MITSUBISHI ELECTRIC

POSITIONING CONTROLLERS

OPERATION NANUAL

E-20TP TEACHING PANEL

E-20TP
Teaching Panel

Operation Manual

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Manual revision: B
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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

CONTENTS

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

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.)

<table>
<tr><td colspan="2">Mode

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

1.2   Description of the Product

The TP is a handneld 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).

LCD: 16 characters x 4 lines
with a backlight

Operation keys:
Function, instruction word,
device symbol, numeric,
and JOG keys

Power supplied
from E-20GM

E-20TP-CAB
program cable (3 m)
(supplied together)

TP unit: 7.8-Kstep program memory is built in.
(backed up by a large-capacity capacitor)

System memory cassette: This is replaced when the system version is upgraded.
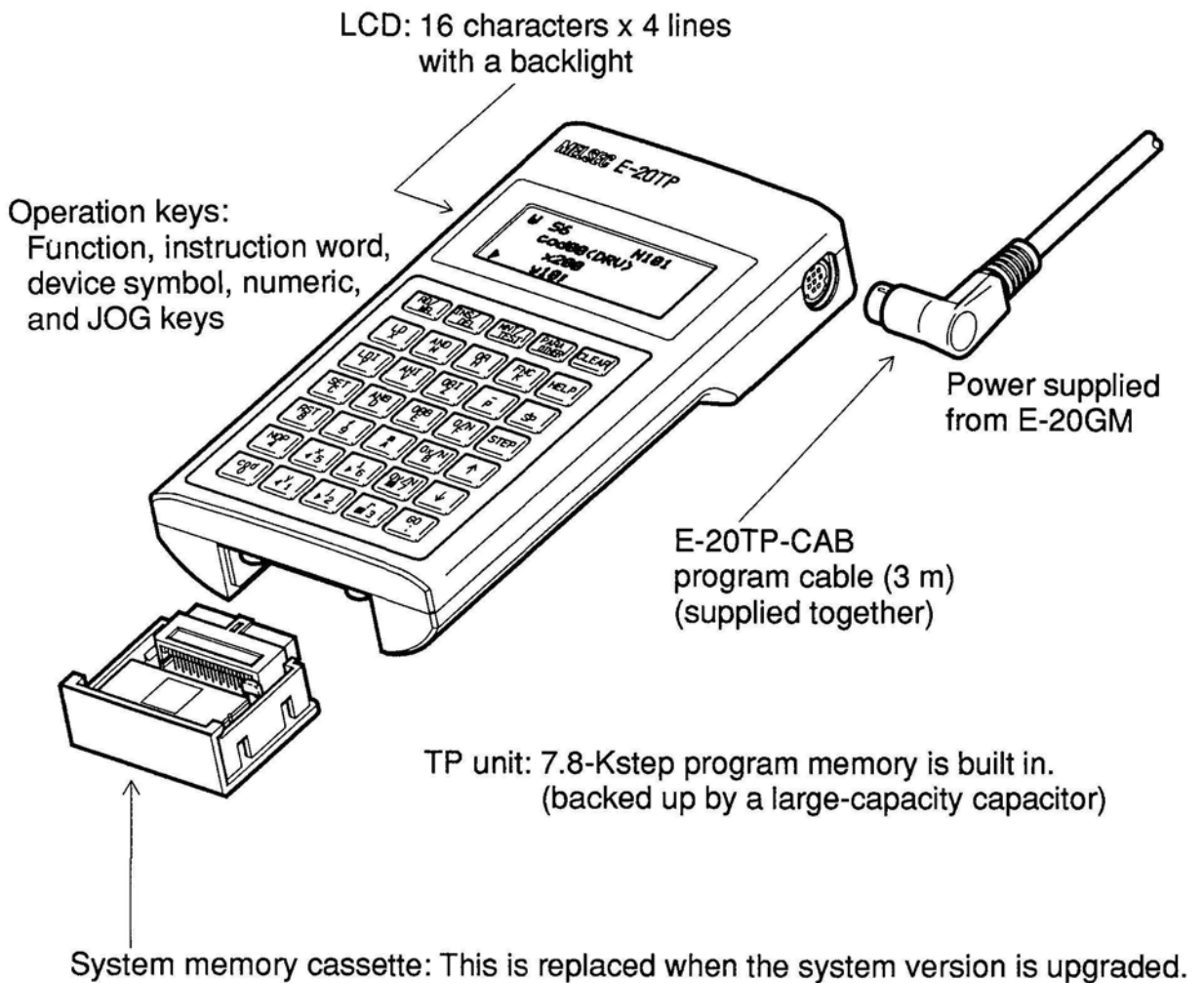
1.3   Description of the Panel Face

1.3.1   Names of keys

The operation keys are named as shown below.

LCD
(16 characters x 4 lines
with a backlight)

Function keys

Instruction and device
symbol keys

CLEAR key
HELP key
Space key
STEP key
Cursor keys
GO key

JOG keys
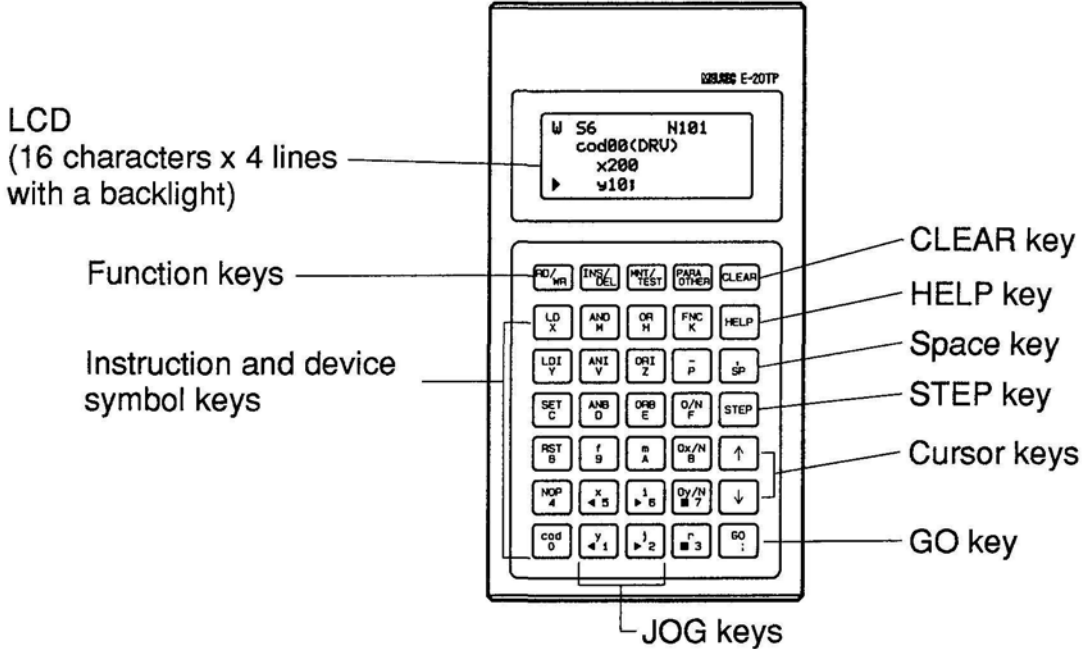
1.3.2   Key functions and the operation common to the keys

- 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.

2) TP connector   *3)* TP cable connector

E-20GM positioning unit (PGU)

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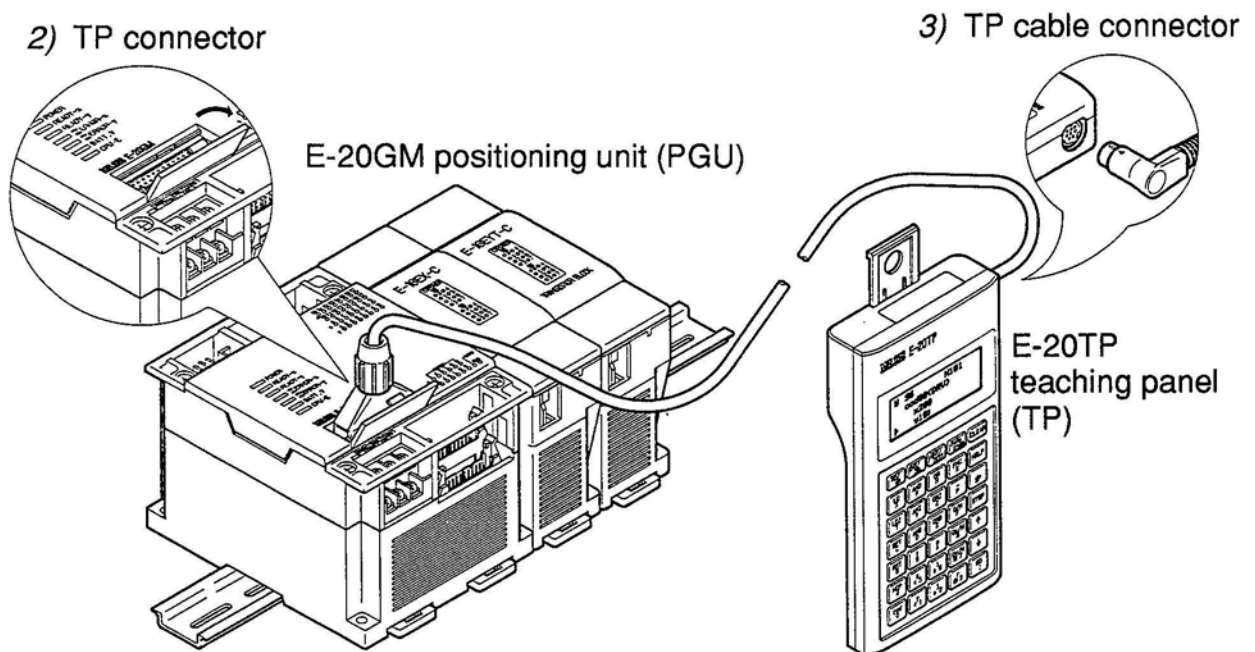
4)   Make sure that the E-20P-CAB program cable is connected securely to the TP and the PGU, and turn ON the power. If the connection is complete, the initial screen shown to the right will be displayed. (This screen will be displayed for about 2 seconds and then the next screen will be displayed.)

Initial screen at power ON

```
COPY RIGHT (C) 1994
  MITSUBISHI
  ELECTRIC CORP.
MELSEC E        V1.10
```

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

1.5 Specifications

1.5.1 Outside dimensions

Holder hole
φ12

The holder can be slid upward as indicated by the dotted lines in the figure. (used to hang it on the wall)

E-20TP-CAB
program cable (3 m)
(supplied together)

Weight: Approx. 0.4 kg
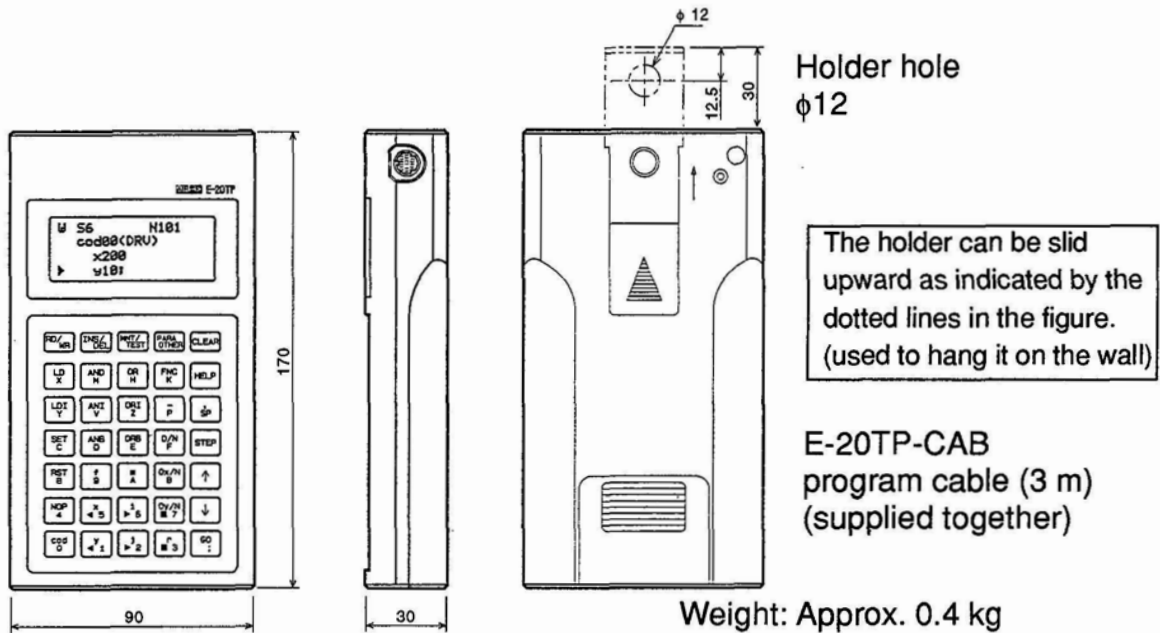
1.5.2 General and performance specifications

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 ± 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
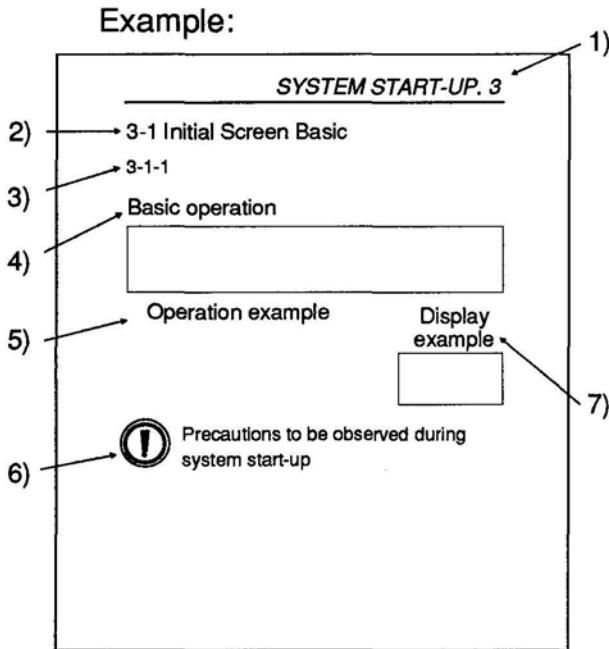
Example:

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.

Example:

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.

3 times

This indicates that the key needs to be pressed 3 times.

1	**INTRODUCTION**
2	**EXAMPLE PROGRAMMING OPERATIONS**
3	**SYSTEM START-UP**
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5	**MONITOR/TEST (ONLINE)**
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8	**OTHER (OFFLINE)**
	APPENDICES

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.

Preparation	• Gives the method for connecting the TP to the PGU.
Mode selection	• Select online or offline mode. Select online mode here since the training requires to write a program directly to PGU memory.
Program creation	• Clear a program in the PGU and write a program to it. The program insertion and deletion functions are also explained.
Parameter setting	• Change parameter settings. Set them to the default (initial) values and change some of the settings.
Monitor	• Operate the PGU and monitor the present values, etc.
Test	• Conduct MANUAL operations (manual mode) such as the JOG operation.
End	• If the contents mentioned above are understood, the readers will become familiar with the basic operation of the TP.

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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 ELECTRIC CORP.
MELSEC E        V 1 . 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.

[GO] [1]

```
[ONline mode]
Select Mode or
            Function
(MEM 7800steps)
```
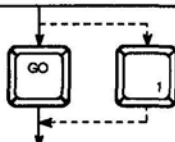
- Select a function.
  Use the [RD/WR], [INS/DEL], [MNT/TEST], or [PARA/OTHER] key.

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

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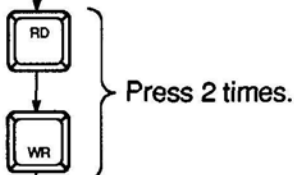
- Press the [RD/WR] key 2 times to select the write function.

- "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.

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

Function display
Fixed at the 1st line

Program number

Line cursor
Indicates the line where
the program is created or
corrected.

Step number where the cursor is located

Block line number where the cursor is located

```
W    S3          N0
O100 , NO
     cod00 (DRV)
▶     x100
```

4 lines
× 16 characters

Instruction

The mnemonic to the
instruction is automatically
displayed.

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
N 0   cod28 (DRVZ) ;
N 1   cod29 (SETR) ;
N 2      m00 (WAIT) ;
N 3   cod90 (ABS)   ;
N 4   cod00 (DRV)
          x 100
          y 100 ;
N 5   cod02 (CW)
          x 200
          y 200
          i 50
          j 50
          f 500 ;
N 7   cod04 (TIM)
          K 100 ;
N 8      m10 (MCOD) ;
N 9   cod30 (DRVR) ;
N 10     m02 (END)   ;
```
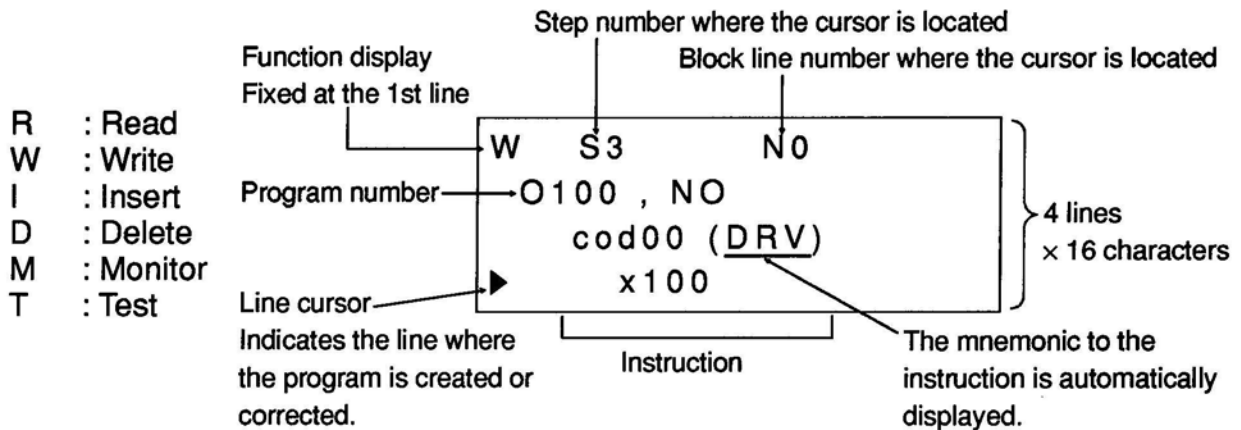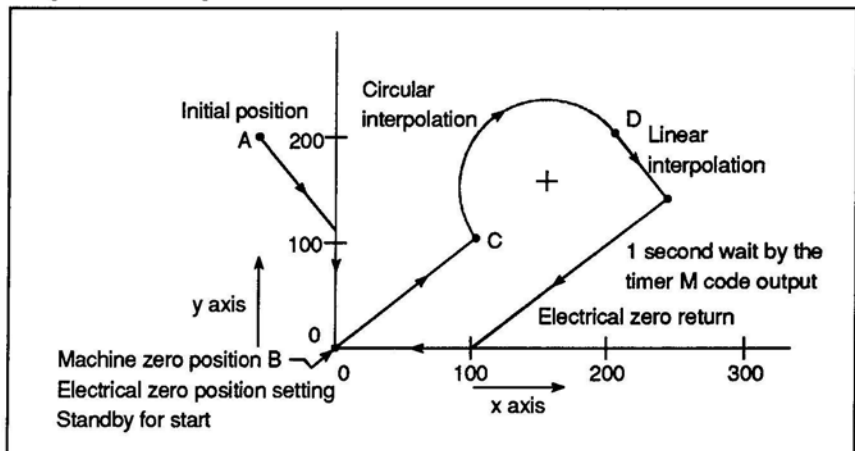
Operation specifications

Circular
interpolation

Initial position
A ● 200

D Linear
interpolation

+

100

C

1 second wait by the
timer M code output

y axis

Electrical zero return

0

Machine zero position B
Electrical zero position setting
Standby for start

0   100   200   300

x axis

● 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)

Switch to write   All clear (batch writing NOP)
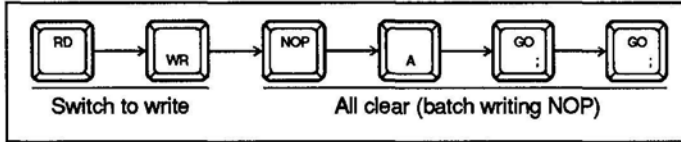
- The [A] key stands for "All". Remember this "to write NOP to all range".

- 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.

```
W      S 0                    N ----
▶        NOP   A
All  Clear
Yes [GO]                No [CLR]
```
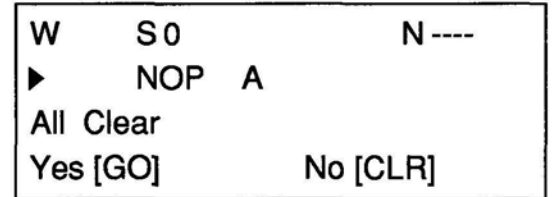
2.3.2   Writing a program

The following gives the program writing procedure.

Writing a cod instruction

(Only a code instruction is input.)

Correction

Repeat this to input 2 devices or more.

Correction   Correction

Writing an M code

Correction
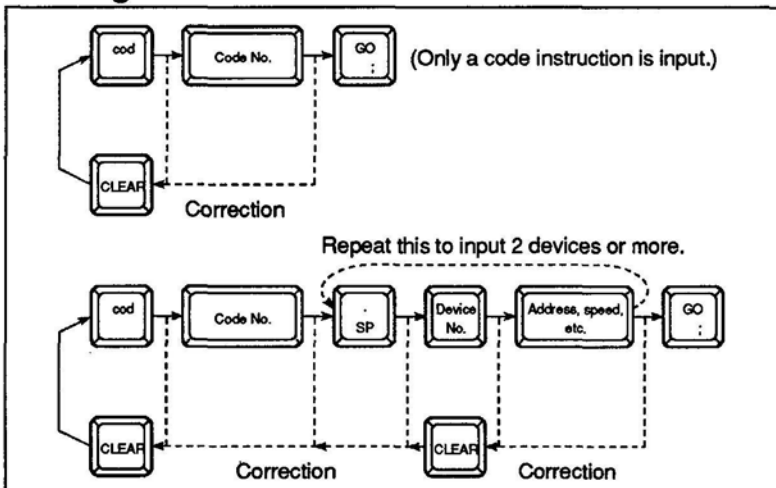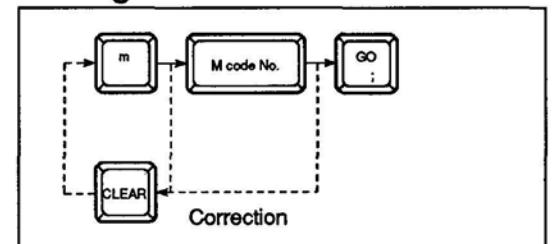
Other write functions are also used.

Key operation

Program all clear (see above)

Program No. input

1)

Display example

```
1) W      S 3            N 0
     O 0, N 0 ;
   ▶      N O P
          N O P
```
①

Program

Keypad sequence: [cod] → [2] → [8] → [GO ;] → [cod] → [2] → [9] →
N0 _____ N1

[GO ;] → [m] → [0] → [GO ;]
N2   2)

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

Keypad sequence: [cod] → [9] → [0] → [GO ;] → [cod] → [0] → [. SP] →
N3 _____ N4

[x] → [1] → [0] → [0] → [. SP] → [y] → [1] →
N4

[0] → [0] → [GO ;]
N4   3)

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

[cod] → [2] → [. SP] → [x] → [2] → [0] → [. 0] →
N5

[. SP] → [y] → [2] → [0] → [0] → [. SP] → [i] →
N5

[5] → [0] → [. SP] → [j] → [5] → [0] → [. SP] →
N5

[f] → [5] → [0] → [0] → [GO ;]
N5   4)

```
4)   W      S29       N6
             j50
             f500;
     ▶   NOP
```

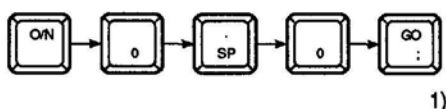[cod] → [1] → [. SP] → [x] → [2] → [5] → [0] →
N6

[. SP] → [y] → [1] → [5] → [. 0] → [. SP] → [∞ ;] →
N6

[5] → [0] → [0] → [GO ;]
N6   5)

```
5)   W      S37       N7
             y150
             f500;
     ▶   NOP
```

[cod] → [4] → [. SP] → [K] → [1] → [0] → [0] →
N7

[GO ;] → [m] → [1] → [0] → [GO ;]
N8   6)

