FX3U-20SSC-H Quick start

Issue: February 2007 /// Created by: FA-EBG Marketing Communications Dept

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Table of Contents:

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1. Introduction

Based on customer demand, the FX3U-20SSC-H was developed and introduced to the world as a high performance, cost effective solution for positioning applications in the Micro PLC range of factory automation. The unit's features and capabilities are very similar to the QD75MH2 positioning module, which was developed for the Q Series automation platform CPUs.
To setup and program the FX3U-20SSC-H for basic positioning operations, FX Configurator-FP and GX Developer or GX IEC Developer can be used with a personal computer. This quick start guide provides an overview of the hardware and software involved and describes how to set up a system and understand the device communication. FX Configurator-FP is used for initializing hardware parameters, setting up positioning tables, and for testing and monitoring the FX3U-20SSC-H. Please refer to the FX Configurator-FP Operation Manual (JY997D21801A) for further help.

Related Documents
FX Configurator-FP Operation Manual (JY997D21801A)
FX3U-20SSC-H User's Manual (JY997D21301C)

2. Components required for Setup

2.1 Hardware requirements

2.1.1 Components

FX3U Series Main PLC
FX3U-20SSC-H
MR-J3-_B servo amplifier
HF-MP/HF-KP or HF-SP servo motor
MR-J3BUS_M fiber optic cable
Programming cables (SC-09, USB)

2.1.2 Setup

With an FX3U Base Unit attached to the FX3U-20SSC-H, up to eight FX3U-20SSC-H modules can be connected via extension cables to the FX3U. The FX3U-20SSC-H requires DC power and SSCNET III communication for operation. Manual pulse generator dial(s) are optional. For connection to MR-J3-B type servo amplifiers, please refer to the MELSERVO-J3 Series MR-J3- B Servo Amplifier Instruction Manual (SH(NA)-030051). A basic wiring overview is explained in the following section.

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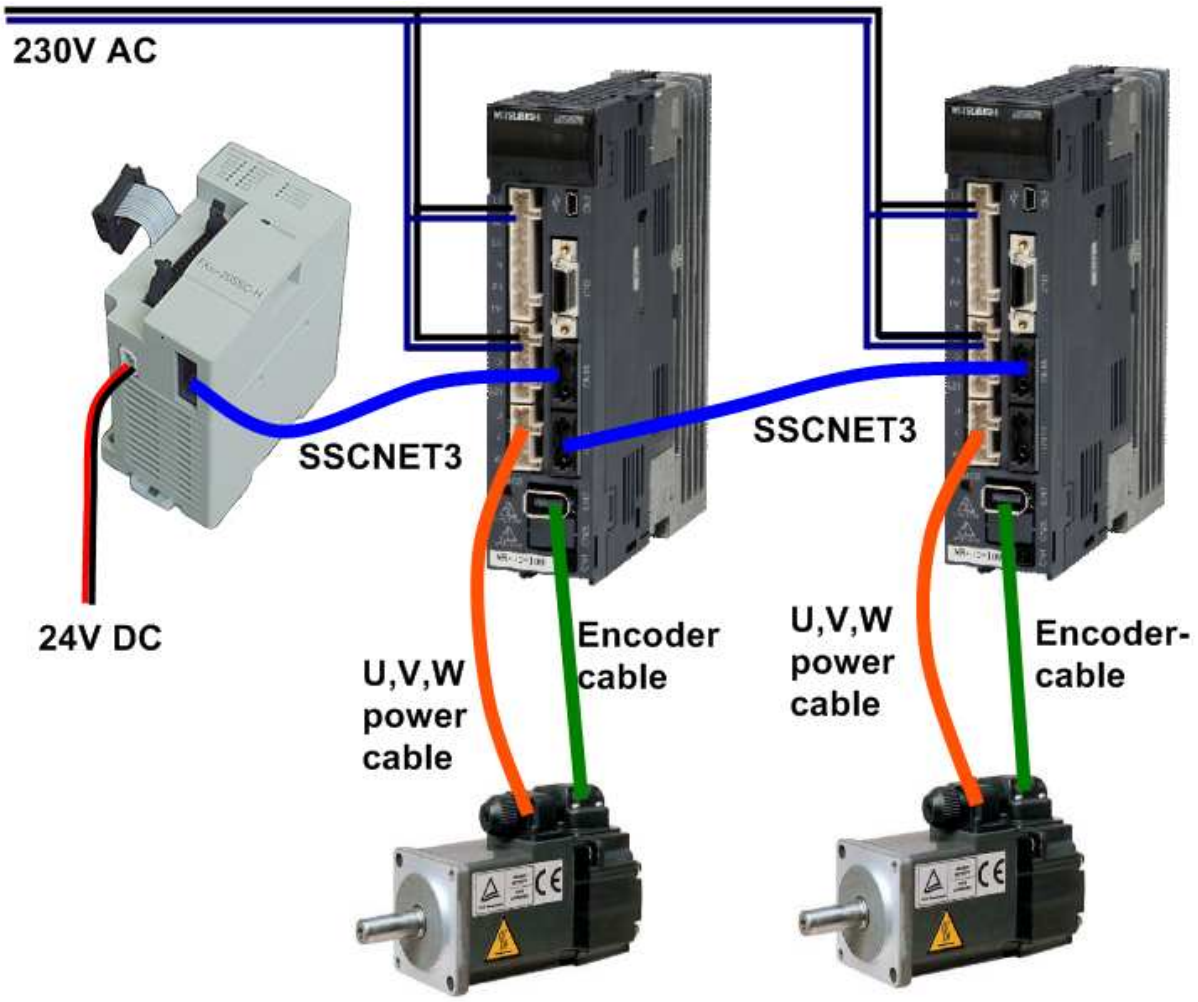
2.1.3 Wiring

- **Wiring requirements for MR-J3-B:**

  200~230V AC to L1, L2, L3 for power circuit
  200~230V AC to L11 and L21 for control circuit
  Power cable between motor and amplifier (U,V,W terminal)
  Encoder cable between motor and amplifier (CN2)
  Fiber optic cable SSCNET 3at CN1A and CN1B

- **Wiring requirements for FX3U-20SSC-H:**

  24 V DC to power connector
  Fibre optic cable at SSCNET3 connector
  Extension cable to FX3U (module takes 100mA from the 5V DC Bus)



