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# MELSEC MX Controller Connection Guide For Drive Unit Manufactured By MABUCHI MOTOR NPM Co., Ltd.

- Target models
- MXR300-16
  - MXR300-32
  - MXR300-64
  - MXR500-128
  - MXR500-256
  - MXF100-8-N32
  - MXF100-8-P32
  - MXF100-16-N32
  - MXF100-16-P32

## Safety Precautions

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- For precautions related to machine design and wiring, please read the safety instructions in the manual for your machine.
- For details regarding the product warranty, please read the warranty information in the manual for your machine.

## Note

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- The examples described in this document are provided for reference only and do not guarantee functionality. When implementing them, please verify the functionality and safety of the equipment or devices yourself before use.
- Available features and settings may vary depending on the product version you are using. Depending on the product version, settings, procedures, and screens may differ from those described in this document. In such cases, refer to your product manual or the software's built-in help.
- Please note that the contents of this manual, including specifications, are subject to change without notice for improvement purposes.
- For information on connecting the software used in this manual to devices, refer to the manuals for each software and device.
- For more detailed information on the contents of this manual, please refer to the relevant manuals.

This section explains the terms used in this document.

For terms not described here, refer to the manuals listed in the “Relevant Manuals” section.

Term	Description
CC-Link IE TSN	An open network that uses “TSN (Time-Sensitive Networking)”, which is an extension of the Ethernet standard, to ensure real-time control and handle information from other open networks simultaneously.
Master station	A station that controls the entire network. This station can perform cyclic transmission and transient transmission with all stations. In this document it refers to the MELSEC MX Controller.
Remote station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission. A transient transmission is available. In this document it refers to a drive unit manufactured by MABUCHI MOTOR NPM Co., Ltd.
PDO	An abbreviation for Process Data Object. A collection of the application objects transmitted periodically between multiple CANopen nodes.
Object	Various data held by the CANopen-compatible device station.

The latest PDF manuals are available from MITSUBISHI ELECTRIC Factory Automation Global website.  
[www.MitsubishiElectric.com/fa](http://www.MitsubishiElectric.com/fa)

Manual name	Manual number
MELSEC MX Controller MX-R Model User's Manual	SH-082641ENG
MELSEC MX Controller MX-R Model Programming Manual	SH-082644ENG
MELSEC MX Controller MX-F Model User's Manual	SH-082634ENG
MELSEC MX Controller MX-F Model Programming Manual	SH-082691ENG
GX Works3 Operating Manual	SH-081215ENG

The latest manuals, library files, and configuration/setup software for drive units manufactured by MABUCHI MOTOR NPM Co., Ltd. are available for download from MABUCHI MOTOR NPM Co., Ltd.'s website.  
[www.pulsemotor.com/global/](http://www.pulsemotor.com/global/)

Manual name	Manual number
CC-Link IE TSN Interface Bipolar 1-axis Stepping Motor Driver CLET-AD1442A1A User's Manual	TA600114-EN
CLET-AD1442A1A Utility Software User's Manual	TA600180-EN

<b>1. OVERVIEW</b>	.....6	<b>4. OPERATION CHECK</b>	.....39
1.1 Overview	.....7	4.1 Create Program	.....40
1.2 Drive Unit Manufactured by MABUCHI MOTOR NPM Co., Ltd.	.....8	4.2 Operation Check	.....49
1.3 List of Restrictions	.....9	<b>APPENDICES</b>	.....54
1.4 System Configuration	.....11	App.1 External Signal Settings	.....55
1.5 Setup Procedure	.....12	App.2 Troubleshooting	.....59
<b>2. DRIVE UNIT SETTINGS</b>	.....13		
2.1 Parameter Settings	.....14		
2.2 Points	.....18		
<b>3. CONTROLLER SETTINGS</b>	.....19		
3.1 Preparation	.....20		
3.2 Create Project	.....21		
3.3 Module Parameter Settings	.....26		
3.4 Axis Parameter Settings	.....34		

# 1. OVERVIEW

This document explains the configuration steps to connect the MELSEC MX Controller MX-R Model\*<sup>1</sup> and a drive unit manufactured by MABUCHI MOTOR NPM Co., Ltd. over CC-Link IE TSN.

In this document the MELSEC MX Controller MX-R Model is referred to as the controller.

By referring to this document and using engineering tools to configure network connections and create programs, you can:

(1) Connect various CC-Link IE TSN compatible devices (drive units, inverters, etc.)

Through the controller, you can connect to drive units and inverters compatible with CC-Link IE TSN. Therefore, the options for equipment selection expand when building or modifying equipment.

(2) With PLCopen<sup>®</sup> Motion Control FB, each drive unit can be controlled with a consistent user experience

You can program using Motion Control FB compliant with IEC 61131-3. Therefore, program specifications such as operation specifications and interface specifications are standardized regardless of a drive unit, allowing each drive unit to be controlled with a consistent user experience.



\*1: You can connect a drive unit manufactured by MABUCHI MOTOR NPM Co., Ltd. to the MX-F Model using the same procedure.

Below is the product specifications of the drive unit “CLET-AD1442A1A” manufactured by MABUCHI MOTOR NPM Co., Ltd. compatible with CC-Link IE TSN.

## ■ CLET-AD1442A1A

Item		Specification
Communication protocol		CC-Link IE TSN Class B
Communication speed		1Gbps / 100Mbps
Operating mode		CiA402 Drive profile: Cyclic synchronous position mode (CSP) / Profile position mode (PP) / Homing mode (HM)
Synchronization method	Time synchronization method	IEEE1588 / IEEE802.1AS
	Communication cycle	Minimum 500 $\mu$ s
Encoder type		Incremental type

Below are the limitations of motion control functions when the controller is connected to the drive unit. For details on each function, please refer to the controller manual.

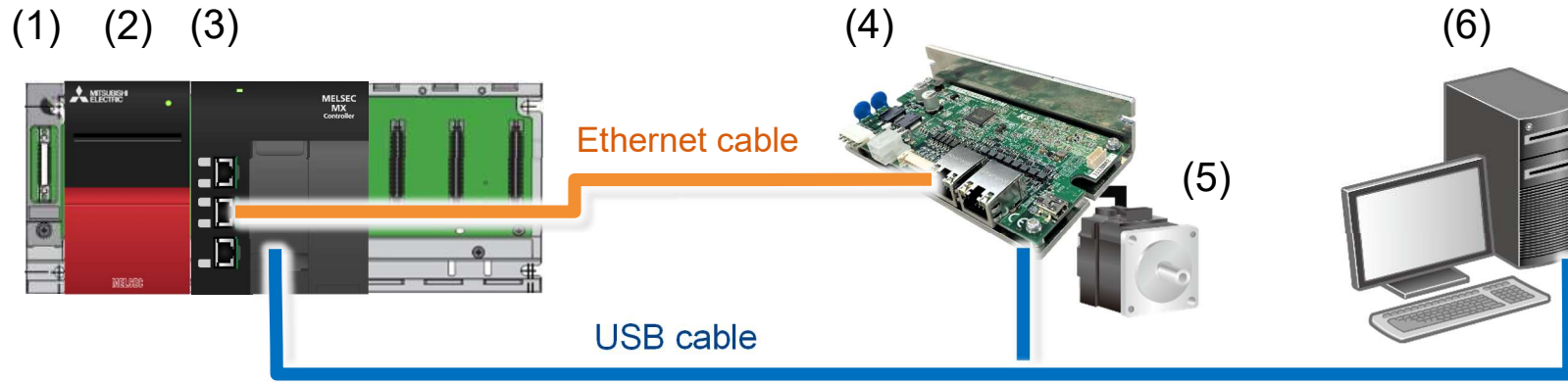
Item	Restriction
Follow up	<p>Always perform a home position return after turning servo ON.</p> <p>Because this is an open-loop control system, the “Position actual value (Index: 6064h, Sub index: 00h)” is not updated during servo OFF.</p> <p>The follow up function uses the “Position actual value (Index: 6064h, Sub index: 00h)” to reflect motor rotation in the controller’s command; therefore, any motor rotation during servo OFF will cause a discrepancy between the controller’s command position and the motor’s actual position.</p>
Absolute position control	Since the encoder is of the incremental type, the absolute position system cannot be used.
Driver homing method	The home position switch (AbsSwitch) for MC_Home (OPR) cannot be used to transmit the dog signal to the drive unit.
Speed to positioning move control	External signal high-accuracy input is not supported.
Velocity control	Since the drive unit does not support Cyclic synchronous velocity mode (CSV), MC_MoveVelocity (Speed Control) cannot be used.
Torque control	Since the drive unit does not support Cyclic synchronous torque mode (CST), MC_TorqueControl(Torque control) cannot be used.
Pressure control	Since only MELSERVO supports the pressure control, MCv_PressureControl (Pressure Control) cannot be used.

Item	Restriction
Torque limit	<p>Since the drive unit does not support “Positive torque limit value (Index: 60E0h, Sub index: 00h)” and “Negative torque limit value (Index: 60E1h, Sub index: 00h),” the following functions cannot be used.</p> <ul style="list-style-type: none"> <li>• AxisName.PrConst.TorqueLimit_Max (Torque Limit Maximum Value)</li> <li>• AxisName.PrConst.TorqueLimit_PositiveInitial (Positive Direction Torque Limit Initial Value)</li> <li>• AxisName.PrConst.TorqueLimit_NegativeInitial (Negative Direction Torque Limit Initial Value)</li> <li>• AxisName.Cd.TorqueLimit_Positive (Positive Direction Torque Limit Value)</li> <li>• AxisName.Cd.TorqueLimit_Negative (Negative Direction Torque Limit Value)</li> <li>• MCv_SetTorqueLimit (Torque Limit Value)</li> </ul>
External signal selection	External signal high-accuracy input is not supported.
Touch probe	External signal high-accuracy input is not supported.
Axis emulation	It is emulated as an MR-J5-G.
Advanced synchronous control	External signal high-accuracy input cannot be used for the clutch signal setting.
Positioning data history	<p>Among this history data, the following data will always remain “0.”</p> <ul style="list-style-type: none"> <li>• Home cycle counter</li> <li>• Home ABS counter</li> <li>• Encoder multiple revolution position</li> <li>• Encoder 1 revolution position</li> </ul>

# 1.4

## System Configuration

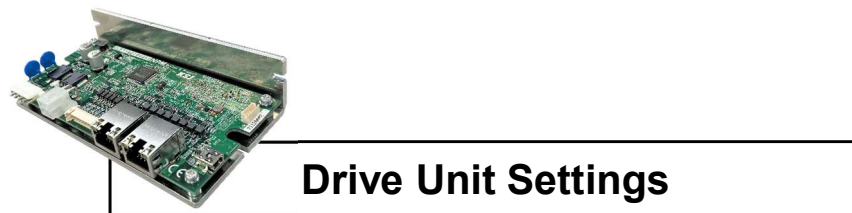
In this document, the explanation is based on the following system configuration.



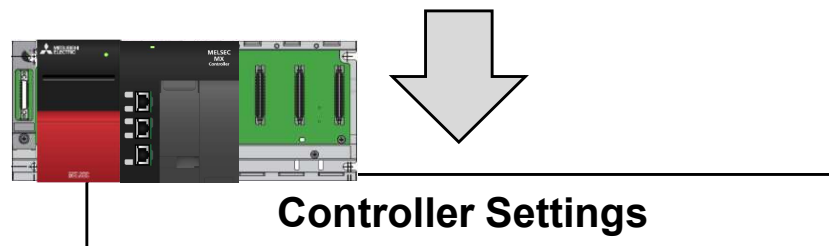
Device		Model name / Software	Supported version	Version used in this document
(1)	Main base module	R35B	—	—
(2)	Power supply module	R64P	—	—
(3)	Controller	MXR500-256	“01” or later	“04”
(4)	Drive unit	CLET-AD1442A1A	—	“02.05.4b”
(5)	Motor	PEM42H235E1KZS-19	—	—
(6)	Configuration PC	GX Works3	“1.115V” or later	“1.120A”
		CLET-Utility	—	“1.0.2”

This section describes the setup procedures to connect the controller and drive unit in the system configuration described above.

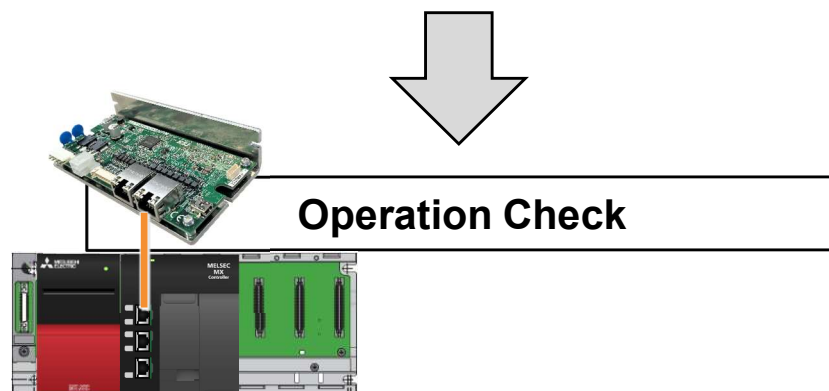
Follow the steps below to perform the setup and verify operation.



Using the engineering tool, configure the parameters of the drive unit.



Using the engineering tool, create the controller project, configure the unit parameters (communication method, connection destination), and set up motion control (axis parameters).



Create a program to verify that the controller and drive unit are correctly configured.

Operate the label to confirm that the motor operates properly.

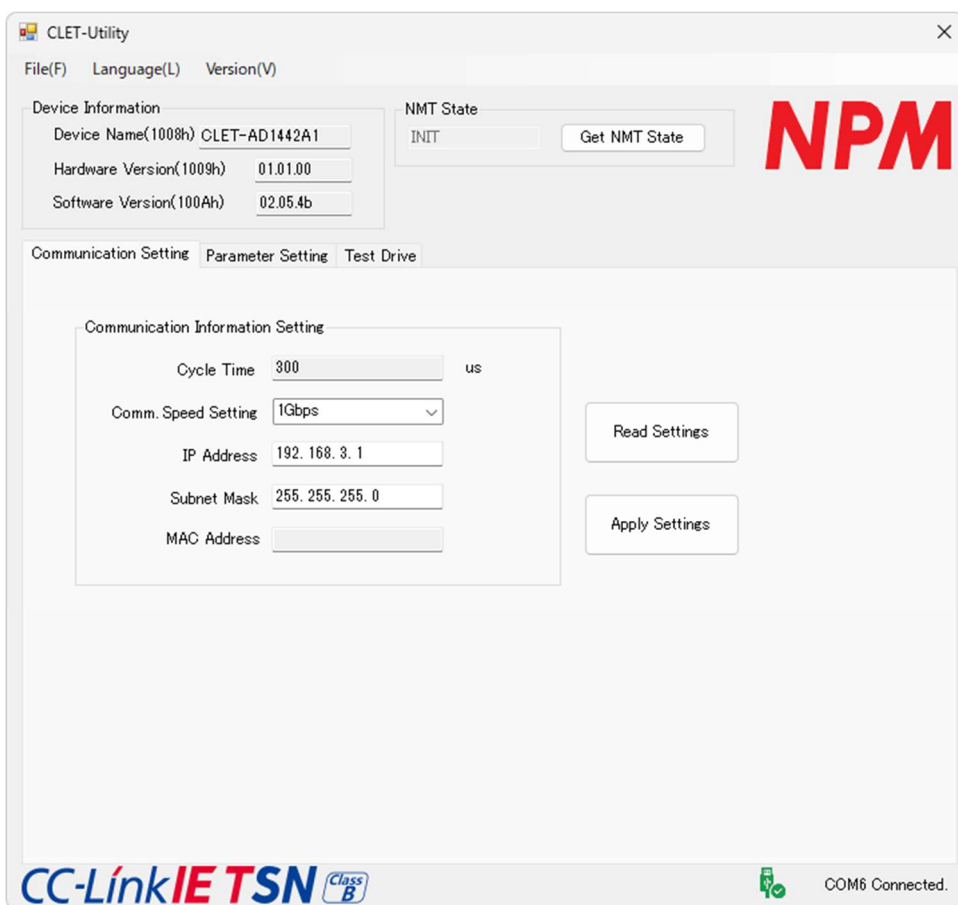
## **2. DRIVE UNIT SETTINGS**

This section explains the procedure for configuring the drive unit parameters using CLET-Utility.

Before launching CLET-Utility, turn on the power to the drive unit and connect it to the configuration PC via an USB cable.

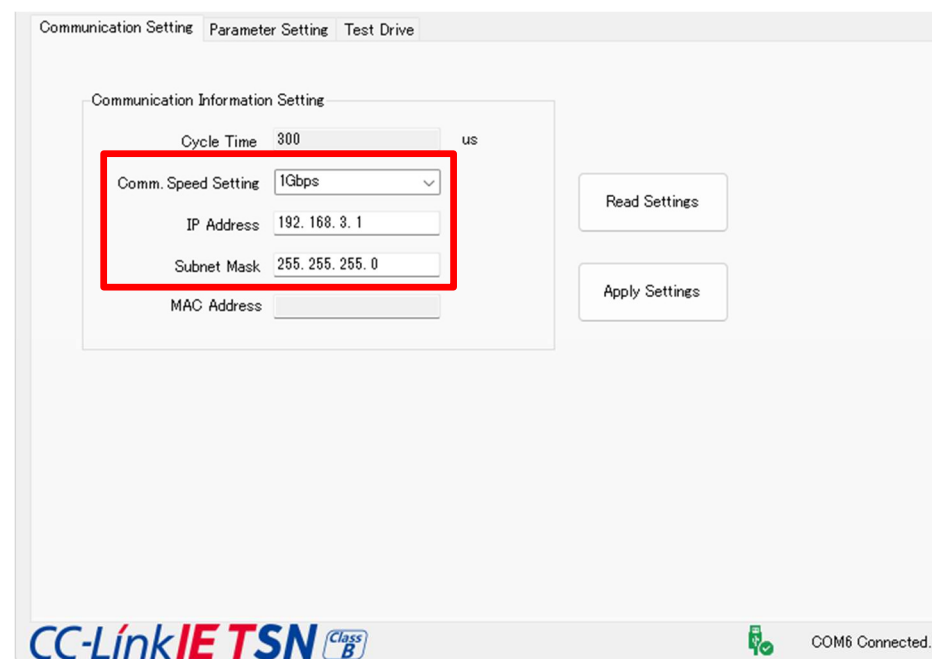
## ■ Communication Setting

### 1. Start CLET-Utility.

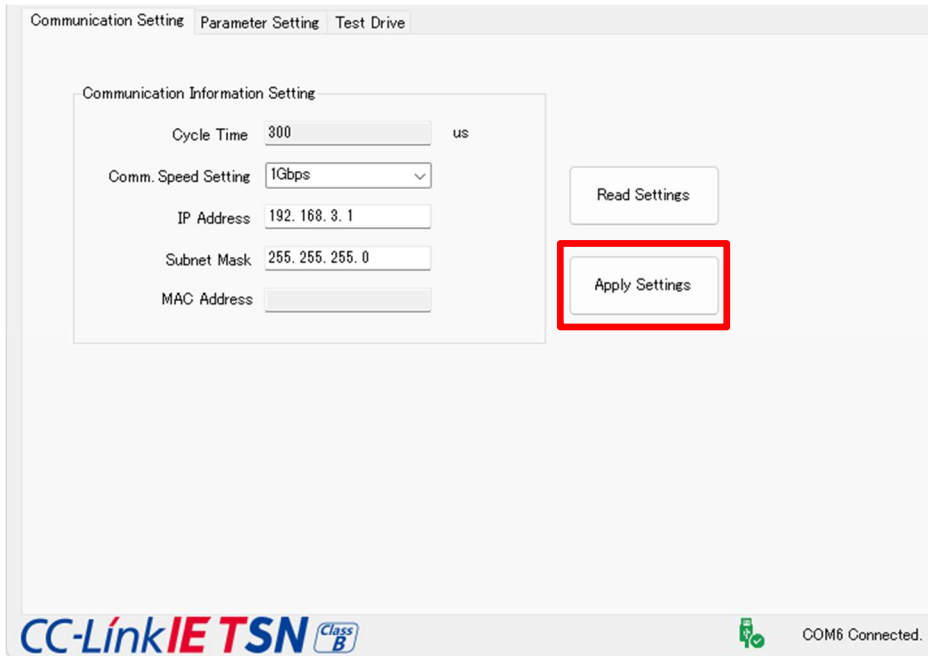


### 2. Select the [Communication Setting] tab, open the “Communication Setting” window, and configure the following items.

- **Comm. Speed Setting: 1Gbps**
- **IP Address: 192.168.3.1**
- **Subnet Mask: 255.255.255.0**



### 3. Click the [Apply Settings] button.



Communication Setting Parameter Setting Test Drive

Communication Information Setting

Cycle Time 300 us

Comm. Speed Setting 1Gbps

IP Address 192.168.3.1

Subnet Mask 255.255.255.0

MAC Address

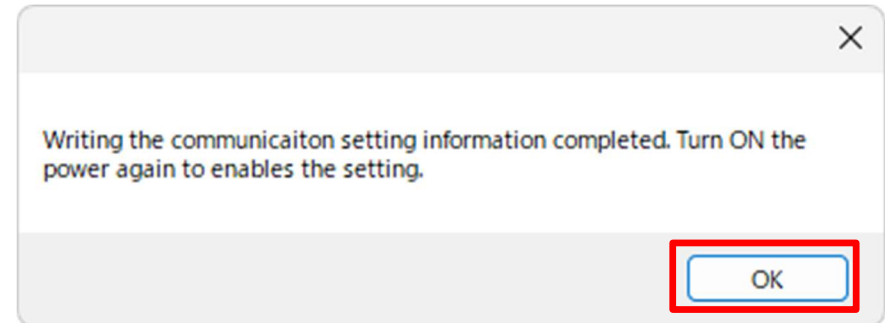
Read Settings

Apply Settings

CC-Link IE TSN Class B

COM6 Connected.

### 4. Click the [OK] button, then turn the power of the drive unit OFF and back ON.

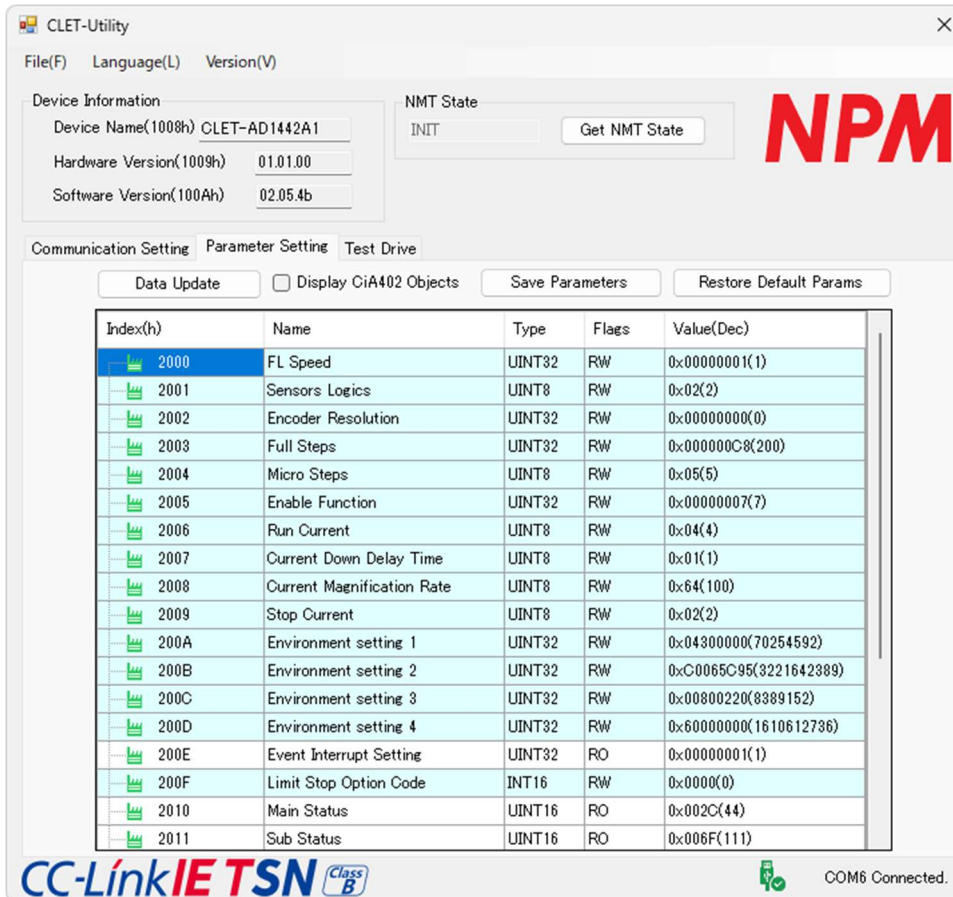


Writing the communication setting information completed. Turn ON the power again to enable the setting.

