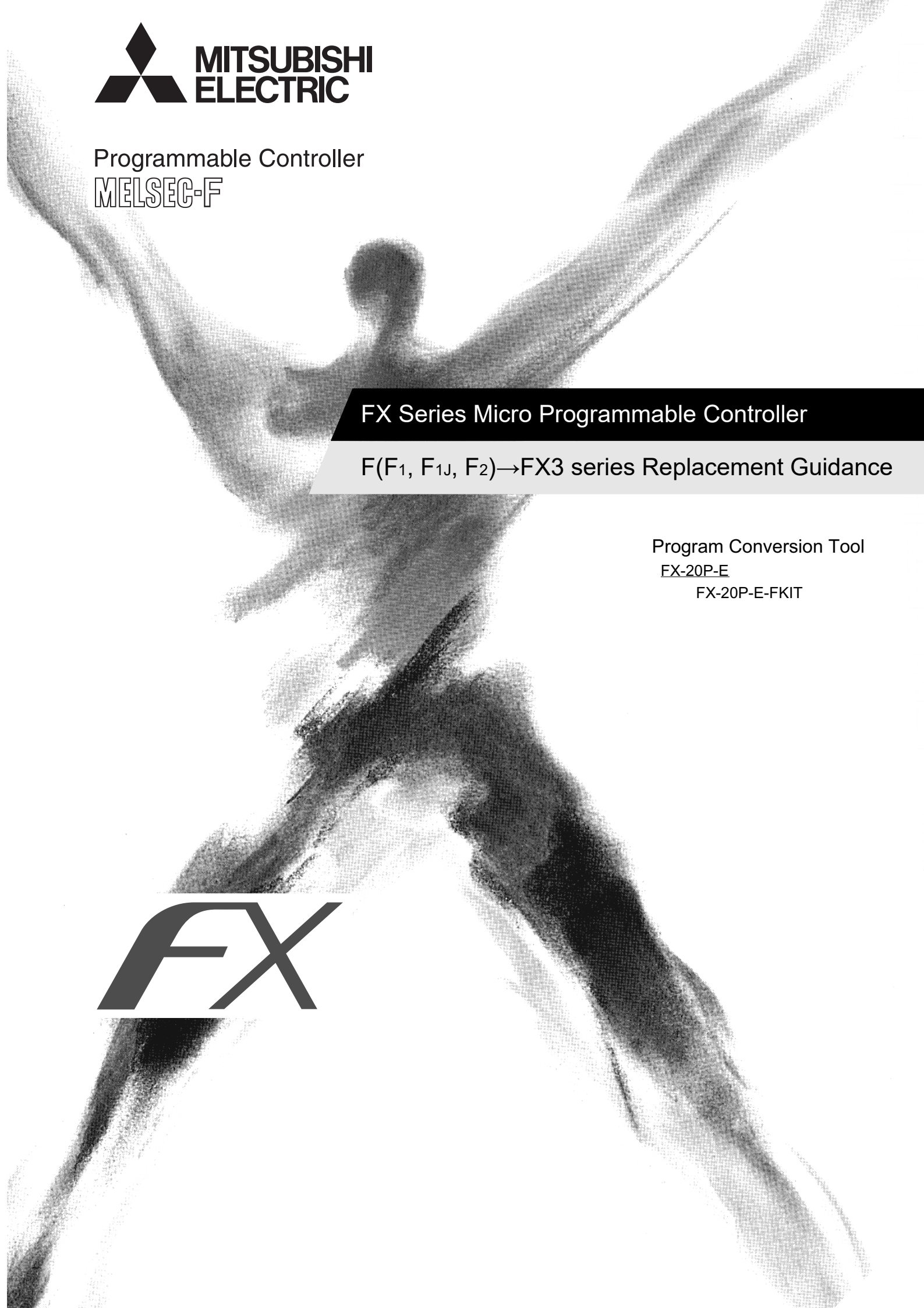
MITSUBISHI ELECTRIC

Programmable Controller

MELSEC-F



FX Series Micro Programmable Controller

F(F_1, F_{1J}, F_2)→FX3 series Replacement Guidance

Program Conversion Tool

FX-20P-E

FX-20P-E-FKIT

F(F1, F1J, F2)→FX3 series Replacement Guidance

Forward

This document describes how to replace MELSEC F1, F1J, and F2 series programmable controllers with FX3 series programmable controllers.
The FX-20P-E-SET0 + FX-20P-E-FKIT are introduced as a conversion tool which can be currently purchased.
This document describes the conversion operation for the FX-20P-E, however, make sure to refer the operation manual included in the tool used.
For the reference manual, refer to Appendix 2.

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Table of Contents

ABBREVIATIONS, GENERIC TERMS, AND TERMINOLOGIES USED IN THIS MANUAL

The following table lists the abbreviations, generic terms, and terminologies used in this manual.

Abbreviation and generic term	Name
Programmable controller	
F1/F2 programmable controller	Generic term for F1, F1J, and F2 series programmable controllers
F1 programmable controller	Generic term for F1 series programmable controller
F1J programmable controller	Generic term for F1J series programmable controller
F2 programmable controller	Generic term for F2 series programmable controller
F2/2K programmable controller	Generic term for F2 series programmable controller, which has a program memory of 2k steps
FX programmable controllers or FXCPU	Generic term for FX0, FX0S, FX1S, FX0N, FX1N, FX1, FX3G, FX2 (FX), FX2C, FX2N, FX3U, FX1NC, FX2NC, and FX3UC series programmable controllers
FX3 series	Generic term for FX3G, FX3U, and FX3UC series programmable controllers
FX3U series	Generic term for FX3U series programmable controller
FX3UC series	Generic term for FX3UC series programmable controller
FX2N series	Generic term for FX2N series programmable controller
FX2NC series	Generic term for FX2NC series programmable controller
FX1N series	Generic term for FX1N series programmable controller
FX1NC series	Generic term for FX1NC series programmable controller
FX1S series	Generic term for FX1S series programmable controller
FX2 (FX) series	Generic term for FX2 (FX) series programmable controller
FX2C series	Generic term for FX2C series programmable controller
FX1 series	Generic term for FX1 series programmable controller
FX0N series	Generic term for FX0N series programmable controller
FX0 series	Generic term for FX0 series programmable controller
FX0S series	Generic term for FX0S series programmable controller
Expansion board	
Expansion board or communication board	Generic term for expansion board
232BD	FX3U-232-BD, FX3G-232-BD
422BD	FX3U-422-BD, FX3G-422-BD
485BD	FX3U-485-BD, FX3G-485-BD
USBBD	FX3U-USB-BD
Special adapter connection board or connector conversion board	Generic term for CNVBD
CNVBD	FX3U-CNV-BD, FX3G-CNV-ADP

Abbreviation and generic term	Name
Special adapter	
Communication special adapter or communication adapter	Generic term for communication special adapter
232ADP	FX_{3U}-232ADP
485ADP	FX_{3U}-485ADP
Program conversion tool and software	
FX-20P-E	Generic term for handy programming panel "FX-20P-E-SET0"
FX-20P-E-FKIT	Generic term for the conversion module to connect the F series (F_1, F_{1J}, and F_2) to FX-20P-E
GX Works2	Generic term for programming software

1. OVERVIEW OF TRANSITION FROM F SERIES (F1, F1J, AND F2) TO FX3 SERIES

FX-20P-E is a program conversion tool, but before considering program conversion, check the programming tool on hand, the availability of the target program data, and the saved data format (creation tool).
For details on how to operate programming tools and program conversion tools (software), refer to the relevant manual.
For information on the production discontinuation period of programmable controllers, refer to Appendix 1.

1.1 Discontinued Models and Alternative Models

This section introduces discontinued models and recommended alternative models.
The alternative models introduced in this manual are standard models in terms of the number of I/O points, program capacity, product, and I/O terminal shape (such as terminal block and connector), but other models may be more suitable depending on the application and operating condition. Refer to [Precautions] below and consider the appropriate alternative model that suits your needs.

[Precautions]

(1) The recommended alternative models described in the table below are alternative products for single models that correspond to models to be discontinued.
Depending on the usage status of the model to be discontinued and the system configuration (usage statuses of the extension module and extension block), other models or series may be suitable as an alternative.

(2) If few I/O points are actually used in a model to be discontinued, it may be possible to use an alternative model with less I/O points than the model listed in the recommended alternative model column.
The recommended alternative model for extension blocks and modules, built-in boards and batteries, and other parts can be connected to the main module of the FX3 series. However, they cannot be connected to the main module of discontinued models.

(3) Items that require particular attention when replacing models are described in the special note column.
Many of the recommended alternative models have different specifications that are not described in the "Special note" column, such as having a smaller dimension than the models to be discontinued, so check the details of the dimensions, power supply, and other specifications in the manuals, in addition to the "Special note" column, when considering the use of a recommended alternative model. (especially when using the relay output type).

(4) If there is no alternative model to recommend due to the description in note 1 above, "No alternative model" will be written.
However, an existing product can be used as an alternative, depending on the application and system configuration.
Check the functions and features needed and consider using an existing product as an alternative.

F1 series (1/2)

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Main module	F1-12MR	FX3G-14MR/ES	When the main module is used as a standalone, it can be replaced with FX1S-14MR.
Main module	F1-20MR	FX3G-24MR/ES	When the main module is used as a standalone, it can be replaced with FX1S-20MR.
Main module	F1-30MR	FX3G-40MR/ES	When the main module is used as a standalone, it can be replaced with FX1S-30MR.
Main module	F1-40MR	FX3G-40MR/ES	
Main module	F1-60MR	FX3G-60MR/ES	
Main module	F1-12MT	FX3G-14MT/ES	When the main module is used as a standalone, it can be replaced with FX1S-14MT.
Main module	F1-20MT	FX3G-24MT/ES	When the main module is used as a standalone, it can be replaced with FX1S-20MT.
Main module	F1-30MT	FX3G-40MT/ES	When the main module is used as a standalone, it can be replaced with FX1S-30MT.
Main module	F1-40MT	FX3G-40MT/ES	
Main module	F1-60MT	FX3G-60MT/ES	

F1 series (2/2)

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Extension module	F1-10ER	FX2N-8EX + FX2N-8EYR	
Extension module	F1-20ER	FX2N-16EX + FX2N-8EYR	Pay attention to the power capacity if there are many extension blocks.
Extension module	F1-40ER	FX2N-48ER	
Extension module	F1-60ER	FX2N-48ER + FX2N-16EX	
Extension module	F1-10ET	FX2N-8EX + FX2N-8EYT	
Extension module	F2-8EYR	FX2N-8EYR	
Extension module	F2-12EX	FX2N-16EX	
Extension module	F1-20ET	FX2N-16EX + FX2N-8EYT	Pay attention to the power capacity if there are many extension blocks.
Extension module	F1-40ET	FX2N-48ET	
Extension module	F1-60ET	FX2N-48ET + FX2N-16EX	

F1J series

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Main module	F1J-12MR	FX3G-14MR/ES	Consider FX3G as an alternative model if shape compatibility does not need to be maintained.
Main module	F1J-32MR	FX3G-40MR/ES	
Main module	F1J-60MR	FX3G-60MR/ES	
Main module	F1J-80MR	FX3G-60MR/ES + FX2N-32ER	
Extension module	F1J-10ER	FX2N-8EX + FX2N-8EYR	
Extension module	F1J-20ER	FX2N-16EX + FX2N-16EYR	
Output module	F1J-Y4R	FX2N-8EYR	
Output module	F1J-Y4T	FX2N-8EYT	
Output module	F1J-Y4S	FX2N-16EYS	
Analog timer	F1J-4T	FX3G-8AV-BD	The program needs to be changed.

F2 series (1/3)

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Main module	F2-20MR	FX3U-32MR/ES	When the main module is used as a standalone, it can be replaced with FX1S-20MR.
Main module	F2-20MS	FX3U-32MS/ES	
Main module	F2-20MT	FX3U-32MT/ES	When the main module is used as a standalone, it can be replaced with FX1S-20MT.
Main module	F2-40MR	FX3U-48MR/ES	
Main module	F2-40MS	FX3U-64MS/ES	
Main module	F2-40MT	FX3U-48MT/ES	

F2 series (2/3)

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Main module	F2-60MR	FX3U-48MR/ES + FX2N-16EX	
Main module	F2-60MS	FX3U-64MS/ES + FX2N-8EX	
Main module	F2-60MT	FX3U-48MT/ES + FX2N-16EX	
Main module (24VDC power supply)	F2-20MR-D	FX3U-32MR/DS	When the main module is used as a standalone, it can be replaced with FX1S-20MR-D.
Main module (24VDC power supply)	F2-40MR-D	FX3U-48MR/DS	

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Main module (24VDC power supply)	F2-60MR-D	FX3U-48MR/DS + FX2N-16EX	
Main module (100VAC input)	F2-20MR-A1	FX3U-32MR/UA1	
Main module (100VAC input)	F2-20MS-A1	No alternative model	
Main module (100VAC input)	F2-40MR-A1	FX3U-64MR/UA1	
Main module (100VAC input)	F2-40MS-A1	No alternative model	
Main module (100VAC input)	F2-60MR-A1	FX3U-64MR/UA1 + FX2N-8EX-UA1/UL	
Main module (100VAC input)	F2-60MS-A1	No alternative model	
Main module (200VAC input)	F2-20MR-A2	No alternative model	
Main module (200VAC input)	F2-20MS-A2	No alternative model	
Main module (200VAC input)	F2-40MR-A2	No alternative model	
Main module (200VAC input)	F2-40MS-A2	No alternative model	
Main module (200VAC input)	F2-60MR-A2	No alternative model	
Main module (200VAC input)	F2-60MS-A2	No alternative model	
Extension module	F2-20ER	FX2N-16EX + FX2N-8EYR	Pay attention to the power capacity if there are many extension blocks.
Extension module	F2-20ES	FX2N-16EX + FX2N-16EYS	Pay attention to the power capacity if there are many extension blocks.
Extension module	F2-20ET	FX2N-16EX + FX2N-8EYT	Pay attention to the power capacity if there are many extension blocks.
Extension module	F2-40ER	FX2N-48ER	
Extension module	F2-40ES	FX2N-32ES + FX2N-8EX	
Extension module	F2-40ET	FX2N-48ET	
Extension module	F2-60ER	FX2N-48ER + FX2N-16EX	
Extension module	F2-60ES	2 FX2N-32ES + FX2N-8EX	
Extension module	F2-60ET	FX2N-48ET + FX2N-16EX	
Extension module	F2-8EYR	FX2N-8EYR	
Extension module	F2-12EX	FX2N-16EX	
Extension module (24VDC power supply)	F2-20ER-D	FX2N-16EX + FX2N-8EYR	Pay attention to the power capacity if there are many extension blocks.

