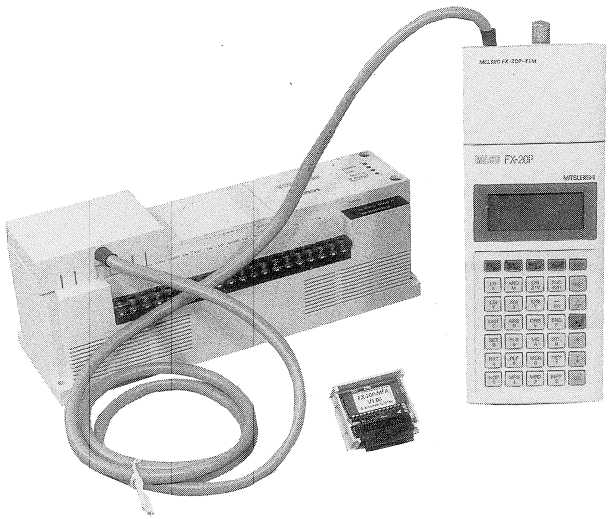
MITSUBISHI

PROGRAMMABLE CONTROLLERS

MELSEC-F

OPERATION MANUAL

FX-20P-E-FKIT



FX

FX-20P-E-FKIT ADAPTOR KIT

OPERATION MANUAL

FOREWORD

This manual describes the programming and monitoring procedures for the MELSEC-F1 and -F2 series Micro Programmable Controllers with the FX-20P-E Handy Programming Panel when equipped with the FX-20P-E-FKIT.

The FX-20P-E-FKIT is applicable to the F2 series (all models, 1K and 2K modes), and F1 series programmable controllers.

Please refer to the Programming Manual and the User's Manual for the programming and installation of the F1 and F2 series programmable controllers.

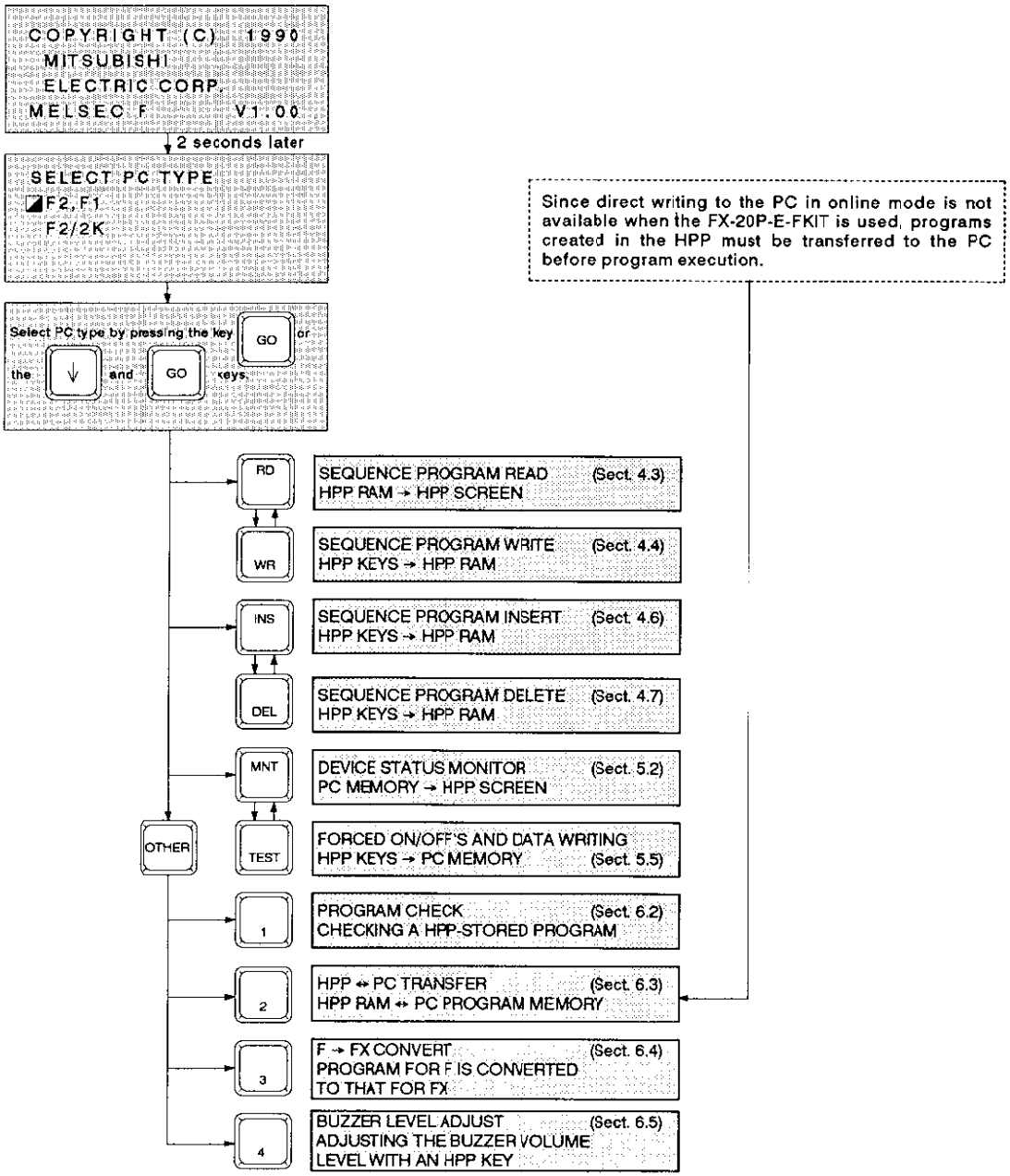
CONTENTS

1. INTRODUCTION

1.1 FUNCTION LIST

The FX-20P-E-FKIT is an interface kit to be coupled with the FX-20P-E Handy Programming Panel (referred to as the HPP in this manual) and enables writing of programs to, or monitoring of operations of, the MELSEC F1 and F2 series programmable controllers (referred to as the PC in this manual). The main functions of the HPP are summarized in the chart below. The chart may be used as an index for accessing desired information in this manual.

After connecting the HPP to the PC using the interface module, turn on the power to the PC.

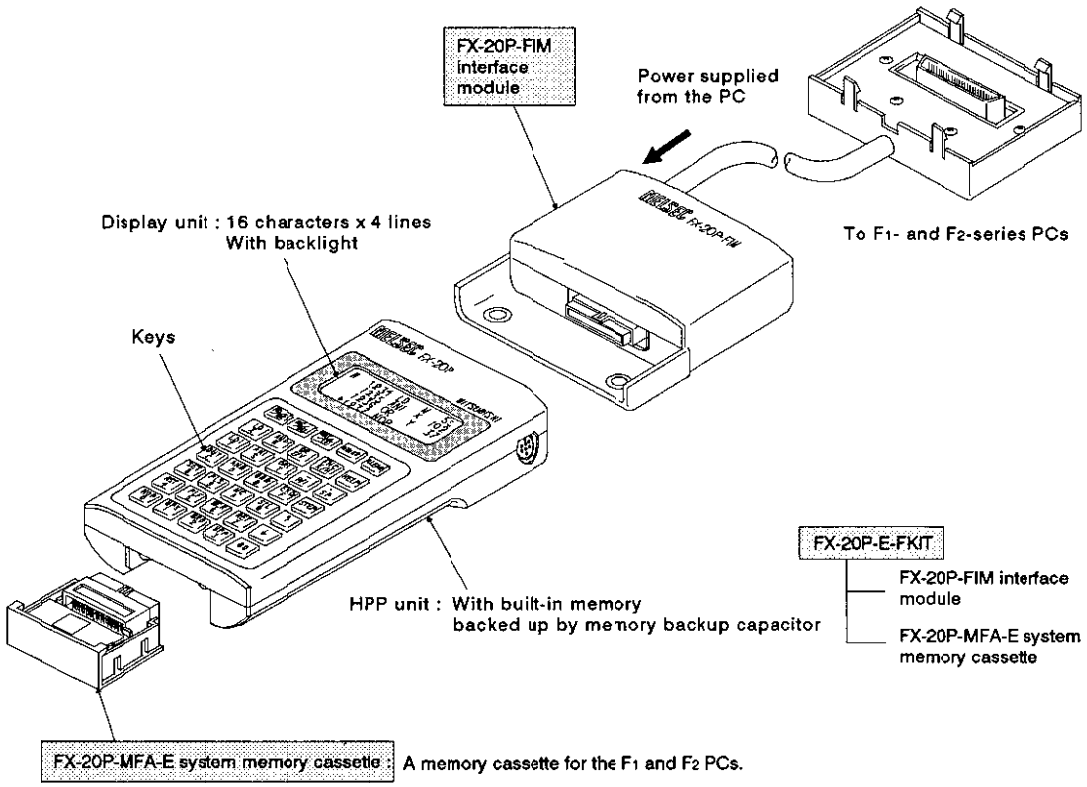


1. INTRODUCTION

1.2 CONFIGURATION

The FX-20P-E-FKIT consists of the FX-20P-FIM interface module for the F1 and F2 series PCs and the FX-20P-MFA-E memory cassette for the F series PCs.

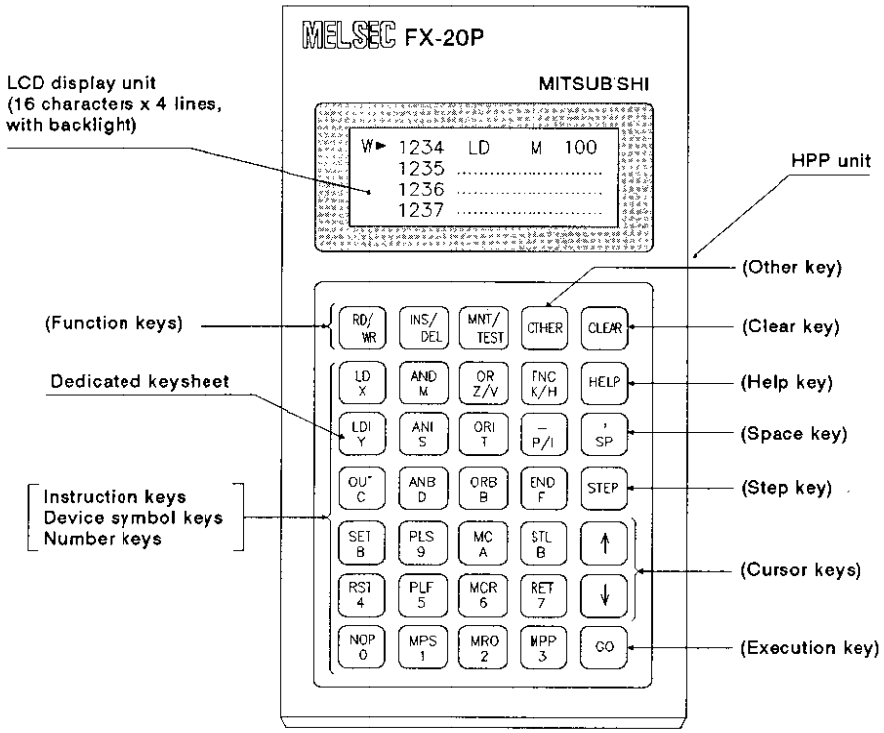
The HPP needs to be coupled with the FX-20P-E-FKIT when creating or monitoring programs of the F1 and F2 series PCs.



(Note) ● *The cassette supplied as attached to the HPP is for the FX series PCs. Replace it with the FX-20P-MFA-E system memory cassette.*

1. INTRODUCTION

1.3 PANEL ARRANGEMENT



KEY NOTATIONS USED IN THIS MANUAL

: Press either the ↑ key or ↓ key.

: Press the ↓ key the required number of times.

To continuously input the same cursor key, hold down the key for more than 1 second.

1. INTRODUCTION

PANEL ARRANGEMENT

1.3.1 KEY GROUP FUNCTIONS

(1) FUNCTION [RD/WR], [INS/DEL], [MNT/TEST] KEYS

The Function keys are toggle keys. Pressing the key once calls the first function. Pressing it again calls the second function.

(2) [OTHER] KEY

Pressing the [OTHER] key calls the mode menu select screen, regardless of the current display mode.

(3) [CLEAR] KEY

If the [CLEAR] key is pressed before the [GO] key is pressed, the keyed-in data is canceled. The [CLEAR] key is also used to clear an error message from the LCD display unit or return to the previously displayed screen.

(4) [HELP] KEY

Pressing the [HELP] key displays the list of the switch keys, current PC name, and the number of available program steps.

(5) SPACE [SP] KEY

The [SP] key is used whenever a device or a constant is to be input.

(6) [STEP] KEY

The [STEP] key is used to input step numbers.

(7) CURSOR [↑], [↓] KEYS

The Cursor keys are used to move the cursor or to designate the device preceding or following the currently designated device.

(8) EXECUTION [GO] KEY

The [GO] key is used to enter and execute commands, to scroll displayed information, or to continue a search.

(9) INSTRUCTION KEYS, DEVICE SYMBOL KEYS, AND NUMBER KEYS

Each of these keys has two functions :

instructions (upper part) and device symbols or numbers (lower part). Which key function is effective during each operational step is automatically determined according to the currently executed operation.

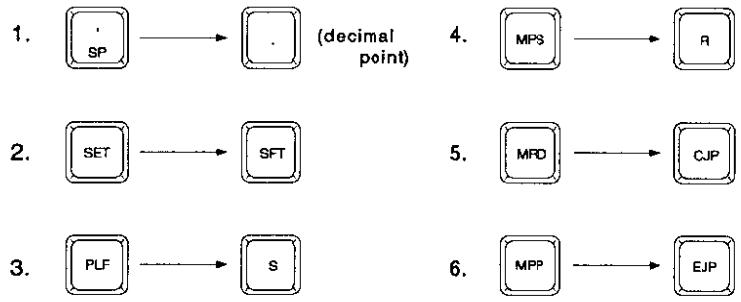
Note: • *[Z/V] and [P/I] keys are not used with the F1 and F2 PCs.*

1. INTRODUCTION

PANEL ARRANGEMENT

1.3.2 CHANGED KEYS

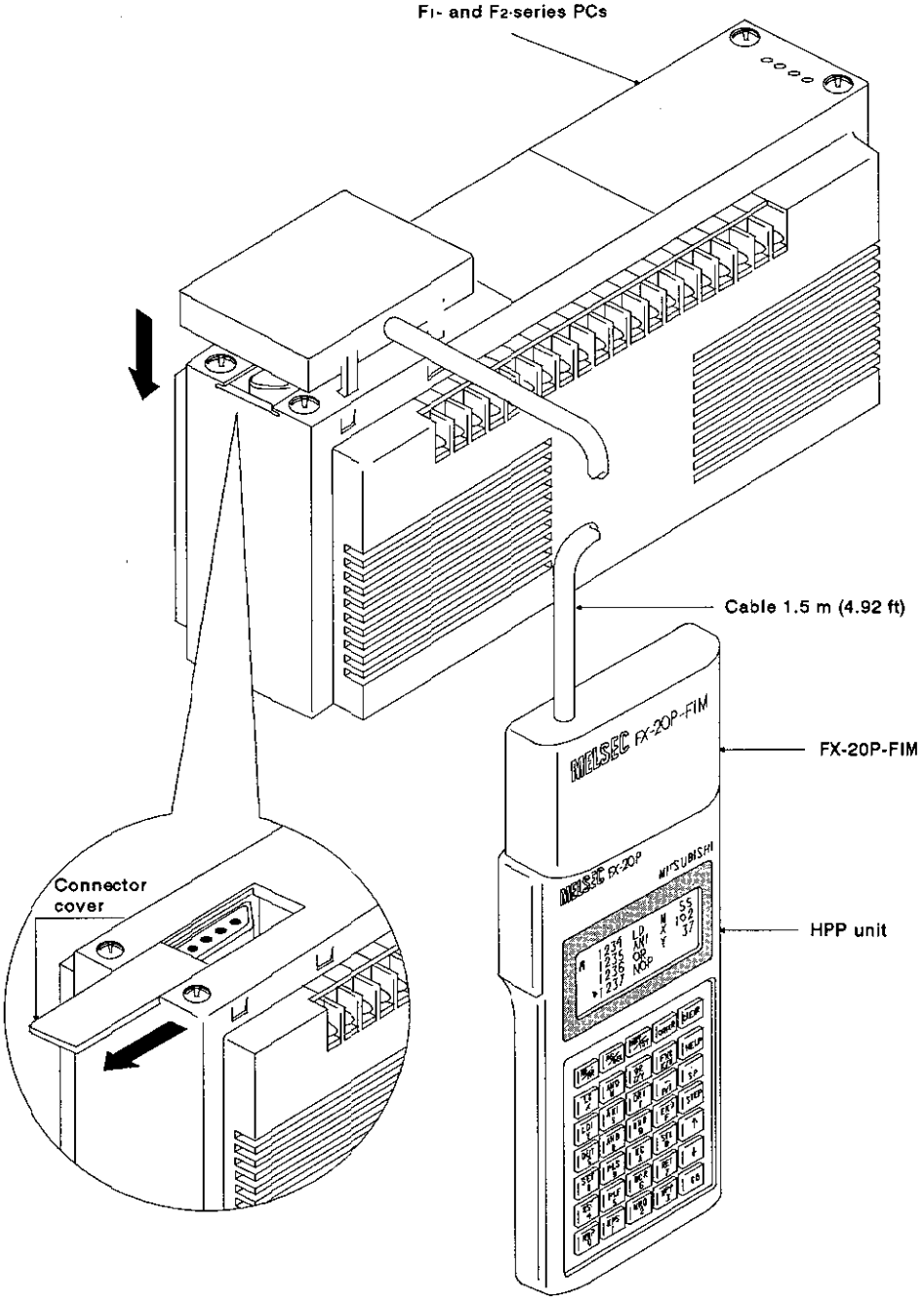
The following keys are the changed keys to be used to designate instructions of the F1 and F2 PCs. (Pressing the [HELP] key displays the list of the changed keys.)



1. INTRODUCTION

1.4 CONNECTIONS

1.4.1 CONNECTING THE HPP TO THE F1- AND F2-SERIES PCs



CONNECTIONS

1.4.2 INSTALLING THE FX-20P-MFA-E CASSETTE

(1) Turn off the PC power. Remove the system memory cassette that is attached to the bottom of the HPP. Then, insert the FX-20P-MFA-E (memory cassette for the F series PCs) into the bottom of the HPP as shown in the figure in Section 1.2.

1.4.3 INSTALLING THE FX-20P-FIM MODULE

(1) Open the cover for the module connector on the top side of the HPP. Insert the FX-20P-FIM interface module into the connector (see the figure in Section 1.2) and tighten the fixing screws.

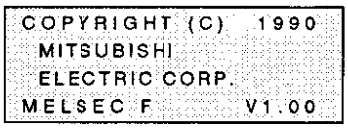
(2) If the FX-20P-FIM interface module is already connected to the PC, turn off the PC power before installing the module to the HPP.

1.4.4 CONNECTING TO THE PC

(1) Turn off the PC power before coupling the FX-20P-FIM interface module with the PC.

(2) Remove the connector cover on the top side of the PC. Insert the PC connector of the FX-20P-FIM interface module into the connector on the PC. (See the figure on the previous page.)

Initial Screen



The screen shown to the left is displayed when the PC is powered up after the HPP has been connected to it. If this screen appears, the FX-20P-CAB programming cable is connected correctly. The initial screen is displayed for approximately 2 seconds. After this period, the next screen is displayed.

IMPORTANT

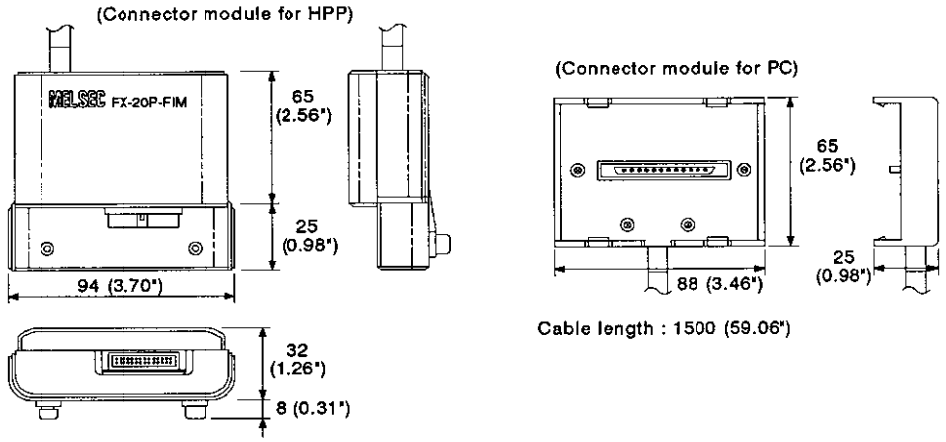
Never touch the HPP connection ports, the connectors used for the PC, or the installation plug and connectors for the interface module and system memory cassette.

If touched, the internal electronic circuitry may be damaged due to static electricity.

1. INTRODUCTION

1.5 SPECIFICATIONS

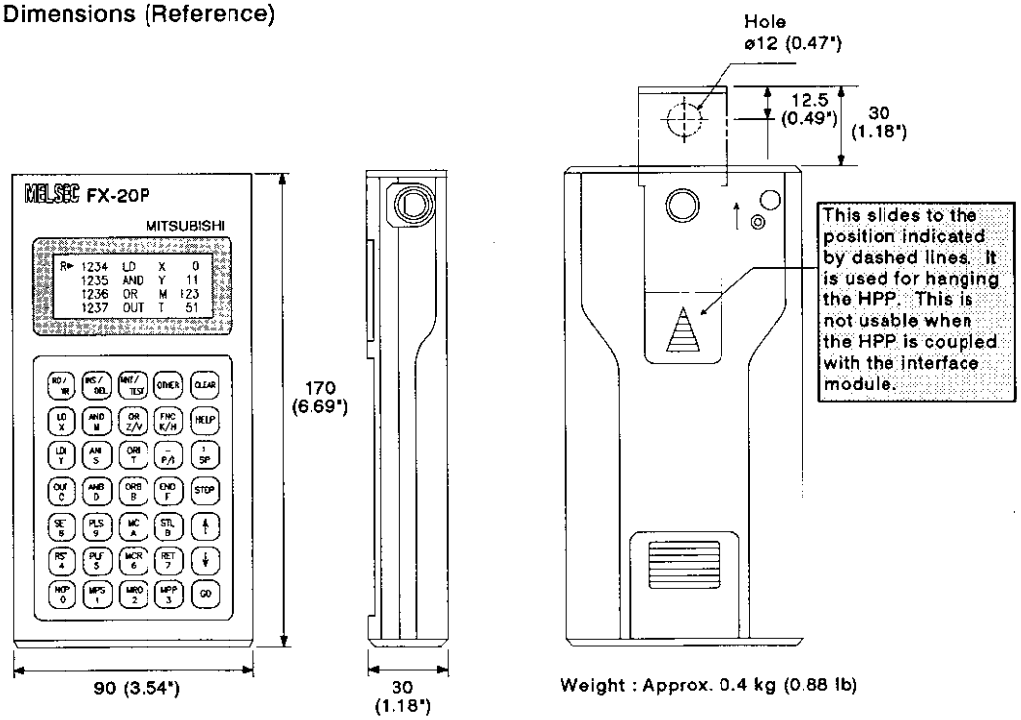
FX-20P-FIM Dimensions



Cable length : 1500 (59.06")

Unit : mm (inch)

HPP Dimensions (Reference)



Weight : Approx. 0.4 kg (0.88 lb)

Unit : mm (inch)

1. INTRODUCTION

SPECIFICATIONS

1.5.1 CONDITIONS

Item	Specification			
Ambient temperature	0°C to 55°C			
Ambient humidity	45 to 85% RH (without condensation)			
Vibration resistance	Conforms to JIS C0911	Frequency	Acceleration	Amplitude
		10 to 55 Hz	1 G	0.1 mm (0.004 in)
		2 hours each in X/Y/Z direction		
Shock resistance	Conforms to JIS C0912 (10G, 3 times each in X/Y/Z direction)			
Environment	Free of corrosive gas and airborne dust			

1.5.2 SPECIFICATIONS

Item		Specification
Applicable PC		F_1 and F_2 PCs
Supply voltage		5V DC ±5% (supplied from PC through FX-20P-FIM module)
Current consumption		150 mA
Memory capacity		RAM = 16 KB
Memory backup for power failure		Memory backup capacitor After being powered for 1 hour, it can retain internal device data for 3 days without externally supplied power.
Display unit		LCD with backlight
Display contents	Number of characters	64 characters (16 columns x 4 lines)
	Character types	Alphanumerics
Keyboard		35 keys
Interface	PC I/F	Used with FX-20P-CAB to connect to FX PC
External dimensions		235 x 90 x 30 mm (9.25 x 3.54 x 1.18 in)
Weight		0.5 kg (HPP unit) + 0.2 kg (FX-20P-FIM module) (1.1 + 0.44 lb)

2. PROGRAMMING EXAMPLE

2.1 INITIAL SETUP

In order to begin to understand the HPP, let's use a sample program to actually operate it. This will give you a "feel" for the HPP. This chapter is prepared so that you can make a program with the HPP and then monitor and test it.