OK

## ■ Parameter Setting

1. Select the [Parameter Setting] tab, open the “Parameter Settings” window.



CLET-Utility

File(F) Language(L) Version(V)

Device Information

Device Name(1008h) CLET-AD1442A1

Hardware Version(1009h) 01.01.00

Software Version(100Ah) 02.05.4b

NMT State


INIT

**NPM**

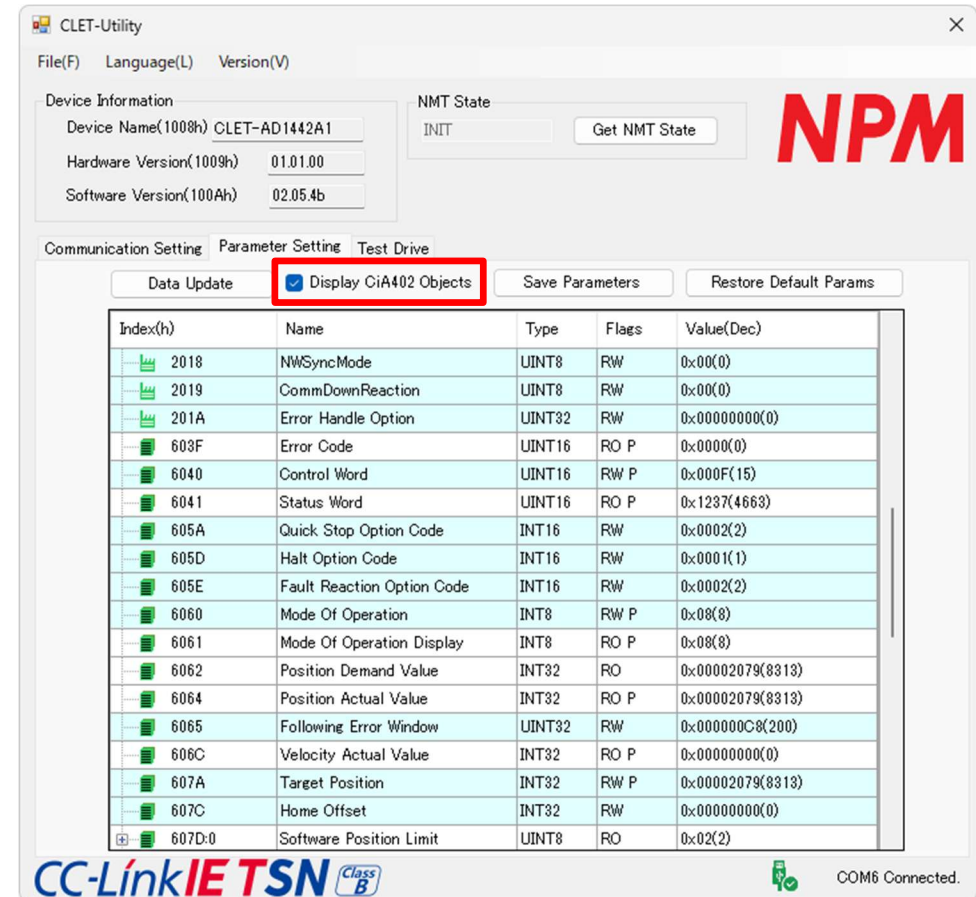
Communication Setting **Parameter Setting** Test Drive

Display CiA402 Objects

Index(h)	Name	Type	Flags	Value(Dec)
2000	FL Speed	UINT32	RW	0x00000001(1)
2001	Sensors Logics	UINT8	RW	0x02(2)
2002	Encoder Resolution	UINT32	RW	0x00000000(0)
2003	Full Steps	UINT32	RW	0x000000C8(200)
2004	Micro Steps	UINT8	RW	0x05(5)
2005	Enable Function	UINT32	RW	0x00000007(7)
2006	Run Current	UINT8	RW	0x04(4)
2007	Current Down Delay Time	UINT8	RW	0x01(1)
2008	Current Magnification Rate	UINT8	RW	0x64(100)
2009	Stop Current	UINT8	RW	0x02(2)
200A	Environment setting 1	UINT32	RW	0x04300000(70254592)
200B	Environment setting 2	UINT32	RW	0xC0065C95(3221642389)
200C	Environment setting 3	UINT32	RW	0x00800220(8389152)
200D	Environment setting 4	UINT32	RW	0x60000000(1610612736)
200E	Event Interrupt Setting	UINT32	RO	0x00000001(1)
200F	Limit Stop Option Code	INT16	RW	0x0000(0)
2010	Main Status	UINT16	RO	0x002C(44)
2011	Sub Status	UINT16	RO	0x006F(111)

CC-Link IE TSN Class B  COM6 Connected.

2. Check [Display CiA402 Objects] to show the CiA402 objects.



CLET-Utility

File(F) Language(L) Version(V)

Device Information

Device Name(1008h) CLET-AD1442A1

Hardware Version(1009h) 01.01.00

Software Version(100Ah) 02.05.4b

NMT State


INIT

**NPM**

Communication Setting **Parameter Setting** Test Drive

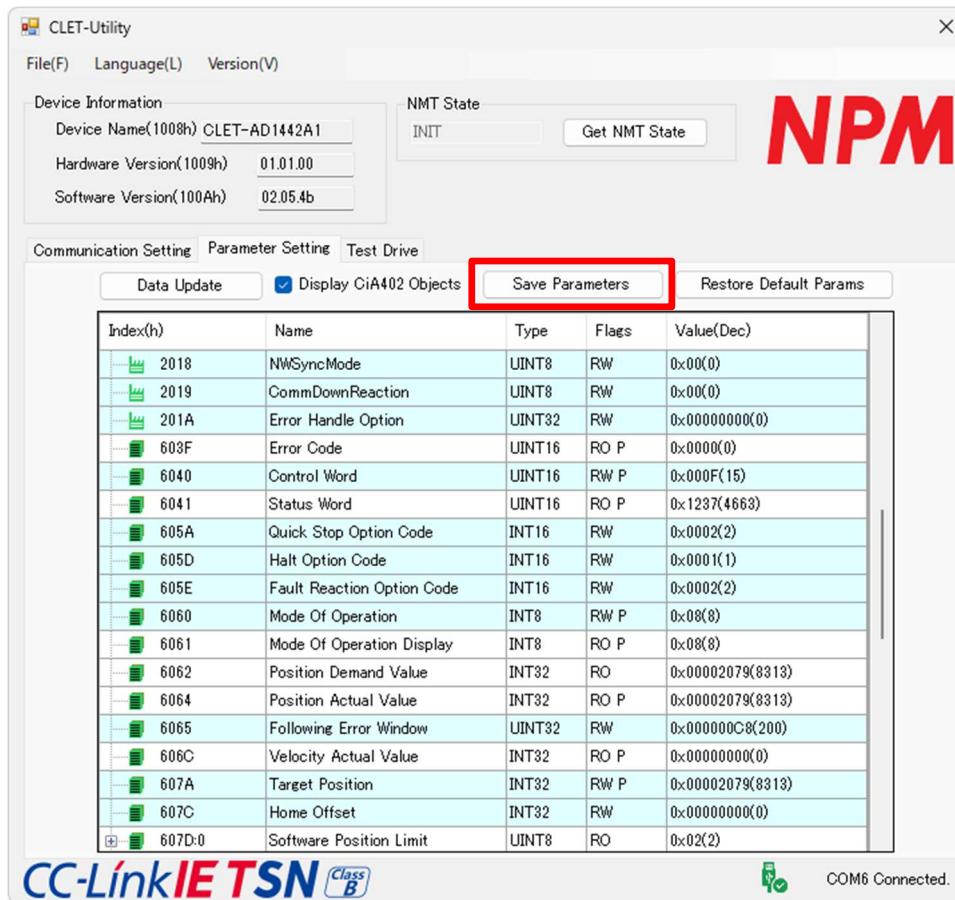
Display CiA402 Objects

Index(h)	Name	Type	Flags	Value(Dec)
2018	NWSyncMode	UINT8	RW	0x00(0)
2019	CommDownReaction	UINT8	RW	0x00(0)
201A	Error Handle Option	UINT32	RW	0x00000000(0)
603F	Error Code	UINT16	RO P	0x0000(0)
6040	Control Word	UINT16	RW P	0x000F(15)
6041	Status Word	UINT16	RO P	0x1237(4663)
605A	Quick Stop Option Code	INT16	RW	0x0002(2)
605D	Halt Option Code	INT16	RW	0x0001(1)
605E	Fault Reaction Option Code	INT16	RW	0x0002(2)
6060	Mode Of Operation	INT8	RW P	0x08(8)
6061	Mode Of Operation Display	INT8	RO P	0x08(8)
6062	Position Demand Value	INT32	RO	0x00002079(8313)
6064	Position Actual Value	INT32	RO P	0x00002079(8313)
6065	Following Error Window	UINT32	RW	0x000000C8(200)
606C	Velocity Actual Value	INT32	RO P	0x00000000(0)
607A	Target Position	INT32	RW P	0x00002079(8313)
607C	Home Offset	INT32	RW	0x00000000(0)
607D:0	Software Position Limit	UINT8	RO	0x02(2)

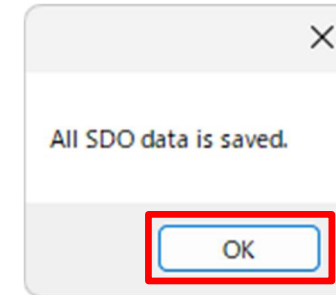
CC-Link IE TSN Class B  COM6 Connected.

3. Configure the parameters as appropriate for your environment.

When you have finished setting the parameters, click the [Store Parameters] button.



4. Click the [OK] button, then turn the power of the drive unit OFF and back ON.



Here are the key points regarding the drive unit parameter settings. For detailed information on the parameters, please refer to the drive unit manual.

- When performing driver-based home position return, the initial value of “Homing method (Index: 6098h, Sub index: 00h)” is “0 (No Mode)” so please set it to a valid value. Also, set “Home offset (Index: 607Ch, Sub index: 00h)” to “0.” If a value other than “0” is set, the controller’s command position and the motor’s actual position may differ when homing is completed.
- Set “Limit stop Option Code (Index: 200Fh, Sub index: 00h)” to “1 (Enable stop processing by +EL, -EL).” The default value of the “Limit Stop Option Code” is 0 (Enable stop processing by +EL, -EL in pp and hm modes / Disable stop processing by +EL, -EL in csp mode), so the axis will not stop if a hardware stroke limit signal is detected in csp mode.
- If you want to change the behavior during communication interruption, set “CommDownReaction (Index: 2019h, Sub index: 00h).” The default value of “CommDownReaction” is “0 (no processing),” and depending on the control mode the axis may not stop during communication interruption.

# 3. CONTROLLER SETTINGS

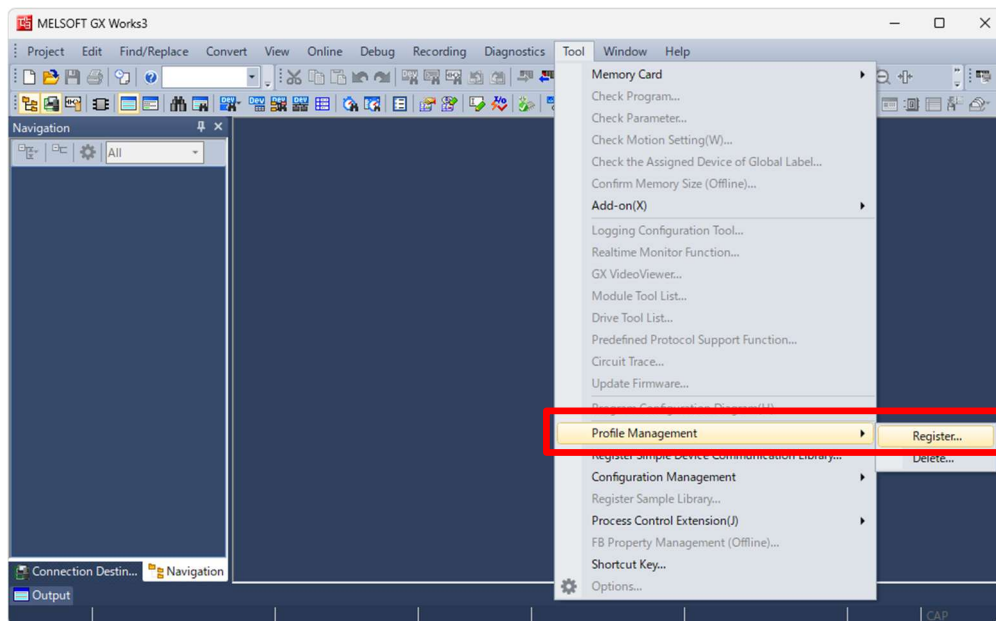
Register the drive unit profile (\*.zip) in GX Works3. Since you cannot register the profile while a project is open, please do this before creating a project.

The profile can be downloaded from MABUCHI MOTOR NPM Co., Ltd.'s website.

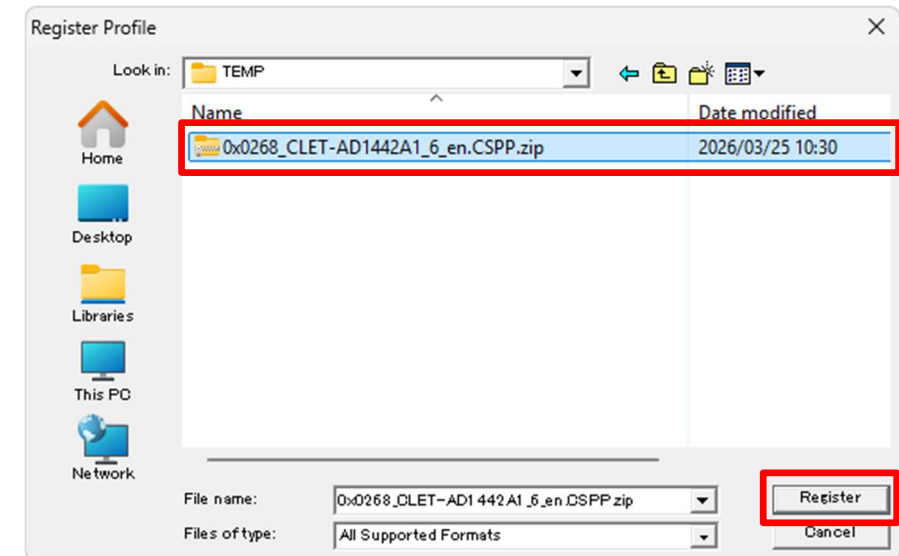
[www.pulsemotor.com/global/](http://www.pulsemotor.com/global/)

### 1. Start GX Works3.

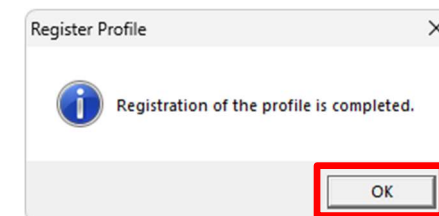
Select [Tool] → [Profile Management] → [Register]  
from the menu bar.



### 2. Choose the profile and click the [Register] button.



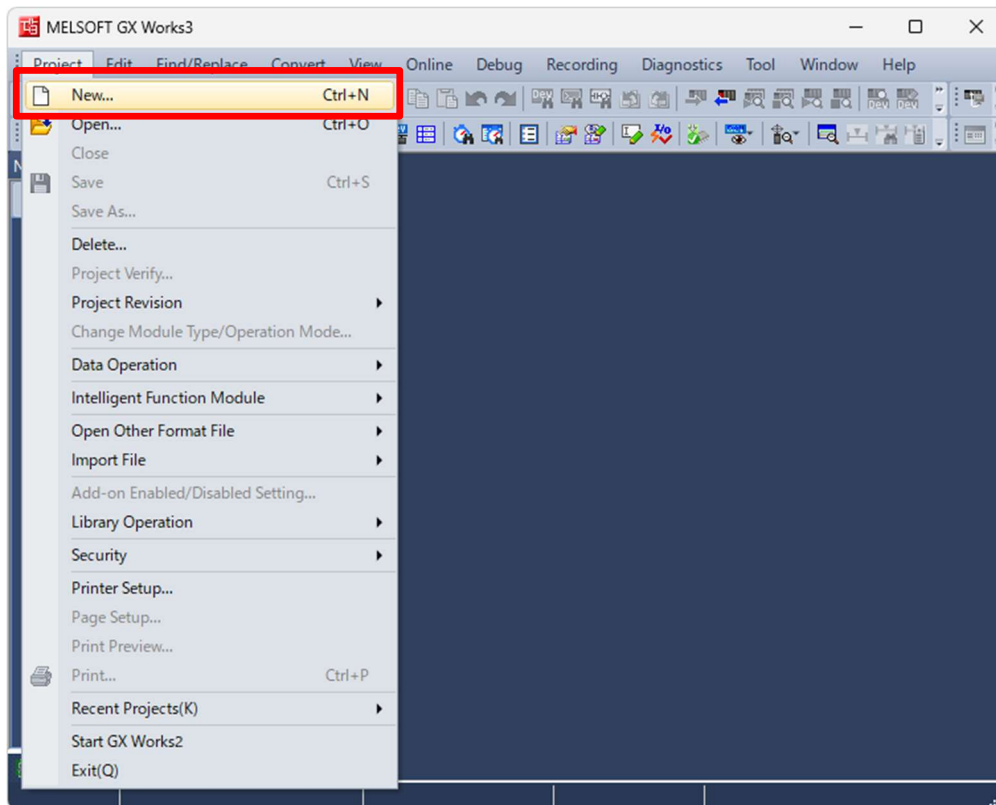
### 3. Click the [OK] button.



Create a controller project in GX Works3.

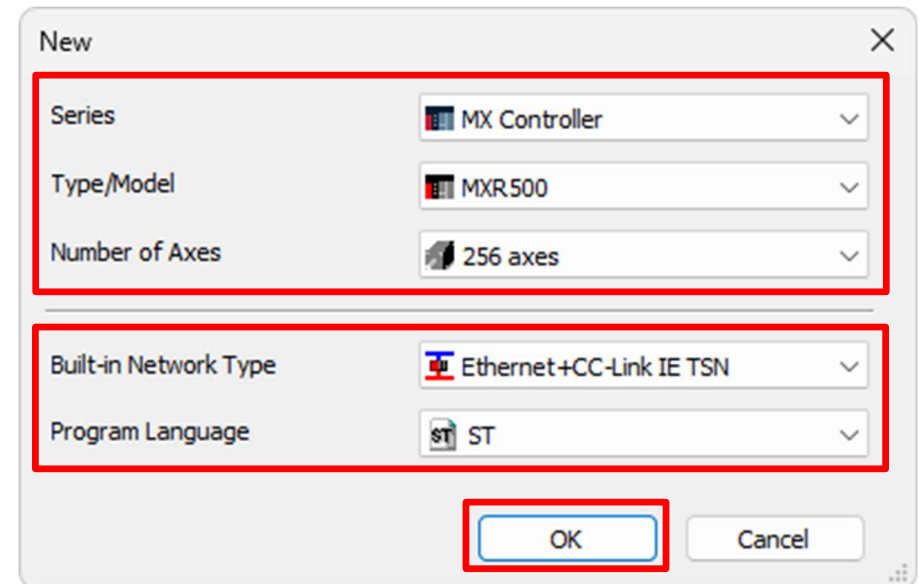
1. Create a new project.

Select [Project] → [New] from the menu bar.

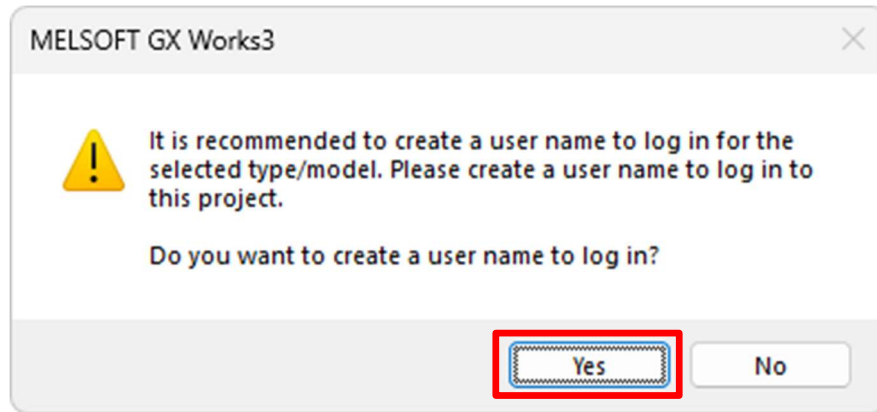


2. In the “New” window, choose the following items and click the [OK] button.

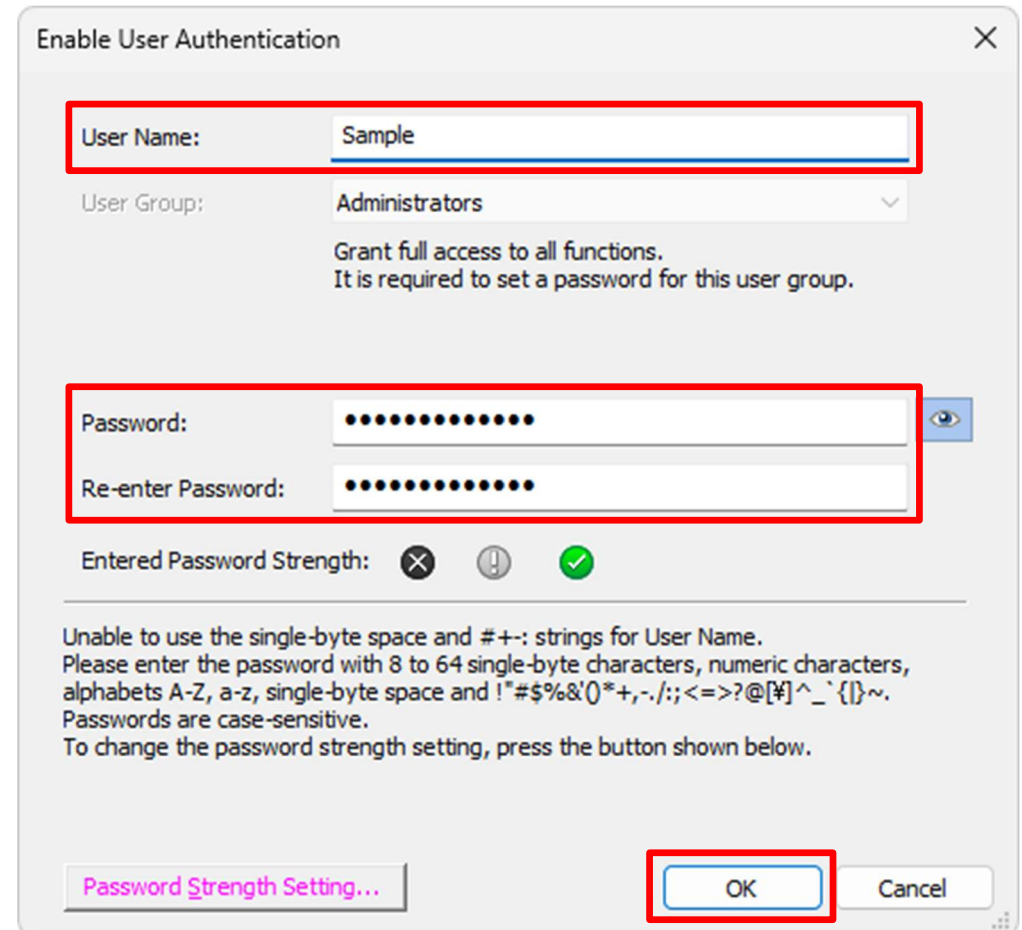
- Series: MX Controller
- Type/Model: MXR500
- Number of Axis: 256 axes
- Built-in Network Type: Ethernet + CC-Link IE TSN
- Program Language: ST



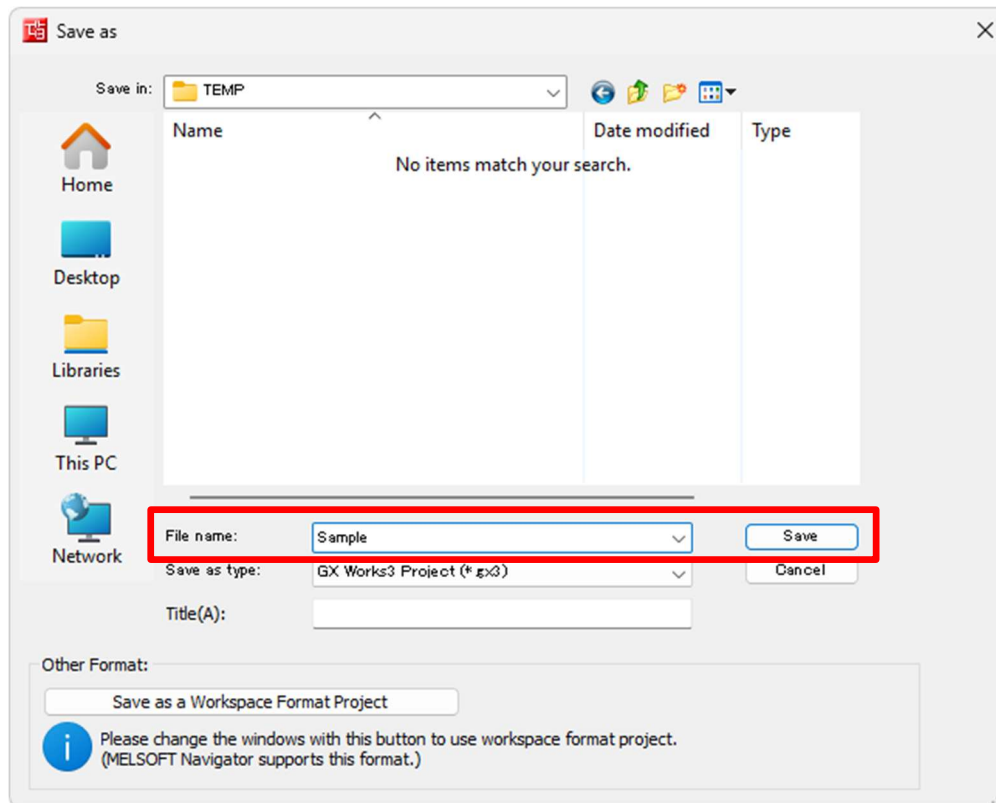
3. Register the username and password used to log in to the project. In the next window, click the [Yes] button.