```
6)   W      S43       N9
             K100;
         m10;
     ▶   NOP
```
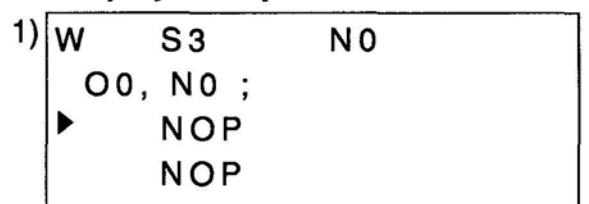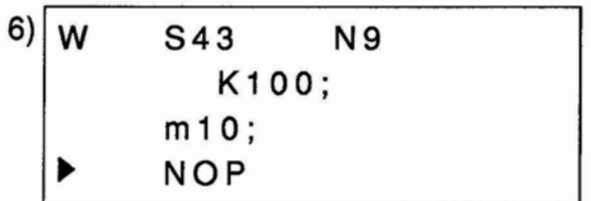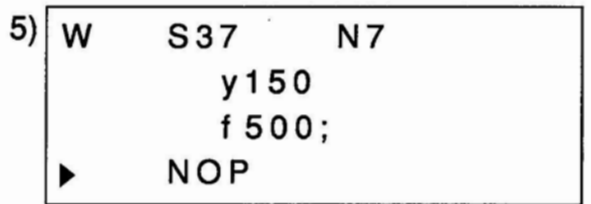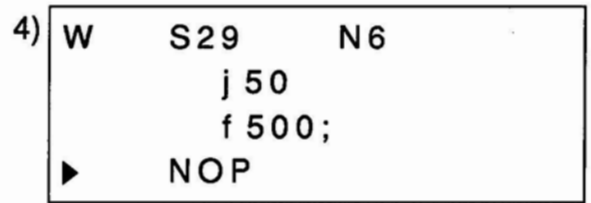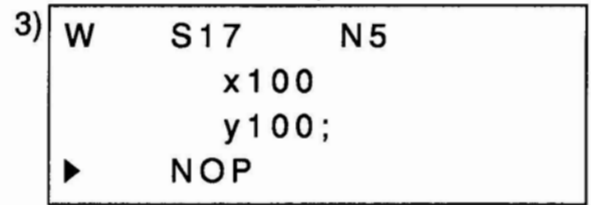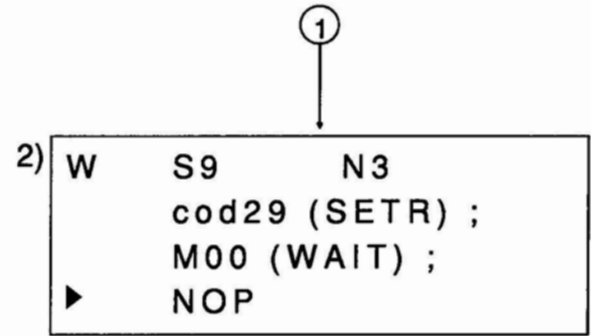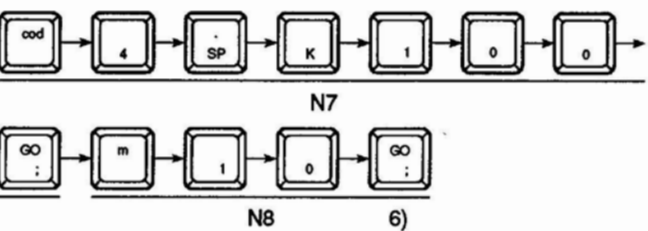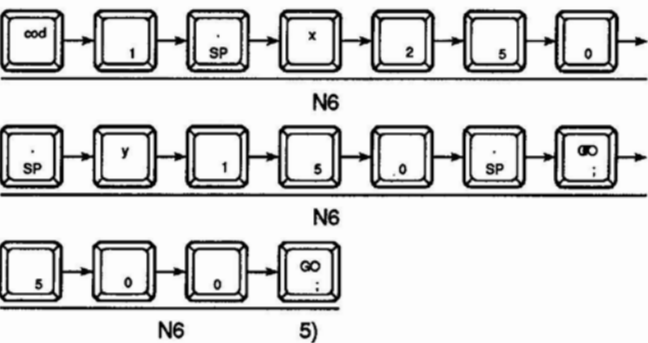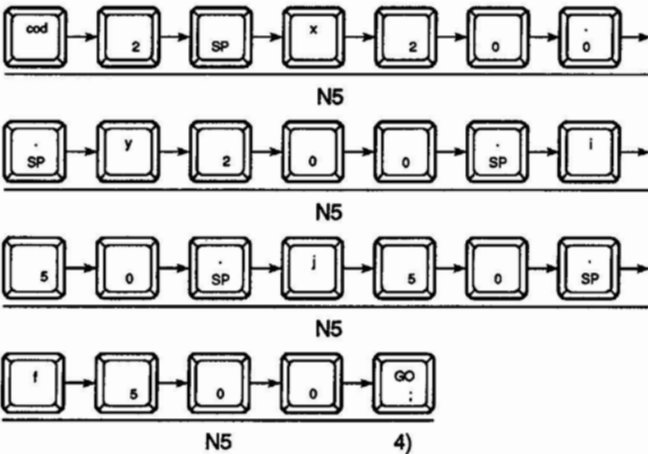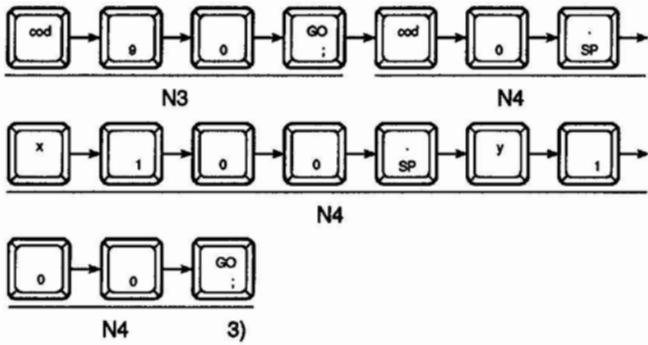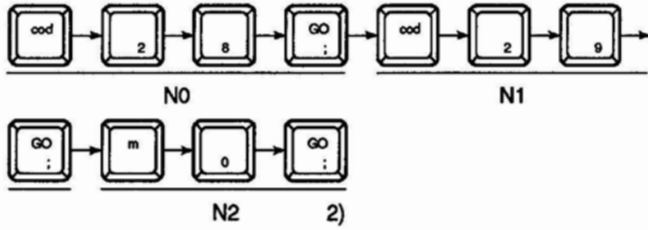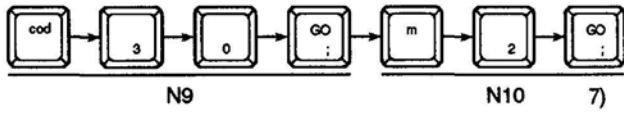
7)
```
W      S47        N11
       cod30(DRVR);
       m02(END);
▶      NOP
```

2.3.3   Reading a program

When a program is written, the program can be read out by the procedure given below.
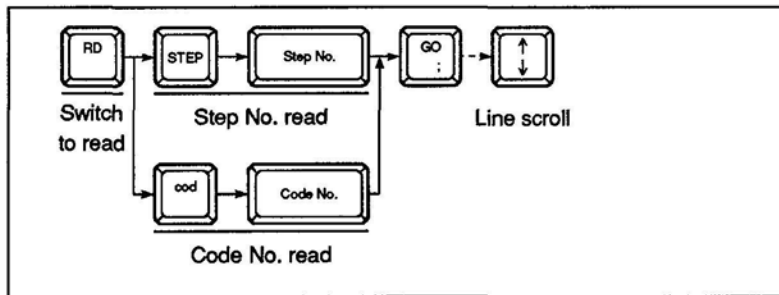
* Other read functions are also used.

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
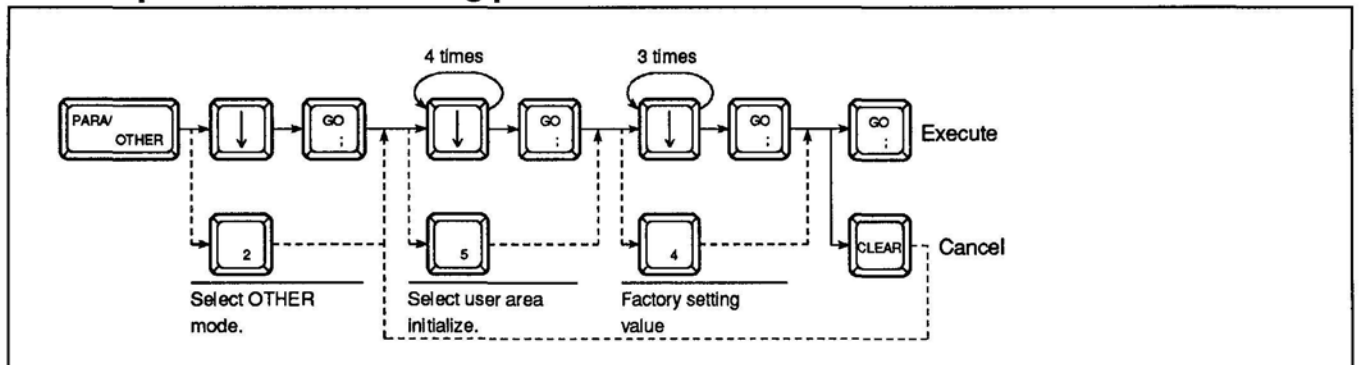
2.4.2   Changing parameters

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

Select parameter. 1)   Select positioning. 2)

Move to the pulse rate.   x axis pulse rate

y axis pulse rate   x axis movement rate

y axis movement rate
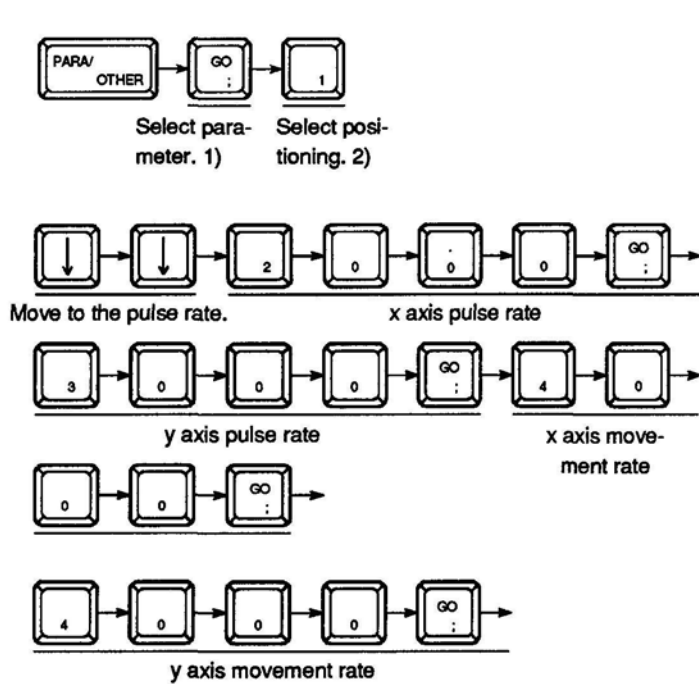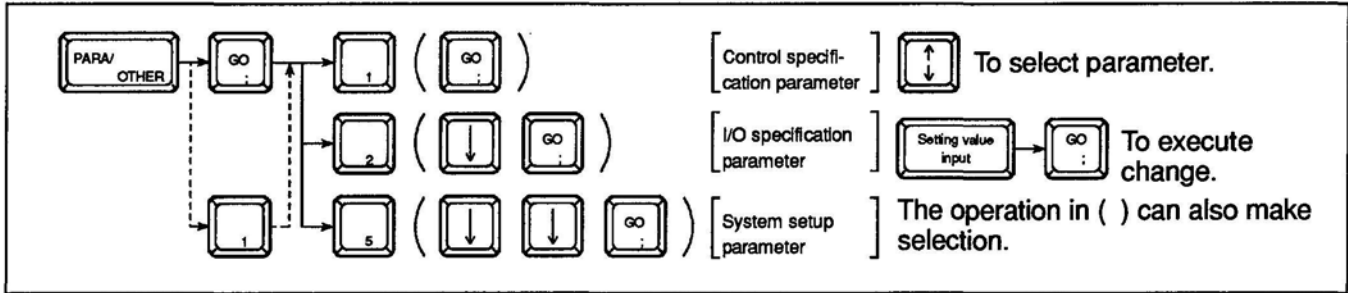
Parameter selection screen

1)
```
Parameter
☑1.Control Spec.
  2.I / O Spec.
  3.System setup
```

2)
```
0        Unit
x        0 (Machine)
y        0 (Machine)
```
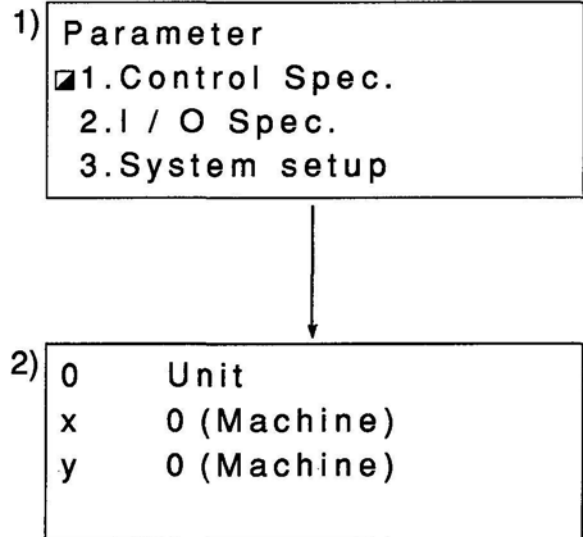
2.5   Monitor

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.
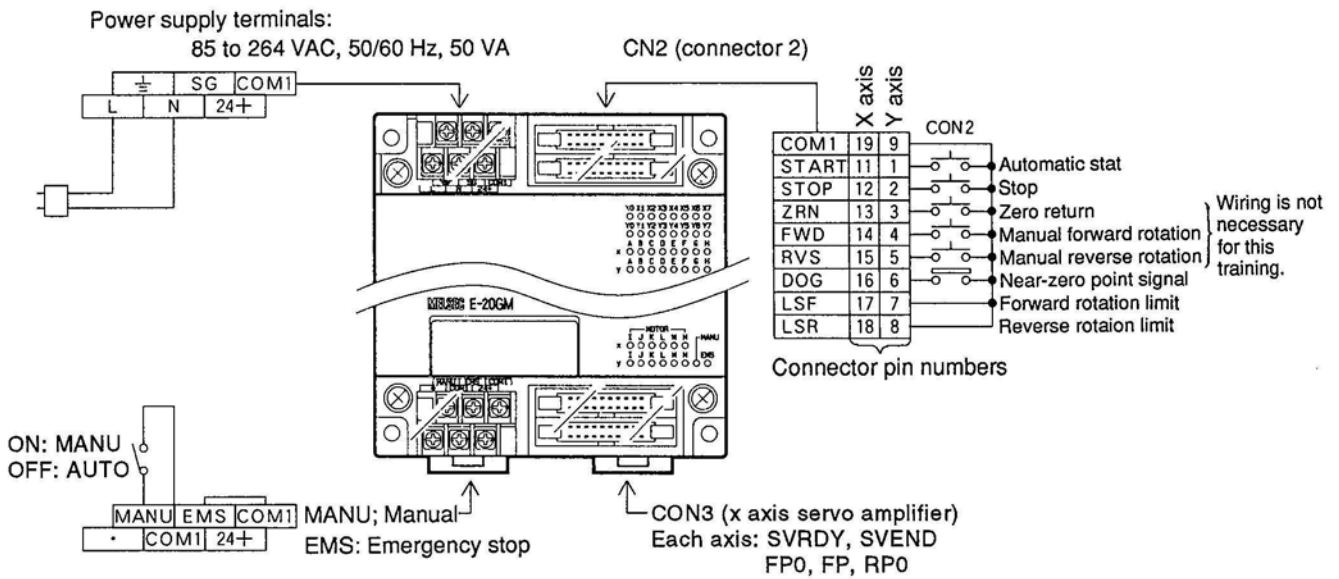
2.5.2   Program monitor

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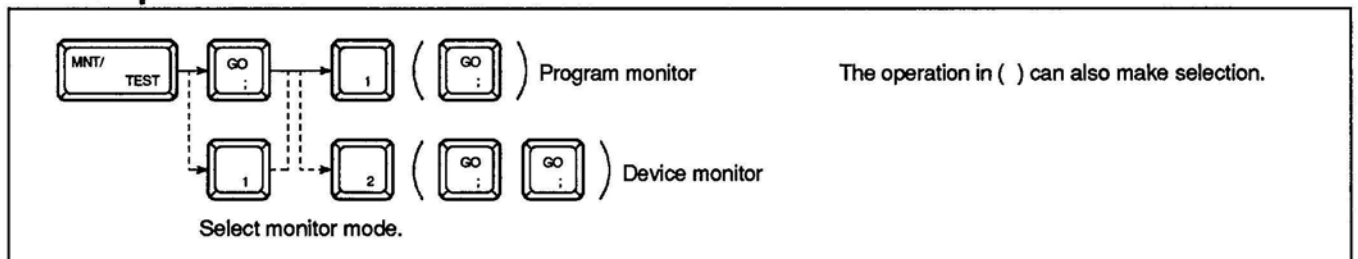
- Set the MANU/AUTO select switch to AUTO.
- Turn ON the automatic start switch.

Monitor screen

```
M   0   0          N   1 0 0              M   3   1 0 0        N    1 0 0
  d r v ( 0 0 )                             d r v ( 0 0 )
  x   +                  1 2 3 4            x   +                    1 2 3 4
  y   +                1 2 3 4 5            y   +                  1 2 3 4 5
```

HELP

Use the [HELP] key to switch the display of the step numbers with the line numbers.
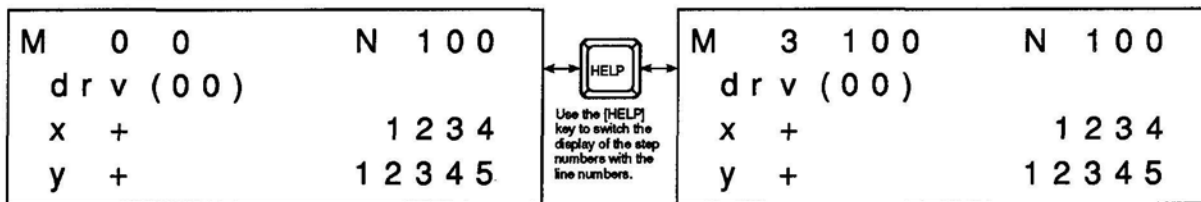
The instructions being executed and present values are automatically monitored.

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
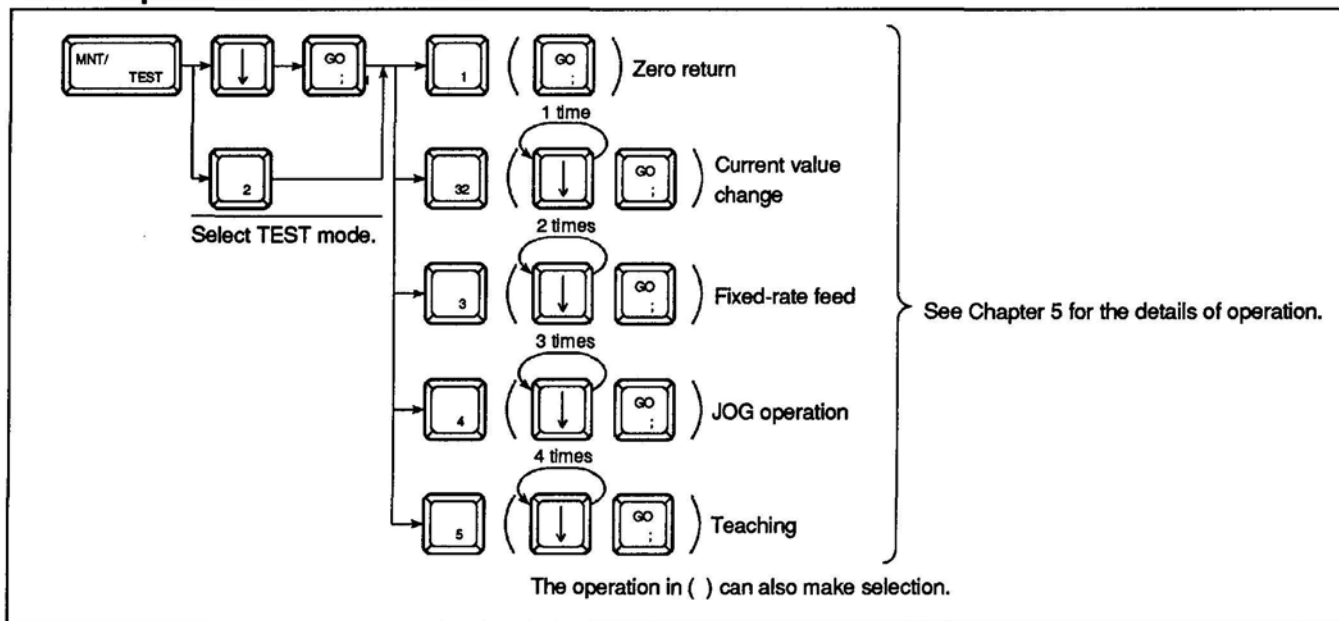
2.6.1 Fixed-rate feed (FEED)

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

MNT/TEST → 2 →

Select TEST mode. 1)

1)
```
Test
☑ 1 . Z N R
   2 . C V R
   3 . F e e d
```

3 → 3 →

Select fixed-rate feed. 2)   Select x axis pulse output.

The x axis pulse output is selected. Setting in mechanical system units such as mm, inch, and deg. is also possible.
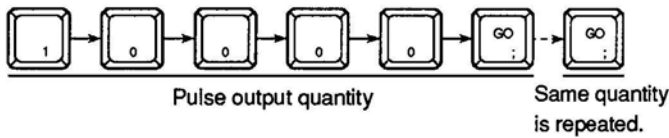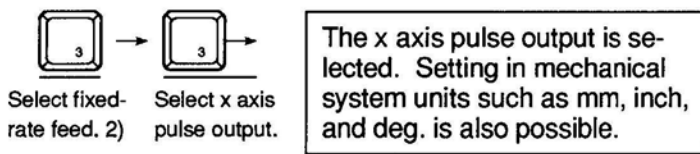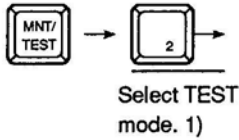
2)
```
F E E D
☑ 1 . x - a x i s
   2 . y - a x i s
   3 . x - a x i s ( p u l s e )
```

1 → 0 → 0 → 0 → 0 → GO → GO

Pulse output quantity   Same quantity is repeated.

3)
```
x - a x   p u l s e   f e e d
x                     0
F e e d   Q u a n t i t y
x =       1 0 0 0 0
```

2.6.2 JOG operation

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

MNT/TEST → 4 →

Select TEST mode. 1)
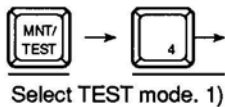
1)
```
Test
☑ 1 . Z N R
   2 . C V R
   3 . F E E D
```

x axis operation

x 5 ◄——► i 6

−1 pulse +1 pulse
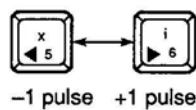
*
```
J O G
■ x             0
■ y             0
```

y axis operation

−1 pulse   +1 pulse
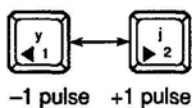
```
┌──────────────────────────────┐
│ J OG                  2 - 11  │
│ ■ x                    0      │
│ ■ y                    0      │
│                               │
└──────────────────────────────┘
```

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.

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

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

- 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

```
COPYRIGHT  (C)  1994
 MITSUBISHI
 ELECTRIC CORP.
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. By pressing the following keys together at the same time during the operation with any function, the initial screen will be displayed.

  [RST] + [GO]   (Press these keys together at the same time.)

Mode setting

```
Select mode
☑ 1.ON line
  2.OFF line
              Select
```

- Select either online or offline mode. (The next page gives the functions available in online and offline modes.)

[GO] [1]

- Select a function in online mode.

[↓] [2]
[GO]

- Select a function in offline mode.

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

```
[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.

