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

FASTECH
Fast Accurate Smooth Motion




Programmable Controllers
MELSEC iQ-F series



Ezi-ROBO® CC-Link IE TSN IGS
Precise Actuator System



Ezi-SERVO® CC-Link IE TSN 4X
Closed Loop Stepping System

# Connection Guide

## MELSEC iQ-F series and

Ezi-ROBO® CC-Link IE TSN IGS
Precise Actuator System

-

Ezi-SERVO® CC-Link IE TSN 4X
Closed Loop Stepping System

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

**FASTECH Products**
Ezi-ROBO CC-Link IE TSN IGS
(Ezi-SERVO CC-Link IE TSN 4X)

# Before you begin

- Thank you for using our company's products.
- The control unit of the Ezi-ROBO IGS is interfaced with the Ezi-SERVO CC-Link IE TSN 4X. The following connection guide is based on the Ezi-SERVO CC-Link IE TSN 4X.
- The Ezi-SERVO 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 on a CC-Link IE TSN network.
- The Ezi-SERVO CC-Link IE TSN 4X is an industrial product. Please 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-SERVO 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-SERVO 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-SERVO 4X] Closed Loop Stepping System | |
| [Connection Guide][CC-Link IE TSN][MELSEC FX5-SSG-G][Ezi-ROBO IGS Ezi-SERVO 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 FX5 Motion Unit / Simple Motion Unit User's Manual (Startup Edition) | IB-0300250 |
| MELSEC iQ-F FX5 Motion Unit/Simple Motion Unit User's Manual (Application Edition) | IB-0300252 |
| MELSEC iQ-F FX5 Motion Unit/Simple Motion Unit User's Manual (Advanced Synchronous Control Edition) | IB-0300254 |
| MELSEC iQ-F FX5 Motion Unit User's Manual (CC-Link IE TSN Edition) | IB-0300567 |
| 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-SERVO 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-SERVO 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

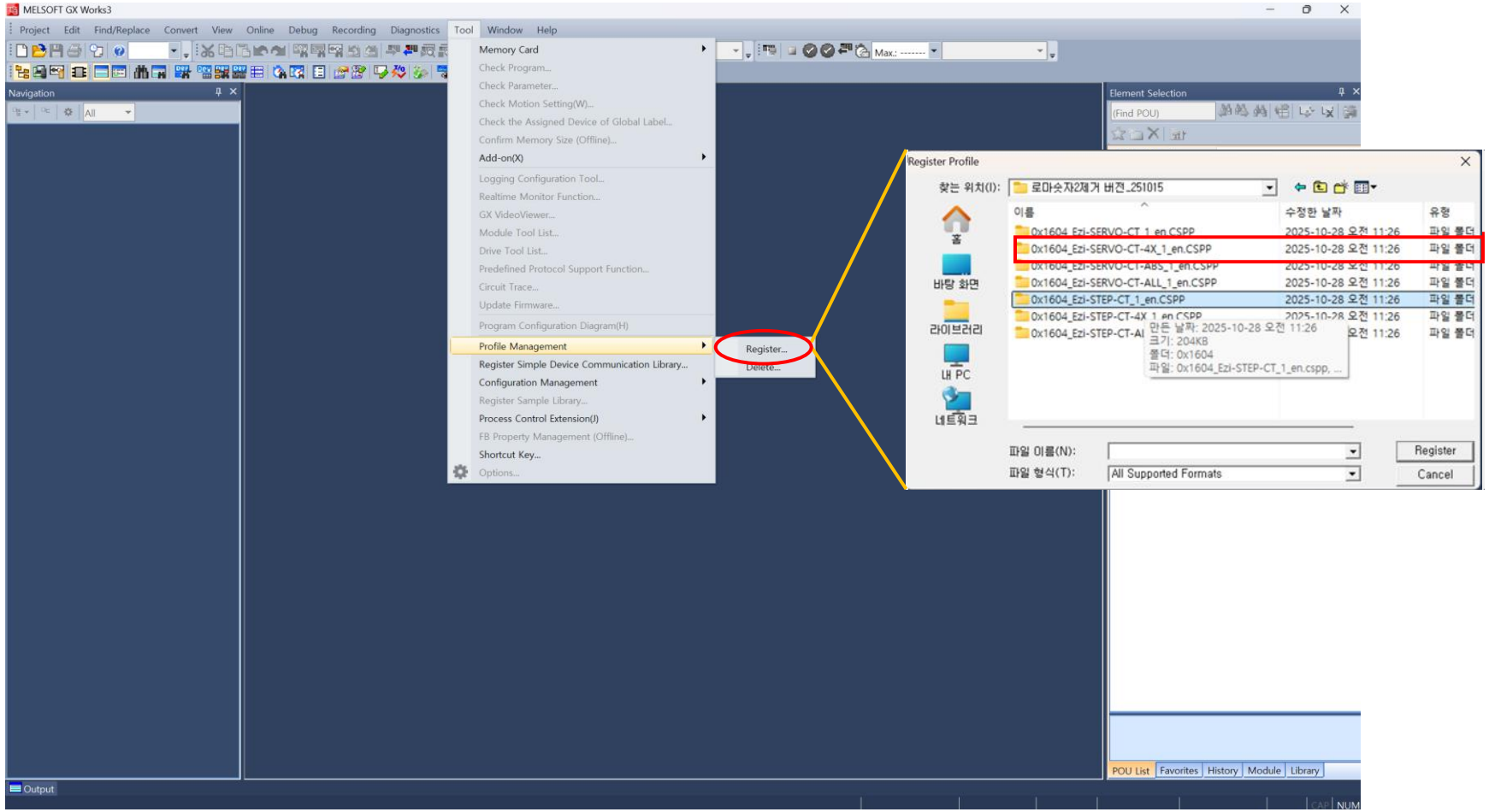
※ For the latest files, please refer to the Mitsubishi Electric website.
(https://www.mitsubishielectric.com/fa/download/index.html)

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

- CSP+ File Download address: https://cltsn.fastech-motions.com/en/download/quick
  File name: 0x1604_Ezi-SERVO-CT-4X_1_en_CSPP

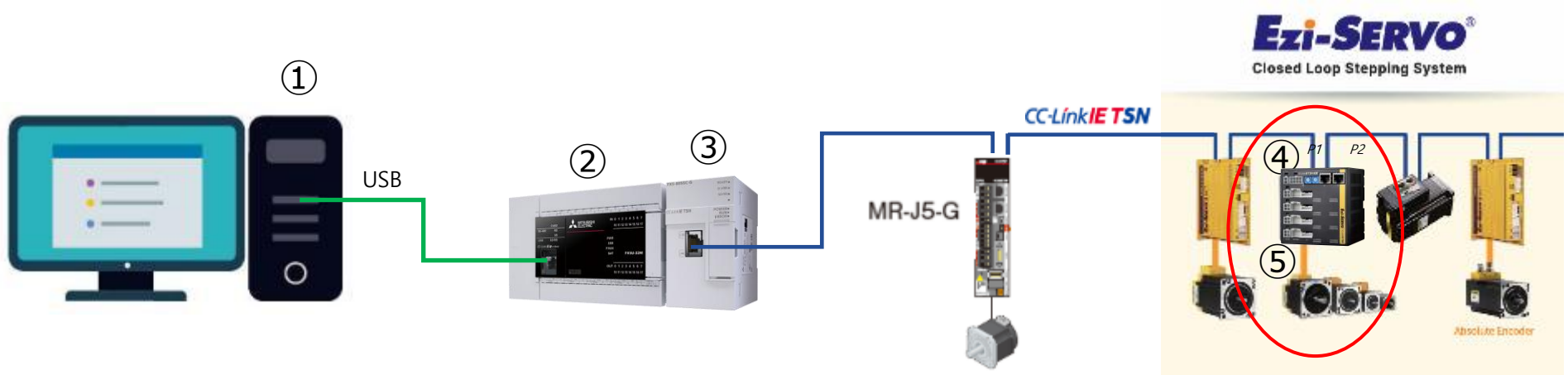
# 1-2. Ezi-SERVO CC-Link IE TSN 4X CSP+ File Registration

- **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 | EzS2-CT-4X | 192.168.3.1 |
| ⑤ | Motor | EzM2-42S-A | - |

# 1-3. CC-Link IE TSN Configuration

- **Ezi-SERVO 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-SERVO, FX5 Parameter Settings**

| No. | Item | Description |
|---|---|---|
| 1 | Ezi-SERVO 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.<br>※ 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 | Verify FX5 + Ezi-SERVO Operation  | Write a program to verify that the FX5 CPU module and Ezi-SERVO are configured correctly.<br>Manipulate labels to verify the motor operates normally. |

# 1-4. Setup Sequence

- **Ezi-SERVO Settings**

| Item | Details |
|---|---|
| IP address setting | ① Set using the driver's rotary switch<br>② Rotary Switch → Setting value: '00', IP address (Index: 2101h, Subindex: 01~04h) |
| Driver homing method setting | ① Homing method (Index: 6098h, Subindex:00h) setting<br>- Set homing method: '0' (default) → '33', etc. ※ See [Appendix 1] Homing Method<br>② Home offset (Index: 607Ch, Subindex:00h) → Set to '0'<br>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<br>- 0: PP, HM → Quick stop / CSP → No stop<br>- 1: PP, HM → Deceleration stop / CSP → Does not stop<br>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<br>- Register a value within the In-position range (5 to 20000 pulses) considering the operating environment<br>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-SERVO)

| 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.<br>・Positive torque limit value (Index:60E0h, Subindex:00h)<br>・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. |
| Virtual servo amplifier function | Emulated by MR-J5-G. |
| Mark detection function | [Pr.800: Mark detection signal setting] Driver's TPR1 (Touch Probe 1) cannot be used. |
| 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].<br>The default value is "0: Not set". Therefore, [Md.109~112: Optional data monitor output 1~4] will be '0'. |

# 1-5. Restrictions

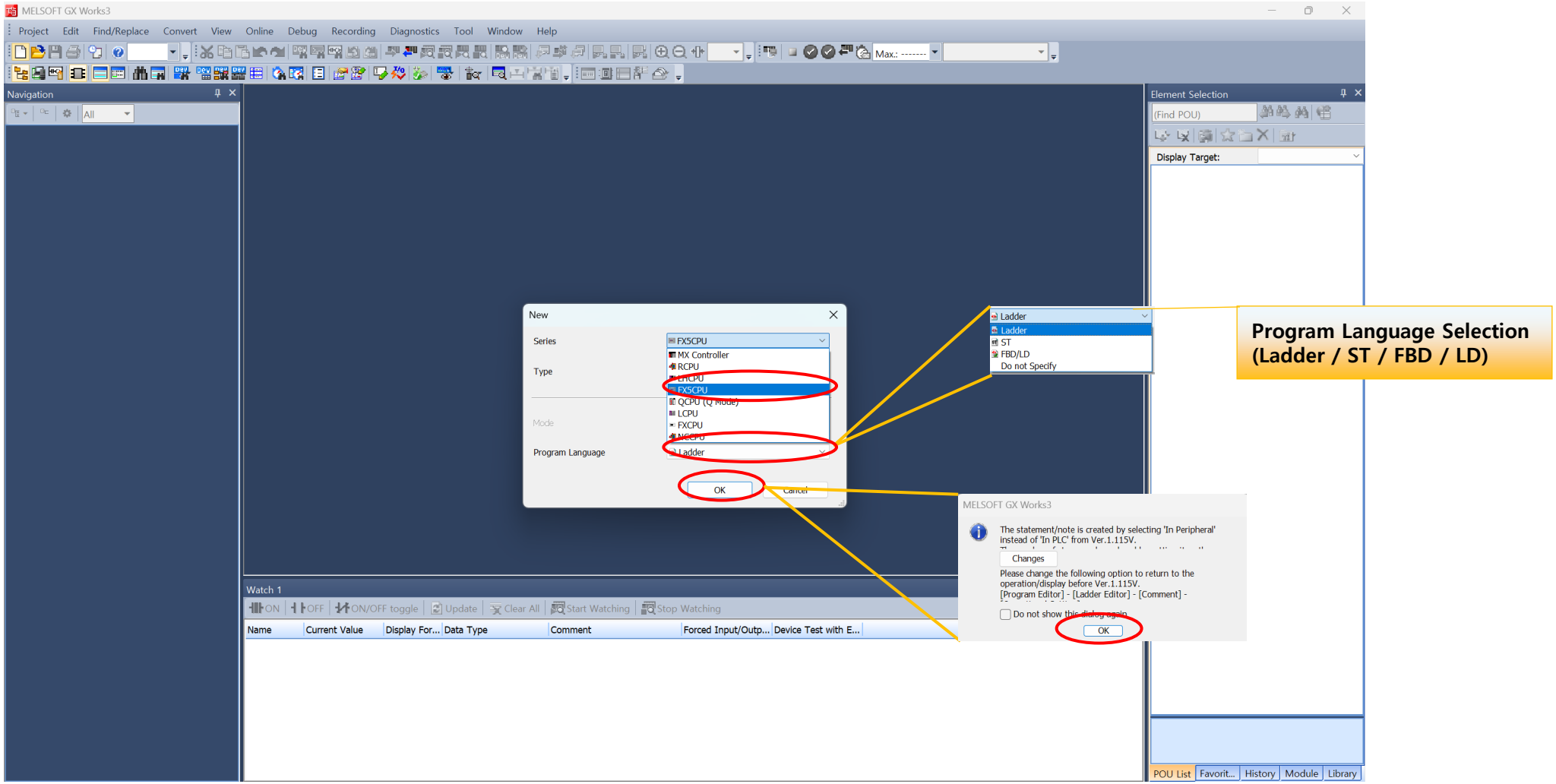
## ● Motion Control Function Restrictions (FX5 and Ezi-SERVO)

| 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 is always displayed as "0". |
| Md.108: Servo status 1 | The following bits in the monitor data are always in the 'OFF' state.<br>· Gain switching (b4)<br>· Fully closed control switching (b5)<br>· Torque limit active (b13)<br>· Absolute position lost (b14)<br>· Servo warning (b15) |
| Md.119: Servo status 2 | The following bits in the monitor data are always in the 'OFF' state.<br>· Zero point pass (b0)<br>· Zero speed (b3)<br>· Speed limit active (b4)<br>· 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

