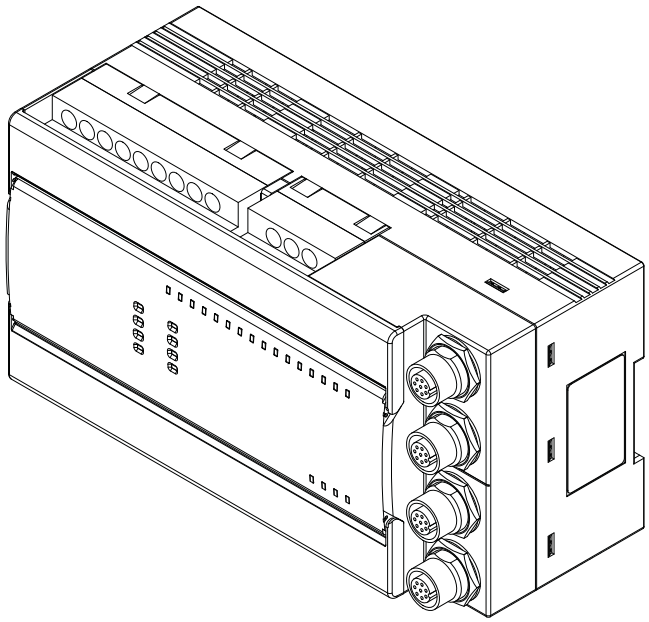
Panasonic

INSTRUCTION MANUAL

CC-Link Safety System Remote I/O Unit with Connectors for Light Curtain

SF-CL1T264T



Thank you very much for using Panasonic Industrial Devices SUNX products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

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.

Notes

1) All the contents of this instruction manual are the copyright of the publishers, and may not be reproduced (even extracts) in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from the publisher.
2) The contents of this instruction manual may be changed without prior notice for further improvement of the device.
3) Though we have carefully drawn up the contents of this instruction manual, if there are any aspects that are not clear, or any error that you may notice, please contact our local Panasonic Industrial Devices SUNX office of the nearest distributor.
4) English and Japanese version of this instruction manuals are original.

Safety Precautions

In this manual, the safety instructions are ranked as "**DANGER**" and "**CAUTION**."
Make sure to follow those instructions for safe use of this product.

⚠ DANGER

"**DANGER**" indicates that mishandling of this system may result in death or serious injury, and this word is limitedly used in the extremely hazardous situations.

⚠ CAUTION

"**WARNING**" indicates that mishandling of this system may result in death or serious injury.

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.

⚠ CAUTION

- **The light curtains that can be used in combination with this product are as follows.**
  SF4B / **SF4B<V2>** series and **SF4B-□-01** / **SF4B-□-01<V2>**
- **When connecting this product to light curtain, be sure to use the following exclusive cables. If you use a cable other than the following, the product may not operate properly.**
  - **Bottom cap cable**
    SFB-CB05-CL (cable length 0.5m), SFB-CB5-CL (cable length 5m)
    SFB-CB10-CL (cable length 10m)
  - **Extension cable with connectors on both ends**
    SFB-CCJ10E-CL (for the emitter: cable length 10m)
    SFB-CCJ10D-CL (for the receiver: cable length 10m)

- Use this product as per its specifications. Do not modify this product since its function and capabilities may not be maintained and it may malfunction.
- This product has been developed / produced for industrial use only.
- This product is suitable for indoor use only.
- Use of this product under the following conditions or environment is not presupposed.
  Please consult us if there is no other choice but to use this product in such an environment.
  1) Operating this product under conditions and environment not described in this manual.
  2) Using this product in the following fields: nuclear power control, railroad, aircraft, automobiles, combustion facilities, medical systems, aerospace development, etc.
- Before using this product, check whether the device performs properly with the functions and capabilities as per the design specifications.
- In case of disposal, dispose this product as industrial waste.

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Before Using This Product

Conformance to the EMC and Low Voltage Directives

When incorporating a PLC compliant with the EMC and Low Voltage Directives into an industrial machinery and ensuring compliance with the directives, refer to “Chapter 3 EMC and Low Voltage Directives” of the “QSCPU User's Manual (Hardware)” produced by Mitsubishi Electric Corporation.
The CE logo is printed on the rating plate of the unit, indicating compliance with the directives.
To conform this product to the EMC and Low Voltage Directives, refer to “Chapter 3 EMC and Low Voltage Directives” and “CC-Link module” of the “QSCPU User's Manual (Hardware)” produced by Mitsubishi Electric Corporation.
When using this product as a CE Marking conforming product, the cable length between this product and the light curtain should be total 30m or less (emitter and receiver, respectively).

Conformance to Standards / Regulations In North America

Use the power supply that conforms to CLASS 2 defined in UL 508 or use the circuit that fulfills the requirements of Limited Voltage / Current Circuit.

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 unit.

Generic Term / Abbreviation	Description
SF-CL1T264T	Abbreviation of CC-Link Safety System Remote I/O Unit
Safety remote I/O unit	Other name for **SF-CL1T264T** (hereinafter called this product or the unit).
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 information in bit unit. Compatible with the safety-related system.
Safety remote station	Other name for safety remote I/O station.
Safety master unit	Other name for CC-Link Safety system master unit.
Standard remote I/O unit	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 unit 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 unit 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 unit	Abbreviation for QS001CPU type safety CPU unit.
Safety PLC	General name for safety CPU unit, safety power supply unit, safety main base unit, CC-Link Safety master unit and CC-Link Safety remote I/O unit.
Standard PLC	General name of each unit 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
SF-CL1T264T	1 unit
Instruction Manual (this manual)	1 pc.

Chapter 1 Overview

1-1 Features

The following describes the features of this product.

(1) Easy connection to light curtain manufactured by Panasonic Industrial Devices SUNX

The light curtains that can be used in combination with this product are as follows.
SF4B / **SF4B<V2>** series and **SF4B-□-01** / **SF4B-□-01<V2>**
Incorporated M8 connector for the light curtain.
Up to 2 sets of the light curtain can be easily connected.
It is possible to connect the light curtain to input terminals.

(2) Highest level of safety approval acquired

This product has acquired the highest level of the certification for PLC [IEC 61508 (SIL3), EN ISO 13849-1 (Category 4, PLe)].
The safety-related system with high security can be configured.

(3) Compatible with the safety category 3 and 4

The system corresponding to category 3 or category 4 of EN ISO 13849-1 can be configured according to the combination of wiring and parameters.

(4) Space-saving system design

Compared to the system with the safety relay, this system can be configured with a smaller space.

(5) Improvement of wiring work efficiency

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

(6) Fail-safe function

When a failure occurs inside the unit, the self-diagnostics function detects the failure and turns OFF the output.

(7) 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.

(8) Simple settings in parameters

Using the parameter setting screen of the programming tool allows the easier settings for the safety remote I/O unit.

(9) Improved maintenanceability at trouble occurrence

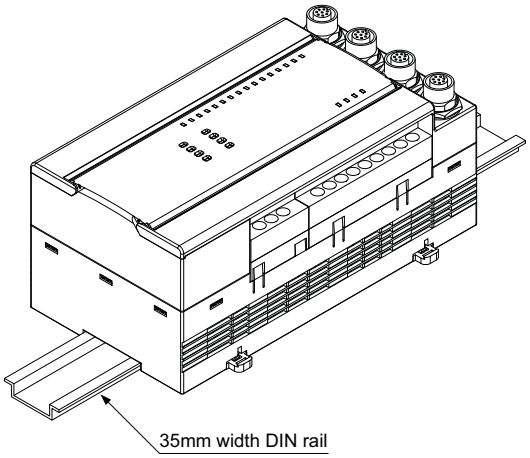
Classifying error information into major / moderate / minor allows the easier judgment of failures / errors.

(10) Reset available for single module

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

(11) The module can be installed in six orientations

The unit can be installed using 35mm width DIN rail.

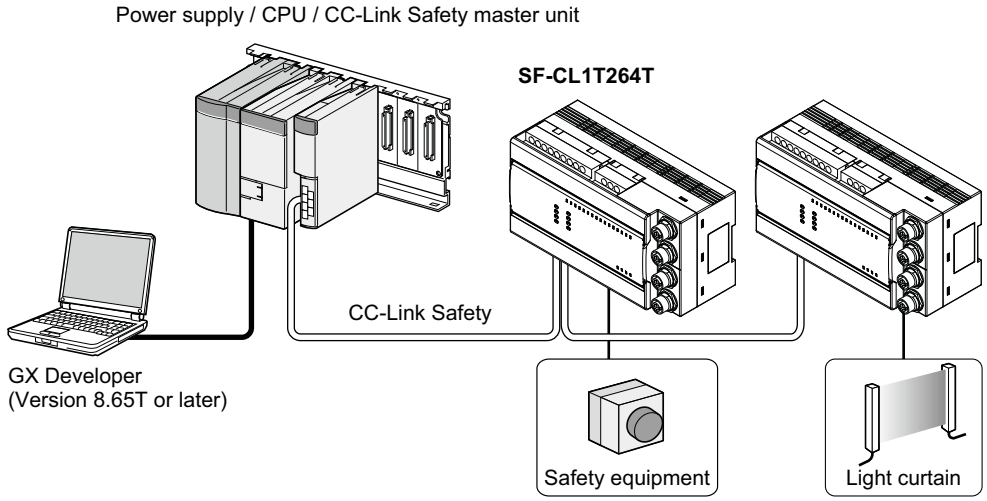


Chapter 2 System Configuration

This chapter describes the system configuration, cautions for use and system equipment of this product.

2-1 Overall Configuration

The following describes the system configuration of this product.
This product 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 unit with a safety CPU unit or safety master unit.



2-2 Cautions on the System Configuration

This section describes the equipment which can be configured and the available software package to use this product.

(1) Applicable master unit

This product can connect to only the safety master unit.

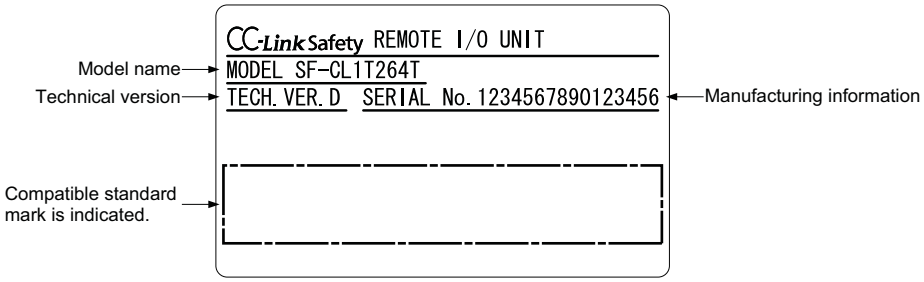
(2) Applicable software package

The following shows the software package compatible with this product.

Designation	Model No.	Remark
GX Developer	SW8D5C-GPPW Version 8.65T or later	Necessary. MELSEC PLC programming software

2-3 Confirming Production Information

The production information of this product can be confirmed on the rating plate on the side face of the unit.



3-1 List of Specifications

Item \ Designation / Model No.			CC-Link Safety system I/O unit with connectors for light curtain **SF-CL1T264T**
Applicable standard			IEC / EN 61508 (SIL3), EN ISO 13849-1 (JIS B 9705-1) (Category 4, PLe), UL 508
Connectable light curtain			**SF4B** / **SF4B<V2>** series, **SF4B-□-01** / **SF4B-□-01<V2>** (Note 1)
Input specifications	No. of input points (Note 2)		Input of light curtain: 2 points [with interference prevention function (Note 3)] Input of terminal block: 6 points (input terminals: 12 points)
	Insulation method		Photocoupler
	Rated input voltage		24V DC
	Rated input current		Approx. 4.6mA
	Operating voltage range		24V DC±10% Ripple P-P 10% or less
	Max. simultaneous input points		100%
	ON voltage / ON current		15V DC or more / 2mA or more
	OFF voltage / OFF current		5V DC or less / 0.5mA or less
	Input resistance		Approx. 5.6kΩ
	Input type		Negative common
	Response time		OFF→ON: 0.4ms or less (at 24V DC), ON→OFF: 0.4ms or less (at 24V DC)
	Safety remote station input response time		Technical version A: 32ms or less + filter-out time (1ms, 5ms, 10ms, 20ms, 50ms) Technical version B or later: 11.2ms or less + filter-out time (1ms, 5ms, 10ms, 20ms, 50ms)
Ouput specifications	No. of output points		4 points (source + sink type), 2 points (source + source type)
	Insulation method		Photocoupler
	Rated load voltage		24V DC
	Rated load voltage range		24V DC±10% Ripple P-P 10% or less
	Max. load current		0.5A / point
	Inrush current		1.0A, 10ms or less
	Leakage current		0.5mA or less
	Residual voltage		1.0V DC or less
	Protective function		Output short-circuit protection function
	Output type		Source + Sink type, Source + Source type
	Response time		OFF→ON: 0.4ms or less (at 24V DC), ON→OFF: 0.4ms or less (at 24V DC)
	Safety remote station input response time		Technical version A: 32ms or less Technical version B or later: ON→OFF: 10.4ms or less, OFF→ON: 11.2ms or less
	Surge protection		Zener diode
External power supply (Note 4)		Voltage	24V DC±10% Ripple P-P 10% or less
		Current	60mA (24V DC, with all points ON, excepting for external load current)
		Protective 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			10^{12} times
Safety refresh response processing			Technical version A: 38ms Technical version B or later: 9.6ms
Unit power (Note 4)		Voltage	24V DC±10% Ripple P-P 10% or less
		Current	140mA or less (24V DC, with all points ON)
		Protective function	Unit 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.
Protection			IP20
Ambient temperature			0 to +55°C (No dew condensation), Storage: -40 to +75°C
Ambient humidity			5 to 95% RH, Storage: 5 to 95% RH
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 500V DC insulation resistance tester

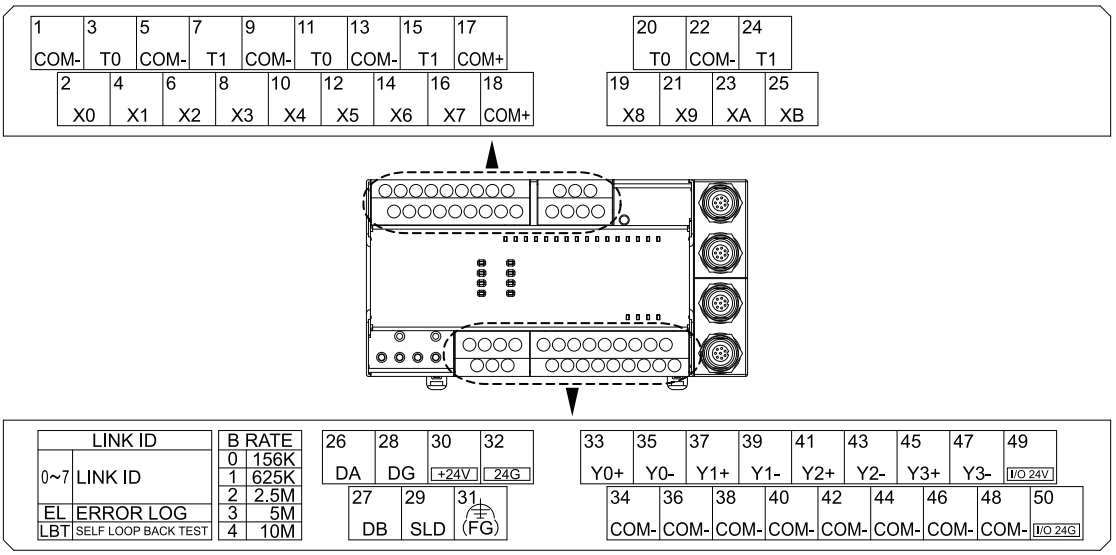
Specifications

<table>
<tr><td>Vibration resistance</td><td colspan="2"><table>
<tr><th></th><th>Frequency</th><th>Constant acceleration</th><th>Half amplitude</th><th>Sweep count</th></tr>
<tr><td rowspan="2">Under intermittent vibration</td><td>5 to 9Hz</td><td>——</td><td>3.5mm</td><td rowspan="4">10 times each in X, Y, Z directions respectively</td></tr>
<tr><td>9 to 150Hz</td><td>9.8m/s^2</td><td>——</td></tr>
<tr><td rowspan="2">Under continuous vibration</td><td>5 to 9Hz</td><td>——</td><td>1.75mm</td></tr>
<tr><td>9 to 150Hz</td><td>4.9m/s^2</td><td>——</td></tr>
</table>(Conforming to JIS B 3502, IEC 61131-2)</td></tr>
<tr><td>Shock resistance</td><td colspan="2">147 m/s^2, duration of action 11ms, three times in X, Y, Z directions respectively by sine half-wave pulse(Conforming to JIS B 3502, IEC 61131-2)</td></tr>
<tr><td>PFD (Note 5)</td><td colspan="2">2.57 × 10^{-5}</td></tr>
<tr><td>Proof test interval (T1) (Note 6)</td><td colspan="2">5 years</td></tr>
<tr><td>PFHd(Note 7)</td><td colspan="2">1.15 × 10^{-9}</td></tr>
<tr><td>MTTFd(Note 8)</td><td colspan="2">More than 100 years</td></tr>
<tr><td>Overvoltage category (Note 9)</td><td colspan="2">II or lower</td></tr>
<tr><td>Pollution level (Note 10)</td><td colspan="2">2 or lower</td></tr>
<tr><td>Operating ambiance</td><td colspan="2">No corrosive gas</td></tr>
<tr><td>Operating altitude (Note 11)</td><td colspan="2">2,000m (6562 ft.) or less</td></tr>
<tr><td>Installation area</td><td colspan="2">Within a control panel</td></tr>
<tr><td>Equipment category</td><td colspan="2">Class III</td></tr>
<tr><td>Weight</td><td colspan="2">Approx. 0.70kg</td></tr>
<tr><td rowspan="2">External connection system</td><td>Communication section, unit power section</td><td>7-point detachable terminal block (Transmission circuits, unit power, FG)
M3 (length 5.2mm), tightening torque: 0.425 to 0.575N·m, 2 crimp-style terminals or less</td></tr>
<tr><td>External power supply section, I/O section</td><td>7-point, 18-point detachable terminal block (External power supply, I/O signals)
M3 (length 5.2mm), tightening torque: 0.425 to 0.575N·m, 2 crimp-style terminals or less</td></tr>
<tr><td>Applicable DIN rail</td><td colspan="2">TH35 to 7.5Fe, TH35 to 7.5Al (Conforming to JIS C 2812)</td></tr>
<tr><td>Applicable crimp-style terminal</td><td colspan="2">0.3 to 2.0mm^2</td></tr>
<tr><td>Applicable crimp-style terminal</td><td colspan="2">RAV1.25-3 (Conforming to JIS B 2805) (Applicalbe 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)</td></tr>
</table>

