Interfacing Modular IO Header M-CCIEF-H with Mitsubishi iQ-R PLC on CC-Link IE TSN Network

Quick Start Guide

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1. Scope of Document

This Quick Start Guide explains procedure to interface Mitsubishi Electric India make Modular IO with a Mitsubishi iQ-R PLC over a CC-Link IE TSN network.

Prerequisites

1. Hardware
   - MELSEC iQ-R PLC with CC-Link IE TSN Master

     (Example uses PSU(R61P), CPU (R04CPU), RJ71GN11-T2 (firmware version 23))
   - Modular IO station with M-CCIEF-H (CC-Link IE TSN header module)

     Header assembly modules – Base module, Power supply module, Header module and I/O Adapter module.

     (Example uses M-B3, M-APSU, M-CCIEF-H and M-ADP)

     IO modules as per requirement

     (Example uses IO modules as M-16D, M-16TE, M-AD4 and M-DA4)
2. Engineering tools
   - MELSEC iQ-R - GX Works3 (Version 1.106L or higher)
   - Modular IO - Modular IO Configurator tool (Version 2.1.0.0 or higher)

     Download from Mitsubishi Electric India website - https://mitsubishielectric.in/fa/fa-modular-io.html
   - Modular IO Profile file “0x2071_M-CCIEF-H_0001_en_CCLinkIETSN.CSPP.zip”

     Download from Mitsubishi Electric India website - https://mitsubishielectric.in/fa/fa-modular-io.html

References

- Modular IO User Manual [Manual Number N16001AAMH]
- MELSEC iQ-R CC-Link IE TSN User's Manual (Application)

  (SH(NA)-082129ENG)

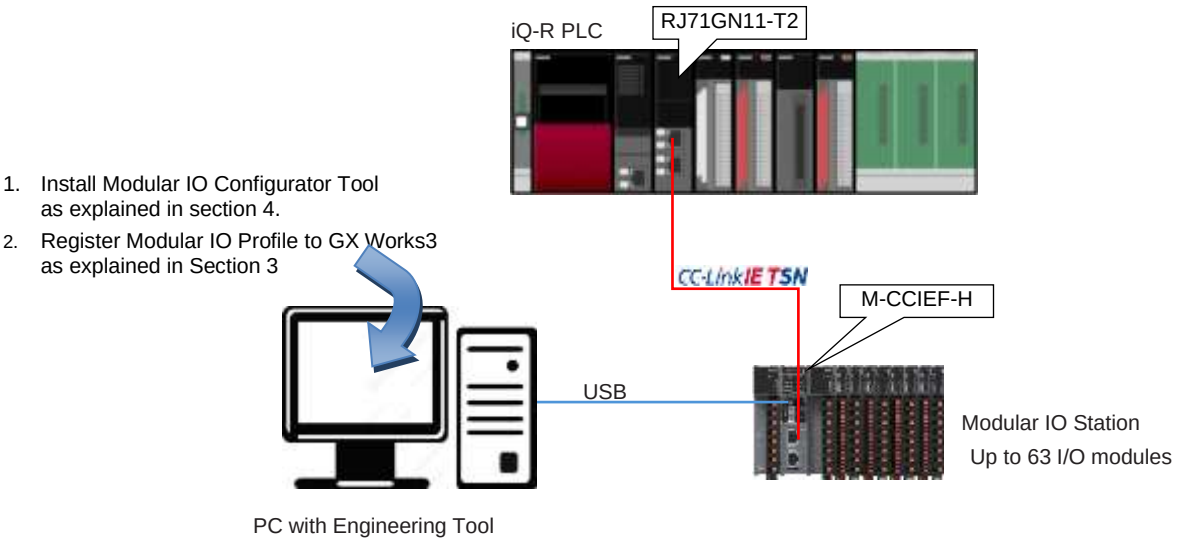
Follow the steps below to interface Modular IO with Mitsubishi PLC.

1. Prepare Hardware Setup
2. Register Modular IO Profile in GX Works3
3. Install Modular IO Configurator Tool
4. Configure Modular IO Station
5. Configure iQ-R master station
6. Monitor Status and Diagnostics

Subsequent sections explain necessary steps in detail.

2. Prepare Hardware Setup

The setup diagram below shows MELSEC iQ-R PLC with RJ71GN11-T2 network module as a CC-Link IE TSN Master and Modular IO station with header module M-CCIEF-H as Slave device.



Setting of IP address / station number

Following two methods can be used to set IP address/ station number

Using parameter + Rotary switch

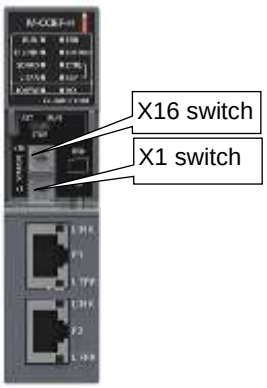
In this method the first three octets are set using parameter 'IP address' and fourth octet of IP address is set using two rotary switches x1 and x16 (hexadecimal) provided on the front side of Header module.

For example:

To set IP address to 192.168.3.21, do settings in Modular IO Configurator Tool as below:

- IP address setting = Rotary switch
- IP address = 192.168.3.X

  Value of X is ignored when "IP address setting = Rotary switch".
- To set 4th octet value i.e. 21 using rotary switch, set x16 = 1 and set x1 = 5. i.e. (1*16)+(5*1)=21



NOTE:

IP address can also be set using parameters ignoring switch setting on the module.

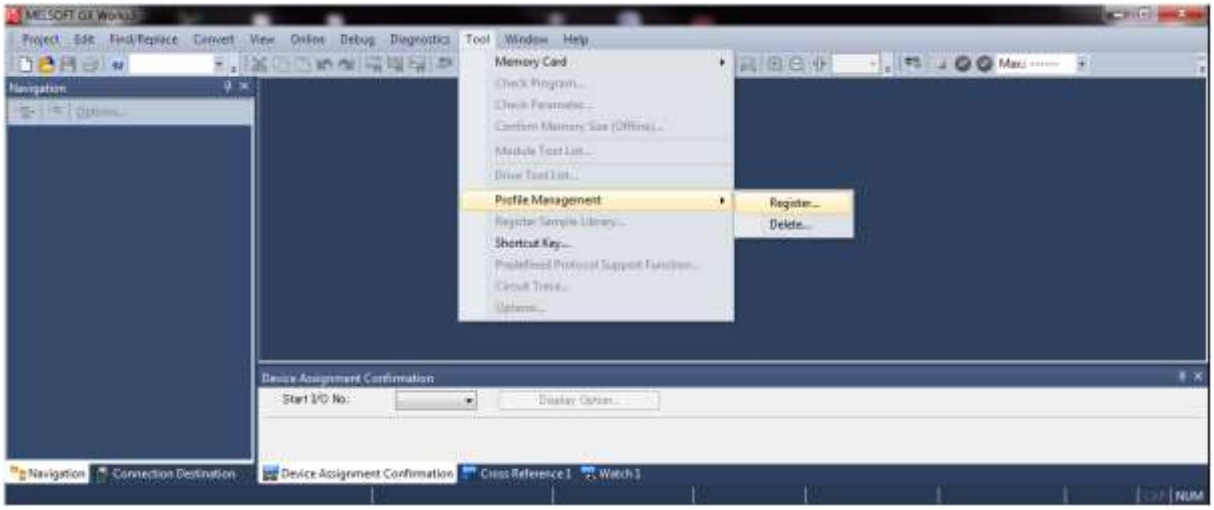
IP address set by rotary switch is detected only during power on, so set the IP address when the header module is powered off.

