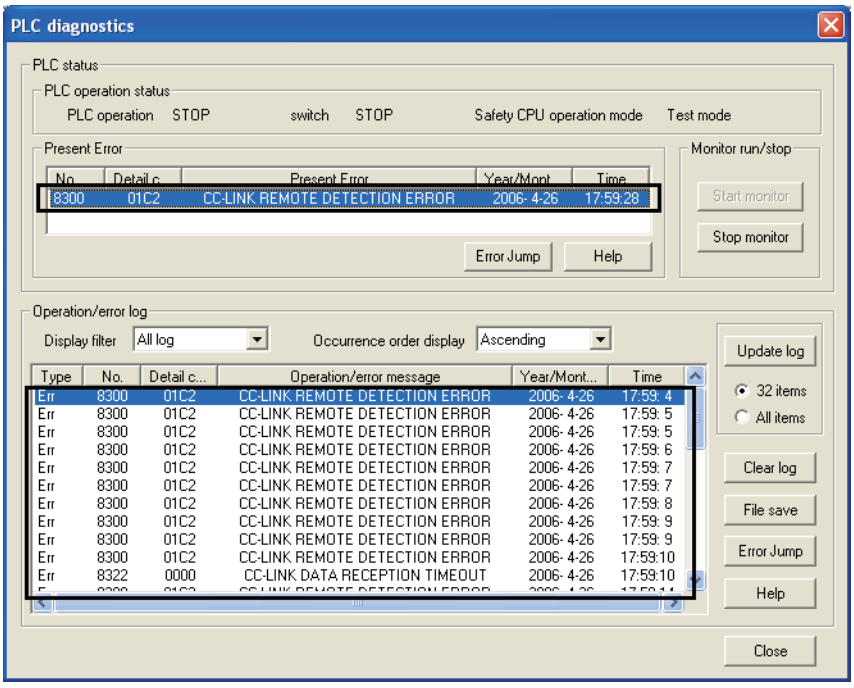


Figure 9.9 PLC diagnostics screen

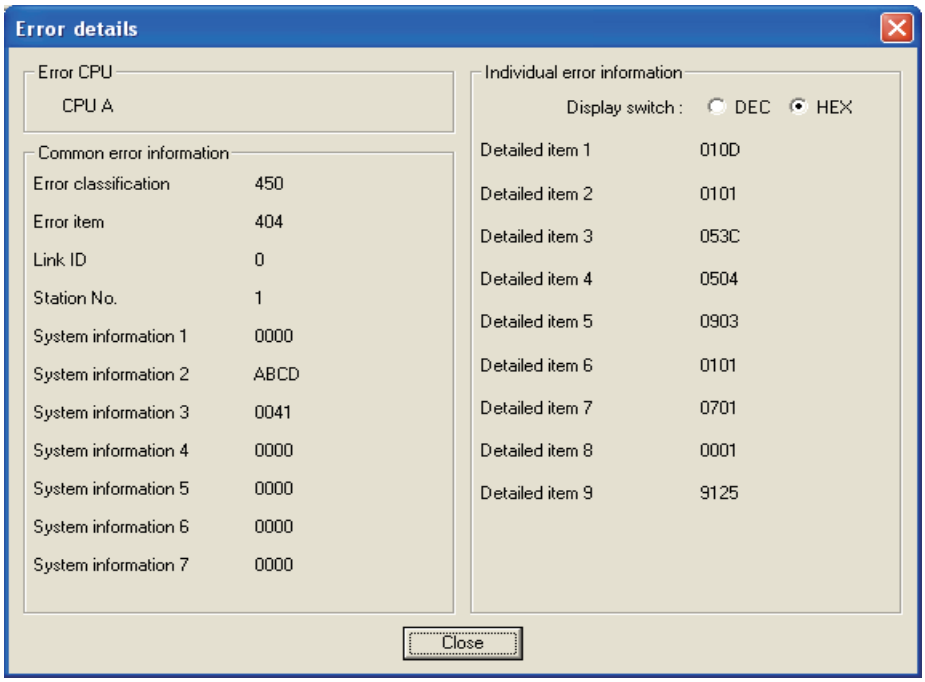


Figure 9.10 Error details screen

For details of the PLC diagnostics, refer to GX Developer Version 8 Operating Manual (Safety PLC).
For error details, refer to Section 9.5.

