https://cltsn.fastech-motions.com/en

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Programmable Controllers
MELSEC iQ-F series

Ezi-STEP® CC-Link IE TSN 4X
Micro Stepping System

Connection Guide

MELSEC iQ-F series and Ezi-STEP® CC-Link IE TSN 4X Micro Stepping System

Mitsubishi Electric Products
FX5-40SSC-G(S), FX5-80SSC-G(S)

FASTECH Products
Ezi-STEP CC-Link IE TSN 4X

Before you begin

- Thank you for using our company's products.
- The Ezi-STEP CC-Link IE TSN 4X is a stepping motor unit consisting of a driver equipped with a 32-bit high-performance ARM processor and various motors. It is used as a remote station in a CC-Link IE TSN network.
- The Ezi-STEP CC-Link IE TSN 4X is an industrial product. Do not use it for any other purpose. Our company shall not be liable for any damages incurred due to non-compliance with this instruction.
- This connection guide provided by our company explains how to connect the Ezi-STEP CC-Link IE TSN 4X to Mitsubishi Electric's MELSEC iQ-F FX5-SSC-G. It covers CSP+ file registration, system configuration, parameter settings, and programming methods.
- Before writing the PLC program, please be sure to read this connection guide, understand its contents accurately, and use the product correctly.
- This connection guide is subject to change without notice. For the latest version, please refer to our company's CC-Link IE TSN website (https://cltsn.fastech-motions.com/en).

Manual Information

- The Ezi-STEP CC-Link IE TSN 4X manual can be downloaded from the FASTECH website.

  https://cltsn.fastech-motions.com/en/download/quick

Manual Name	Manual Number
[Manual][CC-Link IE TSN][Ezi-STEP 4X] Micro Stepping System	
[Connection Guide][CC-Link IE TSN][MELSEC iQ-F FX5-SSC-G][Ezi-STEP 4X]	

- The MELSEC iQ-F FX5-SSC-G manual can be downloaded from the Mitsubishi Electric website.

  https://www.mitsubishielectric.com/fa/index.html

Manual Name	Manual Number
MELSEC iQ-F Motion Unit User's Manual (Startup Edition)	IB-0300405
MELSEC iQ-F Motion Unit User's Manual (Network Edition)	IB-0300425
MELSEC iQ-F Motion Unit User's Manual (Simple Motion Mode Application Edition)	IB-0300571
MELSEC iQ-F Motion Unit User's Manual (Simple Motion Mode Advanced Synchronous Control Edition)	IB-0300574
GX Works3 Operating Manual	SH-081214

Terminology

- This section covers terms used in the connection guide.

Terminology	Description
CC-Link IE TSN	An open network that adopts 'TSN (Time-Sensitive Networking)', an extension of the standard Ethernet specification, enabling simultaneous processing of real-time control and information from other open networks.
Master station (Manager station)	This station manages the entire network and can perform cyclic and transient transmission with all stations. The MELSEC iQ-F FX5 Motion Module corresponds to this station.
Remote station	A station that performs cyclic transmission of bit-level I/O signals and word-level I/O data, also capable of transient transmission. The Ezi-STEP CC-Link IE TSN 4X corresponds to this.
PDO	Abbreviation for Process Data Object. A collection of application objects periodically transmitted between multiple CANopen nodes.
Object	Various data held by device stations corresponding to CANopen.

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[Appendix]

[Appendix 1] Homing Method

1. Overview

1-1. Overview

- **MELSEC iQ-F FX5-SSC-G and Ezi-STEP CC-Link IE TSN 4X Connection Guide**

◆ Master station: FX5-40SSC-G(S) / FX5-80SSC-G(S)

PLCopen® Motion Control FB (Function Block)

- Control programs can be easily written using the PLCopen Motion Control FB library, an international standard specification.
- This program allows third parties to easily understand its contents, significantly reducing design and maintenance time.

◆ Engineering software

- GX Works3: Ver. 1.105K or later
- Motion control setting function: Ver. 1.055H or later

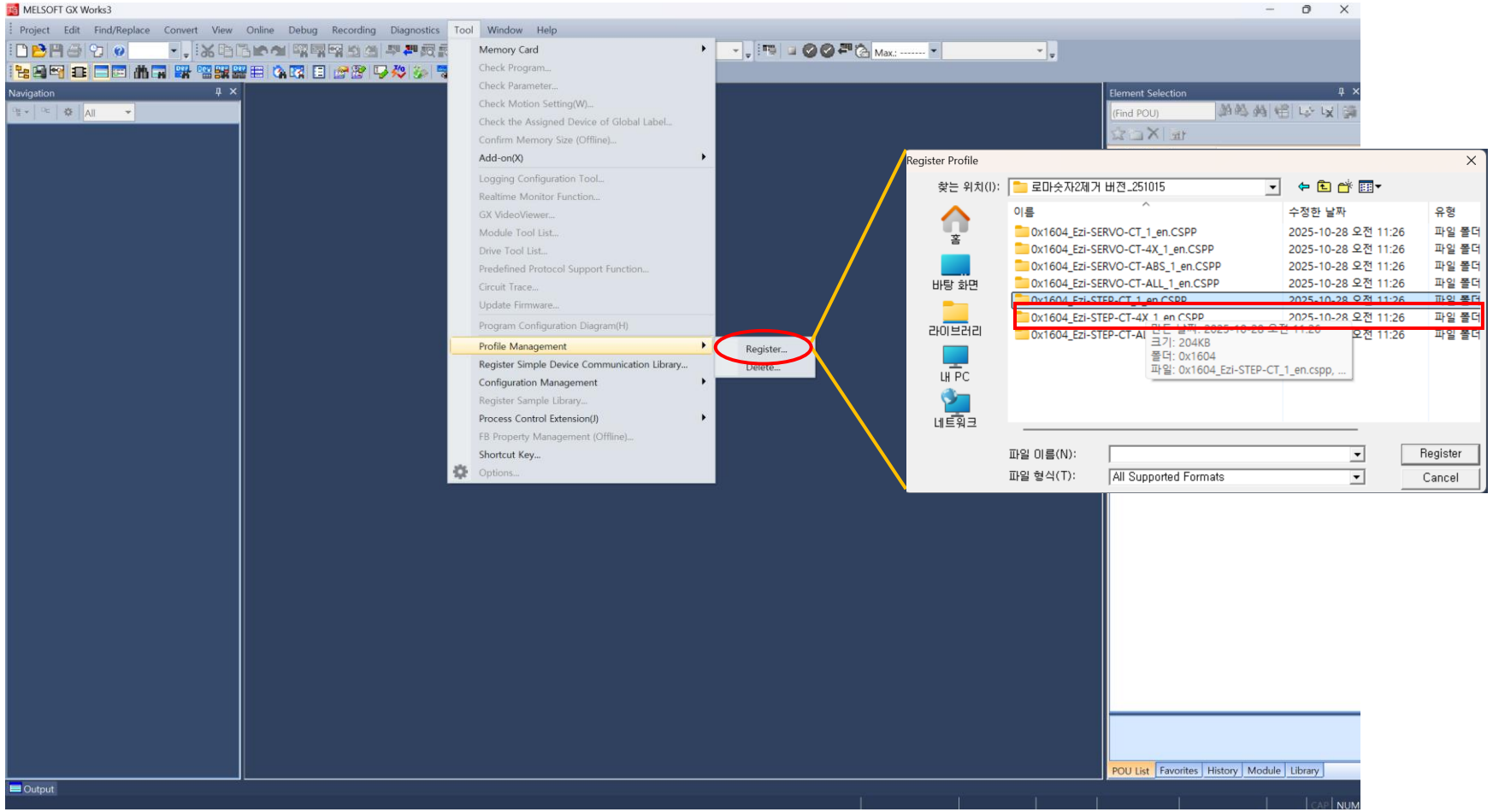
※ For the latest files, please refer to the Mitsubishi Electric website.
(https://www.mitsubishielectric.com/fa/download/index.html)

◆ Remote station: Ezi-STEP CC-Link IE TSN 4X

- Download address: https://cltsn.fastech-motions.com/en/download/quick
- File Name: 0x1604_Ezi-STEP-CT-4X_1_en_CSPP

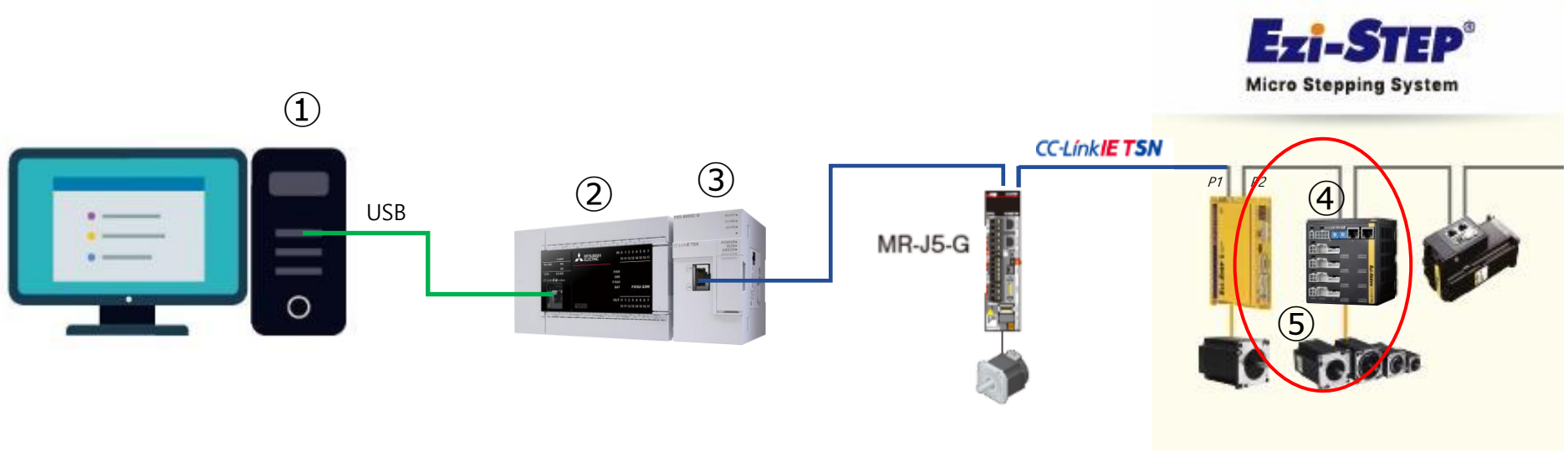
1-2. Ezi-STEP CC-Link IE TSN 4X CSP+ File Registration

- **CSP+ Registration**
  - [GX Works3] Tool / Profile Management / Register ※ Registration is only possible before opening a project.



1-3. CC-Link IE TSN Configuration

- **Network Connection**



Configuration		Product name	IP address
①	Engineering software	GX Works3	-
②	CPU module	FX5U	
③	Motion module	FX5-40SSC-G(S)	192.168.3.253
④	Driver	EzT2-CT-4X	192.168.3.1
⑤	Motor	BM-42S	

1-3. CC-Link IE TSN Configuration

- **Ezi-STEP Specifications**

Item		Specifications
Communication protocol		CC-Link IE TSN Class B
Communication speed		1Gbps / 100Mbps
Modes of operation		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 250 μs
	Network synchronization communication	Synchronous Communication (CSP, PP, HM) / Asynchronous Communication (PP, HM)
Encoder type		Incremental type

1-4. Setup Sequence

- **Ezi-STEP, FX5 Parameter Settings**

No.	Item	Description
1	Ezi-STEP Settings 	Configure parameters using the driver configuration program (Ezi-CT Manager). Please download the configuration program and its usage guide from the FASTECH Co., Ltd. website. ※ Address: https://cltsn.fastech-motions.com/en/download/quick
2	PLC FX5 CPU Configuration 	Create a project for the FX5 CPU module using GX-Works3, then configure the unit parameters (communication method, connection target) and axis parameters (for motion control).
3	Verifying FX5 + Ezi-STEP Operation 	Write a program to verify that the FX5 CPU module and Ezi-STEP are configured correctly. Manipulate labels to verify the motor operates normally.

1-4. Setup Sequence

● Ezi-STEP Setup Notes

Item	Details
IP address setting	① Set using the driver's rotary switch ② Rotary Switch → Setting value: '00', IP address (Index: 2101h, Subindex: 01~04h)
Driver homing method setting	① Set the homing method (Index: 6098h, Subindex: 00h) - Set homing method: '0' (default) → '33', etc. ※ Refer to [Appendix 1] Homing Method ② Home offset (Index: 607Ch, Subindex:00h) → Set to '0' Caution) Setting a value other than 0 may cause rapid acceleration or deceleration upon homing completion.
Limit stop method setting	① Limit stop method (Index:2003h, Subindex:00h) setting - 0: PP, HM → Quick stop / CSP → No stop - 1: PP, HM → Deceleration stop / CSP → Does not stop ② Setting a value other than '0' or '1' may cause '1ED0H: Drive error' when detecting the hardware stroke limit.
In-position range	① In-position range (Index:2B21h, Subindex:00h, Data type:Unsigned32) setting - Register a value within the In-position range (5 to 20000 pulses) considering the operating environment ② If [Md.102: Deviation counter value] is less than the setting value, [Md.108: Servo status 1: In-position] turns ON. As a rule, this object should not be made public. Please configure it using the servo transient transmission function of the FX5 CPU module.

1-5. Restrictions

Motion Control Function Restrictions (FX5 and Ezi-STEP)

Item	Restriction
Speed control	Speed control is unavailable because the driver does not support cyclic synchronous speed mode (CSV).
Torque control	Torque control is not available because the driver does not support cyclic synchronous torque mode (CST).
Continuous operation to torque control	Continuous operation to torque control is only supported by MELSERVO, so continuous operation to torque control is unavailable.
Advanced synchronous control	You cannot set "Synchronous encoder via servo amplifier" in [Pr.320: Synchronous encoder axis type].
Torque limit function	The driver does not support the following objects, so the Torque limit function cannot be used. ・Positive torque limit value (Index:60E0h, Subindex:00h) ・Negative torque limit value (Index:60E1h, Subindex:00h)
Absolute position system	The encoder is of the Incremental type, so the absolute position system cannot be used.
Follow up function	This product must perform homing when the servo is turned ON. Since this is an open-loop control system, the 'Position actual value (Index:6064h, Subindex: 00h)' is not updated when the servo is OFF. In the follow-up function, the motor rotation amount is reflected in the controller command based on the 'Position actual value (Index:6064h, Subindex:00h)'. Therefore, during servo OFF, the controller command and the motor position become misaligned by the amount the motor rotated.
Virtual servo amplifier function	Emulated by MR-J5-G.
Mark detection function	The driver's TPR1 (Touch Probe 1) cannot be used for [Pr.800: Mark detection signal setting].
Optional data monitor function	When using the optional data monitor function, set the objects to monitor in [Pr.91~94: Optional data monitor: Data type setting 1~4] and [Pr.591~594: Optional data monitor: Data type expansion setting 1~4].