F_2 series (3/3)

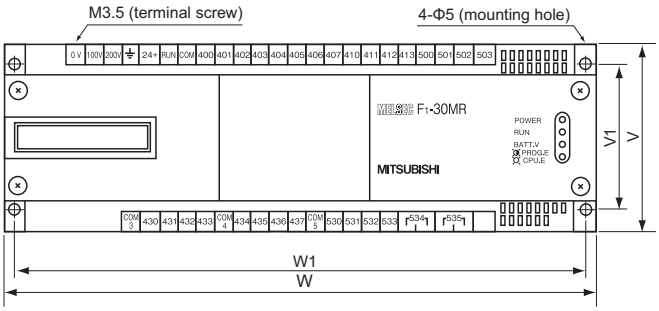
Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
Extension module (24VDC power supply)	F_2-40ER-D	FX_{2N}-48ER-D	
Extension module (24VDC power supply)	F_2-60ER-D	FX_{2N}-48ER-D + FX_{2N}-16EX	
Extension module (100VAC input)	F_2-20ER-A1	2 FX_{2N}-8EX-UA1/UL + FX_{2N}-8EYR	Pay attention to the power capacity if there are many extension blocks.
Extension module (100VAC input)	F_2-20ES-A1	2 FX_{2N}-8EX-UA1/UL + FX_{2N}-16EYS	Pay attention to the power capacity if there are many extension blocks.
Extension module (100VAC input)	F_2-40ER-A1	FX_{2N}-48ER-UA1/UL	
Extension module (100VAC input)	F_2-40ES-A1	3 FX_{2N}-8EX-UA1/UL + FX_{2N}-16EYS	Pay attention to the power capacity if there are many extension blocks.
Extension module (100VAC input)	F_2-60ER-A1	FX_{2N}-48ER-UA1/UL + 2 FX_{2N}-8EX-UA1/UL	
Extension module (100VAC input)	F_2-60ES-A1	5 FX_{2N}-8EX-UA1/UL + 2 FX_{2N}-16EYS + FX_{3U}-1PSU-5V	An extension power supply module is needed for this combination.
Extension module (200VAC input)	F_2-20ER-A2	No alternative model	
Extension module (200VAC input)	F_2-20ES-A2	No alternative model	
Extension module (200VAC input)	F_2-40ER-A2	No alternative model	
Extension module (200VAC input)	F_2-40ES-A2	No alternative model	
Extension module (200VAC input)	F_2-60ER-A2	No alternative model	
Extension module (200VAC input)	F_2-60ES-A2	No alternative model	
Interface adapter for links (wire)	F_2-40AW	FX_{3U}-485ADP	An expansion board is needed to connect to the main module of the FX_{3U} series.
Interface adapter for links (optical fiber)	F_2-40AP	No alternative model	
Interface adapter for high-speed counters	F_2-40AC	No alternative model	Consider using the built-in high-speed counters of the FX series.
Interface adapter for high-speed counters	F_2-40AC2	No alternative model	Consider using the built-in high-speed counters of the FX series.
Pulse output module (positioning control)	F_2-30GM	FX_{2N}-10GM	The program needs to be changed by FX-PCS-VPS/WIN.
Analog I/O module	F_2-6A	FX_{3U}-4AD + FX_{3U}-4DA	
Programmable cam switch	F_2-32RM-SET	FX_{2N}-1RM-SET	
Data I/O module	F_2-40DT-SET	No alternative model	Consider the application instructions of the FX series.
Counter module for positioning	F-20CM-5	No alternative model	

Discontinued model		Recommended alternative model	Special note
Device name	Model	Model	
For NET/MINI optical fiber	F-16NP	No alternative model	Consider a system that has used CC-Link.
For NET/MINI twisted pair	F-16NT	No alternative model	Consider a system that has used CC-Link.
Four-point analog timer measuring 0.1 to 600 seconds	F-4T	No alternative model	

1.2 External Dimensions

This section shows the external dimensions of main modules when converting the F series (F1, F1J, and F2) to the FX3 series.
Compatibility is not an issue for the external dimension, installation method, terminal position, terminal size, and terminal number, so reconsider the installation and wiring methods for the modules again. For information on extension devices, refer to the manual of each device.

■ Main module of the F1 series

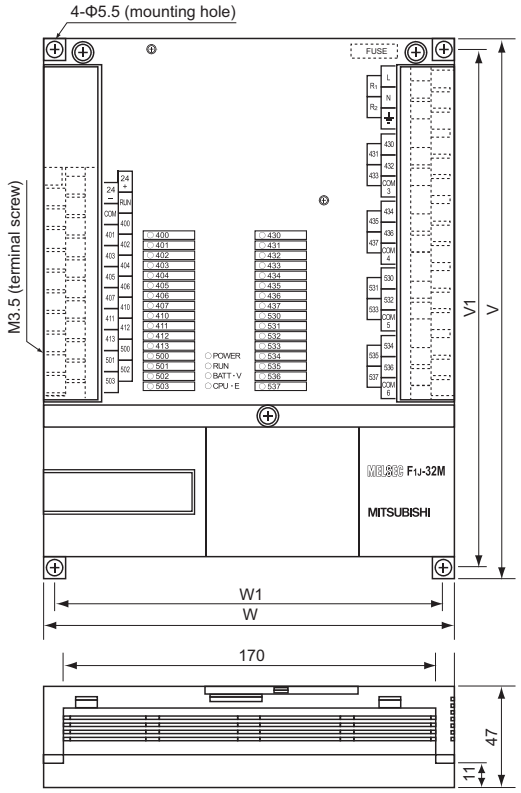


External color: Munsell 5Y7/1
Unit: mm

Model	W	W1	V	V1	Weight (kg)
F1-10M	165	155	90	70	1.2
F1-12M	165	155	90	70	1.2
F1-20M	250	240	90	70	1.5
F1-30M	275	265	90	70	1.9
F1-40M	300	290	110	100	2.3
F1-60M	350	340	140	125	3.5

・M3.5 terminal screw for the terminal block

■ Main module of the F_{1J} series

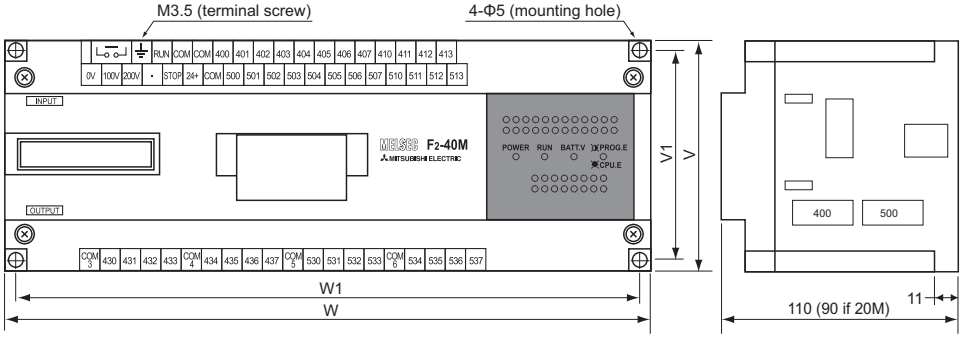


External color: Munsell 5Y7/1
Unit: mm

Model	W	W1	V	V1	Weight (kg)
F_{1J}-12M	180	170	170	160	1.2
F_{1J}-32M	190	180	250	240	1.2
F_{1J}-60M	210	200	330	320	1.8
F_{1J}-80M	280	270	330	320	2.2

・M3.5 terminal screw for the terminal block

■ Main module of the F_2 series

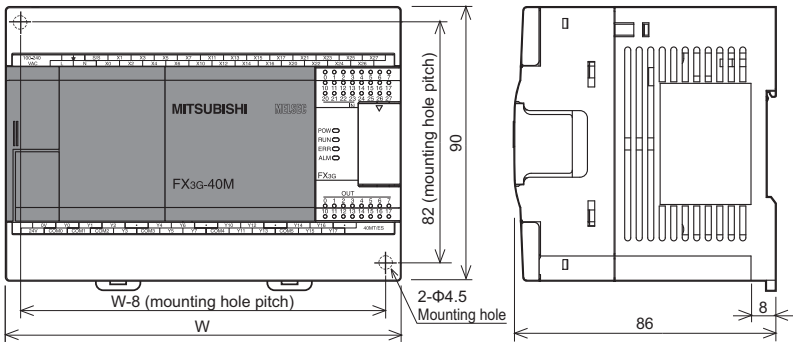


External color: Munsell 5Y7/1
Unit: mm

Model	W	W1	V	V1	Weight (kg)
F_2-20M	250	240	90	70	1.6
F_2-40M	300	290	110	100	2.7
F_2-60M	350	335	140	125	3.5

・M3.5 terminal screw for the terminal block

■ Main module of the FX_{3G} series

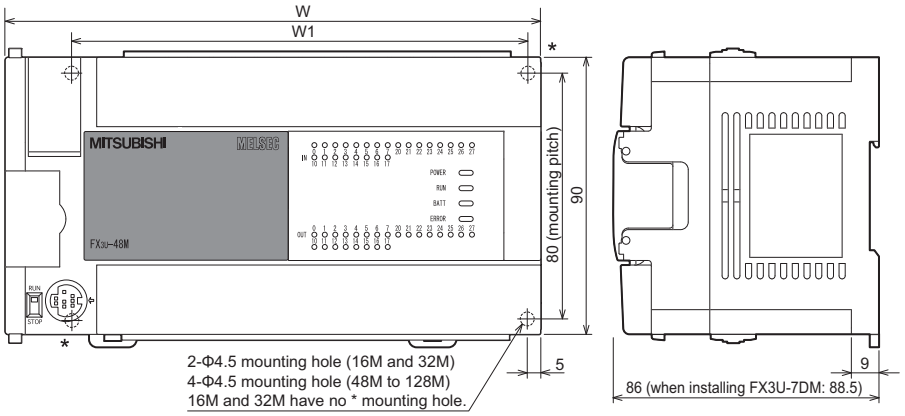


External color: Munsell 0.08GY/7.64/0.81
Unit: mm
Top cover: Munsell N1.5

Model	W	Weight (kg)
FX_{3G}-14M	90	0.50
FX_{3G}-24M	90	0.55
FX_{3G}-40M	130	0.70
FX_{3G}-60M	175	0.85

・M3 terminal screw for the terminal block
・35-mm-wide DIN rail mountable

■ Main module of the FX3U series



External color: Munsell 0.08GY/7.64/0.81
Unit: mm
Top cover: Munsell N1.5

Model	W	W1	Weight (kg)
FX3U-16M	130	103	0.60
FX3U-32M	150	123	0.65
FX3U-48M	182	155	0.85
FX3U-64M	220	193	1.00
FX3U-80M	285	258	1.20
FX3U-128M	350	323	1.80

・M3 terminal screw for the terminal block
・35-mm-wide DIN rail mountable

1.3 Program Conversion Overview

Converting programs from the F to FX3 series involves changing the models for the instructions and element numbers in the basic instructions common to F and FX.
Unconvertible application instructions need to be modified using the programming tool for the FX3 series.
For information on program conversion rules, refer to Chapter 3.
For information on each programming and the operation and functions of program conversion tools, refer to the manual for the relevant tool.

1.4 List of Program Conversion Tool and Software to Convert the F series (F1, F1J, and F2) to the FX3 Series

The following table shows how FX-20P-E(SET0) + FX-20P-E-FKIT can be used as a tool for program conversion.
The computer software is used to perform debug after conversion.
For information on the production discontinuation period of programmable controllers, refer to Appendix 1.