This chapter gives only an outline of each function. For further details, proceed to the other chapters after you have understood the basics of the HPP operations.

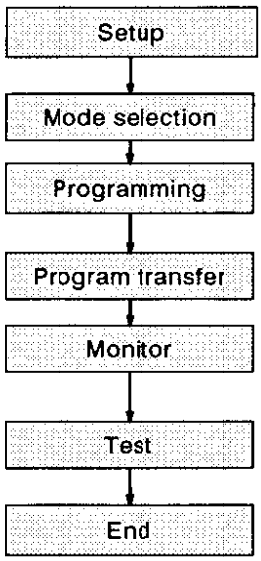
2.1.1 SETUP FOR HPP OPERATION

To operate the HPP according to the instructions described below, the following equipment and devices are required:

- PC — PC CPU module : F1-30MR-ES
  The F1-30MR-ES module is used in the following programming example. Other F1, F2 series PC may substitute.
- HPP (FX-20P-E Handy Programming Panel)
- FX-20P-E-FKIT — FX-20P-FIM interface module, FX-20P-MFA-E system memory cassette for F series
- Simulation switches — Input switches : Please use the simulation switches applicable to the PC type used.

2.1.2 OPERATION FLOW

HPP operation is described in the following order :



- Setup ..... Installing the FX-20P-FIM interface module to the HPP, and connecting it to the PC.
- Mode selection ..... Operating the HPP keys. Turn on the PC power. Select PC type for program creation.
- Programming ..... First, clear the PC program memory area. Now the HPP is ready for you to make a program according to the example.
- Program transfer ..... Transferring created programs to the PC.
- Monitor ..... Check whether the program was written correctly. Designate the device used in the program and monitor its operating status.
- Test ..... Turn the designated device ON/OFF with the HPP keys.
- End ..... After completing the steps indicated above, you will understand the basic concept of the HPP operations.

QUESTIONS?

If you're unsure of any of the points discussed in this chapter and have any questions about the operations, don't worry. The purpose of this chapter is to learn only the basics of the HPP. Just follow the instructions and you'll become familiar with the HPP. You'll learn the specifics of each function in other chapters.

2. PROGRAMMING EXAMPLE

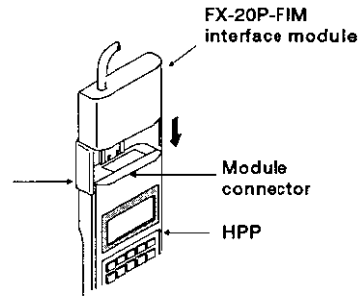
INITIAL SETUP

2.1.3 INITIAL SETUP

The following explains the procedures of the installation of the FX-20P-FIM interface module and the FX-20P-MFA-E system memory cassette for the F series to the HPP and the PC.

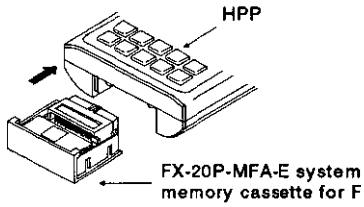
Install the FX-20P-FIM to the HPP.

Open the cover for the module connector on the top side of the HPP. Insert the FX-20P-FIM interface module into the connector and tighten the fixing screws.



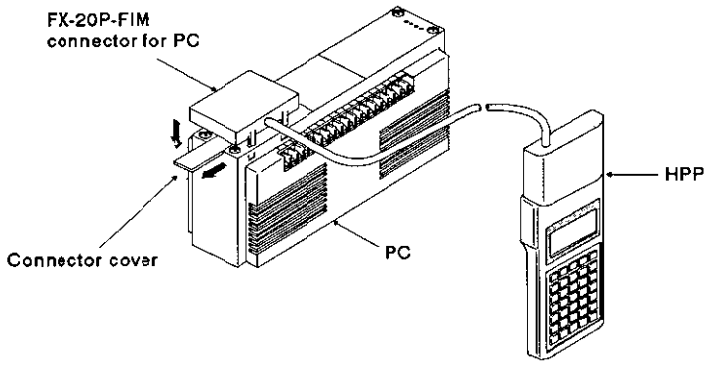
Install the FX-20P-MFA-E to the HPP.

Remove the system memory cassette that is attached to the bottom of the HPP. Then, insert the FX-20P-MFA-E memory cassette for the F series PCs into the HPP.



Connect the HPP to the PC.

Turn off the power to the PC.
Remove the connector cover on the top side of the PC. Insert the PC connector of the FX-20P-FIM interface module into the connector on the PC.



Turn on the power to the PC. (continue to the next page)

Turn ON the power to the PC. Because the HPP doesn't have its own power supply, power is supplied from the PC through the FX-20P-FIM interface module.

CONNECTION CHECK

Turn on the power to the PC after connecting the HPP to the PC. The initial screen, shown below, is displayed on the HPP display if it is correctly connected to the PC.

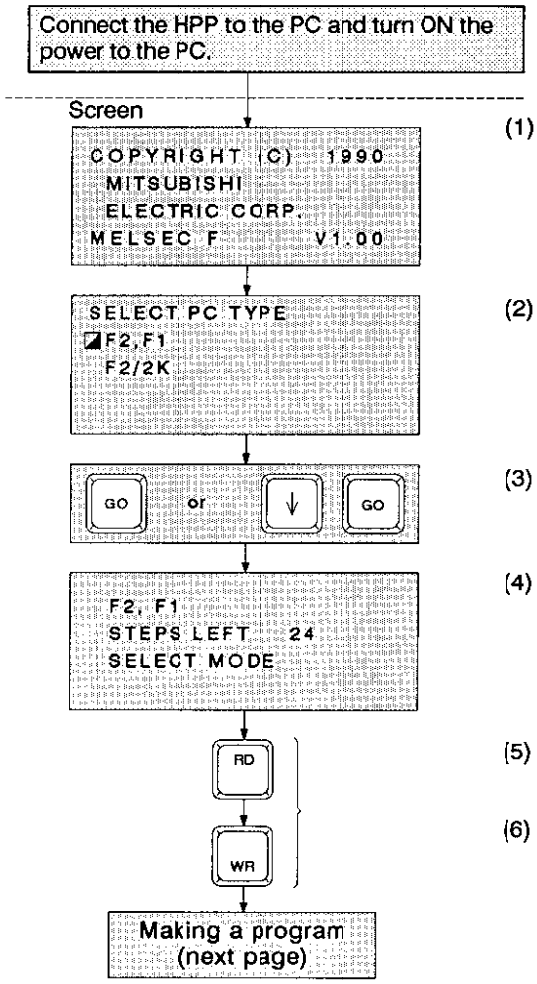
```
COPYRIGHT (C) 1990
MITSUBISHI
ELECTRIC CORP.
MELSEC F      V1.00
```

2. PROGRAMMING EXAMPLE

2.2 START-UP

After completing necessary preparation, start up the HPP.

2.2.1 START-UP



(This operation is the "Initial Setup" step.)

(1) The initial screen is displayed on the HPP display unit for 2 seconds.

(2) Select PC type. Initial setting is F2, F1. (Select the type to be used.)

(3) Select F2/2K to use F2 in 2K step mode.

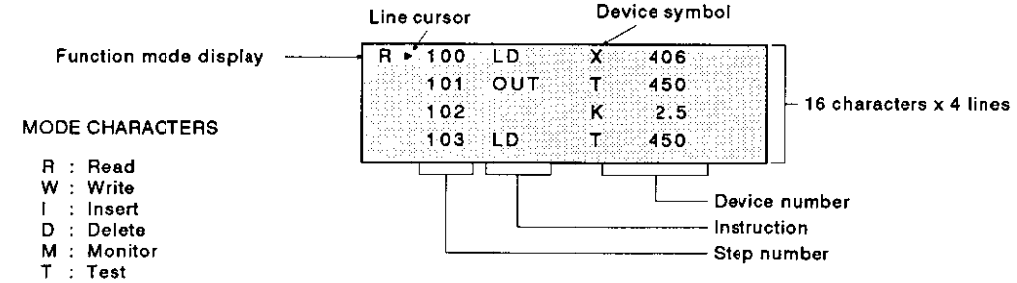
(4) After completing the PC type selection (F2, F1 on the screen), select the write function to write a program.

(5) The [RD/WR] key is a toggle key.
Pressing it two times selects the write mode.

(6) Make sure that the mode character displayed is "W".

SCREEN DISPLAY

The layout of the HPP LCD display unit is described below.



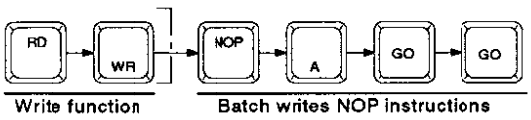
2. PROGRAMMING EXAMPLE

2.3 PROGRAMMING EXAMPLE

Before making your program, batch-write the NOP instruction to the HPP RAM area. Then, write the program by following the example below.
The first required operation is to ensure that the "RUN input terminal is OFF."

2.3.1 BATCH WRITING NOP INSTRUCTIONS

Before making a new program, the entire HPP RAM area should be deleted first. To do this, designate "all area" and write the NOP instruction.

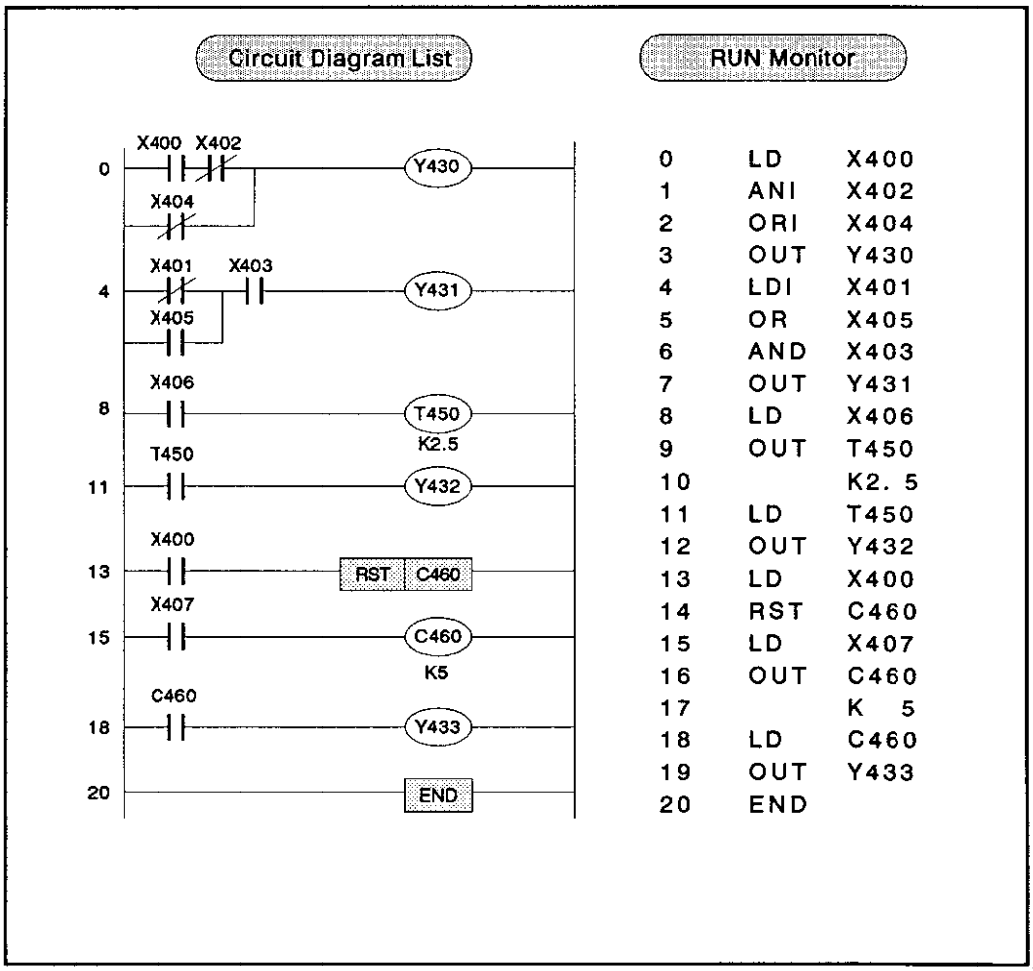


(1) Does the screen display NOP instructions for each step number? If not, repeat the procedure indicated on the left.

W ▸	0	NOP
	1	NOP
	2	NOP
	3	NOP

2.3.2 WRITING A SAMPLE PROGRAM

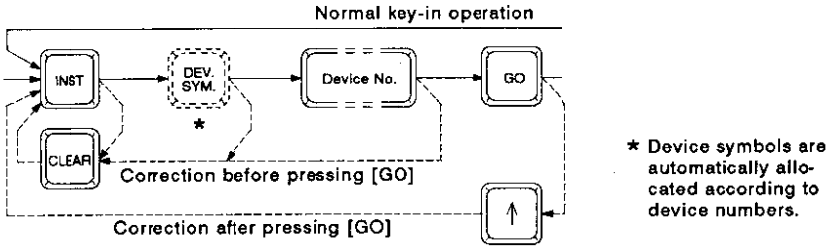
Now it's time to key in a sample program. Proceed step-by-step as indicated below.



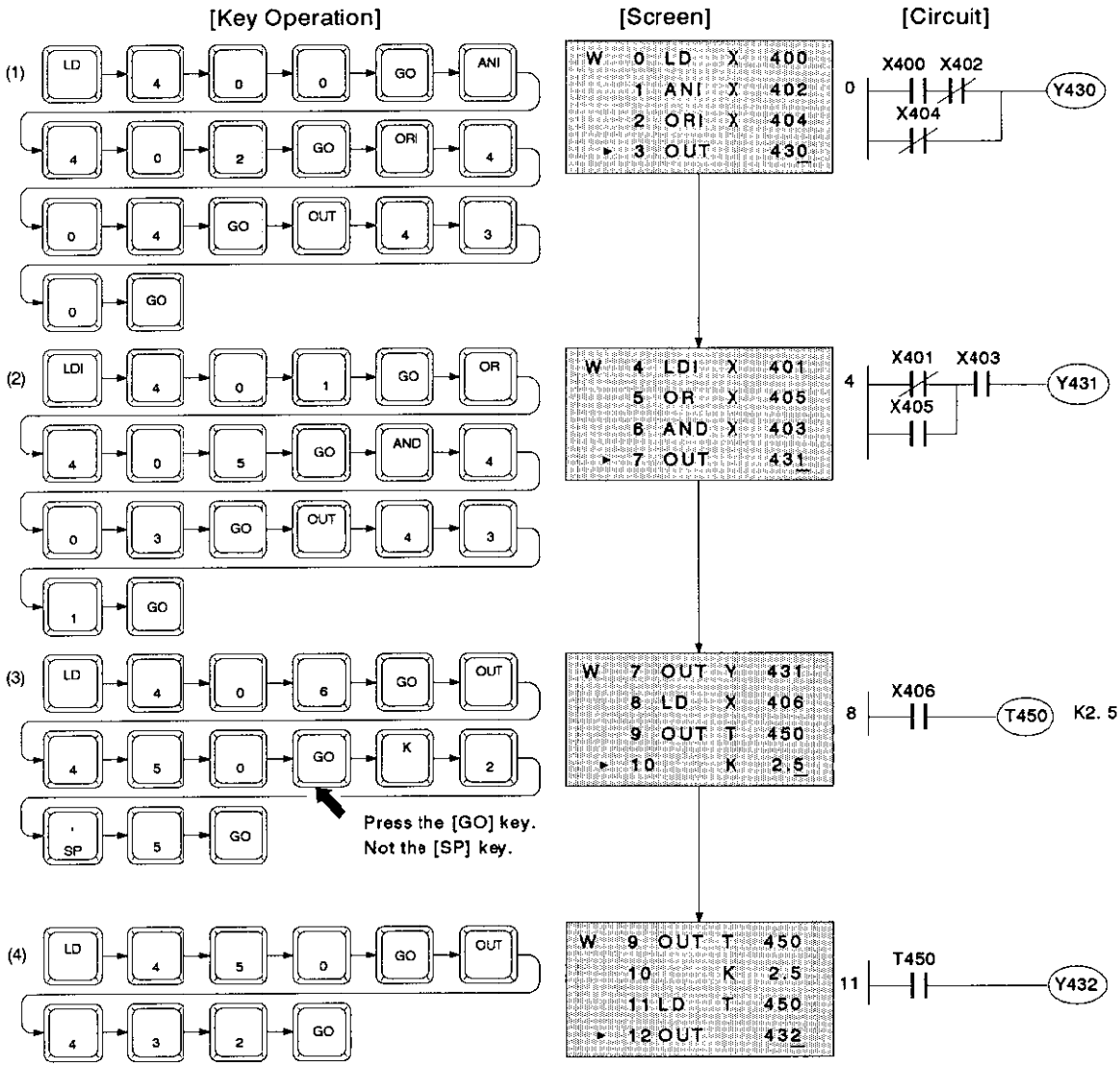
2. PROGRAMMING EXAMPLE

PROGRAMMING EXAMPLE

Keyed-in data is displayed on the screen until the [GO] key is pressed. After keying in each step, check that the characters are correct. Then, press the [GO] key. If you make a mistake when keying in characters, use the [CLEAR] key to clear the keyed-in characters and key in the correct entry.

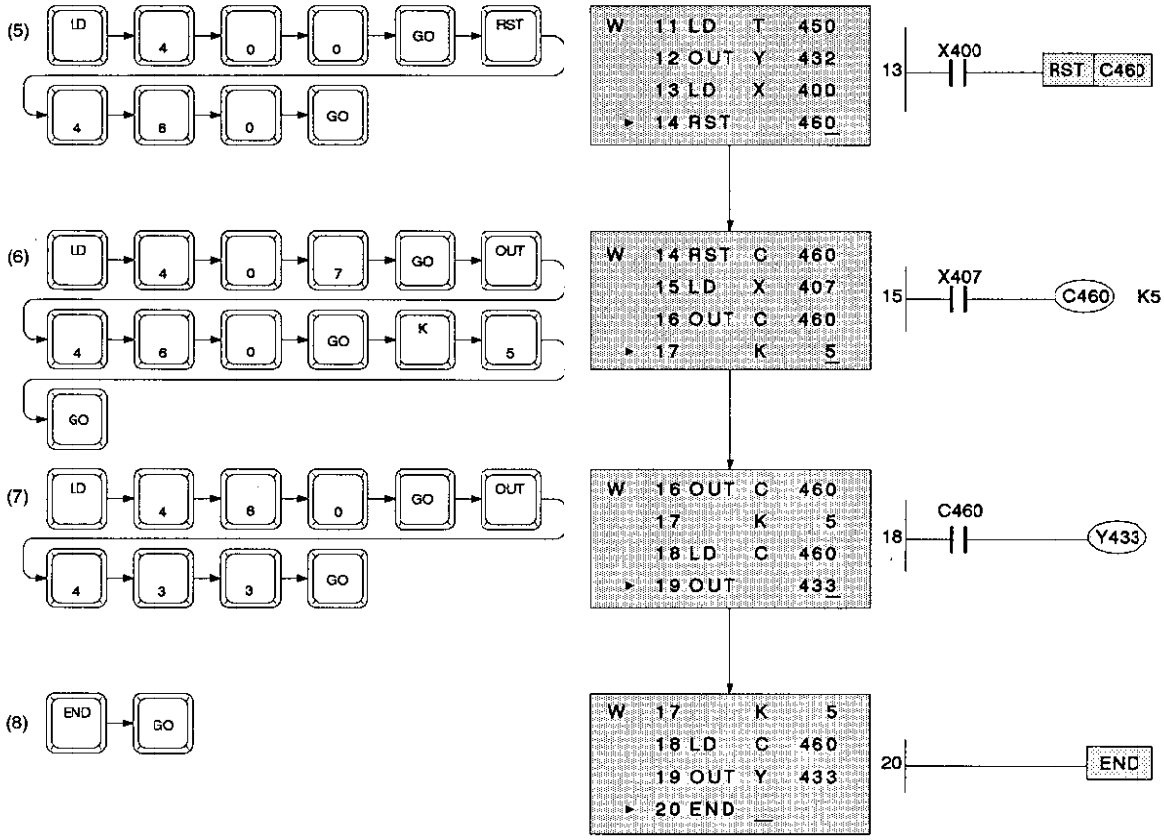


Enter the sample program by following the steps below.

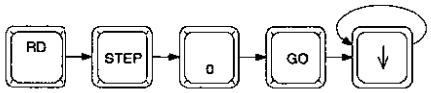


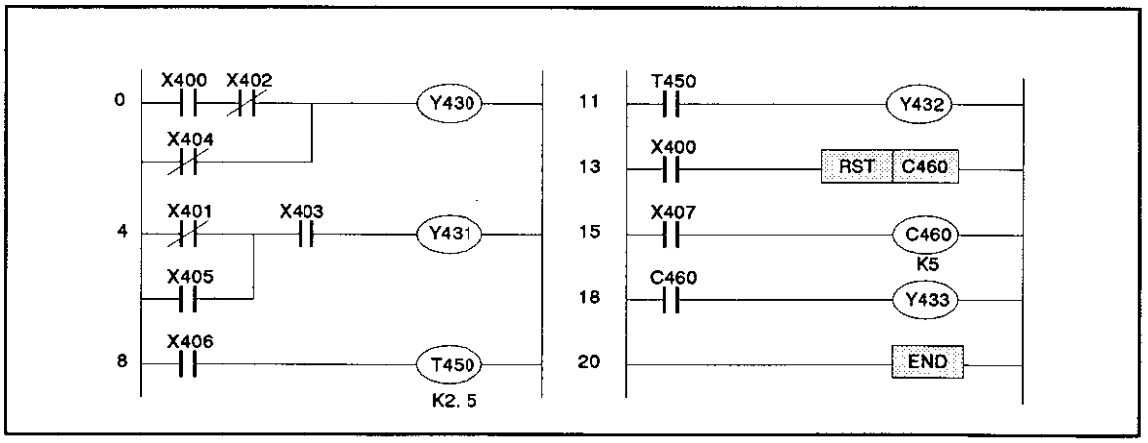
2. PROGRAMMING EXAMPLE

PROGRAMMING EXAMPLE



After writing the program, follow the key operation described below to check it.