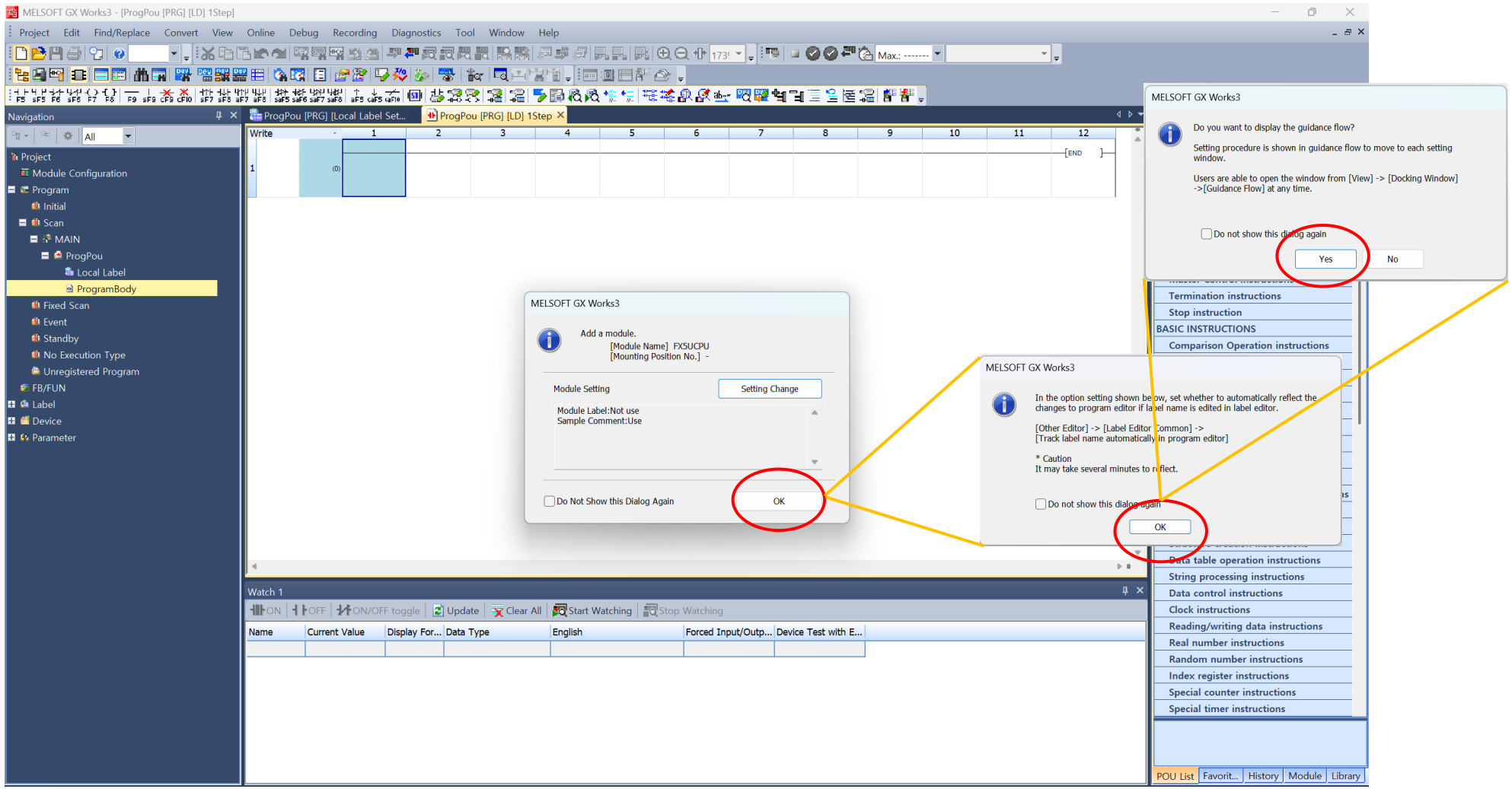
# 2-1. Project Creation

- **When creating a new project, select iQ-F FX5, model name, number of axes used, and programming language**



