

mitsubishi

**MOTION CONTROLLER
(SV21)**

Maintenance Manual

type A373CPU (P21/R21)

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end user.

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IBM, IBM-DOS(PC-DOS) are registered trademark of the International Business Machines Corporation.

1. GENERAL DESCRIPTION

Motion Controller

1. GENERAL DESCRIPTION

The multi-axis positioning control system is a positioning control system 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 data link system of a PC can be configured with a multi-axis positioning 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 the A373CPU system used for a multi-axis positioning control system.

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 SW01X-GSV21PE software package (hereafter called the GSV21PE) to create servo programs for the A373CPU 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 3 kinds:

- A373CPU Independent CPU function (without a data link function)
- A373CPUP21 With a data link function using fiber-optic cable
- A373CPUR21 With a data link function using coaxial cable
(Hereafter, these are all referred to as an A373CPU).

(2) The following 2 modes are used for servo control:

- Real mode Servo control using a servo program
- Virtual mode Servo control using a mechanical system program
(coaxial control function)

(3) An A373CPU 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/mechanical system programs
- SCPU Sequence control (corresponding A3NCPU)
Start of servo programs, manual pulse generator operations enable/disable, JOG operations, etc.

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(4) The GSV21PE has the following 2 functions:

- GPP functionThis function is equivalent to the SW0IX-GPPAE (SW0RX-GPPAE) and is used to develop sequence programs. The SW0IX-GPPAE type GPP Function Software Package Operating Manual gives details.
- Servo functionThis function creates positioning data and servo programs for an A373CPU, monitors the positioning status, and performs test operations.

POINT

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

(5) Creating programs and data using a peripheral device and an A373CPU

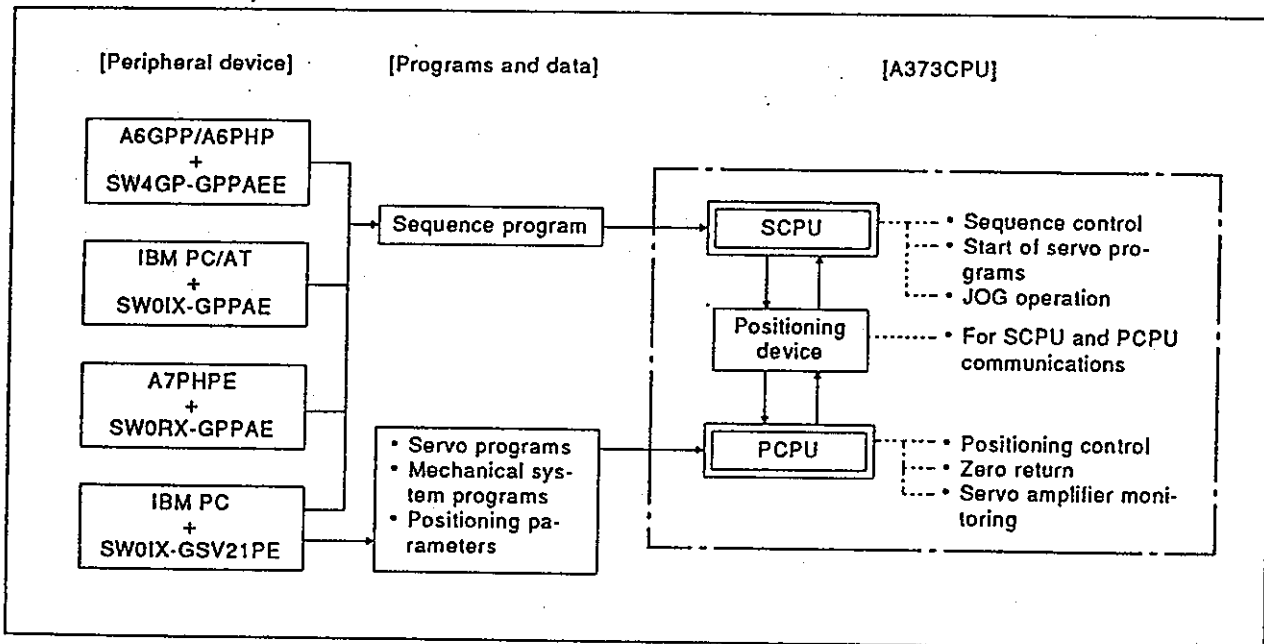


Fig. 1.1 General Description of Processing

- Create sequence programs to be written to the SCPU after starting up the software package for the GPP function by using an A6GPP/A6PHP, IBM PC/AT, or A7PHPE and designating A3N as the PC type name. In addition, a sequence program can be created by the GPP function of the GSV21PE. In this case, create it by designating A373 as the PC type name. Sequence programs are stored in a memory cassette installed in an A373CPU.
- Create servo programs and positioning parameters to be written to a PCPU after using the GSV21PE to start up an IBM PC. Servo/mechanical system program and positioning parameter are stored in the E²ROM of the A373CPU.
- The positioning control status of an A373CPU can be monitored, servo programs can be executed, and JOG operations can be tested by using an IBM PC started up by the GSV21PE.

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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 an A373CPU and the inputting of external inputs.

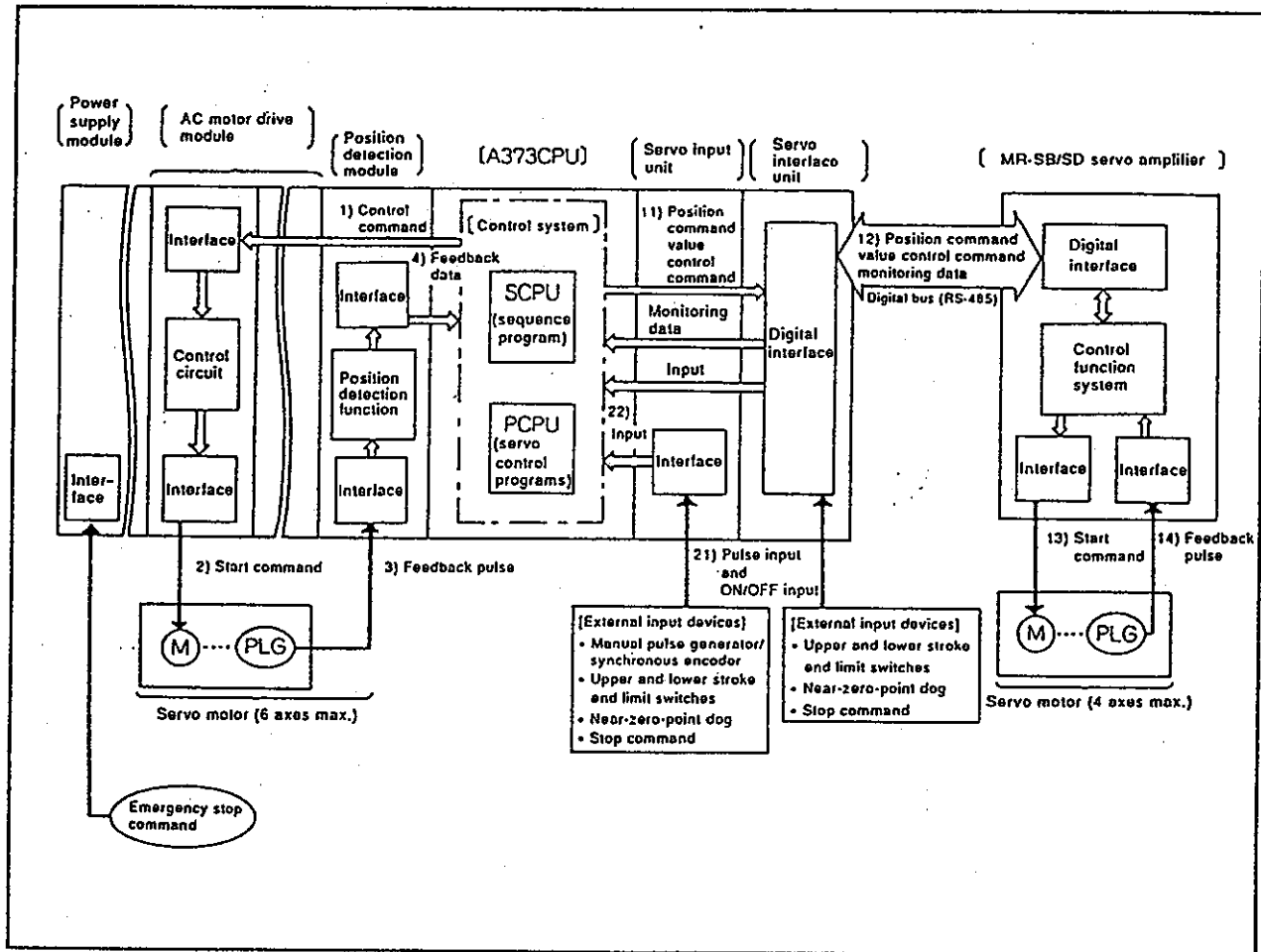


Fig. 1.2 General Description of Positioning Control

(1) General description of operations

- Starting the servo motor using the AC motor drive module
The servo motor (max. 6 axes) is started from an A373CPU by steps 1), 2), 3), and 4) in the above diagram.
- Starting the servo motor using the servo interface unit
The servo motor (max. 4 axes) is started from an A373CPU by steps 11), 12), 13), and 14) in the above diagram.
- Starting and stopping from an external input device by using a servo input unit
External inputs are received by an A373CPU by steps 21) and 22) in the above diagram, and the servo motor is started and stopped in accordance with 1) to 4).
- 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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1.3 Real Mode and Virtual Mode

The following can be executed by using an A373CPU:

- Positioning control by using the real mode.
- Positioning control by using the virtual mode

The real mode is used to control a servo motor connected to an ADU or MR-SB/SD directly by using a servo program.

The virtual mode is used to control the servo motor of a mechanical system created by a mechanical module using a servo program.

A mechanical system that was doing synchronous operations using the main shaft can be easily replaced with a servo motor in the virtual mode.

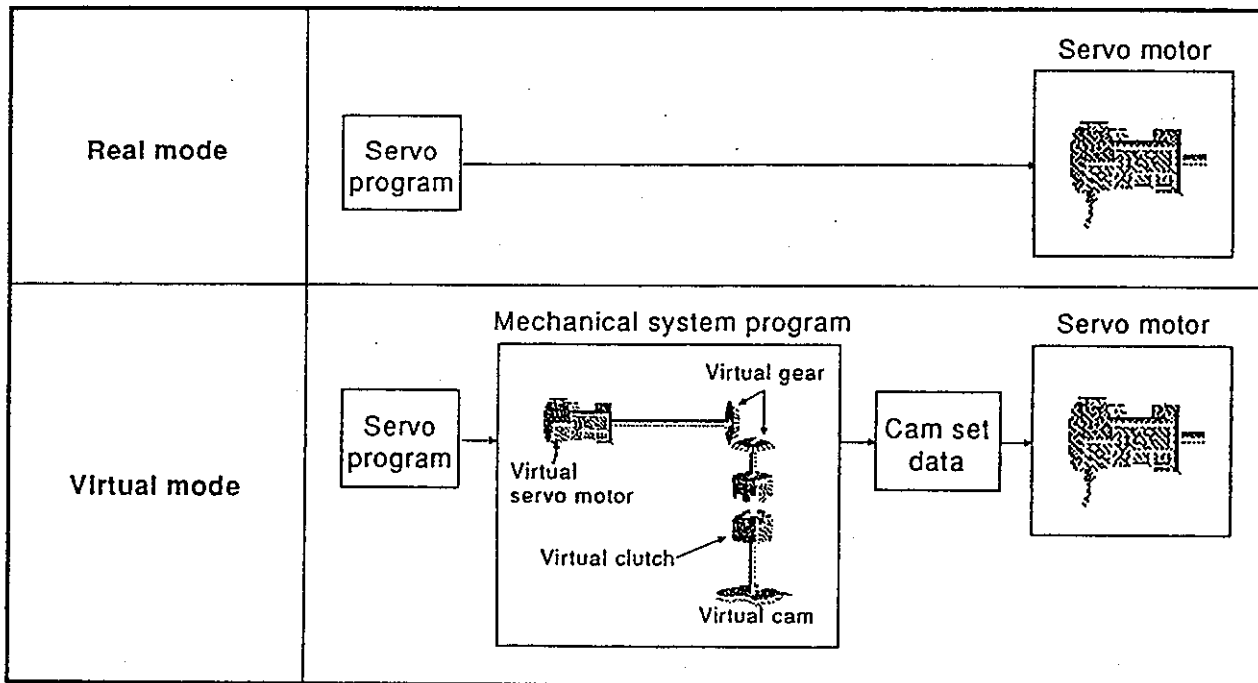


Fig. 1.3 Real and Virtual Modes

REMARK

This manual does not give an explanation of the virtual mode (mechanical system programs and SW0IX-CAMPE). When it is necessary to use the virtual mode for maintenance, consult system supplier.

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The following data is created and programs are set by a GSV21PE to execute positioning control in the real and virtual modes by using an A373CPU.

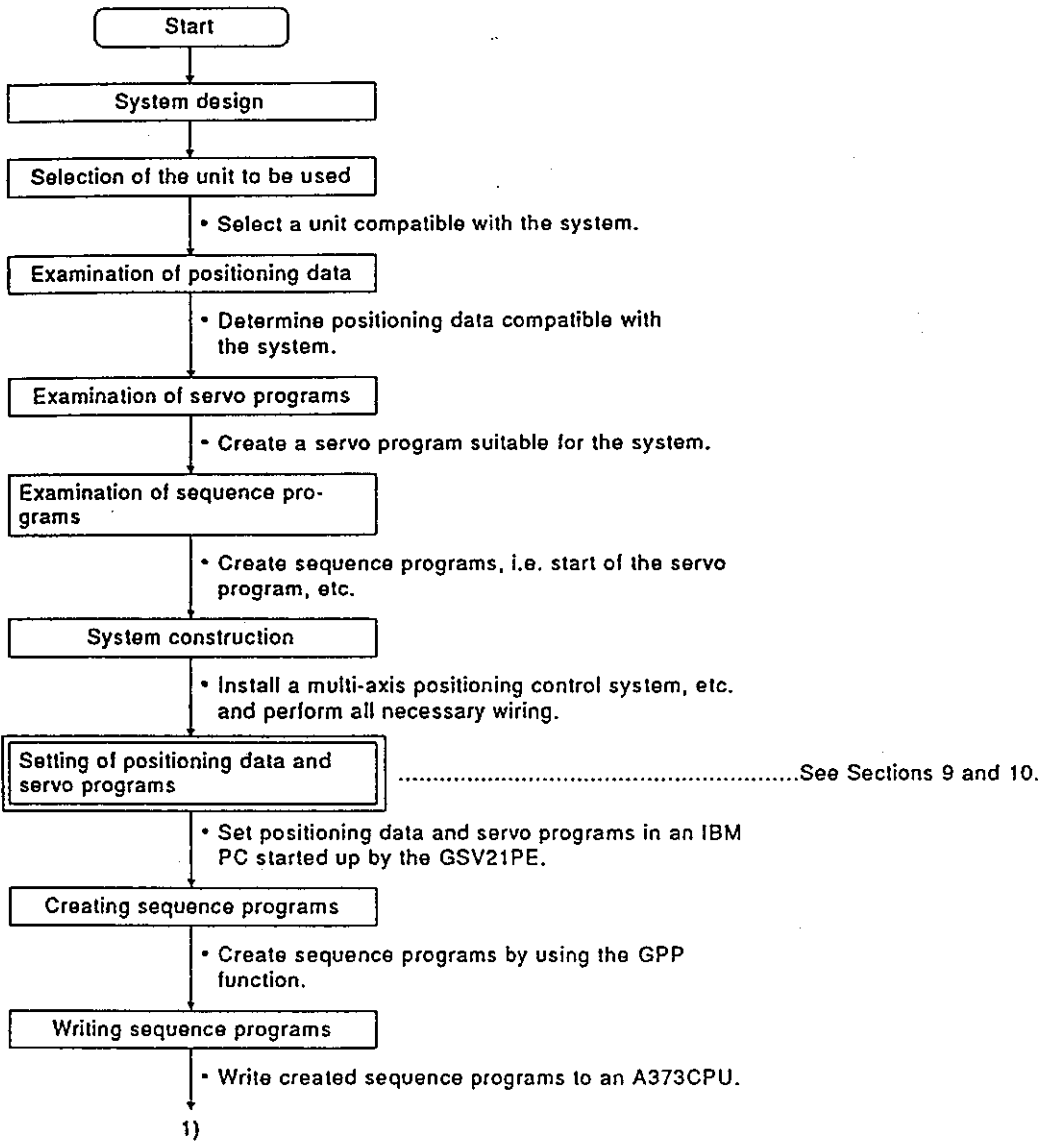
- (1) Real mode controlling:
 - System set data
 - Fixed parameter set data
 - Zero return data
 - JOG operations data
 - Parameter block data
 - Limit switch set data
 - Servo programs
- (2) Virtual mode controlling:
 - System set data *
 - Fixed parameter set data *
 - Zero return data *
 - JOG operations data *
 - Parameter block data *
 - Limit switch set data
 - Servo programs
 - Mechanical system programs
 - Cam data

REMARKS

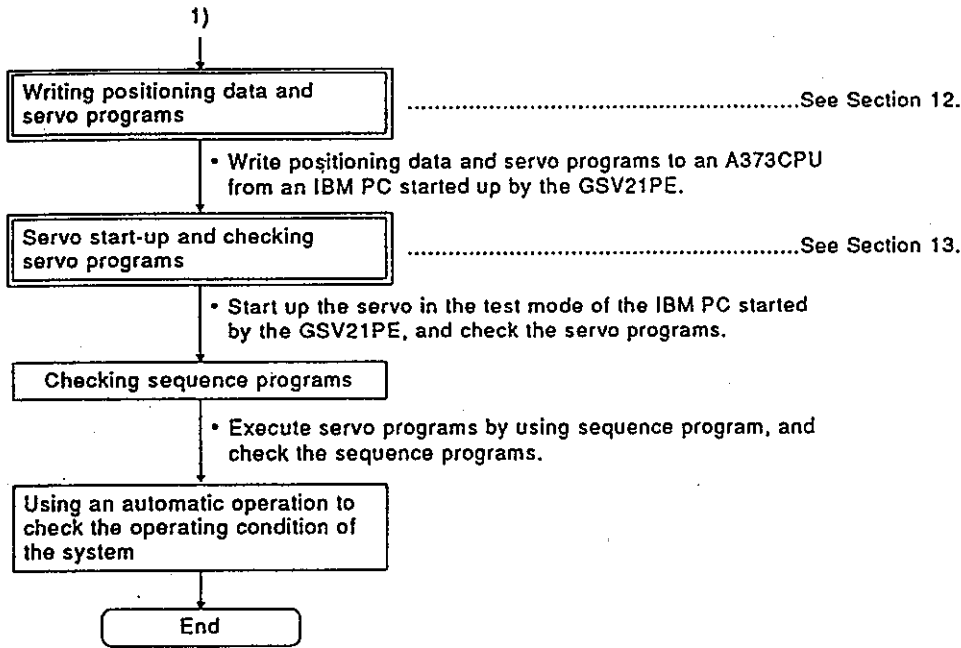
- 1) Setting cam data
It is necessary to set cam data by using CAMPE only when a cam is set as the output module in the mechanical system.
- 2) Data indicated by a * is used in the real mode before switching to the virtual mode.

1.4 Procedure for Starting the System

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



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REMARK

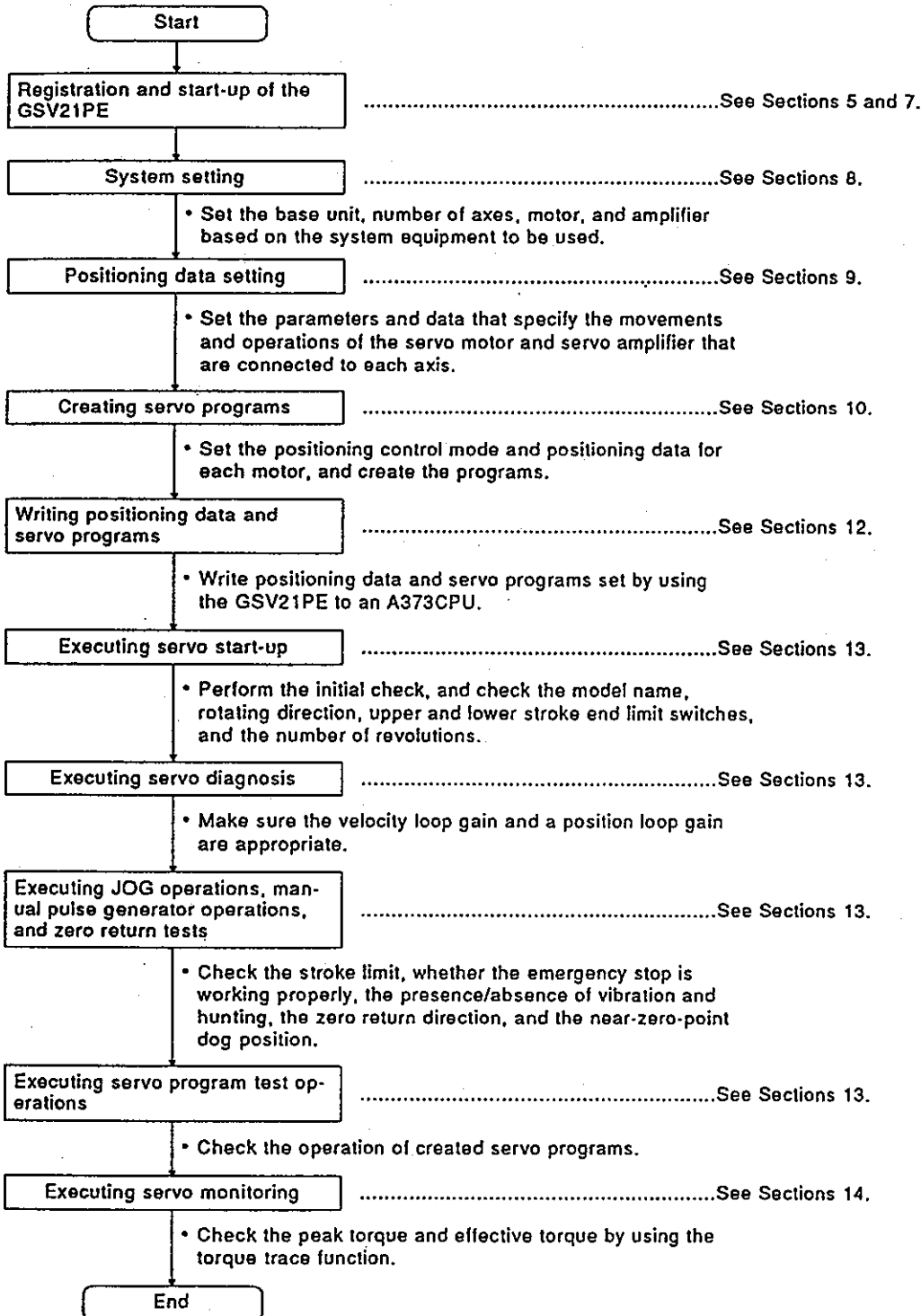
Duplex frame operations are explained in this manual. When executing a duplex frame operation, see the indicated item. When executing an operation other than a duplex frame for maintenance, consult system supplier.

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1.4.1 Outline of the operating procedure using the GSV21PE

When the real mode is used, the operating procedure using the GSV21PE is shown below.

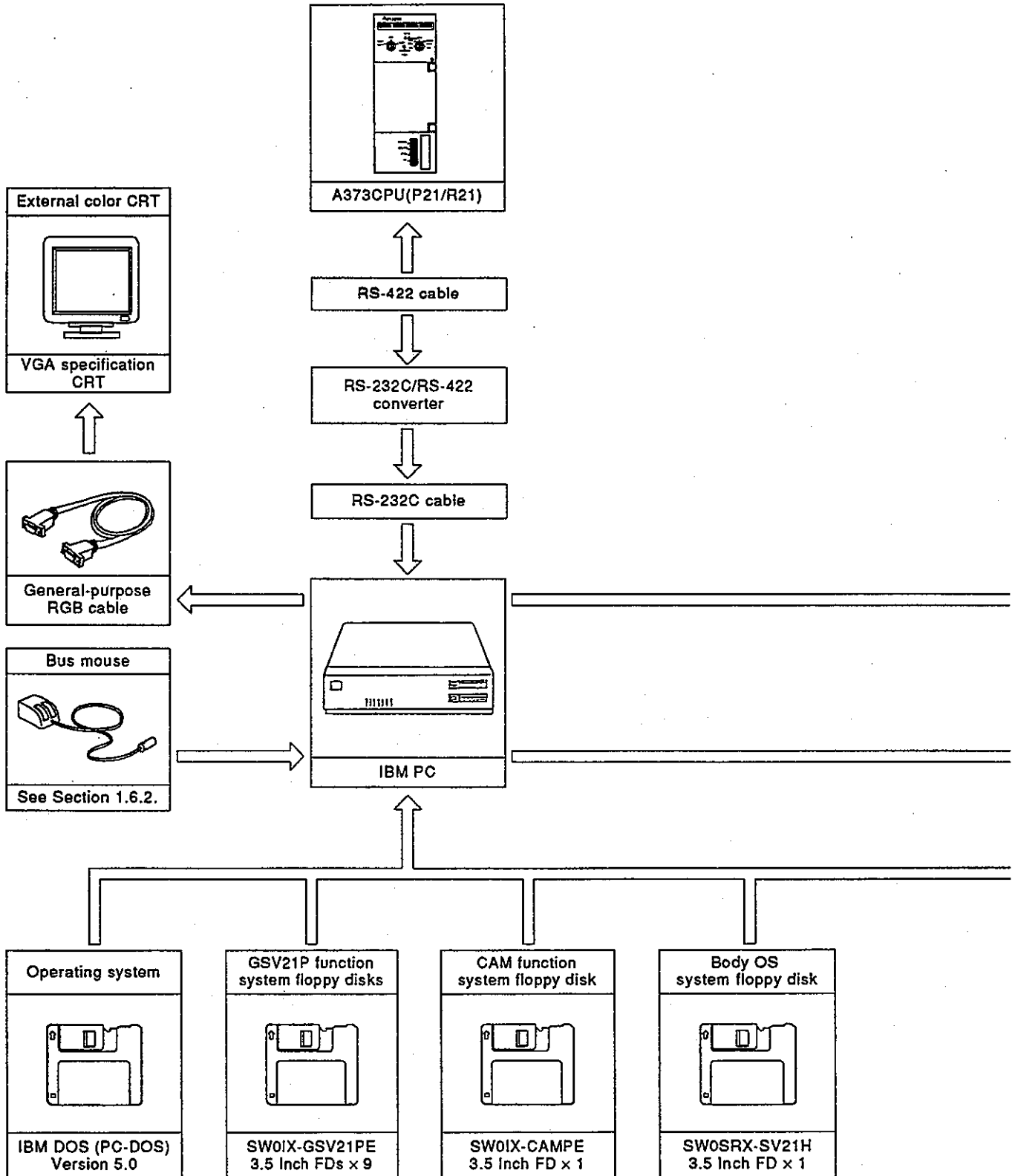


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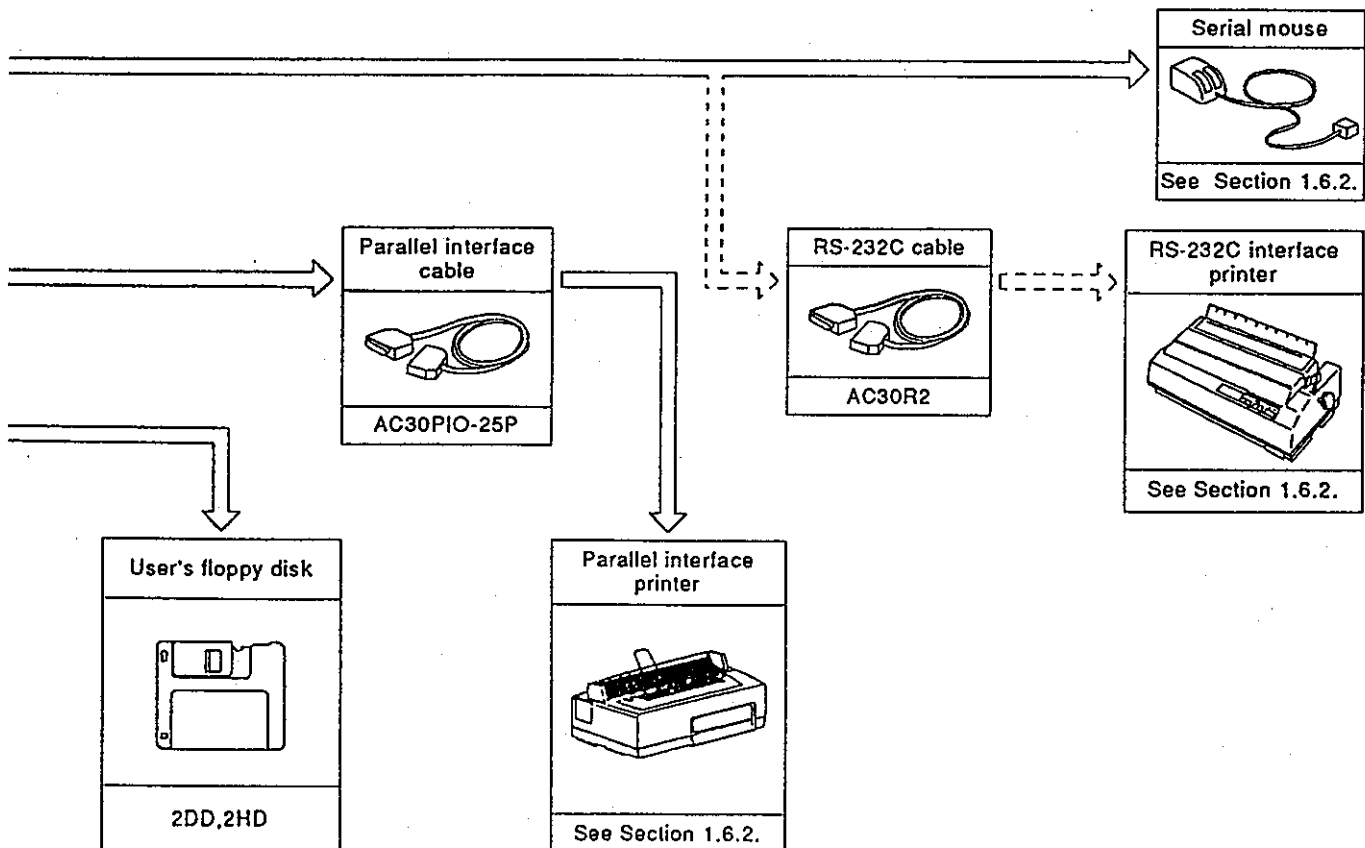
1.5 System Configuration When Operating With the GSV21PE

This section gives the system configuration when the GSV21PE is used in an IBM PC.



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1.6 Key Items When Configuring a System

This section gives the key items to consider when configuring a system using the GSV21PE.

1.6.1 Applicable CPUs

GSV21PE Functions	Applicable CPUs
GPP function	A series CPUs
Servo function	A373CPU *

* : A PC started by the GSV21PE can communicate only with an A373CPU whose OS model name for positioning registered in an A373CPU is SV21P.

1.6.2 Hardware configuration key Items

(1) PCs applicable to the GSV21PE

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	i80286 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	10 M bytes or more	<ul style="list-style-type: none"> The GSV21PE uses about 7.3 M bytes in the system, and CAMPE uses about 1 M bytes in the system. After registering the GSV21PE and CAPME 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 x 1 channel or more	When a serial mouse is used, 2 channels are necessary.

(2) Printer to which the GSV21PE can transmit
A printer that can use ESC/P code can be utilized.

(3) Mice that can be used with the GSV21PE

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

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1.6.3 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
```

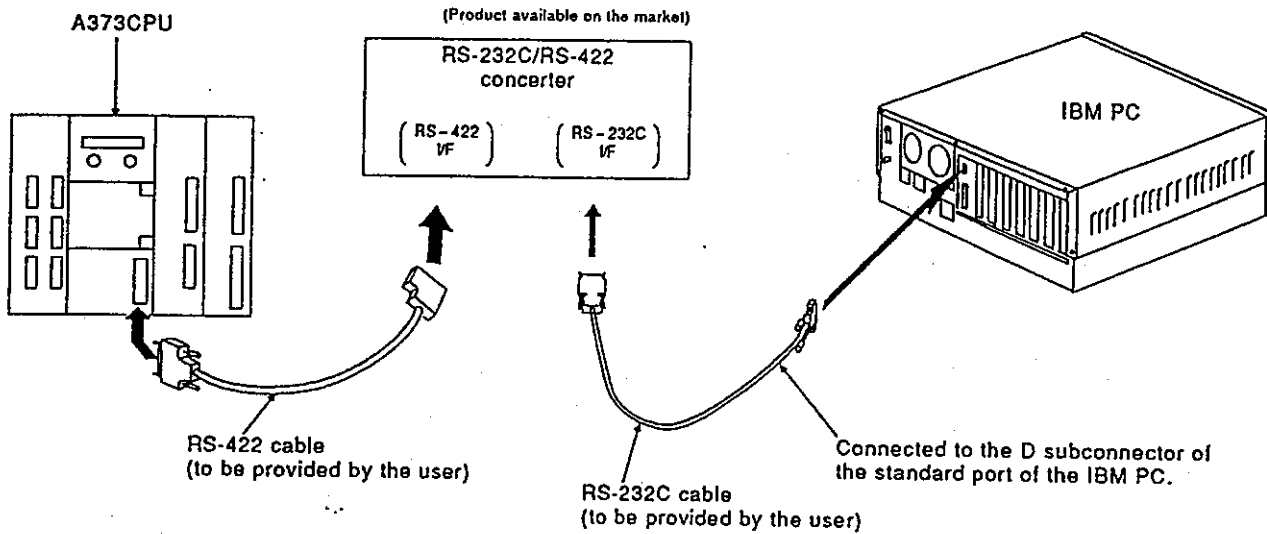
(2) Example of AUTOEXEC.BAT

```
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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1.6.4 How to connect the IBM PC and A373CPU



REMARK

Mitsubishi recommends the following converter for connecting a IBM PC and the A373CPU:

SC-02N converter

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		SC-02N
9-PIN		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 SC-02N converter.

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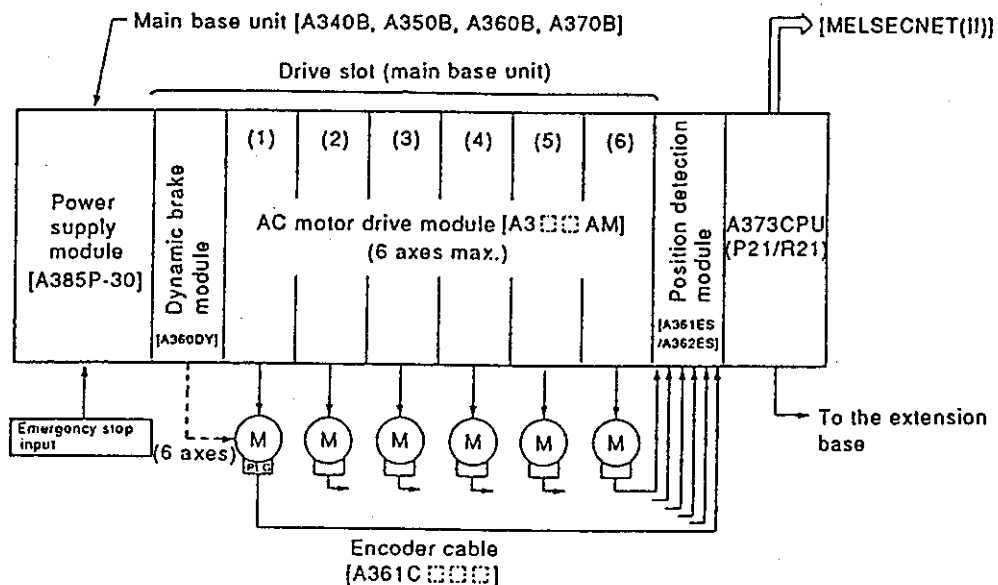
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1.7 Basic Configuration of a Multi-Axis Positioning Control System

1.7.1 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.

(1) Overall configuration



(2) System configuration key items

- (a) 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.
- (b) 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 $< 30A$.
- (c) 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).
- (d) 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.
- (e) 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.

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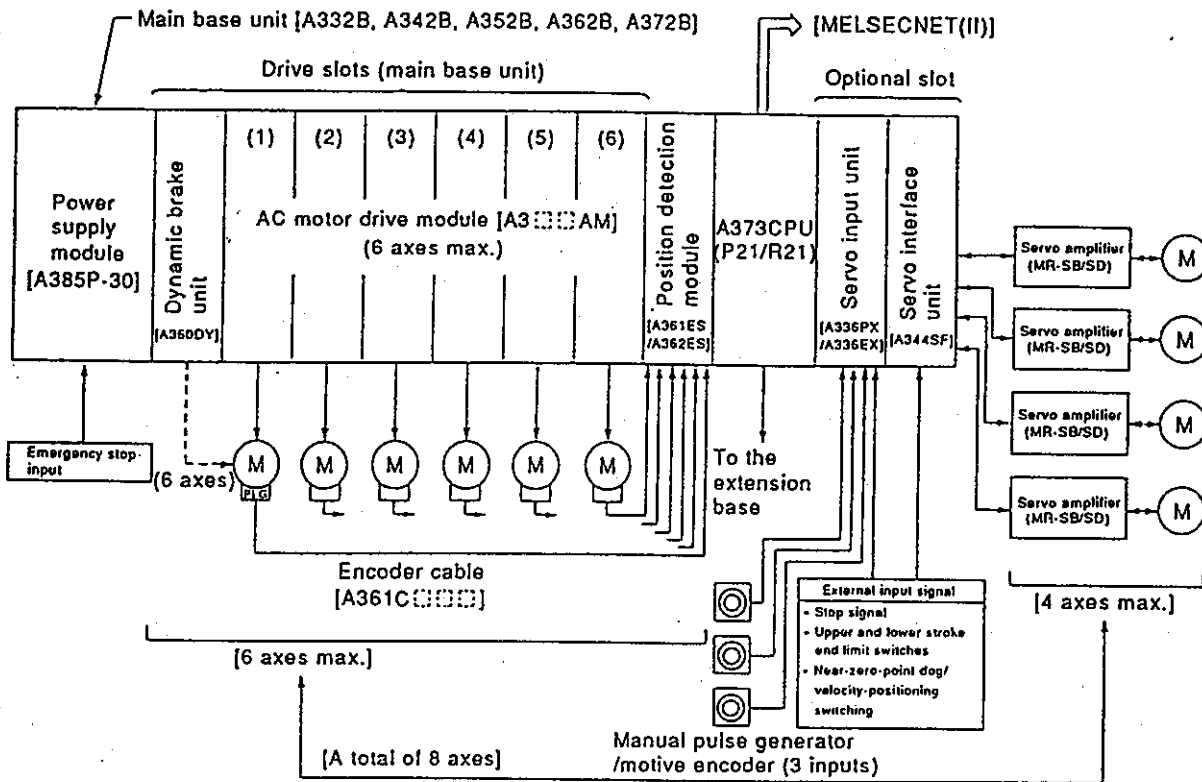
1.7.2 AC motor drive module + MR-SB/SD servo Interface module system

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) AC motor drive module (max. 8 axes possible.)
- 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

(1) Overall configuration



- (2) System configuration key items
 - (a) 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.
 - (b) 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).
 - (c) 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.
 - (d) 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.
 - (e) Only 1 servo interface module can be installed in any slot of an optional slot.
 - (f) A combination of 8 axes max. can be selected optionally.

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.

2. SPECIFICATIONS

2. SPECIFICATIONS

2.1 Performance Specifications

Tables 2.1 and 2.2 give the performance specifications of an A373CPU (PCPU, SCPU).

