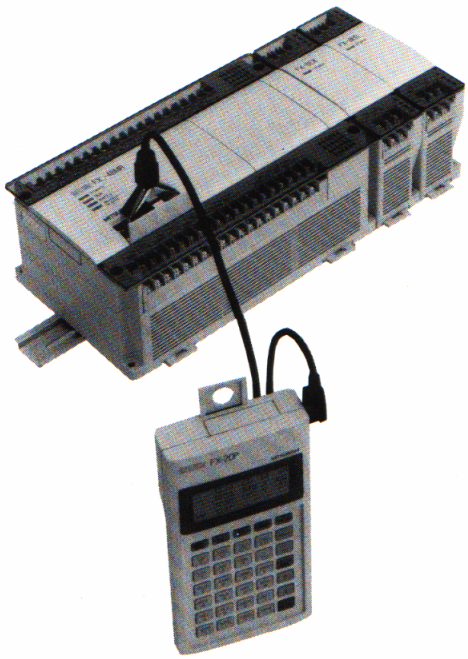
MITSUBISHI
PROGRAMMABLE CONTROLLERS
MELSEC-F

OPERATION MANUAL

FX-20P-E PROGRAMMING PANEL



FX

FX-20P-E HANDY PROGRAMMING PANEL

OPERATION MANUAL

FOREWORD

This manual describes the programming and monitoring procedures for the MELSEC-FX series Micro Programmable Controllers with the FX-20P-E Handy Programming Panel and the procedure for accessing Read Only Memory (ROM) cassettes with the FX-20P-RWM ROM Writer.

For details on the program instructions and the handling of FX series Programmable Controllers, refer to the separately supplied Handy Manual for the relevant programmable controller.

Some of the models described in this manual may not be available in some countries. When ordering products, please ensure that they are currently available.

CONTENTS

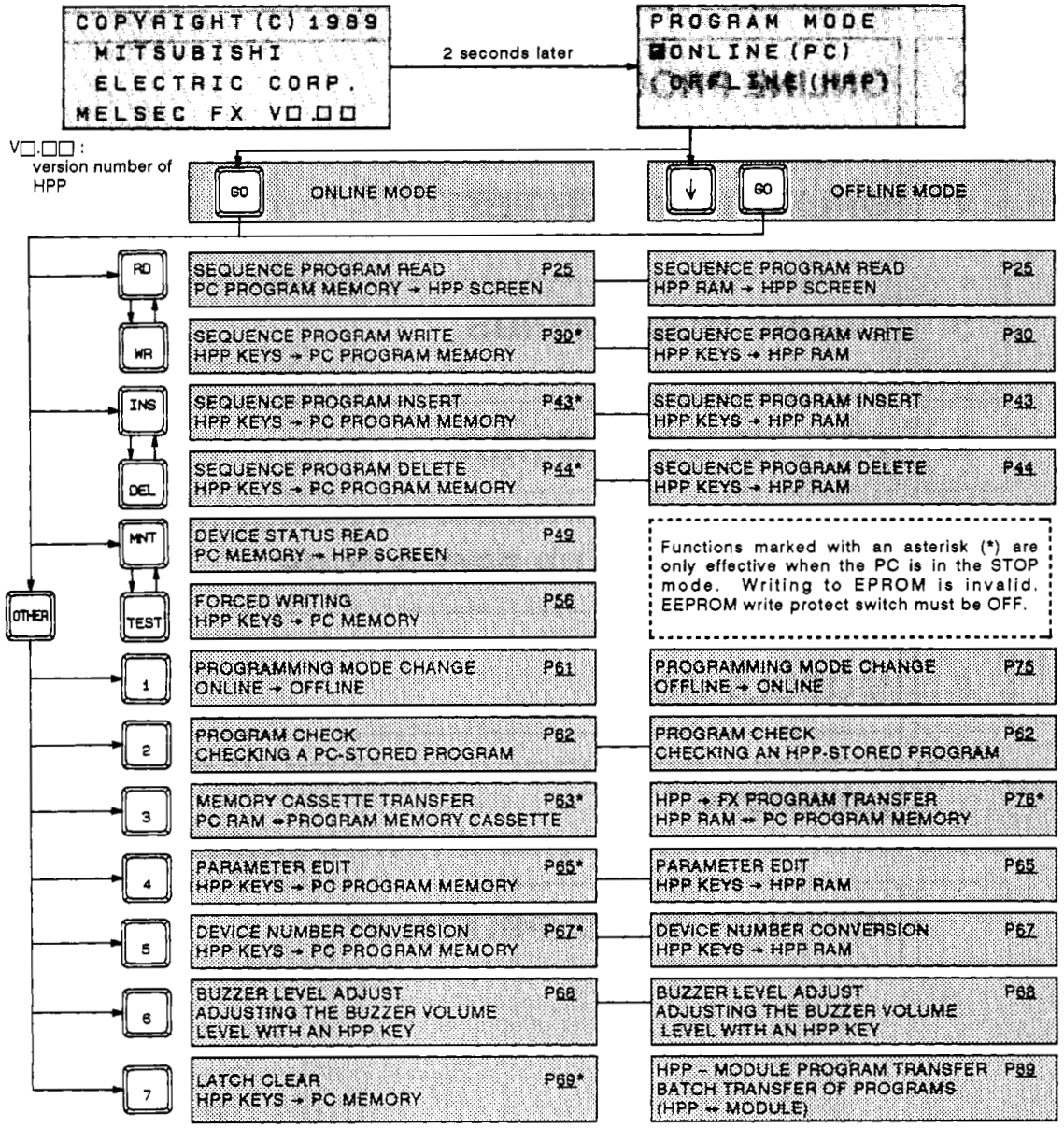
1. INTRODUCTION

1.1 FUNCTION LIST

The FX-20P-E Handy Programming Panel (referred to as the HPP in this manual) is a hand-held programming and monitoring panel used to write programs (sequence programs and parameters) to MELSEC-FX series Programmable Controllers (PC). It can also monitor their operation.

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, turn on the power to the PC.



1. INTRODUCTION

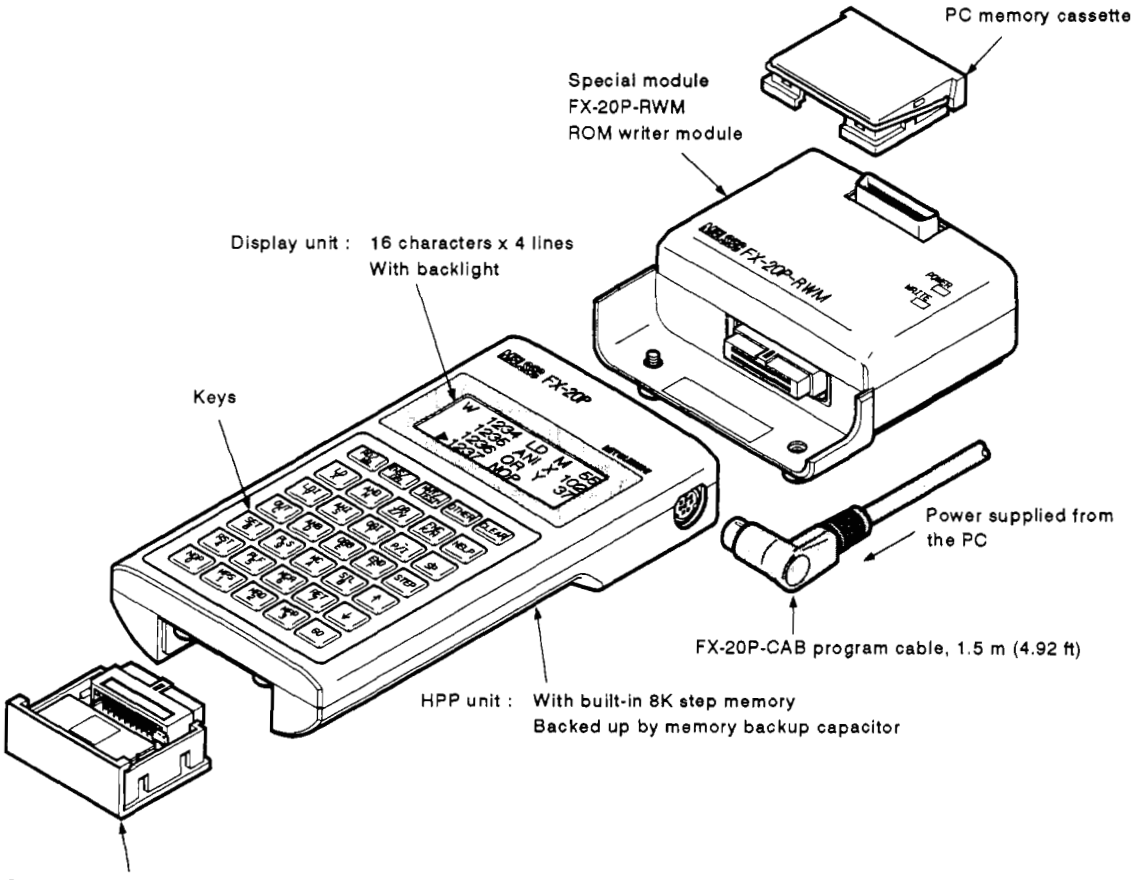
1.2 CONFIGURATION

The HPP consists of the following units :

an LCD display unit (16 characters x 4 lines, with backlight), interface for module connection, interface for memory cassette connection, and dedicated keysheet (functions, instructions, device symbols, and number keys).

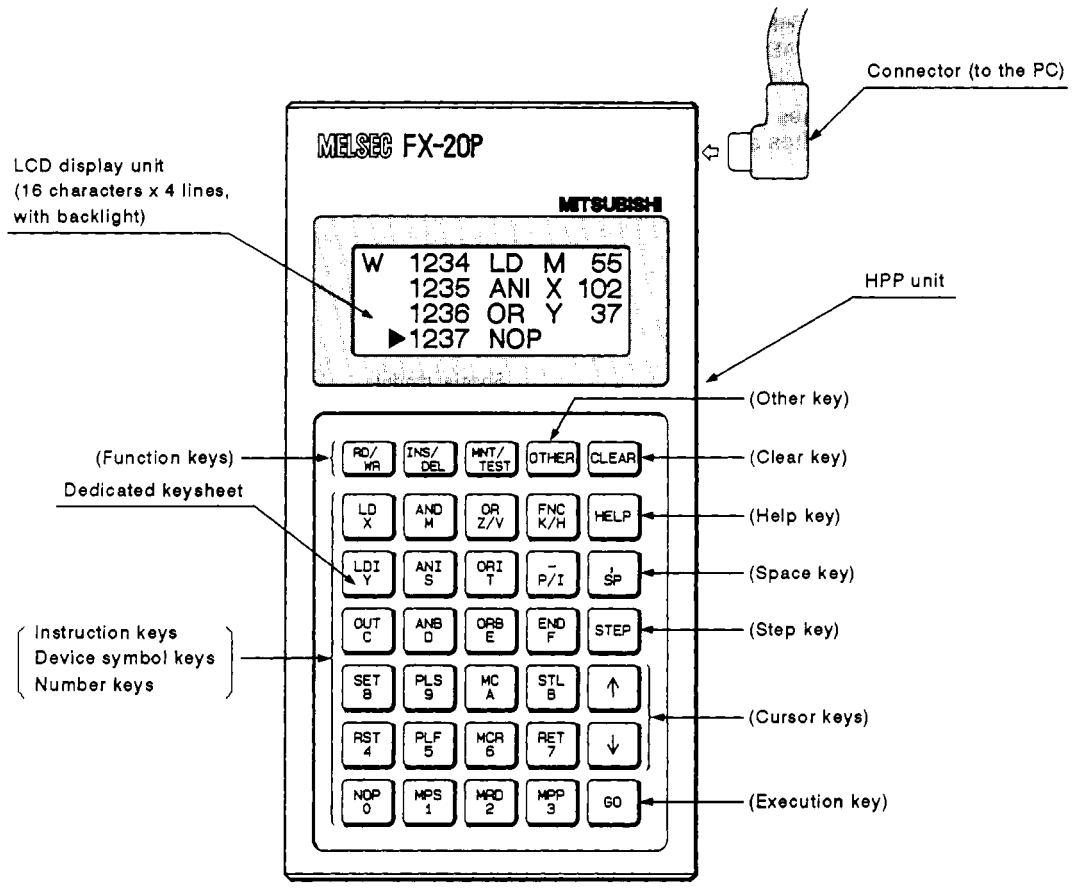
Although it is small, the HPP is a powerful programming and monitoring panel. It communicates with the PC via an FX-20P-CAB cable (1.5 m (4.92 ft)). It can perform offline operations and control any connected special modules.

The FX-20P-E HPP comes with an FX-20P-CAB cable and system memory cassette. Special modules and PC memory cassettes are available as options.



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. When the [OTHER] key is pressed with a special module installed to the HPP, menu selection is made from the offline mode menu.

(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 applied instruction menu or changes the display notation mode to decimal or hexadecimal.

(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 :

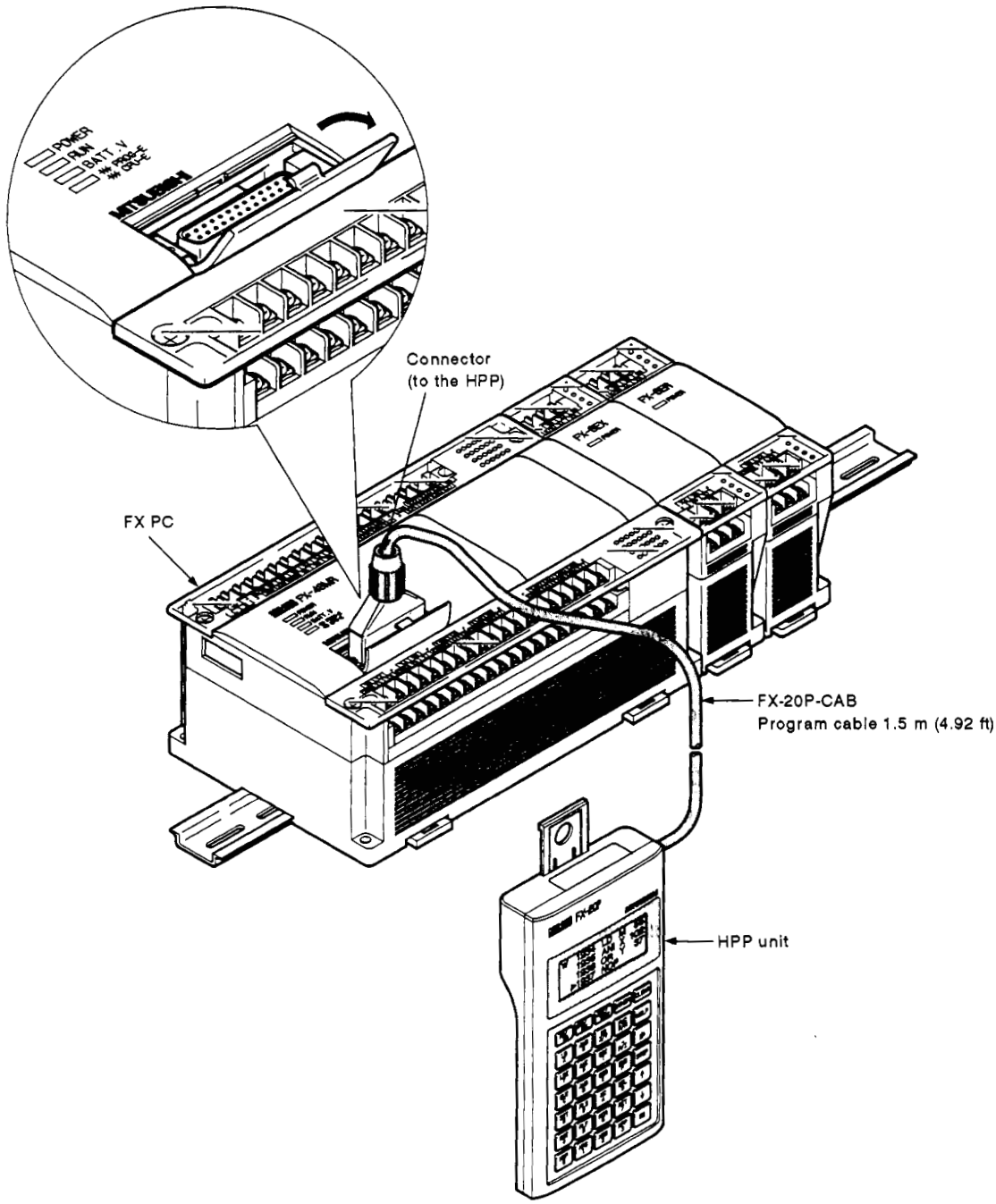
instructions (upper part) and device symbols or numbers (lower part). Which key function is effective during each operational step is automatically determined according to the currently executed operation.

The following device symbol keys are toggled : [Z/V] key, [K/H] key, and [P/I] key.

1. INTRODUCTION

1.4 CONNECTIONS

1.4.1 CONNECTING THE HPP TO THE FX PC



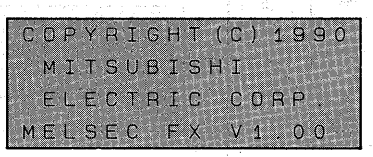
CONNECTIONS

1.4.2 CONNECTING THE HPP

(1) Open the cover of the connector on the HPP base unit and connect the FX-20P-CAB programming cable to it. Securely fasten the connector with screws. Refer to the illustration on the preceding page.

(2) Make sure that the FX-20P-CAB programming cable is connected in the correct direction.

Initial Screen



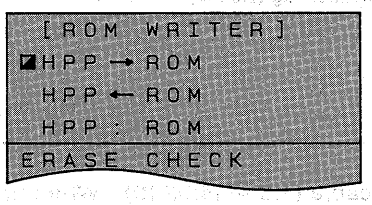
The screen shown to the left is displayed when the PC is powered up after the HPP has been connected to it. If this screen appears, the FX-20P-CAB programming cable is connected correctly. The initial screen is displayed for approximately 2 seconds. After this time, the next screen is displayed.

(3) Before installing or removing a special module or the system memory cassette to or from the HPP unit, make sure the power to the HPP has been turned off.

1.4.3 INSTALLING A SPECIAL MODULE

(1) Open the cover of the special module connection port at the top of the HPP unit. Insert the module into the port in the direction shown in Section 1.2. Fasten the special module with screws.

Special Module Initial Screen (The type of special module is recognized automatically.)



A screen similar to one shown to the left is displayed when the HPP is changed to the module mode after a special module has been connected. If this screen appears, the special module has been installed correctly.

The screen shown to the left is the initial screen appearing when a ROM writer is installed.

1.4.4 INSTALLING A SYSTEM MEMORY CASSETTE

(1) Insert the system memory cassette into the port as shown in Section 1.2.

(2) The initial screen explained in Section 1.4.2. ("Connecting the HPP") will be displayed to confirm correct installation.

(3) The system memory cassette should not need to be removed or installed during normal daily operation. Replacement only becomes necessary when upgrading the system version.

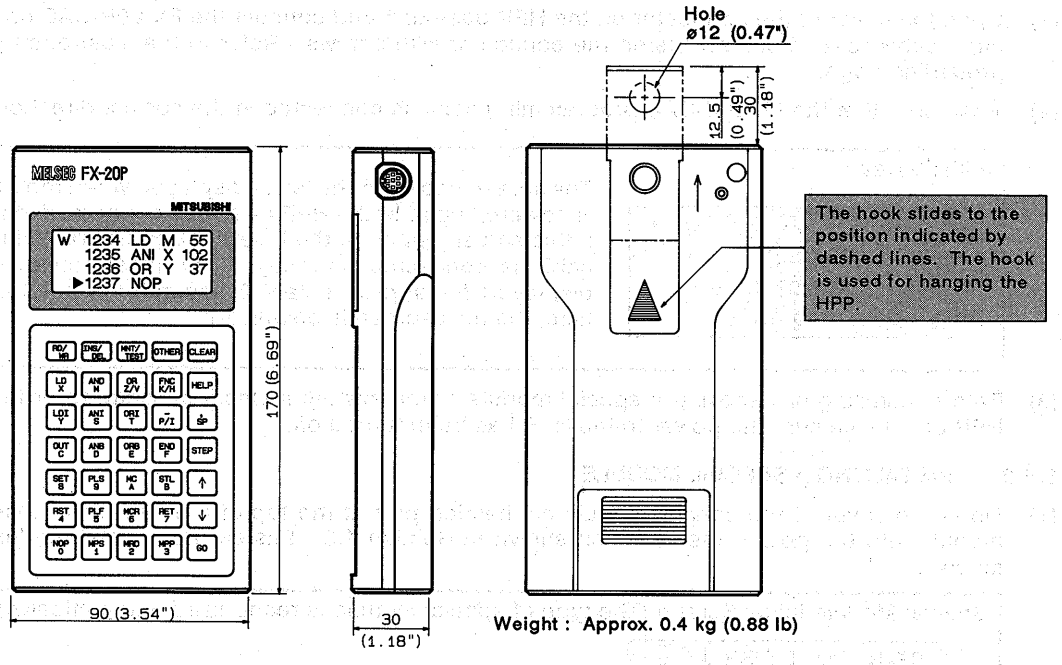
IMPORTANT

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

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

1.5 SPECIFICATIONS

HPP Dimensions



Weight : Approx. 0.4 kg (0.88 lb)

Unit : mm (inch)

The standard HPP comes with FX-20P-CAB programming cable (1.5 m (4.92 ft)). When unpacking the HPP unit, be sure that the cable is there.

1. INTRODUCTION

SPECIFICATIONS

1.5.1 CONDITIONS

Item	Specification			
Ambient temperature	0°C to 40°C			
Ambient humidity	35 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
Supply voltage		5V DC ±5% (supplied from PC)
Current consumption		150 mA
User memory capacity		RAM = 16 KB (8K steps)*
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	Character matrix	1 character : 40 dots (8 x 5), bottom 5 dots of each line (1 x 5 dots) are used for the prompt
	Number of characters	64 characters (16 columns x 4 lines)
	Character types	Alphanumerics
Keyboard		35 keys
Built-in interface	PC I/F	Conforms to EIA, RS422; used with FX-20P-CAB to connect to FX PC
	Module I/F	To connect special module
ROM writer function		Read, write, verify, delete, check (available by connecting the ROM writer module)
External dimensions		170 x 90 x 30 mm (6.70 x 3.55 x 1.18 in)
Weight		0.4 kg (0.88 lb)

- Step : 1 step uses 2 bytes.

MEMO

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 in the online mode 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.

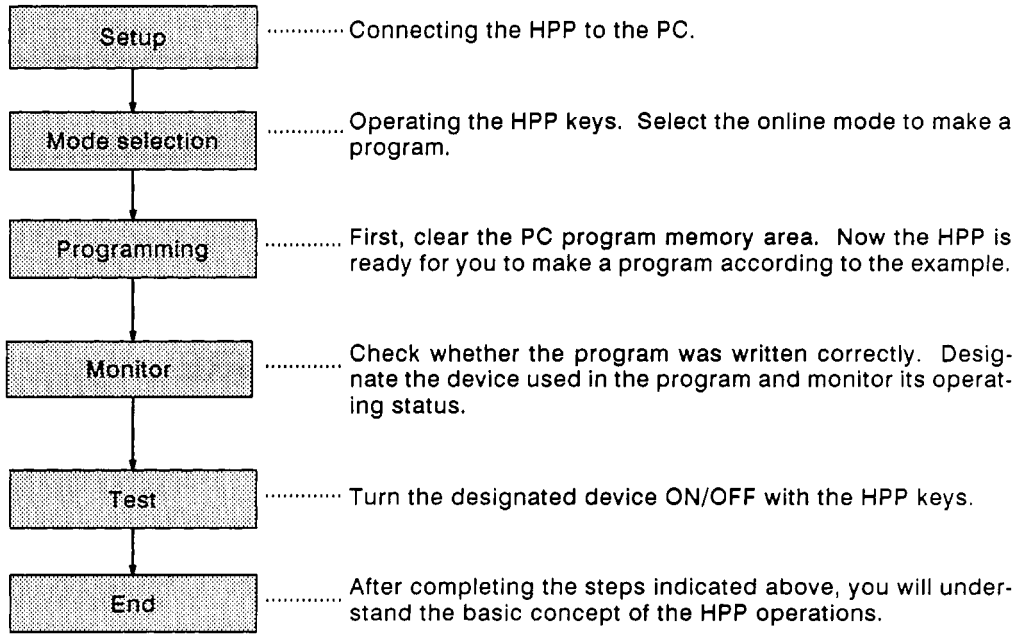
2.1.1 SETUP FOR HPP OPERATION

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

- 32 I/O FX series PC
- HPP with FX-20P-CAB cable
- Simulating switches

2.1.2 OPERATION FLOW

HPP operation is described in the following order :



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

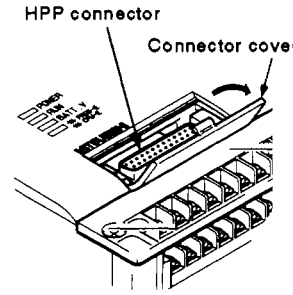
INITIAL SETUP

2.1.3 INITIAL SETUP

The first step, "Initial Setup," the procedure for connecting the HPP to the PC is described below.

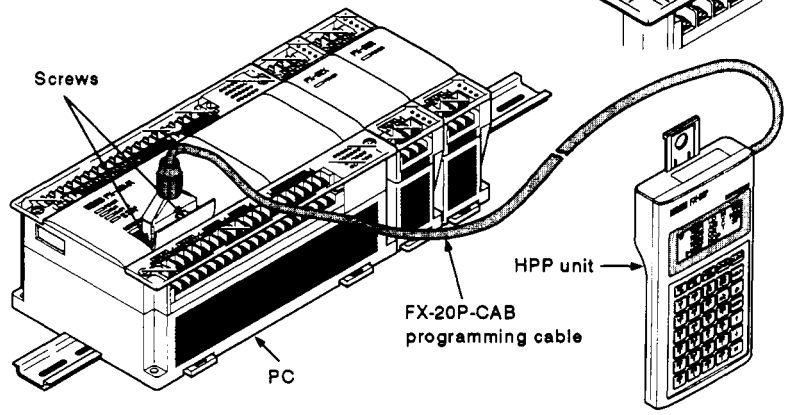
Open the HPP connector cover.

Open the HPP connector cover on the PC. The FX-20P-CAB cable connects to here.



Connect the HPP to the PC.

Plug in the FX-20P-CAB programming cable to the HPP connector on the PC. Use the screws to secure the connector.



Turn on the PC.

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 programming cable.

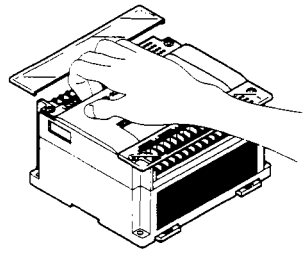
Select the mode. (continued)

Select the online mode by pressing the [GO] key. No other key operation is necessary. After selecting the mode, select the functions required to make a program.

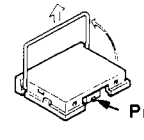
REMOVING THE PC MEMORY CASSETTE

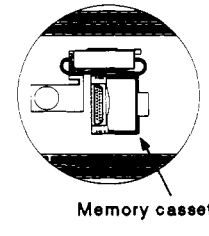
The HPP operations described in this chapter store the program in the PC memory area. If a memory cassette is installed in the PC, remove it as shown below.

(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.





2. PROGRAMMING EXAMPLE

2.2 MODE SELECTION

The next step is selecting the mode. After connecting the HPP to the PC, first select the mode and then the function.

2.2.1 MODE SELECTION

Connect the HPP to the PC and turn ON the power to the PC.

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

Screen

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

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

```
PROGRAM MODE
■ONLINE (PC)
 OFFLINE(HPP)
```

(2) In the initial state, the cursor is in position to select the online mode. Make sure that the cursor is in the position shown on the left and then press the [GO] key.

GO

```
ONLINE MODE FX
 SELECT FUNCTION
 OR MODE
MEM. SETTING  2K
```

(3) Select the function. Since we're going to write a program, select the write function.

RD

WR

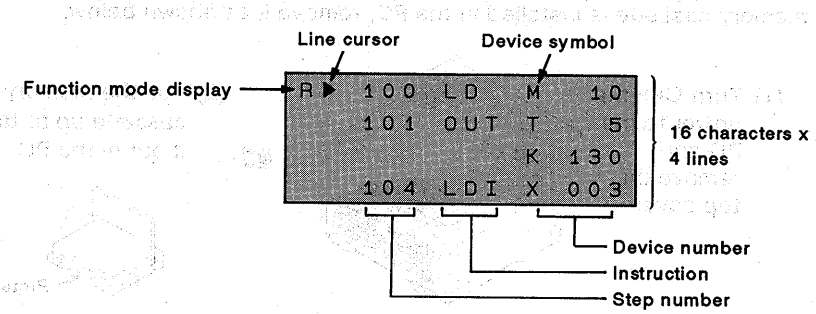
(4) The [RD/WR] key is a toggle key.
Pressing it two times selects the write mode.

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

Making a program (continued)

SCREEN DISPLAY

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



MODE CHARACTERS

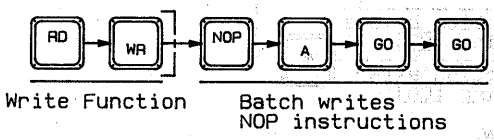
R : Read
W : Write
I : Insert
D : Delete
M : Monitor
T : Test

2.3 PROGRAMMING EXAMPLE

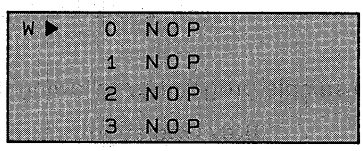
Before making your program, batch-write the NOP instruction to the PC RAM area. Then, write the program following the example below.
The first required operation is to ensure that the "RUN input terminal is OFF."

2.3.1 BATCH WRITING NOP INSTRUCTIONS

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

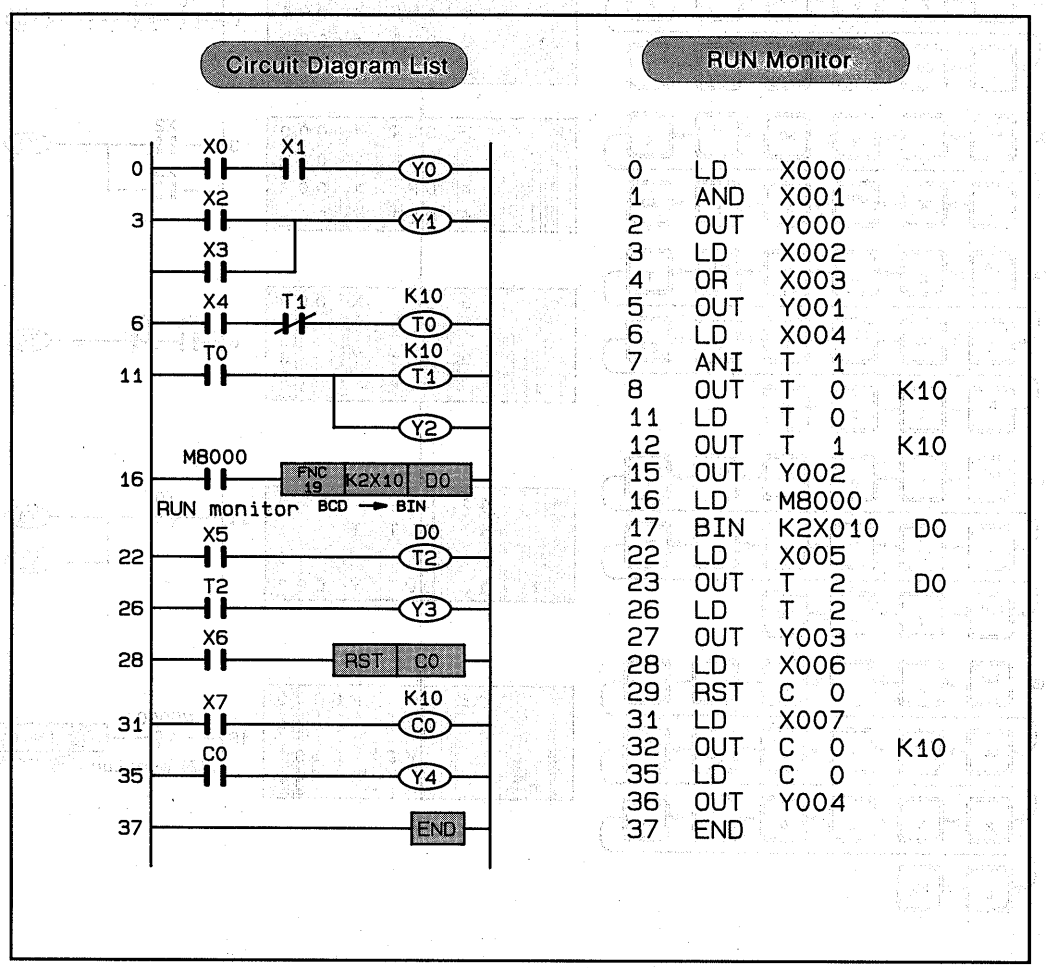


(1) Does the screen display NOP instructions for each step number? If not, repeat the procedure indicated above.



