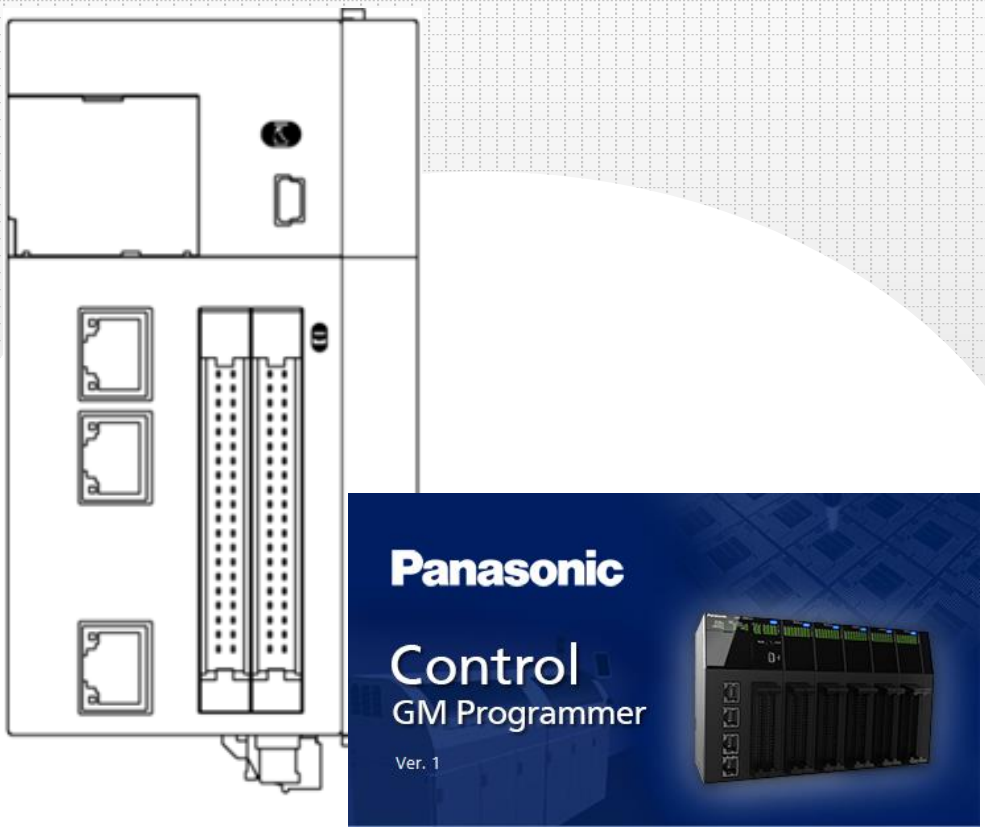
Panasonic®

Hello! GM1 EtherCAT Edition



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• Injuries and damages that may occur as a result of incorrect use are classified into the following levels and safety precautions are explained according to the level.

⚠WARNING	Indicates that there is a risk of death or serious injury
⚠CAUTION	Indicates that there is a risk of minor injury or property damage

🚫	Indicates an action that is prohibited
❗	Indicates an action that must be taken

⚠WARNING
❗• Take safety measures outside this product to ensure the safety of the entire system even if this product fails or an error occurs due to external factors.
🚫• Do not use this product in atmospheres that contain flammable gases. Doing so may result in explosion.
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⚠CAUTION
❗• To prevent abnormal heat generation or smoke generation, use this product with some leeway from the guaranteed characteristics and performance values of the product.
🚫• Do not disassemble or modify this product. Doing so may result in abnormal heat generation or smoke generation.
🚫• Do not touch any terminals while the power is ON.
❗• Configure emergency stop and interlock circuits outside this product.
❗• Connect wires and connectors properly. Failure to do so may result in abnormal heat generation or smoke generation.
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❗• If this product is used in any way that is not specified by Panasonic, its protection function may be impaired.
❗• This product has been developed and manufactured for factory use only.

GM1 EtherCAT Positioning Control

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- PANATERM Lite for GM
- PANATERM

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4 Monitoring

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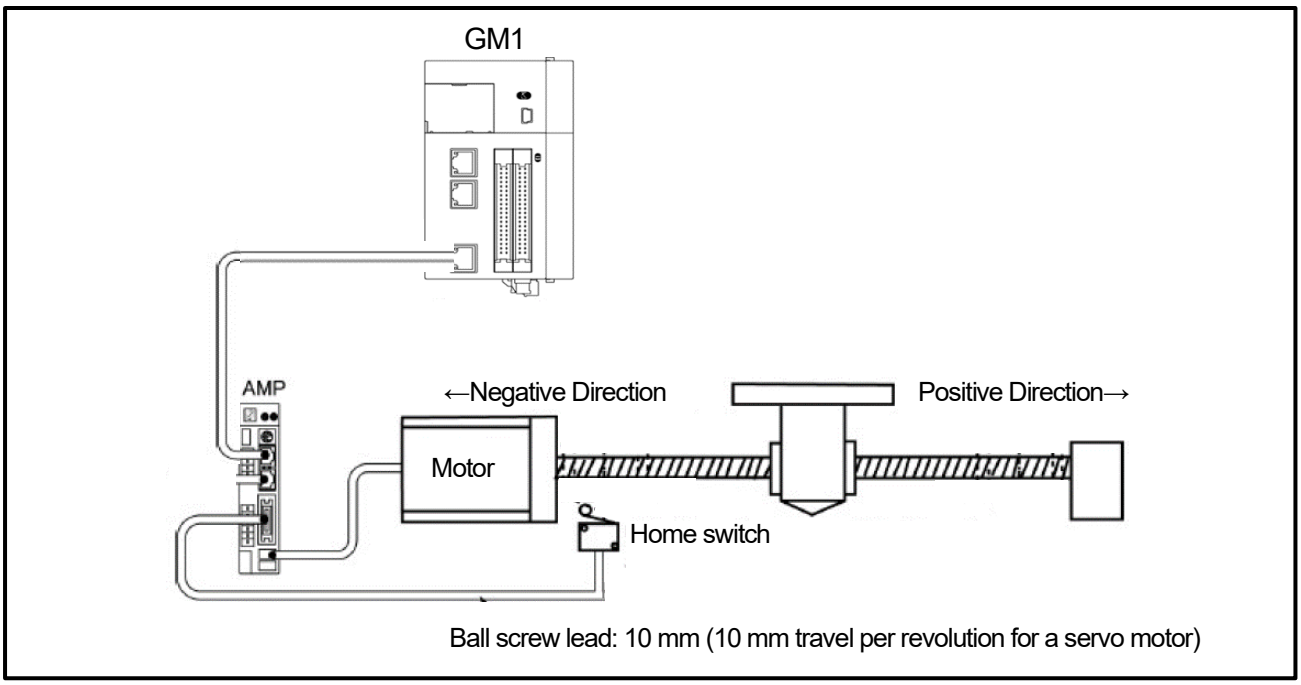
Installation Overview



● Operation patterns

After home return is complete, Operation 2) to Operation 4) are performed continuously.

Operation 1) Home return
The object moves to its home position (0 mm).

Operation 2) Absolute value positioning
The object moves from its home position to target position [1] (200 mm).

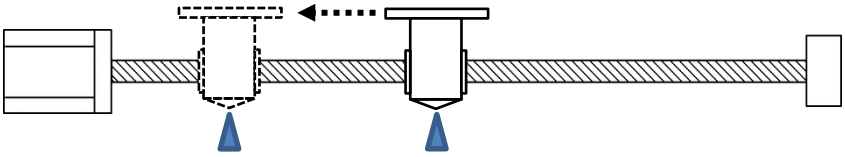
Operation 3) Relative value positioning
The object moves from target position [1] to target position [2] (500 mm).

Operation 4) Relative value positioning
The object moves from target position [2] (500 mm) to target position [3] (300 mm).

● Operation images

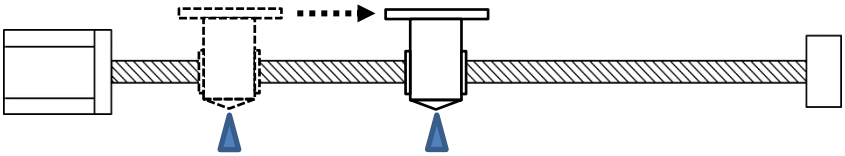
Operation 1) Home return

The object is moved to its home position (0 mm).



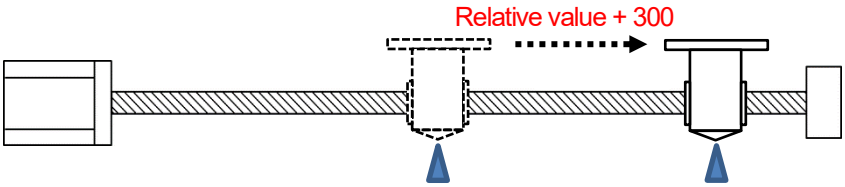
Operation 2) Absolute value positioning

The object is moved from its home position (0 mm) to target position [1] (200 mm).



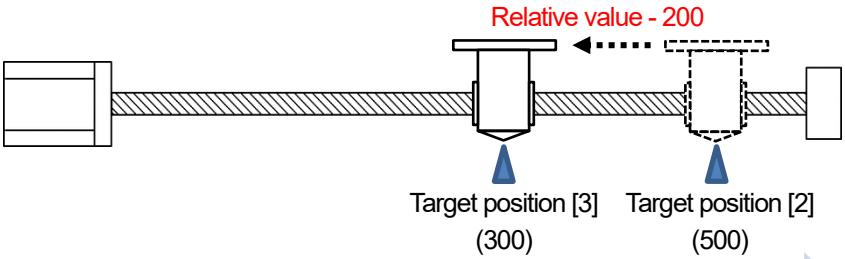
Operation 3) Relative value positioning

The object is moved from target position [1] (200 mm) to target position [2] (500 mm).

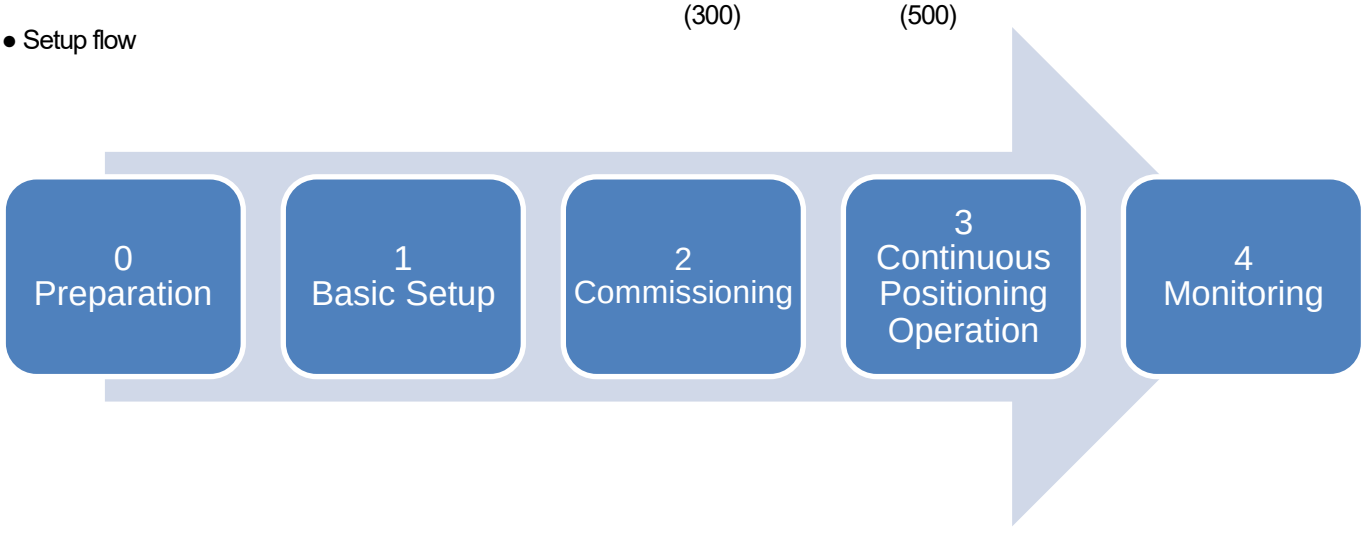


Operation 4) Relative value positioning

The object is moved from target position [2] (500 mm) to target position [3] (300 mm).



● Setup flow



0 Preparation

Installing tool software

Install GM Programmer from the following website:
GM Programmer : https://industrial.panasonic.com/ac/j/motor/motion-controller/mc/gm1/index.jsp

INFO

When GM Programmer is installed, PANATERM Lite for GM, Gateway (CODESYS Gateway), and CodeMeter applications are installed at the same time.

- GM Programmer: This is a setup tool for the GM1 controller. Using GM Programmer makes it possible to set positioning data and various positioning parameters, and perform various monitoring operations.
- PANATERM Lite for GM1: This is a setup support tool for the MINAS series servo amplifiers manufactured by Panasonic Corporation. When GM Programmer is installed, PANATERM Lite for GM is also installed at the same time. By using this tool, parameter setup within servo amplifiers, control status monitoring, setup support, machine analysis, and other operations can be executed on a PC.

Before installing GM Programmer on a PC, log on to the PC with Administrator privileges.
If other applications are running, be sure to close all the applications before installing GM Programmer.

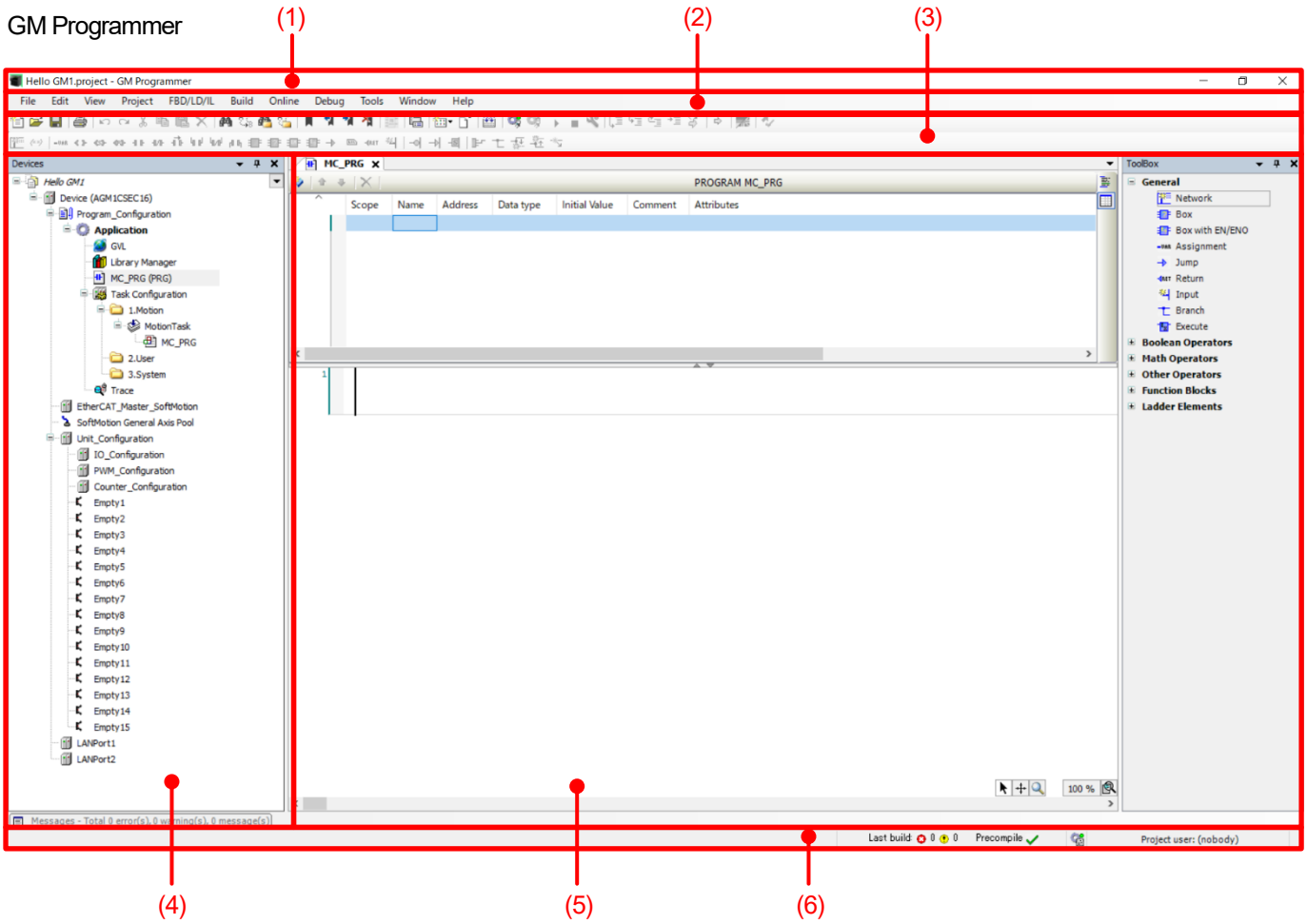
Column [1]: Installing PANATERM

If a PC on which PANATERM is installed is connected to a MINAS servo amplifier with a USB cable, parameter setup, control status monitoring, setup support, machine analysis, and other operations can be performed easily. If necessary, install PANATERM from the following Panasonic website.

- PANATERM: https://www3.panasonic.biz/ac/j/dl/software/index.jsp?series_cd=3514

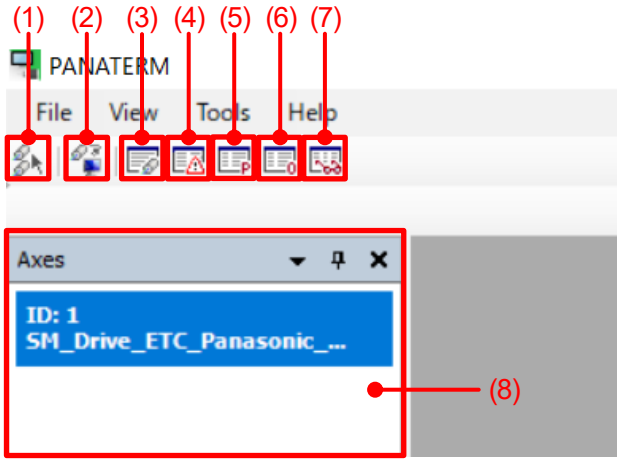
Column [2]: Components of each tool software product

GM Programmer



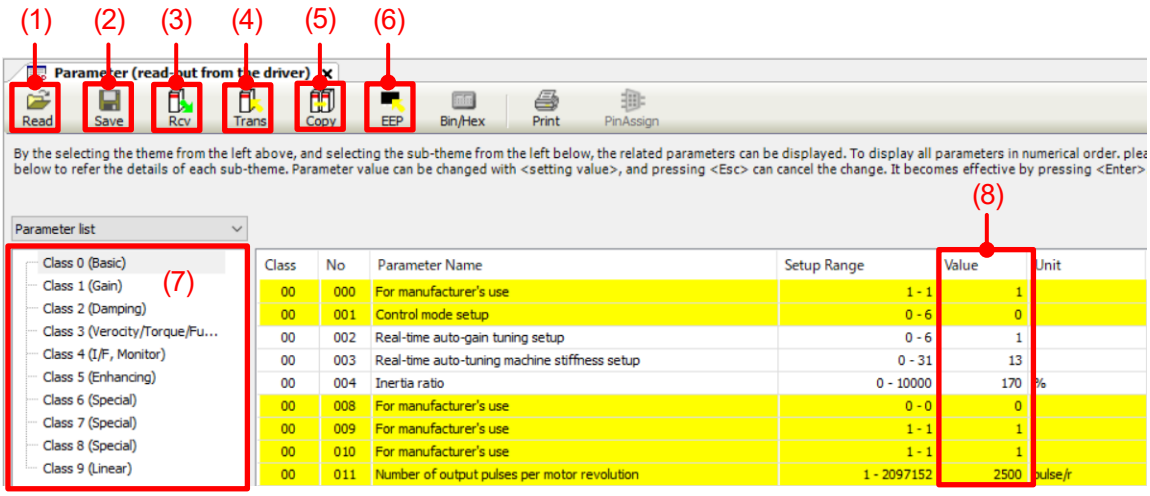
No.	Name	Description
(1)	Title bar	The title bar displays the project file name, minimize button, maximize button, and close button.
(2)	Menu bar	The menu bar displays the menu commands for each purpose in list format.
(3)	Toolbar	The toolbar displays each command as an icon.
(4)	Navigation pane	The navigation pane displays the objects (such as devices, applications, and programs) added to the project in a tree structure.
(5)	Main pane	The main pane displays a program, function settings, messages, and other data. The sub-pane can be switched by selecting a desired tab.
(6)	Status bar	The status bar displays the build status, logged-in users, and other information.

PANATERM Lite for GM (top window)



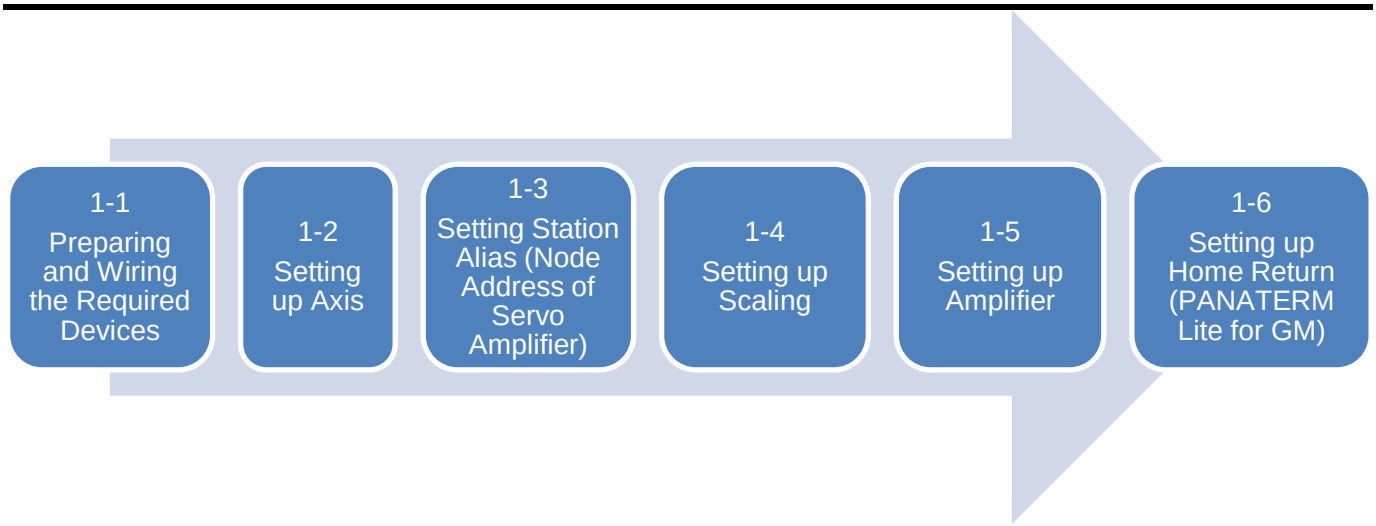
No.	Name	Description
(1)	Select Model	This icon is used to select a model when opening a parameter file with the GM1 controller unconnected.
(2)	Connect Amplifier	This icon is used to select and set the method for connecting to the GM1 controller, USB-based connection with the servo amplifier (for initial amplifier settings), and other items.
(3)	Axis	This icon is used to open the Axis view.
(4)	Alarm	This icon is used to open the Alarm view.
(5)	Parameters	This icon is used to open the Parameter view.
(6)	Object	This icon is used to open the Object view.
(7)	Monitor	This icon is used to open the Monitor view.
(8)	Axes window	This window is used to select a servo amplifier (connected to the GM1 controller) whose data is to be processed. (Data from multiple servo amplifiers cannot be processed at the same time.)

PANATERM Lite for GM (Parameter view)



No.	Name	Description
(1)	**Read** button	This button is used to load parameters stored on the PC.
(2)	**Save** button	This button is used to save the displayed parameters on the PC.
(3)	**Rcv** button	This button is used to receive parameters from the selected servo amplifier.
(4)	**Trans** button	This button is used to transmit parameters to the selected servo amplifier.
(5)	**Copy** button	This button is used to copy parameters from the servo amplifier.
(6)	**EEP** button	This button is used to write parameters to EEPROM from the selected servo amplifier.
(7)	Parameter category selection pane	Click this pane to change a parameter category number.
(8)	**Value** column	Double-click a value to be changed and write a new value.

1 Basic Setup

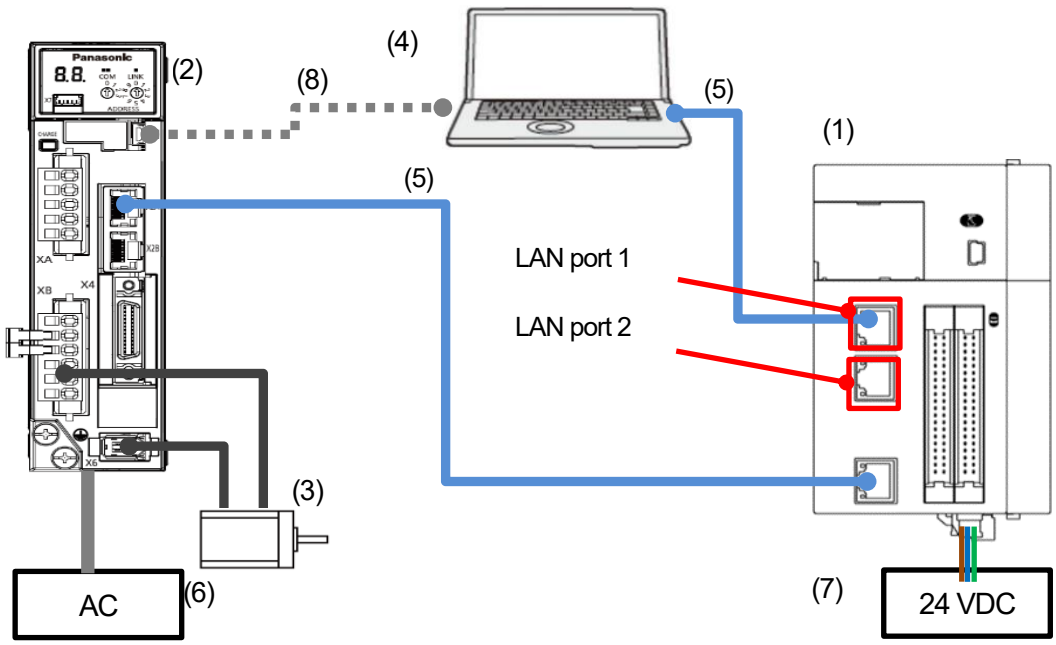


1.1 Preparing and Wiring the Required Devices

Prepare the following devices.

No.	Name
(1)	GM1 controller (EtherCAT type)
(2)	Servo amplifier: MINAS A6B series (MADLN11BE is used in this document)
(3)	Servo motor
(4)	PC (on which GM Programmer and PANATERM Lite for GM are already installed)
(5)	LAN cables: 2
(6)	AC power supply
(7)	24 VDC power supply
(8)	USB cable (Mini-B)

Wire each device as shown below.



The PC communicates with the GM1 controller using GM Programmer and LAN ports.
The IP address (default) of LAN port 1 is set as below.
An IP address on the same network that is different from the IP address of LAN port 1 must be set for the PC.

Interface: LAN port 1

IP address:	192.168.1.5
Subnet mask:	255.255.255.0
Default gateway:	192.168.1.1

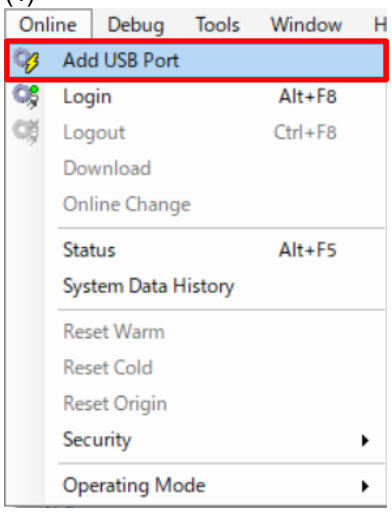
Interface: PC

IP address:	192.168.1.10
Subnet mask:	255.255.255.0
Default gateway:	192.168.1.1

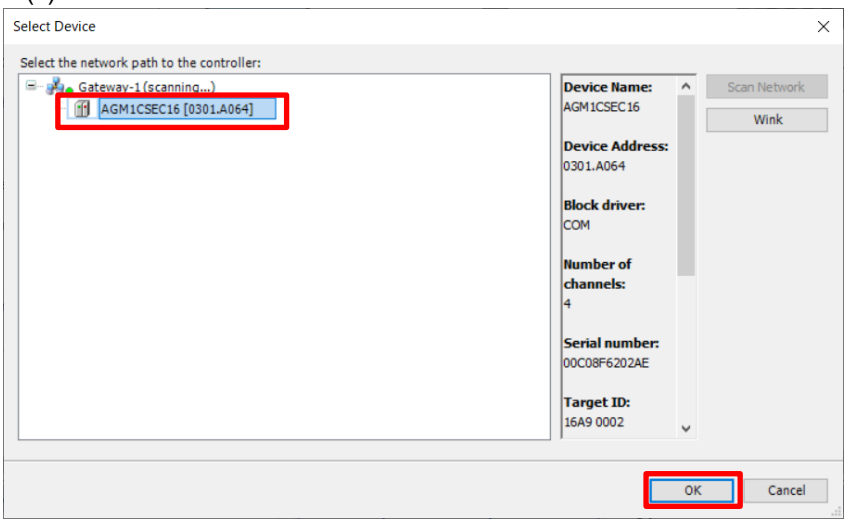
Column [3]: Communication using USB ports

USB ports can be set as a communication interface between the GM1 controller and tool software such as GM Programmer or PANATERA Lite for GM, as below.
(1) Select **Add USB Port** from the **Online** menu.
(2) The **Add USB Port** dialog box will be displayed.
(3) Click **OK** to display a dialog box that restarts the gateway.
(4) Click **OK** to display the **Select Device** dialog box.
(5) Select a GM1 controller that you want to connect and click **OK**.
(6) When a connection is established, USB ports are added as a communication interface between the PC and GM1 controller.