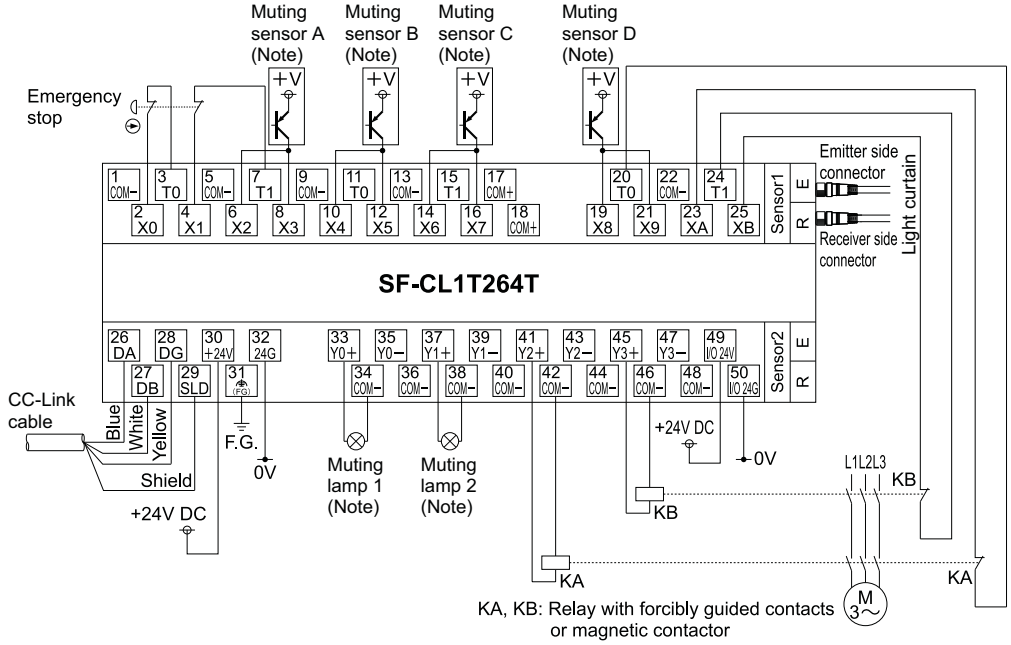
Notes:
1) When using this product as a CE Marking conforming product, the cable length between this product and the light curtain should be total 30m or less (emitter and receiver, respectively).
2) Total number of input points is 8 points, and use 2 points for control output (OSSD 1 / 2) of 2 light cutains.
   Two inputs terminals are assigned for each input since dual wiring is supported.
3) Up to three sets of light curtain (the number of beam channels allowable is max. 192 beam channels in total) can be connected in series to the connector 1 or 2 of this product.
   In case of connecting light curtains to the connectors both 1 and 2 of this product, the interference prevention function works between the connector 1 and 2 if the connected light curtains are up to three sets in total (the number of beam channels allowable is max. 192 beam channels in total). However, take care if the connected light curtains are over three sets or the total number of beam channels is over 192 beam channels, the interference prevention function does not work between the connector 1 and 2.
4) The power supply connected to this product must satisfy the following conditions:
   <1> SELV (Safety Extra Low Voltage): Hazardous potential part (48V or more)
   <2> Compliance with the LVD (Low Voltage Directive)
   <3> Output voltage within 21.6V to 26.4V DC (Ripple ratio: 10% or less.)
   <4> Corresponding to CLASS 2 (only for requiring UL Listing Mark / c-UL US Listing Mark conformation).
5) Probability of failure on demand.
6) Functional proof test interval for system related safety. (Replacement interval of this product)
7) Probability of dangerous failure per hour.
8) Mean time to dangerous failure.
9) This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises. Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2,500V.
10) 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.
11) 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.

3-2 Connection

3-2-1 Terminal layout drawing



3-2-2 Wiring example of light curtain and peripheral devices

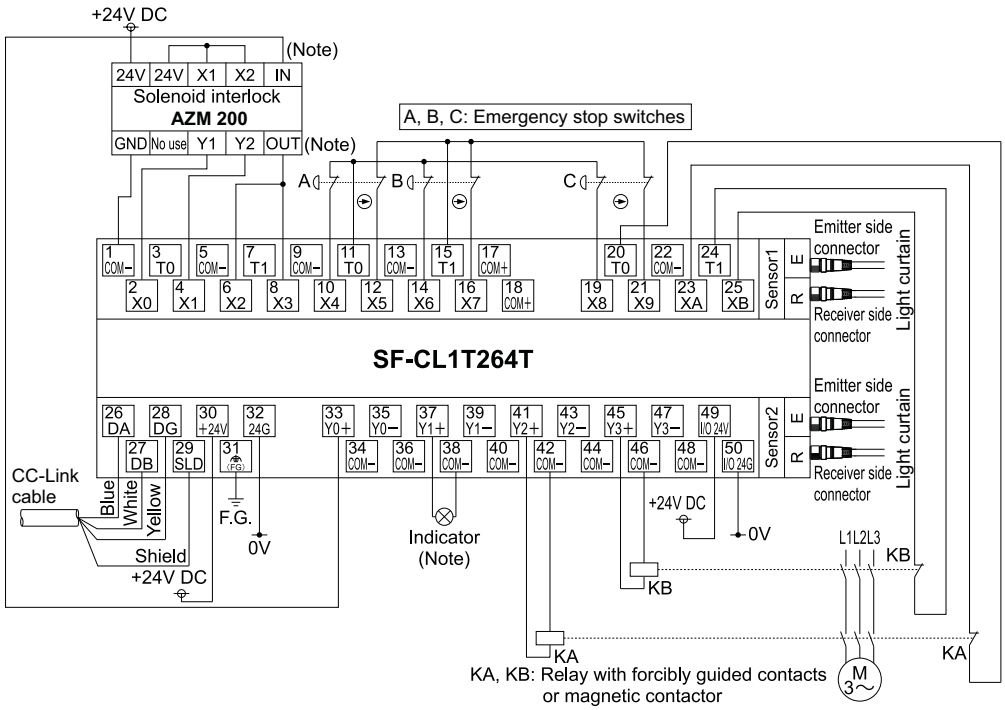


Notes: 1) The muting sensors and the muting lamps which are used in combination with the light curtain can be connected to either this product or standard remote I/O unit.
2) Control the muting sensors and the muting lamps using the safety CPU unit.

• **Parameter setting**

Parameter item	Setting terminal	Setting value
Time of noise removal filter	X0 to X9	1ms
Doubling input discrepancy detection time	X0 to X9	100ms
Input dark test selection	X0, X1, XA, XB	Execute
	X2 to X9	Not execute
Input dark test pulse OFF time		400μs
Method of wiring of output	Y0 to Y3	Dual wiring (Source + Source)
Output dark test selection	Y0, Y1	Not execute
	Y2, Y3	Execute
Output dark test pulse OFF time		1ms

3-2-3 Wiring example of solenoid interlock AZM 200 and emergency-stop switches



Note: Solenoid input (IN), diagnostic output (OUT) and the indicator of Solenoid interlock **AZM 200** can be connected to either this product or standard remote I/O unit.

• **Parameter setting**

Parameter item	Setting terminal	Setting value
Time of noise removal filter	X0, X1	5ms
	X2 to XB	1ms
Doubling input discrepancy detection time	X0 to XB	100ms
Input dark test selection	X0 to X3	Execute
	X4 to XB	Not execute
Input dark test pulse OFF time		400μs
Method of wiring of output	Y0 to Y3	Dual wiring (Source + Source)
Output dark test selection	Y0, Y1	Not execute
	Y2, Y3	Execute
Output dark test pulse OFF time		1ms

3-3 I/O Signals

This product 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 this product, only 16 input points and 4 output points of them are available.

Assignment of I/O signal

Remote input (RX)	Description
RX0	External input signal X0 of this product
RX1	External input signal X1 of this product
RX2	External input signal X2 of this product
RX3	External input signal X3 of this product
RX4	External input signal X4 of this product
RX5	External input signal X5 of this product
RX6	External input signal X6 of this product
RX7	External input signal X7 of this product
RX8	External input signal X8 of this product
RX9	External input signal X9 of this product
RXA	External input signal XA of this product
RXB	External input signal XB of this product
RXC	External input signal XC of this product (connects to OSSD 1 of Sensor 1)
RXD	External input signal XD of this product (connects to OSSD 2 of Sensor 1)
RXE	External input signal XE of this product (connects to OSSD 1 of Sensor 2)
RXF	External input signal XF of this product (connects to OSSD 2 of Sensor 2)
RX (n+1) 0 to RX (n+1) F	Use prohibited (Note)

Remote input (RX)	Description
RY0	External input signal Y0 of this product
RY1	External input signal Y1 of this product
RY2	External input signal Y2 of this product
RY3	External input signal Y3 of this product
RY4 to RYF RY (n+1) 0 to RY (n+1) F	Use prohibited (Note)

Note: The devices of use prohibited cannot be used by a user.
When used (ON / OFF) by a user, normal operation is not guaranteed.

(a) Relationships between I/O signals

Relationships between I/O signals are shown in the following table.

Parameter	Input		Output		Remark
	X00	X01	RXn0	RXn1	
Doubling input	OFF	OFF	OFF	OFF	• 1 signal for 2 inputs. (Note) • When 2 inputs are mismatched, both RXn0 and RXn1 are turned OFF.
	OFF	ON	OFF	OFF	
	ON	OFF	OFF	OFF	
	ON	ON	ON	ON	
Single input (Note 1)	OFF	OFF	OFF	OFF	• The X00 and X01 signals are independent signals. • Sends as RX00 and RX01.
	OFF	ON	OFF	ON	
	ON	OFF	ON	OFF	
	ON	ON	ON	ON	

Notes: 1) For the program, both RXn0 and RXn1 can be used.
2) When setting, confirm the availability of additional functions by the unit's technical version.

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	——	Doubling wiring (Source + Source)	• 2 outputs for 2 signals. • Source output (Y0+) and source output (Y1+) simultaneously turn ON when both RYn0 and RYn1 are turned ON.
	ON	OFF	OFF	——		
ON	OFF	OFF	OFF	——		
	ON	ON	ON	——		

(b) Combination of signals that can be dual

When wiring is dual, the combinations of signals are fixed as the following table.

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 RXn1	RXn2 RXn3	RXn4 RXn5	RXn6 RXn7	RXn8 RXn9	RXnA RXnB	RXnC RXnD	RXnE RXnF

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/

4-1 Function List

Function list is described as follows.

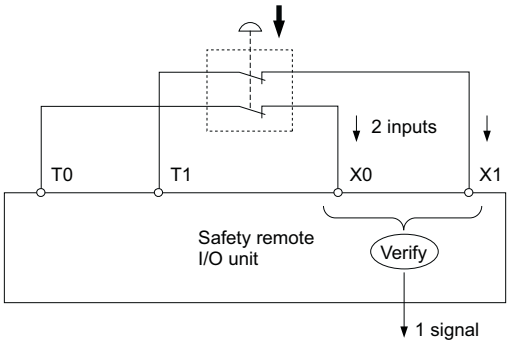
Classification	Function		Description	Reference Section
Input / Output function	Input function		Function used to double the input wiring. Function used to set the filter time for reducing noise of the input signal.	4-2
	Output function		Function used to double the output wiring.	4-3
Safety functions	I/O diagnostics function		Function used to confirm whether I/O signal is normal.	____
	Self-diagnostics function	Hardware diagnostics function	Function used to confirm whether this product 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 units of the safety-related system.	4-4
Error history function	Error history function		Function used to save the error description saved inside this product to the inside nonvolatile memory as an error history. Function used to send the saved error history to the safety CPU unit.	4-5
Parameter function	Input setting function		Function used to set the input parameter.	5-2-1
	Output setting function		Function used to set the output parameter.	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.



(2) Noise removal filter

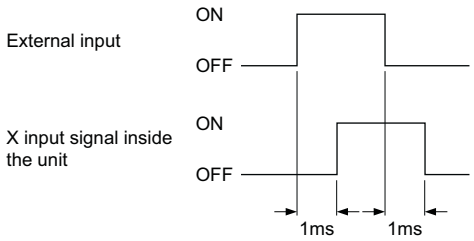
This function is used to set the filter time for reducing noise of the input signal. The noise removal filter can be set to the following five stages.

- 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 “**(1) Time of noise removal filter**” in “**5-2-1 Input parameter**.”

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.

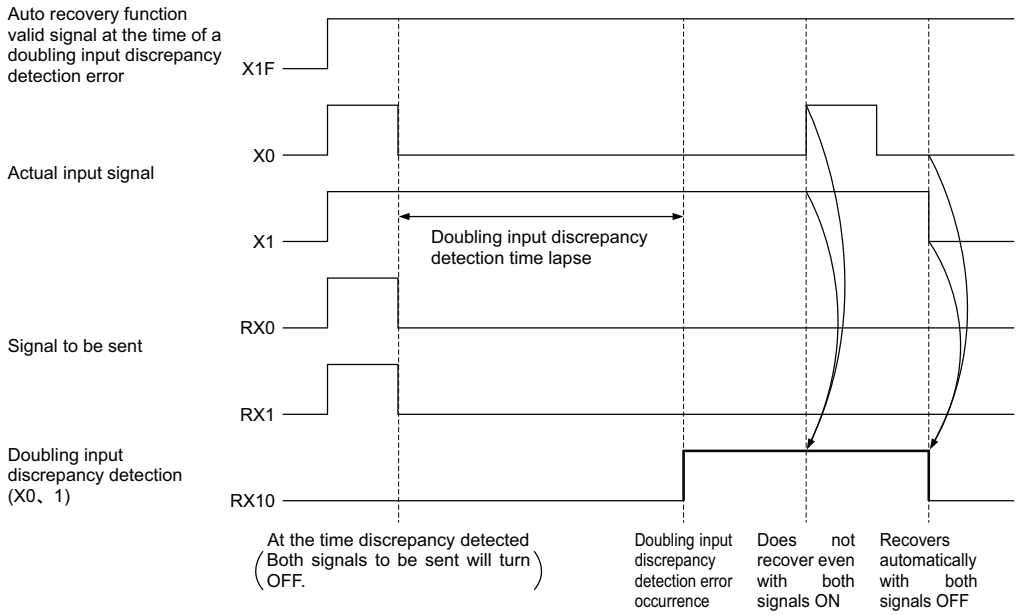
Example) When setting “1ms” to “Time of noise removal filter.”
If there is no effect of noise, the time set for “Time of noise removal filter” and the time taken from when the external input turns ON / OFF until when X input signal inside the unit turns ON / OFF will be equal.



(3) Auto recovery function at the time of a doubling input discrepancy detection error

This function is for automatic recovery to a normal state, when the error factor at the time of a doubling input discrepancy detection error is cleared.
By validating this function, the reset operation of the safety remote I/O unit for the purpose of resetting the error becomes unnecessary.
When the auto recovery function is selected, and a doubling input discrepancy is detected, the safety remote I/O unit will be in a minor error state (Note).

Note: The minor error state refers to the condition where the operation of the safety remote I/O unit continues even at the time of an error occurrence, and does not affect other I/O signals.



<Reference>

Since the operation of the safety remote I/O unit continues with the minor error which occurs with this function, even when the CC-Link Safety communication is unparalleled, it can be re-paralleled.
When re-paralleled, the doubling input discrepancy detection signal [RX(n+1)0–RX(n+1)7] will be cleared once.