1-5. Restrictions

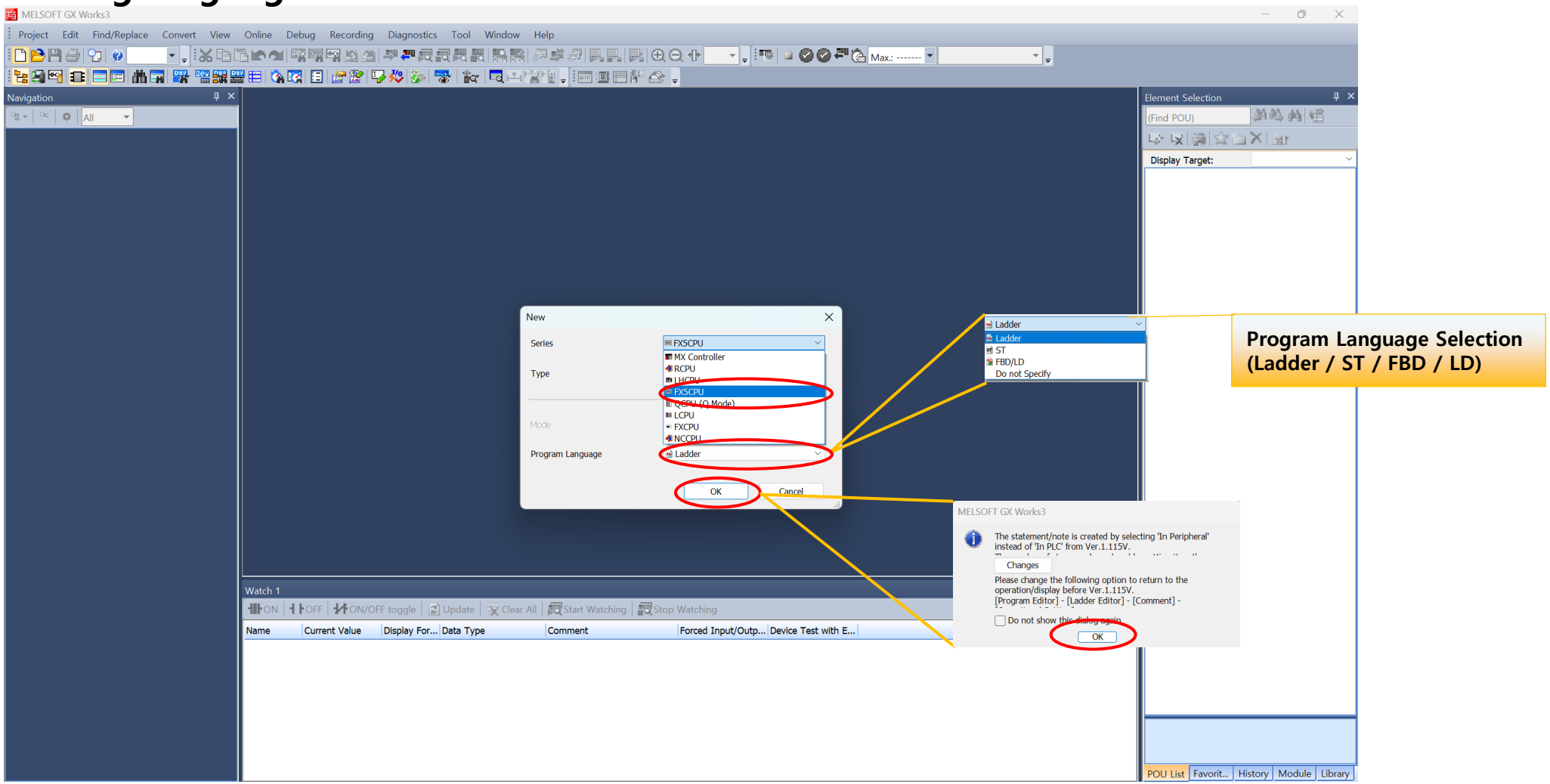
Motion Control Function Restrictions (FX5 and Ezi-STEP)

Item	Restriction
Md.103: Motor rotation speed	Since the driver does not support 'SI unit velocity (Index:60A9h, Subindex:00h)', it outputs the motor rotation speed in pulses per second.
Md.104: Motor current value	Since the driver does not support 'Torque actual value (Index:6077h, Subindex:00h)', it always displays "0".
Md.108: Servo status 1	The following bits in the monitor data are always in the 'OFF' state. · Gain switching (b4) · Fully closed control switching (b5) · Torque limit active (b13) · Absolute position lost (b14) · Servo warning (b15)
Md.119: Servo status 2	The following bits in the monitor data are always in the 'OFF' state. · Zero point pass (b0) · Zero speed (b3) · Speed limit active (b4) · PID control active (b8)
Md.115: Servo alarm detail number	Not supported. This monitor data is always displayed as '0'.
Cd.108: Gain switching command flag	Not supported. Only MELSERVO responds to this data.
Cd.133: Semi/Fully closed loop switching request	Not supported. Only MELSERVO responds to this data.
Cd.136: PI-PID switching request	Not supported. Only MELSERVO supports this data.

2. FX5-40SSC-G(S) Settings

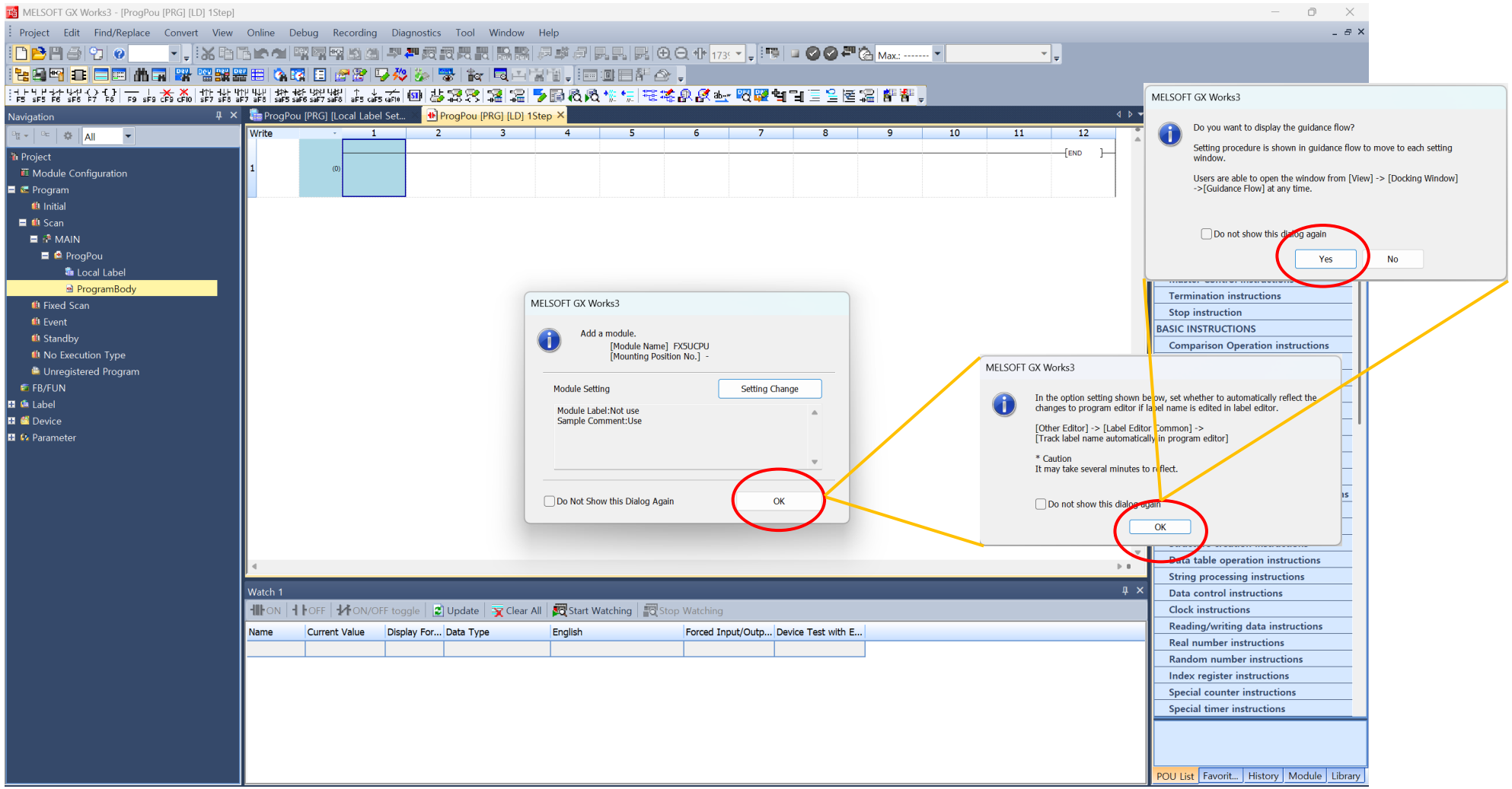
2-1. Project Creation

- **When creating a new project, select FX5CPU, model name, number of axes used, and programming language**



