



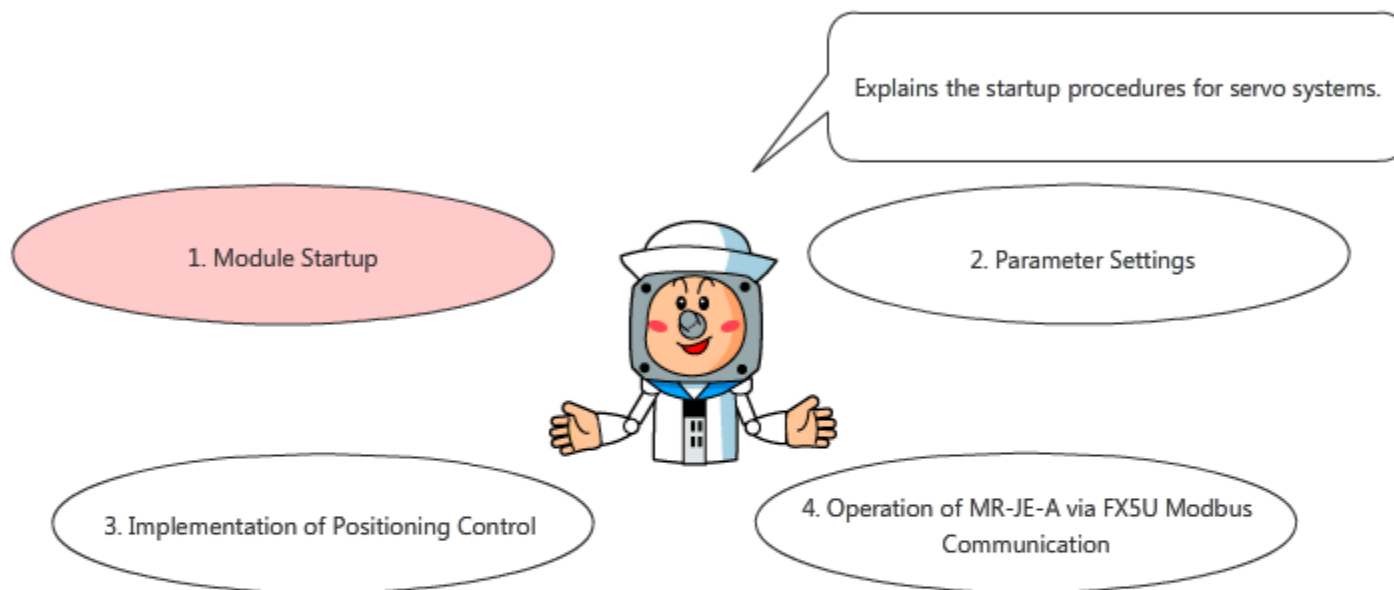
Servo MELSERVO Basics (MR-JE Modbus)

This training course provides instruction on construction methods for servo systems via Modbus connection using the MELSERVO-JE series.

* "Modbus" is a registered trademark of SCHNEIDER ELECTRIC SE.

Introduction Purpose of the Course

This course is intended for individuals who are using the MELSERVO-JE series for the first time to construct a servo system via Modbus connection. The course provides instruction on topics ranging from installation and wiring to test operation and monitoring.



The basic knowledge of AC servos is required to take this course.

For beginners, taking the following courses are recommended.
FA Equipment for Beginners (Servos) course

Introduction Course Structure

The contents of this course are as follows.
We recommend that you start from Chapter 1.

Chapter 1 - Module Startup

Explains the startup procedures for servo systems.

Chapter 2 - Parameter Settings

Explains the parameter settings for the programmable controller and servo amplifier.

Chapter 3 - Performing positioning operation

By using a sample program, explains how to operate the servo motor.

Chapter 4 - Operating MR-JE-A using the FX5U Modbus Communication Function

Explains how to operate the servo amplifier using Modbus-RTU communication for the programmable controller.

Final Test

4 sections in total (9 questions) Passing grade: 60% or higher.

Introduction Screen Switching Operations



Go to the next page		Go to the next page.
Back to the previous page		Back to the previous page.
Move to the desired page		"Table of Contents" will be displayed, enabling you to navigate to the desired page.
Exit the learning		Exit the learning. Window such as "Contents" screen and the learning will be closed.

Introduction Cautions for Use

Safety precautions

When you learn by using actual products, please fully read "Safety Instructions" in the corresponding manuals and use them correctly.

Precautions in this course

- The displayed screens of the software version that you use may differ from those in this course.

The following shows the software used in this course and each software version.

- MELSOFT GX Works3 Ver.1.017T
- MELSOFT MR Configurator2 Ver.1.37P

Reference materials

The following is the reference related to the learning. (You can learn without it.)

Click the reference name to download.

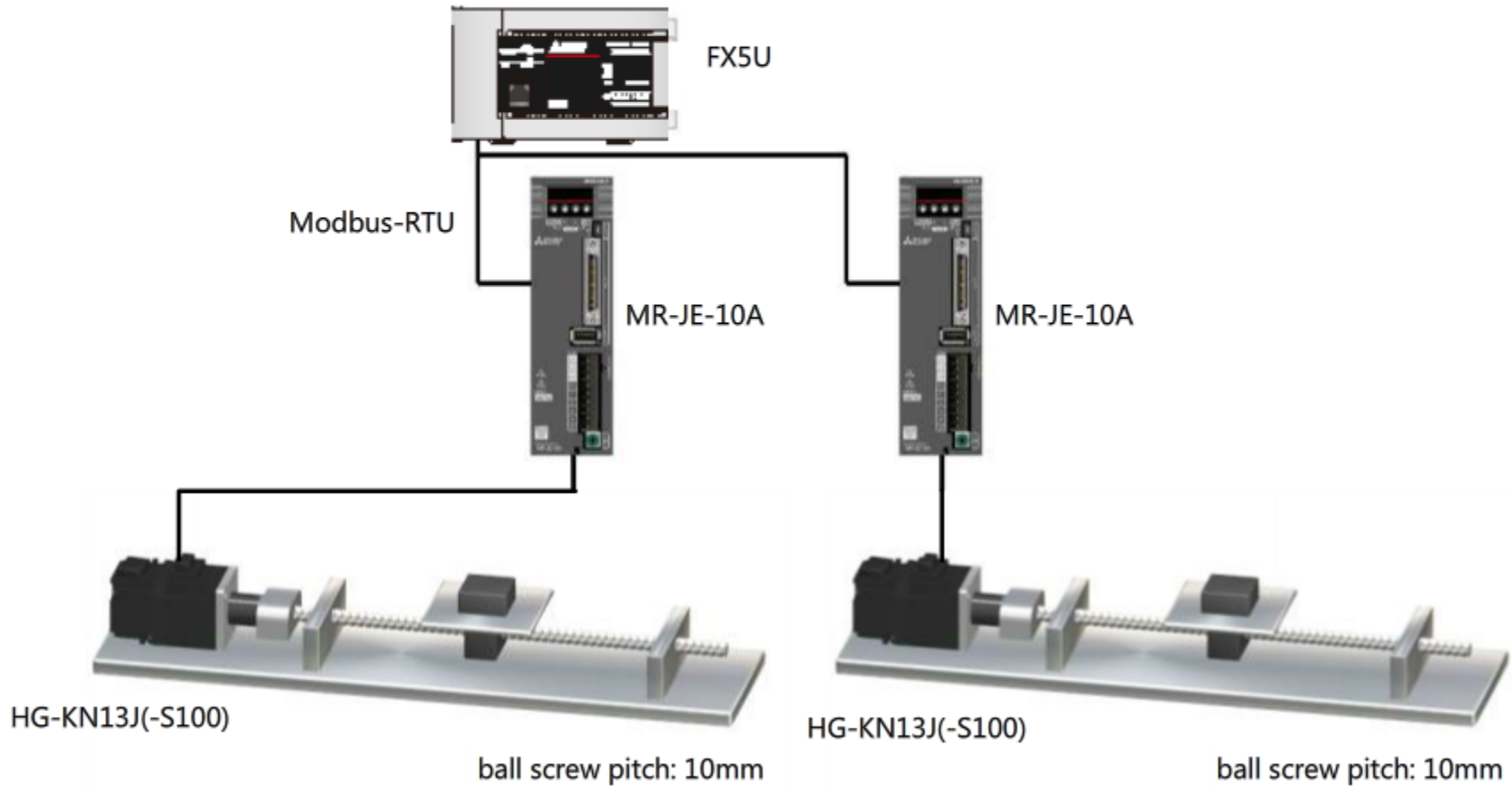
Name of reference	File format	File size
Recordingpaper	Compressed file	6.62 kB

Chapter 1 Module Startup

This chapter covers construction procedures from wiring of each unit to turning on the power.

1.1 System Configuration

The following shows the configuration of the sample system used in this course.



1.2 Startup & Wiring

The wiring diagram in this section is a schematic.
Be sure to read through Instruction Manual for the actual wiring.

1.2.1 Startup Procedure

The following shows the flow of descriptions in this section.

Wiring of Programmable Controller
Power, earth



Wiring of Servo Amplifier
Power, motor power, encoder



Wiring of Communications Cable
Location of terminal
Cable wiring diagram



Wiring of External Input Signals
Forced stop switch, forward/reverse stroke limit

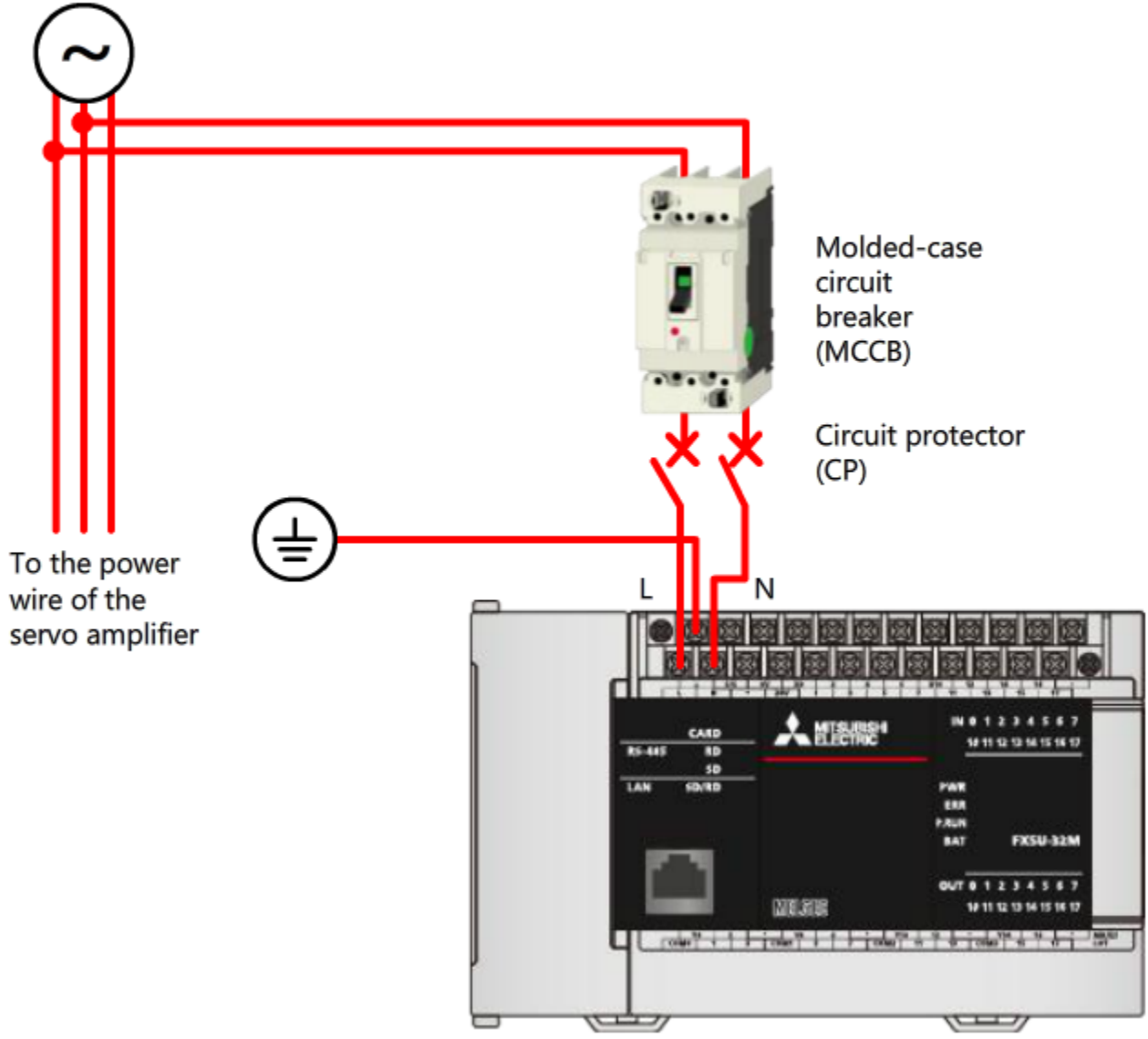


Power-on

1.2.2 Wiring of Programmable Controller

Connect the power wire to the N, L, and earth terminals on the input terminal block of the FX5U programmable controller.