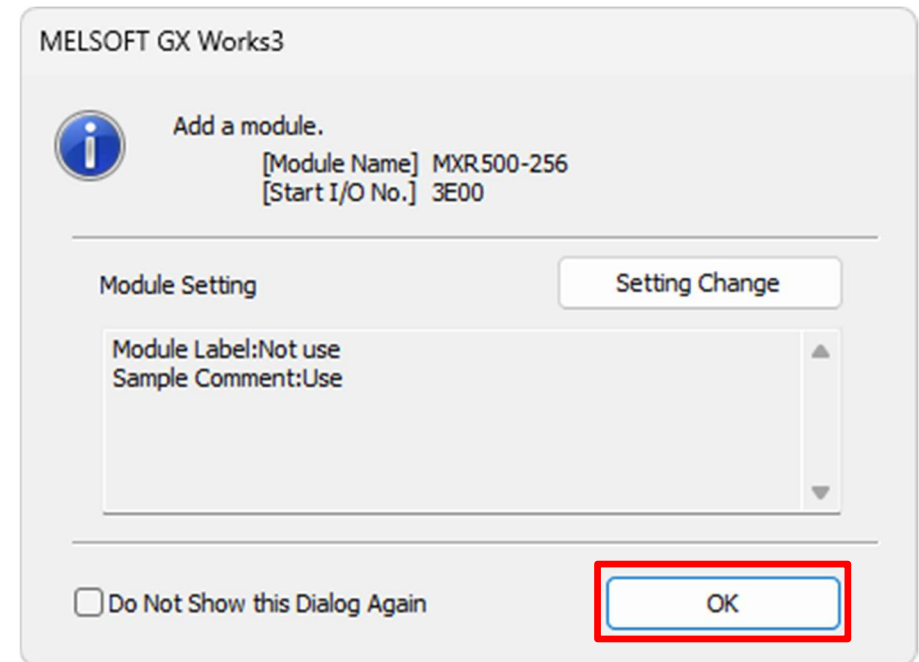
4. In the “Enable User Authentication” window, enter the username and password, then click the [OK] button.



5. In the next window, enter the file name, then click the [Save] button to save the project.

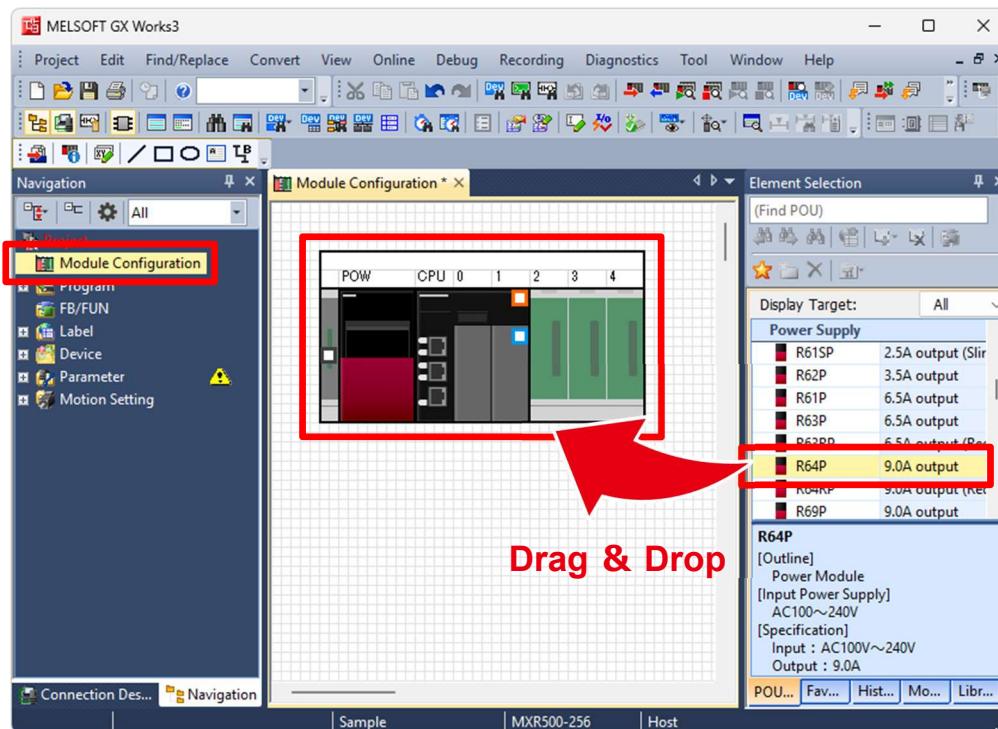


6. In the next window, click the [OK] button.

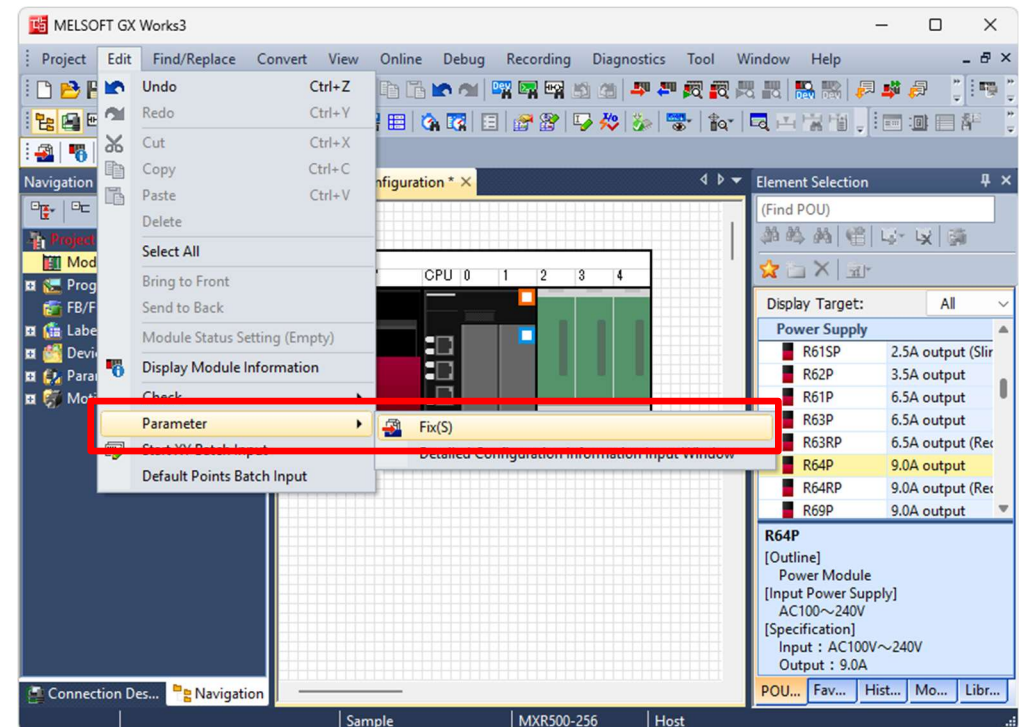


7. Double-click [Navigation] → [Module Configuration], and set up the module configuration diagram. Configure the necessary units according to your system setup.

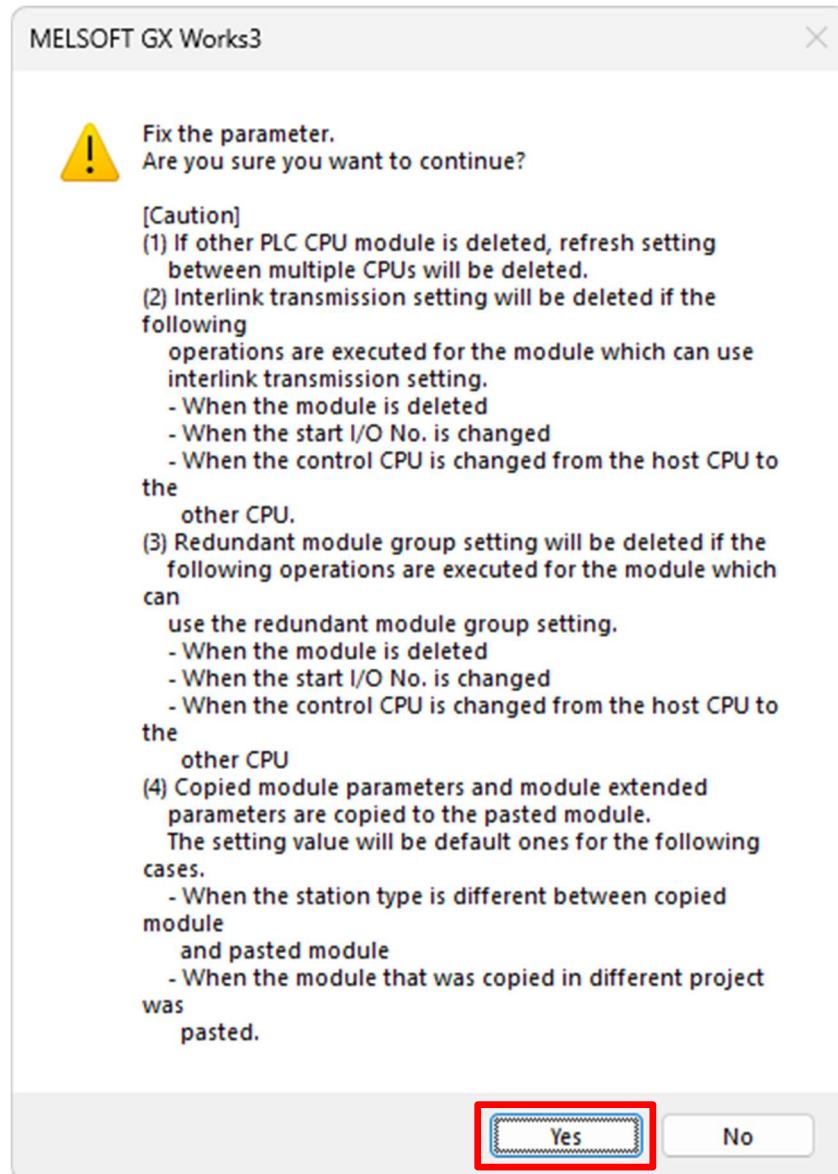
- Main Base: R35B
- Power Supply: R64P
- MX Controller: MXR500-256



8. Click [Edit] → [Parameter] → [Fix] from the menu bar.



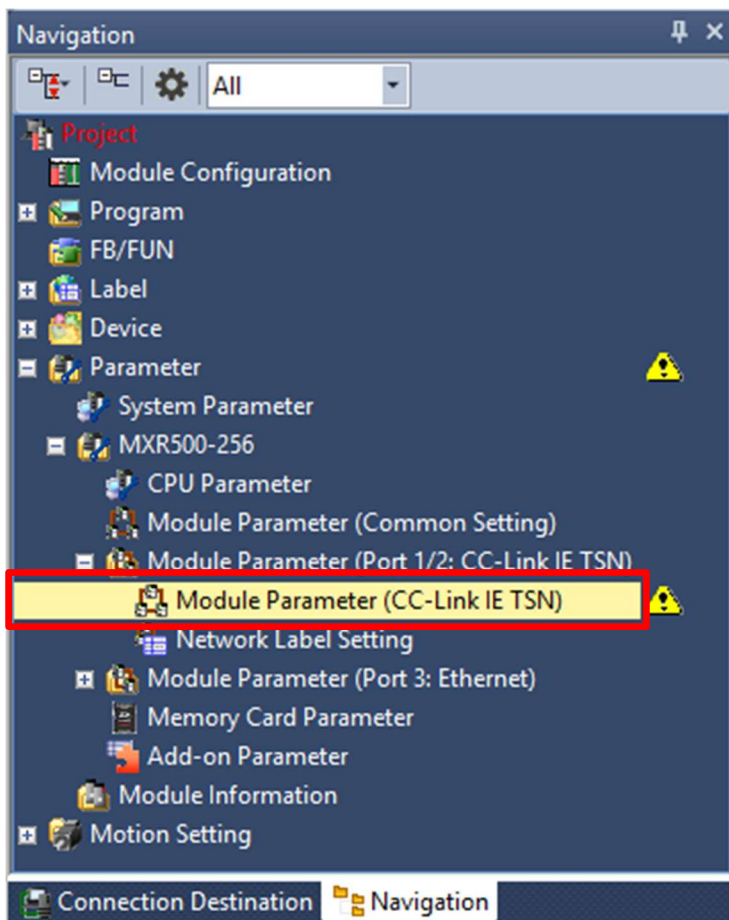
9. In the next window, click the [Yes] button.



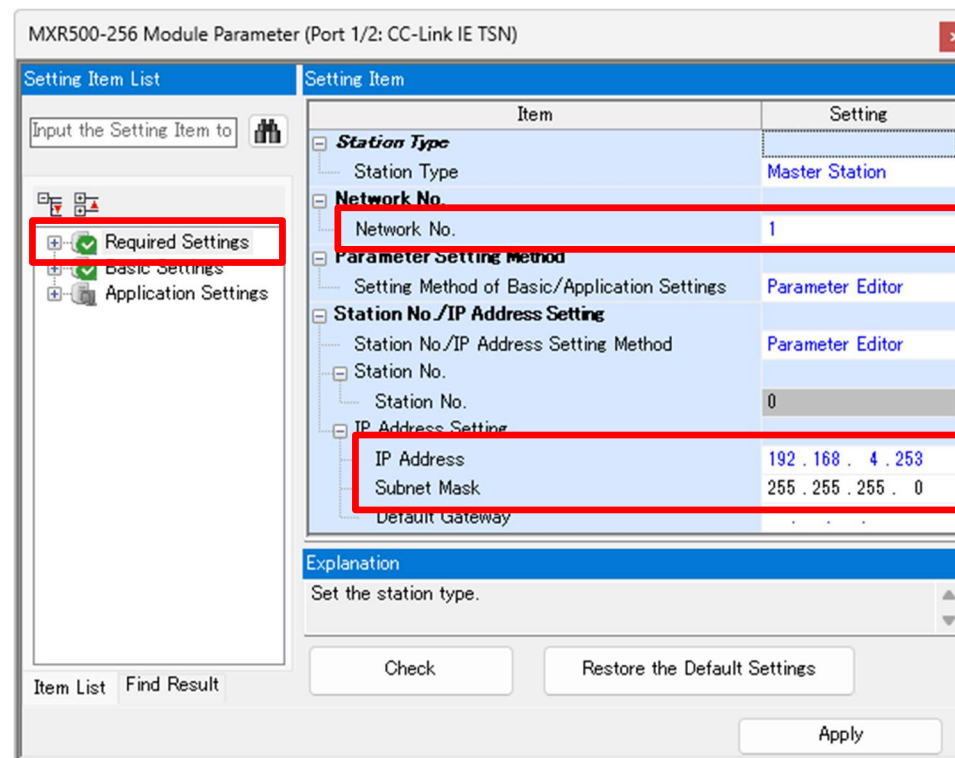
Set the master station parameters in the [Required Settings] of the [Module Parameter (CC-Link IE TSN)].

### ■ Required Settings

1. Double-click [Navigation] → [Parameter] → [MXR500-256] → [Module Parameter (Port 1/2: CC-Link IE TSN)] → [Module Parameter (CC-Link IE TSN)].



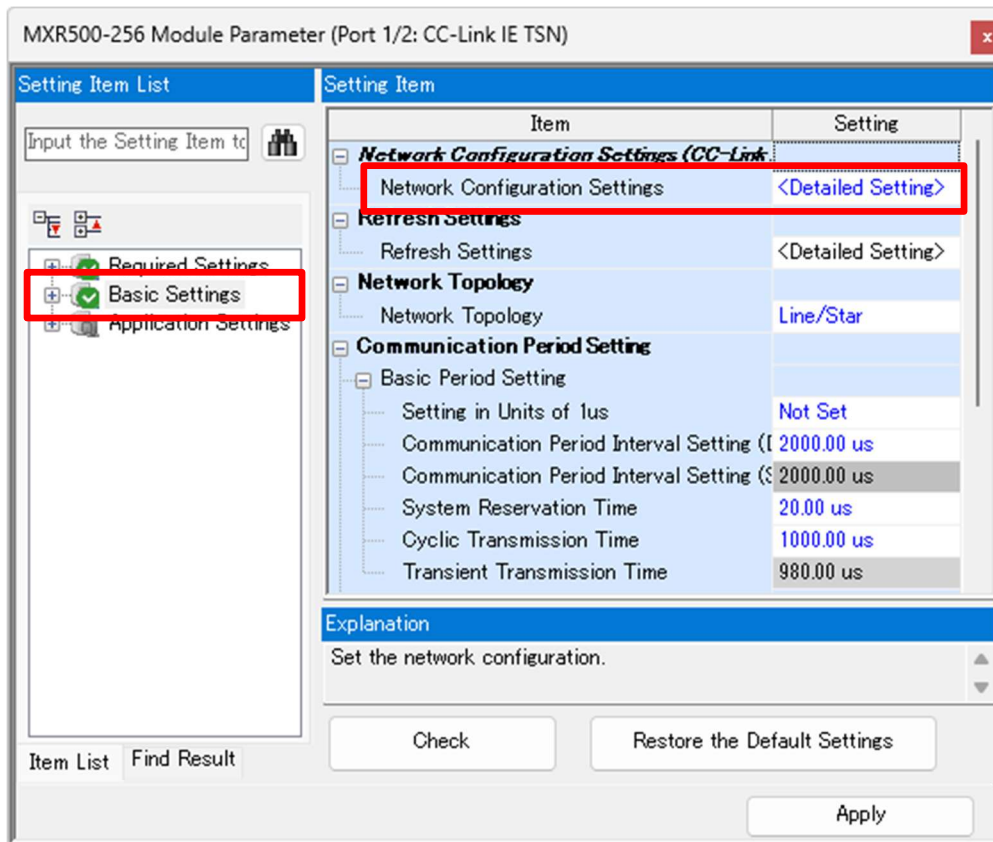
2. The “Module Parameter” window opens. Select [Setting Item List] → [Required Settings], and configure the following items.
  - Network No.: 1 (Default)
  - IP Address: 192.168.4.253 (Default)
  - Subnet Mask: 255.255.255.0



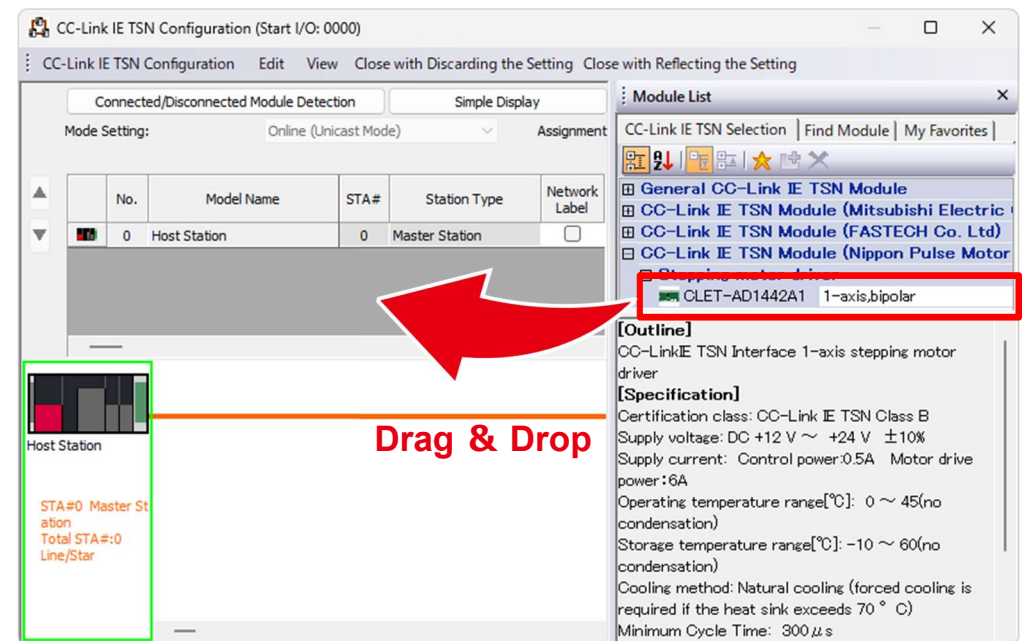
Set the network configurations in the [Basic Settings] of the [Module Parameter (CC-Link IE TSN)].