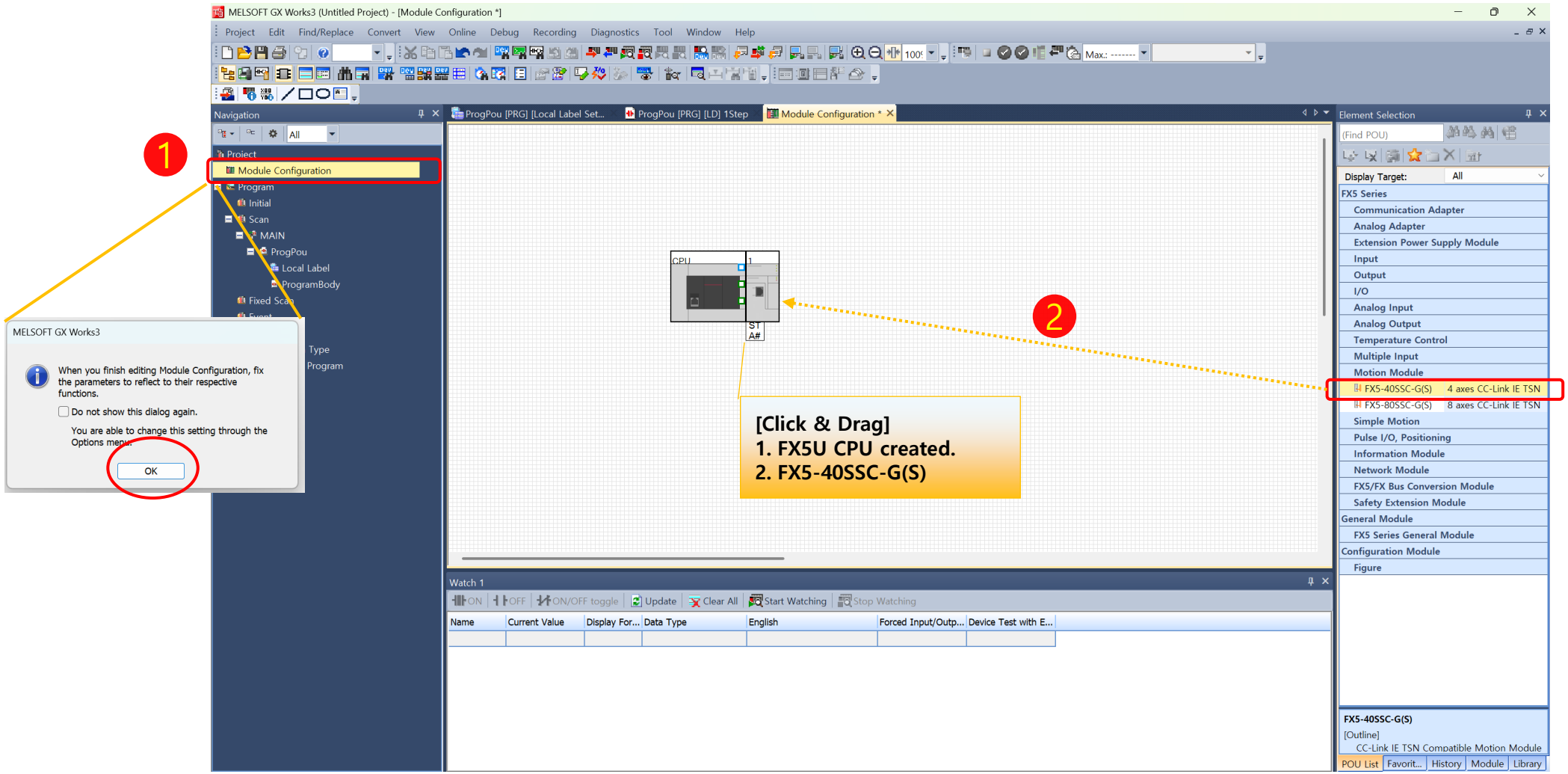
2-2. Module Registration

- **FX5U CPU Registration**



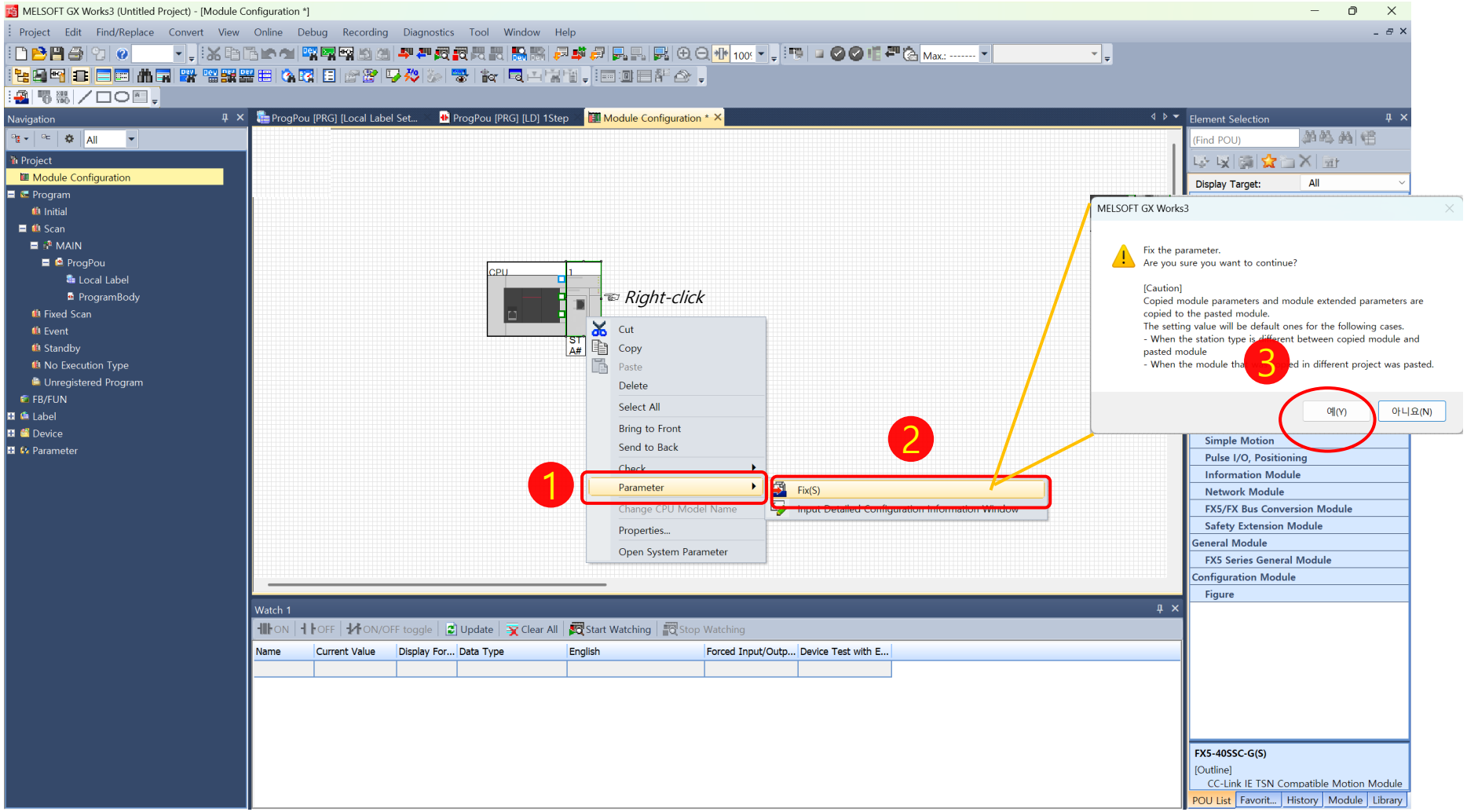
2-2. Module Registration

- **FX5U CPU Registration**



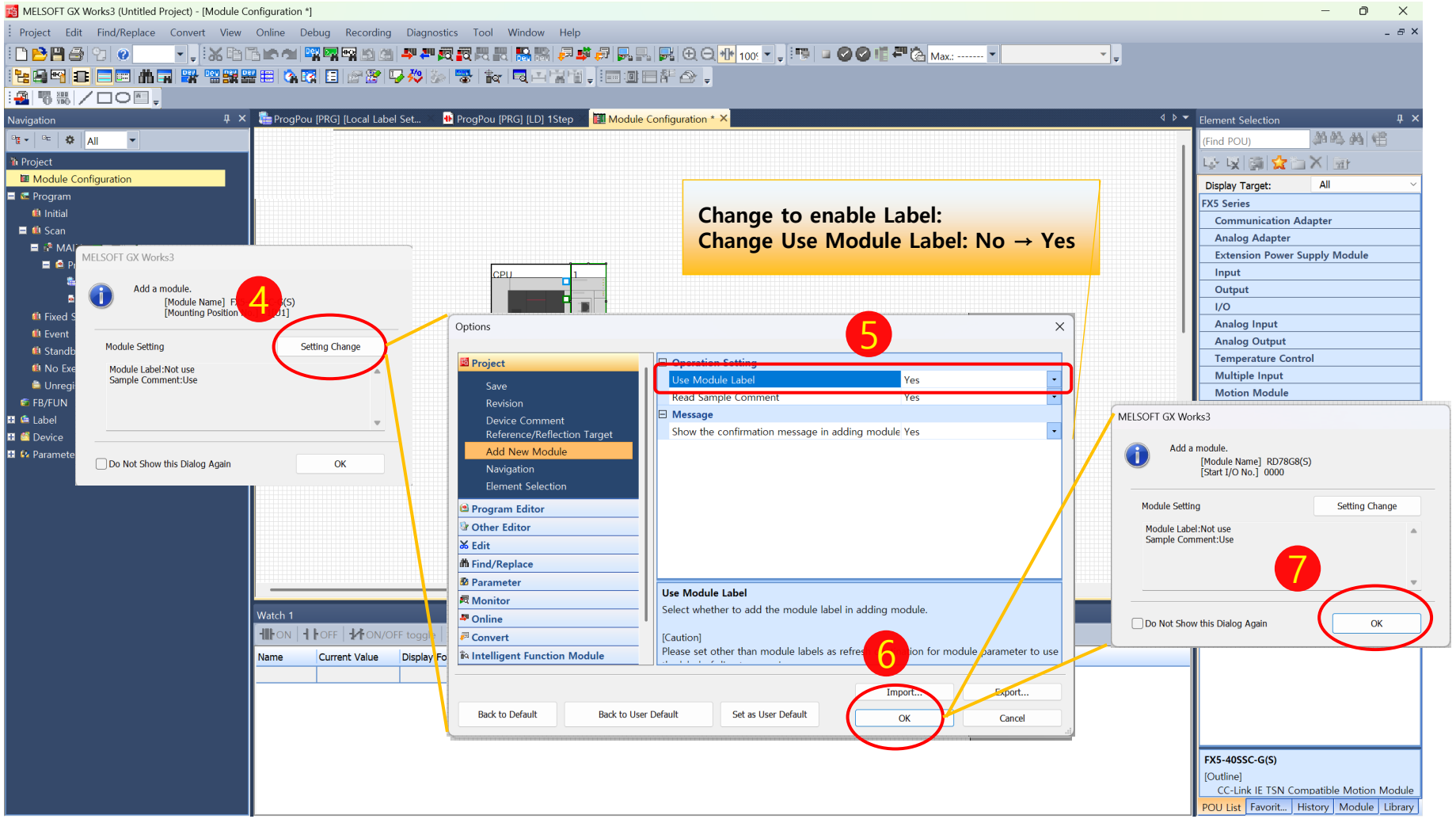
2-3. Module Configuration – H/W

- **Right-click the mouse and select Fix(S) to complete module configuration (1/2)**



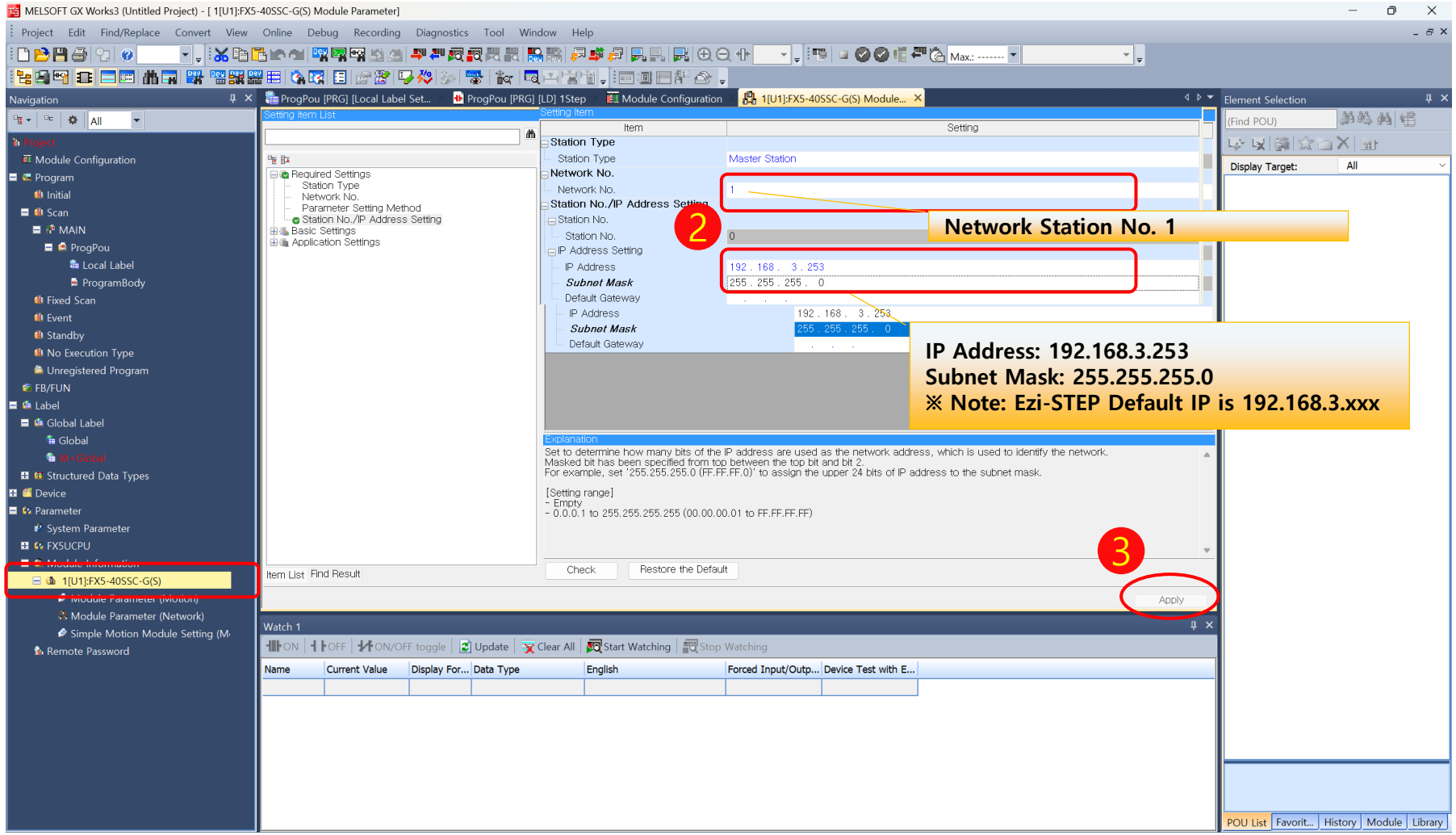
2-3. Module Configuration – H/W

- **Right-click the mouse and select Fix(S) to complete module configuration (2/2)**



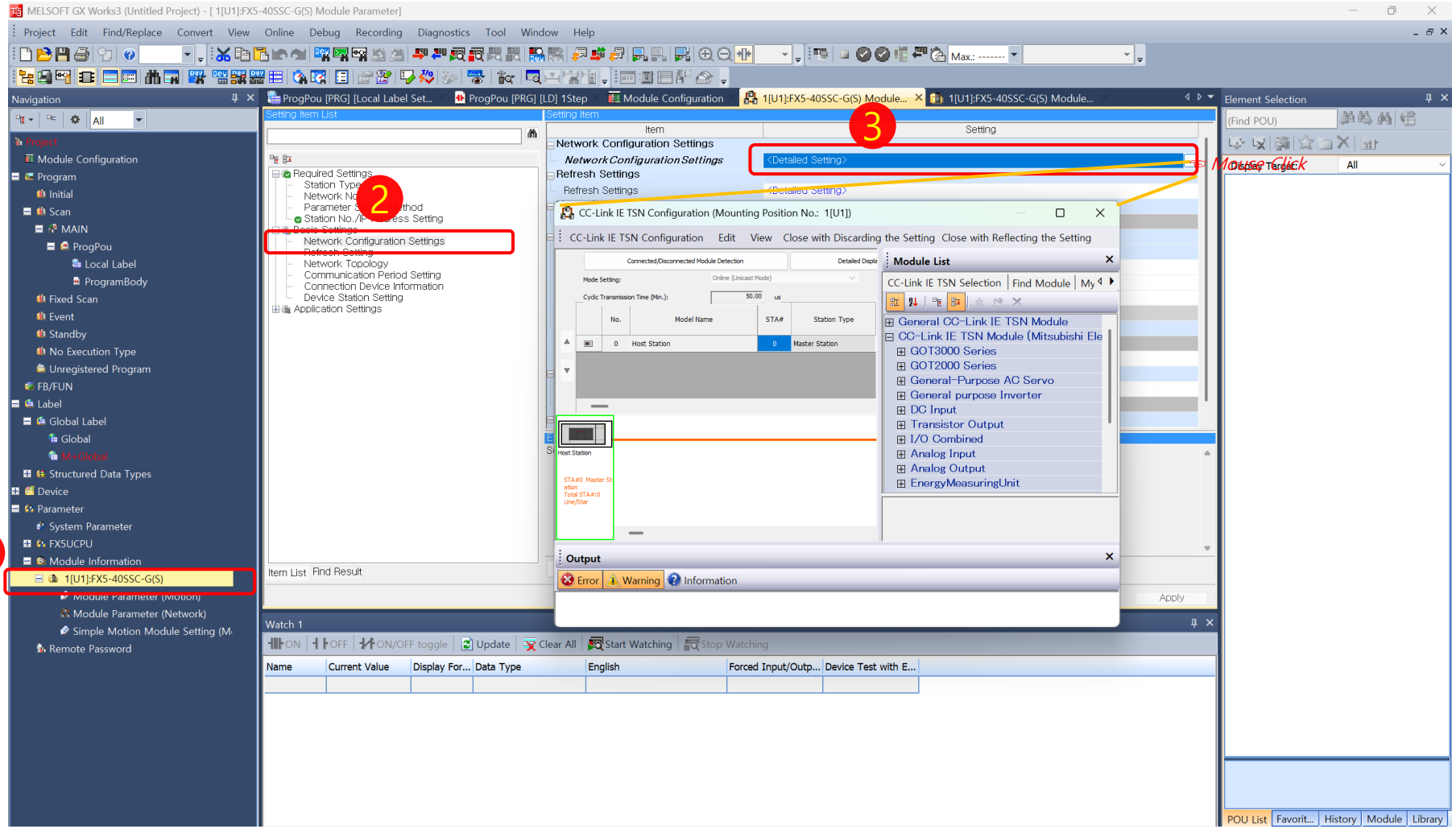
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Station No./IP Address Setting: e.g., IP Address → 192.168.3.253**



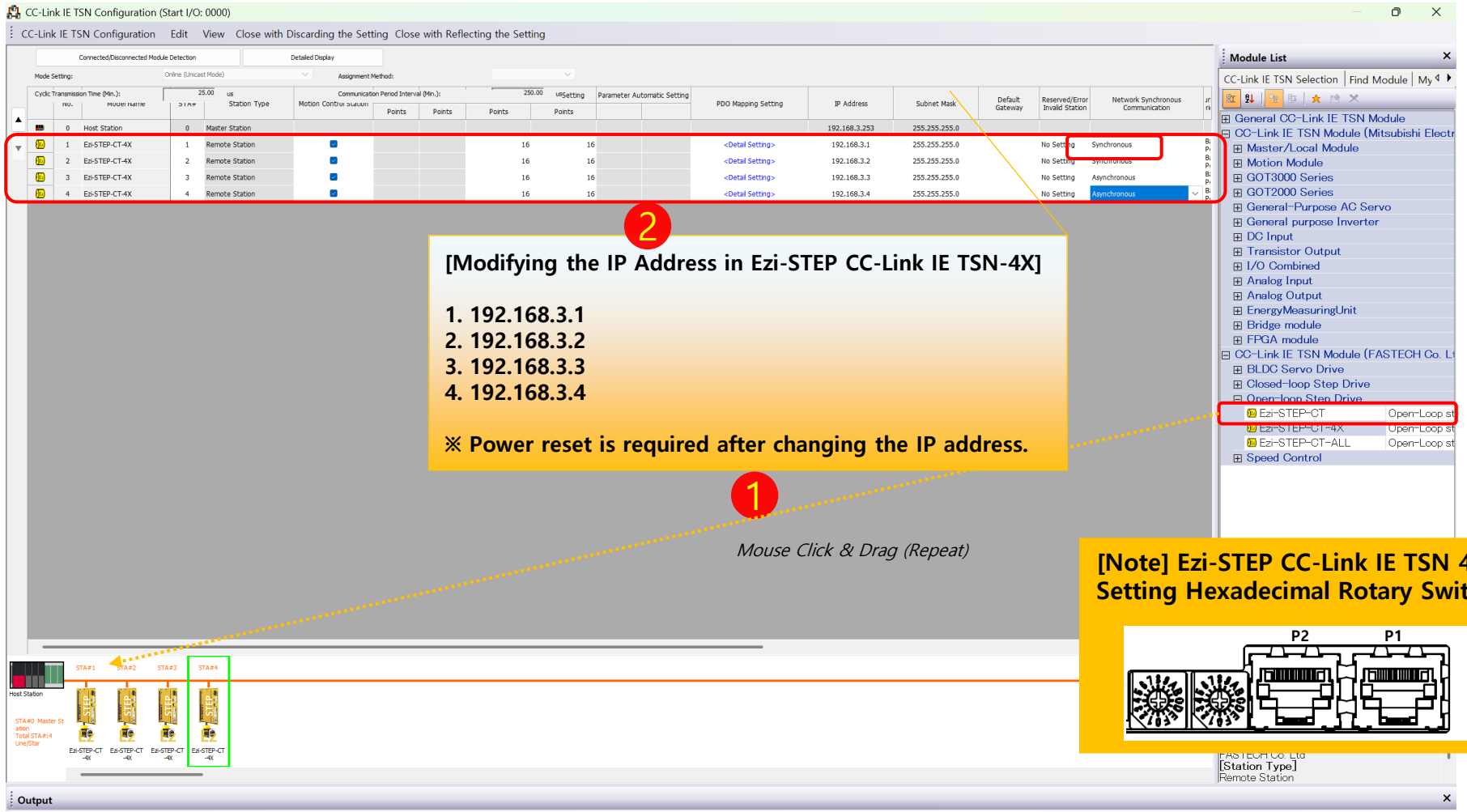
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Network Configuration Settings**



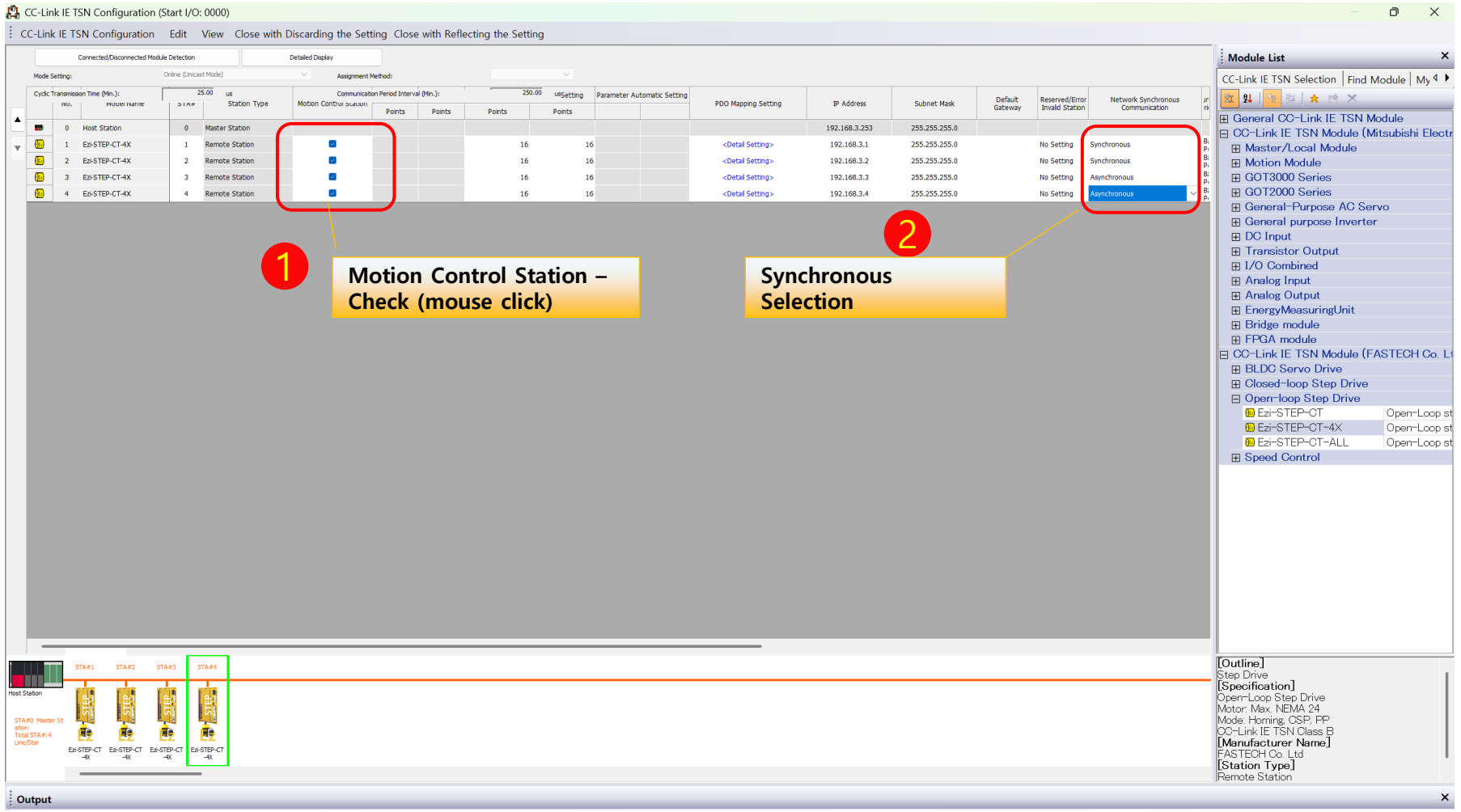
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Configure the CC-Link IE TSN Module manually (click & drag)**



