Panasonic®

PROGRAMMING TOOL OF POSITIONING MODULE

TEACHING UNIT Ⅱ

Manual

TEACHING UNIT Ⅱ Manual
ACG-M0077-1

Matsushita Electric Works, Ltd.

Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safe.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assure in these specifications.
-Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock..
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection might cause abnormal exothermic heat or smoke generation
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on.

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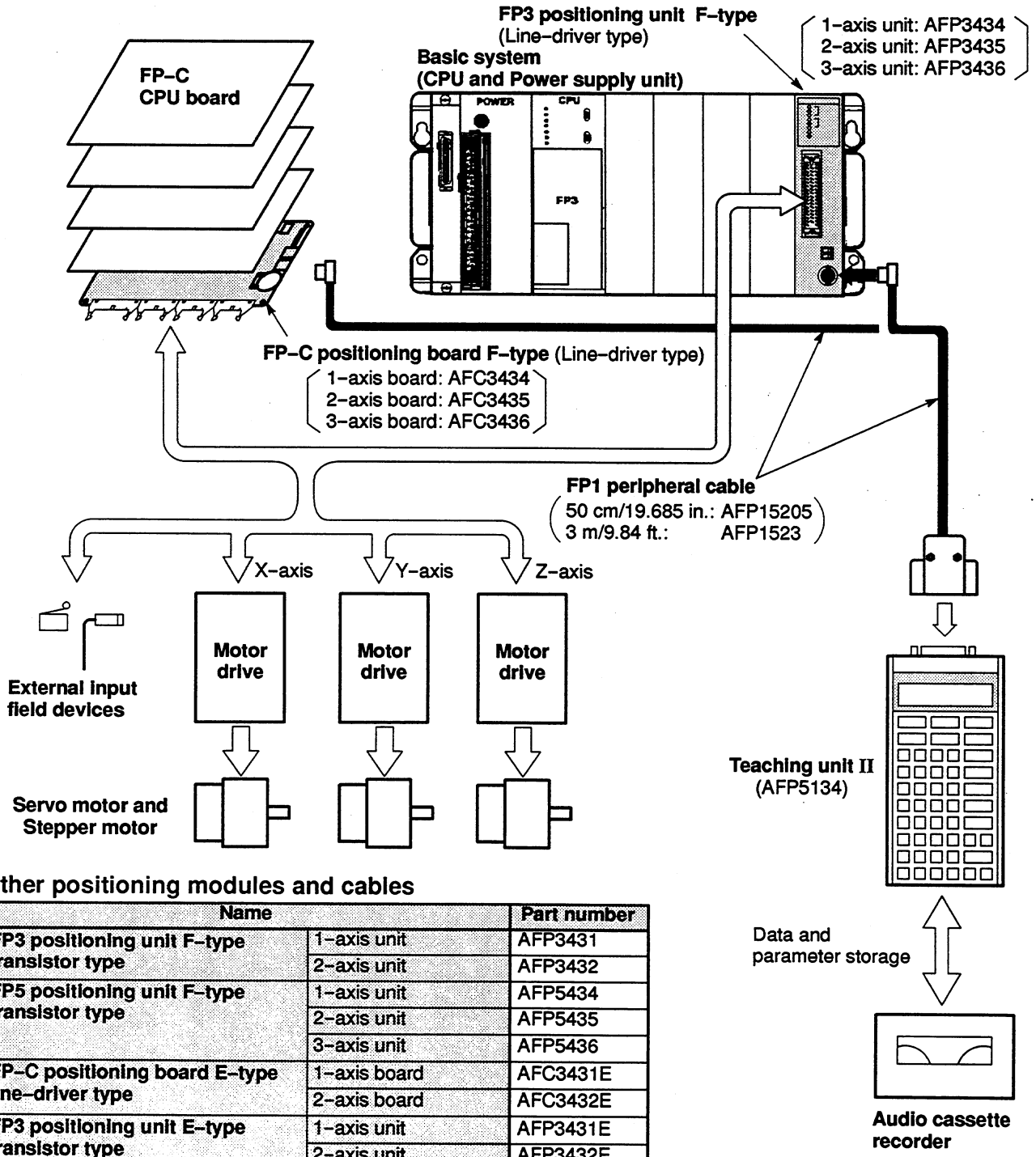
CHAPTER 1

SYSTEM CONFIGURATIONS AND FEATURES

1-1. System Configurations

The teaching unit II is connected to the positioning module E-/F-types. It is a controller that makes it easy to set parameters and positioning point data. JOG and homing operation can be done using keys on the teaching unit II, providing smooth support for test runs where the data is rewritten frequently.

■ Positioning system configurations (Example: FP3 positioning unit F-type and FP-C positioning board F-type)



Other positioning modules and cables

Name		Part number
FP3 positioning unit F-type transistor type	1-axis unit	AFP3431
	2-axis unit	AFP3432
FP5 positioning unit F-type transistor type	1-axis unit	AFP5434
	2-axis unit	AFP5435
	3-axis unit	AFP5436
FP-C positioning board E-type line-driver type	1-axis board	AFC3431E
	2-axis board	AFC3432E
FP3 positioning unit E-type transistor type	1-axis unit	AFP3431E
	2-axis unit	AFP3432E
FP peripheral cable Cable needed for connection between teaching unit II and the positioning units transistor type.	50 cm/19.685 in.	AFP5520
	3 m/9.84 ft.	AFP5523

1-2. Functions

■ Set and Edit

Parameters	• Write parameter data • Selection of parameter items
Positioning point data	• Write positioning point data • Selection of positioning point data number • Selection of positioning point data items
Teaching function	• Absolute motion span can be stored specifying data number after JOG operation.
Memory clear	• Clear parameters, positioning point data, and all memory (All memory is set to default values when cleared.)
Write EEPROM (*1)	• Write positioning point data and parameters to EEPROM in positioning module

■ Operations

JOG positioning (*1)	• JOB selection • Set start data number • Positioning operation (continuous) • Step operation (specific execution of one data at a time) • Current address change
JOG operation	• X- and Y-axis can be operated simultaneously. • Speed change
Hardware homing operation	• X-, Y-, and Z-axis can be started separately or simultaneously. (Interpolation: not available) • Current address change
Software homing operation	• X-, Y-, and Z-axis can be started separately or simultaneously. (Interpolation: not available) • Current address change
Positioning	• JOB selection • Set start data number • Positioning operation (continuous) • Step operation (specific execution of one data at a time) • Current address change
Test for quick-start operation	• Perform data check of program which executes quick-start operation. • No pulse output
Data storage function	• Parameters and positioning point data can be saved in or loaded from cassette tape.
RUN mode monitor	• Actual position monitor specified in RUN mode
Read version number (*1)	• Reads the version numbers for the positioning module E-type and teaching unit II

Note:

- (* 1): Items with this mark are only available on the positioning module E-type.

1-3. Specifications

1. General Specifications

Item	Descriptions
Ambient temperature	0 °C to 50 °C/32 °F to 122 °F
Storage temperature	-20 °C to +60 °C/-4 °F to +140 °F
Ambient humidity	30 % to 85 % RH (non-condensing)
Vibration resistance	10 Hz to 55 Hz, 1 cycle/min: double amplitude 0.75 mm/0.030 in., 10 min on 3 axes
Shock resistance	98 m/s^2, 4 times of 3 axes

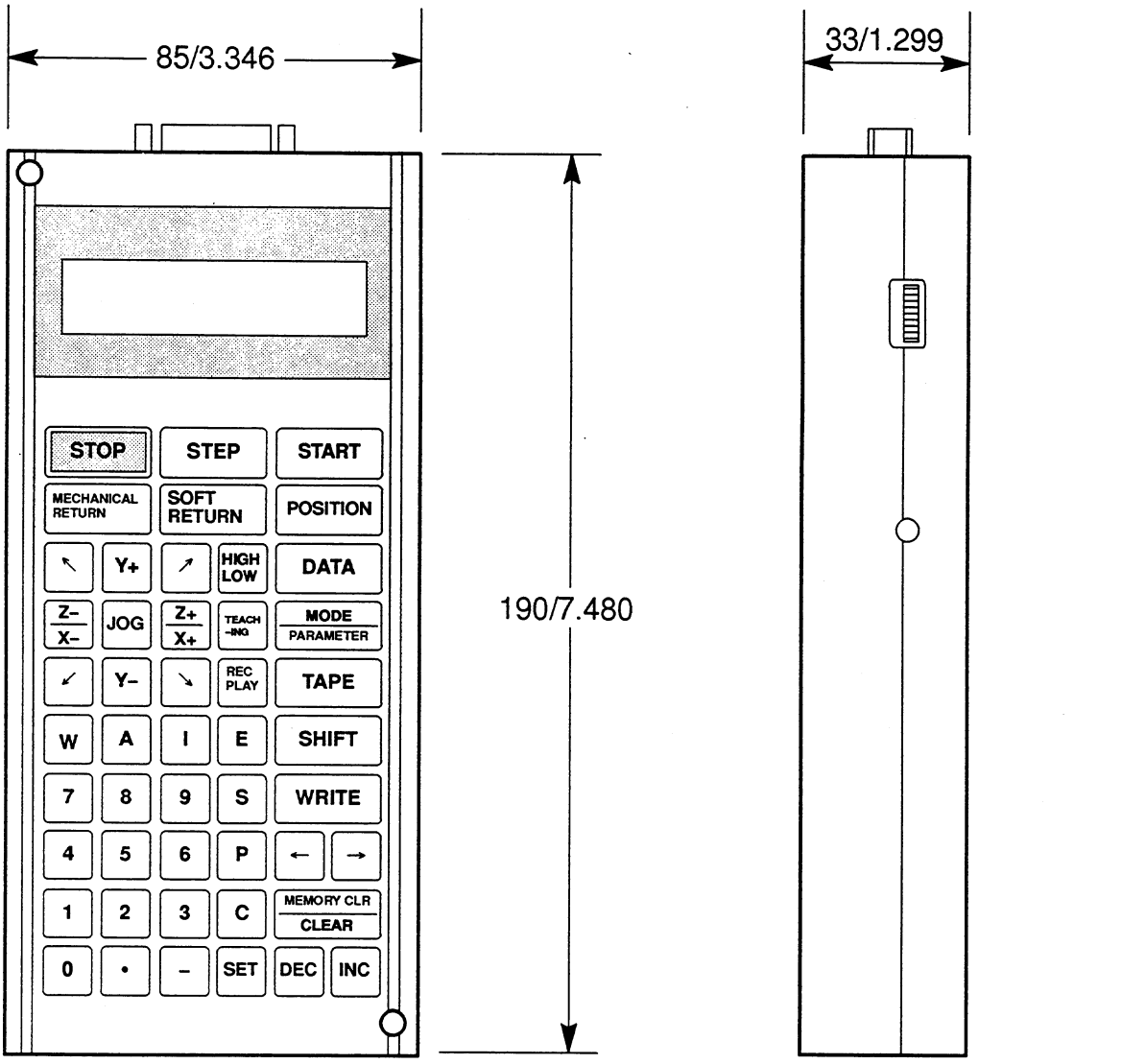
2. Performance Specifications

Item	Descriptions
Functions	• Hardware homing operation • Software homing operation • Positioning operation • JOG operation • Teaching function • Set and edit parameters • Set and edit positioning point data • Data storage function • Clear parameter and positioning point data settings from memory • JOG positioning operation (∗1) • Data backup function (∗1) • Version confirmation function (∗1)
Interface for audio cassette recorder	• **Type of the recorder:** Ordinary audio cassette tape recorder (one that does not have automatic level adjustment) • **Type of tape:** Ordinary audio cassette tape • **Transfer rate:** 1200 bps • **Connection cable:** Ordinary connection cable (without resistor)
RS422 port	• Use this port for connecting a positioning module using FP/FP1 peripheral cables • 15-pin, D-sub • RS422 interface (automatic switching between 19200 and 9600 bps) • Peripheral cable: – FP peripheral cable: for FP3/FP5 positioning units transistor type – FP1 peripheral cable: for FP-C/FP3 positioning modules line-driver type
Power supply	5 V DC (350 mA max.) Supplied from positioning module via FP/FP1 peripheral cables
Weight	Approx. 350 g/12.346 oz.

Note:

• (∗1): Items with this mark are only available on the positioning module E-type.

3. Dimensions

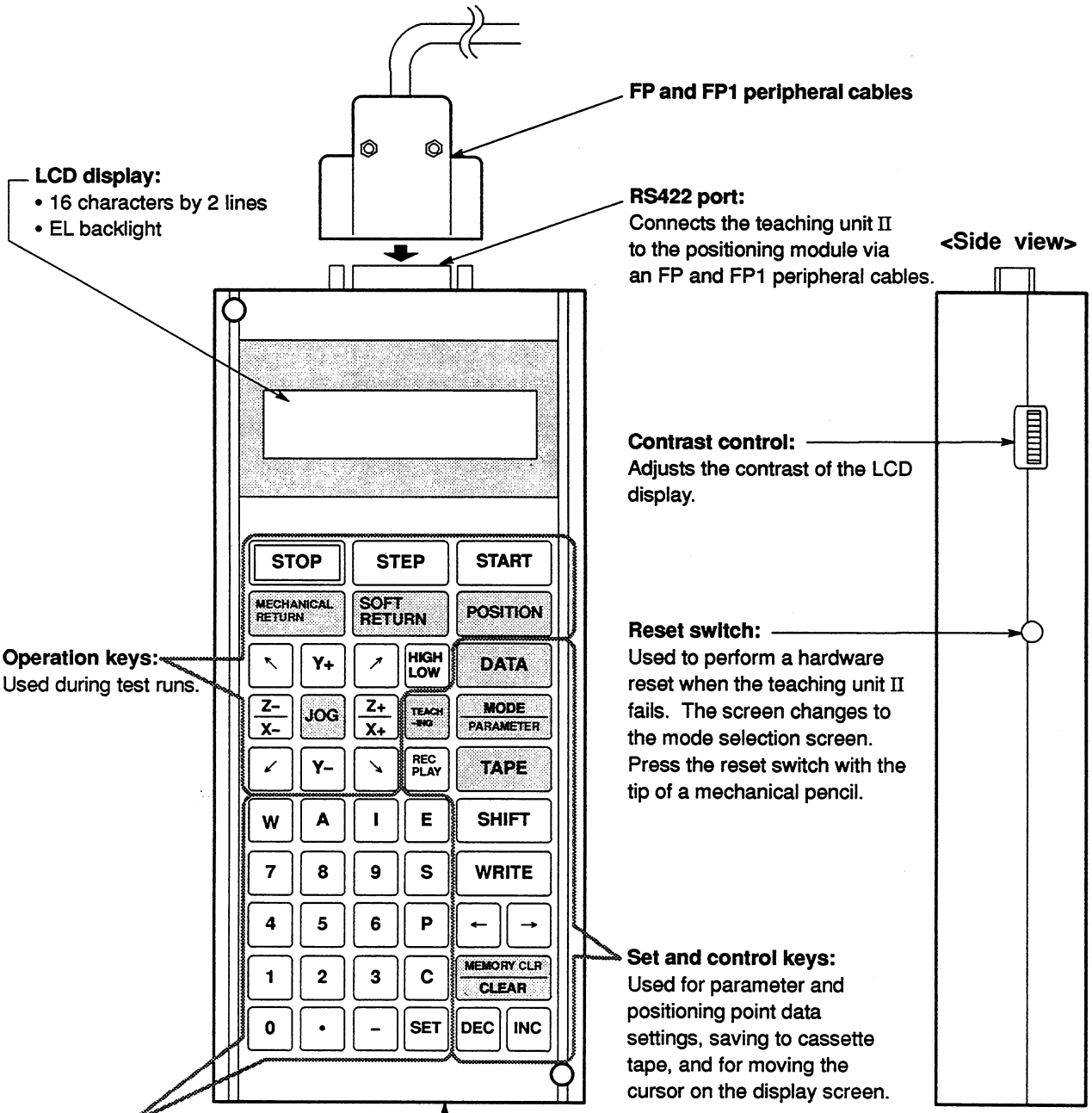


(unit: mm/in.)

CHAPTER 2

PARTS TERMINOLOGY AND CONNECTION

2-1. Parts Terminology



Notes:

- The teaching unit II keyboard has color-coded keys to distinguish the operation keys, set and control keys, and number keys.
- The shaded keys are called "direct keys". Entry of a direct key is accepted at all times except during a RUN mode operation or processing for the teaching unit II.
- When a key marked with two functions is pressed, the bottom function is entered. When the key is pressed together with the [SHIFT] key, the top function is entered.

2-2. Installation Environment

■ Notes on usage

- The teaching unit II should be used within the following conditions.
  - At ambient temperatures of 0° C to 50° C (32° F to 122° F).
  - At ambient humidity of 35 % to 85 % RH.

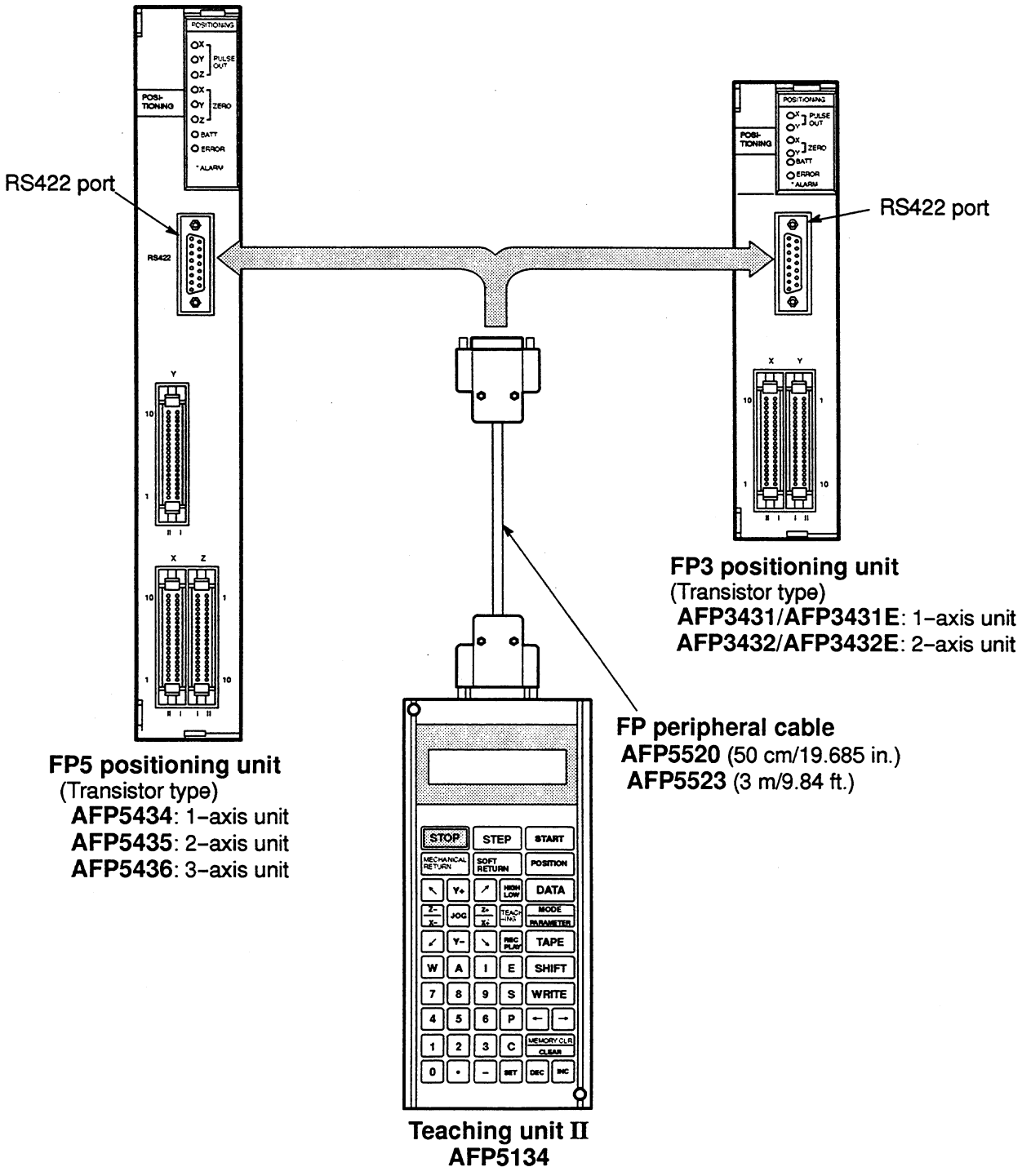
- It should be used in a place where it will not be exposed to:
  - Sudden temperature change causing dew condensation.
  - Inflammable or corrosive gas.
  - Excessive airborne dust or iron particles.
  - Benzine, paint thinner, alcohol, other organic solvents or strong alkaline solutions of ammonia or caustic soda.
  - Excessive vibration or shock.
  - Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that generates high switching surges.
  - Water splashes.
  - Direct sunlight.

2-3. Connection

- The teaching unit II is connected to the RS422 port on the positioning module by a FP/FP1 peripheral cables.

