

POSITIONING CONTROLLERS

OPERATION MANUAL

E-20TP TEACHING PANEL

E-20TP

Teaching Panel

Operation Manual

Manual number: JY992D44901B
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Foreword

- This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the E-20TP unit.
- Before attempting to install or use the E-20TP unit this manual should be read and understood.
- If in doubt at any stage of the installation of the E-20TP unit always consult a professional electrical engineer who is qualified and trained to the local and national standards which apply to the installation site.
- If in doubt about the operation or use of the E-20TP unit please consult the nearest Mitsubishi Electric distributor.
- This manual is subject to change without notice.

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Guidelines for the safety of the user and protection of the E-20TP unit

This manual provides information for the use of the E-20TP unit. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;

- a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
- b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.
- c) All operators of the completed equipment should be trained to use that product in a safe and co-ordinated manner in compliance to established safety practices. The operators should also be familiar with all documentation which is connected with the actual operation of the completed equipment.

Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

Notes on the symbology used in this manual

At various times through out this manual certain symbols will be used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of the equipment. Whenever any of the following symbols are encountered its associated note must be read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

Hardware warnings



Indicates that the identified danger **WILL** cause physical and property damage.



Indicates that the identified danger could **POSSIBLY** cause physical and property damage,



Indicates a point of further interest or further explanation

Software warnings



Indicates special care must be taken when using this element of software



Indicates a special point which the user of the associate software element should be aware of



Indicates a point of interest or further explanation

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1. INTRODUCTION

The E-20TP teaching panel (hereafter called TP) is designed to be connected to an E-20GM 2-axis positioning unit (hereafter called PGU) and used for writing, insertion, and deletion of programs and parameters. It may also be used to monitor the PGU's programs.

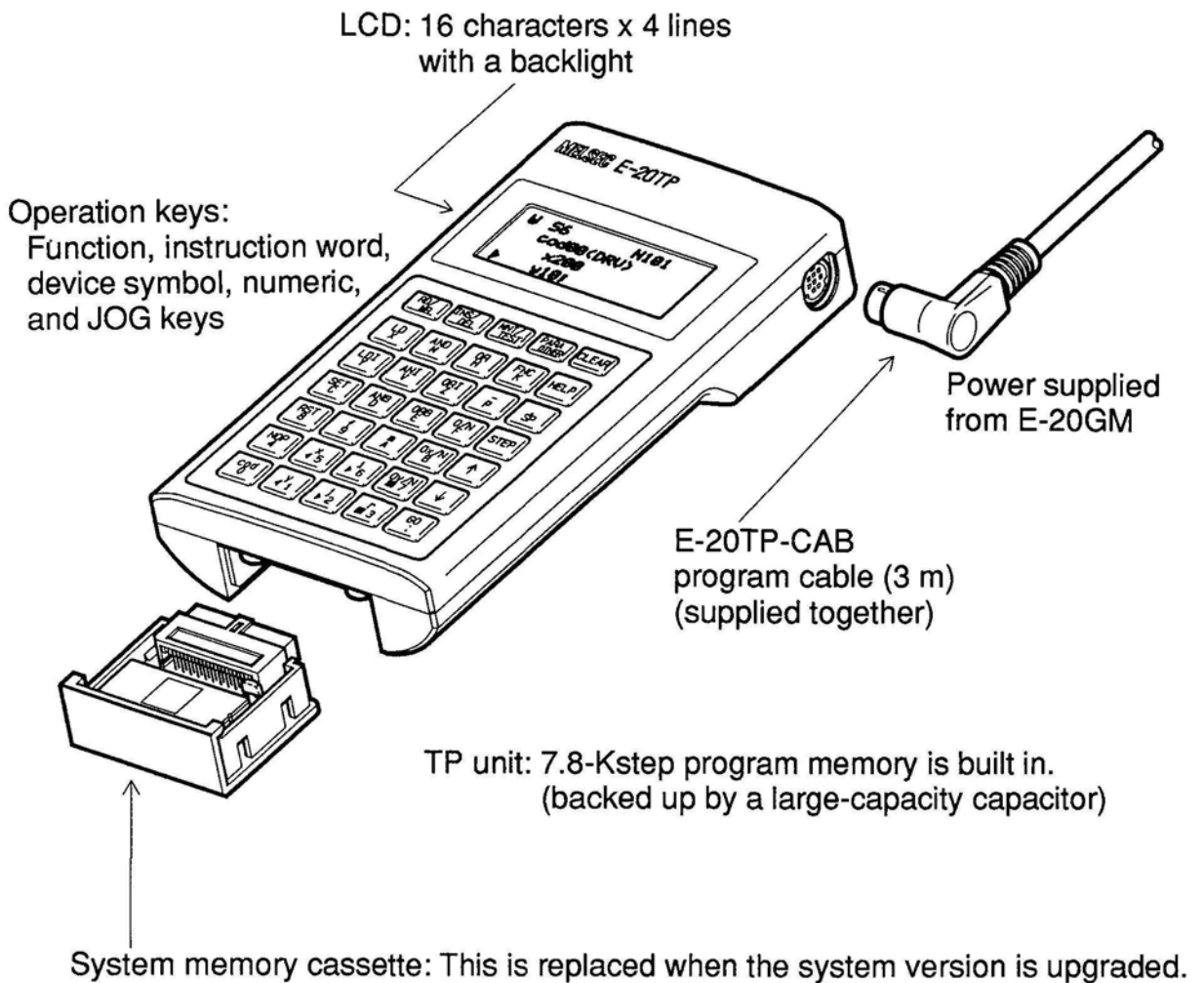
1.1 General Description of Functions

The operation functions of the TP are classified into two main mode classifications: online mode and offline mode. Online mode allows communication directly with memory in the PGU. Offline mode allows editing with the TP's internal memory. (See Chapter 3 for the description of modes.)

Mode		Online Mode (communications directly with PGU's memory)		Offline Mode (editing with the TP's internal memory)	
Function					
Read		Reading of a program PGU memory → TP screen	Page 4-3	Reading of a program TP memory → TP screen	Page 4-3
Write		Writing of a program TP key → PGU memory	Page 4-13	Writing of a program TP key → TP memory	Page 4-13
Insert		Insert instruction blocks TP key → PGU memory	Page 4-26	Insert instruction blocks TP key → TP memory	Page 4-26
Delete		Delete instruction blocks TP key → PGU memory	Page 4-30	Delete instruction blocks TP key → TP memory	Page 4-30
Monitor		Operation and device monitor TP key → PGU memory	Page 5-2	—	—
Test		MANUAL operation, forced ON/OFF, error monitor TP key → PGU memory	Page 5-8	—	—
Parameter		Parameter setting TP key → PGU memory	Page 6-1	Parameter setting TP key → TP memory	Page 6-1
Other	Mode switch	Offline mode switching Online → Offline	Page 7-2	Online mode switching Offline → Online	Page 8-2
	Program check	Program check Program check in PGU	Page 7-3	Program check Program check in TP	Page 7-3
	Parameter check	Parameter check Parameter check in PGU	Page 7-4	Parameter check Parameter check in TP	Page 7-4
	Transfer	Transfer to/from memory cassette PGU internal RAM ↔ EEPROM cassette	Page 7-5	Batch transfer TP memory ↔ PGU memory	Page 8-3
	User area initialize	User area initialize PGU memory initialize	Page 7-8	User area initialize TP memory initialize	Page 7-8
	—	Latch clear Keep area clear	Page 7-9	File register data change File register data change in TP	Page 8-5
	Buzzer sound volume adjustment	Buzzer sound volume adjustment TP buzzer sound adjustment	Page 7-9	Buzzer sound volume adjustment Buzzer sound adjustment in TP	Page 7-9

1.2 Description of the Product

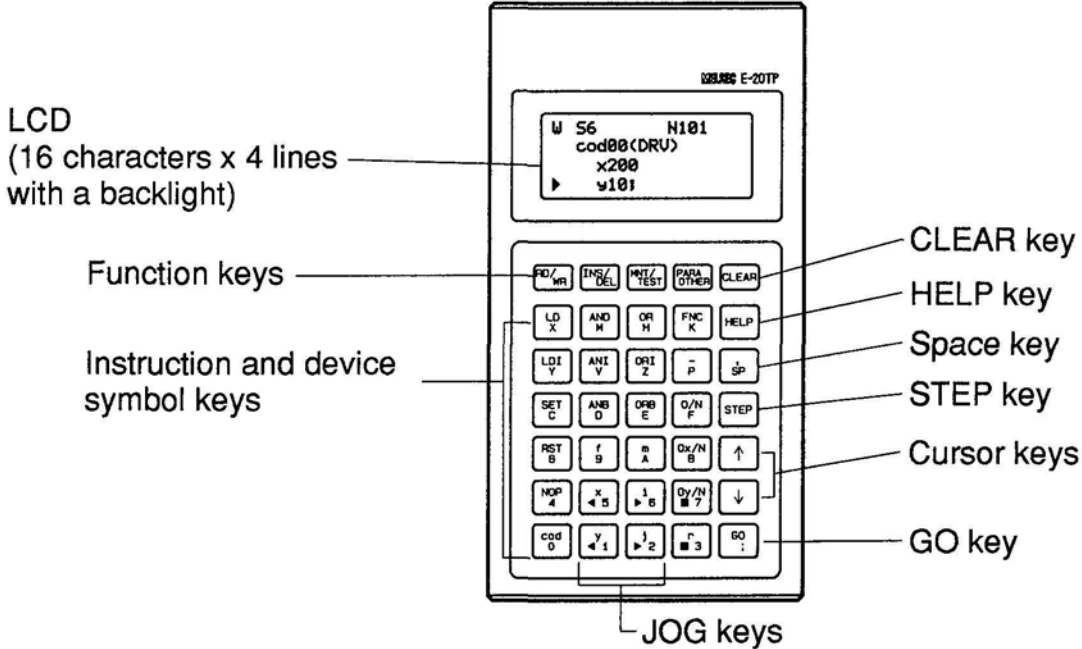
The TP is a handheld programming and monitoring unit provided with a 16-character x 4-line LCD (with a backlight), a system memory cassette interface, and a rubber key pad (function, instruction word, device symbol, and numeric keys). The TP has a system memory cassette installed in it and is supplied together with an E-20TP-CAB program cable (3 m).



1.3 Description of the Panel Face

1.3.1 Names of keys

The operation keys are named as shown below.



1.3.2 Key functions and the operation common to the keys

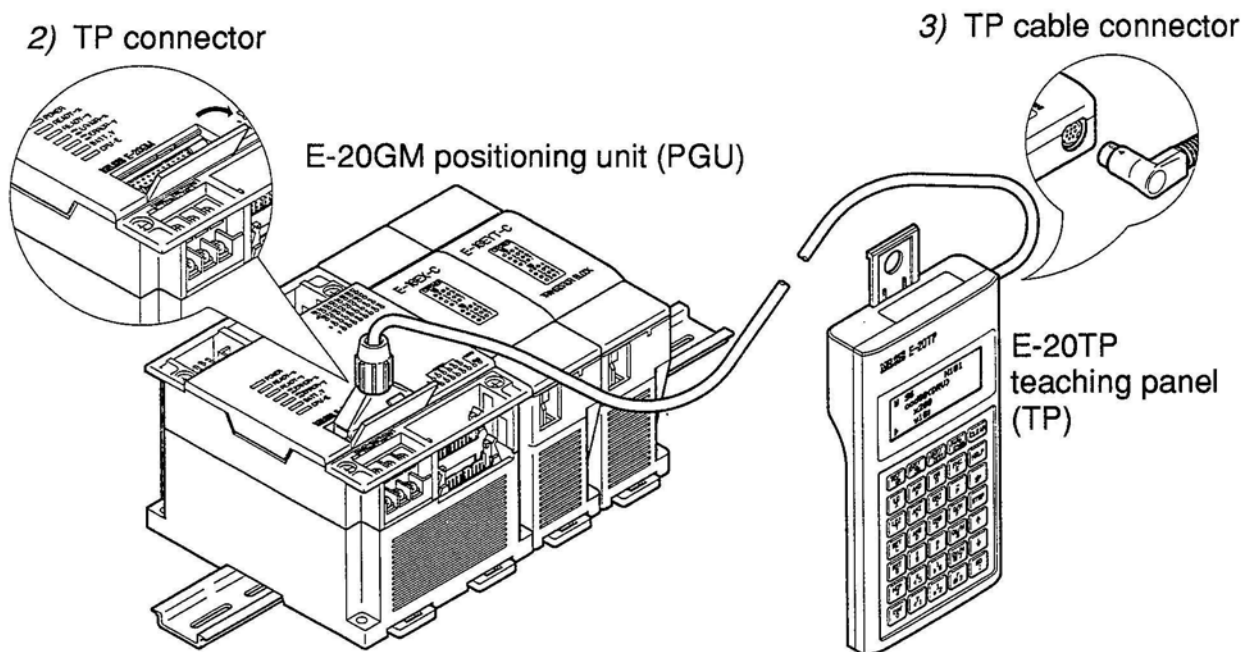
- **Function keys (RD/WR, INS/DEL, MNT/TEST, PARA/OTHER)**
The RD/WR and INS/DEL keys switch their functions alternately. (Pressing it once selects the top function indicated on the key face, and pressing it again switches to the bottom function indicated on the key face.)
- **Instruction and device symbol keys (LD, AND, X, Y, etc.)**
These keys are assigned with the instruction words at the top and the device symbols or numerals at the bottom. The top and bottom functions are automatically selected according to the operation sequence.
- **CLEAR key**
Used to cancel the key inputs before pressing the [GO] (execution) key or to clear error messages.
- **HELP key**
Used to display a list of the FNC and cod instructions. This key has also a supporting function when inputting instructions. In monitor mode, this key is used to switch the display of the decimal and hexadecimal notations.
- **Space key**
Used to input spaces when inputting instructions or to designate devices and constants.
- **STEP key**
Used to designate a step number.

- **Cursor keys**
Used to move the line cursor or to scroll the screen by lines.
- **GO key**
Used to determine and execute a function, scroll the screen after display, or to execute a search.

1.4 Connection to the PGU

Connect the TP to the PGU as follows.



- 1) Turn OFF the PGU power.
- 2) Open the TP connector cover on the PGU and insert the E-20TP-CAB program cable.
- 3) Connect the E-20TP-CAB program cable to the TP. Make sure that the cable connector is inserted securely in the correct direction.



- 4) Make sure that the E-20P-CAB program cable is connected securely to the TP and the PGU, and turn ON the power. If the connection is complete, the initial screen shown to the right will be displayed. (This screen will be displayed for about 2 seconds and then the next screen will be displayed.)

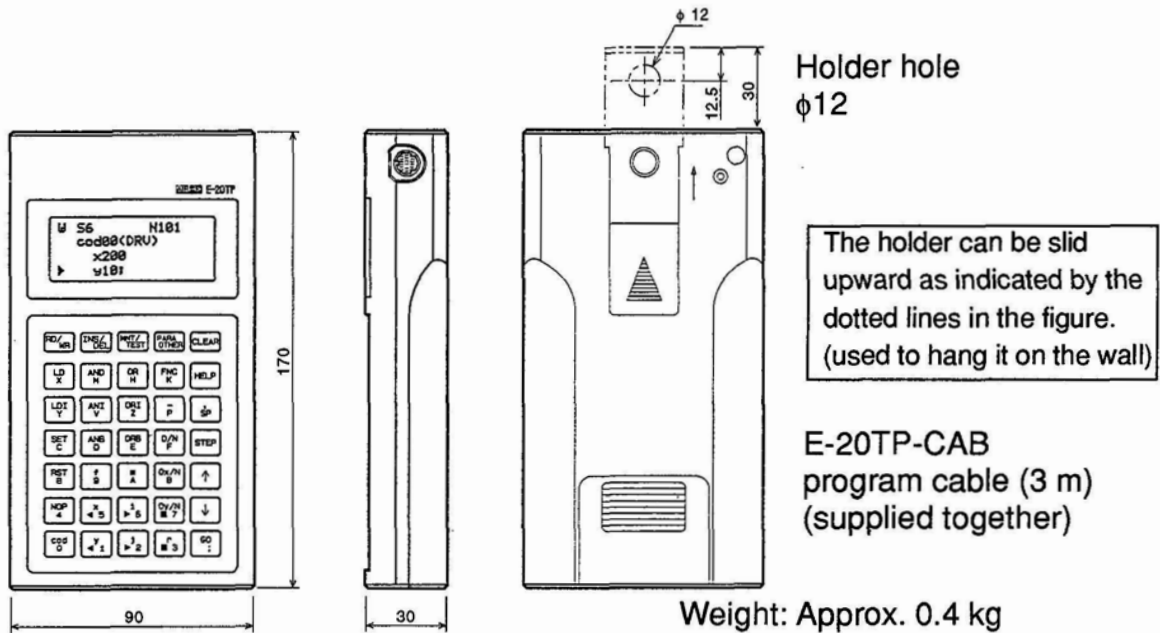
Initial screen at power ON

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ELECTRIC CORP.	
MELSEC E	V1.10

Pressing the  and  together at the same time will display the initial screen without turning OFF the power.

1.5 Specifications

1.5.1 Outside dimensions



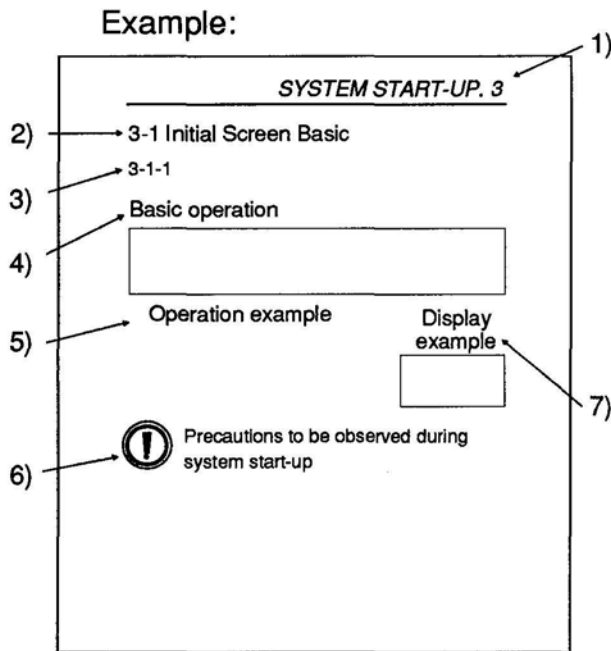
1.5.2 General and performance specifications

Item	General Specifications			
Operating ambient temperature	0 °C to 40 °C			
Operating ambient humidity	35 to 85 % RH (no condensation)			
Vibration resistance	Conforms to JIS C0911.	Vibration Frequency	Acceleration	Amplitude
		10 to 55 Hz	1 G	0.1 mm
		2 hours each in 3 axial directions		
Impact resistance	Conforms to JIS C0912. (10 G x 3 times each in X, Y, and Z directions)			
Operating atmosphere	Free from corrosive gases and excessive dust.			

Item	Performance Specifications	
Power supply voltage	5 VDC \pm 5 % supplied from PGU	
Current consumption	150mA	
User memory capacity	7.8 Ksteps + parameter area	
Memory backup	A large-capacity capacitor backs up the RAM data for 3 days after 1 hour's charge.	
Display	Liquid crystal display with a backlight	
Display contents	Graphic display	1 character: 8 x 5 = 40 dots 1 x 5 dots at the bottom are for prompt.
	Displayed characters	16 characters x 4 lines 64 characters
	Character types	Alphanumerics
Key pad	35 keys	
Built-in interface	Conforms to EIA, RS-422. Used for connection to PGU	
Outside dimensions; mm (inches)	170 x 90 x 30 (6.69 x 3.54 x 1.18)	
Weight; kg (lb)	0.4 (0.88)	

1.6 How to Use This Manual

1.6.1 Description of the contents



- 1) Section title
Classified by modes.
- 2) Section title
Classified by functions.
- 3) Subsection title
Detailed description of functions.
- 4) Basic operation
The basic operation required for using the respective functions.
- 5) Operation example
An example operation based on the basic operation.
- 6) Points for the user's attention.
Cautions and supplementary explanation for the use of respective functions. These are highlighted by hardware and software warning symbols shown at the front of this manual.
- 7) Example display
A screen to be displayed by the example operation.

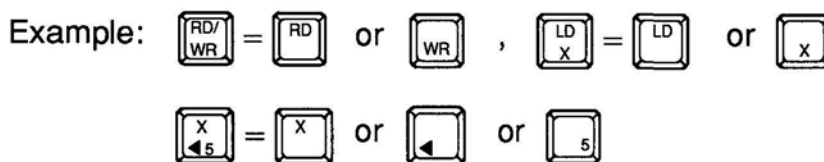
1.6.2 Abbreviations used in this manual

- 1) The FX/E-20GM positioning unit of the MELSEC-E series is abbreviated as PGU (pulse generation unit).
- 2) The E-20TP teaching panel is abbreviated as TP.

1.6.3 Representation of the operation keys

- 1) All operation keys are represented by

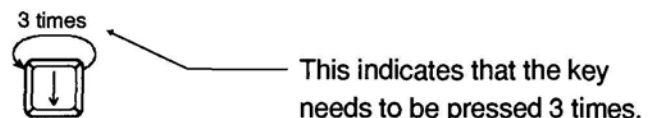
Keys assigned with multiple functions are represented with currently active function according to the operation sequence.



Only the function used for the respective operation is mentioned. Find required operation keys by referring to these key representations.

- 2) The cursor keys and are sometimes represented by

- 3) represents a key to be pressed several times.



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2. EXAMPLE PROGRAMMING OPERATIONS

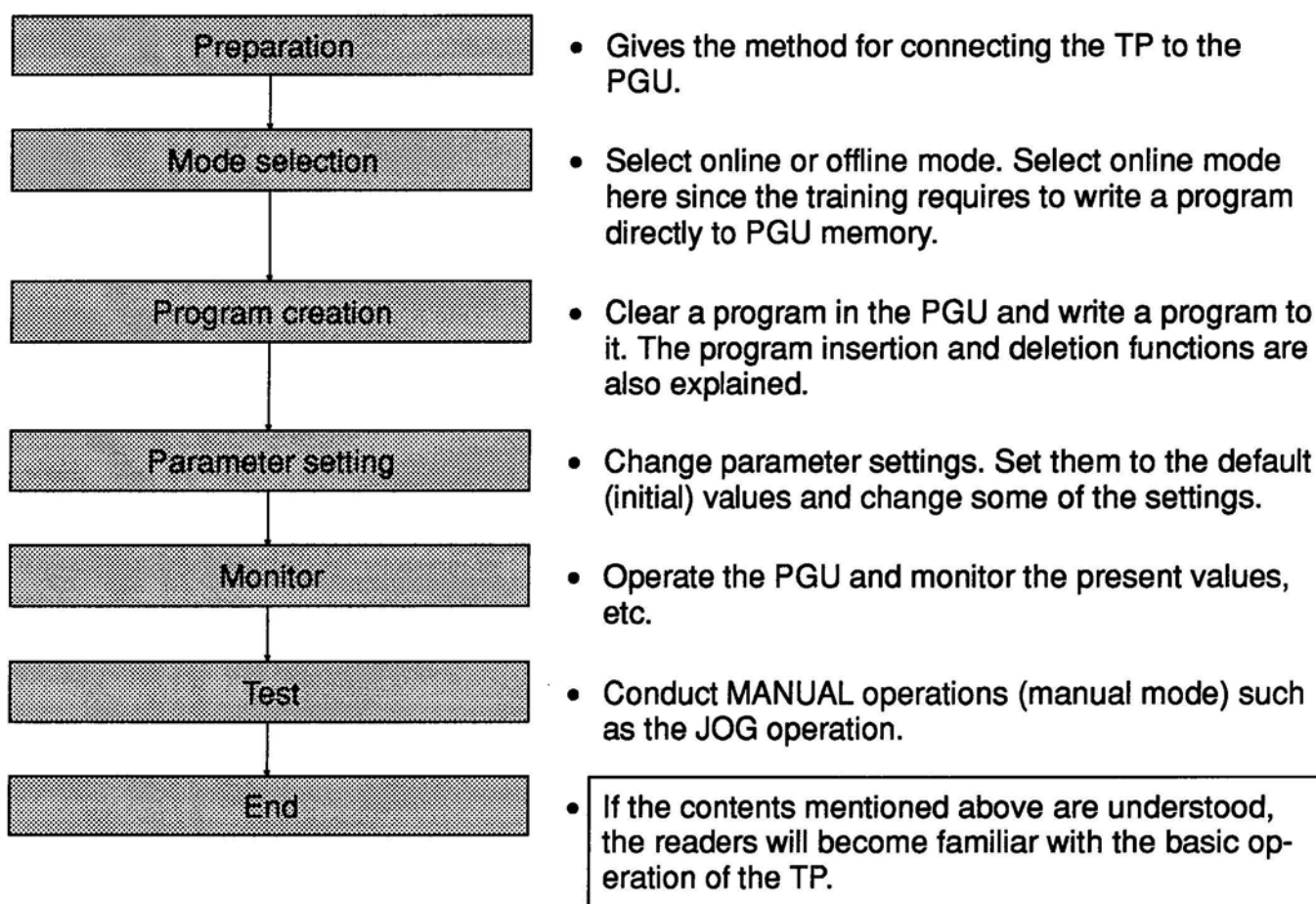
This section gives the training procedures based on simple exercises of programming and parameter creation by using the TP in online mode so that the reader can understand the operation with the TP. The monitor and test functions as well as programming are also used so that the operation can be confirmed.

2.1 Training Procedure

The following products are used for the training:

- FX/E-20GM positioning unit (PGU)
- E-20TP teaching panel (TP)
 - supplied together with an E-20TP-CAB program cable.
- * To use the monitor and test functions, wiring for the inputs of automatic start/stop, MANU/AUTO, etc. is required. To actually drive a motor, wiring for the motor is required. However, the training given in this section can be conducted without using an actual motor.

The training will follow the procedure as mentioned below.





Purpose of this chapter:

- This chapter is intended to familiarize the reader with the operation of the TP. Subsequent sections give more detailed explanations.

2.2 Mode Selection

TP to PGU connection

- Connect the TP to the PGU following the procedure on page 1-4.

Power ON

- Turn ON the PGU power. E-20TP-CAB program cable is used to supply power to the TP.

Initial screen

```
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MELSEC E          V1.10
```

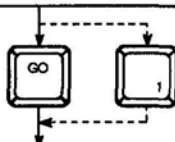
- This initial screen will be displayed for about 2 seconds when the power is turned ON. Then, the screen automatically switches to the mode setting screen.

Mode setting

```
Select mode
 1. ONline
   2. OFFline
                               Select
```

- When the mode setting screen is displayed, the cursor is positioned at the online mode. Press the [GO] or [1] key to select the online mode.

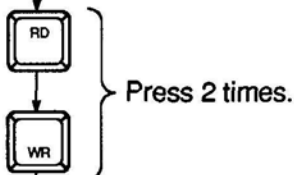
If the mode setting screen is not displayed, follow the procedure on page 1-4.



```
[ONline mode]
Select Mode or
Function
(MEM 7800steps)
```

- Select a function. Use the [RD/WR], [INS/DEL], [MNT/TEST], or [PARA/OTHER] key.

Select the write function by pressing the [WR] key to write a program.



- Press the [RD/WR] key 2 times to select the write function.

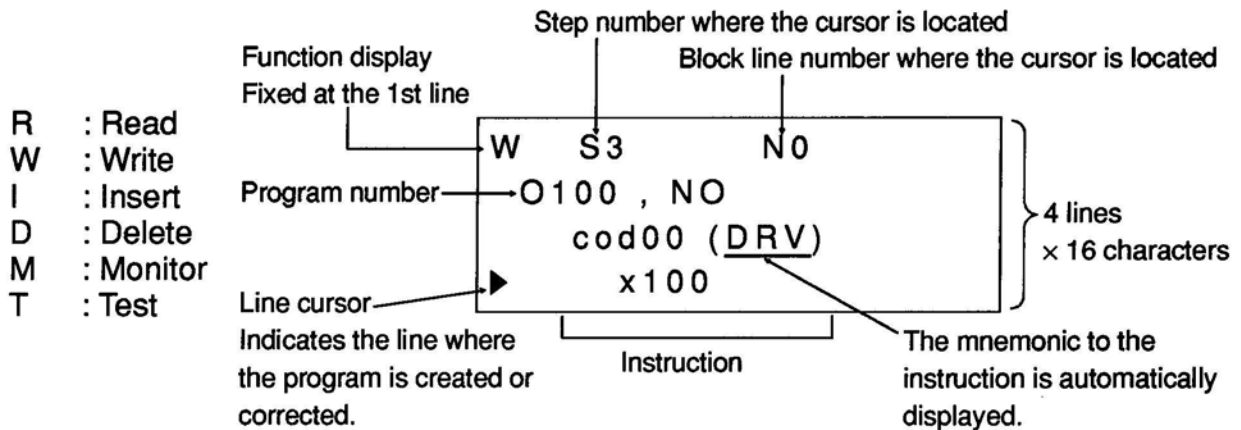
- "W" displayed in the upper left corner indicates that the write function is being selected. (W: Write)

Program creation
(see the next page)



About the function setting:

- The function setting screen gives the information as described below.



2.3 Program

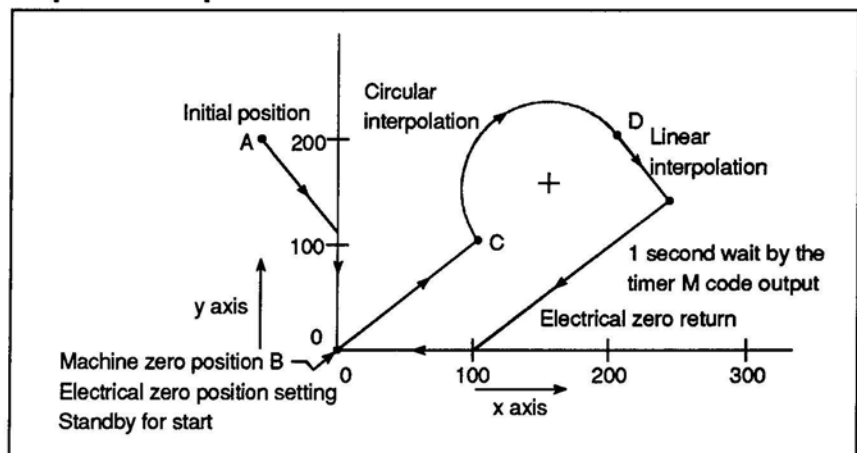
This section gives the procedure to write a program. Before starting, make sure that the PGU is in MANUAL mode. (Program editing can be done only in MANUAL mode.)

Program

```

O. 00
N0 cod28 (DRVZ) ;
N1 cod29 (SETR) ;
N2 m00 (WAIT) ;
N3 cod90 (ABS) ;
N4 cod00 (DRV)
    x100
    y100 ;
N5 cod02 (CW)
    x200
    y200
    i50
    j50
    f500 ;
N7 cod04 (TIM)
    K100 ;
N8 m10 (MCO) ;
N9 cod30 (DRVR) ;
N10 m02 (END) ;
    
```

Operation specifications



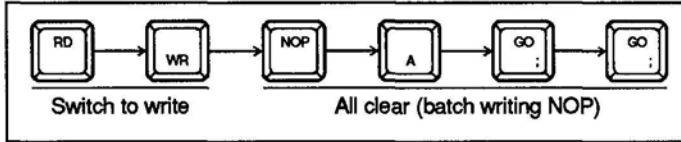
- A zero return is executed from the initial position A to the machine zero position B, and the position B is set to the electrical zero.
- When a start command is given, the machine operation proceeds from the position B to C, D, and to E where an M code is output after 1 second.
- After that, the machine operation returns to the electrical zero position and waits for another start command.

See the FX/E-20GM Hardware/Programming Manual for the details.

2.3.1 Clearing all programs

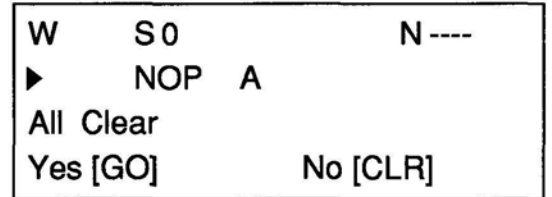
Clear all data in memory (RAM) in the PGU before writing a program to it. Follow the procedure below (batch writing NOP by all-range setting).

Program all clear (batch writing NOP)



- The [A] key stands for "All". Remember this "to write NOP to all range".

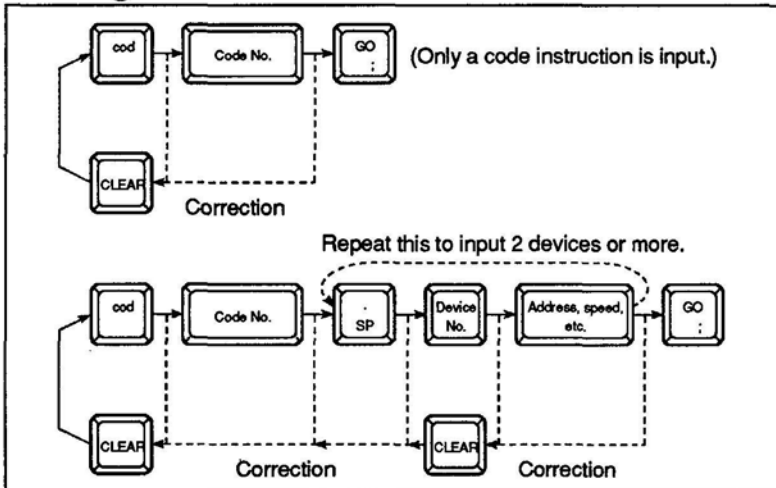
- The screen shown to the right will be displayed. If the screen is not displayed, follow the procedure from the start again.
- All clear can be performed also in OTHER mode.



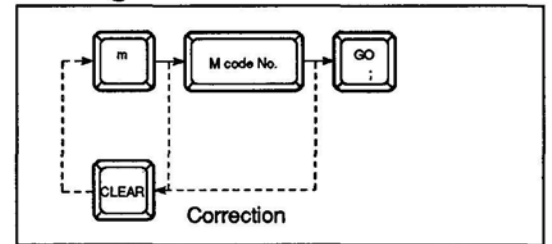
2.3.2 Writing a program

The following gives the program writing procedure.

Writing a cod instruction



Writing an M code

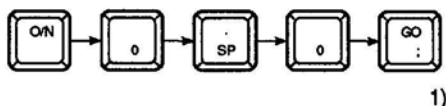


Other write functions are also used.