```
[ON line mode]
System Parm Err Change?
Yes [GO]   No [CLR]
```

Online mode

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.

Offline mode

1. Same as 1. and 2. in online 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).

Select Yes ([GO] key) or No ([CLEAR] key).

Selecting Yes ([GO] key)

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

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

• 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.

Selecting No ([CLEAR] key)

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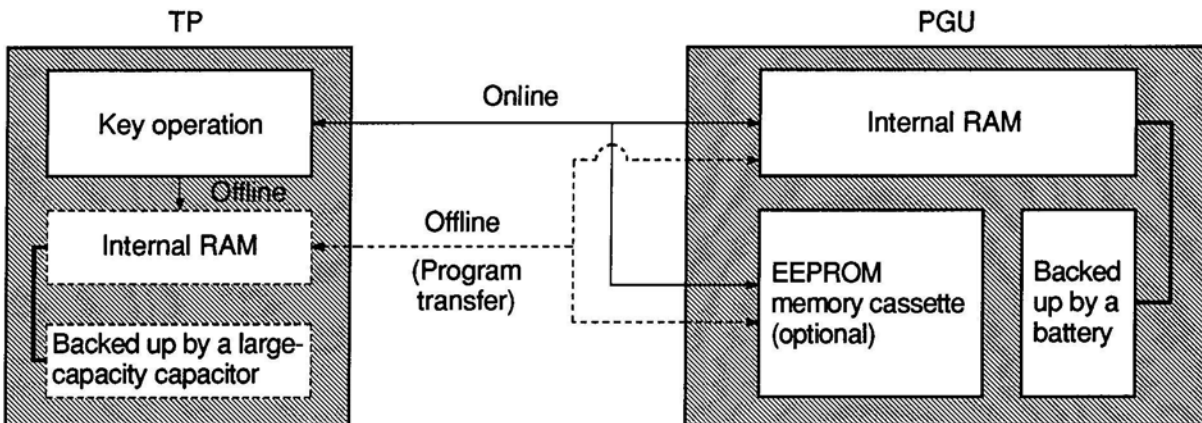
The memory in use automatically switches from the internal RAM to the EEPROM when the EEPROM cassette is installed in the PGU. All subsequent accesses are made to the EEPROM and the RAM contents will not change at all.

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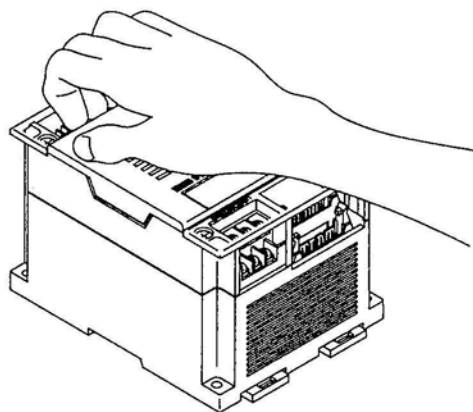
2) Pull upward and detach the EEPROM memory cassette.

3) Set the PROTECT switch to OFF.

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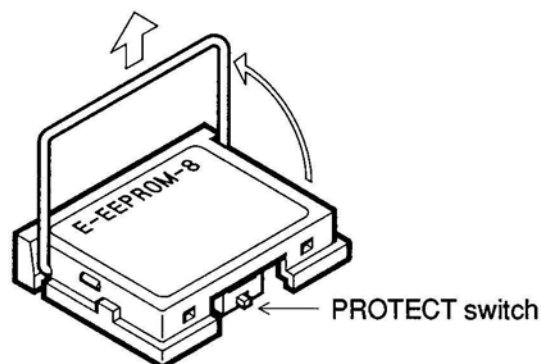
4) Install the EEPROM memory cassette to the PGU, and turn the power ON.

⚠ • 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
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

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.

| System start-up | • Connect the TP to the PGU and turn ON the power. |

↓

| Initial screen | • The initial screen is displayed for about 2 seconds. |

↓

| Mode setting screen | • Select online or offline mode. |

↓

Function setting screen

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

• Select a function.

[RD] : Program read   [INS] : Program insert

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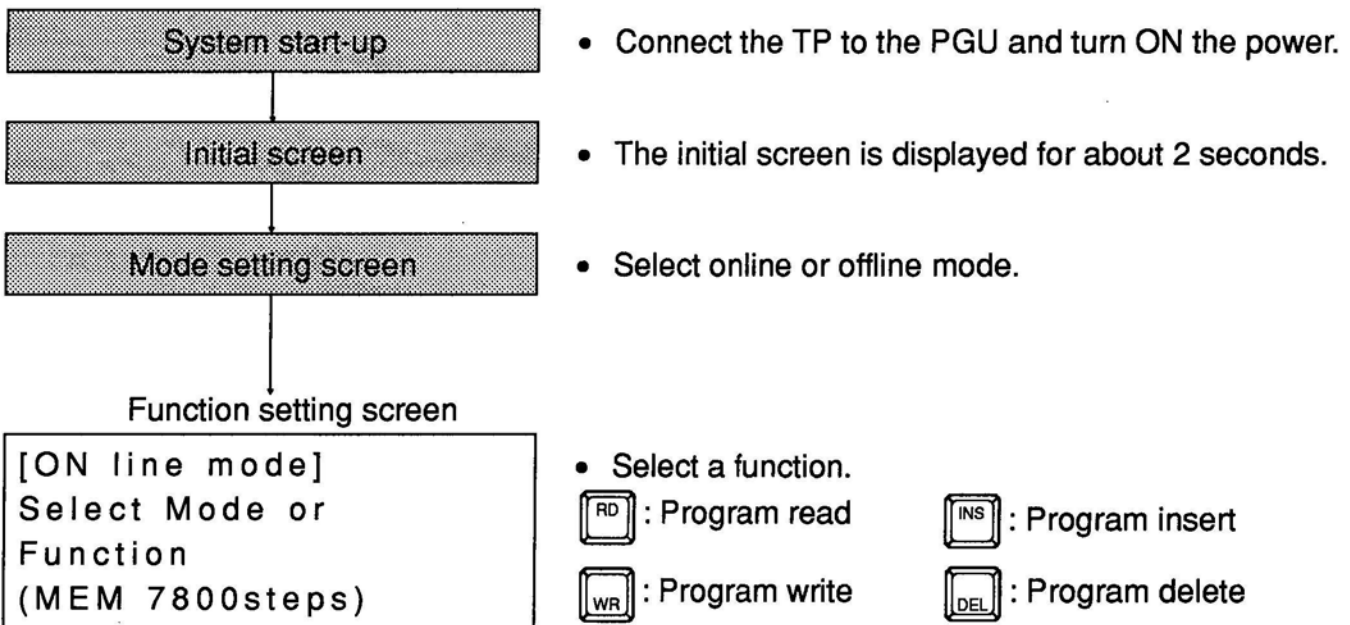
*   The [RD/WR] and [INS/DEL] keys switch their functions alternately. Pressing it once selects the read function, and pressing it again selects the write function.

4.2   Basic Screen Format

The function setting screen gives the information as described below.

Function display
The initial of respective function name is displayed.

R : Read
W : Write
I   : Insert
D : Delete

Step number where the cursor is located (Switches to the program number display by pressing the [HELP] key.)

Block line number where the cursor is located

```
R     S3        N0
  O×0, N0 ;
►       cod28 (DRVZ) ;
        cod29 (SETR) ;
```

4 lines × 16 characters

Program number   Instruction

Line cursor: indicates the line where the program is created or corrected.
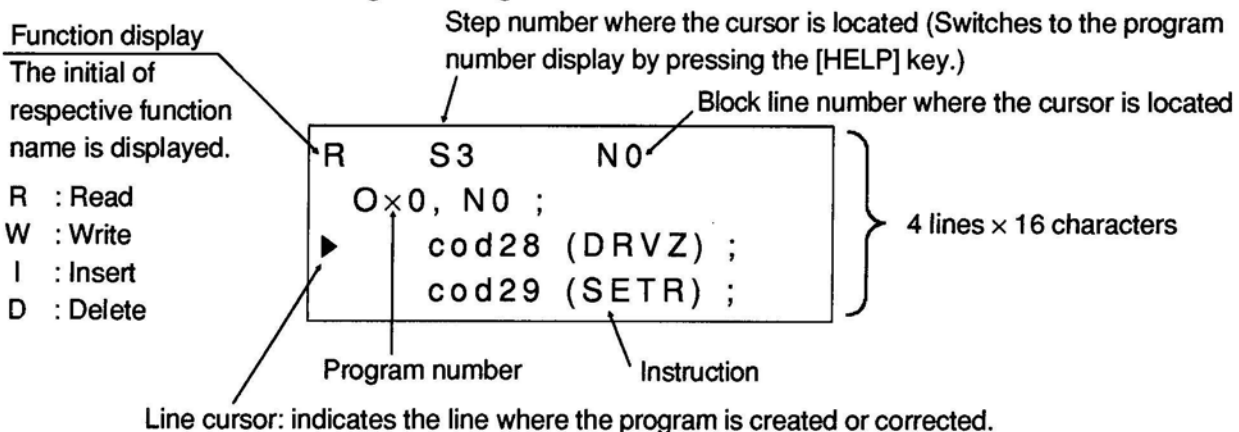
Before starting operation, make sure that the function is correctly selected.

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.

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

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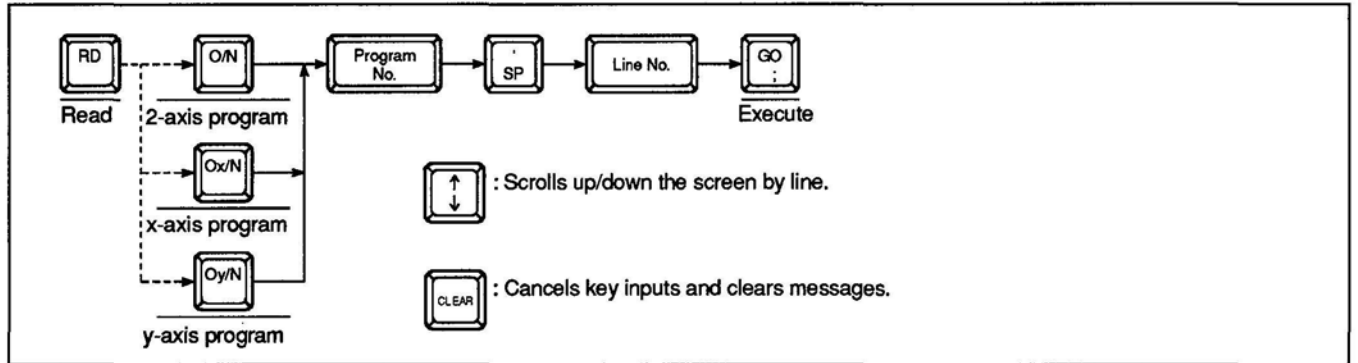
Operation example To read x-axis program number 5 at line number 100:

Key operation   **Display example**
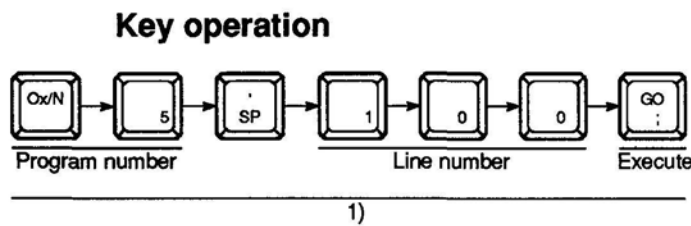
1)
```
R     S0         N0
▶0x5, N100 ;
       cod28 (DRVZ)  ;
Instruction
```

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
▶Ox 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

: Scrolls up/down the screen by line.

: Cancels key inputs.
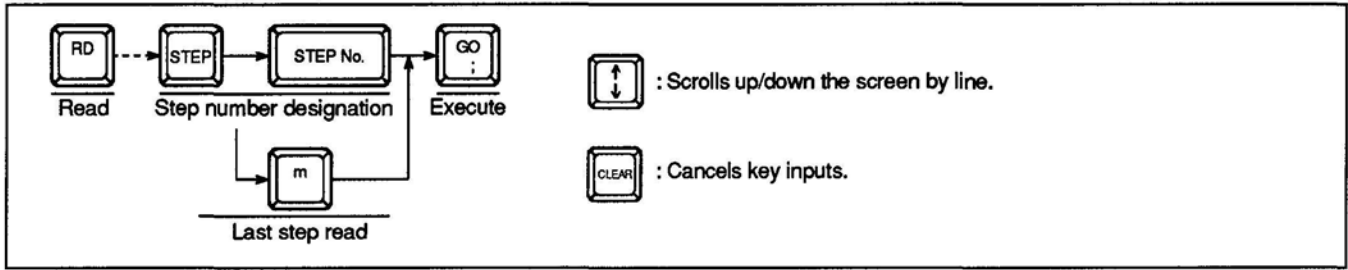
Operation example 1 To read a program at step 200:

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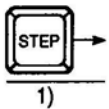
1) Press the [STEP] key. An underline will be displayed in the step number display line.

Display example

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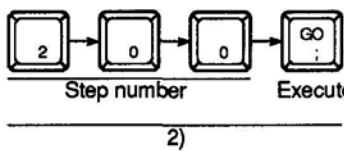

Three program lines beginning with the designated step number will be displayed.

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:
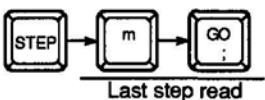

```
R      S7799   N1000
        NOP
        NOP
▶      NOP
```

- 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

[↕]	: Scrolls up/down the screen by line.
[CLEAR]	: Cancels key inputs and clears messages.
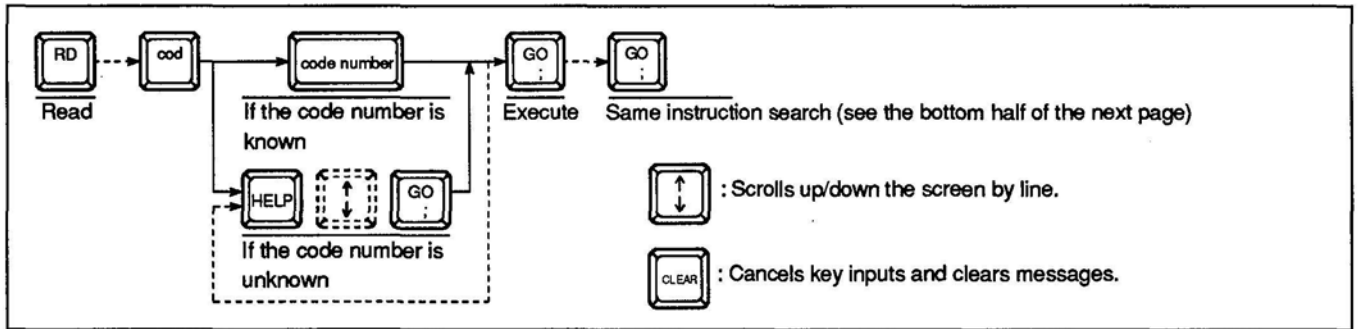
Operation example 1   To read a program by directly designating code number 28 (DRVZ)

Key operation | This is good if a code number is known |

Display example

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

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

Operation example 3   To read a program by designating code number 31 cod (INT) by using the [HELP] key:

Key operation

Code No. 30 designation | An instruction list beginning with code No. 30

1)
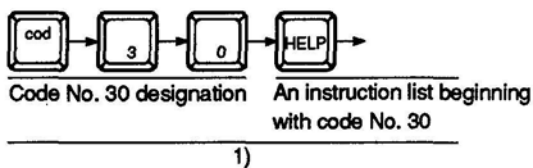
Display example

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


Code No. 31 designation | Same device search

2)
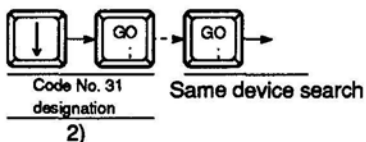
Designate a correct code number by selecting it from the code number list.

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

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

(i) 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 occurrance 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
```
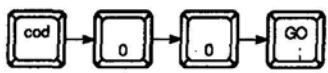

The program is displayed beginning with step 100.

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

```
S200 cod 00 x600
```

The program is displayed beginning with step 200.

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

```
S300 cod 00 x800
```

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

M code No. designation   Execute   Same device search
(see page 4-7)

↑↓ : Scrolls up/down the screen by line.   CLEAR : Cancels key inputs and clears messages.
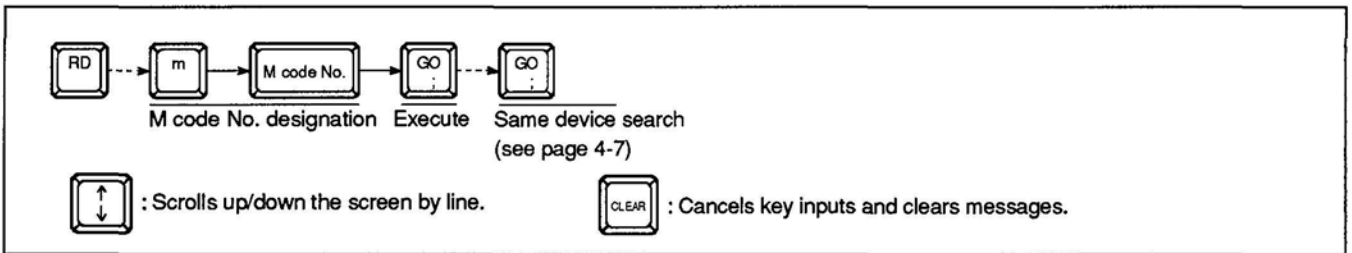
Operation example   To read a program by designating m2 (END):

Key operation

M code 2 designation
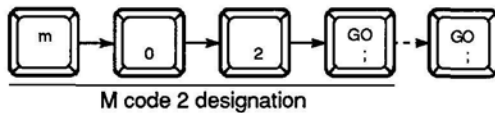
Display example

```
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

| RD | → | instruction word | → | Device symbol | → | Device number | → | GO ; | --- → | GO ; |
| Read | | LD, AND, etc. | | X, Y, M | | | | Execute | | Same instruction search (see page 4-7) |

- Basic sequence instruction only

| RD | → | instruction word | → | GO ; | --- → | GO ; |
| Read | | NOP, ANB, etc. | | Execute | | Same instruction search |

↑↓ : Scrolls up/down the screen by line.

CLEAR : Cancels key inputs and clears messages.

Applicable instruction word
LD, LDI, AND, ANI OR, ORI, SET, RST
Applicable device X, Y, M

Applicable instruction word
NOP, ANB, ORB

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

Key operation

| LD | → | X | → | 1 | → | 2 | → | GO ; | - | GO ; |
| Instruction word | | Device symbol | | Device number | | | | Execute 1) | | Same instruction search |

"0" for LD X012 need not be input.
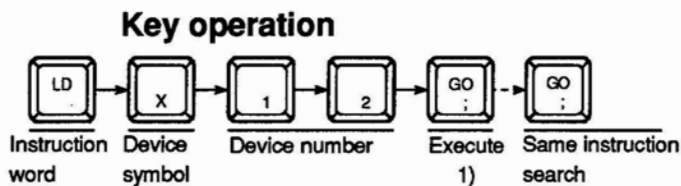
Display example

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

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

| ANB | → | GO ; | - | GO ; |
| Instruction word | | Execute 2) | | Same instruction search |
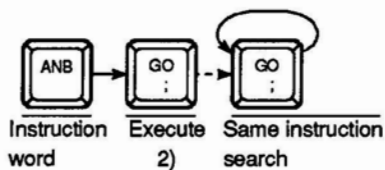
2)
```
R *S300        N50
▶  ANB
   LD          X014 ;
   OR          X015
```

Use of pointers:

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

| RD | - | P | - | Pointer No. | - | GO ; |

⇒ 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 ⎫
CJN POO ⎬ cannot be read.
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

RD — Read

FNC

FNC number — If the FNC number is known

GO — Execute

GO — Same instruction search (see page 4-7)

HELP ↕ GO — If the FNC number is unknown

↑↓ : Scrolls up/down the screen by line.

CLEAR : Cancels key inputs and clears messages.
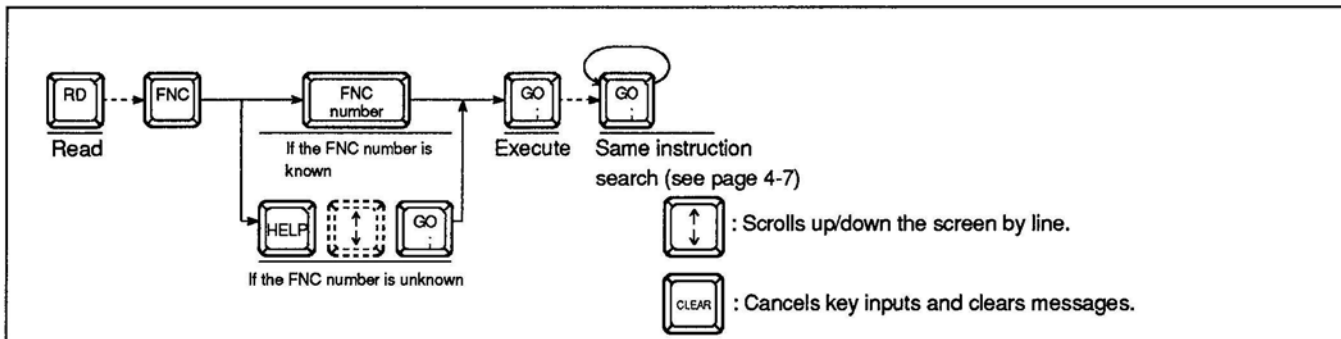
Operation example   To read a program by designating FNC12 (MOV) instruction:

Key operation

FNC — 1 — 2 — GO — GO

FNC No. 1)   Execute 3) Same instruction search 4)

HELP — ↑↓ — GO

FNC12 selection from FNC list 2)

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.
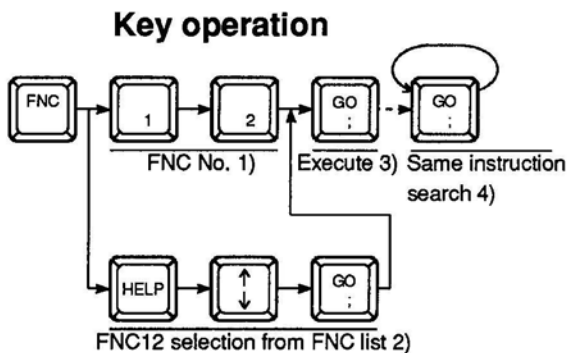
Display example

1)
```
R      S 0          N 0
▶      F N C      1 2
       c o d 2 8 ( D R V Z ) ;
       c o d 2 9 ( S E T R ) ;
```

FNC instruction list

2)
```
▶ F N C    0 0    C J
  F N C    0 1    C J N
  F N C    0 2    C A L L
  F N C    0 3    R E T
```

3)
```
R      * S 2 5 0      N 7 0
▶      M O V      1 2
                D      0
                D      1 ;
```

4)
```
R      * S 2 5 0      N 7 0
▶      M O V      1 2
                D      0
N o t   F o u n d
```

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

RD	╌╌╌	· SP	→	Device symbol	→	Device number	→	GO ;	╌╌╌	GO ;

X, Y, M, D, P　　　　　　　　　　　　　Execute　Same device search

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

Applicable value/device
Positioning
x, y, i, j, r, k, f, m
Sequence
X, Y, M, D, V, Z, P

Operation example   To read X0:

Key operation

SP	→	X	→	0	→	GO ;

X0 designation　　Execute

1)

During the search, the step number display will count up from 0 to the last step number.

GO ;
Same device search 2)

LD   XO

Device subsequent to the basic instruction is searched.

GO ;
Same device search 3)

K4XO   *1

Device in the application instruction is searched.

Display example

1)
```
R     S0        N0
Device        X   0
       cod28 (DRVZ) ;
       cod29 (SETR) ;
```

2)
```
R     *S100     N30
▶     LD      X000 ;
      AND    M  10 ;
      OR     X002 ;
```

3)
```
R     *S130     N36
▶            K4X000
             D    2 ;
      LD     X000 ;
```

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.

PGU ＼ Mode	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	×	O	Δ*1
Offline mode	O*2	O*2	O*2	O*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.

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

