MITSUBISHI ELECTRIC

Programmable Controller

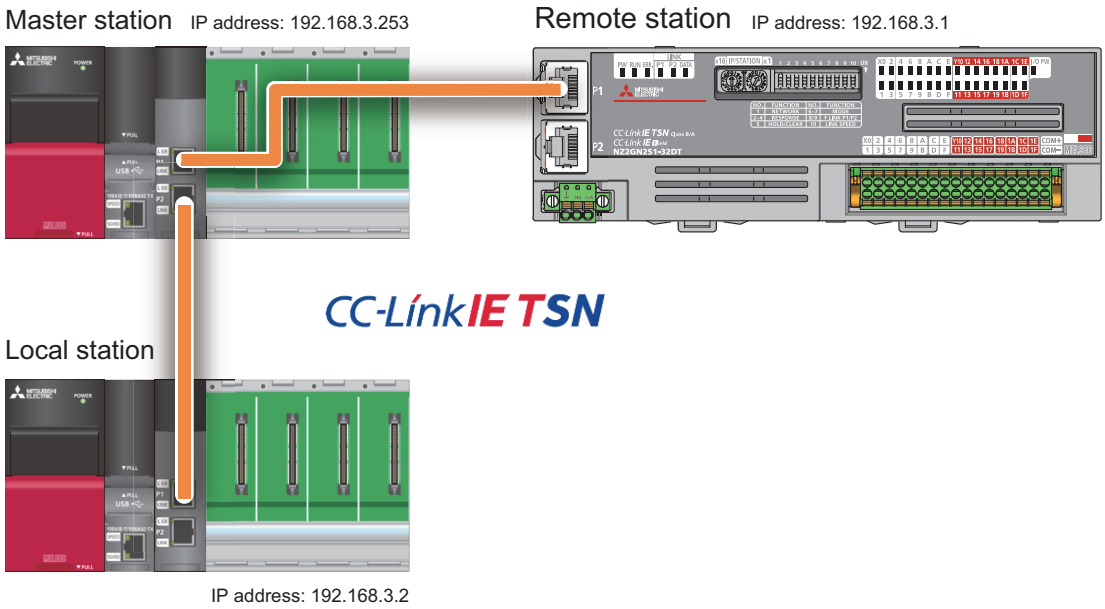
MELSEC iQ-R series

Network

MELSEC iQ-R Series
CC-Link IE TSN Introduction Guidebook

This manual describes how to communicate cyclic data on CC-Link IE TSN using the MELSEC iQ-R series CC-Link IE TSN master/local module.

This manual describes an example of cyclic transmission between the master station and the local station and between the master station and the remote station.



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1 PREPARATION

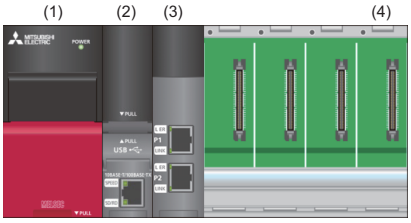
1.1 Required Products

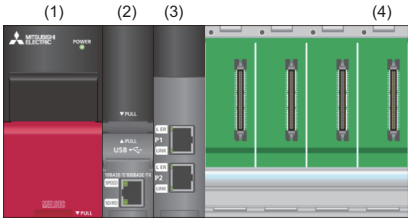
This section describes the products required for configuring a system in this manual.

Master station and local station

Prepare two sets of the MELSEC iQ-R series programmable controllers for the master and local stations.

MELSEC iQ-R series programmable controller

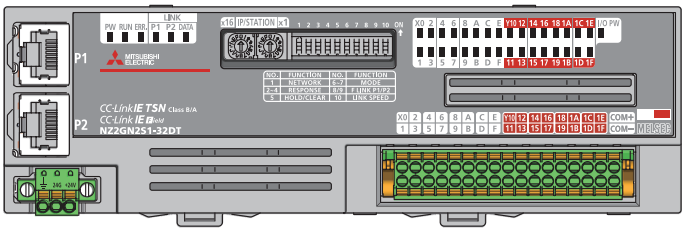




(1) Power supply module: R61P
(2) CPU module: R04CPU (firmware version 43 or later)
(3) Master/local module: RJ71GN11-T2
(4) Base unit: R35B

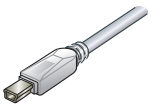
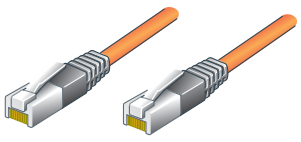
Remote station

CC-Link IE TSN remote I/O module



I/O combined module: NZ2GN2S1-32DT

General-purpose products

Personal computer (one device)	USB cable (one piece)	Ethernet cable (two pieces)
		
GX Works3 (version 1.065T or later)	Mini-B connector	Use Ethernet cables that meet the following standards. • The communication speed of 1Gbps is supported. • Category 5e or higher, straight cable (double shielded, STP) • IEEE 802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)

TSN hub

The use of TSN hub is described in Chapter 4.

CC-Link IE TSN industrial managed switch

8-port managed switch: NZ2MHG-TSNT8F2

2 PARAMETER SETTING

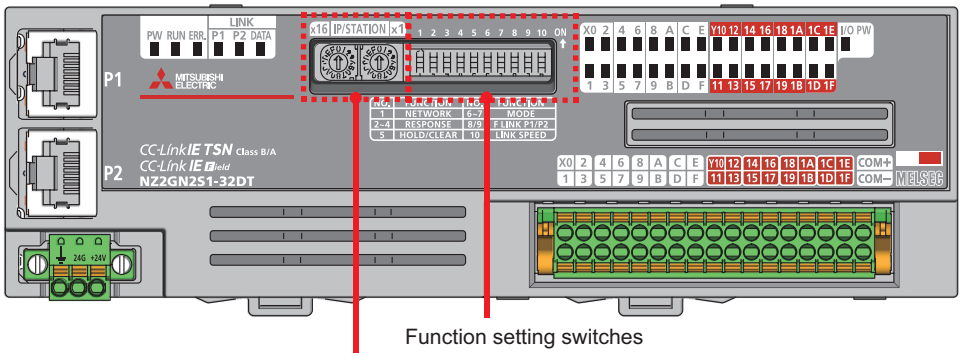
This chapter describes the procedure for setting parameters such as the station type, station number, IP address, remote I/O (RX, RY), and remote register (RWr, RWw) to enable devices that communicate data between devices on CC-Link IE TSN to recognize each other.
Also, configure the link refresh setting to transfer data between the devices of the RJ71GN11-T2 and the devices of the CPU module.
For CC-Link IE TSN, set the IP address and station number of each station connected to the master station first. Thus, set the parameters from a remote station.

Point

If any of the devices to be prepared in Chapter 1 are not to be used in any other than the master station, the settings of the unused devices described in this chapter can be omitted.

2.1 Settings for Remote Stations

This section describes the procedure for setting the parameters with the IP address/station number setting switches of the CC-Link IE TSN remote I/O module.
Set only the IP address and station number from a remote station because the number of link device points of CC-Link IE TSN can be set from the master station collectively.
To use the module functions, set them with the function setting switches.



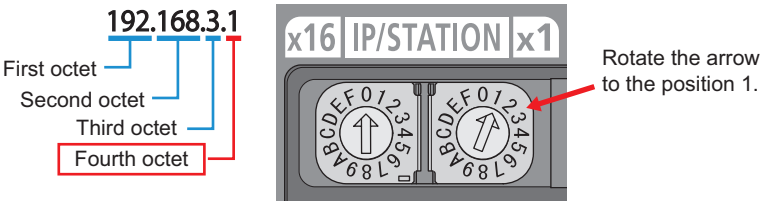
Precautions

Configure the settings of the function setting switches and IP address/station number setting switches while the module is powered off.

Operating procedure

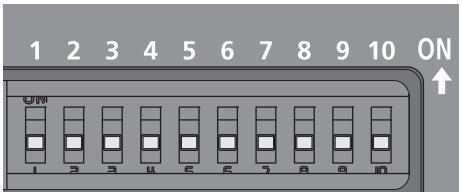
1. Set the IP address fourth octet in hexadecimal with the IP address/station number setting switches.

Set the IP address of the CC-Link IE TSN remote I/O module (NZ2GN2S1-32DT) to 192.168.3.1 in this manual.



2. Set the functions of the CC-Link IE TSN remote I/O module with the function setting switches.

Set the functions to the default settings (all off) in this manual.



For details on each function setting switch, refer to the following.

CC-Link IE TSN Remote I/O Module User's Manual (CC-Link IE TSN Communication Mode)

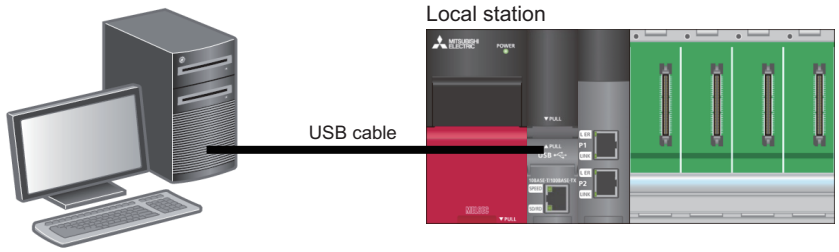
2.2 Setting for Local Stations

Set the parameters using GX Works3 for local stations.

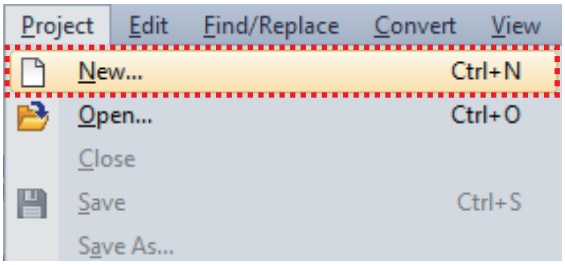
Set the station type, station number, IP address, and refresh settings for the RJ71GN11-T2, which is used as a local station, and write them to the CPU module because the number of link device points of CC-Link IE TSN can be set from the master station collectively.

Operating procedure

1. Connect a personal computer to the CPU module of the local station using a USB cable, and power on the local station. Start GX Works3.

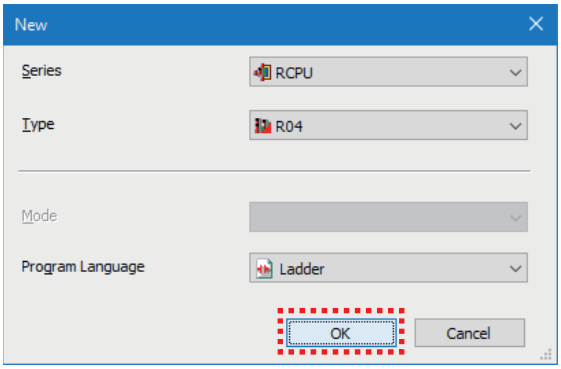


2. Select [Project] in the menu bar and select [New].

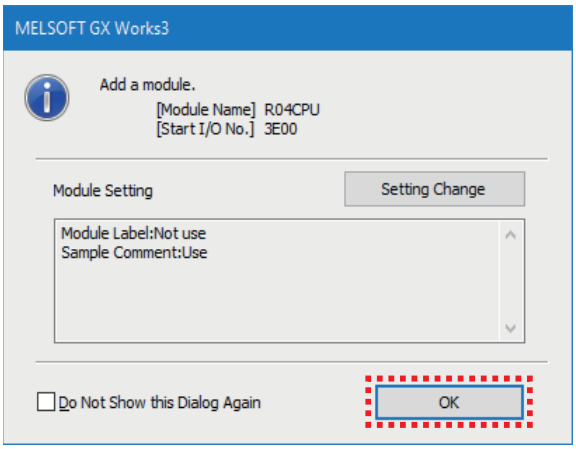


3. Set the following and click the [OK] button.

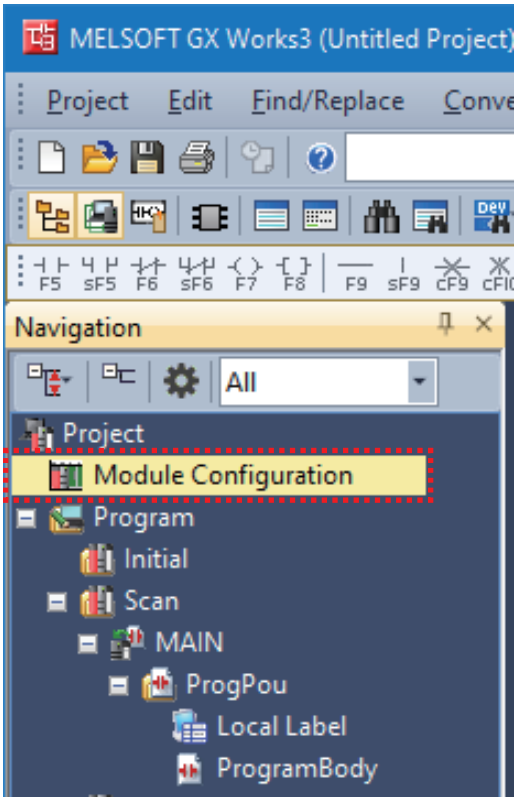
- Series: RCPU
- Model: R04



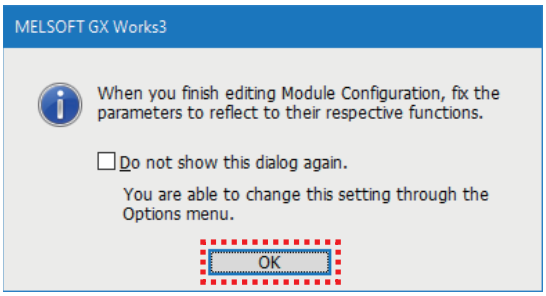
4. Click the [OK] button.



5. Double-click "Module Configuration" in the navigation window.



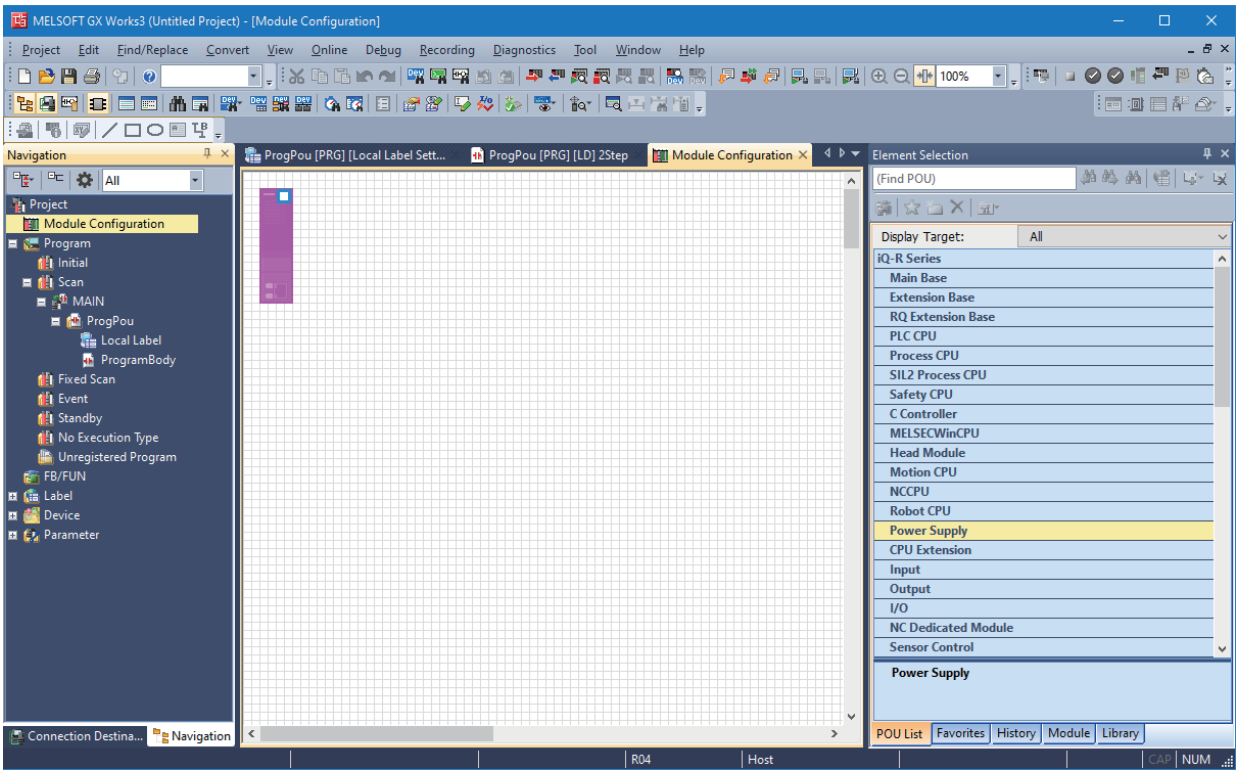
6. Click the [OK] button.



7. Select the modules to be used from the "Element Selection" window and add them to the module configuration diagram by dragging and dropping.

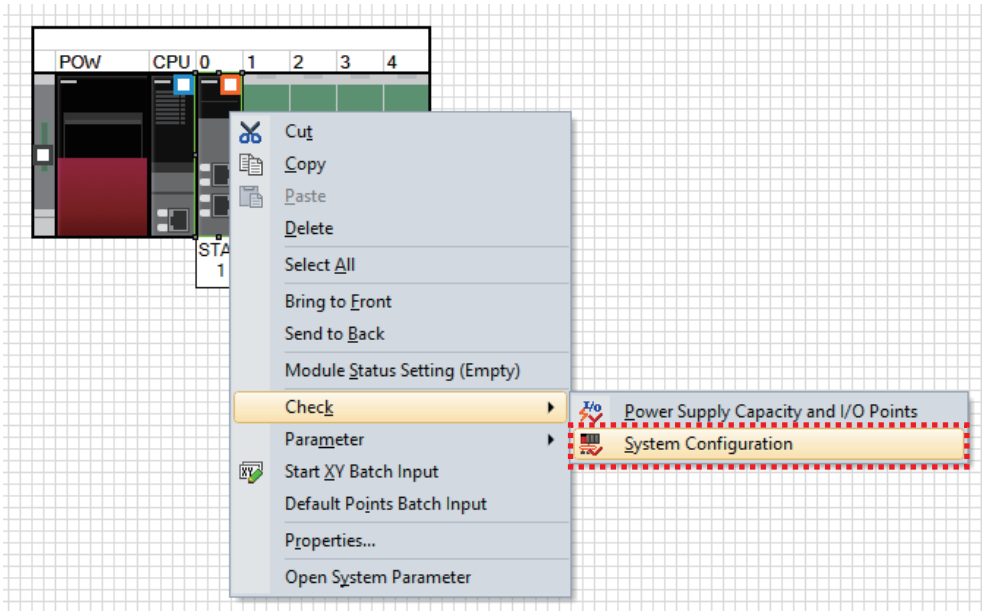
Set the following.

