OPERATING MANUAL

CC-Link I/O MODULE

(CC-Link IE Field network, high resolution, high-speed DC voltage/ current input, 4 points, isolated, separable tension clamp terminal)

MODEL **R7I4DCIE1-SVAF4-4**

CONTENTS

MG CO., LTD. www.mgco.jp
5-2-55 Minamitsumori, Nishinari-ku, Osaka 557-0063 JAPAN

BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact our sales office or representatives.

■ PACKAGE INCLUDES:

High resolution, high-speed DC voltage/current input module...(1)
DIN rail mounter slider.....(2)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

■ CSP+ file

CSP+ file is downloadable at our web site or CC-Link Partner Association's web site (https://www.cc-link.org)

POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- The equipment must be mounted inside the instrument panel of a metal enclosure.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures* to ensure the CE conformity.
  * For example, installation of noise filters and clamp filters for the power source, input and output connected to the unit, etc.

■ POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:
  24V DC rating: 24V ±10%, ≤ 110 mA

■ GENERAL PRECAUTIONS

- Before you remove the unit or mount it, turn off the power supply and input signal for safety.
- Before you remove the terminal block or mount it, make sure to turn off the power supply and input signal for safety.

■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

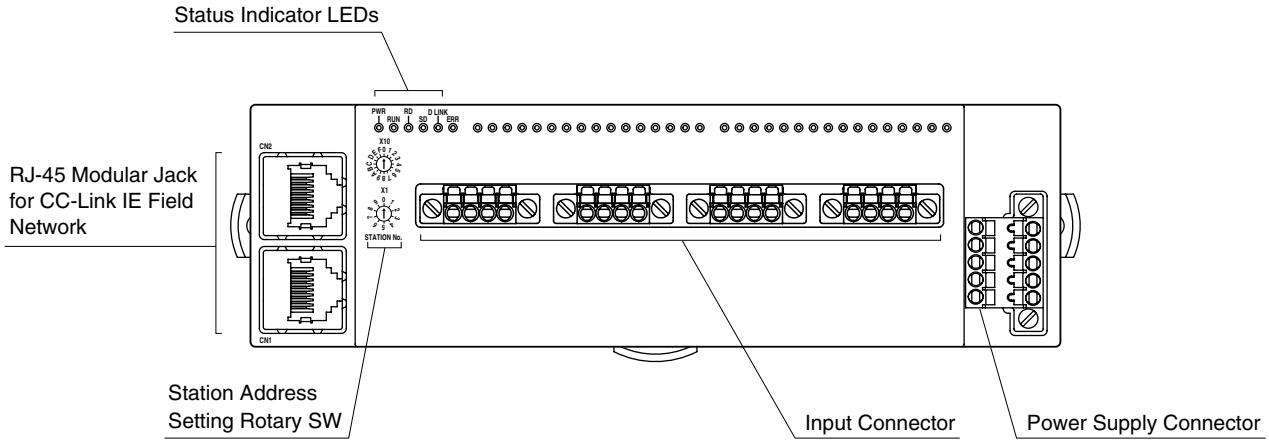
■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.
- Be sure to close the terminal cover for safety.

■ AND ....

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

COMPONENT IDENTIFICATION



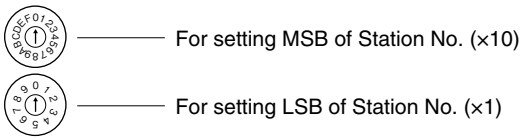
■ STATUS INDICATOR LED

ID	COLOR	FUNCTION	STATUS	DESCRIPTION
PWR	Green	Internal power	ON	Normal
			OFF	Abnormal
RUN	Green	Device status	ON	Normal
			OFF	Device error is occurring
RD	Green	Receiving Data	ON	Receiving
			OFF	Unreceived data
SD	Green	Sending Data	ON	Sending
			OFF	Unsent
D LINK	Green	Data Link Transmitting	ON	Data link in operation (cyclick transmitting)
			Blink	Data link in operation (stop cyclick transmitting)*1
			OFF	Not in operation, disconnected
ERR	Red	Error	ON	Occurring major error*2
			Blink	Occurring minor error*3
			OFF	Normal

*1. Setting as a reserved station, data link stop, etc.
*2. Upper communication error, non-volatile memory error ,etc.
*3. Station no. setting rotary SW has been changed after turning on the power, or input range error has been detected.

■ STATION ADDRESS

The upper rotary SW sets the upper digits (MSB), and the lower rotary SW sets the lowest digit (LSB) (configurable range is 1 to 120).
Confirm available station numbers in the manual of the master unit (Factory setting: 01H).



Example of Station No. setting
Characters on Rotary SW represent; A: 10, B: 11, C: 12.
For example, to set station No. 115, set the SW for MSB to B and SW for LSB to 5.
Do NOT set to D, E, F as they are not in use.

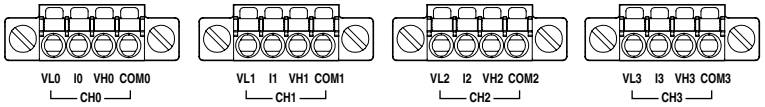
■ **INPUT**

Cable connector: FMC1,5 / 4–STF–3,5
(Phoenix Contact) (included in the package)

Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm

Recommended solderless terminal

- AI0,25–10YE 0.25 mm² (Phoenix Contact)
- AI0,34–10TQ 0.34 mm² (Phoenix Contact)
- AI0,5–10WH 0.5 mm² (Phoenix Contact)
- AI0,75–10GY 0.75 mm² (Phoenix Contact)
- A1–10 1.0 mm² (Phoenix Contact)
- A1,5–10 1.5 mm² (Phoenix Contact)



NO.	ID	FUNCTION	NO.	ID	FUNCTION
1	VL0	Narrow span volt. 0	9	VL2	Narrow span volt. 2
2	I0	Current range 0	10	I2	Current range 2
3	VH0	Wide span volt. 0	11	VH2	Wide span volt. 2
4	COM0	Common 0	12	COM2	Common 2
5	VL1	Narrow span volt. 1	13	VL3	Narrow span volt. 3
6	I1	Current range 1	14	I3	Current range 3
7	VH1	Wide span volt. 1	15	VH3	Wide span volt. 3
8	COM1	Common 1	16	COM3	Common 3

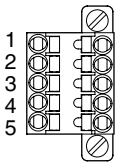
■ **POWER SUPPLY**

Cable connector: TFMC1,5 / 5–STF–3,5
(Phoenix Contact) (included in the package)

Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm

Recommended solderless terminal

- AI0,25–10YE 0.25 mm² (Phoenix Contact)
- AI0,34–10TQ 0.34 mm² (Phoenix Contact)
- AI0,5–10WH 0.5 mm² (Phoenix Contact)
- AI0,75–10GY 0.75 mm² (Phoenix Contact)
- A1–10 1.0 mm² (Phoenix Contact)
- A1,5–10 1.5 mm² (Phoenix Contact)



1. PWR+ Power Supply
2. PWR– Power Supply
3. FE Functional earth
4. NC Unused
5. NC Unused

Note: The numbers marked on the connector have no relationship to the pin number of the unit.
Wire according to the instruction manual of the unit.

PARAMETER SETTING

The following settings can be configured by using the engineering tool (GX Works2 or GX Works3).

■ CHANNEL INDIVIDUAL SETTING

PARAMETER	SETTING RANGE	DEFAULT SETTING
Unused setting	CH enabled CH disabled	CH enabled
Input range	-10 – +10V DC -5 – +5V DC -1 – +1V DC 0 – 10V DC 0 – 5V DC 1 – 5V DC 0 – 1V DC -0.5 – +0.5V DC -20 – +20mA DC 0 – 20mA DC 4 – 20mA DC	-10 to +10V DC
Bias	-320.00 – +320.00 (%)	0.00 (%)
Gain	-3.2000 – +3.2000	1.0000
Data type	Signed Unsigned	Signed
Signed Zero scale	-32,768 – +32,767	0
Signed Full scale	-32,768 – +32,767	10,000
Unsigned Zero scale	0 – 65,535	0
Unsigned Full scale	0 – 65,535	10,000

■ CHANNEL BATCH SETTING

PARAMETER	SETTING RANGE	DEFAULT SETTING
Moving average	1, 2, 4, 8, 16, 32, 64, 128, 256	1

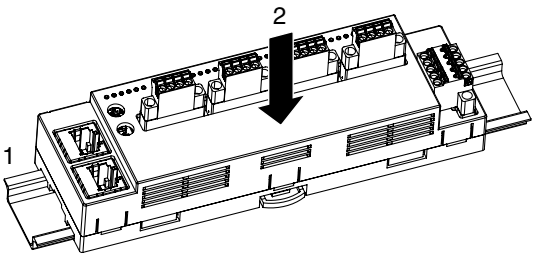
MOUNTING INSTRUCTIONS

■ DIN RAIL MOUNTING (PARALLEL)

• Mounting

1) Set the upper hook at the rear side of the unit on the DIN rail.

2) Push in the lower.

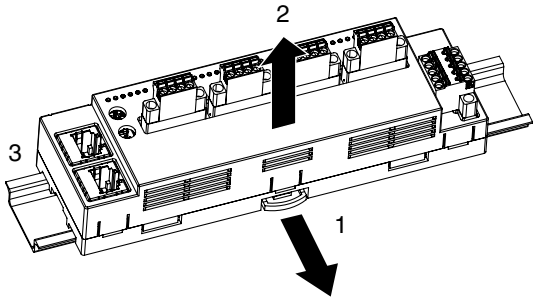


• Dismounting

1) Push down the DIN rail mounter slider with tip of a minus screwdriver.

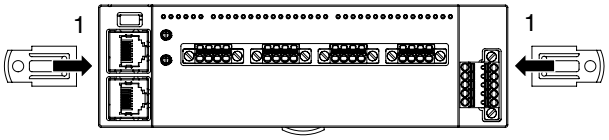
2) Pull the lower of the unit.

3) Remove the upper hook of the unit from the DIN rail.

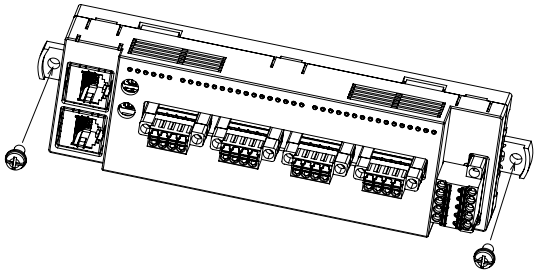


■ SURFACE MOUNTING

1) Insert the two surface mounter sliders until it clicks once, as shown below.