2. PROGRAMMING EXAMPLE

2.4 PROGRAM TRANSFER

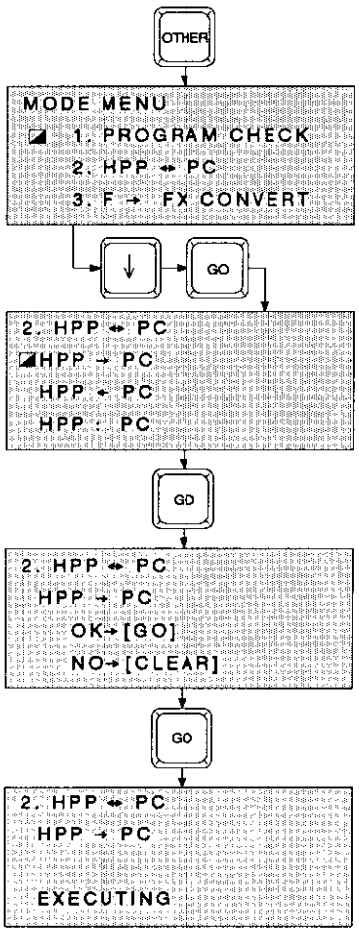
The program, created with the procedures described in the programming example, is now stored in the RAM in the HPP. Now, start transferring the program to the RAM in the PC to perform monitoring or tests to the program.

Transfer the program as follows.

2.4.1 PROGRAM TRANSFER

Select "2. HPP ⇔ PC" in the mode menu.

Start this selection after writing and inspecting the program.



(1) Press the [OTHER] key. The mode menu screen is displayed.

(2) Select "2. HPP ⇔ PC" and then press the [GO] key.

(3) Select "HPP → PC" and press the [GO] key.

(4) Press the [GO] key again. Program transfer is executed.

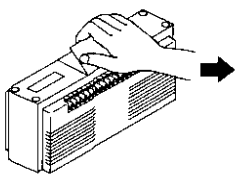
(5) If the message displayed at the bottom has changed from "EXECUTING" to "COMPLETED", the program has been successfully transferred.

(6) To return to the HPP ⇔ PC transfer menu screen, press the [CLEAR] key. To return to the mode menu screen, press the [OTHER] key.

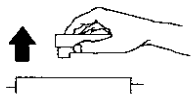
REMOVING THE PC MEMORY CASSETTE

- In the programming example, the program is to be transferred from the HPP to the RAM in the PC. If a memory cassette is installed in the PC, remove it as shown below.

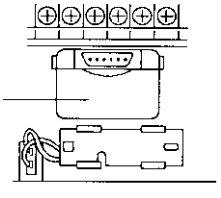
(1) Turn OFF the power to the PC and remove the top cover



(2) Pull the memory cassette up to take it out of the PC.



Memory cassette



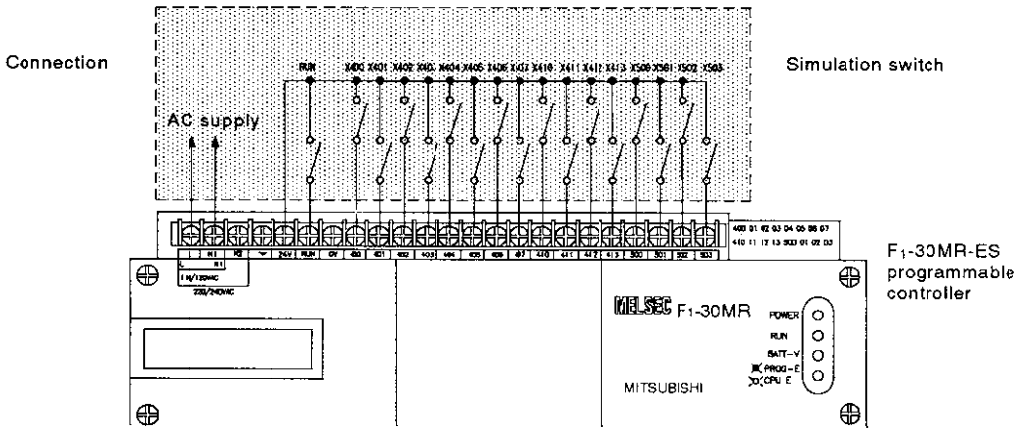
2. PROGRAMMING EXAMPLE

2.5 MONITOR

Once you have written a program, you should run it to check its operation. To do this, you need to have switches to turn on/off the inputs.

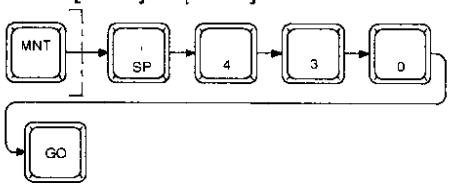
2.5.1 CONNECTION OF INPUT SWITCHES

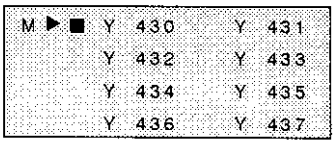
Connect the switches to the PC as shown below. Always turn OFF the power to the PC before connecting any external device.



2.5.2 MONITORING

Designate a device with the HPP keys and check its operation. Turn ON the power and the RUN input. Read Y430 to Y437 on the HPP LCD display unit in units of eight points and operate the simulation switches [X400] to [X503].





(Example : Y430 is turned ON.)

Observe the screen to check how the ON/OFF status of Y430 to Y433 changes according to the simulation switch settings. Before starting the operation of the simulation switch, set all of the switches to OFF.

The ■ symbol to the left of Y430 to Y433 indicates that the corresponding Y is ON.

(1) [X404] : ON → [Y430] : OFF
(2) [X403] : ON → [Y431] : ON
(3) [X406] : ON → Y432 : Turns ON 2.5 seconds later
(4) [X407] : Turn ON 5 times → [Y433] : ON

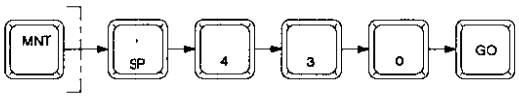
If you have written the example correctly, Y430 to Y437 will turn ON and OFF in correspondence to the operations [X400] to [X503] indicated above. If any of the Y430 to Y437 responses is not correct, read and check the program again.

2. PROGRAMMING EXAMPLE

2.6 TEST

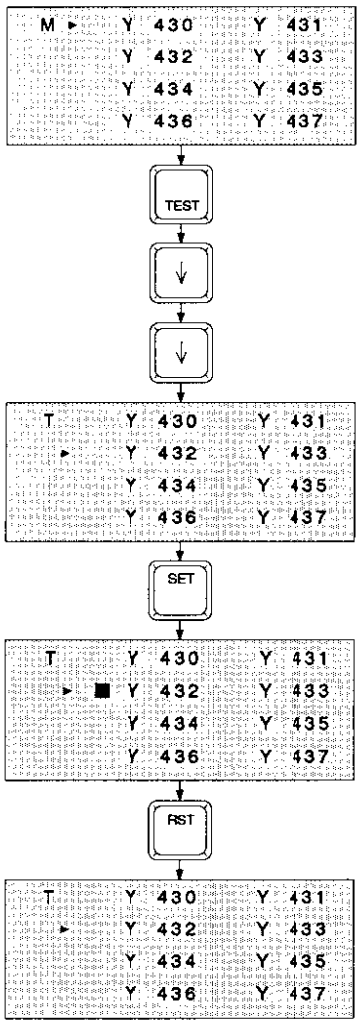
You can turn a device designated in the program ON and OFF with the HPP keys. For this test operation, the RUN switch must be set to the OFF position.

Read eight outputs beginning with Y430 on the HPP display as follows. (The procedures are same as those for reading with the monitor function.).



2.6.1 FORCED ON/OFF OPERATION

After displaying Y430 to Y437 on the screen, turn Y432 ON and OFF in this forced manner.



(1) The screen displays Y430 to Y437.

(2) Press the [TEST] key to call the test function.

(3) Use the [↑] and [↓] keys to increment or decrement the device number (Y432)

(4) The function mode display changes from "M" to "T" with the cursor placed at Y432.

(5) This forcibly turns Y432 ON.

(6) The ■ symbol appears at Y432. This indicates that Y432 is ON.

(7) This forcibly turns Y432 OFF.

(8) The ■ symbol disappears, indicating that Y432 is OFF.

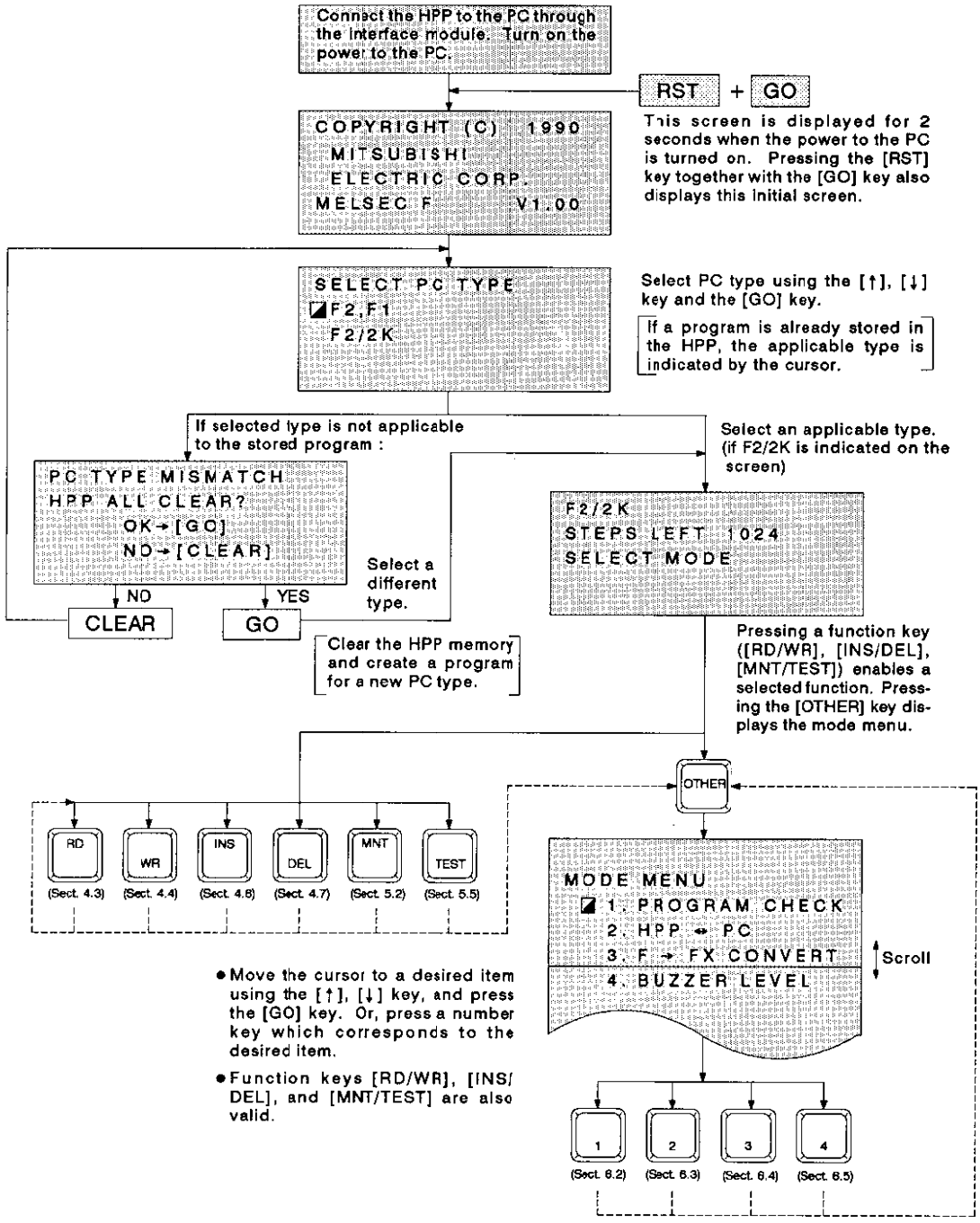
Repeat the steps above for Y430 to Y437 to make sure that each output is forcibly turned ON and OFF in response to the pressing of the [SET] and [RST] keys.

If the output does not turn ON and OFF, there may be an error in your program. Read and check the program.

3. START UP OF THE HPP

3.1 START UP OF THE HPP

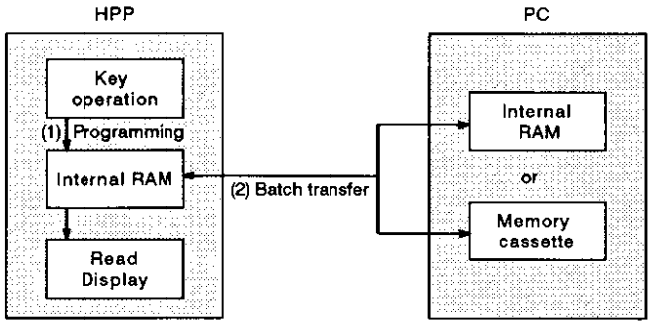
Start up the HPP and select PC type and the mode menu as follows.



4. PROGRAMMING

4.1 PROGRAMMING

Programs created using the keys on the HPP are written to the internal RAM of the HPP. Programs have to be transferred to the PC before they can be used. Programs stored in the PC can be read to the HPP for correction and editing.



(1) Programs created with the HPP are written to the RAM in the HPP regardless of the memory type or RUN/STOP state of the PC.

(2) The following conditions must be met to enable the execution of batch transfer to the PC.

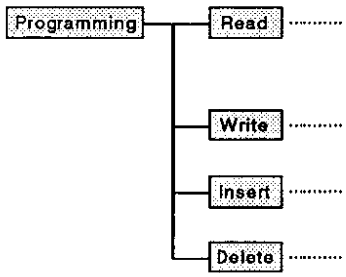
	RUN/STOP state of PC	Program memory of PC
Write from HPP to PC	STOP	RAM/EEPROM*
Read from PC to HPP	RUN/STOP	RAM/EEPROM/ EPROM
Verify between HPP and PC		

* When the memory protect switch is OFF.

4. PROGRAMMING

4.2 PROGRAM EDIT FUNCTIONS

Select the required program edit function.



- **Read** ..... The stored program is read.
  The program can be read by designating the step number, instruction, or device.
- **Write** ..... A new program can be written. An existing program can be overwritten or have steps added to it.
- **Insert** ..... Instructions are inserted into the existing program. Step numbers are reassigned for the ensuing instructions.
- **Delete** ..... Instructions are deleted from the existing program. Step numbers are reassigned for the ensuing instructions.
  The Delete mode can perform an all NOP delete, step delete, or a range delete of instructions by designating the delete range.

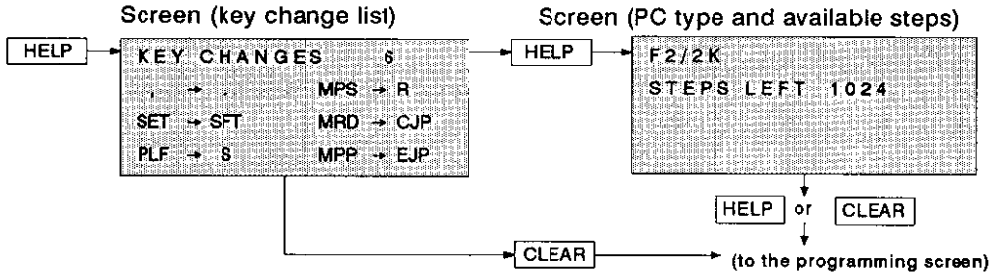
(1) Switch keys and the [HELP] key

Since some of the instructions used with the FX series PCs are different from those used with the F1 and F2 series PCs, some of the instruction keys on the HPP represent a different function.

There are 6 changed keys which are listed on the screen by pressing the [HELP] key. (see below)

Pressing the [HELP] key again, the screen displays current PC type and the number of available steps.

Pressing the [HELP] key again or the [CLEAR] key switches the screen to the programming screen.



(2) The procedure for making a new program is explained in Section 2. This section explains the procedure for reading, editing, and adding instructions.

ABOUT THE EXAMPLES OF SCREEN DISPLAY

The examples of screen display of programs and instructions are prepared with the F1-30MR-ES PC. For detail of instructions and device numbers, which vary according to the type of PC, refer to the lists of instructions and device numbers in Section 7 (Appendix).

4. PROGRAMMING

PROGRAM EDIT FUNCTIONS

4.2.1 BASIC PROCEDURE

Programming is entered by the following steps.

Initial Setup	Connect the HPP to PC. (Refer to Section 1.4.2 for details.)
Starting up the system	Turn ON the power to the PC or reset the HPP ([RST] + [GO]). (Refer to Section 3 for details.)
Selecting the PC type	Select the PC type using the cursor key on the PC type selection screen. (Refer to Section 3 for details.)
Programming	Make a new program or edit an existing program by using the write, read, insert, or delete function.
End	End of programming.

4.2.2 PROGRAMMING

There are two programming methods; writing a new program and editing an existing program. After starting up the system, select the PC type and press the [GO] key. Now, the required program edit function can be selected.

Item	Function Key	Operation
Writing a new program	RD → WR	Program writing begins.
Editing an existing program	RD	The program to be edited is read and displayed.
	Read the instruction → WR	The existing program will be overwritten.
	INS	The required instructions can be inserted.
	INS → DEL	Unnecessary instructions can be deleted.

4.2.3 END

Created programs are written to the RAM in the HPP.

To end the operation, turn OFF the power to the PC.

STORAGE AND USE OF PROGRAMS

Purpose of the RAM in the HPP :

Programs are written to the RAM in the HPP.

To create a program when another program is already stored in the RAM, transfer the stored program to the PC so that it may be recovered when a new program is created.

When a program stored in the PC is transferred to the HPP, the program in the RAM in the HPP is erased.

Purpose of the Memory Backup Capacitor :

The RAM in the HPP is backed up by a capacitor. (1 hour of charge retains memory for 3 days)

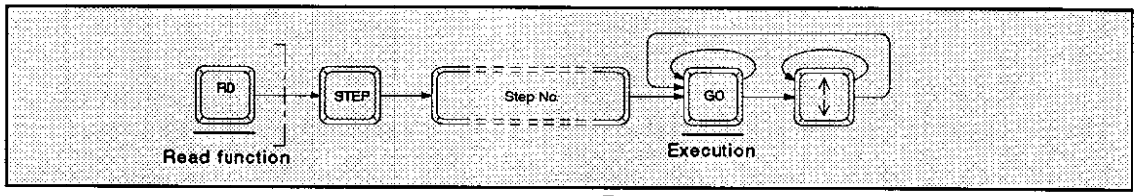
You can write a program in the office with the HPP and bring it to the factory to transfer the program to the PC.

4. PROGRAMMING

4.3 PROGRAM READING

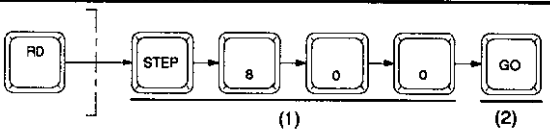
4.3.1 READING THE PROGRAM BY DESIGNATING A STEP NUMBER

<BASIC OPERATION>

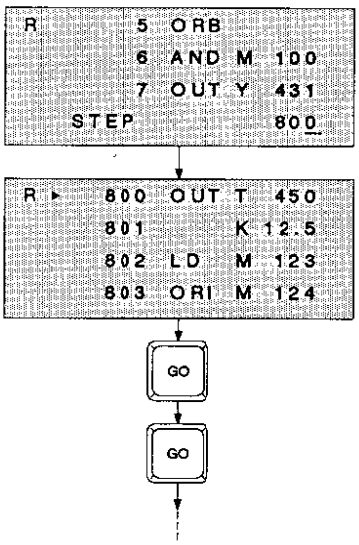


<OPERATION EXAMPLE 1>

To read program step number 800



Display Example :



Key Operation :

(1) Press the [STEP] key and key in [8] [0] [0].

(2) Press the [GO] key and the corresponding program line is read.

Explanation :

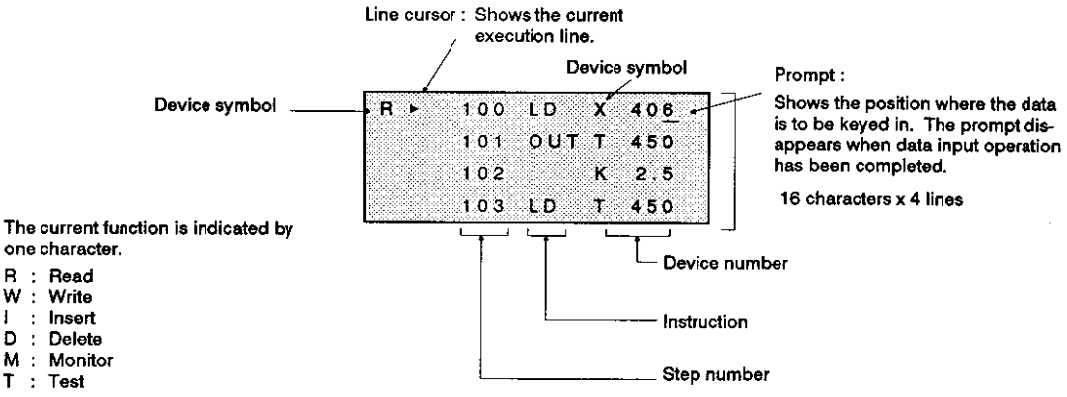
(a) The screen displays four lines of the program with the designated step number displayed as the first line.

(b) Press the [GO] key and the next four lines of program will be displayed.

(c) The required step number can also be displayed by single line scrolling through the program with the cursor keys.

SCREEN CONFIGURATION WHEN PROGRAMMING

When a programming function is called, the layout of the HPP LCD display unit screen will be as described below.