### ■ Basic Settings

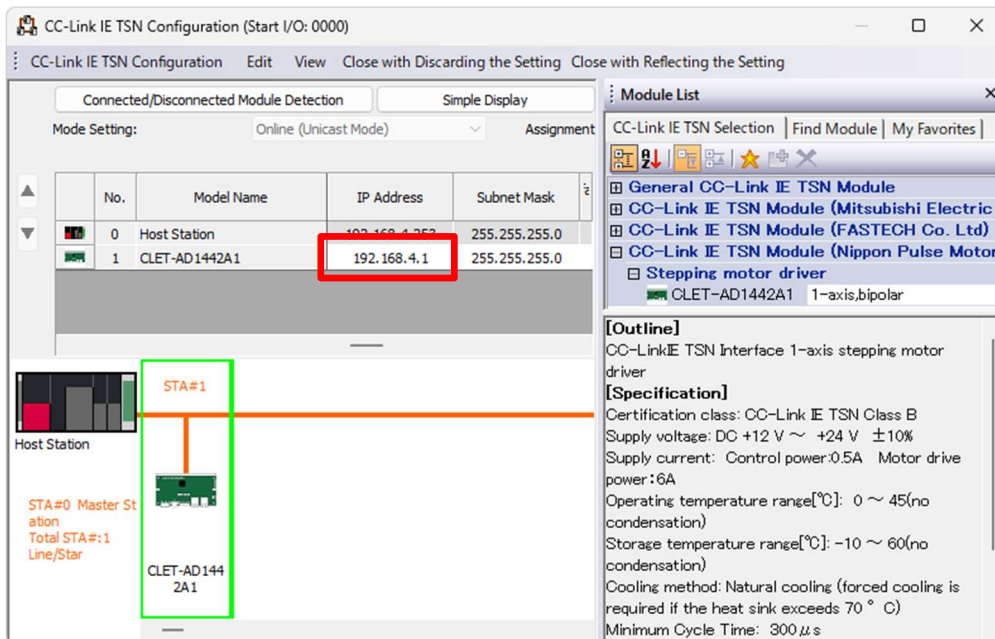
1. Select [Setting Item List] → [Basic Settings], then double-click [Detailed Setting] in the [Network Configuration Settings].



2. The “CC-Link IE TSN Configuration” window opens. From [Module List] → [CC-Link IE TSN Module (Nippon Pulse Motor Corporation)] → [Stepping motor driver], select [CLET-AD1442A1] and drag and drop it.



### 3. Set the [IP Address] for [CLET-AD1442A1].



The screenshot shows the 'CC-Link IE TSN Configuration' window. The 'Module List' table is as follows:

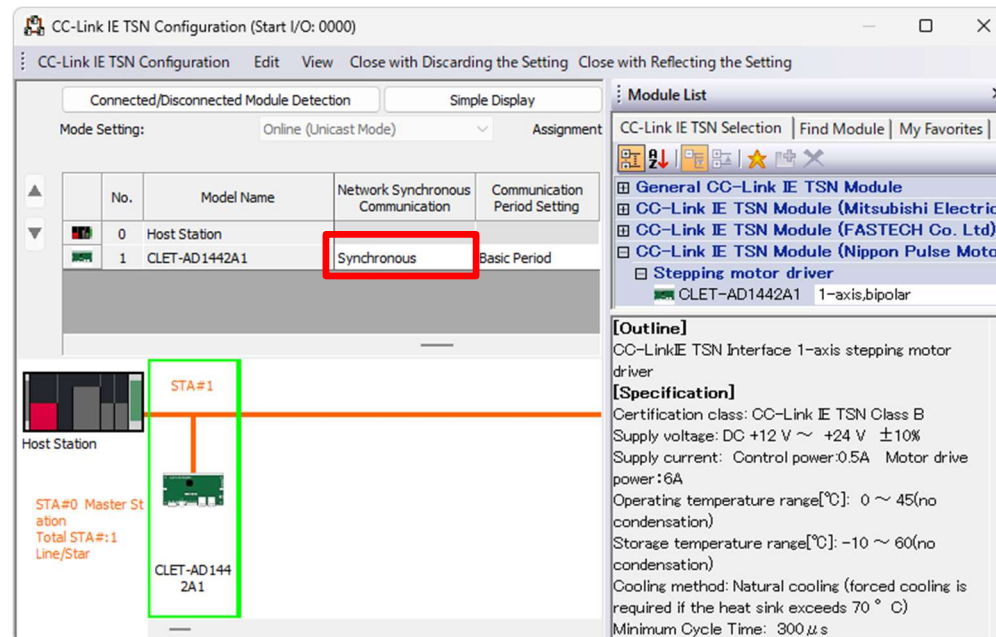
No.	Model Name	IP Address	Subnet Mask
0	Host Station	192.168.4.252	255.255.255.0
1	CLET-AD1442A1	192.168.4.1	255.255.255.0

The IP address '192.168.4.1' for the CLET-AD1442A1 module is highlighted with a red box. The 'Mode Setting' is 'Online (Unicast Mode)'. The 'Module List' on the right includes 'General CC-Link IE TSN Module', 'CC-Link IE TSN Module (Mitsubishi Electric)', 'CC-Link IE TSN Module (FASTECH Co. Ltd)', 'CC-Link IE TSN Module (Nippon Pulse Motor)', and 'Stepping motor driver'. The 'Stepping motor driver' section is expanded to show 'CLET-AD1442A1 1-axis,bipolar'. The 'Outline' section shows 'CC-Link IE TSN Interface 1-axis stepping motor driver' and the 'Specification' section lists: Certification class: CC-Link IE TSN Class B, Supply voltage: DC +12 V ~ +24 V ±10%, Supply current: Control power:0.5A Motor drive power:6A, Operating temperature range[°C]: 0 ~ 45(no condensation), Storage temperature range[°C]: -10 ~ 60(no condensation), Cooling method: Natural cooling (forced cooling is required if the heat sink exceeds 70 ° C), and Minimum Cycle Time: 300 μs.

#### Point

Make sure the IP address you configure matches the IP address setting of the drive unit [CLET-AD1442A1A]. For details on IP address configuration, refer to “2. Drive Unit Settings.”

### 4. Set the [Network Synchronous Communication] for [CLET-AD1442A1] to “Synchronous.”

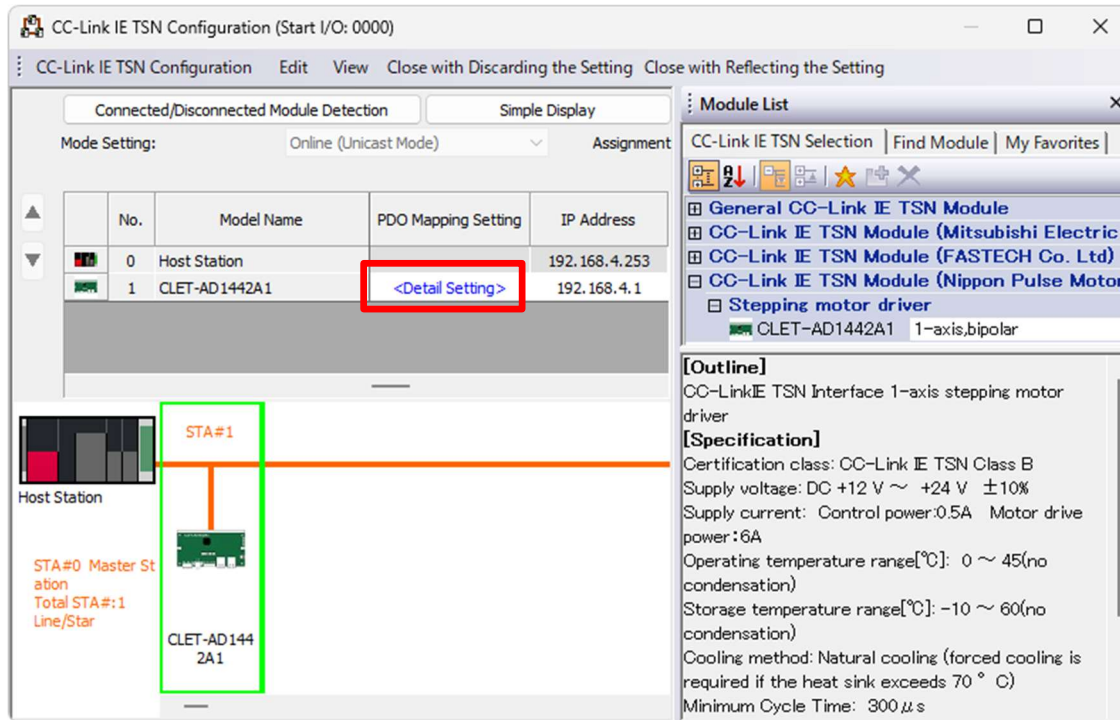


The screenshot shows the 'CC-Link IE TSN Configuration' window. The 'Module List' table is as follows:

No.	Model Name	Network Synchronous Communication	Communication Period Setting
0	Host Station		
1	CLET-AD1442A1	Synchronous	Basic Period

The 'Network Synchronous Communication' setting 'Synchronous' for the CLET-AD1442A1 module is highlighted with a red box. The 'Mode Setting' is 'Online (Unicast Mode)'. The 'Module List' on the right includes 'General CC-Link IE TSN Module', 'CC-Link IE TSN Module (Mitsubishi Electric)', 'CC-Link IE TSN Module (FASTECH Co. Ltd)', 'CC-Link IE TSN Module (Nippon Pulse Motor)', and 'Stepping motor driver'. The 'Stepping motor driver' section is expanded to show 'CLET-AD1442A1 1-axis,bipolar'. The 'Outline' section shows 'CC-Link IE TSN Interface 1-axis stepping motor driver' and the 'Specification' section lists: Certification class: CC-Link IE TSN Class B, Supply voltage: DC +12 V ~ +24 V ±10%, Supply current: Control power:0.5A Motor drive power:6A, Operating temperature range[°C]: 0 ~ 45(no condensation), Storage temperature range[°C]: -10 ~ 60(no condensation), Cooling method: Natural cooling (forced cooling is required if the heat sink exceeds 70 ° C), and Minimum Cycle Time: 300 μs.

5. Double-click [Detail Setting] in the [PDO Mapping Setting] for [CLET-AD1442A1], and select a PDO mapping pattern. For each link device, choose the option specified in the table below.



CC-Link IE TSN Configuration (Start I/O: 0000)

Connected/Disconnected Module Detection    Simple Display

Mode Setting: Online (Unicast Mode)    Assignment

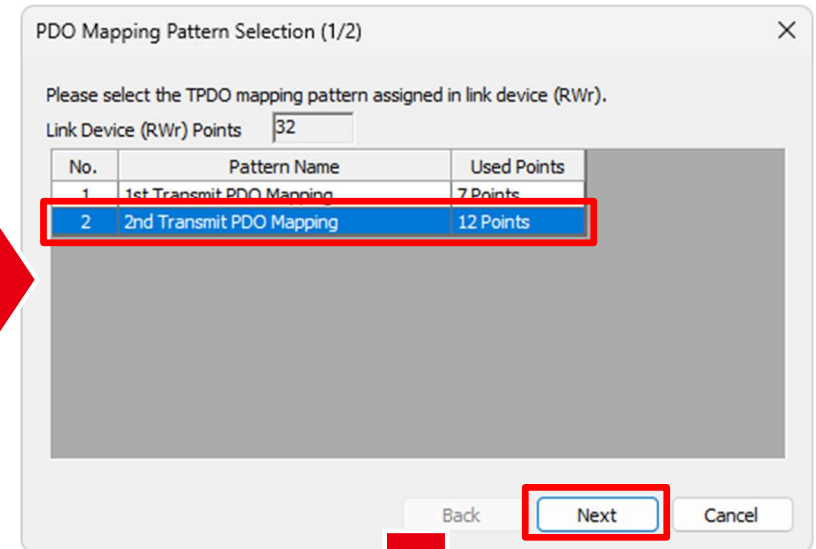
No.	Model Name	PDO Mapping Setting	IP Address
0	Host Station		192.168.4.253
1	CLET-AD1442A1	<Detail Setting>	192.168.4.1

Module List

- General CC-Link IE TSN Module
- CC-Link IE TSN Module (Mitsubishi Electric)
- CC-Link IE TSN Module (FASTECH Co. Ltd)
- CC-Link IE TSN Module (Nippon Pulse Motor)
- Stepping motor driver
  - CLET-AD1442A1 1-axis,bipolar

[Outline]  
CC-LinkIE TSN Interface 1-axis stepping motor driver

[Specification]  
Certification class: CC-Link IE TSN Class B  
Supply voltage: DC +12 V ~ +24 V ±10%  
Supply current: Control power:0.5A    Motor drive power:6A  
Operating temperature range[°C]: 0 ~ 45(no condensation)  
Storage temperature range[°C]: -10 ~ 60(no condensation)  
Cooling method: Natural cooling (forced cooling is required if the heat sink exceeds 70 ° C)  
Minimum Cycle Time: 300 μs



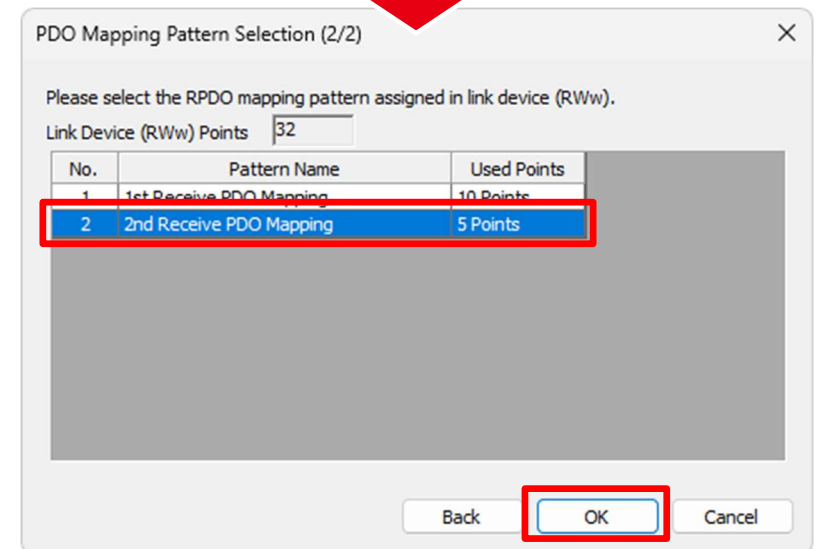
PDO Mapping Pattern Selection (1/2)

Please select the TPDO mapping pattern assigned in link device (RWr).

Link Device (RWr) Points 32

No.	Pattern Name	Used Points
1	1st Transmit PDO Mapping	7 Points
2	2nd Transmit PDO Mapping	12 Points

Back    **Next**    Cancel



PDO Mapping Pattern Selection (2/2)

Please select the RPDO mapping pattern assigned in link device (RWw).

Link Device (RWw) Points 32

No.	Pattern Name	Used Points
1	1st Receive PDO Mapping	10 Points
2	2nd Receive PDO Mapping	5 Points

Back    **OK**    Cancel

Link device	Pattern name
RWr	2nd Transmit PDO Mapping
RWw	2nd Receive PDO Mapping

## 6. Map the objects required for motion control to PDO.

Configure the TPDO and RPDO to match the table below.

### ■ TPDO

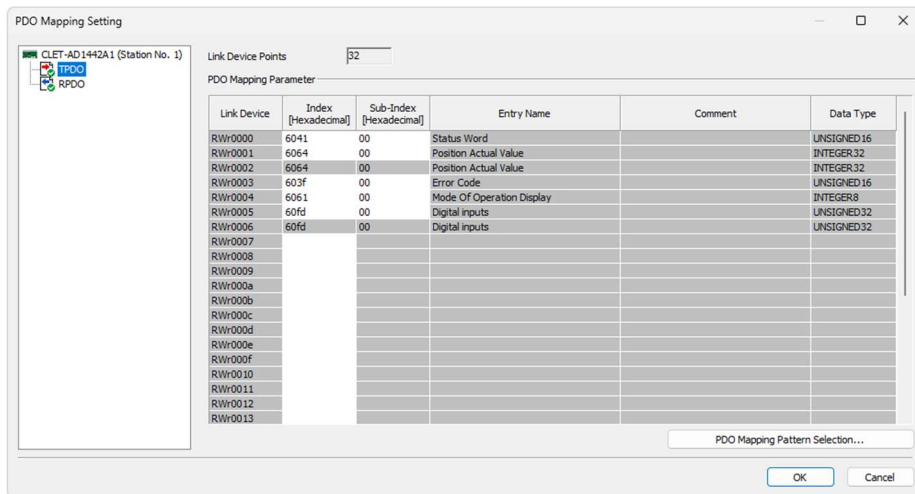
Index	Sub index	Data type	Name
6041	00	U16	Status Word
6064	00	I32	Position Actual Value
603F	00	U16	Error Code
6061	00	I8	Mode Of Operation Display
60FD	00	U32	Digital inputs

### ■ RPDO

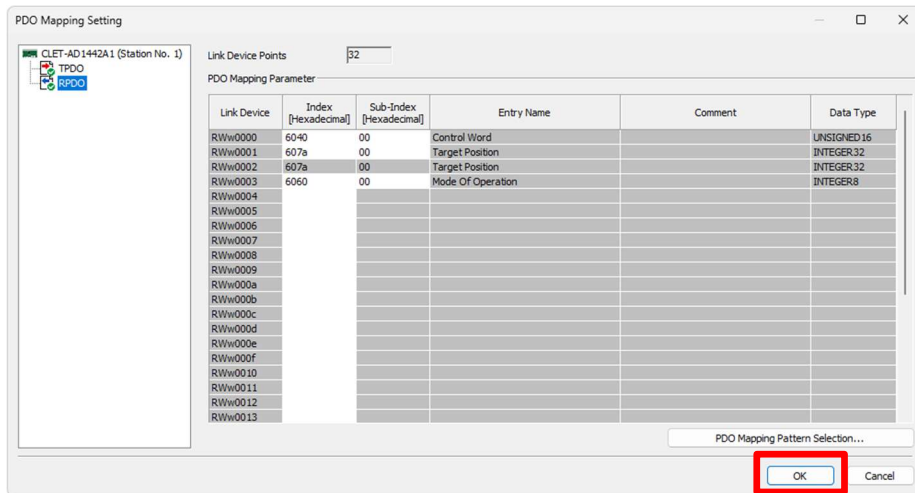
Index	Sub index	Data type	Name
6040	00	U16	Control Word
607A	00	I32	Target Position
6060	00	I8	Mode Of Operation

7. After completing the TPDO and RPDO settings, click the [OK] button.

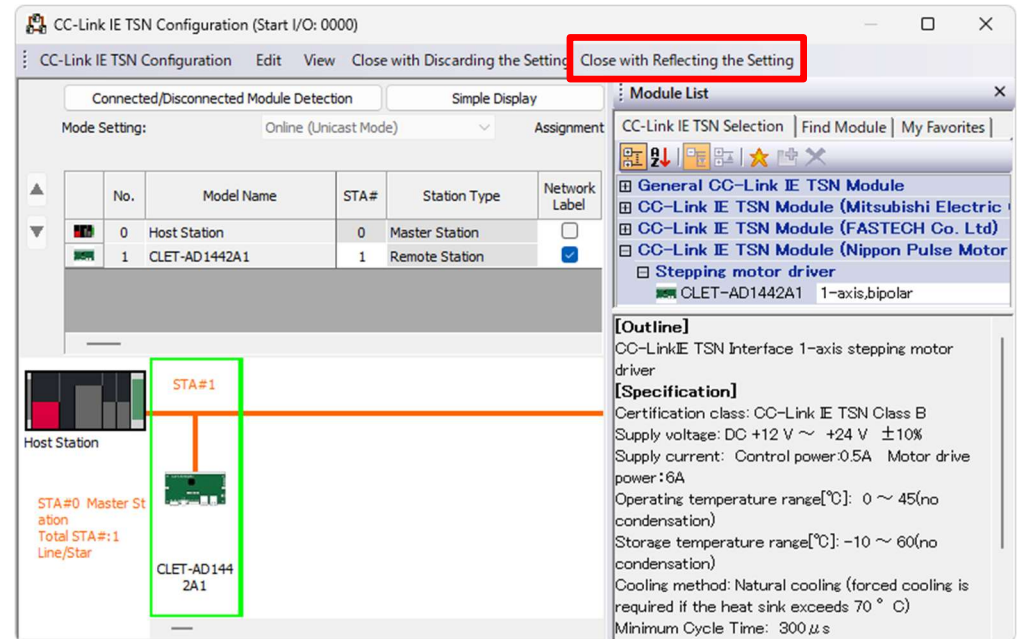
### ■ TPDO



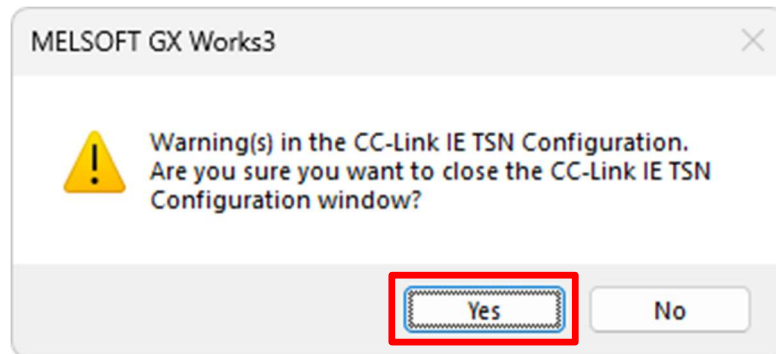
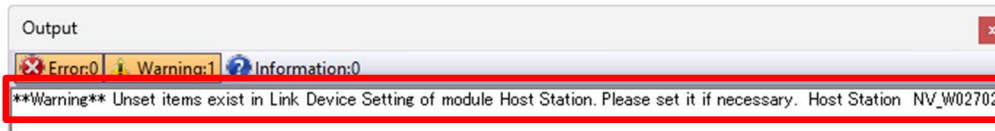
### ■ RPDO



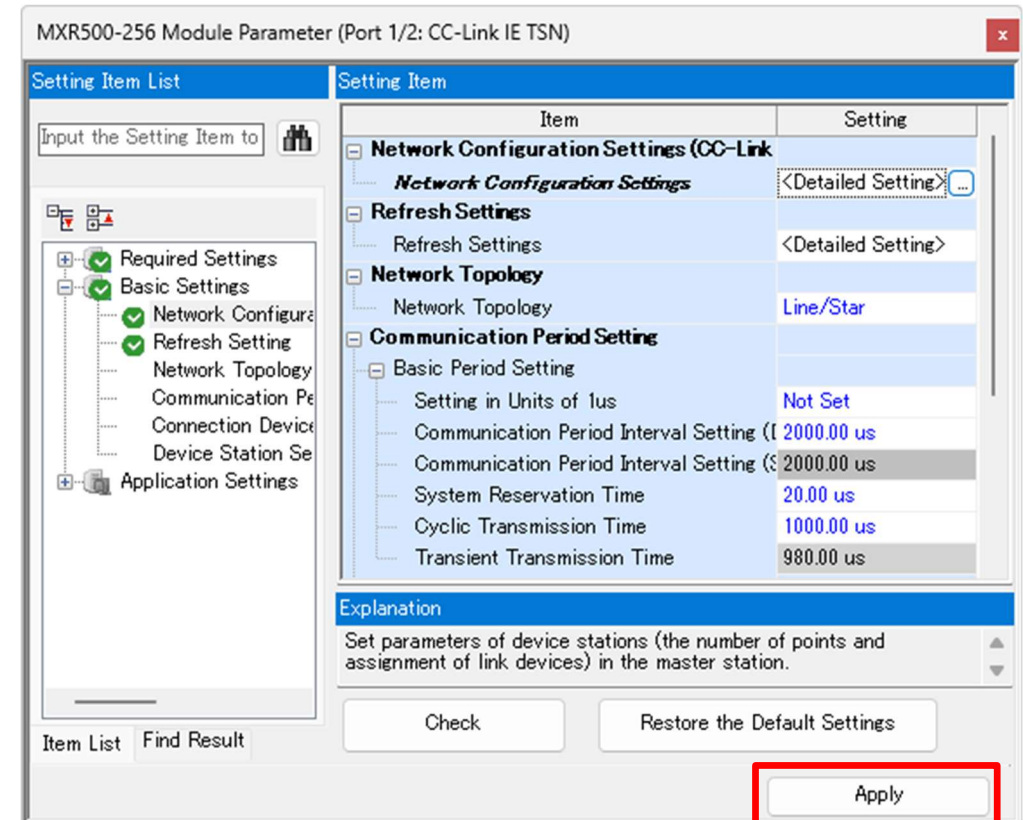
8. Click [Close with Reflecting the Setting].



