

mitsubishi

**MOTION CONTROLLER
(SV13)**

Maintenance Manual

**type A373CPU (P21/R21)-S3/
A373UCPU/A273UCPU**

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1. GENERAL DESCRIPTION

Motion Controller

1. GENERAL DESCRIPTION

The motion controller is a controller which integrates the control functions of PC control and servo control.

The machine and line of 8 axes max. can be controlled and the MELSECNET (II, B) data link system or MELSECNET/10 network system of a PC can be configured with a motion controller. Lines can be automated and production systems can be improved to be more advanced and flexible by using a network.

This manual is designed for the person(s) responsible for maintaining and using the SW[]SRX-SV13[] for the operating system (OS).

The SW[]SRX-SV13[] is classified into the following models according to the applicable CPU and whether or not it has a teaching function. Prior to maintenance and inspection, check the OS type installed in the controller.

OS Type	Applicable CPU	Teaching Function
SW0SRX-SV13H	A373CPU(P21/R21)-S3	Not provided
SW0SRX-SV13I	A373CPU(P21/R21)-S3	Provided
SW1SRX-SV13H	A373UCPU	Not provided
SW1SRX-SV13I	A373UCPU	Provided
SW1SRX-SV13J	A273UCPU	Not provided
SW1SRX-SV13K	A273UCPU	Provided

This manual also gives the causes of hardware and software errors which occur when the system is operated and indicates the corrective actions to take to solve these problems.

In addition, use this manual when operating the SW1SRX-GSV13PE software package (hereafter called the GSV[]PE) to create servo programs for the servo system CPU and positioning parameters by installing it in a personal computer manufactured by the International Business Machines Corporation (hereafter called an IBM PC).

1.1 Product General Description

- (1) CPU units consist of the following 5 kinds: (hereinafter called the servo system CPU)
 - A373CPU-S3..... Independent CPU function (without a data link function)
 - A373CPUP21-S3... With a data link function using fiber-optic cable
 - A373CPUR21-S3... With a data link function using coaxial cable (Hereafter, these are all referred to as an A373CPU).
 - A373UCPU..... Independent CPU function (without a data link function)
 - A273UCPU..... Independent CPU function (without a data link function)

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- (2) A servo system CPU incorporates a CPU for positioning control (hereafter called a PCPU) and a CPU for PC control (hereafter called an SCPU) which perform the following activities:
- PCPU Supervision of positioning control, zero return, and controlling servo amplifiers by using servo programs
 - SCPU Sequence control (The A373CPU corresponds to the A3NCPU, and the A373U/A273UCPU correspond to the A3UCPU.)
Start of servo programs, manual pulse generator operations enable/disable, JOG operations, etc.
- (3) The GSV[]PE has the following three functions:
- GPP function..... This function is equivalent to the SW1IX-GPPAE and is used to develop sequence programs. The SW1IX-GPPAE type GPP Function Software Package Operating Manual gives details.
 - SFC function..... This function is equivalent to the SW2IVD-SAP2 (MELSAP-II) and is used to develop SFC programs.
The SW2IVD-SAP2 (MELSAP-II) type Function Software Package Operating Manual gives details.
 - Servo function..... This function creates positioning data and servo programs for a servo system CPU, monitors the positioning status, and performs test operations.

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Address any inquiries about items not stated in this manual to system supplier.

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(4) Creating programs and data using a peripheral device and a servo system CPU

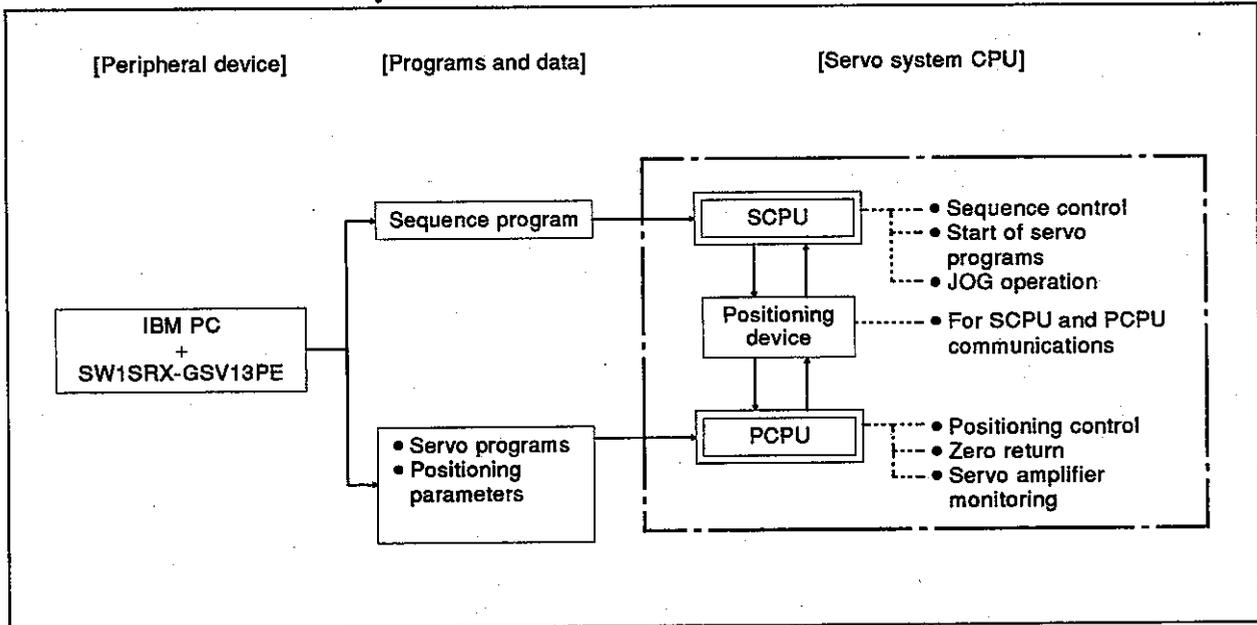


Fig. 1.1 General Description of Processing

- Create sequence programs to be written to the SCPU after starting up the software package for the GPP function by using an IBM PC/AT. (An SVST instruction cannot be used to create a sequence program by a peripheral device which is started by a system other than the GSV[][]PE.)

In addition, a sequence program can be created by the GPP function of the GSV[][]PE.

In this case, create it by designating following PC type names.

Applicable CPU	PC Type Name
A373CPU	A373
A373UCPU	A373U
A273UCPU	A273U

Sequence programs are stored in a memory cassette installed in a servo system CPU.

- Create servo programs and positioning parameters to be written to a PCPU after using the GSV[][]PE to start up an IBM PC. Servo and positioning parameter are stored in the E²ROM of the servo system CPU.
- The positioning control status of a servo system CPU can be monitored, servo programs can be executed, and JOG operations can be tested by using an IBM PC started up by the GSV[][]PE.

(5) This manual uses the following abbreviations:

- ADUAC motor drive module
- MR-SB/SD MR-SB/SD type servo amplifier
- MR-H-B/MR-J-B..... MR-H[]B/MR-J[]B type servo amplifier

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1.2 General Description of Positioning Control

This section gives a general description of the operation to start a servo motor from a servo system CPU and the inputting of external inputs.

1.2.1 When an A373/A373UCPU is used

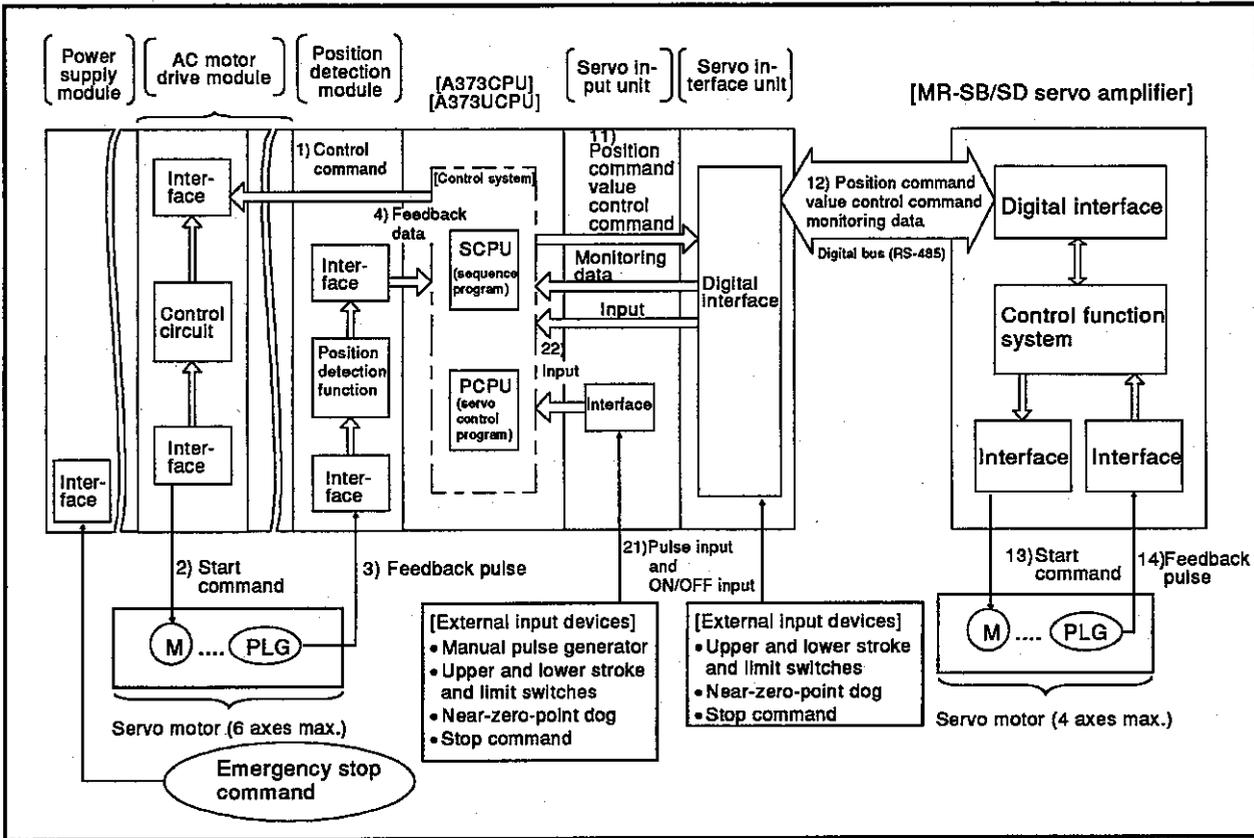


Fig. 1.2 General Description of Positioning Control (When an A373/A373UCPU is used)

- (1) General description of operations
 - (a) Starting the servo motor using the AC motor drive module
The servo motor (max. 6 axes) is started from an A373/A373UCPU by steps 1), 2), 3), and 4) in the above diagram.
 - (b) Starting the servo motor using the servo interface unit
The servo motor (max. 4 axes) is started from an A373/A373UCPU by steps 11), 12), 13), and 14) in the above diagram.
 - (c) Starting and stopping from an external input device by using a servo input unit
External inputs are received by an A373/A373UCPU by steps 21) and 22) in the above diagram, and the servo motor is started and stopped in accordance with 1) to 4).
 - (d) Emergency stop of a servo motor
An emergency stop of all axes of a servo motor can be executed by doing wiring which enables an emergency stop command to be sent to the interface of the power supply module.

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1.2.2 When an A273UCPU is used

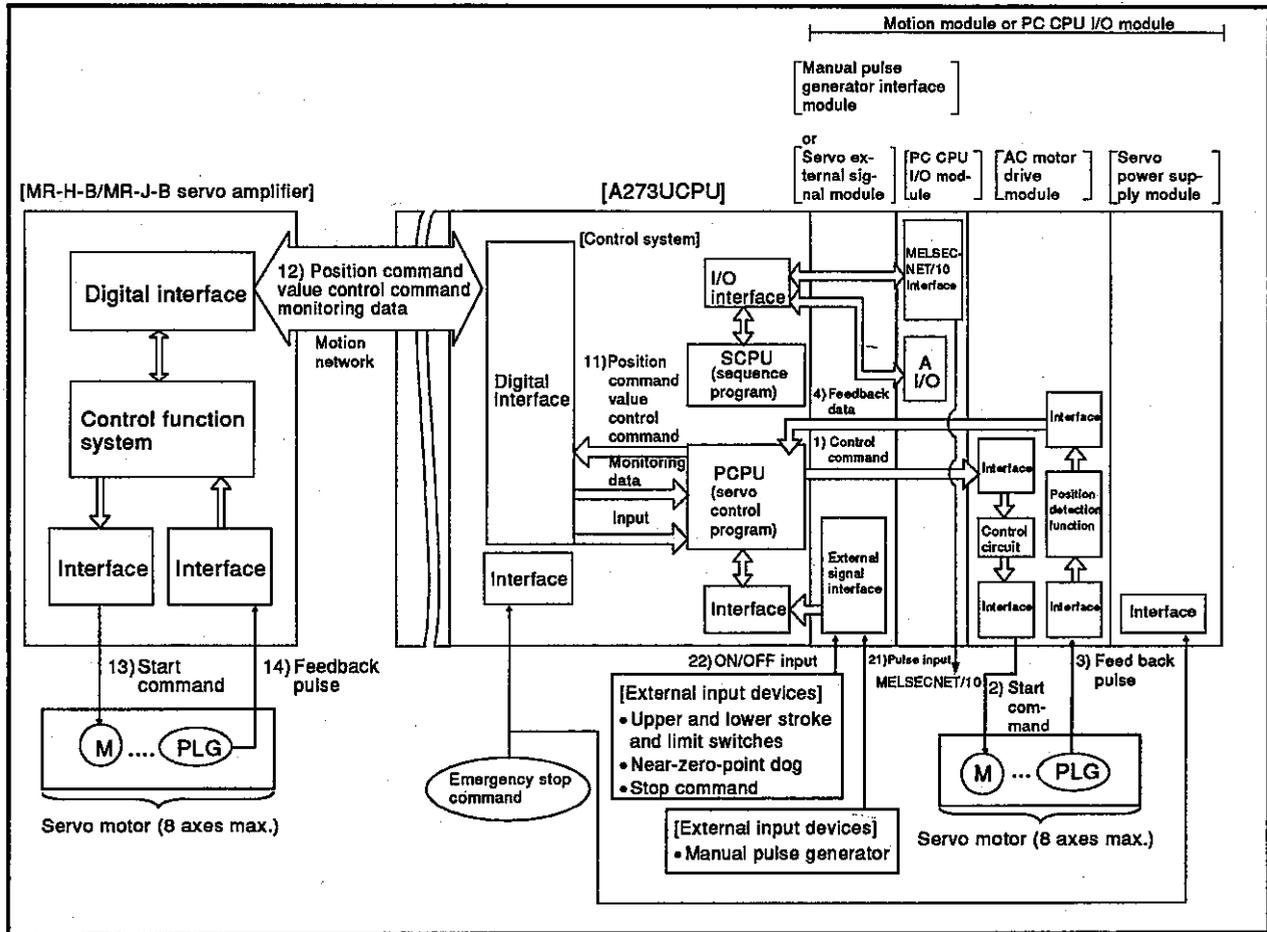


Fig.1.3 General Description of Positioning Control (When an A273UCPU is used)

(1) General description of operations

(a) Starting the servo motor using the AC motor drive module

The servo motor (max. 8 axes) is started from an A273UCPU by steps 1), 2), 3), and 4) in the above diagram.

An AC motor drive module can control two axes max..

ADU Model	Number of Controllable Axes per ADU
A211AM-20	1
A221AM-20	2
A222AM-20	2

(b) Starting the servo motor using the MR-H-B/MR-J-B servo amplifier

The servo motor (max. 8 axes) is started from an A273UCPU by steps 11), 12), 13), and 14) in the above diagram.

An A273UCPU can control up to eight axes by using the AC motor drive module and the MR-H-B/MR-J-B servo amplifier together.

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- (c) Starting and stopping from an external input device by using a servo external signal module or a manual pulse generator/synchronous encoder interface module

External inputs are received by an A273UCPU by steps 21) and 22) in the above diagram, and the servo motor is started and stopped in accordance with 1) to 4).

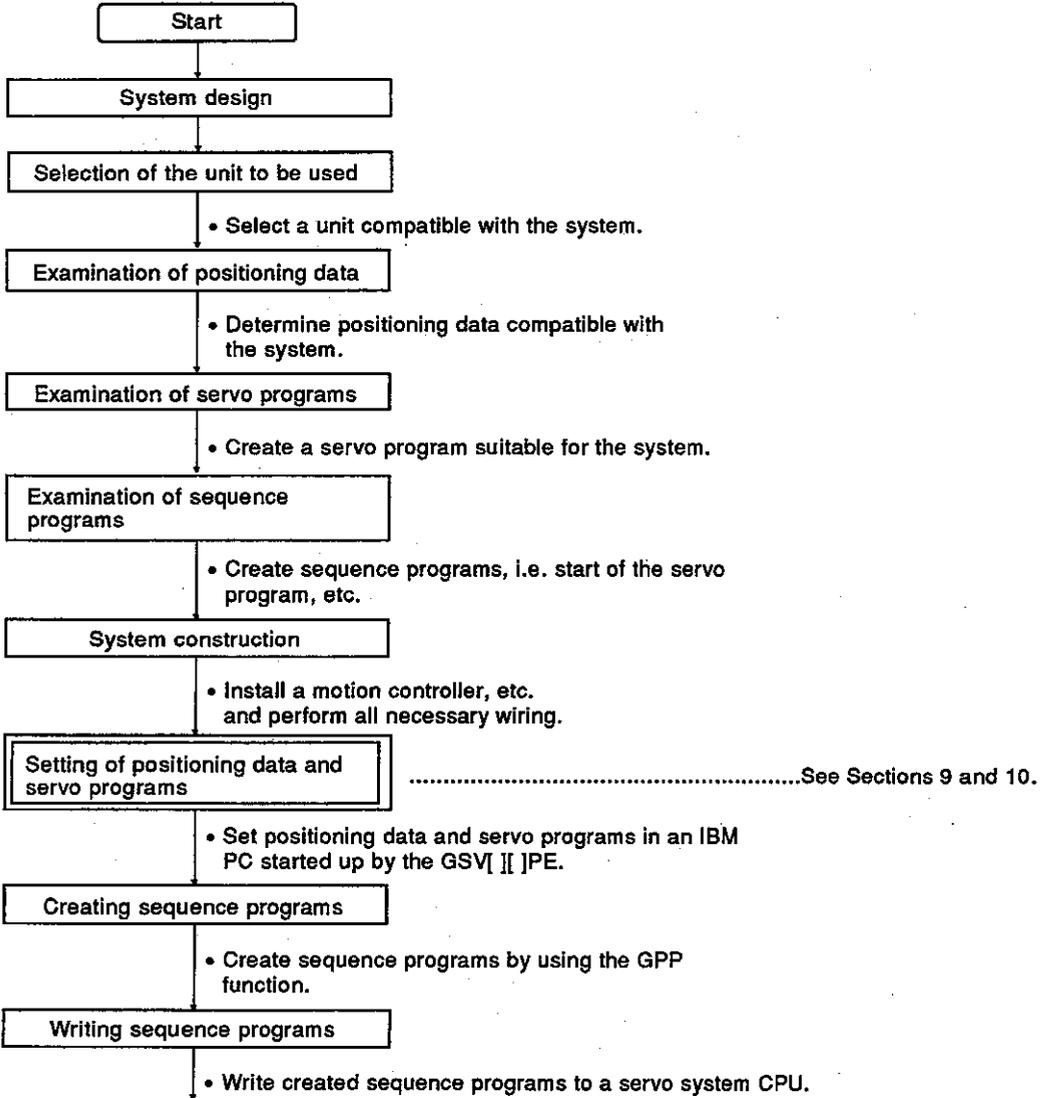
- (d) Emergency stop of a servo motor

An emergency stop of all axes of a servo motor can be executed by doing wiring which enables an emergency stop command to be sent to the interface of the servo system CPU or the servo power supply module.

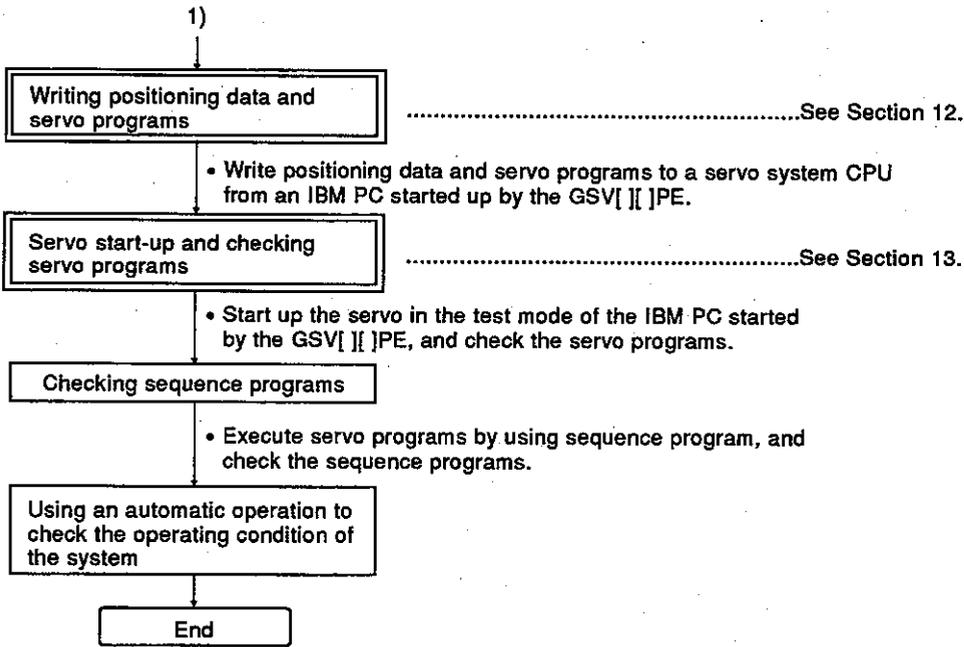
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1.3 Procedure for Starting the System

This section gives an outline of the procedure for starting the designed system.



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REMARK

Duplex frame operations are explained in this manual. When executing a duplex frame operation, see the indicated item. When executing an operation other than a duplex frame for maintenance, consult system supplier.

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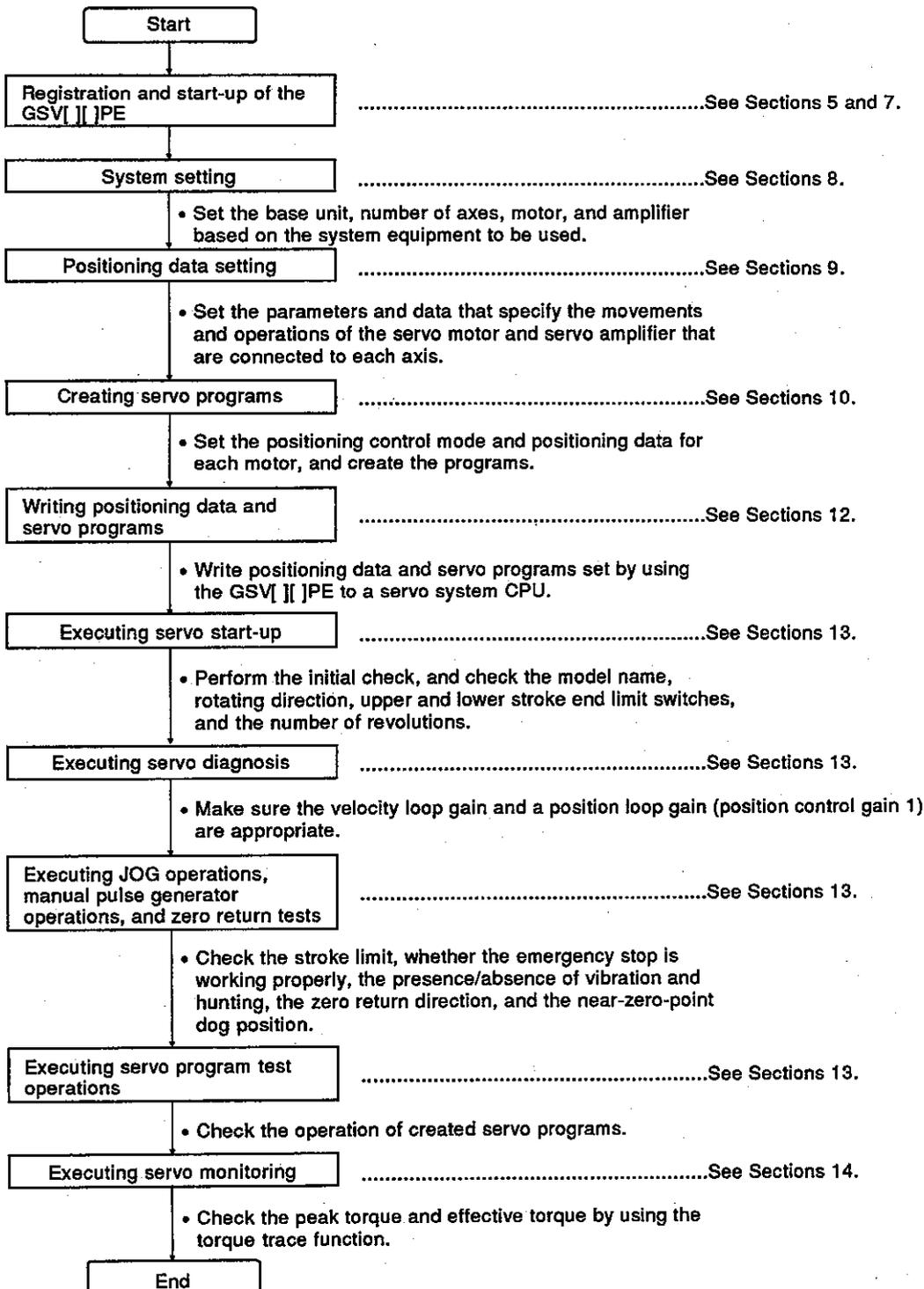
When an A373U/A273UCPU is used, programs for servo program start-up can be prepared in the form of SFC diagrams.

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1.3.1 Outline of the operating procedure using the GSV[][]PE

The operating procedure using the GSV[][]PE is shown below.

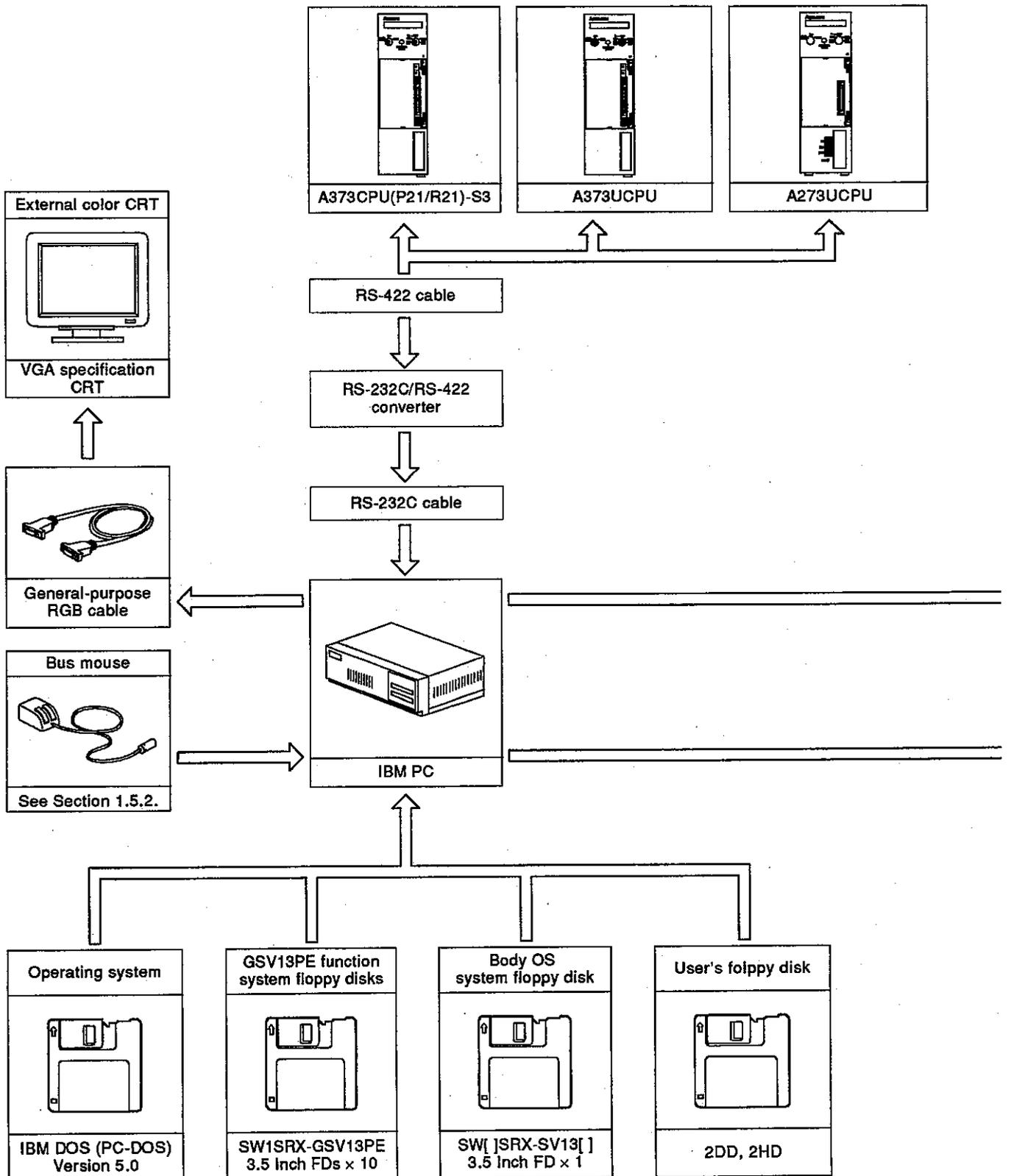


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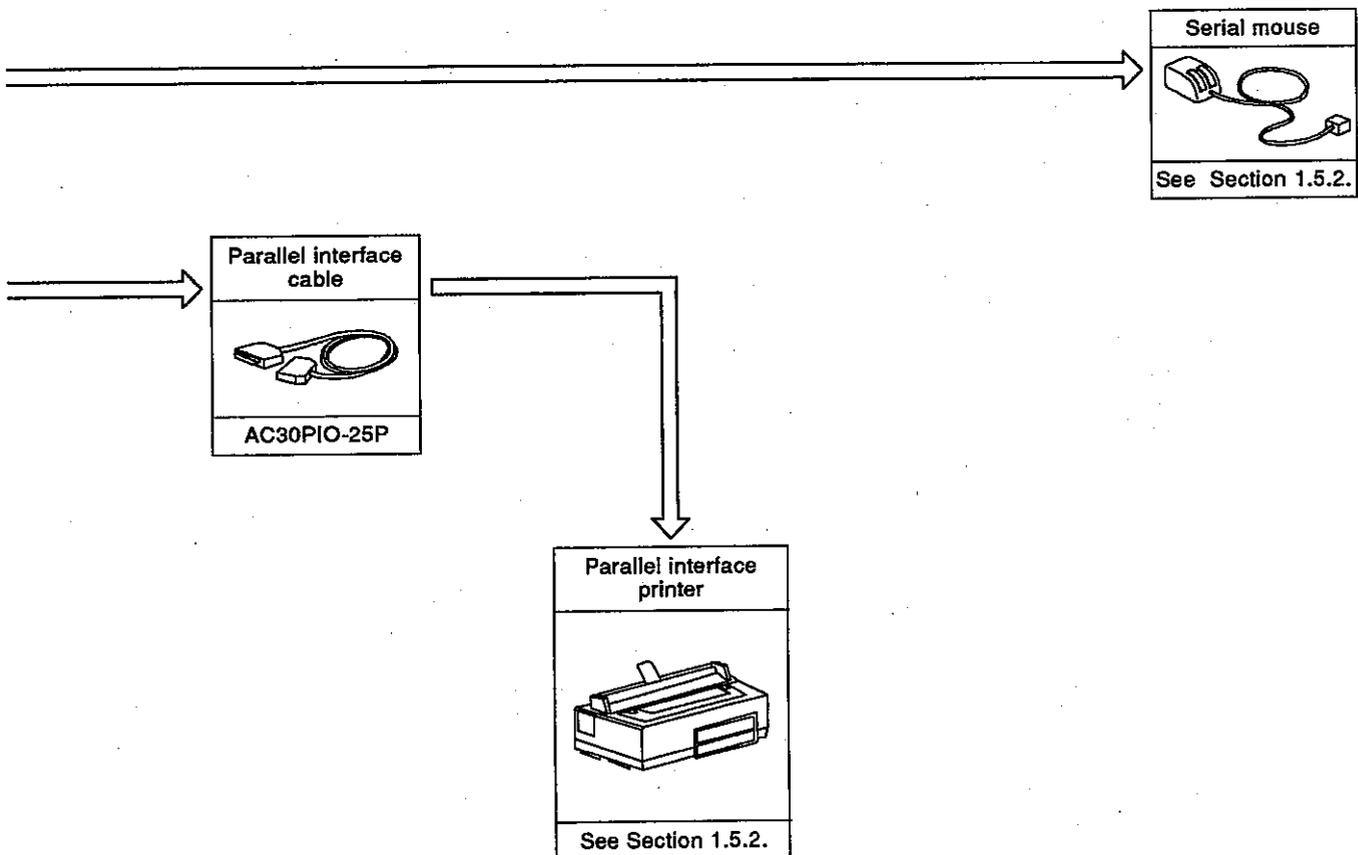
1.4 System Configuration When Operating with the GSV[] []PE

This section gives the system configuration when the GSV[] []PE is used in an IBM PC.



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1. GENERAL DESCRIPTION

1.5 Key Items When Configuring a System

This section gives the key items to consider when configuring a system using the GSV[][]PE.

1.5.1 Applicable CPUs

GSV[][]PE Functions	Applicable CPUs
GPP function	A series CPUs
Servo function	A373CPU, A373UCPU, A273UCPU

Note: Servo system CPU started by the GSV[][]PE can communicate only with a servo system CPU whose OS model name for positioning registered in a servo system CPU is SV13[].

1.5.2 Hardware configuration key items

(1) PCs applicable to the GSV[][]PE

Items	Specifications	Remarks
Model name	IBM PC PC/AT or 100% compatible PC series (PS/2 or PS/55)	VGA board must be used
CPU	i80386 and later	
Main memory	More than 640 K bytes	
Necessary empty memory	500 K bytes or more	
Extended memory	EMS memory: 1 M bytes or more	
Built-in hard disk	11 M bytes or more	<ul style="list-style-type: none"> • The GSV[][]PE uses about 10 M bytes in the system. • After registering the GSV[][]PE to a hard disk, an empty capacity of 1M bytes or more is required for the hard disk.
FDD	More than 1 drive	
Communications port	Serial port × 1 channel or more	When a serial mouse is used, 2 channels are necessary.

(2) Printer to which the GSV[][]PE can transmit

A printer that can use ESC/P code can be utilized.

(3) Mouse that can be used with the GSV[][]PE

- Serial mouse..... Connect via a serial port.
- Bus mouse (PS/2 mouse) Connect via the DIN connector. (depending on the model)

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1.5.3 Software configuration key items

Items	Specifications	Remarks
Operating system	IBM DOS (PC-DOS) version 5.0	
Necessary drivers	<ul style="list-style-type: none">• COUNTRY.SYS• HIMEM.SYS• ANSI.SYS• KEYBOARD.SYS• EMM386.EXE• (Conforms to LIM 4.0)• MOUSE.COM• KEYB.COM• GRAPHICS.COM	CONFIG.SYS and AUTOEXEC.BAT must be set by the user.

(1) Example of CONFIG.SYS

```
FILES = 20
BUFFERS = 20
DOS = HIGH
COUNTRY = 001,, C:\DOS\COUNTRY.SYS
SHELL = C:\DOS\COMMAND.COM /P/E:512
DEVICE = C:\DOS\HIMEM.SYS
DEVICE = C:\DOS\EMM386.EXE 1024
DEVICE = C:\DOS\ANSI.SYS
LASTDRIVE = G
```

(2) Example of AUTOEXEC.BAT

```
ECHO OFF
SET SYS = C:
SET COMSPEC = C:\DOS\COMMAND.COM
SET PATH = C:\;
PROMPT $P$G
PATH = C:\;C:\DOS;
C:\DOS\PROPRINT ON
C:\DOS\MOUSE
C:\DOS\GRAPHICS
C:\DOS\KEYB
```

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1.5.4 How to connect the IBM PC and the servo system CPU

Listed below are the recommended converters used for the connection of the IBM PC to the servo system CPU:

- SC-02N converter
- DCNV-RS24(L) interface module
- DCNV-RS42R interface module
- DAC30R24 interface integrating cable

The details of the converters and the connections of the IBM PC to the servo system CPU are as follows:

- (1) Connecting the IBM PC to the servo system CPU with a SC-02N converter used

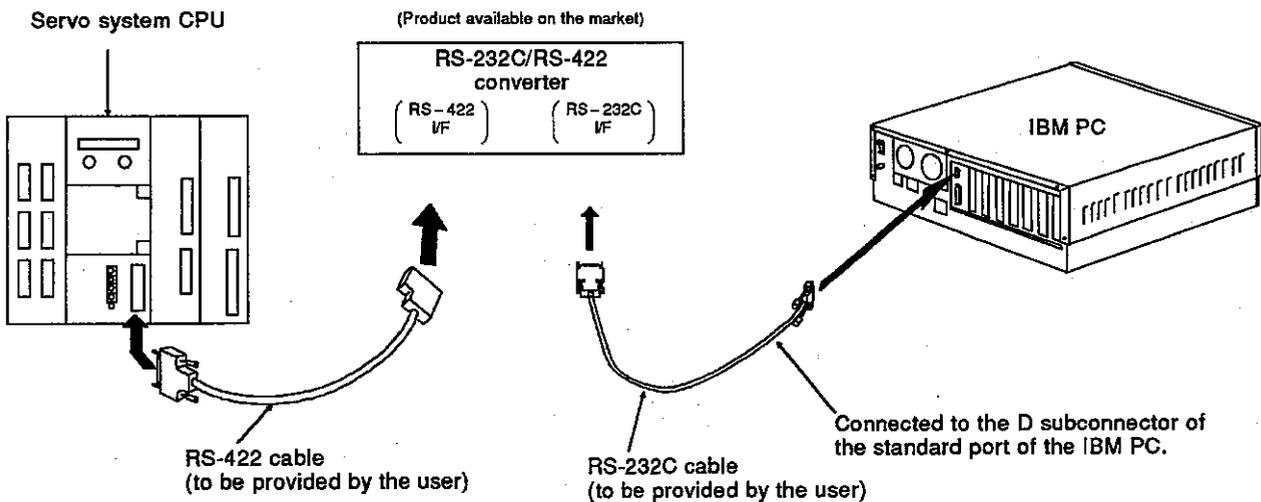


Fig. 1.4 Connecting the IBM PC to the SC-02N

The pin assignments for the cable connecting the 9-pin connector on the IBM PC personal computer to the 25-pin connector on the SC-02N converter unit are as follows:

IBM-PC	9-PIN	SC-02N	25-PIN
(RS-232C port)			
DCD	1	→	8
RD	2	→	3
TD	3	→	2
DTR	4	→	20
GND	5	→	7
DSR	6	→	6
RTS	7	→	4
CTS	8	→	5

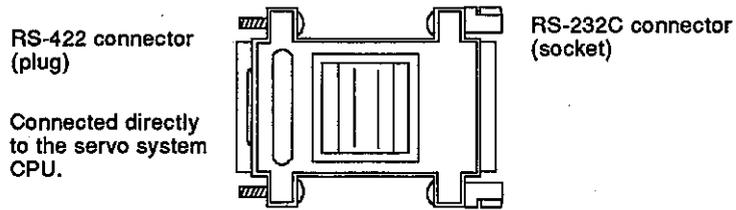
* Consult your nearest Mitsubishi representative about the converter.

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(2) Connecting the IBM PC to the servo system CPU with a DCNV- RS24(L) interface module used

- DCNV-RS24 converter Without LEDs



- DCNV-RS24L converter With LEDs

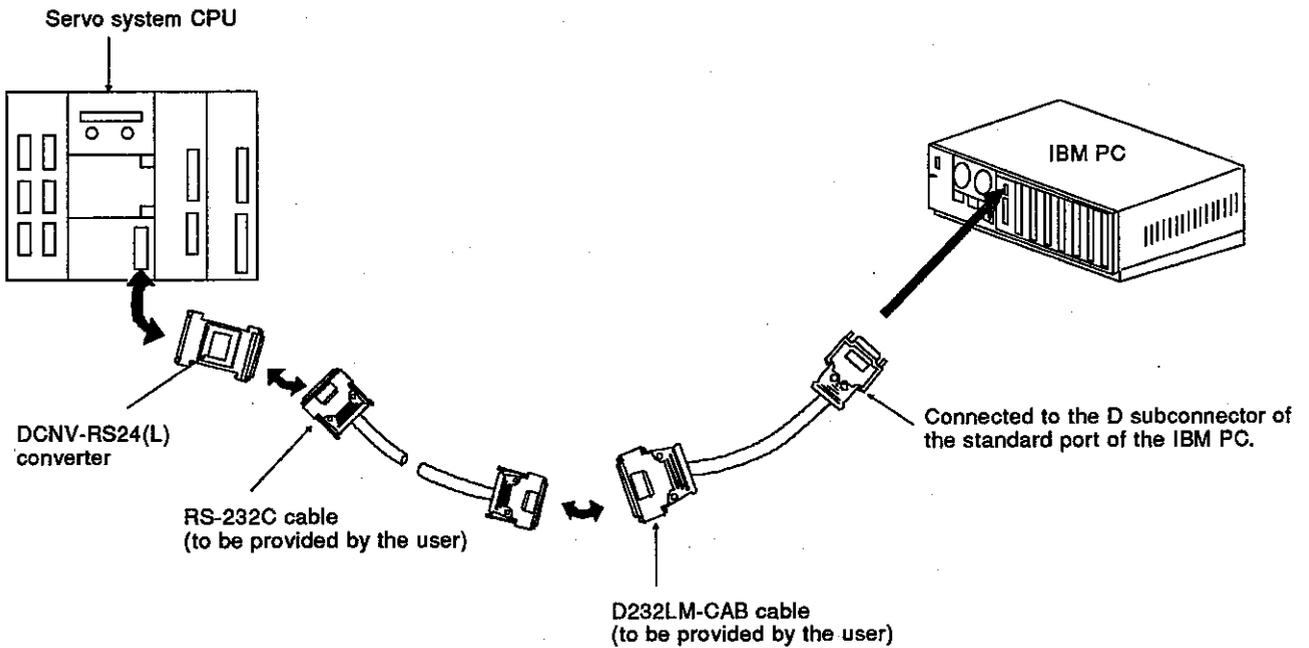
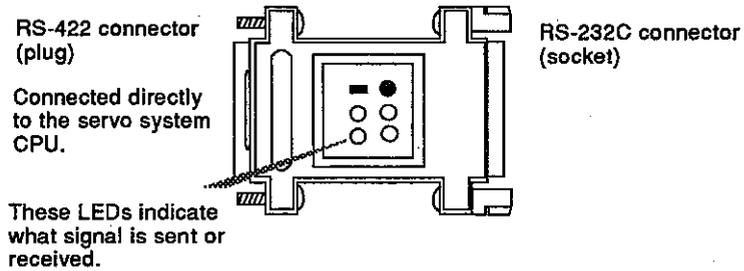


Fig. 1.5 Connecting the IBM PC to the Servo System CPU

1. GENERAL DESCRIPTION

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- (3) Connecting the IBM PC to the servo system CPU with a DCNV- RS42R used

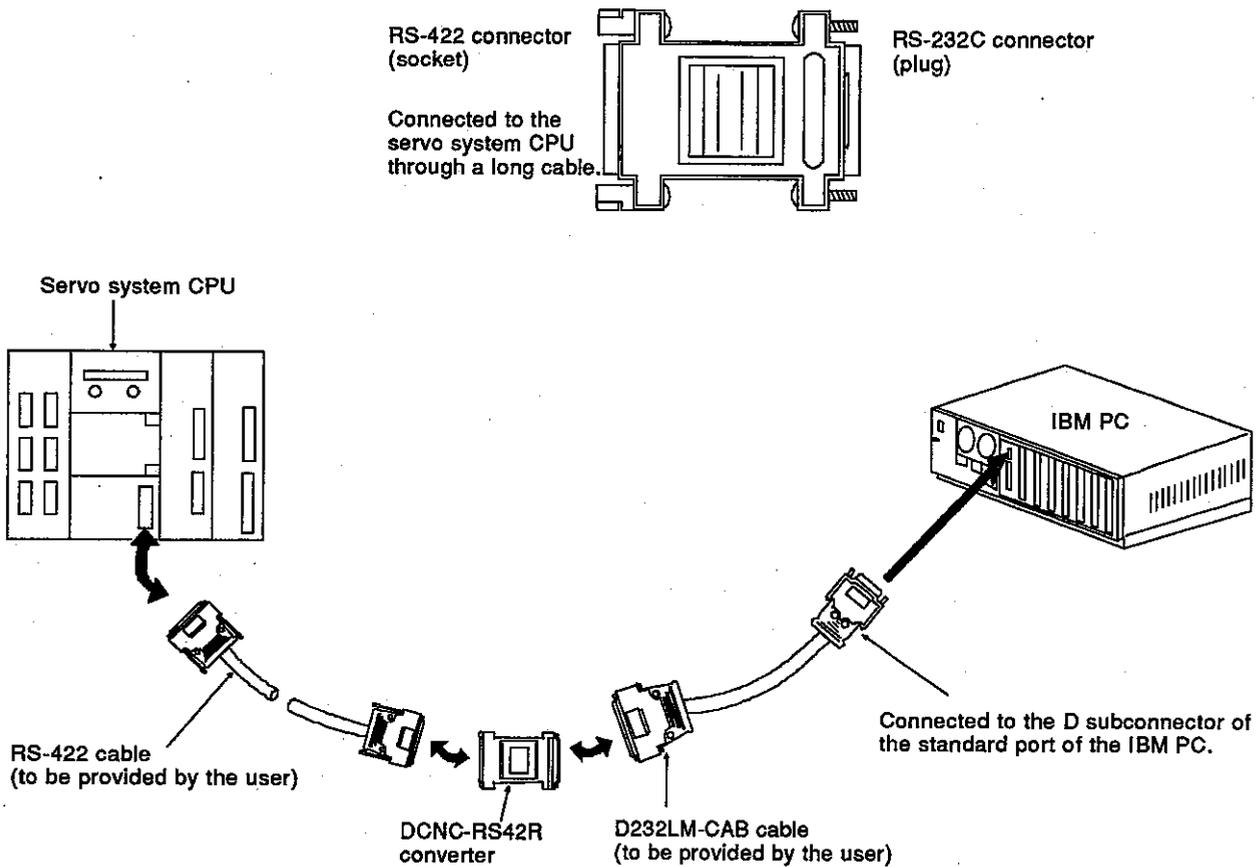


Fig. 1.6 Connecting the IBM PC to the Servo System CPU

- (4) Connecting the IBM PC to the servo system CPU with a DAC30R24 interface integrating cable used

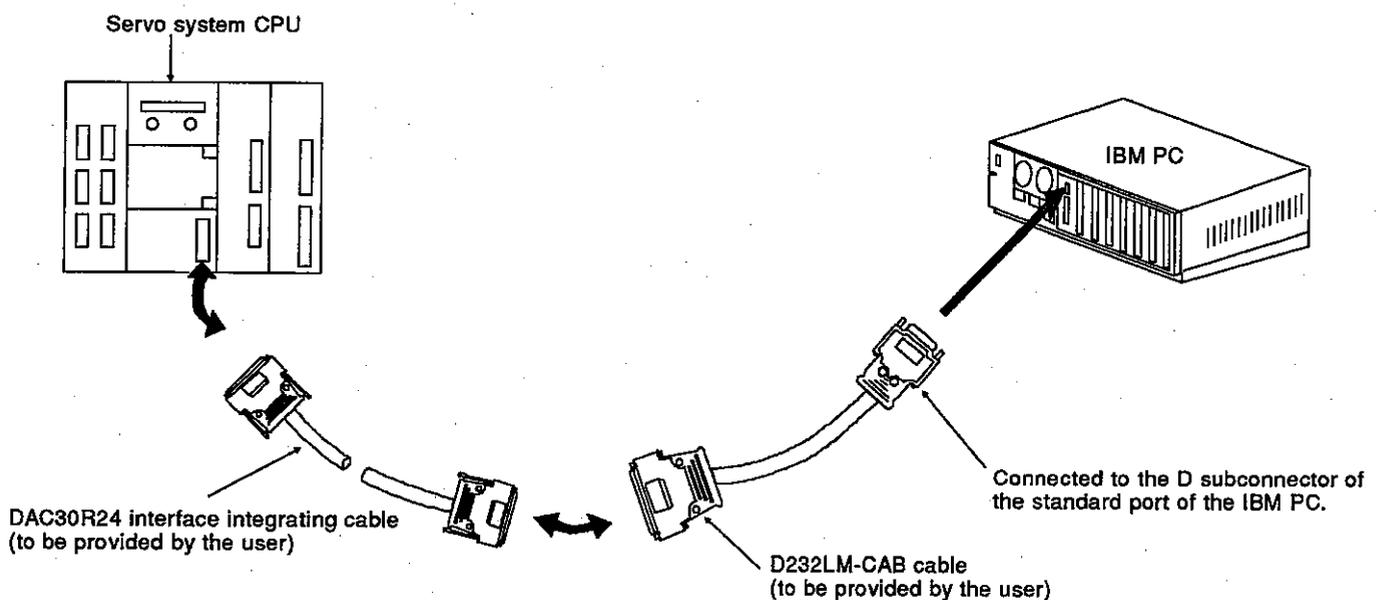


Fig. 1.7 Connecting the IBM PC to the Servo System CPU

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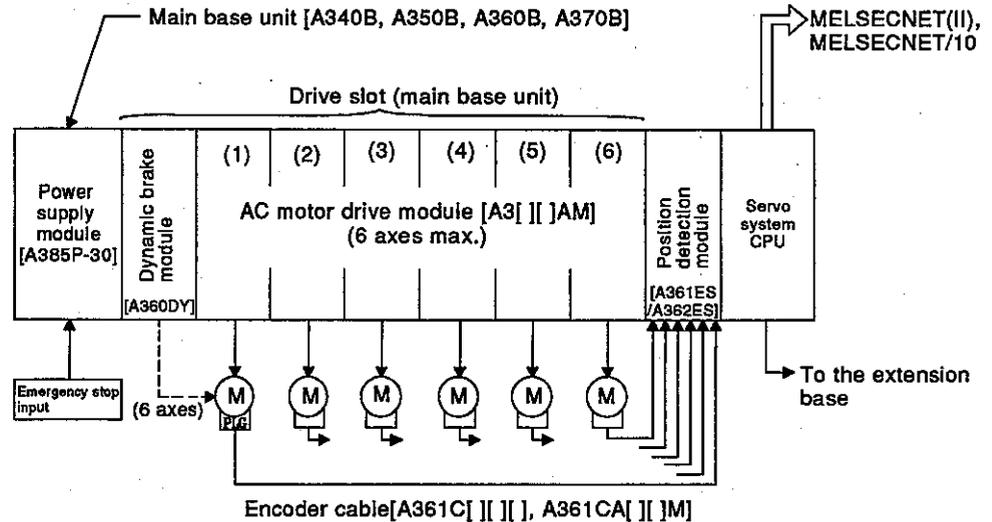
1.6 Basic Configuration of a Motion Controller

1.6.1 When an A373/A373UCPU is used

(1) AC motor drive module independent system

This system uses the AC motor drive module to control 6 axes max. Since an axis cannot be controlled by an external input signal, use this system for any system that does not have to be externally controlled.

(a) Overall configuration



(b) System configuration key items

- 1) Apply this system to a system which does not need a zero return using upper and lower stroke end limit switches and a near-zero-point dog.
- 2) Select the AC motor drive module and install it in accordance with the servo motor output current.
When an A375AMW is used, 2 slots are occupied.
Select a servo motor so that a total current of each axis is < 30A/60A (30A when using an A385P-30, 60A when using an A385P-60.)
- 3) Be sure to install the dynamic brake module in a slot next to the power supply module when there are 7 drive slots. If there are 4 to 6 drive slots, install it in the last slot (any slot is possible).
- 4) When executing all axes increment position detection, install an A361ES position detection module. When executing all axes absolute value position detections, install an A362ES position detection module.
- 5) There are 4 kinds of main base units which have 4, 5, 6, or 7 drive slots.
Make the selection in accordance with the number of dynamic brake modules and AC motor drive modules used.
- 6) When an A373UCPU is used, connect the system from the network module installed in the PC CPU extension base to the MELSECNET/10.

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Motion Controller

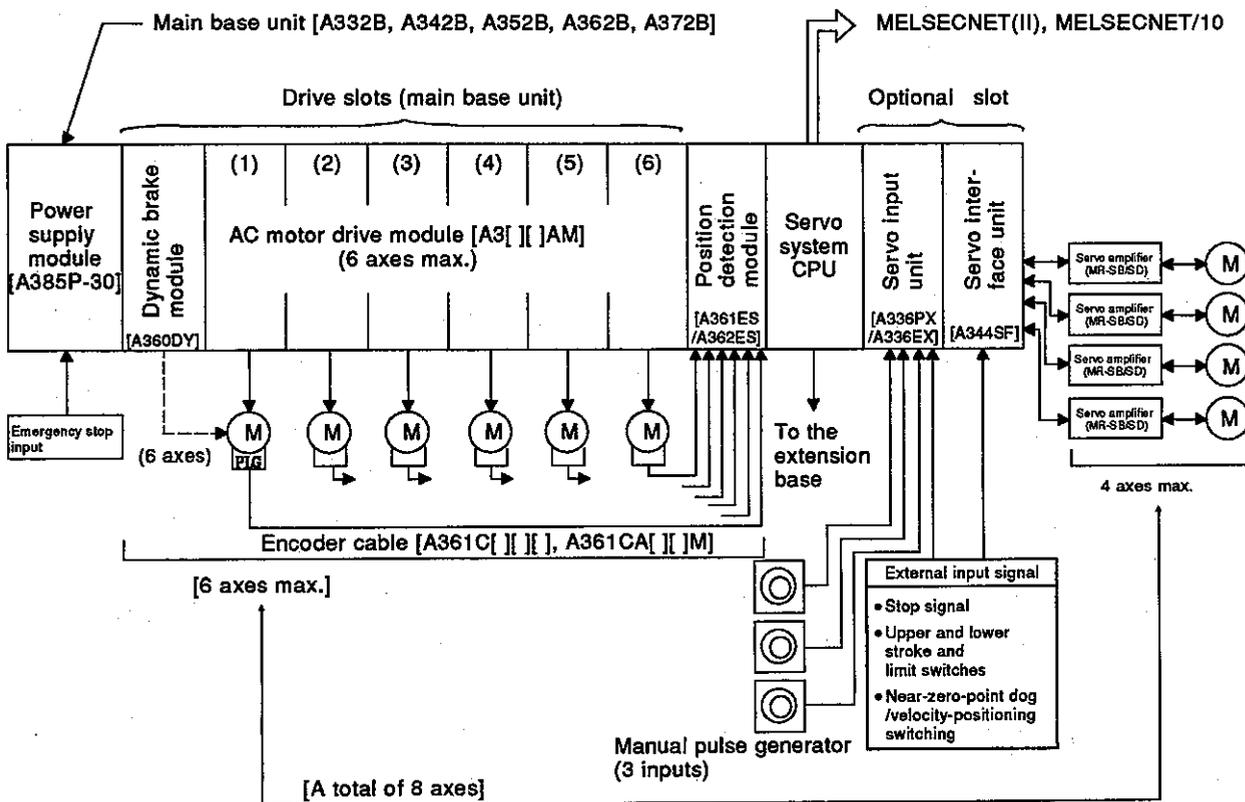
(2) AC motor drive module + MR-SB/SD servo interface module system

This system can control 8 axes max. by using the AC motor drive module and the MR-SB/SD servo interface module.

The servo interface module can connect the MR-SB/SD servo amplifier for 4 axes max. and is useful in the following cases:

- 1) When AC motor drive is insufficient with 6 axes (max. 8 axes can be controlled by using the AC motor drive module and the MR-SB/SD servo interface module together.)
- 2) When dispersing to a servo amplifier because the rated output current of the power supply module runs short
- 3) When using a servo motor that cannot be started by the AC motor drive module such as a mass/special servo motor

(a) Overall configuration



1. GENERAL DESCRIPTION

Motion Controller

(b) System configuration key items

- 1) Select the AC motor drive module and install it in accordance with the servo motor output current.
When an A375AMW is used, 2 slots are occupied.
Select a servo motor so that a total current of each axis is < 30A/60A(30A when using an A385P-30, 60A when using an A385P-60.)
- 2) Be sure to install the dynamic brake module in a dedicated slot next to the power supply module when there are 7 drive slots. If there are 3 to 6 drive slots, install it in the last slot (any slot is possible).
- 3) When executing all axes increment position detection, install an A361ES position detection module. When executing all axes absolute value position detections, install an A362ES position detection module.
- 4) There are 5 kinds of main base units which have 3, 4, 5, 6, or 7 drive slots. Make the selection in accordance with the number of dynamic brake modules and AC motor drive modules used.
An optional slot is fixed to 2 slots.
- 5) Only 1 servo interface module can be installed in any slot of an optional slot. Use an A336PX when the synchronous encoder to be connected is an increment type. If the asynchronous encoder is an absolute type, use an A336EX.
- 6) Only 1 servo interface modules can be installed in any slot of an optional slot.
- 7) A combination of 8 axes max. can be selected optionally.
- 8) When an A373UCPU is used, connect the system from the network module installed in the PC CPU extension base to the MELSECNET/10.

POINT

When using a servo interface module (A344SF), be sure to use it simultaneously with the AC motor drive module (A3[][]AM).
A servo interface module cannot be used independently.

1. GENERAL DESCRIPTION

Motion Controller

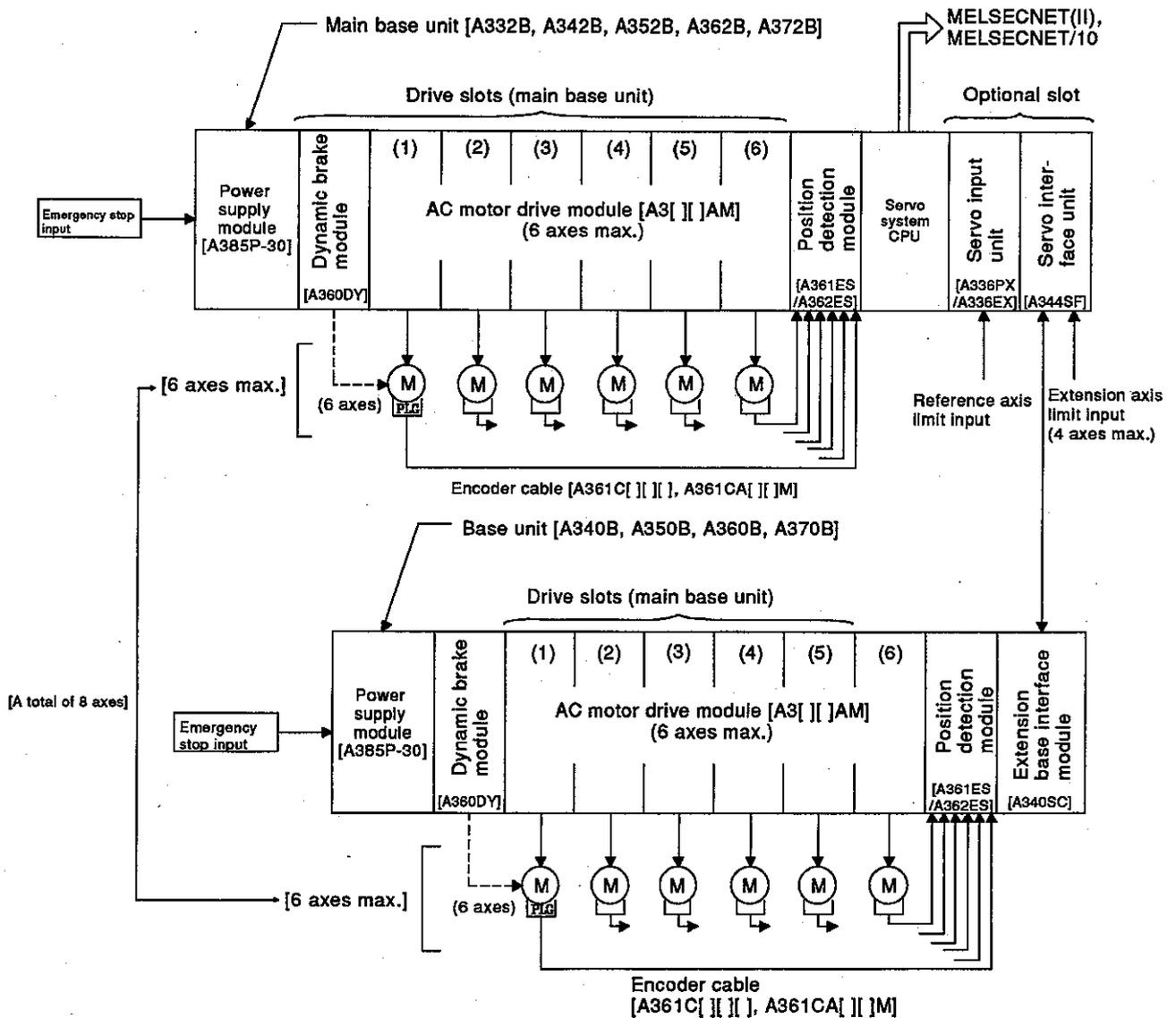
(3) AC motor drive module + extension base interface module system

This system can control 8 axes max. by using the AC motor drive module and the extension base interface module.

The extension base interface module can connect an AC motor drive module for 6 axes max., and is useful in the following cases:

- 1) When an AC motor drive module for 6 axes is insufficient
..... (max. 8 axes possible in total)
- 2) When only built-in amplifiers are used

(a) Overall configuration



1. GENERAL DESCRIPTION

Motion Controller

(b) System configuration key items

- 1) Select the AC motor drive module and install it in accordance with the servo motor output current.
When an A375AMW is used, 2 slots are occupied.
Select a servo motor so that a total current of each axis is < 30A/60A(30A when using an A385P-30, 60A when using an A385P-60.)
- 2) Be sure to install the dynamic brake module in a dedicated slot next to the power supply module when there are 7 drive slots. If there are 3 to 6 drive slots, install it in the last slot (any slot is possible).
- 3) When executing all axes increment position detection, install an A361ES position detection module. When executing all axes absolute value position detections, install an A362ES position detection module.
- 4) There are 5 kinds of main base units which have 3, 4, 5, 6, or 7 drive slots. Make the selection in accordance with the number of dynamic brake modules and AC motor drive modules used.
An optional slot is fixed to 2 slots.
- 5) Only 1 servo interface module can be installed in any slot of an optional slot. Use an A336PX when the synchronous encoder to be connected is an increment type. If the asynchronous encoder is an absolute type, use an A336EX.
- 6) Only 1 extension base interface module can be installed in the CPU slot of the extension base unit.
- 7) A combination of 8 axes max. can be selected optionally.
- 8) Enter the external input for the extension base unit servo motor (upper stroke end limit LS, lower stroke end limit LS, near-zero point dog, stop) in the A344SF in the main base unit. Up to 4 axes can be entered for the external input for the extension base unit servo motor.
- 9) The external input for the extension base unit servo motor, from the left ADU, corresponds to the d1 input, d2 input, d3 input, and d4 input of the A344SF, regardless of the AMP slot numbers.
- 10) Turn ON the power supply to the extension base unit prior to the power supply to the main base unit. If the power supply to the extension base unit is turned off in the middle of operation, turn it on again, and reset the servo system CPU. Or the extension base unit cannot be started.
- 11) If an error occurs in an extension base unit servo amplifier, all the servo amplifiers of the extension base unit will be turned OFF, except those of the main base unit.
- 12) When an A373UCPU is used, connect the system from the network module installed in the PC CPU extension base to the MELSECNET/10.

POINT

When using a servo interface module (A344SF), be sure to use it simultaneously with the AC motor drive module (A3[][]AM).
A servo interface module cannot be used independently.

1. GENERAL DESCRIPTION

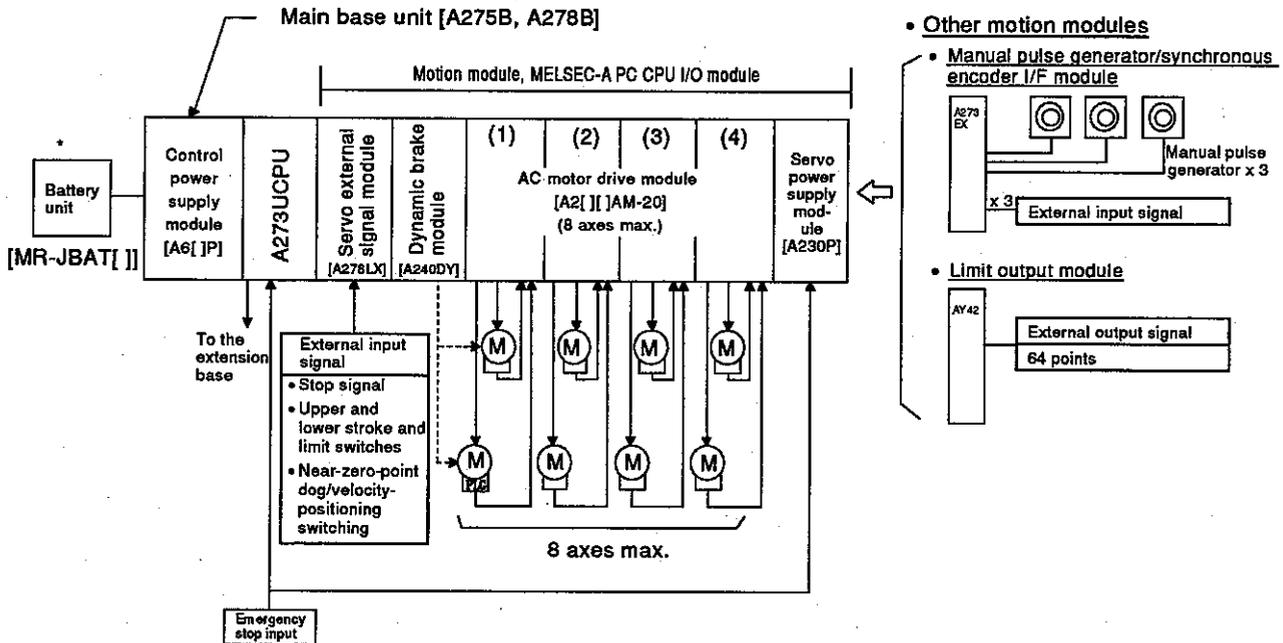
Motion Controller

1.6.2 When an A273UCPU is used

(1) AC motor drive module independent system

This system uses the AC motor drive module to control 8 axes max. This system is suitable for a compact system configuration using a servo motor of 600 W or less and only a main base unit.

(a) Overall configuration



REMARK

*: Required when a servomotor equipped with an absolute position detector is connected to the AC motor drive module.

(b) Notes on system configuration

- 1) Up to eight servo motor axes can be controlled by an AC motor drive module.
- 2) Select the model of AC motor drive module in accordance with the capacity of the servo motors used.

- Motor capacity: Up to 200W A221AM-20
Up to 600W A211AM-20, A222AM-20

- 3) A servo system CPU, a control power supply module, and the modules indicated below can be installed on the main base unit. The modules indicated below can also be installed on a motion extension base unit.

There are no restrictions on the installation position when any of these modules is installed on a main base unit or motion extension base unit.

- i) AC motor drive module
- ii) Dynamic brake module
- iii) Manual pulse generator/synchronous encoder interface module
- iv) Servo external signal module
- v) Servo power supply module
- vi) MELSEC A series I/O module*

1. GENERAL DESCRIPTION

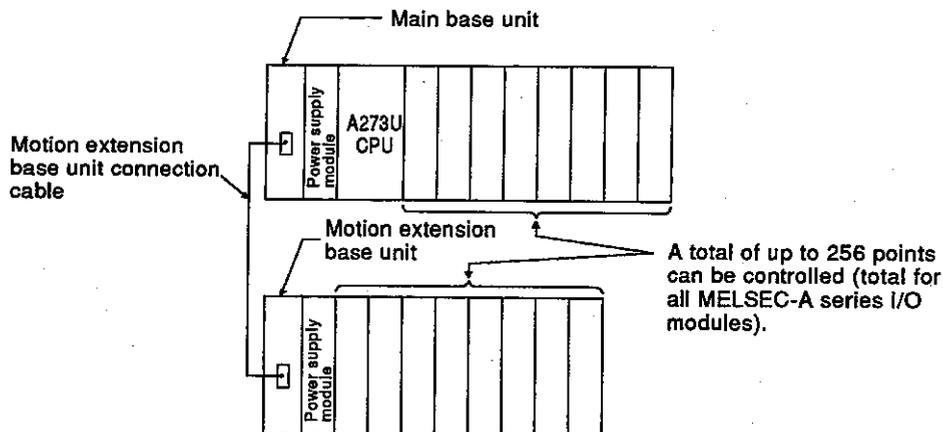
Motion Controller

- 4) If a MELSEC A series I/O module cannot be installed on the main base unit or motion extension base unit, or if using a MELSEC-A series special function module, install the module on the PC CPU extension base unit.
- 5) The type (incremental or absolute) of the encoders connected to the AC motor drive modules must be selected to suit individual motors.
If an absolute encoder is used, a battery unit to retain the absolute position must be connected to the main base unit.
- 6) The servo system CPU requires two types of power supply: a control power supply and a servo power supply.
 - For the control power supply, use a MELSEC-A series power supply module (A61P, A62P, A63P).
 - For the servo power supply, use an A230P power supply module.Connect the P and N terminals of the power supply module to the P and N terminals of each AC motor drive module with a cable.
- 7) Connect the system from the link module or network module installed in the PC CPU extension base unit to the MELSECNET (II) or MELSECNET/10.

REMARKS

- (1) * : The I/O numbers of I/O modules mounted to the main base unit and motion extension base unit are set in the servo control system settings.
Set I/O numbers in a range higher than that reserved for the PC CPU extension base unit.

(2)



1. GENERAL DESCRIPTION

Motion Controller

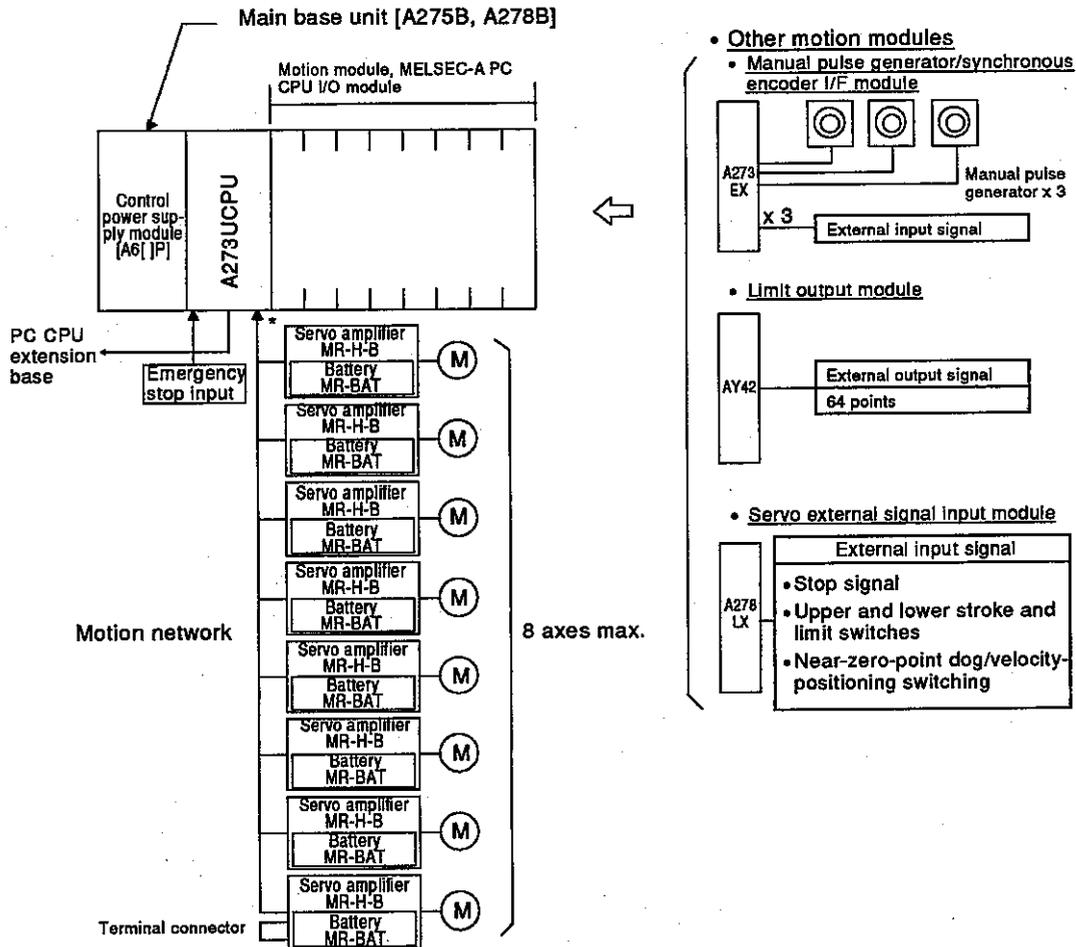
(2) MR-H-B/MR-J-B servo amplifier independent system

This system uses the MR-H-B/MR-J-B servo amplifier to control 8 axes max.

A273UCPU can connect the MR-H-B/MR-J-B servo amplifier for 8 axes max. and is useful in the following cases;

- 1) When dispersing to a servo amplifier because the rated output current of the control power supply module runs short
- 2) When using a servo motor that cannot be started by the AC motor drive module such as a mass/special servo motor

(a) Configuration when using MR-H-B



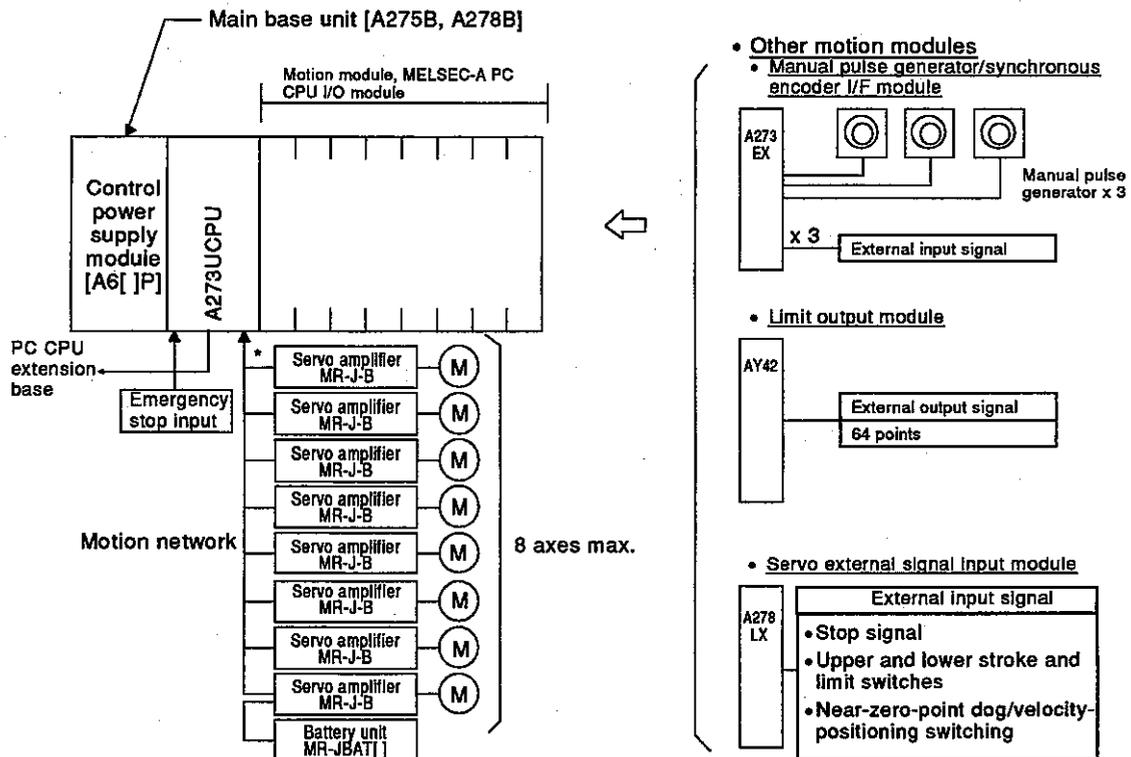
REMARK

- * : Up to eight axes can be controlled using external servo amplifiers only. A terminal resistor must be connected after the final external amplifier unit. When a servomotor equipped with an absolute position detector is used, a terminal resistor may or may not be required, depending on the model of servo amplifier.