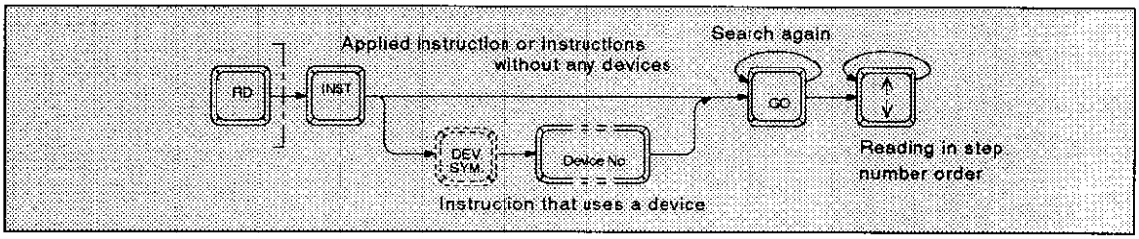


4. PROGRAMMING

PROGRAM READING

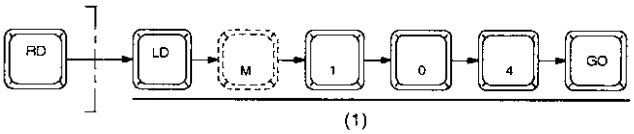
4.3.2 READING A PROGRAM BY DESIGNATING AN INSTRUCTION

<BASIC OPERATION>

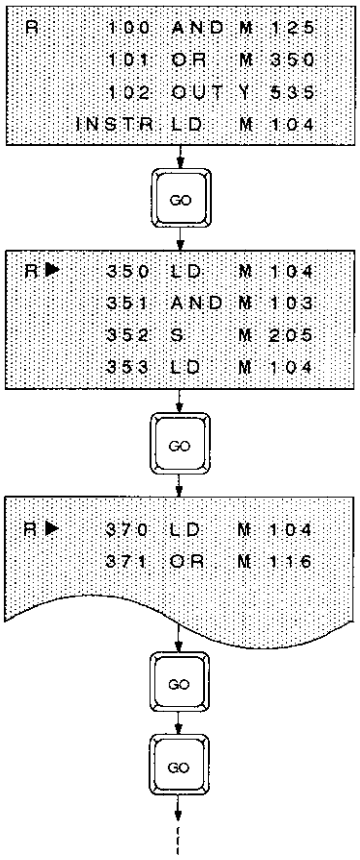


<OPERATION EXAMPLE 1>

To read instruction PLS M104



Display Example :



Key Operation :

(1) After pressing an instruct on key, key in the device number if the designated instruction uses a device.

Explanation :

(a) The designated instruction is searched for in the program beginning with step number 0. The screen displays four lines of the program. The first line contains the designated instruction.

(b) If the [GO] key is pressed again, a search for the next step containing the designated instruction begins.

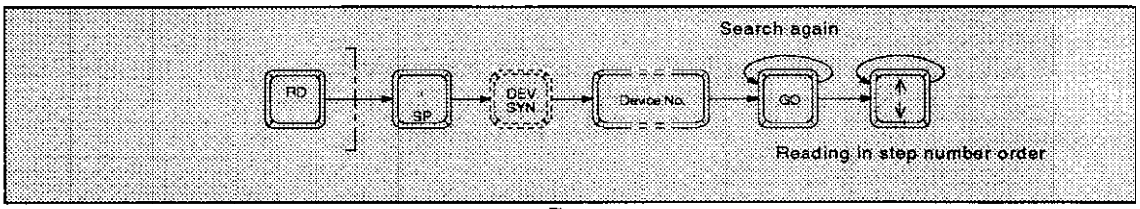
(c) If the designated instruction is not found, the "NOT FOUND" message is displayed.

(d) If you press a cursor key while in the read state, the program will be read in the order of step number.

PROGRAM READING

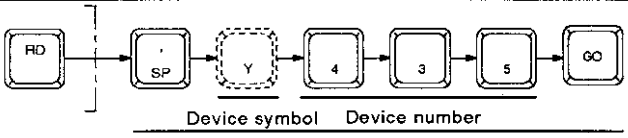
4.3.3 READING A PROGRAM BY DESIGNATING A DEVICE

<BASIC OPERATION>

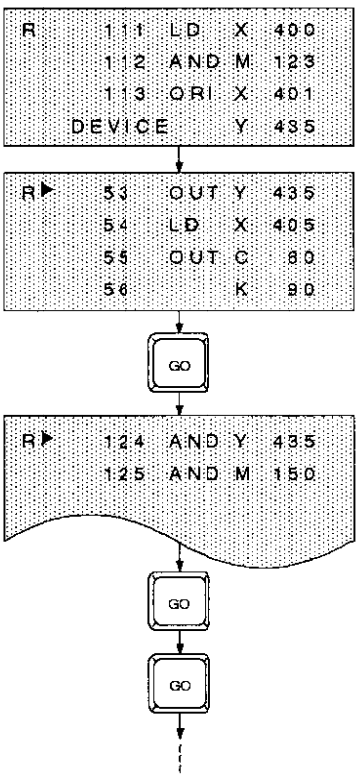


<OPERATION EXAMPLE 1>

To read Y435



Display Example :



Key Operation :

(1) After pressing the [SP] key, key in [Y] [4] [3] [5], the desired device symbol or device number, and press the [GO] key.

Explanation :

(a) The designated device is searched for beginning with step number 0. The screen displays four lines of the program. The first line contains the designated device.

(b) If the [GO] key is pressed again, a search is made for the next step containing the designated device.

(c) If the designated device is not found, the "NOT FOUND" message is displayed.

Note: • Cautions on Reading a Program by a Designating Device :

Constant K cannot be designated on its own to read a program.

4. PROGRAMMING

4.4 BASIC WRITING OPERATIONS

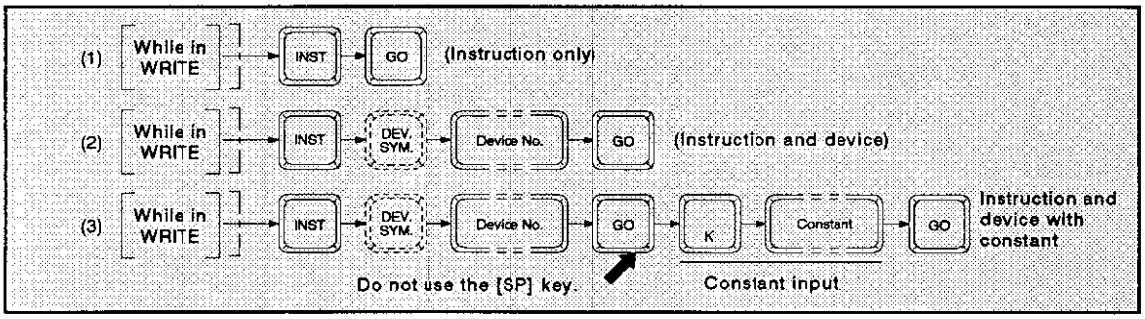
4.4.1 INPUTTING BASIC INSTRUCTIONS

Basic instructions or step ladder instructions can be input in any of the following methods :

- Instruction only
- Instruction and device
- Instruction and device with constant

These three input methods are explained below.

<BASIC OPERATION>



(1) INSTRUCTIONS WITHOUT ANY DEVICES

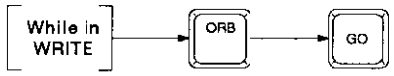
The following instructions are accessed without designating a device :

ANB, ORB, RET, END, and NOP

As an example, the display and the required key operation for inputting the ORB instruction are shown below.

Display Example :

```
W      4  LDI    X 404
       5  AND    X 405
       6  ORB
     ► 7  NOP
```



(a) After pressing the [ORB] key, press the [GO] key. The ORB instruction is then written.

(2) INSTRUCTIONS THAT REQUIRE THE DESIGNATION OF ONE DEVICE

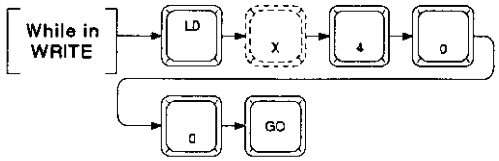
The following instructions can be accessed when designated with a valid device :

LD, LDI, AND, ANI, OR, ORI, SFT(SET), RST, PLS, S(PLF), R(MPS), CJP(MRD), EJP(MPP), MC, MCR, STL, and OUT

A display example and the required key operation for inputting the LD X400 instruction are shown below.

Display Example : (before pressing the [GO] key)

```
W►     0  LD     400
       1  NOP
       2  NOP
       3  NOP
```



Display Example : (after pressing the [GO] key)

```
W      0  LD     X 400
     ► 1  NOP
       2  NOP
       3  NOP
```

(a) After pressing the [LD] key, press the [4], [0] and [0] keys.

(b) When the HPP is waiting for a device symbol or device number to be input, the prompt appears at the end of the line.

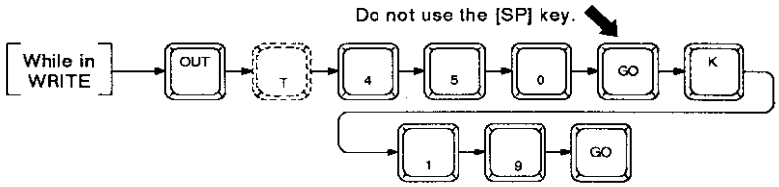
(c) Press the [GO] key to complete the writing.

BASIC WRITING OPERATIONS

(3) INSTRUCTION AND DEVICES WITH CONSTANT

The following instruction can be accessed when designated with a constant : OUT(T, C, F)

A display example and the required key operation for inputting the OUT T450 K19 instruction are shown below.



Display Example :

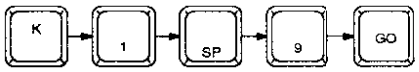
```
W  100  OUT    M  100
   101  OUT    T  450
   102           K   19
 ▶ 103  NOP
```

(a) After pressing the [OUT] key, press the following keys in order : [4] [5] [0] [GO] [K] [1] [9]. Press the [GO] key to complete the writing.

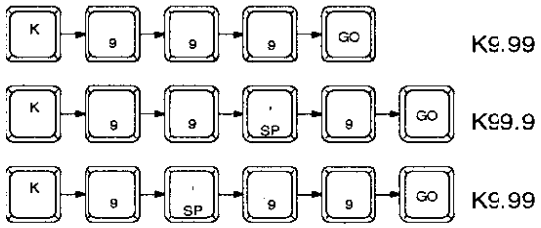
(b) The prompt is displayed when the HPP is waiting for the input of a device symbol or its number.

(c) Use the [SP] key to enter a decimal point.

<Example : K1.9>



How to enter for T650 to T657 :



• Use caution since the [SP] key works differently from that for the FX series.

Note : • Entry of Device Symbols :

Device symbols need not be entered since they are recognized by corresponding device numbers.

Device symbols are automatically displayed when corresponding device numbers are entered.

If an entered device symbol does not match with the device number, priority is given to the device number, and the device symbol is automatically changed to the corresponding symbol.

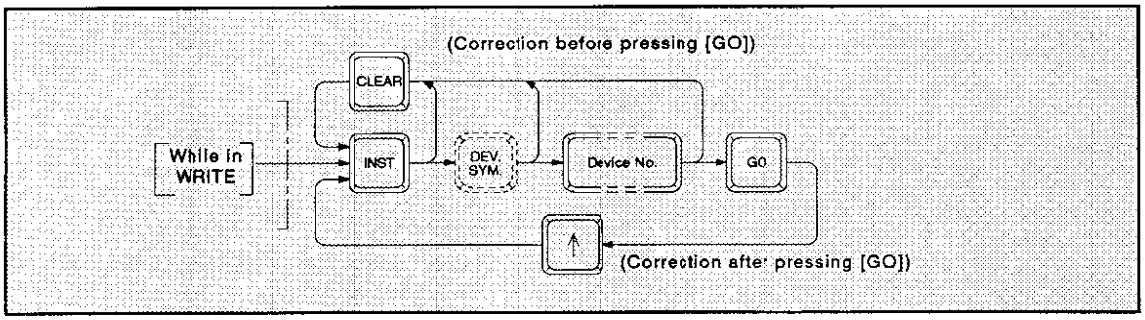
BASIC WRITING OPERATIONS

4.4.2 CORRECTION AND NUMERIC VALUE ENTRY

(1) CORRECTING KEYED-IN DATA BEFORE AND AFTER PRESSING THE [GO] KEY

Use the following procedure to correct data during or after completing the entry.

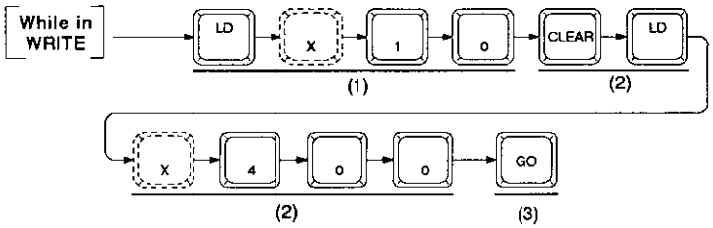
<BASIC OPERATION>



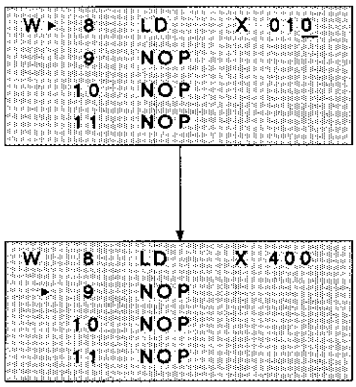
<OPERATION EXAMPLE 1>

Correction of an instruction by the [CLEAR] key (before pressing the [GO] key) :

The following key operation corrects the instruction "LD X10" to "LD X400".



Display Example :



Key Operation :

(1) Key operation before pressing the [GO] key. (The cursor indicates the line being entered.)

(2) Press the [CLEAR] key and start entry with the instruction key.

(3) Press the [GO] key to complete the correction.
(The cursor moves to the next line.)

Explanation :

(a) Constants can be corrected in the same way.

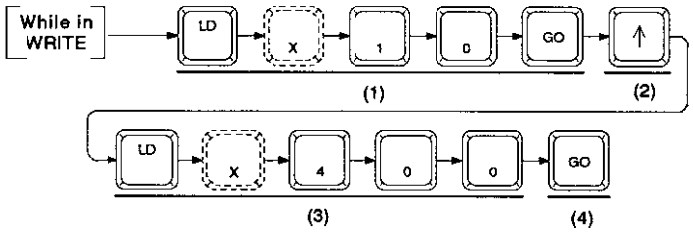
4. PROGRAMMING

BASIC WRITING OPERATIONS

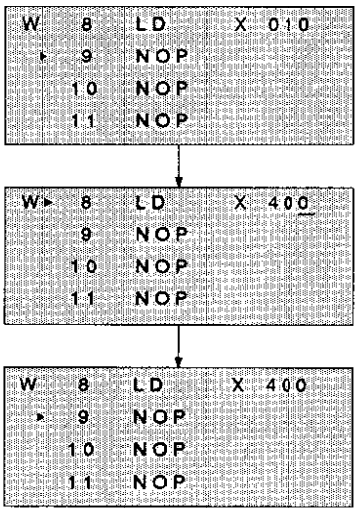
<OPERATION EXAMPLE 2>

Correction of an instruction by cursor movement (after pressing [GO]) :

The following key operation corrects the instruction "LD X10" to "LD X400".



Display Example :



Key Operation :

(1) Keying in an instruction.
(The cursor moves to the next line.)

(2) Press the [↑] key to move the cursor to the line to be corrected.

(3) Key in a new instruction.

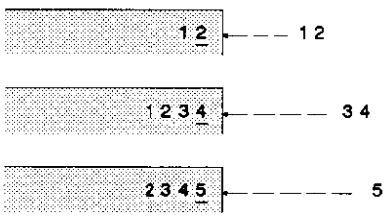
(4) Press the [GO] key to write the keyed-in data.
(The cursor moves to the next line.)

Explanation :

(a) Constants can be corrected in the same way.

<OPERATION EXAMPLE 2>

If you key in [1] [2] [3] [4] [5] when only four digits can be input, the end result is displayed as shown below.



Explanation :

(a) Each time a number key is pressed, the keyed-in number is displayed in the far-right column and the previously keyed-in numbers are shifted to the left. Therefore, when a number with more than the acceptable number of digits is keyed in, the excess digits disappear from the screen beginning with the first keyed-in digit.

If only three or less digits are keyed-in for X and Y (which accept up to four digits), the other digit places are filled with leading zeros.

(b) The digits disappeared from the display are not written to memory.

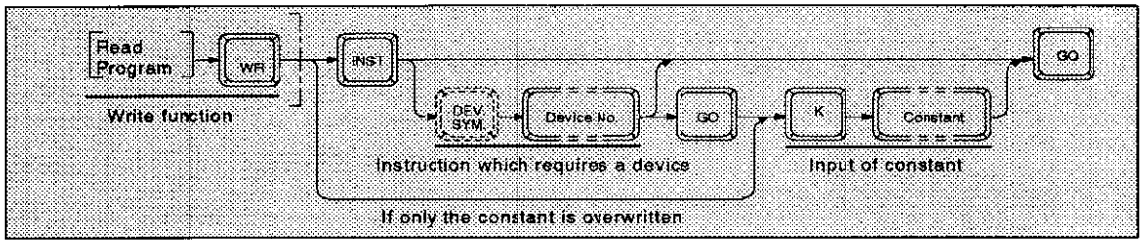
4. PROGRAMMING

4.5 OVERWRITING EXISTING INSTRUCTIONS

4.5.1 WRITING INSTRUCTIONS AND POINTERS

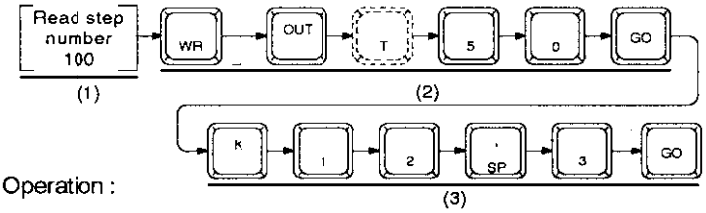
Use the following procedure to overwrite a program.

<BASIC OPERATION>



<OPERATION EXAMPLE 1>

Overwrite in step number 100 with "OUT T50 K12.3".



Display Example :

```
R▶  100 OUT M 110
    101 OUT M 111
    102 LDI M 124
    103 AND M 125
```

```
W▶  100 OUT T  50
    101 OUT M 111
    102 LDI M 124
    103 AND M 125
```

```
W   100 OUT T  50
 ▶  101     K 12.3
    102 LDI M 124
    103 AND M 125
```

```
W   100 OUT T  50
    101     K 12.3
 ▶  102 LDI M 124
    103 AND M 125
```

Key Operation :

(1) Read the required program step by designating the step number 100.

(2) Press the [WR] key, and then, input an instruction, (a device symbol), and a device number. Then, press the [GO] key.

(Write a program by each instruction or constant.)

(3) To write a constant, press the [K] key and input a numeric value.

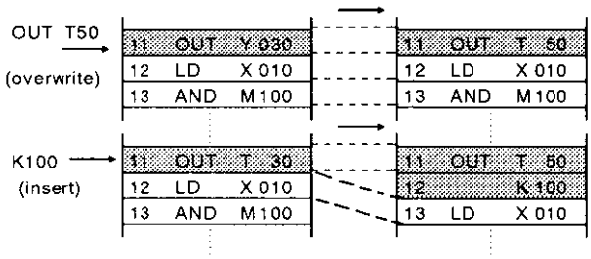
Explanation :

(a) Press the [GO] key to write the keyed-in instructions.

To overwrite instructions in steps near the currently displayed step number, move the line cursor to the required step number.

Note: • *Overwriting an instruction with a constant :*

The constant following an instruction overwrites one step. Use the insert function to write it.



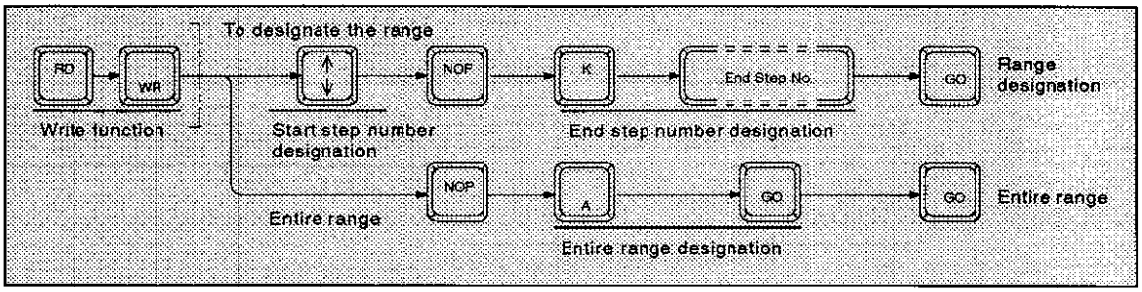
4. PROGRAMMING

OVERWRITING EXISTING INSTRUCTIONS

4.5.2 BATCH WRITING NOP INSTRUCTIONS

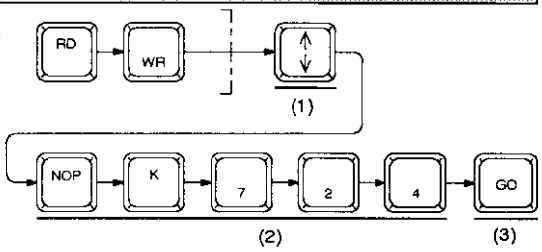
Use the following procedure to batch-write NOP instructions within a designated range.

<BASIC OPERATION>

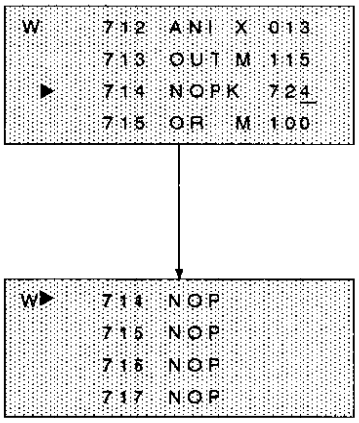


<OPERATION EXAMPLE 1 – RANGE DESIGNATE>

To batch write NOP instructions from step number 714 to step number 724



Display Example :



Key Operation :

(1) Press the [RD/WR] key twice to select the write function and move the line cursor to step 714.

(2) Press the [NOP] key and then the [K] key. Key in [7] [2] [4], the end step number of the range.

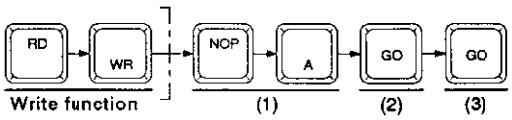
(3) Press the [GO] key to batch write the NOP instruction in the designated range.

4. PROGRAMMING

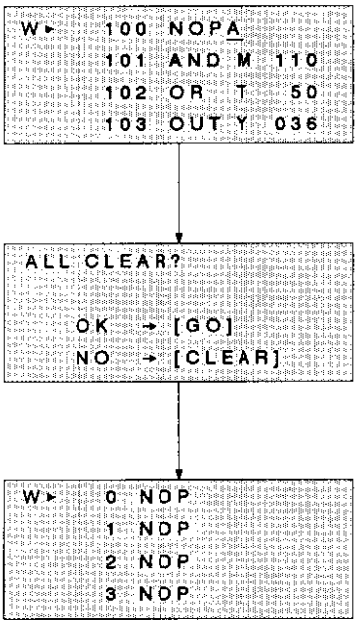
OVERWRITING EXISTING INSTRUCTIONS

<OPERATION EXAMPLE 2 – ERASING THE ENTIRE PROGRAM MEMORY>

To write NOP instructions throughout the entire program memory.



Display Example :



Key Operation :

(1) Press the [RD/WR] key twice to select the write function and press the [NOP] key and then the [A] key.

The line cursor may be at any position.

(2) Press the [GO] key. The "ALL CLEAR?" message is displayed.