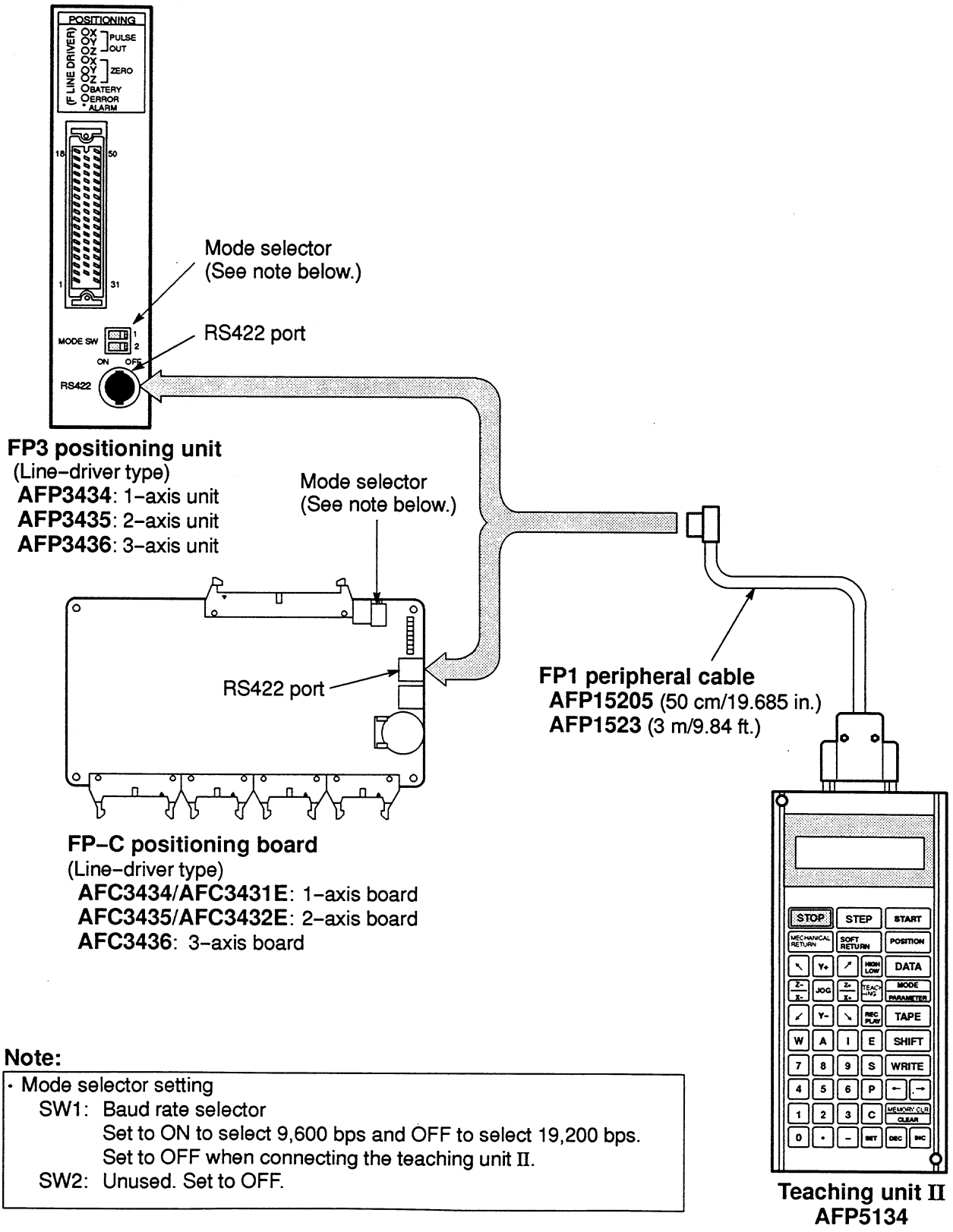
1. FP3/FP5 Positioning Unit Transistor Type

- The teaching unit II is connected to the RS422 port on the FP3/FP5 positioning unit transistor type by a FP peripheral cable.



2. FP3 Positioning Unit and FP-C Positioning Board Line-driver Type

- The teaching unit II is connected to the RS422 port on the FP3 positioning unit and FP-C positioning board line-driver type by a FP1 peripheral cable.



Note:

- Mode selector setting
  - SW1: Baud rate selector
    - Set to ON to select 9,600 bps and OFF to select 19,200 bps.
    - Set to OFF when connecting the teaching unit II.
  - SW2: Unused. Set to OFF.

CHAPTER 3

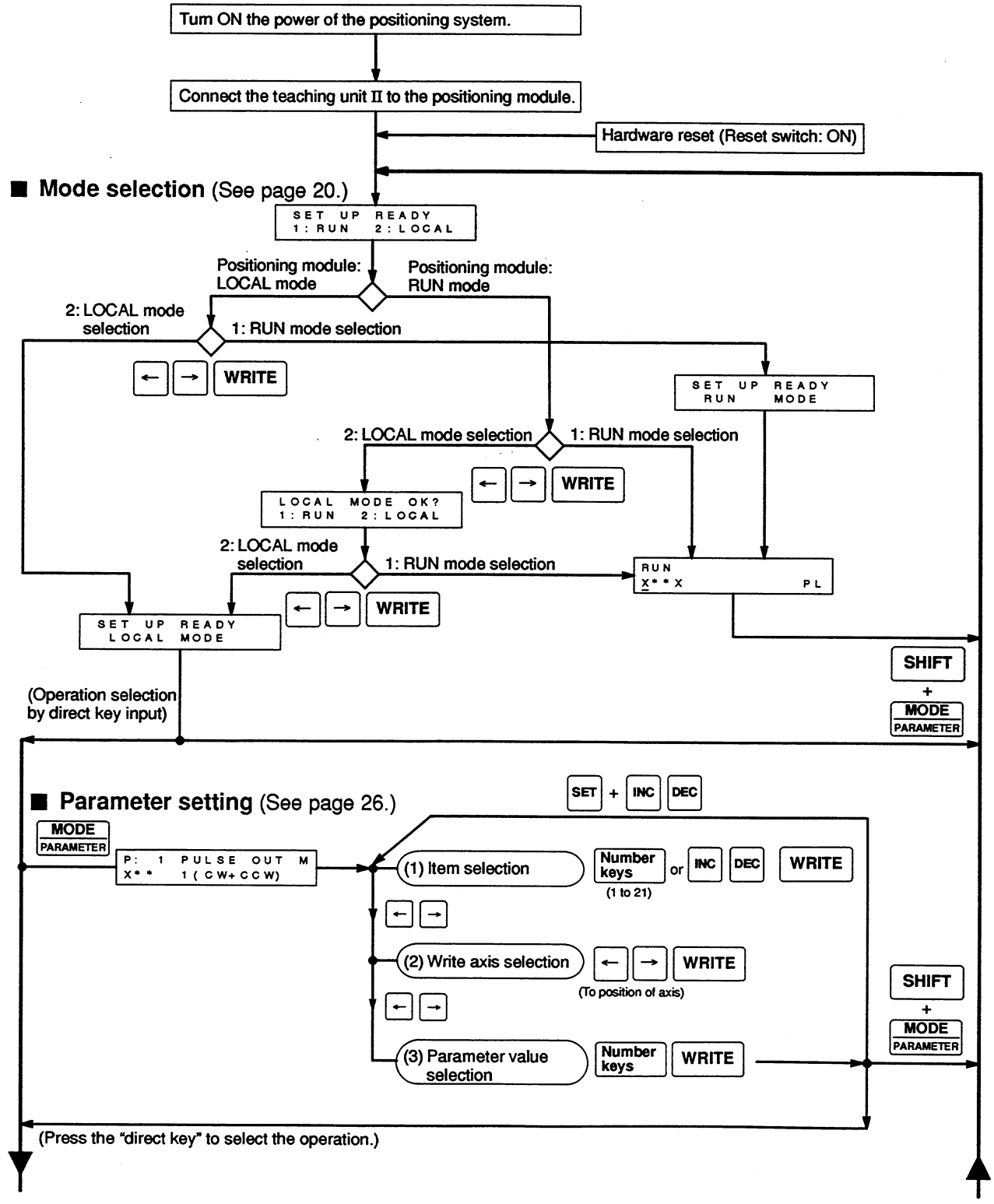
OPERATIONS

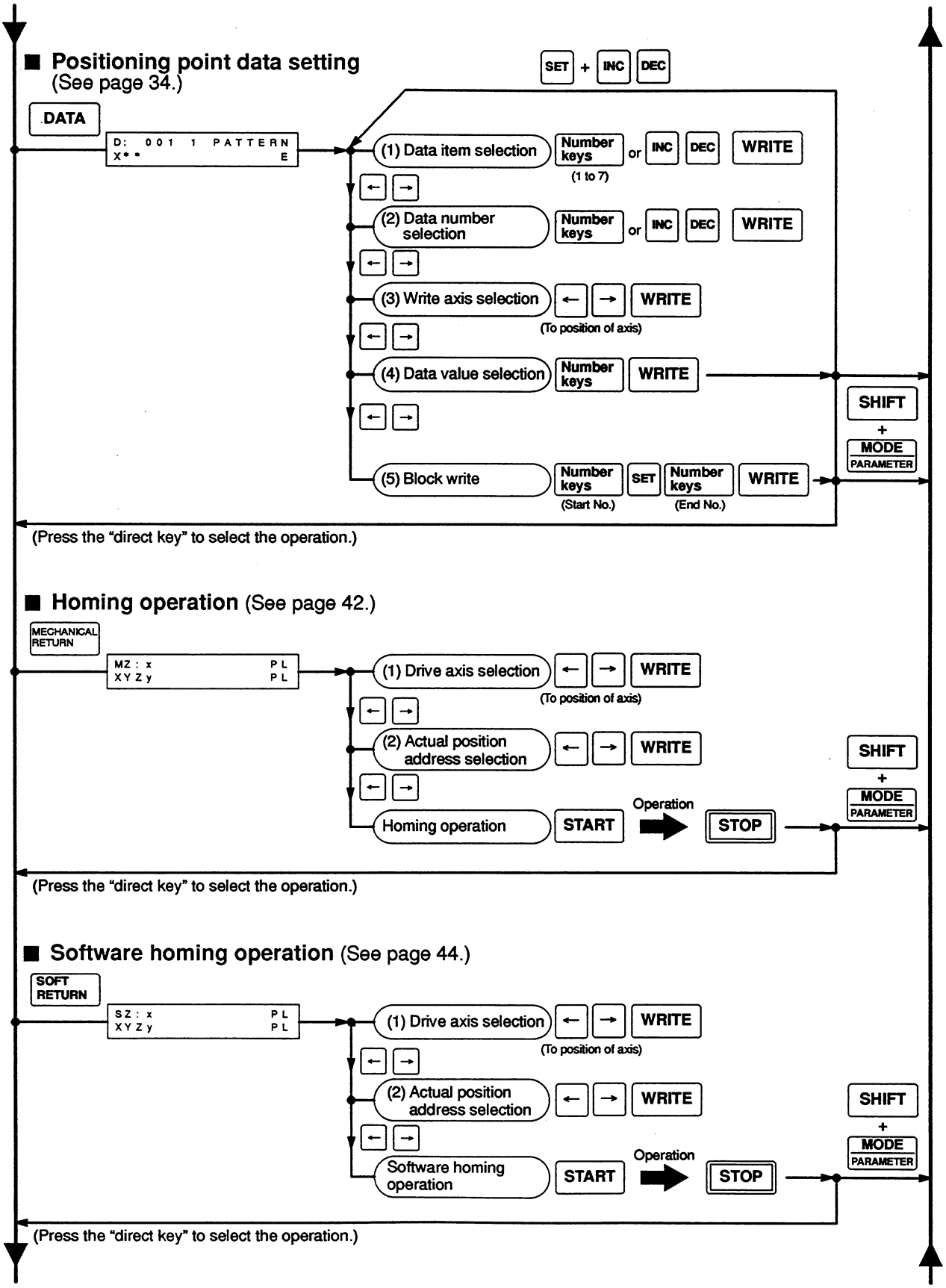
3-1. Operating Procedures Overview

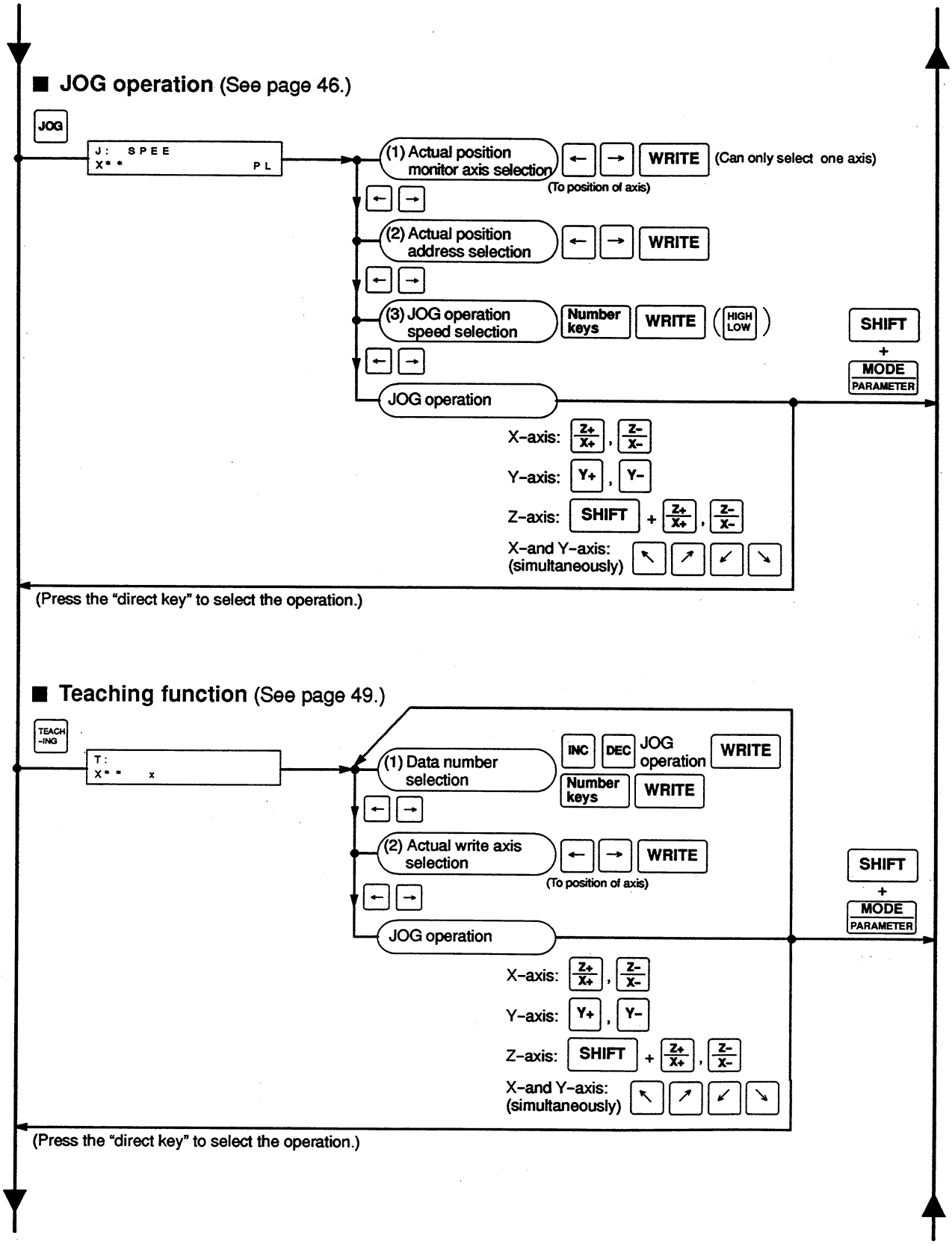
1. Key Operation Flowchart

Note:

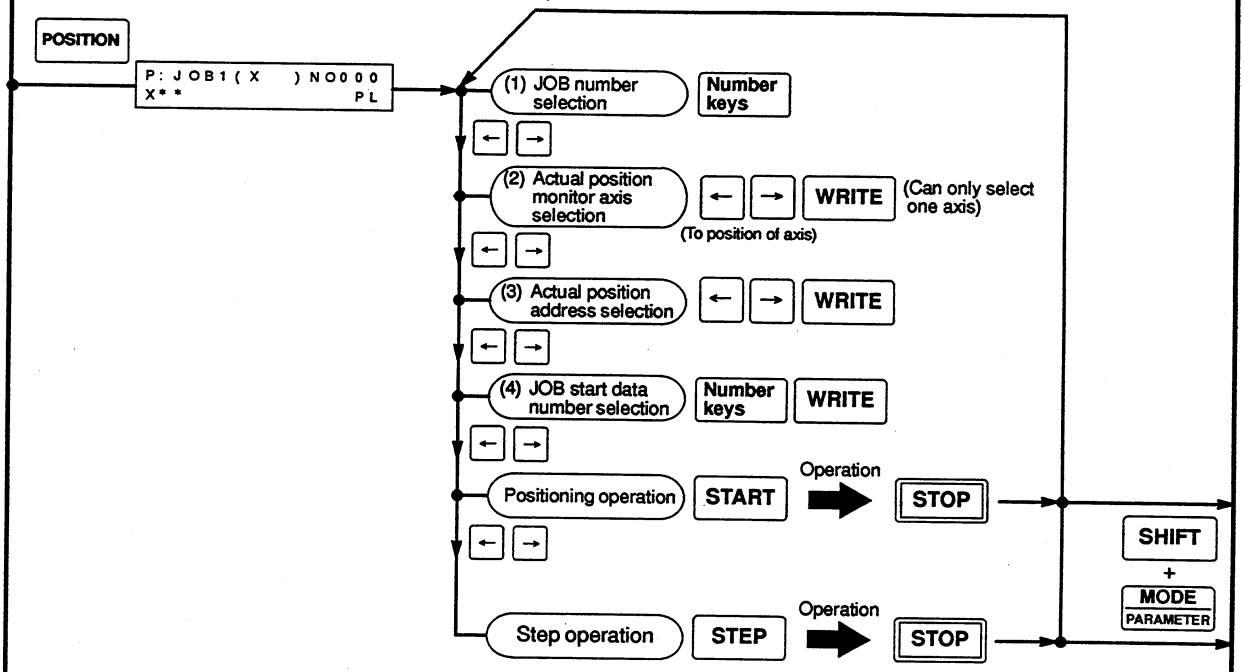
- If the entry is incorrect, press the MEMORY CLR / CLEAR key to return to the previous display.




■ Positioning point data setting
(See page 34.)
SET + INC DEC
DATA
D: 001 1 PATTERN
X** E
(1) Data item selection
Number keys
(1 to 7)
or INC DEC WRITE
(2) Data number selection
Number keys
or INC DEC WRITE
(3) Write axis selection
← → WRITE
(To position of axis)
(4) Data value selection
Number keys
WRITE
(5) Block write
Number keys
SET
Number keys
WRITE
(Start No.)
(End No.)
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)
■ Homing operation (See page 42.)
MECHANICAL RETURN
MZ : x PL
XYZy PL
(1) Drive axis selection
← → WRITE
(To position of axis)
(2) Actual position address selection
← → WRITE
Homing operation
START
Operation
STOP
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)
■ Software homing operation (See page 44.)
SOFT RETURN
SZ : x PL
XYZy PL
(1) Drive axis selection
← → WRITE
(To position of axis)
(2) Actual position address selection
← → WRITE
Software homing operation
START
Operation
STOP
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)

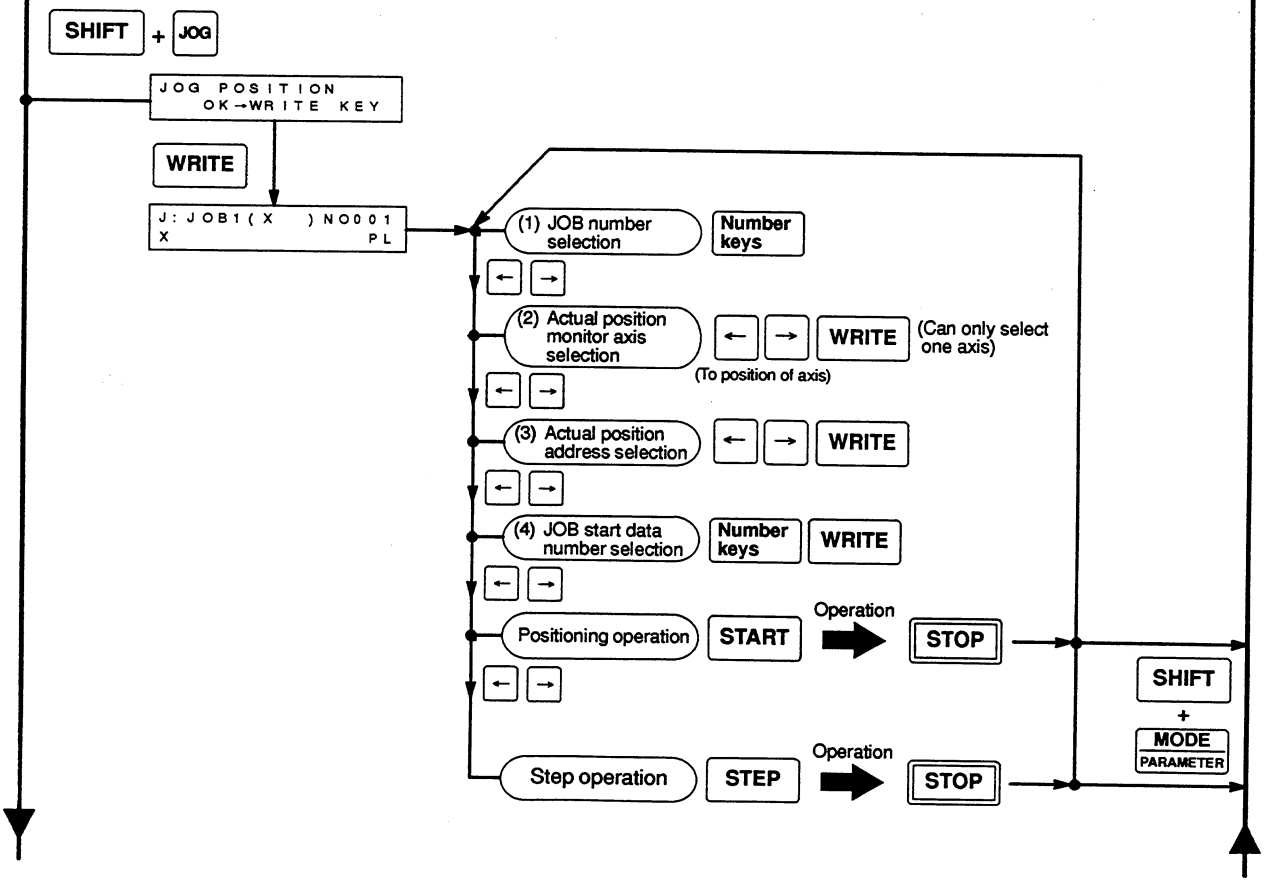

■ JOG operation (See page 46.)
JOG
J: SPEE
X* * PL
(1) Actual position monitor axis selection
WRITE
(Can only select one axis)
(To position of axis)
(2) Actual position address selection
WRITE
(3) JOG operation speed selection
Number keys
WRITE
HIGH LOW
SHIFT
+
MODE PARAMETER
JOG operation
X-axis: Z+ X+ , Z- X-
Y-axis: Y+ , Y-
Z-axis: SHIFT + Z+ X+ , Z- X-
X-and Y-axis: (simultaneously)
(Press the "direct key" to select the operation.)
■ Teaching function (See page 49.)
TEACH -ING
T:
X* * x
(1) Data number selection
INC
DEC
JOG operation
WRITE
Number keys
WRITE
(2) Actual write axis selection
WRITE
(To position of axis)
SHIFT
+
MODE PARAMETER
JOG operation
X-axis: Z+ X+ , Z- X-
Y-axis: Y+ , Y-
Z-axis: SHIFT + Z+ X+ , Z- X-
X-and Y-axis: (simultaneously)
(Press the "direct key" to select the operation.)