1. GENERAL DESCRIPTION

Motion Controller

(b) Configuration when using MR-J-B



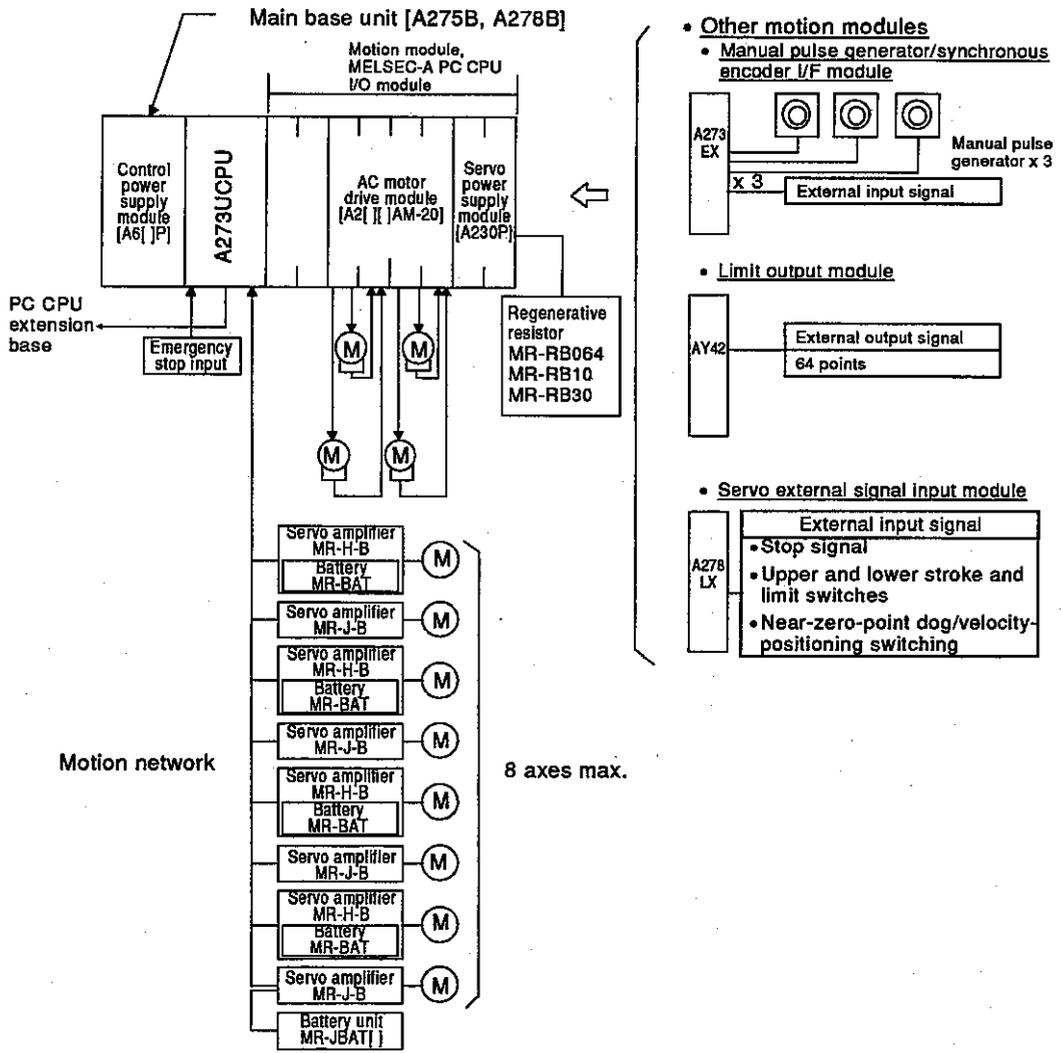
REMARK

- * : Up to eight axes can be controlled using external servo amplifiers only.
When a servomotor equipped with an absolute position detector is used, a battery/battery unit is required.
A terminal resistor must be connected after the final external amplifier unit.
When a servomotor equipped with an absolute position detector is used, a terminal resistor may or may not be required, depending on the model of servo amplifier.

1. GENERAL DESCRIPTION

Motion Controller

(c) Configuration when using AC motor drive module + MR-H-B + MR-J-B



REMARK

When a servomotor equipped with an absolute position detector is used with an MR-J-B, a battery/battery unit is required.

1. GENERAL DESCRIPTION

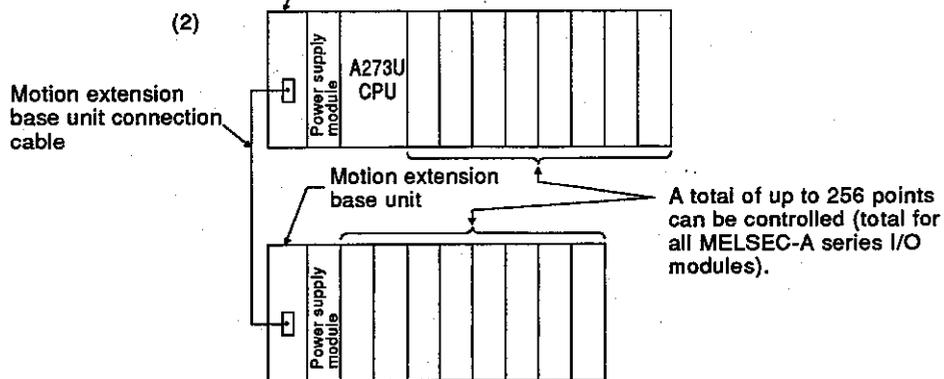
Motion Controller

(d) Notes on system configuration

- 1) Up to eight servo motor axes can be controlled with external servo amplifiers.
- 2) A servo system CPU, control power supply module, and the modules indicated below can be installed on the main base unit. The modules indicated below can also be installed on a motion extension base unit. There are no restrictions on the installation position when any of these modules is installed on a main base unit or motion extension base unit.
 - i) Manual pulse generator/synchronous encoder interface module
 - ii) Servo external signal input module
 - iii) MELSEC-A series I/O module *
- 3) If a MELSEC A series I/O module cannot be installed on the main base unit or motion extension base unit, or if using a MELSEC-A series special function module, install the module on the PC CPU extension base unit.
- 4) Use a power supply module for a MELSEC-A series PC (A61P, A62P, A63P) as the control power supply for the servo system CPU.
- 5) Connect the system from the link module or network module installed in the PC CPU extension base unit to the MELSECNET (II) or MELSECNET/10.

REMARKS

- (1) * : The I/O numbers of I/O modules mounted to the main base unit and motion extension base unit are set in the servo control system settings. Set I/O numbers in a range higher than that reserved for the PC CPU extension base unit.



1. GENERAL DESCRIPTION

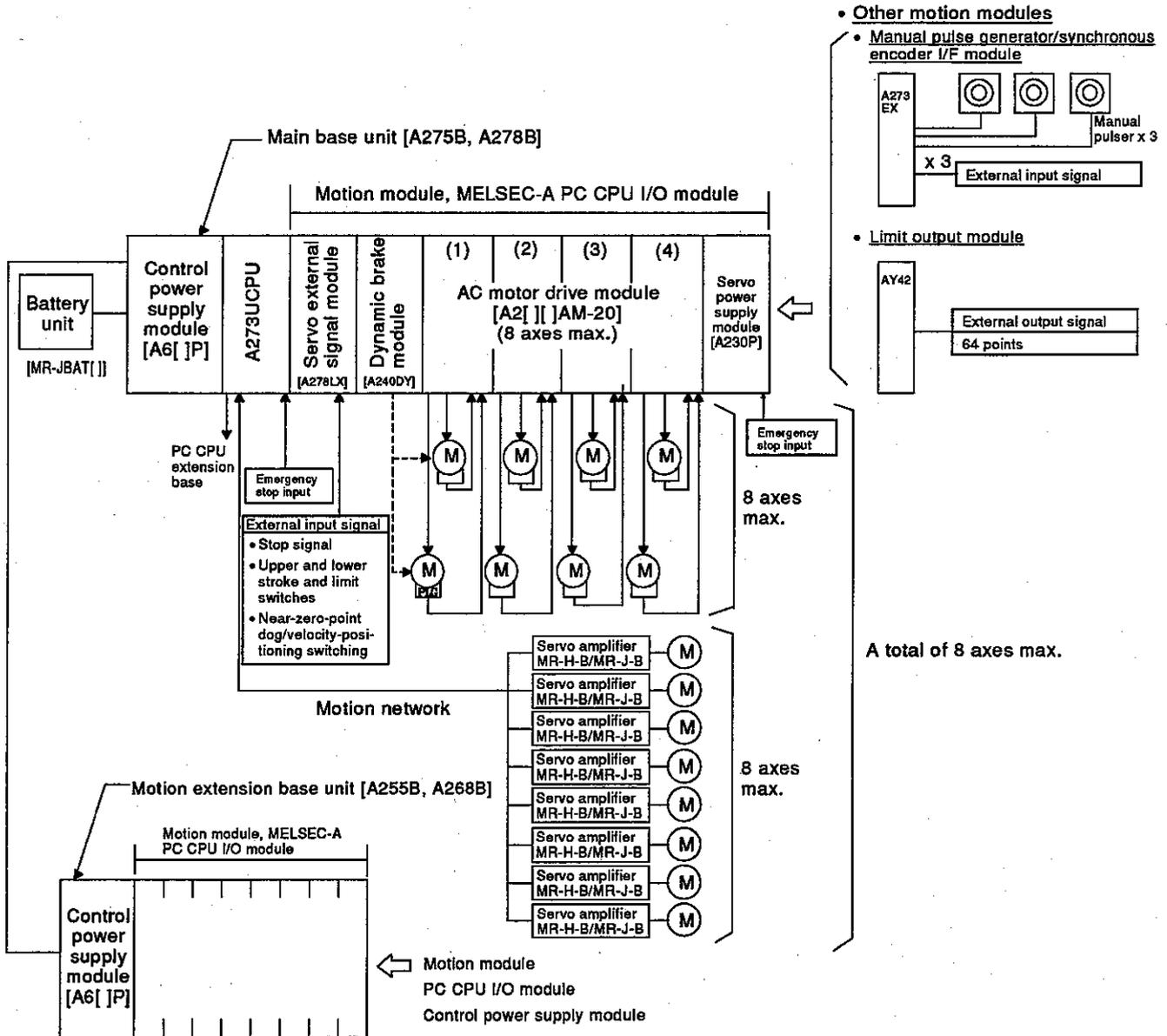
Motion Controller

(3) System using a motion extension base unit

This system can control 8 axes max. by connecting a motion extension base unit to the main base unit.

When the main base unit is occupied with motion modules, PC CPU I/O modules, etc., a motion extension base unit can be connected to the main base unit.

(a) Overall configuration



(b) Notes on system configuration

- 1) The following extension base units can be used as the PC CPU extension base unit.
 - A1S62B, A1S65B, A1S68B Only one extension can be connected.
 - A62B, A65B, A68B Up to 7 extensions can be connected. Extension base units that do not need a power supply module cannot be used.
- 2) The maximum permissible overall distance for the extension cable is 6.6 m.
- 3) Between 1 and 7 PC CPU extension base units can be set.
- 4) The first number of the I/O numbers for the first extension base is X/Y 100".
(The 1792 points from X/Y 100 to X/Y 7FF can be used.)
- 5) All MELSEC-A series I/O modules and special function modules can be installed on the PC CPU extension base unit.
Sequence control for the A273UCPU is the same as for the MELSEC-A series A3UCPU.
When using a special function module, read occurrences of "A3UCPU" in the manual for the module used as "A273UCPU".
- 6) Connect the system from the link module or network module installed in the PC CPU extension base unit to the MELSECNET(II) or MELSECNET/10.

2. SPECIFICATIONS

Motion Controller

2. SPECIFICATIONS

2.1 Performance Specifications

(1) PCPU performance specifications

Table 2.1 gives the performance specifications of a servo system CPU (PCPU).

Model Names		PCPU			
Items					
Number of control axes		8 axes (simultaneous 8 axes and independent 8 axes)			
Interpolation functions		Straight line interpolation (4 axes max.) and circular-arc supplement (2 axes)			
Control modes		PTP (Point to point), velocity control, velocity-position control, fixed-rate transmission, constant velocity control, position follow-up control			
Control units		mm · inch · degree · pulse			
Program	Languages	Dedicated instructions (sequence ladders + servo programs) SFC programming of servo programs also possible			
	Capacity	13 Ksteps (13312 steps)			
	Positioning number of points	Approx. 400 points/axis (depending on the program) Positioning data can be indirectly designated.			
Positioning	Method	PTP Selection of an absolute system/increment method Velocity and position control and fixed-rate transmission Increment method Constant velocity control Absolute systems and increment methods can be used together. Position follow up control Absolute systems method			
	Position command	The four types of command unit indicated below can be selected for each axis.			
		Control unit	Command unit	Address setting range	Travel value setting range
		mm	$\times 10^{-1} \mu\text{m}$	-2147483648 to 2147483647	0 to ± 2147483647
inch		$\times 10^{-5}$ inch			
degree		$\times 10^{-5}$ degree	0 to 35999999		
PULSE	PULSE	-2147483648 to 2147483647			
Velocity command (command unit)	0.01 to 6000000.00 (mm/min) 0.001 to 600000.000 (inch/min) 0.001 to 600000.000 (degree/min) 1 to 1000000 (pulse/sec)				
Velocity adjustment processing	Automatic trapezoid velocity adjustment	Acceleration time..... 1 to 65535 (msec) Deceleration time 1 to 65535 (msec)			
	S-curve ratio velocity adjustment	S-curve ratio setting: 0 to 100%			
Compensation	Electronic gear	Magnification setting function of the actual travel distance for a command value			
	Backlash compensation	(0 to 65535) x position command unit (units converted to pulses: 0 to 65535 pulses)			
Zero return function		When an absolute position system is not used : Selection of a near-zero-point dog type/count type When an absolute position system is used : Selection of a near-zero-point dog type/count type/data set type			
JOG operation function		Provided			
Manual pulse generator operations function		3 PCPUs max. can be connected. Use a sequence program to set the number of axes to be controlled. It is possible to set smoothing magnificient.			
M function		With the M code output function			
Limit switch output function		8 points/axis ON/OFF setting point can be set up to 10 points.			
Absolute position system	A373/A373UCPU	Possible with a motor equipped with an absolute position detector (when A362ES is used).			
	A273UCPU	Possible with a motor equipped with an absolute position detector.			

2. SPECIFICATIONS

Motion Controller

(2) SCPU performance specifications

Tables 2.2 through 2.4 give the performance specifications of an A373CPU, an A373UCPU and A273UCPU (SCPU).

Table 2.2 SPCU performance specifications (A373CPU)

Items		Model Names	SCPU	
Control mode			Repeat operation (using a stored program)	
I/O control modes			Refresh mode/direct mode can be selected.	
Program language			Language dedicated to sequence control (relay symbol word and logical symbolic word)	
Number of instructions (types)	Sequence instructions		22	
	Basic instructions		132	
	Application instructions		107	
Processing velocity (sequence instruction) (μsec/step)			Direct: 1.0 to 2.3 Refresh: 1.0	
Number of I/O points (point)			1792 (X/Y 100 to 7FF are used.) (X/Y 00 to FF are for positioning.)	
Watchdog timer (WDT)(msec)			10 to 2000	
Memory capacity			Capacity of an installation memory cassette	
Program capacity			Main sequence program + sub-microcomputer program = 30 Ksteps max. A main microcomputer program of 58 Kbytes max. (29 Ksteps) can be set. Subsequence program + sub-microcomputer program = 30 Ksteps max. A sub-microcomputer program of 58 Kbytes max. (29K steps) can be set.	
Devices	Number of internal relay points (M) (point)		1000 (M0 to 999)	
	Number of latched relay points (L) (point)		1000 (L1000 to 1999)	
	Number of step relay points (S) (point)		0 (No initial status)	
	Number of link relay points (B) (point)		1024 (B0 to 9FF)	
	Timer (T)	Number of points (point)		256
		Specifications		100 msec timer: Setting time: 0.1 to 3276.7s (T0 to 199) 10 msec timer: Setting time: 0.01 to 327.67s (T200 to 255) 100 msec addition timers: Setting time: 0.1 to 3276.7s
	Counter (C)	Number of points (point)		256
		Specifications		Usual counter: Setting range: 1 to 32767 (C0 to 255) Counter for an interruption program: Setting range: 1 to 32767 → Counter to be used in the interruption program
	Number of data register points (D) (Point)			800 (D0 to D799): D800 to D1023 are devices for positioning.
	Number of link register points (W) (point)			1024 (W0 to 3FF)
	Number of annunciator points (F) (point)			256 (F0 to 255)
	Number of file register points (R) (point)			8192 (R0 to 8191) max.
	Number of accumulator points (A) (point)			2 (A0, A1)
	Number of index register points (V, Z) (point)			2 (V, Z)
	Number of pointer points (P) (point)			256 (P0 to 255)
Number of interruption pointer points (I) (point)			32 (I0 to 31)	
Number of special relay points (M) (point)			256 (M9000 to 9255)	
Number of special register points (D) (point)			256 (D9000 to 9255)	
Number of comment points (point)			4032 max. (set in units of 64 points.)	
Self-diagnosis			Watchdog error monitoring, memory error detection, CPU error detection, I/O error detection, battery error detection, etc.	
Operation mode when an error occurs			Selection of stop/continuation	
Output mode switching when STOP is switched to RUN			Selection of re-output of an operation status before STOP/output after executing an operation	
Outside dimensions mm(inch)			250 (H) × 79.5 (W) × 190 (D) (9.84 × 3.13 × 7.48)	
Weight Kg (lb)			1.2 (2.64) (A373CPU), 1.5(3.3) (A373CPUP21/R21)	

2. SPECIFICATIONS

Motion Controller

Table 2.3 SPCU performance specifications (A373UCPU)

Items		Model Names	SCPU	
Control mode			Repeat operation (using a stored program)	
I/O control modes			Refresh mode	
Program language			Language dedicated to sequence control (relay symbol word and logical symbolic word, MELSAP-II(SFC))	
Number of instructions (types)	Sequence instructions		22	
	Basic / Application instructions		240	
	Dedicated Instructions		204	
Processing velocity (sequence instruction) (μsec/step)			0.15	
Number of I/O points (point)			1792 (X/Y 100 to 7FFF are used.) (X/Y 00 to FF are for positioning.)	
Watchdog timer (WDT)(msec)			10 to 190	
Memory capacity			Capacity of an installation memory cassette (max. 1024 Kbytes)	
Program capacity			Main sequence program : 30 Ksteps max. Subsequence program : 30 Ksteps max.	
Devices	Number of internal relay points (M) (point)		7144 (M0 to 999, M2048 to 8191)	
	Number of latched relay points (L) (point)		1000 (L1000 to 1999)	
	Number of step relay points (S) (point)		0 (No initial status)	
	Number of link relay points (B) (point)		8192 (B0 to B1FFF)	
	Timer (T)	Number of points (point)		2048 (initial status: 256 points)
		Specifications		100 msec timer: Setting time: 0.1 to 3276.7s (T0 to 199) 10 msec timer: Setting time: 0.01 to 327.67s (T200 to 255) 100 msec timers: Setting time: 0.1 to 3276.7s (no initial status) Extension timer: Time is (T256 to 2047) by word devices (D, W, R). Set by parameter.
	Counter (C)	Number of points (point)		1024 (initial status: 256 points)
		Specifications		Usual counter: Setting range: 1 to 32767 Counter for an interruption program: Can be set between C224 and C255. Count values are set by word devices (D, W, R). Extension counter: Set by parameter.
	Number of data register points (D) (Point)			8192 (D0 to D8191)
	Number of link register points (W) (point)			8192 (W0 to W1FFF)
	Number of annunciator points (F) (point)			2048 (F0 to F2047)
	Number of file register points (R) (point)			8192 (R0 to R8191)
	Number of accumulator points (A) (point)			2 (A0, A1)
	Number of index register points (V, Z) (point)			14 (V, V1 to V6, Z, Z1 to Z6)
	Number of pointer points (P) (point)			256 (P0 to 255)
Number of interruption pointer points (I) (point)			32 (I0 to 31)	
Number of special relay points (M) (point)			256 (D9000 to 9255)	
Number of special register points (D) (point)			256 (D9000 to 9255)	
Number of comment points (point)			4092 max. (set in units of 64 points.)	
Number of extension comment point (point)			3968 (set in unit of 64 points)	
Output mode switching when STOP is switched to RUN			Selection of re-output of an operation status before STOP(default)/output after executing an operation	
Self-diagnosis			Watchdog error monitoring (watchdog timer fixed at 200 msec), memory error detection, CPU error detection, I/O error detection, battery error detection, etc.	
Operation mode when an error occurs			Selection of stop/continuation	
Starting method at RUN			Initial start (automatic restart when RUN switch is set to ON position at power-on, and at power restoration after a power interruption).	
Latch (data retention during power interruption) range			Defaults to L1000 to 2047 (latch range can be set for L, B, T, C, D and W relays).	
Remote RUN/PAUSE contact			One RUN contact and one PAUSE contact can be set within the range from X0 to X1FFF.	
Print title entry			Available (128 characters)	
Entry code registration			Available	
I/O allocation			Number of occupied I/O points and module model can be entered.	
Step RUN			Can execute or stop sequence program operation	
Interrupt processing			Interrupt program can be run in response to a signal from an interrupt unit or by a constant-cycle interrupt signal.	
Data link			MELSECNET/10, MELSECNET (II)	
Outside dimensions mm (Inch)			250 (H) × 79.5 (W) × 190 (D) (9.84 × 3.13 × 7.48)	
Weight Kg (lb)			1.2 (2.64)	

2. SPECIFICATIONS

Motion Controller

Table 2.4 SPCU performance specifications (A273UCPU)

Items		Model Names	SCPU	
Control mode			Repeat operation (using a stored program)	
I/O control modes			Refresh mode	
Program language			Language dedicated to sequence control (relay symbol word and logical symbolic word, MELSAP-II(SFC))	
Number of instructions (types)	Sequence instructions		22	
	Basic / Application Instructions		250	
	Dedicated instructions		204	
Processing velocity (sequence instruction) (μsec/step)			0.15	
Number of I/O points (point)			1792 (X/Y 100 to 1FFF are used.) (X/Y 00 to FF are for positioning.)	
Watchdog timer (WDT)(msec)			10 to 190	
Memory capacity			Capacity of an installation memory cassette	
Program capacity			Main sequence program : 30 Ksteps max. Subsequence program : 30 Ksteps max.	
Devices	Number of internal relay points (M) (point)		7144 (M0 to 999, M2048 to 8191)	
	Number of latched relay points (L) (point)		1000 (L1000 to 1999)	
	Number of step relay points (S) (point)		0 (No initial status)	
	Number of link relay points (B) (point)		8192 (B0 to B1FFF)	
	Timer (T)	Number of points (point)		2048 (initial status: 256 points)
		Specifications		100 msec timer: Setting time: 0.1 to 3276.7s (T0 to 199) 10 msec timer: Setting time: 0.01 to 327.67s (T200 to 255) 100 msec timers: Setting time: 0.1 to 3276.7s (no initial status) Extension timer: Time is (T256 to 2047) by word devices (D, W, R). Set by parameter.
	Counter (C)	Number of points (point)		1024 (initial status: 256 points)
		Specifications		Usual counter: Setting range: 1 to 32767 Counter for an interruption program: Can be set between C224 and C255. Extension counter: Count values are set by word devices (D, W, R). Set by parameter.
	Number of data register points (D) (Point)			Total of 8192 points for motion control use and sequence control use.
	Number of link register points (W) (point)			8192 (W0 to W1FFF)
	Number of annunciator points (F) (point)			2048 (F0 to F2047)
	Number of file register points (R) (point)			8192 (R0 to R8191)
	Number of accumulator points (A) (point)			2 (A0, A1)
	Number of index register points (V, Z) (point)			14 (V, V1 to V6, Z, Z1 to Z6)
Number of pointer points (P) (point)			256 (P0 to 255)	
Number of interruption pointer points (I) (point)			32 (I0 to 31)	
Number of special relay points (M) (point)			256 (D9000 to 9255)	
Number of special register points (D) (point)			256 (D9000 to 9255)	
Number of comment points (point)			4032 max. (set in units of 64 points.)	
Number of extension comment point (point)			3968 (set in unit of 64 points)	
Output mode switching when STOP is switched to RUN			Selection of re-output of an operation status before STOP(default)/output after executing an operation	
Self-diagnosis			Watchdog error monitoring (watchdog timer fixed at 200 msec), memory error detection, CPU error detection, I/O error detection, battery error detection, etc.	
Operation mode when an error occurs			Selection of stop/continuation	
Starting method at RUN			Initial start (automatic restart when RUN switch is set to ON position at power-on, and at power restoration after a power interruption).	
Latch (data retention during power interruption) range			Defaults to L1000 to 2047 (latch range can be set for L, B, T, C, D and W relays).	
Remote RUN/PAUSE contact			One RUN contact and one PAUSE contact can be set within the range from X0 to X1FFF.	
Print title entry			Available (128 characters)	
Entry code registration			Available	
I/O allocation			Number of occupied I/O points and module model can be entered.	
Step RUN			Can execute or stop sequence program operation	
Interrupt processing			Interrupt program can be run in response to a signal from an interrupt unit or by a constant-cycle interrupt signal.	
Data link			MELSECNET/10, MELSECNET (II)	
5 VDC Internal current consumption (A)			1.5	
Outside dimensions mm (Inch)			250 (H) x 79.5 (W) x 190 (D) (9.84 x 3.13 x 7.48)	
Weight Kg (lb)			1.1 (2.2)	

2. SPECIFICATIONS

Motion Controller

2.2 List of Servo System CPU Functions

The functions of the servo system CPU (PCPU, SCPU) are presented below.

Table 2.5 List of PCPU functions

Functions		1-Axis Straight Line	2-Axes Straight Line Interpolation	3-Axes Straight Line Interpolation	4-Axes Straight Line Interpolation	2-Axes Circular Arc Interpolation	Outline Explanations of Functions
Positioning	Positioning	○	○	○	○	○	<ul style="list-style-type: none"> Positioning control is executed at first velocity. Absolute systems and increment methods are possible.
	Fixed-rate transmission	○	○	○	×	×	<ul style="list-style-type: none"> Positioning control of a constant distance can be repeated infinitely by setting a travel distance.
	Velocity control	○	×	×	×	×	<ul style="list-style-type: none"> Control can be executed at the designation velocity until a stop command is input by a one-time start command.
	Velocity/position control	○	×	×	×	×	<ul style="list-style-type: none"> Velocity control is started by a one-time start command, and the setting travel distance is controlled by position control after a position switching input signal (CHANGE) is externally input. Change of the setting travel distance and restart after stopping in the halfway are enabled during velocity control.
	Velocity switching control	○	○	○	×	×	<ul style="list-style-type: none"> Positioning is executed changing to the setting velocity at the point set in advance by a one-time start command.
	Constant velocity control	○	○	○	○	○	<ul style="list-style-type: none"> Positioning is executed to the end point at a constant velocity executing setting positioning control (circular arc, straight line, etc. can be set at random) to the pass point set in advance by a one-time start command. The same control can be repeated by using a repeat instruction (FOR/NEXT).
	Position follow-up control	○	×	×	×	×	<ul style="list-style-type: none"> Positioning to the address set in the specified word device is executed. It is possible to change the address during positioning.
JOG operations		○	×	×	×	×	<ul style="list-style-type: none"> When a JOG start signal (Yn2/Yn3) goes ON, JOG operations can be executed. Simultaneous start of JOG operations (8 axes max.: forward/reverse can be selected for every axis.) is enabled.
Manual pulse generator operations		○	×	×	×	×	<ul style="list-style-type: none"> Positioning in accordance with the input number of pulses is enabled by inputting a pulse by a manual pulse generator. Manual pulse generator operations enable 3 independent axes. In addition, 3 axes at the same time are possible.
Zero return							<ul style="list-style-type: none"> The current value when a zero return is executed and stopped by a zero return start command is corrected to the zero point address. Near-zero-point dog type/count type/ data set type can be selected for the zero return method.
Simultaneous start							<ul style="list-style-type: none"> 3 programs max. of any servo program such as positioning control and zero return can be started simultaneously.
Control change	Velocity change						<ul style="list-style-type: none"> The velocity can be changed during positioning control during JOG operations. However, the velocity cannot be changed during circular interpolation control and zero return.
	Travel distance change						<ul style="list-style-type: none"> The setting travel distance after a position switching input signal (CHANGE) is input can be changed during a velocity control operation by velocity-position control.
	Current value change						<ul style="list-style-type: none"> A current value address can be changed during an interruption.
M codes							<ul style="list-style-type: none"> An M code (0 to 255) can be output during positioning control. An M code can be set at every velocity switching point by using velocity switching control. An M code can be set at every pass point by constant velocity control.

2. SPECIFICATIONS

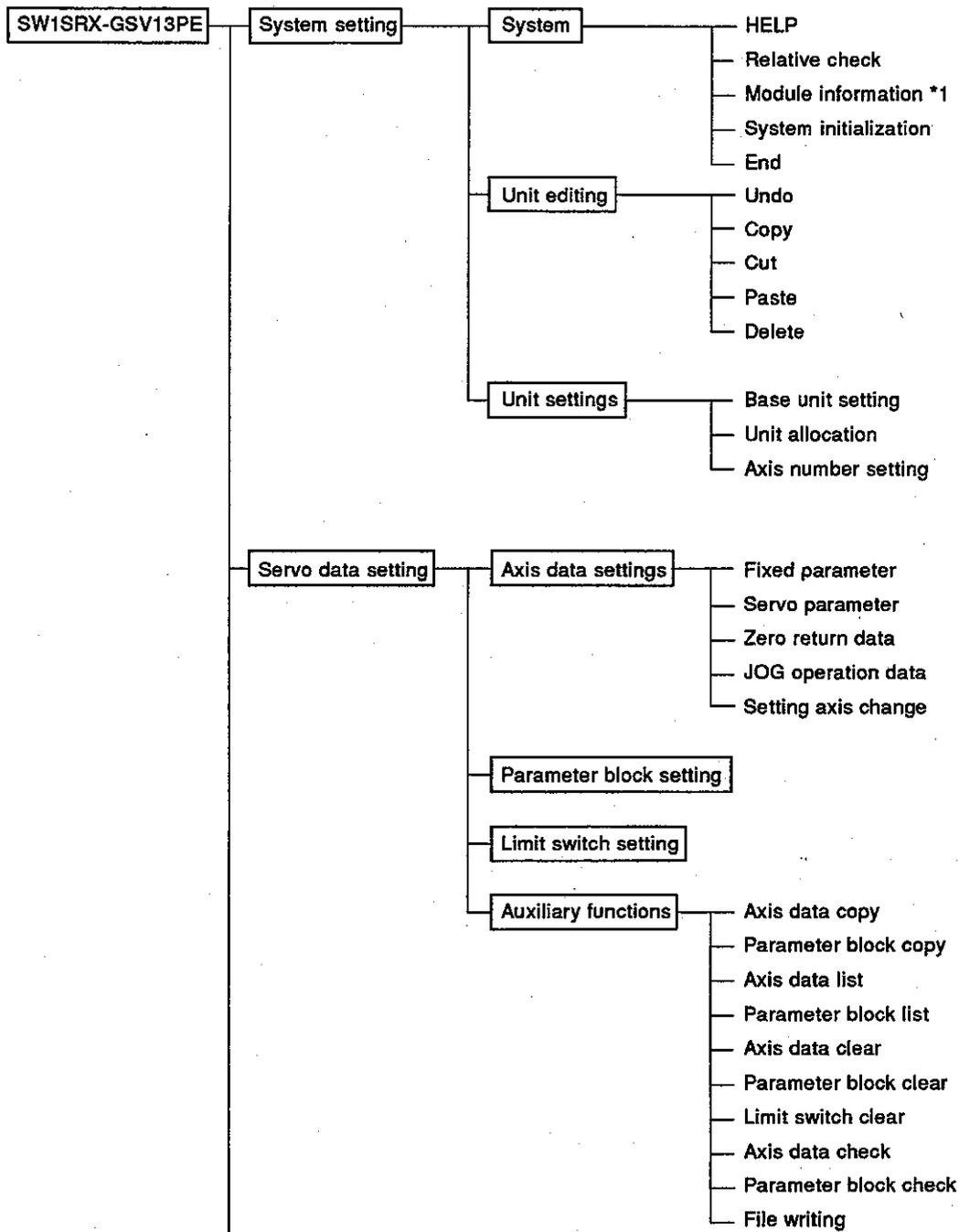
Motion Controller

Functions	1-Axis Straight Line	2-Axes Straight Line Interpolation	3-Axes Straight Line Interpolation	4-Axes Straight Line Interpolation	2-Axes Circular Arc Interpolation	Outline Explanations of Functions
Backlash compensation						<ul style="list-style-type: none"> • Backlash compensation processing is enabled when each axis is started. • The backlash compensation amount is set by a peripheral device.
Electronic gear						<ul style="list-style-type: none"> • Command value errors and actual travel distances can be compensated. • Valid for all operations.
Torque limit						<ul style="list-style-type: none"> • Torque limit values such as for positioning operations and JOG operations can be set by using a servo program. (0 to 300 %)
Limit switch output						<ul style="list-style-type: none"> • A limit switch output which corresponds to the actual current value address of each axis is enabled on the basis of data set in advance. • Up to 10 ON/OFF switching points can be set for each axis. • The number of outputs is 8 points per axis. • Output to a MELSEC-A series AY42 output module is possible.
Test mode operations						<ul style="list-style-type: none"> • Start and teaching are possible in a peripheral device's test mode. • Addresses taught by JOG operations and manual pulse generator operations are written to designated servo programs. • The test mode is available even if PC is in the RUN or STOP status.
Absolute position detection						<ul style="list-style-type: none"> • An absolute position detection system can be utilized by using the servo motor that can be used for an absolute position.
Feed forward control						<ul style="list-style-type: none"> • Since a feed forward factor can be set by a servo parameter, servo follow-up can be improved.
S-curve acceleration/deceleration						<ul style="list-style-type: none"> • Deceleration and acceleration can be set to follow a sine curve.

2. SPECIFICATIONS

2.3 GSV[][]PE Servo Functions

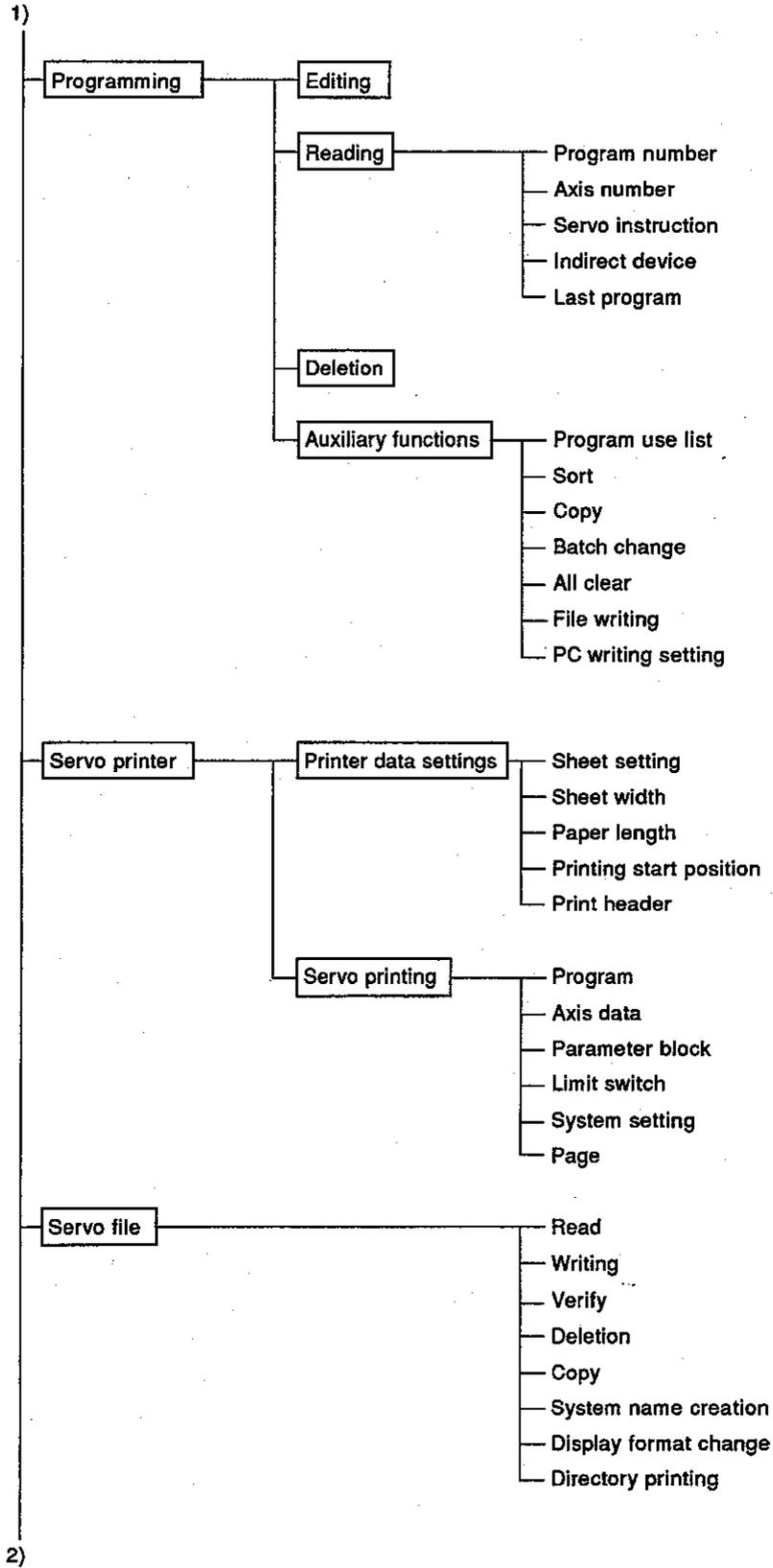
This section gives the GSV[][]PE servo functions.



1)

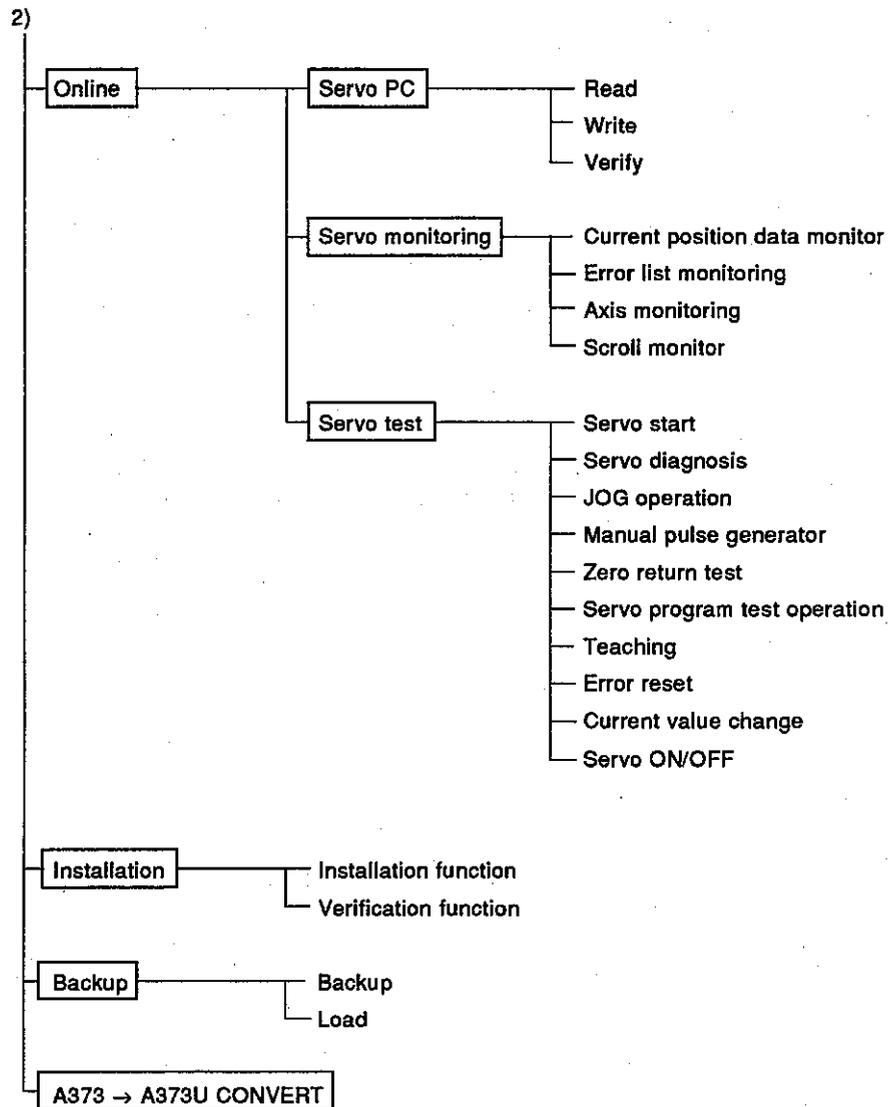
2. SPECIFICATIONS

Motion Controller



2. SPECIFICATIONS

Motion Controller



REMARKS

- 1) The GPP function and the SFC function are contained in GSV[II]PE.
- 2) The SW11X-GPPAE Type GPP Function Software Package Operating Manual gives details about the GPP function.
The SW21VD-SAP2 (MELSAP-II) Type Function Software Package Operation Manual gives details about the SFC Function.
- 3) Functions with a *1 indicate a function to be used only when an A273UCPU is used.

2. SPECIFICATIONS

Motion Controller

2.4 Positioning Signals

Internal signals of a servo system CPU and external signals to a servo system CPU are used as positioning signals.

(a) Internal signals

The following 6 kinds of devices are used as servo system CPU internal signals.

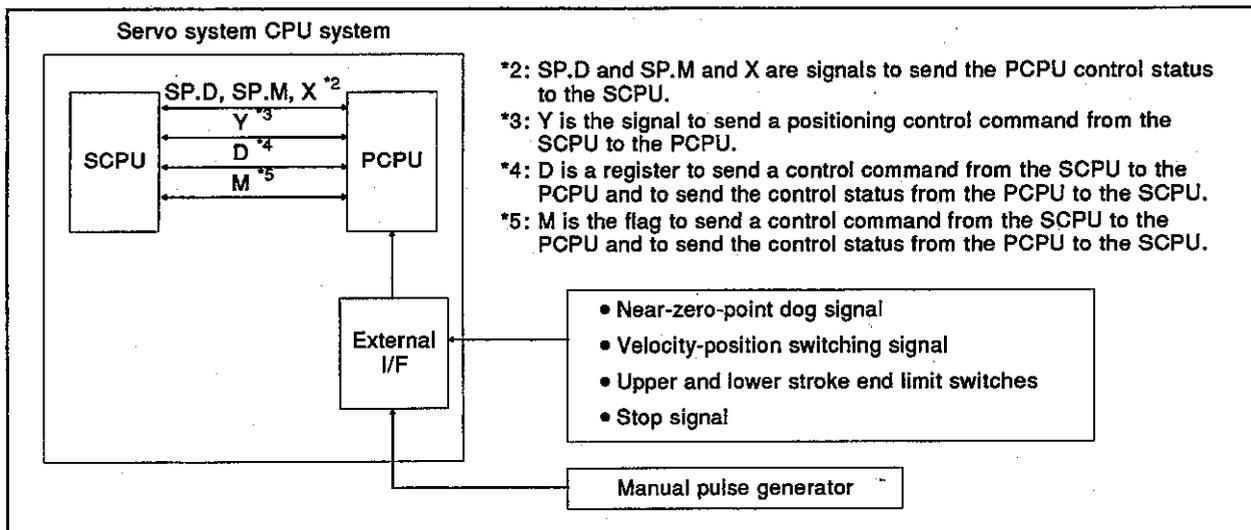
- 1) Input (X)X0 to XFF (256 points)
- 2) Output (Y)Y0 to YFF (256 points)
- 3) Internal relay (M).....M2000 to M2047 (48 points)
- 4) Special relay (SP.M).....M9073 to M9079 (7 points)
- 5) Data register (D)D800 to D1023 (224 points)
- 6) Special register (SP.D)D9180 to D9199 (20 points)

(b) External signals

Upper and lower stroke end limit switch input and stop signals, near-zero-point dog/velocity-position switching signals, and manual pulse generator input signals make up the external signals to a servo system CPU.

- 1) Upper and lower stroke end limit switch signals
Signals that controls an upper limit/lower limits of a positioning range
- 2) Stop signal
Stop signal that controls the velocity
- 3) Near-zero-point dog signal *1.....
The signal that switches velocity to position is used.
- 4) Velocity-position switching signal *1.....
This is the ON/OFF signal from the near-zero-point dog.
The signal that switches velocity to position is used.

(c) Manual pulse generator input signal Signal from the manual pulse generator



REMARK

*1: In the case of the A336[]X and A344SF models, the near-zero-point dog signal and velocity-position switching signal share the same terminal.

2. SPECIFICATIONS

Motion Controller

2.4.1 I/O (X/Y)

An A373CPU has 2048 I/O points from X/Y0 to X/Y7FF.

An A373U/A273UCPU has 8192 I/O points from X/Y0 to X/Y1FFF.

X/Y0 to X/YFF are used to exchange data for all axes between the SCPU and PCPU. Signal names and the I/O number of each axis are shown in the following table.

(1) Input (X0 to XFF)

An input is data to be set in the PCPU. These can be used to check the control status of each axis with a sequence program and to instruct the next positioning.

(2) Output (Y0 to YFF)

These are used to set an output with a sequence program and output positioning commands to the PCPU.

Device No.	Signal Name	Device No.	Signal Name
Xn0	Positioning start completed	Yn0	Stop command
Xn1	Positioning completed	Yn1	Rapid stop command
Xn2	In-position	Yn2	Forward JOG start
Xn3	Command in-position	Yn3	Reverse JOG start
Xn4	During velocity control	Yn4	End signal OFF command
Xn5	Velocity-position switching latch	Yn5	Velocity-position switching enabled
Xn6	Zero pass	Yn6	Limit switch output enable
Xn7	Error detection	Yn7	Error reset
Xn8	Servo error detection	Yn8	Servo error reset
Xn9	Zero return request	Yn9	External STOP input/invalid when starting
XnA	Zero return completed	YnA	Unusable
XnB	External signal FLS	YnB	Feed position data update request command
XnC	External signal RLS	YnC	
XnD	External signal STOP	YnD	
XnE	External signal DOG/CHANGE (When an A373/A373UCPU is used) External signal DOG (When an A273UCPU is used)	YnE	Unusable
XnF	Servo READY	YnF	Servo OFF
XDn	Torque controlling		
XDm	External signal CHANGE (When an A273UCPU is used)		

REMARK

"m" and "n" in the table represents the numerical value that corresponds to the axis number.

Axis number	m	n
1	8	0
2	9	1
3	A	2
4	B	3
5	C	4
6	D	5
7	E	6
8	F	7

POINT

When the power supply is turned ON and the PC READY (M2000) is turned ON, ON/OFF data of X0 to XFF is in the OFF status until the PCPU preparation completed flag (M9074) goes ON.
X0 to XFF go into the normal input status if M9074 goes ON.

2. SPECIFICATIONS

2.4.2 Internal relays (M)

An A373CPU has 2048 internal relay/latch relay points from M/L0 to M/L2047. An A373U/A273UCPU has 8192 internal relay/latch relay points from M/L0 to M/L8191.

M2000 to M2047 are used for positioning control. Those uses are indicated in the following table.

Device Numbers	Signal Names	Signal Directions
M2000	PC READY flag	SCPU → PCPU
M2001	Axis 1 start accept flag	PCPU → SCPU
M2002	Axis 2 start accept flag	
M2003	Axis 3 start accept flag	
M2004	Axis 4 start accept flag	
M2005	Axis 5 start accept flag	
M2006	Axis 6 start accept flag	
M2007	Axis 7 start accept flag	
M2008	Axis 8 start accept flag	
M2009	All axis servo start accept flag	
M2010 to M2011	Unusable by the user	
M2012	Manual pulse generator 1 enable flag	SCPU → PCPU
M2013	Manual pulse generator 2 enable flag	
M2014	Manual pulse generator 3 enable flag	
M2015	JOG simultaneous start command	
M2016	Velocity switching point designation flag	
M2017 to M2019	Unusable by the user	—
M2020	Start buffer full	PCPU → SCPU
M2021	Axis 1 velocity change flag	
M2022	Axis 2 velocity change flag	
M2023	Axis 3 velocity change flag	
M2024	Axis 4 velocity change flag	
M2025	Axis 5 velocity change flag	
M2026	Axis 6 velocity change flag	
M2027	Axis 7 velocity change flag	
M2028	Axis 8 velocity change flag	
M2029 to M2041	Unusable by the user	—
M2042	All axes servo start command	SCPU → PCPU
M2043 to M2046	Unusable by the user	—
M2047	Optional slot module error detection flag (when an A373/A373UCPU is used) Motion slot module error detection flag (when an A273UCPU is used.)	PCPU → SCPU

POINT

The internal relay for positioning control is not latched even inside the latch range.

2.4.3 Special relays (SP.M)

A servo system CPU has 256 special relay points from M9000 to M9255. The 7 points from M9073 to M9079 are used for positioning control and their applications are shown in the following table.

Device Numbers	Signal Names	Signal Direction
M9073	WDT error flag	PCPU → SCPU
M9074	PCPU READY-completed flag	
M9075	In-test-mode flag	
M9076	External emergency stop input flag	
M9077	Manual pulse generator axis setting error flag	
M9078	Test mode request error flag	
M9079	Servo program setting error flag	

2. SPECIFICATIONS

Motion Controller

2.4.4 Data registers (D)

An A373CPU has 1024 data register points from D0 to D1023.

An A373U/A273UCPU has 8192 data register points from D0 to D8191.

The 224 points from D800 to D1023 are used for positioning control and their applications are as shown in the following table.

Device Number	Signal Names	Device Number	Signal Names																																																																																				
D800 to D819	Axis 1 monitoring data	<table border="1"> <tr><td>D1012</td><td>Axis number setting register to be controlled in manual pulse generator 1</td></tr> <tr><td>D1013</td><td>Axis number setting register to be controlled in manual pulse generator 2</td></tr> <tr><td>D1014</td><td>Axis number setting register to be controlled in manual pulse generator 3</td></tr> <tr><td>D1015</td><td>JOG operation simultaneous start axis setting register</td></tr> <tr><td>D1016</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 1</td></tr> <tr><td>D1017</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 2</td></tr> <tr><td>D1018</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 3</td></tr> <tr><td>D1019</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 4</td></tr> <tr><td>D1020</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 5</td></tr> <tr><td>D1021</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 6</td></tr> <tr><td>D1022</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 7</td></tr> <tr><td>D1023</td><td>1 pulse input magnification setting register of a manual pulse generator for axis 8</td></tr> </table>	D1012	Axis number setting register to be controlled in manual pulse generator 1	D1013	Axis number setting register to be controlled in manual pulse generator 2	D1014	Axis number setting register to be controlled in manual pulse generator 3	D1015	JOG operation simultaneous start axis setting register	D1016	1 pulse input magnification setting register of a manual pulse generator for axis 1	D1017	1 pulse input magnification setting register of a manual pulse generator for axis 2	D1018	1 pulse input magnification setting register of a manual pulse generator for axis 3	D1019	1 pulse input magnification setting register of a manual pulse generator for axis 4	D1020	1 pulse input magnification setting register of a manual pulse generator for axis 5	D1021	1 pulse input magnification setting register of a manual pulse generator for axis 6	D1022	1 pulse input magnification setting register of a manual pulse generator for axis 7	D1023	1 pulse input magnification setting register of a manual pulse generator for axis 8	<table border="1"> <tr><td>0</td><td>Feed position data</td><td>L</td></tr> <tr><td>1</td><td></td><td>H</td></tr> <tr><td>2</td><td>Real current value</td><td>L</td></tr> <tr><td>3</td><td></td><td>H</td></tr> <tr><td>4</td><td>Deviation counter value</td><td>L</td></tr> <tr><td>5</td><td></td><td>H</td></tr> <tr><td>6</td><td>Low error code</td><td>L</td></tr> <tr><td>7</td><td>High error code</td><td>L</td></tr> <tr><td>8</td><td>Servo error code</td><td>L</td></tr> <tr><td>9</td><td>Travel distance when near-zero-point dog is ON</td><td>L</td></tr> <tr><td>10</td><td></td><td>H</td></tr> <tr><td>11</td><td>Zero return re-travel distance</td><td>L</td></tr> <tr><td>12</td><td>Execution program number</td><td>L</td></tr> <tr><td>13</td><td>M code</td><td>L</td></tr> <tr><td>14</td><td>Torque limit value</td><td>L</td></tr> <tr><td>15</td><td>Travel distance change register</td><td>L</td></tr> <tr><td>16</td><td></td><td>H</td></tr> <tr><td>17</td><td>Real current value when STOP is input</td><td>L</td></tr> <tr><td>18</td><td></td><td>H</td></tr> <tr><td>19</td><td>Data set pointer for constant velocity control</td><td>L</td></tr> </table>	0	Feed position data	L	1		H	2	Real current value	L	3		H	4	Deviation counter value	L	5		H	6	Low error code	L	7	High error code	L	8	Servo error code	L	9	Travel distance when near-zero-point dog is ON	L	10		H	11	Zero return re-travel distance	L	12	Execution program number	L	13	M code	L	14	Torque limit value	L	15	Travel distance change register	L	16		H	17	Real current value when STOP is input	L	18		H	19	Data set pointer for constant velocity control	L
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D900 to D919	Axis 6 monitoring data																																																																																						
D920 to D939	Axis 7 monitoring data																																																																																						
D940 to D959	Axis 8 monitoring data																																																																																						
D960 to D965	Axis 1 data storage area for control change	<table border="1"> <tr><td>0</td><td>Current value change register</td><td>L</td></tr> <tr><td>1</td><td></td><td>H</td></tr> <tr><td>2</td><td>Velocity change register</td><td>L</td></tr> <tr><td>3</td><td></td><td>H</td></tr> <tr><td>4</td><td>JOG velocity setting register</td><td>L</td></tr> <tr><td>5</td><td></td><td>H</td></tr> </table>	0	Current value change register	L	1		H	2	Velocity change register	L	3		H	4	JOG velocity setting register	L	5		H																																																																			
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D1002 to D1007	Axis 8 data storage area for control change																																																																																						
D1008 to D1011	Limit switch output disable setting																																																																																						

2. SPECIFICATIONS

Motion Controller

(1) Monitoring data area (D800 to D959)

.....Data between the PCPU and the SCPU
The monitoring data area is used for the PCPU to store such data as feed position data, actual current values, and the number of accumulated pulses of the deviation counter.

This area can be used to confirm the positioning control status with a sequence program.

The user cannot write data to the monitoring data area (other than the travel distance change register).

Names	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
Feed position data	D801, D800	D821, D820	D841, D840	D861, D860	D881, D880	D901, D900	D921, D920	D941, D940
Real current value	D803, D802	D823, D822	D843, D842	D863, D862	D883, D882	D903, D902	D923, D922	D943, D942
Devlation counter value	D805, D804	D825, D824	D845, D844	D865, D864	D885, D884	D905, D904	D925, D924	D945, D944
Low error code	D806	D826	D846	D866	D886	D906	D926	D946
High error code	D807	D827	D847	D867	D887	D907	D927	D947
Servo error code	D808	D828	D848	D868	D888	D908	D928	D948
Travel distance after near-zero-point dog is ON	D810, D809	D830, D829	D850, D849	D870, D869	D890, D889	D910, D909	D930, D929	D950, D949
Zero return re-travel distance	D811	D831	D851	D871	D891	D911	D931	D951
Execution program number	D812	D832	D852	D872	D892	D912	D932	D952
M code	D813	D833	D853	D873	D893	D913	D933	D953
Torque limit value	D814	D834	D854	D874	D894	D914	D934	D954
Travel distance change register	D816, D815	D836, D835	D856, D855	D876, D875	D896, D895	D916, D915	D936, D935	D956, D955
Real current value when STOP is input	D818, D817	D838, D837	D858, D857	D878, D877	D898, D897	D918, D917	D938, D937	D958, D957
Constant velocity control data setting pointer	D819	D839	D859	D879	D899	D919	D939	D959

(a) Feed position data register ... Data from the PCPU to the SCPU

- 1) This register stores the target address output to the servo amplifier on the basis of the positioning address/travel distance specified in the servo program.
- 2) The stroke range check is performed with respect to this feed position data.

POINT

The storage of data to the monitoring data area is delayed at the times shown below in accordance with the ON/OFF status of the positioning device (input, internal relay, or special relay).

(1) When an A373CPU is used

- (a) When the scan time of a sequence program is 90 msec or less:
..... 90 msec
- (b) When the scan time of a sequence program exceeds 90 msec:
..... 1 scan time

(2) When an A373U/A273UCPU is used

- (a) Feed position data 3.5 msec
- (b) Real current value 28.4 msec
- (c) Deviation counter value .. 28.4 msec
- (d) Other 2-word data 90 msec
- (e) Other 1-word data 3.5 msec

2. SPECIFICATIONS

Motion Controller

- (b) Actual current value register ... Data from the PCPU to the SCPU
- 1) This register stores the current value attained in actual travel (feed position data minus the number of accumulated pulses of the deviation counter).
 - In fixed-rate transmission, the travel value counted up from 0 after motion starts is stored.
 - In velocity-position switching control, the current value counted up from the address when motion starts is stored here.
 - During velocity control, 0 is stored.
 - 2) In the stopped status, the feed position data is equal to the actual current value.
- (c) Deviation counter value register ... Data from the PCPU to the SCPU
- This register stores the difference between the feed position data and the actual current value.
- (d) Low error code register ... Data from the PCPU to the SCPU
- 1) When a low error occurs, the corresponding error code is stored in this register (see 20.3.2).
If another low error occurs, the previous error code is overwritten by the new error code.
 - 2) Low error codes can be cleared by an error reset signal (Yn7).
- (e) High error code register ... Data from the PCPU to the SCPU
- 1) When a high error occurs, the corresponding error code is stored in this register (see 20.3.3).
If another high error occurs, the previous error code is overwritten by the new error code.
 - 2) High error codes can be cleared by an error reset signal (Yn7).
- (f) Servo error code register ... Data from the PCPU to the SCPU
- 1) When a servo error occurs, the corresponding error code is stored in this register (see 20.3.4).
If another servo error occurs, the previous error code is overwritten by the new error code.
 - 2) Servo error codes can be cleared by a servo error reset signal (Yn8).
- (g) Travel distance after near-zero-point dog is ON register ... Data from the PCPU to the SCPU
- 1) When a zero return operation is performed, the travel distance from the point where the near-zero-point dog comes ON to the point where the zero return operation is completed is stored in this register (with no sign appended).
 - 2) In velocity-position switching control, the travel distance during positioning control is stored in this register (with no sign appended).

2. SPECIFICATIONS

Motion Controller

- (h) Zero return re-travel distance register ... Data from the PCPU to the SCPU

If the position at which motion stops in accordance with the travel distance setting after the near-zero-point dog has been switched ON by a peripheral device is not the zero point, the servo system CPU will initiate "re-travel" motion to the zero point. The travel distance to the zero point during this re-travel motion is stored in this register (with no sign appended).

Note that in the case of a data set type zero return operation, the data remains unchanged (the previous value stands).

- (i) Executed program number register ... Data from the PCPU to the SCPU

1) The program number of the program being executed is stored in this register when the DSFRP/SVST instruction is executed.

2) In JOG operation and manual pulse generator operation, the values indicated below are stored in this register.

- JOG operationFFFFH
- Manual pulse generator operation ...FFFEH
- When the power is turned onFF00H

3) While either of the following is being executed by a peripheral device in the test mode, "FFFDH" is stored in this register.

- A zero-point return
- A position loop gain or position control gain 1 check in servo diagnosis

- (j) M code register ... Data from the PCPU to the SCPU

1) The M code set for the executed servo program is stored in this register when positioning starts.

If no M code is set for the servo program, the value stored is "0".

2) If positioning is started by a means other than a servo program, the existing value does not change.

3) The stored value changes to "0" at the leading edge of the PC READY signal (M2000).

- (k) Torque limit value register ... Data from the PCPU to the SCPU

This register stores the value for the torque limit imposed on the servo system.

The default value of 300% is stored in this register when the power to the servo system is turned on or at the leading edge of the PC READY signal (M2000).

- (l) Travel distance change register ... Data from the SPCU to the PCPU

This is the area used when the travel distance is changed in velocity-position switching control or positioning control.

- (m) Real current value when STOP is input register ... Data from the PCPU to the SCPU

This register stores the actual current value when a STOP signal is input from an external source.

2. SPECIFICATIONS

Motion Controller

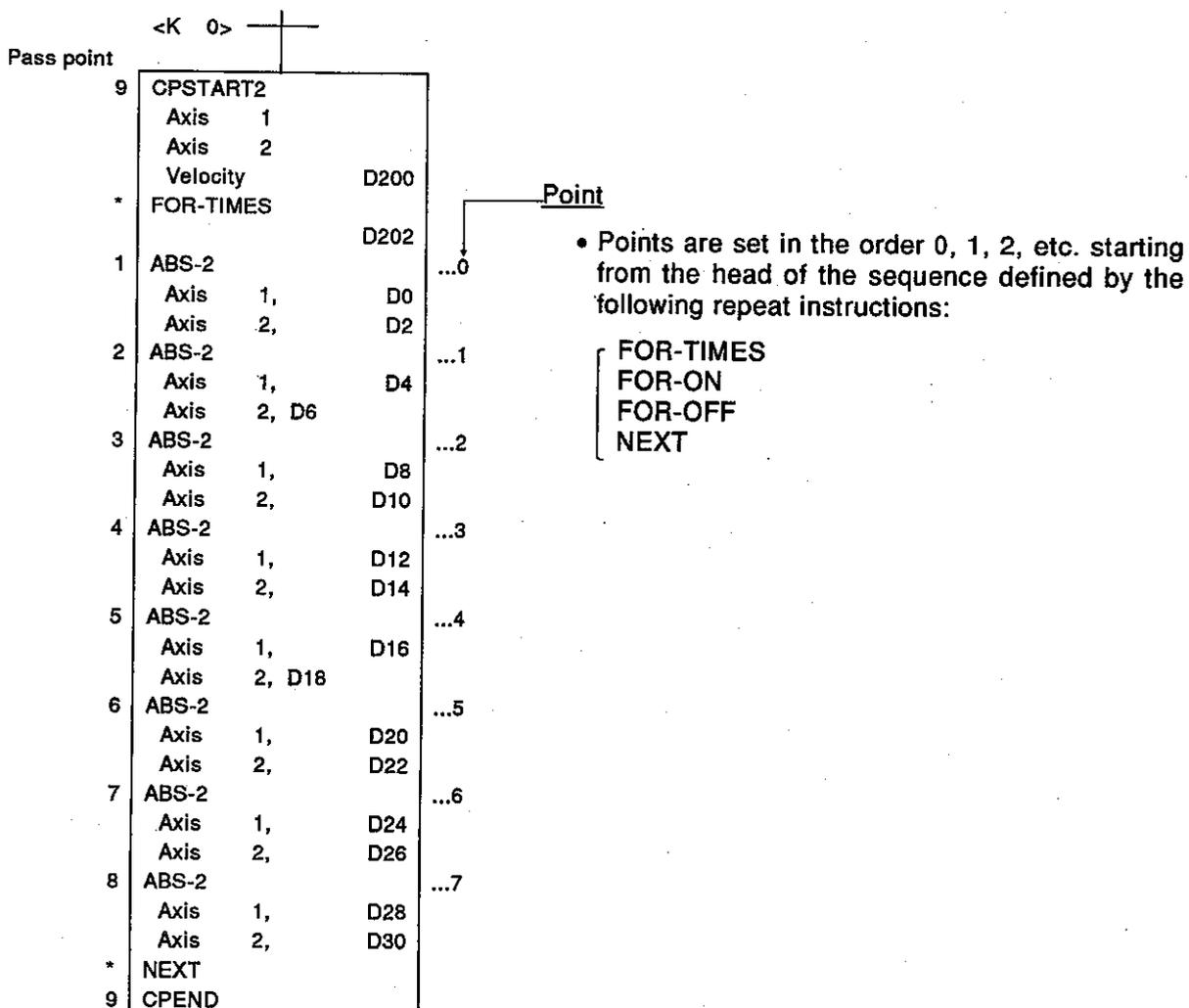
- (n) Constant velocity control data setting pointer ... Data from the PCPU to the SCPU

This pointer is used in constant velocity control when specifying positioning data indirectly and substituting positioning data during operation.

It stores a "point" that indicates which of the values stored in indirect devices has input to the PCPU when positioning is being repeated by using a repeat instruction (FOR-TIMES, FOR-ON, FOR-OFF).

Use this pointer in conjunction with the PC set pointer (controlled by the user in the sequence program) - which indicates the extent to which the positioning data has been updated at the SCPU - to confirm which positioning data is to be updated.

The use of the data set pointer and PC set pointer for constant velocity control is explained here using the example servo program below.

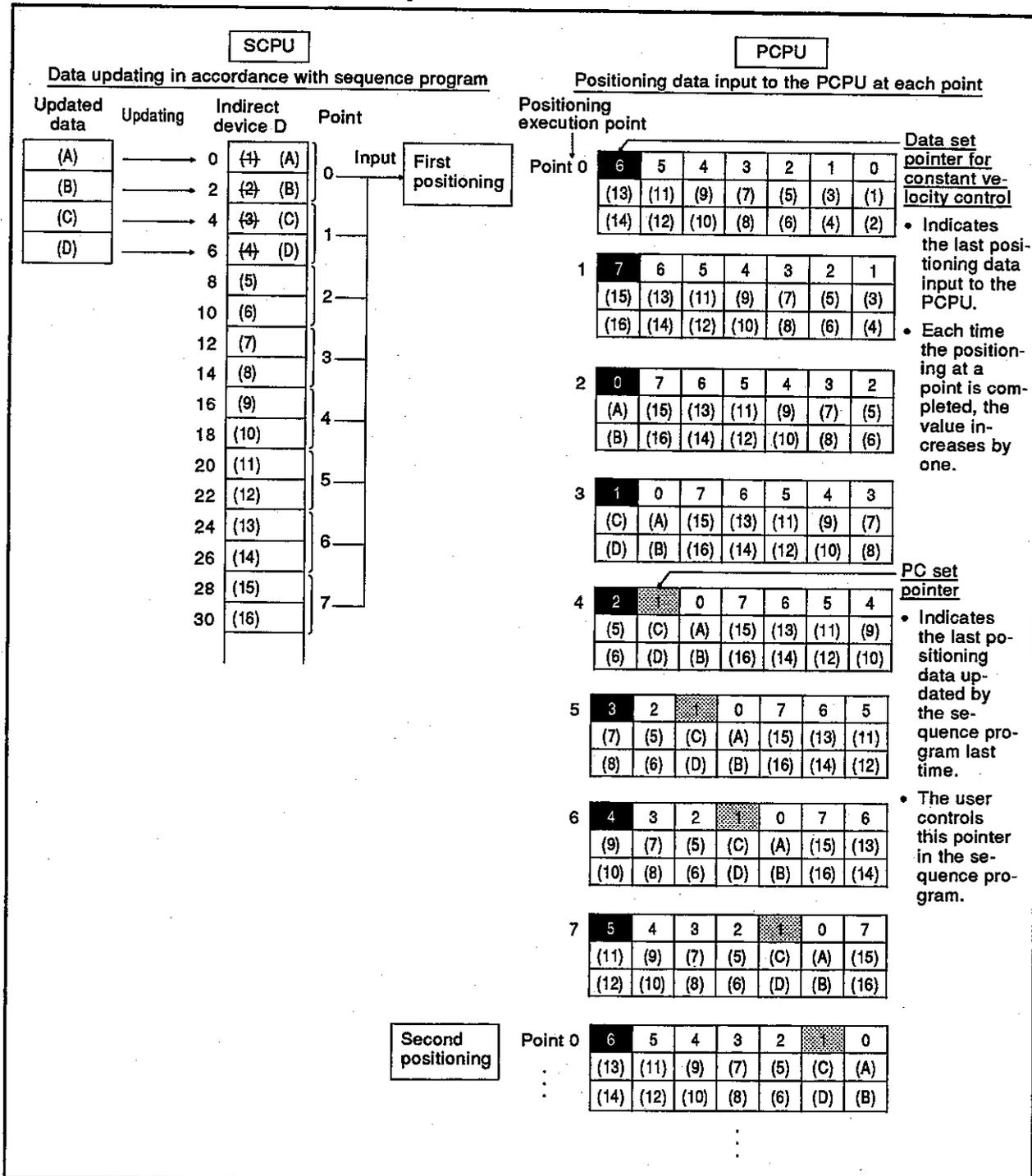


The input of positioning data to the PCPU on updating the positioning data in indirect devices D0 to D6 when 2-axis constant velocity control is executed using the servo program shown above is described overpage.

2. SPECIFICATIONS

Motion Controller

[Input of positioning data to the PCPU]



The internal processing for the operation shown above is described overpage.

2. SPECIFICATIONS

Motion Controller

[Internal processing]

- (1) On starting the operation, the positioning data of points 0 to 6 ((1) to (14)) is input to the PCPU.
At this time, the last point of the data to be input - which is point "6" - is stored in the data set pointer for constant velocity control.
The "6" stored in the data set pointer for constant velocity control indicates that updating of the positioning data stored in points 0 to 6 is possible.
- (2) The positioning data of points 0 and 1 ((A) to (D)) is updated in accordance with the sequence program.
The last positioning data to be rewritten - which is the data of point "1" - is stored in the PC set pointer (which must be controlled by the user in the sequence program).
Updating of the positioning data of points 2 to 6 (data (1) to (14)) remains possible.
- (3) On completion of the positioning for point 0, the value in the data set pointer for constant velocity control is automatically incremented by one to "7".
At this time, the positioning data of point 0 ((1) to (2)) is discarded and the positioning data for point 7 ((15) to (16)) is input to the PCPU.
- (4) Hereafter, each time the positioning for a point is completed, the positioning data shifts one place.
The positioning data that can be updated is the data after that indicated by the PC set pointer: this is the data which has not yet been input to the PCPU.
Consequently, after completion of the positioning corresponding to point 3, even if the values stored in indirect devices D8 and D10 are updated, the point 2 positioning data that is input to the PCPU will not be updated and the second positioning will be executed using the unupdated data.
In other words, the data set pointer for constant velocity control is a pointer that indicates data that has not yet been input to the PCPU and can be updated by the sequence program.

POINT

(1) Number of points that can be defined by a repeat instruction

- Create a subprogram to include at least eight points.
- If there are less than eight points and these include pass points with small travel values, the positioning at each point may be completed, and the data input to the PCPU, before the data has been updated by the sequence program.
- Create a sufficient number of points to ensure that data will not be input to the PCPU before the SCPU has updated the values in the indirect devices.

2. SPECIFICATIONS

Motion Controller

- (2) Data storage area (D960 to D1007) for a control change
 Data from the SCPU to the PCPU
 The data storage area for control change is the area for storing current value change data, speed change data, and JOG operating speed data.

Names	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
Current value change register	D961, D960	D967, D966	D973, D972	D979, D978	D985, D984	D991, D990	D997, D996	D1003, D1002
Speed change register	D963, D962	D969, D968	D975, D974	D981, D980	D987, D986	D993, D992	D999, D998	D1005, D1004
JOG speed setting register	D965, D964	D971, D970	D977, D976	D983, D982	D989, D988	D995, D994	D1001, D1000	D1007, D1006

(a) Present value change register

- 1) This register stores the feed present value after the change when the feed present value of a stopped axis is changed.
- 2) The ranges of values that can be set in the present value change register are indicated below.

Item	mm		Inch		degree		PULSE		Remarks
	Setting range	Units	Setting range	Units	Setting range	Units	Setting range	Units	
Present value Change value	-2147483648 to 2147483647	$\times 10^{-1}$ μm	-2147483648 to 2147483647	$\times 10^{-5}$ inch	-2147483648 to 2147483647	$\times 10^{-5}$ degree	-2147483648 to 2147483647	PLS	Even if the set value is outside the stroke range, no error will occur.

- 3) When the positioning control change instruction (DSFLP) is executed, the value stored in the present value change register becomes the feed present value.

(b) Speed change register

- 1) This register stores the speed after the change when the speed of an axis in motion is changed.
- 2) The setting ranges for the speed change register are indicated below.

Item	mm		Inch		degree		PULSE	
	Setting range	Units	Setting range	Units	Setting range	Units	Setting range	Units
Speed change value	0 to 600000000	$\times 10^{-2}$ mm/min	0 to 600000000	$\times 10^{-3}$ inch/min	0 to 600000000	$\times 10^{-3}$ degree/min	0 to 600000000	PLS/sec

- 3) When the positioning control change instruction (DSFLP) is executed, the value stored in the speed change register becomes the positioning speed.

(c) JOG speed setting register

- 1) This register stores the JOG speed during JOG operation.
- 2) The setting ranges for JOG speed are indicated below.

Item	mm		Inch		degree		PULSE	
	Setting range	Units	Setting range	Units	Setting range	Units	Setting range	Units
JOG speed	1 to 600000000	$\times 10^{-2}$ mm/min	1 to 600000000	$\times 10^{-3}$ inch/min	1 to 600000000	$\times 10^{-3}$ degree/min	0 to 1000000	PLS/sec

- 3) At the leading edge (OFF → ON) of the JOG start signal, the value stored in the JOG speed setting register becomes the effective value.
 It is only possible to change the data during JOG operation; the JOG speed cannot be changed.

2. SPECIFICATIONS

Motion Controller

(3) Limit switch output disable setting register (D1008 to D1011)

..... Data from the SCPU to the PCPU
 This is a register for disabling the external output to the outside of a limit switch output 1 point in units of 1 point.
 If a corresponding bit is set to 1, the limit switch output prohibition is set.
 And then, the external output goes OFF.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
D1008	LY0F	LY0E	LY0D	LY0C	LY0B	LY0A	LY09	LY08	LY07	LY06	LY05	LY04	LY03	LY02	LY01	LY00
	For axis 2							For axis 1								
D1009	LY1F	LY1E	LY1D	LY1C	LY1B	LY1A	LY19	LY18	LY17	LY16	LY15	LY14	LY13	LY12	LY11	LY10
	For axis 4							For axis 3								
D1010	LY2F	LY2E	LY2D	LY2C	LY2B	LY2A	LY29	LY28	LY27	LY26	LY25	LY24	LY23	LY22	LY21	LY20
	For axis 6							For axis 5								
D1011	LY3F	LY3E	LY3D	LY3C	LY3B	LY3A	LY39	LY38	LY37	LY36	LY35	LY34	LY33	LY32	LY31	LY30
	For axis 8							For axis 7								

1) Set each bit to 1/0.
 1: Disable — The limit switch output status is OFF.
 0: Enable — The limit switch output goes ON and goes OFF in accordance with the set data.

2) LY of LY00 to LY3F shows the limit switch output.

(4) Axis number setting registers to be controlled by the manual pulse generator (D1012, D1013, D1014)

..... Data from the SCPU to the PCPU
 These are the registers to store numbers to be controlled by the P1 to P3 manual pulse generators.

(5) JOG operation simultaneous start axis setting register (D1015)

..... Data from the SCPU to the PCPU
 This is a register to set the axis number by which simultaneous start of the JOG operation is executed and directed.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
D1015	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1
	Reverse JOG start axis								Forward JOG start axis							

* Set the JOG operation simultaneous start axis to 1/0.
 1: Simultaneous start execution
 0: Simultaneous start non-execution

(6) 1 pulse input magnification setting registers of a manual pulse generator (D1016 to D1023)

..... Data from the SCPU to the PCPU
 These are the registers to set the magnification (1 to 100) per pulse of the input number of pulses from the manual pulse generator during manual pulse generator operations.

2. SPECIFICATIONS

Motion Contoroller

2.4.5 Special registers (SP.D)

A servo system CPU has 256 special register points from D9000 to D9255. The 20 points from D9180 to D9199 are used for positioning control and their applications are as shown in the following table. (For the applications of special registers other than D9180 to D9199, see section 20.3.5.)

Device Number	Signal Name
D9180	Limit switch output status storage area for axis 1 and axis 2
D9181	Limit switch output status storage area for axis 3 and axis 4
D9182	Limit switch output status storage area for axis 5 and axis 6
D9183	Limit switch output status storage area for axis 7 and axis 8
D9184	PCPU error cause
D9185	Servo amplifier loading information
D9186	
D9187	Manual pulse generator axis setting error
D9188	Test mode request error
D9189	Error program number
D9190	Error item information
D9191	Servo amplifier setting information
D9192	Area for setting the manual pulse generator (P1) smoothing magnification.
D9193	Area for setting the manual pulse generator (P2) smoothing magnification.
D9194	Area for setting the manual pulse generator (P3) smoothing magnification.
D9195 to D9199	Unusable

3. NOMENCLATURE AND SETTING

Motion Controller

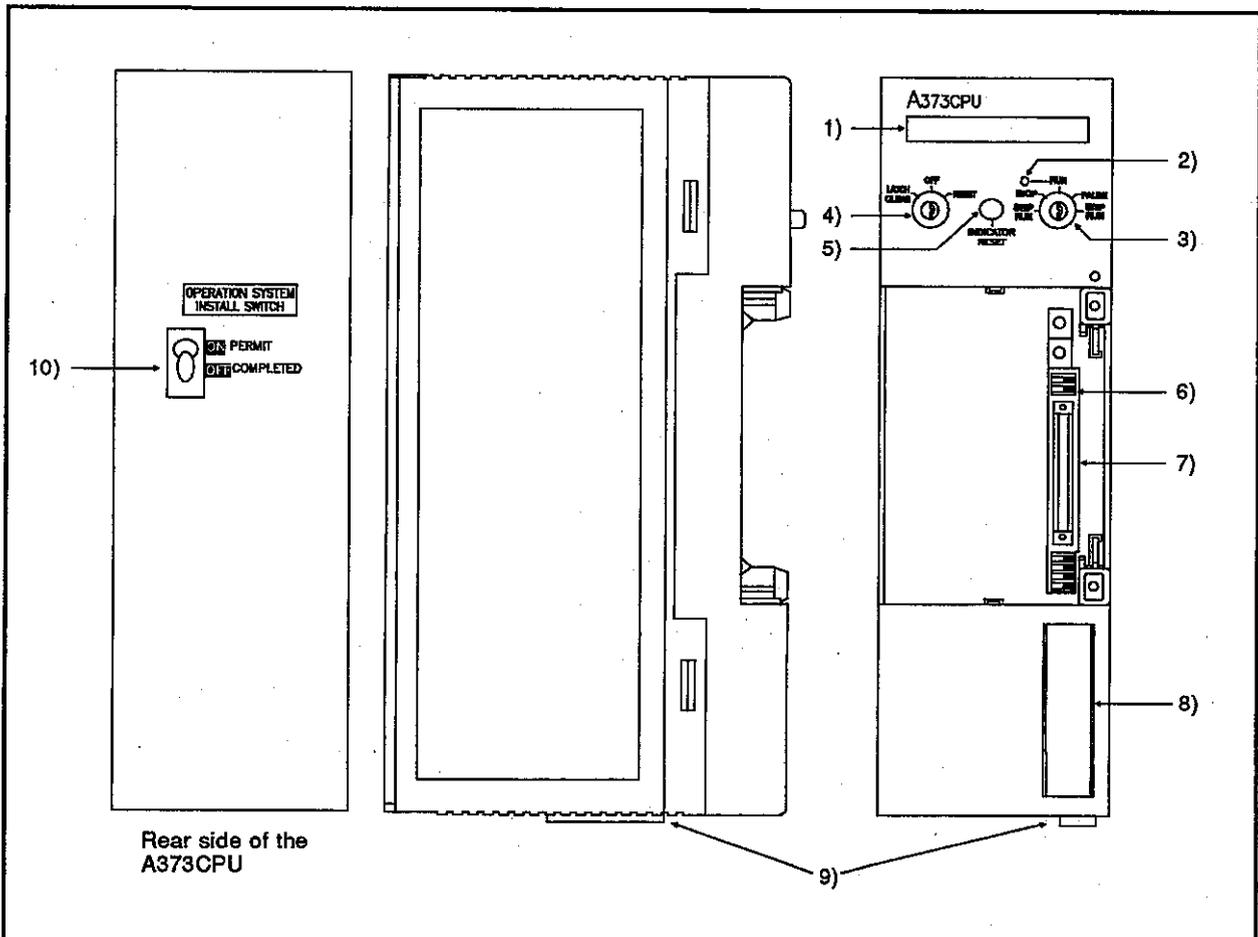
3. NOMENCLATURE AND SETTING

3.1 A373CPU

(1) A373CPU

This section explains the nomenclature and the setting method used to set an A373CPU.