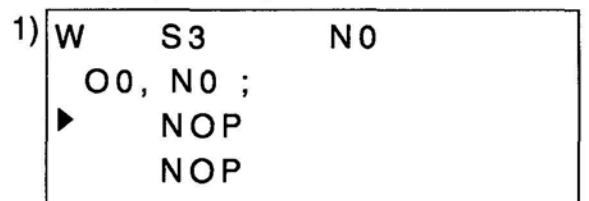
Key operation

Program all clear (see above)

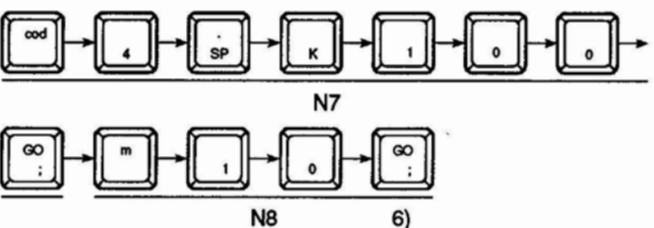
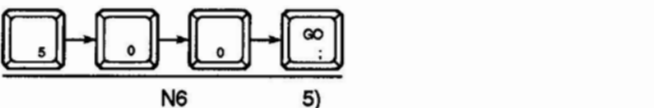
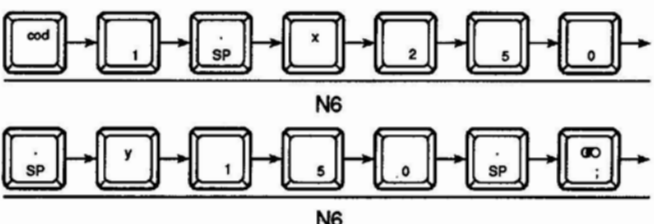
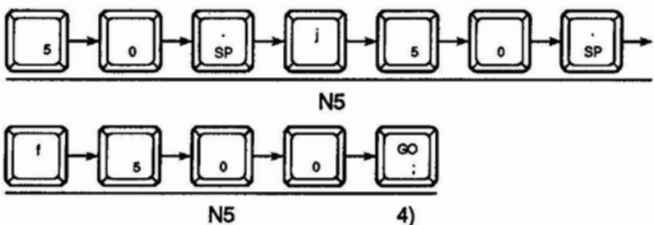
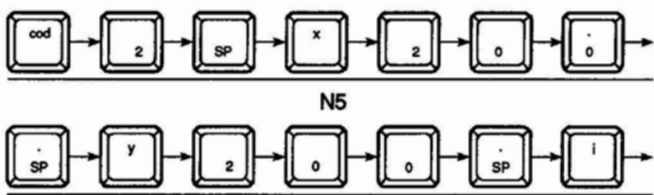
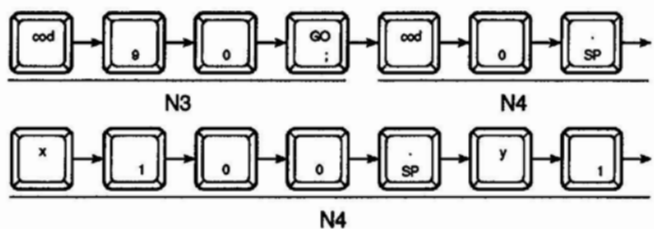
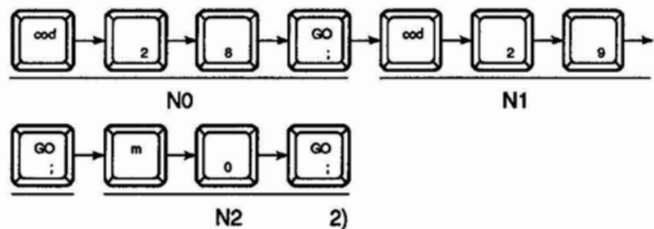
Program No. input



Display example



Program



①

```

2) W   S9   N3
      cod29 (SETR) ;
      M00 (WAIT) ;
      ►   NOP
    
```

```

3) W   S17  N5
      x100
      y100;
      ►   NOP
    
```

```

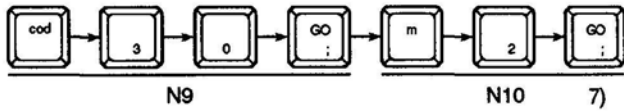
4) W   S29  N6
      j 50
      f 500;
      ►   NOP
    
```

```

5) W   S37  N7
      y150
      f 500;
      ►   NOP
    
```

```

6) W   S43  N9
      K100;
      m10;
      ►   NOP
    
```

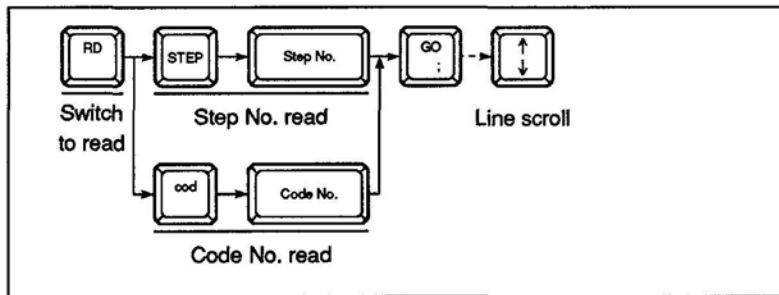



```

7) W   S47   N11
      cod30 (DRVR) ;
      m02 (END) ;
      NOP
    
```

2.3.3 Reading a program

When a program is written, the program can be read out by the procedure given below.



* Other read functions are also used.

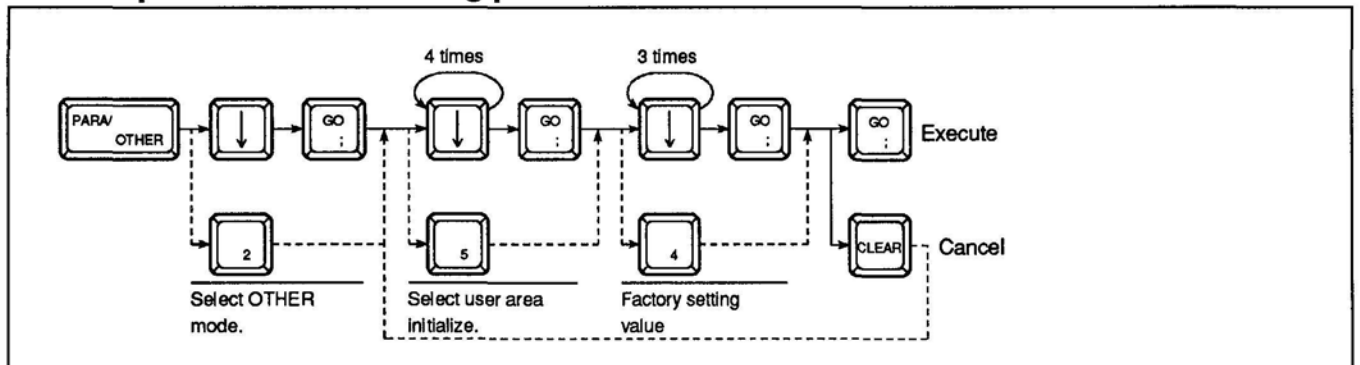
2.4 Parameters

All parameters have been set to the initial values which are general values used for positioning. This section gives the procedure to return the values to the initial (factory setting) values and also to change some of them.

2.4.1 Initializing parameters

Initialize the parameters by following the procedure given below.

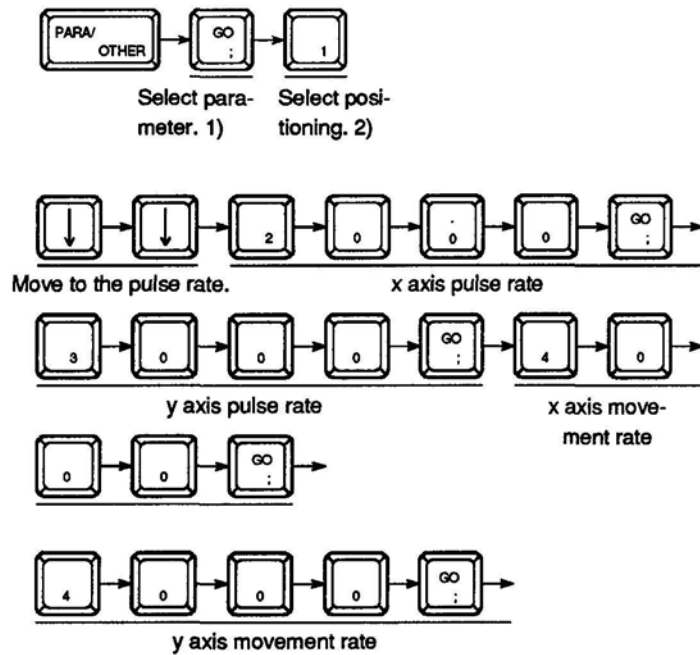
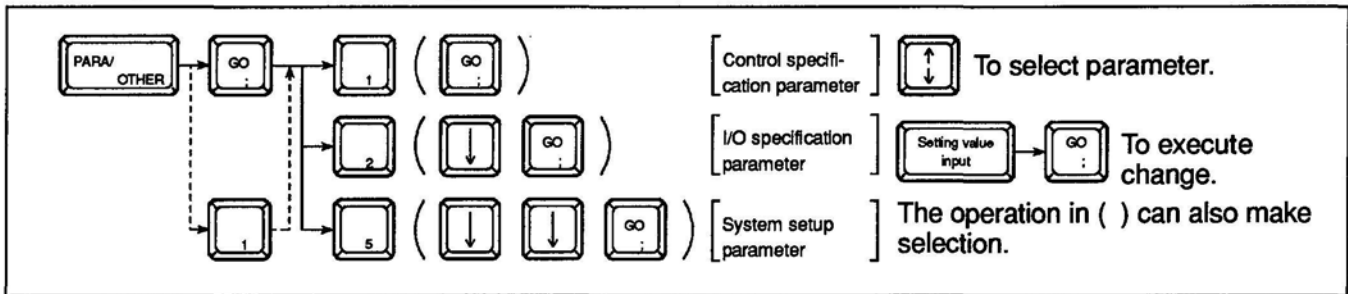
Basic operation for initializing parameters



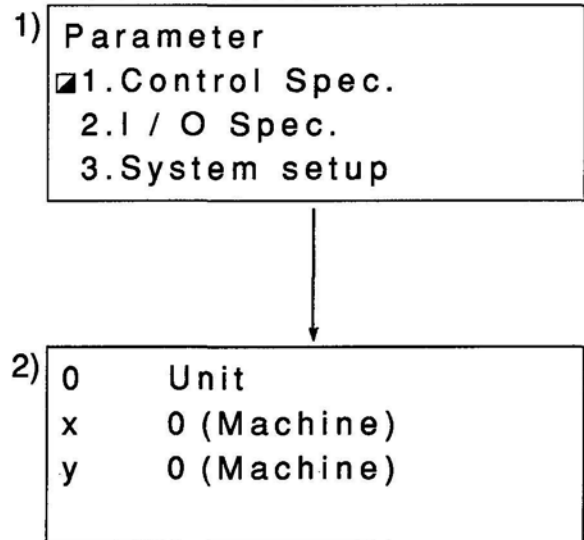
2.4.2 Changing parameters

Parameters are classified into three main categories: system setup parameters, control specification parameters, and I/O specification parameters. The following procedure is used for changing some of the control specification parameters. The procedure is basically the same for changing other parameters.

Basic operation for changing parameters



Parameter selection screen

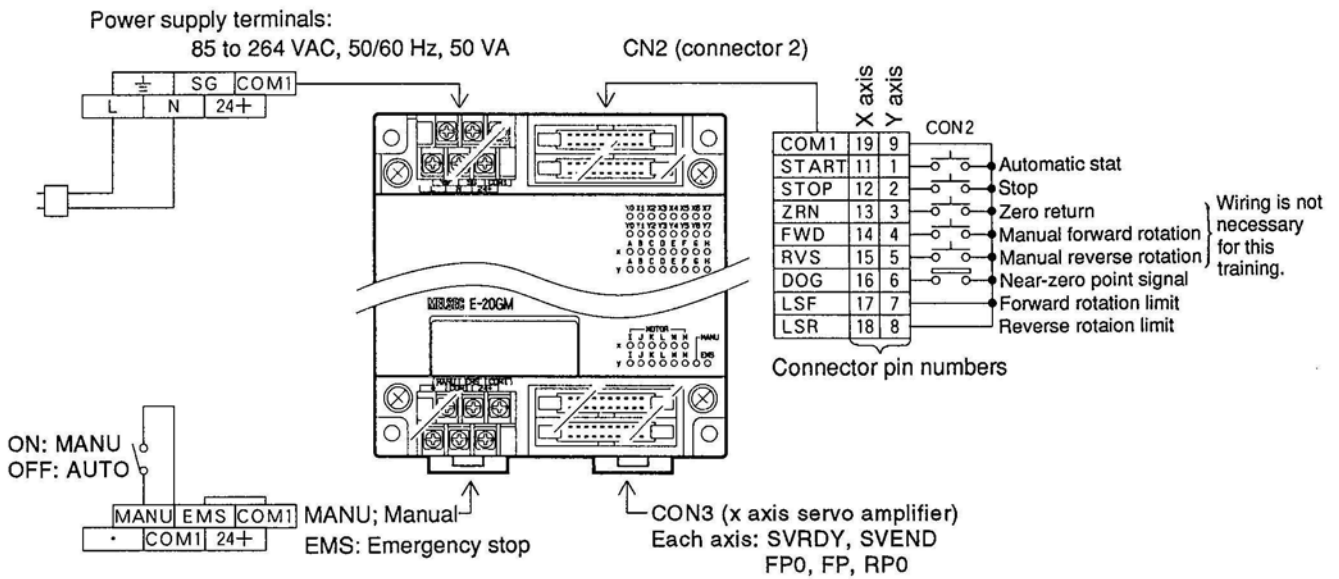


2.5 Monitor

After completing the creation of a program and parameters, start the PGU and monitor its operation.
To start the PGU, connect wiring as shown below.

2.5.1 Preparation

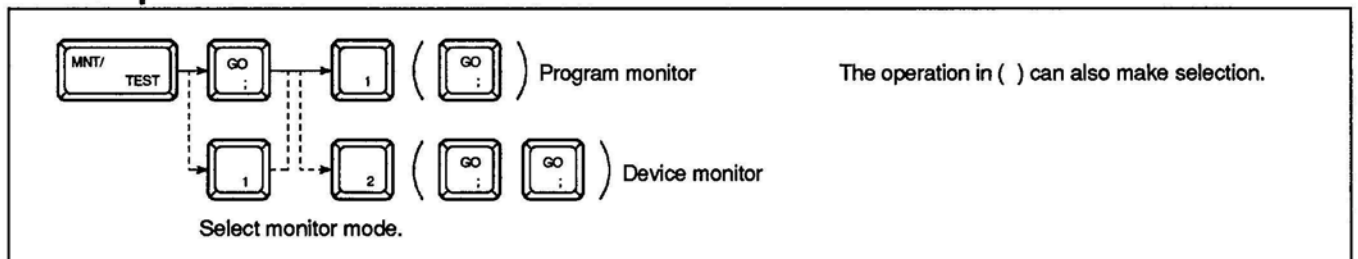
Conduct wiring for the power supply, MANU mode, automatic start and stop, forward rotation limit, and reverse rotation limit.



2.5.2 Program monitor

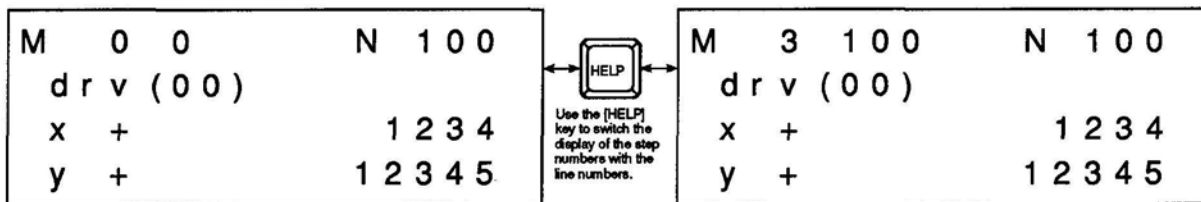
Monitor mode is used to execute a program monitor which displays the instruction word being executed and the present position or an device monitor such as the ON/OFF monitor of X, Y, and M and the present value monitor of D.
The following explains the program monitor only.

Basic operation of monitor



- Set the MANU/AUTO select switch to AUTO.
- Turn ON the automatic start switch.

Monitor screen



The instructions being executed and present values are automatically monitored.

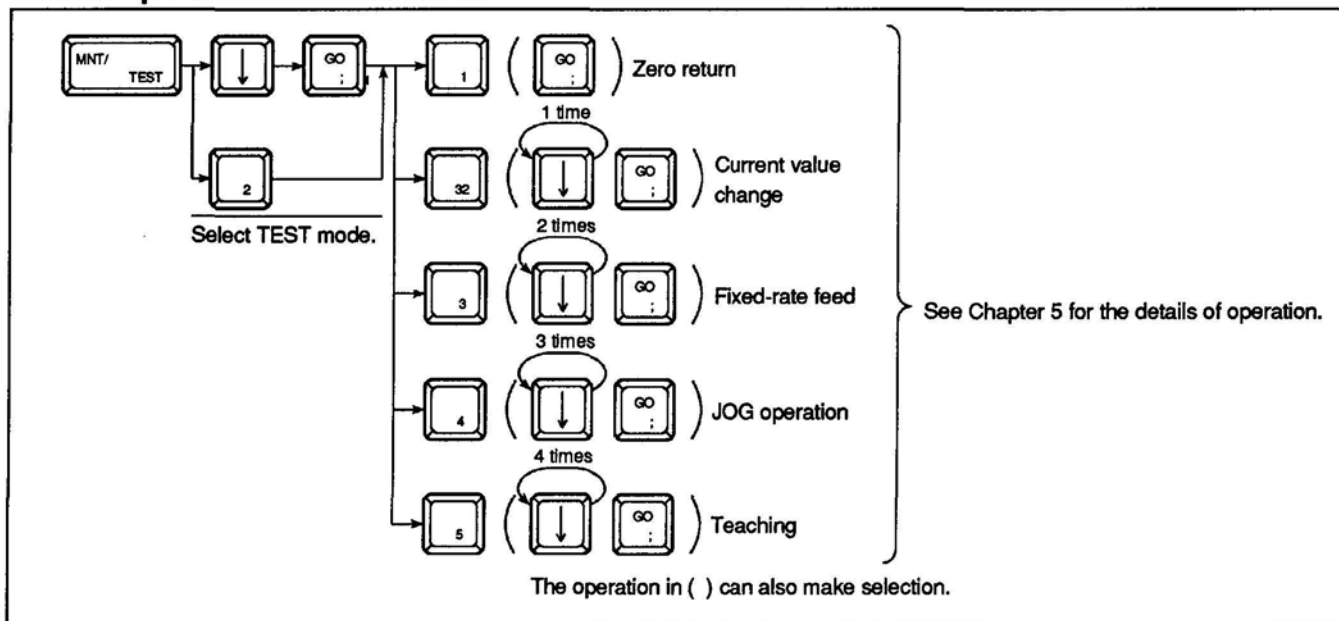
2.6 Test

Test mode is used to give commands from the TP to the PGU for zero return, current value change, fixed-rate feed, error reset, and JOG operation. The fixed-rate feed and JOG operation can be executed without a program stored in the PGU and used also for checking the connection to a motor.

This section gives a training of fixed-rate feed and JOG operation.

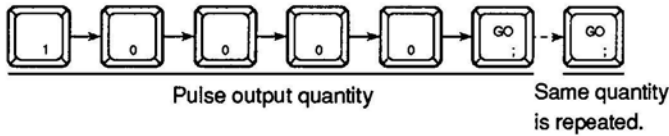
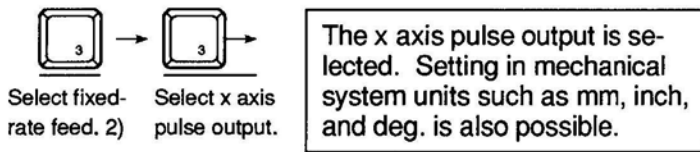
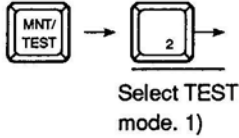
To use the test function, set the MANU/AUTO select switch to MANU.

Basic operation of TEST mode



2.6.1 Fixed-rate feed (FEED)

Select the fixed-rate feed (FEED) in TEST mode and output 10000 pulses on the x axis.



```

1) Test
  1. ZNR
  2. CVR
  3. Feed
    
```

```

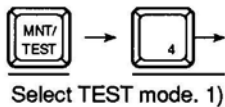
2) FEED
  1. x - axis
  2. y - axis
  3. x - axis (pulse)
    
```

```

3) x - axis pulse feed
   x                0
   Feed Quantity
   x = 10000
    
```

2.6.2 JOG operation

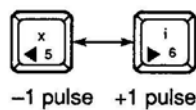
Pulse output is executed while the TP's keys are pressed.



```

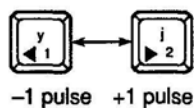
1) Test
  1. ZNR
  2. CVR
  3. FEED
    
```

x axis operation



```

* JOG
  x      0
  y      0
    
```

y axis operation

J O G

■ x	0
■ y	0

Each time the [▲] or [▼] key is pressed for less than 0.2 second, one pulse is output. When either key is pressed for 0.2 second or more, pulses are continuously output.

- * The ■ symbol displayed to the left of x or y indicates that the PGU is in the READY state and that JOG operation can be executed.

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3. SYSTEM START-UP

This section gives details of the procedure ranging from the connection of the TP to the PGU and the selection of the system start-up function.

3.1 Initial Screen

Start up the system following the procedure given below.

TP to PGU connection



Power ON

Initial screen
 COPYRIGHT (C) 1994
 MITSUBISHI
 ELECTRIC CORP.
 MELSEC E V1.10

Mode setting
 Select mode
 1.ON line
 2.OFF line
 Select

GO : 1

[ON line mode]
 Select Mode or
 Function
 (MEM 7800 steps)

- Connect the TP to the PGU following the procedure on page 1-4.
- Turn ON the PGU power. E-20TP-CAB program cable is used to supply power to the TP.
- This initial screen will be displayed for about 2 seconds when the power is turned ON. Then, the screen automatically switches to the mode setting screen. By pressing the following keys together at the same time during the operation with any function, the initial screen will be displayed.
 +  (Press these keys together at the same time.)
- Select either online or offline mode.
 (The next page gives the functions available in online and offline modes.)

↓ 2
 GO :
 • Select a function in offline mode.

[OFF line mode]
 Select Mode or
 Function
 (MEM 7800 steps)



Precautions to be observed during system start-up:

- The function selection in online/offline mode is disabled in the following cases. Conduct the clear operation as given below.

	Online mode	Offline mode
<p>[ON line mode] System Parm Err Change? Yes [GO] No [CLR]</p>	<ol style="list-style-type: none"> 1. System set-up parameter #100 is neither 0 nor 1. 2. File register capacity is 3000 or over. 3. The PGU's battery is low, or the battery was removed and installed. 	<ol style="list-style-type: none"> 1. Same as 1. and 2. in on-line mode. 2. TP is used just after unpacking or the TP has not been supplied with power for a long period (3 days or more).
<p>Select Yes ([GO] key) or No ([CLEAR] key).</p>		

Selecting Yes ([GO] key)

If "Yes" is selected, the following screen will be displayed.

⇒ [ON line mode]
 1. All Clear
 2. Para change

Selecting No ([CLEAR] key)

- Selecting all clear ([1] key) will clear the program and return the parameters to the initial values.
- Selecting parameter change ([2] key) will allow system parameter #100 for memory capacity and #101 for file register capacity to be input and the operation can be continued.
- Program edit can be conducted with 7800 steps of the program size and without file register setting.

3.2 Online / Offline Mode

The TP has two principal operation modes: online mode and offline mode.

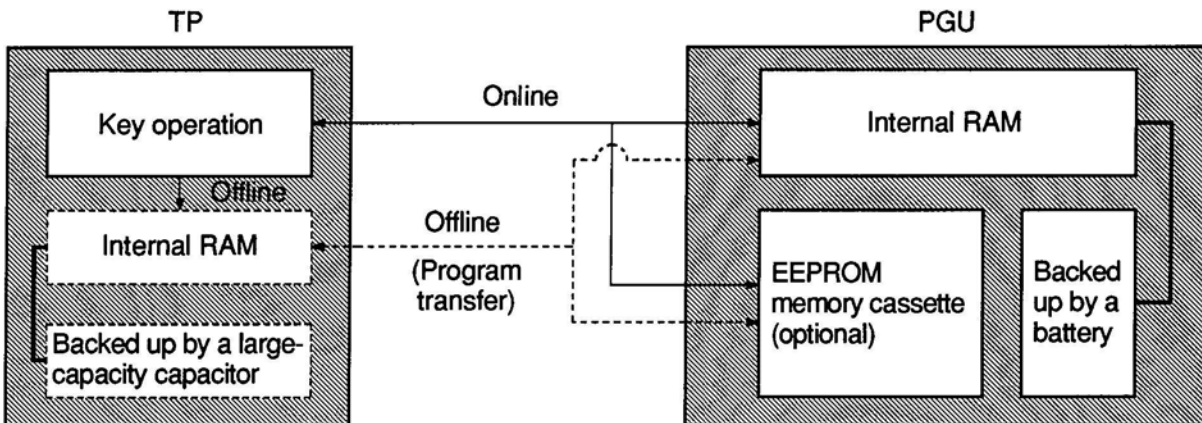
Online mode

This mode is used to read, write, monitor, or test programs and parameters while maintaining a direct communication with the PGU memory (internal RAM or optional EEPROM cassette). The communications are usually done with the internal RAM. When an optional EEPROM cassette is installed in the PGU, the communication function automatically selects the EEPROM.

Offline mode

This mode is used to read and write programs and parameters from and to the RAM in the TP. (The monitor and test functions are not available.) Offline mode allows the TP to be used to transfer programs and data between PGUs. The internal RAM is backed up by a large-capacity capacitor which can hold the data in memory for about three days (the capacitor can be charged fully in one hour when the TP is connected to the PGU and powered). The programs and data in the internal RAM will not be safe after three days of backup. Therefore, it is necessary to copy the programs and data to an EEPROM cassette in case a power failure occurs. When the capacitor is fully discharged, the error mentioned on the previous page will occur. Clear the error by following the specified procedure.

Operations in Online/Offline Modes



The memory in use automatically switches from the internal RAM to the EEPROM when the EEPROM cassette is installed in the PGU. All subsequent accesses are made to the EEPROM and the RAM contents will not change at all.

3.3 Memory Cassette

The TP communicates with the PGU memory which is automatically selected in both online and offline modes as mentioned below.

If the EEPROM is not installed

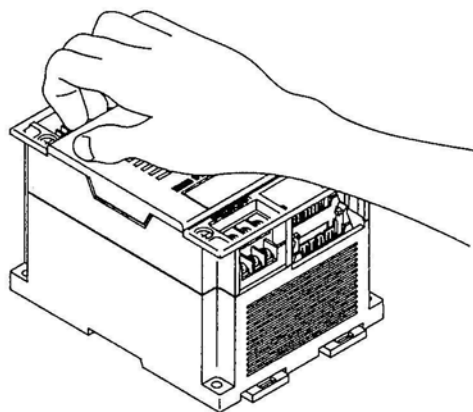
The TP communicates with the internal RAM of the PGU in both online and offline modes.

If the EEPROM is installed

The TP communicates with the EEPROM memory cassette of the PGU in both online and offline modes. To write a program or parameter to the EEPROM, set the PROTECT switch on the memory cassette to OFF.

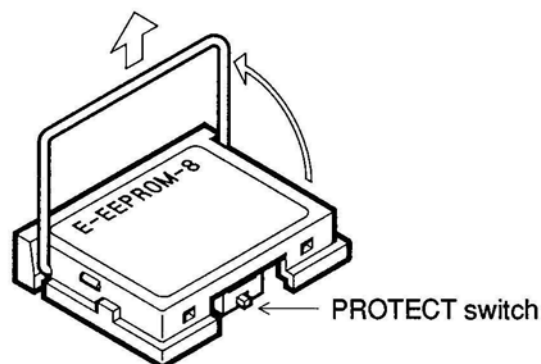
To remove and install the EEPROM memory cassette

- 1) Turn OFF the PGU power, and remove the top cover of the PGU.



- 2) Pull upward and detach the EEPROM memory cassette.

- 3) Set the PROTECT switch to OFF.



- 4) Install the EEPROM memory cassette to the PGU, and turn the power ON.



- Be sure to turn OFF the PGU power before removing and installing the EEPROM memory cassette.

3.4 Online/Offline Mode Functions

The following functions are available in online/offline modes. The reference pages give details of respective function.

Online mode	
Read (RD) Page 4-3	• Programs in the PGU memory can be read out. Either program number, line number, step number, or device can be designated for reading a program.
Write (WR) Page 4-13	• Programs can be written to the PGU memory.
Insert (INS) Page 4-26	• Allows programs in the PGU memory to have sections inserted.
Delete (DEL) Page 4-30	• Allows parts of programs in the PGU memory to be deleted. Deletion can be made in units of program block, instruction, or device.
Monitor (MNT) Page 5-2	• Program operations and device units can be monitored. Devices Y and M can be forcibly set and reset, and the present value of registers can be changed.
Test (TEST) Page 5-8	• Zero return, present position change, fixed-rate feed, error cancel, JOG operation, and teaching are possible from the TP.
Parameters (PARA) Page 6-1	• Parameters can be read and written.
Other (OTHER) Page 7-1	• Switching to offline, program check, parameter check, memory cassette transfer, memory cassette compare, program and parameter initialize, and latch clear are possible.
Offline mode	
Read (RD) Page 4-3	• Programs in the TP's internal RAM can be read out. Either program number, line number, step number, or device can be designated for reading a program.
Write (WR) Page 4-13	• Programs can be written to the TP's internal RAM.
Insert (INS) Page 4-26	• Allows programs in the TP's internal RAM to have sections inserted.
Delete (DEL) Page 4-30	• Allows parts of programs in the TP's internal RAM to be deleted. Deletion can be made in units of program block, instruction, or device.
Parameters (PARA) Page 6-1	• Parameters can be read and written.
Other (OTHER) Page 8-1	• Switching to online, program and parameter batch transfer, program check, parameter check, program and parameter initialize, and file register data edit are possible.

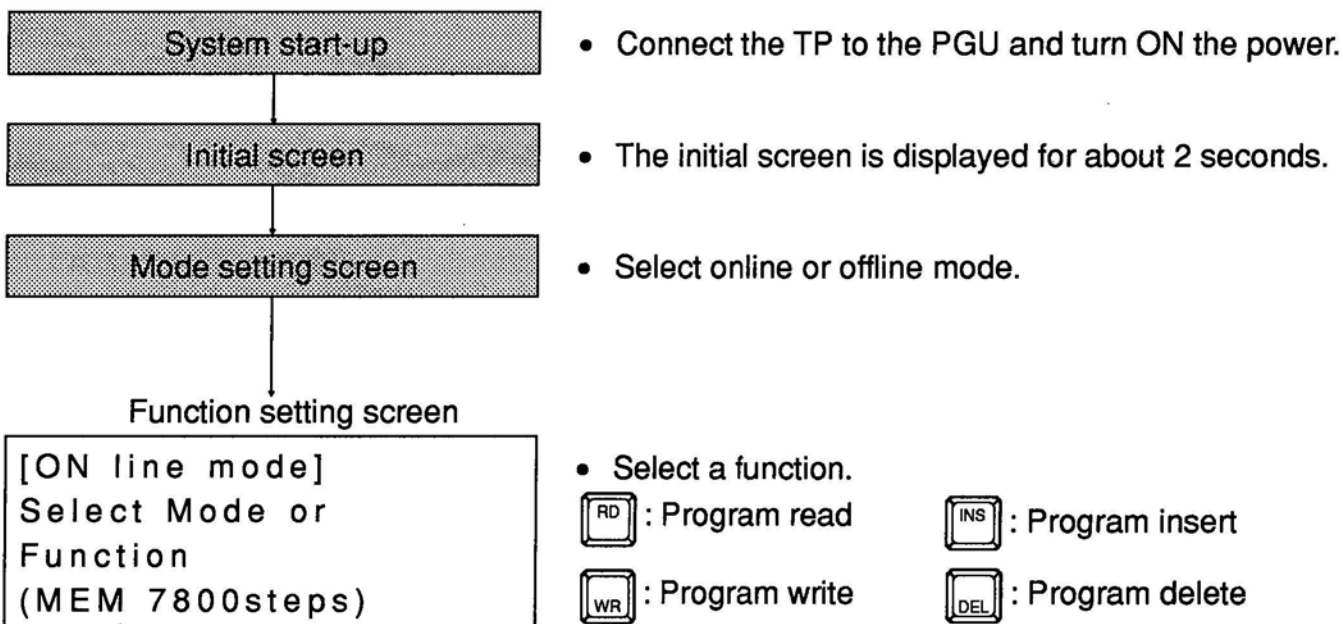
1	INTRODUCTION
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5	MONITOR/TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

4. PROGRAM

This chapter gives a basic method of program creation and the procedures used for reading, writing, inserting, and deleting a program. Refer to Chapter 3 for the procedures of system start-up to mode selection. The same procedure applies to both online and offline modes.

4.1 Selecting the Programming Function

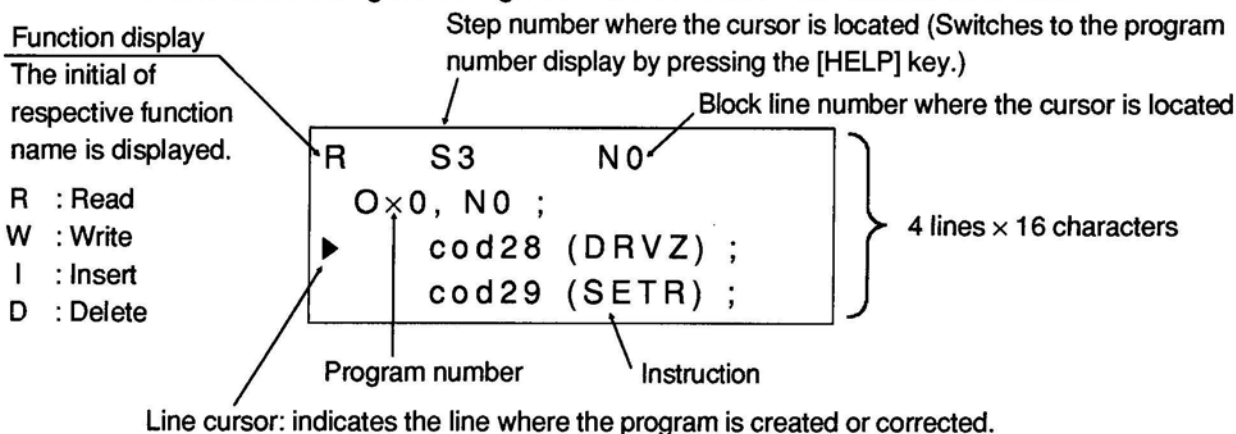
Select mode and function.



* The [RD/WR] and [INS/DEL] keys switch their functions alternately. Pressing it once selects the read function, and pressing it again selects the write function.

4.2 Basic Screen Format

The function setting screen gives the information as described below.



Before starting operation, make sure that the function is correctly selected.

- R : Read Displays a designated program with the cursor position as the reference.
- W : Write Allows program instructions to be written at the cursor position. If a program already exists at the cursor position, the new instructions are written over the existing ones.
- I : Insert Allows new instructions to be inserted one line above the cursor position.
- D : Delete ... Deletes the instruction located at the cursor position. If the cursor is located at the head of a program block (O, Ox, Oy), deletion in program block units is possible.

4.3 Read

This section describes the function for reading programs. This function allows a specified part of a program to be searched for and read out starting from a designated position.

4.3.1 Conditions for reading a program

To read a program, the PGU must be in one of the conditions as given below.

Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	○	○	○
Offline mode	*1 ○	*1 ○	*1 ○	*1 ○

*1 In offline mode, editing of the programs stored in the TP's internal RAM is possible. Therefore, the TP only needs to be powered and is not affected by the conditions of the PGU's state and memory.