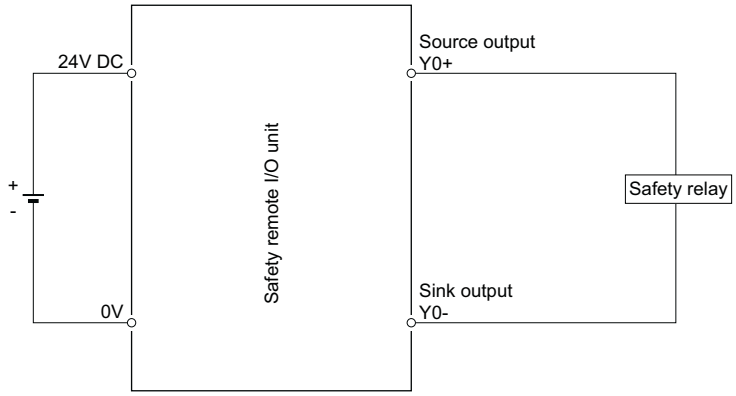
4-3 Output Function

The output function has output dual wiring function.

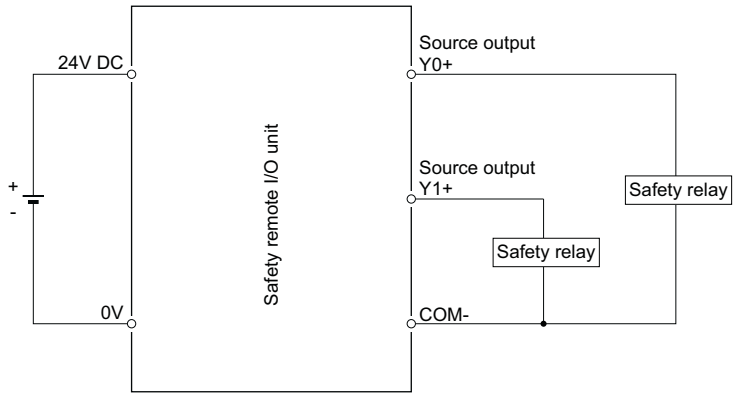
Output dual wiring function

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 this product. 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



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

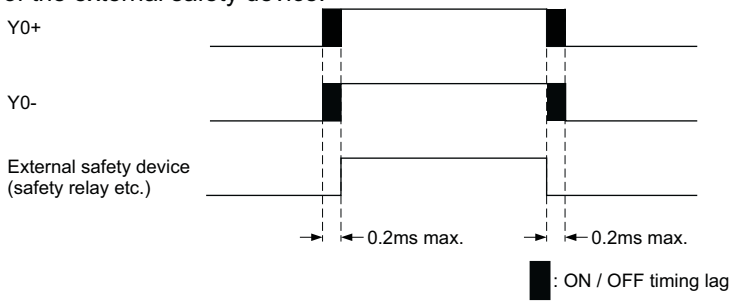


Set the method of output wiring in the “Method of wiring of output” parameter.
For the setting of the “Method of wiring of output,” refer to “**(1) Method of wiring of output**” in “**5-2-2 Output parameter**.”

<Reference>

(1) On this product, 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 this product.
The following wave pattern may be detected on the output terminal, there is no effect to operation of the external safety device.



4-4 Protection Function

The protection function has five types of functions shown in the following table.

Designation	Purpose	Description
Unit power supply overvoltage protection function	Prevents fire or burning from this product due to the primary side overvoltage.	Operates when the unit internal power supply goes into the primary side overvoltage status.
Unit power supply overcurrent protection function	Prevents fire or burning from this product due to the primary side overcurrent.	Operates when the unit internal power supply goes into the primary side overcurrent status.
I/O control power supply over-voltage protection function	Prevents fire or burning from this product 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 over-current protection function	Prevents fire or burning from this product 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 this product 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 unit 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.

Saving of the error history

When an error occurs in this product, the error description is saved to the nonvolatile memory inside the unit as an error history.

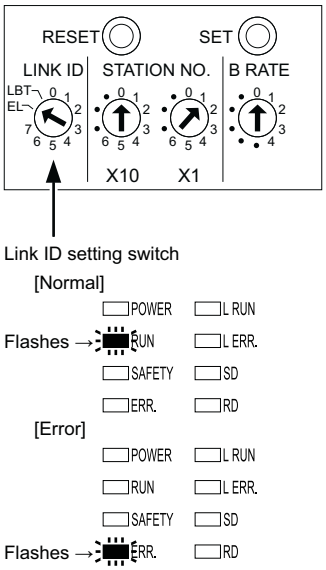
Reading of the error history

The description of error saved in the nonvolatile memory inside this product can be read from the safety CPU unit by the previous link ID switch setting and confirmed by GX Developer. The safety CPU unit reads all the error histories inside this product.

By confirming the error history, the cause of the error can be identified.
For confirming errors, refer to "**8-4 Troubleshooting with GX Developer**."
For classification of erros, refer to "**8-5 Error Code List**."

The reading procedure of error history is shown in the following table.

Start
↓
Terminal block removal Turn OFF the power supply of this product and remove the terminal block part.
↓
Switch setting Set the link ID switch of this product 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 this product. The safety CPU unit automatically reads the error history from the safety remote I/O unit.
↓
Completion of reading the error history Completion of reading the error history [Normal] When RUN indicator (green) flashes, the reading of error history is completed normally. Turn OFF the power supply of this product. [Error] When ERR. indicator (red) flashes, the reading of error history is completed abnormally. Turn OFF the power supply of this product and read the error history again.



<Reference>

(1) The reading of error history can be used only when this product can be connected with CC-Link Safety at power-on.
When reading of error history is impossible, deal with it in accordance with troubleshooting. (Refer to "**8-2 Troubleshooting with indicators**.")

(2) Perform the reading of error history for one safety remote I/O unit per read.
When the reading of error history is simultaneously performed in the multiple safety remote I/O units, the error histories in the multiple units are displayed together on the PLC diagnostics display.

Chapter 5 Parameter Setting

This chapter describes the parameter setting of this product.
The following must be considered for this product 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 this product are written via the safety master unit at the following operation.

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

(1) Parameter setting method

The parameter setting of this product 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” produced by Mitsubishi Electric Corporation.
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.

(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.

(c) Model and unit technical version settings
Set the model and unit technical version of this product.
For checking the unit technical version, refer to “**2-3 Confirming Production Information**.”

<Reference>

The “Unit technical version” shows the function of this product.

(d) Production information setting
To manage a system by the production information, put a check in "specify production information to find unit."
When a check is put, whether the safety remote I/O unit 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 Unit User's Manual” produced by Mitsubishi Electric Corporation.
For checking the production information, refer to “**2-3 Confirming Production Information**.”

<Reference>

The “Production information” shows the management number inherent to this product.
As for production information, enter the 16 digits described in SERIAL column of the rated plate.

(e) Parameter setting
The parameter setting is made for each parameter.
For the parameter, refer to "**5-2-1 Input parameter**" and "**5-2-2 Output parameter**."

(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 "**8-5 Error Code List**."

(g) Parameter setting completion
Click the End button to complete each parameter setting.

(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 this product.
Obtaining / registering the safety CSP file corresponding to the technical version of this product is described below.

(a) Safety CSP file download
Download the latest safety CSP file from the CC-Link Partner Association website or our Panasonic Industrial Devices SUNX website.
CC-Link Partner Association website: http://www.cc-link.org/
Panasonic Industrial Devices SUNX website: http://panasonic-electric-works.net/sunx/

(b) Safety CSP file registration
Store the downloaded safety CSP file into the "CSP" folder in the installation folder of GX Developer.

5-1 Parameter List

The parameters of this product are listed in the following table.

Parameter name	Type	Parameter item	Description	Reference section
Time of noise removal filter	Input	1. Time of noise removal filter X0, X1 to 8. Time of noise removal filter XE, XF	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 (2)
Doubling input discrepancy detection time	Input	9. Doubling input discrepancy detection time X0, X1 to 16. Doubling input discrepancy detection time XE, XF	Sets the ON / OFF transient state time at redundant wiring. If the ON / OFF disagreement state continues for more than setting time, an error occurs. Default : 20ms Setting range: Not detected, 20ms, 40ms, 60ms (Note 1) 80ms, 100ms, 120ms, 140ms 160ms, 180ms, 200ms, 220ms 240ms, 260ms, 280ms, 300ms 320ms, 340ms, 360ms, 380ms 400ms, 420ms, 440ms, 460ms 480ms, 500ms, 1sec., 2sec., 5sec. 10sec., 20sec., 30sec., 60sec.	5-2-1 (3)
Input dark test selection	Input	17. Input dark test selection X0, X1 to 24. Input dark test selection XE, XF XC, D, XE, F: Not execute (Fixed)	Sets whether the “Input dark test function” of this product diagnostics function is executed or not. Default : Execute Setting range: Execute : Not execute	5-2-1 (5)
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 (6)
Output wiring method	Output	26. Output wiring method Y0 to 29. Output wiring method 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 this product 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)
Doubling input / Single input selection (Note 2)	Input	38. Doubling input / Single input selection X0、1 to 45. Doubling input / Single input selection XE、F	Sets the wiring method of the input signal. Default : Doubling input Setting range: No Use, Doubling input (Note 3) Xn, Xn+1: Single input selection Xn: Single input selection, Xn+1: No Use Xn: No Use, Xn+1: Single input selection	5-2-1 (1)
Auto recovery function valid signal at the time of a doubling input discrepancy detection error (Note 2)	Input	46. Auto recovery function valid signal at the time of a doubling input discrepancy detection error	Sets the auto recovery function at the time of a doubling input discrepancy detection error. Default : Invalid Setting range: Invalid, Valid	5-2-1 (4)

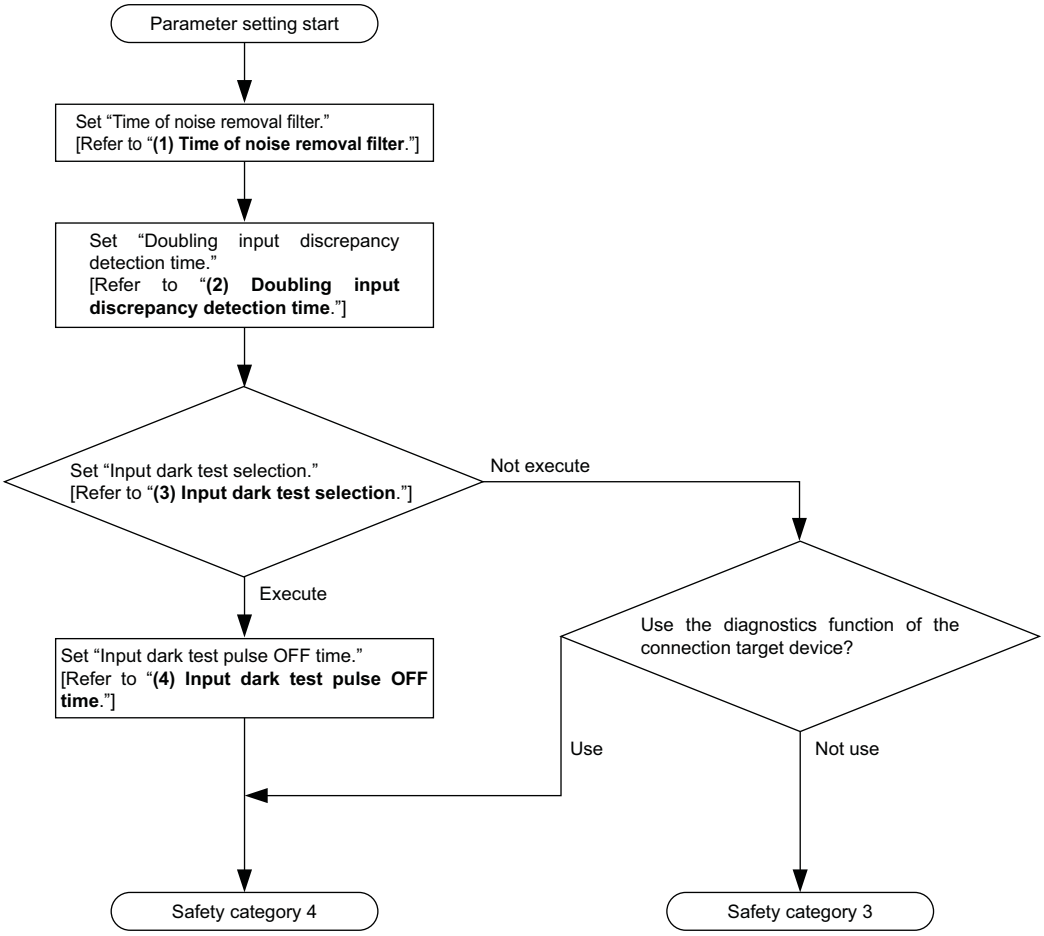
Notes: 1) The setting range changes with unit’s technical version.
For details, confirm the availability of additional functions by the unit’s technical version.
2) When setting, confirm the availability of additional functions by the unit’s technical version.
3) The indications of Xn, Xn+1 refer to “X0, X1”, “X2, X3” ... “XE, XF”.

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 the following diagram.



<Reference>

Only setting this product parameters does not allow obtaining the safety category certification. For the wiring and setting of the entire system to obtain the safety category certifications as a safety-related system, refer to "Safety Application Guide" produced by Mitsubishi Electric Corporation.

(1) Doubling input / Single input selection (Note 1)

These parameters are used to set the input for double wiring or single wiring.
The settings are shown in the following table.

Parameter item	Setting range	Default
38. Doubling input / Single input selection X0, X1	No Use Doubling input Xn, Xn+1: Single input selection Xn: Single input selection, Xn+1: No Use Xn: No Use, Xn+1: Single input selection	Doubling input
39. Doubling input / Single input selection X2, X3		
40. Doubling input / Single input selection X4, X5		
41. Doubling input / Single input selection X6, X7		
42. Doubling input / Single input selection X8, X9		
43. Doubling input / Single input selection XA, XB		
44. Doubling input / Single input selection XC, XD		
45. Doubling input / Single input selection XE, XF		

Notes: 1) When setting, confirm the availability of additional functions by the unit's technical version.
2) The indications of Xn, Xn+1 refer to "X0, X1", "X2, X3" ... "XE, XF".

(2) 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 the following table.

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 the error, refer to "**8-5 Error Code List**."

<Reference>

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) Input dark test pulse OFF time**."

(3) 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 the following table.

Parameter item	Setting range	Default
9. Doubling input discrepancy detection time X0, X1	Not detected, 20ms, 40ms 60ms, 80ms, 100ms, 120ms 140ms, 160ms, 180ms, 200ms 220ms, 240ms, 260ms, 280ms 300ms, 320ms, 340ms, 360ms 380ms, 400ms, 420ms, 440ms 460ms, 480ms, 500ms, 1sec. 2sec., 5sec., 10sec., 20sec. 30sec., 60sec.	20ms
10. Doubling input discrepancy detection time X2, X3		
11. Doubling input discrepancy detection time X4, X5		
12. Doubling input discrepancy detection time X6, X7		
13. Doubling input discrepancy detection time X8, X9		
14. Doubling input discrepancy detection time XA, XB		
15. Doubling input discrepancy detection time XC, XD		
16. Doubling input discrepancy detection time XE, XF		

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 the error, refer to “**8-5 Error Code List**.”

When a value outside of the setting range is set, an error out of the setting range of the doubling input discrepancy detection will occur. For the errors, refer to “**8-5 Error Code List**.”

(a) What is doubling input discrepancy detection?

This function determines trouble with the connected devices, when a discrepancy detection of the doubling input signal passes beyond the “doubling input discrepancy detection time” which is set and adjusted by the user.

(b) Setting of doubling input discrepancy detection time

Refer to the following guidelines, and set the doubling input discrepancy detection time.

1) When the synchronization time of the doubling input has been determined

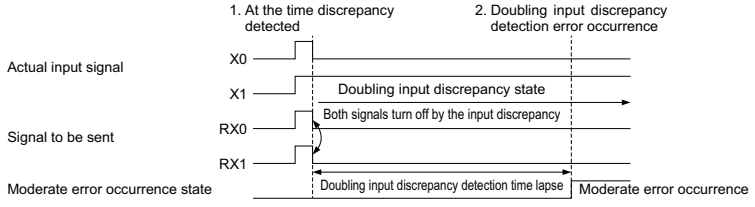
For the functions where the synchronization time is indicated in the specifications, such as the safety relay, safety switch and etc., set the time to more than double the synchronization time considering the safety factors for detection errors. (Example: When the synchronization time is 1 sec, set the detection time to 2 sec.)

2) When the synchronization time of the doubling input has not been determined

When the synchronization time has not been determined for the door switch which is opened and closed manually and etc., set the setting range to “Not detected”, or set a time with sufficient margin on the user’s system.

<Reference>

The doubled input signal “1. At the time discrepancy detected” in the following figure performs a fail safe operation (both signals turn OFF), and the system stops safely.
The system performs the same when the doubling input discrepancy detection time is set to “Not detected.” Set the timing of “2. Doubling input discrepancy detection error occurrence” in the following figure for the doubling input discrepancy detection time. In order to prevent the occurrence of detection errors, set the time with a margin for the doubling input discrepancy detection time.



(c) Auto recovery at the time of doubling input discrepancy detection error
When a doubling input discrepancy detection error occurs, the send data can be turned off for the applicable input signal only, without interrupting the operation of the unit.
By both input signals being turned off, the system will determine that the error was cleared and resets automatically.
For the parameter settings, refer to "**(4) Auto recovery function at the time of doubling input discrepancy detection error**."
For the details of the functions, refer to "**4-2 Input Function**."