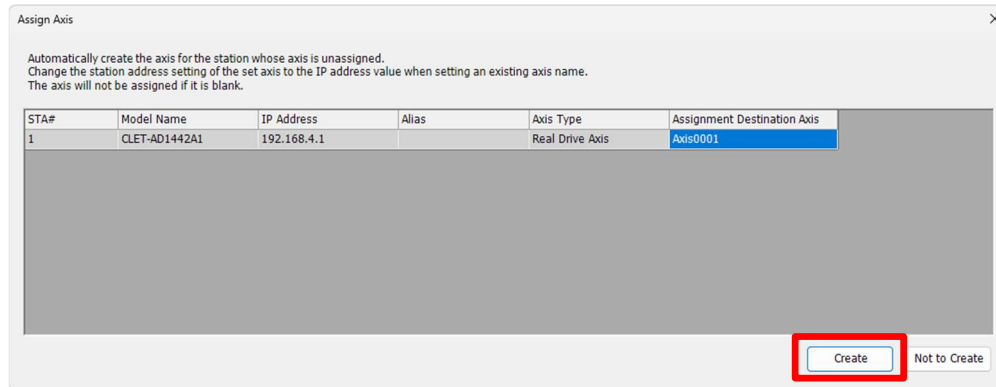
9. If the following warning appears, click the [Yes] button.



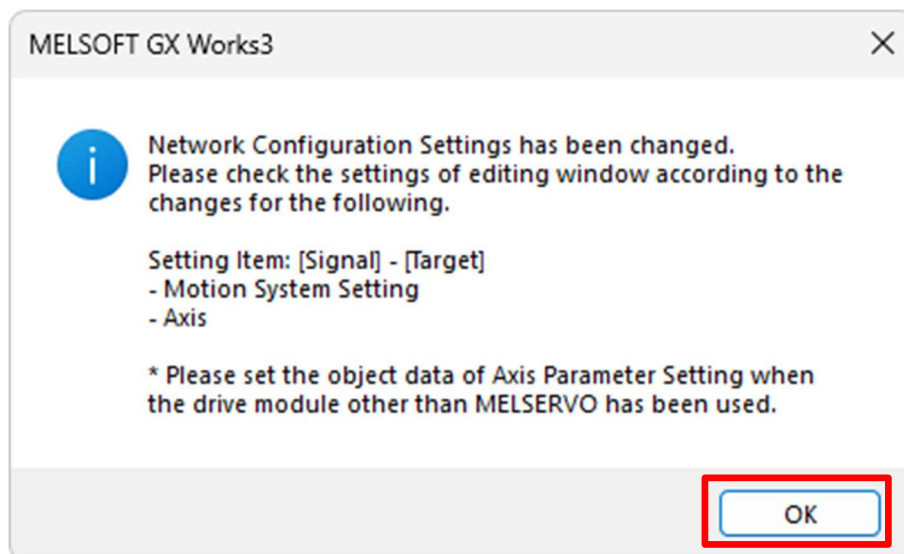
10. In the “Module Parameter” window, click the [Apply] button.



11. If the following window appears, click the [Create] button to assign the drive unit to the axis.

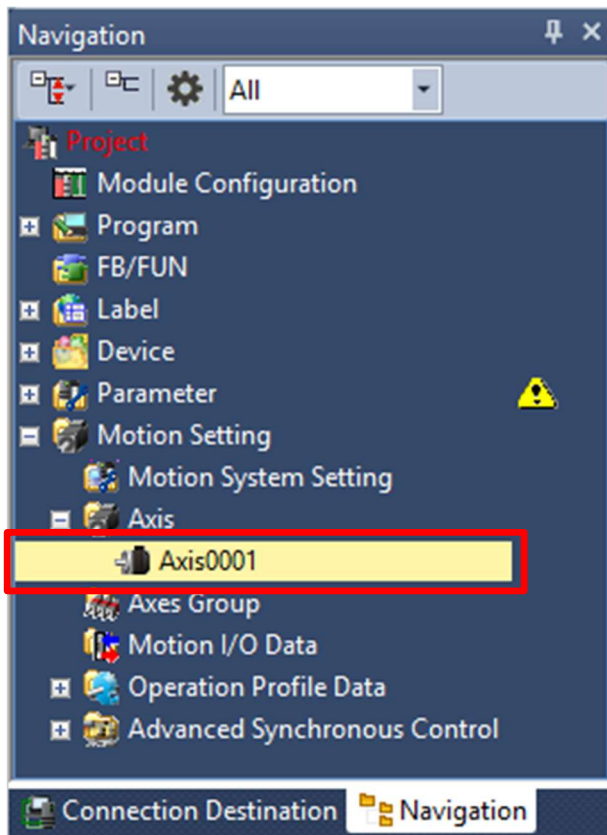


12. In the next window, click the [OK] button.

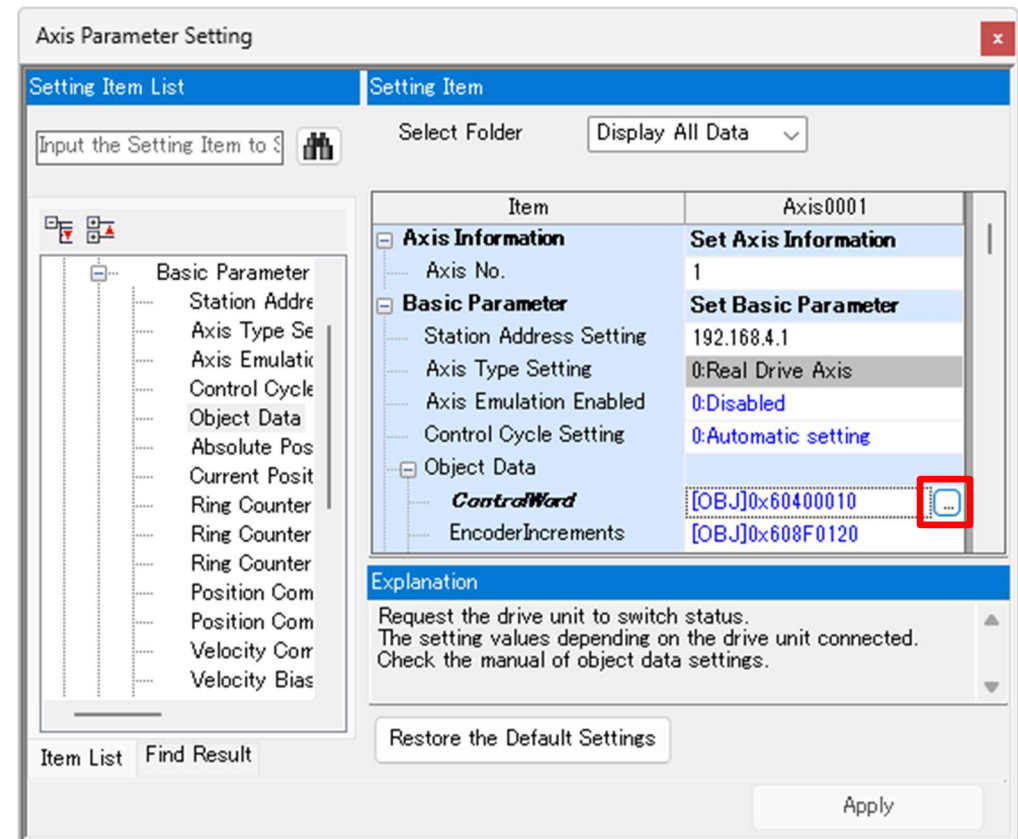


Configure the drive unit's axis parameters in the [Motion Setting].

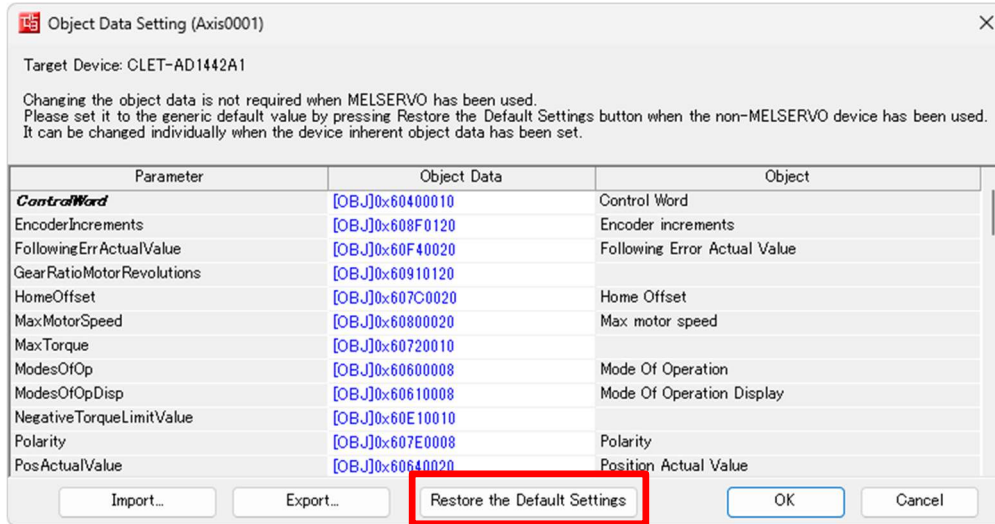
1. Double-click [Navigation] → [Motion Setting] → [Axis] → [Axis0001].



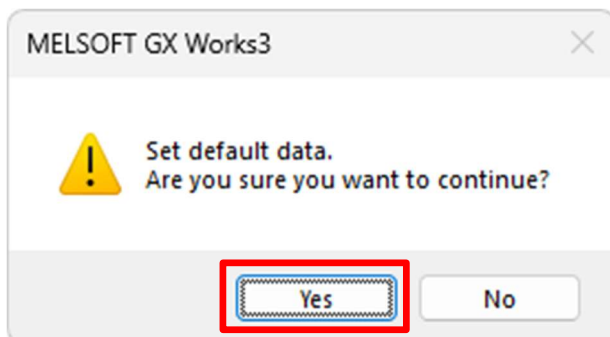
2. The “Axis Parameter Setting” window opens. Select [Setting Item List] → [Real Drive Axis] → [Basic Parameter] → [Object Data], then click the [...] button next to any item.



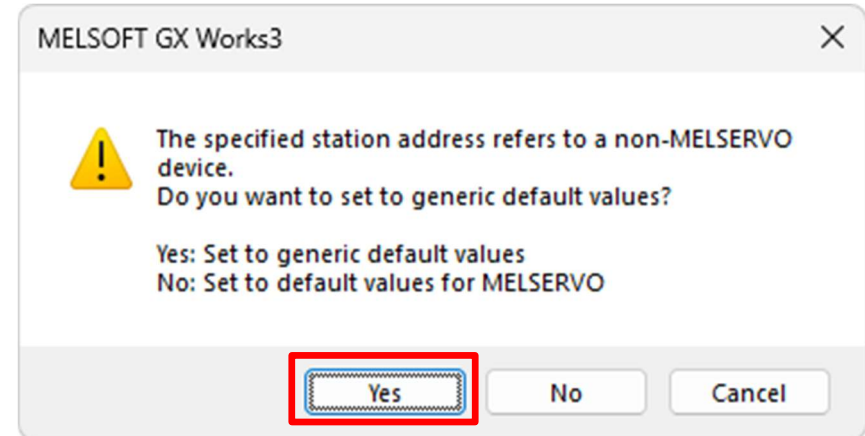
3. In the “Object Data Setting” window, click the [Restore the Default Settings] button.



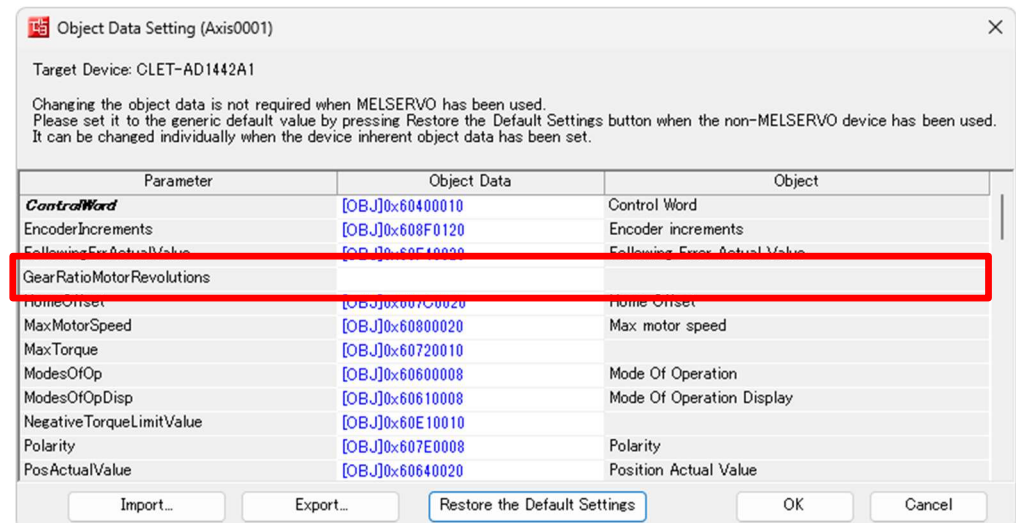
4. A confirmation dialog will appear asking whether to set the default data. Click the [Yes] button.



5. A confirmation dialog will appear asking whether to set the generic default values. Click the [Yes] button.



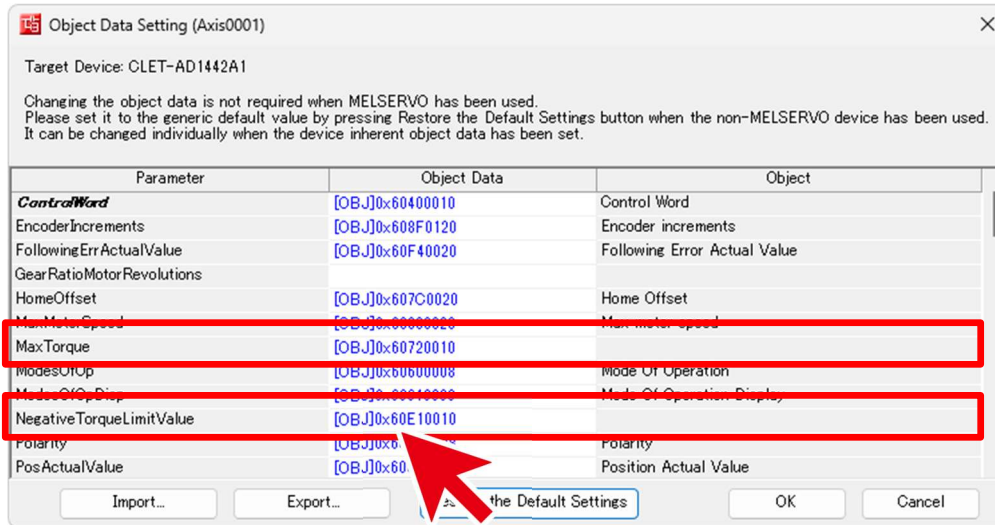
The [Object Data] column will be partially cleared.



# 3.4

## Axis Parameter Settings

- 6. Clear any object data settings that are not supported by the drive unit. Delete the values in the [Object Data] column for rows where the [Object] column is blank.



Object Data Setting (Axis0001)

Target Device: CLET-AD1442A1

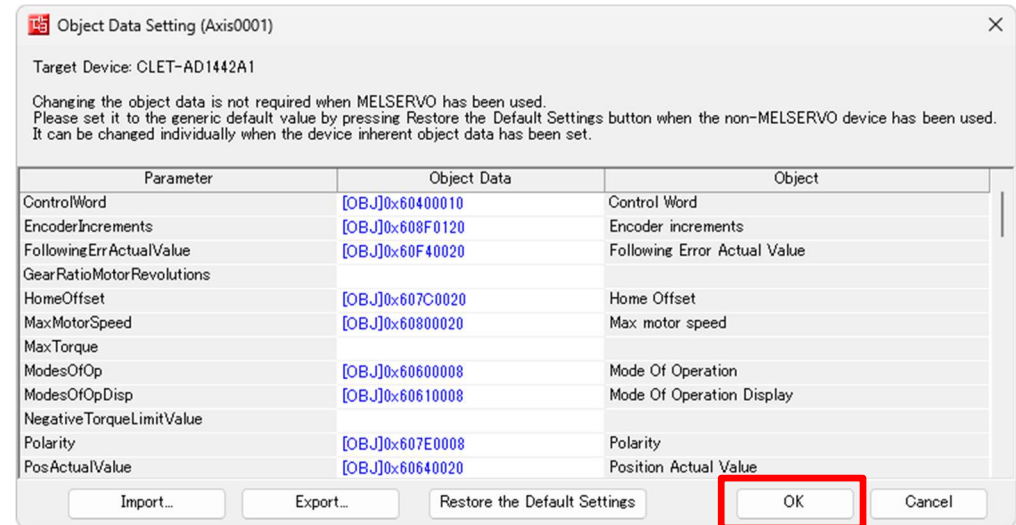
Changing the object data is not required when MELSERVO has been used. Please set it to the generic default value by pressing Restore the Default Settings button when the non-MELSERVO device has been used. It can be changed individually when the device inherent object data has been set.

Parameter	Object Data	Object
<b>ControlWord</b>	[OBJ]0x60400010	Control Word
EncoderIncrements	[OBJ]0x608F0120	Encoder increments
FollowingErrActualValue	[OBJ]0x60F40020	Following Error Actual Value
GearRatioMotorRevolutions		
HomeOffset	[OBJ]0x607C0020	Home Offset
MaxMotorSpeed	[OBJ]0x60800020	Max motor speed
MaxTorque	[OBJ]0x60720010	
ModesOfOp	[OBJ]0x60600008	Mode Of Operation
ModesOfOpDisp	[OBJ]0x60610008	Mode Of Operation Display
NegativeTorqueLimitValue	[OBJ]0x60E10010	
Polarity	[OBJ]0x60	Polarity
PosActualValue	[OBJ]0x60	Position Actual Value

Buttons: Import... Export... Restore the Default Settings OK Cancel

**Click & Delete**

- 7. Once you have completed the settings, click the [OK] button.



Object Data Setting (Axis0001)

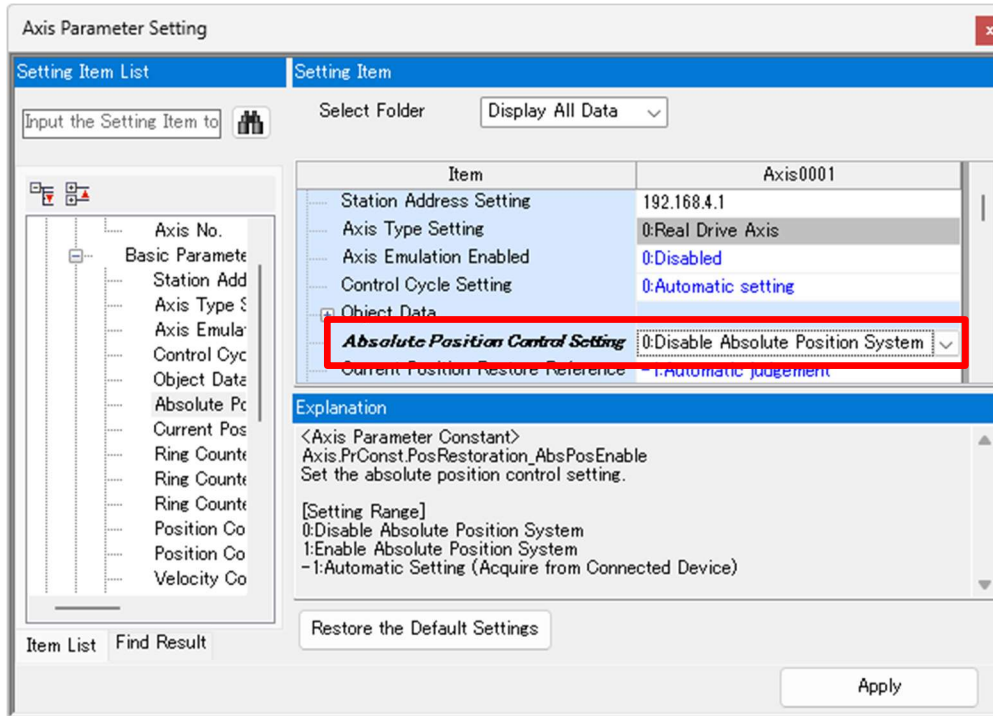
Target Device: CLET-AD1442A1

Changing the object data is not required when MELSERVO has been used. Please set it to the generic default value by pressing Restore the Default Settings button when the non-MELSERVO device has been used. It can be changed individually when the device inherent object data has been set.

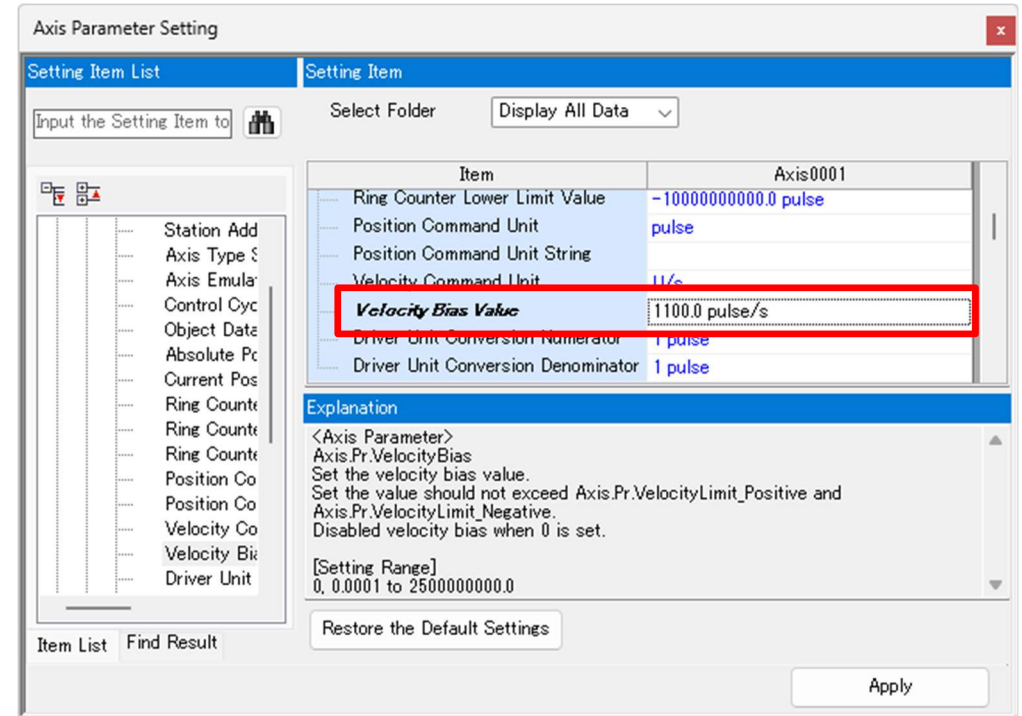
Parameter	Object Data	Object
ControlWord	[OBJ]0x60400010	Control Word
EncoderIncrements	[OBJ]0x608F0120	Encoder increments
FollowingErrActualValue	[OBJ]0x60F40020	Following Error Actual Value
GearRatioMotorRevolutions		
HomeOffset	[OBJ]0x607C0020	Home Offset
MaxMotorSpeed	[OBJ]0x60800020	Max motor speed
MaxTorque		
ModesOfOp	[OBJ]0x60600008	Mode Of Operation
ModesOfOpDisp	[OBJ]0x60610008	Mode Of Operation Display
NegativeTorqueLimitValue		
Polarity	[OBJ]0x607E0008	Polarity
PosActualValue	[OBJ]0x60640020	Position Actual Value

Buttons: Import... Export... Restore the Default Settings OK Cancel

8. Select [Setting Item List] → [Real Drive Axis] → [Basic Parameter] → [Absolute Position Control Setting], and set it to “0: Disable Absolute Position System.”