	Tool for program conversion	Program save destination and creation tool for F1, F1J, and F2 programmable controllers before conversion		Program save destination and modification tool for FX3 series programmable controllers after conversion		Reference
		Save destination	Program tool	Save destination	Program tool	
HPP	FX-20P-E(SET0) + FX-20P-E-FKIT	Program memory (built-in RAM and memory cassette) of F1, F1J, and F2 programmable controllers	-	Program memory (built-in RAM and memory cassette) of FX3 series programmable controllers	FX-30P*1	Chapter 2
Computer	GX Works2*2	-	-	In the computer	GX Works2*2	Chapter 3

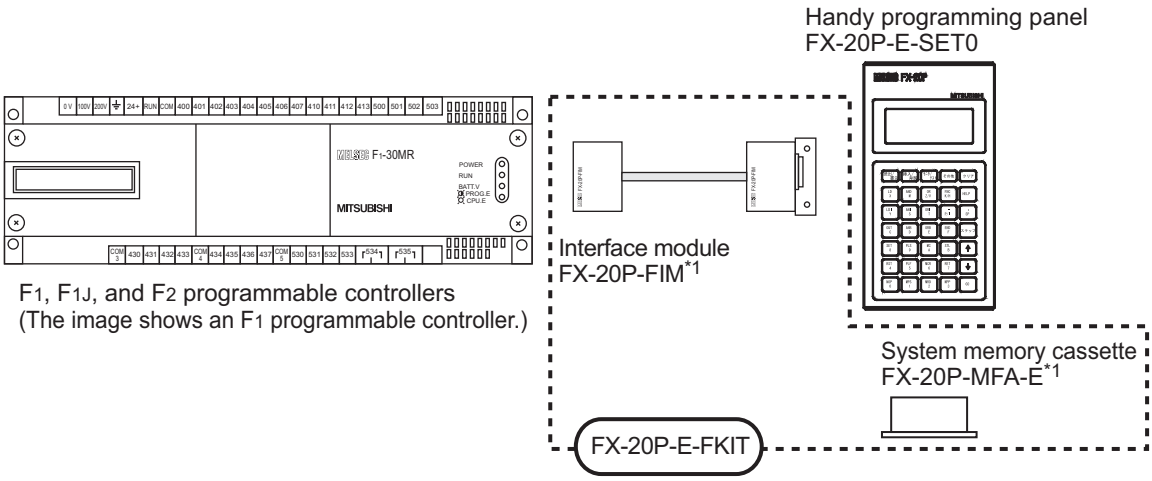
*1 For information on the supported programmable controller version, refer to the FX-30P Operation Manual.
*2 For information on the operating environment of GX Works2, refer to the GX Works2 Operating Manual.

1.5 Connecting with Programmable Controllers

Before connecting to a programming tool, refer to the safety precautions written in the manual of the programmable controller.

1.5.1 Connecting FX-20P-E and programmable controllers

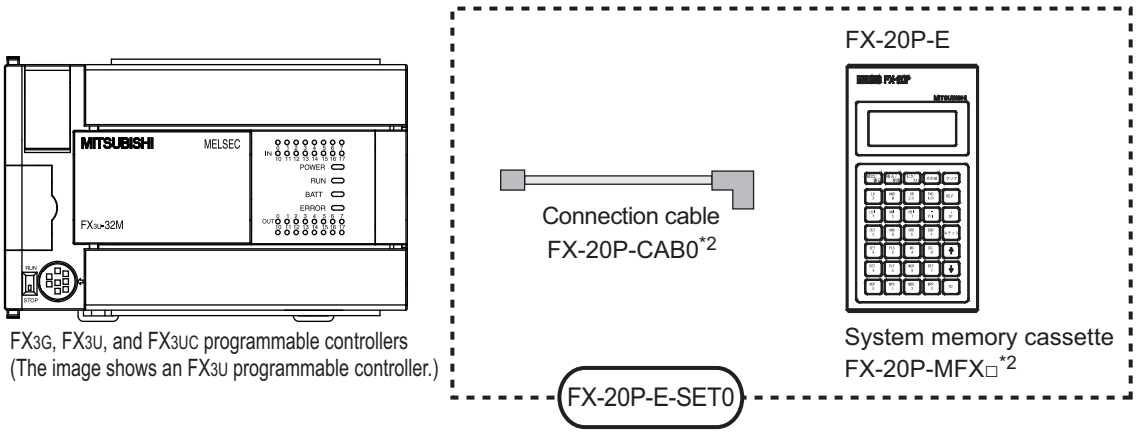
(1) Connecting with F1, F1J, and F2 programmable controllers



F1, F1J, and F2 programmable controllers
(The image shows an F1 programmable controller.)

*1 FX-20P-FIM and FX-20P-MFA-E are included in FX-20P-E-FKIT.

(2) Connecting with FX3G, FX3U, and FX3UC programmable controllers

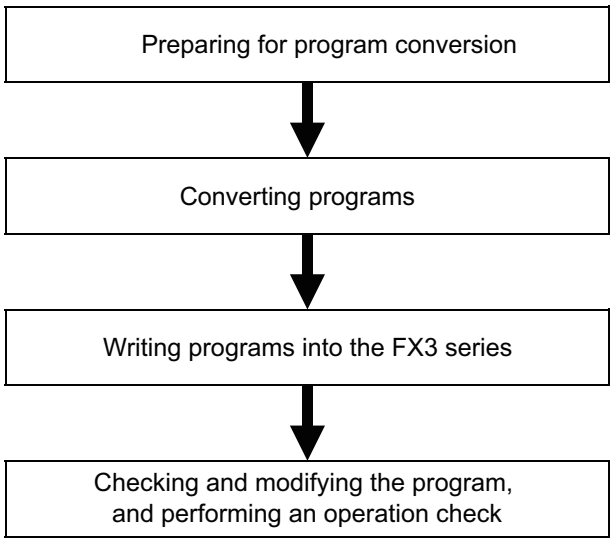


FX3G, FX3U, and FX3UC programmable controllers
(The image shows an FX3U programmable controller.)

*2 FX-20P-CAB0 and FX-20P-MFX are included in FX-20P-E-SET0.

2. OVERVIEW OF PROGRAM CONVERSION USING FX-20P-E

2.1 Program Conversion Procedure



- Turn on FX-20P-E + FX-20P-E-FKIT. (Refer to Chapter 2.3.1.)
- Read the program to be converted from F1, F1J, and F2 programmable controllers. (Refer to Chapter 2.3.2.)
- Convert the target program for the FX series. (Refer to Chapter 2.3.3.)
  For information on program conversion rules, refer to Chapter 3.
- Write the converted program into the FX3 series. (Refer to Chapter 2.3.4.)
- Check and modify the converted program, and perform an operation check. (Refer to Section 2.4.)

2.2 Items to Prepare

Prepare the following items to use FX-20P-E to convert programs of F1, F1J, F2 programmable controllers to programs for FX3 series programmable controllers. For details on the connection configuration with programmable controllers, refer to Chapter 1.5.1.

- The F1, F1J or F2 programmable controller containing the program to be converted
- Paper describing the program to be converted
  There are instructions that cannot be converted by the FX-20P-E-FKIT program conversion function. The paper is needed to modify the program after executing the program conversion function.
- The FX3 series programmable controller to store the converted program
- FX-20P-E (-SET0)
- FX-20P-E-FKIT
  FX-20P-E-FKIT consists of FX-20P-FIM and FX-20P-MFA-E.
- Programming tools GX Works2 or FX-30P, which are compatible with the FX3 series, can be used to check or modify the converted program.
- Programming tool and programmable controller manual

2.3 Program Conversion Operation

2.3.1 Turning on FX-20P-E + FX-20P-E-FKIT

This section describes the steps to attach FX-20P-FIM and FX-20P-MFA-E onto FX-20P-E and launch it.

■ CAUTION

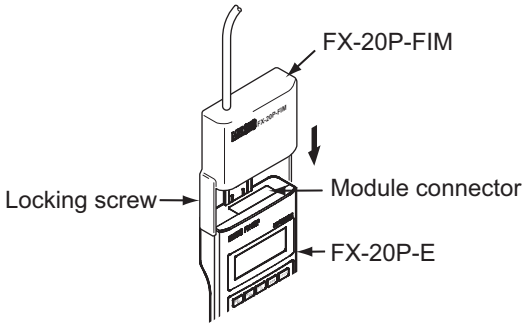
Do not touch the connecting part for the programmable controller of FX-20P-E, the special module, the connecting part for the memory cassette, and the connecting part for FX-20P-E of the system memory cassette. The internal electric circuit may become faulty due to static electricity. Turn off the power of the programmable controller before connecting FX-20P-E to it.

(1) Attach FX-20P-FIM to FX-20P-E.

(a) Remove the cover from the special module connection part at the top of FX-20P-E.

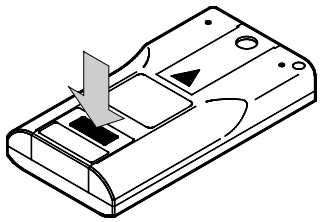
(b) Connect FX-20P-FIM.

(c) Secure FX-20P-FIM onto FX-20P-E with a screw.

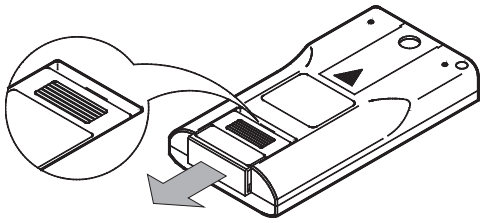


(2) Replace the system memory cassette of FX-20P-E for the FX series with FX-20P-MFA-E (system memory cassette for the MELSEC-F series).

(a) Push down the anti-slip of the system memory cassette from the back of FX-20P-E.



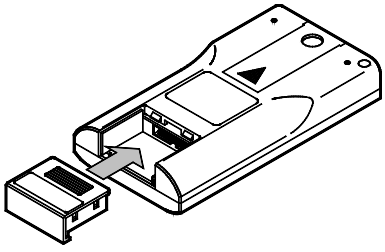
(b) Once there is a gap of approx. 1mm between the system memory cassette and FX-20P-E, pull out the system memory cassette in the direction indicated by the arrow.



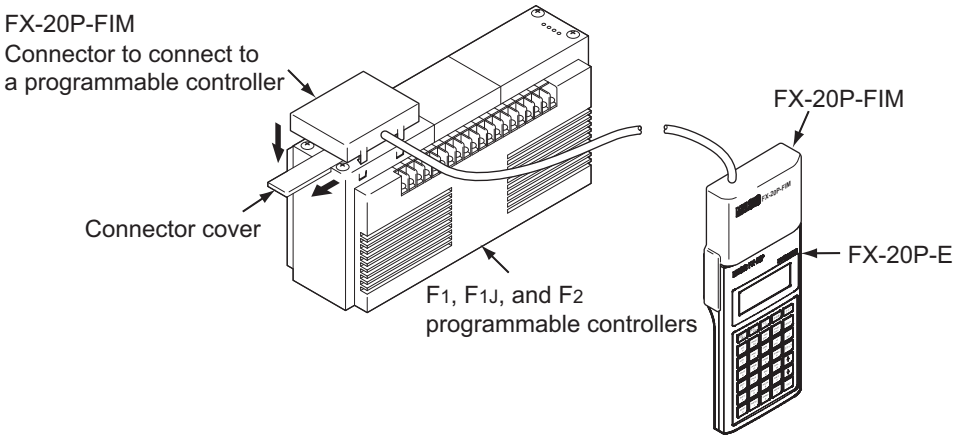
(c) Connect (attach) FX-20P-MFA-E.

■ CAUTION

Do not touch the connecting part of the system memory cassette and FX-20P-E.



(3) With the power of the programmable controller turned off, connect FX-20P-FIM to the target programmable controller (F1, F1J, or F2).



(4) Turn on the programmable controller (F1, F1J, or F2) to display the "SELECT PC TYPE" window.

```
SELECT PC TYPE
▮F2, F1
 F2/2K
```

(5) On the "SELECT PC TYPE" window, use the [↑] and [↓] keys to select the target programmable controller model and press the [GO] key. The window shown on the right is displayed.

The window on the right is displayed when "F2/2K" is selected.

```
F2/2K
STEPS LEFT 1024
SELECT MODE
```

■ About the display of cursor for selecting models at startup

If the program is already stored in the RAM memory of FX-20P-E, the cursor is displayed on the relevant model.
If a different model is selected, the window on the right is displayed. Press the [GO] key to delete the program stored in the RAM memory of FX-20P-E. A "SELECT MODE" message is displayed. To check the content, press the [CLEAR] key.
For information on how to display programs, refer to the FX-20P-E-FKIT Operation Manual.

```
PC TYPE MISMATCH
HPP ALL CLEAR?
   OK→ [GO]
   NO→ [CLEAR]
```

2.3.2 Reading the program to be converted from F1, F1J, and F2 programmable controllers

FX-20P-E-FKIT reads and creates programs offline. Thus, it is necessary to read the program from the target programmable controller in the RAM memory of FX-20P-E using the following steps. This section describes the operation to read programs from the target programmable controller (F1, F1J, or F2).

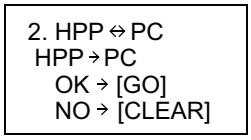
(1) Press the [OTHER] key to display the "MODE MENU" window.

```
MODE MENU
▮1. PROGRAM CHECK
 2. HPP ⇔ PC
 3. F → FX CONVERT
 4. BUZZER LEVEL
```

(2) On the "MODE MENU" window, use the [↑] and [↓] keys to select "2.HPP↔PC" and press the [GO] key. The "2.HPP↔PC" window is displayed.

```
 2. HPP ⇔ PC
▮HPP → PC
 HPP ← PC
 HPP : PC
```

(3) On the "2.HPP↔PC" window, use the [↑] and [↓] keys to select "HPP←PC" and press the [GO] key. The window shown on the right is displayed.



CAUTION
The display and creation of programs using FX-20P-E + FX-20P-E-FKIT are done offline.
Always read the program from the programmable controller first before converting it.
When converting F programs to FX programs, they are not written to F1, F1J, and F2 programmable controllers.

(4) Press the [GO] key to read (transfer) programs. A message stating "EXECUTING" is displayed.
Once the program has been read, the message changes to "COMPLETED".
An error message is displayed if the program cannot be read successfully.
For information on how to resolve error messages, refer to the FX-20P-E-FKIT Operation Manual.