2.3.2 WRITING A SAMPLE PROGRAM

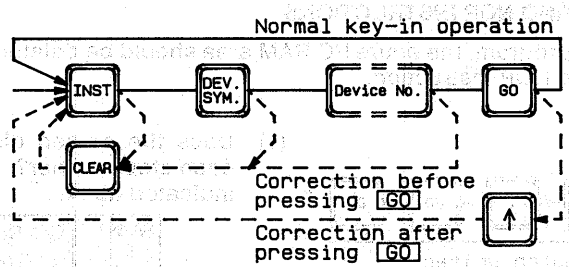
Now it's time to key in a sample program. Proceed step-by-step as indicated below.



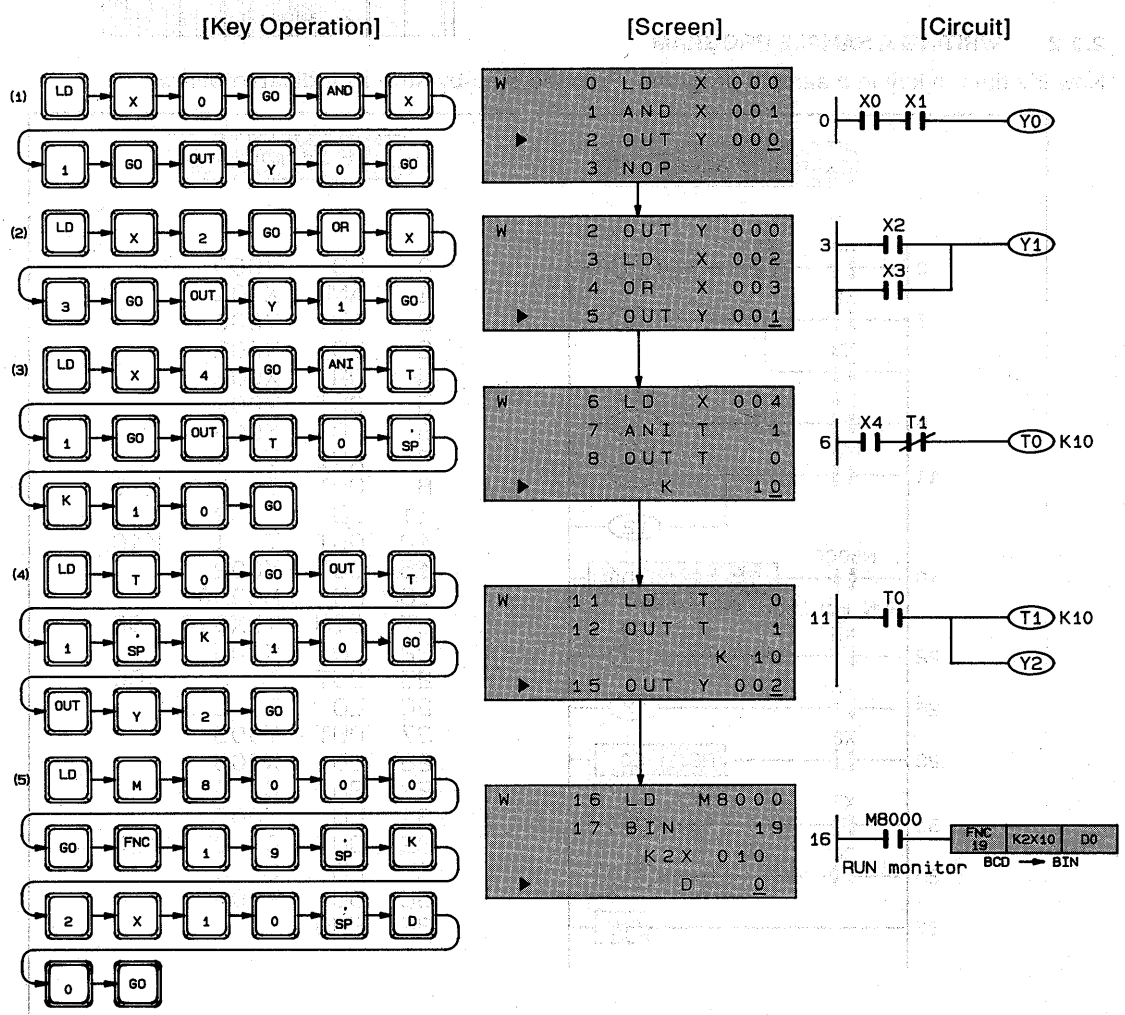
2. PROGRAMMING EXAMPLE

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.

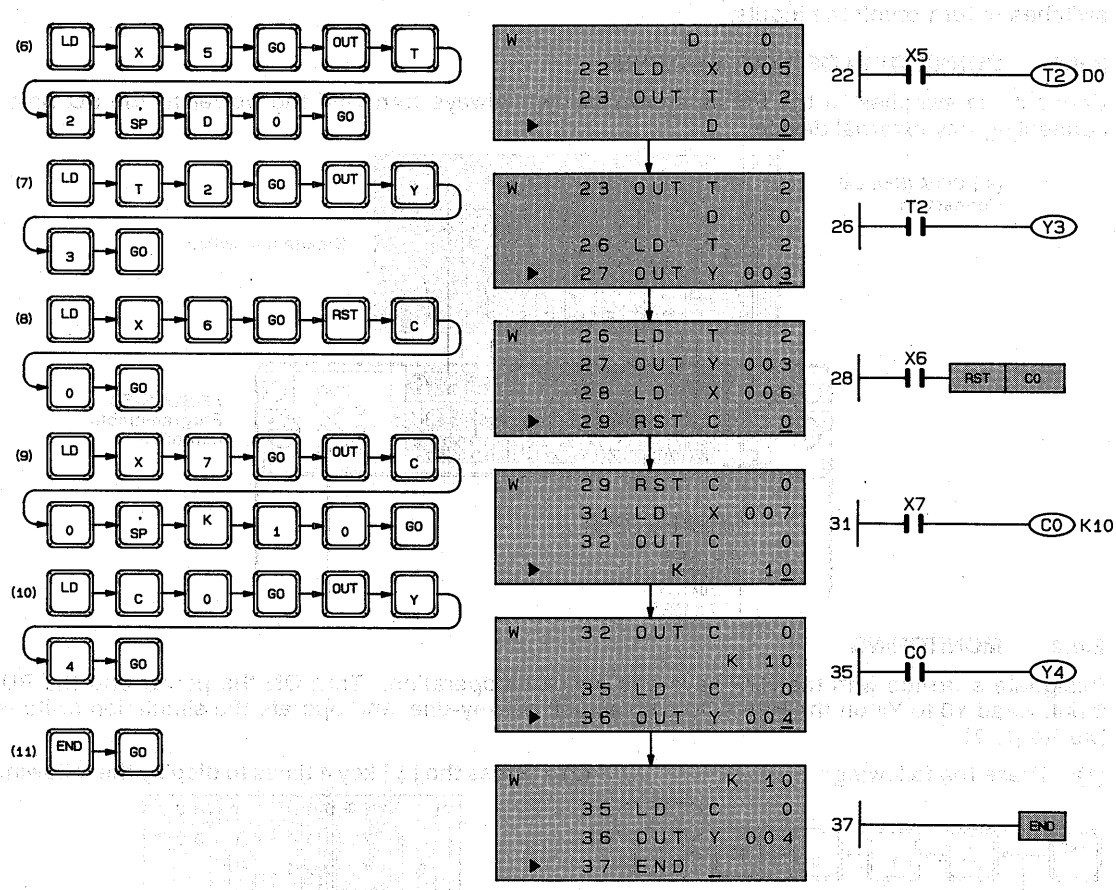


Enter the sample program by following the steps below.

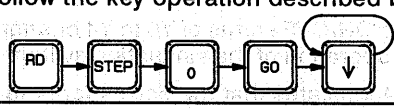


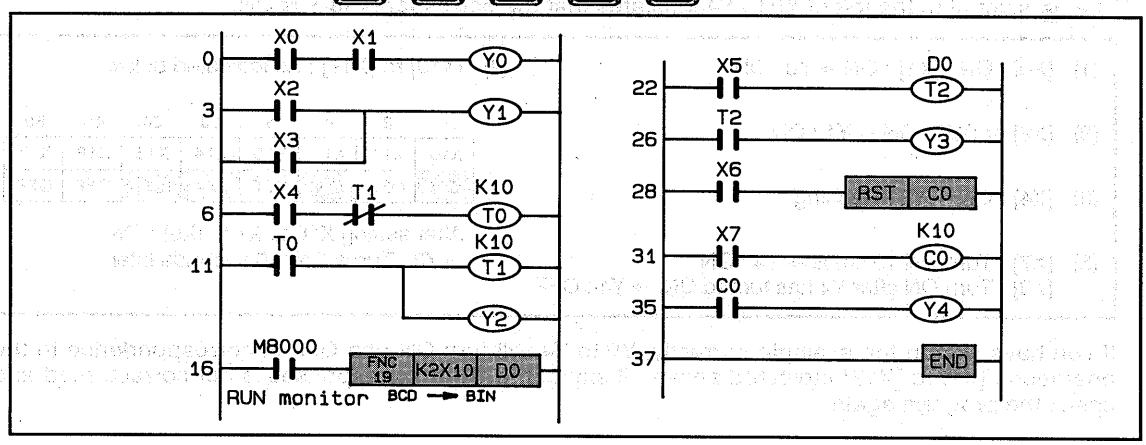
2. PROGRAMMING EXAMPLE

PROGRAMMING EXAMPLE



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





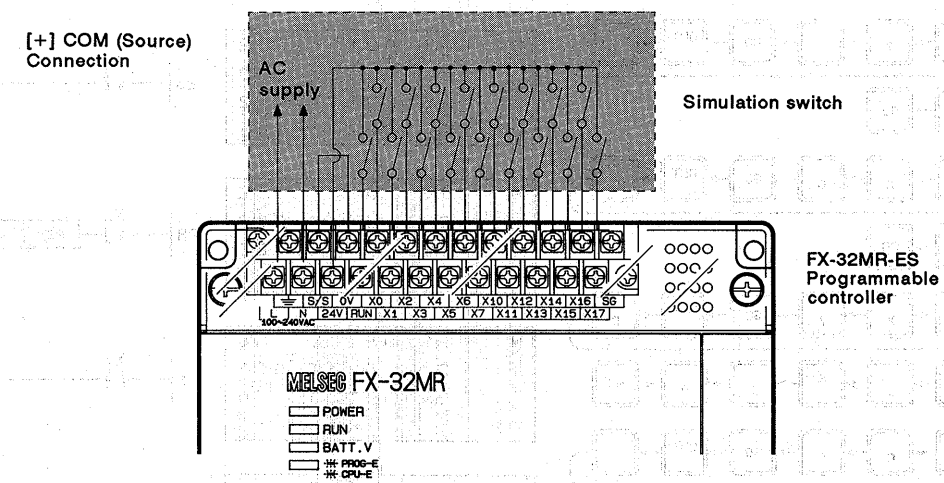
2. PROGRAMMING EXAMPLE

2.4 MONITOR

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

2.4.1 CONNECTION OF INPUT SWITCHES

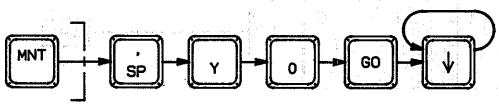
Connect the switches to the PC as shown below. Always turn OFF the power to the PC before connecting any external device.



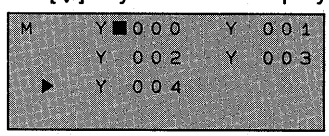
2.4.2 MONITORING

Designate a device with the HPP keys and check its operation. Turn ON the power and the RUN input. Read Y0 to Y4 on the HPP LCD display unit one-by-one and operate the simulation switches [X0] to [X17].

(1) Press the following:



(2) Press the [↓] key 4 times to display the following:



(Example : Y0 is turned ON.)

Observe the screen to check how the ON/OFF status of Y0 to Y4 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 Y0 to Y4 indicates that the corresponding Y is ON.

(1) [X0] : ON [X1] : ON → Y0 : ON

(2) [X2] or [X3] : ON → Y1 : ON

(3) [X4] : ON → Y2 : Flashing

(5) [X7] : Turn ON 10 times → Y4 : ON
[X6] : Turn ON after Y4 has turned ON. → Y4 : OFF

(4) [X10] to [X17] : As indicated below

1	2	4	8	10	20	40	80
X10	X11	X12	X13	X14	X15	X16	X17
ON	OFF	ON	OFF	ON	ON	OFF	OFF

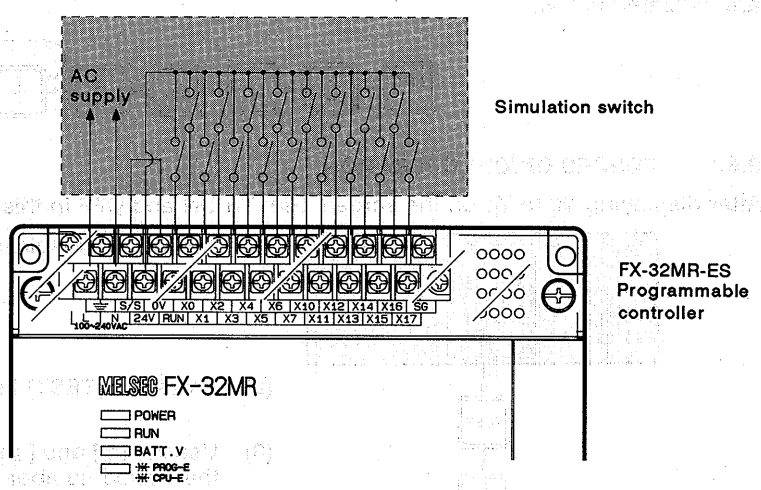
After setting X10 to X17, [X5] : ON
→ Y3 : Turns ON 3.5 seconds later

If you have written the example correctly, Y0 to Y4 will turn ON and OFF in correspondence to the operations [X1] to [X17] indicated above. If any of the Y0 to Y4 responses is not correct, read and check the program again.

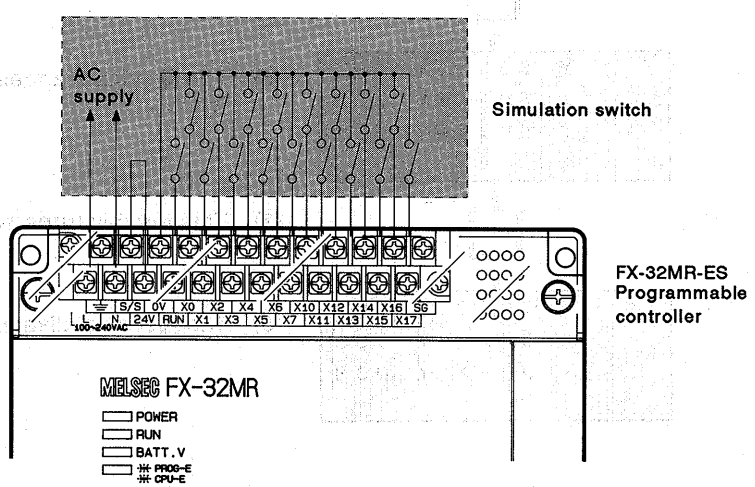
2. PROGRAMMING EXAMPLE

MONITOR (SINK/SOURCE CONFIGURATION)

[+] COMMON (SOURCE) CONNECTION



[–] COMMON (SINK) CONNECTION

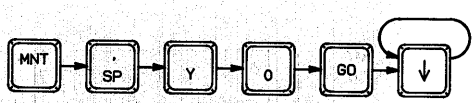


2. PROGRAMMING EXAMPLE

2.5 TEST

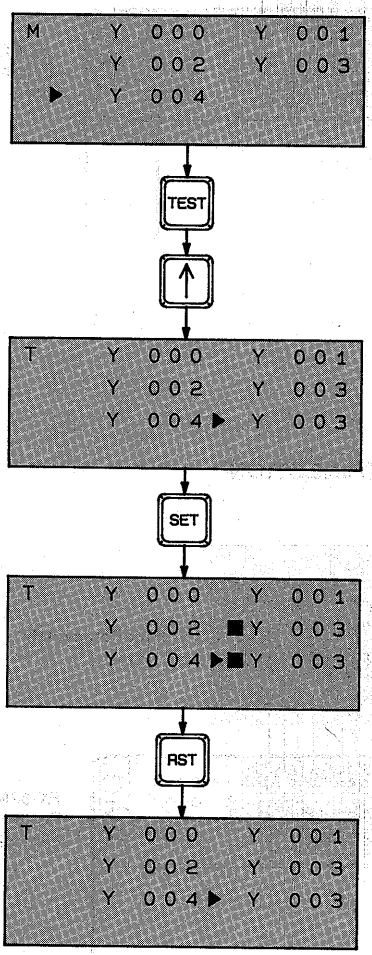
You can turn a device designated in the program ON and OFF with the HPP keys. For this test operation, the RUN switch must be set to the OFF position.

Read Y0 to Y4 one-by-one with the monitor function. The key operations required to read a device are indicated below.



2.5.1 FORCED ON/OFF OPERATION

After displaying Y0 to Y4 on the screen, turn Y3 ON and OFF in this forced manner.



(1) The screen displays Y0 to Y4.

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

(3) Use the [↑] and [↓] keys to increment or decrement the device number (Y3).

(4) The function mode display changes from "M" to "T" with the cursor placed at Y3.

(5) This forcibly turns Y3 ON.

(6) The ■ symbol appears at Y3. This indicates that Y3 is ON.

(7) This forcibly turns Y3 OFF.

(8) The ■ symbol disappears, indicating that Y3 is OFF.

Repeat the steps above for Y0 to Y4 to make sure that each output is forcibly turned ON and OFF in response to the pressing of the [SET] and [RST] keys.

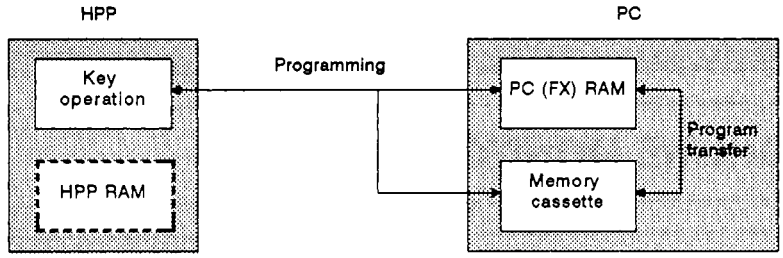
3. ONLINE PROGRAMMING

3.1 ONLINE MODE

In the online mode, you can directly access the PC memory area with the HPP.

The PC memory area is the built-in memory inside the PC (termed as the FX-RAM) when the memory cassette is not installed. When a memory cassette is installed, the memory cassette becomes the PC memory area. However, writing to the memory cassette is not possible when an EPROM is used as the memory cassette. If the EEPROM is used as the memory cassette, writing is possible only when the memory protect switch is set to the OFF position.

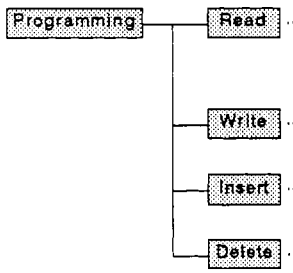
A program can be transferred between the FX-RAM area and the memory cassette installed in the PC with the HPP (for details, see Section 5.4).



3. ONLINE PROGRAMMING

3.2 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, device, or pointer.
- **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.

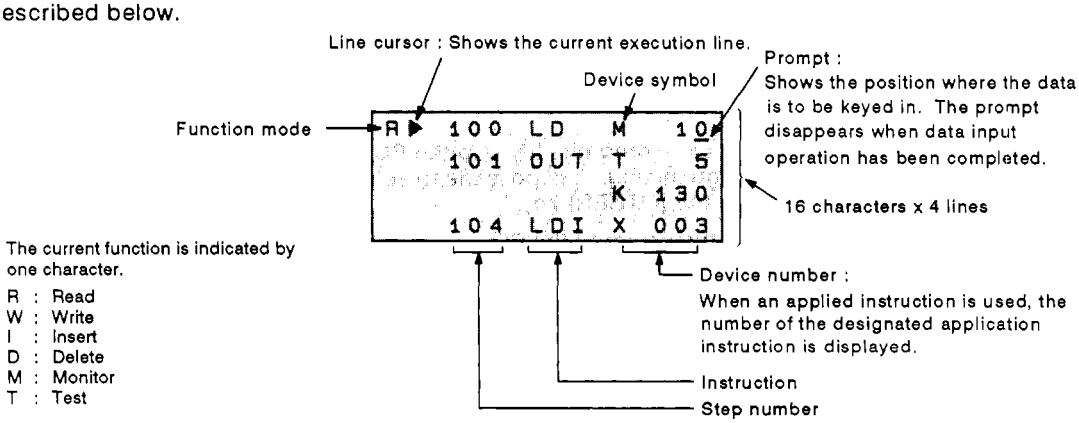
(1) Pressing the [HELP] key during programming displays the usable no. of program steps.
To clear [HELP] information, press the [HELP] key again. If the [HELP] key is pressed after the [FNC] key, applied instruction menus can be displayed or removed.

(2) With the HPP, a program is created in the form of an instruction list. Program storage destination depends on the current mode. In the online mode, the program is stored directly in the PC memory. In the offline mode, the program is stored in the HPP memory.

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

SCREEN CONFIGURATION WHEN PROGRAMMING

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



3. ONLINE PROGRAMMING

PROGRAM EDIT FUNCTIONS

This section describes the basic programming functions in online mode.

The procedure to input basic instructions, applied instructions, devices, pointers (P, I), and numerical values is described in Section 3.4.

3.2.1 BASIC PROCEDURE

Online mode programming is entered by the following steps.

Initial Setup	Connect the HPP to PC (for details, see Section 1.4.2).
Starting up the system	Turn ON the power to the PC or reset the HPP ([RST] + [GO]) (for details, see Section 7.1).
Setting the online mode	Press the [GO] key at the mode select screen to select the online mode (for details, see Section 7.4).
Programming	Make a new program or edit an existing program by using the write, read, insert, or delete function.
End	End of programming.

3.2.2 PROGRAMMING

There are two programming methods; writing a new program and editing an existing program. After starting up the system, set the desired ON/OFF line mode 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.

3.2.3 END

In the online mode, the program is stored directly into the PC memory. You don't have to transfer the program to the PC after programming. It is possible to select another function or another menu while programming by pressing the [OTHER] key.

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

Note: • *Programming :*
Programming is done with list form instructions. Instructions include basic instructions, step ladder instructions, and applied instructions.

• *Instruction Types :*
- *Basic instructions (includes step ladder instructions)*
Instructions which can be directly input using the HPP keys (22 types)
- *Applied instructions*
Instructions which are displayed on the screen by pressing the [FNC] and [HELP] keys (85 types).

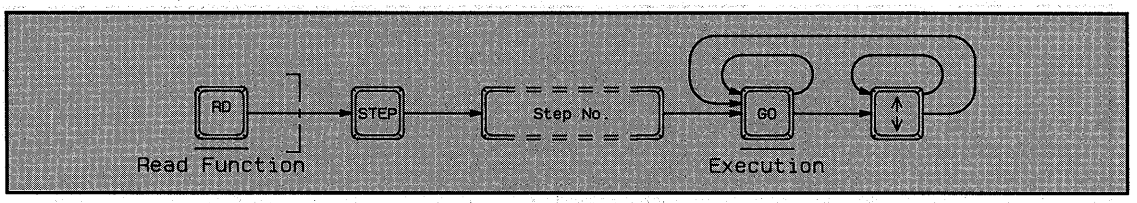
3. ONLINE PROGRAMMING

3.3 PROGRAM READING

3.3.1 READING THE PROGRAM BY DESIGNATING A STEP NUMBER

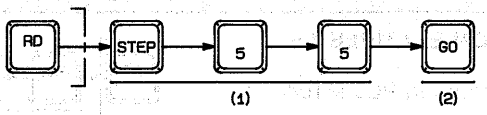
Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

<BASIC OPERATION>

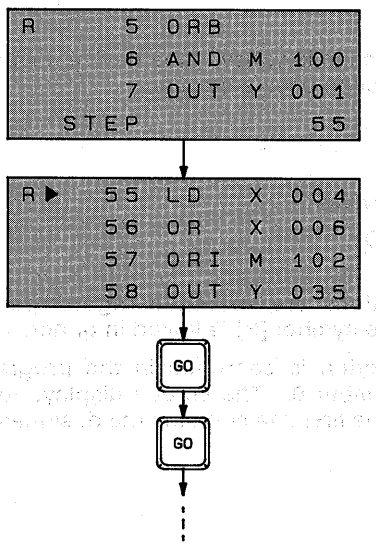


<OPERATION EXAMPLE 1>

To read program step number 55



Display Example :



Key Operation :

(1) Press the [STEP] key and key in [5] [5].

(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) If the designated step number corresponds to an operand such as a T/C setting value, the corresponding instruction is read and four lines of program are displayed with that instruction at the first line.

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

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

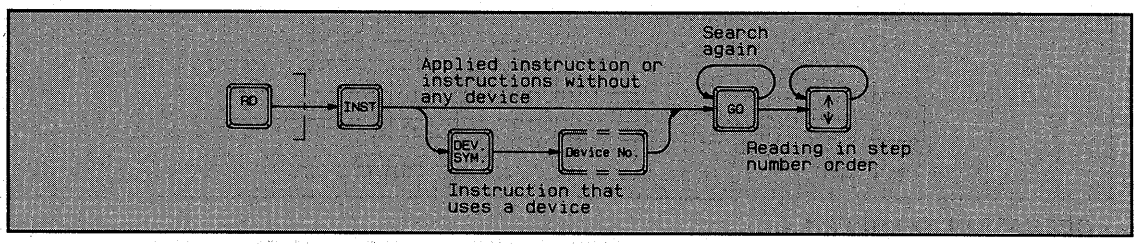
3. ONLINE PROGRAMMING

PROGRAM READING

3.3.2 READING A PROGRAM BY DESIGNATING AN INSTRUCTION

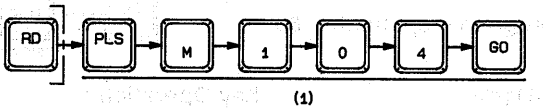
Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

<BASIC OPERATION>

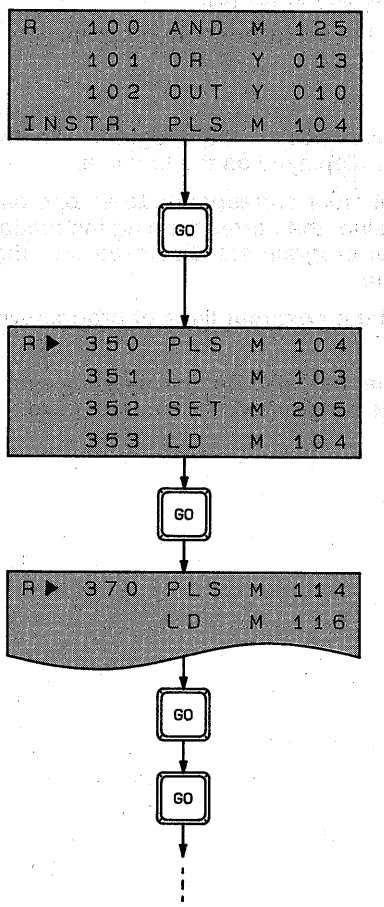


<OPERATION EXAMPLE 1>

To read instruction PLS M104



Display Example :



Key Operation :

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

Explanation :

(a) Applied instructions

Key in either of the following :

[FNC] [D] [1] [2] [GO]
[FNC] [1] [2] [GO]

Both types of instructions are searched regardless of whether or not the pulse symbol [P] is keyed in or not.

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

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

(d) If the designated instruction is not found, the "NOT FOUND" message is displayed. Program steps beyond the END instruction cannot be searched.

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

3. ONLINE PROGRAMMING

PROGRAM READING

BASIC SEQUENCE INSTRUCTIONS AND OBJECTIVE DEVICES

Instruction	Function	Device	Instruction	Function	Device
LD LOAD	Logical operation start (NO contact)	X, Y, M, S, T, C, Special M	LDI LOAD INVERSE	Logical operation start (NC contact)	X, Y, M, S, T, C, Special M
OUT OUT	Coil drive	X, Y, M, S, T, C, Special M			
AND AND	Logical AND (serial connection of NO contacts)	X, Y, M, S, T, C, Special M	ANI AND INVERSE	Inverse of logical AND (Serial connection of NC contacts)	X, Y, M, S, T, C, Special M
OR OR	Logical OR (Parallel connection of NO contacts)	X, Y, M, S, T, C, Special M	ORI OR INVERSE	Inverse of logical OR (Parallel connection of NC contacts)	X, Y, M, S, T, C, Special M
ORB OR BLOCK	Parallel connection of serial circuit blocks	*	ANB AND BLOCK	Serial connection of parallel circuit blocks	*
MPS PUSH	Push down stack	*	MRD READ	Read from stack	*
MPP POP	Pop up stack	*			
MC MASTER CONTROL	Connecting common serial contact	N-Y, M	MCR MASTER CONTROL RESET	Resetting common serial contacts	N
SET SET	Latches a device to ON	Y, M, S, Special M	RST RESET	Latches a device to OFF	Y, M, S, T, C, V, Z, D, Special M, Special D
PLS PULSE	Generates a pulse of period equal to one operation cycle at the edge of an input signal turning on	Y, M	PLF PULSE	Generates a pulse of period equal to one operation cycle at the edge of an input signal turning off	Y, M
NOP NOP	No processing	For erasing instructions or reserving program space			
END END	End of program	The last instruction at the end of a program *			
STL STEP LADDER	Start of step-ladder	*	RET RETURN	End of step-ladder programming	*

NO : Normally-open
NC : Normally-close

Instructions marked with a symbol (*) do not require object devices.