2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Select the CC-Link IE TSN Module for Motion Control Station and Synchronous**



2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **PDO Mapping Settings are automatically assigned and configured as follows.**

■TPDO

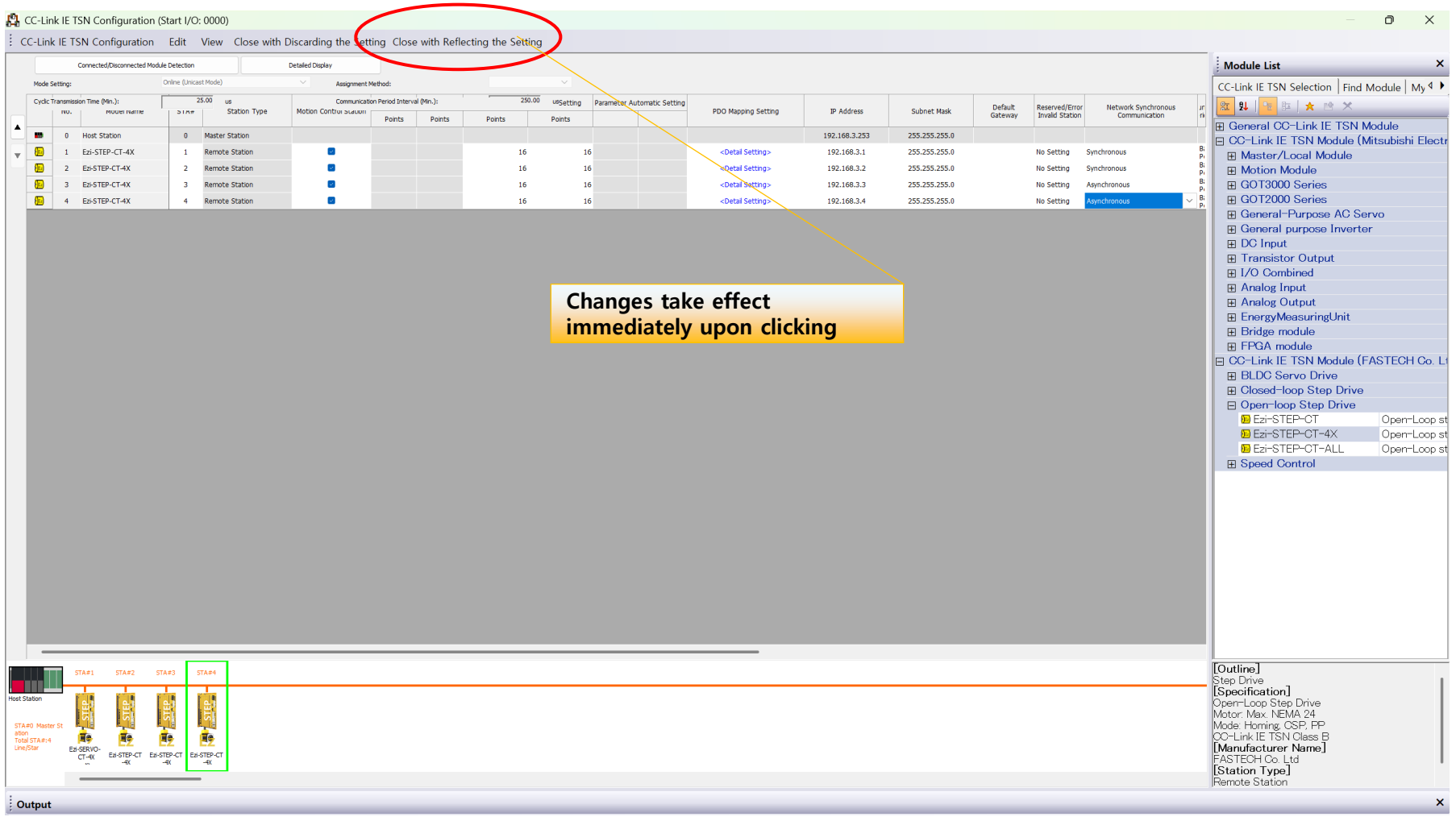
Index	Sub index	Data Type	Content
1D02	01	U16	Watchdog counter UL 1
6061	00	I8	Modes of operation display
0000	00	U8	GAP
6064	00	I32	Position Actual Value
60F4	00	I32	Following error actual value
6041	00	U16	Status word
2B12	00	U16	Status DO 1
603F	00	U16	Error code
60FD	00	U32	Digital inputs
0000	00	U32	GAP
0000	00	U32	GAP

■RPDO

Index	Sub index	Data Type	Content
1D01	01	U16	Watchdog counter DL 1
6060	00	I8	Modes of operation
0000	00	U8	GAP
607A	00	I32	Target position
6040	00	U16	Controlword
2B02	00	U16	Control DI 5
0000	00	U32	GAP
0000	00	U32	GAP
0000	00	U32	GAP
0000	00	U32	GAP

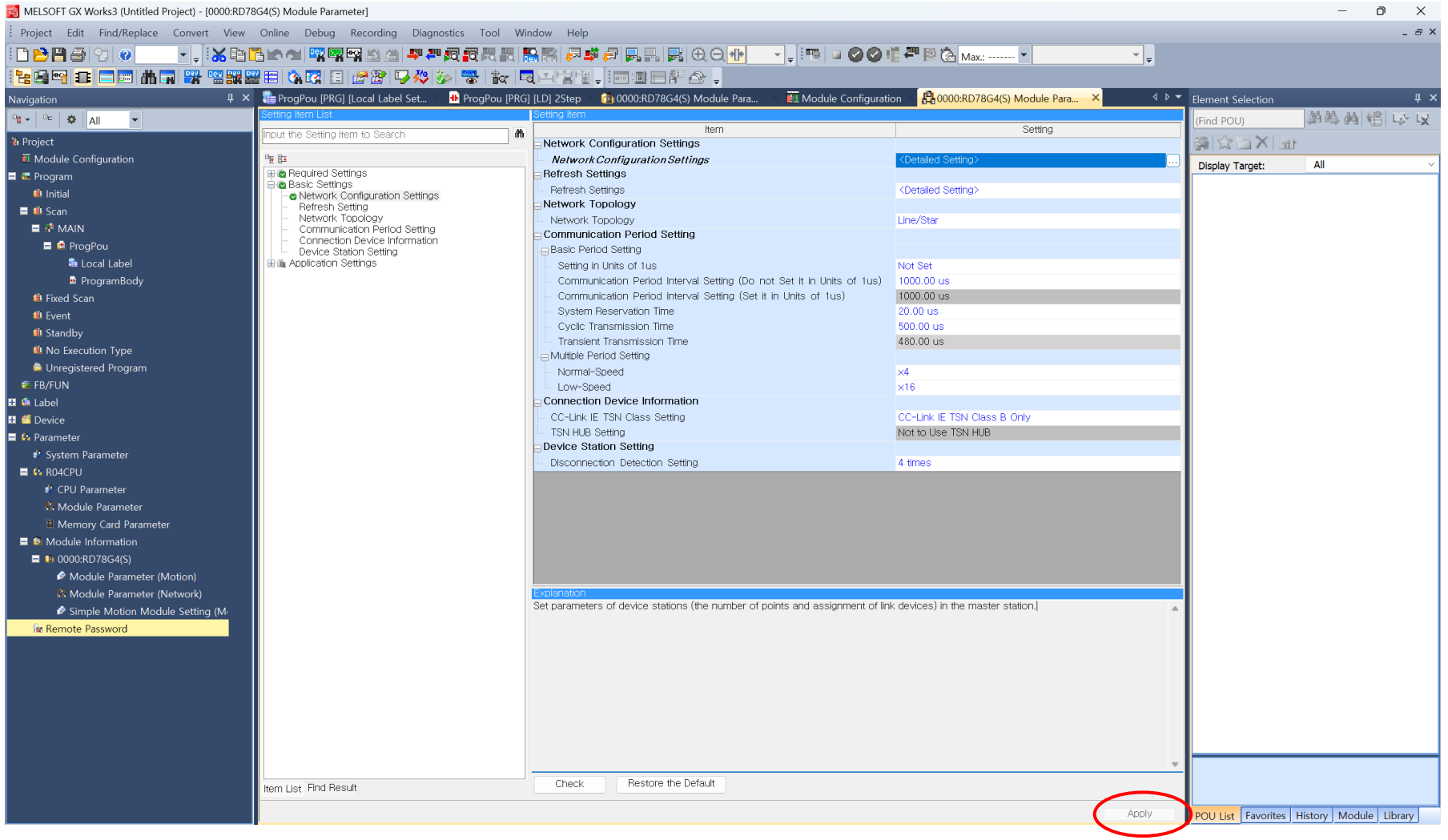
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Select the CC-Link IE TSN Module for Motion Control Station and Synchronous**



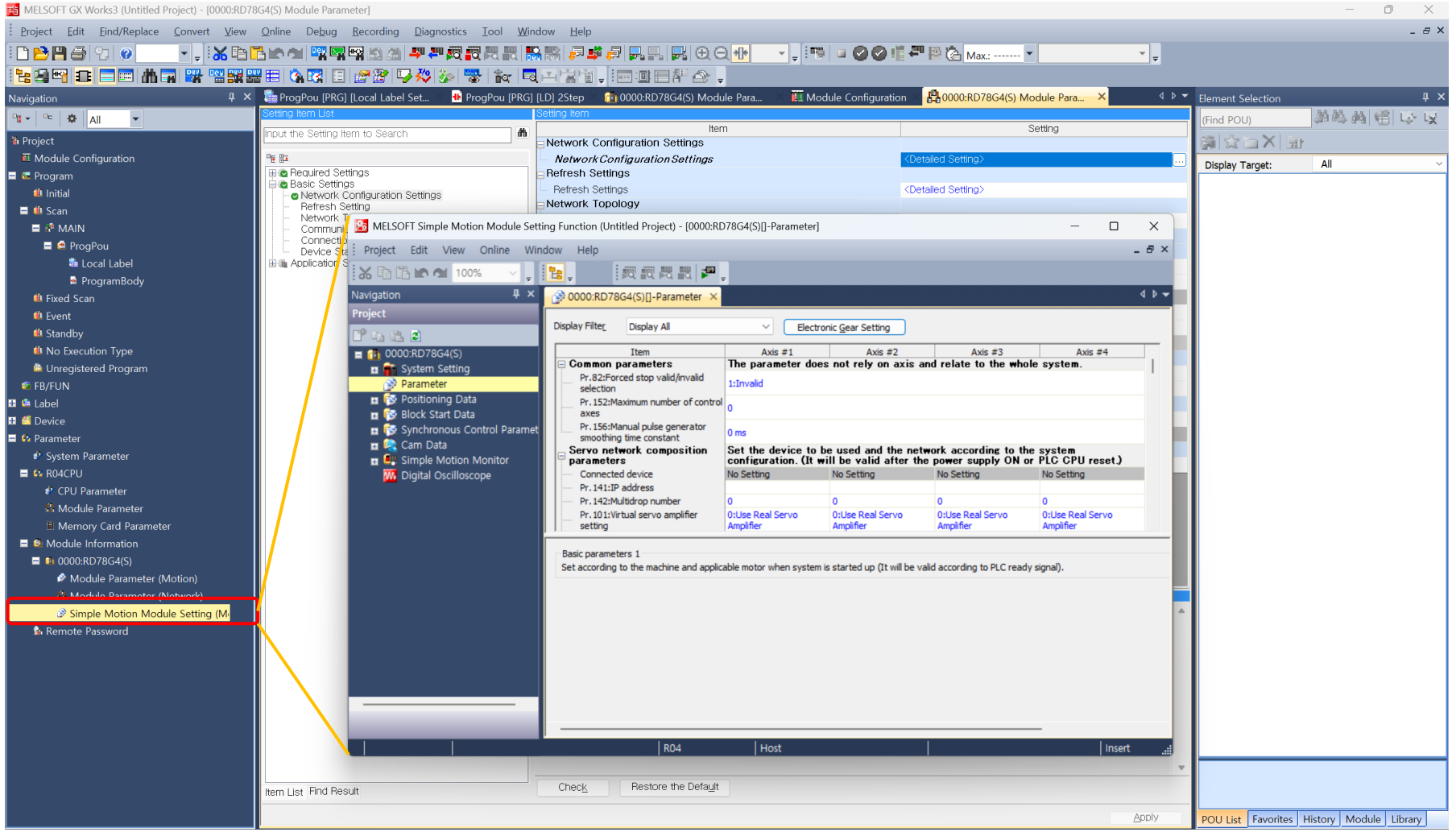
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Applying Network Configuration Settings**



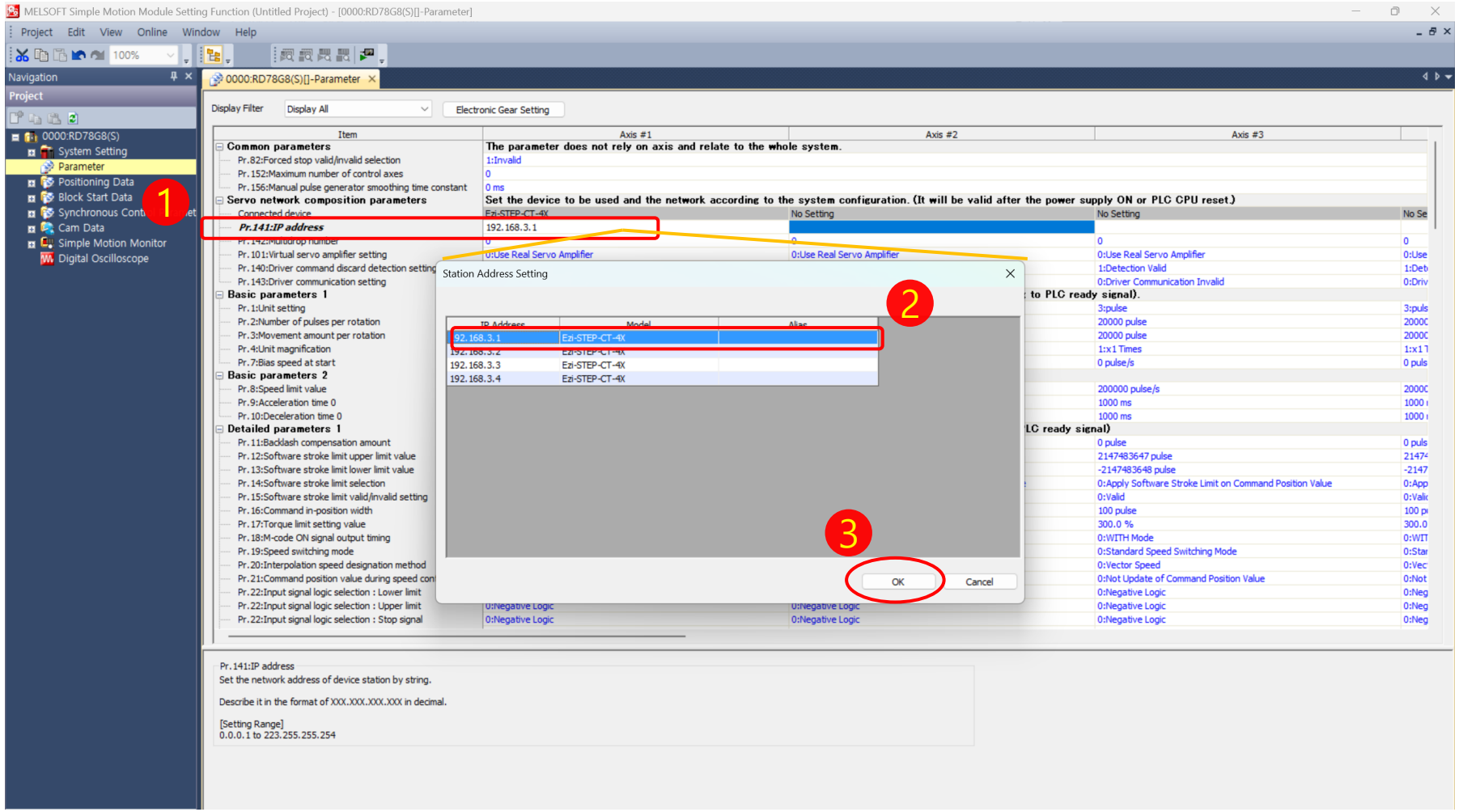
2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Running the Simple Motion Module Setting Program**