■ Positioning operation (See page 52.)

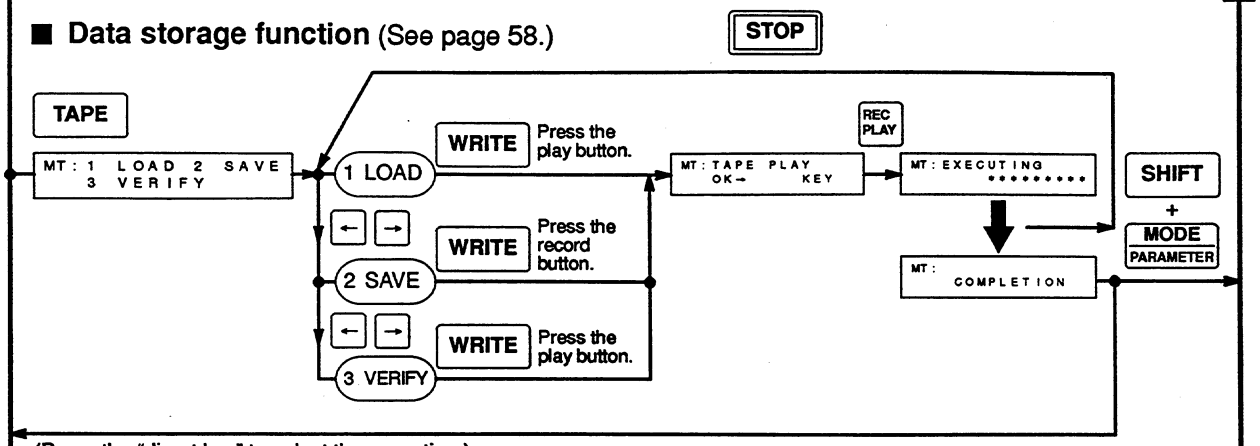


■ JOG positioning operation (See page 57.)

(Only for positioning module E-type)

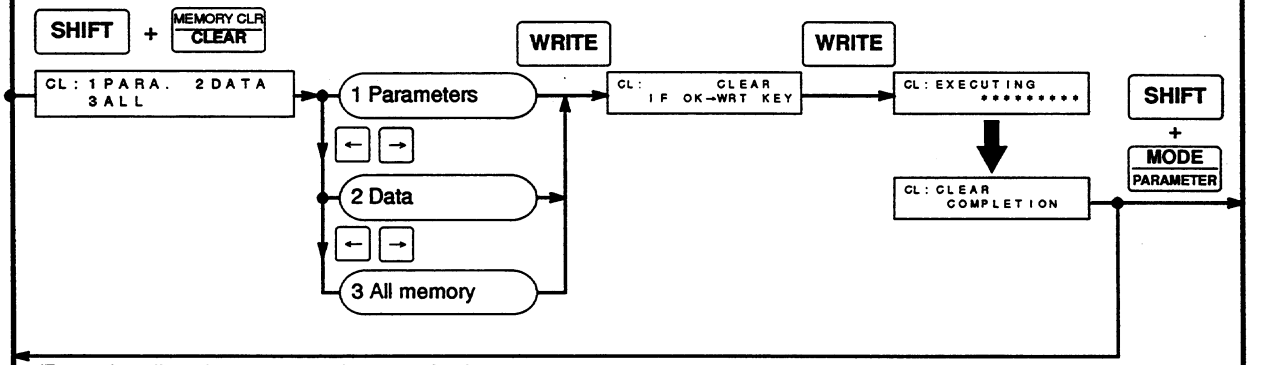


■ Data storage function (See page 58.)



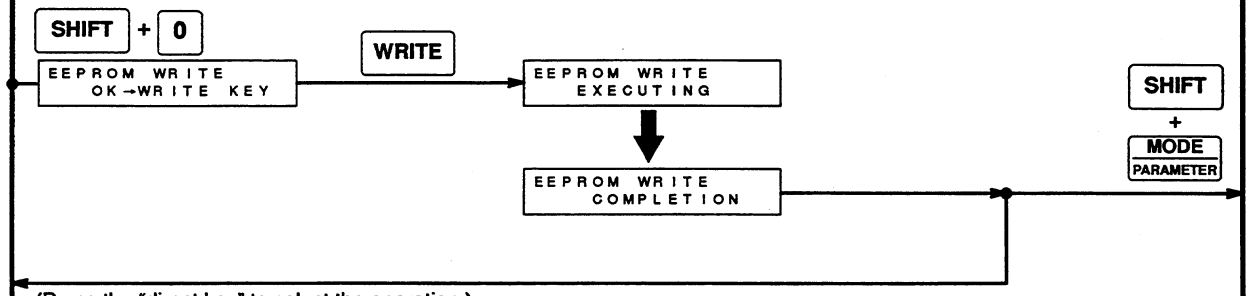
(Press the "direct key" to select the operation.)

■ Clear memory function (See page 63.)



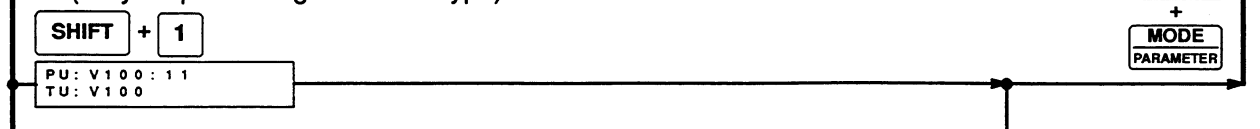
(Press the "direct key" to select the operation.)

■ Data backup function (See page 66.)
(Only for positioning module E-type)



(Press the "direct key" to select the operation.)

■ Version confiramation function (See page 67.)
(Only for positioning module E-type)



(Press the "direct key" to select the operation.)

2. Notes on Operating

- The direct keys (DATA , MODE/PARAMETER , TAPE , POSITION , SOFT/RETURN , JOG , SHIFT) are always accepted, except when the positioning module is in the during positioning operation, homing operation, or executing a cassette load, save, or verify.

- The numeric value input can be cleared by pressing the MEMORY CLR/CLEAR key before the WRITE key. The previously displayed data is redisplayed.

- When an error occurs for some reason during the setting operating from the teaching unit II, the error code or error name is displayed. Press the MEMORY CLR/CLEAR key and eliminate the cause of the error.

- Stopping the positioning operation
  - When the positioning module is operating in LOCAL mode, or during the homing operation, press the STOP key to stop the positioning or homing operation.
  - When pulses are being output by the positioning module in RUN mode (positioning operation, homing or JOG operation), the pulse output is stopped when the teaching unit II switches the positioning module to LOCAL mode.

3-2. Explanation of Operation

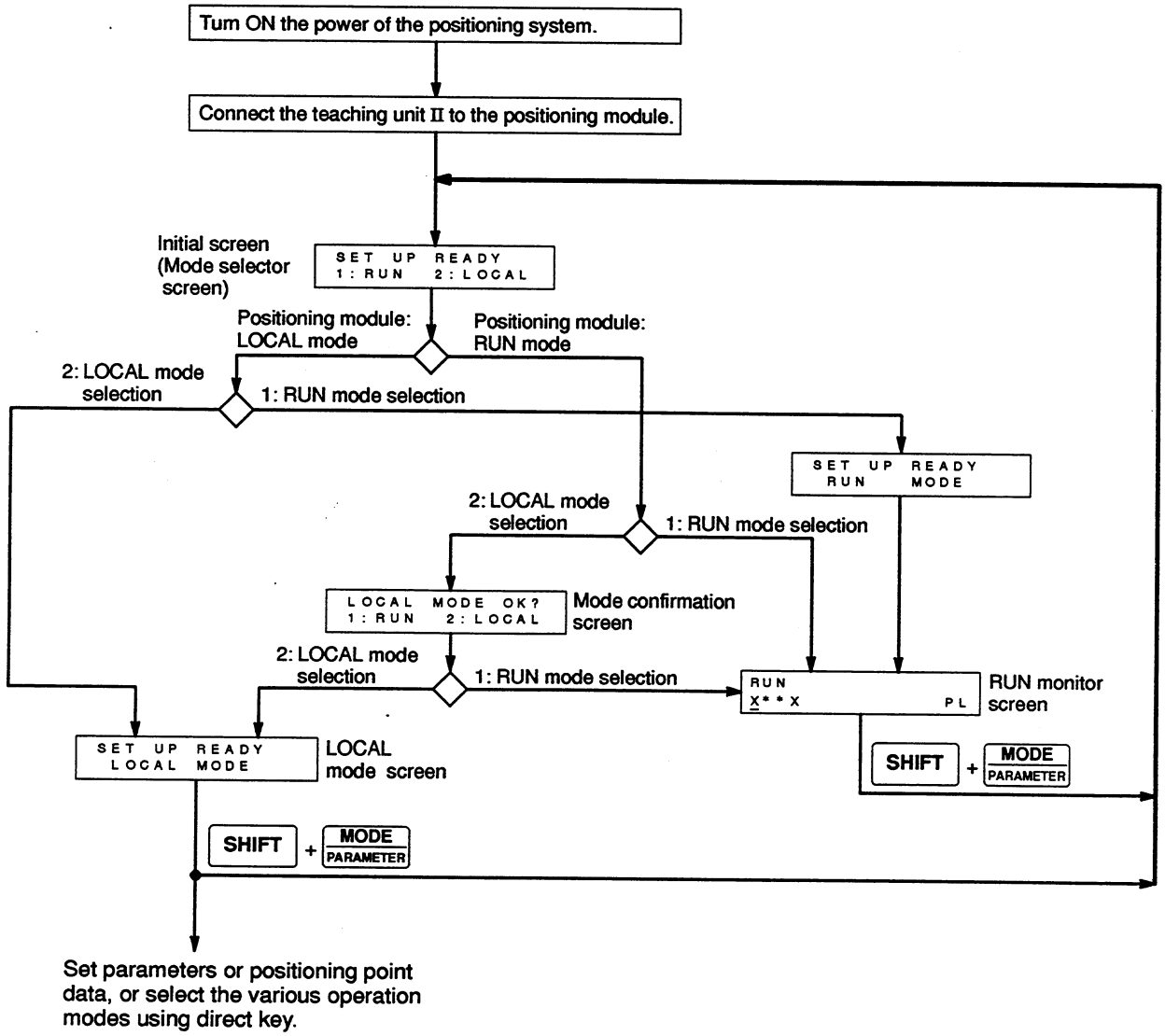
1. Mode Selection

■ Mode selection screen selection

```
SET UP READY
1 : RUN   2 : LOCAL
```

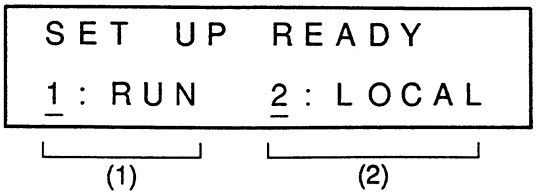
- The mode selection screen will be displayed as following conditions.
  - When the teaching unit II is connected to the positioning module.
  - When a software reset is performed. (SHIFT key + MODE/PARAMETER key)
  - When the hardware reset is pushed. (Reset switch ON)

■ Mode selection operation and screens



■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) RUN mode selection field in the initial screen.)

(1) .. RUN mode selection field
When RUN mode is selected, the positioning module can receive selection and operation commands from the programmable controller. Performs monitoring of the actual position during operation by the programmable controller.

(2) .. LOCAL mode selection field
Set or edit the parameter or data settings. Performs homing, JOG, and positioning test run operation.

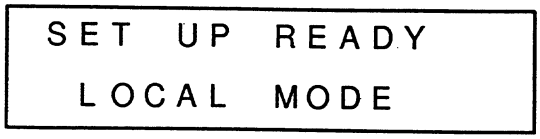
Notes:

- When LOCAL mode is selected while the positioning module is operating in RUN mode (during pulse output), the operating axis will slow down and stop, the RUN/LOCAL I/O contact will be set to OFF, and LOCAL mode is forcibly selected.
- For the RUN mode and LOCAL mode selection, press the [←] and [→] keys to make the selection, then press [WRITE] key.

■ When positioning module is in LOCAL mode

LOCAL mode selection

LOCAL mode screen



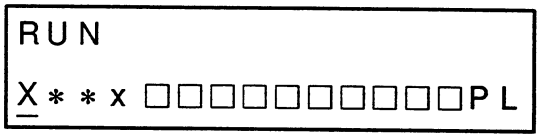
- LOCAL mode is selected. Can set or edit parameters and data, or execute the various operations.

RUN mode selection

Transition screen

- After RUN mode is selected, a transition screen is displayed for approximately 0.5 seconds before the RUN monitor screen appears.

RUN monitor screen



- RUN monitor screen

■ When positioning module is in RUN mode

LOCAL mode selection

Mode confirmation screen

```
L O C A L   M O D E   O K ?
1 : R U N     2 : L O C A L
```

- The confirmation screen indicates that the positioning module is in RUN mode, and requests confirmation to stop RUN mode and switch to LOCAL mode.

→ **LOCAL mode selection**

LOCAL mode screen

```
S E T   U P   R E A D Y
  L O C A L   M O D E
```

- LOCAL mode screen

→ **RUN mode selection**

RUN monitor screen

```
R U N
X * * X □□□□□□□□□□P L
```

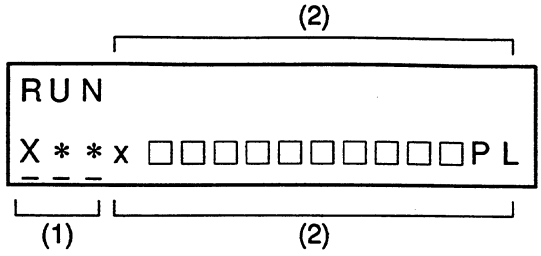
- RUN monitor screen

Note:

- If the positioning module is operating in RUN mode (generating pulse output) when the switch is made to LOCAL mode, the positioning module will decelerate and stop.

■ Screen description

RUN monitor screen



<Display>

_ . . . Indicates the cursor positions
(The cursor is positioned at the X-axis selection field in the initial screen, and the X-axis is selected.)

(1) Axis selection field for actual position address monitor display

	1-axis module	2-axis module	3-axis module
Initial display	X	X*	X**
Y-axis selection	-	XY	XY*
Z-axis selection	-	-	XYZ
X-axis clear	*	*Y	*YZ
Y-axis clear	-	**	**Z
Z-axis clear	-	-	***

• The (2) actual position address display is cleared when the entire display axis selection area is cleared.

(2) Actual position address monitor

• The actual position address is updated every 0.5 seconds for the positioning module F-type, and every 0.1 seconds for the positioning module E-type.

• Only the software reset (SHIFT key + MODE PARAMETER key) and cursor keys (← →) are accepted in the RUN monitor screen.

■ **Actual position address monitor operation example** (For a 3-axis positioning module F-type)

Operations	Display screen	Description
RUN monitor screen	RUN X * * x □□□□□□□□□□P L	
← → WRITE	RUN x □□□□□□□□□□P L XY * y Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ P L	• Y-axis selection • The actual position address for the X-axis moves from the lower row to the upper row, and the actual position address for the Y-axis is displayed in the lower row.
← → WRITE	RUN y Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ P L XY Z z □□□□□□□□□□P L	• Z-axis selection • The actual position address for the X-axis is cleared from the upper row and the actual position address for the Y-axis is displayed instead. The actual position address for the Z-axis is displayed on the lower row.
MEMORY CLR CLEAR	RUN y Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ P L XY * x □□□□□□□□□□P L	• The Z-axis value is cleared. • The actual position address for the Z-axis displayed in the lower row is cleared.

2. Parameter Setting

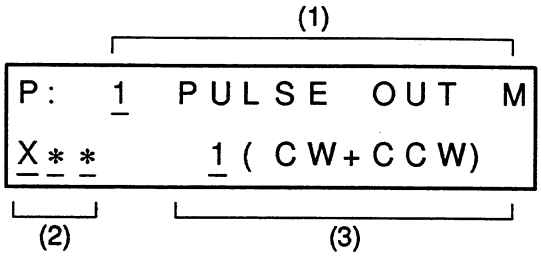
■ Parameter screen selection

```
P:  1  PULSE OUT M
X**     1(CW+CCW)
```

The parameter screen is selected by pressing the [MODE PARAMETER] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) Item selection field in the initial screen.)
(1) .. Item selection field
(2) .. Write axis selection field
(3) .. Parameter value selection field

<Selection fields>

(1) Item selection field
- The numeric display field where the cursor is positioned indicates the item number.
- The contents of the item are displayed to the right of the item number.
- Item numbers 1 to 21 can be selected by moving the cursor to the item number and pressing the [INC] or [DEC] key.
  An item can also be specified directly by pressing the number keys 1 to 21 followed by the [WRITE] key.
- When the cursor is in the parameter value selection field, the item number can also be selected using the [SET] + [INC] and [SET] + [DEC] keys.

(2) Write axis selection field

- Selects the write axis for the parameter value.
- Move the cursor to the position of the axis to be set or cleared. When the [WRITE] key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected. When the [MEMORY CLR / CLEAR] key is pressed, an asterisk (*) is displayed and the axis selection is cleared.
- When the selected write axis is changed, the parameter value of the axis is read and displayed in the (3) Parameter value selection field.
- If multiple axes are selected, the parameter values are displayed in the order of X-Y-Z.

Write axis selection field display

	1-axis module	2-axis module	3-axis module
Initial display	X	X*	X**
Y-axis selection	-	XY	XY*
Z-axis selection	-	-	XYZ
X-axis clear	*	*Y	*YZ
Y-axis clear	-	**	**Z
Z-axis clear	-	-	***

- The parameter value display is cleared when all write axes are cleared.

(3) Parameter value selection field

- Enter a numeric value and press the [WRITE] key. The data is written for the axis selected in (2) and the data item selected in (1).
- If the entry is incorrect, press the [MEMORY CLR / CLEAR] key to return to the previous display.
- Numeric values which exceed the allowed tolerance can be entered. However, the entry is not accepted when the [WRITE] key is pressed, and the previous value is restored.