9.5 Error Code List

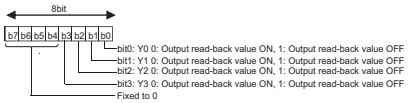
The safety remote I/O module sends the error information to the safety CPU module via a safety master module when the moderate error[*1] occurs at power-on or during operation of the PLC.
The error codes that the safety remote I/O module sends are listed in Table9.4.
For reading an error code, refer to Section 9.4.

*1 Safety remote I/O module error codes are classified into minor, moderate, and major errors as shown below.
However, minor error is not applied to the safety remote I/O module status.

- Minor error: Errors that may allow the safety remote I/O module to maintain the safety functions.
- Moderate error: Errors that may cause the safety remote I/O module to stop the safety functions with error detection enabled.
- Major error: Errors that may cause the safety remote I/O module to stop the safety functions with error detection disabled.

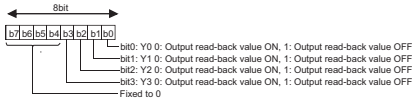
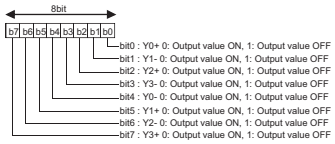
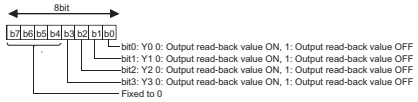
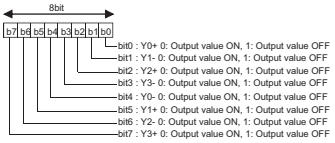
Outputs will be all points OFF when moderate errors or major errors occur.

Table9.4 Error code list

Error classification	Error item	Name	Error definition	Corrective action
302	0000	CC-Link Safety protocol (Out of receive command range)	An unexpected protocol occurred.	Error codes of CC-Link Safety protocol
304	0000	CC-Link Safety protocol division number error (Product information)	The continuity of division numbers collapsed in the send/receive processing of product information.	
	0001	CC-Link Safety protocol division number error (Safety slave station parameters)	The continuity of division numbers collapsed in the send/receive processing of the safety slave station parameters.	
	0002	CC-Link Safety protocol division number error (Error information)	The continuity of division numbers collapsed in the send/receive processing of error information.	
	0003	CC-Link Safety protocol division number error (Safety slave station internal information)	The continuity of division numbers collapsed in the safety slave station internal information access processing.	
305	0000	CC-Link Safety protocol product mismatch (Link ID mismatch)	The link ID received from the safety master station and that of the host station are different.	
	0001	CC-Link Safety protocol product mismatch (Manufacturer code mismatch)	The manufacturer code received from the safety master station and that of the host station mismatched in the product information verification processing.	
	0002	CC-Link Safety protocol product mismatch (Module inherent code mismatch)	The inherent code received from the safety master station and that of the host station mismatched in the product information verification processing.	
	0003	CC-Link Safety protocol product mismatch (Module technical version mismatch)	The module technical version received from the safety master station and that of the host station mismatched in the product information verification processing.	
	0004	CC-Link Safety protocol product mismatch (Product information mismatch)	The product information received from the safety master station and that of the host station mismatched in the product information verification processing.  Host information 1, 2: Lowest 16 bits of product information Host information 7, 8: Highest 16 bits of product information	

Error classification	Error item	Name	Error definition	Corrective action
305	0005	CC-Link Safety protocol product mismatch (Model name information mismatch)	The model name information received from the safety master station and that of the host station mismatched in the product information verification processing. Details 1 to 9 Error details 1: 'QS' Error details 2: '0J' Error details 3: '65' Error details 4: 'BT' Error details 5: 'B2' Error details 6: '-1' Error details 7: '2D' Error details 8: 'T ' Error details 9: 0x0020	Error codes of CC-Link Safety protocol
306	0001	CC-Link Safety protocol safety slave station parameter error (Verification request acceptance disabled)	The verification request for the safety slave station parameters is accepted from the safety master station. However, it is not supported by the local station.	
	0002	Safety slave station parameters Out of parameter number range	The number of the safety slave station parameters is out of range.	
	0003	Safety slave station parameters Same parameter number setting	The same number is set for the safety slave station parameters.	
	0004	Safety slave station parameter Out of setting range	The settings of the safety slave station parameters are out of range.	
	0005	CC-Link Safety protocol safety slave station parameter error (CRC32 mismatch)	For the safety slave station parameters received from the safety master station, the CRC32 calculated from the overall parameters and the received one mismatch.	