4.3.2 Outline of the program read function

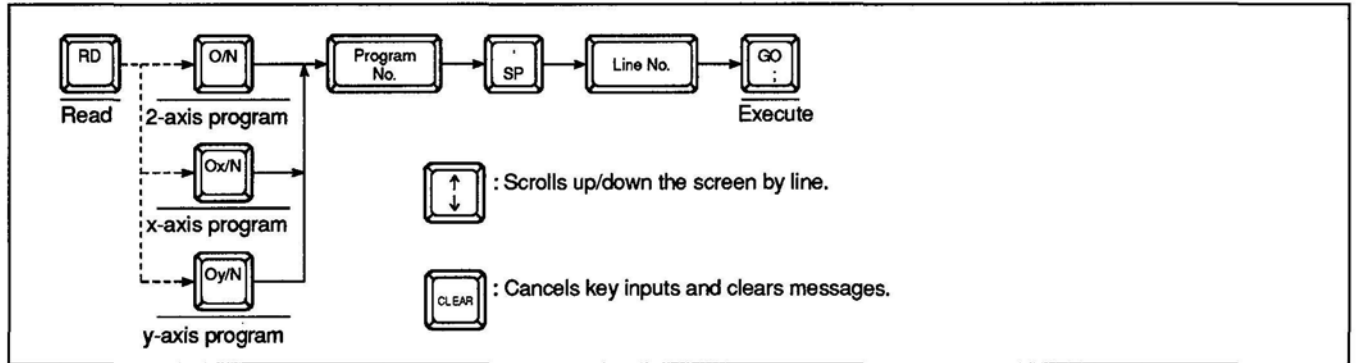
The following functions are available with the program read operation.

Function	Description	Detailed Explanation on Page
Read from a designated program/line number onwards	Designated program/line number is searched for beginning with step 0 and read out. • Designate a program number (O, Ox, Oy) + line number (N).	4-4
Read from a designated step number onwards	Designated step number is searched for beginning with step 0 and read out. • Designate a step number.	4-5
Read from a designated instruction word onwards	cod instruction Designated cod number is searched for beginning with step 0 and read out. • Designate a cod number. (cod 00, cod 01, etc.)	4-6
	M code Designated M code is searched for beginning with step 0 and read out. • M code. (m01, m02, etc.)	4-8
	Basic sequence instruction Designated sequence instruction and device number are searched for beginning with step 0 and read out. • Basic sequence instruction (LD, AND, OR, etc.) + device number (X000, Y000, etc.) • Basic sequence instruction only (NOP, ORB, ANB) • Pointer (P0, P1, etc.)	4-9
	FNC instruction Designated FNC number is searched for beginning with step 0 and read out. • Designate an FNC number. (FNC 10, FNC 12, etc.)	4-10
Read from a designated device onwards	Designated device (instruction word is not necessary) is searched for beginning with step 0 and read out. • Designate an device. Positioning devices (x, y, i, j, r, k, f, m) Sequence devices (X, Y, M, D, V, Z, P)	4-11

4.3.3 Read from a designated program/line number onwards

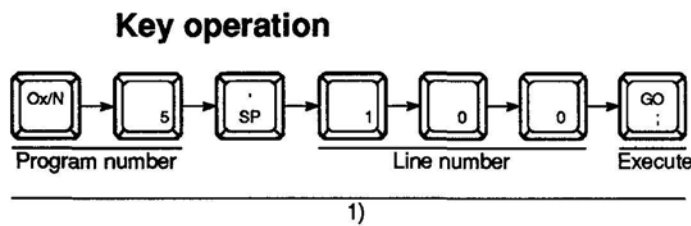
Designated program/line number is searched for beginning with step 0 and read out.

Basic operation



Operation example

To read x-axis program number 5 at line number 100:



Display example

```

R    S0    N0
▶ 0x5, N100 ;
      cod28 (DRVZ) ;
Instruction
    
```

Press the [GO] key. The "Searching" message will be displayed while searching is executed.



If the designated program number is found, the program will be displayed beginning with the program number.

```

R    S0    N100
▶ 0x5, N100 ;
      cod28 (DRVZ) ;
      cod29 (SETR) ;
    
```

Use the [↑] and [↓] keys to scroll the program line by line.

If the designated program number is not found, the "Not Found" message will be displayed.

```

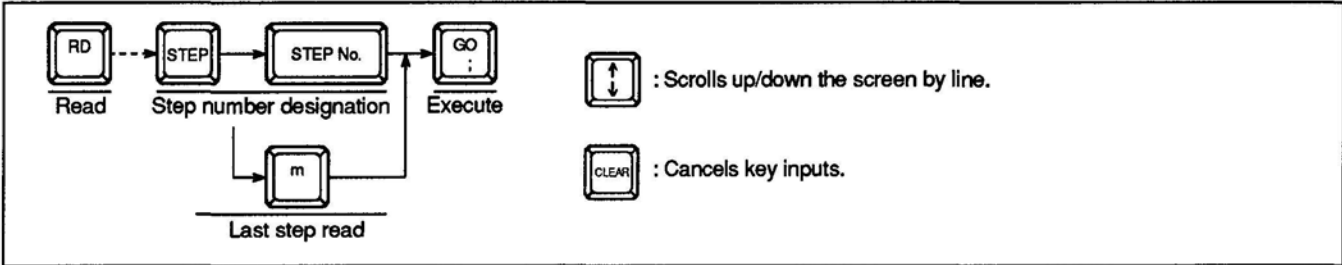
R    S0    N0
▶ 0x 5, N 100
      cod28 (DRVZ) ;
Not Found
    
```

Press the [CLEAR] key to clear the message and allow key inputs again.

4.3.4 Read from a designated step number onwards

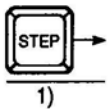
Designated step number is searched for beginning with step 0 and read out.

Basic operation



Operation example 1 To read a program at step 200:

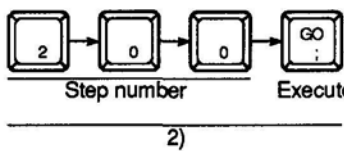
Key operation



Press the [STEP] key. An underline will be displayed in the step number display line.

Display example

```
1) R   S   _
   ▶ O0, N0 ;
     cod28 (DRVZ) ;
     cod29 (SETR) ;
```

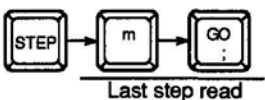


Three program lines beginning with the designated step number will be displayed.

```
2) R   S200  N300
   ▶   cod00 (DRV)
     x100
     y100
```

Use the [↑] and [↓] keys to scroll the program line by line.

Operation example 2 To read the last step:



```
R   S7799  N1000
   NOP
   NOP
   ▶  NOP
```

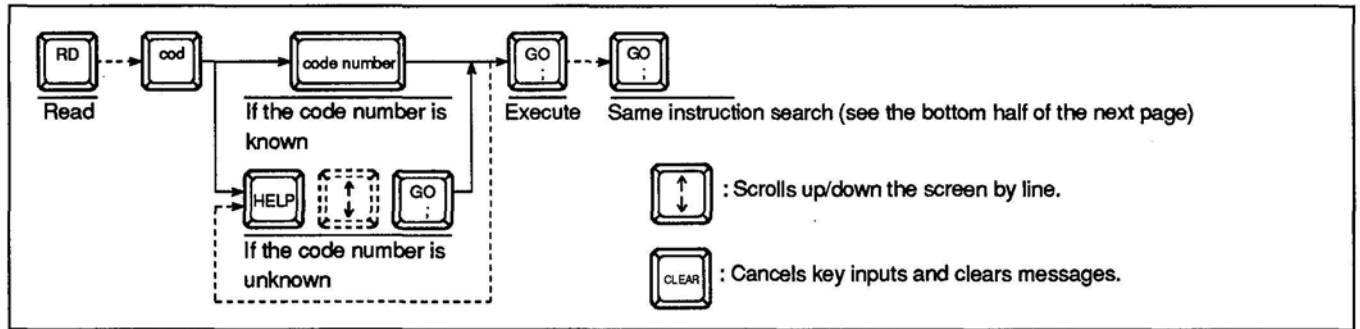
- According to the program capacity setting with parameter #100, the last step will be 3799 or 7799.

4.3.5 Read from a designated instruction word onwards

Designated instruction word is searched for beginning with step 0 and read out. Cod, basic sequence or FNC instructions can be read by entering the relevant instruction.

- (1) Reading from a designated code instruction (cod) onwards
Designated cod number is searched for beginning with step 0 and read out.

Basic operation



Operation example 1 To read a program by directly designating code number 28 (DRVZ)

Key operation This is good if a code number is known

1) **Display example**

```

1) R *S3          N0
   ▶ cod28 (DRVZ) ;
     cod29 (SETR) ;
     cod00 (DRV)
    
```

The key operation sequence is: [cod] → [2] → [8] → [GO] → [GO]. The display example shows the resulting screen output.

Operation example 2 To read a program by designating code number cod02 (cw) by using the [HELP] key:

This is good if a code number is not known

2) **Display example**

```

2) ▶ cod00 (DRV)
     cod01 (LIN)
     cod02 (CW)
     cod03 (CCW)
    
```

Press the [HELP] key to display a list of code numbers in ascending order. Use the [↑] and [↓] keys to designate a code number.

3) **Display example**

```

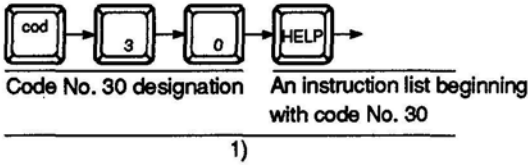
3) R *S300       N10
   ▶ cod02 (CW)
     x100
     y200
    
```

The key operation sequence for example 2 is: [cod] → [HELP] → [↓] → [↓] → [GO]. The key operation sequence for example 3 is: [GO] → [GO].

Operation example 3

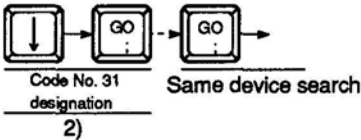
To read a program by designating code number 31 cod (INT) by using the [HELP] key:

Key operation



Display example

```
1) ▶ cod30 (DRVR)
    cod31 (INT)
    cod71 (SINT)
    cod72 (DINT)
```



Designate a correct code number by selecting it from the code number list.

```
2) R *S3 N0
    ▶ cod 31
      cod29 (SETR) ;
      cod01 (LIN)
```

Designated code number is searched and the corresponding block will be displayed.



Searching for instructions:

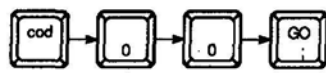
- A program often contains several of the same instructions. If such an instruction is designated to read a program, the TP starts searching from the beginning of the program when the [GO] key is pressed, and displays the first one it finds. Press the [GO] key again to find the next occurrence of the same instruction.

Example

To read out cod00:

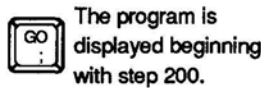
The "*" symbol indicates the step number which had been searched by designating an instruction word.

```
S100 cod 00 x400
S200 cod 00 x600
S300 cod 00 x800
```



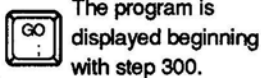
The program is displayed beginning with step 100.

```
R *S100 N200
    ▶ cod00 (DRV)
      x100
      y100
```



The program is displayed beginning with step 200.

```
R *S200 N220
    ▶ cod00 (DRV)
      x100
      y200
```



The program is displayed beginning with step 300.

```
R *S300 N240
    ▶ cod00 (DRV)
      x200
      y300
```

The "Not Found" message will be displayed when the designated instruction word is not found beyond the step at which the [GO] key was pressed. The same message will be displayed when the designated instruction word is not found at all.

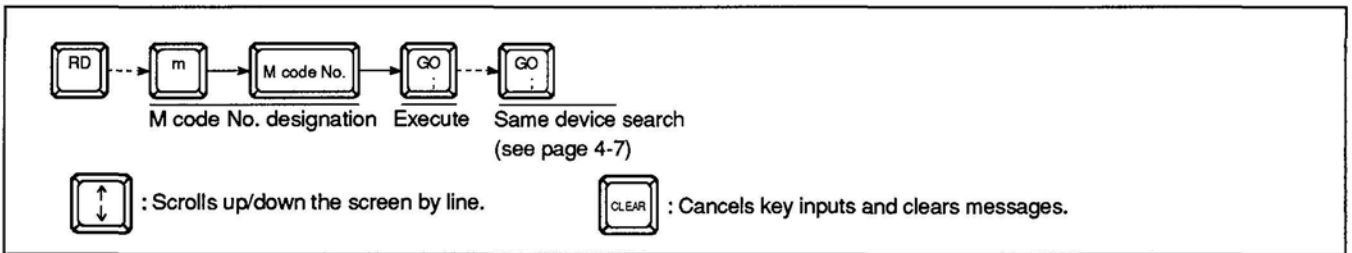


Reading starting from designated basic sequence or FNC instructions:

- This method also applies to reading a program from a designated basic sequence or FNC instruction onwards.

(2) Reading from a designated M code number used in After mode onwards:
Designated M code number is searched for and read out.

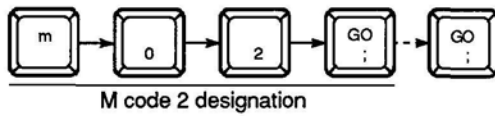
Basic operation



Operation example

To read a program by designating m2 (END):

Key operation



Display example

```
R *S45      N10
▶ m2 (END) ;
  NOP
  NOP
```



Reading from a designated M code number used in With mode onwards:

- See section 4.3.6.

- (3) Reading from a designated basic sequence instruction onwards
Designated sequence instruction is searched for and the program read out.

Basic operation

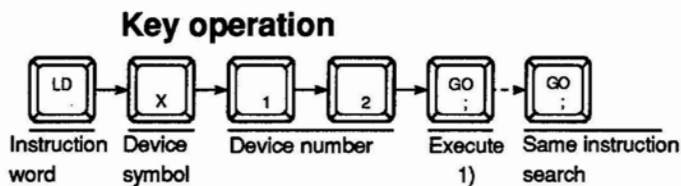
- **Basic sequence instruction + device number**

Applicable instruction word LD, LDI, AND, ANI OR, ORI, SET, RST
Applicable device X, Y, M
- **Basic sequence instruction only**

Applicable instruction word NOP, ANB, ORB
--

: Scrolls up/down the screen by line.
 : Cancels key inputs and clears messages.

Operation example 1 To read a basic sequence instruction + device number LD X012:



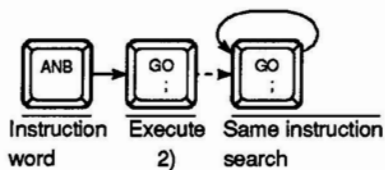
"0" for LD X012 need not be input.

Display example

```

1) R *S100      N10
   ▶ LD         X012 ;
     AND        X013 ;
     SET        Y000 ;
    
```

Operation example 2 To read a basic sequence instruction ANB only:



```

2) R *S300      N50
   ▶ ANB
     LD         X014 ;
     OR         X015 ;
    
```



Use of pointers:

- Pointers can be used for the program read with restrictions as mentioned below.

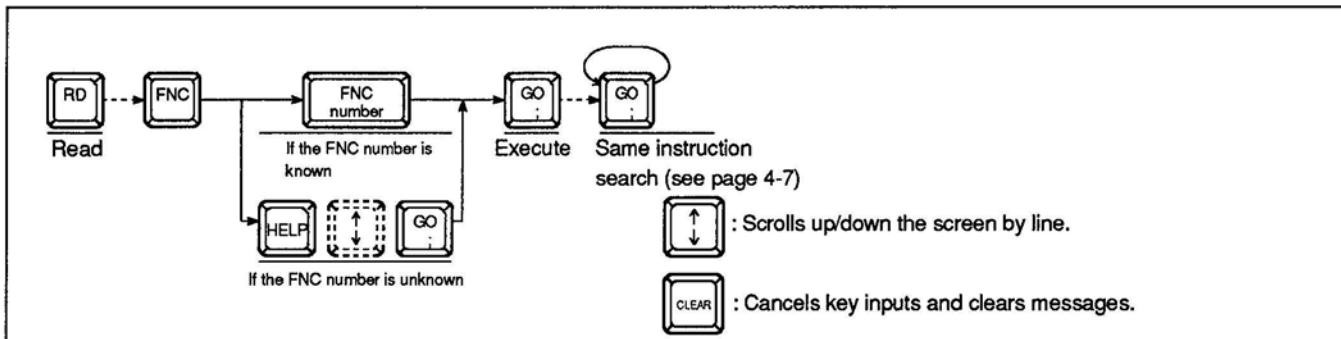


This key operation will only search for pointer "POO" in the program. If other pointers which follow a jump source CJ, CJN, or CMP need to be searched, use the program read method by designating a device as mentioned on page 4-11.

POO can be read.
 CJ POO } cannot be read.
 CJN POO }
 JMP POO }

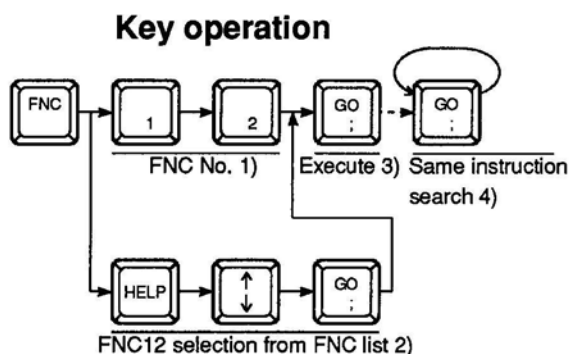
- (4) Reading from a designated application instruction (FNC) onwards
Designated FNC instruction is searched for beginning with step 0 and read out.

Basic operation



Operation example

To read a program by designating FNC12 (MOV) instruction:



Display example

```

1) R   S0      N0
   ► FNC      12
      cod28 (DRVZ) ;
      cod29 (SETR) ;
    
```

FNC instruction list

```

2) ► FNC 00 CJ
     FNC 01 CJN
     FNC 02 CALL
     FNC 03 RET
    
```

```

3) R   *S250   N70
   ►      MOV    12
          D      0
          D      1 ;
    
```

```

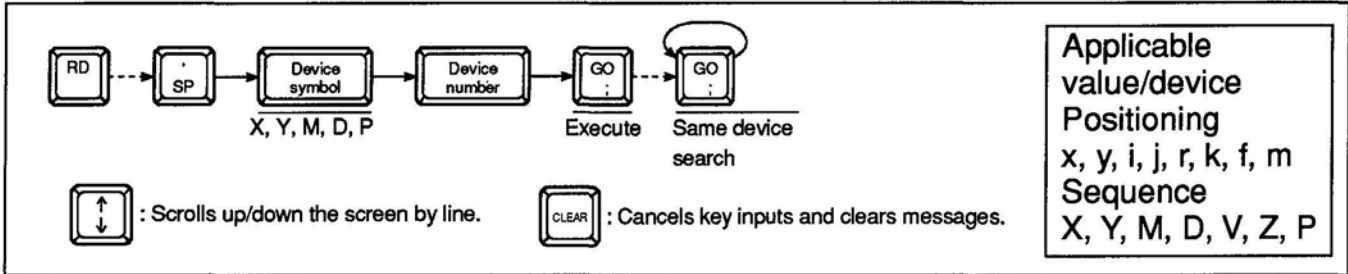
4) R   *S250   N70
   ►      MOV    12
          D      0
   Not Found
    
```

The "Not Found" message will be displayed when all designated instruction words have been searched or the designated instruction word is not found. Press the [CLEAR] key to clear the message.

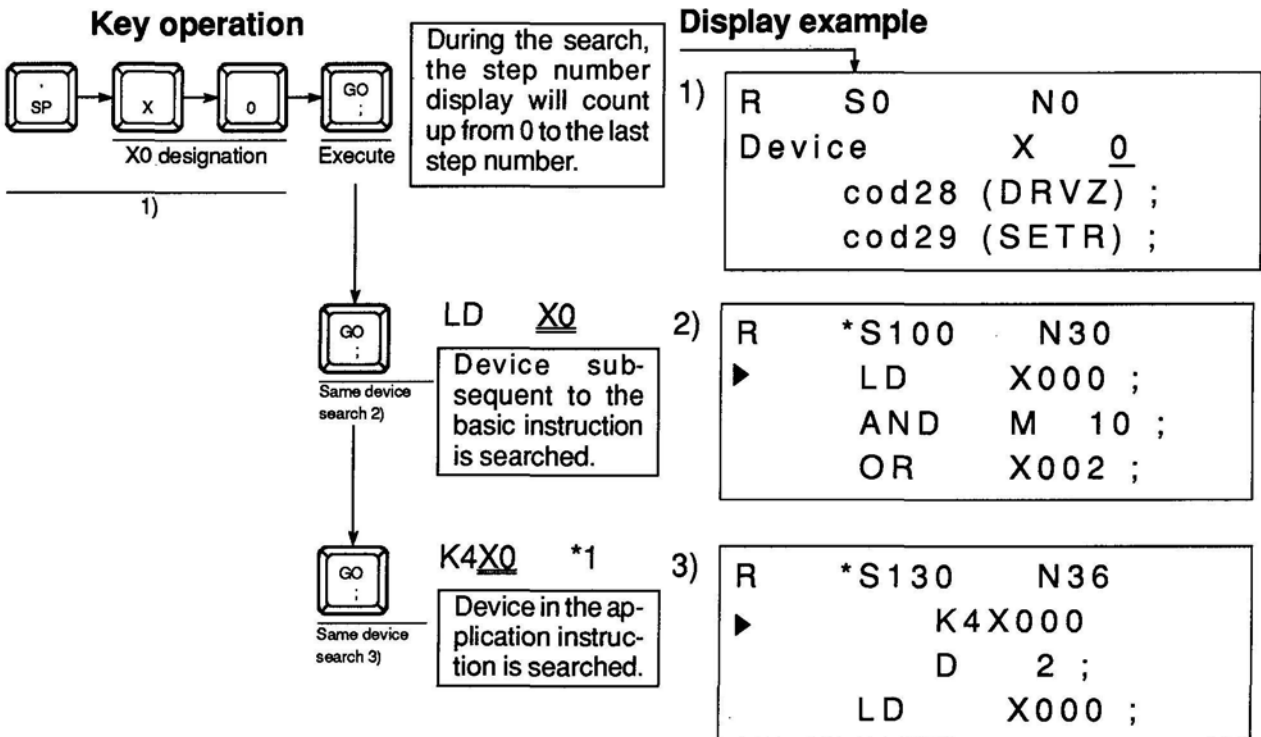
4.3.6 Reading a program from a designated device onwards

Designated device is searched for beginning with step 0 and read out.

Basic operation



Operation example To read X0:



The "Not Found" message will be displayed when all designated devices have been searched or the designated device is not found. Press the [CLEAR] key to clear the message.



Devices which can be searched for:

- All devices subsequent to the instruction word can be searched for by designating devices except the following:

Example: Application instruction FNC12 (MOV), K4X0, D0

- K4X0 in the instruction represents X0 to X17.
However, while searching for "X0" is possible, searching for "X1 to X17" is not possible.

Only the devices that are designated directly can be searched. Devices included within the range of an instruction as given in the example above cannot be searched.

4.4 Write

This chapter describes the function for writing programs.

4.4.1 Conditions for writing a program

To write a program, the PGU must be in one of the conditions as given below.

Mode	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	×	○	Δ ^{*1}
Offline mode	○ ^{*2}	○ ^{*2}	○ ^{*2}	○ ^{*2}

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

*2 In offline mode, editing of the programs stored in the TP's internal RAM is possible. Therefore, the PGU's state does not affect the TP's operation.

4.4.2 Outline of the program write function

The following functions are available with the program write operation.

Function	Description	Detailed Explanation on Page
Batch writing NOP (program all clear)	NOPs are written to the whole range of the program area.	4-14
Writing a program/line number	Program/line number is written. • Program number (O, Ox, Oy) + line number (N).	4-15
Writing a code instruction	cod instruction • The cod instructions are written. • Code (cod) instruction + [address (x, y, etc.)]	4-16
	M code • The M codes are written. • M code	4-18
Writing sequence instructions	Basic instruction • Basic sequence instructions are written. • Basic sequence instruction (LD, AND, etc.) + device number (X000, Y000, etc.) • Basic sequence instruction only (NOP, AND, ORB) • Pointer (P0, P1, etc.)	4-19
	FNC instruction • Application instructions (FNC instructions) are written. • FNC number + device	4-21
Overwriting a program	Edit existing instructions by overwriting them.	4-24

By pressing the [HELP] key before pressing an instruction key, the "Memory", "Program", and "File reg." capacity setting list will be displayed.



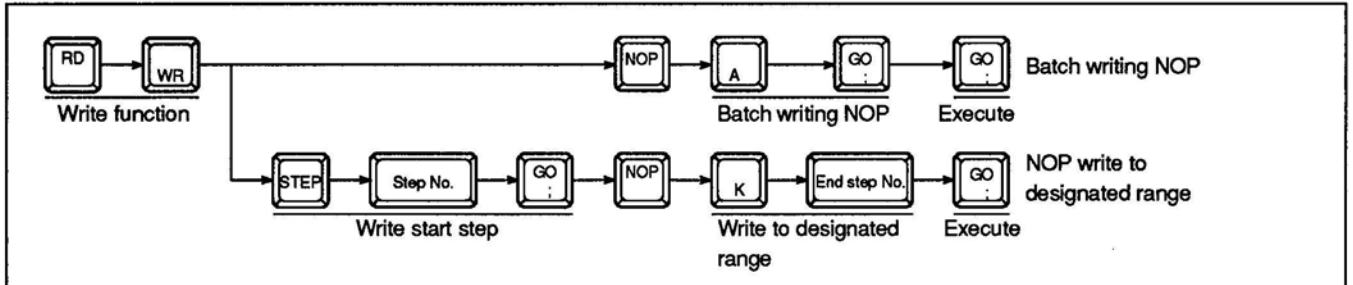
Memory	7800
Program	7800
File reg.	0

Press the [CLEAR] key to return to the previous screen.

4.4.3 Batch writing NOP (Program all clear)

All programs are cleared by writing NOPs to the whole range of the program area. It is possible to write NOPs to only designated ranges.

Basic operation



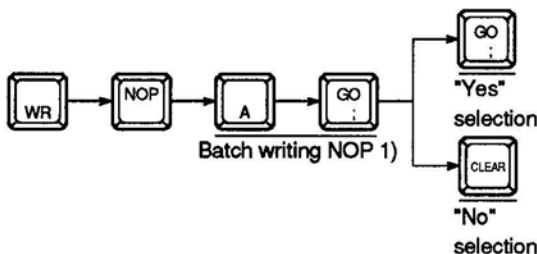
Batch writing NOP:

- The range of NOP write can be designated by system setting parameter #100:

System setting parameter #100: "0" 7800 steps } NOPs are written to this range.
 "1" 3800 steps }

The execution of batch writing NOP will not initialize parameters and file registers. To initialize them, use the "user area initialize" function in OTHER mode.

Operation example



Display example

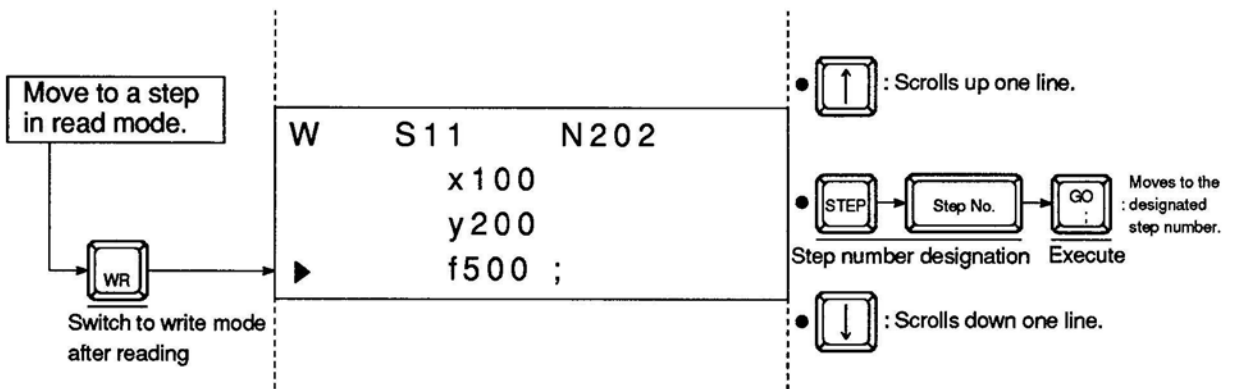
```

1) W   S0      N0
   ▶  NOP     A
   All Clear
   Yes [GO]  No [CLR]
    
```



Program write position:

- Program write is executed beginning with where the cursor is located in the screen. To write to a designated step, read the step in read mode or follow the procedure below before writing a program.

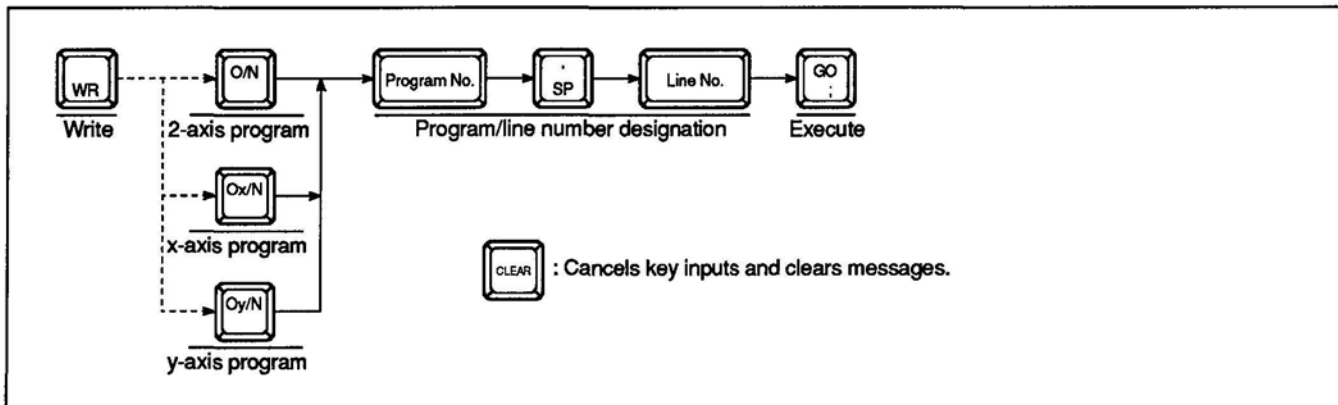


After an instruction word is written, the cursor will move to the next step.

4.4.4 Writing a program/line number

Write a program number as follows.

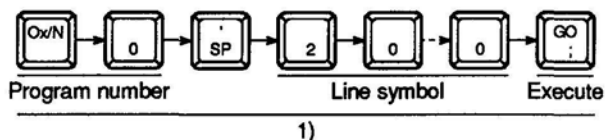
Basic operation



Operation example

To write x-axis program number 0 and line number 200:

Key operation



Display example

```
1) W   S3   N200
    Ox0, N200 ;
    ▶  NOP
      NOP
```

If a program number that has already been written is input, a "dual defined" error message will be displayed and the write will be disabled.

Press the [CLEAR] key to clear the message and input another program number.

Note that writing over the same step number is possible.

```
W   S3   N200
Ox0, N200 ;
O dual defined
  NOP
```

4.4.5 Writing a code instruction

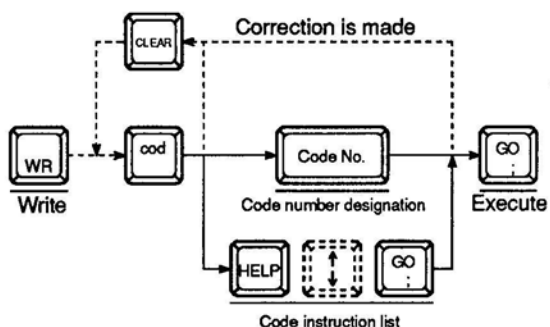
Write a cod instruction and M code as follows.

(1) Writing a cod instruction

Write a cod instruction as follows. It can be written directly or by selecting from a code number list by using the [HELP] key.

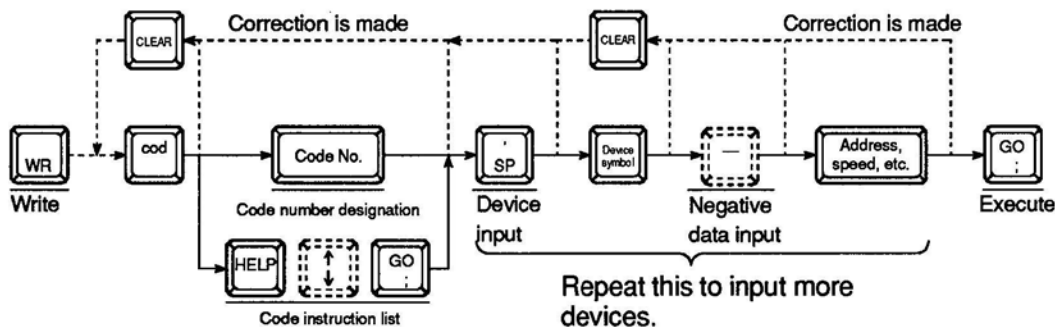
Basic operation

• Code number only



If a nonexistent code number is input, the "Instruction Err" message will be displayed. Input a correct number.

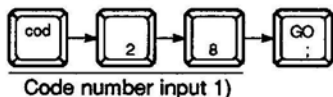
• Code number and device designation



Operation example 1

To write code number only: cod28 (DRVZ)

Key operation



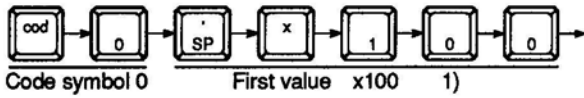
Display example

```

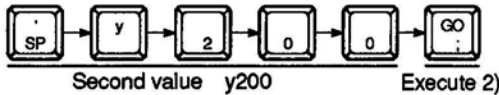
1) W   S3      N200
    Ox0, N200 ;
    ▶   cod    28
        NOP
    
```

Press the [cod] key and then input a code number.
To cancel the key input, press the [CLEAR] key before pressing the [GO] key.