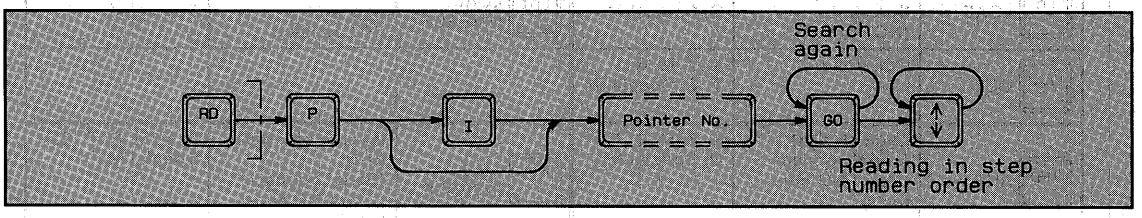
3. ONLINE PROGRAMMING

PROGRAM READING

3.3.3 READING A PROGRAM BY DESIGNATING A POINTER

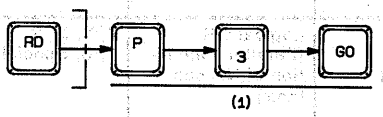
Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

<BASIC OPERATION>

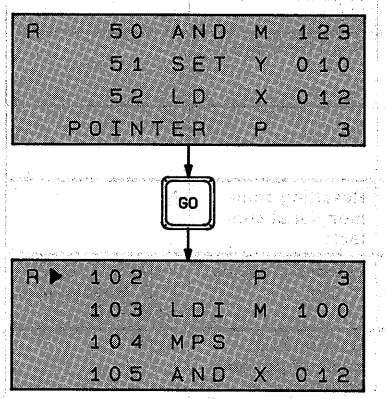


<OPERATION EXAMPLE 1>

To read the label assigned pointer number 3



Display Example :



Key Operation :

(1) After pressing the [P] key, key in [3] and press the [GO] key. The label corresponding to the designated pointer is read.

Explanation :

(a) The screen displays four lines of the program. The first line contains a label corresponding to the designated pointer.

(b) If the designated label is not found, the "NOT FOUND" message is displayed. Labels beyond the END instruction cannot be searched.

(c) This pointer search only looks for the label with this pointer. A pointer designated as an operand in an applied instruction cannot be searched.

Note: • *P (pointer) :*

A device used in a branch instruction to designate the jump destination. The destination is the label of the same number.

• *Label :*

A pointer number that is programmed at the beginning of a destination block that may be jumped to by a branch instruction.

• *I (interrupt pointer) :*

A label used by interrupt processes.
It is programmed at the beginning of an interrupt program. An interrupt program must end with the IRET instruction.

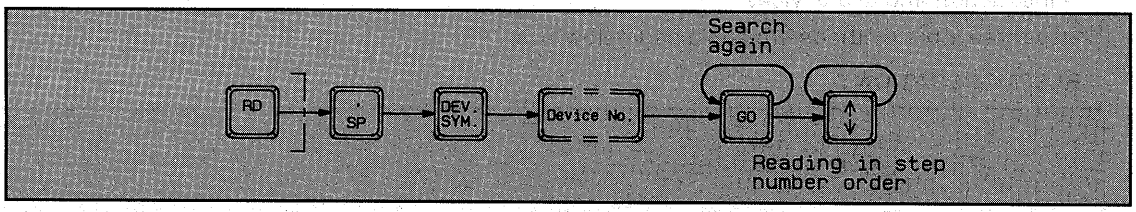
3. ONLINE PROGRAMMING

PROGRAM READING

3.3.4 READING A PROGRAM BY DESIGNATING A DEVICE

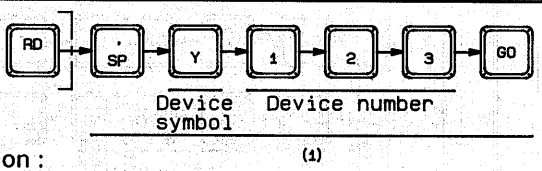
Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

<BASIC OPERATION>

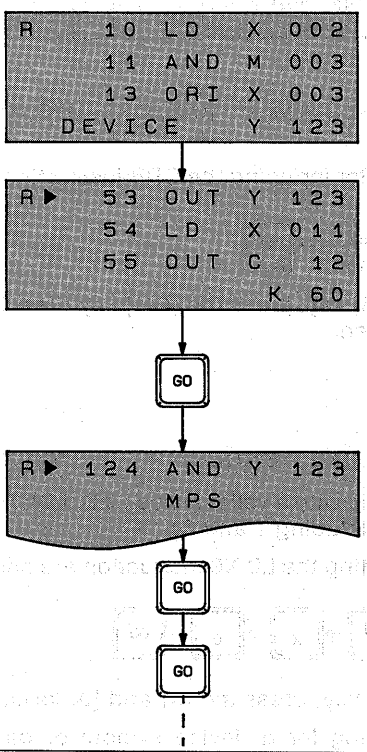


<OPERATION EXAMPLE 1>

To read Y123



Display Example :



Key Operation :

(1) After pressing the [SP] key, key in [Y] [1] [2] [3], the desired device symbol and device number, and press the [GO] key.

Explanation :

(a) The designated device is searched 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. Program steps beyond the END instruction cannot be searched.

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

Only X, Y, M, S, T, C, D, V, and Z devices can be designated for a search.

Only the D devices used in steps after the timer and counter OUT instruction can be designated for a search. V and Z devices used as indices are not searched.

3. ONLINE PROGRAMMING

3.4 BASIC WRITING OPERATIONS

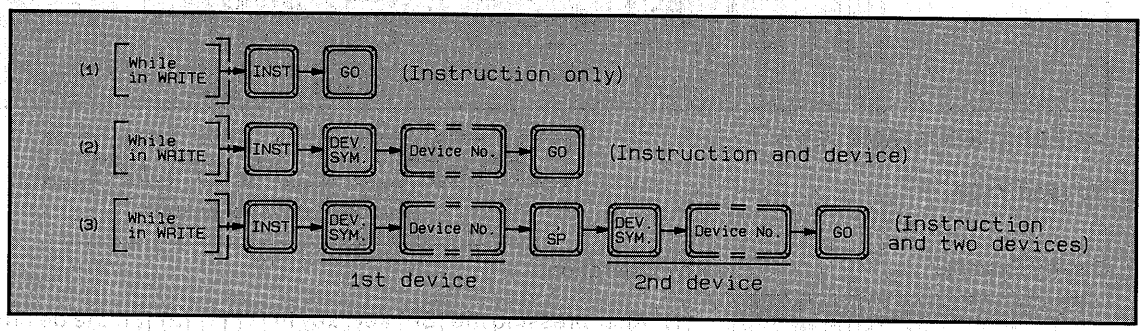
3.4.1 INPUTTING BASIC INSTRUCTIONS

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

- Instruction only
- Instruction and device
- Instruction and two devices

These three input methods are explained below.

<BASIC OPERATION>

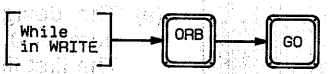


(1) INSTRUCTIONS WITHOUT ANY DEVICES

The following instructions are accessed without designating a device : ANB, ORB, MPS, MRD, MPP, 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  004
         5  AND  X  005
         6  ORB
      ▶  7  NOP
```

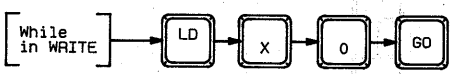
(a) After pressing the [ORB] key, press the [GO] key. The ORB instruction is then written.

(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, SET, RST, PLS, PLF, MCR, STL, and OUT (excluding T and C).

A display example and the required key operation for inputting the LD X0 instruction are shown below.

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




```
W ▶      0  LD   X  000
         1  NOP
         2  NOP
         3  NOP
```

(a) After pressing the [LD] key, press the [X] 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.

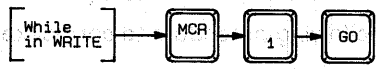
Display Example : (after pressing the [GO] key)

```
W        0  LD   X  000
      ▶  1  NOP
         2  NOP
         3  NOP
```

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

BASIC WRITING OPERATIONS

Display Example :




```
W     10  AND  M1023
      11  OUT  T  100
      12  MCR  N    1
  ▶   14  NOP
```

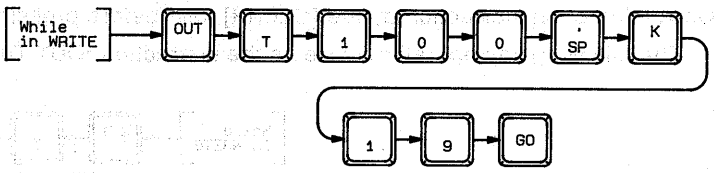
(a) The symbol "N", representing the nesting level, is automatically displayed when the [MCR] key is pressed. Press the [1] and [GO] keys to complete the writing.

Each program step number is assigned automatically. For details on the number of steps occupied by each instruction, see Appendix 1.

(3) INSTRUCTIONS THAT REQUIRE THE DESIGNATION OF TWO DEVICES

The following instructions can be accessed when designated with proper devices : MC, OUT (T or C)

A display example and the required key operation for inputting the OUT T100 K19 instruction are shown below.

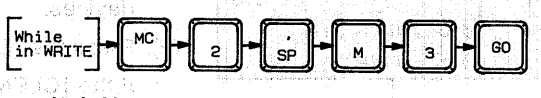


Display Example :

```
W    100  OUT  M  100
     101  OUT  T  100
               K   19
  ▶  104  NOP
```

(a) After pressing the [OUT] key, press the following keys in order : [T] [1] [0] [0] [SP] [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.



Display Example :

```
W     20  OUT  M   10
      21  MC   N    2
               M    3
  ▶   24  NOP
```

(a) The symbol "N", representing the nesting level, is automatically displayed when the [MC] key is pressed.

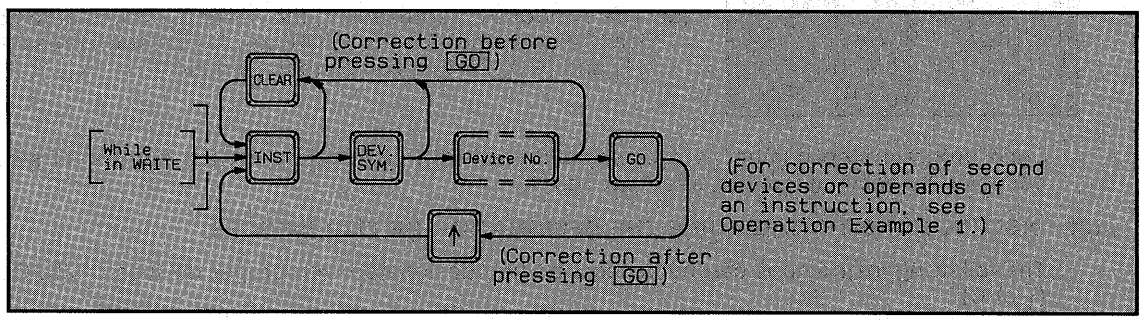
3. ONLINE PROGRAMMING

BASIC WRITING OPERATIONS

(4) CORRECTING KEYED-IN DATA (BEFORE PRESSING [GO])

Use the following procedure to correct keyed-in data.

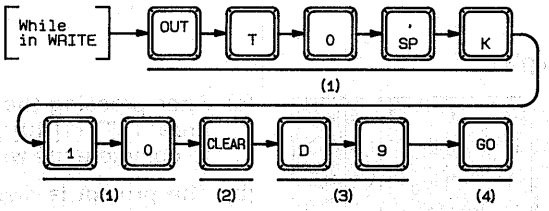
<BASIC OPERATION>



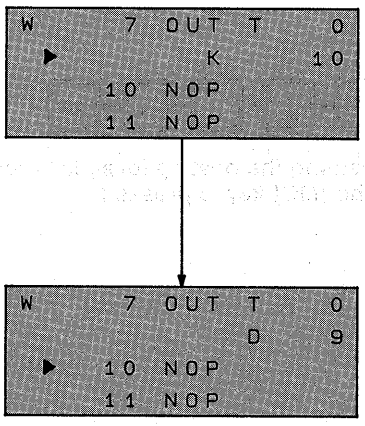
<OPERATION EXAMPLE 1>

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

The following key operation corrects the instruction "OUT T0 K10" to "OUT T0 D9".



Display Example :



Key Operation :

(1) After pressing an instruction key, key in the first and second devices.

(2) Press the [CLEAR] key once to clear the second device.

If the [CLEAR] key is pressed twice, the data beginning at step number 7 can be corrected.

(3) Key in the correct second device.

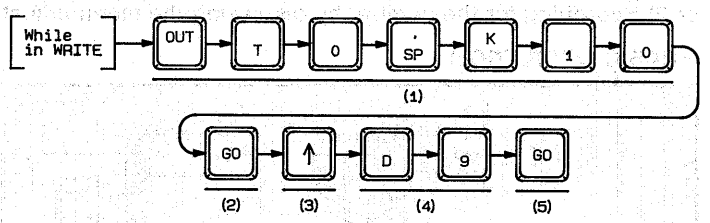
(4) Press the [GO] key to complete the correction.

BASIC WRITING OPERATIONS

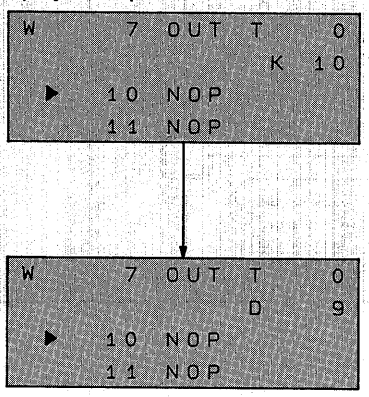
<OPERATION EXAMPLE 2>

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

The following key operation corrects the instruction "OUT T0 K10" to "OUT T0 D9".



Display Example :



Key Operation :

(1) After pressing an instruction key, key in the first and second devices.

(2) Press the [GO] key to complete the operation. The cursor moves to the next step.

(3) Return the line cursor to the "K10" position.

(4) Key in the correct second device.

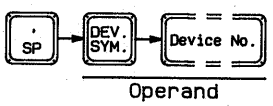
(5) Press the [GO] key to write the keyed-in data.

Note: • *What is an Operand? :*

Briefly, an operand is an element used by an instruction. For example, if you key in the MOV instruction, you must key in the operands as described below :

[MOV D0 D1]
Operand

To key in an operand, always press the [SP] [operand] key to declare that an operand is keyed in.



3. ONLINE PROGRAMMING

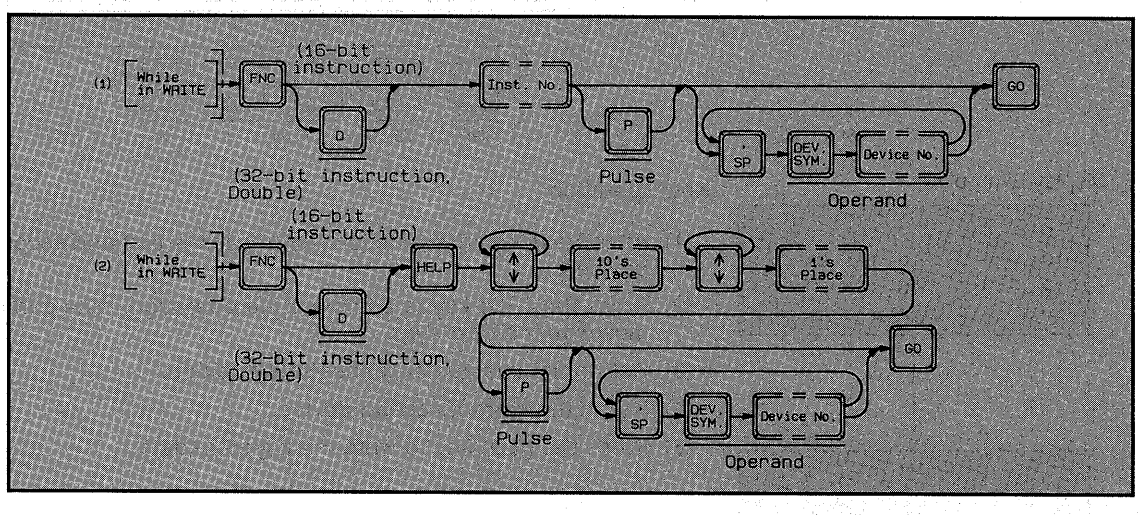
BASIC WRITING OPERATIONS

3.4.2 INPUTTING APPLIED INSTRUCTIONS

If an applied instruction is to be input, use the [FNC] key and an instruction number. There is no device symbol for the instruction number.

An instruction number is input in either of the following methods : 1) Inputting the number directly, or 2) Searching for the number by displaying the menu of instructions with the HELP function.

<BASIC OPERATION>



3. ONLINE PROGRAMMING

BASIC WRITING OPERATIONS

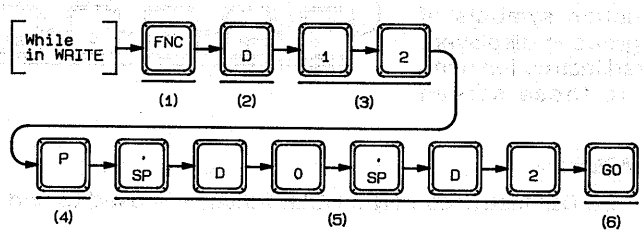
(1) DIRECTLY INPUTTING THE APPLIED INSTRUCTION NUMBER

If you know the applied instruction number, key in that number directly after pressing the [FNC] key.

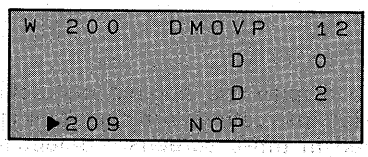
A list of instructions is given in Appendix 1 for reference.

<OPERATION EXAMPLE 1>

To write the "DMOVP D0 D2" instruction



Display :



Key Operation :

(1) Press the [FNC] key.

(2) To key in a 32-bit (D : double) instruction prior to or after keying in the applied instruction number, press the [D] key.

(3) Key in the applied instruction number.

(4) To designate a P (pulse) instruction, press the [P] key after keying in the applied instruction number.

(5) To enter a device, press the [SP] key. Then key in the device symbol and device number.

The instruction symbol of an applied instruction is automatically displayed on the screen along with the instruction number.

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

The HPP cannot write an ASC instruction even though it can be displayed on the screen. Use the A6GPP or A6PHP to write this instruction.

Note: • *Designation of D and P Prefix/Suffix :*

D and P can be input in the order displayed (Operation Example 1) or input by keying in after the instruction number.

D and P themselves can be input in any order.

If you are not sure whether the instruction in question is effective as a D and/or P instruction, press the [HELP] key to display the list of instructions while keying in the instructions. See Note on the next page.

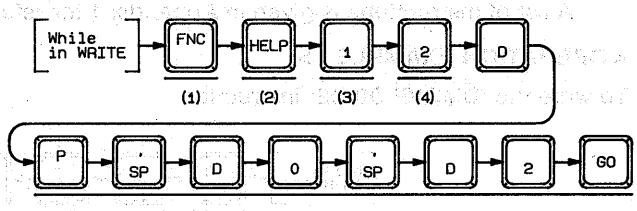
3. ONLINE PROGRAMMING

BASIC WRITING OPERATIONS

(2) INPUTTING AN APPLIED INSTRUCTION NUMBER BY REFERRING TO THE INSTRUCTION MENU DISPLAYED WITH THE HELP FUNCTION

If you are not sure of the applied instruction number, press the [HELP] key after pressing the [FNC] key.

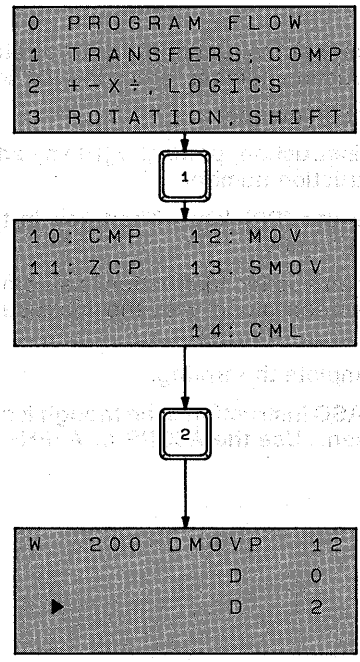
The screen displays the applied instruction classifications. Then the menu of instruction symbols of each selected group is displayed. Input the required instruction number referring to these screen guides.



<OPERATION EXAMPLE 2>

To write the "DMOVP D0 D2" instruction (The HELP function is used to find the applied instruction number.)

Display Example :



Key Operation (as above) :

(1) Press the [FNC] key.

(2) Press the [HELP] key to display the applied instruction classifications. The applied instructions are classified into ten groups and displayed in three screens. Select the screen by pressing the cursor key.

(3) Select the required applied instruction group by its number. The screen changes to display the menu of instruction numbers and instructions corresponding to that selected group. (The group number comes in the 10's place of the instruction numbers.)

The instructions assigned the instruction numbers [ ]0 to [ ]9 are displayed on two display pages. Select the pages with the cursor key.

(4) Select the required instruction symbol by its 1's place number.

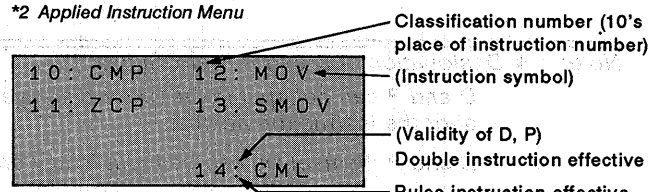
Steps (3) and (4) designate the applied instruction number in two digits.

(5) Follow steps (4), (5), and (6) in Operation Example 1.

Note: **1 Applied Instruction Classifications*

0 Program flow
1 Transfers, comp
2 +-x÷, logics
3 Rotation, shift
4 Data operation
5 High-speed processing
6 Handy instructions
7 External device FX I/O
8 External device FX SER
9 External device F2

**2 Applied Instruction Menu*



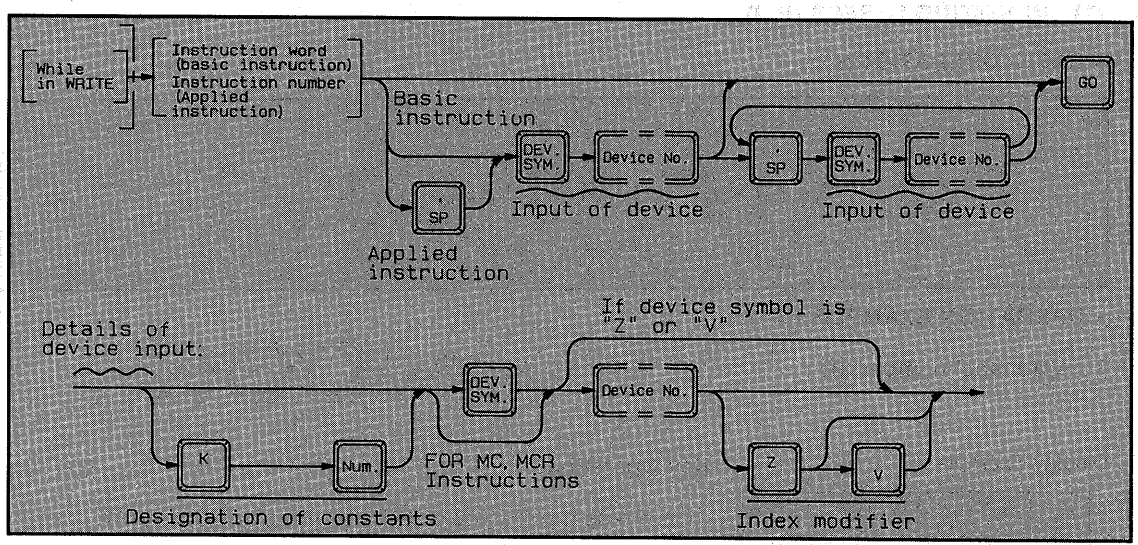
A dot(s) appearing between the instruction number and instruction symbol show the validity of the D/P prefix/suffix. The upper dot indicates the validity of the "D" prefix and the lower dot indicates as the "P" suffix.

BASIC WRITING OPERATIONS

3.4.3 INPUTTING DEVICES

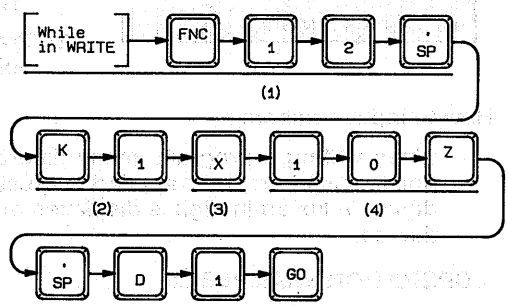
Use the following procedure to input a device.

<BASIC OPERATION>



<OPERATION EXAMPLE 1>

To write the "MOV K1X10Z D1" instruction



Display Example :

```
W    100  MOV      12
          K1X  010Z
            D    1
▶   105  NOP
```

Key Operation :

(1) The applied instruction is entered by its number and its operands are separated by the space key.

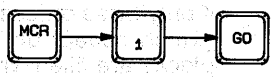
(2) Designate the constants when required.

K1 to K4 is valid for 16-bit instructions and K1 to K8 is valid for 32-bit instructions. "K1" represents 4 bits.

(3) Key in the device symbol.

For the MC (master control) and MCR (master control reset) instructions, symbol "N", representing the nesting level, is automatically displayed. In this case, just key in the device number.

Example : MCR N1



(4) Key in the device number.

An index modifier, Z or V, can be appended to the device number.

3. ONLINE PROGRAMMING

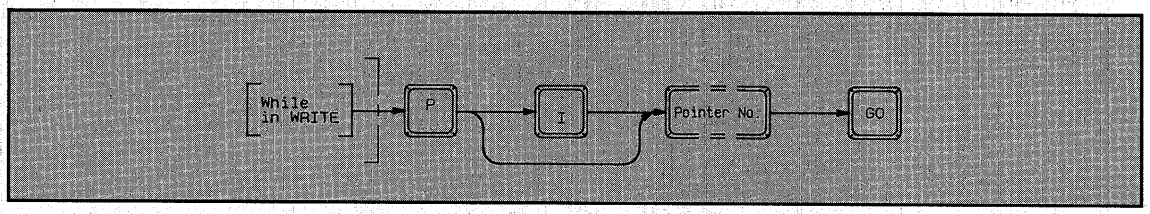
BASIC WRITING OPERATIONS

3.4.4 INPUTTING LABELS AND NUMBERS

P (pointer) and I (interrupt pointer) are used as labels in a sequence program. They can be input in the same manner as inputting an instruction.

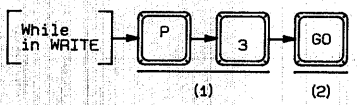
(1) INPUTTING LABELS (P, I)

<BASIC OPERATION>



<OPERATION EXAMPLE 1>

To write label number "3"



Display Example :