Table 2.1 PCPU performance specifications

Model Names		PCPU	
Items			
Number of control axes	8 axes (simultaneous 2 axes, simultaneous 3 axes and independent 8 axes)		
Interpolation functions	Straight line interpolation (2 axes and 3 axes) and circular-arc supplement (2 axes)		
Control modes	PTP (Point to point) velocity control, velocity-position control, fixed-rate transmission, constant velocity control, velocity switching, synchronous control		
Control units	mm · inch · degree · pulse		
Program	Languages	Dedicated language and mechanical support language	
	Capacity	64 Kbytes (EEPROM)	Cam data: Max. 32 Kbytes (The memory area of a memory cassette is used.) Use A3NMCA-16 memory cassettes and later.
	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 command (command unit)	Increment/absolute value system	-2^{31} to 2^{31-1} ($\times 10^{-1}$ μm) MAX. 429 M -2^{31} to 2^{31-1} ($\times 10^{-5}$ inch) MAX. 42949 inch 0 to 35999999 ($\times 10^{-5}$ degree) MAX. 360 degree -2^{31} to 2^{31-1} (PULSE) MAX. 4294967296 PULSE
	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/s)	
	Velocity adjustment processing	Automatic trapezoid velocity adjustment Acceleration time 1 to 65535 (msec) Deceleration time 1 to 65535 (msec)	
Compensation	Electronic gear	Magnification setting function of the actual travel distance for a command value	
	Backlash compensation	A unit is converted into PULSE. 0 to 65535 PULSE	
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 : 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.		
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	Available (when using an A362ES absolute value motor)		

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Table 2.2 SPCU performance specifications

Model Names		SCPU		
Items				
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 (*1)	107		
Processing velocity (sequence instruction) (μsec/step)		Direct : 1.0 to 2.3 Refresh : 1.0		
Number of I/O points (point) (*1)		Real mode (*2) : 1792 (X/Y 100 to 7FF are used.) (X/Y 00 to FF are for positioning.) Virtual mode (*3) : 1664 (X/Y 180 to 7FF are used.) (X/Y 00 to 17F are for positioning.)		
Watchdog timer (WDT)(msec)		10 to 2000		
Memory capacity		Capacity of an installation memory cassette		
Program capacity		Main sequence program + main microcomputer program = 30 Ksteps max. A main microcomputer program of 58 Kbytes max. (29 Ksteps) can be set. Subsequence program + main microcomputer program = 30 Ksteps max. A sub-microcomputer program of 58 Kbytes max. (29K steps) can be set.		
Devices	Number of points of internal relay (M) (point)	1000 (M0 to 999)	(Shared to M, S, and L. 2000 total) (Set by parameter.)	
	Number of latched relay points (L) (point) (*1)	1000 (L1000 to 1999)		
	Number of step relay points (S) (point)	0 (initial status)		
	Number of link relay points (B) (point)		1024 (B0 to 3FF)	
	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 } Set by parameter.	
	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 } Set by parameter. → Counter to be used in the interruption program	
	Number of data register points (D) (Point) (*1)		Real mode (*2) : 800 (D0 to D799): D800 to D1023 are devices for positioning Virtual mode (*3) : 700 (D0 to D699): D700 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 (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.)		
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)		

REMARKS

- *1: This indicates an item that is different from the A3NCPU.
- *2: When the main operating system uses the SV11P or GSV21PE real mode
- *3: When the main operating system uses the GSV21PE virtual mode

2. SPECIFICATIONS

Motion Controller

2.2 List of A373CPU Functions

Table 2.3 lists an A373CPU PCPU functions.

Since an A373CPU SCPU functions are the same as the functions of an A3NCP, see the A3NCP User's Manual for details about SCPU functions.

Table 2.3 List of PCPU functions

Functions		1-Axis Straight Line	2-Axes Straight Line Interpolation	3-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).
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 and JOG operations. However, the velocity cannot be changed during circular-arc 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

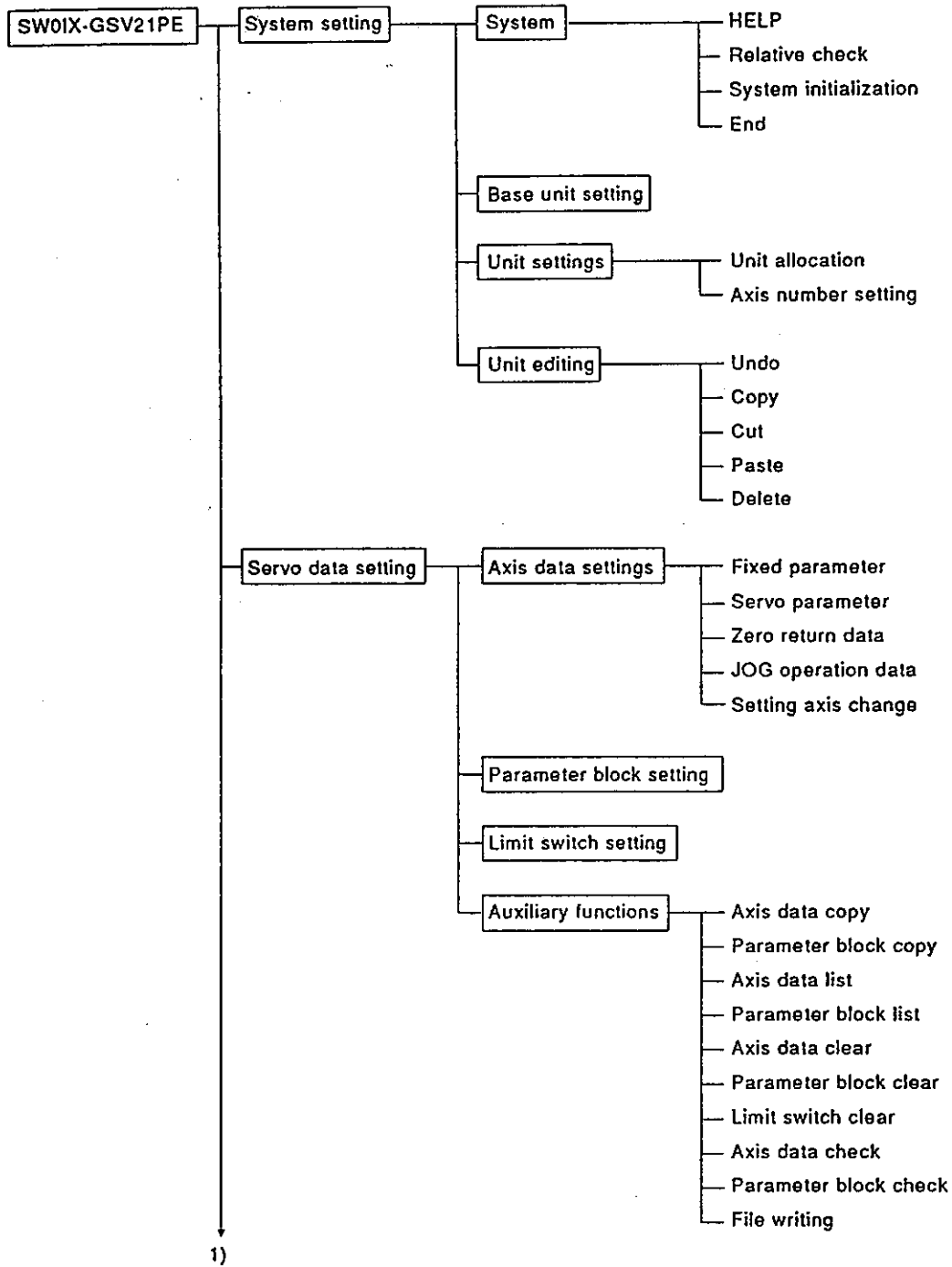
Table 2.3 List of PCPU functions (continued)

Functions	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 500 %)
Limit switch output	<ul style="list-style-type: none">• A limit switch output which corresponds to the <u>actual current value address</u> 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.
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 amplifier that can be used for an absolute position.
Feed forward control	<ul style="list-style-type: none">• Since a feed forward coefficient can be set by a servo parameter, servo follow-up can be improved.

2. SPECIFICATIONS

2.3 GSV21PE Servo Functions

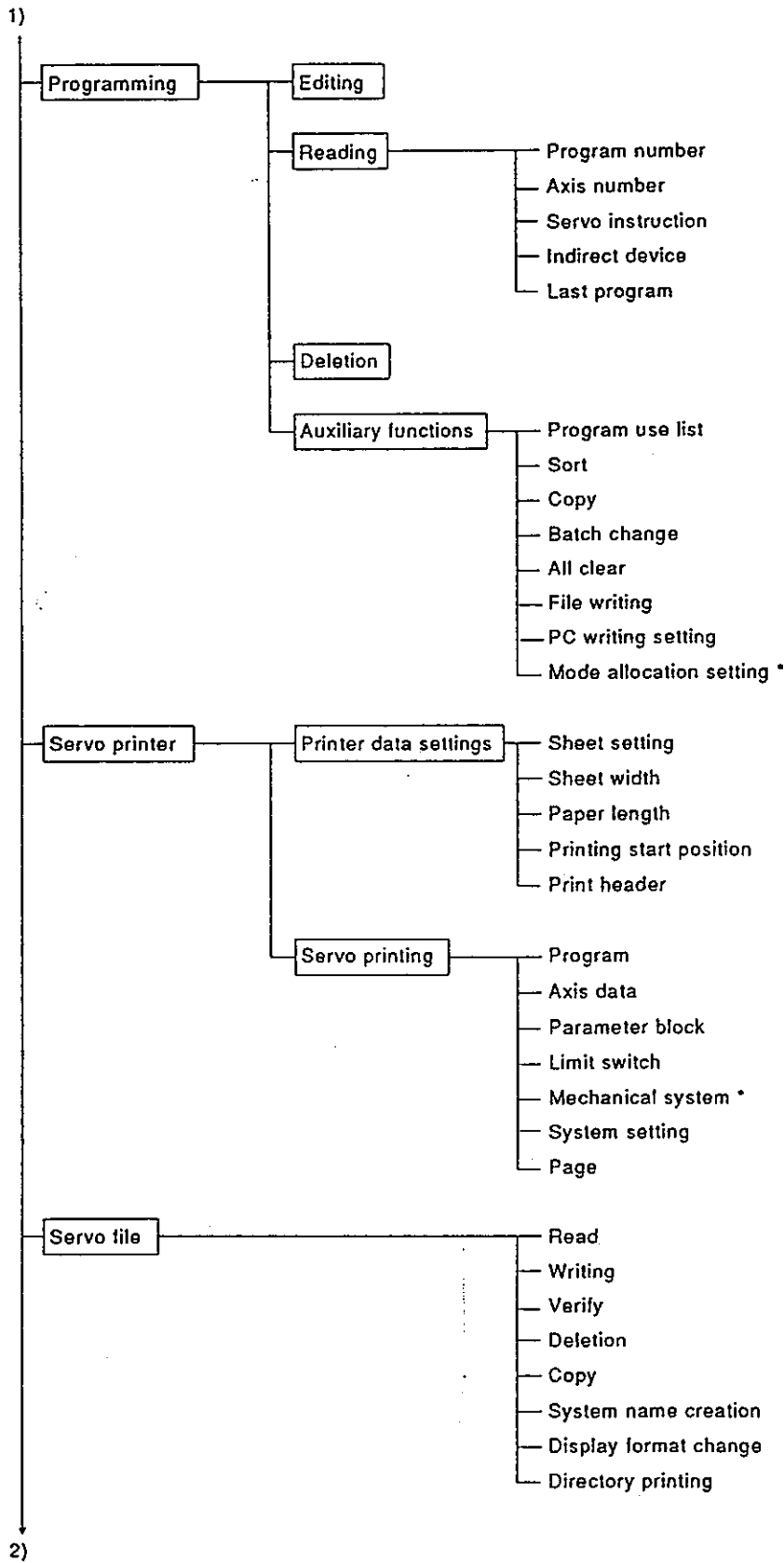
This section gives the GSV21PE servo functions.



1)

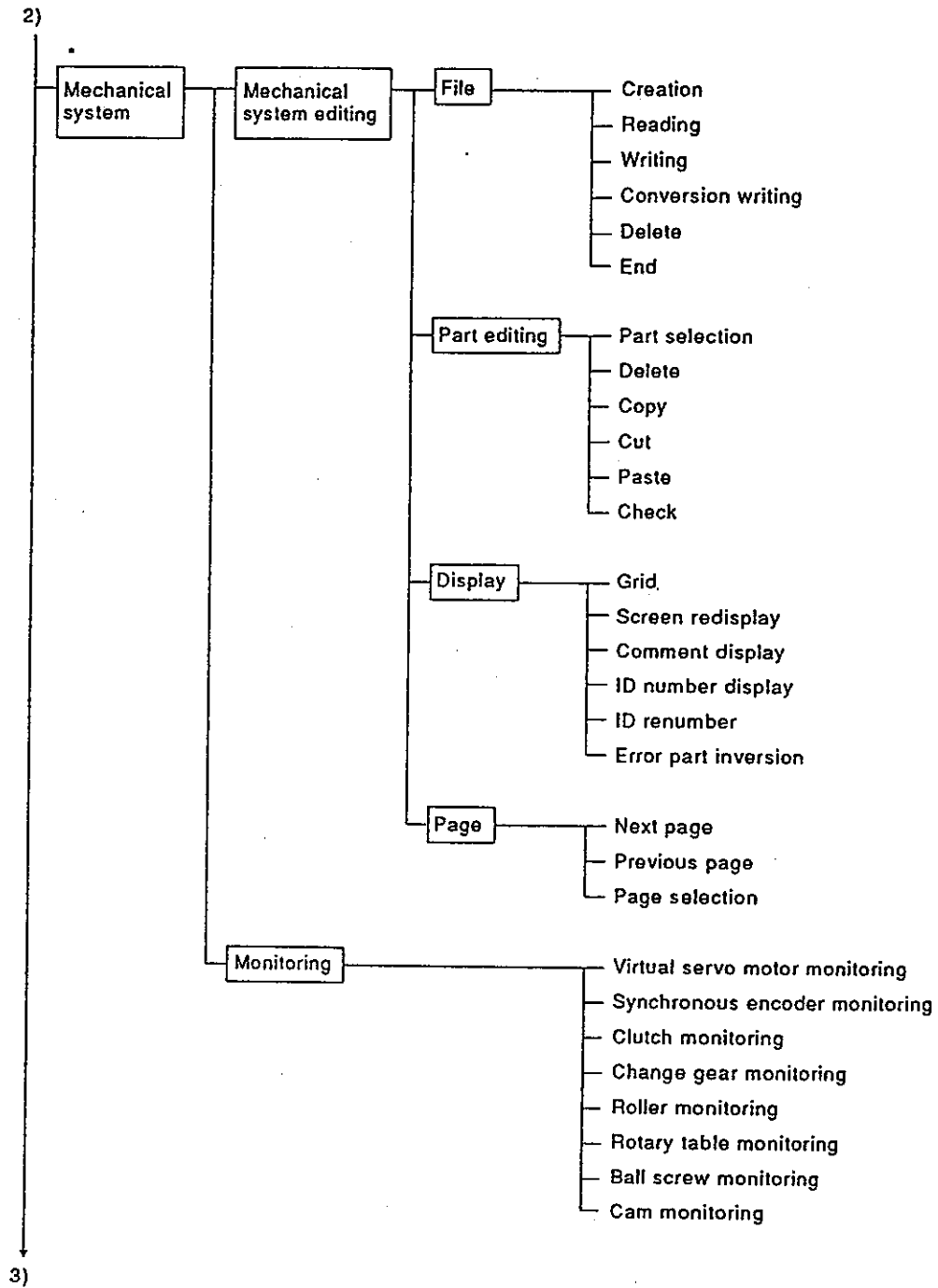
2. SPECIFICATIONS

Motion Controller



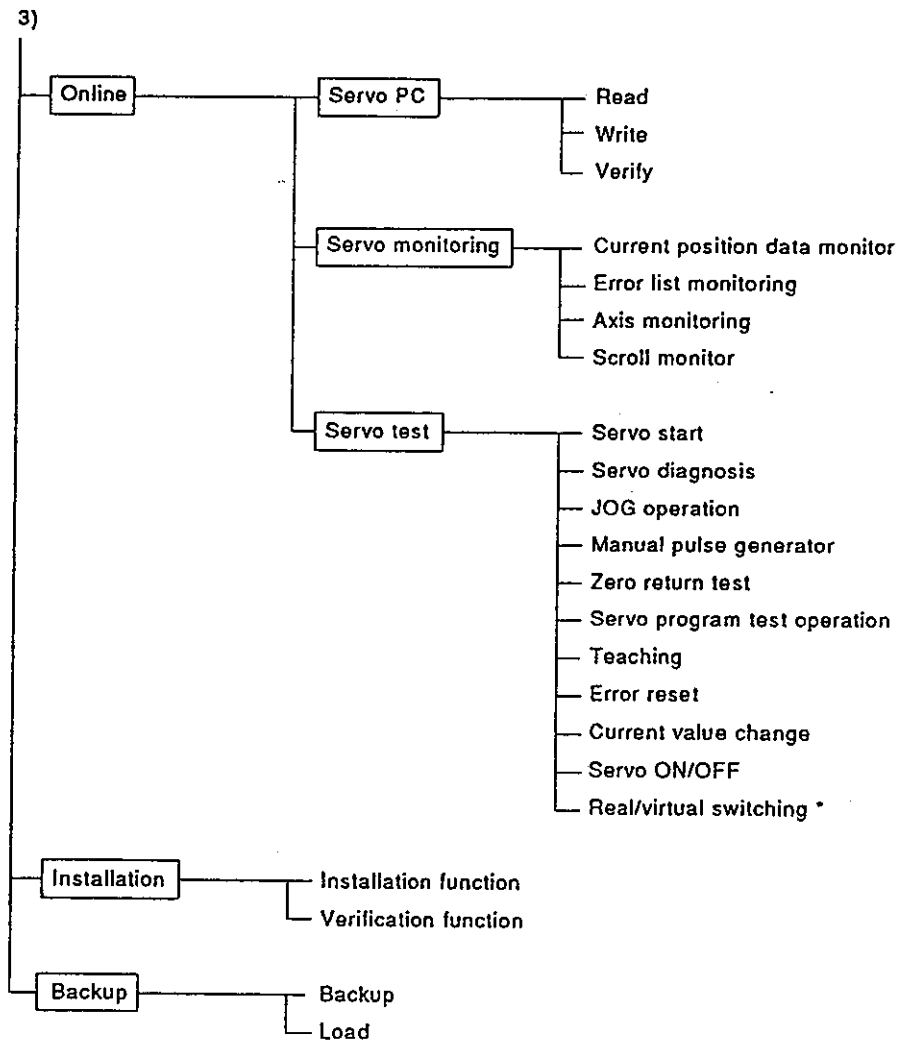
2. SPECIFICATIONS

Motion Contoroller



2. SPECIFICATIONS

Motion Controller



REMARKS

- 1) The GPP function is contained in GSV21PE.
- 2) The SW01X-GPPAE Type GPP Function Software Package Operating Manual gives details about the GPP function.
- 3) Functions with a * indicate functions to be used in the virtual mode. This manual only gives details about some of the functions used in the real mode. If a function to be used in the virtual mode or a function without a detailed explanation is used, either consult system supplier or check how to use the GSV21PE HELP function (see Section 6.7) and perform the operation.

2. SPECIFICATIONS

2.4 Positioning Signals

Internal signals of an A373CPU and external signals to an A373CPU are used as positioning signals.

(a) Internal signals

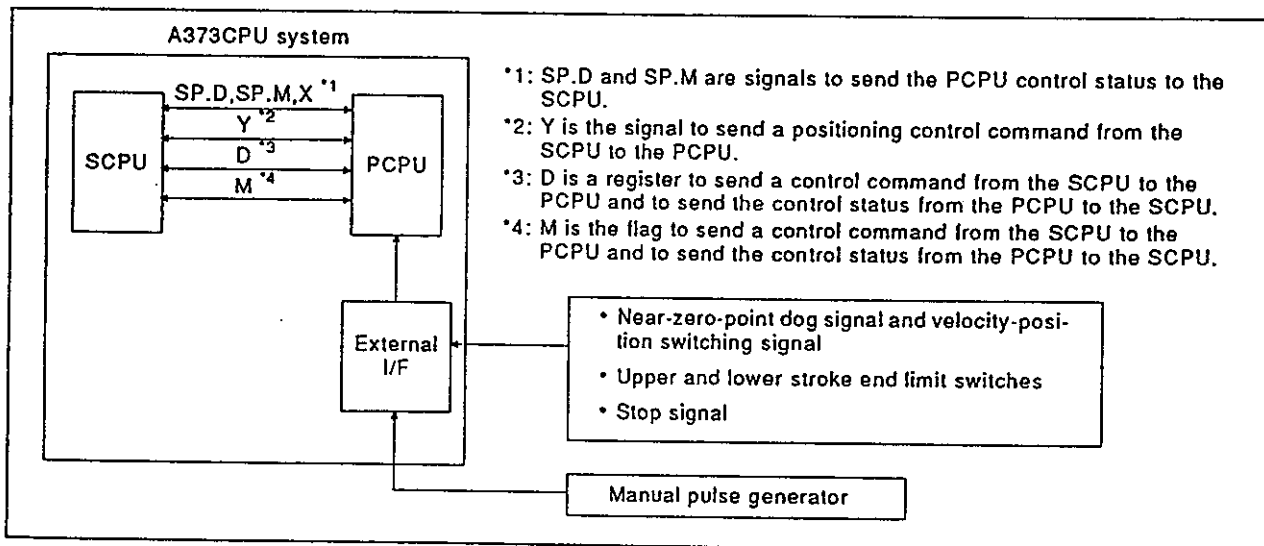
The following 6 kinds of devices are used as A373CPU internal signals.

- 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 an A373CPU.

- 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/velocity-position switching signal
When executing zero return, a near-zero-point dog signal is used. When controlling velocity-position switching, the signal that switches velocity to position is used.
- 4) Manual pulse generator input signal
Signal from the manual pulse generator



2. SPECIFICATIONS

Motion Controller

2.4.1 I/O (X/Y)

An A373CPU has 2048 I/O points from X/Y0 to X/Y7FF. 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	
XnC	External signal RLS	YnC	Feed position data update request command
XnD	External signal STOP	YnD	Unusable
XnE	External signal DOG/CHANGE	YnE	
XnF	Servo READY	YnF	Servo OFF

REMARK

n in the table represents the numerical value (0 to 7) that corresponds to the axis number.

Axis number	n
1	0
2	1
3	2
4	3
5	4
6	5
7	6
8	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. 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 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 M2047	Unusable by the user	—

POINT

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

2.4.3 Special relays (SP.M)

An A373CPU 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. 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	D1012	Axis number setting register to be controlled in manual pulse generator 1
D820 to D839	Axis 2 monitoring data	D1013	Axis number setting register to be controlled in manual pulse generator 2
D840 to D859	Axis 3 monitoring data	D1014	Axis number setting register to be controlled in manual pulse generator 3
D860 to D879	Axis 4 monitoring data	D1015	JOG operation simultaneous start axis setting register
D880 to D899	Axis 5 monitoring data	D1016	1 pulse input magnification setting register of a manual pulse generator for axis 1
D900 to D919	Axis 6 monitoring data	D1017	1 pulse input magnification setting register of a manual pulse generator for axis 2
D920 to D939	Axis 7 monitoring data	D1018	1 pulse input magnification setting register of a manual pulse generator for axis 3
D940 to D959	Axis 8 monitoring data	D1019	1 pulse input magnification setting register of a manual pulse generator for axis 4
D960 to D965	Axis 1 data storage area for control change	D1020	1 pulse input magnification setting register of a manual pulse generator for axis 5
D966 to D971	Axis 2 data storage area for control change	D1021	1 pulse input magnification setting register of a manual pulse generator for axis 6
D972 to D977	Axis 3 data storage area for control change	D1022	1 pulse input magnification setting register of a manual pulse generator for axis 7
D978 to D983	Axis 4 data storage area for control change	D1023	1 pulse input magnification setting register of a manual pulse generator for axis 8
D984 to D989	Axis 5 data storage area for control change		
D990 to D995	Axis 6 data storage area for control change		
D996 to D1001	Axis 7 data storage area for control change		
D1002 to D1007	Axis 8 data storage area for control change		
D1008 to D1011	Limit switch output disable setting		

First data register number	Signal Name	Bit
0	Feed position data	L
1		H
2	Real current value	L
3		H
4	Error counter value	L
5		H
6	Low error code	L
7	High error code	L
8	Servo error code	L
9		H
10	Travel distance when near-zero-point dog is ON	L
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	Unusable by the user	

First data register number	Signal Name	Bit
0	Current value change register	L
1		H
2	Velocity change register	L
3		H
4	JOG velocity setting register	L
5		H

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).

POINT

The storage of data to the monitoring data area (other than M code and travel distance change register) is delayed at the times shown below in accordance with the ON/OFF status of the positioning device (input, internal relay, or special relay).

(a) When the scan time of a sequence program is 80 msec or less:
..... 80 msec

(b) When the scan time of a sequence program exceeds 80 msec:
..... 1 scan time

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
Error 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
The 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
Unusable by the user	D819	D839	D859	D879	D899	D919	D939	D959

(2) Data storage area (D960 to D1007) for a control change

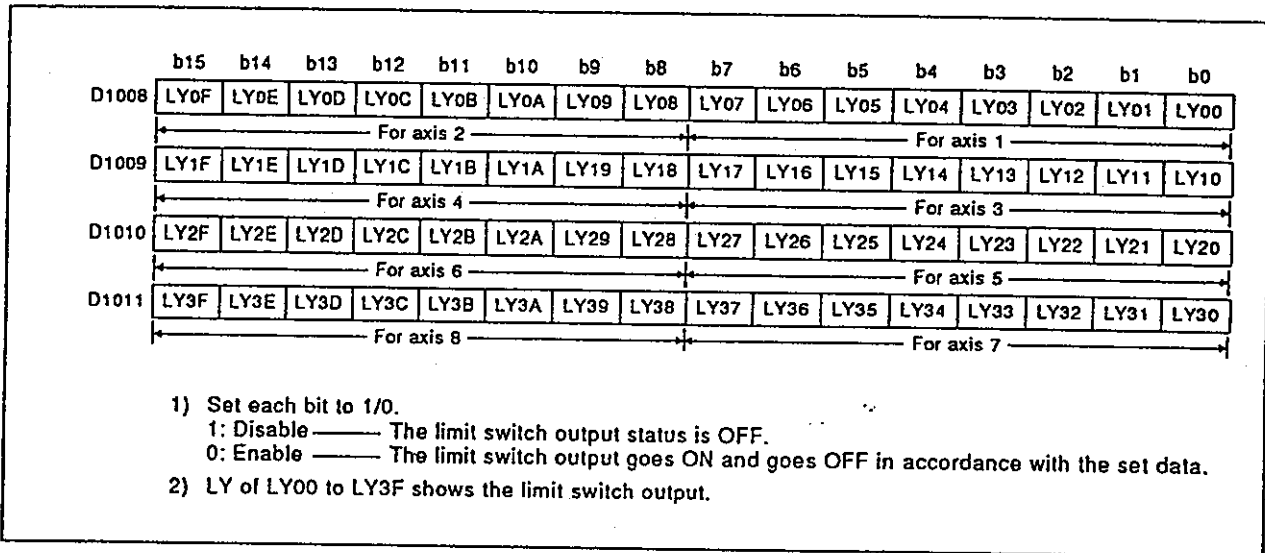
..... Data from the SCPU to the PCPU
The data storage area for control change is the area for storing current value change data, speed change data, and JOG operating speed data.

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

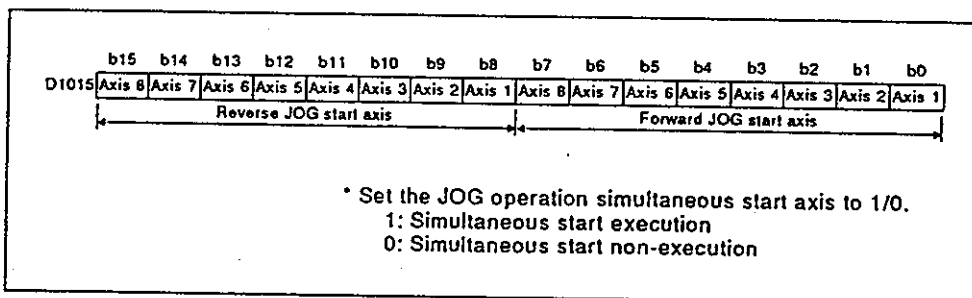
2. SPECIFICATIONS

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.



- (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.



- (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 Controller

2.4.5 Special registers (SP.D)

An A373CPU 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.

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	Monitoring in the torque restriction
D9187	Manual pulse generator axis setting error
D9188	Test mode request error
D9189	Error program number
D9190	Error item information
D9191 to D9199	Unusable

3. NOMENCLATURE AND SETTING

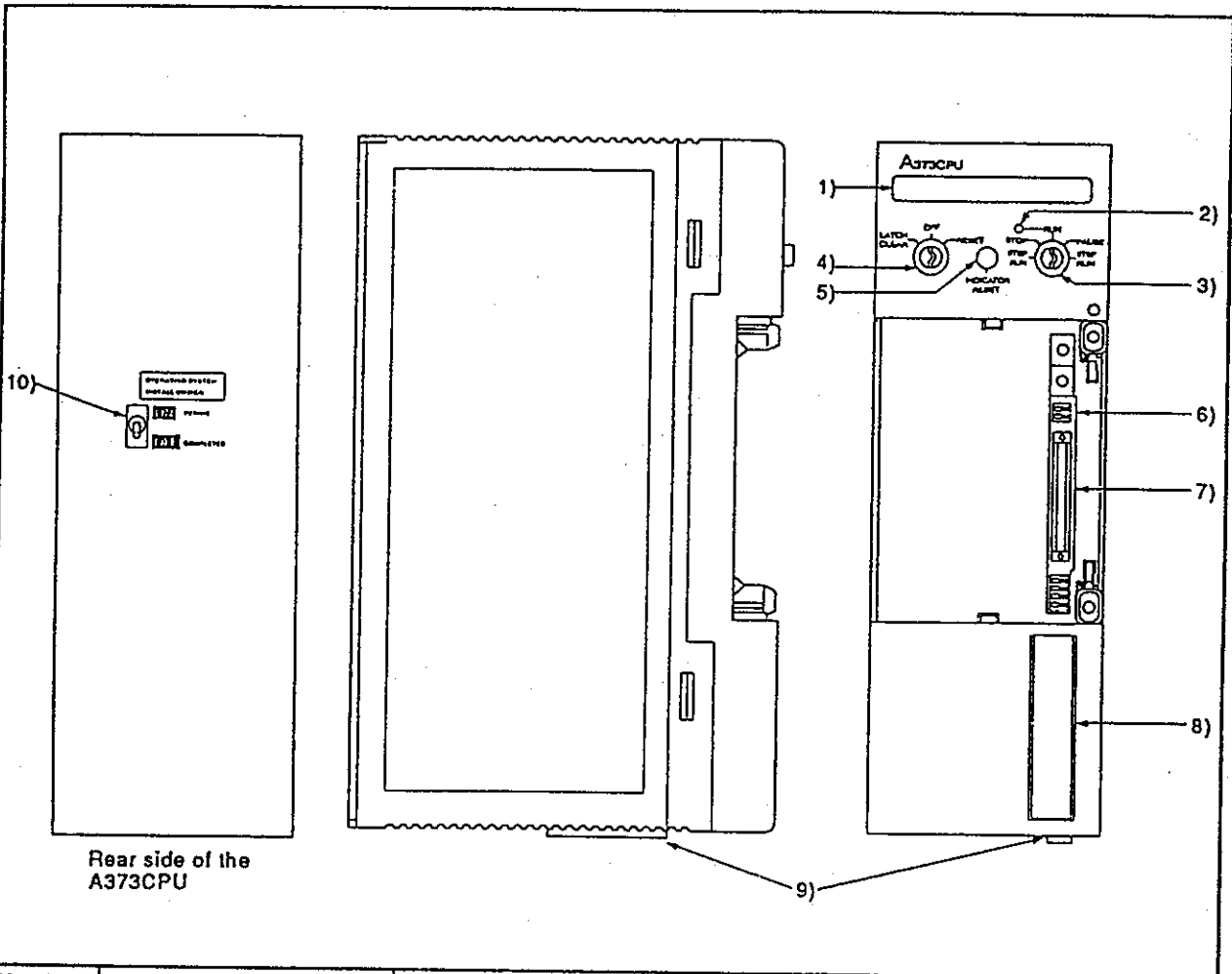
Motion Controller

3. NOMENCLATURE AND SETTING

3.1 Nomenclature and Setting of an A373CPU

This section explains the nomenclature used to set an A373CPU.

(1) Nomenclature



Rear side of the A373CPU

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).

3. NOMENCLATURE AND SETTING



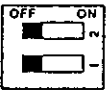

Motion Controller

Numbers	Names	Uses
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. Section 16 gives details about the installation procedure.

(2) Settings

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

- (a) 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

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

- (b) The A3NCPU User's Manual gives details about memory and memory cassette settings.

3. NOMENCLATURE AND SETTING

Motion Controller

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 system.

POINT

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.

4. MAINTENANCE AND INSPECTION

Motion Controller

4. MAINTENANCE AND INSPECTION

This section explains items which must be inspected daily and periodically, as well as maintenance procedures, to ensure that the PC 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.)
		The Troubleshooting section of the A3NCPU User's Manual gives details about corrective actions.		

REMARK

If it is necessary to exchange an I/O module during multi-axis 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 PC 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	Measure the voltage across the 100/200 VAC terminal.	85 to 132 VAC ----- 170 to 264 VAC	Change the power supply.	
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	Confirm that "2025" and "2103" are not shown as servo errors.	Preventive maintenance	Replace the battery if there is a battery voltage drop.	
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.	
8	Fan	Check for vibrations and noise during operations.	Excessive vibrations and noise.	Replace the fan.	

4. MAINTENANCE AND INSPECTION

Motion Controller

4.3 Replacement of Batteries and Fuses

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

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

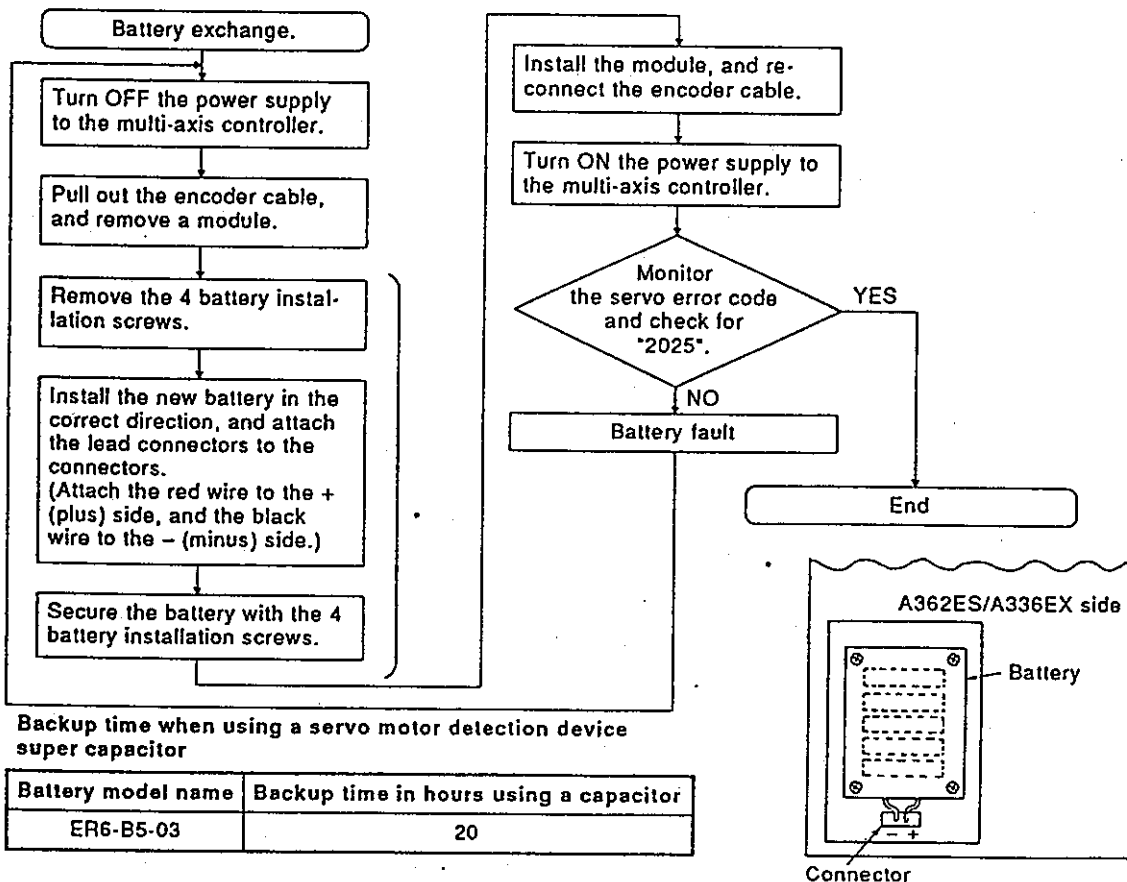
4.3.1 Service life and replacement of the battery of the position detection module

- (1) 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.
- (2) 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).

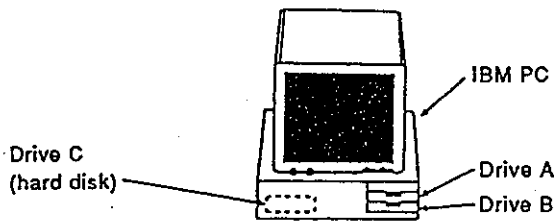


5. REGISTERING THE GSV21PE IN AN IBM PC

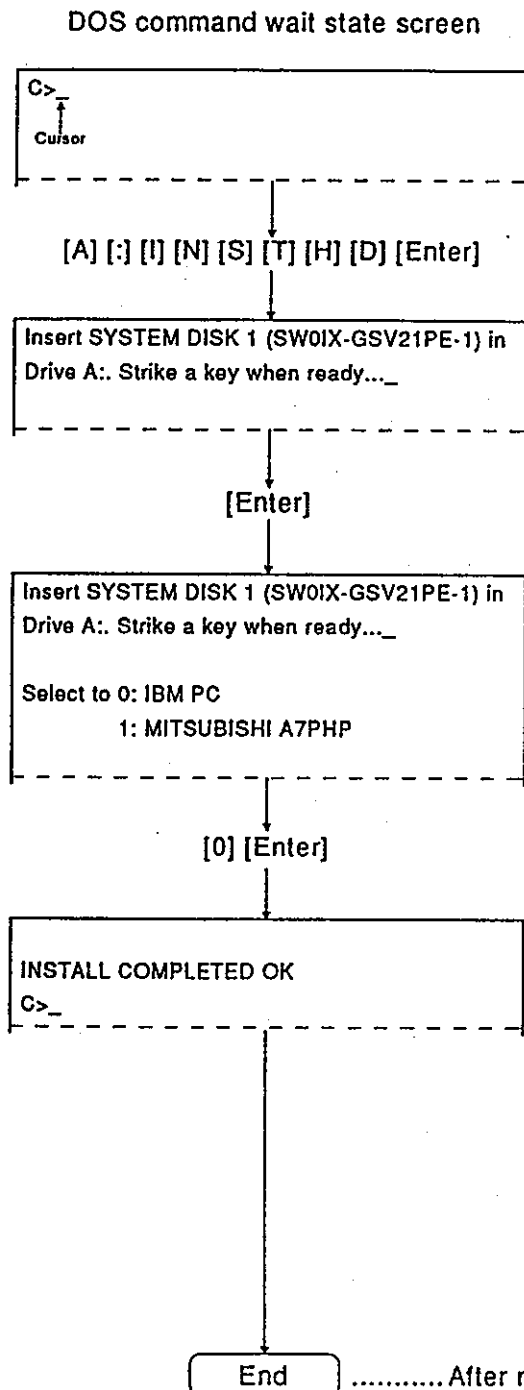
Motion Controller

5. REGISTERING THE GSV21PE IN AN IBM PC

This section gives the procedure for registering the GSV21PE 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 GSV21PE-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 GSV21PE-1 disc has been completed, the "Insert SYSTEM DISK [] (SW0IX-GSV21PE-[]) in Drive A:. Strike a key when ready..._" message will be displayed. Take out GSV21PE-1 from drive A and insert GSV21PE-2 and press the [Enter] key. Then, the registration of the GSV21PE-2 is executed.

Register GSV21PE-3 to -9 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 GSV21PE IN AN IBM PC

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POINTS

- (1) When registering SW0IX-CAMPE to the hard disk of an IBM PC, the same operation for registering the GSV21PE can be used.

(How to start up SW0IX-CAMPE)

When "C>_" (the DOS command wait state) is displayed, input "CAMMAINS" and then press the [Enter] key. Then, the SW0IX-CAMPE is started up.

- (2) Even when the GSV21PE 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 GSV21PE.

(b) Setting of AUTOEXEC.BAT

Set PATH at AUTOEXEC.BAT on a route to use the GSV21PE.

PATH setting example

PATH = C: \GPP\SYSGSV21;

↑ Drive in which the GSV21PE is registered

6. GSV21PE COMMON ITEMS

6. GSV21PE COMMON ITEMS

This section explains common items when operating the GSV21PE.

6.1 Common Items of File Management

This section explains the common items and precautions to take when performing file management using the GSV21PE.

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.