```
[HELP] →  Memory      7800
          Program     7800
          File reg.      0
```

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
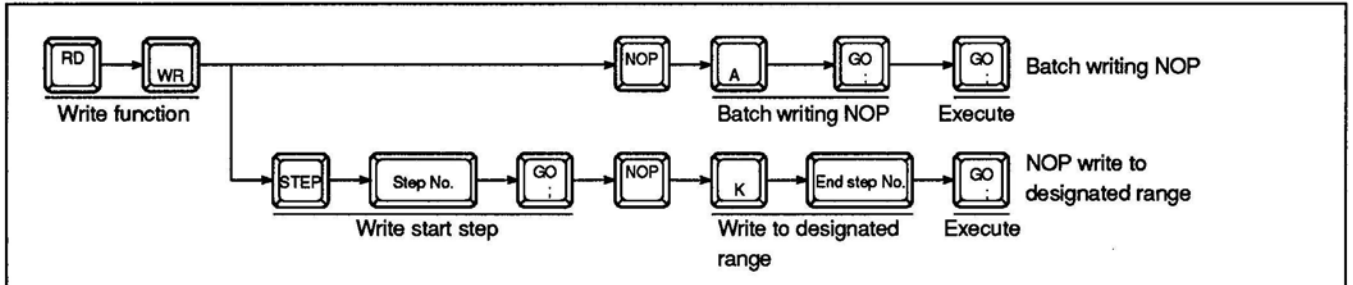
Batch writing NOP:

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

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

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
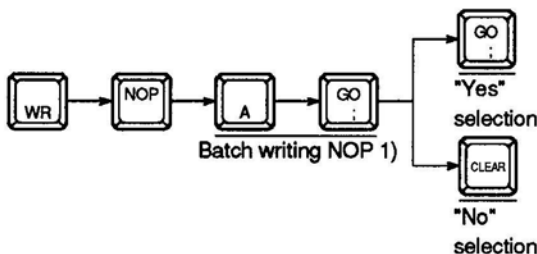
Display example

1)

| W   S 0   N 0 |
| ▶   N O P   A |
| All Clear |
| Yes [G O]   No [C L R] |

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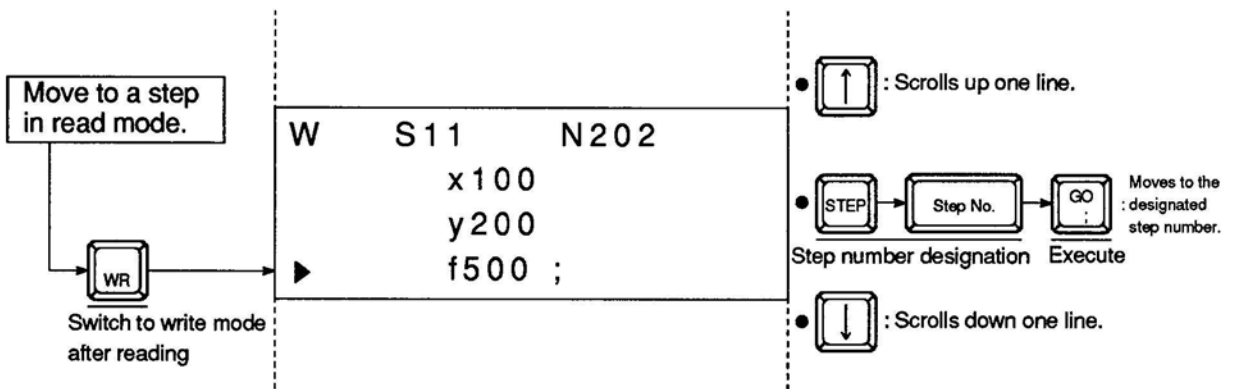
After an instruction word is written, the cursor will move to the next step.

4.4.4   Writing a program/line number

Write a program number as follows.

Basic operation

```
[WR] ----+---> [O/N] ---+---> [Program No.] --> [' SP] --> [Line No.] --> [GO ;]
Write    |     2-axis program|  Program/line number designation         Execute
         |                   |
         +---> [Ox/N] -------+
         |     x-axis program
         |
         +---> [Oy/N] -------+
               y-axis program
```

[CLEAR] : Cancels key inputs and clears messages.
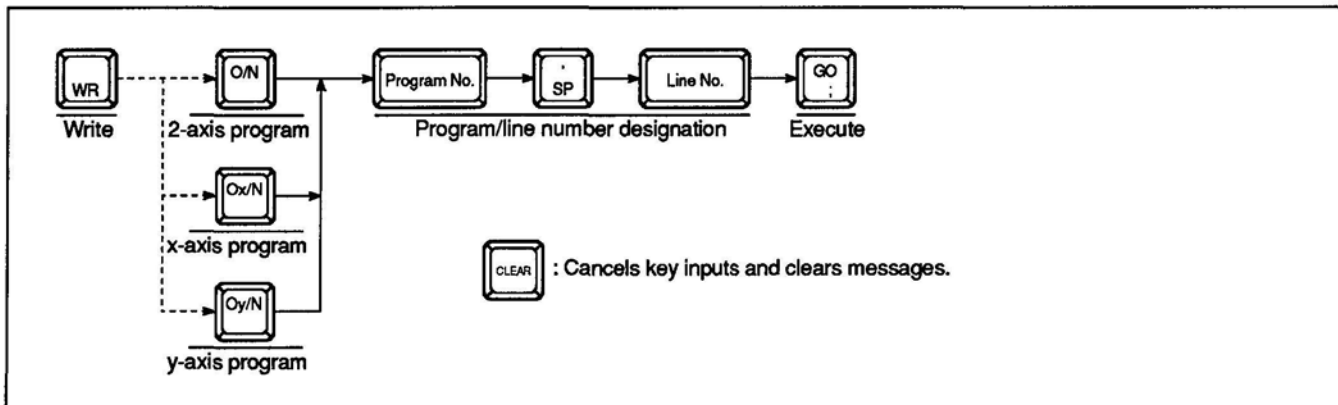
Operation example   To write x-axis program number 0 and line number 200:

Key operation

```
[Ox/N]--[0]--[' SP]--[2]--[0]--[0]--[GO ;]
Program number    Line symbol   Execute
              1)
```
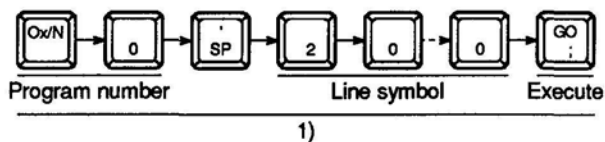
Display example

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

If a program number that has already been
written is input, a "dual defined" error mes-
sage 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
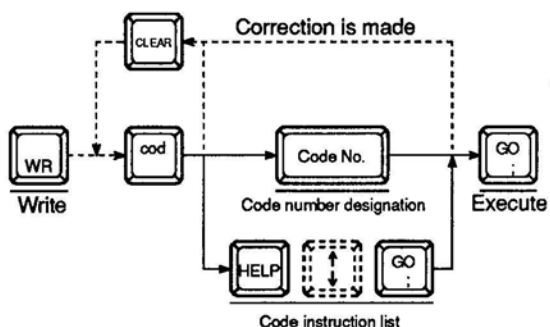
If a nonexistent code number is input, the "Instruction Err" message will be displayed. Input a correct number.

• Code number and device designation
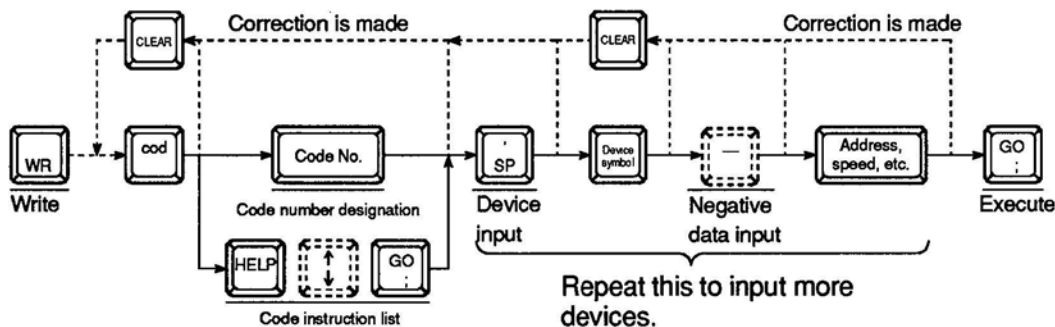
Operation example 1 To write code number only: cod28 (DRVZ)

Key operation
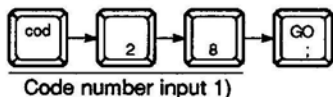
Code number input 1)

Display example

1)
```
W     S3          N200
 Ox0, N200 ;
▶       cod      2 8
        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

Code symbol 0　　　First value　x100　　1)
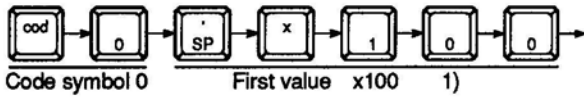
Include a space ([SP] key) between the code number and the value.
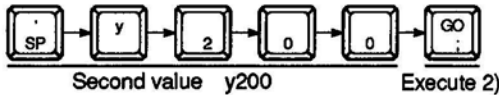
1)
```
W      S5       N201
    cod00 (DRV)
        x100
        y      200
```


Second value　y200　　　　　Execute 2)

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)

Code number　cod 01
list 1)　　selection
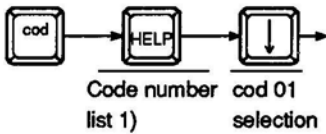
Alternatively:

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)
```


Code number　First value　x300　2)
decided
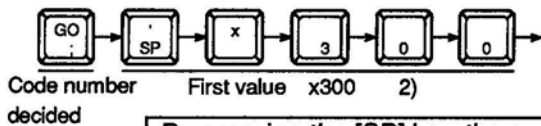
By pressing the [SP] key, the cursor moves one line down.

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


Second value　　　　3)
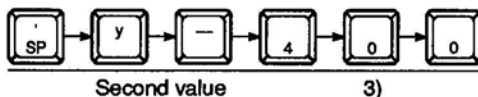
3)
```
W      S11      N202
  ▶ cod01 (LIN)
        x300
        y     —400
```

Third value　　f600　　4)
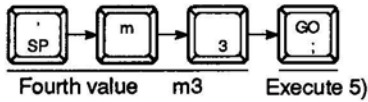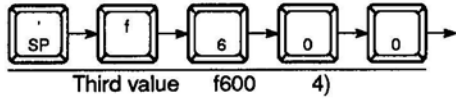
4)
```
W      S11        N202
          x300
          y—400
▶         f        600
```


Fourth value　　m3　　Execute 5)

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

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

Basic operation

Key input cancel

Write　　M code number designation　　When M code is indirectly designated　　Execute
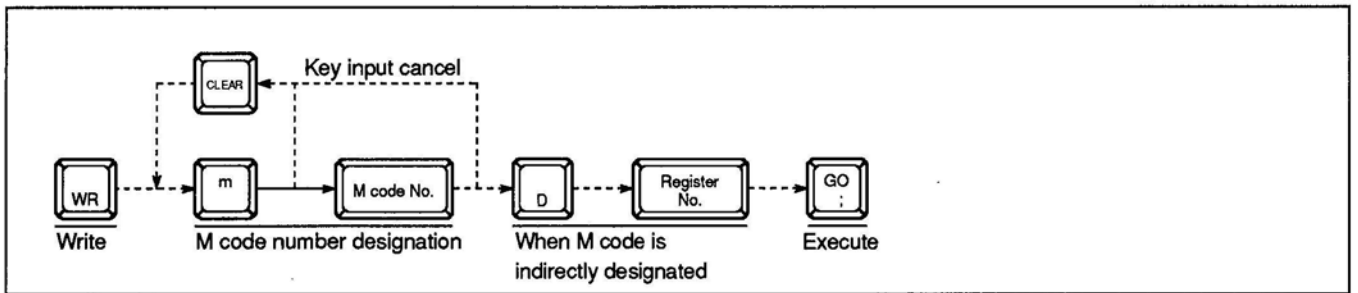
Operation example　　To write m10:

Key operation

M code number
designation 1)
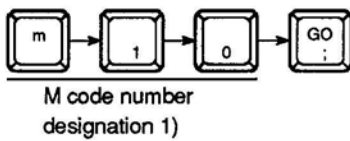
Display example

1)
```
W      S21        N203
          f600
          m3  ;
▶       m 1 0
```

4.4.6   Writing a positioning address value

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

Basic operation
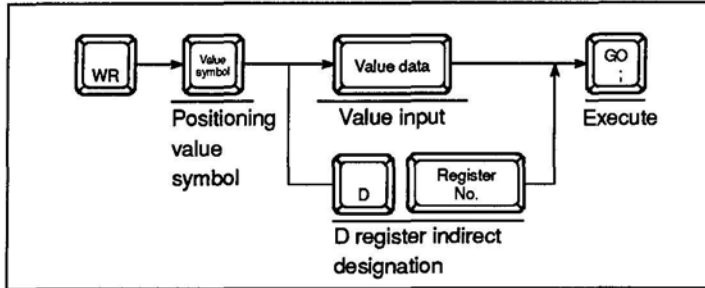
Operation example To write positioning address value x1000:

Key operation

Device symbol | Value | Execute 1)
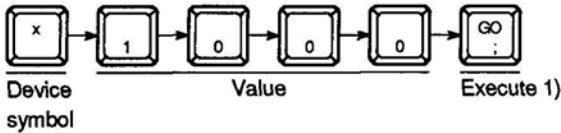
Display example

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

• Basic instruction + device number
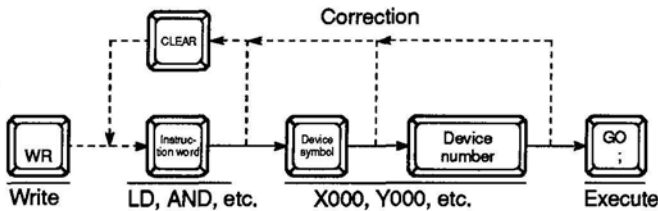
Applicable instruction words
LD, LDI, AND, ANI, OR, ORI, SET, RST

Applicable devices
X, Y, M,

• Basic instruction only
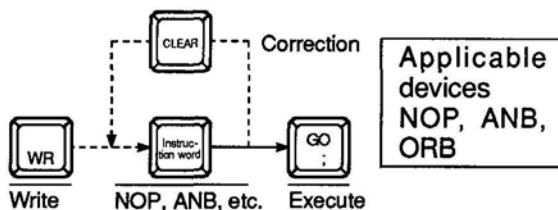
Applicable devices
NOP, ANB, ORB

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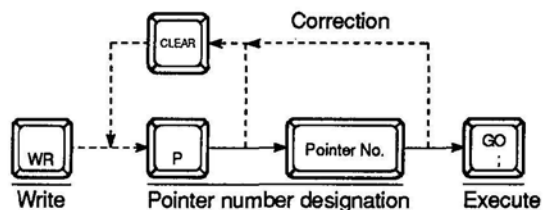
Operation example 1 To write a basic instruction + device number LD X017:

Key operation

| LD | → | . x | → | 1 | → | 7 | → | GO : |
Instruction word | Device number X17 input 1) | | | Execute
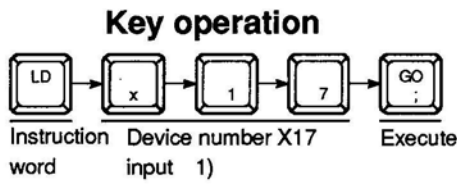
"0" of X017 need not be input.

Display example

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

Operation example 2 To write a basic instruction ANB only:

| ANB | → | GO : |
Instruction word 1) | Execute
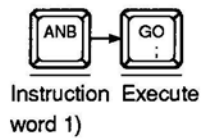
1)
```
W      S200      N220
▶      ANB
       NOP
       NOP
```

Operation example 3 To write pointer number 20:

| P | → | 2 | → | 0 | → | GO : |
Pointer number 20 1) | | | Execute
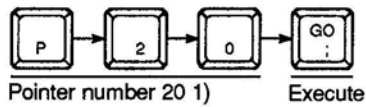
1)
```
W      S300      N260
▶ P    20
```

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

Basic operation

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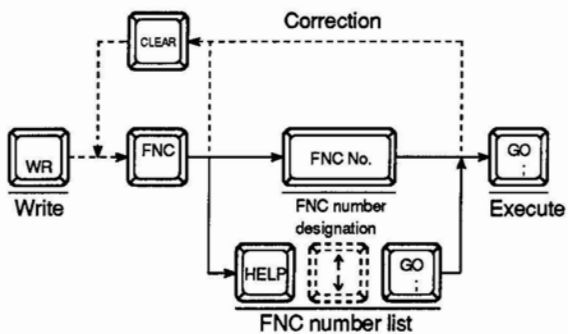
If a nonexistent FNC number is input, the "Instruction Err" message will be displayed.
Input a correct number.

- Inputting an FNC number and devices
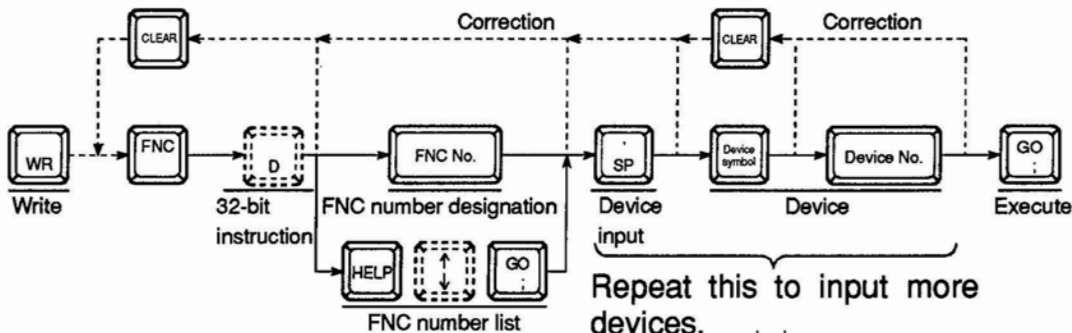
Repeat this to input more devices.

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
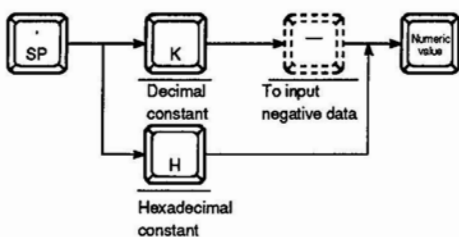
* Index qualification D □ Z □ etc.
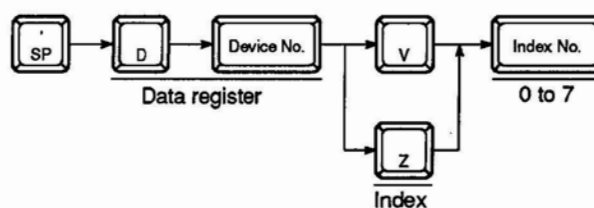
* Digit designation K □ X □ □ etc.   K □ X □ □ Z □ etc.
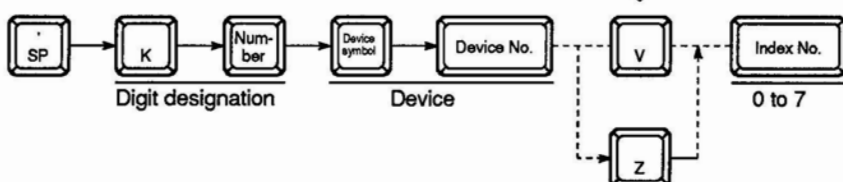
Operation example 1 To write FNC12 (MOV) D0 D1:

Key operation

FNC → 1 → 2 → SP → 1)
FNC symbol 1) New line

▶ FNC 00 CJ
FNC 01 CJN
FNC 02 CALL
FNC 03 RET

HELP
FNC No. list

GO → 2)

D → 0 → SP → D → 1 → GO
First device New line Second device Execute 2)

Display example

1)
W	S100	N20
	MOV	12
▶		—
	NOP	

↕ Move the cursor : to FNC12 in the FNC number list.

2)
W	S100	N21
	D	0
	D	1 ;
▶	NOP	
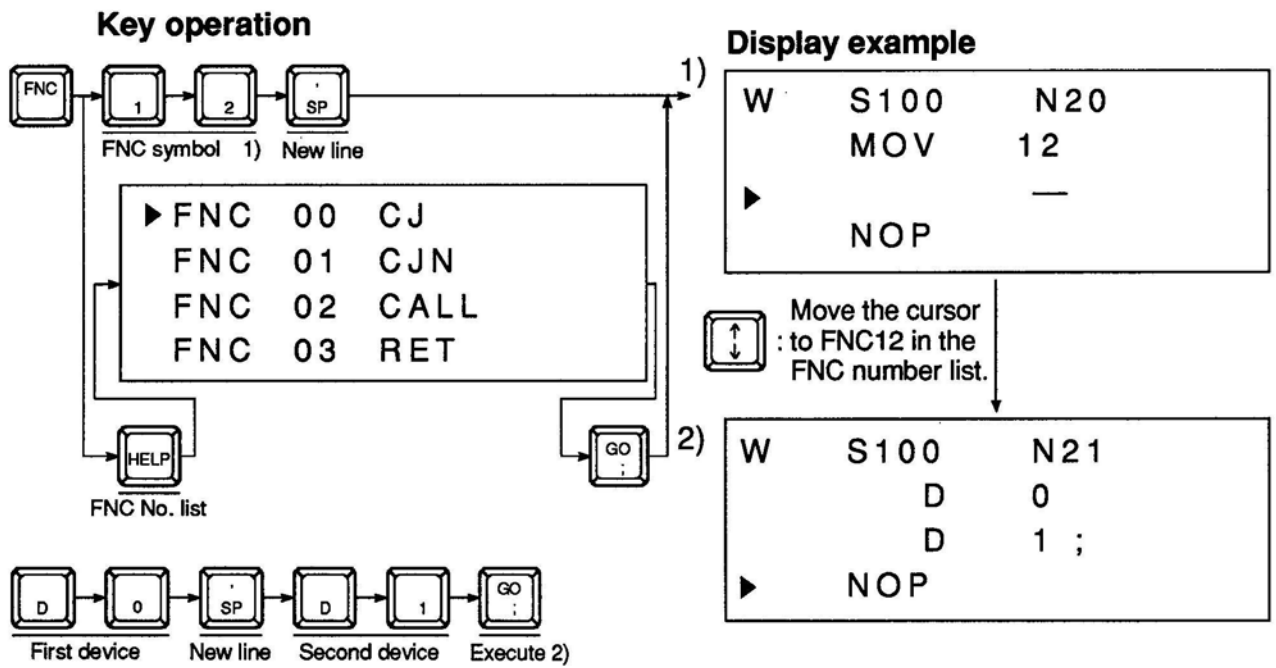
Operation example 2 To write FNC10 (CMP) K-100 D2Z0 M3:

[FNC] → [1] → [0] → [SP]
     Device number 1) New line

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

[K] → [—] → [1] → [0] → [0] → [SP]
  First device   2)   New line
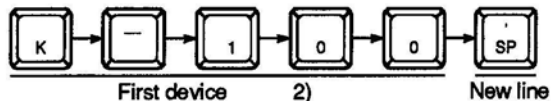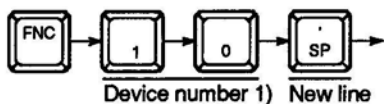
To write a constant

2)
```
W      S200      N40
       CMP       10
▶         K    —100
       NOP
```

[D] → [2] → [Z] → [0] → [SP]
  Second device 3)   New line
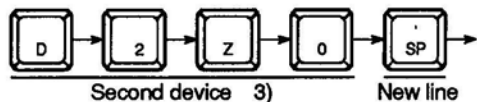
To input an index register | If an index register device number is omitted, the message "Input 0-7" will be displayed.
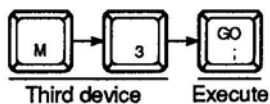
3)
```
W      S200      N40
       CMP       10
          K—100
▶         D     2Z0
```

[M] → [3] → [GO]
 Third device Execute

```
W      S200      N40
          K—100
          D     2Z0
▶         M      3
```

4.4.8   Overwriting a program

A program can be modified by writing a new program over an existing program. Instruction blocks or instruction values can be overwritten.

(1)   Overwriting in units of instruction blocks

Example

```
Ox10  N0;        ]
cod  28;         ]
m00  (WAIT) ;    ]
cod  00  (DRV)   ] ⎫
   x100          ] ⎬ ──── To change cod 00 (DRV) x100 y100 to cod 01 (LIN) x100 y100
   y100 ;        ] ⎭      f500:
cod  02 (cw)     ]
   x200          ]
   y300          ]
   r100 ;

FNC12 (MOV)      ]
   D0            ]
   D1 ;          ]
```

To overwrite an instruction, move the cursor to the head of the instruction block. A ";" (End Of Block) symbol is inserted in the end of an instruction. Use the EOB symbol for the target of search.

Move the cursor to the correct position.

W	S300	N90
▶	cod00 (DRV)	
	x100	
	y100 ;	

⇓

W	S308	N91
	y100	
	f500 ;	
▶	cod02 (CW)	

If the number of steps before change is different from that after change, it is automatically adjusted by the TP's internal processing.

] indicates a unit of instruction word.

Overwriting procedure:
- The procedure is the same as the usual writing procedure. Please see page 4-16 for more details.

(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].
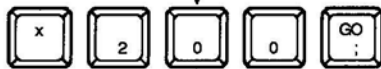
After overwriting ↓

```
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.