(a) Nomenclature



Numbers	Names	Uses
1)	LED indicator	Displays up to 16 characters. Displays a comment by using the error comment created by the self-diagnoses OUT F and SET F.
2)	RUN LED	Indicates the operating status of a CPU. ON : During operation when the keyswitch is set to RUN or STEP RUN OFF : During interruption when the keyswitch is set to STOP and PAUSE or STEP RUN Flashing : An error is detected by self-diagnosis (However, when STOP is designated by the parameter setting, the operation continues even when an error is detected.)
3)	RUN/STOP keyswitch	RUN/STOP: Executes/stops operation of a sequence program PAUSE : Stops the operation of the sequence program and keeps the output state just before the PAUSE state. STEP RUN: Executes the step run of a sequence program.
4)	Reset keyswitch	RESET : H/W reset. Used to reset a CPU stopped by an operating error and to initialize an operation. LATCH CLEAR : Sets all latch area data (as defined by parameters) to OFF or 0. (Valid only when the RUN/STOP keyswitch is set to STOP.)

3. NOMENCLATURE AND SETTING

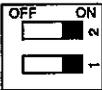
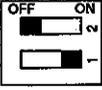
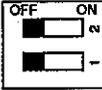
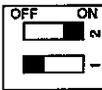
Motion Controller

Numbers	Names	Uses
5)	LED display reset switch	Clears a LED display and displays the next data (if any).
6)	I/O control switch	Sets the direct mode or refresh mode
7)	Memory cassette installation connector	Connects a CPU and memory cassette
8)	RS-422 connector	Connects to a peripheral device. Covered when not in use.
9)	Extension base connector	Connects with an extension base of the MELSEC-A series.
10)	Installation switch	Changes the CPU operating system (OS) by using a peripheral device. ON : Goes ON when installing an operating system OFF : Goes OFF when the installation has been completed, and CPU operations are enabled. The operating manual for the motion controller software package gives details about the installation procedure.

(b) Settings

This section shows how to set the CPU unit I/O control mode.

- I/O control modes consist of the direct and the refresh modes. Modes are set by a switch. It is set to the direct mode when shipped.

Switch Settings	Inputs (X)	Outputs (Y)	D9014 Values
	Direct mode	Direct mode	0
	Refresh mode	Direct mode	1
	Refresh mode	Refresh mode	3
			

POINTS

- Set I/O control switches when a power supply is OFF.
- After setting a switch, check the switch state when the power supply is turned ON.
- Since I/O control mode values are stored in BIN in special register D9014, they can be monitored by a peripheral device.

- The A3NCP User's Manual gives details about memory and memory cassette settings.

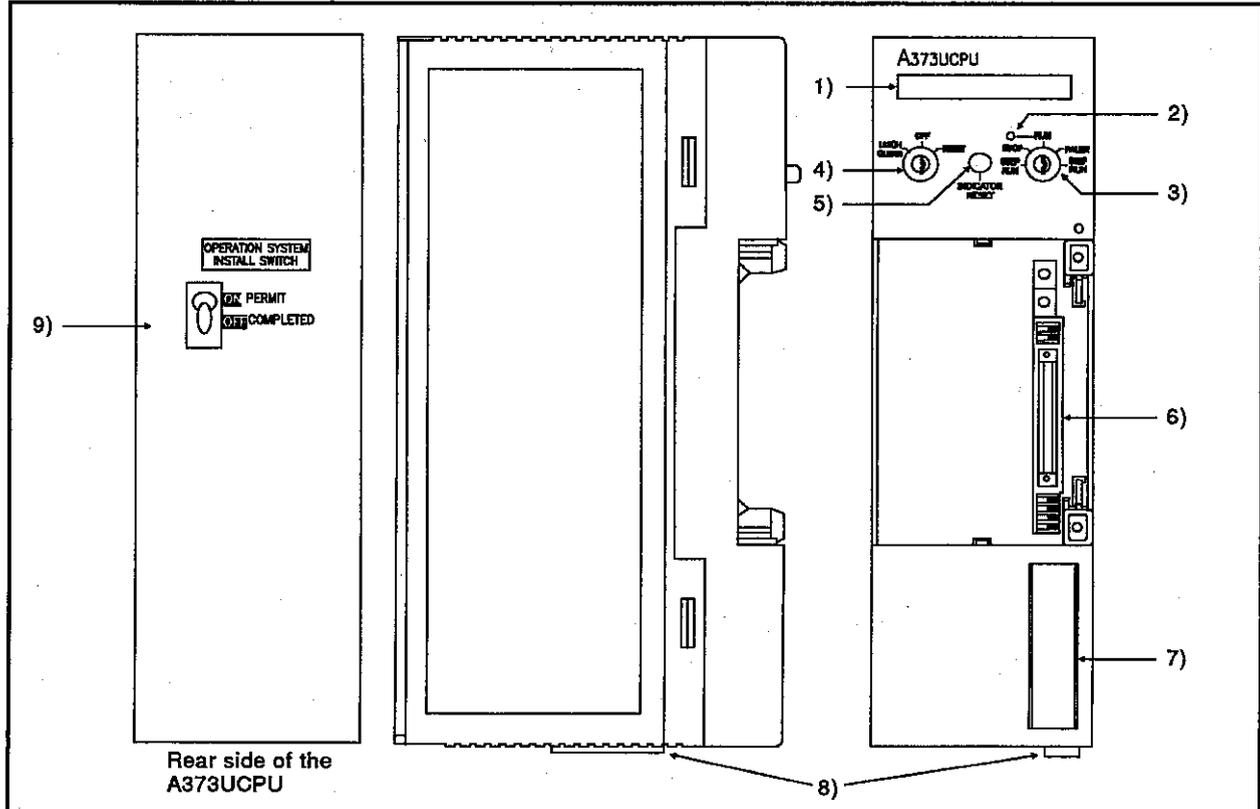
3. NOMENCLATURE AND SETTING

Motion Controller

(2) A373UCPU

This section explains the nomenclature and the setting method used to set an A373UCPU.

(a) Nomenclature



Numbers	Names	Uses
1)	LED indicator	Displays up to 16 characters. Displays a comment by using the error comment created by the self-diagnoses OUT F and SET F.
2)	RUN LED	Indicates the operating status of a CPU. ON : During operation when the keyswitch is set to RUN or STEP RUN OFF : During interruption when the keyswitch is set to STOP and PAUSE or STEP RUN Flashing : An error is detected by self-diagnosis (However, when STOP is designated by the parameter setting, the operation continues even when an error is detected.)
3)	RUN/STOP keyswitch	RUN/STOP : Executes/stops operation of a sequence program PAUSE : Stops the operation of the sequence program and keeps the output state just before the PAUSE state. STEP RUN : Executes the step run of a sequence program.
4)	Reset keyswitch	RESET : H/W reset. Used to reset a CPU stopped by an operating error and to initialize an operation. LATCH CLEAR : Sets all latch area data (as defined by parameters) to OFF or 0. (Valid only when the RUN/STOP keyswitch is set to STOP.)
5)	LED display reset switch	Clears a LED display and displays the next data (if any).
6)	Memory cassette installation connector	Connects a CPU and memory cassette
7)	RS-422 connector	Connects to a peripheral device. Covered when not in use.
8)	Extension base connector	Connects with an extension base of the MELSEC-A series.
9)	Installation switch	Changes the CPU operating system (OS) by using a peripheral device. ON : Goes ON when installing an operating system OFF : Goes OFF when the installation has been completed, and CPU operations are enabled. The operating manual for the motion controller software package gives details about the installation procedure.

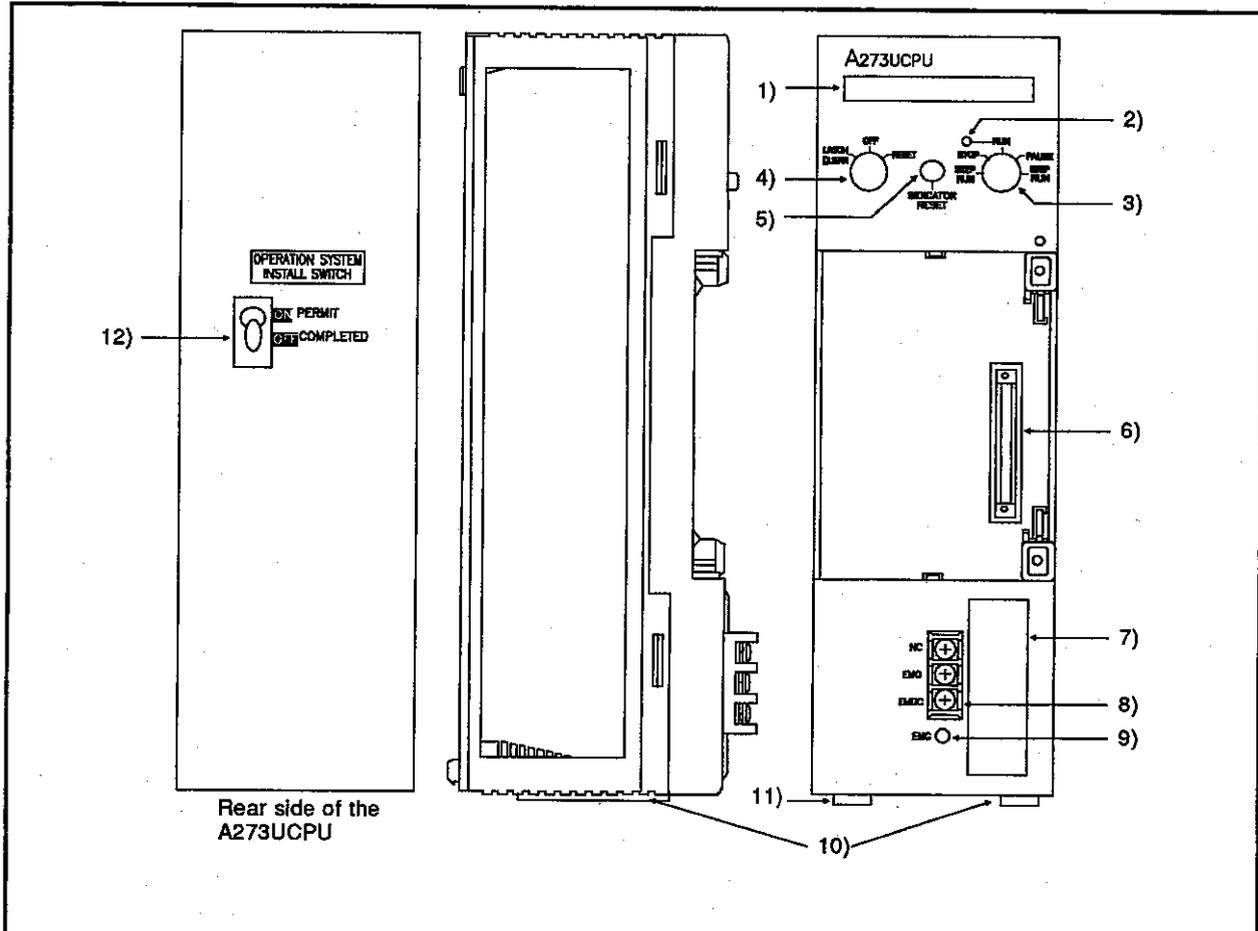
3. NOMENCLATURE AND SETTING

Motion Controller

(3) A273UCPU

This section explains the nomenclature and the setting method used to set an A273UCPU.

(a) Nomenclature



Numbers	Names	Uses
1)	LED indicator	Displays up to 16 characters. Displays a comment by using the error comment created by the self-diagnoses OUT F and SET F.
2)	RUN LED	Indicates the operating status of a CPU. ON : During operation when the keyswitch is set to RUN or STEP RUN OFF : During interruption when the keyswitch is set to STOP and PAUSE or STEP RUN Flashing : An error is detected by self-diagnosis (However, when STOP is designated by the parameter setting, the operation continues even when an error is detected.)
3)	RUN/STOP keyswitch	RUN/STOP: Executes/stops operation of a sequence program PAUSE : Stops the operation of the sequence program and keeps the output state just before the PAUSE state. STEP RUN : Executes the step run of a sequence program.
4)	Reset keyswitch	RESET : H/W reset. Used to reset a CPU stopped by an operating error and to initialize an operation. LATCH CLEAR : Sets all latch area data (as defined by parameters) to OFF or 0. (Valid only when the RUN/STOP keyswitch is set to STOP.)
5)	LED display reset switch	Clears a LED display and displays the next data (if any).
6)	Memory cassette installation connector	Connects a CPU and memory cassette
7)	RS-422 connector	Connects to a peripheral device. Covered when not in use.

3. NOMENCLATURE AND SETTING

Motion Controller

Numbers	Names	Uses
8)	Emergency stop input terminal (5 to 24 VDC)	Terminal for inputting the emergency stop signal
9)	Emergency stop input status indicator LED	Lights when an emergency stop is executed
10)	Extension base connector	Connects with an extension base of the MELSEC-A series.
11)	Connector for motion network	Connector that connects the serial bus to servo amplifiers (for use with MR-H-B/MR-J-B). Eight servo amplifiers can be connected. The total cable length cannot exceed 30 m.
12)	Installation switch	Changes the CPU operating system (OS) by using a peripheral device. ON : Goes ON when installing an operating system OFF : Goes OFF when the installation has been completed, and CPU operations are enabled. The operating manual for the motion controller software package gives details about the installation procedure.

3.2 Nomenclature and Setting of Positioning Modules

Consult system supplier for details about the nomenclature, settings, and handling of positioning modules used for the A373/A373UCPU system.

Consult system supplier for details about the nomenclature, settings, and handling of motion modules, PC CPU I/O modules, battery unit, and teaching unit used for the A273UCPU system.

POINTS

- When an A373CPU is used, the power supply module, base unit, extension cable, memory, memory cassette specifications, and handling procedures are the same as those used with an A3NCPU. The A3NCPU User's Manual gives details about each of these items.
- When an A373UCPU is used, the power supply module, base unit, extension cable, memory, memory cassette specifications, and handling procedures are the same as those used with an A3UCPU. The A3UCPU User's Manual gives details about each of these items.
- When an A273UCPU is used, the control power supply module, servo power supply module, base unit, extension cable, memory, memory cassette specifications and handling procedures are the same as those used with an A3UCPU. The A3UCPU User's Manual gives details about each of these items.

4. MAINTENANCE AND INSPECTION

Motion Controller

4. MAINTENANCE AND INSPECTION

This section explains items which must be inspected daily and periodically to ensure that the motion controller will be in the best possible operating condition.

4.1 Daily Inspection

Table 4.1 shows the items which should be inspected daily.

Table 4.1 Daily Inspection Items

Number	Inspection Items	Check Points	Criteria	Corrective Action
1	Base unit mounting conditions	Check for loose mounting screws and covers.	The base unit should be securely mounted.	Tighten any loose screws.
2	Mounting conditions of the positioning module, etc.	Check if the module is disengaged.	The positioning module should be securely mounted.	Tighten any loose screws.
3	Connecting conditions	Check for loose terminal screws.	Screws should not be loose.	Tighten any loose terminal screws.
		Check distances between solderless terminals.	Sufficient clearance between solderless terminals.	Correct if necessary.
		Check the extension cable connectors	Connectors should not be loose.	Tighten any connector mounting screws.
4	CPU module display lamps	POWER LED	Check that the LED is ON.	ON (OFF indicates an error.)
		RUN LED	Check that the LED is ON during RUN.	ON (OFF or flashing indicates an error.)
		Input LED	Check that the LED goes ON and OFF.	ON when input is ON. OFF when input is OFF. (Any other state indicates an error.)
		Output LED	Check that the LED goes ON and OFF.	ON when output is ON. OFF when output is OFF. (Any other state indicates an error.)

REMARK

If it is necessary to exchange an I/O module installed on a PC CPU extension base unit during motion controller operations, do so as indicated in the Online I/O module replacement section of the ACPU Programming Manual (Fundamental)).

4. MAINTENANCE AND INSPECTION

Motion Controller

4.2 Periodic Inspections

This section explains the inspection items that should be checked every 6 months to 1 year. Such inspections should also be made if the equipment has been moved or modified, or if wiring changes have been made.

Table 4.2 Periodic Inspection Items

Number	Inspection Items	Check Points	Criteria	Corrective Action	
1	Ambient environment	Ambient temperature	Measure with thermometer and hygrometer. Check for corrosive gas.	0 to 55 °C	When the motion controller is inside a panel, the temperature inside the panel is considered the ambient temperature.
		Ambient humidity		10 to 90%RH	
		Atmosphere		There should be no corrosive gas.	
2	Line voltage check	A6[JP	Measure the voltage across the 100/200 VAC terminal.	85 to 132 VAC	Change the power supply.
		A385P-[]	Measure the voltage across two of the three terminals R, S, and T.	170 to 242 VAC	
		A230P			
3	Mounting conditions	Looseness and/or play	Check if the module moves.	The module should be securely mounted.	Tighten any loose screws. If the CPU, I/O, or power supply module are loose, secure the module with screws.
		Presence of dust or foreign matter	Visual check	There should be no dust or foreign matter.	Remove any and thoroughly clean.
4	Connecting conditions	Loose terminal screws	Tighten any loose screws with a screwdriver.	Connectors should not be loose.	Tighten any loose connectors.
		Distance between solderless terminals	Visual check	Sufficient clearance between solderless terminals.	Correct.
		Loose connectors	Visual check	Connectors should not be loose.	Tighten any loose connector mounting screws.
5	Memory cassette battery	Check whether M9006 or M9007 is OFF in monitor mode using a peripheral device.	(Preventive maintenance)	Even if the battery capacity drop is not indicated, replace the battery if the specified service life has been exceeded.	
6	A362ES/A336EX battery (A373/A373UCPU)	Confirm that "2025" and "2103" are not shown as servo errors.	(Preventive maintenance)	Replace the battery if there is a battery voltage drop.	
	MR-JBAT[] battery (A273UCPU)				
7	Fuses	Check for blown fuses.	(Preventive maintenance)	Even if fuses are not blown, elements may be consumed by rush current. Therefore, replace fuses periodically.	

4. MAINTENANCE AND INSPECTION

Motion Controller

Table 4.2 Periodic Inspection Items (Continued)

Number	Inspection Items	Check Points	Criteria	Corrective Action
8	Fan	Check for vibrations and noise during operations.	Excessive vibrations and noise.	Replace the fan.
9	Check on the servo external signal input module A336[JX, A344SF, A278EX	Check by forcibly operating the external switches	Normal operation must be observed for each signal.	Replace the external switches or the module
10	Check on the manual pulse generator	Check by carrying out manual pulse generator operation.	Manual pulse generator operation must proceed normally.	Adjust the wiring, replace the manual pulse generator, or replace the module
11	Check on the synchronization encoder	Check for synchronization error	There must be no error in synchronized operation.	Adjust the wiring, replace the synchronization encoder, eliminate noise.
12	Check on the brake circuit	Switch the servo system ON and OFF to forcibly operate the brake.	The brake must operate normally.	Adjust the wiring, adjust the settings, repair the mechanical brake, or replace the module.

4. MAINTENANCE AND INSPECTION

Motion Controller

4.3 Replacement of Batteries

The program and back-up battery service life for the power failure back-up function, as well as the procedures for replacing batteries are the same as those for the A3NCPU or A3UCPU.

The Maintenance and inspection section of the A3NCPU User's Manual or A3UCPU User's Manual gives details.

4.3.1 Service life of the battery

(When an A373/A373UCPU is used)

The backup time of absolute value data and the service life of batteries which are installed in the side of an A362ES position detection module or an A336EX servo input module are shown below.

Item	Contents
Battery backup time	30,000 hours
Battery life	5 years
Battery voltage	+ 2.5 to + 5.25 V

Preventive maintenance is as described below.

- (1) Even if the total power failure time is less than the guaranteed value in the above table, replace the battery after 4 to 5 years.
- (2) Even if the total power failure time is less than the guaranteed value in the above table, replace the battery if a battery voltage drop error "2025" (at power ON) or "2103" (during operations) occurs as a servo error.

(When an A273UCPU is used)

The life of the battery used to back up absolute value data, which is connected at the left side of the main base unit, is shown below.

Item	MR-JBAT4	MR-JBAT8
Battery backup time	10,000 hours	
Battery life	5 years	
Battery voltage	3.6 V	

Preventive maintenance is as described below.

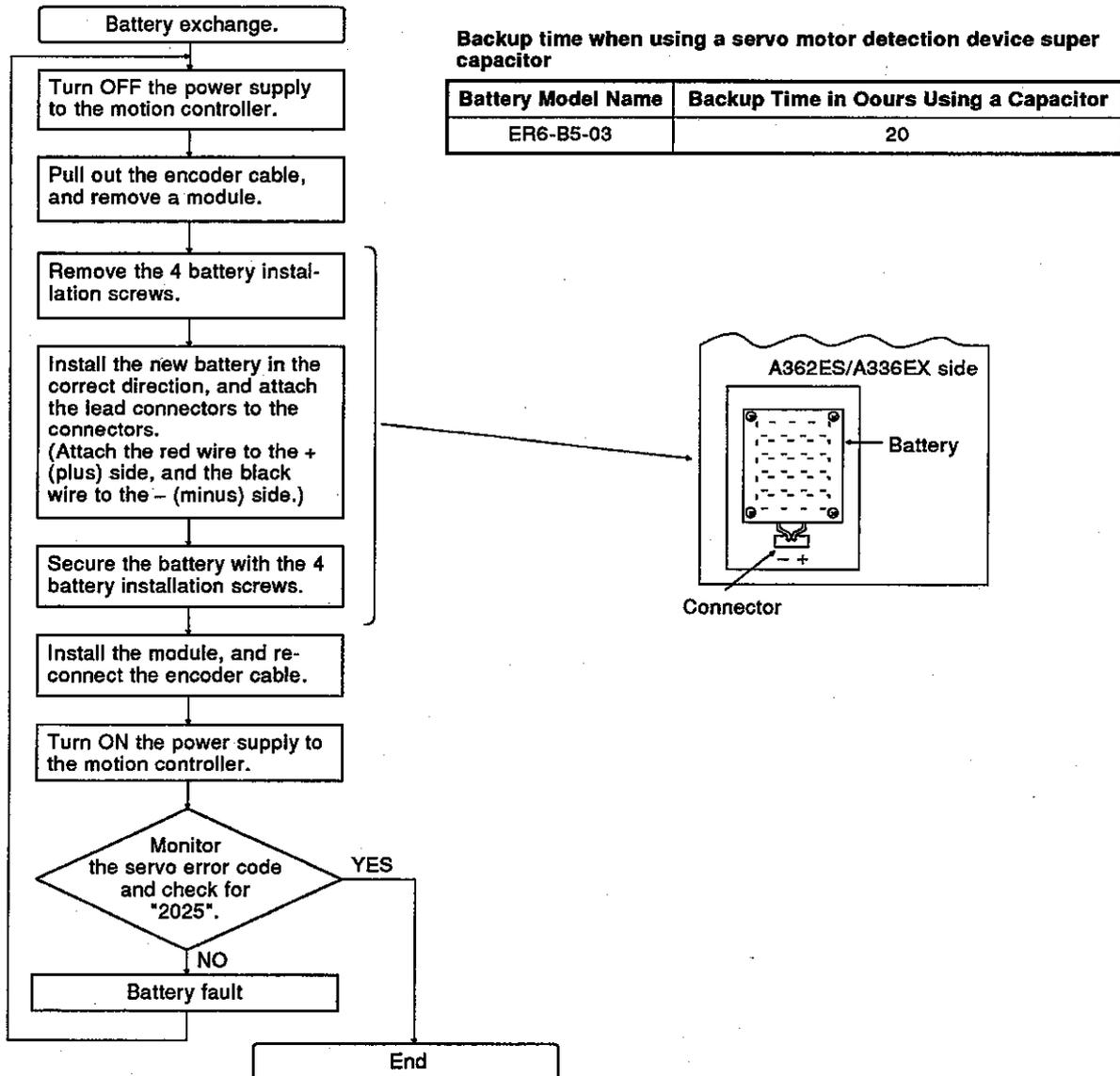
- (1) Even if the total power failure time is less than the guaranteed value in the above table, replace the battery after 4 to 5 years.
- (2) Even if the total power failure time is less than the guaranteed value in the above table, replace the battery if a battery voltage drop error "2025" (at power ON) or "2103" (during operations) occurs as a servo error.

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4.3.2 Replacement of the battery of the position detection module/servo input module

The following flowchart shows the procedure for replacing batteries installed on the side of a position detection module (A362ES only) or servo input module (A336EX only).



4.4 Loading and Installation

This section describes the correct methods for loading and installation in order to ensure that the system will operate reliably and that its functions will perform optimally.

4.4.1 Consideration for safety

When the power to the motion controller is turned ON or OFF, the process output may not perform normally at times due to the difference between the delay time and the rise time of the power supply of the motion controller and the external power supply for processing (especially DC).

For example, if the power to the motion controller is turned ON after the external power supply for processing has been turned ON at a DC output module, the DC output module may temporarily give erroneous outputs when the power to the motion controller is turned ON. To solve this problem, it is essential to configure a circuit in which the power to the motion controller is turned ON first.

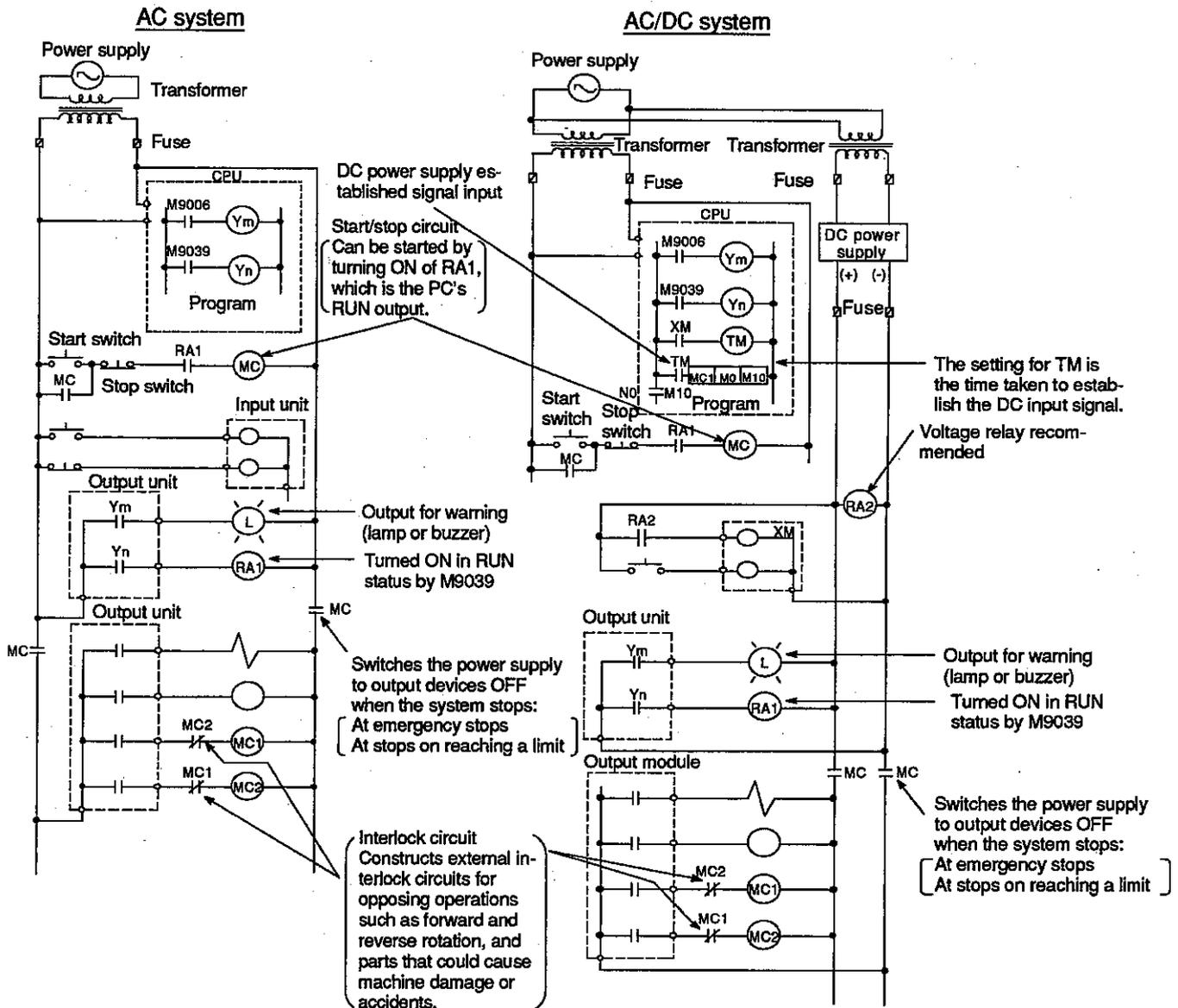
The system may also operate erroneously if there is a fault in the external power supply or trouble affecting the motion controller.

To (a) prevent erroneous operation of the entire system, and (b) ensure safety, prepare circuits external to the motion controller (such as an emergency stop circuit, protection circuit and interlock circuit) that prevent machine damage and/or accidents due to erroneous operation of peripheral devices. An example system design circuit based on this concept is given on the following page.

4. MAINTENANCE AND INSPECTION

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System design circuit example



AC system

- [1] Switch the power supply ON.
- [2] Set the CPU to RUN.
- [3] Switch the start switch ON.
- [4] The output devices are driven in accordance with the program when the magnetic contactor (MC) comes ON.

AC/DC system

- [1] Switch the power supply ON.
- [2] Set the CPU to RUN.
- [3] Switch RA2 ON when establishment of the DC power supply starts.
- [4] Switch the timer (TM) ON when the DC power supply is 100% established. (The set value for TM must be the time it takes for 100% establishment of the DC power after RA2 is switched ON. Make this set value 0.5 seconds.)
- [5] Switch the start switch ON.
- [6] The output devices are driven in accordance with the program when the magnetic contactor (MC) comes ON. (If a voltage relay is used at RA2, no timer (TM) is necessary in the program.)

4. MAINTENANCE AND INSPECTION

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4.4.2 Cautions relating to positioning systems based on AC motor drive modules

Cautions on wiring

- (1) The following points require particular care when wiring between AC motor drive modules (hereafter "ADUs") and servo motors:
 - (a) The wiring work must be completed before power is supplied to the power supply module.
 - (b) It is essential to ensure that the phases of the ADU terminals (U, V, W) match the phases of the servo motor terminals (U, V, W) when wiring.

It is not possible to reverse the direction of rotation of a motor by connecting mismatched phases.

Method for emergency stop, and follow-up processing

- (1) An ADU emergency stop can be executed by setting the emergency stop circuit (EMG) to the "open" status: this stops the ADU and all the axes in the MR-SB/SD or MR-J-B/MR-H-B system.

The following modules have an emergency stop circuit (EMG):

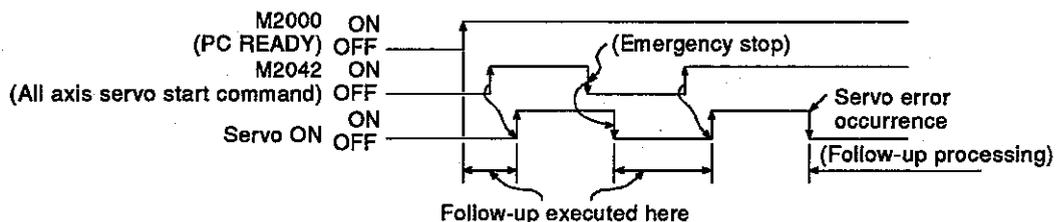
- When using A373/A373U:Power supply module
- When using A273U:CPU module

- (2) Machine motion is monitored in the emergency stop status or the servo OFF status and the results are reflected by changing the actual current value so that, when the servo ON status is restored, positioning can be continued without rotation by the amount dictated by the deviation counter.

The processing just described is called follow-up processing and it is executed under the following conditions.

- (a) When M2000 (PC READY signal) is ON.
- (b) When the "servo OFF" status is established by the sequence program, for example due to execution of an all axis servo OFF or individual axis servo OFF instruction.
- (c) When an emergency stop is executed with the emergency stop circuit (EMG). (However, follow-up processing is not executed in the case of an emergency stop executed by the emergency stop circuit of an MR-SB or MR-J-B/MR-H-B.)

The time chart for follow-up processing is presented below.



- (3) After an emergency stop has occurred, eliminate its cause, then restore the servo ON status immediately with an emergency stop cancellation (EMG circuit ON) signal.

4. MAINTENANCE AND INSPECTION

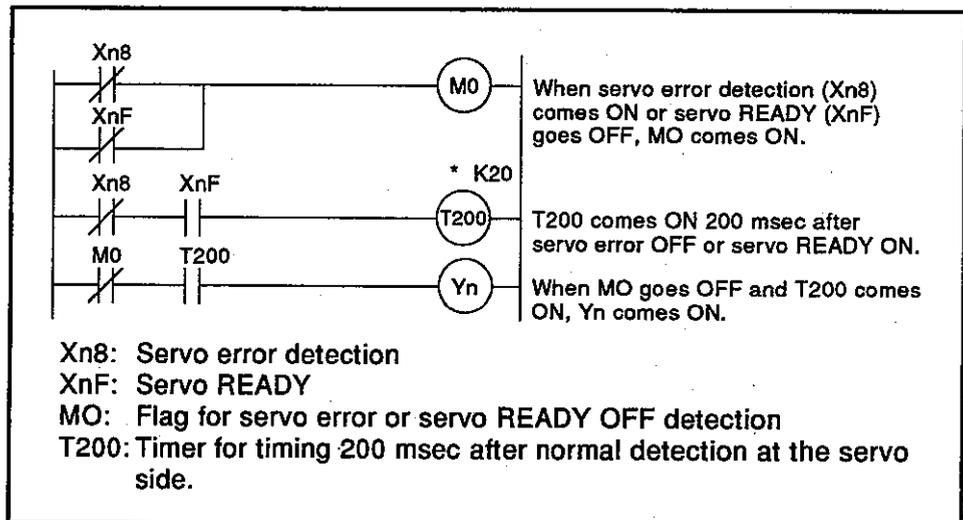
POINT

If an emergency stop state is cancelled within the parameter-set rapid stop deceleration time, an error will occur and the servo OFF status will be established.

Sequence program for electromagnetic brake operation

To switch off the output for an electromagnetic brake, switch ON the servo error detection signal (Xn8) or switch OFF the servo READY signal (XnF) in the sequence program.

Also, program so that the output for the electromagnetic brake is switched ON 200 msec after normal detection (Xn8 : OFF, XnF : ON) at the servo side.



POINT

- * T200 is a 10 msec timer which is subject to some degree of error depending on the sequence program scan time. This error is in the range of minus two scans to plus one scan. Actually release the electromagnetic brake and adjust the set value so that no error occurs at the servo side.

Emergency stop methods

The emergency stop methods for the MR-SB/MR-SD and MR-J-B/MR-H-B are:

(1) Method using the emergency stop circuit

An emergency stop for all axes of the ADU and external servo amplifier (MR-SB/MR-SD or MR-J-B/MR-H-B) can be executed by setting the emergency stop (EMG) circuit to the "open" status. After an emergency stop has occurred, eliminate its cause, then restore the servo ON status immediately with an emergency stop cancellation (EMG circuit ON) signal. (When an emergency stop occurs the servo error signal Xn8 does not come ON.)

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- (2) Method using emergency stop wiring to the MR-SB or MR-H-B (not possible for MR-SD or MR-J-B)

An MR-SB or MR-H-B can be placed in the emergency stop state by opening its emergency stop contact, but the motion controller interprets this as a servo error. Accordingly, in order to cancel the emergency stop state, the emergency stop contact of the MR-SB or MR-H-B must be closed and the error reset signal (Yn8) must be switched ON.

POINT

The MR-SB/SD servo amplifier displays E7 (emergency stop) until the servo ON state is established by the all axis servo start command (M2042).

4.5 Wiring

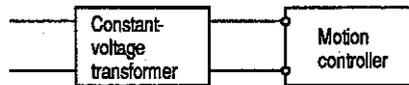
This section gives the wiring instructions for the system.

4.5.1 Wiring instructions

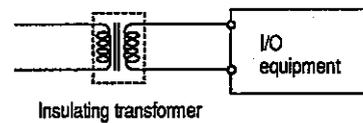
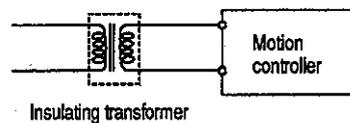
Instructions for wiring the power cable and I/O cables.

(1) Wiring of the power supply

- (a) When voltage fluctuations are larger than the specified value, connect a constant-voltage transformer.



- (b) Use a power supply which generates minimal noise between wires and between the PC and ground. If excessive noise is generated, connect an insulating transformer.

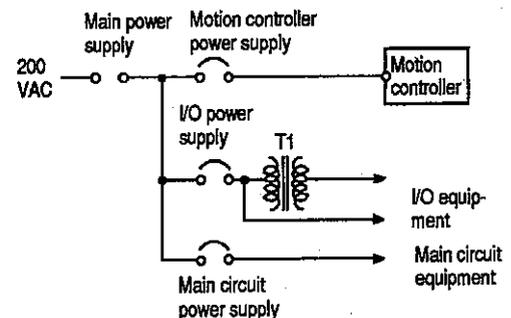
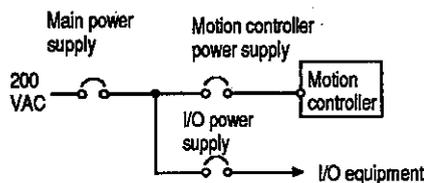


- (c) When a power transformer or insulating transformer with a secondary voltage of 200 VA is employed, use one with a capacity greater than those indicated in the following table.

Power Supply Module	Transformer Capacity	Power Supply Module	Transformer Capacity
A385P-30	10KVA x n	A65P	110VA x n
A230P	10KVA x n	A66P	95VA x n
A61P	110VA x n	A68P	95VA x n
A62P	110VA x n	A171SCPU	105VA x n

"n" stands for the number of power supply modules.

- (d) When wiring, separate the motion controller power supply from the I/O and power equipment as shown below.



REMARK

As a safety precaution, when carrying out the wiring work for equipment where I/O modules are removed and installed while the power is ON, provide a separate switch for each unit and equipment.

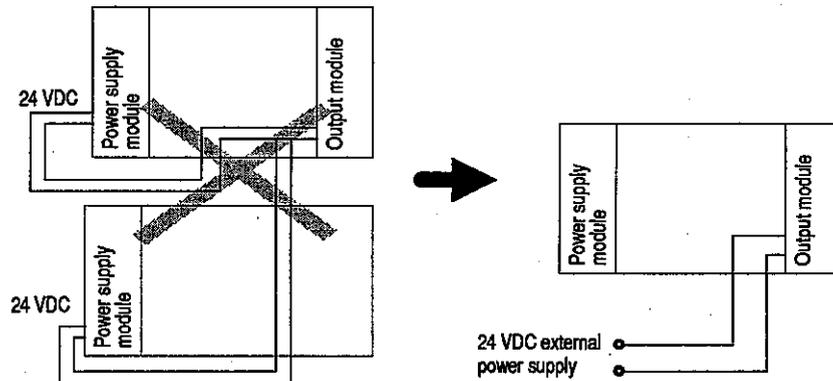
4. MAINTENANCE AND INSPECTION

MELSEC-A

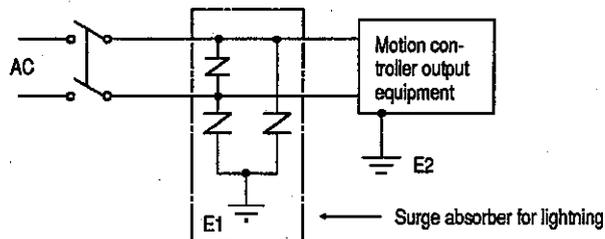
- (e) Note on using the 24 VDC output of the A385P-30, A62P, A65P, and A66P power supply module.

To protect the power supply modules, do not supply one I/O module with 24 VDC from several power supply modules connected in parallel.

If the 24 VDC output capacity is insufficient for one power supply module, supply 24 VDC from the external 24 VDC power supply as shown below:



- (f) Twist the 100 VAC, 200 VAC, and 24 VDC cables as closely as possible. Connect modules with the shortest possible wire lengths.
- (g) To minimize voltage drop, use the thickest wires possible for the 100VAC, 200 VAC, and 24 VDC cables.
- (h) Do not bundle the 200 VAC and 24 VDC cables with main-circuit wires (high-voltage, large-current) or the I/O signal wires, or lay these cables and wires close to each other when wiring. If possible, provide a distance of more than 200 mm (7.88 in.) between the cables and wires.
- (i) As a lightning-protection measure, connect a surge absorber as shown below.

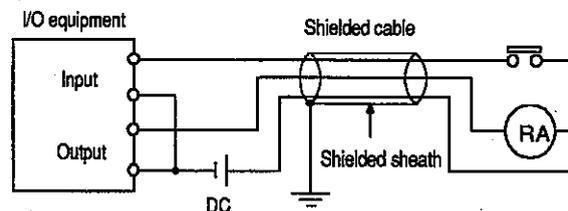


POINTS

- (1) Ground the surge absorber (E1) and the PC (E2) separately from each other.
- (2) When selecting a surge absorber for lightning, make sure its maximum permitted circuit voltage is not exceeded even at the maximum voltage rise of the power supply.

(2) Wiring of I/O equipment

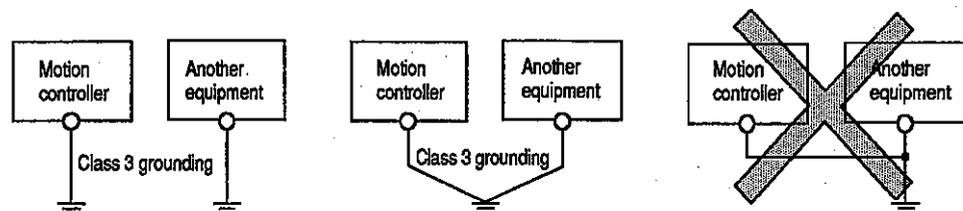
- (a) The applicable size of wire for connection to the terminal block connector is $0.75(18)$ to 2 mm^2 . However, it is recommended to use wires of 0.75 mm^2 for convenience.
- (b) Separate the input and output lines.
- (c) I/O signal wires must be at least 200 mm (7.88 in.) away from high-voltage and large-current main circuit wires.
- (d) If the I/O signal wires cannot be separated from the main circuit wires and power wires, ground at the I/O equipment side with batch-shielded cables. Under some conditions, it may be preferable to ground at the other side.



- (e) If wiring has been done with piping, ground the piping.
- (f) Separate the 24 VDC I/O cables from the 100 VAC and 200 VAC cables.
- (g) If wiring over 200 m (0.12 mile) or longer distances, problems can be caused by leakage currents due to line capacity.

(3) Grounding

- (a) Grounding must be done in conformance with (b) to (d) below
- (b) Ground the motion controller as independently as possible. Class 3 grounding should be used (grounding resistance 100Ω or less).
- (c) If independent grounding is impossible, use the joint grounding method as shown in the figure below (2).



(1) Independent grounding...Best

(2) Joint grounding....Good

(3) Joint grounding.....Not allowed

- (d) Use a wire with a cross-sectional area of at least 2 mm^2 for grounding. Make the grounding point as close to the motion controller as possible so that the grounding wire is not too long.

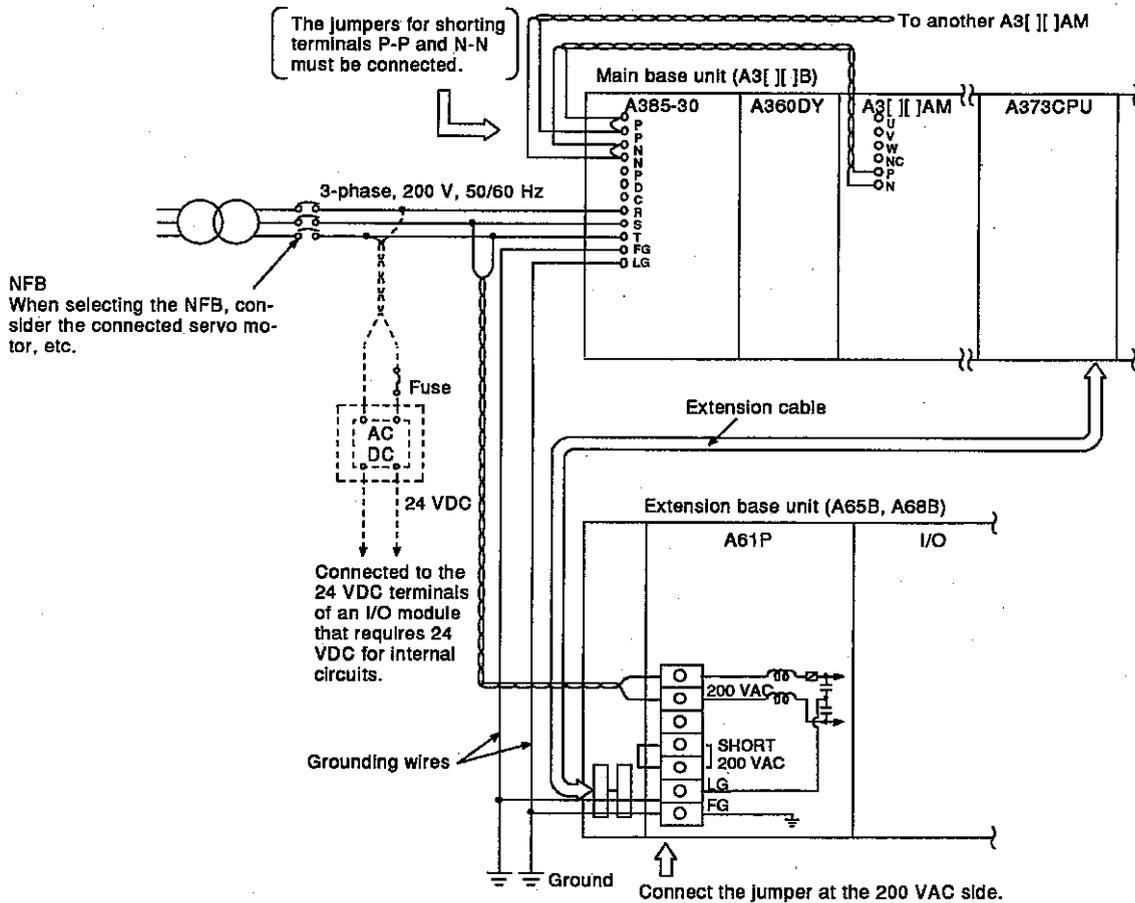
4. MAINTENANCE AND INSPECTION

Motion Controller

4.5.2 Wiring to unit terminals

(1) When using an A373(U)

An example showing how the power supply and grounding wires can be connected to the main base unit and extension base unit is given below.



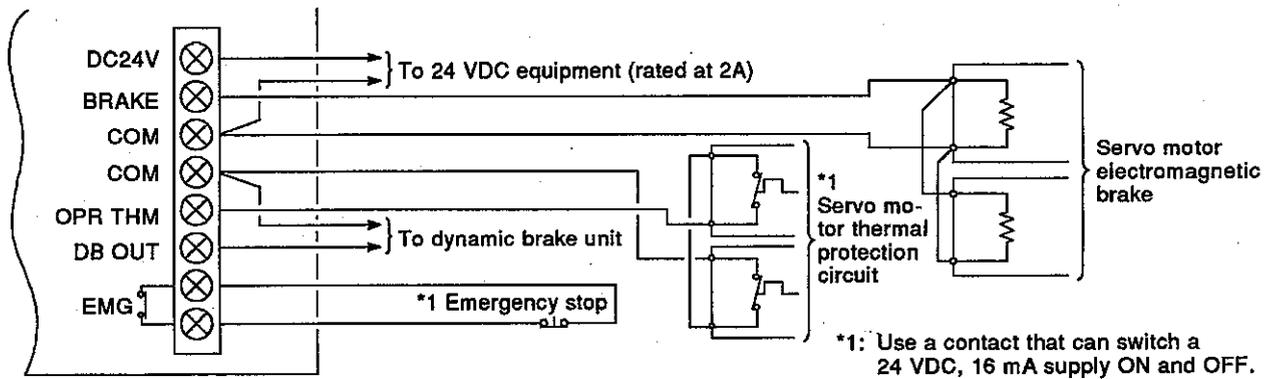
POINTS

- (1) The cross sectional area of the 200 VAC power supply wire to the main base unit must be as large as possible.
- (2) The cross sectional area of the extension base and 24 VDC power supply wires must be no greater than 2 mm^2 and they must be twisted, starting from the point where they are connected to the terminals. In addition, the solderless terminals must be the type provided with insulating sleeves to prevent short circuiting if screws come loose.
- (3) Be sure to ground the LG terminal and FG terminal of the main base unit and extension base unit. Note that the potential at the LG terminal is half the input voltage and you may sustain an electrical shock if you touch the terminal area.
- (4) Use a grounding wire with a thickness of at least 2 mm^2 .
- (5) Supply the same power supply to power supply modules of the main base unit (A3[][]B) and extension base unit (A65B, A68B), and the A68P power supply module.

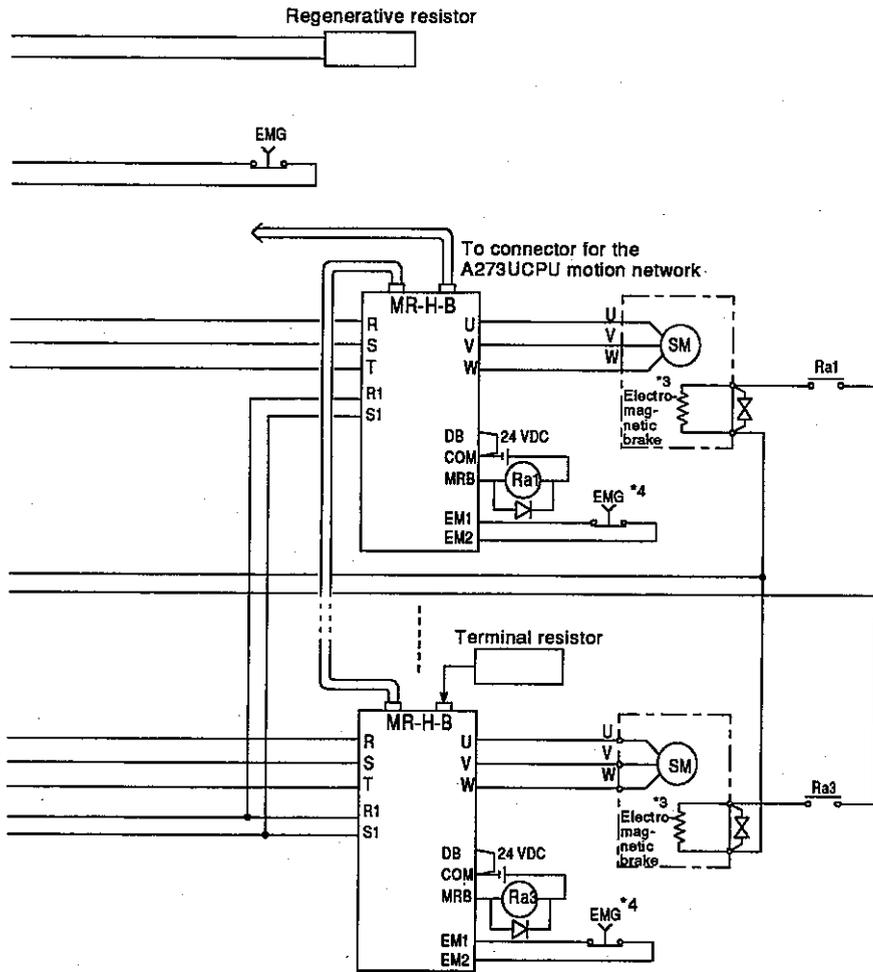
4. MAINTENANCE AND INSPECTION

Motion Controller

The wiring for the A385P-30 control terminal block is shown below.



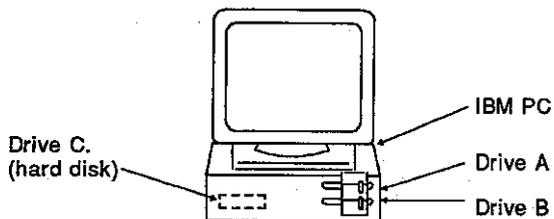
4. MAINTENANCE AND INSPECTION



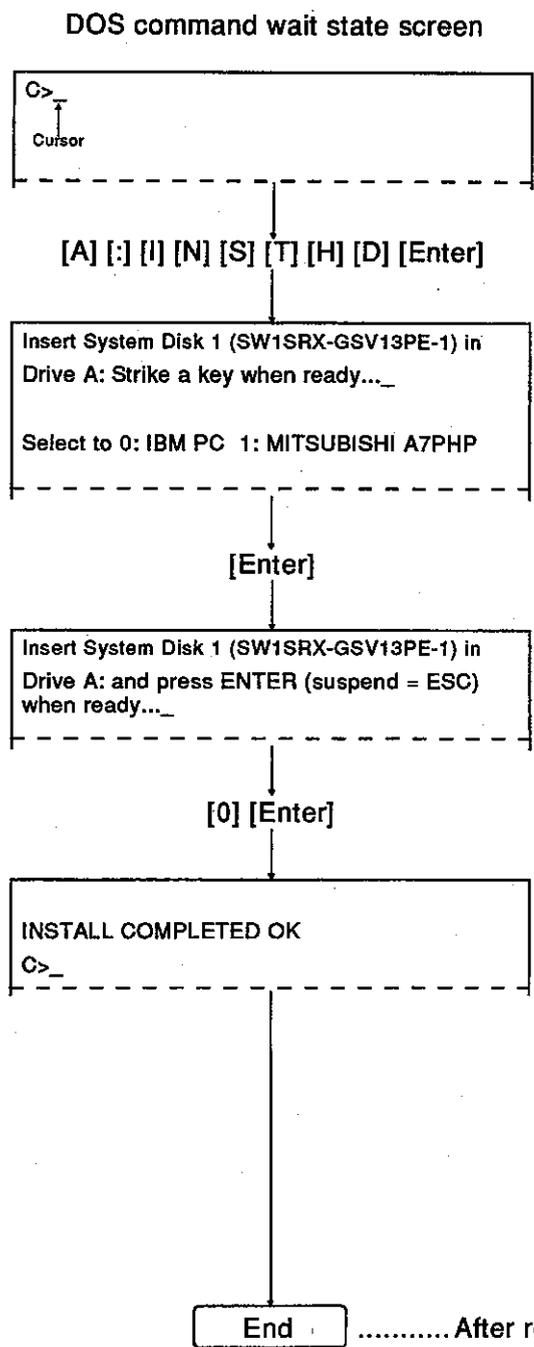
5. REGISTERING THE GSV[][]PE IN AN IBM PC

5. REGISTERING THE GSV[][]PE IN AN IBM PC

This section gives the procedure for registering the GSV[][]PE in an IBM PC assuming the following system is used.



• Use IBM DOS (PC-DOS) version 5.0 for the operating system



- 1** Use the IBM DOS (PC-DOS) to start up the IBM PC (putting it in the ON state).
- 2** Insert the GSV[][]PE-1 disc in drive A of IBM PC.
- 3** After "C>" is displayed, input "A:INSTHD", and then press the [Enter] key.
- 4** Confirm the registration ready confirmation message, and then press the [Enter] key.
- 5** Select 0 from the selection screen of the computer to be used, and then press the [Enter] key. (Do not select 1. If 1 is selected, registration will not executed normally.) Registration is executed. When the registration of the GSV[][]PE-1 disc has been completed, the "Insert System Disk [] (SW1SRX-GSV13PE-[]) in Drive A: and press ENTER (suspend = ESC) when ready..._" message will be displayed. Take out GSV[][]PE-1 from drive A and insert GSV[][]PE-2 and press the [Enter] key. Then, the registration of the GSV[][]PE-2 is executed. Register GSV[][]PE-3 to -10 in the same way. When all registration has been completed, the message on the screen to the left is displayed.

..... After registration has been completed, reset the IBM PC. Section 7.1 gives details about how to start-up.

5. REGISTERING THE GSV[][]PE IN AN IBM PC

Motion Contoroller

POINT

(1) Even when the GSV[][]PE is registered in the hard disk of the IBM PC, the contents of CONFIG.SYS and AUTOEXEC.BAT before registering are not changed.

(a) Setting of CONFIG.SYS

It is necessary to set the driver (see Section 1.6.3) which is necessary to operate the GSV[][]PE.

(b) Setting of AUTOEXEC.BAT

Set PATH at AUTOEXEC.BAT on a route to use the GSV[][]PE.

PATH setting example

PATH = C: \GPP\SYSGSV13;

↑ Drive in which the GSV[][]PE is registered

6. GSV[][]PE COMMON ITEMS

This section explains common items when operating the GSV[][]PE.

6.1 Common Items of File Management

This section explains the common items and precautions to take when performing file management using the GSV[][]PE.

6.1.1 Drive name

The drive name indicates where data will be registered.

The IBM PC has 3 drives: the A drive, C drive, and D drive.

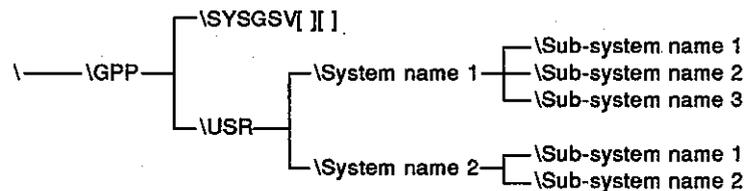
A drive: Designate this drive when registering data in a floppy disk or when reading data from the floppy disk.

C drive: Designate this drive when registering data in the hard disk in which the GSV[][]PE is registered, or when reading data from the hard disk. The user can set the hard disk capacity optionally. (10 Mbytes are necessary for registration of the GSV[][]PE; this area is different from the D drive.)

D drive: Designate this drive when registering data in a hard disk in which the GSV[][]PE is not registered, or when reading data from the hard disk. The user can set the hard disk capacity optionally. (This area is different from the C drive.)

* Some models have a B drive. The B drive can be used the same as the A drive.

The GSV[][]PE has an hierarchical directory as shown below.



6.1.2 System names

System names comprise a group of several related sub-system names in which data created by the user can be stored.

A system name (8 characters max.) can be input by using alphanumeric characters and "-" (a hyphen). However, the first character must be a letter of the alphabet.

6.1.3 Sub-system names

Sub-system names are directory names in which both data created by the user and individual data items can be stored.

A system name (8 characters max.) can be input by using an alphanumeric characters and "-" (a hyphen). However, the first character must be a letter of the alphabet.

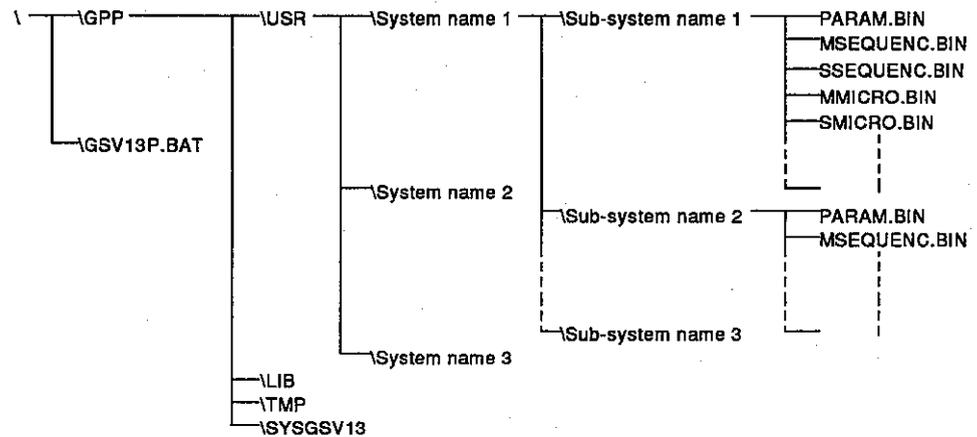
POINT**Headline statements and title statements**

- A headline statement is the system name and the comment for a sub-system name. The general description and the date a stored program was created serve as name confirmation during retrieval. A headline statement (32 characters max.) can be input by using alphanumeric characters and special symbols.
- A title statement is a comment to create compatibility with the file comment of an A6GPP. This is a comment to be added to a file after converting the program created by the GPP function to be used for an A6GPP. This is displayed in the comment area when a directory is displayed on an A6GPP. A title statement (20 characters max.) can be input by using alphanumeric characters and special symbols.

6. GSV[][]PE COMMON ITEMS

6.2 File Configuration

(1) File configuration of the GSV[][]PE



(2) File name

The following files are created under the sub-system names of the GSV [][]PE in accordance with the setting contents of the data.

	(File names)		
1. Parameter	PARAM.BIN	} Fixed file name	
2. Main sequence (includes T/C set values)	MSEQUENC.BIN		
3. Sub-sequence (includes T/C set values)	SSEQUENC.BIN		
4. SFC block title	SFCBTL.BIN		
5. SFC step comment	SFCn.BIN (n = 0 to 255)		
6. Step trace	STPTRACE.BIN		
7. Main microcomputer	MMICRO.BIN		
8. Substitute microcomputer	SMICRO.BIN		
9. Main statement	MSTATEM.BIN		
10. Sub-statement	SSTATEM.BIN		
11. Main note	MNOTE.BIN		
12. Sub-note	SNOTE.BIN		
13. Sampling trace	[Data name].STR		} Fixed identifier File names (8 characters max.) can be set.
14. Status latch	[Data name].SLT		
15. Device memory	[Data name].DEV		
16. System information (PC type, headline statement, and printer information)	GPPA.CNF	} Fixed file name	
17. PC type (A273U)	GSV.CNF		
18. Print header	PHEADER.BIN		
19. Extension comment	NEWCOM.BIN		
20. Servo data	SVDATA.BIN		
21. Servo data (default data for MR-J-B)	SVDATA3.BIN		
22. Servo program	SVPROG.BIN		
23. Trace graph data	SVTRCE01.BIN to SVRECE08.BIN		
24. Back up data	SVBACK13.BIN		

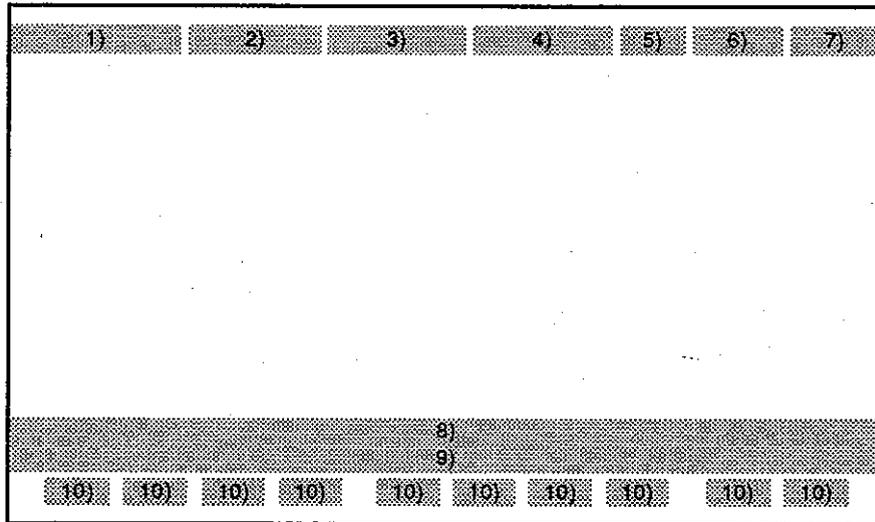
6. GSV[][]PE COMMON ITEMS

Motion Controller

6.3 Common Display Area

This section explains the layout and contents which are displayed on the screen commonly by the GSV[][]PE.

- (1) When a mode other than the system setting mode is selected The following explains the common display areas in modes other than the system setting mode.



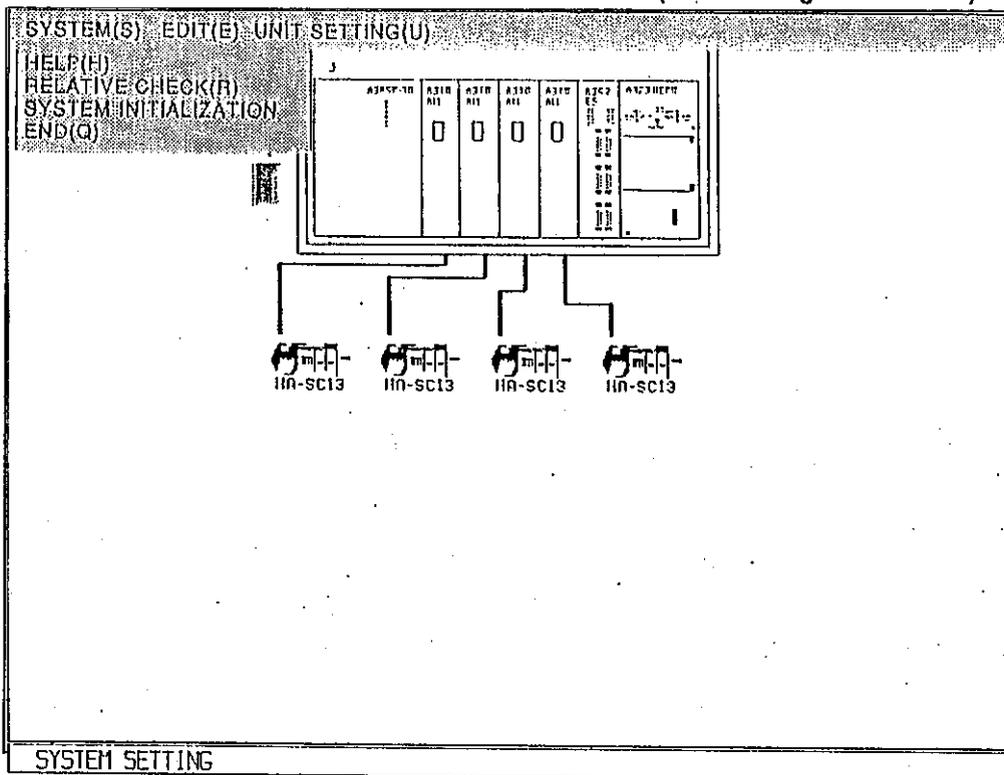
Numbers	Names	Contents
1)	Mode/function display area	Displays the current mode and function.
2)	PC type/PC number/monitoring destination display area	Displays the PC type, channel number, PC number, monitoring destination (PC, DM (device memory), SL (status latch)) which were set by the initial setting, and network number.
3)	Number of used memory and number of used steps/remaining numbers display area	Displays the number of used steps and remaining number when the programming mode is selected.
4)	Drive name: sub-system name display area	Displays the drive name and system name set by the initial setting.
5)	Main (sub) display area	Displays whether the currently executed program is a main program or sub-program.
6)	F11 function display area	F11: MENU (The menu selection window is displayed by pressing the [F11] key.)
7)	F12 function display area	F12: HELP (The help window is displayed by pressing the [F12] key.)
8)	Keyed-in data display area	Displays the GPP function (ladder mode and list mode) and the SFC function keyed-in data.
9)	Guidance/error message display area	Displays a guidance/error message.
10)	Function key display area	Displays the functions of the [F1] to [F10] keys.

6. GSV[][]PE COMMON ITEMS

Motion Controller

(2) System setting mode

(When using A373UCPU)



Number	Name	Contents
1)	Menu bar display area	Displays a menu bar by pressing the right button of the mouse or the [Esc] key.
2)	System setting area	Whole window A unit is allocated.
3)	Base unit display area	Displays a selected base unit and the status of the installed unit.
4)	Servo amplifier display area	When A373/A373UCPU is selected: Displays the status of the utilized servo amplifier (d1 to d4). When A273UCPU is selected: Displays the status of the utilized servo amplifier (d1 to d8)
5)	Dialog/alert display area	Displays dialog/alert.
6)	System message display line	Displays the current edit mode, etc.

6.4 Window/Guidance Explanation

When operating the GSV[][]PE, the following 6 kinds of windows/guidances can be displayed:

- Menu selection windowSee Section 6.4.1
- Mode and function selection windowSee Section 6.4.2
- Sub-function selection windowSee Section 6.4.3
- Execution/setting windowSee Section 6.4.4
- Confirmation dialogSee Section 6.4.5
- Alternative dialogSee Section 6.4.6

All functions can be selected by using one of the following 3 methods:

- 1) Selection using a numeric keyWhen selecting a function from a menu or when selecting data from selectable items, press and select the numeric key of item to be selected.
- 2) Selection using arrow keysWhen selecting a function from a menu or when selecting data from selectable items, use the arrow keys to move the cursor to an item to be selected, and then press the [Enter] key.
- 3) Selection using mouseWhen selecting a function from a menu bar, select an item by right-dragging and right-releasing the mouse.
When selecting data from selectable items, select an item selected by the left-clicking the mouse.

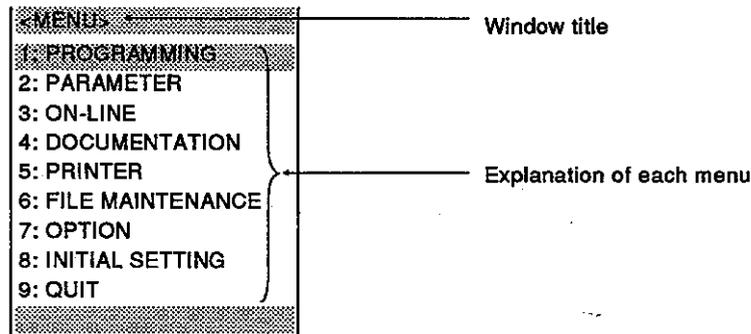
However, when using the GSV[][]PE, a function can be selected with the mouse only in the system setting mode.

6. GSV[][]PE COMMON ITEMS

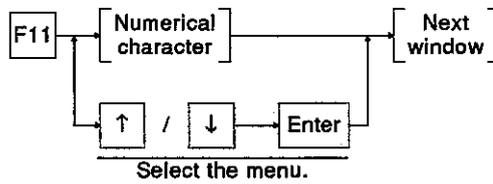
6.4.1 Menu selection window

The menu selection window is used to select the GPP function operating items. The menu selection window can be displayed by pressing the [F11] key when operating any function except the initial setting mode and the system setting mode of the GSV[][]PE.

When operating in the initial setting mode and the system setting mode, the menu selection window can be displayed by exiting the mode.

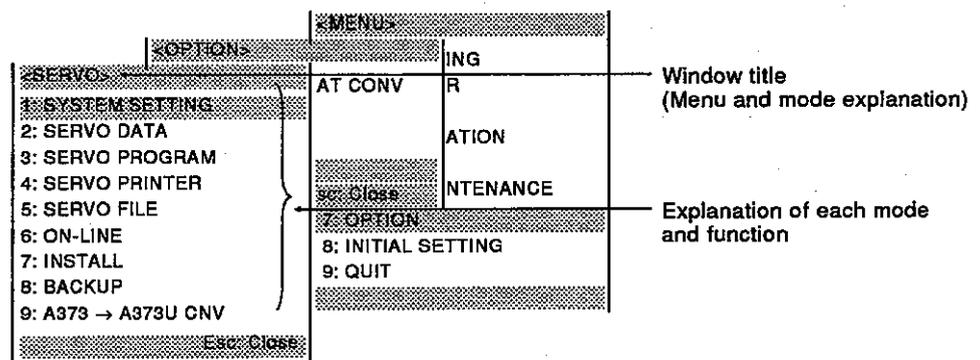


[Key operation explanation]

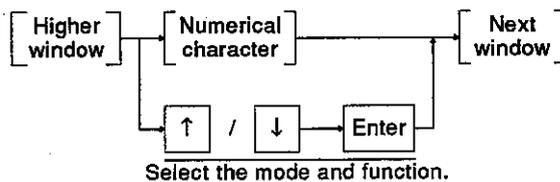


6.4.2 Mode and function selection window

The mode and function selection window is displayed in every item set in a higher window such as the menu selection window. This window is used to set a lower selection item.



[Key operation explanation]



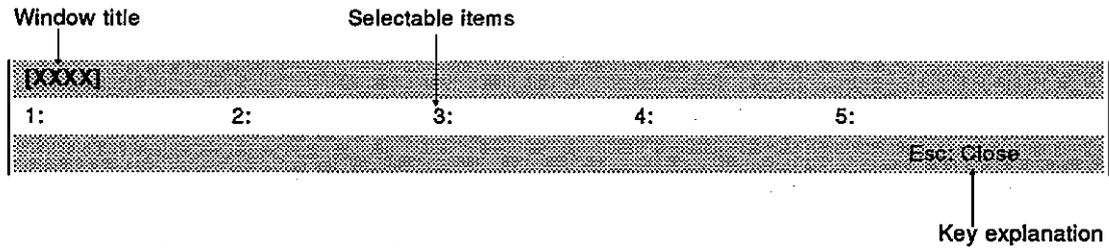
- Press the [Esc] key to return to a higher window.

6. GSV[][]PE COMMON ITEMS

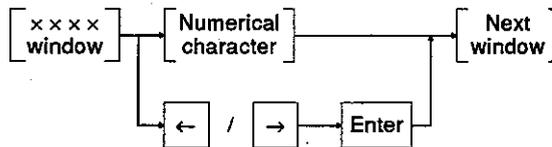
Motion Controller

6.4.3 Sub-function selection window

When the mode function is selected and when there is a selected item, the sub-function selection window is displayed.



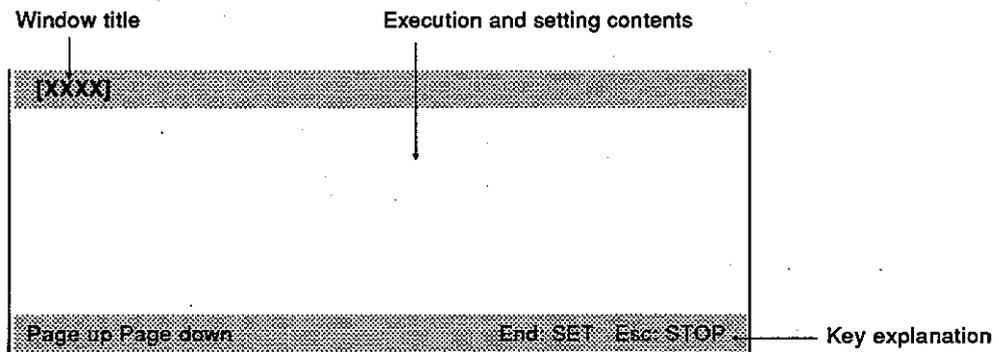
[Key operation explanation]



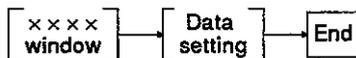
- Press the [Esc] key to return to a higher window.

6.4.4 Execution/setting window

The execution/setting window is used to execute numerical value inputs, the designation of selectable items, and alternative selections.



[Key operation explanation]



- To return to a higher window, press the [Esc] key.
- When there are several execution and setting windows, press the [Page Up] key to display the previous page. Press the [Page Down] key to display the next page.

6.4.5 Confirmation dialog

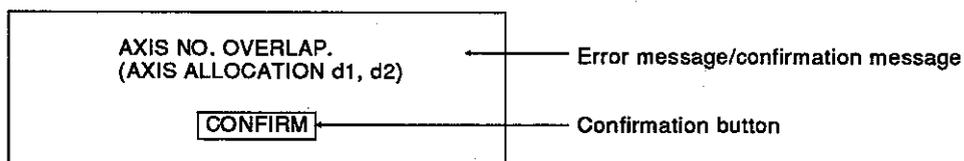
Confirmation dialog is used for the following operations:

- Display of the error message when an error which disables continuation occurs
- Display of the message that confirms processing has been executed

When an error message is displayed, check the error description, and take corrective action.

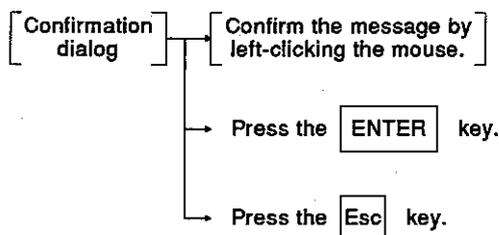
When a confirmation message is displayed, confirm that processing has been executed.

[Confirmation dialog]



[Key/mouse operation explanation]

- Confirmation of an error message

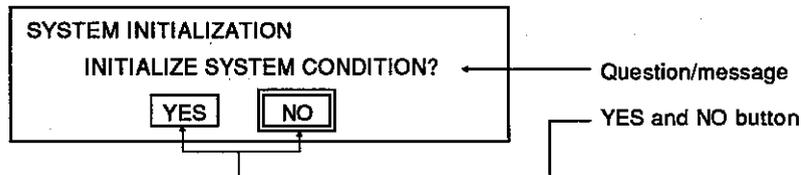


6.4.6 Alternative dialog

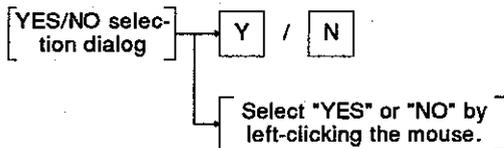
Alternative dialog is used to select YES/NO for a question, message, and setting contents.

There are 2 kinds of dialog boxes. The selectable questions/messages/setting contents and YES/NO and OK/CANCEL are displayed on each dialog box. Select "YES/OK" or "NO/CANCEL" by using the mouse or an arrow key for the question/message/setting contents.

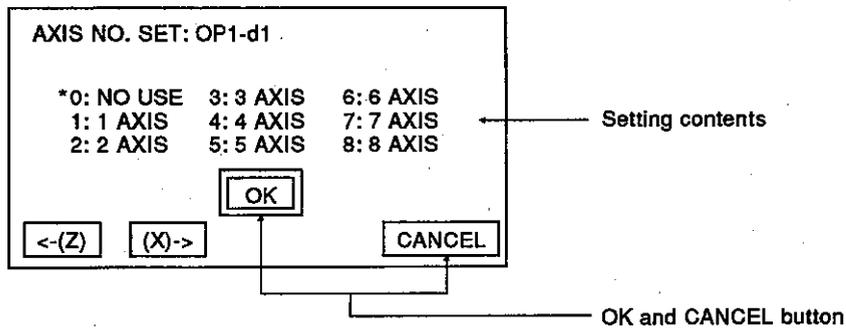
[YES/NO selection dialog]



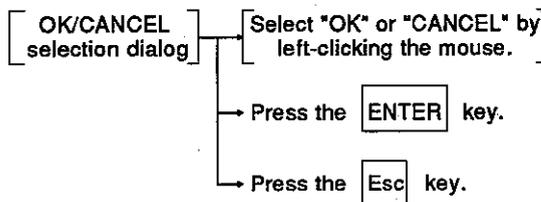
[Key/mouse operation explanation]



[OK/CANCEL selection dialog]



[Key/mouse operation explanation]

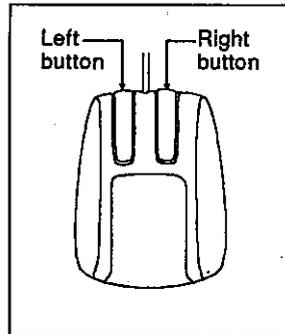


6.5 Basic Mouse Operations

This section explains how to operate the mouse used with the GSV[][]PE and its functions.

