FANUC Series 16*i*-LB
FANUC Series 160*i*-LB

MAINTENANCE MANUAL

B-63665EN/01

The export of this product is subject to the authorization of the government of the country from where the product is exported.

In this manual we have tried as much as possible to describe all the various matters.
However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.
Therefore, matters which are not especially described as possible in this manual should be regarded as ”impossible”.

SAFETY PRECAUTIONS

This section describes the safety precautions related to the use of CNC units. It is essential that these precautions be observed by users to ensure the safe operation of machines equipped with a CNC unit (all descriptions in this section assume this configuration).
CNC maintenance involves various dangers. CNC maintenance must be undertaken only by a qualified technician.
Users must also observe the safety precautions related to the machine, as described in the relevant manual supplied by the machine tool builder.
Before checking the operation of the machine, take time to become familiar with the manuals provided by the machine tool builder and FANUC.

Contents

1 DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the maintenance personnel (herein referred to as the user) and preventing damage to the machine. Precautions are classified into Warnings and Cautions according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

WARNING

Applied when there is a danger of the user being injured or when there is a danger of both the user being injured and the equipment being damaged if the approved procedure is not observed.

CAUTION

Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

NOTE

The Note is used to indicate supplementary information other than Warning and Caution.

❍ **Read this manual carefully, and store it in a safe place.**

2 WARNINGS RELATED TO CHECK OPERATION

WARNING

1. When checking the operation of the machine with the cover removed

(1) The user's clothing could become caught in the spindle or other components, thus presenting a danger of injury. When checking the operation, stand away from the machine to ensure that your clothing does not become tangled in the spindle or other components.

(2) When checking the operation, perform idle operation without workpiece. When a workpiece is mounted in the machine, a malfunction could cause the workpiece to be dropped or destroy the tool tip, possibly scattering fragments throughout the area. This presents a serious danger of injury. Therefore, stand in a safe location when checking the operation.

2. When checking the machine operation with the power magnetics cabinet door opened

(1) The power magnetics cabinet has a high–voltage section (carrying a ⚠ mark). Never touch the high–voltage section. The high–voltage section presents a severe risk of electric shock. Before starting any check of the operation, confirm that the cover is mounted on the high–voltage section. When the high–voltage section itself must be checked, note that touching a terminal presents a severe danger of electric shock.

(2) Within the power magnetics cabinet, internal units present potentially injurious corners and projections. Be careful when working inside the power magnetics cabinet.

3. Never attempt to machine a workpiece without first checking the operation of the machine. Before starting a production run, ensure that the machine is operating correctly by performing a trial run using, for example, the single block, feedrate override, or machine lock function or by operating the machine with neither a tool nor workpiece mounted. Failure to confirm the correct operation of the machine may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

4. Before operating the machine, thoroughly check the entered data.
Operating the machine with incorrectly specified data may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

WARNING

5. Ensure that the specified feedrate is appropriate for the intended operation. Generally, for each machine, there is a maximum allowable feedrate. The appropriate feedrate varies with the intended operation. Refer to the manual provided with the machine to determine the maximum allowable feedrate. If a machine is run at other than the correct speed, it may behave unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

6. When using a tool compensation function, thoroughly check the direction and amount of compensation.
Operating the machine with incorrectly specified data may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

3 WARNINGS RELATED TO REPLACEMENT

WARNING

1. Always turn off the power to the CNC and the main power to the power magnetics cabinet. If only the power to the CNC is turned off, power may continue to be supplied to the serve section. In such a case, replacing a unit may damage the unit, while also presenting a danger of electric shock.
2. When a heavy unit is to be replaced, the task must be undertaken by two persons or more. If the replacement is attempted by only one person, the replacement unit could slip and fall, possibly causing injury.
3. After the power is turned off, the servo amplifier and spindle amplifier may retain voltages for a while, such that there is a danger of electric shock even while the amplifier is turned off. Allow at least twenty minutes after turning off the power for these residual voltages to dissipate.
4. When replacing a unit, ensure that the new unit has the same parameter and other settings as the old unit. (For details, refer to the manual provided with the machine.) Otherwise, unpredictable machine movement could damage the workpiece or the machine itself, and present a danger of injury.

4 WARNINGS RELATED TO PARAMETERS

WARNING

1. When machining a workpiece for the first time after modifying a parameter, close the machine cover. Never use the automatic operation function immediately after such a modification. Instead, confirm normal machine operation by using functions such as the single block function, feedrate override function, and machine lock function, or by operating the machine without mounting a tool and workpiece. If the machine is used before confirming that it operates normally, the machine may move unpredictably, possibly damaging the machine or workpiece, and presenting a risk of injury.
2. The CNC and PMC parameters are set to their optimal values, so that those parameters usually need not be modified. When a parameter must be modified for some reason, ensure that you fully understand the function of that parameter before attempting to modify it. If a parameter is set incorrectly, the machine may move unpredictably, possibly damaging the machine or workpiece, and presenting a risk of injury.

5 WARNINGS AND NOTES RELATED TO DAILY MAINTENANCE

WARNING

1. Memory backup battery replacement

When replacing the memory backup batteries, keep the power to the machine (CNC) turned on, and apply an emergency stop to the machine. Because this work is performed with the power on and the cabinet open, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing the batteries, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching the uncovered high–voltage circuits presents an extremely dangerous electric shock hazard.

NOTE

The CNC uses batteries to preserve the contents of its memory, because it must retain data such as programs, offsets, and parameters even while external power is not applied.
If the battery voltage drops, a low battery voltage alarm is displayed on the machine operator's panel or LCD screen.
When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the contents of the CNC's memory will be lost.
To replace the battery, see the procedure described in Section 2.8 of Series 16*i*/18*i*/160*i*/180*i*–MODEL B Maintenance Manual (B–63525EN).

WARNING

2. Absolute pulse coder battery replacement

When replacing the memory backup batteries, keep the power to the machine (CNC) turned on, and apply an emergency stop to the machine. Because this work is performed with the power on and the cabinet open, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing the batteries, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching the uncovered high–voltage circuits presents an extremely dangerous electric shock hazard.

NOTE

The absolute pulse coder uses batteries to preserve its absolute position.
If the battery voltage drops, a low battery voltage alarm is displayed on the machine operator's panel or CRT screen.
When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the absolute position data held by the pulse coder will be lost.
To replace the battery, see the procedure described in FANUC SERVO MOTOR α series Maintenance Manual (B–65165E).

WARNING

3. Fuse replacement

Before replacing a blown fuse, however, it is necessary to locate and remove the cause of the blown fuse.
For this reason, only those personnel who have received approved safety and maintenance training may perform this work.
When replacing a fuse with the cabinet open, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching an uncovered high–voltage circuit presents an extremely dangerous electric shock hazard.

PREFACE

Description of this manual

1.Display and operation

This chapter covers those items, displayed on the screen, that are related to maintenance. A list of all supported operations is also provided at the end of this chapter.

2.Hardware

This chapter covers hardware–related items, including the hardware configuration, connection, and NC status indicated on printed circuit boards. A list of all units is also provided as well as an explanation of how to replace each unit.

3.Data input/output

This chapter describes the input/output of data, including programs, parameters, and tool compensation data, aswell as the input/output procedures for conversational data.

4.Interface between the CNC and PMC

This chapter describes the PMC specifications, the system configuration, and the signals used by the PMC.

5.Digital servo

This chapter describes the servo tuning screen and how to adjust the reference position return position.

6.Trouble shooting

This chapter describes the procedures to be followed in the event of certain problems occurring.

APPENDIX

The appendix consists of a list of all alarms, a list of maintenance parts, and boot system.
This manual does not provide a parameter list. If necessary, refer to the separate PARAMETER MANUAL (B–63530EN, B–63670EN).

Applicable models

This manual can be used with the following models. The abbreviated names may be used.

Pruduct name	Abbreviation	
FANUC Series 16*i*–LB	16*i*–LB	Series 16*i*
FANUC Series 160*i*–LB	160*i*–LB	Series 160*i*

NOTE
Some function described in this manual may not be applied to some products.
For details, refer to the DESCRIPTIONS manual.

Table of Contents

APPENDIX

1 DISPLAY AND OPERATION

This chapter describes how to display various screens by the function keys. The screens used for maintenance are respectively displayed.

1.1 FUNCTION KEYS AND SOFT KEYS

Operations and soft key display staturs for each function key are described below:

1.1.1 Soft Keys

To display a more detailed screen, press a function key followed by a soft key. Soft keys are also used for actual operations.
The following illustrates how soft key displays are changed by pressing each function key.

The symbols in the following figures mean as shown below :


: Indicates screens

: Indicates a screen that can be displayed by pressing a function key(*1)

[ ] : Indicates a soft key(*2)

( ) : Indicates input from the MDI panel.

[ ] : Indicates a soft key displayed in green (or highlighted).

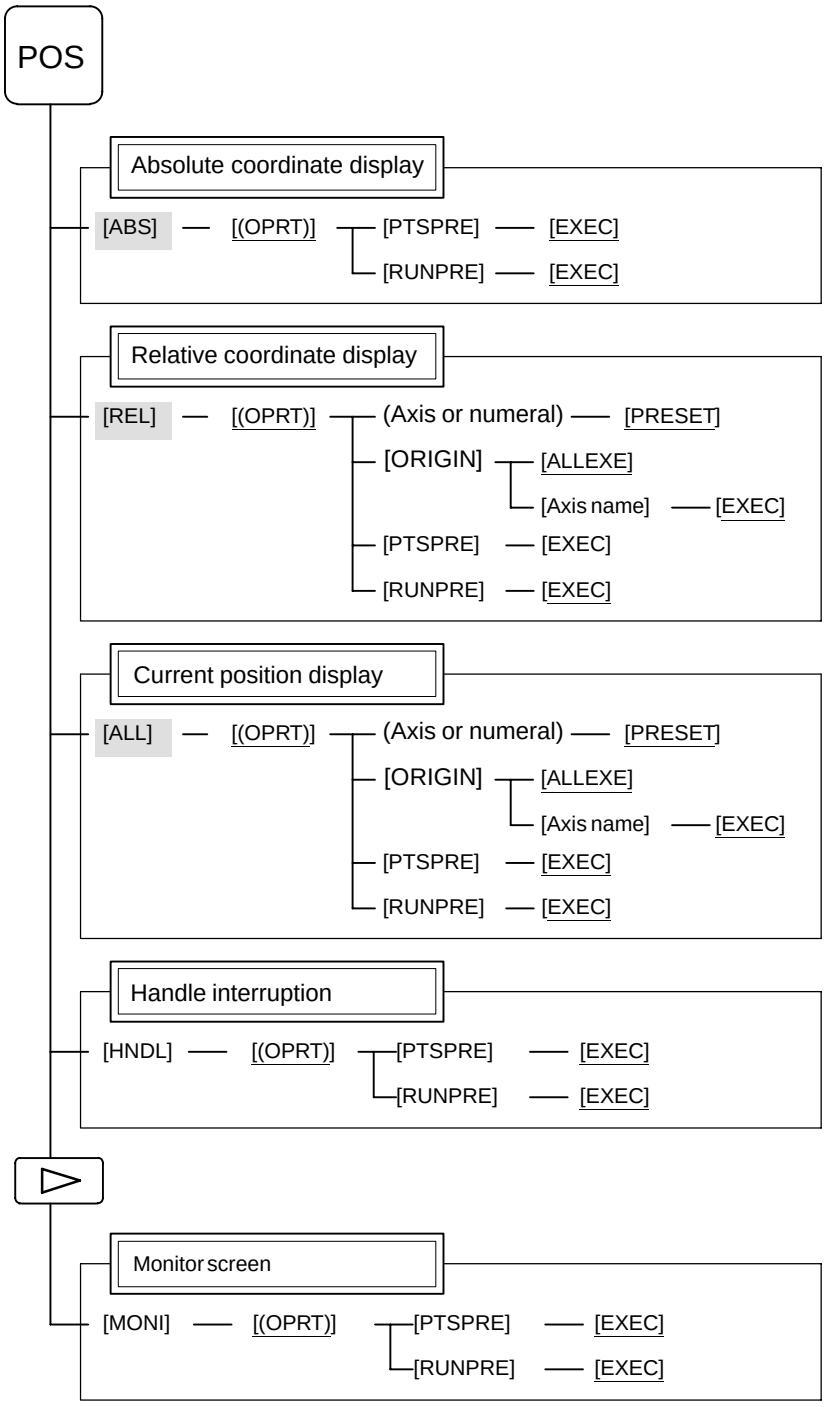

: Indicates the continuous menu key (rightmost soft key)(*3).

*1 Press function keys to switch between screens that are used frequently.

*2 Some soft keys are not displayed depending on the option configuration.

*3 In some cases, the continuous menu key is omitted when the 12 soft keys type is used.

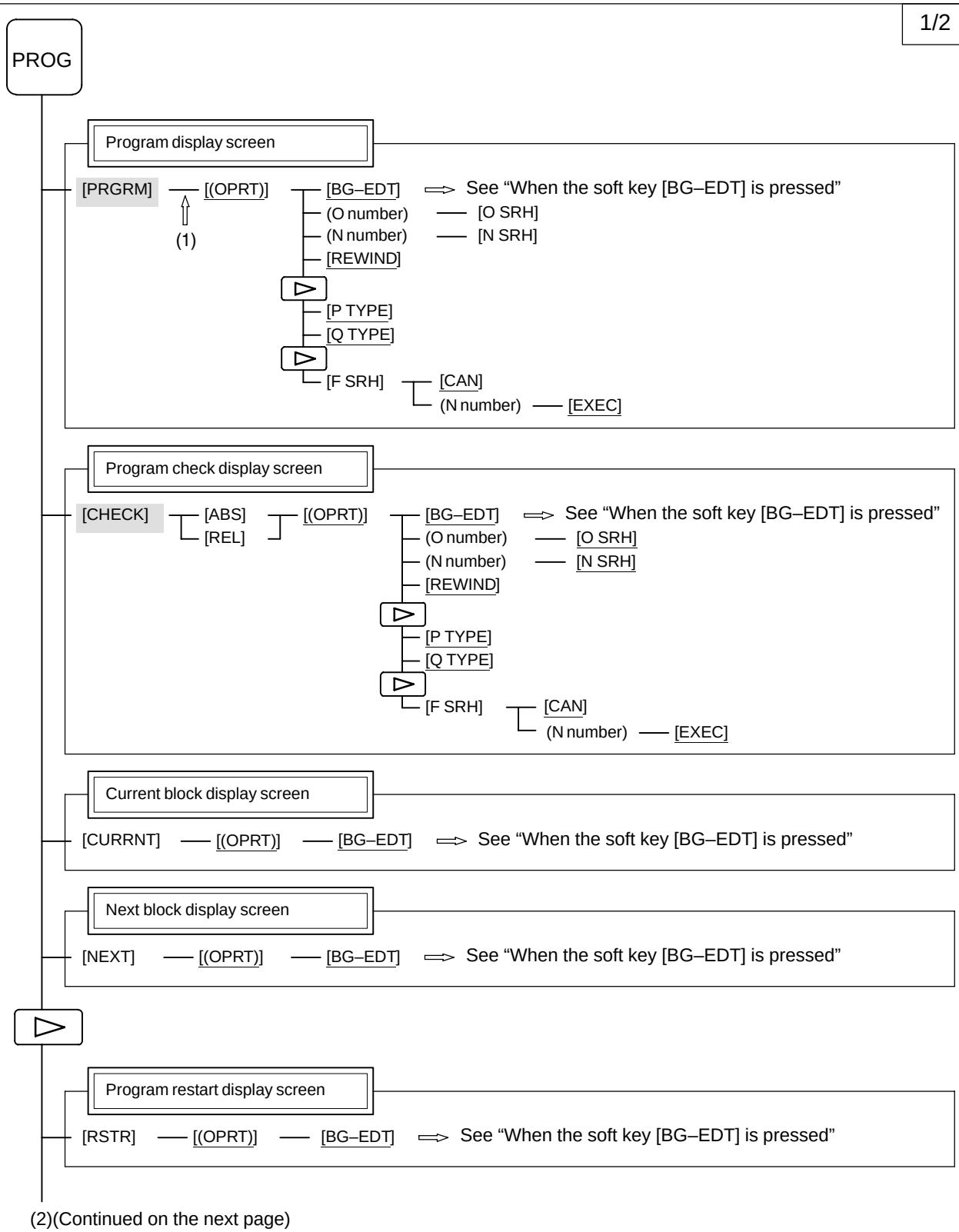
POSITION SCREEN Soft key transition triggered by the function key POS



PROGRAM SCREEN

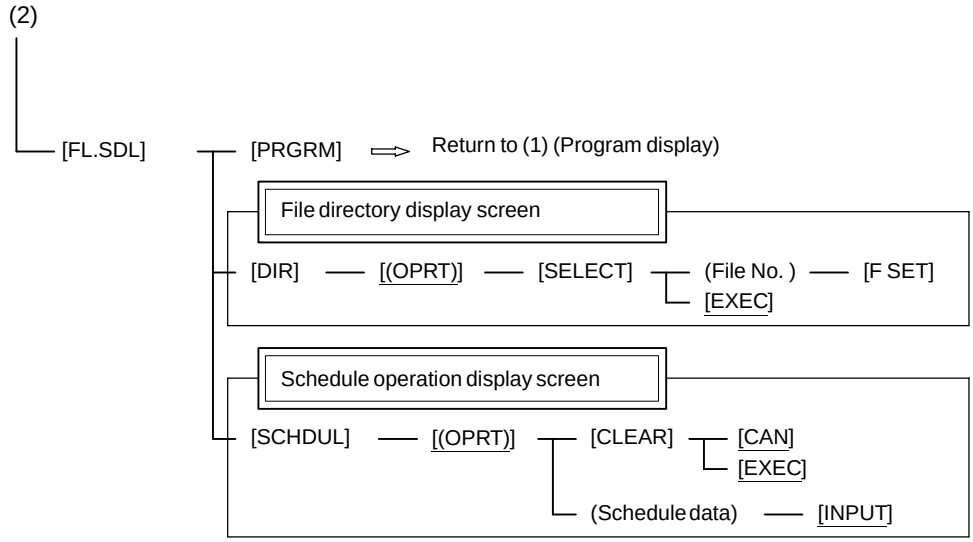
Soft key transition triggered by the function key PROG in the MEM mode

1/2



(2)(Continued on the next page)

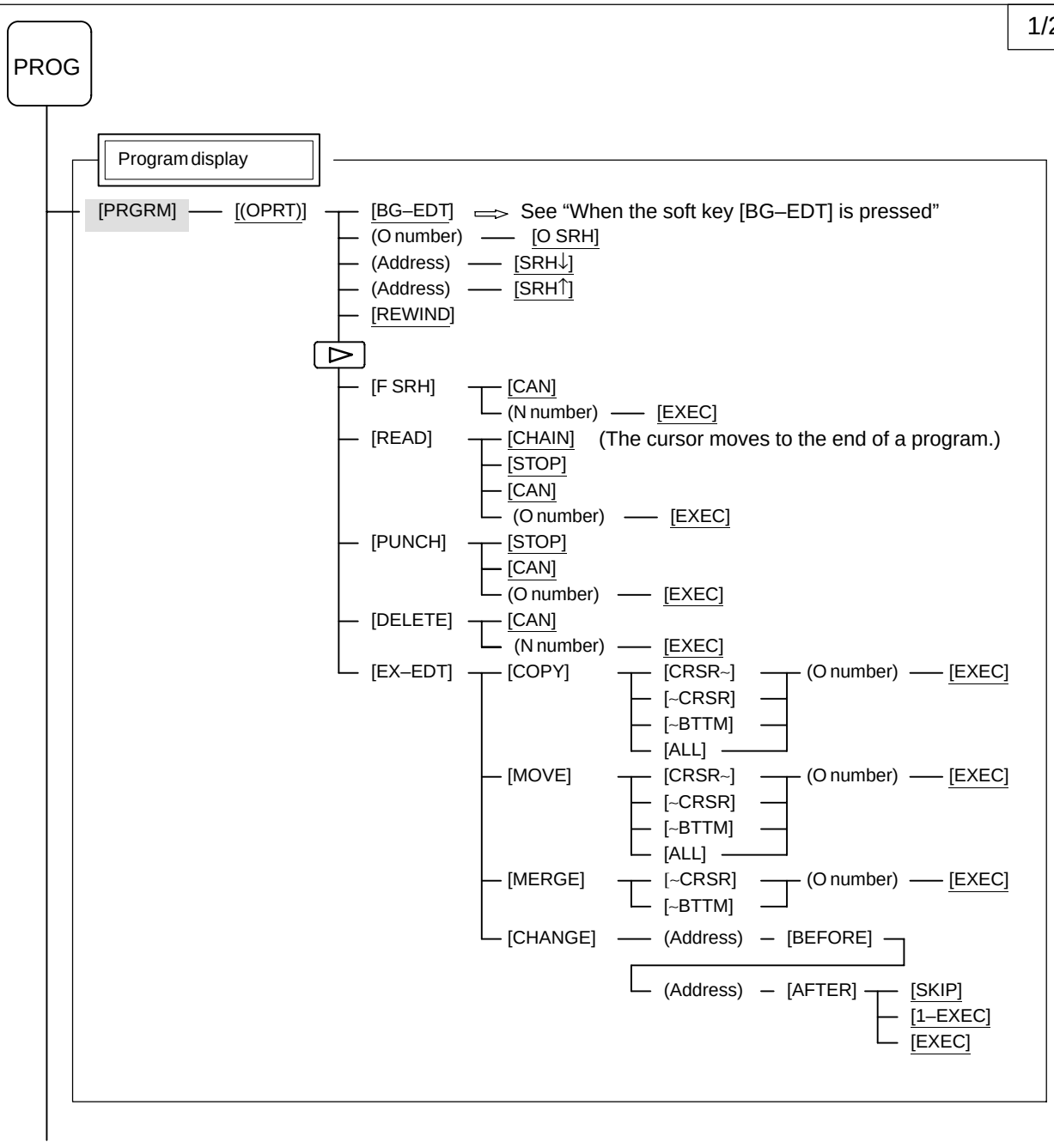
2/2


(2)
[FL.SDL]
[PRGRM]
Return to (1) (Program display)
File directory display screen
[DIR]
[(OPRT)]
[SELECT]
(File No.)
[F SET]
[EXEC]
Schedule operation display screen
[SCHDUL]
[(OPRT)]
[CLEAR]
[CAN]
[EXEC]
(Schedule data)
[INPUT]

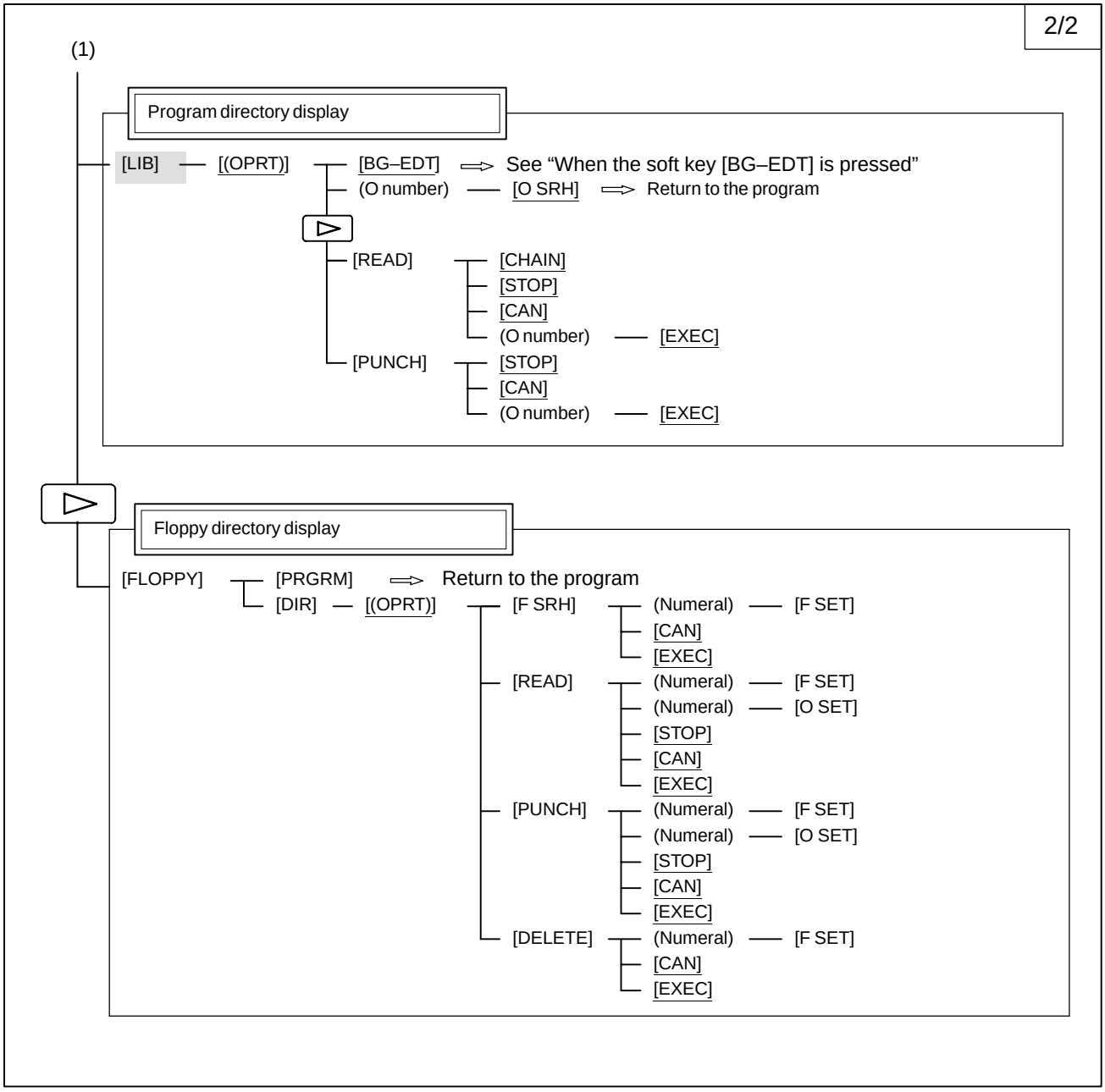
PROGRAM SCREEN

Soft key transition triggered by the function key PROG in the EDIT mode

1/2



(1)(Continued on the next page)

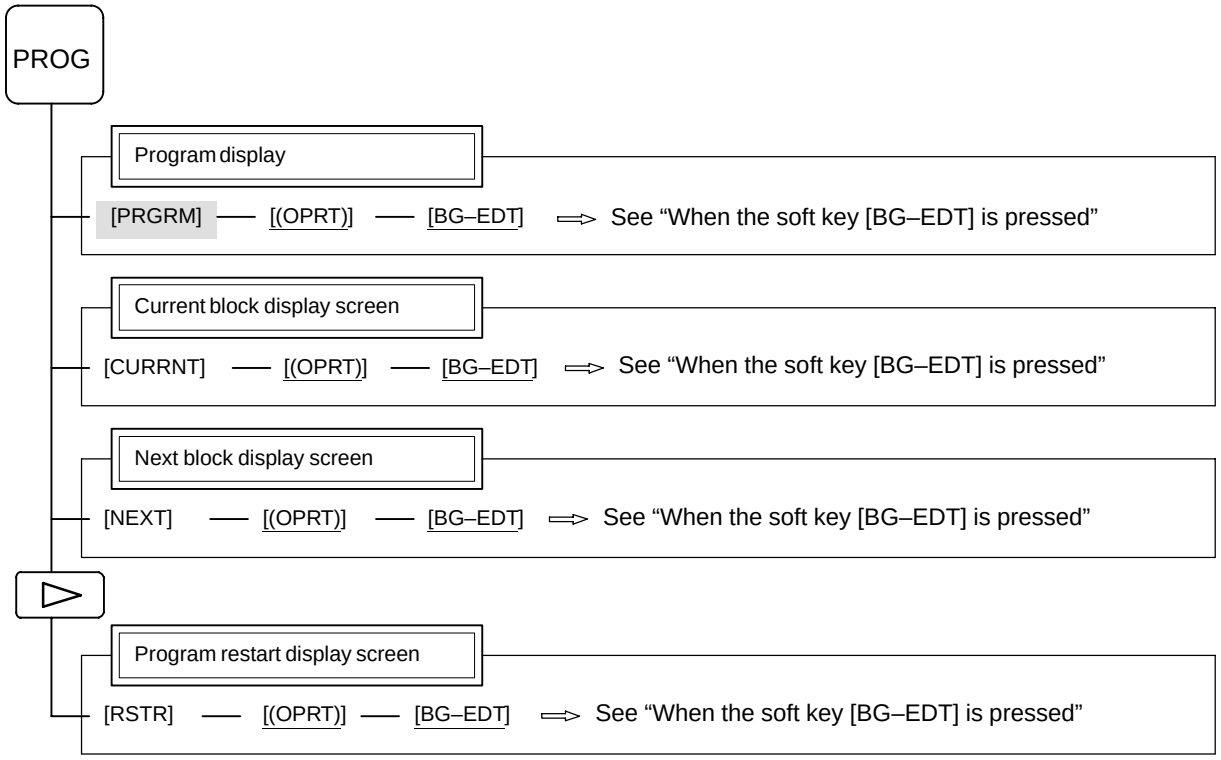

2/2
(1)
Program directory display
[LIB]
[(OPRT)]
[BG–EDT]
See “When the soft key [BG–EDT] is pressed”
(O number)
[O SRH]
Return to the program
[READ]
[CHAIN]
[STOP]
[CAN]
(O number)
[EXEC]
[PUNCH]
[STOP]
[CAN]
(O number)
[EXEC]
Floppy directory display
[FLOPPY]
[PRGRM]
Return to the program
[DIR]
[(OPRT)]
[F SRH]
(Numeral)
[F SET]
[CAN]
[EXEC]
[READ]
(Numeral)
[F SET]
(Numeral)
[O SET]
[STOP]
[CAN]
[EXEC]
[PUNCH]
(Numeral)
[F SET]
(Numeral)
[O SET]
[STOP]
[CAN]
[EXEC]
[DELETE]
(Numeral)
[F SET]
[CAN]
[EXEC]

PROGRAM SCREEN

Soft key transition triggered by the function key PROG in the MDI mode

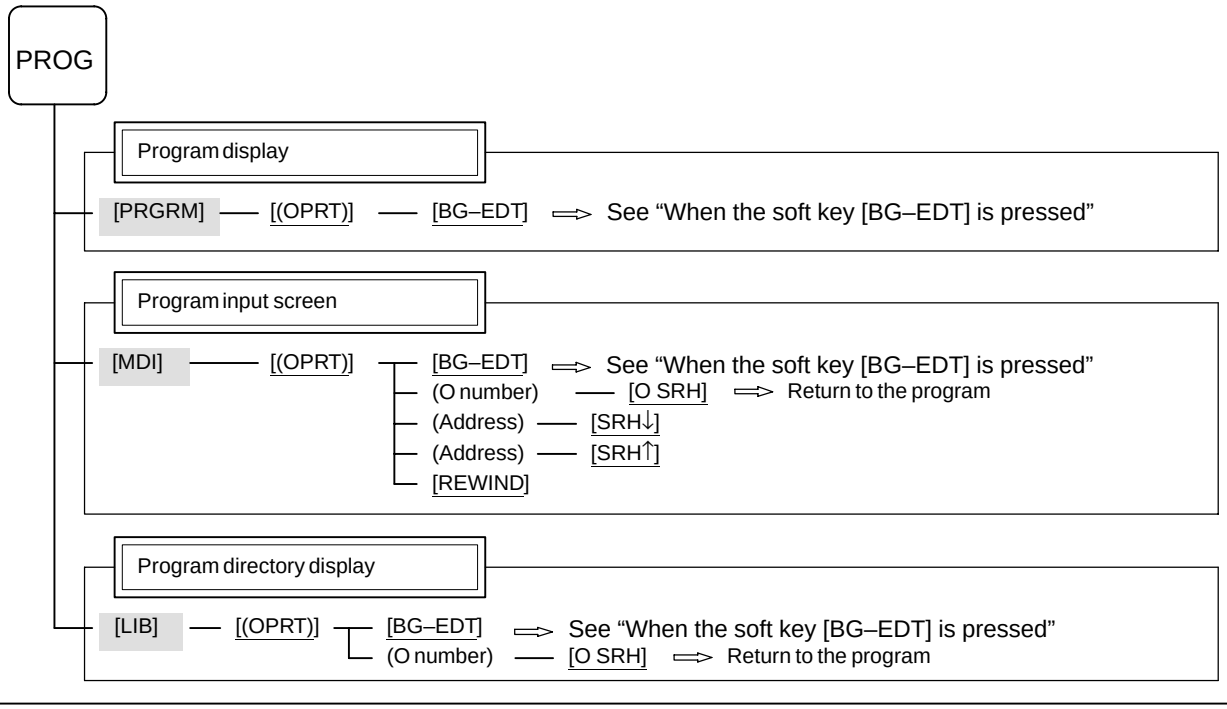
PROGRAM SCREEN

Soft key transition triggered by the function key PROG in the HNDL, JOG, or REF mode



PROGRAM SCREEN

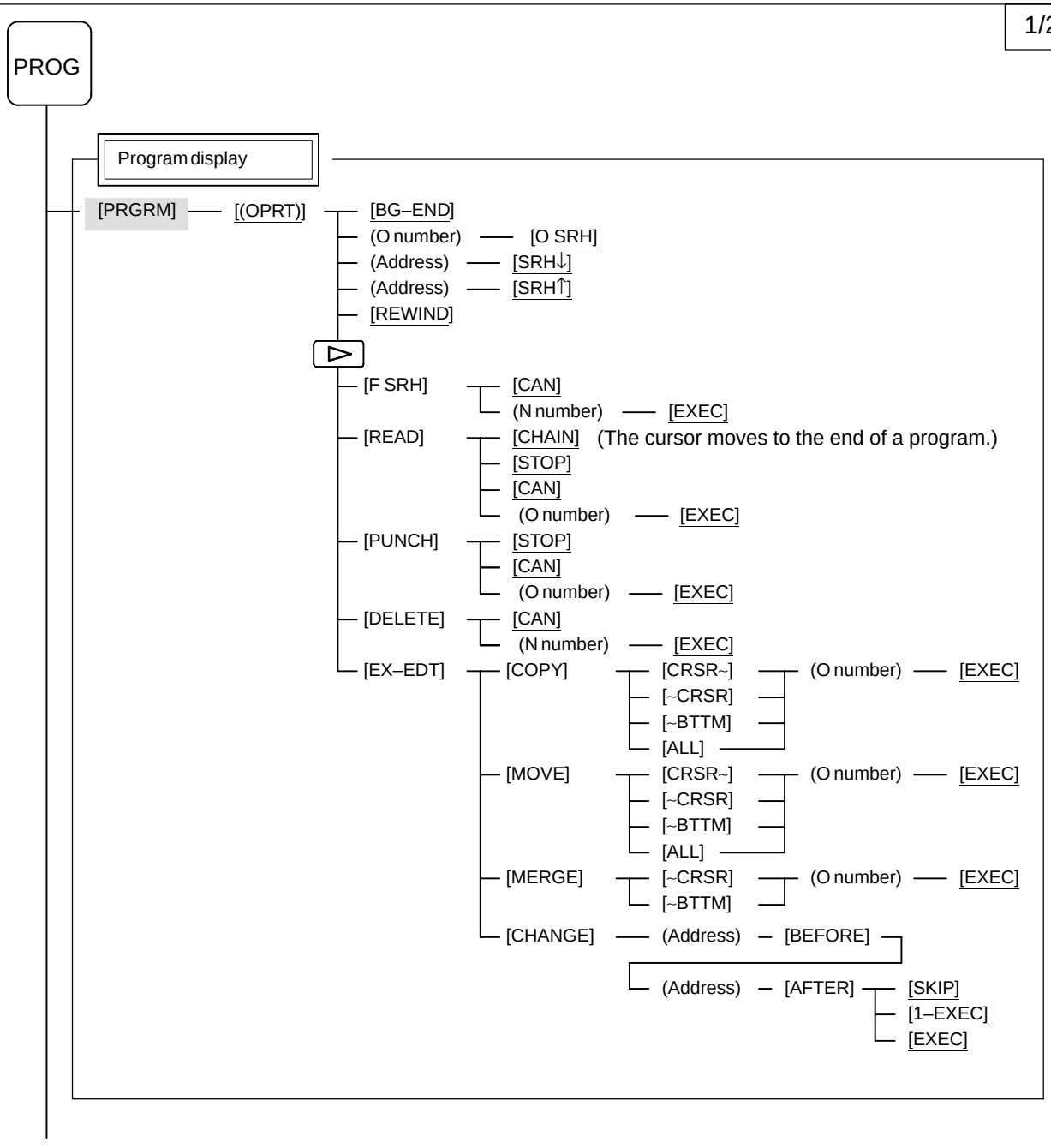
Soft key transition triggered by the function key PROG in the TJOG or THDL mode



PROGRAM SCREEN

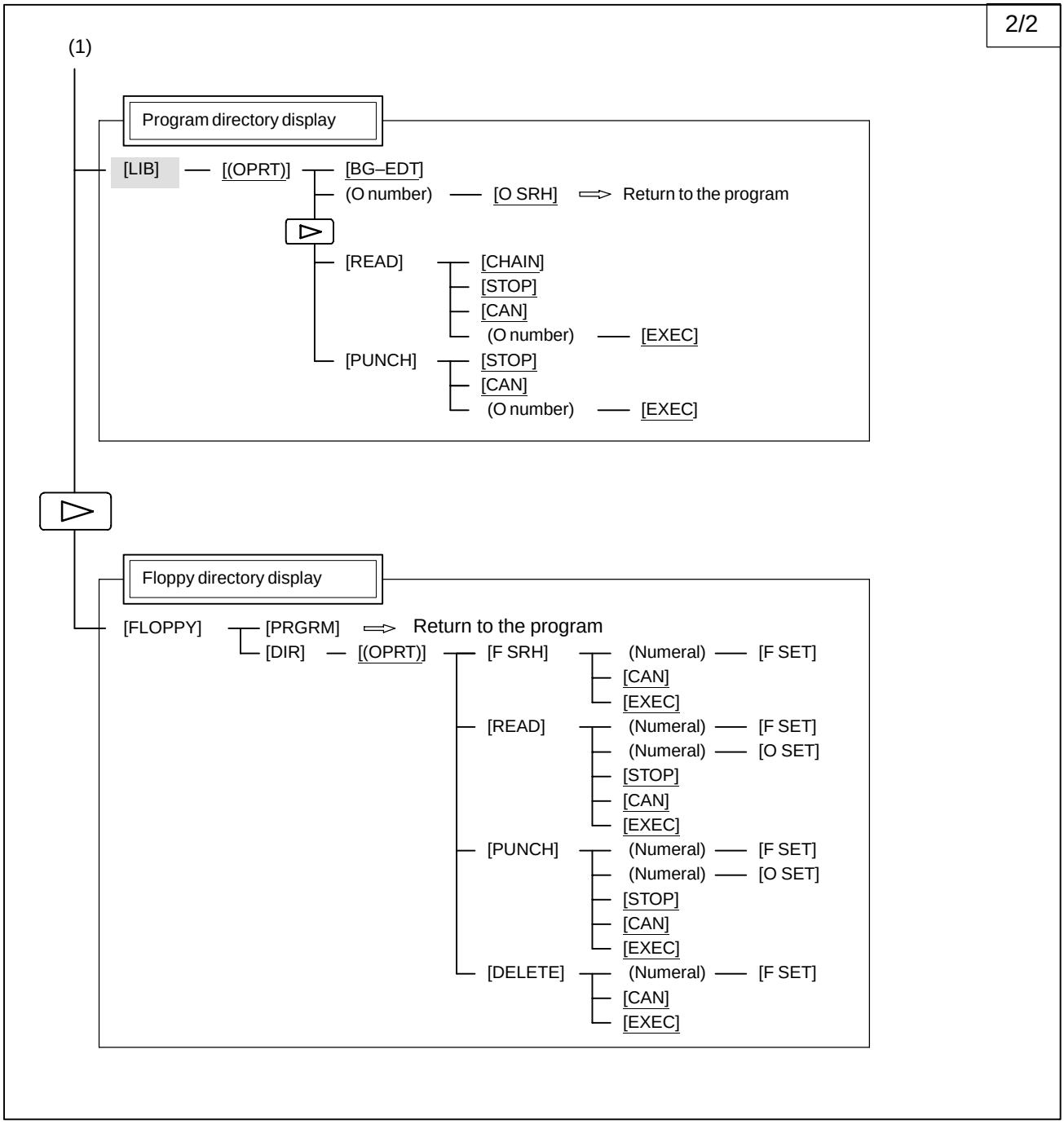
Soft key transition triggered by the function key PROG
(When the soft key [BG–EDT] is pressed in all modes)

1/2



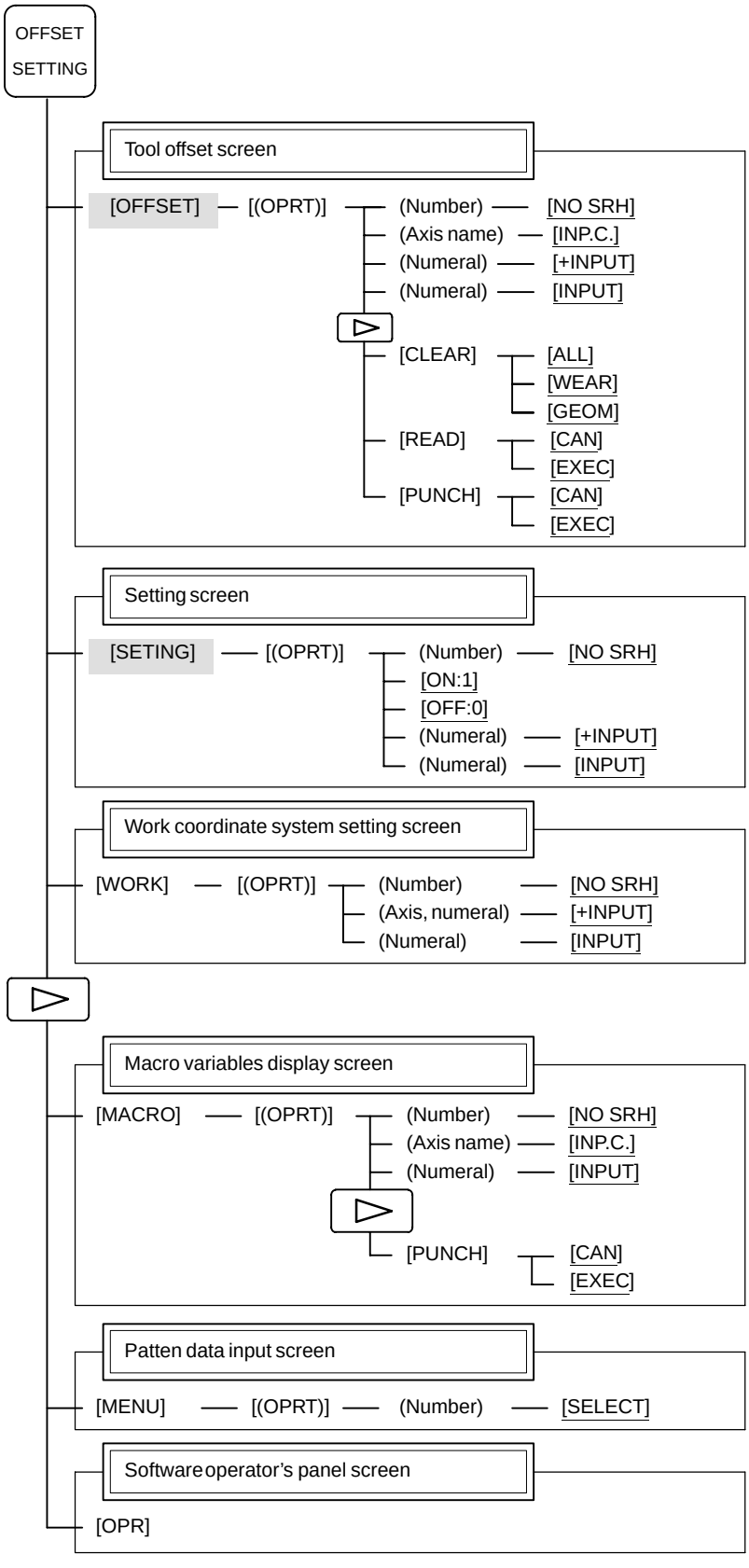
(1)(Continued on the next page)

2/2


(1)
Program directory display
[LIB]
[(OPRT)]
[BG–EDT]
(O number)
[O SRH]
Return to the program
[READ]
[CHAIN]
[STOP]
[CAN]
(O number)
[EXEC]
[PUNCH]
[STOP]
[CAN]
(O number)
[EXEC]
Floppy directory display
[FLOPPY]
[PRGRM]
Return to the program
[DIR]
[(OPRT)]
[F SRH]
(Numeral)
[F SET]
[CAN]
[EXEC]
[READ]
(Numeral)
[F SET]
(Numeral)
[O SET]
[STOP]
[CAN]
[EXEC]
[PUNCH]
(Numeral)
[F SET]
(Numeral)
[O SET]
[STOP]
[CAN]
[EXEC]
[DELETE]
(Numeral)
[F SET]
[CAN]
[EXEC]

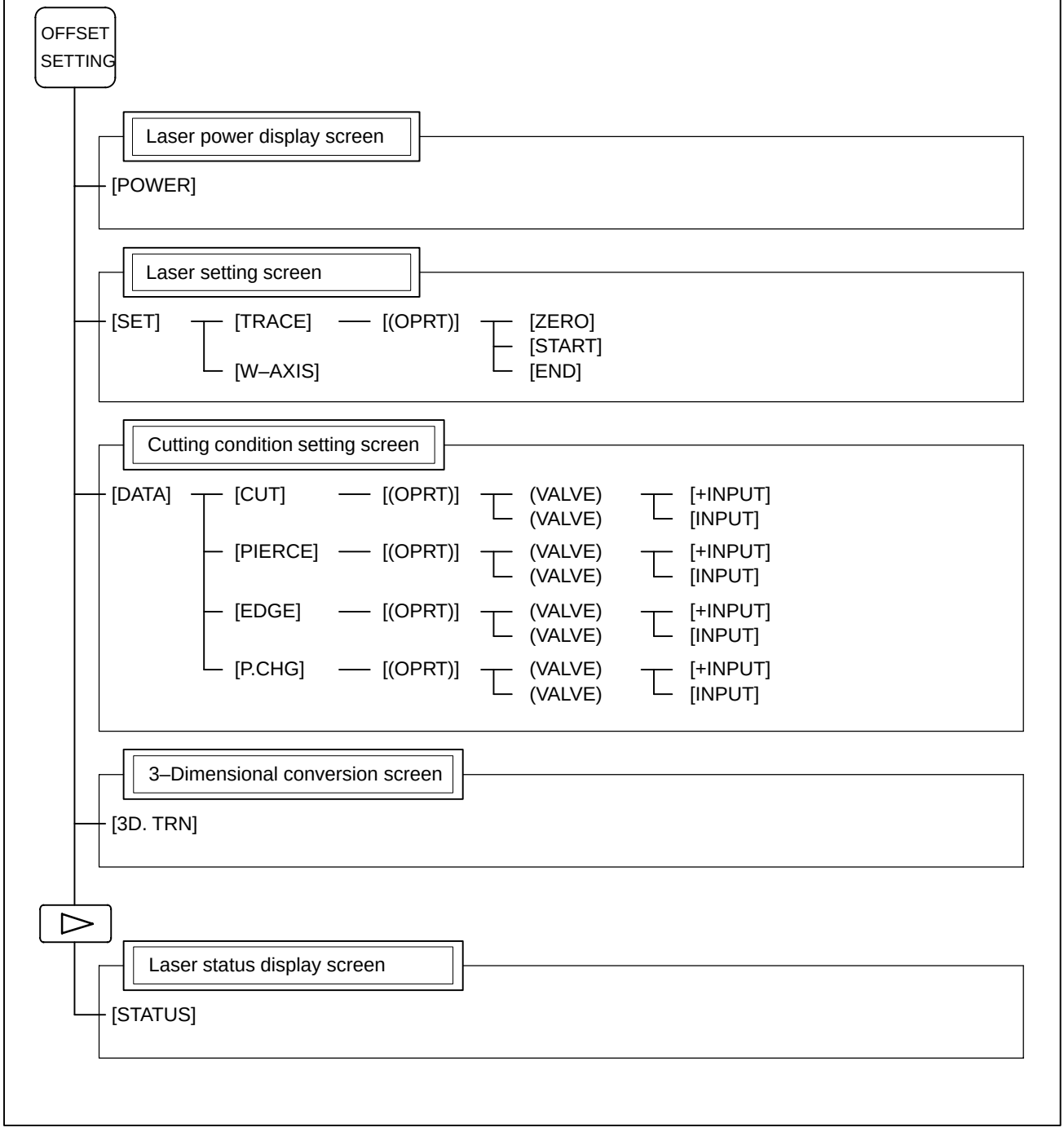
OFFSET/SETTING SCREEN

Soft key transition triggered by the function key 



LASER SETTING SCREEN

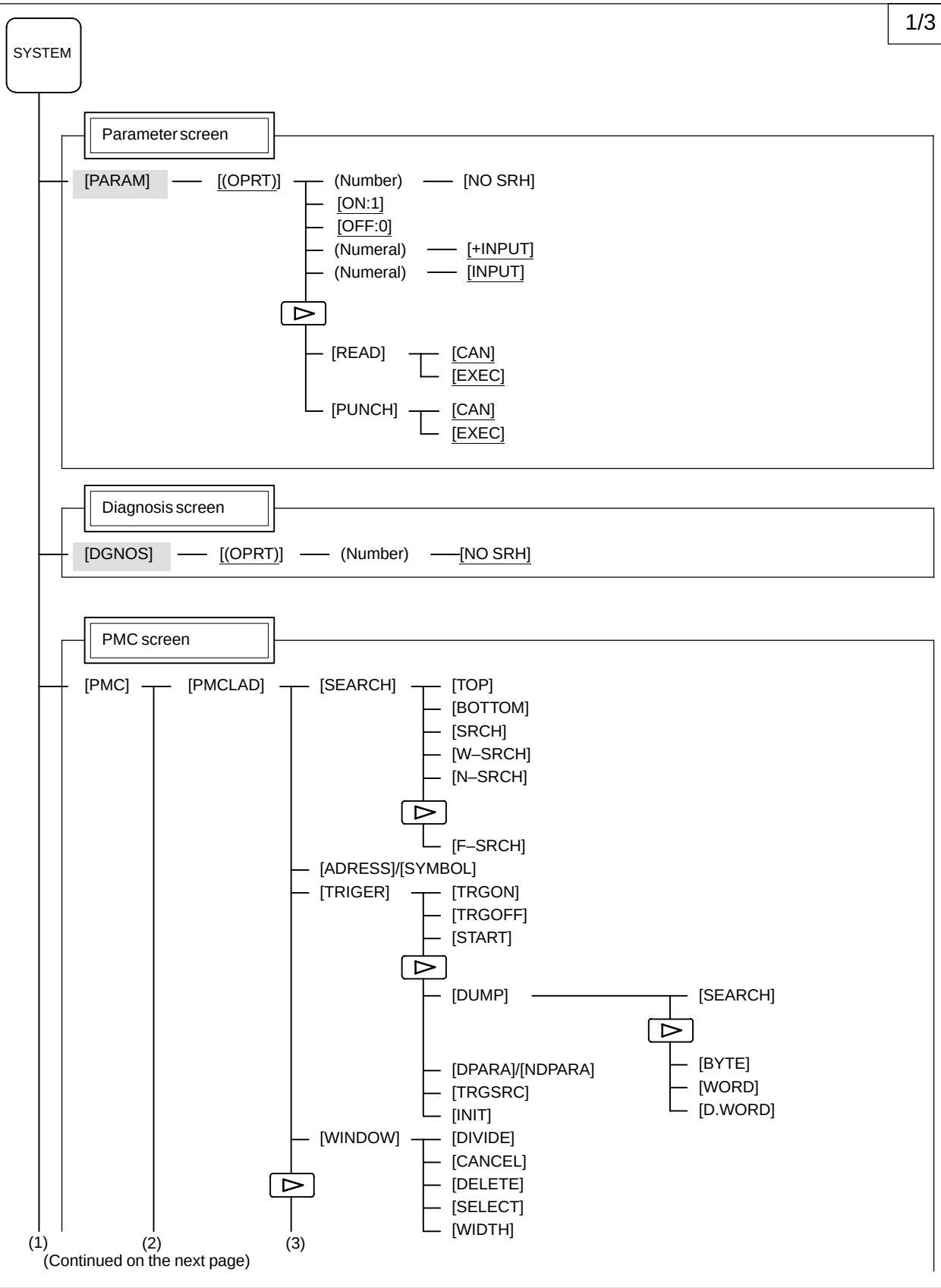
Soft key transition triggered by the function key OFFSET SETTING