Operation example 2 To input a code number and values: cod00 (DRV) x100 y200



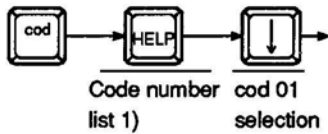
Include a space ([SP] key) between the code number and the value.



```
1) W S5 N201
    cod00 (DRV)
      x100
      y 200
```

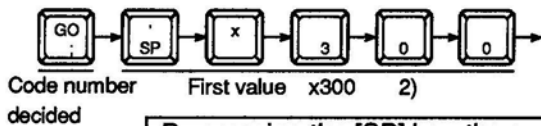
```
2) W S11 N202
    x100
    y200 ;
    ▶ NOP
```

Operation example 3 To input from a code number list by using the [HELP] key: cod01 (LIN) x300 y-400 f600 m3 (With mode)



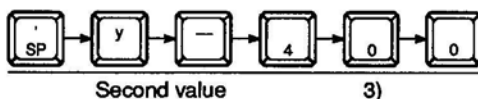
Alternatively:
Input a code number and press the [HELP] key. A code number list beginning with the input code number will be displayed.

```
1) ▶ cod00 (DRV)
    cod01 (LIN)
    cod02 (CW)
    cod03 (CCW)
```

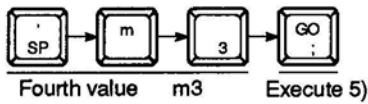
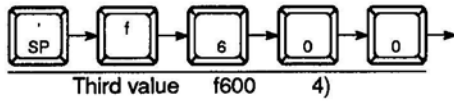


By pressing the [SP] key, the cursor moves one line down.

```
2) W S11 N202
    y200 ;
    cod01 (LIN)
    ▶ x 300
```



```
3) W S11 N202
    ▶ cod01 (LIN)
      x300
      y -400
```

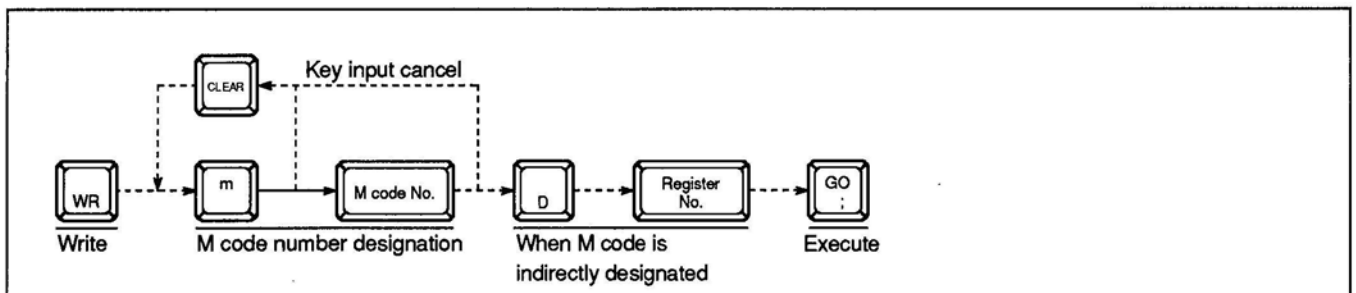


```
4) W   S11   N202
      x300
      y-400
      f     600
```

```
5) W   S21   N203
      f600
      m3 ;
      NOP
```

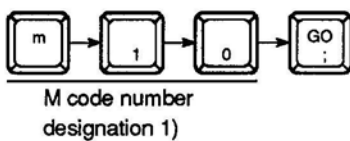
(2) Writing an M code (After mode)
 Write an M code as follows.

Basic operation



Operation example To write m10:

Key operation



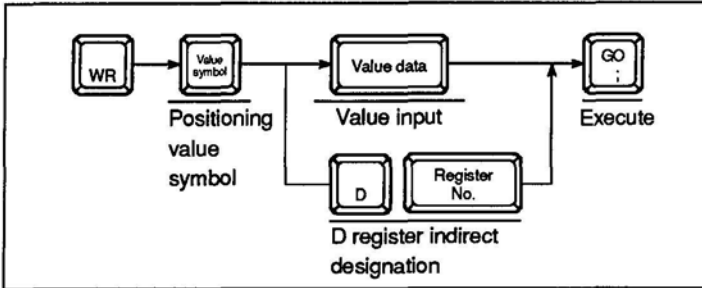
Display example

```
1) W   S21   N203
      f600
      m3 ;
      m 10
```

4.4.6 Writing a positioning address value

Write the value (without a code instruction) as follows.

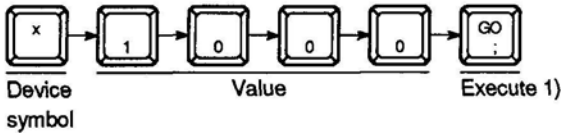
Basic operation



Operation example

To write positioning address value x1000:

Key operation



Display example

```

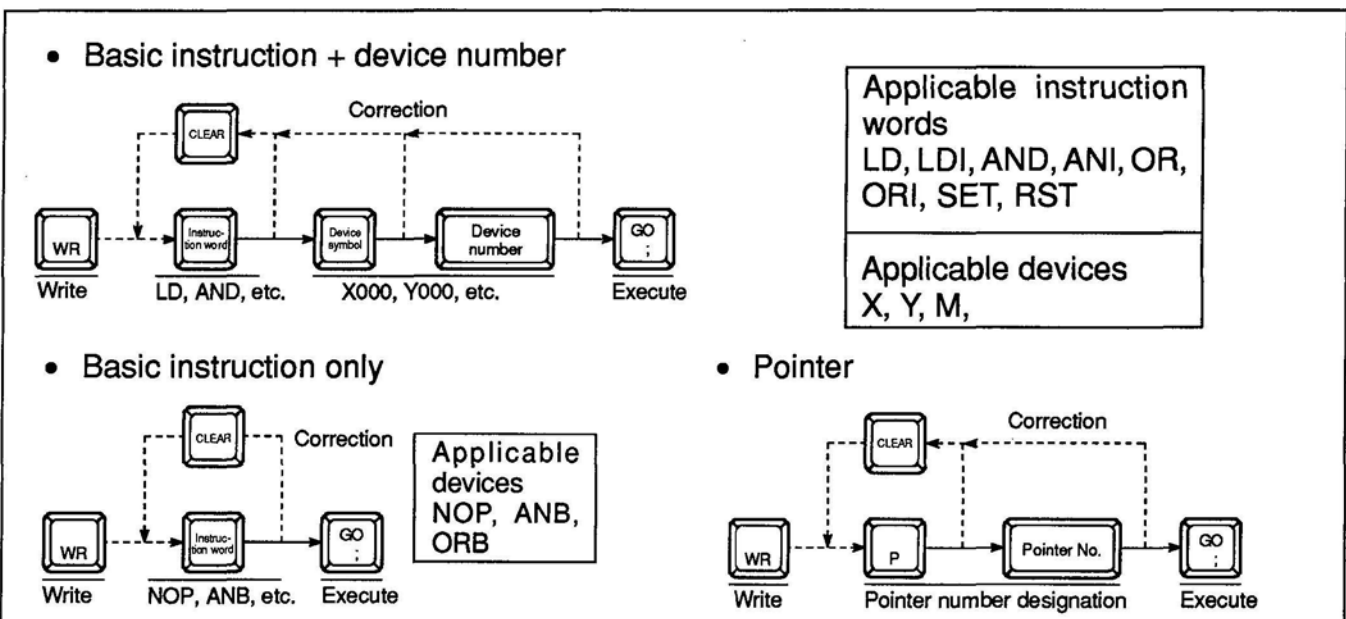
1) W   S60   N10
      x1000 ;
▶  NOP
   NOP
    
```

4.4.7 Writing a sequence instruction

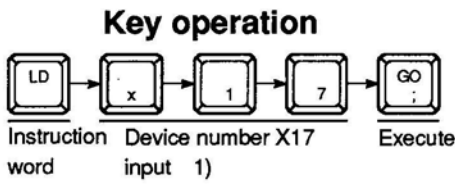
Write a sequence instruction as follows.

- (1) Basic instruction
Write a basic instruction as follows.

Basic instruction



Operation example 1 To write a basic instruction + device number LD X017:



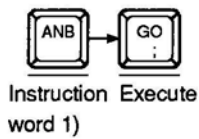
"0" of X017 need not be input.

Display example

```

1) W   S100   N200
    ▶ LD     X  17
      NOP
      NOP
    
```

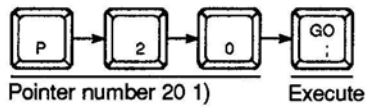
Operation example 2 To write a basic instruction ANB only:



```

1) W   S200   N220
    ▶ ANB
      NOP
      NOP
    
```

Operation example 3 To write pointer number 20:



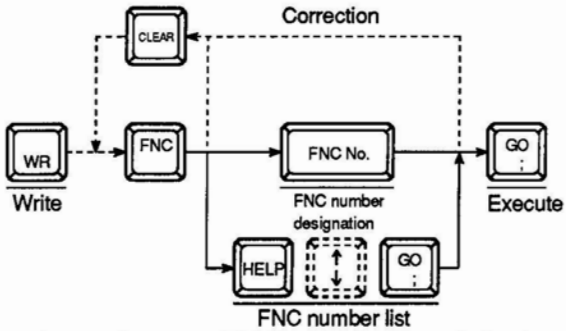
```

1) W   S300   N260
    ▶ P   20
    
```

- (2) Application (FNC) instruction
Write an application instruction by inputting an FNC number.

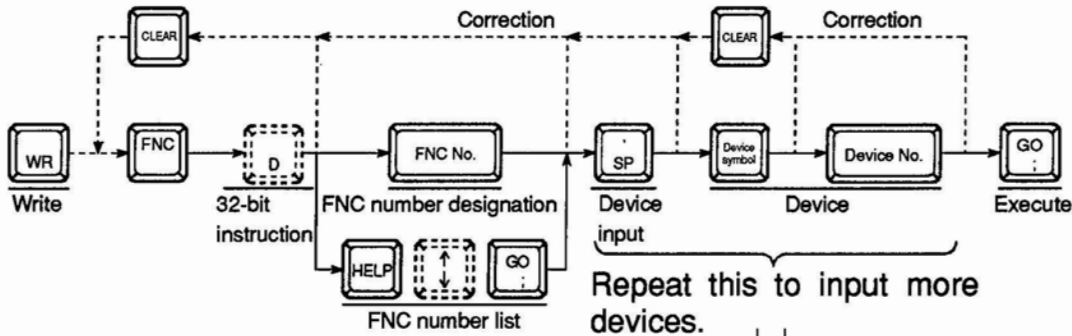
Basic operation

- Inputting an FNC number only



If a nonexistent FNC number is input, the "Instruction Err" message will be displayed. Input a correct number.

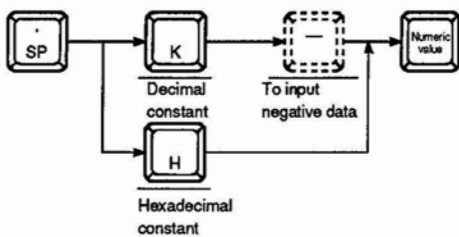
- Inputting an FNC number and devices



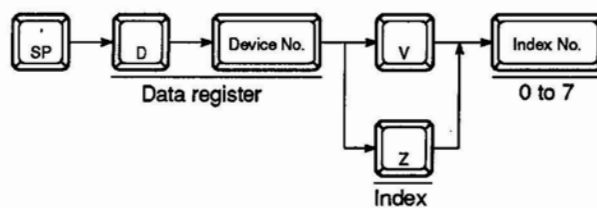
Repeat this to input more devices.

Constants and index as well as device symbol and device number may also be designated by this operation. Designate them as follows after pressing the [SP] key.

- * Constants K and H

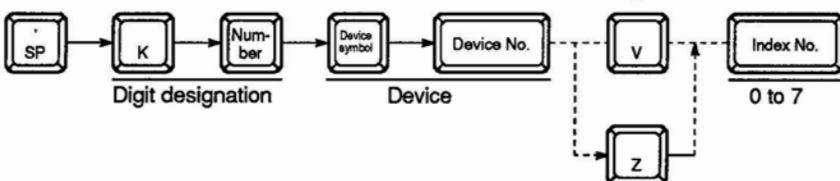


- * Index qualification D □ Z □ etc.

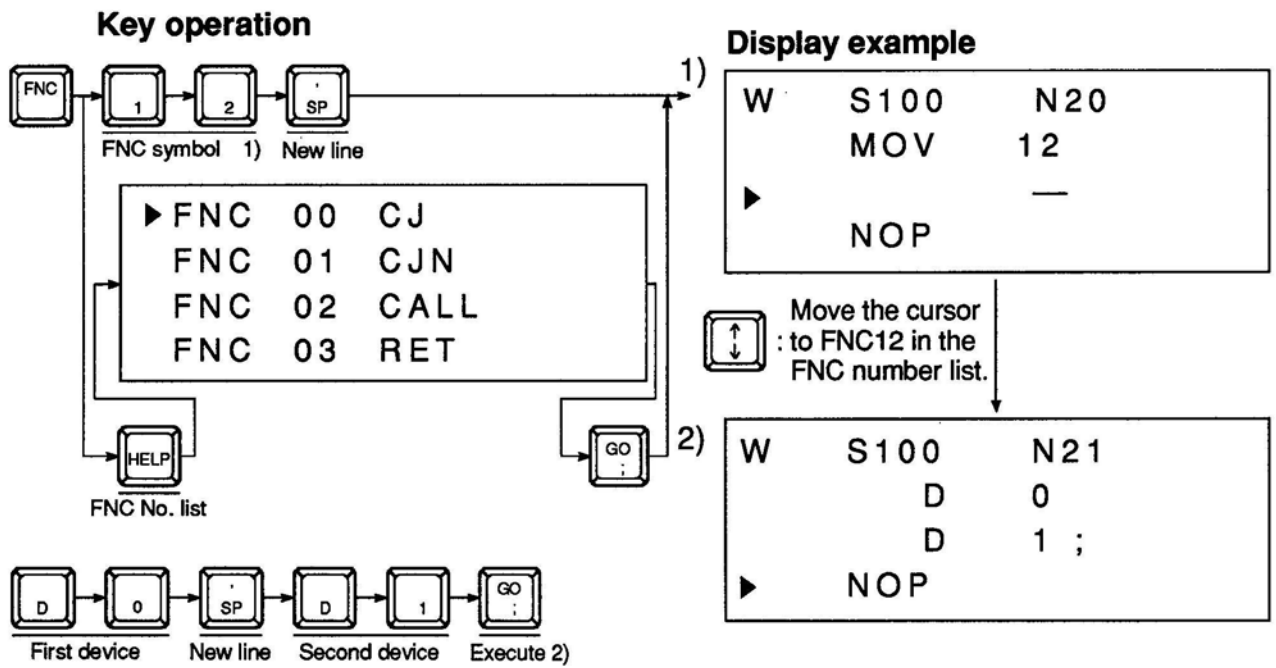


- * Digit designation K □ X □ □ etc.

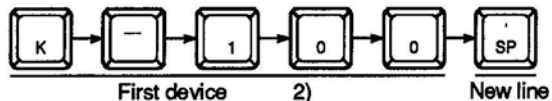
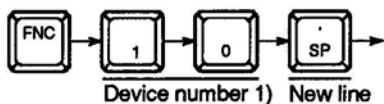
K □ X □ □ Z □ etc.



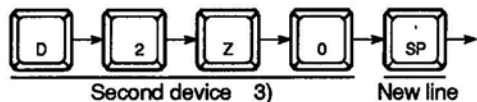
Operation example 1 To write FNC12 (MOV) D0 D1:



Operation example 2 To write FNC10 (CMP) K-100 D2Z0 M3:

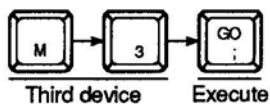


To write a constant



To input an index register

If an index register device number is omitted, the message "Input 0-7" will be displayed.



```

1) W   S200   N40
   ►   FNC   10
      NOP
      NOP
    
```

```

2) W   S200   N40
   ►   CMP   10
      K  -100
      NOP
    
```

```

3) W   S200   N40
   ►   CMP   10
      K  -100
      D   2Z0
    
```

```

W   S200   N40
   K  -100
   D   2Z0
►   M    3
    
```


(2) Overwriting values

Values in a program instruction can also be overwritten. This applies to cod and FNC instructions only.

cod instruction:

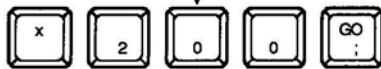
Before overwriting

```

W   S301   N90
▶   x100
    y100
    f500 ;
    
```

Move the cursor to the value to be overwritten.
 Input a new value.
 x100 is changed to x200.

Input [x][2][0][0][GO].



After overwriting

```

W   S303   N90
    x200
▶   y100
    f500 ;
    
```



Limitations on overwriting values:

- Only the numeric value can be changed for a code instruction. Value symbols x, y, i, j, r, f, etc. cannot be changed.
 However, the device symbol can be changed for the FNC instruction.

4.5 Insert

This section describes the function for inserting new instructions and/or values into a program.

4.5.1 Conditions for using the insert function

To use the insert function, the PGU must be in one of the conditions as given below.

Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	×	○	△ *1
Offline mode	○ *2	○ *2	○ *2	○ *2

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

*2 In offline mode, editing of the programs stored in the TP's internal RAM is possible. Therefore, the PGU's state does not affect the TP's operation.

4.5.2 Outline of the insert function

The following functions are available with the insert function.

Function	Description	Detailed Explanation on Page
Insert instruction blocks	Insertion of instruction blocks is executed.	4-27
Insert positioning instruction values	Insertion of positioning values (x, y, i, j, r, f, m) is executed.	4-28

4.5.3 Insert instruction blocks

Insert instruction blocks as follows. To use this function, the cursor must be located at the head of the instruction block in front of which another will be inserted.

Example

O 00 N0 ; ← A ";" (End Of Block) symbol is inserted in the end of an instruction cod28 (DRVZ) ; block. Use the EOB symbol to identify individual blocks.

⌋

cod 00 (DRV) To insert cod 09 (CHK) between cod 00 (DRV) and cod 01 (LIN) blocks:
 x100

Insert position }
 y100 ;
 cod 01 (LIN)
 x500
 y300
 f500 ;

Make sure that I:insert mode has been selected.

Move the cursor to cod 01 line.

```
I   S506   N400
▶   cod01 (LIN)
      x500
      y300
```

⇓

The rest of the program after the inserted block is automatically shifted by the number of inserted steps. If the program capacity is exceeded, the "Program Over" message will be displayed.

```
I   S508   N401
▶   cod09 (CHK);
      cod01 (LI N)
      x500
```



Writing the inserted block:

- The procedure is the same as Write mode. Please see page 4-16 for more details.

4.5.4 Insert positioning instruction values

Insert cod instruction positioning values (x, y, i, j, r, f, m) as given below.

Rules

Observe the following rules when inserting positioning values.

The cod instruction has the following three syntax types. It is not possible to insert values which do not follow these rules.

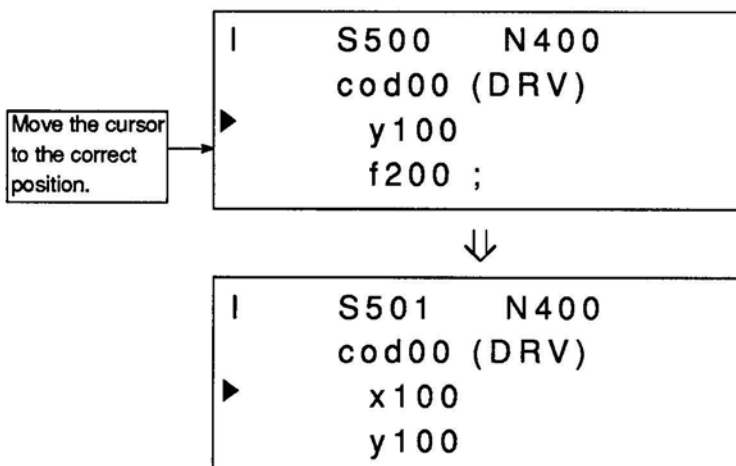
- | | | |
|-------------------------|-------------------------|-------------------------|
| 1) x : x-axis address | 2) x : x-axis address | 3) x : x-axis address |
| f : x-axis speed | y : y-axis address | y : y-axis address |
| y : y-axis address | i : } Interpolation | r : Radius |
| f : y-axis speed | j : } address | f : Vector speed |
| m : M code in With mode | f : Vector speed | m : M code in With mode |
| | m : M code in With mode | |

Some of the devices shown above may be omitted for programming. However, the devices must always be input in the given order. If the syntax is not observed, the key operation will not be accepted. Move the cursor to a correct position and execute the insert.

Insert procedure

First, move the cursor to the position to insert a program.

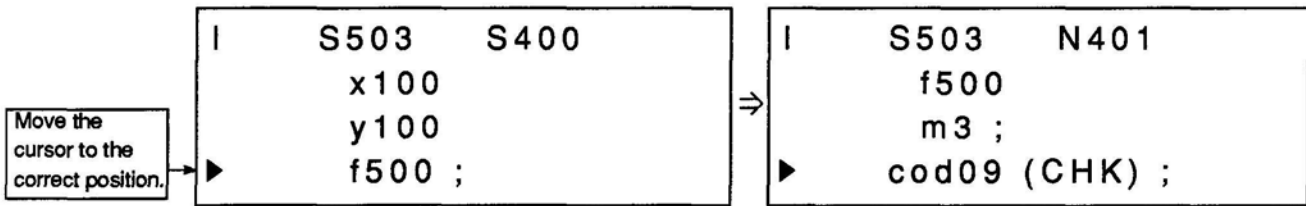
Example: To insert x100 in cod 00 y100 f200:



- The program after the inserted
- Move the cursor to the y line.
- Input.

position will be shifted one line down.

Example: To insert an M code (With mode) m03:



- Move the cursor to the end of the instruction block.
- m3 will be inserted after the last device of the instruction block.

• Input. m 3 GO

4.6 Delete

This chapter describes the function for deleting instructions and/or values in a program.

4.6.1 Conditions for deleting a program

To delete a program, the PGU must be in one of the conditions as given below.

Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○ *2	× *2	○ *2	△ *2
Offline mode	○	○	○	○

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

*2 In offline mode, editing of the programs stored in the TP's internal RAM is possible. Therefore, the PGU's state does not affect the TP's operation.

4.6.2 Outline of the delete function

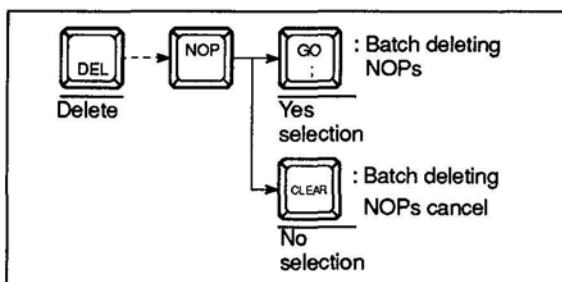
The following functions are available with the delete function.

Function	Description	Detailed Explanation on Page
NOP all delete	All NOPs in a program are deleted simultaneously.	4-30
Delete program blocks	Deletion of program blocks is executed.	4-31
Delete instruction blocks	Deletion of instruction blocks defined by the ";" (EOB: End Of Block) symbol is executed.	4-32
Delete positioning instruction values	Deletion of positioning values (x, y, i, j, r, f, m) after a cod instruction is executed.	4-32
Range delete	The range designated with step numbers is deleted.	4-33

4.6.3 NOP all delete

All NOPs contained within a program are deleted simultaneously and the step numbers are shifted forward.

Basic operation



- The following screen will be displayed when the [NOP] key is pressed. Press the [GO] key to delete NOPs in the program. Press the [CLEAR] key to cancel the deletion and return to the screen before the [NOP] key was pressed.

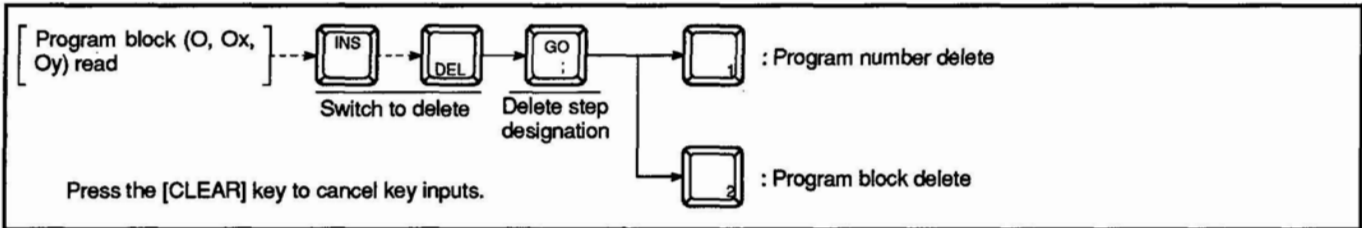
```

D   S100   N50
NOP ALL Delete
Yes [GO] No[CLR]
    
```

4.6.4 Delete program blocks

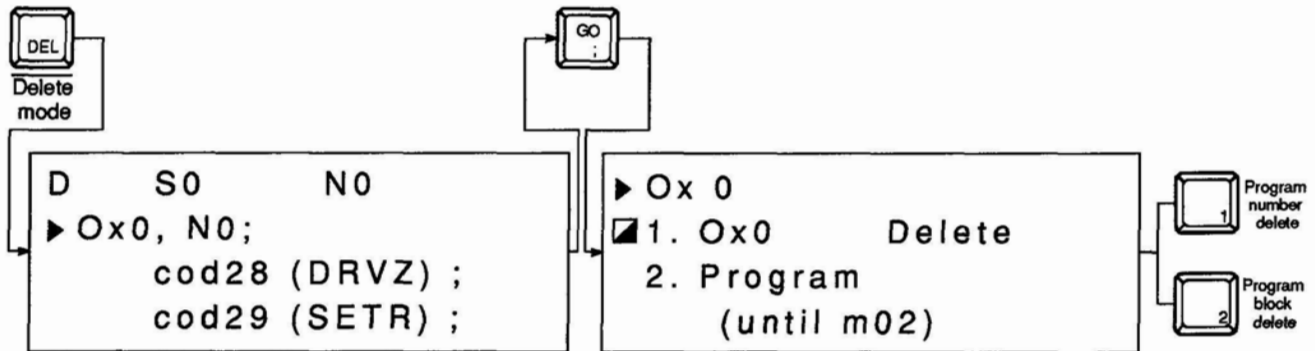
Delete a program in program block units.

Basic operation



Operation example To delete Ox0:

Read program block Ox0 using the read function.



- Move the cursor to Ox0.

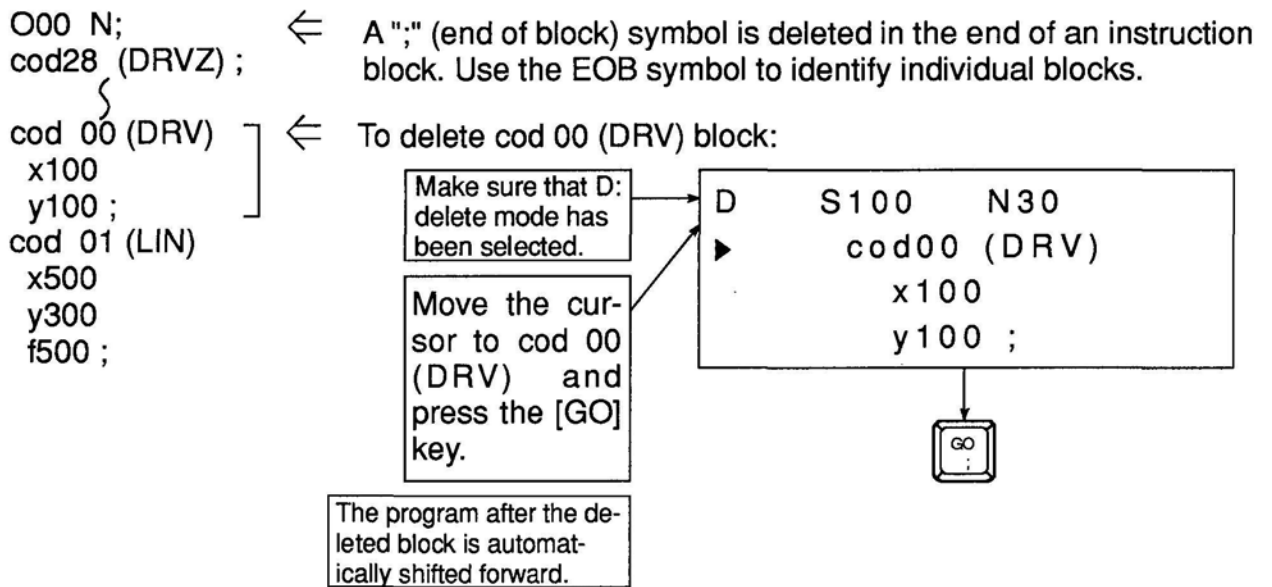
The program will be shifted forward automatically after the deletion.

- The screen shown above will be displayed by pressing the [GO] key. Press the [1] key to delete the program number (O, Ox, Oy). Press the [2] key to delete the program block (m2: until END).

4.6.5 Delete instruction block units

Delete a program in instruction block units as follows. To use this function, move the cursor to the head of the instruction block to be deleted and press the [GO] key.

Example



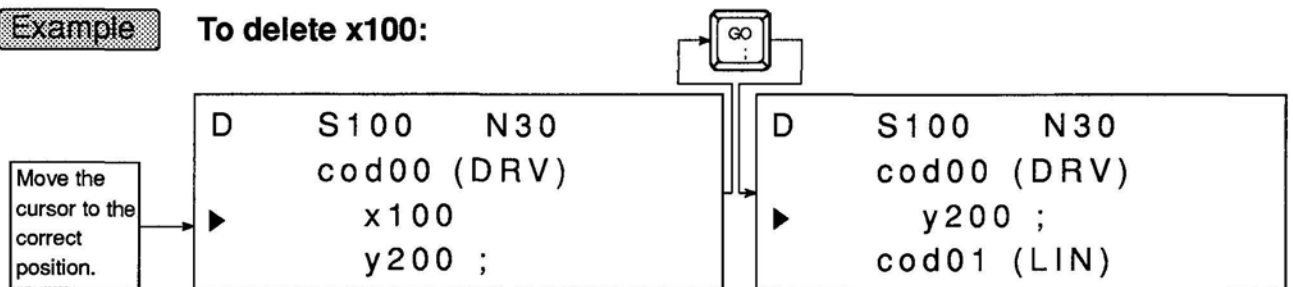
4.6.6 Delete positioning instruction values

Delete a program in positioning device units (x, y, i, j, r, f, k, m) as given below. (The delete function in device units is not available with the FNC instruction.)

- (1) Deleting a positioning device following a cod instruction
Move the cursor to the device to be deleted and press the [GO] key.

Example

To delete x100:



- Move the cursor to x100.
- The program after the deleted steps is automatically shifted forward.

(2) Deleting a positioning value without a cod instruction

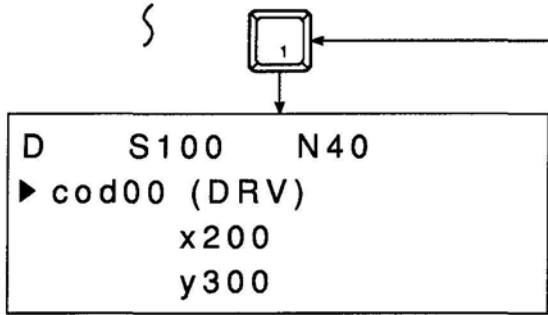
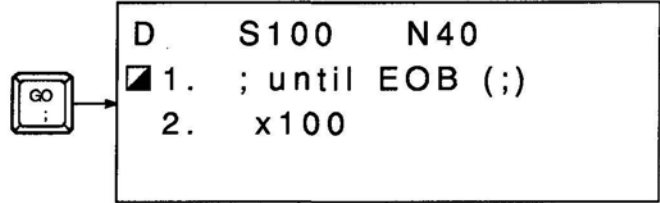
If only positioning values without a cod instruction are used, move the cursor to the head of a block to be deleted and press the [GO] key. Then select whether the instruction block or designated device is deleted.

Example To delete a positioning device without a cod instruction:

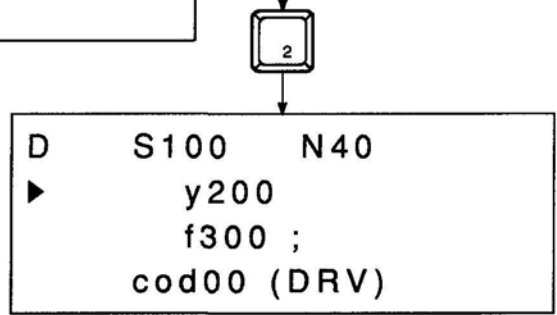
```
P10 ;
x100
y200
f300 ;
cod 00 (DRV)
x200
y300
f400 ;
)
```

One instruction block without a cod instruction

- Move the cursor to x100 and press the [GO] key.



- Deleting till EOB (x100 to f300)

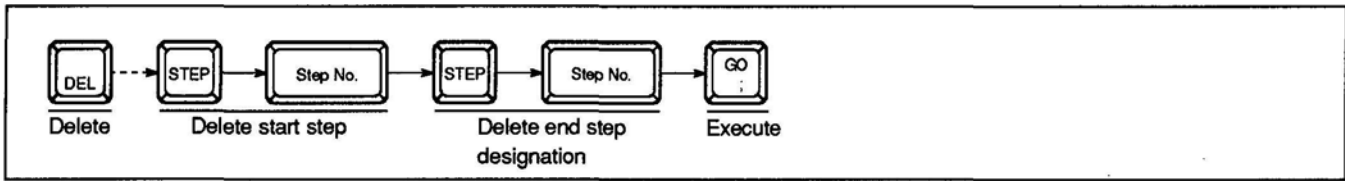


- Deleting X100 only

4.6.7 Range delete

The range designated with step numbers is deleted.

Basic operation



- The program after the deleted steps is automatically shifted forward. If other than the head of an instruction block has been designated as the delete start and end steps, the program will be deleted all the way to the EOB marker.

1	INTRODUCITON
2	EXAMPLE PROGRAMMING OPERAIONS
3	SYSTEM START-UP
4	PROGRAM (ONLINE/OFFLINE)
5	MONITOR/TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

5. MONITOR / TEST

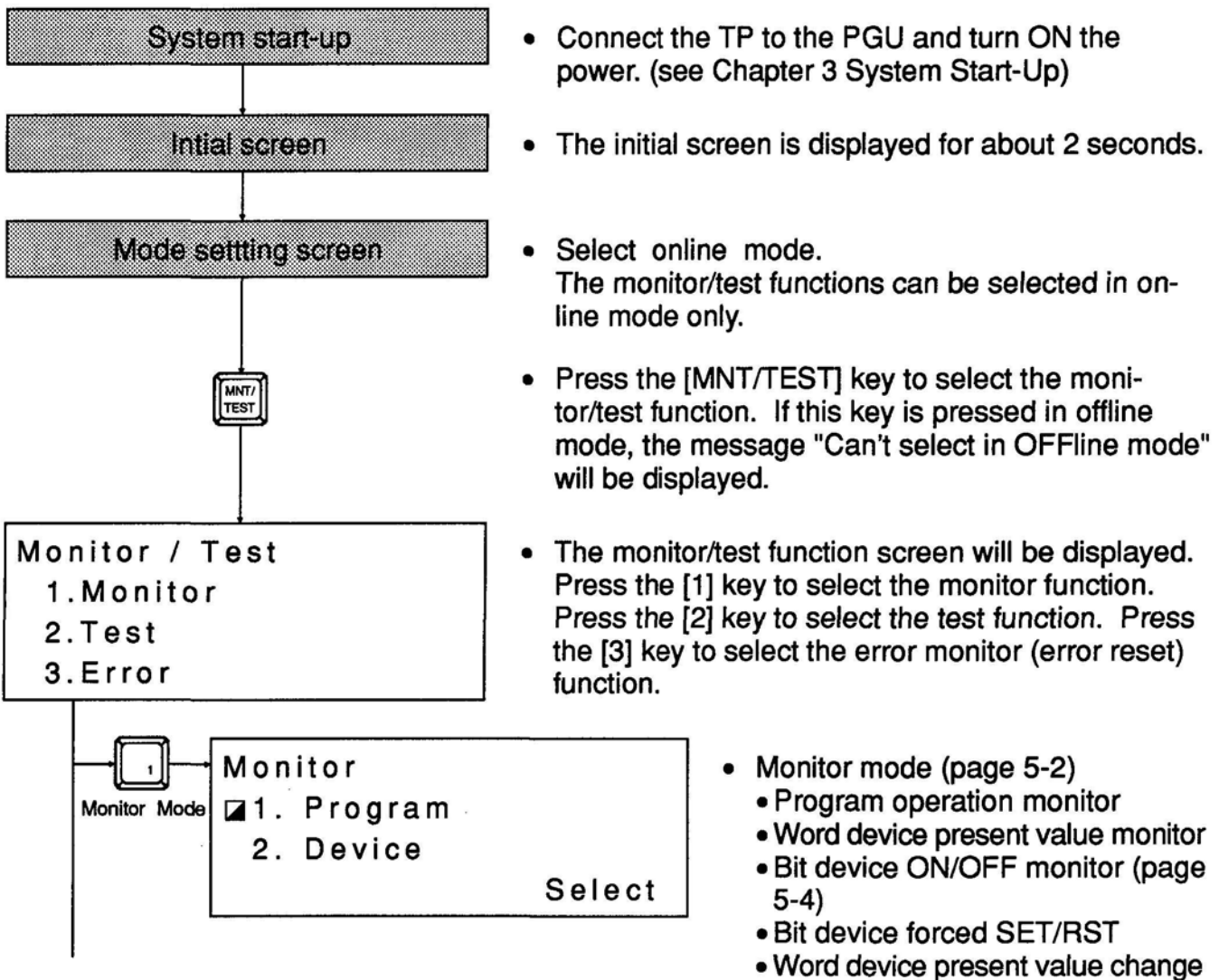
This chapter gives the monitor and test functions.