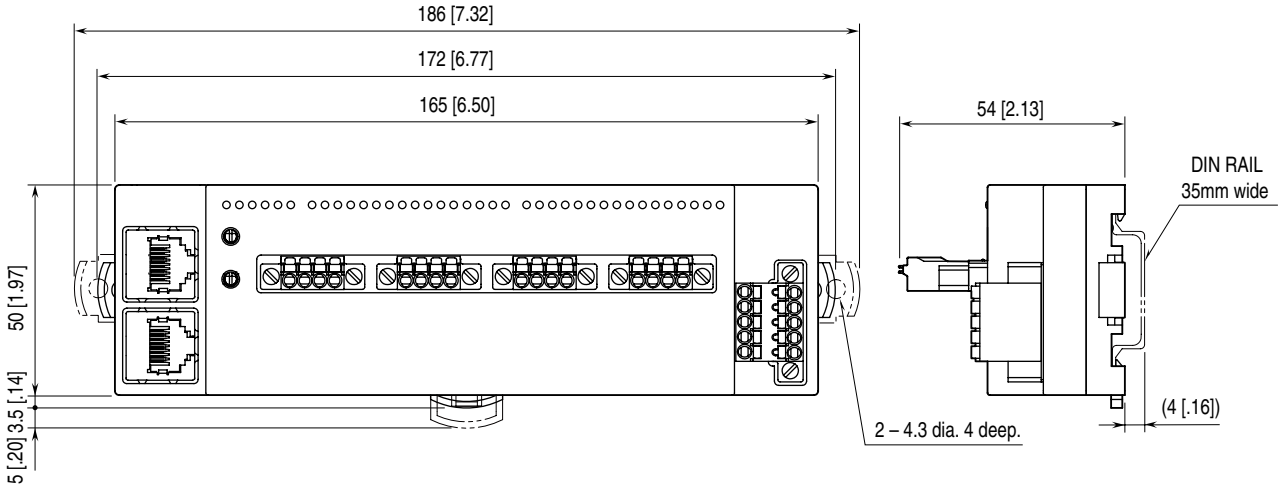
2) Mount the unit with M4 screws referring the External Dimensions. (Torque: 1.4 N·m)



TERMINAL CONNECTIONS

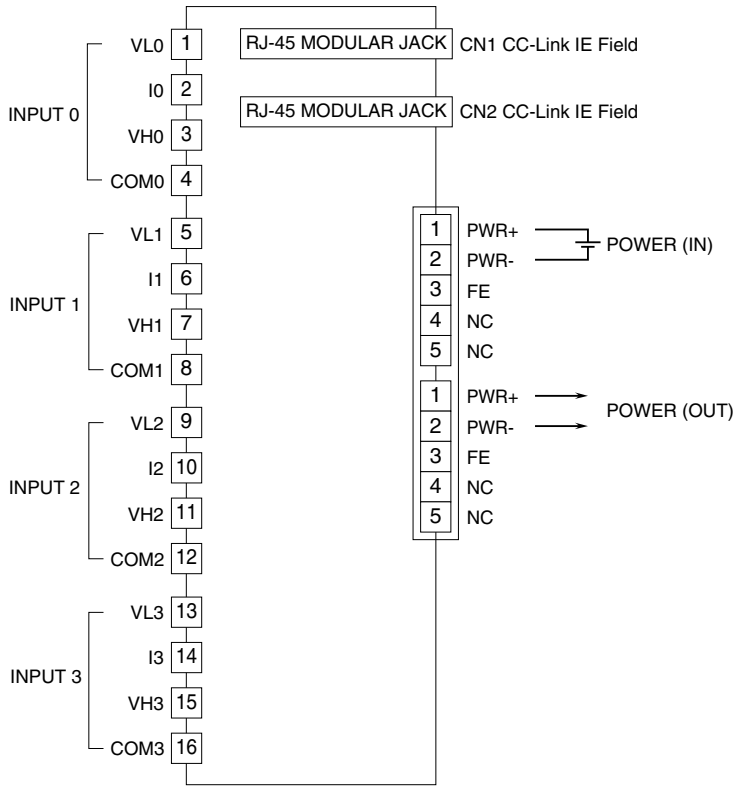
Connect the unit as in the diagram below.

■ EXTERNAL DIMENSIONS unit: mm [inch]



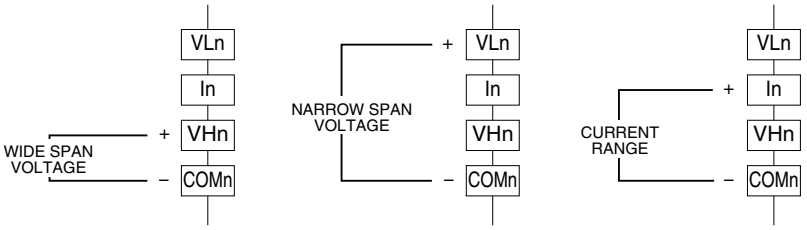
■ CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FE terminal to ground.
Caution: FE terminal is NOT a protective conductor terminal.

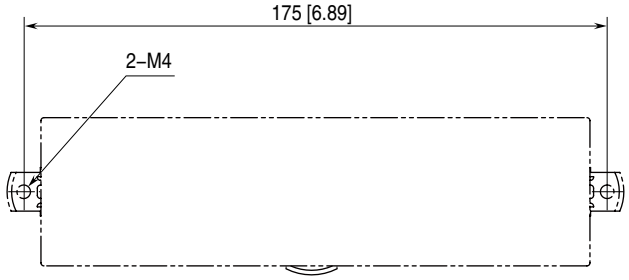


Note: Regarding CN1 and CN2 of RJ-45 modular jack for CC-Link IE Field network, there is no restriction for connection order.

■ INPUT CONNECTION EXAMPLE



MOUNTING REQUIREMENTS unit: mm [inch]



CC-Link IE Field COMMUNICATION

Protocol: IEEE 802.3
Transmission type: 1000BASE-T
Communication speed: 1 Gbps
Network cable: Cable conformed to CC-Link IE Field
Double shielded twist pair cable (CAT5e)
RJ-45 connector
Network topology: Line, star and ring
Max. number of stations: 120 (Total slave stations)
(Number of max. connectable slaves may vary depending on the master module. Refer to the instruction manual of the master module)
Max. station-to-station distance: 100 m
Station type: Remote device station
Link device: RX/RY 16 points, RWw/RWr 16 points
NetWork No.: Recognized automatically (After turning on the power, the network number of the first connected CC-Link IE Field master device is automatically set.)
Synchronous communication: Available

TRANSMISSION DATA DESCRIPTIONS

■ REMOTE REGISTER

• INPUT DATA (RWr)

The figure below shows the data sent from the device to the master.

	15	0
RWr (n+0)	Input 0 data	
+1	Input 1 data	
+2	Input 2 data	
+3	Input 3 data	
+4	Unused	
+5	Unused	
+6	Unused	
+7	Unused	
+8	Unused	
+9	Unused	
+10	Unused	
+11	Unused	
+12	Unused	
+13	System reservation	
+14	Unused	
+15	Unused	

• OUTPUT REGISTER (RWw)

The figure below shows the data received from the master.

	15	0
RWw (n+0)	Unused	
+1	Unused	
+2	Unused	
+3	Unused	
+4	Unused	
+5	Unused	
+6	Unused	
+7	Unused	
+8	Unused	
+9	Unused	
+10	Unused	
+11	Unused	
+12	Unused	
+13	System reservation	
+14	Unused	
+15	Unused	

■ REMOTE I/O SIGNAL

• REMOTE INPUT (RX)

The figure below shows the data sent from the device to the master.

	15	0
RX (n+0) 0	Input 0 Input range error	
1	Input 1 Input range error	
2	Input 2 Input range error	
3	Input 3 Input range error	
4	Input 0 ADC error	
5	Input 1 ADC error	
6	Input 2 ADC error	
7	Input 3 ADC error	
8	Unused	
9	Unused	
A	Unused	
B	Remote READY	
C	Unused	
D	Unused	
E	Unused	
F	Unused	

• REMOTE OUTPUT (RY)

The figure below shows the data received from the master.

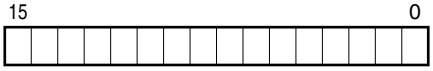
	15	0
RY (n+0) 0	Unused	
1	Unused	
2	Unused	
3	Unused	
4	Unused	
5	Unused	
6	Unused	
7	Unused	
8	Unused	
9	Unused	
A	Unused	
B	Unused	
C	Unused	
D	Unused	
E	Unused	
F	Unused	

Note: When the converted value reaches the upper or lower limit of the scaling value (-32,768 or +32,767 for signed, or 0 or 65,535 for unsigned), it will also result in an input range error.

I/O DATA DESCRIPTIONS

Scaling of analog input module is configurable with GX Works2 or GX Works3.
Refer to "SETTING (NORMAL MODE)" for details.

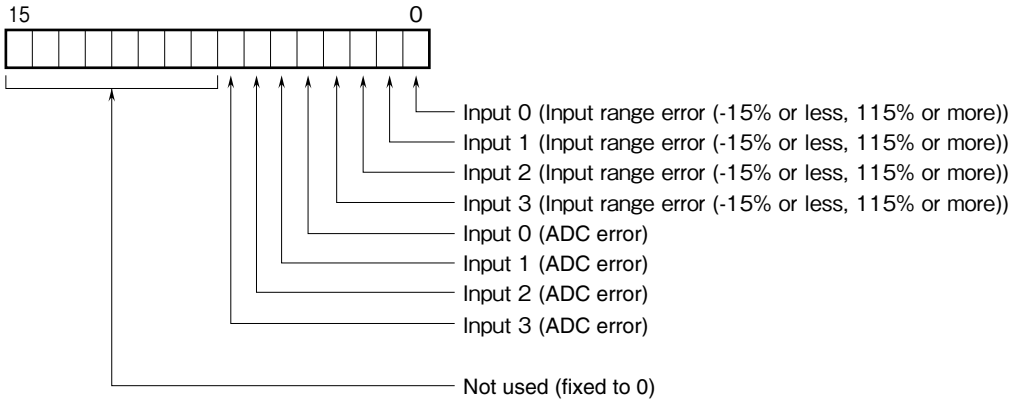
■ ANALOG INPUT



Data is represented in 16-bit binary.
Negative value is represented in 2's complements

■ STATUS

Input status of each channel is indicated.



Input range error
0: normal, 1: error
ADC error (no response from ADC)
0: normal, 1: error

SETTING (NORMAL MODE)

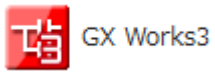
■SUMMARY

This section explains the setting of the unit on the premise of using GX Works3 made by Mitsubishi Electric (hereinafter called “GX Works3”).