Refer 'Modular IO User Manual' for more details.

3. Register Modular IO Profile in GX Works 3

This section explains how to register Modular IO profile in Engineering Tool so that Modular IO (M-CCIEF-H) appears in the Module List of Network Configuration Setting → CC-Link IE TSN Configuration.

1. Start GX Works3 and execute command “Tool” → “Profile Management” → “Register”.

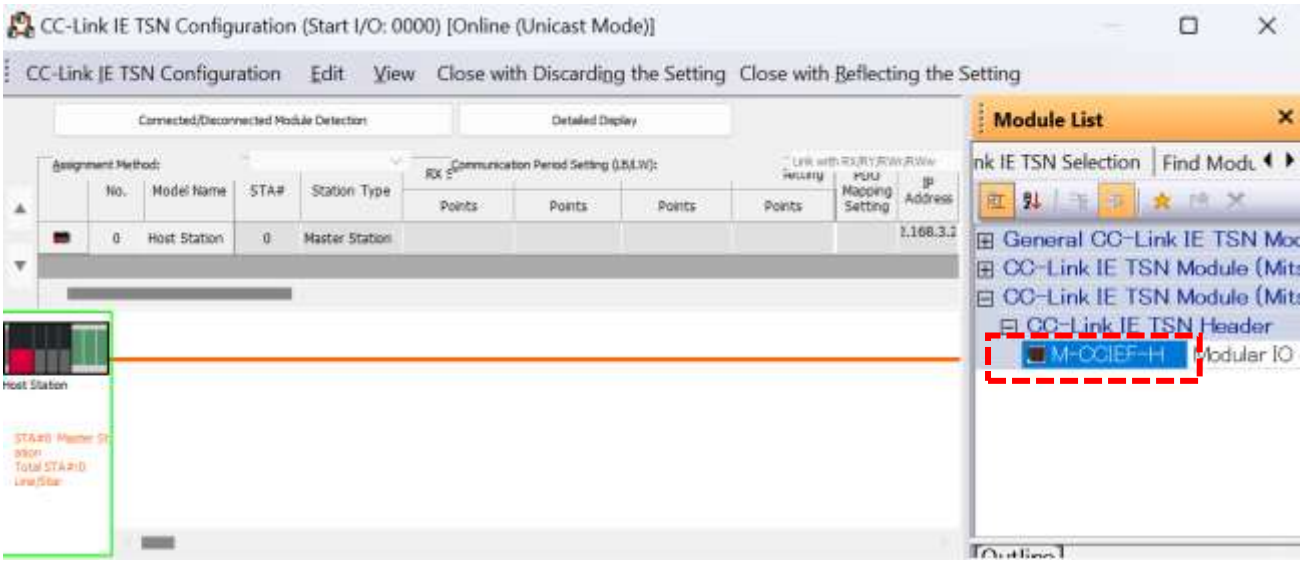


This will invoke “Register Profile” dialogue. Browse Modular IO profile file “0x2071_M-CCIEF-H_0001_en_CCLinkIETSN.CSPP.zip” and click on “Register” button. You will get the message “Registration of the profile is completed “on successful completion.

2. After registration, M-CCIEF-H can be seen in the Module List of “CC IE TSN Configuration” as shown below.

To view the CC IE TSN Configuration window,

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨[Master module RJ71GN11-T2]⇨ [Basic Settings] ⇨ [Network Configuration Setting] and then click on<Detailed Setting>



4. Install Modular IO Configurator Tool

You should have following installer files stored at the same location.

a. ModularIOConfiguratorSetup2.1.0.0.exe

b. ModularIOCommunicationComponent2.1.0.0.exe

Software setup requirement:

Processor	Intel core i3 or Higher version
Disk space	200 MB
RAM memory	2GB or Higher
Screen resolution	1280 x 768 or Higher
Platform	Windows 11 (64 bit)
USB interface	USB 2.0

Following steps explain how to install Modular IO Configuration Tool

1. Run ModularIOConfiguratorSetup2.1.0.0.exe. It will open Modular IO Configuration Tool Setup wizard.

   Click on Next button to complete installation of Modular IO Configuration Tool Setup, Communication Component Setup and Device Driver

2. Click on Finish button to complete Modular IO Configuration Tool Setup.

3. Connect the Modular IO Header module (M-CCIEF-H) to the machine using USB (2.0) cable. For the first time, the driver is automatically searched and configured. Please wait for few minutes while this step is executed.

4. Once the driver is successfully installed, following message will appear.

5. Configure Modular IO Station

This section explains configuration and special features of Modular IO Configurator Tool.

5.1. Configuration of Modular IO Station

Example here shows configuration of following modules.

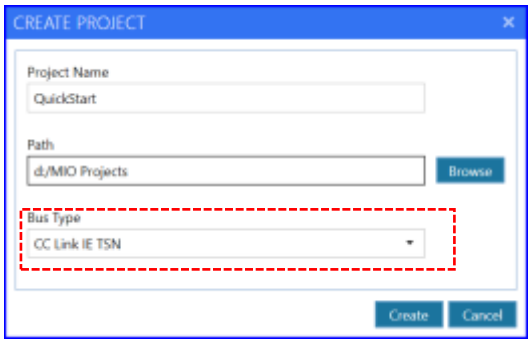
Description	Ordering Code	Quantity
3-slots Base Module	M-B3	1
Redundant AC Power Supply Module	M-APSU	1
CC Link IE Field Header Module	M-CCIEF-H	1
I/O Adapter Module	M-ADP	1
16 Point Digital Input, 24 VDC, Sink Type (Negative Common) Module	M-16D	1
16 Point Digital Output, 24 VDC, Source Type Module	M-16TE	1
2 Channel Universal Analog Input Module	M-AD4	1
2 Channel Analog Output Voltage/ Current Module	M-DA4	1

The following steps explain how to configure modular IO station.