- Main Base: R35B
- Power Supply: R61P
- PLC CPU: R04CPU (Displayed in the module configuration diagram by default.)
- Network Module: RJ71GN11-T2 (Drag and drop this module to the slot No.0.)

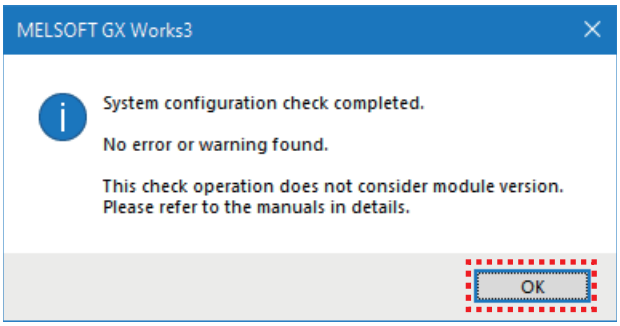


8. Check the module configuration.

Right-click on the "Module Configuration" window and select [Check] ⇨ [System Configuration].

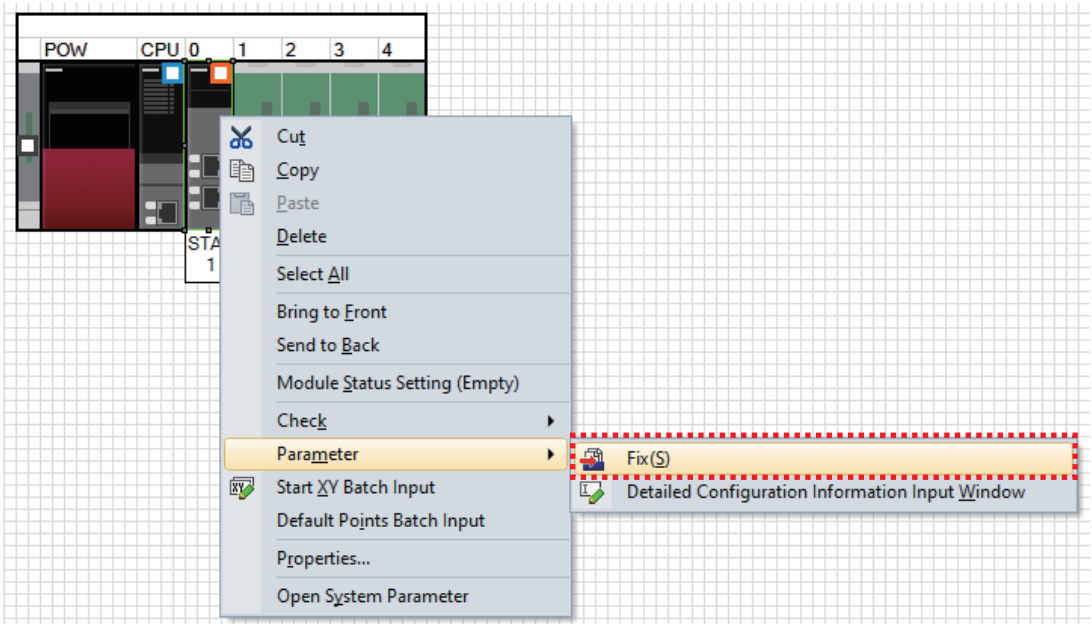


9. After the system configuration check is completed and there is no error or warning, click the [OK] button.

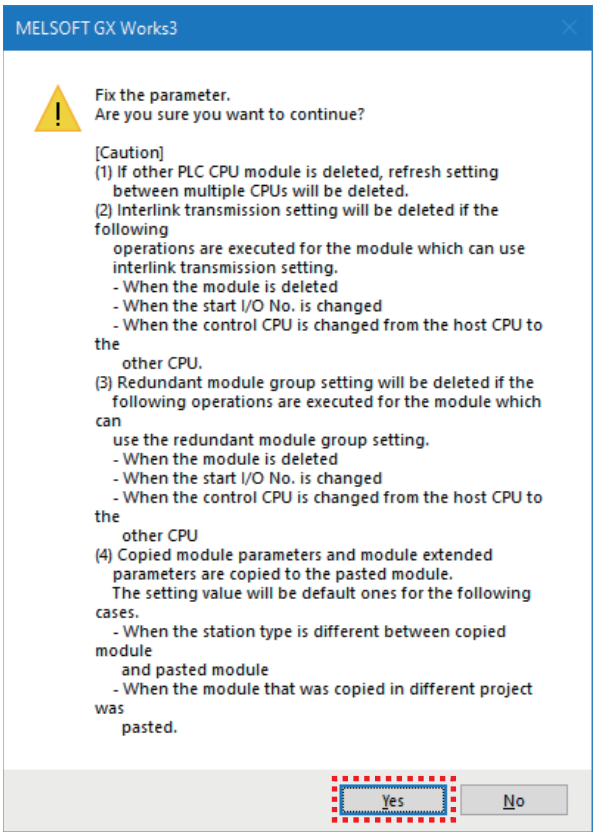


10. Fix the module configuration.

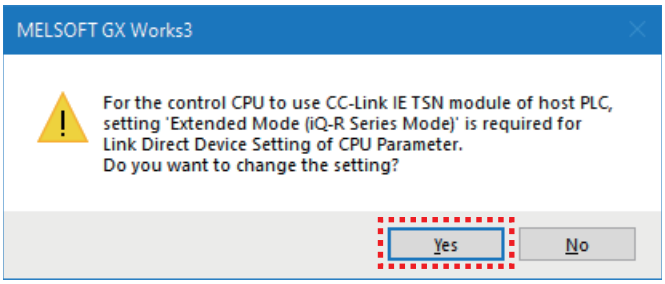
Right-click on the "Module Configuration" window and select [Parameter] ⇨ [Fix].



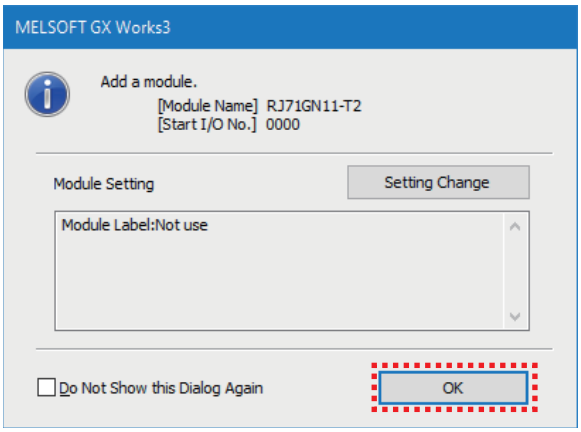
11. When the confirmation window appears, check the contents and click the [Yes] button.



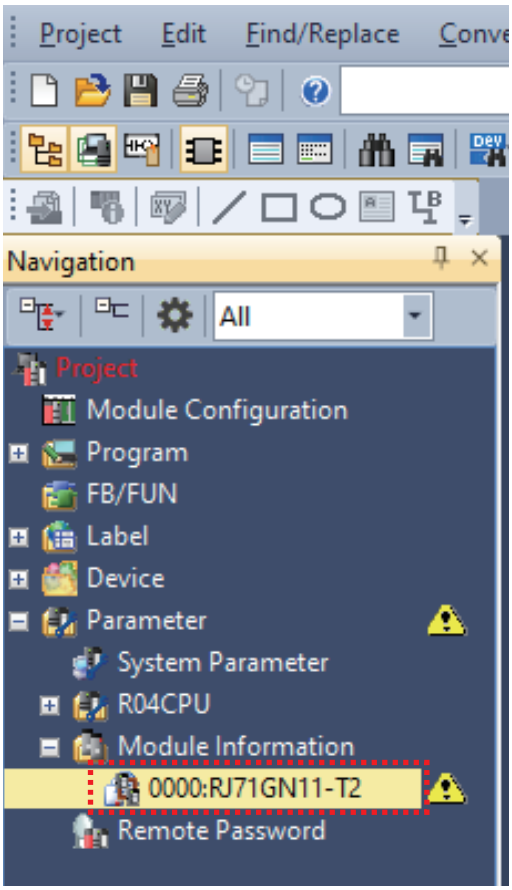
12. Click the [Yes] button.



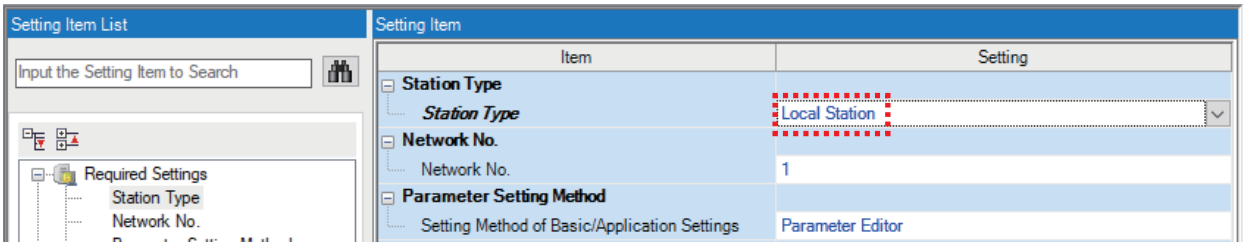
13. Click the [OK] button.



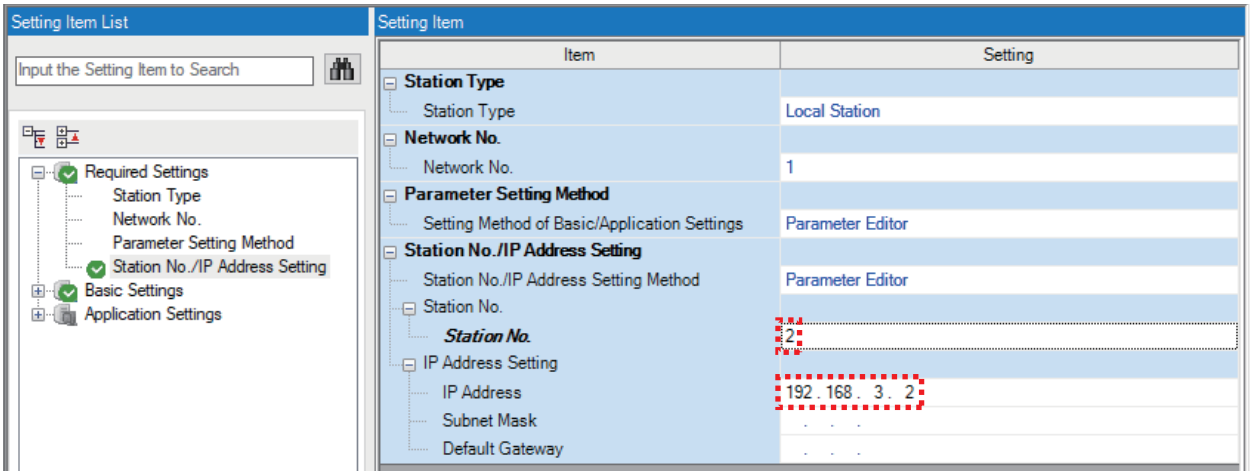
14. Double-click "RJ71GN11-T2" on the navigation window.



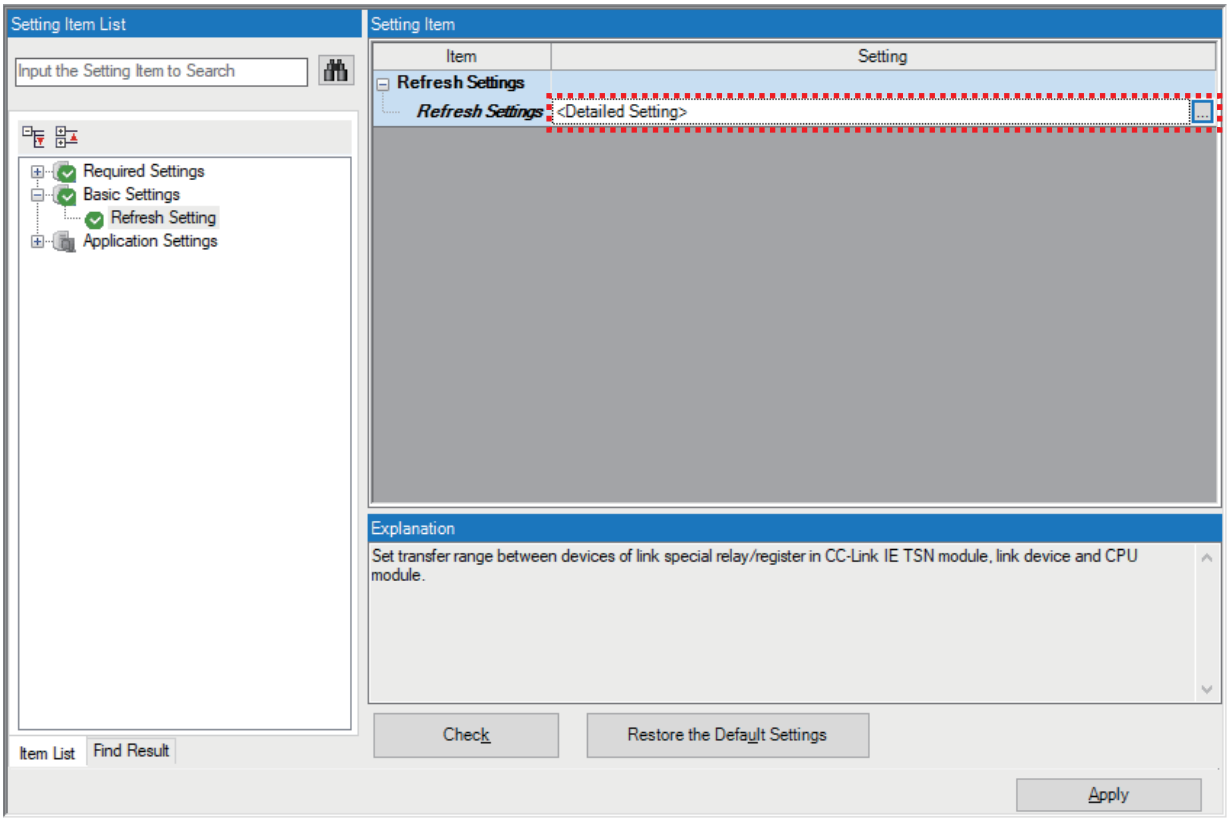
15. Check that "Station Type" in "Required Settings" is set to "Local Station".



16. Set "Station No." to "2" and "IP Address" to "192.168.3.2".



17. Select "Basic Settings" on the module parameter setting window and double-click <Detailed Settings> for "Refresh Settings".

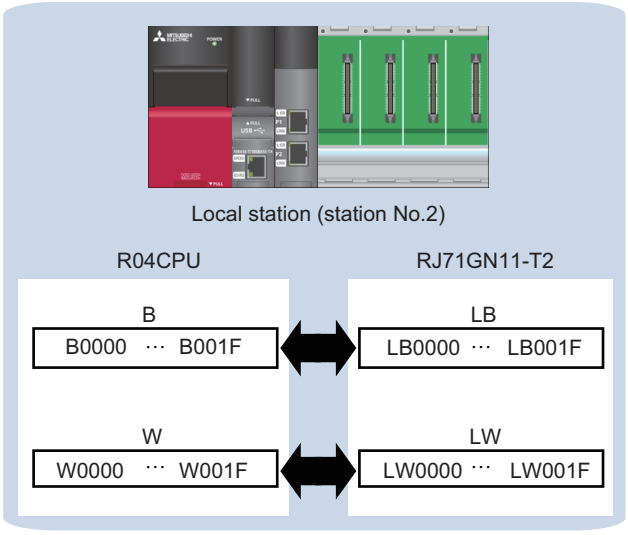


18. Set the devices and range between the RJ71GN11-T2 and the R04CPU to be refreshed.

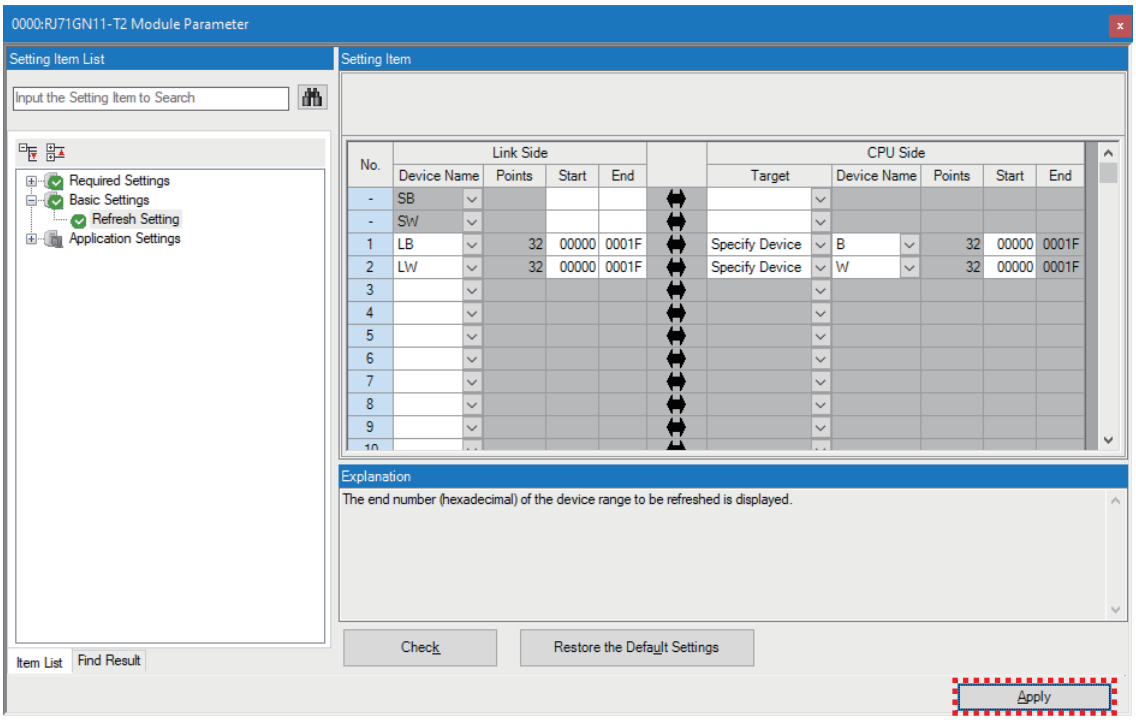
No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB				⇔					
-	SW				⇔					
1	LB	32	00000	0001F	⇔	Specify Device	B	32	00000	0001F
2	LW	32	00000	0001F	⇔	Specify Device	W	32	00000	0001F

Point

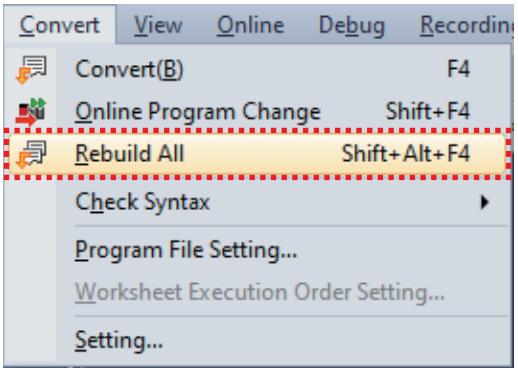
With the refresh setting, data in the following range is automatically transferred when the operation is performed.