```
W    100          P    3
     101  NOP
     102  NOP
     103  NOP
```

Key Operation :

(1) Press the [P] key or [P] and [I] keys. Key in [3].

P and I, used as a label, are handled in the same manner as instruction words.

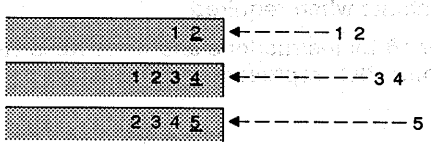
(2) Press the [GO] key to write the keyed-in pointer or interrupt pointer.

How to input numbers :

When writing a program, many different numbers are used (step numbers, device numbers, pointer numbers, and applied instruction numbers). These numbers may contain up to four digits. A keyed-in digit is displayed at the far-right column and the previous input is shifted to the left.

<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.



- 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 specified 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.

- The digits disappeared from the display are not written to memory.

3. ONLINE PROGRAMMING

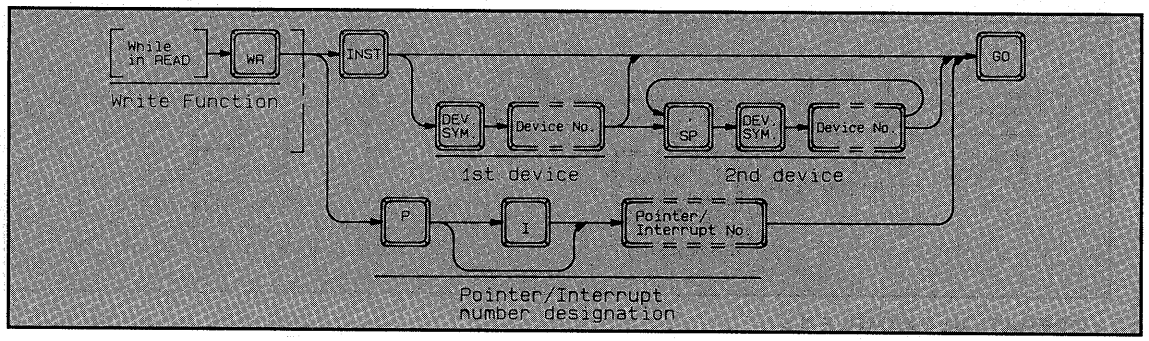
3.5 OVERWRITING EXISTING INSTRUCTIONS

3.5.1 WRITING INSTRUCTIONS AND POINTERS

Allowable PC status : STOP
Usable memory : RAM, EEPROM

Use the following procedure to overwrite a program.

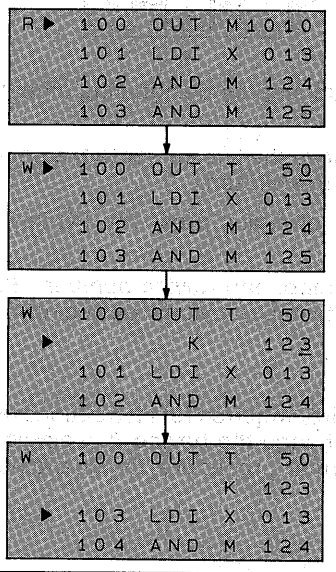
<BASIC OPERATION>

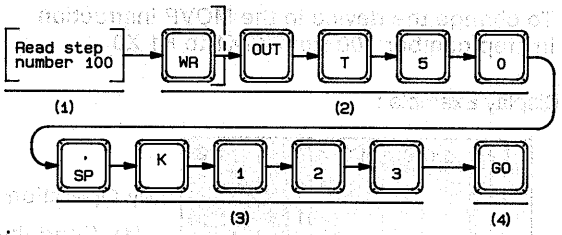


<OPERATION EXAMPLE 1>

Overwrite in step number 100 with "OUT T50 K123".

Display Example :





Key Operation :

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

(2) Press the [WR] key and key in the instruction word, device symbol, and device number in that order.

(3) To write the second device, press the [SP] key and then key in the second device symbol and device number.

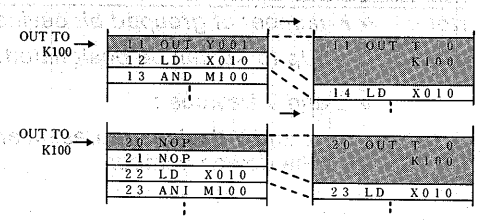
The setting of timers and counters can be changed with the monitor function (for details, see Section 4.7,<OPERATION EXAMPLE 3>).

(4) 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: ● *Step Numbers after Overwriting*

If the number of steps used by the instructions before and after overwriting differ from each other, the ensuing instructions are shifted as illustrated.
When overwriting is made over an NOP instruction, the NOP is deleted and the new instruction is inserted.



3. ONLINE PROGRAMMING

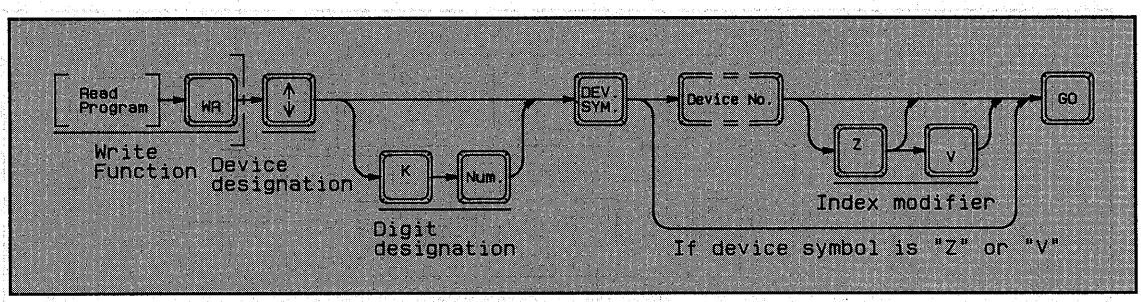
OVERWRITING EXISTING INSTRUCTIONS

3.5.2 WRITING DEVICES

Allowable PC status : STOP
Usable memory : RAM, EEPROM

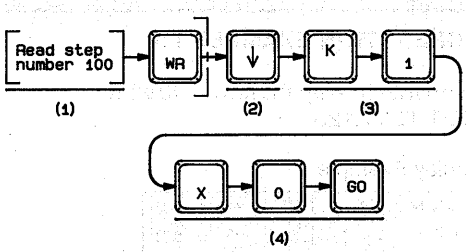
Use the following procedure to change only the device for a designated instruction.

<BASIC OPERATION>

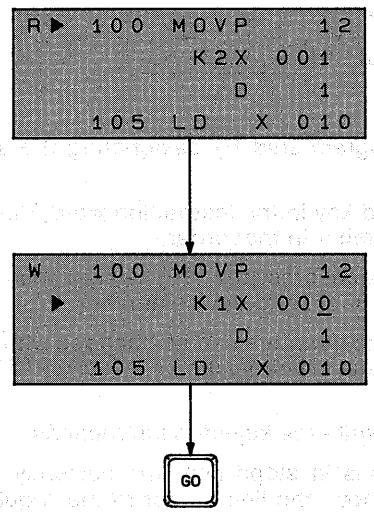


<OPERATION EXAMPLE 1>

To change the device in the MOVP instruction in step number 100 from K2X1 to K1 X0



Display Example :



Key Operation :

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

(2) Press the [WR] key and move the line cursor to the position where the device is to be overwritten.

(3) To designate the number of digits, press the [K] key and input a number.

(4) Key in the new device symbol and device number. Press the [GO] key to overwrite the previous device with the keyed-in device.

Explanation :

(a) This change by cursor is only required for instructions using more than one line. To change the device with single line instructions, use the normal procedure for changing an instruction.

Note: • *K-number of grouped bit devices :*

Up to K8 can be designated. K1 uses 4 bits.

• *Z and V Devices :*

Z and V devices represent an index register. The index register is used as a modifier to the device number.

3. ONLINE PROGRAMMING

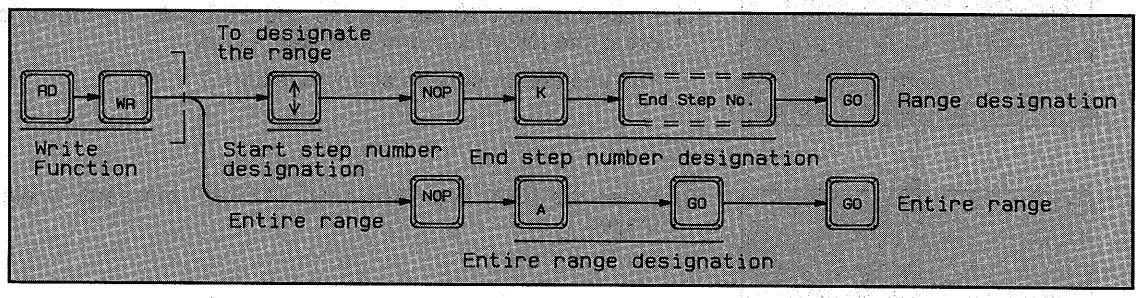
OVERWRITING EXISTING INSTRUCTIONS

3.5.3 BATCH WRITING NOP INSTRUCTIONS

Allowable PC status : STOP
Usable memory : RAM, EEPROM

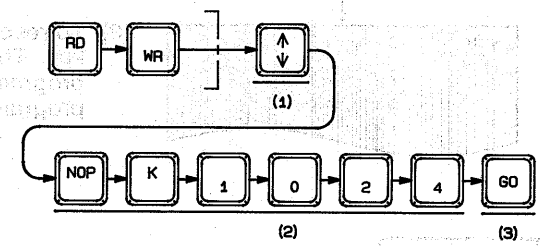
Use the following procedure to batch-write NOP instructions within a designated range.

<BASIC OPERATION>

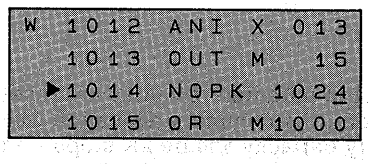


<OPERATION EXAMPLE 1– RANGE DESIGNATE>

To batch write NOP instructions from step number 1014 to step number 1024



Display Example :



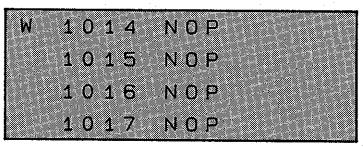
Key Operation :

(1) Press the [RD/WR] key twice to select the write function and move the line cursor to 1014.

It is not possible to write on the line that has not been assigned a step number.

(2) Press the [NOP] key and then the [K] key. Key in [1] [0] [2] [4], the end step number of the range.

(3) Press the [GO] key to batch write the NOP instruction in the designated range. If the designated end-step number lies in the middle of an instruction, the whole of this instruction is cleared with NOP's.



IMPORTANT

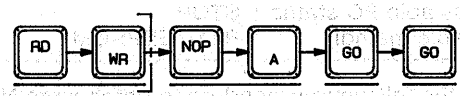
Instructions can be written to both the RAM and the EEPROM. However, it is advised that instructions should first be written to the RAM and then transferred to the EEPROM (for details, see Page 64).

3. ONLINE PROGRAMMING

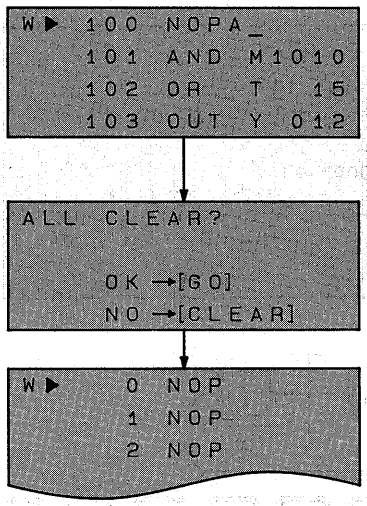
OVERWRITING EXISTING INSTRUCTIONS

<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).

IMPORTANT

When a NOP instruction is written to every program step, all the parameters values are reset to the default settings. Latch elements are also reset. Therefore, the comment allocation will be 0 blocks, file register allocation will be 0 blocks, and memory capacity will be 2K steps (in the offline mode or online mode when there is not any memory cassette installed). If a memory cassette is installed, the memory capacity is defaulted to the maximum memory cassette capacity.

Note: ● *The following devices can be used in a latched manner :*

(1) M (Auxiliary relays)
(2) S (State)
(3) T (Timers)
(4) C (16-bit counters)
(5) C (32-bit counters)
(6) D (Data registers)
(7) D (File registers)

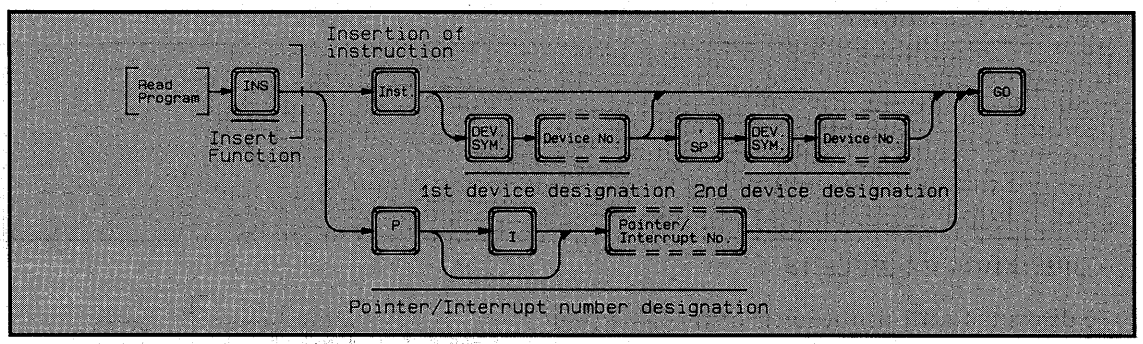
3. ONLINE PROGRAMMING

3.6 INSERTING

Allowable PC status : STOP
Usable memory : RAM, EEPROM

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

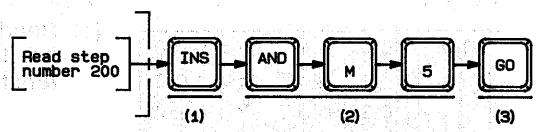
<BASIC OPERATION>



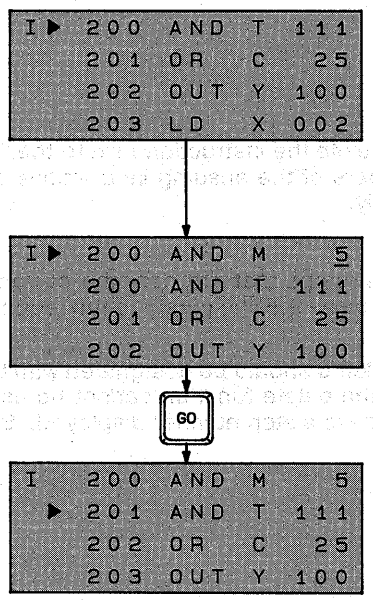
<OPERATION EXAMPLE 1>

To insert "AND M5" instruction at step number 200

Key Operation :



Display Example :



(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.

The insertion function cannot be used for a line that does not have a step number displayed.

(2) Key in the instruction word, device symbol and device number, or pointer symbol and pointer 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 will be displayed.

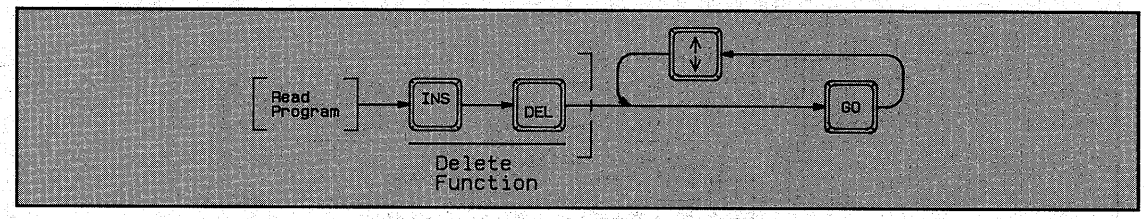
3.7 DELETING

3.7.1 DELETING INSTRUCTIONS

Allowable PC status : STOP
Usable memory : RAM, EEPROM

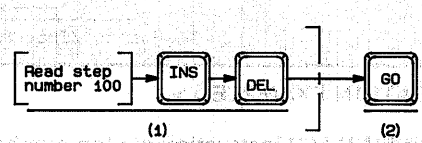
Use the following procedure to delete the instructions one-by-one.

<BASIC OPERATION>

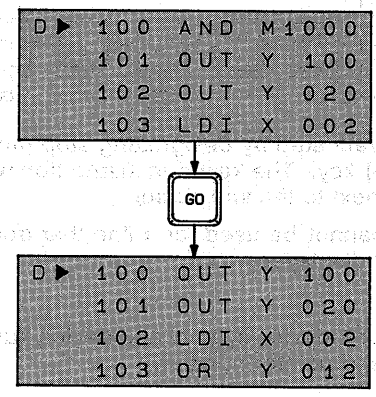


<OPERATION EXAMPLE 1>

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 in steps that are near the currently displayed step number, move the line cursor to the required step number.

(b) The instruction to be deleted should be designated with the line cursor. However, the delete function cannot be used for a line that does not have a step number displayed. See *Note* below.

Note: • *If the line cursor is on a line that is not assigned a step number and an attempt is made to delete an instruction on that line, the "OPERATION ERROR" message is displayed. The instruction will not be deleted.*

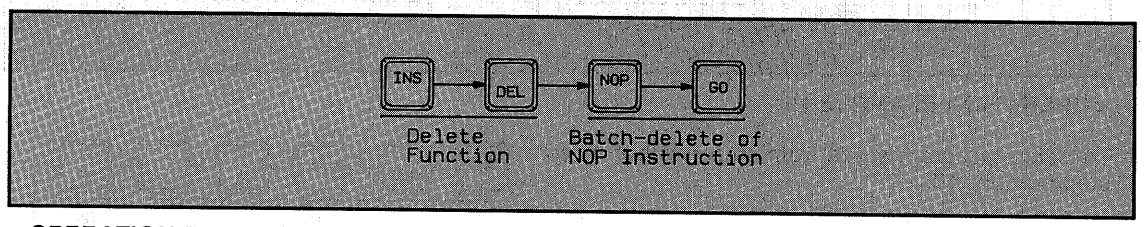
DELETING

3.7.2 BATCH DELETING NOP INSTRUCTIONS

Allowable PC status : STOP
Usable memory : RAM, EEPROM

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.

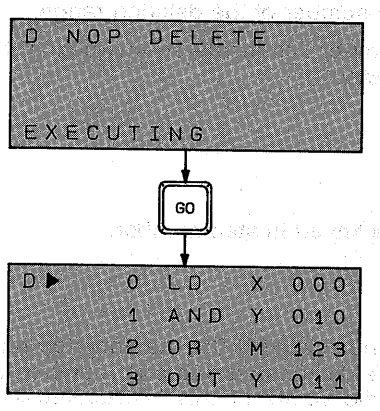
<BASIC OPERATION>



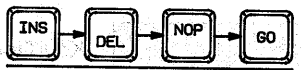
<OPERATION EXAMPLE 1>

To batch delete NOP instructions

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.

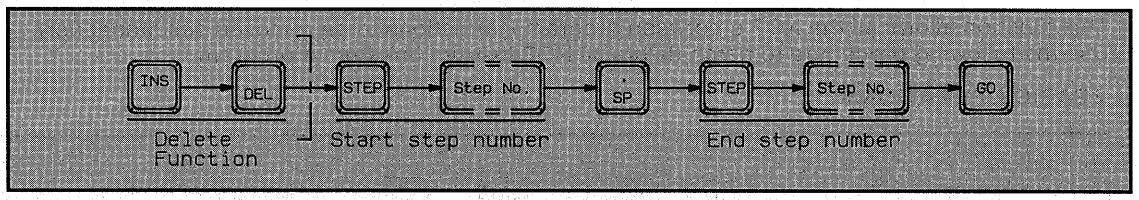
(b) After all NOP instruction steps have been deleted, the step numbers are reassigned automatically.

DELETING

3.7.3 DELETING PROGRAM STEPS BY DESIGNATING A RANGE

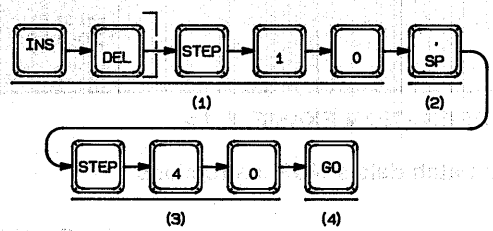
Use the following procedure to delete program steps within a designated range.

<BASIC OPERATION>

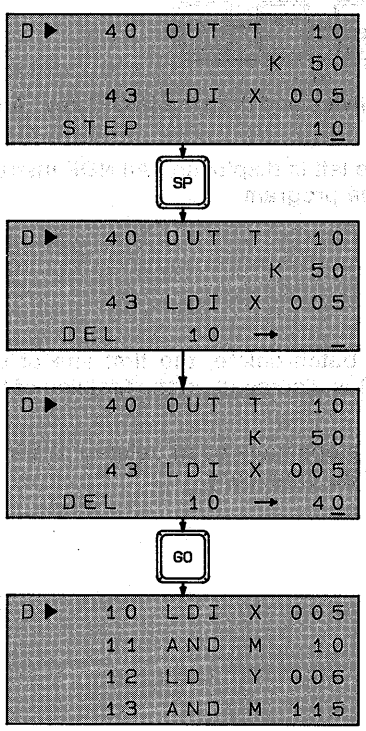


<OPERATION EXAMPLE 1>

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.

If the keyed in step number lies inside an instruction, the entire instruction is deleted.

(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. If the designated end-step number lies inside an instruction, the whole of this instruction is included in the deletion.

In the Operation Example, even though 40 has been designated as the end-step number, the end result of the deletion is that steps up to 42 is deleted. The instruction of step number 43 is not deleted.

(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 :*

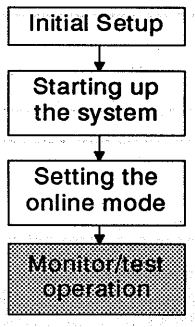
Press the [CLEAR] key before pressing the [GO] key. The first time the [CLEAR] key is pressed, the end step number is cleared. The second time the [CLEAR] key is pressed, the start step number is cleared.

4. ONLINE MONITOR/TEST

4.1 FUNCTION OVERVIEW

4.1.1 BASIC MONITOR/TEST PROCEDURE

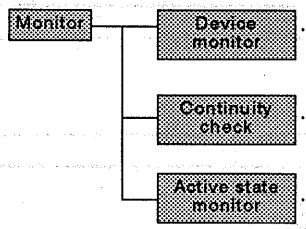
The following procedure is used to perform the online mode monitor/test.



- Initial Setup ..... Connect the HPP to PC (for details, see Section 1.4.2).
- Starting up the system ..... Turn ON the power to the PC or reset the HPP ([RST] + [GO]) (for details, see Section 7.1).
- Setting the online mode ..... Press [GO] with the mode select screen displayed to select the online mode (for details, see Section 7.4).
- Monitor/test operation ..... Check and confirm the program by using the monitor/test function.

4.1.2 MONITOR

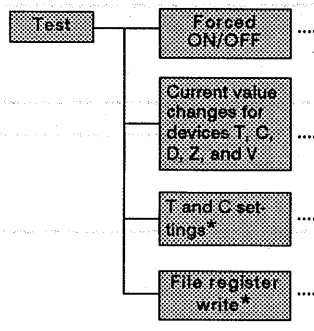
The monitor function allows you to check the operation and control state of the PC with the HPP screen.



- Device monitor ..... The ON/OFF status of a designated device, T, C, and D settings or current value, and file registers can be monitored.
- Continuity check ..... A program is read to monitor contact continuity and coil operation.
- Active state monitor ..... Transfer of state elements can be checked by automatically displaying active states in a priority of low to high state number.

4.1.3 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.



- Forced ON/OFF ..... A designated device can be forcibly turned ON or OFF by operating the HPP to change the image memory.
- Current value changes for devices T, C, D, Z, and V ..... The current value of devices T, C, D, Z, and V can be changed.
- T and C settings* ..... The settings of devices T and C can be changed (changes the program memory setting).
- File register write* ..... Numerical values can be written to file registers.

* These operations are only effective to RAM memory during the RUN state. RAM and EEPROM (memory protect switch set to OFF) are valid during the STOP state.
The EPROM cassette memory cannot be overwritten by these operations.

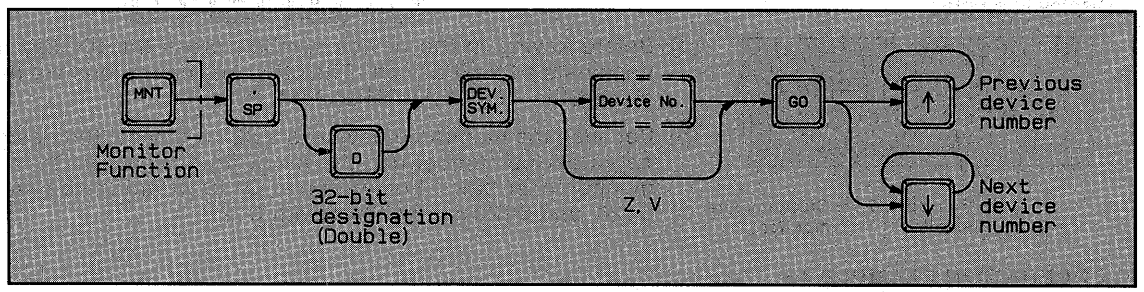
4. ONLINE MONITOR/TEST

4.2 DEVICE MONITOR

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

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>

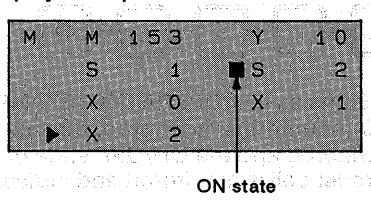


<OPERATION EXAMPLE 1>

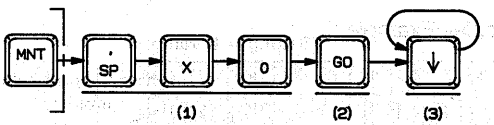
To monitor X0 and the succeeding devices in order

[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 and 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).

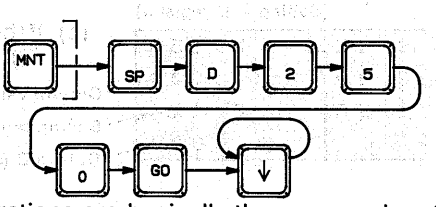
(3) Use the [↑] and [↓] keys to monitor the ON/OFF state of preceding and succeeding devices.

The screen can display the ON/OFF state for up to 8 devices. Different devices can be monitored on one screen.

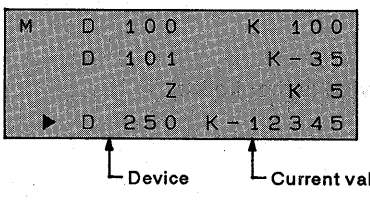
<OPERATION EXAMPLE 2>

To monitor D250 and the succeeding devices in order

[Device : D, Z, V (16 bits)]



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.

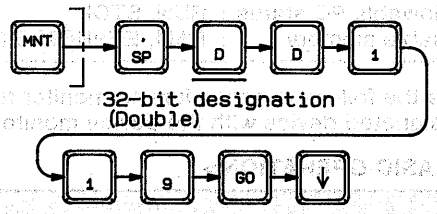
4. ONLINE MONITOR/TEST

DEVICE MONITOR

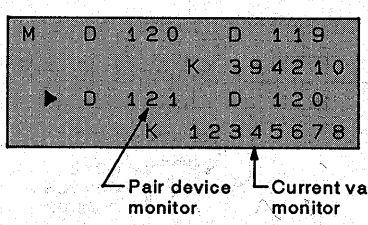
<OPERATION EXAMPLE 3>

To monitor the device succeeding devices which are already monitored in pair (D119 and D120)

[Device : D, Z (32 bits)]



Display Example :



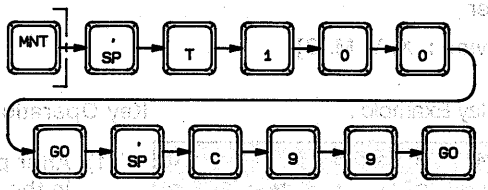
(a) Before keying in the device symbol, press the [D] key to designate a 32-bit device. The other key operations are the same as in <OPERATION EXAMPLE 1>.

(b) Because the monitored device is a 32-bit device, the designated device number and the following device number are monitored in pair. For example, D119 is monitored with D120, and D120 is monitored with D121.

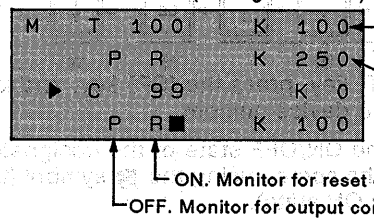
<OPERATION EXAMPLE 4>

To monitor T100 and C99

[Device : T, C (16 bits)]



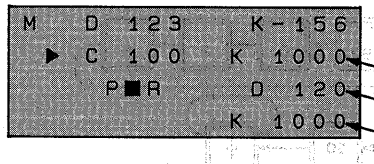
Display Example : (Setting = K value)



(a) Use the same key operations as in <OPERATION EXAMPLE 1>. When T (timer) or C (counter) is monitored, the current and setting data are monitored and the ON/OFF state of the output contact and the reset coil is monitored and indicated with the " ■ " symbol.

With non-retentive timers, there is no need for a reset coil. When this reset coil is not programmed, the "R" on the monitor screen is not effective.

Display Example : (Setting = D register)



(b) If the T/C setting is designated indirectly with a data register (D), the monitor screen will be as shown on the left.

(c) If the screen becomes full, it will scroll up when the next device is monitored.

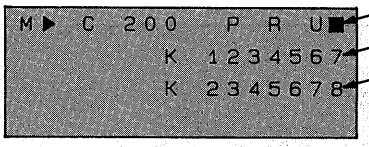
4. ONLINE MONITOR/TEST

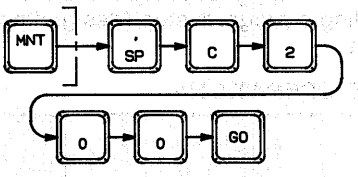
DEVICE MONITOR

<OPERATION EXAMPLE 5>

To monitor C200 (32-bit counter)

Display Example :

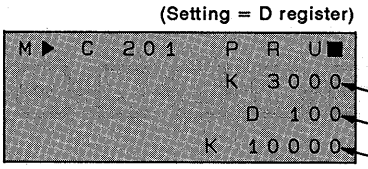




(a) Use the same key operations as in <OPERATION EXAMPLE 1>. The current value and the setting to be monitored are of 32-bits.

(b) The monitored contents are basically the same as those monitored in <OPERATION EXAMPLE 3>. In addition, the up/down mode of counter are also monitored. (■ indicates UP)

Display Example :



(c) If the C200 setting is designated indirectly with a data register (D), the monitor screen will be as shown to the left.

(d) The monitored current value can be displayed as decimal data or hexadecimal data by pressing the [HELP] key.

Decimal data : KΔ to Δ

Hexadecimal data : Hoooo (16 bits)
Hooooooo (32 bits)

Note: • *Direct Designation :*

The numerical value designated as constant K (decimal) is handled as the setting. Only a decimal setting is possible for constant K. The allowable setting ranges are as follows :

16 bits : –32768 to 32767

32 bits : –2147483648 to 2147483647

• *Indirect Designation :*

The setting is designated by a data register (D) number. For example, if the designation is "D10" and the data set for D10 is "123", it can be regarded as the setting "K123". However, the data in the data register (D) will be lost if the battery voltage drops below the allowable limit, even if that data register is backed up by the back-up battery.

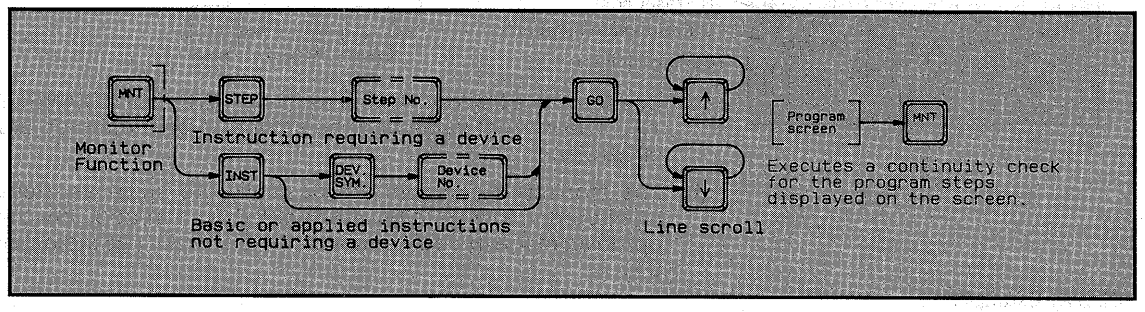
4. ONLINE MONITOR/TEST

4.3 CONTINUITY CHECK

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

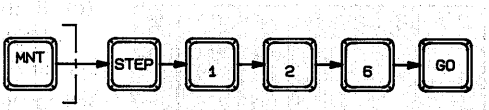
Use the following procedure to monitor the circuit continuity and coil operation of a designated device by reading a program step (designated by the step number or instruction) with the continuity check function.

<BASIC OPERATION>

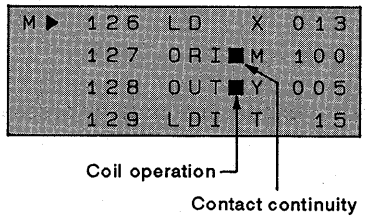


<OPERATION EXAMPLE 1>

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.

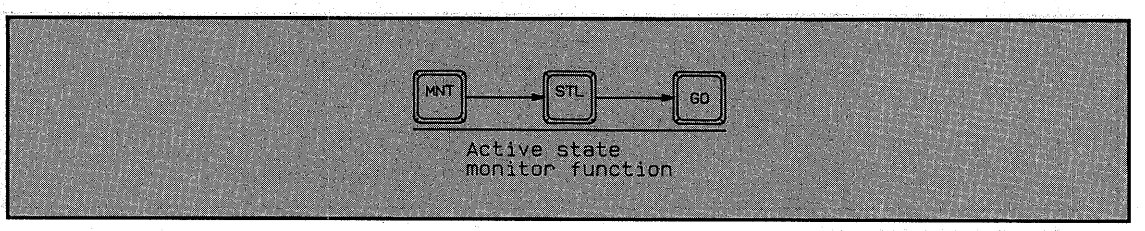
4. ONLINE MONITOR/TEST

4.4 ACTIVE STATE MONITOR

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

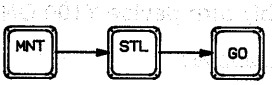
Use the following procedure to monitor the active state of up to 8 points beginning with the lowest active state number when step ladder instructions are used.

<BASIC OPERATION>

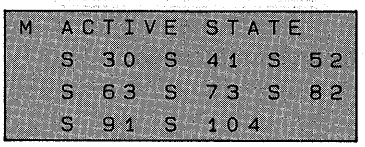


<OPERATION EXAMPLE 1>

Monitoring the active state



Display Example :

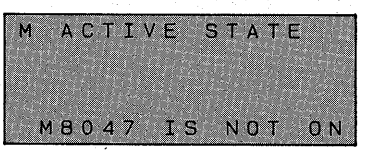


(a) Press the [MNT] key, then the [STL] key, and then the [GO] key. The screen displays the state of up to 8 currently operating states, beginning with the lowest state number.

(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.

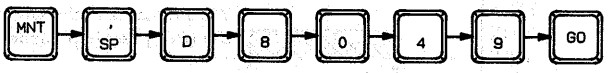
(c) The range of monitorable states is : S0 to S899.
S900 (annunciator) and further states are ignored.

Display Example :



(d) The active state monitor function is not effective unless special auxiliary relay M8047 is set to the ON state.

ANNUNCIATOR MONITOR



The lowest number operating in the S900 to S999 range can be monitored with the procedure described above when M8049 is set to ON. If they are all OFF, –1 is displayed.

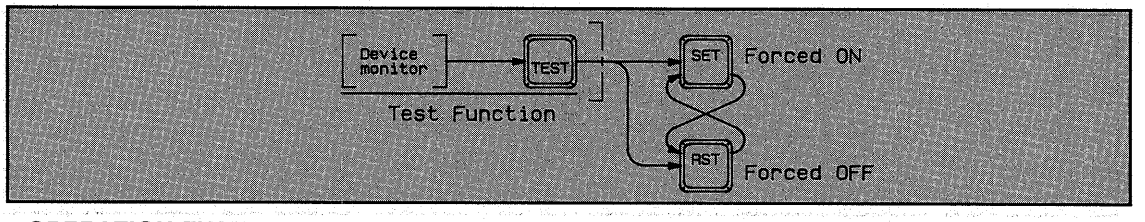
4. ONLINE MONITOR/TEST

4.5 FORCED ON/OFF

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

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.

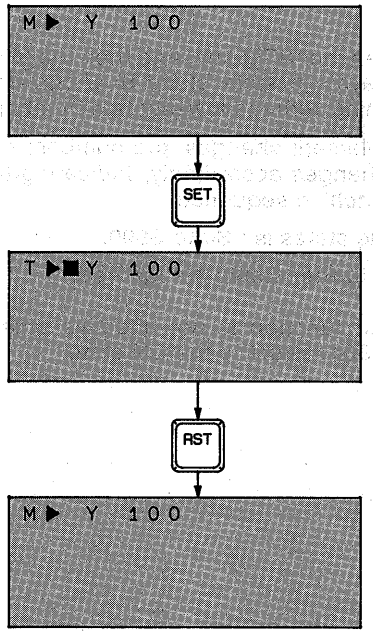
<BASIC OPERATION>

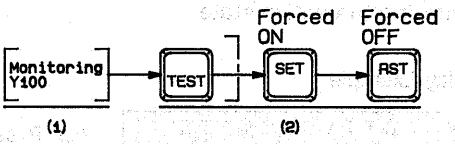


<OPERATION EXAMPLE 1>

To forcibly turn device Y100 ON/OFF

Display Example :





Key Operation :

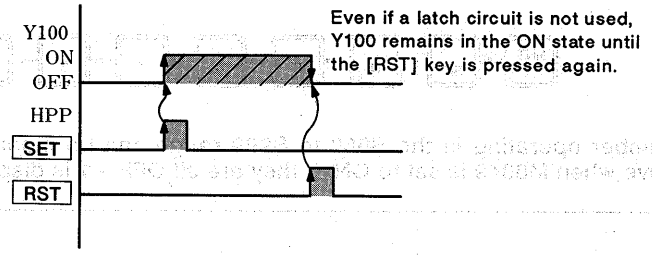
(1) Monitor the device with the monitor function.

(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 :*



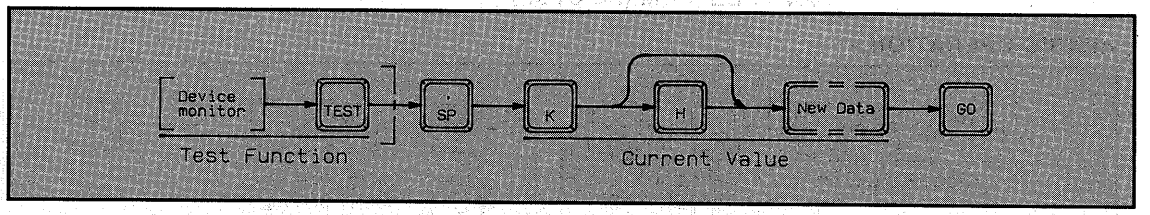
4. ONLINE MONITOR/TEST

4.6 T, C, D, Z, V DATA CHANGE

Allowable PC status : STOP, RUN (under certain condition)
Usable memory : RAM, EEPROM, EPROM

Use the following procedure to change the data of devices T, C, D, Z and V by accessing the test function after the monitor function.

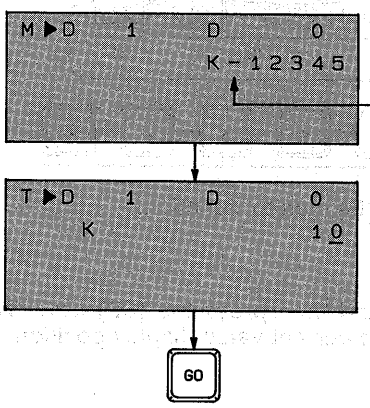
<BASIC OPERATION>



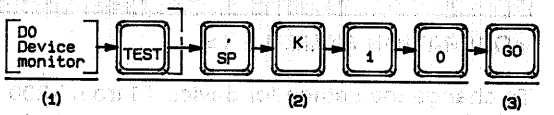
<OPERATION EXAMPLE 1>

To change the current value of the 32-bit counter setting registers (D1, D2) from K-12345 to K10

Display Example :



Key Operation :



(1) Monitor the device with the monitor function.

(2) Press the [TEST] key and then the [SP] key. Designate decimal or hexadecimal and set the new data.

[K] : Decimal

[K] [H] : Hexadecimal

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

The current value can be displayed as decimal data or as hexadecimal data by pressing the [HELP] key.

Use this mode to write data into the file register.

Only RAM memory is effective during PC RUN, but both the RAM and EEPROM memories are valid during PC STOP.

The current value of device T, C, D, Z, or V is not stored in the memory area unlike the file register so that they can be changed regardless of the PC status (RUN or STOP) or program memory type.

Note: ● *Writing to File Register :*

File register is allocated in the program memory (RAM, EEPROM, EPROM) in units of 500 points. Up to 2,000 points can be allocated by the appropriate parameter settings.

File registers can be used by designating data registers D1000 to D2999 (for details, see Section 5.5).

4. ONLINE MONITOR/TEST

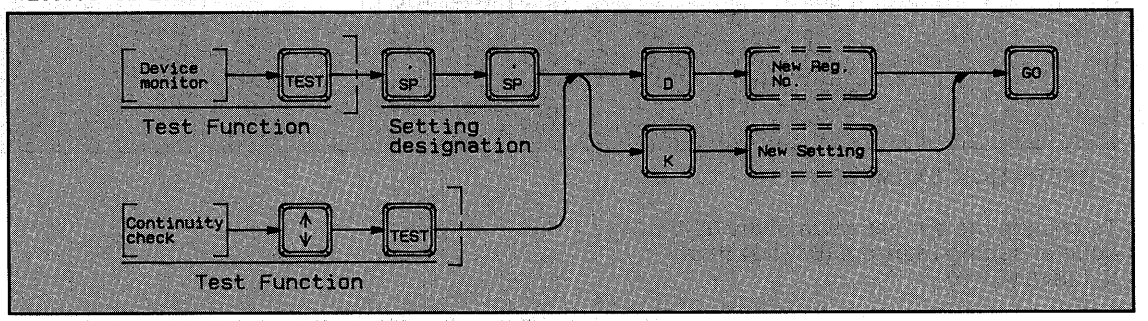
4.7 T, C SETTING CHANGE

Allowable PC status : STOP, RUN (under certain condition)
Usable memory : RAM, EEPROM

Use the following procedure to change the settings for devices T and C with the test function via the continuity check monitor function.

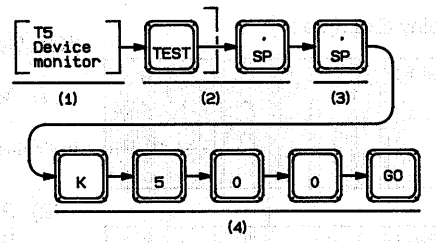
Valid memory types : RAM (PC RUN)
RAM or EEPROM (PC STOP)

<BASIC OPERATION>

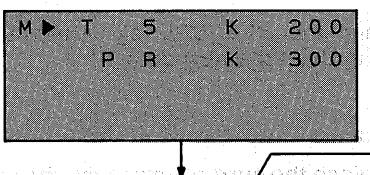


<OPERATION EXAMPLE 1>

To change the setting for device T5 from K300 to K500

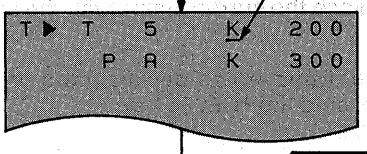


Display Example :



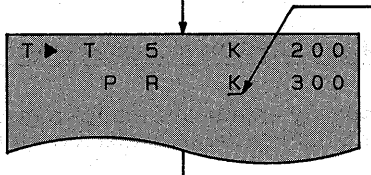
Key Operation :

(1) Monitor the device with the monitor function.



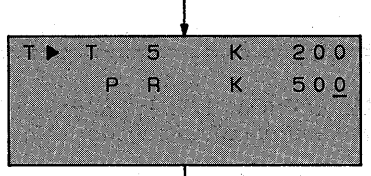
Prompt

(2) Press the [TEST] key and then press the [SP] key. The prompt will appear at the current value display position.



Prompt

(3) Press the [SP] key again. The prompt moves to the setting display position.



(4) Key in a new setting and press the [GO] key to replace the current value with the new data.

Explanation :

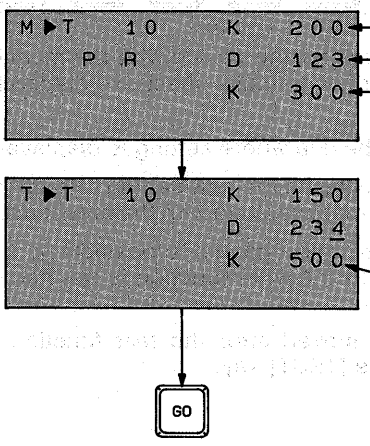
(a) This operation changes the setting for the first OUT T or C instruction of the monitored device in the program. In the case where there are many out coils of the same device, changing of the setting of a specific coil should be made by first searching for the desired coil by using the continuity check function (for more details see <OPERATION EXAMPLE 3>).

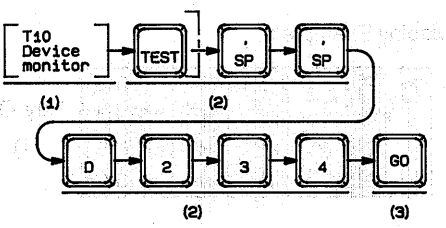
T, C SETTING CHANGE

<OPERATION EXAMPLE 2>

To change the setting of the device T10 from D123 to D234

Display Example :





Key Operation :

(1) Monitor the device with the monitor function.

(2) Press the [SP] key twice. The prompt will move to the display position for the data register number where the setting is stored. Key in the new data register number.

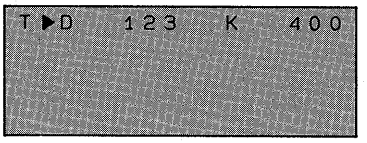
(3) Press the [GO] key to replace the current value register number with the new register number.

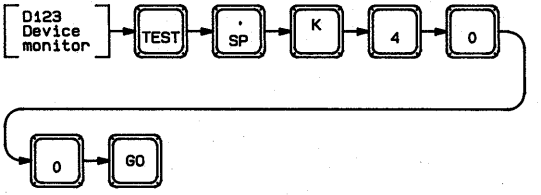
* To change the data in D :

To change the data in D, execute the current value monitor/test operation for this D device (for details, see Section 4.6).

To change the data set for device D123 from K300 to K400

Display Example :





4. ONLINE MONITOR/TEST

T, C SETTING CHANGE

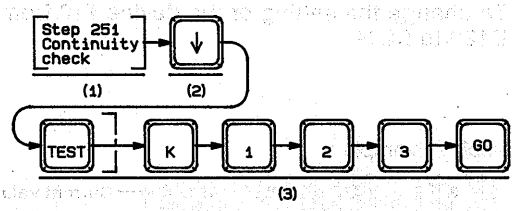
<OPERATION EXAMPLE 3>

Changing the setting of the OUT T instruction in step number 251 from K1234 to K123

Display Example :