(4) Auto recovery function at the time of doubling input discrepancy detection error (Note)

This function is used to set whether to suspend the operation of the unit, or perform auto recovery when the error is cleared at the time of a doubling input discrepancy detection error occurrence. When the function is set to "Valid," auto recovery will be performed.
The settings are shown in the following table.

Parameter item	Setting range	Default
46. Auto recovery function at the time of doubling input discrepancy detection error	Invalid, Valid	Invalid

Note: When setting, confirm the availability of additional functions by the unit's technical version.

(5) Input dark test selection

This parameter is used to set in 2 input points unit if the "Input dark test function" of this product diagnostics function is executed or not.
The settings are shown in the following table.

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	Not execute	Not execute
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 the error, refer to "**8-5 Error Code List**."

(6) Input dark test pulse OFF time

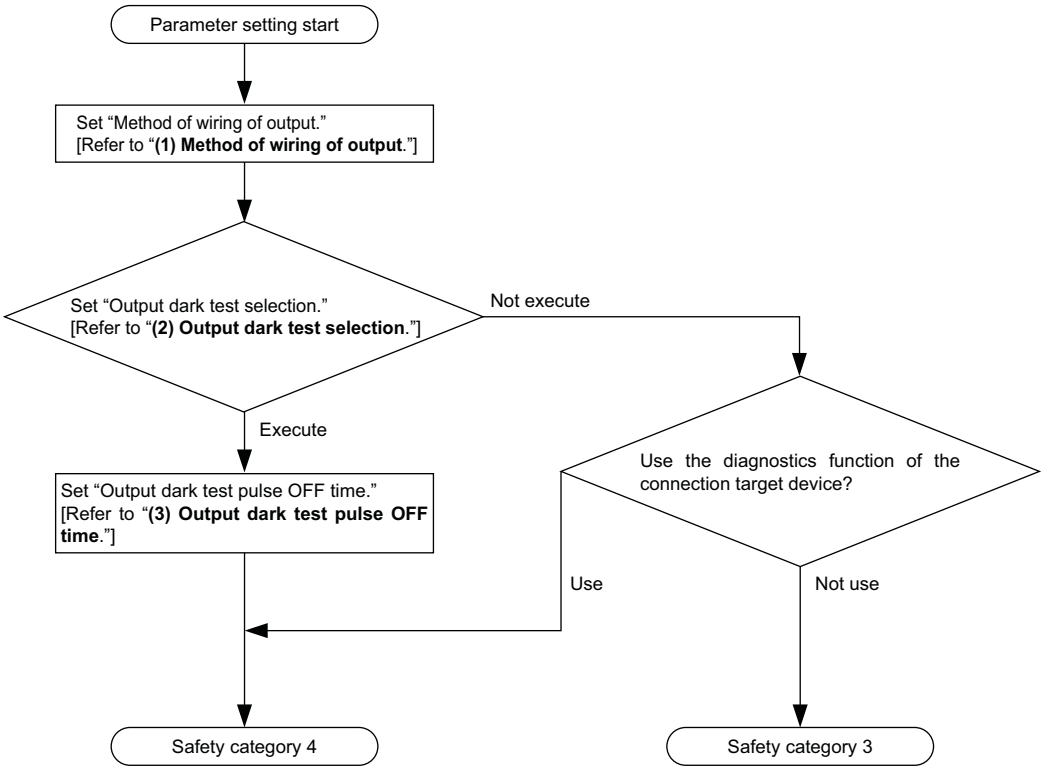
This parameter is used to set the OFF pulse width that T0 and T1 terminals output in every unit.
The settings are shown in the following table.

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 the error, refer to "**8-5 Error Code List**."

5-2-2 Output parameter

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



<Reference>

Only setting this product parameters does not allow obtaining the safety category certifications. 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" produced by Mitsubishi Electric Corporation.

(1) Method of wiring of output

This unit is used to set the “Method of wiring of output” in the output point unit.
The settings are shown in the following table.

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 the error, refer to “**8-5 Error Code List**.”

(2) Output dark test selection

This parameter is used to set in the output point unit whether the "Output dark test function" of this product diagnostics function is executed or not.
The settings are shown in the following table.

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 the error, refer to “**8-5 Error Code List**.”

(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 the following table.

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 the error, refer to “**8-5 Error Code List**.”

Chapter 6 Procedures and Settings Before System Operation

This chapter describes the procedures and settings before the operation of this product.

6-1 Procedures and Settings before System Operation

This section describes the procedures before the operation of this product and the replacement of the unit.

6-1-1 Procedure from unit installation to system operation

The procedure from the installation of this product to the CC-Link Safety system operation is shown in the following diagram.
In addition, parameters are considered to be separately created.
For the parameter setting, refer to "**Chapter 5 Parameter Setting**."
For the connection between the safety CPU unit and GX Developer, refer to "GX Developer Version 8 Operating Manual (Safety PLC)" produced by Mitsubishi Electric Corporation.

Start	
↓	
Unit installation Install this product to a control panel and a machine.	For the installation and setting of this product, refer to "**6-2 Mounting and Installation**."
↓	
Power supply wiring Wire the power supply to this product.	
↓	
Self-loopback test execution Execute the self-loopback test of this product.	For the procedure of the self-loopback test, refer to "**6-4 Check of Unit Status (Self-Loopback Test)**."
↓	
Switch setting Save the settings for the link ID, station number and transmission speed setting switch of this product to the nonvolatile memory inside the unit.	For the switch setting, refer to "**6-6 Switch Setting**."
↓	
Unit wiring (Note) Turn OFF the power supply of this product and wire to the followings. • Various types of safety devices • Safety master unit	For the wiring of this product, refer to "Safety Application Guide" produced by Mitsubishi Electric Corporation.
↓	
Parameter writing Write the parameters set on GX Developer to the safety CPU unit. (The parameters are written to this product via the safety master unit.)	For writing parameters to the safety CPU unit, refer to "GX Developer Version 8 Operating Manual" produced by Mitsubishi Electric Corporation.
↓	
Connection to CC-Link Safety system Connect to the CC-Link Safety system with the setting saved to the nonvolatile memory inside the unit by resetting or powering this product from OFF to ON.	
↓	
Confirmation of system operation Start the safety CPU unit in TEST MODE and confirm the system operation.	For starting the safety CPU unit in TEST MODE, refer to "QSCPU User's Manual (Function Explanation, Program)" produced by Mitsubishi Electric Corporation.
↓	
Start of system operation Change the safety CPU operation mode to SAFETY MODE using GX Developer.	Change the safety CPU operation mode to SAFETY MODE using GX Developer. For changing to SAFETY MODE of the safety CPU unit, refer to "QSCPU User's Manual (Function Explanation, Program Fundamentals)" produced by Mitsubishi Electric Corporation.
↓	
Completed	

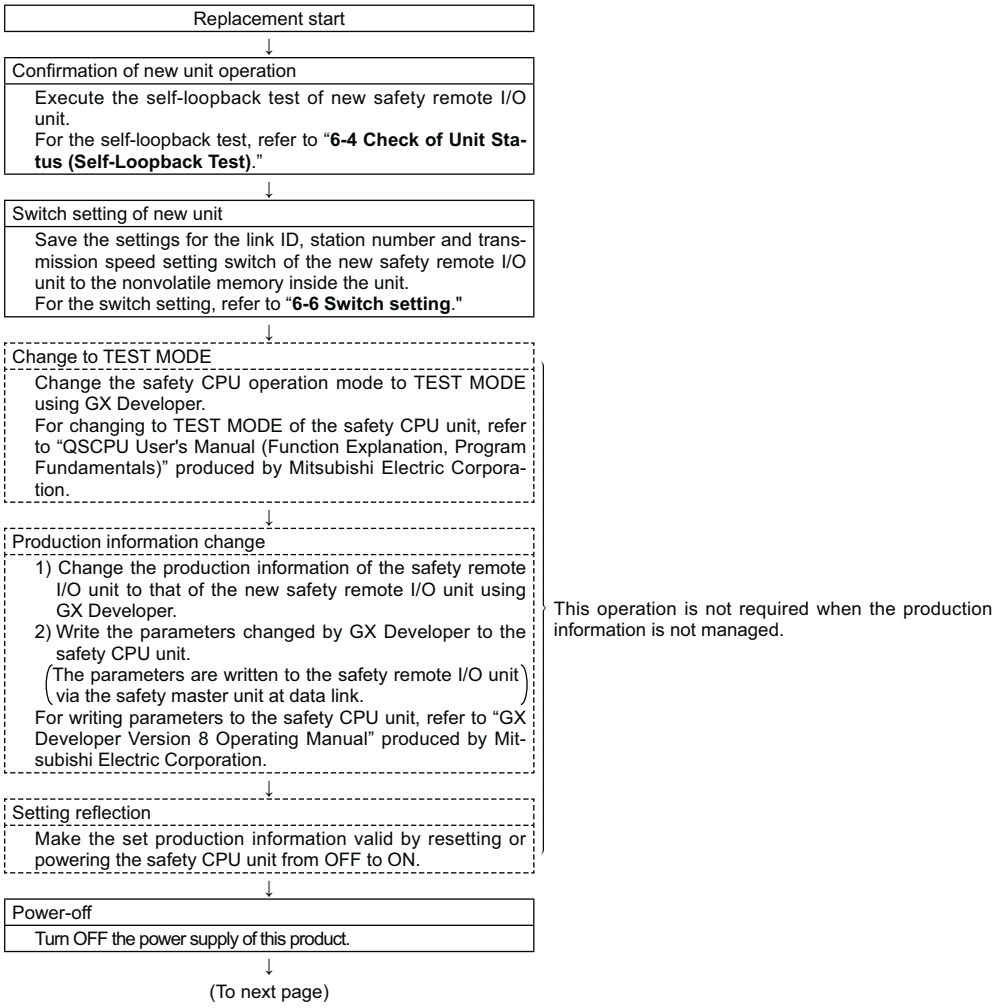
Note: Even when various safety devices are not connected, perform wiring for the external supply power.
When the external supply power is not wired, an error of the external supply power occurs.
For the error, refer to "**8-5 Error Code List**."

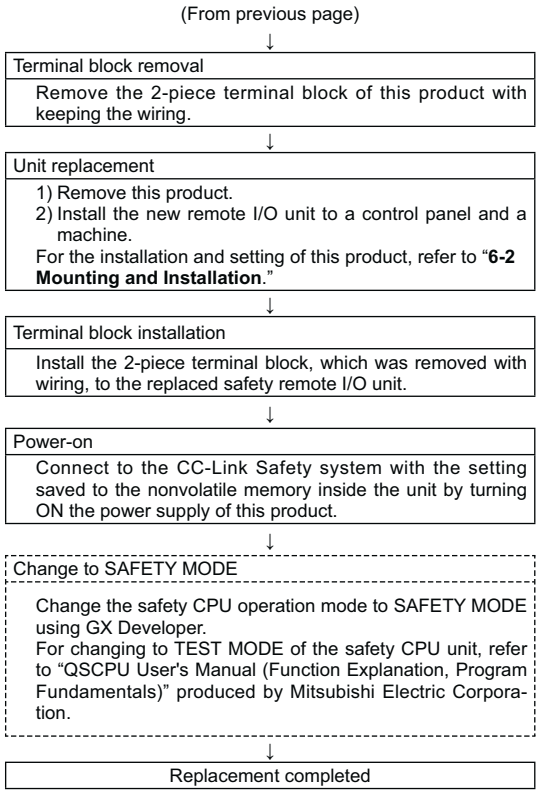
6-1-2 Replacement procedure of the unit

The replacement procedure of this product is shown in the following diagram.
[ ] in the following indicates the operation for managing the production information.

For the function differences between managing and not managing the production information, refer to "**(1) Parameter setting method**" in "**Chapter 5 Parameter Setting**."

For the connection between the safety CPU unit and GX Developer, refer to "GX Developer Version 8 Operating Manual (Safety PLC)" produced by Mitsubishi Electric Corporation.





This operation is not required when the production information is not managed.

<Reference>

(1) When managing the production information, change the production information to the number of the new safety remote I/O unit.
If not doing so, production information mismatch error occurs.
For product information mismatch error, refer to "CC-Link Safety System Master Unit User's Manual" produced by Mitsubishi Electric Corporation.

(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 this product.

⚠ DANGER

- Do not touch the terminals while power is on.
  Doing so could cause an electrical shock.

⚠ CAUTION

- Be sure there are no foreign substances such as sawdust or wiring debris inside the unit.
  Such debris could cause fires, damage, or erroneous operation.

- Do not disassemble or modify the units.
  Doing so could cause trouble, erroneous operation, injury, or fire.
  If the product is repaired or remodeled by other than our company, the warranty is not covered.

- Do not directly touch the unit's conductive parts or electronic components. Touching the conductive parts could cause an operation failure or give damage to the unit.

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

- When installing this product to a control panel, provide clearance of at least 60mm between the unit's top / bottom and any other structure or component to ensure proper airflow and to make unit replacement easy.

- Tighten a terminal block mounting screw and a terminal 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 unit, resulting in a drop of the screw or unit, a short circuit or malfunctions.

- When disposing of the unit, treat it as industrial waste.

- Make sure to fix the unit with a DIN rail securely.

- Completely turn off the externally supplied power used in the system before mounting or removing the unit to / from the panel.
  Not doing so may result in a fault or malfunctions of the unit.

• Do not remove the printed circuit board (PCB) of this product from the case.
Doing so may cause failure.

• Install this product to a flat surface.
If it is not flat, an excess force may be applied to the PCB, causing failure.

• Tighten the terminal block screws within the following torque range.
Overtightening may result in damage to the screws or the unit case.

Screw	Specified torque range
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

• 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 200mm or less.

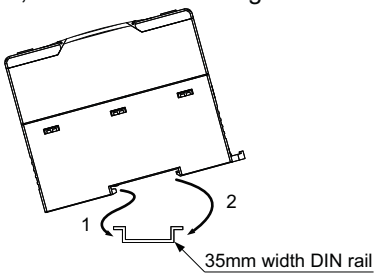
• For installing or removing this product to / from the DIN rail, refer to the following.

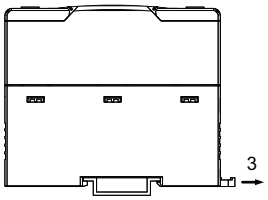
<How to install this product to the DIN rail>

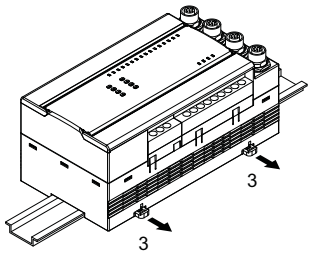
1. Fit the front part of the installing section of this product on a 35mm width DIN rail.
2. Press down the rear part of the installing section (DIN rail stopper side) and fit it to the DIN rail.

<How to remove this product from the DIN rail>

3. Pull the DIN rail stopper using a flathead driver, etc. to remove this product.



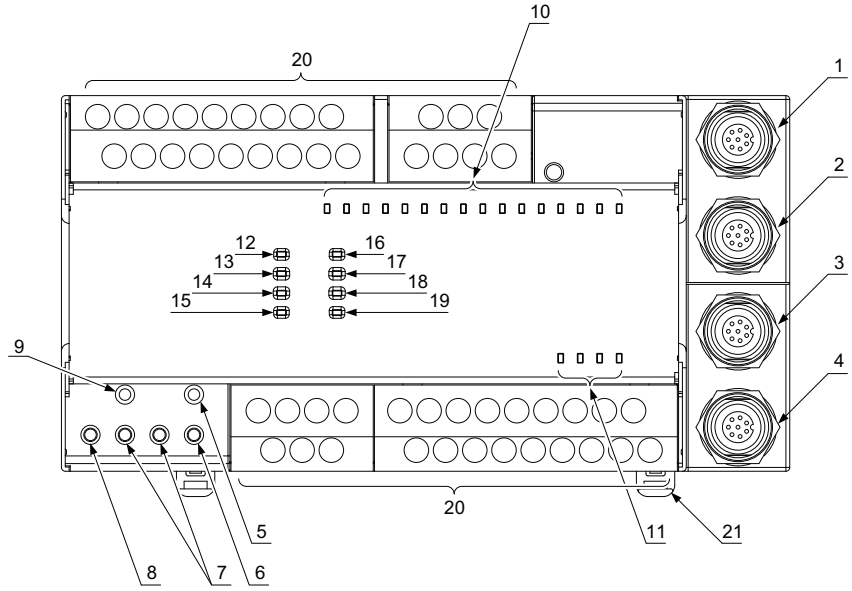




6-2-2 Installation environment

For installation environment, refer to "**3-1 List of Specifications**."