3-phase 200V AC to 240V AC



To the power wire of the servo amplifier

Molded-case circuit breaker (MCCB)

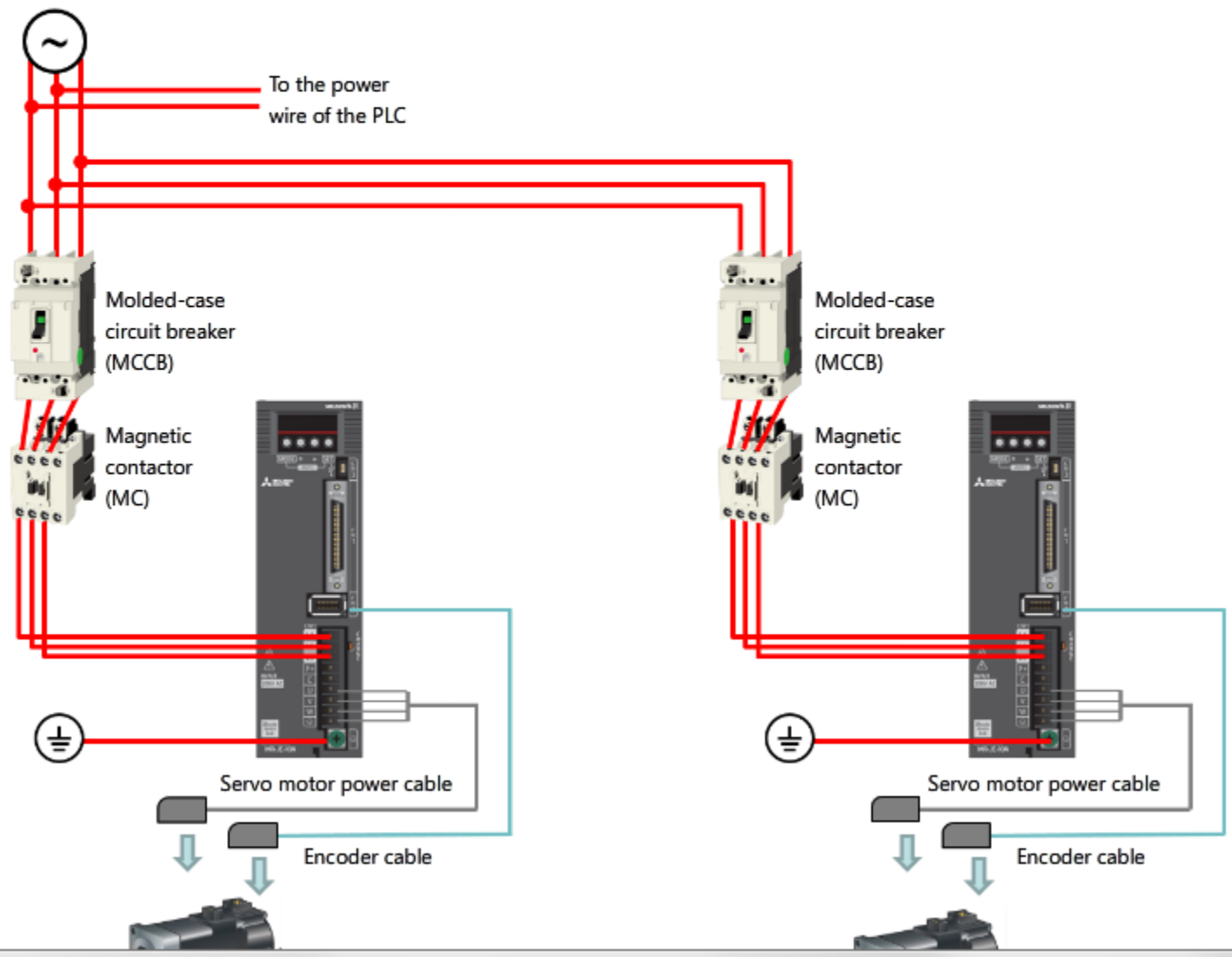
Circuit protector (CP)

L N

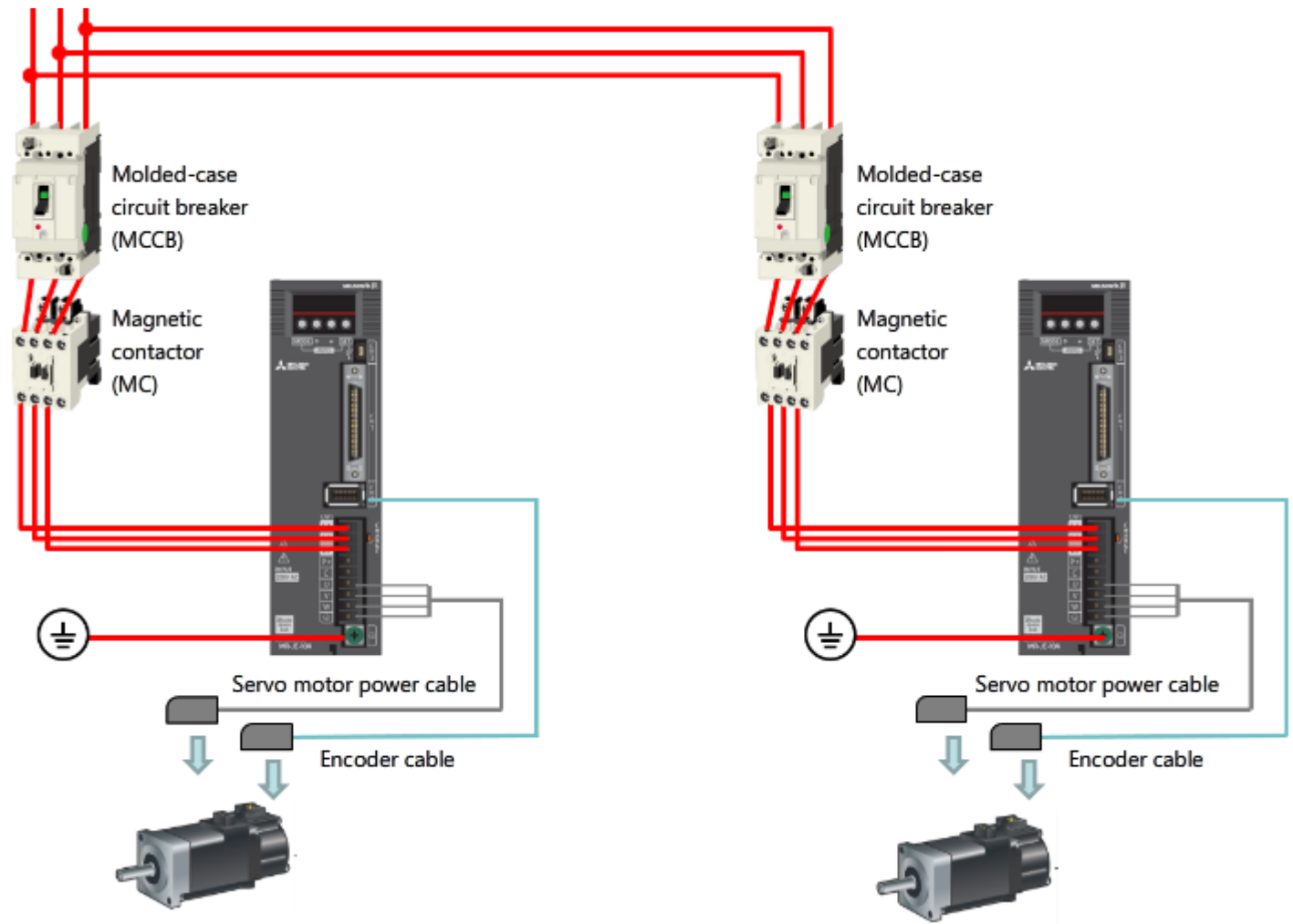
1.2.3 Wiring of Servo Amplifier

Connect the power wire to the L1, L2, and L3 terminals and to the front earth terminal on CNP1 of the servo amplifier.
Connect the servo motor power cable to the U, V, W, and earth terminals on CNP1.
Connect the encoder cable to CN2.

3-phase 200V AC to 240V AC

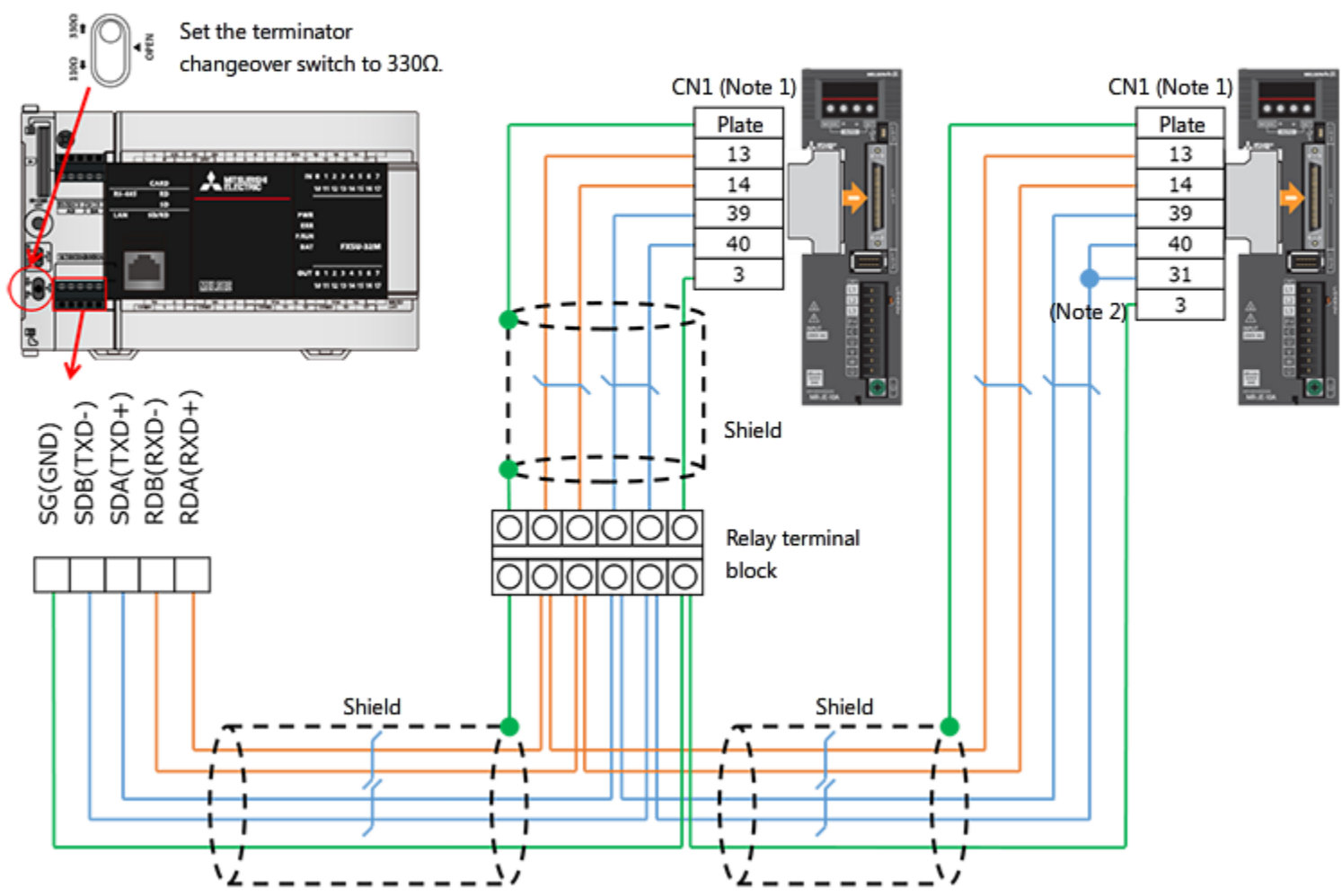


1.2.3 Wiring of Servo Amplifier



1.2.4 Wiring of Communications Cable

Wire the communications cable as shown below. The following is a connection diagram for full duplex wiring. In environments with a low level of noise, keep total extension to 30 meters or less.