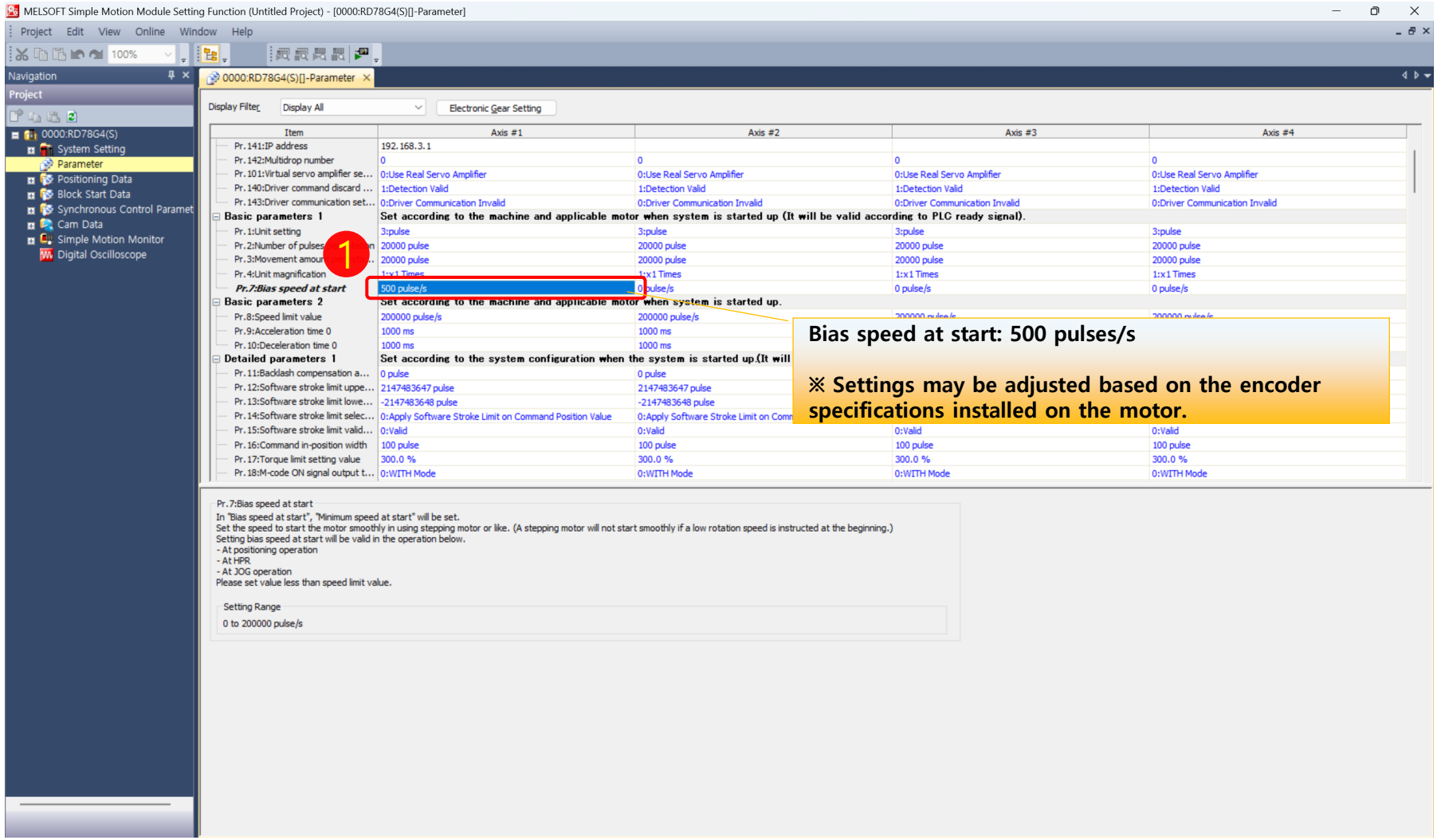
2-5. Simple Motion Module Setting

- **Parameter / STEP network composition parameters / Pr.141:IP address setting**



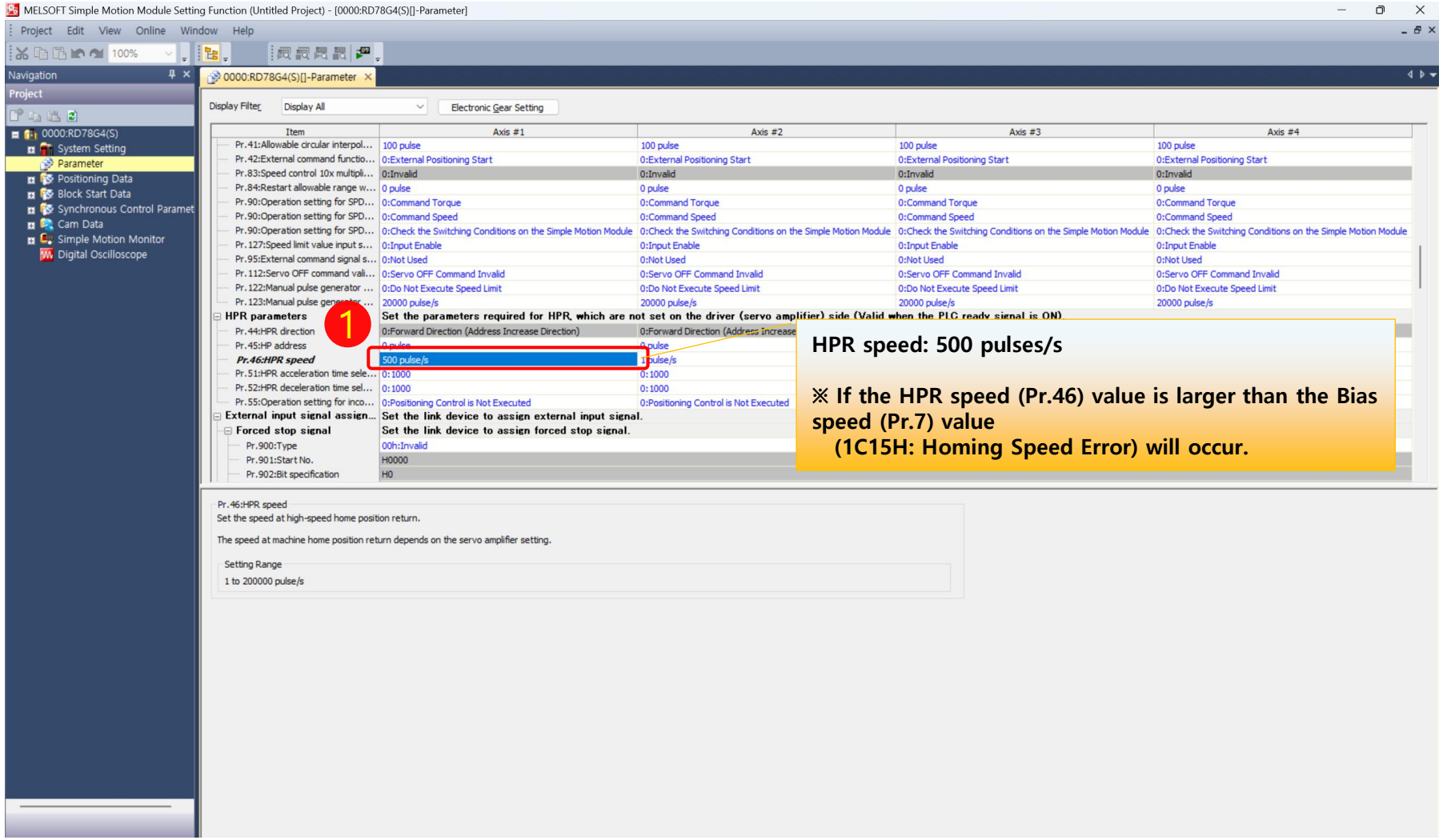
2-5. Simple Motion Module Setting

- **Parameter / Basic parameters 1 / Pr.7:Bias speed at start(500 pulse/s) Setting**