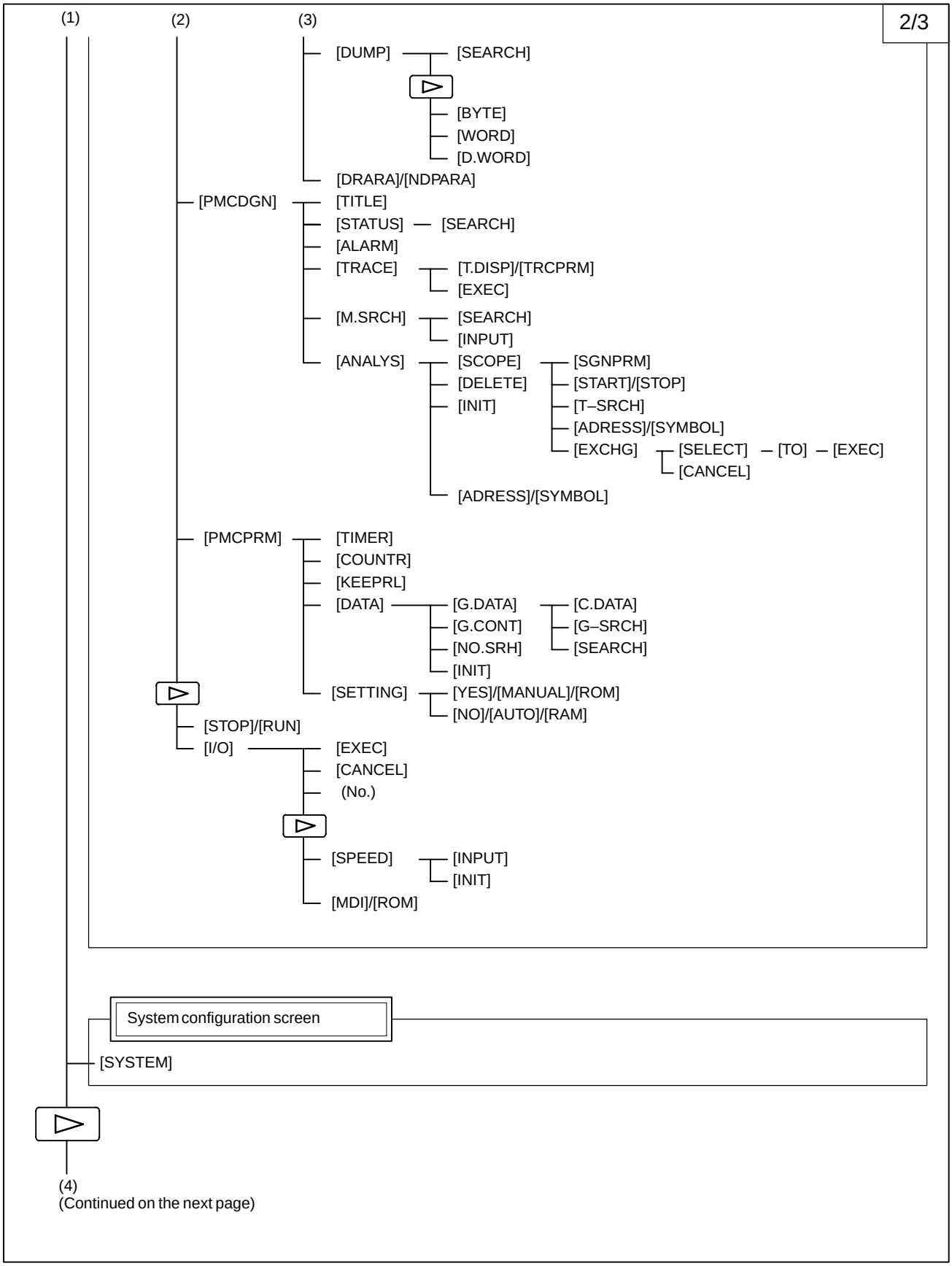
SYSTEM SCREEN

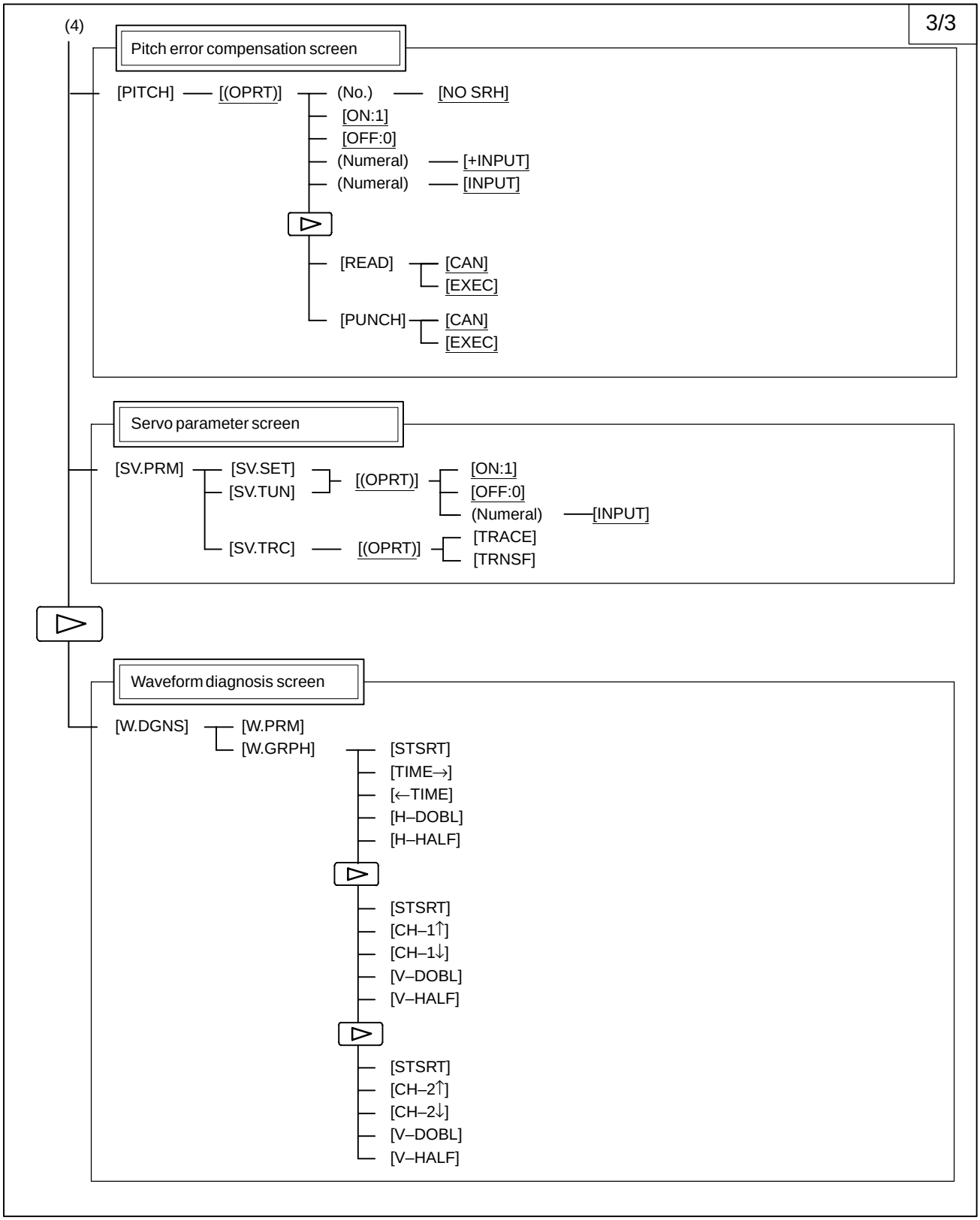
Soft key transition triggered by the function key SYSTEM

1/3

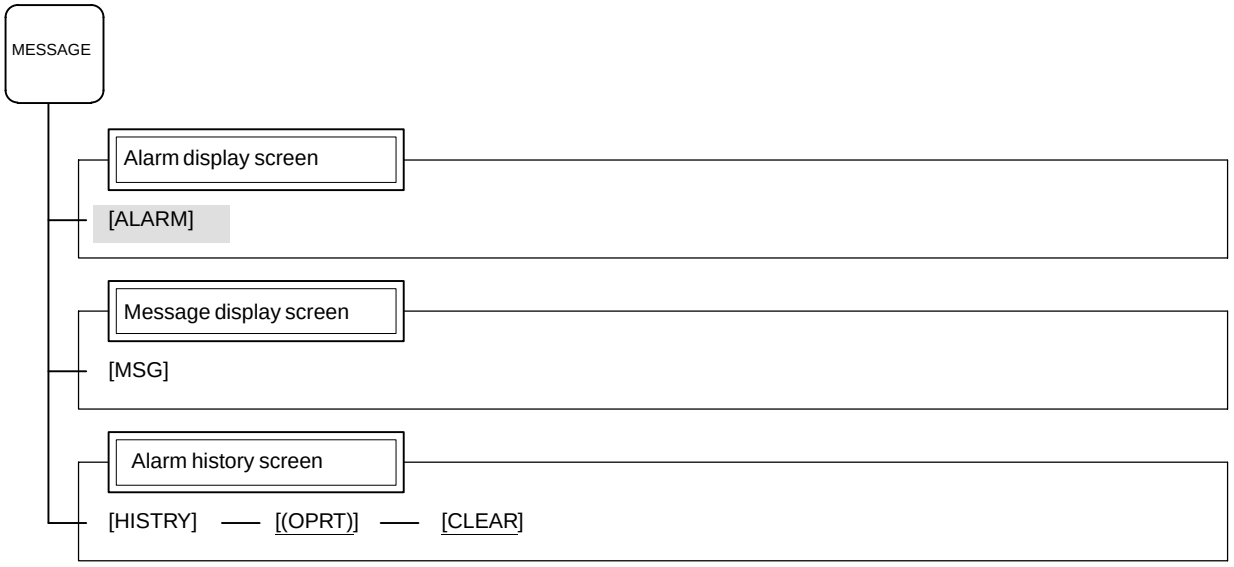


(Continued on the next page)

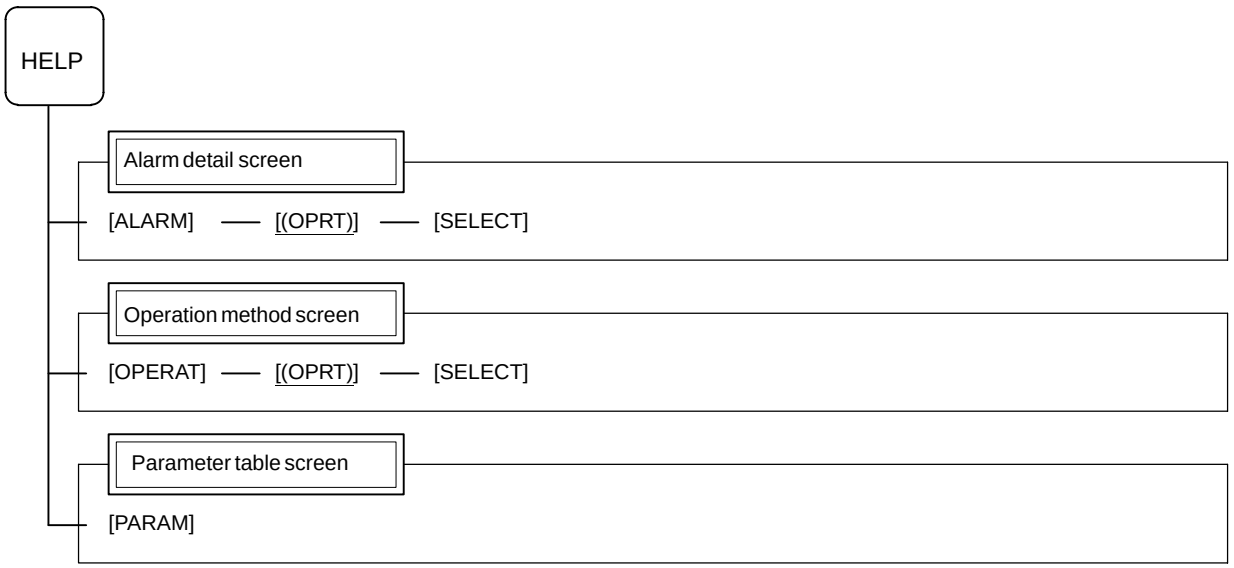

2/3
(1)
(2)
(3)
[DUMP]
[SEARCH]
[BYTE]
[WORD]
[D.WORD]
[DRARA]/[NDPARA]
[PMCDGN]
[TITLE]
[STATUS]
[SEARCH]
[ALARM]
[TRACE]
[T.DISP]/[TRCPRM]
[EXEC]
[M.SRCH]
[SEARCH]
[INPUT]
[ANALYS]
[SCOPE]
[SGNPRM]
[DELETE]
[START]/[STOP]
[INIT]
[T–SRCH]
[ADRESS]/[SYMBOL]
[EXCHG]
[SELECT]
[TO]
[EXEC]
[CANCEL]
[ADRESS]/[SYMBOL]
[PMCPRM]
[TIMER]
[COUNTR]
[KEEPRL]
[DATA]
[G.DATA]
[C.DATA]
[G.CONT]
[G–SRCH]
[NO.SRH]
[SEARCH]
[INIT]
[SETTING]
[YES]/[MANUAL]/[ROM]
[NO]/[AUTO]/[RAM]
[STOP]/[RUN]
[I/O]
[EXEC]
[CANCEL]
(No.)
[SPEED]
[INPUT]
[INIT]
[MDI]/[ROM]
System configuration screen
[SYSTEM]
(4)
(Continued on the next page)


3/3
(4)
Pitch error compensation screen
[PITCH]
[(OPRT)]
(No.)
[NO SRH]
[ON:1]
[OFF:0]
(Numeral)
[+INPUT]
(Numeral)
[INPUT]
[READ]
[CAN]
[EXEC]
[PUNCH]
[CAN]
[EXEC]
Servo parameter screen
[SV.PRM]
[SV.SET]
[SV.TUN]
[(OPRT)]
[ON:1]
[OFF:0]
(Numeral)
[INPUT]
[SV.TRC]
[(OPRT)]
[TRACE]
[TRNSF]
Waveform diagnosis screen
[W.DGNS]
[W.PRM]
[W.GRPH]
[STSRT]
[TIME→]
[←TIME]
[H–DOBL]
[H–HALF]
[STSRT]
[CH–1↑]
[CH–1↓]
[V–DOBL]
[V–HALF]
[STSRT]
[CH–2↑]
[CH–2↓]
[V–DOBL]
[V–HALF]

MESSAGE SCREEN Soft key transition triggered by the function key MESSAGE



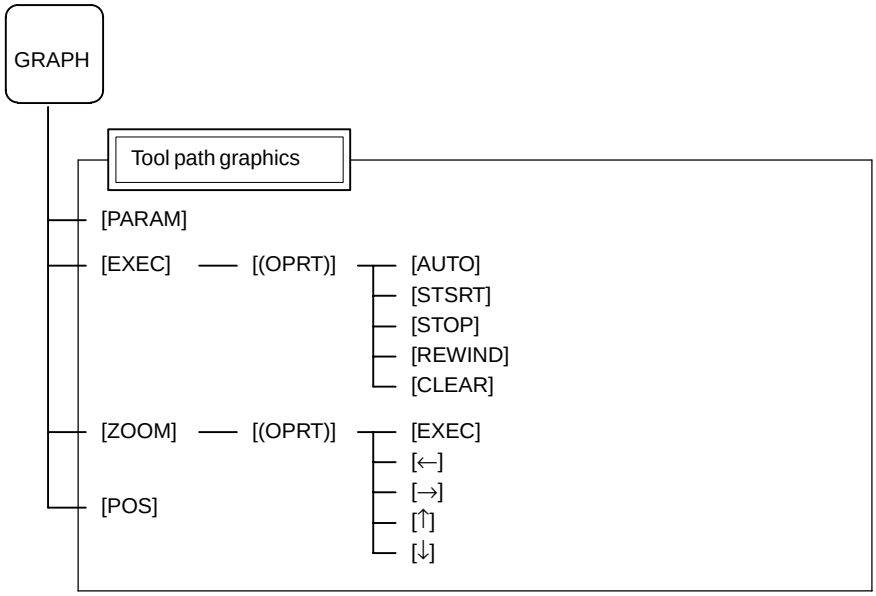
HELP SCREEN Soft key transition triggered by the function key HELP



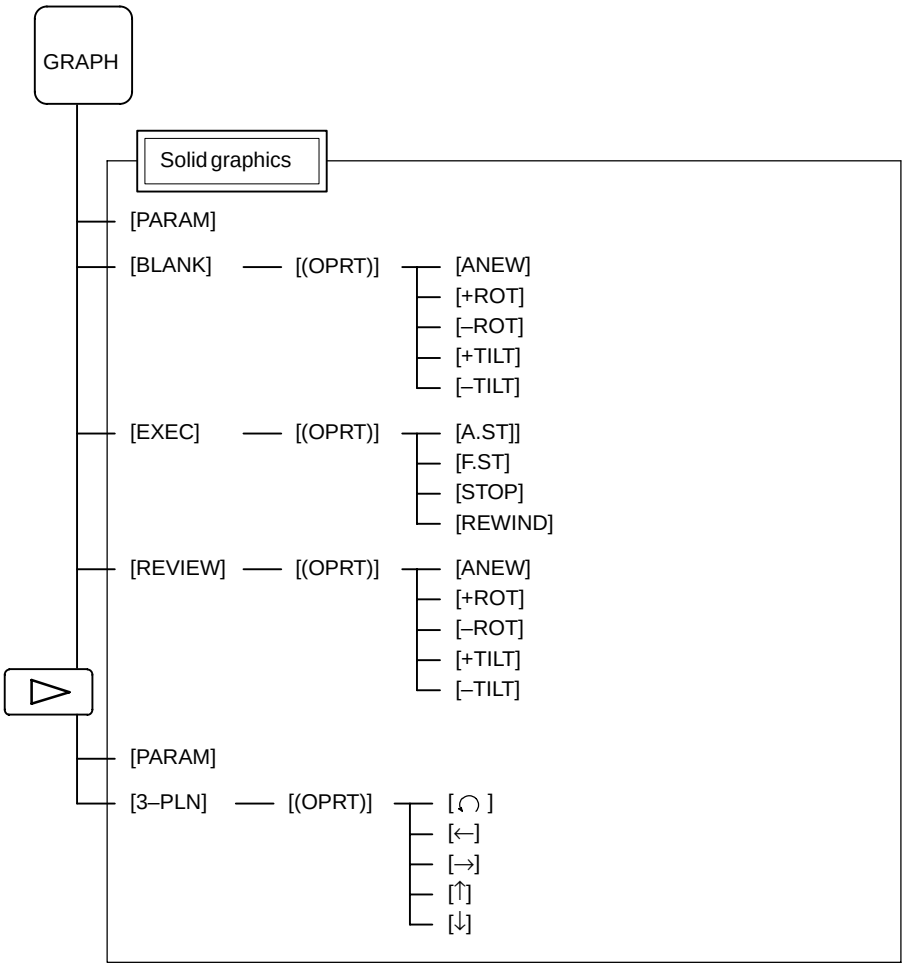
GRAPHIC SCREEN

Soft key transition triggered by the function key GRAPH

Tool path graphics



Solid graphics

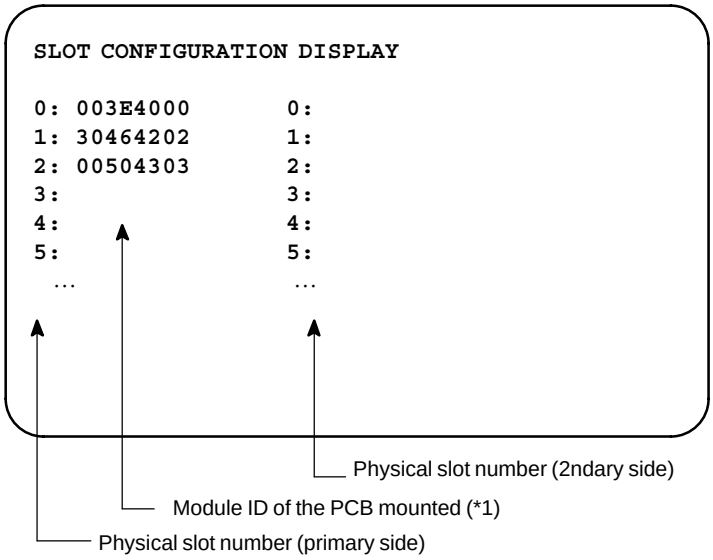


1.2 SCREEN DISPLAYED IMMEDIATELY AFTER POWER IS TURNED ON

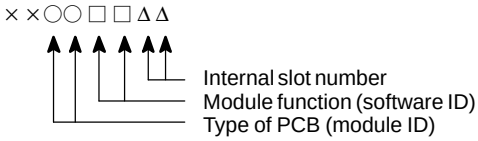
1.2.1 Slot Status Display

Types of PCBs mounted on the slots are displayed.
If a hardware trouble or an incorrect mounting is found, this screen is displayed.

- **Slot state screen**



*1) Module ID of PCB



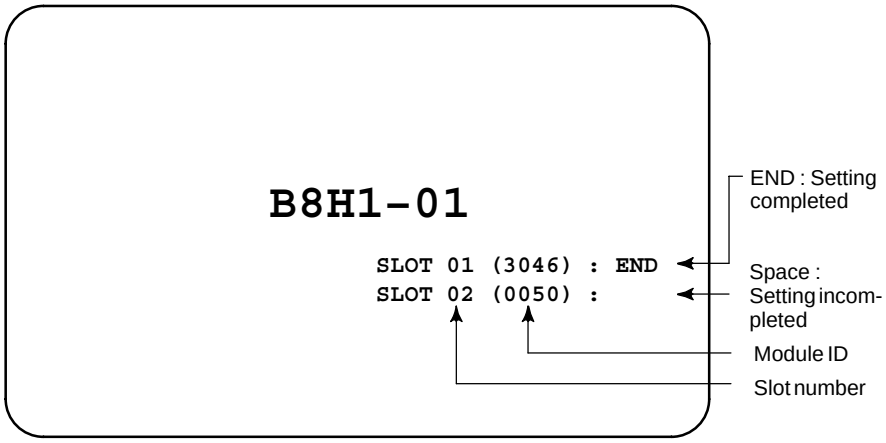
- **Module ID**

ID	Name
D5	Series 16*i* motherboard
CC	Series 160*i* motherboard
CD	Serial communication board: remote buffer/DNC2
	Serial communication board: DNC1
	C language board
CF	RISC board
A3	Data server board
9E	Analog Input board
AA	HSSB interface board
C9	PC function card
D3	Loader control board

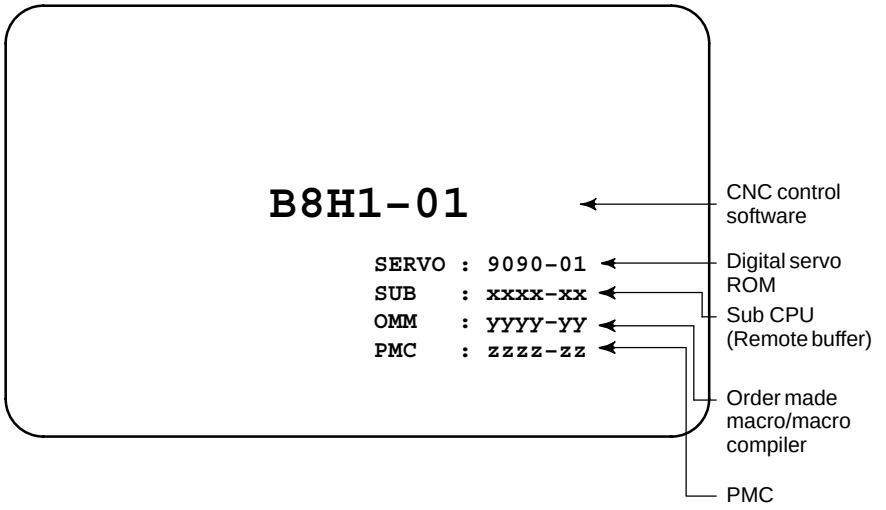
- **Software ID**

40 : Main CPU
41 : C language
4A : Remote buffer
53 : Loader control
59 : RISC board for high–precision contour control
5E : HSSB interface (with PC)
6F : Analog Input board

1.2.2 Setting Module Screen



1.2.3 Configuration Display of Software



1.3 SYSTEM CONFIGURATION SCREEN

After the system has been installed correctly, you can find the PCBs installed and the softwares integrated on the system configuration screen.

1.3.1 Display Method

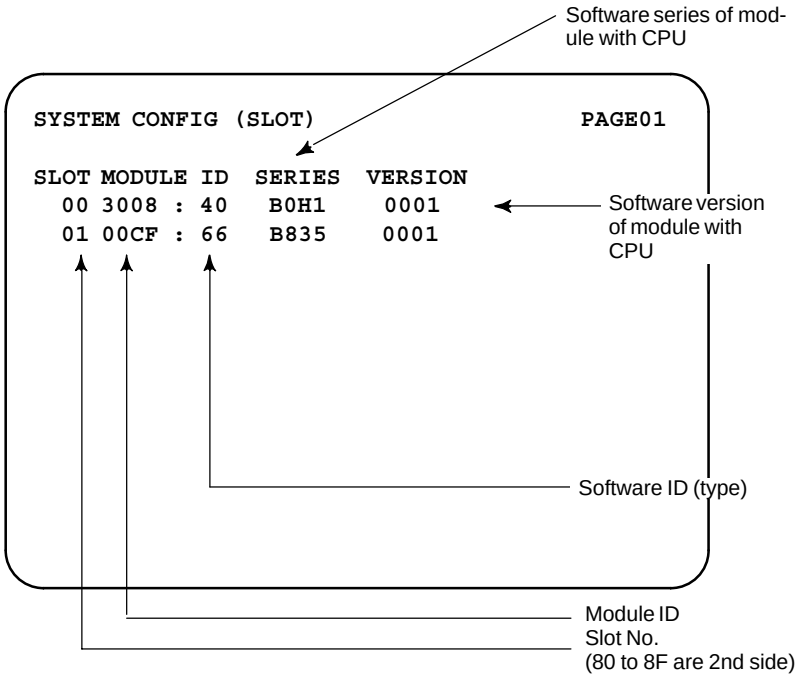
(1) Press SYSTEM key.

(2) Press soft key **[SYSTEM]**, then the system configuration screen is displayed.

(3) The system configuration screen is composed of three screens and each of them can be selected by the page key PAGE PAGE.

1.3.2 Configuration of PCBs

- **Screen**



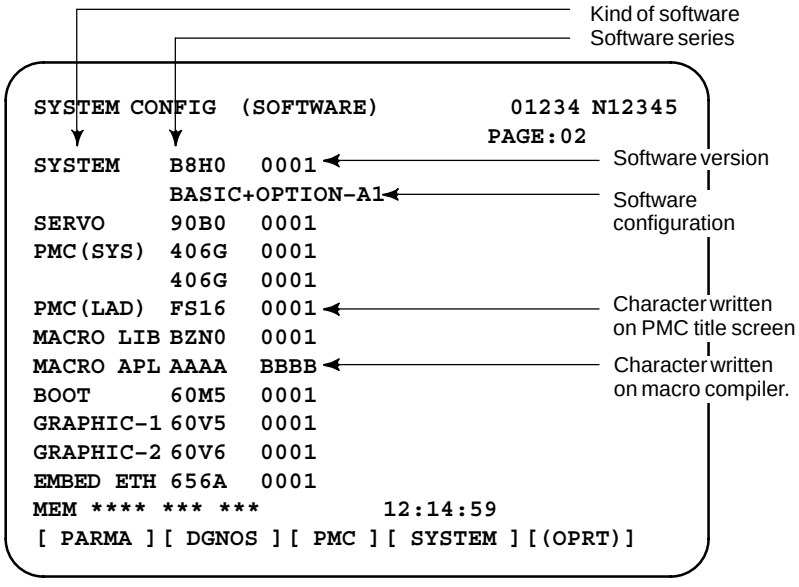
- **Module ID**

ID	Name
D5	Series 16*i* motherboard
CC	Series 160*i* motherboard
CD	Serial communication board: remote buffer/DNC2
	Serial communication board: DNC1
	C language board
CE	Sub–CPU board
CF	RISC board
A3	Data server board
D3	Loader control board
AA	HSSB interface board
C9	PC function card

- **Software ID**

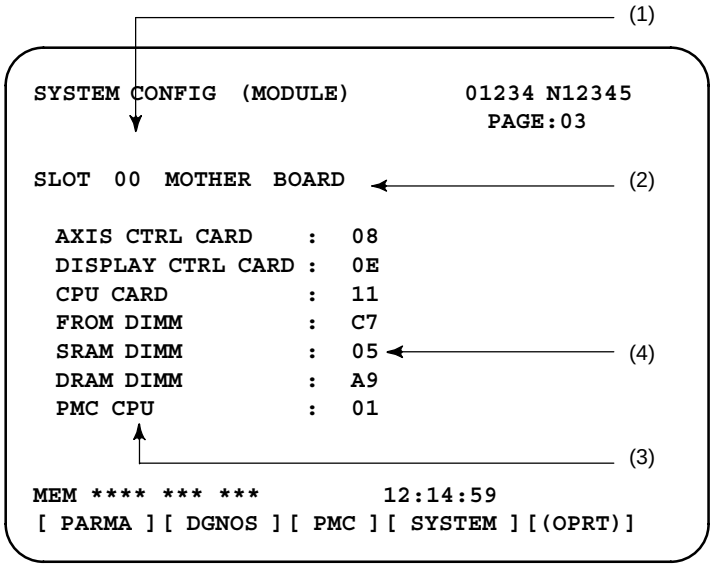
40 : Main CPU
41 : C language
43 : Sub CPU
4A : Remote buffer
53 : Loader control
59 : RISC board for high–precision contour control
5E : HSSB interface (with PC)

1.3.3 Software Configuration Screen



1.3.4 Module Configuration Screen

Configuration of the modules displayed on PCB.



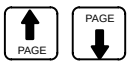
Contents of display

(1) Slot number (The number is corresponding to PCB configuration screen)

(2) Type of PCB mounted

(3) Name of card PCB or DIMM module

(4) Hardware ID of mounted card PCB or DIMM module
Refer to “Series 16*i*/18*i*/160*i*/180*i*–Model B Maintenance Manual (B–63525EN)” for correspondence with each hardware ID and drawing number.

Pressing the PAGE key  displays the system configuration screen of other PCBs.

1.4 ALARM SCREEN

1.4.1 Alarm History Screen

Alarms generated in the NC are recorded. The latest 50 alarms generated are recorded. The 51st and former alarms are deleted.

1.4.1.1 Screen Display

(1) Press MESSAGE key .

(2) Press soft key **[HISTRY]** and an alarm history screen is displayed.

(3) Other pages are displayed by PAGE ↑ or PAGE ↓ key.

```
ALARM HISTORY                          O1234 N12345

97/04/18 20:56:26
 506 OVERTRAVEL :  +X
97/04/18 19:58:11
 000 TURN OFF POWER
97/04/18 19:52:45
 000 TURN OFF POWER
97/04/18 19:48:43
 300 APC ALARM  : X-AXIS ZERO RETURN REQUEST
97/04/18 18:10:10
 507 OVERTRAVEL :  +B



[ ALARM ][ MSG ][ HISTRY ][       ][(OPRT)]
```

1.4.1.2 Clearing Alarm History

(1) Press soft key **[(OPRT)]**.

(2) Press soft key **[(CLEAR]**, then the alarm history is cleared.

1.4.1.3 Alarm Display

When an external alarm (No. 1000 to 1999) or a macro alarm (No. 3000 to 3999) is output, the alarm history function can record both the alarm number and message if so specified in the following parameter. If recording of the message is not set or if no message is input, only an external alarm or macro alarm is displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3112					EAH			

[Data type] Bit

#3 (EAH) The alarm history function:

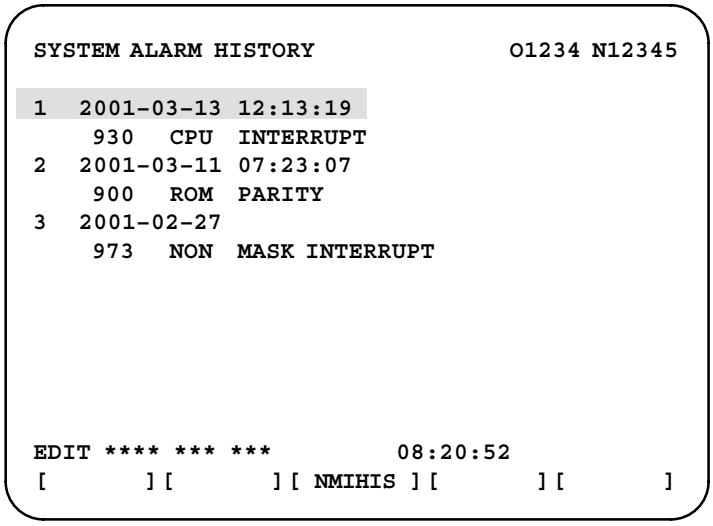
0 : Does not record the messages output with external alarms or macro alarms.

1 : Records the messages output with external alarms or macro alarms.

1.4.2 System Alarm History

1.4.2.1 General

Up to three system alarms issued in the past are stored, and information about those alarms can be displayed on the system alarm history screen.



1.4.2.2 System alarm history screen (history list screen)

By setting bit 2 (NMH) of parameter No. 3103 to 1, information about up to three system alarms including the latest system alarm can be displayed. The latest system alarm information is displayed at the top of the list, and a lower item in the list indicates older system alarm information.

Procedure

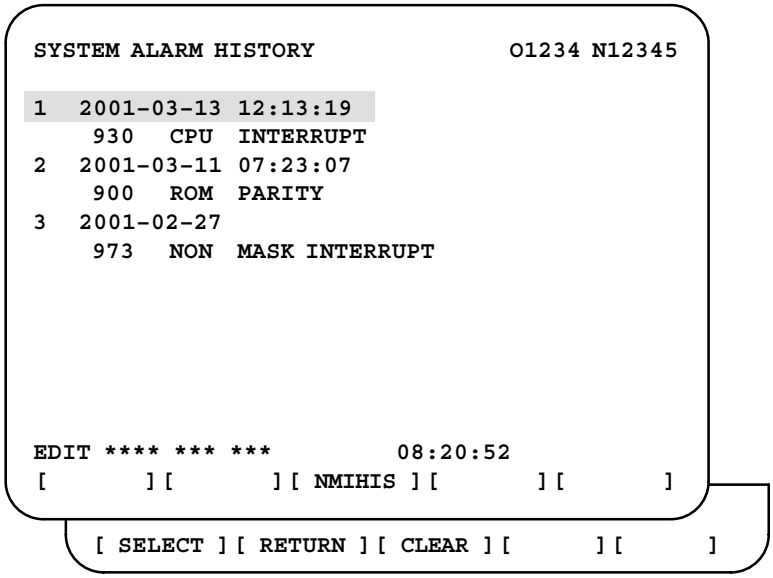
1 Set bit 2 (NMH) of parameter No. 3103 to 1.

2 Press the function key <MESSAGE>.

3 Press the [NMIHIS] chapter selection soft key.

The following information is displayed:

1. System alarm occurrence date and time
2. System alarm number
3. System alarm message (No message is displayed for some system alarms.)



[SELECT] soft key

This soft key displays the details of a system alarm.

Procedure

1 Press the [(OPRT)] soft key on the system configuration screen.

2 By using the cursor keys PAGE ↑ PAGE ↓, move the cursor to the system alarm number whose details are to be displayed.

3 Press the [SELECT] soft key.

4 The details of the selected system alarm are displayed.

[CLEAR] soft key

This soft key clears all system alarm information stored.

When bit 4 (OPC) of parameter No. 3110 is set to 1, this soft key is displayed. When bit 4 (OPC) of parameter No. 3110 is set to 0, this soft key is not displayed.

Procedure

1 Set bit 4 (OPC) of parameter No. 3110 to 1.

2 Press the [(OPRT)] soft key on the system configuration screen.

3 Press the [CLEAR] soft key.

4 Information about all of the three system alarms stored is cleared.

[RETURN] soft key

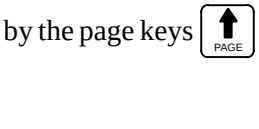
Pressing the [RETURN] soft key while system alarm history screen (detail screen) is displayed returns the screen display to the system alarm list screen.

1.4.2.3 System alarm history screen (detail screen)

The system alarm history screen (detail screen) displays information items such as registers and stacks involved when a system alarm is issued.

The following items are displayed:

1. System alarm occurrence date and time
2. System alarm number
3. System alarm message (No message is displayed for some system alarms.)
4. System alarm occurrence series and edition
5. Number of display pages
6. General–purpose resistor, pointer index register, segment register, task register, LDT register, flag register, interrupt source, error code, error address
7. Contents of stacks (up to 32 stacks)
8. Contents of stacks of privilege level 3 (up to 48 stacks)
9. NMI information

You can switch among the information items 6 to 9 by the page keys 

.

Pressing the [RETURN] soft key returns the screen display to the state alarm history list screen.

```
SYSTEM ALARM HISTORY                O1234 N12345

2  2001-03-11 07:23:07       B8H1-01(1/4)
   973 NON MASK INTERRUPT
EAX       EBX       ECX       EDX
00000000  00930063  000003E0  00000040
ESI       EDI       EBP       ESP
00000010  009404E0  0000FFB4  0000FFDC
SS   DS   ES   FS   GS   TR   LDTR
06D8 0338 0248 0440 0338 0628 0028
EFLAGS    VECT      ERRC      ERROR-ADDRESS
00003046  FFFF      0000      03E0:000009BC


EDIT **** *** ***          08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 1)

```
SYSTEM ALARM HISTORY              O1234 N12345

2  2001-03-11 07:23:07      B8H1-01(2/4)
   973 NON MASK INTERRUPT

STACK  (PL0)
3646 0338 7CBA 0001 0958 FFF8 0068 0063
0346 0000 0000 02BC 08F8 52F1 2438 0338
0580 0440 0580 001F 03C0 0214 0780 0FFF
0000 0000 0000 0000 0000 0000 0000 0000



EDIT **** *** ***         08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 2)

```
SYSTEM ALARM HISTORY              O1234 N12345

2  2001-03-11 07:23:07      B8H1-01(3/4)
   973 NON MASK INTERRUPT
  STACK!(PL3)
SS:ESP3 =0804:00007C50
CS:EIP =1350:00001234
  1008 1408 0001 0002 0003 0004 1008 FFE4
  1008 3678 00FA 0024 0000 0000 0000 0000
  0000 0000 0000 0000 0000 0000 0000 0000
  0000 0000 0000 0000 0000 0000 0000 0000
  0000 0000 0000 0000 0000 0000 0000 0000
  0000 0000 0000 0000 0000 0000 0000 0000

EDIT **** *** ***         08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 3)

```
SYSTEM ALARM HISTORY              O1234 N12345

2  2001-03-11 07:23:07      B8H1-01(4/4)
   973 NON MASK INTERRUPT
NMIC
00000000  00000000  00000000  00000000
SVL
11111111  11111111
SVR
11111111  11111111  11111111  11111111
11111111  11111111  11111111  11111111
ADRS
007F0000

EDIT **** *** ***         08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 4)

CAUTION
1 In the case of an NMI on other than the main board, the registers of detail display screen 1, and the contents of detail display screen 2 and detail display screen 3 are displayed.

```
SYSTEM ALARM HISTORY                O1234 N12345

2  2001-03-11 07:23:07       B8H1-01(1/1)
   972 NMI OCUURRED IN OTHER MODULE

SLOT> 02        0080415F
       <1>          <2>




EDIT **** *** ***          08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 5)

<1> NMI occurrence slot number

<2> Message address set with the NMI occurrence slot (string address)

```
SYSTEM ALARM HISTORY                O1234 N12345

2  2001-03-11 07:23:07       B8H1-01(1/1)
   900 ROM PARITY

00000000     00000000
                  <1>




EDIT **** *** ***          08:20:52
[ SELECT ][ RETURN ][ CLEAR ][      ][      ]
```

(Detail display screen 6)

<1> ROM parity cause

Basic ROM	2F(h)
(800000A97FFFF)	
Additional ROM	40(h)
(A00000AA3FFFF)	
OMM ROM	80(h)
Servo ROM	100(h)
Built in MMC ROM	200(h)
Online Custom Screen	400(h)

1.4.2.4 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
3103						NMH		

[Data type] Bit

NMH The system alarm history screen is:

0 : Not displayed.
1 : Displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
3110				OPC				

[Data type] Bit

OPC On the operation history screen, the [CLEAR] soft key is:

0 : Not enabled.
1 : Enabled.

1.5 EXTERNAL OPERATOR MESSAGES RECORD

This function enables the saving of external operator messages as a record.
The record can be viewed on the external operator message history screen.

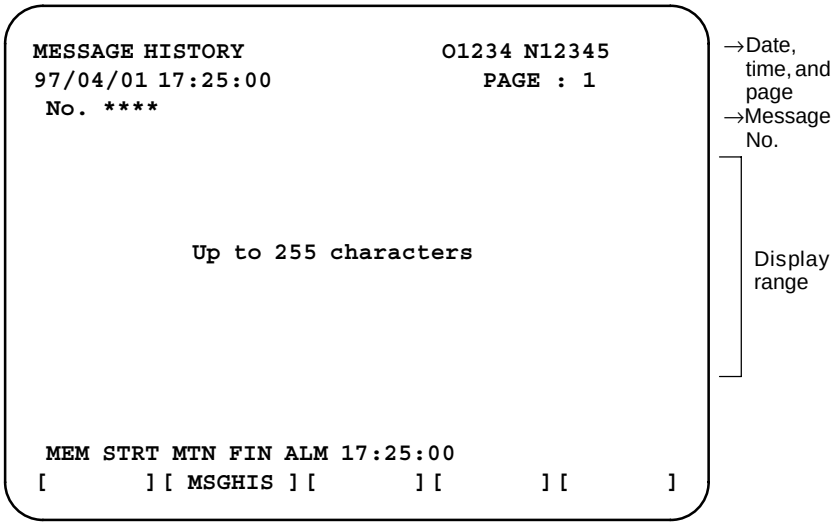
1.5.1 Screen Display

(1) Press the MESSAGE function key.

(2) Press the rightmost soft key ▷.

(3) Press the **[MSGHIS]** soft key.

(4) To display the previous or subsequent screen, press the PAGE ↑ or PAGE ↓ key.



1.5.2 Deletion of External Operator Messages Record

(1) The recorded external operator message can be deleted by setting the MMC bit (bit 0 of parameter 3113) to 1.
Pressing the **[CLEAR]** soft key erases all the records of the external operator message.

(2) The MS1 and MS0 bits (bits 7 and 6 of parameter 3113) specify the number of records to be displayed on the external operator message history screen. When the bits are changed, all external operator message records retained up to that point are erased.

1.5.3 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
3113	MS1	MS0						MHC

#0 (MHC) The records of an external operator message:

0 : Cannot be erased.
1 : Can be erased.

#6, #7 (MS0, MS1) These bits set the number of characters to be retained in each record of an external operator message, as well as the number of records, as shown in the following table:

MS1	MS0	Number of characters in each record	Number of records
0	0	255	8
0	1	200	10
1	0	100	18
1	1	50	32

* An external operator message of up to 255 characters can be specified. Combining the MS1 bit and MS0 bit (bits 7 and 6 of parameter No. 3113) selects the number of records by limiting the number of characters to be retained as the record of an external operator message.

	#7	#6	#5	#4	#3	#2	#1	#0
3112						OMH		

#2 (OMH) The external operator message history screen is:

0 : Not displayed.
1 : Displayed.

NOTE
After setting this parameter, briefly turn the power off, then on again.

1.5.4 Notes

When the number of an external operator message is specified, the system starts updating the records of the specified message. The system continues to perform update until another external operator message is specified or until an instruction to delete the records of the external operator message is specified.

1.6 OPERATION HISTORY

This function displays the key and signal operations performed by the operator upon the occurrence of a fault or the output of an alarm, together with the corresponding alarms.
This function records the following data:

(1) MDI key operations performed by the operator

(2) Status changes (ON/OFF) of input and output signals (selected signals only)

(3) Details of alarms

(4) Time stamp (date and time)

1.6.1 Parameter Setting

	#7	#6	#5	#4	#3	#2	#1	#0
3106	OHS			OPH				

[Data type] Bit

#4 (OPH) The operation history screen is:

0 : Not displayed.
1 : Displayed.

#7 (OHS) The operation history is:

0 : Sampled.
1 : Not sampled.

3122	Interval at which the clock time is recorded in the operation history

[Data type] Word

[Units of data] Minutes

[Valid data range] 0 to 1439

The clock time is recorded to the operation history at specified intervals. If zero is set as the interval, ten minutes is assumed. The time is recorded only when data is recorded within the corresponding interval.

1.6.2 Screen Display

- **Displaying the operation history**

(1) Press the SYSTEM function key.

(2) Press the continue menu key [▷]. The **[OPEHIS] [(OPRT)]** soft key are displayed.

(3) Press the **[OPEHIS]** soft key twice. The operation history screen is displayed.

```
OPERATION HISTORY                    O1234 N12345
                                       Page : 123
 No. DATA        No. DATA        No. DATA
  01 97/06/03    11 F0000.7↑     21 F0001.0↓
  02 08:40:00    12 F0000.5↑     22 <POS>
  03 <DELETE>    13 F0001.0↑     23 <PROG>
  04 F0000.6↑    14 F0000.5↓     24 <RESET>
  05 MEM         15 P/S0010      25 EDIT
  06 G0009.0↑    16 97/06/03     26 O
  07 G0009.1↑    17 09:27:49     27 1
  08 G0009.2↑    18 <PROG>       28 2
  09 ST↑         19 <RESET>      29 3
  10 ST↓         20 F0000.7↓     30 4

EDIT ****   ***  ***             08:20:52
[  TOP  ][ BOTTOM ][       ][      ][PG.SRH]
```

On the operation history screen, the soft keys are configured as shown below:

⇒ [▷] [PARAM] [DGNOS] [PMC] [SYSTEM] [(OPE)] [▷]
⇓push
[◁] [W.DGNS] [ ] [ ] [OPEHIS] [(OPE)] [▷]
⇓ push
[◁] [OPEHIS] [SG–SEL] [ ] [ ] [(OPE)] [▷]
⇓push
[◁] [TOP] [BOTTOM] [ ] [ ] [PG.SRH] [▷]

(4) To display the next part of the operation history, press the page down key PAGE ⇓. The next page is displayed.

To display the interface between two pages, press cursor key → or ←. The screen is scrolled by one row. On a 14–inch CRT screen, pressing the cursor key scrolls the screen by half a page.

These soft keys can also be used:

1) Pressing the **[TOP]** soft key displays the first page (oldest data).
2) Pressing the **[BOTTOM]** soft key displays the last page (latest data).
3) Pressing the **[PG.SRH]** soft key displays a specified page.

Example) By entering 50 then pressing the **[PG.SRH]** key, page 50 is displayed.

Data displayed on the operation history screen

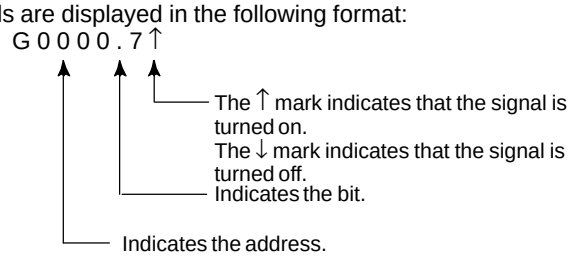
(1) MDI keys

Address and numeric keys are displayed after a single space.
Soft keys are displayed in square brackets ([]).
Other keys (RESET/INPUT, for example) are displayed in angle brackets (<>).
A key pressed at power–on is displayed in reverse video.
For two–path control, the operations of path 2 are displayed in the same way, but preceded by S_.

1) Function key: [POS], [PROG], [OFFSET SETTING], etc.
2) Address/numeric key: A to Z, 0 to 9, ; (EOB), +, –, (, etc.
3) Page/cursor key: [PAGE↑], [↓], [←]
4) Soft key: [SF1], [SF2], etc.
5) Other key: [RESET], [CAN], etc.
6) Key pressed at power–on: [RESET]

(2) Input and output signals

General signals are displayed in the following format:



Some signals are indicated by their symbol names.

SBK ↑ (Indicates that the single block switch is turned on.)

Mode selection signals and rapid traverse override signals are displayed as indicated below:

Input signal					Name displayed
MD1	MD2	MD4	REF	DNC1	
0	0	0	0	0	MDI
1	0	0	0	0	MEM
1	0	0	0	1	RMT
0	1	0	0	0	NOMODE
1	1	0	0	0	EDT
0	0	1	0	0	H/INC
1	0	1	0	0	JOG
1	0	1	1	0	REF
0	1	1	0	0	TJOG
1	1	1	0	0	THND

Input signal		Name displayed
ROV1	ROV2	
0	0	R 100%
1	0	R 50%
0	1	R 25%
1	1	R F0%

(3) NC alarms

NC alarms are displayed in reverse video.
P/S alarms, system alarms, and external alarms are displayed together with their numbers.
For other types of alarms, only the alarm type is displayed. (No details are displayed.)

(4) Time stamp (date and time)

The following time data (date and time) is recorded:

1) Date and time of power–on
2) Date and time of power–off
3) Date and time when an NC alarm occurs
4) The clock time is recorded at predetermined intervals, together with each new calendar day.

1) The power–on time is displayed as shown below:
   97/01/20 ==== Year/Month/Day
   09:15:30 ==== Hour:Minute:Second
2) The power–off time and the time when an NC alarm occurred are displayed in reverse video.
   97/01/20 ==== Year/Month/Day
   09:15:30 ==== Hour:Minute:Second
   If a system alarm occurs, the date and time are not recorded.
3) At predetermined intervals, the clock time is displayed in reverse video. Set the interval in minutes in parameter No. 3122. If zero is set, the time is stamped at ten–minute intervals.
   09:15:30 ==== Hour:Minute:Second
   Each new calendar day is displayed in reverse video.
   97/01/20 ==== Year/Month/Day

CAUTION
The clock time is recorded for a specified interval only when data is stored within that interval.

- **Input signal or output signal to be recorded in the operation history**

(1) Press the SYSTEM function key.

(2) Press the continuous menu key [▷]. The **[OPEHIS]** (operation history) soft key is displayed.

(3) Press the **[OPEHIS]** soft key, then press the **[SG–SEL]** soft key. The operation history signal selection screen is displayed.