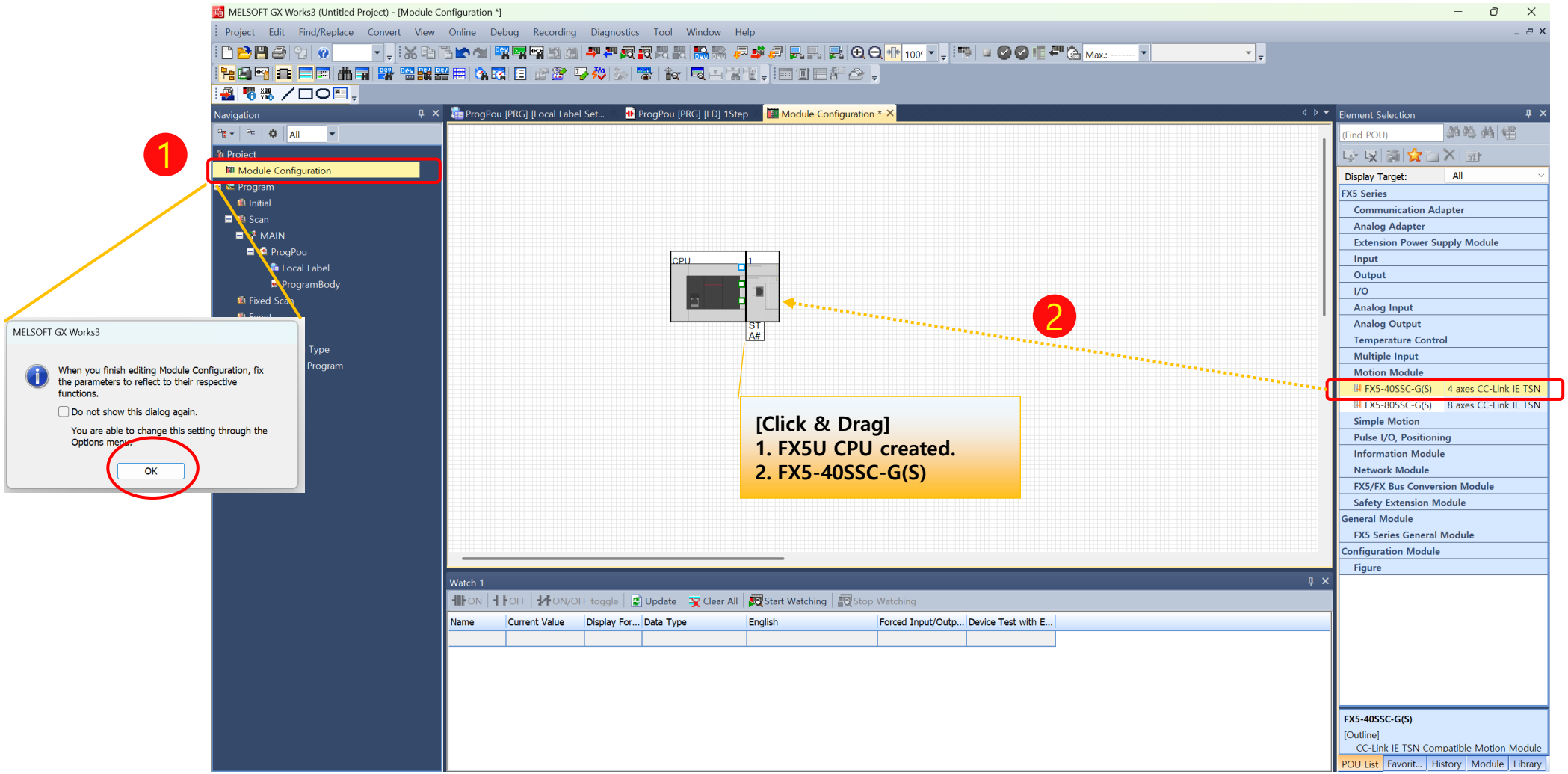
# 2-2. Module Registration

- **FX5U CPU Registration**



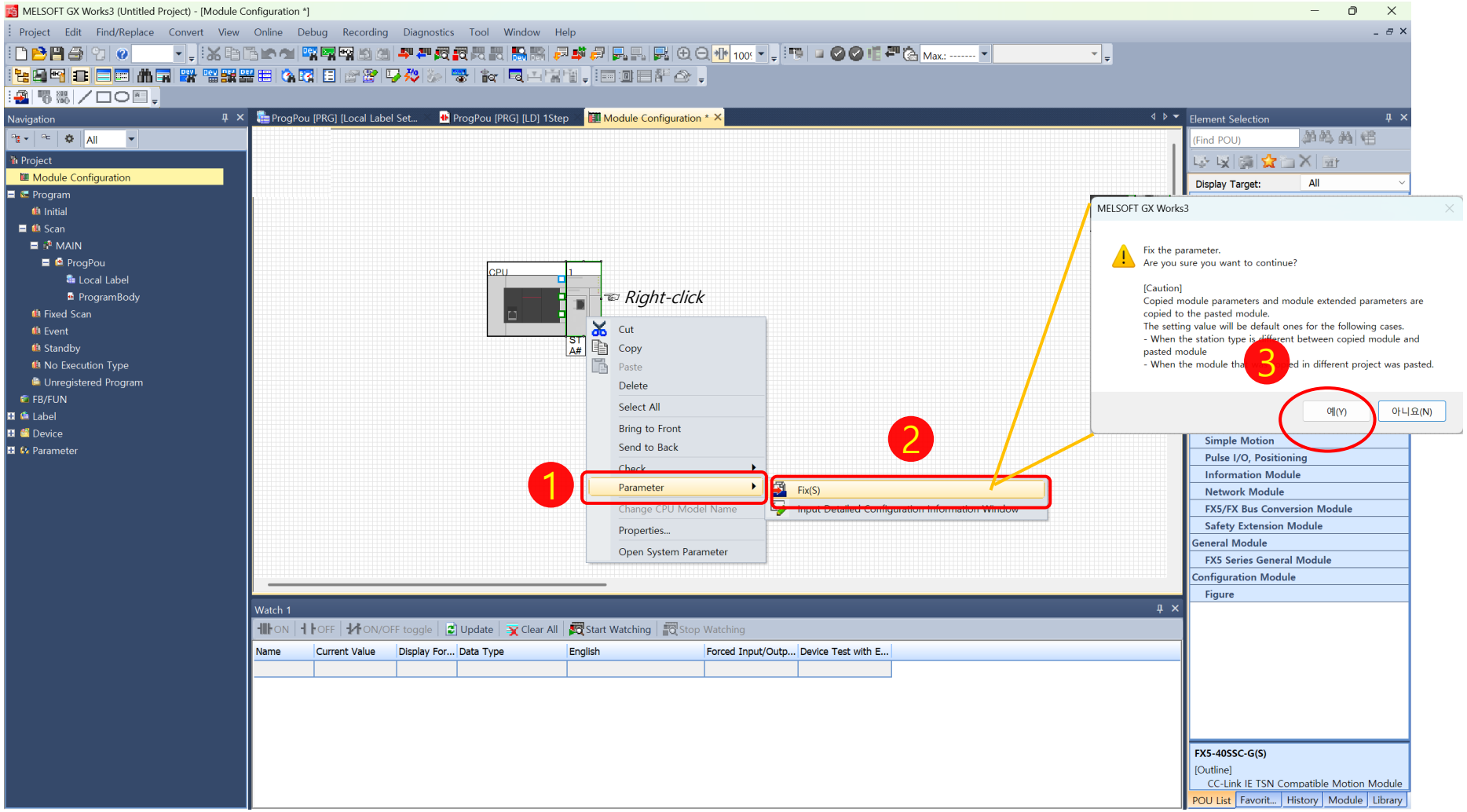
# 2-3. Module Configuration – H/W

- **Click and drag with the mouse to install FX5-40SSC-G(S)**



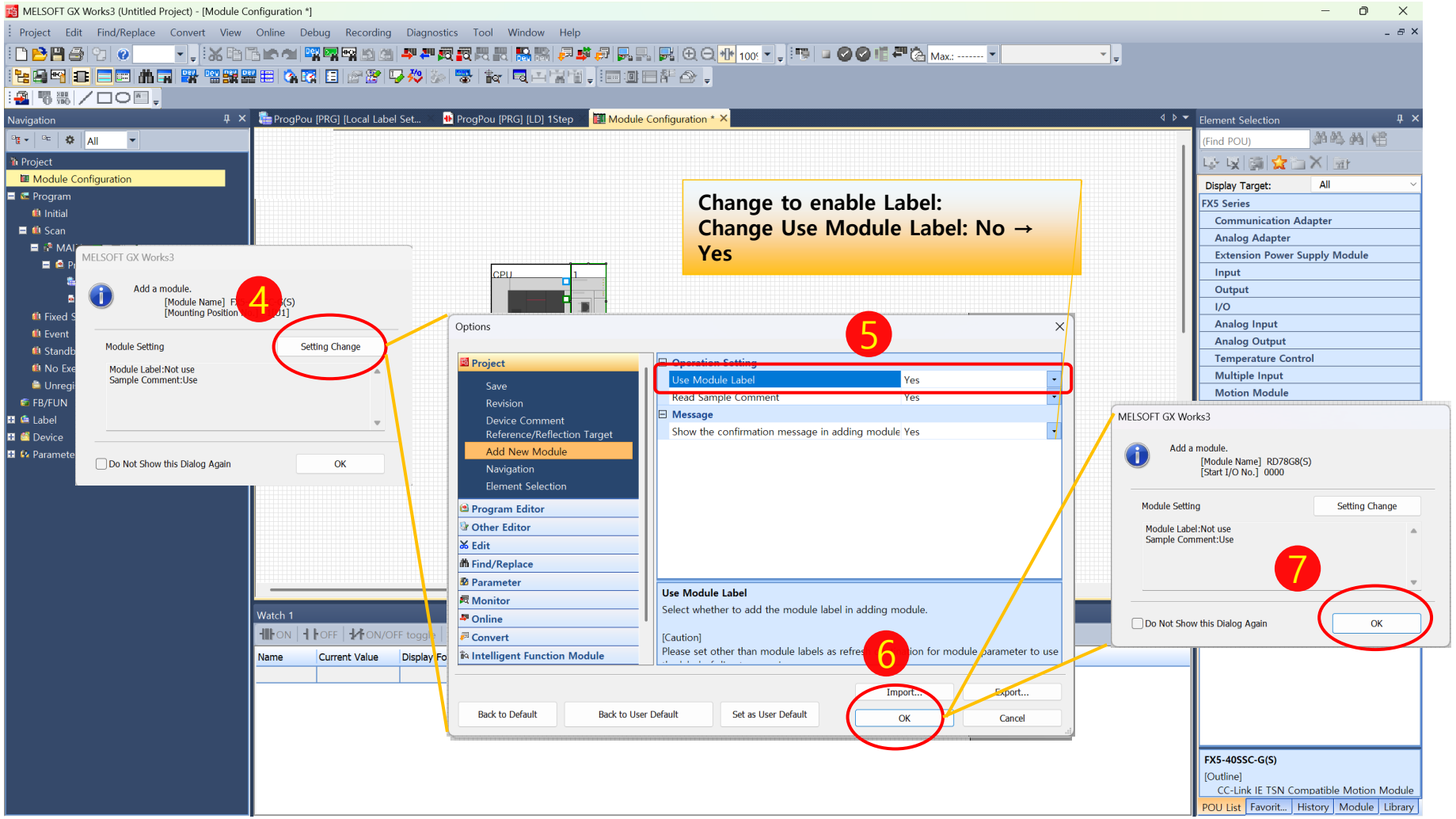
# 2-3. Module Configuration – H/W

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



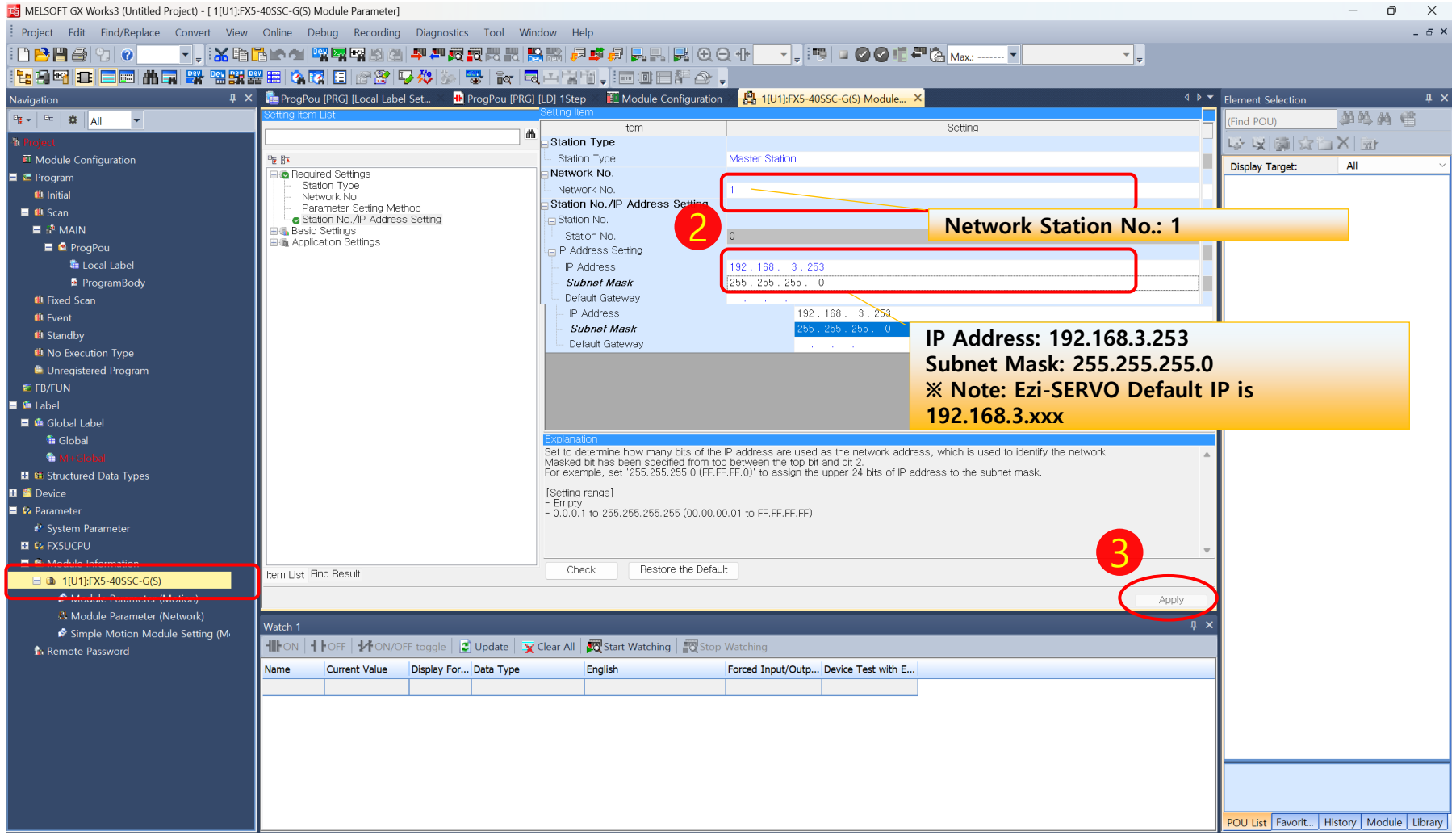
# 2-3. Module Configuration – H/W

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



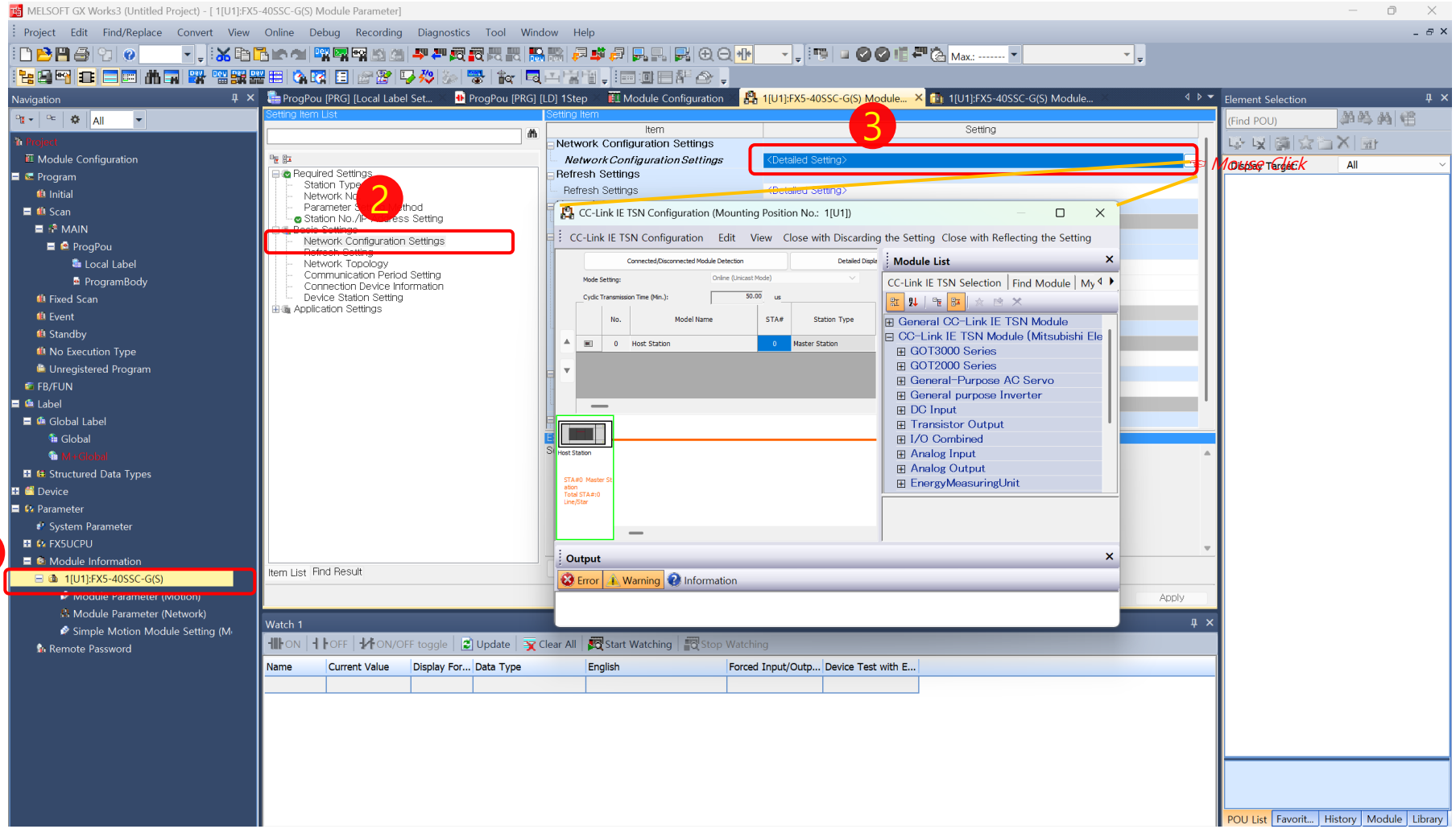
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Station No./IP Address Setting : Example) IP Address → 192.168.3.253**



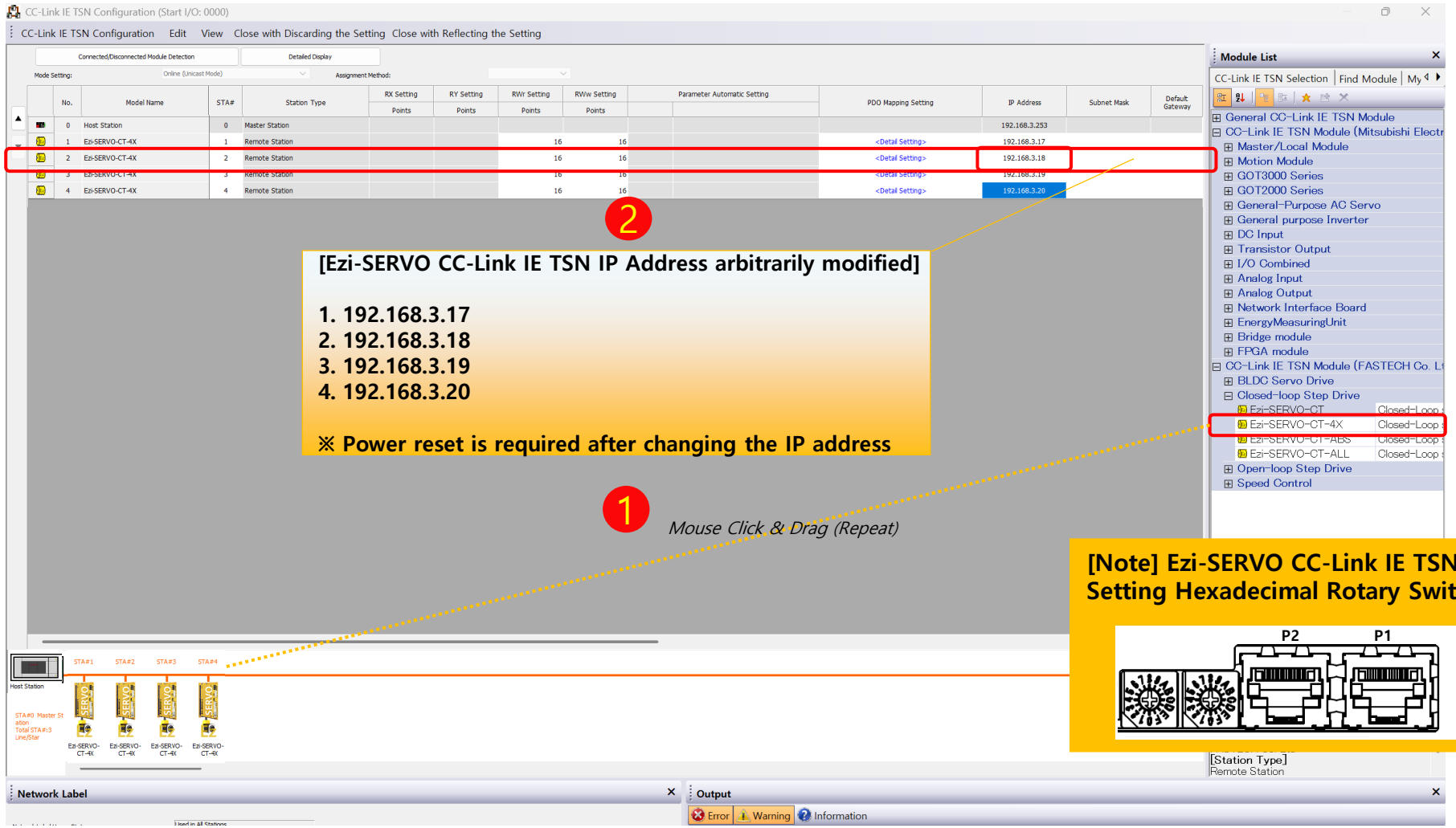
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Network Configuration Settings**



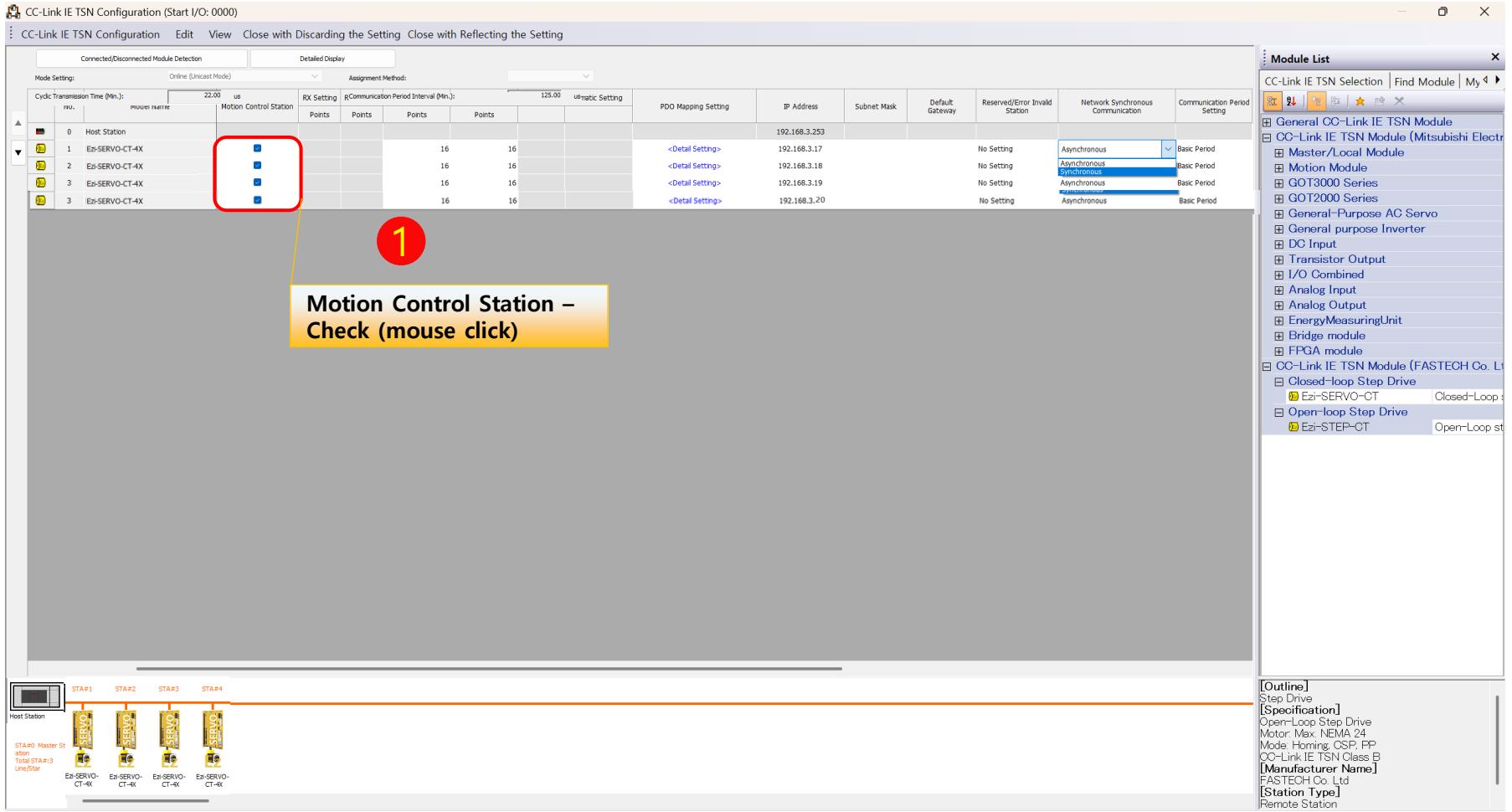
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