2.2 Software requirements

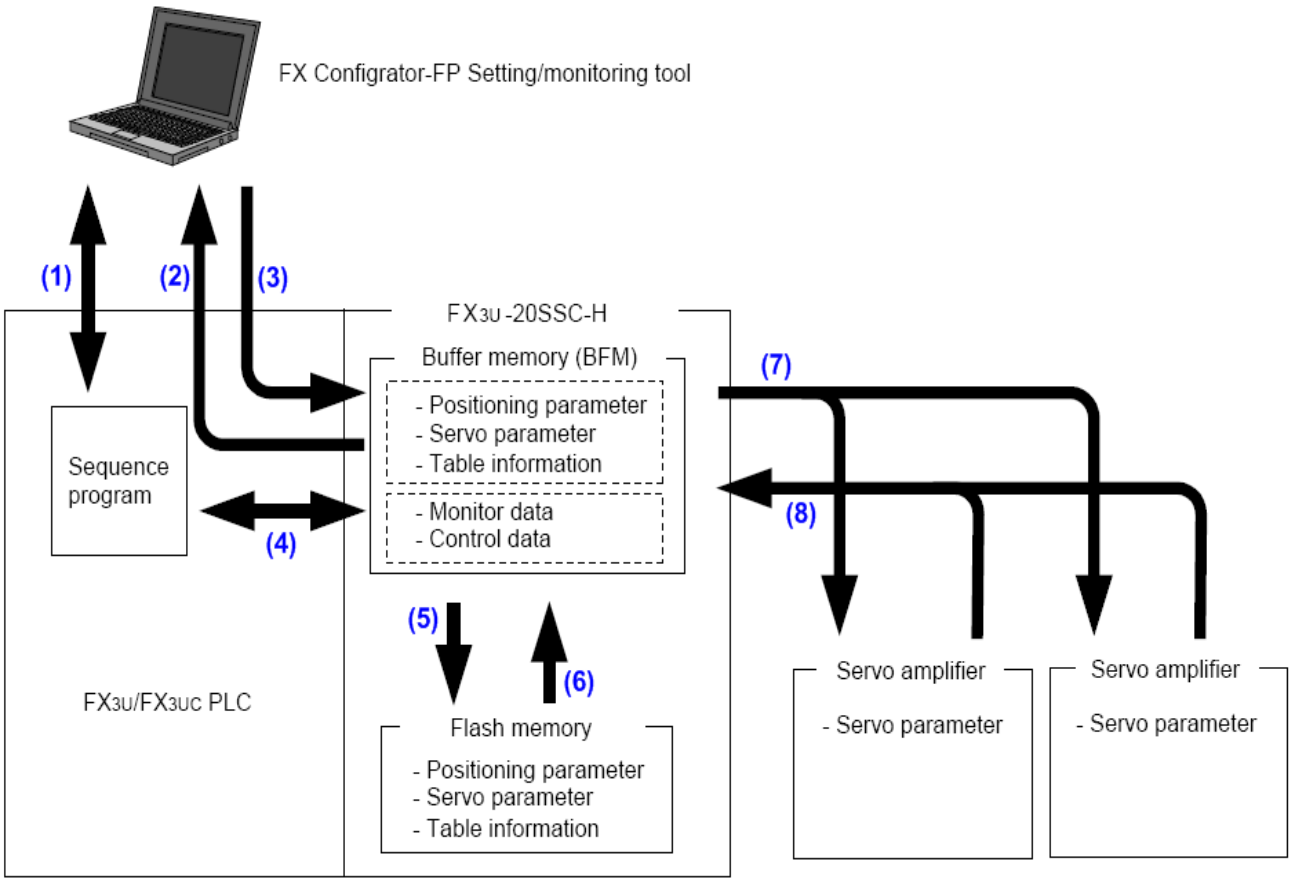
2.2.1 Components

- **FX Configurator FP Version 1.00 or later (optional, but needed of using this document)**
- **GX Developer Version 8.23Z or later**
  or GX IEC Developer Version 7.00 or later

3. Explanation of System Configuration

3.1 Memory configuration

The F3U-20SSC-H has two types of memory for initial data transfer processes and continuous communication with servo equipment and programming devices. The module's flash memory retains parameter information and table data for initializing servo equipment at power-ON while the buffer memory (BFM) constantly communicates with servo equipment and PLC sequence programs. To set up positioning parameters, servo parameters and table information for the F3U-20SSC-H, it is necessary to send data to the module from a PLC sequence program or from FX Configurator-FP. Due to the convenience and reduced complexity of program coding, FX Configurator-FP should be used whenever possible to program table operations.
Below is a diagram of how the 20SSC-H memory communicates with servo amplifiers, PLCs and other equipment.



20SSC-H System Communication

No.	Description
(1)	Read/Write/Monitor/Test the sequence programs with GX (IEC) Developer.
(2)	Read out the following data from the FX3U-20SSC-H BFM to FX Configurator-FP. · Positioning parameters · Servo parameters · Table information · Monitor data (Operation status, motion status, input signal status, etc.)
(3)	Write the following data from FX Configurator-FP to the FX3U-20SSC-H BFM. · Positioning parameters · Servo parameters · Table information · Control data (The present value change, speed change and operation test command, etc.)
(4)	Read/Write the following data in BFM with sequence program. · Positioning parameters · Servo parameters · Table information · Monitor data (Operation status, motion status, input signal status, etc.) · Control data (The present value change, speed change and operation test command, etc.)
(5)	Store the following BFM data to the Flash ROM by the store command from a sequence program, FX Configurator-FP. · Positioning parameters · Servo parameters · Table information
(6)	Positioning/servo parameters and table information transfer from the Flash ROM to the BFM at power ON. Simultaneously, servo parameters transfer to the servo amplifiers.
(7)	Servo parameters in the BFM transfer to the servo amplifiers at power ON.
(8)	FX3U-20SSC-H retrieves the servo parameters changed by the servo amplifiers and updates the servo parameters in its BFM.