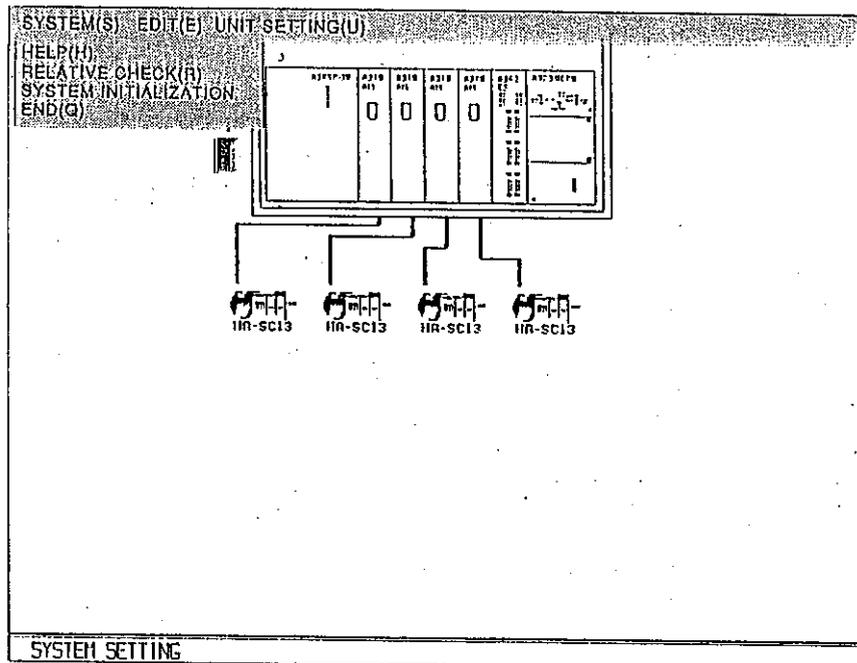
(1) Appearance of the mouse and the mouse cursor

[Appearance of the mouse]



The mouse has a left button and a right button as shown on the left.

[Mouse cursor]



The mouse cursor is used to select and set functions and items. The mouse cursor is displayed in the system setting mode.

(2) Operation of the mouse and its functions

(a) Pressing the buttons (ON)

Pressing the right button is called right-pressing.

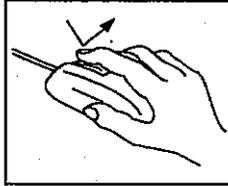
- When a system is in the input wait state, the menu bar is displayed by right-pressing.

(b) Button release (OFF)

This is the operation of lifting a fingertip from a pressed left/right button. The operation of lifting a fingertip from the left-clicking state is called the left release, and the operation of lifting a fingertip from the right-clicking state is called the right release.

- A selected item can be moved to a different position by using a drag and left release operation.
- A selected menu item determined by selecting by the right release at the position of an item selected by dragging (See this section (e)) across the displayed pull down menu.

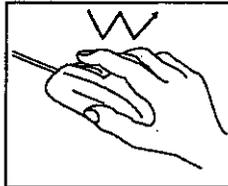
(c) Clicking



This is the operation of immediately pressing and releasing a left button. Operation of the left button is called left-clicking.

- A function is selected and executed by left-clicking after moving the mouse cursor to the item to be selected.

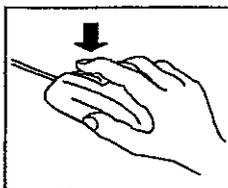
(d) Double-clicking



This is the operation of quickly left-clicking twice. Operation of the left button is called left double-clicking.

- Each dialog can be displayed by left double-clicking after moving the mouse cursor to the area which the unit in which unit data setting is done.

(e) Drag



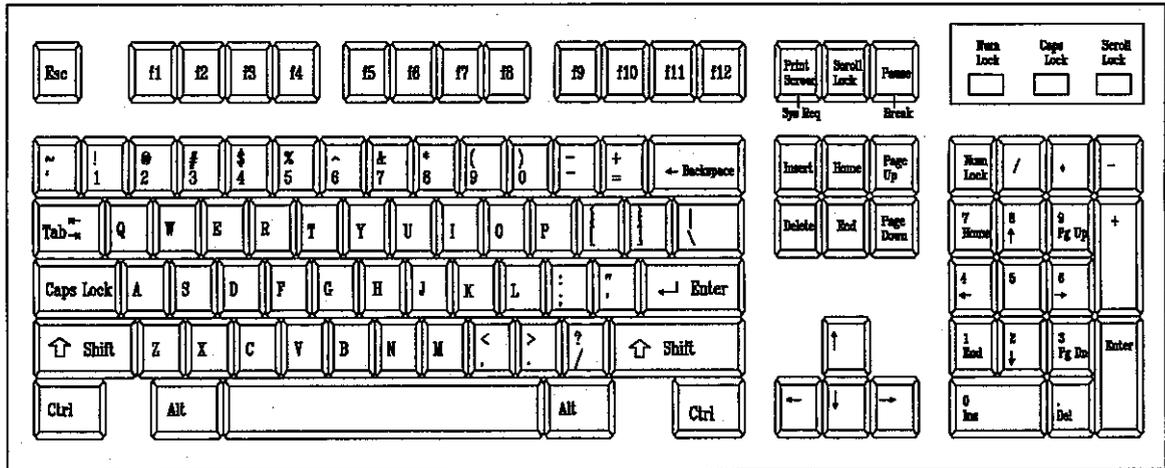
This is the operation to move the mouse to the destination position in the left/right press state. Operation of the left button is called the left drag, and operation of the right button is called the right drag.

- To move a selected item, left drag it and left release at the target position.
- An item can be selected from a menu bar which is displayed by the right press by a right drag and right release at the selected item position.

6. GSV[][]PE COMMON ITEMS

6.6 Keyboard Explanation

This section explains the IBM standard keyboard to be used for the GSV[][]PE and the use of various keys.



6.6.1 Common keys

The following chart explains the common keys used for the GSV[][]PE.

(1) Key use

Key Names		Use
Keys conforming to JIS	Esc	Closes a window, and interrupts execution.
	Tab	Displays the HELP menu.
	Ctrl	This key is used together with an alphanumeric character key. (See item (2))
	Shift	This key is used together with a function key.
	Caps Lock	Switches letters from upper case to lower case and vice versa.
	Alt	This key is used together with the [F11] key. (See item (2))
	Back Space	Deletes the character just left of the cursor. Executes an emergency stop of all axes in the test mode.
Special keys	Enter	Determines inputs and selections.
	Page Up	Displays the previous page (ladder, list, HELP, SFC diagram, etc). Switches axes (for servo monitoring, servo test, etc). (-1)
	Page Down	Displays the next page (ladder, list, HELP, SFC diagram, etc). Switches axis numbers (servo monitoring, servo test, etc). (+1)
	Insert	Inserts a space where the cursor is.
	Delete	Deletes the character where the cursor is.
	Home	Moves the cursor to the home position.
	End	Ends the setting, and closes a window.
	Arrow Keys	Moves the character cursor.
Function keys	Print Screen	Copies a screen.
	Num Lock	The Ten-key part is used only for numeric keys.
	F11	Displays the menu selection window.
	F12	Displays the help window.

6. GSV[][]PE COMMON ITEMS

Motion Contoroller

(2) Control key and alternate key specifications

Keys Pushed	Operation
Ctrl + E	Moves the cursor up. (Same function as the [↑] key)
+ X	Moves the cursor down. (Same function as the [↓] key)
+ D	Moves the cursor to the right. (Same function as the [→] key)
+ S	Moves the cursor to the left. (Same function as the [←] key)
+ F	Moves the cursor 1 word to the right. Moves the cursor to the right end in the case of a ladder.
+ A	Moves the cursor 1 word to the left. Moves the cursor to the left end in the case of a ladder.
+ R	Displays the previous page. (Same function as the [Page Up] key)
+ C	Displays the next page. (Same function as the [Page Down] key)
+ G	Deletes the character where the cursor is. (Same function as the [Delete] key)
+ Y	Deletes 1 line of keyed-in data.
+ H	Deletes the character just left of the cursor.
+ F1	Saves positioning data and servo program files.
+ F11	Switches between the servo programming mode and the circuit editing mode. Switches between the servo programming mode and the SFC program editing mode. Switches from the circuit monitoring mode to the servo programming mode. Switches from the SFC monitoring mode to the servo programming mode. Switches from the servo monitoring mode to the PC test. Switches from the servo PC mode to the PC test. Switches between the servo test and the PC test.
Alt + F11	Switches between the servo monitoring mode and the circuit monitoring mode. Switches between the servo PC mode and the circuit monitoring mode. Switches between the servo monitoring mode and the SFC monitoring mode. Switches between the servo PC mode and the SFC monitoring mode. Switches from the servo test to the circuit monitoring mode.

POINTS

(1) Key operations in this manual are as follows:

- Procedures

[A] + [B] Press the [B] key while pressing the [A] key.

[A] → [B] Press the [B] key after pressing the [A] key.

- Key operation explanation

[A] + [B] Press the [B] key while pressing the [A] key.

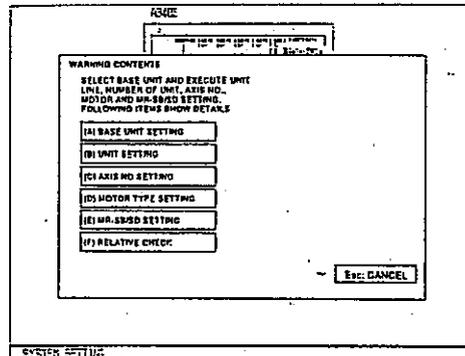
[A] → [B] Press the [B] key after pressing the [A] key.

(2) If the [Ctrl] + [F1] keys are pressed, the "WRITE TO FILE? YES/NO" dialog box appears.

Set data is written to the current system name file by selecting "YES".

File writing is stopped by selecting "NO", and the YES/NO selection dialog box is closed.

- (4) Guidance HELP window in the system setting mode
 This section explains the HELP window in the system setting mode. The HELP window in the system setting mode contains the HELP table of contents window and the HELP window.
 Select "HELP" from a menu bar by left-clicking.
- HELP table of contents window
 The HELP table of contents window example is shown below.



[Key operations explanation]

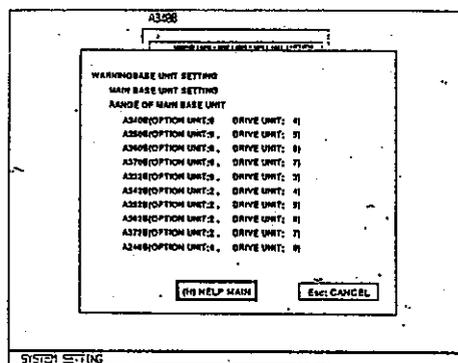
Selection of a HELP display item:

Select a HELP display item by left-clicking the mouse, or pressing the corresponding [A] to [F] key. The HELP window is displayed.

Exiting the HELP table of contents display:

Select "CANCEL" by left-clicking the mouse to exit the HELP table of contents display, or press the [Esc] key.

- HELP window
 A HELP window example is shown below.



[Key operations explanation]

Page switching:

To display the previous page, select "<(Z)" by left-clicking the mouse, or press the [Z] key. To display the next page, select "(X)>" by left-clicking the mouse, or press the [X] key.

Displaying the HELP table of contents:

To display the HELP table of contents, select "(H) HELP MAIN" by left-clicking the mouse, or press the [H] key.

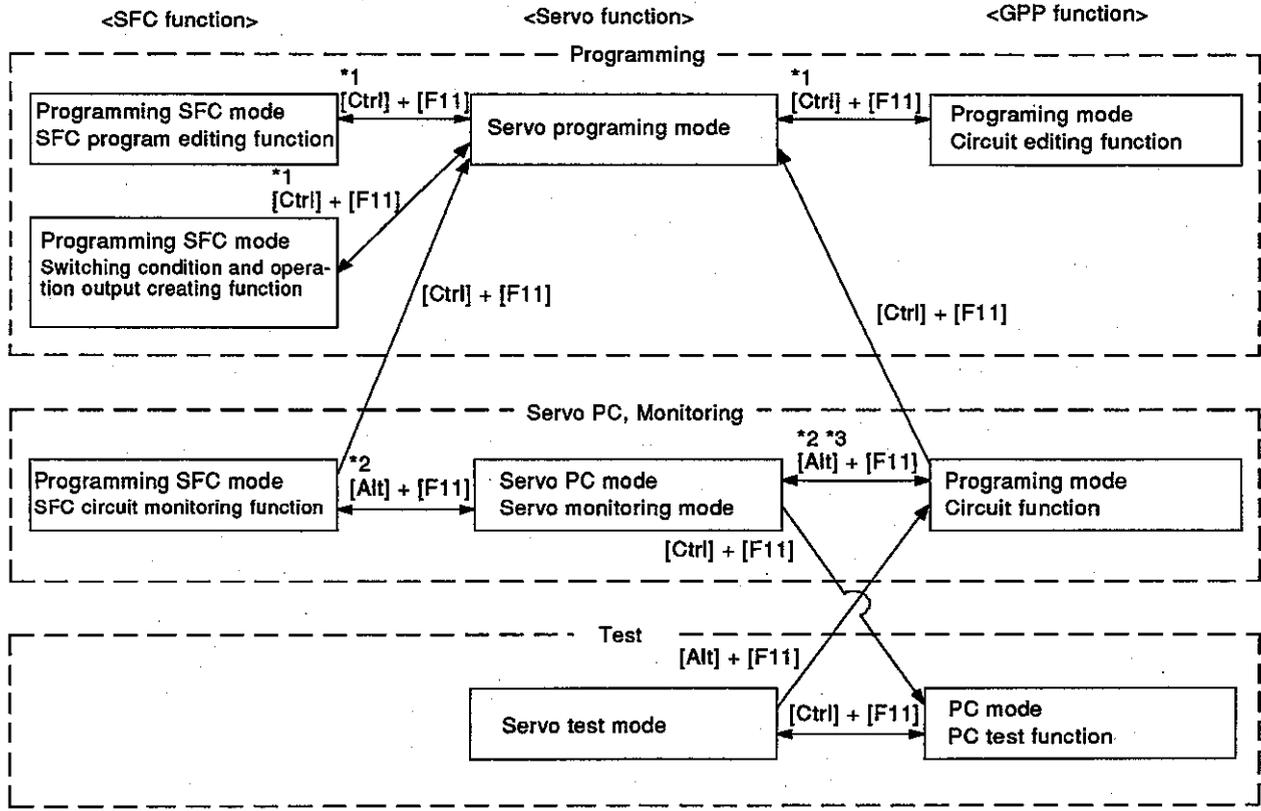
Exiting the HELP display:

To exit the HELP display, select "CANCEL" by left-clicking the mouse, or press the [Esc] key.

6. GSV[][]PE COMMON ITEMS

6.8 Switching between the Servo Function and the GPP/SFC Function

In the GSV[][]P, the on-going servo function can be switched to the GPP/SFC function, and vice versa.
 Use the following keys to make switching between the servo function and the GPP/SFC function:



- *1. When the [Ctrl] + [F11] keys are pressed in the servo programming mode without displaying the SFC or circuit related mode at all, the mode switches to the circuit editing function.
- *2. When the [Alt] + [F11] keys are pressed in the servo monitoring mode or the servo PC mode without displaying the SFC circuit monitoring or circuit monitoring mode at all, the mode switches to the circuit monitoring function.
- *3. It is not possible to switch from the circuit monitoring function to the servo PC mode.

7. STARTING UP AND ENDING THE GSV[][]PE

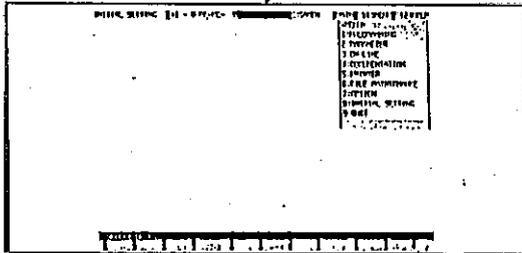
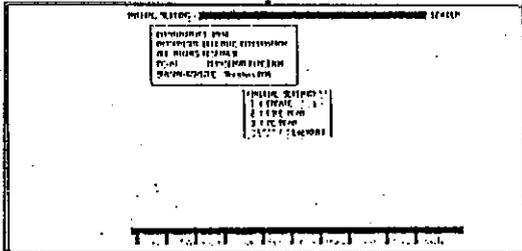
7. STARTING UP AND ENDING THE GSV[][]PE

7.1 How to Start-Up

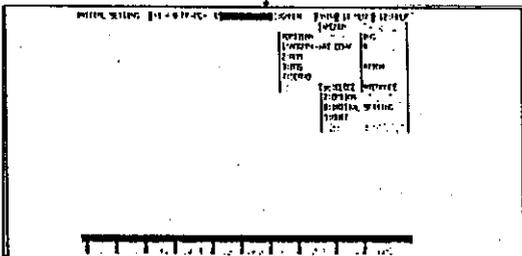
The section explains how to display the GPP functions initial screen after starting up the GSV[][]PE registered in an IBM PC.



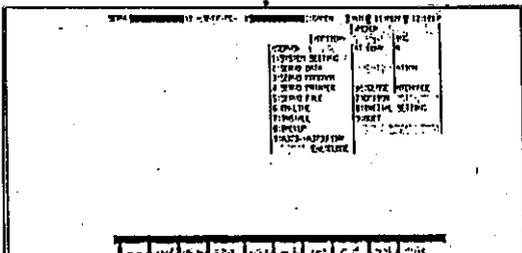
[G] [S] [V] [1] [3] [P] [Enter]



[7]



[4]



- 1 Set the IBM PC status to ON (DOS command wait state).
- 2 Input "GSV13P" next to "C", and then press the [Enter] key.
- 3 The GSV[][]PE is now started up and the GPP functions initial screen is displayed. Do the initial setting. (The SW2IVD- GPPA Operating Manual gives details about initial settings.)
- 4 The menu selection window is displayed. Select "7:Option".
- 5 The optional function selection window is displayed. Select "4:Servo". The servo function is started.
- 6 The servo function selection window is displayed.

8. SYSTEM SETTING

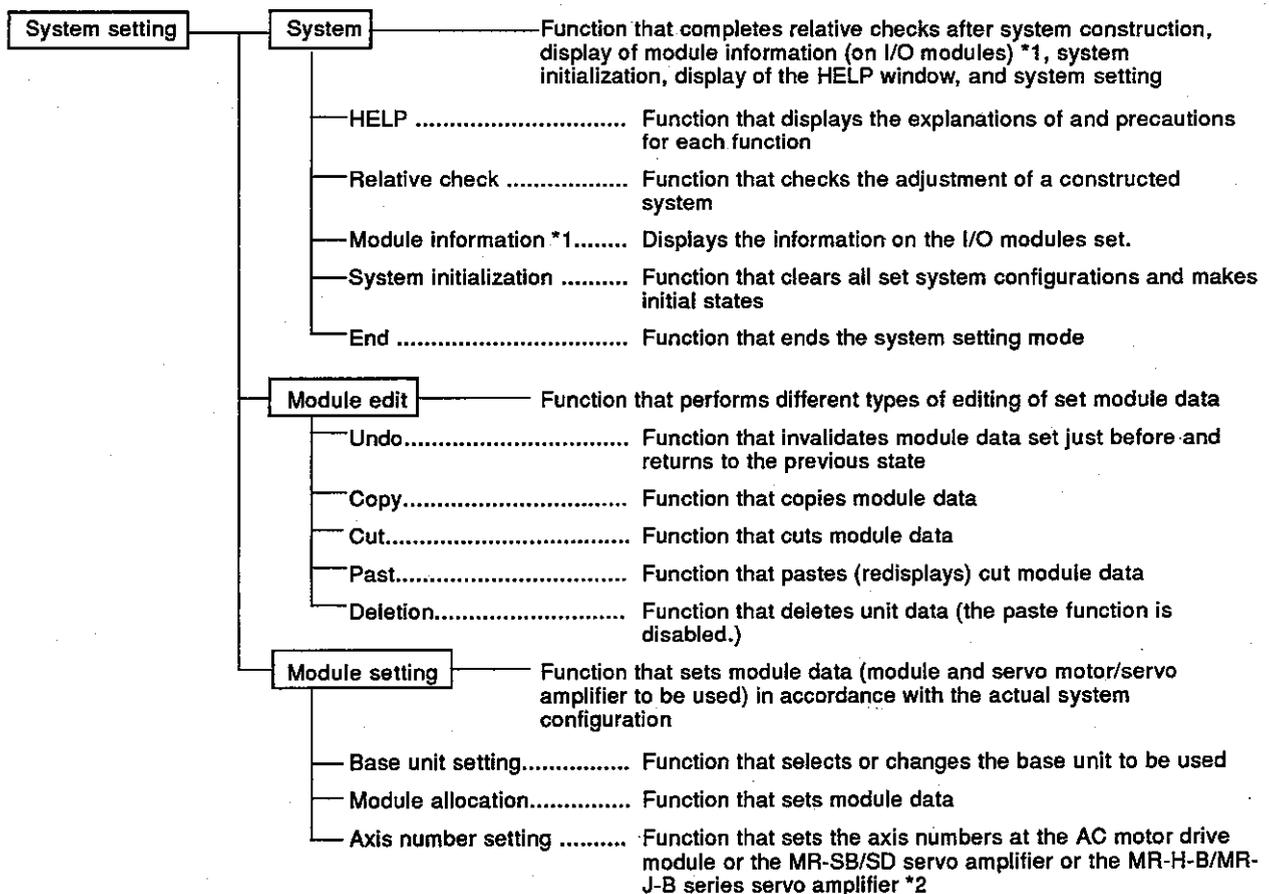
Select a base unit in accordance with the actual system configuration, allocate each module, and set the program's axis number, servo motor and servo amplifier.

And then, check to make sure the system configuration which has been set is correct.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

8.1 General Description of Functions

The system setting mode of the GSV[][]PE contains the following functions:



*1: Function that can be selected only when an A273UCPU is used.

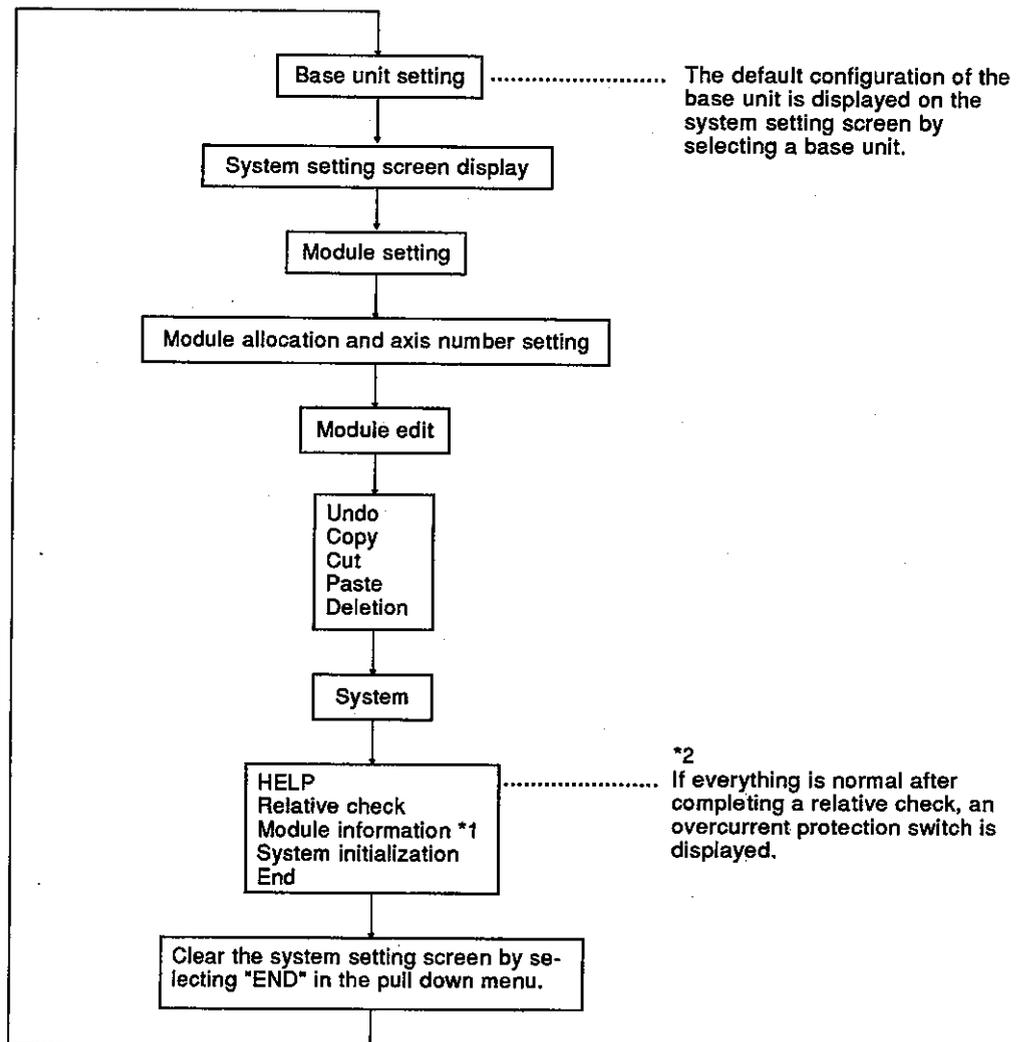
*2: Servo amplifiers that can be selected only when an A273UCPU is used.

8. SYSTEM SETTING

Motion Controller

8.2 Overall Procedure

This section shows the overall procedure of the system setting mode.



*1: Function that can be selected only when an A273UCPU is used.

*2: Only displayed when an A373/A373UCPU is used.

9. SETTING OF POSITIONING DATA

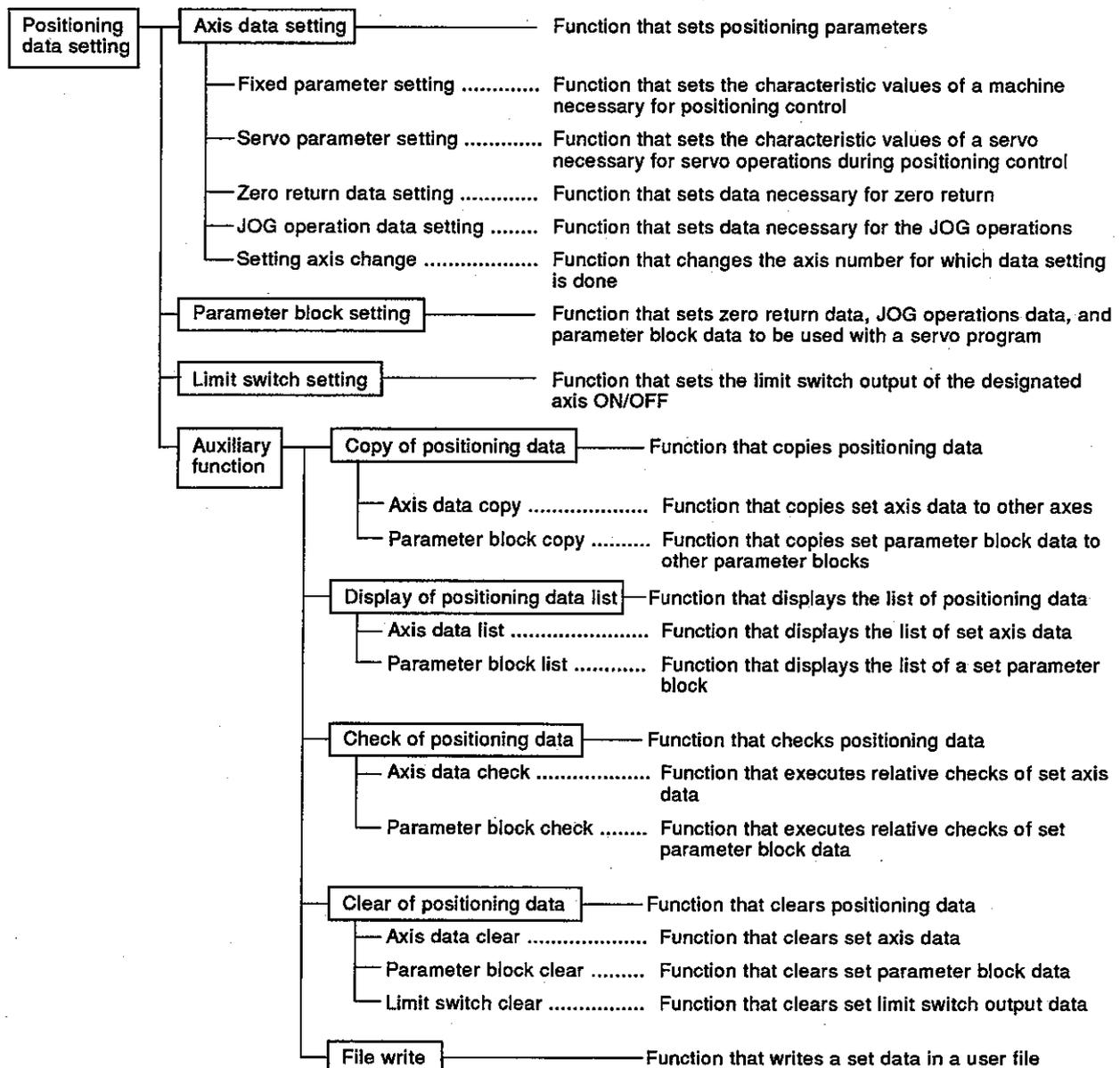
9. SETTING OF POSITIONING DATA

The servo data setting mode is used to set positioning data.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

9.1 General Description of Functions

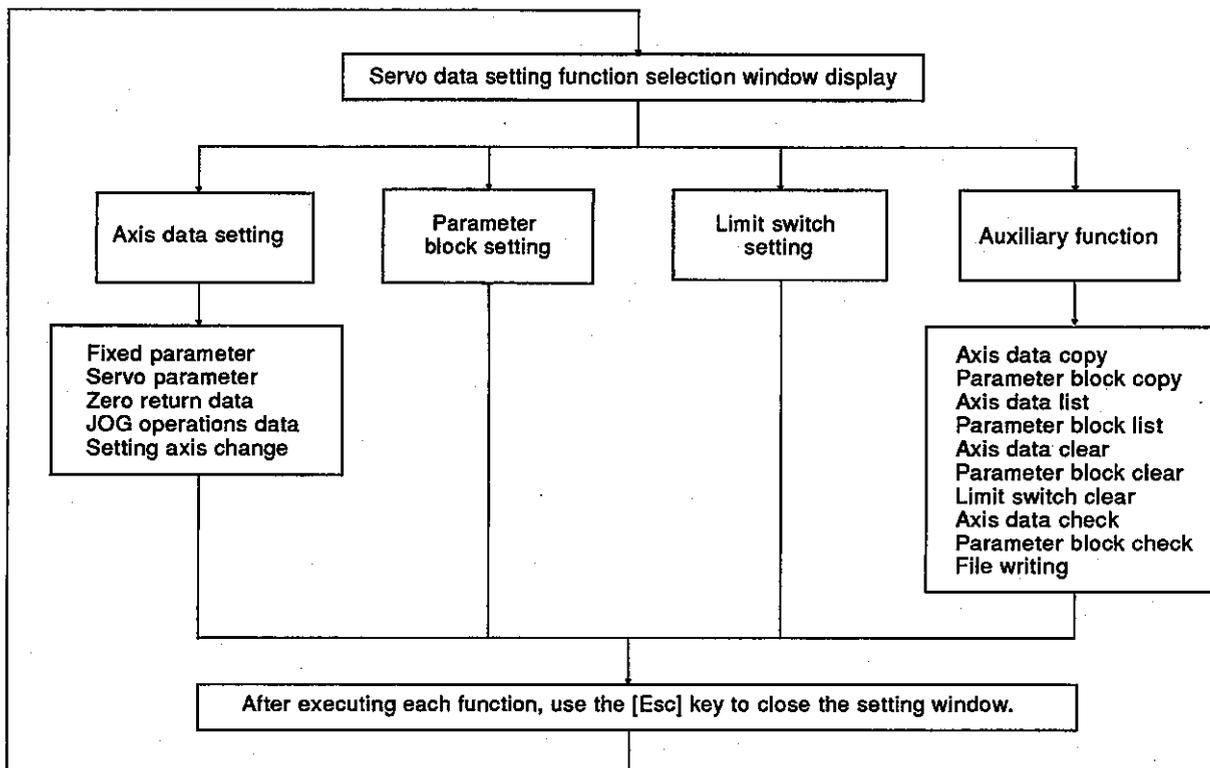
The servo data setting mode of GSV[][]PE contains the following functions:



9. SETTING OF POSITIONING DATA

9.2 Overall Procedure

This section shows the overall procedure for positioning data setting.



POINTS

- (1) When selecting each function from the servo data setting function selection window, if the system setting has not been set, the "SYSTEM NOT SET" error message will be displayed. Select the servo data setting function after completing the system setting.
- (2) When executing the system setting, if axis setting is attempted to an axis which has been set to "unused axis", the "UNUSED AXIS" error message will be displayed.

10. CREATING AND MODIFYING SERVO PROGRAMS

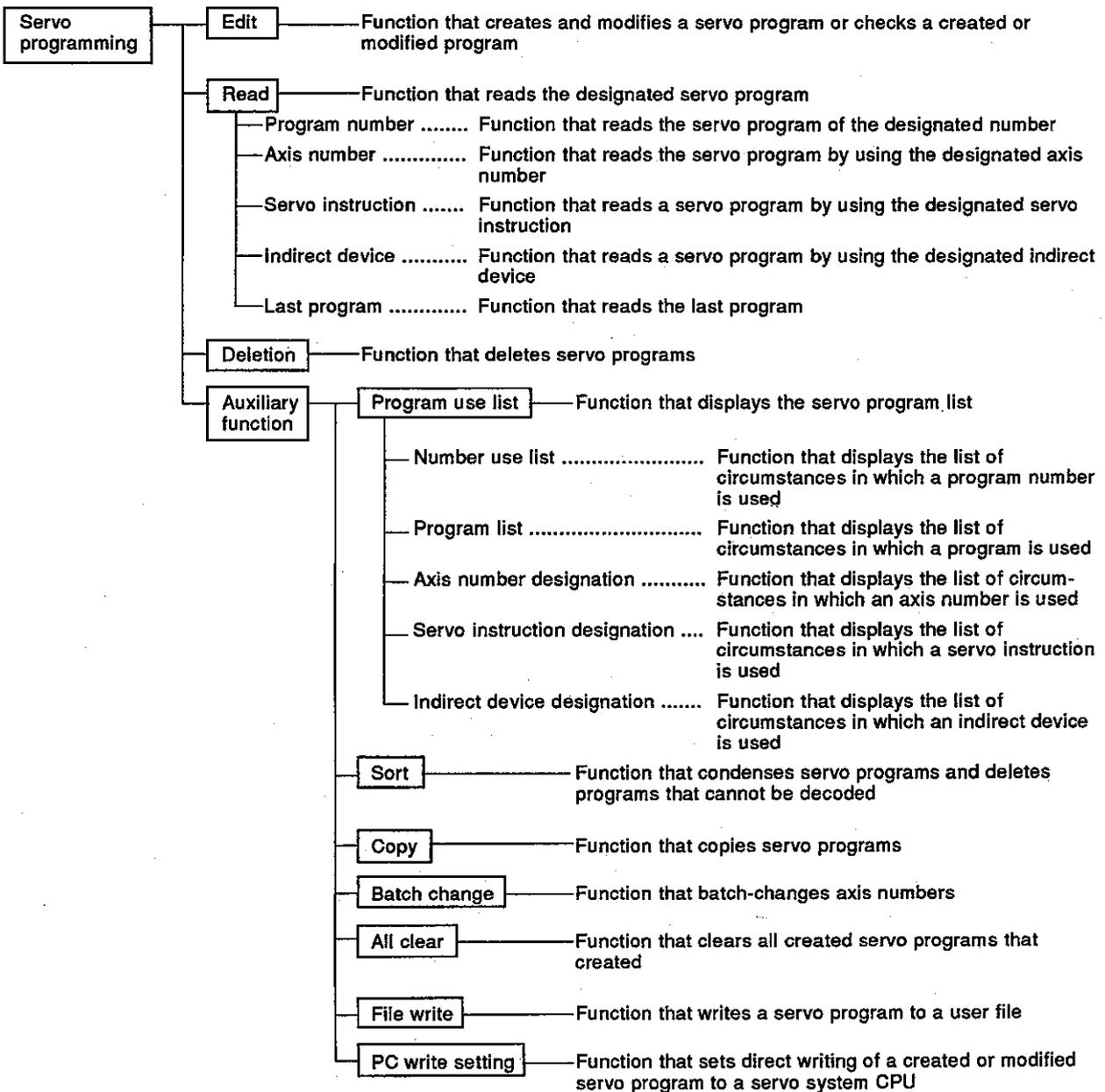
10. CREATING AND MODIFYING SERVO PROGRAMS

The programming mode is used to set the positioning method, positioning speed, etc. and to create servo programs.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

10.1 General Description of Functions

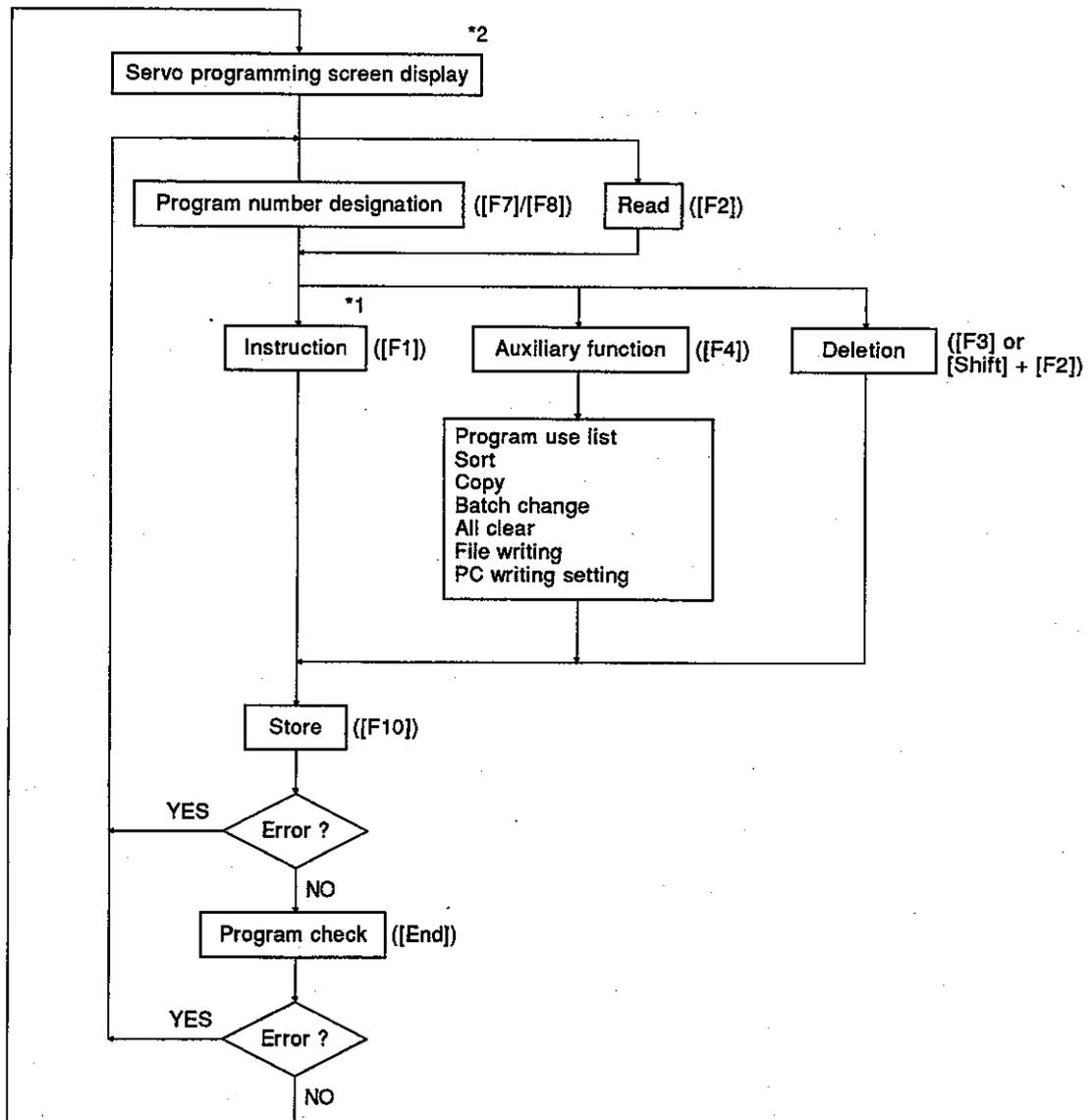
The programming mode of the GSV[][]PE contains the following functions:



10. CREATING AND MODIFYING SERVO PROGRAMS

10.2 Overall Procedure

This section shows the overall procedure for the servo programming mode.



*1: Select an instruction segment and a servo instruction in the instruction selection window, and edit the servo program.

*2: To switch to the ladder mode of the GPP function, press the [F11] key after pressing the [Ctrl] key.

10. CREATING AND MODIFYING SERVO PROGRAMS

Motion Controller

10.3 Servo Instruction Selection Display

The position of the inversion part of an instruction segment area changes a servo instruction area.

The servo instruction area displays in each segment are shown below.

1) Positioning	
1: ABS-1	9: INC-1
2: ABS-2	A: INC-2
3: ABS-3	B: INC-3
4: ABS-4	C: INC-4

2) Positioning circular-arc interpolation			
1: ABS		8: INC	
2: ABS		9: INC	
3: ABS		A: INC	
4: ABS		B: INC	
5: ABS		C: INC	
6: ABS		D: INC	
7: ABS		E: INC	

3) Fixed-rate transmission	
1: FEED-1	
2: FEED-2	
3: FEED-3	

4) Velocity control	
1: VF	
2: VR	
3: VVF	
4: VVR	

5) Velocity/position control	
1: VPF	
2: VPR	
3: VPSTART	

6) Velocity switching control	
(Start)	(Point)
1: VSTART	8: VABS
(End point)	9: VINC
2: ABS-1	(END)
3: ABS-2	A: VEND
4: ABS-3	(Repeat)
5: INC-1	B: FOR-ON
6: INC-2	C: FOR-OFF
7: INC-3	D: FOR-TIMES
	E: NEXT

7) Constant velocity control			
(Start)	(Point)		
1: CPSTART1	E: ABS	—	M: INC
2: CPSTART2	F: ABS		N: INC
3: CPSTART3	G: ABS		O: INC
4: CPSTART4	H: ABS		P: INC
(End)	I: ABS		Q: INC
9: CPEND	J: ABS		R: INC
(Repeat)	K: ABS		S: INC
A: FOR-ON	L: ABS		T: INC
B: FOR-OFF			
C: FOR-TIMES			
D: NEXT			

8) Position follow-up control	
1: PFSTART	

9) Zero return	
1: ZERO	

10) Simultaneous start	
1: START	

11. GPP FUNCTIONS AND SFC FUNCTIONS

11. GPP FUNCTIONS AND SFC FUNCTIONS

The GSV[][]PE has GPP functions and SFC functions. For details of the GPP functions, refer to the SW2IVD-GPPA Type GPP Function Software Package Operating Manual.

For details of the SFC functions, refer to the SW2IVD-SAP2 (MELSAP-II) Type Function Software Package Operating Manual.

11.1 GPP Functions

11.1.1 Differences between the GSV[][]PE GPP functions and the SW1IX-GPPAE type GPP function software package

(1) Editing function and monitoring function

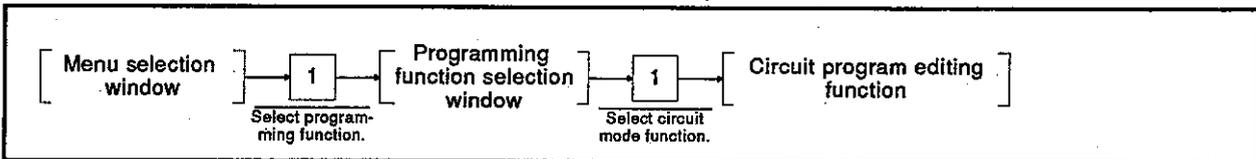
In the programming mode of the GPP function, the following servo instruction editing and circuit monitoring can be executed:

- DSFRP instruction
...Instruction to request start-up of servo programs for axes No.1 to No.3.
- DSFLP instruction
...Instruction to change the current value or velocity.
- SVST instruction
...Instruction to request start-up of servo programs for axes No.1 to No.8.

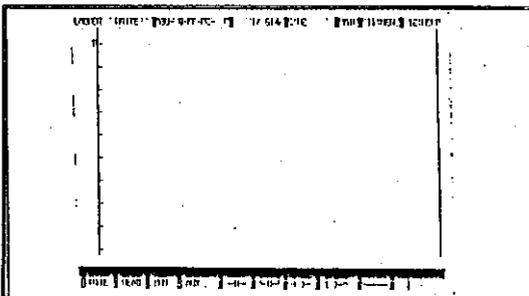
These instructions serve as the program language for circuit and list programs.

The following shows how to write an SVST instruction to a circuit program.

[Procedure for displaying the circuit program editing screen]



[Circuit program editing screen]



11. GPP FUNCTIONS AND SFC FUNCTIONS

Motion Controller

[Key operations explanation]

Writing servo instruction

- 1) Enter an SVST instruction execution command (condition part), and press the return key.
- 2) Enter the instruction part, and press the return key.
Enter the instruction part as follows:
[F8](C)→[S]→[V]→[S]→[T]→[SP]→
[axis No. to start]→[SP]→[servo program No.]

Enter all axis numbers to start up (up to four numbers can be set). The servo program number can be set by direct or indirect designation.

By ending the writing of the instruction part (pressing the return key), the circuit as shown in the following example will be displayed.

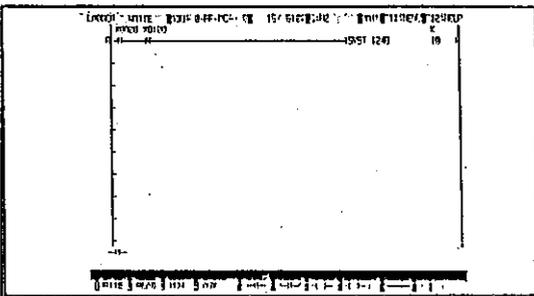
Setting example) When starting up axes No.1, No.2, and No.4 by servo program No.10 (Designate the servo program number directly.)



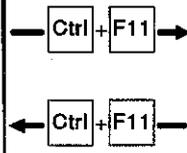
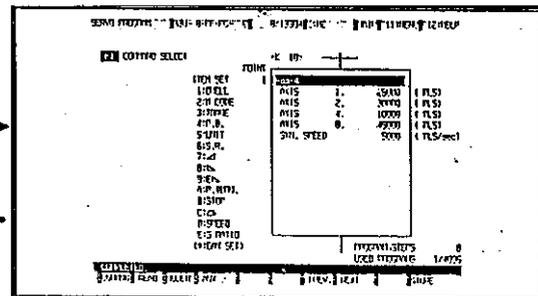
Conversion

- 1) After writing the circuit program, be sure to perform conversion. Press the [Shift]+[F4] keys. When the conversion is made properly, "COMPLETED, STEP NO. CHANGED." will be displayed.

[Circuit program editing screen]



[Servo programming screen]



Switching to the servo programming function

- 1) To refer or edit to a servo program, which starts up by a servo instruction, during circuit program editing, the circuit program function can be switched to the servo programming function by one key operation. (It is, however, impossible during list program editing.)
Move the cursor to the circuit block in which the start-up instruction for the servo program to be referred to or edited is set.
- 2) Holding down the [Ctrl] key, press the [F11] key.
The servo programming function is now available.
When a servo program, which starts up by a servo instruction, is directly designated the designated servo program will appear.
When a servo program, which starts up by a servo instruction, is indirectly designated, servo program No.0 will appear.
- 3) To switch to the circuit program editing function from the servo programming function, press the [F11] key with the [Ctrl] key held down.
The circuit program editing screen will reappear, on which the circuit program shown before switching to the servo programming function will be again displayed.

(2) Printing function

The following servo instructions can be printed out in the printer mode of the GPP function.

- DSFRP instruction
...Instruction to request start-up of servo programs for axes No.1 to No.3.
- DSFLP instruction
...Instruction to change the current value or velocity.
- SVST instruction
...Instruction to request start-up of servo programs for axes No.1 to No.8.

11. GPP FUNCTIONS AND SFC FUNCTIONS

11.2 SFC Functions

When using an A373U/A273UCPU, the system can be controlled by setting servo program start-up conditions using an SFC program.

11.2.1 GSV[][]PE SFC functions

The list below shows the GSV[][]PE SFC functions.

Mode with Additional Functions	Description
SFC program editing function	The servo program start-up symbol [SV] can be edited.
	Sequence programs using DSFRP, DSFLP, and SVST instructions can be edited.
	Interlock conditions can automatically be inserted/deleted while DSFRP, DSFLP, and SVST instructions are edited.
	Switching between the SFC program editing function and the servo programming function can be made during operation output or editing a circuit with switching conditions set.
SFC monitoring function	DSFRP, DSFLP, and SVST instructions can be monitored.
	The servo program in operation can be referred to while an SFC diagram is monitored.
SFC printing function	The servo program start-up symbol [SV] can be printed out.
	DSFRP, DSFLP, and SVST instructions can be printed out.

11. GPP FUNCTIONS AND SFC FUNCTIONS

11.2.2 SFC diagram symbols dedicated to servo programs

The following SFC diagram symbol can be used as the step symbol:

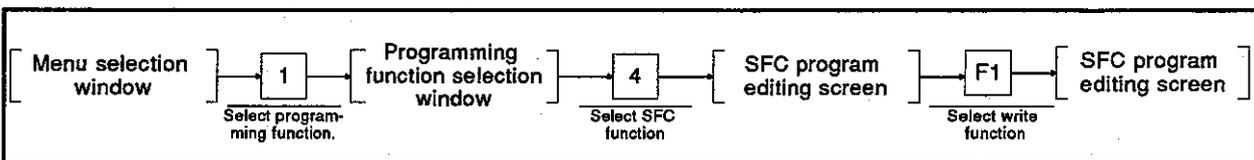
(1) Symbol dedicated to servo programs

Classification	Name	Symbol	Number of Symbols	Assignment Function Key	Application
Step	Servo program start-up step	SV i	Up to 254 (i = 1 to 254) in each block, including other steps	F9	Inserting a sequence program for servo program start-up SVST instructions

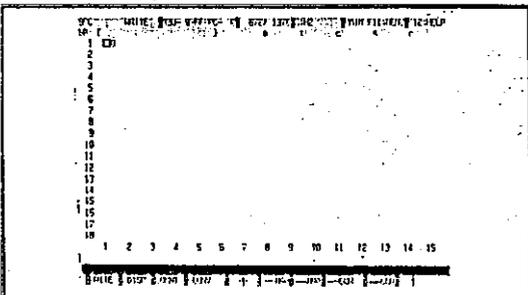
(2) Creating a servo program start-up sequence program on the SFC program editing function

Create a servo program start-up sequence program on the SFC program editing screen as follows:

[Procedure for writing a servo program start-up step]



[SFC program editing screen]



[Display/setting contents explanation]

Make sure that the SFC program editing screen displays the SFC program to which a servo program start-up step will be written. Or, create a new SFC program.

[Key operations explanation]

Writing a servo program start-up step

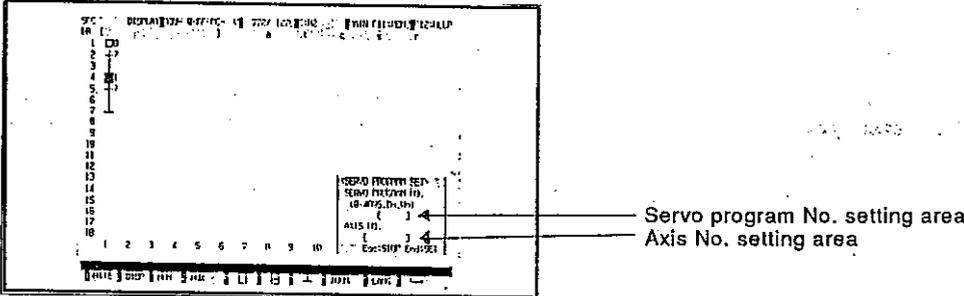
- 1) Before writing servo program start-up steps, make sure that the write function is selected. If not, press the [F1] key to switch the on-going function to the write function.
- 2) Move the cursor to the position where a servo program start-up step will be written.
- 3) Press the [F9] key. The servo program start-up step symbol "SV" will appear (a servo program start-up sequence program is not created), and a step number will be displayed next to it.

Conversion

- 1) After writing a step, be sure to perform conversion. When the [F4] key is pressed and conversion is made properly, the block information setting window will be displayed.

11. GPP FUNCTIONS AND SFC FUNCTIONS

[Servo program selection window]



[Display/setting contents explanation]

- Servo program No. setting area** The servo program number, which will start up by the designated servo program start-up step, is displayed.
- Axis No. setting area** The axis number, which will start up by the designated servo program start-up step, is displayed.

[Key operations explanation]

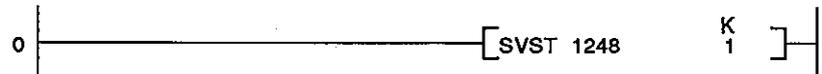
Creating a servo program start-up sequence program (servo program No./axis No. setting)

- 1) When creating a servo program start-up sequence program by the use of the servo program start-up step written, make sure that the display function is selected.
If the write function is still displayed, press the [F2] key to switch it to the display function.
- 2) Move the cursor to the servo program start-up step symbol [SV] to which the servo program No./axis No. to start up will be designated.
- 3) Press the [F8] key to display the servo program selection window. The cursor will appear in the servo program No. setting area.
- 4) Enter the servo program number to start up, and press the return key. (Number setting range: 0 to 4095, indirect servo program number designation possible, too.)
The cursor will move to the axis No. setting area.
- 5) Enter the axis number to start up. (Number setting range: 1 to 8)
Setting example) To start axes No.1, No.2, No.4, and No.8, enter as follows:

AXIS NO.
[1248]

Completing setting

- 1) To close the servo program selection window after setting the data for the servo program No./axis No., press the [End] key. Base on the set servo program No./axis No., a servo instruction will automatically be created, and the SFC program editing screen will reappear.
Creating example) When the setting for servo program No.: 1 and for the axis No.: 1, 2, 4, 8, the following sequence program will be created:



The designated "[SV]" will change to "[SV]".

- 2) To check the set data, press the [F8] key. The automatically created sequence program will be displayed on the screen.
- 3) If the message "INCORRECT DATA." is displayed, the servo program number is out of the setting range. Reset it.

11. GPP FUNCTIONS AND SFC FUNCTIONS

Motion Controller

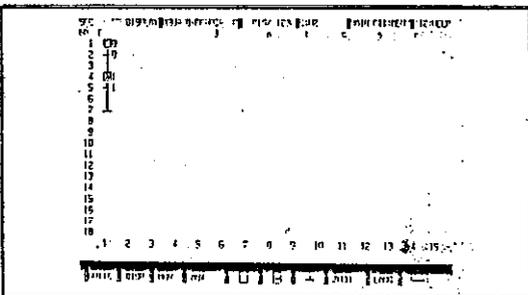
Discontinuing setting

- 1) To close the servo program selection window without setting the data for servo program No./axis No., press the [Esc] key.
A servo program start-up sequence program will not be created, and the SFC program editing screen will reappear.

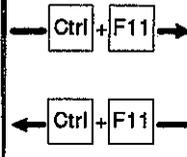
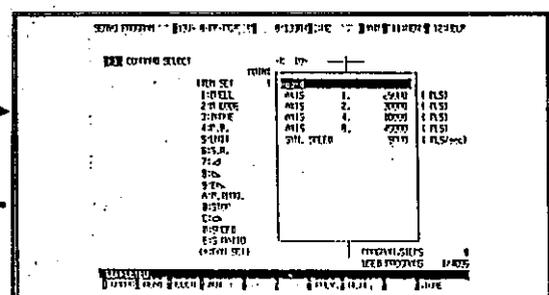
Modifying a servo program start-up sequence program

- 1) Before modifying a created servo program start-up sequence program, make sure that the display function is selected on the SFC program editing screen.
If the write function is still displayed, press the [F2] key to switch it to the display function.
- 2) Move the cursor to the servo program start-up step to be modified, and press the [F8] key.
The sequence program editing screen will be displayed.
- 3) Press the [F1] key to switch to the write function, modify the axis number or servo program to start up, and press the return key.
Enter new data as follows:
[F8] (←)→[S]→[V]→[S]→[T]→[SP]→
[axis No. to start up]→[SP]→[servo program No.]
- 4) Holding down the [Shift] key, press the [F4] key to perform conversion.
When the conversion is properly made, "COMPLETED." will be displayed.
- 5) To end modification, press the [F4] key.
The screen will return to the SFC program editing screen.

[SFC program editing screen]



[Servo programming screen]



Switching to the servo programming function

- 1) To refer to or edit a servo program which starts up by a servo instruction, the on-going function can be switched to the servo programming function by one key operation.
Before switching to the servo programming function, make sure that the display function is selected.
If another function is selected, press the [F2] key to switch it to the display function.
- 2) Move the cursor from the start-up instruction for the servo program to be referred to or edited to the servo program start-up step symbol.
- 3) Holding down the [Ctrl] key, press the [F11] key.
The servo programming function is now available, and the servo program designated by the servo instruction is displayed.
Refer to or edit the servo program.
- 4) For switching from the servo programming function to the SFC program editing function, press the [F11] key with the [Ctrl] key held down.
The SFC program editing screen displayed before switching to the servo programming function will reappear.

11. GPP FUNCTIONS AND SFC FUNCTIONS

Motion Controller

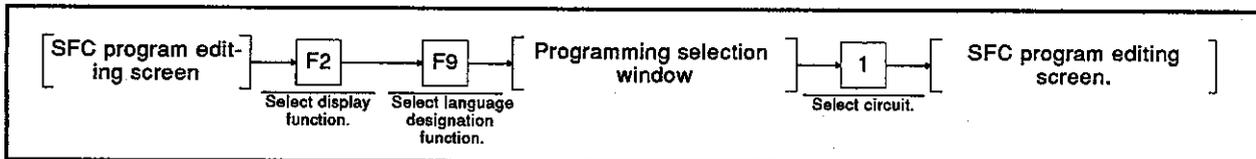
11.2.3 Servo instructions when creating a switching condition or operation output program

When creating a switching condition or operation output program, the following servo instructions can be edited at each SFC program step:

- DSFRP instruction
...Instruction to request start-up of servo programs for axes No.1 to No.3.
- DSFLP instruction
...Instruction to change the current value or velocity.
- SVST instruction
...Instruction to request start-up of servo programs for axes No.1 to No.4.

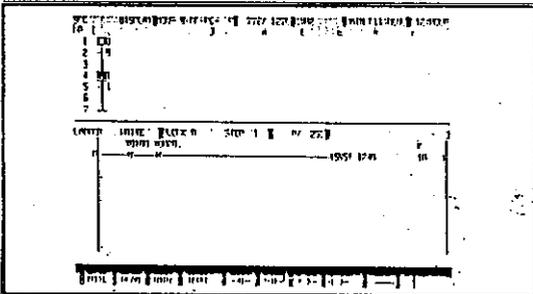
The following shows how to write an SVST instruction to a circuit program.

[Procedure for selecting a circuit program]



* The circuit program is designated as the default programming language without following the procedure above.

[Sequence program editing screen]



[Display/setting contents explanation]

Make sure that the SFC program editing screen displays the SFC program to which a servo instruction will be written. Or, create a new SFC program.

[Key operations explanation]

Designating a servo instruction write step

- 1) Before writing a servo instruction, make sure that the display function is selected.
If not, press the [F2] key to switch the on-going function to the display function.
- 2) Move the cursor to the step to which a servo instruction will be written.
- 3) Press the [F8] key to display the sequence program editing screen.

11. GPP FUNCTIONS AND SFC FUNCTIONS

Motion Controller

Writing a servo instruction

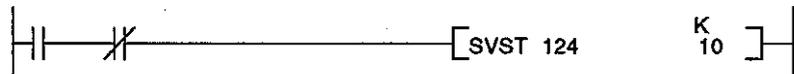
- 1) Enter an SVST instruction execution command (condition part), and press the return key.
- 2) Enter the instruction part, and press the return key.
Enter the instruction part as follows:
[F8] (←) → [S] → [V] → [S] → [T] → [SP] →
[axis No. to start up] → [SP] → [servo program No.]

Enter all axis numbers to start up (up to four numbers can be set).

The servo program number can be set by direct or indirect designation.

By ending the writing of the instruction part (pressing the return key), the circuit as shown in the following example will be displayed:

Setting example) When starting up axes No.1, No.2, and No.4 by servo program No.10
(Designate the servo program number directly.)



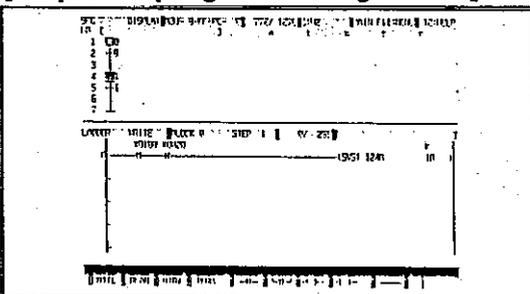
Conversion

- 1) After writing the circuit program, be sure to perform conversion. When the [Shift] + [F4] keys are pressed and the conversion is properly made, "COMPLETED." will be displayed.

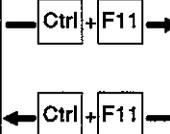
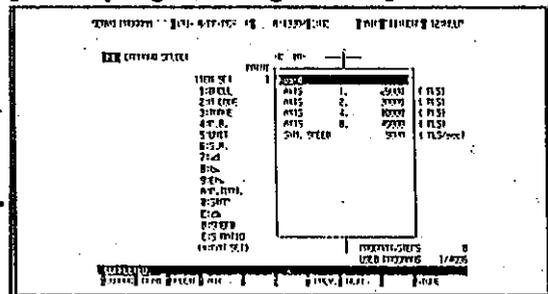
Ending creation of a sequence program

- 1) To end the creation of a sequence program at a designated step, press the [F4] key. The SFC program editing screen will reappear.

[Sequence program editing screen]



[Servo programming screen]



Switching to the servo programming function

- 1) To refer to or edit a servo program, which starts up by a servo instruction, during circuit program editing, the circuit program editing function can be switched to the servo programming function by one key operation. (It is, however, impossible during list program editing.)
Move the cursor to the circuit block in which the start-up command for the servo program to be referred to or edited is set.
- 2) Holding down the [Ctrl] key, press the [F11] key. The servo programming function is now available.
When a servo program, which starts up by a servo instruction, is directly designated, the designated servo program will be displayed.
When a servo program, which starts up by a servo instruction, is indirectly designated, servo program No.0 will be displayed. Refer to or edit the servo program.
- 3) To switch to the SFC program editing function from the servo programming function, press the [F11] key with the [Ctrl] key held down.
The SFC program displayed before switching to the servo programming function and the sequence program editing screen will reappear.

11. GPP FUNCTIONS AND SFC FUNCTIONS

11.2.4 Automatic switching condition insert/delete function

If the following servo instructions are edited and converted when a switching condition or operation output program is created, an interlock signal is automatically inserted in the switching conditions before and after each step or deleted from them.

Servo Instruction	Interlock Signal to be Inserted/Deleted	Remarks
DSFRP	Start-up acceptance bit for axis used (M200n)	n=1 to 8
SVST		
DSFLP	Flag during velocity change (M202n)	

11.2.5 GSV[][]PE SFC monitoring functions

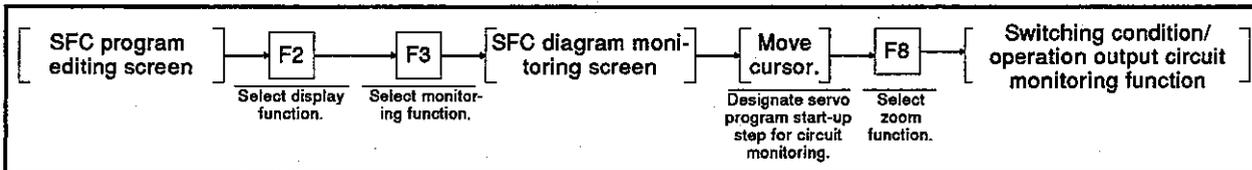
The advantages of the GSV[][]PE SFC monitoring function are listed below.

- Servo program start-up steps created by the use of a SFC program can be monitored.
- Servo instructions set when a switching condition or operation output program was created can be monitored.
- A servo program can be displayed when a switching condition or operation output circuit is monitored.

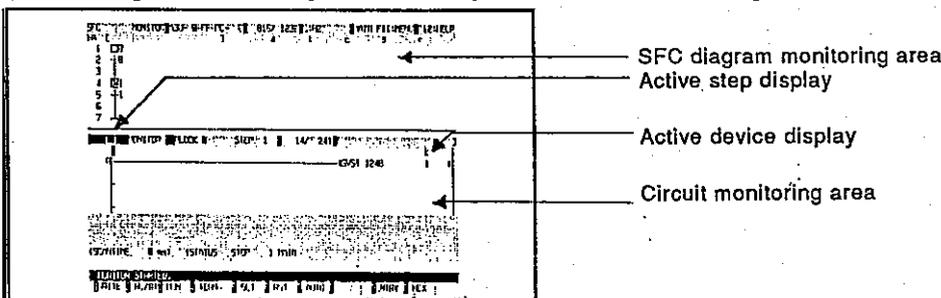
(1) Monitoring a servo program start-up step

After switching to the SFC diagram monitoring function, servo program start-up steps created by the use of a SFC program can be monitored. Like other steps, an active servo program start-up step is highlighted. An output circuit for a servo program start-up step can also be monitored.

[Procedure for displaying the operation output circuit monitoring screen for servo program start-up steps]



[Switching condition/operation output circuit monitoring screen]



11. GPP FUNCTIONS AND SFC FUNCTIONS

Motion Controller

[Display/setting contents explanation]

- Active step display** The display shows ON (■) when the servo program start-up step of which the circuit is monitored is active, or OFF (□) when it is inactive.
- Active device display** The display shows ON (■) when the device of which the circuit is monitored is active, or OFF (□) when it is inactive.
- SFC diagram monitoring area** An SFC diagram is displayed.
- Circuit monitoring area** The designated switching condition or operation output circuit is monitored.

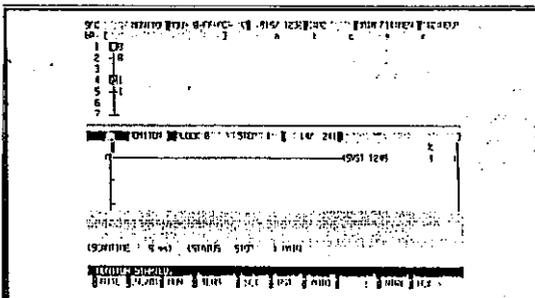
[Key operations explanation]

- Starting monitoring** 1) Press the [F3] key.
Circuit monitoring will start.
- Ending monitoring** 1) Press the [F4] key.
Circuit monitoring ends, and the SFC diagram monitoring screen will reappear.

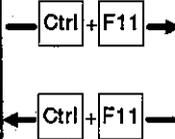
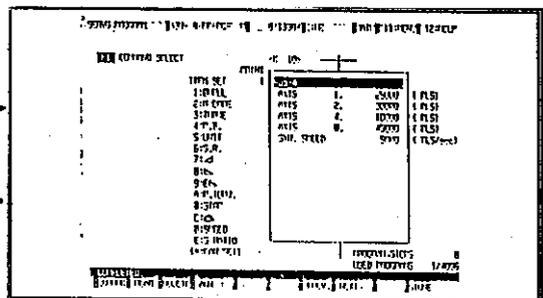
POINT

If the order of steps has been changed by addition or insertion, the interlock condition may not be automatically added/deleted in the switching conditions. Therefore, if a step has been added or inserted, always display the switching conditions using ZOOM display and check the interlock.

[Switching condition/operation output circuit monitoring screen]



[Servo programming screen]



Switching to the servo programming function

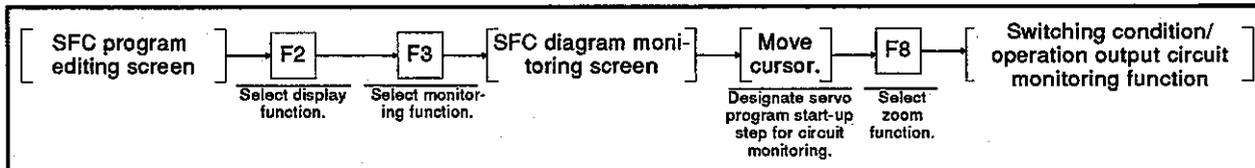
- 1) To refer to or edit the designated servo program during SVST instruction monitoring, the switching condition/operation output circuit monitoring function can be switched to the servo programming function (servo program monitoring is impossible).
When referring to a servo program, press the [F11] key with the [Ctrl] key held down.
When a servo program, which starts up by an SVST instruction, is directly designated, the designated servo program will be displayed.
When a servo program, which starts up by an SVST instruction, is indirectly designated, servo program No.0 will be displayed.
Refer to or edit the servo program.
- 2) To switch to the switching condition/operation output circuit monitoring function from the servo programming function, press the [F11] key with the [Ctrl] key held down.
The circuit monitoring function before switching to the servo programming function will reappear, and circuit monitoring will resume.

(2) Monitoring servo instructions

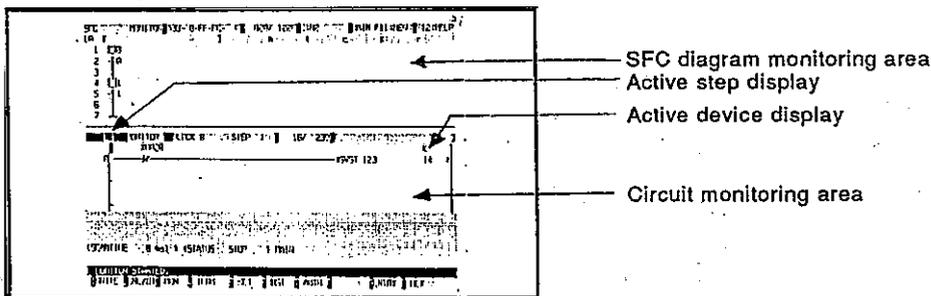
Servo instructions at the steps with servo instructions set can be monitored during switching condition/operation output circuit monitoring. The following are the servo instructions that can be monitored:

- DSFRP
- DSFLP
- SVST

[Procedure for displaying the operation output circuit monitoring screen for servo instructions at steps]



[Switching condition/operation output circuit monitoring screen]



[Display/setting contents explanation]

- | | |
|------------------------------------|---|
| Active step display | The display shows ON (■) when the step of which the circuit is monitored is active, or OFF (□) when it is inactive. |
| Active device display | The display shows ON (—■—) when the device of which the circuit is monitored is active, or OFF (—□—) when it is inactive. |
| SFC diagram monitoring area | An SFC diagram is displayed. |
| Circuit monitoring area | The designated switching condition or operation output circuit is monitored. |

[Key operations explanation]

- | | |
|----------------------------|---|
| Starting monitoring | 1) Press the [F3] key.
Circuit monitoring will start. |
| Ending monitoring | 1) Press the [F4] key.
Circuit monitoring will end, and the SFC diagram monitoring screen will reappear. |

12. VERIFYING, WRITING TO, AND READING FROM A SERVO SYSTEM CPU

12. VERIFYING, WRITING TO, AND READING FROM A SERVO SYSTEM CPU

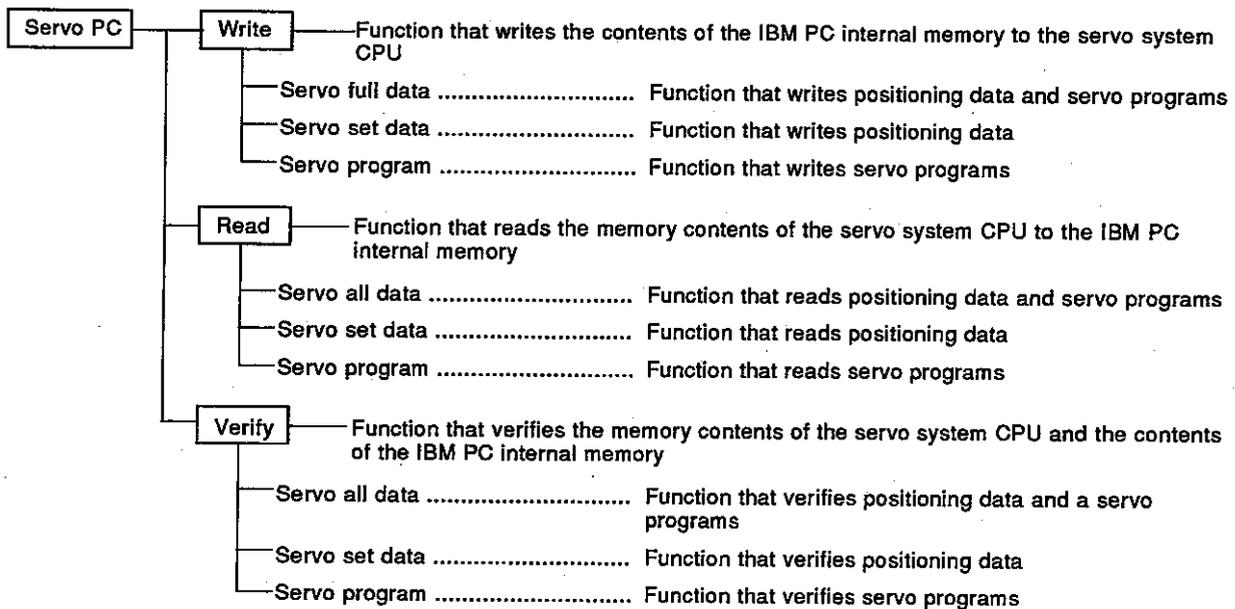
When a servo system CPU and an IBM PC are connected, the servo PC mode is used for reading, writing, and verifying the following data:

- Servo full data (positioning data and servo program)
- Positioning data (system set data, axis data, parameter block data and limit switch output data)
- Servo programs

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

12.1 General Description of Functions

The servo PC mode of the GSV[][]PE contains the following functions:

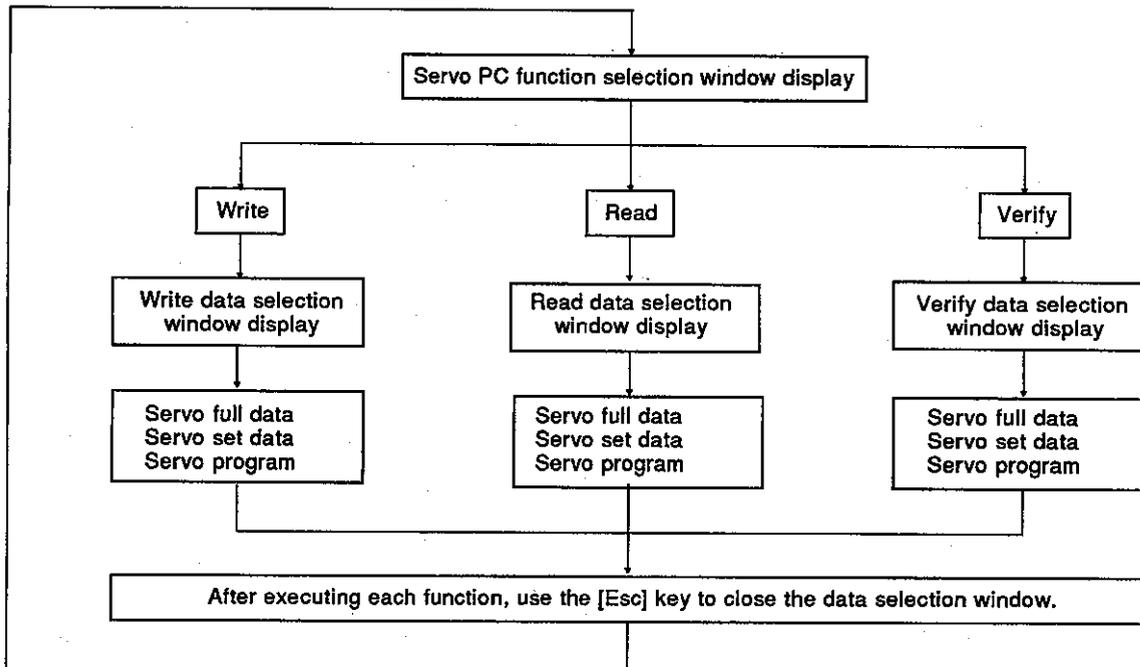


12. VERIFYING, WRITING TO, AND READING FROM A SERVO SYSTEM CPU

Motion Controller

12.2 Overall Procedure

This section shows the overall procedure for writing, reading, and verifying data to/from a servo system CPU.



REMARK

If the following operations are executed in the writing, reading, and verifying data selection window of the servo PC mode, they can be switched to the GPP function.

- 1) Switching to the ladder monitor
Press the [Alt] + [F11] keys. It is switched to the ladder monitor.
- 2) Switching to the PC test
Press the [Ctrl] + [F11] keys. It is switched to the PC test.