1. Open Modular IO Configurator Tool and view screen layout as beside.

2. Click on  create new project. This operation opens “Create Project” window.

   Enter project name, browse path where project file will be saved. Select Bus type as CC-Link IE TSN.

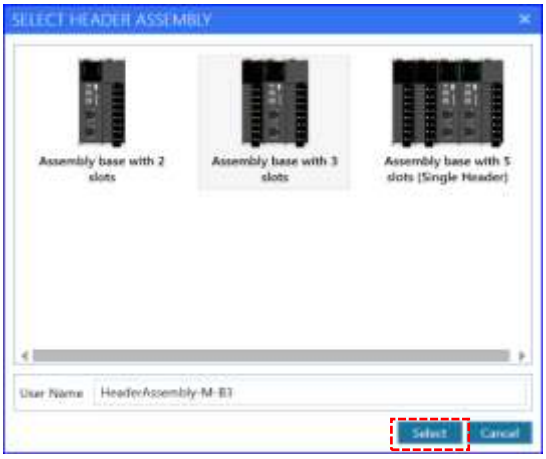


3. Click on  Add header button

4. Add and configure Header module

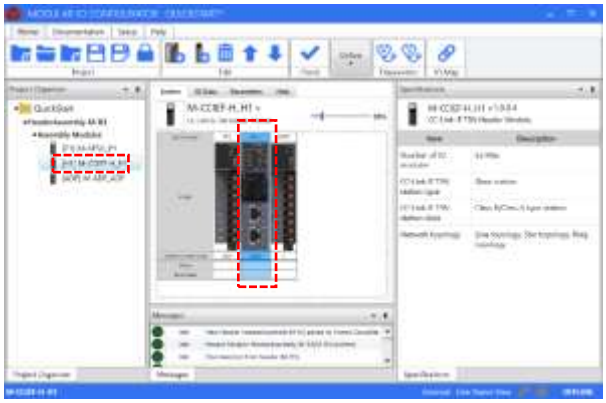
   Add Header dialogue box shows list of Header modules of selected Bus Type. Select Header module M-CCIEF-H and click on '*Add*' button.

5. Select header assembly according to base module requirement and click on '*Select'* button.

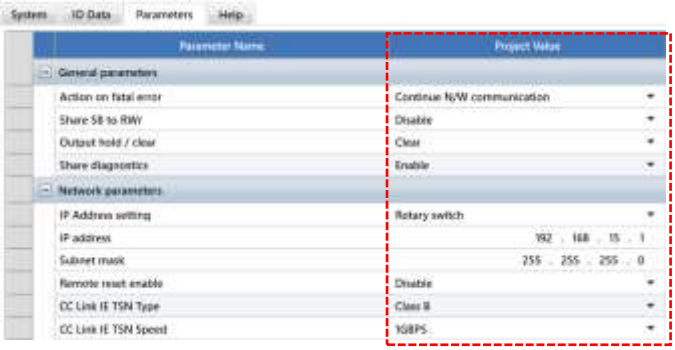


6. Configure header assembly modules as per requirement and click on Add button.

7. Added Header assembly is displayed in tree view as well as in System tab of working area as beside.



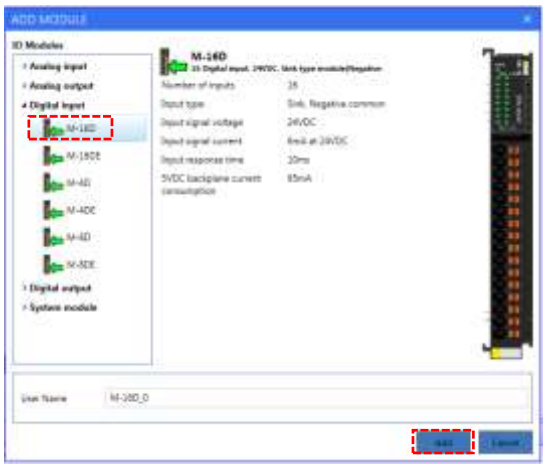
8. Set header parameters - Select Header module H1 from Project Organizer window and click on “Parameters” tab to set Header configuration parameters. User can modify Project Values for individual parameter.



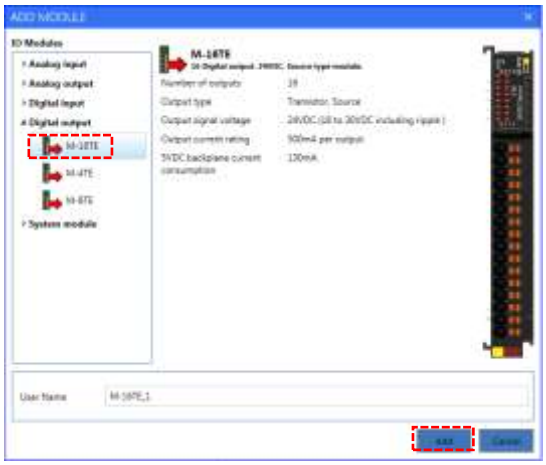
9. Add and configure IO module to modular IO station, as below.

   Click on function  to open dialog box of “Add Module” which shows list of IO modules grouped as per IO module type.

   Select M-16D Digital Input module and click on *Add* button.