In this document, sections of the FX3U-20SSC-H BFM are referred to as:

Positioning parameters
Servo parameters
Table information
Monitor data
Control data

The positioning parameters, servo parameters and table information can be read and written with several devices including FX Configurator-FP, GX (IEC) Developer and human machine interfaces. The monitor data can only be read from the BFM (except for the current address, which has write access), while the control data can be read and written to the BFM. Control data is written to the BFM very frequently, while positioning parameters, table information and servo parameters are usually set up less frequently. For a list of how the areas of the buffer memory can be accessed in terms of read/write, please refer to the following table.

Read/Write Properties for the 20SSC-H Buffer Memory

BFM #	Content	R/W
0 – 99	X-axis Monitor Data	R*1
100 – 199	Y-axis Monitor Data	R*1
200 – 499	Undefined	R
500 – 599	X-axis Control Data	R/W
600 – 699	Y-axis Control Data	R/W
700 – 999	Undefined	R
1000 – 3999	X-axis Table Information	R/W
4000 – 6999	Y-axis Table Information	R/W
7000 – 12999	XY-axis Table Information	R/W
13000 – 13999	Undefined	R
14000 – 14199	X-axis Positioning Parameters	R/W
14200 – 14399	Y-axis Positioning Parameters	R/W
14400 – 14999	Undefined	R
15000 – 15199	X-axis Servo Parameters	R/W
15200 – 15399	Y-axis Servo Parameters	R/W
15400 – 15999	Undefined	R
16000 – 16255	System Use Only	R

*1: R/W is possible for the Current address (user) in BFM #1,#0 and BFM #101,#100

4. Begin to Use FX3U-20SSC-H with FX Configurator-FP

4.1 Initialization Process

When setting up the F3U-20SSC-H for the first time or when beginning a new project, it is recommended to clear the servo parameters and positioning parameters and then write the desired settings (as needed by the user application) to the controller. The purpose of this section is to define basic settings for the initial testing of the module using the FX Configurator-FP software.

1) Confirm that the hardware is set up correctly (as described in *Section 2.1: Hardware Requirements*) and the PLC is in STOP mode. Turn the power ON. (Both of the servos should display 'Ab' when the power is turned ON for the very first time.)

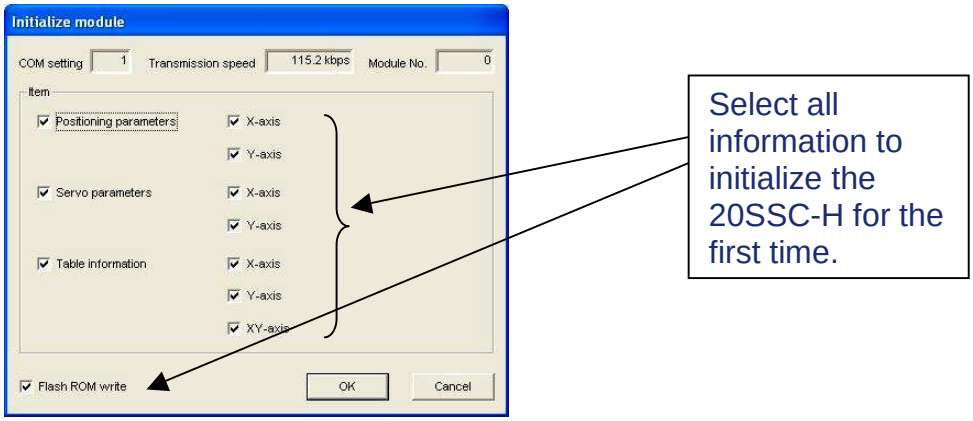
2) Open FX Configurator-FP from the Start menu [Start → MELSOFT Application → FX Configurator-FP] or from the Tools menu of GX Developer [Tools → FX special function utility → FX Configurator-FP] and create a New file by clicking on  in the Toolbar.

3) Expand the tree of folders in the 'File data list' panel on the left-hand side by double clicking on 'Unset file,' 'Edit' and 'Monitor.'

4) Go to [Online → Connection setup → Comm. Test.]
Verify that the devices are communicating properly.

5) Go to [Online → Initialize module.]

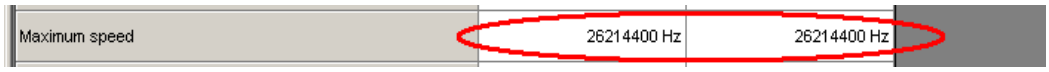
Select all servo parameters, positioning parameters and table information and place a check mark in 'Flash ROM write.' Click the OK button and proceed with selecting 'Yes' and then 'OK.'



6) Set the positioning parameters
Double click on **'Positioning parameters'** in the 'File data list' panel on the left-hand side to modify the positioning parameters.

Change the following items from the 'Item' column:

Positioning parameters
· Maximum speed →
"26214400 Hz" for X- and Y-axes.



Positioning parameters
· OPR mode →
"1: Data set" for X- and Y-axes.
(This setting is used specifically for a system without a DOG or mechanical zero-point.)

Positioning parameters
· OPR interlock setting →
"0: Invalid" for X- and Y-axes.
(This is used to ensure that the START command functions regardless of the zero return complete flag's Status (BFM#28/128, b3).)

7) Set the servo parameters (20SSC-H v.1.04 and later)

7.1) **<u>When FX Configurator-FP is used and the forced stop is NOT being used:</u>**
If a forced stop switch is not used with the MR-J3-B servos, the servo forced stop setting must be disabled before the servo series is set with the Configurator-FP as follows:

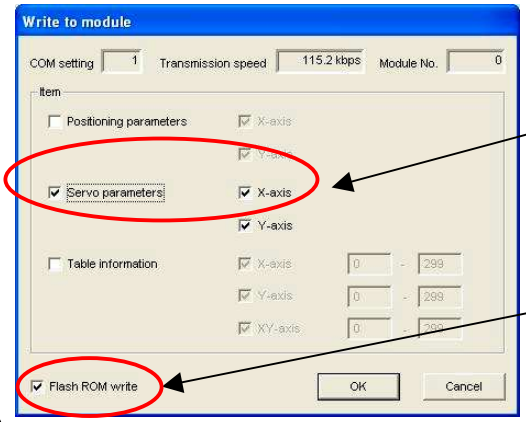
Double click on **'Servo parameters'** in the 'File data list' panel on the left-hand side to modify the servo parameters. Be sure to change settings for BOTH the X & Y axes.