1) Parameter List for the Positioning Module F-type

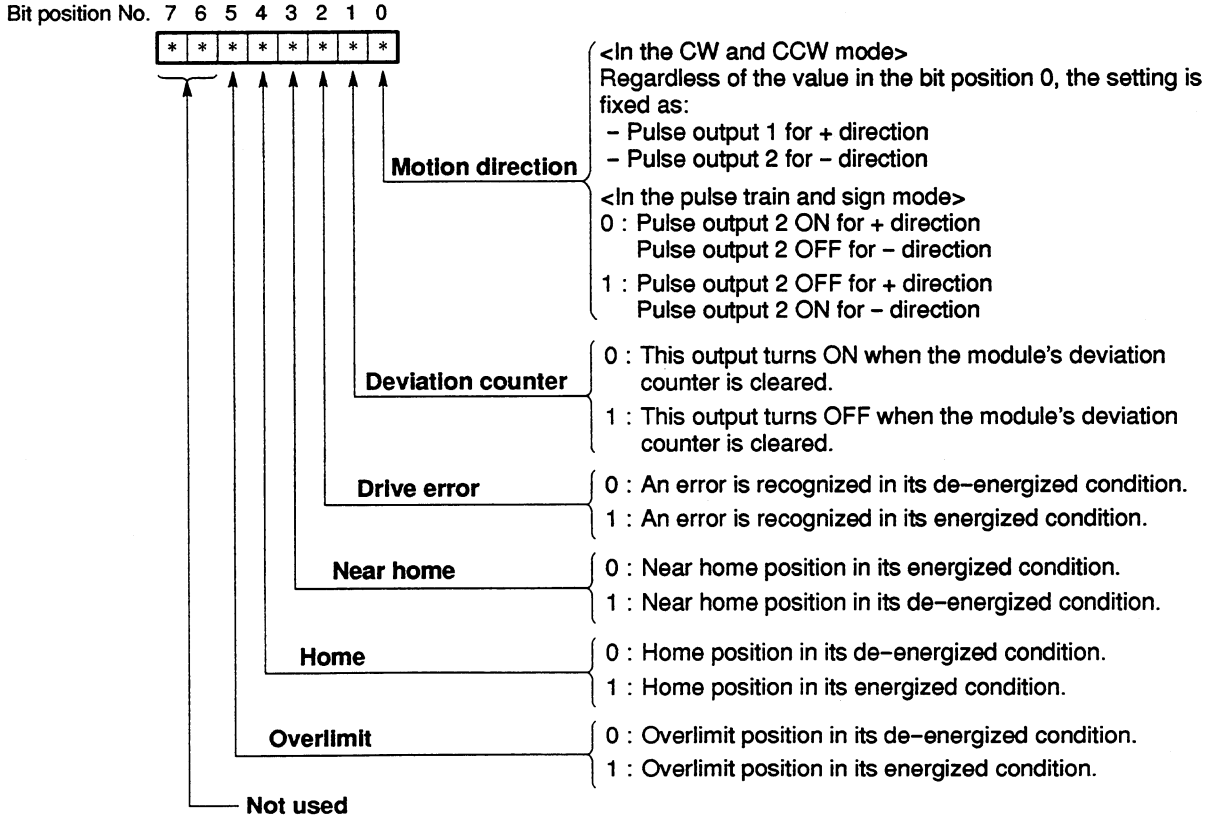
Parameter item	Description	Default value	Setting range
Pulse output mode (1)	This selects the pulse output control mode using pulse output terminals 1 and 2.	1 (CW and CCW)	0: Pulse train and sign 1: CW and CCW
Axis mode (2)	This specifies that axes are handled independently or simultaneously.	0 (Independent)	0: Independent 1: Simultaneous 2-axis (* 1) 2: Simultaneous 3-axis
Unit setting (3)	This specifies which unit you use for parameters and positioning point data.	0 (Pulse)	0: Pulse 1: mm 2: inch 3: degree
Conversion rate (4)	This specifies the rate for converting pulse into the unit set.	1	1: in "pulse unit" 0.0001 to 0.1: in mm unit 0.00001 to 0.001: in inch or degree unit
Speed limit (5)	This specifies the maximum speed available for the positioning module using the conversion rate.	400000	$0 \leqq \frac{\text{Speed limit}}{\text{Conversion rate}} \leqq 400000$
Software limit (+) (6) (* 2)	This specifies the positive limit, which does not actually exist, inside the hardware limit switches using the conversion rate.	8388607	$0 \leqq \frac{\text{Software limit (+)}}{\text{Conversion rate}} \leqq 8388607$
Software limit (-) (7) (* 2)	This specifies the negative limit, which does not actually exist, inside the hardware limit switches using the conversion rate.	- 8388607	$-8388607 \leqq \frac{\text{Software limit (-)}}{\text{Conversion rate}} \leqq 0$
Base speed (8)	This specifies base speed which is used for starting and stopping stage of the stepper motor.	0	$0 \leqq \text{base speed} \leqq \text{speed limit}$ (when axis speed $\neq$ 0, base speed $\leqq$ axis speed)
Interpolation speed setting mode (9)	This selects the interpolation speed is set based on the long-axis or tracking speed.	1 (Tracking speed)	0: Long-axis speed 1: Tracking speed
Backlash compensation (10)	This specifies the correction value to compensate for the gap of ball screw and speed reducer using the conversion rate.	0	$0 \leqq \frac{\text{Backlash compensation}}{\text{Conversion rate}} \leqq 255$
Deviation compensation (11)	This specifies the value for correcting the deviation caused by indivisible rate setting or by pitch error when mm, inch or degree unit is used.	0	0: in "pulse unit" ± 1.0000: in mm unit ± 1.00000: in inch or degree unit
In-position time (12)	This specifies the in-position signal ON duration.	300 (ms)	1 to 2,000 (ms)
Homing direction (13)	This specifies the direction for homing operation.	1 (Negative direction)	0: Positive direction 1: Negative direction

- The default value is the value set when the clear parameters or the clear all operation is executed using the clear memory function of the teaching unit II.
- (* 1): When using the simultaneous 2-axis or simultaneous 3-axis modes, set the units and conversion rate parameters to the same values.
- (* 2): When both software limit (+) and (-) are set to 0, the software limit is ignored for version 2.0 and higher.

Parameter item	Description	Default value	Setting range
Home offset address (14)	This specifies the address of the hardware home address from the software home.	0	Software limit (–) ≦ Home offset address ≦ Software limit (+)
Home return speed (high) (15)	This specifies the higher speed for homing operation. This is also used for JOG and software home operations.	50000	Home return speed (low) ≦ Home return speed (high) ≦ Speed limit
Home return speed (low) (16)	This specifies the lower speed for homing operation. This is also used for JOG operation.	100	
Acceleration/ deceleration time (17)	This specifies the time for acceleration and deceleration speed for homing and JOG operations.	1000 (ms)	64 to 4999 (ms)
Start mode (18)	This specifies the start mode from the four.	0 (Immediate normal-start)	0: Immediate normal-start 1: Normal-start after homing 2: Quick-start 3: Test for quick-start
Homing method (19)	This specifies the homing method from the four.	0 (Near home ON)	0: Near home ON 1: Near home OFF 2: Near home ON/OFF 3: Limit search (* 1)
Interface logics (20)	This specifies the interface logics setting "0" or "1" in the specified bit position.	00000000	See explanation below.

• (* 1): The limit search homing method is available for the positioning module F-type with a system ROM version SV 2.4 or later.

■ Explanation of the interface logic settings



2) Parameter List for the Positioning Module E-type

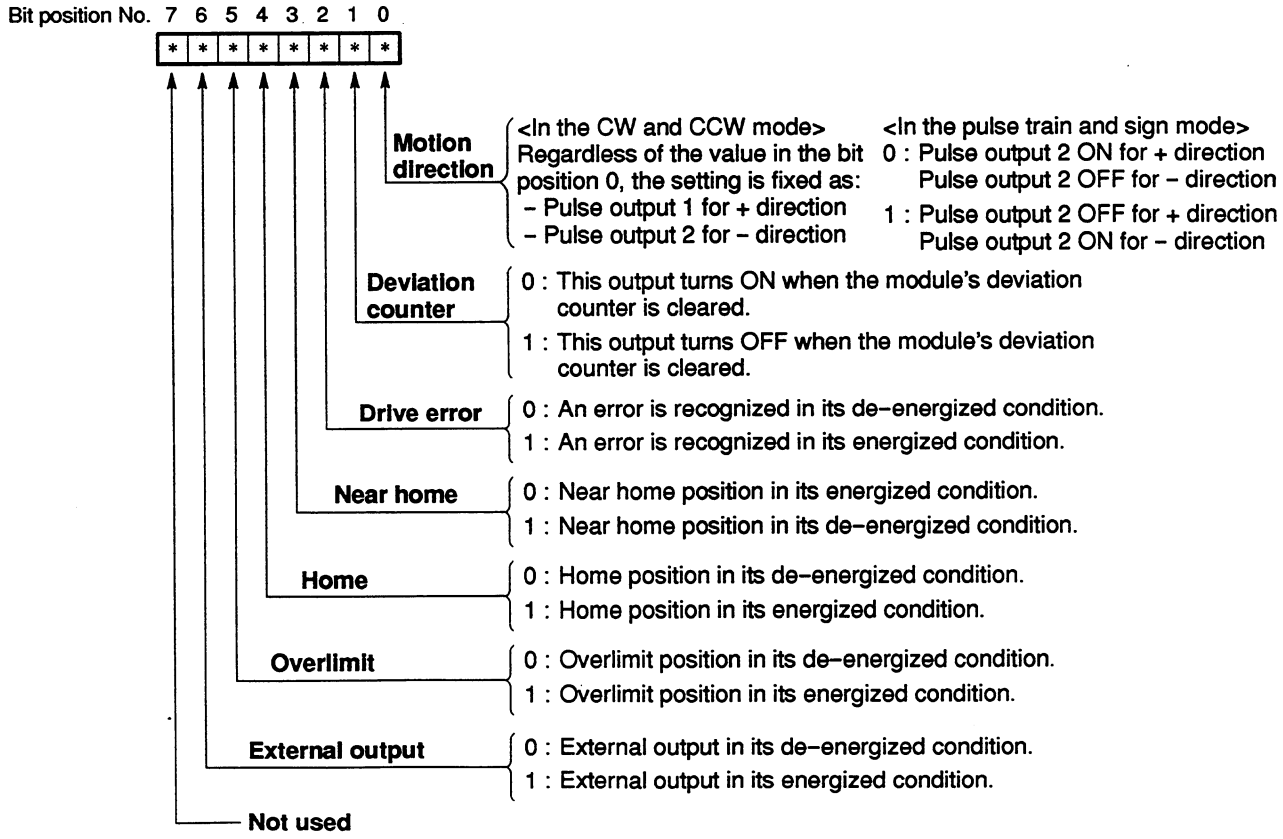
Parameter item	Description	Default value	Setting range
Pulse output mode (1)	This selects the pulse output control mode using pulse output terminals 1 and 2.	1 (CW and CCW)	0: Pulse train and sign 1: CW and CCW
Axis mode (2)	This specifies that axes are handled independently or simultaneously.	0 (Independent)	0: Independent
Unit setting (3)	This specifies which unit you use for parameters and positioning point data.	0 (Pulse)	0: Pulse
Conversion rate (4)	This specifies the rate for converting pulse into the unit set.	1	1: in "pulse unit"
Speed limit (5)	This specifies the maximum speed available for the positioning module using the conversion rate.	200000	0 ≦ Speed limit ≦ 200000
Software limit (+) (6) (*1)	This specifies the positive limit, which does not actually exist, inside the hardware limit switches using the conversion rate.	8388607	0 ≦ Software limit (+) ≦ 8388607
Software limit (–) (7) (*1)	This specifies the negative limit, which does not actually exist, inside the hardware limit switches using the conversion rate.	– 8388607	–8388607 ≦ Software limit (–) ≦ 0
Base speed (8)	This specifies base speed which is used for starting and stopping stage of the stepper motor.	0	0 ≦ base speed ≦ 8000 (when axis speed ≠ 0, base speed ≦ axis speed)
Interpolation speed setting mode (9) (*2)	This selects the interpolation speed is set based on the long-axis or tracking speed.	1 (Tracking speed)	0: Long-axis speed 1: Tracking speed
Backlash compensation (10)	This specifies the correction value to compensate for the gap of ball screw and speed reducer using the conversion rate.	0	0
Deviation compensation (11)	This specifies the value for correcting the deviation caused by indivisible rate setting or by pitch error when mm, inch or degree unit is used.	0	0: in "pulse unit"
In-position time (12)	This specifies the in-position signal ON duration.	300 (ms)	1 to 2,000 (ms)
Homing direction (13)	This specifies the direction for homing operation.	1 (Negative direction)	0: Positive direction 1: Negative direction

- The default value is the value set when the clear parameters or clear all operation is executed using the clear memory function of the teaching unit II.
- (* 1): When both software limit (+) and (–) are set to 0, the software limit is ignored.
- (* 2): The positioning module E-type cannot perform interpolation. This setting is ignored.

Parameter item	Description	Default value	Setting range
Home offset address (14)	This specifies the address of the hardware home address from the software home.	0	Software limit (−) ≦ Home offset address ≦ Software limit (+)
Home return speed (high) (15)	This specifies the higher speed for homing operation. This is also used for JOG and software home operations.	50000	Home return speed (low) ≦ Home return speed (high) ≦ Speed limit
Home return speed (low) (16)	This specifies the lower speed for homing operation. This is also used for JOG operation.	100	
Acceleration/ deceleration time (17)	This specifies the time for acceleration and deceleration speed for homing and JOG operations.	1000 (ms)	64 to 4999 (ms)
Start mode (18)	This specifies the start mode from the four.	0 (Immediate normal-start)	0: Immediate normal-start 1: Normal-start after homing
Homing method (19)	This specifies the homing method from the four.	0 (Near home ON)	0: Near home ON 1: Near home OFF 2: Near home ON/OFF
Interface logics (20)	This specifies the interface logics setting "0" or "1" in the specified bit position.	01000000	See explanation below.
Unit number (21)	The number is used for the recognition of additional positioning module.	1	1 to 32 (* 1)

• (* 1): This setting has no effect on the operation when using the teaching unit II.

■ Explanation of the interface logic settings



■ Parameters setting operation example (Using a 3-axis positioning module F-type)

The following describes the operations for setting parameters using the teaching unit II.

Settings:

- Item 5 - X-axis speed limit: 100,000 pps
- Item 5 - Y-axis speed limit: 50,000 pps
- Item 6 - X-axis software limit: 200,000 PLS (Pulse)
- Item 6 - Y-axis software limit: 200,000 PLS (Pulse)

Operations	Display screen	Description
MODE/PARAMETER	P: 1 PULSE OUT M X** 1(CW+CCW)	· Call up the parameter screen.
5 WRITE	P: 5 MAX. SPEED X** 400000PL/S	· Item 5 (speed limit) setting
→	P: 5 MAX. SPEED X** 400000PL/S	· Move the cursor to the parameter value selection field.
1 0 0 0 0 0 WRITE	P: 5 MAX. SPEED X** 100000PL/S	· Write 100,000 PL/s for the X-axis speed limit.
→ → →	P: 5 MAX. SPEED X** 100000PL/S	· Move the cursor to the X-axis selection field.
MEMORY CLR/CLEAR	P: 5 MAX. SPEED ***	· Clear the X-axis display.
←	P: 5 MAX. SPEED ***	· Move the cursor to the Y-axis selection field.

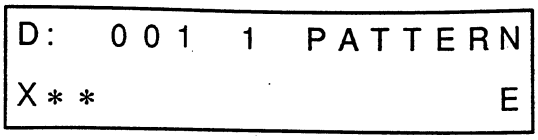
Operations	Display screen	Description
WRITE	P: 5 MAX. SPEED *Y* 400000PL/S	· Y-axis speed limit display
← ←	P: 5 MAX. SPEED *Y* 400000PL/S	· Move the cursor to the parameter value selection field.
5 0 0 0 0 WRITE	P: 5 MAX. SPEED *Y* 50000PL/S	· Write 50,000 PL/s for the Y-axis speed limit.
SET + INC	P: 6 MAX. STROKE *Y* +8388607PL	· Set item 6 (software limit (+)).
→ → →	P: 6 MAX. STROKE *Y* +8388607PL	· Move the cursor to the X-axis selection field.
WRITE	P: 6 MAX. STROKE XY* +8388607PL	· XY is displayed in the axis selection field. (The X-axis data is displayed in the parameter value selection field.)
→ →	P: 6 MAX. STROKE XY* +8388607PL	· Move the cursor to the parameter value selection field.
2 0 0 0 0 0 WRITE	P: 6 MAX. STROKE XY* +2000000PL	· Write 200,000 PL for the X and Y-axis software limit (+). (X and Y can both be written simultaneously.)

Note:

· When using the positioning module E-type, perform an EEPROM write operation after setting the parameters. Refer to page 66 for the operating procedures.

3. Positioning Point Data Setting

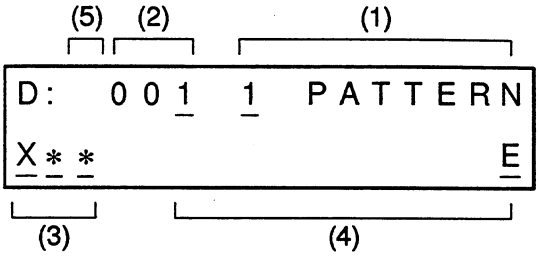
■ Data screen selection



The data screen is selected by pressing the [DATA] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



The initial screen displays the contents of data number 1 for item 1 (MOTION PATTERN).

<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) Data item selection field in the initial screen.)
(1) .. Data item selection field
(2) .. Data number selection field
(3) .. Write axis selection field
(4) .. Data value selection field
(5) .. Block write display field

<Selection fields>

(1) Data item selection field

- The numeric display field where the cursor is positioned indicates the item number (1 to 7).
- The contents of the item are displayed to the right of the item number.
- Item numbers 1 to 7 can be selected by moving the cursor to the item number selection field and pressing the [INC] or [DEC] key. An item can also be specified directly by pressing the number keys 1 to 7 followed by the [WRITE] key.
- When the cursor is in the data value selection field, the item number can also be selected using the [SET] + [INC] and [SET] + [DEC] keys.

(2) Data number selection field

- Indicates the data number corresponding to the positioning point.
- The data number can be selected by moving the cursor to the data number selection field and pressing the [INC] or [DEC] key. The data number can also be specified directly by pressing the number keys followed by the [WRITE] key.
  - Positioning module F-type : Data No. 1 to 400
  - Positioning module E-type : Data No. 1 to 50

(3) Write axis selection field

- Selects the write axis for the data value.
- Move the cursor to the position of the axis to be set or cleared. When the [WRITE] key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected. When the [MEMORY CLR CLEAR] key is pressed, an asterisk (*) is displayed and the axis selection is cleared.
- When the selected write axis is changed, the data value of the axis is read and displayed in the (4) data value selection field.
- If multiple axes are selected, the data values are displayed in the order of X-Y-Z.

Write axis selection field display (when the axis mode parameter is independent)

	1-axis module	2-axis module	3-axis module
Initial display	X	X*	X**
Y-axis selection	-	XY	XY*
Z-axis selection	-	-	XYZ
X-axis clear	*	*Y	*YZ
Y-axis clear	-	**	**Z
Z-axis clear	-	-	***

- The data value display is cleared when all write axes are cleared.

- When the axis mode parameter is independent, the interpolation speed in data item 4 is meaningless, and the axis display becomes "* * *". (Data write is not necessary).
- When the axis mode parameter is set for simultaneous 2-axis or simultaneous 3-axis, "xy" or "xyz" is displayed in lower case in the axis selection field, and the axes are cleared or set simultaneously. However for item 2 (motion span), the write axes XYZ are displayed in upper case, and even in simultaneous selection mode, the axes are set independently.
- When the axis mode parameter is simultaneous 2-axis or simultaneous 3-axis, data item 3 (axis speed), is meaningless, and the axis display field becomes "* * *". (Data write is not necessary).

(4) Data value selection field

- Move the cursor to field (4) and enter a numeric value followed by the [WRITE] key. The item data selected in (1) is written for the axis selected in (3) and the data number selected in (2).
- If the entry is incorrect, press the [MEMORY CLR CLEAR] key to return to the previous value.

(5) Block write display field

- For example, when the data for item 5 (acceleration and deceleration), is the same for data numbers 1 to 10, the data can be written in a block. First input the data for the item and move the cursor to the data number selection field. After selecting No. 1, press the [SET] key and input No. 10 followed by the [WRITE] key. Data numbers 1 to 10 will be written in a block. When the [SET] key is pressed, an arrow (→) is displayed in the block write field (5). The procedure is the same for the other items.

Range Table for Positioning Point Data Settings

(These are the contents for each data number for each axis)

Positioning point data item	Description	Default value	Setting range
Motion pattern (1)	This specifies the motion patterns and point data number for next execution. When setting only motion pattern code, such as "C", "P" or "S", is input from the teaching unit II, the data with 1 larger than its own data number is automatically set. (When setting by the CPU's program, be sure to set also the next processing data number.) In case of "S" code, the next processing data number should be one with 1 larger than its own data number.	E (End point)	CXXX: Continuation point PXXX: Pass point SXXX: Circular interpolation point E: End point "XXX" means the positioning point data number for next execution as: 1 ≦ XXX ≦ 400 when "XXX" = 999, return to the original procedures before jump operation. (* 3)
Motion span (2)	This specifies the direction of next motion and its span setting the absolute address or span from the actual position with sign.	I0 (Not move)	A******** : Absolute address I******** : Increment span Software limit (−) ≦ ******** / Conversion unit ≦ Software limit (+)
Axis speed (3) (* 1)	This specifies the axis speed for the independent axis mode.	0	0 ≦ Axis speed ≦ Speed limit (Base speed ≦ Axis speed when axis speed ≠ 0)
Interpolation speed (4) (* 1)	This specifies the interpolation speed for the simultaneous axis mode.	0	0 ≦ Interpolation speed ≦ Speed limit (Base speed ≦ Interpolation speed when interpolation speed ≠ 0)
Acceleration/ deceleration time (5)	This specifies the acceleration and deceleration time to reach the specified speed or to stop the movement.	300 (ms)	64 to 4,999 (ms) (* 2)
Dwell time (6)	This specifies the time lag from the end of the pulse output to the in-position/complete-to-test signal ON.	0	0 to 499 (× 10 ms)
Auxiliary code (7)	This specifies optional codes for the positioning point data. The code set here can be monitored in the shared memory in the timing of the start or end of its execution. You can know which data is executing by monitoring this.	A0 (Auxiliary code not used)	AXXX : End mode WXXX : Start mode 0 ≦ "XXX" ≦ 255 A0: Auxiliary code not used.