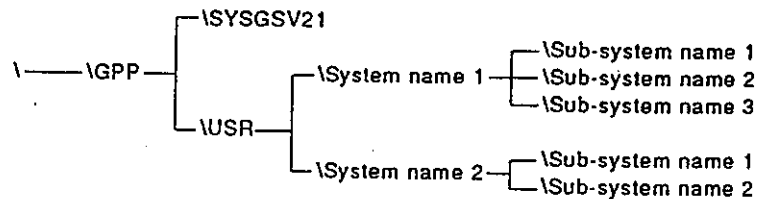
A drive: Designate this drive when registering data in a floppy disk or when reading data from the floppy disk.

C drive: Designate this drive when registering data in the hard disk in which the GSV21PE 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 GSV21PE; this area is different from the D drive.)

D drive: Designate this drive when registering data in a hard disk in which the GSV21PE 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 GSV21PE 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.

6. GSV21PE COMMON ITEMS

Motion Controller

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.

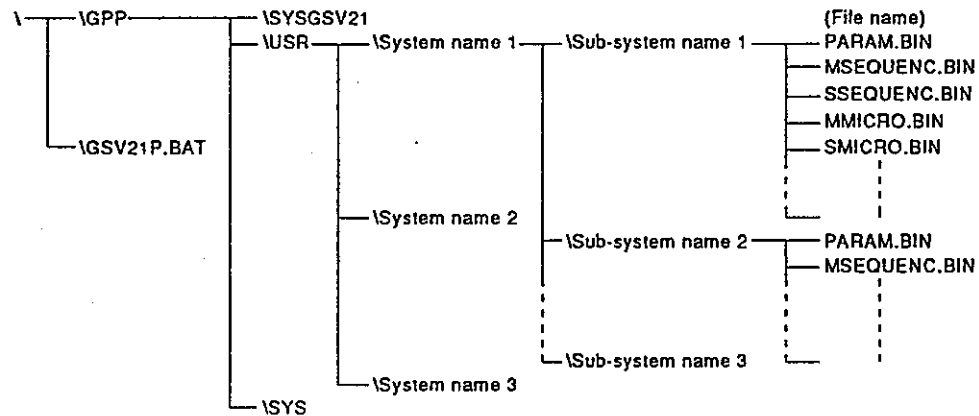
A headline statement (32 characters max.) can be input by using alphanumeric characters and special symbols.

- 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.

6.2 File Configuration

(1) File configuration of the GSV21PE



(2) File name

The following files are created under the sub-system names of the GSV21PE in accordance with the setting contents of the data.

1. Parameter	(File names) 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. Main microcomputer	MMICRO.BIN	
5. Substitute microcomputer	SMICRO.BIN	
6. Main statement	MSTATEM.BIN	} Fixed identifier File names (8 characters max.) can be set.
7. Sub-statement	SSTATEM.BIN	
8. Main note	MNOTE.BIN	
9. Sub-note	SNOTE.BIN	
10. Sampling trace	[Data name].STR	
11. Status latch	[Data name].SLT	} Fixed file name
12. Device memory	[Data name].DEV	
13. System information (PC type, headline statement, and printer information)	GPPA.CNF	
14. Print header	PHEADER.BIN	} Fixed file name
15. Extension comment	NEWCOM.BIN	
16. Servo data	SVDATA.BIN	
17. Servo program	SVPROG.BIN	
18. Mechanical mechanism edit data	SVEDTADAT.BIN	
19. Mechanical mechanism parameter	SVMCHPRM.BIN	
20. Cam axis data	SVCAMPRM.BIN	

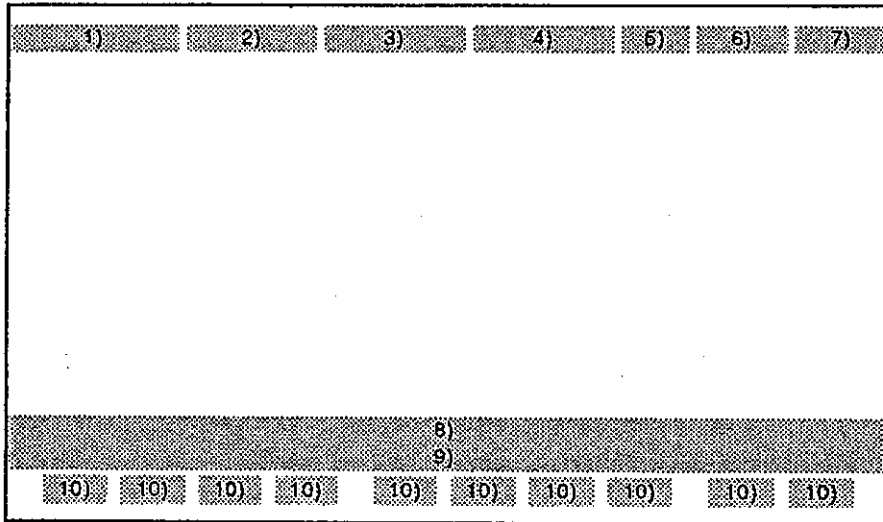
6. GSV21PE COMMON ITEMS

Motion Contoroller

6.3 Common Display Area

This section explains the layout and contents which are displayed on the screen commonly by the GSV21PE.

- (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.

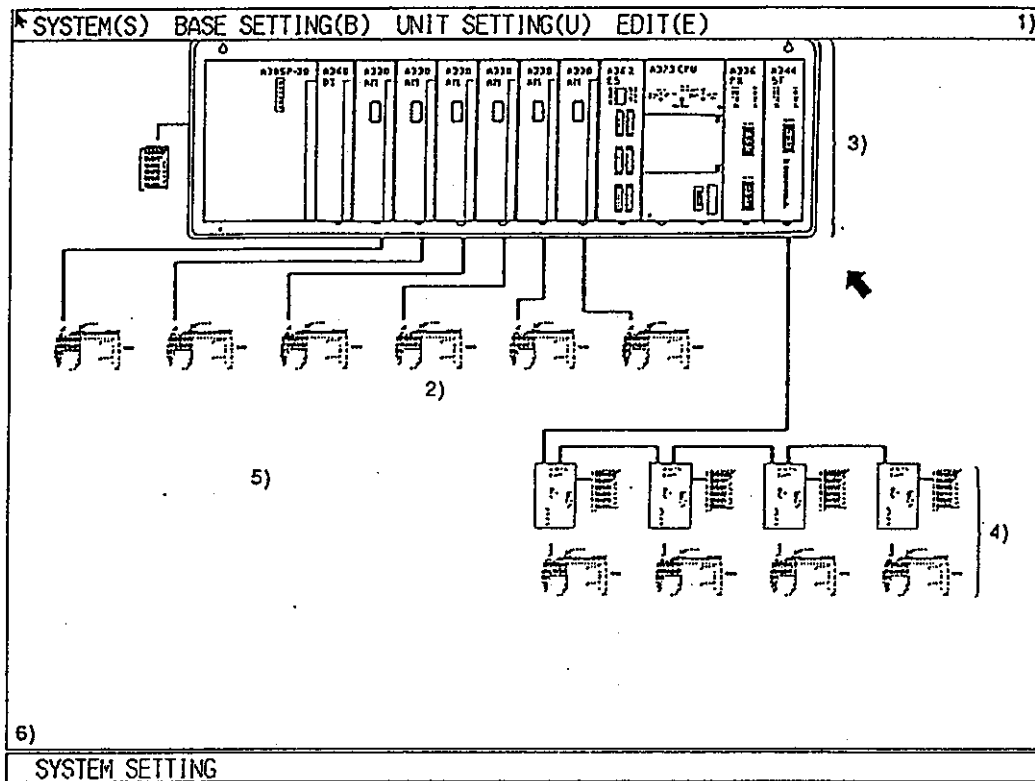


Numbers	Names	Contents
1)	Mode/function display area	Displays the current mode and function.
2)	PC type/PC number/monitoring destination display area	Displays the PC type, PC number, monitoring destination (PC, DM (device memory) and SL (status latch)) which were set by the initial setting.
3)	Number 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) 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. GSV21PE COMMON ITEMS

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(2) System setting mode



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	Displays the status of the utilized servo amplifier (d1-I4).
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 GSV21PE, the following 8 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
- Executing dialogSee Section 6.4.7
- Selection dialogSee Section 6.4.8

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.

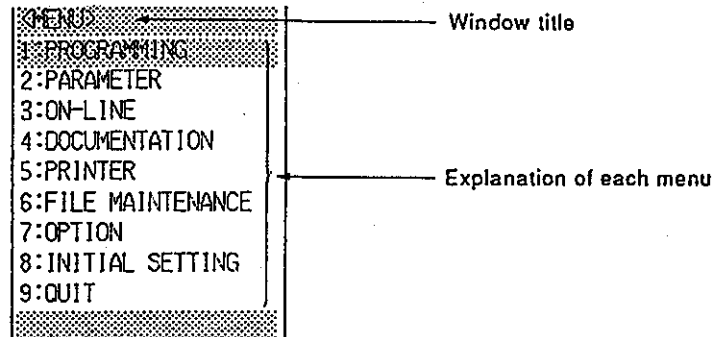
However, when using the GSV21PE, a function can be selected with the mouse only in the system setting mode.

6. GSV21PE COMMON ITEMS

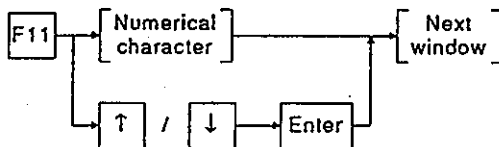
6.4.1 Menu selection window

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 GSV21PE.

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

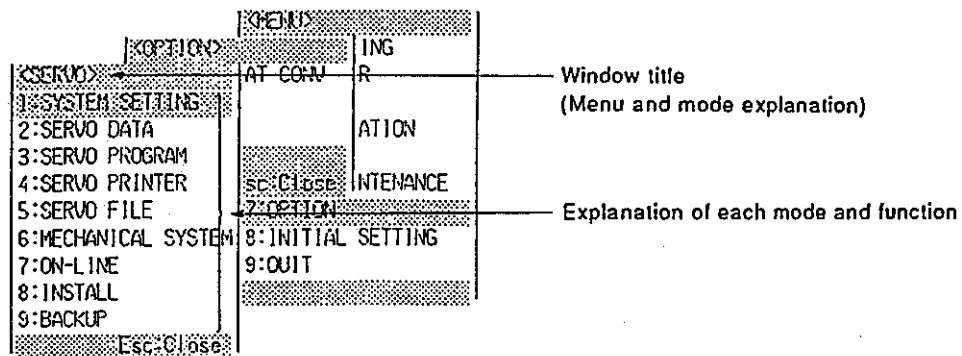


[Key operation explanation]

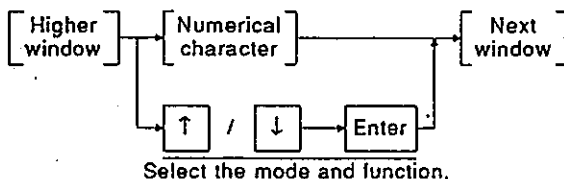


6.4.2 Mode and function selection window

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.

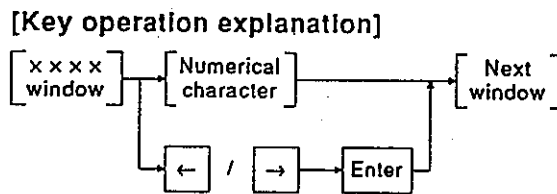
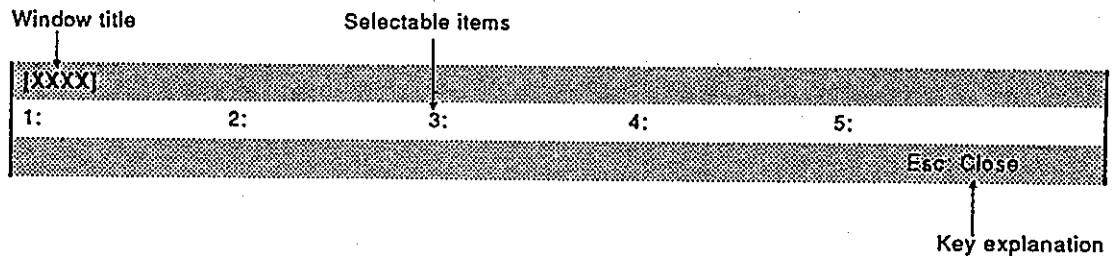
6. GSV21PE COMMON ITEMS

Motion Controller

6.4.3 Sub-function selection window

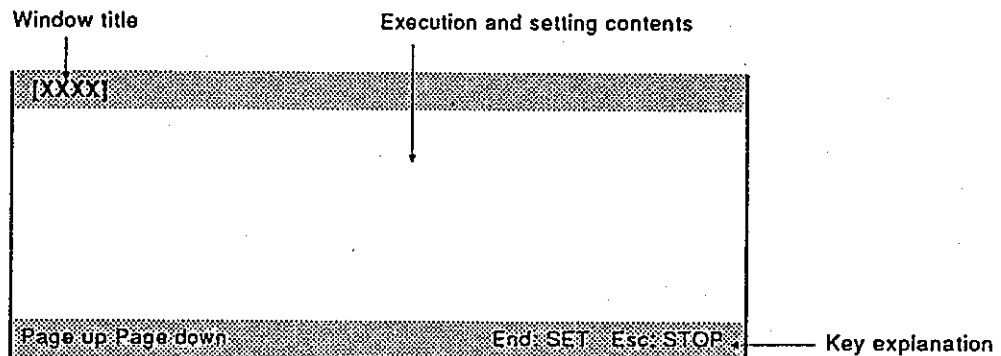
When the mode function is selected and when there is a selected item, the sub-function selection window is displayed.

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

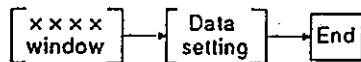


6.4.4 Execution/setting window

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. GSV21PE COMMON ITEMS

Motion Controller

6.4.5 Confirmation dialog

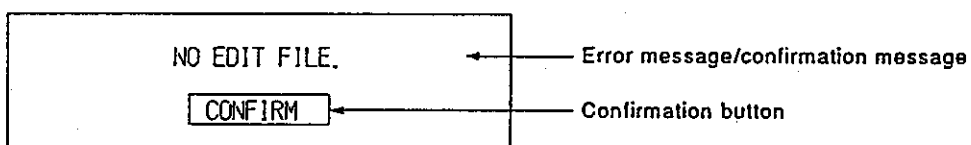
Confirmation dialog is used for the following operations:

- 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.

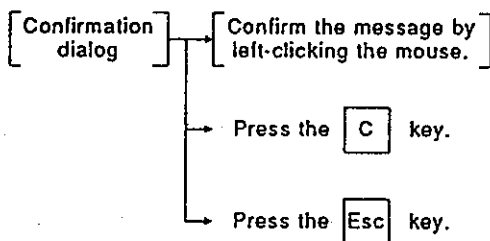
When a confirmation message is displayed, confirm that processing has been executed.

[Confirmation dialog]



[Key/mouse operation explanation]

- Confirmation of an error message



6. GSV21PE COMMON ITEMS

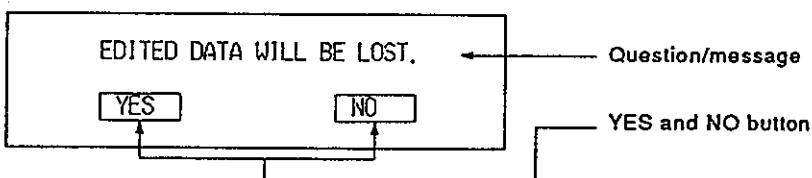
Motion Controller

6.4.6 Alternative dialog

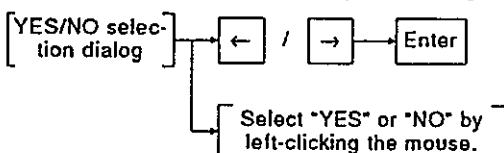
Alternative dialog is used to select YES/NO for a question, message, and setting contents.

There are 3 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.

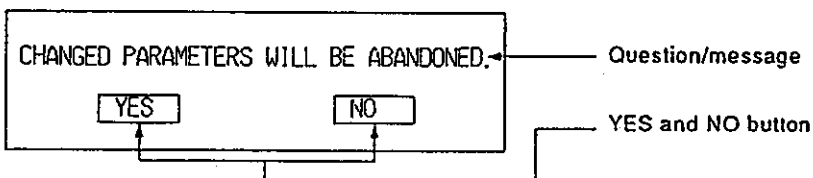
[YES/NO selection dialog]



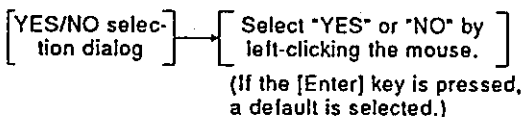
[Key/mouse operation explanation]



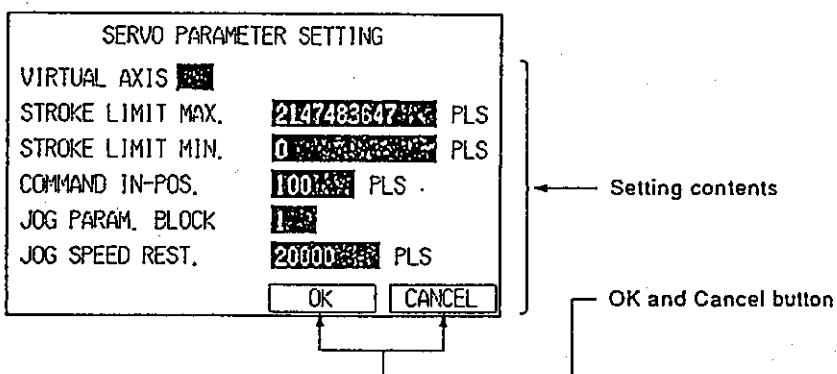
[YES/NO selection dialog]



[Key/mouse operation explanation]



[OK/CANCEL selection dialog]



[Mouse operation explanation]



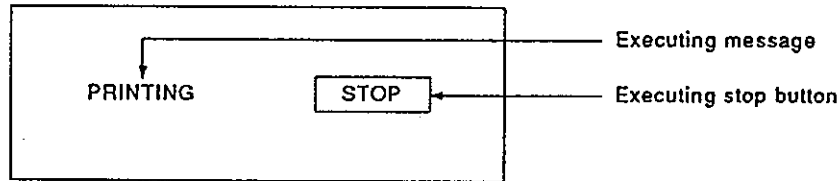
6. GSV21PE COMMON ITEMS

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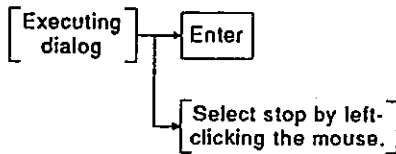
6.4.7 Executing dialog

Executing dialog displays processing contents currently being executed. Processing can be stopped with a stop button.

[Executing dialog]



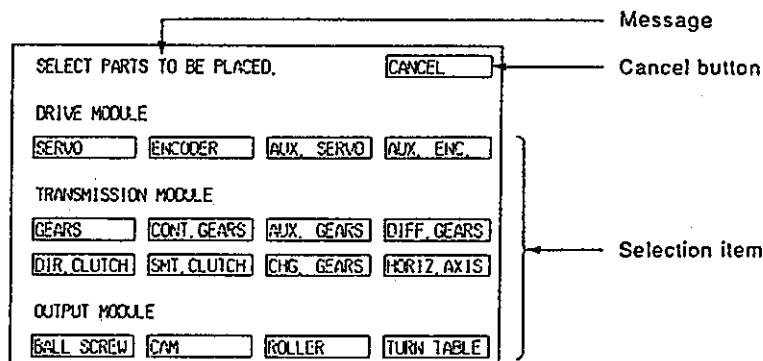
[Key/mouse operation explanation (when stopping execution)]



6.4.8 Selection dialog

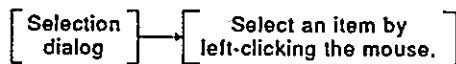
A selection dialog is the dialog for selecting an execution item from a displayed item. A selection can be interrupted with the CANCEL button.

[Selection dialog]



[Mouse operation explanation]

- When an item is selected



- When the selection of an item is interrupted

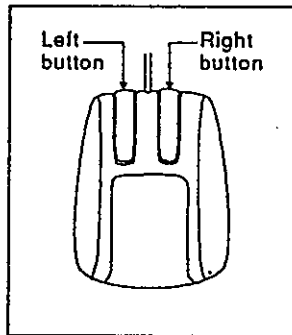


6.5 Basic Mouse Operations

This section explains how to operate the mouse used with the GSV21PE and its functions.

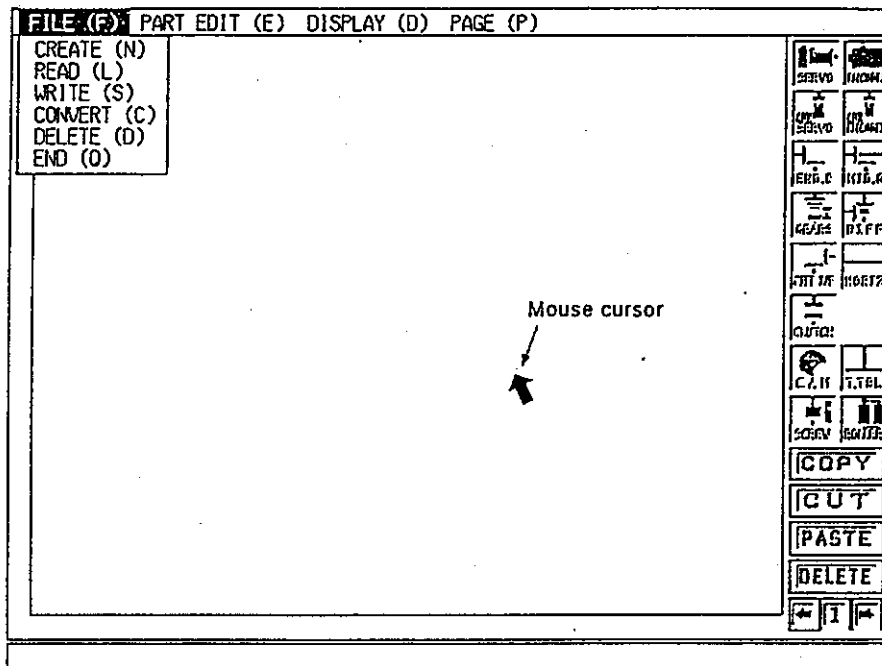
(1) Appearance of the mouse and the mouse cursor

[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 mode for doing mouse operations (during operations in the system setting mode).

(2) Operation of the mouse and its functions

(a) Pressing the buttons (ON)

This operation consists of pressing the left/right button. Pressing the left button is called left-pressing, and pressing the right button is called right-pressing.

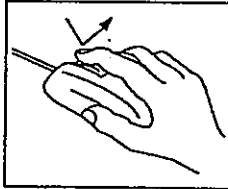
- When a system is in the input wait state, the menu bar is displayed by right-pressing.

(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 menu item determined by selecting by the right release at the position of an item selected by dragging across the displayed pull down menu.
- The movement position is determined by the right release after dragging and moving selected parts or dialog, etc.

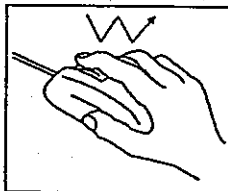
(c) Clicking



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

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

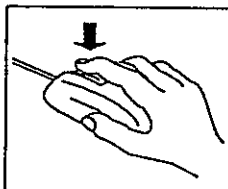
(d) Double-clicking



This is the operation of quickly left-/right-clicking twice. Operation of the left button is called left double-clicking, and operation of the right button is called right double-clicking.

- Each dialog can be displayed by left double-clicking after moving the mouse cursor to the area which parameter setting is done, or 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.

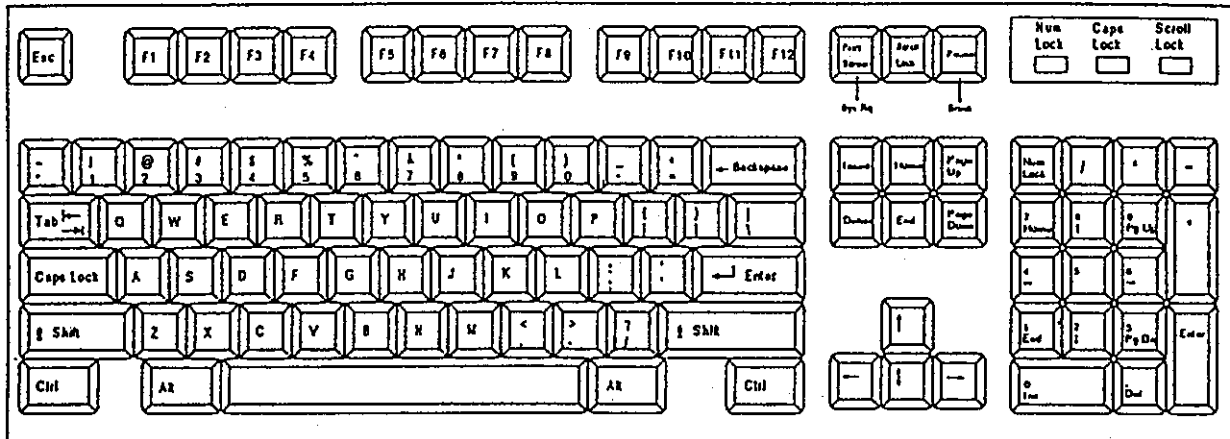
- A selected item can be moved by the left drag and then released at the destination position.
- An item can be selected from a menu bar which is displayed by the right press by a right drag and right release at the selected item position.

6. GSV21PE COMMON ITEMS

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6.6 Keyboard Explanation

This section explains the IBM standard keyboard to be used for the GSV21PE and the use of various keys.



6.6.1 Common keys

The following chart explains the common keys used for the GSV21PE.

(1) Key use

Key Names	Use
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.
Enter	Determines inputs and selections.
Page Up	Displays the previous page (ladder, list, HELP, etc). Switches axes (for servo monitoring, servo test, etc). (+1)
Page Down	Displays the next page (ladder, list and HELP, 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.
Print Screen	Copies a screen.
Num Lock	The 10-key part is used only for numeric keys.
F11	Displays the menu selection window.
F12	Displays the help window.

(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 ladder monitor and the servo programming mode. Switches between the PC test and servo PC, monitoring, and test.
Alt + F11	Switches between the ladder monitor and servo PC, monitoring, and test.

POINTS	<p>(1) Key operations in this manual are as follows:</p> <ul style="list-style-type: none"> • Procedures <ul style="list-style-type: none"> [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 <ul style="list-style-type: none"> [A] + [B] Press the [B] key while pressing the [A] key. [A] → [B] Press the [B] key after pressing the [A] key. <p>(2) Common keys other than the [Esc] and [Enter] keys become invalid in the system setting mode.</p> <p>(3) 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.</p>
---------------	--

6. GSV21PE COMMON ITEMS

Motion Controller

6.7 HELP Functions

The HELP functions explain functions and operations, how to process errors, etc.

The GSV21PE has the following 3 kinds of HELP functions:

- Guidance
- Troubleshooting
- Menus

The HELP functions for all functions are given in the following table:

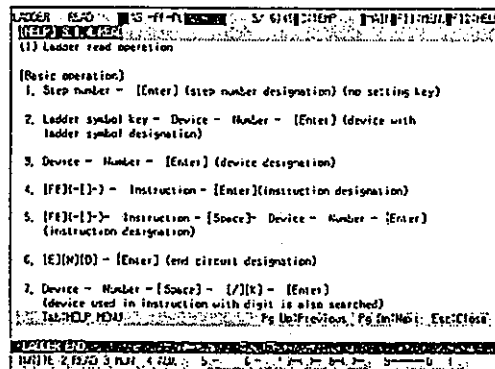
Functions	HELP function		
	Guidance HELP	HELP for trouble-shooting	HELP menu
System setting	○	-	-
Servo data setting	○	○	○
Servo programming	○	○	○
Servo printer	○	○	○
Servo file	○	○	○
Online	○	○	○
Installation	○	○	○

(1) Guidance HELP window

The guidance HELP window explains the operating procedures and the methods of operation.

To display the guidance HELP window, press the [F12] key after confirming that "F12:HELP" is displayed on the upper right hand side of the screen. ((4) below gives details about the guidance HELP window in the system setting mode.)

An example of a guidance HELP window is shown below.



[Key operations explanation]

Page switching:

Press the [Page Up] key to display the previous page.

Press the [Page Down] key to display the next page.

Display of the HELP menu: Press the [Tab] key to display the HELP menu.

End of the guidance HELP display: Press the [Esc] key to exit guidance HELP display.

(2) HELP window for troubleshooting

The HELP window for troubleshooting explains the causes of and corrective actions for an error message displayed while operating a function. Press the [Shift] + [F12] keys to display the troubleshooting HELP window when an error message is displayed. An example of a troubleshooting HELP window is shown below.

Cause	Action
A program which does not contain the END instruction is displayed.	Write END instruction.
A servo program which does not contain neither VEID nor OVED instruction is displayed.	Write VEID or OVED instruction at the end of servo program.

[Key operations explanation]

Page switching:

Press the [Page Up] key to display the previous page. Press the [Page Down] key to display the next page.

End of the troubleshooting HELP display:

Press the [Esc] key to exit troubleshooting HELP.

(3) HELP menu

The HELP menu window is the table of contents of guidance HELP. Press the [Tab] key to display the HELP menu window when the guidance HELP window is displayed. The HELP menu window example is shown below.

(1) AUXILIARY FUNCTION (LOADER READ FUNCTION)
(2) BATCH I/O, I/O CONTACTS CONNECTION
(3) BATCH DEVICE CONNECTION
(4) I.C. SETTING VALUE LIST
(5) ALL CLEAR
(6) MEMORY CAPACITY SETTING
(7) BATCH COPY
(8) BATCH MOVE
(9) BATCH DELETE
(10) CONTACT AND COIL LIST
(11) DEVICE USED LIST
(12) COMMENT (DISPLAY SHIELD)
(13) COMMENT CREATION
(14) NOTE CREATION
(15) STATEMENT CREATION

[Key operations explanation]

Page switching:

Press the [Page Up] key to display the previous page.

Press the [Page Down] key to display the next page.

Exiting the HELP menu display:

Press the [Esc] key to exit the HELP menu.

POINT

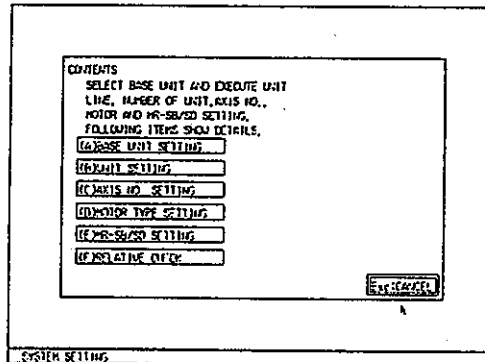
If the [Shift] + [F12] keys are pressed when an error message is not displayed, a beeping sound occurs, but the troubleshooting HELP window is not displayed.

- (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.

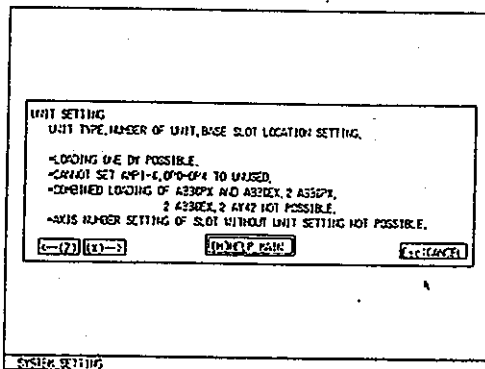
The HELP window is displayed.

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.

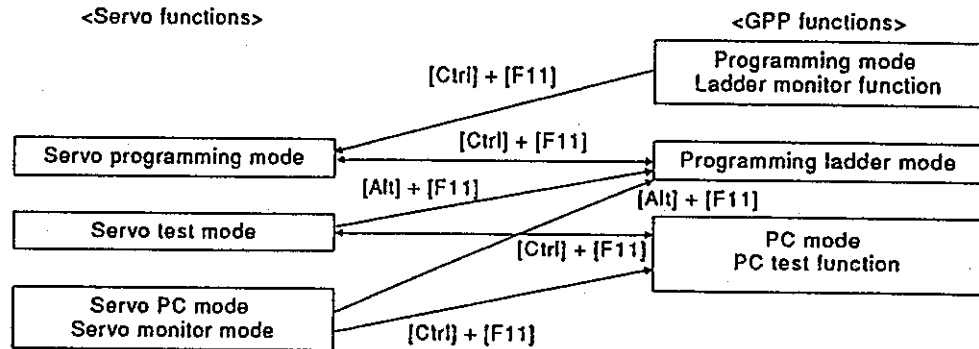
6. GSV21PE COMMON ITEMS

Motion Controller

6.8 Switching the Servo and the GPP Functions

The GSV21PE can be used to switch back and forth between the Servo and GPP functions.

This section explains how to switch between these functions.



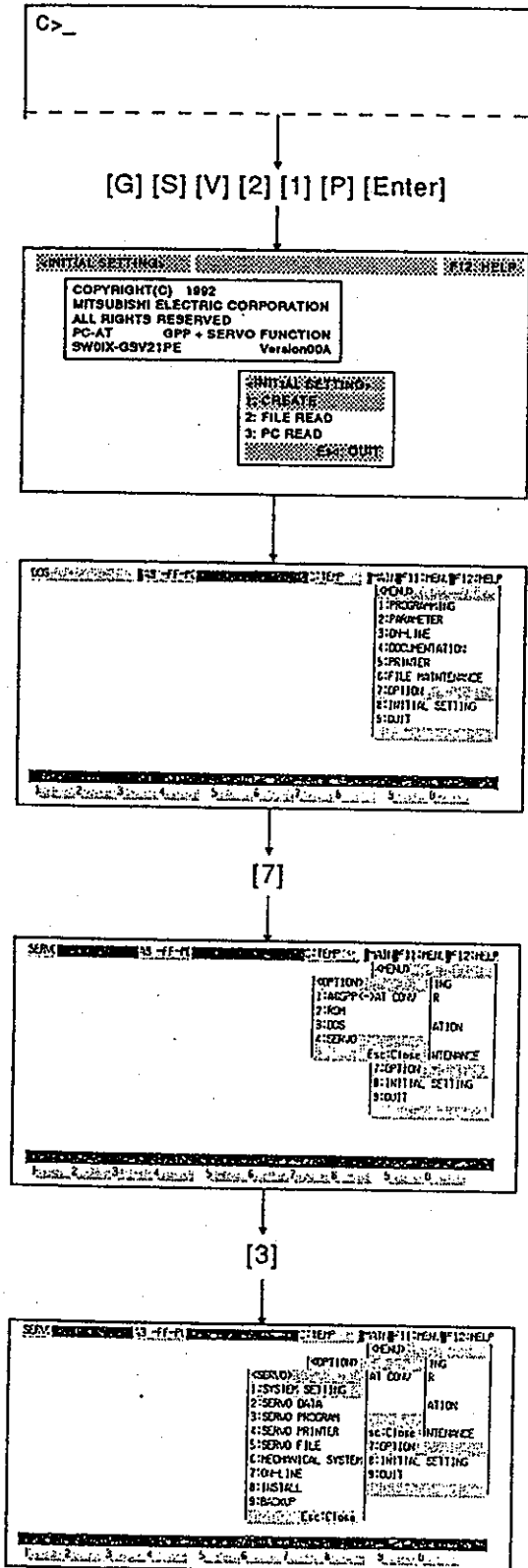
- Press the [Ctrl] + [F11] keys to switch between the servo programming mode of the servo function and the ladder monitor of the GPP function.
- Press the [Alt] + [F11] keys to switch between the servo PC mode, servo monitor mode or servo test mode of the servo function and the ladder monitor of the GPP function.
- Press the [Ctrl] + [F11] keys to switch between the servo PC mode, servo monitor mode or servo test mode of the servo function and the PC test of the GPP function.
- Press the [Ctrl] + [F11] keys to switch between the PC test of the GPP function to servo test mode.

7. STARTING UP AND ENDING THE GSV21PE

7. STARTING UP AND ENDING THE GSV21PE

7.1 How to Start-Up

The section explains how to display the GPP functions initial screen after starting up the GSV21PE registered in an IBM PC.



1 Set the IBM PC status to ON (DOS command wait state).

2 Input "GSV21P" next to "C", and then press the [Enter] key.

3 The GSV21PE is now started up and the GPP functions initial screen is displayed. Do the initial setting. (The SW0IX-GPPAE 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 "3:Servo". The servo function is started.

6 The servo function selection window is displayed.

7. STARTING UP AND ENDING THE GSV21PE

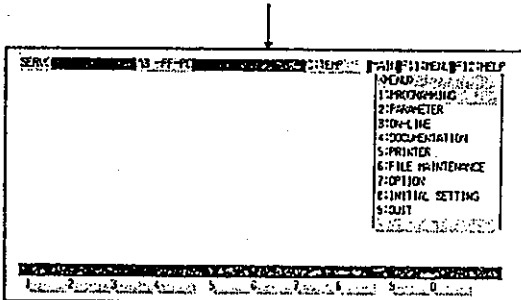
POINT

The drivers shown in Section 1.6.3 are necessary to operate the GSV21PE.
Section 1.6.3 gives details about setting the drivers to CONFIG.SYS and AUTOEXEC.BAT.
After setting the drivers, start the GSV21PE by resetting the IBM PC or turning ON the power.

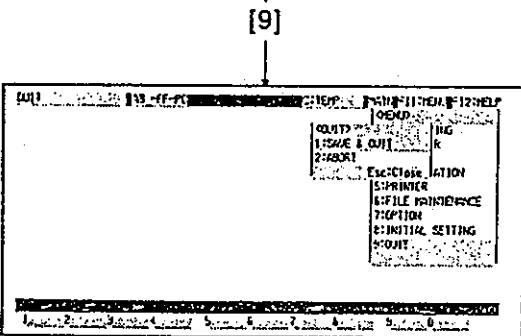
7.2 How to End

This section explains how to end the GSV21PE and return to the DOS command wait state.

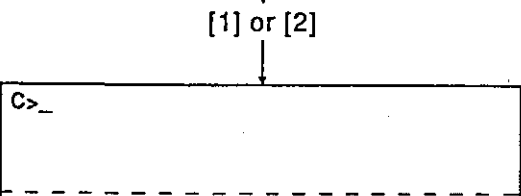
- 1 Either use the [Esc] key to close all data setting windows and sub-function selection windows, or display the menu selection window by pressing the [F11] key.



- 2 The menu selection window is displayed. The GSV21PE function has now been ended. Select "QUIT" from the menu. Then, the GPP function is ended.



- 3 The end menu window is displayed. Select the method for ending.
 - When "SAVE & QUIT" is selected (Press the [1] key.)
Writes the set servo data to a file and ends.
 - When "ABORT" is selected (Press the [2] key.)
Writes the set servo data to a file and ends.



- 4 The screen then returns to the DOS command wait state screen.

POINT

Ending after file writing
When the servo function is ended without executing writing by the servo function, select "SAVE & QUIT" in the end mode of the GPP function, write the data currently being programmed to a file, and then end.

8. SYSTEM SETTING

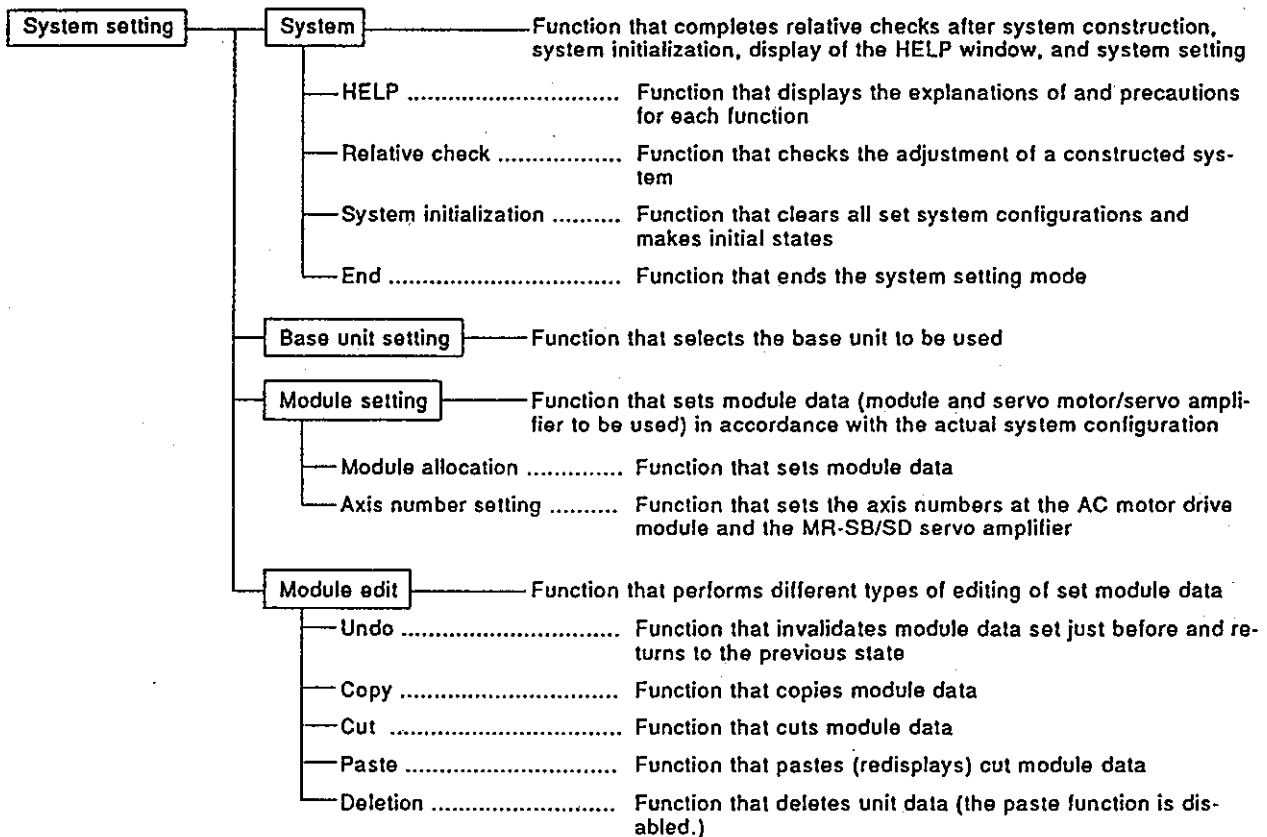
Select a base unit in accordance with the actual system configuration, allocate each module, and set the program's axis number, servo motor and servo amplifier.