Set the following item from the 'Kind' column:

Servo parameters
· Basic setting parameters → Function selection A-1 → Servo forced stop selection →
"1: Invalid (Do not use the forced stop signal.)" for X- and Y-axes.

	detection system	position detection system	system	system
	Function selection A-1	Servo forced stop selection	1:Invalid (Do not use the forced stop signal.)	1:Invalid (Do not use the forced stop signal.)
Basic setting	Auto tuning	Gain adjustment mode setting	1:Auto tuning mode 1	1:Auto tuning mode 1

Write  the servo parameters to the 20SSC-H BFM and Flash ROM by pressing the 'Write to module' button or by using [Online → Write to module (Ctrl+T).] Select only the servo parameters and put a check mark in the 'Flash ROM write' box as shown below. Click the OK button and proceed with selecting 'Yes' and then 'OK.'



Only the Servo parameters are selected to be written.

Check 'Flash ROM write' so that these settings are active every time the power is turned ON.

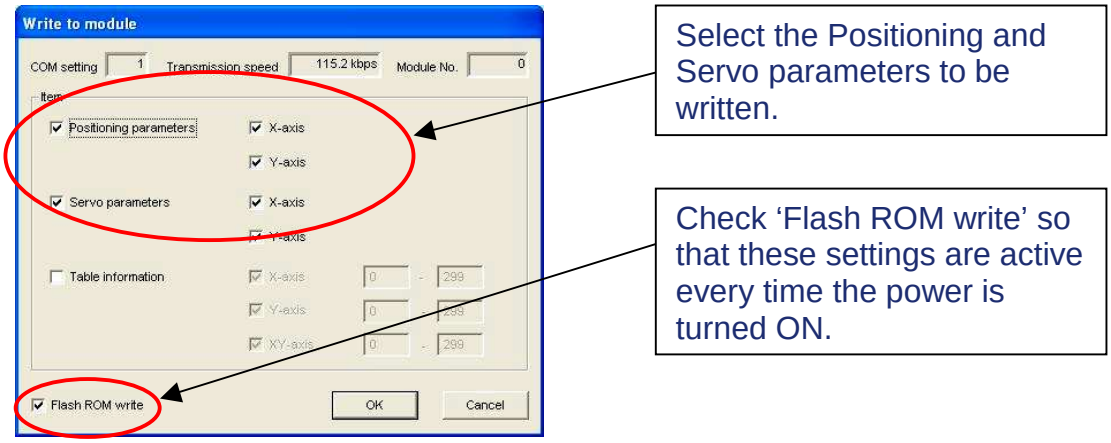
Reboot the power to the SSCNET system.

Servo parameters
· Servo amplifier series → Servo amplifier series →
"1: MR-J3-B" for X- and Y axes.

Servo amplifier series	Servo amplifier series	1:MR-J3-B	1:MR-J3-B

8) Write the servo and positioning parameters

Write  the servo parameters and positioning parameters to the FX3U-20SSC-H by pressing the 'Write to module' button or by using [Online → Write to module (Ctrl+T).] Select only the servo and positioning parameters and put a check mark in the 'Flash ROM write' box as shown below. Click the OK button and proceed with selecting 'Yes' and then 'OK.'



4.2 Using TEST MODE

Verify that the PLC is in STOP mode before proceeding with this section.

To enter TEST MODE, press the Test On/Off button  in the Test toolbar or go to [Online → Test → Test On/Off.] Select 'Yes,' and then 'OK.'
Open up the X- and Y- axis Operation test windows by clicking on the two buttons:  and  .

4.2.1 JOG Operation, X-axis

In the 'X-axis Operation test' window, click on the JOG/MPG tab. Click and hold down the FWD JOG button. Try changing the JOG speed and JOG instruction evaluation time. (For more information on the JOG instruction evaluation time, refer to Chapter 8.2.1 in the FX3U-20SSC-H User's Manual (JY997D21301A).)

4.2.2 Setting the Zero Point

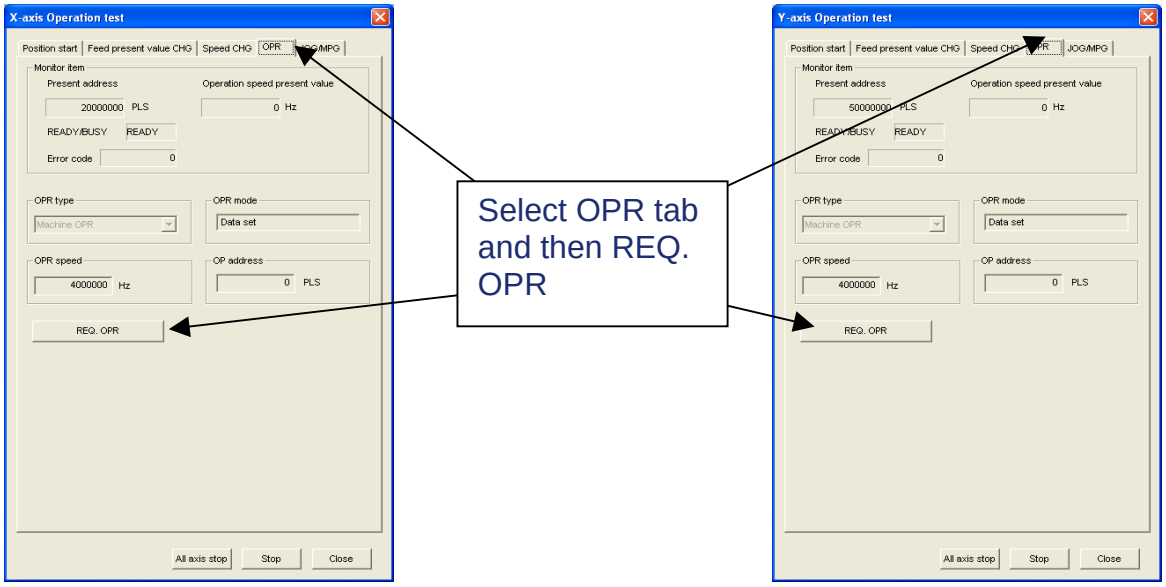
Click on the X-axis and Y-axis OPR tabs and then click the REQ. OPR button and select 'Yes' and 'OK.'