Notes:

- (* 1): When using the teaching unit II, axis speed is not displayed in simultaneous axis mode and interpolation speed is not displayed in independent axis mode.
- (* 2): For the positioning module F-type with a system ROM version SV 2.0 or later has ability to set in the range of 0 to 4,999 ms. However, the setting in the range of 0 to 63 ms cannot correctly be set.
- (* 3): The number × × × specifying the next data number to be executed cannot be set on the positioning module E-type. Execution will automatically proceed to the next data number in sequence.

■ Set data operation example (Using a 3-axis positioning unit F-type)

The following describes the operations for setting positioning point data using the teaching unit II. The parameter settings are the default values (cleared memory state).

Settings:

The following data will be input.

Positioning	Data No	1) Motion pattern			2) Motion span			3) Axis speed			4) Interpolation speed			5) Acceleration/ deceleration time			6) Dwell time			7) Auxiliary code		
		X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
P_1	1	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_2	2	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_3	3	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_4	4	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_5	5	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_6	6	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_7	7	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_8	8	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_9	9	C	C	–	I+5000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_{10}	10	E	E	–	I–45000	I+3000	–	5000	5000	–	–	–	–	300	300	–	0	0	–	A0	A0	–
P_{11}	11																					
P_{12}	12																					
Remarks											Does not need to be set if the axis mode is Independent.			Same as the default value			Same as the default value			Same as the default value		

Operations	Display screen	Description
DATA	D: 0 0 1 1 PATTERN X * * E	• Call up the data screen.
← ← ←	D: 0 0 1 1 PATTERN X * * E	• Move the cursor to the Y-axis selection field.
WRITE	D: 0 0 1 1 PATTERN X Y * E	• Display the Y-axis. (The X-axis data is displayed in the data value selection field.)
← ←	D: 0 0 1 1 PATTERN X Y * E	• Move the cursor to the data value selection field.
C WRITE	D: 0 0 1 1 PATTERN X Y * C	• Write pattern C (continuation point) to data number 1. (The X and Y-axis can be written simultaneously.)
← ←	D: 0 0 1 1 PATTERN X Y * C	• Move the cursor to the data number selection field.
SET 9	D: →0 0 9 1 PATTERN X Y * C	• Select data numbers 1 to 9.
WRITE	D: 0 0 9 1 PATTERN X Y * C	• Write pattern C to data numbers 1 to 9. (Write the X and Y-axis simultaneously.)

Operations	Display screen	Description
1 0 WRITE or INC	D: 0 1 0 1 PATTERN XY* E	• Set the data number to 10.
→	D: 0 1 0 1 PATTERN XY* E	• Move the cursor to the item selection field.
2 WRITE or INC	D: 0 1 0 2 MOVE XY* I+0PL	• Item number 2 (motion span) is displayed.
← ← ← MEMORY CLR CLEAR	D: 0 1 0 2 MOVE X* * I+0PL	• Move the cursor to the Y-axis selection field. • Clear the Y-axis display.
← ←	D: 0 1 0 2 MOVE X* * I+0PL	• Move the cursor to the data value selection field.
I - 4 5 0 0 0 WRITE	D: 0 1 0 2 MOVE X* * I-45000PL	• Write the motion span to X-axis data number 10.
DEC	D: 0 0 9 2 MOVE X* * I+0PL	• Display data number 9. (The data for data number 9 is displayed in the data value selection field.)
I 5 0 0 0 WRITE	D: 0 0 9 2 MOVE X* * I+5000PL	• Write the motion span to X-axis data number 9.

Operations	Display screen	Description
← ←	D: 0 0 9 2 MOVE X * * I + 5 0 0 0 PL	• Move the cursor to the data number selection field.
SET 1 WRITE	D: 0 0 1 2 MOVE X * * I + 5 0 0 0 PL	• Write the motion span to X-axis data numbers 1 to 9.
← MEMORY CLR CLEAR	D: 0 0 1 2 MOVE * * *	• Move the cursor to the X-axis selection field. • Clear the X-axis display.
← WRITE	D: 0 0 1 2 MOVE * Y * I + 0 PL	• Move the cursor to the Y-axis selection field. • Display the Y-axis.
← ←	D: 0 0 1 2 MOVE * Y * I + 0 PL	• Move the cursor to the data value selection field.
1 3 0 0 0 WRITE	D: 0 0 1 2 MOVE * Y * I + 3 0 0 0 PL	• Write the motion span to the Y-axis data number 1.
← ←	D: 0 0 1 2 MOVE * Y * I + 3 0 0 0 PL	• Move the cursor to the data number selection field.
SET 1 0 WRITE	D: 0 1 0 2 MOVE * Y * I + 3 0 0 0 PL	• Write the motion span for Y-axis data numbers 1 to 10.

Operations	Display screen	Description
← WRITE	D: 0 1 0 2 MOVE XY* I-45000PL	• Move the cursor to the X-axis selection field and display the X-axis. (The X-axis data is displayed in the data value selection field.)
← ← ←	D: 0 1 0 2 MOVE XY* I-45000PL	• Move the cursor to the data value selection field.
SET + INC	D: 0 1 0 3 A.SPEED XY* 0PL/S	• Call up item 3 (axis speed).
5 0 0 0 WRITE	D: 0 1 0 3 A.SPEED XY* 5000PL/S	• Write axis speed to X and Y-axis data number 10. (The X and Y-axis can be written simultaneously.)
← ←	D: 0 1 0 3 A.SPEED XY* 5000PL/S	• Move the cursor to the data number selection field.
SET 1 WRITE	D: 0 0 1 3 A.SPEED XY* 5000PL/S	• Write axis speed to X and Y-axis data numbers 1 to 10.

Note:

- When using the positioning module E-type, perform an EEPROM write operation after setting the parameter data. Refer to page 66 for the operating procedures.

4. Homing Operation

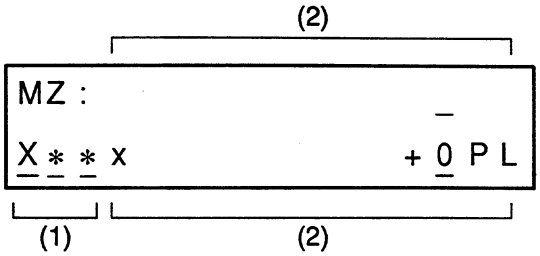
■ Homing operation screen selection

```
MZ : x □□□□□□□□□□PL
XYZy ΔΔΔΔΔΔΔΔΔΔPL
```

The homing operation screen is selected by pressing the [MECHANICAL RETURN] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) Drive axis selection field in the initial screen.)
(1) .. Drive axis selection field
(2) .. Actual position address display and selection field

<Selection fields>

(1) Drive axis selection field

- Specifies the drive axis for the homing operation.
- Move the cursor to the position of the axis to be set or cleared. When the [WRITE] key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected. When the [MEMORY CLR CLEAR] key is pressed, an asterisk (*) is displayed and the axis selection is cleared.

(2) Actual position address display and selection field

- Displays the actual position address.
- In the initial selection screen, the drive axis is X* * and the X-axis is selected. The actual position address for the X-axis is displayed in the lower row.
- After execution of the homing operation, the home offset address value is displayed.
- You can move the cursor and change the actual position address.

■ Homing operation example (Using a 3-axis positioning module F-type)

The following describes the operations for a homing operation using the teaching unit II. Executing these operations moves the X, Y, and Z-axis of the 3-axis module to their home positions.

Operations	Display screen	Description
MECHANICAL RETURN	MZ : X * * x Δ Δ Δ Δ Δ Δ P L	• Select homing operation. • When the X-axis is selected in the axis selection field, the actual position address for the X-axis is displayed in the actual position address display field.
← WRITE	MZ : x Δ Δ Δ Δ Δ Δ P L XY * y Δ Δ Δ Δ Δ Δ P L	• X and Y are displayed in the axis selection field. • The actual position addresses for the X and Y-axis are displayed in the actual position address display fields.
← WRITE	MZ : y Δ Δ Δ Δ Δ Δ P L XYZ z Δ Δ Δ Δ Δ Δ P L	• X, Y and Z are displayed in the axis selection field. • The actual position addresses for the Y and Z-axis are displayed in the actual position address display fields.
START	MZ : y □ □ □ □ □ □ P L XYZ z □ □ □ □ □ □ P L	• Start X, Y, and Z-axis homing operation. (The actual position address is updated approximately every 0.5 seconds.)
	• • • •	• • • •
	MZ : y ☆ ☆ ☆ ☆ ☆ ☆ P L XYZ z ☆ ☆ ☆ ☆ ☆ ☆ P L	• When the homing operation for the X, Y, and Z-axis is completed, the current address value is set to the value of the home offset address.

5. Software Homing Operation

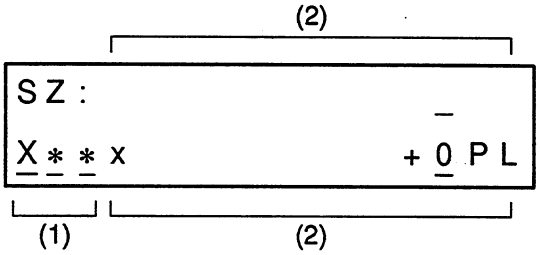
■ Software homing screen selection

```
SZ: x □□□□□□□□□□PL
XYZy ΔΔΔΔΔΔΔΔΔΔPL
```

The software homing screen is selected by pressing the [SOFT RETURN] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) Drive axis selection field in the initial screen.)
(1) .. Drive axis selection field
(2) .. Actual position address display and selection field

<Selection fields>

(1) Drive axis selection field

- Specifies the drive axis for the software homing operation.
- Move the cursor to the position of the axis to be set or cleared. When the [WRITE] key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected. When the [MEMORY CLR CLEAR] key is pressed, an asterisk (*) is displayed and the axis selection is cleared.

(2) Actual position address display and selection field

- Displays the actual position address.
- In the initial selection screen, the drive axis is X* * and the X-axis is selected. The actual position address for the X-axis is displayed in the lower row.
- After execution of the software homing operation, the current value 0 is displayed.
- You can move the cursor and change the actual position address.

■ Software homing operation example (Using a 3-axis positioning module F-type)

The following describes the operations for a software homing operation using the teaching unit II. Executing these operations causes the X, Y, and Z-axis of the 3-axis module to move to the software homing position simultaneously.

Operations	Display screen	Description
SOFT RETURN	SZ : X * * x Δ Δ Δ Δ Δ Δ P L	· Select the software homing operation. · When the X-axis is selected in the axis selection field, the actual position address of the X-axis is displayed in the actual position address display field.
← WRITE	SZ : x Δ Δ Δ Δ Δ Δ P L XY * y Δ Δ Δ Δ Δ Δ P L	· X and Y are displayed in the axis selection field. · The actual position addresses for the X and Y-axis are displayed in the actual position address display fields.
← WRITE	SZ : y Δ Δ Δ Δ Δ Δ P L XYZ z Δ Δ Δ Δ Δ Δ P L	· X, Y and Z are displayed in the axis selection field. · The actual position addresses for the Y and Z-axis are displayed in the actual position address display fields.
START	SZ : y □ □ □ □ □ □ P L XYZ z □ □ □ □ □ □ P L	· Start X, Y, and Z-axis software homing operation. (The actual position address is updated approximately every 0.5 seconds.)
	• • • •	• • • •
	SZ : y + 0 P L XYZ z + 0 P L	· Software homing operation completed. (The actual position address displays 0.)

6. JOG Operation

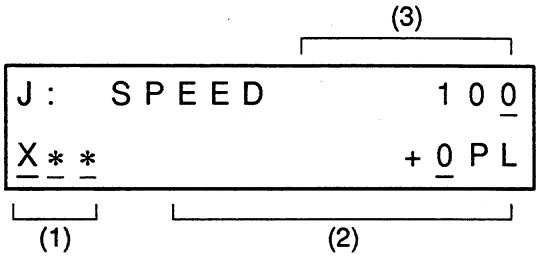
■ JOG operation screen selection

```
J :   S P E E D □□□□□□□□
X * *   Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ P L
```

The JOG operation screen is selected by pressing the [JOG] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ . . . Indicates the cursor positions
(The cursor is positioned at the (3) JOG operation speed selection field in the initial screen.)
(1) . . Actual position monitor axis selection field
(2) . . Actual position address display and selection field
(3) . . JOG operation speed display and selection field

<Selection fields>

(1) Actual position monitor axis selection field
- In the initial screen, "X* *" and the X-axis are displayed.
- Move the cursor to the position of the axis to be set. When the [WRITE] key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected. The [MEMORY CLR / CLEAR] key is not accepted for any axis.
- Multiple axes cannot be selected simultaneously.
  However, the JOG operation can be performed simultaneously for the X and Y-axis using the [↖]·[↗]·[↙]·[↘] keys.
- The operation keys [Z+/X+]·[Z-/X-]·[Y+]·[Y-]·[↖]·[↗]·[↙]·[↘] have priority for the drive axis currently being displayed, and the display changes according to the drive axis.

(2) Actual position address display and selection field
- Displays the actual position address selected in (1)
- You can move the cursor and change the actual position address.

(3) JOG operation speed display and selection field
- Displays the JOG speed of the selected axis.
- Move the cursor and use the numeric input and [WRITE] key to change the JOG speed.
  (Set a value that is less than the speed limit parameter.)
- Each time the [HIGH/LOW] key is pressed, the display alternates between displaying the "home return high speed" and "home return low speed" parameters.

■ JOG operation example (Using a 3-axis positioning module F-type)

The following describes the operations for a JOG operation using the teaching unit II.

Initial parameter settings:

- Home return speed (high): 50,000 PLS/s
- Home return speed (low): 100 PLS/s
- Unit setting: 0 (Pulse)

Operations	Display screen	Description
JOG	J : SPEED 100 X * * +0 PL	• Select JOG mode • The home return low speed (100 PLS/sec) is displayed. • The actual position address [+0 PLS(X)] is displayed.
2 0 0 0 WRITE	J : SPEED 2000 X * * +0 PL	• Change the JOG speed to 2,000.
Z+/X+	J : SPEED 100 X * * +533 PL	• JOG X-axis clockwise • X-axis actual position address: +553
Y+	J : SPEED 100 * Y * +1734 PL	• JOG Y-axis clockwise • Y-axis actual position address: +1734 (The drive axis and JOG speed display change to track the Y-axis.)
↘	J : SPEED 100 * Y * -16 PL	• JOG X-axis clockwise and Y-axis counterclockwise simultaneously • The tracking axis display continues to track the Y-axis, and the actual position address for the Y-axis (-16) is displayed.
SHIFT + Z+/X+ (Press at the same time)	J : SPEED 100 * * Z +720 PL	• JOG Z-axis clockwise • The actual position address for the Z-axis (+720) is displayed.
Z-/X-	J : SPEED 2000 X * * +35 PL	• JOG X-axis counterclockwise • X-axis actual position address: +35

Operations	Display screen	Description
HIGH LOW HIGH LOW	J : SPEED 50000 X * * +35PL	• Select home return high speed 50,000 PLS/sec.
Z- X-	J : SPEED 50000 X * * -205PL	• JOG X-axis counterclockwise • X-axis actual position address: -205
HIGH LOW	J : SPEED 100 X * * -205PL	• Select home return low speed 100 PLS/sec.
↗	J : SPEED 100 X * * -16PL	• JOG X-axis clockwise and Y-axis clockwise simultaneously

7. Teaching Function

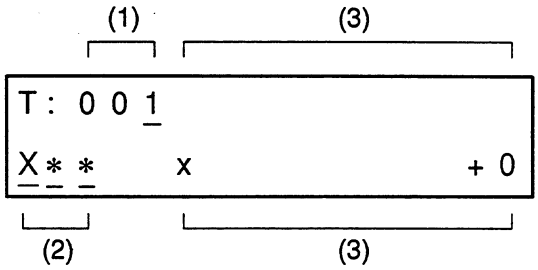
■ Teaching screen selection

```
T: □□□
X * *      x Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ
```

The teaching screen is selected by pressing the TEACHING key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) Data number selection field in the initial screen.)
(1) .. Data number selection field
(2) .. Actual position write axis display and selection field
(3) .. Actual position address display field

<Selection fields>

(1) Data number selection field
- Indicates the data number where the actual position address will be written (taught).
- The data number can be selected by moving the cursor and pressing the INC , DEC or number keys.
- When the cursor is in the (1) Data number selection field and the WRITE key is pressed, the actual position address is written as the motion span. (It is written as absolute data).
  The write (teaching) cannot be performed when the cursor is in any other position.

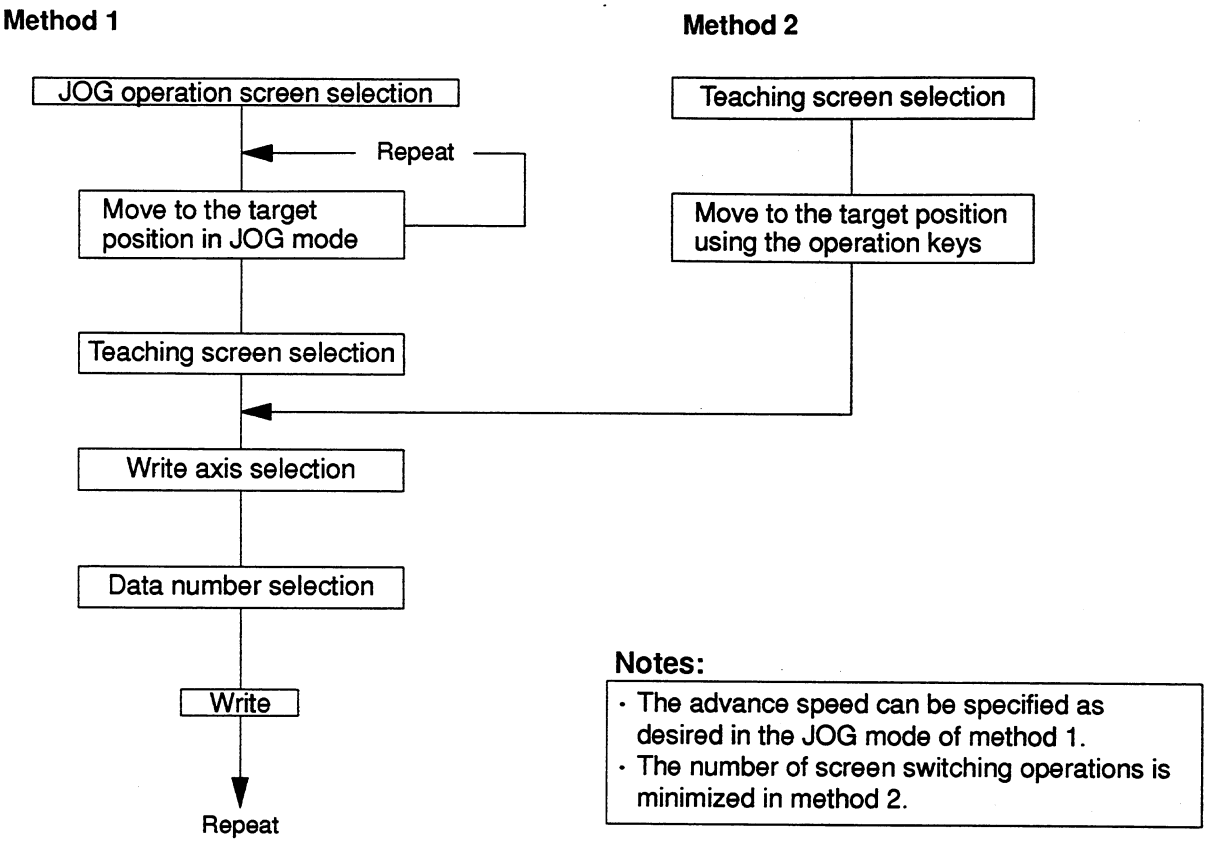
(2) Actual position write axis display and selection field
- In the initial screen, "X* *" and the X-axis are displayed.
- Move the cursor to the position of the axis to be selected.
  When the WRITE key is pressed, the letter (X, Y, or Z) for the axis is displayed and the axis is selected.
- By selecting all 3-axis X, Y, and Z, the data for all 3-axis can be written and taught in one operation.
  (However, only 2-axis are shown in the actual position address display.)

(3) Actual position address display field
- Displays the actual position address. (Units are not displayed).
- In the initial selection screen, the X-axis current value is displayed in the lower row.

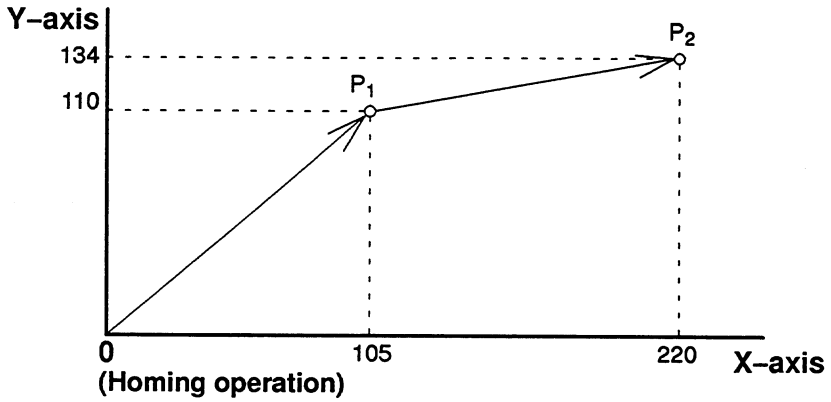
■ Teaching function example

The following describes the operations for a teaching function using the teaching unit II.