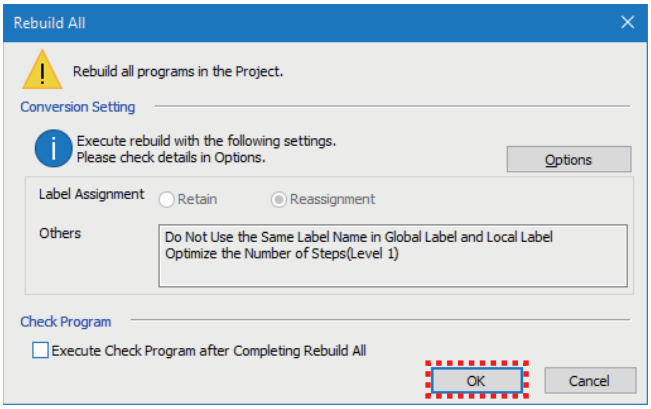
19. Click the [Apply] button.



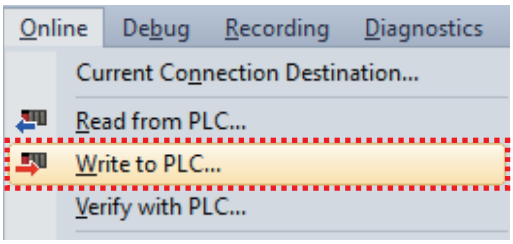
20. Select [Convert] in the menu bar and select [Rebuild All].



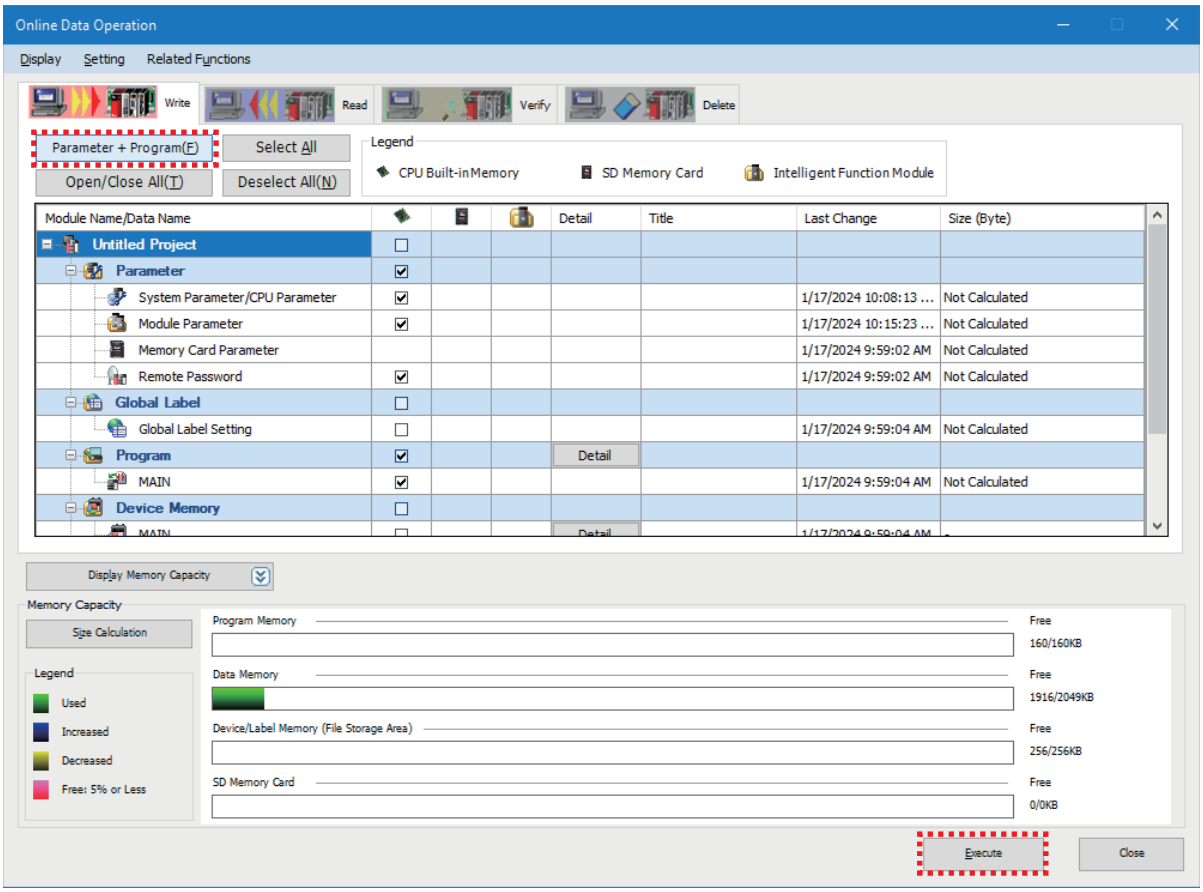
21. Click the [OK] button.



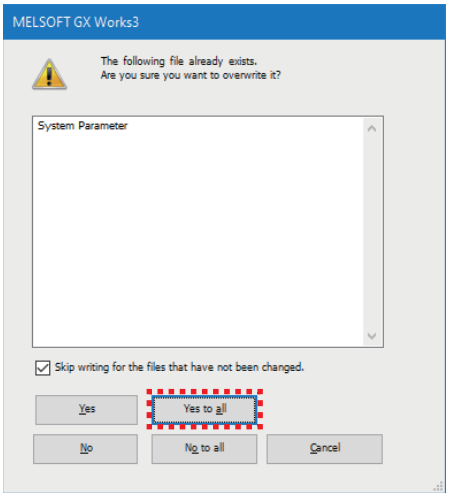
22. Select [Online] in the menu bar and select [Write to PLC].



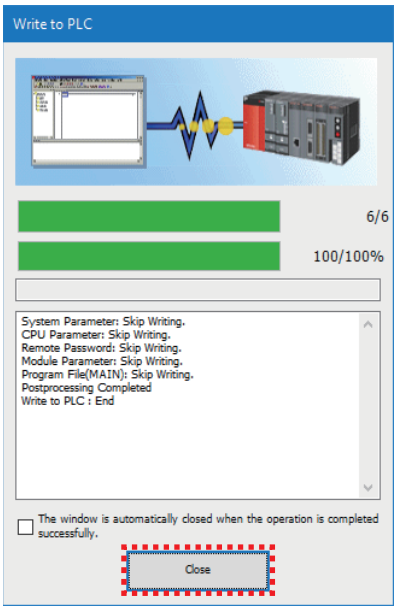
23. Click the [Parameter + Program] button and then the [Execute] button.



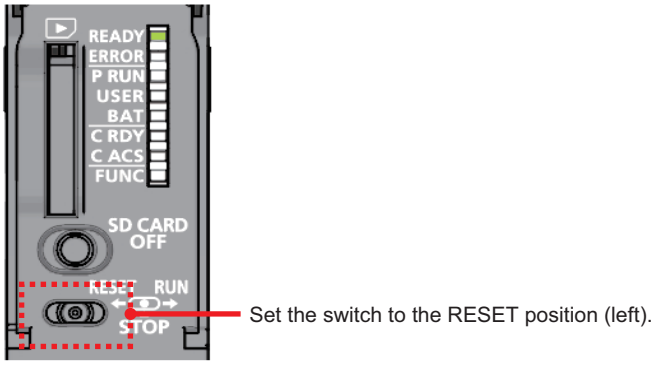
24. When the window below appears, click the [Yes to all] button.



25. After the parameters are written, click the [Close] button to close the window.



26. Set the RUN/STOP/RESET switch of the CPU module to the RESET position. When all the LEDs turn off on the CPU module, return the switch to the STOP position. (Powering off and on the module is regarded as the same operation above.)



The CPU module is reset.

Precautions

When the ERROR LED is on or flashing, check the error details on GX Works3 and eliminate the cause(s).

2.3 Settings for Master Station

Set the station type and refresh settings using GX Works3 for the master station.
Register remote stations and local stations to be connected in the network configuration settings, and set the CC-Link IE TSN parameters such as the number of link device points at once.
Set these parameters to the RJ71GN11-T2 (master station), and write them to the CPU module.

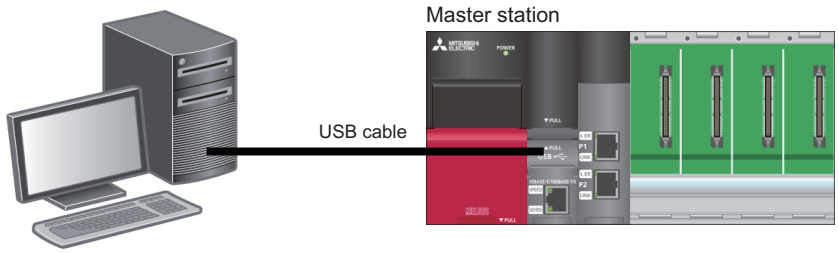
Point

For CC-Link IE TSN, the communication cycle needs to be adjusted depending on the number of remote stations to be connected and the number of link device points to be set. Check the parameter settings of the master station.
For the setting details, refer to the following.
MELSEC iQ-R CC-Link IE TSN User's Manual (Application)

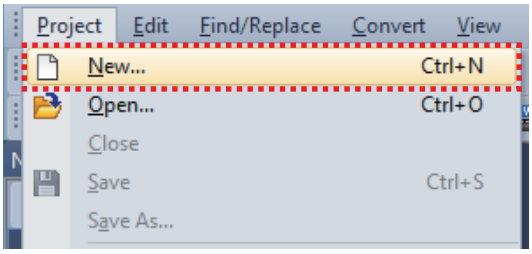
Operating procedure

1. Connect a personal computer to the CPU module of the master station using a USB cable, and power on the master station.

Start GX Works3.

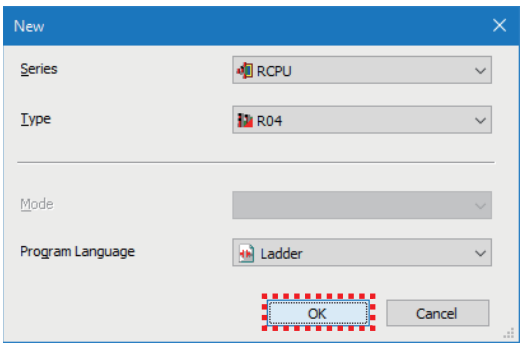


2. Select [Project] in the menu bar and select [New].

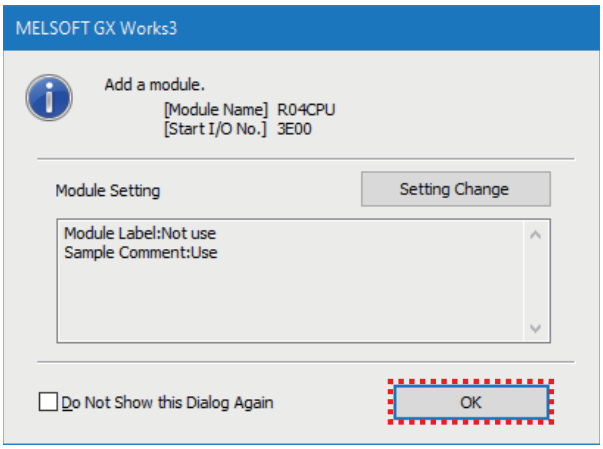


3. Set the following and click the [OK] button.

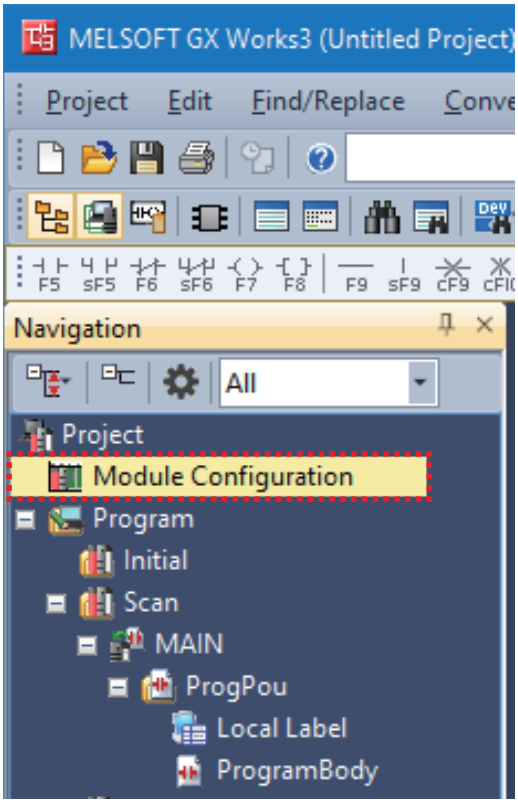
- Series: RCPU
- Model: R04



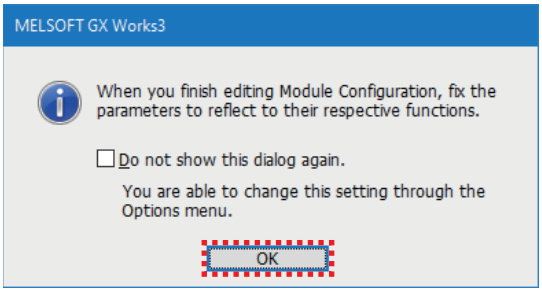
4. Click the [OK] button.



5. Double-click "Module Configuration" in the navigation window.



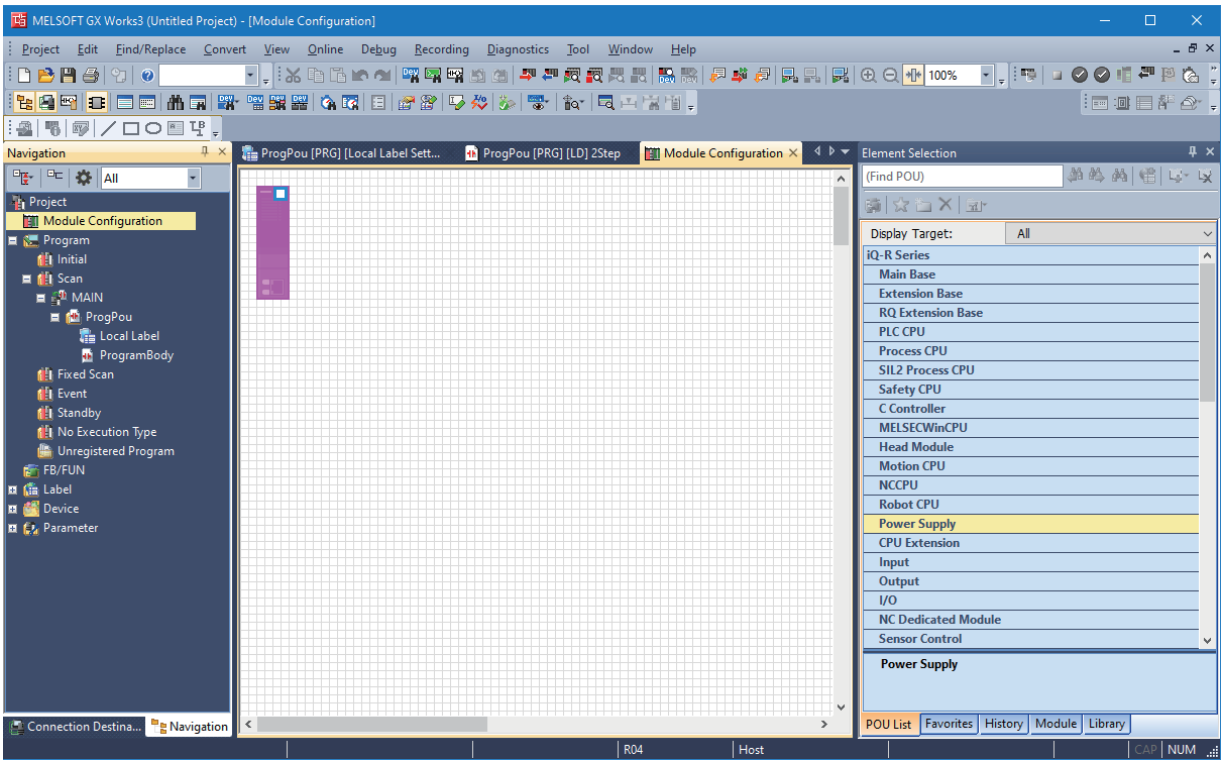
6. Click the [OK] button.



7. Select the modules to be used from the "Element Selection" window and add them to the module configuration diagram by dragging and dropping.