6-3 Functional Description



No.	Designation	Description
1	Connector 1 for the emitter of the light curtain	Connects the emitter 1 of the light curtain.
2	Connector 1 for the receiver of the light curtain	Connects the receiver 1 of the light curtain.
3	Connector 2 for the emitter of the light curtain	Connects the emitter 2 of the light curtain.
4	Connector 2 for the receiver of the light curtain	Connects the receiver 2 of the light curtain.
5	Setting saving switch	Saves the values set by switches 6 to 8 into the nonvolatile memory inside this product.
6	Transmission speed setting switch	Setting / Transmission speed 0 / 156kbps 1 / 625kbps 2 / 2.5Mbps 3 / 5Mbps 4 / 10Mbps Always set this switch within a range of 0 to 4.
7	Station No. setting switch	Set station No. of this product within a range from 0 to 64. (Note 1) • Tens place of station No. is set by “X10.” • Units place of station No. is set by “X1.”
8	Link ID setting switch	Setting / Description 0 to 7 / Link ID setting EL / Setting for reading error logs (For error logs, refer to “**4-5 Error History Function**.”) LBT / Setting for self-loopback test [For Setting for self-loopback test, refer to “**6-4 Check of Unit Status (Self-Loopback Test)**.”] To update the changed switch setting, reset or power OFF and ON this product.
9	Reset switch	Resets the hardware of this product.
10	Input indicator (X0 to XF) (Red)	Indicates the I/O status of this product. ON: I/O ON OFF: I/O OFF
11	Output indicator (Y0 to Y3) (Red)	

No.	Designation	Description
12	POWER indicator (Green)	Indicates the power status of this product. Lights up: Normally powered Turns OFF: Powered off or error occurred (blown fuse)
13	RUN indicator (Green) (Note 2)	Indicates the operating status of this product. Lights up: Normally operating, or moderate error occurred Flashes: Saving switch setting Turns OFF: Serious error occurred
14	SAFETY indicator (Green) (Note 2)	Indicates the CC-Link Safety system connection status of this product. Lights up: Connected to CC-Link Safety system (Note 3), or self-loopback test completed normally Flashes: Self-loopback test in execution Turns OFF: Not connected to CC-Link Safety system, or self-loopback test completed in error
15	ERR. indicator (Red) (Note 2)	Indicates failure or error status of this product. Lights up: Serious error occurred, or self-loopback test completed in error RUN indicator (green) turns OFF: Serious error occurred Flashes: Moderate error occurred Turns OFF: Normally operating
16	L RUN indicator (Green)	Indicates the communication status of this product in the CC-Link Safety system. Lights up: Normally communicating in the CC-Link Safety system Turns OFF: Communication failure in the CC-Link Safety system (Timeout error)
17	L ERR. indicator (Red)	Indicates the communication error status of this product in the CC-Link Safety system. Lights up: Value set by Link ID, station number, or transmission setting switch is out of range Flashes regularly: Setting of Link ID, station number, and / or transmission setting switch is different from that of the internal nonvolatile memory Flashes irregularly: Wrong terminal resistor setting, or noise influence Turns OFF: Normally operating
18	SD indicator (Green)	Indicates the sending status of this product in the CC-Link Safety system. Lights up: Data being sent
19	RD indicator (Green)	Indicates the receiving status of this product in the CC-Link Safety system. Lights up: Data being received
20	2-piece terminal block	2-piece terminal block for connection of I/O unit power, transmissions, and I/O signals.
21	DIN rail stopper	Hook used for installing the unit to a DIN rail. Press the center part of the hook until a click is heard.

Notes: 1) Duplicate station number setting is not allowed.
2) Although the RUN indicator (green), SAFETY indicator (green) and ERR. indicator (red) momentarily light up immediately after power-up or reset, it does not mean any fault.
3) The SAFETY indicator (green) turns off when no safety remote I/O station parameters have been received during connection to the CC-Link Safety system.

6-4 Check of Unit Status (Self-Loopback Test)

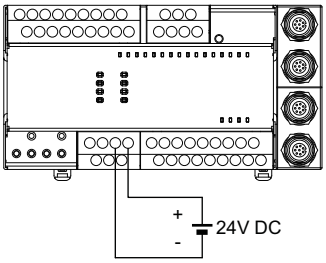
The self-loopback test checks whether this product operates correctly in stand-alone.
Be sure to execute the self-loopback test before connecting the system.
The self-loopback test cannot be performed properly in the condition that the communication cables and I/O wires are connected.

Execute the self-loopback test in the following procedure.

Start

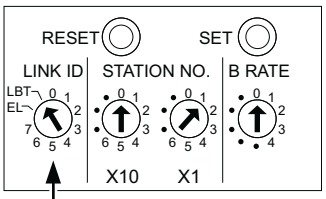
↓

Power supply wiring
Wire the power supply to this product.



↓

Link ID switch change
Set the link ID switch of this product to “LBT.”



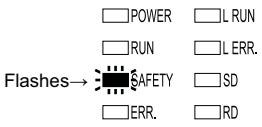
↓

Power-on
Turn ON the power supply of this product.

Link ID setting switch

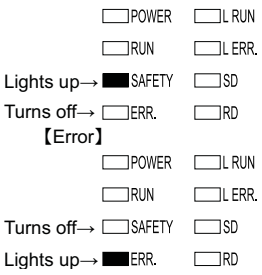
↓

Start of self-loopback test
Press the setting saving switch of this product once to start the self-loopback test.
SAFETY indicator (green) flashes during the self-loopback test, and the test completes in approximately five seconds.



↓

Completion of self-loopback test
[Normal]
When SAFETY indicator (green) lights up and ERR. indicator (red) turns OFF, the reading of error history is completed normally.
[Error]
When SAFETY indicator (green) turns OFF and ERR. indicator (red) lights up, the reading of error history is completed abnormally.
Replace the unit for a hardware error of this product.



<Reference>

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

(1) Is the power supply of this product turned ON? [Does the POWER indicator (green) light up?]
(2) Is the power supply turned ON after the link ID setting switch of this product 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 unit.

6-5 Wiring

This section describes the wiring precautions and wiring examples of this product.

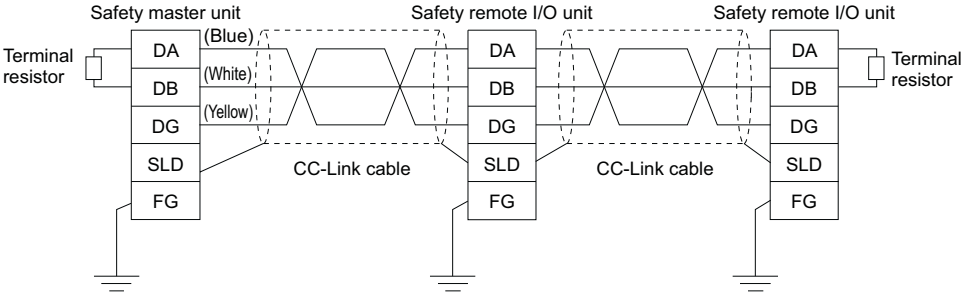
6-5-1 Precautions for handling CC-Link cables

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 this products are connected with dedicated CC-Link cables.



<Reference>

(1) Connect the shielded wire of the CC-Link cable to SLD terminal of each unit, and ground both ends to the protective ground connectors via F.G. terminals.
The SLD and F.G. terminals are connected inside the unit.

(2) Always connect terminal resistors to the unit located on both ends of the data link network.
Connect a terminal resistor between DA and DB terminals.

6-5-3 Precautions for wiring unit power supply

When wiring the unit power supply of this product, note the following.

- Cable length of the unit power supply must be within 10m.

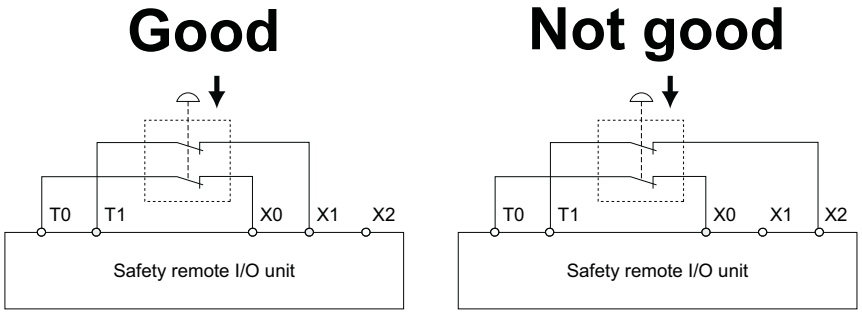
6-5-4 Precautions for wiring safety devices

This section describes precautions for wiring to each safety device.

(1) Wiring of the input terminal section

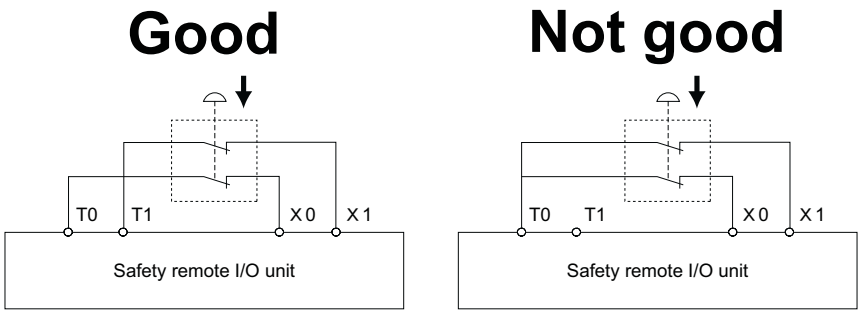
(a) Combinations of input terminals

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



(b) Combinations of the test pulse output terminals

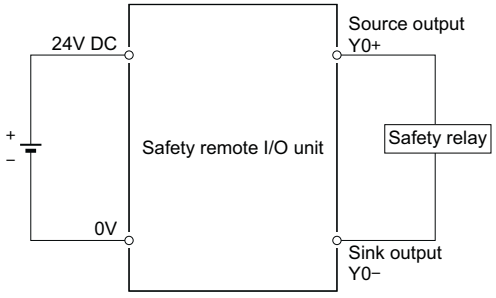
Using the same test pulse for one device is not allowed.
If the same test pulse is used in combinations such as X0 and T0, X1 and T0, a medium failure will occur.



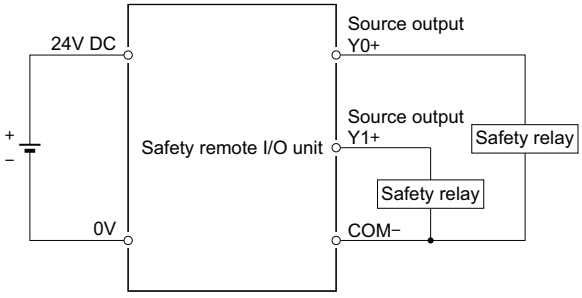
(2) Wiring of the output terminal section

Use sink outputs in combination with source outputs.
Combinations of two sink outputs or single use of sink output is not allowed.

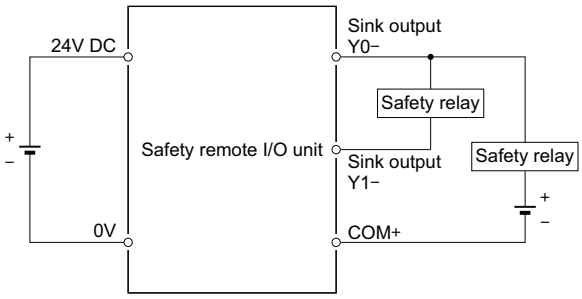
Good



Good



Not good



6-5-5 Safety devices and wiring example

This section describes the wiring between this product and safety devices.

To make the wiring specified in category 4, the following two points must be executed in this product.

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

For the wiring example between this product and safety devices which meets the above points, refer to “Safety Application Guide” produced by Mitsubishi Electric Corporation.

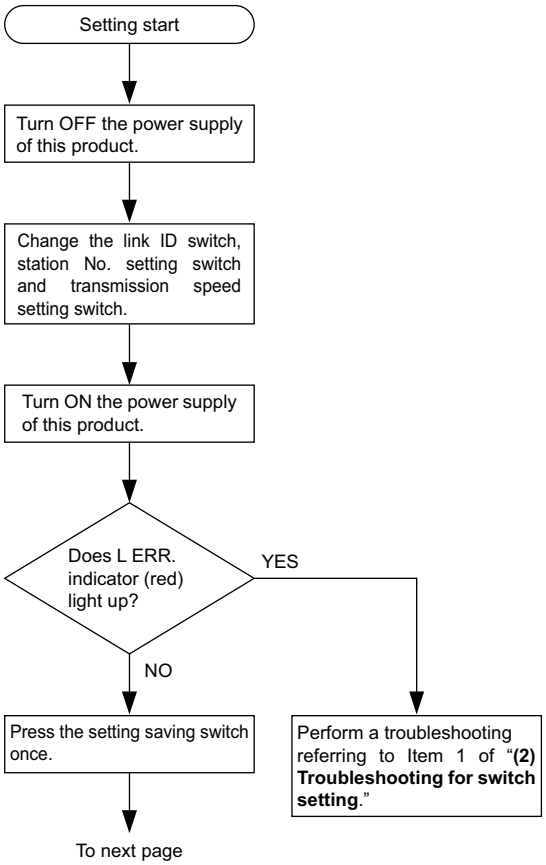
6-6 Switch Setting

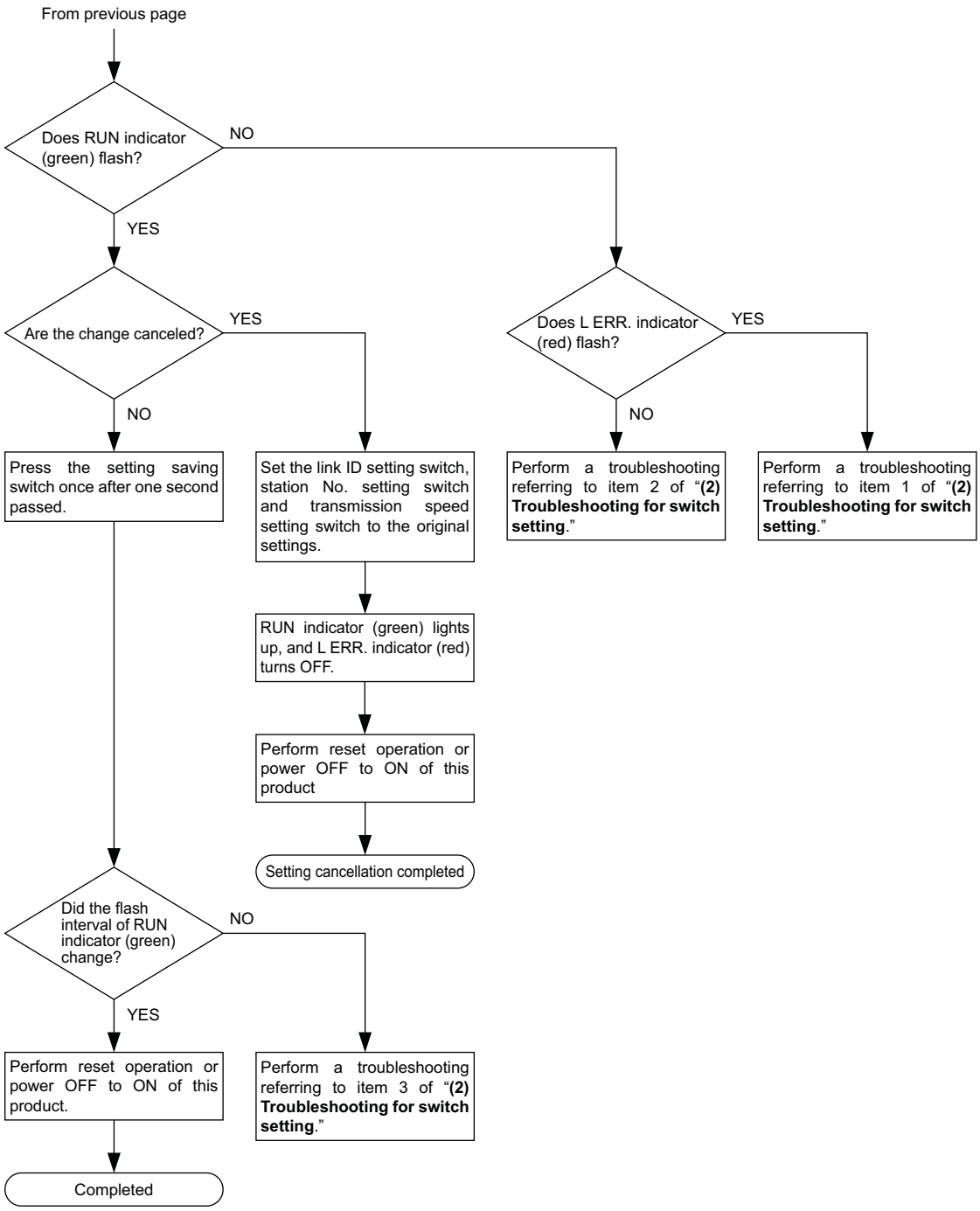
This section describes the procedure before starting the data link with the settings of the link ID setting switch, station No. setting switch and transmission speed setting switch of this product.

(1) Switch setting procedure

Switch setting must be made in the power-off status of this product.
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 this product is required.
After making or canceling the switch setting, be sure to perform reset operation or power OFF to ON of this product.




From previous page
Does RUN indicator (green) flash?
NO
YES
Are the change canceled?
YES
NO
Press the setting saving switch once after one second passed.
Set the link ID setting switch, station No. setting switch and transmission speed setting switch to the original settings.
RUN indicator (green) lights up, and L ERR. indicator (red) turns OFF.
Perform reset operation or power OFF to ON of this product
Setting cancellation completed
Does L ERR. indicator (red) flash?
YES
NO
Perform a troubleshooting referring to item 2 of "(2) Troubleshooting for switch setting."
Perform a troubleshooting referring to item 1 of "(2) Troubleshooting for switch setting."
Did the flash interval of RUN indicator (green) change?
NO
YES
Perform reset operation or power OFF to ON of this product.
Perform a troubleshooting referring to item 3 of "(2) Troubleshooting for switch setting."
Completed

(2) Troubleshooting for switch setting

Corrective actions for the invalid indicator operation at switch setting are shown in the following table.