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



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

- **CC-Link IE TSN Module selected 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

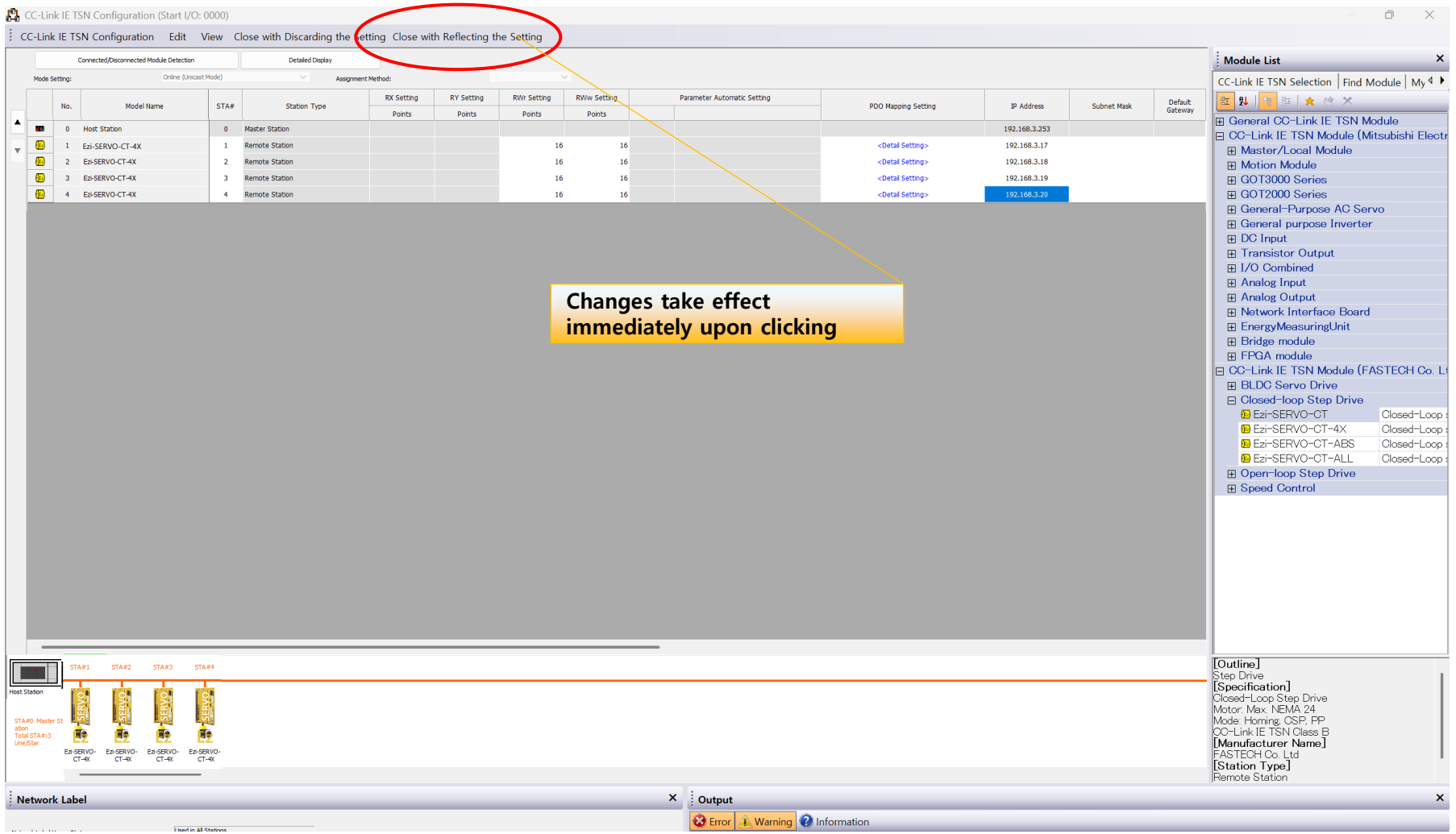
| Index | Sub index | Data Type | Content |
|---|---|---|---|
| 1D02 | 01 | U16 | Watchdog counter UL 1 |
| 6061 | 00 | I8 | Modes of operation display |
| 0000 | 00 | U8 | GAP |
| 6064 | 00 | I32 | Position Actual Value |
| 60F4 | 00 | I32 | Following error actual value |
| 6041 | 00 | U16 | Status 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 |

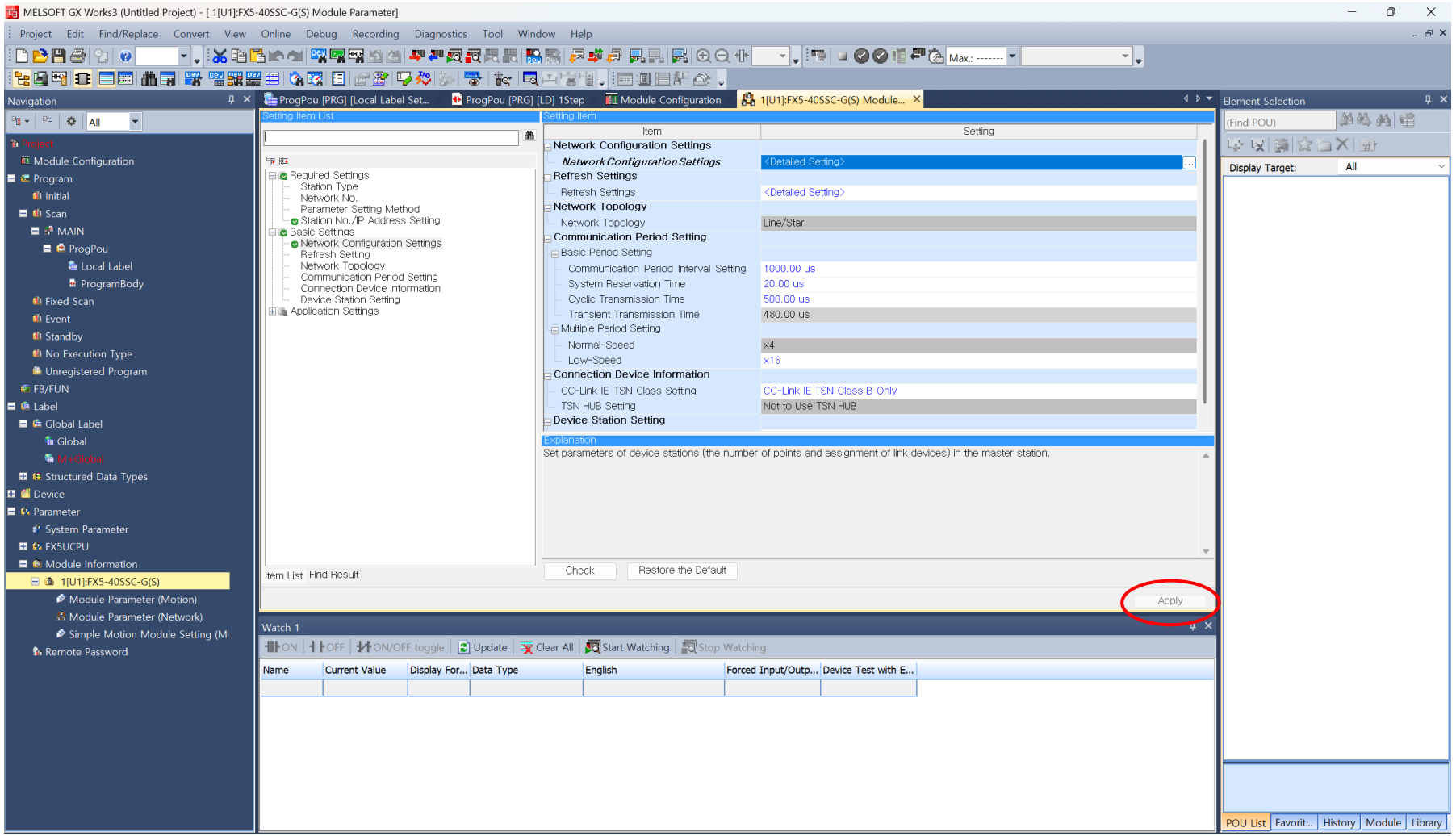
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

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



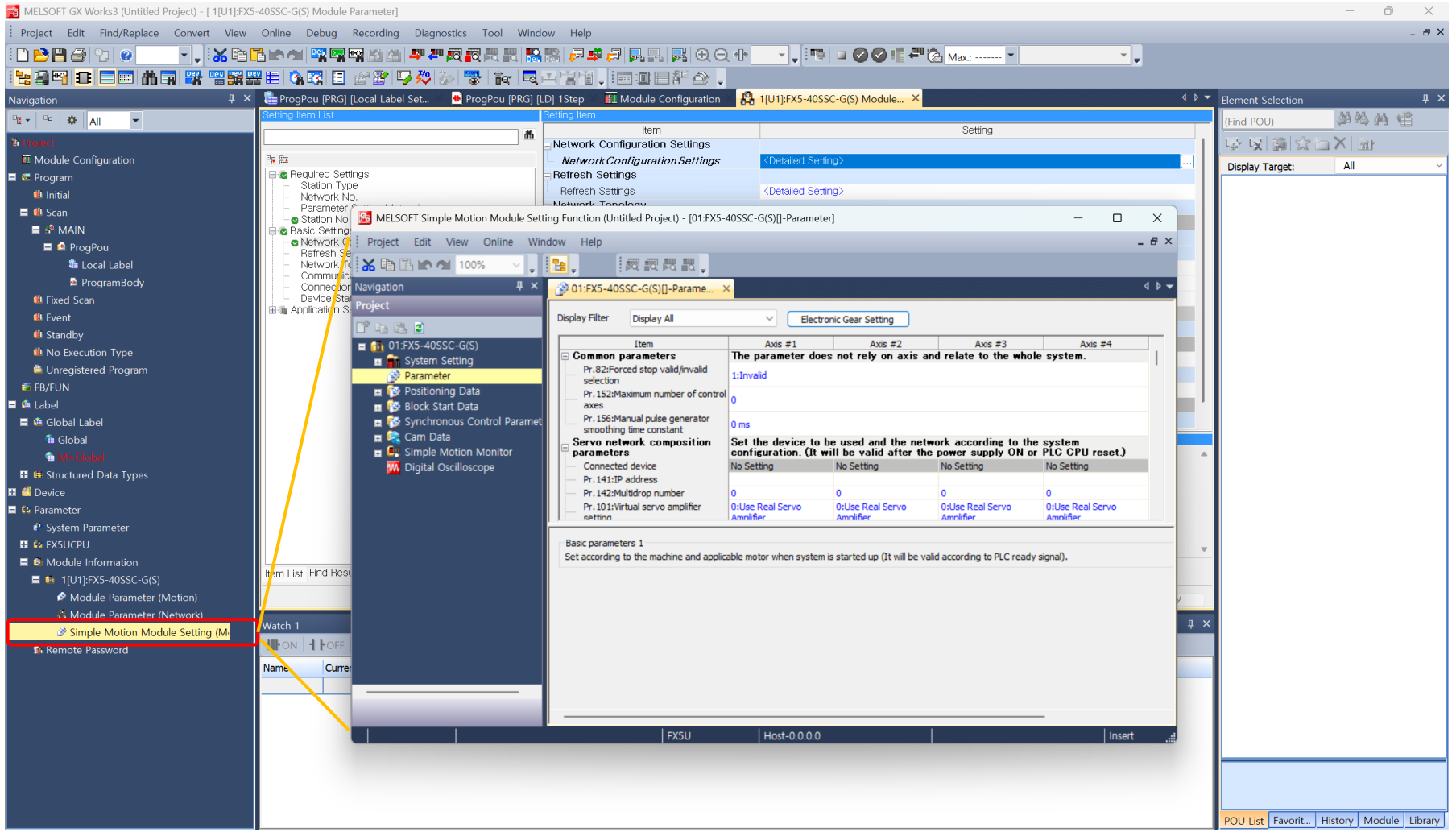
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

- **Applying Network Configuration Settings**



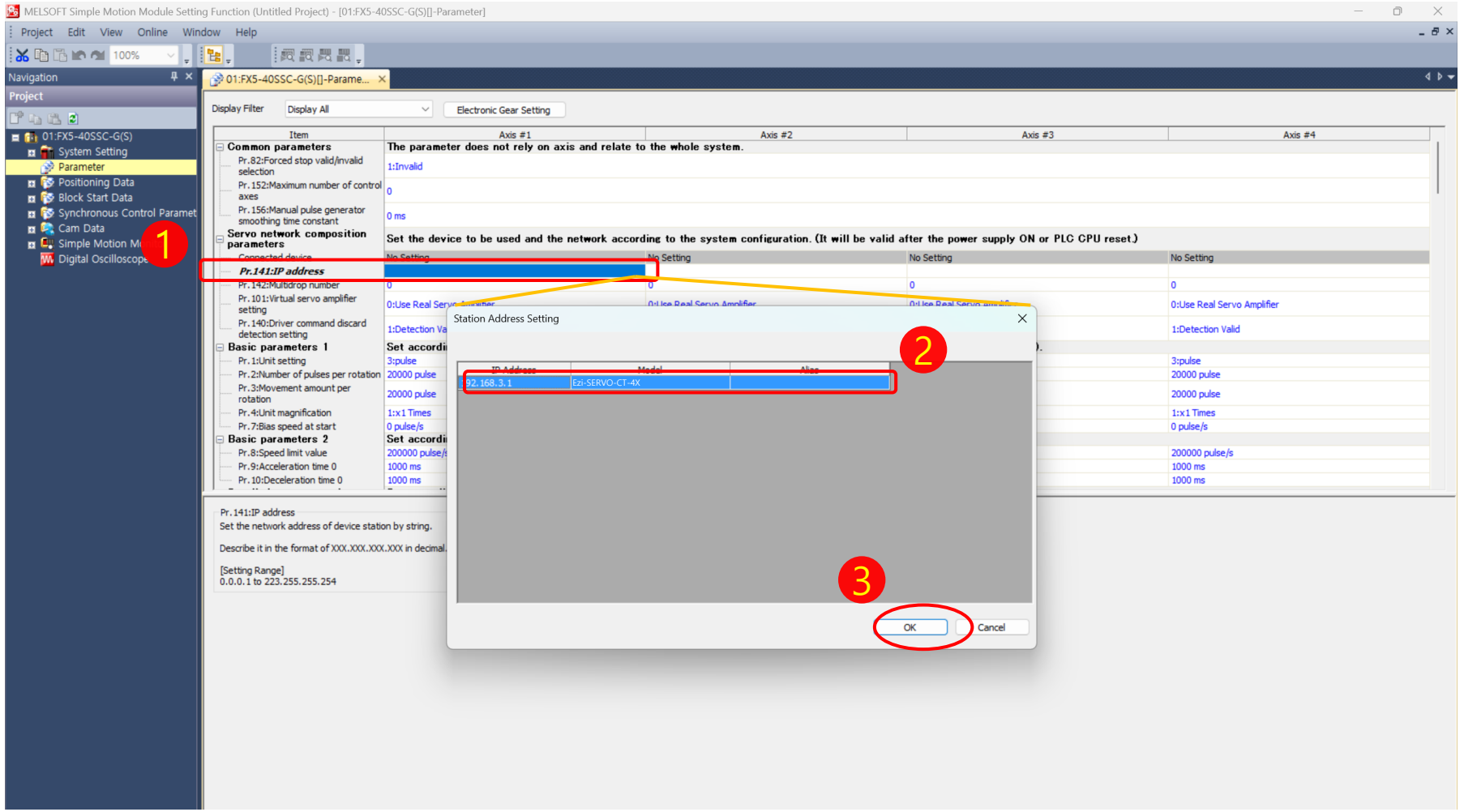
# 2-4. Parameter / Module Information / 1[U1]:FX5-40SSC-G(S)