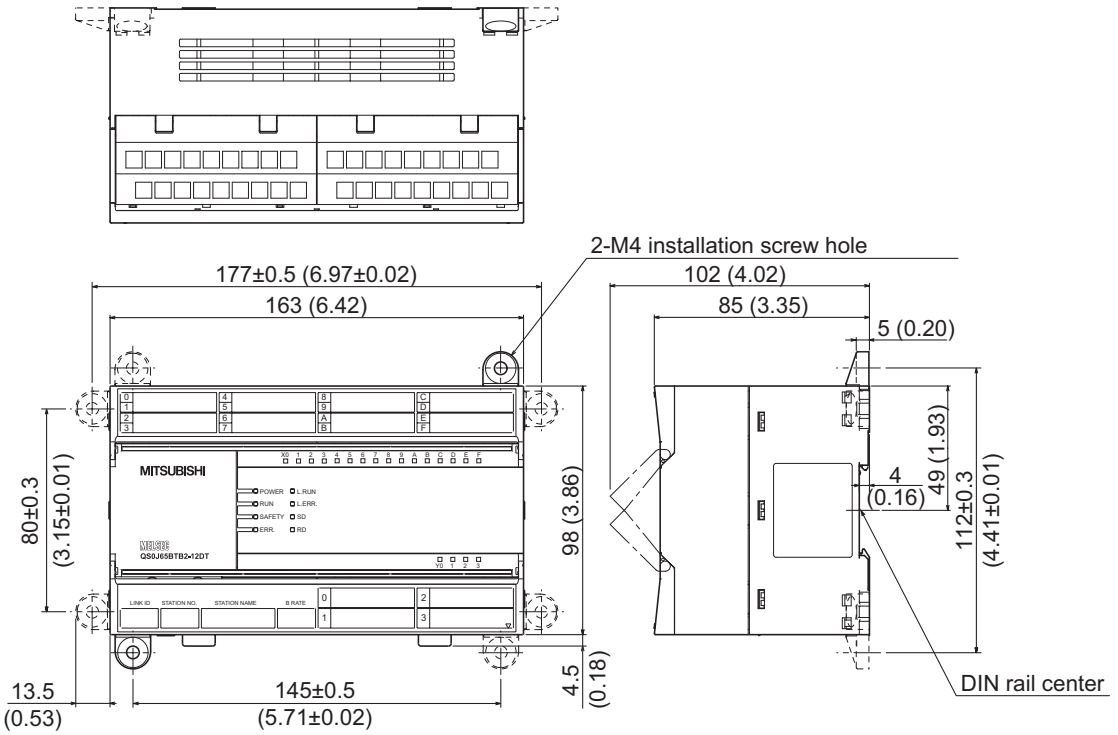
Error classification	Error item	Name	Error definition	Corrective action
350	0917	Safety slave station parameter mismatch	Safety slave station parameter mismatch. <Error details 2> 201: Mismatch of "Time of noise removal filter" ('Input dark test pulse OFF time' is greater than "Time of noise removal filter X0,1") 601: "Method of wiring of output" mismatch (When "Source+Source" is selected as a method of wiring of output, the setting of the paired method of wiring of output is not the same. 701: Output dark test selection mismatch (When "Source+Source" is selected as a method of wiring of output, the setting of output dark test selection is not the same.)	• Determine the mismatch according to the error details 2 on the left and correct parameters. • After checking that the CSP file is not damaged and that the latest CSP file is registered, set the safety remote I/O module parameters again.
	0719	CC-Link Safety protocol safety slave station parameter number error	The received numbers of safety slave station parameters are out of range.	• After checking that the CSP file is not damaged and that the latest CSP file is registered, set the safety remote I/O module parameters again.
450	0102	Doubling input discrepancy detection time	A mismatch has been detected in paired inputs (X0 and X1, X2 and X3, etc.) over the doubling input discrepancy detection time.	Reexamine the connected devices and the wiring.