(Notes)

1. The terminal names for CN1 of MR-JE-10A are shown below. The LG terminal also exists for pins other than #3.

1.2.4

Wiring of Communications Cable

(Notes)

1. The terminal names for CN1 of MR-JE-10A are shown below. The LG terminal also exists for pins other than #3.

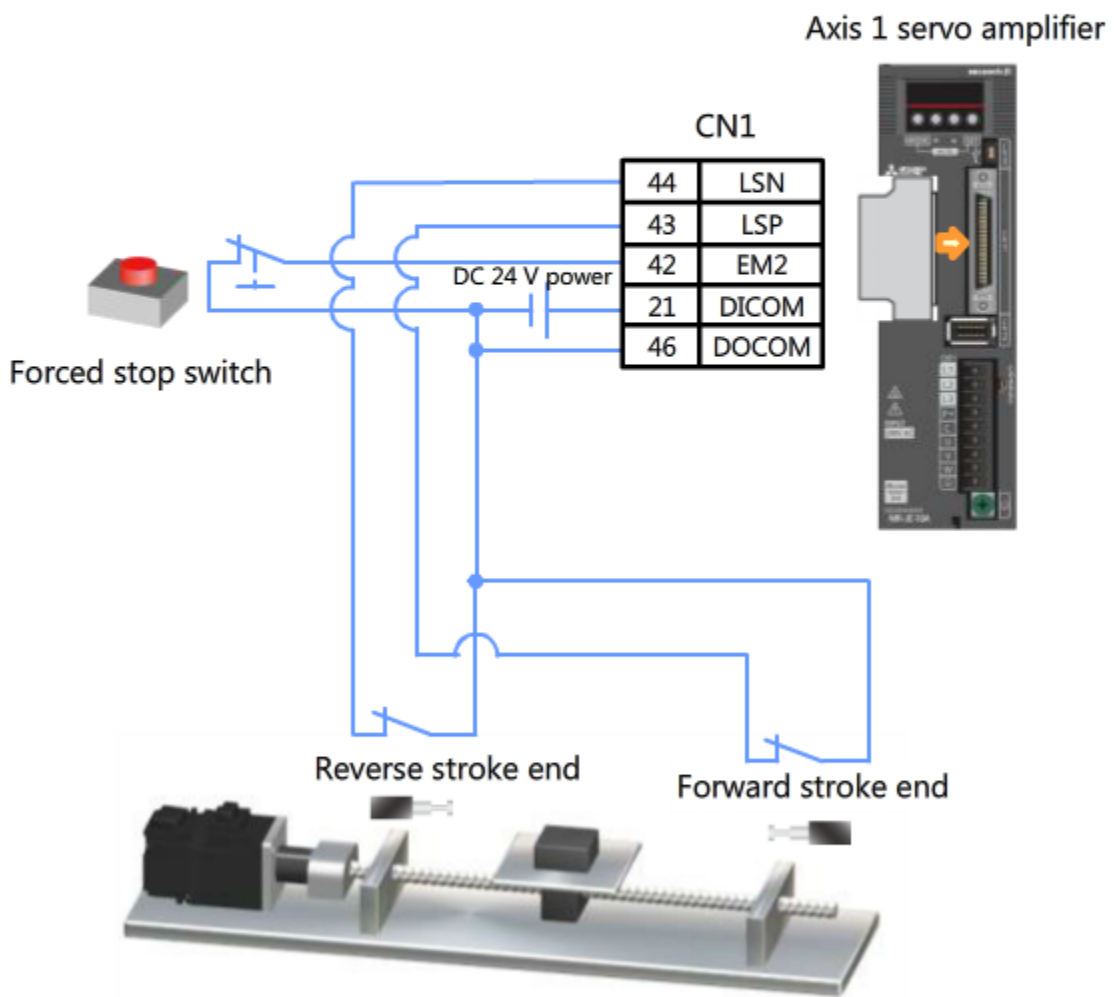
No.	Pin Name
Plate	SD
13	SDP
14	SDN
39	RDP
40	RDN
31	TRE
3	LG

2. Connect RDN and TRE (terminator) for Axis 2 (final axis) only.

1.2.5 Wiring of Servo Amplifier Input Signal

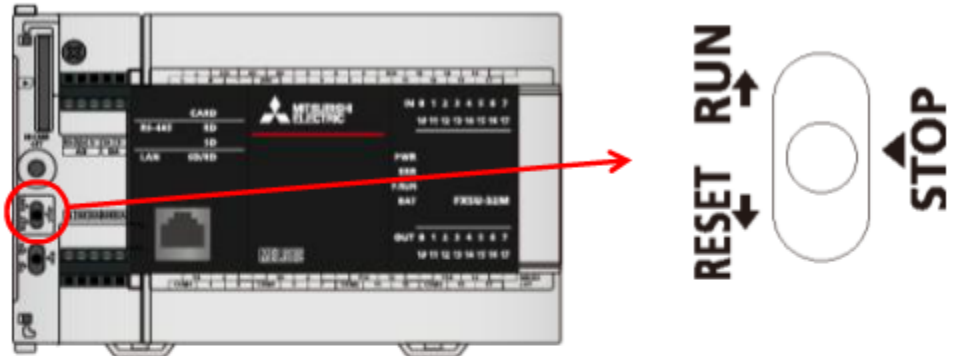
Connect the B-contact switch to each signal for the forced stop signal, forward stroke end, and reverse stroke end of the servo amplifier.

The following is a connection diagram for synchronized input. Also perform the same wiring for the Axis 2 servo amplifier.



1.2.6 Power-on

Confirm that the RUN/STOP/RESET switch for the programmable controller has been set to STOP.



Turn on the power.



If alarm E6.1 occurs for the servo amplifier, check if the forced stop switch is correctly connected to EM2.



To start up the system more safely, it is recommended to check the operation of the motor alone before starting the operation of the machine. For details, refer to the Servo Amplifier Instruction Manual.

1.3**Summary of This Chapter**

In this chapter, you have learned:

- System Configuration
- Startup & wiring

Important points

System Configuration	<ul style="list-style-type: none">• Configuring a system in which the FX5U programmable controller and 2 MR-JE-10A servo amplifiers are connected using Modbus-RTU.
Startup & wiring	<ul style="list-style-type: none">• Perform wiring for the programmable controller power cable, the servo amplifier power cable, the servo motor power cable, the encoder cable, the communication cable, and the external input/output signals.• When performing wiring for the communication cable, connect the terminator to the programmable controller and servo amplifier of the final station. Terminators are installed inside of the FX5U programmable controller and the MR-JE-A servo amplifier.• After completing wiring, turn on the power.

Chapter 2 Parameter Settings

In this chapter, you will conduct parameter settings for the programmable controller and servo amplifier.

The following MELSOFT versions are required for the contents taught in this course.

MELSOFT GX Works3 ver.1.017T or later

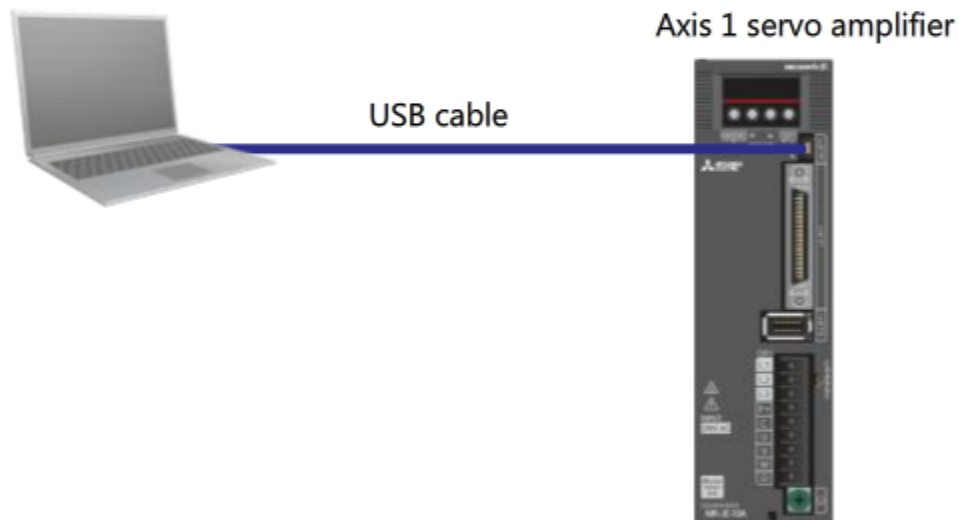
MELSOFT MR Configurator2 ver.1.37P or later (note)

(note) MR Configurator2 is installed at the same time as GX Works3. You do not need to separately purchase MR Configurator2.

2.1 Settings for Servo Amplifier

2.1.1 Connecting the Servo Amplifier and PC

Use a USB cable to connect the servo amplifier and PC.
At the servo amplifier, connect the USB cable to CN3.



2.1.2

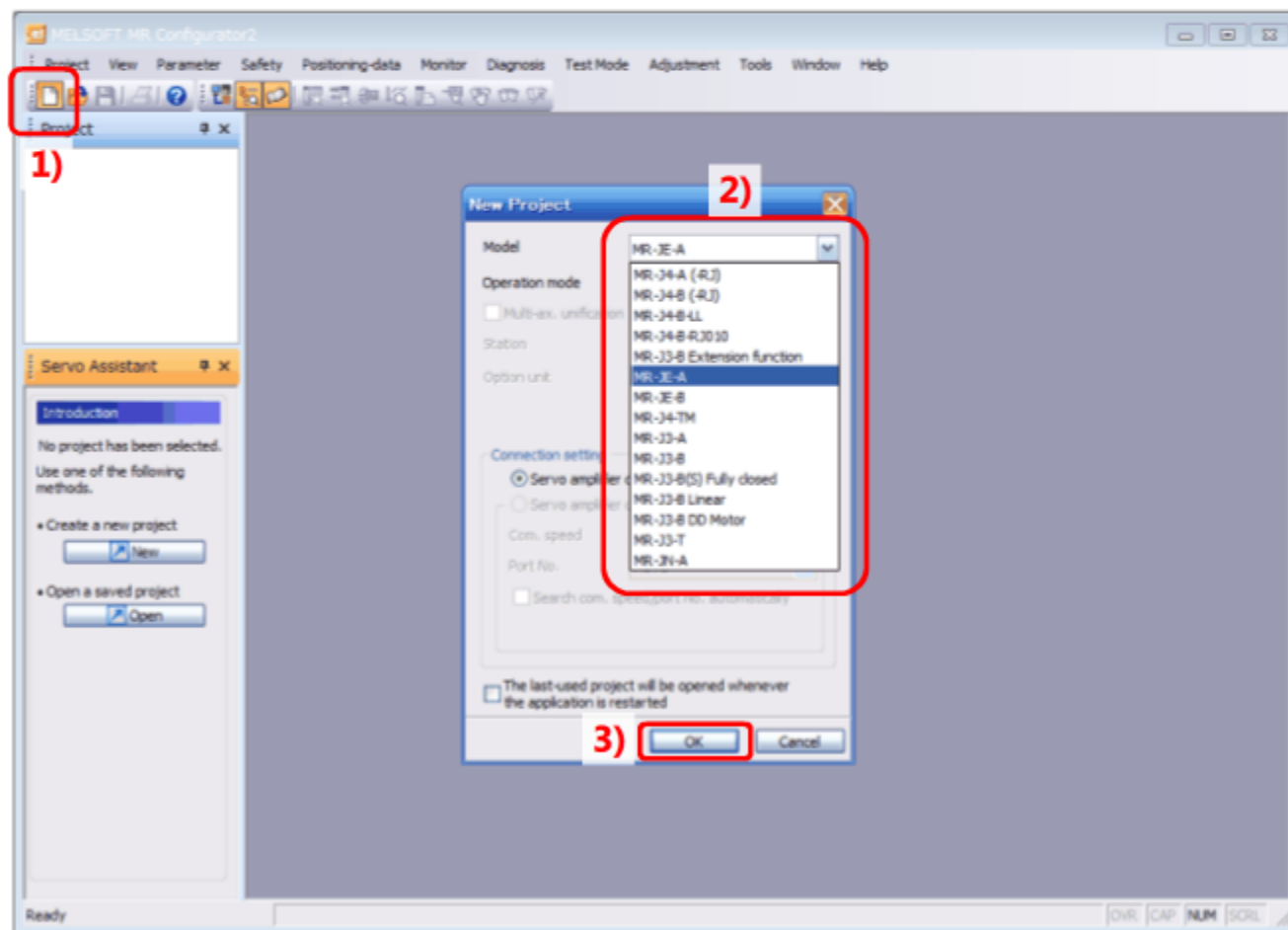
Parameter Settings for Axis 1

(1) Start MR Configurator2 and create a new project.

1) Click the Create New Project icon on the menu bar.

2) At the Create New Project screen, select "MR-JE-A" from the drop-down list for model types.

3) Click [OK].



2.1.2 Parameter Settings for Axis 1

(2) Specify settings to enable reading and writing for all parameters.

- 1) Double-click [Parameter] in the project tree.
- 2) At the Parameters Setting screen, click [List Display] – [Basic].
- 3) Select [PA19] and set the parameter to "00AB."
- 4) With PA19 selected, click the [Selected Items Write] button.
- 5) After writing to the servo amplifier has finished, turn the power on again.

The screenshot shows the 'Parameter Setting' window for Axis 1. The 'Function display' pane has 'Basic' selected. The parameter table is as follows:

No.	Abbr.	Name	Units	Setting range	Axis 1
PA01	*STY	Operation mode		1000-1007	0000
PA02	*REG	Regenerative option		0000-0006	0000
PA03	*ABS	For manufacturer setting		0000-0000	0000
PA04	*AOP1	Function selection A-1		0000-2000	2000
PA05	*FBP	Number of command input pulses per revolution		3000-1000000	10000
PA06	CMX	Elec. gear numerator (Cmd. pls. mult. factor num.)		1-16777215	8192
PA07	CDV	Elec. gear denominator (Cmd. pls. mult. factor den.)		1-16777215	625
PA08	ATU	Auto tuning mode		0000-0004	0001
PA09	RSP	Auto tuning response		1-40	16
PA10	INP	In-position range		0-65535	100
PA11	TLP	Forward rotation torque limit	%	0.0-100.0	100.0
PA12	TLN	Reverse rotation torque limit	%	0.0-100.0	100.0
PA13	*PLS5	Command pulse input status		0000-0412	0100
PA14	*POL	Rotation direction selection		0-1	0
----	*ENR	Encoder output pulse	pulse/rev	1-4194304	4000
----	*ENR2	Encoder output pulse 2		1-4194304	1
----	----	For manufacturer setting		0000-0000	0000
PA19	*BLK	Parameter block		0000-FFFF	00AB
PA20	*TDS	Tough drive setting		0000-1100	0000
PA21	*AOP3	Function selection A-3		0000-1001	0001
PA22	*PCS	For manufacturer setting		0000-0000	0000
PA23	DRAT	Drive recorder arbitrary alarm trigger setting		0000-FFFF	0000
PA24	ACP4	Function selection A-4		0000-0002	0000
PA25	OTH0V	One-touch tuning - Overshoot permissible level	%	0-100	0
PA26	*AOP5	Function selection A-5		0000-00A1	0000
PA27	----	For manufacturer setting		0000-0000	0000
PA28	----	For manufacturer setting		0000-0000	0000
PA29	----	For manufacturer setting		0000-0000	0000
PA30	----	For manufacturer setting		0000-0000	0000



2.1.2

Parameter Settings for Axis 1

(3) Confirm that reading and writing has been enabled for all parameters.