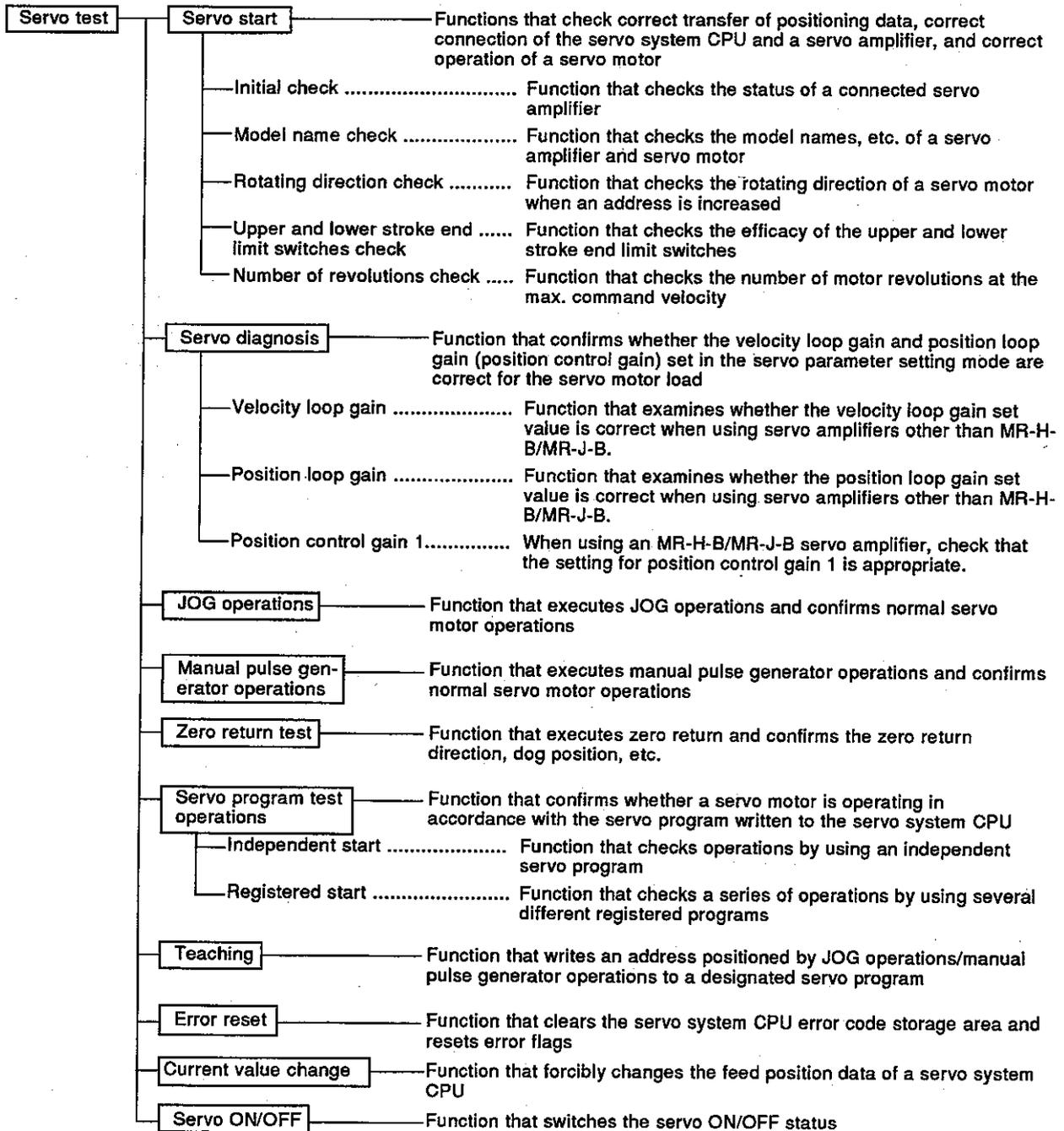
13. SERVO SYSTEM CPU TEST

The servo test mode is used by connecting a servo system CPU and an IBM PC to execute test operation to see whether a servo motor is operating in accordance with the GSV[][]PE.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

(1) General description of functions

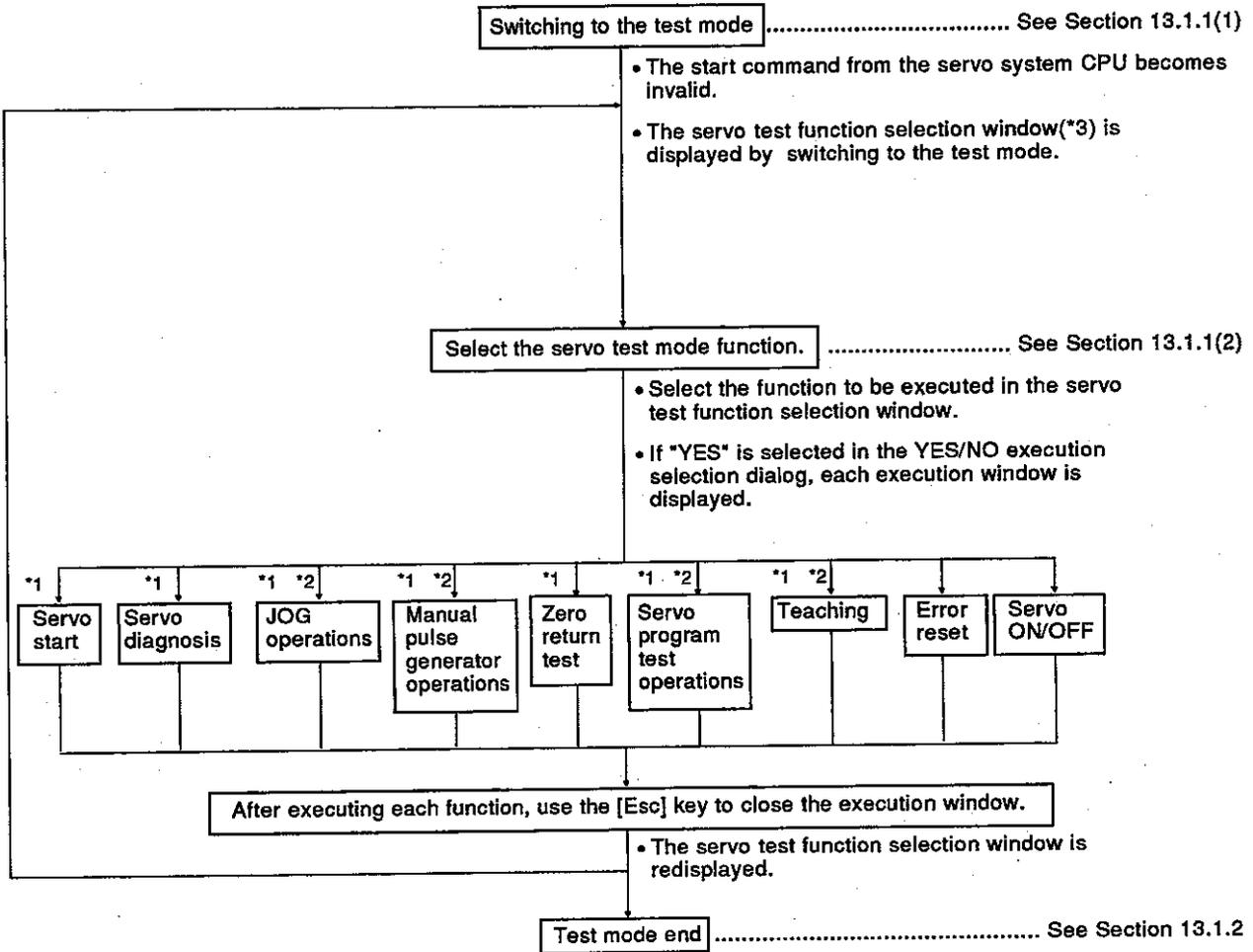
The servo test mode of the GSV[][]PE contains the following functions:



13. SERVO SYSTEM CPU TEST

(2) Overall procedure

This section shows the overall procedure of the servo test mode.



*1: Can be switched to the error reset function by pressing the [F8] key in each execution window.

*2: Can be switched to the current value change function by pressing the [F9] key in each execution window.

*3: Can be switched to the PC test function in the PC mode of the GPP function by the [Ctrl] + [F11] keys after the servo test function selection window is displayed (in the test mode).

POINTS

- (1) Emergency stop of all axes
All axes being started can be immediately stopped by pressing the [Back Space] key during test operations.
- (2) Confirmation of the contents of a display error code
To confirm the error description of an error code to be monitored in each execution window in the servo test mode, open the Guidance HELP window by pressing the [F12] key, and confirm the error description.

13. SERVO SYSTEM CPU TEST

13.1 Switching to the Test Mode and Ending

This section describes the operation for switching to the test mode and the operation for ending the test mode.

Test operation is possible whether the servo system CPU is in the STOP state or RUN state.

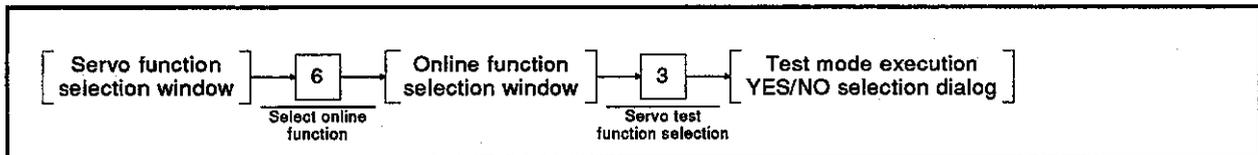
However, if test operation is executed while the servo system CPU is in the RUN state, the start instruction from the sequence program (DSFRP/SVST instruction) will be ignored.

13.1.1 Switching to the test mode

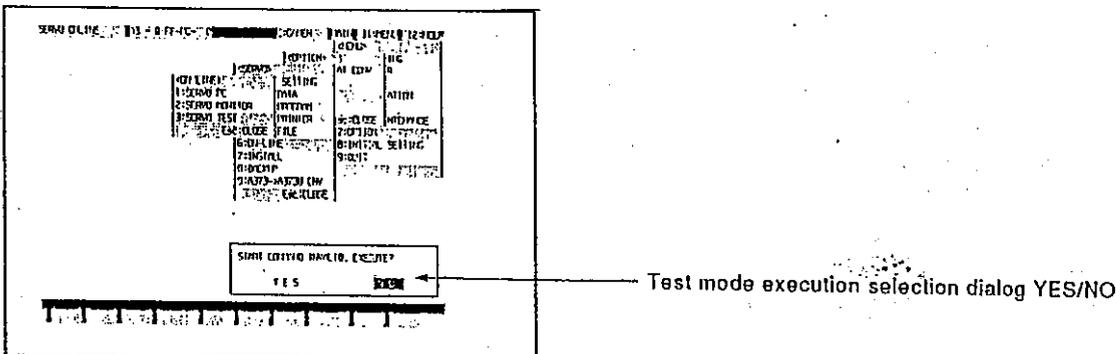
Switch to the test mode when control using the servo system CPU servo program has been completed and all axes are stopped.

(1) Test mode execution

[Procedure for displaying the test mode execution YES/NO selection dialog]



[Test mode execution YES/NO selection dialog]



[Display/setting contents explanation]

When executing the test operations, select "YES" for the start command invalid execution. (If "NO" is selected, the test operations are not executed.)

[Key operations explanation]

- Switching to the test mode**
- 1) When switching to the test mode, press the [Enter] key after highlighting "YES" by pressing the [←] key.
The servo test function selection window is displayed. (A default is set to "NO".)
 - 2) If "NO" is selected, the window returns to the online function selection window.

PRECAUTION

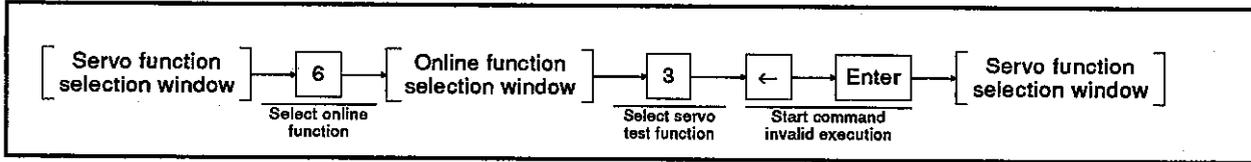
When the "CANNOT EXECUTE DURING START UP" error message is displayed by the above operations, the servo motor has been operated by a start command from the servo system CPU.
Reselect servo test in the online function selection window after confirming that all axes are stopped, and then execute the test mode.

13. SERVO SYSTEM CPU TEST

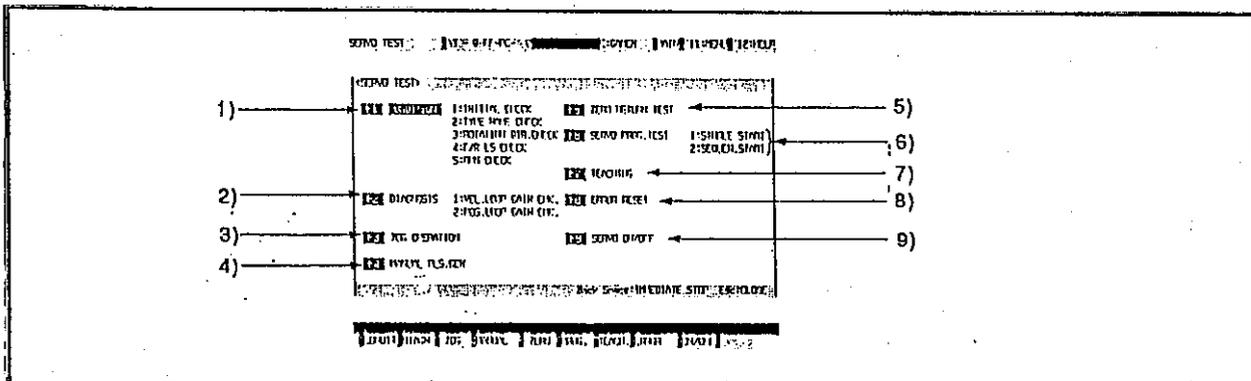
Motion Controller

- (2) Servo test function selection
 When switching to the test mode has been completed, the servo test function selection window is displayed.
 Select the servo test function to be executed.

[Procedure for displaying the servo test function selection window]



[Servo test function selection window] (When an A373/A373UCPU is selected)



Functions	Selection Operations
1) Servo start	When executing servo start, press the [F1] key. "SERVO START" is highlighted. Select the check function to be executed by pressing a numeric key. If "YES" is selected in the YES/NO execution selection dialog, the window to execute the selected check function will be displayed.
2) Servo diagnosis	When executing servo diagnosis, press the [F2] key. SERVO DIAGNOSIS is highlighted. Select the diagnosis function to be executed by pressing a numeric key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute the selected diagnosis function will be displayed.
3) JOG operations	When executing JOG operations, press the [F3] key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute the test operations will be displayed.
4) Manual pulse generator operations	When executing manual pulse generator operations, press the [F4] key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute the test operations will be displayed.

POINT
 Highlight the function to be selected by pressing an arrow key. And then, the function can be selected by pressing the [Enter] key.

13. SERVO SYSTEM CPU TEST

Functions	Selection Operations
5) Zero return test	When executing the zero return test, press the [F5] key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute zero return will be displayed.
6) Servo program test operations	When executing servo program test operations, press the [F6] key. "SERVO PROGRAM TEST OPERATIONS" is highlighted. Select the servo program test operation function to be executed by pressing a numeric key. If "YES" is selected in the execution YES/NO selection dialog, the window to set the selected test operation will be displayed.
7) Teaching	To execute teaching, press the [F7] key. If "YES" is selected in the execution YES/NO selection dialog, the window to set teaching will be displayed.
8) Error reset	When executing error reset, press the [F8] key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute error reset will be displayed.
9) Servo ON/OFF switching	To execute servo ON/OFF switching, press the [F9] key. If "YES" is selected in the execution YES/NO selection dialog, the window to execute servo ON/OFF switching will be displayed.

13. SERVO SYSTEM CPU TEST

13.1.2 Ending the test mode

The test mode is canceled. Start command becomes valid by using a sequence program when the servo system CPU is in the RUN state.

The test mode can be ended by using either of the following methods.

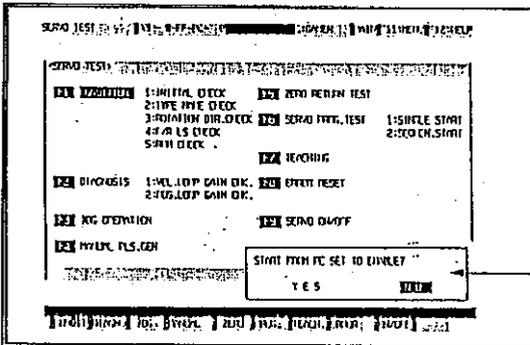
- Ending by using the servo test function selection window
- Ending by using each check in the test operations execution window

(1) Ending by using the servo test function selection window

Close of the servo test function selection window

The test mode is canceled by closing the servo test function selection window.

[Servo test function selection window] (When an A373/A373UCPU is selected)



Test mode ending YES/NO selection dialog

[Key operations explanation]

Ending the test mode

- 1) To end the test mode, press the [Esc] key.
The test mode ending YES/NO selection dialog is displayed.
- 2) After highlighting "YES" by pressing the [←] key, press the [Enter] key.
The test mode is ended, the online function selection window is displayed, and the test mode of the servo system CPU is canceled.
- 3) The servo test function selection window is displayed by selecting "NO" or pressing the [Esc] key, and the servo system CPU test mode is canceled.

Switching to the PC test function

The test mode is canceled by switching to the PC test function of the GPP function.

[Key operations explanation]

Switching to the PC test function

- 1) When switching to the PC test function, press the [Ctrl] + [F11] keys.
The test mode ending YES/NO selection dialog is displayed.
- 2) After highlighting "YES" by pressing the [←] key, press the [Enter] key.
The servo test mode is ended and switched to the PC test function, and the servo system CPU test mode is canceled.

13. SERVO SYSTEM CPU TEST

Motion Controller

GPP function menu selection

The test mode is canceled by displaying the menu selection window and selecting the GPP function menu.

[Key operations explanation]

Switching to the GPP function

- 1) To switch to the GPP function, press the [F11] key.
The test mode ending YES/NO selection dialog is displayed.
The window returns to the former window by selecting "NO" when the dialog is displayed, or pressing the [Esc] key.
- 2) After highlighting "YES" by pressing the [←] key, press the [Enter] key.
The menu selection window is displayed.
If the [Esc] key is pressed when the menu selection window is displayed, the window returns to the former window.
- 3) After displaying the function name to be switched by pressing the [↑]/[↓] keys, press the [Enter] key.
The servo test mode is ended, it switches to the selected GPP function, and the servo system CPU test mode is canceled.

13. SERVO SYSTEM CPU TEST

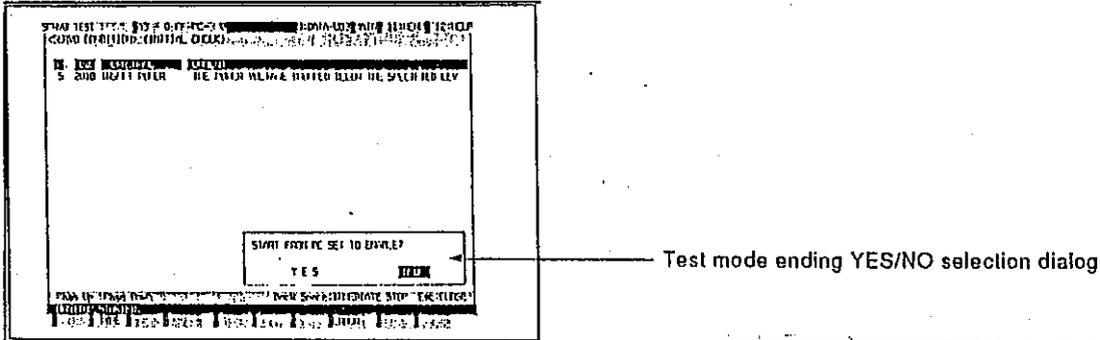
Motion Controller

(2) Ending by using each check in the test operations execution window

Switching to the PC test function

The test mode is canceled by switching the GPP function to the PC test function.

[Initial check window] (When an A373/A373UCPU is used)



[Key operations explanation]

Switching to the PC test function

- 1) To switch to the "PC test" function, press the [Ctrl] + [F11] keys.
The test mode ending YES/NO selection dialog is displayed.
- 2) After highlighting "YES" by pressing the [←] key, press the [Enter] key.
The servo test mode is ended and switched to the PC test function, and the servo system CPU test mode is canceled.

GPP function menu selection

The test mode is canceled by displaying the menu selection window and selecting the GPP function menu.

[Key operations explanation]

Switching to the GPP function

- 1) When switching to the GPP function, press the [F11] key.
The test mode ending YES/NO selection dialog is displayed.
If "NO" is selected or the [Esc] key is pressed when this dialog is displayed, the window returns to the former window.
- 2) After highlighting "YES" by pressing the [←] key, press the [Enter] key.
The menu selection window is displayed.
If the [Esc] key is pressed when the menu selection window is displayed, the window returns to the former window.
- 3) After highlighting the function name that is switched by pressing the [↑] / [↓] key, press the [Enter] key.
The servo test mode is ended and switched to the selected GPP function, and the servo system CPU test mode is canceled.

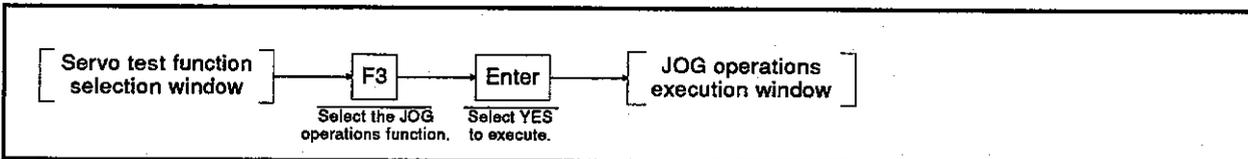
13. SERVO SYSTEM CPU TEST

13.2 JOG Operations

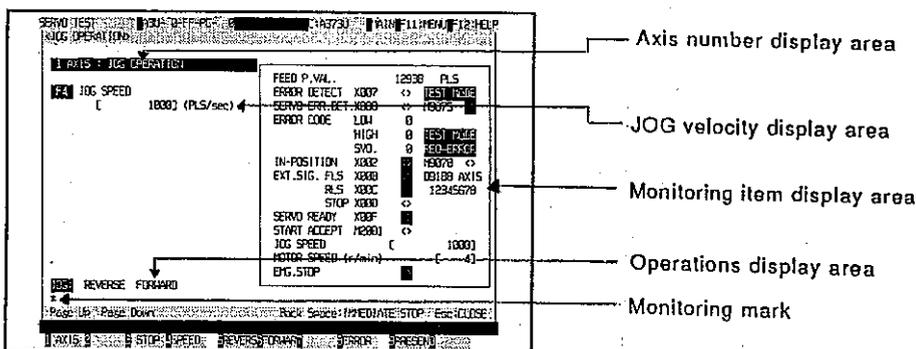
JOG operations are executed for each axis by using set JOG operations data. JOG operations of a servo motor connected to an ADU or MR-SB/SD or MR-H-B/MR-J-B are executed.

Before executing the JOG operations, it is necessary to set JOG operations data and to set data at the parameter block to be used.

[Procedure for displaying the JOG operations execution window]



[JOG operations execution window]



[Display/setting contents explanation]

Execute the forward/reverse JOG operations for each axis after confirming the establishment of the start conditions shown below in the monitoring item display area to be displayed on the right side of the window.

Forward JOG start condition

SERVO ERR.	<input type="checkbox"/>	OFF
EXT. SIG. FLS	<input checked="" type="checkbox"/>	ON
STOP	<input type="checkbox"/>	OFF
SERVO READY	<input checked="" type="checkbox"/>	ON

Reverse JOG start condition

SERVO ERR.	<input type="checkbox"/>	OFF
EXT. SIG. RLS	<input checked="" type="checkbox"/>	ON
STOP	<input type="checkbox"/>	OFF
SERVO READY	<input checked="" type="checkbox"/>	ON

If the [F5]/[F6] key is pressed when the above start conditions have not been met, JOG operations are not executed.

The monitoring item that caused the failure condition is highlighted, and the "CANNOT EXECUTE" error message is displayed.

Monitoring item display area

The feed position data and ON/OFF status of a device during monitoring are displayed.

Axis number display area

The motor axis number that executes the JOG operations is displayed.

JOG velocity display area

The set JOG operating velocity is displayed.

Operations display area

Forward JOG operations or reverse JOG operations are highlighted.

Monitoring mark

This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

13. SERVO SYSTEM CPU TEST

Motion Contoroller

[Key operations explanation]

- JOG velocity setting/change**
- 1) When changing the set JOG operating velocity, press the [F4] key. Change the velocity in the displayed JOG operating velocity setting window.
- Forward JOG operations execution**
- 1) When executing a forward JOG operations, press the [F6] key after setting the JOG operating velocity. While the [F6] key is pressed, the motor rotates at the set JOG operating velocity. When the [F6] key is released, the motor decelerates and stops.
- Reverse JOG operations execution**
- 1) When executing reverse JOG operations, press the [F5] key after setting the JOG operating velocity. While the [F5] key is pressed, the motor rotates at the set JOG operating velocity. When the [F5] key is released, the motor decelerates and stops.
- Designation of axis numbers**
- 1) When changing the motor axis that executes the JOG operations by designating the axis number, press the [F1] key. The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the currently designated axis is displayed.) Input the axis number to be checked, and then press the [Enter] key. The axis designation is now completed and the window returns to the JOG operations execution window. To interrupt the setting, press the [Esc] key.
 - 2) Previous axis number/next axis number of the currently displayed axis in the axis number display area is displayed by pressing the [PageUp]/[PageDown] key.
- Monitoring stop/restart**
- 1) When stopping or restarting monitoring, press the [F3] key.
- Error reset**
- 1) When resetting an error, press the [F8] key. Reset an error in the displayed error reset window.
- Current value change**
- 1) When changing feed position data, press the [F9] key. Change feed position data in the displayed current value change window.
- Closing the window**
- 1) Press the [Esc] key to close the JOG operations execution window and to return to the servo test function selection window.

13. SERVO SYSTEM CPU TEST

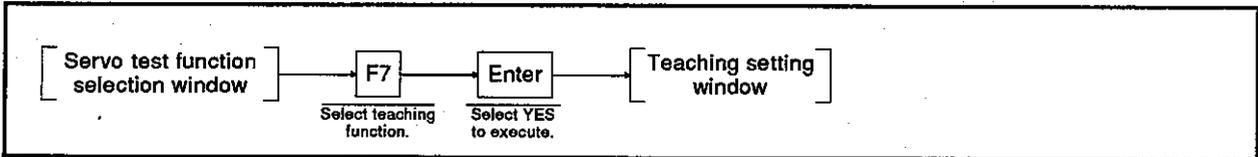
13.3 Address Setting of a Servo Program by Using Teaching

Addresses determined by JOG operations or manual pulse generator operations are written to the designated servo program.

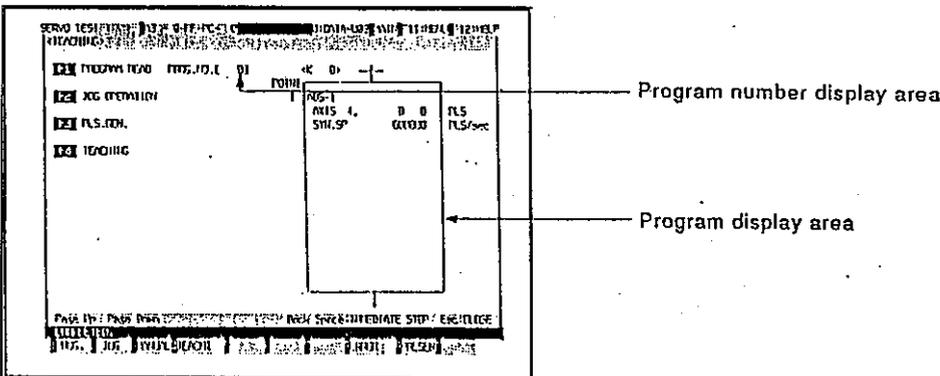
It is necessary to create a servo program to be designated in advance in the servo programming mode. (It is recommended that the address be set to 0, and the command velocity be set to slow velocity.)

(1) Setting of teaching

[Procedure for displaying the teaching setting window]



[Teaching setting window]



[Display/setting contents explanation]

Execute teaching by the following procedure for all of these operations.

1. Program read
2. Jog operations or manual pulse generator operations
3. Current value writing
4. Program registration

Program number display area

Program number read on the program read window is displayed.

Program display area

The read servo program is displayed.

13. SERVO SYSTEM CPU TEST

Motion Controller

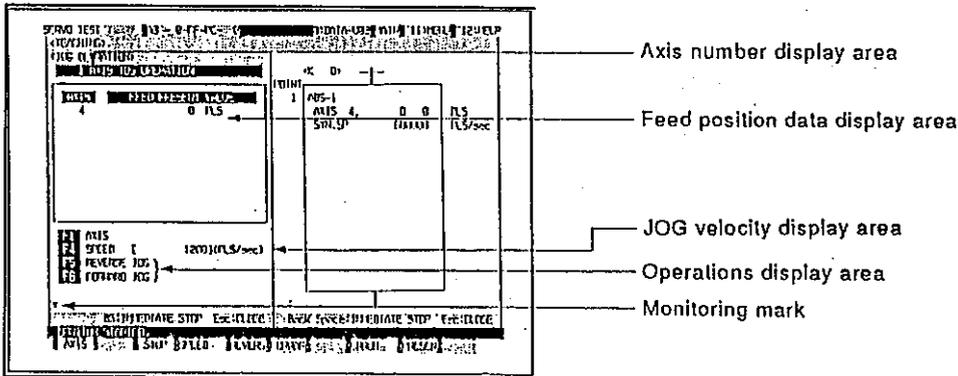
[Key operations explanation]

- Program read**
- 1) When reading a servo program to which an address is written, press the [F1] key.
The program read window is displayed.
 - 2) Input the servo program number to which an address is written by using a numeric key, and then press the [Enter] key. (The setting range is 0 to 4095.)
The setting is ended and returns to the teaching setting window.
The set servo program number is displayed in the program number display area, and the contents of the designated servo program are displayed in the program display area.
When the "FILE NOT FOUND" error message is displayed, this means that there is no program which corresponds to the set program number. Therefore, reread that program.
- Program confirmation**
- 1) If all read servo programs cannot be displayed on a program display area when a velocity switching instruction and a constant velocity control instruction are read, scroll the servo program up and down by pressing the [PageUp]/[PageDown] keys, and confirm a program.
- Switching to the JOG operations execution window**
- 1) When feed position data must be written to a designated servo program by a JOG operation, press the [F2] key.
Execute the JOG operation in the displayed JOG operation execution window.
- Switching to the manual pulse generator operations execution window**
- 1) When feed position data must be written to a designated servo program by a manual pulse generator operation, press the [F3] key.
Execute the manual pulse generator operation in the displayed manual pulse generator operations execution window.
- Switching to the teaching execution window**
- 1) When feed position data must be written by using a JOG operation/manual pulse generator operation to a designated servo program, press the [F4] key.
Execute registration of feed position data and the servo program in the displayed teaching execution window.
- Error reset**
- 1) To reset an error, press the [F8] key. Execute error reset in the displayed error reset window.
- Changing current values**
- 1) When changing feed position data, press the [F9] key.
Change feed position data in the displayed changing current values window.
- Closing the window**
- 1) Press the [Esc] key to close the teaching setting window and return to the servo test function selection window.

13. SERVO SYSTEM CPU TEST

- (2) JOG operation execution
 Feed position data to be written to the designated servo program is required by JOG operations.
 Before executing JOG operations, set JOG operations data and set data at the parameter block to be used.

[JOG operations execution window]



[Display/setting contents explanation]

Feed position data display area	The feed position data for a designated operations axis is displayed during monitoring.
Axis number display area	The motor axis number that executes the JOG operations is displayed.
JOG velocity display area	The set JOG operating velocity is displayed.
Operations display area	Forward JOG operations or reverse JOG operations are highlighted.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

- JOG velocity setting/change**
- When setting or changing the JOG operating velocity, press the [F4] key.
 Set or change the JOG operating velocity in the displayed JOG operating velocity setting window.
- Designation of the axis number**
- When selecting the axis number that executes the JOG operation from a motor axis used with a designated servo program, press the [F1] key.
 The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the currently designated axis is displayed.)
 - Input the axis number that requires feed position data, and then press the [Enter] key.
 The axis designation is now completed and the window returns to the JOG operations execution window.
 To interrupt the setting, press the [Esc] key.
- Forward JOG operations execution**
- When executing forward JOG operations, press the [F6] key after setting the JOG operating velocity.
 While the [F6] key is pressed, the motor rotates at the set JOG operating velocity. (The feed position data for a designated axis is displayed in the feed position data display area.)
 When the [F6] key is released, the motor decelerates and stops.

13. SERVO SYSTEM CPU TEST

Motion Controller

- Reverse JOG operations execution**
- 1) When executing reverse JOG operations, press the [F5] key after setting the JOG operating velocity.
While the [F5] key is pressed, the motor rotates at the set JOG velocity. (The feed position data for a designated axis is displayed on the feed position data display area.)
When the [F5] key is released, the motor decelerates and stops.
- Error reset**
- 1) When resetting an error, press the [F8] key.
Execute error reset in the displayed error reset window.
- Changing current values**
- 1) When changing feed position data, press the [F9] key.
Change feed position data in the displayed changing current values window.
- Closing the window**
- 1) Press the [Esc] key to close the JOG operations execution window and return to the teaching setting window.

POINT

Starting conditions for JOG operations

- When JOG operations are being executed and the "CANNOT EXECUTE" error message is displayed, the start conditions given below have not been satisfied.

Re-execute the JOG operations after confirming that the start conditions given below have been satisfied.

Forward JOG start condition

SERVO ERR.	<input type="checkbox"/>	OFF
EXT. SIG. FLS	<input checked="" type="checkbox"/>	ON
STOP	<input type="checkbox"/>	OFF
SERVO READY	<input checked="" type="checkbox"/>	ON

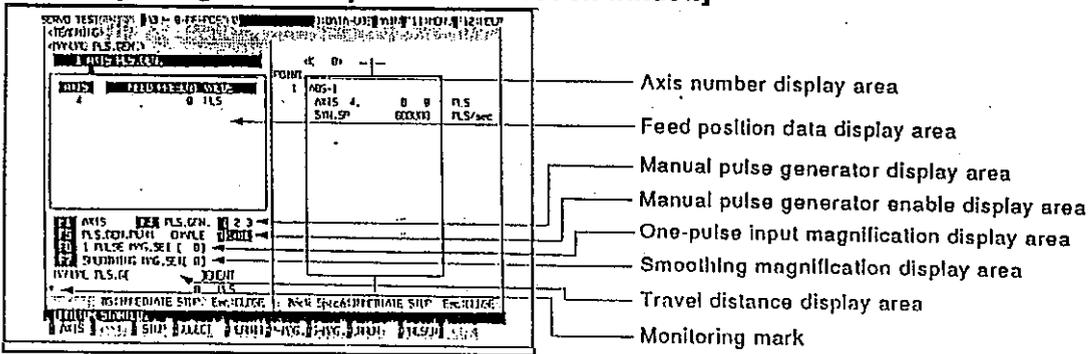
Reverse JOG start condition

SERVO ERR.	<input type="checkbox"/>	OFF
EXT. SIG. RLS	<input checked="" type="checkbox"/>	ON
STOP	<input type="checkbox"/>	OFF
SERVO READY	<input checked="" type="checkbox"/>	ON

13. SERVO SYSTEM CPU TEST

- (3) Manual pulse generator operations execution
- Feed position data to be written to a designated servo program is required by the manual pulse generator. Before executing manual pulse generator operations, the setting of items 1 to 6 below is required. Operate the manual pulse generator after finishing the setting of items 1 to 6, and execute a test operations
1. Manual pulse generator disable setting
 2. Selection of the manual pulse generator
 3. Setting of the operation axis number
 4. One-pulse input magnification setting
 5. Smoothing magnification setting
 6. Manual pulse generator enable setting
- (writing manual pulse generator operations data to a servo system CPU)

[Manual pulse generator operations execution window]



[Display/setting contents explanation]

- Feed position data display area** The feed position data for a designated operations axis is displayed by monitoring.
- Axis number display area** Motor axis number that executes manual pulse generator operations is displayed.
- Manual pulse generator display area** Displays which manual pulse generator is used.
- One-pulse input magnification display area** Magnification for the input of 1 pulse from the manual pulse generator is displayed.
- Smoothing magnification display area** Magnification to make the leading and falling edges of manual pulse generator operations smooth is displayed.
- Manual pulse generator enable display area** The enable/disable status of pulse generator operations is displayed. The highlighted display shows which is currently selected.
- Travel distance display area** The travel distance of each manual pulse generator 1 pulse is displayed.
- Monitoring mark** This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

POINT

Travel distance for each manual pulse generator 1 pulse

- The travel distance is calculated by using the following formula:

$$[\text{Travel distance}] = [\text{Manual pulse generator 1 pulse input magnification}] \times A$$
- As shown in the chart on the right, values for A differ depending on which unit is used.

Unit	A
μm	0.1
inch	0.00001
degree	0.00001
PULSE	2

[Key operations explanation]

- | | |
|--|---|
| Manual pulse generator disable setting | 1) If manual pulse generator enable is set when setting manual pulse generator operations data (operations axis number, one-pulse input magnification, and smoothing magnification), open the manual pulse generator enable/disable setting window by pressing the [F5] key. And then, select manual pulse generator disable. Now, set the manual pulse generator operations data. |
| Manual pulse generator selection | 1) When setting the manual pulse generator to do the operations, press the [F4] key.
Set it in the displayed manual pulse generator setting window. |
| Axis number designation | 1) When selecting the axis number that executes manual pulse generator operations from an axis used with the designated servo program, press the [F1] key.
The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that is currently designated is displayed.)
2) Input the axis number that requires feed position data, and then press the [Enter] key.
The axis designation is now completed and the window returns to the manual pulse generator operations execution window.
To interrupt the setting, press the [Esc] key. |
| One-pulse input magnification setting | 1) When setting a one-pulse input magnification, press the [F6] key.
Set the magnification of the displayed one-pulse input magnification in the setting window. |
| Smoothing magnification setting | 1) When setting smoothing magnification, press the [F7] key.
Set the magnification in the displayed smoothing magnification setting window. |
| Writing of manual pulse generator operations data | 1) When writing set manual pulse generator operations data (operations axis number, one-pulse input magnification, and smoothing magnification) to a servo system CPU, open the manual pulse generator enable/disable setting window by pressing the [F5] key. And then, select manual pulse generator enable.
Operations data is written to the servo system CPU. |
| Monitoring stop/restart | 1) When stopping or restarting monitoring, press the [F3] key. |
| Error reset | 1) When executing error reset, press the [F8] key. Reset errors in the displayed error reset window. |
| Changing current values | 1) When changing feed position data, press the [F9] key.
Change feed position data in the displayed changing current values window. |
| Closing the window | 1) Press the [Esc] key to close the manual pulse generator operations execution window and return to the teaching setting window. |

POINTS

(1) Precaution when executing manual pulse generator operations

- Execute manual pulse generator operations after confirming that "ENABLE" is highlighted in the manual pulse generator permission display area.

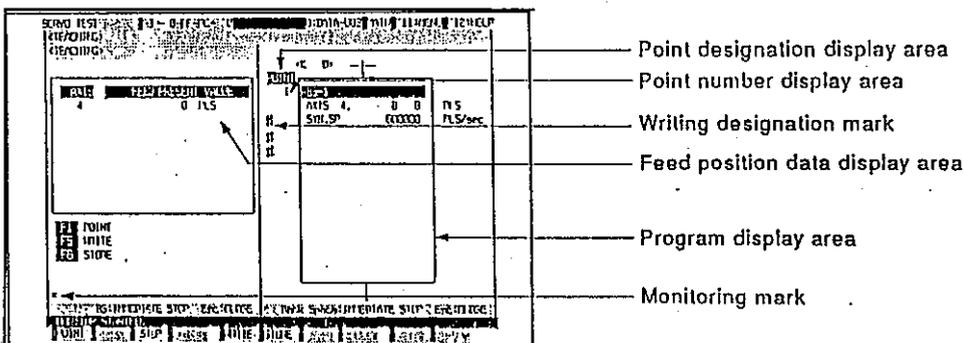
(2) Precautions when completing manual pulse generator operations

- The axis set to "ENABLE" in manual pulse generator enable display area of the manual pulse generator operations execution window can be started only from the manual pulse generator. When manual pulse generator operations are not being executed, "DISABLE" must be set.
- When completing manual pulse generator operations, set "DISABLE".

13. SERVO SYSTEM CPU TEST

- (4) Teaching execution
Feed position data required by JOG operations or manual pulse generator operations is written to the designated servo program.

[Teaching execution window]



[Display/setting contents explanation]

The axis or point to be written is designated, feed position data is written to the designated servo program, and the servo program is registered in the internal memory of a servo system CPU.

- Writing by designating the writing axis
Writing is executed only to the designated axis in the point.
- Writing by designating the point
Writing is executed to all axes set in the designated point.
This is point unit writing.

Feed position data display area

The feed position data for each axis required by JOG operations or manual pulse generator operations is displayed.

Program display area

The contents of the servo program to which feed position data is written are displayed.

Point designation display area

When writing is executed by point designation, POINT is highlighted. When writing is executed by writing axis designation, POINT is displayed.

Point number display area

Switching the point number by using velocity switching control or the pass point number by using constant velocity control is displayed. ("1" shows that the number of points is displayed by using other servo instructions.)

Writing designation mark

This is displayed on the left side of the axis to which feed position data is written. (Writing cannot be executed to an axis on which this mark is not displayed.)

Monitoring mark

This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

Writing axis designation

- 1) When designating the axis to which an address is written, first confirm that the point designation display is a normal display. If the display is highlighted, pressing the [F1] key returns to the normal display.
- 2) Press the [↑]/[↓] keys to move the cursor in the program display area to the axis line to which feed position data is written. The writing designation mark "#" is displayed on the left side of the axis to which writing was designated.

Point designation

- 1) When designating the point to which an address is written, confirm whether the point designation display is highlighted. If the display is normal, pressing the [F1] key highlights it.
- 2) Press the [↑]/[↓] keys to move the cursor in the program display area to the axis line in the point containing the axis in which feed position data is written. The "#" writing mark and the designation are displayed on the left side of all axes in the point.

Execution of writing

- 1) When executing writing, press the [F5] key after executing the writing axis designation or the point designation. The value displayed in the feed position data display area is written to the designated servo program.

Program registration

- 1) When registering a servo program stored with feed position data in a servo system CPU, press the [F6] key. When registration has been completed, "COMPLETED" is displayed in the message area.

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

- 1) Press the [Esc] key to close the teaching execution window and return to the teaching setting window.

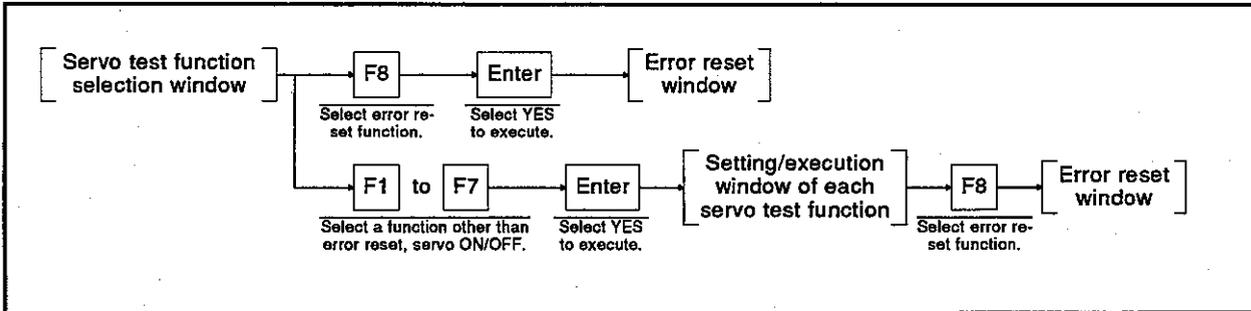
13. SERVO SYSTEM CPU TEST

13.4 Error Resetting

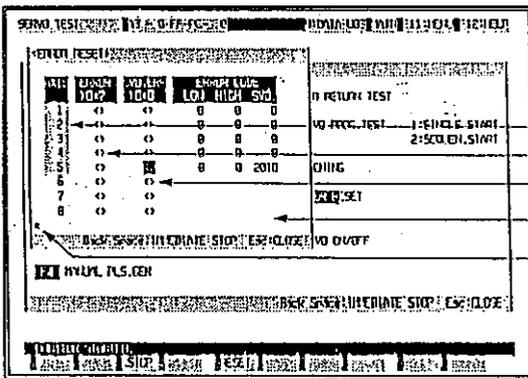
The servo system CPU error code storage area is cleared, and the error flag is reset.

Execute resetting after removing the cause of the error.

[Procedure for displaying the error reset window]



[Error reset window]



- Axis number display area
- Error detection display area
- Servo error detection display area
- Error code display area
- Monitoring mark

[Display/setting contents explanation]

Error information for each axis is displayed. Confirm the error description, and reset the errors for all axes.

- Axis number display area** Axis number display area motor axis number is displayed.
- Error detection display area** This is highlighted depending on minor or major error detection.
- Servo error detection display area** This is highlighted by using the servo amplifier side's error detection.
- Error code display area** The minor/major/servo error code is displayed.
- Monitoring mark** Shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

13. SERVO SYSTEM CPU TEST

Motion Contoroller

[Key operations explanation]

Error reset execution

- 1) When resetting an error, press the [F5] key.
The execution YES/NO selection dialog is displayed.
- 2) Press the [Enter] key when YES is highlighted.
Error reset is executed, the error detection signal and servo error detection signal go OFF, and "0" is displayed in the error code display area.

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

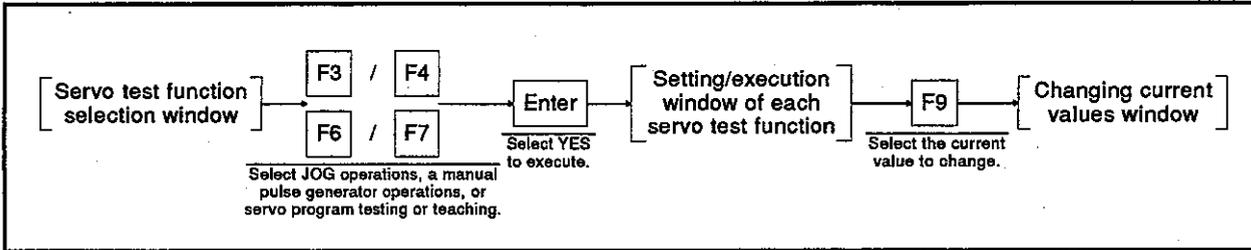
- 1) Press the [Esc] key to close the error reset window and return to the servo test function selection window or the setting/execution window of each servo test function.

13. SERVO SYSTEM CPU TEST

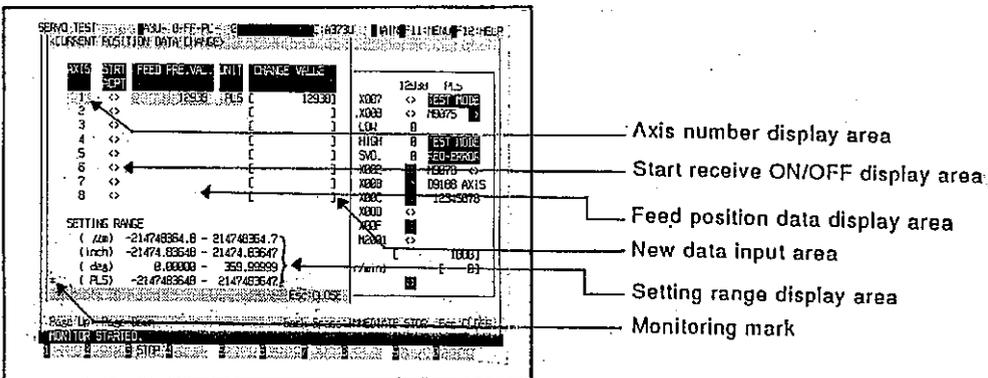
13.5 Changing Current Values

The feed position data of a servo system CPU is changed forcibly in the servo test mode.

[Procedure for displaying the changing current values window]



[Changing current values window]



[Display/setting contents explanation]

Designate the axis whose feed position data is changed, and input the new value.

- Axis number display area** The motor axis number whose feed position data is changed is displayed.
- Start receive ON/OFF display area** The ON/OFF status of the start receive signal is displayed. Make sure it is OFF when changing feed position data.
- Feed position data display area** The feed position data of each axis is displayed.
- New data input area** New data is input.
- Setting range display area** A setting range by control unit is displayed.
- Monitoring mark** This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

13. SERVO SYSTEM CPU TEST

Motion Controller

[Key operations explanation]

- Axis number designation** 1) When designating the axis number whose feed position data is changed, press the [↑]/[↓] keys to move the cursor to the designating axis number line.
- New data input** 1) Input a new value by using either numerical keys or the [.]/[-] keys, and then press the [Enter] key.
Defining new data moves the cursor to the following line.
- Monitoring stop/restart** 1) When stopping or restarting monitoring, press the [F3] key.
- Closing the window** 1) Press the [Esc] key to close the changing current values window and return to the setting/execution window for each servo test function.

POINT

Precautions when changing feed position data

- Feed position data cannot be changed for an axis during start-up or for an axis where a servo error has occurred. Change feed position data after confirming the axis is stopped and the servo error signal is OFF.

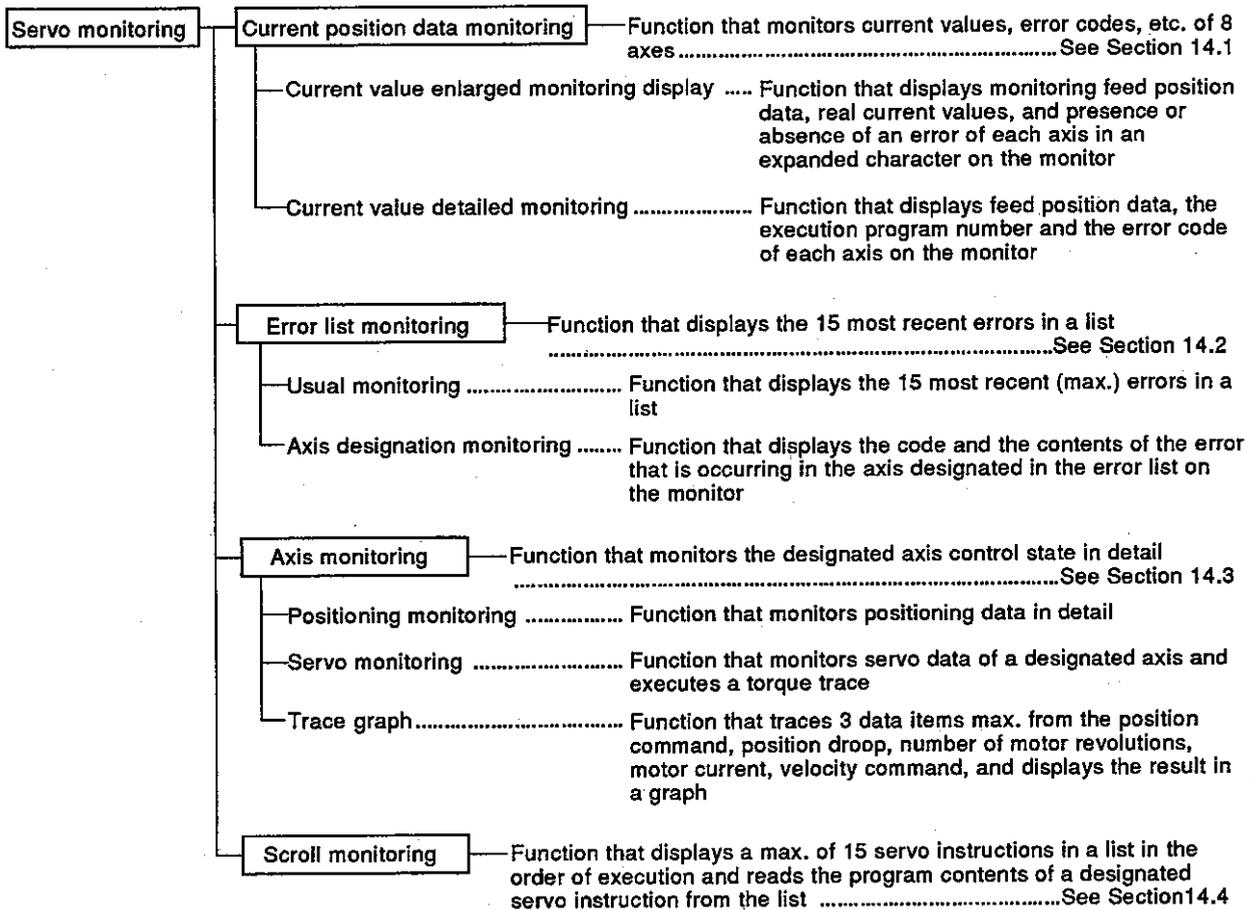
14. MONITORING THE POSITIONING STATE

The servo monitor mode is used to monitor a current value and an error occurrence, etc. in the positioning state when an IBM PC is connected to a servo system CPU.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

(1) General description of functions

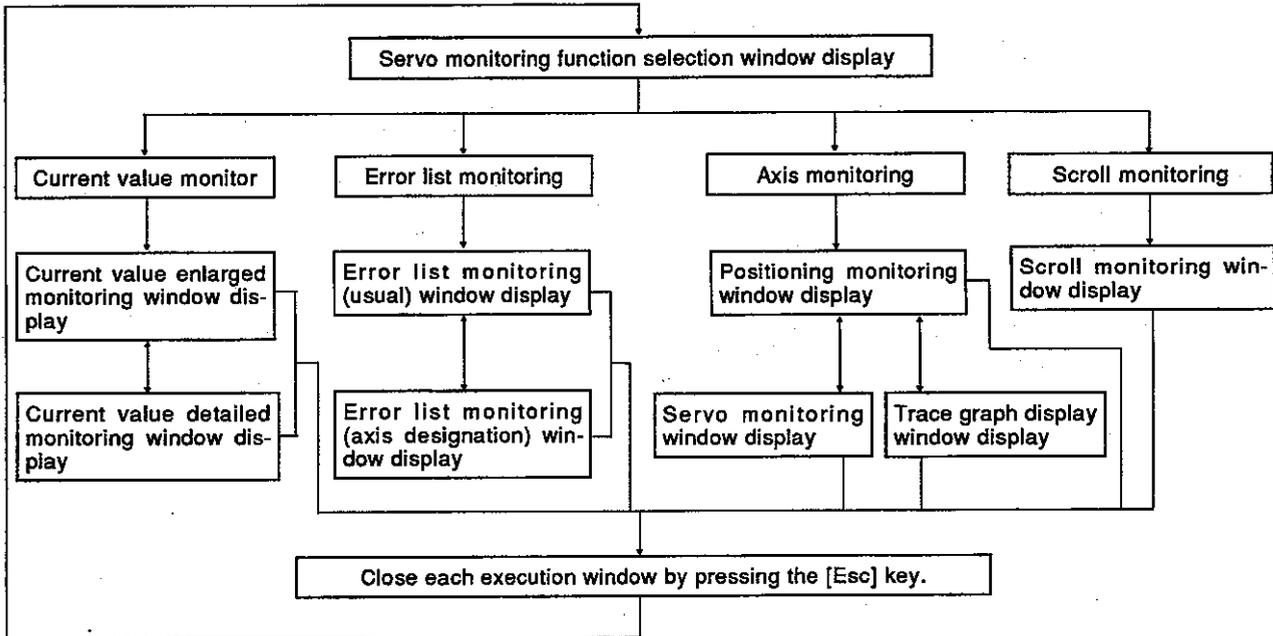
The servo test mode of the GSV[][]PE contains the following functions:



14. MONITORING THE POSITIONING STATE

(2) Overall procedure

This section shows the overall procedure of the servo monitor mode.



(3) Switching to other functions

The servo monitoring mode can be switched to the ladder monitoring function in the ladder mode of the GPP function by pressing the [Alt] + [F11] keys and vice versa.

The following explains the details:

- When servo monitoring is switched to ladder monitoring, monitoring is started from the first step of a sequence ladder.
- When ladder monitoring is switched to servo monitoring, the current value enlarged monitoring window is displayed.
- When servo monitoring is switched to ladder monitor, and then switched to servo monitoring, monitoring is started by a lower function selected in the previous servo monitoring mode.
- When ladder monitoring is switched to servo monitoring, and then switched to ladder monitoring, ladder monitoring is started from the step when switching to the servo monitoring mode.

POINTS

- Confirming the contents of a display error code
When confirming the error description of an error code to be monitored in each execution window in the servo monitoring mode, open the guidance HELP window by pressing the [F12] key. And then, confirm the error description.
- During current value enlarged monitoring, the menu selection window is not displayed.

14. MONITORING THE POSITIONING STATE

14.1 Monitoring Current Values

This section shows how the current values and error codes of 8 axes are displayed in batch during monitoring.

Use this function when confirming current values while operating the system, or when confirming the presence or absence of an error.

(1) Types of current value data monitoring function

There are 2 current value data monitoring functions.

- Current value enlarged monitoring display Feed position data and real current values are displayed in enlarged letters.
- Current value detailed monitoring Detailed items such as feed position data and error codes are displayed.

(2) Start of a current value enlarged monitoring display

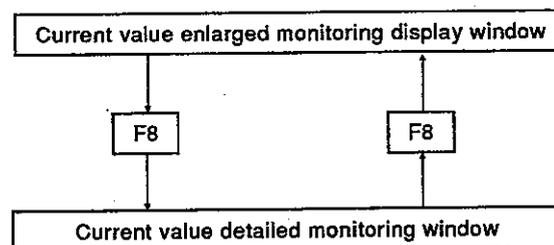
If "PRE. VALUE MON." is selected in the servo monitoring function selection window, the current value enlarged monitoring display window is displayed, and monitoring of feed position data is started.

(3) Start of current value detailed monitoring

If the [F8] key is pressed in the current value enlarged monitoring display window, the current value detailed monitoring window is displayed, and monitoring of feed position data is started.

(4) Switching of the current value enlarged monitoring display and current value detailed monitoring

The current value enlarged monitoring display can be switched to the current value detailed monitoring and vice versa by pressing the [F8] key in the current value enlarged monitoring display window or current value detailed monitoring window.

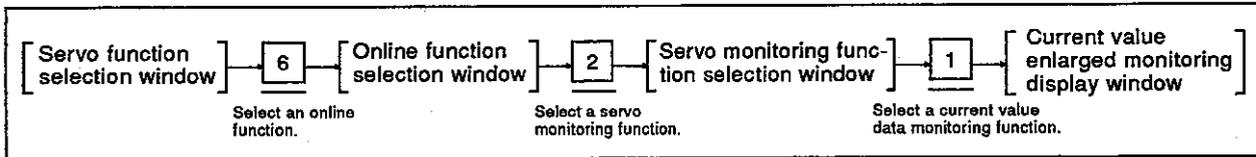


14. MONITORING THE POSITIONING STATE

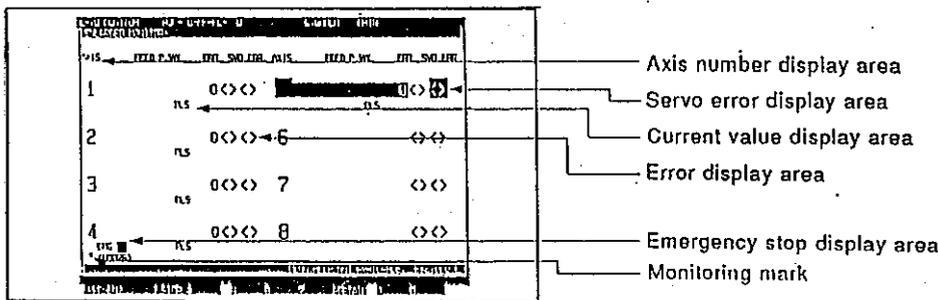
14.1.1 Current value enlarged monitoring display

Feed position data or the real current values of 8 axes is displayed in enlarged letters.

[Procedure for displaying the current value enlarged monitoring display window]



[Current value enlarged monitoring display window]



[Display/setting contents explanation]

- Axis number display area** Operating axis number is displayed.
- Current value display area** Feed position data from a servo system CPU for an operating axis or the real current value which is fed back to a servo system CPU from an operating axis is displayed.
- Error display area** This displays the presence or absence of a low/high error in the operating axis.
- Servo error display area** This displays the presence or absence of a servo error in the operating axis.
- Emergency stop display area** When an axis which is started is stopped because of an emergency, the display returns to the normal display.
- Monitoring mark** This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

REMARKS

- 1) If the servo READY signal is OFF though a servo motor is packaged, the corresponding axis number and feed position data are highlighted.
- 2) If the servo READY signal is OFF when a servo motor is not packaged, the corresponding axis number and feed position data are not highlighted.

14. MONITORING THE POSITIONING STATE

Motion Controller

[Key operations explanation]

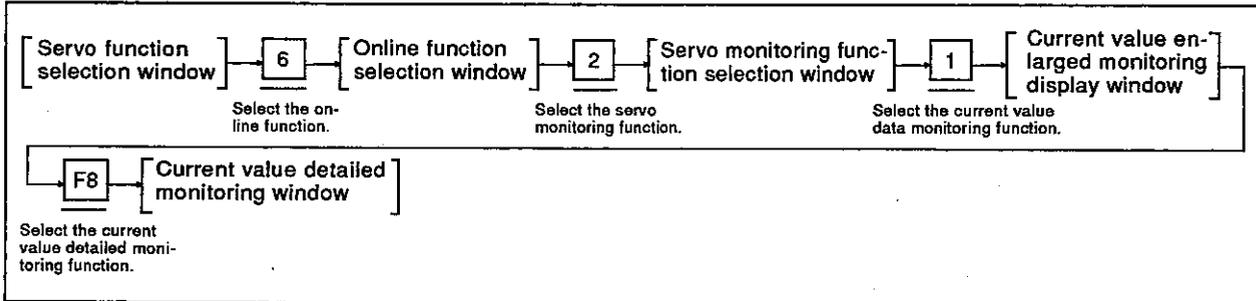
- | | |
|--|---|
| Current value display switching | 1) When switching the feed position data display to the real current value display or vice versa, press the [F1] key. |
| Switching to the current value detailed monitoring function | 1) When monitoring current value details, press the [F8] key. The current value detailed monitoring window is displayed (see Section 14.1.2). |
| Monitoring stop/restart | 1) When stopping or restarting monitoring, press the [F3] key. |
| Closing the window | 1) When closing the current value enlarged monitoring display window, press the [Esc] key.
The window returns to the servo monitoring function selection window. |

14. MONITORING THE POSITIONING STATE

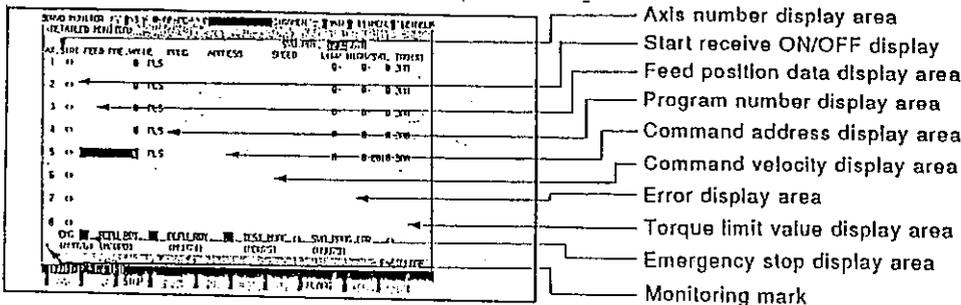
14.1.2 Current value detailed monitoring

Feed position data, error codes, execution program numbers, etc. for 8 axes are displayed on the monitor.

[Procedure for displaying the current value detailed monitoring window]



[Current value detailed monitoring window]



[Display/setting contents explanation]

- Axis number display area** Number of the operating axis is highlighted.
- Start receive ON/OFF display** Axis number whose start receive signal is ON is highlighted.
- Feed position data display area** The feed position data from a servo system CPU for an operating axis is displayed.
- Program number display area** The executing servo program number is displayed. (0 to 4095)

REMARK

The axis that is executing JOG operations, manual pulse generator operations, etc. is displayed as follows.

- When JOG operations are being executed JOG
- When manual pulse generator operations are being executed MAN
- When a zero return test operation is being executed..... TEST
- When position loop gain check (servo diagnosis) is being executed } TEST
- When position control gain 1 check (servo diagnosis) is being executed }
- When a rotating direction check (servo start) is being executed TEST
- When positioning control is not being executed..... Blank

Command address display area	A command address to be output from a servo system CPU to the servo amplifier (value after converting the unit of actually controlled data) is displayed.
Command velocity display area	A command velocity to be output from a servo system CPU to the servo amplifier (value after converting the unit of actually controlled data) is displayed.
Error display area	The error code of the low/high/servo error that is occurring in the operating axis is displayed.
Torque limit value display area	The torque limit value is displayed.
PC READY ON/OFF display	When the PC READY signal (M2000) is ON, this is highlighted.
PCPU READY completion ON/OFF display	When there are no errors on the PCPU side, this is highlighted.
ON/OFF display in the test mode	This is highlighted in the test mode.
Program setting error display	When there is an error in the positioning data of a servo program during execution, this is highlighted.
Emergency stop display area	When an axis which is started is stopped for an emergency, this is highlighted.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

Switching to the current value enlarged monitoring display function	1) When executing the current value enlarged monitoring display, press the [F8] key. The current value enlarged monitoring display window is displayed.
Monitoring stop/restart	1) When stopping or restarting monitoring, press the [F3] key.
Closing the window	1) When closing the current value detailed monitoring window, press the [Esc] key. The window returns to the servo monitoring function selection window.

14.2 Error List Display

The error code of the max. 15 most recent errors and the error description are displayed in the order they were generated.

This is a convenient function for confirming the servo system CPU control state and cause of errors.

Refer to the error description, confirm the servo, and modify the positioning data/servo program.

(1) Types of error list monitoring function

There are 2 error list monitoring functions:

- Usual monitoring..... Errors that occur in 8 axes are monitored.
- Axis designation monitoring..... Errors that occur in the designated axis are monitored.

(2) Start of usual monitoring

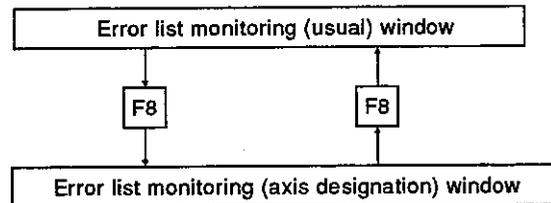
If "ERROR LIST MON." is selected in the servo monitoring function selection window, the error list monitoring (usual) window is displayed, and monitoring of an error in 8 axes is started.

(3) Start of axis designation monitoring

The error list monitoring window (axis designation) is displayed by pressing the [F8] key in error list monitoring (usual) window, and monitoring of the axis error that is occurring in number 1 is started.

(4) Switching of usual monitoring and axis designation monitoring

Usual monitoring can be switched to axis designation monitoring and vice versa by pressing the [F8] key in the error list monitoring (usual) window or the error list monitoring (axis designation) window.



(5) Clearing error lists

The error list are cleared in the following cases:

- When the PC READY leading edge is (M2000)
- When the PC READY signal is OFF and a servo system CPU is switched to the test mode (If the signal is ON and is switched to the test mode, the error list is not cleared.)

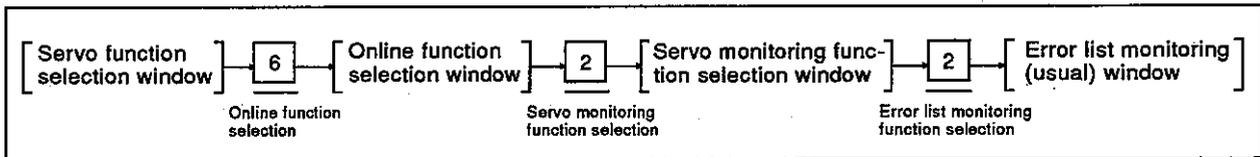
14. MONITORING THE POSITIONING STATE

14.2.1 Error list monitoring (usual)

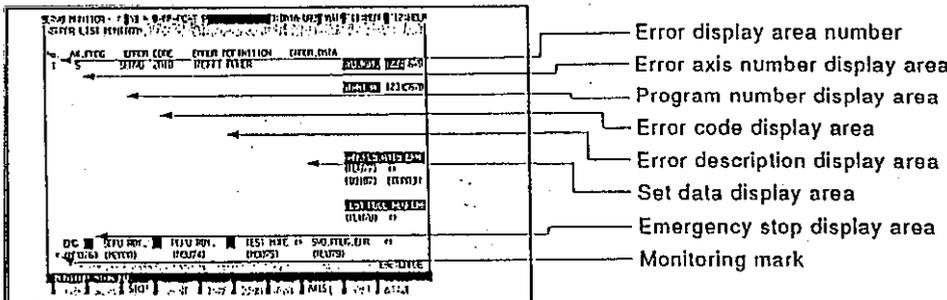
Max. 15 errors of the following kinds of errors that occur when the leading edge PC READY signal is (M2000) are displayed in a list.

- Low errors
- High errors
- Servo errors
- Servo program setting errors

[Procedure for displaying the error list monitoring (normal) window]



[Error list monitoring (usual) window]



[Display/setting contents explanation]

- Error display area number** Error occurrence order is displayed. Number 1 is the oldest error and number 15 is the most recent error.
- Error axis number display area** Axis number where an error occurred is displayed.
- Program number display area** Servo program number executed when an error occurs is displayed. (0 to 4095)

REMARK

When an error occurs in the axis that is executing JOG operations or manual pulse generator operations, the display is as follows:

- When JOG operations are being executed JOG
- When manual pulse generator operations are being executed MAN
- When a zero return test is being executed TEST
- When a position loop gain check (servo diagnosis) is being executed } TEST
- When position control gain 1 check (servo diagnosis) is being executed }
- When a rotating direction check (servo start) is being executed TEST
- When positioning control is not being executed Blank

14. MONITORING THE POSITIONING STATE

Error code display area The error classification and the error code of the error are displayed.

REMARK

The error classifications are displayed as follows:

- Minor error LOW
- Major error HIGH
- Servo error SERVO
- Servo program setting error SVO. P

Error description display area An error description is displayed.

Set data display area When set data has an error, the set data is displayed.

Servo READY ON/OFF display area The servo READY signal whose motor axis number is ON is highlighted.

Start receive ON/OFF display area The motor axis number which start receive signal is ON is highlighted.

Manual pulse generator axis setting error indication When manual pulse generator operations set data (axis number and 1 pulse input magnification, etc.) contain an error, this is highlighted and the register in which abnormal set data is stored is displayed.

Test mode request error indication If a servo system CPU is not switched to the test mode even when a test mode request is executed in the GSV[][]PE, this is highlighted.

PC READY ON/OFF display When the PC READY signal is ON, this is highlighted.

PCPU READY completion ON/OFF display When there is no error on the PCPU side, this is highlighted.

ON/OFF display in the test mode This is highlighted in the test mode.

Program setting error display When there is an error in the positioning data of an executing servo program, this is highlighted.

Emergency stop display area When an axis which is started is stopped for an emergency, this returns to the normal display.

Monitoring mark This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

Switching to the axis designation monitoring function 1) When executing monitoring by designating an axis, press the [F8] key.
The error list monitoring window (axis designation) is displayed.

Monitoring stop/restart 1) When stopping or restarting monitoring, press the [F3] key.

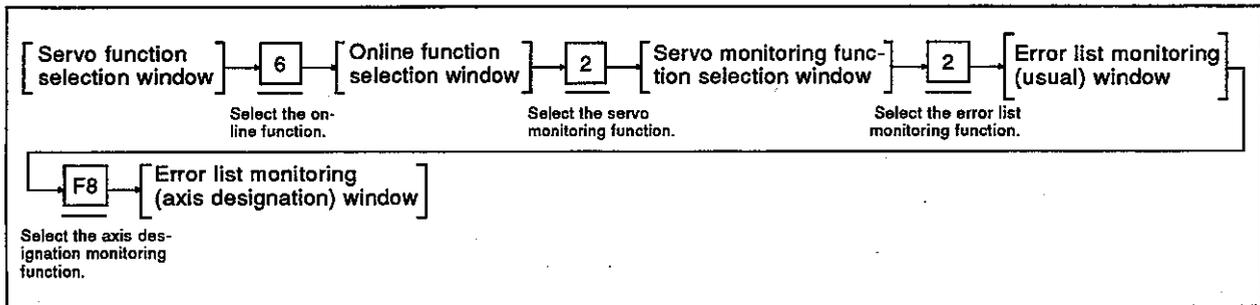
Closing the window 1) When closing the error list monitoring (usual) window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

14. MONITORING THE POSITIONING STATE

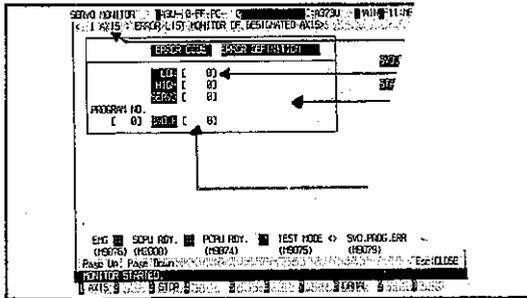
14.2.2 Error list monitoring (axis designation)

The most recent error in the designated axis is displayed.

[Procedure for displaying the error list monitoring (axis designation) window]



[Error list monitoring (axis designation) window]



[Display/setting contents explanation]

- Axis number display area** Currently monitored axis number is displayed.
- Error code display area** The error code of the current low/high/servo error and servo program setting is displayed.
- Error description display area** The description of the occurring error is displayed.
- Program number display area** Servo program number which was executed when the error occurred is displayed. (0 to 4095)

REMARKS

- The axis that is executing JOG operations, manual pulse generator operations, etc. is displayed as follows.
 - When JOG operations are being executed JOG
 - When manual pulse generator operations are being executed MAN
 - When the zero return test operation is being executed TEST
 - When a position loop gain check (servo diagnosis) is being executed } TEST
 - When position control gain 1 check (servo diagnosis) is being executed }
 - When a rotating direction check (servo start-up) is being executed TEST
 - When positioning control is not being executed Blank
- Section 14.2.1 gives details about screen display items not explained here. [Detailed explanation]

14. MONITORING THE POSITIONING STATE

Motion Controller

Switching to the usual monitoring function

- 1) When monitoring all axes, press the [F8] key.
The error list monitoring (usual) window is displayed. (See Section 14.2.1.)

Changing axis numbers

- 1) When changing the axis number that executes error list monitoring by designating an axis number, and then press the [F1] key.
The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that is currently executing error list monitoring is displayed.)
Input the monitoring axis number, and then press the [Enter] key. The axis designation is now completed and the window returns to the error list monitoring (axis designation) window.
- 2) Previous axis number/next axis number of the axis number currently displayed in the current axis number display area is displayed by pressing the [Page Up]/[Page Down] key.

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

- 1) When closing the error list monitoring (axis designation) window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

14. MONITORING THE POSITIONING STATE

14.3 Monitoring Positioning Data of a Designated Axis

This section shows how the positioning state of any axis is monitored in detail. Use this function to confirm operations during a test operation or abnormal operation.

Selection of the motor capacity can be confirmed by using the torque trace function to look at the actual load state.

(1) Types of axis monitoring function

There are 3 types of axis monitoring functions.

- Positioning monitoring Detailed data concerning positioning is monitored.
- Servo monitoring Servo data monitoring and torque trace of a designated axis is executed.
- Trace graph A trace of the position command/position droop/number of motor revolutions/motor currents/velocity command is executed, and the results displayed on a graph.

(2) Start of positioning monitoring

If "AXIS MON." is selected in the servo monitoring function selection window, the positioning monitoring window is displayed. And then, monitoring of positioning axis data set at number 1 is started.

(3) Start of servo monitoring

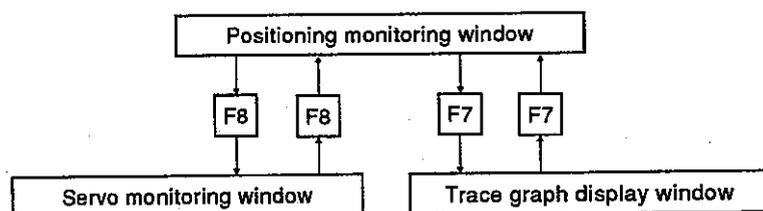
The servo monitoring window is displayed by pressing the [F8] key in the positioning monitoring window. And then, monitoring of the servo data set at the axis monitored in the positioning monitoring window is started.

(4) Trace graph display

The trace graph display window is displayed by pressing the [F7] key in the positioning monitoring window. When a trace is executed by the axis designation and trace data setting, the trace results are displayed on a graph.

(5) Positioning monitoring and switching of servo monitoring/trace graph

The positioning monitoring function and the servo monitoring function/trace graph function can be switched by the following key operations in each execution window.

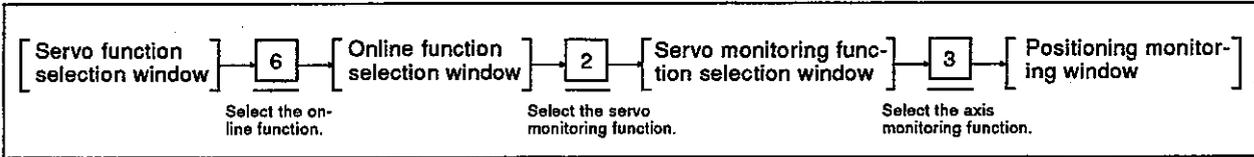


14. MONITORING THE POSITIONING STATE

14.3.1 Positioning monitoring

This section shows how positioning data set at any axis is monitored in detail.

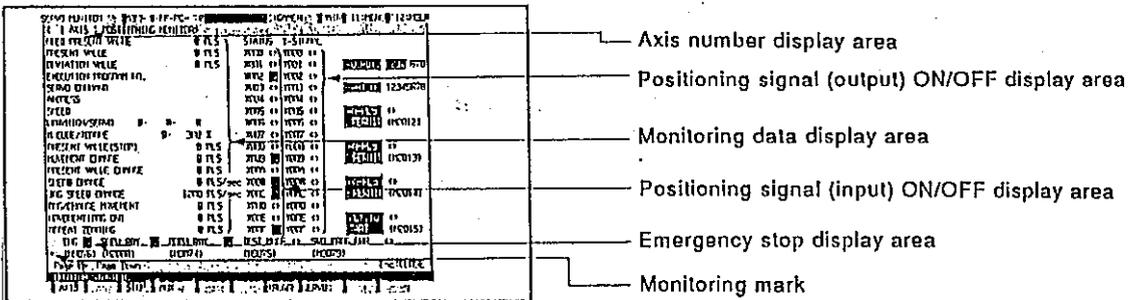
[Procedure for displaying the positioning monitoring window]



(1) Status signal and a command signal displays

Data when positioning control is executed by a PCPU and the positioning signal (status/command signal) ON/OFF state are displayed.