Since the mechanical zero return mode has been set to the data-set type from *Section 4.1: Initialization Process*, the value in BFM# 14028, 14029 (initially zero) is directly written to the current address. (In stopper type and DOG type mechanical zero return modes, this method will cause the motor to turn in the direction of the zero point and will not write zero until the motor comes to a complete stop after detecting an external DOG signal or stopper device. If the REQ. OPR button causes the motor to rotate continuously, verify that the Data-set OPR mode has been set in the Positioning Parameters as described in *Section 4.1: Initialization Process.*)

WARNING: In OPR modes other than Data-set type, the motor will not stop without an external DOG signal or stopper device.

X-axis

Y-axis



4.2.3 Positioning at 1-Step Speed

By default, the FX3U-20SSC-H is set in Absolute positioning mode. If Incremental positioning (Relative positioning) is desired, a table operation or PLC sequence program must be used to specify the 'Incremental mode'. The following procedure uses the default Absolute positioning mode and is meant to be followed step-by-step.

Positioning at 1-step speed

Set the zero-point according to *Section 4.2.2: Setting the Zero Point* above if you haven't already done so. Click on the Position start tab and select 'Positioning at 1-step speed' in the X-axis Pattern drop-down menu. Set the following X-axis information:

Target address 1:	50,000,000 PLS
Operation speed 1:	10,000,000 Hz

Click on the Start button and observe the motor. Click 'Yes' and 'OK.'

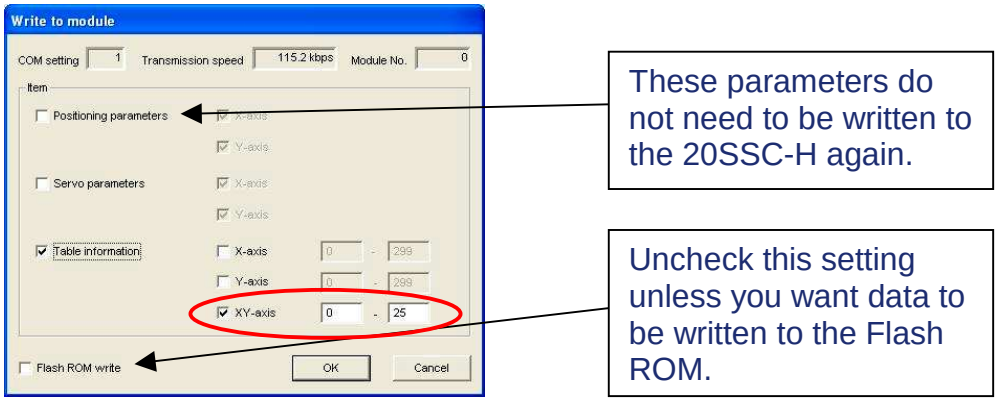
4.3 Creating table information

If you are in TEST MODE, press the Test On/Off button  in the Test toolbar and click 'Yes' to disengage TEST MODE. Double-click on **'XY-axis Table information'** in the 'File data list' panel on the left-hand side and maximize the window.
Enter the following data in the XY-axis Table information

No.	Command Code	Address x:[PLS] y:[PLS]	Speed fx:[Hz] fy:[Hz]	Arc center i:[PLS] j:[PLS]	Time [10ms]	Jump No.	m code
0	Incremental address specification						-1
1	X-axis positioning at 1-step speed	20,000,000	10,000,000				-1
2	Y-axis positioning at 1-step speed	20,000,000	10,000,000				-1
3	XY-axis positioning at 1-step speed	5,000,000 -5,000,000	2,000,000 2,000,000				-1
4	Circular interpolation(CNT,CW)	0 0	15,000,000	5,000,000 5,000,000			-1
5	Dwell				30		-1
6	XY-axis positioning at 2-step speed	10,000,000 -10,000,000	10,000,000 10,000,000				-1
7	XY-axis positioning at 2-step speed	-10,000,000 10,000,000	10,000,000 10,000,000				
8	Dwell				30		-1
9	XY-axis positioning at 2-step speed	10,000,000 -10,000,000	10,000,000 10,000,000				-1
10	XY-axis positioning at 2-step speed	-10,000,000 10,000,000	10,000,000 10,000,000				
11	Dwell				30		-1
12	Circular interpolation(CNT,CCW)	0 0	7,000,000	5,000,000 5,000,000			-1
13	Dwell				30		-1
14	XY-axis positioning at 2-step speed	10,000,000 5,000,000	15,000,000 7,500,000				-1
15	XY-axis positioning at 2-step speed	-5,000,000 -10,000,000	7,500,000 15,000,000				
16	Dwell				30		-1
17	Linear interpolation	20,000,000 -20,000,000	26,214,400				-1
18	Dwell				150		-1
19	Jump					0	
20	End						

(With PLS addresses, the numbers can be very large. To reduce the number size, the Position data magnification item can be changed to "3:×1000 times" in the **'Positioning parameters.'** If this is changed with data already entered in a table information window, the fields with addresses that lay outside the range –2,147,483,648 to 2,147,483,647 will be highlighted in RED, indicating they must be changed.)

After entering the above table, click on the  button or use [Online → Write to module (Ctrl+T).] Remove checkmarks from 'Positioning parameters' and 'Servo parameters' and put a checkmark in 'Table information.' Unselect the 'X-axis' and 'Y-axis,' put a checkmark in 'XY-axis,' and modify the table number range (table rows) from 0 – 25. This will decrease the download time to the 20SSC-H. Unselect the 'Flash ROM write' button, click 'OK' and then 'OK' again.



Save the project.

To perform the table operation:
Select 'XY-axis table operation' in the X-axis Pattern drop-down menu of the Position start tab. Set the Table operation start No. as desired (0 in this example) and begin positioning by pressing the Start button, 'Yes,' and 'OK.'