2.3.3 Converting programs

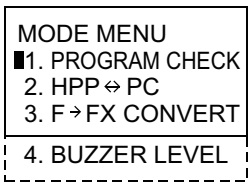
This section describes the operation to convert programs from the target programmable controller that was read in FX-20P-E (F1, F1J, or F2) to programs for FX3 series programmable controllers.
For information on program conversion rules, refer to Chapter 3.

■ Important points

To convert programs used with a capacity of 2000 steps ("F2/2K" selected as the model) in an F2 programmable controller, read the programs from the F2 programmable controller and change the following programs first.
For information on how to change programs, refer to the FX-20P-E-FKIT Operation Manual.

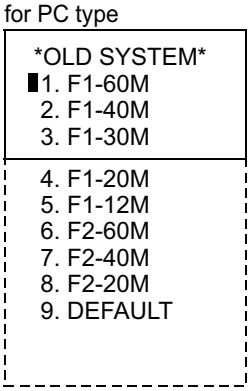
- Program modification details
  Add (write) an END instruction to the end of the program (last step of 1999).

(1) Press the [OTHER] key to display the "MODE MENU" window.

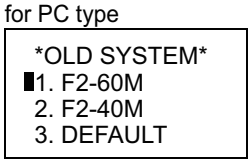


(2) On the "MODE MENU" window, use the [↑] and [↓] keys to select "3.F→FX CONVERT" and press the [GO] key. The "OLD SYSTEM" window shown on the right is displayed according to the model selected during system startup.

When F1/F2 is selected for PC type



When F2/2K is selected for PC type



(3) On the "OLD SYSTEM" window, use the [↑] and [↓] keys to select the main module of the target program and press the [GO] key. The "NEW SYSTEM" window is displayed.

```
 *NEW SYSTEM*
▮FX
  F
 CONVERT : [GO]
```

■ CAUTION

The conversion of the I/O number when converting programs differs depending on whether the main module has been specified. For information on I/O number conversion rules, refer to Chapter 3.2.1.

(4) Press the [GO] key to execute the program conversion function. The "END RESULT" window is displayed. During execution, a message stating "EXECUTING" is displayed.

```
*END RESULT*
ERRORS    =000/2K
USE FX SYS CASS
TO CHECK PROGRAM
```

Programs are converted according to the conversion rules described in Chapter 3, but some instructions cannot be converted due to differences in functions. The "END RESULT" window displays the instruction number and program capacity (2K or 4K) that cannot be converted as the conversion result.

2.3.4 Writing programs into FX3 series programmable controllers

After converting programs, transfer them to an FX3 series programmable controller and check and edit them. This section describes the steps to remove the FX-20P-FIM and FX-20P-MFA-E attached to FX-20P-E and launch FX-20P-E.
If the system memory cassette is replaced to that for the FX series while connected to an F_1, F_{1J}, or F_2 programmable controller, the converted program can be checked and modified on FX-20P-E.

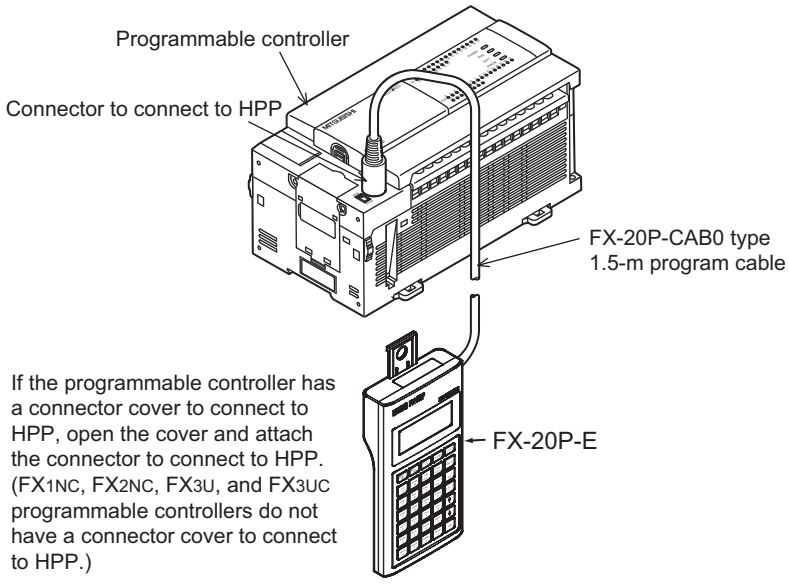
■ CAUTION

Do not turn off the power of the programmable controller or disconnect the connection cable immediately after converting programs.
Doing so may cause the program saved in the RAM memory of FX-20P-E to disappear.
Electricity must be supplied to FX-20P-E for one hour or more to retain the RAM memory in it (for three days).

(1) Turn off the programmable controller (F_1, F_{1J}, or F_2).
(2) Remove FX-20P-FIM from the target programmable controller (F_1, F_{1J}, or F_2).
Perform the steps written in "Chapter 2.3.1 (3)" in reverse.
(3) Replace FX-20P-MFA-E with the system memory cassette for the FX series.
Follow the steps written in "Chapter 2.3.1 (2)".
(4) Remove FX-20P-FIM.
Perform the steps written in "Chapter 2.3.1 (1)" in reverse.

(5) Connect FX-20P-E with the FX3 series programmable controller using the FX-20P-CAB0 cable.

<<Connecting with FX3G, FX3U, and FX3UC programmable controllers>>



■ CAUTION

Do not touch the connecting part for the programmable controller of FX-20P-E. The internal electric circuit may become faulty due to static electricity. Turn off the power of the programmable controller before connecting FX-20P-E to it.

(6) Turn on the programmable controller to display the "PROGRAM MODE" window.

```
PROGRAM MODE
▮ON LINE   (PC)
 OFF LINE (HPP)
```

(7) On the "PROGRAM MODE" window, use the "↑" and "↓" keys to select "OFFLINE (HPP)" and press the [GO] key. The "SELECT PC TYPE" window is displayed.
FX-20P-E does not support the FX3 series, so select "FX2N, FX1N, F1S".
Select "FX2N" if the system cassette version is 4 or older, and "FX2" if the version is 3 or older.

```
SELECT PC TYPE
 FX, FX0
▮FX2N, FX1N, FX1S
```

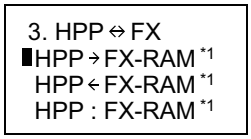
(8) On the "SELECT PC TYPE" window, select the connected programmable controller model and press the [GO] key. The window shown on the right is displayed.
The window on the right is displayed when "FX2N" is selected.

```
ON LINE MODE FX
 SELECT FUNCTION
 OR MODE
MEM. SETTING 8k
```

(9) Press the [OTHER] key to display the function menu window of other modes (as shown on the right).

```
OFFLINE MODE FX
▮1. ONLINE MODE
 2. PROGRAM CHECK
 3. HPP ⇔ FX
 4. PARAMETER
 5. XYM..NO.CONV.
 6. BUZZER LEVEL
 7. MODULE
```

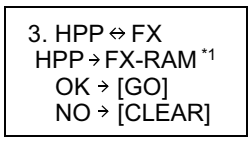
(10) On the function menu window, use the "↑" and "↓" keys to select "3.HPP↔FX",
and press the [GO] key. The "HPP↔FX" window is displayed.
The window on the right is displayed if the memory cassette is not installed in the programmable controller.



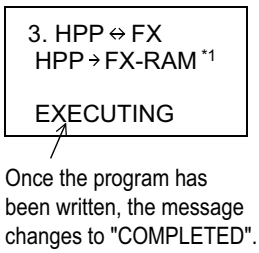
■ CAUTION

When a memory cassette is installed in the programmable controller, the memory cassette type is automatically identified as FX-20P-E.
Programs can only be written into the memory cassette if the PROTECT switch is turned off. If the PROTECT switch is turned on, a message stating "WRITE FORBIDDEN" is displayed.

(11) On the "3.HPP↔FX" window, use the "↑" and "↓" keys to select "HPP→FX-RAM*1" and press the [GO] key. The window shown on the right is displayed.
The window on the right is displayed if the memory cassette is not installed in the programmable controller.



(12) Press the [GO] key to write programs. A message stating "EXECUTING" is displayed.
Once the program has been written, the message changes to "COMPLETED".



*1 The content displayed on FX-RAM differs depending on the memory cassette installation state and memory type.

2.4 Editing Programs

After converting F programs to FX programs and writing them into FX3 series programmable controllers, check and modify them. The GX Works2 programming software is recommended to edit programs. It is compatible with the FX3 series, and device replacement and other functions can be performed easily. For information on how to operate the programming software, refer to the manual.

The converted programs are equivalent to FX1 and FX2 programs, so read the following cautions and edit them according to the FX3 series system that you have built based on the conversion rules described in Chapter 3 and subsequent chapters.

(1) Changing the device number
The device converted using the program conversion function is within the device range of FX1 and FX2.
(Refer to Chapter 3.2 Device Conversion.)
Some special devices are converted to temporary devices due to differences in functions.
(Refer to Chapter 3.2.6 Special devices marked with an asterisk (*).)

(2) Changing basic instructions (Refer to Chapter 3.3.)
The following basic instructions are converted automatically, but they need to be checked. Refer to the relevant section and edit them accordingly.
- Converting master control instructions (Refer to Chapter 3.3.2.)
- Converting reset instructions (Refer to Chapter 3.3.3.)
- Converting shift instructions (Refer to Chapter 3.3.3.)
- Converting jump instructions (Refer to Chapter 3.3.4.)

(3) Changing application instructions (Refer to Chapter 3.4.)
Application instructions differ depending on the program type and method, so they cannot be converted automatically. Even if they can be converted, those containing structures that do not follow the rules are converted to NOP. Refer to the list in Chapter 3.4 and the programming manual to convert them into supported application instructions for the FX3 series.

3. CONVERSION RULES FOR THE PROGRAM CONVERSION FUNCTION

This chapter describes program conversion rules.

3.1 Precautions When Converting Programs

After executing the F-to-FX program conversion function, check and edit the following points.*1
For information on how to operate programming tools, refer to the manual for the relevant tool.
For information on device range and instructions, refer to the manual for the relevant tool.

(1) Changing the device number
The device converted using the program conversion function is within the device range of FX1 and FX2 programmable controllers*2, so the device may need to be changed (replaced) after conversion depending on the model. Check the device range of the model with the conversion rule (refer to Section 3.2), and change the device number.
Some special devices (special auxiliary relay (M)) are converted to temporary devices due to differences in functions. Use GX Works2, a supported programming software for the FX3 series, to change converted programs to those used for functions and instructions supported by FX3 series programmable controllers.

(2) Changing programs
Some instructions cannot be converted due to differences in functions. (Refer to Sections 3.3 and 3.4.) Change unconvertible instructions to programs used for functions and instructions supported by FX3 series programmable controllers after the conversion.
Even if the instructions can be converted, CJP 777 and EJP 777 jump instructions and those containing structures that do not follow the rules are converted to NOP, so change them to programs used for functions and instructions supported by FX3 series programmable controllers.

(3) Checking programs as a whole
Check programs for errors. If there is an error, change the program accordingly.

(4) Checking program operation
The program operation cycle is changed, so write the program to the programmable controller and check the system operation as a whole. Modify the program as necessary.

*1 The GX Works2 programming software is recommended to edit programs. It is compatible with the FX3 series, and device replacement and other functions can be performed easily.

*2 These products have been discontinued. For information on the production discontinuation period of programmable controllers, refer to Appendix 1.

3.2 Device Conversion

3.2.1 Input relay (X) and output relay (Y)

Note that the I/O number assignment differs depending on whether the model of the main module to be converted is specified using the program conversion function.

(1) When the main module has been specified

The element numbers of input relay (X) and output relay (Y) of the main module and extension module are assigned to the input relay (X) and output relay (Y) of the FX series sequentially in the following order. Element numbers are assigned even if they are not used.

(a) The element numbers of input relay (X) and output relay (Y) of the main unit are assigned in the following order: numbers in groups of 100 starting from 0, 400 and 500.

(b) If an element number of input relay (X) and output relay (Y) that is not in the element number system of the main module exists in the program, it is considered to be the element number of an extension module and assigned as sequential element numbers after the main module. However, the F-4T extension module is not considered.

Assignment example 1 (Specified main module: F2-60M)

	F2		FX	
Main module	X000 to X013	→ Convert	X000 to X013	(1)
	X400 to X413		X014 to X027	(2)
	X500 to X513		X030 to X043	(3)
Considered an extension module	X014 to X027		X044 to X057	(4)
	X414 to X427		X060 to X073	(5)
	X514 to X527		X074 to X107	(6)

	F2		FX	
Main module	Y030 to Y037	→ Convert	Y000 to Y007	(1)
	Y430 to Y437		Y010 to Y017	(2)
	Y530 to Y537		Y020 to Y027	(3)
Considered an extension module	Y040 to Y047		Y030 to Y037	(4)
	Y440 to Y447		Y040 to Y047	(5)
	Y540 to Y547		Y050 to Y057	(6)

Assignment example 2 (Specified main module: F1 and F1J-12M)

	F1, F1J		FX	
Main module	X400 to X405	→ Convert	X000 to X005	(1)
Considered an extension module	X414 to X427		X006 to X021	(2)

	F1, F1J		FX	
Main module	Y430 to Y435	→ Convert	Y000 to Y005	(1)
Considered an extension module	Y440 to Y447		Y006 to Y015	(2)

(2) When the main module has not been specified

The element numbers of input relay (X) and output relay (Y) of the program are assigned alternately between the main module and extension module in the following order: numbers in groups of 100 starting from 0, 400 and 500 (order of assignment: (1) to (6) as shown below). Element numbers are assigned even if they are not used.