10. Select M-16TE Digital output module and click on Add button.



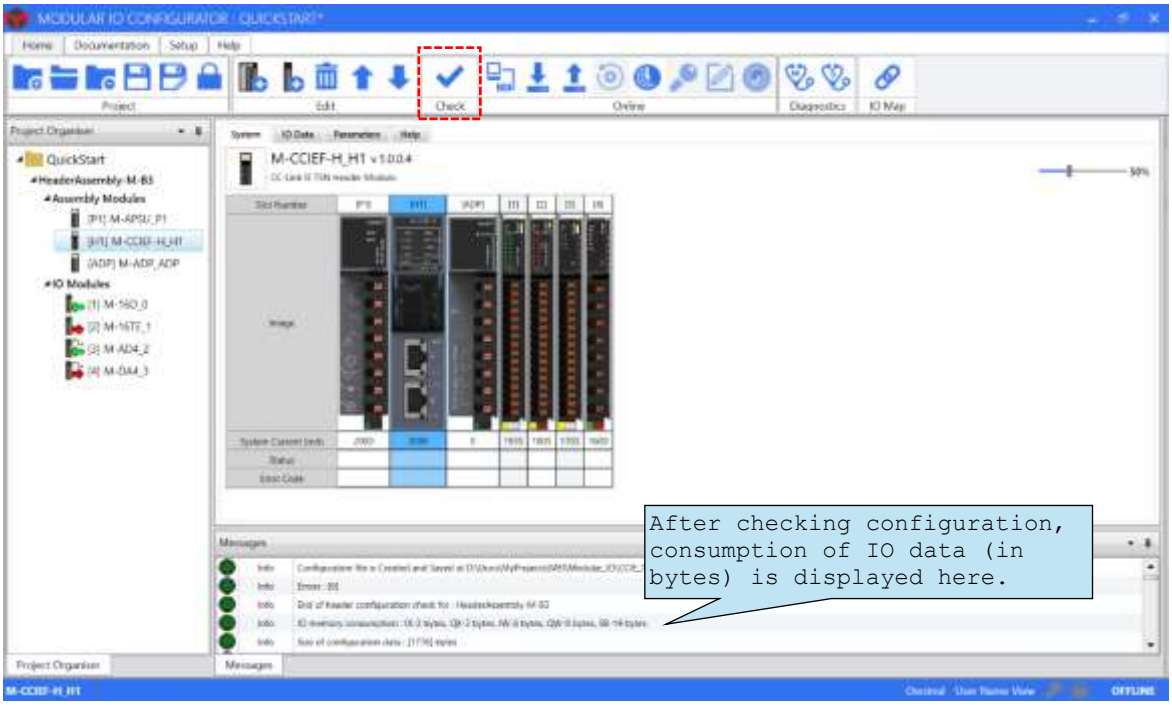
NOTE:

You can use ‘Scan IO modules’ function of Modular IO configurator to read the list of IO modules (other than system modules) physically attached to the Header assembly.

Refer ‘Modular IO User Manual’ for more details.

11. Follow the same procedure to add M-AD4 and M-DA4.

    Added IO modules are displayed in tree view and in System tab in working area as shown below.

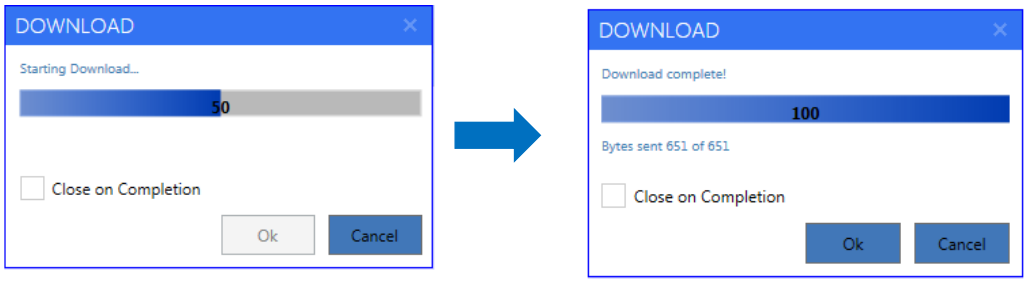


    After adding modules, set parameters of each IO module as per the application requirement.

    For details of parameters of IO modules, refer 'Modular IO User Manual'.

12. User should attach Bus End module (M-BE) at the last slot position if there are 16 or more IO modules.
13. Use 'Check' button to validate configuration. IO memory consumption of Modular IO station is displayed in message window as shown above.
14. Connect Header module to your machine via standard USB cable.

    Click on to download the configuration to connected Header module. This pop ups progress window as shown below. After successful downloading, click Ok.



15. Connect to modular IO station from Modular IO configurator tool and check IO module health and monitor IO memory. Refer section 'Diagnostics in 'Modular IO Configurator'' for details.

NOTE:

You can use 'Output Test' function of Modular IO configurator to test output modules locally even when header is not connected to the fieldbus/ network. You can write individual output (True/ False to digital output module and channel data to analog output module) and test individual output. Refer 'Modular IO User Manual' for more details.

6. Configure iQ-R master station

1. Create new project in GX-Works3

   [Open GX Works3 tool]⇨[Project]⇨[New]⇨[Series - RCPU]⇨[Type – R04]

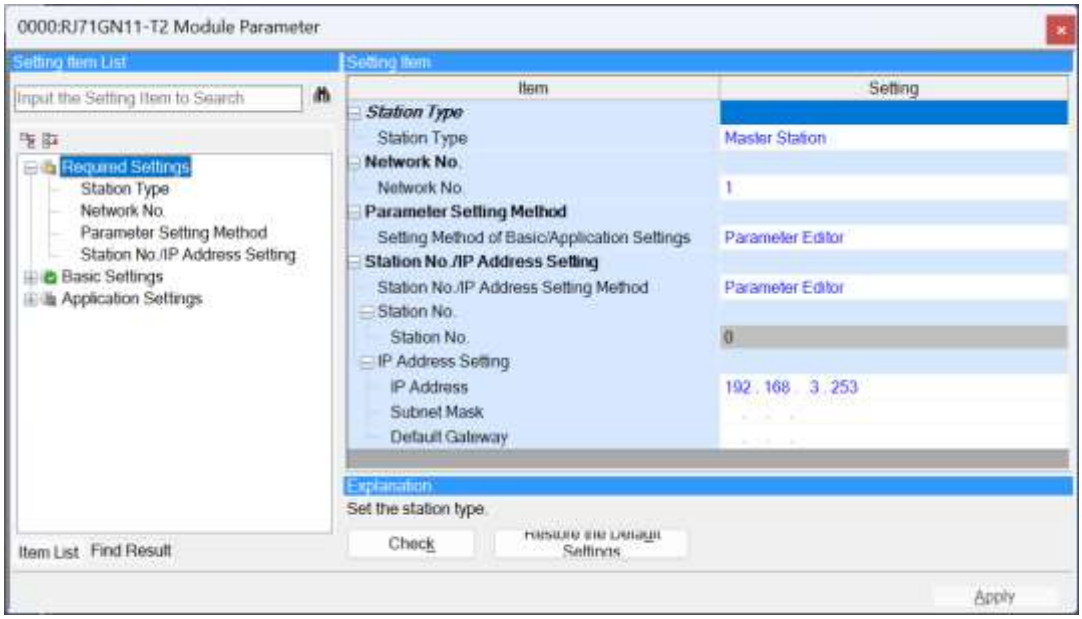
2. Add RJ71GN11-T2 master module in configuration

   [Navigation window] ⇨ [Parameter] ⇨ [System Parameter] ⇨ [I/O Assignment Setting] ⇨ [Click on Module Name field of Slot 0] ⇨ [Add New Module] ⇨[Module Type - Network Module] ⇨[Module name - RJ71GN11-T2] ⇨ [Station Type - Master Station]