4.4 Using Monitor Mode

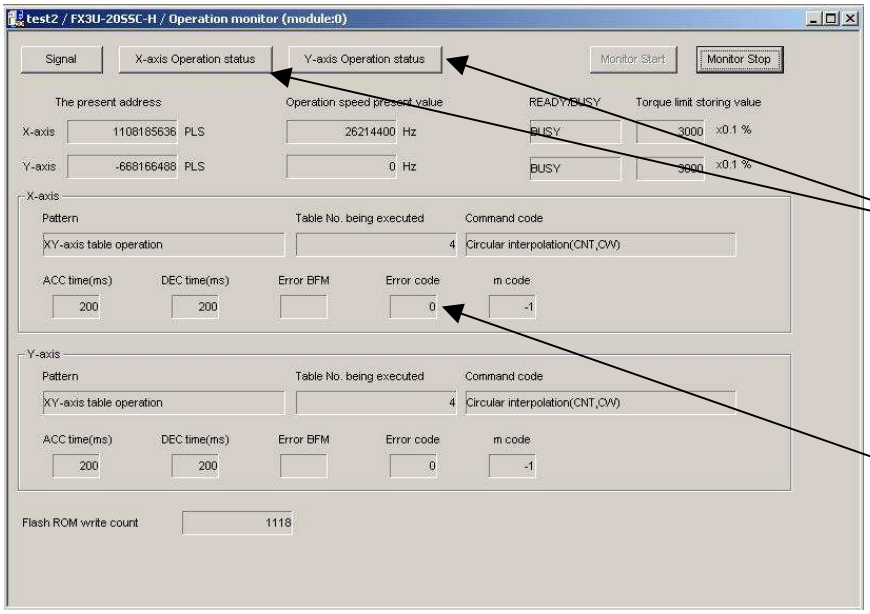
4.4.1 Table Monitor

To use table monitor during positioning, first enable the XY-operation Table pattern in TEST MODE and begin its operation by following *Section 4.3: To perform the table operation* above. Do not stop the operation. Ensure that the **'XY-axis Table information'** window is open and click on the Monitor button  in the Test toolbar or go to [Online → Monitor → Monitor On/Off.]

4.4.2 Operation Monitor

To use operation monitor during positioning, first enable the XY-operation Table pattern in TEST MODE and begin its operation by following *Section 4.3:To perform the table operation* above. Do not stop the operation. Instead, click on the Close button to exit the X-axis Operation test window.

Press the Test On/Off button  in the Test toolbar and click 'Yes' to turn TEST MODE off. Double-click on **'Operation monitor'** in the 'File data list' panel on the left-hand side. Click on the Monitor Start button and experiment with the X-axis Operation status and Y-axis Operation status buttons to monitor axis control data such as target addresses and operation speeds and servo status. By clicking on the Signal button, the FX3U-20SSC-H monitor data can be displayed for useful feedback. The Operation Monitor is also helpful for determining positioning errors.



These buttons provide detailed information about the operation speeds and addresses. They also allow monitoring of servo speeds in RPM.

The Error code number allows you to diagnose the cause of the problem with the FX_{3U}-20SSC-H User's Manual.

4.5 Resetting an Error

When an error occurs on the X- or Y- axis, the 'X-ERROR' or 'Y-ERROR' light on the FX3U-20SSC-H begins blinking and positioning operations are halted until the error-reset bit in the operation data is set via GX (IEC) Developer or FX Configurator-FP.

-- NOTE --
If the FX3U-20SSC-H error LEDs are continually blinking and the servos read 'E6,' even after recycling the power, refer to *Section 5 Clearing Servo Warning 'E6'* to reset the error.

When an error occurs, the  icon in FX Configurator-FP turns on if you're in TEST MODE, or while you're using the Table monitor, or during the **'Operation monitor'** Monitor Start mode. The Error code is listed in the X-axis Operation or Y-axis Operation test window as shown below and may be seen in the Operation monitor as well.

To remove the error, click on the  button or select [Online → Test → Error reset → Error reset X-axis] and press 'Yes' and 'OK.'

4.6 Absolute Position Detection System

The absolute position detection system is a feature available from the MR-J3-B servo amplifiers to remember the current position of the work piece at all times. According to Chapter 7.6.4 in the FX3U-20SSC-H User's Manual (JY997D21301A), the current position is stored in the servo amplifiers' battery backed memory, and even if the work piece moves at power failure, the moving distance is added to the current position with the absolute encoder and servo amplifier absolute position system.

To set the absolute position detection system, it is necessary to write information to the servo parameters and then perform a mechanical zero return operation once to define the coordinate system. After the coordinate system is defined, the zero return operation does not need to be executed again, even when the power is turned on. If the absolute position detection system is disabled and then enabled again, however, the mechanical zero return operation will be needed again.

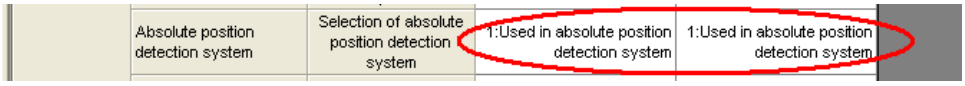
Follow the steps below to activate the absolute position detection system.

1) Set the servo parameters
Double click on **'Servo parameters'** in the 'File data list' panel on the left-hand side to modify the servo parameters. Be sure to change settings for BOTH the X & Y axes.

Set the necessary items from the 'Kind' column:

· Basic setting parameters → Absolute position detection system → Selection of absolute position detection system →

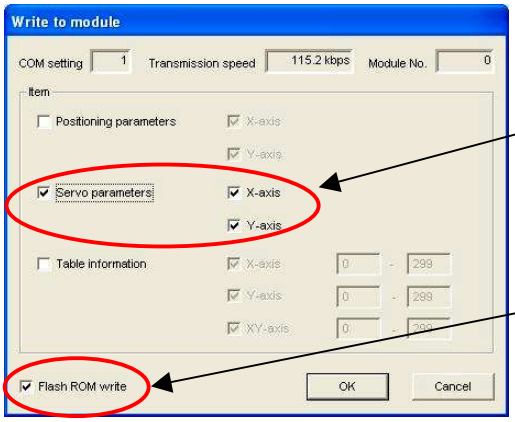
"1: Used in absolute position detection system" for X- and Y-axes.



Set all other parameters that are needed for your system if necessary.

2) Write the servo parameters

Write  the servo parameters to the 20SSC-H BFM and Flash ROM by pressing the 'Write to module' button or by using [Online → Write to module (Ctrl+T).]
Select only the servo parameters and put a check mark in the 'Flash ROM write' box as shown below. Click the OK button and proceed with selecting 'Yes' and then 'OK.'