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 GSV21PE, and execute it.

8.1 General Description of Functions

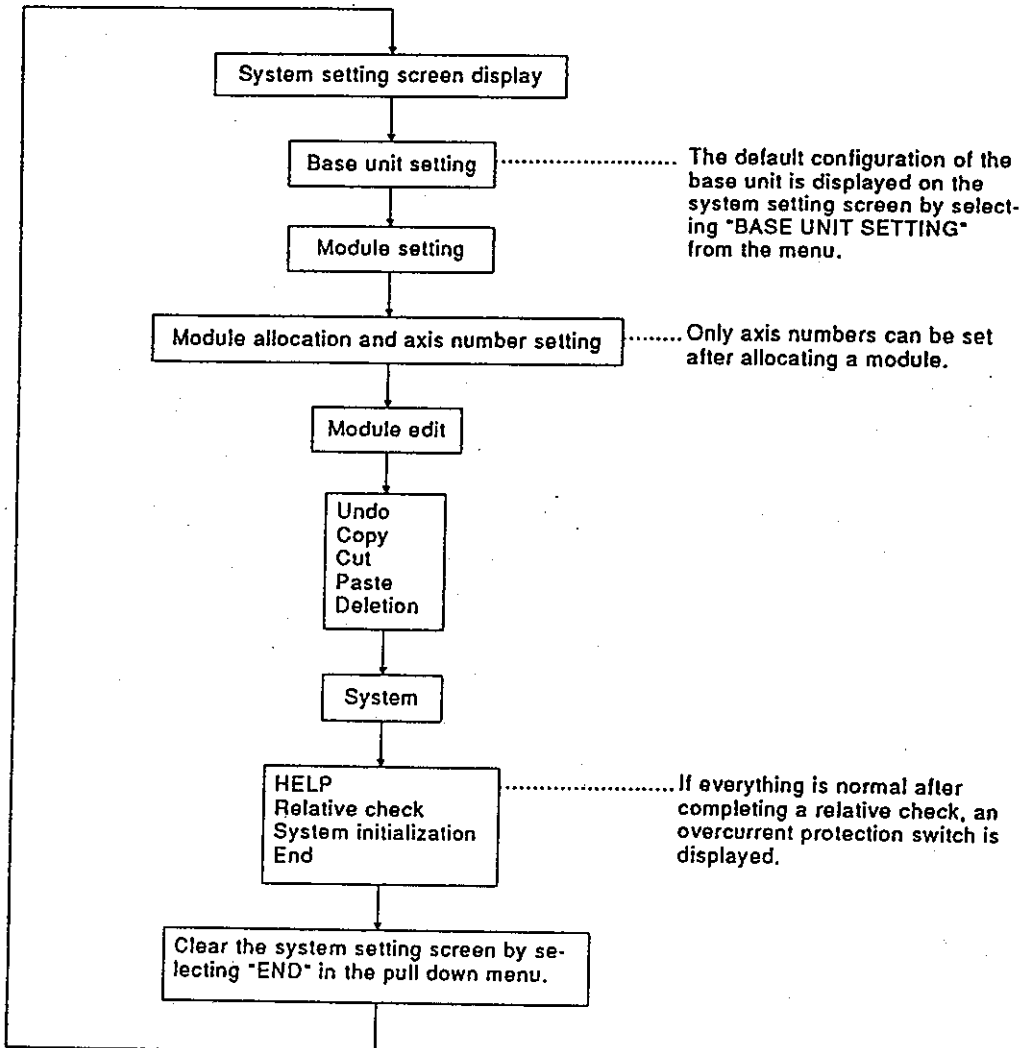
The system setting mode of the GSV21PE contains the following functions:



8. SYSTEM SETTING

8.2 Overall Procedure

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



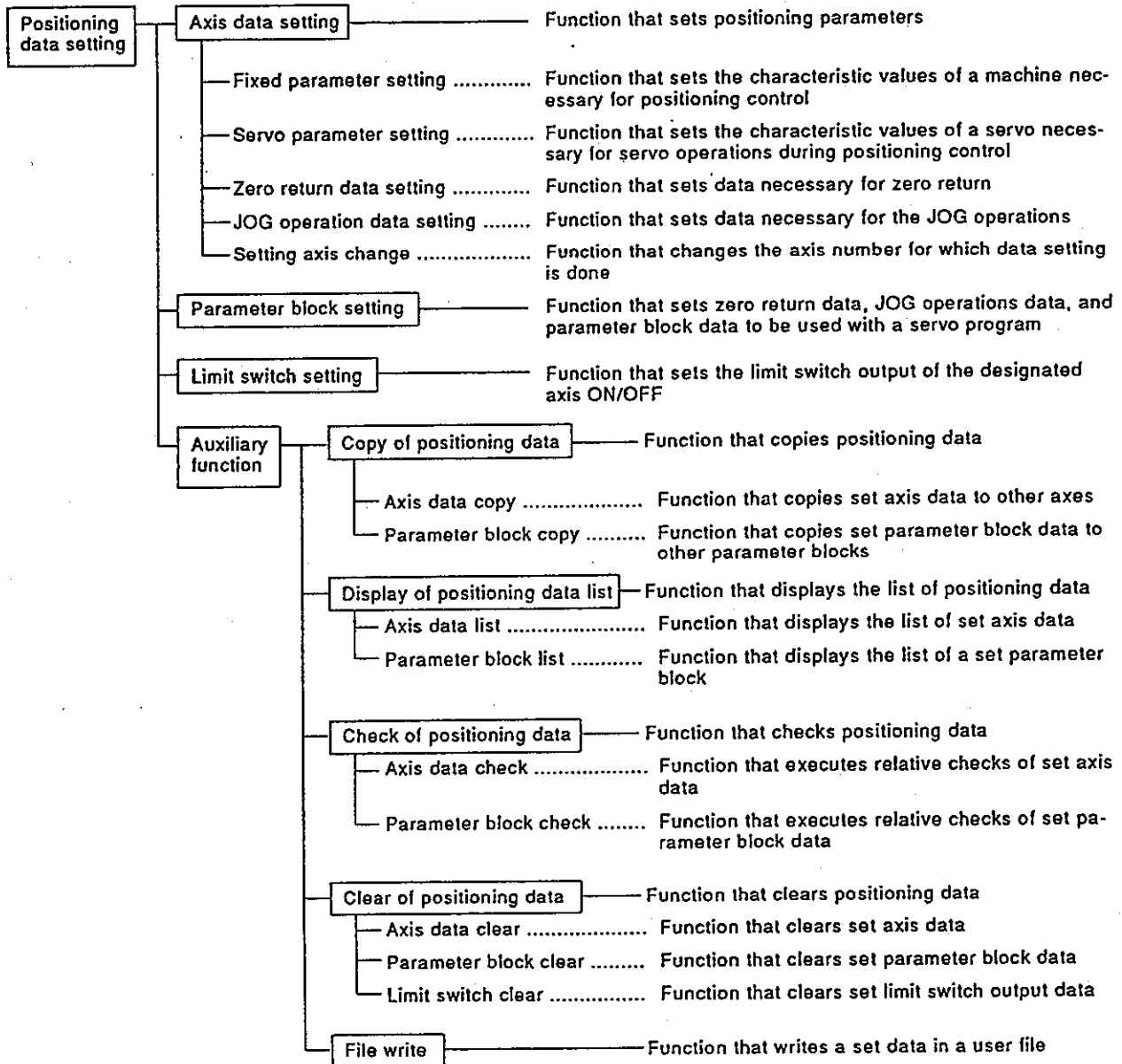
9. SETTING OF POSITIONING DATA

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 GSV21PE, and execute it.

9.1 General Description of Functions

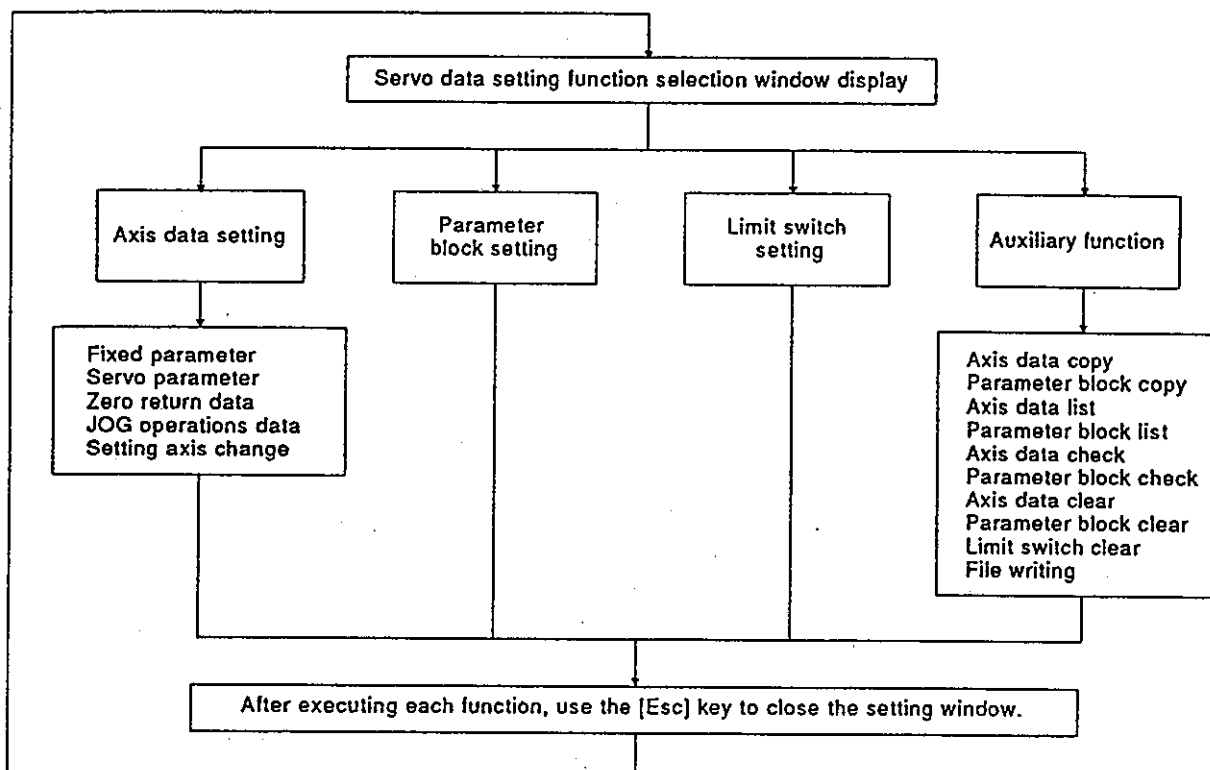
The servo data setting mode of GSV21PE contains the following functions:



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

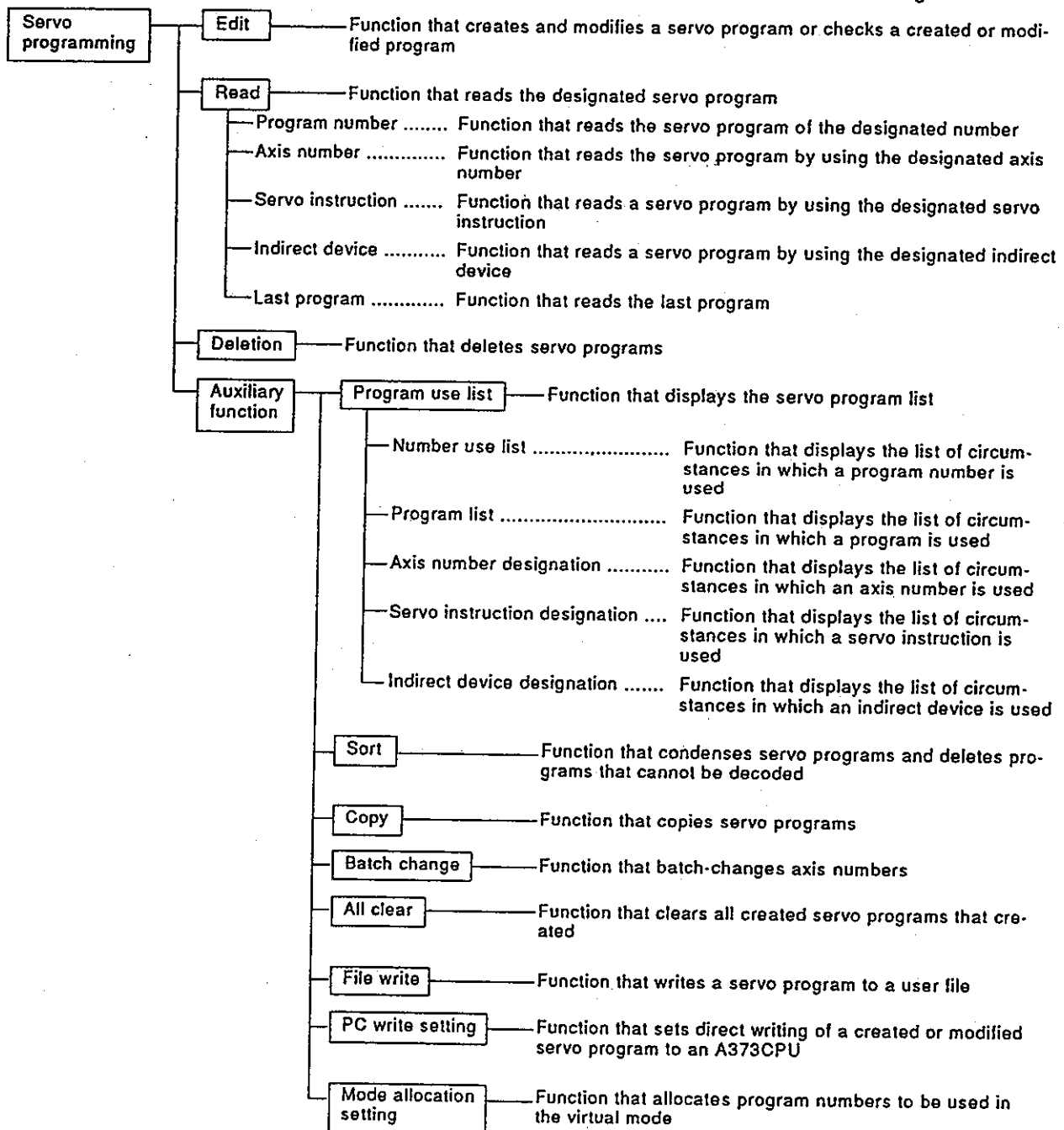
10. CREATING AND MODIFYING SERVO PROGRAMS

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 GSV21PE, and execute it.

10.1 General Description of Functions

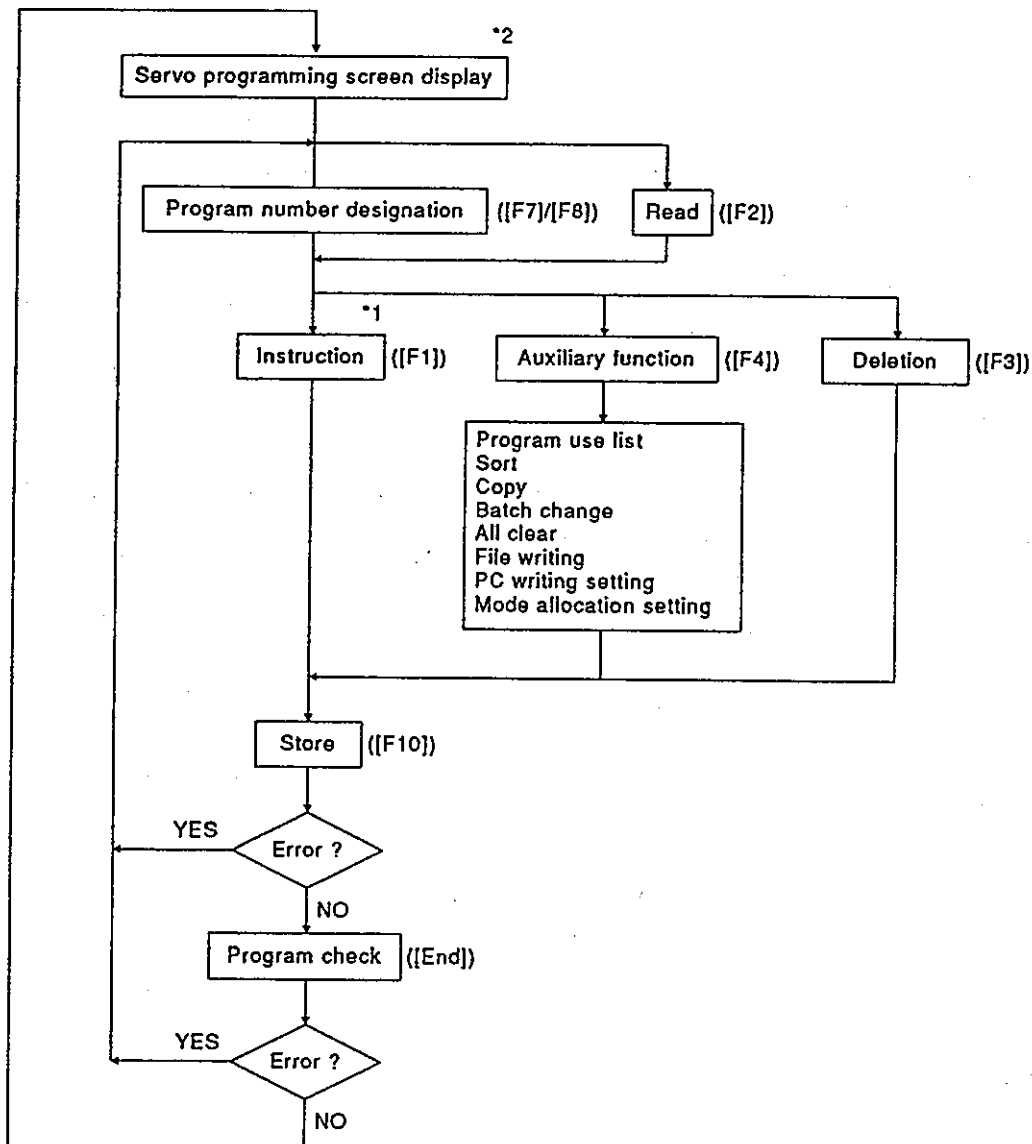
The programming mode of the GSV21PE contains the following functions:



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

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	
2: ABS-2	
3: ABS-3	
4: INC-1	
5: INC-2	
6: INC-3	

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	

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: CPSTART2	8: ABS-2	H: INC-2
2: CPSTART3	9: ABS-3	I: INC-3
(End)	A: ABS	J: INC
3: CPEND	B: ABS	K: INC
(Repeat)	C: ABS	L: INC
4: FOR-ON	D: ABS	M: INC
5: FOR-OFF	E: ABS	N: INC
6: FOR-TIMES	F: ABS	O: INC
7: NEXT	G: ABS	P: INC

8) Zero return	
1: ZERO	

9) Simultaneous start	
1: START	

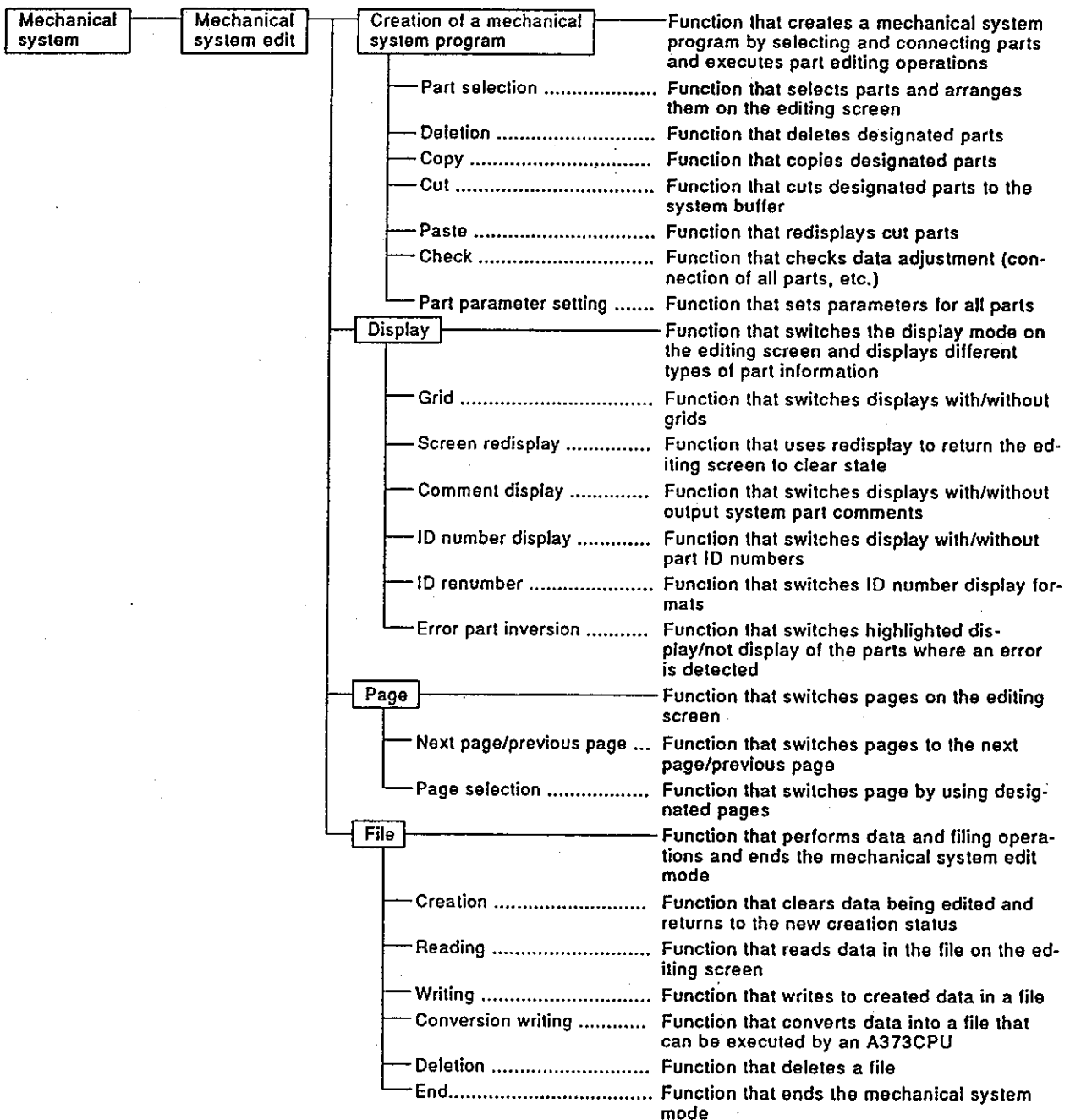
11. MECHANICAL SYSTEM PROGRAMS

The mechanical system edit mode of the mechanical system mode is used to create mechanical system programs by connecting part images, setting part parameters, etc.

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 GSV21PE, and execute it.

11.1 General Description of Functions

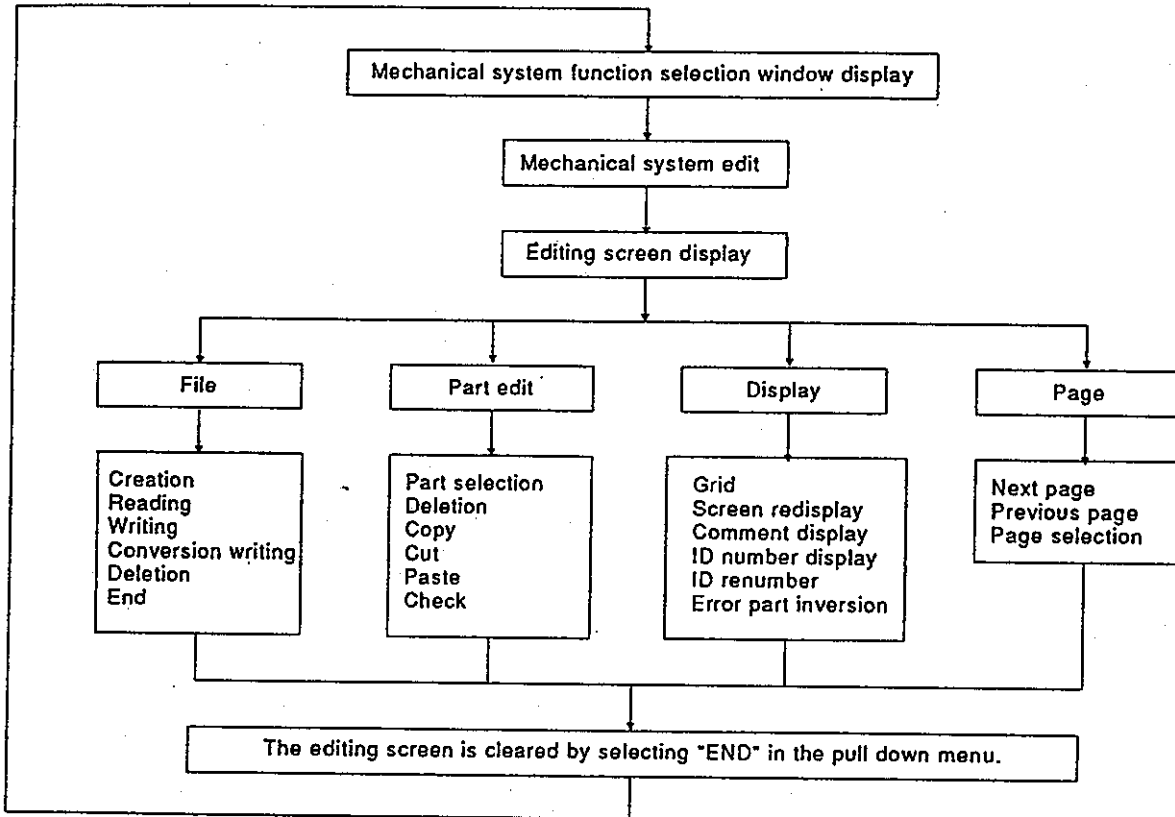
The mechanical system edit mode of the mechanical system mode contains the following functions:



11. MECHANICAL SYSTEM PROGRAMS

11.2 Overall Procedure

This section shows the overall procedure for the structure edit mode.



12. VERIFYING, WRITING TO, AND READING FROM AN A373CPU

12. VERIFYING, WRITING TO, AND READING FROM AN A373CPU

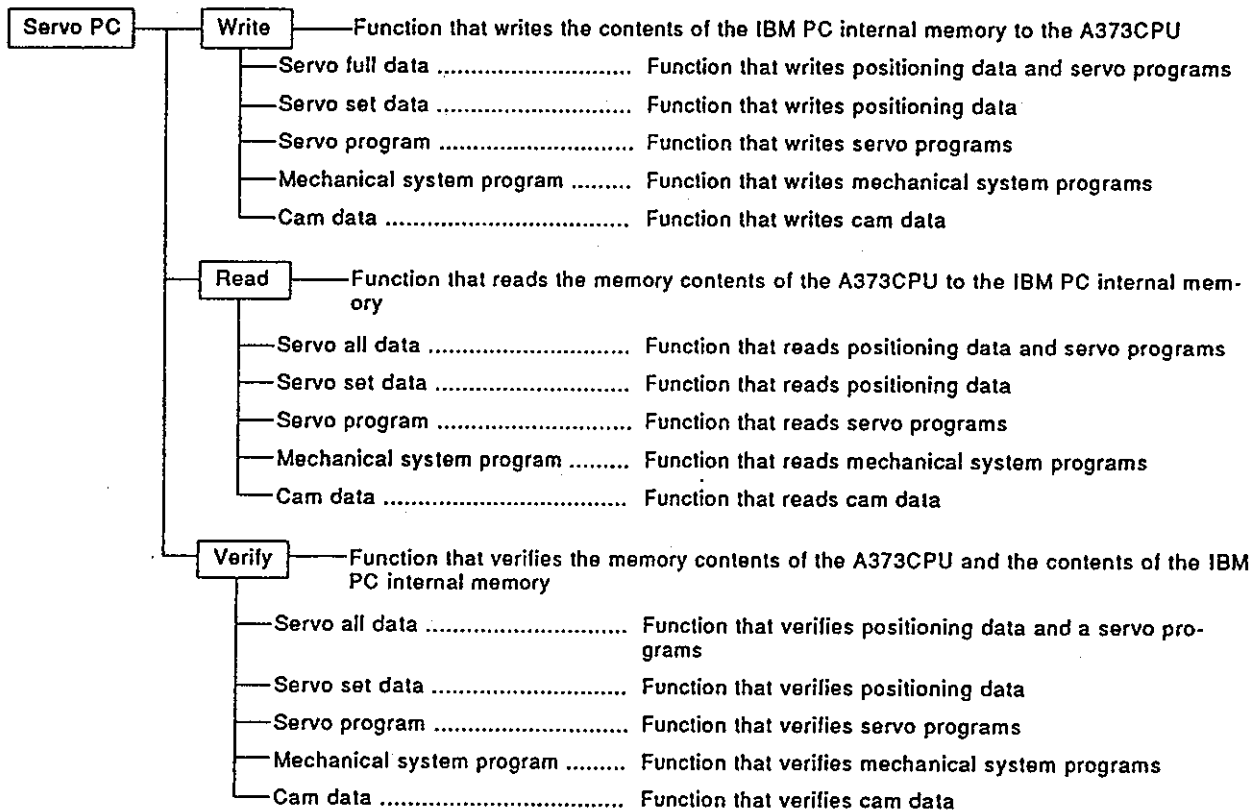
When an A373CPU and an IBM PC are connected, the servo PC mode is used for reading, writing, and verifying the following data:

- 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
- Mechanical system programs
- Cam 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 GSV21PE, and execute it.

12.1 General Description of Functions

The servo PC mode of the GSV21PE contains the following functions:

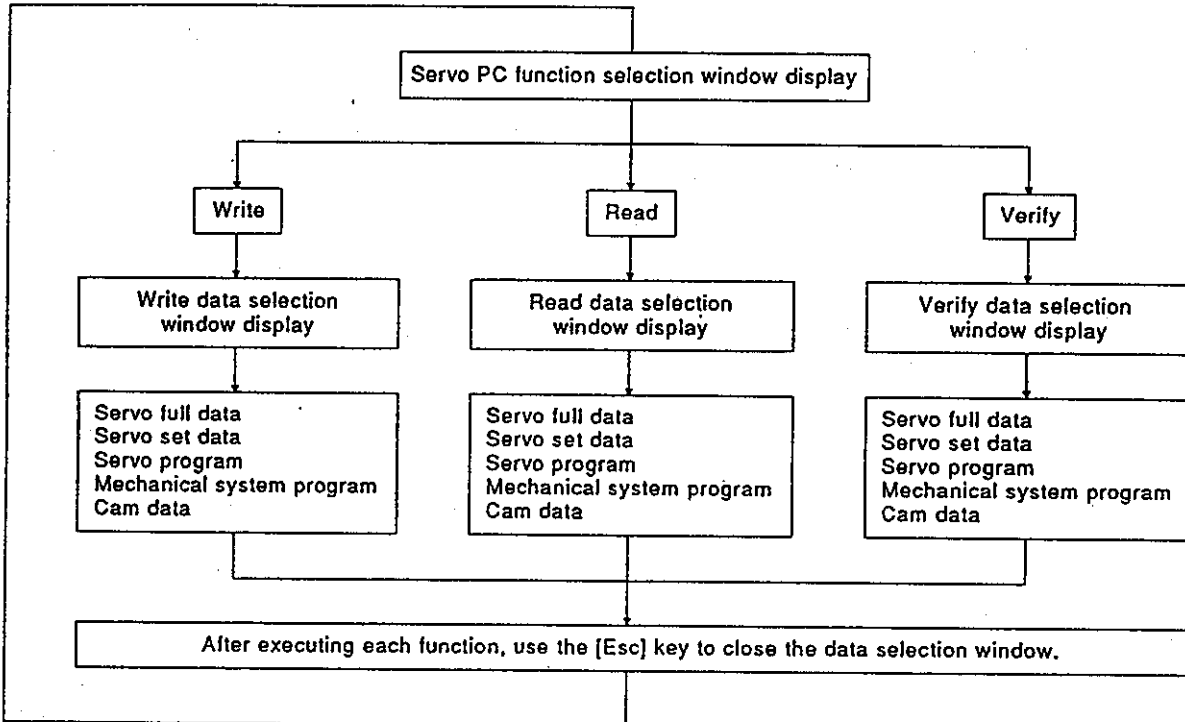


12. VERIFYING, WRITING TO, AND READING FROM AN A373CPU

Motion Controller

12.2 Overall Procedure

This section shows the overall procedure for writing, reading, and verifying data to/from an A373CPU.



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.

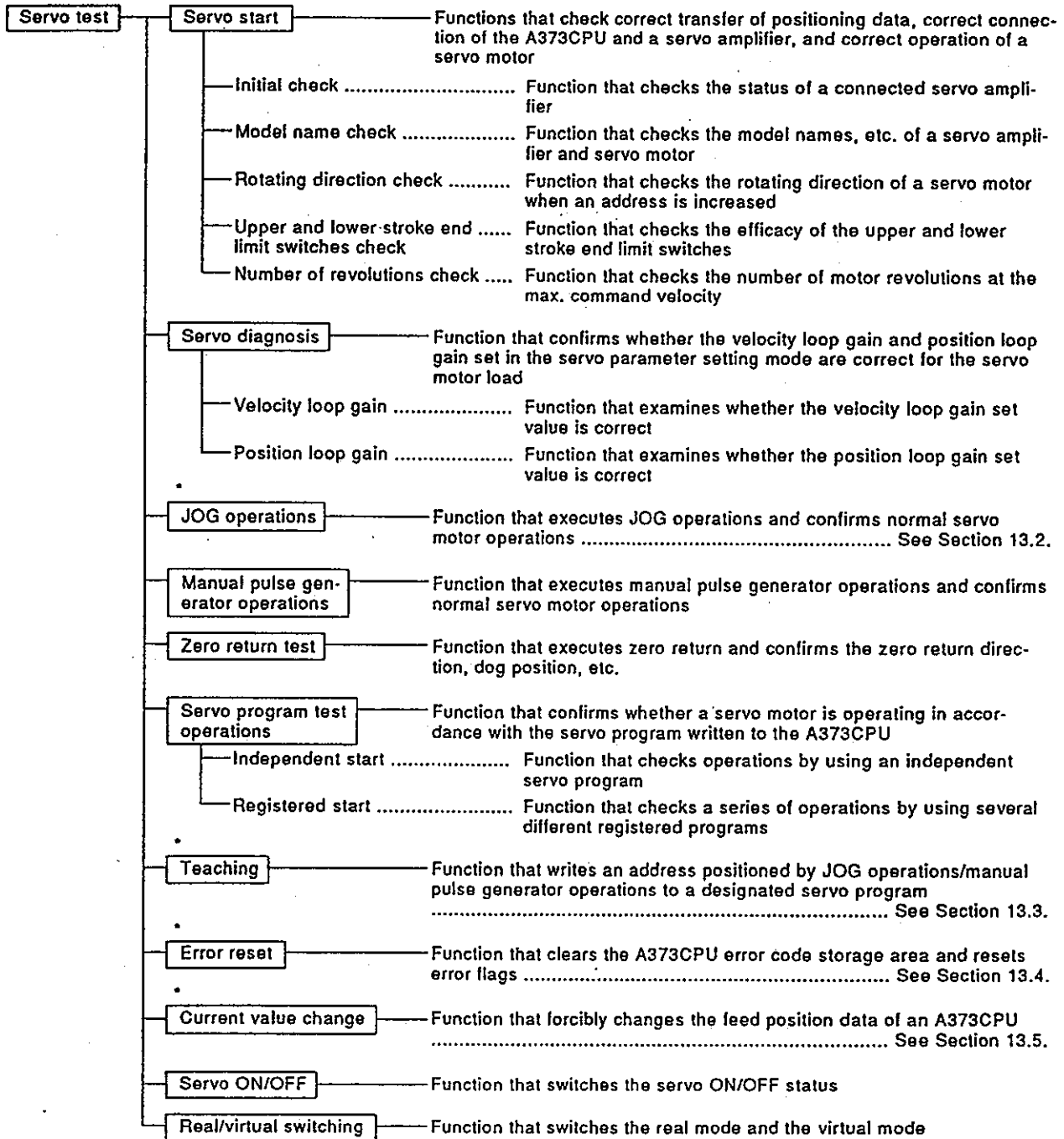
13. A373CPU TEST

The servo test mode is used by connecting an A373CPU and an IBM PC to execute test operation to see whether a servo motor is operating in accordance with the GSV21PE.

This manual explains only operating details of those functions given below indicated by a * (Only operations in the real mode). If it is necessary to use a function other than the functions with a * for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) operation of the GSV21PE, and execute it.

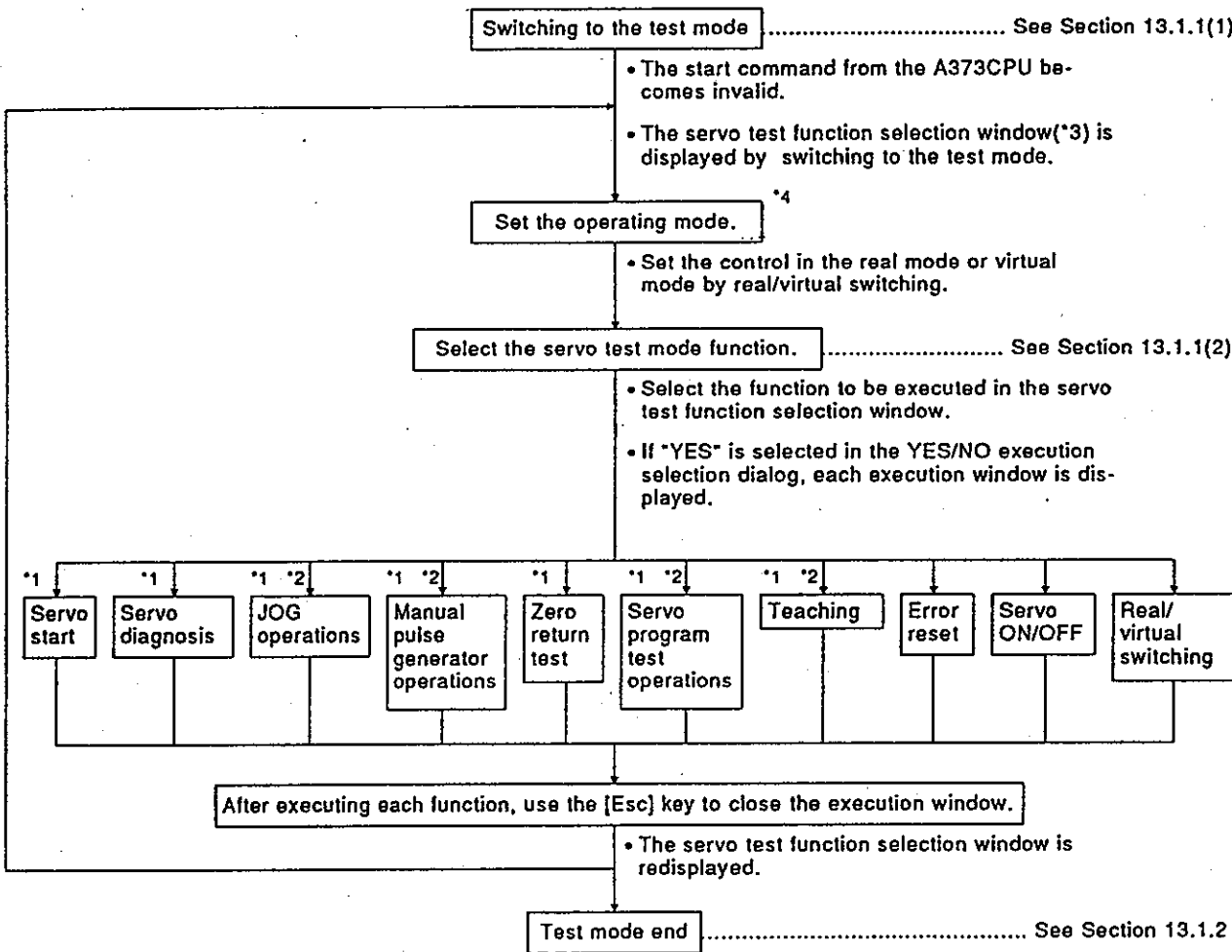
(1) General description of functions

The servo-test mode of the GSV21PE contains the following functions:



(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).
- *4: Since operations in the virtual mode is not given, if they are necessary for maintenance, consult system supplier. Or, check how to use the HELP function (see Section 6.7) of the GSV21PE.