```
M  251  OUT  T    50
 ▶          K  1234
  254  LDI  M   135
  255  AND  M   136
```

```
T  251  OUT  T    50
           K   123
 ▶254  LDI  M   135
  255  AND  M   136
```



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.

For timers and counters, this change is possible in the monitor function. Entry to the write function is not necessary.

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

Note: • *Line Cursor :*

The line cursor moves in units of devices in the device monitor function. It scrolls in units of lines in the continuity check function.

5. ONLINE MODE MENUS

5.1 BASIC PROCEDURE

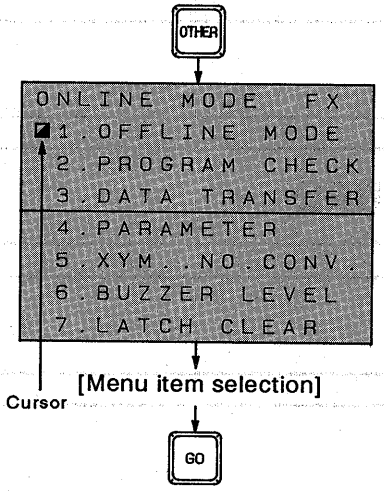
5.1.1 BASIC DISPLAY PROCEDURE OF MENU SCREENS

Use the following procedure to display the online mode menu screen.

Initial Setup	.....	Connect the HPP to PC (for details, see Section 1.4.2).
Starting up the system	.....	Turn ON the power to the PC or reset the HPP ([RST] + [GO]) (for details, see Section 7.1).
Setting the online mode	.....	Press [GO] with the mode select screen displayed to select the online mode (for details, see Section 7.4).
Mode Menu Screen	.....	Press the [OTHER] key to display the mode menu screen. The following functions are available : mode change, program check, data transfer to memory cassette, parameter setting, device number conversion, buzzer volume adjustment, and latch clear (mode menu screen)

5.1.2 ONLINE MODE MENU SCREEN

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



(1) The ONLINE MODE includes seven items as shown on the left.

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

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.

5. ONLINE MODE MENUS

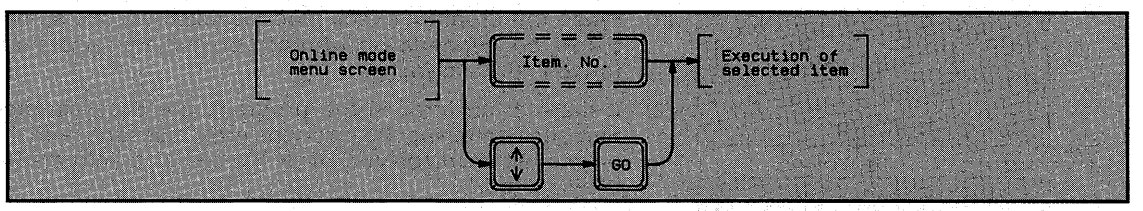
5.2 MODE CHANGE

Details on online mode menu screen are explained below.

5.2.1 SELECTION PROCEDURE OF ITEMS ON THE MENU

The following procedure is used to select a menu item from the online mode menu screen.

<BASIC OPERATION>



When the online mode menu screen is displayed, an item can be accessed by either keying in the desired item number or moving the cursor to the required item and pressing the [GO] key.

5.2.2 CHANGING TO THE OFFLINE MODE

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

The following procedure is used to change from online mode to offline mode.

Display :