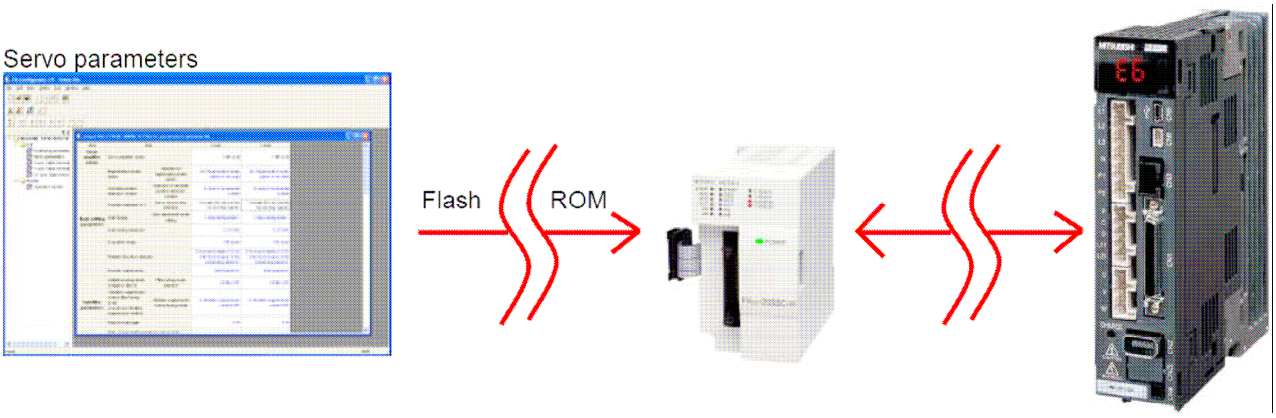


Only the Servo parameters are selected to be written.

Check 'Flash ROM write' so that these settings are active every time the power is turned ON.

5. Clearing Servo Warning ‘E6’

If the servo warning signal ‘E6’ does not go away when the power is recycled, the Flash ROM needs to be written to with GX (IEC) Developer instead of using FX Configurator-FP. This situation occurs when a forced stop signal is not hardwired to the servos (CN3 terminal) and the FX3U-20SSC-H Flash ROM has been configured to use the forced stop signal.
Write the correct servo parameters to the BFM and then use GX (IEC) Developer to write the BFM to the Flash ROM as described below.



How to Write to the 20SSC-H Flash ROM with Servo Warning ‘E6’

1) Using Configurator-FP, write the servo parameters to the 20SSC-H buffer memory *only*. Double click on **‘Servo parameters’** in the ‘File data list’ panel on the left-hand side to review the servo parameters. Be sure to change settings for BOTH the X & Y axes.

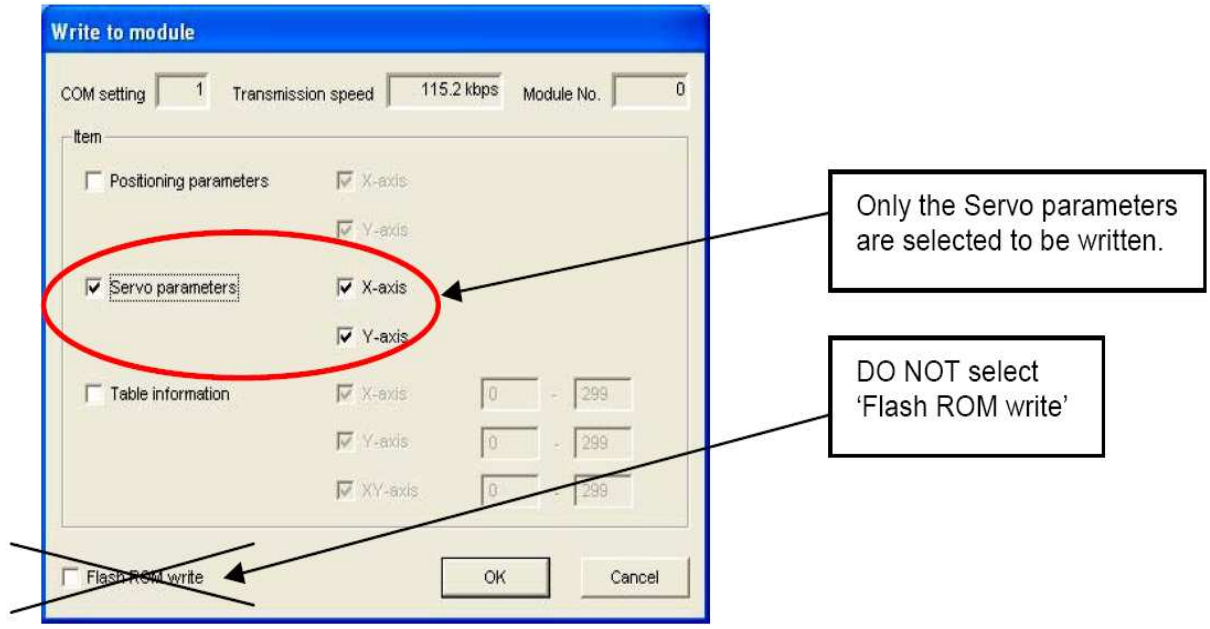
Set the following items:

Unset file / FX3U-20SSC-H / Servo parameters (module:0)

Kind	Item		X-axis	Y-axis
Servo amplifier series	Servo amplifier series		1:MR-J3-B	1:MR-J3-B
Basic setting parameters	Regenerative brake option	Selection of regenerative brake option	00: Regenerative brake option is not used	00: Regenerative brake option is not used
	Absolute position detection system	Selection of absolute position detection system	0:Used in incremental system	0:Used in incremental system
	Function selection A-1	Servo forced stop selection	1:Invalid (Do not use the forced stop signal.)	1:Invalid (Do not use the forced stop signal.)
	Auto tuning	Gain adjustment mode setting	1:Auto tuning mode 1	1:Auto tuning mode 1
	Auto tuning response		12:37.0Hz	12:37.0Hz
	In-position range		100 pulse	100 pulse
	Rotation direction selection		0:Forward rotation (CCW) with the increase of the	0:Forward rotation (CCW) with the increase of the

Set these two items.