[Positioning monitoring window] (without a name display) (when A373/A373UCPU is used)



[Display/setting contents explanation]

- Axis number display area** Monitoring operating axis number is displayed.
- Monitoring data display area** Data when positioning control is executed by a PCPU is displayed.
 - 1) Feed present value Destination address output to the servo amplifier
 - 2) Present value Current values that actually moved
 - 3) Deviation value Disparity between feed position data and a real current value
 - 4) Execution program No. Executing servo program number
 - 5) Servo command Executing servo instruction
 - 6) Address Value after converting a unit of actually controlled data (Positioning control)
 - 7) Speed Value after converting a unit of an actually controlled velocity (Velocity control)
 - 8) Error code Error code of the most recent low/high/servo error
 - 9) M code/torque M code and torque limit value of an execution servo program

14. MONITORING THE POSITIONING STATE

Motion Controller

- 10) Present value (STOP) Real current value when a STOP signal is externally input
- 11) Movement change Changed travel distance in positioning control by the velocity-position switching control
- 12) Present value change Feed position data after changing feed position data
- 13) Speed change Velocity after changing the velocity
- 14) JOG speed change JOG operating velocity during JOG operations
- 15) DOG/CHANGE Changed travel distance in positioning control by external velocity-position switching control
- 16) Movement (DOG on) Travel distance from the near-zero-point dog ON to the zero return completion
- 17) Repeat Zeroing Re-travel distance from the stop position to the zero

Positioning signal (input) ON/OFF display area

ON/OFF of the signal that indicates the controlled condition (status) of every axis is displayed.

Positioning signal (output) ON/OFF display area

Positioning command signal ON/OFF is displayed.

Servo READY ON/OFF display area

Motor axis number whose servo READY signal is ON is highlighted.

Start receive ON/OFF display area

Motor axis number whose start receive signal is ON is highlighted.

Manual pulse generator enable display area

When positioning control can be executed by input from manual pulse generators 1 to 3, this is highlighted.

JOG operations simultaneous start command display area

When JOG operations simultaneously start, this is highlighted

PC READY ON/OFF display

When the PC READY signal (M2000) is ON, this is highlighted.

PCPU READY completion ON/OFF display

When the PCPU side does not have an error, this is highlighted.

ON/OFF display in the test mode

When the current mode is the test mode, this is highlighted.

Program setting error display

When there is an error in the positioning data of an executing servo program, this is highlighted.

Emergency stop display area

When an axis which is started is stopped due an emergency, this is highlighted.

Monitoring mark

This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

14. MONITORING THE POSITIONING STATE

[Key operations explanation]

Axis number change

- 1) When changing the axis number that executes positioning monitoring by designating the axis number, press the [F1] key. The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that is currently executing positioning monitoring is displayed.)
Input the monitoring axis number, and press the [Enter] key. The axis designation is completed and returns to the positioning monitoring window.
- 2) Previous axis number/next axis number of the axis number currently displayed in the current axis number display area is displayed by pressing the [Page Up]/[Page Down] key.

Switching the status/ command signal name display

- 1) When displaying the name of a status signal or a command signal during monitoring on a screen, display the auxiliary function selection window by pressing the [F4] key.
- 2) After selecting the name display state by using the [←]/[→] keys, either press the [Enter] key in the auxiliary function selection window or select the name display state by pressing a numeric key.
The positioning monitoring window becomes the selected name display state.
- 3) When closing a window without selecting an auxiliary function, press the [Esc] key.
The name display state of positioning monitoring window does not change.

Switching to the trace graph function

- 1) When executing a data trace and displaying trace results, press the [F7] key.
The trace graph display window is displayed (see Section 14.3.3).

Switching to the servo monitoring function

- 1) When executing servo monitoring or torque trace, press the [F8] key.
The servo monitoring window is displayed (see Section 14.3.2).

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

- 1) When closing the positioning monitoring window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

14. MONITORING THE POSITIONING STATE

(2) Status signal ON/OFF display (with status name)

Data when positioning control is executed by the PCPU and the ON/OFF state of the signal (status signal) that shows the positioning state are displayed with a status name.

[Positioning monitoring window] (with status name) (when A373/A373UCPU is used)

The screenshot shows a table of status signals with columns for signal names, their current states (ON/OFF), and their descriptions. The signals listed include: POSITION WIRE, POSITION WIRE 2, POSITION WIRE 3, POSITION WIRE 4, POSITION WIRE 5, POSITION WIRE 6, POSITION WIRE 7, POSITION WIRE 8, POSITION WIRE 9, POSITION WIRE 10, POSITION WIRE 11, POSITION WIRE 12, POSITION WIRE 13, POSITION WIRE 14, POSITION WIRE 15, POSITION WIRE 16, POSITION WIRE 17, POSITION WIRE 18, POSITION WIRE 19, POSITION WIRE 20, POSITION WIRE 21, POSITION WIRE 22, POSITION WIRE 23, POSITION WIRE 24, POSITION WIRE 25, POSITION WIRE 26, POSITION WIRE 27, POSITION WIRE 28, POSITION WIRE 29, POSITION WIRE 30, POSITION WIRE 31, POSITION WIRE 32, POSITION WIRE 33, POSITION WIRE 34, POSITION WIRE 35, POSITION WIRE 36, POSITION WIRE 37, POSITION WIRE 38, POSITION WIRE 39, POSITION WIRE 40, POSITION WIRE 41, POSITION WIRE 42, POSITION WIRE 43, POSITION WIRE 44, POSITION WIRE 45, POSITION WIRE 46, POSITION WIRE 47, POSITION WIRE 48, POSITION WIRE 49, POSITION WIRE 50, POSITION WIRE 51, POSITION WIRE 52, POSITION WIRE 53, POSITION WIRE 54, POSITION WIRE 55, POSITION WIRE 56, POSITION WIRE 57, POSITION WIRE 58, POSITION WIRE 59, POSITION WIRE 60, POSITION WIRE 61, POSITION WIRE 62, POSITION WIRE 63, POSITION WIRE 64, POSITION WIRE 65, POSITION WIRE 66, POSITION WIRE 67, POSITION WIRE 68, POSITION WIRE 69, POSITION WIRE 70, POSITION WIRE 71, POSITION WIRE 72, POSITION WIRE 73, POSITION WIRE 74, POSITION WIRE 75, POSITION WIRE 76, POSITION WIRE 77, POSITION WIRE 78, POSITION WIRE 79, POSITION WIRE 80, POSITION WIRE 81, POSITION WIRE 82, POSITION WIRE 83, POSITION WIRE 84, POSITION WIRE 85, POSITION WIRE 86, POSITION WIRE 87, POSITION WIRE 88, POSITION WIRE 89, POSITION WIRE 90, POSITION WIRE 91, POSITION WIRE 92, POSITION WIRE 93, POSITION WIRE 94, POSITION WIRE 95, POSITION WIRE 96, POSITION WIRE 97, POSITION WIRE 98, POSITION WIRE 99, POSITION WIRE 100.

[Display/setting contents explanation]

(When A273UCPU is used)

- 15) External signal DOG Goes ON when a zero return is executed (when the near-zero-point dog signal goes ON).
- 16) External signal CHANGE Turned ON when velocity-position control switching input comes ON.
- 17) Servo READY Goes ON when the servo amplifier of the designated axis goes into the READY status.

Axis number display area

Operating axis number to be monitored is displayed.

Monitoring data display area

Data when positioning control is executed by the PCPU is displayed.

Positioning signal (input) ON/OFF display area

- 1) Positioning start Goes ON when positioning control and the start of the designated axis have been completed
- 2) Positioning Goes ON when positioning control of the designated axis has been completed
- 3) In-position Goes ON when the accumulated amount in the deviation counter becomes less than the in-position range.
- 4) Command in-position Goes ON when it becomes less than the command position and the difference power command in-position range of the feed position data.
- 5) During velocity control Goes ON during velocity control control
- 6) Velocity-position switching latch Goes ON when velocity control is switched to positioning control
- 7) Zero pass Goes ON after zero pass
- 8) Error detection Goes ON when a minor/major error is detected
- 9) Servo error detection Goes ON when an error is detected on the servo amplifier side

14. MONITORING THE POSITIONING STATE

Motion Controller

- 10) Zero return Goes ON when it is necessary to confirm request a zero point address
- 11) Zero return Goes ON when zero return is completed normally
- 12) External signal Turned ON by the upper-limit limit switch FLS OFF input
- 13) External signal Turned ON by the lower-limit limit switch RLS OFF input
- 14) External signal Turned ON by the ON stop signal Stop

(When A373/A373UCPU is used)

- 15) External signal Turned ON by the velocity/positioning DOG/CHANGE control switch ONinput
- 16) Servo READY Goes ON when the servo amplifier of the designated axis goes into the READY status.

(When A273UCPU is used)

- 15) External signal Goes ON when a zero return is executed (when the near-zero-point dog signal goes ON).
- 16) External signal Turned ON when velocity-position control switching input comes ON.
- 17) Servo READY Goes ON when the servo amplifier of the designated axis goes into the READY status.

REMARK

Section 14.3.1(1) gives details about the screen display items not explained here.

14. MONITORING THE POSITIONING STATE

[Key operations explanation]

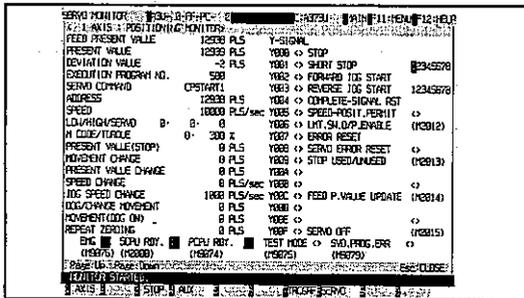
- Axis number designation**
- 1) When changing the axis number that executes positioning monitoring by designating the axis number, press the [F1] key. The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that is currently executing positioning monitoring is displayed.)
Input the monitoring axis number, and then press the [Enter] key. Axis designation has now been completed and the window returns to the positioning monitoring window.
 - 2) Previous axis number/next axis number of the axis number currently displayed in the current axis number display area is displayed by pressing the [Page Up]/[Page Down] key.
- Switching the status/
command signal name
display**
- 1) When displaying the ON/OFF state or the name of a command signal during monitoring on a screen, display the auxiliary function selection window by pressing the [F4] key.
 - 2) After selecting the name display state by using the [←]/[→] keys, either press the [Enter] key in the auxiliary function selection window, or select the name display state by using a numeric key. The positioning monitoring window becomes the selected name display state.
 - 3) When closing a window without selecting an auxiliary function, press the [Esc] key.
The name display state of the positioning monitoring window does not change.
- Switching to the trace
graph function**
- 1) When executing a data trace and displaying the trace results, press the [F7] key.
The trace graph display window is displayed (see Section 14.3.3)
- Switching to the servo
monitoring function**
- 1) When executing servo monitoring or torque trace, press the [F8] key.
The servo monitoring window is displayed (see Section 14.3.2).
- Monitoring stop/restart**
- 1) When stopping or restarting monitoring, press the [F3] key.
- Closing the window**
- 1) When closing the positioning monitoring window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

14. MONITORING THE POSITIONING STATE

- (3) Command signal ON/OFF display (with a command signal name)

Data when positioning control is executed by the PCPU and the ON/OFF state of a positioning signal (command signal) are displayed with a name.

[Positioning monitoring window] (With a command signal name) (when A373/A373UCPU is used)



[Display/setting contents explanation]

- Axis number display area** Monitoring operating axis number is displayed.
- Monitoring data display area** Data when positioning control is executed by the PCPU is displayed.
- Positioning signal (output) ON/OFF display area**
 - 1) Stop command Stops the operating axis externally
 - 2) Rapid stop Immediately stops an operating axis externally
 - 3) Forward JOG start Goes ON during JOG operations in the address increase direction.
 - 4) Reverse JOG start Goes ON during JOG operations in the address decrease direction.
 - 5) End signal OFF Turns OFF a positioning start completed signal/positioning completed signal
 - 6) Velocity-position Switches to positioning control from velocity control externally
 - 7) Limit switch output Enables a limit switch output enable
 - 8) Error reset Clears the error code storage area of a minor/major error and resets the error detection signal
 - 9) Servo error reset Clears the error code storage area of a servo error and resets the servo error detection signal
 - 10) STOP input/invalid Invalidates an external input (valid when ON and invalid when OFF)
 - 11) Feed position data Sets whether the feed position data is cleared or not cleared when starting in the velocity-position control switching mode (ON: not cleared, OFF: cleared).
 - 12) Servo OFF Puts the servo motor in the free RUN state

REMARK

Section 14.3.1(1) gives details about screen display items not explained here.

14. MONITORING THE POSITIONING STATE

[Key operations explanation]

Axis number designation

- 1) When changing the axis number that executes positioning monitoring by designating an axis number, press the [F1] key. The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that currently executes positioning monitoring is displayed.)
Input the monitoring axis number, and press the [Enter] key. The axis designation has now been completed and the window returns to the positioning monitoring window.

- 2) Previous axis number/next axis number of the axis number currently displayed in the current axis number display area is displayed by pressing the [Page Up]/[Page Down] key.

Switching the status/command signal name display

- 1) When displaying the ON/OFF state or the name of a status signal during monitoring on a screen, display the auxiliary function selection window by pressing the [F4] key.
- 2) After selecting the name display state by using the [←]/[→] keys, either press the [Enter] key in the auxiliary function selection window, or select the name display state by using a numeric key. The positioning monitoring window becomes the selected name display state.
- 3) When closing a window without selecting an auxiliary function, press the [Esc] key.
The name display state of the positioning monitoring window does not change.

Switching to the trace graph function

- 1) When executing a data trace and displaying trace results, press the [F7] key.
The trace graph display window is displayed (see Section 14.3.3).

Switching to the servo monitoring display function

- 1) When executing servo monitoring or a torque trace, press the [F8] key.
The servo monitoring window is displayed (see Section 14.3.2).

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

- 1) When closing the positioning monitoring window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

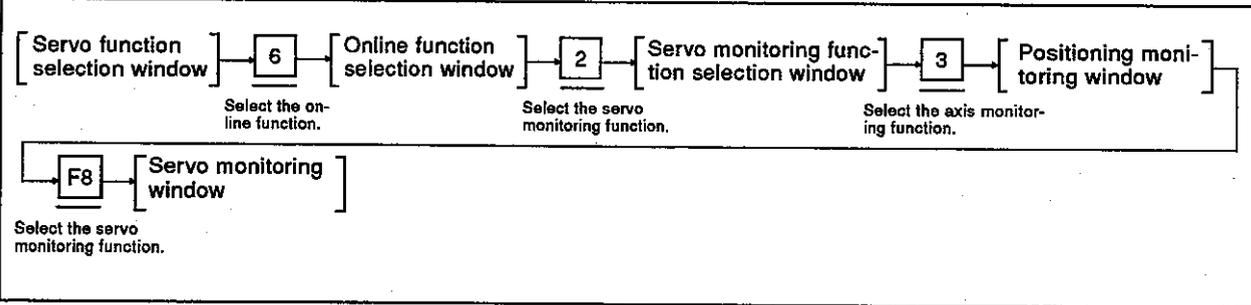
14. MONITORING THE POSITIONING STATE

14.3.2 Servo monitoring

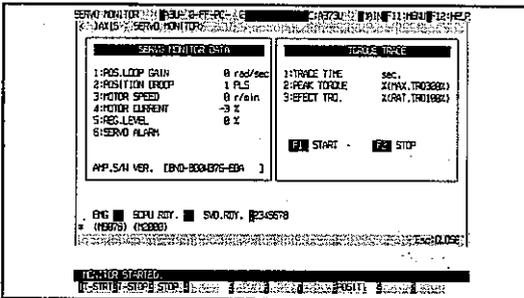
This section shows how the servo motor of an axis designated in positioning monitoring window is monitored. In addition, a torque trace is executed and the result is displayed.

Change the monitoring axis number in the positioning monitoring window.

[Procedure for displaying the servo monitoring window]



[Servo monitoring window] (when ADU, MR-SB/SD is used)



[Display/setting contents explanation]

Axis number display area Axis number designated in the positioning monitoring window is displayed.

Servo monitoring data display area Data about the servo motor/amplifier is displayed.

- 1) Position loop gain..... Velocity of a control response during positioning control (when ADU, MR-SB/SD is used), or, Position control gain (when MR-H-B/MR-J-B is used)
- 2) Position droop Real current value error for feed position data
- 3) Motor speed..... Real number of revolutions of a servo motor
- 4) Motor current Motor current when the rated current is set to 100%
- 5) Regenerative level Data to supervise the regenerative resistance load
- 6) Servo alarm Alarms detected on the servo amplifier side (max. 2 alarms are displayed.)
- 7) Amp. S/W version..... The servo amplifier software version

14. MONITORING THE POSITIONING STATE

Motion Controller

Torque trace result display area	Torque trace result that an operation was actually executed is displayed. Confirm the load situation of an actual servo amplifier. 1) Trace time Time from the trace start to the trace stop 2) Peak torque Max. torque in the torque trace when the rated torque is set to 100% 3) Effect torque Effective torque in the torque trace when the rated torque is set to 100%
PC READY ON/OFF display	When the PC READY signal (M2000) goes ON, this is highlighted.
Servo READY ON/OFF display area	The motor axis number whose READY signal is ON is highlighted.
Emergency stop display area	When an axis which is started is stopped because of an emergency, this is highlighted.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

Execution of torque trace	1) When starting a torque trace, press the [F1] key. "TRACING" is displayed in the message area. 2) When stopping a torque trace, press the [F2] key. "COMPLETED" is displayed in the message area, and the trace results are displayed in the torque trace result display area.
Switching to the positioning monitoring function	1) When executing positioning monitoring, press the [F8] key. The window returns to the positioning monitoring window.
Monitoring stop/restart	1) When stopping or restarting monitoring, press the [F3] key.
Closing the window	1) When closing the servo monitoring window, press the [Esc] key. The window returns to the servo monitoring function selection window.

POINTS

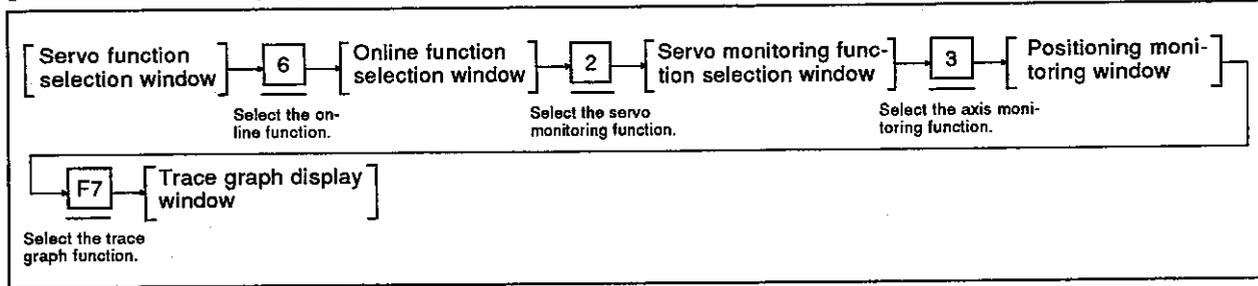
- (1) Stopping the torque trace
 - Since other functions cannot be executed during a torque trace, execute other functions after stopping a trace by pressing the [F2] key.
- (2) Torque trace time
 - The max. time that a trace can be executed is 1 hour, 2 minutes, and 8 seconds.
 - If the trace is not stopped (when the [F2] key is not pressed), even if the trace time exceeds 1 hour, 2 minutes, and 8 seconds, the torque trace will be stopped automatically.
- (3) Confirming the servo READY signal is ON
 - Execute a torque trace after confirming that the servo READY signal of the corresponding axis is turned ON in the servo READY ON/OFF display area.
If the [F1] key is pressed when the servo READY signal is turned OFF, the "CANNOT EXECUTE, SERVO READY OFF" message is displayed, and the torque trace is not executed.

14. MONITORING THE POSITIONING STATE

14.3.3 Trace graph

A max. of 3 data items from the position command/position droop/number of motor revolutions/motor current/velocity command for a designated axis can be traced, and the results are displayed on a graph.

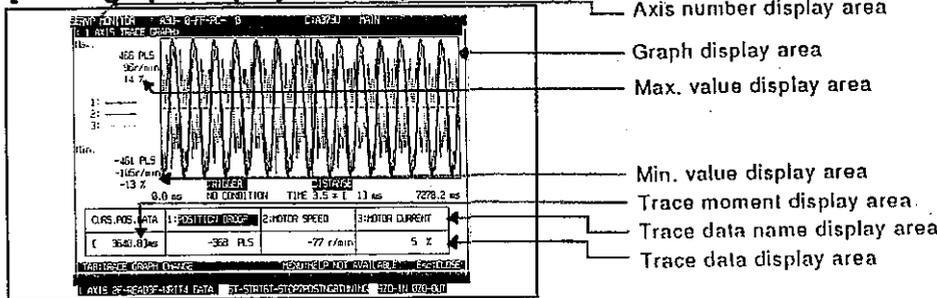
[Procedure for displaying the trace graph display window]



(1) Trace graph display

This section explains the execution of the data trace and the graph display of trace results.

[Trace graph display window]



[Display/setting contents explanation]

Axis number display area Axis number that executes the data trace is displayed.

Graph display area Designated trace data is displayed as a graph.

- 1) Data 1 Trace graph of the data name displayed on the left side of the trace data name display area
- 2) Data 2 Trace graph of the data name displayed in the middle of the trace data name display area
- 3) Data 3 Trace graph of the data name displayed on the right side of the trace data name display area
- 4) Vertical axis cursor... The trace moment when data is picked up is shown.
- 5) Horizontal cursor The value of data denoting the position of a zero.

14. MONITORING THE POSITIONING STATE

Motion Controller

Max. value display area	The max. values of data 1, data 2, and data 3 during tracing is displayed.
Min. value display area	The min. values of data 1, data 2 and data 3 during tracing is displayed.
Trace data name display area	The data name (data 1 to 3) selected as tracing data in the trace data setting window is displayed. The data (graph) name that can be scrolled up and down is highlighted.
Trace moment display area	A trace moment of data selected by the vertical axis cursor from trace time (data trace moment within the trace times between trace start and trace stop) is displayed.
Trace data display area	Data selected by the vertical axis cursor is displayed.
Trigger condition display area	The data trace start time and start condition are displayed.
Trace interval display area	Trace interval (msec) is displayed.
Trace time display area	The first trace moment and the last trace moment of a graph displayed on a graph display area within the trace time between data trace start and data trace stop are displayed.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

Change of axis number	<ol style="list-style-type: none">1) When changing the axis number that executes a data trace by designating axis number, press the [F1] key. (When the trace graph display window is opened from the positioning monitoring window, the axis number that was selected in the positioning monitoring window is set.) The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the currently designated axis is displayed.)2) Input the axis number that executes the data trace, and then press the [Enter] key. The axis designation has now been completed and the window returns to the trace graph display window.
Setting of trace data	<ol style="list-style-type: none">1) When setting the type of trace data, the trace start condition, or the trace interval, press the [F4] key. The trace data setting window is displayed (see Section 14.3.3 (2)).
Trace start	<ol style="list-style-type: none">1) When starting the data trace, press the [F5] key. The trace execution YES/NO selection dialog box is displayed.2) To execute the data trace, press the [←] key to highlight "YES" and then press the [Enter] key. The trace is started on the basis of data set in the trace data setting window.3) To abort the data trace, press the [Enter] key while "NO" is highlighted.
Trace stop	<ol style="list-style-type: none">1) When completing the data trace, press the [F6] key. The data trace is stopped, and the trace results are displayed in the graph display area as a graph.

14. MONITORING THE POSITIONING STATE

Motion Controller

Writing to a file

- 1) When writing the trace results to a file, press the [F3] key. The writing execution YES/NO selection dialog is displayed.
- 2) Press the [Enter] key when "YES" is highlighted. The trace result displayed on the trace graph display window is written, and the window returns to the trace graph display window.
- 3) When not executing file writing, press the [Enter] key after highlighting "NO" by pressing the [→] keys.

Reading from a file

- 1) When reading the trace result written by the file writing function from a file and displaying it in a graph, press the [F2] key. The read execution YES/NO selection dialog is displayed.
- 2) When "YES" is highlighted, press the [Enter] key. The window returns to the trace graph display window. (Read data is displayed in the window.)
- 3) When not executing a file read, press the [Enter] key after highlighting "NO" by pressing the [→] keys.

Data pickup (movement of the vertical cursor)

- 1) When displaying the value of data currently displayed in a window in the trace data display area, move the vertical cursor to the value to be displayed within the trace time by pressing the [←]/[→] keys. The trace data for a displayed graph and the vertical cursor cross is displayed in the trace data display area.
- 2) If the vertical cursor is moved to the left or right side of the graph display area, the screen scrolls to the left or the right.

Horizontal scrolling of the screen

- 1) When scrolling data (graph) currently displayed on a window to the right or left, press the [←]/[→] keys while pressing the [Shift] key.

Vertical scrolling of the screen (movement of the side cursor)

- 1) When selecting the data to be vertically scrolled from data 1 to 3 displayed in the graph display area, press the [Tab] key.
- 2) When the [Tab] key is pressed, the highlighted position moves from the left to the right. The currently selected data name is highlighted.
- 3) When scrolling currently selected (graph) data vertically, press the [↑]/[↓] keys. Only currently selected data is vertically scrolled. (Other data does not move.)

POINTS

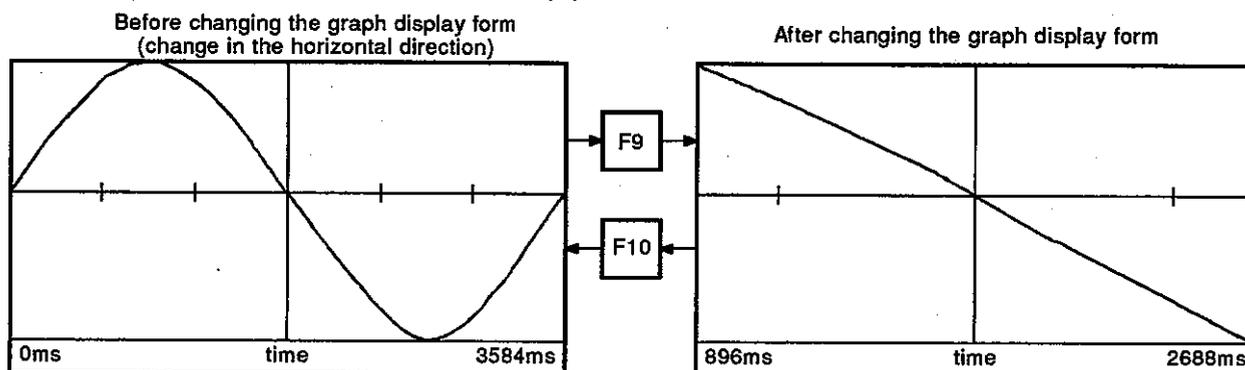
- (1) Storage of trace results
 - When a trace graph display window is closed, the data trace results executed in this window are cleared.
 - To store trace results, write data to a file by using the file writing function of the trace graph function before closing the window.
- (2) Restrictions when the trace graph display window is opened
 - Even when the [F11] key is pressed, the menu selection window will not be displayed.
 - The HELP function cannot be used.
- (3) Trace stop
 - Since other functions cannot be executed during trace operations, execute other functions after stopping the trace operation by pressing the [F6] key.

14. MONITORING THE POSITIONING STATE

Motion Controller

Change of the graph display form (wide/narrow in the horizontal direction)

- 1) When displaying data (graph) currently displayed in the window at double size horizontally, press the [F9] key.
Whenever the [F9] key is pressed, the graph is displayed at double size horizontally, as compared with the previous display. (Enlarged displays are disabled when the trace time is 0 to 7 msec.)
- 2) When reducing a graph enlarged by the [F9] key horizontally by half, press the [F10] key.
Whenever the [F10] key is pressed, a graph is displayed at half-size horizontally as compared with the previous display. (Reduced display are disabled except between trace start and trace stop.)



Changing the graph display form (tall/short in the vertical direction)

- 1) When displaying data (graph) currently displayed in the window vertically at double size, press the [F9] key while pressing the [Shift] key.
Whenever the [F9] key is pressed while pressing the [Shift] key, the graph is displayed at double-size vertically.
- 2) When displaying a graph enlarged by the [Shift] + [F9] keys at half-size vertically, press the [F10] key after pressing the [Shift] key.
Whenever the [F10] key is pressed after pressing the [Shift] key, the graph is displayed at half-size vertically. (Reduced display of a data axis outside the range of the max. to the min. value is disabled.)

Switching to the tuning function

- 1) When it is necessary to change the following servo parameter after executing a data trace, press the [F8] key.
 - Position loop gain (or position control gain 1)
 - Velocity loop gain (or velocity control gain 1)
 - Velocity integration compensation
 - Feed forward coefficientThe tuning window is displayed (see Section 14.3.3 (3)). Change the set value in the tuning window.

Switching to the positioning monitoring function

- 1) When switching to the positioning monitoring function, press the [F7] key.
The positioning monitoring window (without a name display) is displayed. And then, monitoring of an axis selected in the trace graph display window is started.

Closing the window

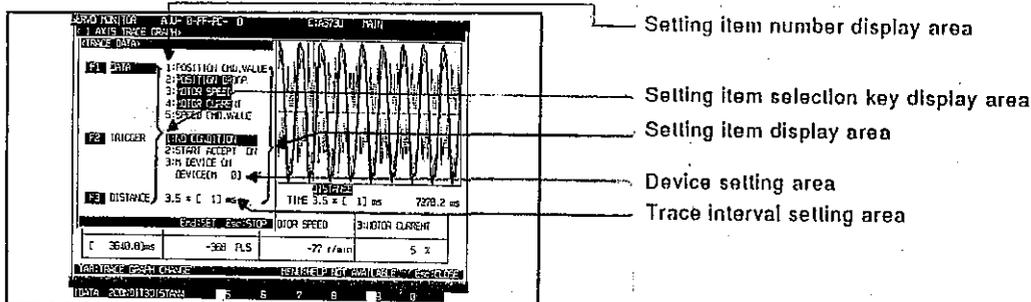
- 1) When closing the trace graph display window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

14. MONITORING THE POSITIONING STATE

(2) Setting of trace data

The type of data that executes a data trace, the conditions for starting a trace, and the interval in which a trace is executed are set.

[Trace data setting window]



[Display/setting contents explanation]

Setting item selection key display area	The key to select the setting item is displayed.
Setting item display area	The required setting item (setting item) to execute a data trace is displayed.
Selectable item number display area	Selectable item numbers for each setting item are displayed.
Selectable item display area	Selectable items for each setting item are displayed.
Device setting area	When designating the leading edge of device M as the trace start trigger, set a device number.
Trace interval setting area	Set the data trace execution interval.

[Key operations explanation]

- Setting of the data type**
- 1) When setting the type of trace data, press the [F1] key. "DATA" and "1" of the selectable item display area are highlighted.
 - 2) Highlight the selectable item number of the trace data name with the [↑]/[↓] keys, and then press the [Enter] key. The selectable item (data name) is highlighted.
 - 3) Although all trace data names can be highlighted by repeating step 2), only 3 items can be selected.
 - 4) When a selectable item has been selected, close the window either by selecting other setting items or pressing the [End] key.
 - 5) When canceling data trace setting of a selectable item, highlight the selected item number that cancels the setting by pressing the [↑]/[↓] keys, and then press the [Enter] key. The window returns to highlighted selected item data name normal display, and the setting is canceled.

14. MONITORING THE POSITIONING STATE

Motion Controller

Setting of the trigger condition

- 1) When setting the condition for starting a data trace, press the [F2] key. "TRIGGER" and "1" of the selectable item display area are highlighted.
- 2) Highlight the condition for starting the trace by using the [↑]/[↓] keys.
 - When starting a data trace by "T-START" of the trace graph display function, select "NO CONDITION".
 - When starting a data trace by having the start receive signal ON, select "START ACCEPT ON".
 - When starting a data trace by the leading edge of a designated device, select "M DEVICE ON".
- 3) When "M DEVICE ON" is selected as the trigger condition, confirm the selection by pressing the [Enter] key. The cursor lights in the device setting area. Input a device number and confirm it by pressing the [Enter] key.
- 4) When confirming the selected trigger condition, select other setting items or close the window by pressing the [End] key.

Setting of a trace interval

- 1) When setting the trace data interval, press the [F3] key. "DISTANCE" is highlighted, and the cursor lights in the trace interval setting area.
- 2) To decide the trace interval, input a multiple (interval is multiplied by 3.5 msec), and press the [Enter] key. The setting range is 1 to 256.

End of setting

- 1) When writing set data and closing the trace data setting window, press the [End] key. The window returns to the trace graph display window, and data set at the trace data name display area/trigger condition display area/trace interval display area is displayed.

Interruption of setting

- 1) When closing the trace data setting window without writing set data, press the [Esc] key. The window returns to the trace graph display window.

14. MONITORING THE POSITIONING STATE

(3) Tuning

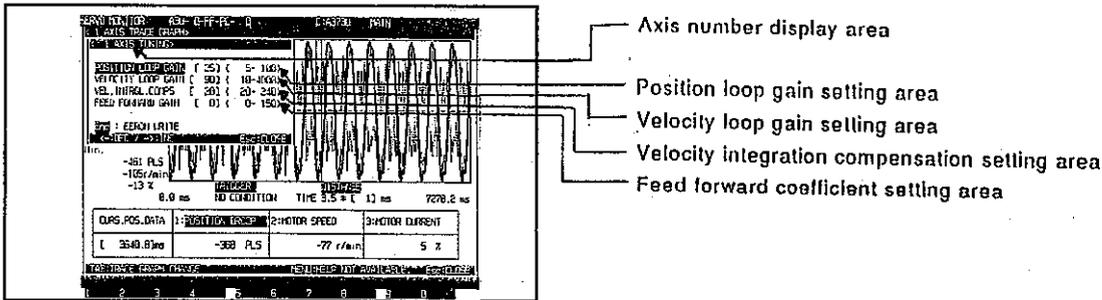
(a) When ADU, MR-SB/SD is used

The following servo parameters can be changed:

- Position loop gain values
- Velocity loop gain values
- Velocity integration compensation values
- Feed forward coefficients

Change set values in accordance with results of the data trace.

[Tuning window]



[Display/setting contents explanation]

- | | |
|---|--|
| Axis number display area | The axis number whose servo parameter is changed (axis number set in the trace graph display window) is displayed. |
| Position loop gain setting area | The position loop gain set at an ADU, an MR-SB/SD and the position loop gain after the change are displayed. |
| Velocity loop gain setting area | The velocity loop gain set an ADU, an MR-SB/SD and a velocity loop gain after the change are displayed. |
| Velocity integration compensation setting area | The velocity integration compensation set at an ADU, an MR-SB/SD and the velocity integration compensation after the change are displayed. |
| Feed forward coefficient setting area | The feed forward coefficient set at an ADU, an MR-SB/SD and the feed forward coefficient after the change are displayed. |

14. MONITORING THE POSITIONING STATE

Motion Controller

POINTS

- (1) Setting range of the servo parameter is set
The setting range of servo parameters differs among an ADU and an MR-SB/SD as follows.

Amplifier classifications Servo parameters	A373/A373UCPU		A273UCPU
	ADU	MR - SB/SD	ADU
Position loop gain	1 to 999 (5 to 100)	1 to 999 (1 to 9999)	1 to 999 (5 to 100)
Velocity loop gain	1 to 4999 (10 to 4000)	1 to 9999 (20 to 9999)	1 to 9999 (10 to 4000)
Velocity integration compensation	20 to 240 (20 to 240)	1 to 9999 (1 to 9999)	1 to 999 (2 to 240)
Feed forward coefficient	0 to 150 (0 to 150)	0 to 100 (0 to 100)	0 to 150 (0 to 150)

* The figures in parentheses indicate the effective range. If a setting outside the effective range is made, a servo error occurs.

- (2) Setting and display of a feed forward coefficient
Set the feed forward coefficient in the tuning window in 1% units. When a feed forward coefficient is set in 0.1% units in the servo data setting mode, the coefficient is displayed by rounding off numbers less than 1%.

[Key operations explanation]

Change of data

- 1) Highlight the item which a set value is changed by using the [↑]/[↓] keys.
- 2) Input data by using the numeric key or adjust the set value by using the [←]/[→] keys.
Values are added or subtracted in units of 1 by pressing the [←]/[→] keys.
- 3) Press the [Enter] key after changing all set values to be changed by repeating steps 1) and 2).
A range check of the set data is executed.
If the check is completed normally, the new data is written to an ADU and MR-SB/SD of the designated axis.
When the writing has been completed, the "COMPLETED" message is displayed, and the window closes.
When the "OUT OF RANGE SETTING" message is displayed, a value outside the range has been set. Reset a value.

Writing data to an EEROM

- 1) Open the tuning window by pressing the [F8] key if there are no problems with the data trace result after changing data.
- 2) Press the [End] key, and write the data to be changed to a servo system CPU EEROM.
When writing is completed, the "COMPLETED" message is displayed, and the window returns to the data trace graph display window.
When the "WRITE-IN ERROR" message is displayed, this means the servo system CPU EEROM is faulty.
When the "CANNOT WRITE. PC READY (M2000) ON" message is displayed, the PC READY signal is turned ON. Re-execute writing after turning OFF the signal.

Closing the window

- 1) When closing the tuning window without changing a set value, press the [Esc] key.
The window returns to the data trace graph display window.

POINTS

- (1) When not writing data to an EEROM
If any of the following operations are executed without writing new data to the servo system CPU EEROM after changing the set value in the tuning window, the new data is cleared:
 - The power supply of servo system CPU is turned ON.
 - The PC READY signal (M2000) is turned ON.
 - Servo error reset
 - Switching to the test mode is executed in the OFF state of PC READY signal (M2000).Be sure the new data is written to the servo system CPU EEROM in the tuning window when operating an axis designated by the new data.
- (2) When writing new data to an EEROM
When writing new data to a servo system CPU EEROM, execute writing after confirming that the PC READY signal (M2000) is OFF.

14. MONITORING THE POSITIONING STATE

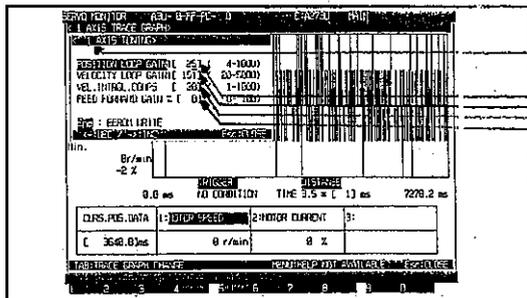
(b) When using MR-H-B/MR-J-B

The following servo parameters can be changed.

- Position control gain 1 values
- Velocity control gain 1 values
- Velocity integration compensation values
- Feed forward coefficients

Change set values in accordance with the results of the data trace.

[Tuning window]



- Axis number display area
- Position control gain 1 setting area
- Velocity control gain 1 setting area
- Velocity integration compensation setting area
- Feed forward coefficient setting area

[Display/setting contents explanation]

- Axis number display area** The axis whose servo parameter is changed (axis number set in the trace graph display window) is displayed.
- Position control gain 1 setting area** The position control gain 1 set at an MR-H-B/MR-J-B, and the position control gain 1 after the change, are displayed.
- Velocity control gain 1 setting area** The velocity control gain 1 set at an MR-H-B/MR-J-B, and the velocity control gain 1 after the change, are displayed.
- Velocity integration compensation setting area** The velocity integration compensation set at an MR-H-B/MR-J-B, and the velocity integration compensation after the change, are displayed.
- Feed forward coefficient setting area** The feed forward coefficient set at an MR-H-B/MR-J-B, and the feed forward coefficient after the change, are displayed.

POINT

(1) Setting ranges for servo parameters
The setting ranges for servo parameters are indicated below.

Servo parameters	A273UCPU	
	MR-H-B	MR-J-B
Position control gain 1	1 to 9999 (4 to 1000)	
Velocity control gain 1	1 to 9999 (20 to 5000)	
Velocity integration compensation	1 to 9999 (1 to 1000)	
Feed forward coefficient	0 to 100	

* The figures in parentheses indicate the effective range. If a setting outside the effective range is made, a servo error occurs.

14. MONITORING THE POSITIONING STATE

Motion Controller

[Key operations explanation]

Change of data

- 1) Highlight the item which a set value is changed by using the [↑]/[↓] keys.
- 2) Input data by using the numeric key or adjust the set value by using the [←]/[→] keys.
Values are added or subtracted in units of 1 by pressing the [←]/[→] keys.
- 3) Press the [Enter] key after changing all set values to be changed by repeating steps 1) and 2).
A range check of the set data is executed.
If the check is completed normally, the new data is written to an MR-H-B/MR-J-B of the designated axis.
When the writing has been completed, the "COMPLETED" message is displayed, and the window closes.
When the "OUT OF RANGE SETTING" message is displayed, a value outside the range has been set. Reset a value.

Writing data to an EEROM

- 1) Open the tuning window by pressing the [F8] key if there are no problems with the data trace result after changing data.
- 2) Press the [End] key, and write the data to be changed to a servo system CPU EEROM.
When writing is completed, the "COMPLETED" message is displayed, and the window returns to the data trace graph display window.
When the "WRITE-IN ERROR" message is displayed, this means the servo system CPU EEROM is faulty.
When the "CANNOT WRITE. PC READY (M2000) ON" message is displayed, the PC READY signal is turned ON. Re-execute writing after turning OFF the signal.

Closing the window

- 1) When closing the tuning window without changing a set value, press the [Esc] key.
The window returns to the data trace graph display window.

POINTS

(1) When not writing data to an EEROM

If any of the following operations are executed without writing new data to the servo system CPU EEROM after changing the set value in the tuning window, the new data is cleared:

- The power supply of servo system CPU is turned ON.
- The PC READY signal (M2000) is turned ON.
- Servo error reset
- Switching to the test mode is executed in the OFF state of PC READY signal (M2000).

Be sure the new data is written to the servo system CPU EEROM in the tuning window when operating an axis designated by the new data.

(2) When writing new data to an EEROM

When writing new data to a servo system CPU EEROM, execute writing after confirming that the PC READY signal (M2000) is OFF.

14. MONITORING THE POSITIONING STATE

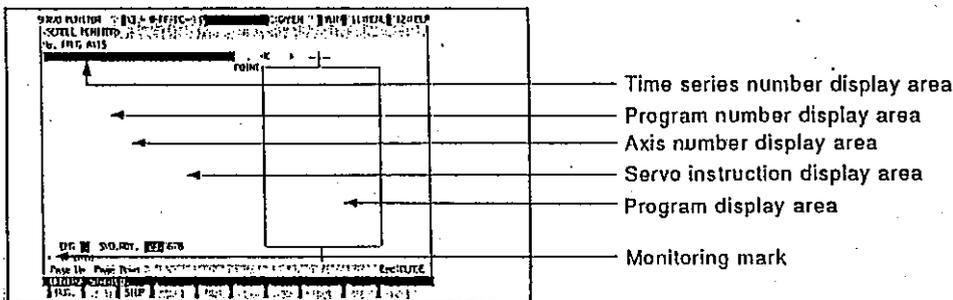
14.4 Scroll Monitoring

The servo program being executed and the previous Max. 15 servo instructions are displayed as a list in the order of execution.

When the new servo program is executed, the servo instruction is displayed in the lowest line. The servo program that was executed is scrolled up by 1 line. (When 15 servo program lines are already displayed, the servo program displayed on the top line is erased.)

If "SCROLL MONITOR" is selected in the servo monitoring function selection window, scroll monitoring starts.

[Scroll monitoring window]



[Display/setting contents explanation]

Time series number display area	The order of execution of servo programs displayed during monitoring is displayed. The highest number is the most recently executed servo program.
Program number display area	The number of the servo program being executed is displayed. (0 to 4095)
Axis number display area	Axis number used in the servo instruction displayed on the right side is displayed. This becomes blank when the START instruction is executed.
Servo instruction display area	The servo instruction used with an executed servo program is displayed. When a zero return test operation/position loop gain check (position control gain 1) is executed in the servo test mode, "TEST" is displayed. The START instruction is displayed on two lines.
Program display area	Positioning data of a servo instruction selected from the servo program listing is displayed.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

14. MONITORING THE POSITIONING STATE

[Key operations explanation]

Program read

- 1) When reading the contents of a listed execution servo program, press the [F1] key.
Monitoring is stopped, and the monitoring mark vanishes from the top of a window.
- 2) Select the servo program to be read from the list by using the [↑]/[↓] keys, and then press the [Enter] key.
The contents of the selected servo program are read to the program display area.
Scroll the servo program by pressing [Page Up]/[Page Down] keys if all the read servo programs cannot be displayed in the program display area, and confirm the contents.
- 3) When the START instruction is selected by using the [↑]/[↓] keys, select the servo program number to be read by using the [←]/[→] keys, and press the [Enter] key.
The contents of the selected servo program are read to the program display area.
- 4) When reading the contents of another servo program, repeat steps 2) and 3).
The read contents are cleared by pressing the [Enter] key, and then the contents of the selected servo program are displayed.

Monitoring stop/restart

- 1) When stopping or restarting monitoring, press the [F3] key.

Closing the window

- 1) When closing the scroll monitoring window, press the [Esc] key.
The window returns to the servo monitoring function selection window.

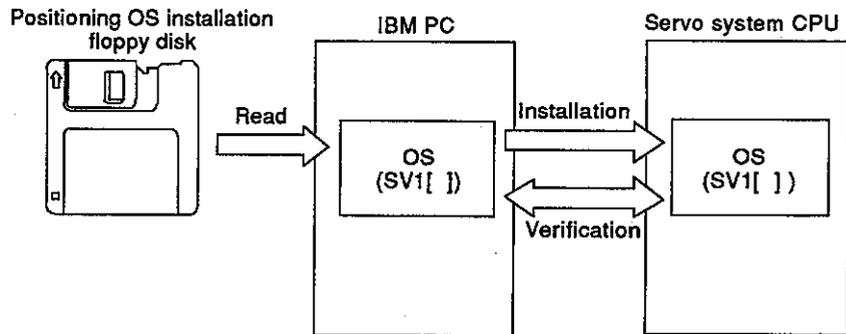
15. INSTALLING AND VERIFYING A POSITIONING OS *Motion Controller*

15. INSTALLING AND VERIFYING A POSITIONING OS

A servo system CPU can write an internal positioning OS (operating system) by using the IBM PC.

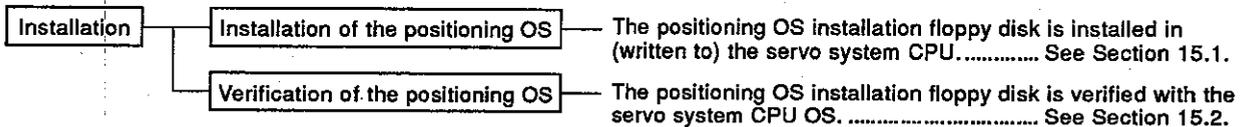
The positioning OS is stored to a floppy disk (SW1SRX-SV13[]) for installation. Installation and verification can be executed by the IBM PC started up by the GSV[][]PE.

- Installation is writing the positioning OS from an IBM PC to a servo system CPU.
The servo system CPU executes positioning control by using the installed positioning OS.
- Verification is executed between the positioning OSs installed in the servo system CPU and IBM PC.



(1) General description of functions

The installation mode of the GSV[][]PE contains the following functions:



15. INSTALLING AND VERIFYING A POSITIONING OS *Motion Controller*

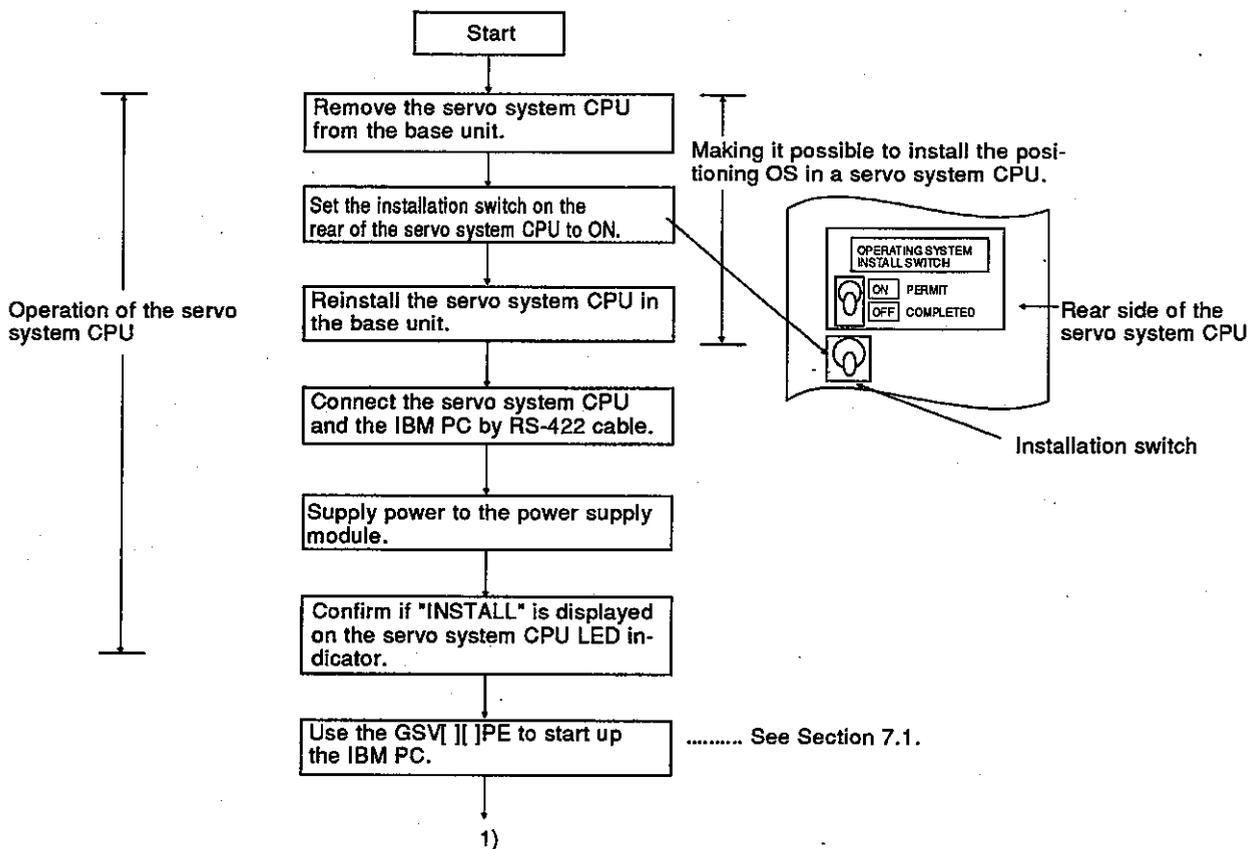
15.1 Installing a Positioning OS

(1) Installation is executed in the following cases:

- When changing the positioning OS installed in a servo system CPU into the positioning OS of a different model name
- When changing to a newer version positioning OS version following the update of a positioning OS

(2) Installation procedure

This section shows the procedure for installing the positioning OS in the servo system CPU.



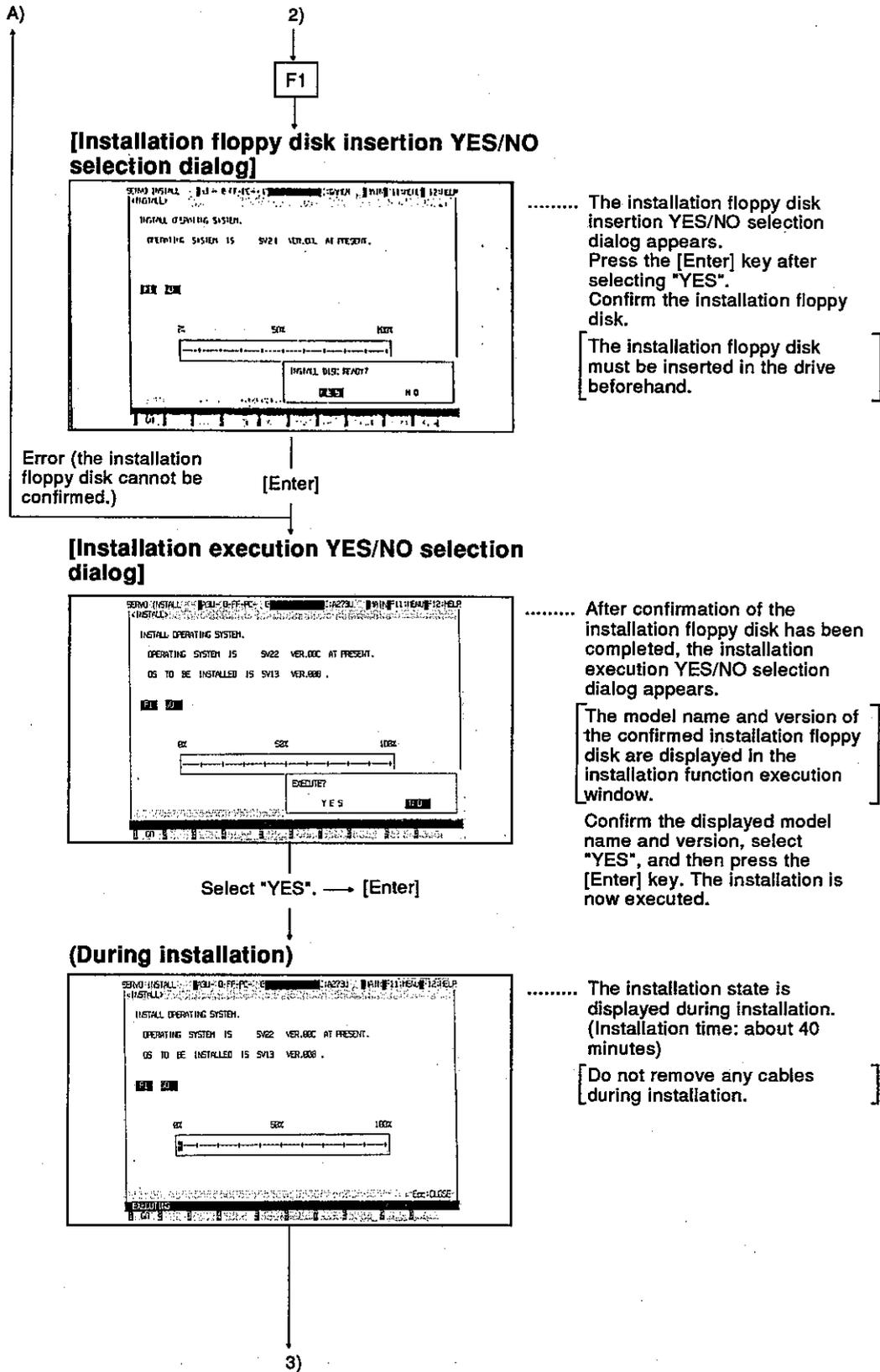
POINTS

- (1) The positioning OS is installed when the servo system CPU is shipped. Execute the installation after confirming the model name and version of the positioning OS installed in the servo system CPU.
- (2) Even when installation is executed, positioning data and a servo programs written to a servo system CPU are not rewritten.

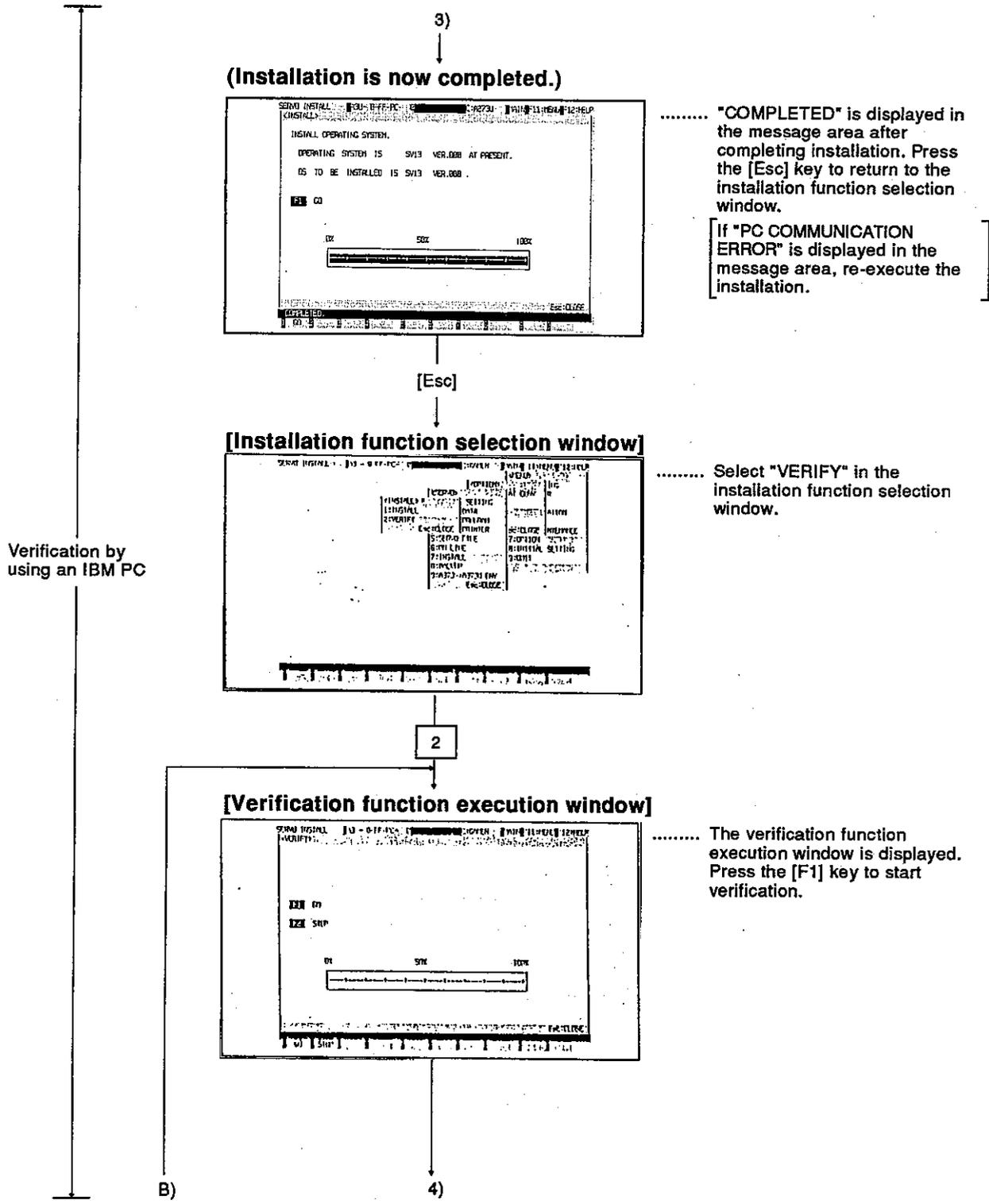
15. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller

Installation by using an IBM PC



15. INSTALLING AND VERIFYING A POSITIONING OS *Motion Contoroller*



15. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller

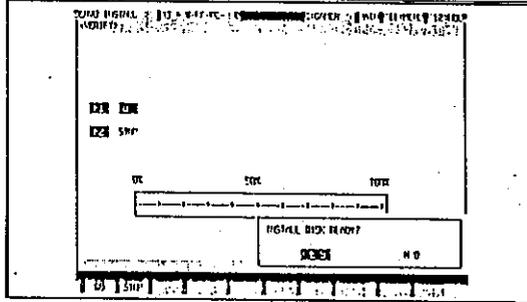
Verification by using an IBM PC

B)

4)

F1

[Verification floppy disk insertion YES/NO selection dialog]



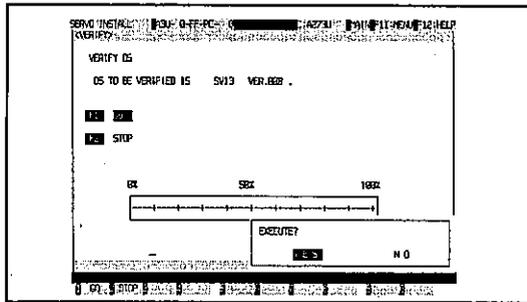
..... The verification floppy disk insertion selection dialog YES/NO is displayed. Press the [Enter] key after selecting "YES". Confirm the verification floppy disk.

[The verification floppy disk must be inserted in the drive beforehand.]

Error (the verification floppy disk cannot be confirmed.)

[Enter]

[Verification execution YES/NO selection dialog]

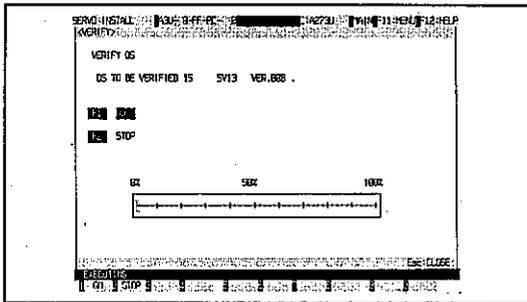


..... When confirmation of a verification floppy disk has been completed, the verification execution YES/NO selection dialog appears and the model name and version of the confirmed verification floppy disk are displayed in the verification function execution window.

Confirm the displayed model name and version, select "YES", and then press the [Enter] key. The verification is now executed.

[Enter]

(During verification)



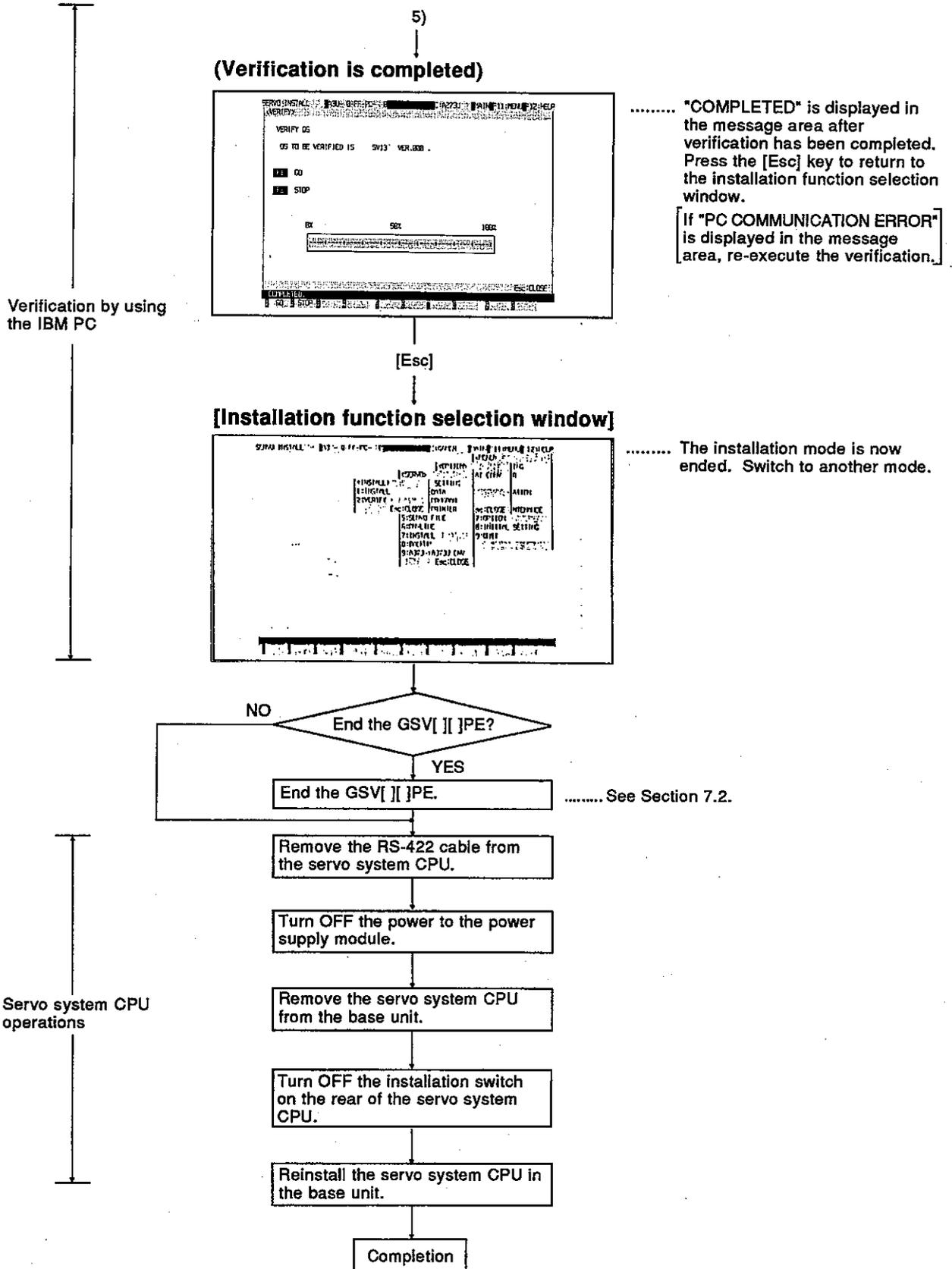
..... The verification state is displayed during verification. (Verification time: about 30 minutes)

[Do not remove any cables during verification. Press the [F2] key to interrupt verification. The interruption execution YES/NO selection dialog appears, and execution is temporarily interrupted. Select "YES" to interrupt. Select "NO" to continue]

5)

15. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller



15. INSTALLING AND VERIFYING A POSITIONING OS

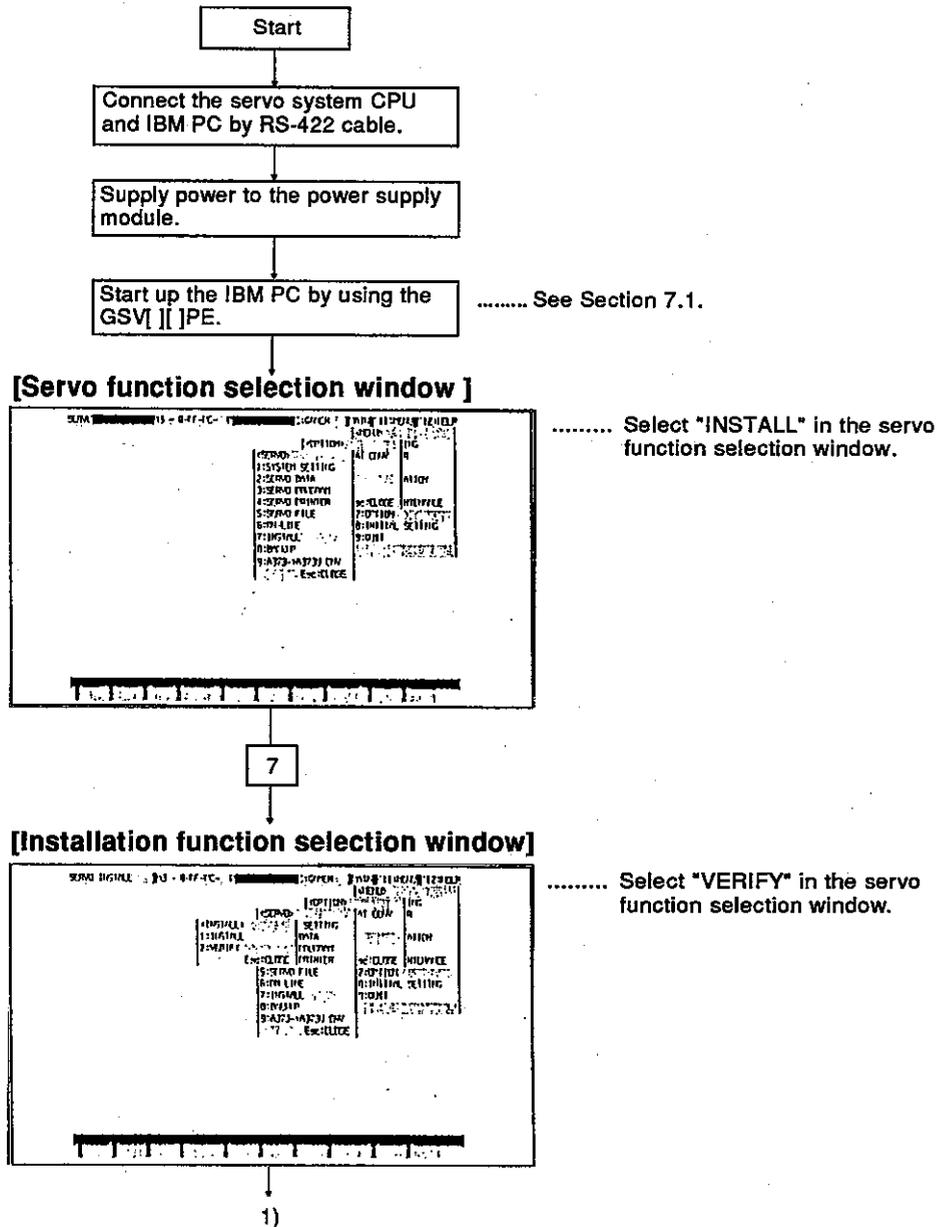
Motion Controller

15.2 Positioning OS Verification

This section shows the procedure for verification when a positioning OS installed in a servo system CPU.

(1) Procedure for verification

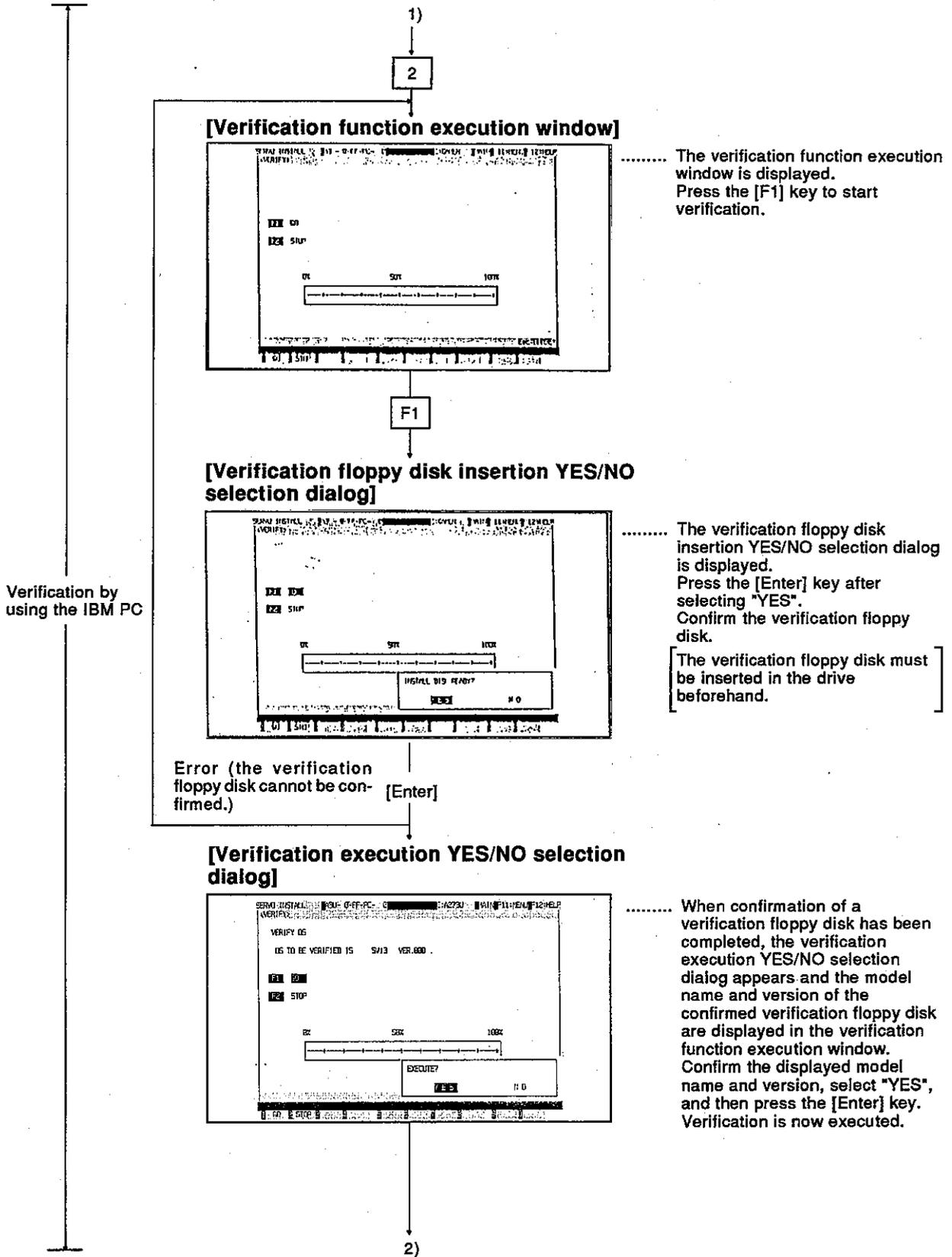
The following shows the procedure for verification when positioning OSs are installed in the servo system CPU and IBM PC.



POINTS	<p>(1) Verification of positioning OS can be executed independently of the ON/OFF state of the installation switch of the servo system CPU.</p> <p>(2) If "DATA MISMATCH" is displayed in the message area, verification cannot be executed.</p>
---------------	--

15. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller



16. BACKUP FUNCTION

16. BACKUP FUNCTION

The backup function is used to store (read) data in a servo system CPU to a backup file and to load (write) backup file data to a servo system CPU by when the servo system CPU is connected to an IBM PC.

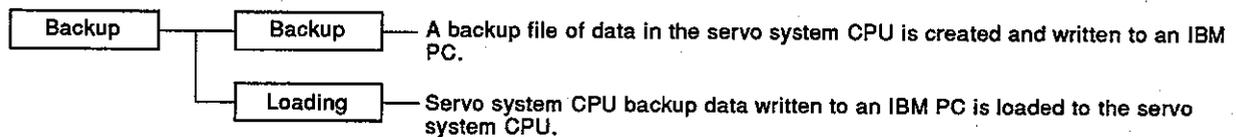
The following 4 kinds of data can be stored to a backup file:

- System set data
- Positioning data
- Servo program data
- Necessary data for zero return in the servo system CPU

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

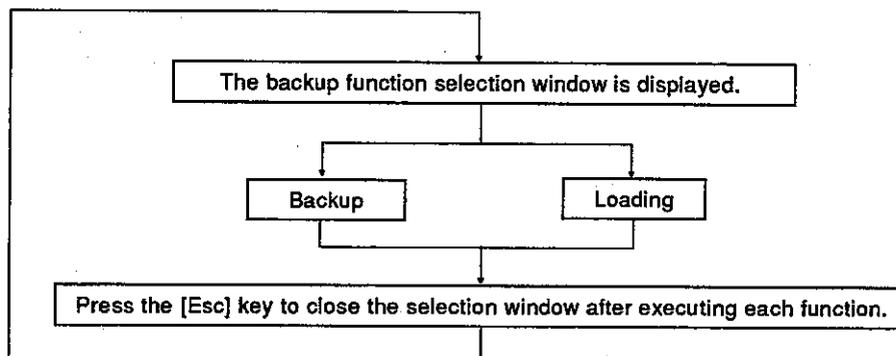
16.1 General Description of Functions

The backup functions of the GSV[][]PE consist of the following functions:



16.2 Overall Procedure

This section shows the overall procedure for executing backup/loading.



POINTS

- (1) When replacing a servo system CPU with another servo system CPU, the backup function can return the servo system CPU to the previous state (state before replacement) by loading backup data from the replaced servo system CPU to the new servo system CPU.
- (2) The backup data file of the servo system CPU is stored as the SVBACK13.BIN file in the \GPP\USR\system name\sub-system name.

17. FILE MAINTENANCE

The servo file mode is used to write/read the following servo file data to/from a hard disk/floppy disk:

- Servo data
- Servo program

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

17.1 General Description of Functions

The servo file mode of the GSV[][]PE contains the following functions:

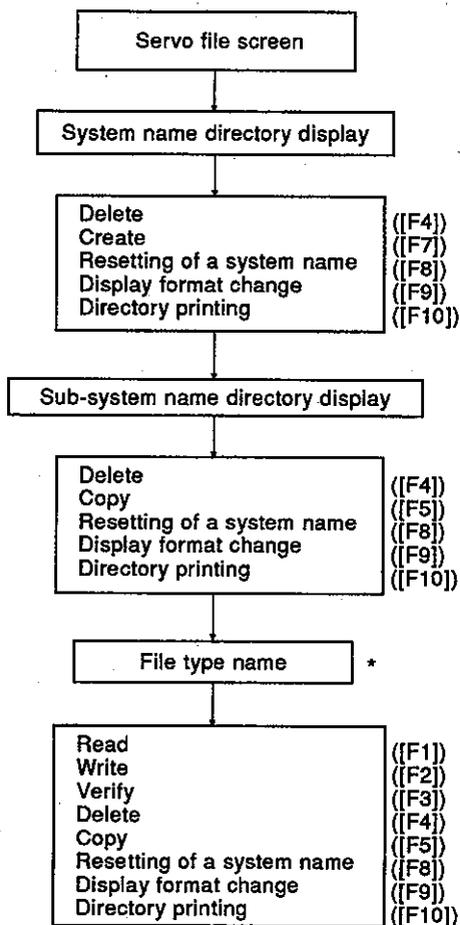
Servo file	System name directory	Sub-system name directory	File name
			Read Function that reads a servo file stored in a hard disk/floppy disk
			Write Function that writes the contents of the internal memory to a floppy disk/hard disk by using a designated file name
			Verify Function that verifies a servo file in the hard disk/floppy disk and the internal memory
			Delete Function that deletes a designated servo file from file data registered in the hard disk/floppy disk
			Copy Function that copies designated contents from a designated drive
			Directory Function that displays the directory of a file name in a list
			Display format Function that sets the display of a comment and a comment (GPP) and selects the display order
			Directory Function that prints a system name, a sub-system name and a file type name
		Deletion	Function that designates a sub-system name registered in a hard disk/floppy disk and deletes a servo file
		Copy	Function that copies all servo files of a designated sub-system name from a designate drive
		Directory	Function that displays the directory of a file name in a list
		Display format	Function that sets the display of a comment and a comment (GPP) and selects display order
		Directory	Function that prints a system name, a sub-system name and a file type name
	Deletion		Function that designates a system name registered in the hard disk/floppy disk and deletes a servo file
	Creation		Function that creates a system name and a comment
	Directory		Function that displays the directory of a file name in a list
	Display format		Function that sets a display of a comment and a comment (GPP) and selects display order
	Directory		Function that prints a system name, a sub-system name and a file type name

POINT

Always make sure the floppy disk has been formatted when writing to a floppy disk.

17.2 Overall Procedure

This section shows the overall procedure of the servo file mode.



* Select a file type, and execute each operation.