```
1.OFFLINE MODE
EXECUTE?
    OK  →  [GO]
    NO  →  [CLEAR]
```

(1) Press the [GO] key to change from online mode to offline mode.

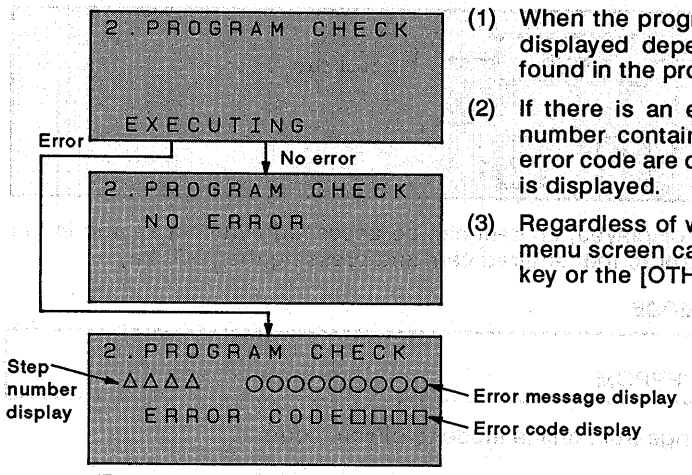
(2) Press the [CLEAR] key to return to the mode menu screen.

5. ONLINE MODE MENUS

5.3 PROGRAM CHECK

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

Display :



(For error messages and error codes, see Appendix 4.)

(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.

(4) If there is an error, clearing it will automatically reset special auxiliary relay M8068 and special data register D8068 (for details, see Section 4.5 and 4.6). If other errors remain, the next error code is stored.

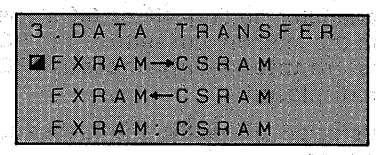
5. ONLINE MODE MENUS

5.4 DATA TRANSFER

Allowable PC status : STOP
Usable memory : RAM, EEPROM, EPROM (under certain condition)

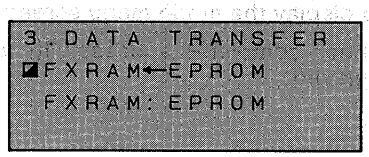
Use the following procedure to transfer programs and parameters between the RAM in the PC and the memory cassette installed in the PC. After transferring data, verify the data of both memory areas.

Display 1 :



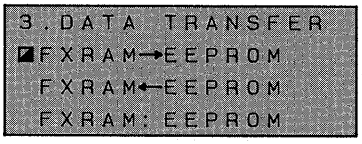
1) Transferring programs and parameters from the PC (FX) RAM to the CSRAM cassette. (N.B. CSRAM is cassette RAM)
2) Transferring programs and parameters from the RAM cassette to the PC (FX) RAM.
3) Verifying programs and parameters in PC (FX) RAM and the RAM cassette.

Display 2 :



1) Transferring programs and parameters from the EPROM cassette to the PC (FX) RAM.
2) Verifying programs and parameters in the PC (FX) RAM and the EPROM cassette.

Display 3 :



1) Transferring programs and parameters from the PC (FX) RAM to the EEPROM cassette.
2) Transferring programs and parameters from the EEPROM cassette to the PC (FX) RAM.
3) Verifying programs and parameters in the PC (FX) RAM and the EEPROM cassette.

(1) Use the [↑] and [↓] keys to move the cursor to make the selection from the menu and then press the [GO] key.

(2) The messages displayed on the screen differ depending on the type of memory cassette used (PC (FX) RAM, EPROM, EEPROM). However, the operation procedure for each memory type is identical. The procedure is described with Display 4.

(3) Set the EEPROM cassette memory protect switch to the OFF position to execute an FX-RAM → EEPROM data transfer operation.

Note: • *CSRAM :*

This is the RAM cassette memory installed in the PC. The name "CSRAM" is used to distinguish it from the RAM in the PC (FX-RAM). Data transfer and verification between FX-RAM and CSRAM is valid for only 2K step settings.

• *Verify Error :*

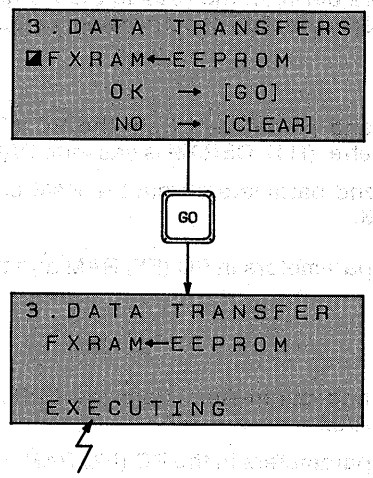
If an error is found in the parameter verification, the "VERIFY ERROR" message is displayed with the mismatch setting.

5. ONLINE MODE MENUS

DATA TRANSFER

Display 4 :

(Press the [GO] key after moving the cursor to FX-RAM ← EEPROM)



The message "COMPLETED" will be displayed.

(1) Press the [CLEAR] key to display the mode menu screen (Display 1 to Display 3) corresponding to the memory type used by the PC.

(2) A program made with parameter setting 4K or 8K steps cannot be transferred from the memory cassette to the PC (FX) RAM. If this data transfer is attempted, "PC PARA.ERROR" message is displayed.

(3) After data has been transferred correctly, the message "COMPLETED" will be displayed.

(4) Press the [CLEAR] key to display the data transfer menu screen (Display 1 to Display 3).

(5) Press the [OTHER] key to display the mode menu screen.

(6) If the operation has not been completed successfully, an error message will be displayed.

EFFECTIVE USAGE OF MEMORY CASSETTES

Ideal Usage of Memory Cassettes :

If you're using a PC with an EEPROM as the memory cassette for online programming, the program is written directly into the EEPROM. The EEPROM requires more time to write the instructions than the RAM. This, in turn, makes program insertion and deletion time longer. More importantly, you can only write to the EEPROM 10,000 times.

Therefore, if a program is less than 2K steps, it's better to write the program to the PC (FX) RAM and then transfer it to the EEPROM later.

If the program exceeds 2K steps, write it in the offline mode.

Backup and Master :

Write a program to the EEPROM cassette and keep it as the "master". When you want to run the program, transfer it from the EEPROM cassette to the PC. Once transferred, further modifications can also be carried out.

If the program is less than 2K steps, program in the online mode. If the program is more than 2K steps, program in the offline mode.

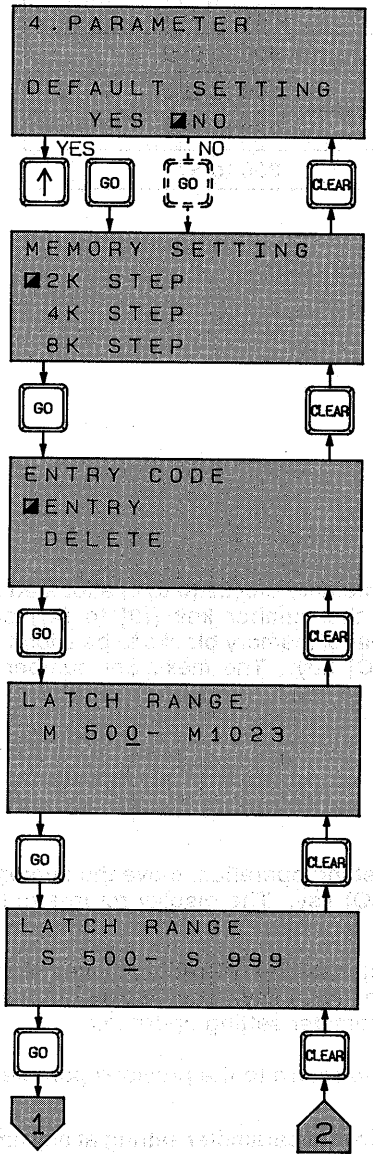
5. ONLINE MODE MENUS

5.5 PARAMETERS

Allowable PC status : STOP
Usable memory : RAM, EEPROM

Use the following procedure to set the parameters (default values, memory capacity, latch range, file register setting, and entry code registration).

Display :



(1) Move the cursor to "YES" and press the [GO] key to set the parameters to their default values. If you do not wish to set to the default values, press the [GO] key with the cursor located at "NO".

The steps indicated below explain what to do after selecting "YES".

(2) To change the memory capacity setting, move the cursor to the required memory capacity step and press the [GO] key.

(3) To register an entry code, move the cursor to "ENTER". Key in the new entry code and press the [GO] key (default : entry code not registered). If the registered entry code need not be changed, just press the [GO] key.

(4) To delete a registered entry code move the cursor to "DELETE". Key in the registered entry code and press the [GO] key.

(5) For more details on entry codes, see Section 7.

(6) To change the latch range, key in the device number and press the [GO] key.

Note that both numbers of the device range can be changed. The latch range screen displays the currently set latch range.

(7) If the latch range need not be changed, just press the [GO] key.

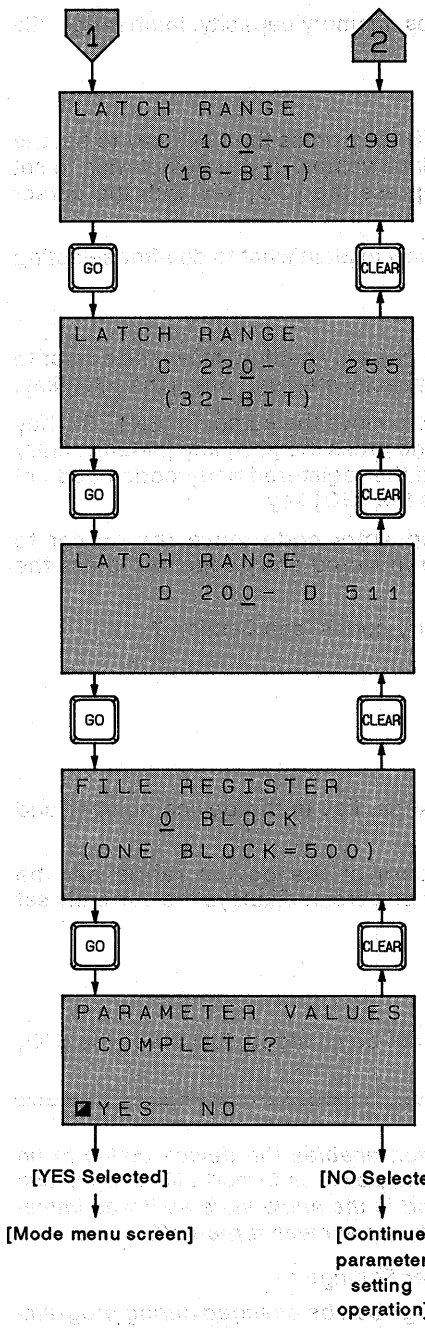
Note: • *Latch :*

The latch function enables the device status to be retained when the power is turned off. The PC can then be restarted in the same state as it was immediately before the power was turned off.

• *Changing Parameter Settings :*

Parameter settings can be changed during programming. You can begin programming without setting parameters (i.e., using the defaults) and then set the parameters later.

PARAMETERS



(8) The latch range default settings are the maximum settings.

Latch Range List

Device	Latch Range
M	500 to 1023
S	500 to 999
C (16 bit)	100 to 199
C (32 bit)	220 to 255
D	200 to 511

(9) To input the number of memory blocks (0 to 4) allocated for file registration, press the number key ([0] to [4]) corresponding to the number of memory blocks to be allocated and then press the [GO] key. The maximum number of blocks is "4".

(10) To end the parameter setting operation, move the cursor to "YES" and press the [GO] key. The display returns to the mode menu screen.

To continue the parameter setting operation, move the cursor to "NO" and press the [GO] key. The display returns to the initial screen for parameter setting operation.

(11) Press the [CLEAR] key to return to the previous parameter setting screen.

(12) Press the [OTHER] key to end parameter setting at any time. The display will return to the mode menu screen.

* If no settings are changed, press the [GO] key for each screen.

5. ONLINE MODE MENUS

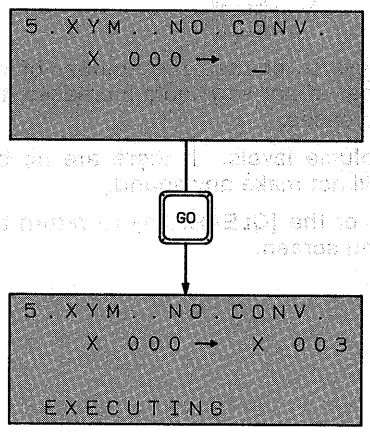
5.6 XYM... NUMBER CONVERSION

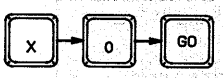
Allowable PC status : STOP
Usable memory : RAM, EEPROM

Use the following procedure to change device numbers. When the device number conversion operation is executed, all corresponding devices in the entire program memory area are changed to the set device number (even instructions written after the END instruction).

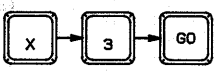
Display :

(To convert device X0 to device X3)





(1) Key in the device and the device number to be changed and press the [GO] key.



(2) Key in the new device symbol and number that will replace the previously keyed in device and then press the [GO] key.

(3) Press the [CLEAR] key to clear the device and device number (source or destination). The [CLEAR] key can only clear keyed-in data that has not been entered by the [GO] key.

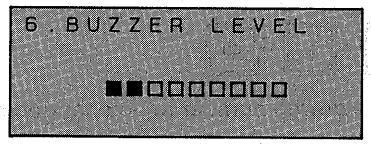
5. ONLINE MODE MENUS

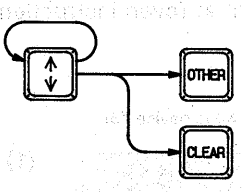
5.7 BUZZER VOLUME

Allowable PC status : STOP
Usable memory : RAM, EEPROM, EPROM

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.

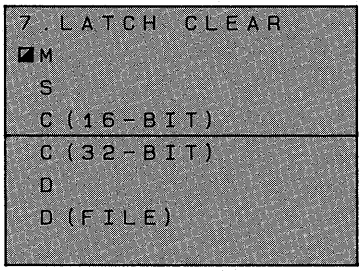
5. ONLINE MODE MENUS

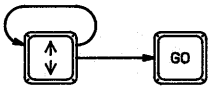
5.8 LATCH CLEAR

Allowable PC status : STOP
Usable memory : RAM, EEPROM and EPROM (under certain condition)

Use the following procedure to clear the latched devices.

Display :





(1) The devices that can be latched are displayed on the screen. Use the cursor keys to scroll to other devices.

(2) Move the cursor to the device for which latch is to be cleared and press the [GO] key.

The latch clear operation should be executed for each device.

* When the EPROM cassette is used for the program memory, file registers cannot be cleared by this operation.

When the EEPROM cassette is used, file register data can only be cleared when the memory protect switch is set to the OFF position.

* Other than file registers, the latch clear operation is effective for all devices, regardless of program memory type (RAM, EPROM, EEPROM).

Note: • *File registers are stored in the same memory as programs. If EPROM cassette is used, neither the program nor file register can be erased.*

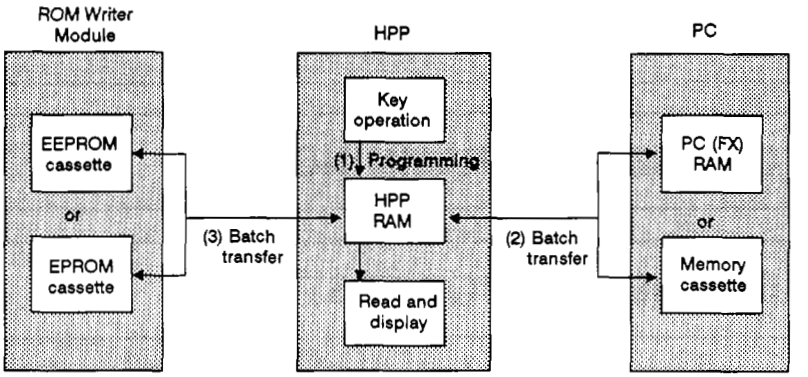
MEMO

6. OFFLINE MODE MENUS

6.1 OFFLINE MODE

HPP memory can be accessed in the offline mode.

Programs written to the HPP RAM can be batch transferred to the PC (FX) RAM or memory cassette installed in the PC. Programs can also be transferred from the HPP RAM to the ROM writer in the offline mode.



(1) In the offline mode, a program created with the HPP is always written to the HPP RAM regardless of the PC memory type or RUN/STOP status.

(2) Programs can be batch transferred from the HPP RAM to the PC memory under the following conditions :

	PC RUN/STOP Status	PC Program Memory
HPP → PC (write)	STOP	RAM, EEPROM*
HPP ← PC (read)	RUN/STOP	RAM, EEPROM, EPROM
HPP : PC (verify)		

*The memory protect switch must be set to the OFF position.

(3) Programs can be batch transferred from the HPP RAM to the ROM writer module under the following conditions :

	PC Status	Memory Installed to Module
HPP → Module (write)	RUN/STOP Any memory type	EEPROM*1 EPROM*2
HPP ← Module (read)		EEPROM EPROM*3
HPP : Module (verify)		EEPROM EPROM

*1: The memory protect switch must be set to the OFF position.

*2: The EPROM must be erased first.

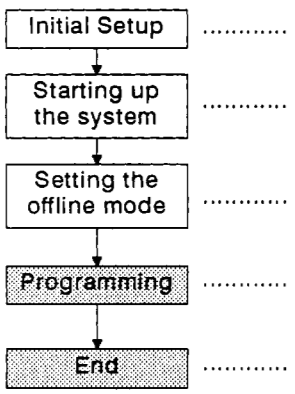
*3: The EPROM must contain a program.

6. OFFLINE MODE MENUS

6.2 OFFLINE PROGRAM

(1) BASIC PROCEDURE

Use the following procedure to create a program in the offline mode.



..... 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]) (for details, see Section 7.1).

..... Press [↓] [GO] with the mode select screen displayed to select the offline mode (for details, see Section 7.5).

..... Make a new program or edit an existing program by using the write, read, insert, or delete function.

..... End of programming.

(2) PROGRAMMING

The offline mode programming procedure is the same as the online mode programming procedure.

For details on online mode programming procedure, see Section 3.

(3) END

The program created in the offline mode will be written to the HPP RAM. The program must be transferred to the PC memory. Otherwise, the program in the PC memory will not be updated.

If a special module ROM writer is used, the program can be transferred from the HPP memory to the memory cassette (for details, see Section 8).

IN THE OFFLINE MODE

HPP RAM :

When you are programming in the offline mode, the program is written to the HPP RAM. If the HPP, on which the program is stored, is used to execute online programming to the PC, the resident program in the HPP RAM will still be retained.

However, if a program is transferred from the PC to the HPP RAM, the resident program will be overwritten by the transferred program.

Memory Backup Capacitor :

The HPP RAM is backed up by a memory backup capacitor. Data will be retained for over 3 days if power has been supplied to the capacitor for at least 1 hour.

This backup capacity makes it possible to take a program stored on the HPP to another plant. There, the program can be written from the HPP RAM to a PC.

6. OFFLINE MODE MENUS

6.3 OFFLINE MODE MENU

6.3.1 BASIC PROCEDURE

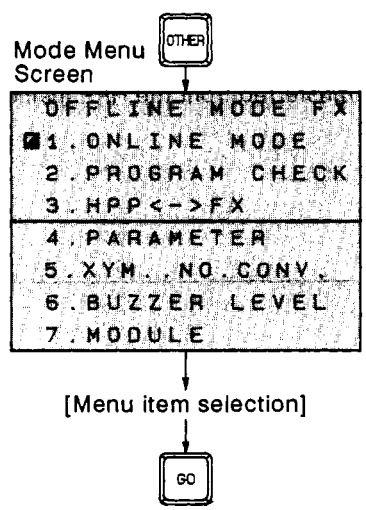
(1) BASIC PROCEDURE FOR DISPLAYING THE MODE MENU

Use the following procedure to display the offline mode menu.

Initial Setup	Connect the HPP to PC (for details, see Section 1.4.2).
Starting up the system	Turn ON the power to the PC or reset the HPP ([RST] + [GO]) (for details, see Section 7.1).
Setting the offline mode	Press [↓] [GO] with the mode select screen displayed to select the offline mode (for details, see Section 7.5).
Mode menu screen	Press the [OTHER] key to display the mode menu screen. The following functions are available : mode change, program check, data transfer (HPP ↔ FX), parameter setting, device number conversion, buzzer volume adjustment, and data transfer to special module (mode menu screen selection).

(2) OFFLINE MODE MENU SCREEN

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



(a) The ONLINE MODE includes the 7 items shown on the left.

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

(c) For details on module handling, see Section 8.2.

6. OFFLINE MODE MENUS

OFFLINE MODE MENU

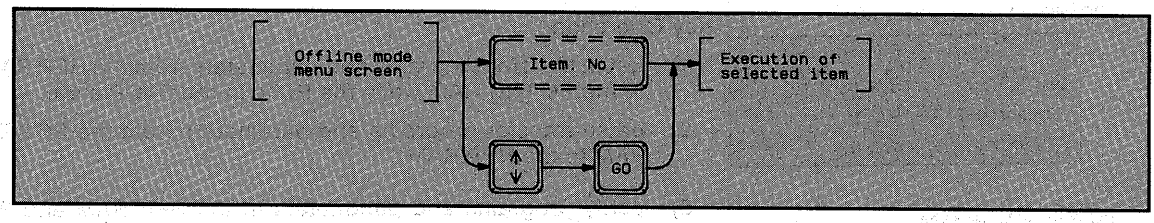
6.3.2 CHANGING TO THE ONLINE MODE

Offline mode functions are executed the same way as online mode functions. There are, however, some functions that are only available in the offline mode.

(1) SELECTION OF ITEMS FROM MENUS

The following procedure is used to select a menu item from the offline mode menu screen.

<BASIC OPERATION>



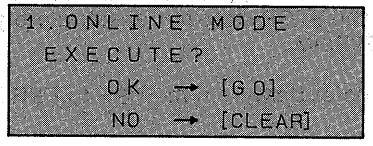
When the online mode menu screen is displayed, an item can be accessed by either keying in the desired item number or moving the cursor to the required item and pressing the [GO] key.

(2) CHANGING TO THE ONLINE MODE

Allowable PC status : RUN, STOP
Usable memory : RAM, EEPROM, EPROM

The following procedure is used to change from the offline mode to the online mode.

Display :



(a) Press the [GO] key to change from the online mode to the offline mode.

(b) Press the [CLEAR] key to return to the mode menu screen.

SOME OFFLINE MODE FUNCTIONS ARE EXECUTED THE SAME WAY AS ONLINE MODE FUNCTIONS

5.3 PROGRAM CHECK
5.5 PARAMETERS
5.6 XYM.. NUMBER CONVERSION
5.7 BUZZER VOLUME

These functions are executed in the same manner for both the online and offline modes. For details on these functions, see the section listed. The functions are effective for the HPP RAM regardless of the PC memory type or RUN/STOP status.

6. OFFLINE MODE MENUS

OFFLINE MODE MENU

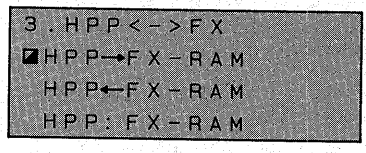
6.3.3 HPP ⇔ FX TRANSFER

Allowable PC status : STOP, RUN (under certain condition)
Usable memory : RAM, EEPROM, EPROM

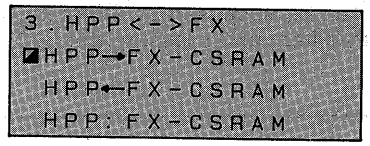