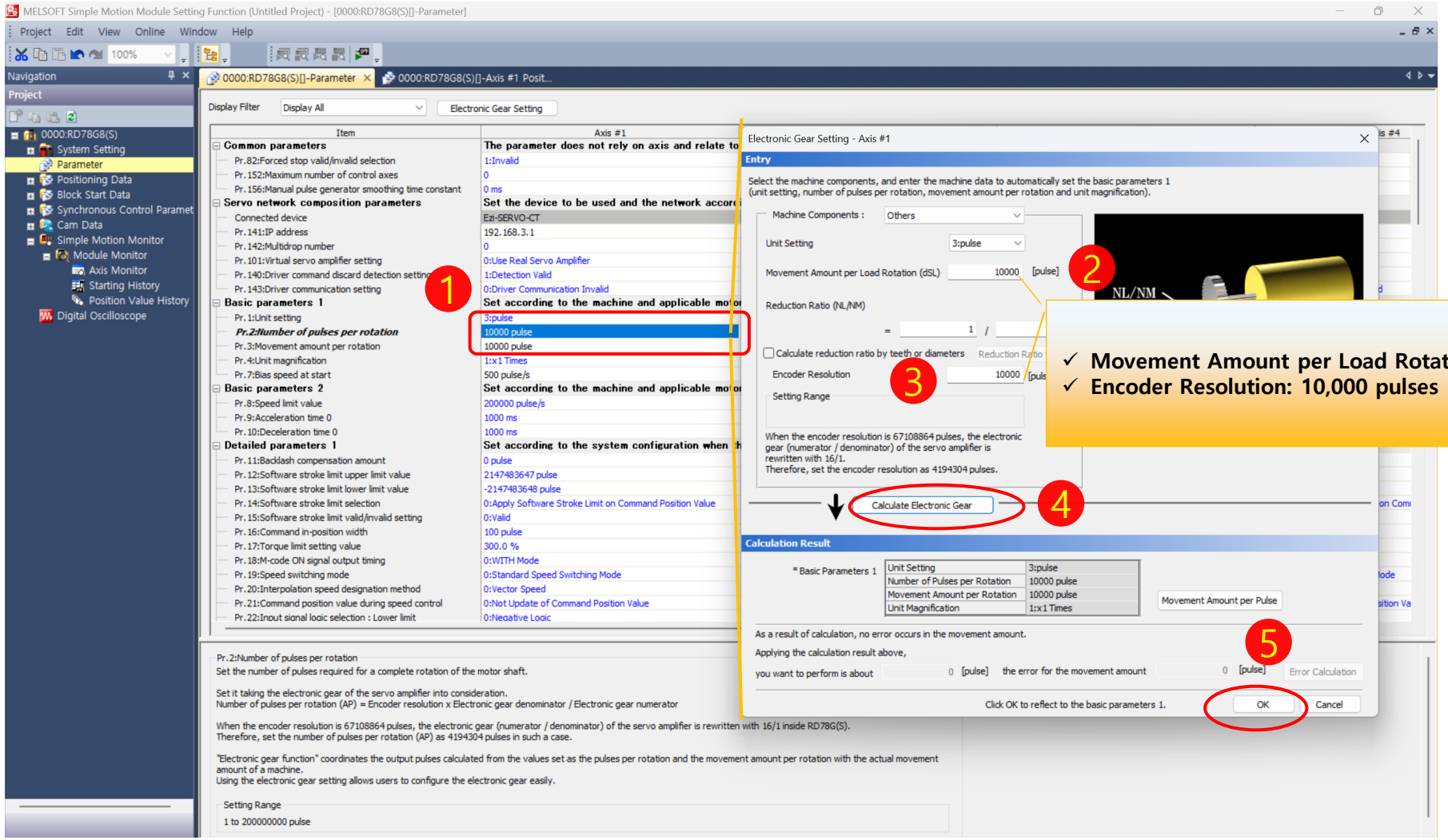
2-5. Simple Motion Module Setting

- **Parameter / HPR parameters / Pr.46:HPR speed (500 pulses/s) setting**



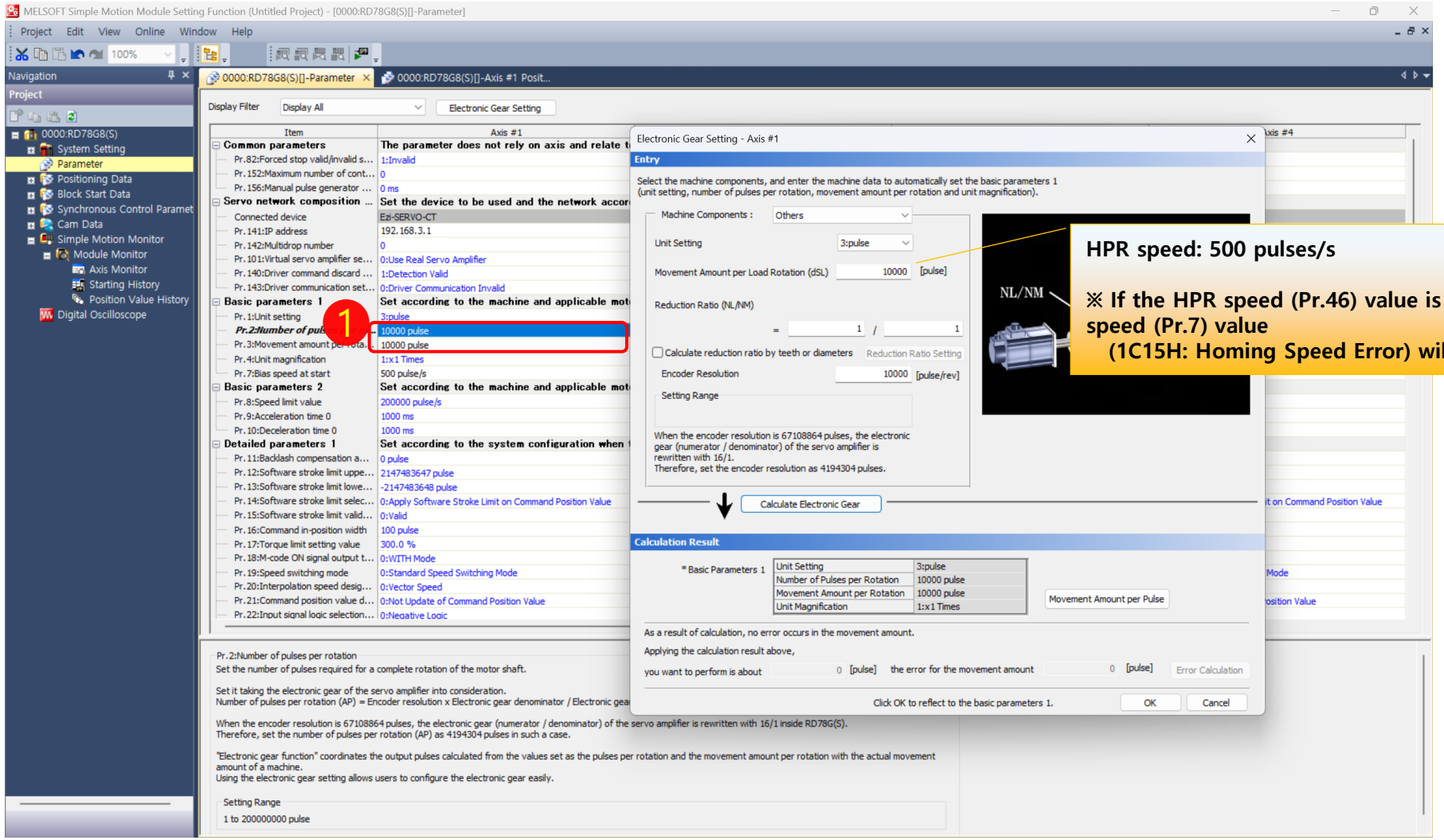
2-5. Simple Motion Module Setting

- **Parameter / Basic parameters 1 / Number of pulses per rotation**



2-5. Simple Motion Module Setting

- **Parameter / HPR parameters / Pr.46:HPR speed (500 pulses/s) setting**

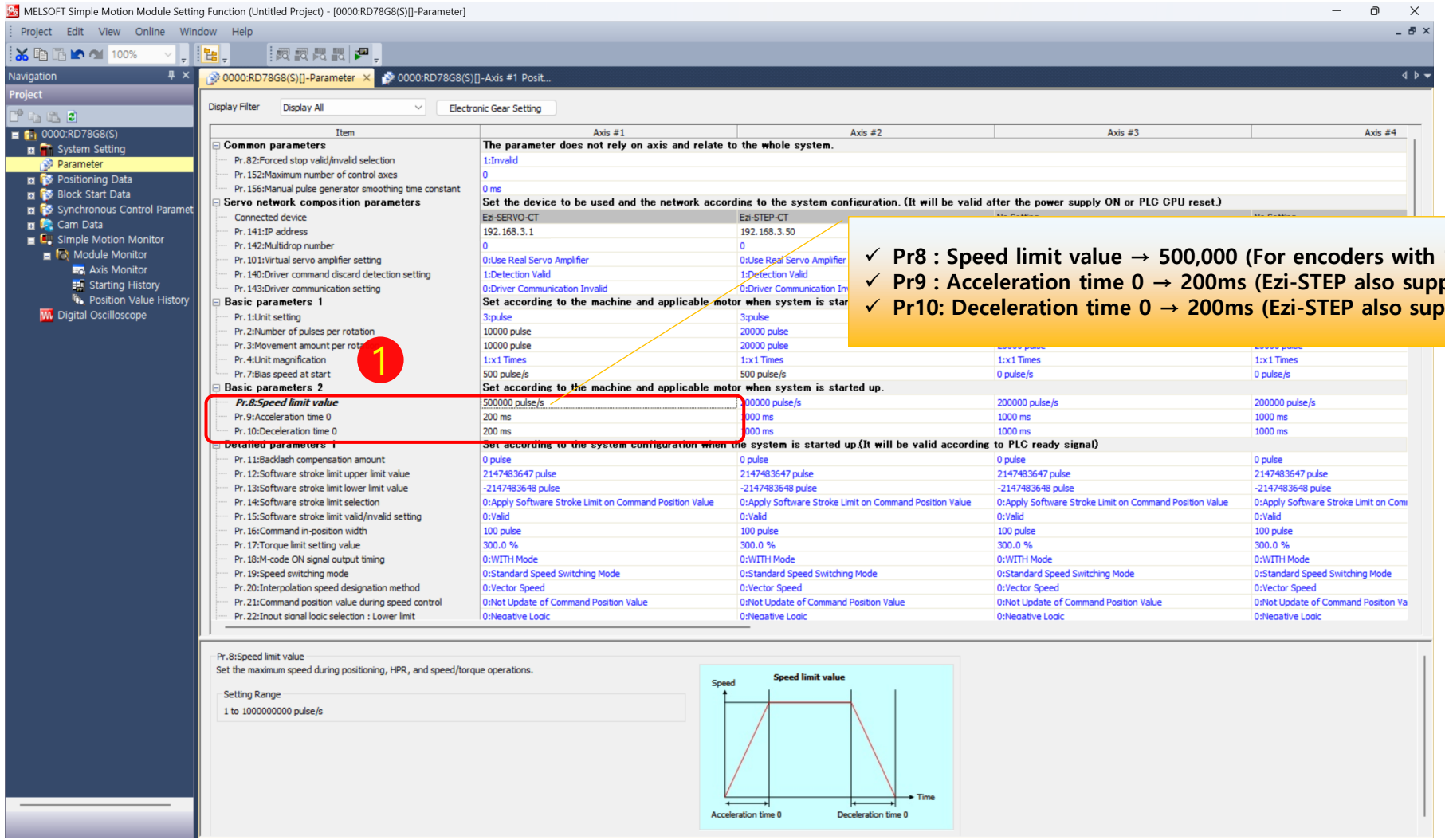


HPR speed: 500 pulses/s

※ If the HPR speed (Pr.46) value is larger than the Bias speed (Pr.7) value
(1C15H: Homing Speed Error) will occur.

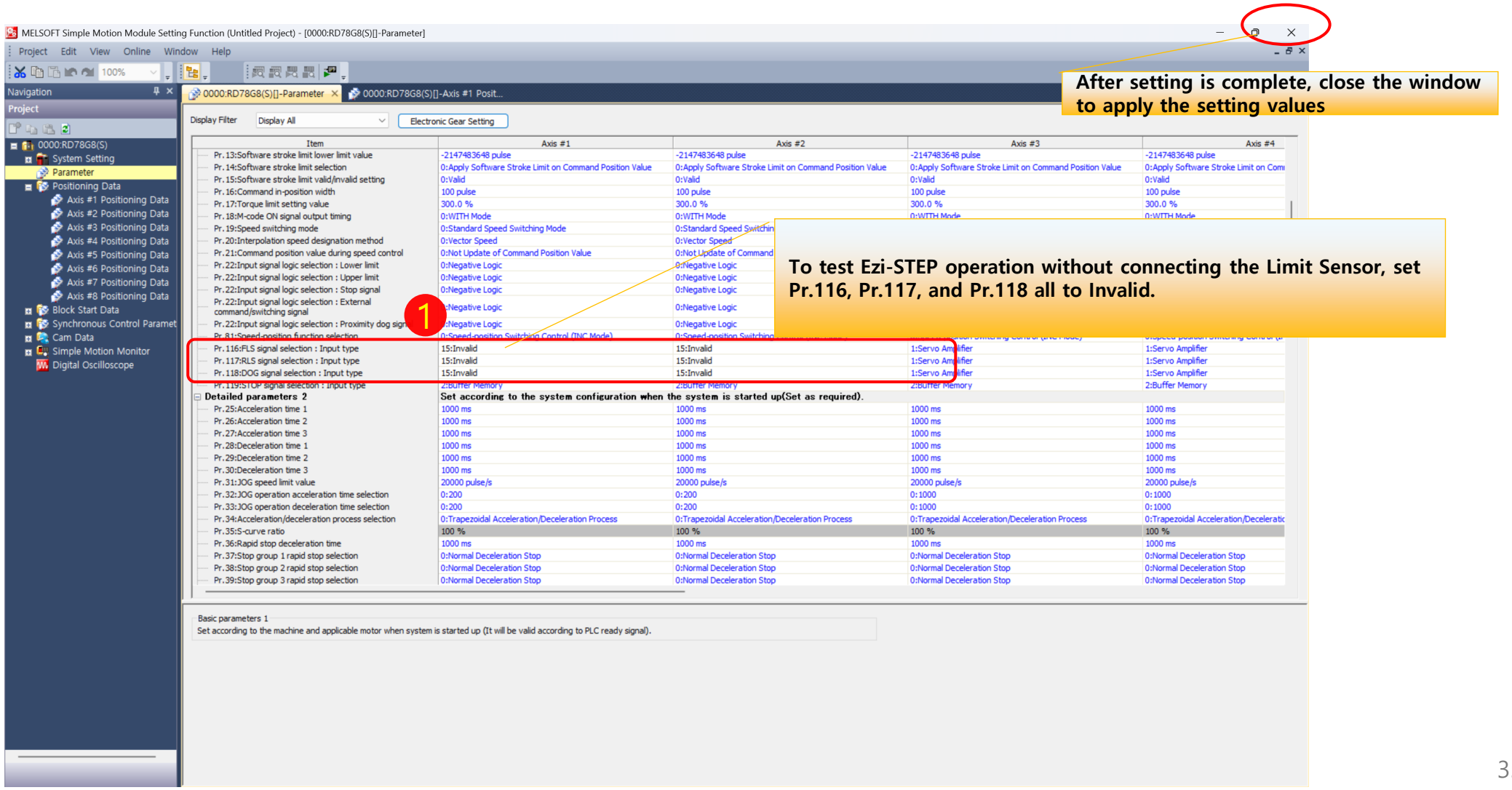
2-5. Simple Motion Module Setting

- **Parameter / Basic parameters 2 / Speed limit value, Acceleration time 0, Deceleration time 0**