3. CC-Link IE TSN Setting - Required settings

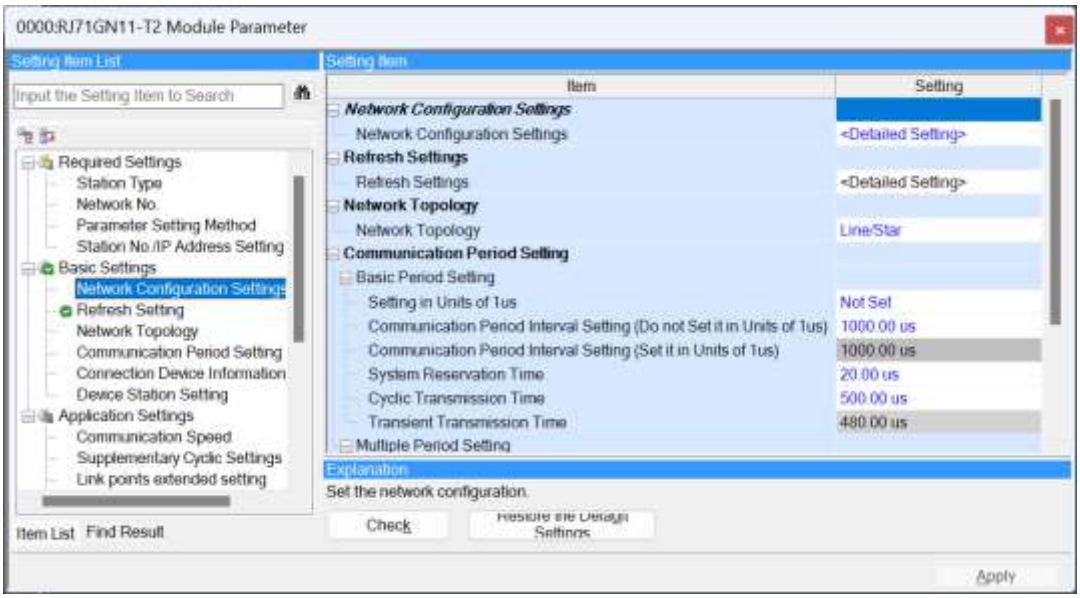
   [Navigation window] ⇨[Parameter] ⇨ [Module Information] ⇨ [Master module RJ71GN11-T2] ⇨ [Required Settings]

Set “Station type”, “Network No.” and “Station no. / IP Address” values in the required settings window.

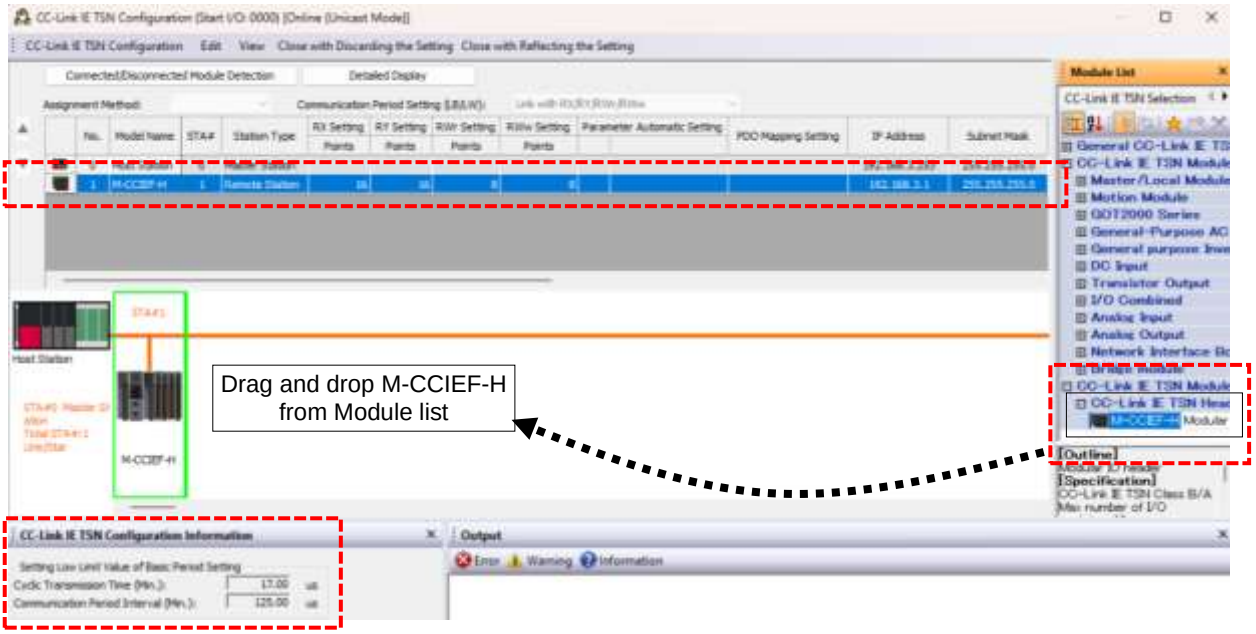


4. CC-Link IE TSN Setting - Basic settings

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [Master module RJ71GN11-T2] ⇨ [Basic Settings]



5. CC-Link IE TSN Setting - Basic settings - Network Configuration Settings → <Detailed setting>
Drag 'M-CCIEF-H from module list and drop to configuration as shown below.



M-CCIEF-H is added as Remote station' in CC-Link IE TSN configuration with default RX/RY Size of 16 points and RWr/RWw size of 8 points.

Item		Description
RX/RY setting		Assign RX/RY points up to 1024 in increments of 16. Default: 16 points.
RWr/RWw setting		Assign RWr/RWw points up to 512 in increments of 4. Default: 8 points.
IP Address		Set the IP address of a station that performs cyclic transmission.
Subnet Mask		Set a subnet mask to identify a network address.
Communication Period Setting		Set communication period setting as below: • Basic period or Normal-Speed: When master station and modular IO station are operating at same speed (1Gbps or 100Mbps) • Low-Speed: When master is operating at 1Gbps and modular IO station is operating at 100Mbps.
CC-Link IE TSN Class		Set whether Modular IO station is a CC-Link IE TSN Class B device or class A device. Default: Class B
CC-Link IE TSN Configuration Information	Cyclic Transmission Time (Min.)	The value that is calculated from the number of device stations and the number of link device points is displayed. These values can be used as reference minimum values to set the cyclic transmission time and communication period interval under 'Basic setting → Communication period setting'.
	Communication Period Interval (Min.)	

6. CC-Link IE TSN Setting - Basic settings - Refresh Settings

Configure refresh settings of RJ71GN11-T2.