- 1) Click the [Read] button on the Parameter Settings screen.
- 2) Confirm that the number of configurable parameter items shown in the List Display has increased.

The screenshot shows the 'Parameter Setting' window for 'Axis 1'. The 'Read' button is highlighted with a red box and labeled '1)'. The 'List display' section is expanded to show a table of parameters. The 'Option setting' sub-section is highlighted with a red box and labeled '2)'. The table lists parameters PA01 through PA30 with their respective names, units, and setting ranges.

No.	Abbr.	Name	Units	Setting range	Axis 1
PA01	*STY	Operation mode		1000-1007	1000
PA02	*REG	Regenerative option		0000-0006	0000
PA03	*ABS	For manufacturer setting		0000-0000	0000
PA04	*AOP1	Function selection A-1		0000-2000	2000
PA05	*FBP	Number of command input pulses per revolution		1000-1000000	10000
PA06	CMX	Elec. gear numerator (Cmd. pls. mult. factor num.)		1-16777215	8192
PA07	CDV	Elec. gear denominator (Cmd. pls. mult. factor den.)		1-16777215	625
PA08	ATU	Auto tuning mode		0000-0004	0001
PA09	RSP	Auto tuning response		1-40	16
PA10	INP	In-position range		0-65535	100
PA11	TLP	Forward rotation torque limit	%	0.0-100.0	100.0
PA12	TLN	Reverse rotation torque limit	%	0.0-100.0	100.0
PA13	*PLSS	Command pulse input status		0000-0412	0100
PA14	*POL	Rotation direction selection		0-1	0
PA15	*ENR	Encoder output pulse	pulse/rev	1-4194304	4000
PA16	*ENR2	Encoder output pulse 2		1-4194304	1
PA17		For manufacturer setting		0000-0000	0000
PA18		For manufacturer setting		0000-0000	0000
PA19	*BLK	Parameter block		0000-FFFF	00AB
PA20	*TDS	Tough drive setting		0000-1110	0000
PA21	*AOP3	Function selection A-3		0000-1001	0001
PA22	*PCS	For manufacturer setting		0000-0000	0000
PA23	DRAT	Drive recorder arbitrary alarm trigger setting		0000-FFFF	0000
PA24	AOP4	Function selection A-4		0000-0002	0000
PA25	OTHOV	One-touch tuning - Overshoot permissible level	%	0-100	0
PA26	*AOP5	Function selection A-5		0000-00A1	0000
PA27		For manufacturer setting		0000-0000	0000
PA28		For manufacturer setting		0000-0000	0000
PA29		For manufacturer setting		0000-0000	0000
PA30		For manufacturer setting		0000-0000	0000

2.1.2

Parameter Settings for Axis 1

(4) Set the operation mode to Point Table mode.

- 1) Click [List Display] – [Basic].
- 2) Select [PA01] and set the parameter to "1006" (Positioning Mode (Point Table Mode)).

The screenshot shows the 'Parameter Setting' window for 'Axis 1'. The interface includes a menu bar with options like 'Read', 'Set To Default', 'Verify', 'Parameter Copy', and 'Parameter Block'. A toolbar contains 'Open', 'Save As', 'Copy', 'Paste', 'Undo', and 'Redo'. The main area is a table of parameters, with the 'Basic' group selected. The 'PA01' parameter is highlighted, and its value is set to '1006'.

No.	Abbr.	Name	Units	Setting range	Axis 1
PA01	*STY	Operation mode		1000-1007	1006
PA02	*REG	Regenerative option		0000-0006	0000
PA03	*ABS	For manufacturer setting		0000-0000	0000
PA04	*AOP1	Function selection A-1		0000-2000	2000
PA05	*FBP	Number of command input pulses per revolution		1000-1000000	10000
PA06	CMX	Elec. gear numerator (Cmd. pls. mult. factor num.)		1-16777215	8192
PA07	CDV	Elec. gear denominator (Cmd. pls. mult. factor den.)		1-16777215	625
PA08	ATU	Auto tuning mode		0000-0004	0001
PA09	RSP	Auto tuning response		1-40	16
PA10	INP	In-position range		0-65535	100
PA11	TLP	Forward rotation torque limit	%	0.0-100.0	100.0
PA12	TLN	Reverse rotation torque limit	%	0.0-100.0	100.0
PA13	*PLSS	Command pulse input status		0000-0412	0100
PA14	*POL	Rotation direction selection		0-1	0
PA15	*ENR	Encoder output pulse	pulse/rev	1-4194304	4000
PA16	*ENR2	Encoder output pulse 2		1-4194304	1
PA17		For manufacturer setting		0000-0000	0000
PA18		For manufacturer setting		0000-0000	0000
PA19	*BLK	Parameter block		0000-FFFF	00AB
PA20	*TDS	Tough drive setting		0000-1110	0000
PA21	*AOP3	Function selection A-3		0000-1001	0001
PA22	*PCS	For manufacturer setting		0000-0000	0000
PA23	DRAT	Drive recorder arbitrary alarm trigger setting		0000-FFFF	0000
PA24	AOP4	Function selection A-4		0000-0002	0000
PA25	OTHOV	One-touch tuning - Overshoot permissible level	%	0-100	0
PA26	*AOP5	Function selection A-5		0000-00A1	0000
PA27		For manufacturer setting		0000-0000	0000
PA28		For manufacturer setting		0000-0000	0000
PA29		For manufacturer setting		0000-0000	0000
PA30		For manufacturer setting		0000-0000	0000

2.1.2

Parameter Settings for Axis 1

(5) Perform settings for Modbus-RTU communication.

This course uses the settings shown in the table below.

The next page shows how to set parameters for Modbus-RTU communication.

Item	Setting Details
Area code	1 (for Axis 1)
Communication protocol	Modbus-RTU
Communication baud rate	115200 bps
Input device operation	Operate via Modbus-RTU communication
Parity	No parity (stop bit length: 2 bits)
Timeout time	0[s]

2.1.2 Parameter Settings for Axis 1

MELSOFT MR Configurator2 New project - [Parameter Setting]

Project View File Parameter Setting(Z) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help



Parameter Setting x

Axis 1 Read Set To Default Verify Parameter Copy Parameter Block

Open Save As Copy Paste Undo Redo

- Speed control
- Torque control
- Speed setting (S)
- Servo adjustment
 - Basic
 - Extension
 - Filter 1
 - Filter 2
 - Filter 3
 - Vibration control
 - One-touch tuning
- Gain changing
- Digital I/O
 - Basic
 - Extension
- Analog input
- List display
 - Basic
 - Gain/filter
 - Extension
 - I/O
 - Extension 2
 - Extension 3
 - Option setting

Extension 3						Selected Items Write	Single Axis Write
No.	Abbr.	Name	Units	Setting range	Axis1		
PF28	*OVAL	For manufacturer setting		-100-0	0		
PF29	*FOP9	For manufacturer setting		0000-0001	0000		
PF30	RTL	For manufacturer setting		0-0	0		
PF31	FRIC	Machine diagnosis func. - Friction judgement speed	r/min	0-65535	0		
PF32	*VIBT	For manufacturer setting		1-50	50		
PF33	*FOP10	For manufacturer setting		0000-0001	0000		
PF34	*SOP3	For manufacturer setting		0000-1000	0000		
PF35	OTOP1	For manufacturer setting		0000-1111	0000		
PF36	OTOP2	For manufacturer setting		0000-1000	0000		
PF37	*FOP11	For manufacturer setting		0000-0021	0000		
PF38	IPFSV	For manufacturer setting		0000-FFFF	0000		
PF39	IPFRV	For manufacturer setting		0000-FFFF	0000		
PF40	IPFSP	For manufacturer setting		0-20000	0		
PF41	IPFSTB1	For manufacturer setting		0-10000	0		
PF42	IPFSTB2	For manufacturer setting		0-0	0		
PF43	*IPFSTC	For manufacturer setting		0-0	0		
PF44	ORLV	For manufacturer setting		0-100	0		
PF45	*FOP12	Function selection F-12					
PF46	MIC	Modbus-RTU communication - Communication time-out					
PF47		For manufacturer setting					
PF48		For manufacturer setting					

This completes parameter settings for Modbus-RTU communication.

Click to proceed to the next screen.

Docking Help

2.1.2 Parameter Settings for Axis 1

Depending on the control mode set at parameter PA01, the setting contents for parameter PC71 are subject to restrictions like those listed below.

Also, the usable input devices and Modbus registry will change. Use caution regarding this point. For details, refer to technical documentation.

[Setting of [Pr. PC71] for the Modbus-RTU communication]

[Pr.PA01]	Modbus-RTU communication	
	For operating input devices via DI	For operating input devices via the Modbus-RTU communication
___ 0 (Position control mode)	_ 1 _ 1	Unavailable
___ 1 (Position control mode and speed control mode)		
___ 2 (Speed control mode)		
___ 3 (Speed control mode and torque control mode)		
___ 4 (Torque control mode)		
___ 5 (Torque control mode and position control mode)		
___ 6 (Positioning mode (point table method))		_ 0 _ 1
___ 7 (Positioning mode (program method))		

The following are possible for Modbus-RTU communication:
 (1) Monitor
 (2) Parameter settings

The following are possible for Modbus-RTU communication:
 (1) Monitor
 (2) Parameter settings
 (3) Motor operation

2.1.2 Parameter Settings for Axis 1

(6) Perform parameter settings which match the machine.

The following settings are specified for the target system of this course.

1) Set the home position return method to the data set method.



Set "0012" for PT04.

2) In this course, the positioning order method is set to the incremental value command method.



Set "0001" for PT01.

3) Set the electrical gear.

When the pitch is a 10 mm ball screw and there is no reduction gear, the following values are calculated.

$$\frac{PA06}{PA07} = \frac{131072}{10000} = \frac{8192}{625}$$



Set "8192" for PA06 and "625" for PA07.

2.1.2

Parameter Settings for Axis 1

(7) Write the parameters to the servo amplifier.

- 1) At the Parameter Settings screen, click the [Single Axis Write] button.
- 2) After writing of parameters is finished, turn on the servo amplifier power again.

Parameter Setting x

Axis1 Read Set To Default Verify Parameter Copy Parameter Block

Open Save As Copy Paste Undo Redo

Function display

Common

Basic

Extension

Extension 2

Alarm setting

Tough drive

Drive record

Component part

Position control

Speed control

Torque control

Speed setting (%)

Servo adjustment

Basic

Extension

Filter 1

Filter 2

Filter 3

Vibration cor

One-touch t

Gain changing

Digital I/O

Basic

Extension

Analog input

List display

Basic

Gain/filter

Extension

I/O

Extension 2

Extension

No. Abbr. Name Units Setting range Axis1

PC49 For manufacturer setting 0-0 0

PC50 *COPB For manufacturer setting 0000-0000 0000

PC51 RSBP Forced stop deceleration time constant ms 0-20000 100

PC52 RSBS For manufacturer setting 0-1000 0

PC53 RBRX For manufacturer setting 0-20000 0

PC54 RSUP1 Vertical axis freefall prevention compensation amount 0.0001rev -25000-25000 0

PC55 RSUP2 For manufacturer setting 0-0 0

PC56 RSUP3 For manufacturer setting 100-100 100

PC57 *ENRS2 For manufacturer setting 0000-0000 0000

PC58 OSL For manufacturer setting 0-20000 0

PC59 COPC For manufacturer setting 0000-0000 0000

PC60 *COPO Function selection C-D 0000-1001 0001

PC61 *COPE For manufacturer setting 0000-0011 0000

PC62 For manufacturer setting 0000-0000 0000

PC63 For manufacturer setting 0000-0000 0000

PC64 For manufacturer setting 0000-0000 0000

PC65 For manufacturer setting 0000-0000 0000

PC66 LPSPL Mark detection range+ -999-999 0

PC67 LPSPH Mark detection range+ -999-999 0

PC68 LPSNL Mark detection range- -999-999 0

PC69 LPSNH Mark detection range- -999-999 0

PC70 *SNOM Modbus-RTU Communication station number setting 0-247 1

PC71 *COPF Function selection C-F selection 0000-2161 0041

PC72 *COPG Function selection C-G selection 0000-0001 0000

PC73 ERW Error excessive warning level rev 0-1000 0

PC74 For manufacturer setting 0000-0000 0000

PC75 For manufacturer setting 0000-0000 0000

PC76 For manufacturer setting 0000-0000 0000

PC77 For manufacturer setting 0000-0000 0000

PC78 For manufacturer setting 0000-0000 0000

Selected Items Write Single Axis Write



2.1.3 Parameter Settings for Axis 2

At the Axis 2 servo amplifier, change only the settings for the station number for Modbus-RTU communication. Other than setting "2" for PC70, set all other parameters to the same values as for Axis 1.