Item	Indicator status	Check description	Corrective action
1	After power-on or during switch setting, L ERR. indicator (red) lights up.	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 within the setting range, replace this product.
2	After the first setting saving switch is pressed, RUN indicator (green) 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 this product.
3	After the second setting saving switch is pressed, the flash interval of RUN indicator (green) 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 indicator (green) does not change when the second setting saving switch is pressed after one or more seconds passed, replace this product.

Chapter 7 Maintenance and Inspection

⚠ DANGER

- Do not touch the terminals while power is on.
  Doing so could cause an electrical shock.

⚠ CAUTION

- Turn off all phases of the external supply power used in the system when cleaning the unit or retightening the terminal block mounting screws and terminal screws.
  Not doing so could result in an electrical shock.
  Tighten a terminal block mounting screw and a terminal 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 unit, resulting in a drop of the screw of the unit, a short circuit or malfunctions.

- Do not disassemble or modify the units.
  Doing so could cause trouble, erroneous operation, injury, or fire.
  If the product is repaired or remodeled by other than our company, the warranty is not covered.

- Restrict the mounting / removal of a unit, base unit, and terminal block up to 50 times (conforming to JIS B 3502, IEC 61131-2), after the first use of the product.
  Failure to do so may cause the unit to malfunction due to poor contact of connector.

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

- Completely turn off the externally supplied power used in the system before installing or removing the unit to / from the panel.
  Not doing so may result in a fault or malfunctions of the unit.

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.

7-1 Daily Inspection

The items that must be inspected daily are listed in the following.

Item	Inspection item		Inspection	Judgement	Remedy
1	Installation	Installation to DIN rail	Check that this product is stable.	This product must be stable.	Reinstall this product to the DIN rail.
		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	Unit indicator at power-on / reset	POWER indicator (Green)	Check that the indicator lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	Refer to "**8-2 Troubleshooting with indicator**."
		RUN indicator (Green)	Check that the indicator momentarily lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	Replace the unit.
		SAFETY indicator (Green)	Check that the indicator momentarily lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	
		ERR. indicator (Red)	Check that the indicator momentarily lights up.	The indicator (red) must turn OFF. (Abnormal if the indicator is OFF.)	
4	Unit indicator during operation	POWER indicator (Green)	Check that the indicator lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	Refer to "**8-2 Troubleshooting with indicator**."
		RUN indicator (Green)	Check that the indicator lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	
		SAFETY indicator (Green)	Check that the indicator lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	
		ERR. indicator (Red)	Check that the indicator is OFF.	The indicator must be OFF. (Abnormal if the indicator lights up or flashes (red).)	
		L RUN indicator (Green)	Check that the indicator lights up.	The indicator (green) must light up. (Abnormal if the indicator is OFF.)	
		L ERR. indicator (Red)	Check that the indicator is OFF.	The indicator must be OFF. (Abnormal if the indicator lights up or flashes (red).)	
		SD indicator (Green)	Check that the indicator dimly lights up.	The indicator must dimly light up (green). (Abnormal if the indicator is OFF.)	
		RD indicator (Green)	Check that the indicator dimly lights up.	The indicator must dimly light up (green). (Abnormal if the indicator is OFF.)	
		Input indicator (X0 to XF) (Red)	Check that the indicator lights up and turns off.	The indicator must light up (red) when the input power is turned ON. The indicator must be extinguished when the input power is turned OFF. Abnormal if the indicator does not light up or turn OFF as indicated above.	Replace the unit.
		Output indicator (Y0 to Y3) (Red)	Check that the indicator lights up and turns off.	The indicator must light up (red) when the output power is turned ON. The indicator must be extinguished when the output power is turned OFF. Abnormal if the indicator does not light up or turn OFF as indicated above.	

7-2 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.

Item	Inspection item		Inspection	Judgment	Remedy
1	Ambient environment (Note)	Ambient temperature	Measure with a temperature and a hygrometer.	0 to +55°C	Change the ambient environment according to the judgement.
		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 24V DC.	21.6 to 26.4V DC	Change the supply power according to the judgement.
3	Installation	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.

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

7-3 Time for Replacement of this Product

In order to keep the safety system, replace the old product with new product in each 5 years.

Chapter 8 Troubleshooting

This section describes the various types of trouble that occur when this product is operated, and causes and remedies of these troubles.

8-1 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 this product (stop status and operation status)
2) Power supply status of this product
3) Status of extenal devices
4) Installation condition of the safety power supply unit, safety CPU unit and safety master unit
5) Status of wiring (I/O wires, power cables, CC-Link dedicated cables)
6) Display status of various types of indicators (POWER indicator, RUN indicator, SAFETY indicator, ERR. indicator, etc.)
7) Status of setting of various types of set switches

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

(2) Check of trouble

Check to see how the operating condition of this product varies while the following are operated.

1) Set the safety CPU unit RUN / STOP / RESET switch connected to this product to “STOP.”
2) Reset the trouble with the safety CPU unit RUN / STOP / RESET switch connected to this product.
3) Turn ON and OFF the power supply of this product.
4) Reset the trouble with this product reset switch.

(3) Narrowing down the range of trouble occurrence causes

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

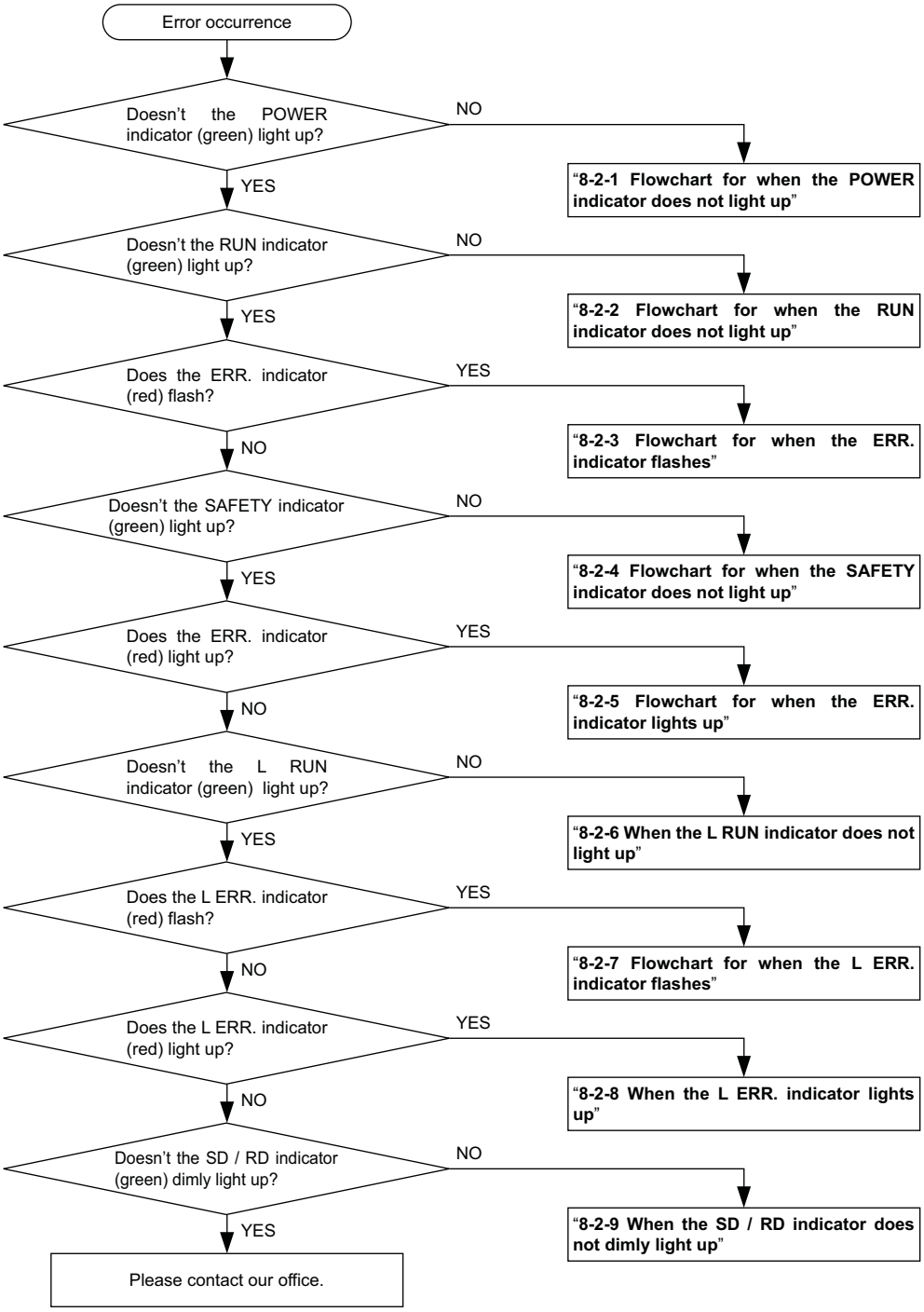
1) This product or external devices
2) Safety master unit or others
3) Safety CPU unit
4) PLC program

8-1-1 Precautions for troubleshooting

This product 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.

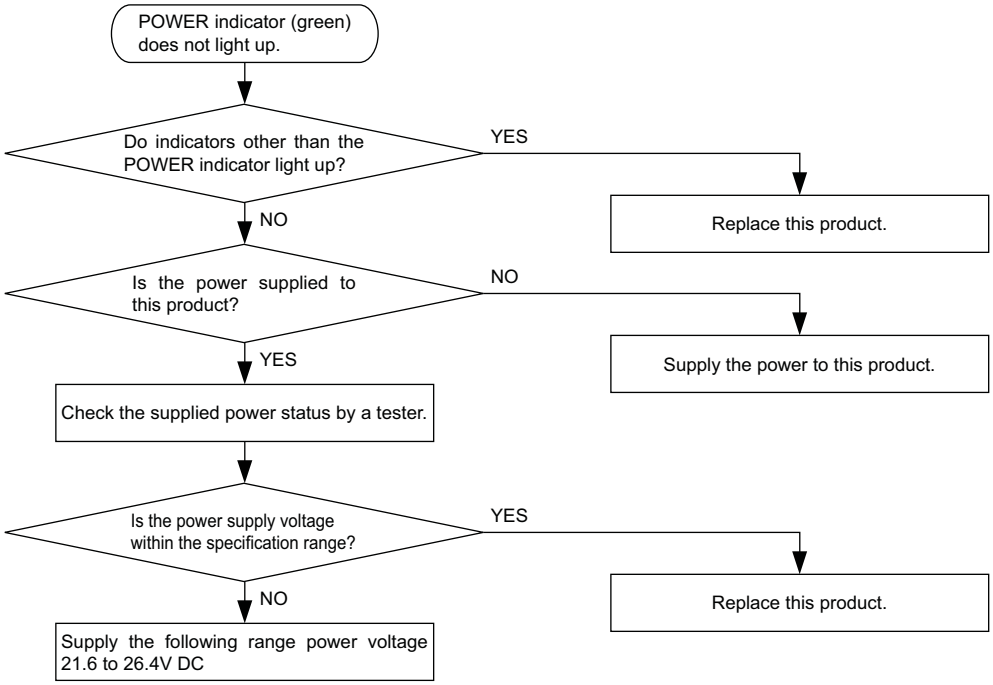
8-2 Troubleshooting with Indicators

This section classifies the error definitions by the indicator status and describes them.



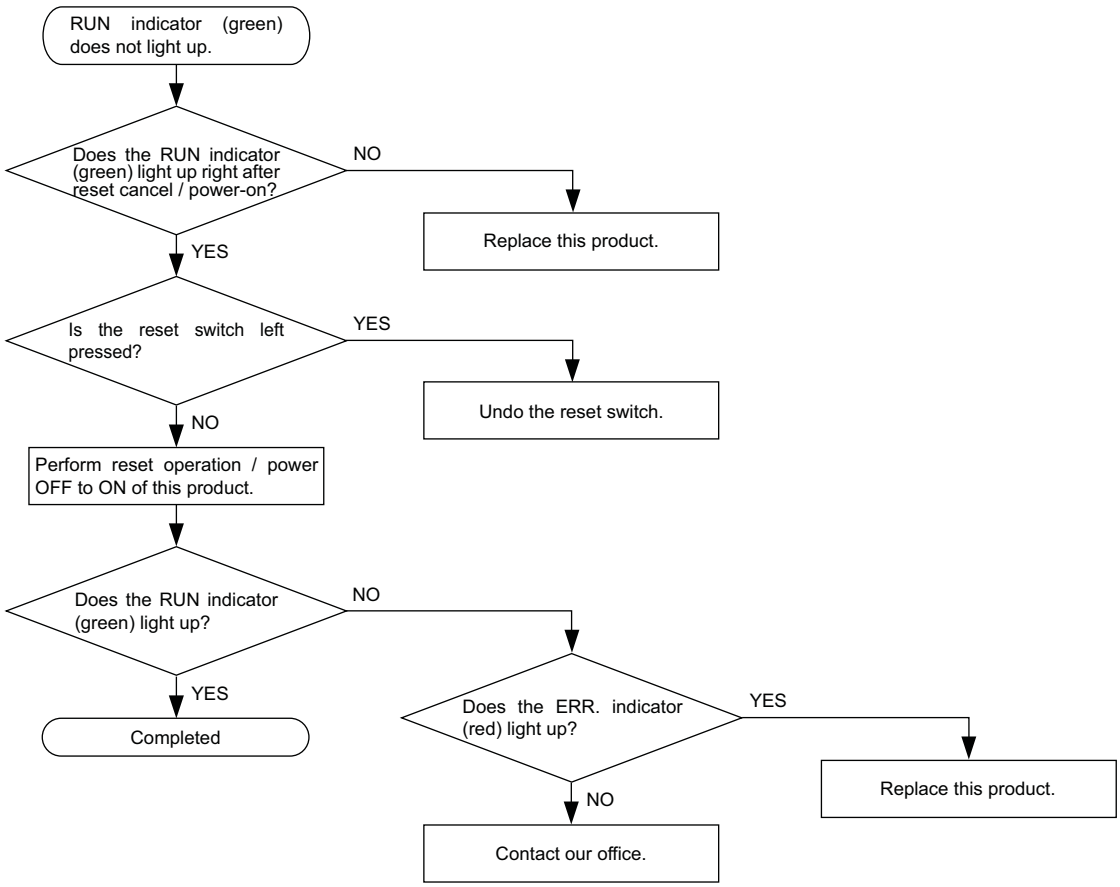
8-2-1 Flowchart for when the POWER indicator does not light up

The following shows the flowchart for when the POWER indicator (green) does not light up at power-on of this product or during operation of the unit.



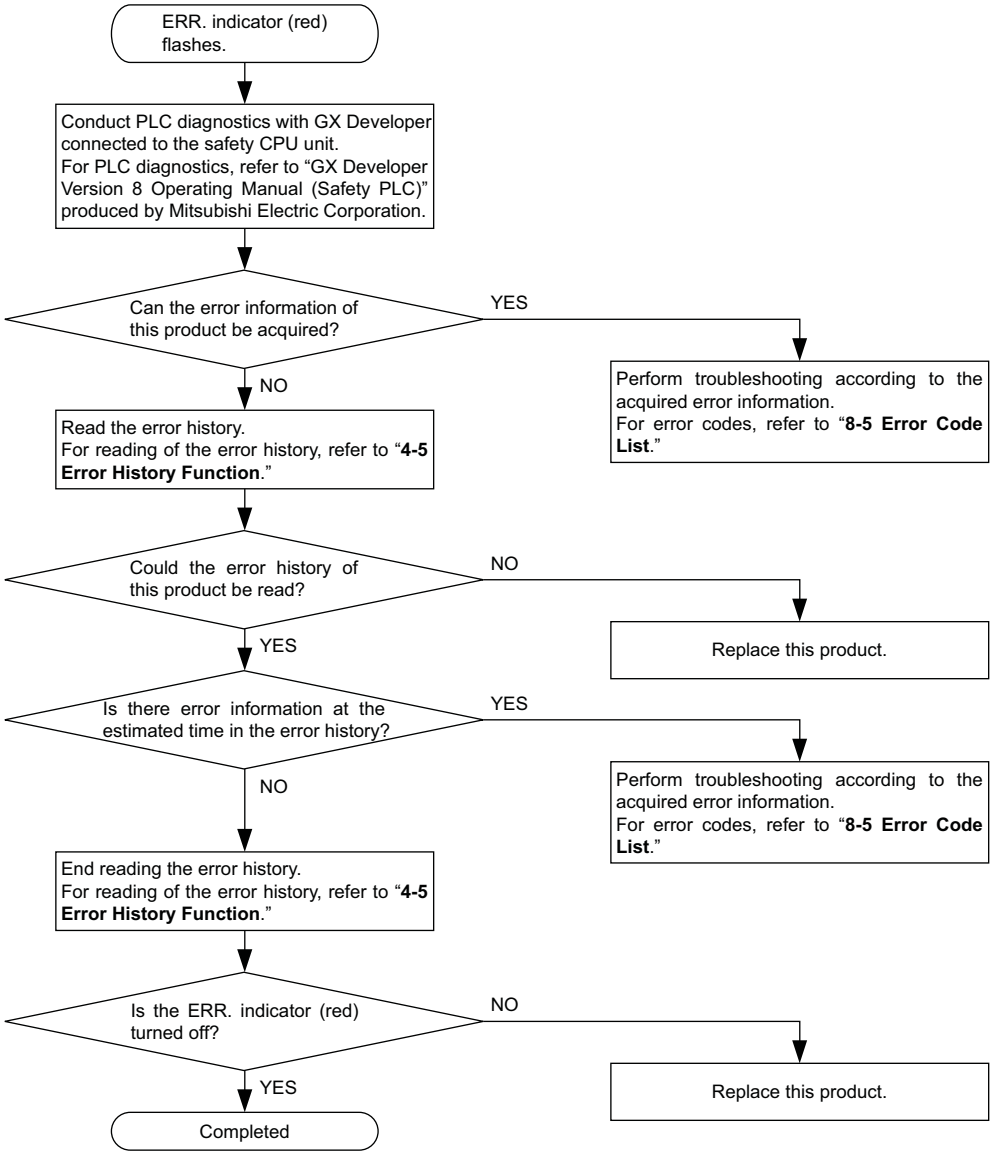
8-2-2 Flowchart for when the RUN indicator does not light up

The following shows the flowchart for when the RUN indicator (green) does not light up at power-on of this product or during operation of the unit.