Below image shows refresh settings for example modular IO configuration explained in this document

No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB	512	00000	001FF	⇔	Specify Devi	SB	512	00000	001FF
-	SW	512	00000	001FF	⇔	Specify Devi	SW	512	00000	001FF
1	RX	16	00000	0000F	⇔	Specify Devi	X	16	01000	0100F
2	RY	16	00000	0000F	⇔	Specify Devi	Y	16	01000	0100F
3	RWr	4	00000	00003	⇔	Specify Devi	W	4	00000	00003
4	RWw	4	00000	00003	⇔	Specify Devi	W	4	01000	01003

7. CC-Link IE TSN Setting - Application settings – Communication speed (1Gbps / 100Mbps)

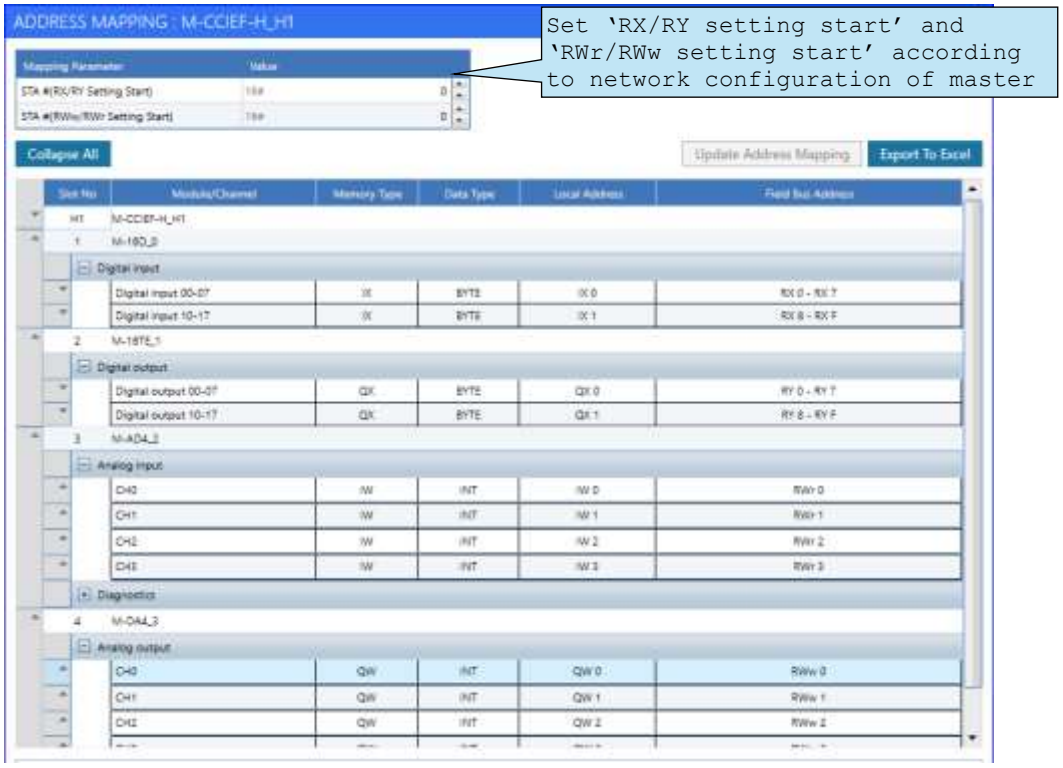
Set the communication speed between the module and the external device i.e. between the master and modular IO station. Communication speed setting at modular IO station may differ depending on project requirement.

In cases where master station is operating at 1Gbps and modular IO station is operating at 100Mbps, set ‘Communication Period Setting’ to ‘Low-Speed’ in ‘Network Configuration Settings → Communication Period Setting’

8. Prepare memory mapping of IO points from Modular IO station → Link side devices → CPU side devices.

You can prepare memory mapping of IO points from ‘Modular IO station local address → Link side devices’ using ‘IO map’ function in Modular IO Configuration tool. The following IO map is created by tool for an example configuration.

Export address mapping to Excel and add CPU side address for each device manually.



The following table shows mapping of Modular IO station local address → CPU side devices of master station.

IO module	Modular IO station local address	Fieldbus address (Link Side address)	CPU Side address
M-16D	IX0.0 to IX1.7	RX0 to RXF	X01000 - X0100F
M-16TE	QX0.0 to QX1.7	RY0 to RYF	Y01000 - Y0100F
M-AD4	IW0 to IW3	RWr0 to RWr3	W00000 – W00003
M-DA4	QW0 to QW3	RWw0 to RWw3	W01000 – W01003