PA19: Set to "00AB"



Write to the servo amplifier



Turn on power again



Set the following parameters
 PA01 : 1006
 PC70 : 2
 PC71 : 0041
 PF45 : 0002
 PF46 : 0
 PT05 : 0012
 PT01 : 0001
 PA06 : 8192
 PA07 : 625



Write to the servo amplifier



Turn on power again



USB cable

Axis 2 servo amplifier



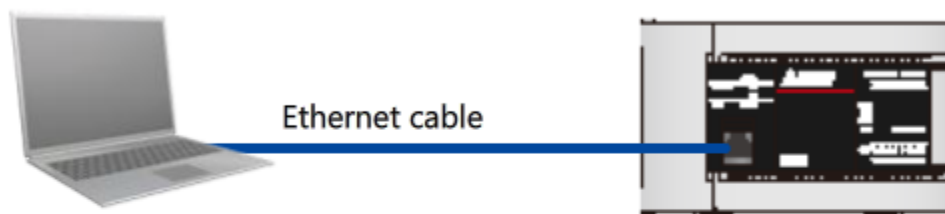
2.2

Settings for Programmable Controller

2.2.1

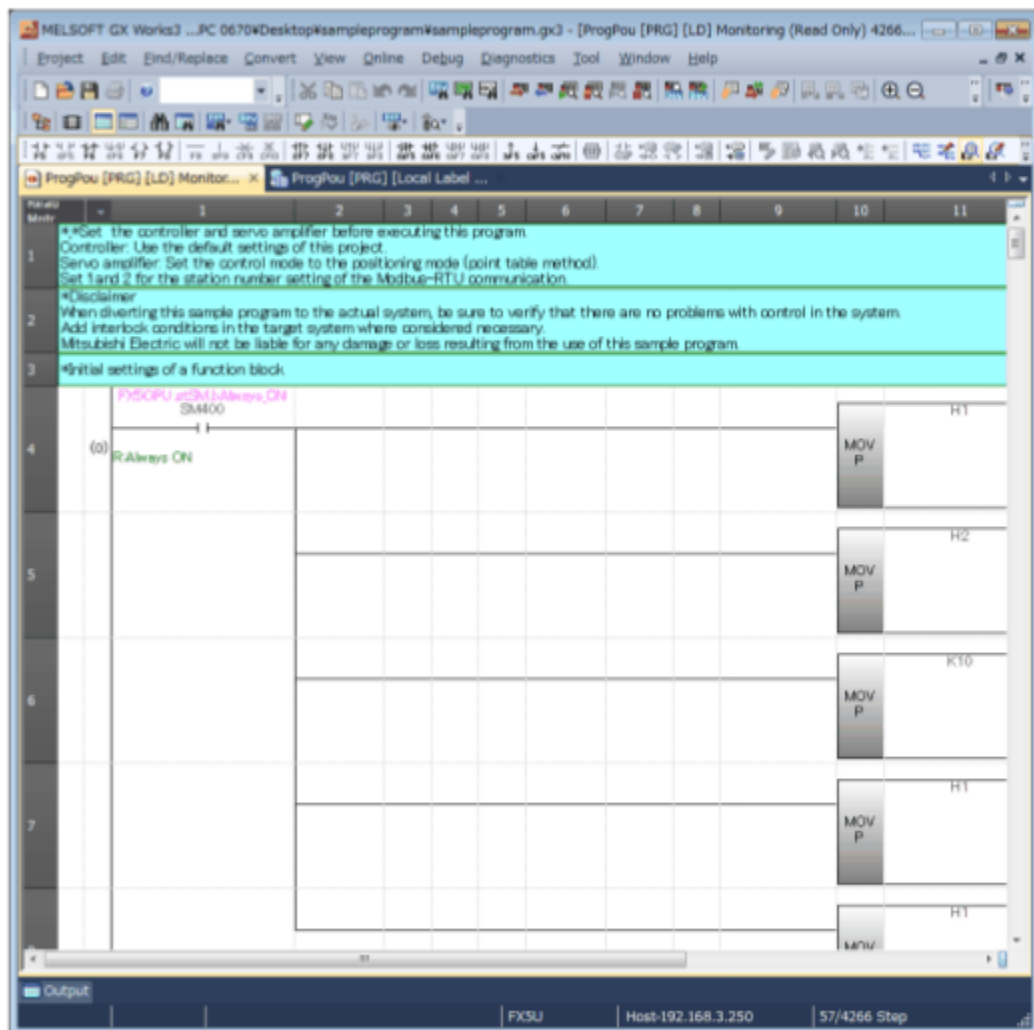
Connect the Programmable Controller and PC

Use an Ethernet cable to connect the FX5U programmable controller and PC.



2.2.2 Download the Sample Project File

Click [here](#) to download the sample project file.
 Open using GX Works3.



2.2.3 Communication Settings for GX Works3

In order to connect the PC and the PLC by Ethernet, confirm settings for the specified connection destination of GX Works3.

(1) At the GX Works3 toolbar, select [Online] – [Specify Connection Destination].

(2) At the PC interface, select "Ethernet Board."

(3) When this screen is displayed, click [Yes].

(4) At the programmable controller interface, select "PLC Module." For the Other Station Setting, select "No Specification."

(5) Click [Communication Test].

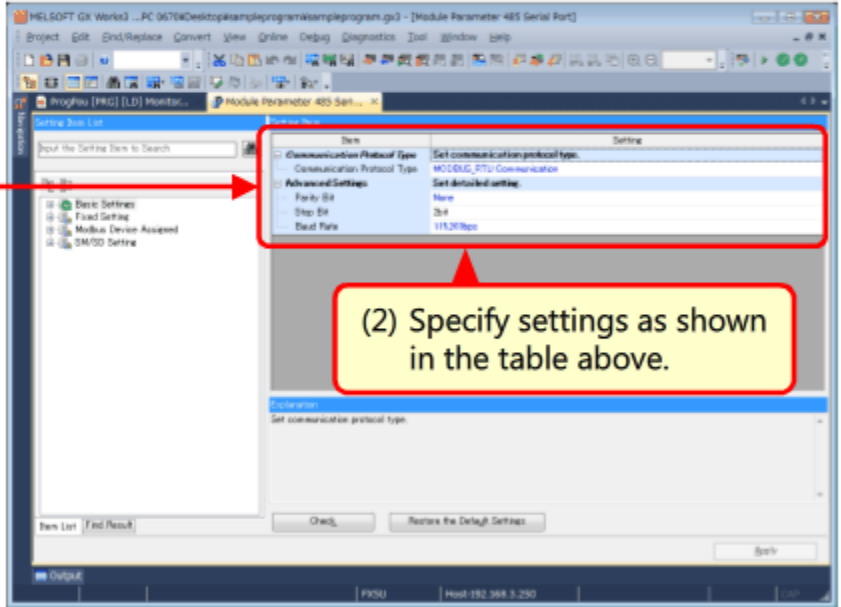
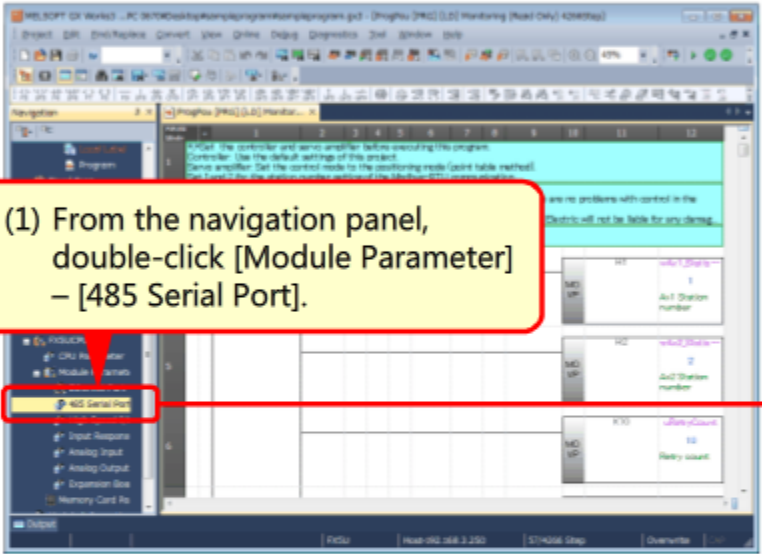
(6) If the communication test is successful, it is possible to communicate with the programmable controller.

2.2.4 Settings for RS-485 Port

Check the settings for Modbus-RTU communication of the programmable controller. It is necessary for these settings to match settings for the servo amplifier. In the case of the sample project, settings have already been specified.

Item	Setting Details
Communication protocol	Modbus-RTU
Parity	No parity
Stop parity	2 bits
Communication baud rate	115200 bps

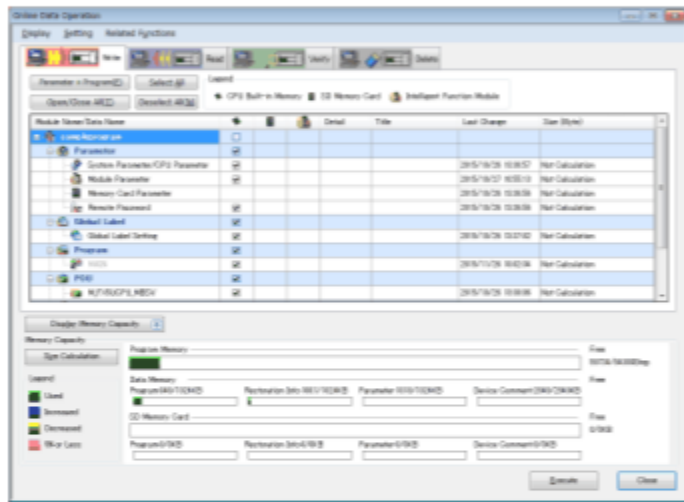
(1) From the navigation panel, double-click [Module Parameter] – [485 Serial Port].



(2) Specify settings as shown in the table above.

2.2.5 Writing the Program

Write the program to the programmable controller.
 After writing is finished, set the RUN/STOP/RESET switch of the programmable controller to RUN.



2.3**Summary of This Chapter**

In this chapter, you have learned:

- Settings for the servo amplifier.
- Settings for the programmable controller.

Important points

Settings for the servo amplifier	<ul style="list-style-type: none">• Specify the Point Table method for the operation mode.• Modbus-RTU communication settings must match settings for the programmable controller.• Set the electric gear in accordance with the machine structure.
Settings for the programmable controller	<ul style="list-style-type: none">• First, specify settings for using Ethernet to connect with the PC.• Modbus-RTU communication settings must match settings for the servo amplifier.

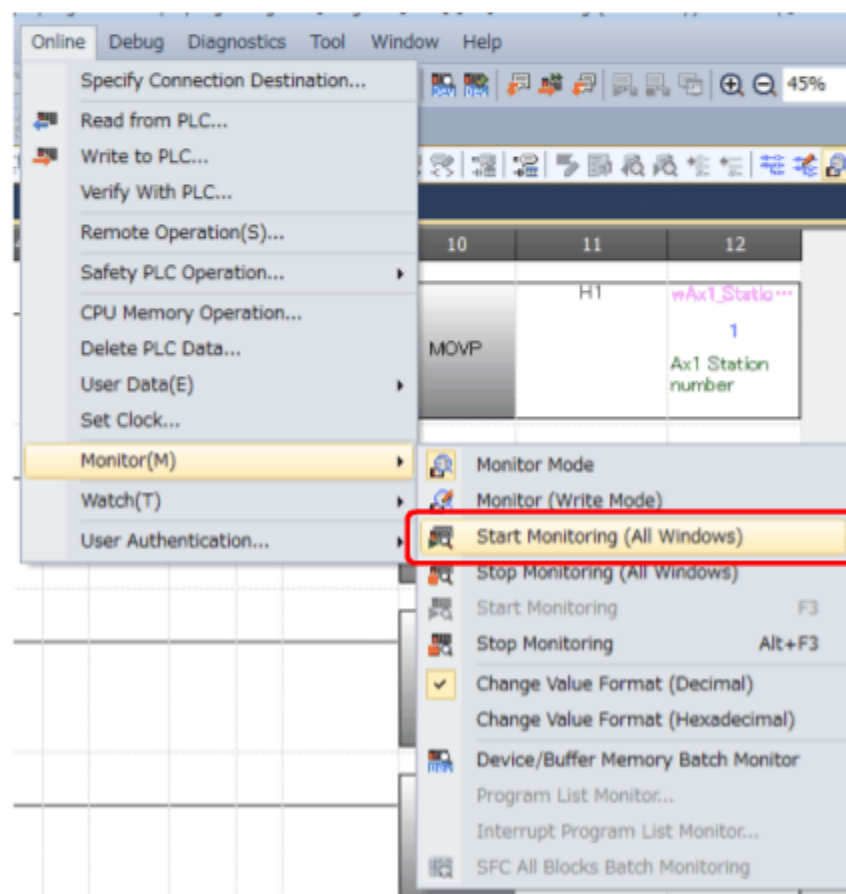
Chapter 3 Performing Positioning Operation

This chapter uses a sample program to explain how to operate the servo motor. The sample program uses function blocks (FBs). With FBs, users can easily create a program and operate motors.

In this chapter, the operation of each contact is performed and shown on the window of GX Works3, not on a program, for the purpose of explanation.