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. A373CPU TEST

13.1 Switching to the Test Mode and Ending

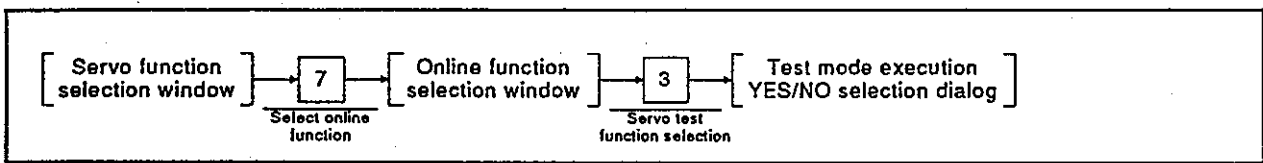
Test operations are enabled if the A373CPU is in the STOP or RUN states. However, a start instruction (DSFRP instruction) from the sequence program will be ignored if test operations are executed during A373CPU RUN. This section explains the operations for switching to the test mode and ending the test mode.

13.1.1 Switching to the test mode

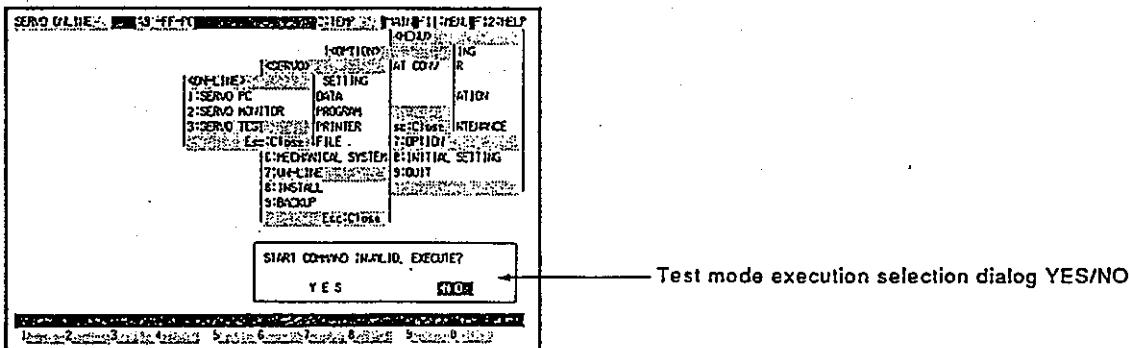
Switch to the test mode when control using the A373CPU servo program has been completed and all axes are stopped.

(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

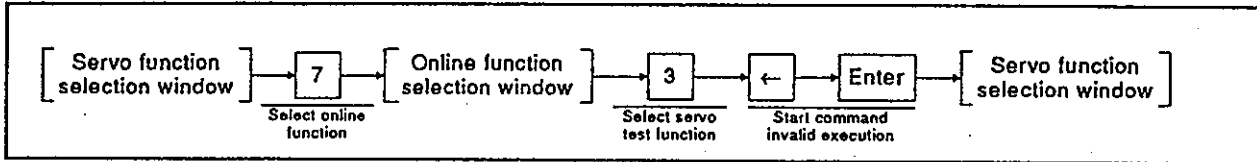
When the "CANNOT EXECUTE DURING START UP" error message is displayed by the above operations, the servo motor has been operated by a start command from the A373CPU. Reselect servo test in the online function selection window after confirming that all axes are stopped, and then execute the test mode.

(2) Servo test function selection

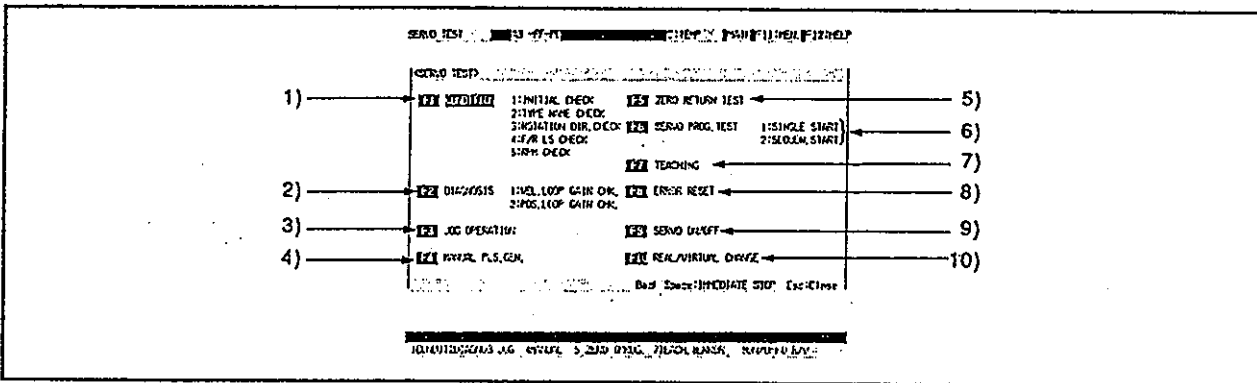
When switching to the test mode has been completed, the servo test function selection window is displayed.

Select the servo test function to be executed.

[Procedure for displaying the servo test function selection window]



[Servo test function selection window]



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. A373CPU TEST

Motion Contoroller

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.
10) Real/virtual switching	Press the [F10] key to execute real/virtual switching. If "YES" is selected in the execution YES/NO selection dialog, the window to execute switching will be displayed.

13. A373CPU TEST

13.1.2 Ending the test mode

The test mode is canceled. Start command becomes valid by using a sequence program when the A373CPU is in the RUN state.

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

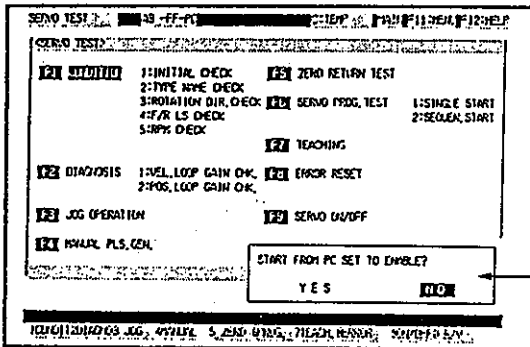
- Ending by using the servo test function selection window
 - Ending by using each check in the test operations execution window
- This section explains how to perform both methods.

(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]



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 A373CPU is canceled.
- 3) The servo test function selection window is displayed by selecting "NO" or pressing the [Esc] key, and the A373CPU 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 A373CPU test mode is canceled.

PRECAUTION

A373CPU test mode cancellation disable

- When "NO" is selected by key operations when switching to the above "PC test" function, or when the [Esc] key is pressed, the servo test mode of the GSV21PE is ended, but the A373CPU test mode is not 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) 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 A373CPU test mode is canceled.

13. A373CPU 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.

[Model name check window] (Example)

AL	APP	APP	RES. M	REQUA	MONA	CAPACITY	RESOLUT	SV
IS	NO.	TYPE	L. SET	RES. DATA	TYPE	(μm)	(Ppm)	1224
1	APP1	A373CPU	N	NO USE	NO-SC	4000	3000	1101
2	APP2	A373CPU	N	NO USE	NO-SC	4000	3000	1101
3	APP3	A373CPU	N	NO USE	NO-SC	4000	3000	1101

SERVO MOTOR PROTECTION DATA

START FROM PC SET TO DISABLE?

YES NO

Test mode ending YES/NO selection dialog

[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 A373CPU 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 func-
tion

- 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 A373CPU test mode is canceled.

PRECAUTION

A373CPU test mode cancellation disable

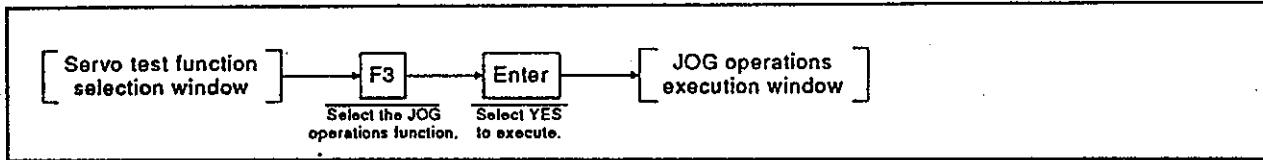
- If "NO" is selected or the [Esc] key is pressed in operation 2) above for canceling the test mode, the servo test mode of the GSV21PE is ended, but the A373CPU test mode is not canceled.

13.2 JOG Operations

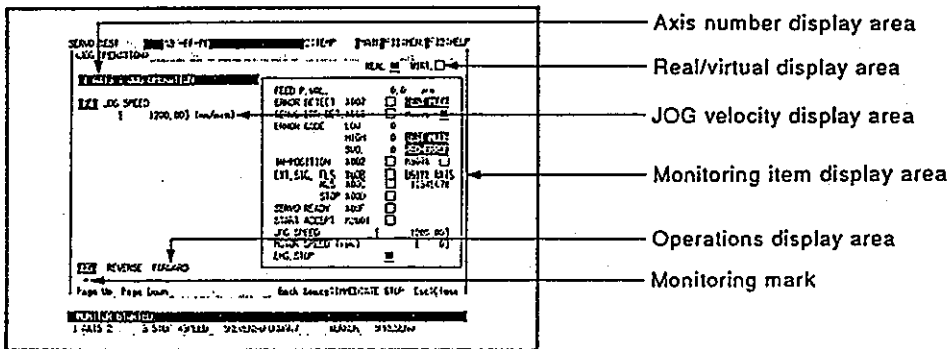
JOG operations are executed for each axis by using set JOG operations data. JOG operations of a servo motor connected to an ADU or MR-SB/SD are executed.

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. FLS	<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 where the JOG operations are executed is displayed.

JOG velocity display area

The set JOG operating velocity is displayed.

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Motion Controller

Operations display area	Forward JOG operations or reverse JOG operations are highlighted.
Real/virtual display area	Displayed whether the current mode is the real mode or the virtual mode.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)
[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) Next axis number/previous 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.

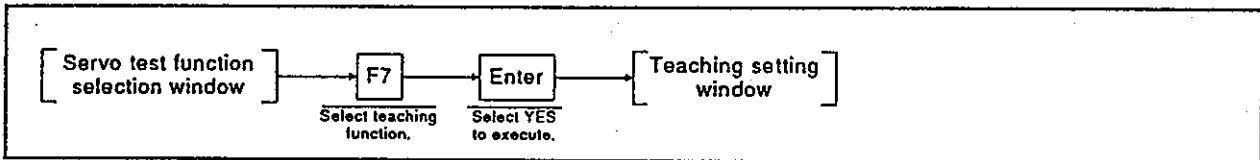
13.3 Address Setting of a Servo Program by Using Teaching

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

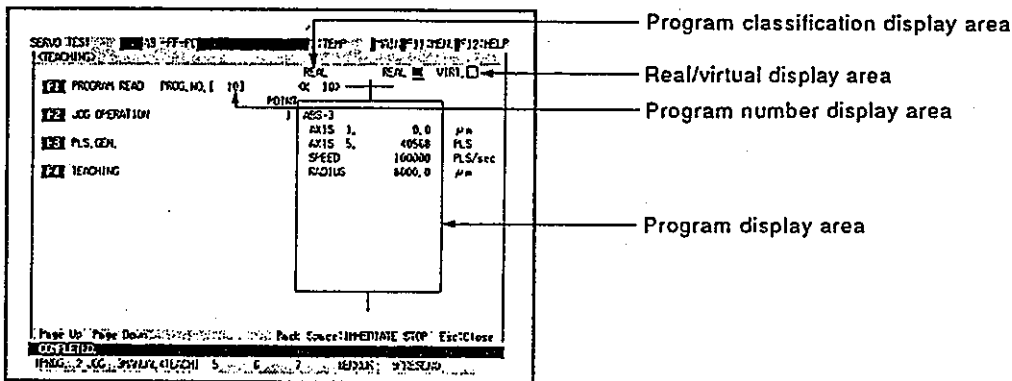
It is necessary to create a servo program to be designated in advance in the servo programming mode. (It is recommended that the address be set to 0, and the command velocity be set to slow velocity.)

(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.

Program classification display Displayed whether the read servo program is used in the real mode or the virtual mode.

Real/virtual display area Displayed whether the current mode is the real mode or the virtual mode.

[Key operations explanation]

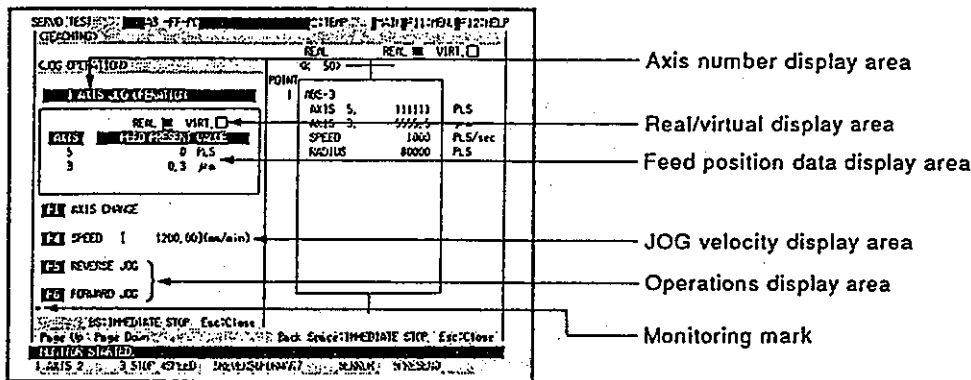
- Program read**
- 1) When reading a servo program to which an address is written, press the [F1] key.
The program read window is displayed.
 - 2) Input the servo program number to which an address is written by using a numeric key, and then press the [Enter] key. (The setting range is 0 to 4095.)
The 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.

POINT**Confirmation of virtual/real mode**

- When the virtual mode is selected, teaching cannot be executed for a real mode servo program.
When a servo program that executes teaching is used in the real mode, execute teaching after confirming the real mode in the real/virtual display area.
- When the real mode is selected, teaching cannot be executed for a virtual mode servo program.
When a servo program that executes teaching is used in the virtual mode, execute teaching after confirming the virtual mode in the real/virtual display area.

- (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. |
| Real/virtual display area | Displayed whether the current mode is the real mode or virtual mode. |
| Monitoring mark | This shows that monitoring is currently being executed.
(Not displayed during monitoring stop.) |

[Key operations explanation]

- | | |
|--------------------------------|--|
| JOG velocity setting/change | <ol style="list-style-type: none"> When setting or changing the JOG operating velocity, press the [F1] key.
Set or change the JOG operating velocity in the displayed JOG operating velocity setting window. |
| Designation of the axis number | <ol style="list-style-type: none"> When selecting the axis number that executes the JOG operation from a motor axis used with a designated servo program or a virtual servo motor axis, 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. |

13. A373CPU TEST

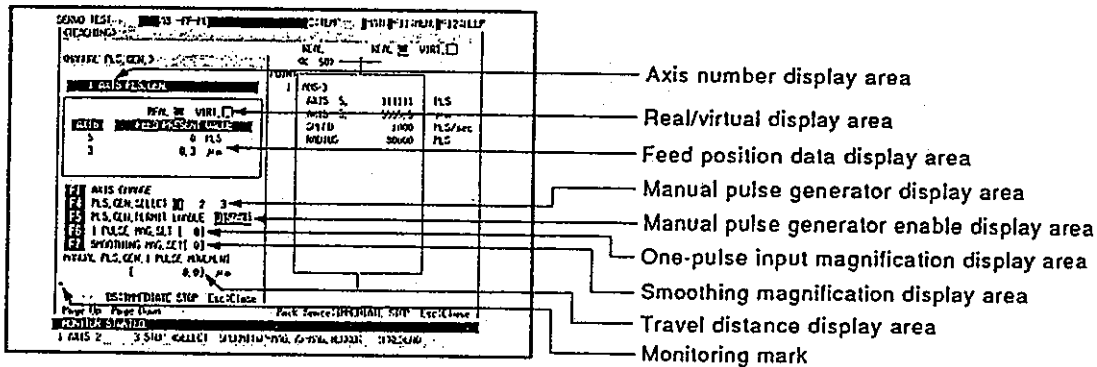
Motion Controller

- Forward JOG operations execution**
- 1) 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.
- 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. FLS	<input checked="" type="checkbox"/> ON
STOP	<input type="checkbox"/> OFF
SERVO READY	<input checked="" type="checkbox"/> ON

- (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 an A373CPU)

[Manual pulse generator operations execution window]



[Display/setting contents explanation]

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

<p>POINT</p> <p>Travel distance for each manual pulse generator 1 pulse</p> <ul style="list-style-type: none"> • The travel distance is calculated by using the following formula: [Travel distance] = [Manual pulse generator 1 pulse input magnification] × A • As shown in the chart on the right, values for A differ depending on which unit is used. 	<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Unit</th> <th style="padding: 2px;">A</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">μm</td> <td style="padding: 2px;">0.1</td> </tr> <tr> <td style="padding: 2px;">inch</td> <td style="padding: 2px;">0.00001</td> </tr> <tr> <td style="padding: 2px;">degree</td> <td style="padding: 2px;">0.00001</td> </tr> <tr> <td style="padding: 2px;">PULSE</td> <td style="padding: 2px;">2</td> </tr> </tbody> </table>	Unit	A	μm	0.1	inch	0.00001	degree	0.00001	PULSE	2
Unit	A										
μm	0.1										
inch	0.00001										
degree	0.00001										
PULSE	2										

[Key operations explanation]

- | | |
|--|--|
| Manual pulse generator enable/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 a motor axis or virtual servo motor 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 an A373CPU, 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 A373CPU. |
| 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

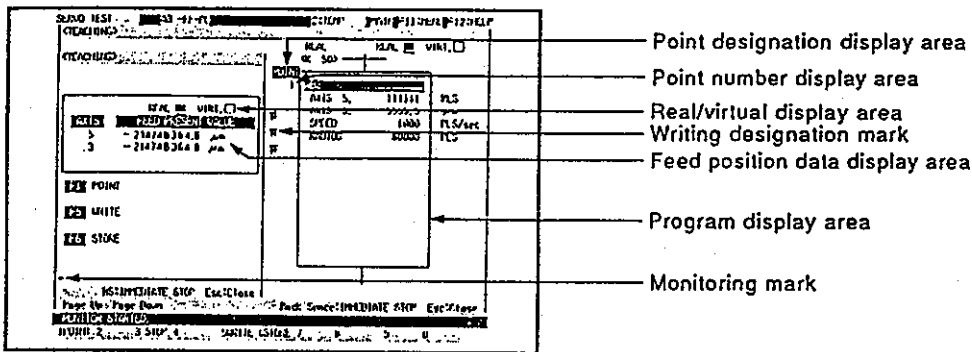
- Execute manual pulse generator operations after confirming that "ENABLE" is highlighted in the manual pulse generator permission display area.

(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".

- (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 an A373CPU.

- 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.)
Real/virtual display area	This displays that the servo program to be written is used for the virtual mode or real mode.
Monitoring mark	This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

[Key operations explanation]

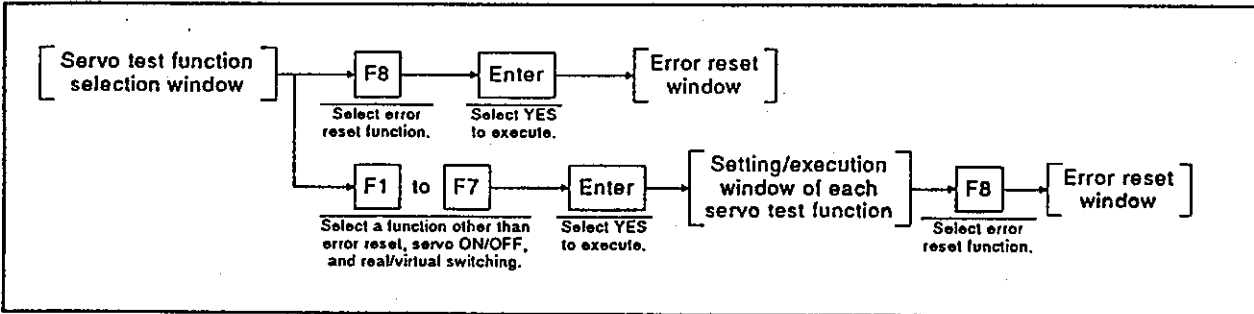
- Writing axis designation**
- 1) When designating the axis to which an address is written, first confirm that the point designation display is a normal display. If the display is highlighted, pressing the [F1] key returns to the normal display.
 - 2) Press the [↑]/[↓] keys to move the cursor in the 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 an A373CPU, 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. A373CPU TEST

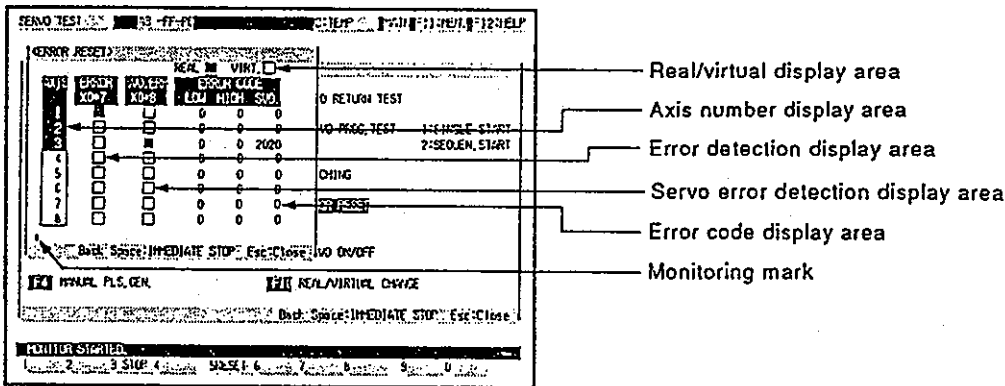
13.4 Error Resetting

The A373CPU 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]



[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.
- Real/virtual display area** Displays that the current mode is the real mode.
- Monitoring mark** Shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

13. A373CPU TEST

Motion Contoroller

[Key operations explanation]

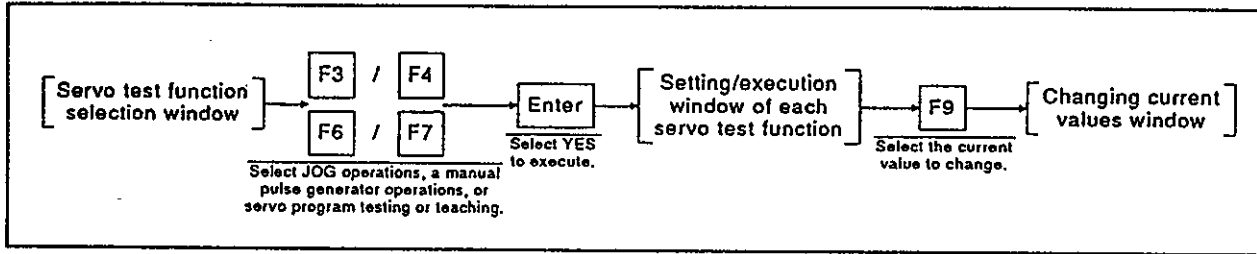
- Error reset execution**
- 1) When resetting an error, press the [F5] key.
The execution YES/NO selection dialog is displayed.
 - 2) Press the [Enter] key when YES is highlighted.
Error reset is executed, the error detection signal and servo error detection signal go OFF, and "0" is displayed in the 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. A373CPU TEST

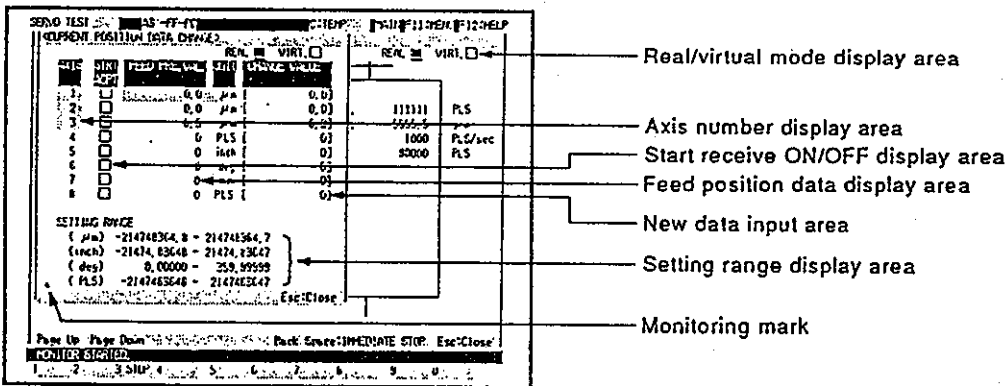
13.5 Changing Current Values

The feed position data of an A373CPU 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.
- Real/virtual mode display area** The current mode (real/virtual) is displayed. Confirm that "REAL" is displayed.
- Monitoring mark** This shows that monitoring is currently being executed. (Not displayed during monitoring stop.)

13. A373CPU 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

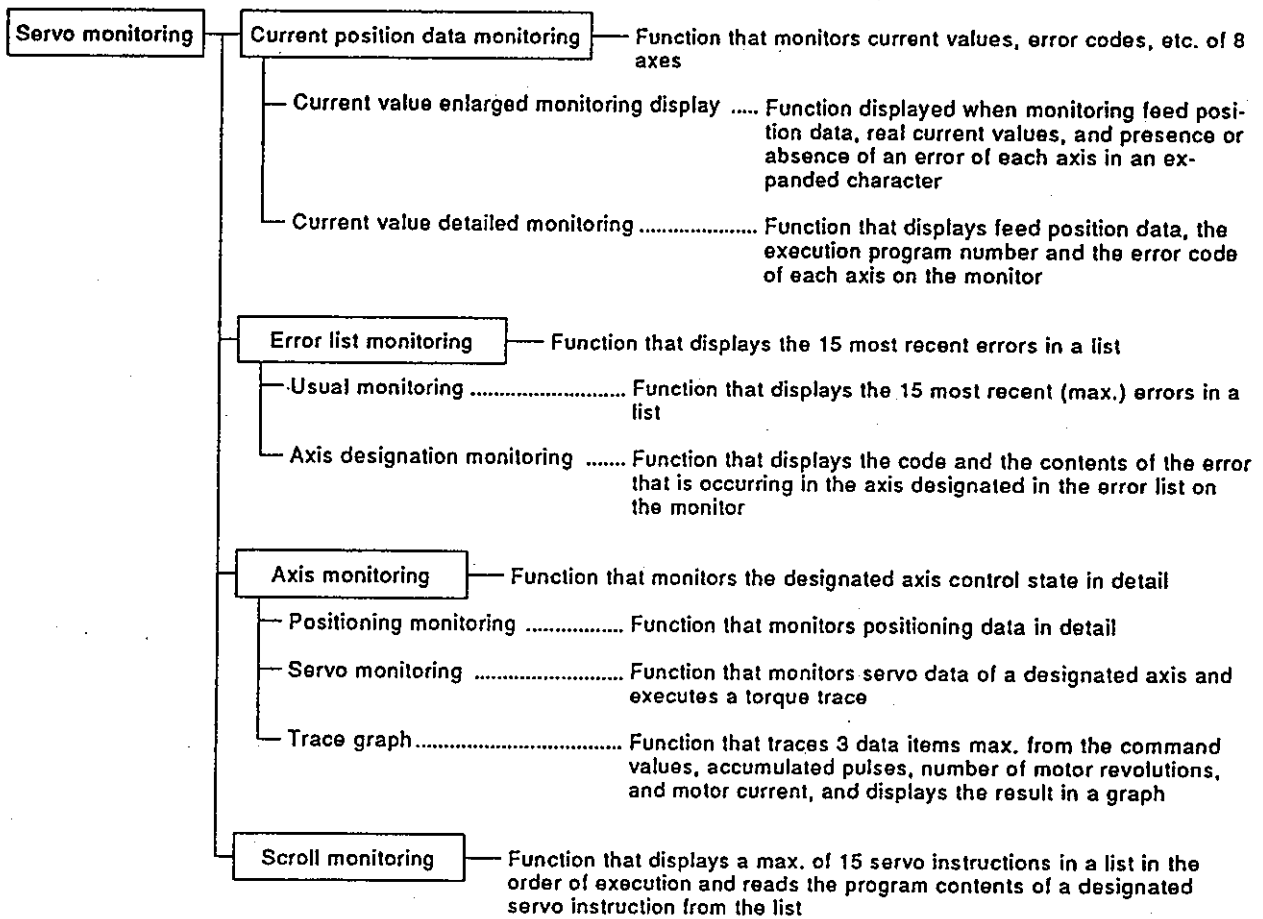
14. MONITORING THE POSITIONING STATE

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 an A373CPU.

This manual only explains operating details of those functions in the real mode.
If it is necessary to use the functions in the virtual mode, consult your nearest Mitsubishi representative. Or, check how to use the HELP function (see Section 6.7) operation of the GSV21PE, and execute it.

(1) General description of functions

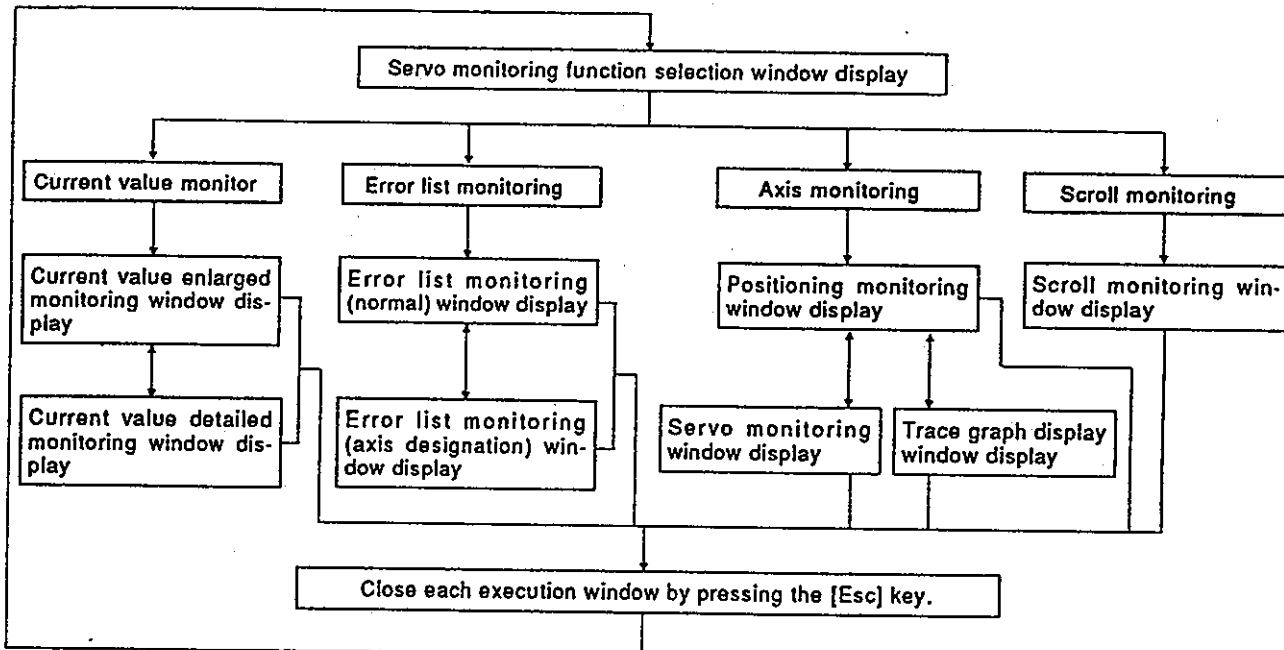
The servo test mode of the GSV21PE contains the following functions:



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 online function selection 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.

POINT

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.

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 upper case 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

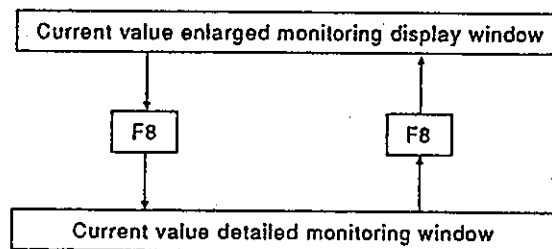
If "PRE. VALUE MON." is selected in the servo monitoring function selection window, the current value enlarged monitoring display window is displayed, and monitoring of feed position data is started.

(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.

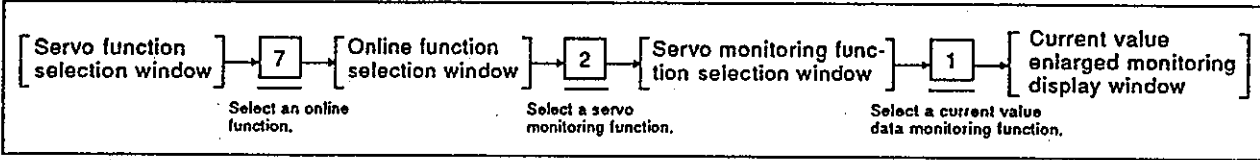


14. MONITORING THE POSITIONING STATE

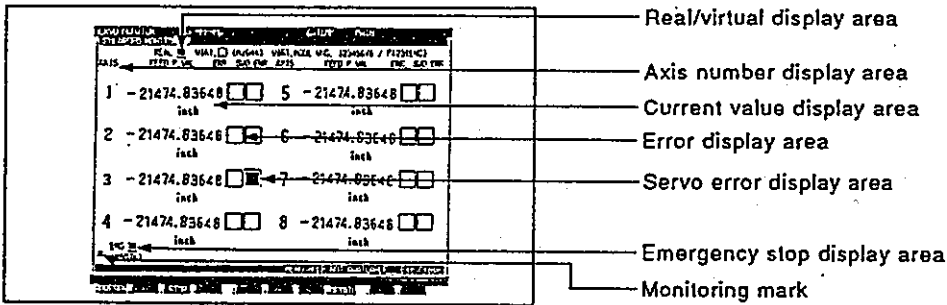
14.1.1 Current value enlarged monitoring display

Feed position data or the real current values of 8 axes is displayed in upper case 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 an A373CPU for an operating axis or the real current value which is fed back to an A373CPU 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.
- Real/virtual display area** This displays that the current mode is the real mode.
- 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

[Key operations explanation]

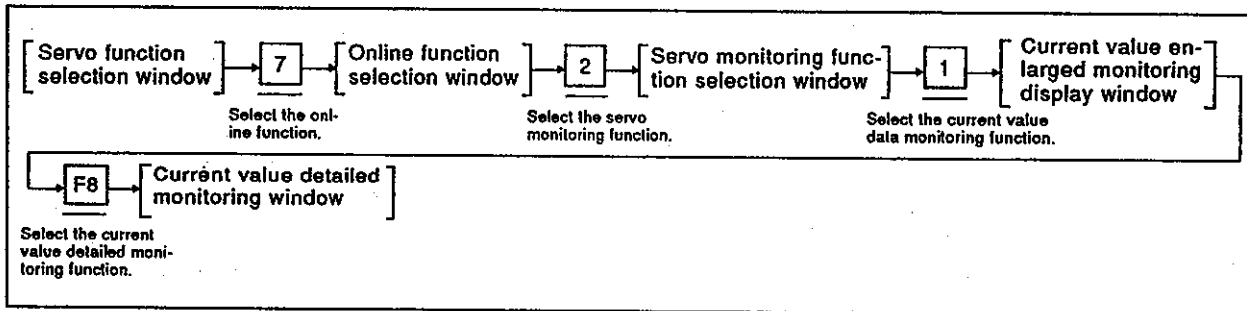
- Current value display switching** 1) When switching the feed position data display to the real current value display or vice versa, press the [F1] key.
- Switching to the current value detailed monitoring function** 1) When monitoring current value details, press the [F8] key. The current value detailed monitoring window is displayed.
- 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

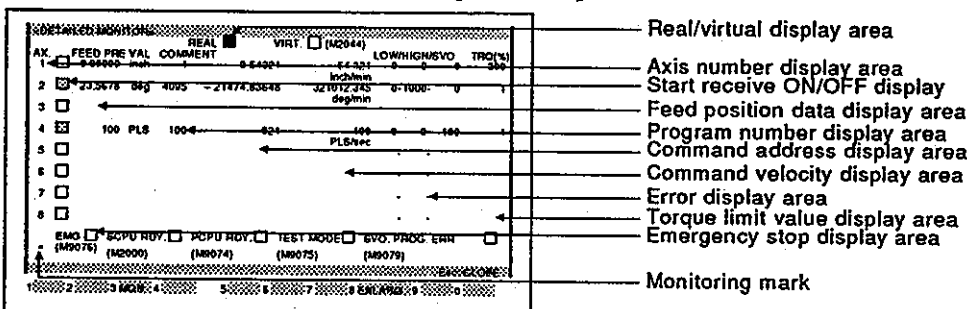
14.1.2 Current value detailed monitoring

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 an A373CPU 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
 - Position loop gain check execution (servo diagnosis) TEST
 - When a rotating direction check (servo start) is being executed TEST
 - When positioning control is not being executed Blank

14. MONITORING THE POSITIONING STATE

Motion Controller

Command address display area	A command address to be output from an A373CPU 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 an A373CPU 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.
Real/virtual display area	This shows that monitoring is currently being executed.
Emergency stop display area	When an axis which is started is stopped for an emergency, this is highlighted.
Monitoring mark	This shows that the current mode is the real mode. (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 A373CPU 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

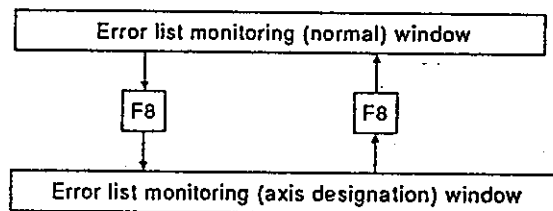
If "ERROR LIST MON." is selected in the servo monitoring function selection window, the error list monitoring (normal) window is displayed, and monitoring of an error in 8 axes is started.

(3) Start of axis designation monitoring

The error list monitoring window (axis designation) is displayed by pressing the [F8] key in error list monitoring (normal) 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 (normal) 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 an A373 is switched to the test mode (If the signal is ON and is switched to the test mode, the error list is not cleared.)

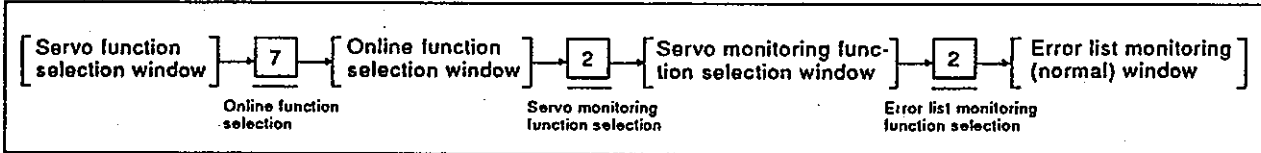
14. MONITORING THE POSITIONING STATE

14.2.1 Error list monitoring (normal)

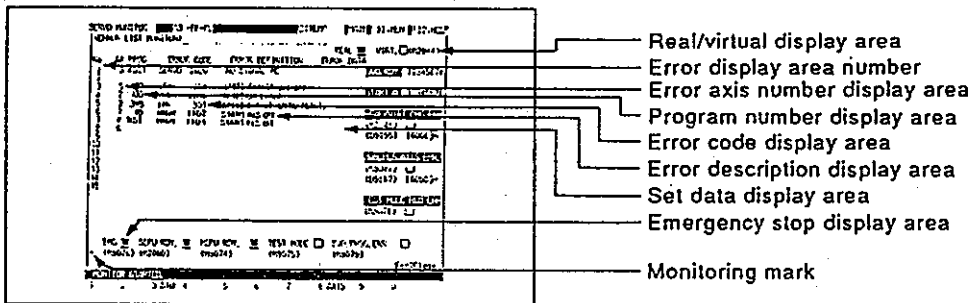
Max. 15 errors of the following kinds of errors that occur when the leading edge PC READY signal is (M2000) are displayed in a list.