Error classification	Error item	Name	Error definition	Corrective action
450	0203	Output overload error (At Safety pre-diagnostics)	The overcurrent protection or overheat protection has been activated in the output circuit transistor.	(1) Reexamine the connected devices and the wiring. (2) Replace the safety remote I/O module.
	0204	Output read-back error (At pre-Safety diagnostics)	The read-back value and the output value do not match. <Error details2> Upper 8 bits  Lower 8 bits  Because of restrictions on hardware, the sink side output read-back always reads ON regardless of ON/OFF of the output.	
	0209	Output overload error (At mid-Safety connection diagnostics)	The overcurrent protection or overvoltage protection has been activated in the output circuit transistor.	
	0210	Output read-back error (At mid-Safety connection diagnostics)	The read-back value and the output value do not match. <Error details2> Upper 8 bits  Lower 8 bits  Because of restrictions on hardware, the sink side output read-back always reads ON regardless of ON/OFF of the output.	
	0304	Input dark test error	The test pulse could not be detected during the input dark test.	(1) Reexamine the connected devices and the wiring. (2) Replace the safety remote I/O module
	0305	Output dark test error	The test pulse could not be detected during the output dark test.	

Error classification	Error item	Name	Error definition	Corrective action
450	0402	I/O control power supply voltage error	I/O control power supply overvoltage error The overvoltage/undervoltage has been detected in the I/O control power supply that poles every 10ms.	(1) Reexamine the connected devices and the wiring. (2) Match the timing of powering on the external power supply to that of powering on the safety remote I/O module.
	0404	External power supply error	I/O control power supply voltage switching-off circuit error. The safety remote I/O module could not turn ON the I/O control power supply at start-up.	Reexamine the wiring and voltage of the external power supply.
	0908	Error history reading status record	Record of error history reading status. The error history is read in a statue where no error history exits. After the new error code is stored, this error code will not be read from the histroy.	Use the module as is, since it is normal.
	0911	Module forced stop control	The operation of the safety remote I/O module has stopped by receiving a forced stop command from the master module. Module forced stop control. However, errors received after an error is sent are eliminated. However, errors received after an error is sent or errors received at the time of reading error history are eliminated.	Refer to the error history of the safety CPU module/safety master module.
	1213	Setting registration switch status error at power-on	The ON status of the setting registration switch is detected at power-on	(1) Do not turn ON power supply or reset with pressing the setting registration switch. (2) If this error occurs at power-on or reset operation without pressing the setting registration switch, the failure is due to the setting registration switch. Replace the module.

APPENDICES

Appendix 1 External Dimensions



Unit: mm (inch)

Diagram App.1 External dimensions

Memo

INDEX

Memo

WARRANTY

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

1. Limited Warranty and Product Support.

a. Mitsubishi Electric Company ("MELCO") warrants that for a period of eighteen (18) months after date of delivery from the point of manufacture or one year from date of Customer's purchase, whichever is less, Mitsubishi MELSEC Safety programmable logic controllers (the "Products") will be free from defects in material and workmanship.
b. At MELCO's option, for those Products MELCO determines are not as warranted, MELCO shall either repair or replace them or issue a credit or return the purchase price paid for them.
c. For this warranty to apply:
   (1) Customer shall give MELCO (i) notice of a warranty claim to MELCO and the authorized dealer or distributor from whom the Products were purchased, (ii) the notice shall describe in reasonable details the warranty problem, (iii) the notice shall be provided promptly and in no event later than thirty (30) days after the Customer knows or has reason to believe that Products are not as warranted, and (iv) in any event, the notice must given within the warranty period;
   (2) Customer shall cooperate with MELCO and MELCO's representatives in MELCO's investigation of the warranty claim, including preserving evidence of the claim and its causes, meaningfully responding to MELCO's questions and investigation of the problem, grant MELCO access to witnesses, personnel, documents, physical evidence and records concerning the warranty problem, and allow MELCO to examine and test the Products in question offsite or at the premises where they are installed or used; and
   (3) If MELCO requests, Customer shall remove Products it claims are defective and ship them to MELCO or MELCO's authorized representative for examination and, if found defective, for repair or replacement. The costs of removal, shipment to and from MELCO's designated examination point, and reinstallation of repaired or replaced Products shall be at Customer's expense.
   (4) If Customer requests and MELCO agrees to effect repairs onsite at any domestic or overseas location, the Customer will pay for the costs of sending repair personnel and shipping parts. MELCO is not responsible for any re-commissioning, maintenance, or testing on-site that involves repairs or replacing of the Products.
d. Repairs of Products located outside of Japan are accepted by MELCO's local authorized service facility centers ("FA Centers"). Terms and conditions on which each FA Center offers repair services for Products that are out of warranty or not covered by MELCO's limited warranty may vary.
e. Subject to availability of spare parts, MELCO will offer Product repair services for (7) years after each Product model or line is discontinued, at MELCO's or its FA Centers' rates and charges and standard terms in effect at the time of repair. MELCO usually produces and retains sufficient spare parts for repairs of its Products for a period of seven (7) years after production is discontinued.
f. MELCO generally announces discontinuation of Products through MELCO's Technical Bulletins. Products discontinued and repair parts for them may not be available after their production is discontinued.