3.1 Monitor Mode

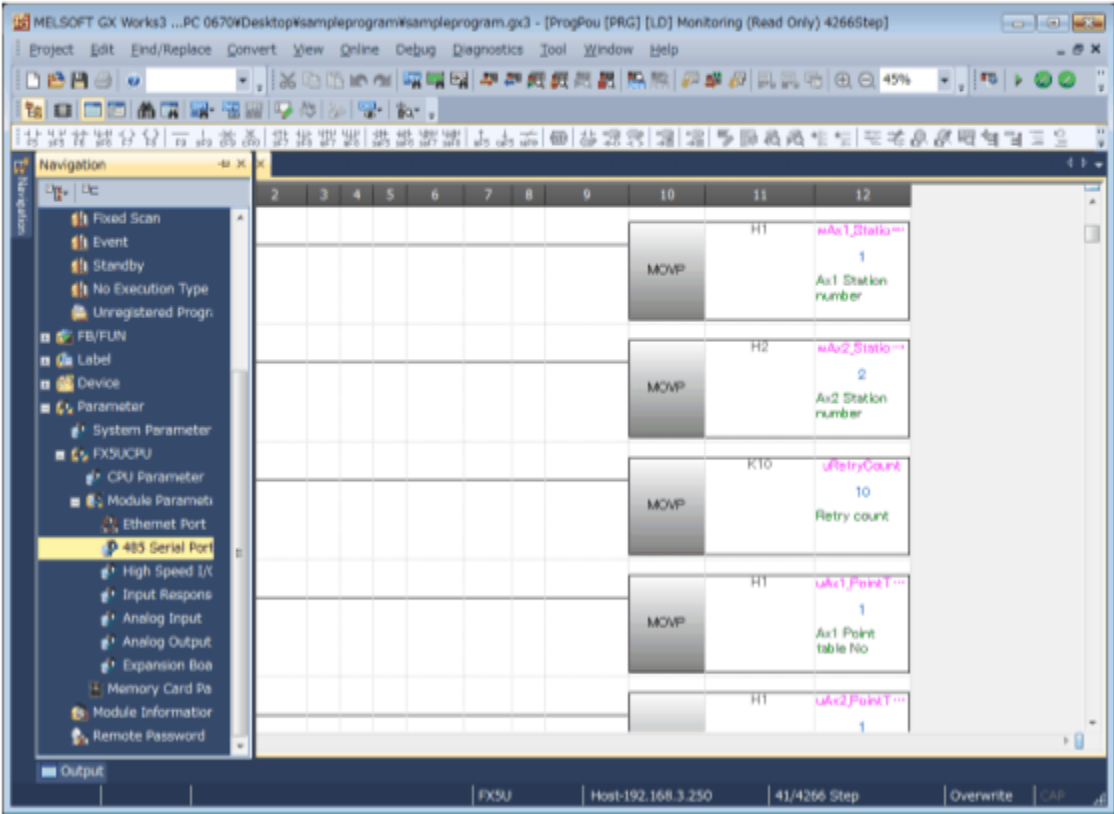
Turn on power for the system.
Confirm that the programmable controller and PC have been connected using an Ethernet cable.
From the GX Works3 menu bar, select [Online] – [Monitor] – [Start Monitor (All Windows)] to activate monitor mode.



3.2 Writing of Point Table Data

3.2.1 Execute Function Block

First, write Point Table data to the Axis 1 servo amplifier.
 In the sample program, data is written via the function block.
 The next page shows how to specify settings for Point Table data using the sample program.



3.2.1 Execute Function Block



MELSOFT GX Works3 ...PC 0670\Desktop\sampleprogram\sampleprogram.gx3 - [ProgPou [PRG] [LD] Monitoring (Read Only) 4266Step]

Project Edit Find/Replace Convert View Online Debug Diagnostics Tool Window Help

ProgPou [PRG] [LD] Monitor... x ProgPou [PRG] [Local Label ...

Read Mntn	1	2	3	4	5	6	7	8	9	10	11	12
18	bAx1_SetPointTa... Ax1 Set point table data					Bi: ... Execution com m...	o_b... Execu tion stat us					bAx1_SetPoi...
19				wA [1] Ax1 Stat ion num	UW:j... 1 Stati on No.	o_b... [1] Normal com pl...					bAx1_SetPoi...	Ax1 SetPointTable ExecutionStat us
20				uA [1] Ax1 Poin t tabl	UW:j... 1 Poin t table No.	o_b... [1] Erro r com pl...						Ax1

hAx1 WriteMode

Output

FX5U | Host-192.168.3.250 | 57/4266 Step

This completes settings for Point Table data using the sample program.

Click to proceed to the next screen.

3.2.2 Check the Servo Amplifier Settings

MELSOFT MR Configurator2 New project - [Point Table]

Project View File Point Table(Z) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help

Project: New project, System Setting, **Axis1:MR-JE-A Stan**, Parameter, Point Table, Program

Servo Assistant: Assistant List, Servo Startup Procedure

Step 1: Amplifier Setting (Amplifier Setting)

Step 2: Test Run (Test Run)

Step 3: Servo Adjustments (Servo Adjustments)

Maintenance of the Servo Amplifier Parts (Maintenance)

Parameter Setting: Point Table

Axis1: Open, Save As, Read, Set to default, Verify, Detailed Setting, Single-step Feed

Copy, Paste, Insert, Delete, Restore, Redo

Point table positioning operation (Incremental value command system)

Selected Items Write Write All Update


	Target position	Rotation speed	Accel. time const.	Decel. time const.	Dwell time	Auxiliary func.	M code
	0.000-999.999	0-65535	0-20000	0-20000	0-20000	0-1,8-9	0-99
No.	mm	r/min	ms	ms	ms		
1	123.456	100	10	10	0	0	0
2	0.000	0	0	0	0	0	0
3	0.000	0	0	0	0	0	0
4	0.000	0	0	0	0	0	0
5	0.000	0	0	0	0	0	0
6	0.000	0	0	0	0	0	0
7	0.000	0	0	0	0	0	0
8	0.000	0	0	0	0	0	0
9	0.000	0	0	0	0	0	0
10	0.000	0	0	0	0	0	0

Docking Help

TARGET POSITION

Set target address (Absolute value) when using this point table

Set the move distance when using this point table as increment

This completes checking of Point Table data.
Click  to proceed to the next screen.

Ready [Station 00] MR-JE-A Standard Servo amplifier connection: USB OVR CAP NUM SCRL

3.2.3

Writing to the Axis 2 Servo Amplifier

Next, write Point Table data to the Axis 2 servo amplifier.

Similar to Axis 1, use the following procedures to write Point Table data to the Axis 2 servo amplifier.

Turn on contact bAx2_SetPointTableData.



Confirm that contact bAx2_SetPoinTable_Completion has been turned on.



Use a USB cable to connect the Axis 2 servo amplifier and the PC.



Open MR Configurator2.



Read out the Point Table data.



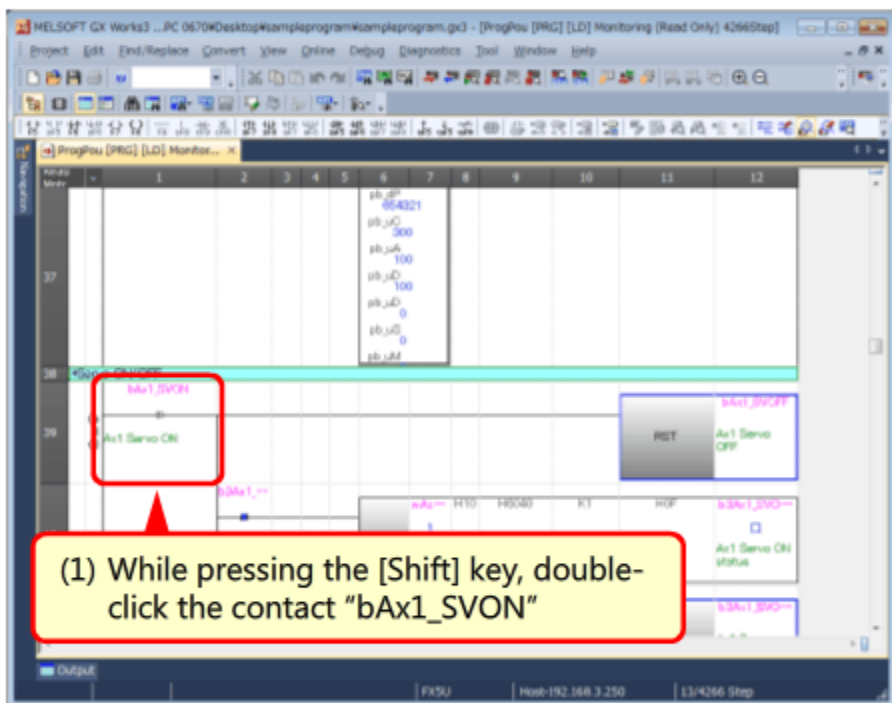
Confirm that Point Table data has been registered.

3.3 Turn On the Servo-on Command

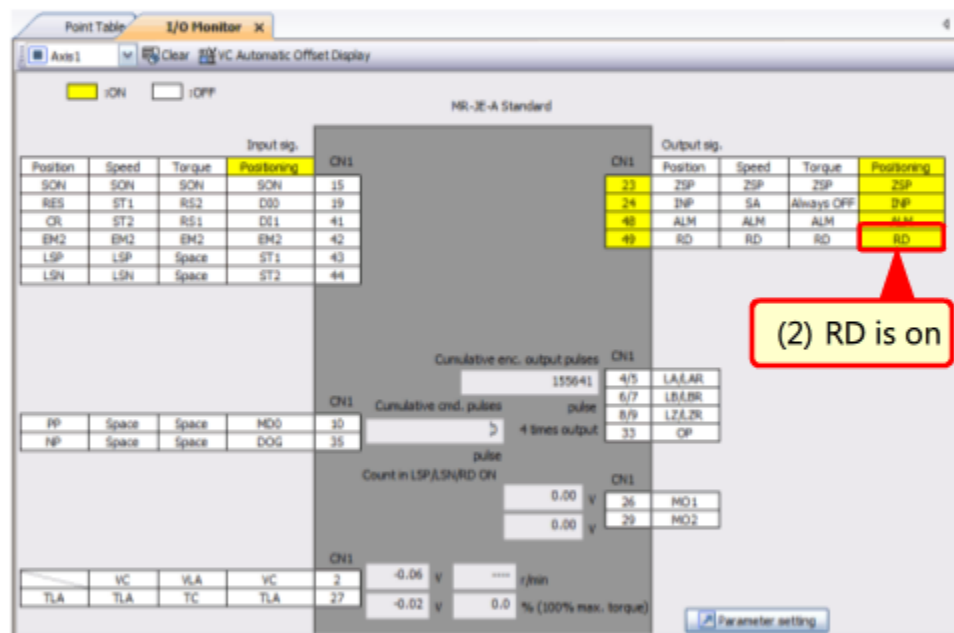
Turn on the servo-on command of Axis 1.

- (1) Turn on the contact bAx1_SVON and the servo will turn on.
- (2) At MR Configurator2, select [Monitor] – [I/O Monitor] and confirm that the RD signal is on.
- (3) Follow the same procedures to turn on the servo for Axis 2. Turn on the contact bAx2_SVON.

<GX Works3>



<MR Configurator2>



3.4 Jog Operation

3.4.1 Add Monitor Items

Before performing JOG operation, add items for Current Position and Command Position to the Monitor Display for MR Configurator2.

(2) Double-click the [Settings] button.

The screenshot shows the MR Configurator2 interface. The 'Monitor' tab is selected in the top toolbar. A red box highlights the 'Display All...' button. A red arrow points from this button to a 'Display All' dialog box. In this dialog box, the 'Setting' button is highlighted with a red box and a red arrow pointing to a callout box.

No.	Item	Units	Axis1
1	Cumulative feedback pulses	pulse	5100070
2	Servo motor speed	r/min	0
3	Droop pulse	pulse	0
4	Cumulative cmd. pulses	pulse	0

(1) From the MR Configurator2 toolbar, select [Monitor] – [Display All].

The 'Monitor Setting' dialog box is shown. It has two main sections: 'Axis selection' and 'Monitor data selection'. In the 'Axis selection' section, 'Axis1' is checked. In the 'Monitor data selection' section, 'Current position' and 'Command position' are checked. A red box highlights these two checked items, with a red arrow pointing to the next screenshot.

(3) Insert checks in the boxes for [Current Position] and [Command Position].

The screenshot shows the 'Monitor Display' table after the settings have been applied. The table now contains 23 items, with 'Current position' and 'Command position' added at the bottom. A red box highlights the last three rows of the table.

No.	Item	Units	Axis1
1	Cumulative feedback pulses	pulse	0
2	Servo motor speed	r/min	0
3	Droop pulse	pulse	0
4	Cumulative cmd. pulses	pulse	0
5	Command pulse frequency	kpulse/s	0
6	Analog speed command voltage	V	-0.06
7	Analog torque command voltage	V	-0.02
8	Regenerative load ratio	%	0
9	Effective load ratio	%	0
10	Peak load ratio	%	0
11	Instantaneous torque	%	0
12	Within one-revolution position	pulse	0
13	ABS counter	rev	0
14	Load inertia moment ratio	times	7.00
15	Bus voltage	V	272
16	Encoder inside temperature	°C	0
19	Number of high drive operations	times	0
20	Unit power consumption	W	8
21	Unit total power consumption	W	0
22	Current position	mm	0.000
23	Command position	mm	0.000

(4) The number of displayed items increases.

3.4.2**Execute JOG Operation**

Use the sample program to execute JOG operation.
The following page shows how to execute JOG operation.