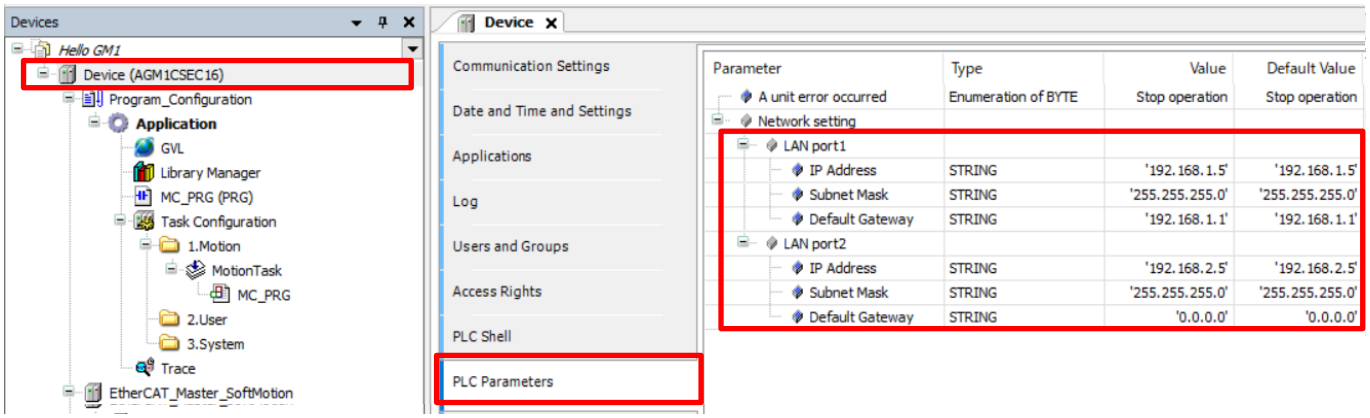
(1)



(5)



* The IP address of the GM1 controller can be checked and set in the main pane displayed by selecting **PLC Parameters** in the **Device** tab.

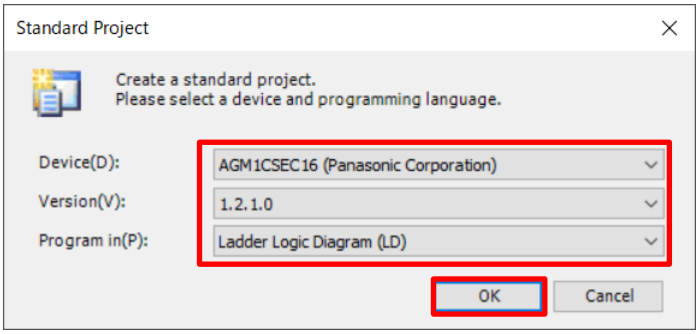


1.2 Setting up Axis

This section explains how to set (register) an axis to be used.

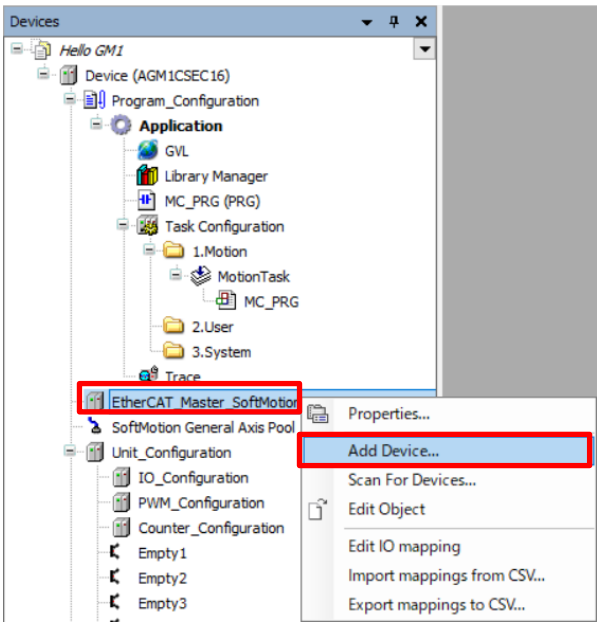
Step 1

Start GM Programmer. Select **New Project** from the **File** menu, assign any name, and then click **OK**.
Device: AGM1CSEC16 (Panasonic Corporation)
Version: Any applicable version
Program in: Ladder Logic Diagram (LD)
Select the above values and click **OK**.



Step 2

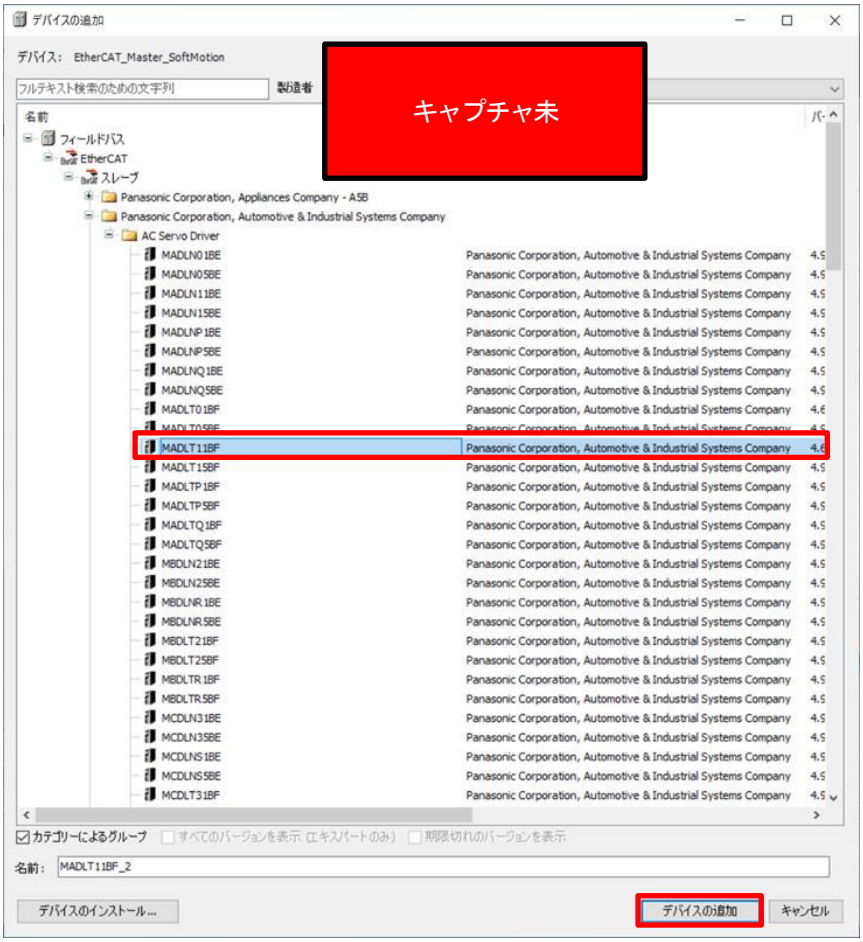
Right-click **EtherCAT_Master_SoftMotion** in the navigation pane and then select **Add Device**.



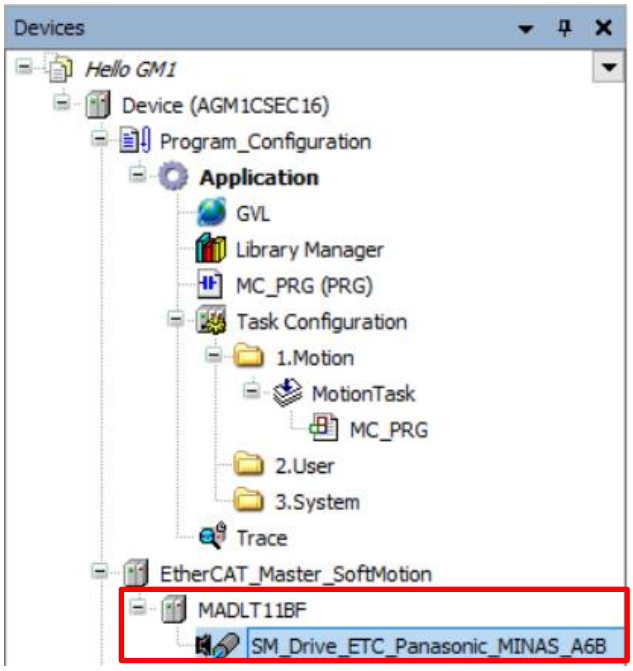
Step 3

The **Add Device** pop-up window will be displayed. Select the connected model and click **Add Device**.
(Model "MADLN11BF" is used in this document.)

* Even if you click **Add Device**, the pop-up window will not close.
After clicking **Add Device**, click **Cancel**.



MADLN11BF and **SM_Drive_ETC_Panasonic_MINAS_A6B** will be added to the navigation pane.

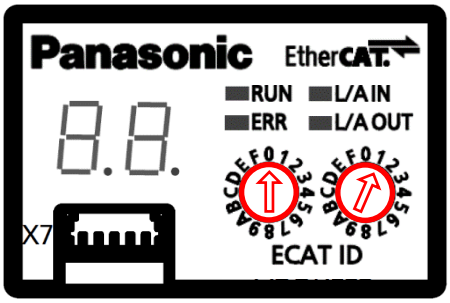


1.3 Setting Station Alias (Node Address of Servo Amplifier)

This section explains how to use the rotary switches on the front panel of the servo amplifier.

Step 1

Set the left and right rotary switches to 0 and 1, respectively, as shown below.



Step 2

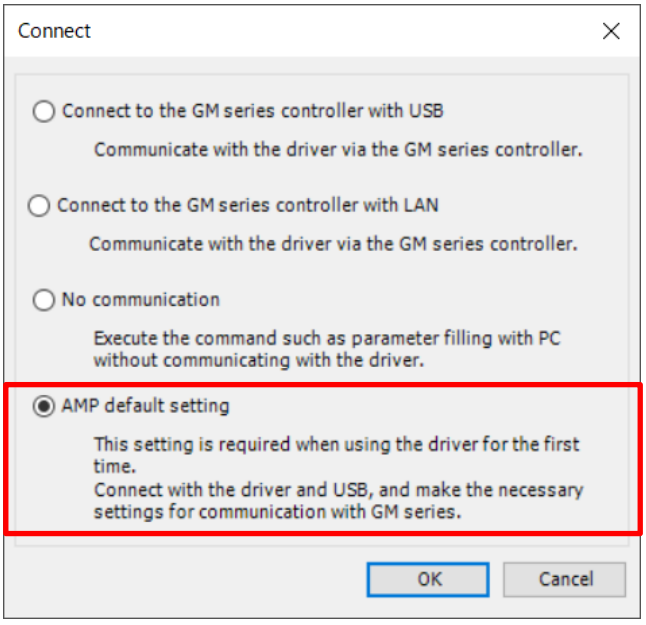
Connect the servo amplifier and the PC with a USB cable (Mini-B).

To establish a communication between the GM1 controller and the servo amplifier, set up relevant parameters in PANATERM Lite for GM with the USB cable connected.

Step 3

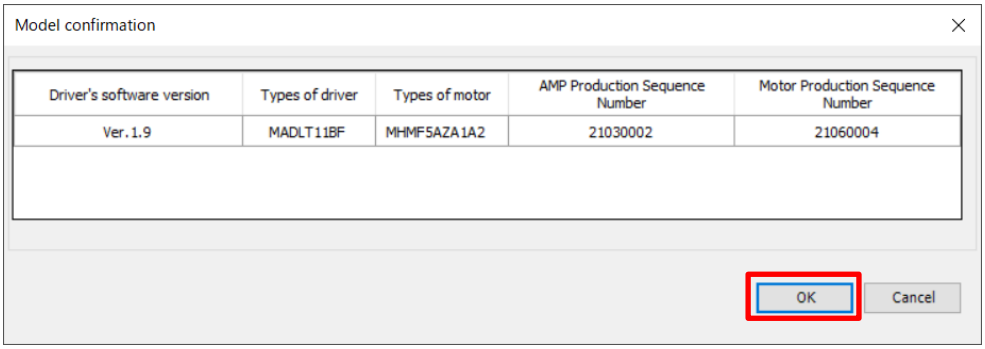
Open PANATERM Lite for GM.

Select **AMP default setting** and click **OK**.



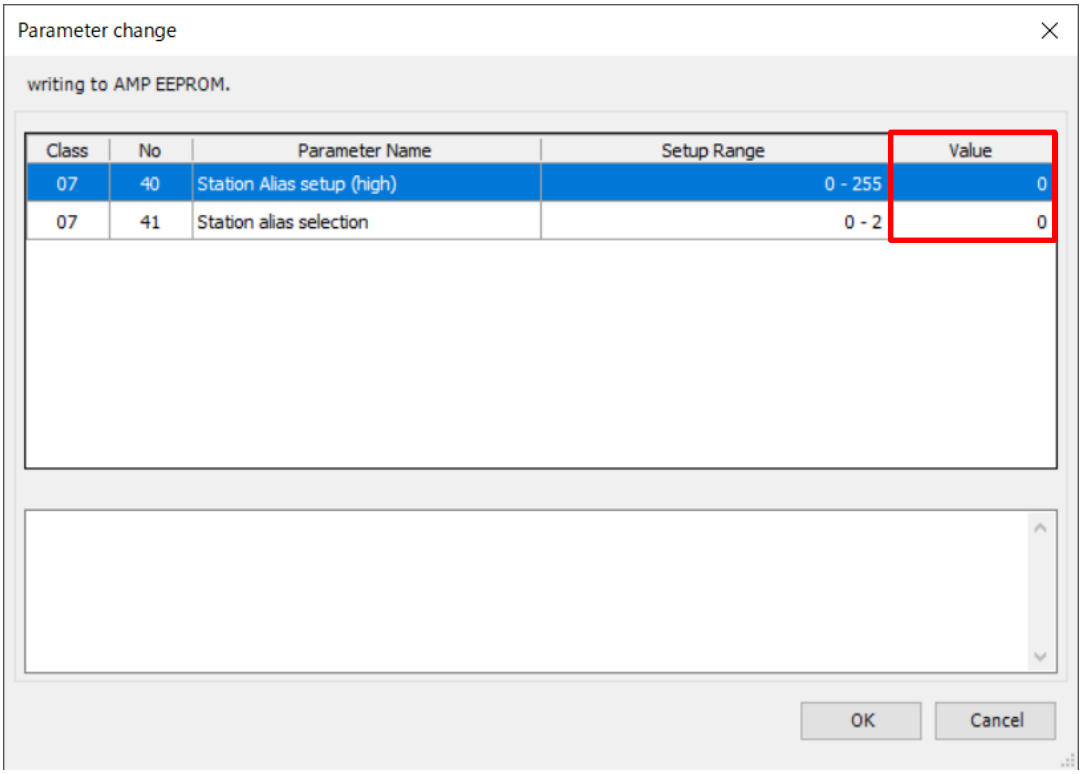
Step 4

The **Model confirmation** dialog box will be displayed. Check the contents of the dialog box and then click **OK**.



Step 5

The **Parameter change** dialog box will be displayed. Change the respective values of No. 40 and No. 41 in Class 07 to "0".



Step 6

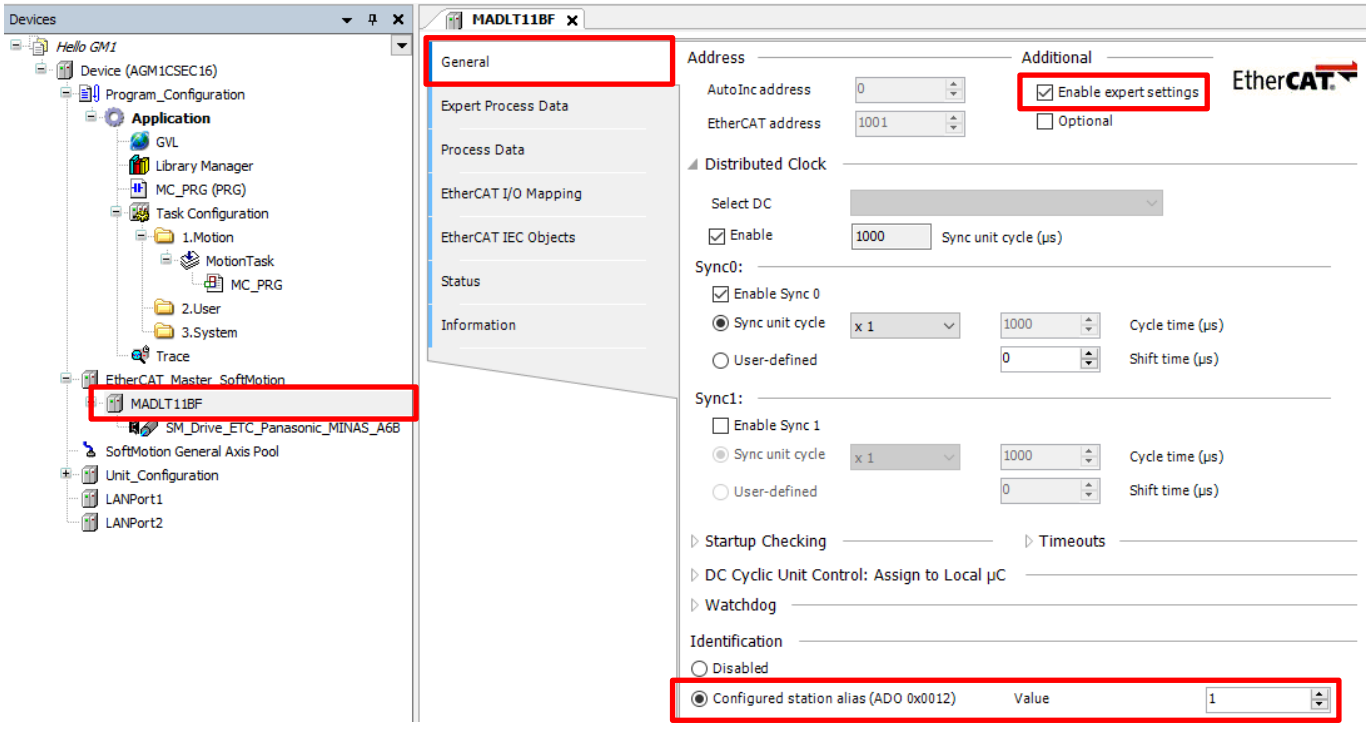
Turn OFF and then ON the servo amplifier.

The servo amplifier will be restarted and the new settings will take effect.

Step 7

Double-click the servo amplifier ("**MADLT11BF**" in this document) in the navigation pane and open the **General** tab.

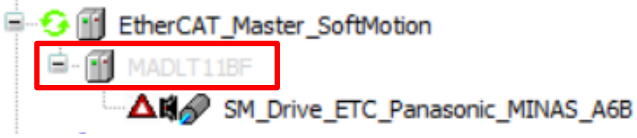
Select the **Enable expert settings** check box and then select the **Configured station alias (ADD 0x0012)** option and enter "1".



INFO

Enter an address that is determined by adding the value set to No. 40 of Class 07 (high order) and the value selected with the rotary switch (low order).
In Step 1, rotary switches COM and LINL are set to 0 and 1, respectively, and in Step 5, No. 40 and No. 41 of Class 07 are set to 0. Therefore, the address should be set to 1.

The settings will be downloaded to the GM1 controller later. Therefore, if the address is not set correctly, the servo amplifier section will be grayed out as shown below.



Column [4]: Setting station aliases without changing the rotary switch settings

Class	No.	Attribute	Parameter name	Setting range	Unit	Function
7	40	R	Station alias setting (high order)	0 to 255	-	Sets the high-order 8 bits of station alias
7	41	R	Station alias selection	0 to 2	-	Specifies a station alias setting method Set value: 0 — Sets a station alias using the value selected with the rotary switch on the front panel and the value set to No. 40 of Class 07 Set value: 1 — Sets a station alias using the value set in the SII area (0004h) Set value: 2 — Used by the manufacturer (Cannot be set)

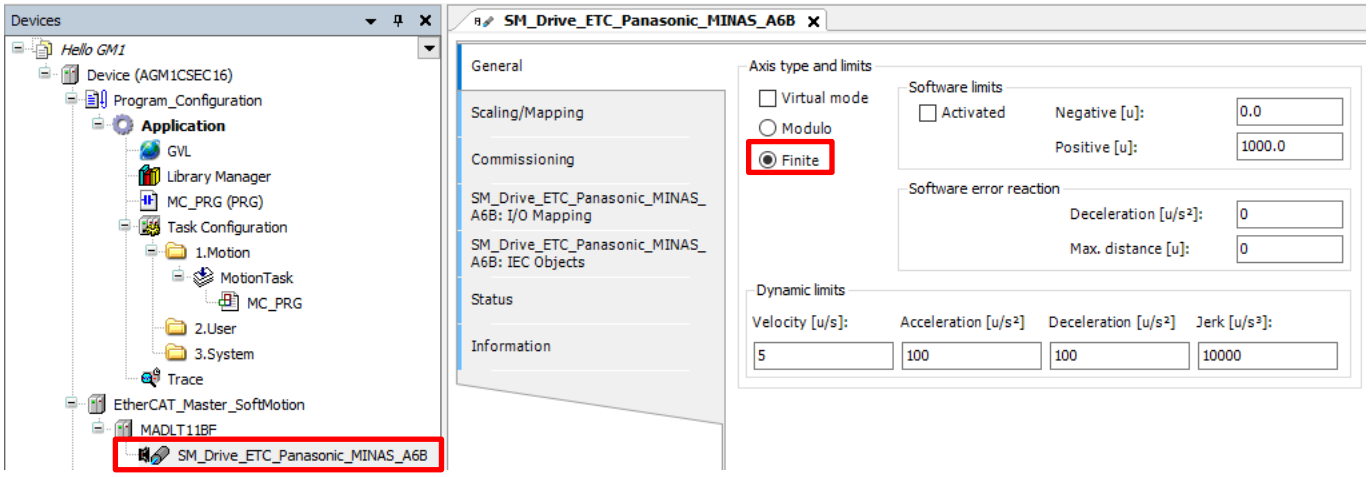
An address is set in two bytes and No. 40 of Class 07 is the high-order byte, so if No. 40 is set to 1, the address will become 256. This is added to the number selected with the rotary switch.
Examples: No. 40 of Class 07 = 0, Rotary switch = 3: 3
No. 40 of Class 07 = 1, Rotary switch = 3: 259

* If the high-order byte set with No. 40 of Class 07 and the rotary switch are both set to "0", the settings will be invalidated and control is performed according to the normal connection sequence (reference to SII).

1.4 Setting up Scaling

Step 1

Double-click the servo amplifier ("**SM_Drive_ETC_Panasonic_MINAS_A6B**" in this document) in the navigation pane and open the **General** tab. As this document assumes a ball screw, select **Finite**.



Column [5]: Explanation of Modulo/Finite

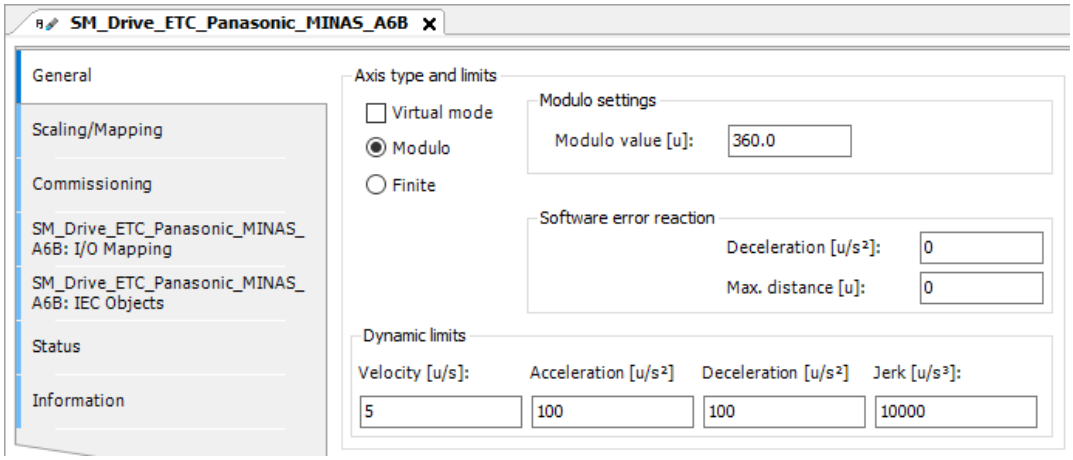
Modulo/Finite: The axis type can be specified.

Modulo: The motor rotates infinitely without limiting the travel range (belt drive, rotary shaft, etc.).

Finite: The set value for the commanded position is a finite value (if the movable range of the object such as a ball screw is predetermined).

Soft limits: When the axis type is set to **Finite**, settings can be specified in the **Software limits** section.

When **Modulo** is selected, the commanded position value keeps looping between 0 and the modulo value.
The maximum settable modulo value is 255 x "units in application".
"units in application" is set in the **Scaling/Mapping** tab.

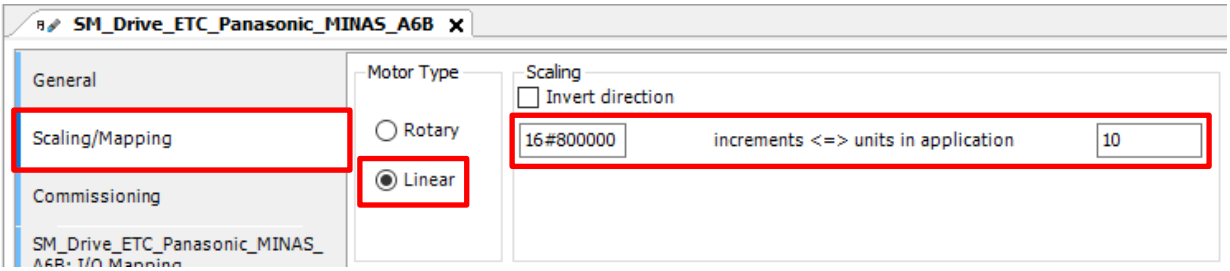


Step 2

Open the **Scaling/Mapping** tab window.

Select the **Linear** option, and enter 16#800000 for **increments** and 10 for **units in application**.

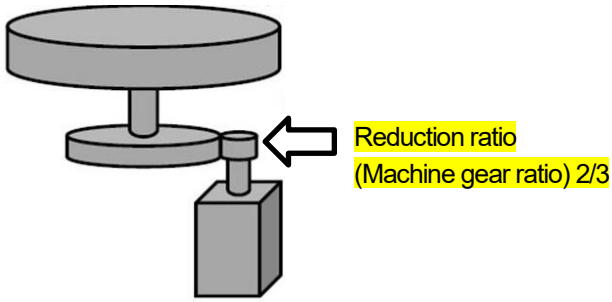
(This is because, in this example, the ball screw lead is 10 mm (10 mm travel per revolution for a servo motor))

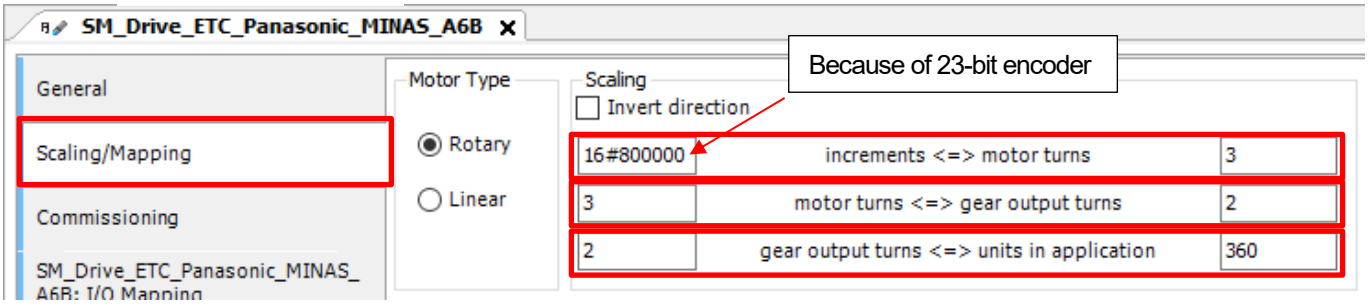


Column [6]: How to specify settings for the **Rotary** option in the **Scaling/Mapping** tab

Rotary: When the axis type is set to **Modulo**, the ratio in the conversion from the drive increment to the application unit is set.
Linear: When the axis type is set to **Finite**, the ratio in the conversion from the drive increment to the application unit is set.