Assignment example 1

	F1, F1J, F2		FX	
Main module	X000 to X013	→ Convert	X000 to X013	(1)
	X400 to X413		X030 to X043	(3)
	X500 to X513		X060 to X073	(5)
Considered an extension module	X014 to X027		X014 to X027	(2)
	X414 to X427		X044 to X057	(4)
	X514 to X527		X074 to X107	(6)

	F1, F1J, F2		FX	
Main module	Y030 to Y037	→ Convert	Y000 to Y007	(1)
	Y430 to Y437		Y020 to Y027	(3)
	Y530 to Y537		Y040 to Y047	(5)
Considered an extension module	Y040 to Y047		Y010 to Y017	(2)
	Y440 to Y447		Y030 to Y037	(4)
	Y540 to Y547		Y050 to Y057	(6)

3.2.2 Auxiliary relay (M) [Excluding special auxiliary relay (M)]

The relay for general use and the relay for backup power are converted as shown in the table below.

	F_1, F_{1J}, F_2		FX
For general use (without backup)	M100 to M107	→ Convert	M0 to M7
	M110 to M117		M8 to M15
	M120 to M127		M16 to M23
	M130 to M137		M24 to M31
	M140 to M147		M32 to M39
	M150 to M157		M40 to M47
	M160 to M167		M48 to M55
	M170 to M177		M56 to M63
	M200 to M207		M64 to M71
	M210 to M217		M72 to M79
	M220 to M227		M80 to M87
	M230 to M237		M88 to M95
	M240 to M247		M96 to M103
	M250 to M257		M104 to M111
	M260 to M267		M112 to M119
	M270 to M277		M120 to M127
For backup power (with backup)	M300 to M307		M500 to M507
	M310 to M317		M508 to M515
	M320 to M327		M516 to M523
	M330 to M337		M524 to M531
	M340 to M347		M532 to M539
	M350 to M357		M540 to M547
	M360 to M367		M548 to M555
	M370 to M377		M556 to M563

3.2.3 Timer (T)

The timer is converted according to the minimum value as shown in the table below.

F_1, F_{1J}, F_2				FX		
Minimum timer value	Element number	Setting value		Minimum timer value	Element number	Setting value
0.1-sec timer (0.1 to 999 sec) K0.1 = 0.1 sec (100-msec timer)	T50 to T57	K99.9 to 0.1	→ Convert	100-msec timer (0.1 to 3276.7 sec) K1 = 0.1 sec	T0 to T7	K999 to 1
		K999 to 1				K9990 to 10
	T450 to T457	K99.9 to 0.1			T8 to T15	K999 to 1
		K999 to 1				K9990 to 10
	T550 to T557	K99.9 to 0.1			T16 to T23	K999 to 1
		K999 to 1				K9990 to 10
0.01-sec timer (0.01 to 99.9 sec) K0.01 = 0.01 sec (10-msec timer)	T650 to T657	K99.9 to 0.01 (999 to 1)		10-msec timer (0.01 to 327.67 sec) K1 = 0.01 sec	T200 to T207	K999 to 1
		K99.9 to 0.1				K9990 to 10

In F_1, F_{1J}, and F_2, timers can be entered up to three digits, including decimals. Using the 0.1-sec timer as an example, if the minimum value of the T50 timer is set to 0.1 sec, the T0 timer will be set to 1 after converting to FX, according to the table above. Integer values are entered for FX, but K1 is equal to 0.1 sec in the FX series, so the same timer value of 0.1 sec is set.

3.2.4 Counter (C)

The counter is changed according to the number as shown in the table below. The setting value for the counter is converted directly.

The counter for F1, F1J, and F2 programmable controllers are all for backup power.

F1, F1J, F2		FX
C60 to C67	→ Convert	C100 to C107
C460 to C467		C108 to C115
C560 to C567		C116 to C123
C660 to C667		C124 to C131

3.2.5 State (S)

The state is changed according to the number as shown in the table below.

F1, F1J, F2		FX
S600 to S647	→ Convert	S500 to S539
S800 to S877		S540 to S603
S900 to S977		S604 to S667

3.2.6 Special device (special auxiliary relay (M))

The special device is changed according to the number as shown in the table below.

■ CAUTION

Special devices marked with an asterisk (*) have no alternative device in the FX series. They are changed to temporary devices as shown in the table below, so change the program according to the operation of the device.

F1, F1J, F2	Name		FX	Remarks
M70	RUN monitor		M8000	
M71	Initialize (initial) pulse		M8002	
M72	100-ms clock		M8012	ON: 50ms and OFF: 50ms
M73	10-ms clock		M8011	ON: 5ms and OFF: 5ms
* M74	(Parallel) link suspension	→ Convert	M374	Turn it on in the following states. For details on the operation of the device, refer to the F2 Series Programming Manual. · The device is awaiting the response of the other station. · Your station or the other station is in Program Mode state. Consider replacing with M8072 of the FX series. Turn on M8072 when running a parallel link.
* M75	(Parallel) link error		M375	Turn it on in the following states. For details on the operation of the device, refer to the F2 Series Programming Manual. · The device is awaiting the response of the other station. Consider replacing with M8072 of the FX series. Turn M8072 on when running a parallel link.
M76	Battery voltage drop		M8005	
M77	Disable output		M8034	

F_1, F_{1J}, F_2	Name		FX	Remarks
*M470	Internal mode selection		M470	· ON: External count mode Count input turns into high-speed counter adapter when C660 is used with M470 turned on. Use the built-in high-speed counter of the FX series backup power when set to ON. · OFF: Internal count mode Count input turns into an internal device when C660 is used with M470 turned off. Use the counter of the backup power when set to OFF.
*M471	Direction selection		M471	Change the C660 used in external count mode as follows. · When C660 is used as a 1-phase high-speed counter Change to the special auxiliary relay for specifying the count direction of the built-in 1-phase-input high-speed counter of the FX series to be changed. The count direction goes in reverse when the device is turned on and off, so change the program so that the on/off operation is different. · When C660 is used as a 2-phase high-speed counter Change to the special auxiliary relay for monitoring the count direction of the built-in 2-phase-input high-speed counter of the FX series to be changed. The count direction goes in reverse when the device is turned on and off, so change the program so that the on/off operation is different.
*M472	Start signal		M472	If an external start signal is required, use the built-in high-speed counter with the external start function. · ON: Starts counting the C660 used in external count mode. · OFF: Stops counting the C660 used in external count mode.
*M473	Digit increment/decrement flag	→ Convert	M473	Uses the C660 and C661 used in external count mode as six-digit up-down counters. The built-in high-speed counters in the FX series are 32-bit up-down counter, so replace one with a high-speed counter. Change to a program that does not use this device.
*M474	Mode selection		M474	· ON: Up-down mode Specifies the count direction of the subsequent counter when M475 is turned on or off. Use a 32-bit up-down counter for the FX series. · OFF: Down mode Stops counting the C660 used in external count mode.
*M475	Direction selection		M475	Change to the special auxiliary relay for specifying the count direction of the 32-bit up-down counter used in the FX series. The count direction goes in reverse when the device is turned on and off, so change the program so that the on/off operation is different.
*M476	Digit increment/decrement flag		M476	The FX series has 32-bit up-down counters, so replace one with a high-speed counter. Change to a program that does not use this device.
*M477	Shift direction		M477	· ON: Shifts in the reverse direction. (Shifts in the direction of smaller device numbers.) For the FX series, change to a program that uses the bit shift right (SFTR) instruction. · OFF: Shifts in the positive direction. (Shifts in the direction of larger device numbers.) For the FX series, change to a program that uses the bit shift left (SFTL) instruction.
M570	(Operation) error flag		M8067	
M571	Carry flag		M8022	

F_1, F_{1J}, F_2	Name		FX	Remarks
M572	Zero flag	→ Convert	M8020	
M573	Borrow flag		M8021	
M574	Disable state shift		M8040	
M575	Start state shift		M8041	
* M576	All processes completed flag		M576	For the FX series, change to a program that uses the incremental drum sequencer (INCD) instruction.
* M577	C666 and C667 purpose specification		M577	

3.3 Converting Basic Instructions

3.3.1 Converting basic instructions

The following table lists the conversion of basic instructions of F_1, F_{1J}, and F_2 programmable controllers to instructions for the FX series.

■ CAUTION

CJP 777 and EJP 777 jump instructions and instructions containing structures that do not follow the rules are converted to NOP.

	F_1, F_{1J}, F_2			FX		Remarks
	Instruction	Target device		Instruction	Device after conversion	
Contact instruction	LD	X, Y, M, T, C, S	→ Convert	LD	Converted according to device conversion rules.	For information on device conversion rules, refer to Section 3.2.
	LDI			LDI		
	AND			AND		
	ANI			ANI		
	OR			OR		
	ORI			ORI		
Association instruction	ANB	-		ANB	-	
	ORB	-		ORB	-	

	F1, F1J, F2			FX		Remarks
	Instruction	Target device		Instruction	Device after conversion	
Output instruction	OUT	Y, M, T, C, S		OUT	Converted according to device conversion rules.	For information on device conversion rules, refer to Section 3.2.
	OUT	F670 to F677		OUT	M670 to M677	Application instructions for F1, F1J, and F2 programmable controllers For information on converting application instructions, refer to Section 3.4.
	S	Y, M200 to M377, S		SET	Converted according to device conversion rules.	For information on device conversion rules, refer to Section 3.2.
	R	Y, M200 to M377, S		RST		
	RST	C		RST		
	RST	M100		MOV K0 K4M0		Used to clear the shift register in F1, F1J, and F2 programmable controllers. Thus, it is changed to MOV instructions (shown on the left) when F programs are converted to the FX series. Refer to Chapter 3.3.3.
	RST	M120		MOV K0 K4M16		
	RST	M140		MOV K0 K4M32		
	RST	M160		MOV K0 K4M48		
	RST	M200		MOV K0 K4M64		
	RST	M220		MOV K0 K4M80		
	RST	M240		MOV K0 K4M96		
Output instruction	RST	M260	→ Convert	MOV K0 K4M112		
	RST	M300		MOV K0 K4M500		
	RST	M320		MOV K0 K4M516		
	RST	M340		MOV K0 K4M532		
	RST	M360		MOV K0 K4M548		
	PLS	M100 to M377		PLS	Converted according to device conversion rules.	For information on device conversion rules, refer to Chapter 3.2.2.
Master control instruction	MC	M100 to M177		MC	M0 to M63	For information on device conversion rules, refer to Chapter 3.2.2. For more information on conversion, refer to Chapter 3.3.2.
	MCR	M100 to M177		MCR	-	
Shift instruction	SFT	M100		SFTLP M0 M1 K15 K1		For more information on conversion, refer to Chapter 3.3.3.
	SFT	M120		SFTLP M16 M17 K15 K1		
	SFT	M140		SFTLP M32 M33 K15 K1		
	SFT	M160		SFTLP M48 M49 K15 K1		
	SFT	M200		SFTLP M64 M65 K15 K1		
	SFT	M220		SFTLP M80 M81 K15 K1		
	SFT	M240		SFTLP M96 M97 K15 K1		
	SFT	M260		SFTLP M112 M113 K15 K1		
	SFT	M300		SFTLP M500 M501 K15 K1		
	SFT	M320		SFTLP M516 M517 K15 K1		
	SFT	M340		SFTLP M532 M533 K15 K1		
	SFT	M360		SFTLP M548 M549 K15 K1		

	F1, F1J, F2			FX		Remarks
	Instruction	Target device		Instruction	Device after conversion	
Jump instruction	CJP	700 to 707	→ Convert	CJ	PO to P7	The device numbers are converted from octals to decimals. For more information on conversion, refer to Chapter 3.3.4.
		710 to 717			P8 to P15	
		720 to 727			P16 to P23	
		730 to 737			P24 to P31	
		740 to 747			P32 to P39	
		750 to 757			P40 to P47	
		760 to 767			P48 to P55	
		770 to 776			P56 to P62	
		777		NOP	-	
	EJP	700 to 707		PO to P7		
		710 to 717		P8 to P15		
		720 to 727		P16 to P23		
		730 to 737		P24 to P31		
		740 to 747		P32 to P39		
		750 to 757		P40 to P47		
		760 to 767		P48 to P55		
		770 to 776		P56 to P62		
		777		NOP	-	
Other instructions	NOP	-		NOP	-	
Termination instruction	END	-		END	-	

3.3.2 Additional information on converting master control instructions

MR and MCR master control instructions are converted as shown in the table below.

■ Differences in master control instruction expressions between F1, F1J, and F2 programmable controllers and FX series programmable controllers

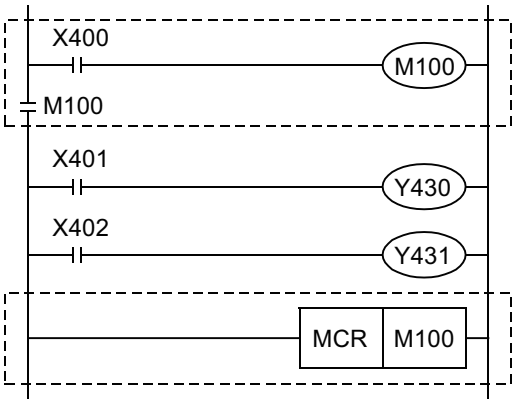
The table shows the differences in the instruction structure of master control instructions in F1, F1J, and F2 programmable controllers and FX series programmable controllers.

Programmable controller	Instruction structure	Remarks
F1, F1J, F2	OUT, MC, and MCR instructions	• The OUT instruction runs the MC contact. • Connect the auxiliary relay specified in the instruction to the ladder block between the MC and MCR instructions as a shared contact in series.
FX	MC and MCR instructions	• The MC instruction runs the MC contact. • Connect the auxiliary relay specified in the instruction to the ladder block between the MC and MCR instructions in the same nest as a shared contact in series. • The nesting function can be used to set master control instructions in master control.