3.4.2 Execute JOG Operation

MELSOFT MR Configurator2 New project - [Display All]

Project View Display All(2) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help

Project

- New project
- System Setting
- Axis1:MR-JE-A Stan**
- Parameter
- Point Table
- Program

Servo Assistant

Assistant List

Servo Startup Procedure

Step 1: Amplifier Setting

Step 2: Test Run

Step 3: Servo Adjustments

Maintenance of the Servo Amplifier Parts

Display All

Font 9pt Line height 12 Clear Restart Pause Setting

No.	Item	Units	Axis1
1	Cumulative feedback pulses	pulse	548366
2	Servo motor speed	r/min	0
3	Droop pulse	pulse	0
4	Cumulative cmd. pulses	pulse	0
5	Command pulse frequency	kpulse/s	0
6	Analog speed command voltage	V	-0.06
7	Analog torque command voltage	V	-0.02
8	Regenerative load ratio	%	0
9	Effective load ratio	%	0
10	Peak load ratio	%	0
11	Instantaneous torque	%	0
12	Within one-revolution position	pulse	24078
13	ABS counter	rev	4
14	Load inertia moment ratio	times	7.00
15	Bus voltage	V	277
16	Encoder inside temperature	°C	0
17	Settling time	ms	75
18	Oscillation detection frequency	Hz	0
19	Number of tough drive operations	times	0
20	Unit power consumption	W	11
21	Unit total power consumption		
22	Current position		
23	Command position		

This completes JOG operation for Axis 1 using the sample program. Use the same procedures to conduct JOG operation for Axis 2.

Click to proceed to the next screen.

3.5**Home Position Return**

Before performing positioning control, always execute home position return.
In the sample program, home position return is executed by the function block.
The next page shows how to execute home position return using the sample program.

3.5 Home Position Return

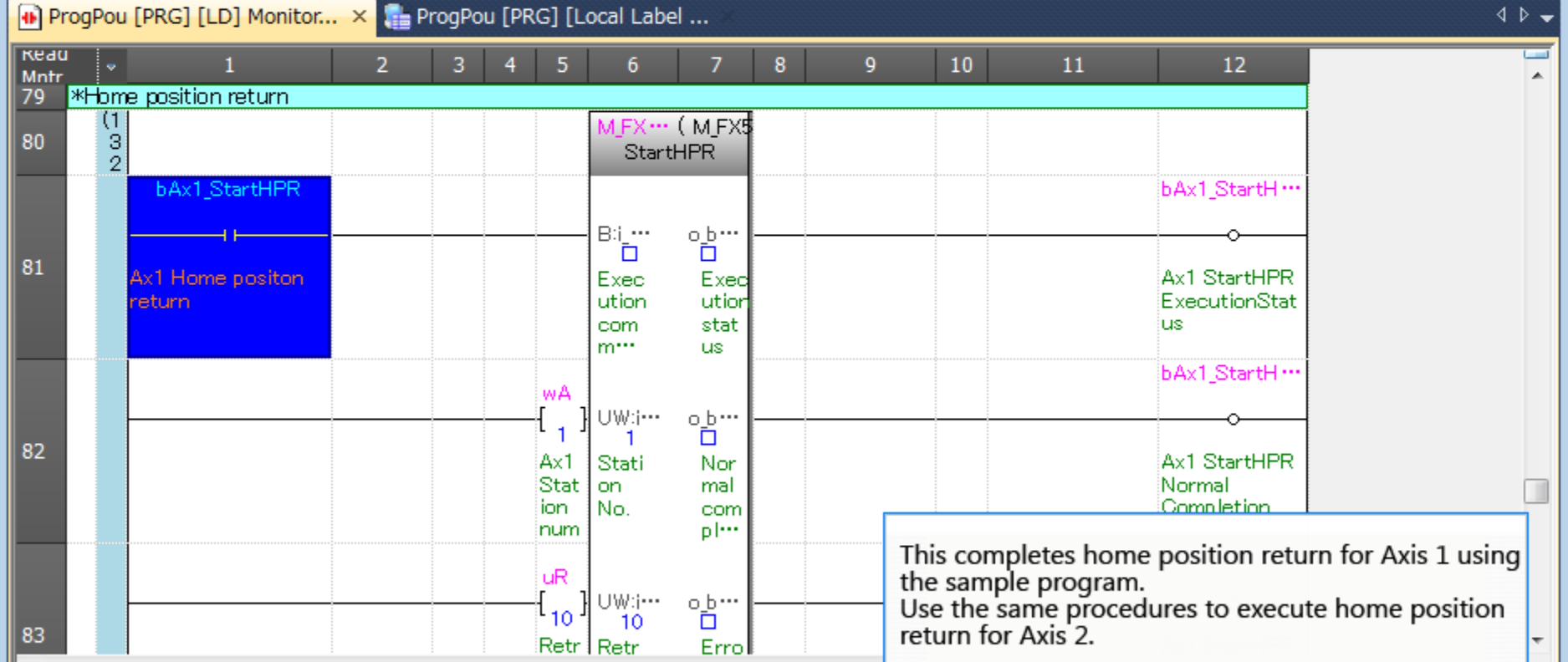


MELSOFT GX Works3 ...PC 0670\Desktop\sampleprogram\sampleprogram.gx3 - [ProgPou [PRG] [LD] Monitoring (Read Only) 4266Step]

Project Edit Find/Replace Convert View Online Debug Diagnostics Tool Window Help



ProgPou [PRG] [LD] Monitor... x ProgPou [PRG] [Local Label ...



This completes home position return for Axis 1 using the sample program. Use the same procedures to execute home position return for Axis 2.

Click to proceed to the next screen.

3.6 Positioning Operation (Point Table Mode)

Execute positioning operation using Point Table mode.
 In the sample program, positioning operating is executed by the function block.
 The next page shows how to execute positioning operation using the sample program.

MELSOFT MR Configurator2 New project - [Display All]

Project View Display All(Z) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help

Project: New project, System Setting, Axis1:MR-JE-A Stan, Parameter, Point Table, Program

Servo Assistant: Assistant List, Servo Startup Procedure (Step 1: Amplifier Setting, Step 2: Test Run, Step 3: Servo Adjustments), Maintenance of the Servo Amplifier Parts

No.	Item	Units	Axis1
1	Cumulative feedback pulses	pulse	3481907
2	Servo motor speed	r/min	0
3	Droop pulse	pulse	0
4	Cumulative cmd. pulses	pulse	0
5	Command pulse frequency	kpulse/s	0
6	Analog speed command voltage	V	-0.06
7	Analog torque command voltage	V	-0.02
8	Regenerative load ratio	%	0
9	Effective load ratio	%	0
10	Peak load ratio	%	0
11	Instantaneous torque	%	0
12	Within one-revolution position	pulse	74035
13	ABS counter	rev	26
14	Load inertia moment ratio	times	7.00
15	Bus voltage	V	271
16	Encoder inside temperature	°C	0
17	Setting time	ms	74
18	Oscillation detection frequency	Hz	0
19	Number of tough drive operations	times	0
20	Unit power consumption	W	11
21	Unit total power consumption	Wh	4
22	Current position	mm	123.456
23	Command position	mm	123.456

Ready [Station 00] MR-JE-A Standard Servo amplifier connection: USB OVR CAP NUM SCRL

3.6

Positioning Operation (Point Table Mode)



MELSOFT MR Configurator2 New project - [Display All]

Project View Display All(2) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help



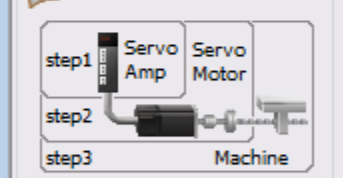
Project

- New project
 - System Setting
 - Axis1:MR-JE-A Standard Servo
 - Parameter
 - Point Table
 - Program

Servo Assistant

Assistant List

Servo Startup Procedure



Step 1: Amplifier Setting
Amplifier Setting

Step 2: Test Run
Test Run

Step 3: Servo Adjustments
Servo Adjustments

Maintenance of the Servo Amplifier Parts
Maintenance

Display All

Font 9pt Line height 12 Clear Restart Pause Setting

No.	Item	Units	Axis1
1	Cumulative feedback pulses	pulse	1863745
2	Servo motor speed	r/min	0
3	Droop pulse	pulse	0
4	Cumulative cmd. pulses	pulse	0
5	Command pulse frequency	kpulse/s	0
6	Analog speed command voltage	V	-0.06
7	Analog torque command voltage	V	-0.02
8	Regenerative load ratio	%	0
9	Effective load ratio	%	0
10	Peak load ratio	%	0
11	Instantaneous torque	%	0
12	Within one-revolution position	pulse	28737
13	ABS counter	rev	14
14	Load inertia moment ratio	times	7.00
15	Bus voltage	V	272
16	Encoder inside temperature	°C	0
17	Settling time	ms	74
18	Oscillation detection frequency	Hz	0
19	Number of tough drive operations	times	0
20	Unit power consumption	W	0
21	Unit total power consumption	W	0
22	Current position	m	0
23	Command position	m	0

This completes positioning operation for Axis 1 using the sample program.
Use the same procedures to execute positioning operation for Axis 2.

Click to proceed to the next screen.

3.7**Summary of This Chapter**

In this chapter, you have learned:

- Point Table Settings
- Turning On the servo-on command
- Jog Operation
- Home Position Return
- Positioning Operation

Important points

Point Table Settings	<ul style="list-style-type: none">• With FBs, users can easily create a program.• In the sample program, Point Table data is registered to the servo amplifier when the function block is executed.
Turning On the servo-on command	<ul style="list-style-type: none">• Enabling servo-on to make the servo amplifier ready to operate will turn on RD.
Jog Operation	<ul style="list-style-type: none">• Before executing JOG operation, it is necessary to specify JOG operation mode.
Home Position Return	<ul style="list-style-type: none">• Home position return can be performed by executing function block.• When using data set mode, the place where home position return is executed is used as the home position.
Positioning Operation	<ul style="list-style-type: none">• Positioning operation can be performed by executing function block.• When using the incremental command method, there is a shift to the forward direction when the forward command is turned on. There is a shift to the reverse direction when the reverse command is turned on.

Chapter 4 Operating MR-JE-A using the FX5U Modbus Communication Function

This chapter explains how to operate the servo amplifier MR-JE-A by using Modbus-RTU communication of the FX5U programmable controller.

4.1 ADPRW Command

When using Modbus communication to send and receive commands from the FX5U programmable controller, use the ADPRW command.



At the storage device, set the station number of the servo amplifier to which you want to send commands.

Set the function code.
MR-JE-A supports the following function codes.
03H (retained register readout)
08H (function diagnosis/communication check)
10H (retained register writing for multiple points)

Set the target Modbus address.

Set the number of access points.
The set value changes depending on the Modbus address.

Specify the device for storing the received data.
Specify the device for storing the sent data.

Specify the bit array for storing the communication status.
(Number of elements: 3)

bit[0]: Turns on while the instruction is executed and turns off in the status other than while the instruction is executed.

bit[1]: Turns on when the instruction is completed normally and turns off when the instruction is started.

bit[2]: Turns on when the instruction is completed with an error and turns off when the instruction is started.

The Modbus registers of the MR-JE-A servo amplifier is listed in the MR-JE-A Servo Amplifier Instruction Manual (Modbus-RTU Protocol).

An example is shown in the figure below.

Control status (Status word: 6041h)

Address	Name	Data type	Read/write	No. of point/ No. of Registers	Continuous read/ continuous write
6041h	Status word (Control status)	2 bytes	Read	1	Impossible

The current control status can be checked using the function code "03h" (Read Holding Registers). The following table lists the bits of this register. The status can be checked with bit 0 to bit 7.

Bit	Description
0	Ready To Switch On
1	Switched On
2	Operation Enabled
3	Fault
4	Voltage Enabled
5	Quick Stop
6	Switch On Disabled
7	Warning
8	Reserved (Note 2)
9	Remote
10	Target reached
11	Internal Limit Active
12 to 13	Operation Mode Specific (Note 1)
14 to 15	Reserved (Note 2)

Note 1. The description changes depending on the control mode.

Note 2. The value at reading is undefined.

4.3 Writing Via the ADPRW Command

4.3.1 Writing Program

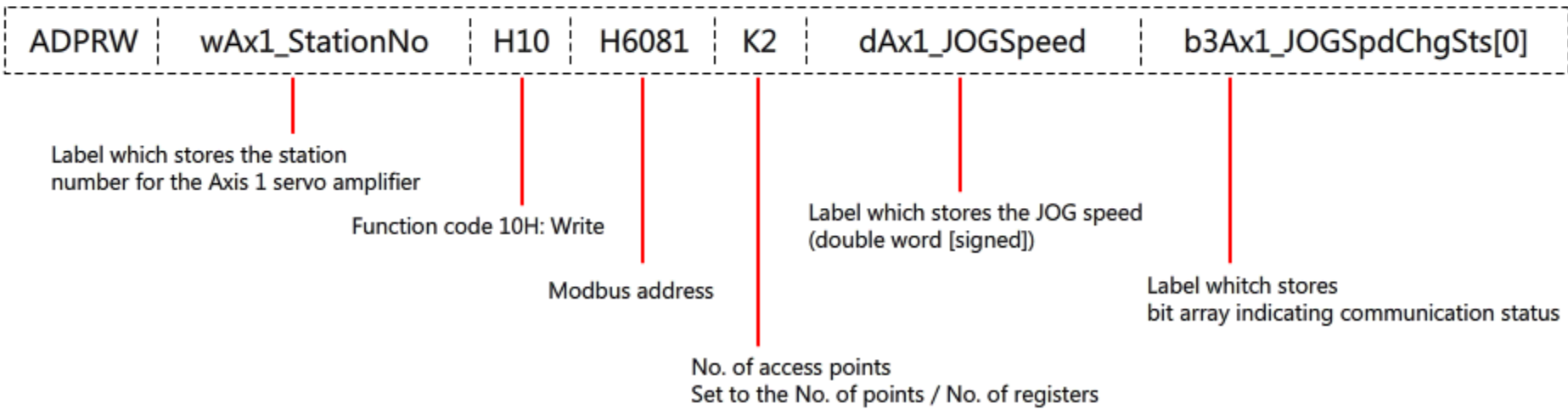
As an example of writing, we will create a program which changes the JOG speed of the Point Table mode. Use the manual to search for the Modbus address which sets the JOG speed.