Increments < = > motor turns:	Specifies the position increment per revolution for a motor
Motor turns < = > gear output turns:	Specifies settings for the use of a speed reducer. When the reduction ratio is 2/3, Motor turns: 3 gear output turns: 2
Gear output turns < = > units in application:	Specifies the gear output turns per 360 in application

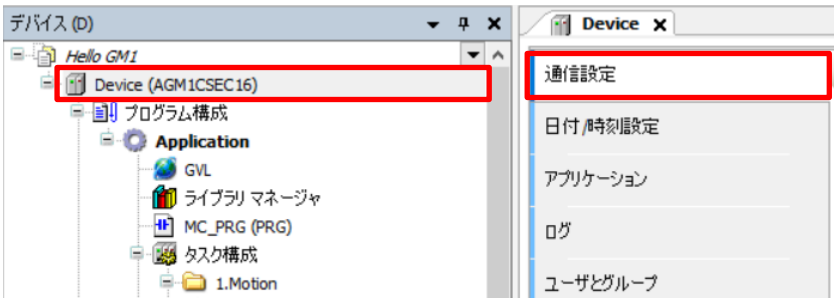




Step 3

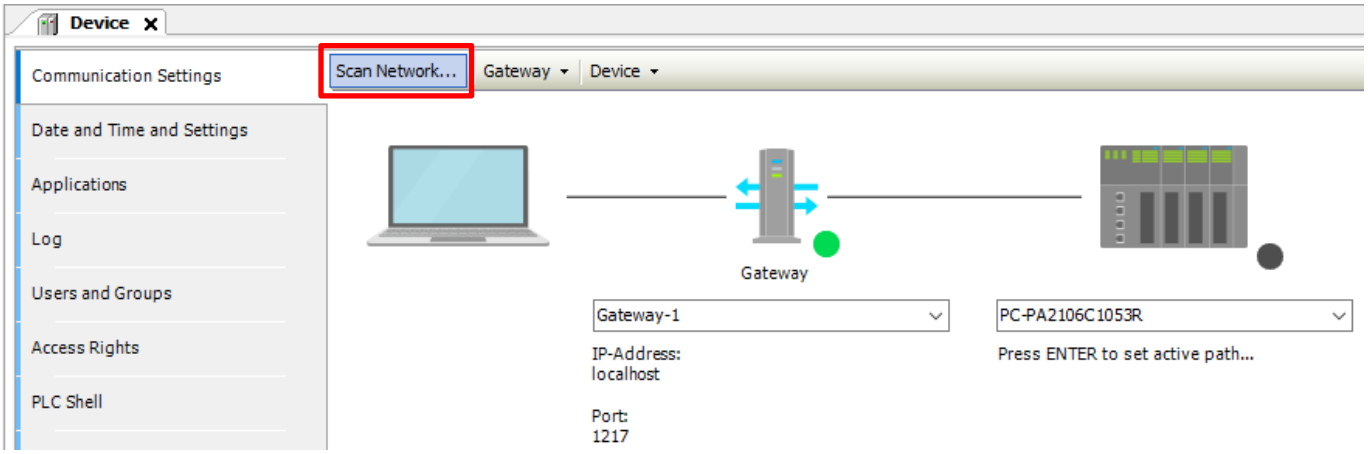
Write the settings to the GM1 controller.

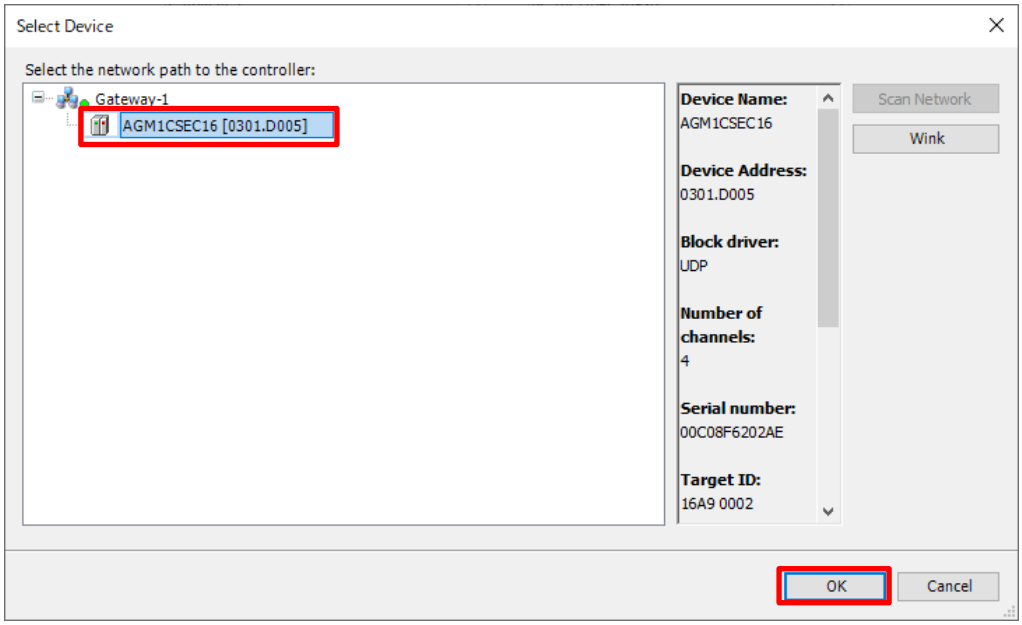
Double-click the **Device** object in the navigation pane and open the **Communication Settings** tab.



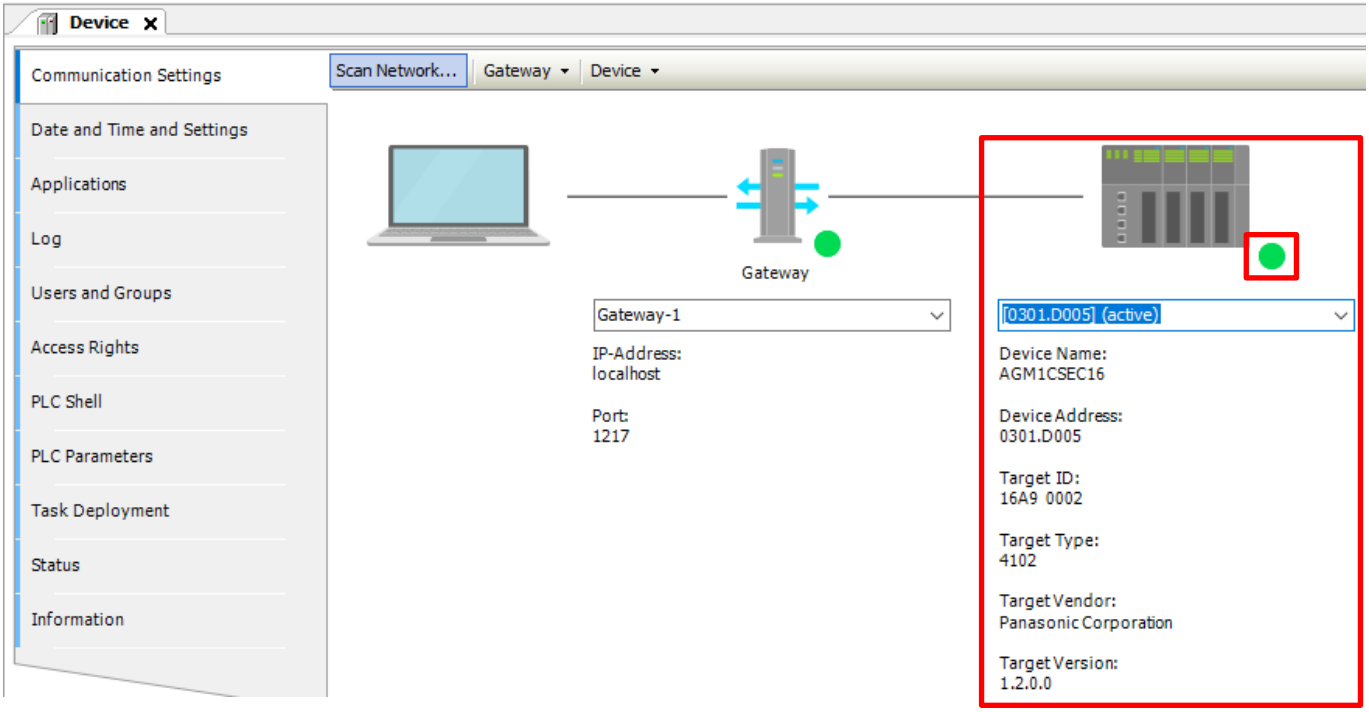
Step 4

Click **Scan Network**, select a controller to be connected, and click **OK**.



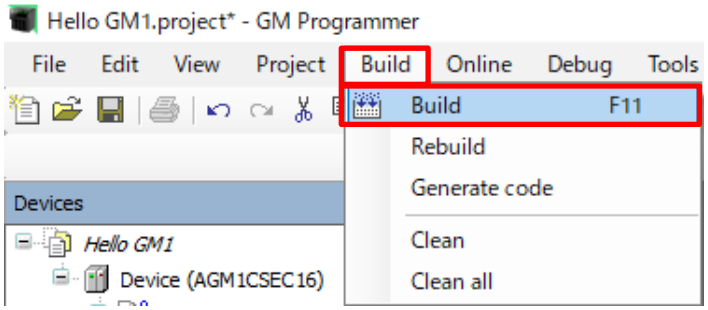


When a connection is completed, the lamps light up in green ( ).
If the display appears as shown in the figure below, it is OK.

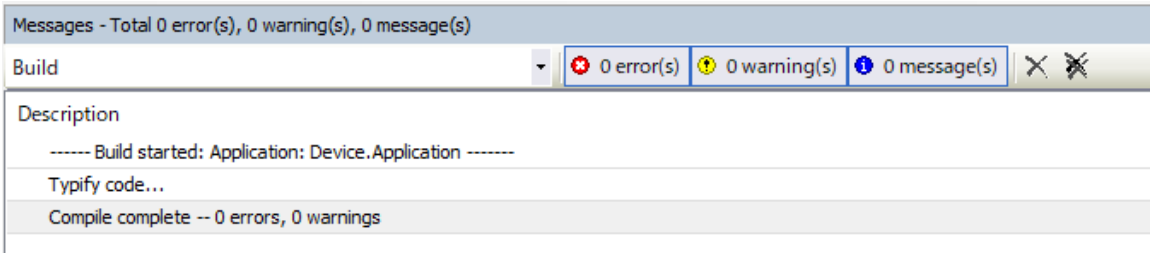


Step 5

Select **Build** from the **Build** menu to execute build.



If the processing is normal, "**Compile complete - 0 errors, 0 warnings**" will be displayed as shown below.



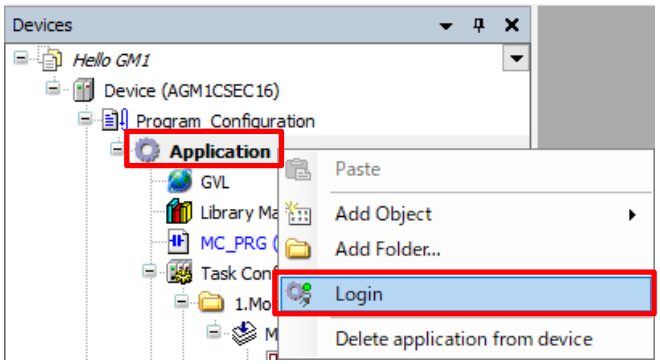
INFO

When a created program or settings are subject to a build process, objects in the application are compiled.
If codes are generated after the build process is executed, an application to be downloaded to the GM1 controller will be generated.

The syntax of all objects is verified when the build process is executed for the first time.
The syntax of only differences is verified when the build process is executed a second time and thereafter. No application code will be generated.

Step 6

Right-click the **Application** object and select **Login** to execute a download.



INFO

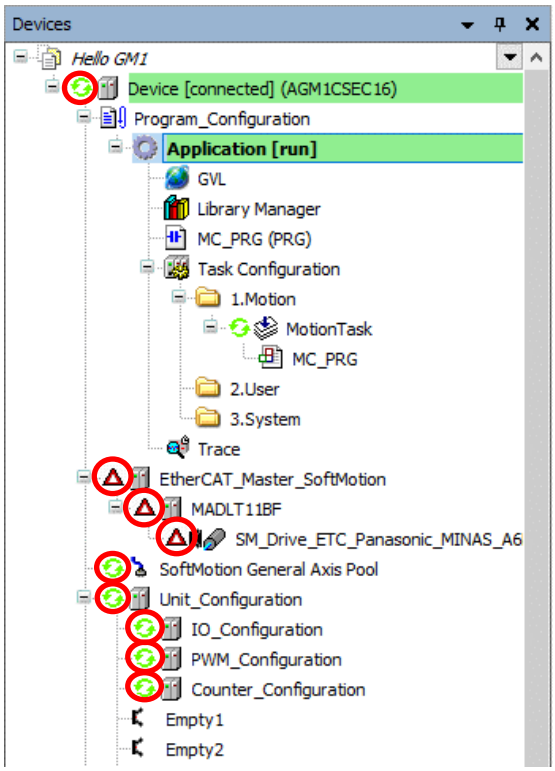
The **Device** and **Application** objects are displayed in the green background, indicating that they are in an online (connected) state.

mark appears on the left side of the **Device** object, indicating that the device is connected to the real machine.

"Stop" appears on the right side of the **Application** object, indicating that the application is not running.

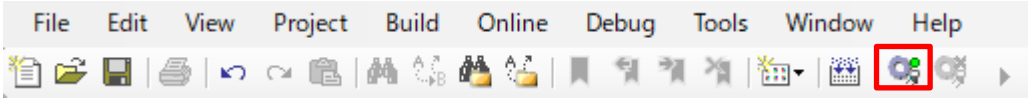
mark also appears on the right side of each device that is operating normally.

mark appears on the right side of each device that is not connected.



INFO

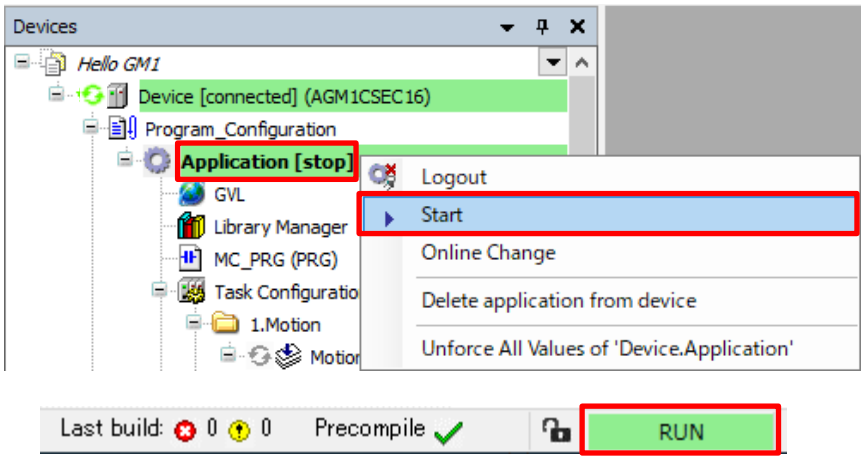
You can also log in from the toolbar.



Step 7

Right-click the **Application [stop]** object and select **Start**.

When the application enters a running state, **RUN** appears in the status area on the bottom of the GM Programmer window.



INFO

At the time of login (connection), there are two states: stopped and run.

"Stopped" indicates that the program is not running, and "Run" indicates that the program is running.

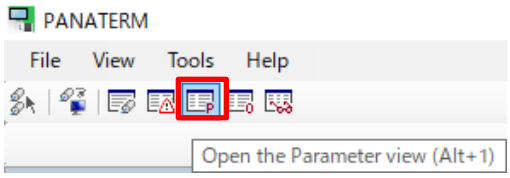
1.5 Setting up Amplifier

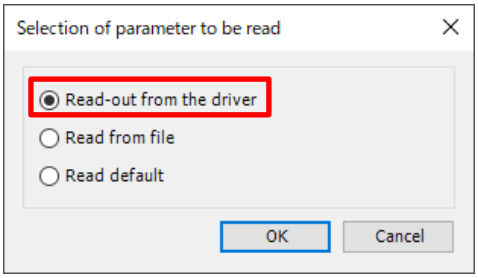
Step 1

Select **PANATERM Lite for GM** from the **Tools** menu to start PANATERM Lite for GM.

Step 2

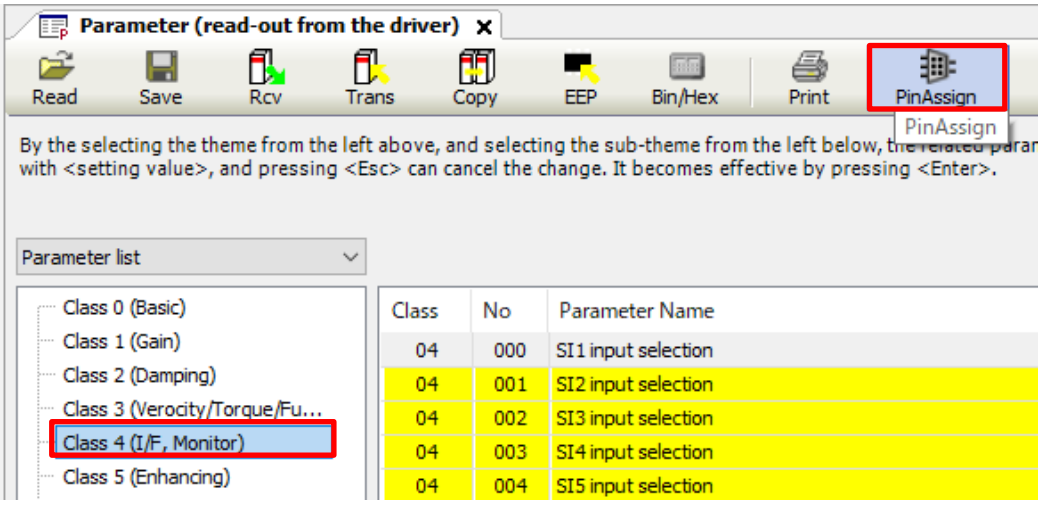
On the toolbar, click the **Open the Parameter view** icon. Select **Read-out from the driver** and click **OK**.





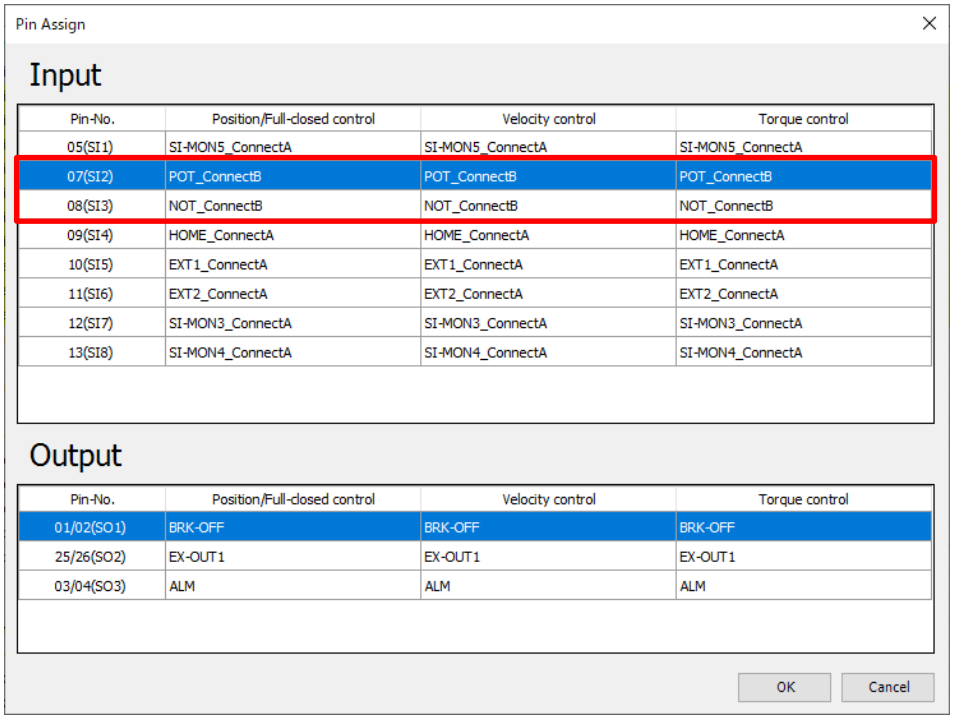
Step 3

Click **Class 4** and then click **PinAssign** with the page opened.

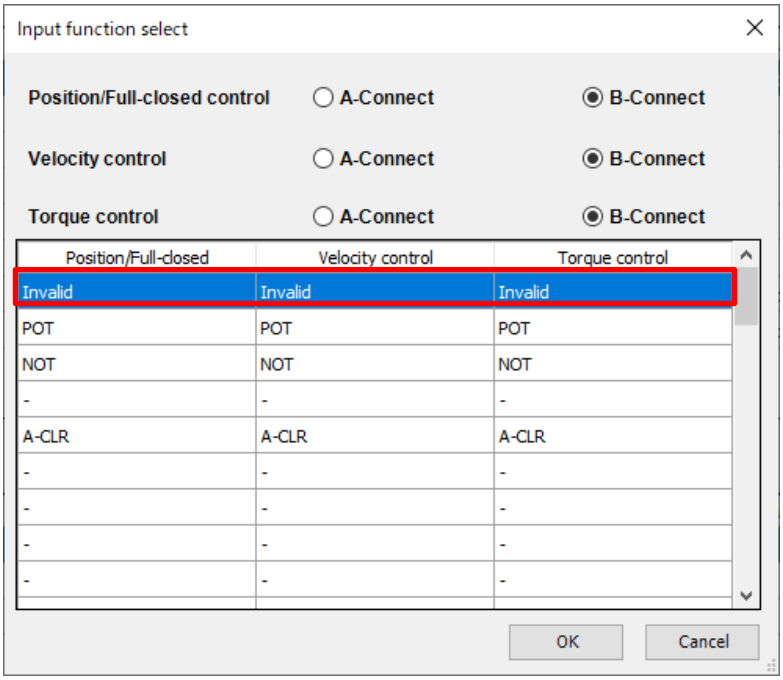


Step 4

Change the pin assignment of 07(SI2) and 08(SI3) to "Invalid", as below.



Double-click 07(SI2) and 08(SI3) separately in the **Pin-No.** column.
Select **Invalid** and click **OK**.

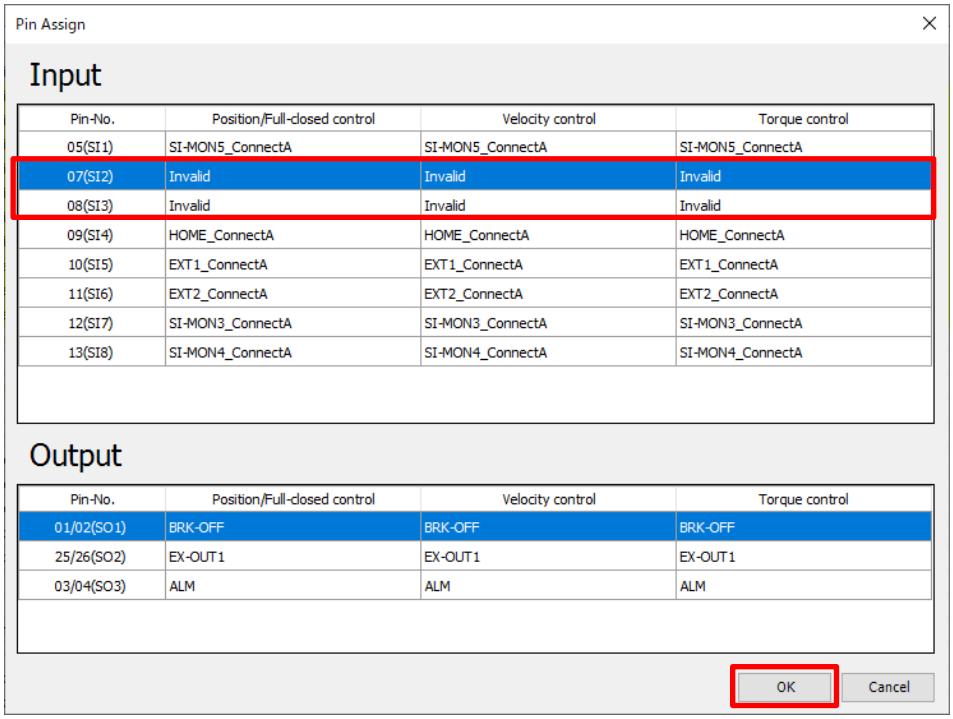


INFO

If limits are set to "**B-Connect**", a limit error will occur because the behavior differs from the device configuration in this document.

Step 5

After all settings are complete, click **OK** to write the settings to the servo amplifier.



Column [7]: List of servo amplifier factory settings

For servo amplifier factory settings, only POT (positive direction over-travel inhibit input) and NOT (negative direction over-travel inhibit input) are factory-set to "**B-Connect**".
For **B-Connect**, if the servo amplifier is used with nothing connected to POT and NOT, it will enter a limit detection state, resulting in a limit error.
Therefore, use the servo amplifier with a limit sensor connected to POT and NOT or, if no limit sensor is used, use the servo amplifier with the settings changed to "**A-Connect**" and "**Invalid**".

Pin name	Pin No.	Corresponding parameter	Factory settings					
			Position/ Full-closed control		Velocity control		Torque control	
			Signal name	Logic	Signal name	Logic	Signal name	Logic
SI1	5	Pr4.00	SI-MON5	A-Connect	SI-MON5	A-Connect	SI-MON5	A-Connect
SI2	7	Pr4.01	POT	B-Connect	POT	B-Connect	POT	B-Connect
SI3	8	Pr4.02	NOT	B-Connect	NOT	B-Connect	NOT	B-Connect
SI4	9	Pr4.03	HOME	A-Connect	HOME	A-Connect	HOME	A-Connect
SI5	10	Pr4.04	EXT1	A-Connect	EXT1	A-Connect	EXT1	A-Connect
SI6	11	Pr4.05	EXT2	A-Connect	EXT2	A-Connect	EXT2	A-Connect
SI7	12	Pr4.06	SI-MON3	A-Connect	SI-MON3	A-Connect	SI-MON3	A-Connect
SI8	13	Pr4.07	SI-MON4	A-Connect	SI-MON4	A-Connect	SI-MON4	A-Connect

1.6 Setting up Home Return (PANATERM Lite for GM)

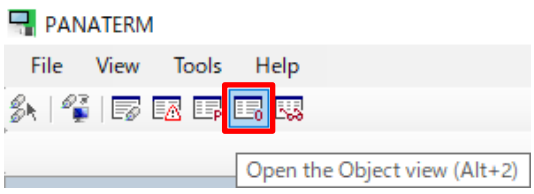
To execute home return operation, you must set up objects related to home return on the servo amplifier beforehand. This section explains the setup method using PANATERM Lite for GM.

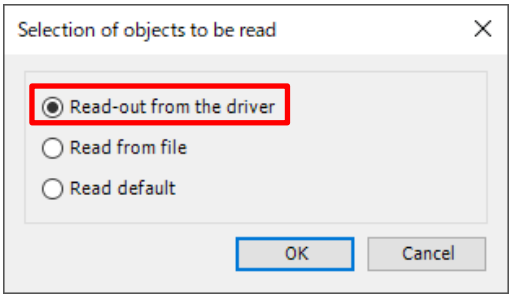
The following table shows amplifier objects related to home return (addresses within Object editor).

Index	Sub-Index	Name	Data size	Lead data value (Default)	Description
6040h	00h	Controlword	16bit	0x000F	Sets a control command to the servo amplifier, such as PDS state transition (Cannot be rewritten using ETC_CO_SdoWrite)
6060h	00h	Mode of operation	8bit	0x08	Sets a control mode to the servo amplifier (Cannot be rewritten using ETC_CO_SdoWrite)
6098h	00h	Homing method	8bit	0x00	Sets a home return method
6099h	01h	Speed during search for switch	32bit	0x000D5555	Sets a movement speed to be used until a switch signal is detected
	02h	Speed during search for zero	32bit	0x00015555	Sets a movement speed to be used until a home position detection position is reached
609Ah	00h	Homing acceleration	32bit	0x000F4240	Sets acceleration and deceleration to be used in home return position control mode (hm)
6072h	00h	Max torque	16bit	0x1388	Sets the maximum motor torque
607Fh	00h	Max profile velocity	32bit	0x06400000	Sets a velocity limit value
6080h	00h	Max motor speed	32bit	0x00000000	Sets the maximum motor speed (Must be set before home return operation because the default value is 0 and operation cannot be performed with the value set to 0)
60B1h	00h	Velocity offset	32bit	0x00000000	Sets an offset value for velocity command
60B2h	00h	Torque offset	32bit	0x00000000	Sets an offset value for torque command
60C5h	00h	Max acceleration	32bit	0xFFFFFFFF	Sets the maximum acceleration
60C6h	00h	Max deceleration	32bit	0xFFFFFFFF	Sets the maximum deceleration
607Ch	00h	Home offset	32bit	0xFE000000	Sets position information so that the index pulse position detected after completion of home return position control mode (hm) execution can be the value of this object
607Eh	00h	Polarity	8bit	0x00	Sets polarity (direction of motor rotation) for position command, velocity command, torque command, or offset

Step 1

On the toolbar, click the **Open the Object view** icon. Select **Read-out from the driver** and click **OK**.