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

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



[Error list monitoring (normal) 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.

REMARKS

- 1) The axis number when a servo program setting error occurs is displayed as follows:
 - Real mode Blank
 - Virtual mode VIRT.

- 2) The axis number where a minor/major/servo error occurs in the virtual mode is displayed as follows:
 - Virtual servo motor axis number V1 to V8
 - Synchronous encoder axis number P1 to P3
 - Output module axis number When the output point amplifier is an ADU AMP1 to AMP6
When the output point amplifier is an MR-SB /SD d1 to d4
M is option slot No. in which an A334SF is installed.

14. MONITORING THE POSITIONING STATE

Motion Controller

Program number display area Servo program number executed when an error occurs is displayed.
(0 to 4095)

REMARKS

- 1) When an error occurs in the axis that is executing JOG operations or manual pulse generator operations in the real mode, 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 a rotating direction check (servo start) is being executed TEST
 - When positioning control is not being executed Blank

- 2) When an error occurs in a synchronous virtual axis/servo motor encoder axis in the virtual mode, the display is as follows:
 - When a virtual mode program is being executed V0 to V4095
 - When JOG operations in the virtual mode are being executed V.JOG
 - When a synchronous encoder axis operation is being executed ENC

- 3) When an error occurs in the output module axis in the virtual mode, the display is as follows:
 - When the output module is a roller ROLL
 - When the output module is a ball screw SCRW
 - When an output module is a rotary table TTBL
 - When an output module is a cam CAM

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
- Real/virtual switching error MODE CHG.

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.

REMARK

The ON/OFF state of the servo READY signal of the output module axis is displayed in the virtual mode.

14. MONITORING THE POSITIONING STATE

Motion Controller

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

REMARK

The ON/OFF state of the servo READY signal of the output module axis is displayed in the virtual mode.

Real/virtual switching error display	If an error occurs when switching the real mode to the virtual mode or vice versa, this is highlighted and the error code is displayed.
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 an A373CPU is not switched to the test mode even when a test mode request is executed in the GSV21PE, 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.
Real/virtual display area	Displays whether the current mode is the real mode or the virtual mode.
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]

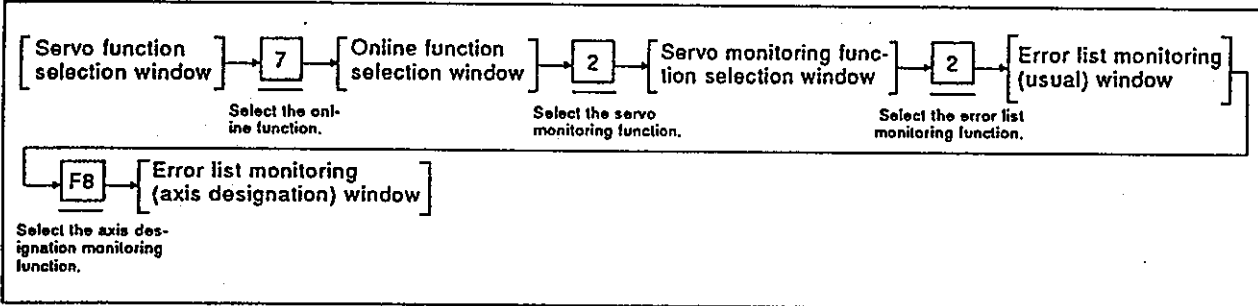
Switching to the axis designation monitoring function	1) When executing monitoring by designating an axis, press the [F8] key. The error list monitoring window (axis designation) is displayed.
Monitoring stop/restart	1) When stopping or restarting monitoring, press the [F3] key.
Closing the window	1) 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

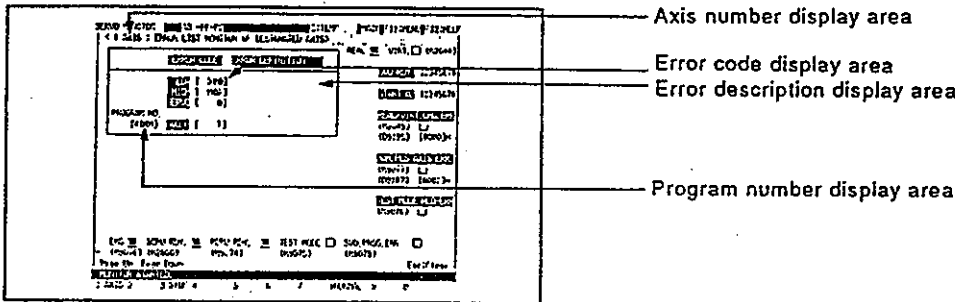
14.2.2 Error list monitoring (axis designation)

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

- 1) 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 a rotating direction check (servo start-up) is being executed TEST
 - When positioning control is not being executed Blank
- 2) Section 14.2.1 gives details about screen display items not explained here.

14. MONITORING THE POSITIONING STATE

Motion Controller

[Key operations explanation]

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) Next axis number/previous 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 monitoring 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 command values/accumulated pulses/number of motor revolutions/motor currents 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

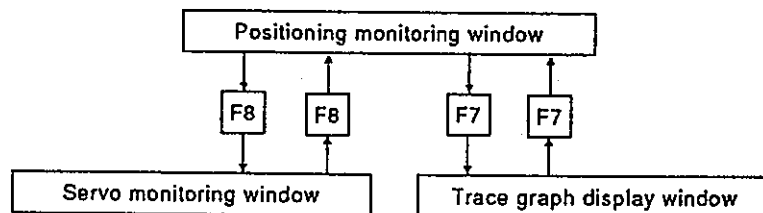
The servo monitoring window is displayed by pressing the [F8] key in the positioning monitoring window. And then, monitoring of the servo data set at the axis monitored in the positioning monitoring window is started.

(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.

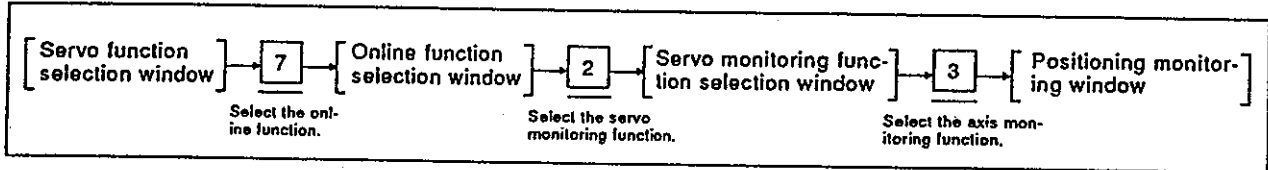


14. MONITORING THE POSITIONING STATE

14.3.1 Positioning monitoring

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

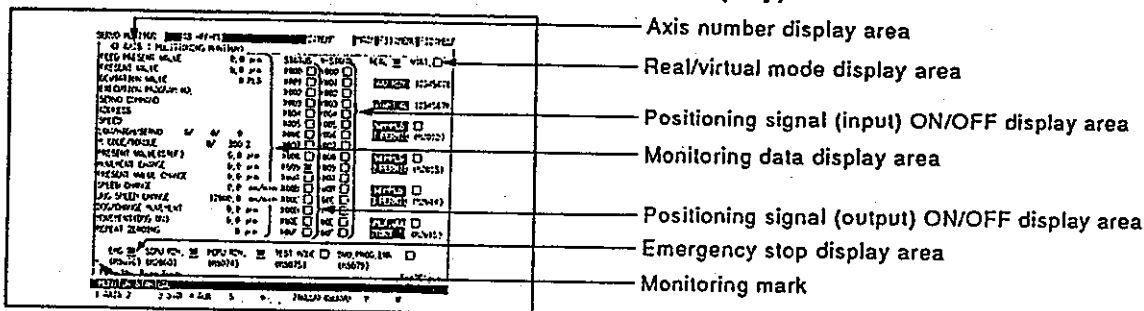
[Procedure for displaying the positioning monitoring window]



(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)



[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

- 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.
Real/virtual display area	When the current mode is the real mode, this is displayed.
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.)

[Key operations explanation]

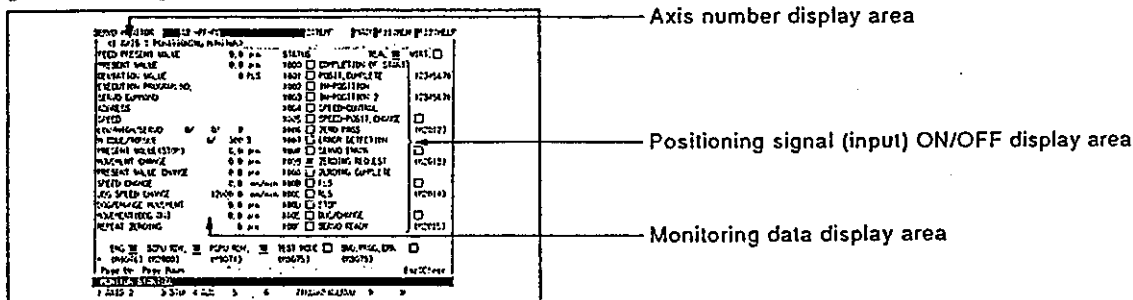
- Axis number change**
- 1) When changing the axis number that executes positioning monitoring by designating the axis number, press the [F1] key. The axis designation window is displayed. (When the axis designation window is displayed, the axis number next to the axis that is currently executing positioning 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) Next axis number/previous 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.
- Switching to the servo monitoring function**
- 1) When executing servo monitoring or torque trace, press the [F8] key. The servo monitoring window is displayed.
- 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)



[Display/setting contents explanation]

- | | |
|---|--|
| 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 | <ol style="list-style-type: none"> 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 6) Velocity-position 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 Goes ON when an error is detected on the servo amplifier side 10) Zero return Goes ON when it is necessary to confirm a zero point address 11) Zero return completed Goes ON when zero return is completed normally 12) External signal FLS Turned ON by the upper-limit limit switch OFF input 13) External signal RLS Turned ON by the lower-limit limit switch OFF input 14) External signal Stop Turned ON by the ON stop signal 15) External signal DOG/CHANGE Turned ON by the velocity/positioning control switch ON input 16) Servo READY ON/OFF Goes ON when the servo amplifier of the designated axis is in the READY state |

REMARK

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

[Key operations explanation]

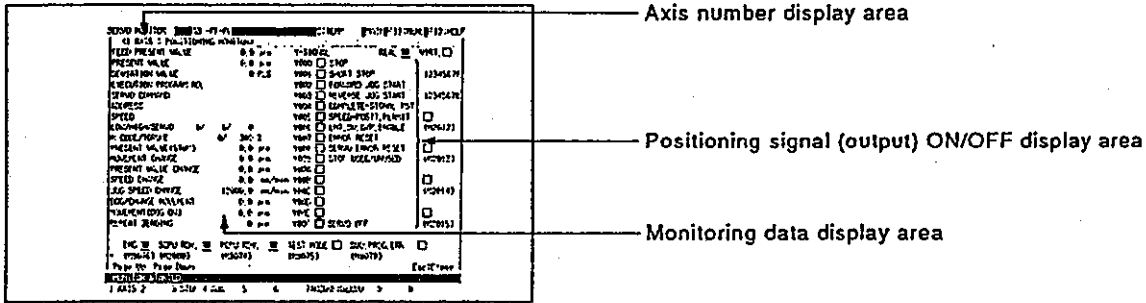
- | | |
|--|--|
| Axis number designation | <ol style="list-style-type: none"> 1) When changing the axis number that executes positioning monitoring by designating the axis number, press the [F1] key.
The axis designation window is displayed. (When the axis designation window is displayed, the axis number 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) Next axis number/previous 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 of a status/command signal name display | <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> 1) When executing a data trace and displaying the trace results, press the [F7] key.
The trace graph display window is displayed. |
| Switching to the servo monitoring function | <ol style="list-style-type: none"> 1) When executing servo monitoring or torque trace, press the [F8] key.
The servo monitoring window is displayed. |
| Monitoring stop/restart | <ol style="list-style-type: none"> 1) When stopping or restarting monitoring, press the [F3] key. |
| Closing the window | <ol style="list-style-type: none"> 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)



[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) 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) Next axis number/previous 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.

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.

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.

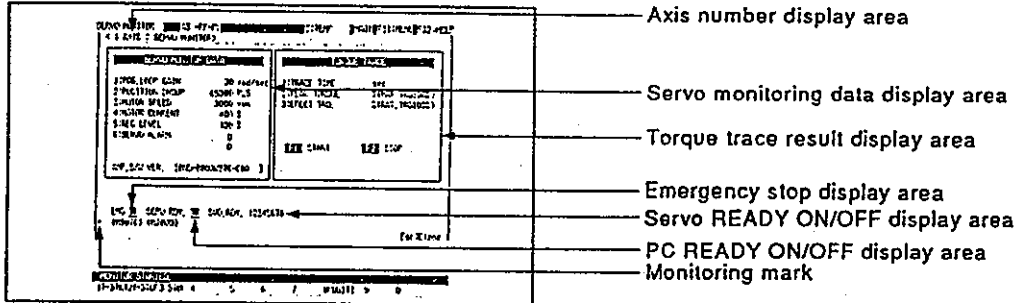
14. MONITORING THE POSITIONING STATE

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.

[Servo monitoring window]



[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
 - 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
- 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.)

14. MONITORING THE POSITIONING STATE

Motion Controller

[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.

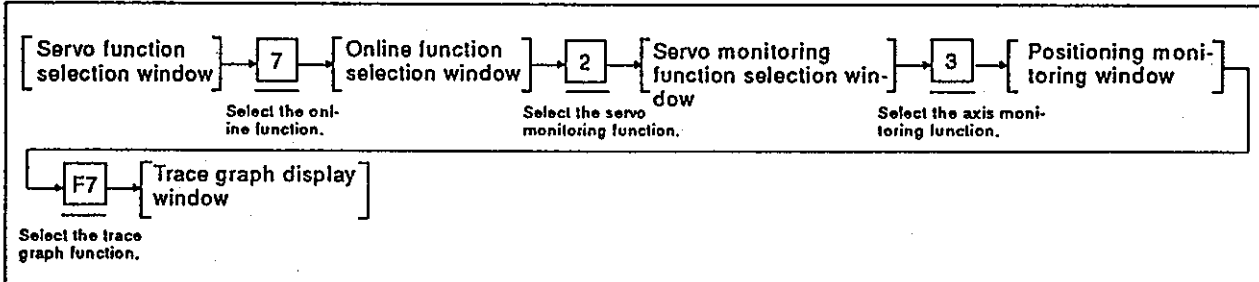
POINTS

- (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.

14.3.3 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.

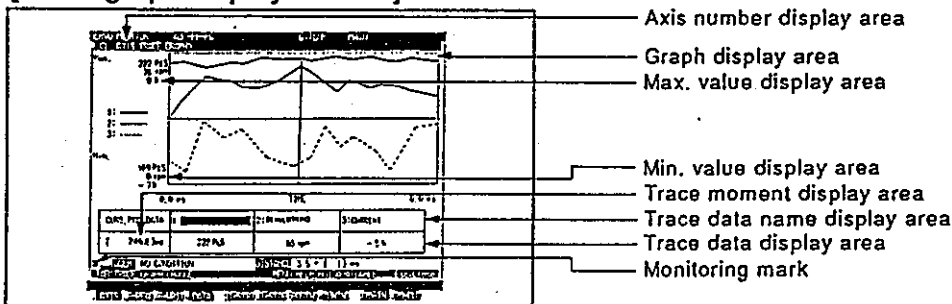
[Procedure for displaying the trace graph display window]



(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

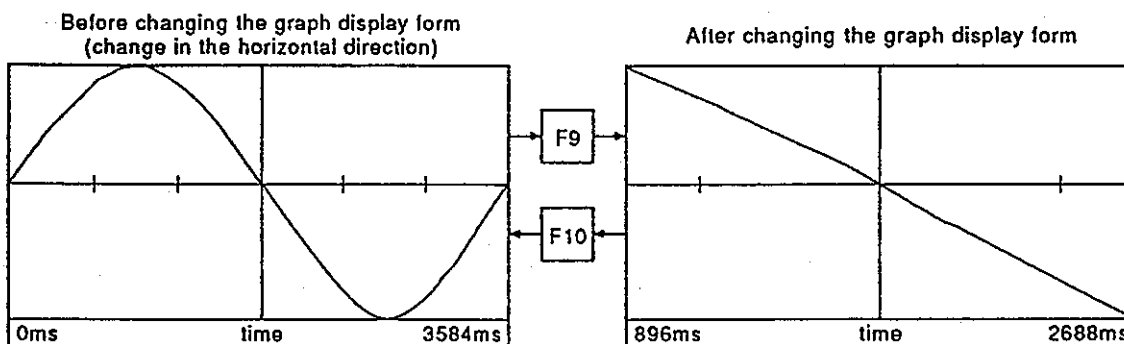
Max. value display area	The max. values of data 1, data 2, and data 3 during tracing is displayed.
Min. value display area	The min. values of data 1, data 2 and data 3 during tracing is displayed.
Trace data name display area	The data name (data 1 to 3) selected as tracing data in the trace data setting 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	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.) 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	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.
Trace start	1) When starting the data trace, press the [F5] key. The trace is started on the basis of data set in the trace data setting window.
Trace stop	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.
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.

14. MONITORING THE POSITIONING STATE

- Reading from a file**
- 3) When not executing file writing, press the [Enter] key after highlighting "NO" by pressing the [→] keys.
 - 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 after 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.)
- Change of the graph display from (wide/narrow in the forlizontal 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.)



14. MONITORING THE POSITIONING STATE

Motion Controller

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 after pressing the [Shift] key.
Whenever the [F9] key is pressed after 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
 - Velocity loop gain
 - Velocity integration compensation
 - Feed forward coefficientThe tuning window is displayed.
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.

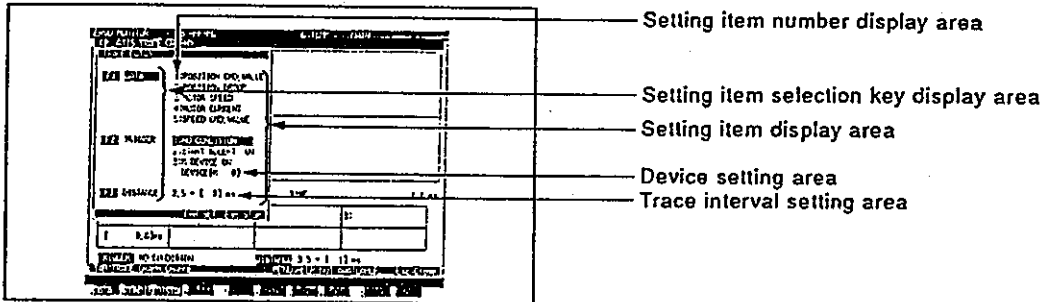
POINTS

- (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 [F2] key.

(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 | <ol style="list-style-type: none"> 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. |
| Setting of the trigger condition | <ol style="list-style-type: none"> 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

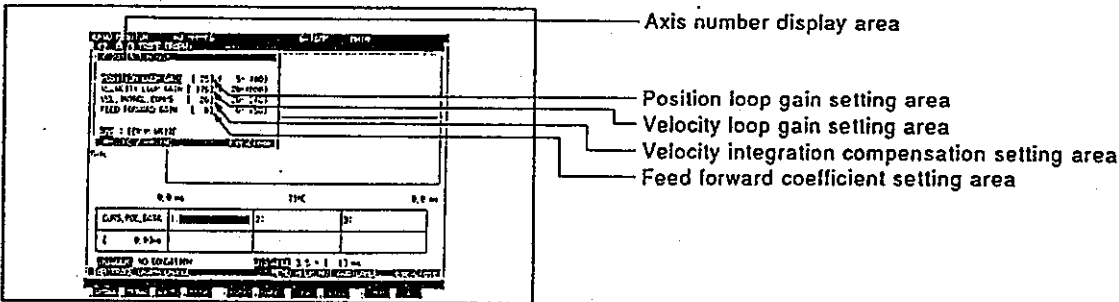
(3) Tuning

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 and an MR-SB/SD and the position loop gain after the change are displayed.
- Velocity loop gain setting area** The velocity loop gain set at an ADU and 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 and 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 and an MR-SB/SD and the feed forward coefficient after the change are displayed.

POINTS

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

Servo parameters	ADU	MR to SB/SD
Position loop gain	5 to 100	5 to 100
Velocity loop gain	20 to 4000	20 to 2000
Velocity integration compensation	20 to 240	1 to 1000
Feed forward coefficient	0 to 150	0 to 100

- (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%.

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 ADU and an 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 an A373CPU 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 A373CPU EEROM is faulty.
When the "CANNOT WRITE. PC READY 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 A373CPU EEROM after changing the set value in the tuning window, the new data is cleared:

- The power supply of A373 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 A373CPU 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 an A373CPU EEROM, execute writing after confirming that the PC READY signal (M2000) is OFF.

14. MONITORING THE POSITIONING STATE

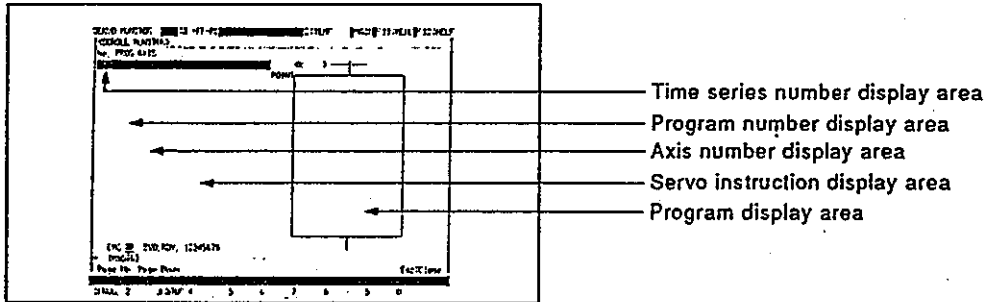
14.4 Scroll Monitoring

The servo program being executed and the previous 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)
The V0 to V4095 display shows a servo program for the virtual mode.
- 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 is executed in the servo test mode, "TEST" is displayed.
- 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. MONITORING MECHANICAL SYSTEM PROGRAMS *Motion Controller*

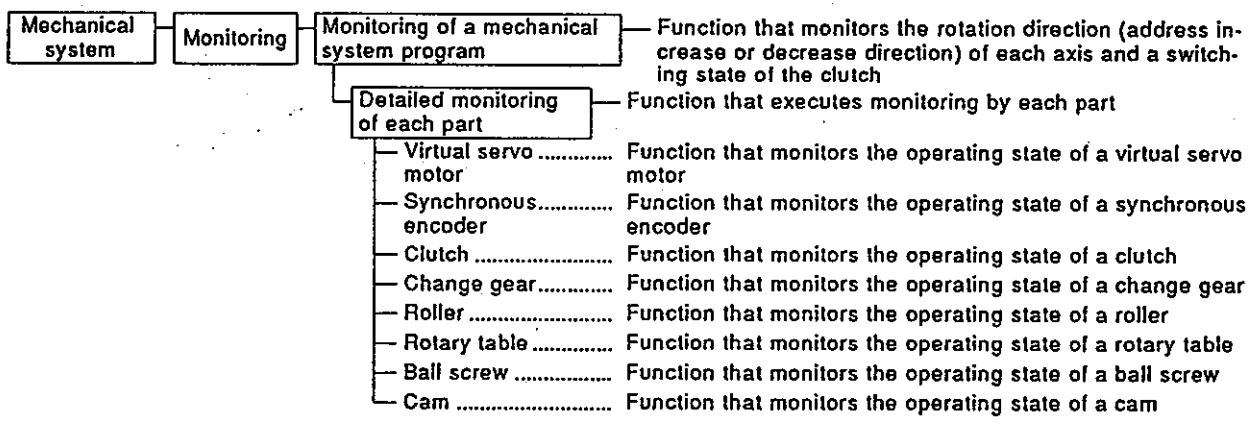
15. MONITORING MECHANICAL SYSTEM PROGRAMS

The monitoring mode of the mechanical system mode is used to display the mechanical part connection figure of mechanical system programs written to an A373CPU, as well as to monitor the rotation direction of virtual main shafts, auxiliary axes, connected axes, and the operating status of all parts.

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 GSV21PE, and execute it.

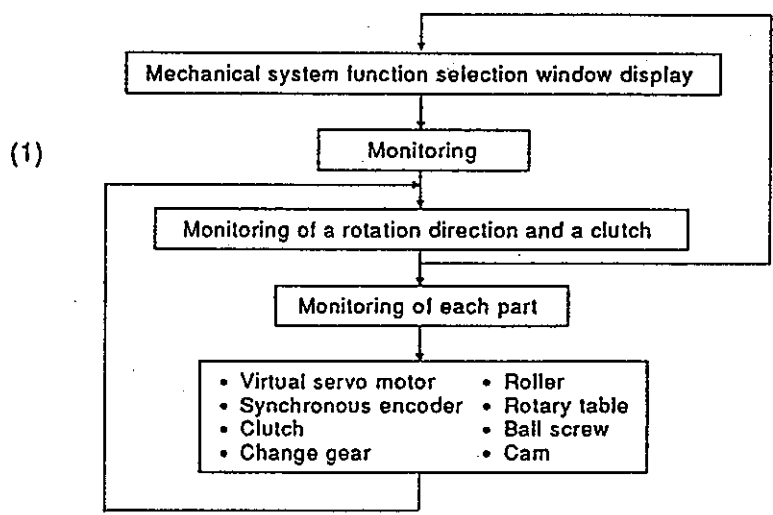
15.1 General Description of Functions

The monitoring mode of the mechanical system mode contains the following functions:



15.2 Overall Procedure

This section shows the overall procedure in the monitoring mode.



POINT

Switch the A373CPU to the virtual mode before executing monitoring. If the real mode is set, an error message is displayed, and monitoring is not executed.

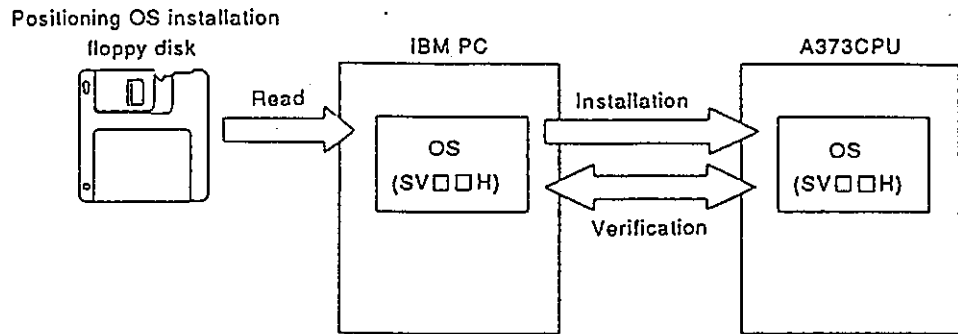
16. INSTALLING AND VERIFYING A POSITIONING OS *Motion Controller*

16. INSTALLING AND VERIFYING A POSITIONING OS

An A373CPU can write an internal positioning OS (operating system) by using the IBM PC.

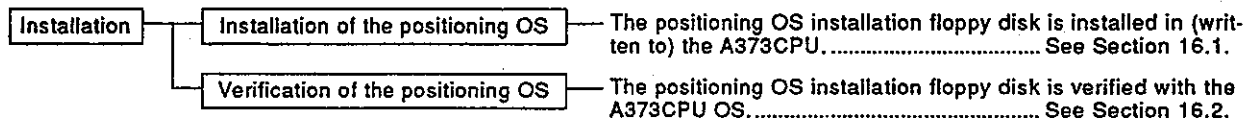
The positioning OS is stored to a floppy disk (SW0SRX-SV [][] H) for installation. Installation and verification can be executed by the IBM PC started up by the GSV21PE.

- Installation is writing the positioning OS from an IBM PC to an A373CPU. The A373CPU executes positioning control by using the installed positioning OS.
- Verification is executed between the positioning OSs installed in the A373CPU and IBM PC.



(1) General description of functions

The installation mode of the GSV21PE contains the following functions:



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

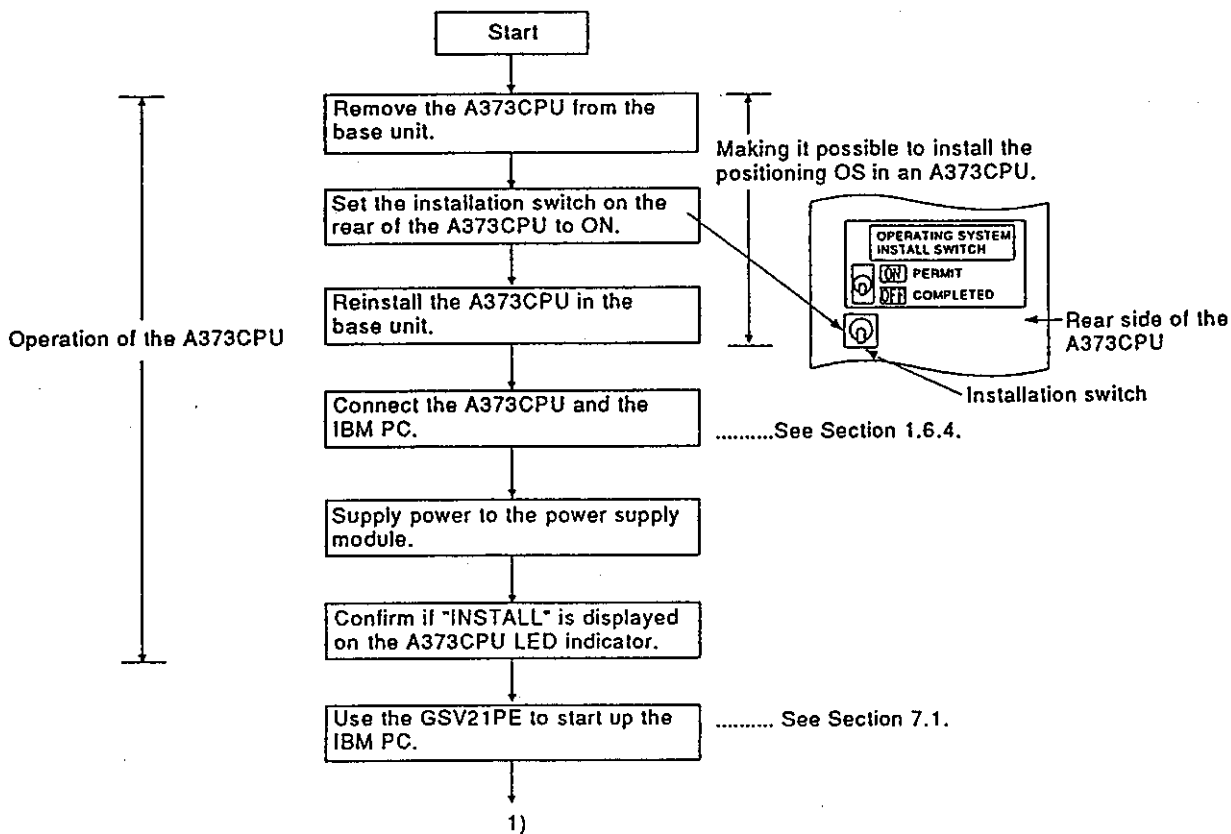
16.1 Installing a Positioning OS

(1) Installation is executed in the following cases:

- When changing the positioning OS installed in an A373CPU 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 A373CPU.

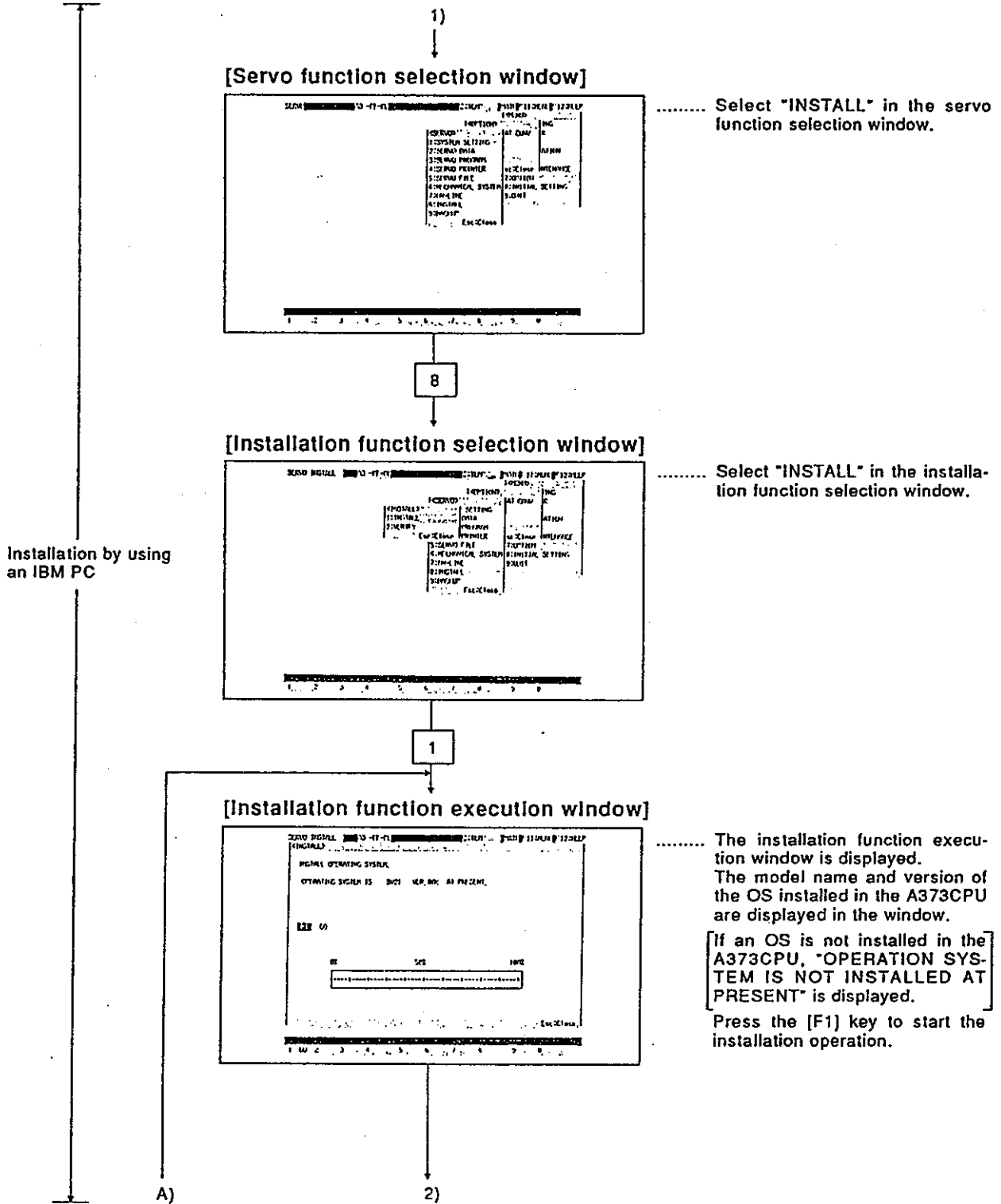


POINTS

- (1) The positioning OS is installed when the A373CPU is shipped. Execute the installation after confirming the model name and version of the positioning OS installed in the A373CPU.
- (2) Even when installation is executed, positioning data and a servo programs written to an A373CPU are not rewritten.

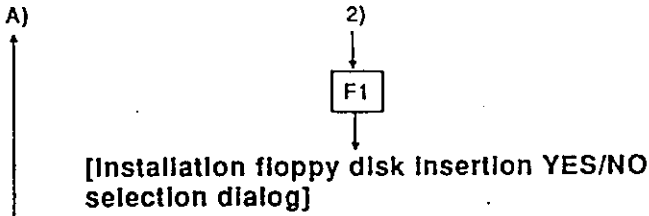
16. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller



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

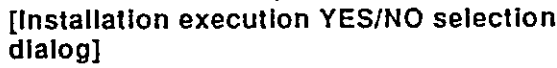
Installation by using an IBM PC



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

The installation floppy disk must be inserted in the drive beforehand.

Error (the installation floppy disk cannot be confirmed.) [Enter]



After confirmation of the installation floppy disk has been completed, the installation execution YES/NO selection dialog appears.

The model name and version of the confirmed installation floppy disk are displayed in the installation function execution window.

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

Select "YES". → [Enter]



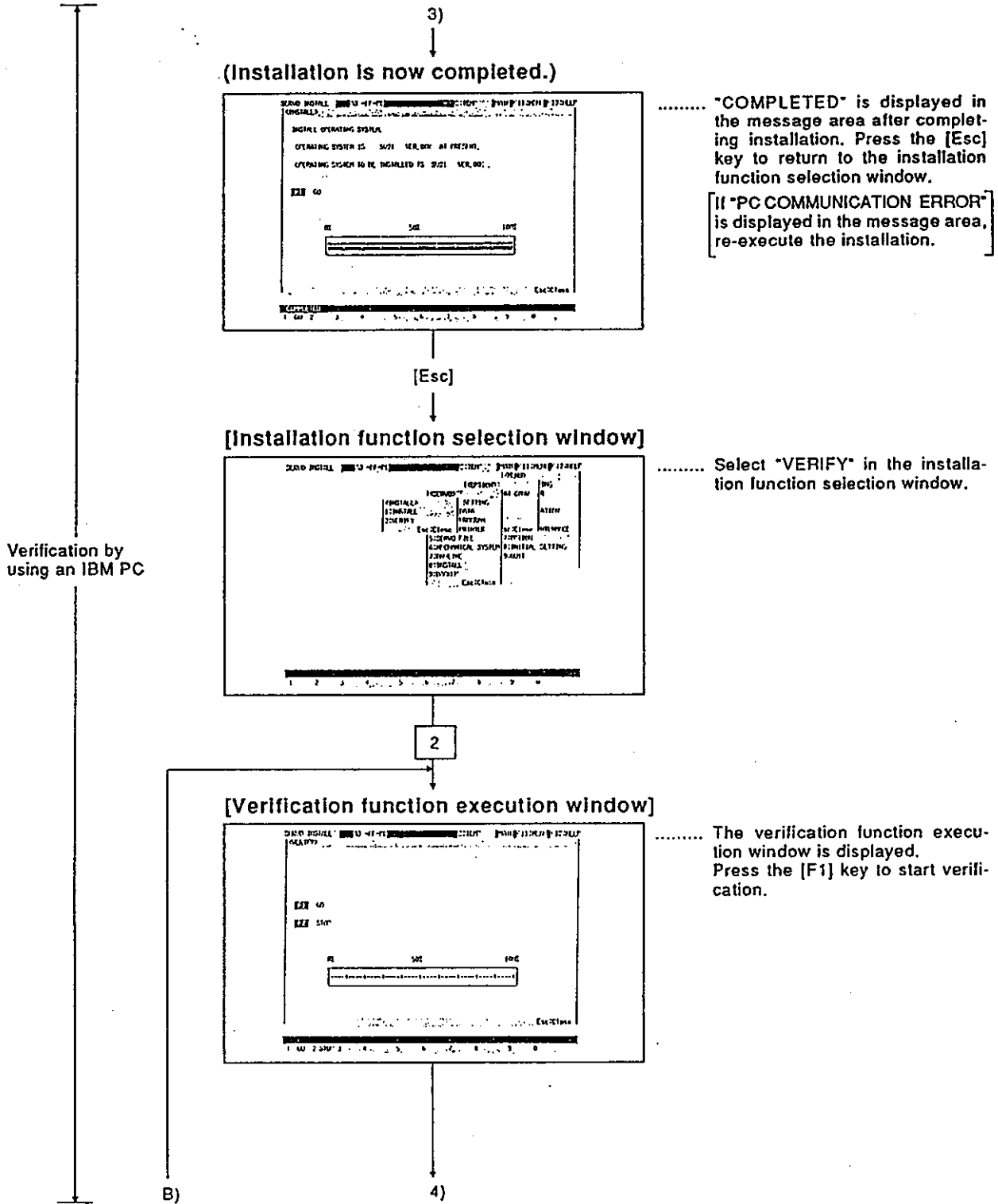
The installation state is displayed during installation. (Installation time: about 15 minutes)

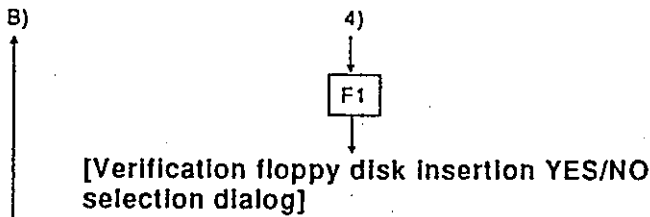
Do not remove any cables during installation.