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



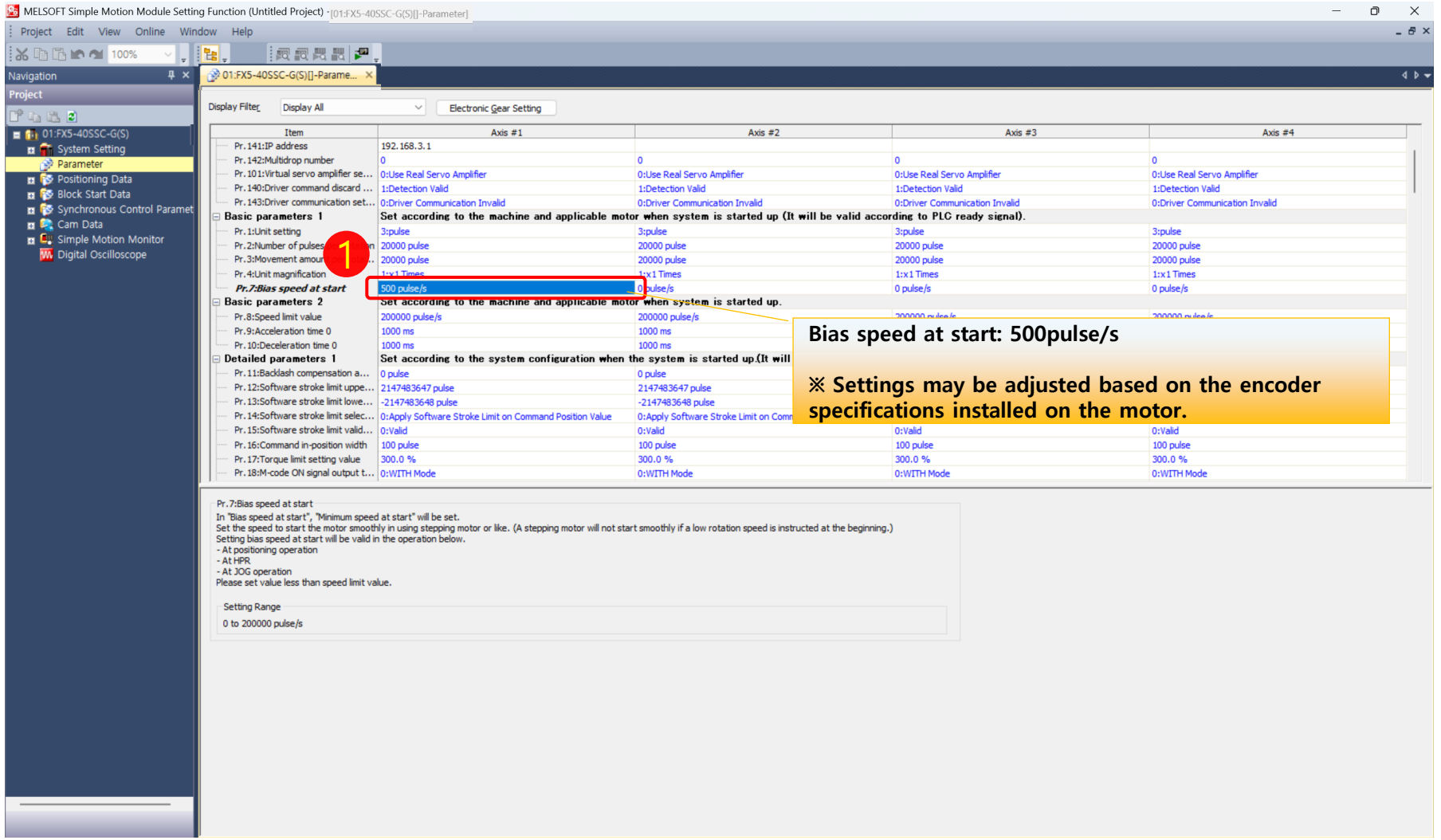
# 2-5. Simple Motion Module Setting

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



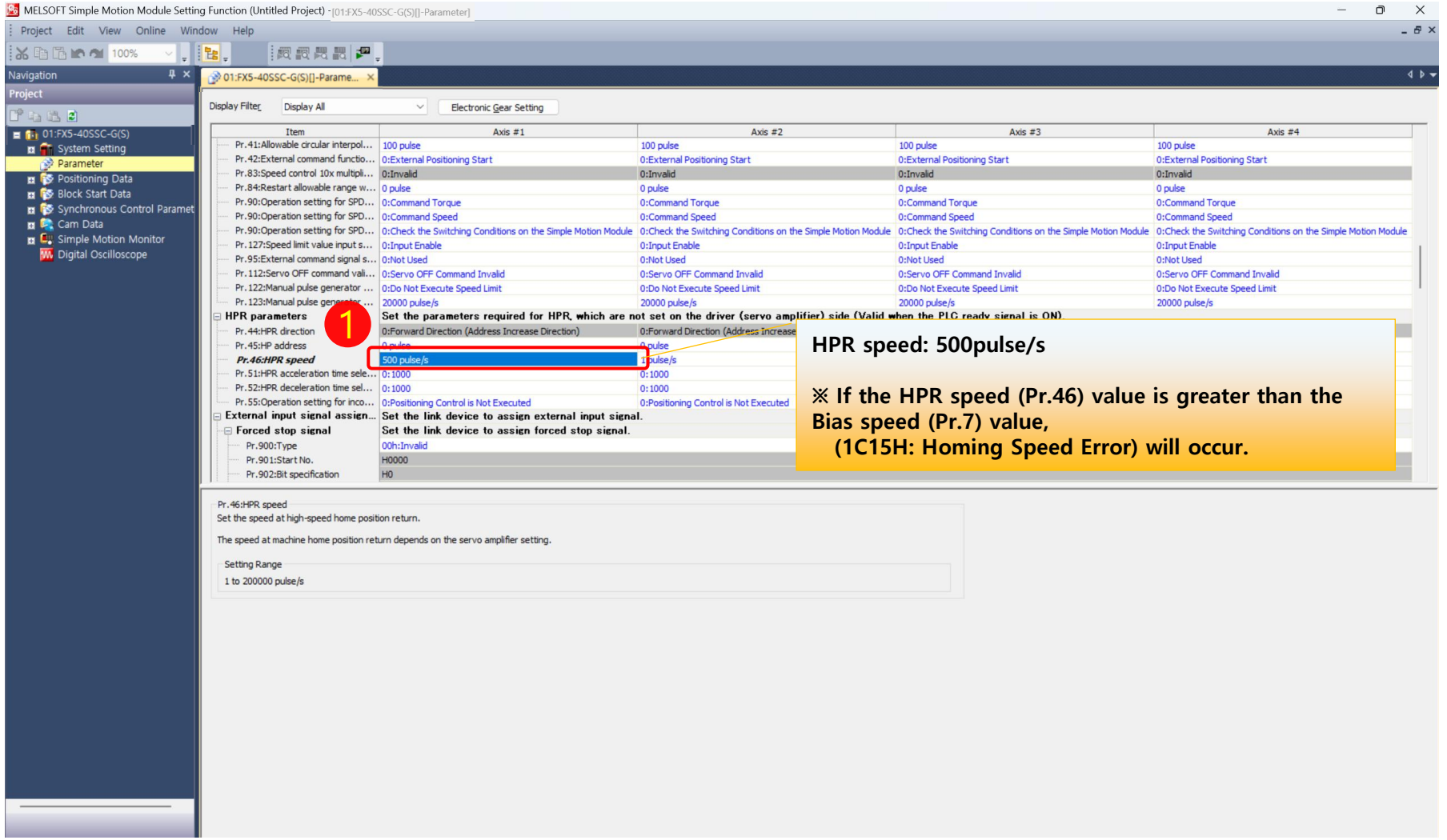
# 2-5. Simple Motion Module Setting

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



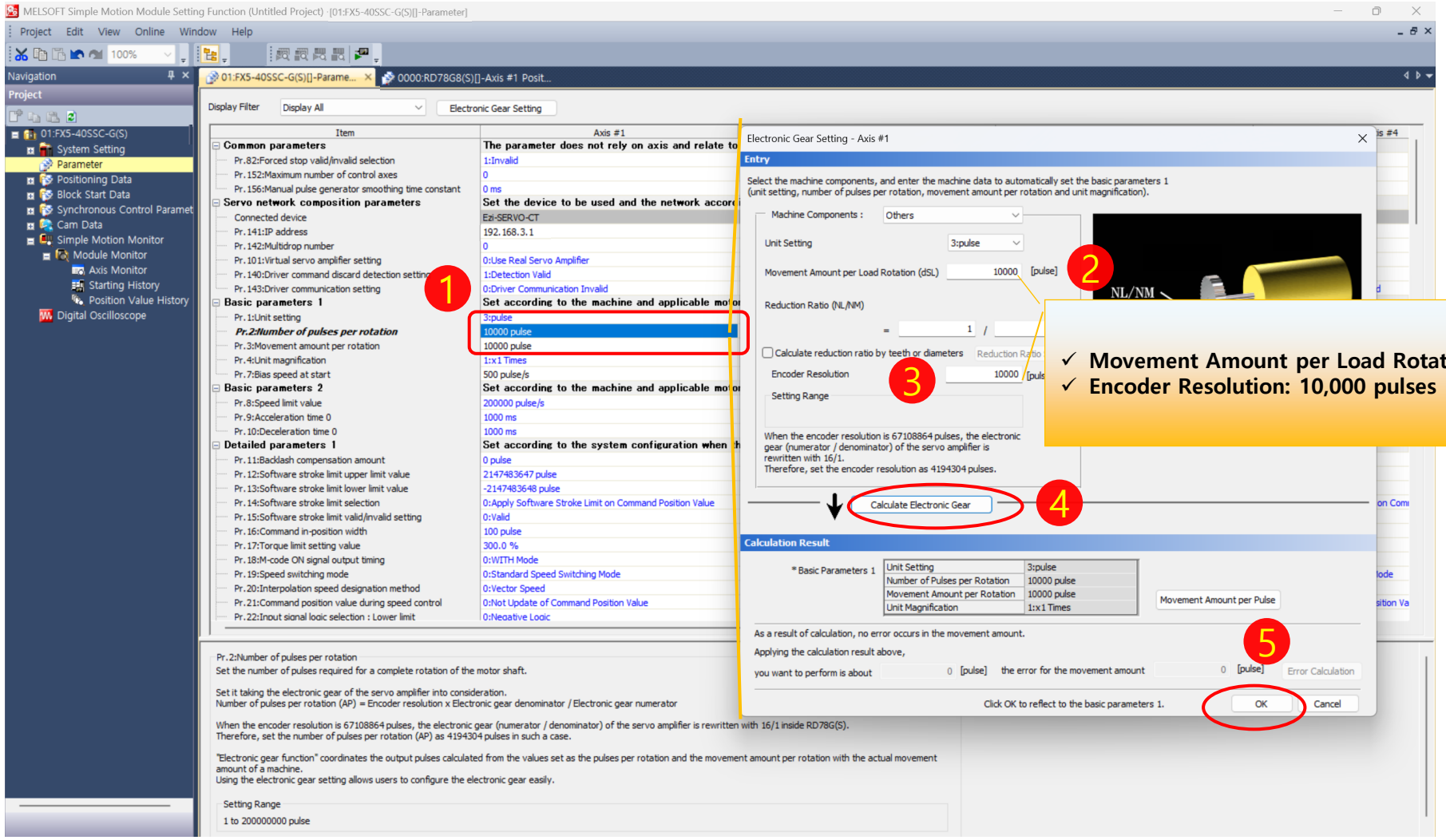
# 2-5. Simple Motion Module Setting

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



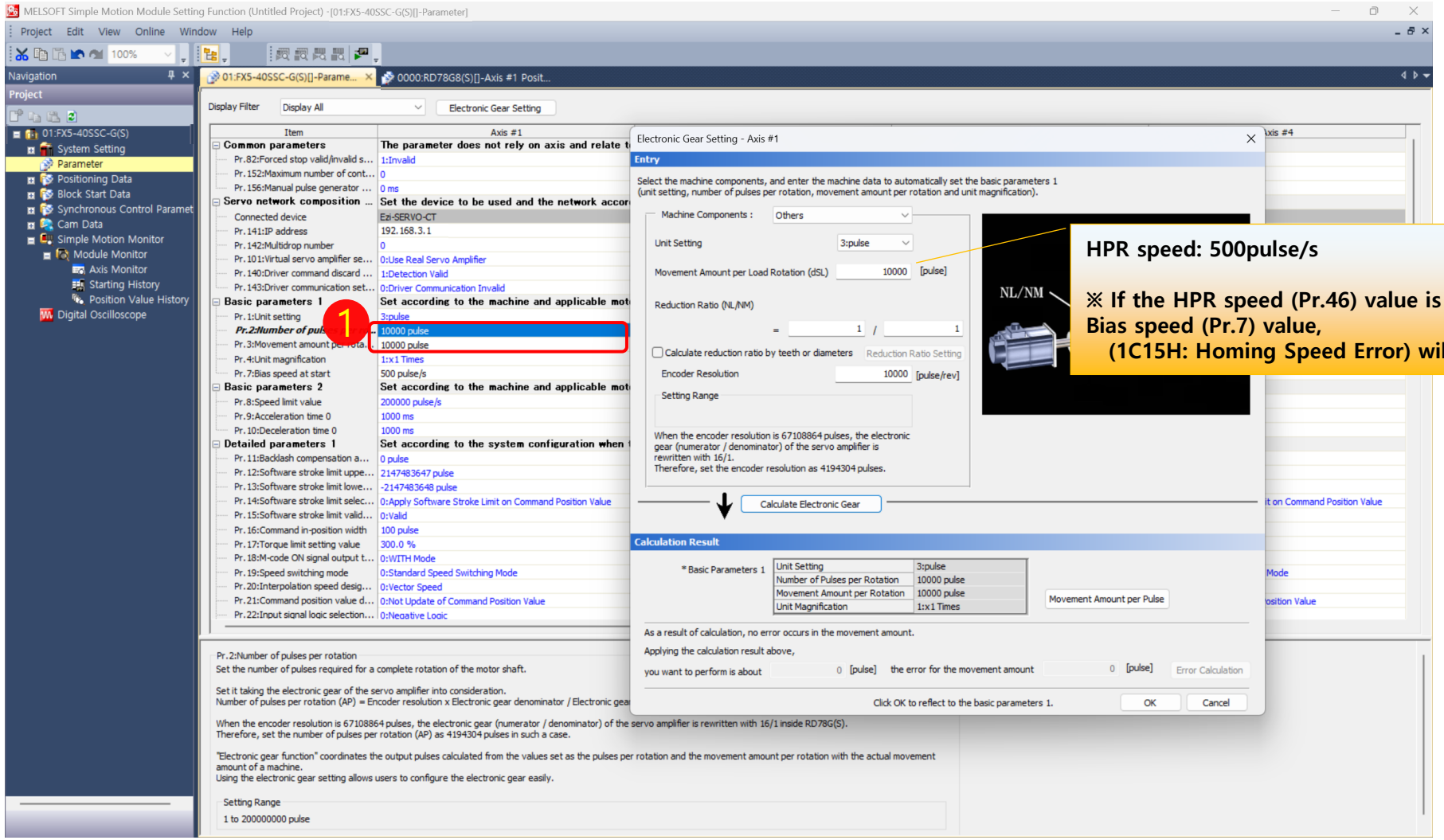