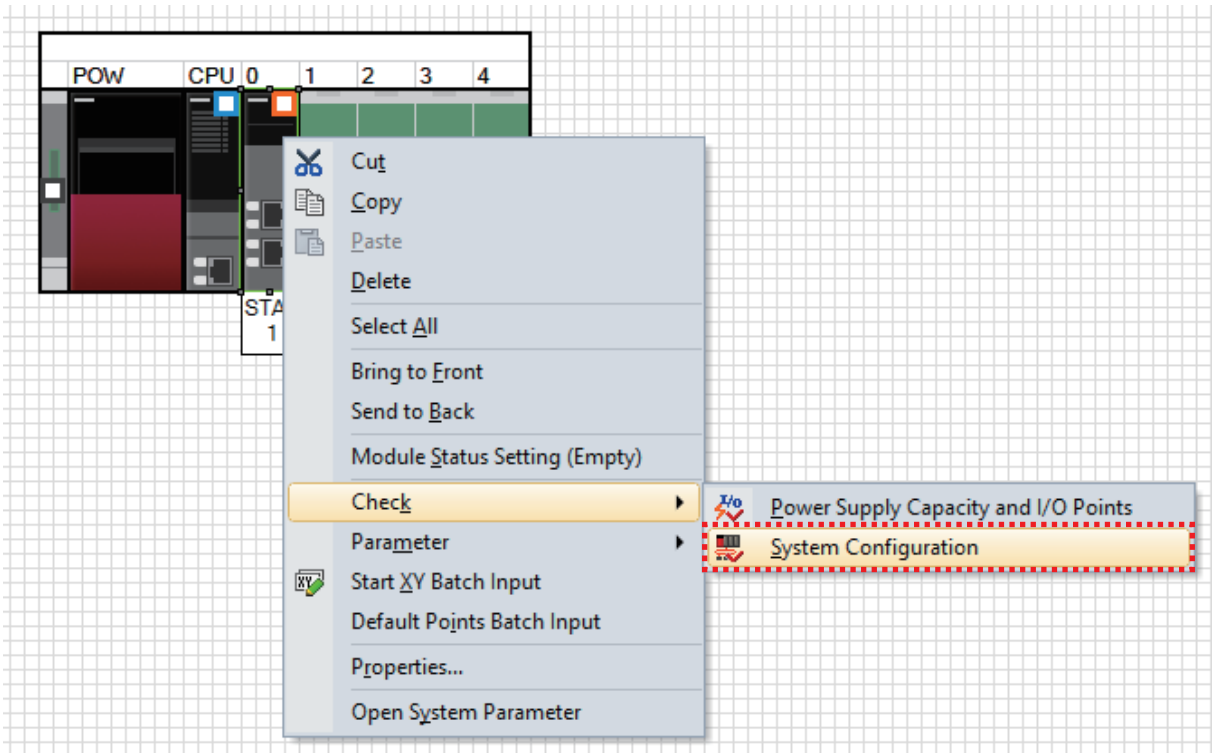
Set the following.

- Main Base: R35B
- Power Supply: R61P
- PLC CPU: R04CPU (Displayed in the module configuration diagram by default.)
- Network Module: RJ71GN11-T2 (Drag and drop this module to the slot No.0.)

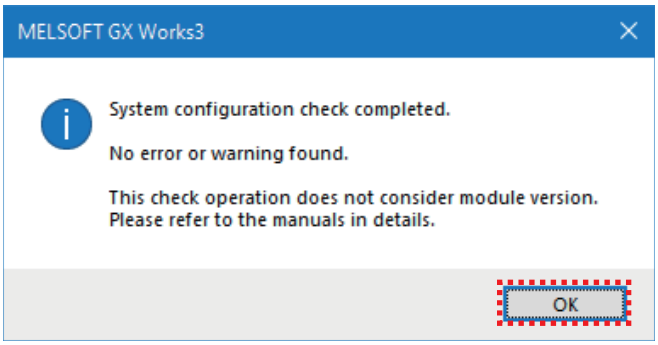


8. Check the module configuration.

Right-click on the "Module Configuration" window and select [Check] ⇨ [System Configuration].

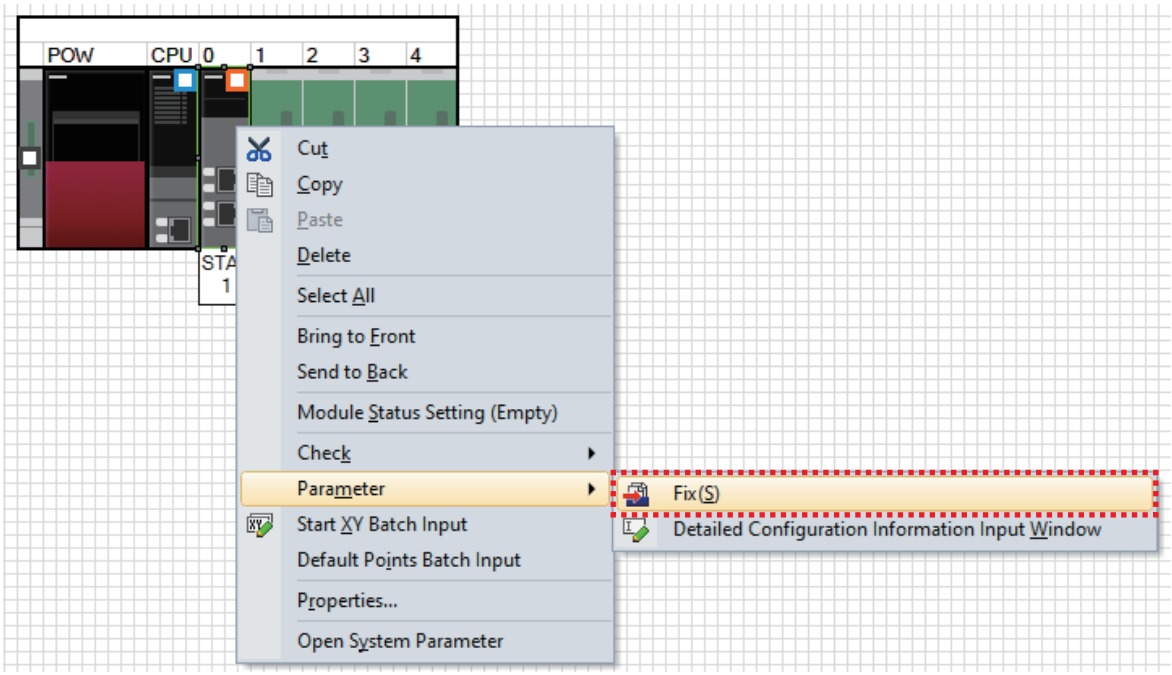


9. After the system configuration check is completed and there is no error or warning, click the [OK] button.

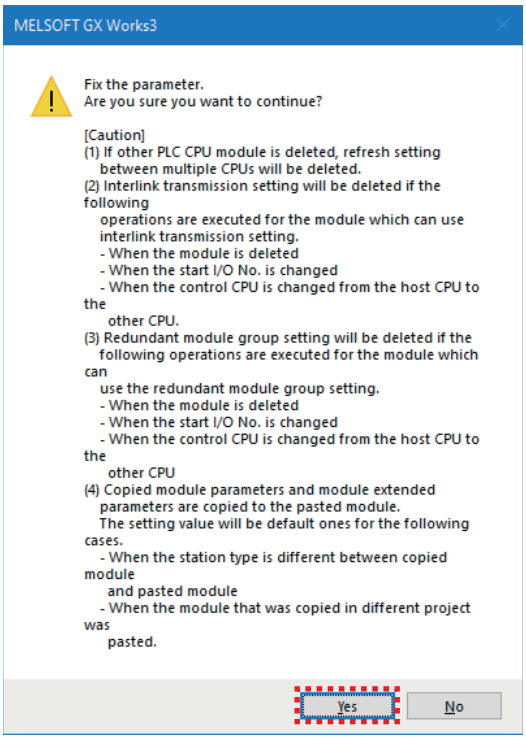


10. Fix the module configuration.

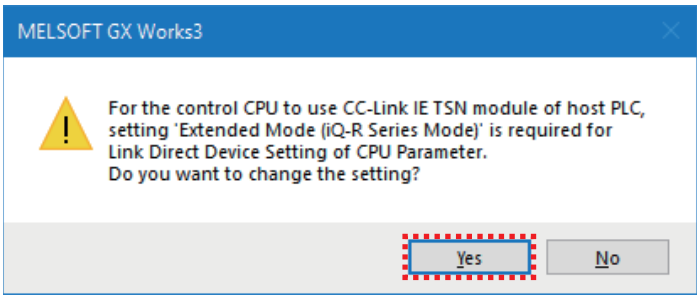
Right-click on the "Module Configuration" window and select [Parameter] ⇨ [Fix].



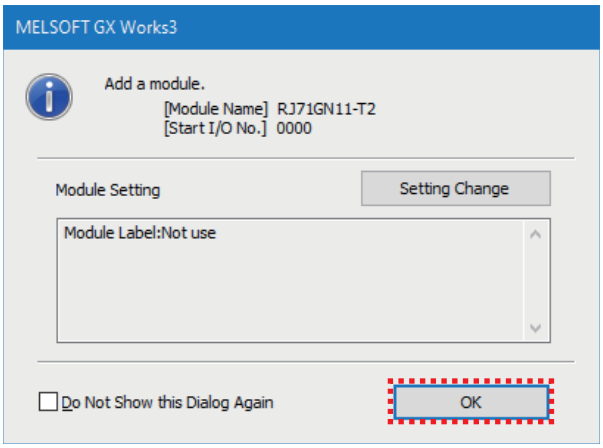
11. When the confirmation window appears, check the contents and click the [Yes] button.



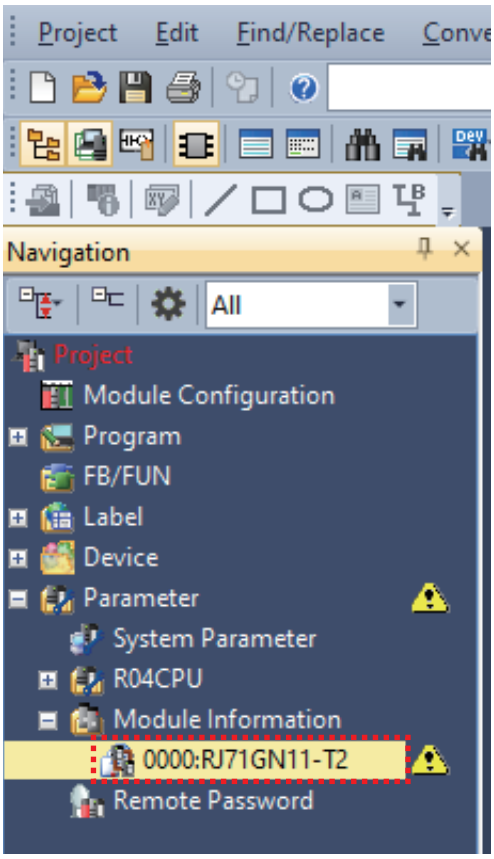
12. Click the [Yes] button.



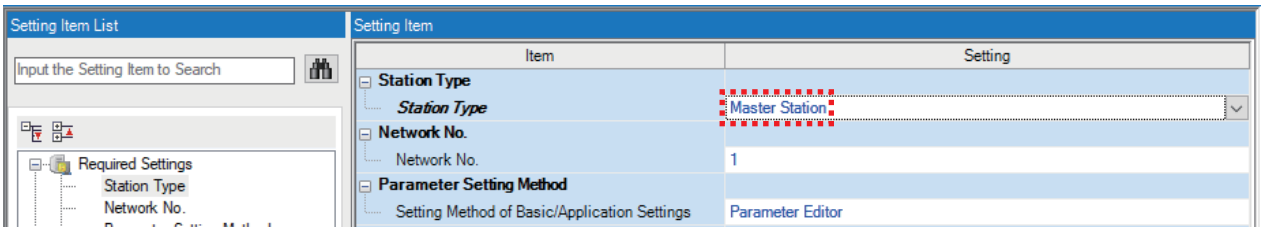
13. Click the [OK] button.



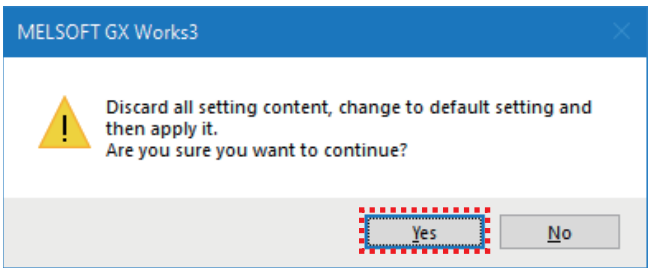
14. Double-click "RJ71GN11-T2" on the navigation window.



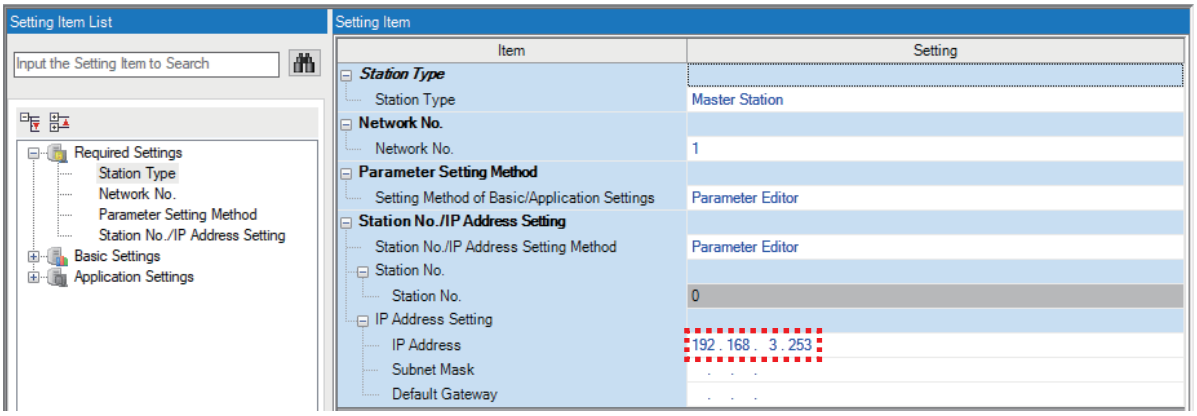
15. Change "Station Type" in "Required Settings" to "Master Station".



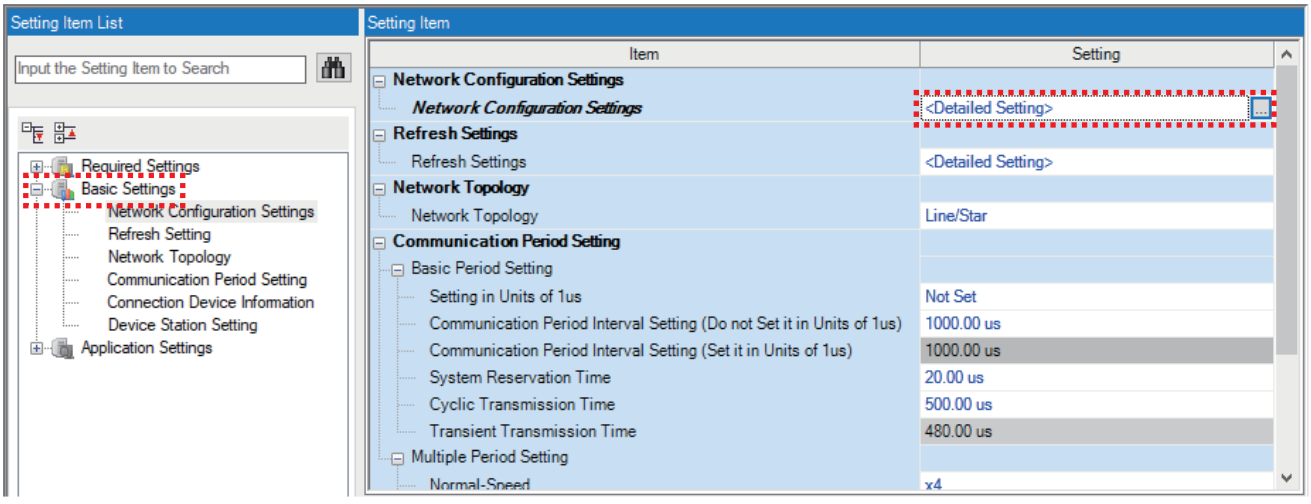
16. Click the [Yes] button.



17. Check that the IP address is "192.168.3.253".

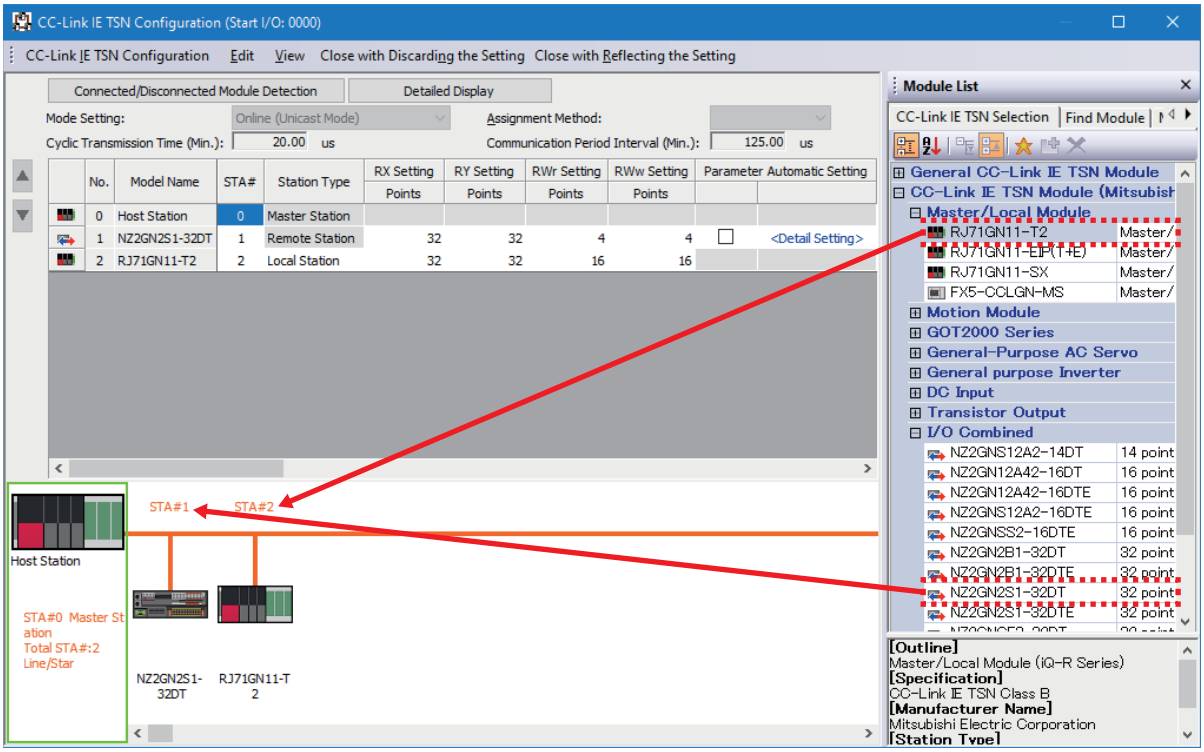


18. Select "Basic Settings" on the module parameter setting window and double-click "Network Configuration Settings".



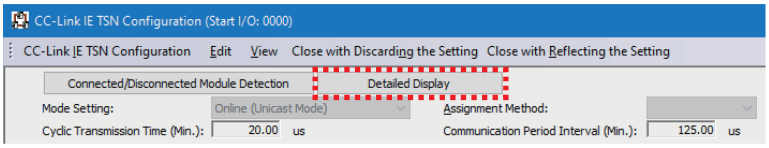
19. Select the modules to be used from "Module List" and add them by dragging and dropping.