■ Program conversion example (when the main module is not specified for the I/O device number)

· Program before conversion (F_1, F_{1J}, and F_2)

<Circuit program>



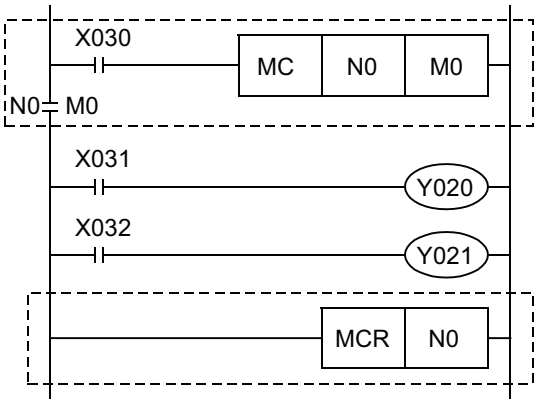
<List program>

```
LD    X400
OUT   M100
MC    M100
LD    X401
OUT   Y430
LD    X402
OUT   Y431
MCR   M100
```

Convert

· Program after conversion (FX)

<Circuit program>



<List program>

```
LD    X030
OUT   M0
LD    M0
MC    N0    M0
LD    X031
OUT   Y020
LD    X032
OUT   Y021
MCR   N0
```

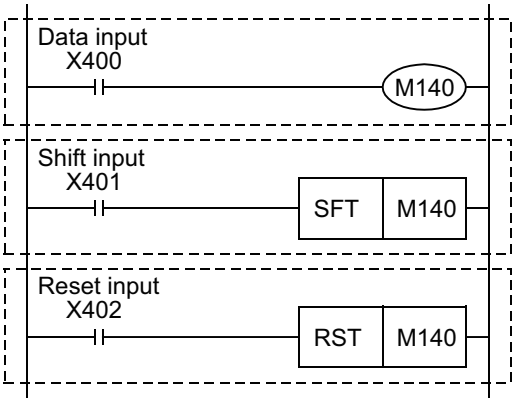
3.3.3 Additional information on converting shift instructions

Shift instructions are converted to SFTLP (FNC 35) instructions as shown in the following example. SFTLP instructions are used to execute pulses for SFTL instructions.

■ Program conversion example (when the main module is not specified for the I/O device number)

· Program before conversion (F_1, F_{1J}, and F_2)

<Circuit program>



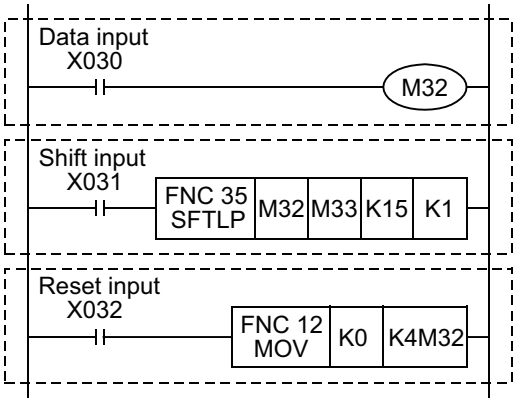
<List program>

```
LD    X400    Data input
OUT   M140
LD    X401    Shift input
SFT   M140
LD    X402    Reset input
RST   M140
```

Convert

· Program after conversion (FX)

<Circuit program>



<List program>

```
LD    X030    Data input
OUT   M32
LD    X031    Shift input
SFTLP M32  M33  K15  K1
LD    X032    Reset input
MOV   K0      K4M32
```

3.3.4 Additional information on converting jump instructions

CJP and EJP instructions are converted to CJ (FNC 00) instructions and pointer (P) as shown in the following example.

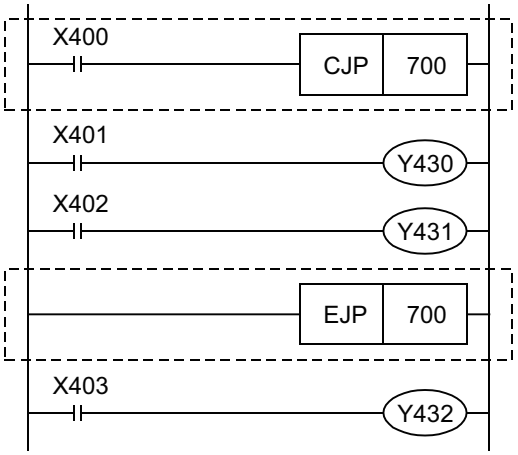
■ About CJP 777 and EJP 777

Use a CJ instruction other than P63 (END jump) to change the program to an unused pointer.

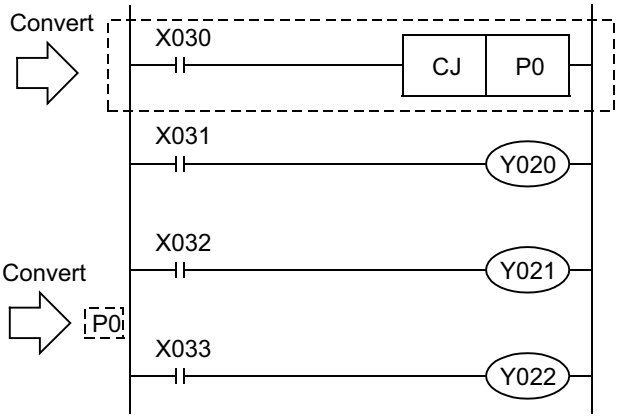
■ Program conversion example (when the main module is not specified for the I/O device number)

· Program before conversion (F_1, F_{1J}, and F_2)

<Circuit program>



Convert



Convert

P0

<List program>

```
LD    X400
CJP   700
LD    X401
OUT   Y430
LD    X402
OUT   Y431
EJP   700
LD    X403
OUT   Y432
```

Convert

Convert

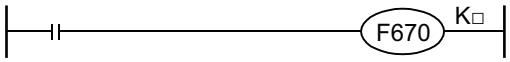
<List program>

```
LD    X030
CJ    P0
LD    X031
OUT   Y020
LD    X032
OUT   Y021
P0
LD    X033
OUT   Y022
```

3.4 Converting Application Instructions

The F_1, F_{1J}, and F_2 series and the FX series have different types and expressions for application instructions, as shown in the table below, so they cannot be converted automatically.
Refer to the programming manuals in the list of relevant manuals in Appendix 2 and convert the instructions to the FX series. If you need a programming manual, consult the store where you purchased the product.

· Application instruction programming example for the F_1, F_{1J}, and F_2 series



*1 Generic term for F_2 series running on versions earlier than V2.1

*2 Generic term for F_2 series running on version V2.1 or later

Application instructions for F_1, F_{1J}, and F_2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F_1, F_{1J}	F_2*1	New F_2*2			
-	Yes	Yes	K0	All input refresh	REF (FNC 50)
-	Yes	Yes	K1	Partial input refresh (8 units)	REF (FNC 50)
-	Yes	Yes	K2	All output refresh	REF (FNC 50)
-	Yes	Yes	K3	Partial output refresh (8 units)	REF (FNC 50)
-	-	Yes	K4	WDT refresh	WDT (FNC 07)
-	-	Yes	K5	Disable preset from set value register for T and C	There is no instruction in the FX series that corresponds to a directly related application instruction. (Handled in the program)
-	Yes	Yes	K6	Subroutine start	Set the start of the subroutine program using pointer P (label P).
-	Yes	Yes	K7	Subroutine call	CALL (FNC 01)
-	Yes	Yes	K8	Return subroutine conditions	The FX series has no corresponding instruction or function.
-	Yes	Yes	K9	Return subroutines	SRET (FNC 02)
-	Yes	Yes	K10	Reset M473 digit increment/decrement flag	RST
-	Yes	Yes	K11	Reset C660 counter output contact	RST
-	Yes	Yes	K12	Read external signals	Interruption I and high-speed counter
-	Yes	Yes	K13	Read RUN input terminal information	The FX series has no corresponding instruction or function.
-	Yes	Yes	K14	Set M571 carry flag	SET M8022
-	Yes	Yes	K15	Reset M571 carry flag	RST M8022
-	Yes	Yes	K16	Set M572 zero flag	SET M8020
-	Yes	Yes	K17	Reset M572 zero flag	RST M8020
-	Yes	Yes	K18	Set M573 borrow flag	SET M8021
-	Yes	Yes	K19	Reset M573 borrow flag	RST M8021
-	Yes	Yes	K20	2 to 4 binary decoder	DECO (FNC 41)
-	Yes	Yes	K21	3 to 8 binary decoder	DECO (FNC 41)
-	Yes	Yes	K22	4 to 16 binary decoder	DECO (FNC 41)
-	Yes	Yes	K23	4 to 2 binary encoder	ENCO (FNC 42)
-	Yes	Yes	K24	8 to 3 binary encoder	ENCO (FNC 42)
-	Yes	Yes	K25	16 to 4 binary encoder	ENCO (FNC 42)

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
-	Yes	Yes	K26	Y, M, and S batch reset	ZRST (FNC 40)
-	Yes	Yes	K27	Write 1- to 3-digit decimal constants	MOV (FNC 12)
-	Yes	Yes	K28	Write 3-digit octal constants	MOV (FNC 12)
-	-	Yes	K29	N-bit information transfer	MOV (FNC 12)
-	Yes	Yes	K30	Write decimal constants for T and C (set value register)	MOV (FNC 12)
-	Yes	Yes	K31	Write T and C set value register	MOV (FNC 12)
-	Yes	Yes	K32	Read T and C set value register	MOV (FNC 12)
-	Yes	Yes	K33	Write decimal constants for T, C (current value register), and D	MOV (FNC 12)
-	Yes	Yes	K34	Read T, C (current value register), and D	MOV (FNC 12)
-	Yes	Yes	K35	Read T, C, and D current values	MOV (FNC 12)
-	-	Yes	K36	Write to data register	MOV (FNC 12)
-	-	Yes	K37	Read data register	MOV (FNC 12)
-	-	Yes	K38	Write same decimal constants	MOV (FNC 12) BMOV (FNC 15)
-	-	Yes	K39	Transfer same data	MOV (FNC 12) FMOV (FNC 16)
-	Yes	Yes	K40	Comparison of constants with T, C, and D current values	CMP (FNC 10)
-	Yes	Yes	K41	Comparison of BCD input with T, C, and D current values	CMP (FNC 10)
-	-	Yes	K42	Comparison of BCD input with C and D current values	CMP (FNC 10)
-	Yes	Yes	K43	Band comparison of T, C, and D current values	ZCP (FNC 11)
-	Yes	Yes	K44	6-digit band comparison of C and D current values	ZCP (FNC 11)
-	-	Yes	K45	Comparison of current counter value between data registers	CMP (FNC 10)
-	-	Yes	K46	Data register clear check	CMP (FNC 10)
-	-	Yes	K47	Data register complement (3-digit BCD)	NEG (FNC 29)
-	-	Yes	K48	Clear data register specification digit	SMOV (FNC 13)
-	-	Yes	K49	Data interchange	XCH (FNC 17)
-	-	Yes	K50	Transfer between set value register and data register	MOV (FNC 12)
-	-	Yes	K51	Transfer between current value register and data register	MOV (FNC 12)
-	-	Yes	K52	Transfer via (D) to D indirect specification	MOV (FNC 12) Indirect specification through index modification (use of both index registers V and Z)
-	-	Yes	K53	Transfer via D to (D) indirect specification	
-	-	Yes	K54	Transfer via (D) to (D) indirect specification	

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
-	-	Yes	K55	Addition between D and K with carry addition (3-digit BCD)	ADD (FNC 20)
-	-	Yes	K56	Addition between D and K with carry addition (6-digit BCD)	ADD (FNC 20)
-	-	Yes	K57	Addition between data registers (3-digit BCD)	ADD (FNC 20)
-	-	Yes	K58	Addition between data registers with carry addition (3-digit BCD)	ADD (FNC 20)
-	-	Yes	K59	Addition between data registers with carry addition (6-digit BCD)	ADD (FNC 20)
-	-	Yes	K60	Addition between data registers (3-digit OCT)	ADD (FNC 20)
-	-	Yes	K61	Data register increment (3-digit BCD)	INC (FNC 24)
-	-	Yes	K62	Data register increment (6-digit BCD)	INC (FNC 24)
-	-	Yes	K63	Data register increment (3-digit OCT)	INC (FNC 24) The corresponding FX series instruction is a binary operation, so the numerical control for the relevant program needs to be changed from octal to binary (decimal).
-	-	Yes	K64	Current counter value increment (3-digit BCD)	INC (FNC 24)
-	-	Yes	K65	Current counter value increment (6-digit BCD)	INC (FNC 24)
-	-	Yes	K66	Subtraction between D and K with borrow subtraction (3-digit BCD)	SUB (FNC 21)
-	-	Yes	K67	Subtraction between D and K with borrow subtraction (6-digit BCD)	SUB (FNC 21)
-	-	Yes	K68	Subtraction between data registers (3-digit BCD)	SUB (FNC 21)
-	-	Yes	K69	Subtraction between data registers with borrow subtraction (3-digit BCD)	SUB (FNC 21)
-	-	Yes	K70	Subtraction between data registers with borrow subtraction (6-digit BCD)	SUB (FNC 21)
-	-	Yes	K71	Subtraction between data registers (3-digit OCT)	SUB (FNC 21)
-	-	Yes	K72	Data register decrement (3-digit BCD)	DEC (FNC 25)
-	-	Yes	K73	Data register decrement (6-digit BCD)	DEC (FNC 25)
-	-	Yes	K74	Data register decrement (3-digit OCT)	DEC (FNC 25) The corresponding FX series instruction is a binary operation, so the numerical control for the relevant program needs to be changed from octal to binary (decimal).
-	-	Yes	K75	Current counter value decrement (3-digit BCD)	DEC (FNC 25)