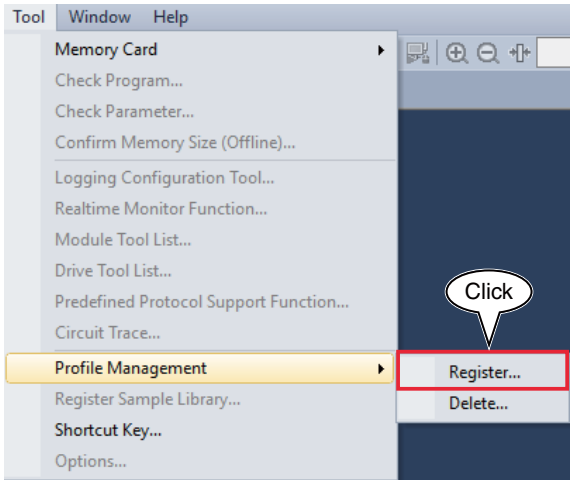
■REGISTRATION OF PROFILE

R7I4DCIE1-SVAF4-4 supports CC-Link Family system profile (hereinafter called “CSP+”).
CSP+ is downloadable at our web site or CC-Link Association Home page, https://www.cc-link.org.
* It is necessary to register CSP+ because the parameters of the device are set with GX Works2 or GX Works3.

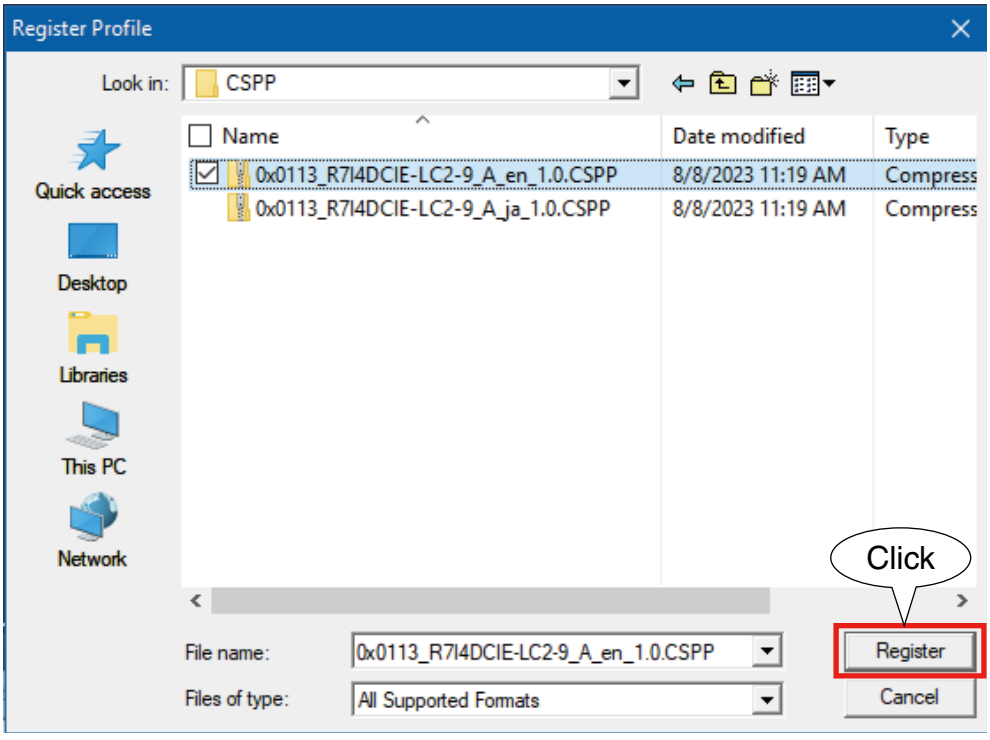
1) Start GX Works3.



2) Click [Tool] → [Profile Management] → [Resister].

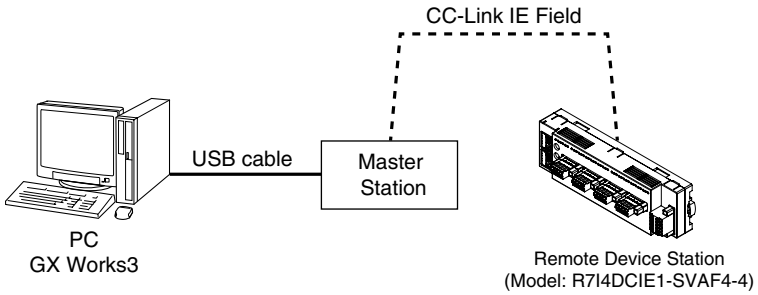


3) Select the downloaded CSP+ file, and click [Register] to finish registration.



■CONSTRUCTION OF SYSTEM

Here is an example of the configuration of a line connection.



1) Connect Master station and Remote Device Station (model: R7I4DCIE1-SVAF4-4) with Ethernet Cable.
Make sure to turn off the power of each unit before wiring. CN1 and CN2 of modular jack RJ-45 for CC-Link IE Field Network have no limit of wiring connection order.

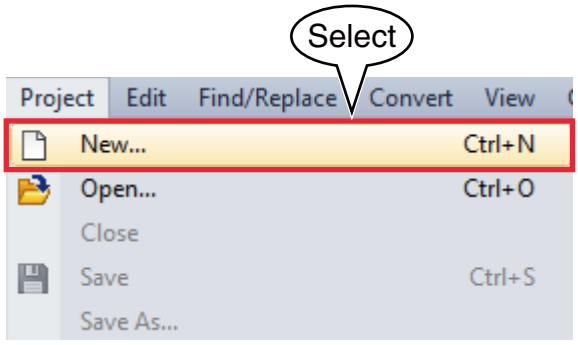
2) After finishing wiring, turn on the power of each unit.

■CREATION OF PROJECT

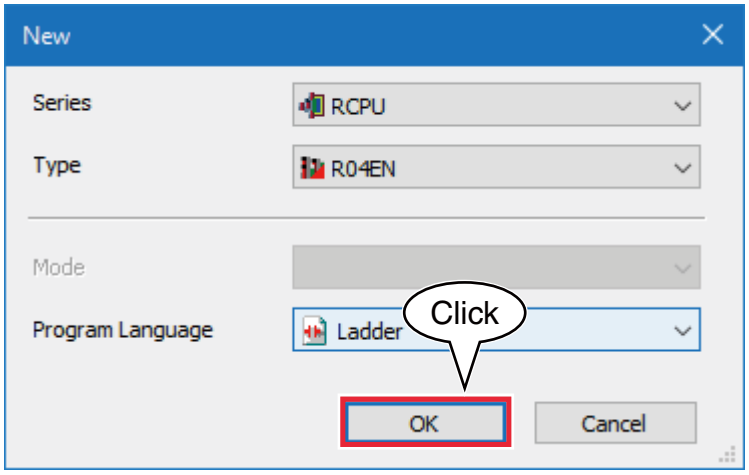
Connect the PC and the master Station, and create a project of the master station by GX Works3 installed on the PC.

1) Start GX Works3.

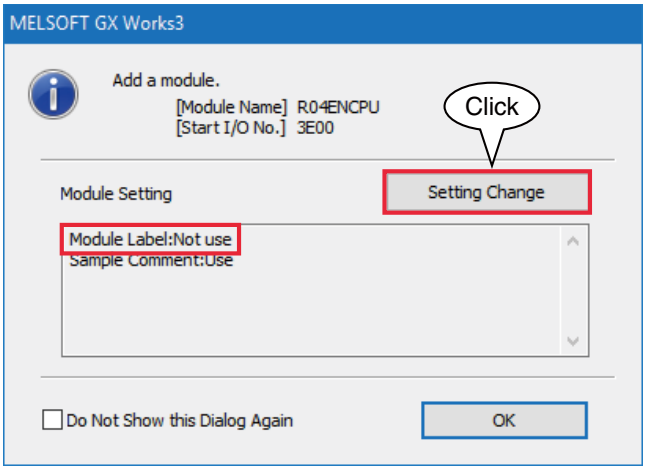
2) Click [Project] ➞ [New] to create a new project.



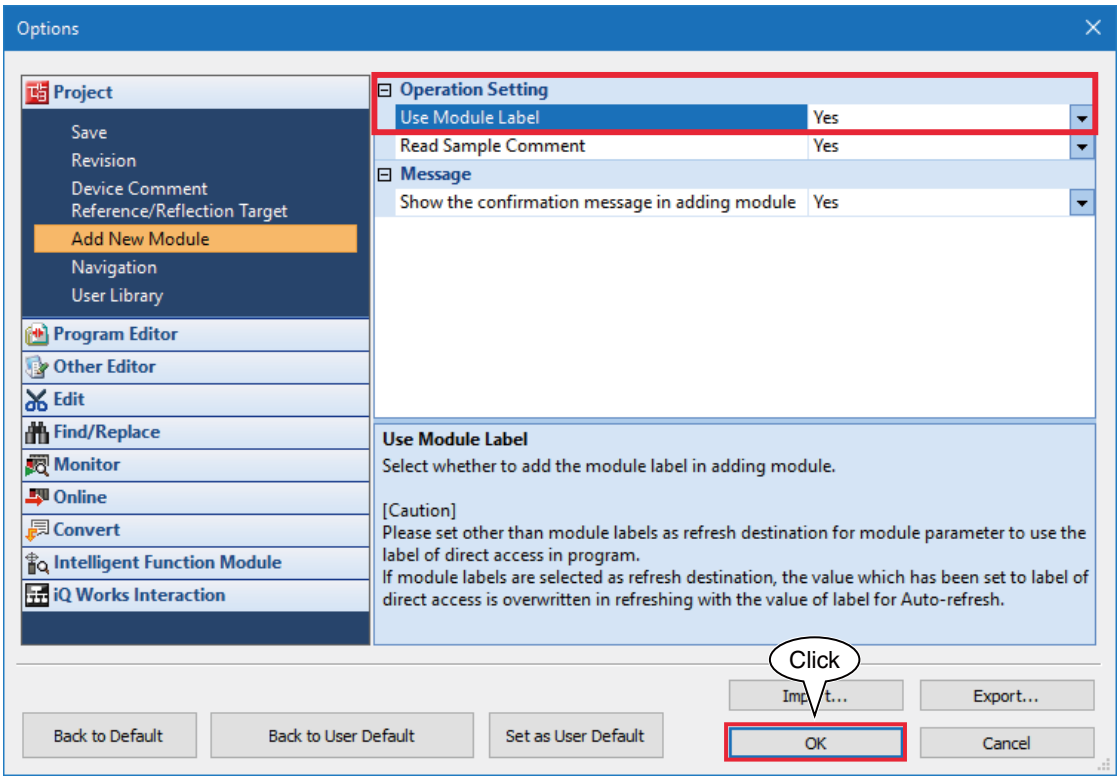
3) Select [Series], [Type] and [Program Language] of the PLC from each pull-down menu, and click [OK].