Command speed (Profile Velocity: 6081h)

Address	Name	Data type	Read/write	No. of point/ No. of Registers	Continuous read/ continuous write
6081h	Profile Velocity (Command speed)	4 bytes	Read/write	2	Impossible

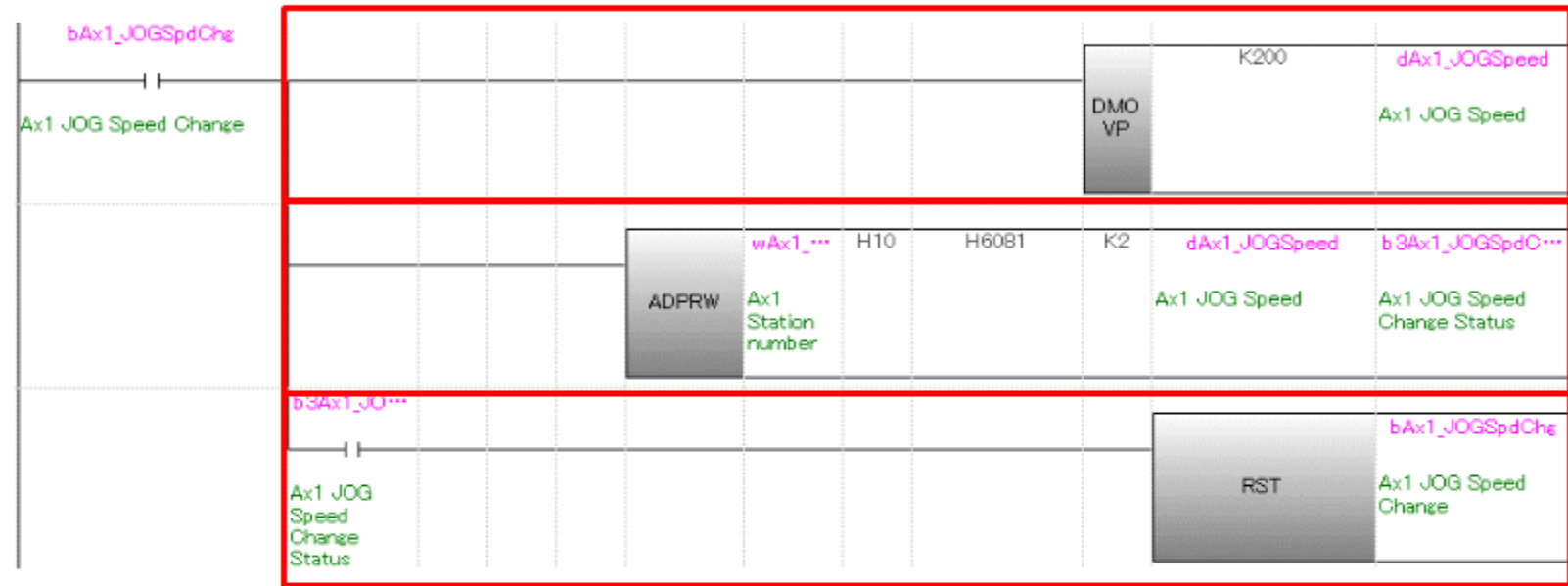
The current speed command value can be read using the function code "03h" (Read Holding Registers). A speed command value can be set using the function code "10h" (Preset Multiple Registers). Set a value in units of r/min.

The ADPRW command used when writing to this address is shown below.



4.3.2 Confirm the Program Action

A program for changing the JOG speed from 100 rpm (initial value) to 200 rpm is created as shown below. Hold the mouse pointer over an area to display a detailed explanation for the program.



***Label settings**

70	bAx1_JOGSpdChg	Bit	...	Ax1 JOG Speed Change
71	b3Ax1_JOGSpdChgStatus	Bit(0..2)	...	Ax1 JOG Speed Change Status
72	dAx1_JOGSpeed	Double Word [Signed]	...	Ax1 JOG Speed

Execute the contact "bAx1_JOGSpdChg."
 If communication is performed successfully, parameter PT13 (JOG speed) for the servo amplifier changes to 200.

4.4 Readout Via ADPRW Command

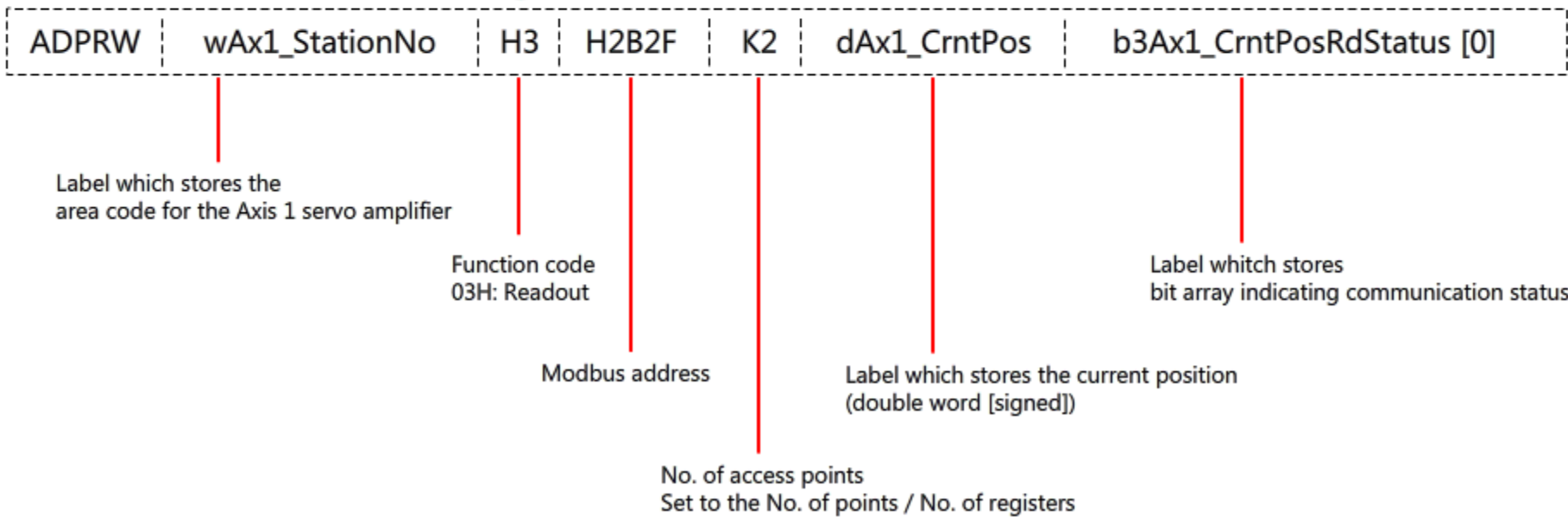
4.4.1 Readout Program

As an example of readout, we will create a program which reads out the current position of Axis 1. The current position for the Modbus address is 2B2FH, and the number of access points is 2.

Address	Name	Unit	Data type	Read/write	No. of point/ No. of Registers	Continuous read/ continuous write
2B2Fh	Current position (Current position)	0.001 mm (Note 1)	4 bytes	Read	2	Possible

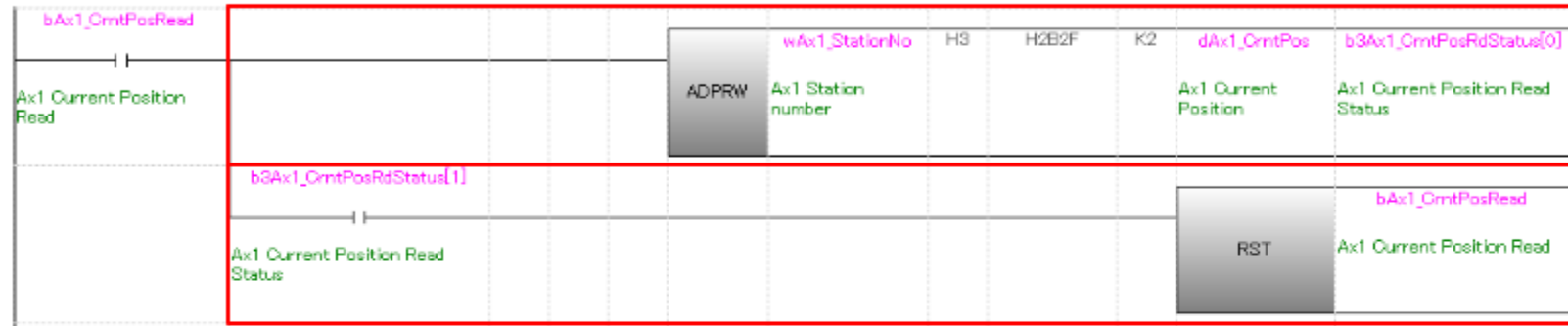
Note 1. The unit and magnification change depending on the setting values of [Pr. PT01] and [Pr. PT03].

The ADPRW command used when reading out this address is shown below.



4.4.2 Confirm the Program Action

A program for reading out the current position is created as shown below.
Hold the mouse pointer over an area to display a detailed explanation for the program.



***Label settings**

72	bAx1_CrntPosRead	Bit	...	Ax1 Current Position Read
73	dAx1_CrntPos	Double Word [Signed]	...	Ax1 Current Position
74	b3Ax1_CrntPosRdStatus	Bit(0..2)	...	Ax1 Current Position Read Status

Execute the contact "bAx1_CrntPosRead."
If communication is performed successfully, the current position for Axis 1 is stored in the label dAx1_CrntPos.

4.5**Summary of This Chapter**

In this chapter, you have learned:

- ADPRW Command
- Address of Servo Amplifier
- Writing Via ADPRW Command
- Readout Via ADPRW Command

Important points

ADPRW Command	<ul style="list-style-type: none">• Use the ADPRW command when conducting Modbus communication at the FX5 programmable controller.
Address of Servo Amplifier	<ul style="list-style-type: none">• The servo amplifier Modbus address is listed in the MR-JE-A Servo Amplifier Instruction Manual (Modbus-RTU Protocol).
Writing Via ADPRW Command	<ul style="list-style-type: none">• Use function code 10H to write to the specified address.
Readout Via ADPRW Command	<ul style="list-style-type: none">• Use function code 03H to readout values from the specified address.

Now that you have completed all of the lessons of the **MELSERVO Basics (MR-JE Modbus)** Course, you are ready to take the final test.

If you are unclear on any of the topics covered, please take this opportunity to review those topics.

There are a total of 4 questions (9 items) in this Final Test.

You can take the final test as many times as you like.

How to score the test

After selecting the answer, make sure to click the **Answer** button. Your answer will be lost if you proceed without clicking the Answer button. (Regarded as unanswered question.)

Score results

The number of correct answers, the number of questions, the percentage of correct answers, and the pass/fail result will appear on the score page.

Correct answers : 4
Total questions : 4
Percentage : 100%

To pass the test, you have to answer **60%** of the questions correct.

Proceed

Review

- Click the **Proceed** button to exit the test.
- Click the **Review** button to review the test. (Correct answer check)
- Click the **Retry** button to retake the test again.

Select all true statements regarding the correct connection method when using Modbus-RTU to connect the FX5U programmable controller and MR-JE-A servo amplifier.

- Use an Ethernet cable to connect the FX5U programmable controller and MR-JE-A servo amplifier.
- Use a communications cable to connect the FX5U programmable controller to the RS-485 communication terminal block, and to connect the MR-JE-A servo amplifier to the CN1 communication terminal.
- Connect a terminator to the FX5U programmable controller and final station servo amplifier.

[Answer](#)[Back](#)

Select all the correct descriptions about the procedure for setting parameters for the Modbus communication between the MR-JE-A servo amplifier and FX5U programmable controller.

- For the Modbus communication between the FX5U programmable controller and the MR-JE-A servo amplifier, use the common settings of the protocol format, parity, stop bit, and baud rate.
- All the station numbers of the servo amplifier are set to a single value.

[Answer](#)[Back](#)

Which one of the following statements is true regarding the Modbus-RTU communication function of the FX5U programmable controller?

- A serial communication unit is required to use the Modbus-RTU communication function.
- It is necessary to align settings for the MR-JE-A and Modbus-RTU communication.
- Use an INPUT/OUTPUT command for sending and receiving commands.

[Answer](#)[Back](#)

Select the correct terms about the ADPRW instruction used in the FX5U programmable controller from the following terms.

ADPRW	(s1)	(s2)	(s3)	(s4)	(s5/d1)	(d2)
-------	------	------	------	------	---------	------

(s1)

(s2)

(s3)

(s4)

(s5/d1)

(d2)

Term

- 1: Modbus address
- 2: Bit device for outputting the communication status
- 3: Station number of the servo amplifier
- 4: Number of read/write points
- 5: Read/write data storage device
- 6: Function code

You have completed the Final Test. Your results are as follows.
To end the Final Test, proceed to the next page.

Correct answers : 4

Total questions : 4

Percentage : 100%

Proceed

Review

Congratulations. You passed the test.

You have completed the **MELSERVO Basics (MR-JE Modbus)** Course.

Thank you for taking this course.

We hope you enjoyed the lessons and the information you acquired in this course will be useful in the future.

You can review the course as many times as you want.

Review

Close