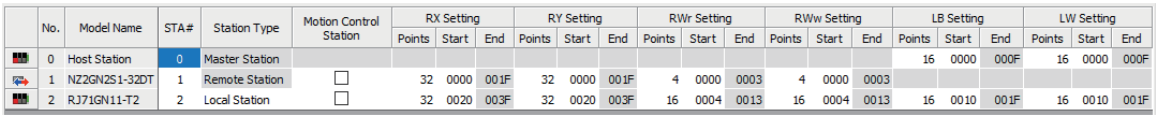
Since the IP address fourth octet is set sequentially from 1 in the order of the dragged and dropped modules, drag and drop them in the order of the NZ2GN2S1-32DT and the RJ71GN11-T2.



20. Set the link devices.

Click the [Detailed Display] button and set as follows.

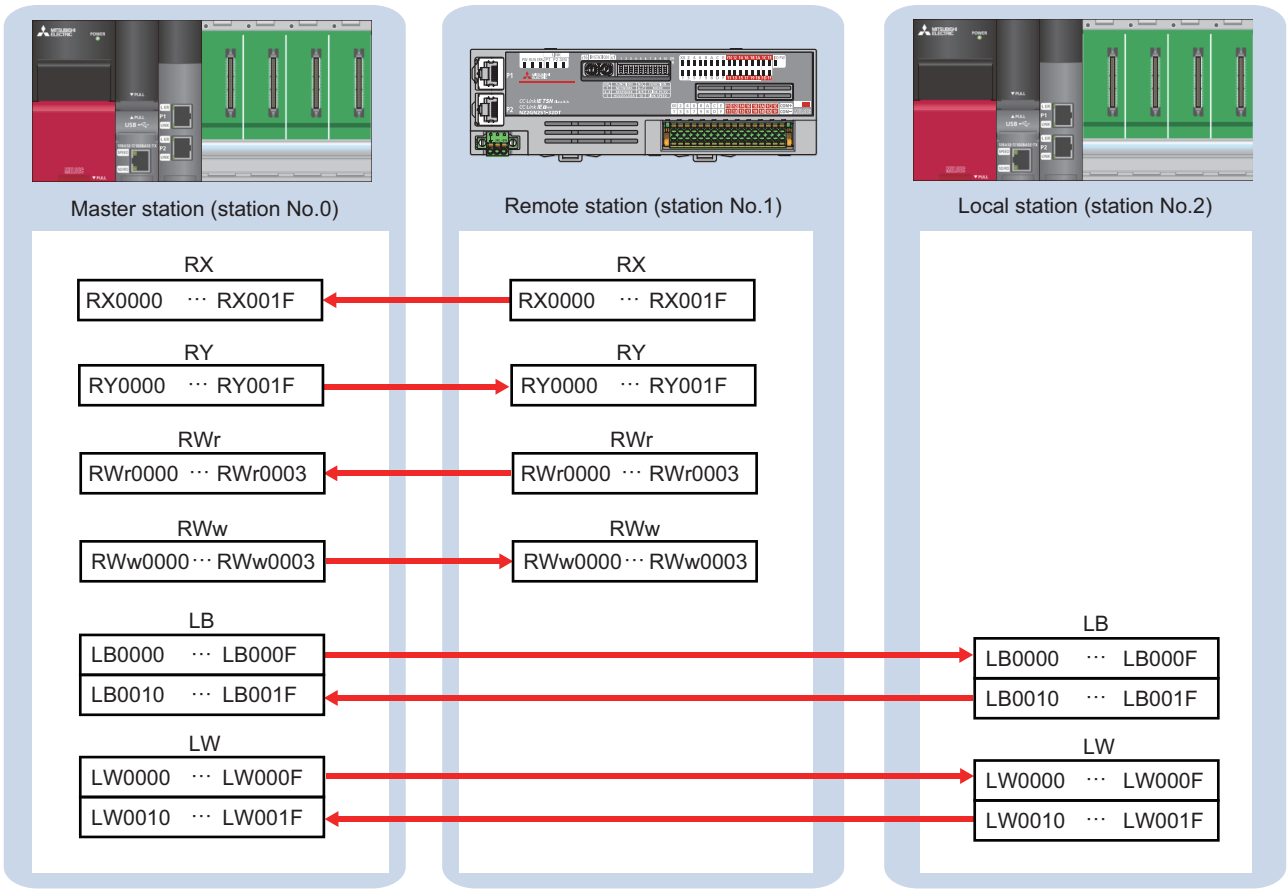




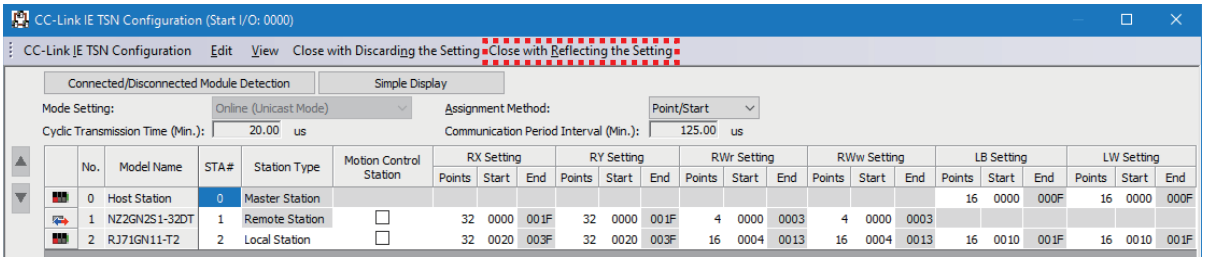
Model	Station type	Setting	Point	Start
Own station	Master station	LB Setting	16	0000
		LW Setting	16	0000
NZ2GN2S1-32DT	Remote station	RX Setting	32	0000
		RY Setting	32	0000
		RWr Setting	4	0000
		RWw Setting	4	0000
RJ71GN11-T2	Local station	LB Setting	16	0010
		LW Setting	16	0010

Point

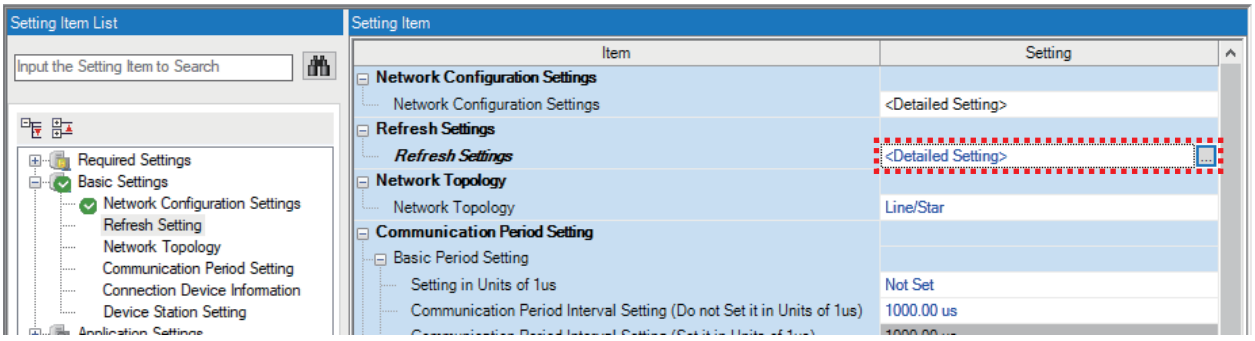
With the link device setting, data in the following range is automatically transferred when the operation is performed.



21. Click the [Close with Reflecting the Setting] button in the menu bar.



22. Double-click "Refresh Setting" on the module parameter setting window.

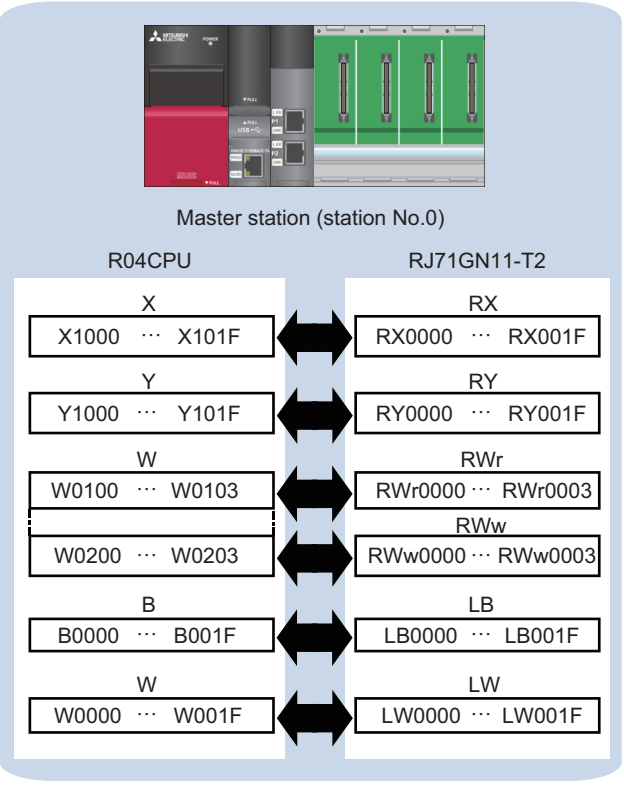


23. Set the devices and range between the RJ71GN11-T2 and the R04CPU to be refreshed.

No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB									
-	SW									
1	RX	32	00000	0001F		Specify Device	X	32	01000	0101F
2	RY	32	00000	0001F		Specify Device	Y	32	01000	0101F
3	RWr	4	00000	00003		Specify Device	W	4	00100	00103
4	RWw	4	00000	00003		Specify Device	W	4	00200	00203
5	LB	32	00000	0001F		Specify Device	B	32	00000	0001F
6	LW	32	00000	0001F		Specify Device	W	32	00000	0001F

Point

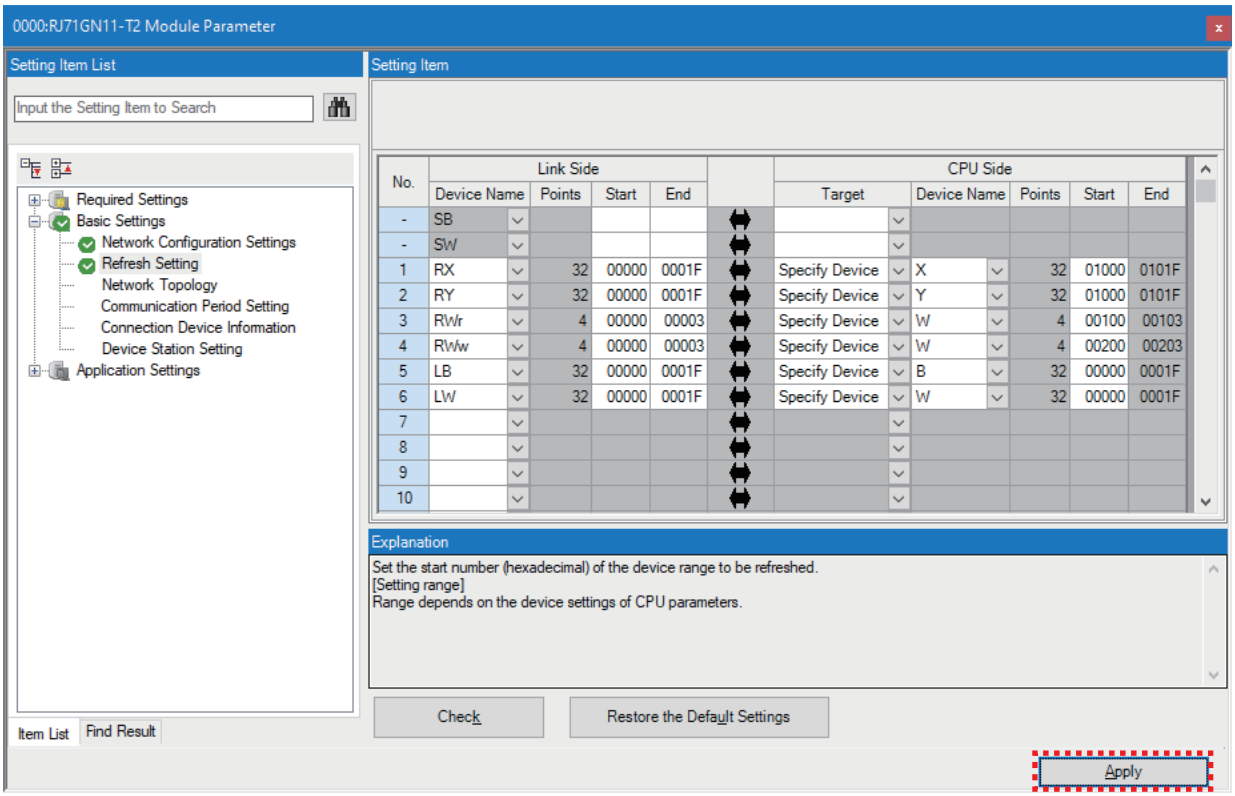
- With the refresh setting, data in the following range is automatically transferred when the operation is performed.



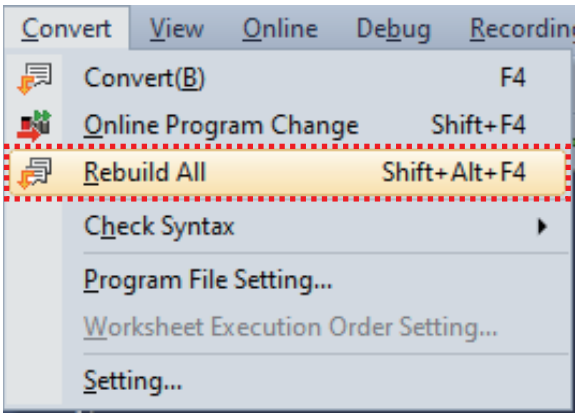
- To communicate data between the master station and the local station using RX/RY/RWr/RWw, set the following refresh settings for both the master station and the local station.

No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB									
-	SW									
1	RX	64	00000	0003F		Specify Device	X	64	01000	0103F
2	RY	64	00000	0003F		Specify Device	Y	64	01000	0103F
3	RWr	20	00000	00013		Specify Device	W	20	00100	00113
4	RWw	20	00000	00013		Specify Device	W	20	00200	00213
5	LB	32	00000	0001F		Specify Device	B	32	00000	0001F
6	LW	32	00000	0001F		Specify Device	W	32	00000	0001F

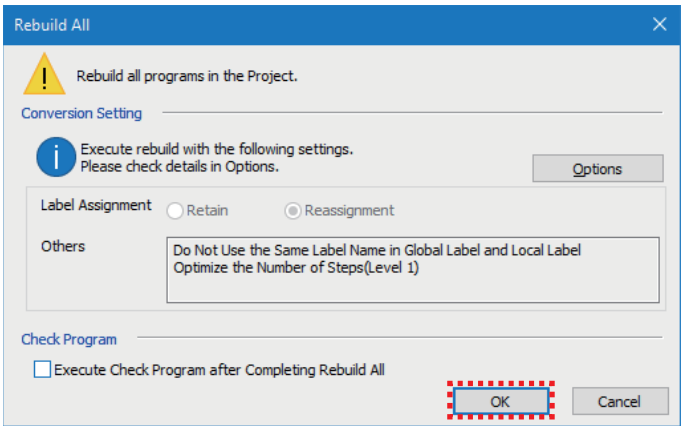
24. Click the [Apply] button.



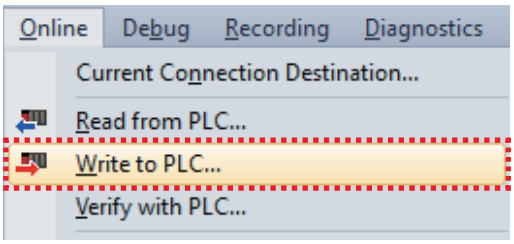
25. Select [Convert] in the menu bar and select [Rebuild All].