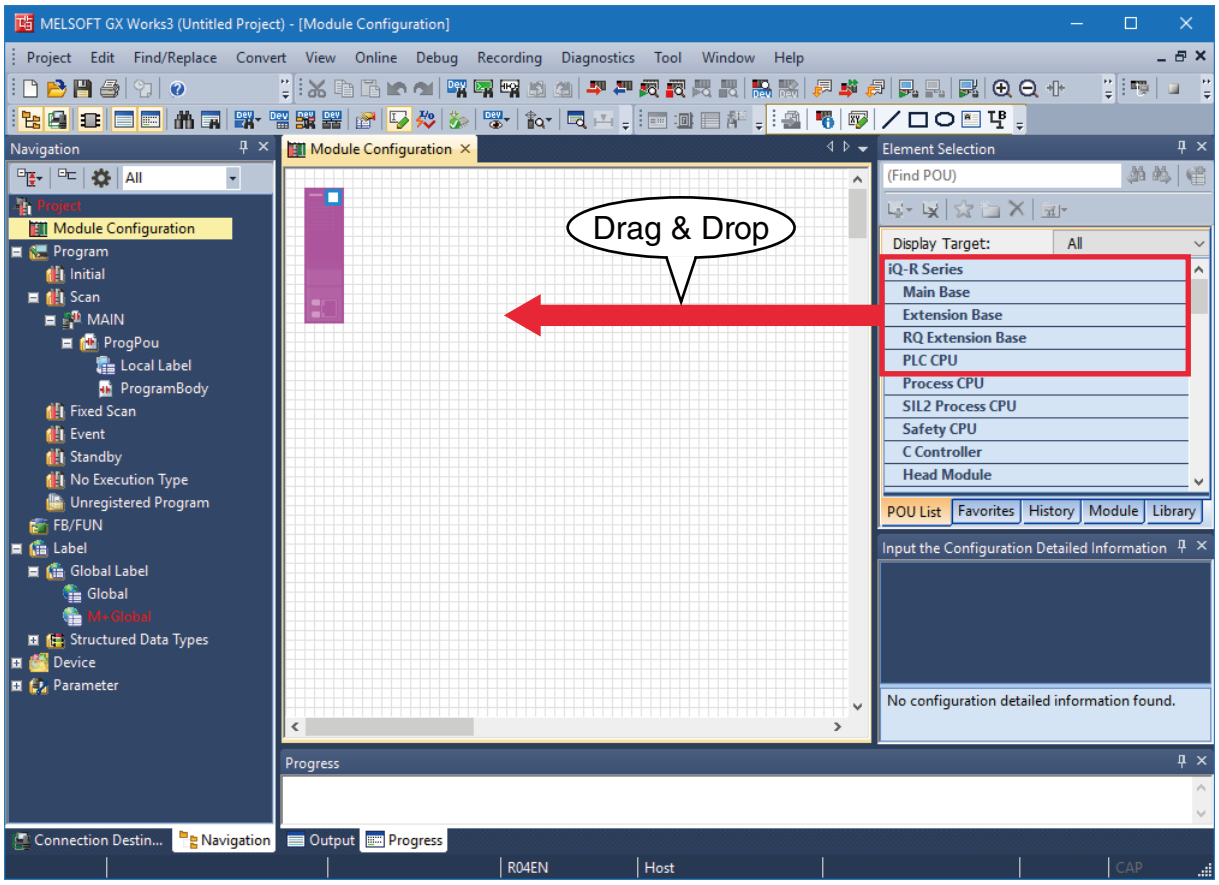
4) In the following window, when [Module Label: Not use] is displayed in Module Setting, click [Setting Change] to open the option window, and change to [Use].



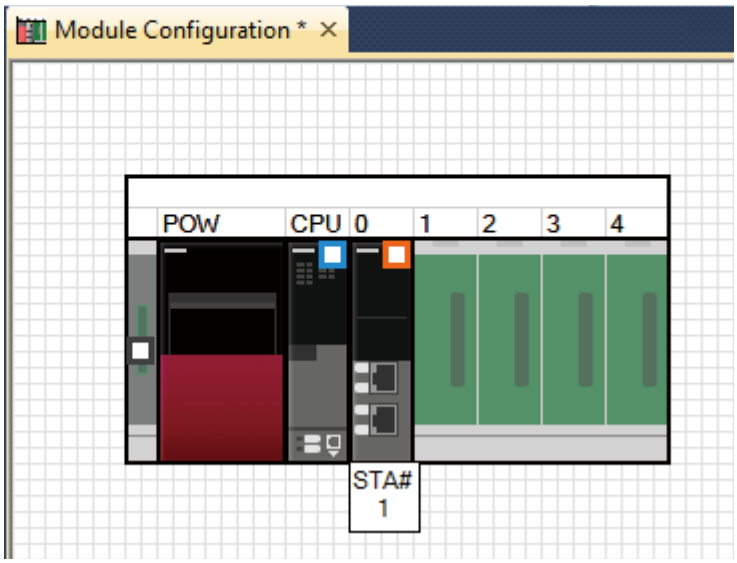
5) Select [Yes] for [Use Module Label] in [Operation Setting], and click [OK].



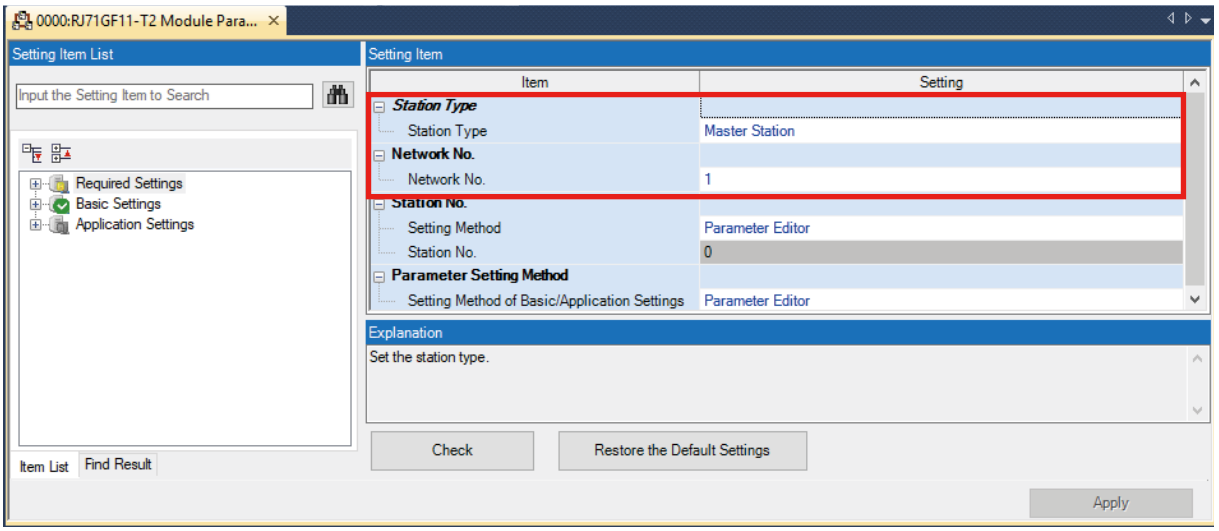
6) Double click [Module Configuration] in the Navigation window to open the [Module Configuration] window. According to the real PLC configuration, select the module from [POU List] of the [Element Selection] window, and drag and drop it to the module configuration diagram.



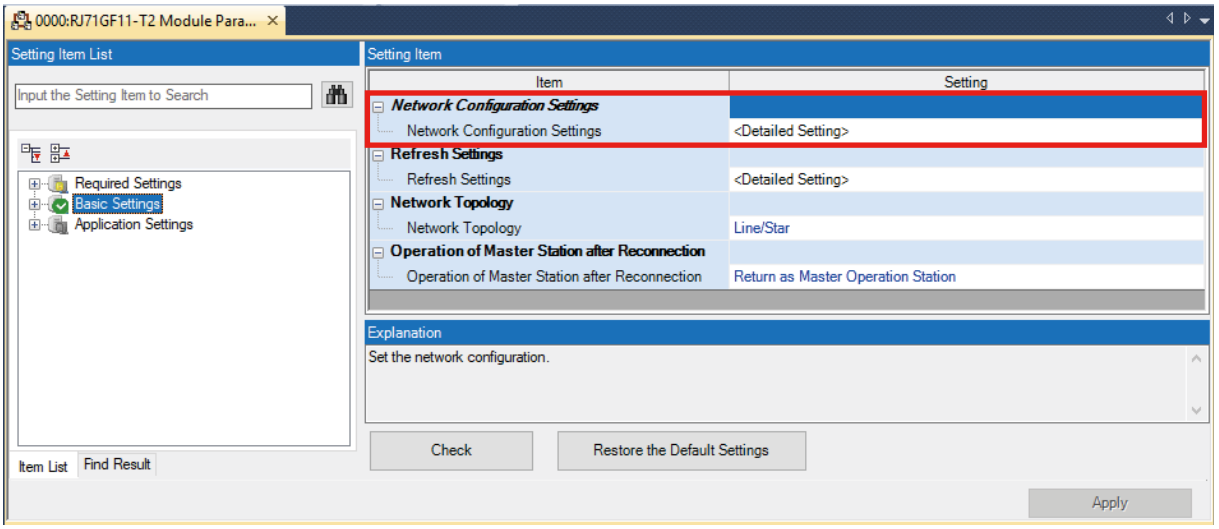
7) Double click [CC-Link IE Field network module] to open the parameter setting window.



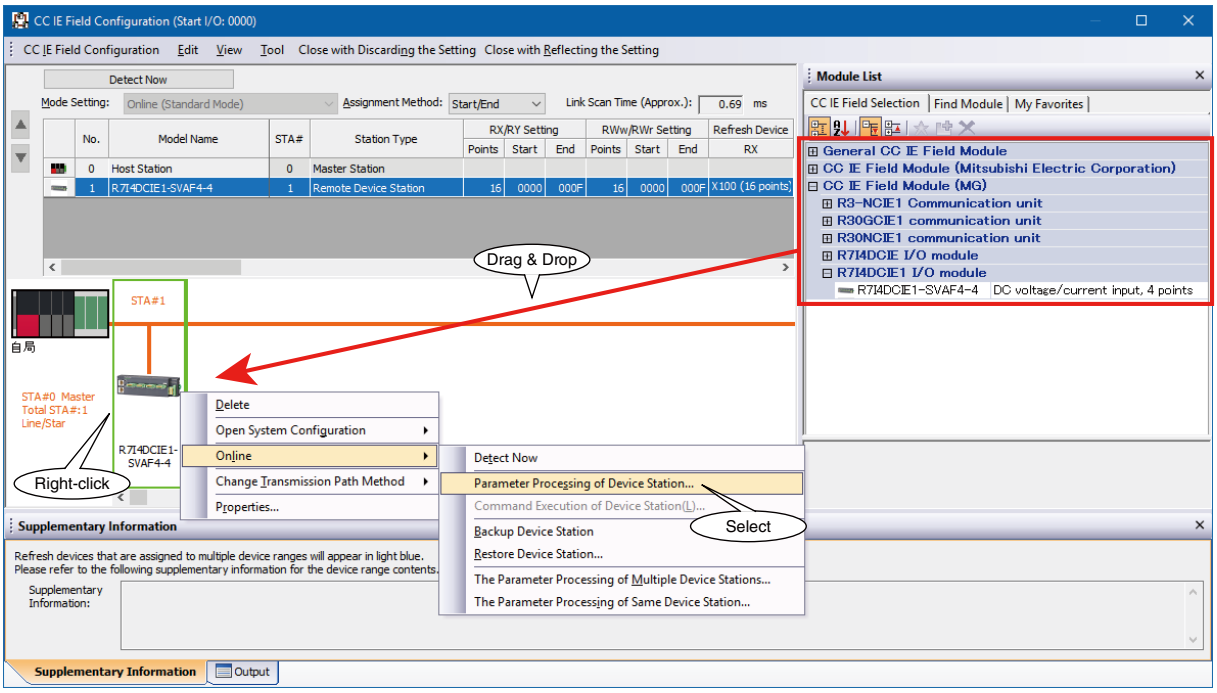
8) In [Required Settings], set Station Type to [Master Station], Network No. to 1.