2. Limits of Warranties.

a. MELCO does not warrant or guarantee the design, specify, manufacture, construction or installation of the materials, construction criteria, functionality, use, properties or other characteristics of the equipment, systems, or production lines into which the Products may be incorporated, including any safety, fail-safe and shut down systems using the Products.
b. MELCO is not responsible for determining the suitability of the Products for their intended purpose and use, including determining if the Products provide appropriate safety margins and redundancies for the applications, equipment or systems into which they are incorporated.
c. Customer acknowledges that qualified and experienced personnel are required to determine the suitability, application, design, construction and proper installation and integration of the Products. MELCO does not supply such personnel.
d. MELCO is not responsible for designing and conducting tests to determine that the Product functions appropriately and meets application standards and requirements as installed or incorporated into the end-user's equipment, production lines or systems.
e. MELCO does not warrant any Product:
   (1) repaired or altered by persons other than MELCO or its authorized engineers or FA Centers;
   (2) subjected to negligence, carelessness, accident, misuse, or damage;
   (3) improperly stored, handled, installed or maintained;
   (4) integrated or used in connection with improperly designed, incompatible or defective hardware or software;
   (5) that fails because consumable parts such as batteries, backlights, or fuses were not tested, serviced or replaced;
   (6) operated or used with equipment, production lines or systems that do not meet applicable and commensurate legal, safety and industry-accepted standards;
   (7) operated or used in abnormal applications;
   (8) installed, operated or used in contravention of instructions, precautions or warnings contained in MELCO's user, instruction and/or safety manuals, technical bulletins and guidelines for the Products;
   (9) used with obsolete technologies or technologies not fully tested and widely accepted and in use at the time of the Product's manufacture;
   (10) subjected to excessive heat or moisture, abnormal voltages, shock, excessive vibration, physical damage or other improper environment; or
   (11) damaged or malfunctioning due to Acts of God, fires, acts of vandals, criminals or terrorists, communication or power failures, or any other cause or failure that results from circumstances beyond MELCO's control.
f. All Product information and specifications contained on MELCO's website and in catalogs, manuals, or technical information materials provided by MELCO are subject to change without prior notice.

g. The Product information and statements contained on MELCO's website and in catalogs, manuals, technical bulletins or other materials provided by MELCO are provided as a guide for Customer's use. They do not constitute warranties and are not incorporated in the contract of sale for the Products.
h. These terms and conditions constitute the entire agreement between Customer and MELCO with respect to warranties, remedies and damages and supersede any other understandings, whether written or oral, between the parties. Customer expressly acknowledges that any representations or statements made by MELCO or others concerning the Products outside these terms are not part of the basis of the bargain between the parties and are not factored into the pricing of the Products.
i. THE WARRANTIES AND REMEDIES SET FORTH IN THESE TERMS ARE THE EXCLUSIVE AND ONLY WARRANTIES AND REMEDIES THAT APPLY TO THE PRODUCTS.
j. MELCO DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