Teaching function flow



Teaching coordinate positions



1. X-axis and Y-axis, 2-axis teaching
2. Homing operatiopn has already been executed.
3. The teaching points are P1 and P2.

Operations	Display screen	Description
TEACH -ING	T: 0 0 1 X * * x + 0	• Teaching mode selection • The actual position address for the X-axis is displayed.
← ← WRITE	T: 0 0 1 x + 0 X Y * y + 0	• Write axes X and Y are selected.
Z+ X+ Z- X- Y+ Y- ↗ ↘ ↙ ↖	T: 0 0 1 x + 1 0 5 X Y * y + 1 1 0	• Move to point P1 Address P1 (+105, +110)
→ → WRITE	T: 0 0 1 x + 1 0 5 X Y * y + 1 1 0	• Write (teach) the current value data for point P1 to data number 1.
Z+ X+ Z- X- Y+ Y- ↗ ↘ ↙ ↖	T: 0 0 1 x + 2 2 0 X Y * y + 1 3 4	• Move to point P2 Address P2 (+220, +134)
INC or 2 ↓ WRITE	T: 0 0 2 x + 2 2 0 X Y * y + 1 3 4	• Write (teach) the current value data for point P2 to data number 2.

8. Positioning Operation (Normal-start, Quick-start, Step operation)

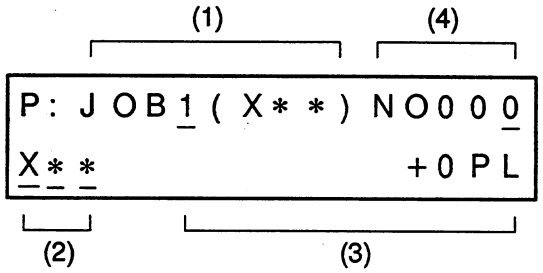
■ Positioning operation screen selection

```
P: JOB1 ( X    ) NO000
X** ΔΔΔΔΔΔΔΔΔΔPL
```

The positioning operation screen is selected by pressing the [POSITION] key in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ ... Indicates the cursor positions
(The cursor is positioned at the (1) JOB number selection field in the initial screen.)
(1) .. JOB number selection field
(2) .. Axis display and selection field for the actual position address monitor
(3) .. Actual position address display and selection field
(4) .. JOB start data number display and selection field
(No. 000 is displayed in the initial screen)

<Selection fields>

(1) JOB number selection field
- Specifies the JOB number of the positioning to be executed.
- Relationship between the parameter settings and the JOB number display.

Parameter \ module	1-axis module	2-axis module		3-axis module		
	X-axis	X-axis	Y-axis	X-axis	Y-axis	Z-axis
0 (Independent)	JOB1(X)	JOB1(X)	JOB2(Y)	JOB1(X)	JOB2(Y)	JOB3(Z)
1 (Simultaneous 2-axis)	—	JOB1(x y)		JOB1(x y)		JOB3(z)
2 (Simultaneous 3-axis)	—	—		JOB1(x y z)		

- Only the number keys [1] , [2] , and [3] are accepted for the settings input.

(2) Axis display and selection field for the actual position address monitor
- The X-axis is selected as the monitor axis in the initial screen.
- Only one of the axes X, Y, or Z can be selected.

X* *
* Y*
* * Z

(3) Actual position address display and selection field
- Displays the actual position address of the selected monitor axis.
- You can move the cursor and change the actual position address.

(4) JOB start data number display and selection field
- Displays and selects the data number for the positioning operation.
- During the positioning operation, the data number of the last completed positioning operation is displayed.

Note:

- To stop the execution of the positioning operation or step operation, keep pressing the STOP key until it is accepted.

■ Positioning operation example

The following describes the operations for a positioning operation using the teaching unit II.
The following are the positioning conditions and data settings.

- Positioning operation on a 2-axis module
- Parameter settings: Simultaneous 2-axis mode
  Other settings use the default values

- Data settings: Default values except for the following:

Data No.	Motion pattern		Motion span		Interpolation speed
	X-axis	Y-axis	X-axis	Y-axis	
1	C	C	A105	A110	100
2	C	C	A220	A134	150
3	E	E	A0	A0	100

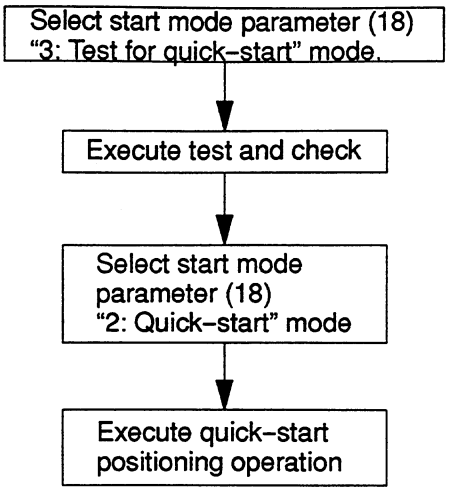
Operations	Display screen	Description
POSITION	P: JOB1 (xy) NO000 X* +0PL	• Positioning operation selection
→ 1 WRITE	P: JOB1 (xy) NO001 X* +0PL	• Move the cursor to the start data number display field and specify the start data.
START	P: JOB1 (xy) NO001 X* ΔΔΔPL	• Start the positioning operation • The current value is updated approximately every 0.5 seconds.
	• • • •	• • • •
	P: JOB1 (xy) NO003 X* +PL	• In-position • The data number after the positioning is executed is displayed in the start data number display field.
1 WRITE	P: JOB1 (xy) NO001 X* +0PL	• Set the start data number.
STEP	P: JOB1 (xy) NO003 X* ΔΔΔPL	• Start step operation (See note.) • The current value is updated approximately every 0.5 seconds.
	• • • •	• • • •
	P: JOB1 (xy) NO001 X* +105PL	• Step operation completed

Note:

- For step operation, the positioning operation stops when positioning data motion pattern C or E is executed.

■ Quick-start operation example

Procedure



- POSITION, select JOB number, select start number, START
- POSITION, select JOB number, select start number, START

* An error occurs if the current value for the quick-start execution differs from the current value for the test and check execution.
* The execution data from the test and check execution is cleared when normal mode is selected after a quick-start or test and check execution, or when the power is turned back ON. It is necessary to redo the test and check operation.

- The conditions for this example are the same as for the positioning operation example on the previous page.
- The quick-start function is available only on the positioning module F-type.

Operations	Display screen	Description
MODE/PARAMETER	P: 1 PULSE OUT M X* * 1 (CW+CCW)	· Call up the parameter screen.
1 8 WRITE	P: 18 START MODE 0 NORMAL	· Set item 18 (start mode).
← 3 WRITE	P: 18 START MODE 3 TEST RUN	· Select "3: Test for quick-start" mode.

Operations	Display screen	Description
POSITION	C: JOB1 (xy) NO000 X* +0 PL	• Select positioning operation.
1 WRITE	C: JOB1 (xy) NO000 X* +0 PL	• Select JOB number 1.
→ 1 WRITE	C: JOB1 (xy) NO001 X* +0 PL	• Move the cursor to the JOB start data number display field and set the start data.
START	C: JOB1 (xy) NO003 X* +0 PL	• Test run execution and completion (No pulse output)
MODE PARAMETER	P: 18 START MODE 3 TEST RUN	• Call up the parameter screen.
← 2 WRITE	P: 18 START MODE 2 QUICK START	• Select "2: Quick-start" mode.
POSITION	P: JOB1 (xy) NO001 X* +0 PL	• Select positioning operation. (Select JOB number 1.)
→ 1 WRITE	P: JOB1 (xy) NO001 X* +0 PL	• Select the start number.
START	P: JOB1 (xy) NO003 X* +0 PL	• Quick-start operation

■ JOG positioning operation example (Only for the positioning module E-type)

The following describes the operations for a positioning operation using the teaching unit II and the positioning module E-type.
The following are the positioning conditions and data settings.

- Positioning module E-type
- JOG positioning operation on a 1-axis module
- Parameter settings: ..... Default values
- Data settings: Default values except for the following

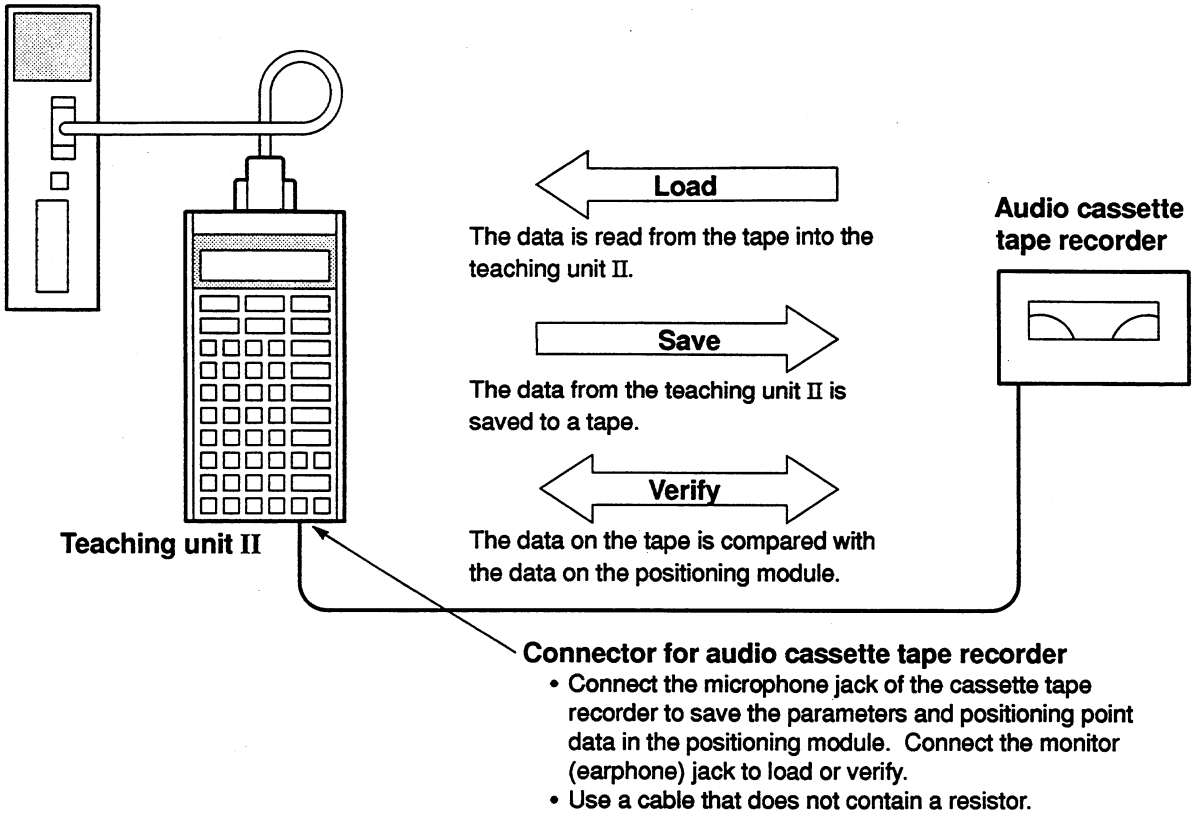
Data No.	Motion pattern	Motion span	Interpolation speed
1	E	I1000	500

Operations	Display screen	Description
JOG	J: SPEED 100 X +0PL	• JOG mode selection
2 0 0 WRITE	J: SPEED 200 X +0PL	• Change JOG speed to 200.
SHIFT + JOG (Press at the same time)	JOG POSITION OK→WRITE KEY	• JOG position confirmation screen
WRITE	J: JOB1 (X) NO000 X +0PL	• JOG position selection
→ 1 WRITE	J: JOB1 (X) NO001 X +0PL	• Select JOB start data number.
START	J: JOB1 (X) NO001 X ΔΔΔΔPL	• Start JOG positioning operation
	J: JOB1 (X) NO001 X +1000PL	• JOG positioning operation completed

9. Data Storage Function (Operating the Cassette Tape Recorder)

■ Cassette tape recorder data transactions

Positioning module

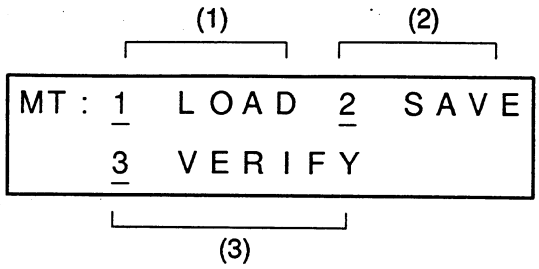


■ Cassette recorder screen selection

The cassette recorder screen is selected by pressing the [TAPE] key in LOCAL mode.
The key is not accepted during positioning operation and homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ . . . Indicates the cursor positions
(The cursor is positioned at the (1) Cassette load selection field in the initial screen.)
(1) . . Cassette load selection field
(2) . . Cassette save selection field
(3) . . Verify selection field

<Selection fields>

(1) Cassette load selection field
• Used to load the data saved on the cassette tape to the positioning module.

(2) Cassette save selection field
• Used to save the data in the positioning module to a cassette tape.

(3) Verify selection field
• When data is saved to tape or when data is loaded from a tape, this function compares the data on the tape with the data in the memory of the positioning module.

Notes:

- To stop the execution of the cassette save, load, or verify operation, keep pressing the STOP key until it is accepted.
- Data transactions with the cassette tape cannot be performed when the start mode parameter (18) is set to "2: Quick-start" or "3: Test for quick-start."

■ Load operation example

The following describes the operations for loading the data saved on a cassette tape recorder into the positioning module.

Operations	Display screen	Description
TAPE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Cassette recorder selection screen
WRITE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Load selection
Press the play button on the tape recorder.	MT : TAPE PLAY L OK→PLAY KEY	• Load selection screen
REC PLAY	MT : EXECUTING L * * * * * * * * *	• Load execution screen • Displayed for approximately 0.2 to 0.3 seconds.
	MT : EXECUTING L LEVEL OK	• Load execution screen • Play level display: OK, LOW, HIGH – When the play level is low, "LEVEL LOW" is displayed. – When the play level is high, "LEVEL HIGH" is displayed. • When "LEVEL LOW" or "LEVEL HIGH" is displayed, adjust the play level of the cassette recorder.
	MT : LOAD COMPLETION	• Load completion screen

■ Save operation example

The following describes the operations for saving the data in the teaching unit II to a cassette tape recorder.

Operations	Display screen	Description
TAPE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Cassette recorder selection screen
→ WRITE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Save selection
Press the record button on the tape recorder.	MT : TAPE PLAY S OK→REC KEY	• Save selection screen
REC PLAY	MT : EXECUTING S * * * * * * * * *	• Save execution screen • Displayed for approximately 22 minutes. • When the teaching unit II is connected to the jack on the tape recorder, then a monitoring sound (beep) is output regardless of the mode. The beep can be verified using a recorder with the sound monitor function. • The data transfer begins approximately 21 seconds after the REC PLAY key is pressed. • Transmission tones (beeping sounds) are output from the teaching unit II at 1 second intervals during execution.
	MT : SAVE COMPLETION	• Save completion screen

■ Verify operation example

The following describes the operations for comparing the data in the teaching unit II with the data from the cassette tape recorder.

Operations	Display screen	Description
TAPE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Cassette recorder selection screen
→ WRITE	MT : 1 LOAD 2 SAVE 3 VERIFY	• Verify selection
Press the play button on the tape recorder.	MT : TAPE PLAY V OK→PLAY KEY	• Verify selection screen
REC PLAY	MT : EXECUTING V *********	• Verify execution screen • Displayed for approximately 0.2 to 0.3 seconds
	MT : EXECUTING V LEVEL OK	• Verify execution screen • Play level display: OK, LOW, HIGH – When the play level is low, "LEVEL LOW" is displayed. – When the play level is high, "LEVEL HIGH" is displayed. • When "LEVEL LOW" or "LEVEL HIGH" is displayed, adjust the play level of the cassette recorder. • Transmission tones (beeping sounds) are output from the teaching unit II at 1 second intervals during execution.
	MT : VERIFY COMPLETION	• Verify completion screen

10. Clear Memory Function

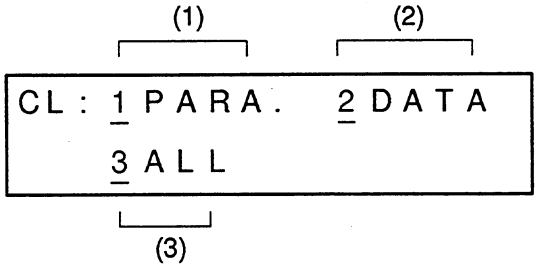
■ Clear screen selection

```
CL : 1 PARA.   2 DATA
     3 ALL
```

The clear screen is selected by pressing the [SHIFT] + [MEMORY CLR / CLEAR] keys in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Display>

_ . . . Indicates the cursor positions
(The cursor is positioned at the (1) Clear parameters selection field in the initial screen.)
(1) . . Clear parameters selection field
(2) . . Clear data selection field
(3) . . Clear all memory selection field

<Selection fields>

(1) Clear parameters selection field
• Used to clear only the parameter area of the memory.

(2) Clear data selection field
• Used to clear only the positioning point data area of the memory.

(3) Clear all memory selection field
• Used to clear both the parameter and positioning point data areas of the memory.

Notes:

- When the memory is cleared, all values are set to default values.
- The clear memory function cannot be executed when the start mode parameter (18) is set to "2: Quick-start" or "3: Test for quick-start."

■ Clear memory operation example: PARAMETER

The following describes the operations for clearing the parameters for the positioning module.

Operations	Display screen	Description
SHIFT + MEMORY CLR CLEAR (Press at the same time)	CL : 1 PARA. 2 DATA 3 ALL	· Clear memory selection screen
WRITE	CL : PARA. CLEAR P IF OK→WRT KEY	· Clear parameters selection confirmation screen · Clear parameters execution selection
WRITE	CL : EXECUTING P * * * * * * * * *	· Clear parameters execution screen
	CL : CLEAR COMPLETION	· Clear parameters completed

■ Clear memory operation example: DATA

The following describes the operations for clearing the positioning point data for the positioning module.

Operations	Display screen	Description
SHIFT + MEMORY CLR CLEAR (Press at the same time)	CL : 1 PARA. 2 DATA 3 ALL	· Clear memory selection screen
→	CL : 1 PARA. 2 DATA 3 ALL	· Clear data selection
WRITE	CL : DATA CLEAR D IF OK→WRT KEY	· Clear data execution selection
WRITE	CL : EXECUTING D * * * * * * * * *	· Clear data execution screen
	CL : CLEAR COMPLETION	· Clear data completed

■ Clear memory operation example: CLEAR ALL

The following describes the operations for clearing the parameters and positioning point data for the positioning module.

Operations	Display screen	Description
SHIFT + MEMORY CLR / CLEAR (Press at the same time)	CL : 1 PARA. 2 DATA 3 ALL	· Clear memory selection screen
←	CL : 1 PARA. 2 DATA 3 ALL	· Clear all memory selection
WRITE	CL : ALL CLEAR A IF OK→WRT KEY	· Clear all memory execution selection
WRITE	CL : EXECUTING A * * * * * * * * *	· Clear all memory execution screen
	CL : CLEAR COMPLETION	· Clear all memory completed

11. Data Backup Function (Only available on positioning module E-type)

■ EEPROM write screen selection

```
EEPROM  WRITE
    OK→WRITE  KEY
```

The EEPROM write screen is selected by pressing the [SHIFT] + [0] keys in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

Notes:

- This function is only available on the positioning module E-type.
- Be sure to perform an EEPROM write after completing the parameter and positioning point data settings on the positioning module E-type.
- At power-ON, the contents of the EEPROM are automatically set in the positioning module system on the positioning module E-type.
- The actual position address value is not written to the EEPROM.

■ EEPROM write operation example

The following describes the operations for writing the parameters and positioning point data for the positioning modul E-type to the EEPROM.

Operations	Display screen	Description
[SHIFT] + [0] (Press at the same time)	EEPROM WRITE OK→WRITE KEY	· EEPROM write confirmation screen
[WRITE]	EEPROM WRITE EXECUTING	· EEPROM write execution screen (Approximately 1 second)
	EEPROM WRITE COMPLETION	· EEPROM write completion screen

12. Version Confirmation Function (Only available on positioning module E-type)

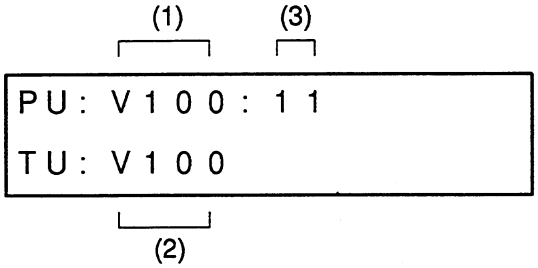
■ Read version screen selection

```
PU: V100: 11
TU: V100
```

The read version screen is selected by pressing the [SHIFT] + [1] keys in LOCAL mode.
The key is not accepted during positioning operation, homing operation, or during execution of cassette load, save, or verify.

■ Screen description

Initial screen



<Description>

(1) . . Positioning module version number display field (Example: Ver. 1.00)
(2) . . Teaching unit II version number display field
(3) . . Module number of positioning module

	Module number for F-type	Module number for E-type
1-axis module	09	11
2-axis module	0B	13
3-axis module	0F	17

Note:

- The version confirmation function is not available on the positioning module F-type.