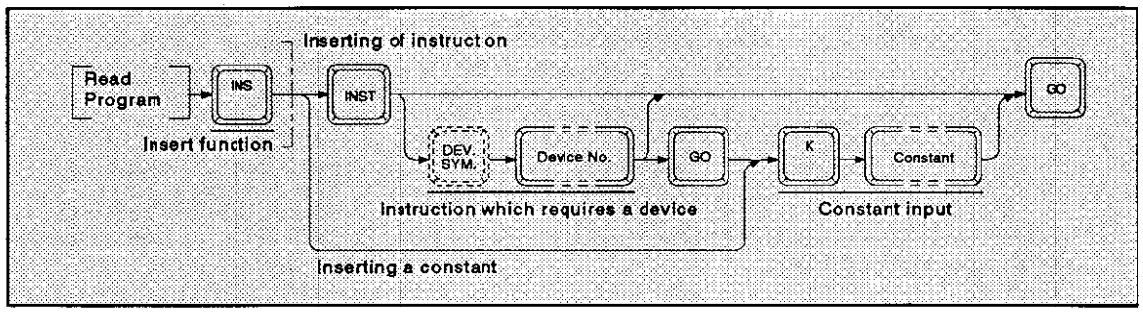
(3) To respond to the "ALL CLEAR?" message, press the [GO] key. The line cursor moves to step number 0 and the entire program is cleared (i.e., a NOP instruction is written to every program step).

4. PROGRAMMING

4.6 INSERTING

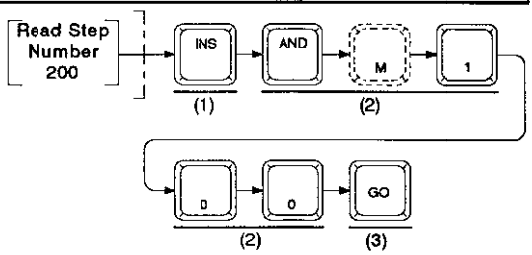
Use the following procedure to insert an instruction at a designated position in a program.

<BASIC OPERATION>



<OPERATION EXAMPLE 1>

To insert "AND M100" instruction at step number 200



Display Example :

```
I►   200 AND T  450
     201 OR  C   60
     202 OUT Y  530
     203 LD  X  002
```

```
I►   200 AND M  100
     200 AND T  450
     201 OR  C   60
     202 OUT Y  530
```

GO

```
I    200 AND M  100
 ►   201 AND T  450
     202 OR  C   60
     203 OUT Y  530
```

Key Operation :

(1) Read the required program step by designating step number 200. Press the [INS] key. The keyed-in instruction will be inserted at the step next to the line cursor.

(2) Key in the instruction word, device symbol, and device number.

(3) Press the [GO] key to complete the insertion. Step numbers of the ensuing instructions are reassigned automatically.

Explanation :

(a) To insert instructions in steps near the currently displayed step number, move the line cursor to the required step number.

Note : ● *Cautions on Inserting an Instruction :*

Insertion is not possible when a program is currently stored has filled the whole memory area. If insertion is attempted when the memory area is full, an error message "PROGRAM OVERFLOW" will be displayed.

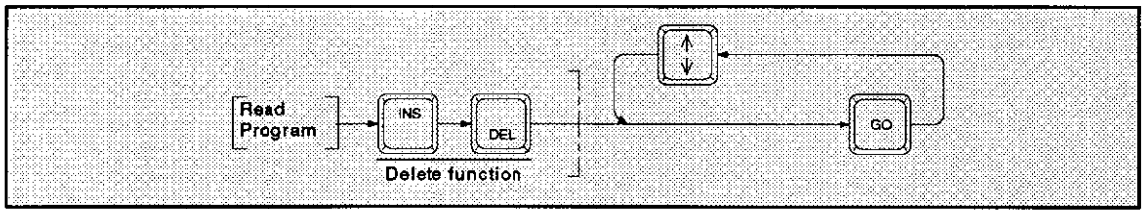
If insertion has been executed at this time, overflowed instructions are erased.

4.7 DELETING

4.7.1 DELETING INSTRUCTIONS

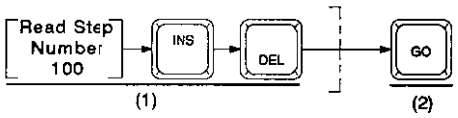
Use the following procedure to delete the instructions and constants one by one.

<BASIC OPERATION>

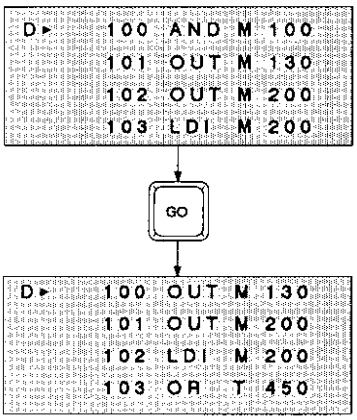


<OPERATION EXAMPLE 1>

To delete the AND instruction in step number 100



Display Example :



Key Operation :

(1) Read the required program step by designating step number 100. Press the [INS/DEL] key twice to select the delete function.

(2) Press the [GO] key to delete the instruction next to the line cursor. The step numbers of the ensuing instructions are reassigned automatically.

Explanation :

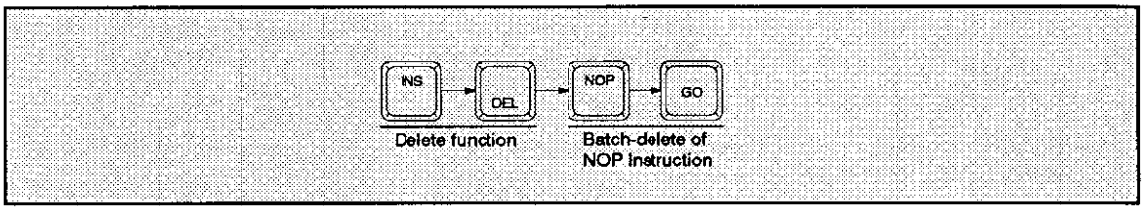
(a) To delete instructions and constants in steps that are near the currently displayed step number, move the line cursor to the required step number.

DELETING

4.7.2 BATCH DELETING NOP INSTRUCTIONS

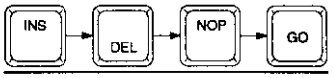
This function allows all the NOP's between program instructions to be removed simultaneously. Use the following procedure to batch delete all NOP instructions from a program.

<BASIC OPERATION>



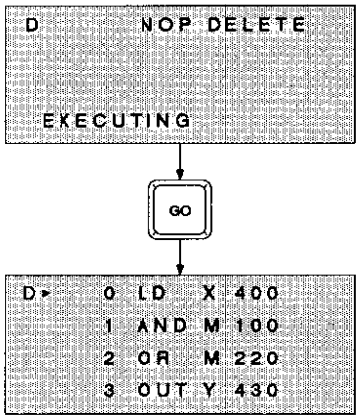
<OPERATION EXAMPLE 1>

To batch delete NOP instructions



(1)

Display Example :



Key Operation :

(1) Press the [INS/DEL] key twice and then the [NOP] key. After that, press the [GO] key.

The screen shown on the left is displayed. All NOP instructions are deleted from the program.

Explanation :

(a) After the completion of batch-delete, the first line of the program (step number 0) is displayed on the first line of the screen.

(b) After all NOP instruction steps have been deleted, the step numbers are reassigned automatically.

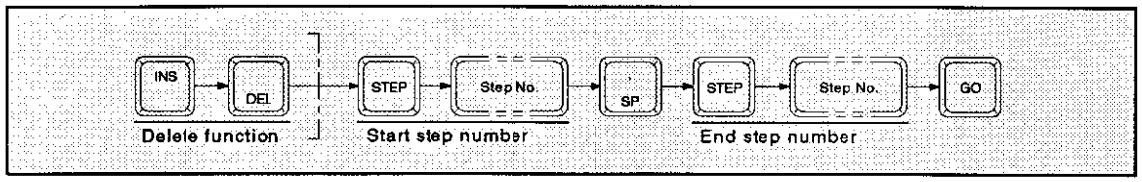
4. PROGRAMMING

DELETING

4.7.3 DELETING PROGRAM STEPS BY DESIGNATING A RANGE

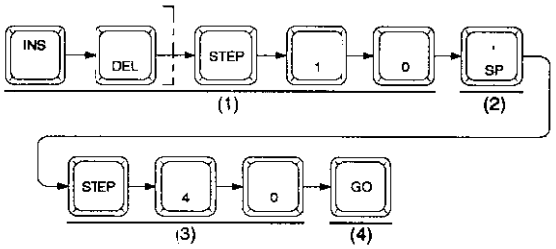
Use the following procedure to delete program steps within a designated range.

<BASIC OPERATION>

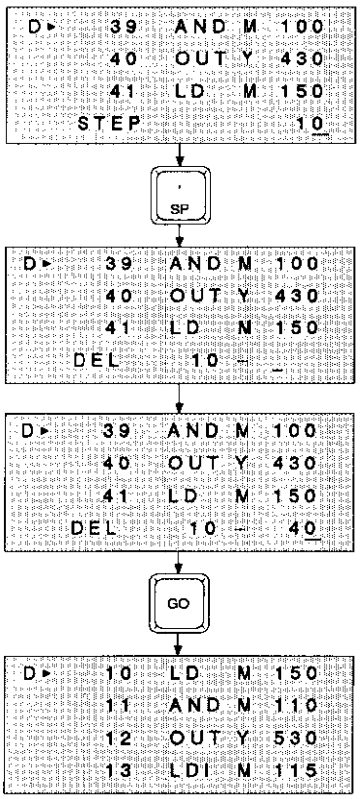


<OPERATION EXAMPLE 1>

To delete program steps from step number 10 to step number 40



Display Example :



Key Operation :

(1) Press the [INS/DEL] key twice and then the [STEP] key. Key in [1] [0], the start step number of the deletion range.

(2) Press the [SP] key.
The screen displays the keyed-in step number.

(3) Press the [STEP] key and key in [4] [0], the end-step number of the range.

(4) Press the [GO] key to delete the program steps in the designated range. The step numbers of the ensuing instructions are reassigned automatically. The program is displayed with the deletion start step number as the first line.

Note: • *To Cancel the Setting :*

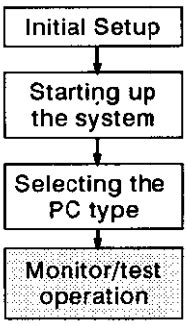
Press the [CLEAR] key before pressing the [GO] key. The first time the [CLEAR] key is pressed, the end step number is cleared. The second time the [CLEAR] key is pressed, the start step number is cleared.

5. MONITOR/TEST

5.1 FUNCTION OVERVIEW

5.1.1 BASIC MONITOR/TEST PROCEDURE

The following procedure is used to perform the online mode monitor/test.



..... Connect the HPP to PC (for details, see Section 1.4.2).

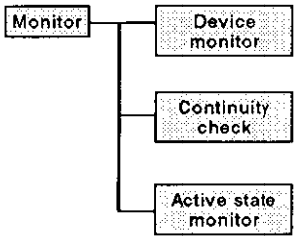
..... Turn ON the power to the PC or reset the HPP ([RST] + [GO]). (Refer to Section 3 for details.)

..... Select the PC type using the cursor key on the PC type selection screen. (Refer to Section 3 for details.)

..... Check and confirm the program by using the monitor/test function.

5.1.2 MONITOR

The monitor function allows you to check the operation and control state of the PC with the HPP screen.



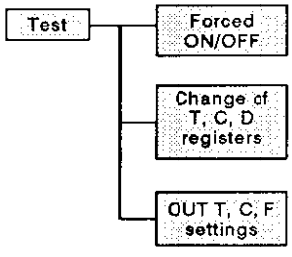
..... The ON/OFF status of a designated device, T, C, and D or current value can be monitored.

..... A program is read to monitor contact continuity and coil operation. Make sure that the program in the PC is same as that in the HPP before starting the continuity check.

..... Transfer of state elements can be checked by automatically displaying active states in a priority of low to high state number.

5.1.3 TEST

Using the test function, you can use the HPP to forcibly turn contacts and coils ON and OFF. The monitor function must be used before accessing the test function.



..... A designated device can be forcibly turned ON or OFF by operating the HPP to change the image memory.

..... The setting value registers of devices T, C, and D can be changed.

..... The settings of devices T, C, and F can be changed (changes the program memory setting).

*1 These operations are only effective to RAM memory. The EPROM and EEPROM cassette memory cannot be overwritten by these operations.

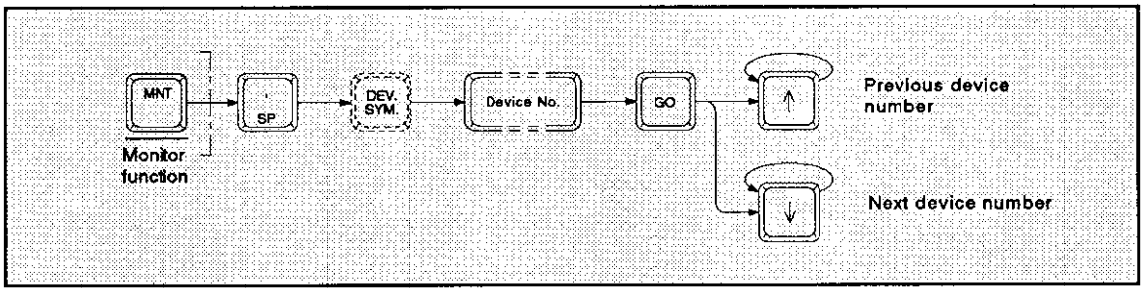
*2 When the F2 series is used, the setting value registers of devices T,C and D can be changed even if EPROM or EEPROM memory cassettes are used.

5. MONITOR/TEST

5.2 DEVICE MONITOR

Use the following procedure to monitor the ON/OFF status, the setting, and the current value of a designated device with the device monitor function.

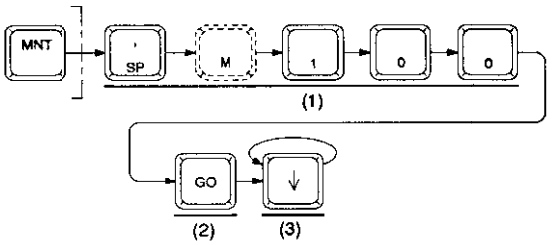
<BASIC OPERATION>



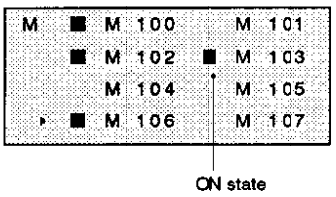
<OPERATION EXAMPLE 1>

To monitor M100 and the succeeding devices in order

[Device : X, Y, M, S]



Display Example :



Key Operation :

(1) After pressing the [MNT] key, press the [SP] key, and key in the device symbol or device number.

(2) Press the [GO] key. The ON/OFF state of the designated device is displayed on the screen using the ■ symbol (the ■ symbol indicates the ON state).

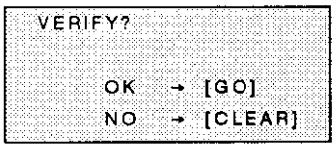
(3) Use the [↑] and [↓] keys to monitor the ON/OFF state of preceding and succeeding devices.

Note : ● *MONITOR/TEST Preparation :*

To monitor or test a program created with the HPP, the program must be batch transferred to the PC. Use the HPP to PC transfer function of the mode menu. (Refer to Section 6.3.)

To monitor or test a program stored in the PC, press the [CLEAR] key.

*Monitor initial screen



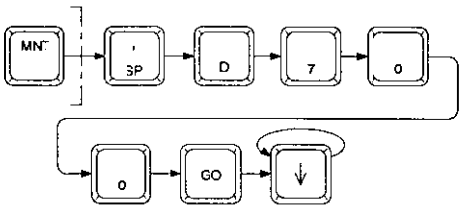
Pressing the [GO] key verifies the programs in the PC and the HPP.

DEVICE MONITOR

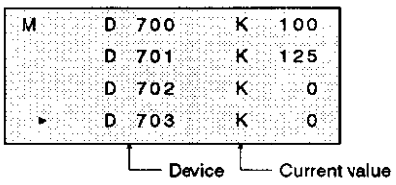
<OPERATION EXAMPLE 2>

To monitor D700 and the succeeding devices in order

[Device : D]



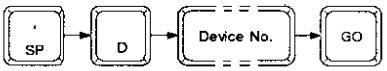
Display Example :



(a) The key operations are basically the same as in <OPERATION EXAMPLE 1>. In this case, however, the current value of the designated device is monitored.

The screen can display device data for up to 4 devices.

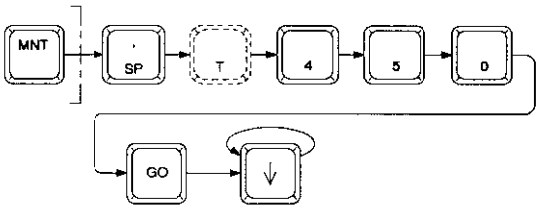
(b) To monitor T or C :



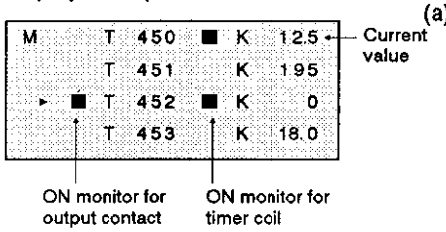
<OPERATION EXAMPLE 3>

To monitor T450 and the succeeding devices in order

[Device : T, C]



Display Example :



(a) The key operations are basically the same as in <OPERATION EXAMPLE 2>. In this case, however, the current value of the designated device is monitored.

The screen can display device data for up to 4 devices.

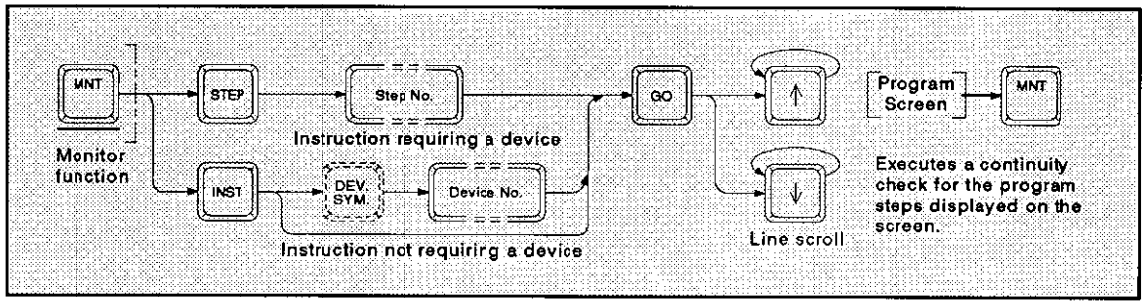
The ON/OFF state of output contacts and timer coils is also monitored.

5. MONITOR/TEST

5.3 CONTINUITY CHECK

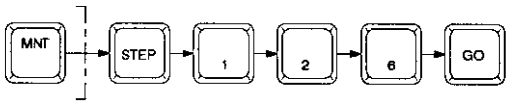
Use the following procedure to monitor the circuit continuity and coil operation of a designated device by reading a program step (designated by the step number or instruction) with the continuity check function.

<BASIC OPERATION>

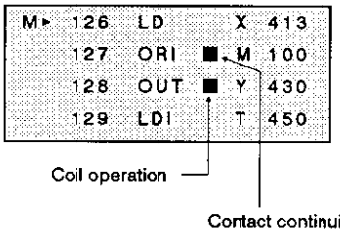


<OPERATION EXAMPLE 1>

Reading program step 126 to check continuity



Display Example :



(a) Press the [MNT] key and read the program.

Read a program step by designating a step number :

Press the [STEP] key, key in the required step number, and press the [GO] key.

Read a program step by designating an instruction :

Press the instruction key of the required instruction. If the instruction requires a device to be designated, designate the device before pressing the [GO] key.

(b) The screen displays four lines of the program with the designated step number displayed on the first line. The contact continuity state and coil operation state are monitored and indicated by the " ■ " symbol.

(c) Use the [↓] and [↑] keys to scroll the displayed program up and down without quitting the monitor mode.

(d) If a program is already displayed on the screen before entering the monitor mode, the continuity is checked and the coil operation is monitored for the displayed program when the [MNT] key is pressed.

(e) Transferring the program from the HPP to the PC will ensure that the programs are the same so that the continuity check can be started without mismatch error.

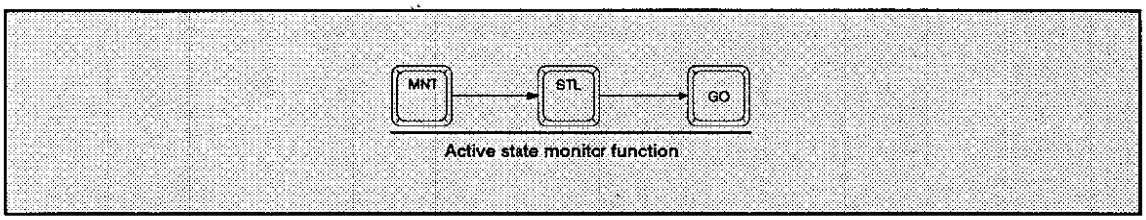
Note : • Use the line cursor keys [↑] and [↓] to select a device in the device monitor operation or to scroll the screen in the continuity check.

5. MONITOR/TEST

5.4 ACTIVE STATE MONITOR

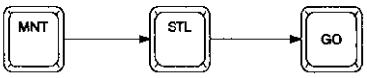
Use the following procedure to monitor the active state of up to 8 points beginning with the lowest active state number when step ladder instructions are used.

<BASIC OPERATION>



<OPERATION EXAMPLE 1>

Monitoring the active state



Display Example :

```
M  ACTIVE STATE
 S600   S610   S620
 S630   SOOO   SOOO
 SOOO   SOOO
```

(a) Press the [MNT] key, then the [STL] key, and then the [GO] key. The screen displays the state of up to 8 currently operating states, beginning with the lowest state number.

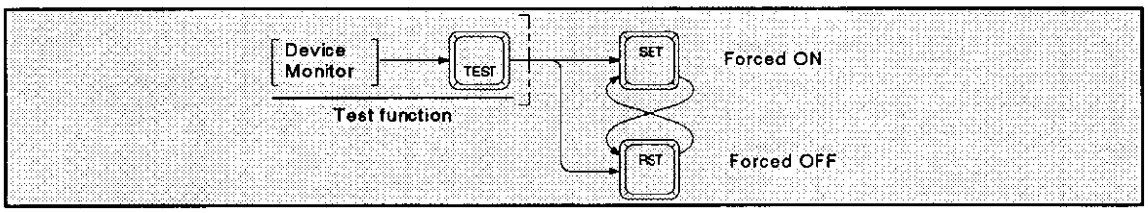
(b) As the state of a state element changes, the numbers displayed on the screen changes accordingly, indicating the process changes in a machine sequence.

5. MONITOR/TEST

5.5 FORCED ON/OFF

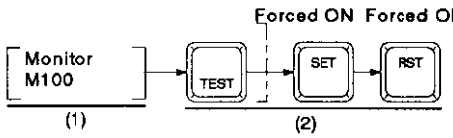
Use the following procedure to forcibly turn devices ON or OFF with the forced ON/OFF function. The test function can be accessed after monitoring the device.