9) Click <Detailed Setting> of [Network Configuration Settings] in [Basic Settings] to display the [CC IE Field Configuration] window.

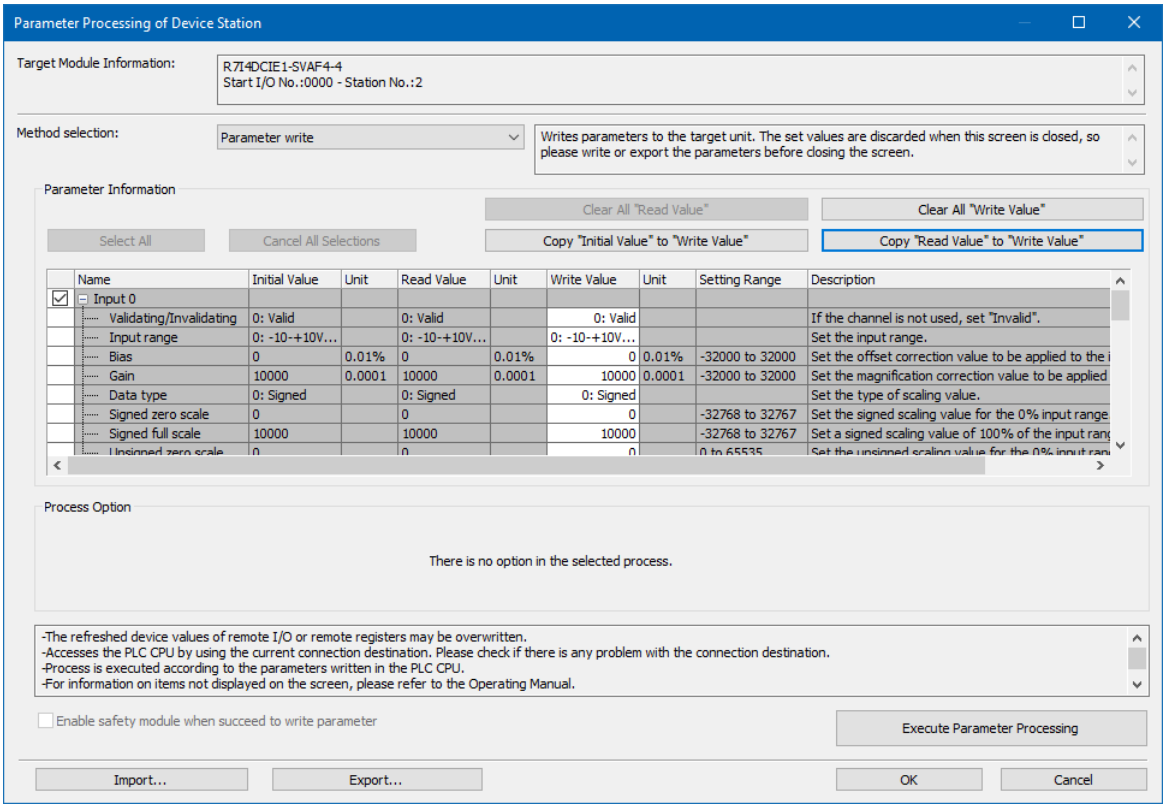


10) According to the real system configuration, select the device from [Module List], and drag and drop it to the device configuration diagram.
Right-click the dragged and dropped icon, and select [Parameter Processing of Device Station...] under [Online].



11) Select [Parameter write] for [Method selection].
Enter the setting value in the [Write Value] and click [Execute Parameter Processing] to write the settings to the device.

Note: Select [Parameter read] for [Method selection] and click [Execute Parameter Processing] to read the parameter settings from the device. By clicking [Copy "Read Value" to "Write Value"], the device settings can be set in [Write Value].



■ SETTING LIST

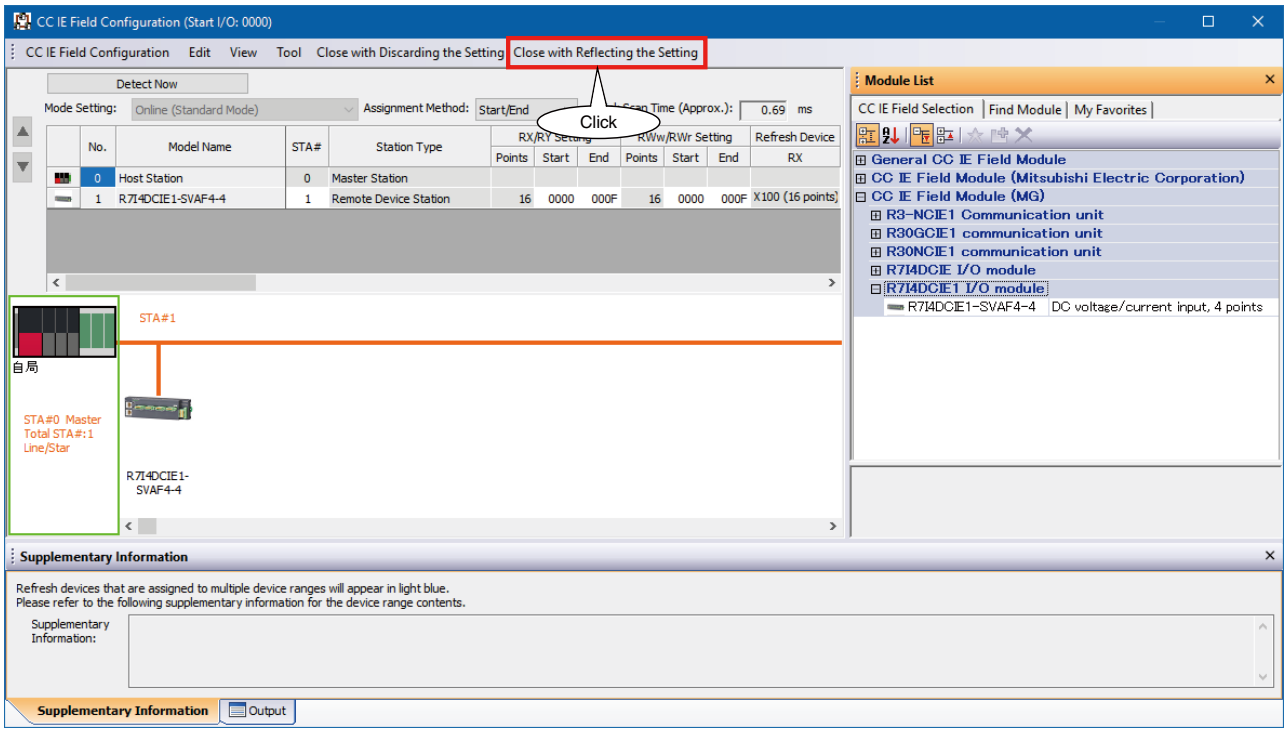
• CHANNEL INDIVIDUAL SETTING (INPUT 0 to INPUT 3)

ID	DESCRIPTION	SETTING RANGE	DEFAULT SETTING
Unused setting	Set the enable/disable status of the input terminals for each channel. Disabled channels stop converting operation, and the input data sent to the CC-Link IE Field master device is fixed at 0, with no detection of input range error or ADC error.	CH enabled CH disabled	CH enabled
Input range	Input range can be set for each channel.	-10 - +10 V DC -5 - +5 V DC -1 - +1 V DC 0 - 10 V DC 0 - 5 V DC 1 - 5 V DC 0 - 1 V DC -0.5 - +0.5 V DC -20 - +20 mA DC 0 - 20 mA DC 4 - 20 mA DC	-10 - +10 V DC
Bias	Set the bias applied to the input value in 0.01% relative to the input range.	-32,000 - +32,000	0
Gain	Set the gain applied to the input value in 0.0001. The bias and gain are calculated for the input percentage value (P), which is converted input signal to percentage of the input range, using the following formula: Corrected P = (P × Gain Value) + Bias Value. Example: If P = 10.00%, Bias Value = 100 (1.00%), Gain Value = 10,100 (1.0100), Corrected P = (10.00 × 1.0100) + 1.00 = 11.1%.	-32,000 - +32,000	10,000
Data type	Select the input data type to be sent to the CC-Link IE Field master device. Selecting "Signed" converts the input percentage value to a signed zero/full-scaling value for transmission. Selecting "Unsigned" converts the input percentage value to an unsigned zero/full-scaling value for transmission.	Signed Unsigned	Signed
Signed Zero scale	Zero scaling value when "Signed" is selected in the data type.	-32,768 - +32,767	0
Signed Full scale	Full scaling value when "Signed" is selected in the data type.	-32,768 - +32,767	10,000
Unsigned Zero scale	Zero scaling value when "Unsigned" is selected in the data type.	0 - 65,535	0
Unsigned Full scale	Full scaling value when "Unsigned" is selected in the data type.	0 - 65,535	10,000