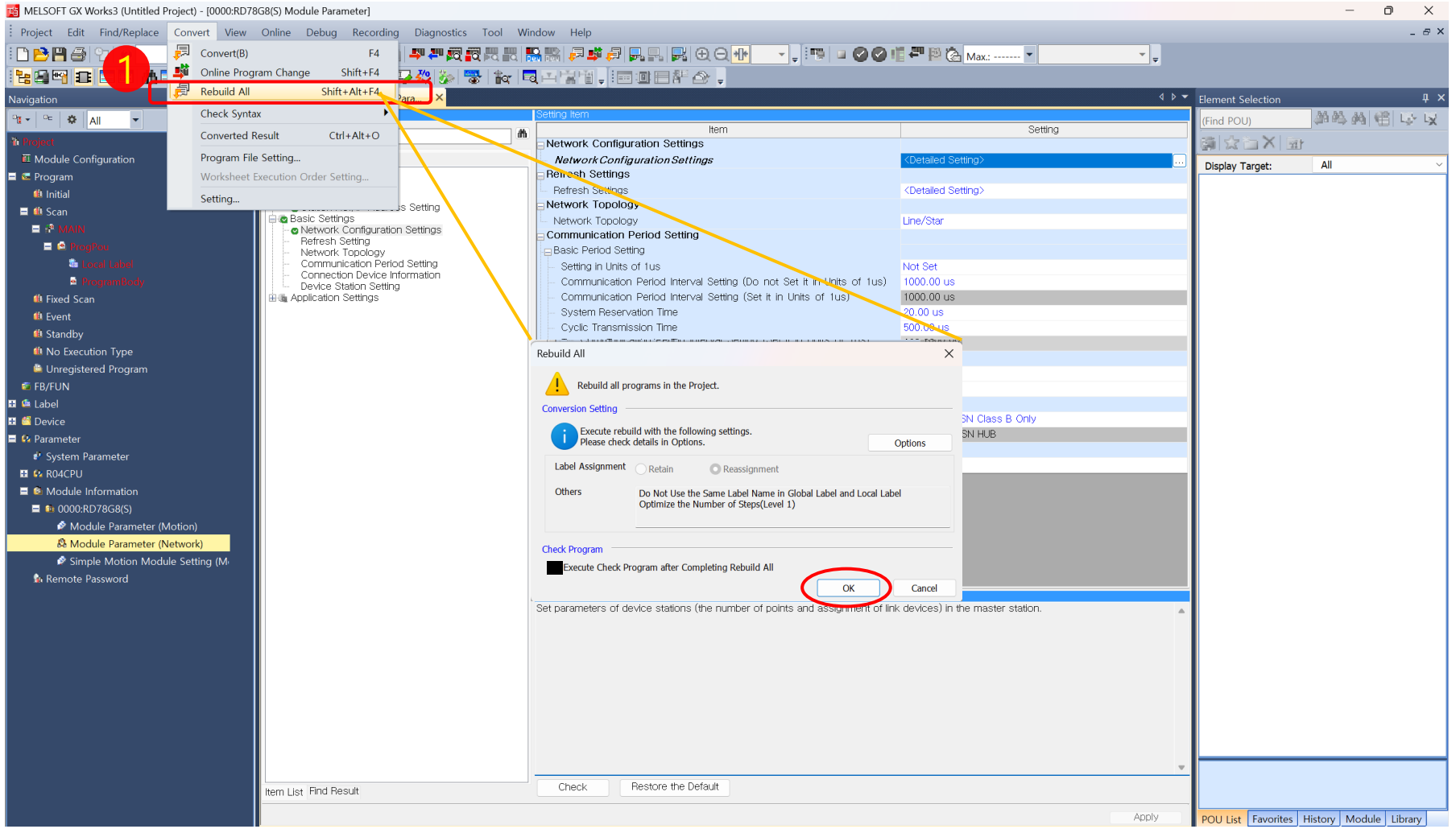
2-5. Simple Motion Module Setting

- **Convert / Rebuild All**



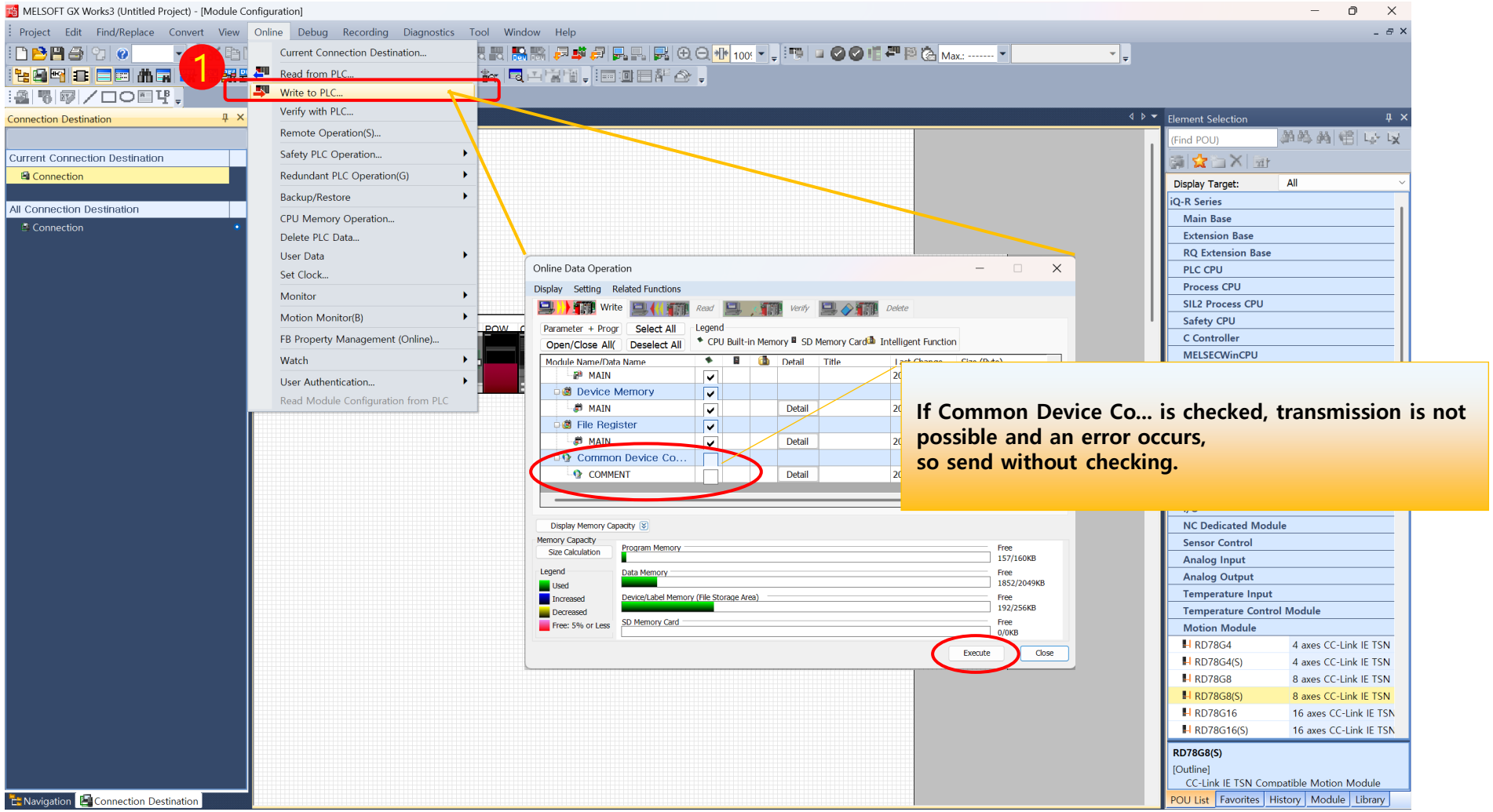
2-6. Convert

- **Convert / Rebuild All**



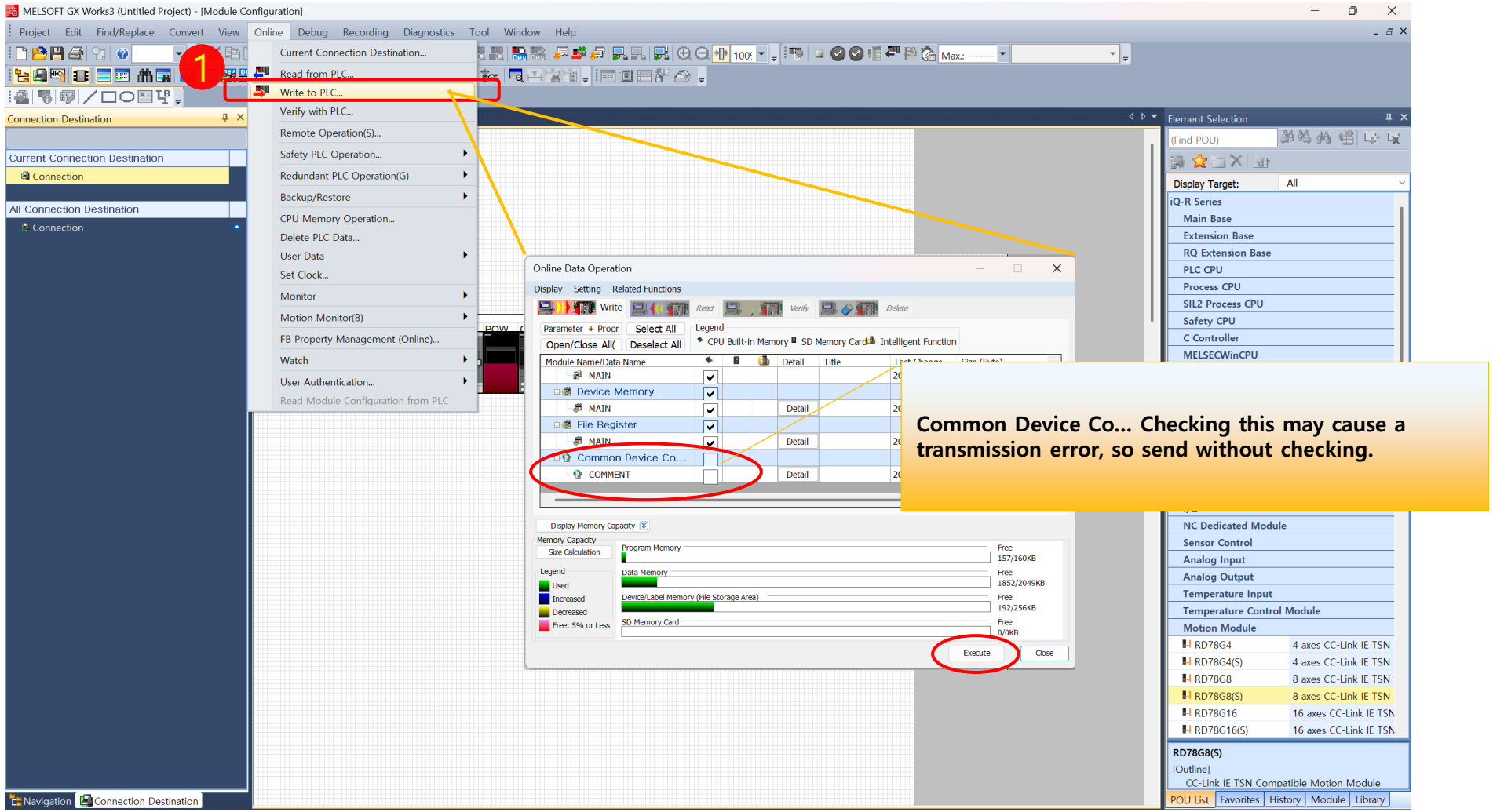
2-6. Convert

- **Parameter / HPR parameters / Pr.46:HPR speed (500 pulses/s) setting**



2-7. Write to PLC

- **Online Data Operation**



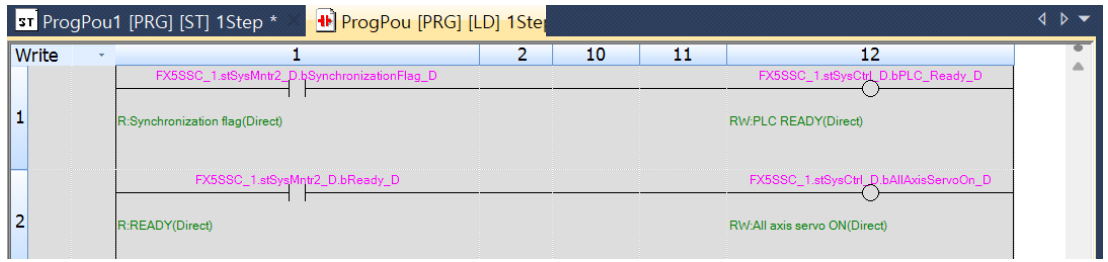
3. Verify Operation

3.1 Program Development

- **PLC Motion Module: Ready / Servo On**

Label (Variable) Method

[Ladder Program]



① Sequence Ready Signal (FX5SSC_1.stSysCtrl_D.bPLC_Ready_D): When ON

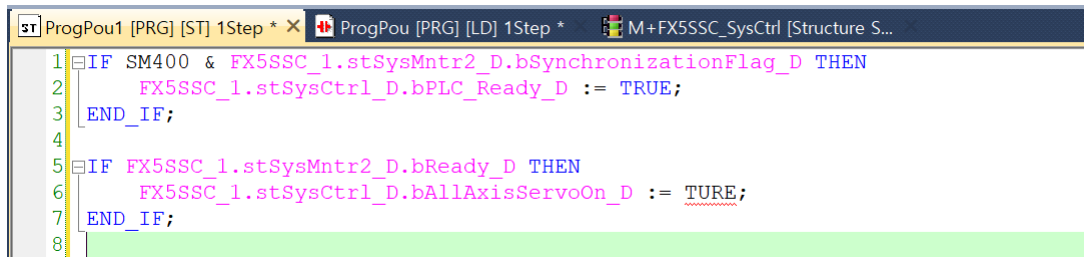
② Synchronization Flag (FX5SSC_1.stSysMntr2_D.bSynchronizationFlag_D): Requires ON

③ Ready Signal (FX5SSC_1.stSysMntr2_D.bReady_D): When ON

④ All-Axis Servo (FX5SSC_1.stSysCtrl_D.bAllAxisServoOn_D): ON required

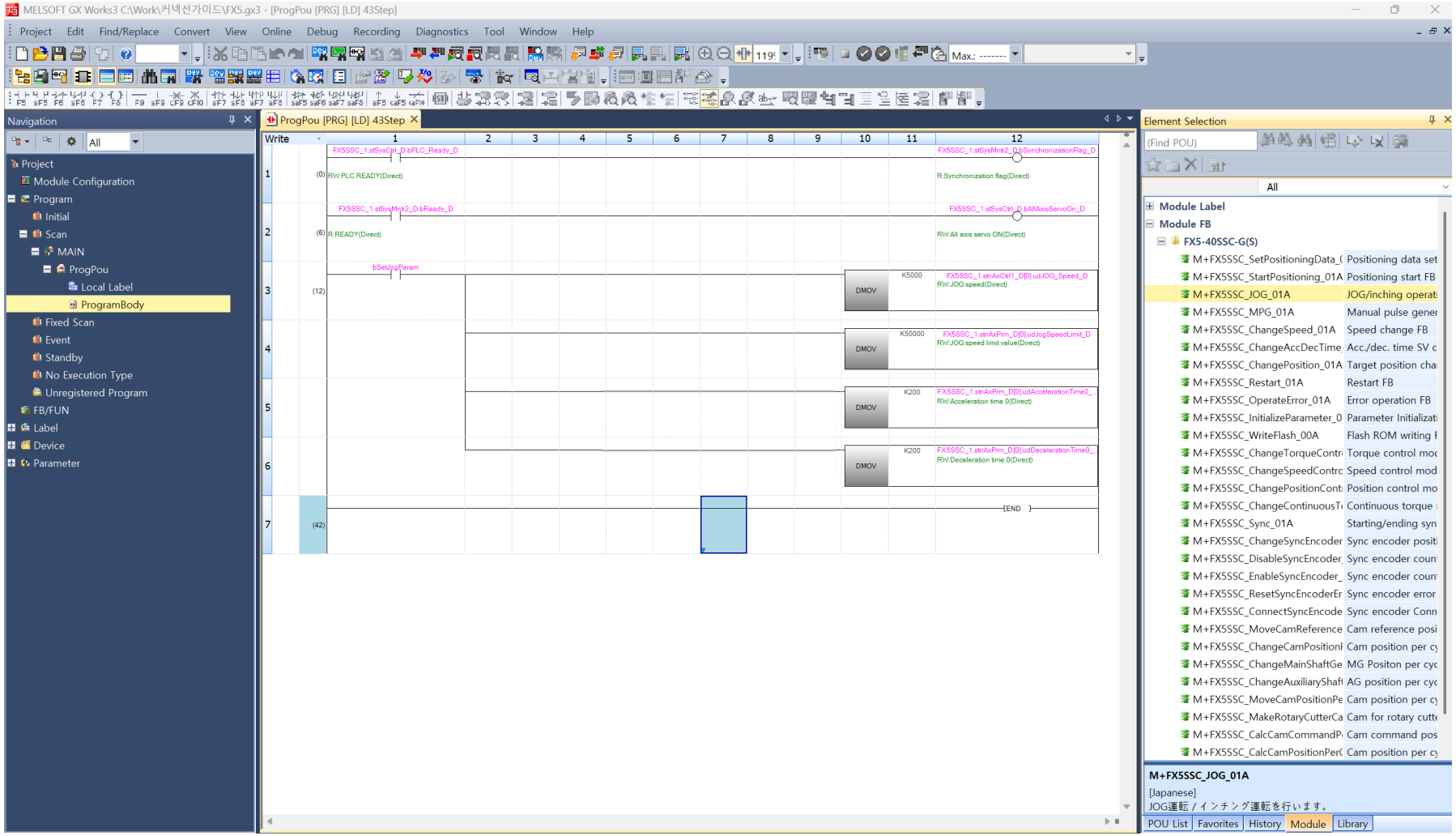
Label (Variable) Method

[ST Program]