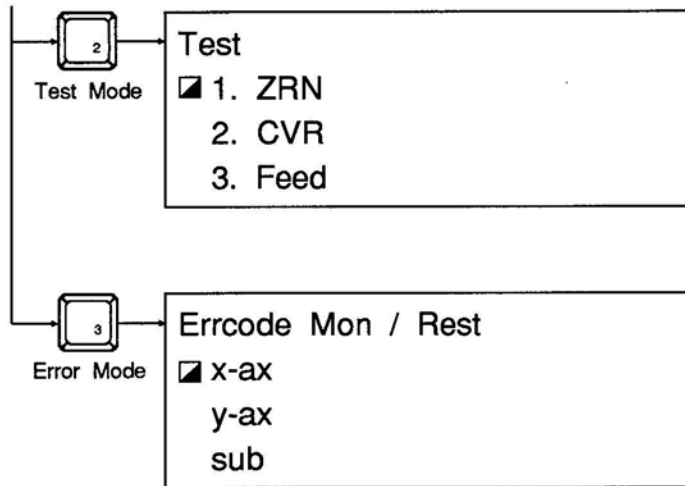
The monitor function allows monitoring of present position and the ON/OFF status of devices.

The test function can be used in MANUAL mode to execute zero return, fixed-rate feed, JOG operation, etc. by using the TP. The monitor and test functions can be selected in online mode only.

5.1 Selecting the Monitor / Test Function

Select online mode and then the monitor/test function.





- Test mode (page 5-8)
 - Zero return
 - x, y current value change
 - Fixed-rate feed
 - JOG operation
 - Teaching function
- Error monitor (page 5-16)
 - x- and y-axis sub task error monitor and error reset

5.2 Monitor Mode

This section describes the monitor function.

5.2.1 Conditions for using the monitor function

To use the monitor function, the PGU must be in one of the conditions as given below.

Mode	PGU	PGU State		PGU Memory	
		MANUAL	AUTO	RAM	EEPROM
Online mode		○	○	○	○
Offline mode		x *1	x *1	x *1	x *1

*1 Monitor mode cannot be selected in offline mode.

5.2.2 Outline of the monitor function

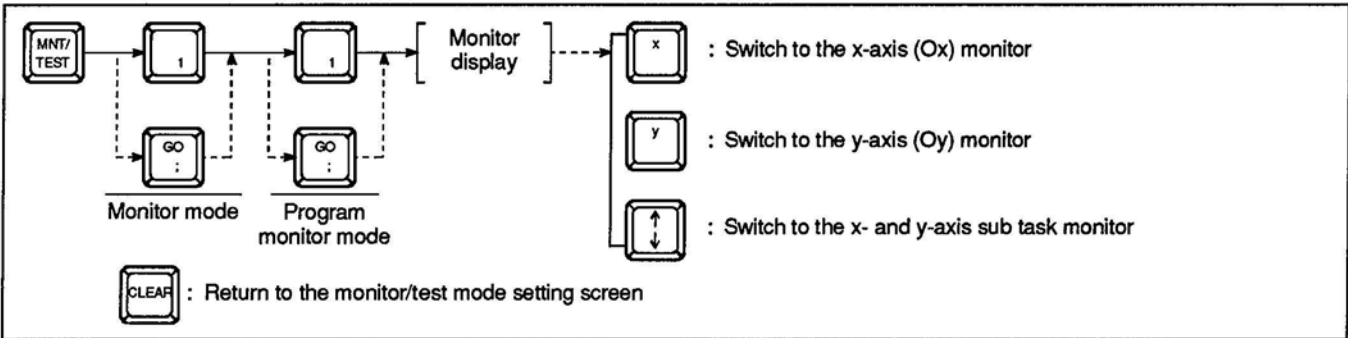
The following functions are available in monitor mode.

Function		Description	Detailed Explanation on Page
Program monitor		Line numbers and current values of an operating program are monitored. If an error occurs in the PGU, an alarm and an error message will be given.	5-3
Device monitor	Device monitor	Bit device (X, Y, M) ON/OFF state and word device (D, V, Z) current value can be monitored.	5-4
	Forced SET/RST	Y and M can be set/reset (ON/OFF) from the TP.	5-5
	Register present value change	Current values of data register (D), index registers (V, Z), and file register (D).	5-6

5.2.3 Program monitor

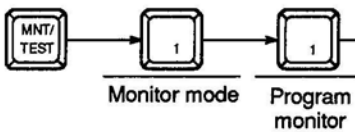
Line numbers and x- and y-axis current values of an operating program can be monitored.

Basic operation



Operation example

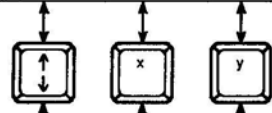
Key operation



Display example

Simultaneous 2-axis or x-axis monitor

```
M  O10      N1000
  drv (00)
  x - 2000
  y + 3000
```



```
M  O100     N3000
  SET Y000;
  x +6000
  y +7000
```

Sub task monitor



```
M  Oy20     N2000
  m02 (END)
  x - 4000
  y + 5000
```

y-axis monitor

When the m code is ON, this symbol is displayed to the left of the corresponding axis.



When a PGU error occurs during monitor operation:

- If an error occurs with the x or y axis in the PGU during the monitor operation, an alarm and an error message will be given.

A "#" symbol will be displayed to the left of the program number.

```

M #O10      N1000
  drv (00)
  x +123456
  y +234567
    
```



Error descriptions and handling:

- Refer to the PGU Hardware/Programming Manual for the description of the errors. Refer to page 5-16 of this manual for the error cancel procedure.

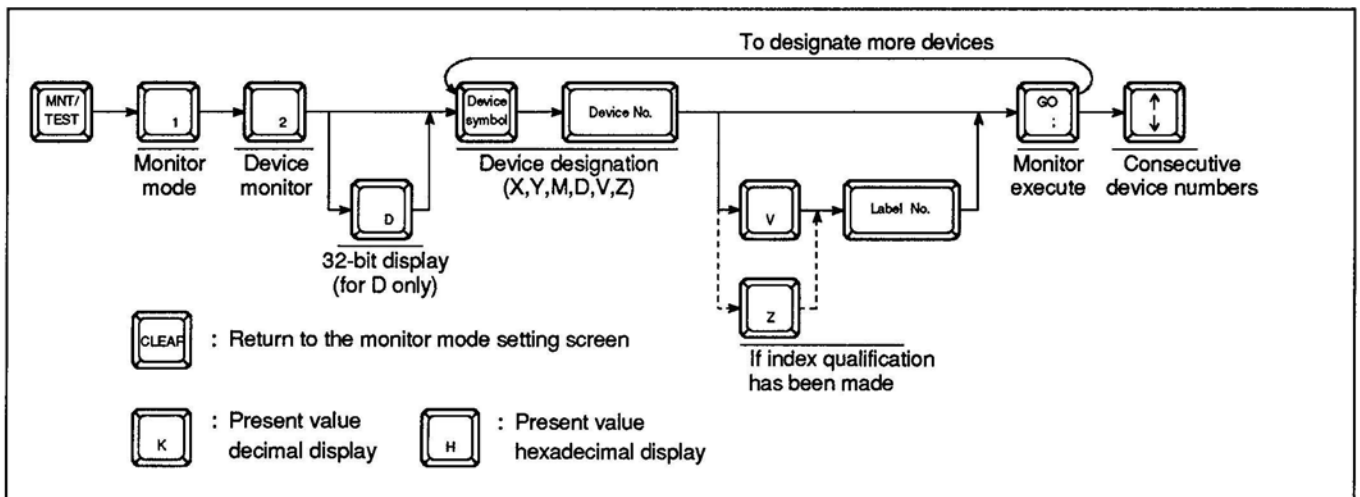
5.2.4 Device monitor

Bit device (X, Y, M) ON/OFF state and word device (D, V, Z) present value can be monitored. Bit device forced ON/OFF and word device present value change can also be executed.

1) Device monitor

Bit device ON/OFF state and word device present value can be monitored. Up to 8 bit device points or 4 word device points (2 points of 32-bit devices or when index qualification is made) are displayed at a time.

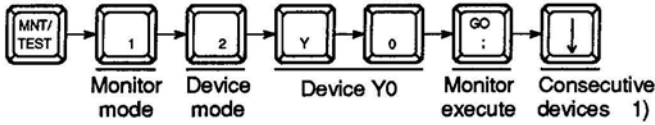
Basic operation



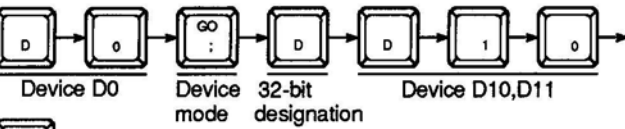
Operation example

To monitor Y0, Y1, D0 (16-bit), D10, and D11 (32-bit):

Key operation

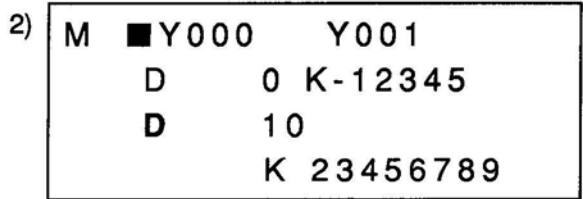
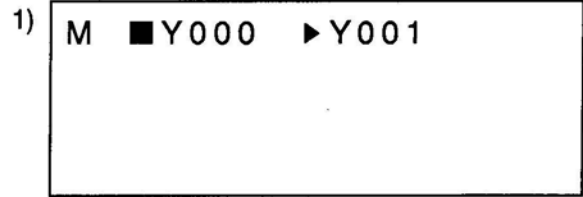


"■" displayed to the left of the device number indicates that the device is ON.
Ex. ■ Y0



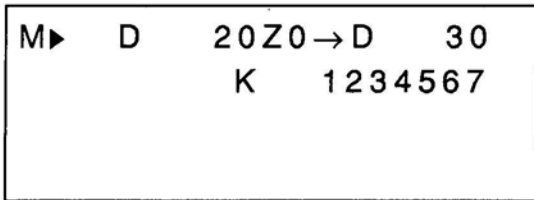
The 32-bit data display gives a bold letter display. Ex. **D**10

Display example

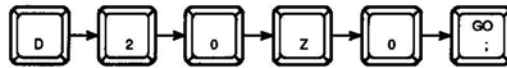


Monitoring with indexing:

- If a data register with indexing is monitored, the data after the indexing is monitored.



Ex. To monitor D20Z0 when Z0 = K10:



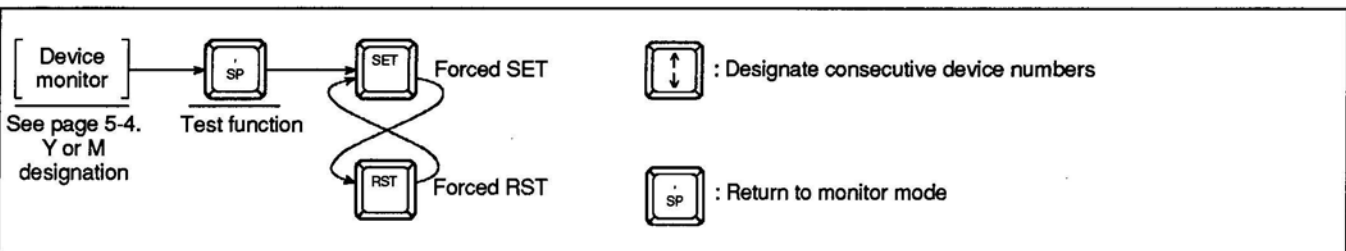
D20Z0 switches to D30, and D30's present value will be displayed.

Present value after index

2) Forced SET/RST

Bit devices (Y and M) can be forcibly set or reset by the TP.
Designate a device to be set or reset forcibly in monitor mode.

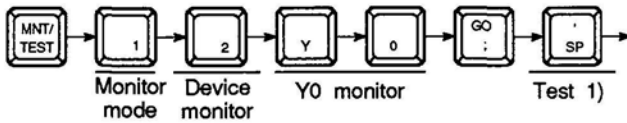
Basic operation



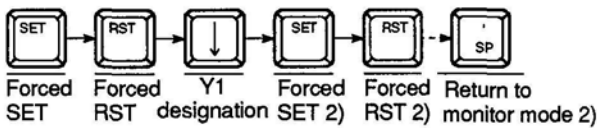
Operation example

To forcibly set and reset Y0 and Y1:

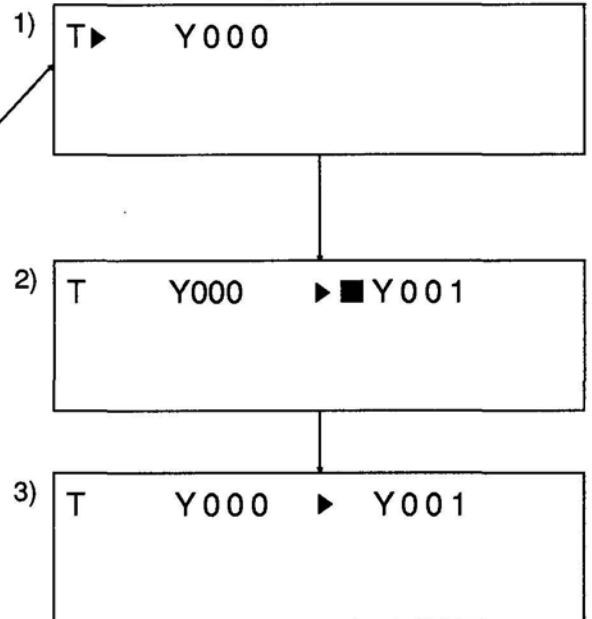
Key operation



Pressing the [SP] key will display "T"

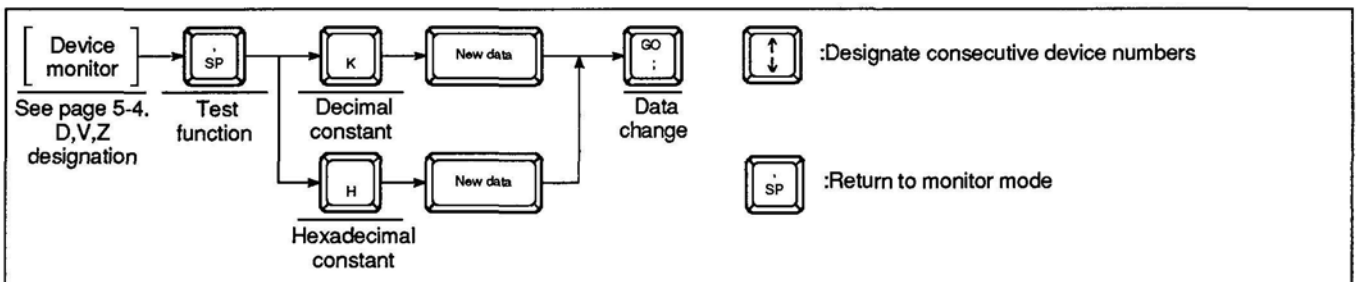


Display example



- 3) Register current value change
 Change the current values of data register (D), index registers (V, Z), and file register (D) as follows.

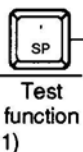
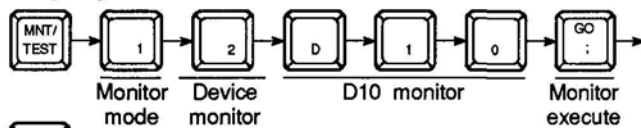
Basic operation



Operation example 1

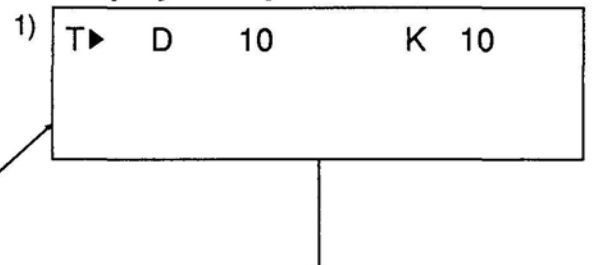
To change current value K10 of D0 to K20

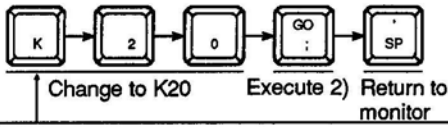
Key operation



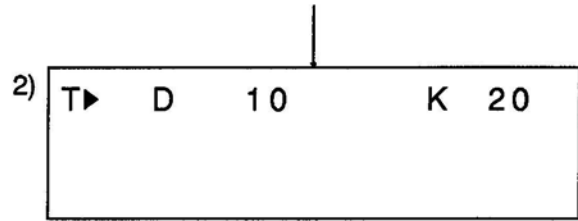
Pressing the [SP] key will display "T"

Display example



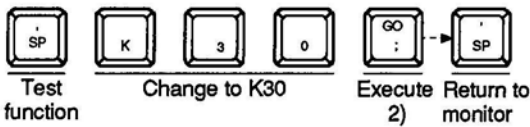
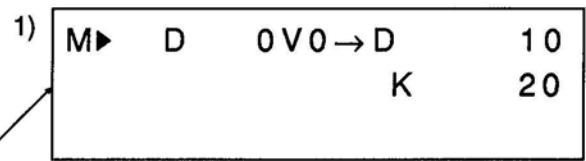
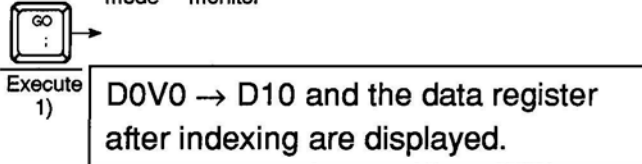
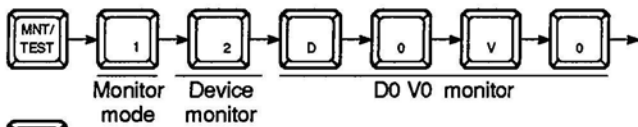


Pressing the [K] key will display an underline at the current value.

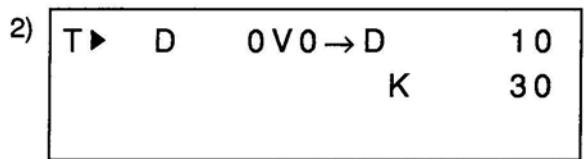


Operation example 2

To change data of D0V0: When V0 = K10, the current value of D10 is changed. Current value K20 of D10 is changed to K30.



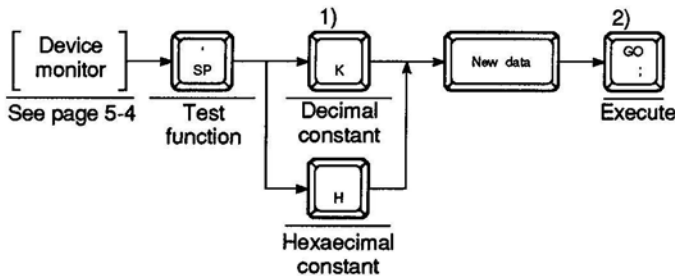
Current value K20 of D10 after indexing is changed to K30.



Operation of changing register values:

- Changing of the data register's current value, mentioned on the previous page, is executed as follows:

Operation



- 1) The device monitor function stops when the [K] or [H] key is pressed.
- 2) Input new data and press the [GO] key. The new data is input and updates data in the PGU. The changed data is monitored after pressing the [GO] key.

Precaution

When changing the data of an indexed data register, the target data register is determined according to the content of the index when the [K] or [H] key is pressed. Therefore, the data of the index register will not be influenced by a change of the index value which occurs after the [K] or [H] key was pressed.

5.3 Test Mode

Zero return, fixed-rate feed, etc. by the key operation on the TP can be executed in test mode.

5.3.1 Conditions for using the test function

To use the test function, the PGU must be in one of the conditions as given below.

Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	x	O	O
Offline mode	x *1	x *1	x *1	x *1

*1 Monitor mode cannot be selected in offline mode.

5.3.2 Outline of the test function

The following functions are available in test mode.

Function	Description	Detailed Explanation on Page
Zero return (ZRN)	The zero return command is sent from the TP.	5-9
Current value change (CVR)	Current values of the x- and y-axes are changed.	5-11
Fixed-rate feed (FEED)	The number of pulses corresponding to a designated feed quantity are output. The feed quantity can be set in mechanical or pulse units.	5-12
JOG operation	Pulses are output while the operation key is being pressed.	5-13
Teaching	The present value of JOG operation is written as a set value to the program.	5-14



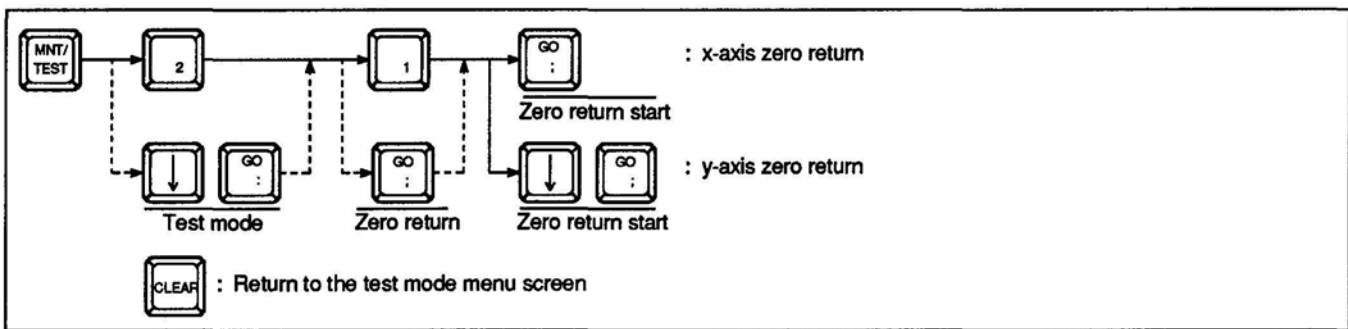
About the operation in test mode:

- The operations of zero return, fixed-rate feed, JOG operation, and teaching are determined by the parameter settings in the PGU. To change the JOG speed or feed quantity, change the parameter setting related to such operation. The unit of present values displayed on the panel is determined by parameter to the mechanical unit (mm, inch, deg) or motor unit (PLS).

5.3.3 Zero return (ZRN)

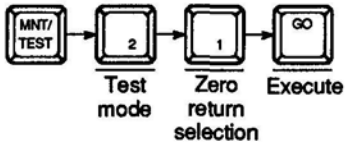
Issue a zero return command for the x or y axis by using the TP.

Basic operation



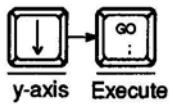
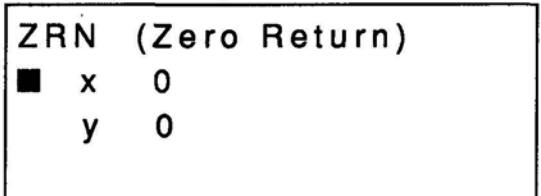
Operation example

Key operation

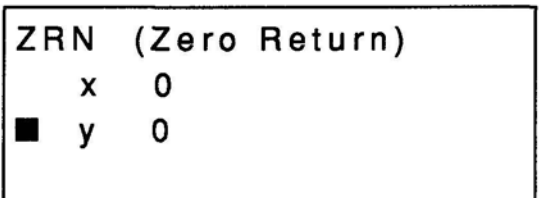


x-axis zero return

Display example



y-axis zero return



- The x and y current values are displayed during zero return. (The units of the current value is determined by the setting of parameter #0.)
- It is not possible to execute the zero return with the x and y axes together simultaneously. The zero return of one axis must be executed after the completion of the zero return of the other axis.

**Emergency stop keys:**

- Use the following keys to stop the operation during zero return.



: Emergency stop during the x-axis zero return

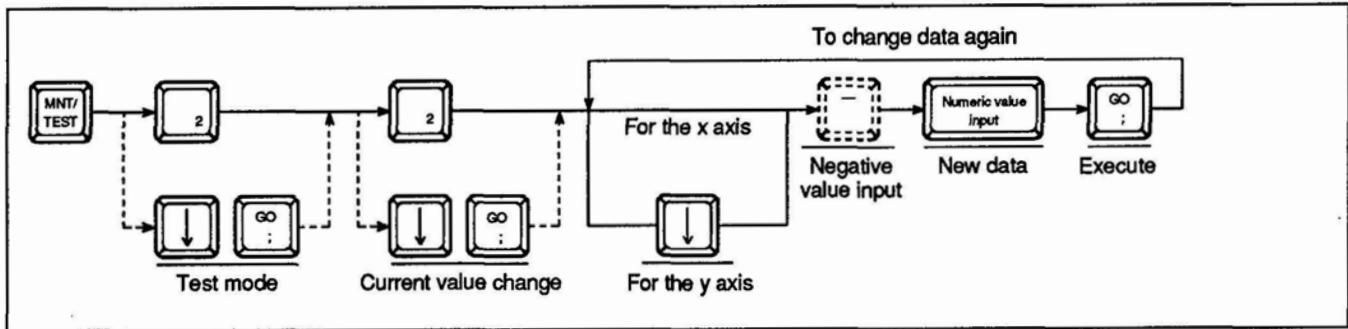


: Emergency stop during the y-axis zero return

5.3.4 Current value change (CVR)

Change the current values of the x and y axes as follows.

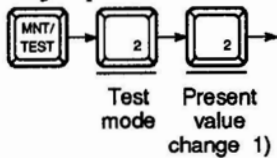
Basic operation



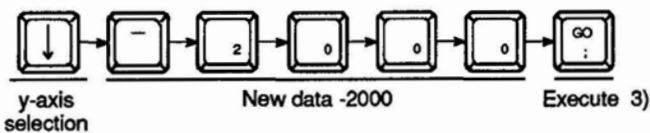
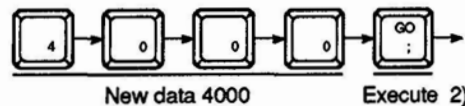
Operation example

To change x-axis current value 2000 to 4000 and y-axis current value -1000 to -2000:

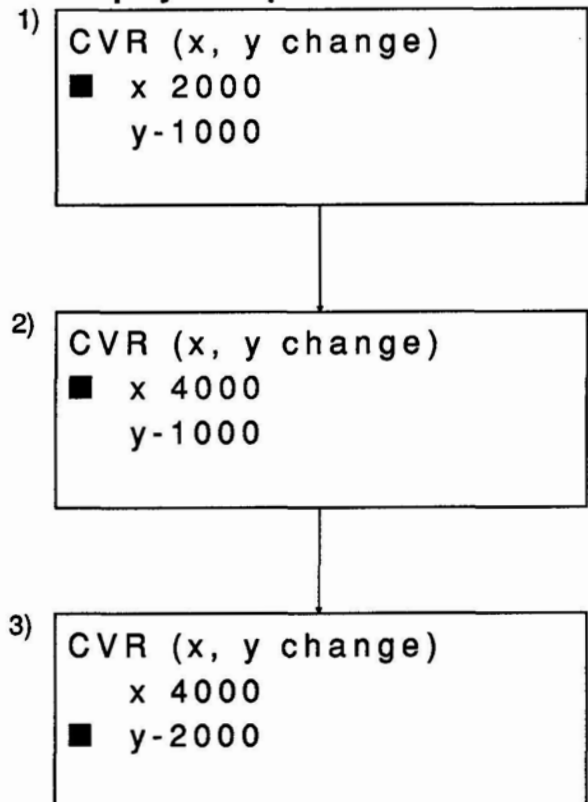
Key operation



Pressing the [GO] key will stop the monitor.



Display example

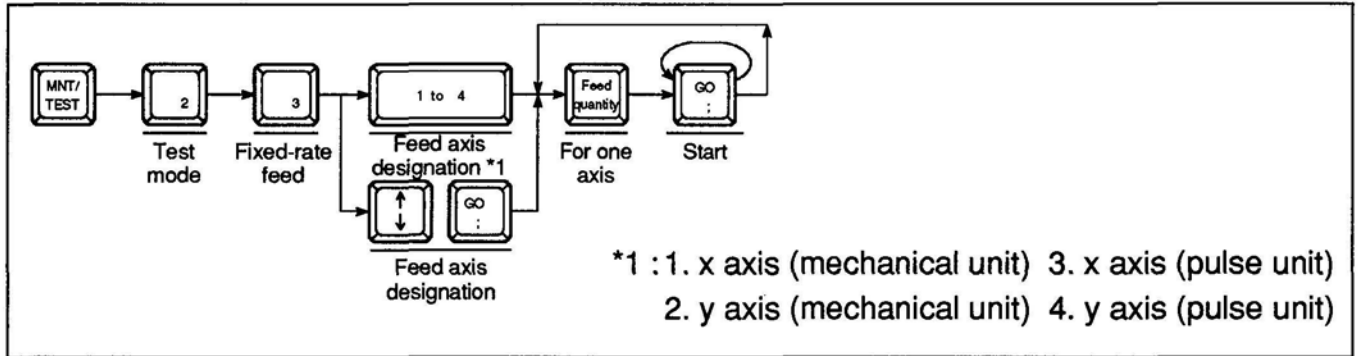


- The units of the current value being monitored on the current value change screen are determined by setting parameter #0's units to mechanical units (mm, inch, deg) or motor units (PLS). The same applies to the new data being entered.

5.3.5 Fixed-rate feed (FEED)

The number of pulses corresponding to a designated feed quantity are output. The feed quantity can be set in mechanical (mm, deg, inch) or pulse (PLS) units.

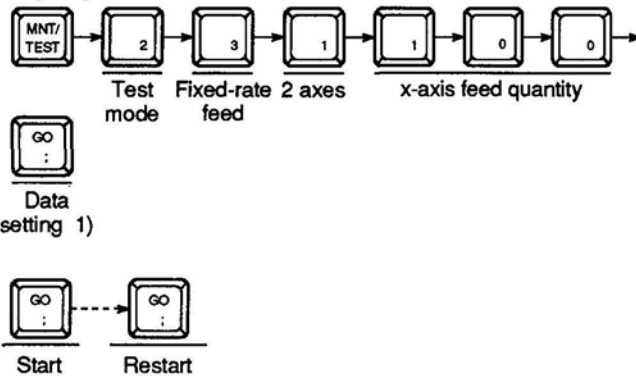
Basic operation



Operation example

To execute the x-axis fixed-rate feed by giving 100 pulses on the x axis:

Key operation



Display example

```

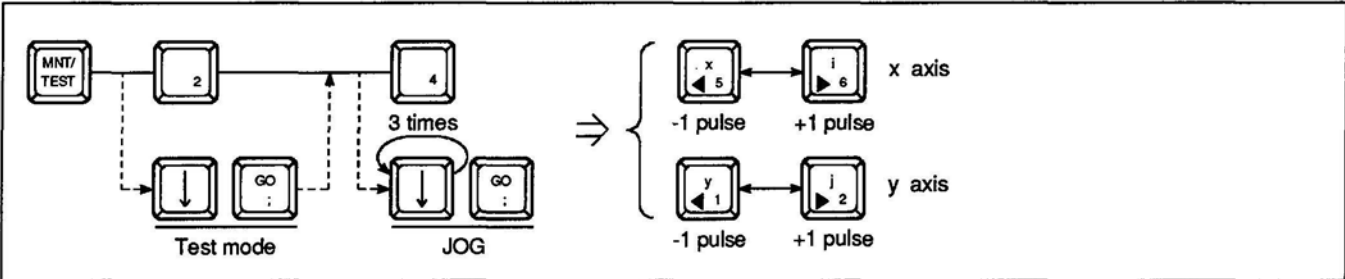
1) x-ax pulse feed
   x   0
   Feed Quantity
   x=  100
    
```

- About the mechanical units
 When fixed-rate feed is executed in mechanical units, the feed quantity is decided by the settings of parameters #1 (pulse meter) and #2 (movement rate).

5.3.6 JOG operation

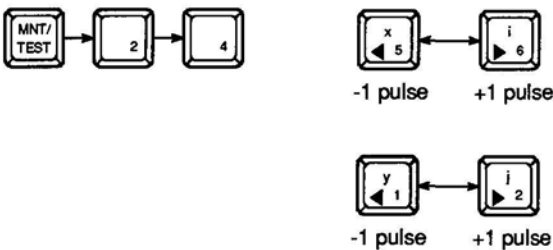
Pulses are output while the operation key is being pressed.

Basic operation

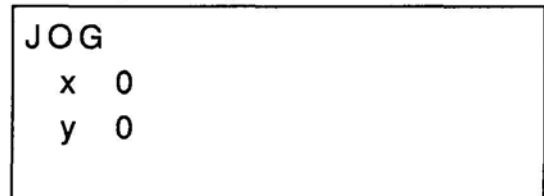


- Pressing and holding the [◀] or [▶] key for 0.2 second or less will output 1 pulse. Pressing and holding the key for 0.2 second or over will output pulses consecutively. Releasing the key will cause the JOG operation to decelerate and stop.
- The unit of current values monitored in the JOG operation screen is determined by parameter #0 being set to mechanical units (mm, inch, deg) or motor units (PLS).
The JOG operation is executed by a pulse output in motor units. In the case of a mechanical unit, the monitored current value may not change at all if the JOG key is pressed for only a short time depending on the #3 (least command increment) setting of parameters #1 (pulse rate) and #2 (movement rate). In such a case, execute monitoring after setting motor units.
- If any key is pressed while the JOG key is being pressed, the pulse output stops.

Operation example



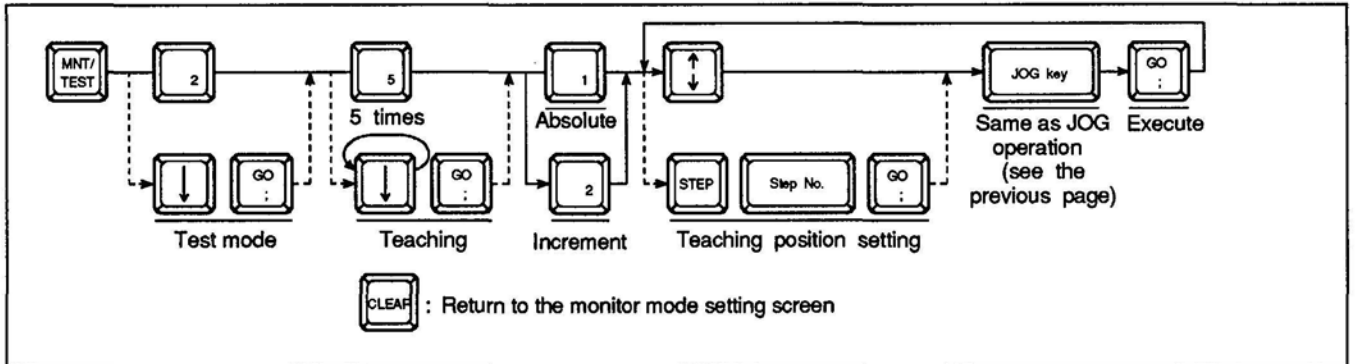
Display example



5.3.7 Teaching

The present value of JOG operation is written as a set value to the program.