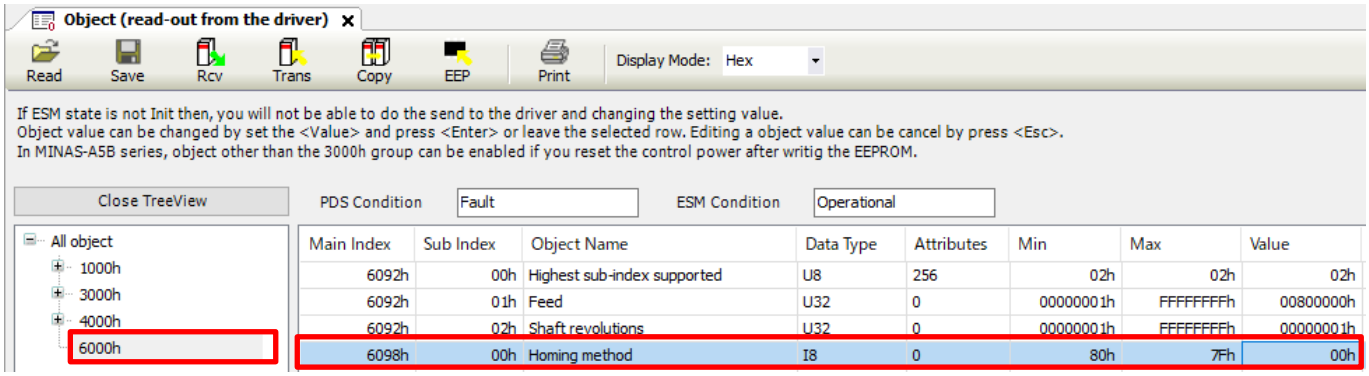


Step 2

Change the value of **6098h** (**Homing method**) in the **Main Index** column, as below.

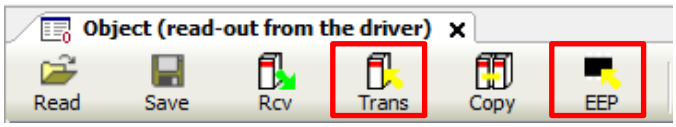
Select **6000h** and double-click the **Value** column corresponding to **Homing method** in the **6098h** row.

Change 00h to 05h (method: 5).



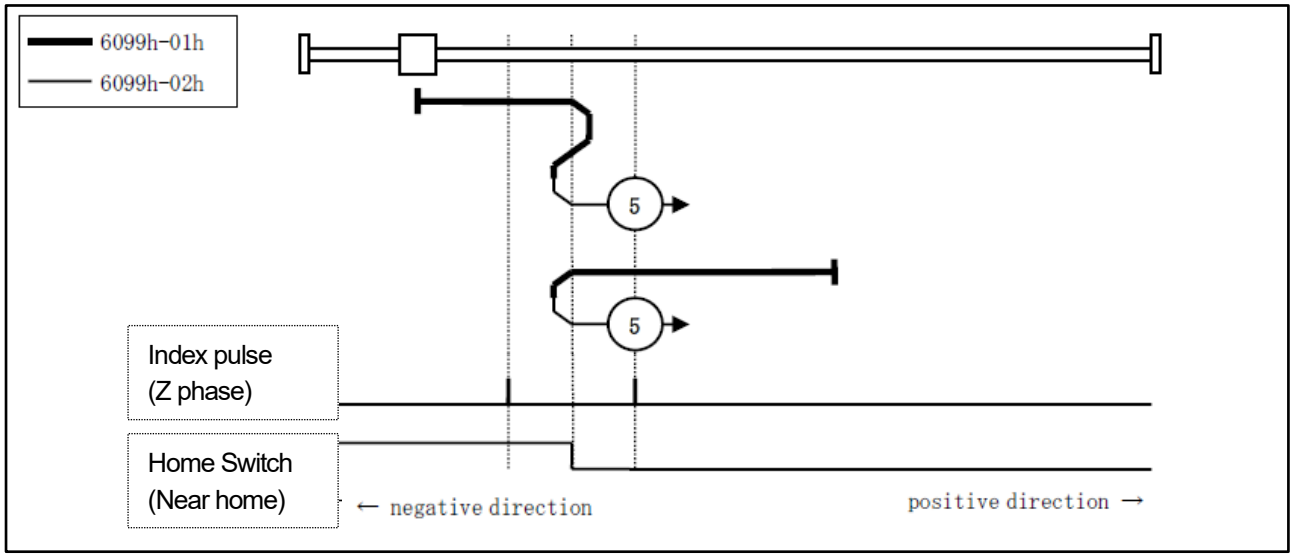
3

Click **Trans** and then **EEP**.



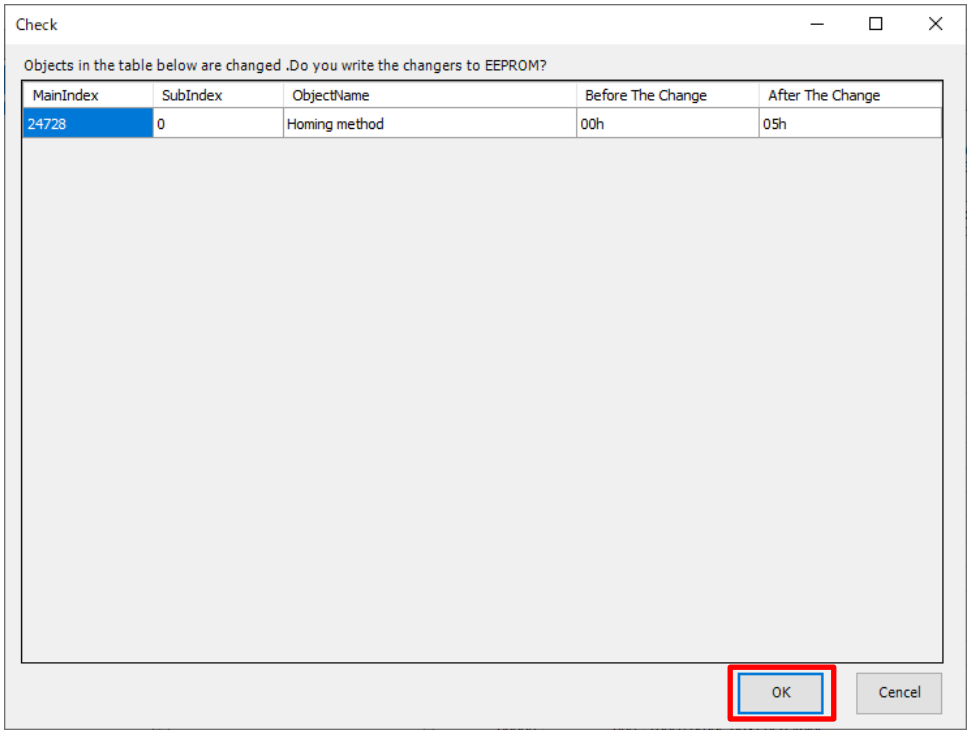
INFO

When the Method is set to 5, the direction of initial movement changes according to the status of the Home Switch at the time of startup. The home position detection position is the first index pulse detection position on the negative or positive side after the status of the Home Switch changes. (See the figure below.) If a home position is unallocated, Homing error = 1 will occur.



Step 4

A "Check" pop-up window will be displayed. Click **OK** to write the changes to EEPROM.



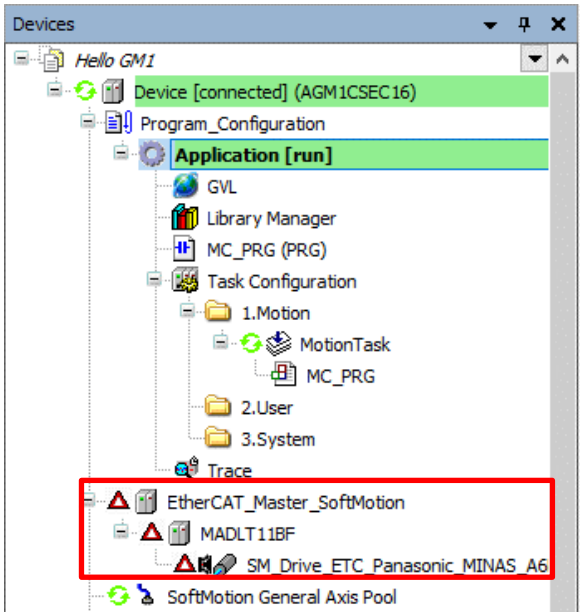
Step 5

Turn OFF and then ON the servo amplifier. The servo amplifier will be restarted and the new settings will take effect.

Step 6

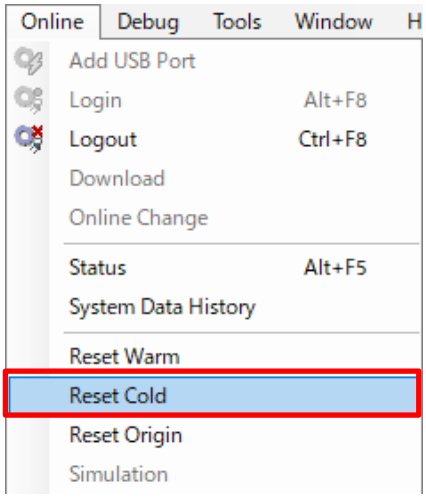
Check that the ERROR LED on the GM1 controller is blinking because the servo amplifier was turned OFF. (The communication was disrupted when the servo amplifier was turned OFF.)

The icons of the registered servo amplifiers in the navigation pane also indicate that the communication was disrupted.

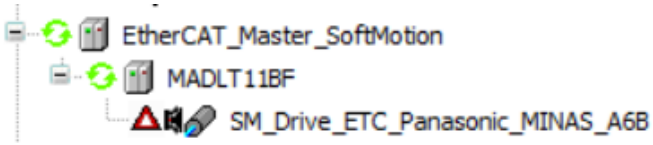


Step 7

Select **Reset Cold** from the **Online** menu to reset the error.

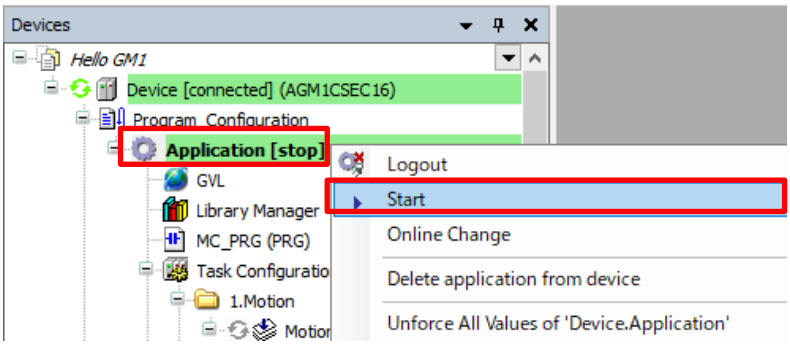


The icon status will change as below.

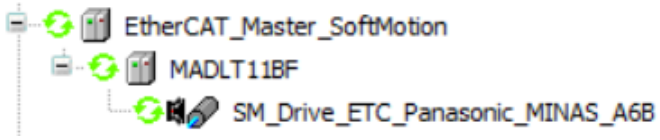


Step 8

Right-click the **Application** object. Select **Start** to change the status from "Stop" to "Start".



The icon status will change as below.

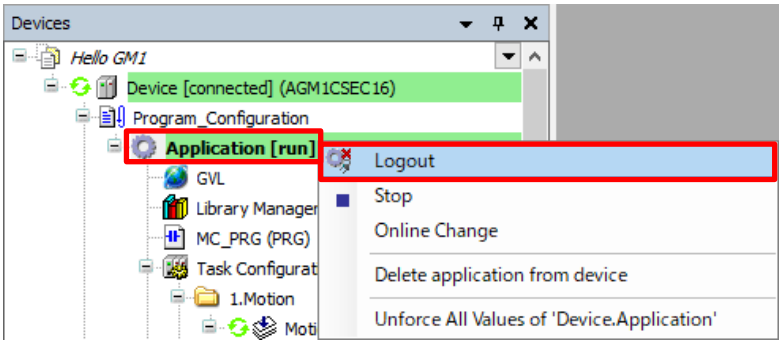


Step 9

Temporarily log out.

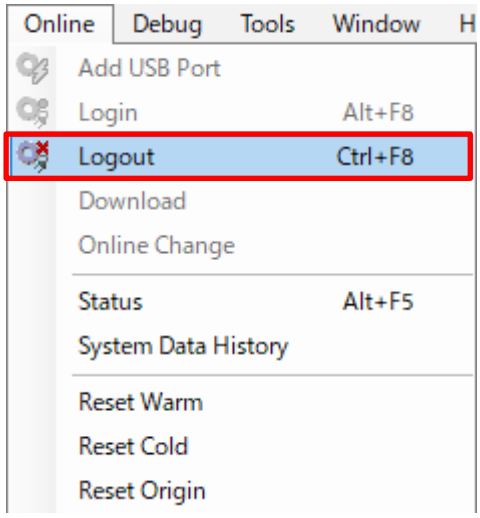
To log out, right-click the **Application** object and select **Logout**.

* After logout, the operation mode at the time of logout is taken over when you log in again.



INFO

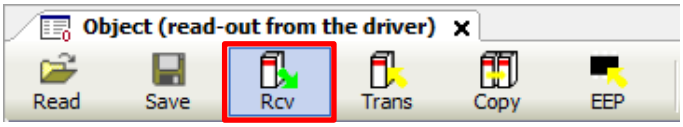
Alternatively, you can log out by selecting **Logout** from the **Online** menu.



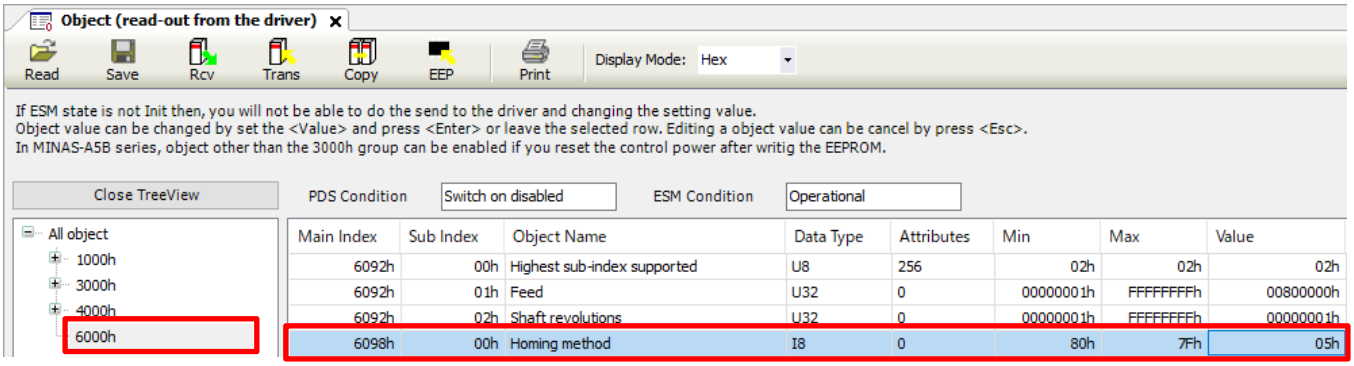
You can also log out using the toolbar.

Step 10

Return to PANATERM Lite for GM and click **Rcv** to check whether the changes have been written to EEPROM normally.



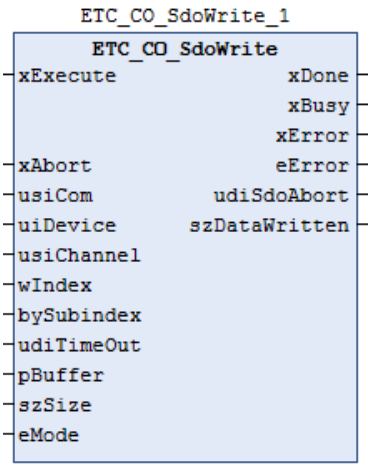
Check that the value of **6098h** (**Homing method**) in the **Main Index** column has been changed to "05h".



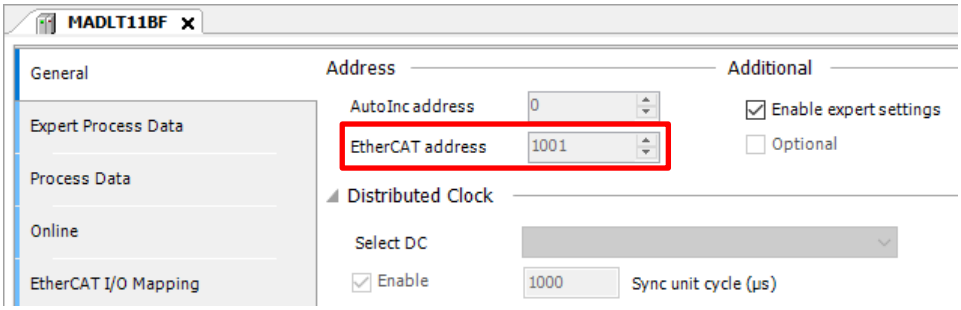
Column [8]: Writing and reading objects using programs

Objects (such as home return methods) can be written and read by using function blocks (FB) from programs.
For details on FB, refer to the GM1 Series Reference Manual (Instruction Edition).

• ETC_CO_SdoWrite (write slave parameters)
This is a function block (FB) that writes EtherCAT slave parameters.



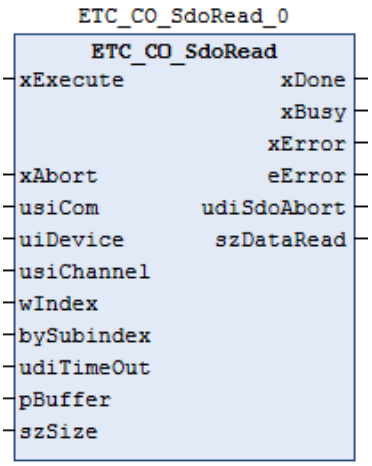
An example of variable setting is shown below.
* EtherCAT address = uiDevice



Type	Parameter name	Set value (example)	Description
Input	Execute	xWrite	Starts execution at the rising edge
	xAbort	FALSE	Cancels execution
	usiCom	usiCom	Number of ETC Master (fixed at 1 when there is only one master)
	uiDevice	uiDevice	Station number of ETC Slave (EtherCAT address)
	usiChannel	Delete “???”	Variable reserved for future expansion
	wIndex	wIndexWrite	Main address of slave unit to be accessed
	bySubindex	byIndexWrite	Sub-address of slave unit to be accessed
	udiTimeOut	uTmOut	Timeout period
	pBuffer	Adr (dwWriteData)	Address of variable to write from
	szSize	sdoWriteSize	Size of data to be written
	eMode	Delete “???”	
Output	Done	Delete “???”	TRUE: Completes execution and shifts to Standstill state
	Busy	Delete “???”	TRUE: FB operation in progress
	Error	Delete “???”	TRUE: An error has occurred
	ErrorID	Delete “???”	An error ID is output
	udiSdoAbort	Delete “???”	Displays additional information when an error occurs during FB execution
	szDataWritten	Delete “???”	Size of written data

• ETC_CO_SdoWrite (read slave parameters)

This is a function block (FB) that reads EtherCAT slave parameters.



Type	Parameter name	Set value (example)	Description
Input	Execute	xRead	Starts execution at the rising edge
	xAbort	xReadAbort	Cancels execution
	usiCom	usiCom	Number of ETC Master (fixed at 1 when there is only one master)
	uiDevice	uiDevice	Station number of ETC Slave (EtherCAT address)
	usiChannel	Delete “???”	Variable reserved for future expansion
	wIndex	wIndexRead	Main address of slave unit to be accessed
	bySubindex	bySubIndex	Sub-address of slave unit to be accessed
	udiTimeOut	udiTimeOut	Timeout period
	pBuffer	Adr (dwReadData)	Address of variable to store data
	szSize	sdoReadSize	Size of data to be read
Output	Done	Delete “???”	TRUE: Completes execution and shifts to Standstill state
	Busy	Delete “???”	TRUE: FB operation in progress
	Error	Delete “???”	TRUE: An error has occurred
	ErrorID	Delete “???”	An error ID is output
	udiSdoAbort	Delete “???”	Displays additional information when an error occurs during FB execution
	szDataRead	Delete “???”	Size of read data

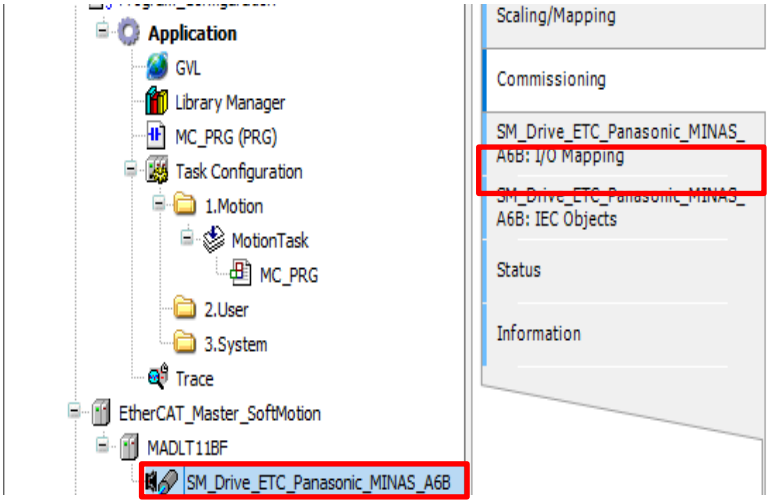
2 Commissioning

2.1 Executing Commissioning

Let's operate the motor in commissioning mode.
In commissioning, Servo ON and inching operations can be performed without using a program.

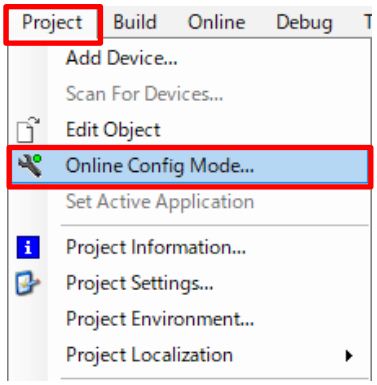
Step 1

Double-click **SM_Drive_ETC_Panasonic_MINAS_A6B** in the navigation pane and select **Commissioning**.



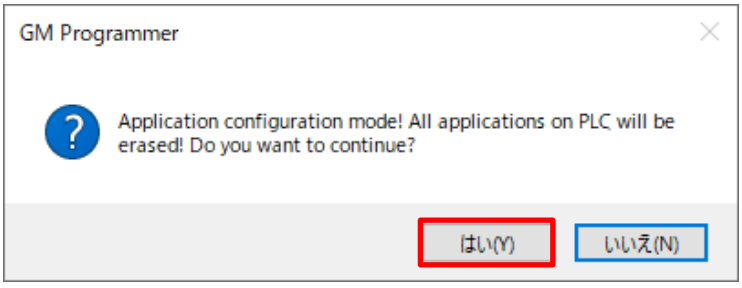
Step 2

Select **Online Config Mode** from the **Project** menu.

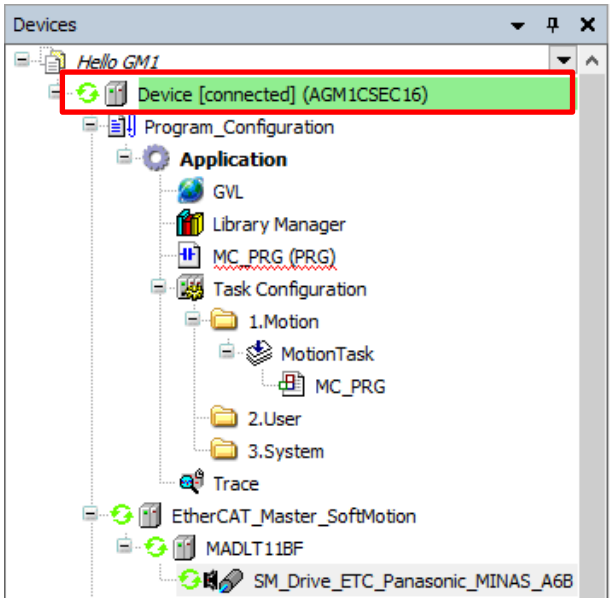


INFO

In online configuration mode, projects for commissioning are downloaded to the GM1 controller.
For this reason, programs that have been downloaded to the GM1 controller to date will be erased.
A confirmation message will be displayed. Click **Yes**.

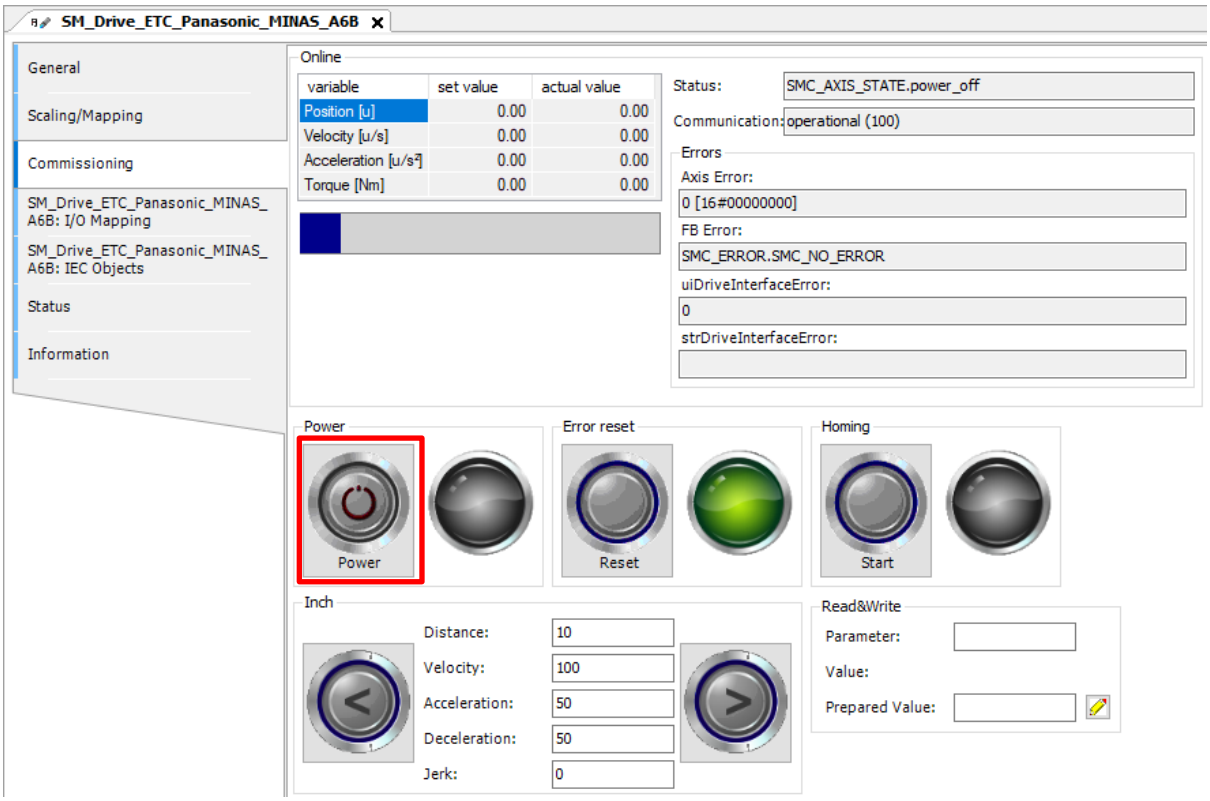


If “connected” is displayed in the navigation pane, commissioning can be executed.



Step 3

Click the **Power** icon to set the status to Servo ON.