9. Select [Setting Item List] → [Real Drive Axis] → [Basic Parameter] → [Velocity Bias Value], and set the velocity bias value appropriate for the motor you will use.



**Point**

Set [Velocity Bias Value] using the motor specifications.  
In this document, the value is calculated from the  
encoder resolution and the motor torque characteristics.

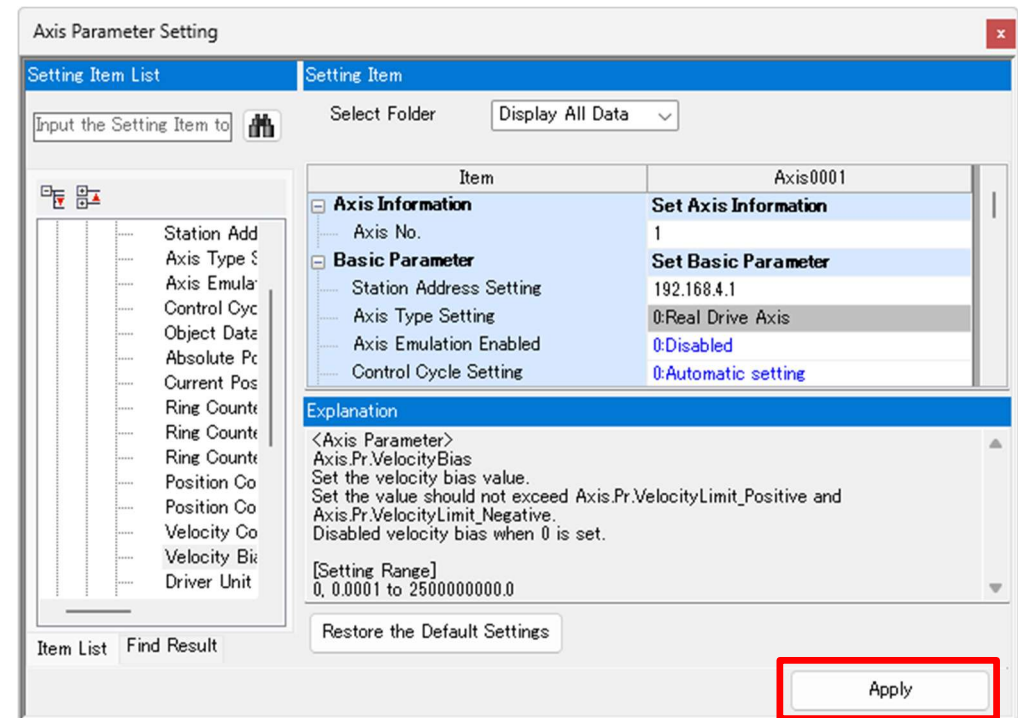
Velocity Bias Value [pulse/s]=

$$\frac{\text{Encoder resolution} \times \text{Minimum rotational speed}}{6400 \text{ pulse/r} \quad 10 \text{ r/min (*1)}} \div 60$$

$$\approx 1100 \text{ pulse/s}$$

\*1: The values are based on the torque characteristics of a  
typical NEMA17 stepping motor.

10. Click the [Apply] button.

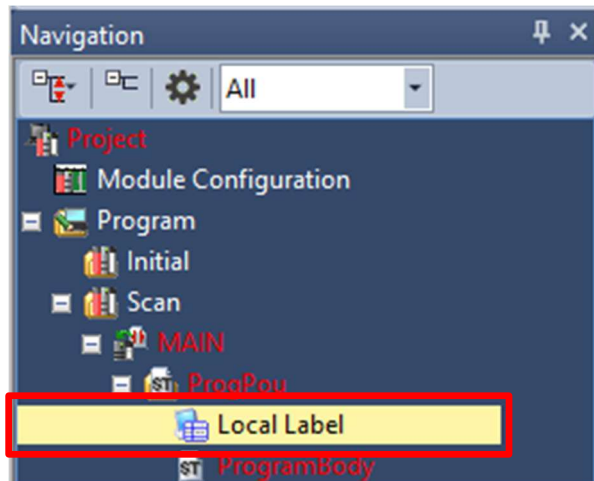


# 4. OPERATION CHECK

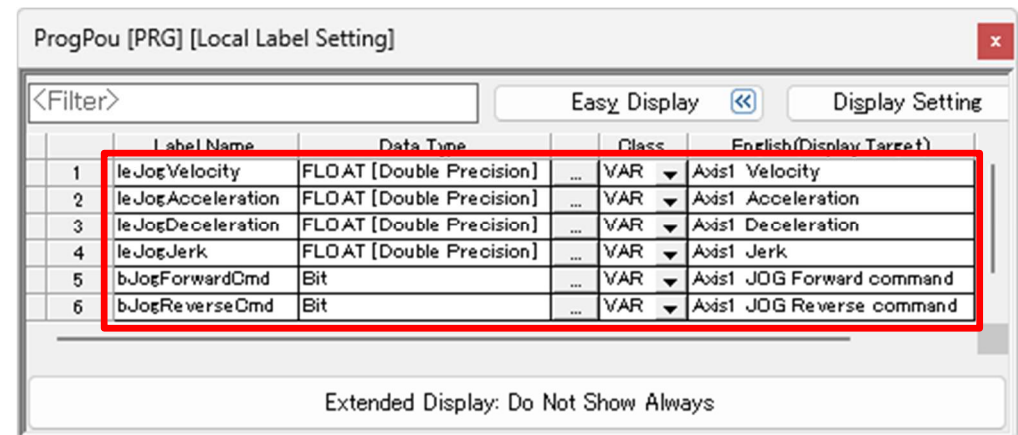
Verify that the controller and drive unit are properly connected over CC-Link IE TSN.

Create a JOG operation program for motion control, perform the connection test by confirming that JOG operation (motion control) runs correctly.

1. Double-click [Navigation] → [Program] → [Scan] → [MAIN] → [ProgPou] → [Local Label].

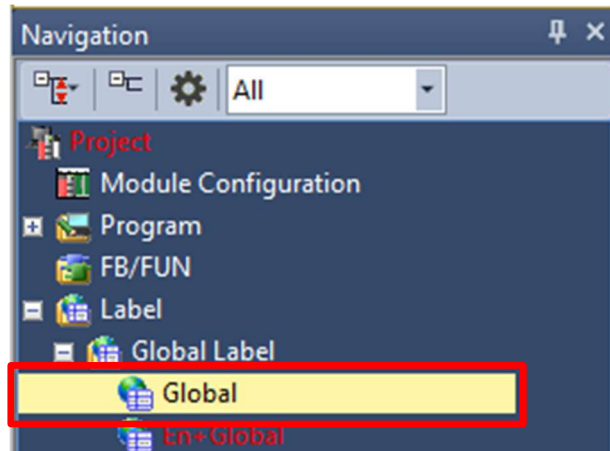


2. Create the local labels necessary for operation check.

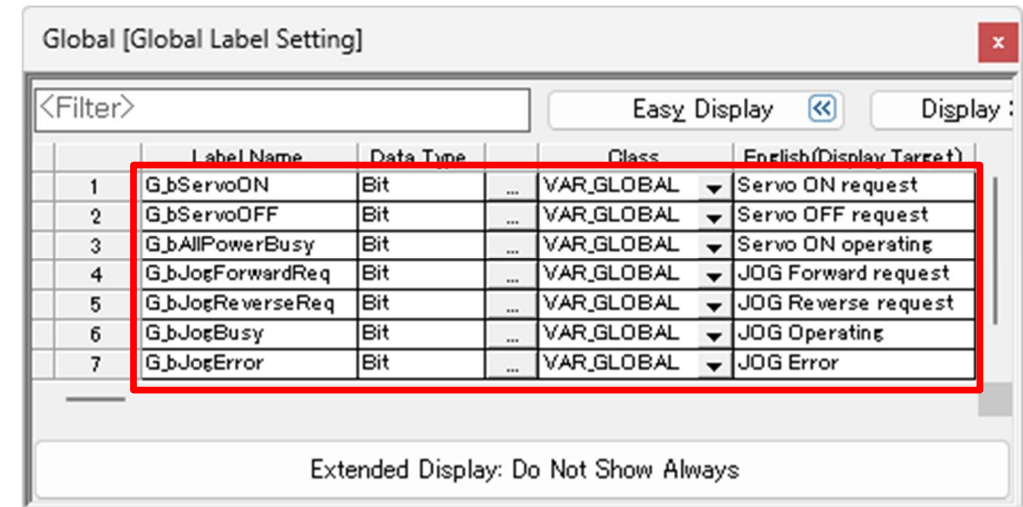


Category	Label name	Data type	Class	Content
Local	leJogVelocity	FLOAT [Double Precision]	VAR	Axis1 Velocity
Local	leJogAcceleration	FLOAT [Double Precision]	VAR	Axis1 Acceleration
Local	leJogDeceleration	FLOAT [Double Precision]	VAR	Axis1 Deceleration
Local	leJogJerk	FLOAT [Double Precision]	VAR	Axis1 Jerk
Local	bJogForwardCmd	Bit	VAR	Axis1 JOG Forward command
Local	bJogReverseCmd	Bit	VAR	Axis1 JOG Reverse command

3. Double-click [Navigation] → [Label] → [Global Label] → [Global].

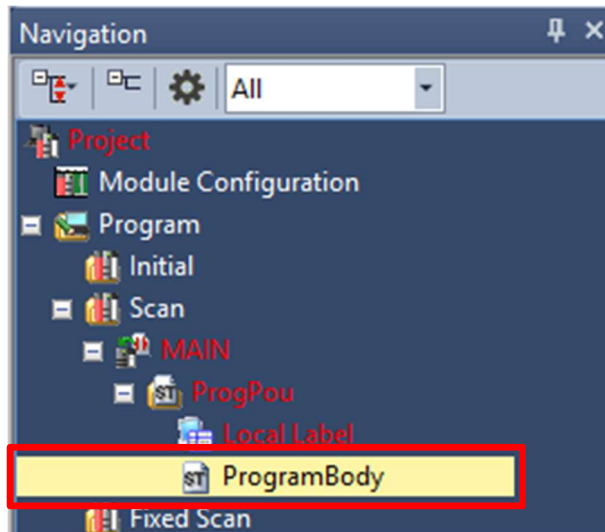


4. Create the global labels necessary for operation check.



Category	Label name	Data type	Class	Content
Global	G_bServoON	Bit	VAR_GLOBAL	Servo ON request
Global	G_bServoOFF	Bit	VAR_GLOBAL	Servo OFF request
Global	G_bAllPowerBusy	Bit	VAR_GLOBAL	Servo ON operating
Global	G_bJogForwardReq	Bit	VAR_GLOBAL	JOG Forward request
Global	G_bJogReverseReq	Bit	VAR_GLOBAL	JOG Reverse request
Global	G_bJogBusy	Bit	VAR_GLOBAL	JOG Operating
Global	G_bJogError	Bit	VAR_GLOBAL	JOG Error

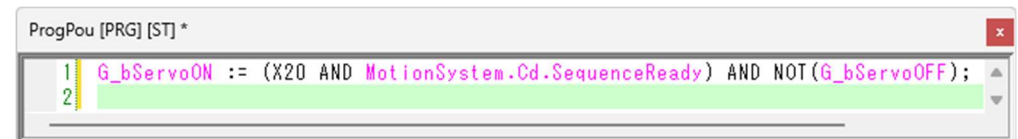
5. Double-click [Navigation] → [Program] → [Scan] → [MAIN] → [ProgPou] → [ProgramBody].



The ST editor opens.



6. Write a program to check that motion control is ready. After the controller is powered on, when the following signals are turns ON, set “Servo ON request (G\_bServoON)” to ON.
- PLC READY (MotionSystem.Cd.SequenceReady)
  - Built-in Motion Ready [X20]

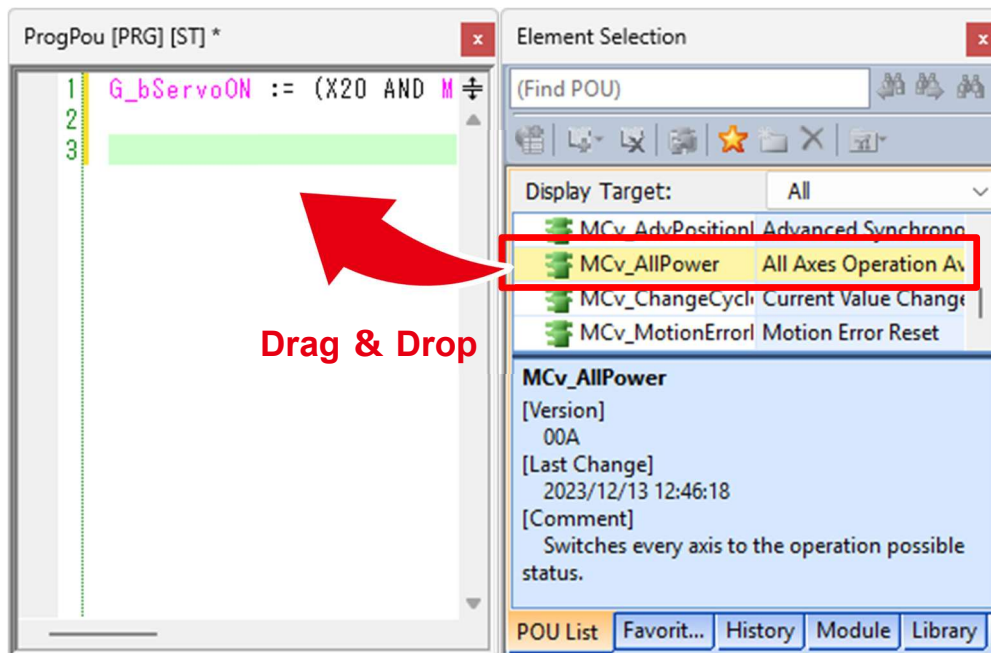


### Point

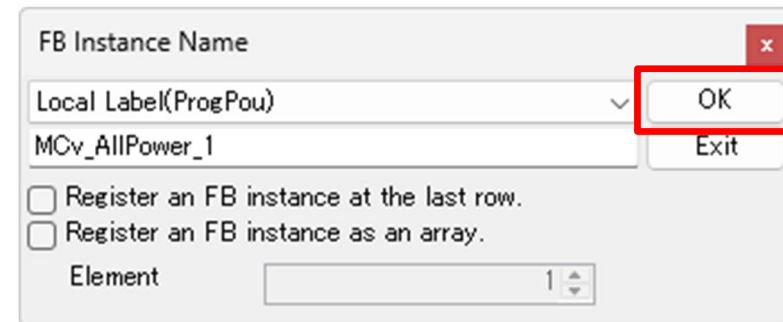
In this document the program will be written in ST language, but it can also be written in other languages.

7. Display the “POU List” tab in the “Element Selection” window.

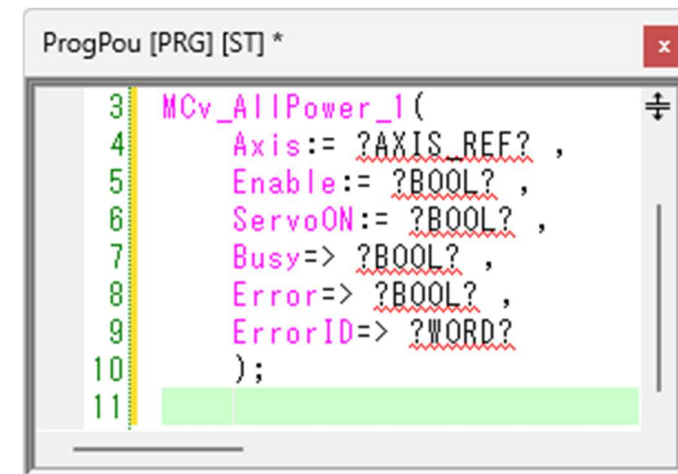
Drag and drop [MCv\_AllPower] from [Motion Control Function / Function Block] → [Administrative] into the ST editor, and insert the FB (MCv\_AllPower).



8. When the “FB Instance Name” window appears, click the [OK] button to accept the defaults and define the FB (MCv\_AllPower\_1).



The FB (MCv\_AllPower\_1) is displayed in the ST editor as shown below.



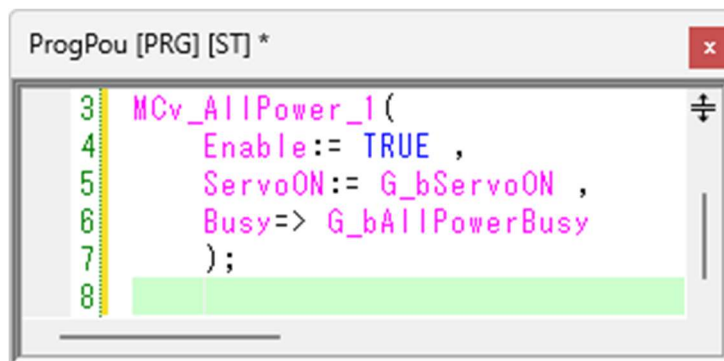
### 9. Describe the FB (MCv\_AllPower\_1).

When “Servo ON request (G\_bServoON)” is ON, execute the FB.

Set the arguments of the FB as shown below. Any arguments other than those listed below are not required, please delete them.

#### ■ FB (MCv\_AllPower\_1) arguments

- Enable: TRUE
- ServoON: G\_bServoON
- Busy: G\_bAllPowerBusy



```

3  MCv_AllPower_1(
4      Enable:= TRUE ,
5      ServoON:= G_bServoON ,
6      Busy=> G_bAllPowerBusy
7  );
8

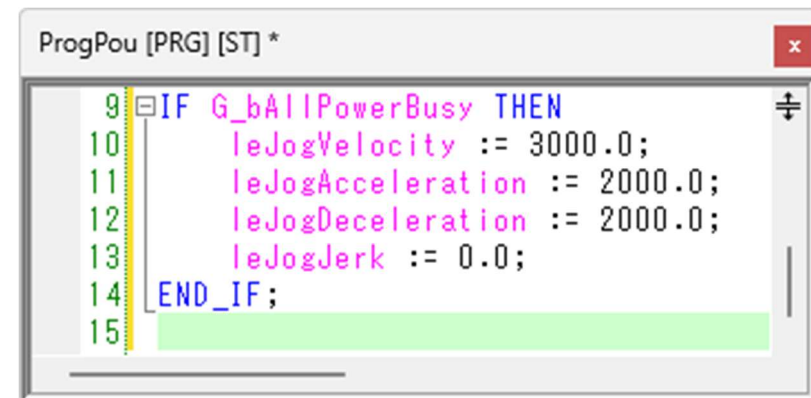
```

### 10. Write a program to configure the velocity, acceleration, deceleration, and jerk for JOG operation.

In this document, they are set as follows:

#### ■ Velocity settings for JOG operation

- Velocity: 3000 [pulse/s]
- Acceleration: 2000 [pulse/s<sup>2</sup>]
- Deceleration: 2000 [pulse/s<sup>2</sup>]
- Jerk: 0 [pulse/s<sup>3</sup>]



```

9  IF G_bAllPowerBusy THEN
10     leJogVelocity := 3000.0;
11     leJogAcceleration := 2000.0;
12     leJogDeceleration := 2000.0;
13     leJogJerk := 0.0;
14  END_IF;
15

```

#### Point

**Jerk is the chronological change ratio of the acceleration or the deceleration.**

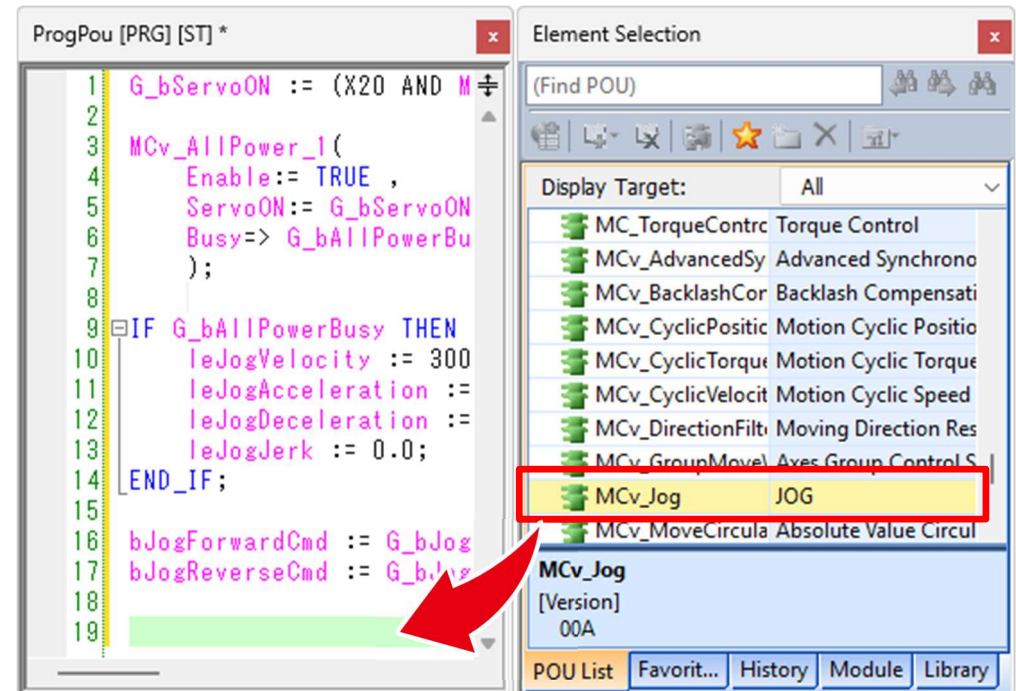
11. Write an interlock program that prevents forward and reverse commands from being executed simultaneously when performing JOG operation.

```

ProgPou [PRG] [ST] *
16 bJogForwardCmd := G_bJogForwardReq AND NOT(G_bJogReverseReq) AND G_bAllPowerBusy;
17 bJogReverseCmd := G_bJogReverseReq AND NOT(G_bJogForwardReq) AND G_bAllPowerBusy;
18

```

12. Drag and drop [MCv\_Jog] from [Element Selection] → [Motion Control Function / Function Block] → [Motion - Individual] into the ST editor, and insert the FB (MCv\_Jog).



```

ProgPou [PRG] [ST] *
1 G_bServoON := (X20 AND M
2
3 MCv_AllPower_1(
4   Enable:= TRUE ,
5   ServoON:= G_bServoON
6   Busy=> G_bAllPowerBu
7 );
8
9 IF G_bAllPowerBusy THEN
10   lJogVelocity := 300
11   lJogAcceleration :=
12   lJogDeceleration :=
13   lJogJerk := 0.0;
14 END_IF;
15
16 bJogForwardCmd := G_bJog
17 bJogReverseCmd := G_bJog
18
19

```

Element Selection

(Find POU)