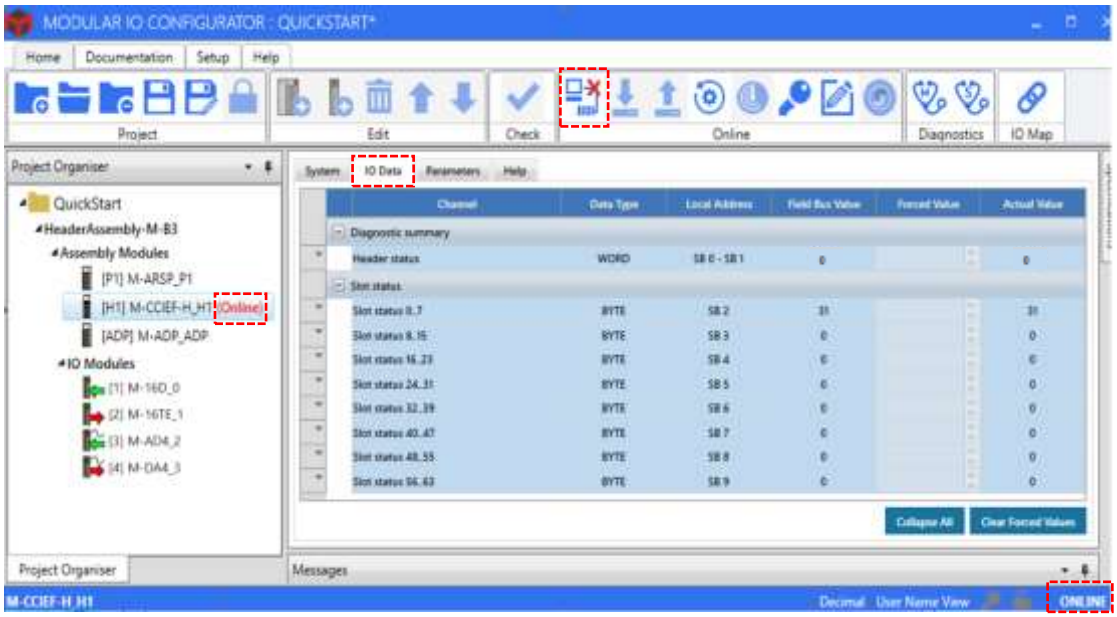
7. Monitor Status and Diagnostics

7.1. Diagnostics in 'Modular IO Configurator'

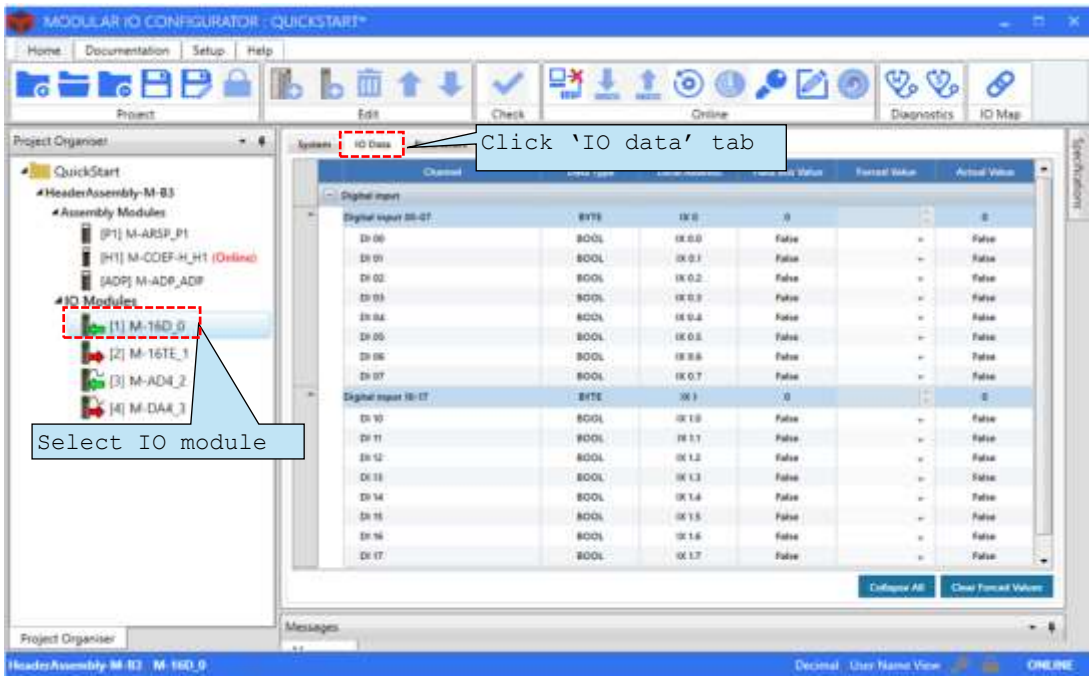
7.1.1. Monitoring IO data

Following steps explain procedure to monitor IO data of a modular IO station in online mode,

1. Click connect button to connect to Header module.
   Icon changes to and Status bar is updated as ONLINE.
2. Select Header module in Project Organiser window and click on tab "IO Data" to monitor diagnostics (SB memory) of Header module.



3. To view IO data of an IO module, select the module in 'Project Organiser' window and click on tab 'IO Data' as shown below.



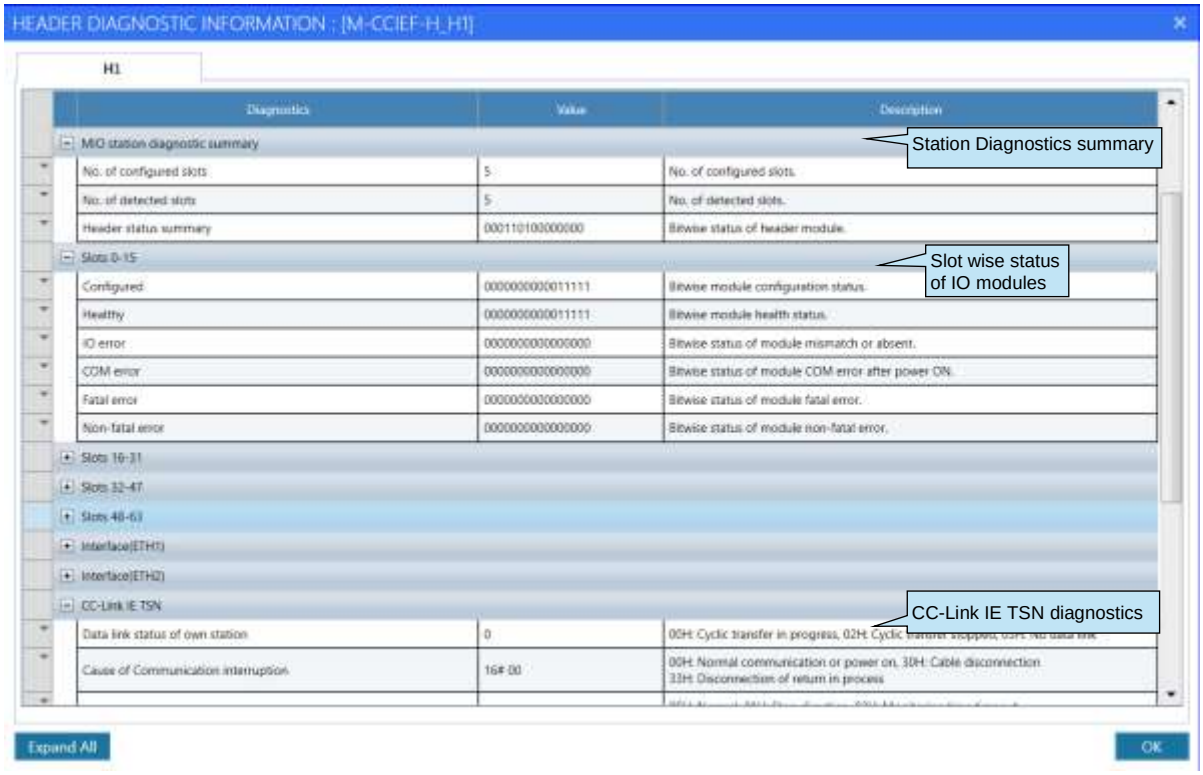
7.1.2. . Header diagnostic

Header diagnostic information covers modular IO station specific as well as Header module specific diagnostic information.

Click on icon to open header diagnostic dialog for monitoring diagnostic information of connected Header module.

This pops up following window of “HEADER DIAGNOSTIC INFORMATION”.