3)

16. INSTALLING AND VERIFYING A POSITIONING OS

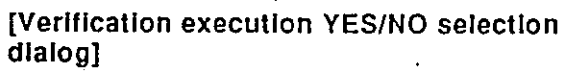
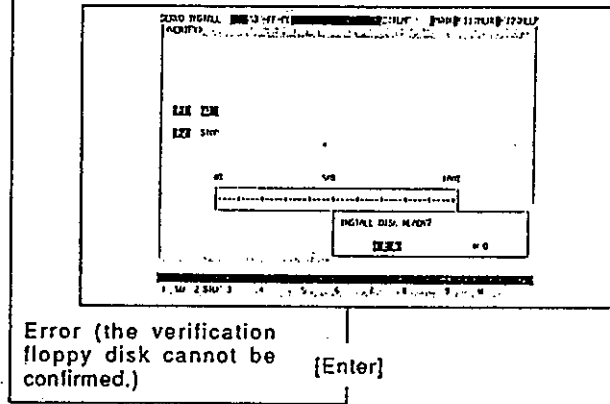
Motion Controller





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

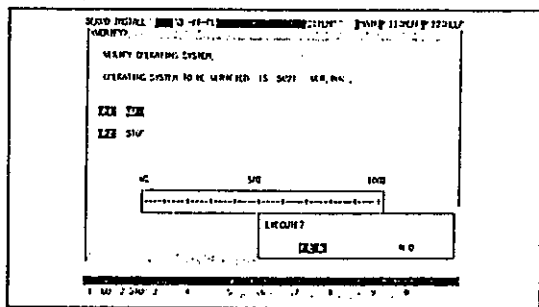
[The verification floppy disk must be inserted in the drive beforehand.]



..... 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.

Verification by using an IBM PC

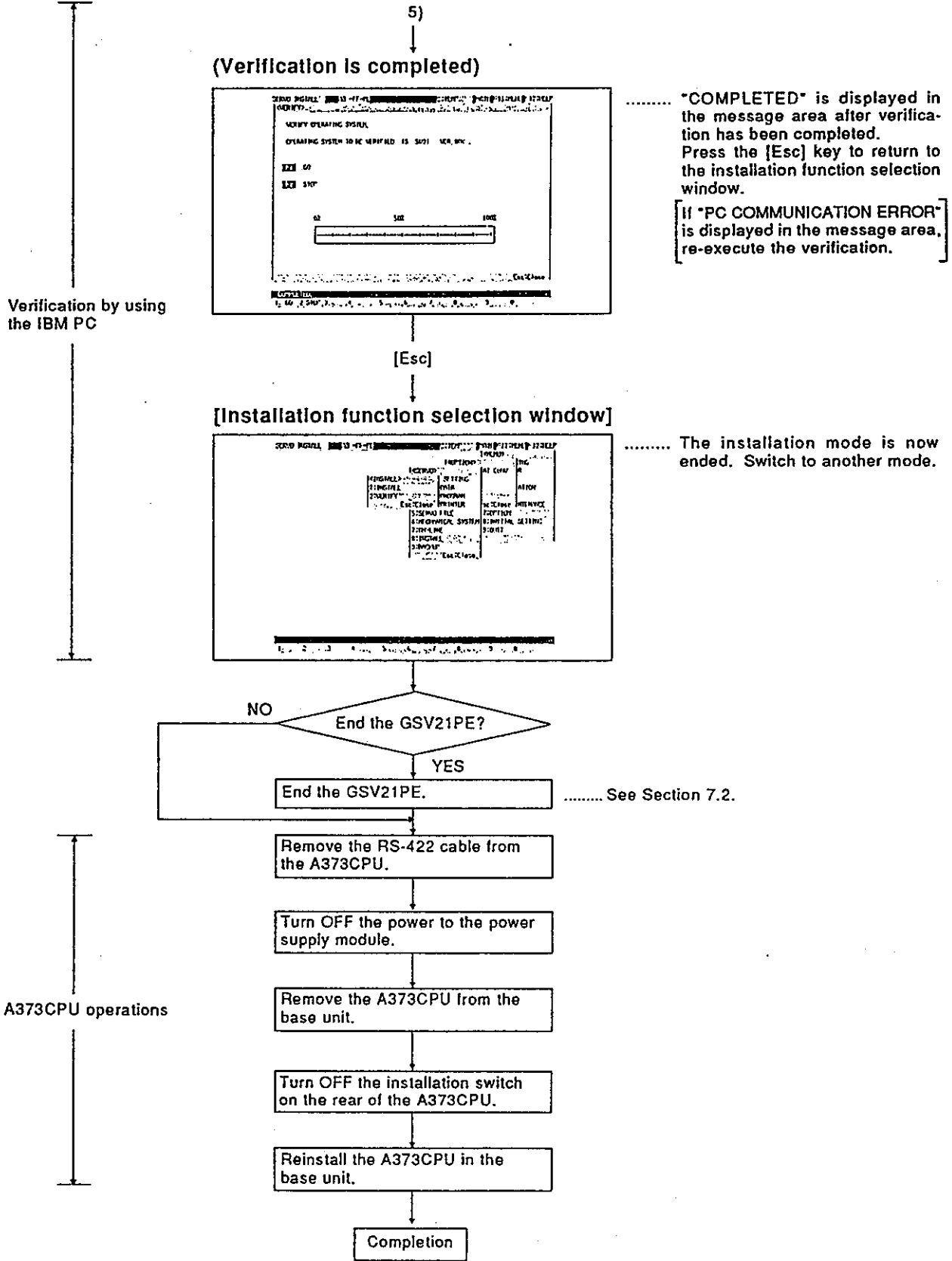


..... The verification state is displayed during verification. (Verification time: about 15 minutes)

[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.]



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



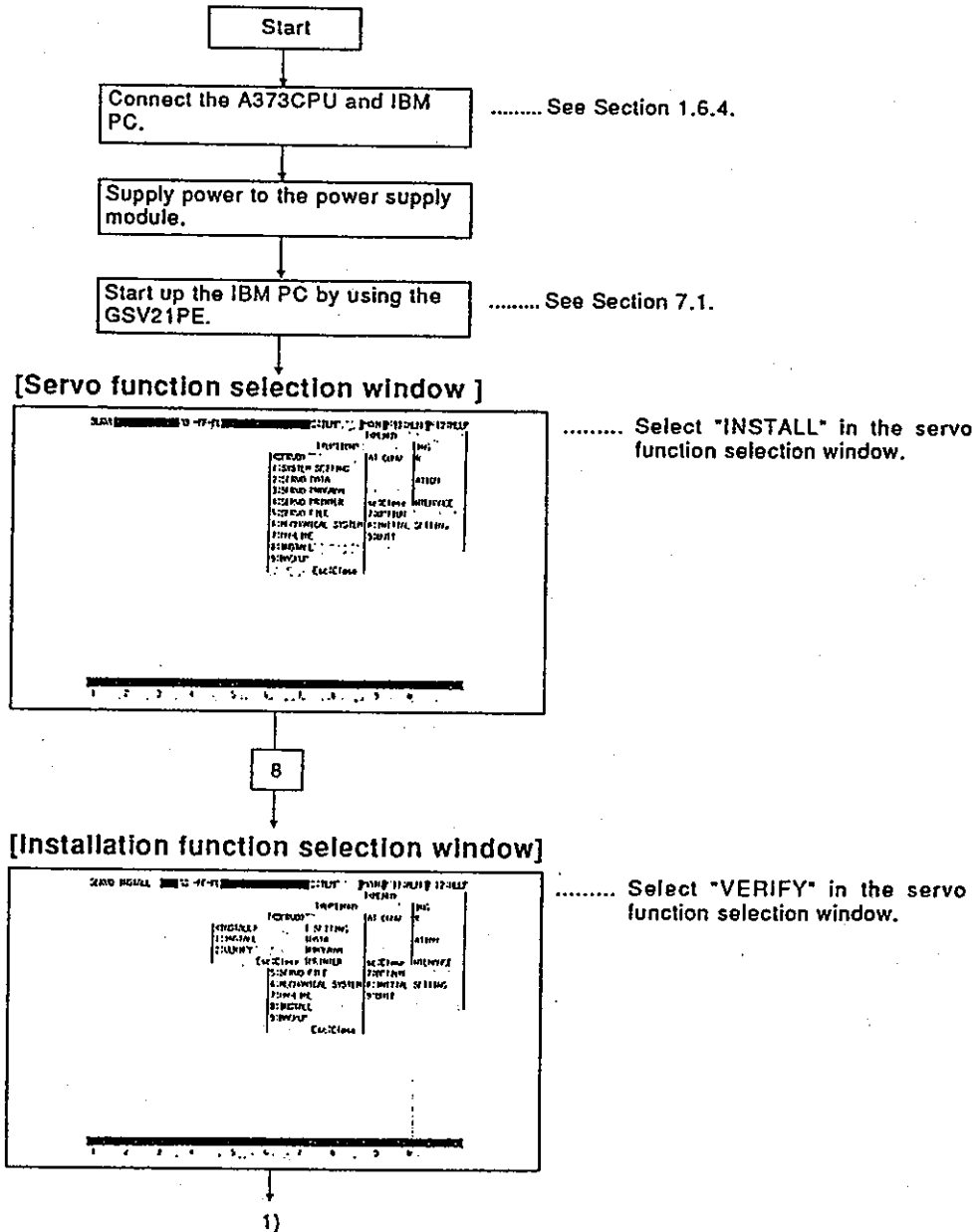
16. INSTALLING AND VERIFYING A POSITIONING OS *Motion Controller*

16.2 Positioning OS Verification

This section shows the procedure for verification when a positioning OS installed in an A373CPU.

(1) Procedure for verification

The following shows the procedure for verification when positioning OSs are installed in the A373CPU and IBM PC.

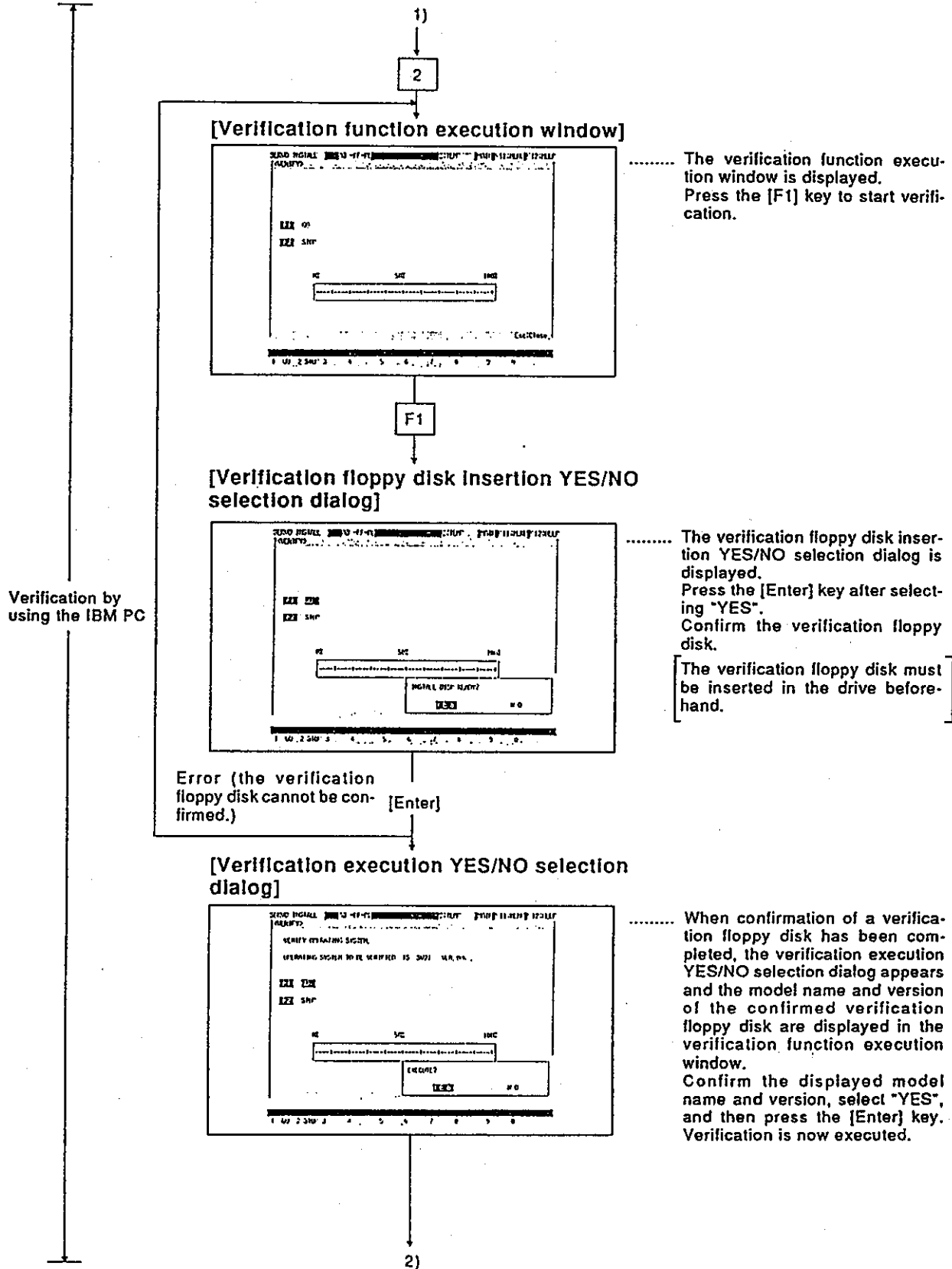


POINTS

- (1) Verification of positioning OS can be executed independently of the ON/OFF state of the installation switch of the A373CPU.
- (2) If "DATA MISMATCH" is displayed in the message area, verification cannot be executed.

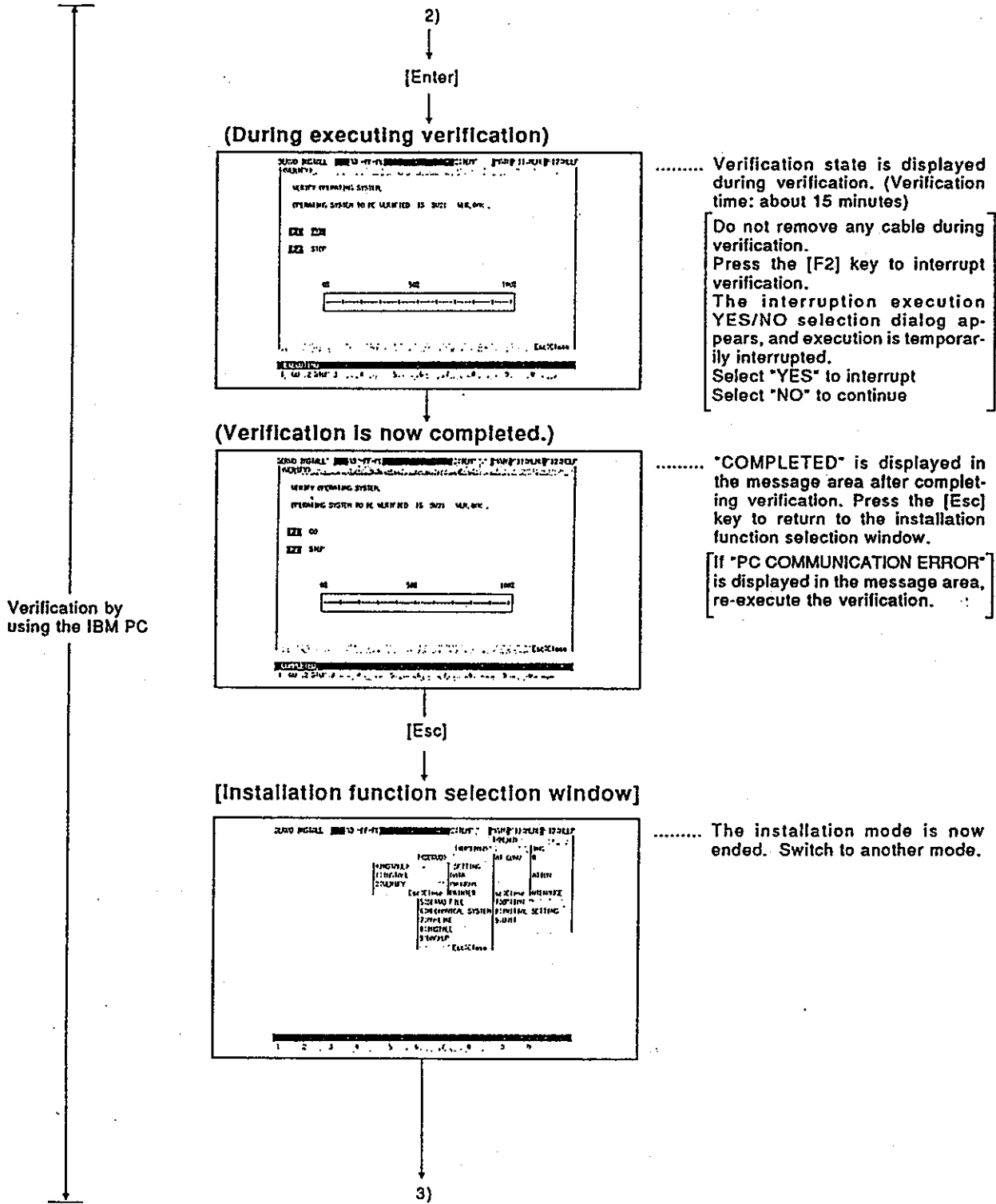
16. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller

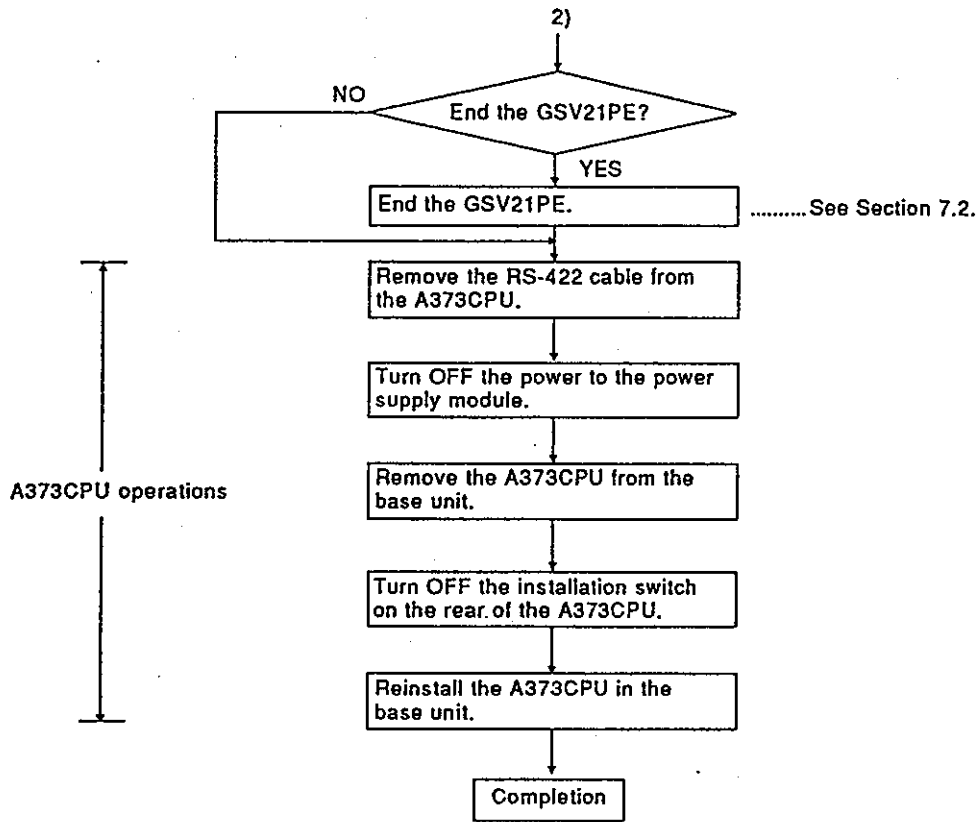


16. INSTALLING AND VERIFYING A POSITIONING OS

Motion Controller



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



17. BUCKUP FUNCTION

17. BACKUP FUNCTION

The backup function is used to store data in an A373CPU to a backup file and to load backup file data to an A373CPU by when the A373CPU is connected to an IBM PC.

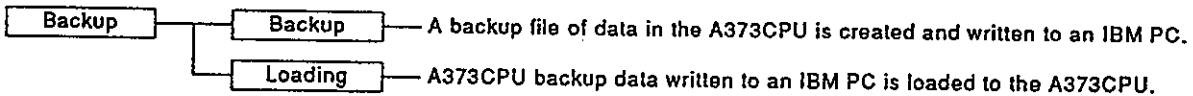
The following 7 kinds of data can be stored to a backup file:

- System set data
- Positioning data
- Servo program data
- Mechanical system program data
- Information about each device of an A373CPU
- Necessary data for zero return in the A373CPU
- Monitoring information for the virtual mode in the A373CPU

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 GSV21PE, and execute it.

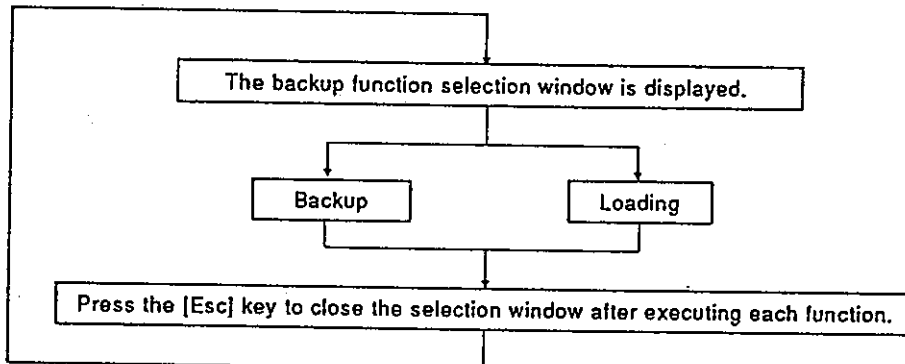
17.1 General Description of Functions

The backup functions of the GSV21PE consist of the following functions:



17.2 Overall Procedure

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



POINTS

- (1) When replacing an A373CPU with another A373CPU, the backup function can return the A373CPU to the previous state (state before replacement) by loading backup data from the replaced A373CPU to the new A373CPU.
- (2) The backup data file of the A373CPU is stored as the SVBACK21.BIN file in the \GPP\USR\system name\sub-system name.

18. 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
- Mechanical system edit data
- Mechanical system parameters
- Cam 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 GSV21PE, and execute it.

18.1 General Description of Functions

The servo file mode of the GSV21PE contains the following functions:

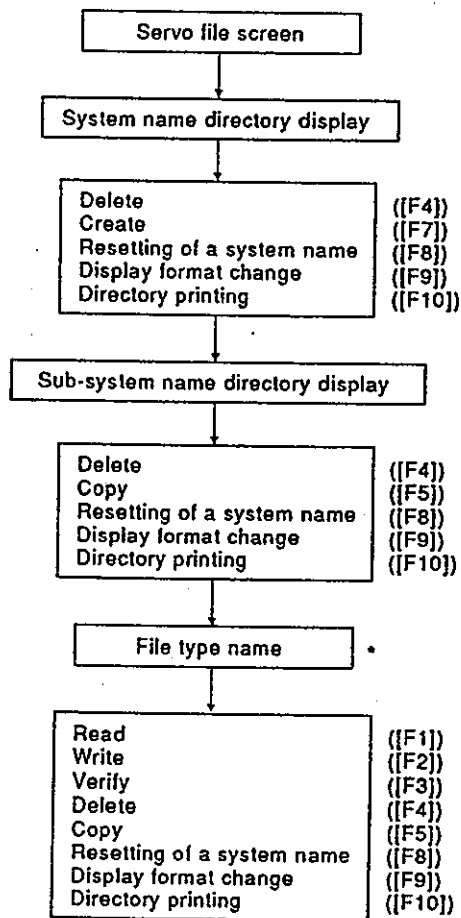
Servo file	System name directory	Sub-system name directory	File name
			Read Function that reads a servo file stored in a hard disk/floppy disk
			Write Function that writes the contents of the internal memory to a floppy disk/hard disk by using a designated file name
			Verify Function that verifies 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 designated drive
		Directory	Function that displays the directory of a file name in a list
		Display format change...	Function that sets the display of a comment and a comment (GPP) and selects display order
		Directory printing	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 printing		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.

18.2 Overall Procedure

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



* Select a file type, and execute each operation.

POINT

The following 5 kinds of file types can be designated:

- Servo data
- Servo program
- Mechanical system edit data
- Mechanical system parameter
- Cam data

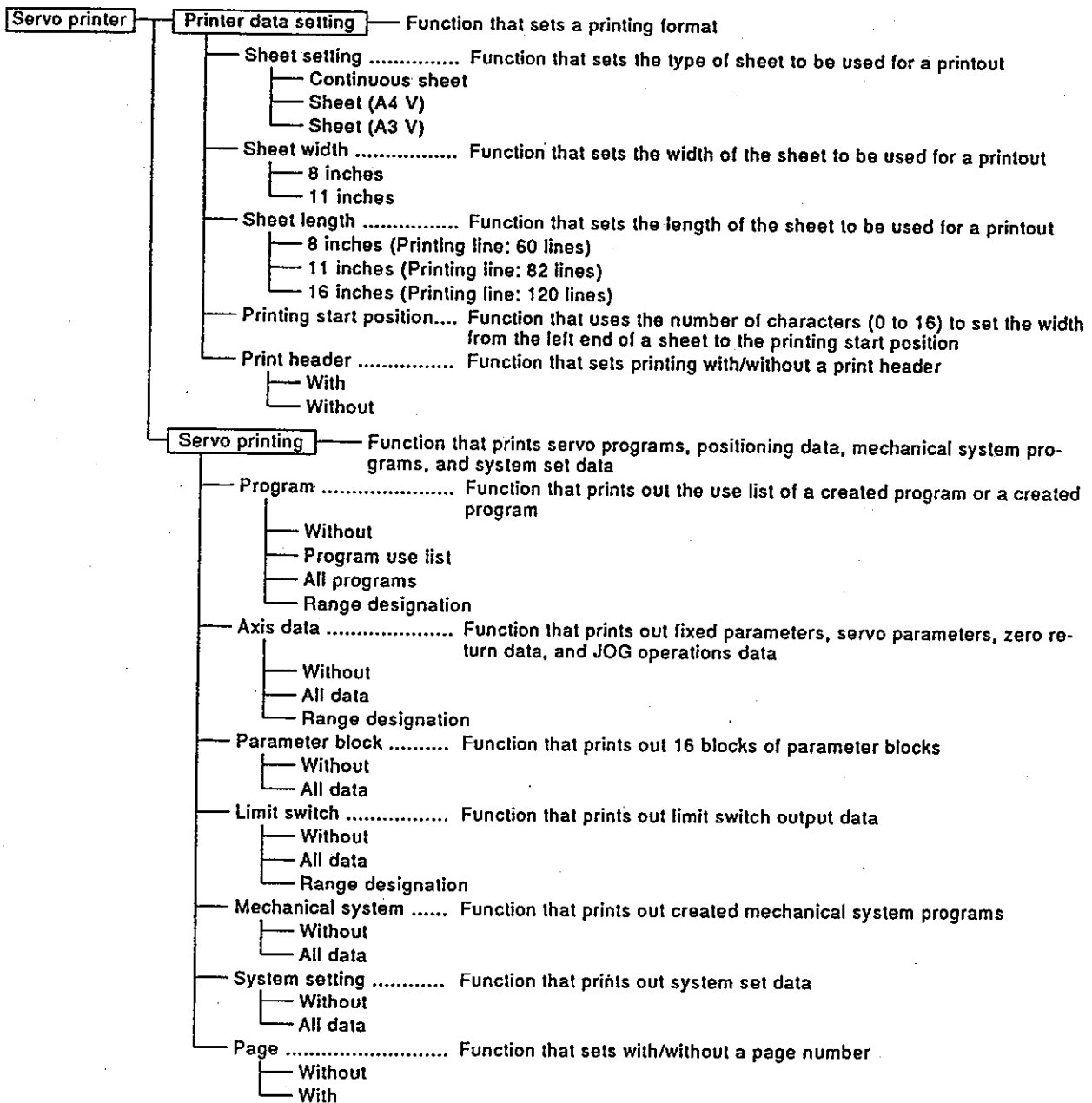
19. PRINTOUT

The servo printer mode is used to print out servo programs, positioning data, mechanical system programs, and system set data set by the GSV21PE.

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 GSV21PE, and execute it.

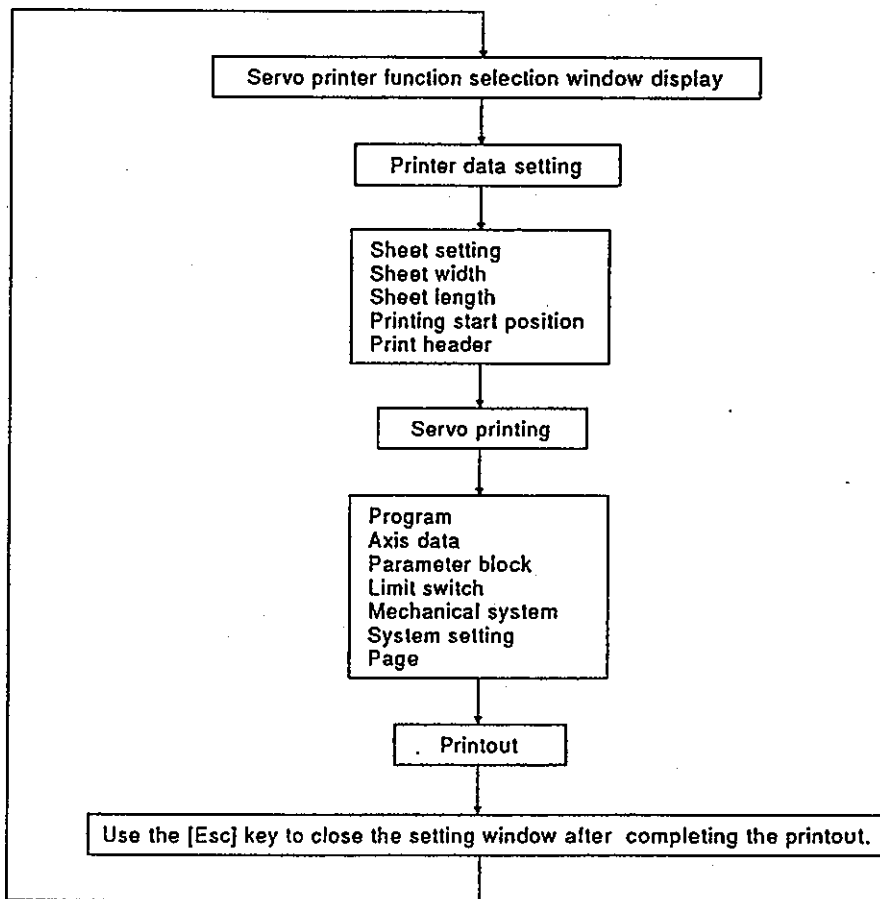
19.1 General Description of Functions

The servo printer mode of the GSV21PE contains the following functions:



19.2 Overall Procedure

This section shows the overall printout procedure.



19.3 Printer Models

Any printer that utilizes ESC/P code can be used by the GSV21PE. Set the printer by a DOS command.

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 multi-axis 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) Multi-axis 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 an A373CPU and the extension base loading unit side are the same as the errors that occur in the A3NCPU. The Troubleshooting section of the A3NCPU User's Manual gives details about handling these errors.

POINT

When the troubleshooting corrective action requires the A373CPU, the positioning 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	Modes	Error Codes	Error Causes	Corrective Action(s)	Reference Pages
Low errors	Real mode	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.	20.3.2
	Virtual mode	Drive module: 1 to 999 Output module: 4000 to 6990			20.3.3
High errors	Real mode	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.	20.3.4
	Virtual mode	Drive module: 1000 to 1999 Output module: 10000 to 11990			20.3.5
Servo errors	Real mode	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.	20.3.6
	Virtual mode				

(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.

i) In the real mode

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	

ii) In the virtual mode

Errors		Error Code Storage Registers								Error Detection Signals	Error Reset Flags
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8		
Virtual servo motor	Minor error codes	D702	D708	D714	D720	D726	D732	D738	D744	X1n7	Y1n7
	Major error codes	D703	D709	D715	D721	D727	D733	D739	D745		
Synchronous encoder	Servo error codes	D750	D754	D758	—	—	—	—	—	X0E0 to X0E2	Y0E0 to Y0E2
	Minor error codes	D751	D755	D759							
Output module	Major error codes	D806	D826	D846	D866	D886	D906	D926	D946	X0n7	Y0n7
	Minor error codes	D807	D827	D847	D867	D887	D907	D927	D947		
	Major error codes	D808	D828	D848	D868	D888	D908	D928	D948		

(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 GSV21PE).

(d) The error detection flag and the error code are stored until the error reset signal or the servo error reset signal goes ON.

POINTS
(1) When a servo error occurs, the same servo error code is sometimes stored again even when the servo error reset 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

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>X10²inch/min</td> </tr> <tr> <td>degree</td> <td>1 to 600000000</td> <td>X10²degree/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 ² inch/min	degree	1 to 600000000	X10 ² 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>	(1) Set the command velocity in the range from 1 to the velocity limit value.
Unit	Address setting range																		
mm	1 to 600000000	X10 ² mm/min																	
inch	1 to 600000000	X10 ² inch/min																	
degree	1 to 600000000	X10 ² 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.															

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;"> <tr> <td>Unit</td> <td>Address setting range</td> </tr> <tr> <td>degree</td> <td>0 to 35999999 X10⁻⁵degree</td> </tr> </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 -214 7483648(H80000000) when doing increment positioning control.)	(2) Set the travel distance in the range from 0 to ±2147483647.							
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;"> <tr> <td>Unit</td> <td>Address setting range</td> </tr> <tr> <td>degree</td> <td>0 to 35999999 X10⁻⁵degree</td> </tr> </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 -214 7483648(H80000000) when doing increment positioning control.	(2) Set the travel distance in the range from 0 to ±2147483647.							
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;"> <tr> <td>Unit</td> <td>Address setting range</td> </tr> <tr> <td>degree</td> <td>0 to 35999999 X10⁻⁵degree</td> </tr> </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 -214 7483648(H80000000) when doing increment positioning control.	(2) Set the travel distance in the range from 0 to ±214783647							

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>X10⁴μm</td> </tr> <tr> <td>inch</td> <td>X10⁵inch</td> </tr> <tr> <td>degree</td> <td>X10³degree</td> </tr> <tr> <td>PULSE</td> <td>PLS</td> </tr> </tbody> </table>	Unit	Address setting range	mm	X10 ⁴ μm	inch	X10 ⁵ inch	degree	X10 ³ 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 ⁴ μm													
inch	X10 ⁵ inch													
degree	X10 ³ 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	(1) The servo program designated by the START command does not exist. (2) There is a "START" command in the designated servo program.	The axis does not start.	(1) Change the servo program number designated by the START command by using peripheral devices. (2) Create a servo program designated by the START command. (3) Delete the servo program containing the START command.										

20. TROUBLESHOOTING

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20.3.2 Low errors (In the real mode)

Low errors are those that occur in the sequence program or servo program. The error codes for the errors are from 1 to 999.

Low 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.

(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
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 A373CPU to RUN. Set the PC ready flag (M2000).
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"> Provide an interlock in the program not to start the corresponding axis (use the start receive reset as the interlock condition).
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. <p>[The designated start point address, assist point address and/or end point address has an error.</p>		<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. <p>[The designated start point address, assist point address and/or end point address has an error.</p>		
109	○					○				<ul style="list-style-type: none"> An address making no arc was designated during circular interpolation with the center. <p>[The designated start point address, assist point address and/or end point address has an error.</p>		
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.
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							○	Count zero return ZCT not set.	Zero return was not completed correctly.	Execute zero return to pass through Z-phase.
121							○	Zero return absolute value storage E ² PROM error		The A373CPU memory hardware life has expired. Replace it.

(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				
200	○	○	○	○	○	○	○	○	○	<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									○	<ul style="list-style-type: none"> The PC ready flag (M2000) was reset during zero return. 		<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									○	<ul style="list-style-type: none"> The stop command (Yn0) was turned ON during zero return 		<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.
203									○	<ul style="list-style-type: none"> The immediate stop command (Yn1) was turned ON during zero return. 	The axis is stopped immediately.	
204	○	○	○	○	○	○	○	○	○	<ul style="list-style-type: none"> The PC ready flag (M2000) was set while decelerating by the PC ready flag (M2000) being reset. 	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.)
206									○	<ul style="list-style-type: none"> An emergency stop was attempted by pressing the [BREAK] or [STOP] key. 	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. <p>(If the near-zero point dog signal is turned ON in the case of count zero return, retry the zero return.)</p>
207	○				○	○				<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. 	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.

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			
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. 		<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. 		<ol style="list-style-type: none"> Set a velocity at which overrun does not occur. Set a travel distance at which overrun does not occur.
213								○	<ul style="list-style-type: none"> Output velocity exceeded 1 MPPS during manual pulse generator operations. 	The output velocity is restricted to 1 MPPS.	<ul style="list-style-type: none"> Set the output velocity of the manual pulse generator operation at 1 MPPS or less. [Method of calculating the output velocity] Output velocity = (the input number of pulses / msec) x (magnification setting of manual pulse generator per pulse)
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. An address to control positioning in the opposite direction was set. One servo program was executed again. 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the velocity change point within the range of the preceding velocity change point and the end point. Modify the sequence program.
									<ul style="list-style-type: none"> The velocity change point address is greater than the end point address. An address to control positioning in the opposite direction was set. 	The axis does not start.	<ul style="list-style-type: none"> Set the velocity change point within the range of the preceding velocity change point and the end point.

- (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
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. 	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 circularly interpolated. 		The velocity of an axis being circularly interpolated 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 1 to the velocity limit value after the velocity change. 	0 : Velocity change processing is ignored. Not 0 : Control is done at the velocity limit value.	Set the velocity within the range from 1 to the velocity limit value after the velocity change.

20.3.3 Low errors (in the virtual mode)

Low errors are those that occurred in the sequence programs or servo programs.

The error codes for drive module errors are 1 to 199, and the error codes for output module errors are 4000 to 6990.

(1) Drive module errors

Table 20.6 Drive module errors list (1 to 999)

Error Codes	Control Mode of Virtual Servo Axis.							Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen.			
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 A373CPU to RUN. Set the PC READY flag (M2000).
101	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Start receive flag (M2001 to M2008) of the corresponding axis was set. 		<ul style="list-style-type: none"> Provide an interlock in the program not to start the corresponding axis (use the start receive reset as an interlock condition).
103	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Stop command of the corresponding axis was turned ON. 		<ul style="list-style-type: none"> Turn OFF the stop command before starting positioning.
104	○	○	○	○	○	○	○	<ul style="list-style-type: none"> Immediate stop command of the corresponding axis was turned ON. 		<ul style="list-style-type: none"> Turn OFF the immediate stop command 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 (destination) 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. 		

*: The error codes of all corresponding interpolation axes are stored in the error code storage area during interpolation.

Table 20.6 Drive module errors list (1 to 999) (continued)

Error Codes	Control Mode of Virtual Servo Axis							Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen. Synchronous Encoder Axis			
116						O		<ul style="list-style-type: none"> The JOG velocity is set at 0. 	Positioning control does not start	<ul style="list-style-type: none"> Set a correct speed (within the specified range).
								<ul style="list-style-type: none"> The set JOG velocity is outside the specified range. 	Controlled in the specified range.	
117						O		<ul style="list-style-type: none"> A set data error occurred when simultaneously starting JOG operations programs. (Forward/reverse rotation restart is designated for the same axis.) 	Positioning control starts in the forward direction.	<ul style="list-style-type: none"> Set the data correctly.
118			O					<ul style="list-style-type: none"> The velocity change point is beyond the end point address. 	Positioning control does not start.	<ul style="list-style-type: none"> Set the velocity change point within the range of the preceding velocity change point or start point and the end point.
								<ul style="list-style-type: none"> An address was set so that positioning would be performed in the opposite direction. 		
125	O							<ul style="list-style-type: none"> At simultaneous starting, positioning cannot be done because positioning is being done by other programs. 		
150								<ul style="list-style-type: none"> Operation disable instruction is started in the virtual mode. (Velocity-position change or zero return) 	Positioning control does not start.	<ul style="list-style-type: none"> Correct the error cause, reset the virtual mode, and start.
151							<ul style="list-style-type: none"> Start disable axis is started in the virtual mode. 			
152							<ul style="list-style-type: none"> Started during deceleration by all axes servo OFF. (M2042 flag: OFF) 			
153							<ul style="list-style-type: none"> Started during deceleration by an output module servo error. 			
200	O	O	O	O	O	O	O	<ul style="list-style-type: none"> The PC READY flag (M2000) was reset while starting positioning in response to a start request given by using 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.
204	O	O	O	O	O	O	O	<ul style="list-style-type: none"> The PC READY flag (M2000) was set during deceleration by the PC READY OFF (M2000). 	No processing	<ul style="list-style-type: none"> Set the PC READY flag after all axes have stopped. (The PC READY flag (M2000) set while decelerating is ignored.)
207	O			O				<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 the command position data exceeded the stroke limit are stored. In the case of linear interpolation, error codes for all interpolation axes are stored. 	The axis decelerates and stops.	<ul style="list-style-type: none"> Set the command position data or modify the set travel distance so that positioning is performed within the stroke limit.