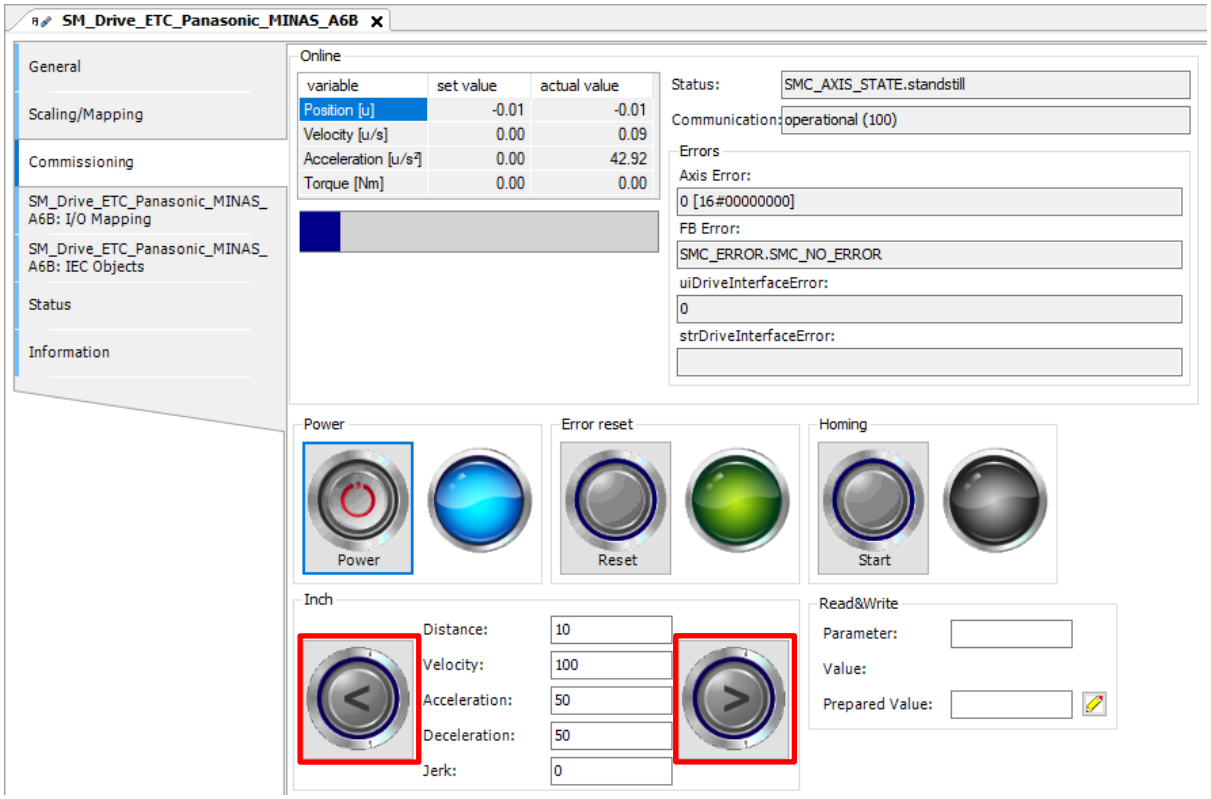


Step 4

Click the and buttons to check whether the direction of inching and the rotational direction of the actual axis match the servo amplifier settings. Set the following values in the setting fields in the **Inch** section and perform inching operation.

Distance	Velocity	Acceleration	Deceleration
10	100	50	50

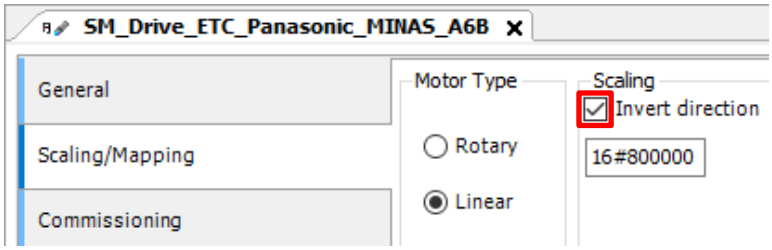
The motor runs one rotation and the object moves 10 mm.



INFO

Inching: While one of the arrow buttons is held down, the object moves according to the distance, velocity, and acceleration or deceleration specified in the respective fields. Releasing the button stops the object at the specified deceleration.

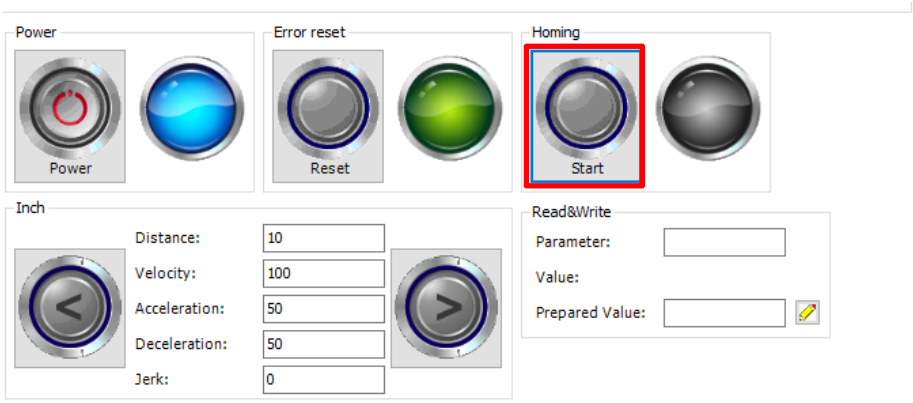
If the direction of inching and the rotational direction of the actual axis are different, select the **Scaling/Mapping** tab and select the **Invert direction** check box in the **Scaling** section. The motor will run in the opposite direction.



Step 5

Check whether home return operation is performed as specified in the "Homing method" object.

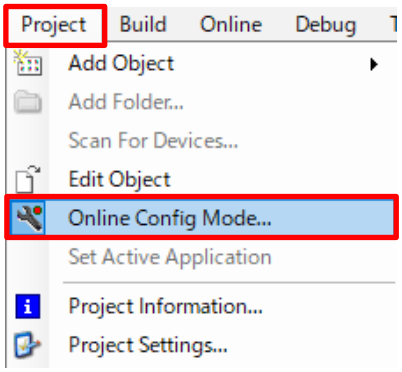
Click **Start** in the **Homing** section and check home return operation.



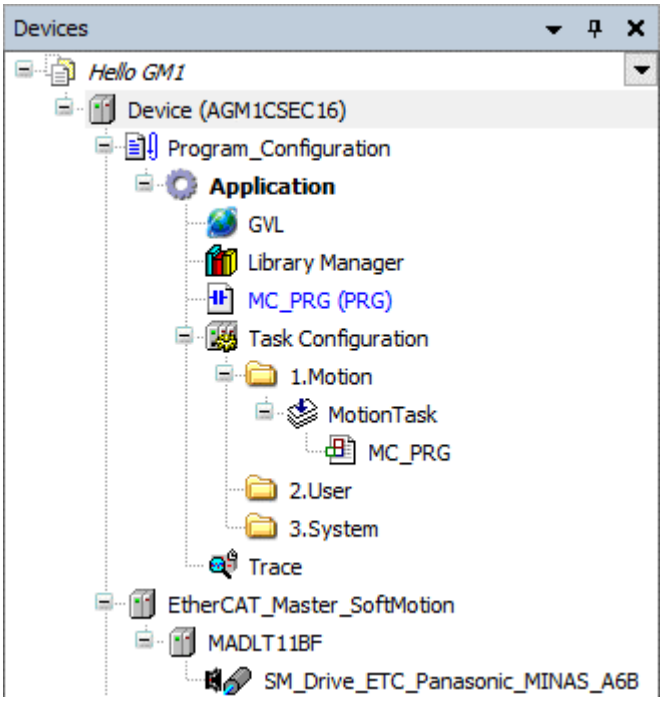
Step 4

If you have checked operations in commissioning mode, cancel the commissioning mode, as below.

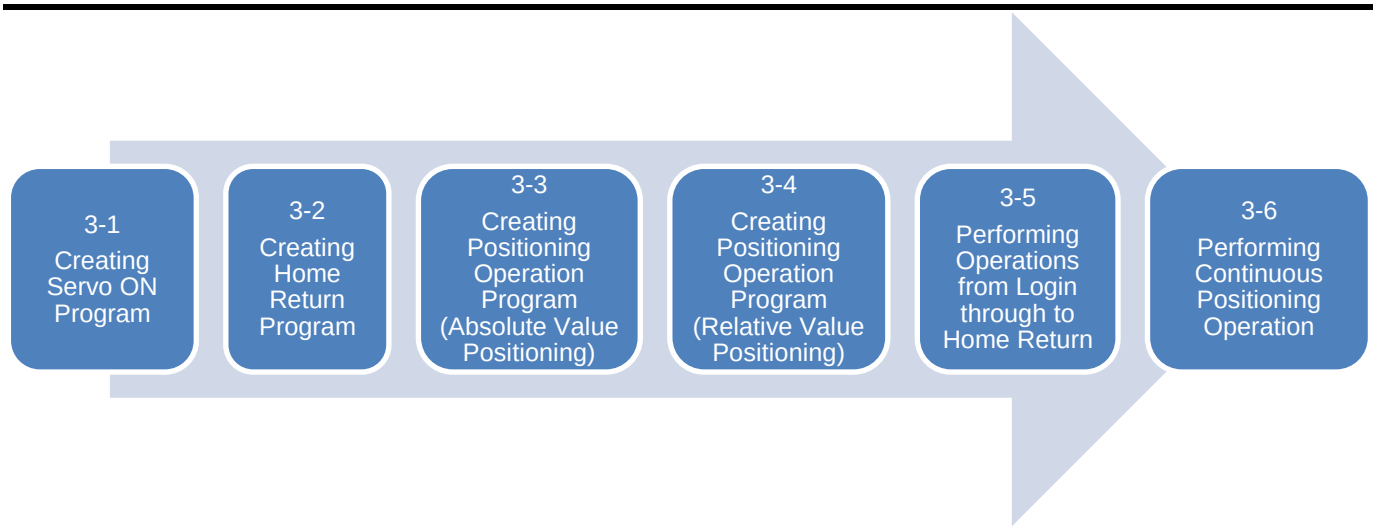
Select **Online Config Mode** from the **Project** menu.



If “connected” disappears from the navigation pane, the commissioning mode has been canceled.



3 Continuous Positioning Operation

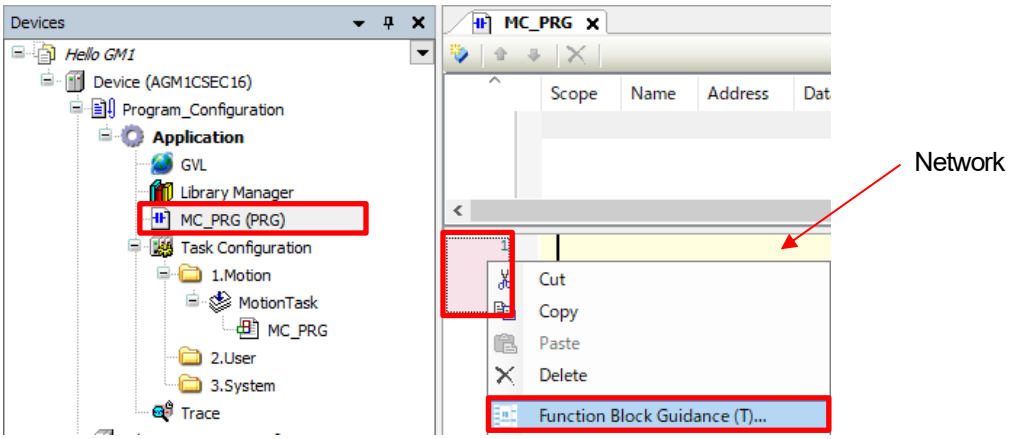


3.1 Creating Servo ON Program

Insert the MC_Power instruction to execute Servo ON.

Step 1

Double-click **MC_PRG** in the navigation pane. Right-click the leftmost section of the network (the red section in the figure below) and select **Function Block Guidance**.

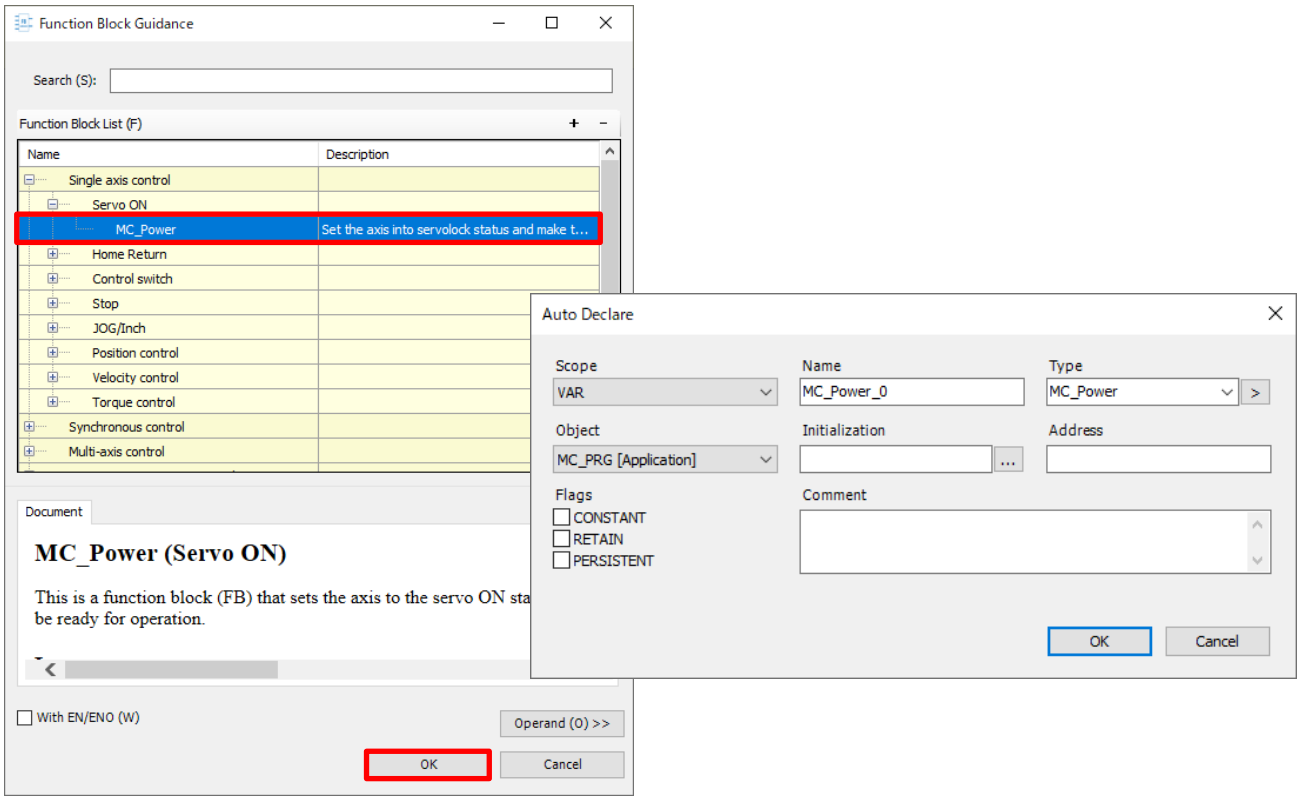


Step 2

Right-click on the new network and select **Function Block Guidance**.

Expand **Single axis control** as shown in the figure below, select **MC_Power (Servo ON)**, and click **OK**.

Variables will be automatically declared for the MC_Power instruction and the **Auto Declare** dialog box will be displayed. Check the contents of the dialog box and then click **OK**.



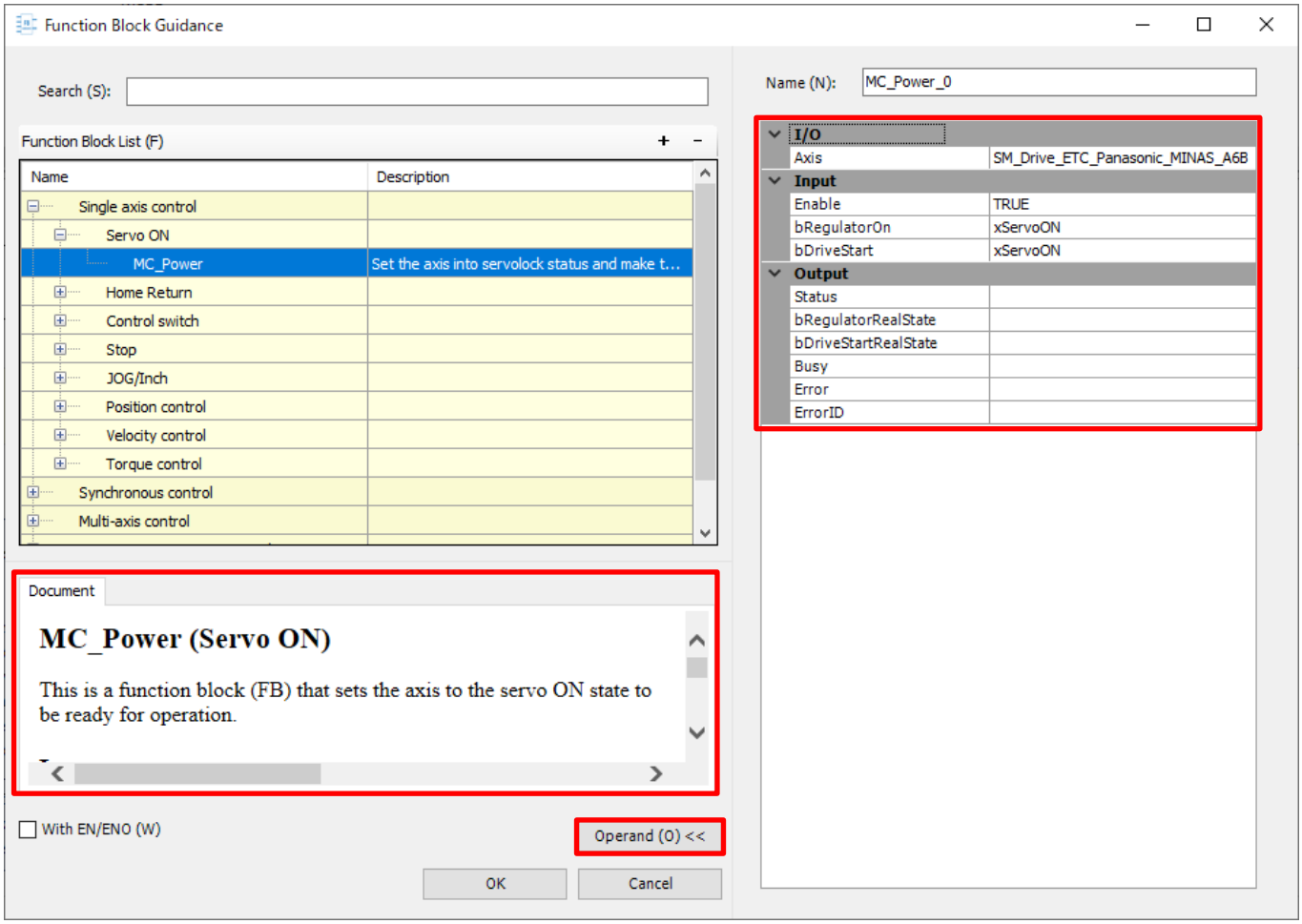
Column [9]: FB Guidance

The method for entering variables directly was explained on the previous page, but there is also a method for entering variables using operands.

Click **Operand**, enter necessary variables in the **Input** and **Output** sections, respectively, and click **OK**.

Then, delete unnecessary “???”.

The **Document** tab contains a description of the selected FB, so that you can check it as necessary.



Column [10]: Variables

Variable names are assigned as English letters.
Each variable name starts with **a prefix that indicates the type and scope of the variable.**
A prefix is followed by a meaningful word name. Only the first character of each word name is capitalized.
For global variables, the first character is "g".

Examples) BOOL type: xServoON
REAL type: rVelocity

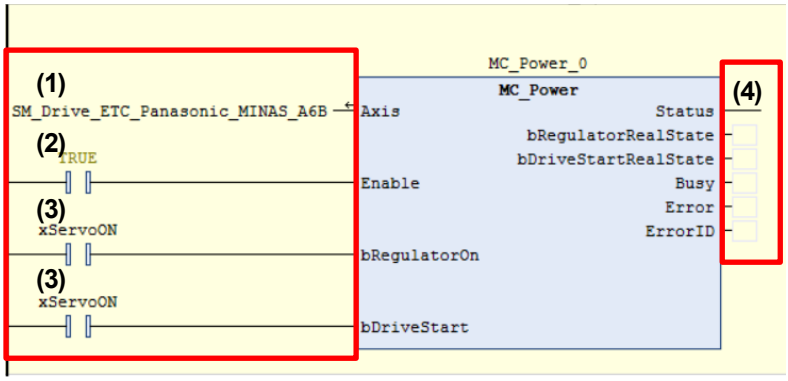
BOOL type (Global variable): g_xPowerON
REAL type (Global variable): g_rPosition

Space and special characters (such as !, ", $, %, @, or &) cannot be used and a numeric character cannot be used as the first character.
Underscores cannot be used consecutively.

Data type	Prefix	Remarks
BOOL	x	"x" is used to distinguish from the identifier ("by") of BYTE data type
	b	
BYTE	by	Not used for arithmetic operations
WORD	w	Not used for arithmetic operations
DWORD	dw	Not used for arithmetic operations
LWORD	lw	Not used for arithmetic operations
SINT	si	
USINT	usi	
INT	i	
UINT	ui	
DINT	di	
UDINT	udi	
LINT	li	
ULINT	uli	
REAL	r	
LREAL	lr	
STRING	s	
WSTRING	ws	
TIME	tim	
LTIME	ltim	
TIME_OF_DAY	tod	
DATE_AND_TIME	dt	
DATE	date	
POINTER	p	
ARRAY	a	
ENUM	e	
SCOPE		A prefix to identify the scope of a variable
VAR_GLOBAL	g_	For global variables. Example: g_uiTest;
VAR CONSTANT	c_	For local constants. Example: c_uiTest:INT;
VAR_GLOBAL CONSTANT	gc_	For global constants. Example: gc_uiTest:INT;

Step 3

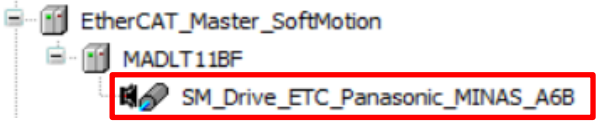
Complete a function block as show below.



	Type	Parameter name	Set value	Description
(1)	I/O	Axis	SM_Drive_ETC_Panasonic_MINAS_A6B	Specifies the axis
(2)	Input	Enable	TRUE	TRUE: FB executable
(3)		bRegulatorOn	xServoON	TRUE: Servo lock FALSE: Servo lock released
		bDriveStart	xServoON	TRUE: Quick stop disabled
(4)	Output	Status	Delete “???”	TRUE: Axis ready for operation
		bRegulatorRealState	Delete “???”	TRUE: FB executable
		bDriveStartRealState	Delete “???”	TRUE: Operation not stopped by quick stop
		Busy	Delete “???”	TRUE: FB execution incomplete
		Error	Delete “???”	TRUE: Error has occurred within FB
		ErrorID	Delete “???”	An error ID is output

INFO

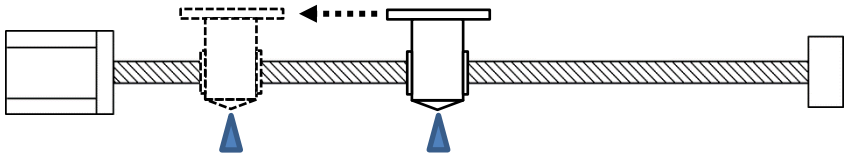
For the "Axis" parameter for I/O, specify the axis corresponding to the servo motor.
Example: For SM_Drive_ETC_Panasonic_MINAS_A6B, substitute "SM_Drive_ETC_Panasonic_MINAS_A6B" for the Axis parameter of the MC_Power instruction.



3.2 Creating Home Return Program

Insert the MC_Home instruction to execute home return. (Operation 1)

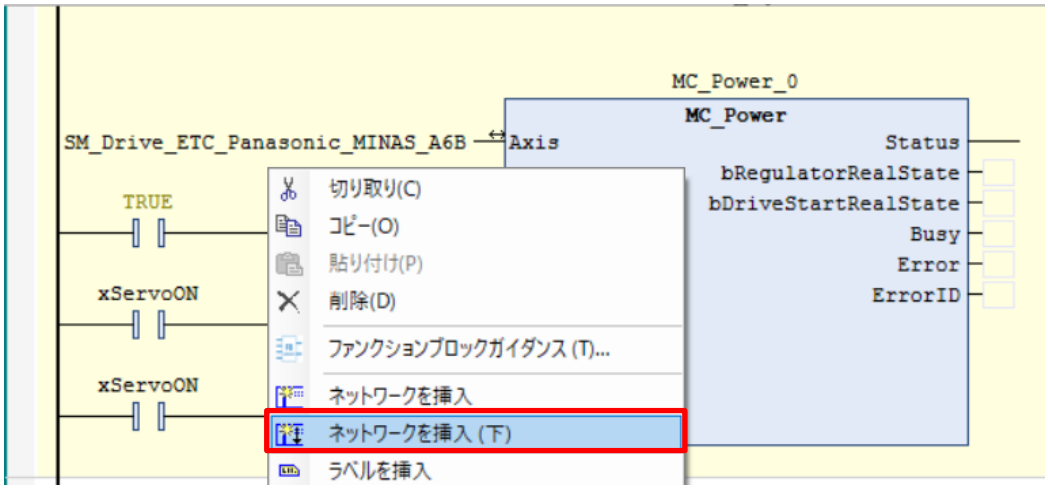
Operation 1) The object is moved to its home position (0 mm). (Home return)



*** For the MINAS A6B series, the home return method is set to the default value (0), so home return will not be performed if the home return method is left unchanged.**
Before performing home return operation, be sure to set up parameters for home return.

Step 1

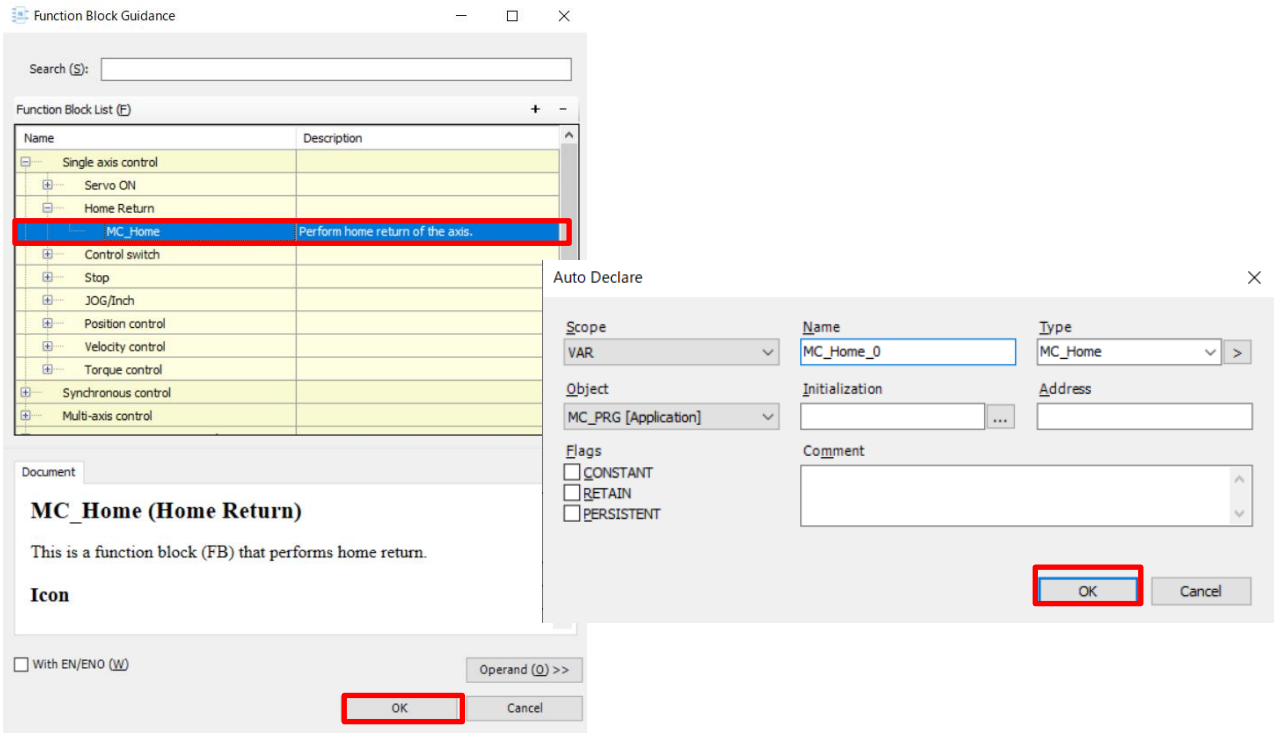
Insert a new network. Right-click in the network and select **Insert Network (Below)**.



Step 2

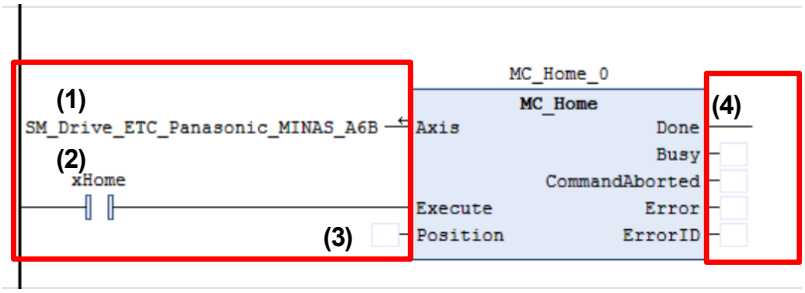
Right-click in the new network and select **Function Block Guidance**. Expand **Single axis control** as shown in the figure below, select **MC_Home** (home return), and click **OK**.

Variables will be automatically declared for the MC_Home instruction and the **Auto Declare** dialog box will be displayed. Check the contents of the dialog box and then click **OK**.



Step 3

Complete a function block as show below.