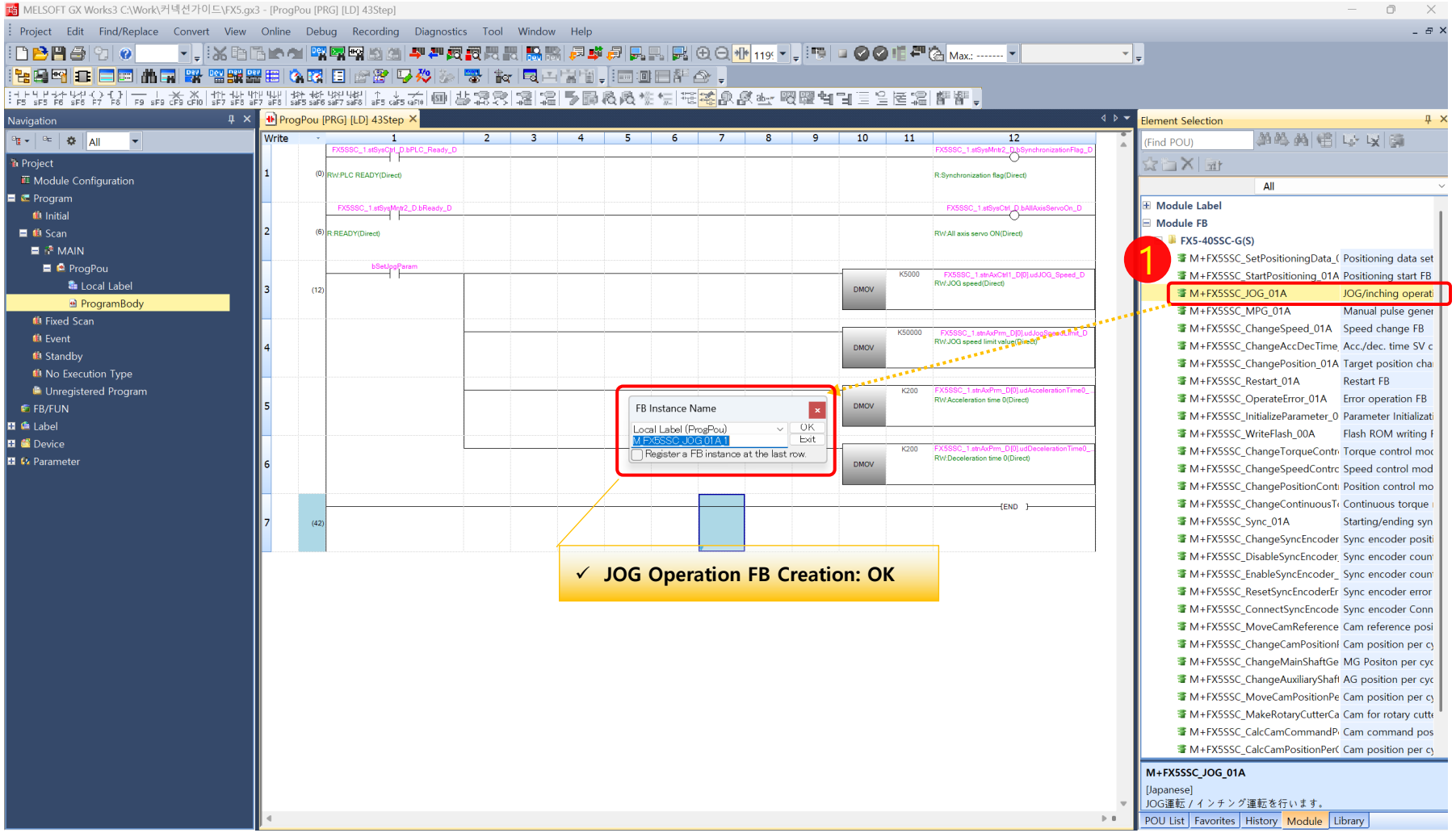
3.1 Program Development

- **Jog Settings: Speed, Limit Speed, Acceleration Time, Deceleration Time**



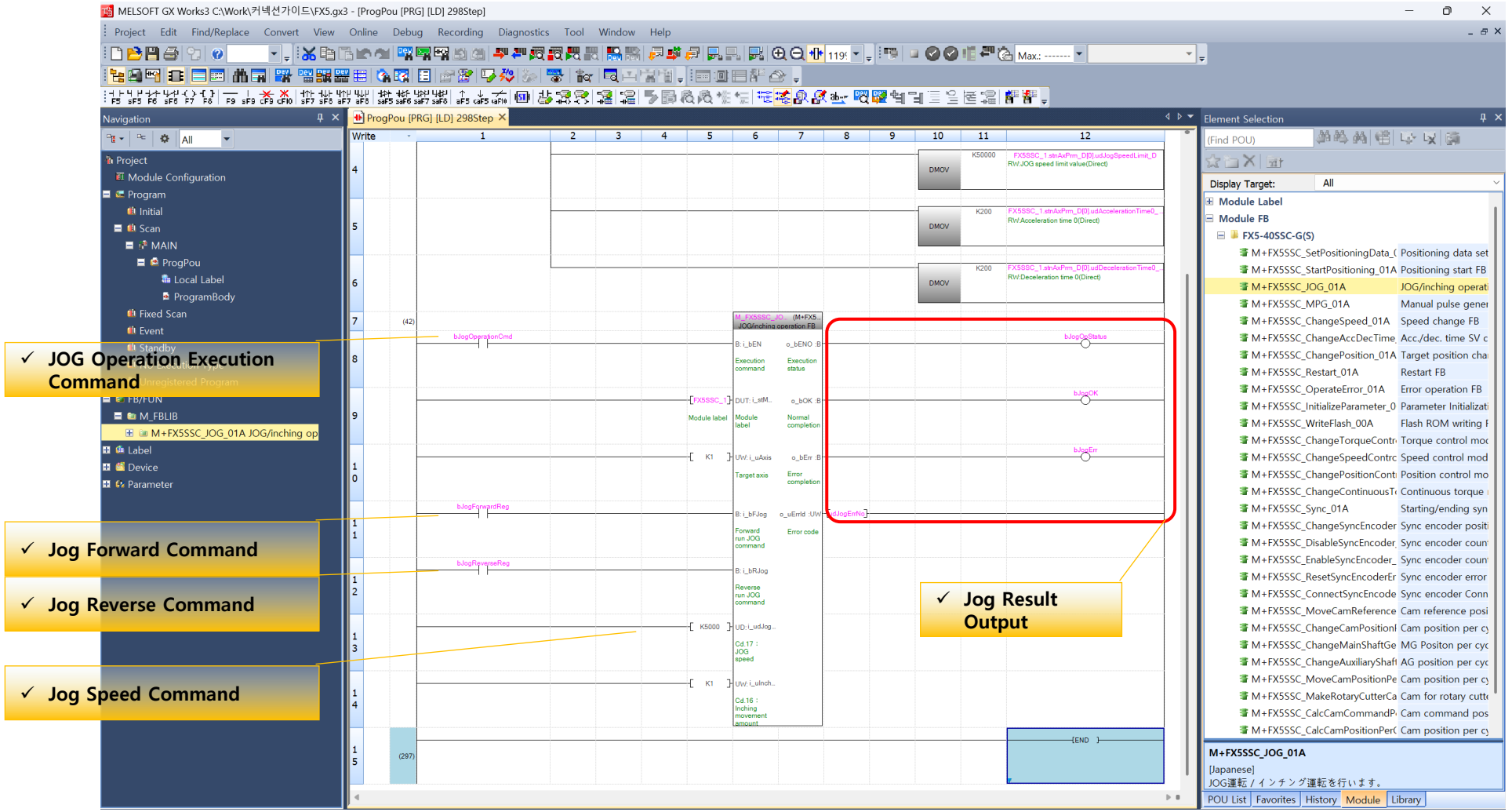
3.1 Program Development

- **Jog Operation Program: Module FB (MFX5SSC_JOG_01A1 Click & Drag)**



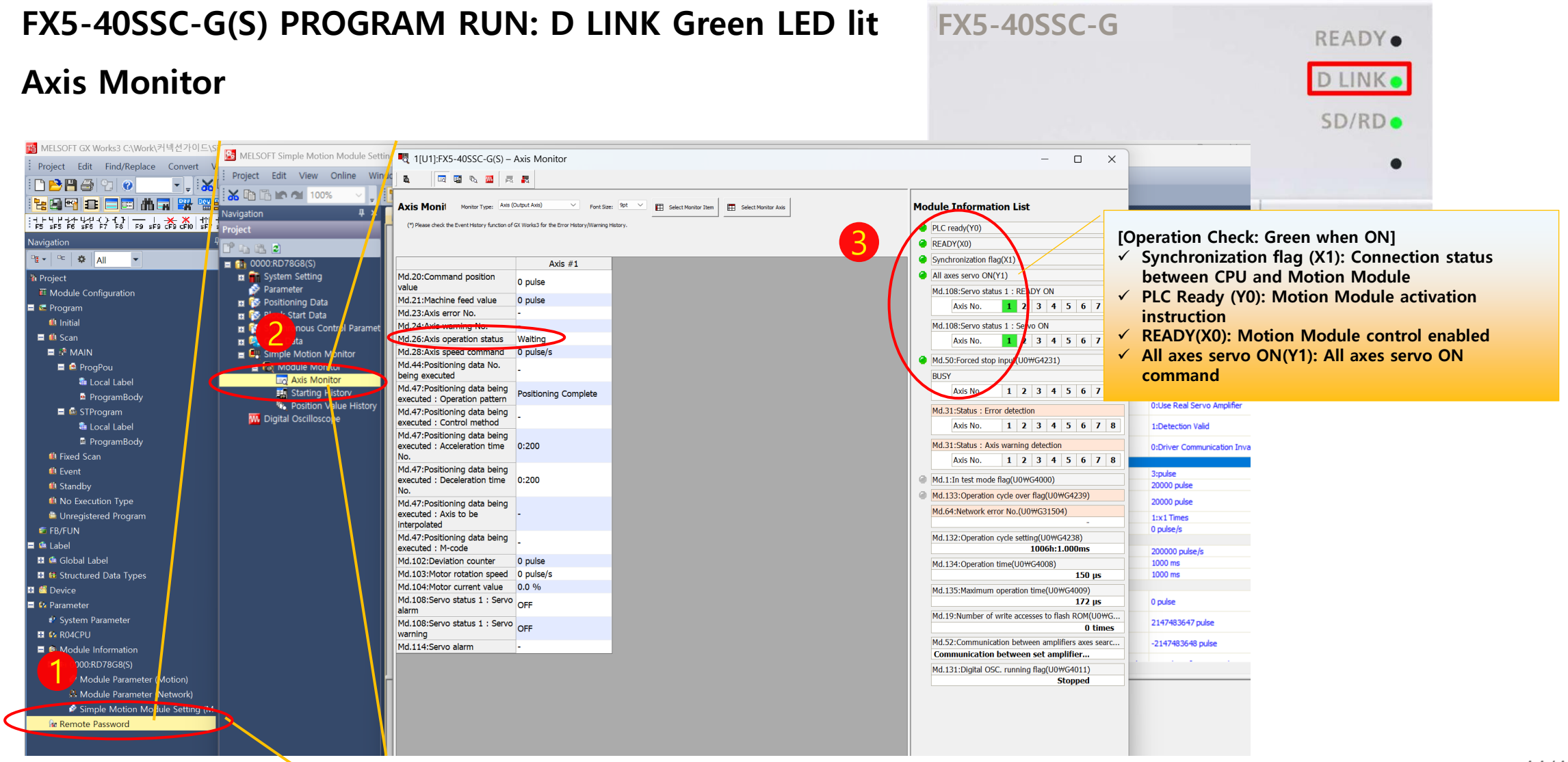
3.1 Program Development

- **Jog Operation Program: Module FB Configuration / Operation / Results**



3.2 Axis Monitoring

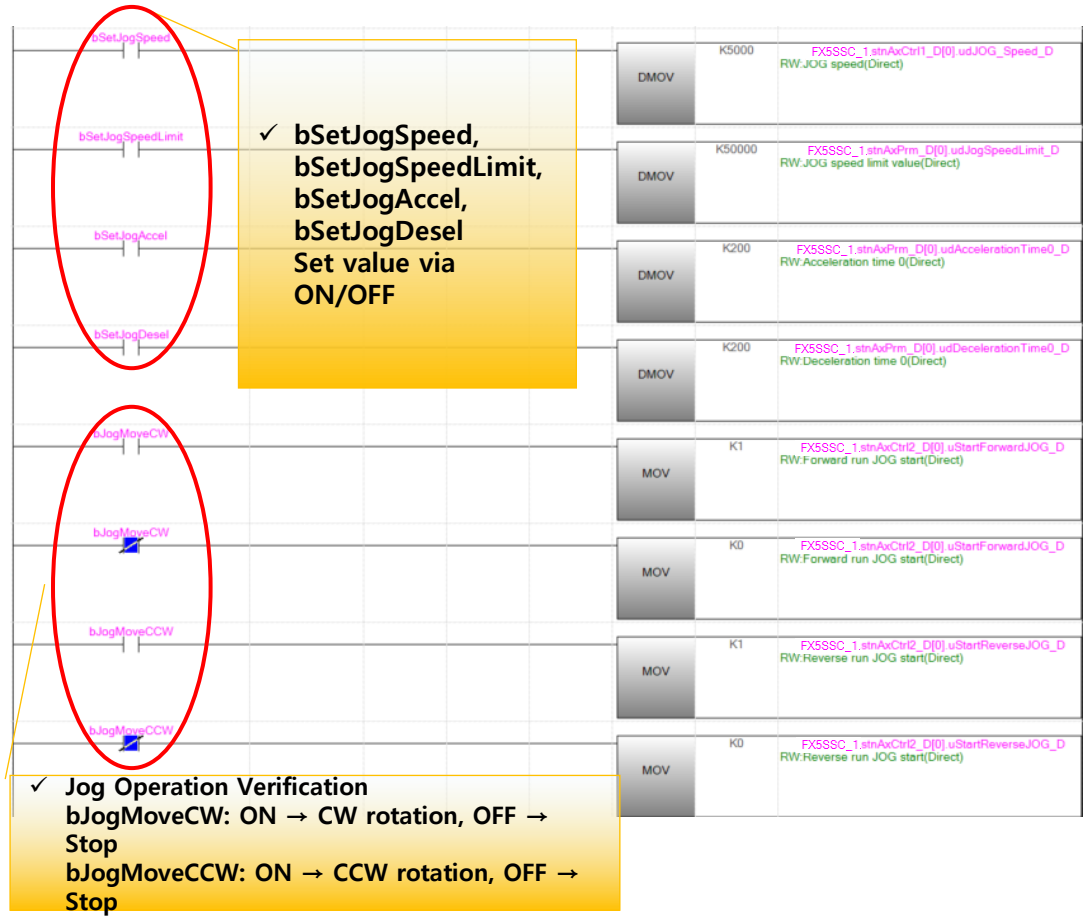
- **FX5-40SSC-G(S) PROGRAM RUN: D LINK Green LED lit**
- **Axis Monitor**



3.3 Axis Operation Verification

- **Jog Operation – Setup and Movement** (Verify Jog Operation Capability: FX5SSC_1.stnAxMntr_D[0].uServoStatus1_D.1 → TRUE)

Program Mode (Ladder, Label)



✓ **bSetJogSpeed, bSetJogSpeedLimit, bSetJogAccel, bSetJogDesel Set value via ON/OFF**

✓ **Jog Operation Verification**
bJogMoveCW: ON → CW rotation, OFF → Stop
bJogMoveCCW: ON → CCW rotation, OFF → Stop

Watch Mode

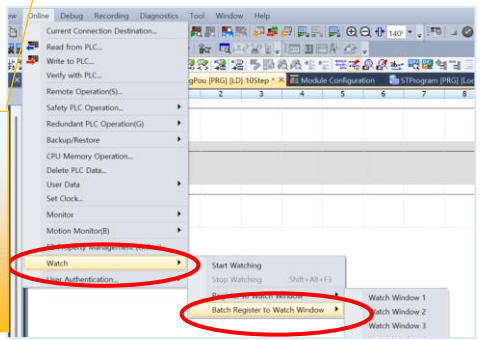
Watch 1[Watching]

ON | OFF | ON/OFF toggle | Update | Clear All

Name	Current Value	English
FX5SSC_1.stSysCtrl_D.bPLC_Ready_D	TRUE	RW:PLC READY(Direct)
FX5SSC_1.stSysCtrl_D.bAllAxisServoOn_D	TRUE	RW:All axis servo ON(Direct)
FX5SSC_1. stnAxCtrl1_D[0].udJOG_Speed_D	5,000	RW:JOG speed(Direct)
FX5SSC_1. stnAxPrm_D[0].udJogSpeedLimit_D	50,000	RW:JOG speed limit value(Di...
FX5SSC_1. stnAxPrm_D[0].udAccelerationTime0_D	200	RW:Acceleration time 0(Direct)
FX5SSC_1. stnAxPrm_D[0].udDecelerationTime0_D	200	RW:Deceleration time 0(Direct)
FX5SSC_1. stnAxCtrl2_D[0].uStartForwardJOG_D	0	RW:Forward run JOG start(D...
FX5SSC_1. stnAxCtrl2_D[0].uStartReverseJOG_D	0	RW:Reverse run JOG start(Di...

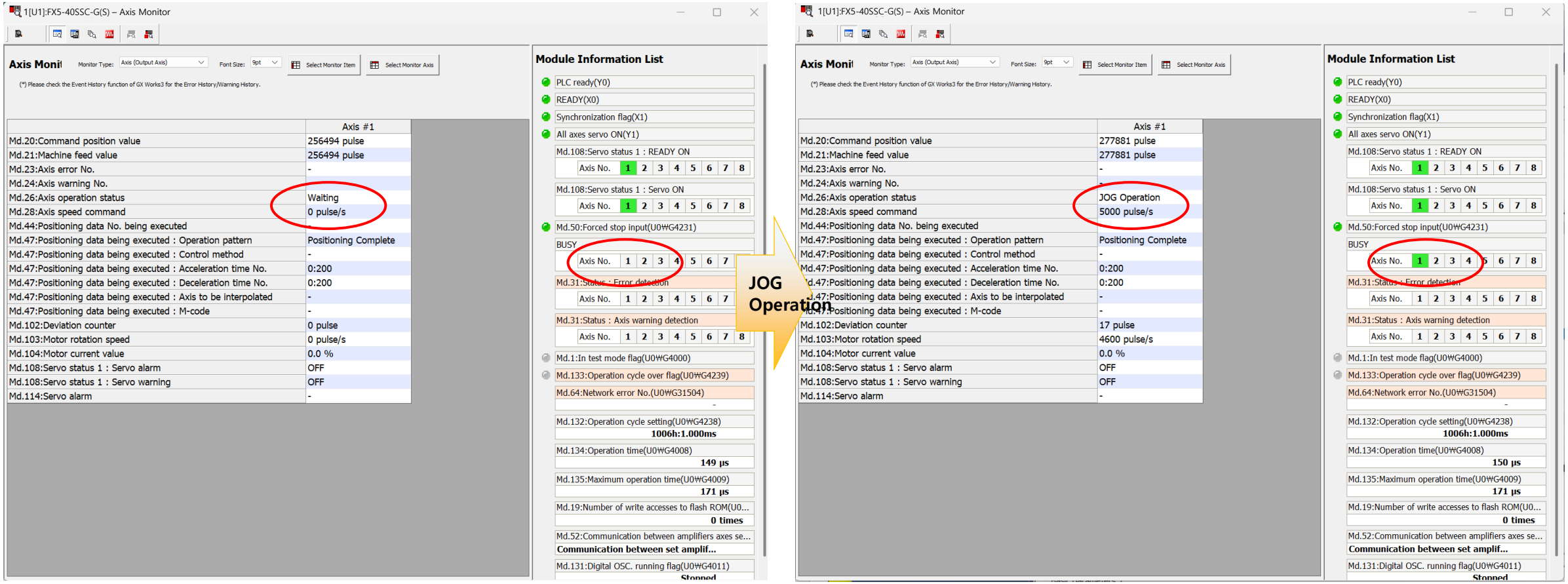
✓ **Registering labels for jog operation**

[Operation Check]
✓ **Key in the values as shown above for Jog Speed/SpeedLimit/Accel/Decel.**
✓ **Jog Operation Verification**
...uStartForwardJOG_D : 1 → Clockwise rotation, 0 → Stop
...uStartReverseJOG_D : 1 → Counterclockwise rotation, 0 → Stop



3.3 Axis Operation Verification

- **Jog Operation: Stop → Move**



Appendix

[Appendix 1] Homing Method

The homing method is classified as follows based on the setting value for the homing method (6098h).

설정값	내용
1	Homing on negative limit switch and index pulse
2	Homing on positive limit switch and index pulse
7	Homing on home switch (positive direction, negative edge) and index pulse
10	Homing on home switch (positive direction, positive edge) and index pulse
11	Homing on home switch (negative direction, positive edge) and index pulse
14	Homing on home switch (negative direction, negative edge) and index pulse
17	Homing on negative limit switch
18	Homing on positive limit switch
24	Homing on home switch (positive direction, negative edge)
25	Homing on home switch (positive direction, positive edge)
28	Homing on home switch (negative direction, positive edge)
29	Homing on home switch (negative direction, negative edge)
33	Homing index pulse (negative direction)
34	Homing index pulse (positive direction)
35	Set the current position origin
37	Set the current position origin and reset current position
-3	Homing on negative mechanical limit
-4	Homing on positive mechanical limit
-5	Homing on negative mechanical limit and index pulse
-6	Homing on positive mechanical limit and index pulse

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