PGU Mode	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	o	×	o	Δ *1
Offline mode	o *2	o *2	o *2	o *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)
   x100

Insert posi-tion {
   y100 ;
cod 01 (LIN)
   x500
   y300
   f500 ;

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

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 (LIN)
          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 instrucion 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:


```
I     S500      N400
      cod00  (DRV)
   ►    y100
        f200 ;
```

⇓

```
I     S501      N400
      cod00  (DRV)
   ►    x100
        y100
```

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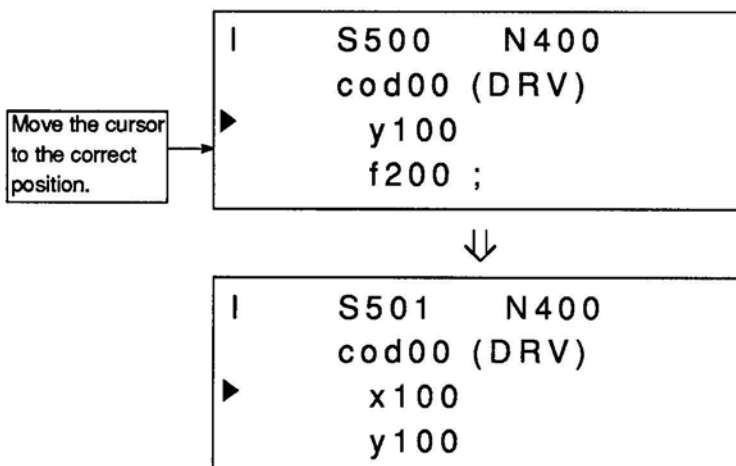
- The program after the inserted
- Move the cursor to the y line.

- Input.

position will be shifted one line down.

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

	S503	S400
	x100	
	y100	
▶	f500 ;	

⇒

	S503	N401
	f500	
	m3 ;	
▶	cod09 (CHK) ;	

Move the cursor to the correct position.
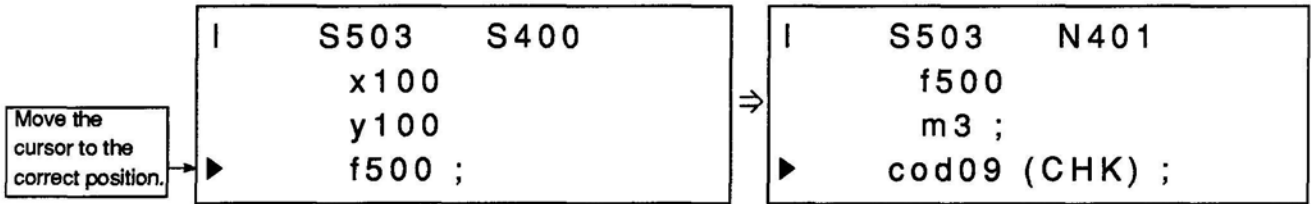
- Move the cursor to the end of the instruction block.

- 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.

PGU Mode	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O *2	× *2	O *2	Δ *2
Offline mode	O	O	O	O

*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

DEL --- NOP → GO : Batch deleting
Delete   ;   NOPs
             Yes selection

             CLEAR : Batch deleting NOPs cancel
             No selection
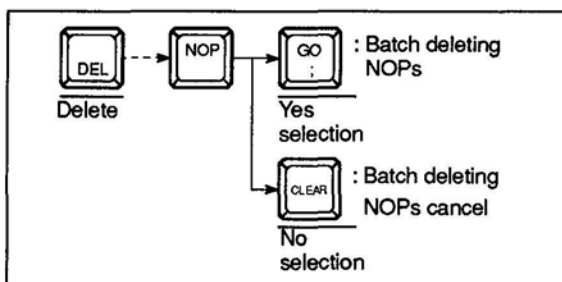
• The following screen will be displayed when the [NOP] key is pressed. Press the [GO] key to delete NOPs in the program. Press the [CLEAR] key to cancel the deletion and return to the screen before the [NOP] key was pressed.

```
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
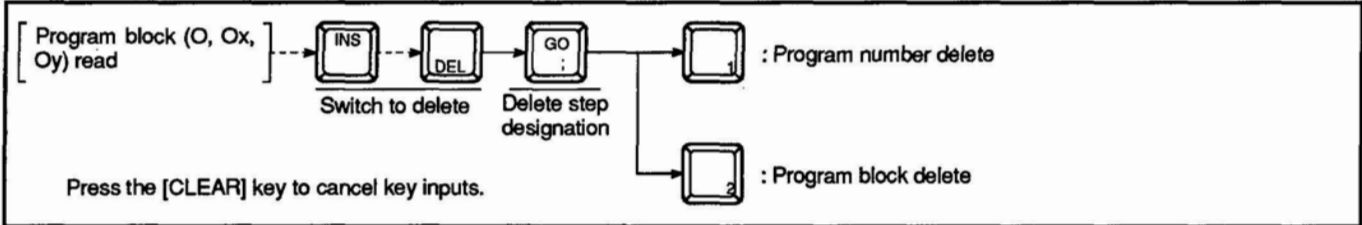
Operation example   To delete Ox0:

Read program block Ox0 using the read function.


```
D      S0        N0
▶Ox0, N0;
      cod28 (DRVZ) ;
      cod29 (SETR) ;
```
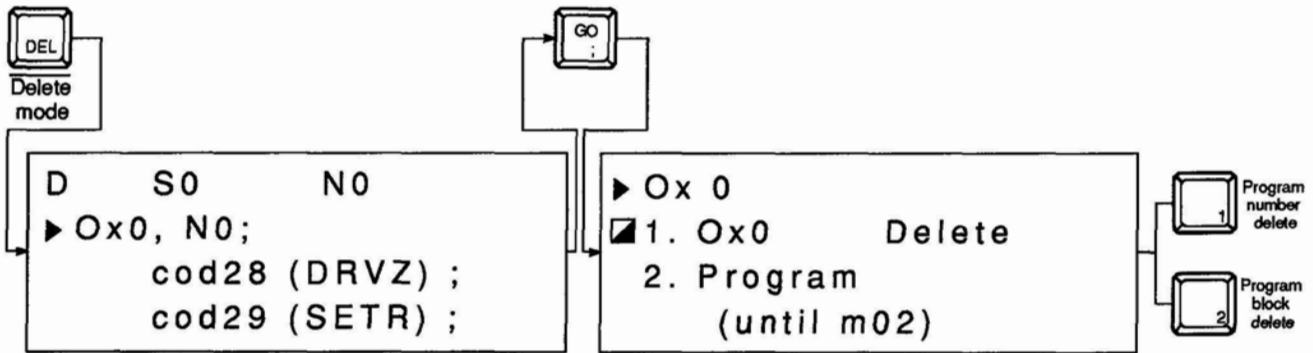
- Move the cursor to Ox0.

  The program will be shifted
  forward automatically after
  the deletion.

```
▶ Ox 0
◪1. Ox0          Delete
  2. Program
      (until m02)
```

- 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

```
O00  N;              ⇐  A ";" (end of block) symbol is deleted in the end of an instruction
cod28 (DRVZ) ;          block. Use the EOB symbol to identify individual blocks.

cod 00 (DRV)  ⌉  ⇐  To delete cod 00 (DRV) block:
   x100
   y100 ;     ⌋
cod 01 (LIN)
   x500
   y300
   f500 ;
```

Make sure that D: delete mode has been selected.	→	D S 1 0 0 N 3 0
Move the cursor to cod 00 (DRV) and press the [GO] key.		▶ cod00 (DRV)
		x 1 0 0
		y 1 0 0 ;

GO

The program after the deleted block is automatically shifted forward.

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:**

GO

Move the cursor to the correct position.	→	D S 1 0 0 N 3 0
		cod00 (DRV)
		▶ x 1 0 0
		y 2 0 0 ;

D   S 1 0 0   N 3 0
cod00 (DRV)
▶   y 2 0 0 ;
cod01 (LIN)
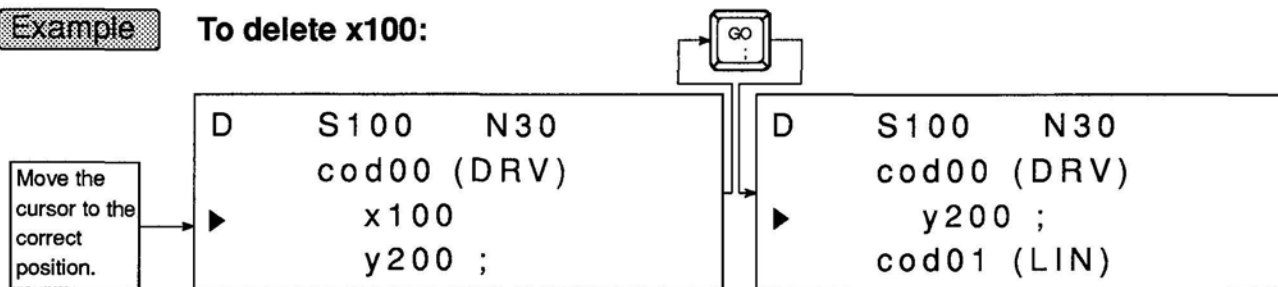
• Move the cursor to x100.

• 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   ⌐ One instruction
y200   │ block without a
f300 ; ⌐┘ cod instruction
cod  00 (DRV)
x200
y300
f400 ;
   ∫
```

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

```
D     S100     N40
▨ 1.  ; until EOB (;)
   2.  x100
```

```
D     S100     N40
▶ cod00 (DRV)
        x200
        y300
```

```
D     S100     N40
▶       y200
        f300 ;
        cod00 (DRV)
```
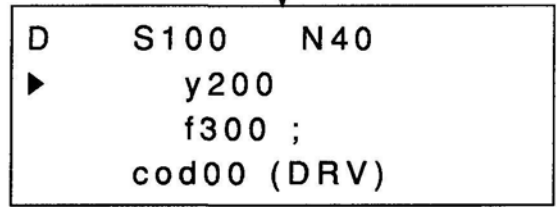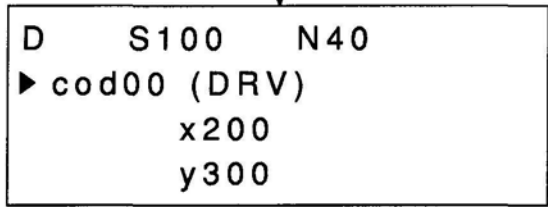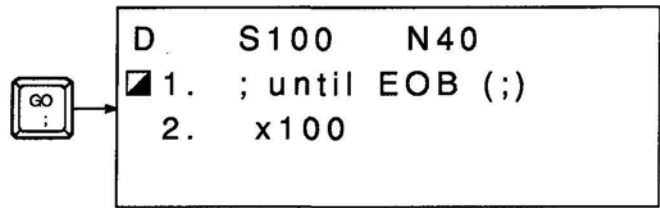
• Deleting till EOB (x100 to f300)

• Deleting X100 only

4.6.7 Range delete

The range designated with step numbers is deleted.

Basic operation

```
[DEL] ----▶ [STEP] ──▶ [Step No.] ──▶ [STEP] ──▶ [Step No.] ──▶ [GO ;]
Delete      Delete start step          Delete end step         Execute
                                       designation
```
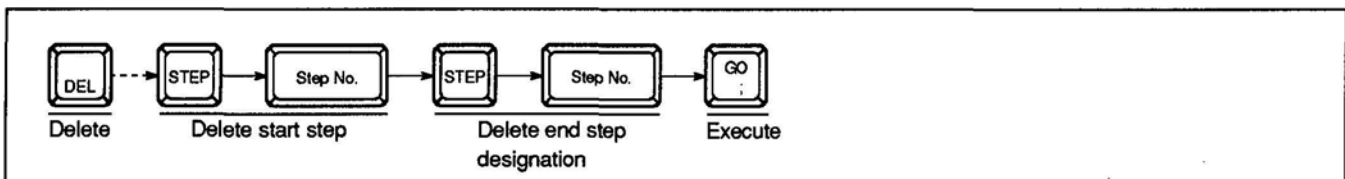
• The program after the deleted steps is automatically shifted forward. If other than the head of an instruction block has been designated as the delete start and end steps, the program will be deleted all the way to the EOB marker.

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

5.   MONITOR / TEST   5 - 1

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.

System start-up	• Connect the TP to the PGU and turn ON the power. (see Chapter 3 System Start-Up)
Initial screen	• The initial screen is displayed for about 2 seconds.
Mode settting screen	• Select online mode. The monitor/test functions can be selected in online mode only.
[MNT/TEST]	• Press the [MNT/TEST] key to select the monitor/test function. If this key is pressed in offline mode, the message "Can't select in OFFline mode" will be displayed.

Monitor / Test
  1.Monitor
  2.Test
  3.Error
	• The monitor/test function screen will be displayed. Press the [1] key to select the monitor function. Press the [2] key to select the test function. Press the [3] key to select the error monitor (error reset) function.

[1] Monitor Mode Monitor
☑ 1. Program
   2. Device
                    Select
	• Monitor mode (page 5-2)
	  • Program operation monitor
	  • Word device present value monitor
	  • Bit device ON/OFF monitor (page 5-4)
	  • Bit device forced SET/RST
	  • Word device present value change

2 Test Mode	Test ☑ 1. ZRN 2. CVR 3. Feed

- Test mode (page 5-8)
  - Zero return
  - x, y current value change
  - Fixed-rate feed
  - JOG operation
  - Teaching function

3 Error Mode	Errcode Mon / Rest ☑ x-ax y-ax sub

- 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.

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

Key	Description
x	: Switch to the x-axis (Ox) monitor
y	: Switch to the y-axis (Oy) monitor
↑↓	: Switch to the x- and y-axis sub task monitor
CLEAR	: Return to the monitor/test mode setting screen
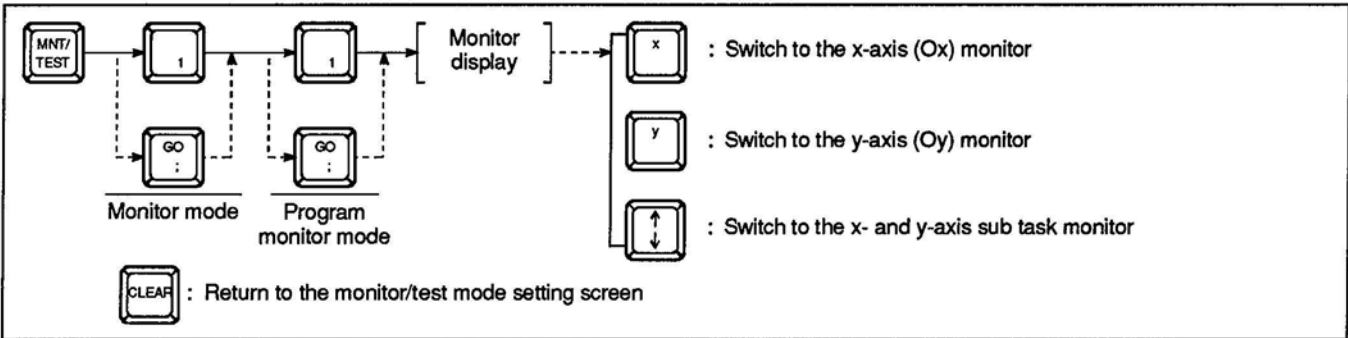
Operation example

Key operation
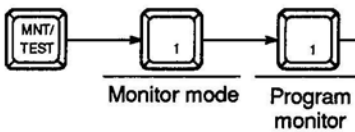
Display example

Simultaneous 2-axis or x-axis monitor

```
M     O10           N1000
   drv  (00)
   x  -  2000
   y  +  3000
```
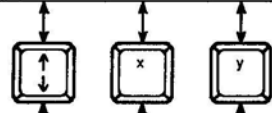
```
M     O100          N3000
   SET  Y000;
   x   +6000
   y   +7000
```
Sub task monitor

```
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
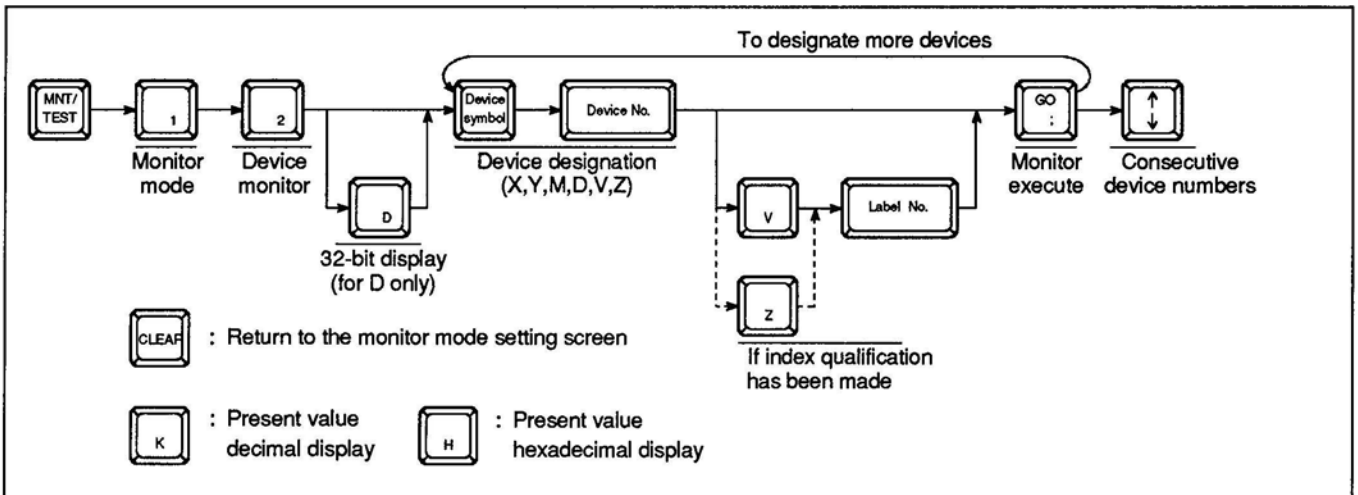
Operation example

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

Key operation

Monitor mode | Device mode | Device Y0 | Monitor execute | Consecutive devices 1)
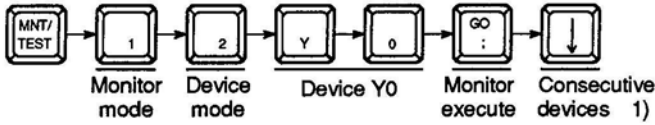
" ■ " displayed to the left of the device number indicates that the device is ON.
Ex. ■ Y0

Device D0 | Device mode | 32-bit designation | Device D10,D11

Monitor execute 2)
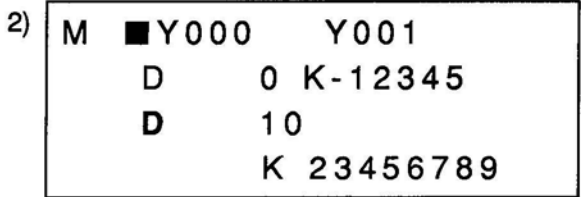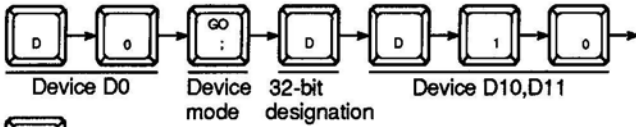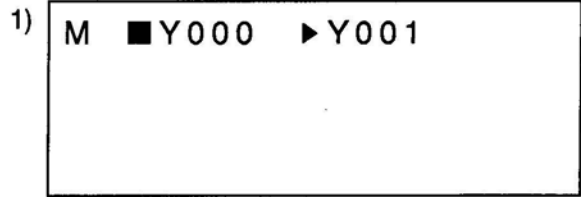
The 32-bit data display gives a bold letter display.   Ex. **D**10

Display example

1)
```
M  ■Y000   ▶Y001
```

2)
```
M  ■Y000    Y001
   D      0 K-12345
   D     10
          K 23456789
```

(i) Monitoring with indexing:
- If a data register with indexing is monitored, the data after the indexing is monitored.

```
M▶  D    20Z0→D    30
         K    1234567
```
Present value after index
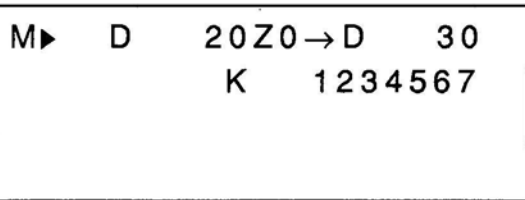
Ex. To monitor D20Z0 when Z0 = K10:
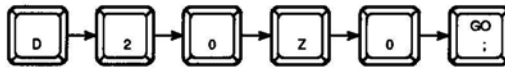
D20Z0 switches to D30, and D30's present value will be displayed.

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

[Device monitor] → SP → SET Forced SET
See page 5-4. Y or M designation | Test function | RST Forced RST

[↕] : Designate consecutive device numbers

[SP] : Return to monitor mode
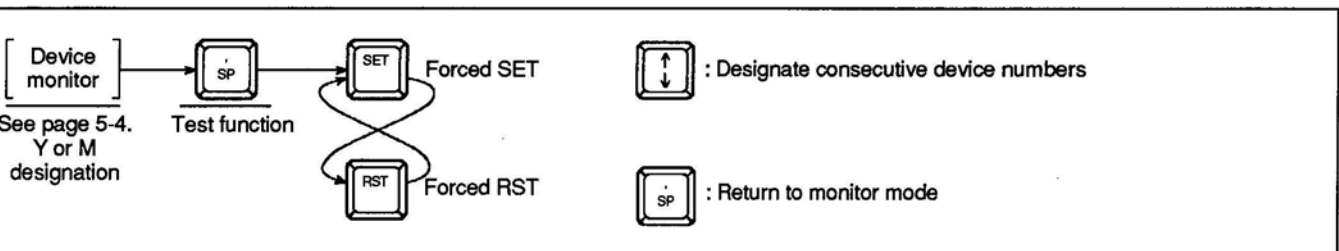
Operation example

To forcibly set and reset Y0 and Y1:

Key operation

MNT/TEST → 1 → 2 → Y → 0 → GO; → SP →
          Monitor   Device   Y0 monitor   Test 1)
          mode   monitor

Pressing the [SP] key will display "T"

SET → RST → ↓ → SET → RST - SP;
Forced Forced Y1   Forced Forced Return to
SET   RST   designation SET 2) RST 2) monitor mode 2)

Display example

1) | T▶   Y000

2) | T   Y000   ▶■Y001

3) | T   Y000   ▶   Y001
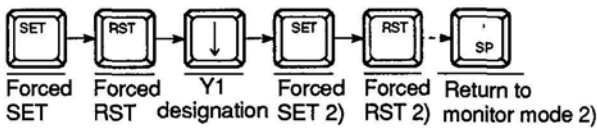
3) Register current value change
Change the current values of data register (D), index registers (V, Z), and file register (D) as follows.

Basic operation

[Device monitor] → SP; → K → New data → GO;
See page 5-4.   Test   Decimal   Data
D,V,Z   function constant   change
designation
                            H → New data
                            Hexadecimal
                            constant

↑↓ :Designate consecutive device numbers

SP; :Return to monitor mode
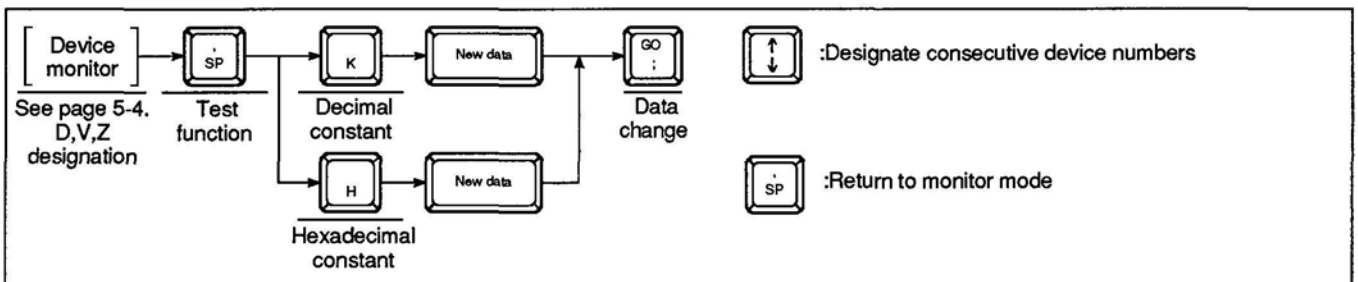
Operation example 1

To change current value K10 of D0 to K20

Key operation

MNT/TEST → 1 → 2 → D → 1 → 0 → GO;
          Monitor Device   D10 monitor   Monitor
          mode   monitor   execute

SP;
Test
function
1)
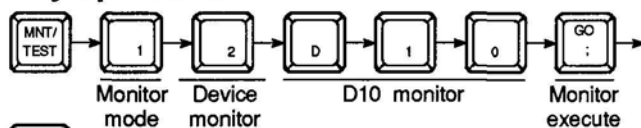
Pressing the [SP] key will display "T"

Display example

1) | T▶   D   10   K   10

Change to K20   Execute 2) Return to monitor
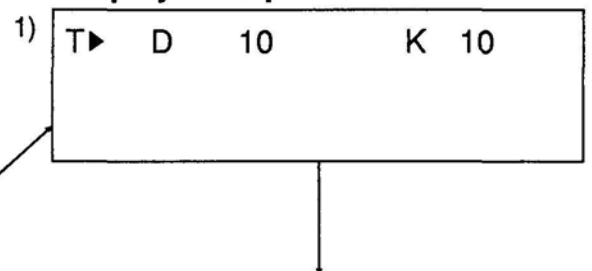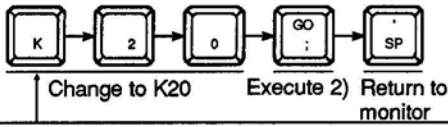
Pressing the [K] key will display an underline at the current value.

2)