	Type	Parameter name	Set value	Description
(1)	I/O	Axis	SM_Drive_ETC_Panasonic_MINAS_A6B	Specifies the axis
(2)	Input	Execute	xHome	Starts execution at the rising edge FALSE: Stops processing
(3)		Position	Delete “???”	Absolute position upon completion of Z-phase search
(4)	Output	Done	Delete “???”	TRUE: Completes execution and shifts to Standstill state
		Busy	Delete “???”	TRUE: FB operation in progress
		CommandAborted	Delete “???”	TRUE: An interruption caused by another FB
		Error	Delete “???”	TRUE: An error has occurred
		ErrorID	Delete “???”	An error ID is output

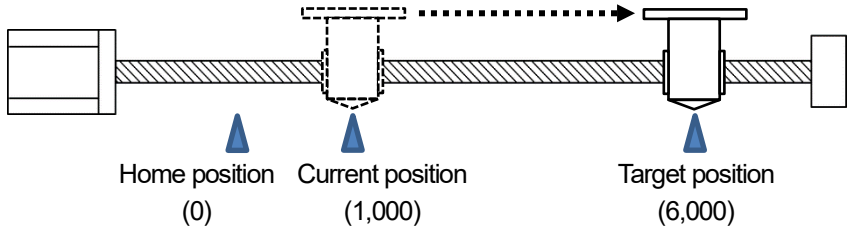
Column [11]: Difference between absolute value positioning and relative value positioning

• Absolute value positioning

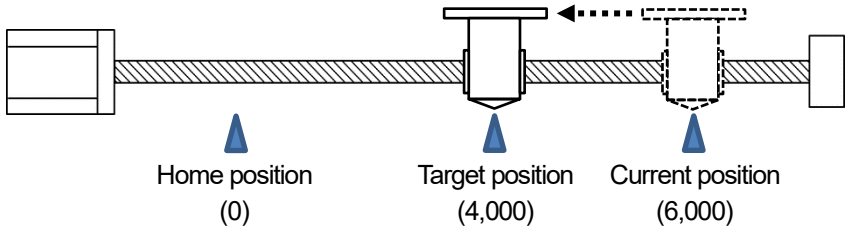
This is a positioning control method in which the target position is specified as an absolute position from the home position.

<Example>

Operation 1) Moving the object to position 6,000 (command value + 6,000)



Operation 2) Moving the object to position 4,000 (command value + 4,000)

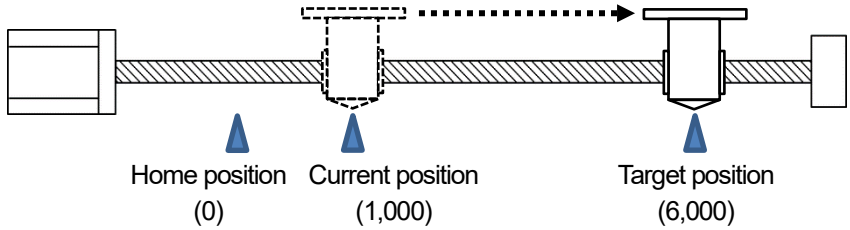


• Relative value positioning

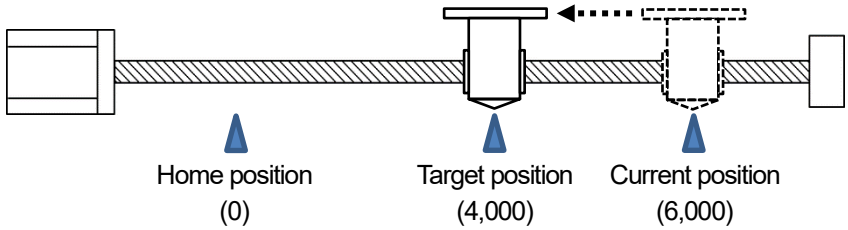
This is a positioning control method in which the target position is specified as a movement distance from the current position.

<Example>

Operation 1) Moving the object to position 6,000 (command value + 5,000)



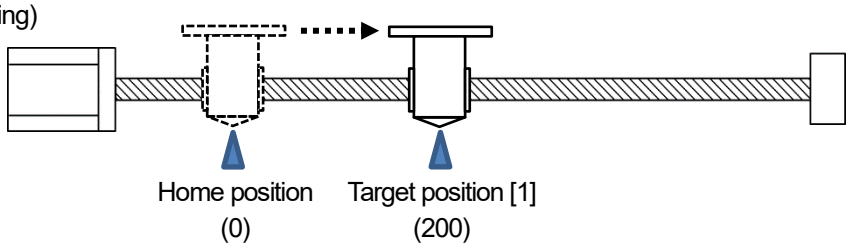
Operation 2) Moving the object to position 4,000 (command value - 2,000)



3.3 Creating Positioning Operation Program (Absolute Value Positioning)

Create a program for absolute value positioning. (MC_MoveAbsolute instruction)

Operation 2) Moving the object from the home position (0 mm) to target position [1] (200 mm) (Absolute value positioning)



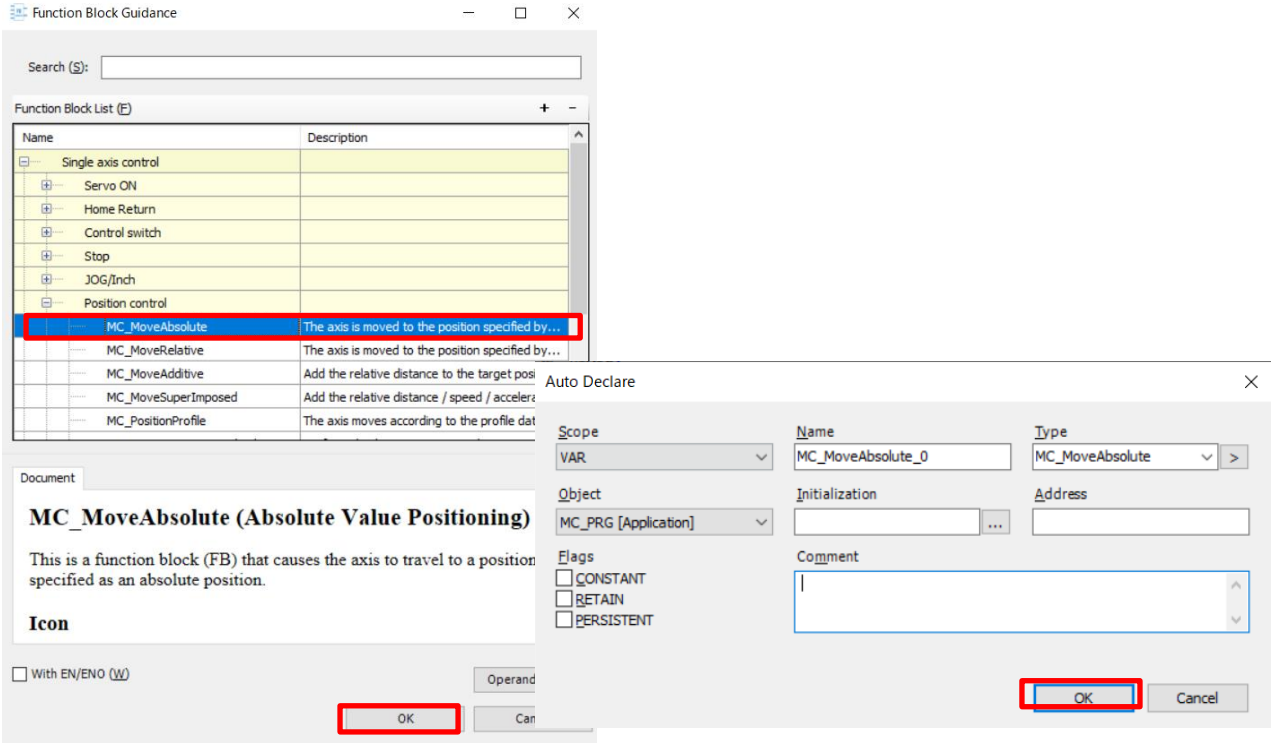
Step 1

Insert a new network. Right-click in the network and select **Insert Network (Below)**.

Step 2

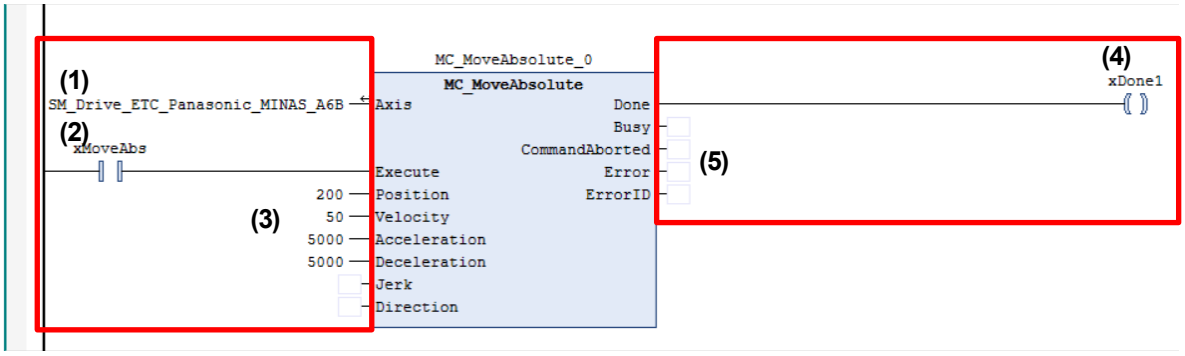
Right-click in the new network and select **Function Block Guidance**. Expand **Single axis control** as shown in the figure below, select **MC_MoveAbsolute**, and click **OK**.

Variables will be automatically declared for the MC_MoveAbsolute instruction and the **Auto Declare** dialog box will be displayed. Check the contents of the dialog box and then click **OK**.



Step 3

Complete a function block as show below.

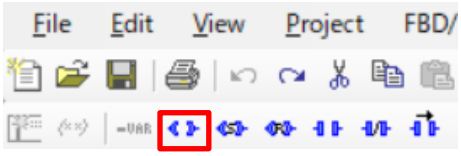


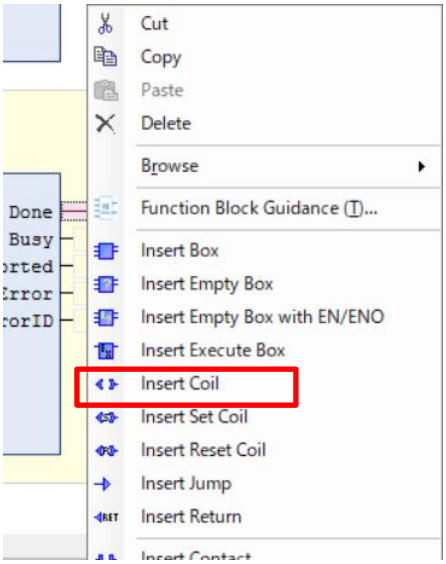
	Type	Parameter name	Set value	Description
(1)	I/O	Axis	SM_Drive_ETC_Panasonic_MINAS_A6B	Specifies the axis
(2)	Input	Execute	xMoveAbs	Starts execution at the rising edge
(3)		Position	200	Specifies the target position (u)
		Velocity	50	Specifies the maximum velocity (u/s)
		Acceleration	5000	Specifies acceleration (u/s^2)
		Deceleration	5000	Specifies deceleration (u/s^2)
		Jerk	Delete “???”	Specifies jerk (u/s^3)
		Direction	Delete “???”	Specifies the direction of axis movement. Direction can be specified only for the Modulo axis type. For the Finite axis type, the specification is ignored.
(4)	Output	Done	xDone1	TRUE: Movement by the specified relative distance is complete
(5)		Busy	Delete “???”	TRUE: FB operation in progress
		CommandAborted	Delete “???”	TRUE: An interruption caused by another FB
		Error	Delete “???”	TRUE: An error has occurred
		ErrorID	Delete “???”	An error ID is output

INFO

How to connect a coil to output "Done"

To insert a coil, select a connection line to "Done" and then click the relevant icon on the toolbar or right-click and select **Insert Coil** from the context-sensitive menu that is displayed.

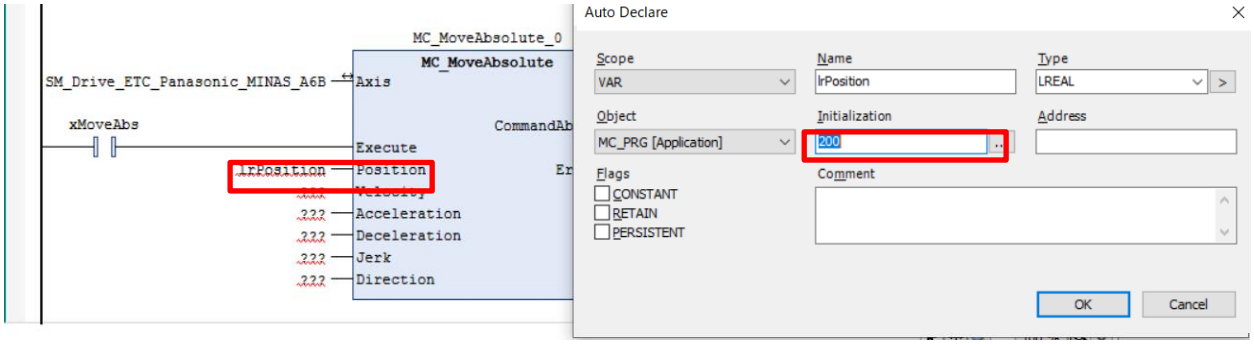




Column [11]: Assigning numerical variables

In the previous example, fixed value "200" is substituted for the "Position" input parameter, but you can also declare a variable and set "200" as the default value.

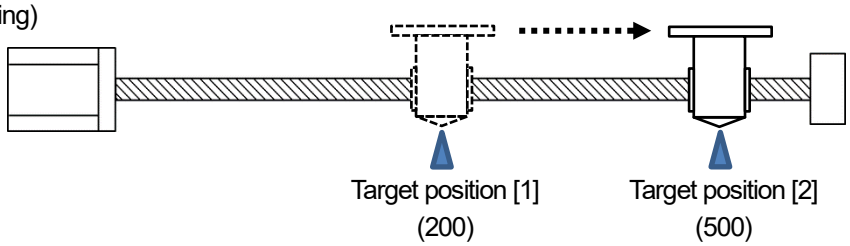
Declaring a variable enables you to change the value flexibly.



3.4 Creating Positioning Operation Program (Relative Value Positioning)

Create a program for relative value positioning. (MC_MoveRelative instruction)

Operation 3) Moving the object from target position [1] (200 mm) to target position [2] (500 mm) (Relative value positioning)



Step 1

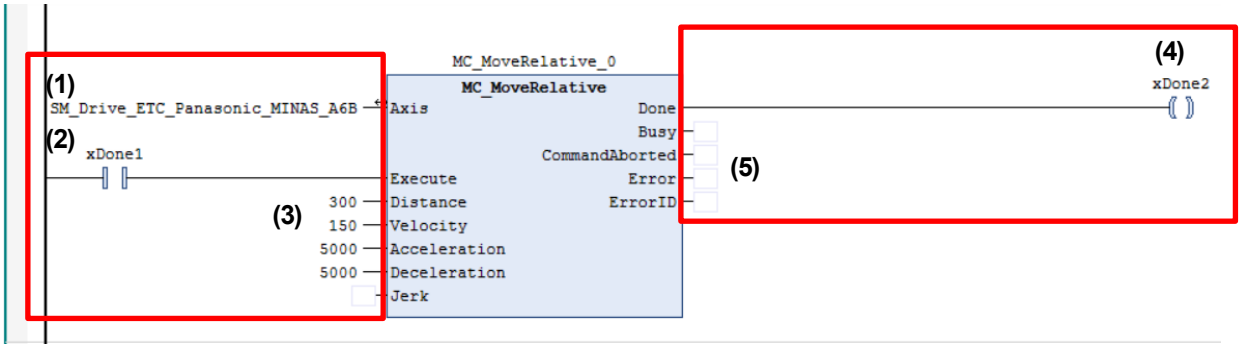
Insert a new network. Right-click in the network and select **Insert Network (Below)**.

Step 2

Select **MC_MoveRelative** in the same way as **MC_MoveAbsolute**.

Step 3

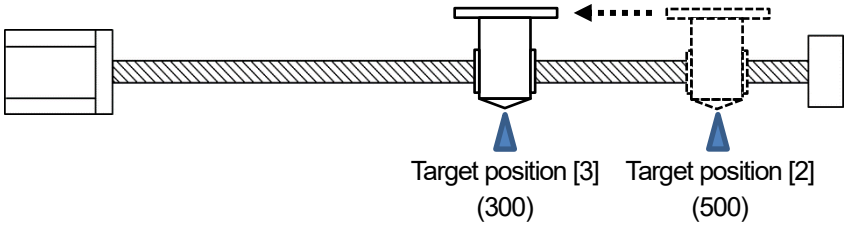
Complete a function block as show below.



	Type	Parameter name	Set value	Description
(1)	I/O	Axis	SM_Drive_ETC_Panasonic_MINAS_A6B	Specifies the axis
(2)	Input	Execute	xDone1	Starts execution at the rising edge
(3)		Distance	300 (500 - 200)	Specifies the relative distance (u)
		Velocity	150	Specifies the maximum velocity (u/s)
		Acceleration	5000	Specifies acceleration (u/s^2)
		Deceleration	5000	Specifies deceleration (u/s^2)
		Jerk	Delete “???”	Specifies jerk (u/s^3)
(4)	Output	Done	xDone2	TRUE: Movement by the specified relative distance is complete
(5)		Busy	Delete “???”	TRUE: FB operation in progress
		CommandAborted	Delete “???”	TRUE: An interruption caused by another FB
		Error	Delete “???”	TRUE: An error has occurred
		ErrorID	Delete “???”	An error ID is output

Create a second program for relative value positioning. (MC_MoveRelative instruction)

Operation 4) Moving the object from target position [2] (500 mm) to target position [3] (300 mm) (Relative value positioning)



Step 1

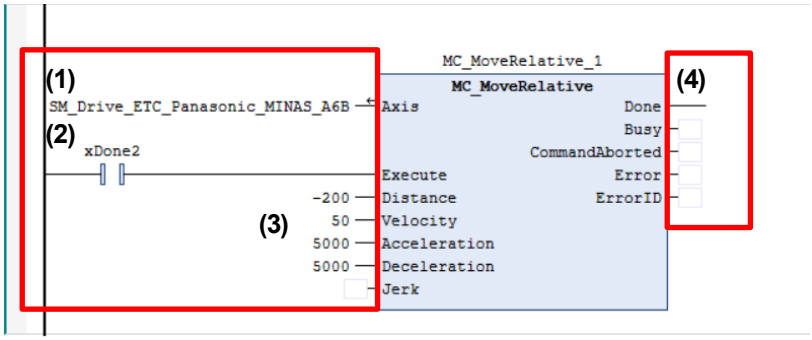
Insert a new network. Right-click in the network and select **Insert Network (Below)**.

Step 2

Select **MC_MoveRelative** in the same way as before.

Step 3

Complete a function block as show below.



	Type	Parameter name	Set value	Description
(1)	I/O	Axis	SM_Drive_ETC_Panasonic_MINAS_A6B	Specifies the axis
(2)	Input	Execute	xDone2	Starts execution at the rising edge
(3)		Distance	-200	Specifies the relative distance (u)
		Velocity	50	Specifies the maximum velocity (u/s)
		Acceleration	5000	Specifies acceleration (u/s^2)
		Deceleration	5000	Specifies deceleration (u/s^2)
		Jerk	Delete “???”	Specifies jerk (u/s^3)
(4)	Output	Done	Delete “???”	TRUE: Movement by the specified relative distance is complete
		Busy	Delete “???”	TRUE: FB operation in progress
		CommandAborted	Delete “???”	TRUE: An interruption caused by another FB
		Error	Delete “???”	TRUE: An error has occurred
		ErrorID	Delete “???”	An error ID is output

Step 4

When creation of the program is completed, execute build and check for any errors.

3.5 Performing Operations from Login through to Home Return

Step 1

Right-click the **Application** object and select **Login** to execute a download and login.

Step 2

Right-click the **Application [stop]** object and select **Start**.

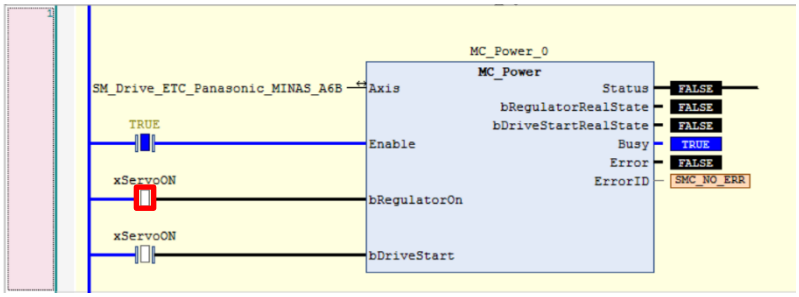
Step 3

Execute Servo ON.

To execute Servo ON, both **bRegulatorOn** and **bDriveStart** inputs in the **MC_Power** section must be set to TRUE.

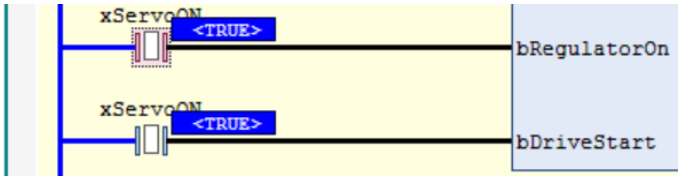
xServoON is set to FALSE by default and the inside of the contact is displayed in white, indicating that the servo is OFF.

Double-click the inside of the **xServoON** contact (the portion surrounded by the red frame in the figure below).

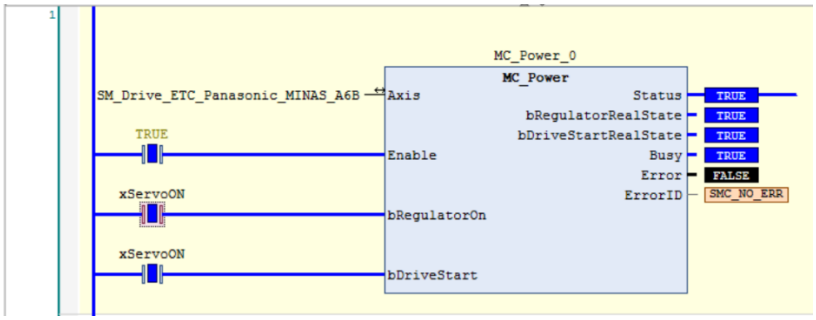


Double-clicking the above portion displays the set value (<TRUE>) for the variable on the right side of the contact.

At this stage, the value has not yet been written to perform operation.



To write input status change values such as TRUE and FALSE, **in this state**, **press the F7 key while holding down the Ctrl key**.

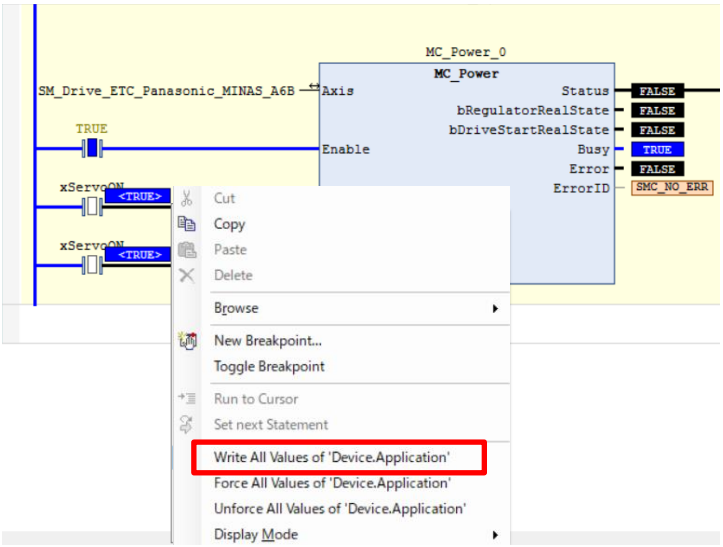


When **xServoON** is set to ON, the inside of the contact is displayed in blue, indicating that the servo is ON.

"**Status**", "**bRegulatorRealState**", and "**bDriveStartRealState**" outputs are also set to TRUE, indicating that the servo is ON.

Column [12]: How to write values

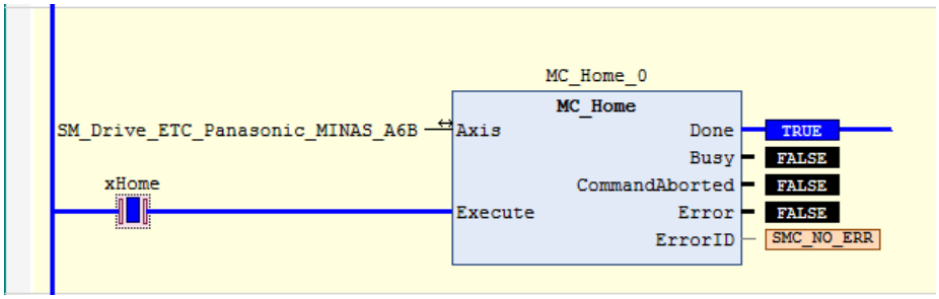
After displaying <TRUE> by double-clicking the relevant portion, you can also write values by right-clicking and selecting **Write All Values of 'Device.Application'**.



Step 4

When all parameter settings are complete, perform home return operation as below.

Double-click the startup contact of the MC_Home instruction (home return). When <TRUE> is displayed, press the Ctrl+F7 keys to execute home return operation.



The motor runs and home return operation is executed.

When the home return operation is completed, **Done** is set to TRUE.

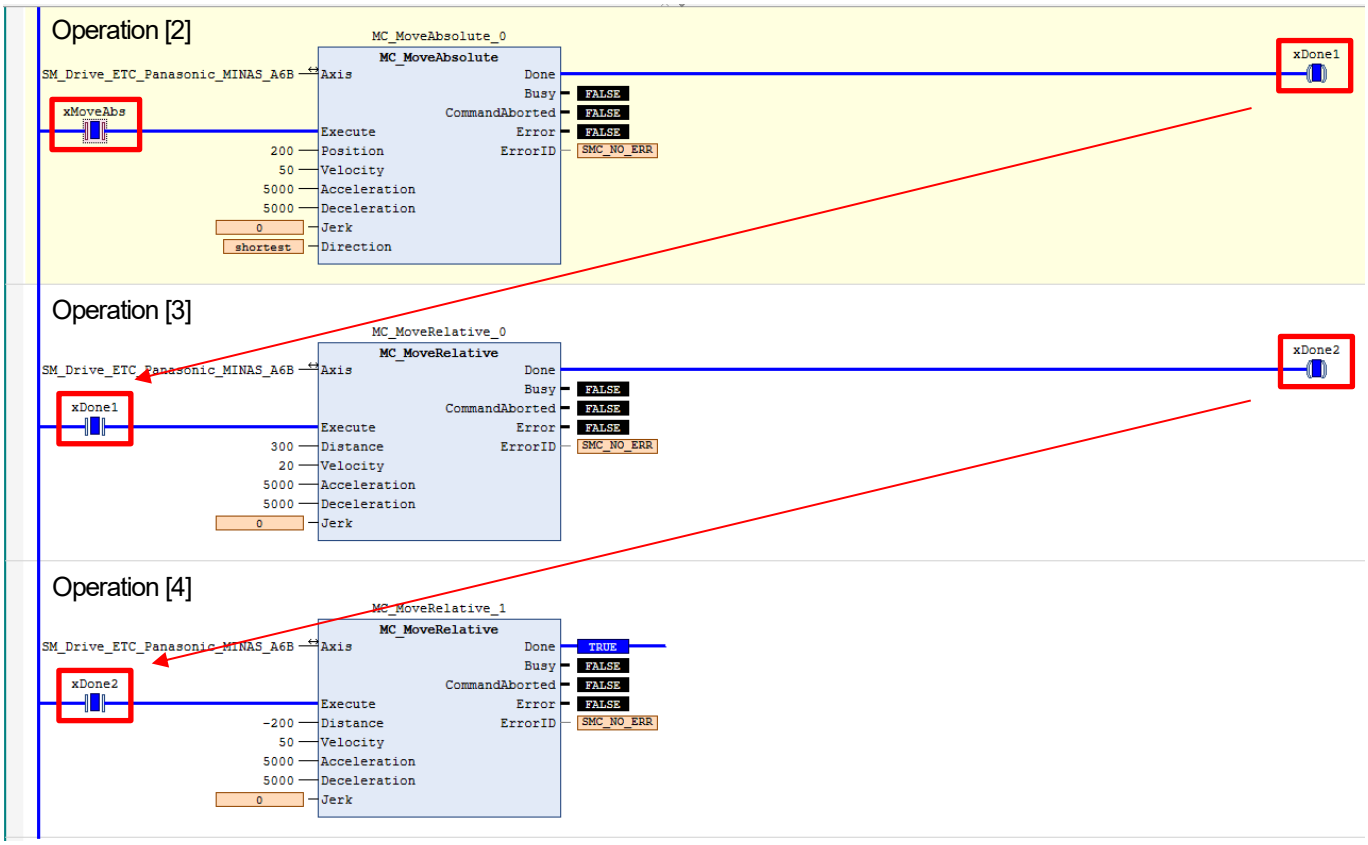
3.6 Performing Continuous Positioning Operation

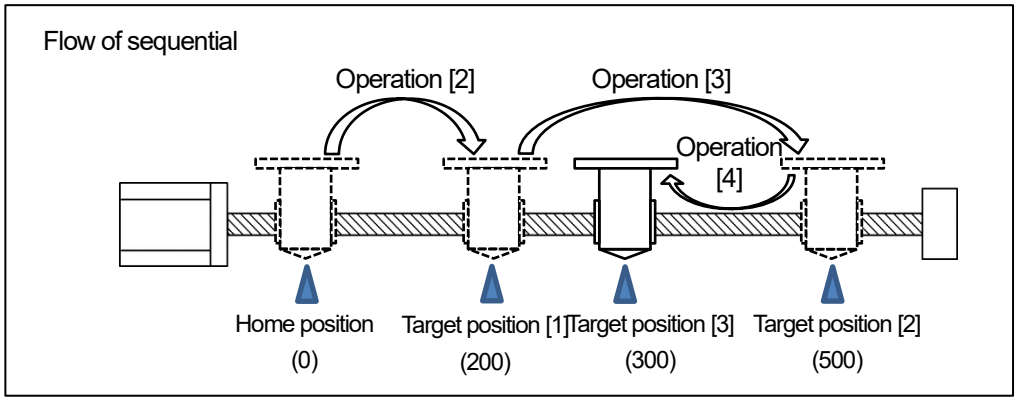
Step 1

xMoveAbs is reset to TRUE.