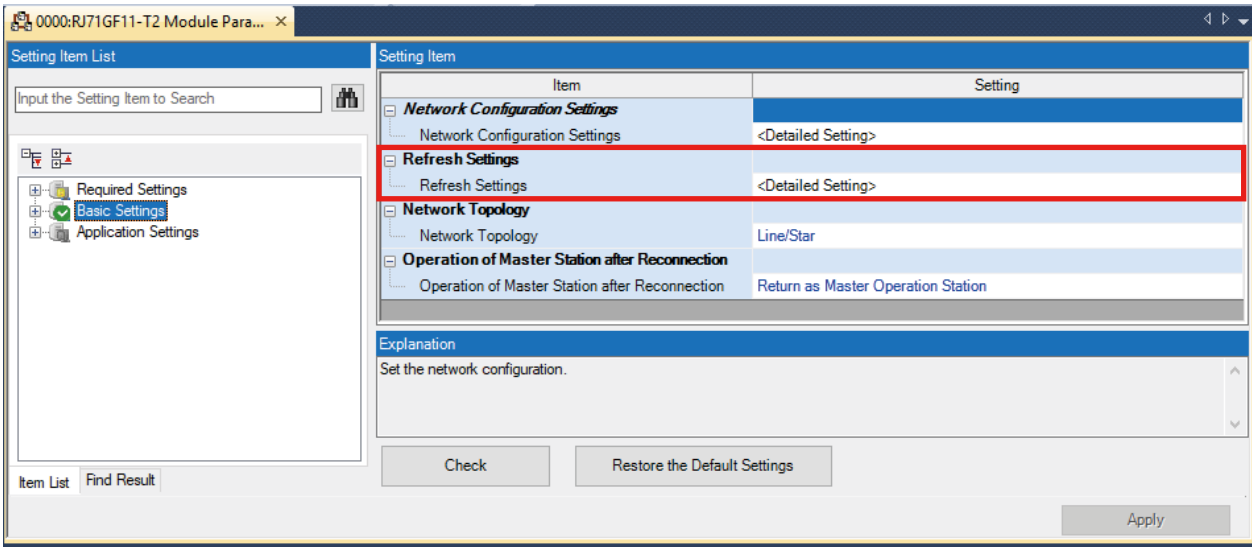
• CHANNEL BATCH SETTING

ID	DESCRIPTION	SETTING RANGE	DEFAULT SETTING
Moving average	Set the moving average number for all channels.	1, 2, 4, 8, 16, 32, 64, 128, 256	1

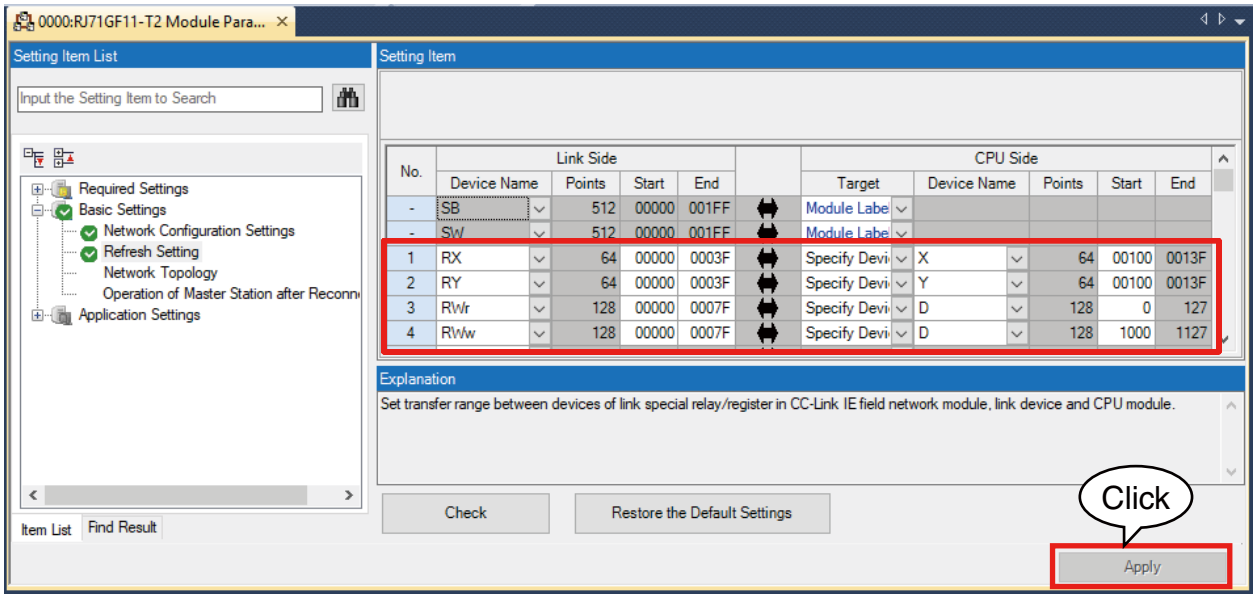
12) After completing parameter setting, Click [OK] and go back to [CC IE Field Configuration] window.
Click [Close with Reflecting the Setting].



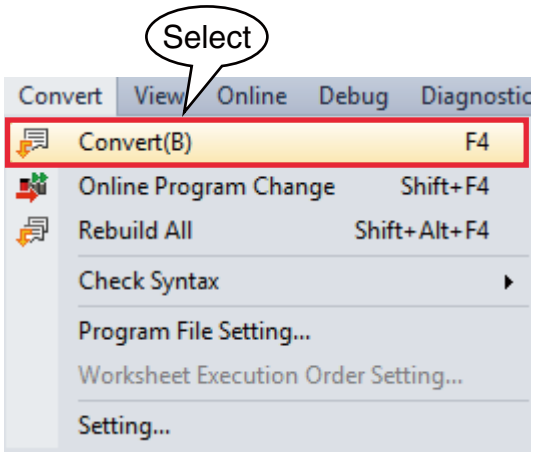
13) Click <Detailed Setting> of [Refresh Setting] to display the Refresh Setting window



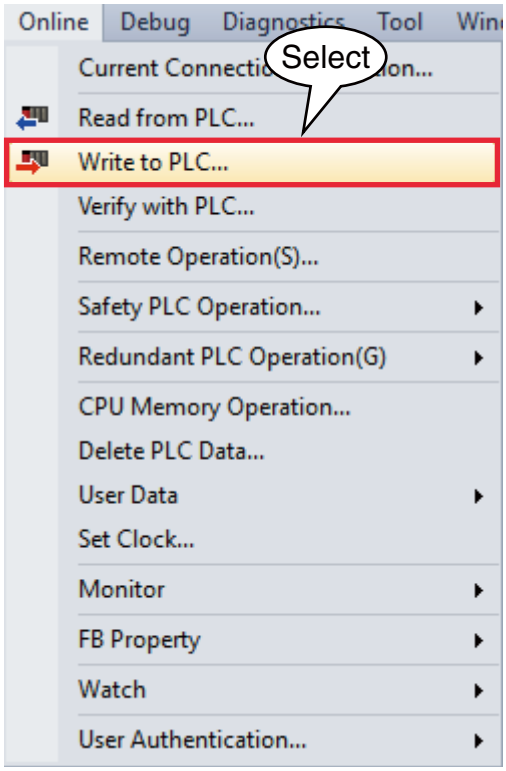
14) Assign link devices RX/RY/RWr/RWw to devices of the CPU unit, click [Apply] to close the window.



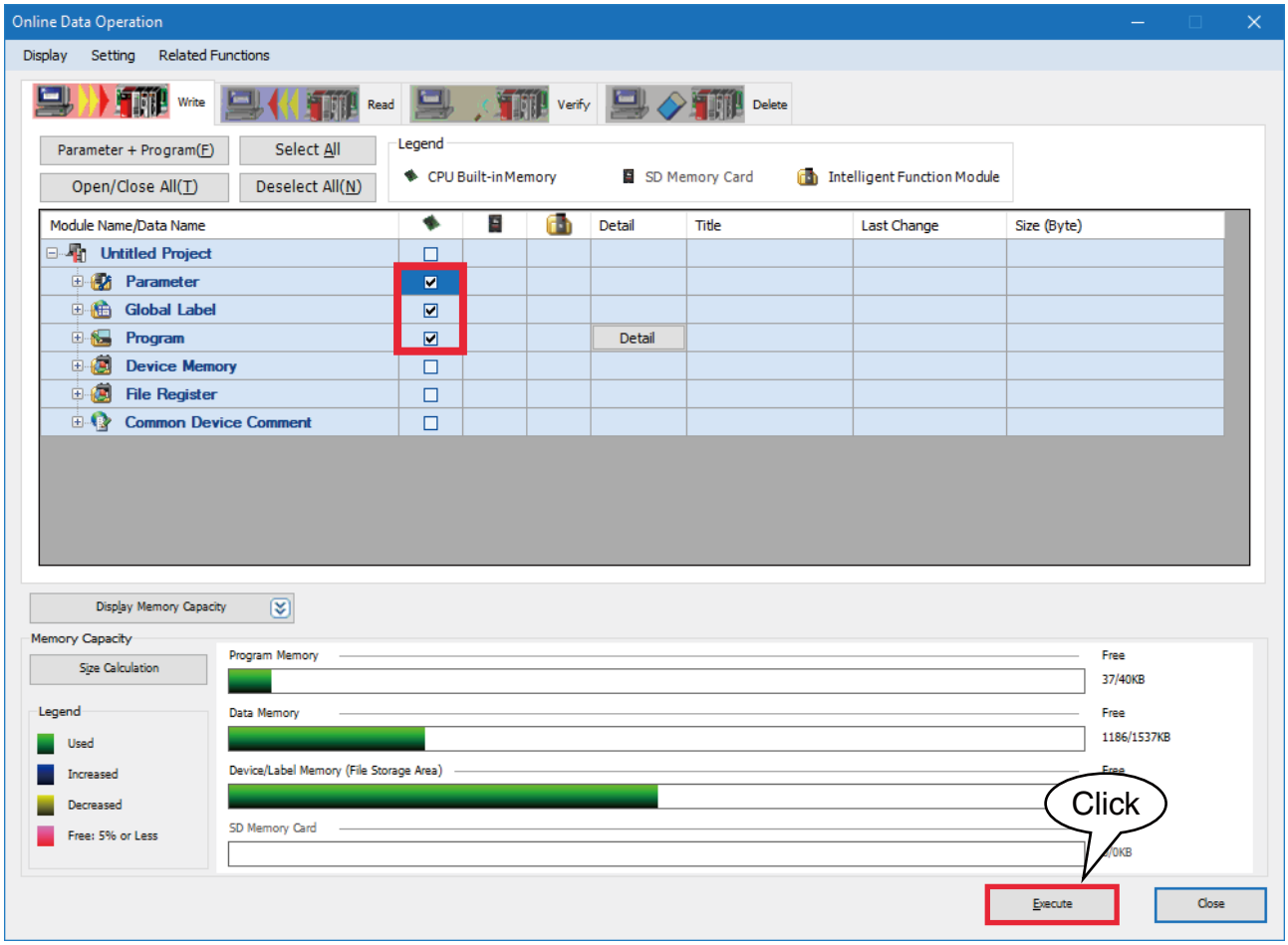
15) Click [Convert] → [Convert] to execute conversion.



16) Click [Write to PLC...] in [Online] on menu bar to open [Online Data Operation] window.