```
T▶   D   1 0        K   2 0
```
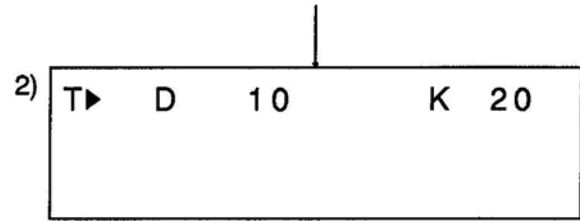
Operation example 2

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

Monitor Device   D0 V0 monitor
mode   monitor

Execute 1)

D0V0 → D10 and the data register after indexing are displayed.

1)

```
M▶   D   0 V 0 → D      1 0
                   K    2 0
```


Test function   Change to K30   Execute 2) Return to monitor
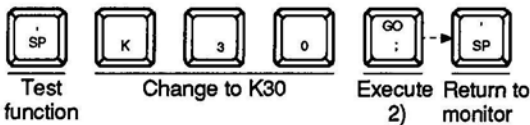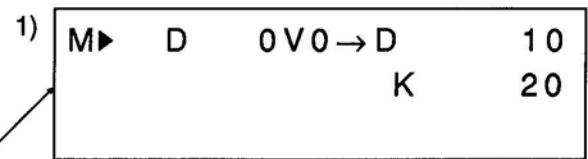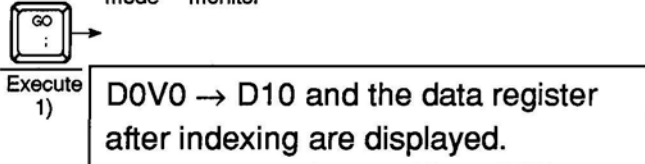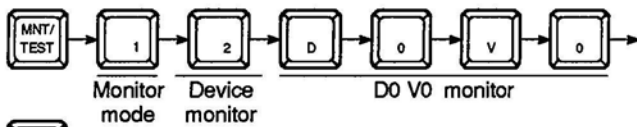
Current value K20 of D10 after indexing is changed to K30.

2)

```
T▶   D   0 V 0 → D      1 0
                   K    3 0
```
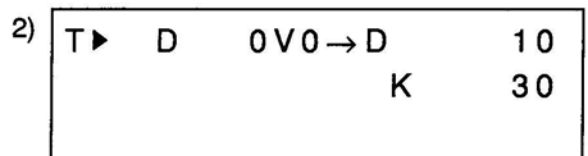

Operation of changing register values:

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

Operation

See page 5-4   Test   Decimal   Execute
               function   constant

                           Hexaecimal
                           constant
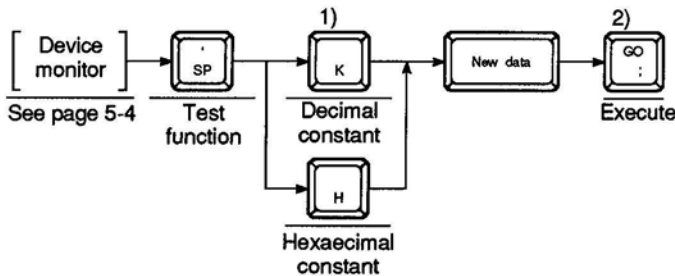
1) The device monitor function stops when the [K] or [H] key is pressed.

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.

PGU / Mode	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
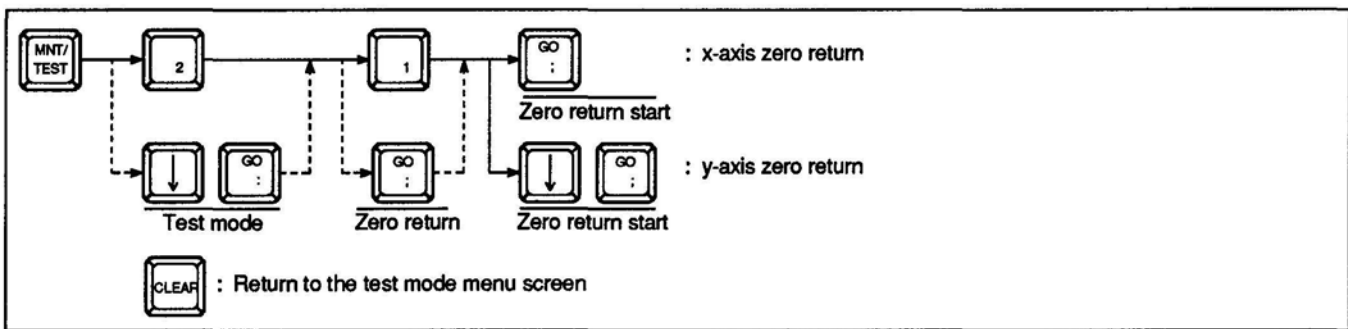
Operation example

Key operation   **Display example**

x-axis zero return

```
ZRN  (Zero Return)
■  x   0
   y   0
```


y-axis zero return

```
ZRN  (Zero Return)
   x   0
■  y   0
```
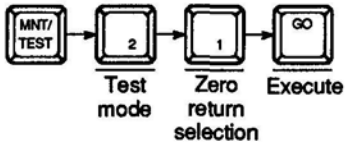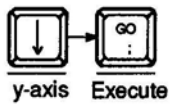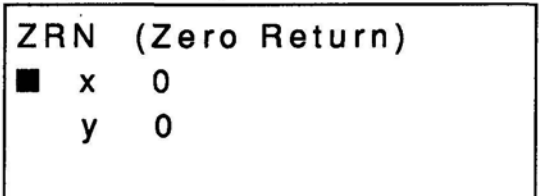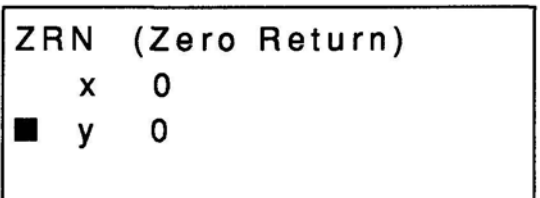
- The x and y current values are displayed during zero return. (The units of the current value is determined by the setting of parameter #0.)

- 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.

  [Oy/N ■7] : Emergency stop during the x-axis zero return

  [Y ■3] : 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
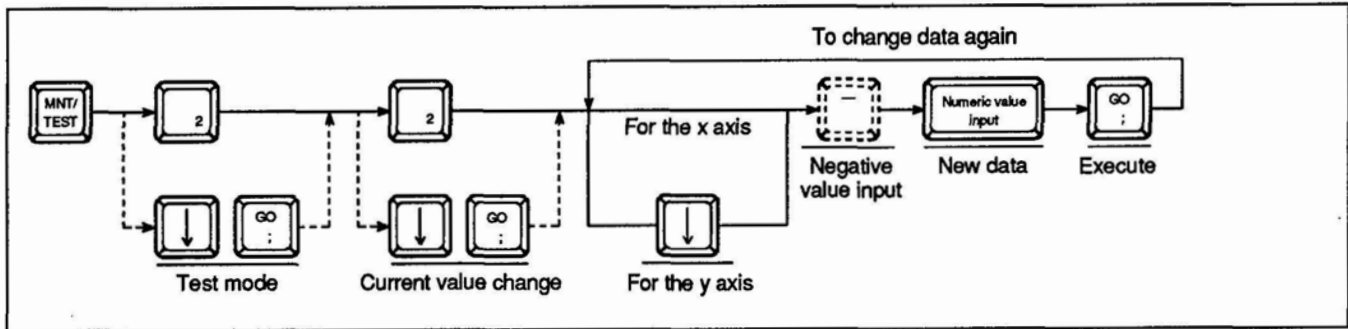
Operation example   To change x-axis current value 2000 to 4000 and y-axis current value -1000 to -2000:

Key operation

Test   Present
mode   value
        change 1)
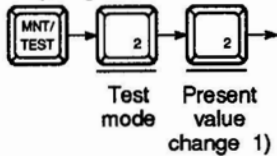
Pressing the [GO] key will stop the monitor.

Display example

1)
```
CVR (x, y change)
■  x 2000
   y-1000
```


New data 4000   Execute 2)

2)
```
CVR (x, y change)
■  x 4000
   y-1000
```


y-axis   New data -2000   Execute 3)
selection

3)
```
CVR (x, y change)
   x 4000
■  y-2000
```
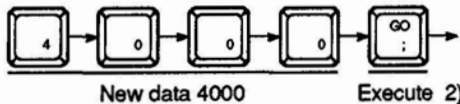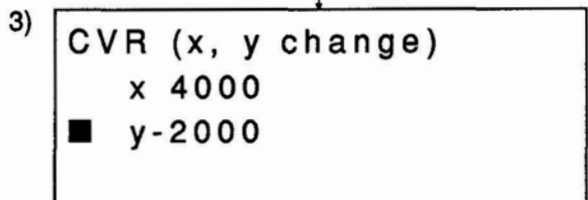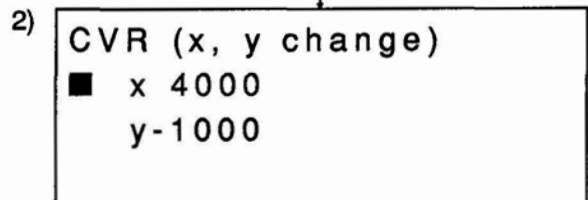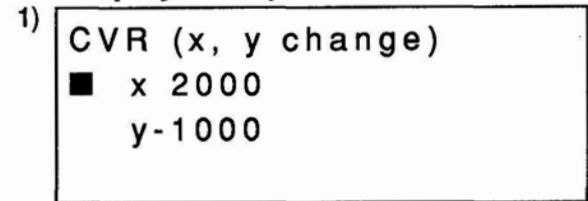
- The units of the current value being monitored on the current value change screen are determined by setting parameter #0's units to mechanical units (mm, inch, deg) or motor units (PLS).
  The same applies to the new data being entered.

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

MNT/TEST	Test mode
2	Fixed-rate feed
3	Feed axis designation *1
1 to 4	Feed axis designation
Feed quantity	For one axis
GO	Start

*1 : 1. x axis (mechanical unit)　3. x axis (pulse unit)
　　2. y axis (mechanical unit)　4. y axis (pulse unit)
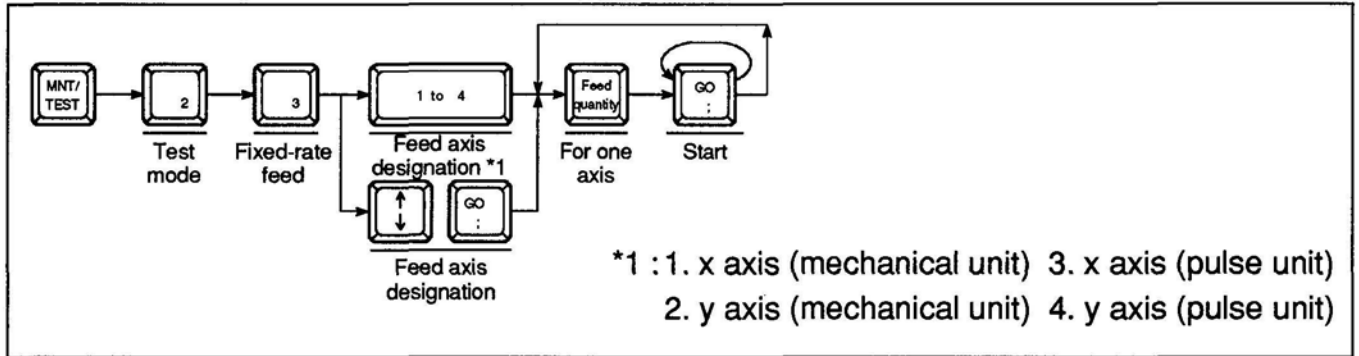
Operation example　　To execute the x-axis fixed-rate feed by giving 100 pulses on the x axis:

Key operation

Test mode　Fixed-rate feed　2 axes　　x-axis feed quantity

Data setting 1)

Start　　Restart

Display example

1)
```
x-ax  pulse feed
x    0
Feed Quantity
x=       100
```
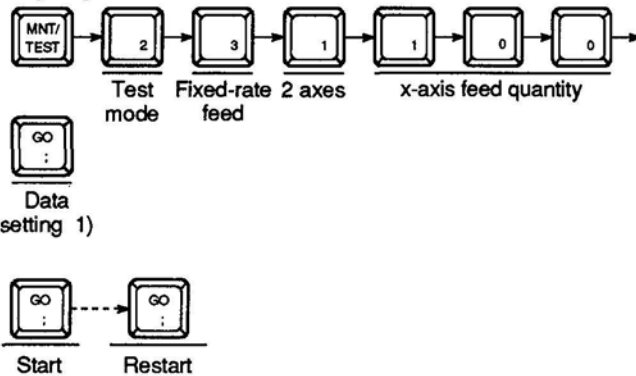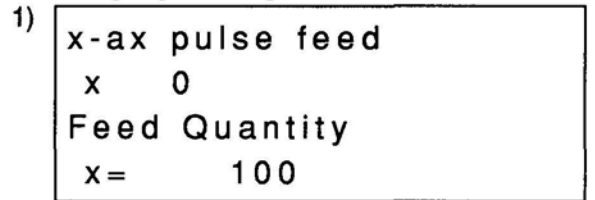
- About the mechanical units
  When fixed-rate feed is executed in mechanical units, the feed quantity is decided by the settings of parameters #1 (pulse meter) and #2 (movement rate).

5.3.6   JOG operation

Pulses are output while the operation key is being pressed.

Basic operation
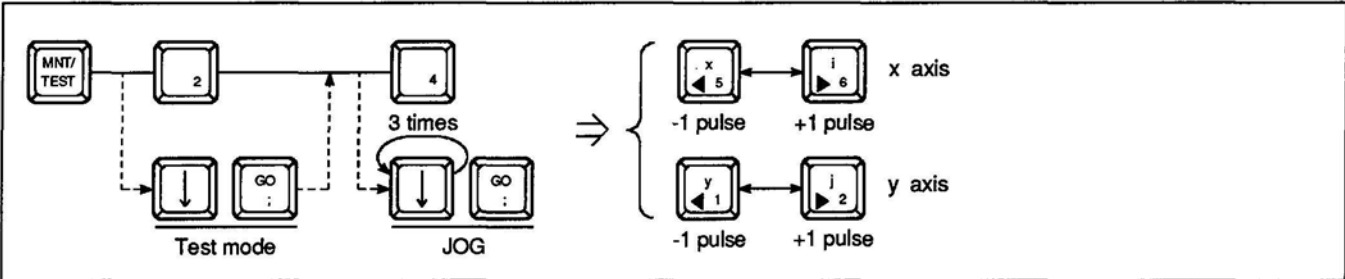
- Pressing and holding the [◀] or [▶] key for 0.2 second or less will output 1 pulse. Pressing and holding the key for 0.2 second or over will output pulses consecutively. Releasing the key will cause the JOG operation to decelerate and stop.

- 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

```
JOG
  x    0
  y    0
```
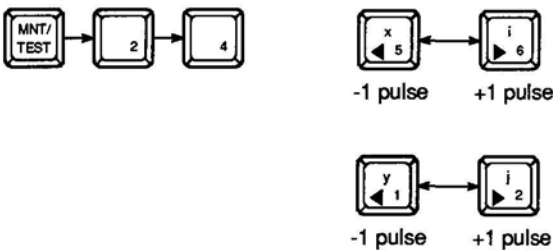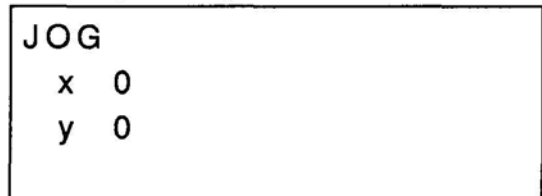
5.3.7   Teaching

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

Basic operation

CLEAR : Return to the monitor mode setting screen
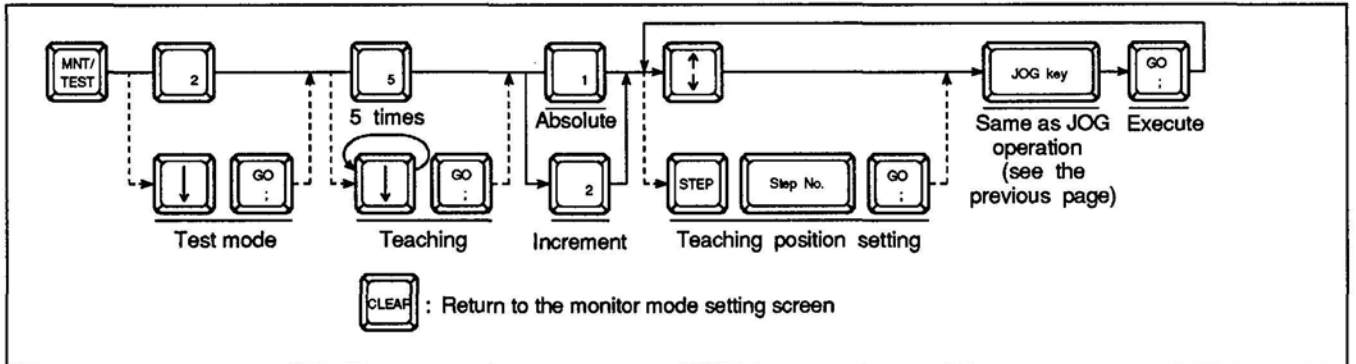
Operation example

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

Key operation

Test mode   Teaching 1)

Increment   Step 10 read

JOG operation 2)   Setting change

Step 11 read   JOG operation 3)   Setting change
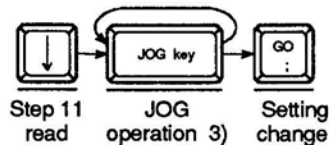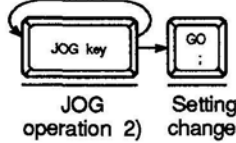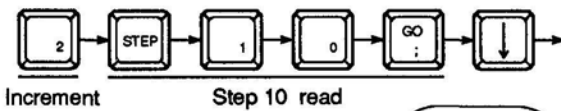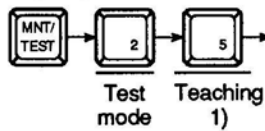
Move the cursor to the positioning value for teaching and press the JOG key. (see the previous page) The cursor will be highlighted during the JOG operation.

Display example

1)
```
Teaching
■1. Absolute
  2. Increment
```

2)
```
T     S10        N1
cod00 (DRV)
▷        x          123
     y200
```

3)
```
T     S12        N1
cod00 (DRV)
     x5742
     y          234
```
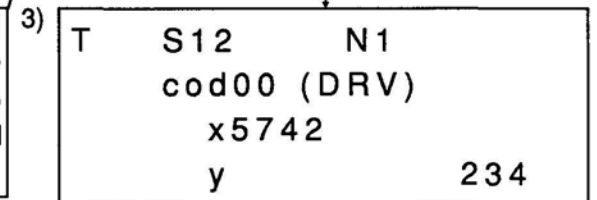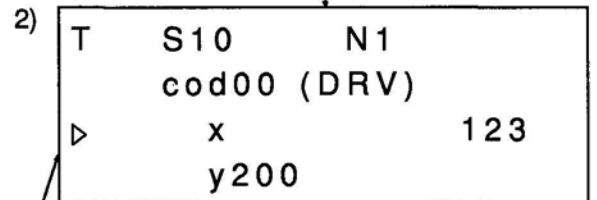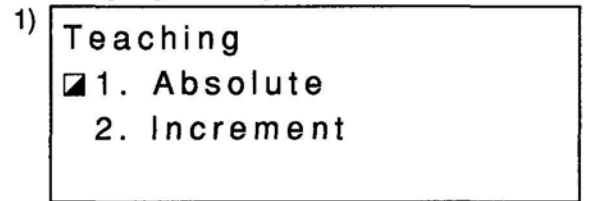
About absolute (ABS) and incremental (INC) addresses:

• 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.

Current value 2000

Absolute
Pulse calculation is made based on current value 2000.

Incremental
Pulse calculation is made based on the current value as 0.
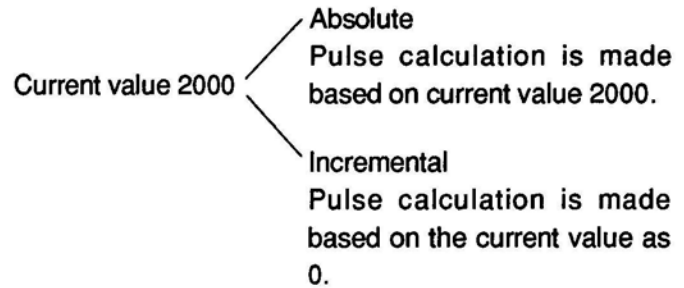
5.4　Error Monitor (Error Reset)

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.

PGU　Mode	PGU State		PGM Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	×	O	O
Offline mode	× *1	× *1	× *1	× *1

*1　Test mode cannot be selected in offline mode.

5.4.2　Error monitor

Execute the error monitor as follows.

Basic operation

Error monitor

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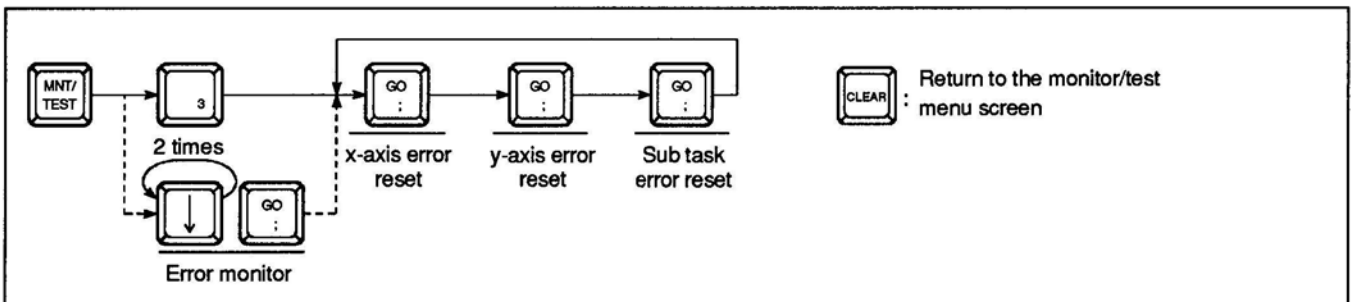
Error monitor display example

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

Error code ⎯⎯⎯⎯⎯⎯　　　　　⎯ Error occurrence step

- 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 start-up

- Connect the TP to the PGU and turn ON the power. (see Chapter 3 System Start-Up)

Initial screen

- The initial screen is displayed for about 2 seconds.

Mode setting screen

- Select online/offline mode.

[PARA/OTHER]

- Pressing the [PARA/OTHER] key will display the Parameter/Other mode setting screen.

```
Parameter / Other
  1.Parameter
  2.Other
                     Select
```

- Press the [1] key to select parameter mode. (The [GO] key can also be used.)

[1] →

```
0     Unit
x     1 (Motor)
y     1 (Motor)
```

- Control spec. parameters
  Parameters required for positioning such as the movement quantity unit and speed are set.

[1]

```
Parameter
☑ 1. Control Spec.
  2. I/O Spec.
  3  System setup
```

[2] →

```
☑ 1. Prog Desig
  2. RDY Output
  3. M-code
  4. Manual Pulser
```

- I/O spec. parameters
  Used to assign PGU's general-purpose I/O to specific purposes such as program number designation and M code output.