# 2-5. Simple Motion Module Setting

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



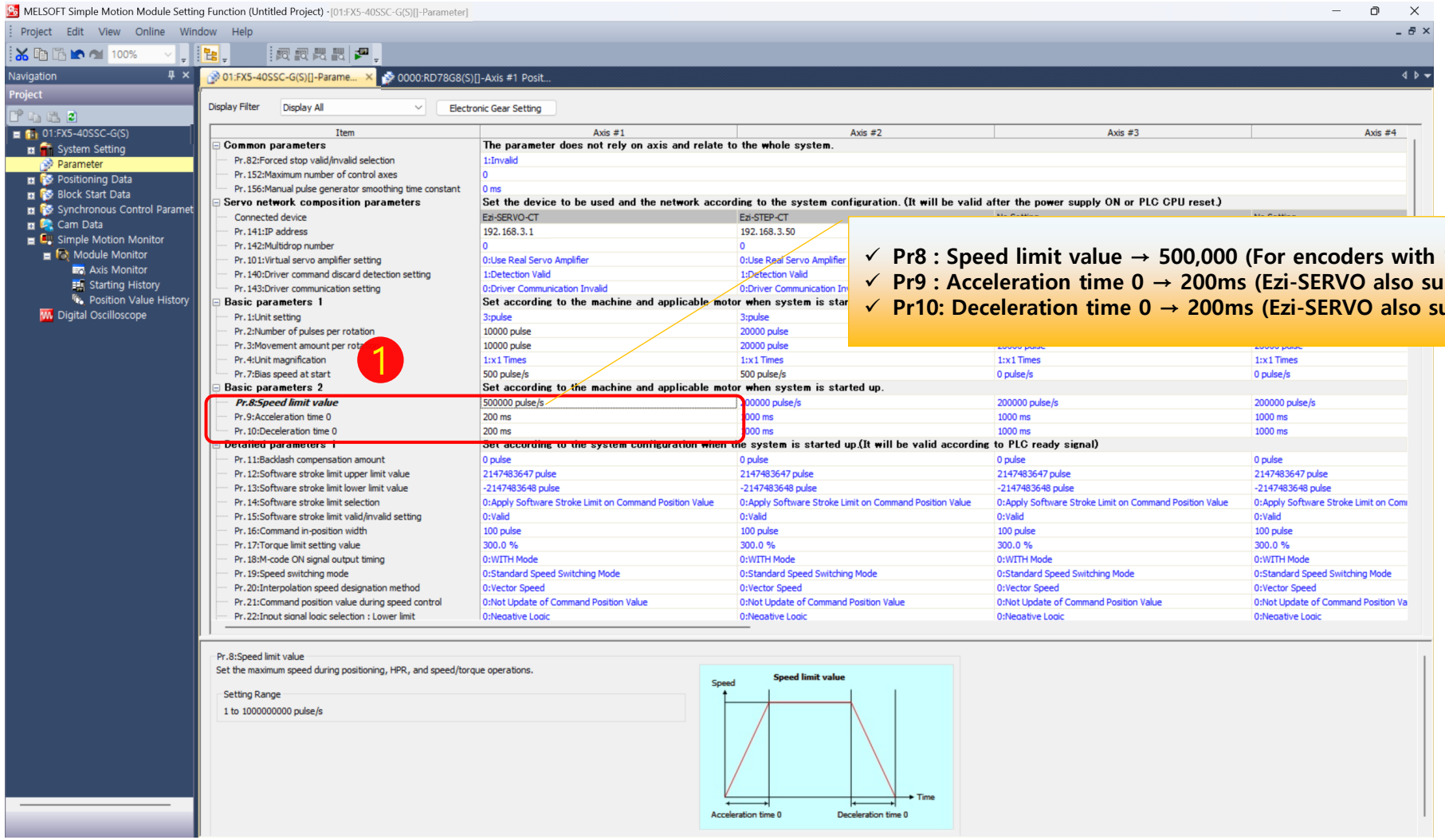
# 2-5. Simple Motion Module Setting

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



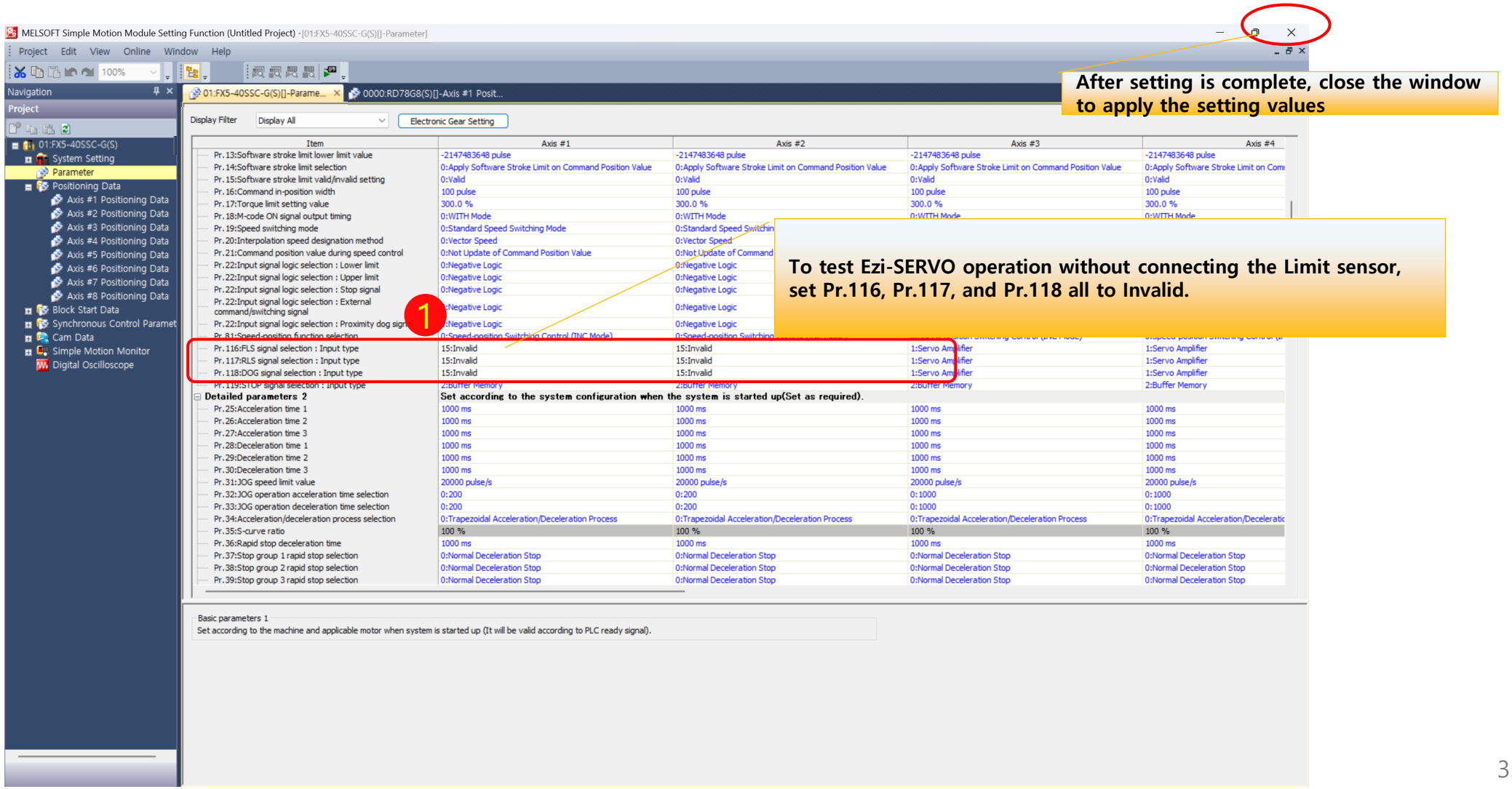
# 2-5. Simple Motion Module Setting

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



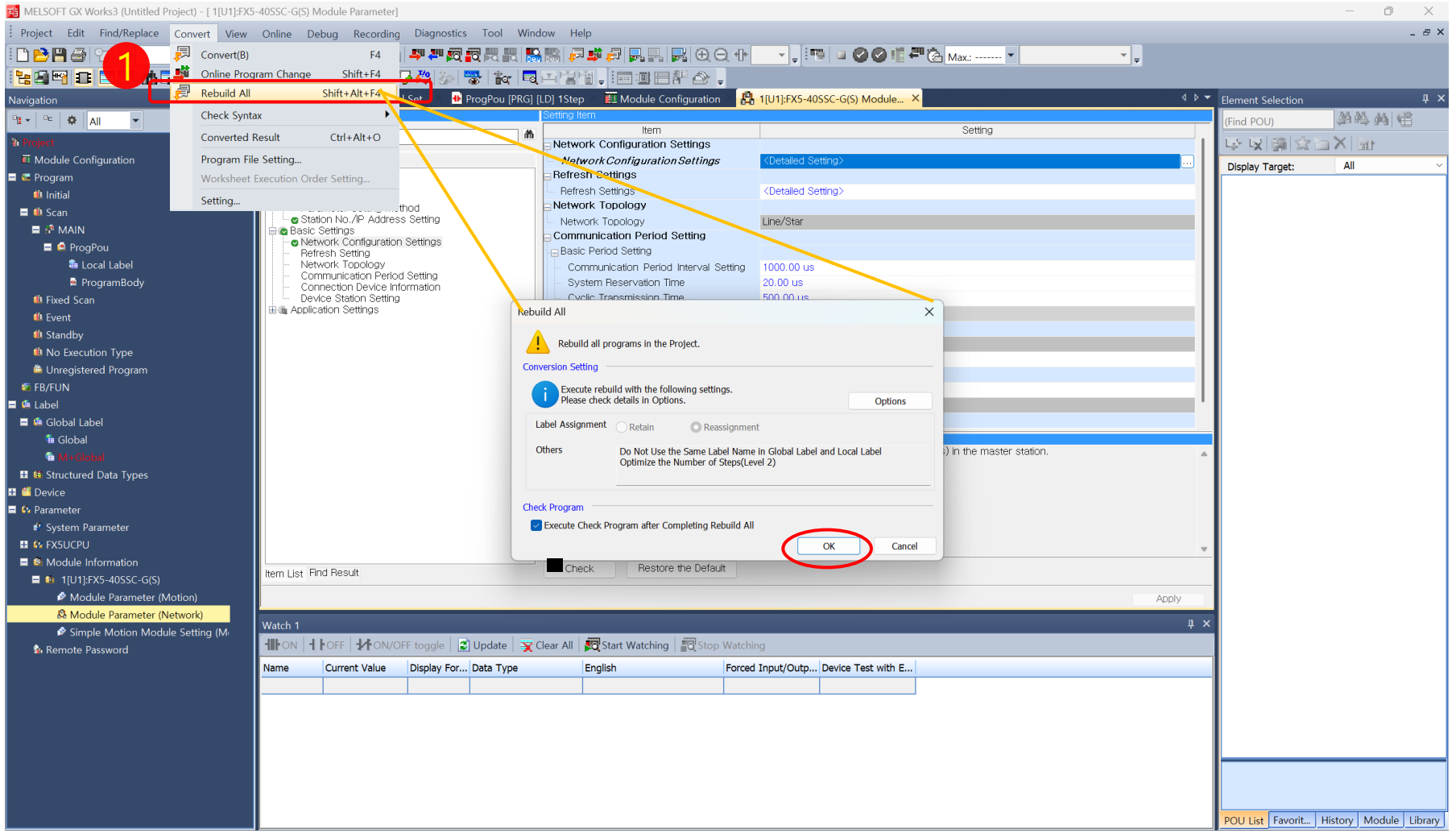
# 2-5. Simple Motion Module Setting

- **Parameter/Detailed parameters 1/FLS, RLS, DOG Signal selection: Input type : Invalid (Temporary)**