```
OP_HIS SIGNAL SELECT                O1000 N02000

 No.  ADDRES  SIGNAL    No.  ADDRES  SIGNAL
 01   X0000   00001000  11   G0000   00000001
 02   X0004   10000000  12   G0004   00000011
 03   X0008   00001100  13   G0008   00000111
 04   X0009   00111000  14   G0003   00001111
 05   X0012   00001111  15   G0043   01100000
 06   Y0000   01000000  16           ********
 07   Y0004   00110000  17           ********
 08   Y0007   00011100  18           ********
 09   Y0008   00011100  19           ********
 10   Y0010   00011100  20           ********
 >
   EDIT  **** *** * * *   00:00:00
[OPEHIS] [SG-SEL] [      ] [      ] [ (OPE) ]
```

1.6.3 Setting the Input Signal or Output Signal to be Recorded in the Operation History

(1) On the operation history signal selection screen, press the **[(OPE)]** soft key.

```
OP_HIS SIGNAL SELECT              O1000 N02000

 No.  ADDRES SIGNAL    No.  ADDRES SIGNAL
 01   G0004  00000010  11          ********
 02          ********  12          ********
 03          ********  13          ********
 04          ********  14          ********
 05          ********  15          ********
 06          ********  16          ********
 07          ********  17          ********
 08          ********  18          ********
 09          ********  19          ********
 10          ********  20          ********
 >
   EDIT **** *** *** *** 00:00:00
[ ALLDEL ][ DELETE ][ ON:1 ][ OFF:0 ][       ]
```

(2) Press the cursor key ↑ or ↓ to position the cursor to a desired position.

(3) Key in a signal type (X, G, F, or Y) and an address, then press the INPUT key.

Example) G0004 INPUT

Signal address G0004 is set in the ADDRES column. The corresponding position in the SIGNAL column is initialized to 000000000.

(4) Select the bit to be recorded.

To select all bits of the specified signal address, press the **[ON:1]** soft key while the cursor is positioned to 00000000 .

To select a particular bit, position the cursor to that bit by pressing the cursor key ← or →, then press the **[ON:1]** soft key. To cancel a selection made by pressing the **[ON:1]** soft key or to cancel a previously selected signal, press the **[OFF:0]** soft key.

(5) Up to 20 addresses can be specified by means of this signal selection. These addresses need not always be specified at consecutive positions, starting from No.1.

(6) Pressing the **[ALLDEL]** and **[EXEC]** soft keys deletes all data. If the **[ALLDEL]** key is pressed by mistake, it can be cancelled by pressing the **[CAN]** key.

(7) To delete a selected signal address, position the cursor to the corresponding position then press the **[DELETE]** and **[EXEC]** soft keys. In the SIGNAL column, asterisks ******** are displayed in place of the deleted data. In the ADDRES column, the corresponding position is cleared.
If the **[DELET]** key is pressed by mistake, it can be cancelled by pressing the **[CAN]** key.

(8) Pressing the return menu key [◁] causes the **[OPEHIS]** (OPE) soft key to be displayed again.

- **Input signals and output signals to be recorded in the history**

NOTE
1 A cross (×) indicates that a signal will not be recorded. Also, any signal for which an address is not specified will not be recorded, either.
2 A circle (○) indicates that a signal can be recorded.
3 A signal indicated by its symbol name will also be displayed by its symbol name.

1. addresses

MT→PMC

	#7	#6	#5	#4	#3	#2	#1	#0
X000	○	○	○	○	○	○	○	○
⌇								
X127	○	○	○	○	○	○	○	○

PMC→CNC

	#7	#6	#5	#4	#3	#2	#1	#0
G000	○	○	○	○	○	○	○	○
⌇								
G003	○	○	○	○	○	○	○	○
G004	○	○	○	○	FIN	○	○	○
G005	○	○	○	○	TFIN	SFIN	○	MFIN
G006	○	○	○	○	○	*ABS	○	SRN
G007	RLSOT	EXLM	*FLUP	○	○	ST	STLK	○
G008	ERS	RRW	*SP	*ESP	○	○	○	*IT
G009	○	○	○	○	○	○	○	○
⌇								
G013	○	○	○	○	○	○	○	○
G014	○	○	○	○	○	○	○	○
G015	○	○	○	○	○	○	○	○
⌇								
G018	○	○	○	○	○	○	○	○
G019	RT	○	○	○	○	○	○	○
G020	○	○	○	○	○	○	○	○
⌇								
G042	○	○	○	○	○	○	○	○

	#7	#6	#5	#4	#3	#2	#1	#0
G043	○	×	○	×	×	○	○	○
G044	○	○	○	○	○	○	MLK	BDT1
G045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
G046	DRN	KEY4	KEY3	KEY2	KEY1	○	SBK	○
G047	○	○	○	○	○	○	○	○
⋮								
G060	○	○	○	○	○	○	○	○
G061	○	○	○	○	○	○	○	RGTA
G062	○	○	○	○	○	○	○	○
⋮								
G099	○	○	○	○	○	○	○	○
G100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G101	○	○	○	○	○	○	○	○
G102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1
G103	○	○	○	○	○	○	○	○
⋮								
G105	○	○	○	○	○	○	○	○
G106	MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1
G107	○	○	○	○	○	○	○	○
G108	MLK8	MLK7	MLK6	MLK5	MLK4	MLK3	MLK2	MLK1
G109	○	○	○	○	○	○	○	○
G110	+LM8	+LM7	+LM6	+LM5	+LM4	+LM3	+LM2	+LM1
G111	○	○	○	○	○	○	○	○
G112	–LM8	–LM7	–LM6	–LM5	–LM4	–LM3	–LM2	–LM1
G113	○	○	○	○	○	○	○	○
G114	*+L8	*+L7	*+L6	*+L5	*+L4	*+L3	*+L2	*+L1
G115	○	○	○	○	○	○	○	○
G116	*–L8	*–L7	*–L6	*–L5	*–L4	*–L3	*–L2	*–L1

	#7	#6	#5	#4	#3	#2	#1	#0
G117	○	○	○	○	○	○	○	○
G118	*+ED8	*+ED7	*+ED6	*+ED5	*+ED4	*+ED3	*+ED2	*+ED1
G119	○	○	○	○	○	○	○	○
G120	*–ED8	*–ED7	*–ED6	*–ED5	*–ED4	*–ED3	*–ED2	*–ED1
G121	○	○	○	○	○	○	○	○
⋮								
G125	○	○	○	○	○	○	○	○
G126	SVF8	SVF7	SVF6	SVF5	SVF4	SVF3	SVF2	SVF1
G127	○	○	○	○	○	○	○	○
⋮								
G129	○	○	○	○	○	○	○	○
G130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1
G131	○	○	○	○	○	○	○	○
G132	○	○	○	○	+MIT4	+MIT3	+MIT2	+MIT1
G133	○	○	○	○	○	○	○	○
G134	○	○	○	○	–MIT4	–MIT3	–MIT2	–MIT1
G135	○	○	○	○	○	○	○	○
⋮								
G255	○	○	○	○	○	○	○	○

PMC→MT

	#7	#6	#5	#4	#3	#2	#1	#0
Y000	○	○	○	○	○	○	○	○
⋮								
Y127	○	○	○	○	○	○	○	○

CNC→PMC

	#7	#6	#5	#4	#3	#2	#1	#0
F000	○	○	○	○	○	○	○	○
⋮								
F255	○	○	○	○	○	○	○	○

1.6.4 Inputting and Outputting the Operation History Data

Recorded data can be output to an input/output unit connected via a reader/punch interface. An output record can be input from the input/output unit.
Set the input/output unit to be used in setting parameters No. 0020 and 0100 to 0135.
To output the data, set a code in the ISO bit of a setting parameter (bit 1 of parameter No. 0020).

- **Output**

(1) Select EDIT mode.

(2) Press the [SYSTEM] key, then select the operation history display screen.

(3) Press the soft keys **[(OPRT)]**, [▷], **[PUNCH]**, and **[EXEC]** in this order.

The data output to the FANUC Floppy Cassette or FANUC FA Card is stored under file name OPERATION HISTORY.

- **Input**

(1) Select EDIT mode.

(2) Press the [SYSTEM] key, then select the operation history display screen.

(3) Press the soft keys **[(OPRT)]**, [▷], **[READ]**, and **[EXEC]** in this order.

- **Output data format**

1. MDI/soft key
2. Signal
3. Alarm
4. For extension (date or time)

The header and recorded operation data are output, in this order. The operation history data is divided into four parts by identifier words. Data other than the identifier words depends on the type.

T(identifier word)

T0	:	Header
T50	:	MDI/soft key
T51	:	Signal
T52	:	Alarm
T53	:	For extension (date or time)

1) Header

T	0	C	O	P	E	R	A	T	I	O	N	

		H	I	S	T	O	R	Y	;	

C: Data word

2) MDI/soft key

T	5	0	P	0 to 1	H	*	*	;	

P0: Usually
P1: At power–on
H **: Key code (See the page 39.)

3) Signal

T	5	1	P	0 to 6	N	0 to 255	H	*	*	,	*	*	;	

New data Old data

P0: X0000 and above
P2: G0000 and above
P4: Y0000 and above
P6: F0000 and above
N***: DI/DO number
H **: Signal information data (hexadecimal)

4) Alarm

T	5	2	P	0 to 10	N	*	*	*	*	;

P0: P/S No. 100
P1: P/S No. 000
P2: P/S No. 101
P3: P/S No. 0001 to 254
P4: Overtravel alarm
P5: Overheat alarm
P6: Servo alarm
P7: System alarm
P8: APC alarm
P9: Spindle alarm
P10: P/S alarm No. 5000 to 5999
P15: External alarm
N****: Alarm number (for P/S alarm, system alarm, and external alarm only)

5) For extension (date or time)

Date

T	5	3	P	0 to 1	E	0	D	*	*	*	*	*	*	*	*	;

Time

T	5	3	P	0 to 1	E	1	D	*	*	*	*	*	*	;

P0: Usually
P1: At power–on
E0: Date
E1: Time
D*..*: Data Example) October 29, 1997

D	1	9	9	7	1	0	2	9

Key codes (MDI/soft key)
(00H to 7FH)

	0	1	2	3	4	5	6	7
0			Space	0	@	P		
1			!	1	A	Q		
2			”	2	B	R		
3			#	3	C	S		
4			$	4	D	T		
5			%	5	E	U		
6			&	6	F	V		
7			’	7	G	W		
8			(	8	H	X		
9			)	9	I	Y		
A	; (EOB)		*	:	J	Z		
B			+		K	[		
C			’	<	L	¥		
D			–	=	M	]		
E			.	>	N			
F			/	?	O	–		

(80H to FFH)

	8	9	A	B	C	D	E	F
0		Reset *						F0 *
1		MMC *						F1 *
2		CNC *						F2 *
3								F3 *
4	Shift	Insert *						F4 *
5		Delete *						F5 *
6	CAN	Alter *						F6 *
7								F7 *
8	Cur→ *	Input *					POS *	F8 *
9	Cur← *						PROG *	F9 *
A	Cur↓ *	Help *					OFFSET SETTING *	
B	Cur↑ *						SYSTEM *	
C							MESSAGE *	
D							CUSTOM GRAPH *1*	
E	Page↓ *						CUSTOM *	FR *
F	Page↑ *						Fapt *	FL *

*1:On the small–sized keypad, ED corresponds to the [CUSTOM GRAPH] key. On a standard keyboard, ED corresponds to the [GRAPH] key and EE to the [CUSTOM] key.

* : Command key

1.6.5 Notes

(1) While the operation history screen is displayed, no information can be recorded to the history.

(2) An input signal having an on/off width of up to 16 msec is not recorded in the history. Some signals are not recorded in the history.

(3) Once the storage becomes full, old data is deleted, starting from the oldest record. Up to about 8000 key information items can be recorded.

(4) The recorded data is retained even after the power is turned off. A memory all clear operation, however, erases the recorded data.

(5) The operation history function cannot execute sampling when the OHS bit (bit 7 of parameter No. 3106) is set to 1.

(6) Set the date and time on the setting screen.

(7) The time needed to input and output 6000 operation records at a rate of 4800 baud is as follows:

Output: About 5 minutes
Input: About 2 minutes and 30 seconds

This file corresponds to a paper tape of about 180 m in length.

1.7 HELP FUNCTION

1.7.1 General

The help function displays alarm information, operation method and a table of contents for parameters. This function is used as a handbook.

1.7.2 Display Method

Press HELP key on any screen other than PMC screen, then a help screen appears.
(However, it is not available when PMC screen/CUSTOM screen is displaying)

- **Display of help screen**

```
HELP (INITIAL MENU)              O1234 N12345

              *****   HELP   *****
           1. ALARM DETAIL
           2. OPERATION METHOD
           3. PARAMETER TABLE









[ALARM]  [OPERAT]  [PARAM]  [     ]  [     ]
```

- **Help for alarm**

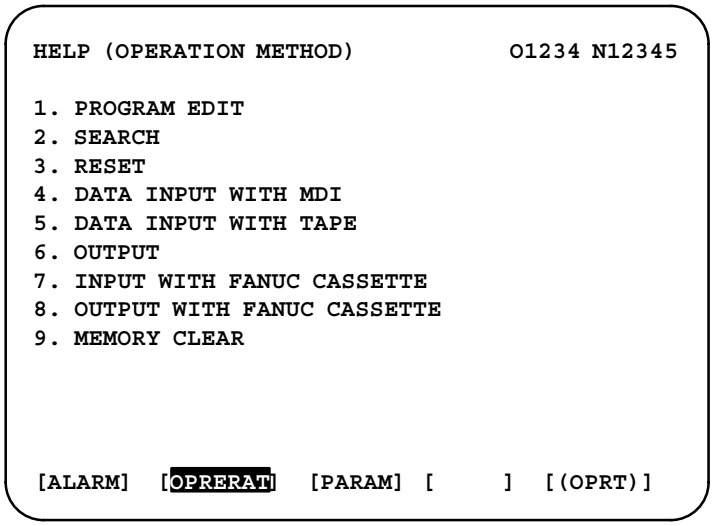
(1) When an alarm is generated, press soft key **[ALARM]**, then a help message of the alarm is displayed.

```
HELP (INITIAL MENU)              O1234 N12345

NUMBER     : 010
M'SAGE  : IMPROPER G CODE
FUNCTION  :
ALARM  :
  A G CODE NOT LISTED IN G-CODE TABLE
  IS BEING COMMANDED
  ALSO G-CODE FOR FUNCTION NOT ADDED
  IS BEING COMMANDED









[ALARM]  [OPERAT]  [PARAM] [     ] [ (OPRT) ]
```

(2) Pressing soft key **[OPERAT]**,(alarm No.), and soft key **[SELECT]** in this order, a help message corresponding to the input alarm number is displayed.

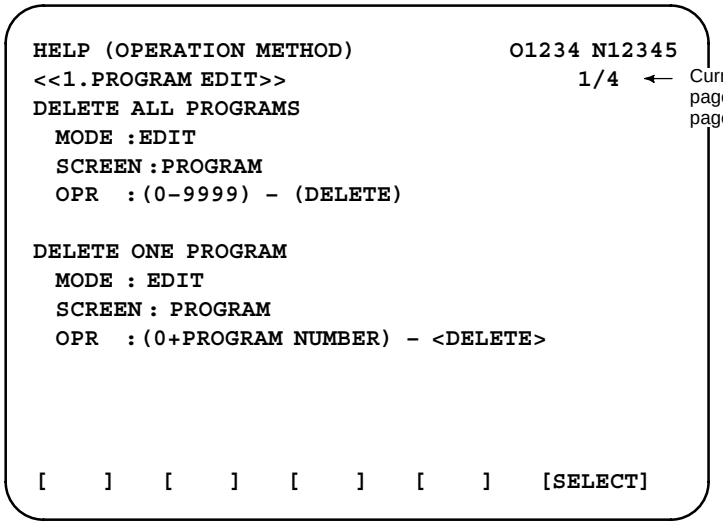
- **Help for operation**

(1) Press **[2 OPR]**, then a menu for operation method is displayed.



(2) Press **[OPERAT]**, (an item number) and soft key **[SELECT]**, then an operation method of the item is displayed.

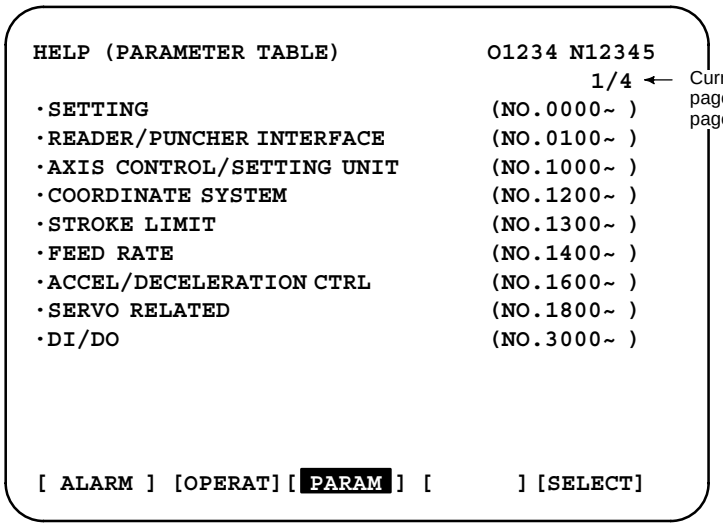
Pressing PAGE key  or  displays another pages.



Current page/ Total page

- **Parameter table**

Press soft key **[PARAM]**, then a parameter table is displayed.



Another screen can be selected by the PAGE key 

or 

.

1.8 DISPLAYING DIAGNOSTIC PAGE

1.8.1 Displaying Diagnostic Page

(1) Press SYSTEM key.

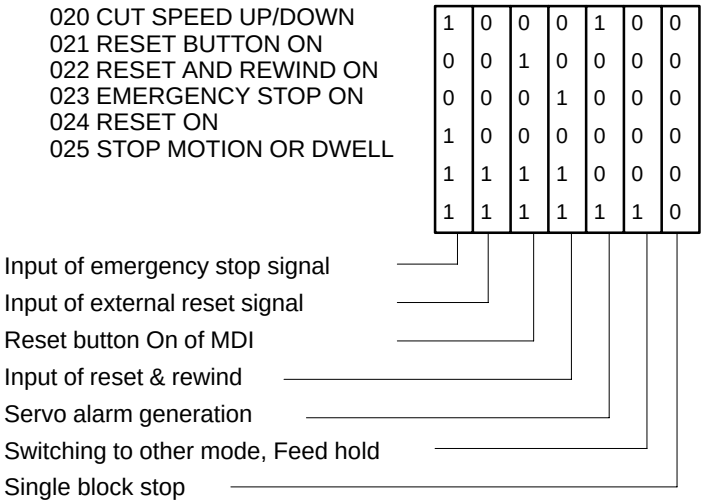
(2) Press soft key **[DGNOS]**, then a diagnostic screen is displayed.

1.8.2 Contents Displayed

- **Causes when the machine does not travel in spite of giving a command**

000 WAITING FOR FIN SIGNAL	An auxiliary function is being executed.
001 MOTION	Travel command of cycle operation is being executed.
002 DWELL	DWELL Dwell is being executed.
003 IN–POSITION CHECK	In–position check is being done.
004 FEEDRATE OVERRIDE 0%	Feedrate override is 0%.
005 INTERLOCK/START LOCK	Interlock or start lock is input.
006 SPINDLE SPEED ARRIVAL CHECK	Waiting for spindle speed arrival signal.
010 PUNCHING	Data is being output through reader/puncher interface.
011 READING	Data is being input through reader/puncher interface.
012 WAITING FOR (UN) CLAMP	Waiting for the end of index table indexing
013 JOG FEEDRATE OVERRIDE 0%	Manual feedrate override is 0%.
014 WAITING FOR RESET, ESP,RRW OFF	NC is in reset state.
015 EXTERNAL PROGRAM NUMBER SEARCH	External Program Number Search External program number search is being done
016 BACKGROUND ACTIVE	Background is being used.

- **Cause of the cycle start LED turned off**



- **State of TH alarm**

030 CHARACTER NUMBER TH ALARM — Position of the character that caused TH alarm. The position is counted from the head.

031 TH DATA — Data of the character that caused TH alarm.

- **Screen hard copy status**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	035				ER3	ER2	ER1	ABT	END

#0(END): Screen hard copy was completed normally.

#1(ABT): Screen hard copy was discontinued.

#2(ER1): An invalid parameter value was specified for screen hard copy.

#3(ER2): An attempt to use a memory card for screen hard copy failed.

#4(ER3): An error occurred during writing to a memory card for screen hard copy.

- **C executor status**

DGN	045	C executor status

[Data type] Bit

[Valid data range] 0 to 255

C executor status

0:	Normal.
2:	Inoperable because of an incorrect FROM content.
3:	Inoperable because the power was switched on with the M and 0 keys held down.
5:	Inoperable because of insufficient SRAM area; increase the SRAM area size. Alternatively, inoperable because of an incorrect C executor library version; use a new C executor library.
6:	Inoperable because of an internal error.
7:	Inoperable because of an internal error.
9:	Inoperable because of an internal error.
10:	Inoperable because of an incorrect C executor library version; use a new C executor library.
11:	Inoperable because of an incorrect FROM content.
12:	Inoperable because of an internal error.

- **Detail of serial pulse coder**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0202		CSA	BLA	PHA	RCA	BZA	CKA	SPH

#6(CSA): Hardware of serial pulse coder is abnormal

#5(BLA): Battery voltage is low (warning)

#4(PHA): Serial pulse coder or feedback cable is erroneous.

#3(RCA): Serial pulse coder is faulty.
Counting of feedback cable is erroneous.

#2(BZA): Battery voltage became 0.
Replace the battery and set the reference position.

#1(CKA): Serial pulse coder is faulty.
Internal block stopped.

#0(SPH): Serial pulse coder or feedback cable is faulty.
Counting of feedback cable is erroneous.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0203	DTE	CRC	STB	PRM				

#7(DTE): Communication failure of serial pulse coder.
There is no response for communication.

#6(CRC): Communication failure of serial pulse coder.
Transferred data is erroneous.

#5(STB): Communication failure of serial pulse coder.
Transferred data is erroneous.

#4(PRM): An invalid parameter is detected on the digital servo side.

- **Details of digital servo alarm**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0200	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

#7(OVL): Overload alarm

#6(LV): Insufficient voltage alarm

#5(OVC): Over current alarm

#4(HCA): Abnormal current alarm

#3(HVA): Overvoltage alarm

#2(DCA): Discharge alarm

#1(FBA): Disconnection alarm

#0(OFA): Overflow alarm

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0201	ALD			EXP				

Overload alarm	0	–	–	–	Motor overheat
	1	–	–	–	Amplifier overheat
Disconnection alarm	1	–	–	0	Built–in pulse coder (hand)
	1	–	–	1	Disconnection of separated type pulse coder (hard)
	0	–	–	0	Disconnection of pulse coder (software)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0204		OFS	MCC	LDA	PMS			

#6(OFS): Abnormal current value result of A/D conversion of digital

#5(MCC): Contacts of MCC of servo amplifier is melted.

#4(LDA): Serial pulse coder LED is abnormal

#3(PMS): Feedback is not correct due to faulty serial pulse coder C or feedback cable.

This data indicates the cause of servo alarm No. 417, detected by the NC. If the alarm is detected by the servo, the PRM bit (bit 4 of DGN No. 0203) is set to 1.

- **Details of stand–alone type serial pulse coder alarms**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	205	OHA	LDA	BLA	PHA	CMA	BZA	PMA	SPH

#7(OHA): Overheat occurred in the stand–alone type pulse coder.

#6(LDA): An LED error occurred in the stand–alone type pulse coder.

#5(BLA): A low battery voltage occurred in the stand–alone type pulse coder.

#4(PHA): A phase data error occurred in the stand–alone type linear scale.

#3(CMA): A count error occurred in the stand–alone type pulse coder.

#2(BZA): The battery voltage for the stand–alone type pulse coder is zero.

#1(PMA): A pulse error occurred in the stand–alone type pulse coder.

#0(SPH): A soft phase data error occurred in the stand–alone type pulse coder.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	206	DTE	CRC	STB					

#7(DTE): A data error occurred in the stand–alone type pulse coder.

#6(CRC): A CRC error occurred in the stand–alone type pulse coder.

#5(STB): A stop bit error occurred in the stand–alone type pulse coder.

	#7	#6	#5	#4	#3	#2	#1	#0
0280		AXS		DIR	PLS	PLC		MOT

#0 (MOT): The motor type specified in parameter No. 2020 falls outside the predetermined range.

#2 (PLC): The number of velocity feedback pulses per motor revolution, specified in parameter No. 2023, is zero or less. The value is invalid.

#3 (PLS): The number of position feedback pulses per motor revolution, specified in parameter No. 2024, is zero or less. The value is invalid.

#4 (DIR): The wrong direction of rotation for the motor is specified in parameter No. 2022 (the value is other than 111 or –111).

#6 (AXS): In parameter No. 1023 (servo axis number), a value that falls outside the range of 1 to the number of controlled axes is specified. (For example, 4 is specified instead of 3.) Alternatively, the values specified in the parameter are not consecutive.

- **Position error amount**

DGN	0300	Position error of an axis in detection unit

$$\text{Position error} = \frac{\text{Feed rate [mm/min]}}{60 \times \text{servo loop gain [1/sec]}} \times \frac{1}{\text{Detection unit}}$$

- **Machine position**

DGN	0301	Distance from reference position of an axis in detection unit

- **Reference position shift function**

DGN	302	Distance from the end of the deceleration dog to the first grid point

[Data type] Two–word axis

[Units of data] 0.001 mm (metric output), 0.0001 inch (inch output)

[Valid data range] 0 to ±99999999

The cause when an reference position return complete parameter goes down can be referred to by the following diagnosis.

- **Position deviation with fine acceleration/ deceleration enabled**

DGN	303	Position deviation with fine acceleration/deceleration enabled

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

- **Reference counter**

DGN	304	Reference counter for individual axes

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

- **Displacement detection**

DGN	305	Position feedback data between Z phases of individual axes

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

If displacement detection is enabled, the feedback data between the Z phases of different axes is represented in the detection unit.

- **Machine coordinates of angular axis/orthogonal axis**

DGN	306	Machine coordinates of a slant axis in the Cartesian coordinate system
DGN	307	Machine coordinates of an orthogonal axis in the Cartesian coordinate system

[Data type] Two–word

[Unit of data]

Increment system	IS–A	IS–B	IS–C	Unit
Metric input	0.01	0.01	0.01	mm
Inch input	0.001	0.001	0.001	inch
Rotation axis	0.01	0.01	0.01	deg

[Valid data range] –99999999 to 99999999

These parameters are updated only when bit 0 (AAC) of parameter No. 8200 is set to 1, and any of the parameters below is set to 1:

- Bit 0 (AOT) of parameter No. 8201
- Bit 1 (AO2) of parameter No. 8201
- Bit 2 (AO3) of parameter No. 8201
- Bit 3 (QSA) of parameter No. 5009 (T series only)
- The interference check option is selected.

- **Cause of the APZ bit (bit 4 of parameter 1815) brought to 0**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	310		DTH	ALP	NOF	BZ2	BZ1	PR2	PR1

#0(PR1): The setting of the following parameters has been changed: Parameters 1821, 1850, 1860, 1861.

#1(PR2): The setting of the ATS bit (bit 1 of parameter 8302) has been changed.

#2(BZ1): The detected APC battery voltage is 0 V (Inductosyn).

#3(BZ2): The detected APC battery voltage is 0 V (separate position detector).

#4(NOF): The Inductosyn output no offset data.

#5(ALP): Before the α pulse coder detects a full single rotation, reference position establishment by parameters was attempted.

#6(DTH): A controlled axis detach signal/parameter was input.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	311		DUA	XBZ	GSG	AL4	AL3	AL2	AL1

#0(AL1): An APC alarm was issued.

#1(AL2): A disconnection was detected.

#2(AL3): The detected APC battery voltage is 0 V (serial pulse coder).

#3(AL4): An abnormal rotation speed (RCAL) was detected.

#4(GSG): The G202 signal was brought from 0 to 1.

#5(XBZ): The detected APC battery voltage is 0 V (serial separate position detector).

#6(DUA): While the dual position feedback function was being used, the difference in error between the semi–closed loop side and the closed loop side became too large.

- **FSSB status**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	320	CFE		ERR	ERP	OPN	RDY	OPP	CLS

Indicates the internal status of the FSSBC.

#0(CLS): Closed.

#1(OPP): Running OPEN protocol.

#2(RDY): Open and ready.

#3(OPN): Open.

#4(ERP): Running ERROR protocol.

#5(ERR):

#7(CFE): Encountered configuration error.
(The actual slave type does not match the one specified in the conversion table.)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	321	XE3	XE2	XE1	XE0	ER3	ER2	ER1	ER0

Indicates the cause of an FSSBC error.

#0(ER0): INFORMED ERROR

#1(ER1): (RESERVE)

#2(ER2): Master port disconnection

#3(ER3): External EMG input

Indicates the cause of an FSSBC error resulting from a request from a slave.

#4(XE0): (RESERVE)

#5(XE1): Slave port disconnection

#6(XE2): Master port disconnection

#7(XE3): External EMG input

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	330					EXT	DUA	ST1	ST0
DGN	332					EXT	DUA	ST1	ST0
	⌇								
DGN	348					EXT	DUA	ST1	ST0

#0, #1(ST0, ST1): Indicates the type code for an actually connected slave.

ST1	ST0	Type	Address
0	0	A	Servo amplifier
0	1	(B: RESERVE)	(Currently nonexistent)
1	0	C	Stand–alone type detector interface unit
1	1	(RESERVE)	(Currently nonexistent)

#2(DUA): 0 : The slave of interest is not on the first axis of the two–axis amplifier.
1 : The slave of interest is on the first axis of the two–axis amplifier.

#3(EXT): 0 : The slave of interest does not exist.
1 : The slave of interest exists.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	331			DMA	TP1	TP0	HA2	HA1	HA0
DGN	333			DMA	TP1	TP0	HA2	HA1	HA0
	⌇								
DGN	349			DMA	TP1	TP0	HA2	HA1	HA0

#0, #1, #2(HA0, HA1, HA2): Indicates the host LSI address specified as a DMA destination.

#3, #4 (TP0, TP1): Indicates the type code of a specified slave.
(See the above descriptions about ST0 and ST1.)

#5(DMA): Indicates a value determining whether to allow DMA to occur.

NOTE
A combination of parameter Nos. 330 and 331 corresponds to one FSSB slave unit. Up to ten slave units are available.

Slave units and the associated diagnosis numbers

Slave unit 00	→	Diagnosis No. 330, No. 331
Slave unit 01	→	Diagnosis No. 332, No. 333
Slave unit 02	→	Diagnosis No. 334, No. 335
Slave unit 03	→	Diagnosis No. 336, No. 337
Slave unit 04	→	Diagnosis No. 338, No. 339
Slave unit 05	→	Diagnosis No. 340, No. 341
Slave unit 06	→	Diagnosis No. 342, No. 343
Slave unit 07	→	Diagnosis No. 344, No. 345
Slave unit 08	→	Diagnosis No. 346, No. 347
Slave unit 09	→	Diagnosis No. 348, No. 349

- **Details of invalid servo parameter setting alarms (on the servo side)**

DGN | 352 | Detail number for invalid servo parameter setting alarm

Indicates information that can be used to identify the location (parameter) and cause of an invalid servo parameter setting alarm (servo alarm No. 417).
This diagnosis information is valid when the following conditions are satisfied.

- Servo alarm No. 417 has occurred.
- Bit 4 of diagnosis No. 203 (PRM) = 1

See the following table for the displayed detail numbers and the corresponding causes. For further detail information that could be used to take measures, refer to FANUC AC Servo Motor αSeries Parameter Manual (B–65150E).

- **Detailed descriptions about invalid servo parameter setting alarms**

Detail number	Parameter number	Cause	Measure
0233	2023	A value specified as the number of velocity pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of velocity pulses to within 13100.
0243	2024	A value specified as the number of position pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of position pulses to within 13100.
0434 0435	2043	The internal value of the velocity loop integration gain has overflowed.	Decrease the value specified in the velocity loop integration gain parameter.
0444 0445	2044	The internal value of the velocity loop proportional gain has overflowed.	Use a function for changing the internal format of the velocity loop proportional gain.
0474 0475	2047	The internal value of the observer parameter (POA1) has overflowed.	Change the setting to: (–1) × (desired setting)/10

Detail number	Parameter number	Cause	Measure
0534 0535	2053	The internal value of the dead zone compensation parameter has overflowed.	Decrease the setting until the invalid parameter setting alarm will not occur any longer.
0544 0545	2054	The internal value of the dead zone compensation parameter has overflowed.	Decrease the setting until the invalid parameter setting alarm will not occur any longer.
0686 0687 0688	2068	The internal value of the feedforward coefficient has overflowed.	Use the position gain magnification function.
0694 0695 0696 0699	2069	The interval value of the velocity feedforward coefficient has overflowed.	Decrease the velocity feedforward coefficient.
0754 0755	2075	The setting of the parameter listed at the left has overflowed.	This parameter is presently not in use. Specify 0 in it.
0764 0765	2076	The setting of the parameter listed at the left has overflowed.	This parameter is presently not in use. Specify 0 in it.
0783	2078	The conversion coefficient parameter listed at the left has not been set up for a full–closed loop linear motor (for the Series 9080 only).	Set a value in this parameter.
0793	2079	The conversion coefficient parameter listed at the left has not been set up for a full–closed loop linear motor (for the Series 9080 only).	Set a value in this parameter.
0843	2084	No positive value has been set for the flexible feed gear numerator. Alternatively, the following condition exists: Feed gear numerator > denominator	Specify a positive value as the flexible feed gear numerator. Alternatively, satisfy the following condition: Feed gear numerator ≦ denominator (except for phase A–/B–specific stand–alone type detector).
0853	2085	No positive value has been set as the flexible feed gear denominator.	Specify a positive value as the flexible feed gear denominator.
0884 0885 0886	2088	The internal value of the machine velocity feedback coefficient has overflowed.	Decrease the machine velocity feedback coefficient. Alternatively, use the damping control function, which has an equivalent effect.
0883	2088	A value of 100 or greater was specified in the machine velocity feedback coefficient for an axis with a serial stand–alone type detector.	The maximum allowable value for the machine velocity feedback coefficient for axes with a serial stand–alone type detector is 100. Decrease the setting to within 100.
0926 0927 0928	2092	The interval value of the advance feedforward coefficient has overflowed.	Use the position gain magnification function.
0996	2099	The internal value for suppressing N pulses has overflowed.	Decrease the setting of the parameter listed at the left.

Detail number	Parameter number	Cause	Measure
1123	2112	No value has been entered for the AMR conversion coefficient parameter when a linear motor is in use.	Specify the AMR conversion coefficient.
1183	2118	No value has been specified in the semi–/full–closed loop error threshold parameter for a full–closed loop linear motor (for the Series 9080 only).	Specify a semi–/full–closed loop error threshold value for the parameter listed at the left.
1284 1285	2128	If the value specified as the number of velocity pulses is small, the internal value of the current control parameter overflows.	Decrease the value for the parameter listed at the left to within a range where no alarm will occur any longer.
1294 1295	2129	If the value specified as the number of velocity pulses is large, the internal value of the current control parameter overflows.	Re–set “a” to a smaller value when the setting of the parameter listed at the left is broken up into: $a \times 256 + b$
1393	2139	The setting of the linear motor AMR offset has exceeded ±45.	Decrease the setting of the parameter listed at the left to within ±45.
1446 1447 1448	2144	The cutting feedforward coefficient for the cutting–/rapid traverse–specific FAD function has overflowed.	Use the position gain magnification function.
1454 1455 1456 1459	2145	The cutting velocity feedforward coefficient for the cutting–/rapid traverse–specific FAD function has overflowed.	Decrease the velocity feedforward coefficient.
8213	1821	No positive value has been set in the reference counter capacity parameter.	Specify a positive value in the parameter listed at the left.
8254 8255 8256	1825	The internal value of the position gain has overflowed.	Use the position gain magnification function.
10016 10019	2200 bit 0	The internal value of a parameter used to detect runaway has overflowed.	Do not use the runaway detection function (specify bit 0 = 1).
10043	1815#1 2010#2	A full–closed loop has been set up for a linear motor (except for the Series 9080).	A full–closed loop cannot be specified for linear motors.
10053	2018#0	The scale reverse connection bit has been set up for a linear motor.	The scale reverse connection bit cannot be used for linear motors.
10062	2209#4	The amplifier in use does not support the HC alarm avoidance function.	If you want to use this amplifier, reset the function bit listed at the left to 0. If you want to use the HC alarm avoidance function, use an amplifier that supports it.

- **Error detection**

DGN 360 Cumulative command pulse count (NC)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

Indicates the cumulative count of movement commands distributed from the CNC since the power was switched on.

DGN 361 Cumulative compensation pulse count (NC)

[Data type] Word axis

[Unit of data] Detection unit

[Valid data range] 32767 to –32767

Indicates the cumulative count of compensation pulses (backlash compensation, pitch error compensation, etc.) distributed from the CNC since the power was switched on.

DGN 362 Cumulative command pulse count (SV)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

Indicates the cumulative count of movement command and compensation pulses received at the servo section since the power was switched on.

DGN 363 Cumulative feedback pulse count (SV)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

Indicates the cumulative count of position feedback pulses received from the pulse coder by the servo section.

- **Diagnostic data related to the Inductosyn absolute position detector**

DGN | 380 | Difference between the absolute position of the motor and offset data

$$\frac{\text{M (absolute position of the motor)} - \text{S (offset data)}}{\lambda\text{(pitch interval)}}$$

The remainder resulting from the division is displayed.

[Data type] Two–word axis

[Units of data] Detection units

DGN | 381 | Offset data from the Inductosyn

Off set data is displayed when CNC calculates the machine position.

[Data type] Two–word axis

[Units of data] Detection units

- **State of remote buffer (protocol A)**

DGN | 0500 | Send command

1: SYN 2: RDY 3: RST 4: ALM
5: SAT 6: GTD 7: RTY 8: SDI

DGN | 0501 | Receive command

1: SYN 2: RDY 3: ARS 4: AAL
5: CLB 6: SET 7: DAT 8: EOD
9: WAT 10: RTY 11:RDI 12: SDO

DGN | 0502 | State of remote buffer

0 : Not ready
1 : Reset state
2 : Operation state
3 : Alarm state
4 : Circuit disconnection

- **Open CNC**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	510								

This data indicates the internal Open CNC information (not available to general users).

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	511								

This data indicates the internal Open CNC information (not available to general users).

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	512	PA1	PA0	BNK		THH	THL		PRA

This data indicates the cause of a system alarm that has occurred in Open CNC.

#0(PRA) 1 : A RAM parity error occurred in shared RAM.

#2(THL) 0 : The temperature of the harddisk of Open CNC is too low.
1 : Normal

#3(THH) 0 : The temperature of the harddisk of Open CNC is too high.
1 : Normal

#4 0 : Normal
1 : An NMI has occurred in HSSB.

#5(BNK) If bit 0 (PRA) is set to 1,
0 : An alarm occurred in the lower half of shared RAM.
1 : An alarm occurred in the upper half of shared RAM.

#6 (PA0) If bit 0 (PRA) is set to 1,
1 : An alarm occurred at an even–numbered address.

#7 (PA1) If bit 0 (PRA) is set to 1,
1 : An alarm occurred at an odd–numbered address.

- **Diagnostic data related to simple synchronous control**

DGN	540	Difference in the position error between the master and slave axes in simple synchronas control
DGN	541	Difference in the position error between the master and slave axes in simple synchronas control

DGN 540 indicates the difference in the position error between the master and slave axes when a single axis pair is subjected to simple synchronous control. DGN 541 is used when two or more pairs are subjected to simple synchronous control. The position error is indicated for the master axis.

DGN 540 and 541 indicate values in detection units. They are displayed only with the M series.

- **Diagnostic data related to the dual position feedback function**

0550	Closed loop error

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

0551	Semi–closed loop error

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

0552	Error between semi–closed and closed loops

[Data type] word axis

[Unit of data] Detection units

[Valid data range] –32768 to +32767

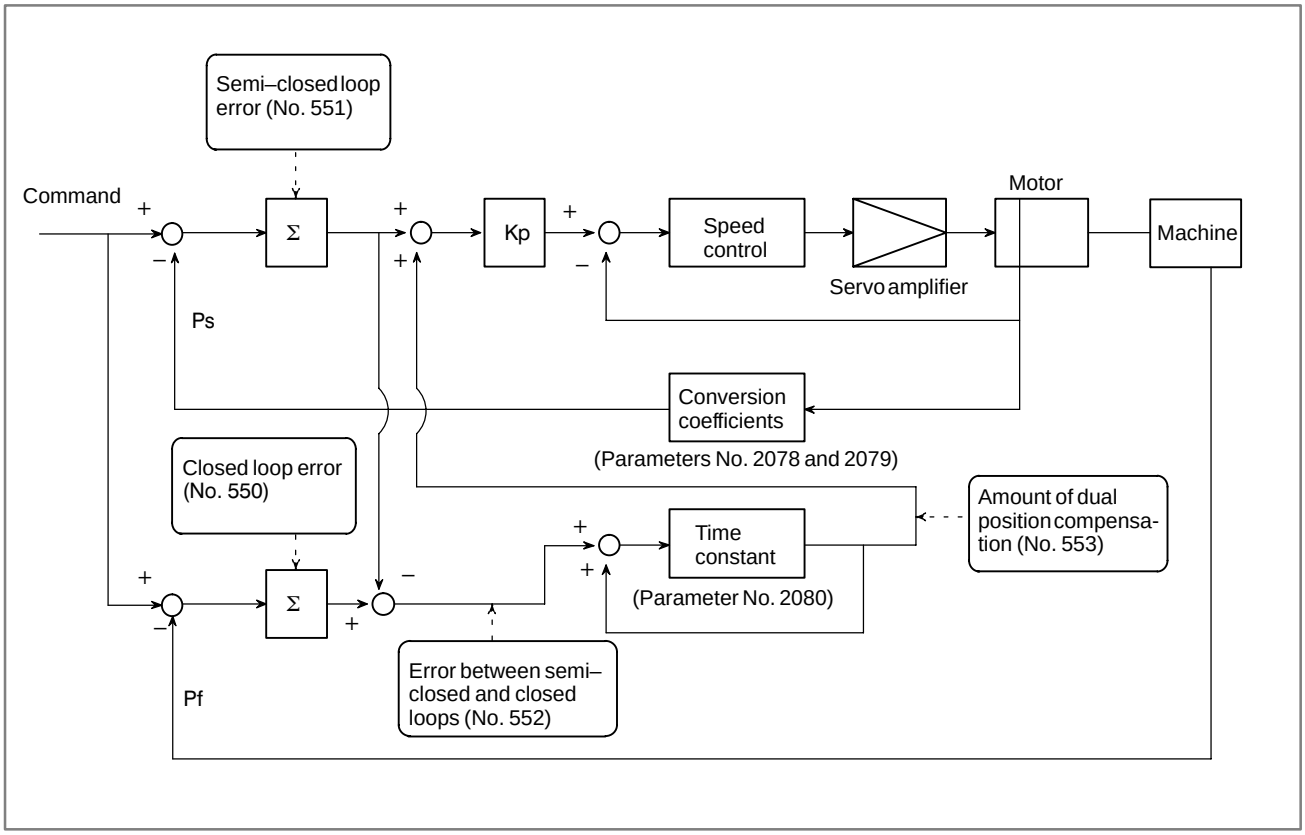
0553	Amount of dual position compensation

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

The data items displayed on the diagnosis screen are obtained at the following positions:



- **Laser oscillator state**
  C series (series B8F1)

900	Laser power command
901	Laser bias command
902	Pulse on time
903	Pulse off time
904	Gas pres. control
905	Laser tube pres.
906	Laser power
907	Trace data
908	Laser sequence

Numbers displayed for No. 908 on the 16*i*–L diagnosis screen

Number	Meaning
10	Package completed
11	Wait for the REV signal at RUN restart
12	Purge in progress
13	Wait for the rotation sensor to be turned on during RUN–OFF
14	75–second wait
16	RUN start in progress
17	Wait for the negative pressure for evacuation completion to reach the predetermined level
18	Wait for the AR signal to be turned on
20	LRDY state
23	Wait for the gas pressure during laser oscillation to settle down to the level at discharge start
26	HVON start in progress (discharge start wait)
27	Wait for the reference discharge at the maximum level to settle down to the predetermined level
28	Power compensation in progress
30	LSTR state
49	Evacuation in progress during RUN–OFF (parameter No. 15256)
50	75–second wait at RUN restart

909	RF voltage 1
910	RF current 1
911	RF voltage 2
912	RF current 2

913	RF voltage 3
914	RF current 3
915	RF voltage 4
916	RF current 4
917	RF voltage 5
918	RF current 5
919	RF voltage 6
920	RF current 6
921	RF voltage 7
922	RF current 7
923	RF voltage 8
924	RF current 8
925	DC VOLTAGE 1
926	DC CURRENT 1
927	DC VOLTAGE 2
928	DC CURRENT 2
929	DC VOLTAGE 3
930	DC CURRENT 3
931	DC VOLTAGE 4
932	DC CURRENT 4
933	DC VOLTAGE 5
934	DC CURRENT 5
935	DC VOLTAGE 6
936	DC CURRENT 6
937	DC VOLTAGE 7
938	DC CURRENT 7
939	DC VOLTAGE 8
940	DC CURRENT 8
941	DC POWER 1

942	DC POWER 2
943	DC POWER 3
944	DC POWER 4
945	DC POWER 5
946	DC POWER 6
947	DC POWER 7
948	DC POWER 8
954	LCKMD INT. PRES. 1
955	LCKMD INT. PRES. 2
956	LCKMD INT. PRES. 3
957	LCKMD INT. PRES. 4

	#7	#6	#5	#4	#3	#2	#1	#0
960	*SFI	*RBT	*MGP	*AP		FRQ	*ESAL	*ENB

***ENB** Intra–IF enable signal

0 : Disabled
1 : Enabled

***ESAL** Emergency stop signal

0 : Emergency stop
1 : Normal processing

FRQ Power frequency detection

0 : 50Hz
1 : 60Hz

***AP** Air pressure sensor

0 : Lower than air pressure
1 : Same as air pressure

***MGP** Laser gas pressure

0 : Low
1 : Normal

***RBT** Blower temperature

0 : Abnormal
1 : Normal

***SFI** Safety interlock

0 : Interlocked
1 : Normal

	#7	#6	#5	#4	#3	#2	#1	#0
961	*ABT	*SHT	SHOF	SHON	*RPAL	*WT1	*CAT	*MVW

***MVW** Water amount sensor
0 : Abnormal
1 : Normal

***CAT** Chamber temperature sensor
0 : Abnormal
1 : Normal

***WT1** Condensation sensor
0 : Abnormal
1 : Normal

***RPAL** Vacuum pump alarm
0 : Abnormal
1 : Normal

SHON Open shutter sensor
The shutter is open when this bit is set to 1.

SHOF Closed shutter sensor
The shutter is closed when this bit is set to 1.

***SHT** Shutter temperature sensor
0 : Abnormal
1 : Normal

***ABT** Absorber temperature sensor
0 : Abnormal
1 : Normal

	#7	#6	#5	#4	#3	#2	#1	#0
962			*OH1	*TCA1	*REV1	*VIB1	*AR1	*IAL1

***IAL1** Inverter alarm 1
0 : Abnormal
1 : Normal

***AR1** Frequency signal 1
0 : Mismatch
1 : Match

***VIB1** Vibration sensor 1
0 : Abnormal
1 : Normal

***REV1** Rotation sensor 1
0 : 8000 rpm or more
1 : Less than 8000 rpm

***TCA1** Turbo current sensor 1
0 : Abnormal
1 : Normal

***OH1** Abnormal turbo temperature 1
0 : Abnormal
1 : Normal

	#7	#6	#5	#4	#3	#2	#1	#0
963			*OH2	*TCA2	*REV2	*VIB2	*AR2	*IAL2

***IAL2** Inverter alarm 2

0 : Abnormal
1 : Normal

***AR2** Frequency signal 2

0 : Mismatch
1 : Match

***VIB2** Vibration sensor 2

0 : Abnormal
1 : Normal

***REV2** Rotation sensor 2

0 : 8000 rpm or more
1 : Less than 8000 rpm

***TCA2** Turbo current sensor 2

0 : Abnormal
1 : Normal

***OH2** Abnormal turbo temperature 2

0 : Abnormal
1 : Normal

	#7	#6	#5	#4	#3	#2	#1	#0
964			*OH3	*TCA3	*REV3	*VIB3	*AR3	*IAL3

***IAL3** Inverter alarm 3

0 : Abnormal
1 : Normal

***AR3** Frequency signal 3

0 : Mismatch
1 : Match

***VIB3** Vibration sensor 3

0 : Abnormal
1 : Normal

***REV3** Rotation sensor 3

0 : 8000 rpm or more
1 : Less than 8000 rpm

***TCA3** Turbo current sensor 3

0 : Abnormal
1 : Normal

***OH3** Abnormal turbo temperature 3

0 : Abnormal
1 : Normal

	#7	#6	#5	#4	#3	#2	#1	#0
966	*PSA08	*PSA07	*PSA06	*PSA05	*PSA04	*PSA03	*PSA02	*PSA01
967	*PSA16	*PSA15	*PSA14	*PSA13	*PSA12	*PSA11	*PSA10	*PSA09

No.966 & 967 Power suplly signal alarm

1 : Normal
0 : Abnormal

	#7	#6	#5	#4	#3	#2	#1	#0
968		ACSI	PLS	SEL1.4	SEL1.3	SEL1.2	SEL1.1	SEL1.0

SEL1.0 to SEL1.4 Select signals for discharge tube monitor data

PLS Pulse command signal

1 : Filter provided
0 : No filter provided

ACSI Access notice signal

0 : OFF
1 : ON

	#7	#6	#5	#4	#3	#2	#1	#0
969						HSCST	SEP2	SEP1

SEP1 Pressure/power select signal

SEP2 Pressure/power select signal

HSCST High–speed A/D conversion start

	#7	#6	#5	#4	#3	#2	#1	#0
970	PS08	PS07	PS06	PS05	PS04	PS03	PS02	PS01
971	PS16	PS15	PS14	PS13	PS12	PS11	PS10	PS09

PS01–PS16 Power select signals 1 to 16

0 : Not selected
1 : Selected

	#7	#6	#5	#4	#3	#2	#1	#0
972	TWV	BPV	PTL	GRDY	VEN	RPA	RBA	PUG

PUG Purge valve

0 : Closed
1 : Open

RBA Roots blower activation

0 : Stopped
1 : Activated

RPA Vacuum pump activation

0 : Stopped
1 : Started

VEN Air release valve

0 : Closed
1 : Open

GRDY Laser gas supply valve

0 : Closed
1 : Open

PTL Flashing light

0 : Off
1 : On

BPV Bypass valve

0 : Closed
1 : Open

TWV Three–way valve

0 : Air release
1 : Open

	#7	#6	#5	#4	#3	#2	#1	#0
973	LSCST		PCS	FW	IB	*PCL	OFS	SHOP

SHOP Shutter open command

0 : Closed
1 : Open

OFS Off sequence

0 : OFF
1 : ON

***PCL** DC power alarm clear

0 : Clear
1 : Normal

IB Semiconductor laser–on command

0 : OFF
1 : ON

FW Inverter start signal

0 : Stopped
1 : Started

PCS Gas pressure PWM command

LSCST Low speed A/D conversion start

0 : OFF
1 : ON

	#7	#6	#5	#4	#3	#2	#1	#0
974								

RF power unit alarms 1 to 8

0 : Normal
1 : Abnormal

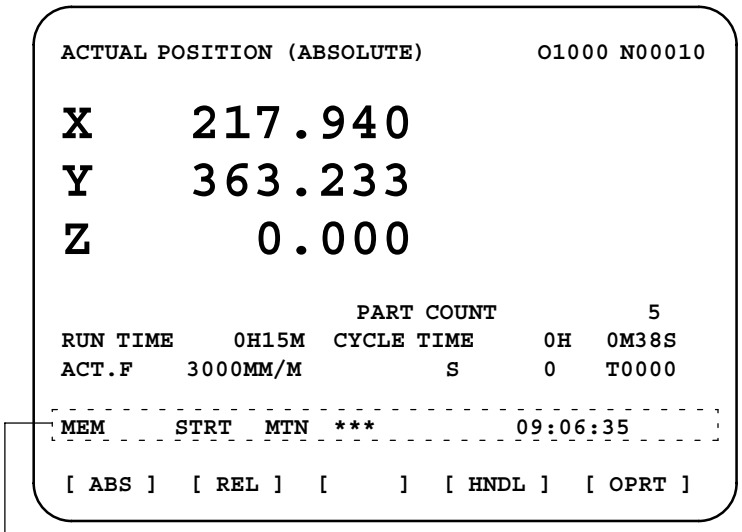
	#7	#6	#5	#4	#3	#2	#1	#0
975								

RF power unit alarm 9 to 16

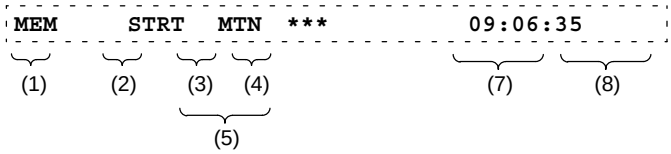
0 : Normal
1 : Abnormal

980	Gas pres. sensor alm
981	A/D conv–1 alm
982	A/D conv–2 alm
983	Voltage down
984	Power down
985	Beam reflection
986	Laser efficiency
987	Bombe change request
988	N2–Gas charge time over

1.9 CNC STATE DISPLAY



· Indicates the current status of the CNC.
· Display example and explanation



(1) Mode selection status
- MEM: Automatic operation (memory operation)
- MDI: Manual data input/MDI operation
- EDIT: Program editing
- RMT: Remote operation
- JOG: Jog feed
- REF: Reference position return
- INC: Incremental feed mode = step feed (if no manual pulse generator is available)
- HND: Manual handle feed mode
- TJOG: Teaching in jog feed mode
- THND: Teaching in handle feed mode

(2) Automatic operation status
- STRT: Automatic operation has started (and program execution is under way).
- HOLD: Automatic operation has been suspended (execution of a block has been discontinued, and automatic operation has stopped).
- STOP: Automatic operation has stopped (a block has been finished, and automatic operation has stopped).
- MSTR: The tool is returning or being repositioned when the tool retract and return function is executed.
- ****: Other status (when the power is switched on, or automatic operation has ended)

(3) Automatic operation status
MTN: Program–specified axis movement is under way.
DWL: Program–specified dwell command (G04) is being executed.
***: Other status

(4) Auxiliary function status
FIN: The completion signal FIN for an auxiliary function is being awaited.
***: Other status

(5) Emergency stop and reset status (displayed at the location of items mentioned in (3) and (4))
—EMG— : Emergency stop status
–RESET–: CNC reset status (The state in which the reset signal or the MDI RESET key remains active.)

(6) Alarm status
ALM : An alarm condition has been detected.
BAT : The lithium battery (CNC back–up battery) voltage is low (the battery is to be replaced).
Blank: Other status

(7) Clock display: Hour:minute:second

(8) Program editing/running status
Input: Data is being input.
Output: Data is being output.
SRCH: A data search is under way.
EDIT: Editing such as insertion or modification is under way.
LSK: Label skip enabled at data input (until valid information is read).
PTRR: Retract or return/re–positioning is under way when the tool retrack and return function is used.
HPCC: High–precision contour control mode.
AICC: AI contour control mode.
RVRS: Reversing based on the retrace function.
RTRY: Re–advancing based on the retrace function.
RVED: Reversing based on the retrace function has ended.
Blank: Editing is not under way.

1.10 WAVEFORM DIAGNOSTIC FUNCTION

Tuning becomes easier by graphically displaying servo error amount and torque command, etc. (Graphic option is required).

The following two types of waveform diagnosis functions are supported:

(1) One–shot type

The one–shot type waveform diagnosis function can graphically display, as a waveform, any variation in those data items listed below. The start of data sampling can be triggered by the rising or falling edge of a machine signal. This function facilitates the adjustment of the servo and spindle motors.

a. Error, pulse distribution amount, torque, speed, current, and thermal simulation data for the servo motor of each axis
b. Composite speed for the first, second, and third axes
c. Spindle motor speed and load meter value
d. On/off state of a machine signal specified with a signal address

(2) Storage type

The storage type waveform diagnosis function enables the storing of any variation in the data items listed below and, if a servo alarm occurs, the graphical display (as a waveform) of the stored data. The end of data sampling can be triggered by the rising or falling edge of a machine signal. This function facilitates the estimation of erroneous locations. Stored data can be output via the reader/punch interface.

a. Error, pulse distribution amount, torque, speed, current, and thermal simulation data for the servo motor for each axis

NOTE
1 To output stored waveform data, the optional reader/punch interface must have been installed.
2 The waveform diagnosis function is enabled when bit 0 (SGD) of parameter No. 3112 is set to 1. Note, however, that a graphics card is necessary to display waveforms.

1.10.1 Setting Parameters

(1) Set a parameter to utilize the servo waveform diagnostic function.

	#7	#6	#5	#4	#3	#2	#1	#0
3112								SGD

#0(SGD) 0 : Do not display servo waveform (usual graphic display).
1 : Displays servo waveform (usual graphic display function cannot be used).

(2) Turn off the power once and turn it on again.

3120	Time between servo alarm and sampling stop (storage type)

[Data type] Word

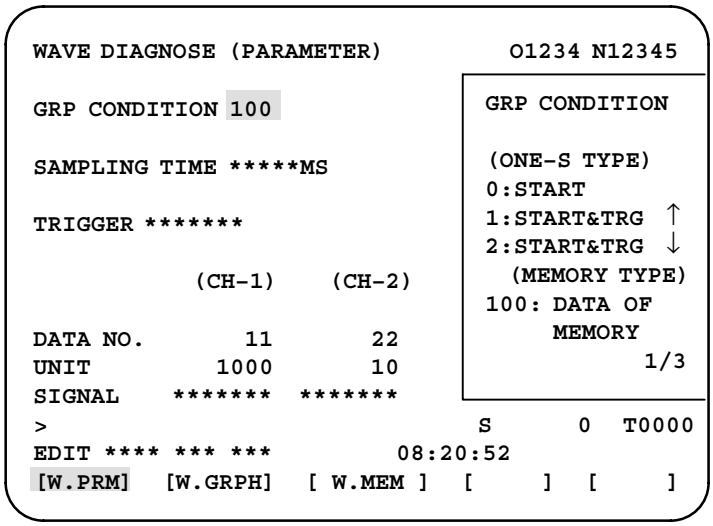
[Unit of data] ms

[Valid data range] 1 to 32760

1.10.2 Waveform Diagnostic Parameter Screen

1. Press the [SYSTEM] key to display a system screen such as aparameter.
2. Press the continuous menu key [▷] several times, and the soft key **[W.DGNS]** is displayed.
3. Press **[W.DGNS]**, then the parameter screen for the waveform diagnosis is displayed.

Set the necessary data items. Position the cursor to the item to be set, enter the corresponding data, then press [INPUT]. Data items for which ***** is displayed cannot be set. To assist in data setting, the frame on the right side of the screen displays help information for that data to which the cursor is positioned. Help information which cannot fit into a single frame is split into several pages, which the user can scroll through using the page keys [↑] and [↓].



- **Waveform diagnosis parameters (one–shot type)**

(1) Display start condition

0 : Starts data sampling upon the **[START]** key being pressed, samples data for the specified period, then draws a waveform.

1 : Starts data sampling upon the detection of the first rising edge of the trigger signal after the **[START]** key is pressed, samples data for the specified period, then draws a waveform.

2 : Starts data sampling upon the detection of the first falling edge of the trigger signal after the [**START**] key is pressed, samples data for the specified period, then draws a waveform.

(2) Sampling period: Set the period during which data will be sampled.

Valid data range: 10 to 32760
Units: ms

(3) Trigger: Set the PMC address and bit for the signal used to trigger the start of data sampling, when 1 or 2 is set for the start condition.

Example) G0007.2: ST signal

(4) Data number: The table below lists the numbers of the data items for which a waveform can be displayed (n = 1 to 8).

Data No.	Description	Units
00	Does not display a waveform.	–
0n	Servo error (8 ms) for the n–th axis (positional deviation)	Pulses (detection units)
1n	Pulse distribution for the n–th axis (move command)	Pulses (input increments)
2n	Torque for the n–th axis (actual current)	% (relative to maximum current)
3n	Servo error (2 ms) for the n–th axis (positional deviation)	Pulses (detection units)
5n	Actual speed for the n–th axis	min^{-1}
6n	Command current for the n–th axis	% (relative to maximum current)
7n	Thermal simulation data for the n–th axis	% (OVC alarm ratio)
90	Composite speed for the first, second, and third axes	Pulses (input increments)
99	On/off state of a machine signal specified with a signal address	None
10n	Actual spindle speed for the n–th axis	% (relative to maximum rotation speed)
11n	Load meter for the spindle for the n–th axis	% (relative to maximum output)
161	Difference in position error calculated on the spindle basis	Pulses (detection unit)

(5) Data units: Weight of data when 1 is specified. The data units are automatically specified for each data item and need not be set unless the units must be changed for some reason.

[Valid data range] 1 to 1000

[Unit]0.001

(6) Signal address: PMC address and bit number. Set in the same way as that for trigger, when the data number is 99.

- **Waveform diagnosis parameters (storage type)**

(1) Display start condition

100 : Draws a waveform for the stored data.

(2) Sampling period: Invalid

(3) Trigger: Invalid

(4) Data number: The table below lists the numbers of the data items for which a waveform can be displayed (n = 1 to 8). Numbers for which no data is stored cannot be specified.

Data No.	Description	Units
00	Does not display a waveform.	–
0n	Servo error (8 ms) for the n–th axis (positional deviation)	Pulses (detection units)
1n	Pulse distribution for the n–th axis (move command)	Pulses (input increments)
2n	Torque for the n–th axis (actual current)	% (relative to maximum current)
5n	Actual speed for the n–th axis	min^{-1}
6n	Command current for the n–th axis	% (relative to maximum current)
7n	Thermal simulation data for the n–th axis	% (OVC alarm ratio)

(5) Data units: Weight of data when 1 is specified. The data units are automatically specified for each data item and need not be set unless the units must be changed for some reason.

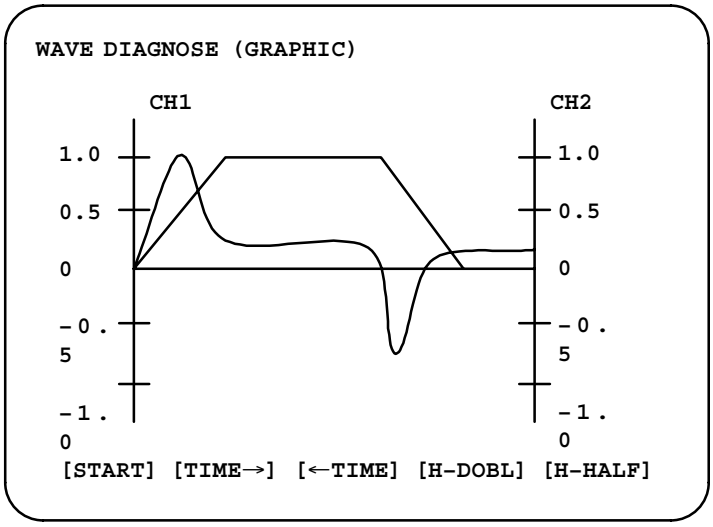
[Valid data range] 1 to 1000

[Unit] 0.001

(6) Signal address: Invalid

1.10.3 Graphic of Wave Diagnosis Data

1. Press soft key **[W.GRPH]**, then graph of waveform diagnosis is displayed.



2. Press soft key **[(OPRT)]**, then the following soft keys are displayed. The following three sets of soft keys are displayed by the ▷ key.

[START] [TIME→] [←TIME] [H–DOBL] [H–DOBL]

[START] [CH–1↑] [CH–1↓] [V–DOBL] [V–HALF]

[START] [CH–2↑] [CH–2↓] [V–DOBL] [V–HALF]

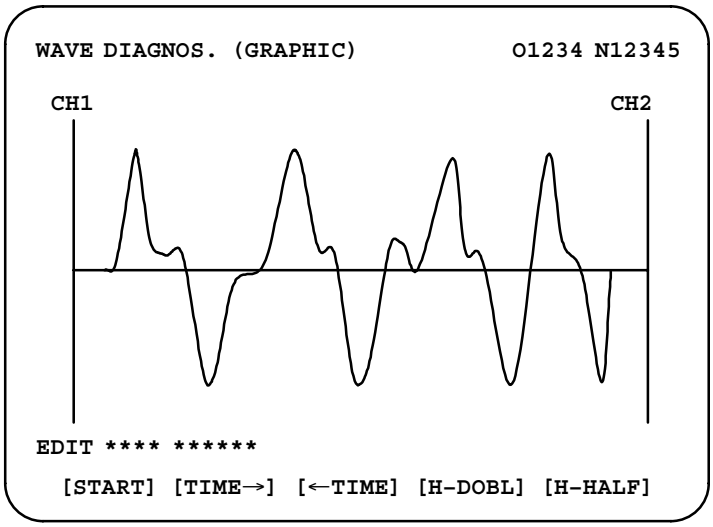
1) **[START]** : Starts Graphic data
2) **[TIME→]** : Shift the waveform of channel 1 and 2 rightward
3) **[←TIME]** : Shift the waveform of channel and 2 leftward
4) **[H–DOBL]** : Double the time scale of the waveform of channel 1 and 2
5) **[H–HALF]** : Half the time scale of the waveform of channel 1 and 2
6) **[V–DOBL]** : Double the height of waveform of channel 1 and 2
7) **[V–HALF]** : Half the height of waveform of channel 1 and 2
8) **[CH–1↑]** : Shift the zero point of channel 1 upward
9) **[CH–1↓]** : Shift the zero point of channel 1 downward
10) **[CH–2↑]** : Shift the zero point of channel 2 upward
11) **[CH–2↓]** : Shift the zero point of channel 2 downward

- **Drawing a waveform for one–shot type waveform diagnosis**

The one–shot type waveform diagnosis function draws a waveform for a specified data item in real time as the data is sampled. The sampled data, however, is not stored and thus cannot be output later.

To sample data for one–shot type waveform diagnosis, press the **[START]** key on the WAVE DIAGNOS. (GRAPHIC) screen. Then, data is sampled when the specified start condition is satisfied. Data sampling continues for the specified period.

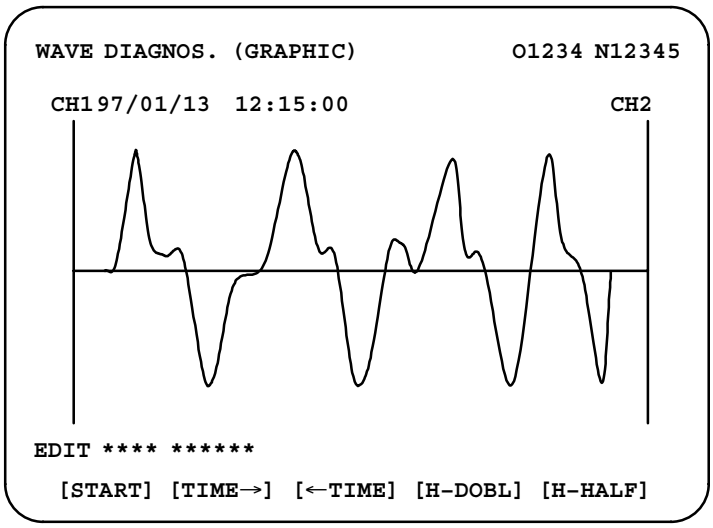
Pressing the [**SATART**] soft key starts data sampling. While sampling is being performed, SAMPLING blinks at the top of the screen. Once data sampling has been completed, a waveform is automatically displayed.



- **Drawing a waveform for storage type waveform diagnosis**

To use storage type waveform diagnosis, set 100 for the display start condition. The maximum data width for storage type waveform diagnosis is 32760 ms. Data must be sampled before starting drawing. The next page explains sampling in detail.

Pressing the **[START]** soft key loads stored data. While the data is being loaded, SAMPLING blinks at the top of the screen. Once the data has been loaded, a waveform is displayed. The date on which the data was stored is displayed at the top left of the screen. If the **[START]** soft key is pressed while data is being stored, storage is stopped and the waveform for the data stored up to that point is displayed. The WAVE DIAGNOS. (MEMORY) screen indicates whether data is being stored.



1.10.4 Data Sampling for Storage Type Waveform Diagnosis

(1) Press the SYSTEM function key. Pressing the menu continuation key [▷] displays the **[W.DGNS]** soft key. Press this soft key to display the WAVE DIAGNOS. (PARAMETER) screen.

(2) Press the **[W.MEM]** soft key to display the WAVE DIAGNOS. (MEMORY) screen. The operation selection soft keys appear.
The configuration of the operation selection soft keys is as follows:

```
WAVE DIAGNOS. (MEMORY)           O1234 N12345

   CONDITION:  100     TRIGGER:  G0123.4

   DATA KINDS          SAMPLING AXIS
   POS ERROR           XYZABCUV
   MOTION CMD          XYZABCUV
   CURRENT (%)         XYZABCUV
   SPEED (RPM)         NONE
   TORQUE CMD          NONE
   HEAT SIMLT          XYZABCUV
                SMPL   TIME :      2. 0SEC
                DATE     : MEMORY

EDIT **** *** ***          08:20:52
  [SELECT] [      ] [      ] [      ] [START]
```

(3) The configuration of the operation selection soft keys is as follows:

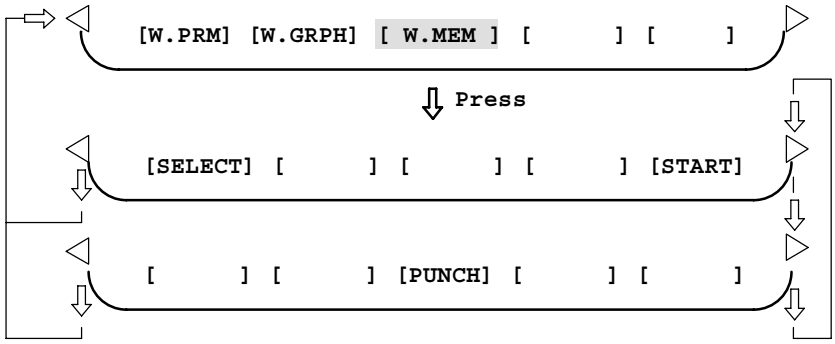


Fig. 1.10.4 Soft keys

(4) Using the cursor, set the necessary data items. To set the sampling axes, position the cursor to the data item to be set, enter the names of the axes for which data will be sampled for that data item, then press **[SELECT]** or INPUT. The axis names are displayed to the right of the data items.

Example) XYZ + **[SELECT]** or INPUT

(5) Once the sampling axes have been selected, the sampling period for each axis is displayed. Subsequently pressing the **[START]** soft key starts data sampling.

CAUTION
1 Data items for which ***** is displayed cannot be set.
2 To change the sampling axes, enter new axis names then press the [SELECT] soft key. Pressing the [SLELCT] soft key without entering an axis name results in no sampling axis being set.
3 If the sampling axes are changed during data sampling, data sampling is stopped. In this case, press the [START] soft key to restart data sampling for the new sampling axes.
4 Initially, no sampling axis is set.

- **Storage data parameters**

(1) Storage stop condition

100: Stops data storage upon the issue of a servo alarm.

101: Stops data storage upon the issue of a servo alarm or the detection of the rising edge of the trigger signal.

102: Stops data storage upon the issue of a servo alarm or the detection of the falling edge of the trigger signal.

The maximum stored data width is 32760 ms. If the storage stop condition is not satisfied within 32760 ms, data is overwritten, starting with the oldest data.

Parameter No. 3120 can be used to delay data storage being stopped by a specified period (ms), after the issue of a servo alarm.

(2) Trigger: Set the PMC address and bit for the signal used to trigger the stopping of data storage, when 101 or 102 is set for the stop condition.

Example) G0007.2: ST signal

(3) Data type: The following table lists the types of data for which a waveform can be displayed.

Data type	Description	Units
POS ERROR	Servo error (8 ms) for the n–th axis	Pulses (detection units)
MOTION CMD	Pulse distribution for the n–th axis	Pulses (input increments)
CURRENT	Torque for the n–th axis	% (relative to maximum current)
SPEED	Actual speed for the n–th axis	min^{-1}
TORQUE CMD	Command current for the n–th axis	% (relative to maximum current)
HEAT SIMLT	Thermal simulation data for the n–th axis	% (OVC alarm ratio)

(4) Sampling axis: The axes along which data will be sampled are displayed.

(5) Sampling period: The sampling period for each axis is displayed.

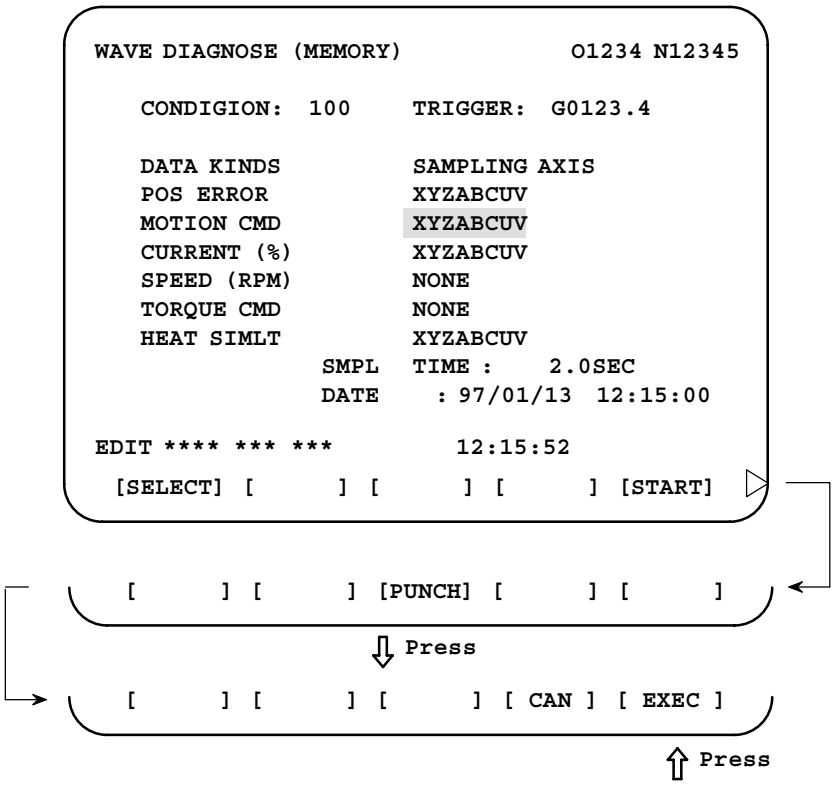
(6) Date of storage: While data is being sampled, MEMORY blinks in this field. When data sampling stops, the date at that point appears in this field.

1.10.5 Outputting Waveform Diagnosis Data (Storage Type)

Waveform diagnosis data of servo alarm format can be output to an I/O device, as follows:

1) Select EDIT mode.
2) Press the SYSTEM key, then display the WAVE DIAGNOS. (MEMORY) screen.
3) Press the **[W.MEM]**, ▷ , **[PUNCH]**, and **[EXEC]** soft keys, in this order.

For details of input/output to/from the FANUC Floppy Cassette or FA Card, see "Output to FANUC Floppy Cassette or FA Card," below.



- **Output to FANUC Floppy Cassette or FA Card**

1) Select EDIT mode.
2) Press the SYSTEM key, then display the WAVE DIAGNOS. (MEMORY) screen.
3) Open the write protect tab on the floppy disk or card.
4) Press the **[W.MEM]**, ▷ , **[PUNCH]**, and **[EXEC]** soft keys, in this order.

   The waveform diagnosis data is output to a file named WAVE DIAGNOS, to which the number of the last file is assigned.

   If a file named WAVE DIAGNOS already exists in the floppy disk or on the card, P/S alarm 86 is issued. A floppy disk or card can contain only one file for waveform diagnosis data. If the existing WAVE DIAGNOS file contains unnecessary waveform diagnosis data of servo alarm format, delete that file before attempting to output new data. The procedure for deleting a file is described later.

- **Directory display**

The directory in the cassette or card is displayed by means of the following procedure:

1) Select EDIT mode.
2) Press the PROG function key to select the program screen.
3) Press the continuous menu key ▷, then press [FLOPPY].
4) Press page key ↓.

The directory is displayed.

- **Deleting a file**

A file stored on a cassette or card is deleted by means of the following procedure:

1) Select EDIT mode.
2) Press the PROG function key to select the program screen.
3) Set the write protect switch on the cassette or card to enable writing.
4) Press [FLOPPY].
5) Press [DELETE].
6) Enter the file number, then press [F SET].
7) Press [EXEC].
   The file corresponding to the specified file number is deleted. The number of each file subsequent to the deleted file is decremented by one.

- **Output format**

In the servo alarm format, the header, date and time, selected axes, and waveform diagnosis data are output in this order. Data items are identified by nine identifier words. Output data other than the identifier words varies with the data type.

T(identifier word)

T0	:	Header
T60	:	Positional deviation
T61	:	Move command
T62	:	Actual current
T63	:	Actual speed
T64	:	Command current
T65	:	Thermal simulation
T68	:	Selected axes
T69	:	Date and time

1) Header

T	0	C	W	A	V	E		D	I	A	G	N	O	S	;

C: Data word

2) Data word

T	6	9	D	*	*	*	*	*	*	,	*	*	*	*	*	*	;

D*..*: Data Example: 12:14 59 seconds on June 23, 1997

T	6	9	D	1	9	9	2	0	6	2	3	,	1	2	1	4	5	9	;

3) Selected axes

T	6	8	P	*	*	D	*	*	,	*	*	,	~	*	*	,

P0: Positional deviation
P1: Actual speed
P2: Move command
P3: Command current
P4: Actual current
P5: Thermal simulation
D*.. *: Axis number (1 to 8)

4) Waveform diagnosis data

T	6	0	D	*	*	,	*	*	,	*	*	,	~	*	*	,	
T	6	1	D	*	*	,	*	*	,	*	*	,	~	*	*	,	
T	6	2	D	*	*	,	*	*	,	*	*	,	~	*	*	,	
T	6	3	D	*	*	,	*	*	,	*	*	,	~	*	*	,	
T	6	4	D	*	*	,	*	*	,	*	*	,	~	*	*	,	
T	6	5	D	*	*	,	*	*	,	*	*	,	~	*	*	,	

D *..*: Waveform diagnosis data x number of axes

NOTE
1 Records are classified into header records and data records.
2 “%” is used as an end–of–record code.
3 Each record starts with an identifier and ends with an end–of–block code.
4 Either the ISO or EIA code system is used.
5 The output code type is specified with parameter ISO (bit 1 of No. 0100). For ISO code, parameter NCR (bit 3 of No. 0100) is used to specify whether the end–of–block code is <LF> only, or a sequence of <LF> <CR> <CR>.
6 Parameter NFD (bit 7 of No. 01X1, where X is the channel number) is used to specify whether a feed code is output before and after the data.
7 No identifier word is output for a data item for which no axis is selected.
8 The above file corresponds to a paper tape of about 200 m in length.

1.10.6 Notes

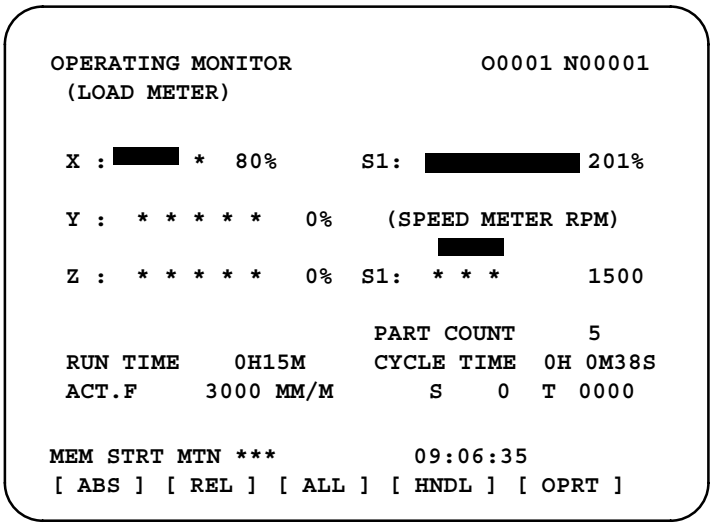
(1) Once the storage is full, the oldest data is overwritten.
(2) Stored–type waveform diagnostic data is not lost, even when the power is turned off.
(3) The waveform diagnostic function is disabled when parameter SGD (bit 0 of No. 3112) is set to 0.
(4) Set the correct date and time using the setting screen.

1.11 OPERATING MONITOR

Load meter of the servo axis can be displayed.

1.11.1 Display Method

1. Set a parameter to display operating monitor. (Bit 5 (OPM) of parameter No.3111)
2. Press the [POS] key to display the position display screen.
3. Press continuous menu key [▷], then soft key **[MONI]** is displayed.
4. Press the soft key **[MONI]**, then the operating monitor screen is displayed.



NOTE
1 The bar graph for the load meter shows load up to 200%.
2 The servo axes for their load meters are displayed are set to parameter No. 3151 to 3. If parameters 3151 to 3153 are all zero, the load meter of the basic axes are displayed.
3 For color display, the bar of the load meter that exceed 100% shows purple color.

1.11.2 Parameters

	#7	#6	#5	#4	#3	#2	#1	#0
311			OPM					

[Data type] Bit

OPM Operating monitor display is:

0 : Disabled
1 : Enabled

3151	Axis number for which the first servo motor load meter is displayed
3152	Axis number for which the second servo motor load meter is displayed
3153	Axis number for which the third servo motor load meter is displayed
3154	Axis number for which the fourth servo motor load meter is displayed
3155	Axis number for which the fifth servo motor load meter is displayed
3156	Axis number for which the sixth servo motor load meter is displayed
3157	Axis number for which the seventh servo motor load meter is displayed
3158	Axis number for which the eighth servo motor load meter is displayed

[Data type] Byte

[Valid data range] 0, 1, ... number of controlled axes

These parameters specify the numbers of the axes for which load meters for servo motors are to be displayed. Up to eight load meters can be displayed. Set 0 for those axes for which no load meter is to be displayed.

1.12 LIST OF OPERATIONS

Reset

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Resetting run hour			–	POS	[(OPRT)] [RUNPRE]→[EXEC]
Resetting no. of machined parts			–	POS	[(OPRT)] [PTSPRE]→[EXEC]
Resetting OT alarm			At Power ON	–	P and CAN
Resetting alarm 100			–	–	CAN and RESET

Registration from MDI

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Inputting parameters		Yes	MDI or E.Stop	SYSTEM (PARAM)	Parameter no.→[NO.SRH]→Data→ INPUT → PWE =0 → RESET
Inputting offset values	OFF		–	OFFSET SETTING	Offset number→[NO.SRH]→Offset value→ INPUT
Inputting setting data	OFF		MDI	OFFSET SETTING	Setting no.→[NO.SRH]Data→ INPUT
Input of PMC parameters, counter and data table	OFF		MDI or E.Stop	SYSTEM (PMC)	[PMCPRM]→[COUNTR] or [DATA]→Data→ INPUT
Inputting PMC parameters (Timer, keep relay)		Yes			[PMCPRM]→[TIMER] or [KEEPRL]→Data→ INPUT
Tool length measurement			JOG	POS → OFFSET SETTING	POS (Display of relative coordinate)<AXIS>→ [ORIGIN] → OFFSET SETTING →Jog the tool to measuring position Offset no.→[NO.SRH]→<AXIS>→[INP.C]

Input/Output with FANUC Cassette

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Heading a file			EDIT	PROG	N →File no.→[▶]→[F SRH]→[EXEC]
Deleting a file	OFF		EDIT	PROG	N →File no.→[▶]→[DELETE→[EXEC]
Collating a program			EDIT	PROG	Heading a file→ O →Program number→[(OPRT)] →[▶]→[READ]→[EXEC]

Inputting From FANUC Cassette

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Inputting parameters		OFF	EDIT or E.Stop	SYSTEM (PARAM)	[(OPRT)]→[▶]→[READ]→[EXEC]
Inputting PMC parameters		OFF	E.Stop	SYSTEM (PMC)	[▶]→[I/O]→(CANNEL NO) 1 INPUT → (DEVICE NAME) [FDCAS]→(KIND OF DATA) [PARAM]→[READ]→(FILE NO) File no. INPUT →[EXEC]
Inputting offset values	OFF		EDIT	OFFSET SETTING	(Heading a file no.)→[(OPRT)]→[▶]→[READ]→[EXEC]
Registering a program	OFF		EDIT	PROG	N →File no.→ INPUT →[▶]→[READ]→[EXEC]
Inputting macro variables	OFF		EDIT	PROG	N →File no.→ INPUT →[▶]→ O → Program no. → [READ]→[EXEC]
			MEMORY	PROG	<START>

Output to FANUC Cassette

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Output of parameter			EDIT	SYSTEM (PARAM)	[(OPRT)]→[▶]→[PUNCH]→[EXEC]
Output of PMC parameter			EDIT	SYSTEM (PMC)	[▶]→[I/O]→(CANNEL NO) 1 INPUT →(DEVICE NAME) [FDCAS] →(KIND OF DATA) [PARAM] → [WRITE] → (FILE NO) – 1 INPUT →[EXEC]
Output of offset			EDIT	OFFSET SETTING	[(OPRT)]→[▶]→[PUNCH]→[EXEC]
Output of all programs			EDIT	PROG	O →–9999→[▶]→[PUNCH]→[EXEC]
Output of one program			EDIT	PROG	O →Program no.→[▶]→[PUNCH]→[EXEC]
Output of macro variables			EDIT	OFFSET SETTING	[▶]→[MACRO]→[(OPRT)]→[▶]→[PUNCH]→[EXEC]

Search

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Searching a program number			MEMORY or EDIT	PROG	O →Program no.→[O SRH]
Searching a sequence number			MEMORY	PROG	Program no. search→ N →Sequence number→[NSRH]
Searching an address word			EDIT	PROG	Data to be searched→[SRH↑] or[SRH↓] or ↑ ↓ (cursor key)
Searching an address only			EDIT	PROG	Address to be searched [SRH↑] or[SRH↓] or ↑ ↓ (Cursor key)
Searching an offset number			–	OFFSET SETTING	Offset no.→[NO.SRH]
Searching a diagnostic number			–	SYSTEM (DGNOS)	Diagnostic number→[NO.SRH]
Searching a parameter number			–	SYSTEM (PARAM)	Parameter no.→[NO.SRH]

Edit

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Display of memory capacity used			EDIT	PROG	[LIB]
Deleting all programs	OFF		EDIT	PROG	O →–9999→ DELETE
Deleting a program	OFF		EDIT	PROG	O →Program no.→ DELETE
Deleting several blocks	OFF		EDIT	PROG	N →Sequence no.→ DELETE (Deleted up to a block with a specified sequence no.)
Deleting a block	OFF		EDIT	PROG	EOB → DELETE
Deleting a word	OFF		EDIT	PROG	Searching a word to be deleted→ DELETE
Changing a word	OFF		EDIT	PROG	Searching a word to be changed→New Data→ ALTER
Inserting a word	OFF		EDIT	PROG	Searching a word immediately before a word to be searched→New Data→ INSERT

Collation

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Collating memory	ON		EDIT	PROG	[(OPRT)]→[▶]→[READ]→[EXEC]

Playback

Function	Data protection key	Parameter write=1	Mode	Function button	Operation
Input of NC data			TEACH –IN JOG/ HAN- DLE	PROG	Jog the machine→ X , Y or Z → INSERT → NC data → INSERT → EOB → INSERT

Clear

Function	Data protection key	Parameter write=1	Mode	Function key	Operation
Memory all clear			At power ON		RESET AND DELETE
Parameter/offset clear		○	At Power ON		RESET
Clearing a program		○	At Power ON		DELETE
Program under edition at power off(PS101)			–		PROG AND RESET
PMC RAM *			At Power ON		X AND O
Additional SRAM area clear			At Power ON		O AND DELETE

* PMC ladder program is not cleard in FROM.

Manual operation

Function	KEY SW	PWE =1	Mode	Function key	Operation
Manual reference point return			JOG		Turn on Reference point return switch → Turn on +X, –X, +Z, or –Z → Reference point return switch LED lit.
Jog feed			JOG		Turn on +X, –X, +Z, or –Z → Use JOG FEEDRATE to set jog feedrate → Press Rapid traverse button, if required.
Incremental feed			INC		Use Move distance selection switch to select move distance → Turn on +X, –X, +Z, or –Z → Press Rapid traverse button, if required.
Manual handle feed			HND		Use Axis selection switch to select axis to be operated → Use Handle magnification selection to select magnification → Turn manual pulse generator.

Display

Function	KEY SW	PWE =1	Mode	Func-tion key	Operation
Amount of program memory in use			EDIT	PROG	[DIR]
Command value display			MEM or MDI	PROG	Command value being executed, and previously specified modal value
					[CURRNT]
					Command value being executed, and next command value to be executed
					[NEXT]
					Command value entered from MDI, and previously specified modal value
					[MDI]
					Program in memory being executed
					[PRGRM]
					Executable blocks in memory and current position
					[CHECK]
Current–position display				POS	Representation of the position in the workpiece coordinate system
					[ABS]
					Representation of the position in the relative coordinate system
					[REL]
					General position indication
					[ALL]
Alarm display			—	MESSAGE	[ALARM] when an alarm condition has occurred.
Alarm history display				MESSAGE	[HISTRY]
Screen erase			—	—	Press the CAN and function keys simultaneously. The function key causes re–display.
Screen switching between NC and loader					SHIFT and HELP

Graphics function

Function	KEY SW	PWE =1	Mode	Function key	Operation	
Parameter setting				GRAPH	[PARAM]	
Tool path drawing				GRAPH	Select a graphics drawing screen.	
					[GRAPH]	
					Begin and end drawing.	
					During automatic operation or manual operation	
Tool path diagram data setting				GRAPH	Press the GRAPH key several times → Display “PATH GRAPHIC (PARAMETER)” screen → [PARAM] → Enter numerals using numeric keys → INPUT	
Tool path drawing			MEM	GRAPH	Press the GRAPH key several times → Display “PATH GRAPHIC (PARAMETER)” screen → [EXEC] → [(OPRT)] → [AUTO] or [START]	
					Suspend drawing	
					[STOP]	
					Suspend drawing	Execute.
						[START]
						Draw starting at the top of the program.
						[REWIND] → [START]
Enlarging part of the tool path drawing				GRAPH	Press the GRAPH key several times → Display “PATH GRAPHIC (PARAMETER)” screen → [SCALE] → [(OPRT)][←][→][↓][↑] → P c or M # → [EXEC]	
Current–tool position mark display				GRAPH	Press the GRAPH key several times → Display “SOLID GRAPHIC (PARAMETER)” screen → [POS]	
Machining profile drawing data setting				GRAPH	Press the GRAPH key several times → “SOLID GRAPHIC (PARAMETER)” screen → Enter numerals using numeric keys → INPUT	
Blank figure drawing				GRAPH	Press the GRAPH key several times → “SOLID GRAPHIC (PARAMETER)” screen → [BLANK] → [(OPRT)] → [ANEW] → [+ ROT][– ROT][+TILT][–TILT]	

Function	KEY SW	PWE =1	Mode	Func-tion key	Operation	
Machining profile drawing			MEM	GRAPH	Press the GRAPH key several times → “SOLID GRAPHIC (PARAMETER)” screen → [EXEC] → [(OPRT)] → [A.ST] or [F.ST]	
					Suspend drawing	
					[STOP]	
					After drawing is suspended	Execute.
						[A.ST] or [F.ST]
						Display the start of part program.
						[REWIND] → [A.ST] or [F.ST]
Re–drawing of “SOLID GRAPHIC (PARAMETER)” in a different orientation				GRAPH	Press the GRAPH key several times → “SOLID GRAPHIC (PARAMETER)” screen → [REVIEW] → [(OPRT)] → [ANEW] → [+ ROT][– ROT][+TILT][–TILT]	
3–plane drawing				GRAPH	Press the GRAPH key several times → “SOLID GRAPHIC (PARAMETER)” screen → [▶] → [3–PLN] → [(OPRT)] → [↺] [←][→][↑][↓]	

NOTE
For the small–size MDI, read the GRAPH function key in this table as the CUSTOM GRAPH function key.

Help function

Function	KEY SW	PWE =1	Mode	Func-tion key	Operation
Initial menu screen display				HELP	HELP
Alarm detail screen display				HELP	[ALARM] → Alarm No. → [SELECT]
Operation method screen display				HELP	[OPERAT] → Operation method item No. → [SELECT]
Parameter table–of–contents screen display				HELP	[PARAM]

Self–diagnosis function

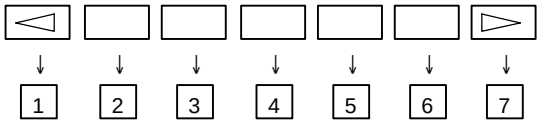
Function	KEY SW	PWE =1	Mode	Function key	Operation
Self–diagnosis screen display				SYSTEM	[DGNOS] ↓ 1. PAGE ↓ PAGE ↑ page switch keys 2. Diagnosis data No. → [NO.SRH]

Boot

Function	KEY SW	PWE =1	Mode	Function key	Operation
System monitor screen display			Power–on time	—	▷ and a soft key at its left
Reading file from memory card					Place the cursor at 1. SYSTEM DATA LOADING on the system monitor screen → [SELECT] → Place the cursor at the target file → [SELECT] → [YES]
Listing files in flash ROM and displaying detail screen					Place the cursor at 2. SYSTEM DATA CHECK on the system monitor screen → [SELECT] → Place the cursor at the target item → [SELECT]
Deleting file from flash ROM					Place the cursor at 3. SYSTEM DATA DELETE on the system monitor screen → [SELECT] → Place the cursor at the target file → [SELECT] → [YES]
Outputting file from flash ROM to memory card					Place the cursor at 4. SYSTEM DATA SAVE on the system monitor screen → [SELECT] → Place the cursor at the target file → [SELECT] → [YES]
Transferring contents between SRAM and memory card in batch					Place the cursor at 5. SRAM DATA BACKUP on the system monitor screen → [SELECT] – Batch output to memory card Place the cursor at 1. SRAM BACK UP → [SELECT] → [YES] – Batch input from memory card Place the cursor at 2. RESTORE SRAM → [SELECT] → [YES]
Deleting file from memory card					Place the cursor at 6. MEMORY CARD FILE DELETE on the system monitor screen → [SELECT] → Place the cursor at the target file → [SELECT] → [YES]
Memory card formatting					Place the cursor at 7. MEMORY CARD FORMAT on the system monitor screen → [SELECT] → [YES]
Exiting system monitor					Place the cursor at 10. END on the system monitor screen → [SELECT] → [YES]

Reference

If no soft key is available as with a touch panel, use the numeric keys on the MDI keypad.



P–CODE loader

Function	KEY SW	PWE =1	Mode	Func-tion key	Operation
Starting P–CODE loader			Pow-er–on time		CAN and PROG

1.13 WARNING SCREEN DISPLAYED WHEN AN OPTION IS CHANGED

- **Warning screen**

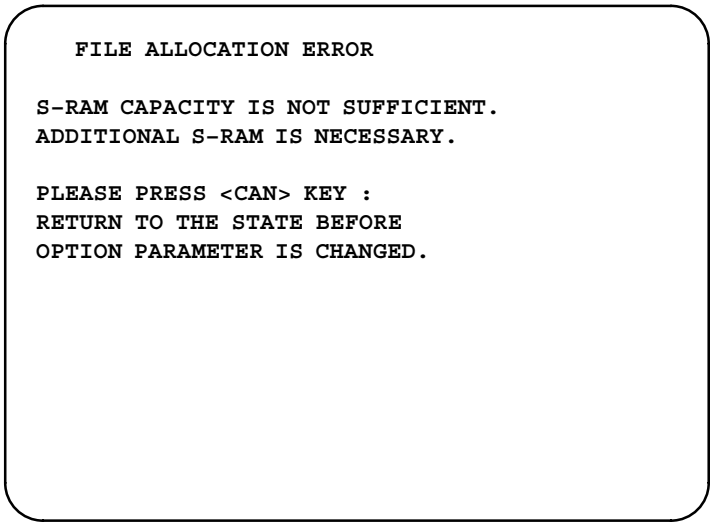
This CNC displays a warning screen when the configuration of the options using the SRAM area is changed. The data for the function indicated on the screen is cleared the next time the system is turned on.

```
   WARNING

YOU SET THE PARAMETER NO.□□□□#□

THE FOLLOWING DATA WILL BE CLEARED.