```
┌─────────────┐
│ 1 0 0  M e m  C a p a c i t y
│ →  0  ( 7 8 0 0  S t e p s )
│
└─────────────┘
```

- 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.

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

*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

[PARA] → [1] → [1] → [STEP] → [Parameter NO.] → [Numeric value input] → [GO]

Parameter selection

Control spec. parameters → [2] → See below

I/O spec. parameters → [3]

System setup parameters

Parameter No. designation   Parameter data   Parameter write

[↑] : Previous parameter/line

[↓] : Next parameter/line
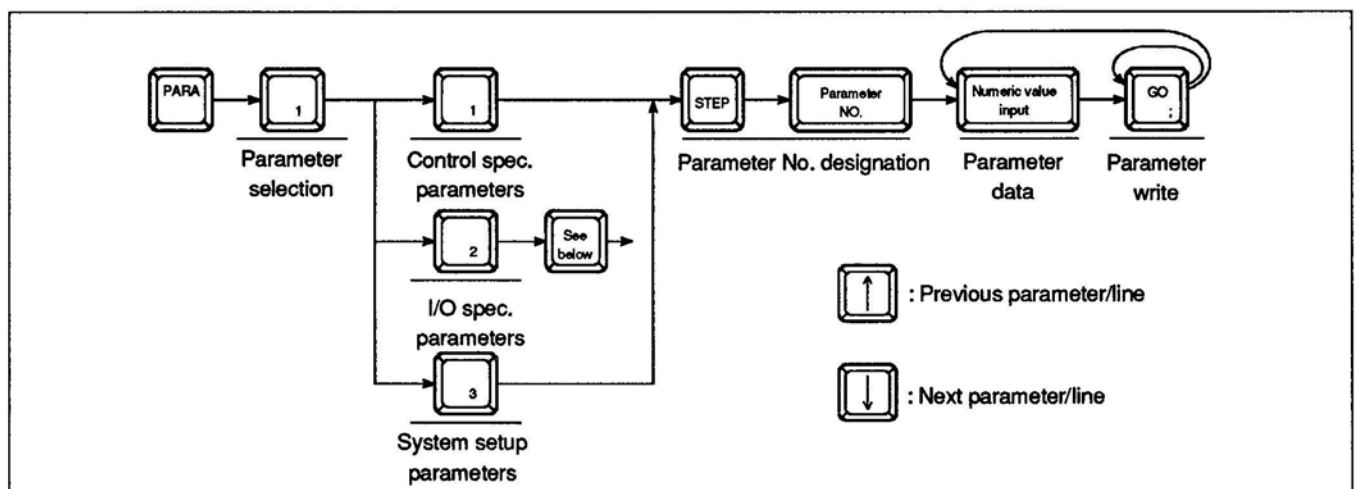
- I/O spec. parameters

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

Key operation   **Display example**

Parameter   I/O spec.
selection   parameter

Selection from the   Parameter   Parameter
classified list   data   write

```
☑1.  Prog Desig
 2.  RDY Output
 3.  M-code
 4.  Manual Pulser
 5.  Spare
 6.  ABS I/F
 7.  Single Run
 8.  F/R/Z Spec
 9.  Spare
```
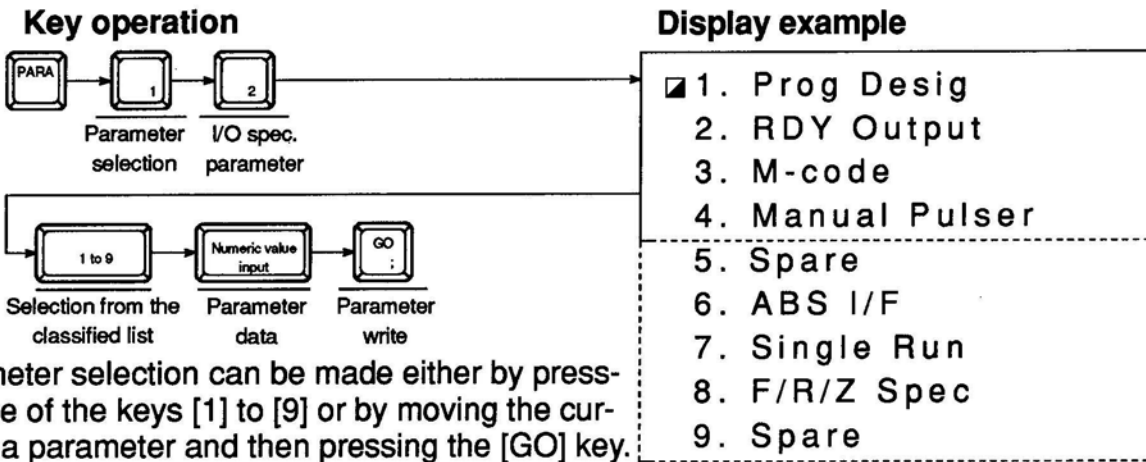
Parameter selection can be made either by pressing one of the keys [1] to [9] or by moving the cursor to a parameter and then pressing the [GO] key.

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

Key operation   **Display example**

Parameter Control spec. Parameter
selection   parameter   #1 1)

1)
```
1   Pulse rate
x        0
y        0
```


Parameter   #1   new data   Execute 2)
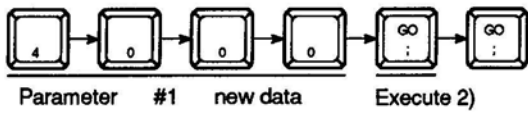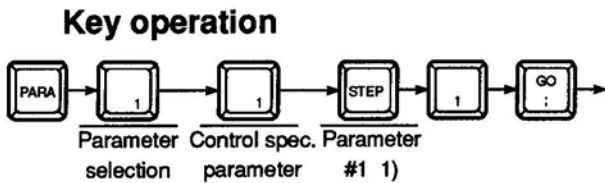
Input new data and press the [GO] key. The parameter setting will be changed and the next parameter will be displayed. To confirm that the setting is correctly changed, press the [↑] key to display the previous parameter.

2)
```
1   Pulse rate
x     4000
y        0
```


Parameter   #2   new data   Execute 3)
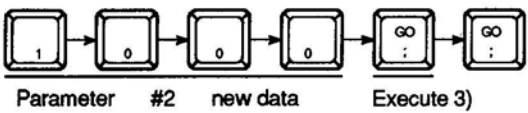
To pass a parameter without changing its setting, press the [↓] or [GO] key to move to the next parameter.

3)
```
2   Movement rate
x     1000
y        0
```
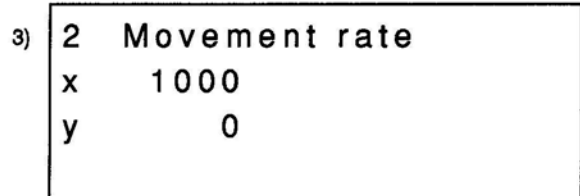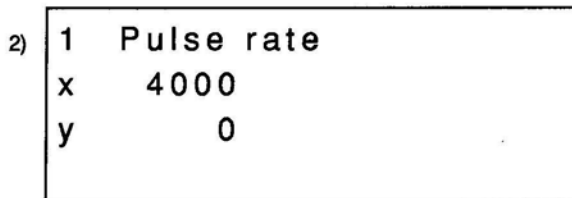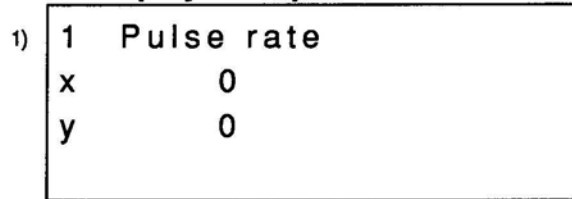
Precautions to be observed when changing the system:

- 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.

1) To change system setup parameter #100 "0" to "1" when #101 file register size is set to "None".
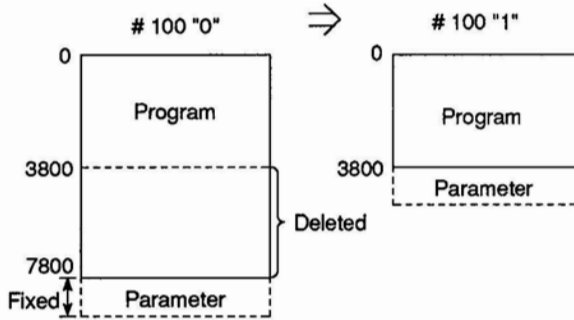
Changing #100 setting to "1" will delete the program stored in the area after the 3800th step.

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.]

2) To change system setup parameter #100 "0" to "1" when #101 file register size is set to 3000.
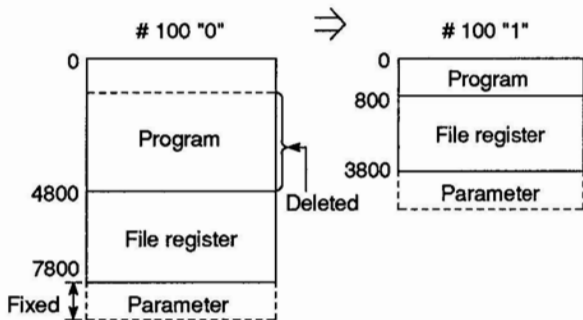
If #101 file register setting has been made, 4000 steps of program area will be deleted.

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

3) #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.

4) 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)   7 - 1

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.

System start-up	• Connect the TP to the PGU and turn ON the power. (see Chapter 3 System Start-Up)
Initial screen	• The initial screen is displayed for about 2 seconds.
Mode setting screen	• Select online mode.
[PARA OTHER]	• Pressing the [PARA/OTHER] key will display the Parameter/Other mode setting screen.

Parameter/Other
☑ 1. Parameter
  2. Other
                    Select
	• Press the [2] key to select OTHER mode. (The [↓] and [GO] keys can also be used.)

```
              ☐ 1. OFFline mode
                2. Program check
                3. Para check
                4. Mem. Cassette
              ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄
                5. Initialize
                6. Latch clear
                7. Buzzer adj
```

• Offline change (page 7-2)
  Switches to offline mode.

• Program check (page 7-3)
  Checks a program.

• Parameter check (page 7-4)
  Checks parameter setting.

• Transfer to/from memory cassette (page 7-5)
  Reads, writes, and verifies programs and parameters between the PGU's RAM and the memory cassette.

• User area initialization (page 7-8)
  Initializes programs and parameters.

• Latch clear (page 7-9)
  Clears all devices in the latch range.
  (M100 to M511, D100 to D3999, and file register)

• Buzzer volume adjustment (page 7-9)
  Adjusts the TP's buzzer volume.

Operation procedures for the program check, parameter check, user area initialization, and buzzer volume adjustment applied in online OTHER mode are the same as those applied in offline OTHER mode.

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.

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

Basic operation

```
[OTHER]  →  [2]  →  [1]  →  [GO :]
           OTHER mode  Offine change  Execute

[CLEAR] : Return to OTHER mode menu
          setting screen
```

Offline change screen

```
OFFline mode

Yes [GO]      No [CLR]
```
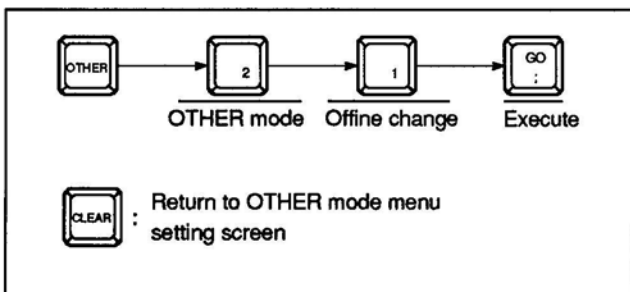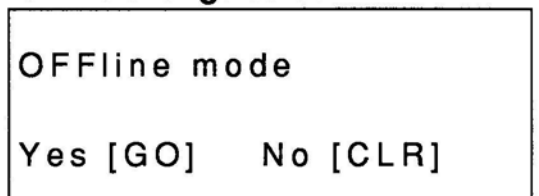
• Pressing the [GO] key switches to offline mode.

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.

PGU / Mode	PGU State		PGU Memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	O	O	O

Basic operation

| | Return to OTHER mode menu |
| CLEAR | : setting screen |

OTHER mode   Program check   Execute
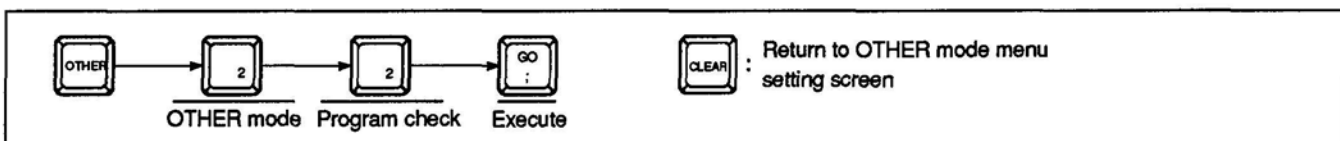
Display example

```
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.

```
Program check
O10    N1023  ──────────────  Error occurrence position
1600   P26 Dual
```

Error occurrence step　　　　Error type
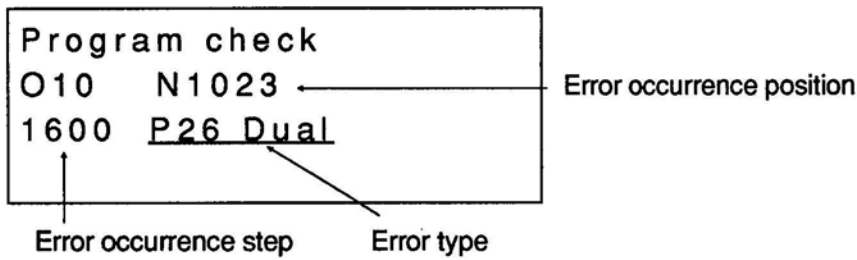
- If an error is found and the program check has stopped, the program check in offline mode can be continued by pressing the [GO] key.

- 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.

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

Basic operation

OTHER mode　　Parameter check　　Execute　　If 2 or more parameter errors exist (offline only)　　or

CLEAR : Return to OTHER mode menu setting screen

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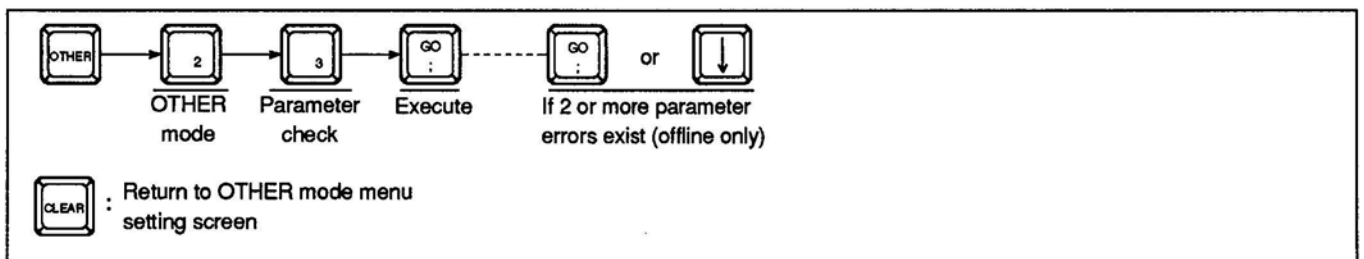
Parameter check Executing
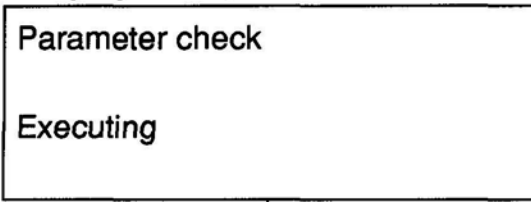
- Press the [3] key to select the parameter check, and then, press the [GO] key to start checking the parameters.

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

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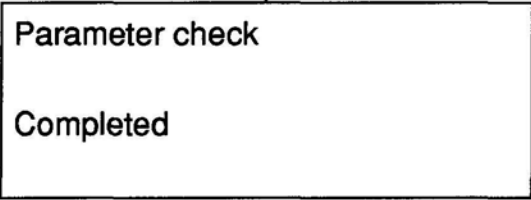
- If the parameter check is completed without error, the "Completed" message will be displayed.

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

Parameter error

Parameter check System param   #04 →   255
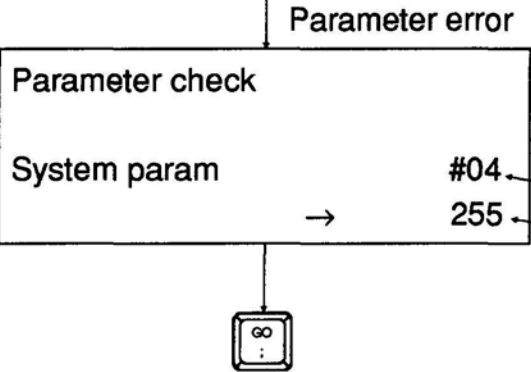
- If a parameter error is found, the error parameter number and the parameter set value will be displayed.
  — Parameter number
  — Set value

- 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.

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

OTHER → 2 → 4 → 1 → GO : GMRAM → EEPROM

OTHER Transfer to/from
mode   memory cassete

CLEAR : Return to OTHER mode menu
setting screen

2 → GO : GMRAM ← EEPROM

3 → GO : GMRAM : EEPROM (Verify)

Operation example

OTHER → 2 → 4
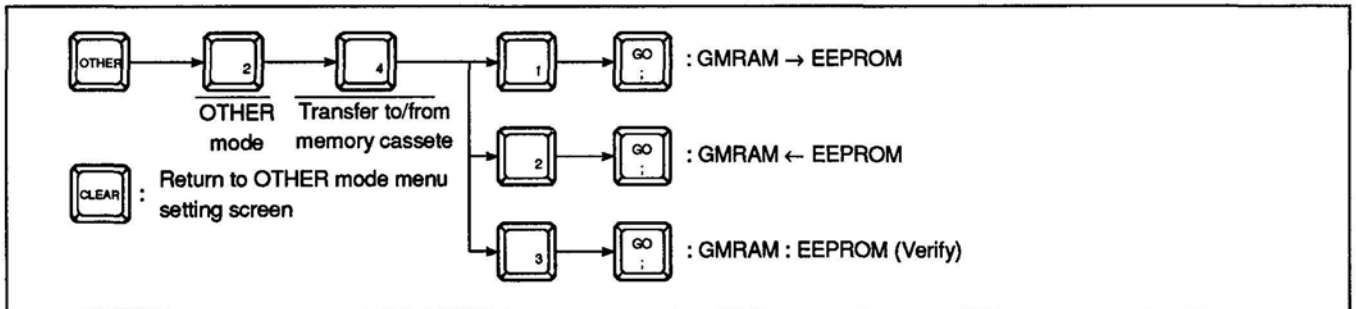
OTHER   Transfer to/from
mode   memory cassete
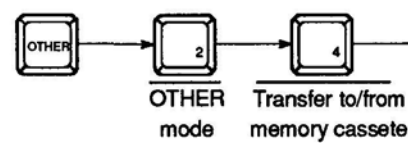
To remove and install
the EEPROM memory
cassette, be sure to
turn the power OFF.
(see page 3-4)

Display example

Data Transfer
☑ 1. G M R A M → E E P R O M
 2. G M R A M ← E E P R O M
 3. G M R A M : E E P R O M

1

GMRAME →
EEPROM

Data Transfer
G M R A M → E E P R O M
Yes [GO]   No [CLR]
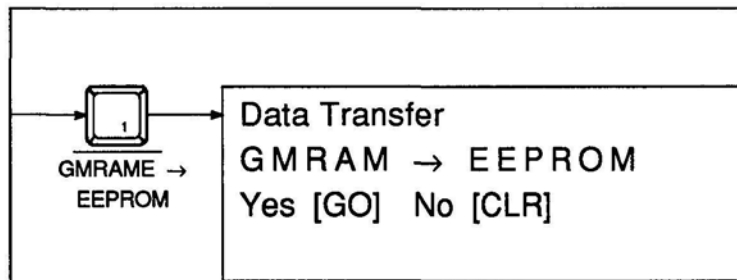
GMRAM → EEPROM

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

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 → E E P R O M*" message.
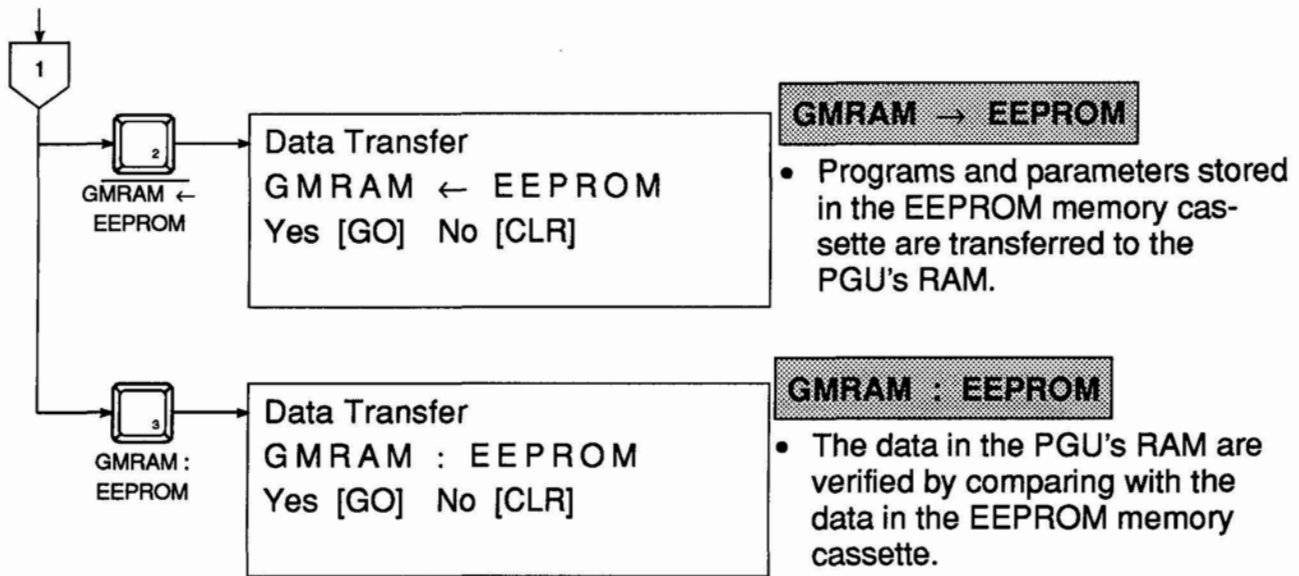
1

```
Data Transfer
G M R A M  ←  E E P R O M
Yes  [GO]   No  [CLR]
```

GMRAM ← EEPROM

GMRAM → EEPROM

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

```
Data Transfer
G M R A M  :  E E P R O M
Yes  [GO]   No  [CLR]
```

GMRAM : EEPROM

GMRAM : EEPROM

- The data in the PGU's RAM are verified by comparing with the data in the EEPROM memory cassette.

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 transfered 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.

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

| OTHER | → | 2 | → | 5 | → | 1 to 5 | → | GO : | | CLEAR : | Return to OTHER mode menu setting screen |
| | | OTHER mode | | User area initialization | | Initialization item selection | | Execute | | | |

Operation example

```
 OTHER
   │
   2      OTHER mode
   │
   5      User area initialization
   │
```

| ■ 1. Sys. parameter |
| 2. Parameter |
| 3. File reg. clear |
| 4. All default |
| 5. Program clear |

- **1**   • System parameter initialization Initializes #100 to #119.

- **2**   • Control spec. parameters and I/O spec. parameters. Initializes #0 to #67.

- **3**   • Initializes the file register area beginning with D4000 to 0. (Only applies when the file registers have been allocated)

- **4**   • Initializes the parameters, program area, and retentive memory (D100 to D3999 and M100 to M511) to the factory setting (default) values. (Retentive memory can be initialized only in online mode.)

- **5**   • NOPs are written to the whole program area. The same operation is made by pressing the [NOP][A][GO][GO] keys in write mode.

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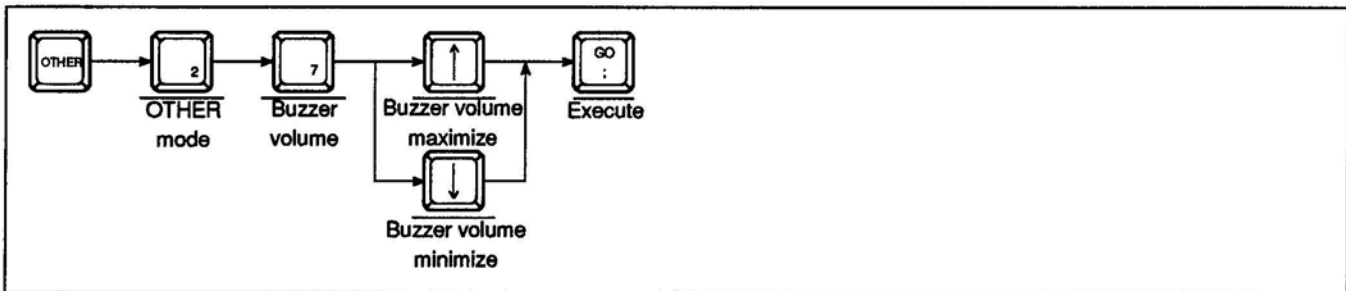
-   Pressing the [↑] or [↓] key will increase or
    decrease the buzzer volume, represented
    by the " ☐ " symbols.

Display example
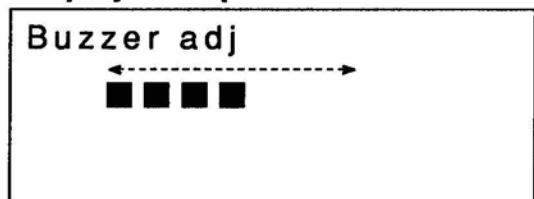
```
Buzzer adj
  ◄------------------►
  ■ ■ ■ ■
```

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.