Use the following procedure to batch transfer programs and parameters between the HPP and PC.

Display 1 :

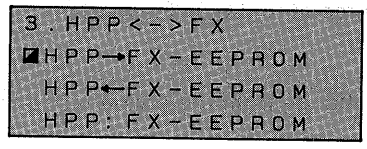
PC without memory cassette



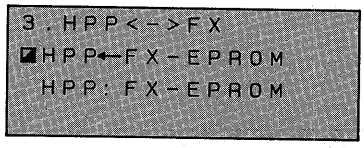
PC with RAM cassette



PC with EEPROM cassette



PC with EPROM cassette



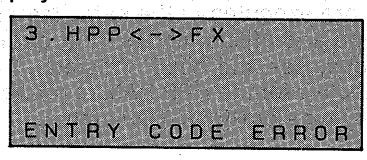
Key Operation :

1) Batch transfer programs and parameters from the HPP RAM to the PC (FX) RAM while the PC is in the STOP state.
2) Batch transfer programs and parameters from the PC (FX) RAM to the HPP RAM.
3) Verify programs and parameters in the HPP RAM and PC (FX) RAM.

Explanation :

(a) Use the [↑] and [↓] keys to move the cursor to the required operation and then press the [GO] key.
(b) The messages displayed on the screen differ depending on the type of memory cassette used.
(c) Select the required function as if the PC did not have a memory cassette.
(d) Set the EEPROM cassette memory protect switch to the OFF position and the PC to the STOP state to transfer a program or parameter to the EEPROM.
(e) It is not possible to transfer data from the HPP to EPROM.

Display 2 : (Entry code mismatch)



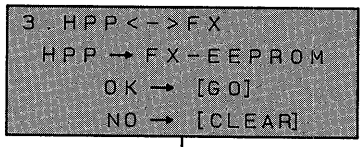
Explanation :

(a) If the HPP entry code and the PC entry code are not the same, the corresponding error message is displayed.
(b) To transfer a program or parameter when an entry code mismatch error occurs, use either of the following methods :
- Delete the PC entry code in the online mode.
- Enter the same entry code to the HPP as that of the PC in the offline mode.
(c) Regardless whether or not an error exists, the previous menu can be displayed by pressing the [CLEAR] key.

6. OFFLINE MODE MENUS

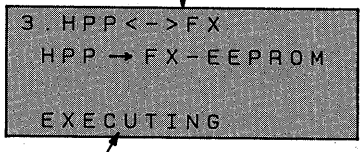
OFFLINE MODE MENU

Display 3 :



GO

Display 4 :



(Later the message "COMPLETED" will be displayed.)

Explanation :

(a) If there is no entry code or parameter mismatch, the required operation can be selected.

(b) Press the [GO] key to begin data transfer between the HPP and PC.

(c) Press the [CLEAR] key to return to Display 1 (data transfer menu screen).

(d) When the data transfer is completed correctly, the message "COMPLETED" is displayed.

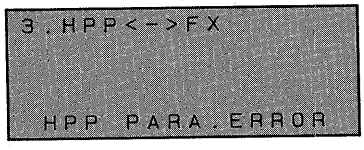
(e) Press the [CLEAR] key to return to Display 1 (data transfer menu screen).

(f) Press the [OTHER] key to return to the mode menu screen.

(g) If a communication error occurs or the memory is write-protected, the corresponding error message is displayed.

* If a verification error occurs, see *Note* below.

* Data transfer is not possible when the destination memory capacity is smaller than the source memory capacity. The message "HPP PARA. ERROR" will be displayed if this is attempted. Press [CLEAR] to remove the error from the screen.

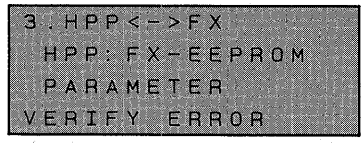


Note: • *Mismatch Error :*

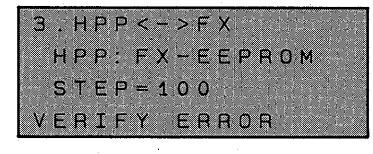
When the verify function "HPP:FX-RAM (EEPROM, EPROM)" is selected from Display 1, a mismatch will cause the "VERIFY ERROR" message to be displayed with the contents of the mismatch.

• *Verify Error Display :*

(Parameter Mismatch)



(Program Mismatch)

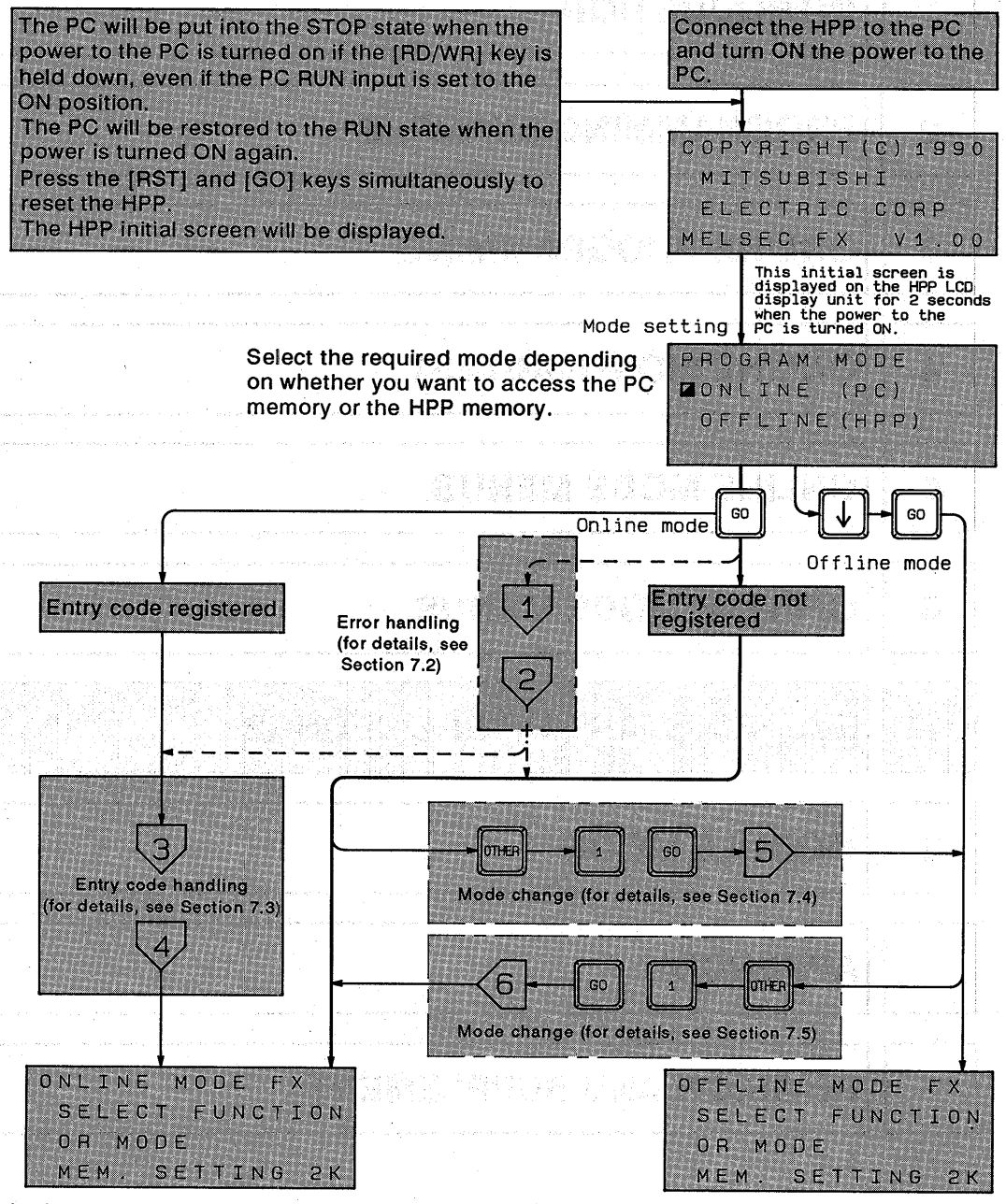


MEMO

7. SYSTEM START-UP PROCEDURE

7.1 INITIAL STATE

Use the following procedure to start up the online/offline mode.



In the online mode, the PC memory area can be accessed directly with the HPP and data can be transferred between the PC (FX) RAM and the memory cassette installed in the PC.

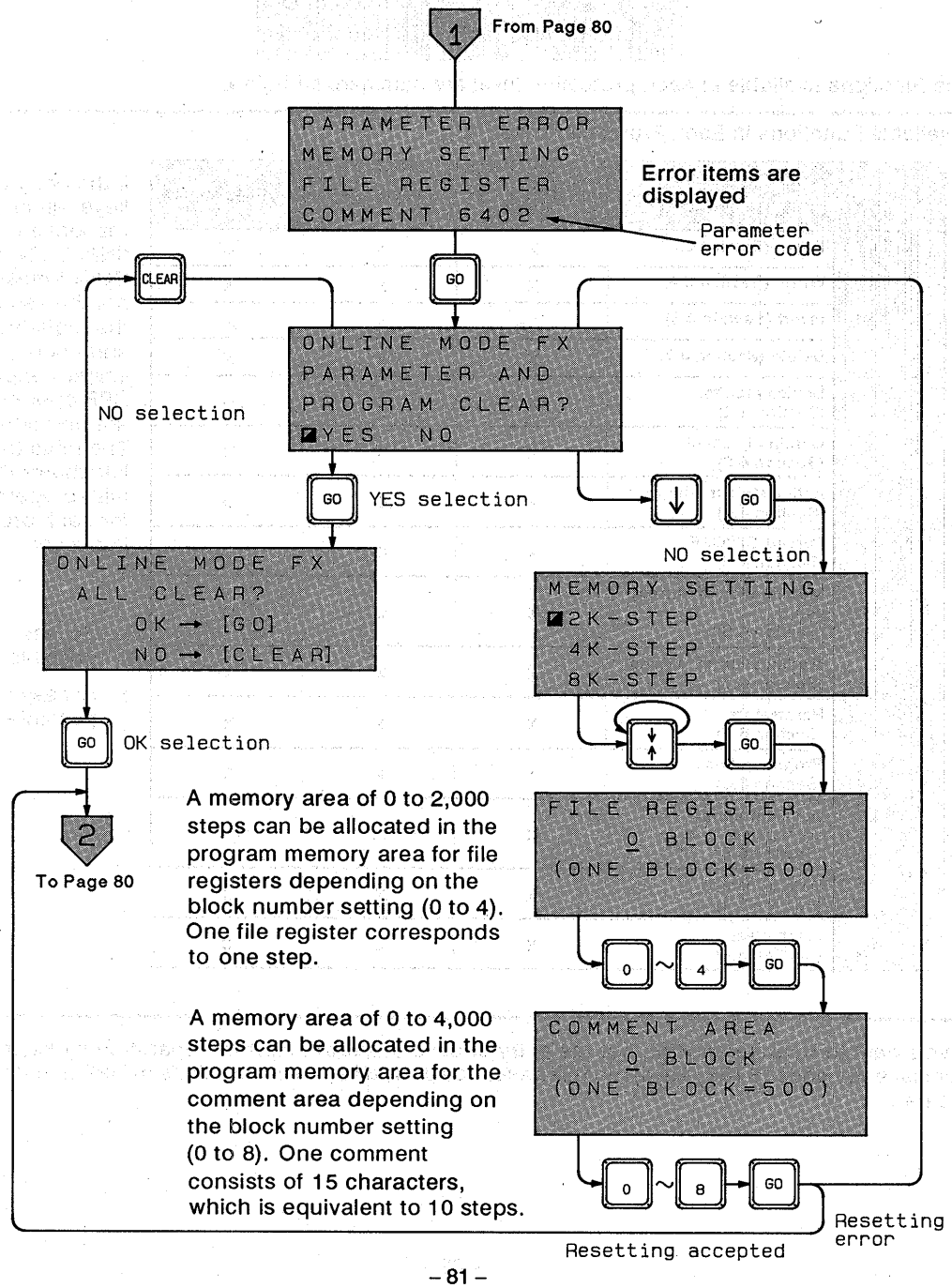
In the offline mode, HPP RAM can be accessed and data can be transferred between the HPP and the PC.

7. SYSTEM START-UP PROCEDURE

7.2 PARAMETER ERRORS

If online mode operation cannot be started because of a PC parameter error, follow the procedure described below. A problem like this may occur if the PC has been left for a long period without a battery.

If an HPP parameter error occurs in the offline mode upon power on, the program stored in the HPP RAM is automatically cleared and the parameters are reset to the default settings. This may occur in the start-up if the memory backup capacitor has been discharged.



7. SYSTEM START-UP PROCEDURE

7.3 ENTRY CODE

In the online mode, three program protection levels can be selected - all operation prohibit, copy-protect, write-protect.

These levels are determined by the first letter of the entry code (see the next page) that consists of 8 hexadecimal characters.

All operation prohibit	:	Aoooooooo
Copy-protect	:	Booooooo
Write-protect	:	Coooooooo

The functions available in each protection level are summarized below.

Available Functions in Each Protection Level

Functions \ Protection Level		All Operation Prohibit	Copy-protect	Write-protect
Program	Read (Section 3.3)	x	x	o
	Write (Section 3.4)	x	x	x
	Insert (Section 3.6)	x	x	x
	Delete (Section 3.7)	x	x	x
Monitor	Device monitor (Section 4.2)	x	o	o
	Continuity check (Section 4.3)	x	x	o
	Active state monitor (Section 4.4)	x	o	o
Test	Forced ON/OFF (Section 4.5)	x	o	o
	Modification of current value (Section 4.6)	x	o	o
	Modification of setting (Section 4.7)	x	x	x
Mode Menu	Parameters (Section 5.5)	x	x	x
	Program check (Section 5.3)	x	x	o
	Device number conversion (Section 5.6)	x	x	x
	Data transfer (Section 5.4)	x	x	x
	Latch clear (Section 5.8)	x	o	o

If the entry code keyed-in in response to the "INPUT ENTRY CODE" message is not the same as the registered entry code, only a limited range of HPP operations are permitted. The table to the left shows the permitted operations for each protection level.

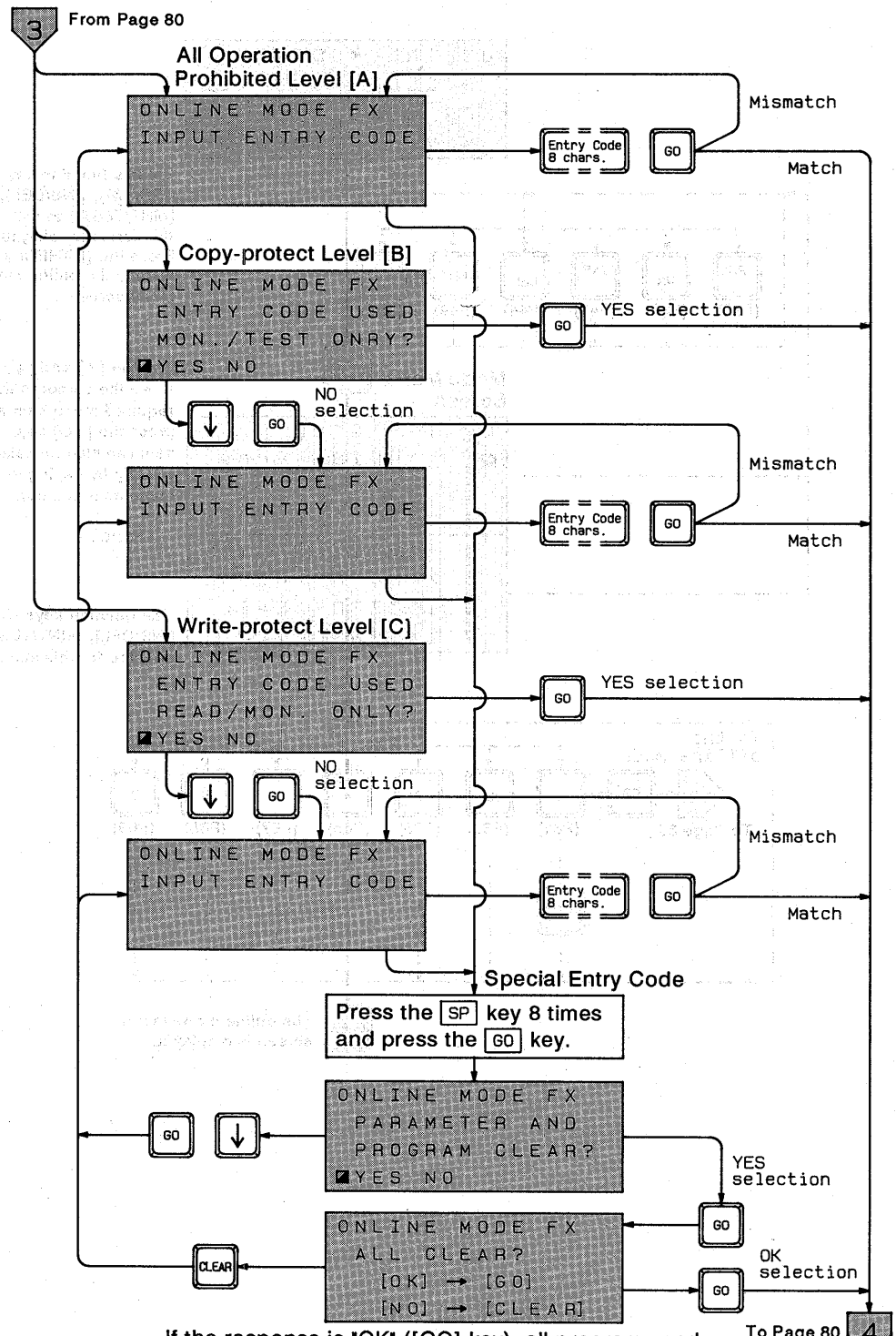
o: Access possible

x: Access not possible

If you want to operate an HPP, but the entry code is unknown, start the operation by keying in the special entry code (8 [SP] keys). In this case, however, all of the instructions in HPP memory will be cleared.

7. SYSTEM START-UP PROCEDURE

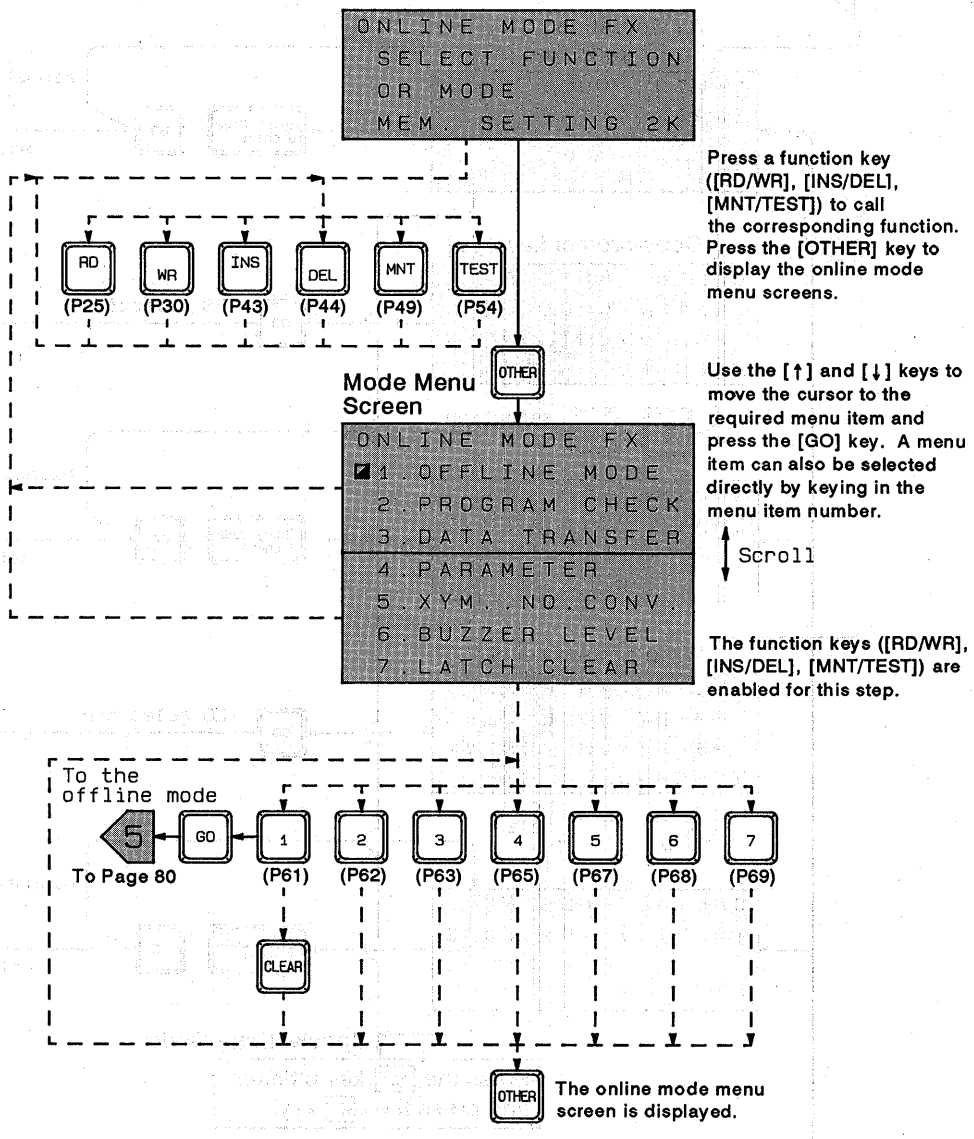
ENTRY CODE



If the response is "OK" ([GO] key), all programs and parameters, including the entry code, are cleared.

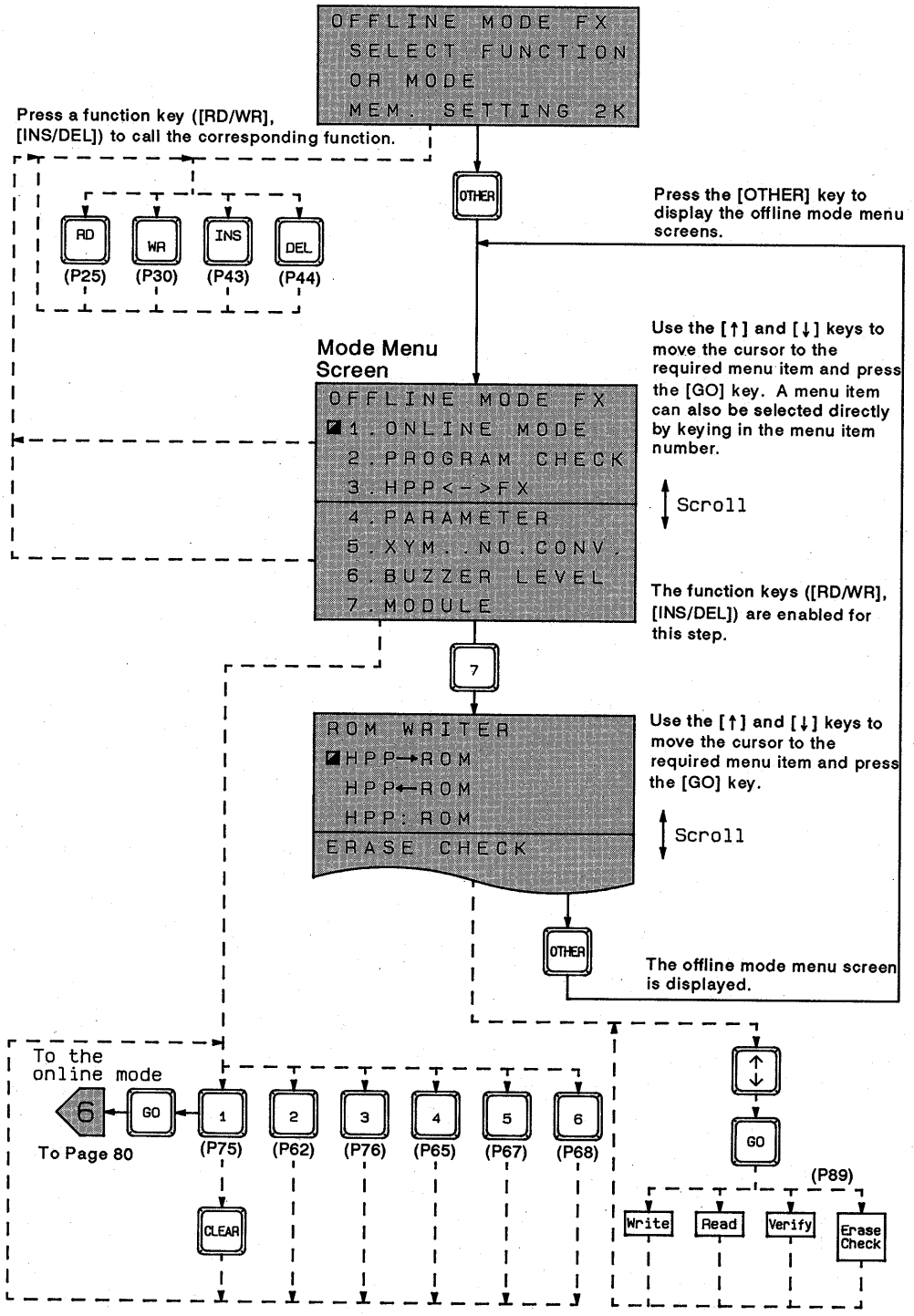
7. SYSTEM START-UP PROCEDURE

7.4 ONLINE MODE START UP

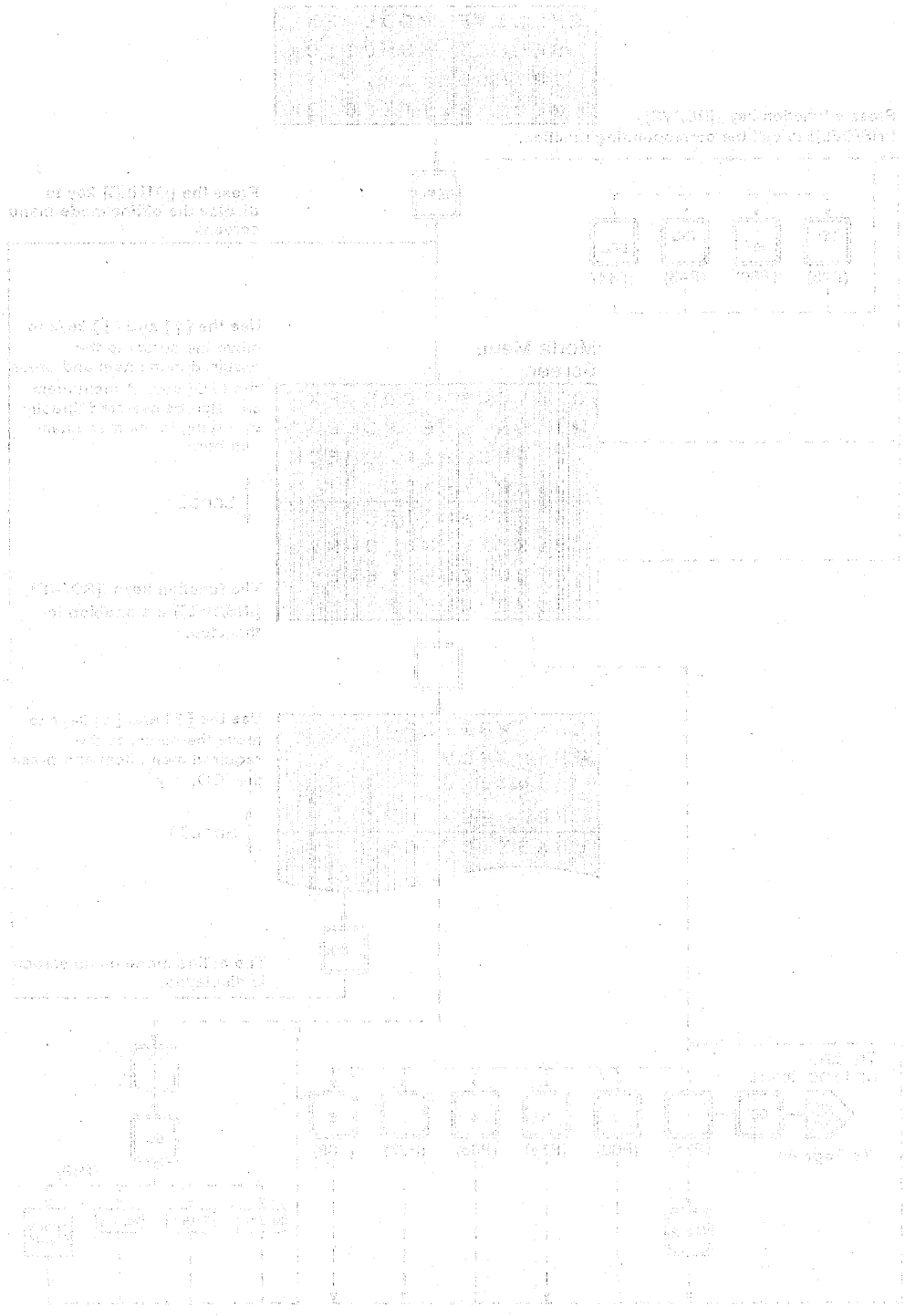


7. SYSTEM START-UP PROCEDURE

7.5 OFFLINE MODE START UP



MEMO



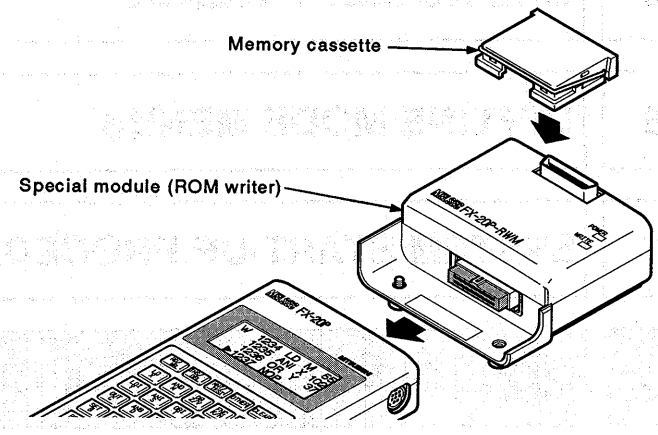
8. MODULE MODE

8.1 MODULE MODE

The module mode can only be selected when a special module is installed to the HPP. The HPP automatically recognizes the installed module and displays the corresponding menu screen.

8.1.1 BASIC PROCEDURE

Initial Setup	.....	Install a special module to the HPP.
Starting Up the System	.....	Turn ON the power to the PC or reset the HPP ([RST] + [GO]) (for details, see Section 7.1).
Setting the Offline Mode	.....	Press [↓] [GO] with the mode select screen displayed to select the offline mode (for details, see Section 7.5).
OTHER	.....	The offline mode menu screen is displayed (for details, see Section 7.5).
7	.....	The mode menu screen for the installed special module is displayed (for details, see Section 8.2).
Module Mode Menu Screen	.....	Select the required operation for the special module. See Section 8.2 for an example operation.



MEMORY TYPES

RAM : Read/write is possible at any time. The data in the RAM will be cleared when the power is turned OFF, so it must be "backed up". RAM is used in the HPP and PC internal memory. (Random Access Memory)

EPROM : EPROM is read only memory. Memory data can be erased by exposing it to ultraviolet rays. Data can be batch written to the EPROM after its entire memory area has been erased. EPROM memory data will be retained when the power is turned OFF. PC memory cassettes of this memory type is available.
(Erasable Programmable Read Only Memory)

EEPROM : EEPROM is also read only memory. Memory data can be written by applying the specified voltage. EEPROM memory data will be retained when the power is turned OFF. The EEPROM has a service life and can be used only within this period, which will differ according to the maker and the type. PC memory cassettes of this memory type is available.
(Electrically Erasable Programmable Read Only Memory)

8. MODULE MODE

8.2 ROM WRITER

8.2.1 SUITABLE MEMORY CASSETTES

FX-EEPROM-4 (4K steps), FX-EEPROM-8 (8K steps), FX-EPROM-8 (8K steps)

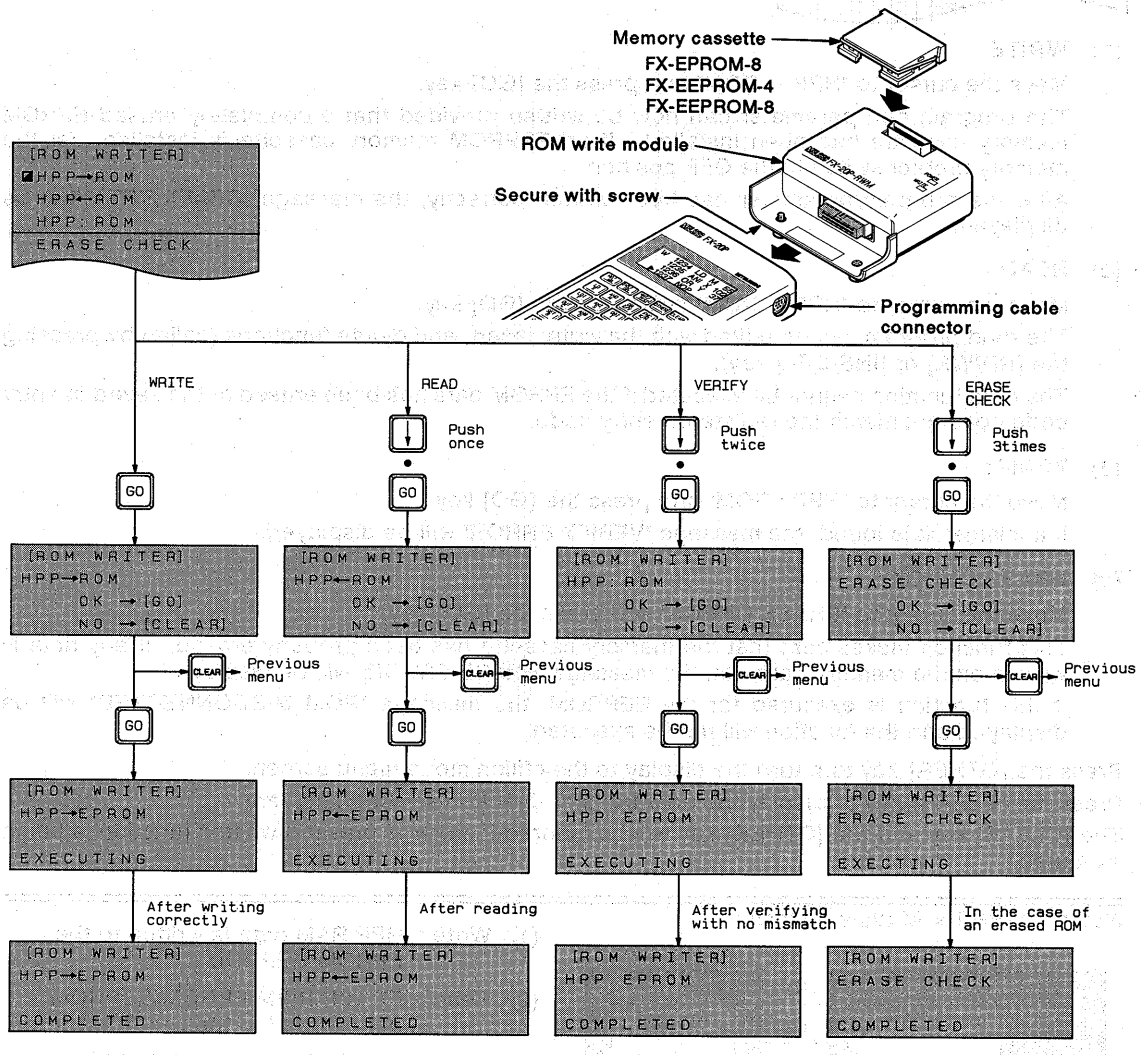
Do not insert or remove memory cassettes from the ROM writer while the WRITE LED is ON.

8.2.2 OPERATIONS OF THE MODULE

(1) The FX-20P-RWM ROM writer connects to the FX-20P-E programming panel in the manner shown by the diagram below. Ensure that the power is off when attaching by disconnecting the programming cable from the programming panel. To prevent the module from disconnecting, tighten the provided screw on the reverse side of the module.

(2) Return power to the (HPP) and select the module option from the offline mode menu.

(3) Select the function with the following menu:

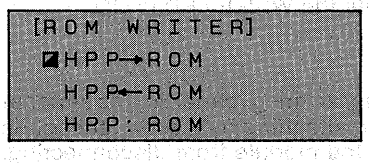


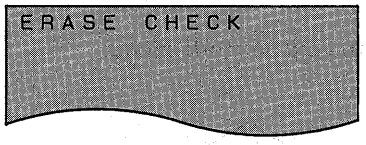
8. MODULE MODE

ROM WRITER

8.2.3 FUNCTIONS OF THE ROM WRITER

Display :





The HPP recognizes the ROM writer when it is installed and displays the menu shown on the left. The type of ROM cassette is also recognized and the ROM writer operates accordingly.

Move the cursor to the required menu item and press the [GO] key. Press the [GO] key again to display the menu screen.

Press the [CLEAR] key to display the initial menu screen.

(1) WRITE

Move the cursor to "HPP → ROM" and press the [GO] key.

The program and parameter can now be written provided that a completely erased EPROM memory cassette has been installed. If an EEPROM memory cassette is installed, set the memory protect switch to the OFF position.

After the program/parameter has been written correctly, the message "COMPLETED" will be displayed.

(2) READ

Move the cursor to "HPP ← ROM" and press the [GO] key.

The read program can be edited with the write, insert, and delete functions (called by pressing the [RD/WR] or [INS/DEL] key).

The read function cannot be executed if the EPROM data has been erased or the keyed-in entry code does not match the registered entry code.

(3) VERIFY

Move the cursor to "HPP : ROM" and press the [GO] key.

If a mismatch is found, the message "VERIFY ERROR" will be displayed.

(4) ERASE CHECK

Move the cursor to "ERASE CHECK" and press the [GO] key.

This function makes sure that the memory cassette has been properly erased. If any data is written on the memory cassette, the message "ERASE ERROR" will be displayed.

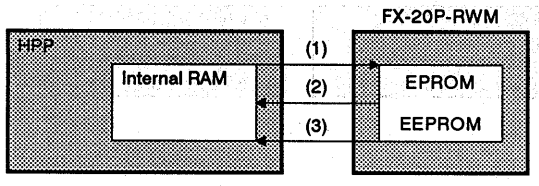
If this function is executed for the EEPROM, the message "ROM MISCONNECTED" will be displayed and the function will not be executed.

Press the [OTHER] key to return the display to the offline mode menu screen.

Press the [CLEAR] key to display the data transfer direction selection screen.

The [CLEAR] key and the [OTHER] key will be ignored if either is pressed while a function is being executed.

Note: ● *HPP ↔ Module Access :*



(1) Write : HPP RAM data is written to the EPROM/EEPROM.

(2) Read : FX-20P-RWM EPROM/EEPROM data is read to the HPP RAM.

(3) Verify : HPP RAM data and EPROM/ EEPROM data are compared.

8. MODULE MODE

ROM WRITER

8.2.4 ERROR MESSAGES

(1) "WRITE ERROR"

Failure to write correctly to the memory cassette. In the case of an EPROM cassette, the problem is probably that the cassette has not been erased properly. In the case of the EEPROM cassette, switch the write-protect switch to the OFF position and try again.

(2) "VERIFY ERROR"

The contents of the memory cassette does not match to that of the HPP panel.

(3) "ROM MISCONNECTED"

The connection of the cassette to the ROM writer is incorrect.

8.2.5 WRITING TIMES

PROGRAM SIZE (set by para.)	EPROM	EEPROM
2K steps	approx. 20 sec.	approx. 15 sec.
4K steps	approx. 40 sec.	approx. 25 sec.
8K steps	approx. 80 sec.	approx. 50 sec.

8.2.6 POINTS TO NOTE

(1) Ensure that the power is off when connecting or removing a memory cassette from the ROM writer.

(2) The memory type of the cassettes are automatically recognized and selected by the HPP unit.

(3) When writing to the cassette the WRITE LED will light to indicate that writing to the cassette is actually occurring.

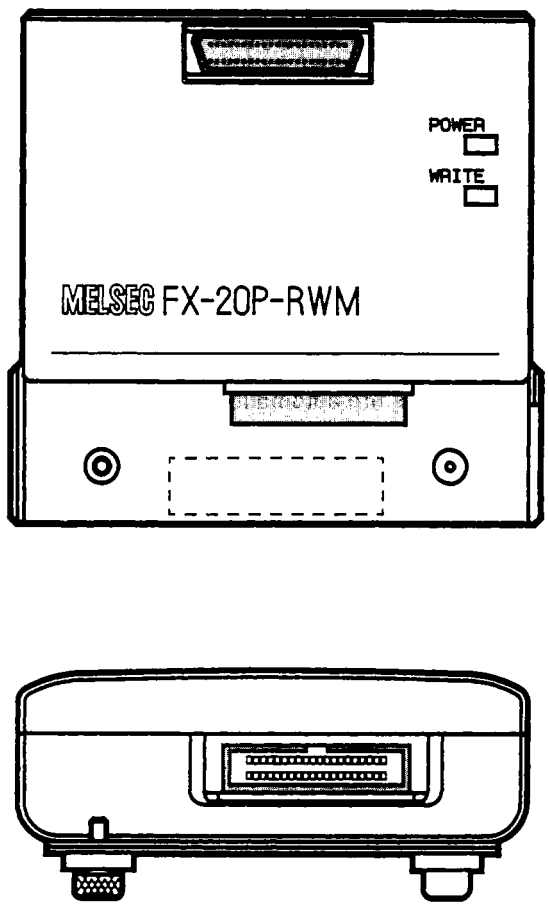
(4) When connecting the memory cassette, ensure that there is no debris inside the connector of the ROM writer.

(5) With the FX-20P-MFA system memory cassette (used for F1, F2 series), the usage of the ROM writer is not available. However, the F1, F2 programs can be converted to FX format with the FX-20P-MFA system cassette and then transferred to the memory cassettes by swapping the FX-20P-MFA with the FX- system cassette.

8. MODULE MODE

ROM WRITER

FX-20P-RWM External View



APPENDIX

1. INSTRUCTION LISTS

BASIC INSTRUCTIONS AND STEP LADDER INSTRUCTIONS

Group	Instruction Word	Device	Number of Steps
Contact instructions	LD	X, Y, M, S, T, C, Special M	1
	LDI	X, Y, M, S, T, C, Special M	1
	AND	X, Y, M, S, T, C, Special M	1
	ANI	X, Y, M, S, T, C, Special M	1
	OR	X, Y, M, S, T, C, Special M	1
	ORI	X, Y, M, S, T, C, Special M	1
Joint instructions	ANB	None	1
	ORB	None	1
	MPS	None	1
	MRD	None	1
	MPP	None	1
Other instructions	MC	N, Y, M	3
	MCR	N (nesting)	2
	NOP	None	1
	END	None	1
Step ladder	STL	S	1
	RET	None	1

Group	Instruction Word	Device	Number of Steps
Output instructions	OUT	Y, M	1
		S	2
		Special M	2
		T-K, D	3
		C-K, D (16 bit)	3
		C-K, D (32 bit)	5
	SET	Y, M	1
		S	2
		Special M	2
	RST	Y, M	1
		S	2
		Special M	2
		T, C	2
		D, V, Z, Special D	3
	PLS	Y, M	2
	PLF	Y, M	2

Group	Instruction Word	Pointer Number	Number of Steps
Label	P	0 to 63	1
	I	0[ ][ ] to 8[ ][ ]	1

APPLIED INSTRUCTIONS

Group	FNC No.	Instruction Symbol	Instruction Name
Program flow	00	CJ	Conditional jump
	01	CALL	Subroutine call
	02	SRET	Subroutine return
	03	IRET	Interruption return
	04	EI	Interruption enabled
	05	DI	Interruption disabled
	06	FEND	Main program end
	07	WDT	Watchdog timer
	08	FOR	Start of repeat range
	09	NEXT	End of repeat range
Transfer, comparison	10	CMP	Comparison
	11	ZCP	Zone comparison
	12	MOV	Move (S) → (D)
	13	SMOV	Digit move
	14	CML	Inverse move $(\overline{S})$ → (D)
	15	BMOV	Batch move
	16	FMOV	Multiple move
	17	XCH	Exchange and move (D) ↔ (D)
	18	BCD	Binary to BCD conversion
	19	BIN	BCD to binary conversion

Group	FNC No.	Instruction Symbol	Instruction Name
Algebraic and logical operations	20	ADD	Addition (binary) (S1) + (S2) → (D)
	21	SUB	Subtraction (binary) (S1) − (S2) → (D)
	22	MUL	Multiplication (binary) (S1) x (S2) → (D)(D)
	23	DIV	Division (binary) (S1) ÷ (S2) → (D)...(D)
	24	INC	Increment (binary) (D) + 1 → (D)
	25	DEC	Decrement (binary) (D) − 1 → (D)
	26	WAND	Logical AND (S1) ∧ → (D)
	27	WOR	Logical OR (S1) ∨ (S2) → (D)
	28	WXOR	Exclusive logical OR (S1) ⊻ (S2) → (D)
	29	NEG	Complementary $(\overline{D})$ + 1 → (D)
Rotation and shift	30	ROR	Rotation (right)
	31	ROL	Rotation (left)
	32	RCR	Rotation (right) with CY
	33	RCL	Rotation (left) with CY
	34	SFTR	Right shift bit
	35	SFTL	Left shift bit
	36	WSFR	Right shift word
	37	WSFL	Left shift word
	38	SFWR	Shift register read
	39	SFRD	Shift register write

APPENDIX

INSTRUCTION LISTS

APPLIED INSTRUCTIONS

Group	FNC No.	Instruction Symbol	Instruction Name
Data processing	40	ZRST	Batch reset
	41	DECO	Decode
	42	ENCO	Encode
	43	SUM	Bit check (number of "1" bits)
	44	BON	Bit ON/OFF judgment
	45	MEAN	Mean
	46	ANS	Annunciator set