Display Target: All

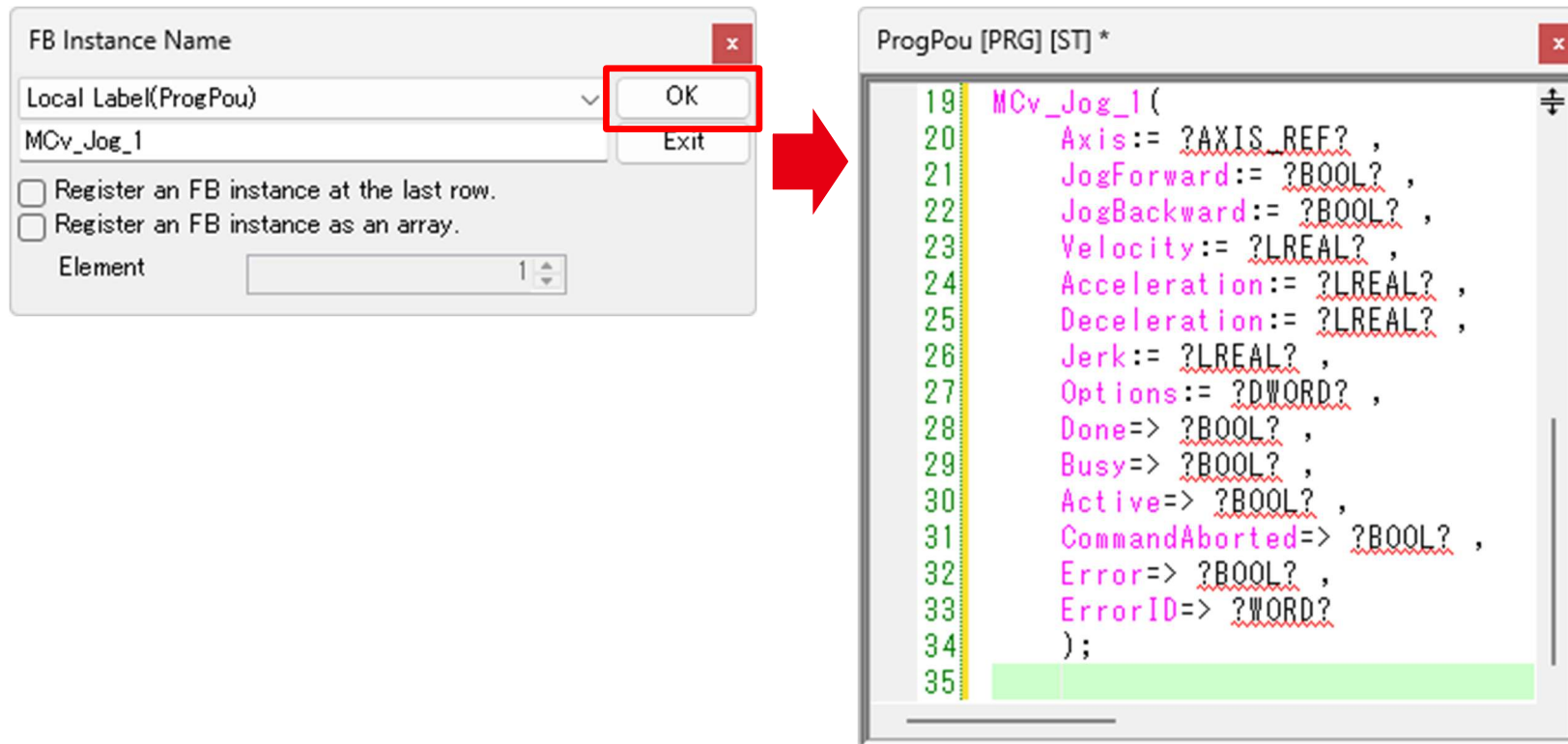
- MC\_TorqueContr Torque Control
- MCv\_AdvancedSy Advanced Synchrono
- MCv\_BacklashCor Backlash Compensati
- MCv\_CyclicPositic Motion Cyclic Positio
- MCv\_CyclicTorque Motion Cyclic Torque
- MCv\_CyclicVelocit Motion Cyclic Speed
- MCv\_DirectionFilt Moving Direction Res
- MCv\_GroupMove Axes Group Control S
- MCv\_Jog JOG**
- MCv\_MoveCircular Absolute Value Circul

MCv\_Jog  
[Version]  
00A

POU List Favorit... History Module Library

**Drag & Drop**

13. When the “FB Instance Name” window appears, click the [OK] button to accept the defaults and define the FB (MCv\_Jog\_1). The FB (MCv\_Jog\_1) is displayed in the ST editor as shown below.



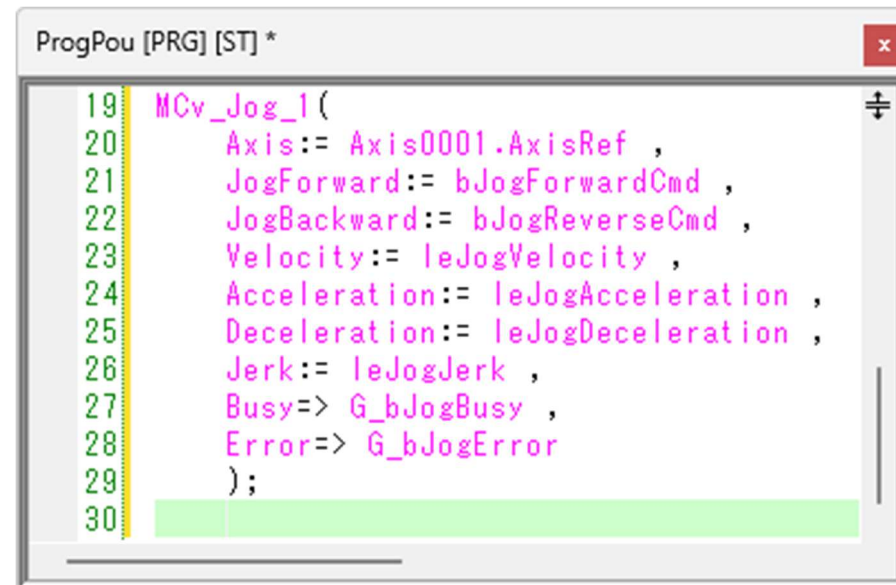
#### 14. Describe the FB (MCv\_Jog\_1).

Execute the FB when either “JOG Forward request (G\_bJogForwardReq)” or “JOG Reverse request (G\_bJogReverseReq)” turns ON.

Set the arguments of the FB as shown below. Any arguments other than those listed below are not required, please delete them.

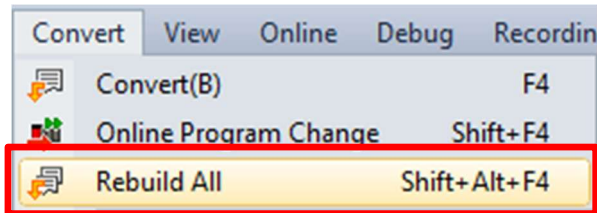
##### ■ FB (MCv\_Jog\_1) arguments

- Axis: Axis0001.AxisRef
- JogForward: bJogForwardCmd
- JogBackward: bJogReverseCmd
- Velocity: leJogVelocity
- Acceleration: leJogAcceleration
- Deceleration: leJogDeceleration
- Jerk: leJogJerk
- Busy: G\_bJogBusy
- Error: G\_bJogError

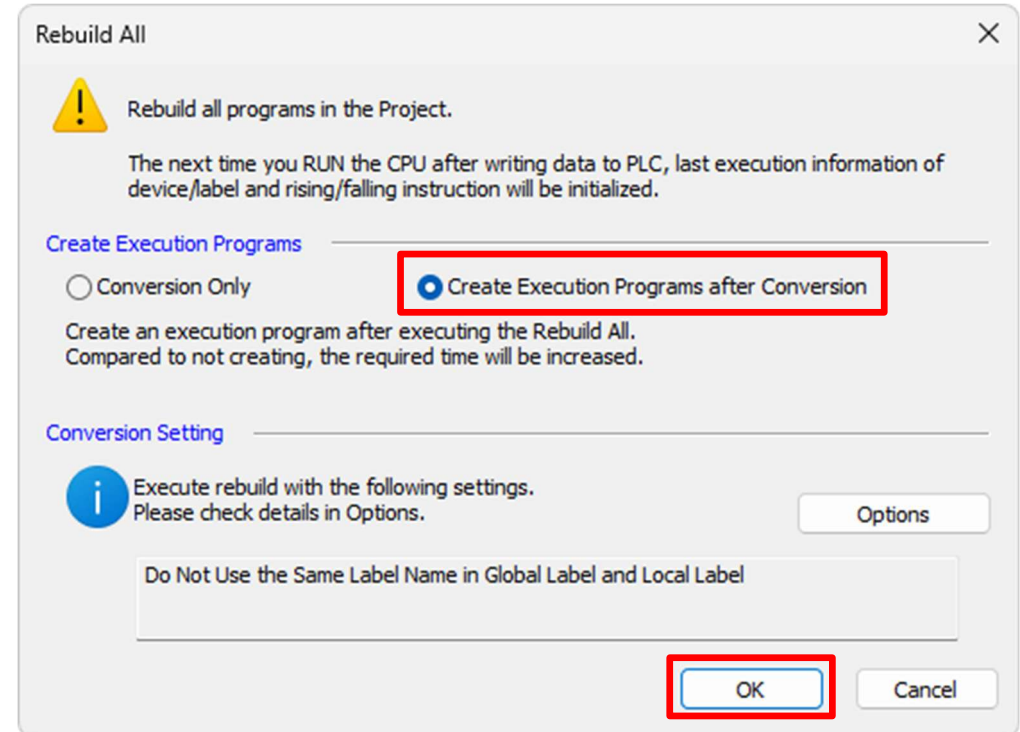


```
19 MCv_Jog_1(  
20   Axis:= Axis0001.AxisRef ,  
21   JogForward:= bJogForwardCmd ,  
22   JogBackward:= bJogReverseCmd ,  
23   Velocity:= leJogVelocity ,  
24   Acceleration:= leJogAcceleration ,  
25   Deceleration:= leJogDeceleration ,  
26   Jerk:= leJogJerk ,  
27   Busy=> G_bJogBusy ,  
28   Error=> G_bJogError  
29 );  
30
```

15. After creating the program, select [Convert] → [Rebuild All] from the menu bar to perform a full conversion of the program.



16. In the “Rebuild All” window, select “Create Execution Programs after Conversion” and click the [OK] button.

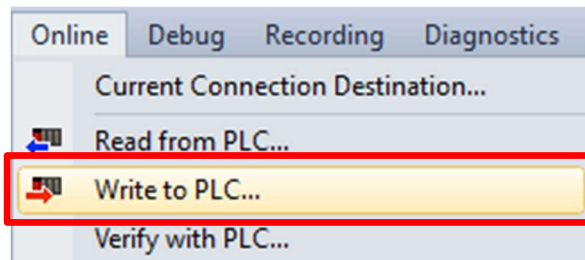


17. If no errors are reported in the “Progress” window, the full conversion is complete.

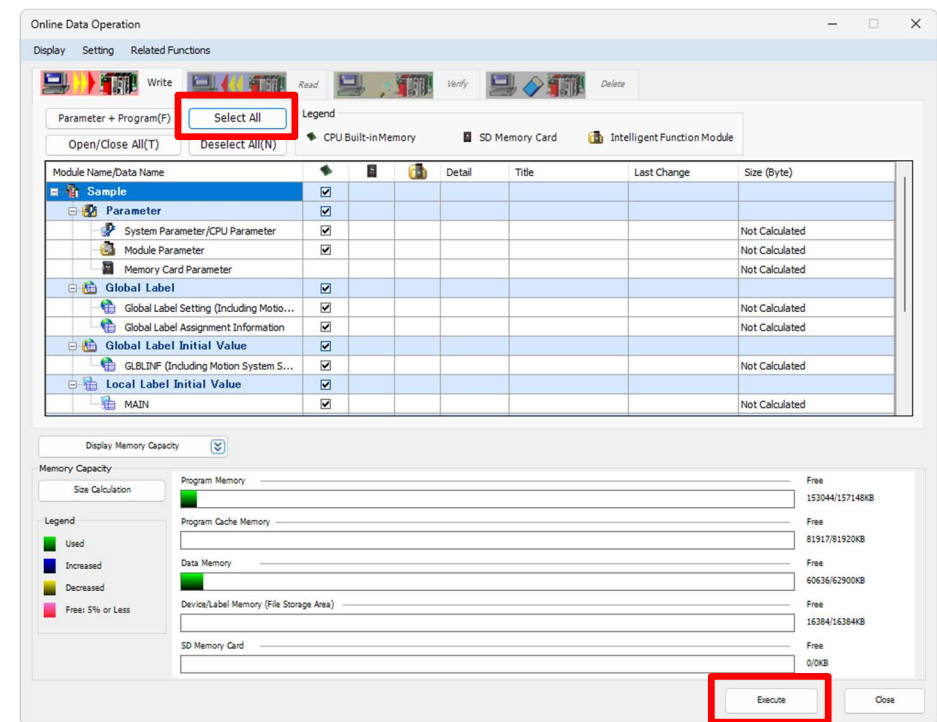


Perform a functional check to confirm that the controller and drive unit communicate correctly over CC-Link IE TSN. Also verify that the drive unit performs JOG operation when it receives the command signal.

1. Click [Online] → [Write to PLC] from the menu bar.  
Make sure to connect the controller and the configuration PC with an Ethernet cable beforehand.



2. Click the [Select All] button, then click the [Execute] button to write the parameters to the controller.

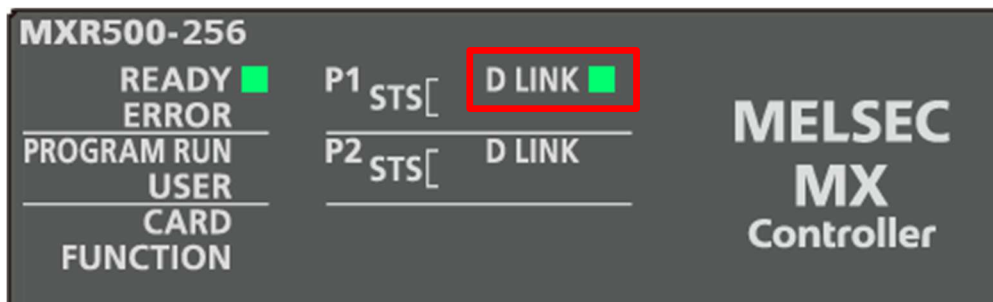


### Point

After the parameter writing is complete, reset the controller, or turn the power off and then on again.

3. Connect the controller and the drive unit with an Ethernet cable.

Check that the controller's [D LINK] LED is lit to ensure that network communication has been established.



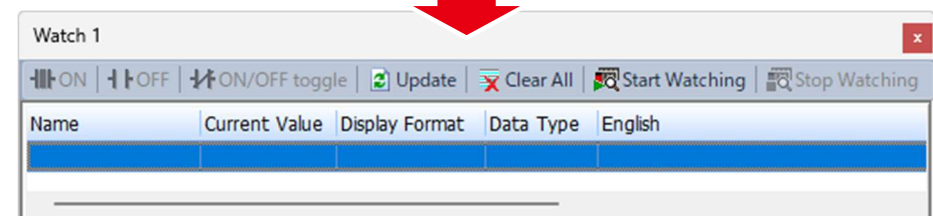
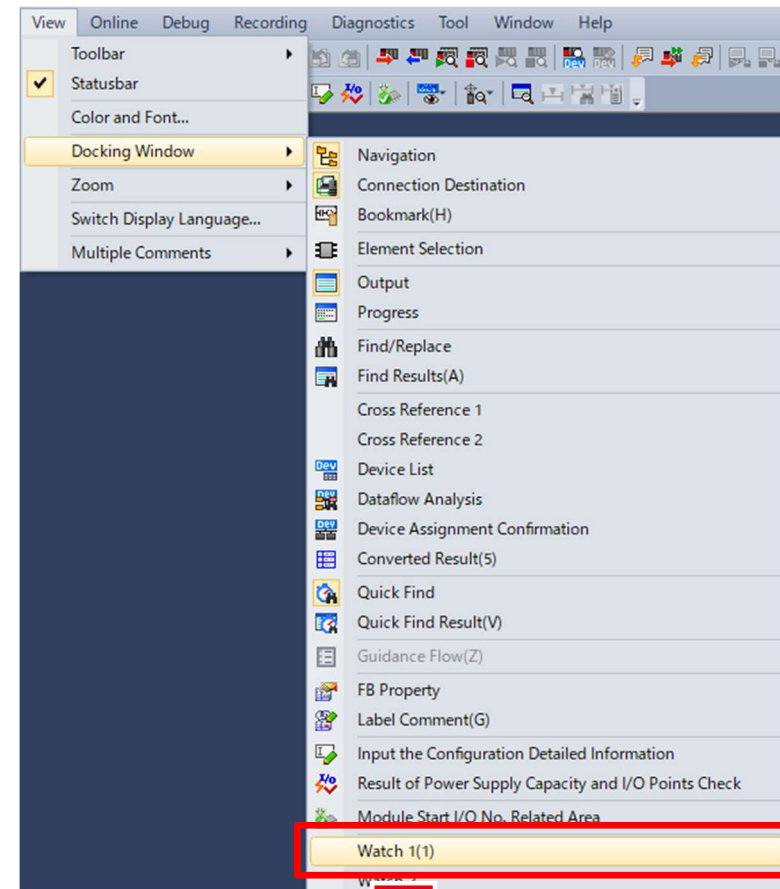
### Point

If the LED is not lit, please refer to the following.

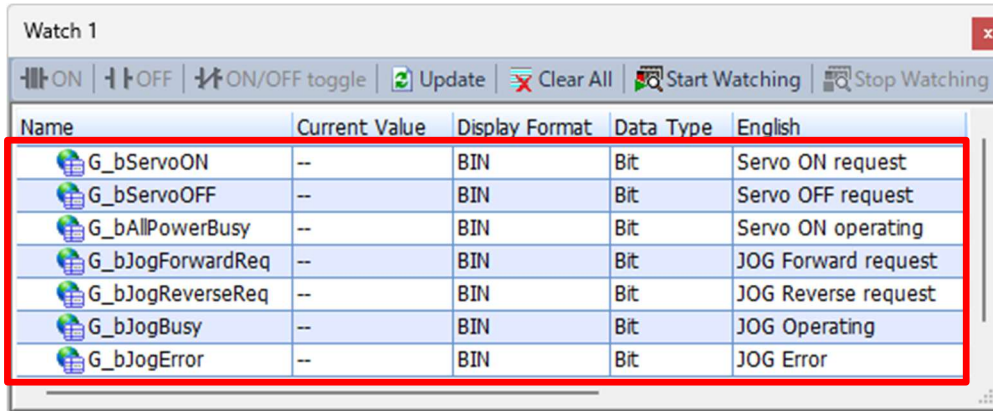
「MELSEC MX Controller MX-R Model User's Manual (SH-082641ENG)」

... Chapter 17 TROUBLESHOOTING

4. From the menu bar, click [View] → [Docking Window] → [Watch 1] to display the “Watch 1” window.

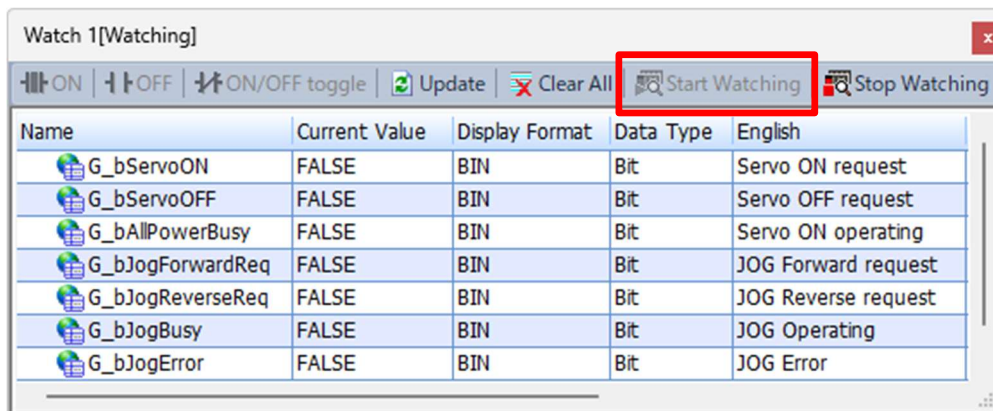


5. Register the created global labels in the “Watch 1” window.



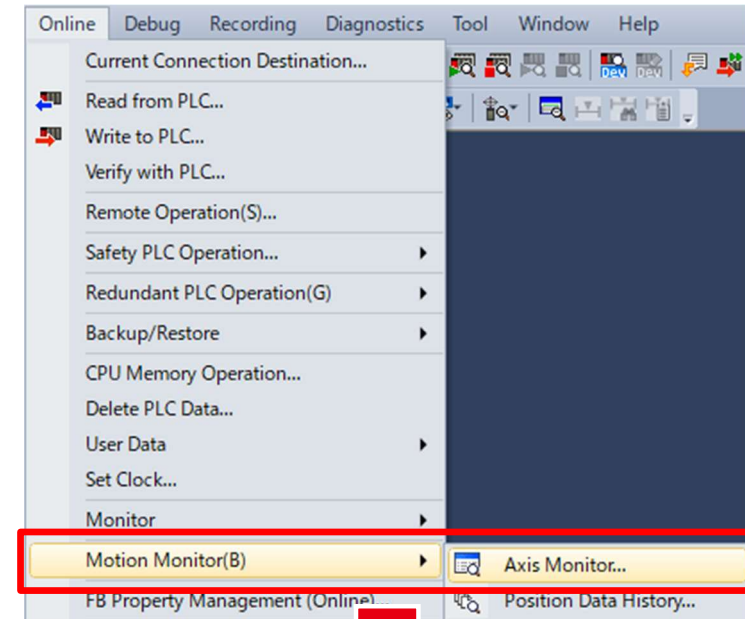
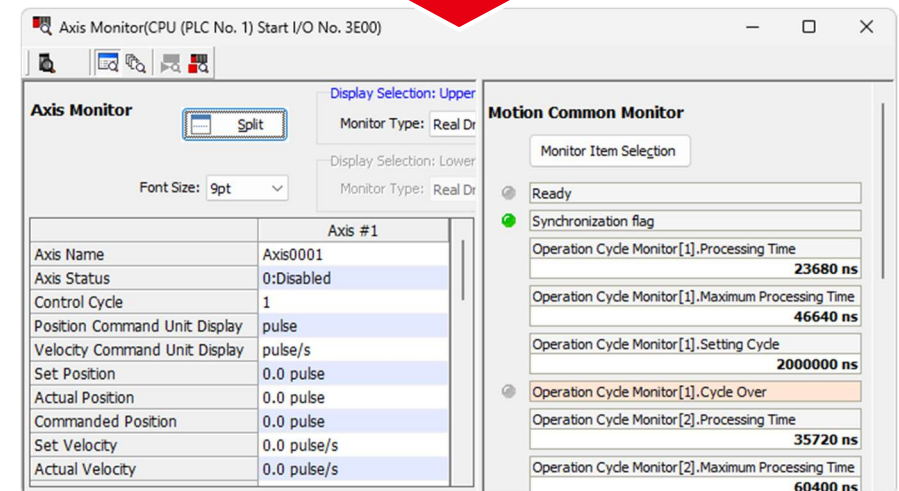
Name	Current Value	Display Format	Data Type	English
G_bServoON	--	BIN	Bit	Servo ON request
G_bServoOFF	--	BIN	Bit	Servo OFF request
G_bAllPowerBusy	--	BIN	Bit	Servo ON operating
G_bJogForwardReq	--	BIN	Bit	JOG Forward request
G_bJogReverseReq	--	BIN	Bit	JOG Reverse request
G_bJogBusy	--	BIN	Bit	JOG Operating
G_bJogError	--	BIN	Bit	JOG Error

6. In the “Watch 1” window, click [Start Watching] to begin monitoring.



Name	Current Value	Display Format	Data Type	English
G_bServoON	FALSE	BIN	Bit	Servo ON request
G_bServoOFF	FALSE	BIN	Bit	Servo OFF request
G_bAllPowerBusy	FALSE	BIN	Bit	Servo ON operating
G_bJogForwardReq	FALSE	BIN	Bit	JOG Forward request
G_bJogReverseReq	FALSE	BIN	Bit	JOG Reverse request
G_bJogBusy	FALSE	BIN	Bit	JOG Operating
G_bJogError	FALSE	BIN	Bit	JOG Error

7. From the menu bar, click [Online] → [Motion Monitor] → [Axis Monitor] to display the “Axis Monitor” window.

Axis #1	
Axis Name	Axis0001
Axis Status	0:Disabled
Control Cycle	1
Position Command Unit Display	pulse
Velocity Command Unit Display	pulse/s
Set Position	0.0 pulse
Actual Position	0.0 pulse
Commanded Position	0.0 pulse
Set Velocity	0.0 pulse/s
Actual Velocity	0.0 pulse/s

Motion Common Monitor	
Monitor Item Selection	Ready
Synchronization flag	<input checked="" type="checkbox"/>
Operation Cycle Monitor[1].Processing Time	23680 ns
Operation Cycle Monitor[1].Maximum Processing Time	46640 ns
Operation Cycle Monitor[1].Setting Cycle	2000000 ns
Operation Cycle Monitor[1].Cycle Over	<input checked="" type="checkbox"/>
Operation Cycle Monitor[2].Processing Time	35720 ns
Operation Cycle Monitor[2].Maximum Processing Time	60400 ns

### 8. Switch the controller to RUN.

When motion control preparation is complete, “Servo ON request (G\_bServoON)” will be set TRUE and the FB (MCv\_AllPower\_1) will be executed. Confirm that “Servo ON operating (G\_bAllPowerBusy)” is TRUE and that the [Axis Status] is “4:Standstill.” Once the FB (MCv\_AllPower\_1) completes successfully, Axis 1 will turn the servo ON state.