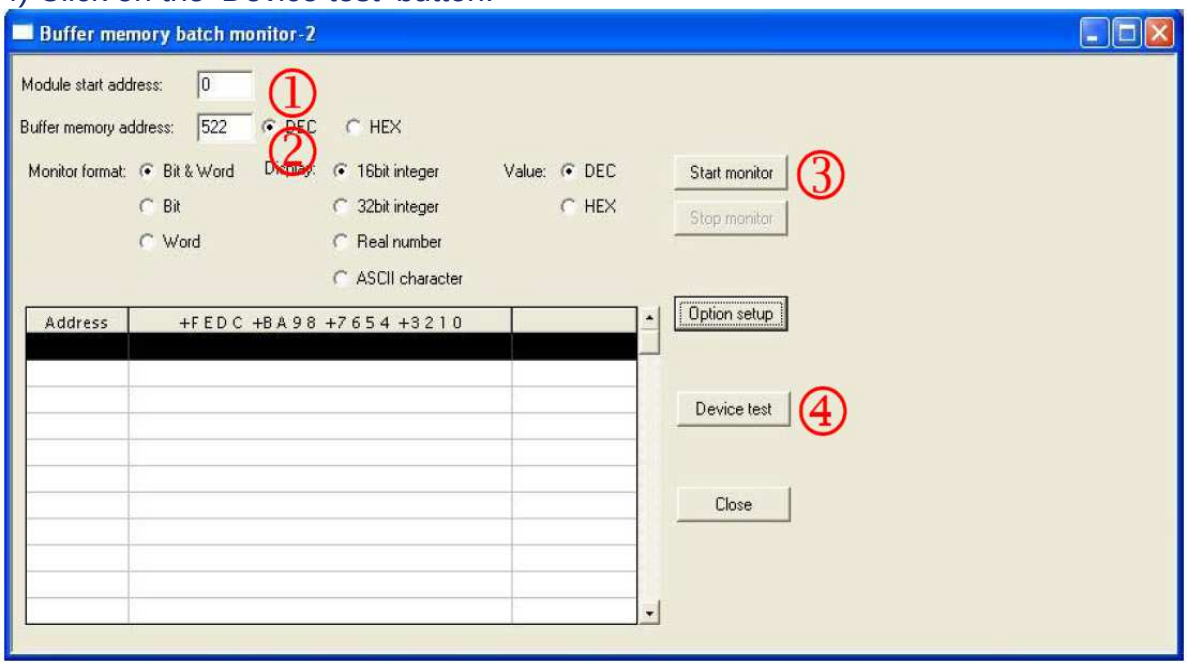
Write  the servo parameters to the FX3U-20SSC-H buffer memory only by pressing the ‘Write to module’ button or by using [Online → Write to module (Ctrl+T).] Select the servo parameters. Click the OK button and proceed with selecting ‘Yes’ and then ‘OK.’



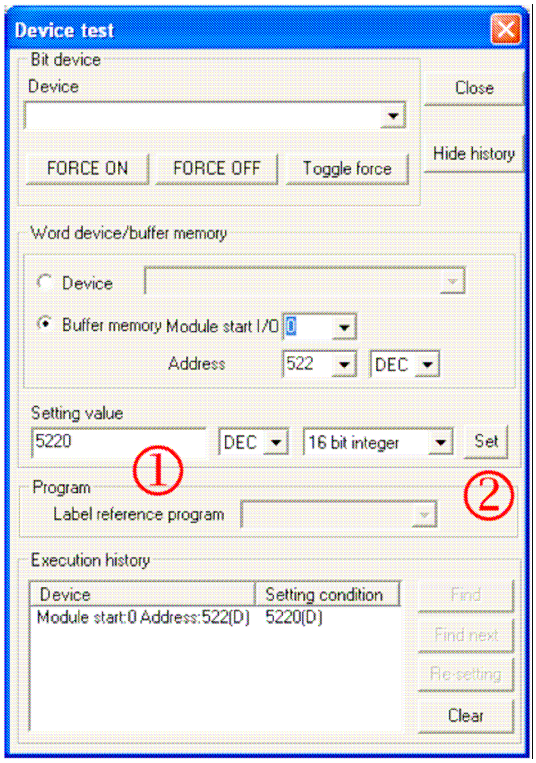
2) Using GX Developer, write the servo parameters to the F3U-20SSC-H Flash ROM. Open GX Developer and create a new FX3U project. To access the BFM, open the Buffer memory batch window by going to [Online → Monitor → Buffer memory batch].

Access BFM #522 by inputting '0' for the 'Module start address' and '522' for the 'Buffer memory address' as shown below. Note, the 'Module start address' is different if you have other hardware connected to the FX3U.

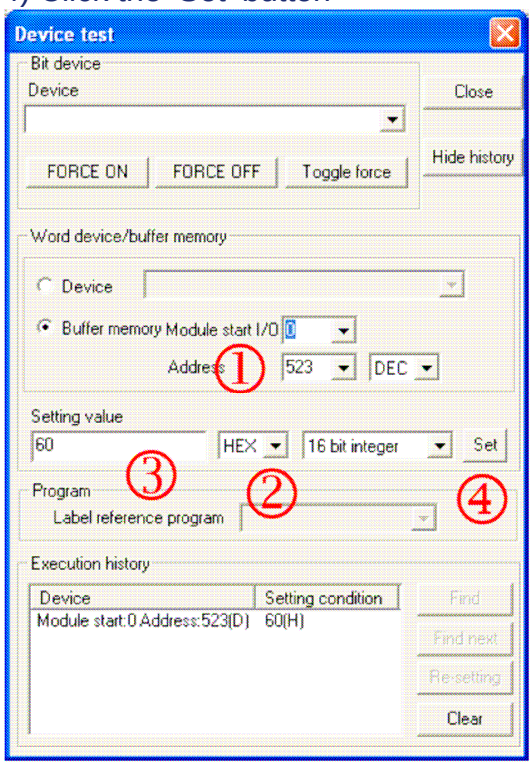
1) Module start address: 0
2) Buffer memory address: 522
3) Click on the 'Start monitor' button.
4) Click on the 'Device test' button.



1) Set ‘5220’ to BFM #522
2) Click the ‘Set’ button



1) Change the ‘Address’ to 523
2) Change the value type to HEX
3) Set ‘60’ to BFM #523
4) Click the ‘Set’ button



Close the ‘Device test’ window and stop the monitoring.

3) Reboot the power of the SSCNET System.

6. Example program with GX Developer