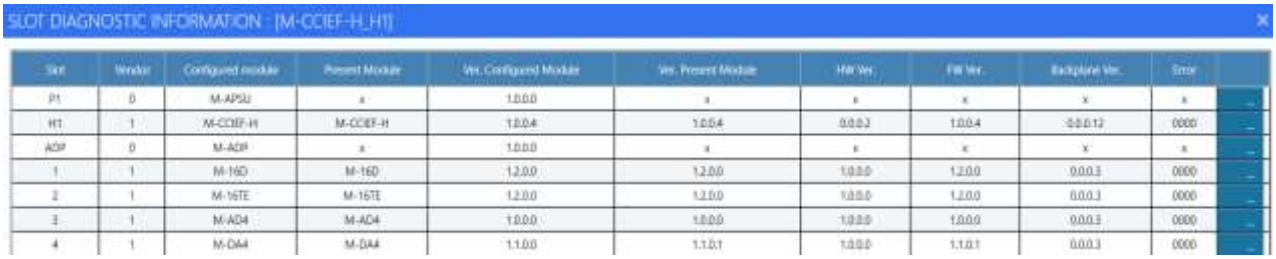
Header diagnostics are categorized for easy monitoring. User can monitor individual parameter by expanding individual diagnostic as shown below.



7.1.3. Slot diagnostic

Slot diagnostic provides slot wise information related to ordering code of configured and present modules, version details of present modules and error code details.

Click on icon to open slot diagnostic dialog.

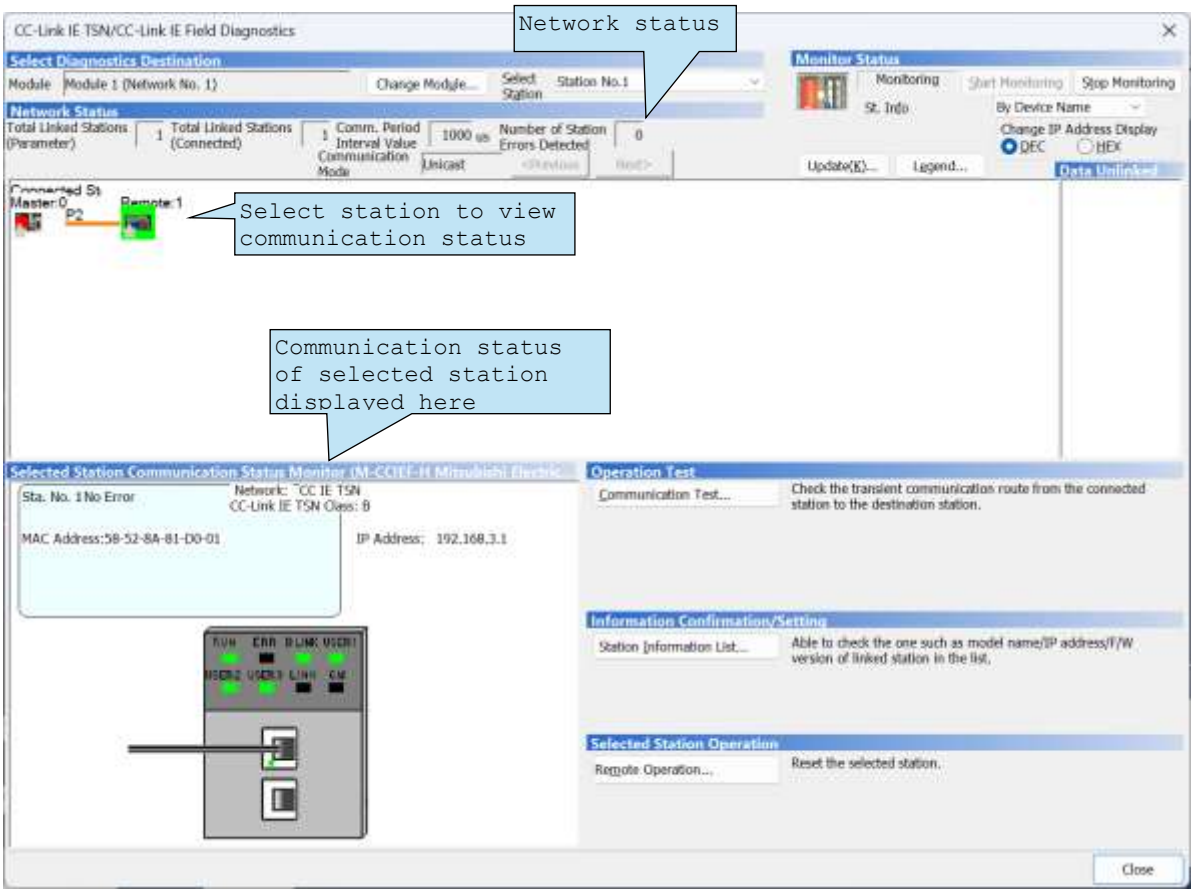


Refer ‘Modular IO user manual’ for more information related to Error codes and diagnostics.

7.2. Diagnostics in GX Works3

7.2.1. CC - Link IE TSN Diagnostics

To access CC-Link IE TSN diagnostics in GX Works3, use menu command [Diagnostics]⇨ [CC-Link IE TSN/CC Link IE Field Diagnostics]. Following CC-Link IE TSN Diagnostics window is displayed.



Refer ‘MELSEC iQ-R CC-Link IE TSN User's Manual (Application) (SH(NA)-082129ENG)’ for more details.

7.3. Diagnostics in link devices of master station

The diagnostic information of CC-Link IE TSN network is also available in link special relays (SB) and link special registers (SW) of master.

Refer 'MELSEC iQ-R CC-Link IE TSN User's Manual (Application) (SH(NA)-082129ENG)' for more details.

Below are few important buffer memory addresses.

Address (Hex)	Name	Description
Link special relays (SB)		
SB0049	Data link error status of own station (Master station)	Stores the data link error status of the own station. Off: Normal, On: Error
SB0065	Loopback status	Stores the loopback status for the loopback function.
SB004C	CPU operating status of own station	Stores the operating status of the CPU module on the own station. Off: RUN, PAUSE On: STOP, or moderate/major error
SB00B0	Data link error status of each station	Stores the data link status of each station. Off: All stations normal On: Faulty station exists
SB00C0	Reserved station setting status	Stores whether a reserved station is set. Off: No setting, On: Set
Link special registers (SW)		
SW0049	Cause of data link stop of own station (master station)	Stores the cause which stopped the data link of the own station.
SW00B0 to SW00B7	Data link status of each station	Stores the data link status of each station. 0: Data link normal station 1: Data link faulty station
SW00C0 to SW00C7	Reserved station setting status	Stores the reserved station setting status of each station. 0: Station other than a reserved station (included reserved stations that have been temporarily cancelled) 1: Reserved station
SW00F0 to SW00F7	CPU operating status of each station	Stores the CPU operating status of each station. 0: RUN, PAUSE 1: STOP or moderate/major error

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