* PART PROGRAM MEMORY

PLEASE PRESS <DELETE> OR <CAN> KEY.
<DELETE> : CLEAR ALL DATA
<CAN>    : CANCEL
```

NOTE (*1)
Mark* varies with the parameter settings. Two or more function names may be displayed.

- **Allocation error screen**

When an option which uses the SRAM area is added, the system software may require more SRAM than is currently installed in the system. In this case, an allocation error screen appears the first time the system is turned on after the addition of the option, thus restoring the state existing before the addition.



NOTE

When the currently installed SRAM is not sufficient, additional SRAM can be mounted. Newly installed SRAM must be cleared before it can be used.

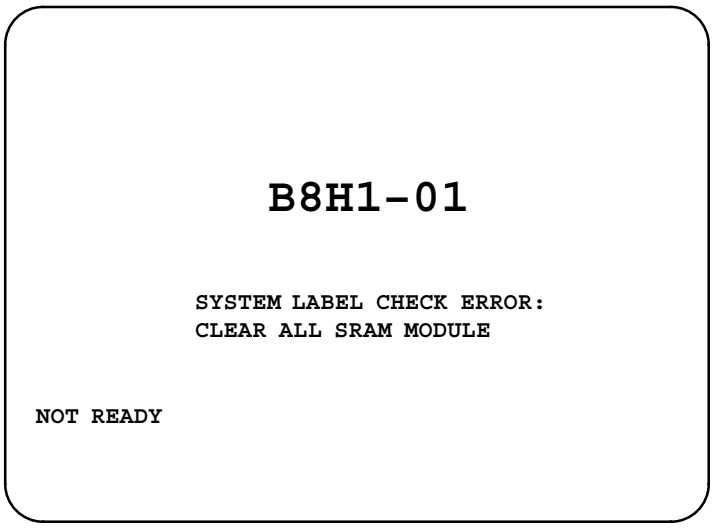
Operation:When turning on the power, hold down the following keys:

O + DELETE

When installing additional SRAM, however, perform all clear. (RESET + DELETE)

1.14 WARNING SCREEN DISPLAYED WHEN SYSTEM SOFTWARE IS REPLACED (SYSTEM LABEL CHECK ERROR)

System software can be replaced only with compatible system software. Otherwise, the first time the CNC is turned on after the system software is replaced, the following screen will be displayed and the system will not be activated:



In this case, perform memory all clear (by holding down the RESET and DELETE MDI keys then turning on the power) or reinstall the original system software.

1.15 MAINTENANCE INFORMATION SCREEN

The maintenance information screen is provided to record the history of maintenance performed by a service person of FANUC or machine tool builder.
The screen has the following features:

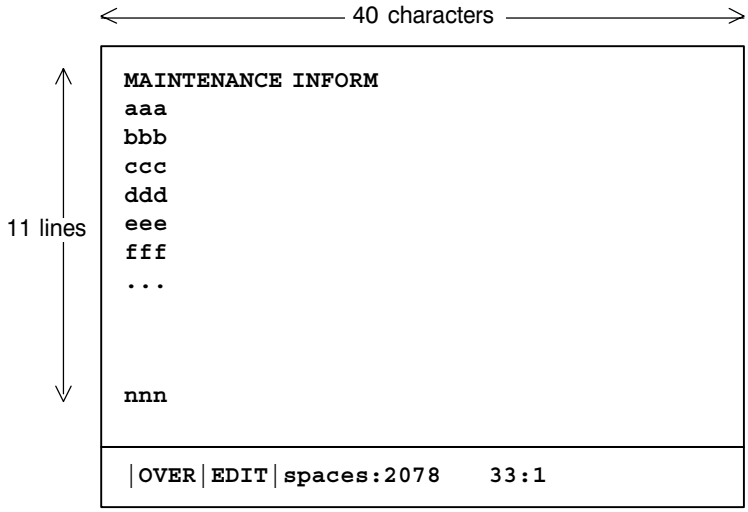
- MDI alphabetical input is allowed.
- The recording screen can be scrolled in units of lines.
- Edited maintenance information can be read and punched.
- The screen can be saved in flash ROM.

1.15.1 Screen Display and Operation

- **Screen display**

1. Press the [SYSTEM] function key.
2. Press the continuous menu key [▷] several times. **[M–INFO]** soft key appears.
3. Press the **[M–INFO]** soft key. The maintenance information screen appears.

When selected, the maintenance screen shows the latest information.
The recording screen has an input area of 40 characters by 11 lines.
The status (mode, number of empty character spaces, cursor line, column number) is displayed at the bottom of the screen.



Status display

- OVER/INSERT : --- OVER : Overwrite mode ; INSERT: Insert mode
- EDIT/VIEW : ------ EDIT : Editing allowed ; VIEW : Editing inhi bited
- Number of empty character spaces
- Current cursor line
- Current cursor column

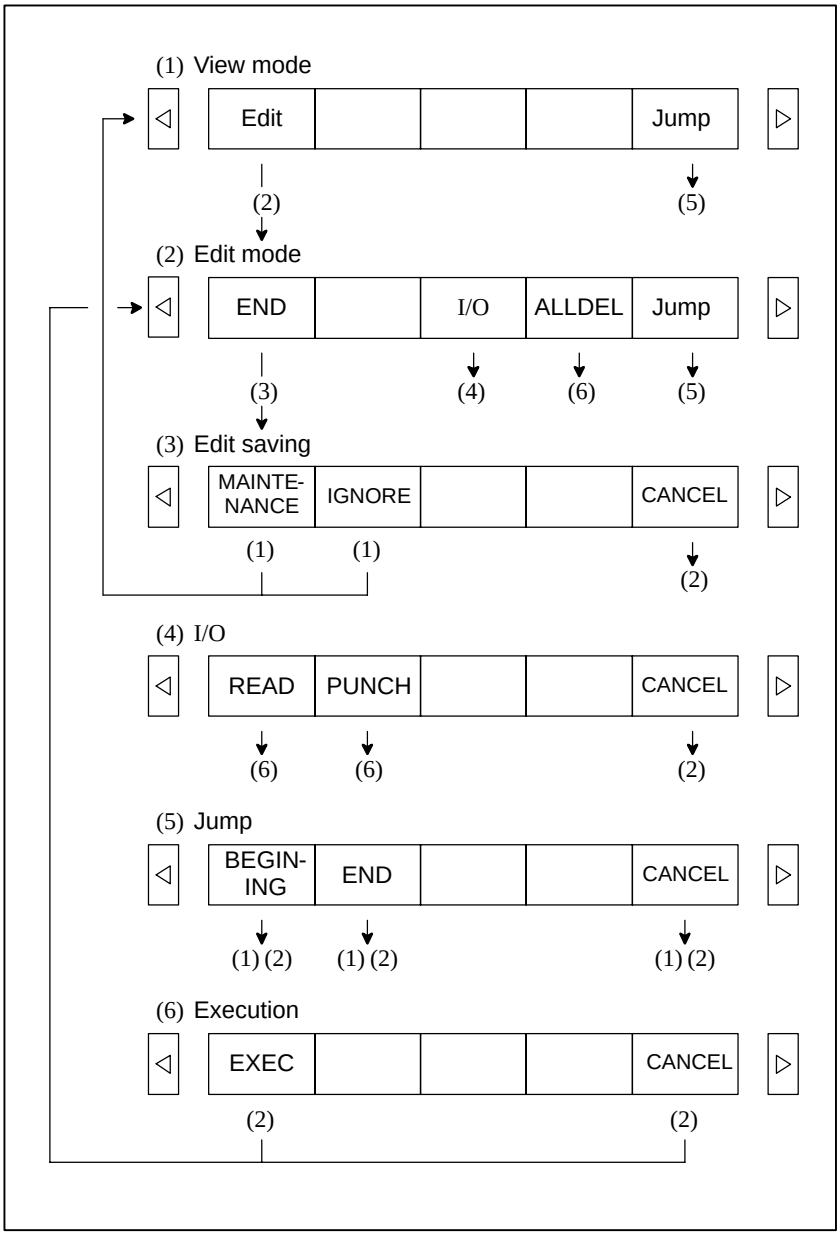
- **Screen operation**

The maintenance information screen has view mode and edit mode, which are selected by pressing the **[END]** or **[EDIT]** soft key.
Initially, view mode is selected. To start editing, select edit mode by pressing the [(OPRT)] and **[EDIT]** keys. When the editing is completed, press the **[END]** key. Then, select **[STORE]** or **[IGNORE]**. Unless **[STORE]** is selected, the edited data will be lost at next power–up.
To scroll the screen showing the recorded information, press a cursor key or page key on the MDI panel.
The following keys are used for editing (character input) and viewing:

Operation table

Mode	Key	Description
View	Soft keys [EDIT] [JUMP]	Allows editing. Displays the beginning or the end.
	Cursor key	Scrolls the screen up or down.
	Page key	Scrolls the screen up or down in units of whole screens.
Edit	Soft keys	
	[END]	Ends editing. Select whether to store the edited data.
	[ALLDEL]	Clears all maintenance information. (This key is enabled when the MDC bit (bit 3 of parameter 3118) is set to 1.)
	[I/O]	Reads or punches the maintenance information.
	[JUMP]	Moves the cursor to the beginning or end.
	Cursor key	Moves the cursor position up or down.
	Page key	Scrolls the screen up or down in units of whole screens.
	Alphanumeric/special/character keys	Allows alphabetical, numeric, or special character input.
	INSERT key	Selects either insert mode or overwrite mode.
	DELETE key	Deletes a single character.
	CAN key	Deletes a single character before the cursor position.
	INPUT key	Starts a new line.

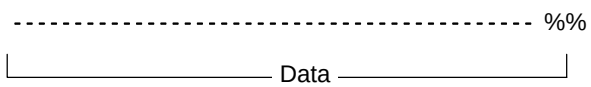
Operation of the soft keys



1.15.2 Maintenance Information Input/Output

The maintenance information can be read and punched.
When the maintenance information is input from or output to a memory card, a file name MAINTINF.DAT is used.

(1) Format



(2) Reading

When a MAINTINF.DAT file generated in the format shown above is read, the data is added at the end of the existing maintenance information.

NOTE
1 A TAB code is converted to one to four blanks, depending on the input position.
2 80h to 90h and E0h to EBh are assumed as prefix codes of double–byte characters. Reading these codes alone is inhibited.
3 Control codes (00H to 1FH) except TAB and LF are discarded in reading.
4 %% cannot be input.

(3) Punching

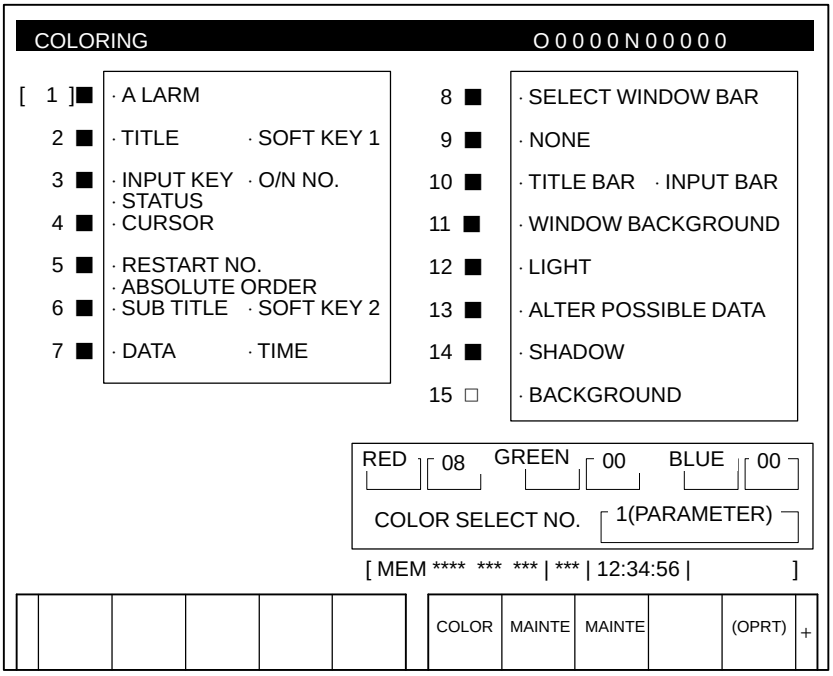
All maintenance information is output in the format shown above.

1.16 COLOR SETTING SCREEN

When VGA screen display is selected (NVG bit (bit 7 of parameter 3119) is set to 0), the color scheme of the VGA screen can be set on the color setting screen.

1.16.1 Screen Display

1. Press the [SYSTEM] function key.
2. Press the continuous menu key [▷] several times. The **[COLOR]** soft key appears.
3. Press the **[COLOR]** soft key. The color setting screen appears.



1.16.2 Color Setting

- **Changing a color (color palette value)**

1. Press the [(OPRT)] soft key. The following operation soft keys appear.

2. Move the cursor to the color number corresponding to the color palette value to be changed.

   The current color palette values of individual color elements are displayed.
3. Select a desired color element by pressing the **[RED]**, **[GREEN]**, or **[BLUE]** operation soft key.

   Two or more color elements can be simultaneously selected.

   Each time the **[RED]**, **[GREEN**], or **[BLUE]** operation soft key is pressed, the selection is made or canceled.

   (If the **[RED]**, **[GREEN]**, and **[BLUE]** operation soft keys are not displayed, press the rightmost soft key.)

4. Press the **[LIGHT]** or **[DARK]** operation soft key to change the luminance of the selected color element.

- **Storing colors (color palette values)**

A specified color palette value can be stored.

	STORE	CALL	COLOR1	COLOR2	COLOR3	+

1. Select a desired storage area by pressing the **[COLOR1]**, **[COLOR2]**, or **[COLOR3]** operation soft key.

   (If the **[COLOR1]**, **[COLOR2]**, and **[COLOR3]** operation soft keys are not displayed, press the rightmost soft key.)

   COLOR1 — Standard color data parameters (6561 to 6595)
   COLOR2 ┐ Internal RAM
   COLOR3 ┘

2. Press the **[STORE]** operation soft key. The following operation soft keys appear.

				CAN	EXEC	+

3. To store the current color palette values in the selected area, press the **[EXEC]** operation soft key. To cancel the storage, press the **[CAN]** operation soft key or the leftmost key.

- **Calling colors (color palette values)**

	STORE	CALL	COLOR1	COLOR2	COLOR3	+

1. Select a color palette storage area by pressing the **[COLOR1]**, **[COLOR2]**, or **[COLOR3]** operation soft key.

   (If the **[COLOR1]**, **[COLOR2]**, and **[COLOR3]** operation soft keys are not displayed, press the rightmost soft key.)

2. Press the **[CALL]** operation soft key. The following operation soft keys appear.

				CAN	EXEC	+

3. To call the color palette values from the selected area, press the **[EXEC]** operation soft key. If no color palette value is stored, this step cannot be executed.

   To stop calling, press the **[CAN]** operation soft key or the leftmost key.

1.16.3 Parameters

	#7	#6	#5	#4	#3	#2	#1	#0
3119	NVG							

[Data type] Bit

NVG When a color display unit is used, the VGA screen display is:

0 : Selected.
1 : Not selected. (Conventional display)

6561	Standard color data of graphic color 1
6562	Standard color data of graphic color 2
6563	Standard color data of graphic color 3
6564	Standard color data of graphic color 4
6565	Standard color data of graphic color 5
6566	Standard color data of graphic color 6
6567	Standard color data of graphic color 7
6568	Standard color data of graphic color 8
6569	Standard color data of graphic color 9
6570	Standard color data of graphic color 10
6571	Standard color data of graphic color 11
6572	Standard color data of graphic color 12
6573	Standard color data of graphic color 13
6574	Standard color data of graphic color 14
6575	Standard color data of graphic color 15
6581	Standard color data of text color 1
6582	Standard color data of text color 2
6583	Standard color data of text color 3
6584	Standard color data of text color 4
6585	Standard color data of text color 5
6586	Standard color data of text color 6
6587	Standard color data of text color 7
6588	Standard color data of text color 8

6589	Standard color data of text color 9
6590	Standard color data of text color 10
6591	Standard color data of text color 11
6592	Standard color data of text color 12
6593	Standard color data of text color 13
6594	Standard color data of text color 14
6595	Standard color data of text color 15

[Data type] Two–word

[Unit of data] Six–digit number rrggbb (rr: Red component value, gg: Green component value, bb: Blue component value)
When five digits or less are specified, the missing high–order digits are assumed as zeros.

[Valid data range] Each color component value: 00 to 15 (Equivalent to the color level on the color setting screen)
When 16 or a higher value is specified, 15 is assumed.

(Example) When specifying a color having red component value 1, green component value 2, and blue component value 3, set the parameter value as 10203.

1.16.4 Notes

(1) At power–up, the color scheme of the screen is determined by the setting in the COLOR1 area (parameters). If no data is stored in the COLOR1 area, the last color scheme before power–down is applied.

(2) The standard color data specified in parameters must not be changed by direct MDI key input. When changing the parameter data, set and store the new data on the color setting screen.

(3) When a wrong value is specified in a standard color data parameter, the screen may not be displayed. If this occurs, turn the power on again, while pressing the DELETE and RESET keys. This clears the whole stored color scheme and restores the FANUC standard color scheme instead.

1.17 CONTRAST ADJUSTMENT

Depending on the eye level and the viewing angle of the operator, the LCD may be hard to read. This problem can be solved by adjusting the contrast. The contrast of a monochrome LCD can be adjusted.

1. Press the OFFSET SETTING function key.
2. Press the [SETTING] chapter selection soft key.
   The LCD contrast item is displayed on the setting (handy) screen.

```
SETTING(HANDY)
PARAMETER WRITE  = 1(0:DISABLE 1: ENABLE)
TV CHECK         = 0(0:OFF 1:ON)
PUNCH CODE       = 0(0:EIA 1:ISO)
INPUT UNIT       = 0(0:MM  1:INCH)
I/O CHANNEL      = 0(0-3:CHANNEL NO.)
SEQUENCE NO.     = 0(0:OFF 1:ON)
TAPE EORMAT      = 0(0:NO CNV  1:F15)
SEQUENCE STOP    = 0(PROGRAM NO.)
SEQUENCE STOP    = 0(SEQUENCE NO.)

[ CONTRAST ]( + = [ ON:1 ] - = [ OFF:0 ])
>_
MDI **** *** *** BAT 00:00:00
[NO.SRH] [ ON:1 ] [OFF:0] [+INPUT] [INPUT]
```

3. Move the cursor to “CONTRAST”.
4. Adjust the contrast by pressing the operation soft key [ON:1] or [OFF:0].

1.18 POWER MATE CNC MANAGER

When the power mate CNC series is used as an additional axis (slave) of the CNC, the power motion manager allows the slave data to be displayed and set by the CNC.
The power mate CNC manager enables the following display and setting:

(1) Current position display (absolute/machine coordinates)
(2) Parameter display and setting
(3) Diagnosis display
(4) System configuration screen display
(5) Alarm display

The power mate CNC series that can be used as the slave is a β amplifier with I/O Link.

1.18.1 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
0960					PMN	MD2	MD1	SLV

[Data type] Bit

SLV When the power mate CNC manager is selected, the screen shows the data of:

0 : A single slave.
1 : Up to four slaves by dividing the screen into four segments.

MD1, MD2 The slave parameters are input from and output to the following devices:

MD2	MD1	I/O device
0	0	Part program storage
0	1	Memory card

The parameters are input or output in the program format, no matter which I/O device is selected.

PMN The power mate CNC manager function is:

0 : Enabled.
1 : Disabled. (Communication with the slave is not performed.)

1.18.2 Screen Display

1. Press the [SYSTEM] function key.
2. Press the continuous menu key [▷] several times. The [PMM] soft key appears.
3. Press the [PMM] soft key. The system configuration screen, which is the initial screen of the power motion manager, appears. The screen has the following soft keys (function selection soft keys).

```
[ POS ][       ][       ][SYSTEM][ MSG ]
```

The currently active soft key is displayed in reverse video. Pressing a soft key enables the corresponding function, as indicated below:

POS: Current position display
SYSTEM: System information
MSG: Alarm list

To select another function after one of the functions listed above is selected, press the return menu key [◁] several times until the soft keys are displayed as shown above. Then, select the desired function.

4. To terminate the Power Mate CNC manager, repeatedly press the return menu key [◁] until the function selection keys are displayed as shown above. Then, press the return menu key once more. The soft keys of the CNC system appear, and the Power Mate CNC manager terminates. The system configuration screen of this function is displayed as the termination screen.

Alternative termination method is to select another function while this function is enabled. To do this, press an MDI function key ([POS] , [PROG] , [MESSAGE] , etc.).

NOTE
After another screen is displayed by pressing a function key, pressing the [SYSTEM] function key, restores the initial status of this function. That is, the soft keys shown above are restored. The data that was being input is canceled.

- **System configuration screen**

This screen displays the system software information of the slave. The screen is displayed first when the Power Mate CNC manager function is selected. This screen is automatically displayed also at the termination of the function.

1. Press the [SYSTEM] function selection soft key. The following soft keys are displayed together with the screen displayed when SYSTEM was last selected. The currently active soft key is displayed in reverse video.

```
[ PARAM ][ DGNOS ][       ][SYSTEM][     ]
```

2. Press the [SYSTEM] soft key again. The system configuration screen appears. While this screen is displayed, the [SYSTEM] soft key is left displayed in reverse video.

```
POWER MOTION MANAGER
SYSTEM CONFIGURATION
1.GROUP0 / β

SYSTEM  <SERIES/VERSION>            88A1 01

[ PARAM ][ DGNOS ][       ][ SYSTEM ][       ]
```

Sample screen: Series and edition of the servo unit β series system list

- **Parameter screen**

The parameters necessary for the functions of the slave must be specified in advance.

1. Press the [SYSTEM] function selection soft key. The following soft keys appear.

```
[ PARAM ][ DGNOS ][      ][SYSTEM][      ]
```

2. Press the [PARAM] soft key. The parameter screen appears.

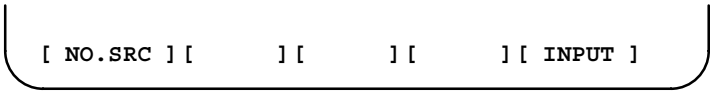
```
POWER MOTION MANAGER
PARAMETER
1.GROUP0 / β
0000        00001000   0010        11110000
0001        00010101   0011        01010000
0002        11111011   0012        00000000
0003        00000000   0013        00000000
0004        00000000   0014        10110001
0005        10100001   0015        00000000
0006        00000000   0016        00000000
0007        10000000   0017        10000010
0008        00000000   0018        00000000
0009        00000000   0019        00000000

[ PARAM ][ DGNOS ][       ][ SYSTEM ][       ]
```

The screen displays just the bit and decimal data. For details of the parameters, refer to the connection manual of the corresponding Power Mate CNC unit.

- Searching for a parameter

A search can be made for the parameter to be displayed.

1. Select the active slave.
2. Press the [(OPRT)] soft key. The following soft keys appear.

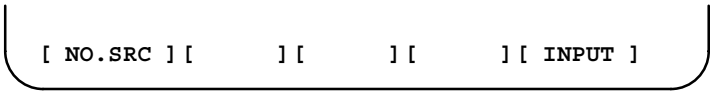


3. Enter a desired number in the key–in field by using MDI numeric keys. Then, press the [NO.SRC] soft key. The search starts.

- Setting a parameter

A parameter of a slave Power Mate CNC unit can be directly set from the CNC.

1. Select the active slave.
2. Press the [(OPRT)] soft key. The following soft keys appear:

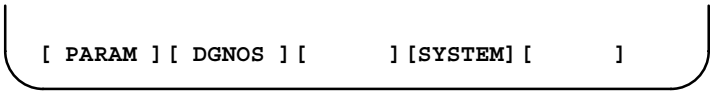


3. Move the cursor to the parameter to be set.
4. Enter desired data in the key–in buffer by using MDI numeric keys. Then, press the [INPUT] soft key. Alternatively, press the MDI INPUT key.

• Diagnosis screen

This screen shows the current status of the slave.

1. Press the [SYSTEM] function selection soft key. The following soft keys appear:



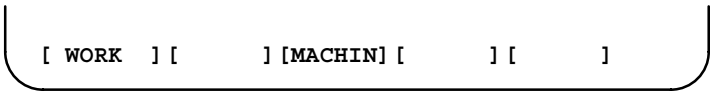
2. Press the [DGNOS] soft key. The diagnosis screen appears. The displayed data is basically the same as the data displayed on the parameter screen.

   For details of the diagnosis information, refer to the connection manual of the corresponding Power Mate CNC unit.

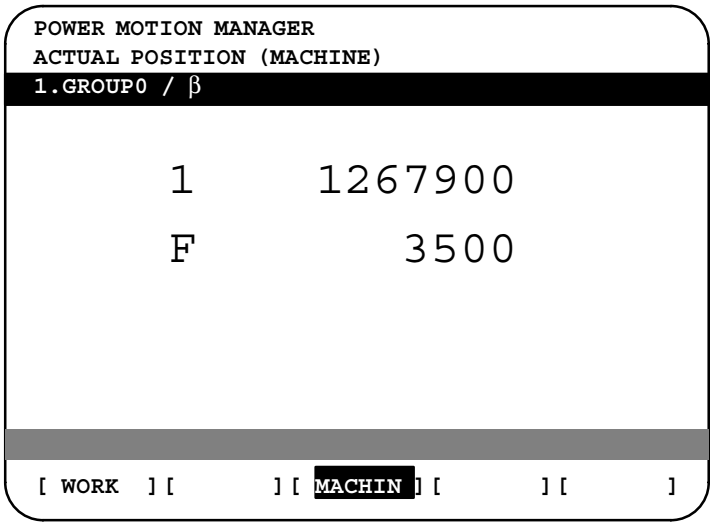
- **Current position display**

The screen shows the current position on the workpiece coordinate system or machine coordinate system.

1. Press the [POS] function selection soft key. The following soft keys appear:



2. To see the absolute coordinate screen, press the [WORK] soft key. To see the machine coordinate screen, press the [MACHIN] soft key.

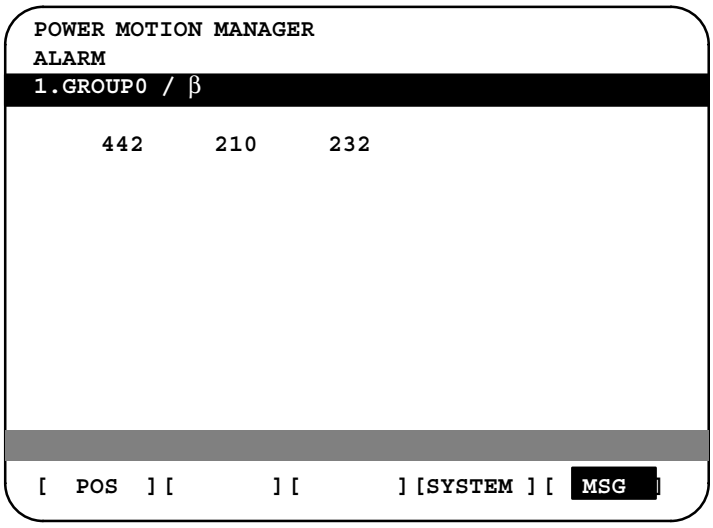


1: Coordinate F: Actual speed

- **Alarm screen**

If an alarm is issued during operation, the group number of the slave causing the alarm is indicated at the right end of the message field on the screen. Check the details on the alarm screen. For example, (13) means that the first and third Power Mate CNC units are in the alarm state.

1. Press the [MSG] function selection soft key. Just the error code is displayed on the screen.



Up to forty codes can be displayed on the screen.

For details of the alarm, refer to the connection manual of the corresponding Power Mate CNC unit.

- **Operating the active slave**

The active slave is subjected to the ZOOM function, which will be described later, and parameter overwrite. The title of the active slave is displayed in a color different from the display color of the other slave titles.

The active slave can be selected by pressing the [↓NEXT] or [↑BACK] soft key, which is displayed after the continuous menu key ▷ is pressed several times.

[↓NEXT]: Displays the screen of the Power Mate CNC unit connected after the currently active slave. The equipment other than the Power Mate CNC unit is ignored.

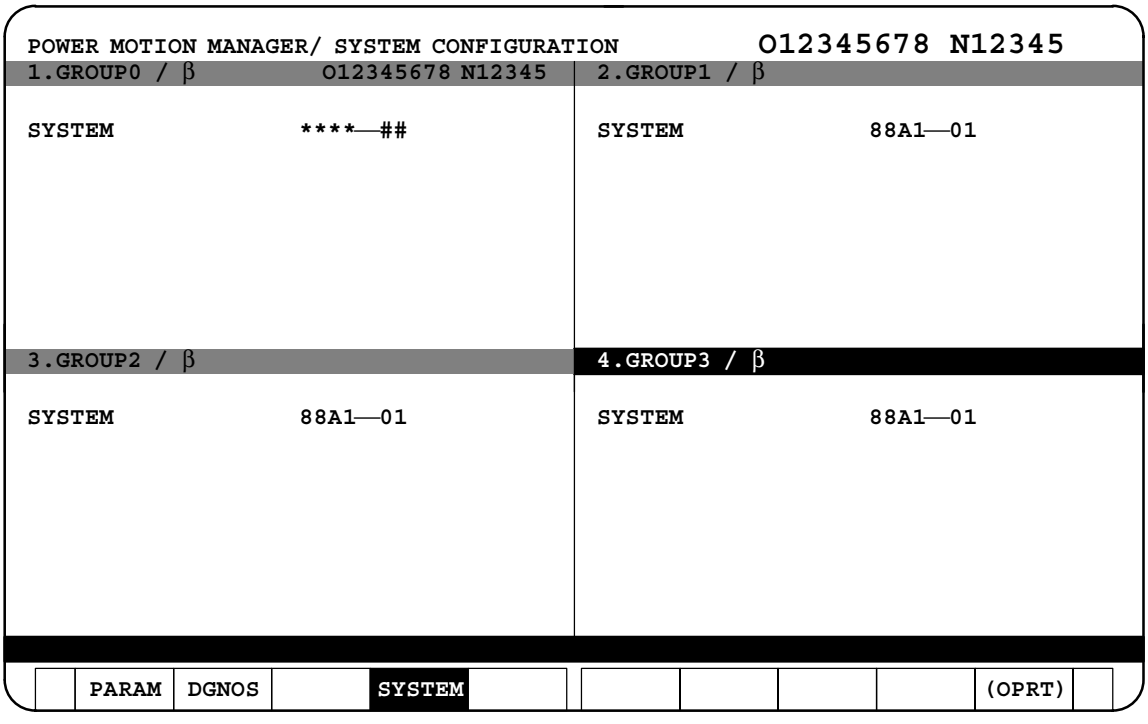
[↑BACK]: Displays the screen of the Power Mate CNC unit connected before the currently active slave.

- **Single–slave display/ Four–slave display**

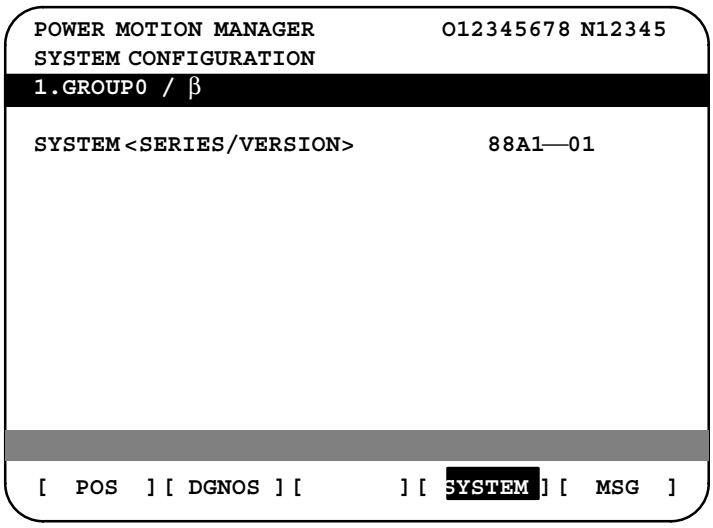
Whether the screen displays the data of just a single unit or of four units in four segments is specified in the SLV bit (bit 0 of parameter 960).

To switch the four–slave display to the single–slave display, press the [ZOOM] soft key, which is displayed after the continuous menu key ▷ is pressed several times. The single–slave display shows the data of the active slave. To switch the single–slave display to the four–slave display showing the data of four slaves including the active slave, press the [ZOOM] key.

When five or more slaves are connected, the four–slave display has two or more pages. To see the slave data that is not displayed on the current page, press soft key [↓NEXT].



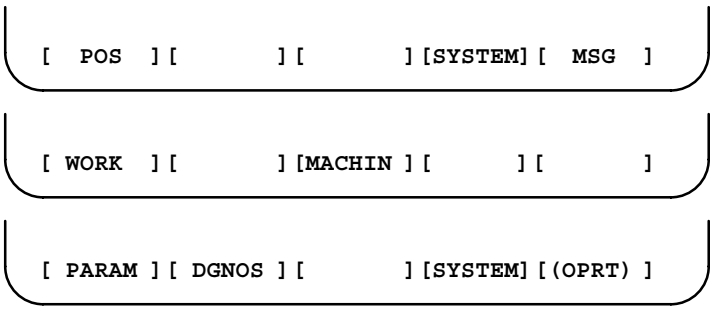
The figure above shows a sample four–slave display screen on a display unit with twelve soft keys. A unit with seven soft keys can also display the four–slave display screen.



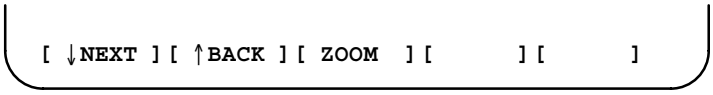
The figure above shows a sample single–slave display screen on a display unit with seven soft keys. A unit with twelve soft keys can also display the single–slave display screen.

- **Guidance message**

While the following soft keys are being displayed, a guidance message is displayed in the message field.



When the soft keys are displayed as shown above, “SELECT ACTIVE SLAVE [>]” is displayed.



When the soft keys are displayed as shown above, “SELECT ACTIVE SLAVE [↓] [↑]” is displayed.

- **Key–in field**

When the [(OPRT)] soft key is pressed, the message line may turn into a key–in field as required. The numeric data input by using MDI keys is displayed after the prompt (>).

On the parameter and diagnosis screens, the key–in field appears when just a numeric value is input. The soft key [(OPRT)] need not be pressed.

1.18.3 Parameter Input/Output

- **Saving parameters**

Parameters can be saved in CNC memory or a memory card as a data file of program format. Specify the first digit of the registration program number in parameter 8760. Programs with predetermined numbers are created for individual slaves. When the parameters are saved in CNC memory, a program having the specified program number is created. When the parameters are saved in a memory card, a file is created, to which the file name consists of the specified program number and an extension PMM.

Example: When parameter 8760 is set to 8000

The program number for group n is 8000 + n*10.

The group number n is indicated in the title area of each slave.

CAUTION
In case that the parameters are saved in a memory card, If the specified program number already exists on memory card, the corresponding program is overwritten with new data.

Specify a desired input device in the MD1 and MD2 bits (bits 1 and 2 of parameter 960). Connect a memory card. Alternatively, check the free area of CNC memory. Then, follow the steps given below:

1. Select the active slave.
2. Press the [(OPRT)] soft key. The following soft keys appear:

```
[ NO.SRC ][      ][      ][      ][ INPUT ]
```

3. Press the continuous menu key [▷]. The following soft keys appear:

```
[      ][ READ  ][ PUNCH  ][      ][      ]
```

4. Press the [READ] soft key. The following soft keys appear:

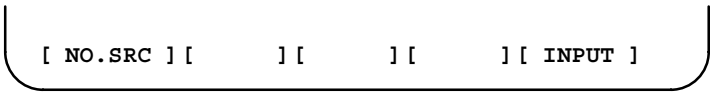
```
[      ][      ][      ][CANCEL ][  EXEC  ]
```

5. Press the [EXEC] soft key.
   During input, “INPUT” blinks in the message field.

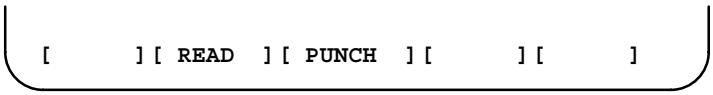
- **Writing parameters**

The data file of parameters saved in CNC memory or a memory card as a program is written into the slave determined by the program number. The program number and memory device are determined as described in “Saving parameters.”

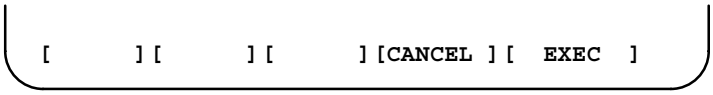
1. Select the active slave.
2. Press the [(OPRT)] soft key. The following soft keys appear:



3. Press the next–menu key. The following soft keys appear:



4. Press the [PUNCH] soft key. The following soft keys appear:



5. Press the [EXEC] soft key.

During output, “INPUT” blinks in the message field.

The screen cannot be changed to another screen during parameter input/output.

When the RESET key is pressed, or when an alarm status is detected in communication, the input/output stops.

1.18.4 Notes

- **Connecting an I/O Link**

When the power mate CNC series is used as a slave of an I/O Link, the CNC assigns I/O addresses. The salve data is input and output in units of 16 bytes. Therefore, 128 input/output points are necessary. Up to eight slaves can be connected.

The module name is OC021 (16–byte input) or OC020 (16–byte output). BASE is always 0, and SLOT is always 1.

- **Ignoring the power mate CNC manager function**

After the data necessary for each slave connected is set and checked, the communication of the power mate CNC manager (PMM) can be stopped to send a command from the CNC ladder to the slave.

When the PMN bit (bit 3 of parameter 960) is set to 1, all communication between CNC and the slave via the I/O Link is open to the ladder.

While the bit is held 1, the screen shows just the title, function name, and other items that are independent of the communication. The following message appears to indicate that communication has stopped.

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- **Data input/output by I/O Link**

When the power mate CNC manager is used, the function for data input/output by I/O Link cannot be used.

- **Alarm**

(1) CNC

When a CNC alarm status is detected, the screen is automatically switched to the CNC alarm screen. Check the details of the alarm. If necessary, display and select the power mate CNC manager screen again by pressing function key SYSTEM .

(2) Slave

A guidance message is usually displayed in the message field. If a slave alarm is detected, the corresponding slave group number is displayed at the right end.

Display the alarm screen to check the details.

- **Data protection key**

When the data protection key of the CNC is turned on, parameters cannot be input to CNC memory.

2 HARDWARE

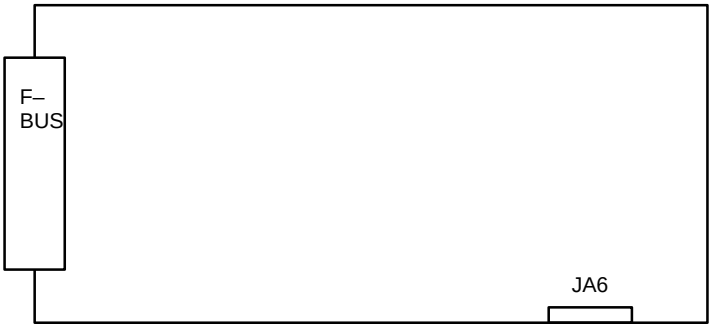
This chapter describes about the analog input board for the laser.
As for the other print circuit board of CNC control unit, the functions of the card PCB on the print circuit board, and the replacing of maintenance parts and so on, see the FANUC Series 16*i*/18*i*/160*i*/180*i*–MODEL B Maintenance Manual (B–63525EN).

2.1 ANALOG INPUT BOARD

- **Specification**

Name	Specification
Analog input board	A20B–8001–0750

- **Connector mounting location**



ANALOG
JA6

10		20	
9		19	
8		18	
7		17	
6	0V	16	0V
5	AOUT	15	
4	0V	14	0V
3	AIN2	13	AIN3
2	0V	12	0V
1	AIN0	11	AIN1

AIN0 to AIN3:
Analog input
AOUT: Analog output

- **Card mounting location**

No card is mounted on the analog input board.

3 INPUT AND OUTPUT OF DATA

After you change a SRAM module, you must set various data again. This chapter describes the procedures to input and output the parameters, the part programs and the tool offset values.

3.1 SETTING PARAMETERS FOR INPUT/OUTPUT

- **Setting procedure of parameters**

1. Set to MDI mode or emergency stop state.
2. Press [OFFSET SETTING] key several times or press soft key **[SETING]** to display **SETTING (HANDY)** screen.
3. Set the cursor to **PARAMETER WRITE** and, press [1] and [INPUT] keys in this order. Here alarm 100 will be displayed.
4. Press [SYSTEM] key several times to display the following screen.

```
PARAMETER (SETTING)              O1234N12345
0000          SEQ                INI  ISO  TVC
      0    0    0    0    0    0    0    0
0001                             FCV

      0    0    0    0    0    0    0    0
0012  RMV                   MIR
   X  0    0    0    0    0    0    0    0
   Y  0    0    0    0    0    0    0    0
   Z  0    0    0    0    0    0    0    0
   B  0    0    0    0    0    0    0    0
0020 I/O  CHANNEL
                                 S    0 T0000

REF **** *** ***          10:15:30
[ F SRH ][ READ  ][       ][DELETE ][      ]
```

To make the cursor display in bit unit, press the cursor key [←] or [→].

5. Press soft key**[(OPRT)]** and the following operation menu is displayed.
   1) Soft key **[NO. SRH]** : Searched by number.
      Examination) Parameter number → **[NO. SRH]**.
   2) Soft key **[ON : 1]** : Item with cursor position is set to 1 (bit parameter)
   3) Soft key **[OFF : 0]** : Item with cursor position is set to 0 (bit parameter)
   4) Soft key **[+INPUT]** : Input value is added to the value at cursor (word type)
   5) Soft key **[INPUT]** : Input value is replaced with the value at cursor (word type)
   6) Soft key **[READ]** : Parameters are input from reader/puncher interface.
   7) Soft key **[PUNCH]** : Parameters are output to reader/puncher interface.

6. After the parameters have been input, set PARAMETER WRITE on the SETTING screen to 0. Press [RESET] to release alram 100.
7. Convenient method
   1) To change parameters in bit unit, press cursor key [←] or [→], then the cursor becomes bit length and you can set parameters bit by bit (Bit parameter only).
   2) To set data consecutively, use [EOB] key.

   (Ex.1) [1] [2] [3] [4] [EOB] [4] [5] [6] [7] [EOB] [9] [9] [9] [9] [INPUT]

   This key sequence sets data as follows:

0		1234
0	⇒	4567
0		9999
0		0

   (Ex.2) [1] [2] [3] [4] [EOB] [EOB] [9] [9] [9] [9] [INPUT]

   This key sequence sets data as follows:

0		1234
0	⇒	0
0		9999
0		0

   3) To set the same data sequentially, press [=].

   (Ex.) [1] [2] [3] [4] [EOB] [a] [EOB] [a] [INPUT]

   This key sequence sets data as follows:

0		1234
0	⇒	1234
0		1234
0		0

   4) Bit parameters can be set as follows:

   (Ex.) [1] [1] [EOB] [a] [EOB] [a] [INPUT]

   This key sequence sets data as follows:

0 0 0 0 0 0 0 0 0		0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 0	⇒	0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 0		0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0 0		0 0 0 0 0 0 0 0

8. After the required parameters are set, set **PARAMETER WRITE** to 0.

3.2 INPUTTING/ OUTPUTTING DATA

The main CPU memorized the following data.
Outputting the data 1/O device while the CNC is rurnning normally

(1) CNC paramter
(2) PMC parameter
(3) Pitch error compensation amount
(4) Custom macro variable values
(5) Tool compensation amount
(6) Part program (machining program, custom macro program)

3.2.1 Confirming the Parameters Required for Data Output

Be sure that data output cannot be done in an alarm status.
Parameters required for output are as follows :

	#7	#6	#5	#4	#3	#2	#1	#0
0000							ISO	

#1 (ISO) 0 : Output with EIA code
1 : Output with ISO code (FANUC cassette)

0020	Selection of I/O channel

0 : Channel 1 (JD36A of mother board)
1 : Channel 1 (JD36A of mother board)
2 : Channel 2 (JD36B of mother board)
3 : Channel 3 (JD38A of serial communication board)

* An operation example shown here assumes that data input/output is performed with an input/output unit connected to the JD36A. (I/O channel = 0)

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

#7 (NFD) 0 : Feed is output when data is output.
1 : Feed is not output when data is output.

#3 (ASI)☆ 0 : EIA or ISO code is used for input/output data.
1 : ASCII code is used.

#0 (SB2) 0 : No. of stop bits is 1.
☆ 1 : No. of stop bits is 2.

0102	pecification number of input/output device

0	RS–232–C (for other than the following)
1	FANUC bubble cassette B1/B2
2	FANUC Floppy cassette adapter F1
3	PROGRAM FILE Mate. FANUC FA card adapter ,FANUC Floppy cassette adapter, FSP–H
4	Not used
5	Portable tape reader
6	FANUC PPR, FSP–G, FSP–H

0103	Baud Rate

1: 50 5: 200 9: 2400
2: 100 6: 300 ☆10: 4800
3: 110 7: 600 11: 9600
4: 150 8: 1200 12: 19200 [BPS]

3.2.2 Outputting CNC Parameters

In case of PPR, steps 2 and 3 are not required.

1. Select **EDIT** mode.
2. [PROG] Press PROG key and soft key **PRGRM** to select a program text.
3. Press soft key **[(OPRT)]** and soft key [▷].
   And then, put out the head of file by pressing **[FSRH]** [0] **[EXEC]**.
4. Press [SYSTEM] key and soft key **[PARAM]** to display parameter screen.
5. Press soft key **[(OPRT)]** ,and soft key [▷].
6. Press soft key **[PUNCH]** and **[EXEC]**,and the parameters are started to be output.

3.2.3 Outputting PMC Parameters

1. Select MDI mode.
2. Press [OFFSET SETTING] key then soft key **[SETTING]** to select a setting screen.
3. Set the cursor to **PARAMETER WRITE** and input [1] and [INPUT].
   At this time, alarm 100 will be generated.
4. Press [SYSTEM] key and soft key **[PMC]**.
5. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**
6. Set the cursor to K17 and set the first bit to 1.
   [X] [X] [X] [X] [X] [X] [1] [X] [INPUT]
   Where, mark x is a former value
   Thus, data input/output screen has been selected.
7. Select EDIT mode.
8. Press soft key [◁] then key[▷].
9. Press soft key **[I/O]** and set the parameters on I/O.
   Item selection cursor moves to the following item after data of an item is set.
10. In CHANNEL NO item, input [1] [INPUT] to select I/O channel 1.
11. In DEVICE item, press soft key **[FDCAS]** to select the floppy cassette.
12. In KIND DATA item, press soft key **[PARAM]**.
13. In FUNCTION item, press soft key **[WRITE]**.

14. In FILE No item, specify a file name. In this example input as follows:
    @ P M C INPUT
15. Press soft key **[EXEC]**. Then PMC parameters are started to be output.
16. After the PMC parameters have been output, set PARAMETER WRITE to 0.
17. Press RESET to release alarm 100.

3.2.4 Outputting Pitch Error Compensation Amount

1. Select EDIT mode.
2. Press SYSTEM key several times, press soft key **[PARAM]**, ▷ and **[PITCH]** to select the SETTING screen for pitch error amount.
3. Press soft key **[(OPRT)]** and ▷.
4. Press soft key **[PUNCH]** and **[EXEC]**, then pitch error compensation amount is started to be output.

3.2.5 Outputting Custom Macro Variable Values

When custom macro function is equipped, values of variable no. 500 and later are output.

1. Press OFFSET SETTING key.
2. Press ▷ key and soft key **[MACRO]** to select custom macro variable screen.
3. Press soft key **[(OPRT)]** and then key ▷.
4. Press soft key **[PUNCH]** and **[EXEC]**, then custom macro variable values are output.

3.2.6 Outputting Tool Compensation Amount

1. Select EDIT mode.
2. Press OFFSET SETTING key and soft key **[OFFSET]** to display the tool compensation amount screen.
3. Press **[(OPRT)]** key and soft key ▷.
4. Press soft key **[PUNCH]** an **[EXEC]** key, and the tool compensation amount is started to be output.

3.2.7 Outputting Part Program

1. Confirm the following parameters. If 1 is set, set to the MDI mode and set it to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
3202				NE9				NE8

#4 (NE9) ☆ 0 : Programs of 9000s are edited.
1 : Programs of 9000s can be protected.

#0 (NE8) ☆ 0 : Programs of 8000s are edited.
1 : Programs of 8000s can be protected.

2. Select EDIT mode.
3. Press [PROG] key and press soft key **[PRGRM]** to display program text.
4. Press **[(OPRT)]** key and press soft key [▷].
5. Input a program number to be output. To output all programs input as: [O] [–] [9] [9] [9] [9]
6. Press **[PUNCH]** and **[EXEC]** key, then program output is started.

3.2.8 Inputting CNC Parameters

1. Set to the emergency stop state.
2. Confirm that the patameters required to input data is correct.
   1) Press [OFFSET SETTING] key several times, and press **[SETING]** to display SETTING screen.
   2) Confirm that PARAMETER WRITE=1.
   3) Press [SYSTEM] key to select the parameter screen.
   4)

	Selectionof I/O channel
0020	

☆ 0 : Channel 1 (JD36A of mother board)
1 : Channel 1 (JD36A of mother board)
2 : Channel 2 (JD36B of mother board)
3 : Channel 3 (JD38A of serial communication board)

   5)

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2

#7 (NFD) 0 : Feed is output when punching out.
1 : Feed is not output when punching out.

#3 (ASI) 0 : EIA or ISO code is used.
1 : ASCII code is used.

#0 (SB2) 0 : No. of stop bits is 1.
☆ 1 : No. of stop bits is 2.

6)

0102	Specification number of I/O device

0	RS–232–C (for other than the following)
1	FANUC Bubble cassette B1/B2
2	FANUCFloppy cassette F1
3	PROGRAM FILE Mate, FANUC FA Card adapter, FANUC Floppy casette adapter, FSP–H, FANUC Handy File
4	Not used
5	Portable tape reader
6	FANUC PPR, FSP–G, FSP–H

7)

0103	Baud rate

1: 50 5: 200 9: 2400
2: 100 6: 300 ☆10: 4800
3: 110 7: 600 11: 9600
4: 150 8: 1200 12: 19200 [BPS]

3. Press soft key **[(OPRT)]** and soft key ▷
4. Press soft key **[READ]** and **[EXEC]**. Then input of parameters are started.
5. Because alarm 300 will generate for the system with absolute pulse coder, set parameter 1815#5 to 0.
6. Alarm 300 is issued if the system employs an absolute pulse coder. In such a case, perform reference position return again.

3.2.9 Inputting PMC Parameters

Set the emergency stop state.
Operation of 12 is not required when PPR is used.

1. Turn off (KEY4=1) the program protect key.
2. Press [OFFSET SETTING] key and soft key **[SETTING]** to select the SETTING screen.
3. Confirm that PARAMETER WRITE=1.
4. Press [SYSTEM] key and soft key **[PMC]**.
5. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**.
6. Set the cursor to K17 and set bit 1 to 1.
   [0] [0] [0] [0] [0] [0] [1] [0] [INPUT].
7. Press [◁] key and [▷] key.
8. Press soft key **[I/O]** and set the parameters required for I/O.
   Item selection cursor displays the next item after an item is set.
9. In CHANNEL item , press [1] [INPUT] to select channel 1.
10. In DEVICE item, press **[FDCAS]** key to select the floppy cassette.
11. In FUNCTION item, press soft key **[READ]** to input data
12. In FILE NO item, press [2] [INPUT] to select file no. 2.
13. Press soft key **[EXECT]** and the PMC parameters are started to be input.
14. After data has been read, turn off power and turn it on.

3.2.10 Inputting Pitch Error Compensation Amount

1. Release the emergency stop and select EDIT mode.
2. Confirm that PARAMETER WRITE=1 on the setting screen.
3. Press [PROG] key and soft key **[PRGRM**] to display program contents.
4. Press soft key **[(OPRT)]**, [▷] , **[F SRH]**, and [3] **[EXEC]** to select the pitch error compensation file.
5. Press [SYSTEM] key several times, soft key **[PARAM]**, [▷] and **[PITCH]** to select the screen for pitch error compensation amount.
6. Press soft key **[(OPRT)]** and [▷] key.
7. Press soft key **[READ**] and **[EXEC]**, then the pitch error compensation amount is started to be input.
8. After data has been input, press [OFFSET SETTING] key twice to display the SETTING screen and return the PARAMETER WRITE to 0.

3.2.11 Inputting Custom Macro Variable Values

If the system is equipped with the custom macro fucntion, input the variable values.
For PPR, item 4 is not required.

1. Confirm that EDIT mode is selected.
2. Turn off the program protect key (KEY2=1).
3. Press [PROG] key then soft key **[PRGRM]** to display program contents.
4. Press soft key **[(OPRT)]**, [▷], **[F SRH]**, and [4] **[EXEC]** to select a file.
5. Press soft key **[(OPRT)]** and key [▷].
6. Press address [O], a program number (0001 for example), soft key **[READ]** and **[EXEC]** key, then custom macro variable values are started to be input.
   Input a program number that is not used.
7. Select MEMORY mode on the machine operator's panel and press cycle start button.
   When the program is executed, macro variables are set.
8. Press [OFFSET SETTING] key, [▷] key and soft key **[MACRO]** to select the custom macro variable screen.
9. Press 500 and soft key **[NO SRH]** to display variable number 500 and confirm the custom macro variables are set correctly.
   Of the data displayed, 0 and vacant differ in meaning.
   Vacant is an undefined variable. To set vacant, press soft key **[INPUT]**.
10. Select EDIT mode again.
11. Press [PROG] key to select the program display screen.
12. Press address [O], and a program number (0001 for example) ,then press [DELETE] to delete the program.

3.2.12 Inputting Tool Compensation Amount

Item 4 is not required for PPR.

1. Select the EDIT mode.
2. Turn off the program protect (KEY=1).
3. Press [PROG] key, and press soft key **[PRGRM]** to display the program contents screen.
4. Press soft key **[(OPRT)]**, [▷], **[F SRH]**, and [5] **[EXEC]** to select the tool compensation amount file.
5. Press [OFFSET SETTING] key, and soft key **[OFFSET]** to display the tool compensation amount screen.
6. Press soft key **[(OPRT)]** and [▷] key.
7. Press **[READ]** key and **[EXEC]** key and data input is started.

3.2.13 Inputting Part Programs

Confirm the following parameters. If 1 is set, set it to 0.
(Change it in MDI mode).

	#7	#6	#5	#4	#3	#2	#1	#0
3201		NPE					RAL	

#6 (NPE) When programs are registered in part program storage area, M02, M30 and M99 are:
0 : regarded as the end of program.
☆ 1 : not regarded as the end of porgram.

#1 (RAL) When programs are registered:
☆ 0 : All programs are registered.
1 : Only one program is registered.

	#7	#6	#5	#4	#3	#2	#1	#0
3202				NE9				NE8

#4 (NE9) ☆ 0 : Programs of 9000s can be edited.
1 : Programs of 9000s are protected.

#0 (NE8) ☆ 0 : Programs of 8000s can be edited.
1 : Programs of 8000s are protected.

For PPR, item 4 is not required.

1. Confirm that mode is EDIT mode.
2. Turn off the program protect (KEY3=1).
3. Press [PROG] key and press soft key **[PRGRM]** to select a part program file.
4. Press soft key **[(OPRT)]**, [▷] **[F SRH]**, and [6] **[EXEC]** to select a part program file.
5. Press soft [◁] key ,**[(OPRT)]** and [▷] key.
6. Press soft key **[READ]** and **[EXEC]**, then data input is started.

3.3 DATA INPUT/OUTPUT ON THE ALL IO SCREEN

To input/output a particular type of data, the corresponding screen is usually selected. For example, the parameter screen is used for parameter input from or output to an external input/output unit, while the program screen is used for program input or output. However, programs, parameters, offset data, and macro variables can all be input and output using a single common screen, that is, the ALL IO screen.

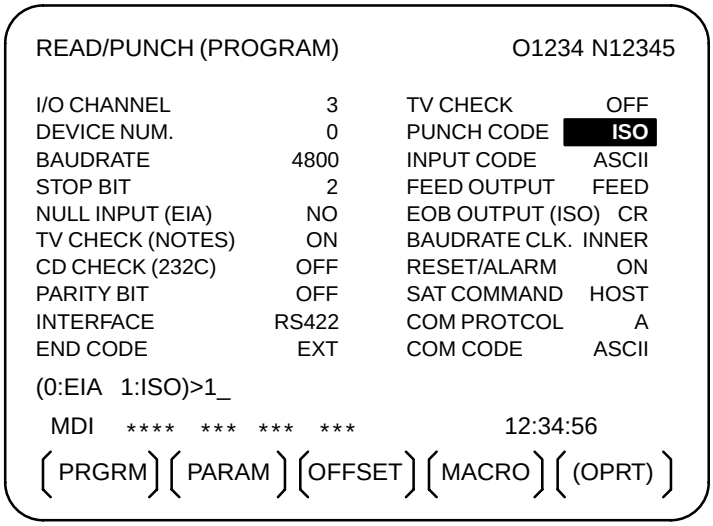


Fig. 3.3 ALL IO screen (when channel 3 is being used for input/output)

3.3.1 Setting Input/Output–related Parameters

Input/output–related parameters can be set on the ALL IO screen. Parameters can be set, regardless of the mode.

Setting input/output–related parameters

Procedure

1 Press function key [SYSTEM].

2 Press the rightmost soft key [▷] (continuous menu key) several times.

3 Press soft key **[ALL IO]** to display the ALL IO screen.

NOTE
1 If program or floppy is selected in EDIT mode, the program directory or floppy screen is displayed.
2 When the power is first turned on, program is selected by default.