■ Read version operation example (For a 2-axis positioning module E-type)

The following describes the operations for reading the version of the positioning module and the teaching unit II.

Operations	Display screen	Description
[SHIFT] + [1] (Press at the same time)	PU: V100: 13 TU: V100	· Read version display

CHAPTER 4

ERROR CODES

4-1. Error Display

• When an error occurs for some reasons during the setting operating from the teaching unit II, the error code or error message is displayed on the LCD.

■ Error code display screen

· The error code is displayed in the underscored position (⎵⎵).

```
* *  ERROR  * *
X⎵⎵  Y⎵⎵  Z⎵⎵
```

· For 3-axis module

```
* *  ERROR  * *
X⎵⎵  Y⎵⎵
```

· For 2-axis module

```
* *  ERROR  * *
X⎵⎵
```

· For 1-axis module

■ Error message screen

```
* *  ERROR  * *
Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ Δ
```

Error message display

4-2. Error Codes

1. Error Codes

Error code (HEX value)	Error name	Description
01	SET UP error or PC CPU error	System start failure or watchdog error of CPU
02	Battery voltage error (* 1)	The backup battery for the memory is either running low or disconnected.
10	Time check error (* 2)	Time check over for the communication line
11	BCC error (* 2)	BCC error occurred in the command data
12	Format error (* 2)	The command message does not match the format.
21	Pulse output mode setting error	Setting range error of parameter (1st → 2nd → Last) Order of priority (when the setting error are occurred at the time)
22	Axis mode setting error	
23	Unit setting error	
24	Conversion rate setting error	
25	Speed limit setting error	
26	Software limit (+) setting error	
27	Software limit (-) setting error	
28	Base speed setting error	
29	Interpolation speed setting error	
30	Backlash compensation setting error	
31	Deviation compensation setting error	
32	In-position time setting error	
33	Homing direction setting error	
34	Home offset address setting error	
35	Home return high-speed setting error	
36	Home return low-speed setting error	
37	Acceleration/deceleration time setting error	
38	Start mode setting error	
39	Homing method setting error	
40	Interface logic setting error	
72 (*3)	Module No. setting error	
41	Motion pattern setting error	Setting range error of positioning point data
42	Motion span setting error	
43	Axis speed setting error	
44 (*4)	Interpolation speed setting error	
45	Acceleration/deceleration time setting error	
46	Dwell time setting error	
47	Auxiliary code setting error	

Notes:

- (* 1): Only available on the positioning module F-type for system ROM version of SV 2.0 or later. If an abnormality in the battery voltage is detected after the power is turned ON, error code "02" is set, but the error detected contact does not turn ON. Battery errors do not affect the positioning operation.
- (* 2): An error name appears on the display when the teaching unit II is connected, but there is no effect on the positioning operation.
- (* 3): Only available on the positioning module E-type.
- (* 4): Only available on the positioning module F-type.

Error code (HEX value)	Error name	Description
50 (*1)	JOB start number error	• In quick-start mode, a data No. other than test execution was selected. • The satrt No. current value selected for the quick-start mode is different from the value for the test run. • Exceeded 10 points per axis (30 points for 3 axes) during the test run.
51	Start mode error	Hardware homing was not completed after homed usual-start mode operation.
52 (*1)	Start mode error	JOG start, teaching mode, or home start was set in test or quick-start mode.
53 (*2)	JOB start No. selection error	Start data outside the allowed tolerance was set or started.
54 (*2)	JOG speed error	JOG speed setting tolerance error (JOG speed ≦ speed limit)
55 (*2)	JOG positioning error	Start data motion span is set to A (absolute) during JOG positioning.
56 (*2)	Start mode selection error	JOG positioning started in normal-start after homing mode.
60	Overlimit switch error	Overlimit switch was turned ON.
61	Software overlimit error	Software limit will be exceeded with the next action.
62 (*1)	Branch error	9 times or more branches were exceeded.
63 (*1)	Return error	Program encountered "Return" without branch.
64	Drive error	Drive error input was active.
65	Speed change error	Cannot accelerate/decelerate at the speed change point.
66	Stop disable error	Insufficient distance for the current speed until stop during C and E points.
67 (*1)	Circular interpolation error	Three points for circular interpolation are on one straight line.
68	Actual position change error	Setting range error Range: - 8,388,607 to + 8,388,607
69 (*1)	CPU ready error	Request-to-run signal turn OFF during a positioning operation.

Notes:

- (* 1): Only available on the positioning module F-type.
- (* 2): Only available on the positioning module E-type.

Error code (HEX value)	Error name	Description
70 (*1)	Data write error	Data write was executed during a test run or quick-start mode.
71 (*2)	Transfer block No. error	Error in transfer block No. setting
72 (*2)	Parameter unit No. error	Range error for parameter unit No. setting Data setting No. (1 to 50) error for data read or write
73 (*2)	Data No. setting error	More than 20 data values are set for command transmission (multiple move setting).
74 (*2)	Parameter item No. error	Range error for parameter item No. setting
75 (*2)	Positioning point data item No. error	Positioning point data item No. (1 to 7) error for command transmission
76 (*2)	Command code error	Command code error for command transmission
77 (*2)	Axis code error	Axis code setting (1 to 3) error for command transmission
78 (*2)	Clear memory function error	Function code error (1 to 3) for clear memory operation by command transmission

Notes:

- (* 1): If the start mode is set to quick-start or test run mode parameters or positioning data cannot be written and the memory cannot be cleared.
  Only available on the positioning module F-type.
- (* 2): Only available on the positioning module E-type.

2. Error Messages

Situation	Error name	Description
When make use of audio cassette	Tape error (TAPE)	Audio cassette tape problem during playback
	Playback error (HEADDER)	Faulty search for header mark during playback, faulty cord connection
	Tape BCC error (TAPE BCC)	BCC error in the data during load, degraded cassette tape
	Verify error (VERIFY)	Memory contents differ during verification
	Type identity error (CONNECTION)	Different models used for writing and reading data
	Phase error (PHASE)	Faulty phase detection at the beginning of playback operation.

The error name is displayed on the LCD display when the teaching unit II is connected.

CHAPTER 5

APPENDIX

5-1. Specifications

1. General Specifications

Item	Descriptions
Ambient temperature	0 °C to 50 °C/32 °F to 122 °F
Storage temperature	-20 °C to +60 °C/-4 °F to +140 °F
Ambient humidity	30 % to 85 % RH (non-condensing)
Vibration resistance	10 Hz to 55 Hz, 1 cycle/min: double amplitude 0.75 mm/0.030 in., 10 min on 3 axes
Shock resistance	98 m/s^2, 4 times of 3 axes

2. Performance Specifications

Item	Descriptions
Functions	• Hardware homing operation • Software homing operation • Positioning operation • JOG operation • Teaching function • Set and edit parameters • Set and edit positioning point data • Data storage function • Clear parameter and positioning point data settings from memory • JOG positioning operation (∗1) • Data backup function (∗1) • Version confirmation function (∗1)
Interface for audio cassette recorder	• **Type of the recorder:** Ordinary audio cassette tape recorder (one that does not have automatic level adjustment) • **Type of tape:** Ordinary audio cassette tape • **Transfer rate:** 1200 bps • **Connection cable:** Ordinary connection cable (without resistor)
RS422 port	• Use this port for connecting a positioning module using FP/FP1 peripheral cables • 15-pin, D-sub • RS422 interface (automatic switching between 19200 and 9600 bps) • Peripheral cable: – FP peripheral cable: for FP3/FP5 positioning units transistor type – FP1 peripheral cable: for FP-C/FP3 positioning modules line-driver type
Power supply	5 V DC (350 mA max.) Supplied from positioning module via FP/FP1 peripheral cables
Weight	Approx. 350 g/12.346 oz.

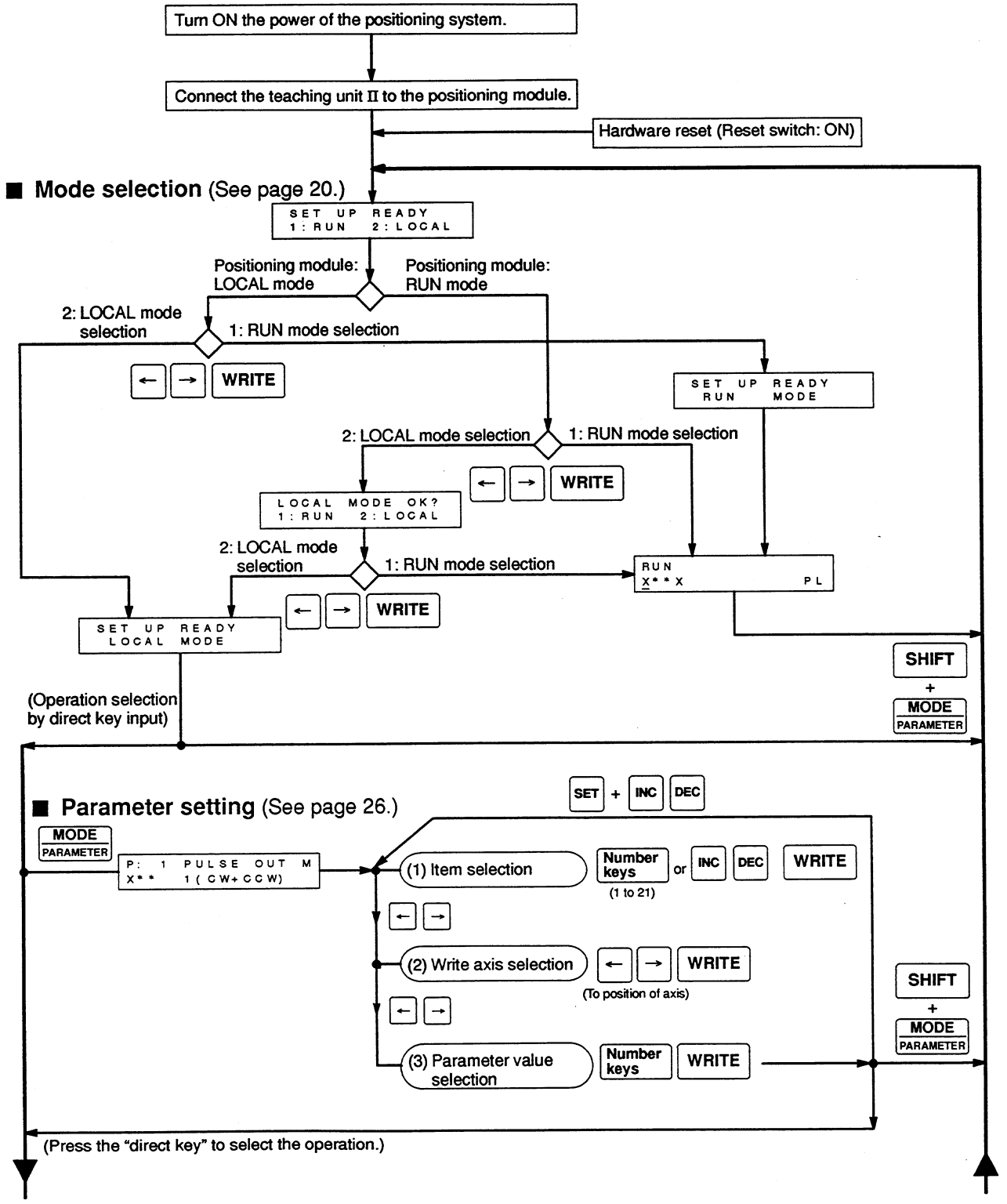
Note:

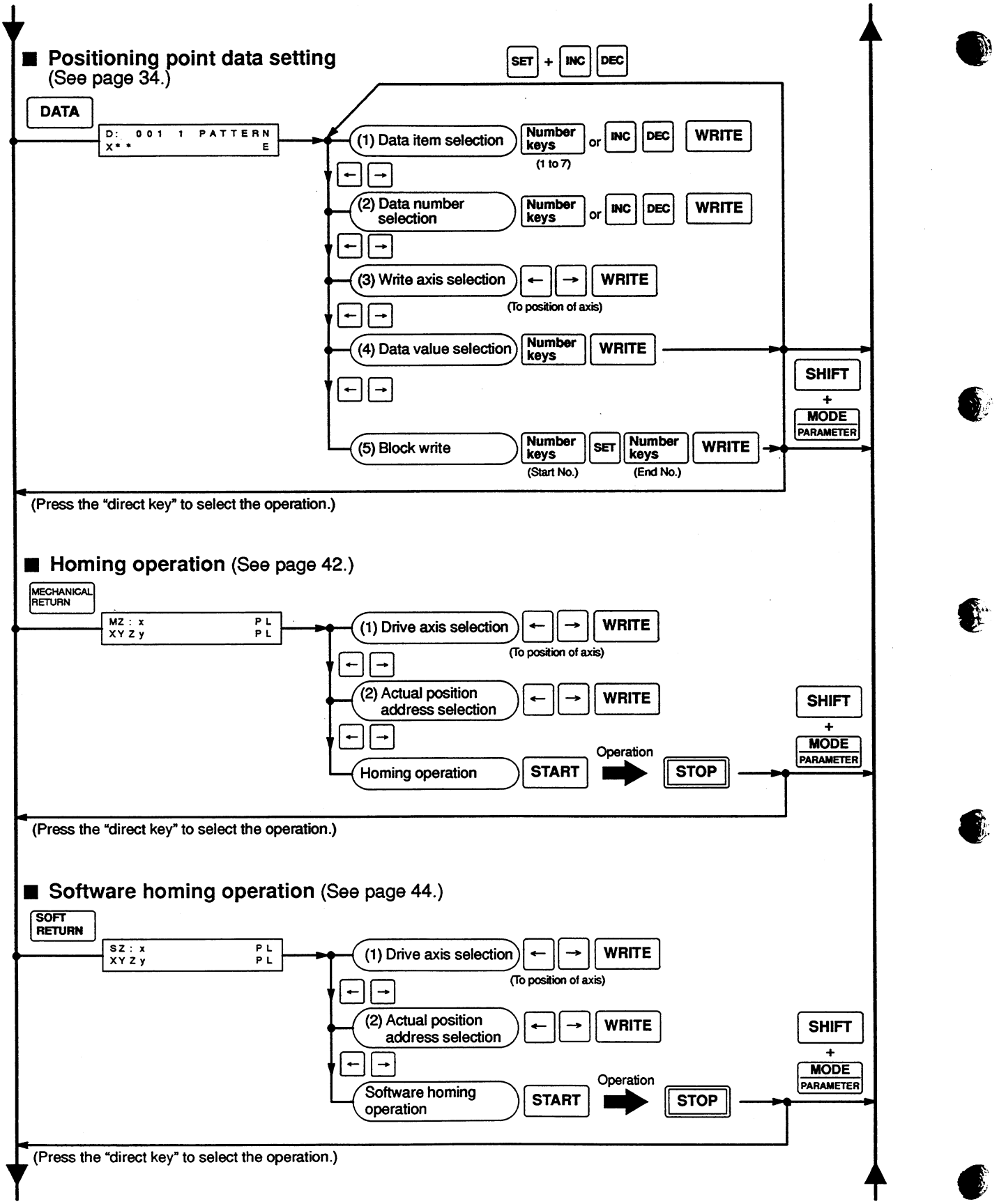
· (∗ 1): Items with this mark are only available on the positioning module E-type.

5-2. Key Operation Flowchart

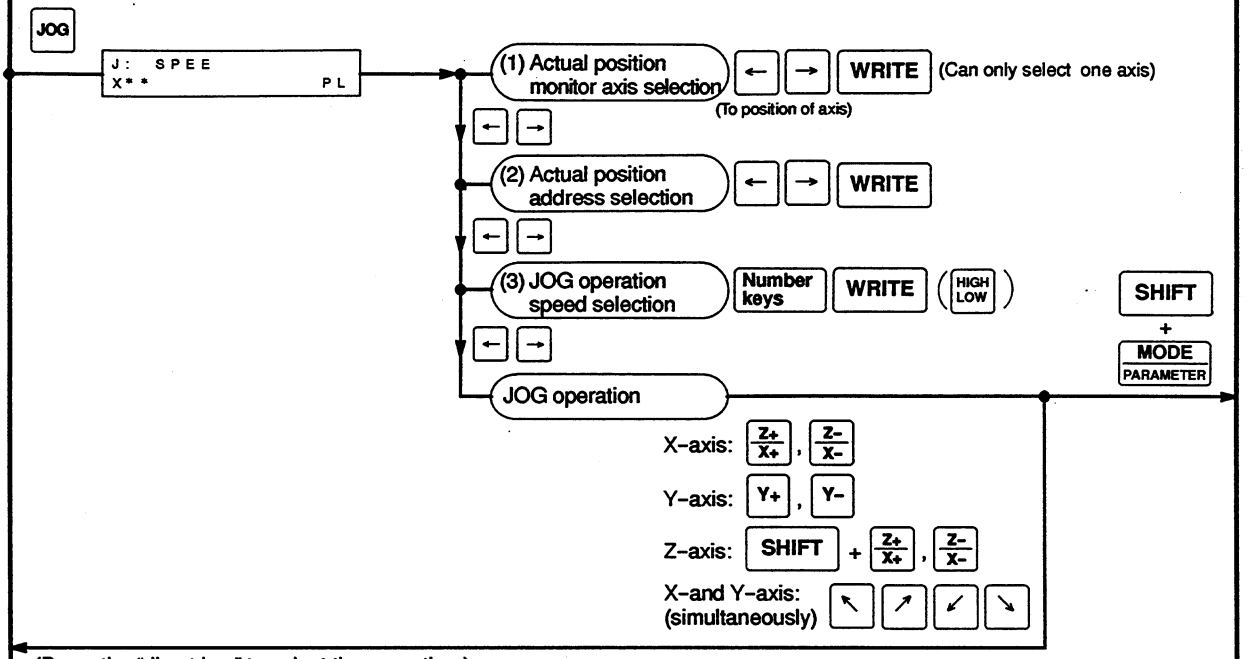
Note:

- If the entry is incorrect, press the MEMORY CLR / CLEAR key to return to the previous display.