	47	ANR	Annunciator reset
	48		
	49		
High-speed processing	50	REF	I/O refresh
	51	REFF	Filter adjustment
	52	MTR	Matrix input
	53	HSCS	Comparison set (high-speed counter)
	54	HSCR	Comparison reset (high-speed counter)
	55	HSZ	Zone comparison (high-speed counter)
	56	SPD	Pulse density
	57	PLSY	Pulse output
	58	PWM	Pulse width modulation
	59		
Handy instructions	60	IST	Initial state (step ladder)
	61		
	62	ABSD	Drum sequence (absolute value)
	63	INCD	Drum sequence (incremental value)
	64	TTMR	Teaching timer
	65	STMR	Off ready, one-shot, flicker timer
	66	ALT	Alternate output
	67	RAMP	Ramp signal
	68	ROTC	Rotary table control
	69		

Group	FNC No.	Instruction Symbol	Instruction Name
External device I/O	70	TKY	10-key pad input
	71	HKY	16-key pad input
	72	DSW	Digital switch, time-sharing interruption
	73	SEGD	7-segment decode
	74	SEGL	7-segment time-sharing display
	75	ARWS	Arrow switch control
	76	ASC	ASCII conversion
	77	PR	ASCII code print
	78	FROM	Reading from special blocks
	79	TO	Writing to special blocks
External device SER	80		
	81	PRUN	For FX_2-40AP/AW
	82		
	83		
	84		
	85	VRRD	FX-8AV read
	86	VRSC	FX-8AV graduation read
	87		
	88		
	89		
External devices F_2	90	MNET	For F-16NP/NT
	91	ANRD	F_2-6A read
	92	ANWR	F_2-6A write
	93	RMST	F_2-32RM start
	94	RMWR	F_2-32RM write
	95	RMRD	F_2-32RM read
	96	RMMN	F_2-32RM monitor
	97	BLK	F_2-30GM block designation
	98	MCDE	F_2-30GM M code read
	99		

Number of steps used by applied instructions :

Instruction part ..... [FNC] + instruction number

1 step

Operand ..... Devices following the instruction number

16-bit instruction : 2 steps per operand
32-bit instruction : 4 steps per operand

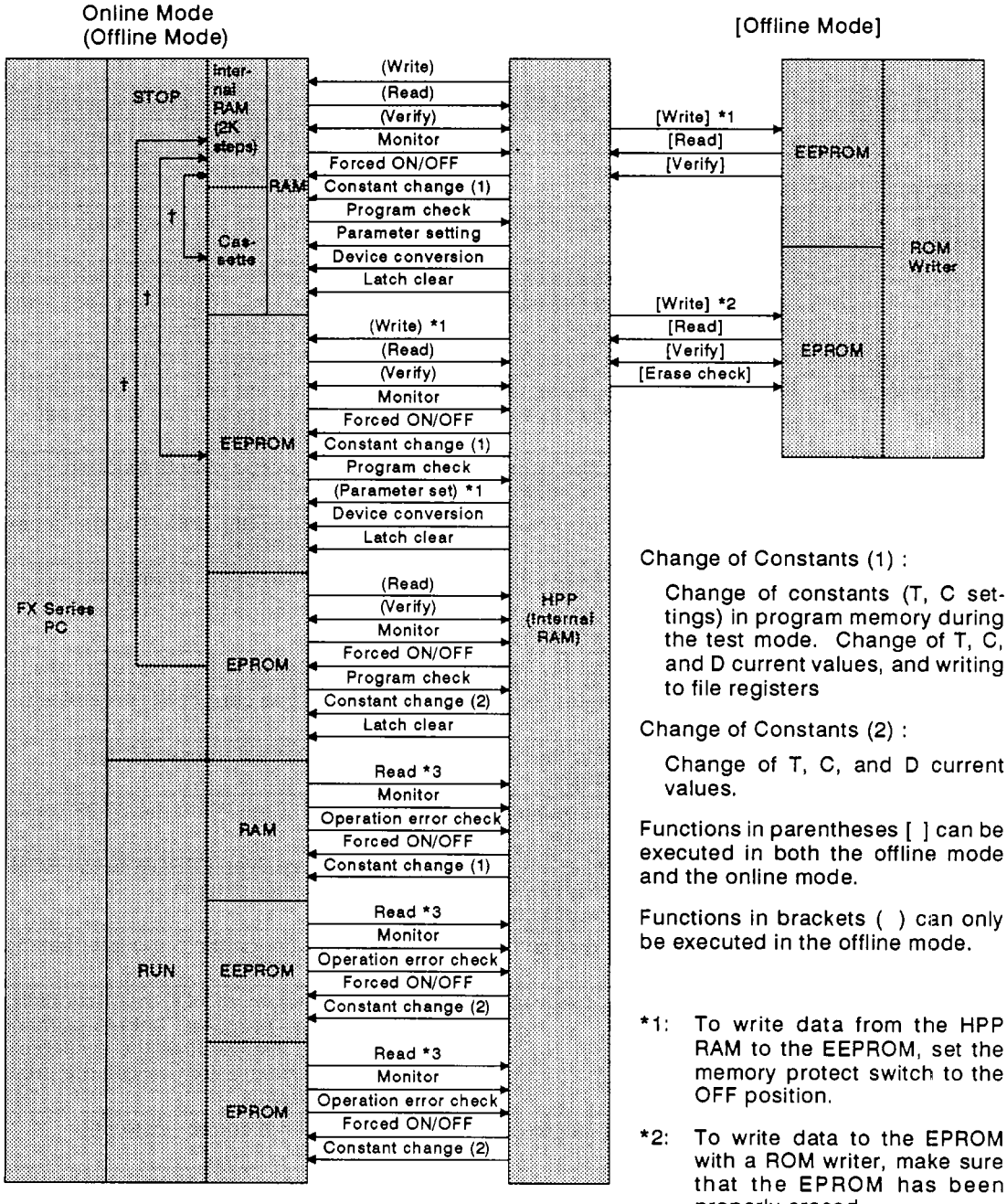
2. DEVICE NUMBER LISTS

FX SERIES DEVICE NUMBER LIST

		Input Relay Number	Output Relay Number	Total Number of Points
Total I/O relay number range		X0 to X177 128 points	Y0 to Y177 128 points	128 points
Base unit	FX-80M	X0 to X47 40 points	Y0 to Y47 40 points	
	FX-64M	X0 to X37 32 points	Y0 to Y37 32 points	
	FX-48M	X0 to X27 24 points	Y0 toY27 24 points	
	FX-32M	X0 to X17 16 points	Y0 to Y17 16 points	
	FX-24M	X0 to X13 12 points	Y0 to Y13 12 points	
	FX-16M	X0 to X7 8 points	Y0 to Y7 8 points	

Device		Device Number			Total Number
Auxiliary relay	For general-use	M0 to M499		Range changeable by parameter setting	500
	For data retention	M500 to M1023			524
	For special-purpose	M8000 to M8255			256
State	For initial	S0 to S9			10
	For general-use	S10 to S499		Range changeable by parameter setting	490
	For data retention	S500 to S899	Backed up by battery		400
	For annunciator	S900 to S999	Backed up by battery		100
Timer	100 msec	T0 to T199			200
	10 msec	T200 to T245			46
	1 msec retention	T246 to T249	Backed up by battery		4
	100 msec retention	T250 to T255	Backed up by battery		6
Counter	Up counter	C0 to C99	For general-use	Range changeable by parameter setting	100
		C100 to C199	Backed up by battery		100
	Up/down counter	C200 to C219	For general-use	Range changeable by parameter setting	20
		C220 to C234	Backed up by battery		15
	High-speed	C235 to C255	Backed up by battery		6 (1-phase)
Register	General-use register	D0 to D199	For general-use	Range changeable by parameter setting	200
		D200 to D511	Backed up by battery		312
	Special register	D8000 to D8255			256
	Index register	V, Z			2
	File register	D1000 to D2999		Parameter setting	2000
Pointer	For JUMP - CALL	P0 to P63			64
	For interruption	I0[ ][ ] to I8[ ][ ]			9
Nesting		N0 to N7			8

3. HPP/DEVICE FUNCTIONS



† : Program Transfer (Less than 2K steps)

Change of Constants (1) :

Change of constants (T, C settings) in program memory during the test mode. Change of T, C, and D current values, and writing to file registers

Change of Constants (2) :

Change of T, C, and D current values.

Functions in parentheses [ ] can be executed in both the offline mode and the online mode.

Functions in brackets ( ) can only be executed in the offline mode.

*1: To write data from the HPP RAM to the EEPROM, set the memory protect switch to the OFF position.

*2: To write data to the EPROM with a ROM writer, make sure that the EPROM has been properly erased.

*3: An instruction can be read by designating the step number.

4. MESSAGE LISTS

ERROR MESSAGE

If an error message is displayed, refer to the following table for the proper corrective action.

Message	Cause	Corrective Action
COMMS. ERR	PC communication error	Check the PC and cable.
HPP PARA. ERROR	HPP parameter error	Set the parameters correctly.
WRITE FORBIDDEN	An attempt was made to write data to EPROM.	Change the destination memory.
	The EEPROM cassette memory protect switch is set in the ON position when an attempt was made to write to EEPROM.	Set the memory protect switch to the OFF position before writing data to EEPROM.
NOT FOUND	The designated instruction was not found.	Proceed to the next step.
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.
NOT USABLE	The selected function cannot be used under the current conditions.	Select a usable function.
ERASE ERROR	EPROM data was not erased.	Erase the data or install a new EPROM.
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 PARA. ERROR	The set PC parameter is incorrect.	Set a correct PC parameter.
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.
ROM MIS CONNECTED	A memory cassette is not installed in the ROM writer. An EEPROM is installed in the ROM writer when erase check is attempted.	Install an EPROM to the ROM writer module.
NO PROGRAM SPACE	There is no more program storage area.	Change the parameter settings.
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.
COMMAND ERROR	The instruction is incorrect.	Set a correct instruction.
NO MEM. CASSETTE	A memory cassette is not installed to the PC.	Install the memory cassette.
DEVICE ERROR	The designated device or pointer is incorrect.	Input the correct device or pointer.

APPENDIX

MESSAGE LISTS

ERROR MESSAGES (PROGRAM CHECK)

The error contents detected by the program check operation in the online/offline mode are described below.

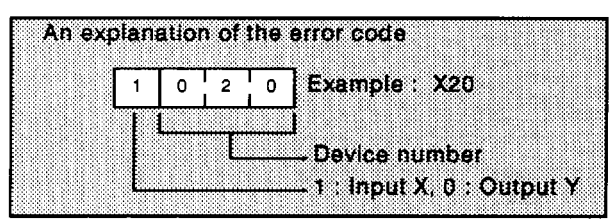
Errors marked with an asterisk (*) can only be checked in the online mode.

Error Message	Error Code	Error Contents
PC H/W ERR*	6101	RAM error
	6102	Operation circuit error
	6103	I/O bus error (M8069 driven)
COMMS ERR*	6201	Parity error, overrun error, frame error
	6202	Communication character error
	6203	Communication data sum check error
	6204	Data format error
	6205	Command error
LINK ERROR*	6301	Parity error, overrun error, frame error
	6302	Communication character error
	6303	Communication data sum check error
	6304	Data format error
	6305	Command error
	6306	Watchdog timer error
PARA. ERROR	6401	Program sum check error
	6402	Memory capacity setting error
	6403	Latch area setting error
	6404	Comment area setting error
	6405	File register area setting error
	6409	Other setting error
GRAM-MAR ERR	6501	Instruction, device symbol, and device number combination error
	6502	No OUT T or C before setting value
	6503	No setting value after OUT T or C; insufficient operands with applied instructions
	6504	Overlapping label number used; overlapping designation of interrupt input and/or high-speed counter input
	6505	Device number range over
	6509	Other

APPENDIX

MESSAGE LISTS

Errors marked with an asterisk (*) can only be checked in the online mode.

Error Message	Error Code	Error Contents
LADDER ERR	6601	LD or LDI used more than 8 times continuously.
	6602	1) No LD or LDI instruction. No coil. Incorrect relationship of LD/LDI and ANB/ORB 2) One of the following is not connected to the bus line : STL, RET, MCR, P (pointer), I (interrupt), EI, DI, SRET, IRET, FOR, NEXT, FEND, END
	6603	MPS used more than 11 times continuously.
	6604	Incorrect relationship between MPS and MRD/MPP
	6605	1) STL used more than 8 times continuously 2) MC, MCR, I (interrupt), or SRET in STL 3) RET outside STL. No STL
	6606	1) No P or I 2) No SRET or IRET 3) I, SRET, or IRET designated in the main program 4) STL, RET, MC, or MCR designated in subroutine or interrupt routine.
	6607	1) Illegal FOR and NEXT designation Nesting level deeper than 5 levels 2) One of the following commands is designated in the FOR-NEXT loop. STL, RET, MC, MCR, IRET, SRET, FEND, END
	6608	1) Illegal MC and MCR designation 2) No MCR N0 3) One of the following commands is designated in the MC-MCR loop. SRET, IRET, I
	6609	Other
RUNTIME ERROR*	6701	No jump destination of CJ or CALL. A label follows after the END instruction. An independent label is in the FOR-NEXT loop or a subroutine program.
	6702	CALL nesting level deeper than 5 levels
	6703	Interrupt nesting level deeper than 2 levels
	6704	FOR-NEXT loop nesting level deeper than 5 levels
	6705	A device other than a valid is used for an applied instruction operand.
	6706	The device number or data designated as an applied instruction operand is outside the allowable designation range.
	6707	File register operation is accessed without allocating the file register area.
	6708	From/To instruction error.
	6709	Other (No IRET or SRET or illegal FOR-NEXT loop)
I/O ERROR*	Example : 1020	The I/O number is not supported by the current hardware. 

APPENDIX

5. PROCESSING TIME LIST

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

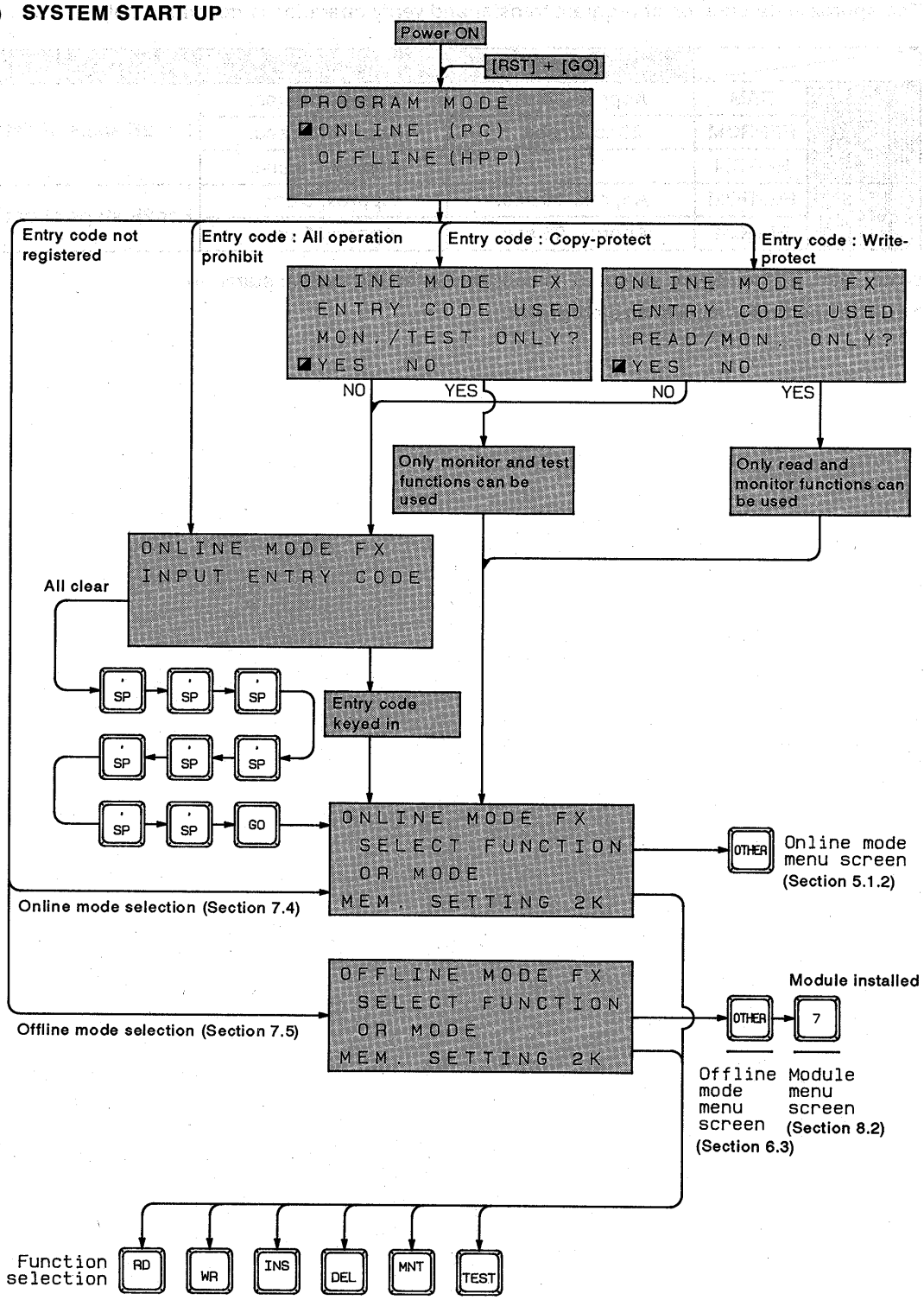
		Write	Read/Verify	Remark
PC	RAM	Approx. 20 sec.	Approx. 10 sec.	For 2K steps of data
	EEPROM	20 to 70 sec. *	Approx. 10 sec.	
	EPROM	—	Approx. 10 sec.	
ROM Writer	EEPROM	Approx. 15 sec.	Approx. 3 sec.	For 2K steps of data
	EPROM	Approx. 25 sec.	Approx. 3 sec.	

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

* Will be shorter for smaller size programs.

6. OPERATION FLOW

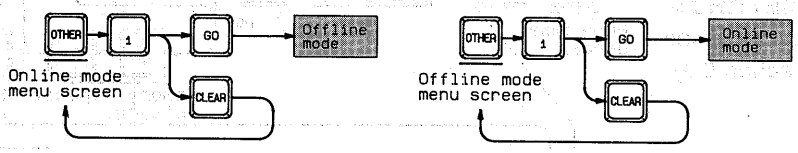
(1) SYSTEM START UP



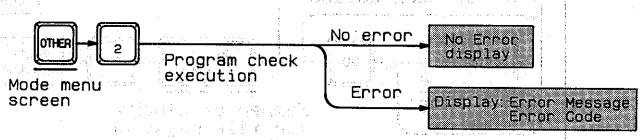
OPERATION FLOW

(2) MODE MENU

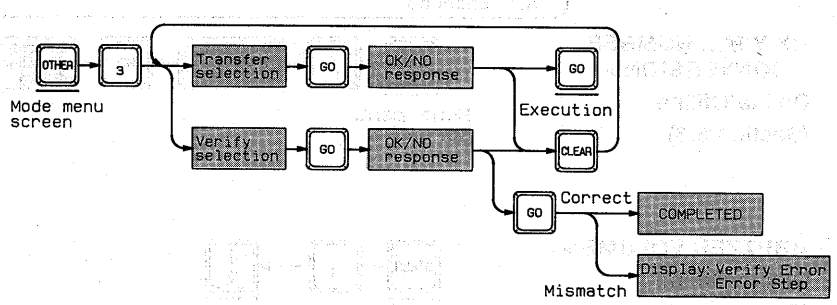
<MODE CHANGE>
Online/Offline
(Sections 5.2 and 6.3.2)



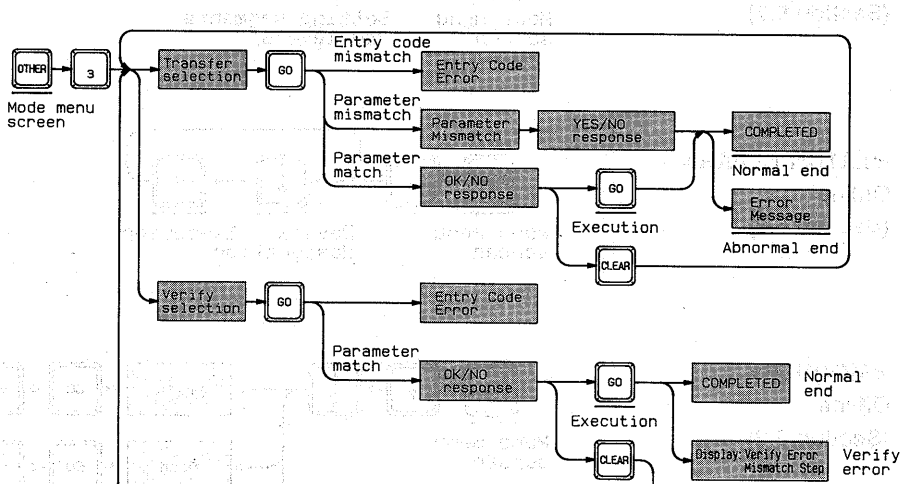
<PROGRAM CHECK>
Online/Offline
(Section 5.3)



<MEMORY CASSETTE DATA TRANSFER>
Online PC STOP
(Section 5.4)



<HPP-FX DATA TRANSFER>
Offline PC STOP
(Section 6.3.3)



Note: • *[OTHER] Key :*

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

• *[CLEAR] Key :*

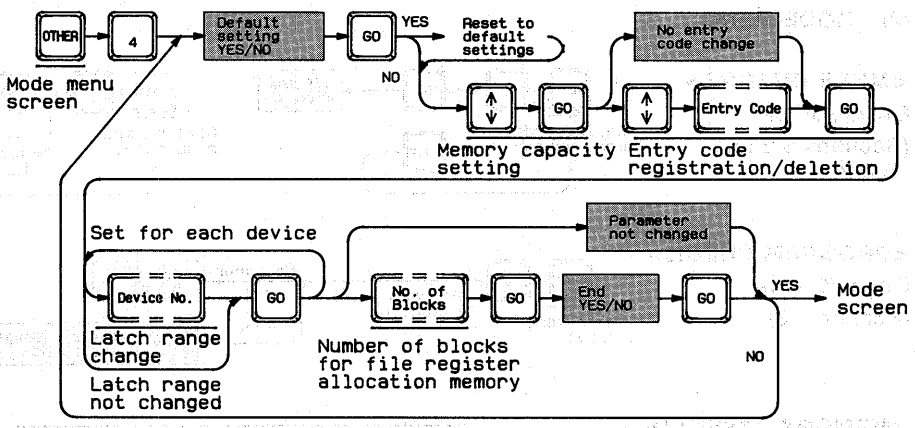
Returns the display to the previous setting item screen.

Will cancel data that has just been keyed in before the [GO] key is pressed :

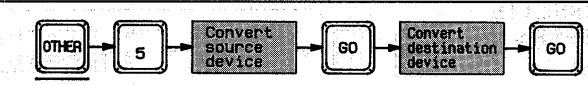
It also returns the display to the mode menu screen when it is pressed in theparameter mode.

OPERATION FLOW

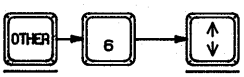
<PARAMETER SETTING>
Online/Offline
(Section 5.5)



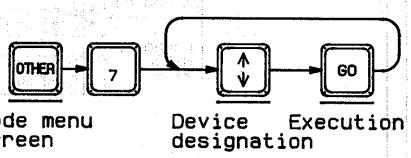
<X,Y,M... NUMBER CONVERSION>
Online/Offline
(Section 5.6)



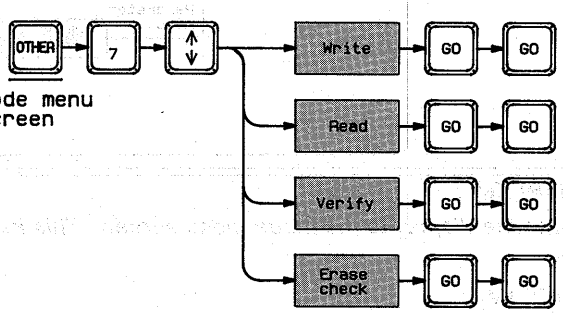
<BUZZER VOLUME>
Online/Offline
(Section 5.7)



<LATCH CLEAR>
Online
(Section 5.8)



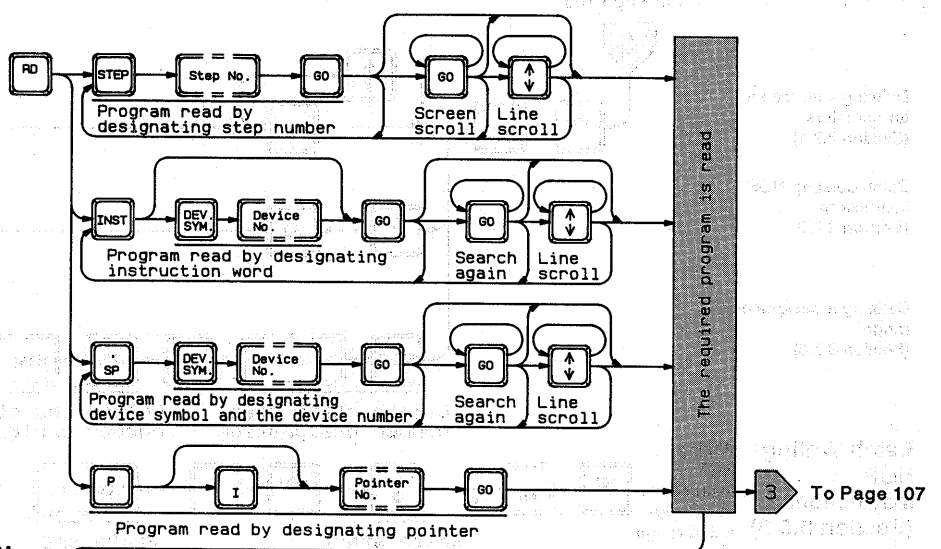
<MODULE>
Offline
(Section 8.2)



OPERATION FLOW

(3) PROGRAMMING

<PROGRAM READ>
(Section 3.3)



<PROGRAM CORRECTION>
(Sections 3.5 to 3.7)

Write :

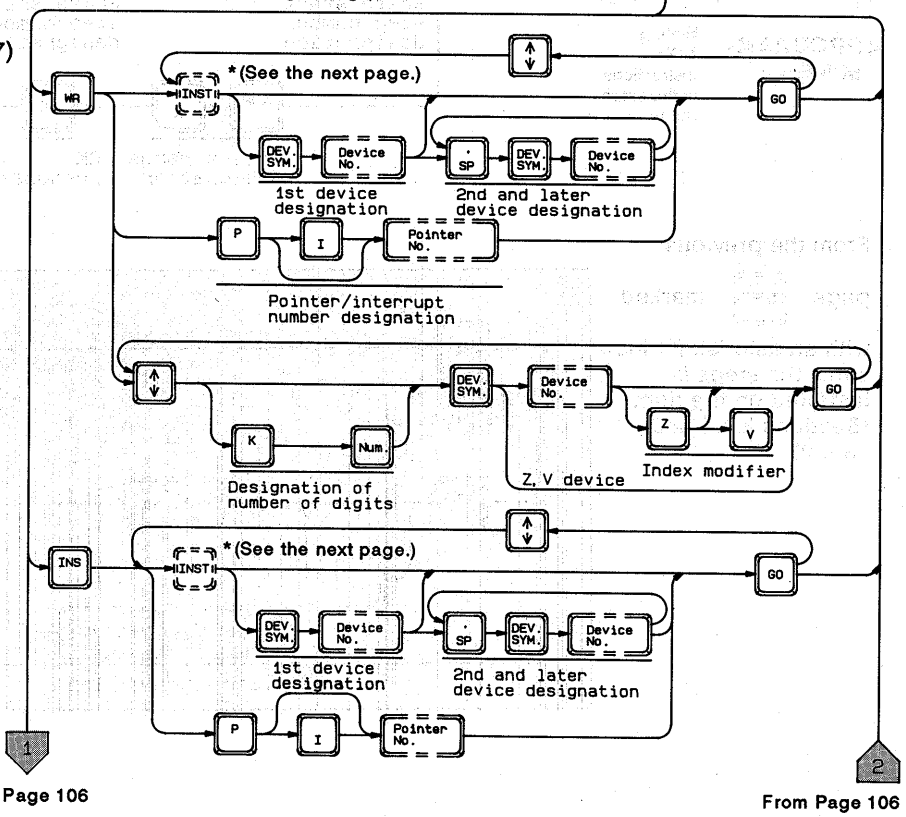
Writing instructions and/or pointers (Section 3.5.1)

Writing devices only (Section 3.5.2)

Insert :

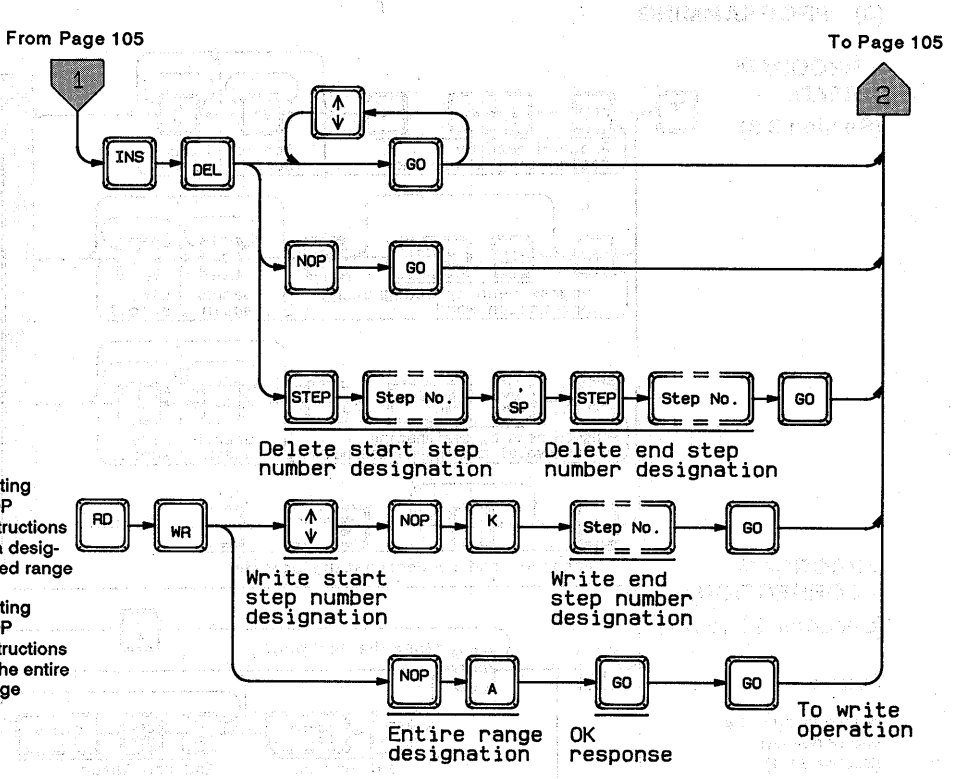
Inserting instructions (Section 3.6)

Inserting pointers

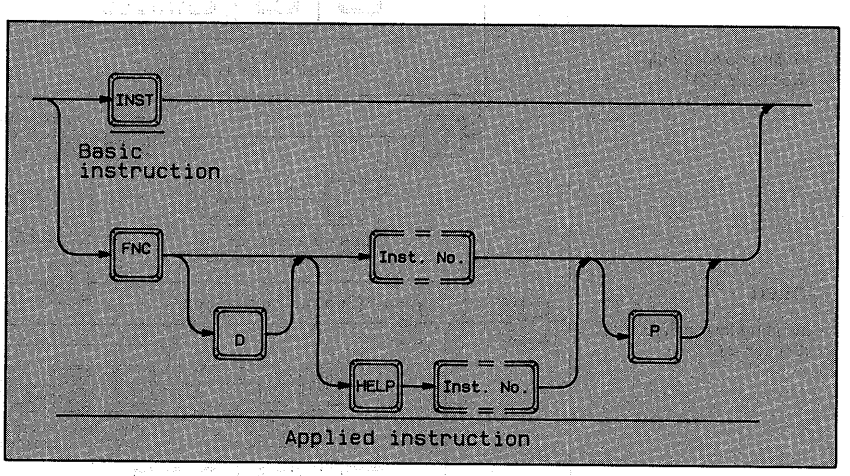


OPERATION FLOW

Delete :



From the previous page INST marked with an asterisk (*) indicates the steps illustrated on the right. (Sections 3.4.1 and 3.4.2)



OPERATION FLOW

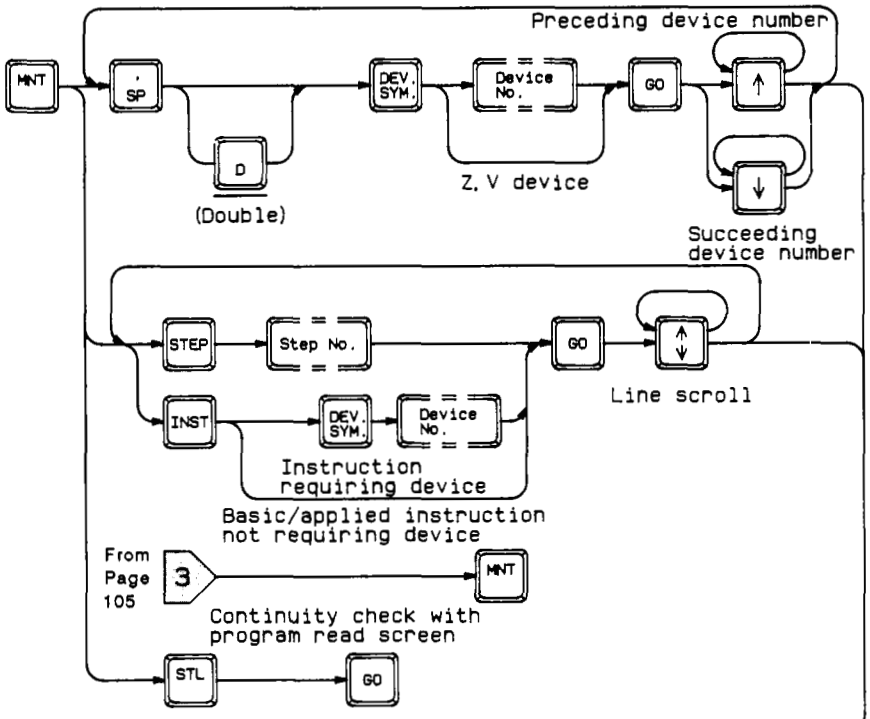
(4) MONITOR/TEST

<MONITOR>

Device monitor
(Section 4.2)

Continuity check
(Section 4.3)

Active state monitor
(Section 4.4)

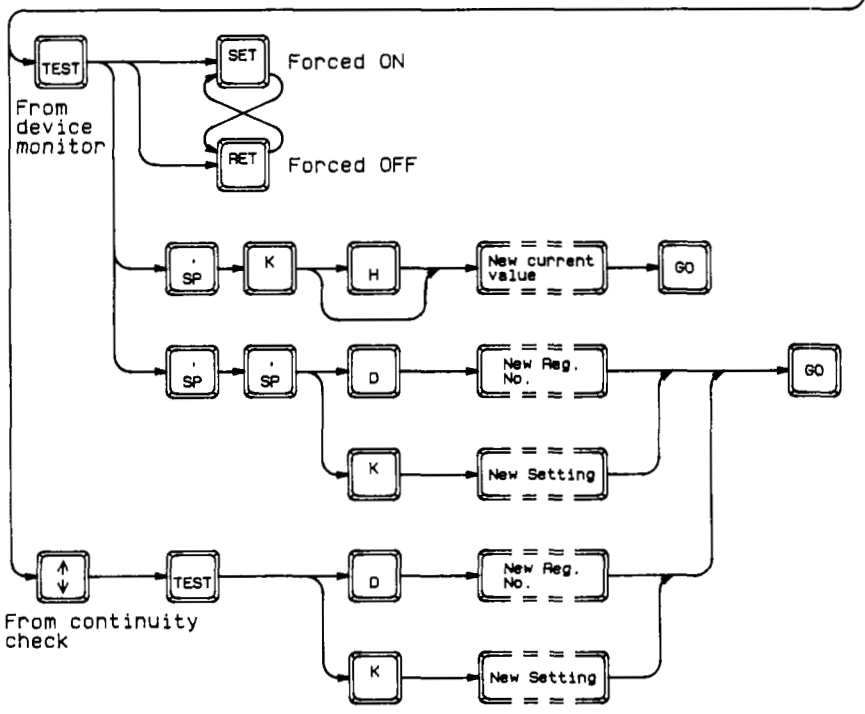


<TEST>

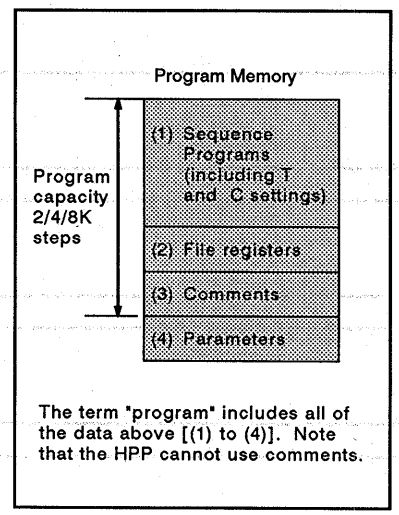
Forced ON/OFF
(Section 4.5)

T, C, D, Z, V Data Change
(Section 4.6)

T, C Setting Change
(Section 4.7)



MEMO



Contents of Program Memory

(1) A sequence program may contain constants for the setting [K] for timers and counters.

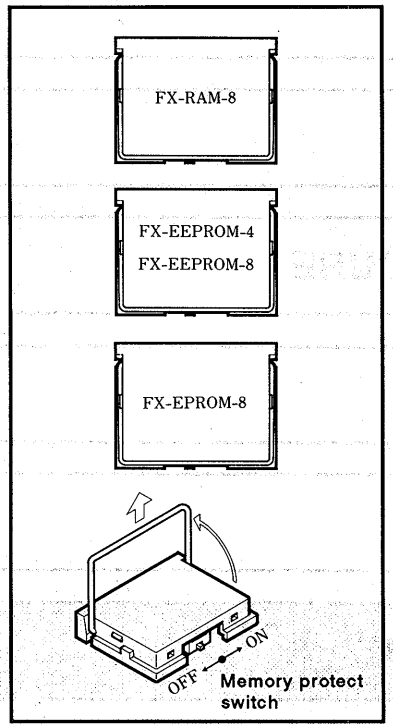
(2) It is necessary to allocate a block by a parameter setting for file register.

Block 0 :	No file register
Block 1 :	D1000 to D1499 500 points/500 steps
Block 2 :	D1000 to D1999 1000 points/1000 steps
Block 3 :	D1000 to D2499 1500 points/1500 steps
Block 4 :	D1000 to D2999 2000 points/2000 steps

(3) The HPP cannot read or write comments.

However, if a program containing comments is transferred to the HPP RAM, the comments will be written to the RAM area.

(4) The parameter area sets the program memory capacity, latch memory device number range, file register block number, entry code, etc.



Program Memory Types

There are three program memory capacities available: 2K steps, 4K steps, and 8K steps.

The memory capacity, steps 0 to 1999/3999/7999, depends on the parameter setting and the area available from the RAM, EEPROM, and EPROM cassettes.

(1) RAM

Battery backup is necessary.

A RAM (2K steps) area is incorporated in the PC and an FX-RAM-8 RAM cassette (8K steps) is also available.

If the RAM cassette is removed from the PC, the program in the cassette will be lost.

(2) EEPROM

Programs cannot be written unless the memory protect switch is set to the OFF position.

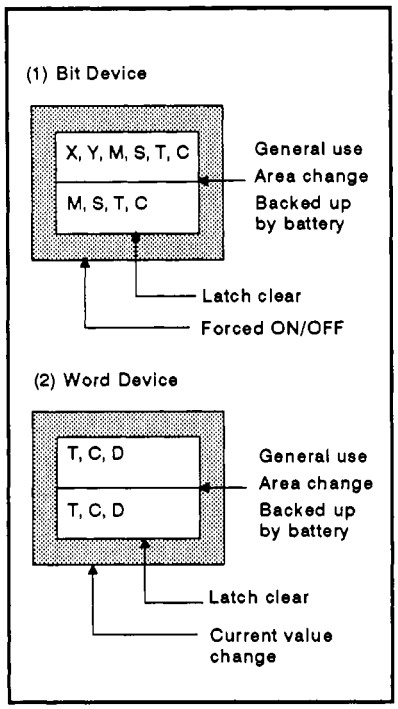
The following EEPROM cassettes are available :

FX-EEPROM-4 (4K steps), FX-EEPROM-8 (8K steps)

(3) EPROM

Use a ROM writer module to write the program to the EPROM cassette.

The FX-EPROM-8 (8K steps) EPROM cassette is available.



Contents of Device Memory

(1) Bit device memory

The bit device memory stores the contact ON/OFF status or coil operation status of input relays (X), output relays (Y), auxiliary relays (M), state (S), timers (T), counters (C), etc.

Some M, S, T, and C device data is backed up by the battery.

For example, M0 to M499 are for general use while M500 to M1023 are for battery back-up use. The areas to be used for general use and battery back-up use can be changed by changing the parameter setting.

(2) Word device memory

The word device memory stores the current value of timers (T), counters (C), data registers (D), and other devices.

The memory area is divided into the two parts; the general use area and the battery back-up use area.

The area size can be changed by changing the parameter setting.

FUNCTIONS AND MEMORY AREAS

RD/WR INS/DEL		Reading, writing, inserting, deleting a sequence program in the program memory or HPP RAM
MNT		Reading a sequence program in the program memory and ON/OFF and numerical data in file registers and device memory.
TEST		Forced ON/OFF or current value for T/C settings in the program memory, file registers (for RAM or EEPROM), or device memory.
OTHER	Program check	Checking a sequence program and parameters in the program memory.
	Transfer	All data in the program memory [(1) to (4)] on previous page] is batch transferred.
	Parameter setting	Parameters are written or corrected.
	Latch clear	Clearing latched ON/OFF data and latched data from the device memory and file registers (RAM or EEPROM).

MEMO

REVISIONS

EDITION DATE	MANUAL NUMBER	REVISION
Nov. 1990	JY992D19101A	First Edition
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OPERATION MANUAL

FX-20P-E PROGRAMMING PANEL

MITSUBISHI ELECTRIC CORPORATION

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

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