After **MC_MoveAbsolute_0** operation is complete, **xDone1** is set to TRUE and **MC_MoveRelative_0** operates.

After **MC_MoveRelative_0** operation is complete, **xDone2** is set to TRUE and **MC_MoveRelative_1** operates.

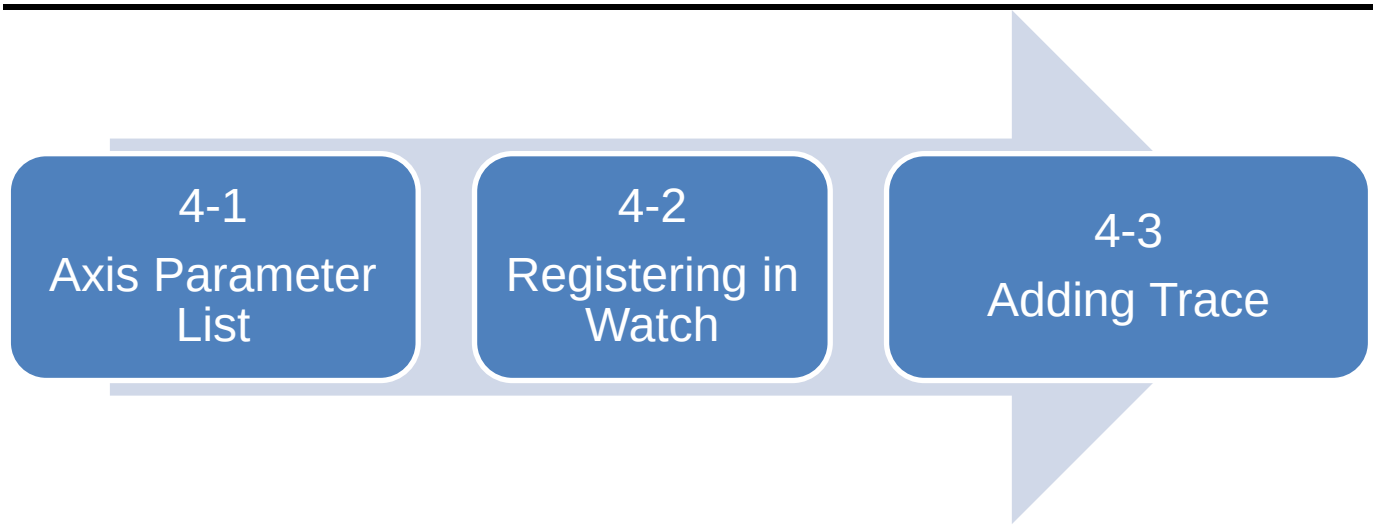




Step 2

Upon completion of operation check, stop the operation and log out.

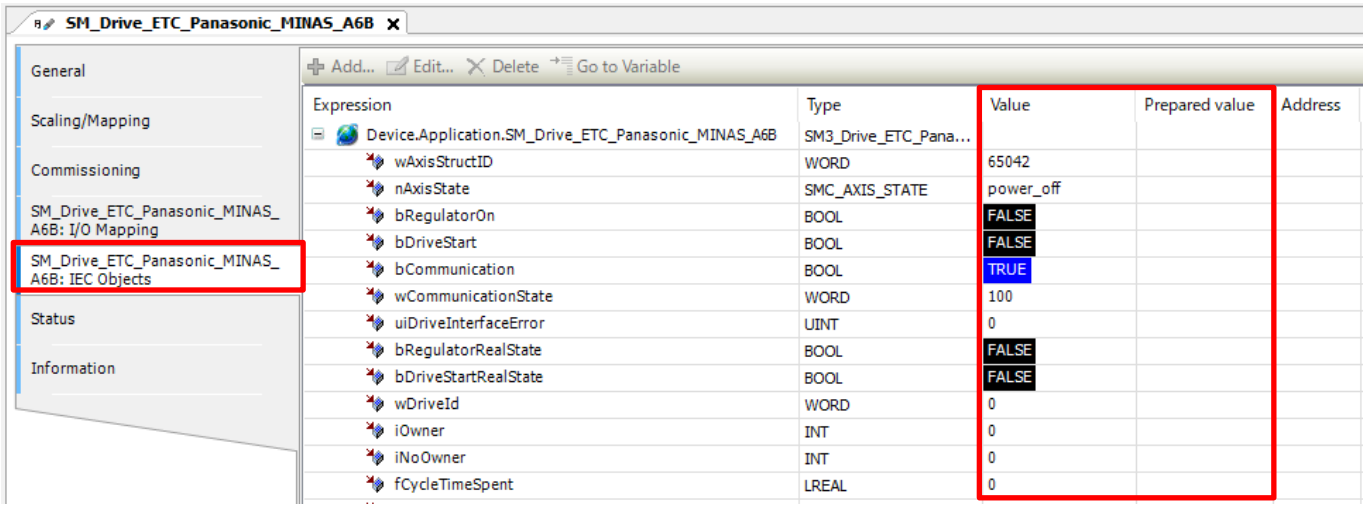
4 Monitoring



4.1 Axis Parameter List

All axis information can be monitored from the axis parameter list.

Double-click **SM_DRIVE_ETC_Panasonic_MINAS_A6B: IEC Objects** in the navigation pane to open **SM_DRIVE_ETC_Panasonic_MINAS_A6B**.
You can check the current value in the **Value** column. You can also write values by double-clicking in the **Prepared value** column corresponding to the variable of the value to be changed and then pressing the Ctr+F7 keys or right-clicking.

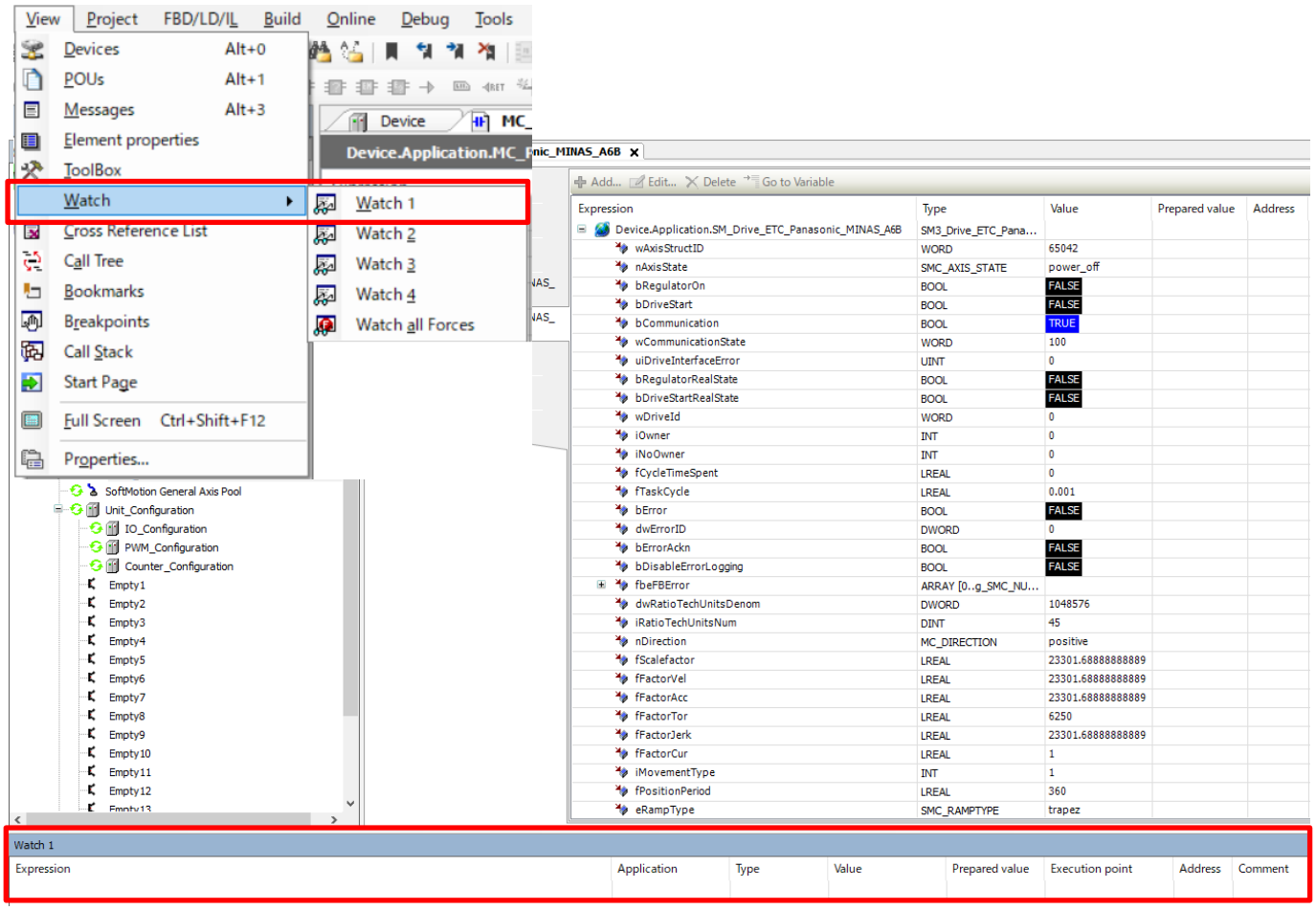


4.2 Registering in Watch

By registering variables in the watch view, you can perform variable value management such as checking or changing variable values.

Step 1

From the **View** menu, select **Watch** and then **Watch 1**. **Watch 1** will be displayed on the bottom of the main window.



Step 2

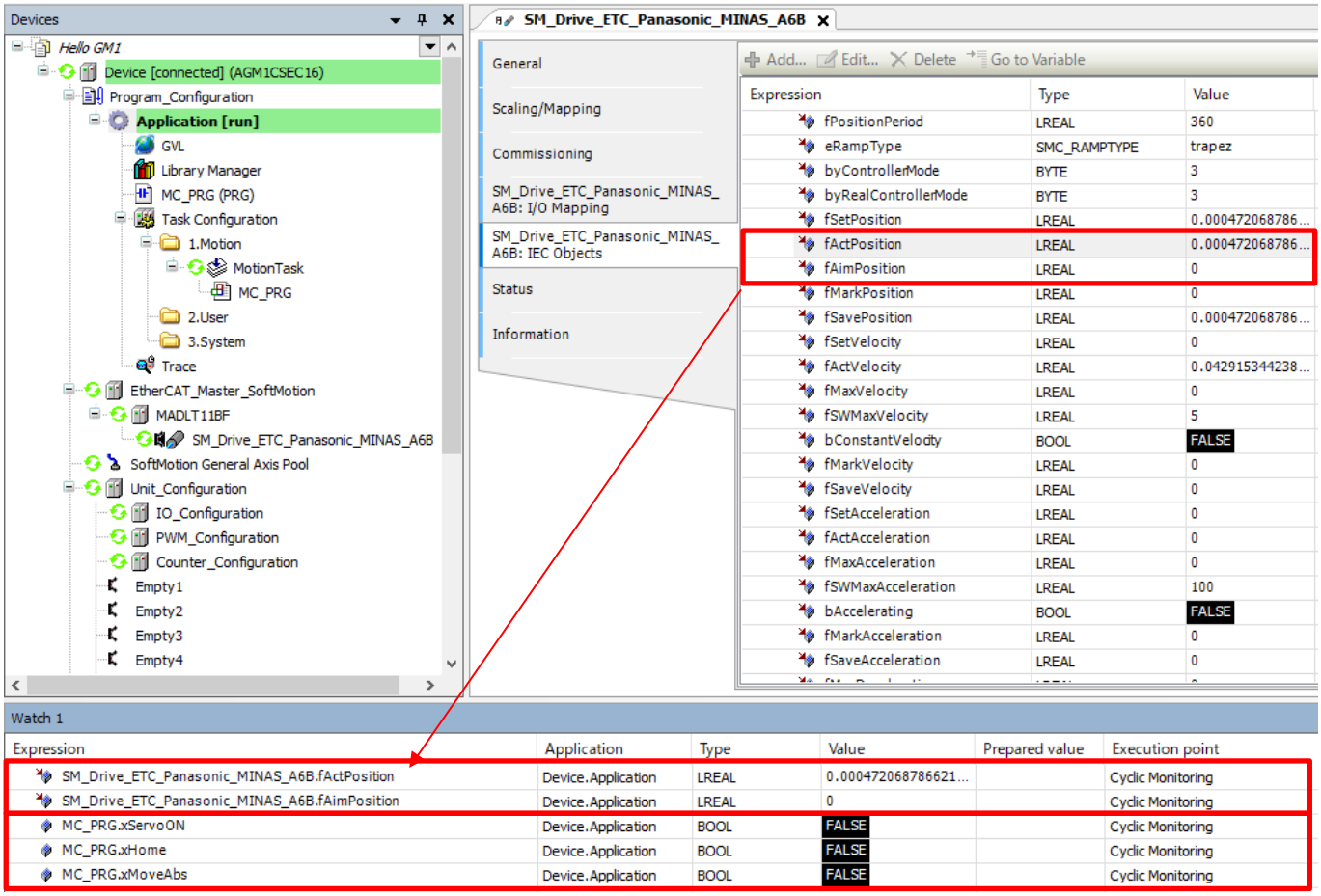
The variables to be monitored can be registered in **Watch 1** by dragging and dropping them into the **Watch 1** pane.

Register fActPosition (current position) and fAimPosition (target position) by dragging and dropping them into the **Watch 1** pane.

Register xServoON (servo ON), xHome (execute home return), and xMoveAbs (execute positioning operation), as below.

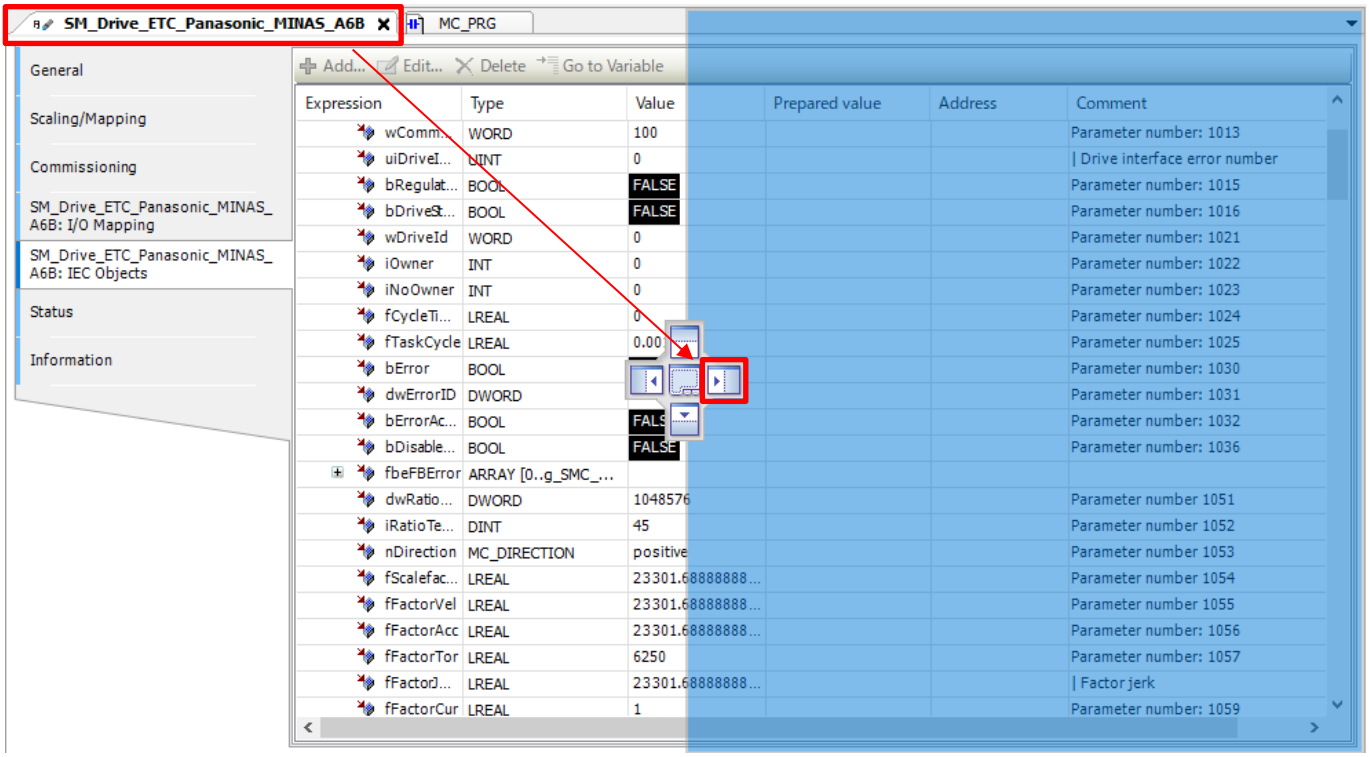
Double-click the empty field below **fAimPosition** and click ...

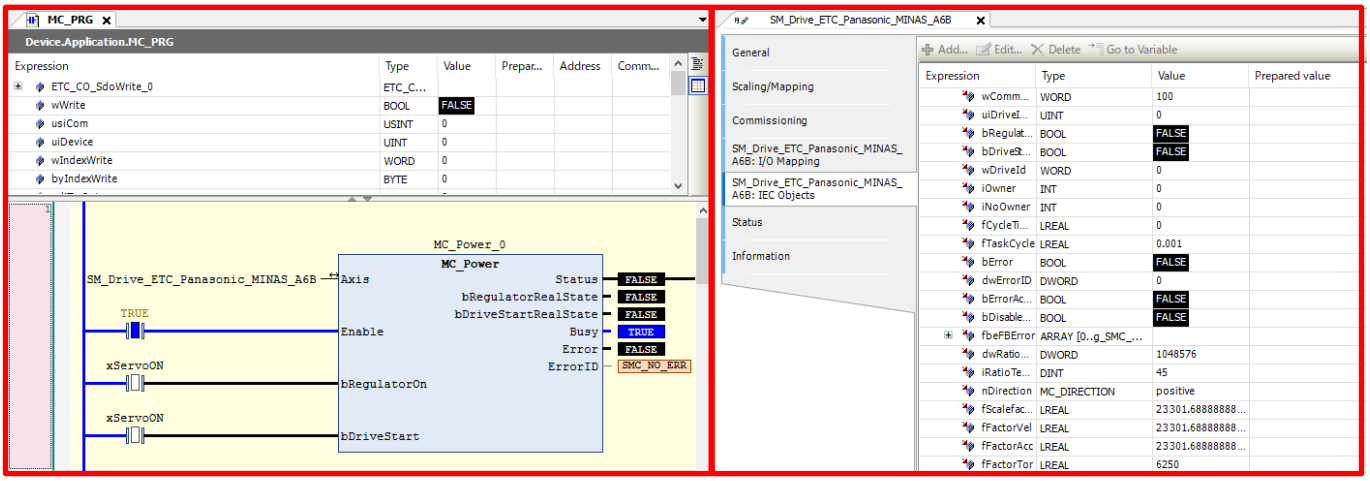
Click **Device**, **Application**, and then **MC_PRG**, select **xServoON**, **xMoveAbs**, and **xHome**, and click **OK**.



Column [13]: How to move tabs

The **SM_DRIVE_ETC_Panasonic_MINAS_A6B** tab can be moved by dragging and dropping it.



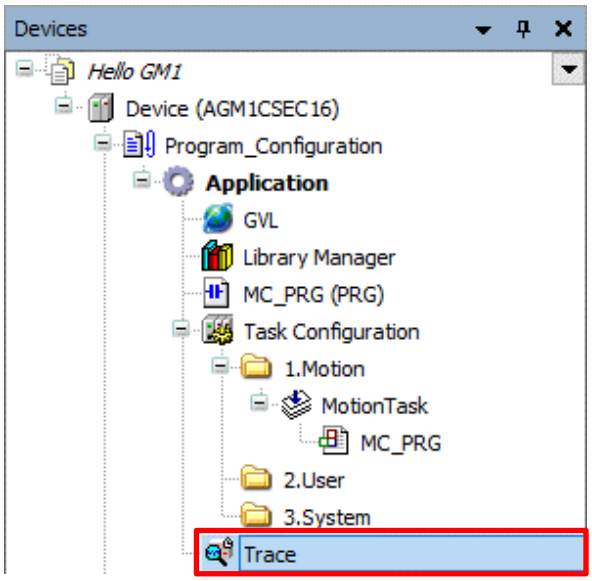


4.3 Adding Trace

The trace function allows the variable value histories in the GM1 controller to be checked in GM Programmer.

Step 1

Double-click **Trace** in the navigation pane.



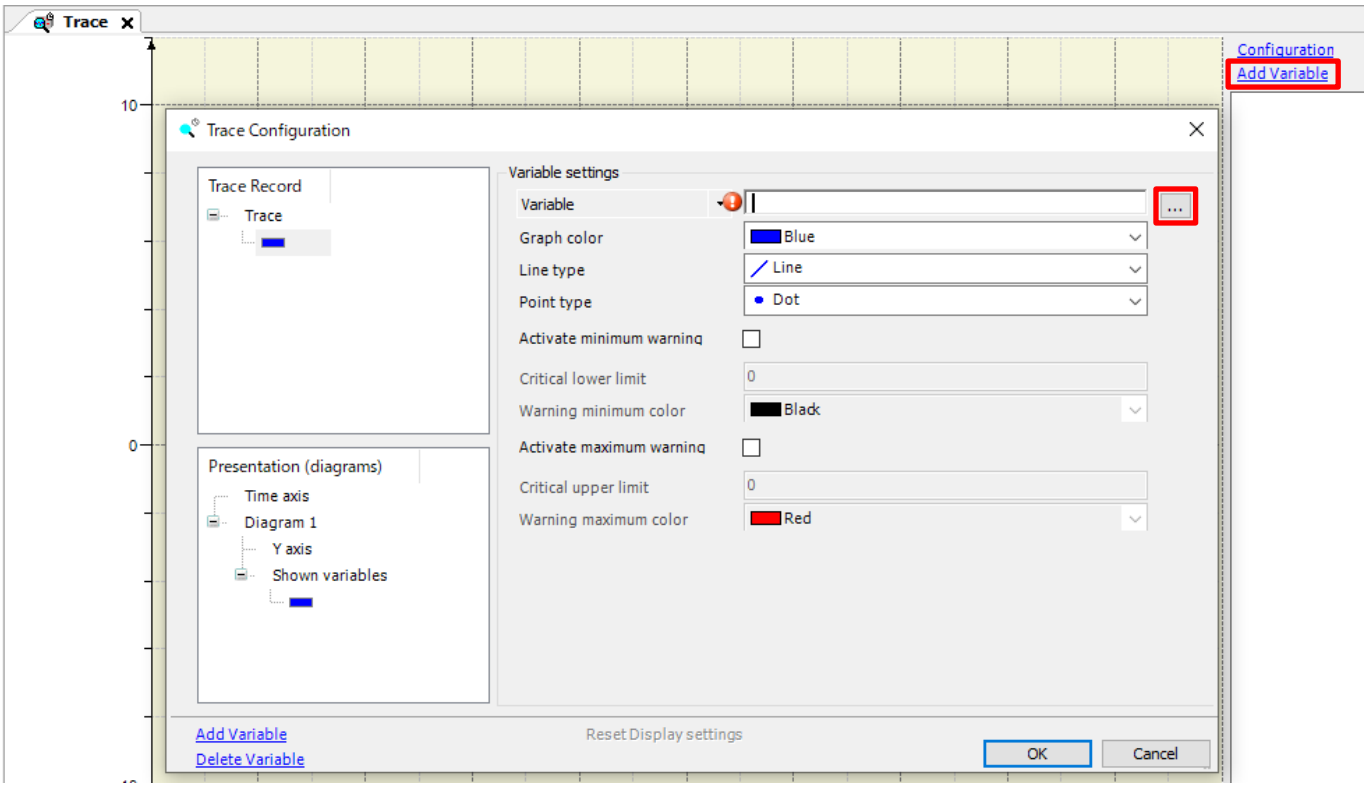
Step 2

Register variables to be traced. You can register and trace global variables and variables within function blocks.

Clicking **Add Variable** on the top right of the **Trace** window displays the **Trace Configuration** dialog box.

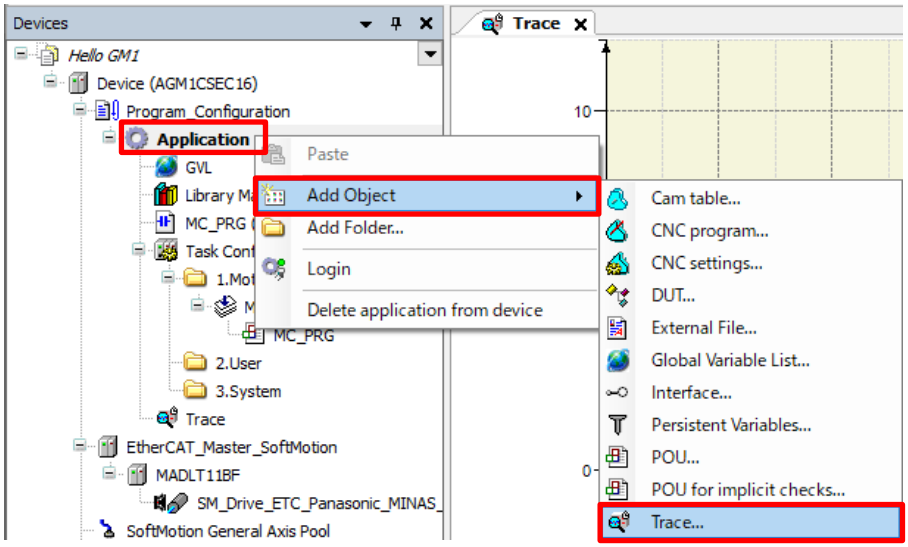
Click ... on the right side of the **Variable** field to display the **Input Assistant** dialog box.

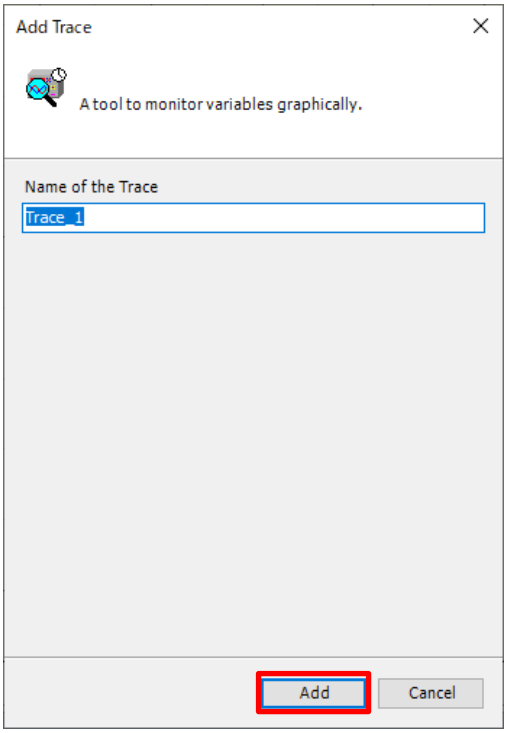
* **indicates required input items. "Variable" is a required input item.**



Column [14]: Adding objects (trace)

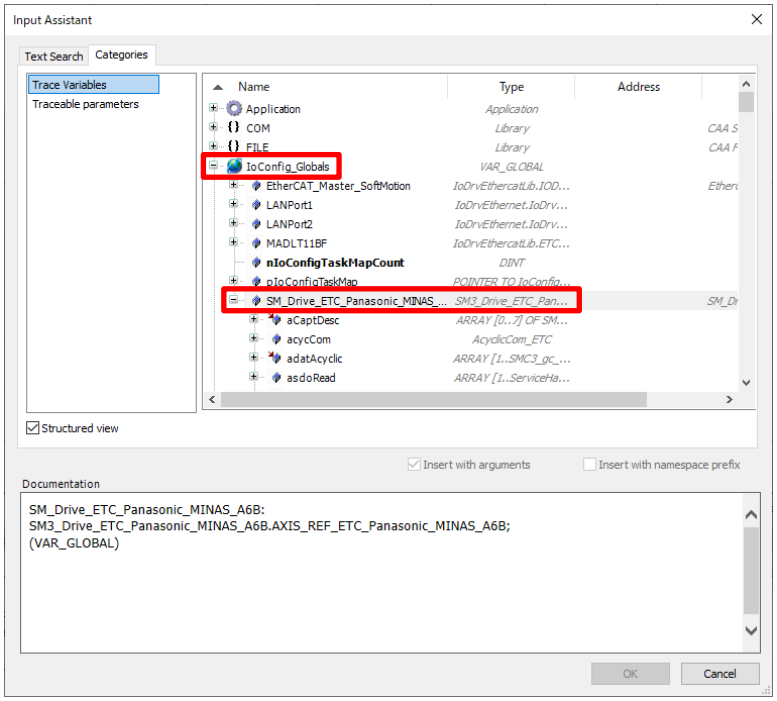
Right-click the **Application** object and select **Add Object** and then **Trace**.
The **Add Trace** dialog box will be displayed. Enter a trace name and click **Add**.