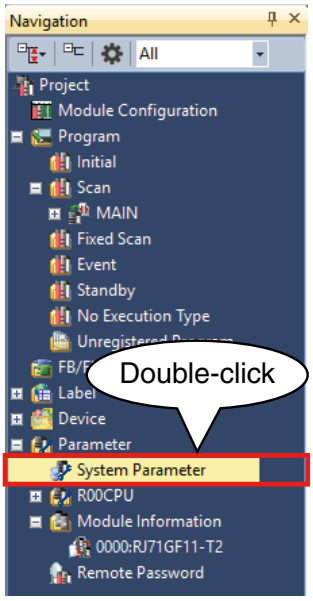
17) Check necessary items, and click [Execute].



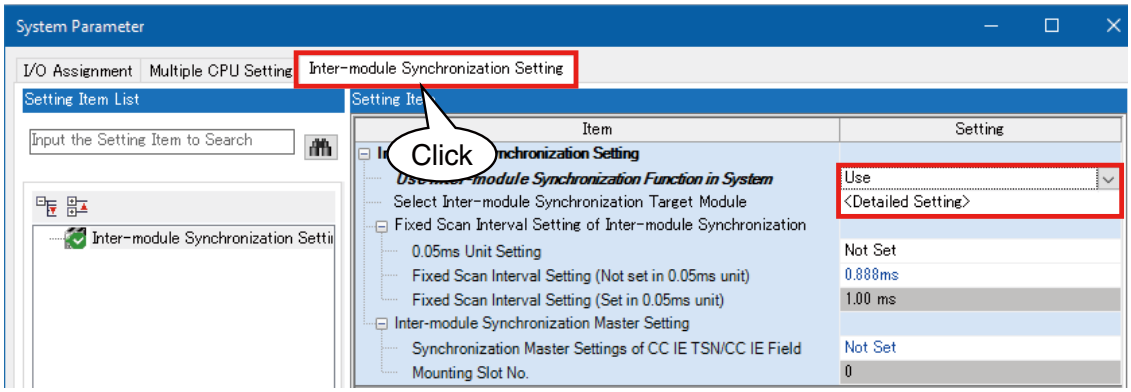
SETTING (SYNCHRONOUS COMMUNICATION MODE)

The R7I4DCIE1-SVAF4-4 supports CC-Link IE Field Inter-module Synchronization function.
Assuming that the project has been created in the previous section, the setup for synchronous communication mode is described below.
Note: Refreshing must be exrcuted before and after the inter-module synchronous interrupt program(I44).
Refer to the reference manual of the master module.

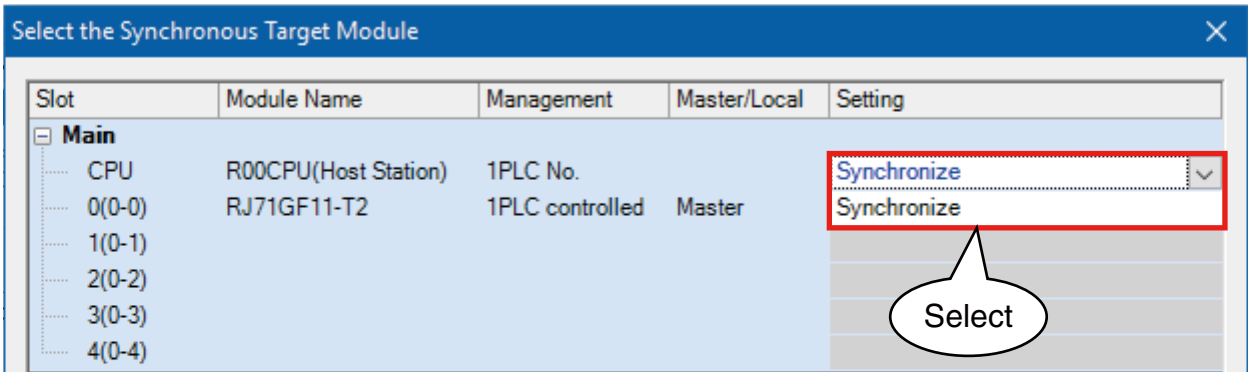
1) Double-click [System Parameter] in [Parameter] on Navigation window.



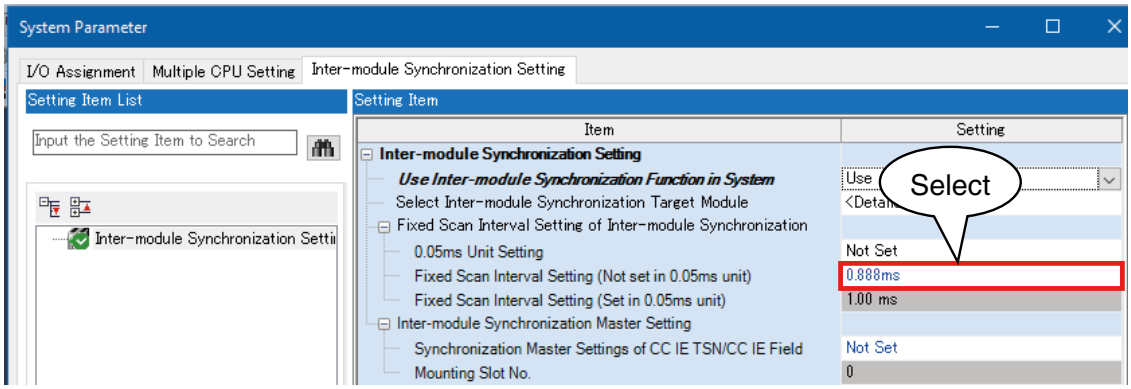
2) Click [Inter-module Synchronization Setting] tab.
Select [Use] for [Use Inter-module Synchronization Function in System].



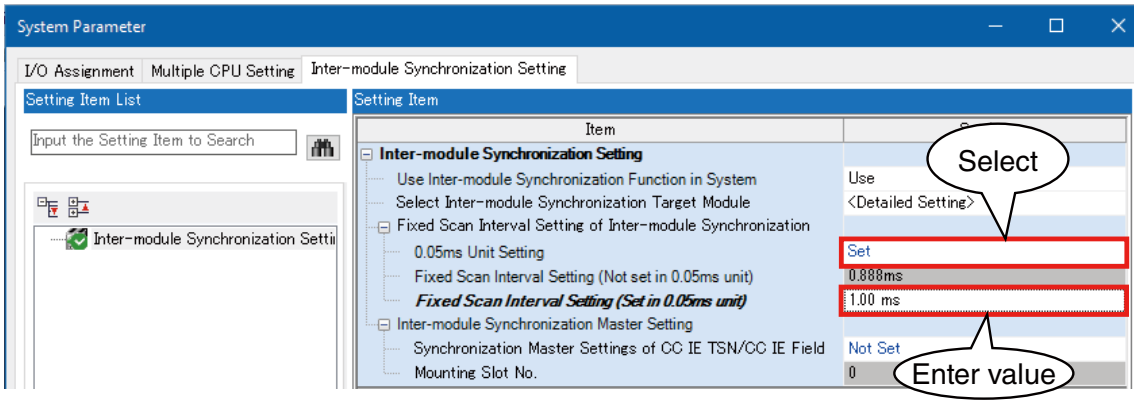
3) Click [Detailed Setting] in [Select Inter-module Synchronization Target Module] and select [Synchronize] for the module to synchronize. Click [OK] to close the window.



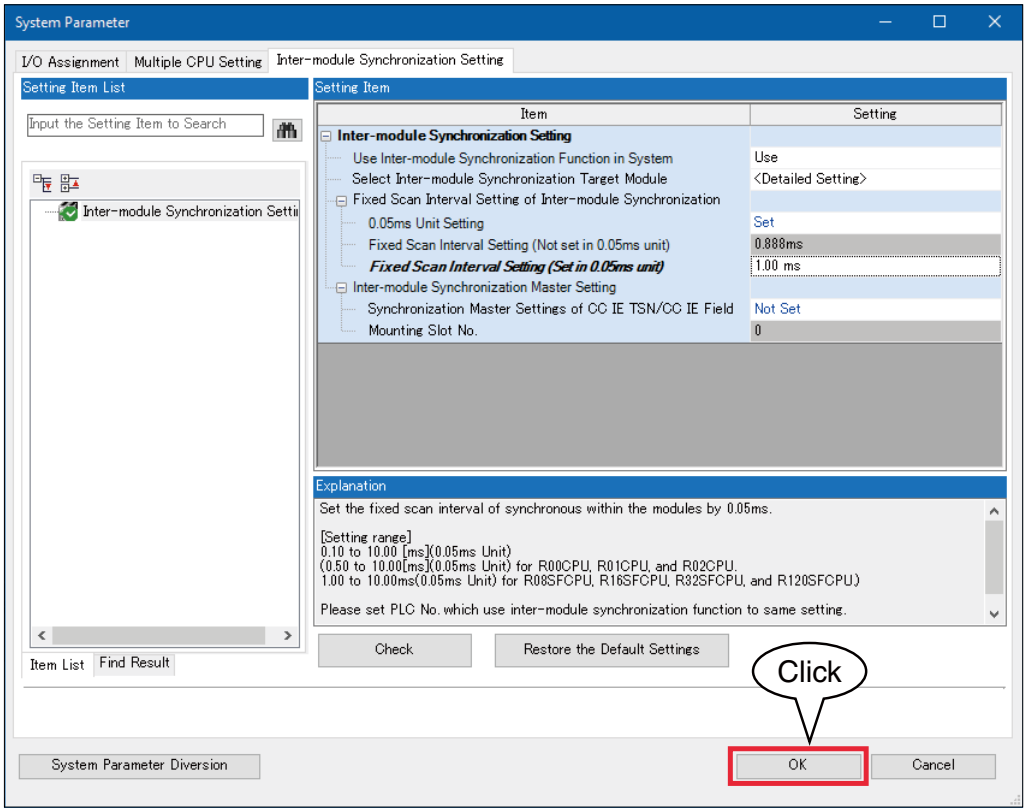
4) When the [Fixed Scan Interval Setting of Inter-module Synchronization] is not set in 0.05 ms unit, select setting value from the pull-sown menu in [Fixed can Interval Setting (Not set in 0.05 ms unit)].