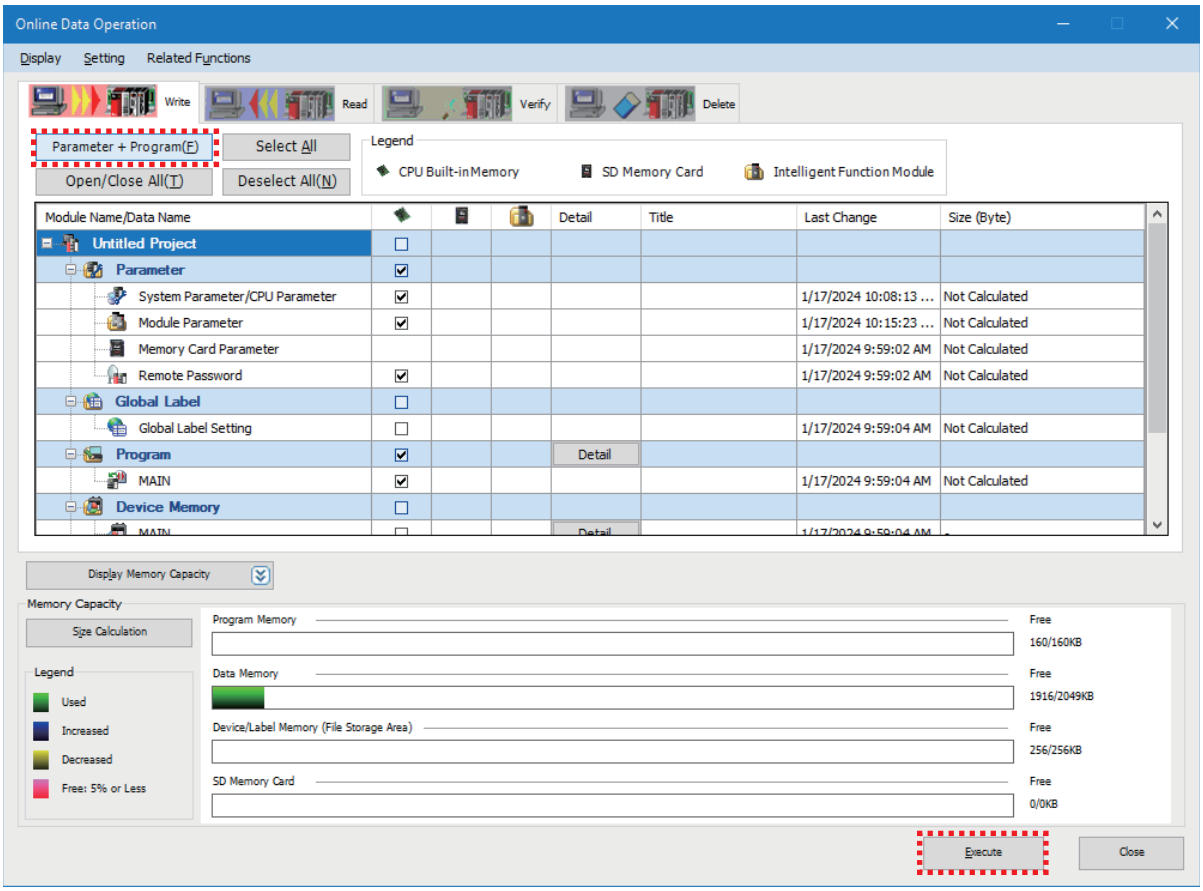
26. Click the [OK] button.



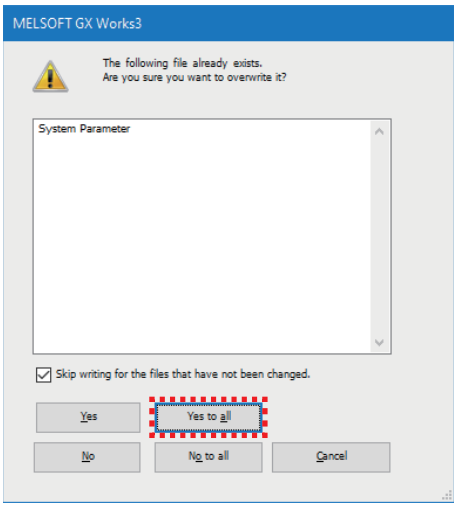
27. Select [Online] in the menu bar and select [Write to PLC].



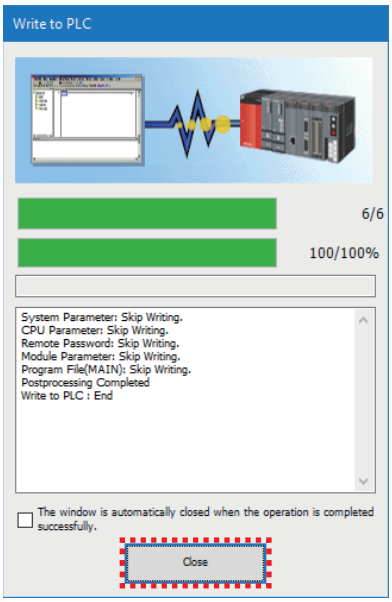
28. Click the [Parameter + Program] button and then the [Execute] button.



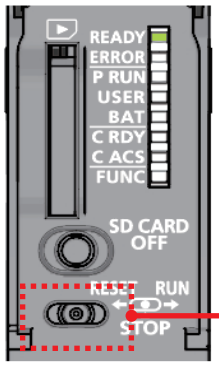
29. When the window below appears, click the [Yes to all] button.



30. After the parameters are written, click the [Close] button to close the window.



31. Set the RUN/STOP/RESET switch of the CPU module to the RESET position. When all the LEDs turn off on the CPU module, return the switch to the STOP position. (Powering off and on the module is regarded as the same operation above.)



Set the switch to the RESET position (left).

The CPU module is reset.

Precautions

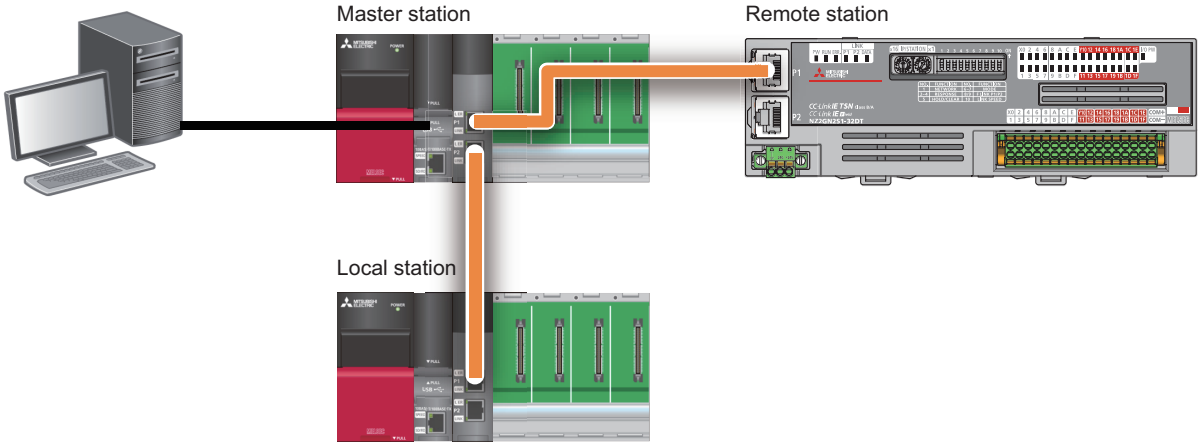
When the ERROR LED is on or flashing, check the error details on GX Works3 and eliminate the cause(s).

3 OPERATION CHECK

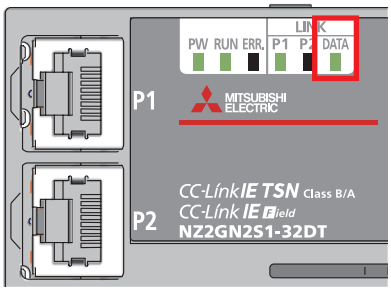
This chapter describes the procedures for checking communications between the master station and the local station and between the master station and the remote station.

Power on the remote station and connect a personal computer (GX Works3) to the master station.

Set the RUN/STOP/RESET switches on the CPU modules of the master and local stations to the RUN position.



When a data link is normally performed, the D LINK LEDs on the RJ71GN11-T2s of the master and local stations and the DATA LINK LED on the NZ2GN2S1-32DT of the remote station turn on.



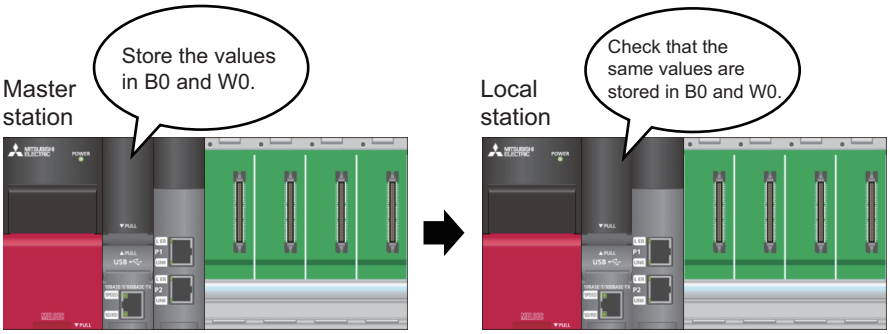
Precautions

When the ERROR LED is on or flashing, check the error details on GX Works3 and eliminate the cause(s).

Checking communications between the master station and the local station

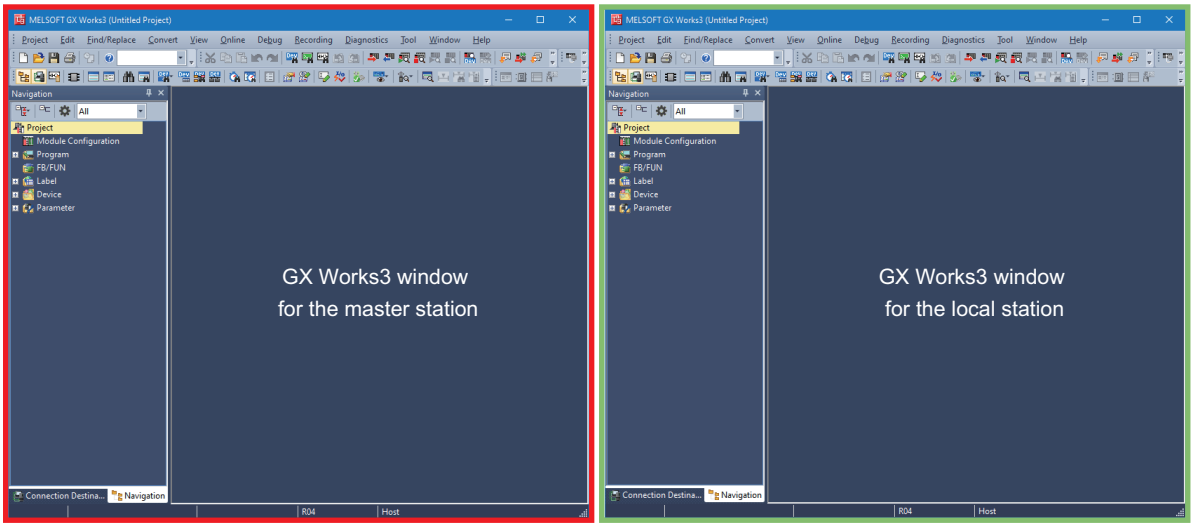
■Checking communications from the master station to the local station

This section describes the procedure for checking communications between the master station and the local station using the LB/LW data set in the refresh settings.

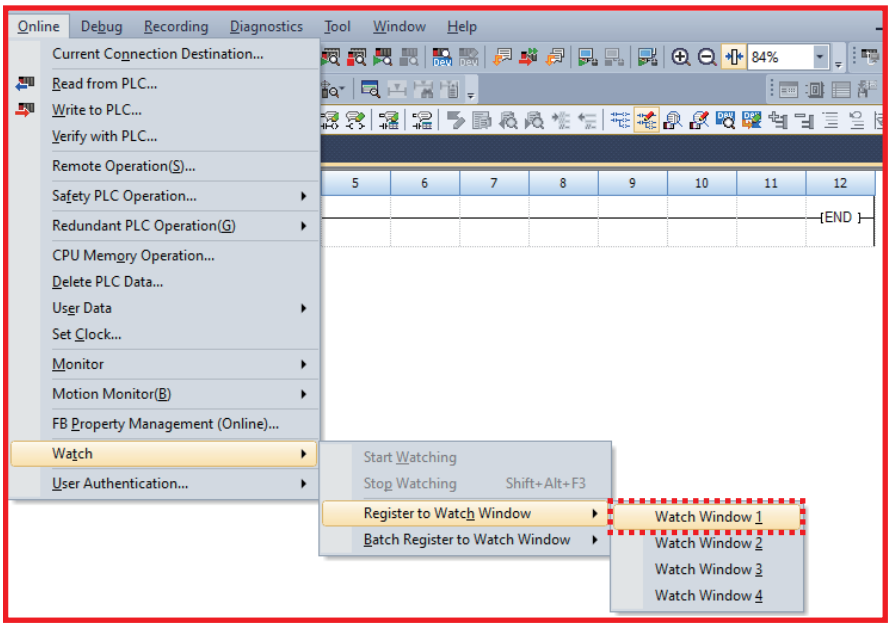


Operating procedure

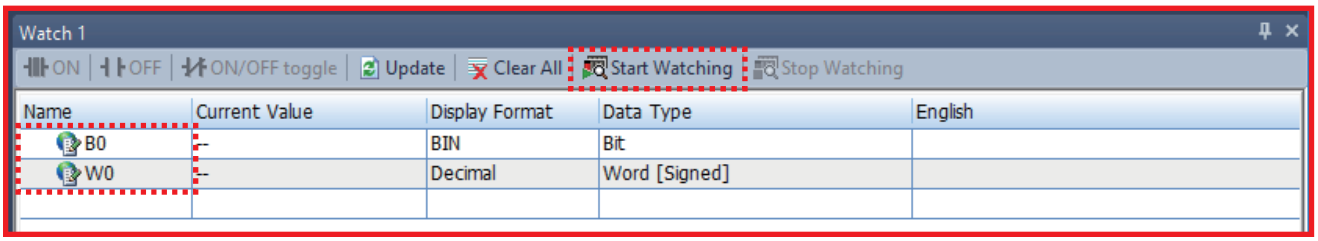
1. Start the project data of the master and local stations on a personal computer.



2. Select [Online] in the menu bar ⇨ [Watch] ⇨ [Register to Watch Window] and click [Watch Window 1] on GX Works3 of the master station.

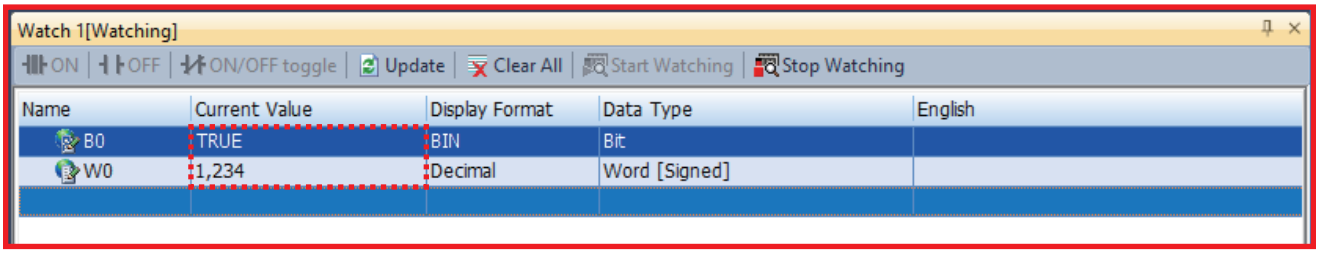


3. Enter [B0] and [W0] in [Name]. ⇨ Click [Start Watching].



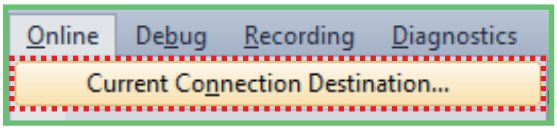
4. Enter the value in [Current Value].

- B0 ⇨ TRUE
- W0 ⇨ 1234



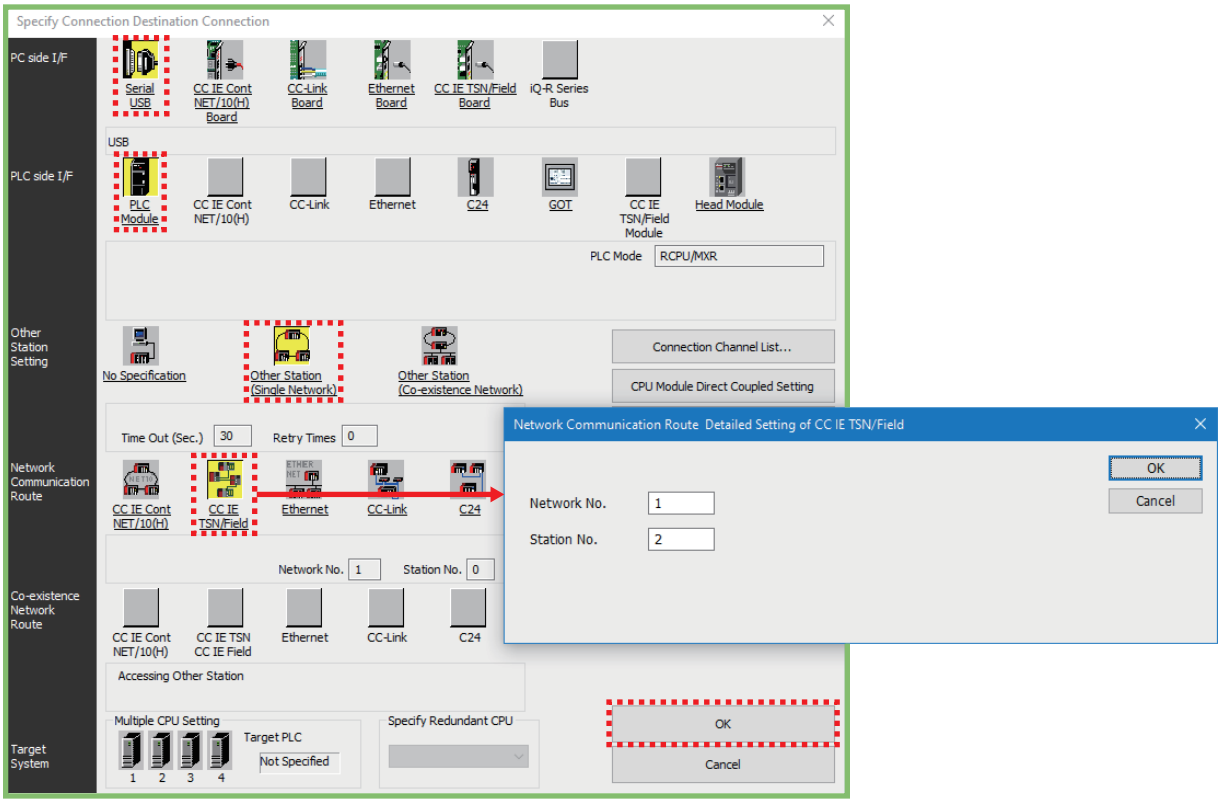
5. Change the connection destination to the local station.