<BASIC OPERATION>

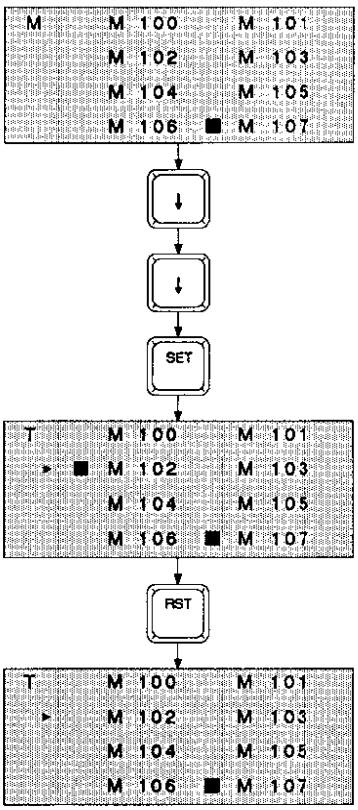


<OPERATION EXAMPLE 1>

To forcibly turn device M102 ON/OFF



Display Example :



Key Operation :

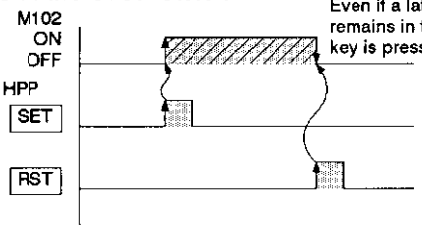
(1) Monitor the device with the monitor function.

(2) Press the [TEST] key. If the monitored device is in the OFF state, press the [SET] key. If it is in the ON state, press the [RST] key.

Explanation :

(a) Forced ON/OFF operation is effective for only one operation cycle. Therefore, forced ON/OFF operation executed during PC RUN is ideal for timers, counters, set/reset circuits, and latch circuits.

Note: • *Operation Example with the PC in the STOP State :*

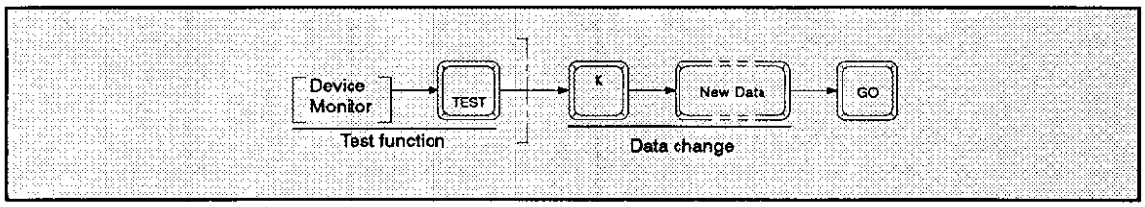


5. MONITOR/TEST

5.6 CHANGE OF T, C, D SETTING VALUE REGISTERS

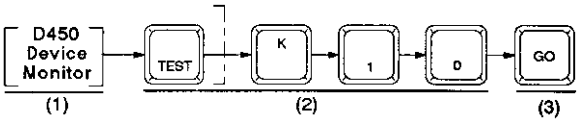
Use the following procedure to change the setting value of devices T, C and D by accessing the test function after the monitor function. Only the F2 -series have setting value registers for Timers and Counters.

<BASIC OPERATION>

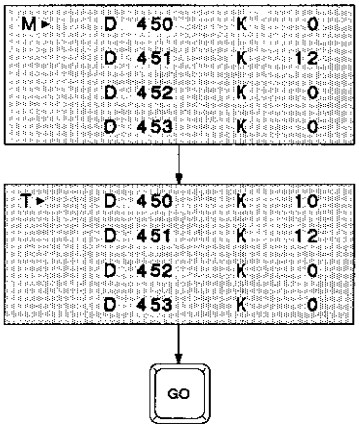


<OPERATION EXAMPLE 1>

To change the value of a timer setting register (D450) from K0 to K10



Display Example:



Key Operation :

(1) Monitor the device with the monitor function.

(2) Press the [TEST] key and then the [K] key. Set the new data.

[K] : Decimal

(3) Press the [GO] key to replace the value with the new data.

REGISTER DATA CHANGE

The operation to change the constant of T and C in the program in the monitor mode is effective to the RAM only.

If the F2 series PCs are used, the data of T and C can also be written to the setting registers (data registers backed up by a battery) in addition to the program memory to which the T and C data (constant) is written following the OUT instruction. When the data of the setting register is 0, the constant written to the program memory is used. When the data of the setting register is not 0, the data in this register is used.

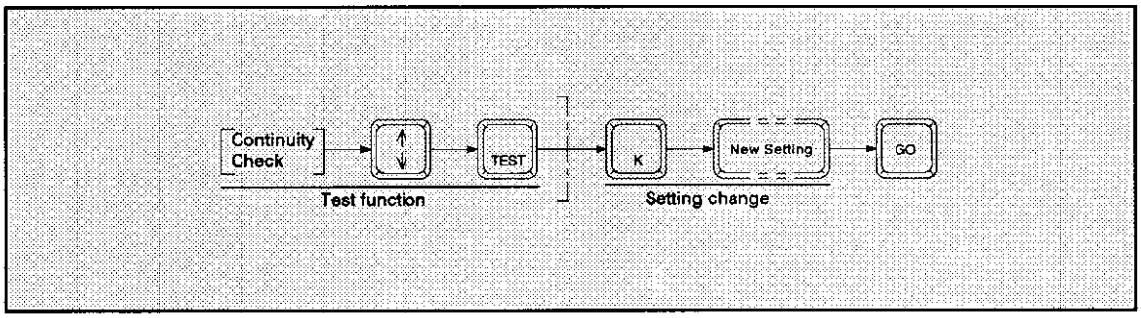
The setting value of T and C can therefore be changed in the RUN/STOP state even though the program is written to ROM memory.

5.7 CHANGE OF OUT T, C, F K SETTINGS

Use the following procedure to change the settings of the OUT T, C and F instructions with the test function via the continuity check monitor function.

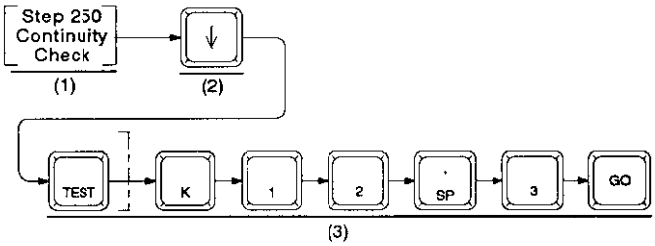
Valid memory types : RAM

<BASIC OPERATION>

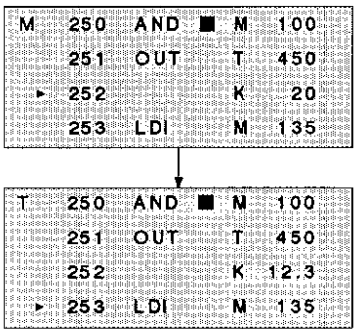


<OPERATION EXAMPLE 1>

Changing the setting of the OUT T instruction in step number 251 from K20 to K12.3



Display Example :



Key Operation :

(1) Execute a continuity check for the device with the monitor function. The results of the continuity check are displayed on the screen.

(2) Move the line cursor to the line where setting is displayed.

(3) Press the [TEST] key and key in the new setting. Press the [GO] key to replace the present setting with the new setting.

Explanation :

(a) The line cursor can be moved after the test function is accessed by pressing the [TEST] key.

(b) This operation changes the setting of device data in the program in both the HPP and the PC.

MEMO

6. MODE MENUS

6.1 BASIC PROCEDURE

6.1.1 BASIC DISPLAY PROCEDURE OF MENU SCREENS

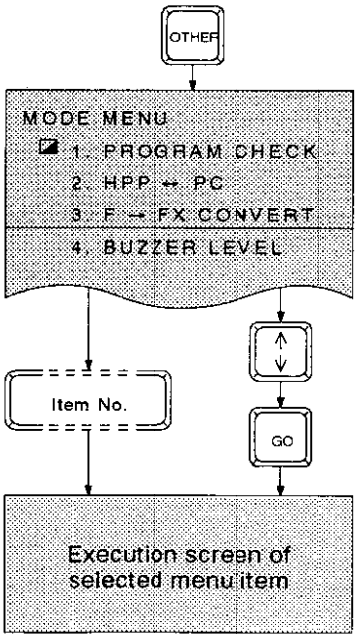
Use the following procedure to display the mode menu screen.

Initial Setup	.....	Connect the HPP to PC. (Refer to Section 1.4.2 for details.)
Starting up the system	.....	Turn ON the power to the PC or reset the HPP ([RST] + [GO]). (Refer to Section 3 for details.)
Selecting the PC type	.....	Select the PC type using the cursor key on the PC type selection screen. (Refer to Section 3 for details.)
Mode Menu Screen	.....	Press the [OTHER] key to display the mode menu screen. The following functions are available : program check, HPP-PC transfer, F → FX conversion, and buzzer volume adjustment (mode menu screen)

6.1.2 SELECTION PROCEDURE OF ITEMS ON THE MENU

The mode menu screen will be displayed when the [OTHER] key is pressed during programming.

Use the following procedure to select items on the menu.



(1) The MODE MENU includes four items as shown on the left.

(2) Use the [↑] and [↓] keys to scroll the screen up and down.

(3) Press item number or move the cursor to the required item and press the [GO] key.

(4) Perform operations following the menu screen. (Refer to the following pages.)

Note: • *Transferring between Function Screen and Mode Menu Screen :*

Press the [OTHER] key during a function screen operation and the mode menu screen will be returned.

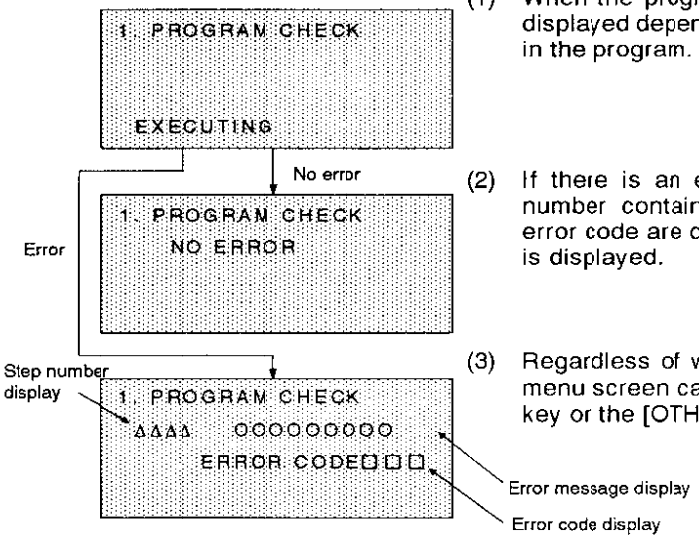
Conversely, pressing a function key from a screen accessed by the [OTHER] key permits the entry to that function operation.

6. MODE MENUS

6.2 PROGRAM CHECK

This operation checks the program written to the HPP for its logic and ladder structure. The check operation starts when the menu selection is done.

Display :



(1) When the program check mode is selected, the screen displayed depends on whether or not any errors are found in the program.

(2) If there is an error in the program, the program step number containing the error, the error message, and the error code are displayed. Only the first error information is displayed.

(3) Regardless of whether or not an error exists, the mode menu screen can be displayed by pressing the [CLEAR] key or the [OTHER] key.

- Corrective action for when an error is displayed

  Read the error step by designating the error step number displayed on the error screen.

  Take corrective actions referring to the error message list in Section 7.3.2 (ERROR MESSAGES - PROGRAM CHECK).

  After correction, check the program again. If "NO ERROR" is displayed, program check has been fully completed.

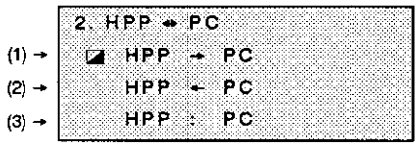
6. MODE MENUS

6.3 HPP – PC TRANSFER

This operation transfers a program between the HPP and the PC.

Normally, the transfer to the PC is done to RAM memory. When a memory cassette is installed to the PC, the transfer is done to the memory cassette.

Display 1 :



(1) HPP → PC

The program in the HPP RAM is batch transferred to the PC.

PC state : STOP
Usable PC memory : RAM, EEPROM
(memory protect switch : OFF)

(2) HPP ← PC

The program in the PC is batch transferred to the HPP RAM.

PC state : RUN/STOP
Usable PC memory : RAM, EPROM, EEPROM

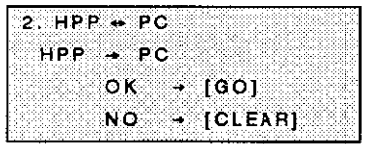
(3) HPP : PC

The programs in the HPP RAM and the PC are verified with each other.

PC state : RUN/STOP
Usable PC memory : RAM, EPROM, EEPROM

- Move the cursor using the [↑][↓] key, and then press the [GO] key to select the items in (1), (2), or (3) above.

Display 2 :



(HPP → PC transfer)

(1) Display 2 shows the screen when HPP - PC is selected.

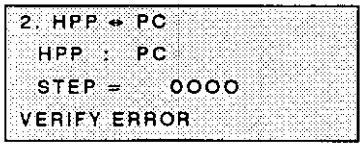
(2) Pressing the [GO] key executes the transfer of a program.

The "EXECUTING" message is displayed while the transfer is being done. The "COMPLETED" message is displayed when the transfer is successfully done.

(3) If the communication between the HPP and the PC is faulty or write protect has been set, an error message is displayed.

(4) Pressing the [CLEAR] key returns the screen to the HPP-PC TRANSFER menu screen.

Display 3 :



(1) If the two programs match with each other by the verify operation, the "COMPLETED" message is displayed.

If any mismatch is found, the "VERIFY ERROR" message and the mismatch step number are displayed as shown in Display 3.

- Executing the HPP → PC transfer clears image and data memory in the PC.

6. MODE MENUS

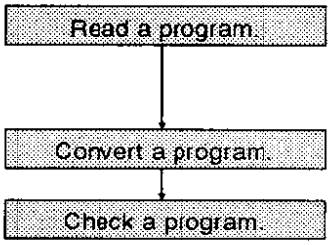
6.4 F → FX PROGRAM CONVERSION

This operation converts a program created with the HPP or the program used with the F1 or F2 series PCs to a program usable with the FX series PCs.

This conversion allows the program used with the F1 and F2 series PCs to be used with the FX series PCs.

6.4.1 OPERATION PROCEDURES

Follow the procedures below for the program conversion.



(1) Read a program to be converted to the HPP RAM.

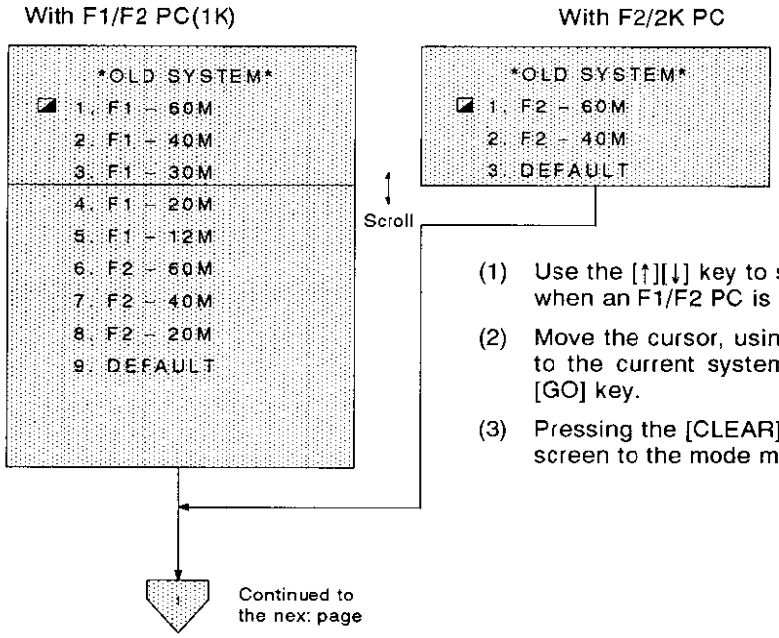
Follow the procedure of HPP - PC transfer in the mode menu. (Refer to the previous page.)

(2) Execute the F - FX program conversion.

(3) Check the converted program if it has been correctly converted.

6.4.2 F → FX PROGRAM CONVERT

Selecting "3. F → FX PROGRAM CONVERT" in the mode menu displays the screen shown below.

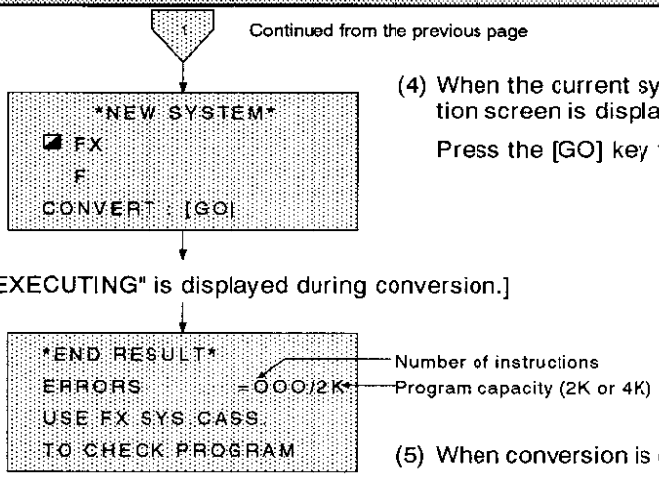


(1) Use the [↑][↓] key to scroll the screen when an F1/F2 PC is used.

(2) Move the cursor, using the [↑][↓] key, to the current system and press the [GO] key.

(3) Pressing the [CLEAR] key returns the screen to the mode menu screen.

F → FX PROGRAM CONVERSION



(4) When the current system is selected, the conversion execution screen is displayed.

Press the [GO] key to execute conversion.

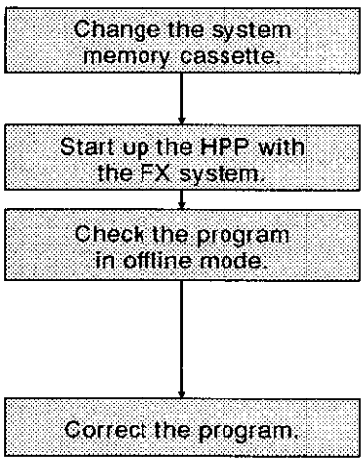
(5) When conversion is done, the screen shown left is displayed.

(6) Conversion is executed according to the conversion rules explained on page 70. Some of the instructions cannot be converted due to differences in function between the current system and the new system. The number of such instructions and program capacity (displayed as "ERRORS") are displayed on the screen.

(7) If the program capacity required after conversion is more than 2K steps, 4K is displayed.

(8) Pressing the [CLEAR] key returns to the mode menu screen.

6.4.3 PROGRAM CHECK



Check the converted program if it has been correctly converted to the one for the FX series PCs. Also check the instructions which cannot be converted, and correct them.

Follow the procedures below.

(1) Turn OFF the power to the PC, and remove the FX-20P-MFA-E (F series system memory cassette) from the bottom of the HPP. Then install the FX system memory cassette (supplied with the HPP).

(2) Turn ON the power to the PC and start up the HPP with the FX system.

(3) • Check the instructions which are not converted or temporarily converted, and make additions or changes. Also check the converted instruction if it is appropriate in function (e.g., special use).

• Select the program check in the offline mode menu. (Refer to the FX-20P-E Operation Manual for details.)

(4) Correct the errors within the program.

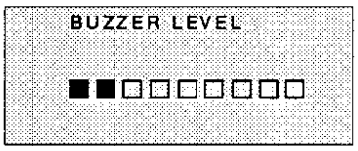
Read the errors detected by program checking, and correct them using the write, insert, and delete functions. (Refer to the FX-20P-E Operation Manual for details.) The program must be transfered to an FX PC to be used.

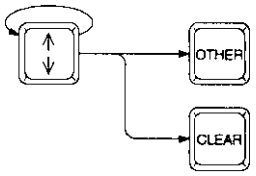
6. MODE MENUS

6.5 BUZZER VOLUME

Use the following procedure to adjust the volume of the buzzer.

Display :





(1) Use the [↑] and [↓] keys to change the number of bar segments. As the number of bar segments increases, the volume of the buzzer increases.

There are 10 buzzer volume levels. If there are no bar segments, the buzzer will not make any sound.

(2) Press the [OTHER] key or the [CLEAR] key to return the display to the mode menu screen.

MEMO

7. APPENDIX

7.1 INSTRUCTION LIST/DEVICE NUMBER LIST

F1 SERIES INSTRUCTIONS

F1 SERIES

Instruction Word	Device
LD	X, Y, M, S, T, C
LDI	
AND	
ANI	
OR	
ORI	
ORB	None
ANB	
OUT	Y, M, S, T, C, F
PLS	M100 to M377
SFT	M100, 120, 140, 160, 200, 220, M240, 260, 300, 320, 340, 360
RST	M100, 120, 140, 160, 200, 220, M240, 260, 300, 320, 340, 360 C (except C661)
S	Y, M200 to M377, S
R	
MC	M100 to M177
MCR	
CJP	700 to 777
EJP	
NOP	None
END	
STL	S600 to S647
RET	None

APPLIED INSTRUCTION (F1 SERIES)

Instruction Number F670	Symbol	Instruction Name
K0	REFX	Input batch refresh
K2	REFY	Output batch refresh
K4	RST	WDT refresh
K10	RST	Counter carry flag M473 reset
K11	RST	C660 counter output contact reset
K14	SET	Carry flag M571 set
K15	RST	Carry flag M571 reset
K16	SET	Zero flag M572 set
K17	RST	Zero flag M572 reset
K18	SET	Borrow flag M573 set
K19	RST	Borrow flag M573 reset
K26	RST	Y, M, and S batch reset
K27	WMOV	1-, 2-, or 3-digit decimal constant write
K28	WMOV	Octal 3-digit constant write
K29	MOV	n-bit data transfer
K33	WMOV	T and C (current value register) and D decimal constant write
K34	WMOV	T and C (current value register) and D write
K35	RMOV	T, C, and D current value read
K36	WMOV	Data register write
K37	RMOV	Data register read
K38	WMOV	Same decimal constant write
K39	MOV	Same data transfer
K40	CMP	Comparison between constant and T, C, and D current value
K41	CMP	Comparison between BCD input and T, C, and D current value
K42	CMP	Comparison between BCD input and C and D current value
K43	CMP	T, C, and D current value zone comparison
K44	DCMP	C and D current value 6-digit zone comparison
K45	CMP	Comparison between counter current value and data register
K46	CMP	Data register clear check
K48	RST	Data register designated digit clear
K49	XCH	Data exchange
K51	MOV	Transfer between current value register and data register
K52	MOV	(D)→D transfer by indirect designation
K53	MOV	D→(D) transfer by indirect designation
K54	MOV	(D)→(D) transfer by indirect designation
K55	ADD	Addition of D and K with carry addition (BCD 3 digits)
K56	DADD	Addition of D and K with carry addition (BCD 6 digits)
K57	ADD	Addition of data registers (BCD 3 digits)