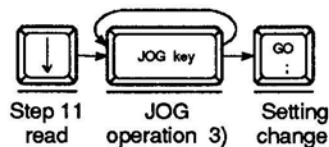
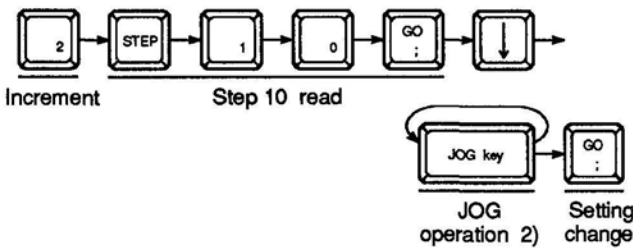
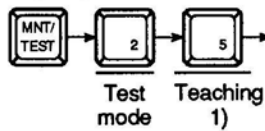
Basic operation



Operation example

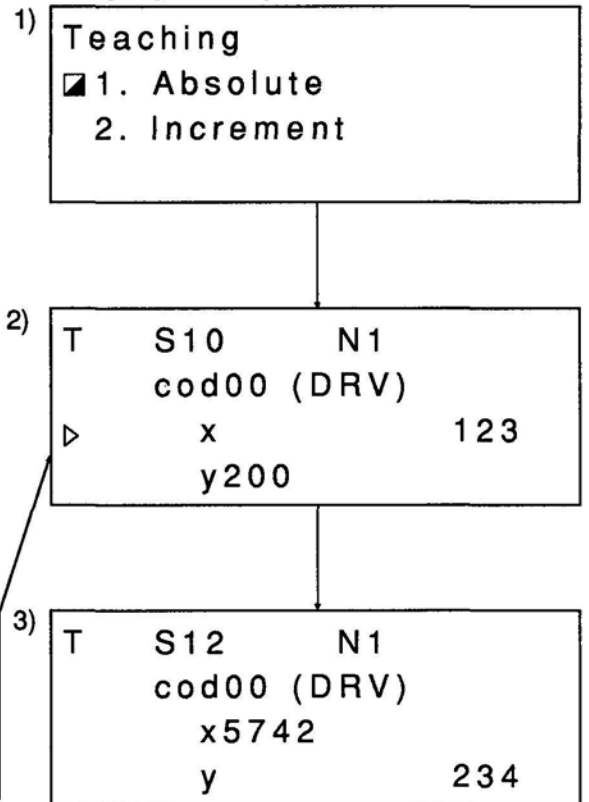
To change x100 at step 10 and y200 at step 11 to the teaching values given in incremental mode:

Key operation



Move the cursor to the positioning value for teaching and press the JOG key. (see the previous page) The cursor will be highlighted during the JOG operation.

Display example



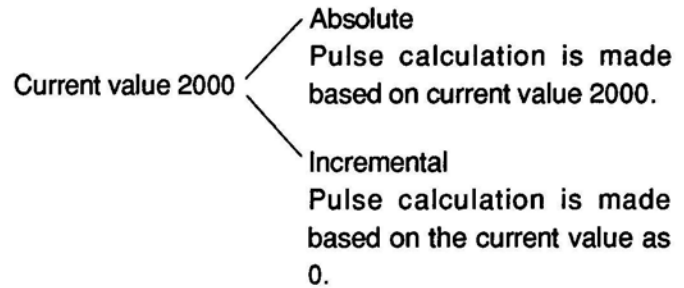


About absolute (ABS) and incremental (INC) addresses:

- An absolute address is the absolute value referenced to the zero (present value 0) point. An incremental address is a relative value referenced to the current value.

Ex. When current value is 2000:

The unit of current value is displayed in mechanical units (mm, inch, deg) or motor unit (PLS) according to the units set with parameter #0.



5.4 Error Monitor (Error Reset)

The error monitor and error reset of the PGU can be executed.

5.4.1 Conditions for executing the error monitor

To execute the error monitor, the PGU must be in one of the conditions as given below.

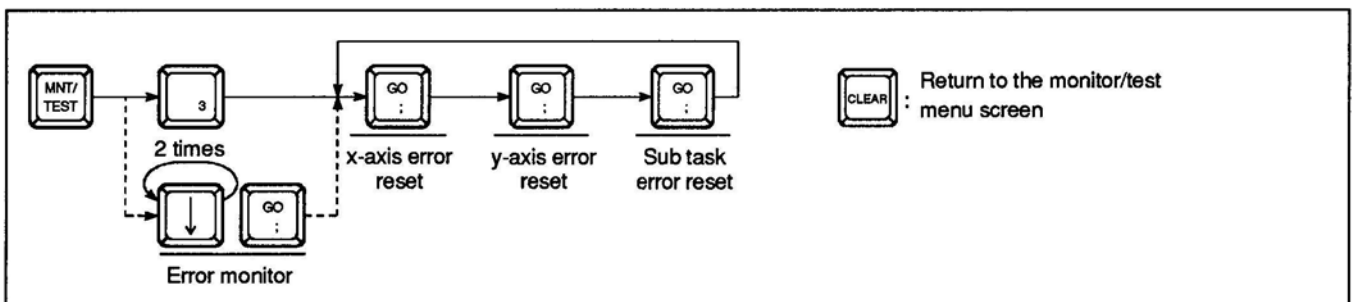
Mode	PGU	PGU State		PGM Memory	
		MANUAL	AUTO	RAM	EEPROM
Online mode		O	×	O	O
Offline mode		×	×	×	×

*1 Test mode cannot be selected in offline mode.

5.4.2 Error monitor

Execute the error monitor as follows.

Basic operation



Error monitor display example

Errcode	Mon/Rset	
■ x-ax	2564	60
y-ax	100	32
sub	50	5162

Error code ——— Error occurrence step

- The error monitor gives the codes and step numbers of the error occurrence about the x-axis, y-axis, and sub task respectively.

- Before resetting an error, check the nature and cause of the error occurrence.

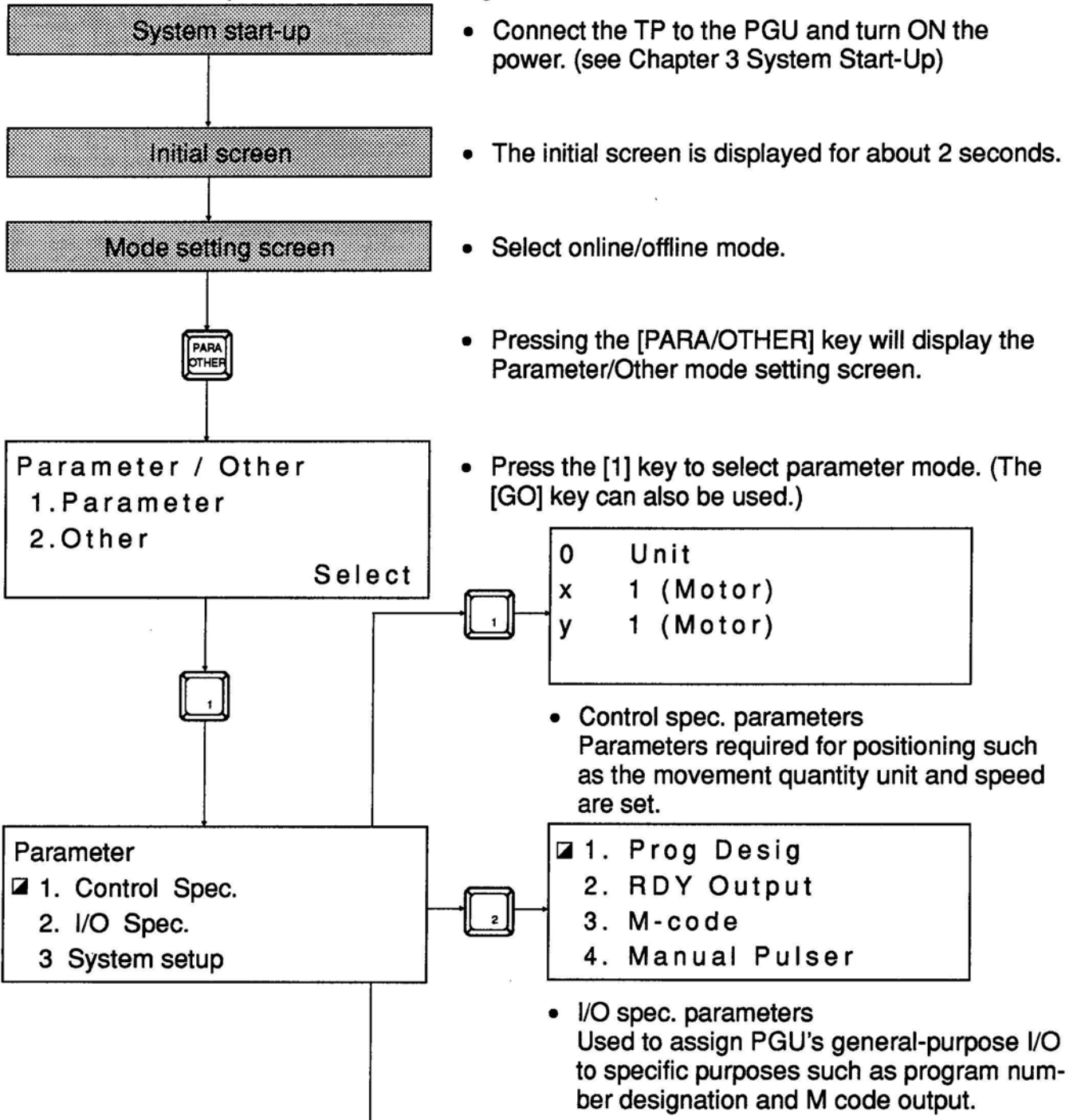
1	INTRODUCTION
2	EXAMPLE PROGRAMMING OPERATIONS
3	SYSTEM START-UP
4	PROGRAM (ONLINE/OFFLINE)
5	MONITOR/TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

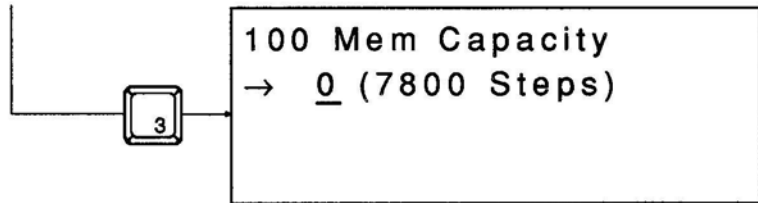
6. PARAMETER

This chapter gives the method of entering parameters. Parameters are classified into three groups: 1. control specification, 2. I/O specification, and 3. system setup parameters. The same procedure is used in online and offline modes.

6.1 Selecting the Parameter Function

Select the parameter function as given below.





- System setup parameters
Used to set memory capacity for programs, file registers, etc. These parameters usually need not be changed once they are set.

6.2 Conditions for Selecting the Parameter Function

To select the parameter function, the PGU must be in one of the conditions as given below.

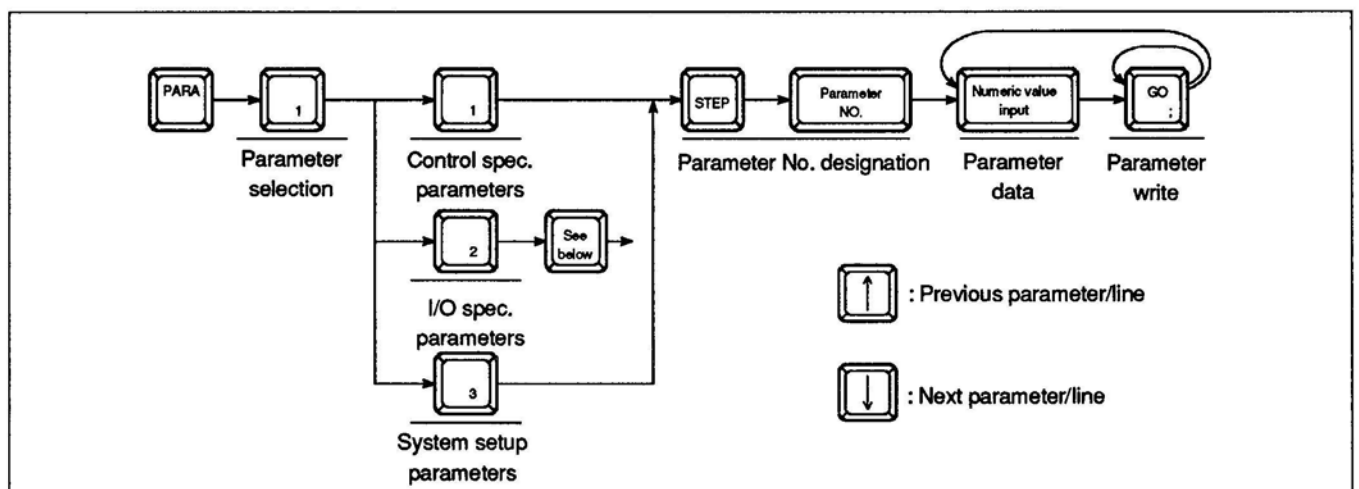
Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	×	○	△ *1
Offline mode	○	○	○	○

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

6.3 Changing Parameter Setting

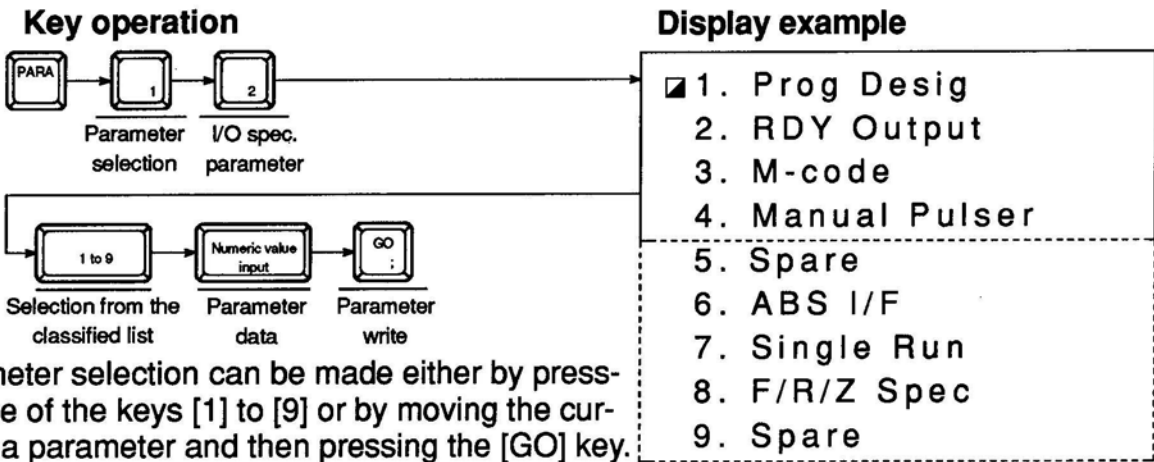
All parameter settings are made to default values before the TP is shipped from the factory, and not all parameters need to be changed when the TP is used. (Parameter settings can be initialized in OTHER mode.)

Basic operation



• I/O spec. parameters

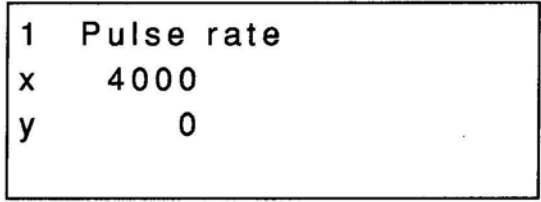
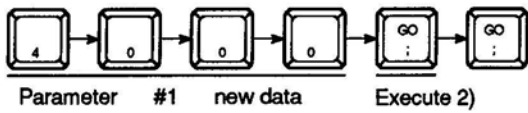
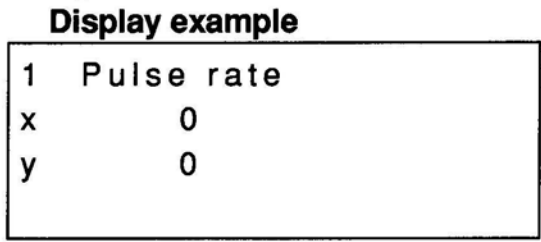
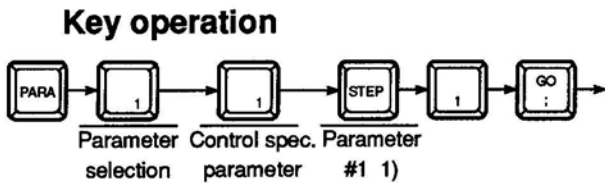
I/O spec. parameters are selected from a classified parameters list as mentioned below.



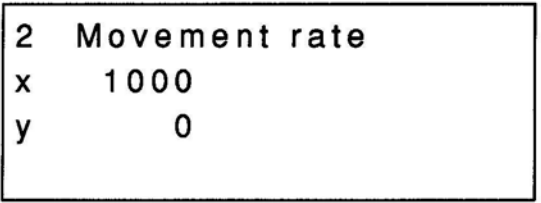
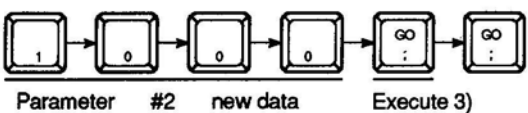
Parameter selection can be made either by pressing one of the keys [1] to [9] or by moving the cursor to a parameter and then pressing the [GO] key.

Operation example

To change control spec. parameter x-axis #1 pulse rate setting to 4000 and x-axis #2 movement rate setting to 1000:



Input new data and press the [GO] key. The parameter setting will be changed and the next parameter will be displayed. To confirm that the setting is correctly changed, press the [↑] key to display the previous parameter.



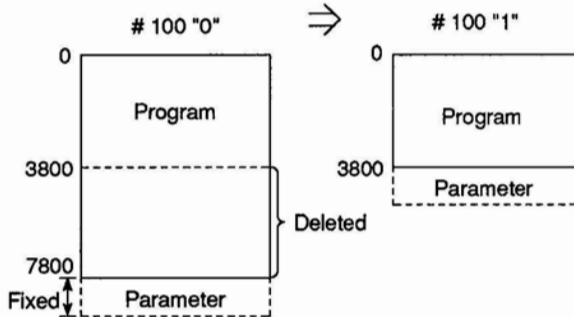
To pass a parameter data without changing its setting, press the [↓] or [GO] key to move to the next parameter.



Precautions to be observed when changing the system:

- The following precautions must be observed when changing system setup parameter #100 (memory size) setting from the default (initial) "0" (7800 steps) to any other setting.

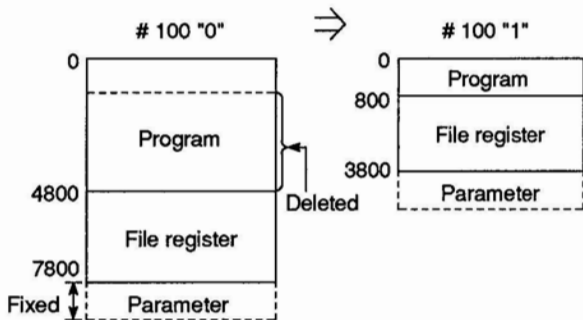
- To change system setup parameter #100 "0" to "1" when #101 file register size is set to "None".



Changing #100 setting to "1" will delete the program stored in the area after the 3800th step.

If a program (instructions other than NOP) exists in the area after the 3800th step, the "Delete?" message will be displayed. Answer "Yes" ([GO] key) to delete or "No" ([CLEAR] key) to cancel.]

- To change system setup parameter #100 "0" to "1" when #101 file register size is set to 3000.



If #101 file register setting has been made, 4000 steps of program area will be deleted.

If a program exists in the area to be deleted, the "Delete?" message will be displayed as explained above in 1).

- #101 file register size setting**
A file register area will be allocated after the program area and up to 3000 steps can be set. When the file register size is to be increased (e. g., from 100 to 1000), and if a program exists in the area to be deleted because of the increase, the "Delete?" message will be displayed as explained above in 1) and 2). The operation to increase the file register size can also be canceled.
- If system setup parameter #100 "1" (3800 steps) is changed to "0" (7800 steps), the program area will increase by 4000 steps to which NOPs will be written.

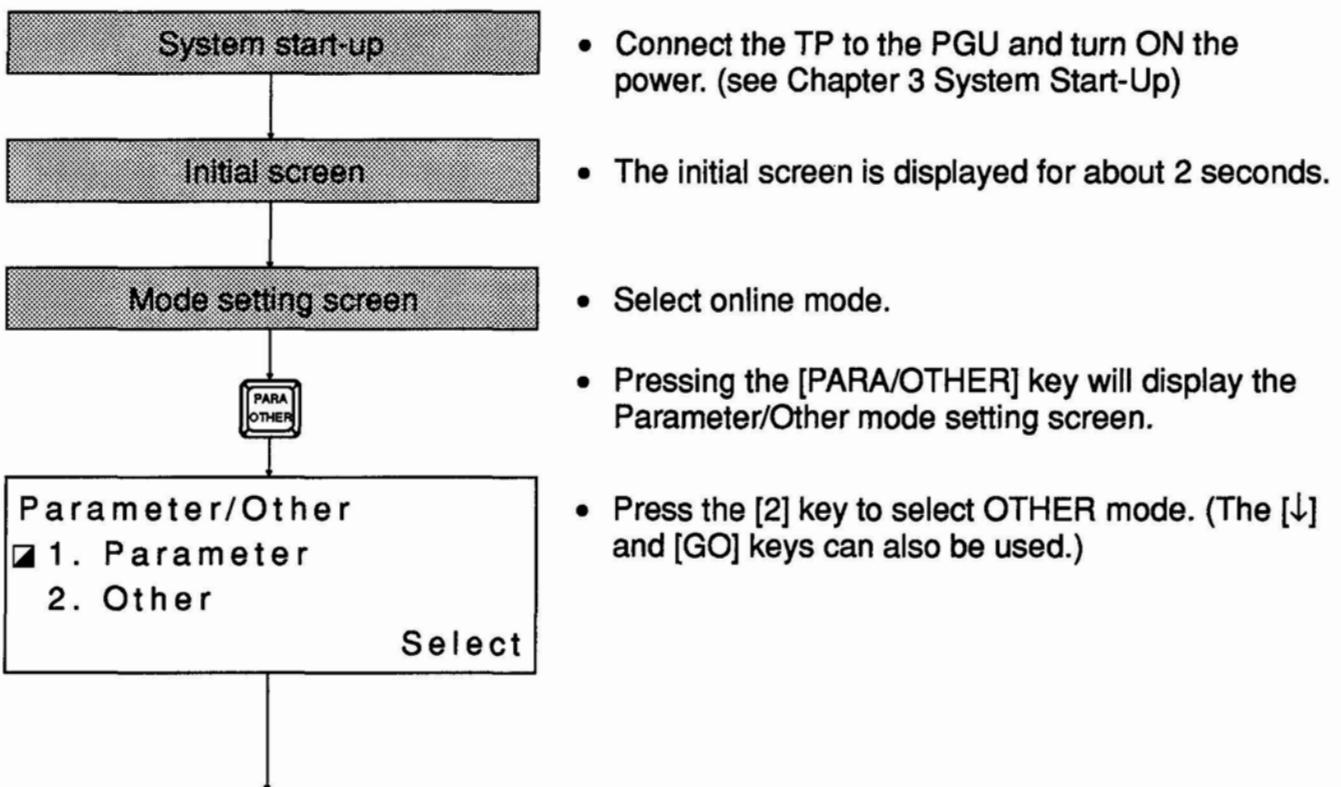
1	INTRODUCTION
2	EXAMPLE PROGRAMMING OPERAONS
3	SYSTEM START-UP
4	PROGRAM (ONLINE/OFFLINE)
5	MONITOR/TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

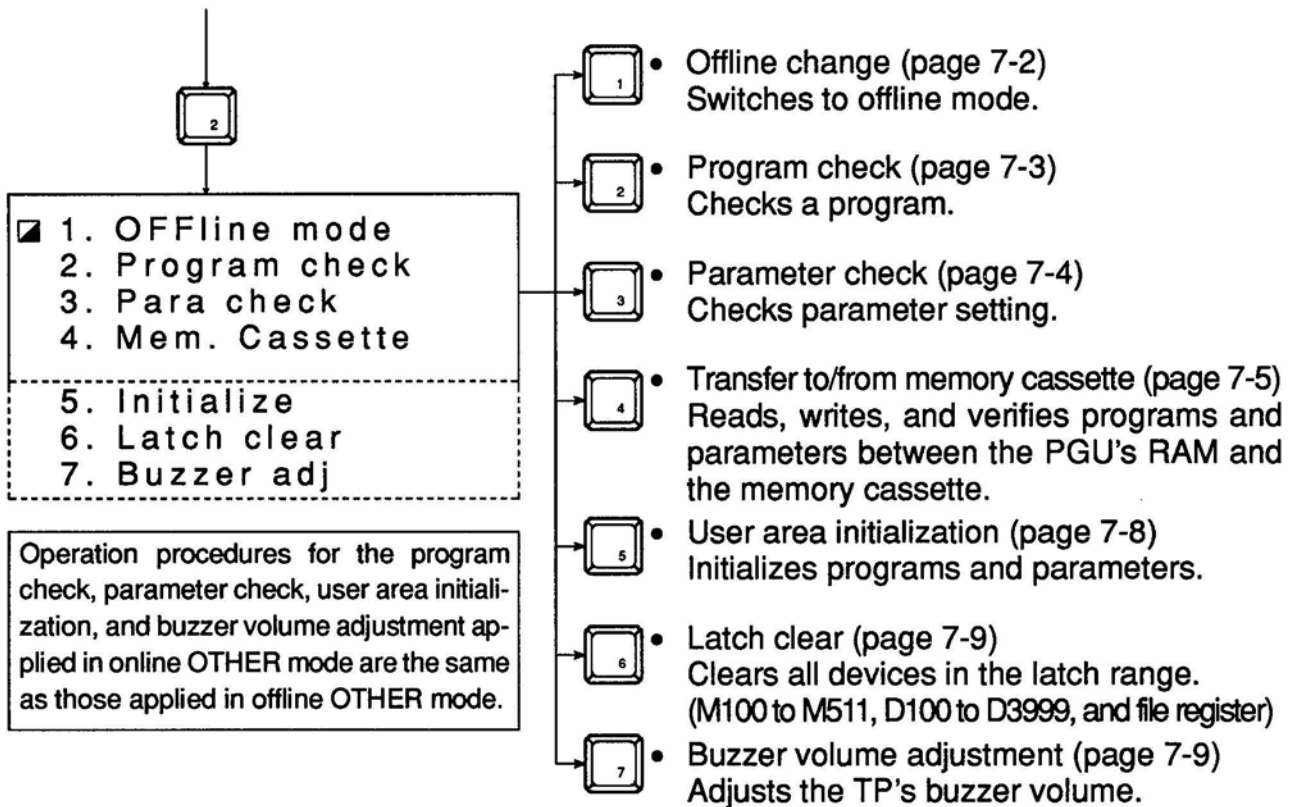
7. OTHER (ONLINE)

Online OTHER mode allows switching to offline mode, program check, parameter check, transfer to/from the memory cassette, verification with the memory cassette, user area initialization, latch clear, and buzzer volume adjustment.

7.1 Selecting OTHER Mode

Select online OTHER mode as given below.





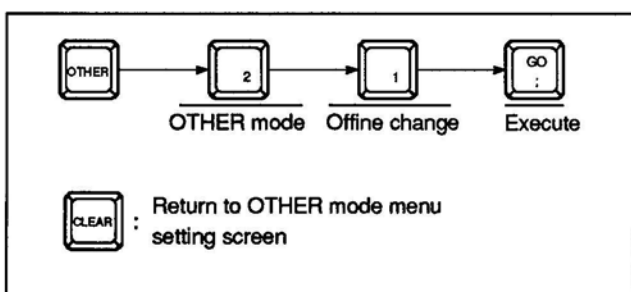
7.2 Offline Change

Switch the operation mode from online to offline as given below.

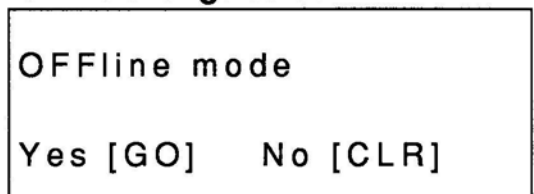
- To switch to offline, the PGU must be in one of the conditions as given below.

Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	○	○	○

Basic operation



Offline change screen



- Pressing the [GO] key switches to offline mode.

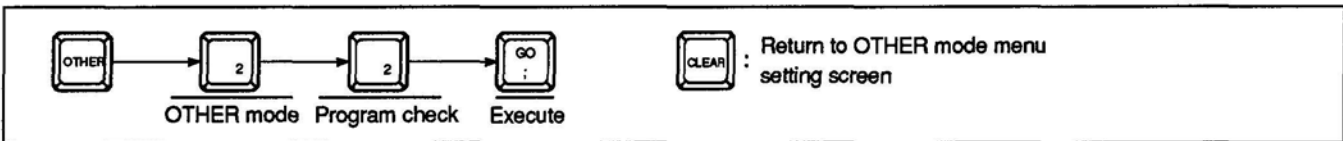
7.3 Program Check

Check the program written to the PGU. The same procedure applies to offline mode.

- To check a program, the PGU must be in one of the conditions as given below.

Mode	PGU	PGU State		PGU Memory	
		MANUAL	AUTO	RAM	EEPROM
Online mode		○	○	○	○

Basic operation



Display example

```

Program check
Executing
  
```

- Press the [2] key to select the program check, and then, press the [GO] key to start checking the program.

The "Executing" message will be displayed when the program is being checked.

```

Program check
Completed
  
```

- If the program check is completed without error, the "Completed" message will be displayed.

If a program error is found, the error information will be displayed. (see the next page)

Online mode display example

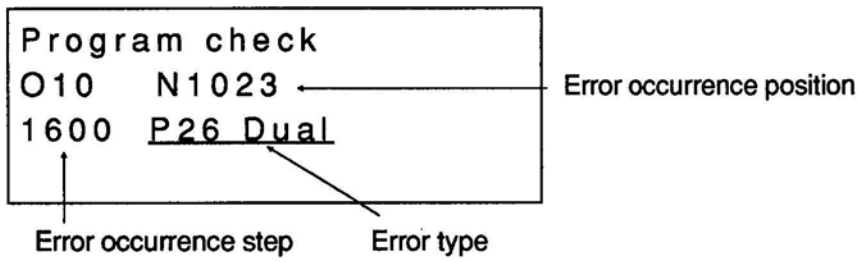
```

Program check
x-ax No err
y-ax 3006 1802
sub 3008 2603
  
```

Error occurrence step

Error code

- The program check in offline mode gives the error information display first.
- The program check operation in online mode is different from that in offline mode as follows. The program check in online mode checks mainly the conditions required for actual program operation, while the program check in offline mode checks syntax by each instruction word and the jump destination setting of each label.



- If an error is found and the program check has stopped, the program check in offline mode can be continued by pressing the [GO] key.
- If an error is found in online mode, the error content is displayed by a code number. The PGU Handy Manual gives details of the error type.
- If an error is found in offline mode, the error type and the error occurrence step are displayed.

Examples:

- Program number O, Ox, Oy, and label duplicated → "Dual"
- Outside the device (X, Y, M, D) ranges "Outside device range"
- Undefined code is found "Undef code"
- Error in the address data combination after cod instruction "Addr data err"
- Undefined cod or FNC instruction is found "Undef cod"
- "Undef FNC"
- ";" (EOB) is missing "; Omitted"

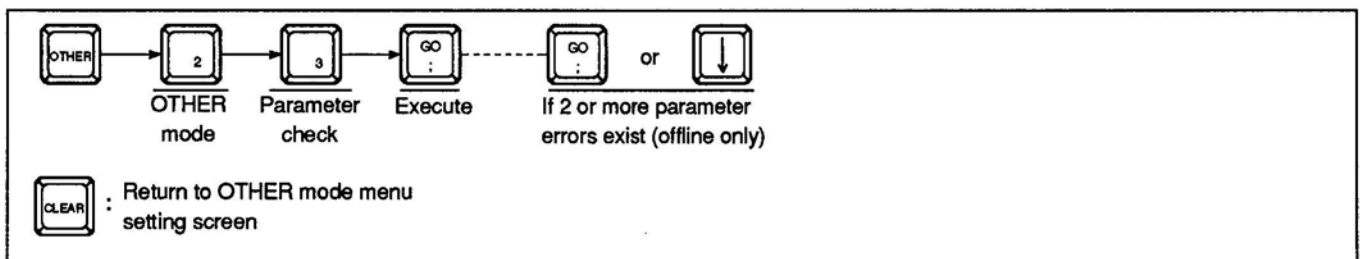
7.4 Parameter Check

Check the parameters written to the PGU's memory.

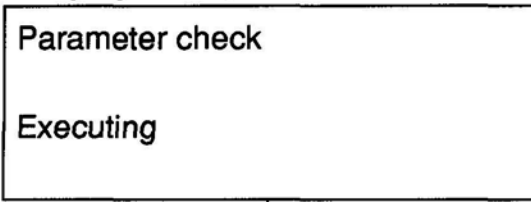
- To check parameter setting, the PGU must be in one of the conditions as given below.

Mode	PGU	PGU State		PGU Memory	
		MANUAL	AUTO	RAM	EEPROM
Online mode		○	○	○	○

Basic operation

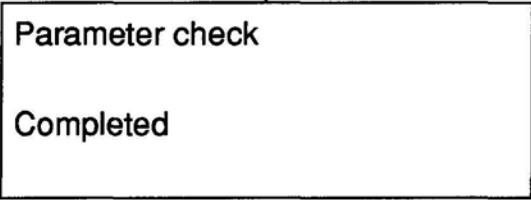


Display example



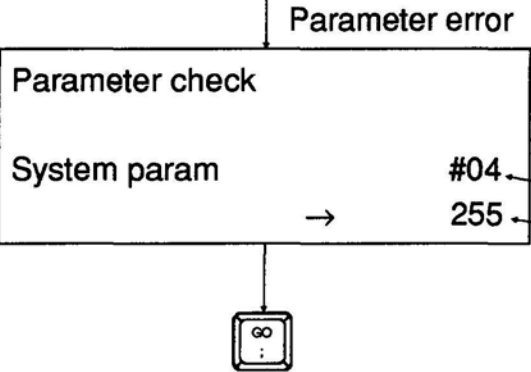
- Press the [3] key to select the parameter check, and then, press the [GO] key to start checking the parameters.

The "Executing" message will be displayed when the parameters are being checked.



- If the parameter check is completed without error, the "Completed" message will be displayed.

Pressing the [CLEAR] key will return to the OTHER mode menu setting screen.



Parameter error

- If a parameter error is found, the error parameter number and the parameter set value will be displayed.

Parameter number
Set value

- If two or more errors exist, press the [GO] or [↓] key to continue the check. (Offline only)

- Effective parameter input range in online mode is different from that in offline mode. (Available input range is wider than the PGU's specification range.)
The TP's parameter check verifies that the entered parameters lie within the allowed numeric range. The check made by the PGU verifies that they lie within the range which can be used for actual operation.