```
READ/PUNCH (PROGRAM)                    O1234 N12345

I/O CHANNEL              3    TV CHECK          OFF
DEVICE NUM.              0    PUNCH CODE        ISO
BAUDRATE              4800    INPUT CODE        ASCII
STOP BIT                 2    FEED OUTPUT       FEED
NULL INPUT (EIA)        NO    EOB OUTPUT (ISO)  CR
TV CHECK (NOTES)        ON    BAUDRATE CLK.     INNER
CD CHECK (232C)         OFF   RESET/ALARM       ON
PARITY BIT              OFF   SAT COMMAND       HOST
INTERFACE             RS422   COM PROTCOL       A
END CODE                EXT   COM CODE          ASCII

(0:EIA  1:ISO)>1_

 MDI   ****  ***  ***  ***                 12:34:56
[PRGRM] [PARAM] [OFFSET] [MACRO] [(OPRT)]
```

NOTE
Baud rate clock, CD check (232C), reset/alarm report, and the parity bit for parameter No. 134, as well as the communication code, end code, communication protocol, interface, and SAT command for parameter No. 135 are displayed only when channel 3 is being used for input/output.

4 Select the soft key corresponding to the desired type of data (program, parameter, and so forth).

5 Set the parameters corresponding to the type of input/output unit to be used. (Parameter setting is possible regardless of the mode.)

3.3.2 Inputting and Outputting Programs

A program can be input and output using the ALL IO screen.
When entering a program using a cassette or card, the user must specify the input file containing the program (file search).

File search

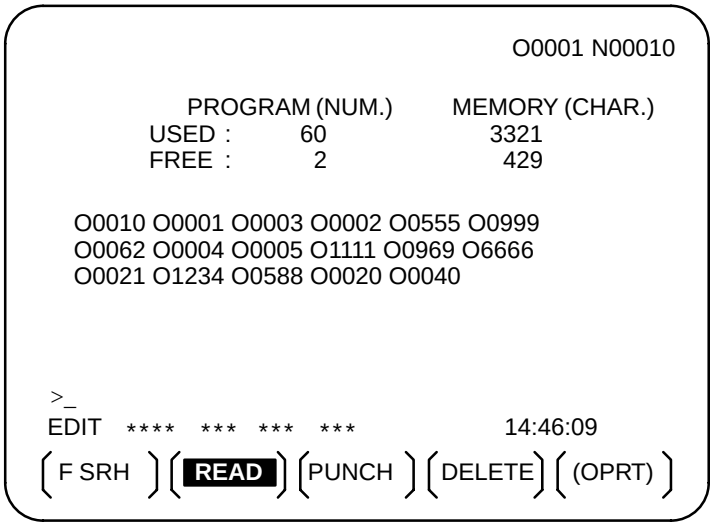
Procedure

1 Press soft key **[PRGRM]** on the ALL IO screen, described in Section 3.3.1.

2 Select **EDIT** mode. A program directory is displayed.

3 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

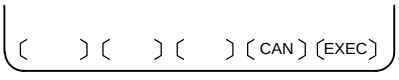
- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 Enter address N.

5 Enter the number of the file to be found.

- N0
  The first floppy file is found.
- One of N1 to N9999
  Among the files numbered from 1 to 9999, a specified file is found.
- N–9999
  The file immediately after that used most recently is found.
- N–9998
  When –9998 is specified, the next file is found. Then, each time a file input/output operation is performed, N–9999 is automatically inserted. This means that subsequent files can be sequentially found automatically.
  This state is canceled by specifying N0, N1 to N9999, or N–9999, or upon a reset.



6 Press soft keys **[F SRH]** and **[EXEC**].
The specified file is found.

Inputting a program

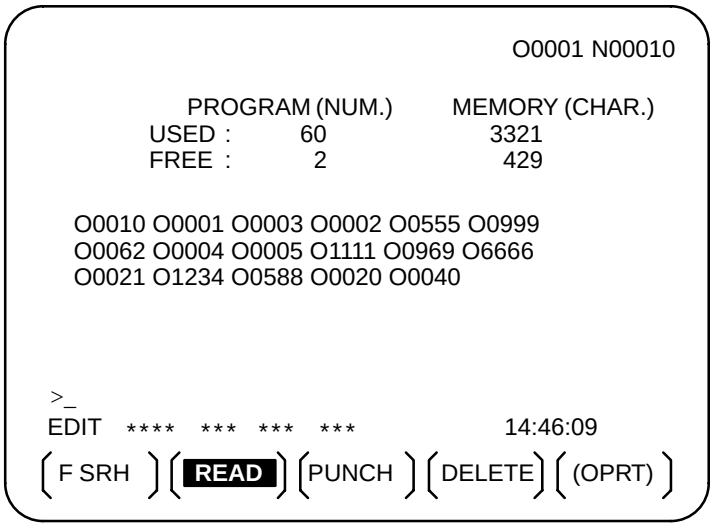
Procedure

1 Press soft key **[PRGRM]** on the ALL IO screen, described in Section 3.3.1.

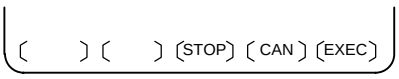
2 Select EDIT mode. A program directory is displayed.

3 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 To specify a program number to be assigned to an input program, enter address O, followed by the desired program number.
If no program number is specified, the program number in the file or on the NC tape is assigned as is.



5 Press soft key **[READ]**, then **[EXEC]**.
The program is input with the program number specified in step **4** assigned.
To cancel input, press soft key **[CAN]**.
To stop input prior to its completion, press soft key **[STOP]**.

Outputting programs

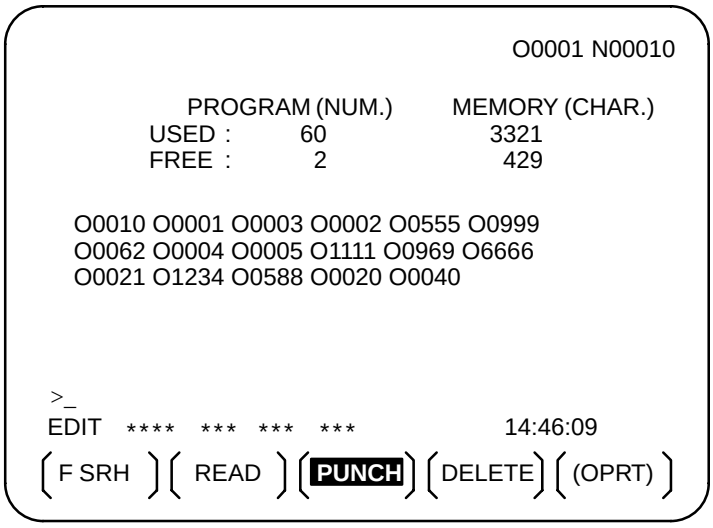
Procedure

1 Press soft key **[PRGRM]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode. A program directory is displayed.

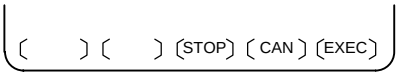
3 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 Enter address O.

5 Enter a desired program number.
If –9999 is entered, all programs in memory are output.
To output a range of programs, enter OΔΔΔΔ, O□□□□. The programs numbered from ΔΔΔΔ to □□□□ are output.
When bit 4 (SOR) of parameter No. 3107 for sorted display is set to 1 on the program library screen, programs are output in order, starting from those having the smallest program numbers.



6 Press soft key **[PUNCH]**, then **[EXEC]**.
The specified program or programs are output. If steps **4** and **5** are omitted, the currently selected program is output.
To cancel output, press soft key **[CAN]**.
To stop output prior to its completion, press soft key **[STOP]**.

Deleting files

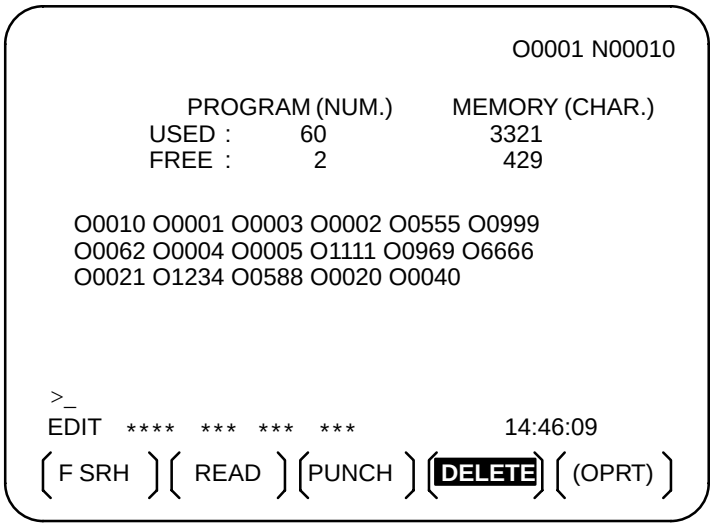
Procedure

1 Press soft key **[PRGRM]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode. A program directory is displayed.

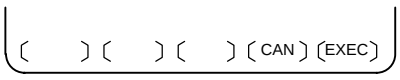
3 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 Press soft key **[DELETE]**.

5 Enter a file number, from 1 to 9999, to indicate the file to be deleted.



6 Press soft key **[EXEC]**.
The k–th file, specified in step 5, is deleted.

3.3.3 Inputting and Outputting Parameters

Parameters can be input and output using the ALL IO screen.

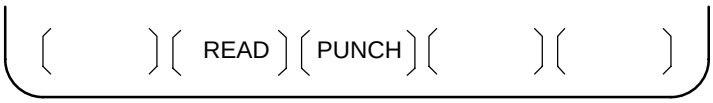
Inputting parameters

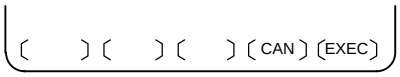
Procedure

1 Press soft key **[PARAM]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode.

3 Press soft key **[(OPRT)]**. Soft keys change as shown below.





4 Press soft key **[READ]**, then **[EXEC]**.
The parameters are read, and the “INPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of input, the “INPUT” indicator is cleared from the screen.
To cancel input, press soft key **[CAN]**.

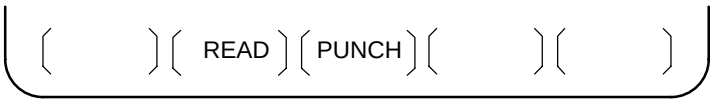
Outputting parameters

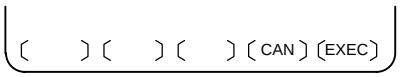
Procedure

1 Press soft key **[PARAM]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode.

3 Press soft key **[(OPRT)]**. Soft keys change as shown below.





4 Press soft key **[PUNCH]**, then **[EXEC]**.
The parameters are output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
To cancel output, press soft key **[CAN]**.

3.3.4 Inputting and Outputting Offset Data

Offset data can be input and output using the ALL IO screen.

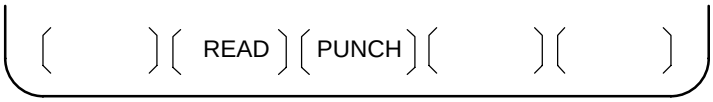
Inputting offset data

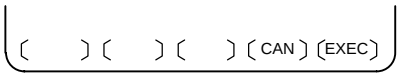
Procedure

1 Press soft key **[OFFSET]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode.

3 Press soft key **[(OPRT)]**. Soft keys change as shown below.





4 Press soft key **[READ]**, then **[EXEC]**.
The offset data is read, and the “INPUT” indicator blinks at the lower–right corner of the screen.
Upon the completion of input, the “INPUT” indicator is cleared from the screen.
To cancel input, press soft key **[CAN]**.

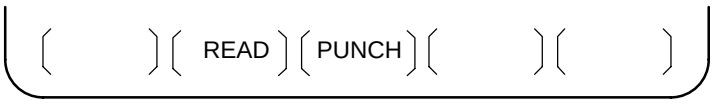
Outputting offset data

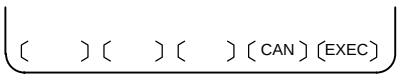
Procedure

1 Press soft key **[OFFSET]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode.

3 Press soft key **[(OPRT)]**. Soft keys change as shown below.





4 Press soft key **[PUNCH]**, then **[EXEC]**.
The offset data is output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
To cancel output, press soft key **[CAN**].

3.3.5 Outputting Custom Macro Common Variables

Custom macro common variables can be output using the ALL IO screen.

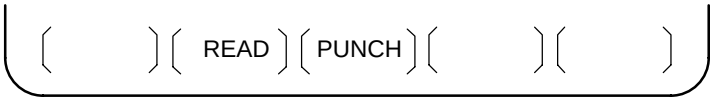
Outputting custom macro common variables

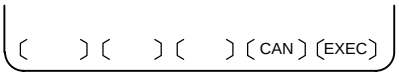
Procedure

1 Press soft key **[MACRO]** on the ALL IO screen, described in Section 3.3.1.

2 Select EDIT mode.

3 Press soft key **[(OPRT)]**. Soft keys change as shown below.





4 Press soft key **[PUNCH]**, then **[EXEC]**.
The custom macro common variables are output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
To cancel output, press soft key **[CAN]**.

NOTE
To input a macro variable, read the desired custom macro statement as a program, then execute the program.

3.3.6 Inputting and Outputting Floppy Files

The ALL IO screen supports the display of a directory of floppy files, as well as the input and output of floppy files.

Displaying a file directory

Procedure

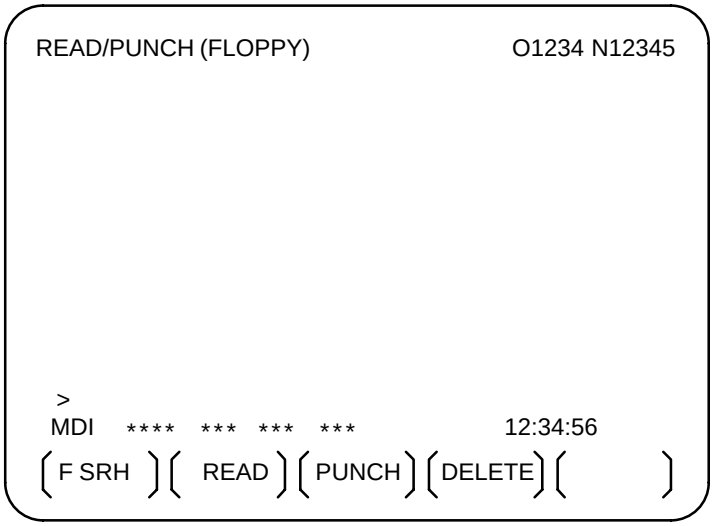
1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen, described in Section 3.3.1.

2 Press soft key **[FLOPPY]**.

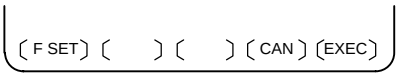
3 Select EDIT mode. The floppy screen is displayed.

4 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

- The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.

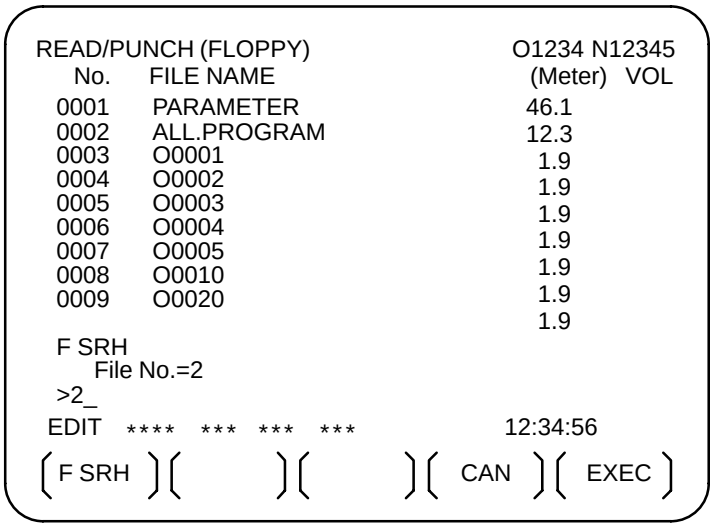


5 Press soft key **[F SRH]**.



6 Enter the number of the desired file, then press soft key **[F SET]**.

7 Press soft key **[EXEC]**. A directory is displayed, with the specified file uppermost. Subsequent files in the directory can be displayed by pressing the page key.



A directory in which the first file is uppermost can be displayed simply by pressing the page key. (Soft key **[F SRH]** need not be pressed.)

Inputting a file

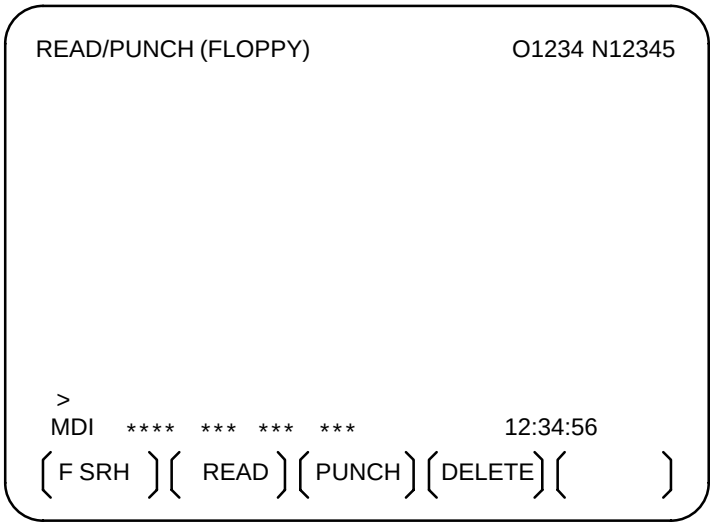
Procedure

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen, described in Section 3.3.1.

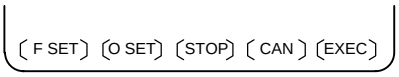
2 Press soft key **[FLOPPY]**.

3 Select EDIT mode. The floppy screen is displayed.

4 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.
The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



5 Press soft key **[READ]**.



6 Enter the number of a file or program to be input.

- Setting a file number: Enter the number of the desired file, then press soft key **[F SET]**.
- Setting a program number: Enter the number of the desired program, then press soft key **[O SET]**.

7 Press soft key **[EXEC]**.
The specified file or program is read, and the “INPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of input, the “INPUT” indicator is cleared from the screen.

Outputting a file

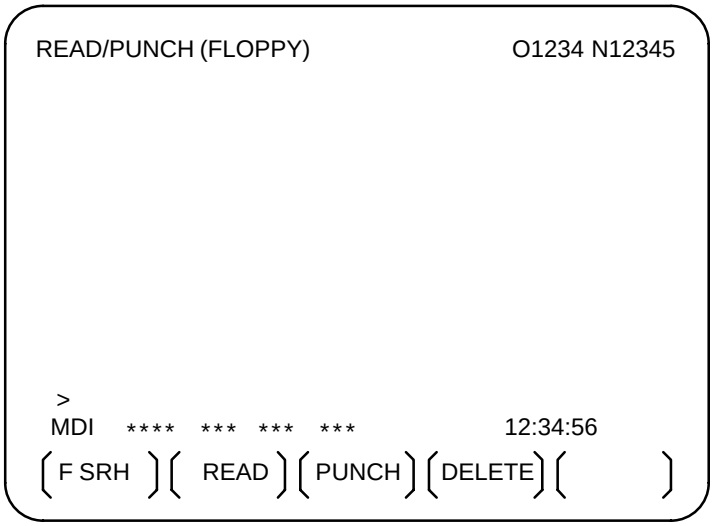
Procedure

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen, described in Section 3.3.1.

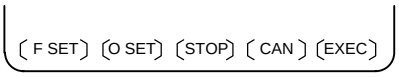
2 Press soft key **[FLOPPY]**.

3 Select EDIT mode. The floppy screen is displayed.

4 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.
The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



5 Press soft key **[PUNCH]**.



6 Enter the number of the program to be output, together with a desired output file number.

- Setting a file number: Enter the number of the desired file, then press soft key **[F SET]**.
- Setting a program number: Enter the number of the desired program, then press soft key **[O SET]**.

7 Press soft key **[EXEC]**.
The specified program is output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
If no file number is specified, the program is written at the end of the currently registered files.

Deleting a file

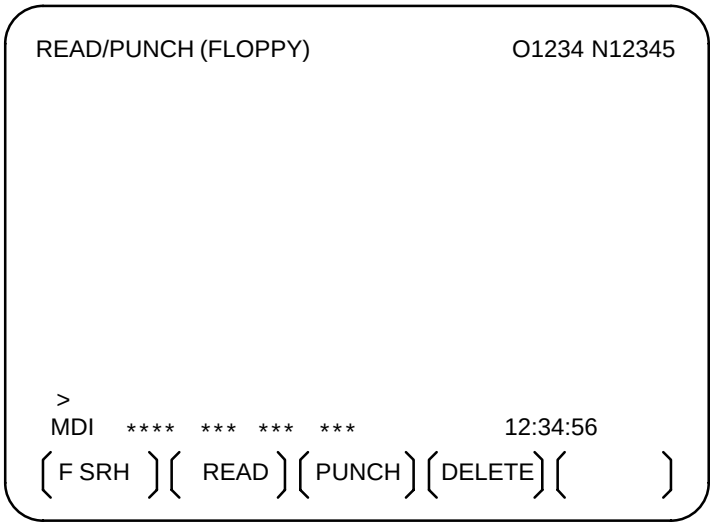
Procedure

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen, described in Section 3.3.1.

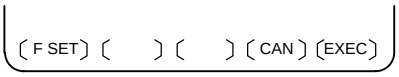
2 Press soft key **[FLOPPY]**.

3 Select EDIT mode. The floppy screen is displayed.

4 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.
The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



5 Press soft key **[DELETE]**.



6 Enter the number of the desired file, then press soft key **[F SET]**.

7 Press soft key **[EXEC]**. The specified file is deleted. After the file has been deleted, the subsequent files are shifted up.

3.4 DATA INPUT/OUTPUT USING A MEMORY CARD

By setting the I/O channel (parameter No. 20) to 4, files on a memory card can be referenced, and different types of data such as part programs, parameters, and offset data on a memory card can be input and output in text file format.
The major functions are listed below.

- Displaying a directory of stored files

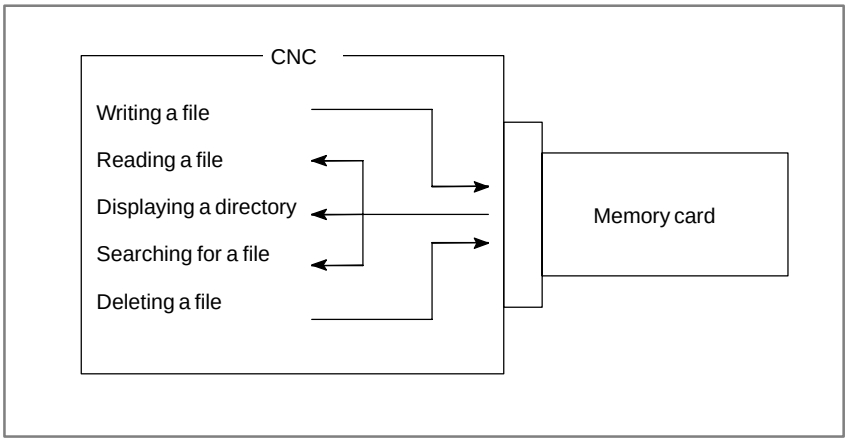
  The files stored on a memory card can be displayed on the directory screen.
- Searching for a file

  A search is made for a file on a memory card and, if found, it is displayed on the directory screen.
- Reading a file

  Text–format files can be read from a memory card.
- Writing a file

  Data such as part programs can be stored to a memory card in text file format.
- Deleting a file

  A file can be selected and deleted from a memory card.



Displaying a directory of stored files

Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed. Using page keys ↑ and ↓ , the screen can be scrolled.

```
DIRECTORY (M–CARD)                           O0034 N00045
   No.    FILE NAME          SIZE             DATE
  0001    O1000            123456          96/07/10
  0002    O1001              8458          96/07/30
  0003    O0002              3250          96/07/30
  0004    O2000             73456          96/07/31
  0005    O2001              3444          96/07/31
  0006    O3001              8483          96/08/02
  0007    O3300               406          96/08/05
  0008    O3400              2420          96/07/31
  0009    O3500              7460          96/07/31

( PROG )(      )( DIR + )(      )( (OPRT) )
```

5 Comments relating to each file can be displayed by pressing soft key **[DIR+]**.

```
DIRECTORY (M–CARD)                           O0034 N00045
   No.    FILE NAME                     COMMENT
  0001    O1000                    (COMMENT         )
  0002    O1001                    (SUB PROGRAM     )
  0003    O0002                    (12345678        )
  0004    O2000                    (                )
  0005    O2001                    (                )
  0006    O3001                    (SKIP–K          )
  0007    O3300                    (HI–SPEED        )
  0008    O3400                    (                )
  0009    O3500                    (TEST PROGRAM)

( PROG )(      )( DIR + )(      )( (OPRT) )
```

6 Repeatedly pressing soft key **[DIR+]** toggles the screen between the display of comments and the display of sizes and dates.
Any comment described after the O number in the file is displayed.
Up to 18 characters can be displayed on the screen.

Searching for a file

Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.   FILE NAME        SIZE          DATE
 0001   O1000           123456        96/07/10
 0002   O1001             8458        96/07/30
 0003   O0002             3250        96/07/30
 0004   O2000            73456        96/07/31
 0005   O2001             3444        96/07/31
 0006   O3001             8483        96/08/02
 0007   O3300              406        96/08/05
 0008   O3400             2420        96/07/31
 0009   O3500             7460        96/07/31
~
[ PROG ][      ][ DIR + ][      ][ (OPRT) ]
```

5 Press soft key **[(OPRT)]**.

[F SRH] [F READ] [N READ] [PUNCH] [DELETE]

6 Set the number of the desired file number with soft key **[F SRH]**. Then, start the search by pressing soft key **[EXEC]**. If found, the file is displayed at the top of the directory screen.

When a search is made for file number 19

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.   FILE NAME          COMMENT
 0019   O1000          (MAIN PROGRAM)
 0020   O1010          (SUBPROGRAM–1)
 0021   O1020          (COMMENT      )
 0022   O1030          (COMMENT      )
~
```

Reading a file

Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. Then, the screen shown below is displayed.

```
DIRECTORY (M–CARD)                          O0034 N00045
   No.    FILE NAME          SIZE             DATE
  0001    O1000            123456          96/07/10
  0002    O1001              8458          96/07/30
  0003    O0002              3250          96/07/30
  0004    O2000             73456          96/07/31
  0005    O2001              3444          96/07/31
  0006    O3001              8483          96/08/02
  0007    O3300               406          96/08/05
  0008    O3400              2420          96/07/31
  0009    O3500              7460          96/07/31

( PROG )(        )( DIR + )(        )( (OPRT) )
```

```
( F SRH )( F READ )( N READ )( PUNCH )( DELETE )
```

5 Press soft key **[(OPRT)]**.

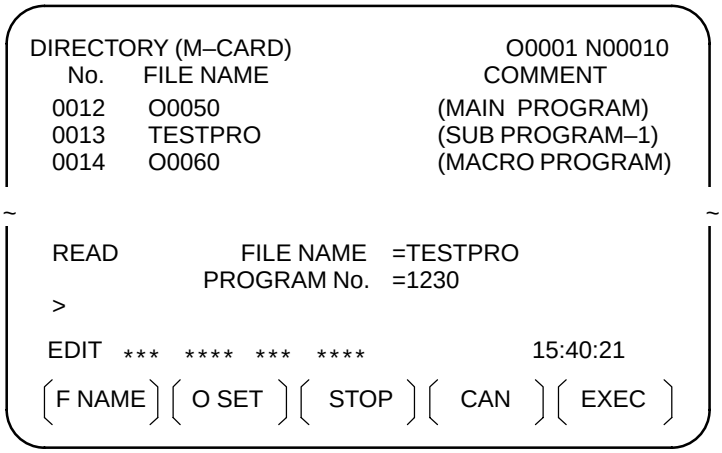
6 To specify a file number, press soft key **[F READ]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                          O0001 N00010
   No.    FILE NAME                      COMMENT
  0019    O1000                    (MAIN  PROGRAM)
  0020    O1010                    (SUBPROGRAM–1)
  0021    O1030                    (COMMENT        )

  READ
          FILE NAME=20             PROGRAM No.=120
  >
 EDIT  ***  ****  ***  ****                 15:40:21
( F NAME )( O SET )( STOP )( CAN )( EXEC )
```

7 Enter file number 20 from the MDI panel, then set the file number by pressing soft key **[F SET]**. Next, enter program number 120, then set the program number by pressing soft key **[O SET]**. Then, press soft key **[EXEC]**.

- File number 20 is registered as O0120 in the CNC.
- Set a program number to register a read file with a separate O number. If no program number is set, the O number in the file name column is registered.

8 To specify a file with its file name, press soft key **[N READ]** in step 6 above. The screen shown below is displayed.



9 To register file name TESTPRO as O1230, enter file name TESTPRO from the MDI panel, then set the file name with soft key **[F NAME]**. Next, enter program number 1230, then set the program number with soft key [O SET]. Then, press soft key **[EXEC]**.

Writing a file

Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.   FILE NAME      SIZE        DATE
 0001   O1000         123456      96/07/10
 0002   O1001           8458      96/07/30
 0003   O0002           3250      96/07/30
 0004   O2000          73456      96/07/31
 0005   O2001           3444      96/07/31
 0006   O3001           8483      96/08/02
 0007   O3300            406      96/08/05
 0008   O3400           2420      96/07/31
 0009   O3500           7460      96/07/31
~
[ PROG ][      ][ DIR + ][      ][ (OPRT) ]
```

5 Press soft key **[(OPRT)]**.

```
[F SRH] [F READ] [N READ] [PUNCH] [DELETE]
```

6 Press soft key **[PUNCH]**.

7 Enter a desired O number from the MDI panel, then set the program number with soft key **[O SET]**.
When soft key **[EXEC]** is pressed after the setting shown below has been made, for example, the file is written under program number O1230.

```
~
 PUNCH          FILE NAME   =
                PROGRAM No. =1230
 >
 EDIT  ***  ****  ***  ****              15:40:21
[F NAME ][ O SET ][ STOP ][ CAN ][ EXEC ]
```

8 In the same way as for O number setting, enter a desired file name from the MDI panel, then set the file name with soft key **[F SET]**.
When soft key **[EXEC]** is pressed after the setting shown below has been made, for example, the file is written under program number O1230 and file name ABCD12.

```
~
 PUNCH          FILE NAME   =ABCD12
                PROGRAM No. =1230
 >
 EDIT  ***  ****  ***  ****              15:40:21
[F NAME ][ O SET ][ STOP ][ CAN ][ EXEC ]
```

Deleting a file

Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                          O0034 N00045
  No.   FILE NAME              SIZE         DATE
  0001  O1000                123456         96/07/10
  0002  O1001                  8458         96/07/30
  0003  O0002                  3250         96/07/30
  0004  O2000                 73456         96/07/31
  0005  O2001                  3444         96/07/31
  0006  O3001                  8483         96/08/02
  0007  O3300                   406         96/08/05
  0008  O3400                  2420         96/07/31
  0009  O3500                  7460         96/07/31

( PROG )(      )( DIR + )(      )( (OPRT) )
```

5 Press soft key **[(OPRT)]**.

(F SRH)(F READ)(N READ)(PUNCH)(DELETE)

6 Set the number of the desired file with soft key **[DELETE]**, then press soft key **[EXEC]**. The file is deleted, and the directory screen is displayed again.

When file number 21 is deleted

```
DIRECTORY (M–CARD)                          O0034 N00045
  No.   FILE NAME                      COMMENT
  0019  O1000                       (MAIN PROGRAM)
  0020  O1010                       (SUBPROGRAM–1)
  0021  O1020                       (COMMENT       )
  0022  O1030                       (COMMENT       )
```

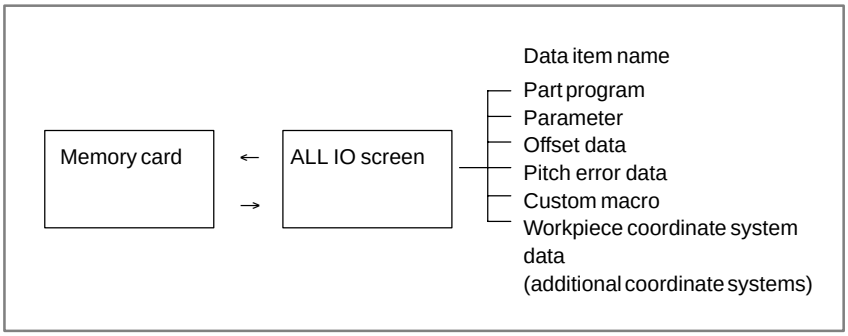
File name O1020 is deleted.

```
DIRECTORY (M–CARD)                          O0034 N00045
  No.   FILE NAME                      COMMENT
  0019  O1000                       (MAIN PROGRAM)
  0020  O1010                       (SUBPROGRAM–1)
  0021  O1020                       (COMMENT       )
  0022  O1030                       (COMMENT       )
```

File number 21 is assigned to the next file name.

Batch input/output with a memory card

On the ALL IO screen, different types of data including part programs, parameters, offset data, pitch error data, custom macros, and workpiece coordinate system data can be input and output using a memory card; the screen for each type of data need not be displayed for input/output.



Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key [SYSTEM] .

3 Press the rightmost soft key [▷] (continuous menu key) several times.

4 Press soft key **[ALL IO]**. The screen shown below is displayed.

```
READ/PUNCH (PROGRAM)                    O0001 N00001
   No.    FILE NAME          SIZE          DATE
 * 0001   O0222              332010        96–04–06
   0002   O1003              334450        96–05–04
   0003   MACROVAR.DAT       653400        96–05–12
   0004   O0002              341205        96–05–13
     [PROGRAM]
   O0001  O0002  O0003  O0005  O0100  O0020
   O0006  O0004  O0110  O0200  O2200  O0441
   O0330
 >
 EDIT  ***  ****  ***  ****                10:07:37
[ PROG ][ PARAM ][OFFSET][      ][ (OPRT) ]
```

Upper part : Directory of files on the memory card
Lower part : Directory of registered programs

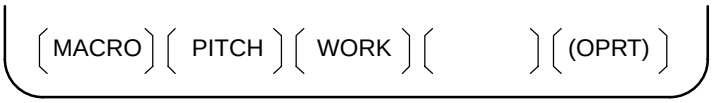
5 With cursor keys [↑] and [↓] , the user can choose between upper part scrolling and lower part scrolling. (An asterisk (*) displayed at the left edge indicates the part for which scrolling is possible.)

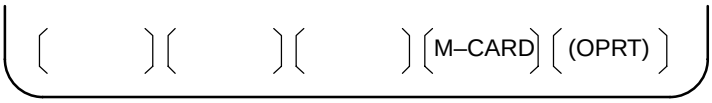
[↑] : Used for memory card file directory scrolling.

[↓] : Used for program directory scrolling.

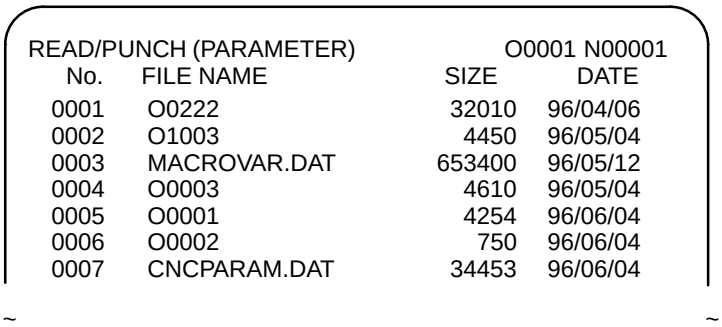
6 With page keys [↑] and [↓], scroll through the file directory or program directory.

7 When this screen is displayed, the program data item is selected. The soft keys for other screens are displayed by pressing the rightmost soft key [▷] (continuous menu key). Soft key **[M–CARD]** represents a separate memory card function for saving and restoring system RAM data.





When a data item other than program is selected, the screen displays only a file directory.
A data item is indicated, in parentheses, on the title line.



READ/PUNCH (PARAMETER) O0001 N00001

No.	FILE NAME	SIZE	DATE
0001	O0222	32010	96/04/06
0002	O1003	4450	96/05/04
0003	MACROVAR.DAT	653400	96/05/12
0004	O0003	4610	96/05/04
0005	O0001	4254	96/06/04
0006	O0002	750	96/06/04
0007	CNCPARAM.DAT	34453	96/06/04

~ ~

8 Display the following soft keys with soft key **[(OPRT)]**.

The operation of each function is the same as on the directory (memory card) screen. Soft key **[O SET]**, used for program number setting, and the "PROGRAM NUMBER =" indication are not displayed for data items other than program.

[F SRH] : Finds a specified file number.
[F READ] : Reads a specified file number.
[PUNCH] : Writes a file.
[N READ] : Reads a file under a specified file name.
[DELETE] : Deletes a specified file number.

NOTE
With a memory card, RMT mode operation and the subprogram call function (based on the M198 command) cannot be used.

Error codes

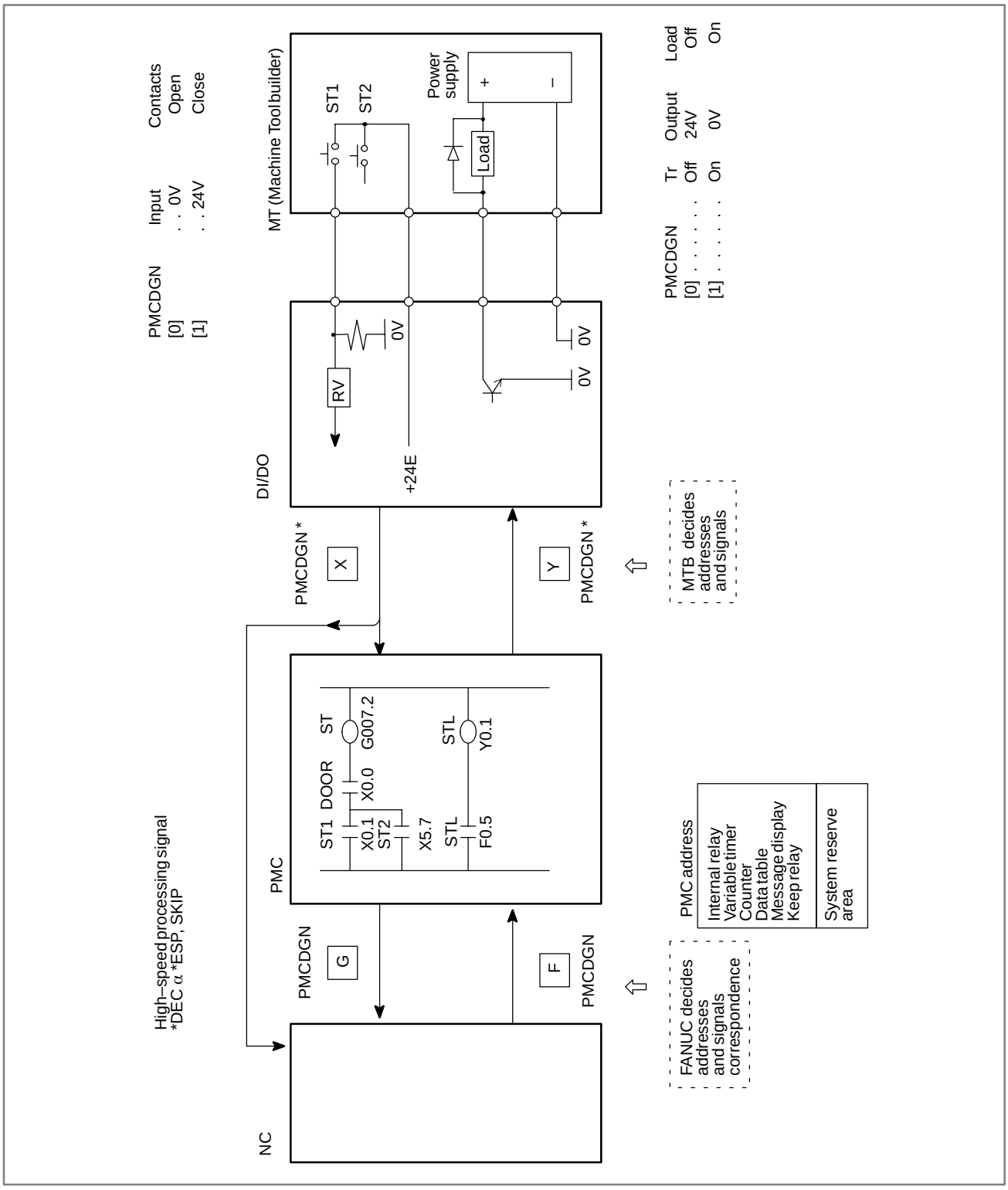
Memory card error codes

Code	Meaning
102	The memory card does not have sufficient free space.
105	No memory card is mounted.
106	A memory card is already mounted.
110	The specified directory cannot be found.
111	There are too many files under the root directory to allow a directory to be added.
114	The specified file cannot be found.
115	The specified file is protected.
117	The file has not yet been opened.
118	The file is already open.
119	The file is locked.
122	The specified file name is invalid.
124	The extension of the specified file is invalid.
129	A non–corresponding function was specified.
130	The specification of a device is invalid.
131	The specification of a pathname is invalid.
133	Multiple files are open at the same time.
135	The device is not formatted.
140	The file has the read/write disabled attribute.

4 INTERFACE BETWEEN NC AND PMC

This chapter describes the signals between the machine operator's panel, magnetics cabinet and the PMC, connection of the signals between PMC and CNC, and confirmation method of on/off state of these signals.
It also describes system configuration of PMC, parameters of PMC, ladder and how to display time chart of the signals on the screen.
It also describes a method of inputting/outputting PMC parameters to an external device.

4.1 GENERAL OF INTERFACE



4.2 SPECIFICATION OF PMC

4.2.1 Specification

Function	Series 16*i*–LB	
	PMC–SA1 (loader control)	PMC–SB7
Programmingmethod	Ladder	Ladder
Number of ladder levels	2	3
1st level execution period	8ms	8ms
Basic instruction execution time	5.0μ sec/step	0.0033μ sec/step
Program size		
• Ladder	12,000 steps max.	Approx. 64,000 steps max.(NOTES 1, 2)
• Symbol/comment	1 to 128 KB	1 KB and up (NOTE 2)
• Message	0.1 to 64 KB	8 KB and up (NOTE 2)
Instruction (basic) (functional)	12 48	14 69
Intemal relay (R)	1,100 bytes	8,500 bytes
Extended relay (E)	–	8,000 bytes
Message request (A)	200 requests (25 bytes)	2,000 requests (500 bytes, 2 bits/request)
Nonvolatile memory and so on		
• Data table (D)	1,860 bytes	10,000 bytes
• Variable timer (T) Fixed timer	40 units (80 bytes) 100 units	250 units (1,000 bytes, 4 bytes/unit) 500 units (timer number specification)
• Counter (C) Fixed counter (C)	20 units (80 bytes) –	100 units (400 bytes, 4 bytes/unit) 100 units (200 bytes, 2 bytes/unit)
• Keep relay (K)	20 bytes	120 bytes
Subprogram (P)	–	2,000 programs
Label (L)	–	9,999 units
Input/output (I/O Link)		
• Input	1,024 points max.	1,792 points max.(NOTE 3)
• Output	1,024 points max.	1,792 points max.(NOTE 3)
Sequence program storage memory	Flash ROM 128KB	Flash ROM 128 KB (16,000–step option or lower) 256 KB (24,000–step option) 384 KB (32,000/40,000–step option) 512 KB (48,000–step option) 768 KB (64,000–step option)

NOTE
1 The maximum number of steps assumes programming using basic instructions. The maximum number of steps varies according to the status of functional instruction use.
2 The total sequence program size (including all of the ladders, symbols/comments, and messages) must not exceed the capacity of the sequence program storage memory. If the size of any of the ladders, symbols/comments, or messages is greater, the maximum allowable size of the others may be limited.
3 The standard specification allows up to 768 input points and up to 768 output points. To use 1,792 input points and 1,792 output points, the I/O Link point extension option is required.

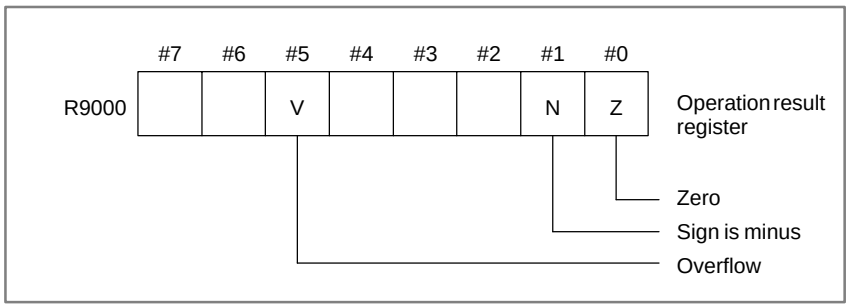
4.2.2 Address

Char-acter	Signal type	Model	
		Series 16*i*–LB	
		PMC–SA1 (loader control)	PMC–SB7
X	Input signal from the machine to the PMC (MT to PMC)	X0 to X127	X0 to X95 X200 to X327(NOTE 1) X1000 to X1127(NOTE 2)
Y	Output signal from the PMC to the machine (PMC to MT)	Y0 to Y127	Y0 to Y95 Y200 to Y327(NOTE 1) Y1000 to Y1127 (NOTE 2)
F	Input signal from the NC to the PMC (NC to PMC)	F0 to F255	F0 to F767(NOTE 3) F1000 to F1767(NOTE 4) F2000 to F2767(NOTE 4) F3000 to F3767(NOTE 5)
G	Output signal from the PMC to the NC (PMC to NC)	G0 to G255	G0 to G767(NOTE 3) G1000 to G1767(NOTE 4) G2000 to G2767(NOTE 4) G3000 to G3767(NOTE 5)
R	Internal relay	R0 to R999 R9000 to R9099	R0 to R7999 R9000 to R9499(NOTE 6)
E	Extended relay	–	E0 to E7999(NOTE 7)
A	Message display request signal	A0 to A24	A0 to A249
	Message display state signal	–	A9000 to A9249(NOTE 8)
C	Counter	C0 to C79	C0 to C399 C5000 to C5199(NOTE 9)
K	Keep relay	K0 to K19	K0 to K99 K900 to K919(NOTE 10)
T	Variable timer	T0 to T79	T0 to T499 T9000 to T9499(NOTE 11)
D	Data table	D0 to D1859	D0 to D9999
L	Label number	–	L1 to L9999
P	Subprogram number	–	P1 to P2000

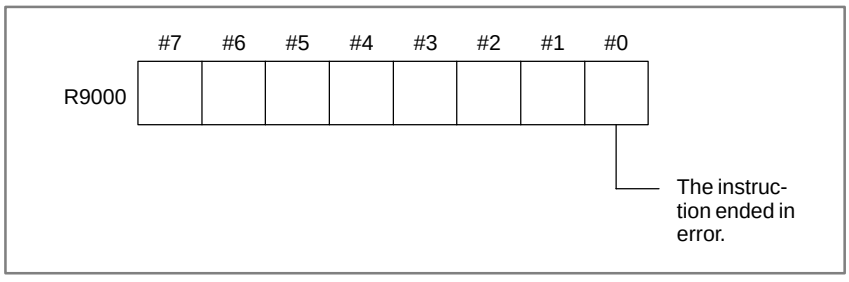
NOTE
1 I/O of channel 2 of the I/O Link can be assigned.
This area is usable when the I/O Link point extension option is selected.
2 This area is reserved for the PMC. I/O cannot be assigned to this area. Do not use this area for sequence programs.
3 This area includes an area reserved for the PMC. The actually usable address range depends on the CNC system configuration.
4 Use this area when the CNC is a multipath system. This area includes an area reserved for the PMC. The actually usable address range depends on the CNC system configuration.
5 This area is reserved for the PMC. Do not use this area for sequence programs.
6 This area is a special relay area managed by the PMC system program. When using this area, follow the description of each signal.
7 In an ordinary system, this area can be used as with the internal relay (R) area. The extended relay (E) area is volatile, but a signal is input to or output from a memory card as a PMC parameter. When a PMC parameter is read, the E area is initialized to the state present at the time of PMC parameter output.
8 Message display state signals corresponding to message display request signals on a one–to–one basis. This area cannot be written to.
9 This area is used for the fixed counter instruction (CTRB instruction), which specifies a preset value as a constant.
10 This area is a special relay area for PMC management software. When using this area, follow the description of each address.
11 This area is reserved for the PMC. Do not use this area for sequence programs.

4.2.3 System Reserve Area of Internal Relay

(1) R9000 (Operation output register for the ADD, SUB, MULB, DIVB, and COMPB functional instructions)

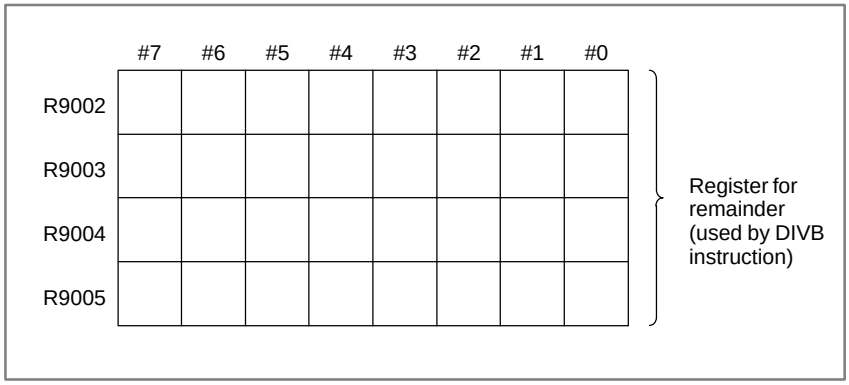


(2) R9000 (Error output for the EXIN, WINDR, WINDW, MMCWR, MMCWW, MMC3R, and MMC3W functional instructions)



(3) R9002 to R9005 (Operation output registers for the DIVB functional instruction)

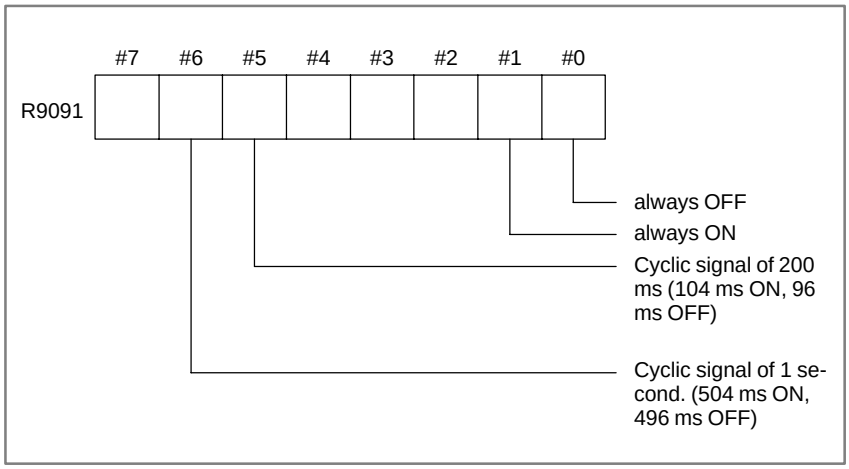
The data remaining after the DIVB functional instruction is executed in output.



(4) R9091 (System timer)

4 signals can be used as system timer.

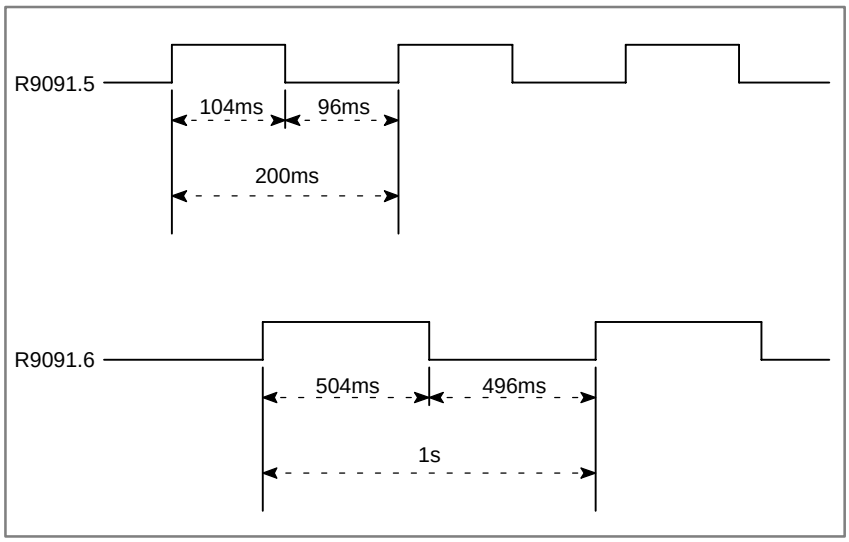
The specifications of every signal are as following.



CAUTION

Each signal is initially off. R9091.0 and R9091.1 are set cyclically at the beginning of the first ladder level.