3. Limits on Damages.

a. MELCO'S MAXIMUM CUMULATIVE LIABILITY BASED ON ANY CLAIMS FOR BREACH OF WARRANTY OR CONTRACT, NEGLIGENCE, STRICT TORT LIABILITY OR OTHER THEORIES OF RECOVERY REGARDING THE SALE, REPAIR, REPLACEMENT, DELIVERY, PERFORMANCE, CONDITION, SUITABILITY, COMPLIANCE, OR OTHER ASPECTS OF THE PRODUCTS OR THEIR SALE, INSTALLATION OR USE SHALL BE LIMITED TO THE PRICE PAID FOR PRODUCTS NOT AS WARRANTED.
b. Although MELCO has obtained the certification for Product's compliance to the international safety standards IEC61508 and EN954-1/ISO13849-1 from TUV Rheinland, this fact does not guarantee that Product will be free from any malfunction or failure. The user of this Product shall comply with any and all applicable safety standard, regulation or law and take appropriate safety measures for the system in which the Product is installed or used and shall take the second or third safety measures other than the Product. MELCO is not liable for damages that could have been prevented by compliance with any applicable safety standard, regulation or law.
c. MELCO prohibits the use of Products with or in any application involving power plants, trains, railway systems, airplanes, airline operations, other transportation systems, amusement equipments, hospitals, medical care, dialysis and life support facilities or equipment, incineration and fuel devices, handling of nuclear or hazardous materials or chemicals, mining and drilling, and other applications where the level of risk to human life, health or property are elevated.
d. MELCO SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL, INDIRECT OR PUNITIVE DAMAGES, FOR LOSS OF PROFITS, SALES, OR REVENUE, FOR INCREASED LABOR OR OVERHEAD COSTS, FOR DOWNTIME OR LOSS OF PRODUCTION, FOR COST OVERRUNS, OR FOR ENVIRONMENTAL OR POLLUTION DAMAGES OR CLEAN-UP COSTS, WHETHER THE LOSS IS BASED ON CLAIMS FOR BREACH OF CONTRACT OR WARRANTY, VIOLATION OF STATUTE, NEGLIGENCE OR OTHER TORT, STRICT LIABILITY OR OTHERWISE.
e. In the event that any damages which are asserted against MELCO arising out of or relating to the Products or defects in them, consist of personal injury, wrongful death and/or physical property damages as well as damages of a pecuniary nature, the disclaimers and limitations contained in these terms shall apply to all three types of damages to the fullest extent permitted by law. If, however, the personal injury, wrongful death and/or physical property damages cannot be disclaimed or limited by law or public policy to the extent provided by these terms, then in any such event the disclaimer of and limitations on pecuniary or economic consequential and incidental damages shall nevertheless be enforceable to the fullest extent allowed by law.
f. In no event shall any cause of action arising out of breach of warranty or otherwise concerning the Products be brought by Customer more than one year after the cause of action accrues.
g. Each of the limitations on remedies and damages set forth in these terms is separate and independently enforceable, notwithstanding the unenforceability or failure of essential purpose of any warranty, undertaking, damage limitation, other provision of these terms or other terms comprising the contract of sale between Customer and MELCO.

4. Delivery/Force Majeure.

a. Any delivery date for the Products acknowledged by MELCO is an estimated and not a promised date. MELCO will make all reasonable efforts to meet the delivery schedule set forth in Customer's order or the purchase contract but shall not be liable for failure to do so.
b. Products stored at the request of Customer or because Customer refuses or delays shipment shall be at the risk and expense of Customer.
c. MELCO shall not be liable for any damage to or loss of the Products or any delay in or failure to deliver, service, repair or replace the Products arising from shortage of raw materials, failure of suppliers to make timely delivery, labor difficulties of any kind, earthquake, fire, windstorm, flood, theft, criminal or terrorist acts, war, embargoes, governmental acts or rulings, loss or damage or delays in carriage, acts of God, vandals or any other circumstances reasonably beyond MELCO's control.

5. Choice of Law/Jurisdiction.

These terms and any agreement or contract between Customer and MELCO shall be governed by the laws of the State of New York without regard to conflicts of laws. To the extent any action or dispute is not arbitrated, the parties consent to the exclusive jurisdiction and venue of the federal and state courts located in the Southern District of the State of New York. Any judgment there obtained may be enforced in any court of competent jurisdiction.

6. Arbitration.

Any controversy or claim arising out of, or relating to or in connection with the Products, their sale or use or these terms, shall be settled by arbitration conducted in accordance with the Center for Public Resources (CPR) Rules for Non-Administered Arbitration of International Disputes, by a sole arbitrator chosen from the CPR's panels of distinguished neutrals. Judgment upon the award rendered by the Arbitrator shall be final and binding and may be entered by any court having jurisdiction thereof. The place of the arbitration shall be New York City, New York. The language of the arbitration shall be English. The neutral organization designated to perform the functions specified in Rule 6 and Rules 7.7(b), 7.8 and 7.9 shall be the CPR.

Mitsubishi Safety
Programmable Logic
Controller

MELSEC QS series

CC-Link Safety System Remote I/O Module User's Manual

MODEL	QS0J65BTB2-12DT-U-SE
MODEL CODE	13JR89
SH(NA)-080612ENG-A(0609)MEE	

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