System start-up	• Connect the TP to the PGU and turn ON the power. (see Chapter 3 System Start-Up)
Initial screen	• The initial screen is displayed for about 2 seconds.
Mode setting screen	• Select offline mode. • Pressing the [PARA/OTHER] key will display the Parameter/Other mode setting screen.

[PARA/OTHER]

Parameter/Other
☑ 1. Parameter
  2. Other
                Select

• Press the [2] key to select OTHER mode. (The [↓] and [GO] keys can also be used.)

[2]

☑ 1. ONline mode
  2. Program check
  3. Para check
  4. TP<−>GM
  5. Initialize
  6. File reg edit
  7. Buzzer adj

Operation procedures for the program check, parameter check, user area initialization, and buzzer volume adjustment applied in offline OTHER mode are the same as those applied in online OTHER mode.

[1] • Online change (page 8-2)
Switches to online mode.

[2] • Program check (page 7-3)
Checks a program.

[3] • Parameter check (page 7-4)
Checks parameter setting.

[4] • Batch program transfer (TP<−>GM) (page 8-3)
Programs and parameters are batch transferred between the PGU's memory (RAM or EEPROM cassette) and the TP's internal RAM.

[5] • User area initialization (page 7-8)
Initializes programs, parameters, and file register area.

[6] • File register data change (page 8-5)
Changes the file register data.

[7] • Buzzer volume adjustment (page 7-9)

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
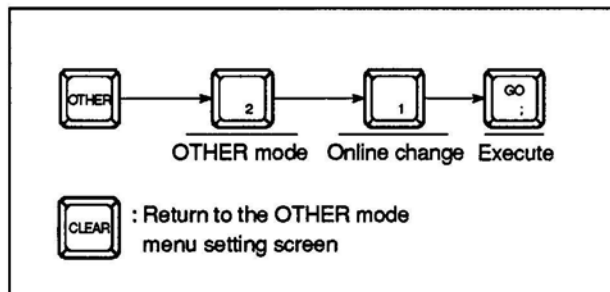
Online change screen

```
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.

PGU \\ Mode	PGU state		PGU memory	
	MANUAL	AUTO	RAM	EEPROM
Online mode	O	×	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

| OTHER | → | 2 (OTHER mode) | → | 4 (Batch transfer) | → | 1 | → | GO | : Write (TP → GM) |

→ | 2 | → | GO | : Read (TP ← GM)

→ | 3 | → | GO | : Verify (TP : GM)

CLEAR : Return to the OTHER mode menu setting screen

Operation example   **Display example**

OTHER → 2 (OTHER mode) → 4 (Batch transfer) →

```
TP<->GM
  1. Write (TP→GM)
  2. Read (TP←GM)
  3. Verify(TP : GM)
```

1 (TP → GM) →

```
TP<->GM
  1. Write (TP→GM)
Yes [GO]   No [CLR]
```
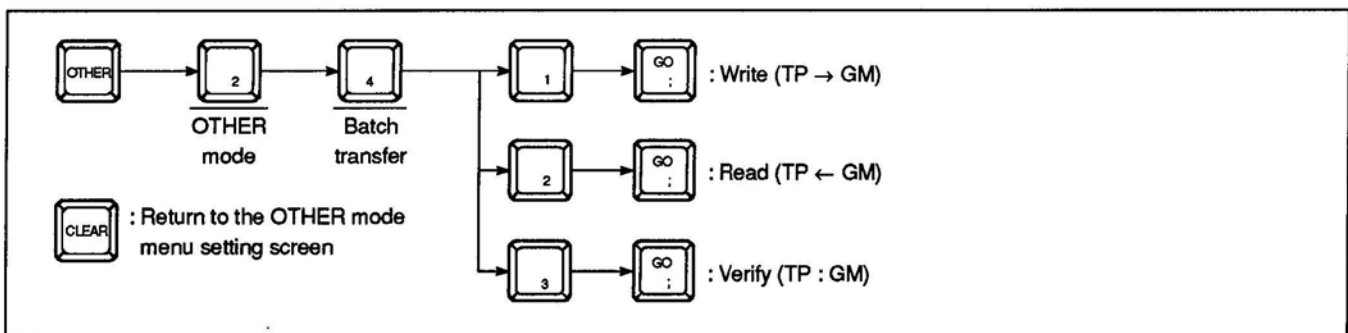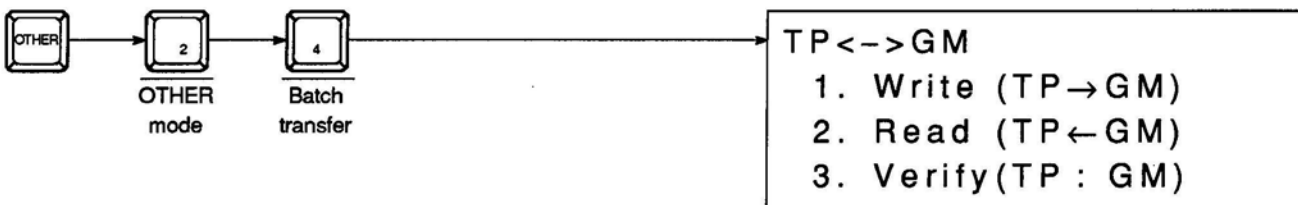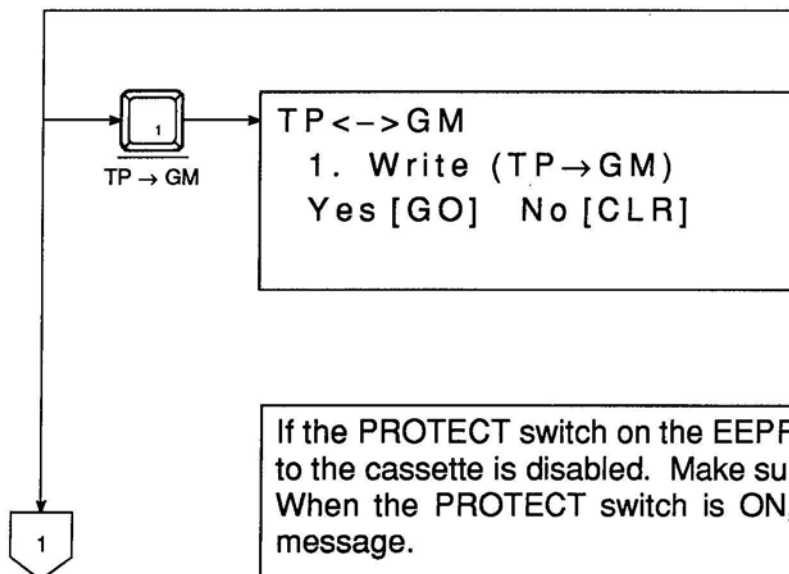
Write (TP → GM)

- 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.

```
TP<->GM
  2. Read    (TP←GM)
  Yes [GO]    No [CLR]
```

```
TP<->GM
  2. Verify   (TP : GM)
  Yes [GO]    No [CLR]
```
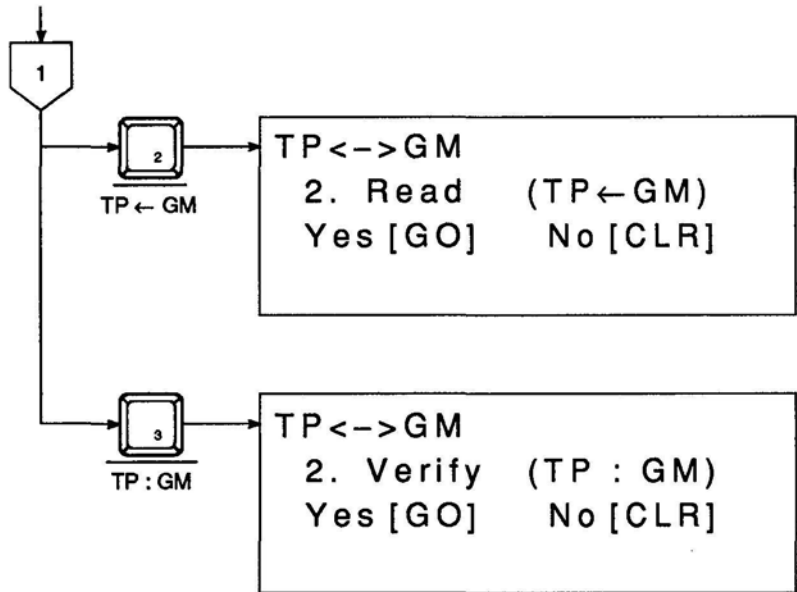
Read (TP ← GM)

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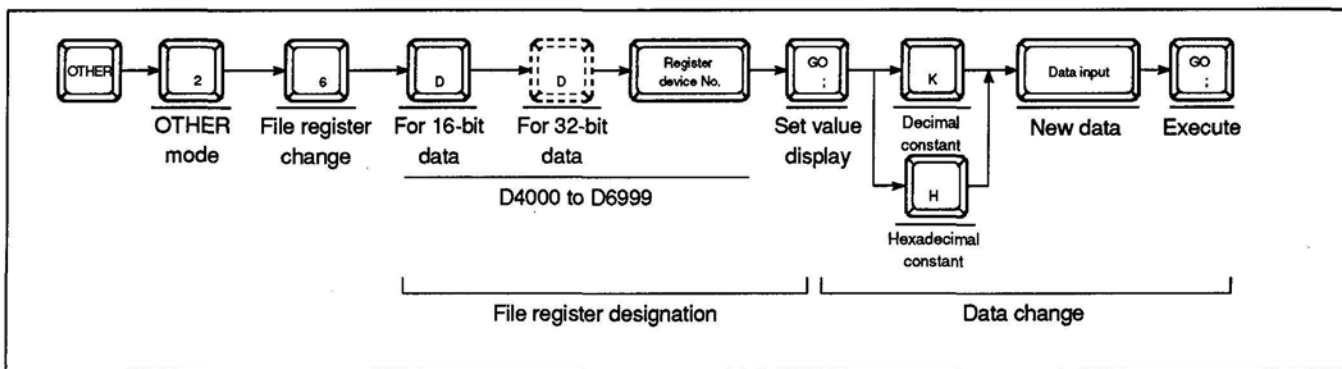
Operation example   To write K1000 to D4000 (16-bit data):

Key operation

Display example

1)
```
▶ D 4 0 0 0              K   0
```

2)
```
▶ D 4 0 0 0              K   1 0 0 0
```
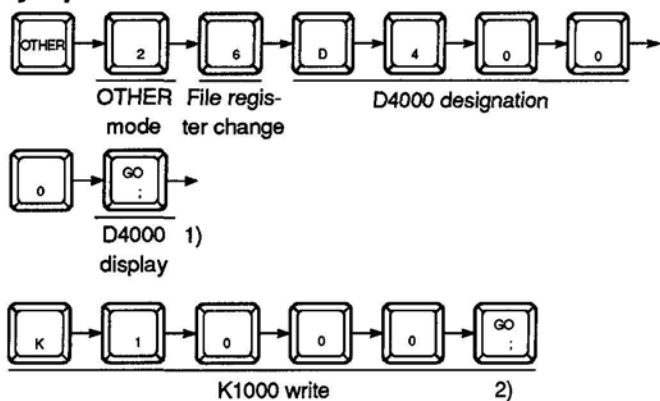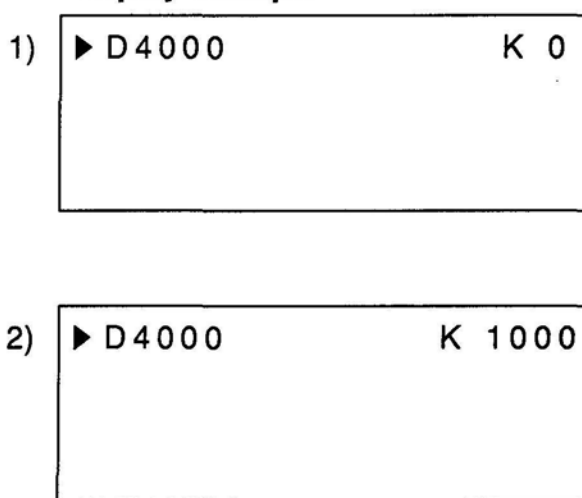
- To input the file register as 32-bit data, press the [D] key 2 times when designating the device number. The "D" symbol in the screen will change into a bold display.
    Ex. **D**5000
- Pressing the [HELP] key will switch the decimal display to/from the hexadecimal display.

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


```
┌──────────────────────────┐
│       Power ON           │
└──────────────────────────┘
            │───────────────────────────── [RST] + [GO]
            ▼
┌──────────────────────────┐
│     System screen        │        • Displayed for about 2
└──────────────────────────┘          seconds.
            │
            ▼
┌──────────────────────────┐
│ Select mode              │        • Online/offline mode se-
│ ■1. ONline               │          lection
│   2. OFFline             │
│                  Select  │
└──────────────────────────┘
```

```
        ┌─────────┐                              ┌─────────┐
        │  1   │ Online                          │  2   │ Offline
        └─────────┘                              └─────────┘
            │                                        │
            ▼                                        ▼
┌──────────────────────┐                  ┌──────────────────────┐
│ [ONline mode]        │                  │ [OFFline mode]       │
│ Select  Mode  or     │                  │ Select  Mode  or     │
│         Function     │                  │         Function     │
│ (MEM  7800steps)     │                  │ (MEM  7800steps)     │
└──────────────────────┘                  └──────────────────────┘
```

ONline mode:

Key	Function
RD	: Read (page 4-3)
WR	: Write (page 4-13)
INS	: Insert (page 4-26)
DEL	: Delete (page 4-30)
MNT/TEST	: Monitor (page 5-2) : Test (page 5-8)
PARA OTHER	: Parameter (page 6-1) : Other (page 7-1)

OFFline mode:

Key	Function
RD	: Read (page 4-3)
WR	: Write (page 4-13)
INS	: Insert (page 4-26)
DEL	: Delete (page 4-30)
PARA OTHER	: Parameter (page 6-1) : Other (page 8-1)

The monitor/test functions cannot be selected.

Reading a program (online/offline)

Reading a program/line number

This can be omitted.

RD → O/N (2-axis program) → Program No. → (SP → Line No.) → GO ; (Execute) → ↑↓ (Line scroll)

Ox/N (x-axis program)

Oy/N (y-axis program)

Designating a program/line number — Execute — Line scroll

Reading a step number

STEP → Step No. → GO ; (Execute) → ↑↓ (Line scroll)

Designating a step number — Execute — Line scroll

Reading a code number

cod → Code No. → GO ; (Execute) → GO ; (Repeat search) → ↑↓ (Line scroll)

HELP → [↑↓] → GO ;

Designating a code number

Code number list

Reading an M code number

m → M code No. → GO ; (Execute) → GO ; (Repeat search) → ↑↓ (Line scroll)

Designating an M code number — Execute — Repeat search — Line scroll

Reading a basic instruction

Instruction word → Device symbol → Device No. → GO ; (Execute) → GO ; (Repeat search) → ↑↓ (Line scroll)

Designating a device

To designate an instruction word only

Execute — Repeat search — Line scroll

Reading an application instruction

FNC → FNC No. → GO ; (Execute) → GO ; (Repeat search) → ↑↓ (Line scroll)

HELP → [↑↓] → GO ;

Designating an FNC number

FNC number list

Execute — Repeat search — Line scroll

Reading a device

SP → Device symbol → Device No. → GO ; (Execute) → GO ; (Repeat search)

Designating a device — Execute — Repeat search

CLEAR Cancels key inputs

Designated program is read.

To the next page 1

From the previous page

Writing and editing a program (online/offline)

Batch writing NOPs (program clear)

Writing a program/line number

Writing a code (cod) instruction

Writing an M code (After mode)

Writing a basic instruction

Writing an application instruction

* Inputting a constant K, H

* Index-qualified device: D□□Z□ etc.

* Digit designation device: K□X□□□ etc.

From reading (page APP-2)

⬡ 1   ⬡ 2

Inserting a program (online/offline)

[INS] ────────────► Move the cursor to the inserting position. Follow the proce-
dure of usual writing function to write a program.

Deleting a program

[INS] ──► [DEL] ──┬──► [NOP] ──► [GO :] ──────────────────────────────►
                  │   Batch deleting NOPs
                  │
Deleting an instruction ──► [GO :]   Deleting an instruction word at the cursor position ──────►
                  │
Deleting a designated ──► [STEP] ──► [Step No.] ──► [STEP] ──► [Step No.] ──► [GO :] ──►
range
                       Delete range start step   End step   Execute

Monitor & Test (online)

[MNT/ TEST] ──┬──► Monitor mode [1] ──► Program monitor [1]   [↑↓] : Program number switching
              │
              │   Device monitor [2] ──► [Device symbol] ──► [Device No.] ──► [↓]
              │   Designating a device   Consecutive devices
              │
              │   [' SP] ──┬──► [SET] Forced ON
              │   Test   │   ⎫ Bit device
              │   └──► [RST] Forced OFF   ⎭
              │
              │   ──► [K] ──► [Numeric value] ⎫
              │   ⎬ Changing a data register current value
              │   ──► [H] ──► [Numeric value] ⎭
              │
              ▼
            ⬡ 3

3

Monitor/Test (continued)

Test mode

2

1. Zero return (ZRN)

1 → **GO ;**
x-axis start

↓ → **GO ;**
y-axis start

2. Current value change (CVR)

2

For x-axis

↓
For y-axis

→ Numeric value input → **GO ;**
   New value   Execute

3. Fixed-rate feed (FEED)

3 → 1 to 4 → Feed quantity → **GO ;**

Selecting a feed unit
Options are shown
to the right.

Fixed-rate
feed quantity

Execute

{ 1. x-axis (mechanical unit)
  2. y-axis (mechanical unit)
  3. x-axis (pulse unit)
  4. y-axis (pulse unit) }

4. JOG operation

4

◄x   **i►**   x-axis
−1   +1

◄y   **j►**   y-axis
−1   +1

Each time the key is pressed for less than
0.2 second, one pulse is output.
When the key is held pressed for 0.2
second or more, pulses are continuously
output.

5. Teaching

5

1
Absolute

2
Incremental (Relative)

→ **↕** → JOG key → **GO ;**

Selecting a
teaching position

Same as the
JOG procedure

Execute

Error reset

3 → **GO ;** → **GO ;** → **GO ;**
x-axis reset   y-axis reset   Sub task reset

Parameter

PARA → **1** → **1** → Numeric value → **GO ;**
  Selecting   Control spec.   Parameter data   Execute
  parameter

2
I/O spec.

3
System setup

STEP : Reading a parameter number

↑ : Previous parameter number

↓ : Line scroll

OTHER mode (online)

OTHER mode

[OTHER] → [2]

1. Offline change → [1] → [GO :] Execute

2. Program check → [2] Error code display

3. Parameter check → [3] Error location display

4. Transfer to/from memory cassette → [4] → [1 to 2] Transfer direction → [GO :] Execute ----- { 1. Internal RAM to memory cassette
2. Memory cassette to internal RAM }

5. User area initialization → [5] → [1 to 5] → [GO :] Execute ----- { 1. System parameter initialization
2. Control spec. parameter and I/O spec. parameter initialization
3. File register initialization
4. Parameter, program area, and retentive memory initialization
5. Batch NOP writing }

6. Latch clear → [6] → [GO :] Execute

7. Buzzer volume adjustment → [7]   [↓] : Buzzer volume minimize   [↑] : Buzzer volume maximize

OTHER mode (offline)

OTHER mode

[OTHER] → [2]

1. Offline change → [1] → [GO :] Execute

2. Program check → [2] Error location and type display

3. Parameter check → [3] Error location display

4. Batch program transfer → [4] → [1 to 3] Selecting a function → [GO :] Execute ----- { 1. Write (TP → GM)
2. Read (TP ← GM)
3. Verify (TP ↔ GM) }

5. User area initialization → [5]

6. File register data change → [6] → [D] → [Register device No.] D4000 to D6999 → [GO :] Designating a D register   To change data → [K] Decimal constant / [H] Hexadecimal constant → [Data input] Inputting new data → [GO :] Execute

7. Buzzer volume adjustment → [7]   [↓] : Buzzer volume minimize   [↑] : Buzzer volume maximize

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

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

2. Setting for Automatic Mode Teaching

When useing 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;      ←Insert it after the line for declaration of O100.
N1   .....
N2   .....           Conventional subtask program
N3   m102;
```

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

```
N0   O100,N0;
N0   SET M9161;      ←Insert it after the line for declaration of O100.
N1   P0;
N2   .....
N3   .....           Conventional subtask program
N4   JMP(FNC04) P0;
N5   m102;
```

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);
```
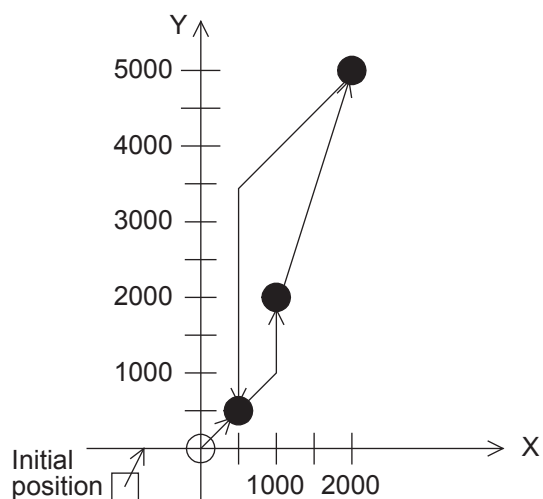
1) Write a program to the positioning unit. Select the automatic mode.

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;
```
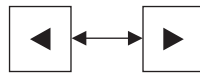
◄ ←→ ►   : Perform jog operation, and advance the program to the desired position.

GO
:   : 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
```

◄ ←→ ►

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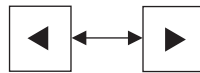
11) Issue a start command. Start execution from the command just after the teaching operation is complete.

```
T  O0      N3
   cod29 (SETR)

   x  +  1393

   y  +  2501;
```

NOP
4   : 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 [r ■3] or [Oy/N ■7] key. However, the teaching screen cannot be displayed even if the [CLEAR] or [STEP] 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
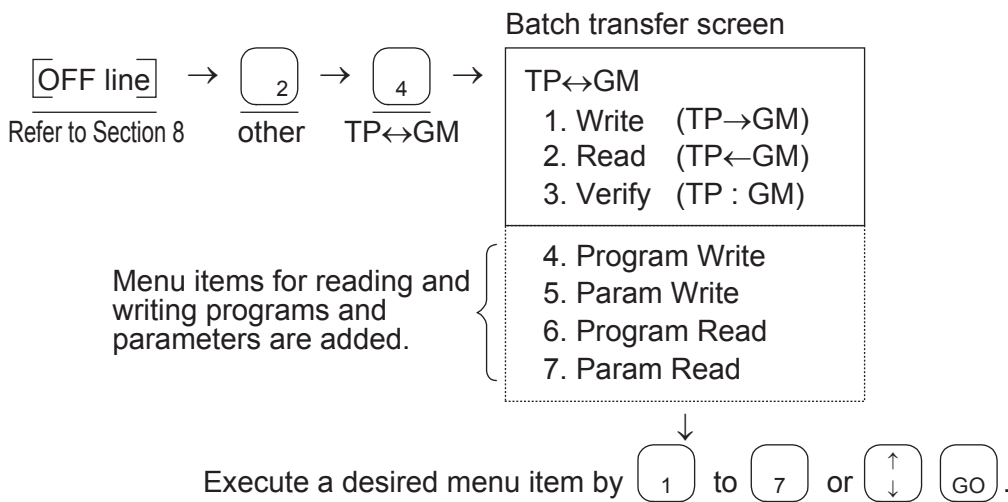• E-20TP-E : Ver. 1.20 and later

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.

Batch transfer screen

OFF line → ② → ④ →
Refer to Section 8   other   TP↔GM

TP↔GM
  1. Write   (TP→GM)
  2. Read   (TP←GM)
  3. Verify (TP : GM)

Menu items for reading and writing programs and parameters are added.
  4. Program Write
  5. Param Write
  6. Program Read
  7. Param Read

Execute a desired menu item by ① to ⑦ or ↑↓ GO .

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.
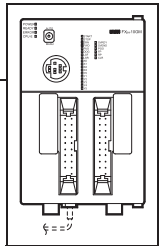
1. System configuration

The system configuration of FX2N-10GM/FX2N-20GM and peripherals is shown.
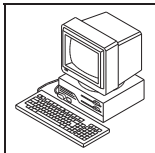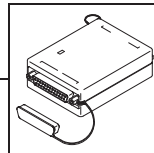
Programming tool
E-20TP-E
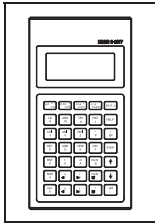
PGU
FX2N-10GM
FX2N-20GM

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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OPERATION NANUAL

E-20TP TEACHING PANEL

MITSUBISHI ELECTRIC CORPORATION