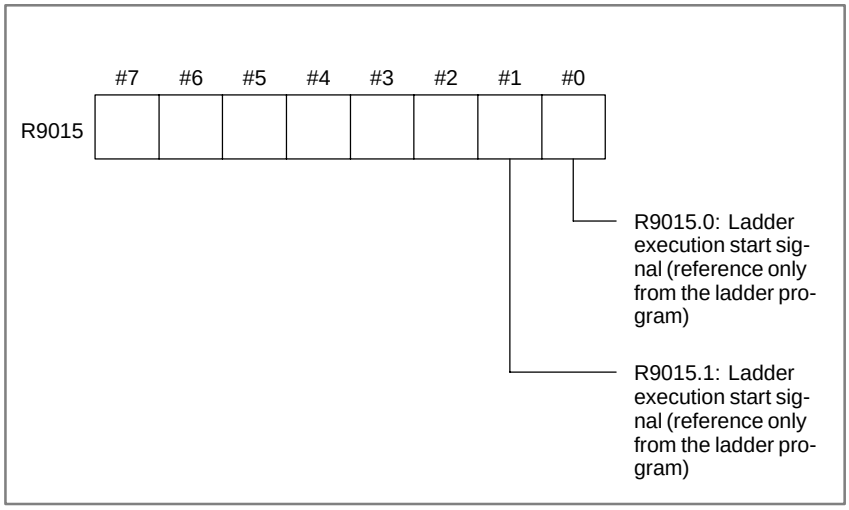
Each signal (ON–OFF signal) has an accuracy of ±8 ms.



(5) Ladder execution start signal, ladder stop signal, ladder execution state signal (PMC–SB7)

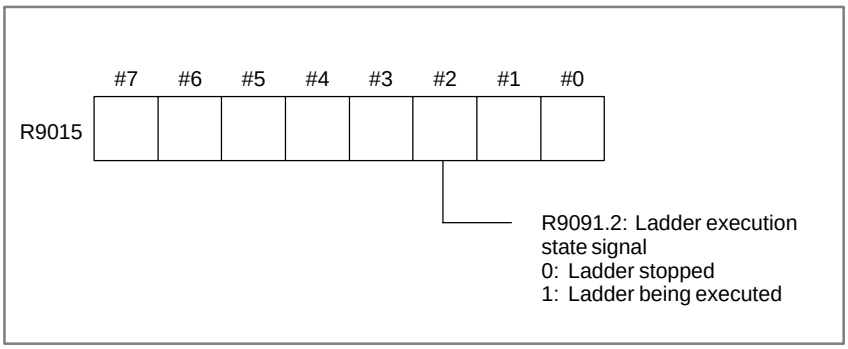
1 Ladder execution start signal and latter stop signal

With the ladder execution start signal or the ladder stop signal, the start or stop of a ladder program can be known in the ladder program.



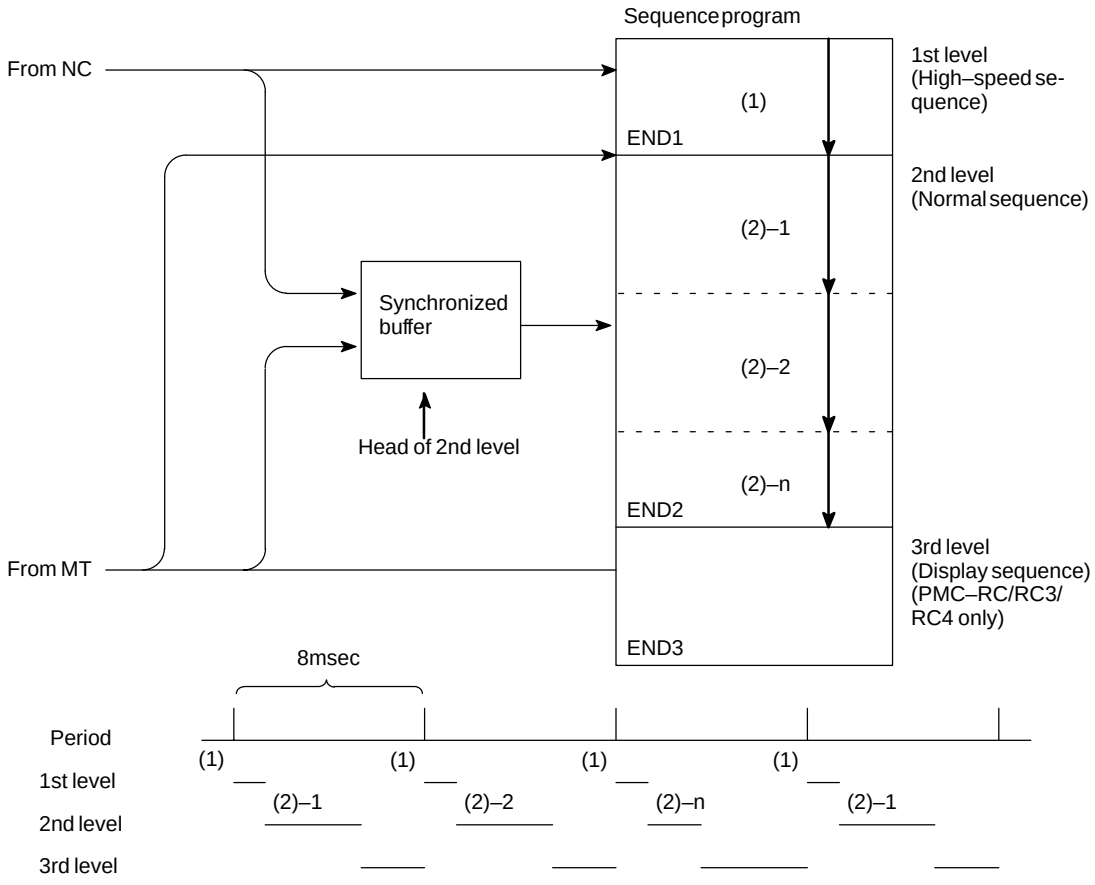
2 Ladder execution state signal

The state of ladder program execution or PMCC language program execution can be known by referencing the ladder execution state signal from an external system or program such as the network board, C executor program, FOCAS1 Ethernet, and HSSB library.

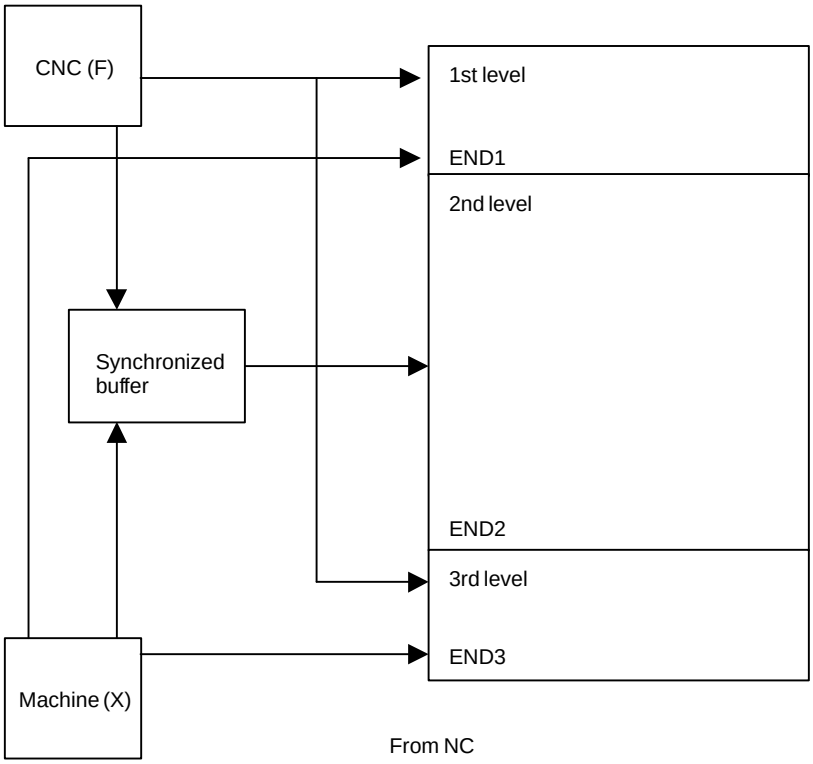


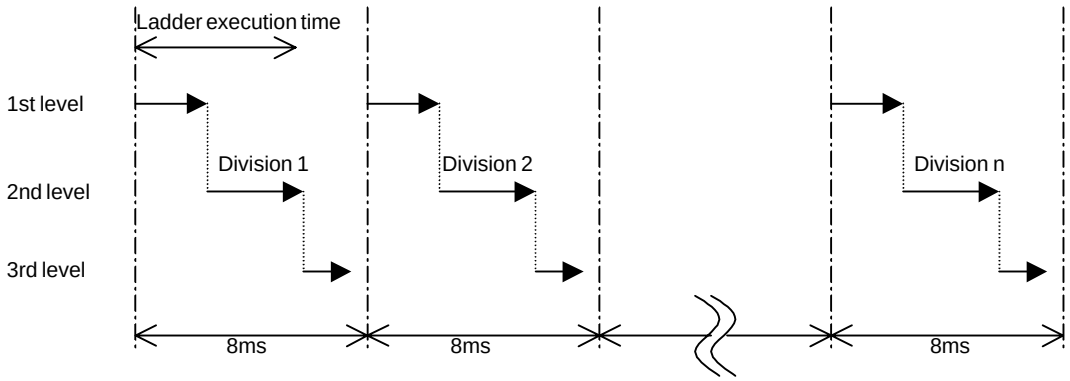
4.2.4 Execution Period of PMC

For PMC–SA1



For PMC–SB7





The ratio of the 1st level execution time to the 2nd level execution time is set in a system parameter for ladder execution time.

- For a ladder that uses the 1st level and the 2nd level only, set the upper limit (150).

- For a ladder that uses the 3rd level, the setting of the upper limit (150) may not ensure full 3rd level operation. In such a case, set this parameter so that the processing times of the 1st level and 2nd level are reduced.

The 1st ladder level or the 2nd ladder level processing time is determined by the following expression:

$$\text{The 1st ladder level or 2nd ladder level processing time} = 5\text{msec} \times \frac{\text{Ladder execution time}}{100}$$

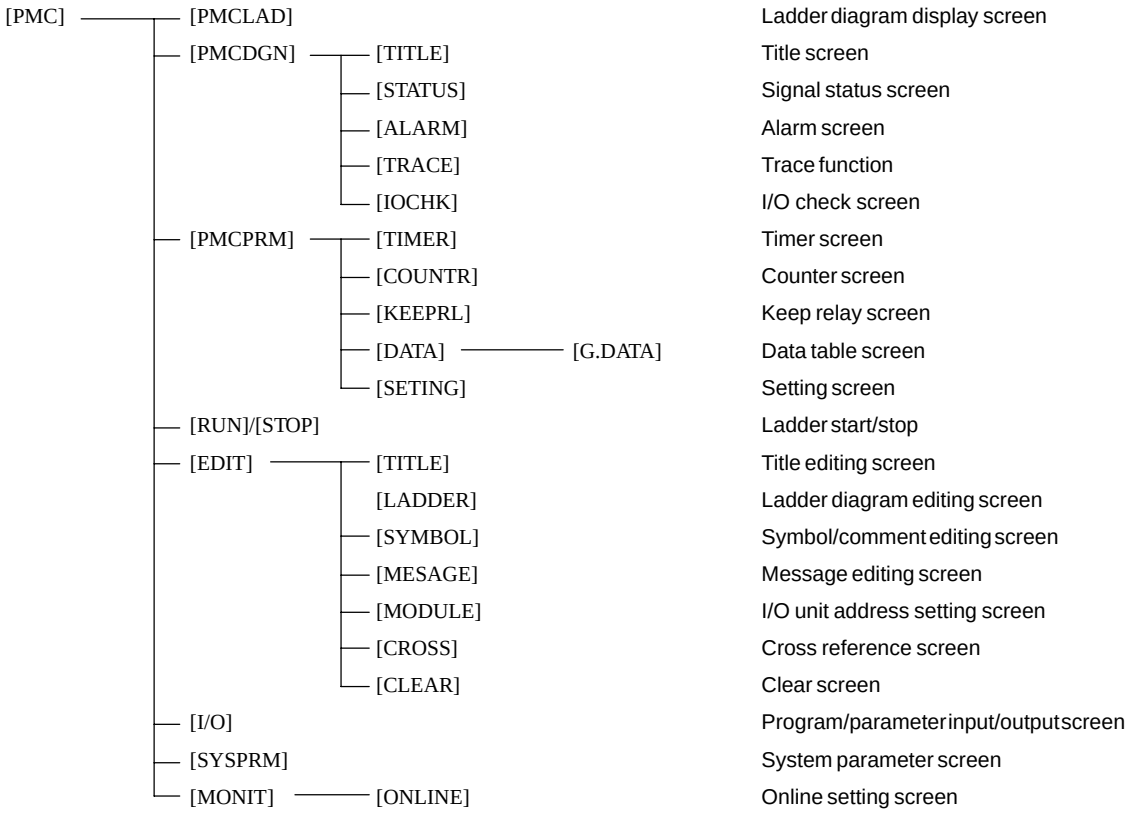
The 3rd ladder level processing time is determined by the following expression:

The 3rd ladder level processing time = 7.5 msec – (1st ladder level and 2nd ladder level processing times)

4.3 PMC SCREEN

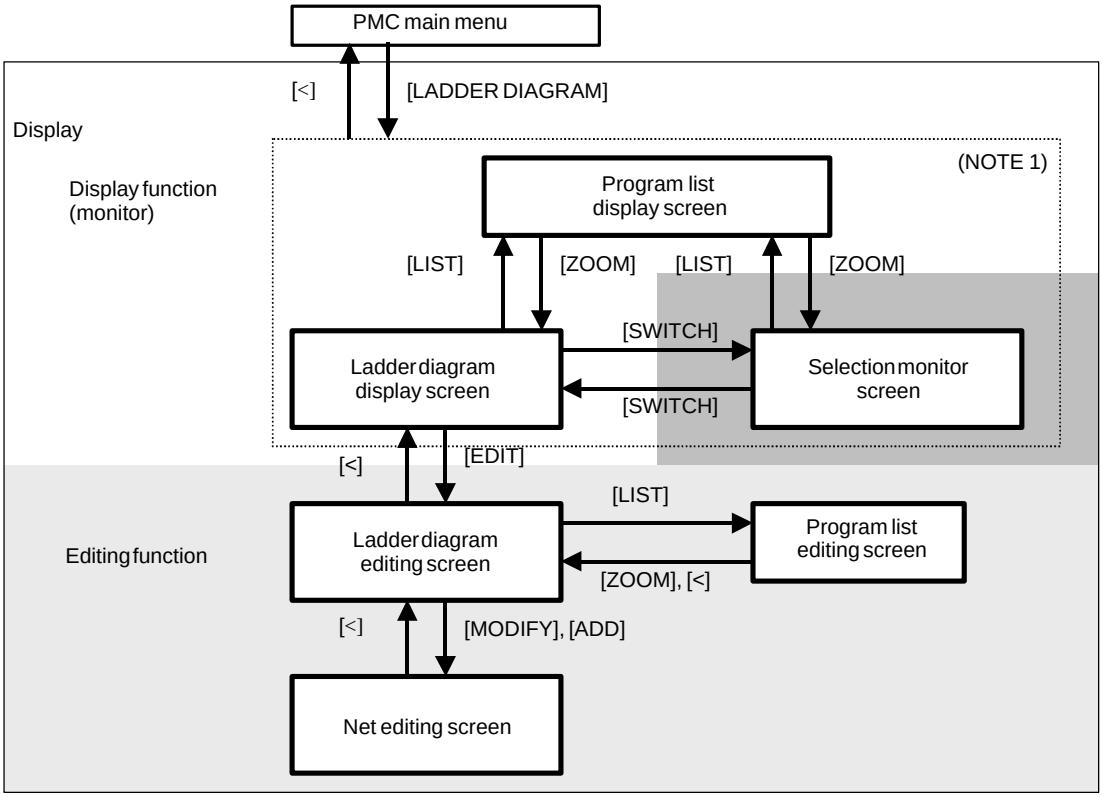
4.3.1 PMC Menu Selection Procedure Using the Soft Keys

PMC–SA1 screen menu selection procedure



4.3.2 Ladder Diagram Display/Editing (PMC–SB7)

Screen transitions are made as shown below.



NOTE

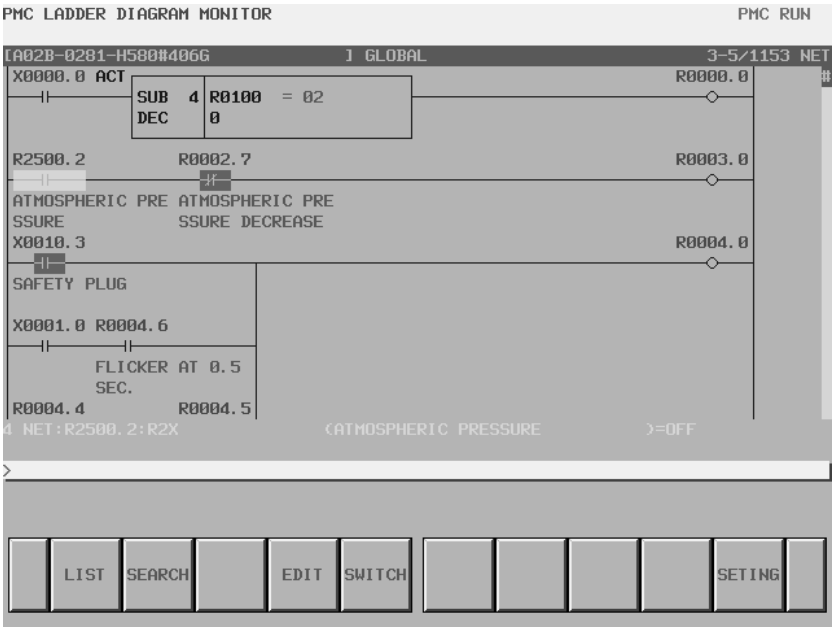
1 When you press the [LADDER DIAGRAM] soft key, the screen previously displayed among the ladder diagram display screen, selection monitor screen, and program list display screen is displayed. However, when you press the [LADDER DIAGRAM] soft key for the first time after turning on the power, the program list display screen is displayed. If a ladder program is replaced by using the input/output function, the program list display screen is first displayed. For details, see the description of the program list display screen.

2 The [EDIT] soft key on the ladder diagram display screen is displayed only when the programmer function is enabled. (To enable the programmer function, specify “YES” for the setting item “Enable Programmer Function” on the PMC parameter setting screen, or set K900.1 to 1.) Alternatively, specify “YES” for “Enable Editing” or set K901.6 to 1. While the online monitor function is enabled, the screen display cannot be switched to the ladder diagram editing screen. (To disable the online monitor function, set “Not Used” for “RS–232C” and “High–speed Interface” on the online monitor setting screen.

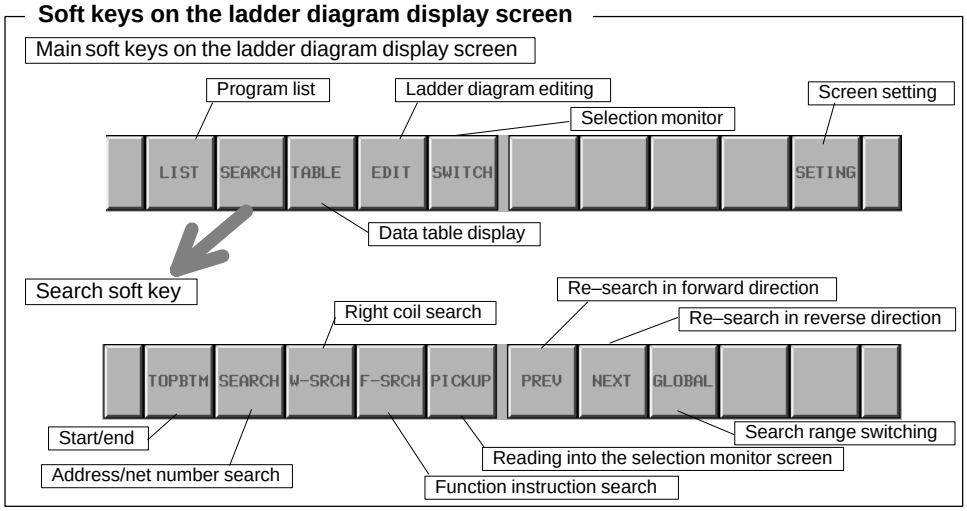
4.3.2.1 Ladder diagram display screen

- Display subprogram switching [LIST]
- Search for addresses [SEARCH]
- Function instruction data table display [TABLE]

- Transition to the selection monitor screen [SWITCH]
- Forced input/output function (FORCING mode)
  "Number" + ENTER key



Screen manipulation



(a) Manipulation using soft keys

1 [LIST] Calling the program list display screen
This soft key calls the program list display screen. The program list display screen enables you to select a subprogram to be displayed on the ladder diagram display screen.

2 [SEARCH] Search/jump menu
This soft key displays the soft keys for search. To return to the main soft key display, use the return key [<].
The soft keys for search are described below.

- [TOPBTM] Start/end
  This soft key makes a jump to the start of the ladder program. If the start of the ladder program is already displayed, a jump is made to the end of the ladder program.

- [SEARCH] Address/net number search
  This soft key searches for the address or net number corresponding to an entered character string, and displays the address on the screen. Both a bit address and a byte address can be searched for.
  When a number is entered, it is assumed to be a net number, and a jump is made.
  When a character string other than numbers is entered, a check is made to see if the character string is defined as a symbol. If the character string is defined as a symbol, the address represented by the symbol is searched for.
  If the character string is not defined as a symbol, the character string is interpreted as a character string representing an address. If interpretation is performed normally, the address is searched for.
  If an address is searched for without displaying the cursor, the screen display is moved so that the net including a found relay is placed at the top of the screen. If an address is searched for with the cursor displayed, the cursor directly moves to the found relay.

- [W–SRCH] Right coil search
  This soft key searches for the bit address represented by an entered character string. A search is made only when the address is used for a right coil. Even if the bit address is used for an ordinary contact, the address is not searched for.

- [F–SRCH] Function instruction search
  This soft key searches for a function instruction when a function instruction number or function instruction name is entered.

- [PICKUP] Reading of a ladder net into the selection monitor screen
  This soft key reads a ladder net to be monitored into the selection monitor screen.

- [PREV] Previous candidate
  This soft key repeats the previously successful search operation towards the start.

- [NEXT] Next candidate
  This soft key repeats the previously successful search operation towards the end.

- [GLOBAL]/[LOCAL] Range switching
  This soft key switches the search target between the whole ladder program (whole) and subprogram currently displayed (local). This soft key is displayed only when a subprogram is displayed. The current search range is displayed at the right end of the information display line at the top of the screen.

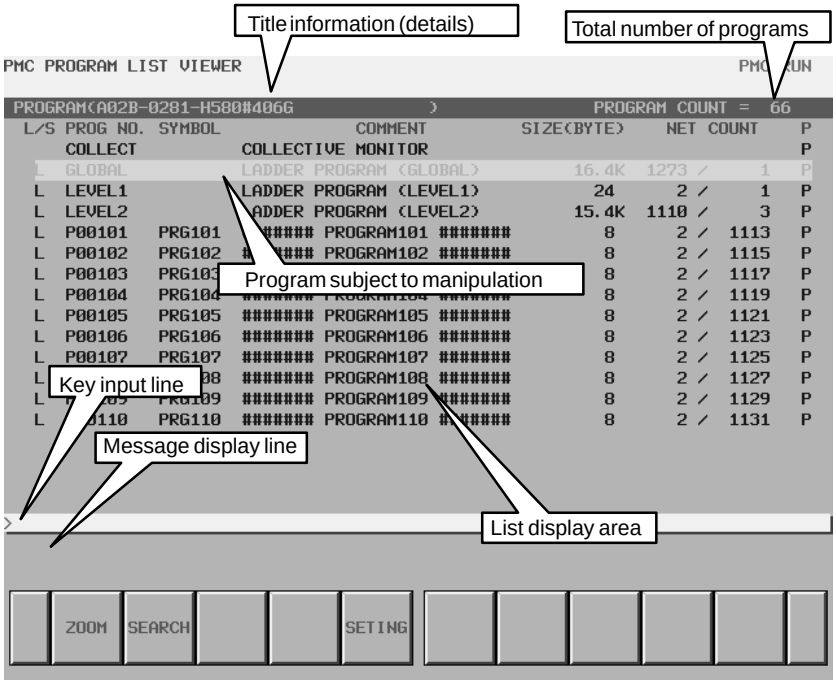
3 [TABLE] Calling the function instruction data table display screen
This soft key displays the data table of a function instruction with a data table such as the COD instruction (SUB7) or CODB instruction (SUB27). This soft key is displayed only when the cursor is placed on a function instruction with a data table.

4 [EDIT] Calling the ladder diagram editing screen
This soft key switches the screen display to the ladder diagram editing screen. This soft key is displayed only when the programmer function is enabled. While the online monitor function is enabled, the screen display can be switched to the ladder diagram editing screen. If a password is set for the ladder program, the input of the password is requested. Enter the password required for editing.

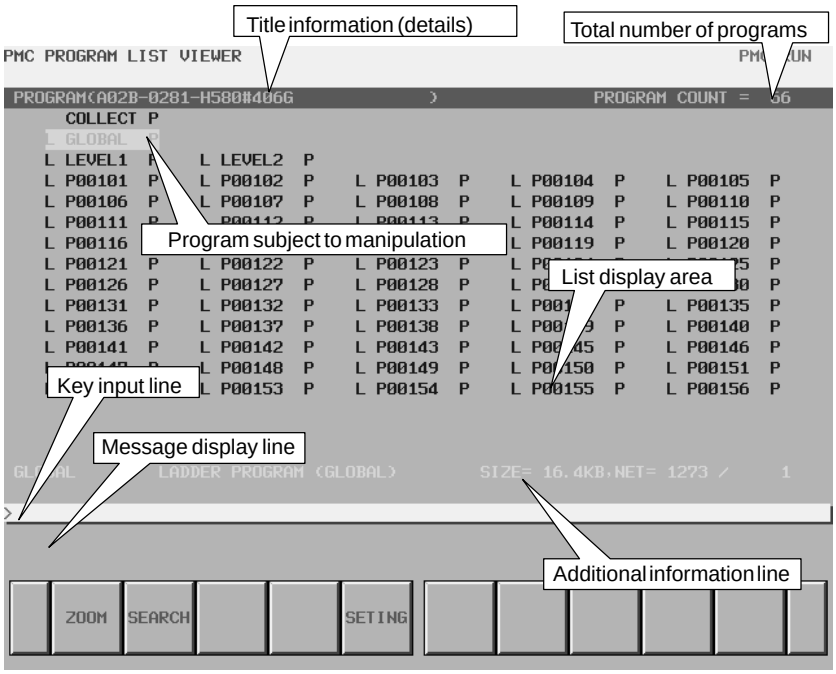
5 [SWITCH] Calling the selection monitor screen
This soft key displays the selection monitor screen.

6 [SETING] Screen setting
This soft key calls the setting screen for the ladder diagram display screen. Various settings for ladder diagram display can be modified. To return to the ladder diagram display screen, use the return key [<]. For details of the setting screen, see "Screen setting" in the description of the ladder diagram display screen.

4.3.2.2 Program list display screen



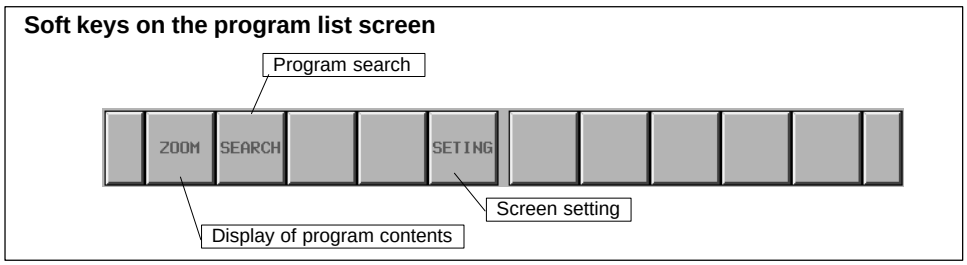
Detail display screen



Simplified display screen

A choice between the detail display screen and simplified display screen can be made on the setting screen.

Screen manipulation



(a) Manipulation using soft keys

1 [ZOOM] Display of program contents
This soft key switches the screen display to the ladder diagram display screen. When you press the [ZOOM] soft key without entering any character string, the program on which the cursor is placed is displayed on the ladder diagram display screen. When you press the [ZOOM] soft key after entering a program name (reference: (c)<1>) or symbol name, the program corresponding to the entered character string is searched for and displayed on the ladder diagram display screen.
If the target program is protected so that it cannot be referenced, the password needs to be released.

2 [SEARCH] Program search
This soft key searches for a program. When you press the [SEARCH] soft key after entering a program name (reference: (c)<1>) or symbol name, the program corresponding to the entered character string is searched for, and the cursor moves to the program.

3 [SETING] Screen setting
This soft key calls the setting screen for the program list display screen. Various settings for program list display can be modified. To return to the program list display screen, use the return key [<]. For details of the setting screen, see “Screen setting” in the description of the program list display screen.

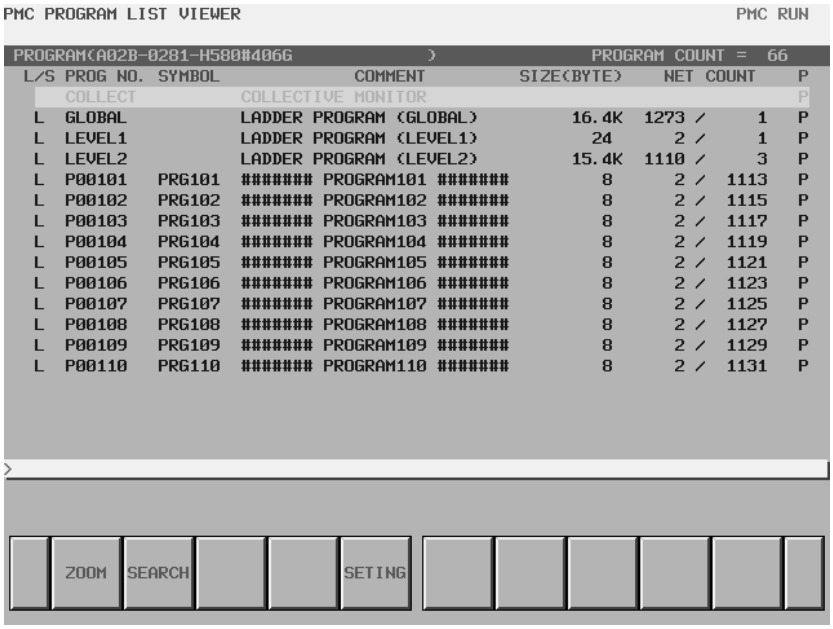
4.3.2.3 Selection monitor function (PMC–SB7)

On the selection monitor screen, only a ladder net including a coil to be monitored can be specified for ladder net monitoring.

Calling the screen

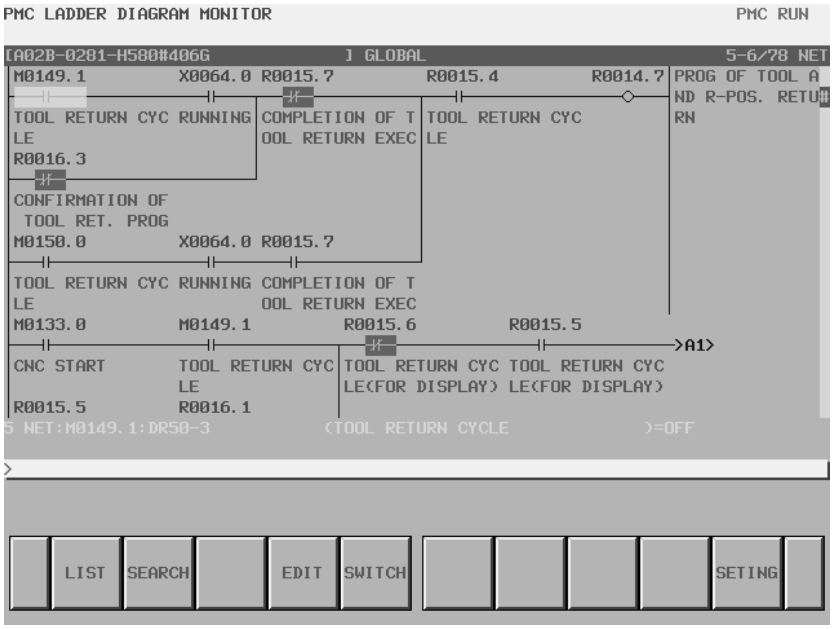
The selection monitor screen can be called as described below.

1 Calling the screen from the program list display screen
On the program list screen, move the cursor to the “COLLECT” program position, then press the [ZOOM] soft key.



Program list display screen

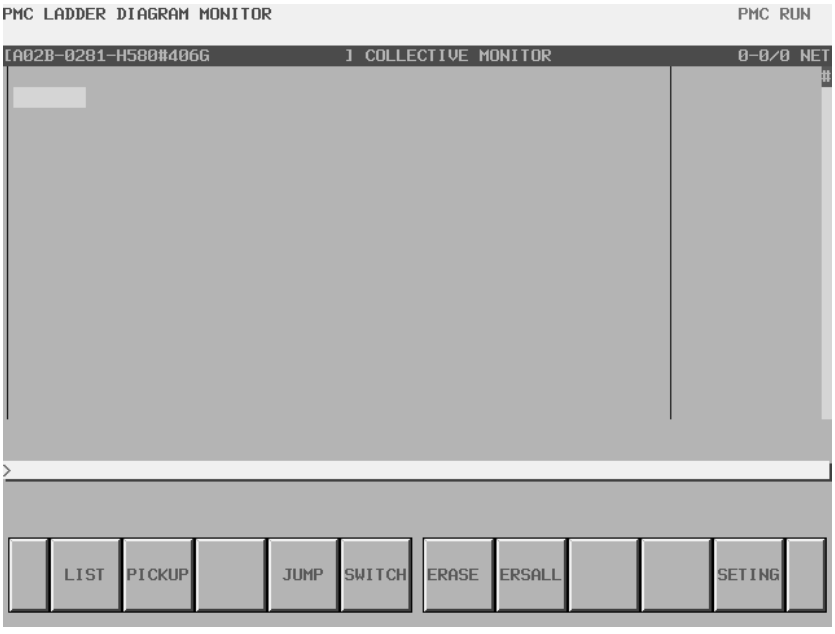
2 Calling the screen from the ladder diagram display screen
On the ladder diagram display screen, press the [SWITCH] soft key.



Ladder diagram display screen

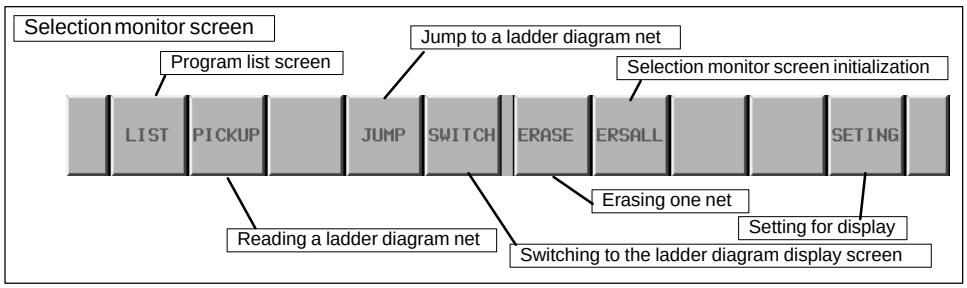
Selection monitor screen

The selection monitor screen is shown below. Initially, no ladder diagram is displayed. Ladder nets selected by coil search and read operation are added step by step. Finally, up to 128 nets can be added on the selection monitor screen. If more than 128 nets are added, the latest 128 nets added are displayed.



Selection monitor screen (initial screen)

Screen manipulation



Soft keys on the selection monitor screen

(a) Manipulation using soft keys

1 [LIST] Calling the program list display screen
This soft key calls the program list display screen. The program list display screen enables you to select a subprogram to be displayed on the ladder diagram display screen.

2 [PICKUP] Reading a ladder net
With this soft key, a ladder net including a coil to be monitored can be read into the selection monitor screen.

3 [JUMP] Jump to a ladder net
This soft key searches the ladder diagram display screen for the ladder net where the cursor is placed on the selection monitor screen, and makes a jump to the net.

4 [SWITCH] Switching to the ladder diagram display screen
This soft key switches the screen display to the ladder diagram display screen.

5 [ERASE] Erasure of ladder diagram net display (one net)
This soft key erases the display of one ladder net read into the selection monitor screen.

6 [ERSALL] Erasure of ladder diagram net display (all nets)
This soft key erases the display of all ladder nets read into the selection monitor screen.

7 [SETING] Screen setting
This soft key calls the setting screen for the selection monitor screen. Various settings for ladder diagram display can be modified. To return to the selection monitor screen, use the return key [<].

● Specifying a ladder diagram to be monitored

The methods described below are available to read a ladder net to be monitored on the selection monitor screen.

1 Specifying a ladder net on the selection monitor screen
- Specification of an address
  Key in the address used for a coil to read the net.
- Specification of a ladder net on the selection monitor screen
  Specify a relay on an already read ladder net with the cursor, and read the net where the relay address is used for a coil.

2 Specifying a ladder net on the ladder diagram display screen
Specify a net on the ladder diagram display screen to read the net into the selection monitor screen.

- **Reading a ladder net on the selection monitor screen**

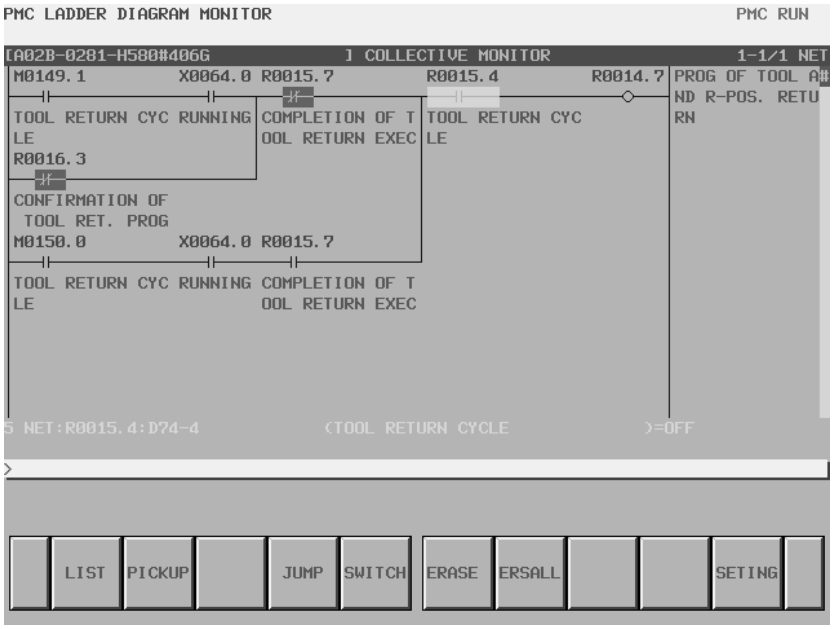
A ladder net can be read from the selection monitor screen. Use the procedure below to read a ladder net.

(a) Specification of an address

1 Enter an address to be monitored. (Example: R14.7)
2 Press the [PICKUP] soft key.
3 The net where the address specified in 1 above is used for a coil is read into the start of the screen.

(b) Specification of an address from the ladder net on the screen

1 Move the cursor to the relay, in a ladder net, which uses an address to be monitored.
2 Press the [PICKUP] soft key.
3 The net where the address specified in 1 above is used for a coil is read into the start of the screen, and the cursor moves to the coil position.

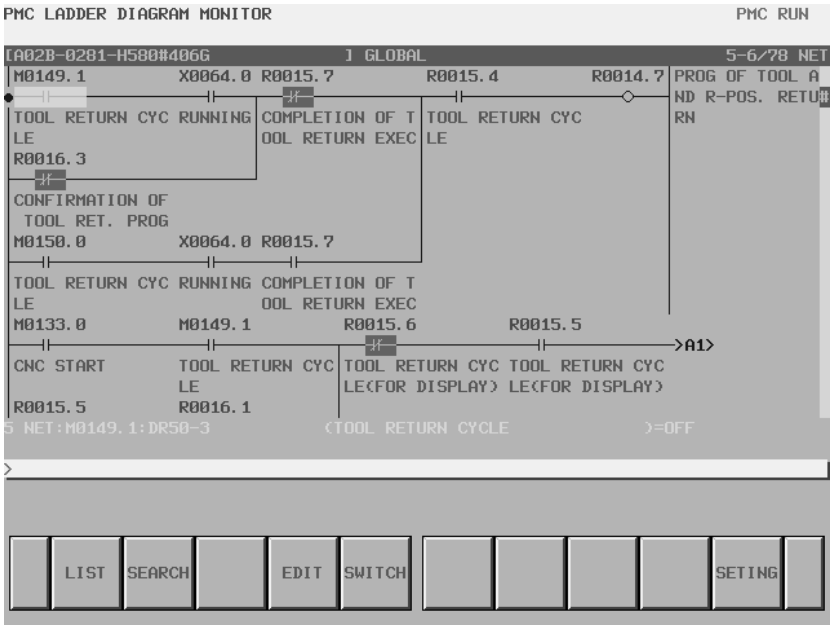


Selection monitor screen

- **Reading a ladder net from the ladder diagram display screen**

A ladder net can be read from the ladder diagram display screen. Use the procedure below to read a ladder net.

1 On the ladder diagram display screen, press the [SEARCH] soft key to display the soft keys for search.
2 Move the cursor to a ladder net to be read.
3 Press the [PICKUP] soft key to read the net specified in 2 above to the start of the selection monitor screen.
4 The ladder net read into the selection monitor screen is marked with ● at the left end of the net.

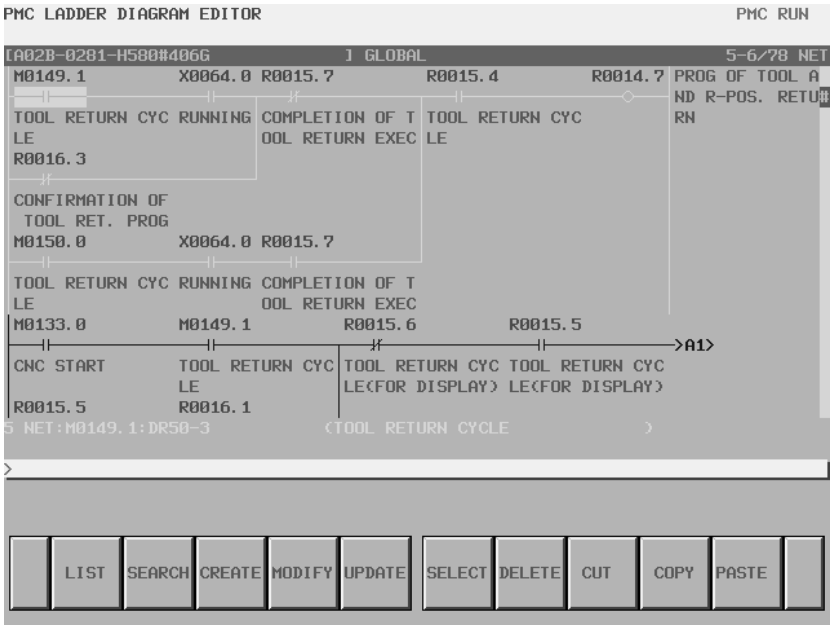


Ladder diagram display screen (search soft keys)

4.3.2.4 Ladder diagram editing screen

On the ladder diagram editing screen, a ladder program can be edited, and its operation can be modified. To display the ladder diagram editing screen, press the [EDIT] soft key on the ladder diagram display screen. On the ladder diagram editing screen, the following editing operations can be performed on a ladder program:

- Net–by–net deletion [DELETE]
- Net–by–net movement [CUT] and [PASTE]
- Net–by–net copy [COPY] and [PASTE]
- Changing the address of a contact or coil
  “Bit address” + INPUT key
- Modifying a function instruction parameter
  “Numeric value/byte address” + INPUT key
- Adding a new net [CREATE]
- Modifying a net figure [MODIFY]
- Reflecting the results of editing [UPDATE]
- Restoring the pre–editing state [RESTOR]



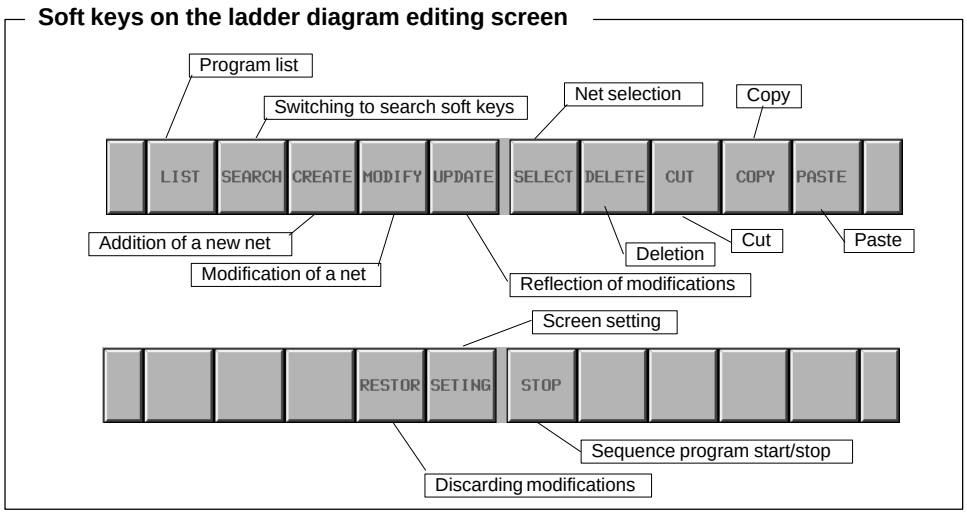
Ladder diagram editing screen

CAUTION

1 A ladder can be edited, regardless of whether operation is in progress or stopped. Before an edited ladder can be executed, however, the ladder must be updated. Press the [UPDATE] soft key or update the ladder when exiting from the ladder diagram editing screen.

2 If the power is turned off without writing an edited sequence program to the flash ROM, the results of editing are cleared. On the input/output screen, write an edited sequence program to the flash ROM. If you specify “YES” for the setting item “Save after Edit” on the PMC parameter setting screen or set K902#0 to 1, a message for confirming whether to write an edited sequence program to the flash ROM upon completion of editing is displayed.

Screen manipulation



Soft keys on the ladder diagram editing screen

(a) Manipulation using soft keys

1 [LIST] Calling the program list editing screen
This soft key calls the program list editing screen. The program list editing screen enables you to select a subprogram to be edited on the ladder diagram editing screen.

2 [SEARCH] Search/jump menu
This soft key displays the soft keys for search. To return to the main soft key display, use the return key [<]. The method of using the soft keys for search is the same as for the ladder diagram display screen.

3 [MODIFY] Calling the net editing screen
This soft key calls the net editing screen to modify the structure of a selected net.

4 [CREATE] Creating a new net
This soft key adds a new net at the location where the cursor is placed. The screen display switches to the net editing screen. Create a net to be added.

5 [UPDATE] Reflecting modifications
This soft key reflects the results of editing in the ladder being executed. When all modifications have been reflected normally, the execution of the edited ladder starts.

WARNING
Use special care when modifying the ladder program being executed. If the ladder program being executed is modified incorrectly, the timing for reflecting modifications is incorrect, or the machine state is improper, the machine may operate unexpectedly. Before reflecting modifications, be sure to check that the modifications are correct, that the machine state is proper, and that there is no person near the machine.

6 [SELECT] Selection of multiple nets
This soft key is used to specify multiple nets when editing such as deletion, cut, or copy is performed. Determine the start point of a selection range with the [SELECT] soft key, then specify the end point of the selection range by moving the cursor or by using the search function. After net selection, perform editing with editing soft keys. While multiple nets are selected, the addition information line displays information about the selection range.

7 [DELETE] Deleting a net
This soft key deletes selected a net. A net deleted with the [DELETE] soft key is lost. If a net deleted by mistake with the [DELETE] soft key needs to be restored, the entire ladder program needs to be restored to the pre–editing state by using the [RESTORE] soft key.

8 [CUT] Cutting a net
This soft key cuts a selected net. The cut contents are transferred to the buffer for pasting, and are deleted from the ladder diagram. The previous contents of the buffer are lost. When moving a net, use this soft key together with the [PASTE] soft key.

9 [COPY] Copying a net
This soft key transfers a selected net to the buffer for pasting. No change is made to the ladder diagram. The previous contents of the buffer for pasting are lost. When copying a net, use this soft key together with the [PASTE] soft key.

10 [PASTE] Pasting a net
This soft key inserts, at the cursor position, a net that has been transferred to the buffer for pasting with the [CUT] soft key or the [COPY] soft key. Press the [PASTE] soft key while a net is selected with the [SELECT] soft key. The selected net is replaced with the net held in the buffer for pasting. The contents of the buffer for pasting are preserved until the power to the NC is turned off.

11 [RESTOR] Discarding modifications
This soft key discards the results of editing performed so far, and restores the ladder present when the screen display switches to the ladder diagram editing screen or the last update operation has been completed. Use this soft key when restoration is difficult because of incorrect editing.

12 [SETING] Screen setting
This soft key calls the setting screen for the ladder diagram editing screen. Various settings for ladder diagram editing can be modified. To return to the ladder diagram editing screen, use the return key [<].

13 [START]/[STOP] Starting and stopping a ladder
These soft keys control ladder program execution. The [START] soft key starts the execution of a ladder program. The [STOP] soft key stops the execution of a ladder program. When modifications have been reflected normally, the execution of the edited ladder starts.

WARNING
Use special care when starting/stopping a ladder program. If a ladder program is started/stopped when the start/stop timing is incorrect, or the machine state is improper, the machine may operate unexpectedly. Moreover, when a ladder program is stopped, the safety mechanism and monitoring based on the ladder program are disabled. When starting/stopping a ladder program, be sure to check that the machine state is proper, and that there is no person near the machine.

14 [<] Ending editing
This soft key reflects the modifications made so far in the ladder being executed, and ends editing. When you press a function key such as the SYSTEM key during ladder program editing, data being edited is discarded.

WARNING
Use special care when modifying the ladder program being executed. If the ladder program being executed is modified incorrectly, the timing for reflecting modifications is incorrect, or the machine state is improper, the machine may operate unexpectedly. Before reflecting modifications, be sure to check that the modifications are correct, that the machine state is proper, and that there is no person near the machine.

4.3.2.5 Net editing screen

On the net editing screen, net editing operations such as the creation of a new net and the modification of an existing net can be performed.

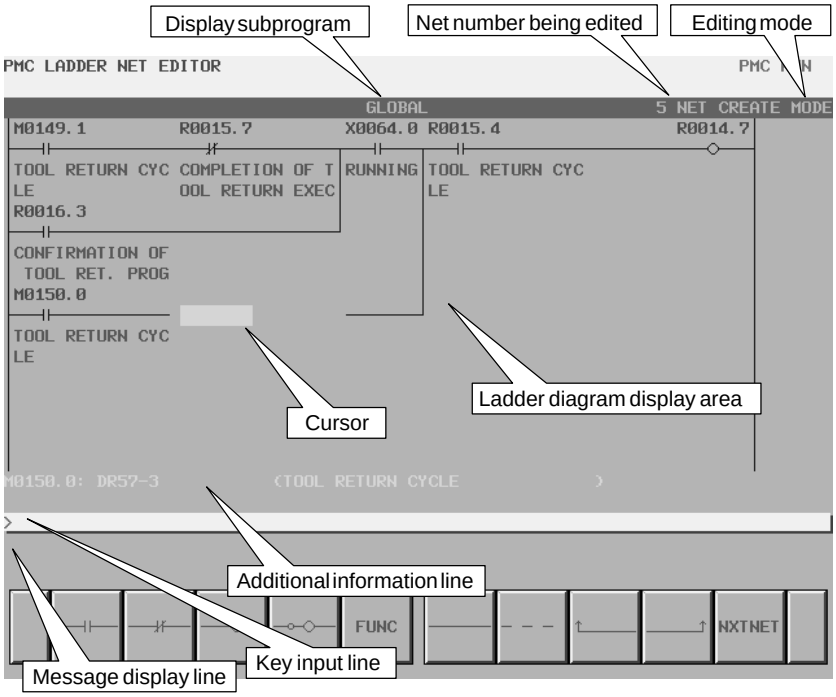
1 Modification to an existing net:
If the net editing screen is displayed with the [MODIFY] soft key, the mode (modification mode) for modifying the net indicated by the cursor is set.