Watch 1[Watching]

ON OFF ON/OFF toggle Update Clear All Start Watching Stop Watching

Name	Current Value	Display Format	Data Type	English
G_bServoON	TRUE	BIN	Bit	Servo ON request
G_bAllPowerBusy	TRUE	BIN	Bit	Servo ON operating
G_bJogForwardReq	FALSE	BIN	Bit	JOG Forward request
G_bJogReverseReq	FALSE	BIN	Bit	JOG Reverse request
G_bJogBusy	FALSE	BIN	Bit	JOG Operating
G_bJogError	FALSE	BIN	Bit	JOG Error

Axis Monitor(CPU (PLC No. 1) Start I/O No. 3E00)

Axis Monitor

Display Selection: Upper  
Monitor Type: Real Dr

Display Selection: Lower  
Monitor Type: Real Dr

Font Size: 9pt

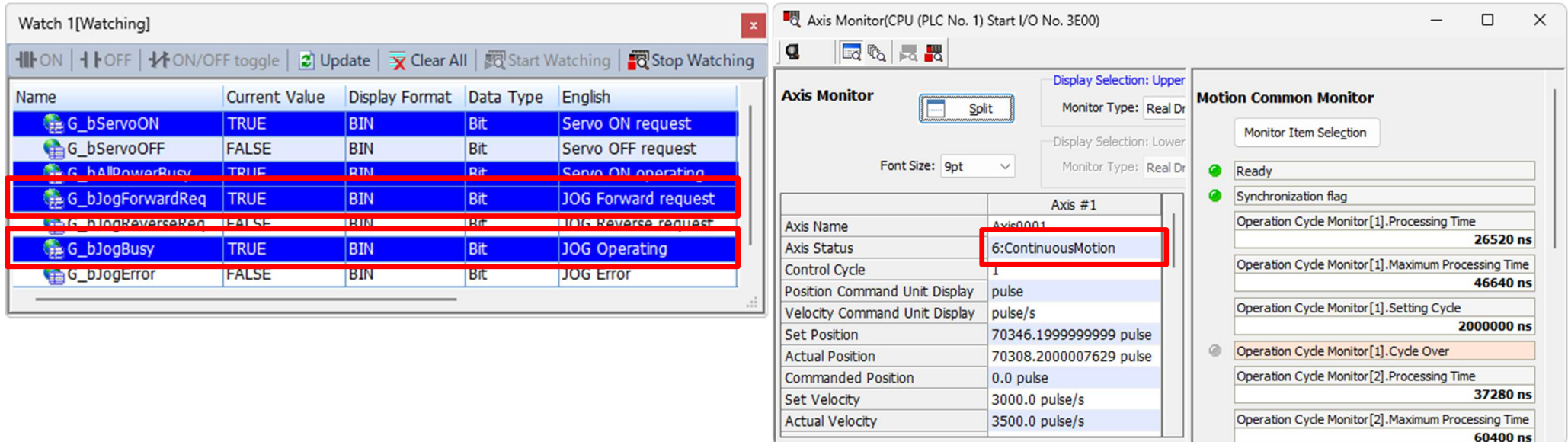
	Axis #1
Axis Name	Axis001
Axis Status	4:Standstill
Control Cycle	1
Position Command Unit Display	pulse
Velocity Command Unit Display	pulse/s
Set Position	0.0 pulse
Actual Position	0.0 pulse
Commanded Position	0.0 pulse
Set Velocity	0.0 pulse/s
Actual Velocity	0.0 pulse/s

Motion Common Monitor

Monitor Item Selection

- Ready
- Synchronization flag
- Operation Cycle Monitor[1].Processing Time  
23800 ns
- Operation Cycle Monitor[1].Maximum Processing Time  
46640 ns
- Operation Cycle Monitor[1].Setting Cycle  
2000000 ns
- Operation Cycle Monitor[1].Cycle Over
- Operation Cycle Monitor[2].Processing Time  
35360 ns
- Operation Cycle Monitor[2].Maximum Processing Time  
60400 ns

9. In the “Watch 1” window, set “JOG Forward request (G\_bJogForwardReq)” or “JOG Reverse request (G\_bJogReverseReq)” to TRUE to execute the FB (MCv\_Jog\_1).  
 Confirm that “JOG Operating (G\_bJogBusy)” is TRUE and that the [Axis Status] is “6:ContinuousMotion.”  
 The FB (MCv\_Jog\_1) will operate normally, and the motor will perform a JOG operation.



The screenshot displays two windows from the Mitsubishi GX Developer software. The 'Watch 1[Watching]' window on the left shows a table of variables with their current values. The 'Axis Monitor' window on the right shows the status of Axis #1.

Name	Current Value	Display Format	Data Type	English
G_bServoON	TRUE	BIN	Bit	Servo ON request
G_bServoOFF	FALSE	BIN	Bit	Servo OFF request
G_bAllPowerBusy	TRUE	BIN	Bit	Servo ON operating
G_bJogForwardReq	TRUE	BIN	Bit	JOG Forward request
G_bJogReverseReq	FALSE	BIN	Bit	JOG Reverse request
G_bJogBusy	TRUE	BIN	Bit	JOG Operating
G_bJogError	FALSE	BIN	Bit	JOG Error

Axis #1	
Axis Name	Axis0001
Axis Status	6:ContinuousMotion
Control Cycle	1
Position Command Unit Display	pulse
Velocity Command Unit Display	pulse/s
Set Position	70346.1999999999 pulse
Actual Position	70308.2000007629 pulse
Commanded Position	0.0 pulse
Set Velocity	3000.0 pulse/s
Actual Velocity	3500.0 pulse/s

10. This completes the operation check.

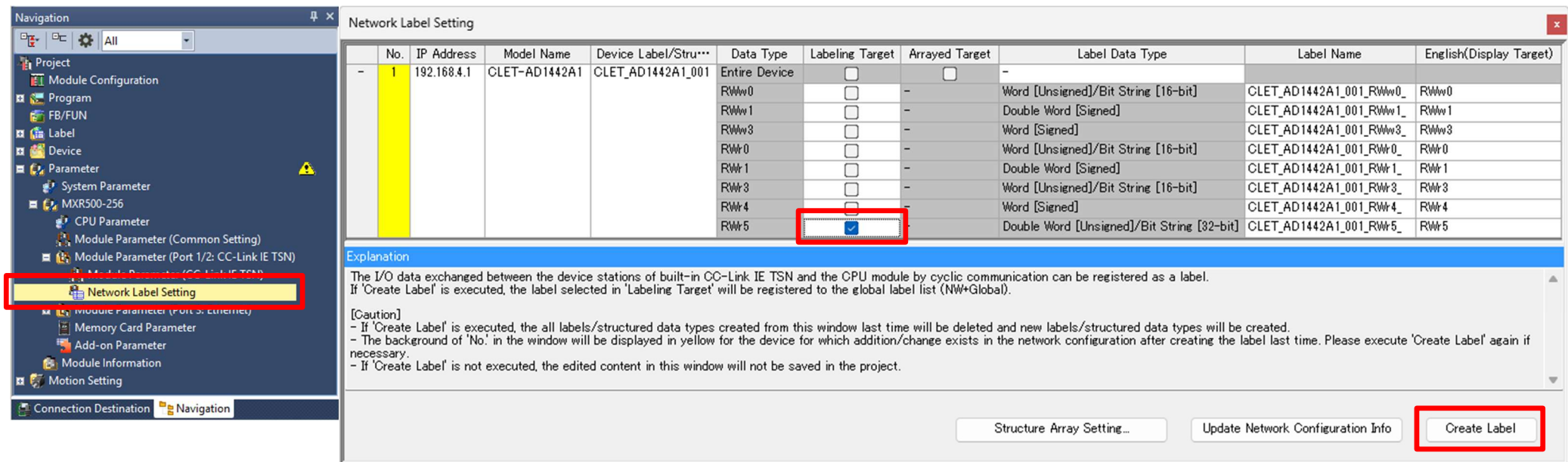
# APPENDICES

This explains how to use external signals connected to a drive unit in the motion system.

You can make those external signals available to the motion system by registering them as labels in the “Network Label Setting.”

## ■ How to create network labels

1. In GX Works3, double-click [Navigation] → [Parameter] → [MXR500-256] → [Module Parameter (Port 1/2: CC-Link IE TSN)] → [Network Label Setting] to open the “Network Label Setting” window.
2. Check the [Labeling target] box for the data corresponding to the object “Digital inputs,” then click the [Create Label] button.



No.	IP Address	Model Name	Device Label/Stru...	Data Type	Labeling Target	Arrayed Target	Label Data Type	Label Name	English(Display Target)
-	192.168.4.1	CLET-AD1442A1	CLET_AD1442A1_001	Entire Device	<input type="checkbox"/>	<input type="checkbox"/>	-		
				RWw0	<input type="checkbox"/>	-	Word [Unsigned]/Bit String [16-bit]	CLET_AD1442A1_001_RWw0_	RWw0
				RWw1	<input type="checkbox"/>	-	Double Word [Signed]	CLET_AD1442A1_001_RWw1_	RWw1
				RWw3	<input type="checkbox"/>	-	Word [Signed]	CLET_AD1442A1_001_RWw3_	RWw3
				RWw0	<input type="checkbox"/>	-	Word [Unsigned]/Bit String [16-bit]	CLET_AD1442A1_001_RWw0_	RWw0
				RWw1	<input type="checkbox"/>	-	Double Word [Signed]	CLET_AD1442A1_001_RWw1_	RWw1
				RWw3	<input type="checkbox"/>	-	Word [Unsigned]/Bit String [16-bit]	CLET_AD1442A1_001_RWw3_	RWw3
				RWw4	<input type="checkbox"/>	-	Word [Signed]	CLET_AD1442A1_001_RWw4_	RWw4
				RWw5	<input checked="" type="checkbox"/>	-	Double Word [Unsigned]/Bit String [32-bit]	CLET_AD1442A1_001_RWw5_	RWw5

**Explanation**

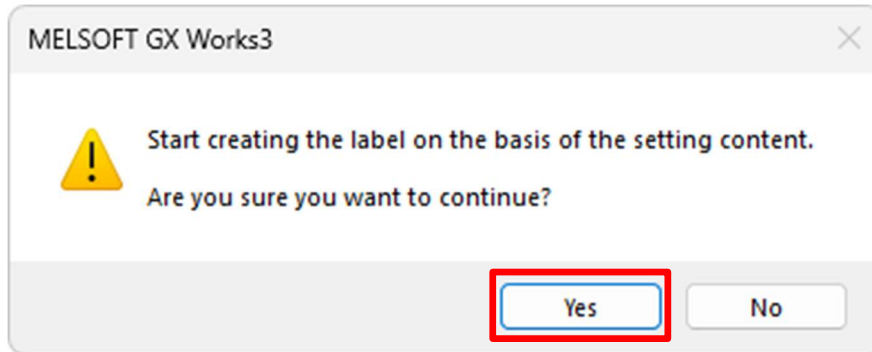
The I/O data exchanged between the device stations of built-in CC-Link IE TSN and the CPU module by cyclic communication can be registered as a label. If 'Create Label' is executed, the label selected in 'Labeling Target' will be registered to the global label list (NW+Global).

**[Caution]**

- If 'Create Label' is executed, the all labels/structured data types created from this window last time will be deleted and new labels/structured data types will be created.
- The background of 'No.' in the window will be displayed in yellow for the device for which addition/change exists in the network configuration after creating the label last time. Please execute 'Create Label' again if necessary.
- If 'Create Label' is not executed, the edited content in this window will not be saved in the project.

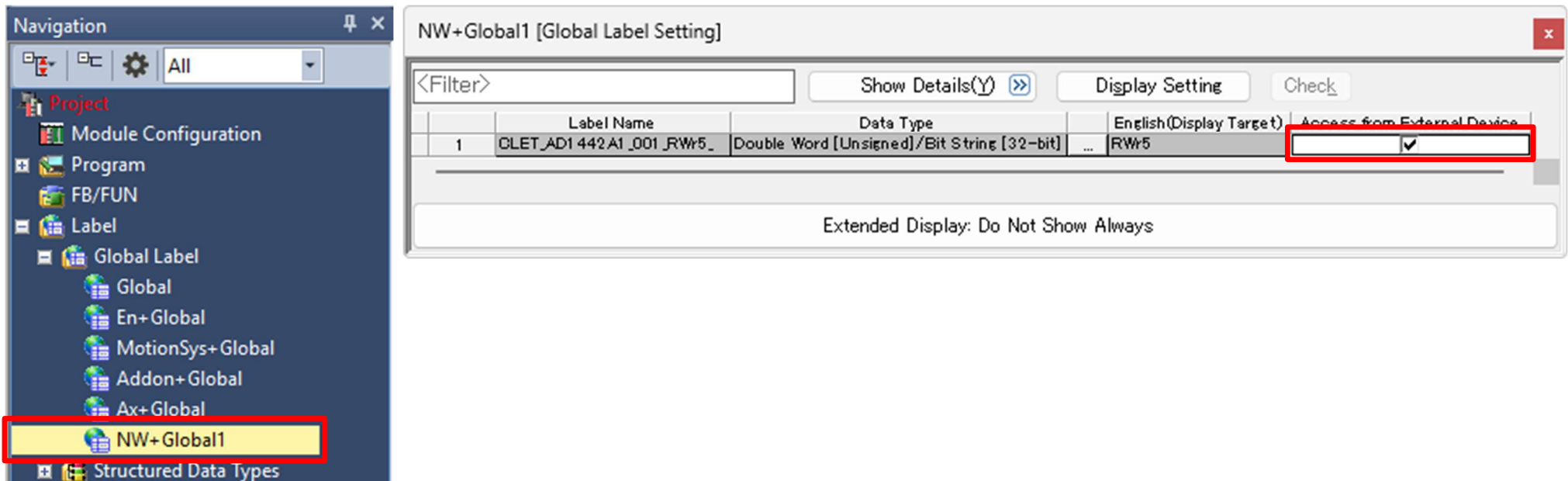
Buttons: Structure Array Setting..., Update Network Configuration Info, **Create Label**

3. Click the [Yes] button to generate the network labels in the Global Labels.

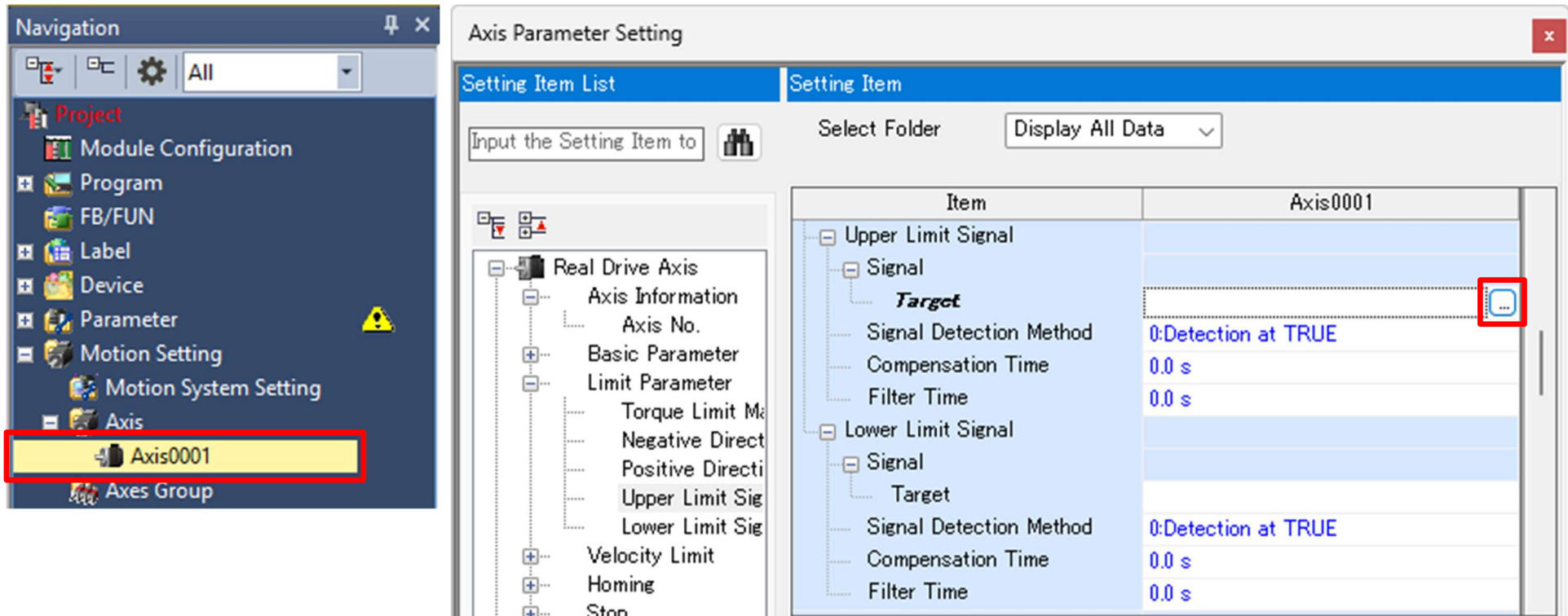


4. Double-click [Navigation] → [Label] → [Global Label] → [NW+Global1] to open the “NW+Global1” window.

5. Check the “Access from External Device” checkbox for the generated network label.



6. Assign the network-labeled “Digital inputs” to the axis upper and lower limit signals.  
Double-click [Navigation] → [Motion Setting] → [Axis] → [Axis0001] to open the “Axis Parameter Setting” window.
7. In [Setting Item List] → [Real Drive Axis] → [Limit Parameter] → [Upper Limit Signal] → [Target], click the [...] button.

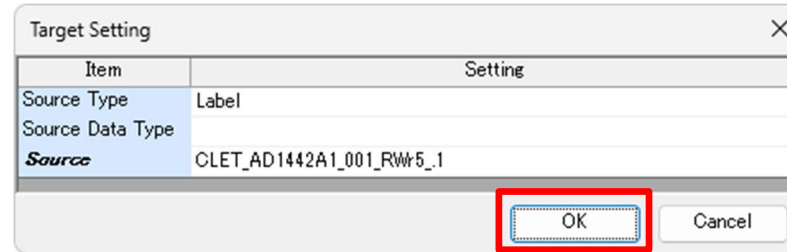


The screenshot shows two windows from a software application. On the left is the 'Navigation' window, which has a tree view of project elements. The 'Axis' folder is expanded, and 'Axis0001' is highlighted with a red box. On the right is the 'Axis Parameter Setting' window. It has two tabs: 'Setting Item List' and 'Setting Item'. The 'Setting Item List' tab is active, showing a tree view of parameters for 'Real Drive Axis'. The 'Limit Parameter' folder is expanded, and the 'Upper Limit Signal' folder is selected. The 'Upper Limit Signal' folder is expanded, and the 'Signal' folder is selected. The 'Signal' folder is expanded, and the 'Target' parameter is selected. The 'Target' parameter has a red box around its [...] button. The 'Setting Item' tab is also visible, showing a table of parameters for 'Axis0001'.

Item	Axis0001
Upper Limit Signal	
Signal	
<i>Target</i>	
Signal Detection Method	0:Detection at TRUE
Compensation Time	0.0 s
Filter Time	0.0 s
Lower Limit Signal	
Signal	
Target	
Signal Detection Method	0:Detection at TRUE
Compensation Time	0.0 s
Filter Time	0.0 s

8. In the “Target Setting” window, configure the following items and then click the [OK] button.

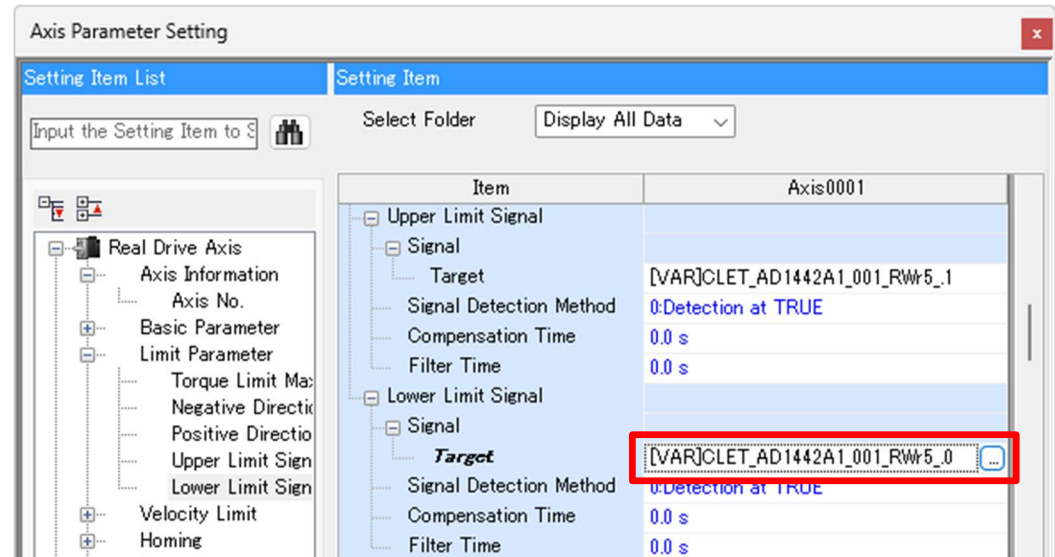
Item	Setting
Source Type	Label
Source	CLET_AD1442A1_001_RWr5_1



Item	Setting
Source Type	Label
Source Data Type	
<b>Source</b>	CLET_AD1442A1_001_RWr5_1

9. Similarly, configure the following items for the [Lower Limit Signal].

Item	Setting
Source Type	Label
Source	CLET_AD1442A1_001_RWr5_0



Item	Axis0001
Upper Limit Signal	
Signal	
Target	[VAR]CLET_AD1442A1_001_RWr5_1
Signal Detection Method	0:Detection at TRUE
Compensation Time	0.0 s
Filter Time	0.0 s
Lower Limit Signal	
Signal	
<b>Target</b>	[VAR]CLET_AD1442A1_001_RWr5_0
Signal Detection Method	0:Detection at TRUE
Compensation Time	0.0 s
Filter Time	0.0 s

10. This completes the setup.

If the operation checks described in this document do not result in correct operation, please refer to the manuals below.

「MELSEC MX Controller MX-R Model User's Manual (SH-082641ENG)」

... Chapter 17 TROUBLESHOOTING

「MELSEC MX Controller MX-F Model User's Manual (SH-082634ENG)」

... Chapter 18 TROUBLESHOOTING

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## For safe use

- To use the products given in this publication properly, always read the relevant manuals before use.

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