Select [Online] ⇨ [Current Connection Destination] to display the "Specify Connection Destination Connection" window on GX Works3 of the local station.

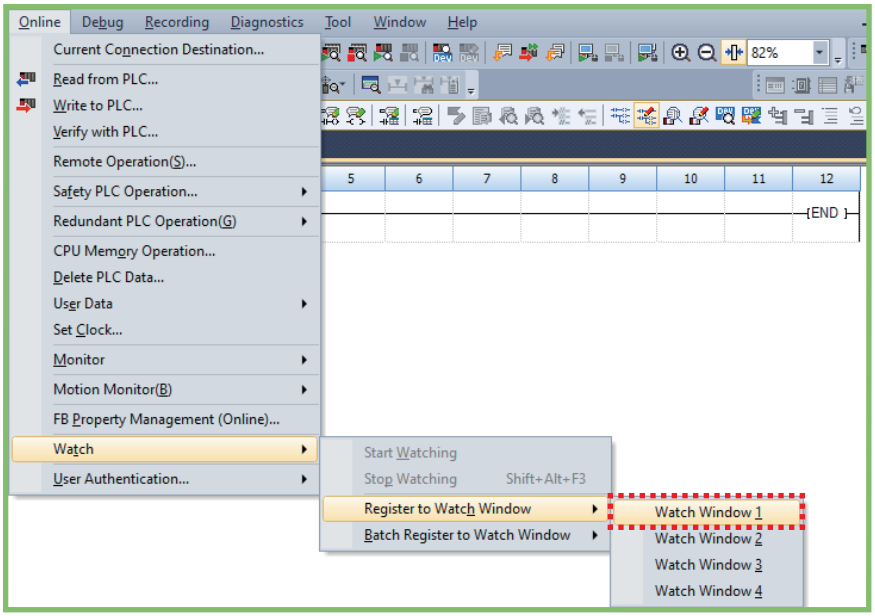


6. Set the following and click the [OK] button.

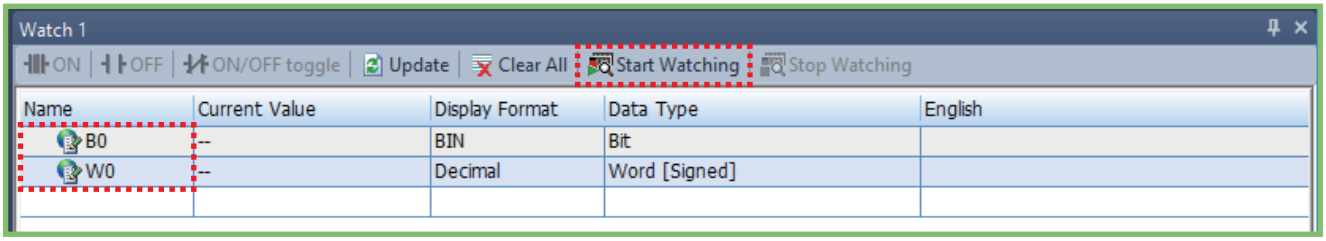
- PC side I/F: Serial USB
- PLC side I/F: PLC Module
- Other Station Setting: Other Station (Single Network)
- Network Communication Route: CC IE TSN
  - Network No.: 1
  - Station No.: 2



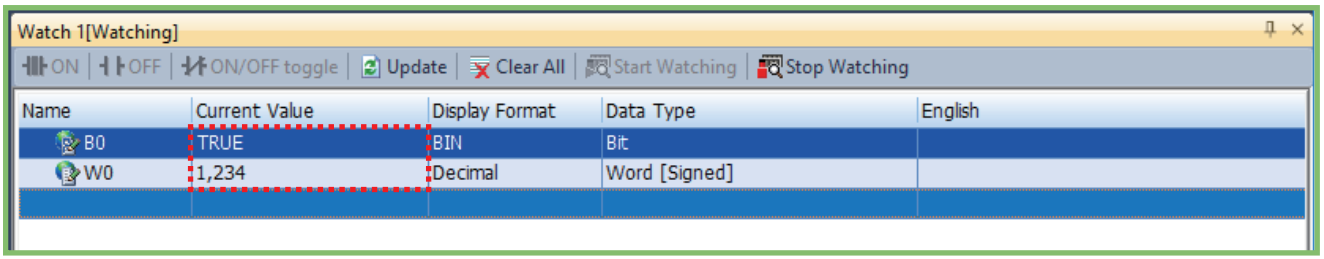
7. Select [Online] in the menu bar ⇨ [Watch] ⇨ [Register to Watch Window] and click [Watch Window 1].



8. Enter [B0] and [W0] in [Name]. ⇨ Click [Start Watching].

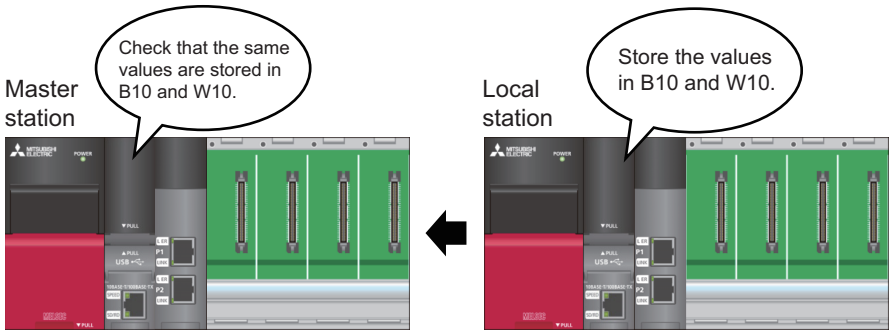


9. Check that the value input at the master station is transferred.



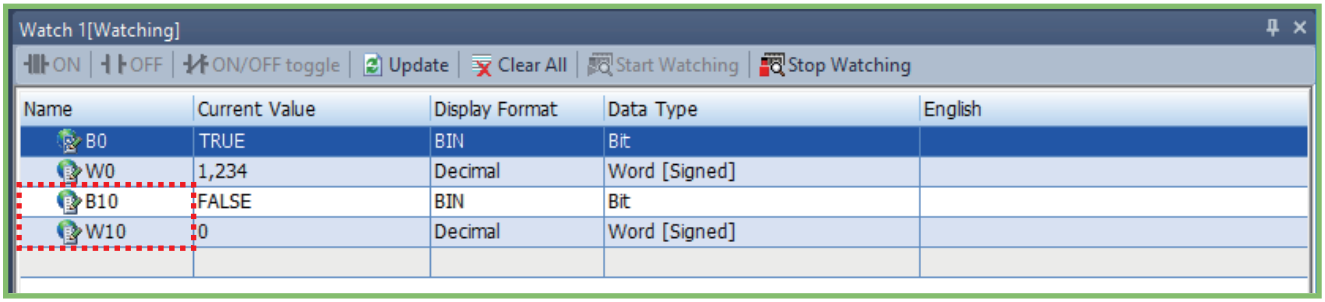
■Checking communications from the local station to the master station

Check that data is successfully sent from the local station to the master station. Store a new value in the device while connected to the local station.



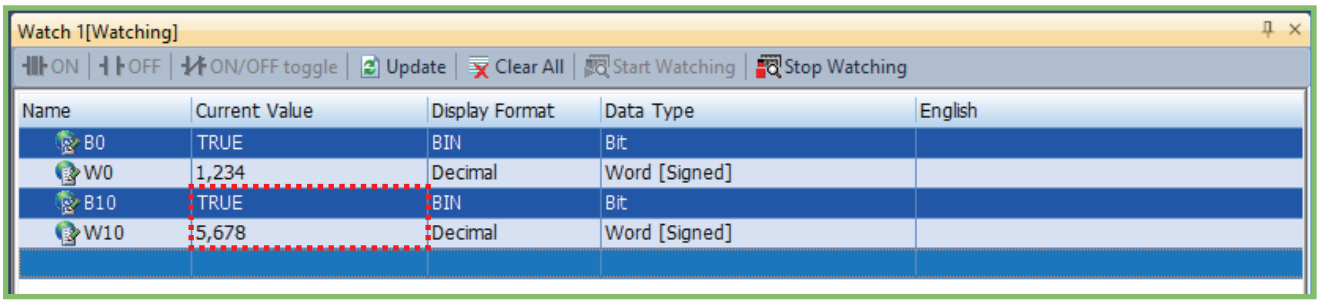
Operating procedure

1. Enter [B10] and [W10] in [Name] on the "Watch 1" window.

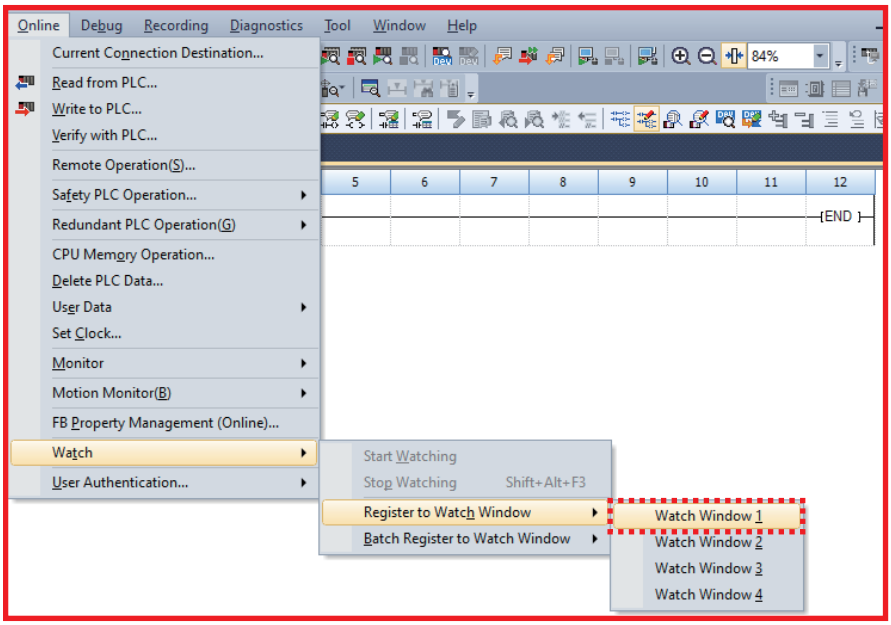


2. Enter the value in [Current Value].

- B10 ⇨ TRUE
- W10 ⇨ 5678

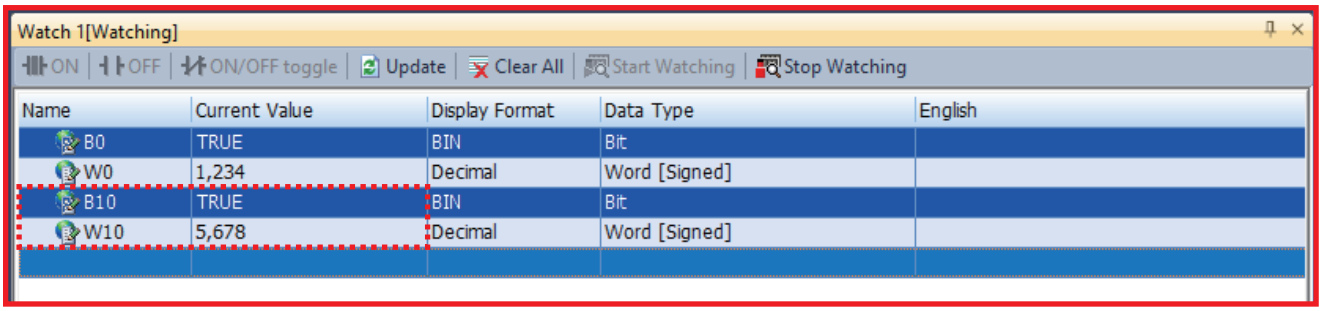


3. Change the connection destination to the master station. Select [Online] in the menu bar ⇨ [Watch] ⇨ [Register to Watch Window] and click [Watch Window 1] on GX Works3 of the master station.



4. Enter [B10] and [W10] in [Name]. ⇨ Click [Start Watching].

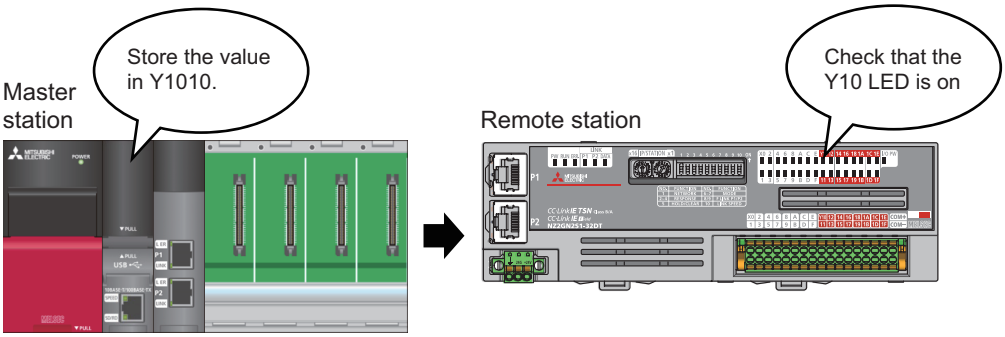
5. Check that the value input at the local station is transferred.



Checking communications between the master station and the local station is completed.

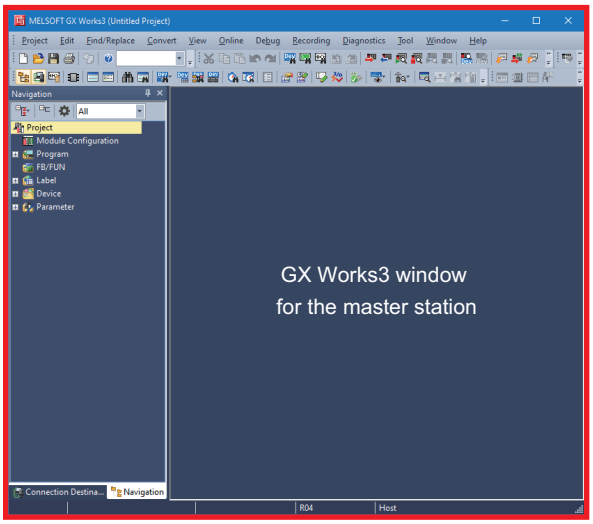
Checking communications from the master station to the remote station

Check that data is successfully sent from the master station to the remote station.

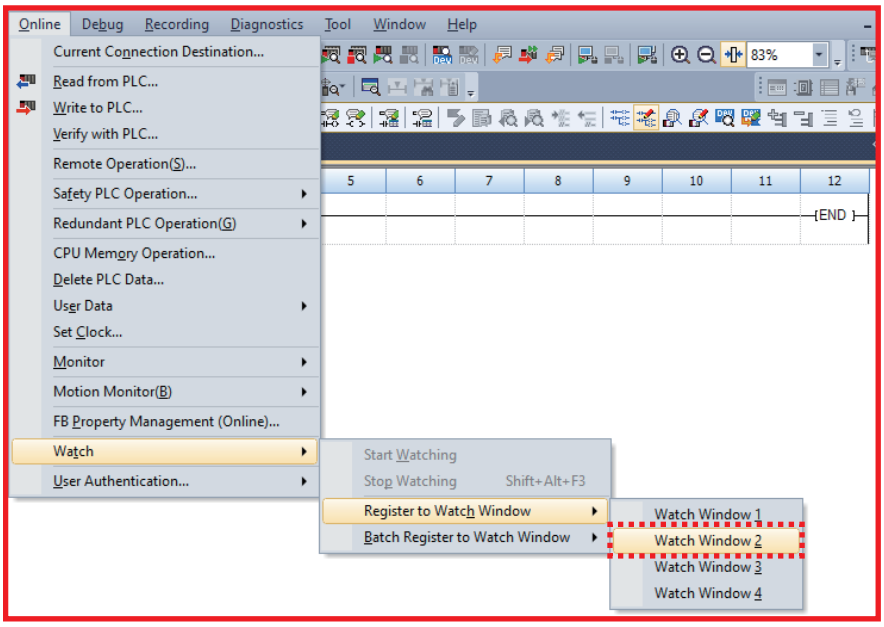


Operating procedure

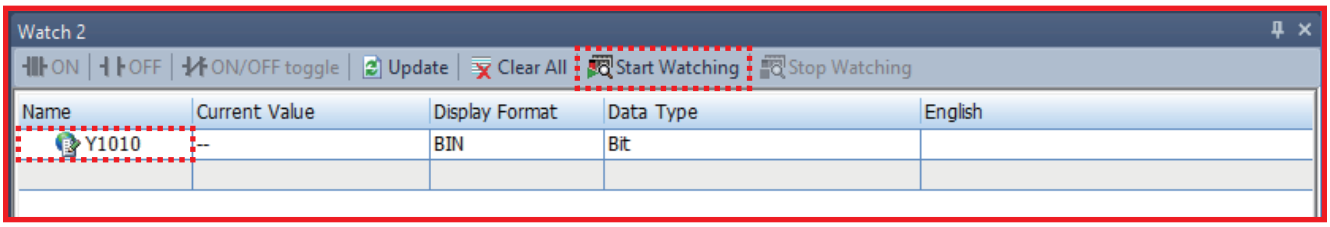
1. Start the project data of the master station on a personal computer.



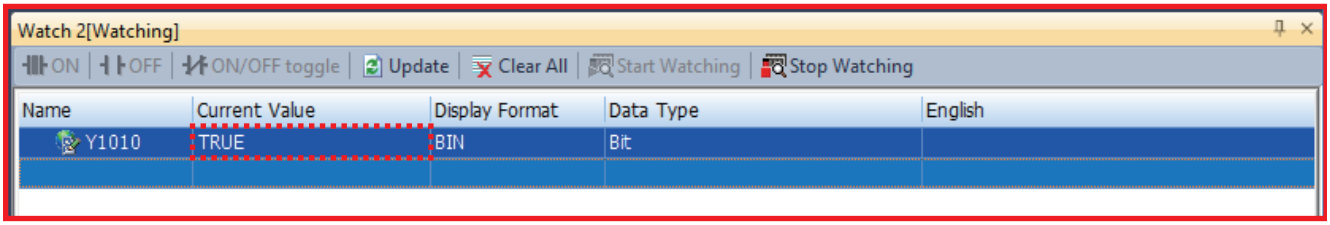
2. Select [Online] in the menu bar ⇨ [Watch] ⇨ [Register to Watch Window] and click [Watch Window 2].