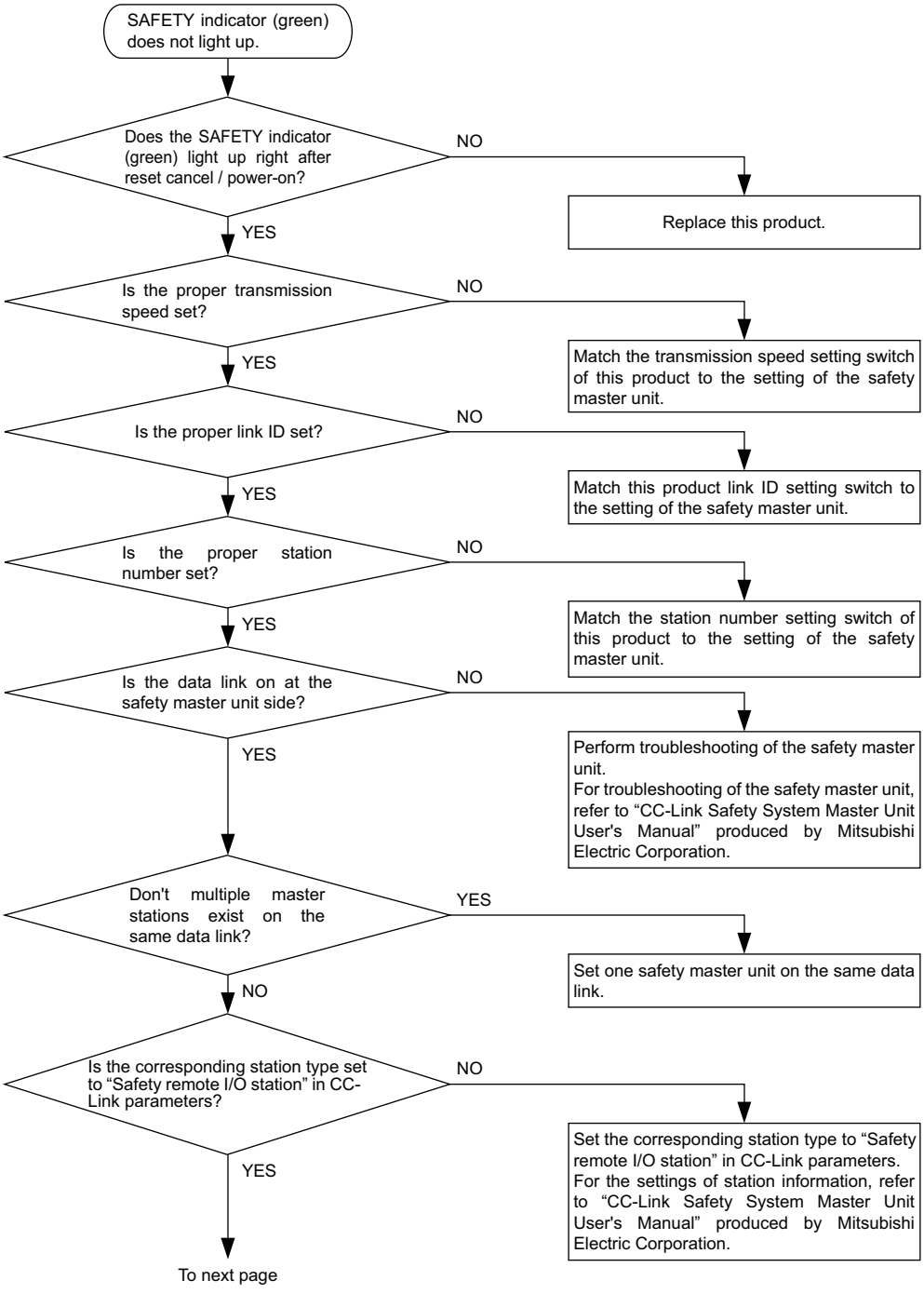
8-2-3 Flowchart for when the ERR. indicator flashes

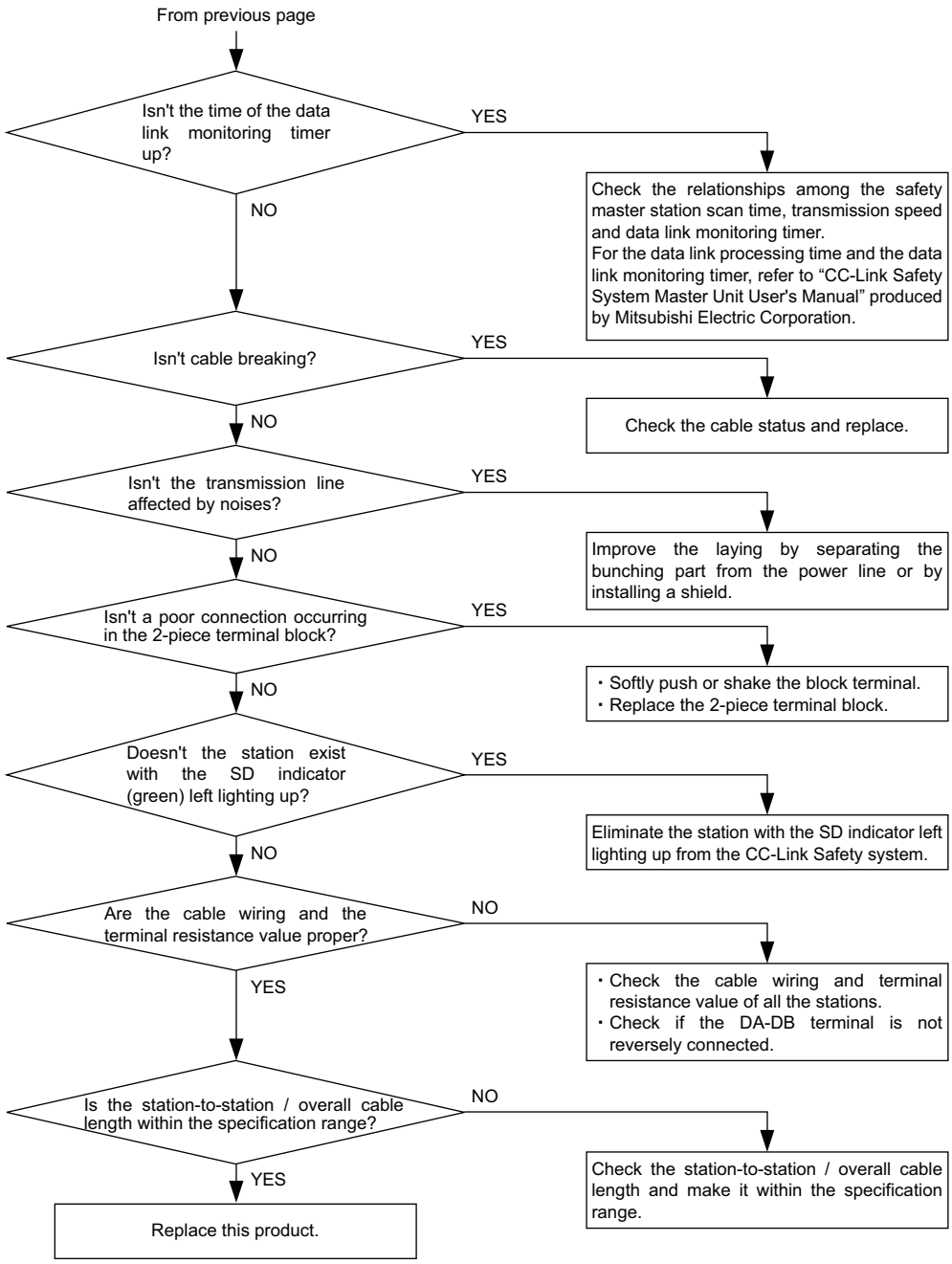
The following shows the flowchart for when the ERR. indicator (red) flashes at power-on of this product or during operation of the unit.



8-2-4 Flowchart for when the SAFETY indicator does not light up

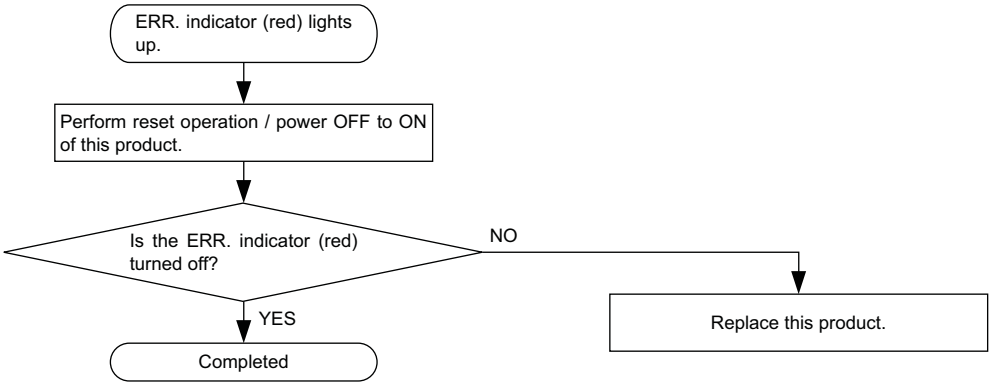
The following shows the flowchart for when the SAFETY indicator (green) does not light up at power-on of this product or during operation of the unit.




From previous page
Isn't the time of the data link monitoring timer up?
YES
Check the relationships among the safety master station scan time, transmission speed and data link monitoring timer.
For the data link processing time and the data link monitoring timer, refer to “CC-Link Safety System Master Unit User's Manual” produced by Mitsubishi Electric Corporation.
NO
Isn't cable breaking?
YES
Check the cable status and replace.
NO
Isn't the transmission line affected by noises?
YES
Improve the laying by separating the bunching part from the power line or by installing a shield.
NO
Isn't a poor connection occurring in the 2-piece terminal block?
YES
・Softly push or shake the block terminal.
・Replace the 2-piece terminal block.
NO
Doesn't the station exist with the SD indicator (green) left lighting up?
YES
Eliminate the station with the SD indicator left lighting up from the CC-Link Safety system.
NO
Are the cable wiring and the terminal resistance value proper?
NO
・Check the cable wiring and terminal resistance value of all the stations.
・Check if the DA-DB terminal is not reversely connected.
YES
Is the station-to-station / overall cable length within the specification range?
NO
Check the station-to-station / overall cable length and make it within the specification range.
YES
Replace this product.

8-2-5 Flowchart for when the ERR. indicator lights up

The following shows the flowchart for when the ERR. indicator (red) lights up at power-on of this product or during operation of the unit.



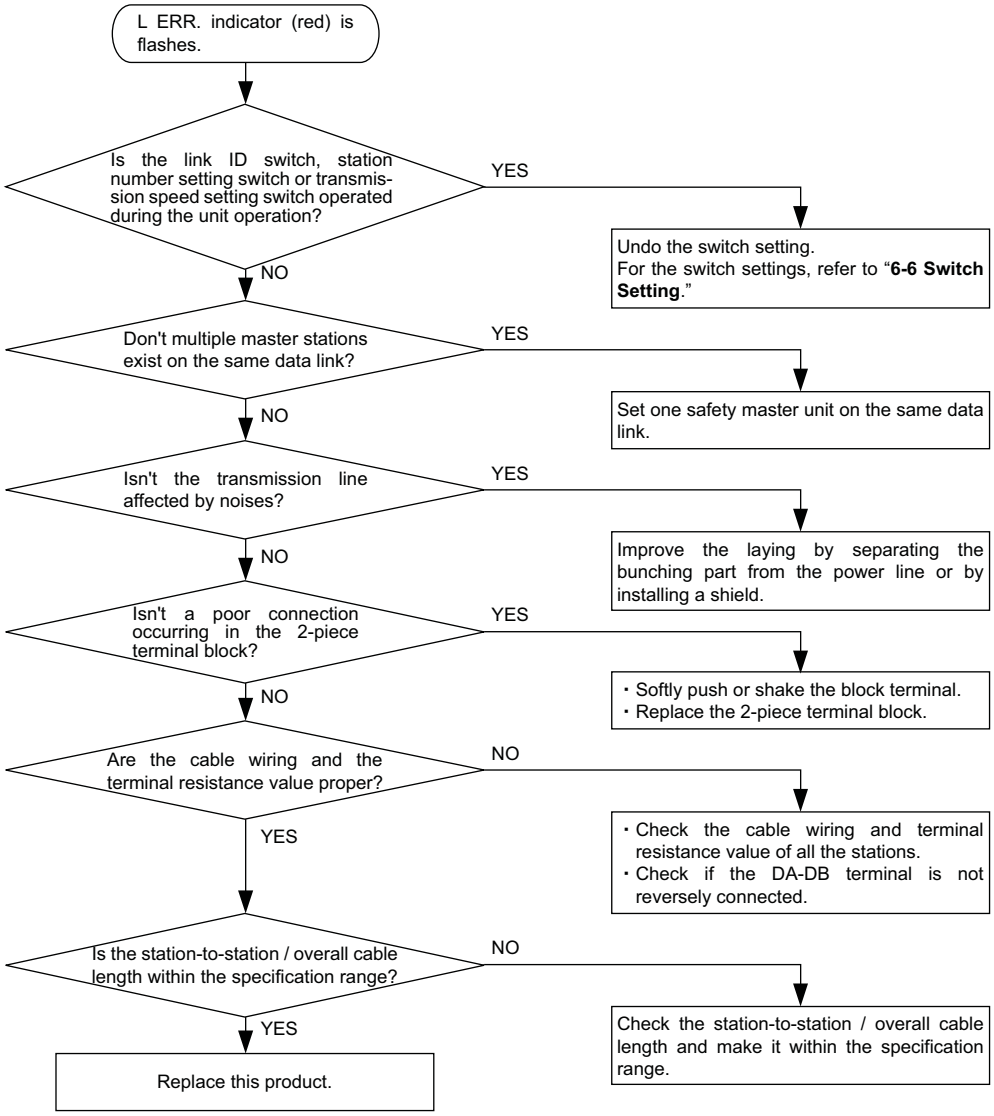
8-2-6 When the L RUN indicator does not light up

The following shows the case when the L RUN indicator (green) does not light up at power-on of this product or during operation of the PLC.

If the L RUN indicator (green) does not light up when the SAFETY indicator (green) lights up, replace this product.
When the SAFETY indicator (green) does not light up, refer to "**8-2-4 Flowchart for when the SAFETY indicator does not light up**."

8-2-7 Flowchart for when the L ERR. indicator flashes

The following shows the flowchart for when the L ERR. indicator (red) flashes at power-on of this product or during operation of the unit.



8-2-8 When the L ERR. indicator light up

The following explains the case when the L ERR. indicator (red) lights up at power-on of this product or during operation of the unit.

If the L ERR. indicator (red) lights up when the ERR. indicator (red) is turned OFF, replace this product.
When the ERR. indicator (red) flashes, refer to "**8-2-3 Flowchart for when the ERR. indicator flashes**."
When the ERR. indicator (red) lights up, refer to "**8-2-5 Flowchart for when the ERR. indicator lights up**."

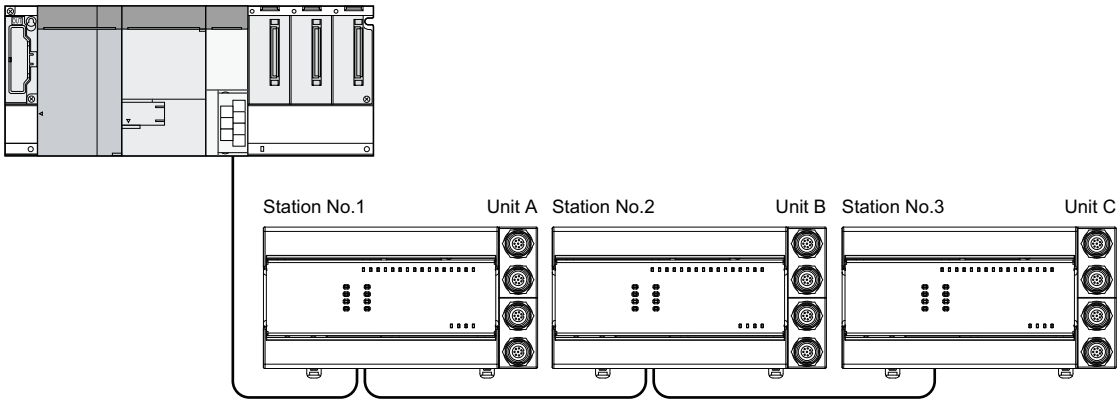
8-2-9 When the SD / RD indicator does not dimly light up

The following explains the case when the SD / RD indicator (green) does not dimly light up at power-on of this product or during operation of the unit.