POINT

The following 2 kinds of file types can be designated:

- Servo data
- Servo program

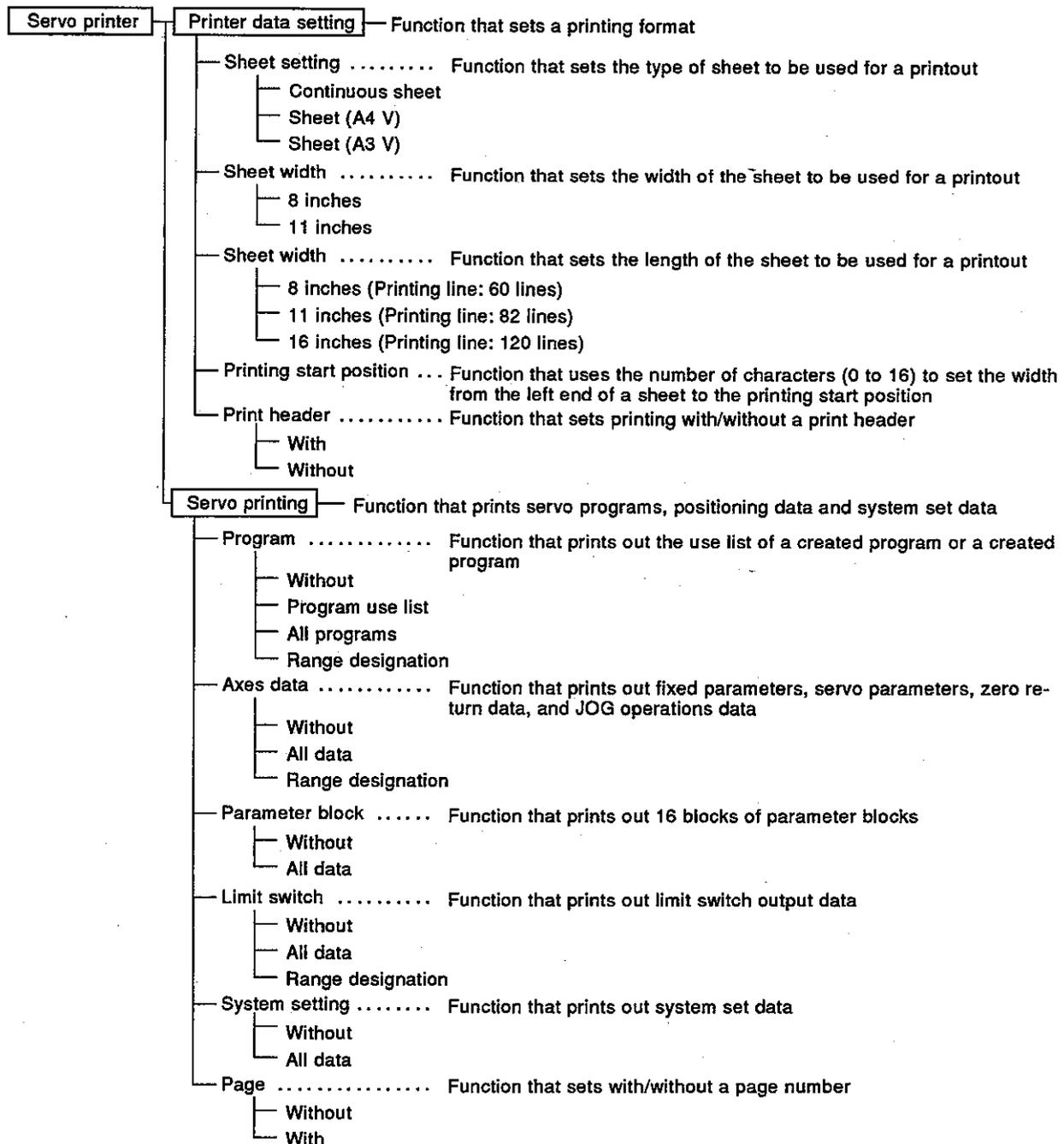
18. PRINTOUT

The servo printer mode is used to print out servo programs, positioning data and system set data set by the GSV[][]PE.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

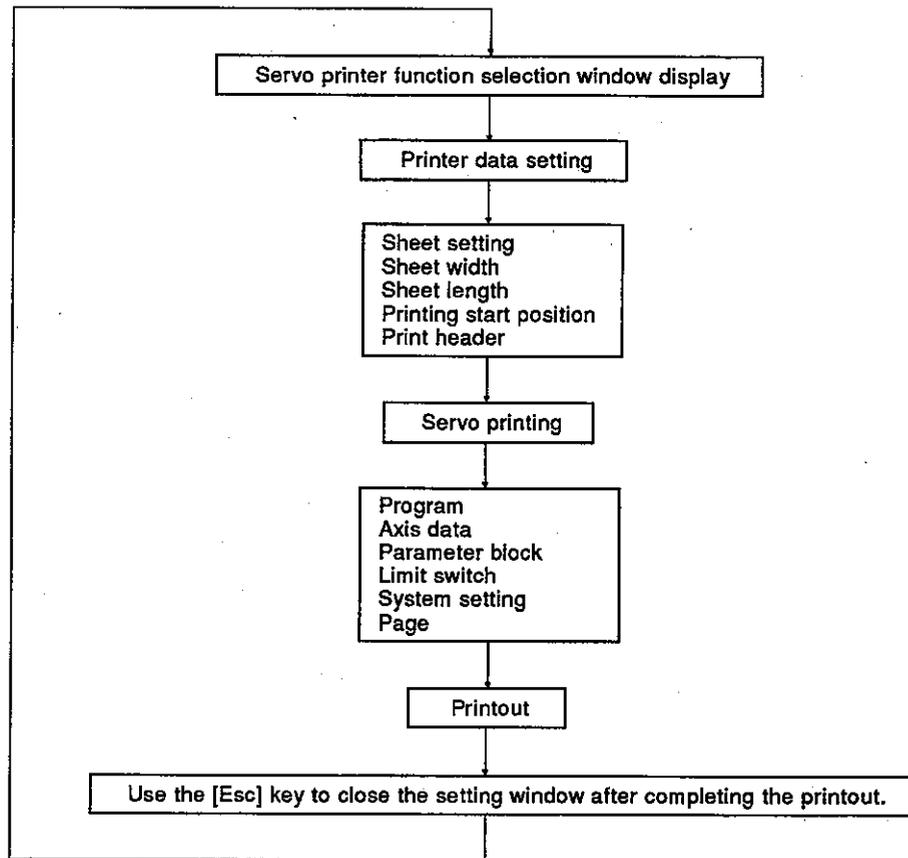
18.1 General Description of Functions

The servo printer mode of the GSV[][]PE contains the following functions:



18.2 Overall Procedure

This section shows the overall printout procedure.



18.3 Printer Models

Any general-purpose printer that utilizes the ESC/P code can be used with the GSV[][]PE.

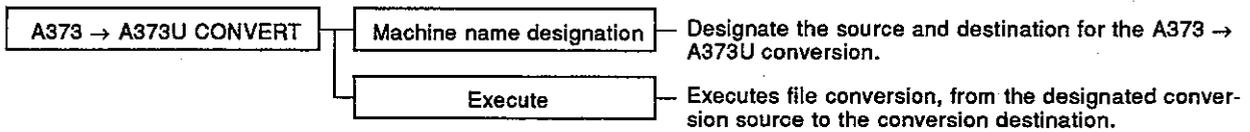
19. A373 → A373U CONVERT

The A373 → A373U convert mode is the mode in which files created at an A373CPU are converted for use at an A373U/A273UCPU.

Since details about the operation of this function are not given in this manual, if it is necessary to use this function for maintenance, consult system supplier. Or check how to use the HELP function (see Section 6.7) operation of the GSV[][]PE, and execute it.

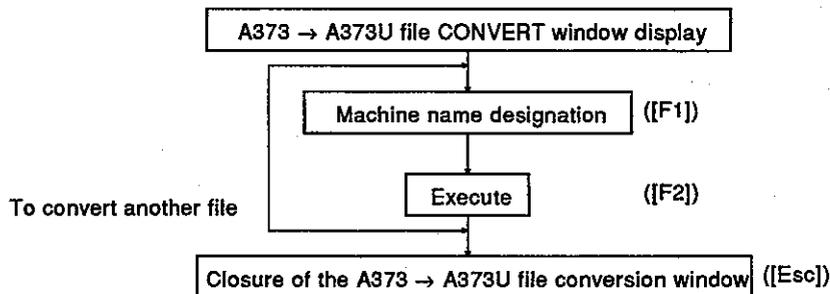
19.1 General Description of Functions

The A373 → A373U convert mode of the GSV[][]PE includes the following functions.



19.2 Overall Procedure

The overall procedure for executing A373 → A373U file conversions is shown below.



20. TROUBLESHOOTING

This section explains error contents, their causes, and corrective actions to take for the errors that can occur when this system is used.

20.1 Troubleshooting Basics

It is important that highly reliable equipment is used to increase the reliability of the system. And, it is more important to be able to restart the system quickly when an error occurs.

This means the cause of the error must be found and corrected quickly.

The following 3 points are critically important when doing troubleshooting:

(1) Visual checking

Visually check the following:

- 1) Machine status (Operating/not operating)
- 2) Power ON/OFF
- 3) State of I/O devices
- 4) Wiring status (I/O wires and cables)
- 5) Display status of the different indicators (RUN LED, POWER LED, I/O LEDs, etc.)
- 6) Settings of the different setting switches (extension base, latch, etc.)

Connect peripheral devices after checking steps 1) to 6) above, and then check the operating state of the motion controller and the program contents.

(2) Malfunction checking

Do the following operations and see if the malfunction changes.

- 1) Set the RUN/STOP keyswitch to STOP.
- 2) Reset by using the reset keyswitch.
- 3) Turn the power supply ON and OFF.

(3) Narrowing the range where the error might have occurred.

Determine in which of the following 3 places the error occurred by doing (1) and (2) above.

- 1) Motion controller or others
- 2) I/O module or others
- 3) Sequence program

20. TROUBLESHOOTING

Motion Controller

20.2 Errors That Occur in the SCPU and the Extension Base Loading Unit Side

The errors that occur in the SCPU of a servo system CPU and the extension base loading unit side are the same as the errors that occur in the A3NCPU (when using an A373CPU) or A3UCPU (when using an A373U/A273UCPU). The Troubleshooting section of the A3NCPU (when using an A373CPU) or A3UCPU (when using an A373U/A273UCPU) User's Manual gives details about handling these errors.

POINT

When the troubleshooting corrective action requires the servo system CPU, the positioning unit, motion unit, I/O unit or the servo motor, etc. to be replaced, consult system supplier.
Also, consult system supplier to confirm the replacement procedure of different units, switch settings, etc.

20.3 Error Codes for Errors That Occur in the PCPU

These errors include are servo program setting errors and positioning errors.

(1) Servo program setting errors

Servo program setting errors involve positioning data set in the servo program. Positioning data is checked at the start of each servo program's execution.

Errors can occur when positioning data is set by indirect setting.

When an error occurs, the following happens:

- 1) the servo program setting error flag (M9079) is set.
- 2) The program where an error occurred is stored in the error program number storage register (D9189).
- 3) The error code is stored in the error item information storage register (D9190).

(2) Positioning errors

- (a) Positioning errors occur at the start of positioning or during positioning. They are classified as low errors, high errors, and servo errors.

Errors	Error Codes	Error Causes	Corrective Action(s)
Low errors	1 to 999	Error caused by a sequence program or servo program	Confirm the error code by using peripheral devices, and remove the cause of the error by modifying the sequence program or servo program.
High errors	1000 to 1999	Error caused by an external input signal or control command from the SCPU	Confirm the error code by using peripheral devices, and remove the cause of the error in the external input signal or sequence program.
Servo errors	2000 to 2999	Errors detected by the servo amplifier	Confirm the error code by using peripheral devices, and remove the cause of the error on the servo side.

20. TROUBLESHOOTING

Motion Controller

- (b) When an error occurs, the error detection signal of the axis where an error occurred goes ON. The error code is stored in the low error code storage register, high error code storage register, or servo error code storage register.

Devices Errors	Error Code Storage Registers								Error detection signal
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	
Low error	D806	D826	D846	D866	D886	D906	D926	D946	Xn7
High error	D807	D827	D847	D867	D887	D907	D927	D947	
Servo error	D808	D828	D848	D868	D888	D908	D928	D948	Xn8

- (c) When another error occurred after storing an error code, the new one is overwritten on the old one and the old one is cleared. However, the history of the error that occurred can be confirmed by using a peripheral device (IBM PC started with the GSV[I] JPE).
- (d) The error detection flag and the error code are stored until the error reset signal (Yn7) or the servo error reset signal (Yn8) goes ON.

POINTS

- (1) When a servo error occurs, the same servo error code is sometimes stored again even when the servo error reset (Xn8:ON) is done.
- (2) When a servo error occurs, remove the cause of the error on the servo side, and do servo error reset.

20. TROUBLESHOOTING

Motion Controller

20.3.1 Servo program setting errors

Error codes, error contents and corrective actions for servo program setting errors are shown in Table 20.1.

In error codes indicated by * in Table 20.1, "n" indicates the axis number (1 to 8).

Table 20.1 Servo program setting errors list

Error Codes Stored in D9190	Error Names	Error Contents	Error Processing	Corrective Action(s)															
1	Parameter block number setting error	The parameter block number is designated outside the range from 1 to 16.	Servo program is executed setting the parameter block number to the default value 1.	Designate a parameter block number in the range from 1 to 16.															
n03*	Address/travel distance setting error (Excluding velocity control and velocity/position control)	<p>(1) Address is set outside the specified range when doing absolute positioning control.</p> <table border="1"> <thead> <tr> <th>Unit</th> <th colspan="2">Address setting range</th> </tr> </thead> <tbody> <tr> <td>degree</td> <td>0 to 35999999</td> <td>X10²degree</td> </tr> </tbody> </table> <p>(2) When doing increment positioning control, the travel distance is set at -2147483648 (H80000000).</p>	Unit	Address setting range		degree	0 to 35999999	X10 ² degree	<p>(1)The axis does not start. (When doing interpolation control, no interpolation control axes start.)</p> <p>(2)If an error is detected during velocity switching control or constant velocity control, the axis decelerates and stops.</p> <p>(3)While multiple servo programs are being executed simultaneously, no servo program is executed when an error occurs in one servo program.</p>	<p>(1) If the control unit is degree, set the address in the range from 0 to 35999999.</p> <p>(2) Set the travel distance in the range from 0 to ±(2147483647).</p>									
Unit	Address setting range																		
degree	0 to 35999999	X10 ² degree																	
4	Command velocity error	<p>(1) Command velocity is set outside the range from 1 to the velocity limit value.</p> <p>(2) Command velocity is set outside the setting range.</p> <table border="1"> <thead> <tr> <th>Unit</th> <th colspan="2">Address setting range</th> </tr> </thead> <tbody> <tr> <td>mm</td> <td>1 to 600000000</td> <td>X10²mm/min</td> </tr> <tr> <td>inch</td> <td>1 to 600000000</td> <td>X10³inch/min</td> </tr> <tr> <td>degree</td> <td>1 to 600000000</td> <td>X10³degree/min</td> </tr> <tr> <td>PULSE</td> <td>1 to 1000000</td> <td>PLS/sec</td> </tr> </tbody> </table>	Unit	Address setting range		mm	1 to 600000000	X10 ² mm/min	inch	1 to 600000000	X10 ³ inch/min	degree	1 to 600000000	X10 ³ degree/min	PULSE	1 to 1000000	PLS/sec	<p>(1)The axis does not start if the command velocity is set at 0 or less.</p> <p>(2)Control is done at the velocity limit value if the command velocity is set exceeding the velocity limit value.</p>	<p>(1) Set the command velocity in the range from 1 to the velocity limit value.</p>
Unit	Address setting range																		
mm	1 to 600000000	X10 ² mm/min																	
inch	1 to 600000000	X10 ³ inch/min																	
degree	1 to 600000000	X10 ³ degree/min																	
PULSE	1 to 1000000	PLS/sec																	
5	Dwell time setting error	Dwell time is set outside the range from 0 to 5000.	Control is done using default value (0).	Set the dwell time in the range from 0 to 5000.															
6	M code setting error	M code is set outside the range from 0 to 255.	Control is done using default value (0).	Set the M code in the range from 0 to 255.															
7	Torque limit value setting error	Torque limit value is set outside the range from 1 to 500.	Control is done using the torque limit value of the designated parameter block.	Set the torque limit value in the range from 1 to 500.															

20. TROUBLESHOOTING

Motion Controller

Table 20.1 Servo program setting errors list (continued)

Error Codes Stored in D9190	Error Names	Error Contents	Error Processing	Corrective Action(s)						
n08*	Assist point setting error (When doing circular interpolation with the assist point)	(1) Address is set outside the specified range when doing absolute positioning control. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Unit</th> <th colspan="2">Address setting range</th> </tr> </thead> <tbody> <tr> <td>degree</td> <td>0 to 35999999</td> <td>X10⁵degree</td> </tr> </tbody> </table>	Unit	Address setting range		degree	0 to 35999999	X10 ⁵ degree	The axis does not start.	(1) If the control unit is degree, set the address in the range from 0 to 35999999.
		Unit	Address setting range							
		degree	0 to 35999999	X10 ⁵ degree						
		(2) Travel distance is set at -2147483648(H80000000) when doing increment positioning control.)	(2) Set the travel distance in the range from 0 to ±2147483647.							
(3) The start point is equal to the assist point, or the point is equal to the end point.	(3) Set the start, assist, and end points so that they will not equal to one another.									
(4) The assist point is located on the line between the start and end points.	(4) Set the assist point OFF the line between the start and end lines.									
n09*	Radius setting error (When doing circular interpolation with the radius)	(1) Address is set outside the specified range when doing absolute positioning control. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Unit</th> <th colspan="2">Address setting range</th> </tr> </thead> <tbody> <tr> <td>degree</td> <td>0 to 35999999</td> <td>X10⁵degree</td> </tr> </tbody> </table>	Unit	Address setting range		degree	0 to 35999999	X10 ⁵ degree	The axis does not start.	(1) If the control unit is degree, set the address in the range from 0 to 35999999.
		Unit	Address setting range							
		degree	0 to 35999999	X10 ⁵ degree						
		(2) Travel distance is set at -2147483648(H80000000) when doing increment positioning control.	(2) Set the travel distance in the range from 0 to ±2147483647.							
(3) The start point is equal to the end point.	(3) Set the start and end points so that they will not be equal to each other.									
(4) The distance between the start and end points is larger than radius.	(4) Adjust the relationship between the start-to-end-point distance (L) and the radius (R) as the following equation shows: $\frac{L}{2R} \leq 1$									
n10*	Center point setting error (When doing circular interpolation with the center)	(1) Address is set outside the specified range when doing absolute positioning control. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Unit</th> <th colspan="2">Address setting range</th> </tr> </thead> <tbody> <tr> <td>degree</td> <td>0 to 35999999</td> <td>X10⁵degree</td> </tr> </tbody> </table>	Unit	Address setting range		degree	0 to 35999999	X10 ⁵ degree	The axis does not start.	(1) If the control unit is degree, set the address in the range from 0 to 35999999.
		Unit	Address setting range							
degree	0 to 35999999	X10 ⁵ degree								
(2) Travel distance is set at -2147483648(H80000000) when doing increment positioning control.	(2) Set the travel distance in the range from 0 to ±2147483647									

20. TROUBLESHOOTING

Motion Controller

Table 20.1 Servo program setting errors list (continued)

Error Codes Stored In D9190	Error Names	Error Contents	Error Processing	Corrective Action(s)										
11	Interpolation control unit setting error	The interpolation control unit is set outside the range from 0 to 3.	Control is done at the default value (3).	Set the interpolation control unit in the range from 0 to 3.										
12	Velocity limit value setting error	The velocity limit value is set outside the set range.	Control is done at the default value (200000PLS/sec).	Set the velocity limit value in the specified range.										
13	Acceleration time setting error	The acceleration time is set at 0.	Control is done at the default value (1000).	Set the acceleration time in the range from 1 to 65535.										
14	Deceleration time setting error	The deceleration time is set at 0.		Set the deceleration time in the range from 1 to 65535.										
15	Deceleration time for an immediate stop setting error	The deceleration time for an immediate stop is set at 0.		Set the deceleration time for an immediate stop in the range from 1 to 65535.										
16	Torque limit value setting error	The torque limit value is set outside the range from 1 to 500.	Control is done at the default value (300 %).	Set the torque limit value in the range from 1 to 500.										
17	Circular interpolation tolerance setting error	The circular interpolation tolerance is set outside the specified range. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Unit</th> <th>Address setting range</th> </tr> </thead> <tbody> <tr> <td>mm</td> <td>X10⁻¹μm</td> </tr> <tr> <td>inch</td> <td>X10⁻⁶inch</td> </tr> <tr> <td>degree</td> <td>X10⁻⁵degree</td> </tr> <tr> <td>PULSE</td> <td>PLS</td> </tr> </tbody> </table>	Unit	Address setting range	mm	X10 ⁻¹ μm	inch	X10 ⁻⁶ inch	degree	X10 ⁻⁵ degree	PULSE	PLS	Control is done at the default value (100PLS).	Set the circular interpolation tolerance in the specified range.
Unit	Address setting range													
mm	X10 ⁻¹ μm													
inch	X10 ⁻⁶ inch													
degree	X10 ⁻⁵ degree													
PULSE	PLS													
18	Repeat count setting error	The repeat count is set outside the range from 1 to 32767.	Control is done by setting the repeat count at 1.	Set the repeat count in the range from 1 to 32767.										
19	START command setting error	<p>(1) The servo program designated by the START command does not exist.</p> <p>(2) There is a "START" command in the designated servo program.</p> <p>(3) More than one axis has been designated for the started servo program.</p>	The axis does not start.	<p>(1) Create a servo program designated by the START command.</p> <p>(2) Delete the servo program containing the START command.</p> <p>(3) Do not designate more than one axis.</p>										
20	Point setting error	During constant velocity control, no point designation has been made in the instructions.		The axis does not start.	Designate a point between CPSTART and CPEND.									

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Table 20.1 Servo program setting errors list (continued)

Error Codes Stored in D9190	Error Names	Error Contents	Error Processing	Corrective Action(s)
21	Reference velocity error	In linear interpolation using the reference axis velocity designation method, an axis other than one to be interpolated has been designated as the reference axis.	The axis does not start.	Set one of the axes to be interpolated as the reference axis.
22	S-curve ratio setting error	The S-curve ratio when designating S-curve acceleration/deceleration is greater than 100%.	The S-curve ratio is controlled so that it does not exceed 100%.	Set the S-curve ratio within the range 0 to 100%.
900	START instruction setting error	The servo program designated by the DSFRP/SVST instruction does not exist.	The axis does not start.	Set the correct servo program number.
901	START instruction setting error	(1) The axis No. set for the DSFRP/SVST instruction is different from the axis No. set for the servo program.	The axis does not start.	(1) Set the correct axis No.
		(2) A DSFRP instruction has been used when executing 4-axis linear interpolation.		(2) Use the SVST instructions for 4-axis linear interpolation.
902	Servo program instruction code error	The instruction code cannot be decoded (the instruction code used does not exist).	The axis does not start.	Set the correct instruction code.
906	Axis No. setting error	An axis not used in the system settings has been set for the servo program set with a DSFRP/SVST instruction.	The axis does not start.	Set an axis No. that is used in the system settings.

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20.3.2 Minor errors

Minor errors are those that occur in the sequence program or servo program. The error codes for the errors are from 1 to 999. Minor errors consist of set data errors, positioning control start-up errors, positioning control errors, and control change errors.

(1) Set data errors (1 to 99)

The data set in the parameters for positioning control is not correct. Error codes, causes, processing, and corrective action(s) are shown in Table 20.2.

Table 20.2 Set data errors list (1 to 99)

Error Codes	Data Where Errors Occurred	Check Timing	Error Causes	Error Processing	Corrective Action(s)
22	Zero return data	When starting zero return	The zero return velocity is set outside the range from 1 to the limit value.	Zero return is not started.	Set the zero return velocity at or below the velocity limit value by using a peripheral device.
23			The creep speed is set outside the range from 1 to the zero return velocity.		Set the creep velocity at or below the zero return velocity by using a peripheral device.
40	Parameter block	When starting interpolation control	The unit for interpolation control of parameter blocks and the unit for control of fixed parameters are not the same.	Control is done using the unit for the control of fixed parameters.	Use the same unit as the unit for the control of servo parameters and the unit for the control of fixed parameters.

POINT

Sometimes, the error code is not stored depending on the combination of units when the units for interpolation control of parameter block and the unit for the control of fixed parameters are not the same.

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(2) Positioning control start-up errors (100 to 199)

The errors shown in this section are those detected when starting up positioning control.

Error codes, causes, processing, and corrective action(s) are shown in Table 20.3.

* The error codes are stored in the error code storage area of all the corresponding interpolation axes when interpolation control is done.

Table 20.3 Positioning control start-up errors list (100 to 199)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
100	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> PC ready flag (M2000) or PCPU ready flag (M9074) was reset. 	Positioning control does not start.	<ul style="list-style-type: none"> Set the servo system CPU to RUN.
101	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Start receive flag (M2001 to M2008) of the corresponding axes was set. 		<ul style="list-style-type: none"> Set the PC ready flag (M2000).
103	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Stop command (Yn0) of the corresponding axis was turned ON. 		<ul style="list-style-type: none"> Turn OFF the stop command (Yn0) before starting positioning
104	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Immediate stop command (Yn1) of the corresponding axis was turned ON. 		<ul style="list-style-type: none"> Turn OFF the immediate stop command (Yn1) before starting positioning.
106*	○	○		○	○					○	<ul style="list-style-type: none"> Positioning outside the stroke limit was called. 		<ul style="list-style-type: none"> Positioning end (target) point must be within the specified stroke limit.
107	○					○					<ul style="list-style-type: none"> An address making no arc was designated during circular interpolation with an assist point. [The designated start point address, assist point address and/or end point address has an error.] 		<ul style="list-style-type: none"> Designate correct addresses (servo program).
108*	○					○					<ul style="list-style-type: none"> An address making no arc was designated during circular interpolation with the radius. [The designated start point address, assist point address and/or end point address has an error.] 		
109	○					○					<ul style="list-style-type: none"> An address making no arc was designated during circular interpolation with the center. [The designated start point address, assist point address and/or end point address has an error.] 		
110*	○					○					<ul style="list-style-type: none"> The difference between the end point address and the ideal end point exceeded the circular interpolation tolerance. 		

Table 20.3 Positioning control start-up errors list (continued)

Error Codes	Control Modes								Error Causes	Error Processing	Corrective Action(s)	
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.				Zero Return
111				○						<ul style="list-style-type: none"> Velocity/position control restart was made although the velocity/position control was not stopped. 	Positioning control does not start.	<ul style="list-style-type: none"> Do not perform restart when the velocity/position control has not been stopped.
115									○	<ul style="list-style-type: none"> The zero return completed signal (XnA) was turned ON during near-zero point restarting. 		<ul style="list-style-type: none"> Zero return cannot be started continuously. Perform a JOG operation or positioning to return the axis to the point before the near-zero point dog signal was output, and retry the zero return.
116								○		<ul style="list-style-type: none"> The set JOG velocity is 0. The set JOG velocity is outside the specified range. 	Controlled at the JOG velocity limit value.	<ul style="list-style-type: none"> Set a correct speed (within the specified range).
117								○		<ul style="list-style-type: none"> A set data error occurred when simultaneously starting JOG operation programs. 	Positioning control starts in the forward direction.	<ul style="list-style-type: none"> Set the data correctly.
120									○	<ul style="list-style-type: none"> Count zero return ZCT not set. 	Zero return was not completed correctly.	<ul style="list-style-type: none"> Execute zero return to pass through Z-phase.
121									○	<ul style="list-style-type: none"> Zero return absolute value storage E2ROM error 		<ul style="list-style-type: none"> The servo system CPU memory hardware life has expired. Replace it.
136			○							<ul style="list-style-type: none"> A VVF/VVR instruction has been used for the MR-SB/SD axis. 	The axis does not start.	<ul style="list-style-type: none"> For the MR-SB/SD axes, use the VF/VR instructions instead of the VVF/VVR instructions.
140	○									<ul style="list-style-type: none"> In linear interpolation for which a reference axis is designated, the travel distance of the reference axis is set at "0". 		<ul style="list-style-type: none"> Do not set an axis whose travel distance is zero as the reference axis.
141									○	<ul style="list-style-type: none"> An odd number is set to the position instruction device for position follow-up control. 		<ul style="list-style-type: none"> Set an even number to the position instruction device for position follow-up control.
142			○						○	<ul style="list-style-type: none"> A external input signal has come ON although external input signal setting has not been performed for A278LX external signals in the system settings. 		<ul style="list-style-type: none"> Perform external input signal setting in system setting.

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(3) Positioning control errors (200 to 299)

Errors shown in this section are those detected during positioning control.

Error codes, causes, processing and corrective action(s) are shown in Table 20.4.

Table 20.4 Positioning control errors list (200 to 299)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)	
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control				
200	<input type="radio"/>	<ul style="list-style-type: none"> The PC ready flag (M2000) was reset while starting positioning in response to a start request given by a sequence program. 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the PC ready flag (M2000) after all axes have stopped. 										
201								<input type="radio"/>		<ul style="list-style-type: none"> The PC ready flag (M2000) was reset during zero return. 	The axis is stopped immediately.		<ul style="list-style-type: none"> After setting the PC ready flag (M2000), or after turning the stop command (Yn0) or the immediate stop command (Yn1) OFF, retry the zero return 	
202								<input type="radio"/>		<ul style="list-style-type: none"> The stop command (Yn0) was turned ON during zero return 				In the case of the near-zero point dog return, perform a JOG operation or positioning to return the axis to the point before the near-zero point dog signal was output, and retry the zero return.
203									<input type="radio"/>	<ul style="list-style-type: none"> The immediate stop command (Yn1) was turned ON during zero return. 	No processing.	<ul style="list-style-type: none"> Set the PC ready flag (M2000) after all axes have stopped. (The PC ready flag (M2000) set while decelerating is ignored.) 		
204	<input type="radio"/>	<ul style="list-style-type: none"> The PC ready flag (M2000) was set while decelerating by the PC ready flag (M2000) being reset. 			The axis is stopped immediately.	<ul style="list-style-type: none"> In the case of the near-zero point dog return, perform a JOG operation or positioning to return the axis to the point before the near-zero point dog signal was output, and retry the zero return. If the near-zero point dog signal is turned OFF in the case of count zero return, perform a JOG operation or positioning to return the axis to the point before the near-zero point dog signal was output, and retry the zero return. (If the near-zero point dog signal is turned ON in the case of count zero return, retry the zero return.) 								
206									<input type="radio"/>	<ul style="list-style-type: none"> An emergency stop was attempted by pressing the [Back Space] key. 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the travel distance or limit stroke so that positioning is performed within the stroke limit. 		
207	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<ul style="list-style-type: none"> The command position data exceeded the stroke limit. In the case of circular interpolation, only error codes for axes where command position data exceeded the stroke limit are stored. In the case of straight line interpolation, error codes for all interpolation axes are stored. 				

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Table 20.4 Positioning control errors list (200 to 299) (continued)

Error Codes	Control Modes								Error Causes	Error Processing	Corrective Action(s)	
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen. Zero Return				Position Follow-up Control
208	○				○	○				<ul style="list-style-type: none"> The command position data of the other axis exceeded the stroke limit during circular interpolation (other axis error). 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the travel distance or limit stroke so that positioning is performed within the stroke limit.
209				○				○		<ul style="list-style-type: none"> During V/P control, an overrun occurred because the set axis travel distance is smaller than the required deceleration distance when inputting the CHANGE signal. On input of the near-zero point dog signal when starting a count zero return, an overrun occurred because the set travel distance was smaller than the deceleration distance. 		<ul style="list-style-type: none"> Correct the velocity setting so that overrun does not occur. Set the setting travel distance at which an overrun does not occur.
210				○						<ul style="list-style-type: none"> During V/P control, the set axis travel distance exceeds the stroke limit when inputting the CHANGE signal. 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the travel distance or limit stroke so that positioning is performed within the stroke limit.
211					○					<ul style="list-style-type: none"> During positioning, an overrun occurs because the deceleration distance for the corresponding output velocity is not attained at the point when the final positioning address is detected. 		<ul style="list-style-type: none"> Set a velocity at which overrun does not occur. Set a travel distance at which overrun does not occur.
214								○		<ul style="list-style-type: none"> An attempt was made to control an axis that has already been moved with the MPG by setting the MPG operation enable flag for that axis. 	The MPG input is ignored until the axis stops.	<ul style="list-style-type: none"> Perform the MPG operation after the axis has stopped.
215					○					<ul style="list-style-type: none"> The velocity change point address is greater than the end point address. 	The axis is stopped immediately.	<ul style="list-style-type: none"> Set the velocity change point within the range of the preceding velocity change point and the end point.
										<ul style="list-style-type: none"> An address to control positioning in the opposite direction was set. 		
220									○	<ul style="list-style-type: none"> In position follow-up control, when the control unit is "degrees", a command address outside the range 0 to 35999999 has been set. 	The axis decelerates and stops (M200[] OFF)	<ul style="list-style-type: none"> When the control unit is "degrees", set a command address within the range 0 to 35999999.
225					○					<ul style="list-style-type: none"> In constant velocity control, the velocity at the pass point exceeds the velocity limit value. 	The velocity is kept at the velocity limit value.	<ul style="list-style-type: none"> Set a velocity command value between 1 and the velocity limit value.

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- (4) Errors occurring when changing current position data and velocity (300 to 399)

Errors shown in this section are those that occur when changing current position data and velocity.

Error codes, causes, processing, and corrective action(s) are shown in Table 20.5.

Table 20.5 List of errors occur when changing current position data and velocity (300 to 399)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
300	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> An attempt was made to change the current position data for an axis being moved. An attempt was made to change the current position data for an axis that was not yet booted. An attempt was made to change the current position data for an axis whose status was "servo OFF". 	The current position data is not changed...	Modify the sequence program so as to use following devices as an interlock to change the current position data. (1) Reset state of the reset start receive flag(M2001 to M2008) (2) ON state of the servo READY signal (XnF)
301									○		<ul style="list-style-type: none"> An attempt was made to change the velocity of an axis being return to the zero point. 	The velocity is not changed.	The velocity of an axis being returned to the zero point cannot be changed.
302	○										<ul style="list-style-type: none"> An attempt was made to change the velocity of an axis being return to the circular interpolation. 		The velocity of an axis being returned to the circular interpolation cannot be changed.
303	○	○		○	○	○				○	<ul style="list-style-type: none"> An attempt was made to change the velocity of an axis after automatic deceleration has started. 		The velocity of an axis cannot be changed after automatic deceleration has started.
304							○				<ul style="list-style-type: none"> An attempt was made to change the velocity of an axis while the axis is decelerating with the JOG operation start signal (Yn2/Yn3) OFF. 		The velocity of an axis cannot be changed while the axis is decelerating with the JOG operation start signal (Yn2/Yn3) OFF.
305	○	○	○	○	○	○	○			○	<ul style="list-style-type: none"> The velocity was set outside the range from 0 to the velocity limit value after the velocity change. 	Control is done at the velocity limit value.	Set the velocity within the range from 0 to the velocity limit value after the velocity change.

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20.3.3 Major errors

Major errors are caused by external input signal or by control commands from the SCPU. The error codes for major errors are 1000 to 1999. Major errors consist of control start-up errors, positioning errors, absolute system errors (only when an MR-SB/SD is used), and system errors.

(1) Positioning control start-up errors (1000 to 1099)

The following errors are detected when starting up positioning control: Error codes, error causes, error processing, and corrective action(s) are shown in Table 20.6.

Table 20.6 Positioning control start-up errors list (1000 to 1099)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
1000	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> The external STOP signal of the corresponding axis was turned ON. 	Positioning control does not start.	<ul style="list-style-type: none"> Turn OFF the STOP signal.
1001	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> When positioning was started in the forward direction (addresses increasing), the external FLS (upper limit LS) signal was turned OFF. 		<ul style="list-style-type: none"> Move the axis in the reverse direction in the JOG mode until the axis enters the axis movable range set by using the limit switch.
1002	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> When positioning was started in the reverse direction (addresses decreasing), the external RLS (lower limit LS) signal was turned OFF. 		<ul style="list-style-type: none"> Move the axis in the forward direction in the JOG mode until the axis enters the axis movable range set with the limit switch.
1003								○			<ul style="list-style-type: none"> When near-zero point dog zero return was started, the external DOG (near-zero point dog) was turned ON. 		<ul style="list-style-type: none"> Move the axis to the point before the near-zero point dog-triggered signal turns ON point in the JOG mode and then do zero return.
1004	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> The servo of the corresponding axis is not in the servo READY state. <ol style="list-style-type: none"> The power supply to the servo amplifier is OFF. Initial processing with the servo amplifier power turned ON. The servo amplifier has not been installed. Servo error has occurred. Cable disconnected 		<ul style="list-style-type: none"> Wait until the servo is READY (XnF: OFF).
1005	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> The servo error detection signal of the corresponding signal (Xn8) was turned ON. 	<ul style="list-style-type: none"> Remove errors on the servo side, reset the servo error detection signal (Xn8) by using the servo error reset command (Yn8), and start operations. 	

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(2) Positioning control errors (1100 to 1199)

The following errors are those detected during positioning. Error codes, error causes, error processing, and corrective action(s) are shown in Table 20.7.

Table 20.7 Positioning control errors list (1100 to 1199)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
1101	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> When positioning was started in the forward direction (addresses increasing), the external FLS (upper limit LS) signal was turned OFF. 	The axis decelerates and stops according to the setting for "stop processing when STOP signal is input" of the parameter block.	<ul style="list-style-type: none"> Move the axis in the reverse direction in the JOG mode until the axis enters the axis movable range set by using the limit switch.
1102	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> When positioning was started in the reverse direction (addresses decreasing), the external RLS (lower limit LS) signal was turned OFF. 		<ul style="list-style-type: none"> Move the axis in the forward direction in the JOG mode until the axis enters the axis movable range set by using the limit switch.
1103								○			<ul style="list-style-type: none"> The external STOP signal (XnD) was turned ON during zero return operations. 		<ul style="list-style-type: none"> Return the axis to a point before the near-zero point dog-triggered signal turning ON point in the JOG mode and execute zero return.
1104	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> The servo error detection signal (Xn8) was turned ON while an axis was moving. 	The axis immediately stops without decelerating.	<ul style="list-style-type: none"> Take corrective action for servo error. The axis can be restarted.
1105	○	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> While an axis was moving, the power supply to the servo amplifier was turned OFF. (The servo amplifier has not been installed. Or, a cable fault was detected.) 	XnF was turned OFF.	<ul style="list-style-type: none"> Turn ON the power supply to the servo amplifier. Check the state of the cable to the servo amplifier.

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(3) Absolute system errors (1200 to 1299)

The following errors listed are those detected in the absolute system. Error codes, error causes, error processing, and corrective action(s) are shown in Table 20.8.

Table 20.8 Absolute system errors list (1200 to 1299)

Error Codes	Control Modes								Error Causes	Error Processing	Corrective Action(s)	
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.				Zero Return
1201										<ul style="list-style-type: none"> A sum check error occurred with the backup data when the power was turned ON. 	Positioning does not start.	<ul style="list-style-type: none"> The service life of the servo system CPU internal memory (E2ROM) has expired. Replace the servo system CPU. This error may occur when the servo system CPU is being used for the first time. Do zero return.

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(4) System errors

(a) When an A373/A373UCPU is used

1) Main base unit errors (1300 to 1399)

The following errors are detected when the power supply is turned ON. Error codes, error causes, error processing, and corrective action(s) are shown in Table 20.9.

Table 20.9 System errors list (1300 to 1399)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
1300											<ul style="list-style-type: none"> The actual amplifier installation is inconsistent with the system setting. AC motor drive module fault 	Positioning does not start.	<ul style="list-style-type: none"> Check the parameters. Replace the AC motor drive module.
1301										<ul style="list-style-type: none"> AC motor drive module has not been installed. Setting is not done to use the AC motor drive module in the system setting. 	<ul style="list-style-type: none"> Check the system setting. The machine cannot be operated if the AC motor drive module has not been installed, even if an MR-SB/SD is used. 		
1302										<ul style="list-style-type: none"> The loaded position detection module (ES) is inconsistent with the system setting. 	<ul style="list-style-type: none"> Check the system setting. 		
1310 to 1326										<ul style="list-style-type: none"> System setting error or servo parameter error Servo system CPU fault 	<ul style="list-style-type: none"> Check the parameters. Replace the servo system CPU. 		

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2) A340SC error (1400 to 1499)

The following errors are detected when an extension base unit is set by using the A344SF.

Table 20.10 A340SC Errors List (1400 to 1499)

Error Codes	Control Modes										Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.	Zero Return	Position Follow-up Control			
1400											<ul style="list-style-type: none"> The actual ADU status of the extension base unit is inconsistent with the system setting. 	Operation does not start.	<ul style="list-style-type: none"> Check the parameters. Replace the extension base unit ADUs.
1401											<ul style="list-style-type: none"> Not any ADUs are installed in the extension base unit. 		<ul style="list-style-type: none"> Check the system setting.
1402											<ul style="list-style-type: none"> The actual position sensing module in the extension base unit is inconsistent with that of the system setting for the extension base unit. 		<ul style="list-style-type: none"> Check the system setting.
1410											<ul style="list-style-type: none"> Incorrect system /servo parameter setting 		<ul style="list-style-type: none"> Check the parameters.
1426											<ul style="list-style-type: none"> A340SC fault 		<ul style="list-style-type: none"> Replace the A340SC.
1430											<ul style="list-style-type: none"> The power to the extension base unit is cut off. 		<ul style="list-style-type: none"> Turn ON the power to the extension base unit, and reset.

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(b) When an A273UCPU is used

1) System errors (1300 to 1399, 1500 to 1599)

The following errors are detected when the power is turned ON. Error codes, error causes, error processing, and corrective action(s) are shown in Table 20.11.

Table 20.11 System Errors List (1300 to 1399, 1500 to 1599)

Error Codes	Control Modes								Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Position	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.			
1300									<ul style="list-style-type: none"> The actual ADU status is inconsistent with the system setting. ADU fault 	Operation does not start.	<ul style="list-style-type: none"> Check the parameters. Replace the ADUs.
1310 to 1326								<ul style="list-style-type: none"> Initial communication with the servo system CPU is not completed properly. Servo system CPU or ADU fault 	<ul style="list-style-type: none"> Replace the servo system CPU or ADU. 		
1500								<ul style="list-style-type: none"> The servo power supply (A230P) is not turned ON. Or an all-axis servo ON command (M2042 ON) was given when an error existed. 	<ul style="list-style-type: none"> Turn ON the servo power supply, and give an all-axis servo ON command. Replace the servo power supply module. 		
1501								<ul style="list-style-type: none"> The 24 VDC is not supplied properly when setting A278LX brake output use setting. 	<ul style="list-style-type: none"> Supply the 24 VDC to the A278LX. 		

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20.3.4 Servo errors

(1) When an A373/A373UCPU is used

Servo errors are those detected by the servo amplifier. The error codes for servo errors are 2000 to 2999.

Servo errors are errors that occur in an MR-SB/MR-SD.

In the following table, the ADU is abbreviated to (A), and the MR-H-B/MR-J-B to (M).

A servo error detection signal (Yn8) goes ON, when a servo error occurs. Remove the cause of an error, reset the servo error by turning the servo error reset signal (Yn8) ON, and restart operations.

Notes 1. When excessive regeneration (2030), overload 1 (2050) and/or overload 2 (2051) errors occur, the state when the error occurred is stored in the servo amplifier even after the protection circuit has operated. The memory contents are cleared if the external power supply is turned OFF, but are not cleared by the RESET signal.

2. When reset by turning OFF the external power supply is done repeatedly when error codes 2030, 2050, and/or 2051 occur, the element may be broken due to overheating. Only restart operations after removing the cause of the error.

Servo error contents are shown in Table 20.12.

Table 20.12 Servo errors list (2000 to 2999)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2010	(A) (M)	Low voltage	<ul style="list-style-type: none"> The voltage to the power supply module was lower than 3ϕ VAC 200/220 (+10%/-15%). The voltage to an MR-SB/SD became lower than 3ϕ VAC 200/200 (\pm 10%). Power supply stopped momentarily. Load was too large. A fault was detected in the power supply module. 	<ul style="list-style-type: none"> Anytime during operations 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the power supply equipment. Lower the load. Replace the power supply module.
2012	(A) (M)	External memory error	<ul style="list-style-type: none"> EPROM check sum, SRAM check, and/or 2-port RAM check error. EPROM, SRAM, and/or 2-port RAM error. Servo system CPU fault 	<ul style="list-style-type: none"> When turning ON the power supply of the servo amplifier When starting up PC READY flag (M2000) 		<ul style="list-style-type: none"> Replace the servo amplifier. Replace the servo system CPU.
2013	(A) (M)	External clock error	<ul style="list-style-type: none"> Data processing of the position command from the servo system CPU was not completed in the normal time. Error in a timing signal (BCLK, SCLK) from a servo system CPU. Servo system CPU fault. 	<ul style="list-style-type: none"> Anytime during operation 		<ul style="list-style-type: none"> Reset the servo system CPU, and confirm if it operates correctly. Replace the servo system CPU.
2014	(A) (M)	Watchdog	<ul style="list-style-type: none"> Timing signal from a servo system CPU or the 2-port RAM error. Servo system CPU fault. 			

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Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2015	(M)	2-port memory error	<ul style="list-style-type: none"> 2-port memory RAM check error occurred, or parity error was detected when receiving initial parameters. Fault of the cable that links the position detection module and the servo input unit, or fault of the 2-port RAM. Servo system CPU fault 	<ul style="list-style-type: none"> When the power supply of the servo amplifier was turned ON When starting up the PC READY flag (M2000) 	Operation is stopped immediately.	<ul style="list-style-type: none"> Reset the servo system CPU, and confirm if it operates correctly. Replace the servo system CPU.
2016	(A) (M)	Magnetic pole position detection error	<ul style="list-style-type: none"> When an initial magnetic pole position detection was done, the magnetic pole position detection was not made normally (error in U, V, or W). Cable or encoder fault Improper setting of servo parameter (OPT) 			<ul style="list-style-type: none"> Reset the servo system CPU, and make sure it operates correctly. Replace the position detection module and the servo motor (encoder). Modify the servo parameter.
2017	(A) (M)	PC board error	<ul style="list-style-type: none"> The value of the A/D converter is not normal (≈ 0.5 or more) during initialization. Fault around the A/D converter Fault of the power supply module Servo system CPU fault 			<ul style="list-style-type: none"> Reset the servo system CPU and make sure it operates correctly. Replace the power supply module or the servo system CPU.
2020	(A) (M)	No-signal ME	<ul style="list-style-type: none"> The connector which links the encoder and the position detection module has come loose. Cable or encoder fault Error of the signals from the encoder connected to RF01 (U, V, W, A, B, or Z error) 	<ul style="list-style-type: none"> Anytime during operations 	<ul style="list-style-type: none"> Replace the servo motor (encoder). 	
2021	(M)	No-signal AE	<ul style="list-style-type: none"> Signal errors (A, B, or Z error) of the encoder connected to the RF31 card or the RF33 card. Cable or encoder fault 			
2022	(M)	No-signal IX	<ul style="list-style-type: none"> Signal error of the resolver connected to the RF32 card or the RF33 card Fault of the cable or the resolver, or excitation signal error 			<ul style="list-style-type: none"> Replace the servo motor (resolver).
2023	(A)	Module not installed	<ul style="list-style-type: none"> Module set by the system setting has not been installed. AC motor drive module fault Power supply module fault Power is not supplied to the AC motor drive module from the power supply module. (The AC motor drive module and the power supply module are not connected.) Servo system CPU fault Position detection module fault 	<ul style="list-style-type: none"> When turning ON the power supply to the servo amplifier When starting up the PC READY flag (M2000) 	<ul style="list-style-type: none"> Install the module as set in the system setting. Replace the AC motor drive module. Replace the power supply module. Connect the AC motor drive module and the power supply module. Replace the servo system CPU Replace the position detection module. 	

* Servo parameter (OPT) : Increment/absolute setting, regeneration resistance setting

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Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2024	(M)	Main ladder error	<ul style="list-style-type: none"> U, V, or W of the servo amplifier output grounded. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Use a tester to check between U, V, or W of the terminal block and the case. Use a tester and megger to check between U, V, or W of the motor and the core.
			<ul style="list-style-type: none"> Damage to the servo amplifier transistor 			<ul style="list-style-type: none"> Use a tester to measure the resistance between the transistor module terminals.
			<ul style="list-style-type: none"> Insufficient charging to the bus. 			<ul style="list-style-type: none"> Increase the power capacity. The power transistor for regeneration may have been destroyed. Replace it.
2025	(A) (M)	Battery alarm	<ul style="list-style-type: none"> The voltage of the battery for an absolute position detection ladder backup for the RF32 and RF33 cards (M), and A362ES(A) dropped. There is a possibility of losing the absolute position, which requires to redo zero return. (This error is detected only in the absolute system.) 	<ul style="list-style-type: none"> When turning ON the power supply of the servo amplifier When starting up the PC READY flag (M2000) 	Zero return request signal goes ON, and the operation is stopped immediately.	<ul style="list-style-type: none"> Replace the battery. Turn the power supply OFF, and turn ON. Establish the absolute position by doing zero return.
2026	(A)	Unit mismatch	<ul style="list-style-type: none"> The specifications of a servo parameter (MSR, MTY), and those of servo amplifier or servo motor do not match. AC motor drive module fault Position detection module fault The servo parameter (OPT) and the position detection module do not match. 		Operation is stopped immediately.	<ul style="list-style-type: none"> Check the servo parameter. Replace the AC motor drive module and the position detection module.
2027	(A)	Initial communications error	<ul style="list-style-type: none"> Communications error with the absolute encoder connected to the position detection module (A362ES). Absolute encoder fault Encoder cable fault A362ES fault 			<ul style="list-style-type: none"> Replace the position detection module and the servo motor (absolute encoder).
2030	(A) (M)	Excessive regeneration	<ul style="list-style-type: none"> The power transistor for regenerative control goes ON and OFF too frequently. (Regenerative resistance sometimes cause overheating.) The power transistor for regenerative control was short circuited and damaged. Incorrect setting of the servo parameter (OPT) Incorrect wiring of regenerative resistance 	<ul style="list-style-type: none"> Anytime during operation 		<ul style="list-style-type: none"> Lower the frequency of the velocity adjustment or lower the velocity. Replace the power supply module. Check the servo parameter. Modify the wiring.

* Servo parameter (MSR) : Motor type setting

(MTY) : Motor capacity setting

(OPT) : Increment/absolute setting, regenerative resistance setting

(ENC) : Setting of number of feedback pulses per 1 rotation of the motor

Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2031	(A) (M)	Overspeed	<ul style="list-style-type: none"> The command velocity is too high. An overshoot occurred during acceleration. Encoder fault Encoder cable fault or incorrect wiring Incorrect setting of the servo parameter (ENC) 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Replace the encoder. Check the servo parameter. Replace the position detection module.
2032	(A) (M)	Overcurrent	<ul style="list-style-type: none"> A servo motor different from the setting has been connected. U, V, or W of the servo amplifier output were short circuited or grounded. incorrect wiring of U, V, or W of the servo amplifier output Damage to the transistor module of the servo amplifier Insufficient coupling of the servo motor and the encoder. Encoder cable fault or incorrect wiring Incorrect setting of the servo parameters (OPT, ENC) The servo motor oscillated. 			<ul style="list-style-type: none"> Match the specifications of the servo parameter and the motor. Replace the servo motor or the cable. Modify the wiring. Replace the servo amplifier or the servo motor. Replace the position detection module. Modify the servo parameter.
2033	(A) (M)	Overvoltage	<ul style="list-style-type: none"> The current bus voltage became 400 V or more. Regenerative ability was exceeded because the velocity adjustment frequency was too high. Incorrect connection of the terminal block for regenerative resistance Regenerative resistance is cut. The power transistor for regeneration has been damaged. Incorrect wiring of terminal block P, D, or C of the power supply module 			<ul style="list-style-type: none"> Replace the power supply module. Replace the regenerative resistance. Modify the wiring.
2034	(M)	Communications error	<ul style="list-style-type: none"> When receiving data from a servo system CPU, a parity occurred. Cable fault or noise 			<ul style="list-style-type: none"> Replace the servo system CPU.
2035	(A) (M)	Data error	<ul style="list-style-type: none"> Change rate of the command position from a servo system CPU is too large. The command velocity is too high. Cable fault or noise. Incorrect setting of the servo parameter (ENC) Fault of the servo system CPU 			<ul style="list-style-type: none"> Replace the servo system CPU. Modify the servo parameter.
2036	(A) (M)	Transmission error	<ul style="list-style-type: none"> Communications with a servo system CPU cannot be done. Cable fault Noise occurred, or an MCP processing error occurred. Servo system CPU fault 			<ul style="list-style-type: none"> Replace the servo system CPU.

* Servo parameter (OPT) : Increment/absolute setting, regenerative resistance setting
 (ENC) : Setting of number of feedback pulses per 1 rotation of the motor

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Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2040	(A)	Power supply error	<ul style="list-style-type: none"> Short circuit of the VDC24 output of the power supply module Fault of the VDC24 power supply ladder of the power supply module Fault of the VDC24 detection ladder 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the wiring. Replace the power supply module or the servo system CPU.
2045	(A) (M)	Fin overheating	<ul style="list-style-type: none"> The fan is stopped. The continuous output current of the servo amplifier is exceeded. Insufficient contact between the radiation fin and the servo amplifier. Insufficient contact between the module and the bracket (fin) of the servo amplifier. The thermal protector of the fin of the servo amplifier operated. Thermal sensor fault 			<ul style="list-style-type: none"> Replace the fan. Lower the load. Install the servo amplifier on the base firmly. Replace the servo amplifier.
2046	(A) (M)	Motor overheating	<ul style="list-style-type: none"> The thermal protector incorporated in the motor operated. The continuous output of the motor has been exceeded. The continuity across OPP-THM and COM of the power supply module is opened. (A) 			<ul style="list-style-type: none"> Replace the servo motor. Short circuit OPR-THM and COM.
2047	(A)	Amplifier power supply overheating	<ul style="list-style-type: none"> The fan is stopped. The continuous output current of the power supply has been exceeded. Insufficient contact between the radiation fin and the power supply module. Thermal sensor fault 			<ul style="list-style-type: none"> Replace the fan. Lower the load. Install the power supply module on the radiation fin firmly. Replace the power supply module.
2050	(A) (M)	Overload 1	<ul style="list-style-type: none"> The rated current of the motor has been exceeded. Incorrect setting of the servo parameters (MSR, MTY) The load inertia and friction are too large, or hunting occurred by setting the parameter improperly. 			<ul style="list-style-type: none"> Lower the load. Check the servo parameter.
2051	(M)	Overload 2	<ul style="list-style-type: none"> The command requiring current of 95% or more of the current limit value lasted more than 0.5 second or more. The machine collided, or the load inertia too large. 			

* Servo parameter (MSR) : Motor type setting
(MTY) : Motor capacity setting

Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2052	(A) (M)	Excessive error	<ul style="list-style-type: none"> The real position for a command exceeded the set value. Incorrect setting of servo parameters (MSR, MTY, or ENC) Acceleration cannot be done sufficiently because the inertia is too large, or an overshoot occurred. Hunting occurred. Fault of the encoder or the cable. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Do zero return. Check servo parameters. Replace the servo motor (encoder) and the cable.
2054	(A)	Amplifier power supply overload	<ul style="list-style-type: none"> The power supply capacity is insufficient. Hunting occurred. 			<ul style="list-style-type: none"> Replace the amplifier power supply with one having larger capacity. Lower the load. Check the servo parameter.
2055	(M)	External emergency stop	<ul style="list-style-type: none"> Continuity across B and R of the servo amplifier terminal block was opened. 			<ul style="list-style-type: none"> Short circuit B and R.
2057	(A)	Hardware fault	<ul style="list-style-type: none"> Hardware fault of a servo system CPU 			<ul style="list-style-type: none"> Replace the servo system CPU
2100	(A) (M)	Initial communications warning	<ul style="list-style-type: none"> When power is supplied to a servo system CPU, an error occurred in the serial signal. Or, the value of the absolute position counter after a retry is not the same as the one before the retry. 		Operation is continued.	<ul style="list-style-type: none"> Replace the cable and the card. Replace the servo motor (encoder).
2101	(A) (M)	Serial communications warning	<ul style="list-style-type: none"> Error occurred in the communication of serial signal of an absolute position detection device during operation. 			
2102	(A) (M)	Battery warning	<ul style="list-style-type: none"> The voltage of the backup battery of the absolute position of the absolute position detection device was decreased. 			<ul style="list-style-type: none"> Charge or replace the battery. Connect the battery.
2103	(A) (M)	Battery disconnection warning	<ul style="list-style-type: none"> The voltage of the power supply supplied to absolute position detection device was decreased. 			
2104	(A) (M)	Position offset warning	<ul style="list-style-type: none"> Relationship between the feedback position and the encoder Z-phase is not correct. 			<ul style="list-style-type: none"> Replace the servo motor (encoder).
2140	(A)	Excessive regeneration warning	<ul style="list-style-type: none"> Excessive regeneration error (2030) is likely to occur. (80% level was detected.) 			<ul style="list-style-type: none"> See the contents of the excessive regeneration error (2030).
2141	(A)	Overload warning	<ul style="list-style-type: none"> Overload errors (2050, 2051) are likely to occur. (80% level was detected.) 			<ul style="list-style-type: none"> See the contents of overload errors (2050, 2051).
2142	(A)	Amplifier power supply overload warning	<ul style="list-style-type: none"> Amplifier power supply overload error (2054) is likely to occur. (80% level was detected.) 			<ul style="list-style-type: none"> See the contents of an amplifier power supply overload error (2054).

* Servo parameter (MSR) : Motor type setting
(MTY) : Motor capacity setting
(ENC) : Setting of number of feedback pulses per rotation of the motor

Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)	
		Error Names	Error Contents				
2143	(A) (M)	Absolute position counter warning	<ul style="list-style-type: none"> RG510 printed board fault The deviation between the feedback position and the data transmitted from the encoder is too large. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is continued.	<ul style="list-style-type: none"> Replace the RG510 and A362ES 	
			<ul style="list-style-type: none"> Encoder fault 			<ul style="list-style-type: none"> Replace the encoder. 	
			<ul style="list-style-type: none"> Malfuction occurred due to noise, etc. 			<ul style="list-style-type: none"> Do zero point initial setting, and turn ON the power supply again. 	
			<ul style="list-style-type: none"> Power OFF (momentary power failure) or CPU reset was done while the motor was rotating. 			<ul style="list-style-type: none"> While the motor is rotating with the up and down axis, etc., do not turn the power ON (a momentary power failure) or reset the CPU. 	
2145	(M)	Absolute position error	<ul style="list-style-type: none"> Absolute position detection is not done normally. (Servo is not turned OFF.) 	<ul style="list-style-type: none"> When turning ON the power supply of the servo amplifier When starting up the PC READY flag (M2000) 	Operation is continued.	<ul style="list-style-type: none"> This error is detected only in the absolute system. Reconfirm the absolute position by doing zero return after servo error reset (Yn8 ON). 	
2146	(A) (M)	Teaching emergency stop	<ul style="list-style-type: none"> An emergency stop has been executed using the teaching unit. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Release the emergency stop. 	
2147	(A) (M)	Emergency stop	<ul style="list-style-type: none"> An emergency stop occurred. (Power supply module) 				
2201 to 2210 2215 2219	(A) (M)	Parameter warning	An incorrect parameter has been set.	<ul style="list-style-type: none"> Anytime during operation 	Operation is continued.	<ul style="list-style-type: none"> Check the parameters and set the correct parameter in the servo system CPU. Reset the servo system CPU. 	
			2201				Amplifier/external regenerative resistor setting
			2202				Motor type
			2203				Motor capacity
			2204				Encoder type
			2205				In-position range
			2206				Position loop gain
			2207				Velocity loop gain
			2208				Velocity intergral compensation
			2209				Torque limit value
			2210				Torque limit value
2215	Excessive error						

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Table 20.12 Servo error list (2000 to 2999) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)																						
		Error Names	Error Contents																									
2500	(A) (M)	Parameter error	<p>One of the following servo parameter settings is abnormal:</p> <ul style="list-style-type: none"> Amplifier setting External regenerative resistor setting Motor type Motor capacity 	<ul style="list-style-type: none"> When the servo amplifier power is ON. When starting up the PC READY flag (M2000) 	—	<ul style="list-style-type: none"> Check the parameters and set the correct parameter in the servo system CPU. Reset the servo system CPU. 																						
2501 to 2510 2515 2519	(A) (M)	Parameter error	<p>An incorrect parameter has been set.</p> <table border="1"> <tr> <td>2501</td> <td>Amplifier/external regenerative resistor setting</td> </tr> <tr> <td>2502</td> <td>Motor type</td> </tr> <tr> <td>2503</td> <td>Motor capacity</td> </tr> <tr> <td>2504</td> <td>Encoder type</td> </tr> <tr> <td>2505</td> <td>In-position range</td> </tr> <tr> <td>2506</td> <td>Position loop gain</td> </tr> <tr> <td>2507</td> <td>Velocity loop gain</td> </tr> <tr> <td>2508</td> <td>Velocity integral compensation</td> </tr> <tr> <td>2509</td> <td>Torque limit value</td> </tr> <tr> <td>2510</td> <td>Torque limit value</td> </tr> <tr> <td>2515</td> <td>Excessive error</td> </tr> </table>	2501	Amplifier/external regenerative resistor setting	2502	Motor type	2503	Motor capacity	2504	Encoder type	2505	In-position range	2506	Position loop gain	2507	Velocity loop gain	2508	Velocity integral compensation	2509	Torque limit value	2510	Torque limit value	2515	Excessive error	<ul style="list-style-type: none"> When the servo amplifier power is ON. When starting up the PC READY flag (M2000) 	—	<ul style="list-style-type: none"> Check the parameters and set the correct parameter in the servo system CPU. Reset the servo system CPU.
2501	Amplifier/external regenerative resistor setting																											
2502	Motor type																											
2503	Motor capacity																											
2504	Encoder type																											
2505	In-position range																											
2506	Position loop gain																											
2507	Velocity loop gain																											
2508	Velocity integral compensation																											
2509	Torque limit value																											
2510	Torque limit value																											
2515	Excessive error																											

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(2) When an A273UCPU is used

Servo errors include servo amplifier errors and servo power supply module errors.

(a) Servo amplifier errors (2000 to 2799)

Servo amplifier errors are those detected by the servo amplifier, and their codes are 2000 to 2799)

Servo amplifier errors are classified into errors that occur in the ADU and errors that occur in the MR-H-B/MR-J-B. In the following table, the ADU is abbreviated to (A), and the MR-H-B/MR-J-B to (M).

A servo amplifier error detection signal (Xn8) goes ON when a servo amplifier error occurs. Remove the cause of the error, reset the servo amplifier error by turning the servo amplifier error reset signal (Yn8) ON, and restart operations. (The servo amplifier error signal is not turned ON even if any of the error codes 2100 to 2499 because they are for warning.)

Notes 1. When excessive regeneration (2030), overload 1 (2050) and/or overload 2 (2051) errors occur, the state when the error occurred is stored in the servo amplifier even after the protection circuit has operated. The memory contents are cleared if the external power supply is turned OFF, but are not cleared by the RESET signal.

2. When reset by turning OFF the external power supply is done repeatedly when error codes 2030, 2050, and/or 2051 occur, the element may be broken due to overheating. Only restart operations after removing the cause of the error.

Servo error contents are shown in Table 20.13.

Table 20.13 Servo amplifier errors list (2000 to 2799)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2010	(A)	No P-N connection	<ul style="list-style-type: none"> The servo power supply module P-N is not connected to the P-N of the ADU. 	<ul style="list-style-type: none"> Anytime during operations 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the connection.
	(M)	Low voltage	<ul style="list-style-type: none"> The voltage to the servo power supply was lower than 160 VAC. 			<ul style="list-style-type: none"> Measure the input voltages (R, S, T) using a voltmeter.
			<ul style="list-style-type: none"> The power supply stopped for more than 15 msec. 			<ul style="list-style-type: none"> Use an oscilloscope to check if a instantaneous power failure occurred.
			<ul style="list-style-type: none"> The voltage to the power supply dropped at the start of operation due to insufficient power supply capacity. 		<ul style="list-style-type: none"> Check the power supply capacity. 	

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2012	(A)	Internal memory error	<ul style="list-style-type: none"> ADU SRAM error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON 	Operation is stopped immediately.	<ul style="list-style-type: none"> Replace the ADU.
	(M)	Memory error 1	<ul style="list-style-type: none"> Servo amplifier SRAM error Servo amplifier EPROM check sum error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Replace the servo amplifier.
2013	(M)	Clock error	<ul style="list-style-type: none"> Servo amplifier clock error 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Replace the servo amplifier.
2014	(A)	Watchdog	<ul style="list-style-type: none"> Servo control system error 			<ul style="list-style-type: none"> Reset the servo system CPU, and recheck.
	(M)		<ul style="list-style-type: none"> ADU fault 			<ul style="list-style-type: none"> Replace the ADU.
			<ul style="list-style-type: none"> Servo amplifier H/W error Controller (CPU) H/W error 			<ul style="list-style-type: none"> Replace the servo amplifier. Replace the CPU.
2015	(A)	2-port memory error	<ul style="list-style-type: none"> ADU 2-port memory error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 	Operation is stopped immediately.	<ul style="list-style-type: none"> Reset the servo system CPU, and recheck. Replace the ADU.
	(M)	Memory error 2	<ul style="list-style-type: none"> Servo amplifier EEPROM error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Replace the servo amplifier.
2016	(A)	Detection device error 1	<ul style="list-style-type: none"> Faulty communication with the encoder at initialization The encoder type (ABS/INC) set in the system settings is inconsistent with the encoder actually connected. 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 	Operation is stopped immediately.	<ul style="list-style-type: none"> Reset the servo system CPU, and recheck. Replace the servo motor (encoder). Correct the system settings.
	(M)		<ul style="list-style-type: none"> Faulty communication with the encoder 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Check if the encoder cable connector is disconnected. Replace the motor. Replace the detection device cable.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2017	(A)	PC board error	<ul style="list-style-type: none"> ADU A/D converter error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 	Operation is stopped immediately.	<ul style="list-style-type: none"> Reset the servo system CPU, and recheck. Replace the ADU.
	(M)		<ul style="list-style-type: none"> Servo amplifier PC board element error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Replace the servo amplifier.
2019	(M)	Memory error 3	<ul style="list-style-type: none"> Servo amplifier flash ROM check sum error 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Replace the servo amplifier.
2020	(A)	Detection device error 2	<ul style="list-style-type: none"> Faulty communication with the error during operation 	Anytime during operation		<ul style="list-style-type: none"> Check the wiring between the encoder and the ADU. Replace the servo motor (encoder).
	(M)		<ul style="list-style-type: none"> Faulty communication with the encoder 			<ul style="list-style-type: none"> Check if the detection device cable connector is disconnected. Replace the motor. Replace the detection device cable.
2024	(M)	Output grounding fault	<ul style="list-style-type: none"> The servo amplifier terminal phases U, V and W are grounded. 			<ul style="list-style-type: none"> Using a tester, check between each of the terminal phases U, V and W and the earth for ground fault. Using a tester and megger, check between each of the terminal phases U, V and W and the core for ground fault.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2025	(A)	Lost absolute position	<ul style="list-style-type: none"> The voltage of the super capacitor in the absolute encoder was 2.5 ± 0.2 V or lower. The rotation speed in the absolute encoder was 500 rpm over or when the power supply is OFF. 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 	Operation is stopped immediately.	<ul style="list-style-type: none"> Replace the battery (MR-JBAT-[]). Check the wiring between the encoder and the ADU.
	(M)	Battery error	<ul style="list-style-type: none"> Voltage drop in the super capacitor in the absolute position encoder Battery voltage drop Defective battery cable or battery (zero return necessary also after error removed) 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 		<ul style="list-style-type: none"> Turn ON the power supply for 2 to 3 minutes to charge the super capacitor, turn OFF the power supply, and set zero return. After turning OFF the power supply to the servo amplifier, measure the battery voltage. Replace the servo amplifier battery.
2026	(A)	Unit mismatch	<ul style="list-style-type: none"> The servo parameter (system setting) and the actually installed servo amplifier do not match. 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 		<ul style="list-style-type: none"> Check the system setting.
2030	(M)	Excessive regeneration	<ul style="list-style-type: none"> The power transistor for regenerative control goes ON and OFF too frequently. (Note that the regenerative resistance sometimes causes overheating.) 	<ul style="list-style-type: none"> Anytime during operation 		<ul style="list-style-type: none"> Check the servo motor regeneration level (%), and lower the frequency of the speed adjustment or the speed. Lower the load. Increase the motor capacity.
			<ul style="list-style-type: none"> Incorrect servo amplifier parameter setting (system setting) 			<ul style="list-style-type: none"> Check the servo parameters (regenerative resistance and motor type of the system setting).
			<ul style="list-style-type: none"> Incorrect wiring of regenerative resistance 			<ul style="list-style-type: none"> Connect the regenerative resistance correctly.
			<ul style="list-style-type: none"> Regenerative resistance fault 			<ul style="list-style-type: none"> Replace the regenerative resistance.
			<ul style="list-style-type: none"> The power transistor for regenerative control was short-circuited or damaged. 			<ul style="list-style-type: none"> Replace the servo amplifier.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2031	(A)	Overspeed	<ul style="list-style-type: none"> The command speed is too high. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the command speed.
	<ul style="list-style-type: none"> An overshoot occurred during acceleration. 		<ul style="list-style-type: none"> Check the servo parameters. 			
<ul style="list-style-type: none"> Encoder fault 	<ul style="list-style-type: none"> Replace the encoder. 					
<ul style="list-style-type: none"> Encoder cable fault or incorrect wiring 	<ul style="list-style-type: none"> Check the wiring between the encoder and the ADU. 					
(M)		<ul style="list-style-type: none"> The motor speed was more than 115% of the rated speed. 				<ul style="list-style-type: none"> Check the motor speed of the servo parameters. Check if the 1-rotation pulse and the 1-rotation travel of the fixed parameters match the machine specifications.
		<ul style="list-style-type: none"> An overshoot occurred due to the too small speed adjustment constant. 				<ul style="list-style-type: none"> When an overshoot occurs during speed adjustment, check the acceleration and deceleration times of the fixed parameters.
		<ul style="list-style-type: none"> An overshoot occurred due to the instable servo system. 				<ul style="list-style-type: none"> When an overshoot occurs, adjust the position loop gain/position control gain 1, 2 or speed loop gain/velocity control gain 1, 2 of the servo parameters, or increase the speed integral compensation.
		<ul style="list-style-type: none"> Detection device fault 				<ul style="list-style-type: none"> Check the detection device cable for disconnection. Replace the servo motor.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)	
		Error Names	Error Contents				
2032	(A)	Over-current	<ul style="list-style-type: none"> A servo motor different from the setting has been connected. 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON. At servo error reset 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the system setting. 	
			<ul style="list-style-type: none"> The phases U, V and W of the ADU output were short-circuited or grounded to one another. 			<ul style="list-style-type: none"> Check the servo motor cable. 	
			<ul style="list-style-type: none"> Incorrect wiring of the phases U, V and W of the ADU output 			<ul style="list-style-type: none"> Connect the servo motor wiring correctly. 	
			<ul style="list-style-type: none"> Damaged ADU transistor module ADU fault 			<ul style="list-style-type: none"> Replace the ADU. 	
			<ul style="list-style-type: none"> Improper coupling between the servo motor and the encoder 			<ul style="list-style-type: none"> Replace the servo motor. 	
			<ul style="list-style-type: none"> The servo motor oscillated. 			<ul style="list-style-type: none"> Check the servo parameters. 	
	(M)			<ul style="list-style-type: none"> The phases U, V and W of the servo amplifier output were short-circuited with one another. 	<ul style="list-style-type: none"> Anytime during operation 		<ul style="list-style-type: none"> Check if the phases U, V and W of the servo amplifier output are short-circuited with one another.
				<ul style="list-style-type: none"> The phases U, V and W of the servo amplifier output were grounded. 			<ul style="list-style-type: none"> Check if the phases U, V and W of the servo amplifier output are grounded to the earth. Check if the phases U, V and W of the servo motor are grounded to the core. If grounded, replace the servo amplifier and the motor.
				<ul style="list-style-type: none"> Incorrect wiring of the phases U, V and W of the servo amplifier output 			<ul style="list-style-type: none"> Connect the wiring correctly.
				<ul style="list-style-type: none"> Damaged servo amplifier transistor 			<ul style="list-style-type: none"> Replace the servo amplifier.
				<ul style="list-style-type: none"> Improper coupling between the servo amplifier and the encoder 			<ul style="list-style-type: none"> Replace the servo motor.
				<ul style="list-style-type: none"> Encoder cable fault 			<ul style="list-style-type: none"> Replace the encoder cable.
				<ul style="list-style-type: none"> A servo motor different from the setting has been connected 			<ul style="list-style-type: none"> Check the connected motor of the system setting.
				<ul style="list-style-type: none"> The servo motor oscillated. 			<ul style="list-style-type: none"> Check and adjust the preset gain value of the servo parameters.
			<ul style="list-style-type: none"> A noise existed in the overcurrent sensing circuit. 			<ul style="list-style-type: none"> Check if a relay or valve operates around the circuit. 	

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2033	(M)	Over-voltage	<ul style="list-style-type: none"> The voltage through the converter bus was 400 V or over. Regenerative ability was exceeded because the speed adjustment was made very frequently. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Increase the acceleration and deceleration times of the fixed parameters.
			<ul style="list-style-type: none"> Incorrect connection of the regenerative resistance 			<ul style="list-style-type: none"> Check the connection of the terminal block for regeneration (C - P).
			<ul style="list-style-type: none"> The regenerative resistance in the servo amplifier is cut. 			<ul style="list-style-type: none"> Using a tester, check between C and P of the terminal block for regeneration. If there is something abnormal, replace the servo amplifier. (Check 3 minutes after the charge lamp goes OFF.)
			<ul style="list-style-type: none"> The power transistor for regeneration has been damaged. 			<ul style="list-style-type: none"> Replace the servo amplifier.
			<ul style="list-style-type: none"> The power supply voltage was high. 			<ul style="list-style-type: none"> Measure the input voltages (R, S, T) with a voltmeter.
2034	(M)	Communications error	<ul style="list-style-type: none"> Faulty data received from the controller (CPU) 			<ul style="list-style-type: none"> Check the connection of the motion bus cable. Check if the motion bus cable is disconnected. Check if the motion bus cable is clamped properly.
2035	(A)	Data error	<ul style="list-style-type: none"> The command speed is too high. 			<ul style="list-style-type: none"> Check the command speed.
			<ul style="list-style-type: none"> CPU fault 			<ul style="list-style-type: none"> Replace the servo system CPU.
	<ul style="list-style-type: none"> The change rate of the position command or the command speed from the controller (CPU) is too high. 		<ul style="list-style-type: none"> Check the command speed and the 1-rotation pulse and 1-rotation travel of the fixed parameters. 			
	<ul style="list-style-type: none"> A noise existed in the command from the controller (CPU). 		<ul style="list-style-type: none"> Check the connection of the motion bus cable connector. Check if the motion bus cable is disconnected. Check if the motion bus cable is clamped properly. Check if a relay or valve operates around the circuit. 			
2036	(A)	Transfer error	<ul style="list-style-type: none"> CPU fault 			<ul style="list-style-type: none"> Replace the servo system CPU.
	(M)		<ul style="list-style-type: none"> Faulty communications with the controller (CPU) 			<ul style="list-style-type: none"> Check the connection of the motion bus cable connector. Check if the motion bus cable is disconnected. Check if the motion bus cable is clamped properly.

20. TROUBLESHOOTING

Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2042	(M)	Feedback error	<ul style="list-style-type: none"> Encoder signal error 	<ul style="list-style-type: none"> Anytime during operation 		<ul style="list-style-type: none"> Replace the servo motor.
2045	(A)	Amplifier fin overheating	<ul style="list-style-type: none"> The ADU fan is stopped. 			<ul style="list-style-type: none"> Replace the ADU fan.
	<ul style="list-style-type: none"> The continuous current output of the ADU has been exceeded. 		<ul style="list-style-type: none"> Lower the load. 			
2045	(M)	Fin overheating	<ul style="list-style-type: none"> ADU thermal sensor fault 			<ul style="list-style-type: none"> Replace the ADU.
	<ul style="list-style-type: none"> The heat sink in the servo amplifier is overheated. Amplifier fault (rated output exceeded) The power supply is turned ON/OFF repeated under overload. Improper cooling 		<ul style="list-style-type: none"> Reduce the effective torque of the servo motor if high. Reduce the speed adjustment frequency. Check if the amplifier fin is stopped. (MR-H150B or higher) Check if ventilation is prohibited. Check if the temperature inside the panel is too high (0 to +55°C). Check if the solenoid brake is actuated externally during operation. Replace the servo amplifier. 			
2046	(A)	Motor overheating	<ul style="list-style-type: none"> The thermal protector incorporated in the motor malfunctioned. 			<ul style="list-style-type: none"> Replace the servo motor.
	<ul style="list-style-type: none"> The continuous output of the servo motor has been exceeded. 		<ul style="list-style-type: none"> Lower the load. 			
	(M)	<ul style="list-style-type: none"> The motor is overloaded. 	<ul style="list-style-type: none"> Reduce the effective torque of the servo motor if high. 			
	<ul style="list-style-type: none"> The motor and the option for regeneration are overheated. 	<ul style="list-style-type: none"> Check the temperature around the servo motor (0 to +40°C). 				
			<ul style="list-style-type: none"> The thermal protector incorporated in the encoder malfunctioned. 			<ul style="list-style-type: none"> Replace the servo motor.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2050	(A)	Overload	<ul style="list-style-type: none"> The rated current of the servo motor has been exceeded. The load inertia and the friction are too high. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is stopped immediately.	<ul style="list-style-type: none"> Lower the load.
	(M)	Overload 1	<ul style="list-style-type: none"> Hunting due to incorrect parameter setting A 200% overload current flowed continuously through the servo amplifier and the servo motor. 			<ul style="list-style-type: none"> Check the parameters. Check if the machine is interfered. If the load inertia is extremely high, increase the speed adjustment constant, or lower the load. In case of hunting, adjust the position loop gain and speed loop gain of the servo parameters. Check the connections between the servo amplifier and the phases U, V and W of the servo motor. Check the detection device cable for disconnection. Replace the servo motor.
2051	(M)	Overload 2	<ul style="list-style-type: none"> The servo amplifier and the servo motor were overloaded near the max. torque (95 % or over of the current limit). 			<ul style="list-style-type: none"> Check if the machine is interfered. If the load inertia is extremely high, increase the speed adjustment constant, or lower the load. In case of hunting, adjust the position loop gain/position control gain 1, 2 and speed loop gain/velocity control gain 1, 2 of the servo parameters. Check the connections between the servo amplifier and the phases U, V and W of the servo motor. Check the detection device cable for disconnection. When the voltage through the bus in the servo amplifier is low (the charge lamp is OFF), replace the servo amplifier. Replace the servo motor.