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
-	-	Yes	K76	Current counter value decrement (6-digit BCD)	DEC (FNC 25)
-	-	Yes	K77	Multiplication between D and K (3-digit BCD)	MUL (FNC 22)
-	-	Yes	K78	Multiplication between D and K (6-digit BCD)	MUL (FNC 22)
-	-	Yes	K79	Multiplication between data registers (3-digit BCD)	MUL (FNC 22)
-	-	Yes	K80	Multiplication between data registers (6-digit BCD)	MUL (FNC 22)
-	-	Yes	K81	Division between D and K (3-digit BCD)	DIV (FNC 23)
-	-	Yes	K82	Division between D and K (6-digit BCD)	DIV (FNC 23)
-	-	Yes	K83	Division between data registers (3-digit BCD)	DIV (FNC 23)
-	-	Yes	K84	Division between data registers (6-digit BCD)	DIV (FNC 23)
-	-	Yes	K85	Analog module read	Change to a program that is compatible with the special function block of the FX series to be used.
-	-	Yes	K86	Analog module write	
-	-	Yes	K87	Subtraction mode selection (BCD subtraction)	Use by combining SUB (FNC 21) and the M8021 borrow flag.
-	-	Yes	K88	Data register BCD check	The FX series has no corresponding instruction or function.
-	-	Yes	K90	Adaptor format specification for high-speed counters	The FX series has no corresponding instruction. The specifications for the built-in high-speed counter of the FX series are determined according to the counter number.
-	-	Yes	K91	External pair counter 1-phase specification	
-	-	Yes	K92	External pair counter 2-phase specification	
-	-	Yes	K93	Internal signal count pair counter	Use a 32-bit counter.
-	-	Yes	K94	ON bit count determination	BON (FNC 44)
-	-	Yes	K95	Operation element number detection	Use the S state to perform a search using the operation state numbers of D8040 to D8047.
-	-	Yes	K96	Standard programmable controller for STL	IST (FNC 60)
-	-	Yes	K97	Battery display control	The FX series has no corresponding instruction. If the LED indicator of the battery voltage drop is off, turn on M8030.
-	-	Yes	K98	Block specification	The FX series has no corresponding instruction. Change to a program that is compatible with the special function unit/block of the FX series to be used.
	-	Yes	K99	6 to 64 binary decoder	DECO (FNC 41)
Yes	-	Yes	K100	All input refresh	REF (FNC 50)
Yes	-	-	K101	Partial input refresh (8 units)	REF (FNC 50)

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
Yes	-	Yes	K102	All output refresh	REF (FNC 50)
Yes	-	Yes	K103	Y, M, and S batch reset	ZRST (FNC 40)
Yes	-	Yes	K104	Current counter value register write	MOV (FNC 12)
Yes	-	Yes	K105	Current counter value read	MOV (FNC 12)
Yes	-	Yes	K106	Band comparison of T, C, and D current values	ZCP (FNC 11)
Yes	-	Yes	K107	Comparison of the current counter value and the BCD input	CMP (FNC 10)
Yes	-	Yes	K108	6-digit band comparison of C and D current values	ZCP (FNC 11)
Yes	-	Yes	K109	Write two 3-digit decimal constants	MOV (FNC 12)
Yes	-	Yes	K110	Reset M473 digit increment/decrement flag	RST
Yes	-	Yes	K111	Reset C660 counter output contact	RST
Yes	-	Yes	K112	Rise detection (phase B) (set)	Choose the input interruption (rise detection) or pulse catch function according to the usage purpose.
Yes	-	Yes	K113	Rise detection (phase B) (read and reset)	
Yes	-	Yes	K114	Rise detection (phase Z) (set)	
Yes	-	Yes	K115	Rise detection (phase Z) (read and reset)	
Yes	-	Yes	K116	Disable external reset	There is no corresponding instruction or function. Consider a reset program with a built-in high-speed counter among input interrupt programs.
Yes	-	Yes	K117	Transfer comparison data for auto-reload	Use the HSZ (FNC 55) instruction table in high-speed comparison mode (M8130=ON).
Yes	-	Yes	K118	Enable auto-reload	
Yes	-	Yes	K119	High-speed output table setting	Use the frequency control mode (M8132=ON) with the HSZ (FNC 55) and PLSY (FNC 57) instructions.
Yes	-	Yes	K120	Disable individual high-speed output	There is no corresponding instruction or function.
Yes	-	Yes	K121	Enable all high-speed outputs	There is no corresponding instruction or function.
-	-	Yes	K122	A-phase pulse width measurement	Consider a program that uses input interruption, high-speed ring counters (or 1-ms retentive timers).
-	-	Yes	K123	Z-phase pulse width measurement	
-	-	Yes	K124	High-speed count with data register (phase B)	There is no corresponding instruction or function. Use the built-in high-speed counter of one phase.
-	-	Yes	K125	High-speed count with data register (phase Z)	
-	-	Yes	K126	Pulse density measurement (phase B)	SPD (FNC 56)
-	-	Yes	K127	Pulse density measurement (phase Z)	SPD (FNC 56)

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
-	-	Yes	K128	Read data from buffer (data I/O module)	Consider using a program that uses the digital switch and the DSW (FNC 72) instruction or an HMI (Human Machine Interface).
-	-	Yes	K129	Write data to buffer (data I/O module)	Consider using a program that uses a 7-segment HMI (Human Machine Interface) and the SEGL (FNC 74) instruction or an HMI (Human Machine Interface).
-	-	Yes	K130	Variable length shift register	Use by combining SFTR (FNC 33) and SFTL (FNC 35).
-	-	Yes	K131	BCD to BIN conversion	BIN (FNC 18)
-	-	Yes	K132	BIN to BCD conversion	BCD (FNC 19)
-	-	Yes	K133	8-bit information transfer	MOV (FNC 12)
-	-	Yes	K134	8-bit data conversion	XCH (FNC 17)
-	-	Yes	K135	8-bit data reverse transfer	CML (FNC 14)
-	-	Yes	K136	Comparison of 8-bit data and octal constants	CMP (FNC 10)
-	-	Yes	K137	Comparison of 8-bit data	CMP (FNC 10)
-	-	Yes	K138	Logical AND of 8-bit data and octal constants	AND (FNC 26)
-	-	Yes	K139	Logical AND of 8-bit data	AND (FNC 26)
-	-	Yes	K140	Logical OR of 8-bit data and octal constants	OR (FNC 27)
-	-	Yes	K141	Logical OR of 8-bit data	OR (FNC 27)
-	-	Yes	K142	Exclusive OR of 8-bit data and octal constants	XOR (FNC 28)
-	-	Yes	K143	Exclusive OR of 8-bit data	XOR (FNC 28)
-	-	Yes	K144	Exclusive NOR of 8-bit data and octal constants	Use by combining XOR (FNC 28) and CML (FNC 14).
-	-	Yes	K145	Exclusive NOR of 8-bit data	
-	-	Yes	K146	BIN addition of 8-bit data and octal constants	ADD (FNC 20)
-	-	Yes	K147	BIN addition of 8-bit data	ADD (FNC 20)
-	-	Yes	K148	BIN subtraction of 8-bit data and octal constants	SUB (FNC 21)
-	-	Yes	K149	BIN subtraction of 8-bit data	SUB (FNC 21)
-	-	Yes	K150	8-bit data increment	INC (FNC 24) The corresponding FX series instruction is a binary operation, so the numerical control for the relevant program needs to be changed from octal to binary (decimal).
-	-	Yes	K151	8-bit data decrement	DEC (FNC 25) The corresponding FX series instruction is a binary operation, so the numerical control for the relevant program needs to be changed from octal to binary (decimal).
-	-	Yes	K152	BIN multiplication of 8-bit data and octal constants	MUL (FNC 22)
-	-	Yes	K153	BIN multiplication of 8-bit data	MUL (FNC 22)

*1 Generic term for F2 series running on versions earlier than V2.1

*2 Generic term for F2 series running on version V2.1 or later

Application instructions for F1, F1J, and F2 programmable controllers					Application instruction (FNC number) and function of the FX programmable controller to be changed
Applicable model			Instruction number F670	Name	
F1, F1J	F2*1	New F2*2			
-	-	Yes	K154	BIN division of 8-bit data and octal constants	DIV (FNC 23)
-	-	Yes	K155	BIN division of 8-bit data	DIV (FNC 23)
-	-	Yes	K156	8-bit data complement	NEG (FNC 29)
-	-	Yes	K157	Multipoint band comparison of C and D current values	ZCP (FNC 11)
-	-	Yes	K158	Time division interruption (digital switch)	DSW (FNC 72)
-	-	Yes	K159	D to (Dt and DC) indirect transfer	MOV (FNC 12) Indirect specification through index modification (use of both index registers V and Z)
-	-	Yes	K160	(Dt and DC) to D indirect transfer	
-	-	Yes	K161	(Rt and RC) to D indirect transfer	
-	-	Yes	K162	Numeric keypad data read	TKY (FNC 70)
-	-	Yes	K163	Clock circuit creation	Use the built-in or optional clock function.
-	-	Yes	K164	Time modification (round up or down)	Use the 30-sec correction function of M8017.
-	-	Yes	K165	Shortcut rotation control circuit	ROTC (FNC 68)
-	-	Yes	K166	Read data from buffer data (data I/O module)	Consider using a program that uses 16 keys and the HKY (FNC 71) instruction or an HMI (Human Machine Interface).

Appendix 1. Discontinued Models [Programmable Controller]

MELSEC-F series programmable controller models described in this document which have already been discontinued as of March 31, 2010 are the following.

Discontinued model	Production stop date	Repair acceptance period
F1 series	September 30, 2000	September 30, 2007
F1J series	September 30, 2000	September 30, 2007
F2 series	September 30, 1995	September 30, 2002
FX0 series	June 30, 2002	June 30, 2009
FX0S series	January 31, 2006	January 31, 2013
FX0N series	January 31, 2006	January 31, 2013
FX1 series	June 30, 2002	June 30, 2009
FX2 series	June 30, 2002	June 30, 2009
FX2C series	June 30, 2002	June 30, 2009

MEMO

Appendix 2. Relevant Manuals

Before using this product, please read this manual, relevant manuals, and manuals for the program conversion tool carefully and develop familiarity with the specifications to handle the product correctly.
For the manuals, please consult your local Mitsubishi representative.

Programmable controller

Manual name	Manual number	Description	Model code
FX3G SERIES USER'S MANUAL - Hardware Edition	JY997D31301	Hardware such as I/O specifications, wiring, and installation of the programmable controller	09R521
FX3U SERIES USER'S MANUAL - Hardware Edition	JY997D16501	Hardware such as I/O specifications, wiring, and installation of the programmable controller	09R516
FX3UC SERIES USER'S MANUAL - Hardware Edition	JY997D28701	Hardware such as I/O specifications, wiring, and installation of the programmable controller	09R519

Programming

Manual name	Manual number	Description	Model code
THE FX SERIES OF PROGRAMMABLE CONTROLLER(FX0, FX0S, FX0N, FX, FX2C, FX2N, FX2NC)	JY992D48301J	Description of basic instruction, application instruction, and each device in the sequence programming	-
FX3S/FX3G/FX3GC/FX3U/FX3UC SERIES PROGRAMMING MANUAL - Basic & Applied Instructions Edition	JY997D16601	Description of basic instruction, application instruction, and each device in the sequence programming	09R517

Peripheral/software

Manual name	Manual number	Description	Model code
FX-20P-E OPERATION MANUAL	JY992D82301	Operation procedure of handy programming panel	09R907
FX-20P-E-FKIT OPERATION MANUAL	JY992D19301	Operation procedure of handy programming panel	-
GX Developer Version 8 Operating Manual	SH-080373	Operation procedure of programming software	13JU41
GX Works2 Operating Manual	SH-080779ENG	Operation procedure of programming software (common)	13JU63
GX Works2 Operating Manual	SH-080780ENG	Operation procedure of programming software (simple project)	13JU64

Appendix 3. Frequently Asked Questions

System configuration

Q	A
What is the meaning of the number of occupied points in special extension devices?	Some special extension devices controlled by FROM/TO instructions have eight occupied points. These eight points do not occupy eight actual I/O numbers of connection positions. Subtract the number from the maximum control points of the programmable controller, and increase input/output up to the remaining number of points.
How many extension cables (FX0N-30EC/FX0N-65EC) can be used?	One cable can be used per system. Two or more cables cannot be used.
How do I extend a special block?	Use FX0N-30EC or FX0N-65EC and FX2N-CNV-BC extension cables to extend extension blocks.
Can I extend an extension cable longer than 65cm?	You cannot extend an extension cable longer than 65cm. Place the main module in a separate location using the parallel link and N:N Network functions, or use CC-Link and CC-Link/LT for distribution.
What are the differences between domestic and international products and precautions that I need to take?	The input signal type is different. Products for use in Japan, apart from FX3G and FX3U, use sink input, but products for use in other countries, FX3G, and FX3U can switch between sink and source input. There are also differences in terms of sink or source for transistor output. Various international standards have been obtained for all products in the FX3G and FX3U series. Various international standards have been obtained for models meant for use in countries outside Japan that are not in the FX3G and FX3U series.
Can the built-in expansion board of the programmable controller and mount-type special adapters be used at the same time?	In the FX1S, FX1N, and FX2N series, only expansion boards for connecting with special adapters can be used at the same time. In the FX3G, FX3U, and FX3UC series, expansion boards for communication and special adapters can be used at the same time.
I want to change the program for a facility that is located far away.	You can write the program into a memory cassette and send it, or perform remote maintenance using a personal computer (GX Works2). For programmable controllers that can use memory cassettes with a loader function, the contents of the memory cassette can be written easily into the built-in memory of the programmable controller even if there is no personal computer (GX Works2) in the target destination.