If the SD / RD indicator (green) does not dimly light up when the SAFETY indicator (green) lights up, replace this product.
When the SAFETY indicator (green) does not light up, refer to "**8-2-4 Flowchart for when the SAFETY indicator does not light up**."

8-3 Verifying Errors from Indicator Status

The following table lists causes and corrective actions for errors indicated by indicators on this product when the network parameters are properly set and also the MST indicator of the safety master unit lights up (i.e. under data link control) in the system configuration example shown below.



<Verifying errors from indicator status>

Indicator status				Cause	Corrective action
Safety master unit	Unit A	Unit B	Unit 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 indicators on the unit A 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 unit.
	POWER * L RUN * L ERR. *	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	The unit A is malfunctioning and the indicators are unstable (all lights are off, in many cases).	Replace the unit A.
	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 unit and correct.

●: Lights up, ○: Turns OFF, *: Lights up, Flashes, or Turns OFF

<Verifying errors from indicator status [When the L RUN indicator (green) does not light up]>

Indicator status				Cause	Corrective action
Safety master unit	Unit A	Unit B	Unit 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 unit A and B. • The line failure (terminal block poor connection, cable disconnection, etc.) is occurring between the units B and C. • The units B and C are affected by noises.	• Check the SLD grounding status of the transmission cable. • Conform 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 tester.
	POWER ● L RUN ○ L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ○ L ERR. ○	The L RUN indicators (green) of the units 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 units are corrected.
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ○ L ERR. ○	POWER ● L RUN ● L ERR. ○	The L RUN indicator (green) of the unit B is OFF, indicating the transmission speed setting for unit B is invalid within the setting range (0 to 4).	Restart the power supply after the transmission speed is set correctly.

●: Lights up, ○: Turns OFF

<Verifying errors from indicator status [When the L ERR. indicator (red) lights up]>

Indicator status				Cause	Corrective action
Safety master unit	Unit A	Unit B	Unit C		
ERR. ○ or ERR. ●	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	POWER ● L RUN ● L ERR. ○	The L ERR. indicator (red) of the unit B lights up, indicating that the unit B is being affected by noises. (L RUN indicator (green) may be off.)	Correctly perform grounding of the F.G.s for the master unit and all units.
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	POWER ● L RUN ● L ERR. ●	• All 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 units B and C. • The units B and C are affected by noises.	• Check the SLD grounding status of the transmission cable. • Conform 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 tester.
	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ○	POWER ● L RUN ● L ERR. ●	A terminal resistor is not attached. (L RUN indicator (green) may be off.)	Check if a terminal resistor is attached.

●: Lights up, ○: Turns OFF

8-4 Troubleshooting with GX Developer

Errors which occur in this product can be verified on the PLC diagnostics screen of GX Developer.

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 this product are registered as remote I/O station error information in “Operation / error history.”
The error history of this product must be sent to the safety CPU unit beforehand.
For sending the error history of this product, refer to “**4-5 Error History Function**.”

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

1) Start GX Developer.
2) Connect the CPU unit and personal computer.
3) On GX Developer, choose the [Online] → [Read from PLC] menu and read the project from the safety CPU unit.
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.

For details of the PLC diagnostics, refer to “GX Developer Version 8 Operating Manual (Safety PLC)” produced by Mitsubishi Electric Corporation.
For the error, refer to “**8-5 Error Code List**.”

8-5 Error Code List

This product sends the error information to the safety CPU unit via a safety master unit when the moderate error 1 (Note) occurs at power-on or during operation of the unit.
The error codes that this product sends are listed in <Error Code List>.
For reading an error code, refer to "**8-4 Troubleshooting with GX Developer**."

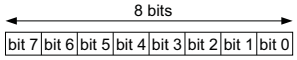
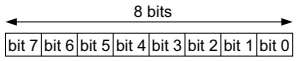
Note: The unit error codes are classified into minor, moderate, and major errors as shown below.
However, minor error is not applied to this product.
- Minor error: Errors that may allow this product to maintain the safety functions.
- Moderate error: Errors that may cause this product to stop the safety functions with error detection enabled.
- Major error: Errors that may cause this product to stop the safety functions with error detection disabled.

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

<Error code list>

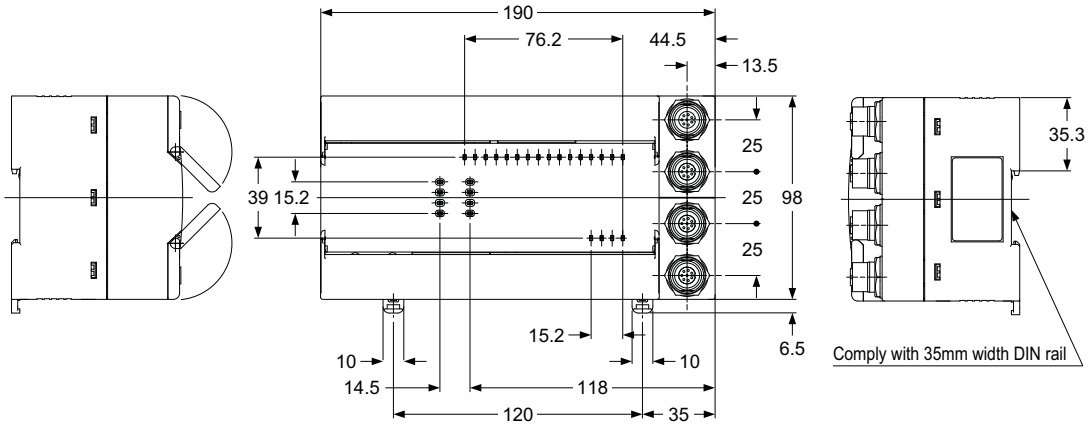
Error classification	Erro item	Designation	Error definition	Corrective action
302	0000	CC-Link Safety protocol (Out of receive command range)	An unexpected protocol occurred.	Error codes of CC-Link Safety protocol
304	0000	CC-Link Safety protocol division number error (Product information)	The continuity 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 manufacture 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 (Unit 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 (Unit technical version mismatch)	The unit 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 to Host information 7, 8: Highest 16 bits of product information	
	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: “SF” Error details 2: “-C” Error details 3: “L1” Error details 4: “T2” Error details 5: “64” Error details 6: “T ” Error details 7: “ ” Error details 8: “ ” Error details 9: 0x0020	
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.	

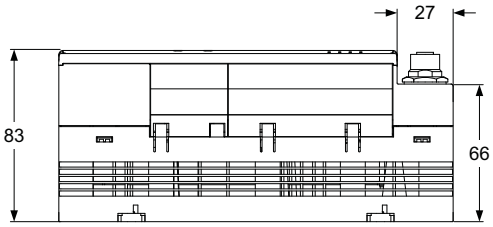
<table>
<tr><th>Error classification</th><th>Erro item</th><th>Name</th><th>Error definition</th><th>Corrective action</th></tr>
<tr><td rowspan="2">350</td><td>0917</td><td>Safety slave station parameter mismatch</td><td>Safety slave station parameter mismatch.
<Error details 2>
201: Mismatch of “Time of noise removal filter”
(Input dark test pulse OFF time is greater than “Time of noise removal filter X0, 1”)
601: Mismatch of “Method of wiring of output”
(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.)</td><td>• 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 unit parameters again.</td></tr>
<tr><td>0719</td><td>CC-Link Safety protocol safety slave station parameter number error</td><td>The received numbers of safety slave station parameters are out of range.</td><td>After checking that the CSP file is not damaged and that the latest CSP file is registered, set the unit parameters again.</td></tr>
<tr><td rowspan="4">450</td><td>0102</td><td>Doubling input discrepancy detection time</td><td>A mismatch has been detected in paired inputs (X0 and X1, X2 and X3, etc.) over the doubling input discrepancy detection time.</td><td>Reexamine the connected devices and the wiring.</td></tr>
<tr><td>0203</td><td>Output overload error (At Safety pre-diagnostics)</td><td>The overcurrent protection or overvoltage protection has been activated in the output circuit transistor.</td><td rowspan="3">(1) Reexamine the connected devices and the wiring.
(2) Replace this product.</td></tr>
<tr><td>0204</td><td>Output read-back error (At Safety pre-diagnostics)</td><td>The read-back value and the output value do not match.
<Error details 2>
Upper 8 bits
8 bits
bit 7 | bit 6 | bit 5 | bit 4 | bit 3 | bit 2 | bit 1 | bit 0
bit 0: Y0 0: Output read-back value ON, 1: Output read-back value OFF
bit 1: Y1 0: Output read-back value ON, 1: Output read-back value OFF
bit 2: Y2 0: Output read-back value ON, 1: Output read-back value OFF
bit 3: Y3 0: Output read-back value ON, 1: Output read-back value OFF
bit 4 to 7: Fixed to 0
Lower 8 bits
8 bits
bit 7 | bit 6 | bit 5 | bit 4 | bit 3 | bit 2 | bit 1 | bit 0
bit 0: Y0+ 0: Output value ON, 1: Output value OFF
bit 1: Y1- 0: Output value ON, 1: Output value OFF
bit 2: Y2+ 0: Output value ON, 1: Output value OFF
bit 3: Y3- 0: Output value ON, 1: Output value OFF
bit 4: Y0- 0: Output value ON, 1: Output value OFF
bit 5: Y1+ 0: Output value ON, 1: Output value OFF
bit 6: Y2- 0: Output value ON, 1: Output value OFF
bit 7: Y3+ 0: Output value ON, 1: Output value OFF
Because of restrictions on hardware, the sink side output read-back always reads ON regardless of ON / OFF of the output.</td></tr>
<tr><td>0209</td><td>Output overload error (At mid-Safety connection diagnostics)</td><td>The overcurrent protection or overvoltage protection has been activated in the output circuit transistor.</td></tr>
</table>

Error classification	Erro item	Name	Error definition	Corrective action
450	0210	Output read-back error (At mid-Safety connection diagnostics)	The read-back value and the output value do not match. <Error details 2> Upper 8 bits  bit 0: Y0 0: Output read-back value ON, 1: Output read-back value OFF bit 1: Y1 0: Output read-back value ON, 1: Output read-back value OFF bit 2: Y2 0: Output read-back value ON, 1: Output read-back value OFF bit 3: Y3 0: Output read-back value ON, 1: Output read-back value OFF bit 4 to 7: Fixed to 0 Lower 8 bits  bit 0: Y0+ 0: Output value ON, 1: Output value OFF bit 1: Y1- 0: Output value ON, 1: Output value OFF bit 2: Y2+ 0: Output value ON, 1: Output value OFF bit 3: Y3- 0: Output value ON, 1: Output value OFF bit 4: Y0- 0: Output value ON, 1: Output value OFF bit 5: Y1+ 0: Output value ON, 1: Output value OFF bit 6: Y2- 0: Output value ON, 1: Output value OFF bit 7: Y3+ 0: Output value ON, 1: Output value OFF Because of restrictions on hardware, the sink side output read-back always reads ON regardless of ON / OFF of the output.	(1) Reexamine the connected devices and the wiring. (2) Replace this product.
	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 this product.
	0305	Output dark test error	The test pulse could not be detected during the output dark test.	
	0402	I/O control power supply voltage error	I/O contorl 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 this product.
	0404	External power supply error	I/O control power supply voltage switching-off circuit error. This product 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 status where no error history exists. After the new error code is stored, this error code will not be read from the history.	Use the unit as is, since it is normal.
	0911	Unit forced stop control	The operation of this product has stopped by receiving a forced stop command from the master unit. Unit forced stop control. 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 unit / safety master unit.
	1213	Setting registration switch status error at power-on	The ON status of the sensing 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 this product.

Chapter 9 Dimensions

(Unit: mm)





Chapter 10 Appendix

10-1 Additions and Changes of Functions by Version Upgrade

Functions can be added and specifications can be changed for the safety remote I/O unit by upgrading the version.
The functions or specifications which can be used in the safety remote I/O unit changes with the unit's technical version.

10-1-1 SF-CL1T264T function upgrades

(1) Specification comparison

Specifications		Technical version	
		A	B or later
Safety refresh response processing time		38ms	9.6ms
Safety remote station input response time		32ms	11.2ms
Safety remote station output response time	ON → OFF	32ms	10.4ms
	OFF → ON	32ms	11.2ms

(2) Function comparison

Availability of additional functions by the unit's technical version is shown in the following.

Added functions	Technical version
Setting of safety data monitoring time	B or later
Item added for settings of doubling input discrepancy detection time (The doubling input discrepancy time can be set from 20ms to 60s.)	C or later
Setting of doubling input / single input selection	
Item added for setting of doubling input discrepancy detection time ("Not detected" can be set from the selection of doubling input discrepancy detection time.)	
Auto recovery function at the time of a doubling input discrepancy detection error	
Item added for the input dark test selection (input dark test selection can be set per point).	

Note: The added functions cannot be used in the safety CPU unit and the safety master unit where the first five digits of the serial number are "10031" or earlier.

10-1-2 When the functions added by the version upgrade are not used

If the conditions shown in the following table are satisfied, the units can be replaced without changing the safety remote station settings of the GX Developer. In this case, the specification values of the unit after replacement are used as the performance specification.

First 5 digits of serial no. of safety CPU unit	Unit technical version before replacement	Unit technical version after replacement
"10032" or later	A	B or later
	B	C or later

When the functions added by the version upgrade are used, it is necessary to reset the safety remote station settings of the GX Developer.

<Reference>

When "specify production information to find unit" is selected in the parameter settings, it is necessary to change the production information.

Chapter 11 Other

11-1 CE Marking Declaration of Conformity

Itemized Essentials of EC Declaration of Conformity

Manufacturer's Name: Panasonic Industrial Devices SUNX Co., Ltd.
Manufacturer's Address: 2431-1, Ushiyama-cho, Kasugai, Aichi 486-0901, Japan

EC Representative's Name and Address:

<Until June 30 ,2013>
Panasonic Electric Works Europe AG
Rudolf-Diesel-Ring 2, D-83607 Holzkirchen, Germany
<From July 1 ,2013>
Panasonic Marketing Europe GmbH Panasonic Testing Center
Winsbergring 15, 22525 Hamburg,Germany

Product: Remote I/O unit with connectors for Light Curtain
Model Name: SF-CL1T264T
Trade Name: Panasonic

Application of Council Directive:
- 2006/42/EC Machinery Directive
- 2004/108/EC EMC Directive

Tested according to:
- EN ISO 13849-1: 2008
- EN 61131-2: 2007
- IEC 61508-1: 1998
- IEC 61508-2: 2000
- IEC 61508-3: 1998
- IEC 61508-4: 1998

Type Examination: Certified by TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln Germany

This is to declare that the product named above has been designed to comply with the relevant sections of the above referenced specifications. The product complies with all essential requirements of the Directives.

Revision History

First edition: May 30, 2007
Second edition: June 10, 2008
Third edition: January 12, 2010
Fourth edition: January 20, 2011
Fifth edition: November 10, 2011
Sixth edition: March 1, 2013

MEMO

1. WARRANTIES:

(1) Subject to the exclusions stated in 2 (EXCLUSIONS) herein below, Panasonic Industrial Devices SUNX warrants the Products to be free of defects in material and workmanship for a period of one (1) year from the date of shipment under normal usage in environments commonly found in manufacturing industry.

(2) Any Products found to be defective must be shipped to Panasonic Industrial Devices SUNX with all shipping costs paid by Purchaser or offered to Panasonic Industrial Devices SUNX for inspection and examination. Upon examination by Panasonic Industrial Devices SUNX, Panasonic Industrial Devices SUNX will, at its sole discretion, repair or replace at no charge, or refund the purchase price of, any Products found to be defective.

2. EXCLUSIONS:

(1) This warranty does not apply to defects resulting from any cause:
   (i) which was due to abuse, misuse, mishandling, improper installation, improper interfacing, or improper repair by Purchaser;
   (ii) which was due to unauthorized modification by Purchaser, in part or in whole, whether in structure, performance or specification;
   (iii) which was not discoverable by a person with the state-of-the-art scientific and technical knowledge at the time of manufacture;
   (iv) which was due to an operation or use by Purchaser outside of the limits of operation or environment specified by Panasonic Industrial Devices SUNX;
   (v) which was due to normal wear and tear;
   (vi) which was due to Force Majeure; and
   (vii) which was due to any use or application expressly discouraged by Panasonic Industrial Devices SUNX in 4 (CAUTIONS FOR SAFE USE) hereunder.

(2) This warranty extends only to the first purchaser for application, and is not transferable to any person or entity which purchased from such purchaser for application.

3. DISCLAIMERS

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   (c) which are likely to be used beyond the limits of operations or environments specified by Panasonic Industrial Devices SUNX in the catalogue or otherwise;
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