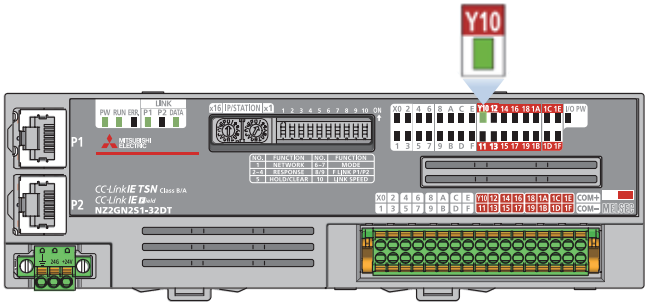
3. Enter [Y1010] in [Name]. ⇨ Click [Start Watching].



4. Enter the value (TRUE) in [Current Value] of Y1010.



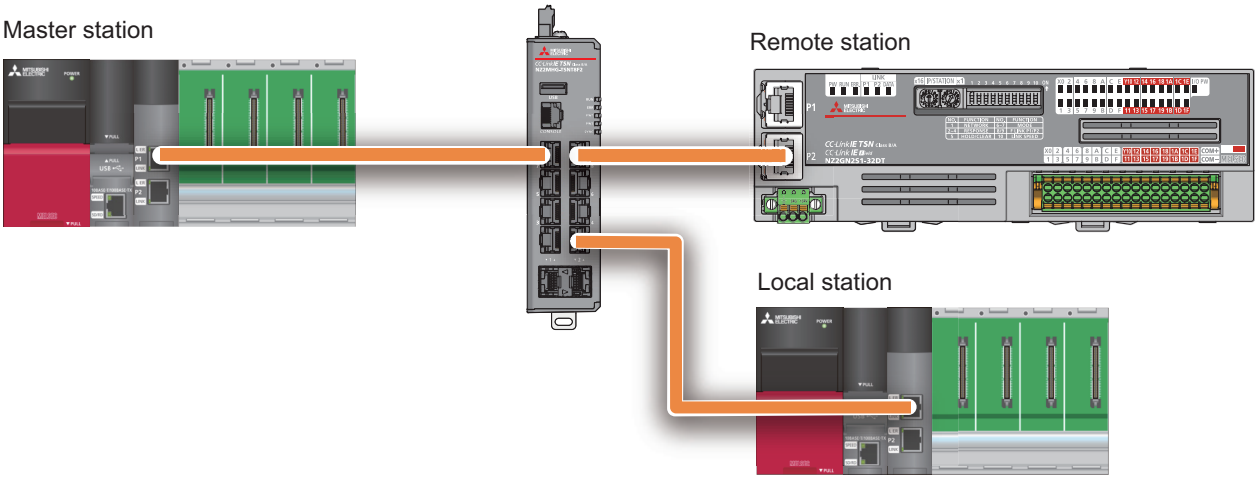
5. Check that Y10 LED at the remote station turns on.



Checking communications between the master station and the remote station is completed.

4 CONNECTING TSN HUB

The network can be configured in a star topology via a TSN hub.
This chapter describes an example which uses the CC-Link IE TSN industrial managed switch (NZ2MHG-TSNT8F2).



Key feature of star topology

A star topology can operate in the same way as a line topology.
In a line topology, when an error occurs in a device station (a station other than the master station (local station or remote station)), the stations connected after the faulty station are disconnected. In a star topology, even when an error occurs in a device station, communications can be continued with the stations that are operating normally.
Devices can be flexibly added even after the system is configured.

Connection method

To connect the CC-Link IE TSN compatible devices, the following settings must be the same in the entire CC-Link IE TSN system.

- Time synchronization method
- Communication cycle

When these settings of the master station are default, a TSN hub can communicate with the default settings.
Set the TSN hub with a web interface or CLI.

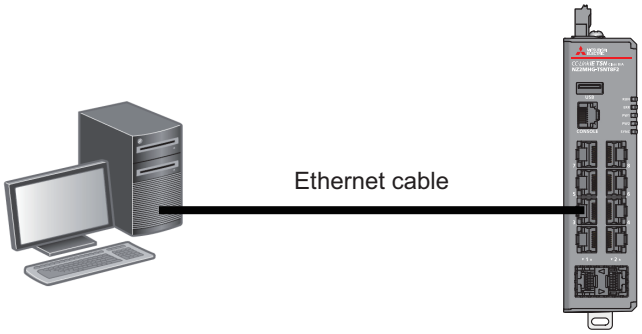
Precautions

When the settings of the master station and the connected CC-Link IE TSN compatible devices and the settings of the TSN hub are set differently, communications may not be performed.
For the details, refer to the manuals in RELEVANT MANUALS.

Operating procedure

The following describes how to connect the TSN hub to the web interface.

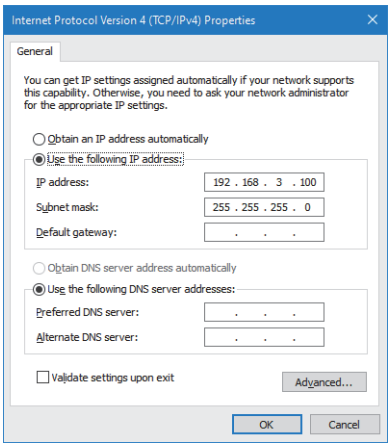
1. Connect the personal computer and the TSN hub with an Ethernet cable.



2. For the IP address of the port on the personal computer connected with the Ethernet cable, set the same IP address of the TSN hub.

The default IP address of the TSN hub is set as follows.

- IP address: 192.168.3.252
- Subnet mask: 255.255.255.0



3. Access the web interface.

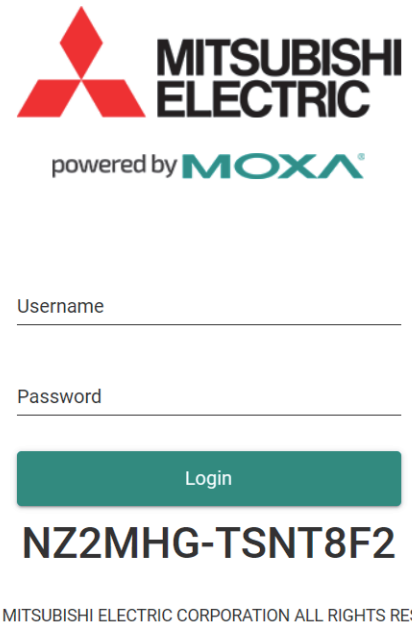
Enter the IP address of the TSN hub into a web browser and access the web interface.

To access the web interface in the encrypted communications (SSL communications), enter the IP address starting with "https://".

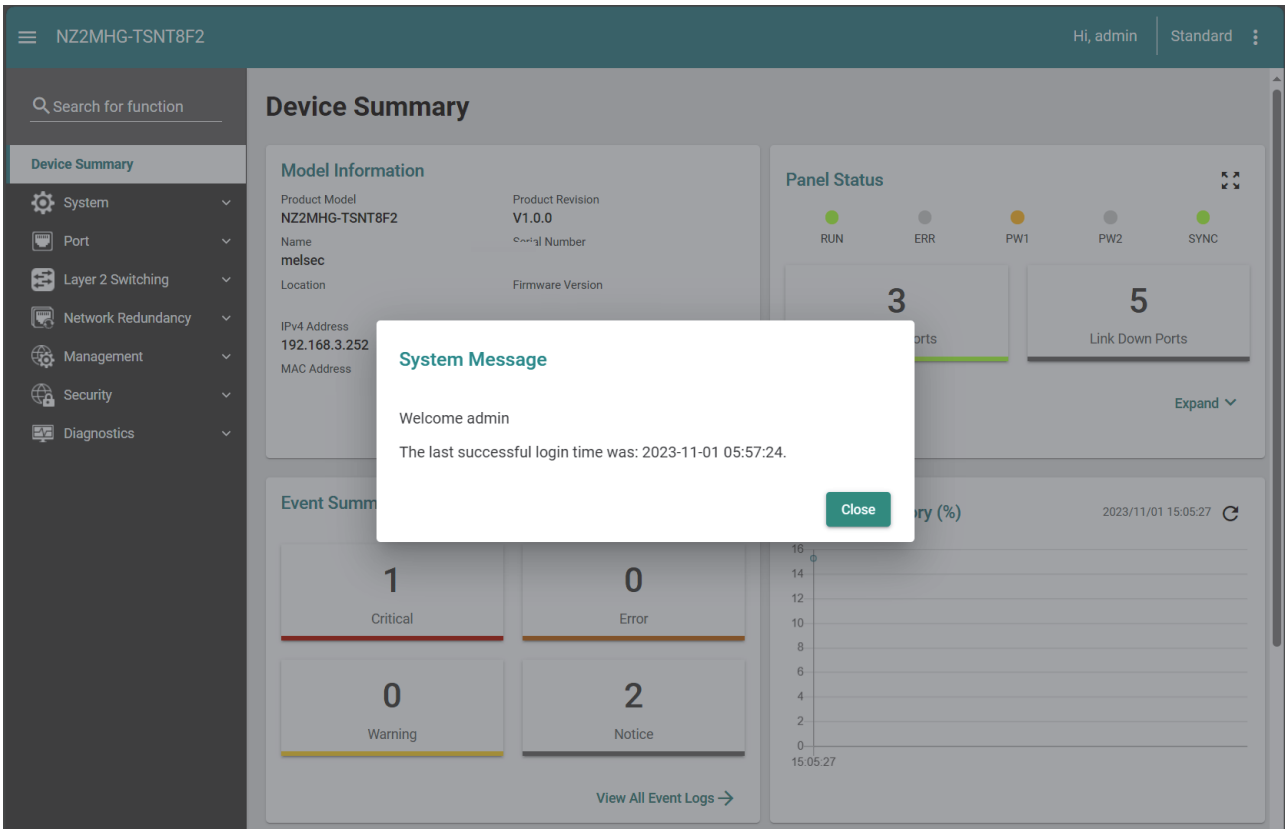
4. Log in.

Enter the account information and log in. The default settings are as follows.

- User name: admin
- Password: admin



5. When the login is successful, a dialog box and the web interface window will appear.



Precautions

- When a proxy server is used, the web interface may not be accessed depending on the proxy server settings. If so, correct the proxy server settings.
- The web interface may not be accessed depending on the firewall settings. If so, correct the firewall settings.
- When accessing the web interface, enable JavaScript and Cookie in the web browser settings.
- For security measures, change the default account information at login.

Point

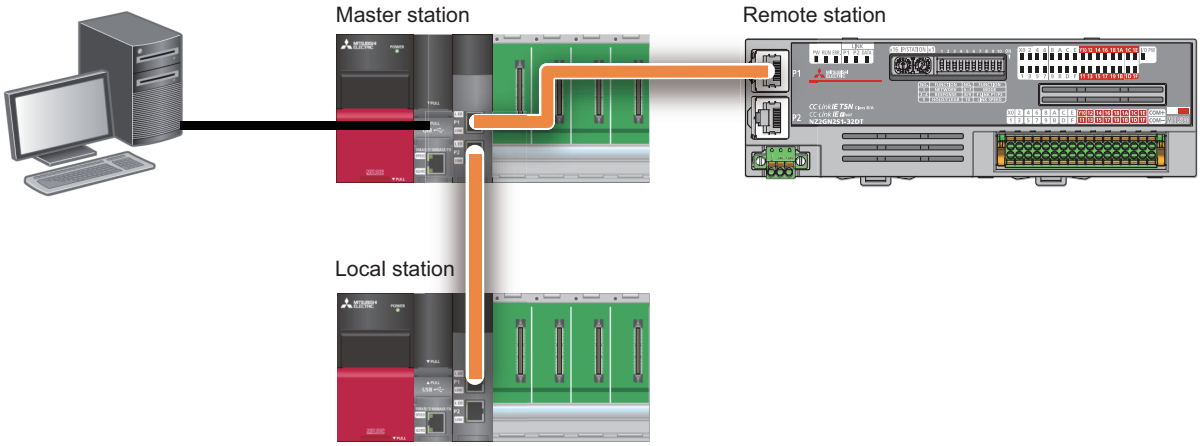
For details on the settings and functions of the TSN hub using the web interface, refer to the manuals in RELEVANT MANUALS.

5 CHECKING CONNECTION STATUS WITH CC-Link IE TSN DIAGNOSTICS

This chapter describes the procedure for checking whether an error occurs in devices or cables connected in a system using the CC-Link IE TSN/CC-Link IE Field diagnostics.
The status of each station can also be checked in the procedure.

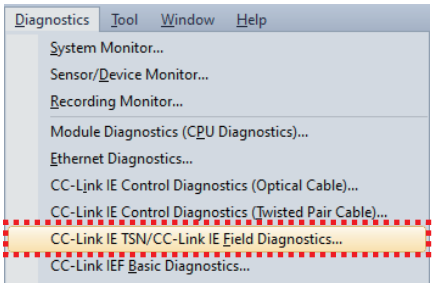
Checking method

The following shows an example of system configuration where a personal computer (GX Works3) is connected to the master station.

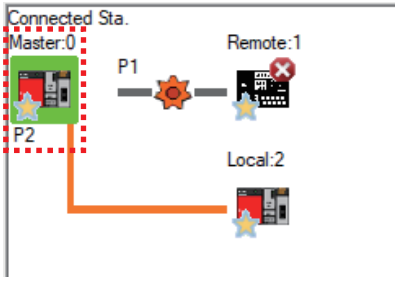


Operating procedure

1. Select [Diagnostics] and [CC-Link IE TSN/CC-Link IE Field Diagnostics] in the menu bar.

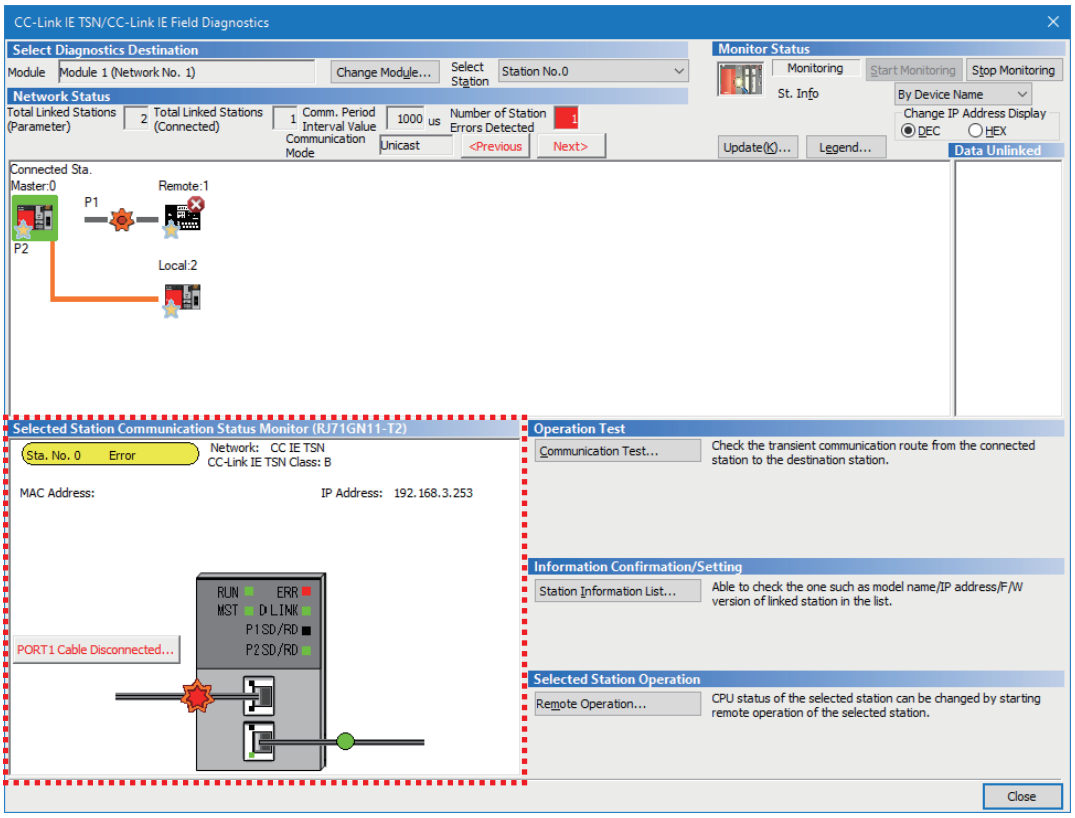


2. Select a station to be checked.



3. The communication status of the selected station is displayed on the top of "Selected Station Communication Status Monitor".

When an error is detected, the [PORT1 Cable Disconnected] button or another error button is display so that the details and corrective actions can be confirmed by clicking the button.



RELEVANT MANUALS

For details, refer to the following relevant manuals.

Manual name [manual number]	Description
MELSEC iQ-R Programmable Controller CPU Module User's Manual [SH-082488ENG]	Procedures before operation, specifications, devices, memory, functions, parameters, and troubleshooting of the programmable controller CPU module
MELSEC iQ-R CC-Link IE TSN User's Manual (Startup) [SH-082127ENG]	Specifications, procedures before operation, system configuration, wiring, and communication examples of CC-Link IE TSN
MELSEC iQ-R CC-Link IE TSN User's Manual (Application) [SH-082129ENG]	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of CC-Link IE TSN
CC-Link IE TSN Remote I/O Module User's Manual (CC-Link IE TSN Communication Mode) [SH-082135ENG]	Part names, specifications, procedures before operation, system configuration, installation, wiring, parameter settings, functions, programming, troubleshooting, and I/O signals of the I/O module to be used in CC-Link IE TSN communication mode
CC-Link IE TSN Industrial Managed Switch User's Manual [SH-082449ENG]	Specifications, procedures before operation, system configuration, installation, wiring, parameter settings, functions, and troubleshooting of the managed switch
GX Works3 Operating Manual [SH-081215ENG]	System configuration, parameter settings, and online operations of GX Works3

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