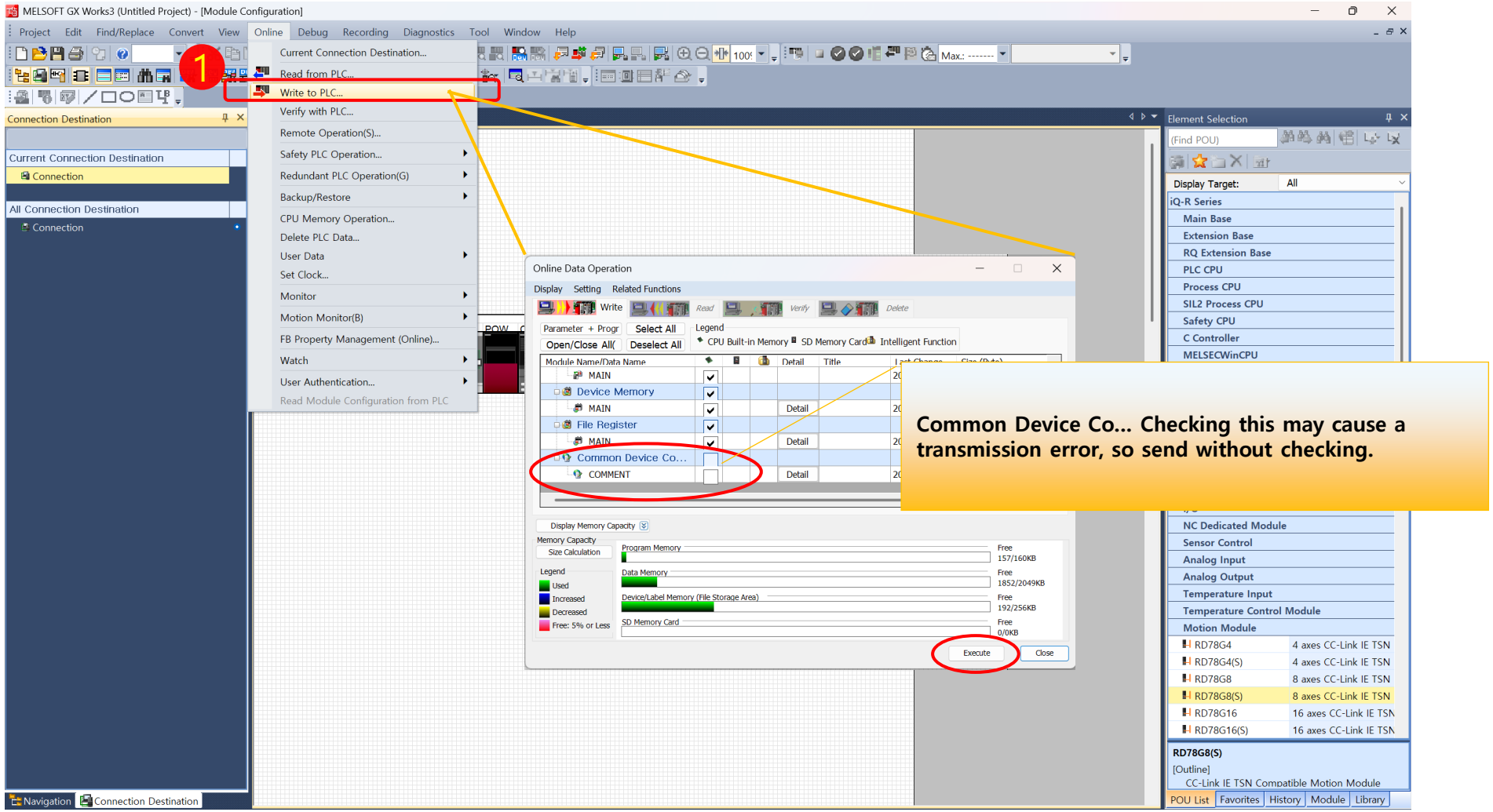
# 2-6. Convert

- **Convert / Rebuild All**



# 2-7. Write to PLC

- **Online Data Operation**



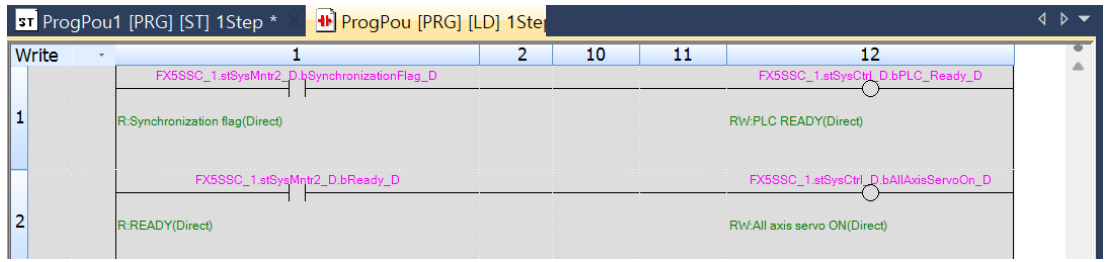
# 3. Verify Operation

# 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

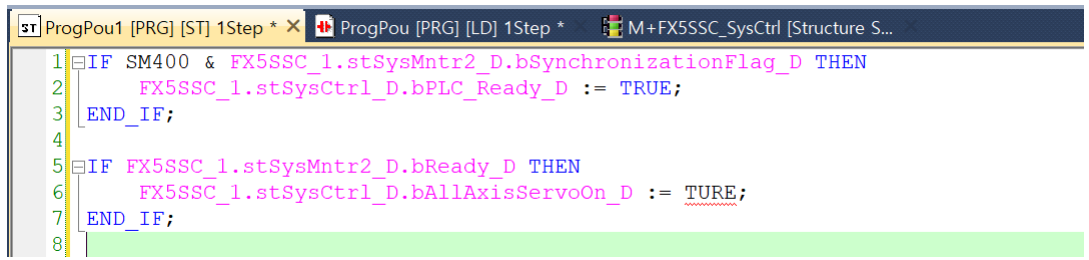
② Synchronization Flag (FX5SSC_1.stSysMntr2_D.bSynchronizationFlag_D): Requires ON

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

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

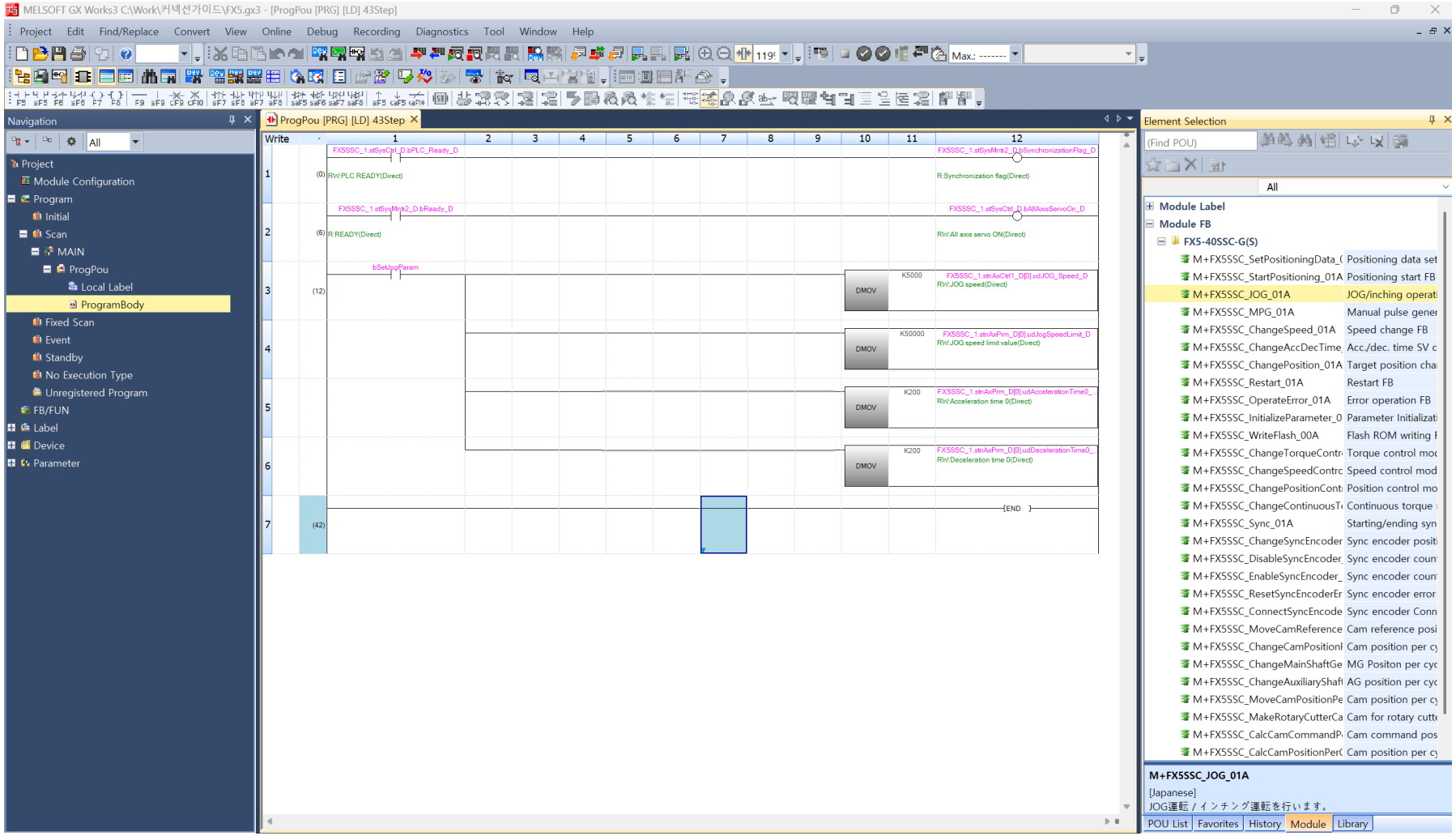
Label (Variable) Method

[ ST Program ]