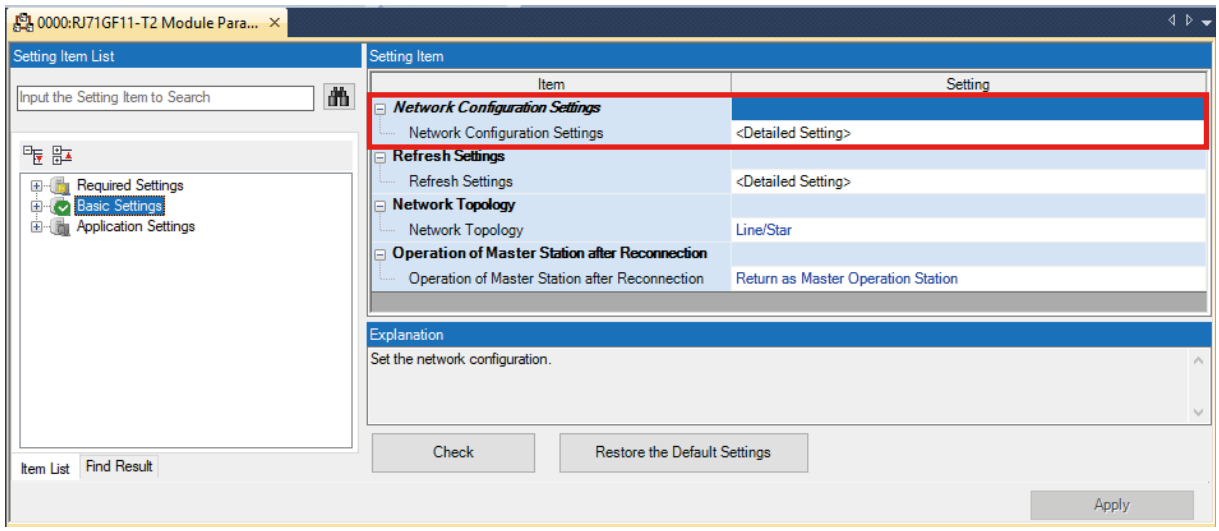
5) When the [Fixed Scan Interval Setting of Inter-module Synchronization] is set in 0.05 ms unit, select [Set] in [0.05 ms Unit Setting] then enter the setting value to [Fixed Scan Interval (Set in 0.05 ms Unit)].



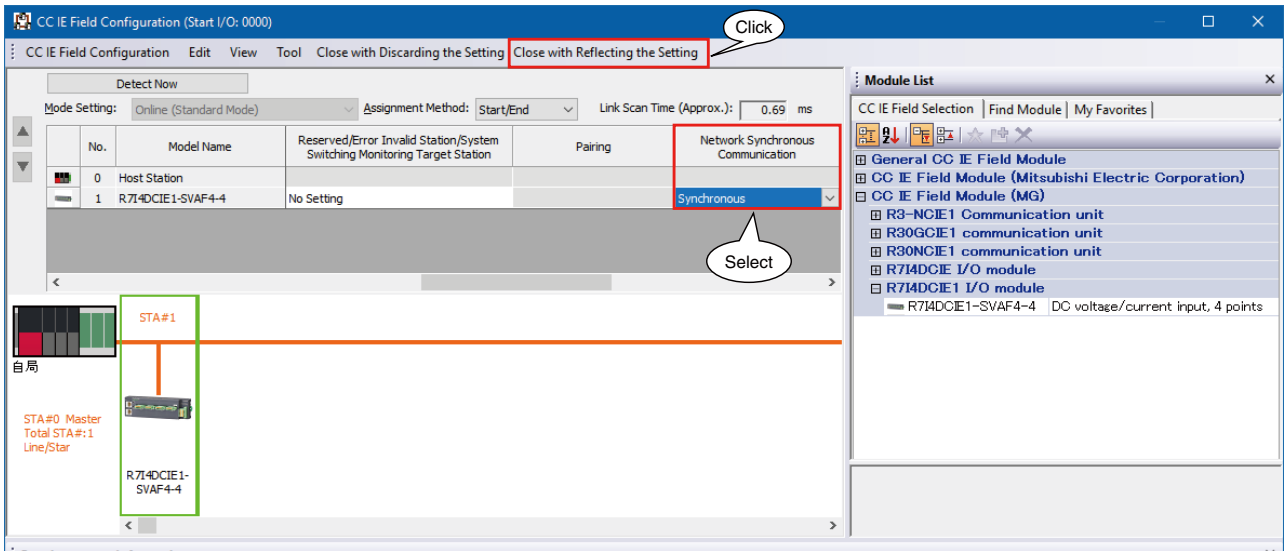
6) Click [OK] to close [System Parameter] window.



7) Open CC-Link IE Field Parameter Setting Window.
Click <Detailed Setting> in [Network Configuration Setting] to open [CC IE Field Configuration] window.



8) Select [Synchronous] in [Network Synchronous Communication].
Click [Close with Reflecting the Setting] to close the window.
Click [Apply] on [CC IE Field Configuration] window to close.



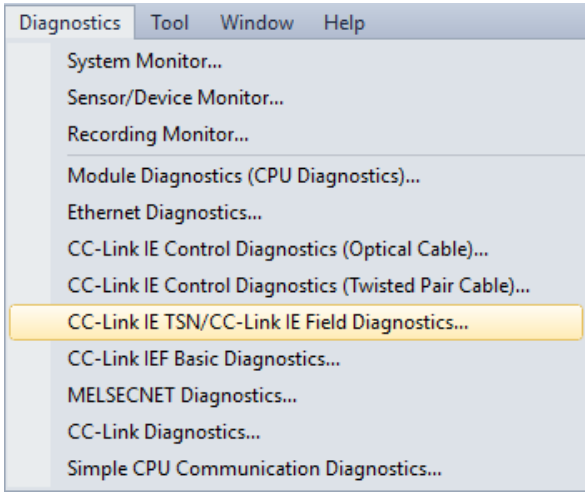
Write to the sequencer according to the procedure described in the previous section 15) or later.

TROUBLESHOOTING

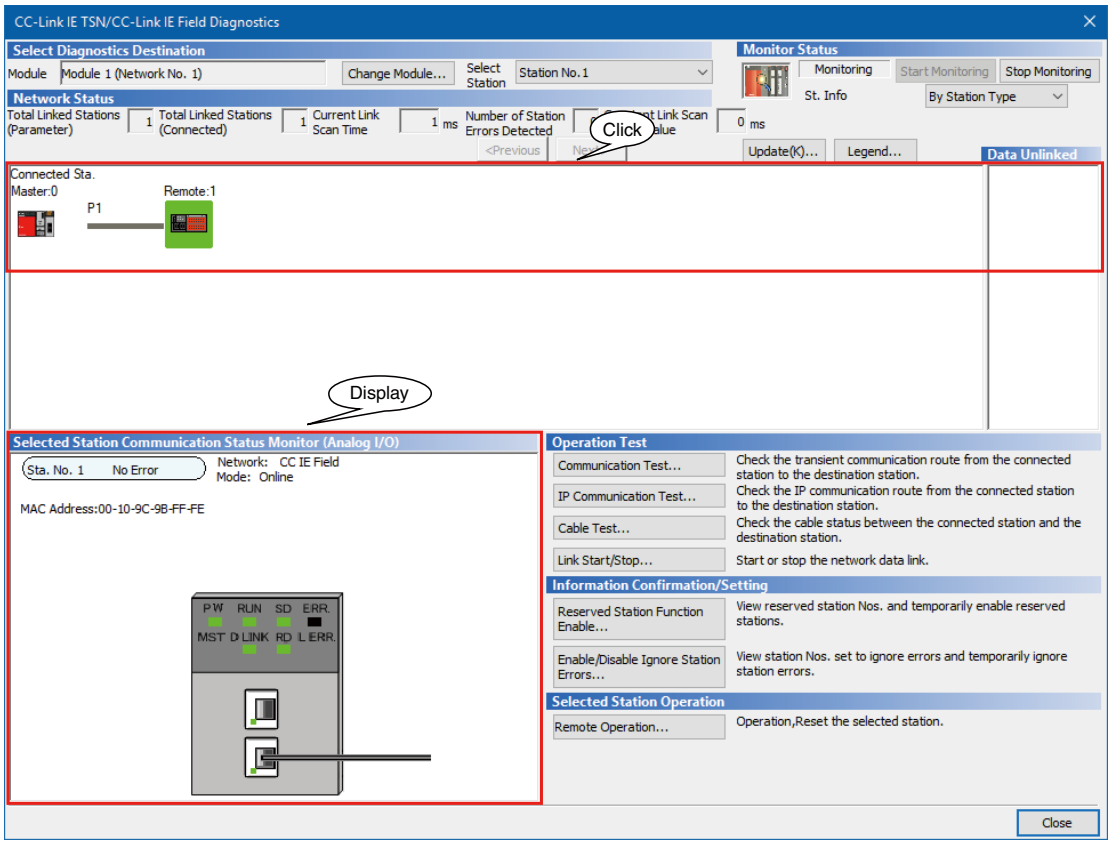
Problem faced	Cause	Method of handling
Despite connecting with the master device via an Ethernet cable and completing settings, D LINK LED turns off or blinks.	A CC-Link IE Field communication error has occurred.	Check the abnormal content using the GX-Works CC-Link IE Field diagnostics (see below) and take appropriate action. If the network number of the CC-Link IE Field master device is changed, the power of the device needs to be turned OFF/ON.
The ERR LED blinks. Or a minor error icon is displayed in the CC-Link IE Field diagnostics.	If the status bit for input range error is 1, the input corresponding to the bit is out of range.	Check the input status and the scaling settings of the device.
	If the status bit for input range error is 0, a change of the station number switch has been detected.	If you change the station number, turn the power of the device OFF/ON. If not, check the station switch and return it to its original state.
The ERR LED is on. Or a serious error icon is displayed in the CC-Link IE Field diagnostics.	If RUN LED is on and D LINK LED is off, and CC-Link IE communication is not operating, the device was temporarily in data link and then disconnected.	Check the operating conditions of the CC-Link IE Field master device and the communication cables of the CC-Link IE Field.
	If both RUN LED and D LINK LED are off and CC-Link IE communication is not operating, damage to the non-volatile memory that stores the device's parameters has been detected.	Repair is required.
	If both RUN LED and D LINK LED are on and the status bit for ADC error is 1, an ADC failure corresponding to the input bit has been detected.	Repair is required.

■CC-LINK IE FIELD DIAGNOSTICS

1) On GX Works3, select [Diagnostics] → [CC-Link IE TSN/CC IE Field Diagnostics...] to display [CC-Link IE TSN/CC IE Field Diagnostics] window.

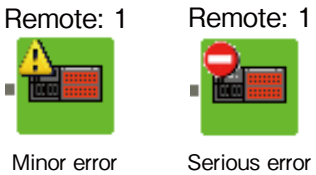


2) Click the station to be diagnosed to display its status on [Selected Station Communication Status Monitor] window.



3) If a following icon is overlaid on the station icon, a minor error or serious error has occurred. Troubleshoot according to the table in the previous section.

Note: In case of serious error, the error may not be transferred to the CC-Link IE Field master device, and the following icon may not be displayed.



Minor error　　Serious error

4) If an error occurrence is displayed on [Selected Station Communication Status Monitor] window, the button such as [Module Error] is displayed. Click the button to display the details, and troubleshoot accordingly.