7.5 Data Transfer

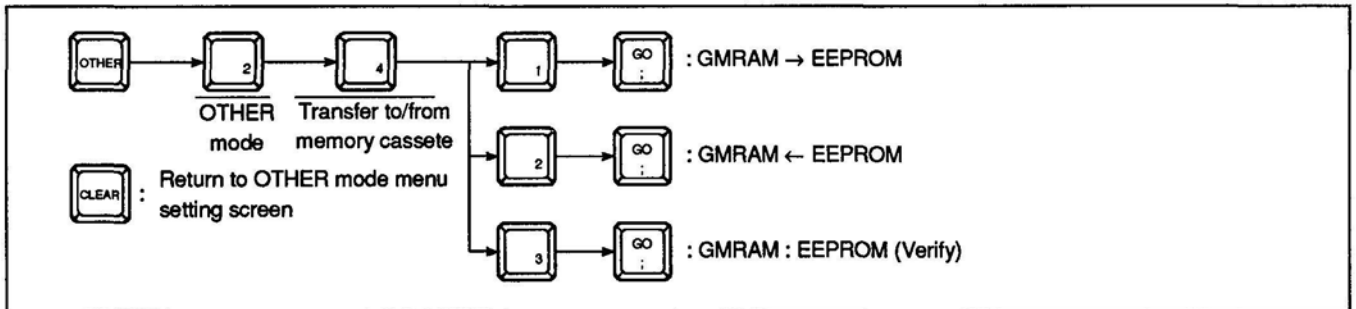
Read, write, and verify programs and parameters between the PGU's RAM and the EEPROM memory cassette.

- To transfer programs and parameters to/from the memory cassette, the PGU must be in one of the conditions as given below.

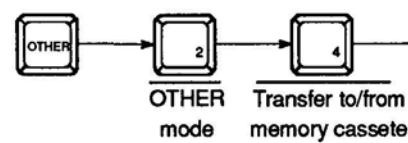
Mode	PGU	PGU State		PGU Memory	
		MANUAL	AUTO	RAM	EEPROM
Online mode		O	x	O	Δ *1

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

Basic operation



Operation example

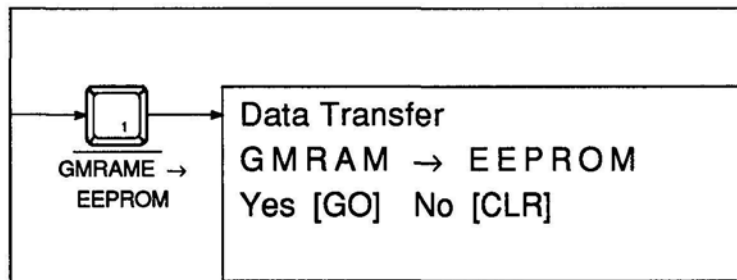


To remove and install the EEPROM memory cassette, be sure to turn the power OFF. (see page 3-4)

Display example

Data Transfer

- 1. GMRAM → EEPROM
- 2. GMRAM ← EEPROM
- 3. GMRAM : EEPROM

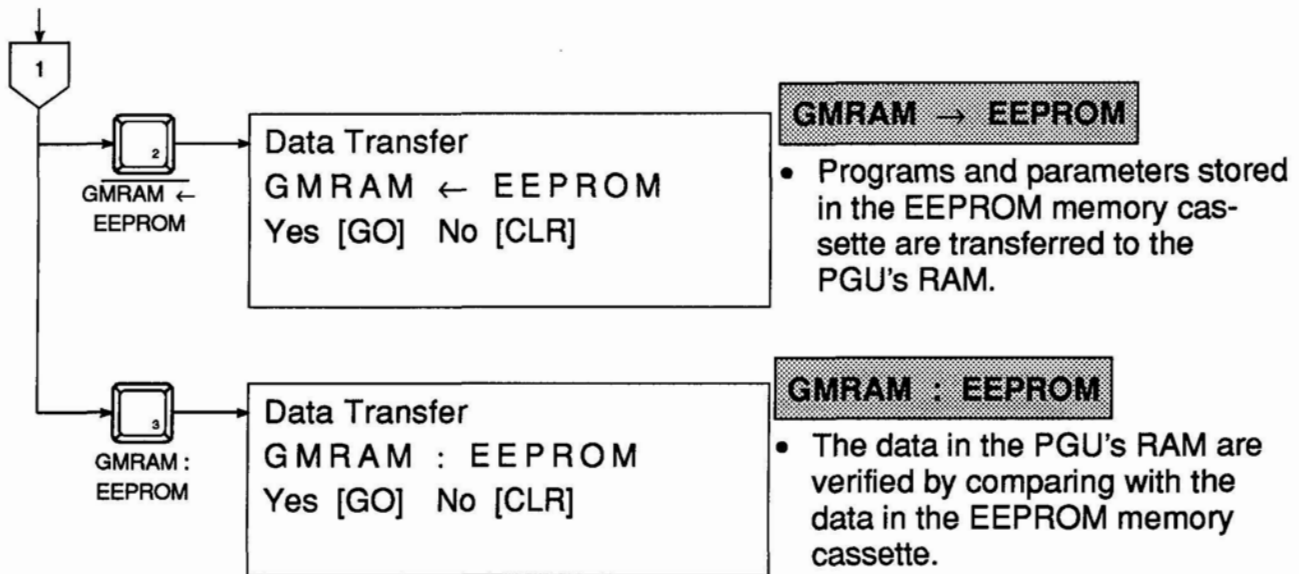


GMRAM → EEPROM

- Programs and parameters stored in the PGU's RAM are transferred to the EEPROM memory cassette.

If the PROTECT switch on the EEPROM memory cassette is ON, writing to the cassette is disabled. Make sure that the PROTECT switch is OFF. When the PROTECT switch is ON, the screen gives the "GMRAM → EEPROM*" message.





Select the transfer direction and press the [GO] key. The "Executing" message will be displayed during the transfer or verification.

When the transfer from GMRAM to EEPROM has been successfully completed, the "Completed" message will be displayed, and the screen will return to the function setting screen after several seconds.

[ONline mode]
 Select Mode or
 Function
 (MEM 7800steps)



Limitation on the number of writes to EEPROM:

- The maximum number of times an EEPROM memory cassette can be written to is 10,000.



Recommended program development technique:

- Using EEPROM for program development can shorten its life because of the number of writes involved. Writing to EEPROM is also slower than writing to RAM. For these reasons, it is recommended to use RAM for programming. A copy of the program can be transferred to EEPROM when development is complete.



Copying programs:

- Transfer a program to an EEPROM cassette and keep it as a master program cassette. The master program cassette can be used to transfer a program to a PGU so that the program can be used as it is or the program can be modified.

7.6 Initializing the User Area

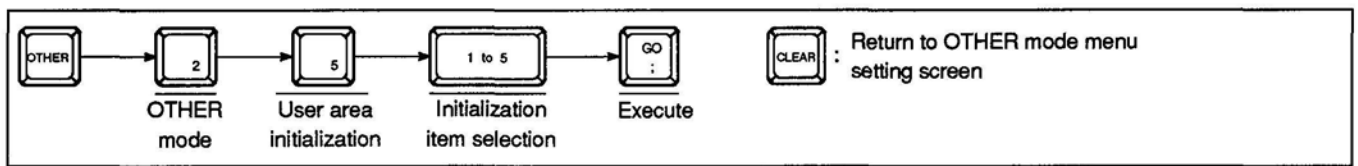
Initialize the programs and parameters.

- To initialize programs and parameters, the PGU must be in one of the conditions as given below.

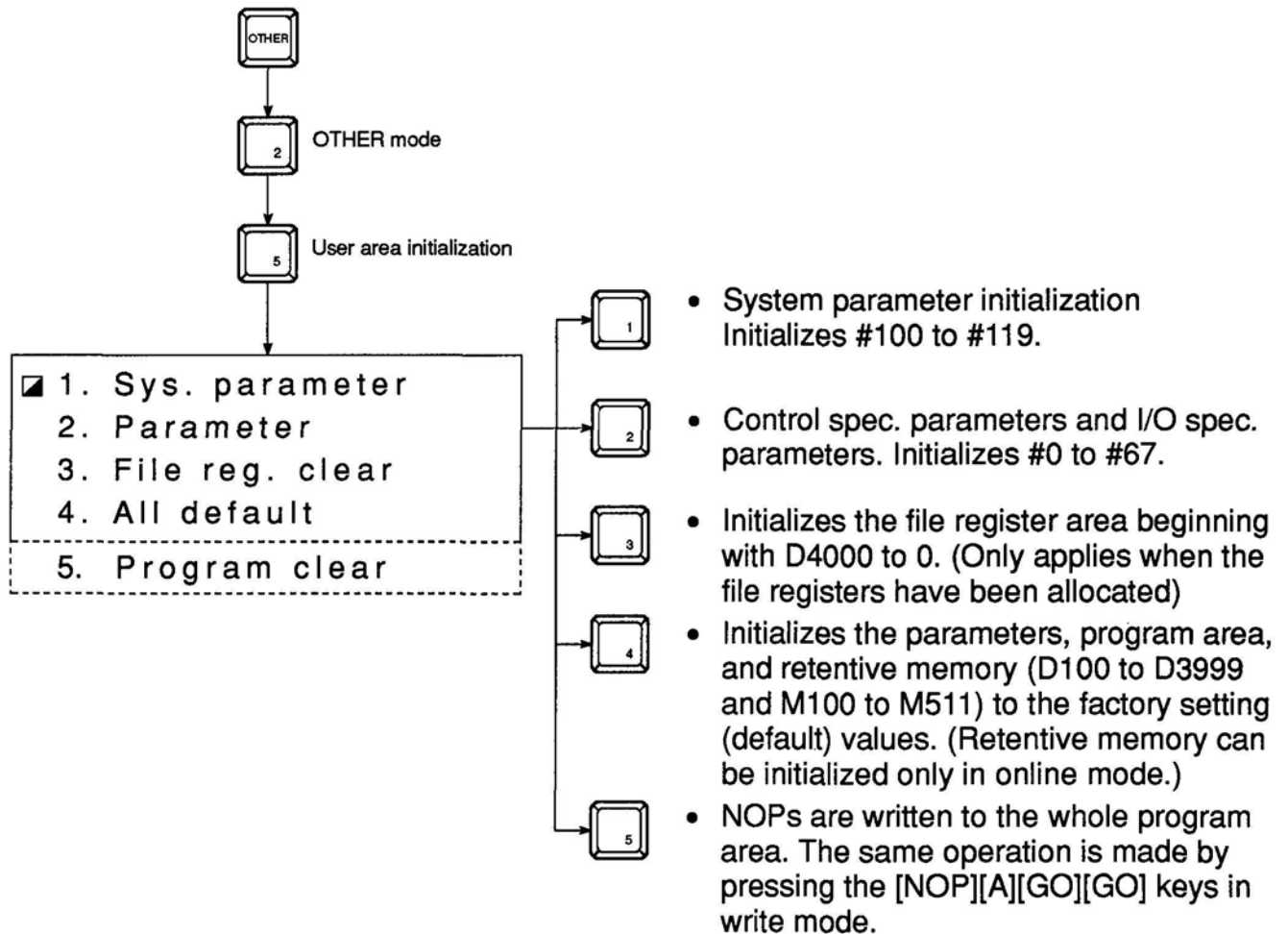
Mode \ PGU	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	○	×	○	△ *1

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

Basic operation



Operation example



7.7 Latch Clear

Reset battery backed auxiliary relays (M) and data registers (D). Data registers will have "0" written to them.

Latch clear

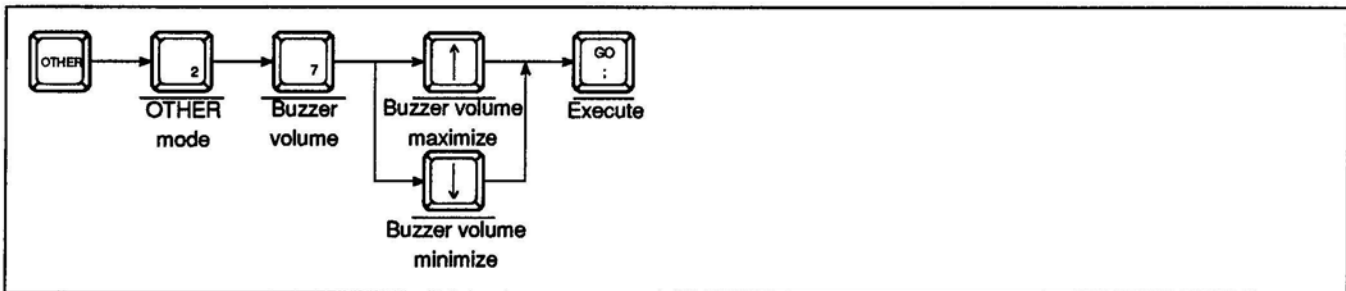
1. M100-M511
2. D1000-D3999
3. D4000-D6999

- "3" is displayed only when file registers have been allocated.

7.8 Adjusting the Buzzer Volume

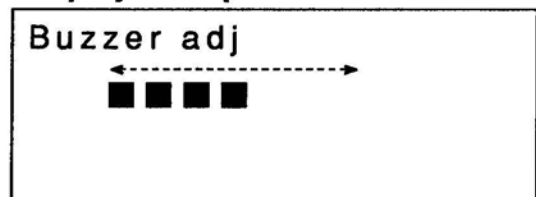
Adjust the sound volume of the buzzer which is given when the keys on the TP are pressed. The buzzer volume can be adjusted over 9 levels.

Basic operation



- Pressing the [↑] or [↓] key will increase or decrease the buzzer volume, represented by the "□" symbols.

Display example



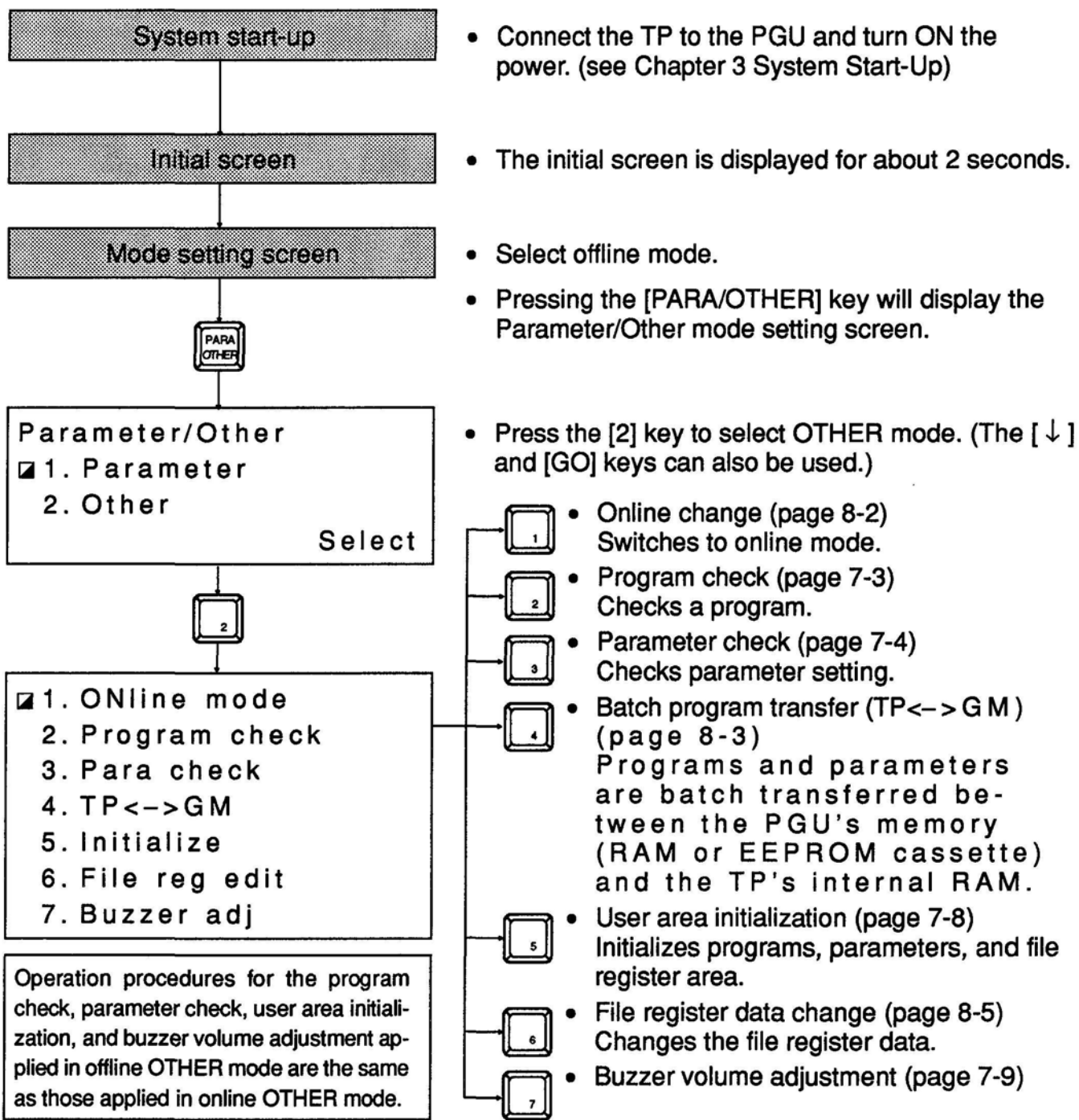
1	INTRODUCTION
2	EXAMPLE PROGRAMMING OPERAIONS
3	SYSTEM START-UP
4	PROGRAM (ONLINE/OFFLINE)
5	MONITOR\TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

8. OTHER (OFFLINE)

Offline OTHER mode allows switching to online mode, program check, parameter check, batch program transfer, user area initialization, file register data change, and buzzer volume adjustment.

8.1 Selecting OTHER Mode

Select offline OTHER mode as given below.



8.2 Common Procedures

The procedures used in online mode except those for switching to online mode, batch transfer, and file register change are the same as those used in offline mode.

Procedures that are the same as those in online mode:

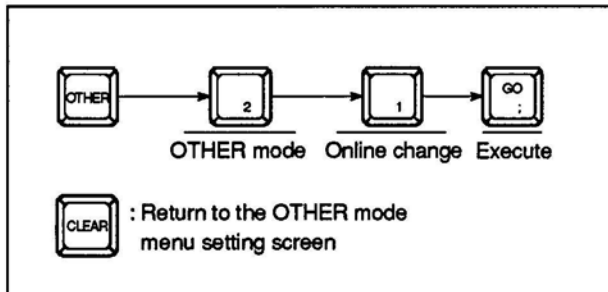
Program check	page 7-3
Parameter check	page 7-4
User area initialization	page 7-8
Buzzer volume adjustment	page 7-9

These procedures are the same as those used in online mode. Note that the operation is executed with the TP's internal RAM. Therefore, these operations can be executed regardless of the PGU state, AUTO/MANUAL modes, and memory type.

8.3 Online Change

Switch the operation mode from offline to online as given below.

Basic operation



Online change screen

ONLine change
 Yes [GO] No [CLR]

- Pressing the [GO] key switches to online mode.

8.4 Batch Program Transfer (TP<->GM)

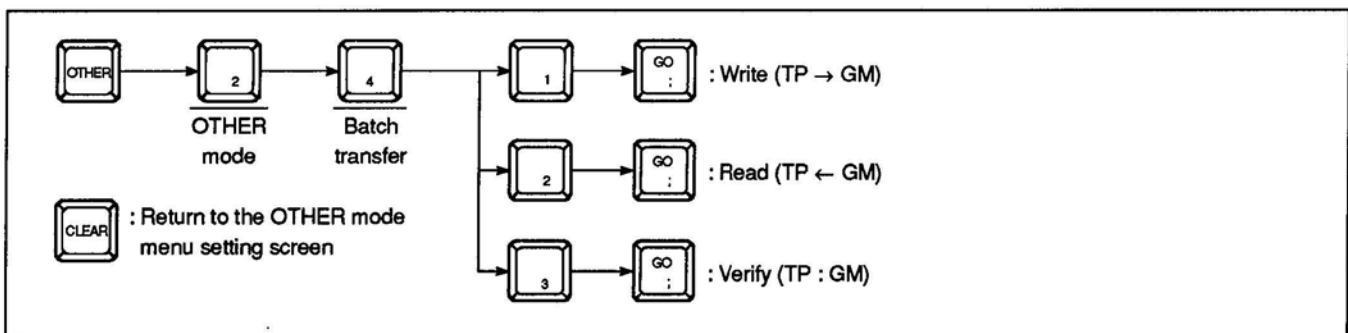
Read, write, and verify programs and parameters between the TP's RAM and the PGU's RAM or EEPROM cassette.

- To batch transfer programs and parameters, the PGU must be in one of the conditions as given below.

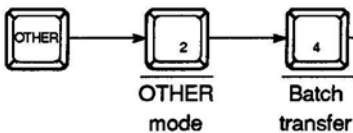
Mode \ PGU	PGU state		PGU memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	x	O	Δ *1

*1 To write to the EEPROM memory cassette, be sure to set the PROTECT switch to OFF. (see page 3-4)

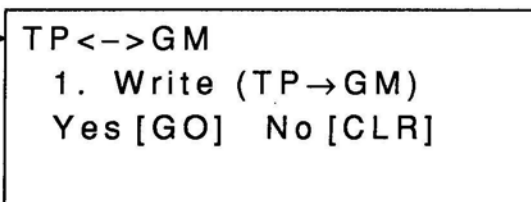
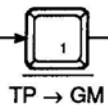
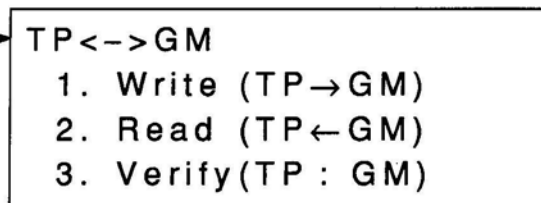
Basic operation



Operation example



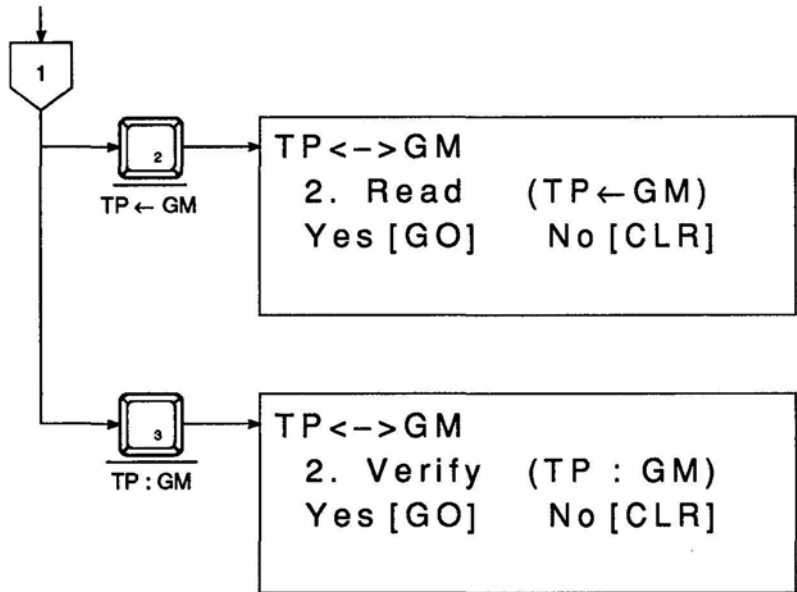
Display example



Write (TP -> GM)

- Programs, parameters and file registers stored in the TP's RAM are written to the PGU's RAM or EEPROM memory cassette.

If the PROTECT switch on the EEPROM memory cassette is ON, writing to the cassette is disabled. Make sure that the PROTECT switch is OFF. When the PROTECT switch is ON, the screen gives the "EEPROM*" message.



Read (TP ← GM)

- Programs, parameters, and file register stored in the PGU's RAM or EEPROM memory cassette are transferred to the TP's RAM.

Verify (TP : GM)

- The programs, parameters, and file register data in the TP's RAM are compared with the data in the PGU's RAM or EEPROM memory cassette.
- The parameters and programs are compared in that order. When the first data mismatch is found, it is displayed and comparison stops.

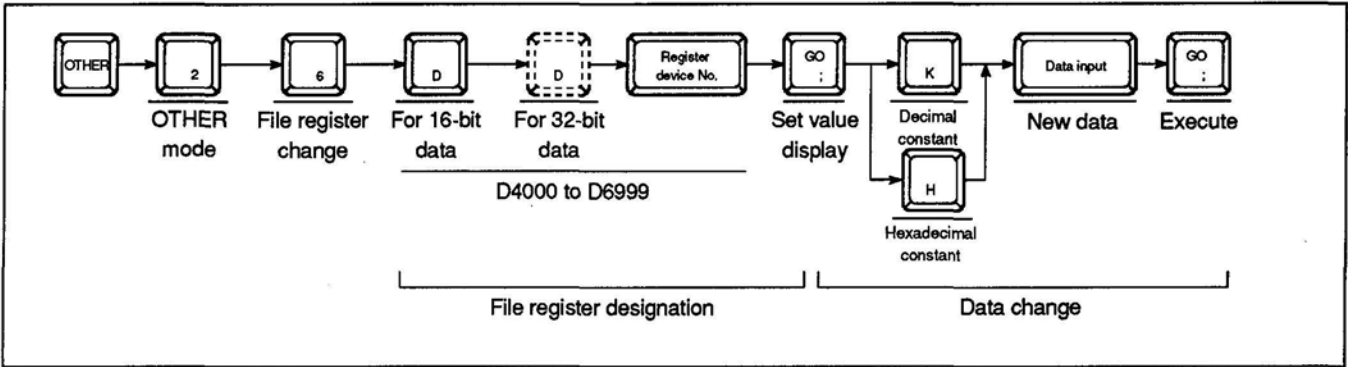
Select the transfer direction and press the [GO] key. The "Executing" message will be displayed during the transfer or verification.

When the transfer has been completed successfully, the "Completed" message will be displayed.

8.5 File Register Data Change

Change the file register data as given below. To write data to the file registers, the file register area must have been allocated with parameter #101.

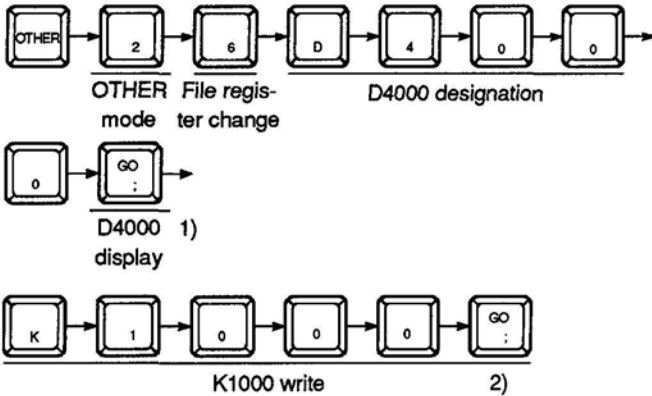
Basic operation



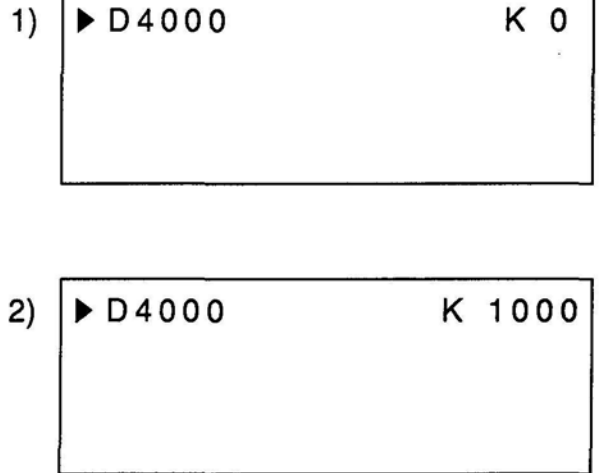
Operation example

To write K1000 to D4000 (16-bit data):

Key operation



Display example



- To input the file register as 32-bit data, press the [D] key 2 times when designating the device number. The "D" symbol in the screen will change into a bold display. Ex. **D**5000
- Pressing the [HELP] key will switch the decimal display to/from the hexadecimal display.



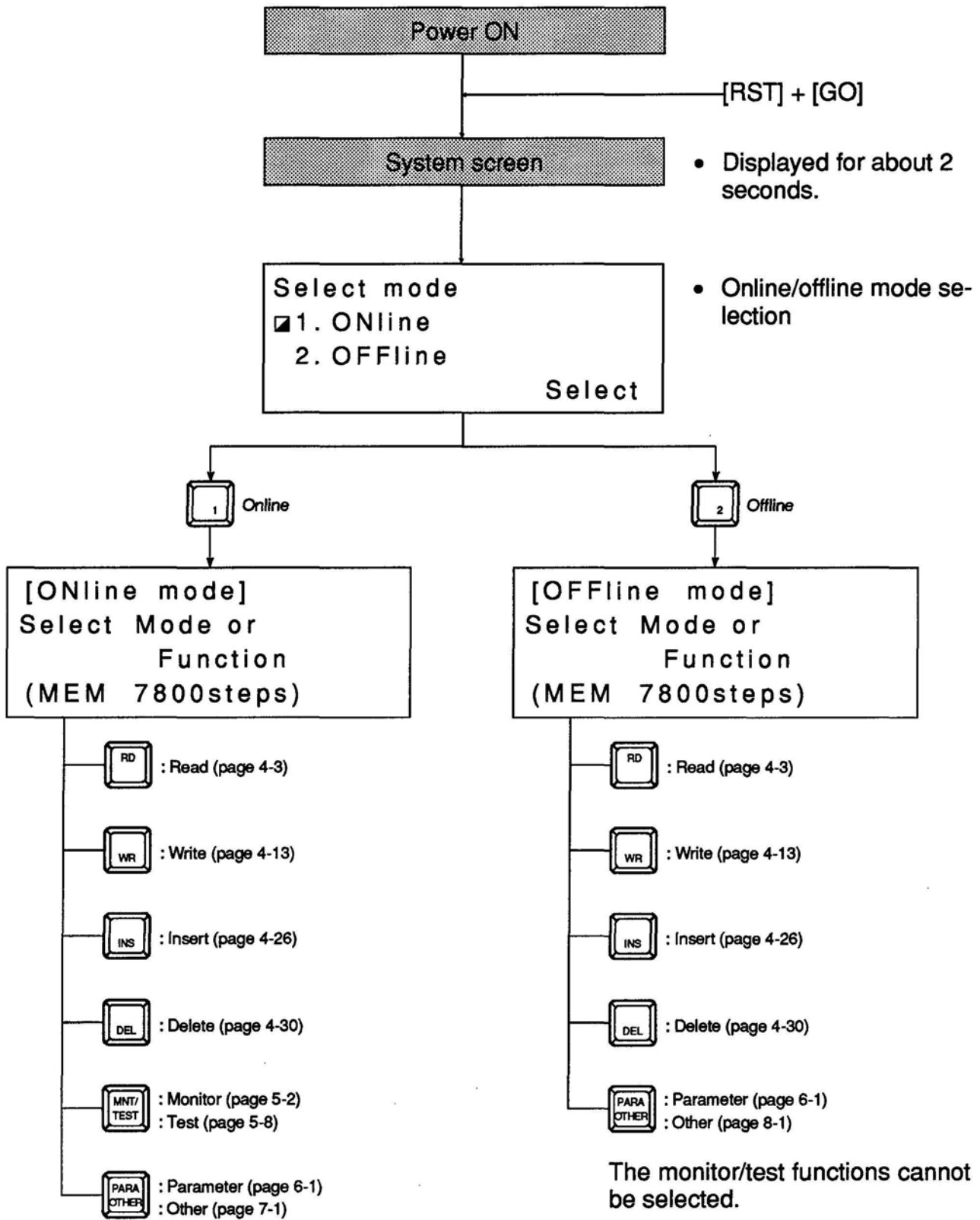
File register allocation:

- This message will be displayed when file registers have not been allocated. Set parameter #101 to allocate the file register. (Refer to Chapter 6 for parameter setting.)

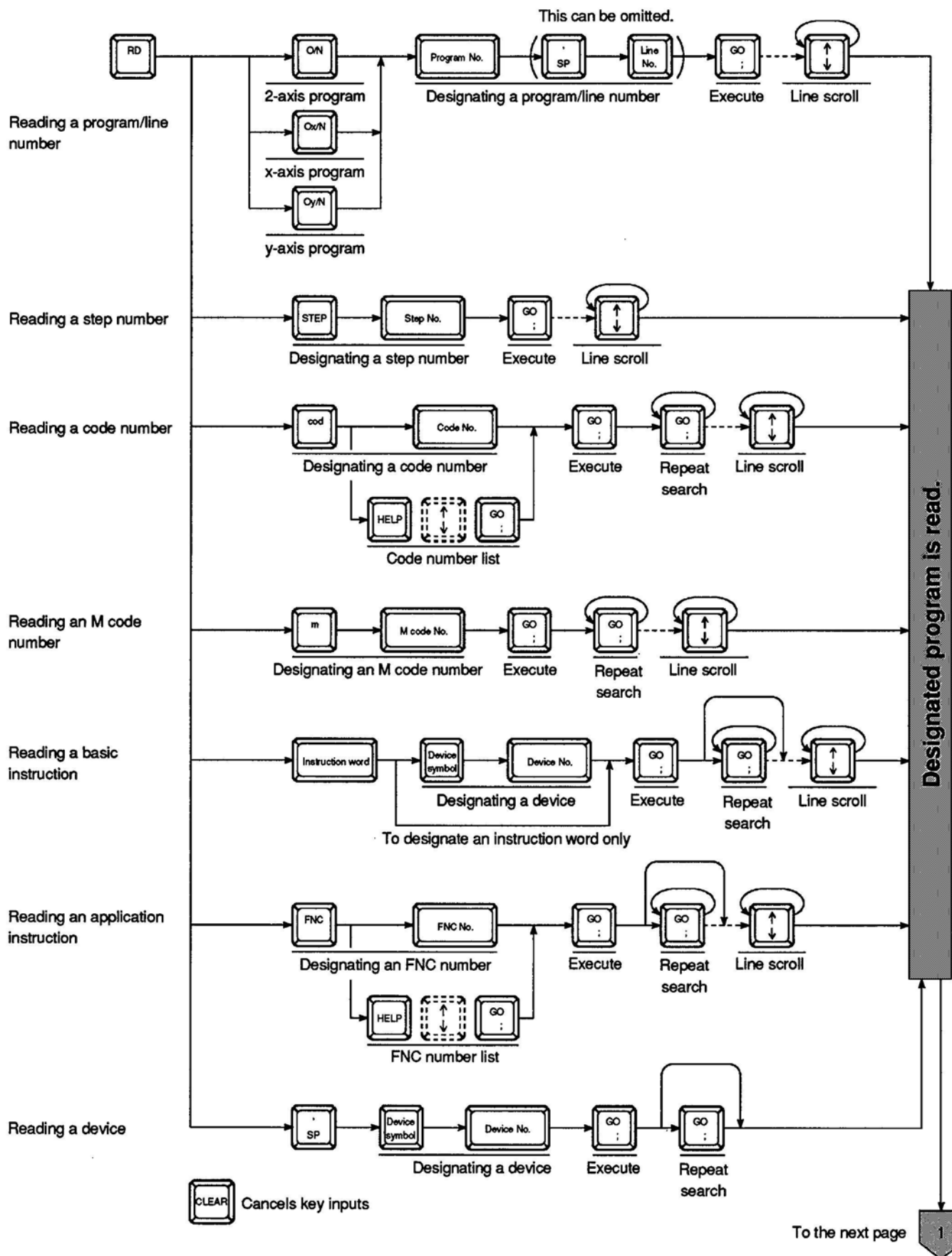
File Registers
not allocated.