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2052	(A)	Excessive error	<ul style="list-style-type: none"> The value of the deviation counter exceeded the specified value. The inertia is too high, and acceleration cannot be done completely. 	Anytime during operation	Operation is stopped immediately.	<ul style="list-style-type: none"> Check the servo parameters.
	(M)		<ul style="list-style-type: none"> Encoder or cable fault 			<ul style="list-style-type: none"> Replace the encoder or cable.
			<ul style="list-style-type: none"> The difference between the command pulse and return pulse of the servo amplifier exceeded 80,000 pulses. 			<ul style="list-style-type: none"> Check if the machine is interfered. Increase the speed adjustment constant. Increase the position loop gain/position control gain 1, 2 of the servo parameters. Check the detection device cable for disconnection. Replace the servo motor. When the voltage through the bus in the servo amplifier (the charge lamp is OFF), replace the servo amplifier.
2057	(A)	Hardware fault	<ul style="list-style-type: none"> ADU hardware fault 			<ul style="list-style-type: none"> Replace the ADU.
2086	(M)	RS232 communications error	<ul style="list-style-type: none"> Parameter unit communications error 			<ul style="list-style-type: none"> Check the parameter unit cable for disconnection. Replace the parameter unit.
2102	(A)	Battery warning	<ul style="list-style-type: none"> The battery voltage of the absolute encoder lowered. 		Operation is continued.	<ul style="list-style-type: none"> Replace the battery (MR-JBAT-[]).
	(M)		<ul style="list-style-type: none"> The voltage of the battery installed in the servo amplifier lowered 			<ul style="list-style-type: none"> Replace the battery.
2013	(M)	Battery disconnection warning	<ul style="list-style-type: none"> The voltage of the power supply to the absolute position encoder lowered. 			<ul style="list-style-type: none"> Replace the battery. Check the detection device cable for disconnection. Replace the servo motor. Replace the servo amplifier.
2140	(M)	Excessive regeneration warning	<ul style="list-style-type: none"> An excessive regeneration error (2030) is likely to occur (when 85% of the maximum load capacity of the regenerative resistance is sensed.) 			<ul style="list-style-type: none"> See the contents of the excessive generation error (2030).

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
		Error Names	Error Contents			
2141	(A)	Overload warning	<ul style="list-style-type: none"> 80% of the overload error (2050) level was sensed. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is continued.	<ul style="list-style-type: none"> See the contents of the overload error (2050).
	(M)		<ul style="list-style-type: none"> An overload error (2050, 2051) is likely to occur (when 85% of the error level is sensed). 			<ul style="list-style-type: none"> See the contents of the overload errors (2050, 2051).
2143	(A)	Absolute counter warning	<ul style="list-style-type: none"> Encoder fault 			<ul style="list-style-type: none"> Replace the encoder.
2146	(M)	Servo emergency stop	<ul style="list-style-type: none"> Electrical continuity between pins 1A and 1B (emergency stop input) of the servo amplifier connector CN6 has been released. 			<ul style="list-style-type: none"> Short 1A and 1B of the servo amplifier connector CN6.
2147	(A)	Emergency stop	<ul style="list-style-type: none"> An emergency stop occurred. 		Operation is stopped immediately.	<ul style="list-style-type: none"> Release the emergency stop.
	(M)		<ul style="list-style-type: none"> An emergency stop (EMG) signal was sent from the controller (CPU). 		Operation is continued.	<ul style="list-style-type: none"> Release the emergency stop.
2149	(M)	Main circuit OFF warning	<ul style="list-style-type: none"> A servo ON (SON) signal was ON when the contact was OFF. The voltage through the main circuit bus lowered to 215 V or below when the speed was 50 rpm. 			<ul style="list-style-type: none"> Turn ON the main circuit contact or main circuit power supply.
2196	(M)	Zero point setting error warning	<ul style="list-style-type: none"> After execution of the zero point setting command, the accumulated pulses were not within the in-position range. 			<ul style="list-style-type: none"> Redo zero return.
2201 to 2210 2215 2219	(A)	Parameter warning	Incorrect parameters were set.			<ul style="list-style-type: none"> Check the system setting and the servo parameters.
			2201	Amplifier/external regenerative resistance setting		
			2202	Motor type		
			2203	Motor capacity		
			2204	Encoder type		
			2205	In-position range		
			2206	Position loop gain		
			2207	Velocity loop gain		
			2208	Velocity intergral compensation		
			2209	Torque limit value		
			2210	Torque limit value		
			2215	Excessive error		
			2219	Feed forward factor		

Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)	
		Error Names	Error Contents				
2301 to 2336	(M)	Parameter error	<ul style="list-style-type: none"> The servo parameters are out of the setting range. (Incorrect parameters are ignored, and the values before setting are retained.) 	<ul style="list-style-type: none"> Anytime during operation 	Operation is continued.	<ul style="list-style-type: none"> Check the servo parameter setting range. 	
			2300				Motor type
			2301				Motor type
			2302				• Regenerative resistance
			2303				Motor type
			2304				Motor capacity
			2305				Motor rpm
			2306				Number of feedback pulses
			2307				Rotating direction setting
			2308				Auto teaching setting
			2309				Servo responsibility setting
			2310				Torque limit (forward)
			2311				Torque limit (reverse)
			2312				Load inertia ratio
			2313				Position control gain 1
			2314				Velocity control gain 2
			2315				Position control gain 2
			2316				Velocity control gain 2
			2317				Velocity integral compensation
			2318				Notch filter
			2319				Feed forward factor
			2320				In-position range
			2321				Solenoid brake sequence output
			2322				Monitor output mode selection
			2323				Optional function 1
			2324				Optional function 2
			2325				Optional function 3
			2326				Optional function 4
			2327				Monitor output 1 offset
			2328				Monitor output 2 offset
			2329				Before-alarm data selection
			2330				Zero speed
			2331				Excessive error alarm level
			2332				Optional function 5
2333	Optional function 6						
2334	PI-PID switching position droop						
2335	Torque limit compensation factor						
2336	Velocity integral compensation (actual velocity differential compensation)						

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Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)																								
		Error Names	Error Contents																											
2500	(A)	Parameter error	<ul style="list-style-type: none"> The following servo parameters were set incorrectly. <ul style="list-style-type: none"> Amplifier/external regenerative resistance setting Motor type Motor capacity 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At servo error reset 	Operation is continued.	<ul style="list-style-type: none"> Check the system setting and the servo parameters. 																								
2501 to 2510 2515 2519	(M)	Parameter error	<ul style="list-style-type: none"> Incorrect parameters were set. <table border="1"> <tbody> <tr> <td>2501</td> <td>Amplifier/external regenerative resistance setting</td> </tr> <tr> <td>2502</td> <td>Motor type</td> </tr> <tr> <td>2503</td> <td>Motor capacity</td> </tr> <tr> <td>2504</td> <td>Encoder type</td> </tr> <tr> <td>2505</td> <td>In-position range</td> </tr> <tr> <td>2506</td> <td>Position loop gain</td> </tr> <tr> <td>2507</td> <td>Velocity loop gain</td> </tr> <tr> <td>2508</td> <td>Velocity integral compensation</td> </tr> <tr> <td>2509</td> <td>Torque limit value</td> </tr> <tr> <td>2510</td> <td>Torque limit value</td> </tr> <tr> <td>2515</td> <td>Excessive error</td> </tr> <tr> <td>2519</td> <td>Feed forward factor</td> </tr> </tbody> </table> 	2501	Amplifier/external regenerative resistance setting	2502	Motor type	2503	Motor capacity	2504	Encoder type	2505	In-position range	2506	Position loop gain	2507	Velocity loop gain	2508	Velocity integral compensation	2509	Torque limit value	2510	Torque limit value	2515	Excessive error	2519	Feed forward factor	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset 	Operation is continued.	<ul style="list-style-type: none"> Check the system setting and the servo parameters.
2501	Amplifier/external regenerative resistance setting																													
2502	Motor type																													
2503	Motor capacity																													
2504	Encoder type																													
2505	In-position range																													
2506	Position loop gain																													
2507	Velocity loop gain																													
2508	Velocity integral compensation																													
2509	Torque limit value																													
2510	Torque limit value																													
2515	Excessive error																													
2519	Feed forward factor																													

20. TROUBLESHOOTING

Table 20.13 Servo amplifier errors list (2000 to 2799) (continued)

Error Codes	Amplifiers	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)	
		Error Names	Error Contents				
2601 to 2636	(M)	Initial parameter error	<ul style="list-style-type: none"> The set parameter values are incorrect. The parameter data was destroyed. 	<ul style="list-style-type: none"> When power supply to the servo amplifier is ON At start-up of PC CPU ready (M2000) At servo error reset When power supply to the controller is ON 	Operation is stopped immediately.	<ul style="list-style-type: none"> Check and modify the set parameter values, and turn OFF and ON the power supply to the controller (CPU) or reset the key, or turn OFF and ON the PC CPU ready (M2000). 	
			2600				Motor type
			2601				Motor type
			2602				Regenerative resistance
			2603				Motor type
			2604				Motor capacity
			2605				Motor rpm
			2606				Number of feedback pulses
			2607				Rotating direction setting
			2608				Auto teaching setting
			2609				Servo responsibility setting
			2610				Torque limit (forward)
			2611				Torque limit (reverse)
			2612				Load inertia ratio
			2613				Position control gain 1
			2614				Velocity control gain 2
			2615				Position control gain 2
			2616				Velocity control gain 2
			2617				Velocity integral compensation
			2618				Notch filter
			2619				Feed forward factor
			2620				in-position range
			2621				Solenoid brake sequence output
			2622				Monitor output mode selection
			2623				Optional function 1
			2624				Optional function 2
			2625				Optional function 3
			2626				Optional function 4
			2627				Monitor output 1 offset
			2628				Monitor output 2 offset
			2629				Before-alarm data selection
			2630				Zero speed
			2631				Excessive error alarm level
2632	Optional function 5						
2633	Optional function 6						
2634	PI-PID switching position droop						
2635	Torque limit compensation factor						
2636	Velocity integral compensation (actual velocity differential compensation)						

(b) Servo power supply module errors (2800 to 2999)

Servo power supply module errors are detected by the servo amplifier, and their codes are 2800 to 2999.

A servo error detection signal (Xn8) goes ON when a servo error occurs. Remove the cause of the error, reset the servo error by turning the servo error reset signal (Yn8) ON, and restart operations. (The servo error detection signal does not go ON even if any of the error codes 2900 to 2999 because they are for warning.)

Notes 1. Regarding the regeneration error protection (error code 2830), the state at the time the error occurred is stored in the servo amplifier even after the protection circuit has operated. The memory contents are cleared when the external power supply is turned OFF, but are not cleared by the RESET signal.

2. If reset by turning OFF the external power supply is repeated when the error code 2830, 2050, and 2051 occurs, the element may be broken due to overheating. Restart operations after the cause of the error has been removed completely.

Servo power supply module errors are shown in Table 20.14.

Table 20.14 Servo Power supply modules errors list (2800 to 2999)

Error Codes	Error Causes		Error Check Points in Time	Error Processing	Corrective Action(s)
	Error Names	Error Contents			
2810	Low voltage	<ul style="list-style-type: none"> The voltage to the power supply module was lower than 170 VAC. A instantaneous power failure occurred. 	<ul style="list-style-type: none"> Anytime during operation 	Operation is immediately stopped.	<ul style="list-style-type: none"> Check the power supply module.
		<ul style="list-style-type: none"> The load is too high. 			<ul style="list-style-type: none"> Check the power supply capacity.
2830	Excessive regeneration	<ul style="list-style-type: none"> The maximum load capacity of the regenerative resistance has been exceeded due to frequent operation or continuous regenerative operation. 			<ul style="list-style-type: none"> Reduce the speed adjustment frequency, or check the operation pattern.
		<ul style="list-style-type: none"> The power transistor for regeneration was damaged. 			<ul style="list-style-type: none"> Replace the servo power supply module.
		<ul style="list-style-type: none"> Incorrect regenerative resistance value of the system setting 			<ul style="list-style-type: none"> Check the system setting.
		<ul style="list-style-type: none"> Incorrect wiring of the regenerative resistance 			<ul style="list-style-type: none"> Connect the wiring correctly.
2833	Overvoltage	<ul style="list-style-type: none"> Incorrect regenerative resistance connection 			<ul style="list-style-type: none"> Connect the wiring correctly.
		<ul style="list-style-type: none"> The power transistor for regeneration was damaged. 			<ul style="list-style-type: none"> Replace the servo power supply module.
		<ul style="list-style-type: none"> The regenerative resistance was disconnected. 			<ul style="list-style-type: none"> Replace the regenerative resistance.
		<ul style="list-style-type: none"> The power supply voltage is high. 			<ul style="list-style-type: none"> Check the power supply module.
2847	Amplifier overheating	<ul style="list-style-type: none"> The servo power supply module fan is stopped. 			<ul style="list-style-type: none"> Replace the fan.
		<ul style="list-style-type: none"> The continuous output current of the power supply module has been exceeded. 			<ul style="list-style-type: none"> Lower the load.
		<ul style="list-style-type: none"> Thermal sensor fault 			<ul style="list-style-type: none"> Replace the servo power supply module.
2940	Excessive regeneration warning	<ul style="list-style-type: none"> 80% of the excessive regeneration error (2830) level was sensed. 		Operation is continued.	<ul style="list-style-type: none"> See the contents of the excessive regeneration error (2830).

20.3.5 Special Registers D

The special registers are data registers used for specific purposes in the servo system CPU. Therefore, do not write data to the special registers in the program (except the ones with numbers marked *2 in the table).

Table 20.15 Special Registers List

Number	Name	Stored Data	Explanation
D9000	Fuse blown	Number of module with blown fuse	<ul style="list-style-type: none"> When modules with blown fuses are detected, the lowest module number among the detected modules is stored in hexadecimal. (Example: When the fuses of Y50 to 6F output modules have blown, "50" is stored in hexadecimal) The module number monitored by the peripheral is hexadecimal. (Cleared when all contents of D9100 to D9107 are reset to 0.)
D9002	I/O unit verify error	I/O module verify error module number	<ul style="list-style-type: none"> If I/O modules whose data is different from data entered are detected when the power is turned on, the first I/O number of the lowest module number among the detected modules is stored in hexadecimal. (Storing method is the same as that of D9000.) The module number monitored by the peripheral is hexadecimal. (Cleared when all contents of D9116 of D9123 are reset to 0.)
*1 D9005	AC DOWN counter	AC DOWN time count	<ul style="list-style-type: none"> 1 is added each time the input voltage becomes 80% or less of the rating while the CPU unit is performing an operation, and the value is stored in BIN code.
*1 D9008	Self-diagnostic error	Self-diagnostic error number	<ul style="list-style-type: none"> When error is found as a result of self-diagnosis, the error number is stored in BIN code.

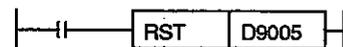
POINTS

- (1) All special register data is cleared by the power-off, latch clear and reset operations. The data is retained when the RUN/STOP switch is set to STOP.
- (2) For the above special registers with numbers marked *1, the contents of the register are not cleared if the normal status is restored. To clear the contents, use the following method:

(a) Method using a user program.

Insert the circuit shown at right into the program and turn on the clear execution command contact to clear the contents of the register.

Clear execution command



(b) Method using peripheral equipment.

Set the register to "0" by changing the present value using the test function of a peripheral device or set it to "0" using forced reset. For the operation procedure, refer to the manual for each peripheral device.

(c) By moving the RESET key switch at the servo system CPU front to the RESET position, the special register is set to "0".

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation																																
D9009	Annunciator detection	F number at which external failure has occurred	<ul style="list-style-type: none"> When one of F0 to F255 is turned on by [OUT F] or [SET F], the F number, detected earliest among the F numbers which have turned on is stored in BIN code. D9009 can be cleared by the [RST F] or [LEDR] instruction by setting the INDICATOR RESET switch on the face of the CPU ON. If another F number has been detected, the clearing of D9009 causes the next number to be stored in D9009. 																																
D9010	Error step	Step number at which operation error has occurred	<ul style="list-style-type: none"> When an operation error has occurred during execution of an application instruction, the step number at which the error has occurred is stored in BIN code. Thereafter, each time an operation error occurs, the contents of D9010 are renewed. 																																
D9011	Error step	Step number at which operation error has occurred	<ul style="list-style-type: none"> When an operation error has occurred during execution of an application instruction, the step number at which the error has occurred is stored in BIN code. Since storage into D9011 is executed when M9011 changes from off to on, the contents of D9010 cannot be renewed unless M9011 is cleared by the user program. 																																
D9014	I/O control mode	I/O control mode number	<ul style="list-style-type: none"> The set mode is represented as follows: 0 = I/O in direct mode 1 = Input in refresh mode, output in direct mode 3 = I/O in refresh mode 																																
D9015	CPU operating states	Operating states of CPU	<p>The operating states of CPU as shown below are stored in D9015.</p> <div style="text-align: center;"> <p>B15 ... B12 B11 ... B8 B7 ... B4 B3 ... B0</p> </div> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2">CPU RUN/STOP switch: Remains unchanged in remote run/stop mode.</td> </tr> <tr><td>0</td><td>RUN</td></tr> <tr><td>1</td><td>STOP</td></tr> <tr><td>2</td><td>PAUSE*</td></tr> <tr><td>3</td><td>STEP RUN</td></tr> <tr> <td colspan="2">Remote RUN/STOP by parameter setting</td> </tr> <tr><td>0</td><td>RUN</td></tr> <tr><td>1</td><td>STOP</td></tr> <tr><td>2</td><td>PAUSE*</td></tr> <tr> <td colspan="2">Status in program</td> </tr> <tr><td>0</td><td>Other than below</td></tr> <tr><td>1</td><td>[STOP] instruction execution</td></tr> <tr> <td colspan="2">Remote RUN/STOP by computer</td> </tr> <tr><td>0</td><td>RUN</td></tr> <tr><td>1</td><td>STOP</td></tr> <tr><td>2</td><td>PAUSE*</td></tr> </table> <p>* When the CPU is in RUN mode and M9040 is off, the CPU remains in RUN mode if changed to PAUSE mode.</p>	CPU RUN/STOP switch: Remains unchanged in remote run/stop mode.		0	RUN	1	STOP	2	PAUSE*	3	STEP RUN	Remote RUN/STOP by parameter setting		0	RUN	1	STOP	2	PAUSE*	Status in program		0	Other than below	1	[STOP] instruction execution	Remote RUN/STOP by computer		0	RUN	1	STOP	2	PAUSE*
CPU RUN/STOP switch: Remains unchanged in remote run/stop mode.																																			
0	RUN																																		
1	STOP																																		
2	PAUSE*																																		
3	STEP RUN																																		
Remote RUN/STOP by parameter setting																																			
0	RUN																																		
1	STOP																																		
2	PAUSE*																																		
Status in program																																			
0	Other than below																																		
1	[STOP] instruction execution																																		
Remote RUN/STOP by computer																																			
0	RUN																																		
1	STOP																																		
2	PAUSE*																																		

POINT

Data is written to the special registers marked *2 by the sequence program.

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation
D9016	Program number	0 : Main program(ROM) 1 : Main program(RAM) 2 : Subprogram(RAM)	<ul style="list-style-type: none"> Indicates the setting of memory select chip. One value among 0 to 2 is stored in BIN code.
D9017	Scan time	Minimum scan time (per 10msec)	<ul style="list-style-type: none"> If the scan time is shorter than the contents of D9017, the value is newly stored at each END. Namely, the minimum value for scan time is stored in D9017 in BIN code.
D9018	Scan time	Scan time (per 10msec)	<ul style="list-style-type: none"> The scan time is stored in BIN code at each END and always rewritten.
D9019	Scan time	Maximum scan time (per 10msec)	<ul style="list-style-type: none"> If the scan time is longer than the contents of D9019, the value is newly stored at each END. This means that the maximum value of the scan time is stored in D9019 in BIN code.
*2 D9020	Constant scan	Constant scan time (User specified in 10msec increments)	<ul style="list-style-type: none"> Sets user program execution intervals in 10msec increments. 0: Constant scan function not used 1 to 200: Constant scan function used, program executed at intervals of (set value) × 10msec.
*2 D9094	Replacement I/O first I/O number	Replacement I/O first I/O number	<ul style="list-style-type: none"> Stores the upper 2 digits of the first I/O number of an I/O module that is removed/replaced in the online status. Example: Input module X2F0 → H2F
*1 D9100 D9101 D9102 D9103 D9104 D9105 D9106 D9107	Fuse blown module	Bit pattern in units of 16 points, indicating the modules whose fuses have blown.	<ul style="list-style-type: none"> The numbers of output modules whose fuses have blown are input as a bit pattern(in units of 16 points). (If the module numbers are set by parameter, the output is in the form of the parametr-set numbers.) <p>(The pattern is not cleared even if the module recovers. Therefore, it must be cleared using a program.)</p>
*1 D9116 D9117 D9118 D9119 D9120 D9121 D9122 D9123	nput/Output module verification error	Bit pattern in units of 16 points, indicating the modules with verification errors.	<ul style="list-style-type: none"> The module numbers of the I/O modules whose information differs from the I/O module information registered when the power was turned ON are set (in units of 16 points). (If the I/O module numbers are set by parameter, the output is in the form of the parameter-set numbers.) <p>(The pattern is not cleared even if the module recovers. Therefore, it must be cleared using a program.)</p>

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation																																																																																																																																															
D9124	Anunciator detection quantity	Anunciator detection quantity	<ul style="list-style-type: none"> When one of F0 to 255 is turned on by [OUT F] or [SET F], 1 is added to the contents of D9124. When the [RST F] or [LED R] instruction is executed, 1 is subtracted from the contents of D9124. <p>The quantity which has been turned on by [OUT F] or [SET F] is stored into D9124 in BIN code. The maximum value of D9124 is 8.</p>																																																																																																																																															
D9125 D9126 D9127 D9128 D9129 D9130 D9131 D9132	Anunciator detection number	Anunciator detection number	<ul style="list-style-type: none"> When one of F0 to 255 is turned on by [OUT F] or [SET F], the F number which has turned on is entered into D9125 to D9132 in due order in BIN code. <p>The F number which has been turned off by [RST F] is erased from D9125 to D9132, and the contents of data registers succeeding the data register, where the erased F number was stored, are shifted to the preceding data registers.</p> <p>When the [LED R] instruction is executed, the contents of D9125 to D9132 are shifted upward by one.</p> <p>When there are 8 annunciator detections, a 9th one is not stored in D9125 to 9132 even if detected.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>SET F50</th> <th>SET F25</th> <th>SET F19</th> <th>SET F25</th> <th>SET F15</th> <th>SET F70</th> <th>SET F85</th> <th>SET F38</th> <th>SET F110</th> <th>SET F151</th> <th>SET F210</th> <th>LEDR</th> </tr> </thead> <tbody> <tr> <td>D9009</td> <td>0</td> <td>50</td> <td>99</td> </tr> <tr> <td>D9124</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>8</td> </tr> <tr> <td>D9125</td> <td>0</td> <td>50</td> <td>99</td> </tr> <tr> <td>D9126</td> <td>0</td> <td>0</td> <td>25</td> <td>25</td> <td>99</td> <td>99</td> <td>99</td> <td>99</td> <td>99</td> <td>99</td> <td>99</td> <td>15</td> </tr> <tr> <td>D9127</td> <td>0</td> <td>0</td> <td>0</td> <td>99</td> <td>0</td> <td>15</td> <td>15</td> <td>15</td> <td>15</td> <td>15</td> <td>15</td> <td>70</td> </tr> <tr> <td>D9128</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>70</td> <td>70</td> <td>70</td> <td>70</td> <td>70</td> <td>65</td> </tr> <tr> <td>D9129</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>65</td> <td>65</td> <td>65</td> <td>65</td> <td>38</td> </tr> <tr> <td>D9130</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>38</td> <td>38</td> <td>38</td> <td>110</td> </tr> <tr> <td>D9131</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>110</td> <td>110</td> <td>151</td> </tr> <tr> <td>D9132</td> <td>0</td> <td>151</td> <td>210</td> </tr> </tbody> </table>		SET F50	SET F25	SET F19	SET F25	SET F15	SET F70	SET F85	SET F38	SET F110	SET F151	SET F210	LEDR	D9009	0	50	50	50	50	50	50	50	50	50	50	99	D9124	0	1	2	3	2	3	4	5	6	7	8	8	D9125	0	50	50	50	50	50	50	50	50	50	50	99	D9126	0	0	25	25	99	99	99	99	99	99	99	15	D9127	0	0	0	99	0	15	15	15	15	15	15	70	D9128	0	0	0	0	0	0	70	70	70	70	70	65	D9129	0	0	0	0	0	0	0	65	65	65	65	38	D9130	0	0	0	0	0	0	0	0	38	38	38	110	D9131	0	0	0	0	0	0	0	0	0	110	110	151	D9132	0	0	0	0	0	0	0	0	0	0	151	210
	SET F50	SET F25	SET F19	SET F25	SET F15	SET F70	SET F85	SET F38	SET F110	SET F151	SET F210	LEDR																																																																																																																																						
D9009	0	50	50	50	50	50	50	50	50	50	50	99																																																																																																																																						
D9124	0	1	2	3	2	3	4	5	6	7	8	8																																																																																																																																						
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D9128	0	0	0	0	0	0	70	70	70	70	70	65																																																																																																																																						
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D9132	0	0	0	0	0	0	0	0	0	0	151	210																																																																																																																																						

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation																																																																																																																																																																																																																																																																																									
D9180	Storage area for axis 1 and axis 2 limit switch output statuses	Limit switch output status storage area 1 : ON 0 : OFF	<ul style="list-style-type: none"> The status of output (ON/OFF) to limit switch output AY42 set with a peripheral device is stored as "1" or "0". 1 : ON 0 : OFF These registers can be used to output limit switch output data to an external device using the sequence program. <div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td></td><td>b15</td><td>b14</td><td>b13</td><td>b12</td><td>b11</td><td>b10</td><td>b9</td><td>b8</td><td>b7</td><td>b6</td><td>b5</td><td>b4</td><td>b3</td><td>b2</td><td>b1</td><td>b0</td> </tr> <tr> <td>D9180</td><td>LY0F</td><td>LY0E</td><td>LY0D</td><td>LY0C</td><td>LY0B</td><td>LY0A</td><td>LY09</td><td>LY08</td><td>LY07</td><td>LY06</td><td>LY05</td><td>LY04</td><td>LY03</td><td>LY02</td><td>LY01</td><td>LY00</td> </tr> <tr> <td colspan="17" style="text-align: center;">├──────────────────┬──────────────────┤</td> </tr> <tr> <td colspan="9" style="text-align: center;">For axis 2</td> <td colspan="8" style="text-align: center;">For axis 1</td> </tr> <tr> <td>D9181</td><td>LY1F</td><td>LY1E</td><td>LY1D</td><td>LY1C</td><td>LY1B</td><td>LY1A</td><td>LY19</td><td>LY18</td><td>LY17</td><td>LY16</td><td>LY15</td><td>LY14</td><td>LY13</td><td>LY12</td><td>LY11</td><td>LY10</td> </tr> <tr> <td colspan="17" style="text-align: center;">├──────────────────┬──────────────────┤</td> </tr> <tr> <td colspan="9" style="text-align: center;">For axis 4</td> <td colspan="8" style="text-align: center;">For axis 3</td> </tr> <tr> <td>D9182</td><td>LY2F</td><td>LY2E</td><td>LY2D</td><td>LY2C</td><td>LY2B</td><td>LY2A</td><td>LY29</td><td>LY28</td><td>LY27</td><td>LY26</td><td>LY25</td><td>LY24</td><td>LY23</td><td>LY22</td><td>LY21</td><td>LY20</td> </tr> <tr> <td colspan="17" style="text-align: center;">├──────────────────┬──────────────────┤</td> </tr> <tr> <td colspan="9" style="text-align: center;">For axis 6</td> <td colspan="8" style="text-align: center;">For axis 5</td> </tr> <tr> <td>D9183</td><td>LY3F</td><td>LY3E</td><td>LY3D</td><td>LY3C</td><td>LY3B</td><td>LY3A</td><td>LY39</td><td>LY38</td><td>LY37</td><td>LY36</td><td>LY35</td><td>LY34</td><td>LY33</td><td>LY32</td><td>LY31</td><td>LY30</td> </tr> <tr> <td colspan="17" style="text-align: center;">├──────────────────┬──────────────────┤</td> </tr> <tr> <td colspan="9" style="text-align: center;">For axis 8</td> <td colspan="8" style="text-align: center;">For axis 7</td> </tr> </table></div> <p style="text-align: center;">* "1" or "0" is stored for each of the bits D9180 through D9183. 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100 to 107 110 to 117	<ul style="list-style-type: none"> Servo amplifier CPU fault (WDT error) The lower two digits have the meanings indicated below. <div style="text-align: center;"> <table border="0"> <tr> <td style="text-align: center;">1 0 0</td> <td rowspan="2" style="vertical-align: middle;">┌──┐</td> <td rowspan="2" style="vertical-align: middle;">└──┘</td> <td rowspan="2" style="vertical-align: middle;">• Indicates the slot No. (0 to 7) where the ADU with the error is installed.</td> </tr> <tr> <td style="text-align: center;">↑</td> </tr> </table> </div> <ul style="list-style-type: none"> Indicates the stage number of the base on which the ADU with the error is installed. (0: main base, 1: extension base) 	1 0 0	┌──┐	└──┘	• Indicates the slot No. (0 to 7) where the ADU with the error is installed.	↑																																																																																																																																																																																																																																																																																						
1 0 0	┌──┐	└──┘				• Indicates the slot No. (0 to 7) where the ADU with the error is installed.																																																																																																																																																																																																																																																																																						
↑																																																																																																																																																																																																																																																																																												
200 to 207 210 to 217	<ul style="list-style-type: none"> H/W fault of module installed on main base unit or motion extension base unit The lower two digits have the meanings indicated below. <div style="text-align: center;"> <table border="0"> <tr> <td style="text-align: center;">2 0 0</td> <td rowspan="2" style="vertical-align: middle;">┌──┐</td> <td rowspan="2" style="vertical-align: middle;">└──┘</td> <td rowspan="2" style="vertical-align: middle;">• Indicates the slot No. (0 to 7) where the module with the error is installed.</td> </tr> <tr> <td style="text-align: center;">↑</td> </tr> </table> </div> <ul style="list-style-type: none"> Indicates the stage number of the base on which the module with the error is installed. (0: main base, 1: extension base) 	2 0 0	┌──┐	└──┘	• Indicates the slot No. (0 to 7) where the module with the error is installed.	↑																																																																																																																																																																																																																																																																																						
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↑																																																																																																																																																																																																																																																																																												
250	• Standalone servo amplifier (MR-H-B/MR-J-B) interface, H/W fault																																																																																																																																																																																																																																																																																											

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation																																	
D9185	Servo amplifier type	Servo amplifier type	<ul style="list-style-type: none"> On switching the power ON or resetting, the servo amplifier type set in the system settings is stored in these devices. (1)When an A373/A373UCPU is used <table border="1" style="margin: 10px 0;"> <tr> <td>b15 to b12</td> <td>b11 to b8</td> <td>b7 to b4</td> <td>b3 to b0</td> </tr> <tr> <td>Axis 4</td> <td>Axis 3</td> <td>Axis 2</td> <td>Axis 1</td> </tr> <tr> <td>Axis 8</td> <td>Axis 7</td> <td>Axis 6</td> <td>Axis 5</td> </tr> </table> <ul style="list-style-type: none"> Servo amplifier type <ul style="list-style-type: none"> 0HUnused axis 1H to 6HDestination amplifier No. when using an ADU 7H to AHCorrespond to switch settings d1 to d4 when using an MR-SB/SD (first one installed) BH to EHCorrespond to switch settings d5 to d8 when using an MR-SB/SD (second one installed) FHA340SC (amplifier at extension side) (2)When an A273UCPU is use <table border="1" style="margin: 10px 0;"> <tr> <td>b15 to b12</td> <td>b11 to b8</td> <td>b7 to b4</td> <td>b3 to b0</td> </tr> <tr> <td>Axis 4</td> <td>Axis 3</td> <td>Axis 2</td> <td>Axis 1</td> </tr> <tr> <td>Axis 8</td> <td>Axis 7</td> <td>Axis 6</td> <td>Axis 5</td> </tr> </table> <ul style="list-style-type: none"> Servo amplifier type <ul style="list-style-type: none"> 0Unused axis 1ADU (main base unit) 2MR-H-B/MR-J-B 5ADU (extension base unit) 	b15 to b12	b11 to b8	b7 to b4	b3 to b0	Axis 4	Axis 3	Axis 2	Axis 1	Axis 8	Axis 7	Axis 6	Axis 5	b15 to b12	b11 to b8	b7 to b4	b3 to b0	Axis 4	Axis 3	Axis 2	Axis 1	Axis 8	Axis 7	Axis 6	Axis 5									
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Axis 4	Axis 3	Axis 2	Axis 1																																	
Axis 8	Axis 7	Axis 6	Axis 5																																	
D9186	Manual pulse generator axis setting error	Manual pulse generator axis setting error	<ul style="list-style-type: none"> Stores the contents of a manual pulse generator axis setting error when the manual pulse generator axis setting flag (M9077) comes ON. <table border="1" style="margin: 10px 0;"> <tr> <td>b15</td><td>b14</td><td>b13</td><td>b12</td><td>b11</td><td>b10</td><td>b9</td><td>b8</td><td>b7</td><td>b6</td><td>b5</td><td>b4</td><td>b3</td><td>b2</td><td>b1</td><td>b0</td> </tr> <tr> <td>Axis 8</td><td>Axis 7</td><td>Axis 6</td><td>Axis 5</td><td>Axis 4</td><td>Axis 3</td><td>Axis 2</td><td>Axis 1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>P3</td><td>P2</td><td>P1</td> </tr> </table> <ul style="list-style-type: none"> Stores setting errors for the 1 pulse input magnification setting for each axis <ul style="list-style-type: none"> 0 : Normal 1 : Setting error (When the input magnification for each axis is outside the range 1 to 100.) Stores manual axis setting errors for the manual pulse generators connected to P1 to P3 of an A336PX <ul style="list-style-type: none"> 0 : Normal 1 : Setting error (When the axis setting for each digit is outside the range 1 to 8) 	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1	0	0	0	0	0	P3	P2	P1	
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0																					
Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1	0	0	0	0	0	P3	P2	P1																					
D9187	Test mode request error	Test mode request error	<ul style="list-style-type: none"> Stores the data of axes being operated when the test mode request error flag (M9078) comes ON. <table border="1" style="margin: 10px 0;"> <tr> <td>b15</td><td>b14</td><td>b13</td><td>b12</td><td>b11</td><td>b10</td><td>b9</td><td>b8</td><td>b7</td><td>b6</td><td>b5</td><td>b4</td><td>b3</td><td>b2</td><td>b1</td><td>b0</td> </tr> <tr> <td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>Axis 8</td><td>Axis 7</td><td>Axis 6</td><td>Axis 5</td><td>Axis 4</td><td>Axis 3</td><td>Axis 2</td><td>Axis 1</td> </tr> </table> <ul style="list-style-type: none"> Stores the operating/stopped status of each axis: <ul style="list-style-type: none"> 0 : Stopped 1 : Operating All set to "0". 	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	0	0	0	0	0	0	0	0	0	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0																					
0	0	0	0	0	0	0	0	0	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1																				
D9188	Error program No.	Error program No.	<ul style="list-style-type: none"> Stores the subprogram No. (range: 0 to 4095) affected by the error when the subprogram setting error flag (M9079) comes ON. If, once an error program No. has been stored, an error occurs in another servo program, the program number of the subprogram with the new error is stored. 																																	
D9189																																				

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation																																																																				
D9190	Error item information	Servo program setting error number	<ul style="list-style-type: none"> When the servo program setting error flag (M9079) has come ON, the error code that corresponds to the relevant setting item is stored in this device. <table border="1"> <thead> <tr> <th>Error Code</th> <th>Error Contents</th> </tr> </thead> <tbody> <tr> <td>900</td> <td>The servo program set for the DSFRP/SVST instruction does not exist.</td> </tr> <tr> <td>901</td> <td>The axis number set for the DSFRP/SVST instruction is different from the axis number set in the servo program.</td> </tr> <tr> <td>902</td> <td>The instruction code cannot be decoded. (There is a questionable instruction code.)</td> </tr> <tr> <td>906</td> <td>An axis designated as unused in the system settings is set in the subprogram set for the DSFRP/SVST instruction.</td> </tr> <tr> <td>Error item data</td> <td>There is an error in the setting items of the servo program set for the DSFRP/SVST instruction.</td> </tr> </tbody> </table>	Error Code	Error Contents	900	The servo program set for the DSFRP/SVST instruction does not exist.	901	The axis number set for the DSFRP/SVST instruction is different from the axis number set in the servo program.	902	The instruction code cannot be decoded. (There is a questionable instruction code.)	906	An axis designated as unused in the system settings is set in the subprogram set for the DSFRP/SVST instruction.	Error item data	There is an error in the setting items of the servo program set for the DSFRP/SVST instruction.																																																								
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Error item data	There is an error in the setting items of the servo program set for the DSFRP/SVST instruction.																																																																						
D9191	Servo amplifier installation information	Servo amplifier installation information	<ul style="list-style-type: none"> When the power is switched ON, or on resetting, the servo amplifier and option slot installation statuses are checked and the results stored in this device. <p>(1)When an A373/A373UCPU is used</p> <table border="1"> <tr> <td>b15 to b12</td> <td>b11 to b8</td> <td>b7</td> <td>b6</td> <td>b5</td> <td>b4</td> <td>b3</td> <td>b2</td> <td>b1</td> <td>b0</td> </tr> <tr> <td>OP2</td> <td>OP1</td> <td>Axis 8</td> <td>Axis 7</td> <td>Axis 6</td> <td>Axis 5</td> <td>Axis 4</td> <td>Axis 3</td> <td>Axis 2</td> <td>Axis 1</td> </tr> </table> <table border="1"> <thead> <tr> <th colspan="2">Servo amplifier installation status</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not installed, or ADU fault, MR-SB/SD power OFF, or connecting cable fault. *1</td> </tr> <tr> <td>1</td> <td>Not installed.</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Option slot installation status</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not installed. *2</td> </tr> <tr> <td>1</td> <td>A336PX</td> </tr> <tr> <td>2</td> <td>A336EX</td> </tr> <tr> <td>3</td> <td>A344SF</td> </tr> <tr> <td>4</td> <td>AY42</td> </tr> <tr> <td>5</td> <td>A I/O</td> </tr> <tr> <td>9</td> <td>A344SF (connected to A340SC)</td> </tr> </tbody> </table> <p>*1: In the case of an ADU, if the module is not installed although an axis number has been set in the system settings, a major error is displayed.</p> <p>*2: Even if a module is installed to a slot designated as unused in the system settings, the status stored will be "unused".</p> <p>(2)When an A273UCPU is used</p> <table border="1"> <tr> <td>b15 to b12</td> <td>b11 to b8</td> <td>b7</td> <td>b6</td> <td>b5</td> <td>b4</td> <td>b3</td> <td>b2</td> <td>b1</td> <td>b0</td> </tr> <tr> <td>0</td> <td>0</td> <td>Axis 8</td> <td>Axis 7</td> <td>Axis 6</td> <td>Axis 5</td> <td>Axis 4</td> <td>Axis 3</td> <td>Axis 2</td> <td>Axis 1</td> </tr> </table> <table border="1"> <thead> <tr> <th colspan="2">Servo amplifier installation status</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Not installed or ADU fault, MR-H-B/MR-J-B power OFF, or connecting cable fault. *1</td> </tr> <tr> <td>1</td> <td>Not installed.</td> </tr> </tbody> </table> <p>*1: In the case of an ADU, if the module is not installed although an axis number has been set in the system settings, a major error is displayed.</p>	b15 to b12	b11 to b8	b7	b6	b5	b4	b3	b2	b1	b0	OP2	OP1	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1	Servo amplifier installation status		0	Not installed, or ADU fault, MR-SB/SD power OFF, or connecting cable fault. *1	1	Not installed.	Option slot installation status		0	Not installed. *2	1	A336PX	2	A336EX	3	A344SF	4	AY42	5	A I/O	9	A344SF (connected to A340SC)	b15 to b12	b11 to b8	b7	b6	b5	b4	b3	b2	b1	b0	0	0	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1	Servo amplifier installation status		0	Not installed or ADU fault, MR-H-B/MR-J-B power OFF, or connecting cable fault. *1	1	Not installed.
b15 to b12	b11 to b8	b7	b6	b5	b4	b3	b2	b1	b0																																																														
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1	Not installed.																																																																						

Table 20.15 Special Registers List (Continued)

Number	Name	Stored Data	Explanation
D9192	Area for setting the smoothing magnification for manual pulse generator 1 (P1)	Areas for setting manual pulse generator smoothing magnifications	<ul style="list-style-type: none"> • Stores the manual pulse generator smoothing time constant. • The smoothing time constant is calculated using the following formula: $\text{Smoothing time constant (t)} = (\text{smoothing magnification} + 1) \times 56.8 \text{ [ms]}$ <p>The setting range for the smoothing magnification is 0 to 59.</p>
D9193	Area for setting the smoothing magnification for manual pulse generator 2 (P2)		
D9194	Area for setting the smoothing magnification for manual pulse generator 3 (P3)		

20. TROUBLESHOOTING

20.3.6 LED indications when an error occurs in the PCPU

If the following error messages are displayed on the LED on the front panel of a servo system CPU, the error codes are not stored in the special register, etc.

Remove the cause of the error, and turn ON the power supply again.

(1) When an A373/A373UCPU is used

Table 20.16 Error message list when an error occurs in the PCPU

Error Messages	Error Causes	Corrective Action(s)
"NOT READY"	OS is not installed correctly.	Install the OS correctly.
"PCPU WDT ERROR"	Servo system CPU fault (An error does not occur if this message is displayed while the CPU is reset.)	Replace the servo system CPU.
"PCPU WDT ERROR 2"	Servo system CPU H/W fault	Replace the servo system CPU.
"SC ERROR"	Servo system CPU H/W fault	Replace the servo system CPU.
"OP[] UNIT ERROR"	A module installed in an optional slot became detached during POWER ON.	Install the module correctly in the optional slot.
"LAY ERROR (I I I I)" ^{*1}	There is a mismatch between the system settings and the mounting status (at the main base unit).	Make the system settings and mounting status match.
"LAY ERROR (I I I I)" ^{*2}	There is a mismatch between the system settings and the mounting status (at the extension base unit).	

*1: AMP1 to 6, ES, OP0 to 3

*2: AMP1 to 6, ES

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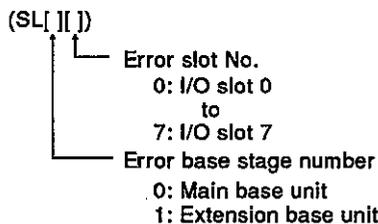
(2) When an A273UCPU is used

Table 20.17 Error Messages when an Error Occurs in the PCPU

Error Messages	Error Causes	Corrective Action(s)
"PCPU WDT ERROR"	Servo system CPU H/W fault (This message displayed at CPU reset does not indicate an error.)	• Replace the servo system CPU.
"PCPU WDT ERROR 2"	Servo system CPU H/W fault	• Replace the servo system CPU.
*1 "PCPU WDT ERR.[] [] []"	• Error codes 100 to 117 Servo amplifier CPU fault	• Replace the ADU.
	• Error codes 200 to 217 Main/motion extension base unit H/W fault	• Replace the base unit.
	• Error code 250 MR-H-B/MR-J-B I/F H/W fault	• Replace the MR-H-B/MR-J-B.
*2 "ADU ERROR(SL[] [])"	ADU H/W fault	Replace the ADU.
*3 "SYS.ERROR.[] [] [] (..)"	• Error code 1500 The power supply (A230P) to the servo system is not turned ON. Or an all-axis servo ON command was given when an error existed.	• Turn ON the power supply to the servo system, and give an all-axis servo ON command. (Supply the 3-phase, 200 V power for the servo power supply (A230P).)
	• Error code 1501 The 24 VDC is not supplied properly when setting the A278LX brake output use.	• Supply the 24 VDC to the A278LX.
*4 *5 "SV.ERROR[] [] [] ([] [])"	A servo error occurred.	• See the contents of the corresponding error code.
*2 "SL[] [] UNIT ERROR"	The module was about to come out, or came out.	• Install the module firmly.
*6 "LAY ERROR (SL[] [])"	The system setting and the modules which actually were installed in the main base unit or extension base unit do not match.	• Make the system settings agree with the actual installation status.

*1: Error codes for PCPU WDT error causes (100 to 250) are displayed.

*2: The slot number is displayed.

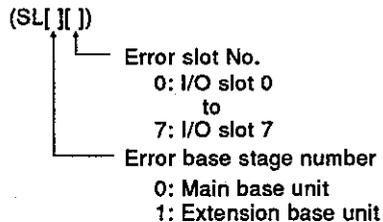


*3: The error code for major error (1500 or 1501) is displayed.

*4: The servo error code is displayed.

*5: The error axis number (01 to 08) is displayed. If the error is common to all axes, ".." is displayed.

*6: The slot number is displayed.



20. TROUBLESHOOTING

20.4 Error Messages During GSV[][]PE Operations

The following errors are those that occur during GSV[][]PE operations. The error contents and corrective action(s) are shown in Table 20.18 to Table 20.21.

Error causes and corrective actions can be displayed on the HELP window for troubleshooting. (While error messages are displayed, pressing the [Shift] + [F12] keys calls the HELP window.)

(1) When an A373/A373UCPU is used

Table 20.18 List of error messages

Error Message	Contents	Corrective Action(s)
ALL AXES ARE NOT USED. PRINT TERMINATED.	An attempt was made to print axis data although no data had been set in system setting.	Print axis data after making the system settings.
ALL ADU AXES UNUSED.	In the system settings, AMP1 to 8 and A336PX/EX are all set as unused. The axis settings are "unused" even though axes are used.	Carry out amplifier function setting in the system setting mode.
AMP[](A330AM):HA-SA[]:CAN NOT CONNECT.	The system settings indicate that a motor that cannot be connected to an amplifier is connected to it.	Check the amp and motor.
AMP. MISMATCH.	When copying axis data in the servo data setting mode, the amplifier for the copying source is different from the amplifier for the copying destination.	Copy between two axes which have the same amplifier.
AXIS NO. OUT OF RANGE.	The designated axis number was set outside the specified range from 1 to 8.	Confirm the set axis number.
AXIS NO. OVERLAP (*AXIS ALLOCATION AMP [], OP[] - D[])	The axis number was set twice in the system setting.	Confirm the axis number.
BEYOND STROKE LIMIT RANGE.	In the absolute system command (ABS[]), positioning address (the end point address in the case of circular interpolation) is set outside the range from the fixed parameter lower stroke limit to the upper stroke fixed parameter limit.	Do address setting in the specified range.
CANNOT CHANGE SERVO PARAMETER.	An attempt was made to change the servo parameter of the servo system CPU. However, the servo system CPU was not in a state where servo parameter change was allowed (in-position signal: ON).	Change the servo parameter after turning the in-position signal (X0n2) ON and setting the servo system CPU in a state where servo parameter changes are allowed.
CANNOT DELETE.	During deletion in a servo program, the [F3] key or [Shift] + [F2] keys were pressed when the cursor was on the required item.	Delete after confirming the item to be deleted. Or delete the entire program.
CANNOT EXECUTE DURING START.	The start command was given for the axis being started in the servo test.	Give the command again after the axis stops.
CANNOT EXECUTE, SERVO READY OFF.	A start command was given to the axis with the servo signal READY OFF in the servo test.	Give the start command after the servo READY signal goes ON.
	The servo READY signal (X0nF) for the corresponding axis is OFF when starting the torque trace start of servo monitoring.	Starts the trace after the servo READY signal goes ON.
CANNOT EXECUTE, SERVO READY ON.	An attempt has been made to write data in the servo PC mode while the SERVO READY signal (X0nF) in ON.	Turn SERVO READY (X0nF) OFF before writing the data.
CANNOT EXECUTE TORQUE TRACE.	When executing servo monitoring, torque trace cannot be done because the trace is being, done by a peripheral device.	Execute the torque trace after the trace has been completed.

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Table 20.18 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
CANNOT PRINT.	The poser to the printer is not ON. Or, the power connection is faulty.	Check the connection to the printer and the power cable.
CANNOT RELEASE TEST MODE.	An attempt was made to cancel the test mode before the axis stopped.	Cancel the test mode after stopping the axis.
CANNOT SELECT.	An attempt was made to select an item that cannot be selected.	Select the correct item.
CANNOT SET.	An attempt was made to set data though data setting was not allowed.	Confirm if data setting is necessary for the item with which data setting is to be done.
CANNOT START.xx └ Error code	The Error Code List gives details about the error contents. (see Table 20.19)	
CANNOT WRITE-IN WHEN PC IS RUNNING.	When doing writing in the servo PC mode, the PC was in the RUN state. Back-up attempted while the servo system CPU was in the RUN state.	Execute writing with the PC in the STOP state.
CANNOT WRITE, PC READY (M2000) ON.	In the PC READY mode, an attempt was made to write data while the PC READY flag (M2000) was set.	Write data after setting the PC READY flag (M2000) off.
CANNOT WRITE, WRITE PROTECT ON.	An attempt has been made to write to a write-protected floppy disk.	Set the write-protect tag of the floppy disk to the writing enabled position.
CHECK MEMORY CASSETTE.	Cam data could not be written to the servo system CPU memory. Or the E2ROM is defective.	The E2ROM is defective. Replace it.
COMMAND ERROR.	In servo programming, the set command code could not be decoded because it was not a correct one.	Set the correct command code.
	During servo test, an improper command was found in the servo program read from the servo system CPU.	Modify the servo program, and rewrite it in the servo system CPU.
CURRENT VALUE SETTING IS NOT POSSIBLE.	An attempt has been made to set the current value at a position other than the positioning address.	Set the current value in relation to the positioning address.
DATA MISMATCH.	Mismatch of data was detected by servo file verification.	Check the servo data and the data in the servo program.
DATA NOT FOUND.	The GSV[] JPE has not been installed correctly.	Install the GSV[] JPE correctly.
	An attempt was made to execute a printout without setting data to be printed out in the servo print mode.	Execute a printout after setting the data to be printed out.
DEVICE NUMBER OUT OF RANGE.	When reading the servo program, a device number other than the following was designated; D0 to D999 and/or W000 to W3FF (when an A373CPU is used), or D0 to D8191 or W0000 to W1FFF (When an A373UCPU is used).	Set the correct device number again. The designated servo program does not exist.
	When reading a program while servo was online, an attempt was made to read a servo program that did not exist.	
DRIVE NOT READY.	A hard disk and floppy disk have not been installed.	Check the hard disk and floppy disk. (This error does not usually occur.)
END POINT INSTRUCTION OVERLAP.	More than one end point designation command was set in the servo programming velocity switching command (VSTART).	Confirm the end point setting command.
FILE NOT FOUND.	There was no designated file.	Confirm the file name.
INCORRECT DATA.	Data outside the setting range has been set.	Set data within the setting range.

20. TROUBLESHOOTING

Motion Controller

Table 20.18 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
INCORRECT DESIGNATED POSITION OF END INSTRUCTION.	There is an instruction after the end instruction (CPEND, VEND) in the servo program.	Delete instructions after the end instruction.
INCORRECT DESIGNATED POSITION OF END POINT INSTRUCTION.	Point designation commands (ABS-1 to ABS-3, INC-1 to INC-3) have not been set in the current position in the servo programming velocity switching command (VSTART). Or there is no end point designation instruction.	Place the end point setting command next to the velocity switching command. Or, confirm the end point setting command.
INCORRECT EXECUTION POSITION.	An attempt has been made to execute a function at an inappropriate position.	Execute the function at an appropriate position.
INCORRECT FOR-NEXT INSTRUCTION.	Repeat commands (FOR-ON, FOR-OFF, FOR-TIMES, NEXT) are not used correctly in constant velocity and velocity change control. (Repeat commands are programmed in the nesting state. Or they are not used in correct pairs.)	Set the repeat commands correctly.
INCORRECT OPERATION.	A page key has been pressed although servo program data has not been read.	Read the servo program data and then press the page key.
INCORRECT SUB-SYSTEM NAME.	An attempt has been made to copy a file to the same drive and sub-system name as the source.	Change the sub-system name for the copy destination.
	The sub-system name is incorrect.	Change the sub-system name to the correct one.
INDIRECT DEVICE SETTING ERROR.	A device that cannot be used for indirect device setting was set in the servo program.	Set the correct indirect setting device.
INSTALL FAILED.	Installation failed.	Retry installation.
INSTALL SWITCH IS OFF.	The servo system CPU installation switch is turned OFF during installation.	Turn the installation switch ON.
INVALID KEY.	An invalid key was pressed.	Press the correct key.
ITEM ALREADY EXISTS.	During servo program edit, the designated setting item was already set.	The same item cannot be set repeatedly.
IT IS NOT POSSIBLE TO OPEN A FILE.	It was not possible to open a file during file writing.	Check possible causes including lack of available space on the hard disk.
NO END COMMAND.	There was no end command (CPEND, VEND) during constant velocity control and velocity change control.	Set the end command.
NO END POINT COMMAND.	There was no end point designation command in the servo programming velocity switching command (VSTART).	Set the end point setting command.
OPERATING SYSTEM MISMATCH.	The operating system names or operating system versions are inconsistent in the operating system in the servo system CPU and in the one to be compared.	Check the same model names or the same versions.
OPERATING SYSTEM NOT INSTALLED.	An OS has not been installed in the servo system CPU.	Install an OS by the installation function, and check it.
OUT OF SETTING RANGE.	An attempt was made to set data outside the setting range.	Do data setting in the setting range.

20. TROUBLESHOOTING

Table 20.18 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
PC COMMUNICATION ERROR.	An error occurred in the communications with the servo system CPU.	Confirm the connection state with the servo system CPU and the state of the cable.
	An attempt was made to read/write/verify data although the servo system CPU was not connected.	
	Connection with the servo system CPU is faulty.	
	Monitoring data could not be read normally.	Retry by pressing keys. There may be a fault if an error occurs during retry.
	It became time over in the servo test execution.	Confirm whether the servo system CPU is operating normally.
PC TYPE MISMATCH.	An attempt was made to read, write, and/or verify data or to do an installation when a CPU other than the servo system CPU was connected.	Connect it to a servo system CPU.
PRINTER NOT READY.	An attempt has been made to print before preparations for printing were completed.	Set the printer.
PROGRAM NOT FOUND.	The designated program does not exist. When program number 0 was displayed, an attempt was made to display the previous program number by pressing the [F7] key. When program number 4095 was, an attempt was made to display the next program number by pressing the [F8] key. Copy source program does not exist.	Confirm the program number.
PROGRAM NUMBER OUT OF RANGE.	Program numbers other than No.0 to No.4095 were designated for the servo program simultaneous start command (START) of the servo program.	Set the correct program number.
RANGE SETTING ERROR.	In the range set for the copy source, the start number is higher than the end number. Or more than one copy source range or copy destination range has been set.	Set a correct range.
	Data outside the setting range was set.	
SET DRIVE A TO READY AND PRESS [ENTER].	No disk is set in the drive when file reading/writing is attempted.	Insert a floppy disk in drive A and press the [Enter] key.
SETTING UNNECESSARY.	An attempt was made to set a parameter for an item where parameter setting was not allowed.	Setting has not been allowed.
SORT	In limit switch setting of servo data setting, an attempt was made to execute the ON/OFF setting in the condition where the point address has not been sorted.	Before executing the ON/OFF point setting, sort the point address.
	During servo programming, the program cannot be stored because there is insufficient free memory area.	Execute sorting to secure free memory area.
START AXIS OVERLAP.	In servo programming, the axes to be started in the program (K0-K4095) set by the simultaneous start command (START) are set twice. The axes to be started for interpolation control are set twice.	Confirm the axis to be started.
START INSTRUCTION IS DESIGNATED.	During servo programming, the START command was set as the program number (K0 to K4095) in the simultaneous start command (START).	Set a program number other than a START command in the simultaneous start.

Table 20.18 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
SUB-SYSTEM NAME NOT FOUND.	The designated machine name xxxxxxxx has not been set.	Set the machine name xxxxxxxx.
SYNTAX ERROR. NO.=xxx └ Program No.	During servo programming, a syntax error - for example one relating to the use of the repeat instruction - has been made.	Modify the servo program.
SYSTEM NOT SET.	An attempt was made to set data in the servo data setting mode, not in the system setting mode. Or, an error was detected in the relative check of the system setting.	Set servo data after doing system setting. Do a relative check to make sure there are no errors after system setting.
THE DATA IS ABNORMAL..	Loading is not possible due to an abnormality in the backup data.	Back up the data again.
THE DRIVE IS ABNORMAL..	The hard disk is abnormal.	Check the hard disk. (This error does not usually occur.)
THE INPUT IS OUTSIDE THE APPLICABLE RANGE.	An input value has exceeded the limit range.	Check the limit range and input another value.
THE INSTRUCTION INPUT FORM IS INCORRECT.	When the servo program was checked, an error was discovered in the set items.	Set the items again.
UNIT MISMATCH.	There is a mismatch between the control units used by the servo unit and the units for the axis.	Change the control units used by the servo program, which are set in the "units" and "P.B" additional items of the servo program, to achieve a match for at least one axis.
UNUSED AXIS.	The axis was set not to be used in the system setting.	The axis where an amplifier has not been loaded could not be selected. Power has not been supplied to the amplifier when doing servo monitoring/servo test. Turn ON the power supply.
WRITE-IN ERROR.	Data cannot be written to the program memory in the servo PC mode.	A fault was detected in the E2ROM. Replace it.
WRITE-IN FORBIDDEN.	An attempt was made to write data to the servo PC when the WRITE IN CPU switch of the A7PHP was set to the FORBID position.	Set the switch to the PERMIT position.

20. TROUBLESHOOTING

<Error Code List (1 to 16)>

Table 20.19 Error code list (codes displayed when axes cannot be started)

Error codes	Contents	Corrective Action(s)
1	The system could not be started because the servo error detection signal (X0n8) is ON.	Start the system after removing the cause of the servo error.
2	The system could not be started because the in-position signal (X0n2) is OFF.	Start the system after the motor comes into the designated in-position range.
3 *1	The system could not be started because the external FLS signal (XnB) is OFF.	Start the system after the external FLS (X0nB) goes ON.
4 *1	The system could not be started because the external RLS signal (X0nC) is OFF.	Start the system after the external RLS (X0nC) goes ON.
5 *1	The system could not be started because the external STOP signal (X0nD) is ON.	Start the system after the external STOP (X0nD) turns OFF.
6	The system could not be started because the servo READY signal (X0nF) is OFF.	Start the system after the servo READY (X0nF) goes ON.
7	The system could not be started because the MR-SB/SD or ADU has not been installed.	Power has not been supplied to the amplifier, or the axis has not been set for use. Supply power to the amplifier, and make sure the axis has been set for use.
8	The system could not be started because either upper limit or the lower limit of the fixed parameter has been exceeded.	Start the system after setting data not to exceed the upper limit and/or the lower limit.
9	Either near-zero point dog return or count zero return was attempted without PX in the ADU axis.	Zero return is impossible.
10	The system could not be started because the start receive flag (M2000 to M2008) was set.	Start the system after the motor has been stopped.
11	The system could not be started because the in-test-mode flag (M9075) was set.	Return to the test mode, and start the system after the in-test-mode flag (M9075) has been set.
12	The system could not be started because the test mode request error flag (M9078) was set.	Start the system after removing the cause of the test mode request error.
13	The system could not be started because torque trace processing was on the way.	Start the system after trace processing has been stopped.
14 *2	Forward JOG operations were attempted by the teaching function when the following conditions were not satisfied: <ul style="list-style-type: none"> External STOP signal is OFF. External FLS signal is ON. Servo error detection signal (X0n8) is OFF. Servo READY signal is ON. 	Start the system after satisfying all the conditions.
15 *3	A reverse JOG operation was attempted by the teaching function when the following conditions were not satisfied: <ul style="list-style-type: none"> External STOP signal is OFF. External RLS signal is ON. Servo error detection signal (X0n8) is OFF. Servo READY signal is ON. 	Start the system after satisfying all the conditions.
16	JOG operations or manual pulse generator operations were attempted by using the teaching function. However, they were not done because an axis could not be designated by the teaching function.	Start the system after designating the axis.

*1: Error does not occur if "without EX/PX" is set for the ADU axis.

*2: FLS and STOP signals are not checked if "without PX" is set for the ADU axis.

*3: RLS and STOP signals are not checked if "without EX not installed" is set for the ADU axis.

In the table above, "n" indicates the number (0 to 7) corresponding to the axis number.

20. TROUBLESHOOTING

(2) When an A373/A373UCPU is used

Table 20.20 List of error messages

Error Message	Contents	Corrective Action(s)
ALL ADU AXES UNUSED.	In the system settings, AMP1 to 8 and A336PX/EX are all set as unused. The axis settings are "unused" even though axes are used.	Carry out amplifier function setting in the system setting mode.
ALL AXES ARE NOT USED. PRINT TERMINATED.	An attempt was made to print axis data although no data had been set in system setting.	Print axis data after making the system settings.
AMP[](A330AM):HA-SA[]:CAN NOT CONNECT.	The system settings indicate that a motor that cannot be connected to an amplifier is connected to it.	Check the amp and motor.
AMP. MISMATCH.	When copying axis data in the servo data setting mode, the amplifier for the copying source is different from the amplifier for the copying destination.	Copy between two axes which have the same amplifier.
AXIS NO. NOT SET.	Not even one axis number has been set in system setting.	Set at least one axis number.
AXIS NO. OUT OF RANGE.	The designated axis number was set outside the specified range from 1 to 8.	Confirm the set axis number.
AXIS NO. OVERLAP (*AXIS ALLOCATION AMP [], OP[] - D[])	The axis number was set twice in the system setting.	Confirm the axis number.
BATTERY UNIT MR-JBAT-[] IS NOT SET FOR MAIN BASE UNIT.	The battery module was not set for the main base unit although the ABS servo motor was set at system setting.	Set the battery unit when using the ABS servo motor.
BEYOND STROKE LIMIT RANGE.	In the absolute system command (ABS[]), positioning address (the end point address in the case of circular interpolation) is set outside the range from the fixed parameter lower stroke limit to the upper stroke fixed parameter limit.	Do address setting in the specified range.
CANNOT CHANGE SERVO PARAMETER.	An attempt was made to change the servo parameter of the servo system CPU. However, the servo system CPU was not in a state where servo parameter change was allowed (in-position signal: ON).	Change the servo parameter after turning the in-position signal (X0n2) ON and setting the servo system CPU in a state where servo parameter changes are allowed.
CANNOT DELETE.	During deletion in a servo program, the [F3] key or [Shift] + [F2] keys were pressed when the cursor was on the required item.	Delete after confirming the item to be deleted. Or delete the entire program.
CANNOT EXECUTE DURING START.	The start command was given for the axis being started in the servo test.	Give the command again after the axis stops.
CANNOT EXECUTE, SERVO READY OFF.	A start command was given to the axis with the servo signal READY OFF in the servo test.	Give the start command after the servo READY signal goes ON.
	The servo READY signal (X0nF) for the corresponding axis is OFF when starting the torque trace start of servo monitoring.	Starts the trace after the servo READY signal goes ON.
CANNOT EXECUTE, SERVO READY ON.	An attempt has been made to write data in the servo PC mode while the SERVO READY signal (X0nF) in ON.	Turn SERVO READY (X0nF) OFF before writing the data.
CANNOT EXECUTE TORQUE TRACE.	When executing servo monitoring, torque trace cannot be done because the trace is being, done by a peripheral device.	Execute the torque trace after the trace has been completed.
CANNOT PRINT.	The poser to the printer is not ON. Or, the power connection is faulty.	Check the connection to the printer and the power cable.
CANNOT RELEASE TEST MODE.	An attempt was made to cancel the test mode before the axis stopped.	Cancel the test mode after stopping the axis.

20. TROUBLESHOOTING

Table 20.20 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
CANNOT SELECT.	An attempt was made to select an item that cannot be selected.	Select the correct item.
CANNOT SET.	An attempt was made to set data though data setting was not allowed.	Confirm if data setting is necessary for the item with which data setting is to be done.
CANNOT START.xx └── Error code	The Error Code List gives details about the error contents. (see Table 20.19)	
CANNOT WRITE-IN WHEN PC IS RUNNING.	When doing writing in the servo PC mode, the PC was in the RUN state. Back-up attempted while the servo system CPU was in the RUN state.	Execute writing with the PC in the STOP state.
CANNOT WRITE, PC READY (M2000) ON.	In the PC READY mode, an attempt was made to write data while the PC READY flag (M2000) was set.	Write data after setting the PC READY flag (M2000)off.
CANNOT WRITE, WRITE PROTECT ON.	An attempt has been made to write to a write-protected floppy disk.	Set the write-protect tag of the floppy disk to the writing enabled position.
CAPACITY OF BATTERY UNIT SET IS INSUFFICIENT.	The capacity of the battery unit set at system setting cannot cover the total number of the ABS servo motors and synchronous encoders.	Check the total number of ABS servo motors and synchronous encoders which the capacity of the battery unit can cover.
CHECK MEMORY CASSETTE.	Cam data could not be written to the servo system CPU memory. Or the E2ROM is defective.	The E2ROM is defective. Replace it.
COMMAND ERROR.	In servo programming, the set command code could not be decoded because it was not a correct one.	Set the correct command code.
	During servo test, an improper command was found in the servo program read from the servo system CPU.	Modify the servo program, and rewrite it in the servo system CPU.
CONTROL POWER SUPPLY MODULE IS NOT SET FOR MAIN BASE UNIT.	The control power supply module was not set for the main base unit at system setting.	Set the control power supply module for the main base unit.
CURRENT VALUE SETTING IS NOT POSSIBLE.	An attempt has been made to set the current value at a position other than the positioning address.	Set the current value in relation to the positioning address.
DATA MISMATCH.	Mismatch of data was detected by servo file verification.	Check the servo data and the data in the servo program.
DATA NOT FOUND.	The GSV[][]PE has not been installed correctly.	Install the GSV[][]PE correctly.
	An attempt was made to execute a printout without setting data to be printed out in the servo print mode.	Execute a printout after setting the data to be printed out.
DEVICE NUMBER OUT OF RANGE.	When reading the servo program, a device number other than the following was designated; D0 to D999 and/or W000 to W3FF (when an A373CPU is used), or D0 to D8191 or W0000 to W1FFF (When an A373UCPU is used).	Set the correct device number again. The designated servo program does not exist.
	When reading a program while servo was online, an attempt was made to read a servo program that did not exist.	
DRIVE NOT READY.	A hard disk and floppy disk have not been installed.	Check the hard disk and floppy disk. (This error does not usually occur.)
END POINT INSTRUCTION OVERLAP.	More than one end point designation command was set in the servo programming velocity switching command (VSTART).	Confirm the end point setting command.
EXTERNAL REGENERATIVE RESISTANCE IS NOT SET FOR SERVO POWER SUPPLY MODULE.	The external regenerative resistance was not set for the servo power supply module at system setting.	Set the external regenerative resistance for the servo power supply module.

* : Underlining indicates that the message displayed differs according to the setting.

20. TROUBLESHOOTING

Table 20.20 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
FILE NOT FOUND.	There was no designated file.	Confirm the file name.
<u>HA-LH52*</u> CANNOT BE CONNECTED TO <u>A221AM</u> (MAIN BASE UNIT I/O3).	A motor, which cannot be connected to the amplifier, was connected at system setting.	Check the servo motor or servo amplifier.
INCORRECT DATA.	Data outside the setting range has been set.	Set data within the setting range.
INCORRECT DESIGNATED POSITION OF END INSTRUCTION.	There is an instruction after the end instruction (CPEND, VEND) in the servo program.	Delete instructions after the end instruction.
INCORRECT DESIGNATED POSITION OF END POINT INSTRUCTION.	Point designation commands (ABS-1 to ABS-3, INC-1 to INC-3) have not been set in the current position in the servo programming velocity switching command (VSTART). Or there is no end point designation instruction.	Place the end point setting command next to the velocity switching command. Or, confirm the end point setting command.
INCORRECT EXECUTION POSITION.	An attempt has been made to execute a function at an inappropriate position.	Execute the function at an appropriate position.
INCORRECT FOR-NEXT INSTRUCTION.	Repeat commands (FOR-ON, FOR-OFF, FOR-TIMES, NEXT) are not used correctly in constant velocity and velocity change control. (Repeat commands are programmed in the nesting state. Or they are not used in correct pairs.)	Set the repeat commands correctly.
INCORRECT OPERATION.	A page key has been pressed although servo program data has not been read.	Read the servo program data and then press the page key.
INCORRECT SUB-SYSTEM NAME.	An attempt has been made to copy a file to the same drive and sub-system name as the source.	Change the sub-system name for the copy destination.
	The sub-system name is incorrect.	Change the sub-system name to the correct one.
INDIRECT DEVICE SETTING ERROR.	A device that cannot be used for indirect device setting was set in the servo program.	Set the correct indirect setting device.
INSTALL FAILED.	Installation failed.	Retry installation.
INSTALL SWITCH IS OFF.	The servo system CPU installation switch is turned OFF during installation.	Turn the installation switch ON.
INVALID KEY.	An invalid key was pressed.	Press the correct key.
<u>I/O NUMBERS OF PC CPU I/O MODULE OVERLAP BETWEEN MAIN BASE UNIT (I/O0) AND MOTION EXTENSION BASE UNIT (I/O7).</u> *	The I/O numbers of the PC CPU I/O module overlapped at system setting.	Confirm the I/O number.
ITEM ALREADY EXISTS.	During servo program edit, the designated setting item was already set.	The same item cannot be set repeatedly.
IT IS NOT POSSIBLE TO OPEN A FILE.	It was not possible to open a file during file writing.	Check possible causes including lack of available space on the hard disk.
NO END COMMAND.	There was no end command (CPEND, VEND) during constant velocity control and velocity change control.	Set the end command.
NO END POINT COMMAND.	There was no end point designation command in the servo programming velocity switching command (VSTART).	Set the end point setting command.
NUMBER OF I/O POINTS OF PC CPU I/O MODULE IS OVER 256.	The number of I/O points of the PC CPU I/O module was over 256 at system setting.	Set data within the permissible setting range.
OPERATING SYSTEM MISMATCH.	The operating system names or operating system versions are inconsistent in the operating system in the servo system CPU and in the one to be compared.	Check the same model names or the same versions.

* : Underlining indicates that the message displayed differs according to the setting.

20. TROUBLESHOOTING

Table 20.20 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
OPERATING SYSTEM NOT INSTALLED.	An OS has not been installed in the servo system CPU.	Install an OS by the installation function, and check it.
OUT OF SETTING RANGE.	An attempt was made to set data outside the setting range.	Do data setting in the setting range.
PC COMMUNICATION ERROR.	An error occurred in the communications with the servo system CPU.	Confirm the connection state with the servo system CPU and the state of the cable.
	An attempt was made to read/write/verify data although the servo system CPU was not connected.	
	Connection with the servo system CPU is faulty.	Retry by pressing keys. There may be a fault if an error occurs during retry.
	Monitoring data could not be read normally.	
	It became time over in the servo test execution.	Confirm whether the servo system CPU is operating normally.
PC TYPE MISMATCH.	An attempt was made to read, write, and/or verify data or to do an installation when a CPU other than the servo system CPU was connected.	Connect it to a servo system CPU.
PRINTER NOT READY.	An attempt has been made to print before preparations for printing were completed.	Set the printer.
PROGRAM NOT FOUND.	The designated program does not exist. When program number 0 was displayed, an attempt was made to display the previous program number by pressing the [F7] key. When program number 4095 was, an attempt was made to display the next program number by pressing the [F8] key. Copy source program does not exist.	Confirm the program number.
PROGRAM NUMBER OUT OF RANGE.	Program numbers other than No.0 to No.4095 were designated for the servo program simultaneous start command (START) of the servo program.	Set the correct program number.
RANGE SETTING ERROR.	In the range set for the copy source, the start number is higher than the end number. Or more than one copy source range or copy destination range has been set.	Set a correct range.
	Data outside the setting range was set.	
SAME AXIS NUMBER IS SET. ALLOCATION TO 1 AXIS : <u>MAIN BASE (I/O1)</u> * : <u>SEPARATE SERVO AMPLIFIER (D2)</u>	The same axis number was set twice at system setting.	Check the axis number.
SERVO EXTERNAL SIGNAL MODULE (A278LX) IS NECESSARY WHEN USING DYNAMIC BRAKE MODULE (A240DY).	The servo external signal module (A278LX) was not set at system setting although the dynamic brake module (A240DY) was set.	Set the servo external signal module (A278LX) when using the dynamic brake module (A240DY).
SERVO POWER SUPPLY MODULE IS NOT SET.	The servo power supply module was not set at system setting.	Set a servo power supply module whenever using an ADU.
SET DRIVE A TO READY AND PRESS [ENTER].	No disk is set in the drive when file reading/writing is attempted.	Insert a floppy disk in drive A and press the [Enter] key.
SETTING UNNECESSARY.	An attempt was made to set a parameter for an item where parameter setting was not allowed.	Setting has not been allowed.

* : Underlining indicates that the message displayed differs according to the setting.

Table 20.20 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
SORT	In limit switch setting of servo data setting, an attempt was made to execute the ON/OFF setting in the condition where the point address has not been sorted.	Before executing the ON/OFF point setting, sort the point address.
	During servo programming, the program cannot be stored because there is insufficient free memory area.	Execute sorting to secure free memory area.
START AXIS OVERLAP.	In servo programming, the axes to be started in the program (K0-K4095) set by the simultaneous start command (START) are set twice. The axes to be started for interpolation control are set twice.	Confirm the axis to be started.
START INSTRUCTION IS DESIGNATED.	During servo programming, the START command was set as the program number (K0 to K4095) in the simultaneous start command (START).	Set a program number other than a START command in the simultaneous start.
SUB-SYSTEM NAME NOT FOUND.	The designated machine name xxxxxxxx has not been set.	Set the machine name xxxxxxxx.
SYNTAX ERROR. NO.=xxx └ Program No.	During servo programming, a syntax error - for example one relating to the use of the repeat instruction - has been made.	Modify the servo program.
SYSTEM NOT SET.	An attempt was made to set data in the servo data setting mode, not in the system setting mode. Or, an error was detected in the relative check of the system setting.	Set servo data after doing system setting. Do a relative check to make sure there are no errors after system setting.
THE DATA IS ABNORMAL..	Loading is not possible due to an abnormality in the backup data.	Back up the data again.
THE DRIVE IS ABNORMAL..	The hard disk is abnormal.	Check the hard disk. (This error does not usually occur.)
THE INPUT IS OUTSIDE THE APPLICABLE RANGE.	An input value has exceeded the limit range.	Check the limit range and input another value.
THE INSTRUCTION INPUT FORM IS INCORRECT.	When the servo program was checked, an error was discovered in the set items.	Set the items again.
TOTAL RATED CURRENT OF SERVO MOTOR IS OVER POWER SUPPLY CAPACITY OF SERVO POWER SUPPLY MODULE BY <u>18.79</u> A. └ Over capacity	The total rated current of the motor connected to the ADU was over the capacity of the servo power supply module at system setting. The underlined portion varies according to the setting (0.01 to 99.99).	Connect the servo motor within the power capacity of the servo power supply module.
UNIT MISMATCH.	There is a mismatch between the control units used by the servo unit and the units for the axis.	Change the control units used by the servo program, which are set in the "units" and "P.B" additional items of the servo program, to achieve a match for at least one axis.
UNUSED AXIS.	The axis was set not to be used in the system setting.	The axis where an amplifier has not been loaded could not be selected. Power has not been supplied to the amplifier when doing servo monitoring/servo test. Turn ON the power supply.
WRITE-IN ERROR.	Data cannot be written to the program memory in the servo PC mode.	A fault was detected in the E2ROM. Replace it.
WRITE-IN FORBIDDEN.	An attempt was made to write data to the servo PC when the WRITE IN CPU switch of the A7PHP was set to the FORBID position.	Set the switch to the PERMIT position.

20. TROUBLESHOOTING

<Error Code List (1 to 16)>

Table 20.21 Error code list (codes displayed when axes cannot be started)

Error codes	Contents	Corrective Action(s)
1	The system could not be started because the servo error detection signal (X0n8) is ON.	Start the system after removing the cause of the servo error.
2	The system could not be started because the in-position signal (X0n2) is OFF.	Start the system after the motor comes into the designated in-position range.
3 *1	The system could not be started because the external FLS signal (XnB) is OFF.	Start the system after the external FLS (X0nB) goes ON.
4 *1	The system could not be started because the external RLS signal (X0nC) is OFF.	Start the system after the external RLS (X0nC) goes ON.
5 *1	The system could not be started because the external STOP signal (X0nD) is ON.	Start the system after the external STOP (X0nD) turns OFF.
6	The system could not be started because the servo READY signal (X0nF) is OFF.	Start the system after the servo READY (X0nF) goes ON.
7	The system could not be started because the MR-SB/SD or ADU has not been installed.	Power has not been supplied to the amplifier, or the axis has not been set for use. Supply power to the amplifier, and make sure the axis has been set for use.
8	The system could not be started because either upper limit or the lower limit of the fixed parameter has been exceeded.	Start the system after setting data not to exceed the upper limit and/or the lower limit.
9	Either near-zero point dog return or count zero return was attempted without PX in the A278LX.	Zero return is impossible.
10	The system could not be started because the start receive flag (M2000 to M2008) was set.	Start the system after the motor has been stopped.
11	The system could not be started because the in-test-mode flag (M9075) was set.	Return to the test mode, and start the system after the in-test-mode flag (M9075) has been set.
12	The system could not be started because the test mode request error flag (M9078) was set.	Start the system after removing the cause of the test mode request error.
13	The system could not be started because torque trace processing was on the way.	Start the system after trace processing has been stopped.
14 *2	Forward JOG operations were attempted by the teaching function when the following conditions were not satisfied: <ul style="list-style-type: none"> • External STOP signal is OFF. • External FLS signal is ON. • Servo error detection signal (X0n8) is OFF. • Servo READY signal is ON. 	Start the system after satisfying all the conditions.
15 *3	A reverse JOG operation was attempted by the teaching function when the following conditions were not satisfied: <ul style="list-style-type: none"> • External STOP signal is OFF. • External RLS signal is ON. • Servo error detection signal (X0n8) is OFF. • Servo READY signal is ON. 	Start the system after satisfying all the conditions.
16	JOG operations or manual pulse generator operations were attempted by using the teaching function. However, they were not done because an axis could not be designated by the teaching function.	Start the system after designating the axis.

*1: Error does not occur if "without EX/PX" is set for the A278LX.

*2: FLS and STOP signals are not checked if "without PX" is set for the A278LX.

*3: RLS and STOP signals are not checked if "without EX not installed" is set for the A278LX.

In the table above, "n" indicates the number (0 to 7) corresponding to the axis number.



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