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

Instruction Number F670	Symbol	Instruction Name
K58	ADD	Addition of data registers with carry addition (BCD 3 digits)
K59	DADD	Addition of data registers with carry addition (BCD 6 digits)
K60	ADD	Addition of data registers (OCT 3 digits)
K61	INC	Data register increment (BCD 3 digits)
K62	DINC	Data register increment (BCD 6 digits)
K63	INC	Data register increment (OCT 6 digits)
K64	INC	Counter current value increment (BCD 3 digits)
K66	SUB	Subtraction between D and K with borrow subtraction (BCD 3 digits)
K67	DSUB	Subtraction between D and K with borrow subtraction (BCD 6 digits)
K68	SUB	Subtraction between data registers (BCD 3 digits)
K69	SUB	Subtraction between data registers with borrow subtraction (BCD 3 digits)
K70	DSUB	Subtraction between data registers with borrow subtraction (BCD 6 digits)
K71	SUB	Subtraction between data registers (OCT 3 digits)
K72	DCR	Data register decrement (BCD 3 digits)
K73	DDCR	Data register decrement (BCD 6 digits)
K74	DCR	Data register decrement (OCT 3 digits)
K75	DCR	Counter current value decrement (BCD 3 digits)
K77	MUL	Multiplication between D and K (BCD 3 digits)
K78	DMUL	Multiplication between D and K (BCD 6 digits)
K79	MUL	Multiplication between data registers (BCD 3 digits)
K80	DMUL	Multiplication between data registers (BCD 6 digits)
K81	DIV	Division between D and K (BCD 3 digits)
K82	DDIV	Division between D and K (BCD 6 digits)
K83	DIV	Division between data registers (BCD 3 digits)
K84	DDIV	Division between data registers (BCD 6 digits)
K85	RDA	Read from analog unit
K86	WRA	Write to analog unit
K87	MODE	Subtraction mode selection (BCD subtraction)
K88	CHK	BCD check of data register

Instruction Number F670	Symbol	Instruction Name
K100	REFX	Input batch refresh
K101	REFX	Input partial refresh
K102	REFY	Output batch refresh
K103	RST	Y, M, and S batch reset
K104	WMOV	Write to counter current value register
K105	RMOV	Counter current value read
K106	CMP	T, C, and D current value zone comparison
K107	CMP	Counter current value and BCD input comparison
K108	DCMP	C and D current value 6-digit zone comparison
K109	WMOV	3 digits x 2 points Decimal constant write
K110	RST	Counter carry flag M473 reset
K111	RST	C660 counter output contact reset
K112	PRD	Leading edge detection (phase B) (setting)
K113	RST	Leading edge detection (phase B) (read, reset)
K114	PRD	Leading edge detection (phase Z) (setting)
K115	RST	Leading edge detection (phase Z) (read, reset)
K116	RST	External reset prohibition
K117	WMOV	Automatic reload comparison data transfer
K118	RST	Automatic reload effective
K119	WMOV	High speed output table setting
K120	MODE	High speed output individual prohibition
K12'	MODE	High speed output batch permission
K122	PWDT	Phase A pulse width measurement
K123	PWDT	Phase Z pulse width measurement
K124	INC	High speed count with data register (phase B)
K125	INC	High speed count with data register (phase Z)
K130	SFT	Variable length shift register
K13'	BIN	BCD → BIN conversion
K132	BCD	BIN → BCD conversion

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

F1 SERIES DEVICE NUMBERS

F1 SERIES

	00 to 13	14 to 27	30 to 37	40 to 47	50 to 57	60 to 67	70 to 77
000 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 1 to 999	SPM 6 points
100 –	M 64 points						
200 –	M 64 points						
300 –	M 64 points						
400 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 1 to 999	SPM 4 points
500 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 1 to 999	SPM 6 points
600 –	S 40 points				T 8 points 0.01 to 99.9s	C C 6 points 1 to 999	F 6 points
700 –	CJP/EJP 64 points				(Data registers D700 – D777)		

Extension unit Battery backed-up

C660, C661
0 to 999999 : one reversible point

X : Input relay Y : Output relay M : Auxiliary relay SPM : Special relay
T : Timer C : Counter S : State F : Applied instruction coil

I/O Relay Numbers (Base Unit)

Base Unit	Input Relay Number	Output Relay Number	Extension Connector
F1-12M	400 to 405 6 points	430 to 435 6 points	400
F1-20M	400 to 413 12 points	430 to 437 8 points	400
F1-30M	400 to 413 12 points 500 to 503 4 points	430 to 437 8 points 530 to 535 6 points	400
F1-40M	400 to 413 12 points 500 to 513 12 points	430 to 437 8 points 530 to 537 8 points	400 500
F1-60M	000 to 013 12 points 400 to 413 12 points 500 to 513 12 points	030 to 037 8 points 430 to 437 8 points 530 to 537 8 points	000 400 500

The value in □ of the extension unit is 0, 4, or 5 depending on extension connector number 000, 400, or 500.

I/O Relay Numbers (Extension Unit)

Base Unit	Input Relay Number	Output Relay Number
F-4T	□20 to □23 4 points	□40 to □43 4 points
F2-8EY	—	□40 to □47 8 points
F1-10E	□14 to □17 4 points	□40 to □45 6 points
F2-12EX	□14 to □27 12 points	—
F1-20E F2-20E	□14 to □27 12 points	□40 to □47 8 points
F1-40E F2-40E	414 to 427 12 points 514 to 527 12 points	440 to 447 8 points 540 to 547 8 points
F1-60E F2-60E	014 to 027 12 points 414 to 427 12 points 514 to 527 12 points	040 to 047 8 points 440 to 447 8 points 540 to 547 8 points

Special relays

M70 : RUN monitor
M71 : Initialize pulse
M72 : 100 msec clock
M73 : 10 msec clock
M76 : Battery voltage low
M77 : All outputs prohibit

M470 : High speed counter
M471 : UP/DOWN
M472 : Count start
M473 : Counter carry flag

M570 : Error flag
M571 : Carry flag
M572 : Zero flag
M573 : Borrow flag
M574 : State transfer prohibit
M575 : Transfer flag from initial state

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

F2 SERIES INSTRUCTIONS

ALL F2 SERIES

<F2 Series Basic Instructions>

Instruction Word	Device
LD	X, Y, M, S, T, C
LDI	
AND	
ANI	
OR	
ORI	
ORB	None
ANB	
OUT	Y, M, S, T, C, F
PLS	M100 to M377
SFT	M100, 120, 140, 160, 200, 220, M240, 260, 300, 320, 340, 360
RST	M100, 120, 140, 160, 200, 220, M240, 260, 300, 320, 340, 360 C
S	Y, M200 to M377, S
R	
MC	M100 to M177
MCR	
CJP	700 to 777
EJP	
NOP	None
END	
STL	S600 to S647 (F2, enhanced F2) S800 to S977 (enhanced F2)
RET	None

<F2 Series Applied Instructions>

Applied Instruction Number F670	Instruction Name
K0	Input batch refresh
K1	Input partial refresh
K2	Output batch refresh
K3	Output partial refresh
K6	Subroutine start
K7	Subroutine call
K8	Subroutine conditional return
K9	Subroutine return
K10	M473 reset
K11	C660 reset
K12	External counter input acceptance
K13	RUN terminal data acceptance
K14	M571 set
K15	M571 reset
K16	M572 set
K17	M572 reset
K18	M573 set
K19	M573 reset
K20	2 → 4 bit decode
K21	3 → 8 bit decode
K22	4 → 16 bit decode
K23	4 → 2 bit encode
K24	8 → 3 bit encode
K25	16 → 4 bit encode
K26	Batch reset
K27	Decimal constant transfer
K28	Octal 3-digit constant transfer
K30	T and C decimal constant write (data register)
K31	T and C BCD input write (data register)
K32	T and C data register read
K33	T and C decimal constant write (current value register)
K34	T and C BCD input write (current value register)
K35	T and C current value read
K40	Decimal constant and T and C current value comparison
K41	BCD input and T and C current value comparison
K43	T and C current value zone comparison
K44	6-digit counter zone comparison

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

F2 SERIES DEVICE NUMBERS

OLD F2 SERIES

	00 to 13	14 to 27	30 to 37	40 to 47	50 to 57	60 to 67	70 to 77
000 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 6 points
100 –	M 64 points						
200 –	M 64 points						
300 –	M 64 points						
400 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 8 points
500 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 8 points
600 –	S 40 points				T 8 points 0.01 to 99.9s	C 8 points 0 to ±999	F 6 points
700 –	CJP/EJP 64 points						

Extension unit Battery backed-up

X : Input relay Y : Output relay M : Auxiliary relay SPM : Special relay
T : Timer C : Counter S : State F : Applied instruction coil

I/O Relay Numbers (Base Unit)

Base Unit	Input Relay Number	Output Relay Number	Extension Connector
F2-20M	400 to 413 12 points	430 to 437 8 points	400
F2-40M	400 to 413 12 points	430 to 437 8 points	400
	500 to 513 12 points	530 to 537 8 points	500
F2-60M	000 to 013 12 points	030 to 037 8 points	000
	400 to 413 12 points	430 to 437 8 points	400
	500 to 513 12 points	530 to 537 8 points	500

The value in □ of the extension unit is 0, 4, or 5 depending on extension connector number 000, 400, or 500.

I/O Relay Numbers (Extension Unit)

Base Unit	Input Relay Number	Output Relay Number
F-4T	□20 to □23 4 points	□40 to □43 4 points
F2-8EY	—	□40 to □47 8 points
F1-10E	□14 to □17 4 points	□40 to □45 6 points
F2-12EX	□14 to □27 12 points	—
F1-20E F2-20E	□14 to □27 12 points	□40 to □47 8 points
F1-40E	414 to 427 12 points	440 to 447 8 points
F2-40E	514 to 527 12 points	540 to 547 8 points
F1-60E F2-60E	014 to 027 12 points 414 to 427 12 points 514 to 527 12 points	040 to 047 8 points 440 to 447 8 points 540 to 547 8 points

Special relays

M70	RUN monitor	M470	Internal/external mode selection	M570	Error flag
M71	Initialize pulse	M471	UP/DOWN (external)	M571	Carry flag
M72	100 msec clock	M472	Start signal (external)	M572	Zero flag
M73	10 msec clock	M473	Counter carry flag(external)	M573	Borrow flag
M74	Link stop	M474	Mode selection (internal)	M574	State transfer prohibit
M75	Link error	M475	UP/DOWN (internal)	M575	Transfer from initial state
M76	Battery voltage low	M476	Counter carry flag(internal)	M576	Drum sequence completed
M77	All outputs prohibit	M477	Shift direction	M577	Drum sequence designation

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

APPLIED INSTRUCTION (ENHANCED F2 SERIES)

Instruction Number F670	Symbol	Instruction Name
K0	REFX	Input batch refresh
K1	REFX	Input partial refresh (8-point unit)
K2	REFY	Output batch refresh
K3	REFY	Output partial refresh (8-point unit)
K4	RST	WDT refresh
K5	MODE	Prohibition of preset from T and C setting registers
K6	SRST	Subroutine start
K7	CALL	Subroutine call
K8	RETC	Subroutine conditional return
K9	RET	Subroutine return
K10	RST	Counter carry flag M473 reset
K11	RST	C660 counter output contact reset
K12	RD	External signal acceptance
K13	RDRN	RUN input terminal data acceptance
K14	SET	Carry flag M571 set
K15	RST	Carry flag M571 reset
K16	SET	Zero flag M572 set
K17	RST	Zero flag M572 reset
K18	SET	Borrow flag M573 set
K19	RST	Borrow flag M573 reset
K20	DEC2	2 →4 bit decode
K21	DEC3	3 →8 bit decode
K22	DEC4	4 →16 bit decode
K23	ENC2	4 →2 bit encode
K24	ENC3	8 →3 bit encode
K25	ENC4	16 →4 bit encode
K26	RST	Y, M, and S batch reset
K27	WMOV	1-, 2-, or 3-digit decimal constant write
K28	WMOV	Octal 3-digit constant write
K29	MOV	n-bit data transfer
K30	WMOV	T and C (setting register) decimal constant write
K31	WMOV	T and C setting register write
K32	RMOV	T and C setting register read
K33	WMOV	T and C (current value register) and D decimal constant write
K34	WMOV	T and C (current value register) and D write
K35	RMOV	T, C, and D current value read
K36	WMOV	Data register write
K37	RMOV	Data register read
K38	WMOV	Same decimal constant write
K39	MOV	Same data transfer
K40	CMP	Comparison between constant and T, C, and D current value
K41	CMP	Comparison between BCD input and T, C, and D current value
K42	CMP	Comparison between BCD input and C and D current value
K43	CMP	T, C, and D current value zone comparison
K44	DCMP	C and D current value 6-digit zone comparison
K45	CMP	Comparison between counter current value and data register
K46	CMP	Data register clear check

Instruction Number F670	Symbol	Instruction Name
K47	CPL	Data register complement
K48	RST	Data register designated digit clear
K49	XCH	Data exchange
K50	MOV	Transfer between setting register and data register
K51	MOV	Transfer between current value register and data register
K52	MOV	(D)→D transfer by indirect designation
K53	MOV	D→(D) transfer by indirect designation
K54	MOV	(D)→(D) transfer by indirect designation
K55	ADD	Addition of D and K with carry addition (BCD 3 digits)
K56	DADD	Addition of D and K with carry addition (BCD 6 digits)
K57	ADD	Addition of data registers (BCD 3 digits)
K58	ADD	Addition of data registers with carry addition (BCD 3 digits)
K59	DADD	Addition of data registers with carry addition (BCD 6 digits)
K60	ADD	Addition of data registers (OCT 3 digits)
K61	INC	Data register increment (BCD 3 digits)
K62	DINC	Data register increment (BCD 6 digits)
K63	INC	Data register increment (OCT 6 digits)
K64	INC	Counter current value increment (BCD 3 digits)
K65	DINC	Counter current value increment (BCD 6 digits)
K66	SUB	Subtraction between D and K with borrow subtraction (BCD 3 digits)
K67	DSUB	Subtraction between D and K with borrow subtraction (BCD 6 digits)
K68	SUB	Subtraction between data registers (BCD 3 digits)
K69	SUB	Subtraction between data registers with borrow subtraction (BCD 3 digits)
K70	DSUB	Subtraction between data registers with borrow subtraction (BCD 6 digits)
K71	SUB	Subtraction between data registers (OCT 3 digits)
K72	DCR	Data register decrement (BCD 3 digits)
K73	DDCR	Data register decrement (BCD 6 digits)
K74	DCR	Data register decrement (OCT 3 digits)
K75	DCR	Counter current value decrement (BCD 3 digits)
K76	DDCR	Counter current value decrement (BCD 6 digits)
K77	MUL	Multiplication between D and K (BCD 3 digits)
K78	DMUL	Multiplication between D and K (BCD 6 digits)
K79	MUL	Multiplication between data registers (BCD 3 digits)

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

Instruction Number F670	Symbol	Instruction Name
K80	DMUL	Multiplication between data registers (BCD 6 digits)
K81	DIV	Division between D and K (BCD 3 digits)
K82	DDIV	Division between D and K (BCD 6 digits)
K83	DIV	Division between data registers (BCD 3 digits)
K84	DDIV	Division between data registers (BCD 6 digits)
K85	RDA	Read from analog unit
K86	WRA	Write to analog unit
K87	MODE	Subtraction mode selection (BCD subtraction)
K88	CHK	BCD check of data register
K90	MODE	High speed counter adapter type designation
K91	MODE	External pair counter phase 1 designation
K92	MODE	External pair counter phase 2 designation
K93	MODE	Internal signal count pair counter
K94	CHK	ON bit count judgment
K95	CHK	Operating device number detection
K96	STL	STL general sequence
K97	BATT	Battery display control
K98	BIN	Block designation
K99	DEC6	6 →64 bit decode
K100	REFX	Input batch refresh
K102	REFY	Output batch refresh
K103	RST	Y, M, and S batch reset
K104	WMOV	Write to counter current value register
K105	RMOV	Counter current value read
K106	CMP	T, C, and D current value zone comparison
K107	CMP	Counter current value and BCD input comparison
K108	DCMP	C and D current value 6-digit zone comparison
K109	WMOV	3 digits x 2 points Decimal constant write
K110	RST	Counter carry flag M473 reset
K111	RST	C660 counter output contact reset
K112	PRD	Leading edge detection (phase B) (setting)
K113	RST	Leading edge detection (phase B) (read, reset)
K114	PRD	Leading edge detection (phase Z) (setting)
K115	RST	Leading edge detection (phase Z) (read, reset)
K116	RST	External reset prohibition
K117	WMOV	Automatic reload comparison data transfer
K118	RST	Automatic reload effective
K119	WMOV	High speed output table setting
K120	MODE	High speed output individual prohibition

Instruction Number F670	Symbol	Instruction Name
K121	MODE	High speed output batch permission
K122	PWDT	Phase A pulse width measurement
K123	PWDT	Phase Z pulse width measurement
K124	INC	High speed count with data register (phase B)
K125	INC	High speed count with data register (phase Z)
K126	INC	Pulse density measurement (phase B)
K127	INC	Pulse density measurement (phase Z)
K128	WMOV	Data read from buffer (data I/O module)
K129	RMOV	Data write to buffer (data I/O module)
K130	SFT	Variable length shift register
K131	BIN	BCD → BIN conversion
K132	BCD	BIN → BCD conversion
K133	MOV	8-bit data transfer
K134	XCH	8-bit data exchange
K135	CML	8-bit data reverse transfer
K136	CMP	Comparison of 8-bit data with octal constant
K137	CMP	Comparison of 8-bit data
K138	AND	8-bit data and octal constant logical AND
K139	AND	8-bit data logical AND
K140	OR	8-bit data and octal constant logical OR
K141	OR	8-bit data logical OR
K142	XOR	8-bit data and octal constant exclusive logical OR
K143	XOR	8-bit data exclusive logical OR
K144	XORN	8-bit data and octal constant exclusive logical NOR
K145	XORN	8-bit data exclusive logical NOR
K146	ADD	8-bit data and octal constant BIN addition
K147	ADD	8-bit data BIN addition
K148	SUB	8-bit data and octal constant BIN subtraction
K149	SUB	8-bit data BIN subtraction
K150	INC	8-bit data increment
K151	DCR	8-bit data decrement
K152	MUL	8-bit data and octal constant BIN multiplication
K153	MUL	8-bit data BIN multiplication
K154	DIV	8-bit data and octal constant BIN division
K155	DIV	8-bit data BIN division
K156	CPL	8-bit data complement
K157	CMP	C and D current value multiple point zone comparison
K158	RDDS	Time-sharing read (digital switch)
K159	MOV	D → (Dt, Dc) indirect transfer
K160	MOV	(Dt, Dc) → D indirect transfer
K161	MOV	(Rt, Rc) → D indirect transfer
K162	WMOV	Ten-key data read
K163	TIM	Clock circuit creation
K164	TIM	Hour and minute adjustment (round off, round up)
K165	CMP	Rotary control circuit
K166	WMOV	Buffer data read (data I/O module)

7. APPENDIX

INSTRUCTION LIST/DEVICE NUMBER LIST

ENHANCED F2 SERIES DEVICE NUMBERS

ENHANCED F2 SERIES

	00 to 13	14 to 27	30 to 37	40 to 47	50 to 57	60 to 67	70 to 77
000 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 8 points
100 –	M 64 points						
200 –	M 64 points						
300 –	M 64 points						
400 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 8 points
500 –	X 12 points	X 12 points	Y 8 points	Y 8 points	T 8 points 0.1 to 999s	C 8 points 0 to ±999	SPM 8 points
600 –	S 40 points				T 8 points 0.01 to 99.9s	C 8 points 0 to ±999	F 6 points
700 –	D 64 points						CJP/EJP 64 points
800 –	S 64 points						
900 –	S 64 points						

I/O Relay Numbers (Base Unit)

Base Unit	Input Relay Number	Output Relay Number	Extension Connector
F2-20M	400 to 413 12 points	430 to 437 8 points	400
F2-40M	400 to 413 12 points	430 to 437 8 points	400
	500 to 513 12 points	530 to 537 8 points	500
F2-60M	000 to 013 12 points	030 to 037 8 points	000
	400 to 413 12 points	430 to 437 8 points	400
	500 to 513 12 points	530 to 537 8 points	500

The value in □ of the extension unit is 0, 4, or 5 depending on extension connector number 000, 400, or 500.

I/O Relay Numbers (Extension Unit)

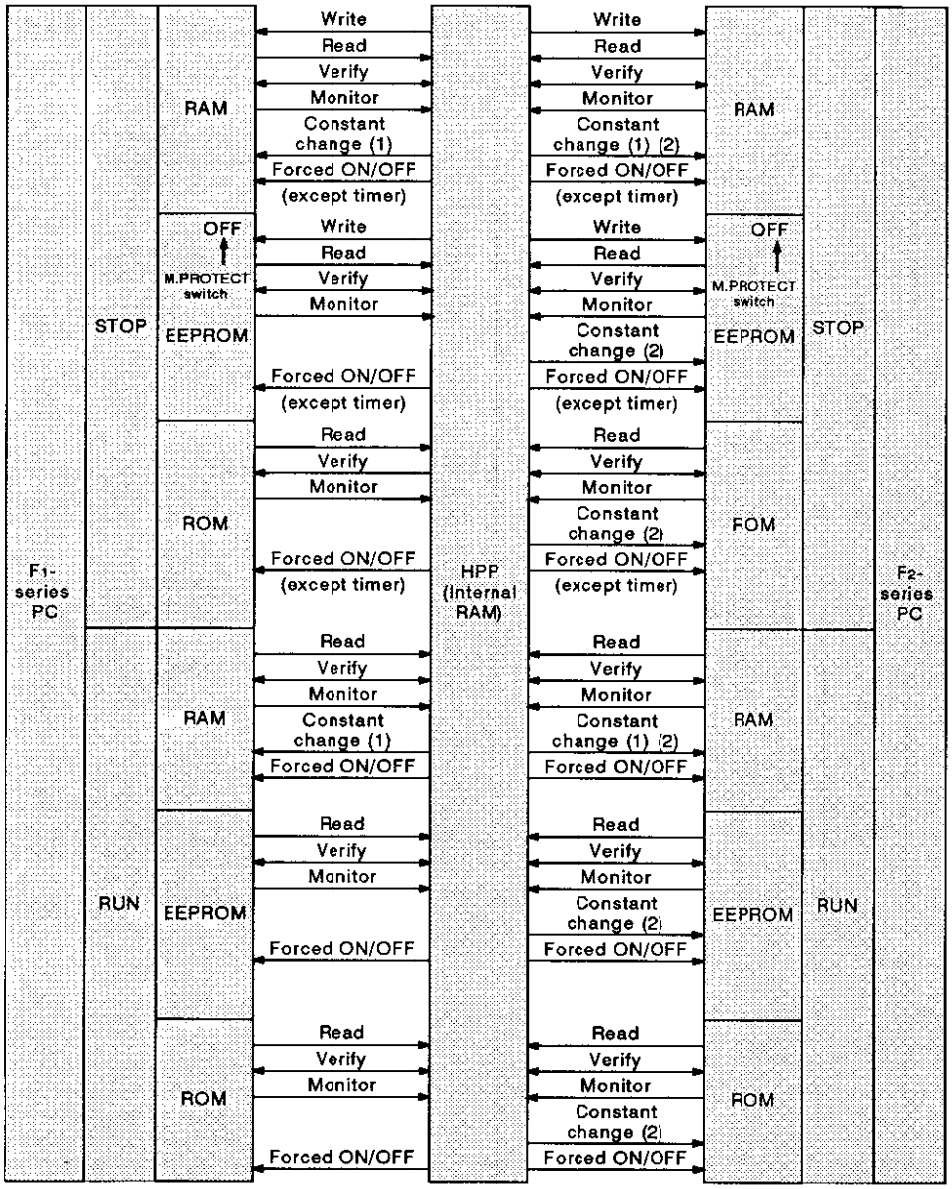
Base Unit	Input Relay Number	Output Relay Number
F-4T	□20 to □23 4 points	□40 to □43 4 points
F2-8EY	—	□40 to □47 8 points
F1-10E	□14 to □17 4 points	□40 to □45 6 points
F2-12EX	□14 to □27 12 points	—
F1-20E F2-20E	□14 to □27 12 points	□40 to □47 8 points
F1-40E	414 to 427 12 points	440 to 447 8 points
F2-40E	514 to 527 12 points	540 to 547 8 points
F1-60E	014 to 027 12 points	040 to 047 8 points
F2-60E	414 to 427 12 points	440 to 447 8 points
	514 to 527 12 points	540 to 547 8 points

Special relays

M70	:	RUN monitor	M470	:	Internal/external mode selection	M570	:	Error flag
M71	:	Initialize pulse	M471	:	UP/DOWN (external)	M571	:	Carry flag
M72	:	100 msec clock	M472	:	Start signal (external)	M572	:	Zero flag
M73	:	10 msec clock	M473	:	Counter carry flag (external)	M573	:	Borrow flag
M74	:	Link stop	M474	:	Mode selection (internal)	M574	:	State transfer prohibit
M75	:	Link error	M475	:	UP/DOWN (internal)	M575	:	Transfer from initial state
M76	:	Battery voltage low	M476	:	Counter carry flag (internal)	M576	:	Drum sequence completed
M77	:	All outputs prohibit	M477	:	Shift direction	M577	:	Drum sequence designation

7. APPENDIX

7.2 HPP/DEVICE FUNCTIONS



[Constant change (1)]

Changing constant K following OUT.T, OUT.C, and OUT.F.