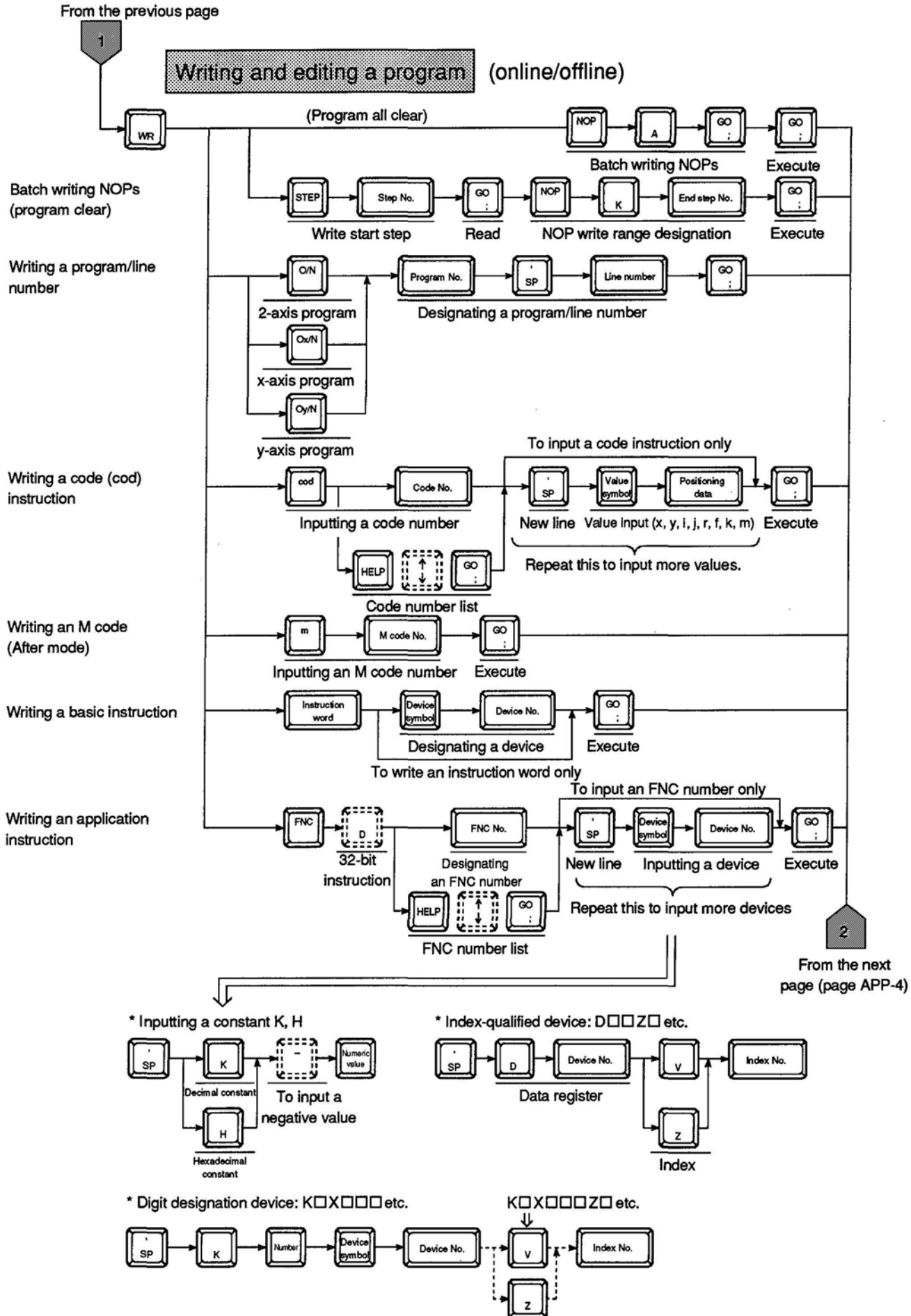
1	INTRODUCTION
2	EXAMPLE PROGRAMMING OPERATIONS
3	SYSTEM START-UP
4	PROGRAM (ONLINE/OFFLINE)
5	MONITOR/TEST (ONLINE)
6	PARAMETER (ONLINE/OFFLINE)
7	OTHER (ONLINE)
8	OTHER (OFFLINE)
	APPENDICES

Operation Flowcharts

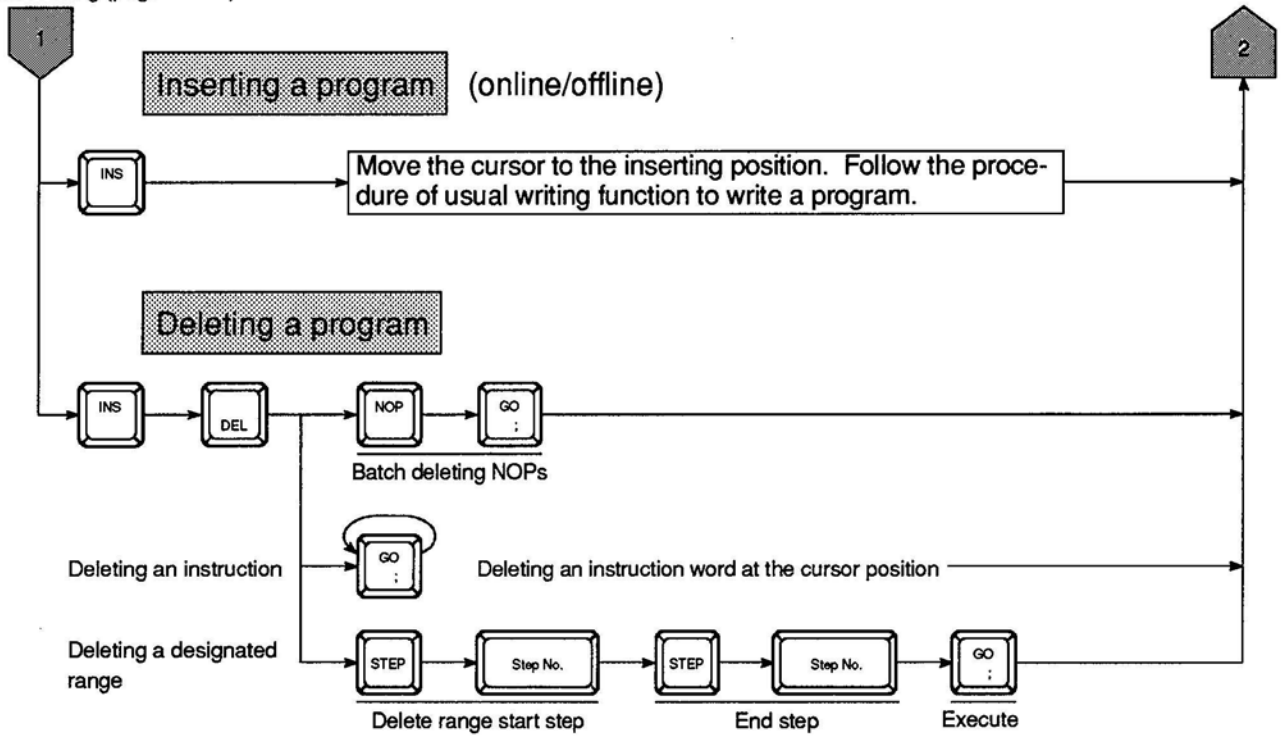


Reading a program (online/offline)

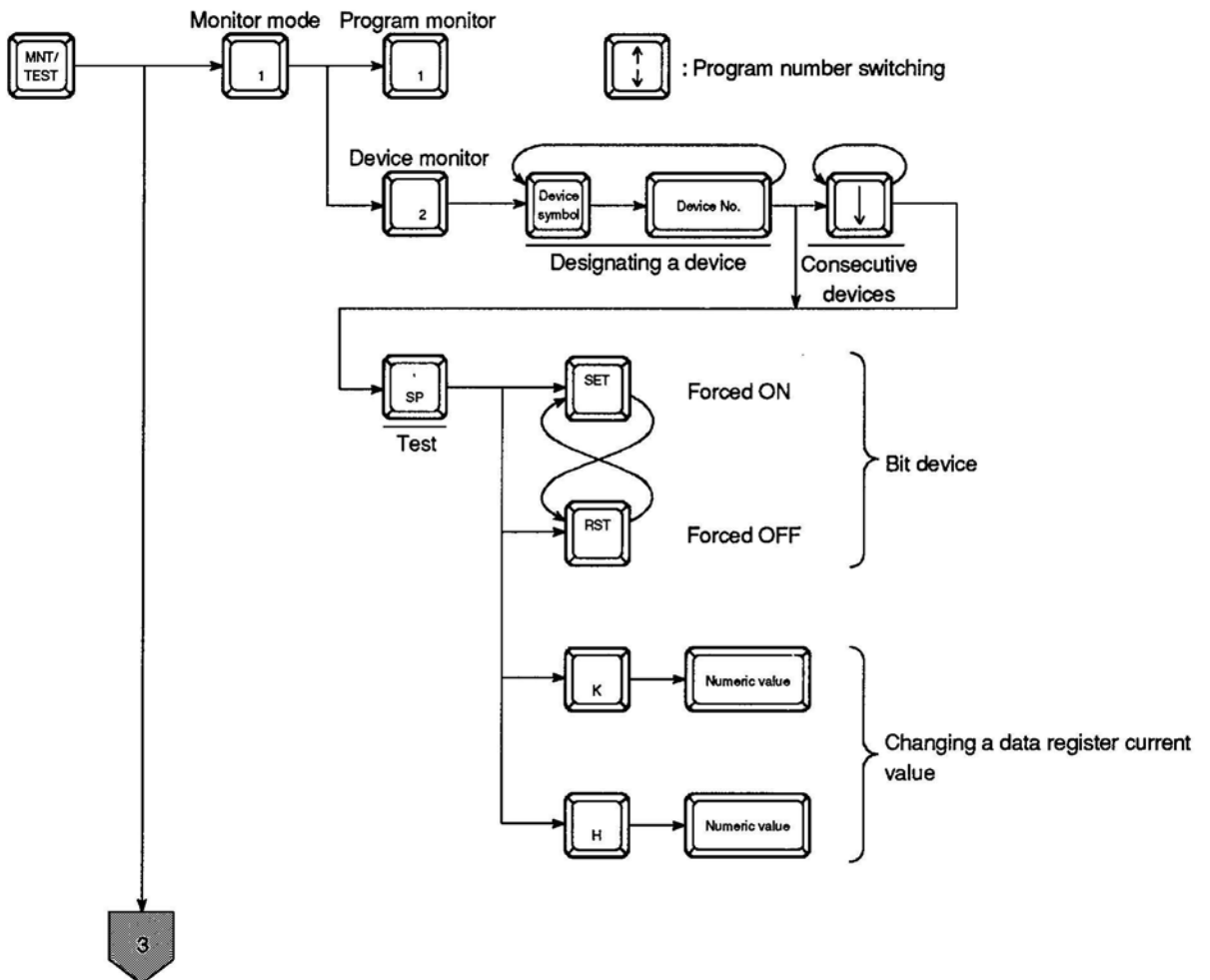


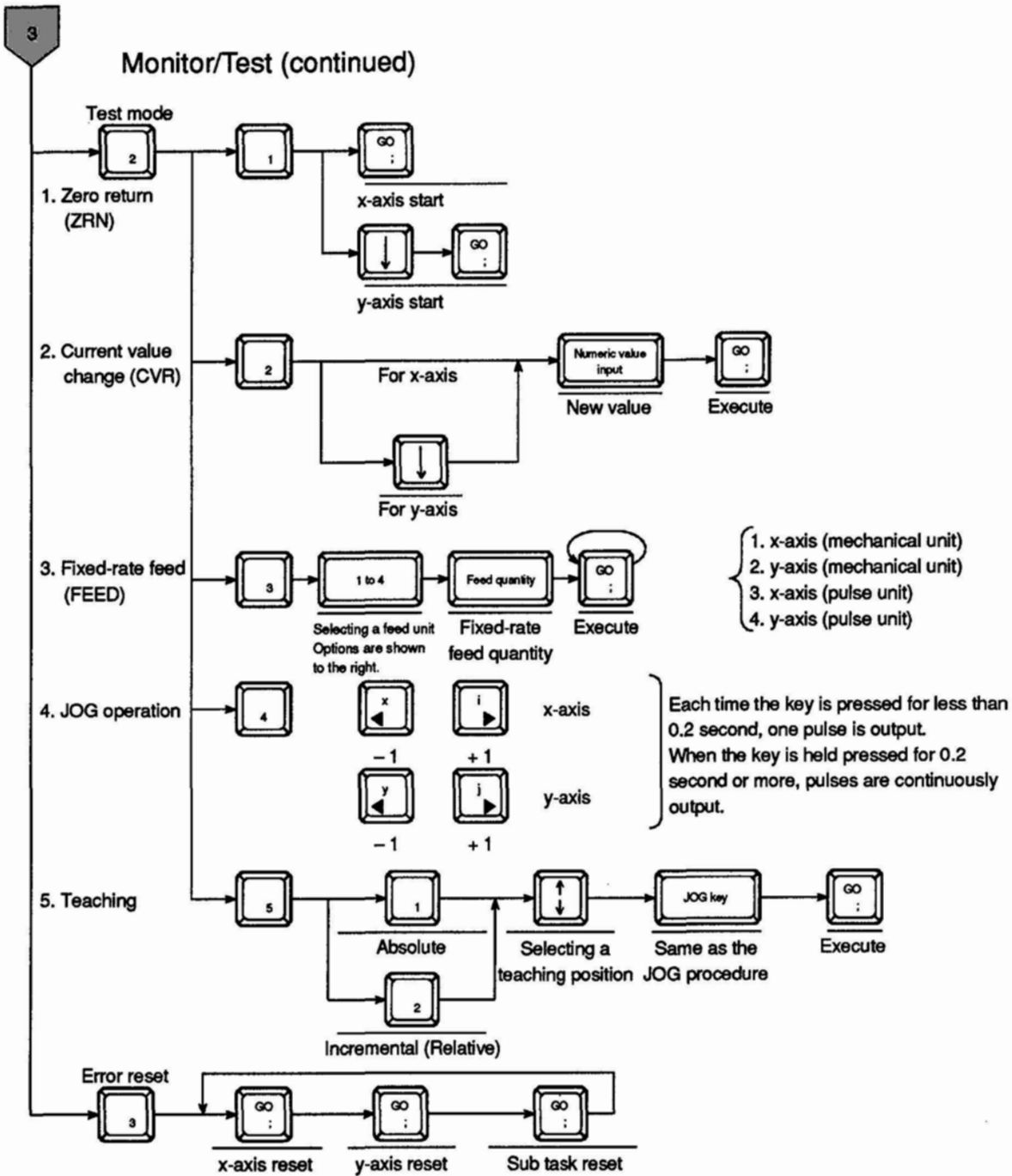


From reading (page APP-2)

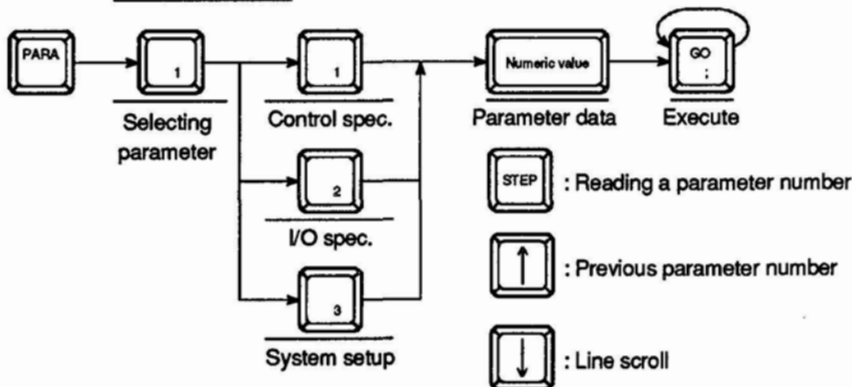


Monitor & Test (online)

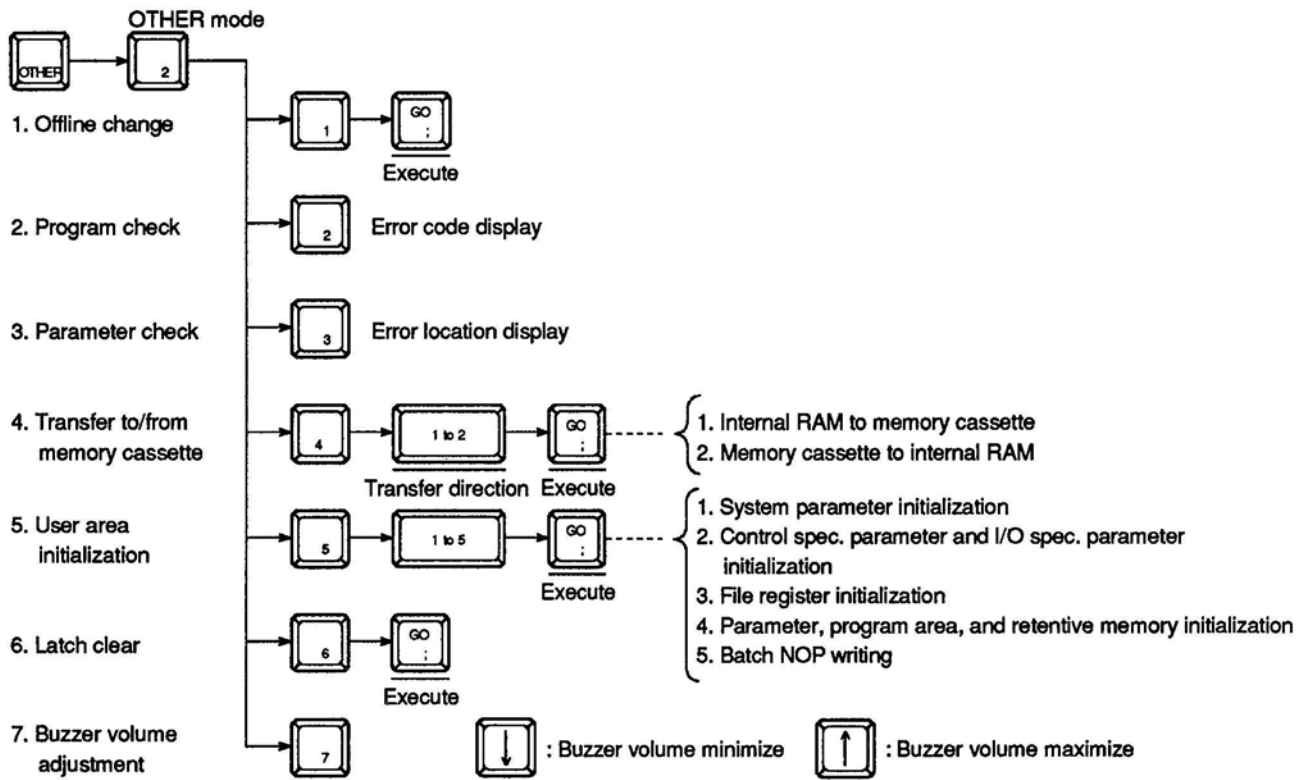




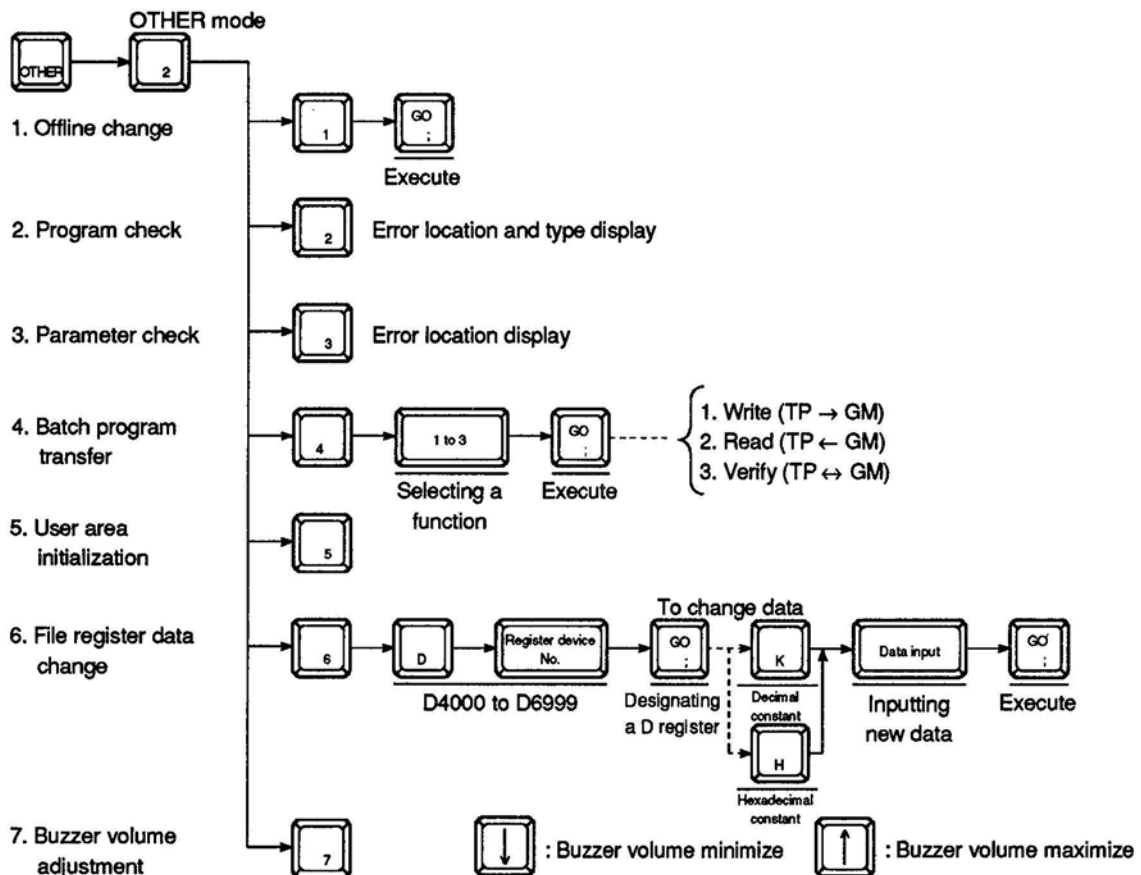
Parameter



OTHER mode (online)



OTHER mode (offline)



Error Message	Meaning and Corrective Action
Comms. Err(Rx)	A parity, overrun, or framing error occurred when receiving data from the PGU. Check the cable connections.
No Response	PGU does not respond to a command. Check the cable connections.
Comms. Err(Tx)	PGU did not correctly receive a command.
Cmd Rejection	PGU rejected a command. The write protect switch is ON or AUTO mode is effective.
Comms. Err(sum)	PGU's response data has a sum check error.
Comms. Err(frame)	PGU's response data has a fault.
Sys. para unequ	Messages indicating a mismatch in batch verification.
X-ax para unequ	
Y-ax para unequ	
Program unequal	
File registers not allocated	File registers have not been allocated.
O dual defined	Duplicate program numbers exist.
P dual defined	Duplicate label Ps exist.
Change MANU mode	Programs and data cannot be written to the PGU since it is in AUTO mode.
Not Found	Designated program is not found by searching.
Not Found	Designated device is not found by searching.
Program Over	Program exceeds the maximum number of steps.
Write Protected	The write protect switch on the EEPROM cassette is ON.
No Cassette	Memory cassette is not installed.
Instruction Err	Undefined cod number of FNC number has been input.
Syntax Err	Address data does not conform to the syntax of cod.
Setting Err	A step number larger than the last step number has been input.

Addition of Automatic Mode Teaching

In the conventional version, teaching in the two-axis positioning unit FX(E)-20GM was available in the manual mode exclusively. In the following versions, teaching is available in the automatic mode also.

Teaching performed in the automatic mode is called “automatic mode teaching”.

Introduction

1. Automatic mode teaching is available in the following units and versions



- FX(E)-20GM: Ver. 3.10 or more
- E-20TP-E : Ver. 1.20 or more

2. Setting for Automatic Mode Teaching

When using automatic mode teaching, a special auxiliary relay M9161 in the positioning unit is required to be set to ON.

Set M9161 to ON

M9161 can be set to ON by “Monitor > Device Monitor > Test > Forced SET” in the E-20TP. In the usual procedure, however, write “SET M9161” in the top line of a subtask (O100). The line “SET M9161” is not required to be deleted even after the teaching work is completed.

1) Example program 1 (when a subtask (O100) is not present currently)

```
N0 O100,N0;
N0 SET M9161;
N1 m102;
```

2) Example program 2 (when a subtask is present currently and loop is not performed)

```
N0 O100,N0;
N0 SET M9161;
N1 .....
N2 .....
N3 m102;
```

←Insert it after the line for declaration of O100.

} Conventional subtask program

3) Program example 3 (when a subtask is present currently and loop is performed)

```
N0 O100,N0;
N0 SET M9161;
N1 P0;
N2 .....
N3 .....
N4 JMP(FNC04) P0;
N5 m102;
```

←Insert it after the line for declaration of O100.

} Conventional subtask program

Operation of Teaching Panel E-20TP

1. Use automatic mode teaching mode

In the E-20TP, automatic mode teaching becomes valid when the following procedure is performed while M9161 is set to ON.

In the automatic mode, press the following keys.

MNT/TEST → 2 (Test) → 5 (Teaching)

At this time, in automatic mode teaching, set M9000 and M9016 to ON and select the Single Run mode.

In the conventional version, when the teaching mode was selected, the program (teaching screen) was displayed.

In automatic mode teaching, the operation monitor screen is displayed.

2. Remote Program start / stop

In automatic mode teaching, program start/stop commands can be given from the E-20TP. (Because the Single Run mode is selected, one line only is executed when one start command is given.)

The program start/stop keys are assigned as follows.

NOP 4 :X-axis remote start	Oy/N ■7 :X-axis remote stop
cod 0 :Y-axis remote start	r ■3 :Y-axis remote stop

3. Teaching procedure

Actual operation examples are picked up in the explanation below.

Positioning example program

```

O0,N0;
N0   cod28(DRVZ);
N1   cod90(ABS);
N2   cod00(DRV)   x500 y500;
N3   cod29(SETR);
N4   cod04(TIME) K200;
N5   cod00(DRV)   x1000 y2000;
N6   cod04(TIME) K200;
N7   cod01(LIN)   x2000 y5000;
N8   cod04(TIME) K200;
N9   cod30(DRVR);
N10  m02(END)

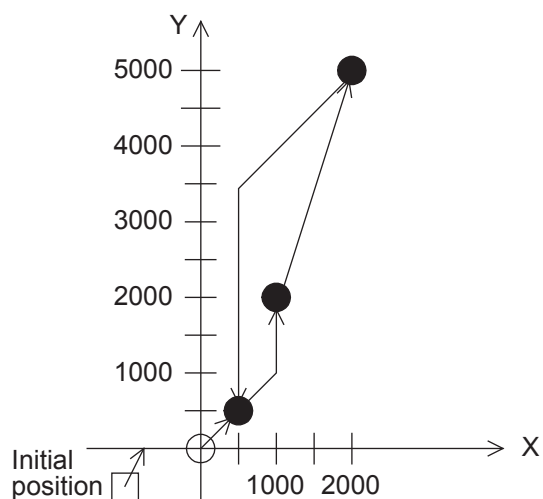
```

subtask example program

```

O100,N1000
N1000 SET M9161;
N1001 P100;
N1002 LD X000
N1003 FNC90(OUT) Y000;
N1004 JMP P100;
N1005 m102(END);

```



- 1) Write a program to the positioning unit. Select the automatic mode.
- 2) Select teaching.

MNT/TEST → 2 → 5

```

Test
  3. Feed
  4. Jog
  ■ 5. Teaching
    
```

- 3) Set M9000 and M9016 to ON, and select the single Run mode.

```

M9000, M9016 ON
and Single Run?

Yes [GO] No [CLR]
    
```

GO
;

: Teaching becomes enabled when the Single Run mode is selected.

- 4) Issue a start command from the E-20TP to execute the program.

```

T
x, y Ready
x 0
y 0
    
```

NOP
4

: Program start

- 5) The command being executed and the current value are displayed.

```

T O0 N0
cod28 (DRVZ)
x -30323
y -32200
    
```

NOP
4

: Program start

```

T O0 N1
cod90 (ABS)
x 0
y 0
    
```

NOP
4

: Program start

- 6) When teaching is to be performed for a positioning address which has been already executed, perform the steps (6-a) and (7) shown below.
 When teaching is to be performed for a positioning address which has not been executed yet, perform the steps (6-b) and (7) shown below.

6-a) Teaching for address already executed

Execute a command for which teaching is to be performed. Perform positioning using the address data in the current program.

```
T O0   N2
  cod00 (DRV)
  x  0
  y  0
```

NOP
4 : Program start

“cod00”, “x500” and “y500” are executed, and the program is waiting for a next command. At this time, when you would like to change the positioning address x500 or y500 which has been already executed, press the following key.

```
T O0   N2
  cod29 (STER)
  x  500
  y  500
```

CLEAR : The monitor screen is changed over to the teaching screen. The screen shown in the step 7 is displayed.

6-b) Teaching for address not executed yet

Execute the program in the Single Run mode just before the position for teaching. When the motor is stopped, press the **STEP** key. The monitor screen is changed over to the teaching screen.

```
T O0   N2
  cod00 (DRV)
  x  0
  y  0
```

STEP : The monitor screen is changed over to the teaching screen.

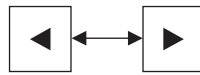
- 7) Move the cursor to the X-axis address data, and perform jog operation.

```
T S8   N2
  cod00 (DRV)
  ► x  500
  y  500;
```

↓ : Move the cursor to the address data.

8) Stop the program in the position for teaching. Update the program.

```
T S8  N2
cod00 (DRV)
▷ x 1393
y 500;
```



: Perform jog operation, and advance the program to the desired position.



: Change the program.

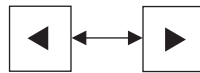
9) Move the cursor to the Y-axis address data. Perform jog operation.

```
T S10  N2
cod00 (DRV)
x 1393
▶ y 500;
```



10) Stop the program in the location for positioning. Update the program.

```
T S10  N2
cod00 (DRV)
x 1393
▷ y 2501
```



11) Issue a start command. Start execution from the command just after the teaching operation is complete.





```
T O0  N3
cod29 (SETR)
x + 1393
y + 2501;
```



: A start command is given, and the monitor screen is displayed at the same time.

12) When you would like to reform another teaching operation, repeat steps 6 through 11.

Note:


The motor can be stopped by pressing the  or  key. However, the teaching screen cannot be displayed even if the  or  key is pressed.

4. Limitation of Function in Automatic Mode Teaching

In the conventional version, the absolute mode or the incremental mode can be selected. In automatic mode teaching, the absolute mode is automatically set.

Addition of Transfer Function in Off-line Mode

1. Applicable Units and Versions

-  The transfer function is added in the following units and versions.
- FX-10GM : From the first product
 - FX-20GM : From the first product
 - E-20TP-E : Ver. 1.20 and later

2. Description

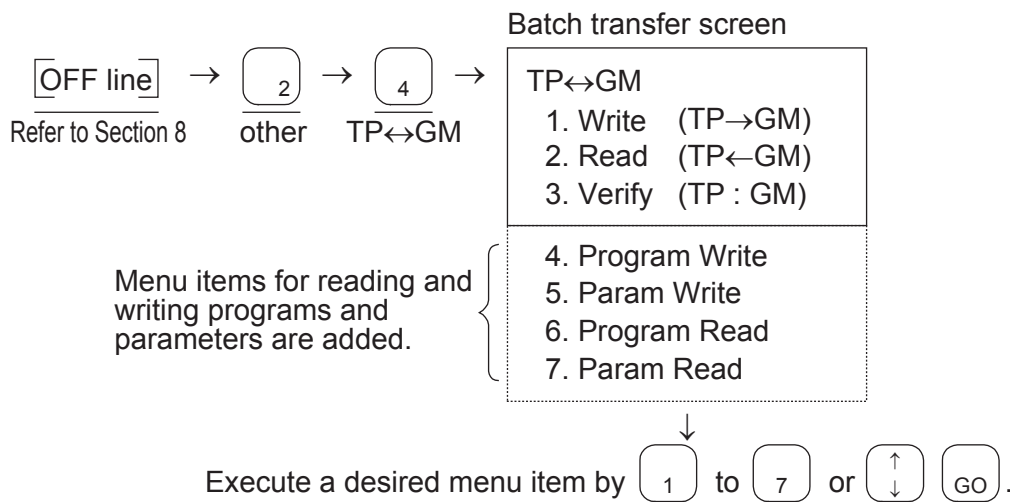
In **TP↔GM** of **Other** in **off-line Mode** in the E-20TP, a new function is added so that programs and parameters are written to and read from a positioning unit separately. In the conventional version, system setting parameters, positioning parameters, I/O setting parameters, programs and file registers were batch-transferred at the same time. In the new version, they are classified into two groups and each group can be transferred separately.

Table 2.1: Transfer Group and target items

Group	Transfer target items
Parameter	1) Positioning parameters 2) I/O setting parameters
Program	1) System setting parameters 2) Programs 3) File registers (exclusively when they are assigned by system setting parameters)

3. Operating Procedure

Select the transfer function using the following procedure.



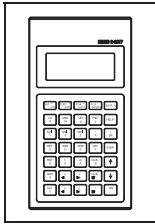
Connection of FX2N-10GM/FX2N-20GM and peripherals

This material is an explanation of the connection of the FX2N-10GM/FX2N-20GM(PGU) and the peripherals shown below. Refer to the appropriate handy manual or the operation manual packed in the product box for the Function, operation, and details of the peripherals.

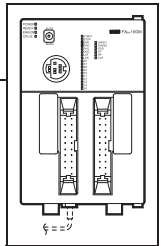
1. System configuration

The system configuration of FX2N-10GM/FX2N-20GM and peripherals is shown.

Programming tool
E-20TP-E

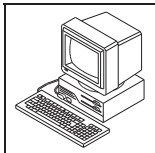


PGU
FX2N-10GM
FX2N-20GM

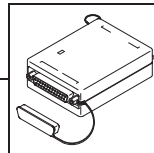


1) Coupling cable

Personal computer *1
FX-PCS-KIT-GM-EE



FX-232AW(C)
(Included in FX-PCS-KIT-GM-EE)



2) RS232C cable

3) RS422 cable

*1 Applicable personal computer PC-AT compatible machine.
Applicable OS MS-DOS.

2. Coupling cable

- 1) Cable for E-20TP-E connection
E-20TP-CAB0 (3m included in E-20TP-E-SET0.)
FX-20P-CAB0 (1.5m Optional)
- 2) RS232C cable for personal computer connection
F2-232CAB-1 (9 pin ↔ 25 pin) (3m included in FX-PCS-KIT-GM-EE)
- 3) RS422 cable for personal computer connection
FX-422CAB0 (1.5m included in FX-PCS-KIT-GM-EE)

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All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

OPERATION MANUAL

E-20TP TEACHING PANEL

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