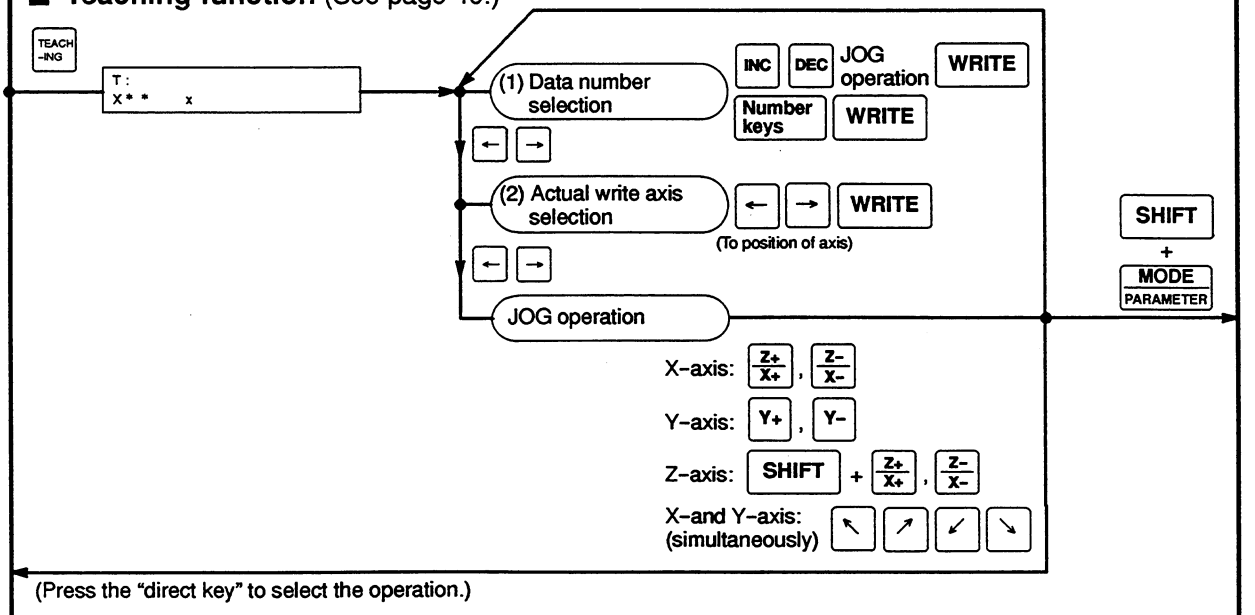


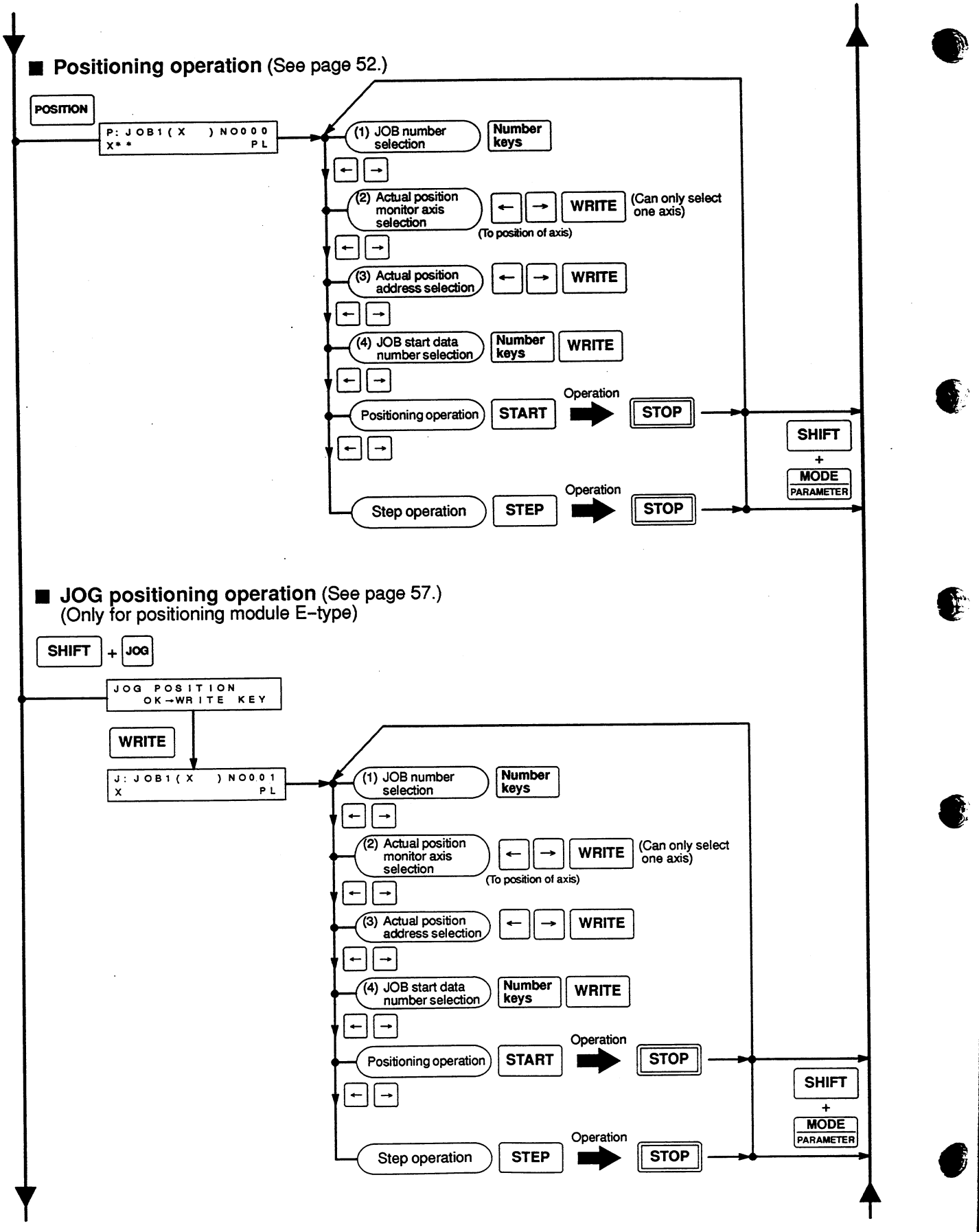

■ Positioning point data setting
(See page 34.)
SET + INC DEC
DATA
D: 001 1 PATTERN
X** E
(1) Data item selection
Number keys
(1 to 7)
or INC DEC WRITE
(2) Data number selection
Number keys
or INC DEC WRITE
(3) Write axis selection
WRITE
(To position of axis)
(4) Data value selection
Number keys
WRITE
(5) Block write
Number keys
SET
Number keys
(Start No.)
(End No.)
WRITE
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)
■ Homing operation (See page 42.)
MECHANICAL RETURN
MZ : x PL
XY Z y PL
(1) Drive axis selection
WRITE
(To position of axis)
(2) Actual position address selection
WRITE
Homing operation
START
Operation
STOP
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)
■ Software homing operation (See page 44.)
SOFT RETURN
SZ : x PL
XY Z y PL
(1) Drive axis selection
WRITE
(To position of axis)
(2) Actual position address selection
WRITE
Software homing operation
START
Operation
STOP
SHIFT + MODE PARAMETER
(Press the "direct key" to select the operation.)

■ JOG operation (See page 46.)

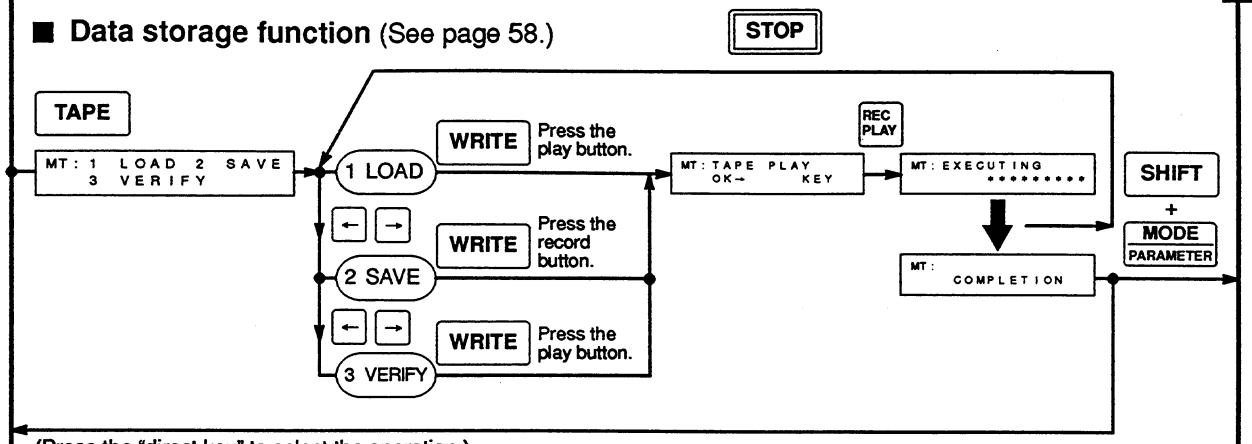


■ Teaching function (See page 49.)



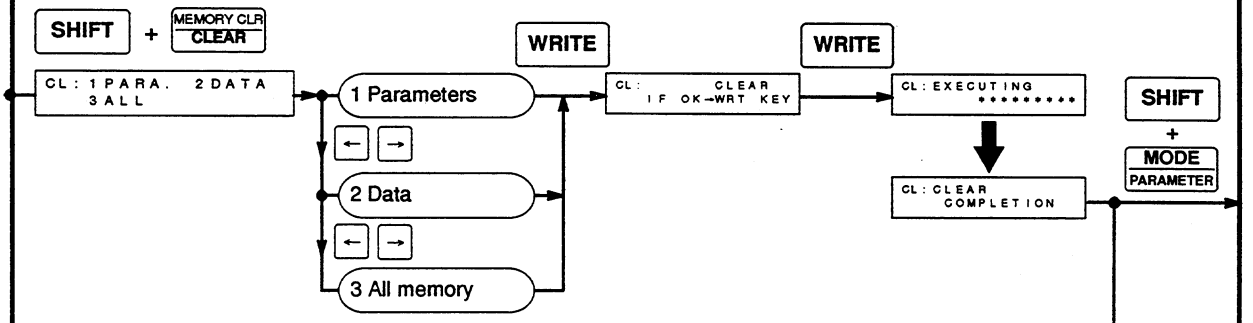

■ Positioning operation (See page 52.)
POSITION
P: JOB1 (X) NO000
X** PL
(1) JOB number selection
Number keys
(2) Actual position monitor axis selection
WRITE
(Can only select one axis)
(To position of axis)
(3) Actual position address selection
WRITE
(4) JOB start data number selection
Number keys
WRITE
Positioning operation
START
Operation
STOP
Step operation
STEP
Operation
STOP
SHIFT
+
MODE
PARAMETER
■ JOG positioning operation (See page 57.)
(Only for positioning module E-type)
SHIFT + JOG
JOG POSITION
OK→WRITE KEY
WRITE
J: JOB1 (X) NO001
X PL
(1) JOB number selection
Number keys
(2) Actual position monitor axis selection
WRITE
(Can only select one axis)
(To position of axis)
(3) Actual position address selection
WRITE
(4) JOB start data number selection
Number keys
WRITE
Positioning operation
START
Operation
STOP
Step operation
STEP
Operation
STOP
SHIFT
+
MODE
PARAMETER

■ Data storage function (See page 58.)



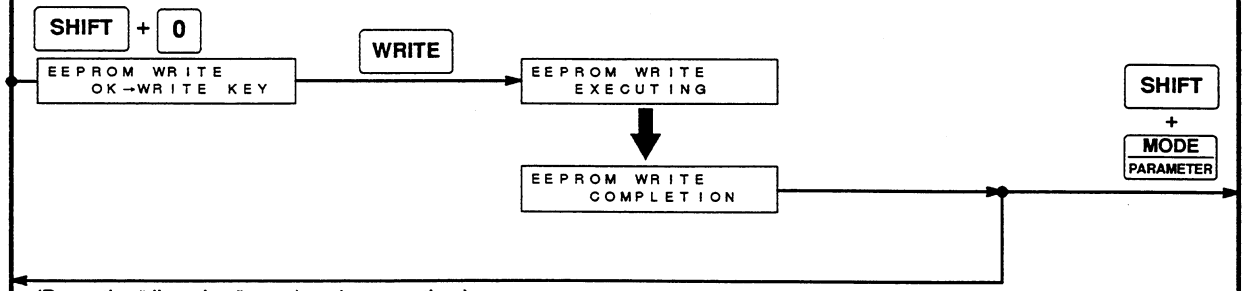
(Press the "direct key" to select the operation.)

■ Clear memory function (See page 63.)



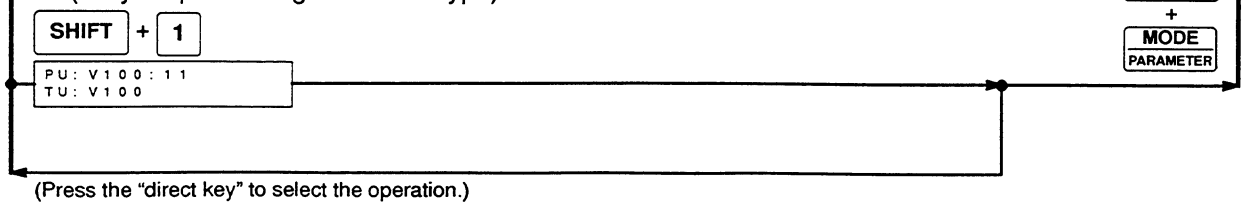
(Press the "direct key" to select the operation.)

■ Data backup function (See page 66.)
(Only for positioning module E-type)



(Press the "direct key" to select the operation.)

■ Version confiramation function (See page 67.)
(Only for positioning module E-type)

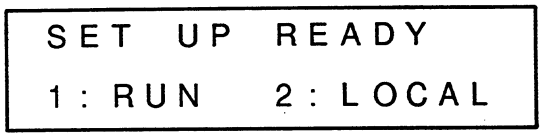


(Press the "direct key" to select the operation.)

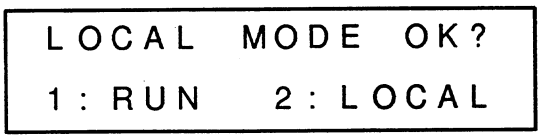
5-3. Screen Displays

1. Initial Selection Screens

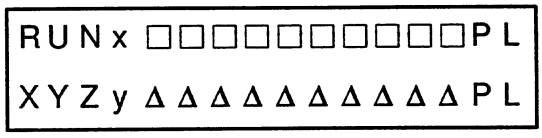
■ **Mode selection** (See page 20.)



Mode selection screen



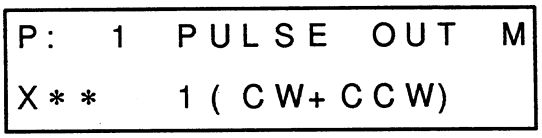
Mode confirmation screen



RUN monitor screen

■ **Parameter setting** (See page 26.)

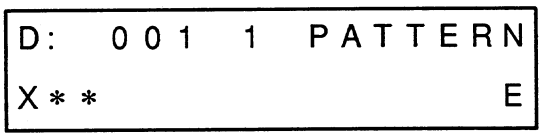
(MODE PARAMETER key)



Parameter screen

■ **Positioning point data setting** (See page 34.)

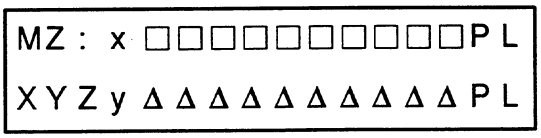
(DATA key)



Data screen

■ **Homing operation** (See page 42.)

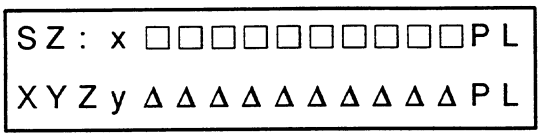
(MECHANICAL RETURN key)



Homing operation screen

■ **Software homing operation** (See page 44.)

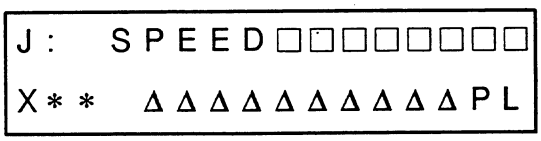
(SOFT RETURN key)



Software homing screen

■ **JOG operation** (See page 46.)

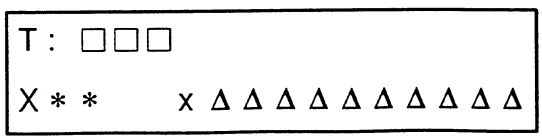
(JOG key)



JOG operation screen

■ **Teaching function** (See page 49.)

(TEACH -ING key)



Teaching screen

■ **Positioning operation** (See page 52.)

(POSITION key)

```
P: JOB1 ( X    ) NO000
X** ΔΔΔΔΔΔΔΔΔΔΔPL
```

Positioning operation screen

■ **Data storage function** (See page 58.)

(TAPE key)

```
MT: 1 LOAD 2 SAVE
    3 VERIFY
```

Cassette recorder screen

■ **Clear memory function** (See page 63.)

(SHIFT + MEMORY CLR / CLEAR keys)

```
CL: 1 PARA.  2 DATA
    3 ALL
```

Clear screen

■ **Data backup function** (See page 66.)

(SHIFT + 0 keys)

```
EEPROM WRITE
   OK→WRITE KEY
```

EEPROM write screen

■ **Version confirmation function** (See page 67.)

(SHIFT + 1 keys)

```
PU: V100:11
TU: V100
```

Read version screen

2. Error Screens

■ **Error code display screens**

The error code is displayed in the underscored position (⎵⎵).

```
 **  ERROR  **
X⎵⎵ Y⎵⎵ Z⎵⎵
```

· For 3-axis module

```
 **  ERROR  **
X⎵⎵ Y⎵⎵
```

· For 2-axis module

```
 **  ERROR  **
X⎵⎵
```

· For 1-axis module

■ **Error message screen**

```
 **  ERROR  **
ΔΔΔΔΔΔΔΔΔΔΔ
```

← Error message display

5-4. Error Codes and Error Messages

1. Error Codes

Error code (HEX value)	Error name	Description
01	SET UP error or PC CPU error	System start failure or watchdog error of CPU
02	Battery voltage error (* 1)	The backup battery for the memory is either running low or disconnected.
10	Time check error (* 2)	Time check over for the communication line
11	BCC error (* 2)	BCC error occurred in the command data
12	Format error (* 2)	The command message does not match the format.
21	Pulse output mode setting error	Setting range error of parameter (1st, 2nd, ..., Last — Order of priority (when the setting error are occurred at the time))
22	Axis mode setting error	
23	Unit setting error	
24	Conversion rate setting error	
25	Speed limit setting error	
26	Software limit (+) setting error	
27	Software limit (-) setting error	
28	Base speed setting error	
29	Interpolation speed setting error	
30	Backlash compensation setting error	
31	Deviation compensation setting error	
32	In-position time setting error	
33	Homing direction setting error	
34	Home offset address setting error	
35	Home return high-speed setting error	
36	Home return low-speed setting error	
37	Acceleration/deceleration time setting error	
38	Start mode setting error	
39	Homing method setting error	
40	Interface logic setting error	
72 (*3)	Module No. setting error	
41	Motion pattern setting error	Setting range error of positioning point data
42	Motion span setting error	
43	Axis speed setting error	
44 (*4)	Interpolation speed setting error	
45	Acceleration/deceleration time setting error	
46	Dwell time setting error	
47	Auxiliary code setting error	

Notes:

- (* 1): Only available on the positioning module F-type for system ROM version of SV 2.0 or later. If an abnormality in the battery voltage is detected after the power is turned ON, error code "02" is set, but the error detected contact does not turn ON. Battery errors do not affect the positioning operation.
- (* 2): An error name appears on the display when the teaching unit II is connected, but there is no effect on the positioning operation.
- (* 3): Only available on the positioning module E-type.
- (* 4): Only available on the positioning module F-type.

Error code (HEX value)	Error name	Description
50 (*1)	JOB start number error	• In quick-start mode, a data No. other than test execution was selected. • The satrt No. current value selected for the quick-start mode is different from the value for the test run. • Exceeded 10 points per axis (30 points for 3 axes) during the test run.
51	Start mode error	Hardware homing was not completed after homed usual-start mode operation.
52 (*1)	Start mode error	JOG start, teaching mode, or home start was set in test or quick-start mode.
53 (*2)	JOB start No. selection error	Start data outside the allowed tolerance was set or started.
54 (*2)	JOG speed error	JOG speed setting tolerance error (JOG speed ≦ speed limit)
55 (*2)	JOG positioning error	Start data motion span is set to A (absolute) during JOG positioning.
56 (*2)	Start mode selection error	JOG positioning started in normal-start after homing mode.
60	Overlimit switch error	Overlimit switch was turned ON.
61	Software overlimit error	Software limit will be exceeded with the next action.
62 (*1)	Branch error	9 times or more branches were exceeded.
63 (*1)	Return error	Program encountered "Return" without branch.
64	Drive error	Drive error input was active.
65	Speed change error	Cannot accelerate/decelerate at the speed change point.
66	Stop disable error	Insufficient distance for the current speed until stop during C and E points.
67 (*1)	Circular interpolation error	Three points for circular interpolation are on one straight line.
68	Actual position change error	Setting range error Range: - 8,388,607 to + 8,388,607
69 (*1)	CPU ready error	Request-to-run signal turn OFF during a positioning operation.

Notes:

- (* 1): Only available on the positioning module F-type.
- (* 2): Only available on the positioning module E-type.

Error code (HEX value)	Error name	Description
70 (*1)	Data write error	Data write was executed during a test run or quick-start mode.
71 (*2)	Transfer block No. error	Error in transfer block No. setting
72 (*2)	Parameter unit No. error	Range error for parameter unit No. setting Data setting No. (1 to 50) error for data read or write
73 (*2)	Data No. setting error	More than 20 data values are set for command transmission (multiple move setting).
74 (*2)	Parameter item No. error	Range error for parameter item No. setting
75 (*2)	Positioning point data item No. error	Positioning point data item No. (1 to 7) error for command transmission
76 (*2)	Command code error	Command code error for command transmission
77 (*2)	Axis code error	Axis code setting (1 to 3) error for command transmission
78 (*2)	Clear memory function error	Function code error (1 to 3) for clear memory operation by command transmission

Notes:

- (* 1): If the start mode is set to quick-start or test run mode parameters or positioning data cannot be written and the memory cannot be cleared.
  Only available on the positioning module F-type.
- (* 2): Only available on the positioning module E-type.

2. Error Messages

Situation	Error name	Description
When make use of audio cassette	Tape error (TAPE)	Audio cassette tape problem during playback
	Playback error (HEADDER)	Faulty search for header mark during playback, faulty cord connection
	Tape BCC error (TAPE BCC)	BCC error in the data during load, degraded cassette tape
	Verify error (VERIFY)	Memory contents differ during verification
	Type identity error (CONNECTION)	Different models used for writing and reading data
	Phase error (PHASE)	Faulty phase detection at the beginning of playback operation.

The error name is displayed on the LCD display when the teaching unit II is connected.

5-5. Product Types

■ Teaching unit II and Positioning modules

Type		Part number
Teaching unit II (Programming tool of positioning module)		AFP5134
FP-C positioning board F-type line-driver type	1-axis board	AFC3434
	2-axis board	AFC3435
	3-axis board	AFC3436
FP3 positioning unit F-type transistor type	1-axis unit	AFP3431
	2-axis unit	AFP3432
FP3 positioning unit F-type line-driver type	1-axis unit	AFP3434
	2-axis unit	AFP3435
	3-axis unit	AFP3436
FP5 positioning unit F-type transistor type	1-axis unit	AFP5434
	2-axis unit	AFP5435
	3-axis unit	AFP5436
FP-C positioning board E-type line-driver type	1-axis board	AFC3431E
	2-axis board	AFC3432E
FP3 positioning unit E-type transistor type	1-axis unit	AFP3431E
	2-axis unit	AFP3432E

■ FP peripheral cables

Type	Part number	Description
50 cm/19.685 in.	AFP5520	Cable needed for connection between teaching unit II and the positioning unit transistor type.
3 m/9.84 ft.	AFP5523	

■ FP1 peripheral cables

Type	Part number	Description
50 cm/19.685 in.	AFP15205	Cable needed for connection between teaching unit II and the positioning module line-driver type.
3 m/9.84 ft.	AFP1523	

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RECORD OF CHANGES

ACG No.	Date	Description of Changes
ACG-M0077-1	NOV.1995	First edition

These materials are printed on ECF pulp.
These materials are printed with earth-friendly vegetable-based (soybean oil) ink.

Please contact .....

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