[Constant change (2)]

Changing data of data register D or setting registers Dt

- The HPP → PC write operation is effective to RAM/EEPROM in STOP state. (The PROTECT switch of EEPROM must be OFF. Set it to ON for other operations.)
- The write, verify, and monitor operations are effective to RAM/EEPROM/ROM in RUN/STOP state.
- The T, C, and F constant change operation is effective to RAM in RUN/STOP state. With the F2 series, changing of data of T and C setting registers and D is effective to ROM/EEPROM.
- The forced ON/OFF operation is effective to RAM/EEPROM/ROM in RUN/STOP state. This is not effective to a timer in STOP state.

7. APPENDIX

7.3 MESSAGE LISTS

7.3.1 ERROR MESSAGE

If an error message is displayed, press the [CLEAR] key to cancel the message, and then, refer to the following table for the proper corrective action.

Message	Cause	Corrective Action
COMMS. ERR	PC communication error	Check the PC and cable.
NOT FOUND	The designated instruction was not found.	Proceed to the next step.
WRITE ERROR	Transfer was accessed to EPROM or EEPROM (PROTECT ON).	Remove the memory cassette, or set the PROTECT switch to OFF.
ENTRY CODE ERROR	An operation was attempted that is not allowed with the keyed-in entry code.	Attempt only the operations that are allowed for the set protection level.
VERIFY ERROR	Mismatched step data was found.	Correct the mismatch.
STEP OVERFLOW	The designated step number is greater than the allowable maximum step number.	Change the step number.
SETTING ERROR	The set value or data is improper.	Key in proper value or data.
PC MISMATCH	The set PC type and the connected PC type are not the same.	Correct the set PC type.
PC RUNNING	A write operation is attempted while the PC is in the RUN state.	Set the PC to the STOP state.
PROGRAM OVERFLOW	No more memory space for inserts.	Delete all NOP instructions from the program. If the program is still larger than the available memory area, revise the program.
NO MODULE	The FX-20P-FIM module is not connected.	Connect the FX-20P-FIM module.

7.3.2 ERROR MESSAGES (PROGRAM CHECK)

The error contents detected by the program check operation in the mode menu are described below.

Error Message	Error Code	Error Contents
GRAM-MAR ERR	201	Instruction, device symbol, and device number combination error
	202	Setting error (No OUT.T, C, or F before constant K)
	203	No setting (No K after OUT.T, C, or F. Missing operand in applied instruction.)
LADDER ERR	301	LD or LDI used more than 7 times continuously.
	302	1) No coil. Incorrect relationship of LD/LDI and ANB/ORB 2) One of the following is not connected to the bus line : MC, MCR, EJP, END
	303	1) Step ladder instruction error 2) No RET 3) No STL on the bus 4) RET outside STL 5) MC or MCR within STL 6) STL continuously used 8 or more times 7) STL in subroutine
	304	Subroutine error

7. APPENDIX

7.4 F → FX CONVERSION RULES LIST

7.4.1 X AND Y CONVERSION

(1) BASE UNIT IS DESIGNATED

The X and Y numbers of the FX are allocated consecutively to the X and Y numbers occupied by the base unit.

The X and Y numbers out of the base unit are regarded as the extension numbers which are allocated consecutively.

Example (Base unit : F1-60M)

	F1		FX
Base	Input 000 to 013	→ Convert	X000 to X013
	Input 400 to 413		X014 to X027
	Input 500 to 513		X030 to X043
Regarded as extension	Input 014 to 027		X044 to X057
	Input 414 to 427		X060 to X073
	Input 514 to 527		X074 to X107

- The X and Y numbers of the base unit are allocated in order of 0s, 400s, and 500s.
- If the X numbers used with a program are not on the base unit of the old system, the numbers are regarded as the extension numbers and are allocated after the numbers occupied by the base unit. Note that the extension unit F-4T is not catered for.

(Base unit : F1-12M)

	F1		FX
Base	Input 400 to 405	→ Convert	X000 to X005
Extension	Input 414 to 427		X006 to X021

- The Y numbers are allocated in the same way.
- Unused numbers are also allocated.

(2) DEFAULT SETTINGS

The device numbers in the program are allocated consecutively in ascending order from the base unit and the extension unit in groups of 0s, 400s, and 500s, as shown by the numbers (1) to (6) below.

Unused numbers are also allocated.

Example

	F1/F2		FX	
Base	000 to 013	→ Convert	X000 to X013	(1)
	400 to 413		X030 to X043	(3)
	500 to 513		X060 to X073	(5)
Regarded as extension	014 to 027		X014 to X027	(2)
	414 to 427		X044 to X057	(4)
	514 to 527		X074 to X107	(6)

7. APPENDIX

F → FX CONVERSION RULES LIST

7.4.2 CONVERSION OF INTERNAL DEVICES OF INSTRUCTIONS

(1) GENERAL-PURPOSE RELAYS (M)

(except special instructions)

	F1/F2	→ Convert	FX
Without backup	M100 to M277		M0 to M127
With backup	M300 to M377		M500 to M563

(2) TIMER

	F1/F2	→ Convert	FX
0.1 sec timer	T50 to T57		T0 to T7
	T450 to T457		T8 to T15
	T550 to T557		T16 to T23
0.01 sec timer	T650 to T657		T200 to T207

(3) COUNTER

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

(4) TIMER AND COUNTER CONSTANT

TIMER

	F1/F2	→ Convert	FX
Other than T650s	K99.9 to 0.1		K999 to 1
	K999 to 1		K9990 to 10
T650s	K99.9 to 0.1		K9990 to 10
	K9.99 to 0.01 (999 to 1)		K999 to 1

- Counter constant is converted as it is.

(5) STATE

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

7. APPENDIX

F → FX CONVERSION RULES LIST

(6) SPECIAL INSTRUCTIONS

PLS, S/R, STL, and RST C follow the device conversion rules. RET, END, and NOP are converted to the same instruction. Others are converted as follows.

Instruction	F_1/F_2		FX
MC/MCR	OUT M100 MC M100		MC N0 M0
	M100 to M177		N0 M0 to N0 M63
	MCR M100 to M177		MCR N0
CJP/EJP	CJP 700 to 776		CJ P0 to P62 (FNC00)
	EJP 700 to 776	→ Convert	P0 to P62
SFT/RST	OUT M100 SFT M100 (to M117) RST M100		OUT M0 SFTLP M0, M0, K16, K1 MOV K0 K4M0
	M100, M120 to M260		M0, M16 to M112
	M300, M320 to M360		M500, M516 to M548
OUT F	OUT F 670 K DO ↓ OUT F 677 K DO		OUT M670 ↓ OUT M677

(7) SPECIAL MEMORY

F_1/F_2		FX
M70	→ Convert	M8000
M71		M8002
M72		M8012
M73		M8011
[M74]		M374
[M75]		M375
M76		M8005
M77		M8034
[M470 to M477]		M470 to M477

F_1/F_2		FX
M570	→ Convert	M8067
M571		M8022
M572		M8020
M573		M8021
M574		M8040
M575		M8041
[M576]		M576
[M577]		M577

Note 1 :• [ ] is regarded as an error instruction and the device is converted to a temporary device number.

Note 2 :• CJP/EJP 777, special instructions which do not follow the conversion rules, and faulty instructions are converted to NOP's.

7. APPENDIX

7.5 PROCESSING TIME LIST

The approximate duration of program transfer and verify operation is as described below.

		Write	Read/Verify	Remark
PC	RAM	Approx. 6 sec.	Approx. 3 sec.	For 1K steps of data
	EEPROM	Approx. 25 sec. *	Approx. 3 sec.	
	EPROM	—	Approx. 3 sec.	

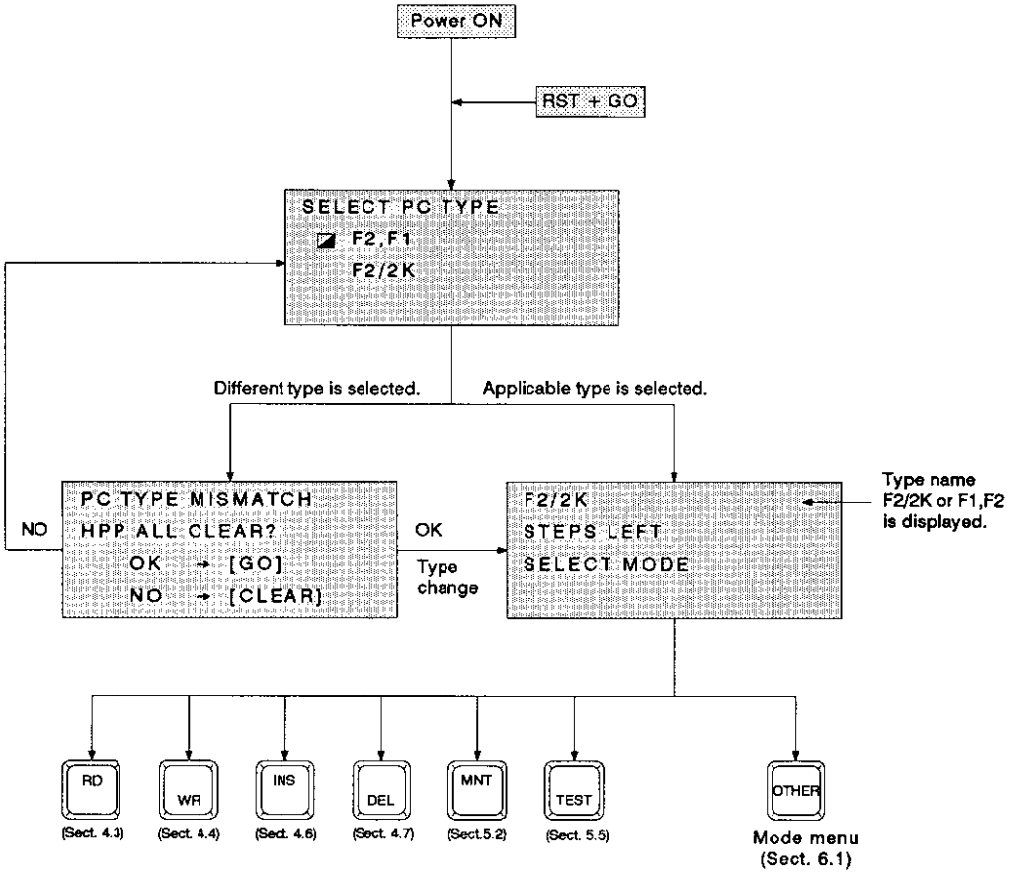
Write, read, and verify are executed immediately when the system starts up.

* Will be shorter for smaller size programs.

7. APPENDIX

7.6 OPERATION FLOW

7.6.1 SYSTEM START UP

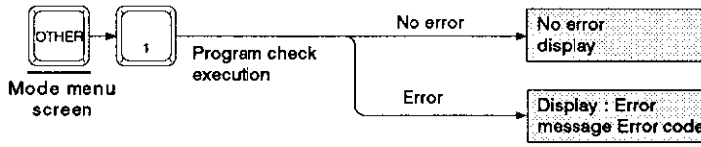


7. APPENDIX

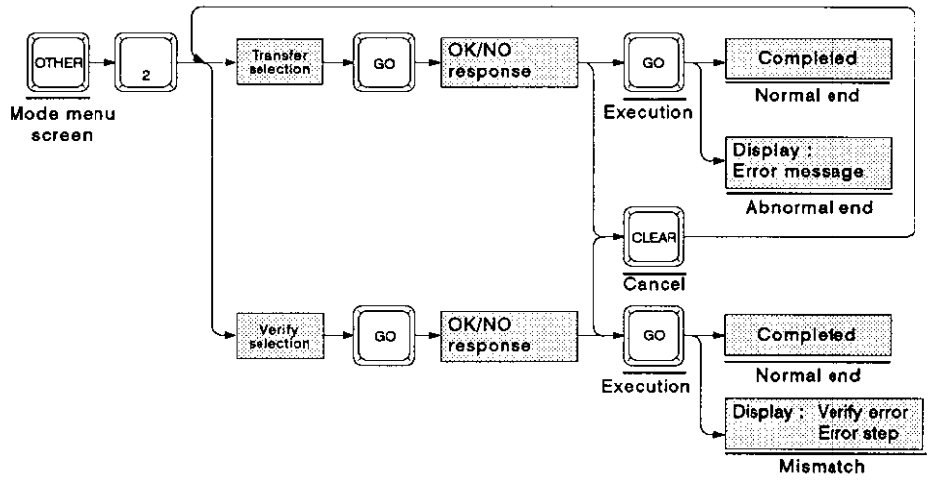
OPERATION FLOW

7.6.2 MODE MENU

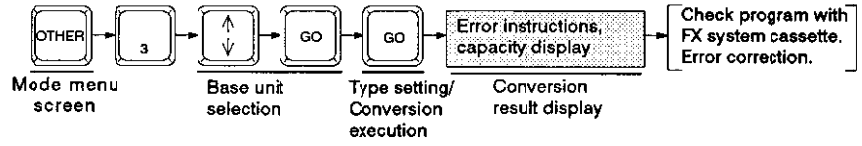
<PROGRAM CHECK>
(Section 6.2)



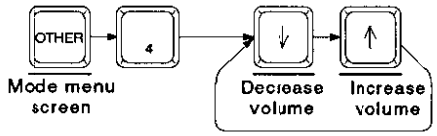
<HPP-PC DATA TRANSFER>
(Section 6.3)



<F → FX PROGRAM CONVERSION>
(Section 6.4)



<BUZZER VOLUME>
(Section 6.5)



Note: • *[OTHER] Key :*

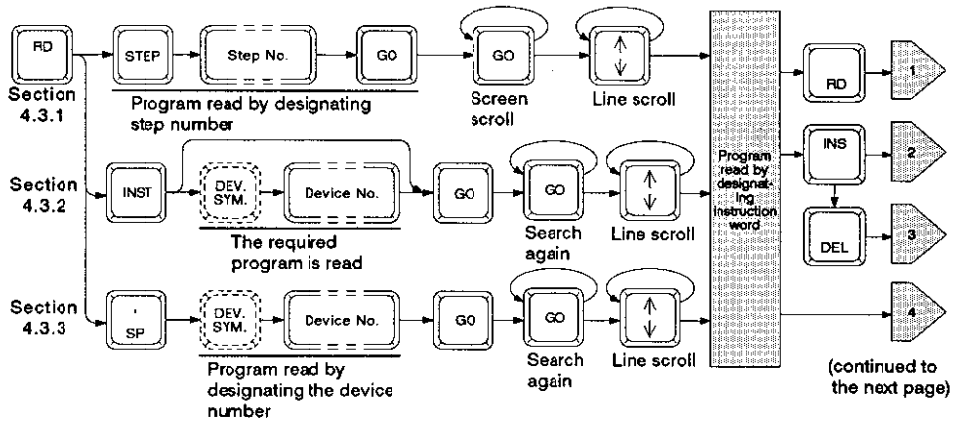
Returns the display to the mode menu screen. This key is effective in any operational step.

7. APPENDIX

OPERATION FLOW

7.6.3 PROGRAMMING

<PROGRAM READ>
(Section 4.3)



<PROGRAM CORRECTION>
(Sections 4.5 to 4.7)

Write :

Writing instructions and constants (Section 4.5.1)

Insert :

Inserting instructions (Section 4.6)

Inserting constants

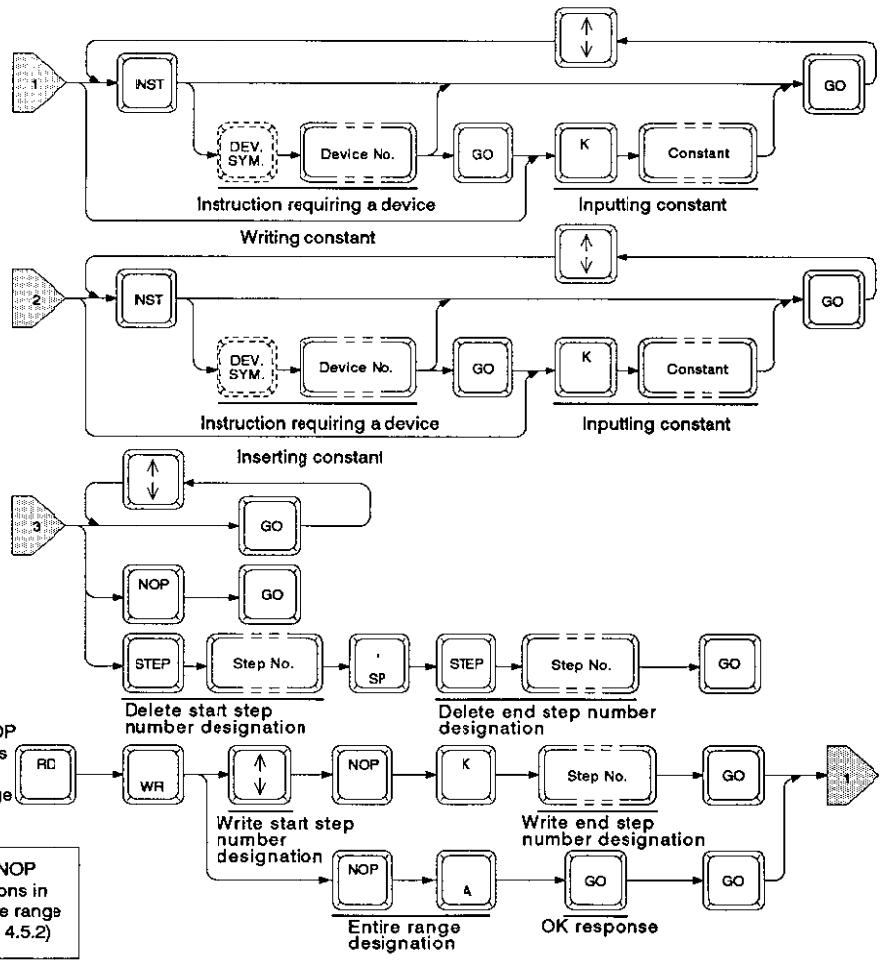
Delete :

Deleting instructions and constants (Section 4.7.1)

Batch deleting NOP instructions (Section 4.7.2)

Deleting a designated range (Section 4.7.3)

Batch Writing NOP Instructions (Section 4.5.2)



<PROGRAM CLEAR> Writing NOP instructions in the entire range (Section 4.5.2)

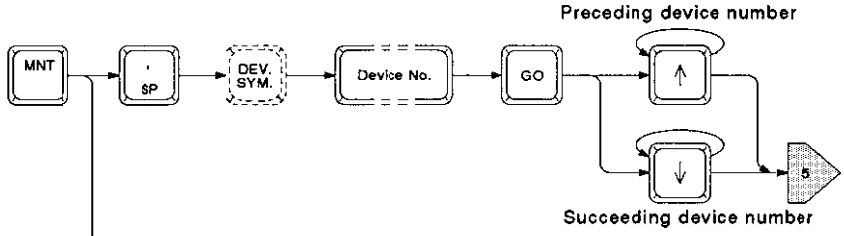
7. APPENDIX

OPERATION FLOW

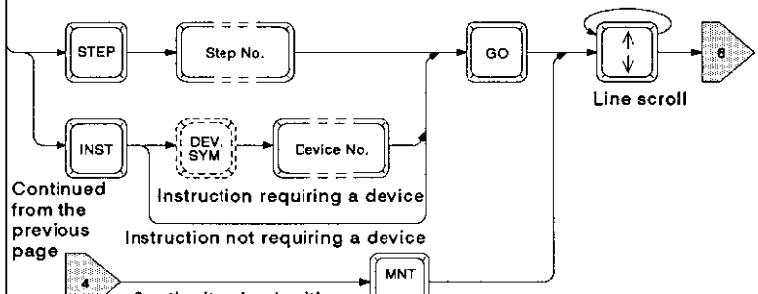
7.6.4 MONITOR/TEST

<MONITOR>

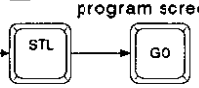
Device monitor
(Section 5.2)



Continuity check
(Section 5.3)



Active state monitor
(Section 5.4)

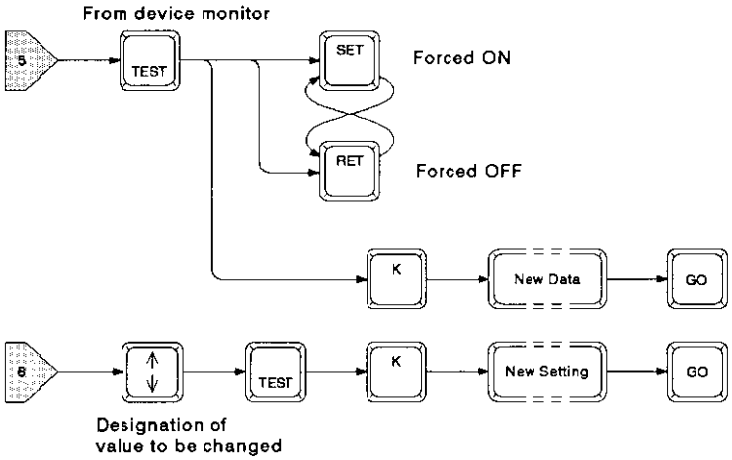


<TEST>

Forced ON/OFF
(Section 5.5)

T, C, D, Z, V Data Change
(Section 5.6)

T, C Setting Change
(Section 5.7)



MEMO

MEMO

MEMO

MEMO

MEMO

MEMO

MEMO

REVISIONS

*The manual number is given on the bottom left of the back cover.

EDITION DATE	MANUAL NUMBER	REVISION
Dec.,1990	JY992D19301A	First edition
Sept.,1993	JY992D19301B	Revised Sentences: pages 19, 28, 29, 31, 34, 52, 53, 55, 56, 72 Diagram Errors: page 35

OPERATION MANUAL

FX-20P-E-FKIT

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100 TELEX: J24532 CABLE MELCO TOKYO
HIMEJI WORKS: 840, CHIYODA CHO, HIMEJI, JAPAN

JY992D19301B
(ILC 9904)

Effective SEP. 1993
Specifications are subject to change without notice.