Table 20.6 Drive module errors list (1 to 999) (continued)

Error Codes	Control Mode of Virtual Servo Axis							Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Change	Constant Velocity	JOG	Man. Pulse Gen. Synchronous Encoder Axis			
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 command position data or modify the set travel distance 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. 	The axis accelerates and stops	<ol style="list-style-type: none"> Set a velocity at which overrun does not occur. Set a travel distance at which overrun does not occur.
215				○				<ul style="list-style-type: none"> The velocity change point address is greater than the end point address. An address to control positioning in the opposite direction was set. The same servo program was re-executed. 		<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"> The velocity change point address is greater than the end point address. An address to control positioning in the opposite direction was set during velocity control. 	The axis does not start.	<ul style="list-style-type: none"> Modify the sequence program. Set the velocity change point within the range of the preceding velocity change point and the end point.
300	○	○	○	○	○	○	○	<ul style="list-style-type: none"> An attempt was made to change the positioning data for an axis being moved. An attempt was made to change the positioning data for an axis that was not yet booted. 	The positioning data is not changed.	<ul style="list-style-type: none"> Modify the sequence program so as to use the following devices as an interlock to change the positioning data: <ol style="list-style-type: none"> Reset state of the start receive flag (M2001 to M2008) ON state of the servo start-up signal
302	○							<ul style="list-style-type: none"> An attempt was made to change the velocity of the axis being circularly interpolated. 	The velocity is not changed.	<ul style="list-style-type: none"> The velocity of the axis being circularly interpolated 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. 		<ul style="list-style-type: none"> 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 OFF. 		<ul style="list-style-type: none"> The velocity of an axis cannot be changed while the axis is decelerating with the JOG operation signal OFF.
305	○	○	○	○	○	○		<ul style="list-style-type: none"> The velocity was set outside the allowable range (1 to velocity limit value). 	0 : Velocity change processing is ignored.	<ul style="list-style-type: none"> Set the velocity within the range from 1 to the velocity limit value.
									Not 0 : Controlled at the velocity limit value.	

(2) Output module error

Table 20.7 Output module errors list (4000 to 6990)

Error Codes		Output Modules					Error Causes	Error Processing	Corrective Action(s)
Output Module	Drive Modules	Roller	Ball Screw	Rotary Table	Cam				
4050	4050				○	<ul style="list-style-type: none"> "Lower stroke limit setting device" value + "stroke setting device" value exceeds $2^{31} - 1$ (set unit) (in the return cam mode). 	Related system does not start.	<ul style="list-style-type: none"> Return to the real mode, and do positioning in the stroke range. 	
4060	4060	○	○	○	○	<ul style="list-style-type: none"> When the drive module is a synchronous encoder connected to the A336PX and the connection clutch is in the external input mode, more than one ON/OFF command bit devices are set. 		<ul style="list-style-type: none"> When an A336PX is used, the "external input mode" clutch can be set in a one-to-one combination only with a synchronous encoder. Return to the real mode, reset the PC READY flag, and correct the clutch setting. 	
5000	5000		○	○	○	<ul style="list-style-type: none"> The command position data exceeded the stroke limit range. In the case of a cam, the command position data is out of the range from the lower stroke limit to the stroke (in the return cam mode). (Current value in cam 1 rotation cannot be calculated.) 		<ul style="list-style-type: none"> Return to the real mode, and do positioning in the stroke limit range. 	
5060	5060				○	<ul style="list-style-type: none"> Though the feed position data is in the stroke range, a current value in one cam shaft rotation cannot be calculated. (Cam table error) 	A related system cannot be started.	<ul style="list-style-type: none"> Correct a cam table. For the cam table, set the stroke amount from the stroke lower limit in the ratio of 0 to 7FFFH. Put the point of 0 to 7FFFH in a cam table. 	
5080	5080	○	○	○	○	<ul style="list-style-type: none"> Torque limit setting outside the range error 	Control with default 300%	<ul style="list-style-type: none"> Set data within the range. 	
6000	600□	○	○	○	○	<ul style="list-style-type: none"> The servo OFF command went ON during operations. 	Operation is continued.	<ul style="list-style-type: none"> The servo maintains ON state. Turn OFF the servo after turning OFF the clutch. 	
6010	601□	○	○	○		<ul style="list-style-type: none"> Output velocity exceeds the velocity limit during operations. (Velocity clamp processing by using the velocity limit is not executed.) 		<ul style="list-style-type: none"> Correct the speed, gear ratio, and speed change ratio of a drive module so the speed becomes within a speed limit value. 	
6020	602□	○	○	○	○	<ul style="list-style-type: none"> The error counter value exceeds the accumulated pulse allowable value during operations. 		<ul style="list-style-type: none"> After stopping the drive module, correct the speed, gear ratio, and speed change ratio of a drive module so the speed becomes within a speed limit value. 	
6030	603□		○	○		<ul style="list-style-type: none"> The command position data exceeds the stroke limit range during operations. 			
6040	604□				○	<ul style="list-style-type: none"> Cam number setting device value is outside the range of the cam number used. Operations continue with the current cam number. 		<ul style="list-style-type: none"> Correct setting of cam No. . 	

Table 20.7 Output module errors list (4000 to 6990)

Error Codes		Output Modules				Error Causes	Error Processing	Corrective Action(s)
Output Module	Drive Modules	Roller	Ball Screw	Rotary Table	Cam			
6050	605□				○	<ul style="list-style-type: none"> The stroke setting device value is outside the range from 1 to $2^{31} - 1$. The "lower stroke limit setting device" value + "stroke setting device" value exceeds "$2^{31} - 1$ (set unit)". Operations continue with the current cam number.) 	Operation is continued.	<ul style="list-style-type: none"> Correct setting of a stroke quantity.
6060	606□				○	<ul style="list-style-type: none"> When switching the cam number, the control modes before and after switching do not match. Operations continue with the current cam number. 	Operation is continued.	<ul style="list-style-type: none"> Modify the control mode after stopping a drive module.
6080	608□	○	○	○	○	<ul style="list-style-type: none"> The torque limit is outside the setting range. Operations are controlled with the default (300%). 		<ul style="list-style-type: none"> Set a torque limit value in the setting range.
6500	650□	○	○	○	○	<ul style="list-style-type: none"> Servo was OFF when the clutch ON command was given. 	The clutch maintains OFF state.	<ul style="list-style-type: none"> Execute clutch ON command again after returning to clutch OFF command and executing servo ON command.
6510	651□				○	<ul style="list-style-type: none"> When the cam axis servo ON command was given (Y0*F was turned OFF), command position data was outside the stroke range (in the return cam mode). During follow up, command position data is outside the stroke range. 	The servo maintains OFF state.	<ul style="list-style-type: none"> Execute servo ON command again after returning a feed position data in the stroke range.
6520	652□				○	<ul style="list-style-type: none"> When the cam axis servo ON command was given (Y0*F was turned OFF), "the lower stroke limit setting device" value + "stroke setting device" value exceeded "$2^{31} - 1$ (set unit)" (in the return cam mode). 		<ul style="list-style-type: none"> Set a stroke lower limit + stroke amount within ($2^{31} - 1$).
6530	6530	○	○	○	○	<ul style="list-style-type: none"> When clutch ON command is executed, zero return request signal (Xn9) has turned ON. (The power supply of MR-SB/SD was switched from OFF to ON.) 	The clutch maintains OFF state.	<ul style="list-style-type: none"> Return to real mode, and after executing a zero return, switch to virtual mode.
6560	6560				○	<ul style="list-style-type: none"> When servo ON command is executed, a current value in the cam axis 1 rotation cannot be calculated though the feed position data is in the stroke limit range. (Cam table error) 	The servo maintains OFF state.	<ul style="list-style-type: none"> Return to the real mode, and correct setting of cam data. Set the stroke amount from the stroke lower limit in the ratio of 0 to 7FFFH. Put points 0 to 7FFFH in a cam table.

20. TROUBLESHOOTING

20.3.4 Major errors (In the real mode)

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, and absolute 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 20.8.

Table 20.8 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				
1000	○	○	○	○	○	○	○	○	○	• The external STOP signal of the corresponding axis was turned ON.	Positioning control does not start.	• Turn OFF the STOP signal.
1001	○	○	○	○	○	○	○	○	○	• When positioning was started in the forward direction (addresses increasing), the external FLS (upper limit LS) signal was turned OFF.		• 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	○	○	○	○	○	○	○	○	○	• When positioning was started in the reverse direction (addresses decreasing), the external RLS (lower limit LS) signal was turned OFF.		• 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									○	• When near-zero point dog zero return was started, the external DOG (near-zero point dog) was turned ON.		• 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	○	○	○	○	○	○	○	○	○	• The servo of the corresponding axis is not in the servo READY state. (1) The power supply to the servo amplifier is OFF. (2) Initial processing with the servo amplifier power turned ON. (3) The servo amplifier has not been installed. (4) Servo error has occurred. (5) Cable disconnected		• Wait until the servo is READY.
1005	○	○	○	○	○	○	○	○	○	• The servo error detection signal of the corresponding signal (Xn8) was turned ON.	• 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 20.9.

Table 20.9 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					
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. 	The axis immediately stops without decelerating.	<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. 	XnF was turned OFF.	<ul style="list-style-type: none"> Take corrective action for servo error. The axis can be re-started.
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.) 		<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.

(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 20.10.

Table 20.10 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 A373CPU internal memory (EEPROM) has expired. Replace the A373CPU. This error may occur when the A373CPU is being used for the first time. Do zero return.

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(4) System 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 20.11.

Table 20.11 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			
1300								<ul style="list-style-type: none"> The actual amplifier installation is inconsistent with the system setting. AC motor drive unit fault 	Positioning does not start.	<ul style="list-style-type: none"> Check the parameters. Replace the AC motor drive unit.
1301							<ul style="list-style-type: none"> AC motor drive unit has not been installed. Setting is not done to use the AC motor drive unit in the system setting. 	<ul style="list-style-type: none"> Check the system setting. The machine cannot be operated if the AC motor drive unit 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 A373CPU fault 	<ul style="list-style-type: none"> Check the parameters. Replace the A373CPU. 		

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20.3.5 Major errors (In the virtual mode)

Major errors are caused by an external input signals or control commands from the SCPU. The error codes for these major errors are 1000 to 1999.

(1) Drive module errors

Table 20.12 Drive module errors list (1000 to 1999)

Error Codes	Control Mode of Virtual Servo Axis						Error Causes	Error Processing	Corrective Action(s)
	Positioning	Incremental Feed	Velocity	Velocity Change	Constant Velocity	JOG			
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 A373CPU internal memory (EEPROM) has expired. Replace the A373CPU. This error may occur when the A373CPU is being used for the first time. Do zero return.
1300							<ul style="list-style-type: none"> The actual amplifier installation is inconsistent with the system setting. AC motor drive unit fault 	Operation does not start.	<ul style="list-style-type: none"> Check the parameter. Replace the AC motor drive unit.
1301							<ul style="list-style-type: none"> AC motor drive unit has not been installed. Setting was not done to use the AC motor drive unit in the system setting. 		<ul style="list-style-type: none"> Check the system setting. The machine cannot be operated when the AC motor drive unit 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 A373CPU fault 		<ul style="list-style-type: none"> Check the parameter. Replace the A373CPU.

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(2) Output module errors

Table 20.13 Output module errors list (10000 to 11990)

Error Codes		Output Modules					Error Causes	Error Processing	Corrective Action(s)
Output Module	Drive Modules	Roller	Ball Screw	Rotary Table	Cam				
10000	1000□	○	○	○	○	<ul style="list-style-type: none"> Zero return required signal is ON. 	Related system does not start.	<ul style="list-style-type: none"> Return to the real mode and execute zero return operations. All axes must complete zero return and positioning. Otherwise, the operations are impossible in the virtual mode. 	
10010	1001□	○	○	○	○	<ul style="list-style-type: none"> The servo error detection signal is ON. 			
10020	1002□	○	○	○	○	<ul style="list-style-type: none"> The servo ON/OFF signal of the output module connected to the main shaft or the auxiliary input axis is turned OFF. 			
10030	1003□	○	○	○	○	<ul style="list-style-type: none"> The external input signal STOP signal of the output module connected to the main shaft or the auxiliary input axis is turned ON. 			
11000	1100□	○	○	○	○	<ul style="list-style-type: none"> The servo error detection signal was turned ON during operations. (The corresponding output module stops immediately and the servo goes OFF.) 	After a corresponding output module stops immediately, the servo OFF state is established.	<ul style="list-style-type: none"> Remove the factor of a servo error. (See Section 10.3) 	
11010	1101□	○	○	○	○	<ul style="list-style-type: none"> The servo was turned OFF. Power to the MR-SB/SD was turned OFF. A servo error was detected in another ADU axis. 			
11020	1102□	○	○	○	○	<ul style="list-style-type: none"> The stop signal (STOP) was turned ON. 	Operation is continued.	<ul style="list-style-type: none"> Perform stop processing with a user's sequence program. 	
11030	1103□	○	○	○	○	<ul style="list-style-type: none"> When positioning was being moved in the forward direction (addresses increasing), the upper limit LS signal (FLS) was turned OFF. 			
11040	1104□	○	○	○	○	<ul style="list-style-type: none"> When positioning was being moved in the reverse direction (addresses decreasing), the lower limit LS signal (RLS) was turned OFF. 			

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20.3.6 Servo errors

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 the AC motor drive unit and errors that occur in an MR-SB/MR-SD.

In the following table, the AC motor drive unit is abbreviated (A), and an MR-SB/MR-SD is abbreviated (M).

A servo error detection signal goes ON, when a servo error occurs. Remove the cause of an error, reset the servo error by turning the servo error reset signal 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 RES 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 20.14.

Table 20.14 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. 	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)	Internal 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. A373CPU 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 A373CPU.
2013	(A) (M)	External clock error	<ul style="list-style-type: none"> Data processing of the position command from the A373CPU was not completed in the normal time. Error in a timing signal (BCLK, SCLK) from an A373CPU. A373CPU fault. 	Anytime during operation		<ul style="list-style-type: none"> Reset the A373CPU, and confirm if it operates correctly. Replace the A373CPU.
2014	(A) (M)	Watchdog	<ul style="list-style-type: none"> Timing signal from an A373CPU or the 2-port RAM error. A373CPU fault. 			

* Servo parameter (OPT) : increment/absolute setting, regeneration resistance setting

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Table 20.14 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. A373CPU 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 A373CPU, and confirm if it operates correctly. Replace the A373CPU.
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). Position detection module fault Cable or encoder fault Improper setting of servo parameter (OPT) 			<ul style="list-style-type: none"> Reset the A373CPU, 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 AD converter is not normal (± 0.5 or more) during initialization. Fault around the A/D converter Fault of the power supply module A373CPU fault 	<ul style="list-style-type: none"> When turning ON the power supply of the servo amplifier When starting up the PC READY flag (M2000) 		<ul style="list-style-type: none"> Reset the A373CPU and make sure it operates correctly. Replace the power supply module or the A373CPU.
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) 	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 of the encoder connected to the RF31 card or the RF33 card. Cable or encoder fault 			
2022	(M)	No-signal 1X	<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 unit fault Power supply module fault Power is not supplied to the AC motor drive unit from the power supply module. (The AC motor drive unit and the power supply module are not connected.) A373CPU 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 unit. Replace the power supply module. Connect the AC motor drive unit and the power supply module. Replace the A373CPU. Replace the position detection module.

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Table 20.14 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. 	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"> Insufficient power supply. The power transistor for regeneration was damaged.
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 unit 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 unit 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 	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 20.14 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) Position detection module fault 	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 Position detection module fault 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 an A373CPU, a parity occurred. Cable fault or noise 			<ul style="list-style-type: none"> Replace the A373CPU.
2035	(A) (M)	Data error	<ul style="list-style-type: none"> Change rate of the command position from an A373CPU is too large. The command velocity is too high. Cable fault or noise. Incorrect setting of the servo parameter (ENC) Fault of the A373CPU 			<ul style="list-style-type: none"> Replace the A373CPU. Modify the servo parameter.
2036	(A) (M)	Transmission error	<ul style="list-style-type: none"> Communications with an A373CPU cannot be done. Cable fault Noise occurred, or an MCP processing error occurred. A373CPU fault 			<ul style="list-style-type: none"> Replace the A373CPU.

* Servo parameter (OPT): Increment/absolute setting, regenerative resistance setting
 (ENC): Setting of the number of feedback pulses per 1 rotation of the motor

Table 20.14 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			
2037	(A) (M)	Parameter error	<ul style="list-style-type: none"> The parameter transmitted at initialization is not correct. 	<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 stopped immediately.	<ul style="list-style-type: none"> Replace the A373CPU.
2040	(A)	Power supply error	<ul style="list-style-type: none"> Short circuit of the VD C24 output of the power supply module Fault of the VDC24 power supply ladder of the power supply module Fault of the VDC24 detection ladder 	Anytime during operation		<ul style="list-style-type: none"> Check the wiring. Replace the power supply module or the A373CPU.
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. 			<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
(ENC): Setting of the number of feedback pulse per each rotation of the motor

Table 20.14 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. 	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 an A373CPU. 			<ul style="list-style-type: none"> Replace the A373CPU.
2100	(A) (M)	Initial communications warning	<ul style="list-style-type: none"> When power is supplied to an A373CPU, 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).

Table 20.14 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 • A362ES fault • The deviation between the feedback position and the data transmitted from the encoder is too large. 	Anytime during operation	Operation is continued.	• Replace the RG510 or A362ES printed board.
			<ul style="list-style-type: none"> • Encoder fault 			• Replace the encoder.
			<ul style="list-style-type: none"> • Malfunction occurred due to noise, etc. 			• 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. 			• 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.
2144	(A) (M)	Parameter error	<ul style="list-style-type: none"> • Incorrect parameter was set. 			<ul style="list-style-type: none"> • Check the parameters. (Servo is not turned OFF.) • Reset the A373CPU.
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) 		<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.
2147	(A) (M)	Emergency stop	<ul style="list-style-type: none"> • An emergency stop occurred. (Power supply module) 	Anytime during operation	Operation is stopped immediately.	• Release the emergency stop.

20.3.7 LED Indications when an error occurs in the PCPU

If the following error messages are displayed on the LED on the front panel of an A373CPU, the error codes are not stored in the special register, etc. Remove the cause of the error, and turn ON the power supply again.

Table 20.15 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 LAY ERROR"	2 sheets of same unit are installed (A336PX, A344SF, AY42) in the option slots.	Do not install 2 sheets of the same unit.
"PCPU WDT ERROR"	A373CPU fault (An error does not occur if this message is displayed while the CPU is reset.)	Replace the A373CPU.
"PCPU WDT ERROR 2"	A373CPU fault	Replace the A373CPU.
"PX PARA. ERROR"	Though it is set to "With PX" in the system setting, an A336PX is not actually installed.	Set "Without PX" in the system setting, or install an A336PX.
"SC ERROR"	A373CPU fault	Replace the A373CPU.

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20.3.8 Errors when switching real mode/virtual mode

Table 20.16 Error code list when switching real mode/virtual mode

Error code stored in D9195		Error description	Corrective action
Decimal display	Hexadecimal display		
1 to 255	0001 to 00FF	<ul style="list-style-type: none"> When all axes were not at a complete stop, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> When M2001 to M2008 turn OFF, switch M2043 from OFF to ON.
257 to 511	0101 to 01FF	<ul style="list-style-type: none"> When all axes were not at a complete stop, M2043 was switched from ON to OFF. 	<ul style="list-style-type: none"> When M2001 to M2008 turn OFF, switch M2043 from ON to OFF.
512	0200	<ul style="list-style-type: none"> When a mechanical system program was not registered, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Write a mechanical system program to the A373CPU.
		<ul style="list-style-type: none"> When axis No. set in the system and amplifier No. set with a mechanical system program did not agree, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Make axis No. of system setting and amplifier No. of a mechanical system program the same, and write it to the A373CPU.
513	0201	<ul style="list-style-type: none"> When PC ready (M2000) or PCPU ready completion flag (M9074) was OFF state, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> After a PC ready and the PCPU ready completion flag turn ON, switch M2043 from OFF to ON.
514	0202	<ul style="list-style-type: none"> When all axes servo start command flag (M2042) was OFF state, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> After M2042 and all axes servo start receive flag turn ON, switch M2043 from OFF to ON.
515	0203	<ul style="list-style-type: none"> When external emergency stop (EMG) was ON state, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Switch M2043 from OFF to ON after turning OFF an external emergency stop.
516	0204	<ul style="list-style-type: none"> While the ADU axis was processing a servo leading edge by servo error reset command (Yn8), M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> After servo error detection signal (Xn8) turns OFF, when Yn8 is turned ON, and a servo error is reset, switch M2034 from OFF to ON.
518	0206	<ul style="list-style-type: none"> When there was an error in an external synchronous encoder, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Check an external synchronous encoder and wiring.
519	0207	<ul style="list-style-type: none"> While processing cam data change (M2016: ON) with a sequence program, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> After cam data change completion flag (M2017) turns ON, when 2016 is turned ON, and cam data is changed, switch M2043 from OFF to ON.
769 to 1023	0301 to 03FF	<ul style="list-style-type: none"> When a zero return request signal was ON when an output module other than a roller axis was used, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> After a zero return (servo program ZERO execution) is executed, and zero return signal (Xn9) turns OFF, switch M2043 from OFF to ON.
1025 to 1279	0401 to 04FF	<ul style="list-style-type: none"> When all axes of ADU and MR-SB/SD were not normal (Xn8: ON), M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Check ADU, MR-SB/SD, a servo motor, wiring, etc.
1281 to 1535	0501 to 05FF	<ul style="list-style-type: none"> When an output module other than a roller axis was used and when fixed parameter and the unit set in the output module did not agree, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Correct a fixed parameter or unit setting of an output module, and write it to the A373CPU.
1537 to 1791	0601 to 06FF	<ul style="list-style-type: none"> When cam data was not registered though a cam is set at an output module, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Write cam data to the A373CPU.
1793 to 2047	0701 to 07FF	<ul style="list-style-type: none"> When cam No. set with use cam No. of the parameter of a cam was not registered, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Correct use cam No. of the parameter of a cam, and write it to the A373CPU.
		<ul style="list-style-type: none"> When use cam No. of the parameter of a cam was not set, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Write data of cam No. set with use cam No. of the parameter of a cam in the A373CPU. Correct use cam No. of the parameter of a cam, and write it to the A373CPU.

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Table 20.16 Error code list when switching real mode/virtual mode (continued)

Error code stored in D9195		Error description	Corrective action
Decimal display	Hexadecimal display		
2049 to 2303	0801 to 08FF	<ul style="list-style-type: none"> When cam No. was not set at cam No. setting device, M2043 was switched from OFF to ON. When cam No. that is not set with use cam No. of the parameter of a cam was set in cam No. setting device, M2043 was switched from OFF to ON. 	<ul style="list-style-type: none"> Switch M2043 from OFF to ON after writing cam No. set at cam No. setting device by using No. the parameter of a cam.
2305 to 2559	0901 to 09FF	<ul style="list-style-type: none"> The set value of the stroke amount setting device of a cam is outside the range of 1 to $(2^{31}-1)$. 	<ul style="list-style-type: none"> Switch M2043 from OFF to ON after setting a value within 1 to $(2^{31}-1)$ at the stroke amount setting device of a cam.
- 4094	F002	<ul style="list-style-type: none"> PC ready (M2000) turned OFF in virtual mode and returned to the real mode. 	<ul style="list-style-type: none"> Turn ON M2000.
		<ul style="list-style-type: none"> The A373CPU was switched to the STOP state in virtual mode. 	<ul style="list-style-type: none"> Make the A373 CPU RUN state.
- 4095	F001	<ul style="list-style-type: none"> Servo error signal (Xn8) turned ON in virtual mode and returned to real mode. 	<ul style="list-style-type: none"> Confirm a cause of error of an axis that a servo error is occurring by a servo error code-storage register, and remove a cause of error.
- 4096	F000	<ul style="list-style-type: none"> External emergency stop (EMG) turned ON in virtual mode and returned to real mode. 	<ul style="list-style-type: none"> Turn OFF an external emergency stop.

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20.4 Error Messages During GSV21PE Operations

The following errors are those that occur during GSV21PE operations. The error contents and corrective action(s) are shown in Table 20.16. 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.)

Table 20.17 List of error messages

Error Message	Contents	Corrective Action(s)
NO IMAGE FILE. ABNORMAL END. (HIT ESC KEY)	None of the following image files are installed: SERV01.IMG, SERV02.IMG, SERV03.IMG and SERV04.IMG.	Install all the image files on the left under \GPP\SYS.
INSTALL SWITCH IS OFF.	The A373CPU installation switch is turned OFF during installation.	Turn the installation switch ON.
INSTALL FAILED.	Installation failed.	Retry installation.
ERROR DETECTED. MAX. 16 GEARS CAN BE USED.	More than 16 gears were set.	Set 16 or less gears.
ERROR DETECTED. UNALLOWABLE MODULE CONNECTED. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	Connection of modules is not correct.	Connect the modules correctly.
ERROR DETECTED. MAX. 16 CLUTCHES CAN BE USED.	More than 16 clutches were set.	Set 16 or less clutches.
ERROR DETECTED. ONE SERVO MOTOR OR ENCODER CAN BE USED PER PAGE.	Two or more main servo motors or encoders were set on 1 page.	Only one main servo motor and encoder can be set in one page. If two or more are to be set, change the page.
ERROR DETECTED. TOTAL NUMBER OF SERVO MOTORS AND ENCODERS THAT CAN BE USED IS 8.	More than 8 main servo motors and encoders were set.	Set 8 or less servo motors and encoders.
ERROR DETECTED. CANNOT SELECT EXTERNAL INPUT MODE FOR SERVO MOTOR CLUTCH. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	The mode for the clutch that can be connected with the servo motor is not external input. The clutch in the external input mode was connected to the servo motor.	Clutches to be connected to the servo motor must be in modes other than external input mode.
THERE ARE SOME USED CAM WHOSE CAM DATA IS NOT SET. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	A cam number whose cam data does not exist among the cam numbers set as cam numbers in the cam parameter of the mechanical system.	Set cam data.
DIFFERENT MODES SPECIFIED FOR USED CAMS. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	Cam modes set for cam data in the cam parameter are not unified.	Unify the cam data modes for one cam.
ERROR DETECTED. MAX. 8 OUTPUT MODULES CAN BE USED.	More than 8 output modules were set.	Set 8 or less output modules.
ERROR DETECTED. SOME PARTS HAVE NOT YET BEEN CONNECTED OR ARE CONNECTED WITH UNALLOWABLE MODULE. THE ERROR PARTS ARE SURROUNDED BY LINES. (CLICK TO CLEAR THE LINES.)	There is a place where connection of modules has not been completed. Or, modules that should not be connected have been connected.(Be very careful when a grid is shown on the screen. Modules that are not actually connected may appear to be connected.)	Confirm module connections.

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Table 20.17 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
ERROR DETECTED. AMP SET TO UNUSED WITH THE SYSTEM SETTING. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	The amplifier set for the amplifier number of the output module is set unused in the system setting.	Change the amplifier number, or modify the system setting to use the amplifier.
ERROR DETECTED. UNIT SETTING DATA IS DIFFERENT FROM DATA SET BY THE FIXED PARAMETER. THE ERROR PARTS ARE SURROUNDED BY LINES. (CLICK TO CLEAR THE LINES.)	The unit set in the servo data setting mode of the amplifier set at the amplifier number of the output module and the unit of the output module are not the same.	Set the same unit for the output module and the amplifier.
EXTERNAL INPUT MODE AND ANOTHER MODE SET FOR CLUTCHES CONNECTED TO THE SAME ENCODER. THE ERROR PARTS ARE SURROUNDED BY LINES. (CLICK TO CLEAR THE LINES.)	Both the clutch in the external input mode and the one in other modes were connected to the encoder.	When the clutch in the external input mode is connected to the encoder, do not connect the clutch in modes other than the external input mode.
ERROR DETECTED. DIFFERENT DEVICES SPECIFIED FOR CLUTCHES (EXTERNAL INPUT MODE) TO BE CONNECTED TO THE SAME ENCODER. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	When more than one clutch in the external mode was connected to the encoder, ON/OFF device has not been unified.	When more than one clutch in the external mode is connected to one encoder, use the same ON/OFF devices.
ERROR DETECTED. SAME DEVICE SPECIFIED MORE THAN ONCE. THE ERROR PARTS ARE SURROUNDED BY LINES. (CLICK TO CLEAR THE LINES.)	The same device was set in several places. (Excluding the ON/OFF device of the clutch in the external input mode)	Change the device.
THERE ARE SOME PARTS WHOSE PARAMETER ARE NOT SET. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	There is a module whose parameters have not been set.	Set the parameter
TOO MANY MODULES CONNECTED IN BLOCK. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	The number of connection modules in the block is too large.	Confirm the number of connected modules.
ERROR DETECTED. TOO MANY AUXILIARY AXES. MAX. 8 AUXILIARY AXES CAN BE USED.	More than 8 auxiliary axes were set.	Set 8 or less auxiliary axes.
ERROR DETECTED. SERVO MOTOR OR ENCODER TO BE UTILIZED NOT FOUND. PARTS THAT CAUSED THE ERROR SURROUNDED BY GREEN LINES. (CLICK TO CLEAR THE GREEN LINES.)	When the parameters of the servo motor or the encoder for input for the auxiliary axes were set using the parameters of other main axes or the parameters of the motor of the auxiliary axis, there were no other axes or a motor.	Do not use the parameter of other main axis or of the motor of the auxiliary axis, or set the main axis or the motor of the auxiliary axis.
OPERATING SYSTEM NOT INSTALLED.	An OS has not been installed in the A373CPU.	Install an OS by using the installation function, and check it.
OPERATING SYSTEM MISMATCH.	The operating system names or operating system versions are inconsistent in the operating system in the A373CPU and in the one to be compared.	Check the same model names or the same versions.

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Table 20.17 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
FILE NOT FOUND.	There was no designated file.	Confirm the file name.
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.	Confirm the program number.
WRITE-IN ERROR.	Data cannot be written to the program memory in the servo PC mode.	A fault was detected in the EEROM. Replace it.
CANNOT EXECUTE IN VIRTUAL MODE.	A servo test was attempted in the virtual mode. (Servo monitor is allowed.)	After returning to the real mode, do a test operation.
CAM DATA CREATION FAILURE.	Cam data file connection failed.	Confirm the remaining capacity of the hard disk and whether the cam data file is correct.
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.
SUB-SYSTEM NAME NOT FOUND.	Designated machine name xxxxxxxx has not been set.	Set machine name xxxxxxxx
CANNOT PLACE HERE. SELECT ANOTHER POSITION; OR CANCEL (RIGHT BUTTON).	The position where parts were to be placed in the mechanical system edit was overlapped by other parts.	Confirm if other parts have already been placed where a required part is to be placed.
CANNOT PLACE HERE. SELECT ANOTHER POSITION.	When an attempt was made to place more than one part, they could not be placed because other parts were already in place.	Put it in a place without other parts.
VIRTUAL AMP NO. ALREADY OCCUPIED.	The amplifier number set for use in the output module is used in other output modules.	Change the amplifier number.
VIRTUAL AXIS NO. ALREADY OCCUPIED.	An axis number set for the servo motor or encoder is used for others.	Change the axis number.
PARAMETER SETTING UNNECESSARY.	An attempt was made to set the parameter of the parts for which parameter setting is not allowed.	Setting has not been allowed.
THIS PART NOT INCLUDED IN EDIT SCREEN.	Parts whose entire image was not on the screen were clicked.	After shifting the screen and displaying the entire image of the parts on the screen, start the operation.
CANNOT MONITOR THIS MODULE.	An attempt was made to monitor parts that cannot be monitored in detail.	Do detailed monitoring of other parts.
CANNOT CHANGE SERVO PARAMETER.	An attempt was made to change the servo parameter of the A373CPU. However, the A373CPU 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 (Xn2) ON and setting the A373CPU in a state where servo parameter changes are allowed.
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 (XnF) for the corresponding axis is OFF when starting the torque trace start of servo monitoring.	Start the trace after the servo READY signal goes ON.
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.
ITEM ALREADY EXISTS.	During servo program edit, the designated setting item was already set.	The same item cannot be set repeatedly.

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Table 20.17 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
AXIS NO. OVERLAP. (* AXIS ALLOCATION AMP □ , OP □ -D □)	The axis number was set twice in the system setting.	Confirm the 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.
CANNOT WRITE, PC READY 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).
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.
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.
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 START.	The Error Code List (1 to 16) gives details about the error contents.	
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.
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.
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 correct position in the servo programming velocity switching command (VSTART).	Place the end point setting command next to the velocity switching command. Or, confirm the end point setting command.
RELATION BETWEEN UPPER/LOWER LMT. IS INVALID.	Parameters for the ball screw are set so that the upper stroke limit < lower stroke limit.	Set it so the upper stroke limit ≥ lower stroke limit.
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 scroll limit to the upper scroll fixed parameter limit.	Do address setting in the specified range.
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 A373CPU was connected.	Connect it to an A373CPU.
OUT OF SETTING RANGE.	An attempt was made to set data outside the setting range.	Do data setting in the setting range.
RANGE SETTING ERROR.	Data outside the setting range was set.	Do data setting in the setting range.
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.
SETTING UNNECESSARY.	An attempt was made to set a parameter for an item where parameter setting was not allowed.	Setting has not been allowed.
CANNOT SELECT.	An attempt was made to select an item that cannot be selected.	Select the correct item.

Table 20.17 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.
INVALID KEY.	An invalid key was pressed.	Press the correct key.
COMMUNICATIONS ERROR! ABNORMAL END. (HIT ESC KEY)	Communications cannot be started when the mechanical system monitor mode starts.	Check the cable, etc.
COMMUNICATIONS ERROR PREVENTS DETAILED MONITORING. END.	An error occurred when detailed monitoring was attempted.	Check the cable, etc.
DATA NOT FOUND.	The GSV21PE has not been installed correctly. An attempt was made to execute a printout without setting data to be printed out in the servo print mode.	Install the GSV21PE correctly. Execute a printout after setting the data to be printed out.
DATA MISMATCH.	Mismatch of data was detected by servo file verification.	Check the servo data and the data in the servo program.
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.
DEVICE NUMBER OUT OF RANGE.	When reading the servo program, a device number other than D0 to D000 and/or W000 to W3FF was designated. When reading a program while servo was online, an attempt was made to read a servo program that did not exist.	Set the correct device number again. The designated servo program does not exist.
DRIVE NOT READY.	A hard disk has not been installed.	Check the hard disk. (This error does not usually occur.)
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.
INCORRECT OPERATION.	The page key was pressed though the servo program data has not been read.	Press the page key after reading servo program data.
PARAMETER SETTING ERROR.	An attempt was made to end parameter setting before the parameters were set.	Set the parameter, or complete the operation by cancellation.
NO PARTS.	No parts were found when connection checks or conversion/writing was attempted.	Do a connection check and/or writing after setting the parts.
CANNOT OPEN THE FILE.	The file could not be opened when file writing.	Confirm the remaining memory capacity of the hard disk, etc.
PRINTER NOT READY.	Printing was attempted though printing preparations were not completed.	Set the printer.
WRONG PROGRAM MODE.	During servo programming, programs both in the real mode and the virtual mode were designated for the simultaneous start command (START).	Designate either a program in the real mode or a program in the virtual mode for the simultaneous start command (START).
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.
NO PART TO BE PASTED.	During mechanical system editing, no data was found in the cut buffer when pasting was attempted.	Store data to be pasted in the cut buffer.
NO EDIT FILE.	No file was found when an attempt was made to read a mechanical system editing file.	Reading could not be done because no file is found.

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Table 20.17 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
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.
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 tests, an improper command was found in the servo program read from the A373CPU.	Modify the servo program, and rewrite it in the A373CPU.
COMMAND ERROR.	During servo program checks, errors were found in the set items.	Redo item setting.
MECHANICAL SYSTEM NOT SET. ABNORMAL END. (HIT ESC KEY)	When starting the mechanical system monitor mode, no data was set though an attempt was made to read data in the mechanical system.	Create mechanical system editing data in the mechanical system editing mode, and then do conversion/writing.
NO MECHANICAL DATA.	During mechanical system editing, the file designated to be read or to deleted was not the one in the mechanical system.	Confirm the file name, and set a correct file name.
CHECK MEMORY CASSETTE.	When reading data in the servo PC mode, a memory cassette whose No.10 block and beyond of the extension resistor was used. Or, writing could not be done because the memory cassette memory size was not large enough for the cam data size.	Replace the memory cassette with one with a larger memory capacity, which contains No.10 block and beyond of the extension register.
CHECK MEMORY CASSETTE.	Cam data could not be written to the A373CPU memory. A memory cassette without blocks No. 10 and beyond of the extension R.	The RAM in the memory cassette is faulty. Replace the memory cassette or exchange the cassette for one with a large memory capacity, containing blocks No. 10 and beyond of extension R.
NOT ENOUGH MEMORY. ABNORMAL END. (HIT ESC KEY)	When starting up the mechanical system monitor mode, monitoring could not be done due to shortage of memory capacity.	End the GSV21PE and restart operations. (This error does not usually occur.)
NOT ENOUGH MEMORY TO RENUMBER.	Renumbering could not be done due to the shortage of memory capacity.	Delete unnecessary parts.
NOT ENOUGH MEMORY TO CHECK.	Checking could not be done due to shortage of memory capacity.	Delete unnecessary parts.
NOT ENOUGH MEMORY TO READ FILE.	Reading files could not be done due to the shortage of memory capacity.	End the GSV21PE, and restart the system.
NOT ENOUGH MEMORY TO ADD/ CUT/COPY/PASTE.	Cutting, pasting, and/or copying could not be done due to the shortage of memory capacity.	Delete unnecessary parts.
NOT ENOUGH MEMORY TO EDIT. END.	Mechanical system data editing could not be done due to the shortage of memory capacity.	Complete the GSV21PE, and restart the system.
CANNOT EXECUTE CAPACITY EXCEEDED.	Writing could not be done because the memory capacity of the disk was too small.	Replace the disk.
LIST HANDLE ERROR.	An error occurred when handling the list structure of the mechanical system.	This error will not occur during normal usage. If it does occur, stop using the GSV21PE immediately, restart the system, and do re-editing.
ALL ADU AXES UNUSED.	None of AMP 1 to 6 or the A336PX/FE were used in the system setting. Even if they had been used, the axis setting has not been set.	Set the amplifier function in the system setting mode.

Table 20.17 List of error messages (continued)

Error Message	Contents	Corrective Action(s)
AMP□ (A330AM: HA-SA□ CANNOT CONNECT.	A motor that cannot be connected to the amplifier is connected in the system setting.	Confirm the type of amplifier or the motor.
CPU NOT IN VIRTUAL MODE. ABNORMAL END. (HIT ESC KEY)	CPU has not put in the virtual mode.	Set the CPU in the virtual mode.
NO. END. COMMAND.	There was no end command (CPEND, VEND) during constant velocity control and velocity change control.	Set the end command.
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.
PC COMMUNICATION ERROR.	An error occurred in the communications with the A373CPU.	Confirm the connection state with the A373CPU and the state of the cable.
	An attempt was made to read/write/verify data although the A373CPU was not connected.	
	Connection with the A373CPU 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 A373CPU is operating normally.
CANNOT WRITE-IN WHEN PC IS RUNNING.	When doing writing in the servo PC mode, the PC was in the RUN state.	Execute writing with the PC in the STOP state.
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.

20. TROUBLESHOOTING

<Error Code List (1 to 16)>

Table 20.18 Error code list

Error codes	Contents	Corrective Action(s)
1	The system could not be started because the servo error detection signal (Xn8) 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 (Xn2) 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 (XnB) goes ON.
4 *1	The system could not be started because the external LS signal (XnC) is OFF.	Start the system after the external RLS (XnC) goes ON.
5 *1	The system could not be started because the external STOP signal (XnD) is ON.	Start the system after the external STOP (XnD) turns OFF.
6	The system could not be started because the servo READY signal (XnF) is OFF.	Start the system after the servo READY (XnF) goes ON.
7	The system could not be started because the 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 M2009) 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 (Xn8) 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 (Xn8) 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, 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.



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