Battery

Q	A
I want to know the battery model name of the programmable controller.	F2-40BL: F1/F1J/F2 series; FX/FX1/FX2/FX2C/FX2N series; FX-20GM/E-20GM/FX-20/30/40/50DU series; and ET-50/51 series FX1N-BAT: FX1N series*1 FX3U-32BL: FX3G*2, FX3U, and FX3UC series; and FX-30P FX2NC-32BL: FX2NC series; and GOT-F93□/F94□ handy GOT PM-20BL: GOT-F94□/ET-940 series GT11-50BAT: GT11 series F-12BL: F-12R F-20BL: F-20R (production number: 24**** or higher) and F-20MR F-40BL: F-40MR G1BAT: G series
What is the battery replacement period?	We recommend replacing batteries periodically. For example, a periodic replacement every three years for programmable controllers that have "a life of approximately five years and a periodic replacement of approximately three years".

Q	A
If the programmable controller is constantly supplied with electricity, will there be a voltage drop in the battery for memory backup?	The battery for memory backup is spent regardless of whether the programmable controller is turned on or off.
Is it okay to perform battery replacement while the programmable controller is turned on?	Turn off programmable controllers before replacing batteries. It depends on the programmable controller series, but for FX2N and FX2NC programmable controllers, data is retained for 20 seconds even if they are turned off and the battery is removed, so replace the battery during this time.
Which programmable controllers use batteries?	F/F1/F1J/F2/FX1/FX2/FX2C/FX2N/FX2NC/FX3U/FX3UC series. The FX0, FX0S, FX0N, FX1S, FX1N*1, FX1NC, and FX3G*2 series do not use batteries.
I want to install an optional battery in the FX3G programmable controller.	The FX3U-32BL battery model can be installed in the FX3G programmable controller. After installation, set "Battery mode: Use battery" in the Parameter window of GX Works2.
The shape of the battery installed in the programmable controller is different from that of F2-40BL provided as a spare part.	F2-40BL, which is installed in the programmable controller, comes with a printed circuit board, but the battery with no circuit board provided as a spare part also has the same function.

*1 FX1N-BAT can be installed as an option.

*2 FX3U-32BL can be installed as an option.

Power supply, input, and output

Q	A
How is the mount-type 24VDC power supply for sensors connected to a programmable controller?	Connect the "0V (-)" of the 24VDC power supply to the COM terminal (on one side of the built-in power supply of the programmable controller) in the input terminal of the programmable controller. Do not connect the "24+" terminal of the external 24VDC power supply to the "24+" terminal of the programmable controller.
Can the power of the 24VDC input (sink input) of the programmable controller be supplied from externally?	In the FX series, only DC power supply type programmable controllers can use an external power supply.
Is a noise filter required for the power supply of the programmable controller?	It is not required, unless otherwise stated in the manual and other documents. However, if there is a lot of noise in your operating environment, using a filter, isolation transformer, or other similar tools for noise removal may be effective as a way to reduce external noise.
Do I have to connect the ground terminal of the programmable controller?	Perform grounding for safety purposes. However, incomplete common grounding in a control panel, common grounding with a heavy electrical system, or other similar acts may cause product malfunction or failure.
The power supply lamp of the programmable controller was working properly, but it does not light up or keeps flashing now.	Remove the wiring of the [24+] (service power supply) terminal, and check if the problem has been resolved. If it has, the service power supply capacity may be exceeded due to load short-circuit and excessive load current, and the protection function may be triggered. If it has not been resolved, send an investigation request to Mitsubishi Electric System Service.
How are I/O numbers assigned?	I/O numbers of FX programmable controllers are assigned in octals. The assignment of octals are as follows: 0 to 7 → 10 to 17 → 20 to 27 ... 70 to 77 → 100 to 107.
Where is the +24V terminal of extension blocks connected?	For AC power supply type, connect to the terminal on the 24+ side of the main module. For DC power supply type, connect to the +24V side of the external power supply. For details, refer to the manual of each product.
There are multiple input COM terminals. Can I use any of them?	The input COM terminals are connected in the programmable controller and all have the same signal.

Q	A
The LED will not turn on even after short circuiting COM and the input with just the extension module.	The extension module must be connected to the main module for the input to turn on.
What are sink input and source input?	Sink input is a 24VDC negative common input. Source input is a positive common input. Sink input is generally used in Japan and North America, while source input is used in Europe.
Do the COMs in the input and output side of FX1S and FX1N have the same signal?	Each COM terminal is connected to the programmable controller inside, so they all have the same signal.
Input terminals of FX3G and FX3U programmable controllers and programmable controllers of other series with overseas specifications have an "S/S terminal". How is it used?	The terminal is used to switch between sink and source input. During source input, the device is connected to the [0V] terminal, and when [24V] - [Input terminal: X□□□] is short-circuited, the input is turned on. During sink input, the device is connected to the [24V] terminal, and when [0V] - [Input terminal: X□□□] is short-circuited, the input is turned on.
There are multiple COM terminals starting with COM1 in the output. How are they different?	The output element of the programmable controller has a common unit structure of 1 point, 4 points, and 8 points. Numbers are assigned from COM0 for every common line. In terms of wiring, a different voltage can be applied to each COM terminal.
Is the protective element of the relay output required?	We recommend connecting diodes for commutation for DC load and surge absorbers (C-R) for AC load as protection for relay contacts.
Can the "·" vacant terminal of input and output terminals be used as a relay terminal?	Do not use vacant terminals.

Memory cassette

Q	A
What do I need to configure when mounting a memory cassette to a programmable controller?	Turn off the programmable controller, mount the memory cassette, and turn the programmable controller back on to automatically identify the memory cassette. After it is mounted, it is separated from the built-in memory of the programmable controller, and data from peripherals is read and written only to the optional memory.
Is a battery required to use a memory cassette?	With the exception of RAM memory, memory cassettes do not delete sequence programs, so no battery is required. However, a battery is needed to use the clock function, auxiliary relay, data register, or other latch functions of the device. A latch function may be required for special data registers, special auxiliary relays, and other similar devices. For details, refer to programming manuals.
Are there are any specific settings required for a battery-less operation?	When performing a battery-less operation in FX2N, FX3U, FX2NC, and FX3UC, set battery-less operation in the programmable controller parameters from GX Works2 and similar tools. For details on how to configure using sequence programs, refer to programming manuals.

Software-related

Q	A
The personal computer where the programming software is installed only has a USB interface. How can I connect it to the programmable controller?	Connect it using FX-USB-AW. To use FX-USB-AW, install the driver software for personal computers that comes with the product. (FX3U-USB-BD can also be used for FX3U and FX3UC programmable controllers, and a USB port is included as a standard built-in feature in FX3G programmable controllers.)

Q	A
I was monitoring operations using GX Works2, but the operation time was not what I had expected.	In the monitor display of GX Works2, the scan time is the maximum value. Check D8010 to confirm the current scan time.
Can the ladder diagram created using FX-PCS/WIN-E be read on GX Works2?	Select [Project Menu] and [Read other file format], and specify the FX-PCS/WIN-E program file.
I want to use the numerical values in the programmable controller in the spreadsheet of my personal computer.	The data can be transferred with a simple configuration using MX Sheet of the MELSOFT MX series.
I want to write comments on the programmable controller.	Use GX Works2 to set the comment capacity in the parameter setting of the programmable controller. To write the comment you wrote into the programmable controller, configure the "Comment Scope Setting" of GX Works2.
I transferred comments from the programmable controller, but they are not displayed.	The comments might not have been written into the programmable controller. Refer to the preceding question for details.
Can A6GPP or A7PHP be used to modify FX2N programs?	They are not supported in FX2N. It can be programmed within FX2, but the instructions and devices that can be modified are limited.

Devices and programs

Q	A
What is the difference between a standard counter and a high-speed counter?	The upper count limit for a standard counter is 10Hz. For high-speed input signals that exceed the limit, use high-speed counters, interrupt instructions, and other methods to make sure they are not affected by the input filter of the programmable controller or the operation cycle.
How do you use high-speed counters?	Keep the OUT coil of the high-speed counter turned on for the period in which you want to perform high-speed count. Do not use the input number (X0 to X7) of counters as the contact point to run the OUT coil of high-speed counters.
Do I need to adjust the input filter when I use a high-speed counter or an external interrupt instruction?	If the coils of high-speed counters and interrupt pointers are programmed, the filter constant of the corresponding input terminal is automatically adjusted to the minimum value by the programmable controller system.
An operation error occurred in an application instruction that uses the current value of the high-speed counter and cannot be executed.	The register for the current value of high-speed counters is a 32-bit register. Application instructions that use this value must also be 32-bit instructions. Using a 16-bit instruction will result in an operation error.
The latch relay is not kept.	If there is an OUT instruction that uses a latch relay number in the sequence program, the latch information may be overwritten and deleted by the OUT instruction. Do not use OUT instructions for device numbers that you want to keep. Use SET instructions instead.
What is the difference between a file register and a standard register?	It is convenient to use file registers to store predetermined values (such as values of standard for product inspection). On the other hand, standard registers are cleared to 0 when the programmable controller is turned off (excluding the latched (battery backed) area), so it is used as a temporary storage area for numerical values used in sequence programs.
How can I use dedicated devices for backup power (auxiliary relay and state) in normal occasions?	Use the initial pulse to clear the required scope with the ZRST instruction when the programmable controller is running. Use M8032 to clear all backup power areas.
How do I use the built-in variable analog potentiometer in the programmable controller (FX1S, FX1N, or FX3G)?	The values are stored in a special data register as numerical data (between 0 to 255) according to the scale position. Set the loaded numerical value as indirect specified value to create a volume-based analog timer. · VR1→D8030 (integer of 0 to 255) - VR2→D8031 (integer of 0 to 255)

Q	A
How do I use the operation completed flag?	The M8029 operation completed flag is shared by multiple instructions. To obtain results indicating that the execution of a specific instruction has been completed, write the M8029 contact directly under that instruction followed by the necessary program. You can also use the execution completed signal after saving it using the SET instruction.
The operation completed flag will not turn on.	If no contact has been programmed directly under the instruction you want to check, the flag might have been turned off by the execution of another instruction that also uses M8029. Refer to the preceding question for details.
I am using the high-speed counter comparison function, but the output contact is not set even though I have rewritten the current value using the MOV instruction.	The output contact is set depending on changes to the current value register caused by count input, so it is not set until the next count is input, even if the value has been changed using the MOV instruction.
When I used the comparison (CMP) instruction, the comparison result still remained even though I have turned off command input.	The comparison result is still retained even if command input has been turned off. To clear the result, reset using the RST or ZRST instruction.
After not using the machine that uses FX1N programmable controller for a while, the data register (D7000s) value changed. What is the cause?	Data registers D256 to D7999 of FX1N are capacity retainers. The backup time is 10 days when fully charged. The value changed because of the voltage drop in the capacitor and the data cannot be stored correctly. If the data register and auxiliary relay are not used as latched (battery backed) area, use the initial pulse to clear the required scope with the ZRST instruction when the programmable controller is running. To store the value for a long period of time, install an FX1N-BAT type battery unit (optional) for FX1N.
The first special extension device is not running in FX3UC.	Normally, the first special extension device number is "K0", but the FX3UC-32MT-LT(-2) programmable controller has a built-in master function for CC-Link/LT, which is set to "K0". Set the block number for the first special extension device to "K1".
Fast (short) inputs are not read and missed sometimes.	The ON width and OFF width for input filter time (10ms) +1 operation hour are needed for programmable controllers to load inputs properly. If the input is even shorter than that, use the filter adjustment function, interrupt function, pulse catch function, or the high-speed counter.

Communication

Q	A
I want to set the communication format.	There are two ways: Configure the communication setting using a sequence program, or configure the "PLC parameter setting" from a personal computer (GX Works2). Choose one of the methods above to avoid confusion.
The communication settings are not reflected.	After changing the communication settings, turn off and turn on the programmable controller.
After configuring the communication setting in the RS-232C communication equipment, the personal computer (GX Works2) and program stopped communicating.	Communication settings need to be cleared (set the communication setting register value to 0) for the programmable controller and personal computer (GX Works2) to communicate. On GX Works2, remove the checkbox of "Communication setting" in "PLC parameter setting (2)".

Old models

Q	A
How are programs of F1 and F2 programmable controllers converted for the FX series?	Use FX-20P-E-FKIT in FX-20P-E to read programs of F1 and F2 programmable controllers and convert them for the FX series. After the conversion, modify unconvertible instructions and programs for which temporary numbers have been set according to conversion rules. If you have programming software (GX Works2) for FX programmable controllers and personal computers, it is more efficient to write the converted programs into the FX programmable controller and load them on the computer for editing.
What program editing equipment can I purchase now for F1 and F2 programmable controllers?	FX-20P-E-FKIT can be attached to FX-20P-E for online editing.
What is the 24VDC service power supply capacity of F-40M and F-40E?	0.1A/24VDC.
Can extension devices for FX0N and FX2N be connected to FX1, FX2, and FX2C?	They cannot be connected. Consider changing to an existing product, including the main module.

REVISIONS

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FX Series Micro Programmable Controller

F(F_1, F_{1J}, F_2)→FX3 series Replacement Guidance

SH-082484ENG-A

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