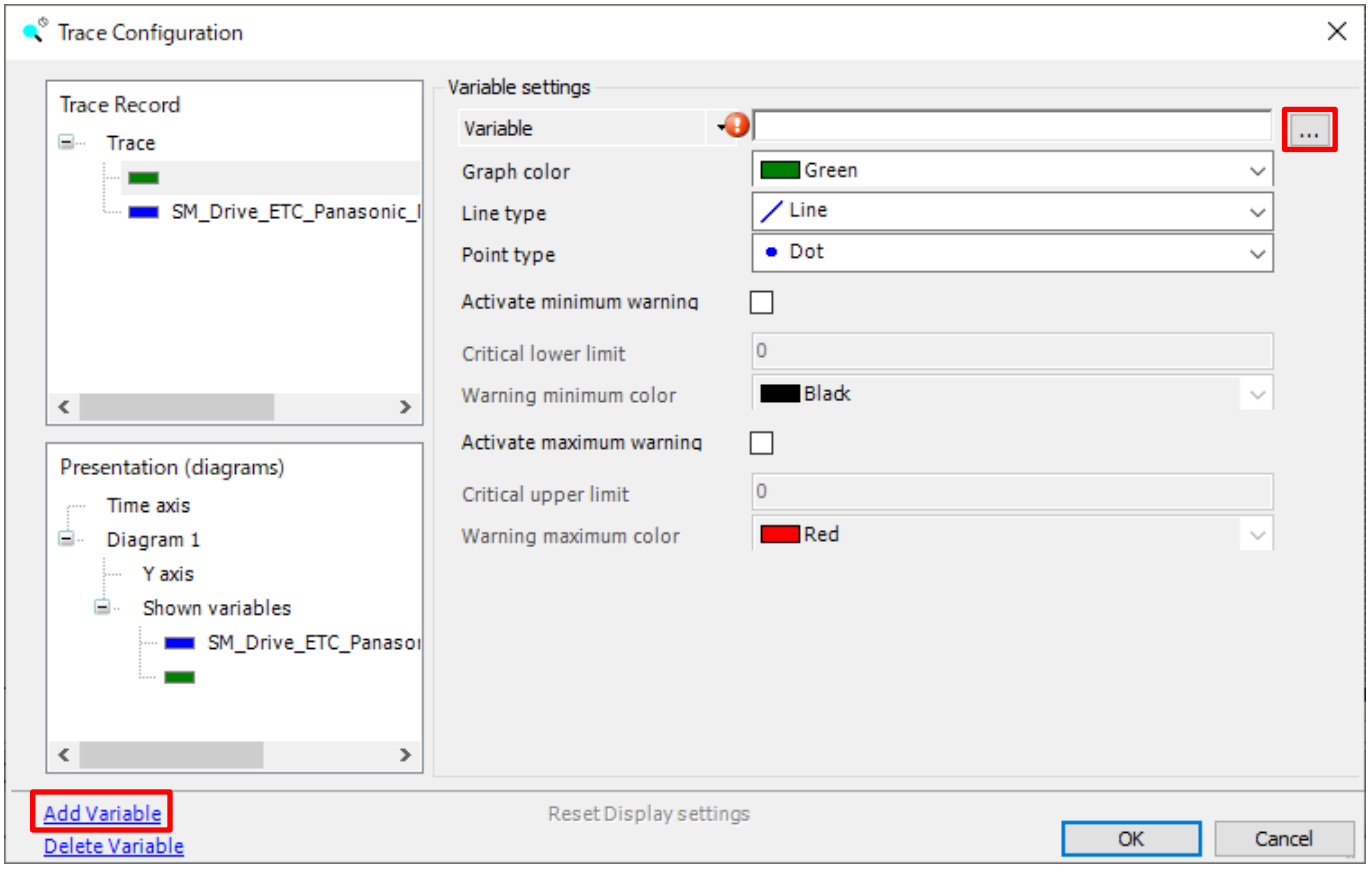
Step 3

In the **Input Assistant** window, select variables to be traced and click **OK**, as below. For the first variable to be traced, select **IoConfig_Globals**, **SM_DRIVE_ETC_Panasonic_MINAS_A6B**, and then **fActPosition**.



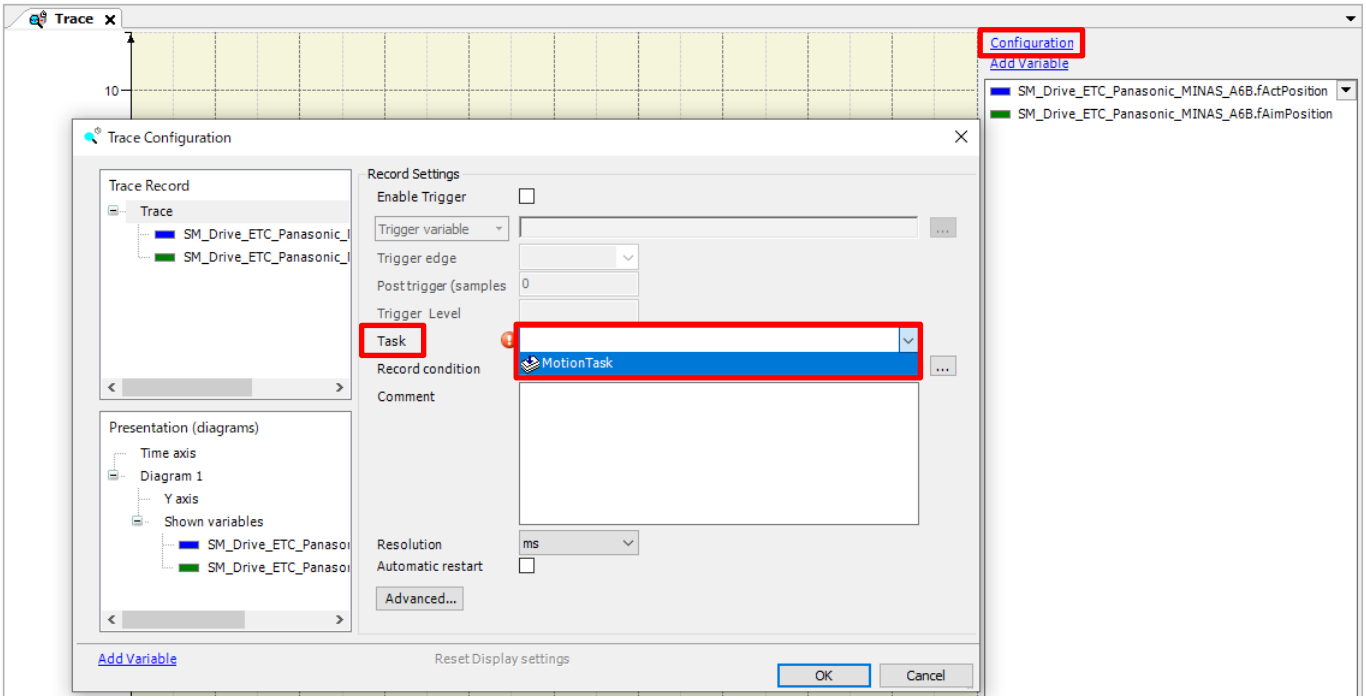
Step 4

After registering the first variable, click **Add Variable**. Click ... on the right side of the **Variable** field to add fAimPosition, as below. Select **IoConfig_Globals**, **SM_DRIVE_ETC_Panasonic_MINAS_A6B**, and then **fAimPosition** and click **OK**.



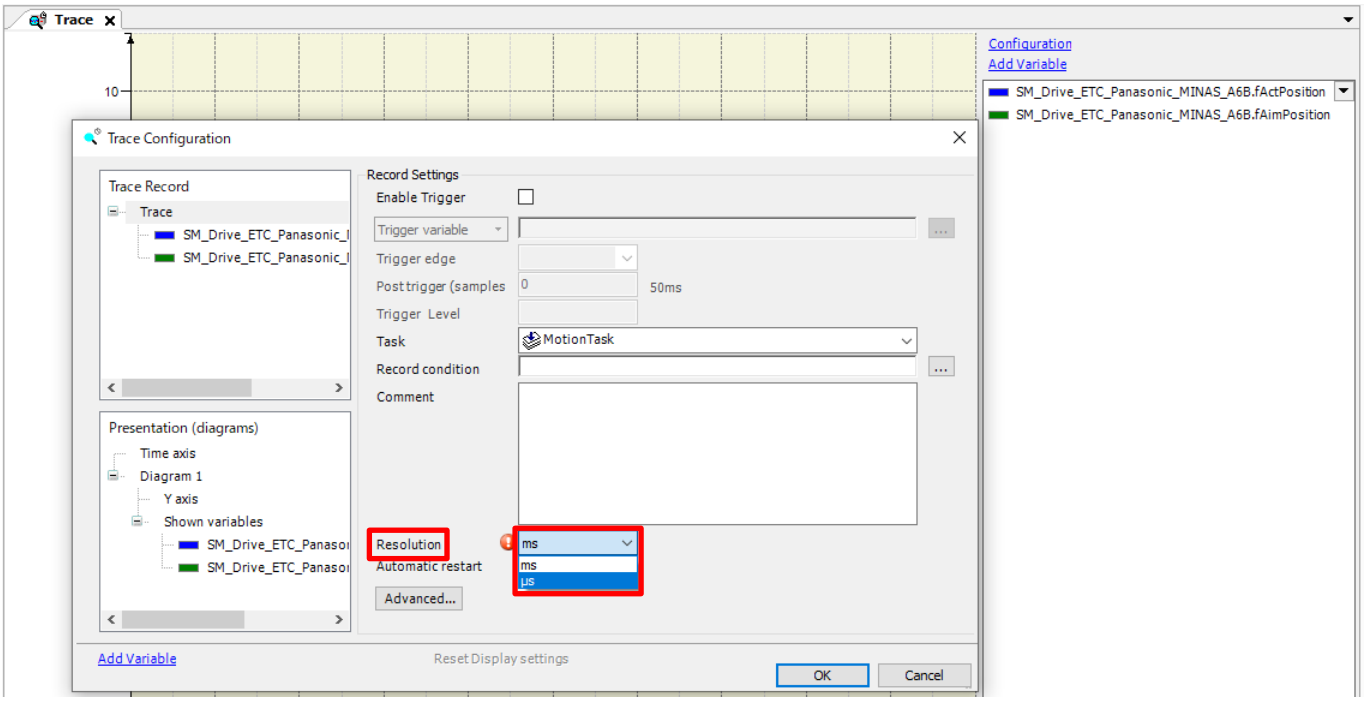
Step 5

Clicking **Configuration** on the top right of the **Trace** window displays the **Trace Configuration** dialog box.
Open the drop-down list of **Task** (required input item) and select **MotionTask**.



Step 6

When a task is selected, **Resolution** becomes a required input item. Open the drop-down list of **Resolution** and select **µs**.



INFO

Task: When tracing a variable related to motion control, select **MotionTask**.

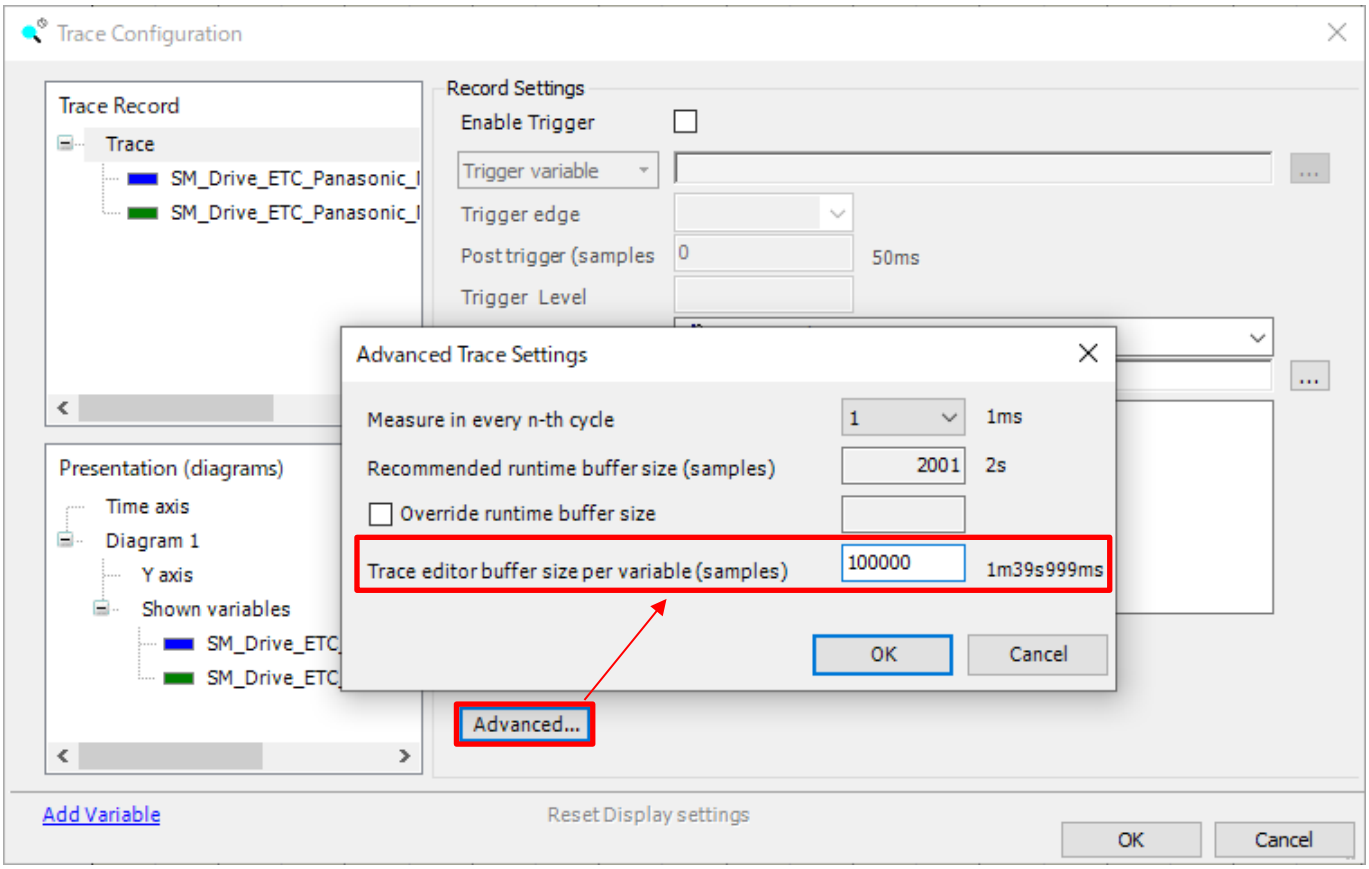
Resolution: The Motion Task interval is 1 ms. Therefore, if **ms** (default) is selected in the **Resolution** drop-down list, a caution message will be output, indicating that sampling resolution is too coarse. As a guide, sampling resolution should be half the interval.

Step 7

After selecting resolution, click **Advanced**.

Change the setting of **Trace editor buffer size per variable (samples)** to 100000.

Trace editor buffer size per variable (samples): Data display area viewed from the horizontal axis (time) of the **Trace** window



When **Trace editor buffer size per variable (samples)** is set to 100000, the buffer size becomes 50 times the recommended runtime buffer size.

Data equivalent to 2 s x 50 = approx. 100 s can be displayed in the **Trace** window.

* This buffer size depends on the PC specifications. Therefore, note that if too large buffer size is set, the tool behavior will become sluggish.

INFO

Measure in every n-th cycle	Measurement interval = Set task interval
Recommended runtime buffer size (samples)	Number of buffers required for the recommended runtime (2 s) To collect trace data precisely, set **Measure in every n-th cycle** to 1 (measurement at every task interval) and prepare buffers equivalent to the recommended size.
Override runtime buffer size	Specifies the size of data to be overwritten in the number of buffers that is specified above Check box cleared: Leaves histories intact without overwriting data Check box selected: Leaves the amount of data that is specified in the override specification field on the right side
Trace editor buffer size per variable (samples)	Data display area viewed from the horizontal axis (time) of the **Trace** window

Step 8

Set xServoON registered in Watch previously to TRUE to execute Servo ON.

Change the value in the **Prepared value** column to <TRUE> and write the setting by pressing the Ctr+F7 keys.

Watch 1

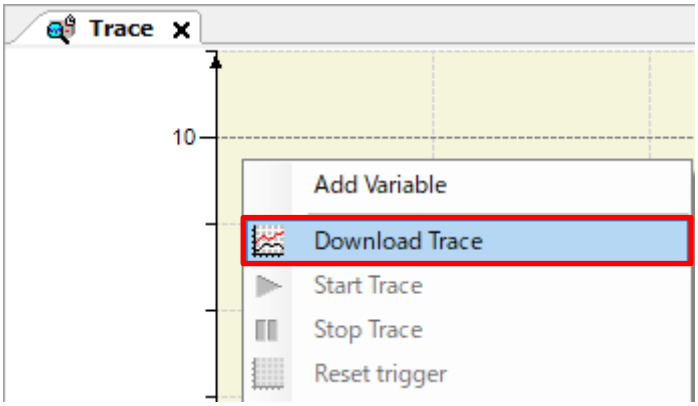
Expression	Application	Type	Value	Prepared value
SM_Drive_ETC_Panasonic_MINAS_A6B.fActPosition	Device.Application	LREAL	0.0006008148193359375	
SM_Drive_ETC_Panasonic_MINAS_A6B.fAimPosition	Device.Application	LREAL	0	
MC_PRG.xServoON	Device.Application	BOOL	FALSE	TRUE
MC_PRG.xHome	Device.Application	BOOL	FALSE	
MC_PRG.xMoveAbs	Device.Application	BOOL	FALSE	

Step 9

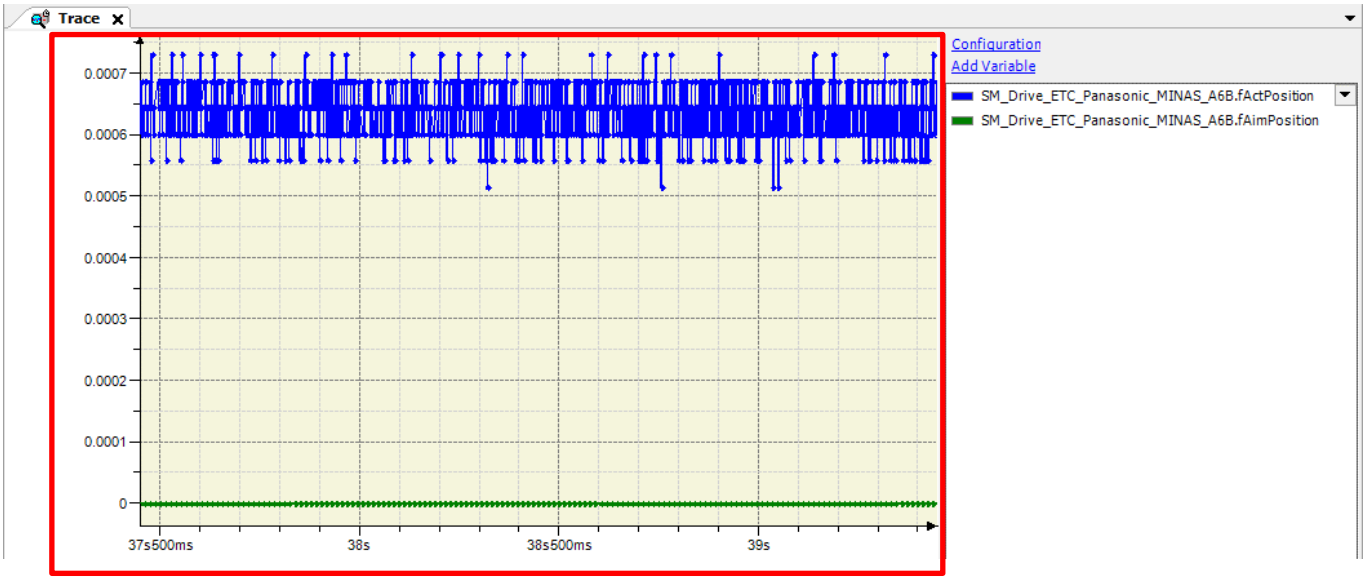
Next, change the setting of xHome to TRUE.

Step 10

Before checking trace operation, right-click in the **Trace** window. Select **Download Trace**.



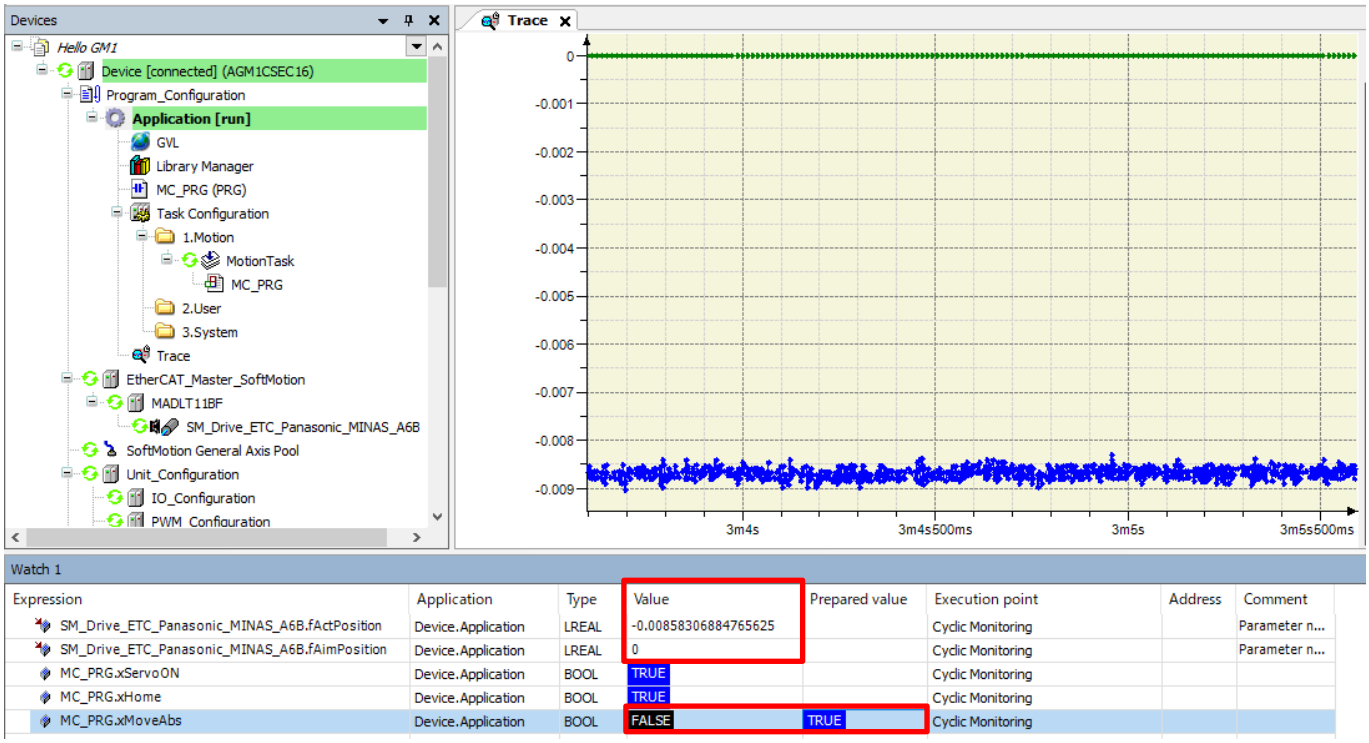
When **Download Trace** is selected, waveforms are displayed.



Step 11

Write <TRUE> to xMoveAbs registered in Watch 1.

Check that fAimPosition and fActPosition registered in Watch 1 during positioning operation contain the target value and current value, respectively.



Watch 1

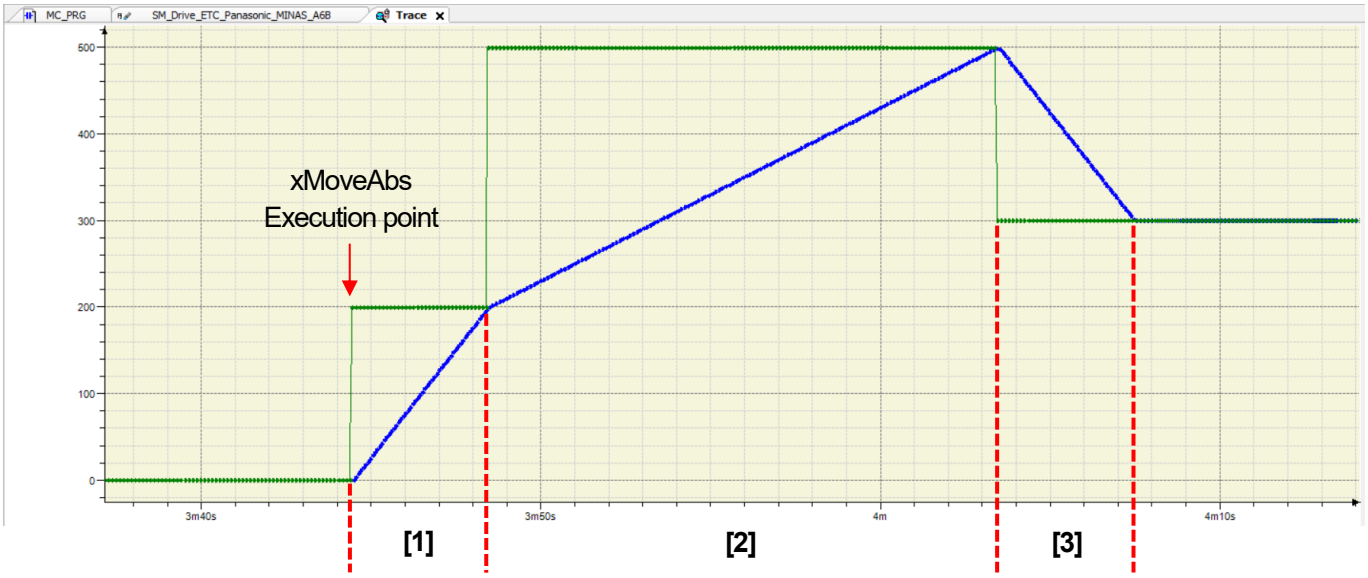
Expression	Application	Type	Value	Prepared value	Execution point	Address	Comment
SM_Drive_ETC_Panasonic_MINAS_A6B.fActPosition	Device.Application	LREAL	-0.00858306884765625		Cyclic Monitoring		Parameter n...
SM_Drive_ETC_Panasonic_MINAS_A6B.fAimPosition	Device.Application	LREAL	0		Cyclic Monitoring		Parameter n...
MC_PRG.xServoON	Device.Application	BOOL	TRUE		Cyclic Monitoring		
MC_PRG.xHome	Device.Application	BOOL	TRUE		Cyclic Monitoring		
MC_PRG.xMoveAbs	Device.Application	BOOL	FALSE	TRUE	Cyclic Monitoring		

Step 12

After positioning operation is complete, right-click in the **Trace** window and select **Stop Trace**.

Blue line: fActPosition (Current position)

Green line: fAimPosition (Target position)



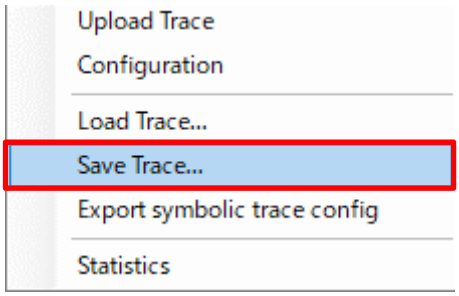
[1] Operation 2) The object moves from the home position to target position [1] (200 mm) (Absolute positioning)

[2] Operation 3) The object moves from target position [1] (200 mm) to target position [2] (500 mm) (Relative positioning)

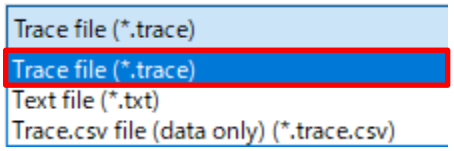
[3] Operation 4) The object moves from target position [2] (500 mm) to target position [3] (300 mm) (Relative positioning)

INFO

By right-clicking in the **Trace** window and selecting **Save Trace**, you can save data in XML, text, or CSV format.



Selecting **Trace file (.trace)** saves the trace setting environment and data without making any changes.
This function is convenient when you perform operation checks on devices in remote locations, for example.



Memo

Revision History

Date of issue	Manual code	Revision details
April 2022	AIM0006_01	First edition

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