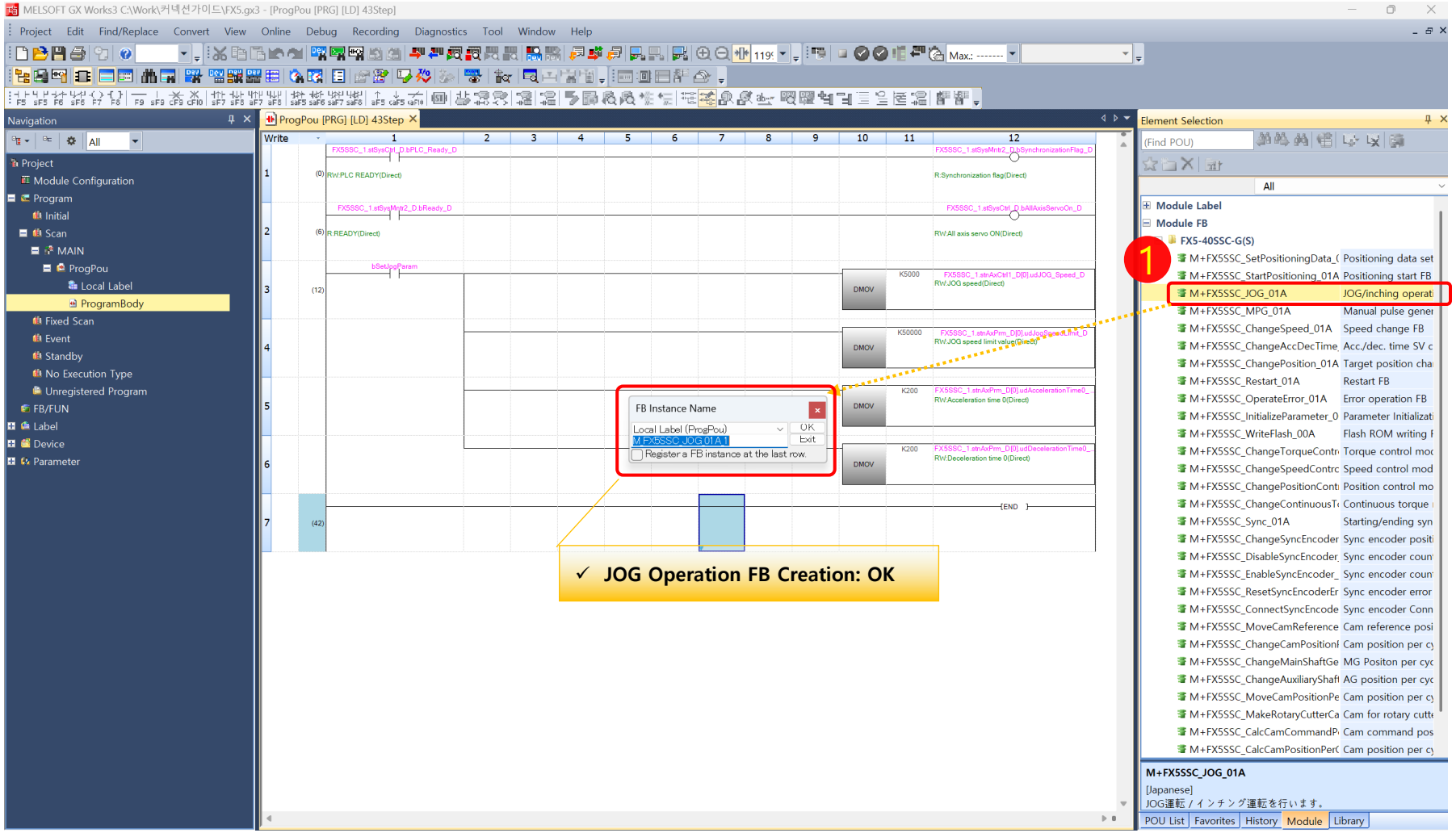
# 3.1 Program Development

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



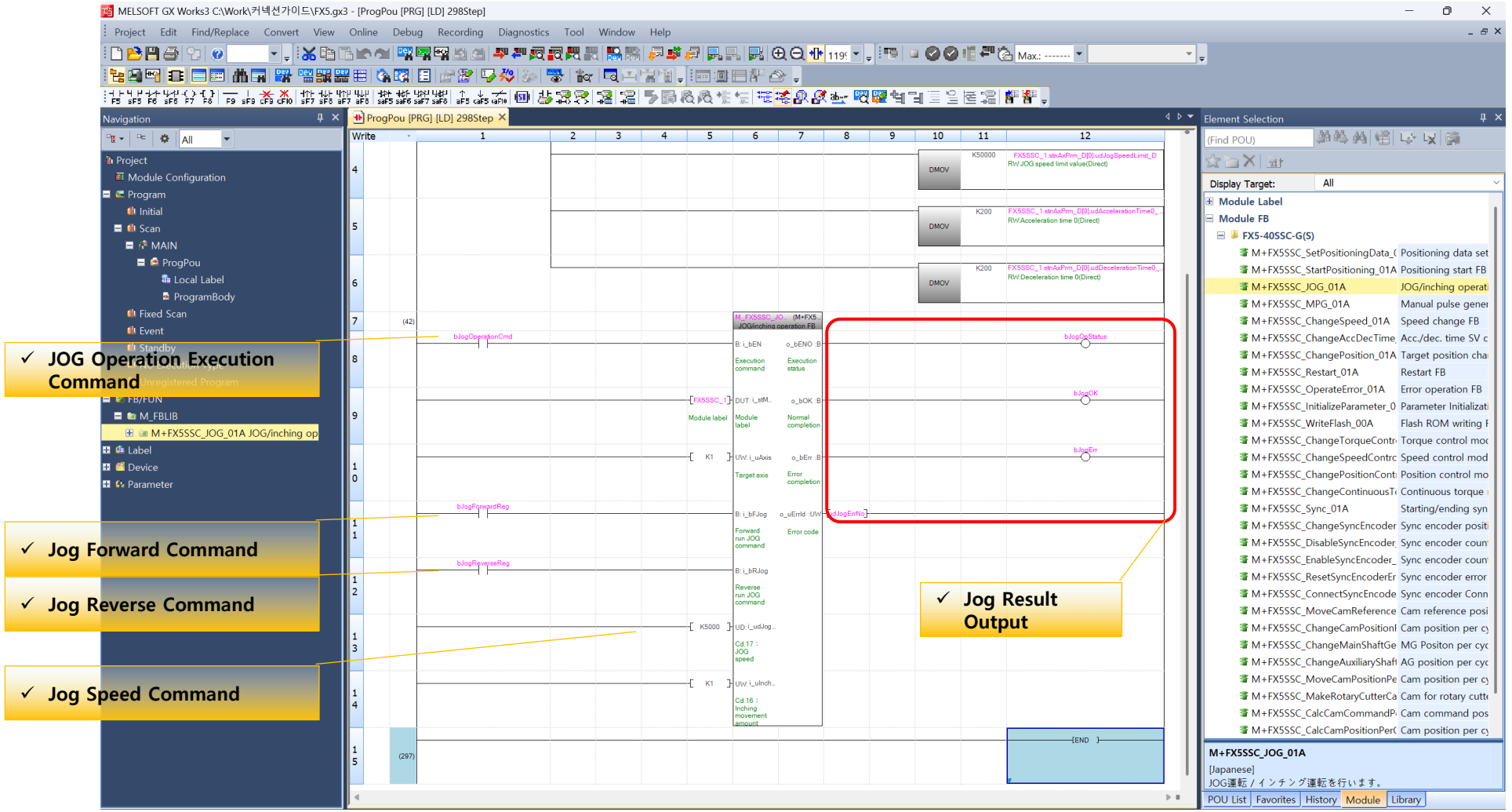
# 3.1 Program Development

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



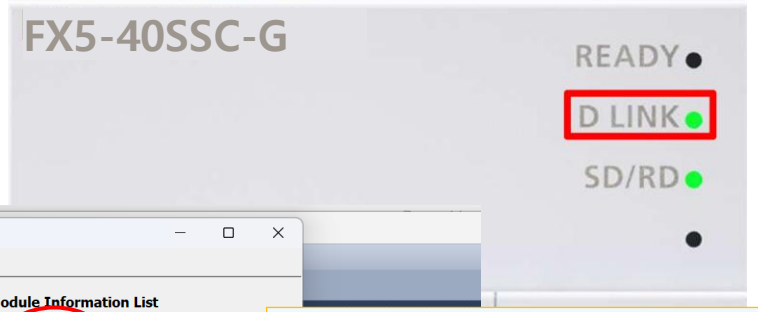
# 3.1 Program Development

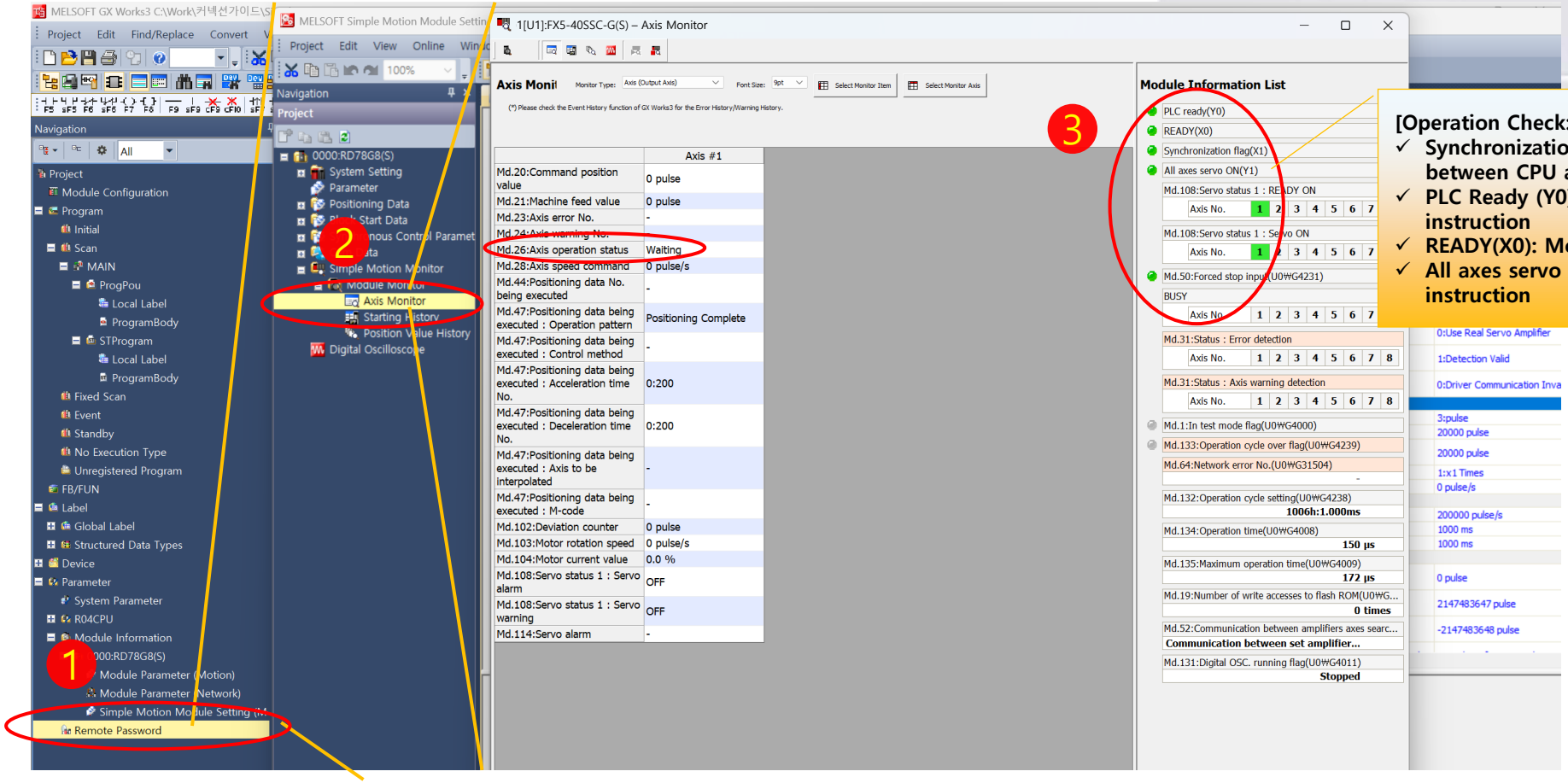
- **Jog Operation Program: Module FB Configuration / Operation / Results**



# 3.2 Axis Monitoring

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




[Operation Check: Green when ON]
- ✓ Synchronization flag (X1): Connection status between CPU and Motion Module
- ✓ PLC Ready (Y0): Motion Module activation instruction
- ✓ READY(X0): Motion Module control enabled
- ✓ All axes servo ON(Y1): All axes servo ON instruction

# 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

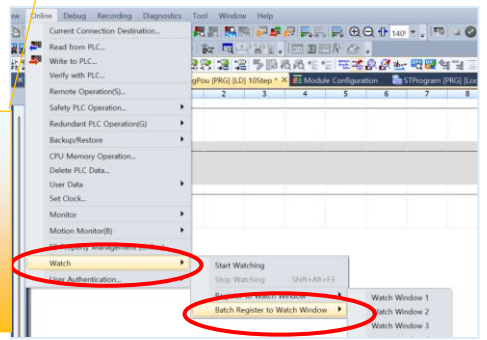
Watch 1[Watching]

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... |

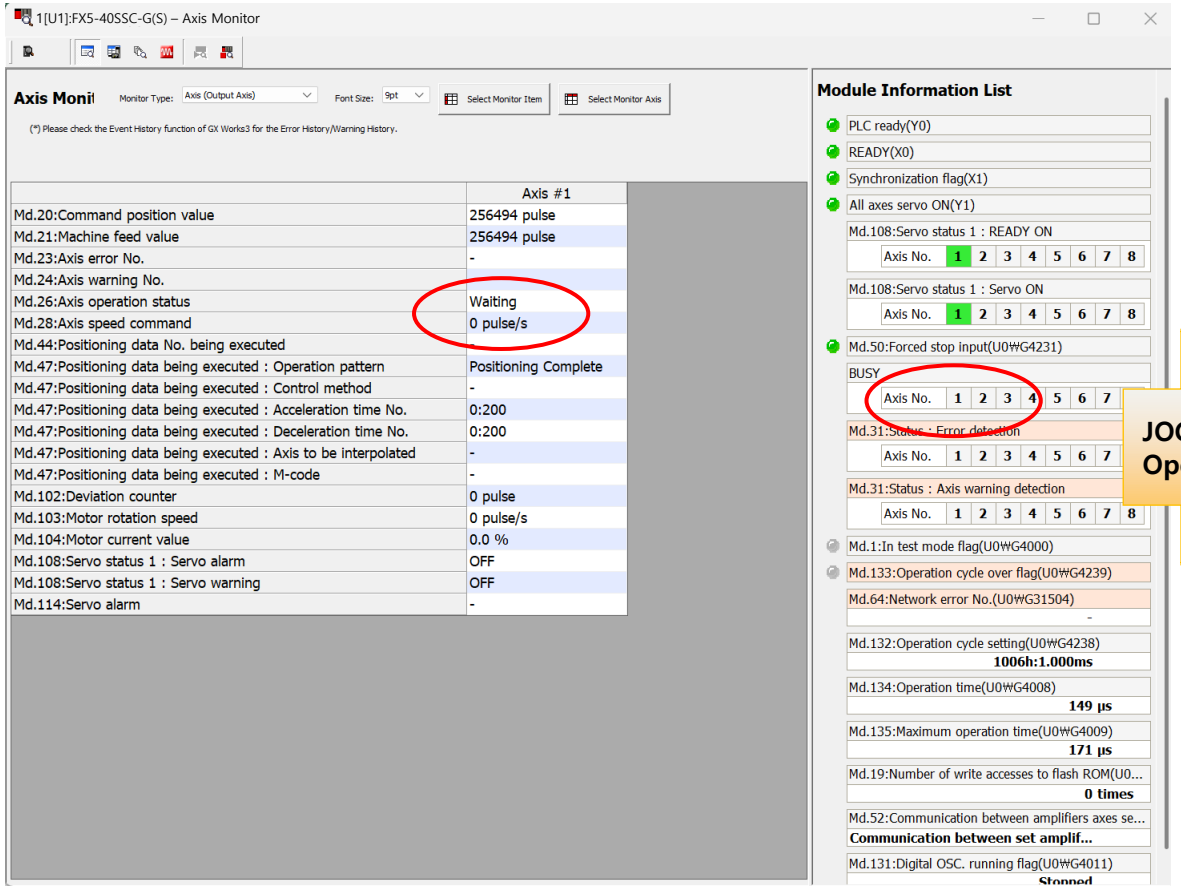
✓ **Registering labels for jog operation**

**[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**

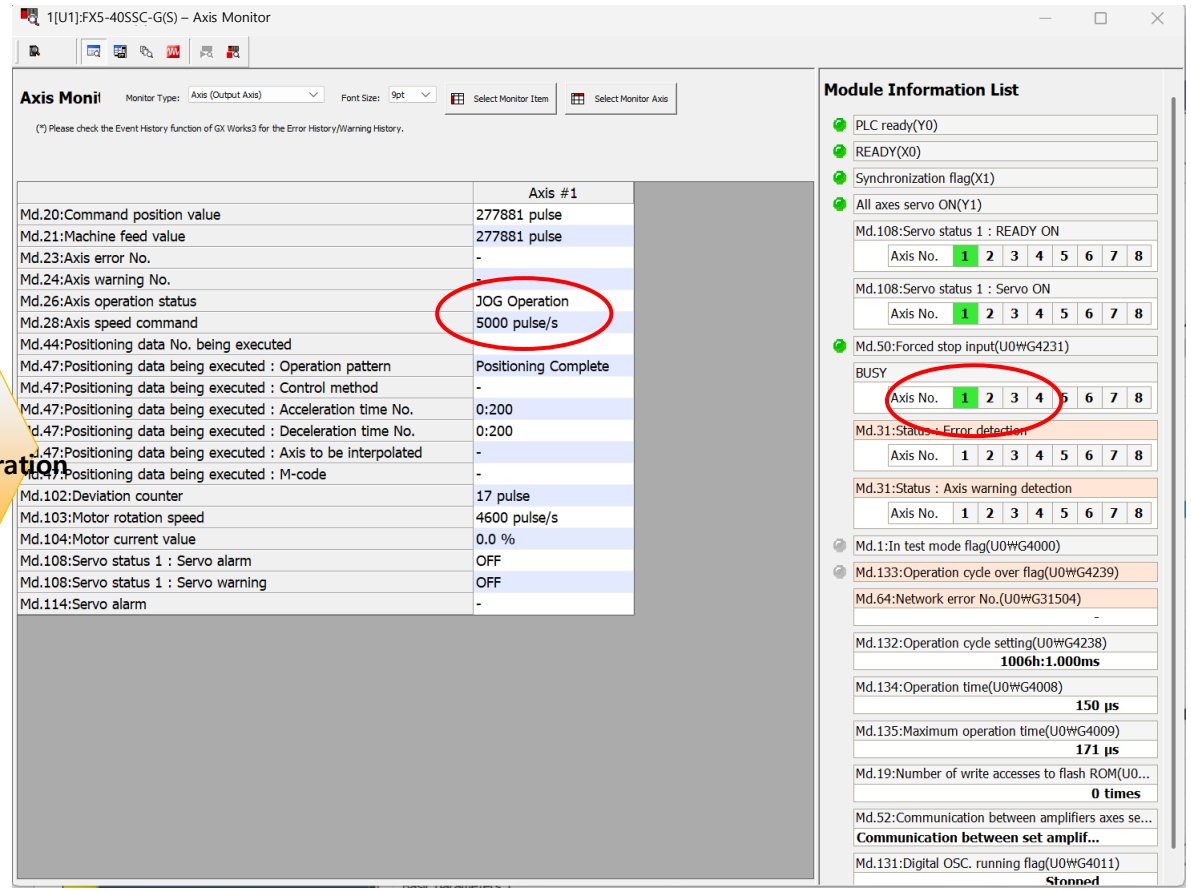


# 3.3 Axis Operation Verification

- **Jog Operation: Stop → Move**




JOG Operation



# 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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