2 Addition of a new net:
If the net editing screen is displayed with the [CREATE] soft key, the mode (creation mode) for creating a new net from a free state is set.

The net editing screen allows the following editing operations:

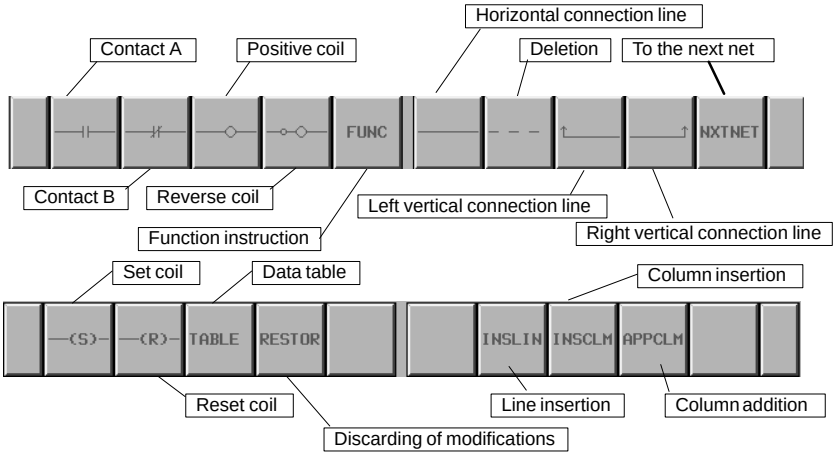
- Placing a new contact/coil
  “Bit address” [⊣ ⊢], [—○—] and so forth
- Changing the type of a contact/coil
  [⊣ ⊢], [—○—]and so forth
- Placing a new function instruction [FUNC]
- Changing the type of a function instruction [FUNC]

- Deleting a contact/coil function instruction
  [·····]
- Adding/deleting a connection line
  [———], [↑———], [———↑]
- Editing the function instruction data table [TABLE]
- Line/column insertion
  [INSLIN], [INSCLM], [APPCLM]
- Changing the address of a contact or coil
  “Bit address” + INPUT key
- Changing a function instruction parameter
  “Numeric value/byte address” + INPUT key
- Discarding the contents of editing [RESTOR]



Screen manipulation

Soft keys on the net editing screen

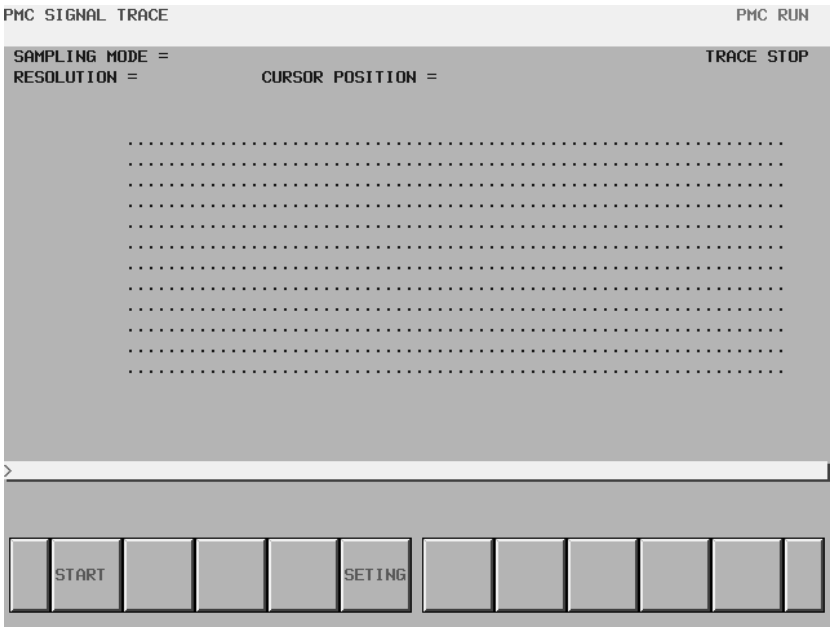


Soft keys on the net editing screen

4.3.2.6 Signal trace function (PMC–SB7)

Signal trace screen (initial screen)

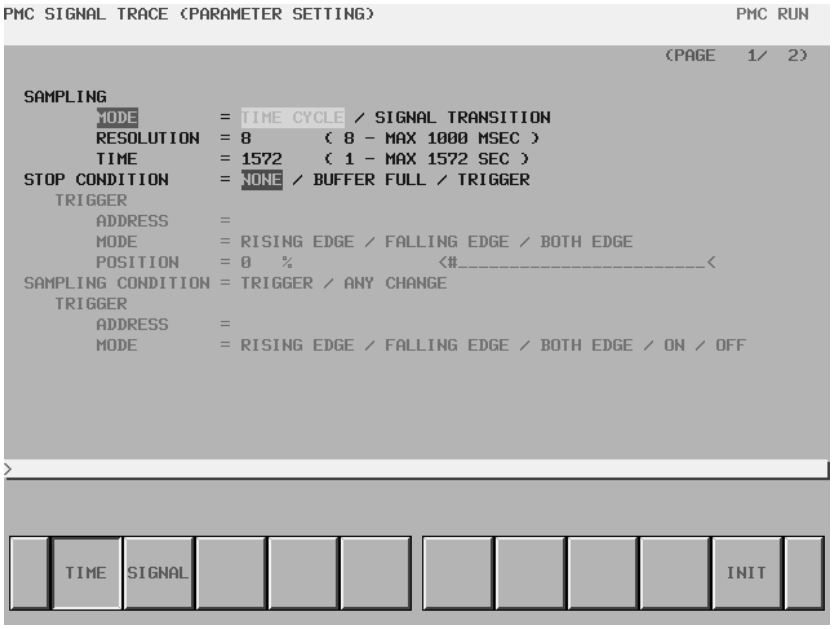
The signal trace screen is displayed when you press the [TRACE] soft key on the PMC diagnosis screen.



Signal trace screen (initial screen)

Trace parameter setting screen

When you press the [SETING] soft key on the signal trace screen, the trace parameter setting screen is displayed. The setting screen consists of multiple pages. Use the page keys to switch between the pages.



Trace parameter setting screen (page 1)

(a) Sample/mode

Set a sampling mode.

- Period: A time period is used for sampling.
- Signal transition: A signal transition is used for sampling.

(b) Sampling/resolution

Set the resolution of sampling. The default is 8 ms.
The setting range is 8 ms to 1,000 ms.
An input value is rounded off to a multiple of 8 ms.

(c) Sampling/time

This item is displayed when “period” is selected for the sampling mode. Set a desired sampling time.
The allowable input value depends on the setting of “resolution” and the number of sampled signals. An allowable time range is indicated at the right end.

(d) Sampling/frame

This item is displayed when “signal transition” is selected for the sampling mode. Set a desired sampling count.
The allowable input value depends on the setting of “resolution” and the number of sampled signals. An allowable time range is indicated at the right end.

(e) Stop condition

Set a trace stop condition.

- None: Trace operation is not automatically stopped.
- Buffer full: Trace operation is stopped when the sampling buffer is full.
- Trigger: Trace operation is stopped by a trigger.

(f) Stop condition/trigger/address

This item becomes settable when “trigger” is selected as the trace stop condition. Set a trigger address for stopping trace operation.

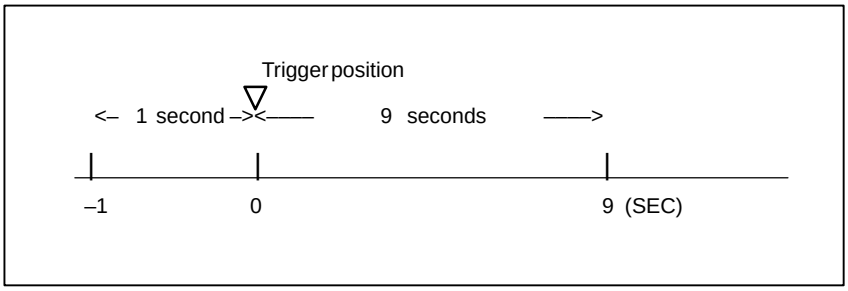
(g) Stop condition/trigger/mode

This item becomes settable when “trigger” is selected as the trace stop condition. Set a trigger mode for stopping trace operation.

- Rising: Trace operation is automatically stopped on a rising edge of the trigger signal.
- Falling: Trace operation is automatically stopped on a falling edge of the trigger signal.
- Transition: Trace operation is automatically stopped when the trigger signal makes a transition.

(h) Stop condition/trigger/position

This item becomes settable when “trigger” is selected as the trace stop condition. Set a position in the entire sampling time (or count) where a stop trigger is initiated, by using a ratio to the sampling time (or count). Set a proper value as required. For example, set a larger value when checking the signal before the trigger condition, or set a smaller value when checking the signal after the trigger condition.
Example: Graph display range when the sampling time is 10 seconds and the sampling position is 10%



(i) Sampling condition

This item becomes settable when “signal transition” is selected as the trace stop condition. Set a condition for sampling.

- Trigger: Sampling is performed when a sampling trigger condition is satisfied.
- Transition: Sampling is performed when the signal at the sampling address makes a transition.

(j) Sampling condition/trigger/address

This item becomes settable when “signal transition” is selected as the sampling mode and “trigger” is selected as the sampling condition. Set a sampling trigger address.

(k) Sampling condition/trigger/mode

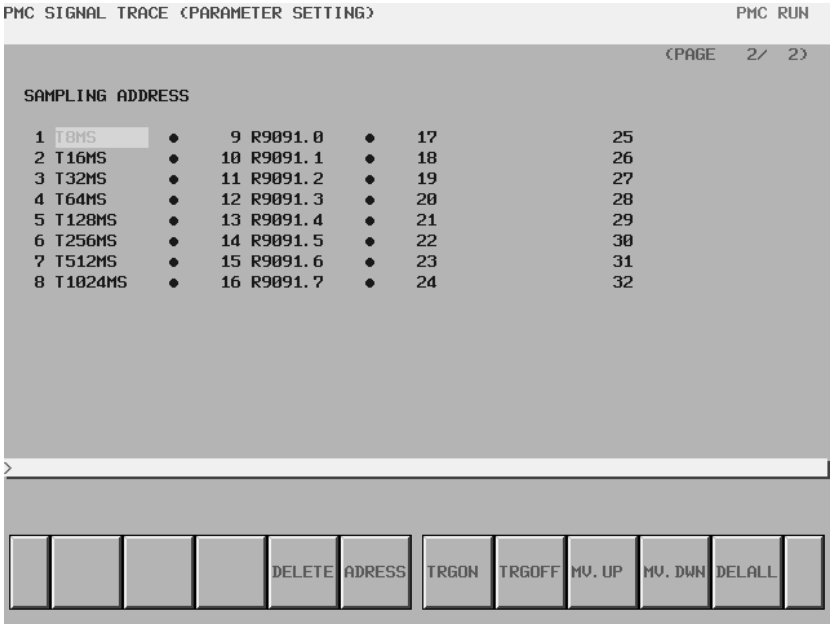
This item becomes settable when “signal transition” is selected as the sampling mode and “trigger” is selected as the sampling condition. Set a trigger condition mode.

- Rising: Sampling is performed on a rising edge of the trigger signal.
- Falling: Sampling is performed on a falling edge of the trigger signal.
- Transition: Sampling is performed when the trigger makes a transition.
- On: Sampling is performed when the trigger signal is on.
- Off: Sampling is performed when the trigger signal is off.

Sampling address setting

(a) Address setting

On page 2 of the trace parameter setting screen, set the address of a signal to be sampled.



Trace parameter setting screen (page 2)

Specify a bit address for a signal address. If a byte address is input, bits 0 to 7 of the input address are input. Up to 32 signal address points can be set.

NOTE

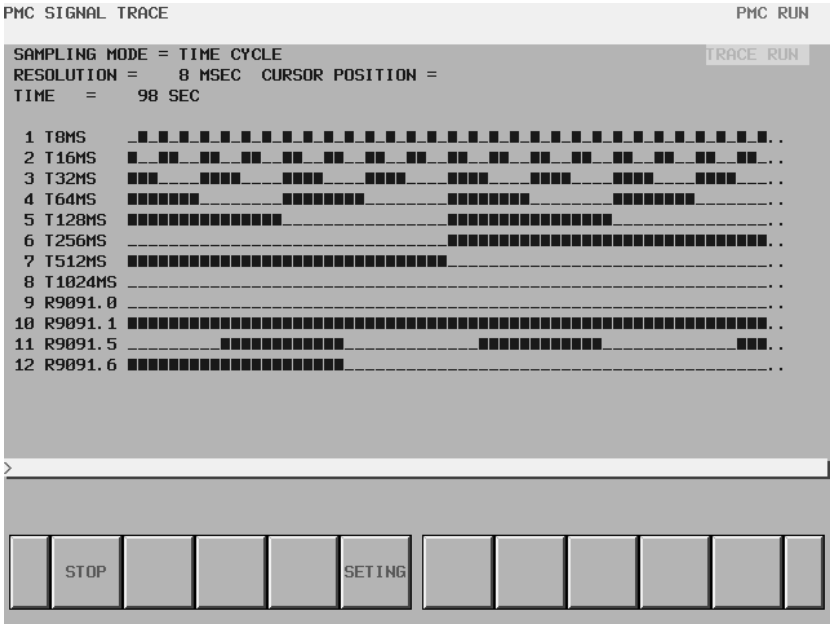
Depending on the number of points of signal addresses subject to sampling and the sampling resolution, the maximum allowable input value for the sampling time or frame increases or decreases.

If the maximum allowable input value becomes smaller than an existing sampling time or frame value, the message below is displayed, and the setting is changed. (In the messages below, xxx represents a maximum allowable input value.)

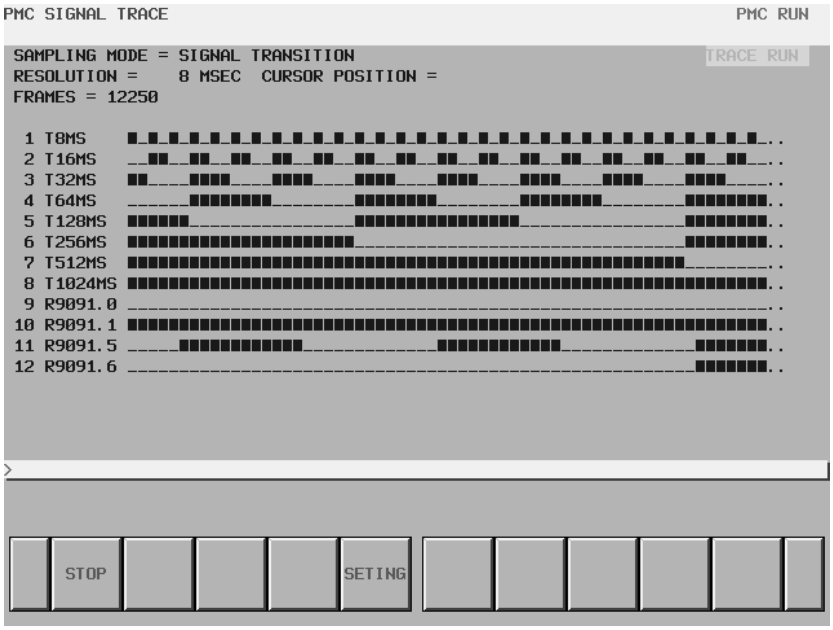
a) When a sampling time is set
   “The sampling time has decreased to xxx seconds.”
b) When a sampling frame is set
   “The sampling frame has decreased to xxx seconds.”

Trace execution

After trace parameter setting, press the [START] soft key on the trace screen. Trace operation is started.
The screens below are examples of execution in the period mode and signal transition mode.



Signal trace execution screen (time cycle mode)

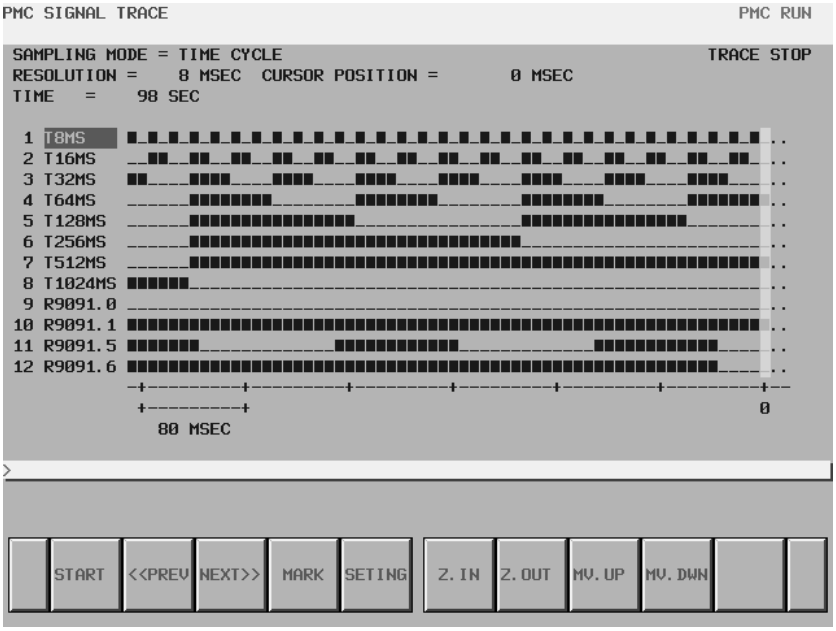


Signal trace execution screen (signal transition mode)

During trace execution, the results of trace operation are displayed in real–time mode. When the trace stop condition set in the trace parameter setting screen is satisfied, trace execution stops. Pressing the [STOP] soft key also stops trace execution. In the signal transition mode, sampling is performed when a signal transition is made. So, trace display is not updated until a trigger signal transition is made.

Checking trace results

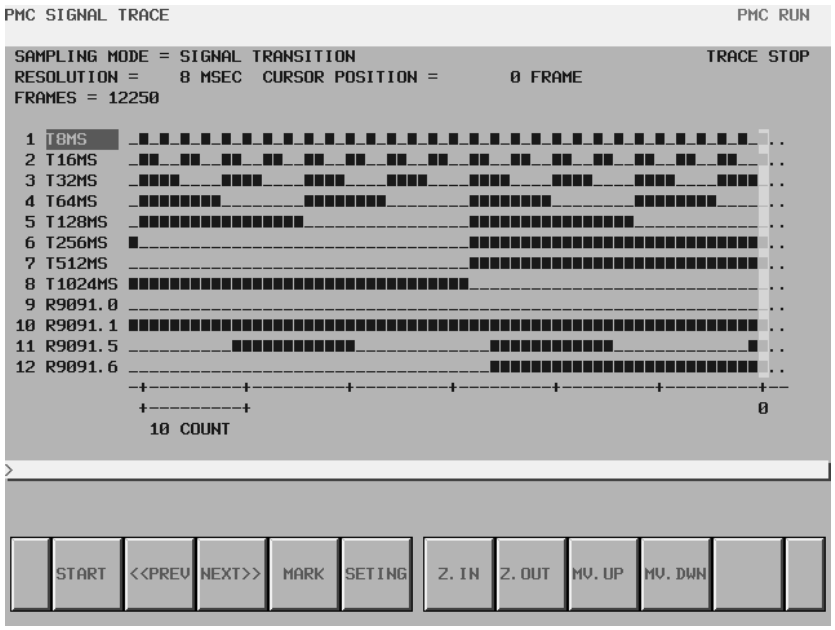
Upon completion of trace execution, trace results can be checked.



Signal trace result screen (time cycle mode)

(a) Automatic selection range calculation display

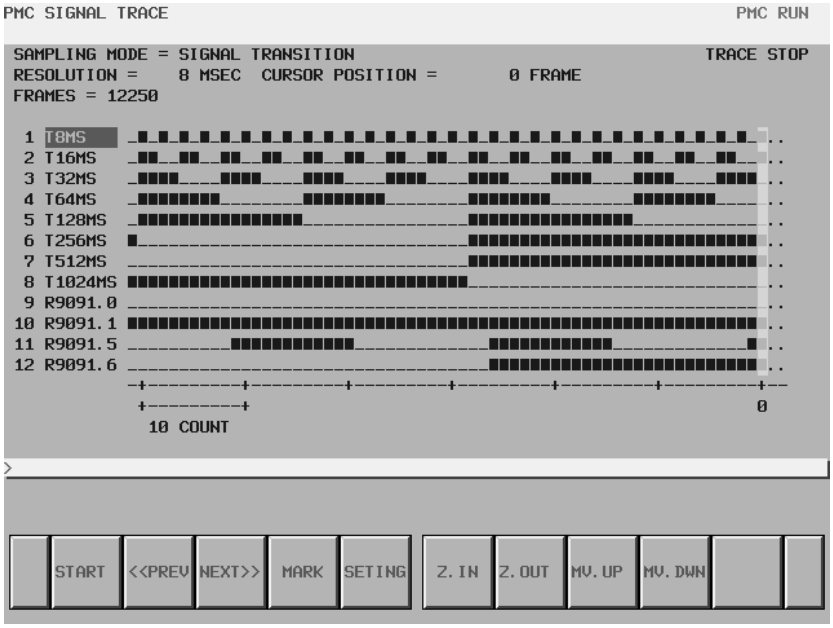
When you press the [MARK] soft key, the cursor position at that time is marked, and a mark cursor is displayed. If the mark cursor and the current position cursor are placed at the same position, the current position cursor takes priority. At the top of the screen, a mark position indicating the mark cursor position and range information indicating the range from the mark cursor position to the current position cursor are displayed. These values change as the current position cursor move. To cancel the range selection, press the [MARK] soft key again.



Signal trace result screen (mark cursor display)

(b) Enlarged/reduced trace result data display

With the [Z.IN] or [Z.OUT] soft key, the graph can be enlarged or reduced. This operation changes the scale value of one graph division. Immediately after trace operation, the graph is enlarged to a maximum extent. If reduced display disables ON/OFF changes from being displayed precisely, “X” is used for graph display as shown below. Reduced display is possible until all trace results are held on one page.



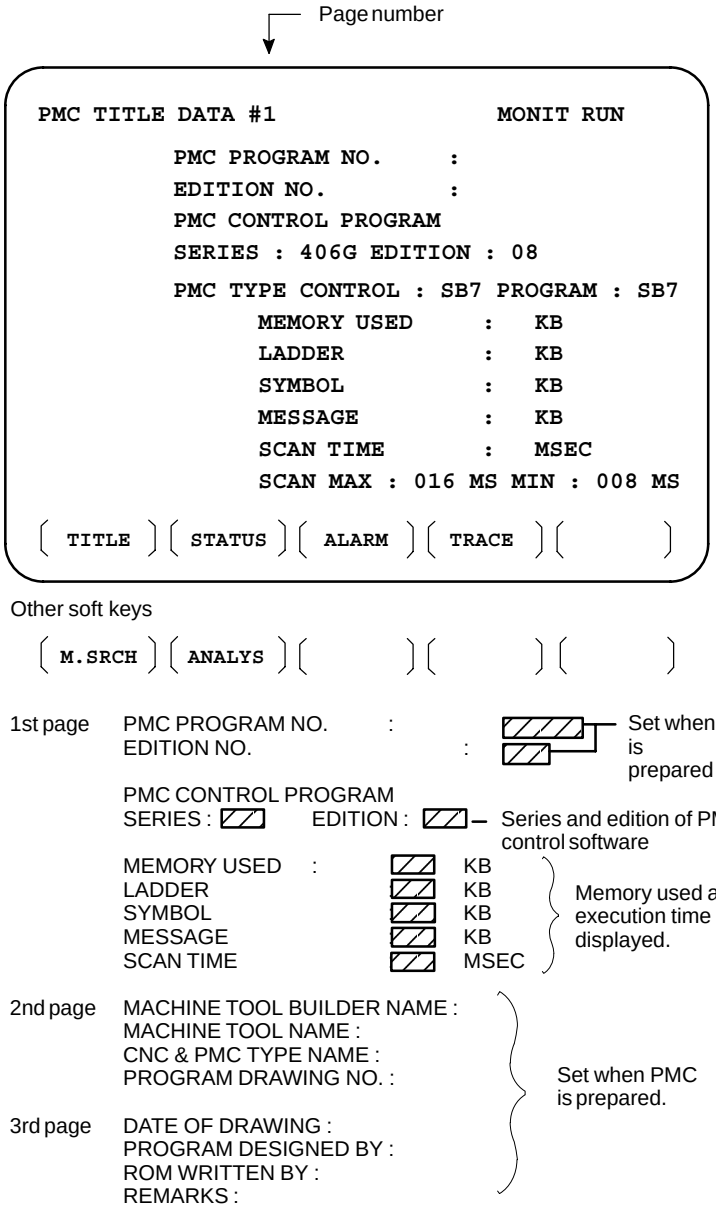
Signal trace result screen (reduced display)

4.3.3 PMCDGN Screen

Press soft key **[PMCDGN]** then PMC's diagnostic screen is displayed.

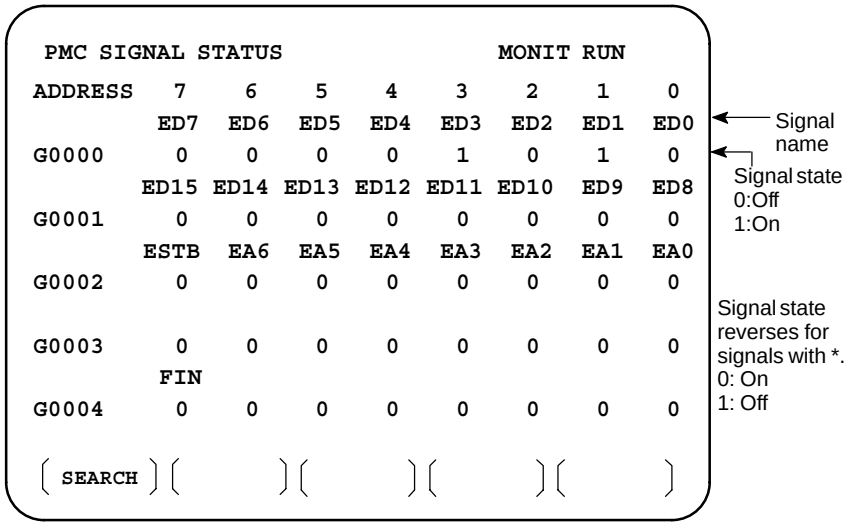
- **TITLE screen**

The title data registered when a ladder program is prepared is displayed.



- **STATUS screen**

On/Off state of input/output signals and internal relay is displayed.

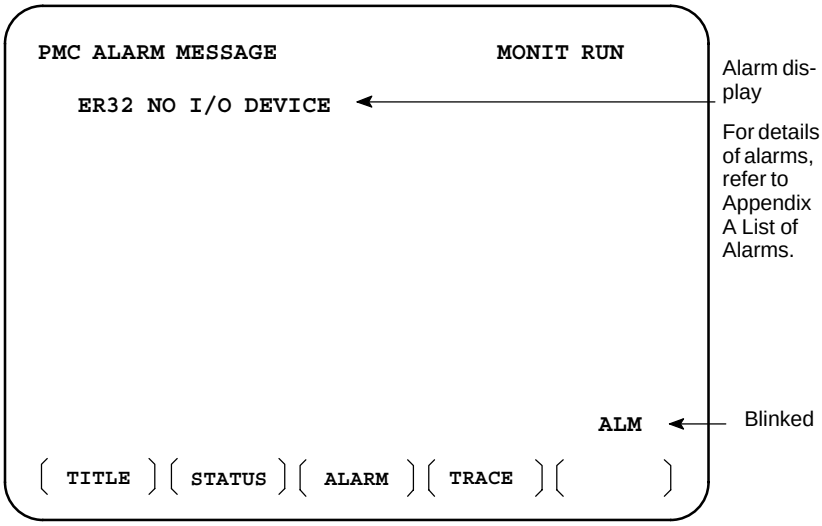


[Search Method]

- Page key :Forward and Backward by screen
- Cursor key :Forward and Backward by diagnostic number
- To search a specified address or signal name, input an address number or signal name and press **[SEARCH]**.

- **Alarm screen**

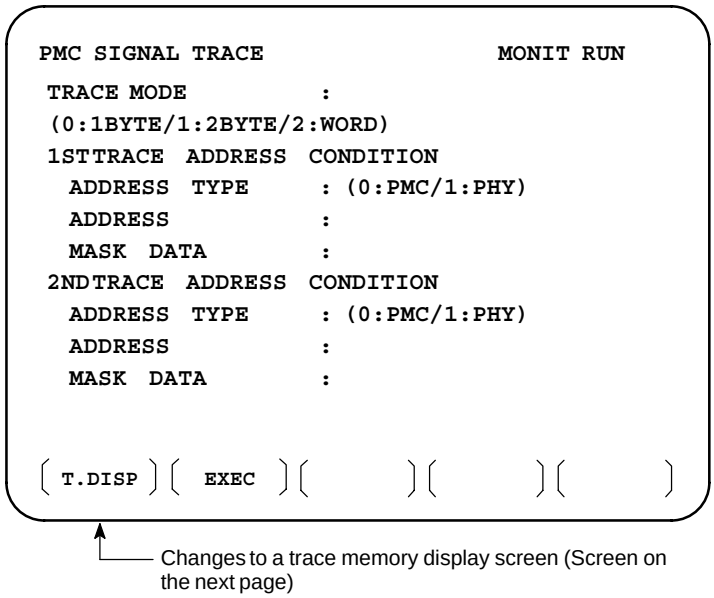
Displays an alarm generated in PMC.



- **TRACE screen**

Every time a specified signal changes, the signal status is memorized in the trace memory. This function is useful for identifying intermittent troubles.

1 Trace parameter screen



a. TRACE MODE: Select the trace mode
0=Records changes of 1–byte signals
1=Records changes of independent 2–byte signals
2=Records changes of consecutive 2–byte signals

b. ADDRESS TYPE:
0=PMC address is used for tracing address.
1=Physical address is used for tracing address.
(Mainly used for C–language program)

c. ADDRESS:Set a tracing address.

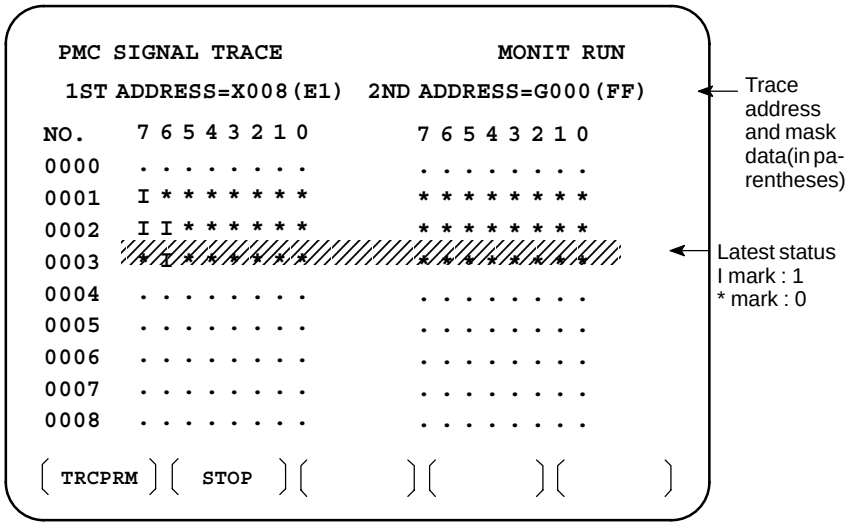
d. MASK DATA: The bits to be traced are specified by a hexadecimal number (2 digits).
For example, to trace the signals at bit 7, 6, 5 and 0, set E1 (hexadecimal) to MASK DATA.

	#7	#6	#5	#4	#3	#2	#1	#0
E1%	1	1	1	0	0	0	0	1

However, even if bit 4, 3, 2 and 1 changes, tracing (memory registration) cannot be done but signal status is memorized when a tracing is executed.
[Correspondence of binary and hexadecimal number]

$0000_2 : 0_{16}$	$0001_2 : 1_{16}$	$0010_2 : 2_{16}$	$0011_2 : 3_{16}$
$0100_2 : 4_{16}$	$0101_2 : 5_{16}$	$0110_2 : 6_{16}$	$0111_2 : 7_{16}$
$1000_2 : 8_{16}$	$1001_2 : 9_{16}$	$1010_2 : A_{16}$	$1011_2 : B_{16}$
$1100_2 : C_{16}$	$1101_2 : D_{16}$	$1110_2 : E_{16}$	$1111_2 : F_{16}$

2 Trace memory contents display screen

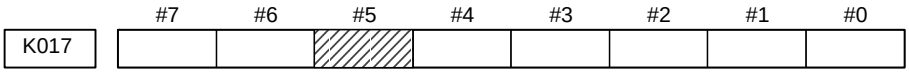


a. Soft key **[TRCPRM]**: Return to the trace parameter setting screen (screen of previous page)

b. Soft key **[EXEC]**: Starts tracing.
Trace memory is cleared and each time a specified signal changes, its status is recorded. Trace memory is 256 bytes and if tracing is executed 128 times by 2–byte tracing, tracing is executed again from the head of memory.

c. Soft key **[STOP]**: Ends the tracing.

*The tracing parameters are held even if the power is turned off.



#5 0 : Tracing starts by **[EXEC]**.
1 : Tracing starts automatically after power on

4.3.4 PMCPRM Screen

● Inputting PMC parameters from the MDI

1 Set to MDI mode or emergency stop state.

2 Set PARAMETER WRITE (on setting screen) to 1 or set the program protect signal (KEY4) to 1.

	PWE	KEY4	
Timer	○	–	
Counter	○	○	Either one
Keep relay	○	–	
Data table	○	○	Either one

3 Press a soft key and select a required screen.
[TIMER] :Timer screen
[COUNTR] :Counter screen
[KEEPRL] :Keep relay screen
[DATA] :Data table screen

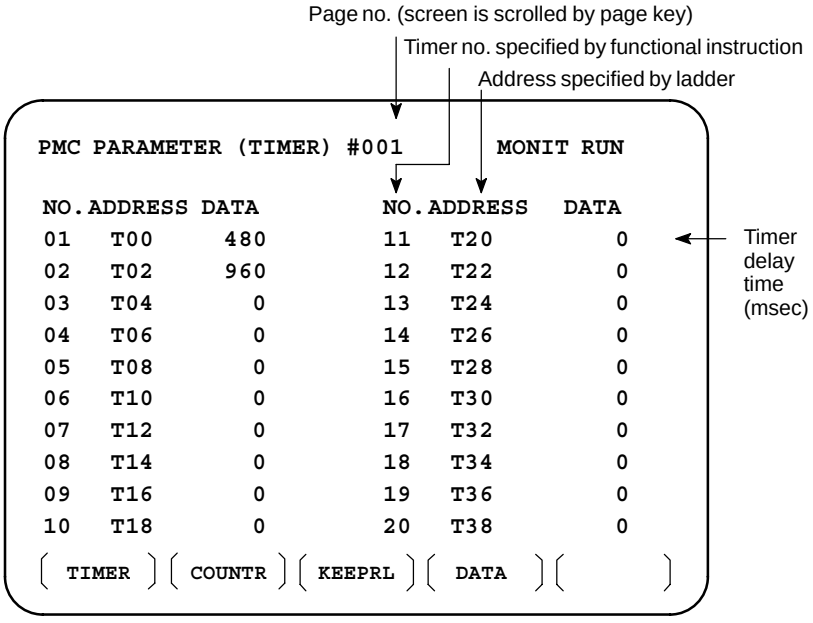
4 Press cursor key and move the cursor to a desired number.

5 Input a numeric key and press INPUT key and data is input.

6 After the data is input, set PARAMETER WRITE or KEY4 on setting screen to 0.

● TIMER screen

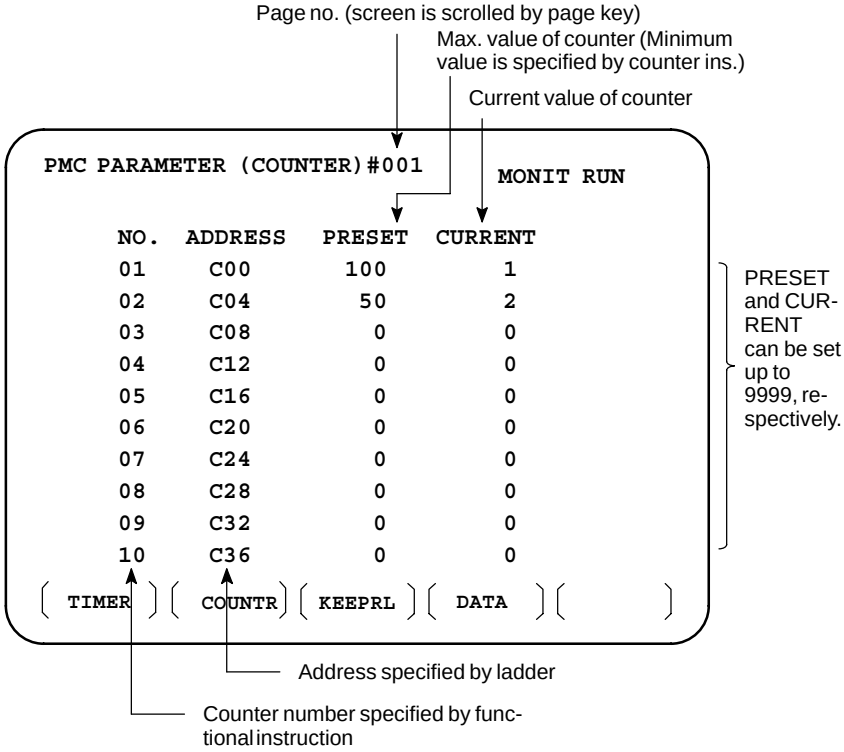
This screen is used for setting timer time of the functional instruction (SUB 3).



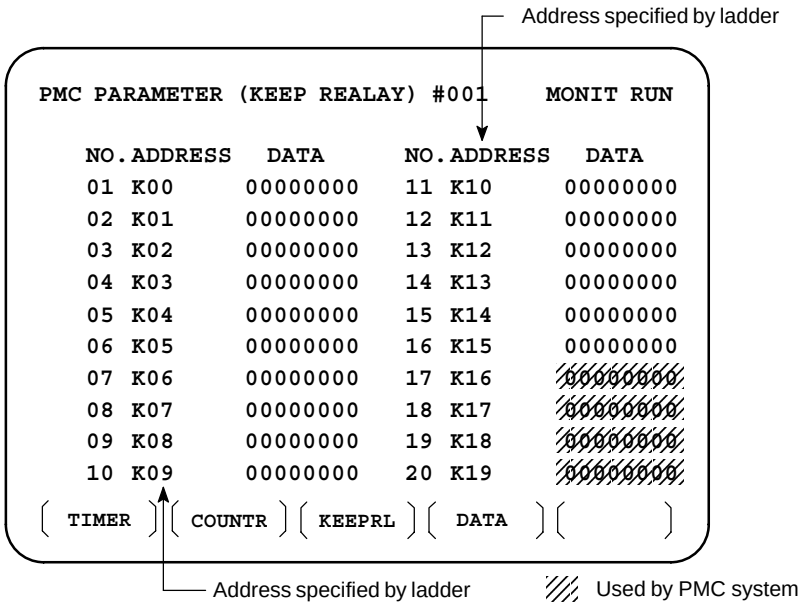
Timer set time : Timer no. 1–8 is max. 1572.8 sec and its accuracy is 48ms.
Timer no. 9 is max. 262.1 sec and its accuracy is 8ms.

- **COUNTER screen**

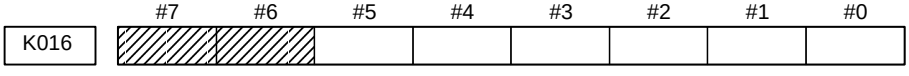
This screen sets and displays max. value of counter and current value of the counter instruction (SUB 4).



- **KEEP RELAY screen**



1 Nonvolatile memory control

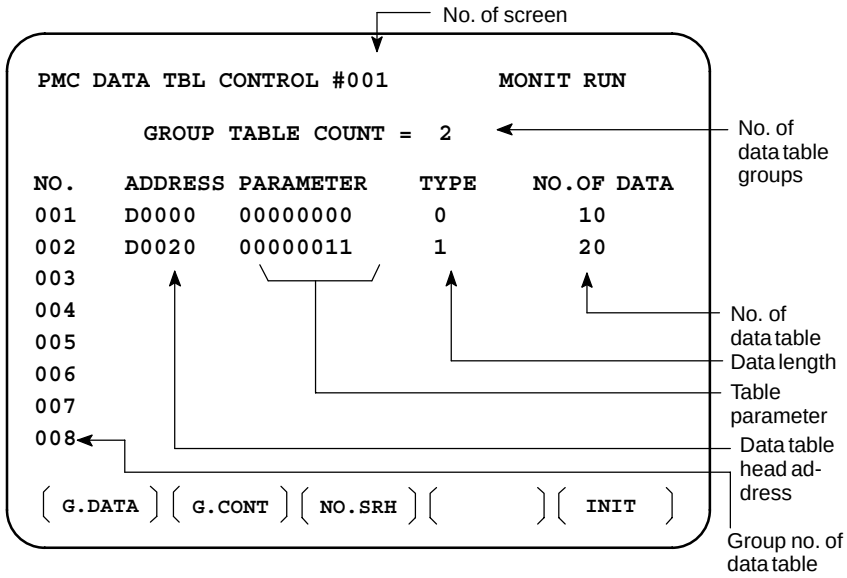


#7(MWRTF2) : For checking the writing status in nonvolatile memory

#6(MWRTF1) : Writing status in nonvolatile memory

- **DATA TABLE screen**

1 Data table setting screen



a. Soft key **[G.DATA]** : Select data display screen of data table. (Next screen)

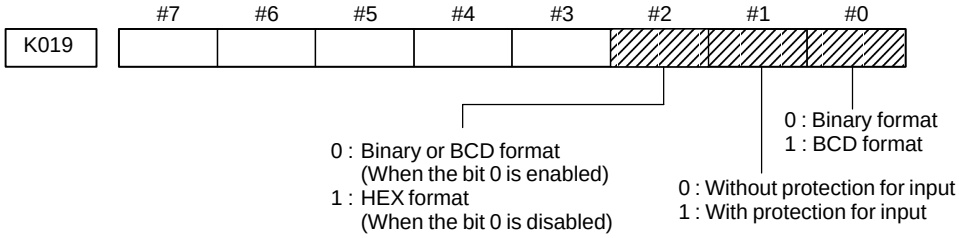
b. NO. OF GROUPS **[G.CONT]**: Set the no. of groups of data table.

c. Group No. **[NO.SRH]**: Move the cursor to a specified group.

d. Soft key **[INIT]**: Initializes the setting of data table.
No. of groups is 1, ADDRESS is D0000, PARAMETER is 0000000, TYPE is 0, NO. OF DATA is 1860.

This operation is done usually when a sequence program is prepared. When PMC parameters are set, internal parameters are not affected.

PARAMETER

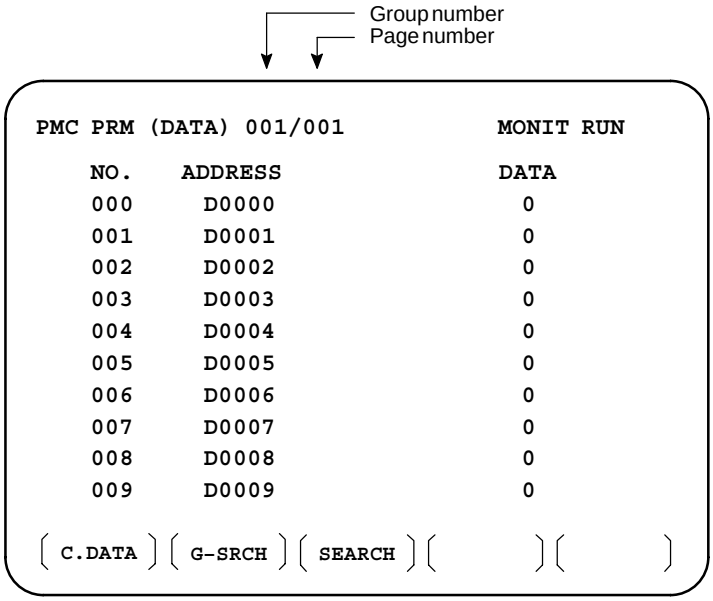


TYPE

0 : 1–byte length 1 : 2–byte length 2 : 4–byte length

e. Using the page key PAGE / PAGE, next screen/previous screen can be selected.

2 Data display screen

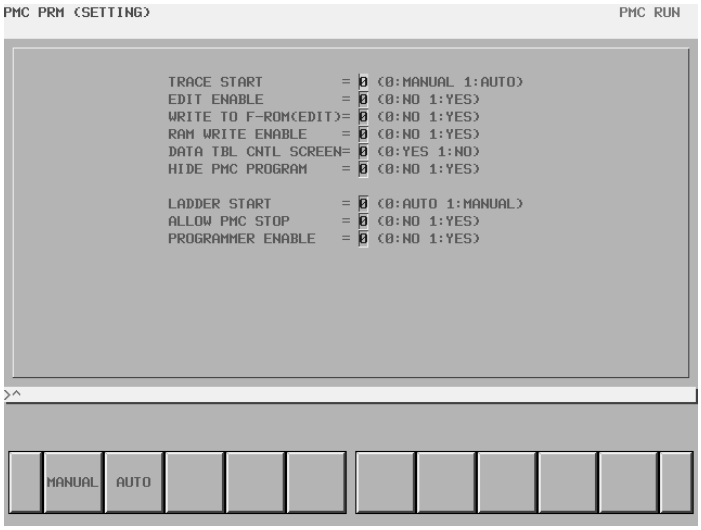


a. Soft key **[C.DATA]** : Returns to the data table setting screen. (Previous screen)

b. Group No. **[G–SRCH]** : Head of the specified group is selected.

c. Address **[SEARCH]** : Searches an address in a group currently selected.

4.3.5 Setting Screen



PMC–SB7 setting screen

- Trace function start (PMC–SB7:K906.5)
  Manual (0): The trace function starts trace operation when the [EXEC] soft key is pressed.
  Automatic (1): The trace function starts sampling automatically after the power is turned on.
- Enable editing (PMC–SB7:K901.6, PMC–SA1:K18.6)
  No (0): The editing of a sequence program is disabled.
  Yes (1): The editing of a sequence program is enabled.
- Save after editing (PMC–SB7:K902.0, PMC–SA1:K19.0)
  No (0): After ladder editing, the F–ROM is not written to automatically.
  Yes (1): After ladder editing, the F–ROM is written to automatically.
- Enable memory write (PMC–SB7:K900.4, PMC–SA1:K17.4)
  No (0): The forcing function and the override function are disabled.
  Yes (1): The forcing function and the override function are enabled.
- Data table GRP setting display (PMC–SB7:K900.7, PMC–SA1:K17.7)
  Yes (0): The PMC parameter data table control screen is displayed.
  No (1): The PMC parameter data table control screen is not displayed.
- Disable PMC program read (PMC–SB7:K900.0, PMC–SA1:K17.0)
  No (0): The reading of a sequence program is enabled.
  Yes (1): The reading of a sequence program is disabled.
- PMC program execution (PMC–SB7:K900.2, PMC–SA1:K17.2)
  Automatic (0): After the power is turned on, a sequence program is automatically executed.
  Manual (1): A sequence program is executed by pressing the sequence program execution soft key.
- Enable PMC stop (PMC–SB7:K902.2, PMC–SA1:K19.2)
  No (0): The execution/stop operation of a sequence program is disabled.
  Yes (1): The execution/stop operation of a sequence program is enabled.
- Enable the programmer function (PMC–SB7:K900.1, PMC–SA1: K17.1)
  No (0): The built–in programmer function is not operated.
  Yes (1): The built–in programmer function is operated.

4.4 LIST OF SIGNALS BY EACH MODE

- **Automatic operation**

MODE		INPUT/OUTPUT SIGNAL	FEED RATE, ETC
AUTOMATIC OPERATION	EDIT	[PMC ⇒ CNC] KEY3(Program protect key)	
	MEM MDI RMT	[PMC ⇒ CNC) ST (Cycle start) *SP (Feed hold) SBK (Single block) DRN (Dry run) BDT1 to 9 (Block delete) MIα (Mirror image) PN1 to 8 (External program no. search) MINP (External program input) DNCI (DNC input mode) HSα1A to D (Handle interrupt axis select) AFL (Auxiliary function neglect) FIN, MFIN2, MFIN3 (Auxiliary function complete) MFIN, SFIN, TFIN, TFIN (High–speed M/S/T function complete)	[PMC ⇒ CNC] *FV0 to 7 (Feed rate override) *AFV0 to 7 (2nd feed rate override) OVC (Override cancel) ROV1,ROV2, HROV, *HROV0 to 6 (Rapid traverse override)
		[CNC ⇒ PMC] STL (Cycle start LED) SPL (Feed hold LED) MF, M00 to M31 MF2, M200 to M215 } (Miscellaneous function) MF3, M300 to M315 SF, S00 to S31 (Spindle speed function) TF, T00 to T31 (Tool function) BF, B00 to B31 (2nd miscellaneous func.) DEN (Distribution end) OP (Automatic operating)	

- **Manual operation**

MODE			INPUT/OUTPUT SIGNAL	FEED RATE, ETC
MANUAL OPERATION	Handle/ incremental		[PMC ⇒ CNC] HSnA to D(Axis selection) n:1 to 3(No. of MPGs) +α, –α (Jog feed)	[PMC ⇒ CNC] MP1, MP2 (Multiplier)
	JOG		[PMC ⇒ CNC] RT (Rapid traverse)	[PMC ⇒ CNC] *JV0 to 15 (Manual feedrate override) +α, –α (Manual feed move command) ROV1, ROV2 HROV *HROV0 to 6 (Rapid traverse override)
		ZRN	[PMC ⇒ CNC] ZRN(Reference position return mode) [MT ⇒ CNC] *DECα(Reference position deceleration)	
			[CNC ⇒ PMC] ZPα ZP2α, ZP3α, ZP4α (Reference position return completion)	

- **Others**

Others	[PMC ⇒ CNC] MD1 to 4 (Mode selection) *ESP (Emergency stop) KEY1 to 4 (Memory protection key) MLK,MLKα (All axes/ each axis machine lock) *IT,*ITα (All axes/ each axis machine lock) *±MITα (interlock per axis and direction) *ABSM (Manual absolute) SVFα (Servo off) *FLWP (Follow up) ERS (External reset) RRW (Reset & Rewind) EXLM (Stored stroke limit external switching) ±LMα, RLSOT (Software limit external setting) *±Lα (Overtravel limit) *±EDα (External deceleration of each axis)
	[CMC ⇒ PMC] MA (NC ready) SA (Servo ready) AL (NC alarm) RST (Resetting) BAL (Battery alarm) INPα (In–position) MVα (Axis moving)

- **Laser oscillator operation**

Laser oscillator operation	[PMC→CNC]	
	RUN	Oscillator start
	CLRDY	Chiller prepared completion
	HVON	Discharge start completion
	AGRDY	Assist gas prepared
	AGST	Assist gas start
	SHTON	Shutter open
	*SHTLC	Shutter lock
	BEMON	Beam on
	*BEMLC	Beam lock
	POV0 to 7	Power override
	*DU1 to 16	Pulse duty override
	*FOV0 to 7	Pulse frequency override
	*AOV0 to 7	Assist gas presure override
	PTS	Piercing time shortening
	PTE	Piercing time extension
	SCLON	Guide light on
	PWCTL	Power control mode
	BCAN	Gas cylinder replace
	LCAN	Leak check start
	[CNC→PMC]	
	AGSLT	Assist gas selection in progress signal
	LPRC	Laser machining in progress signal
	PIRC	Piercing in progress signal
	PURGE	Purge completion
	WAIT	Oscillator starting
	CLON	Chiller start request
	LRDY	Discharge start prepared completion
	RFHV	Base discharge starting
	LSTR	Oscillating
	AG1, AG2, AG3	Assist gas selection
	WKP	Process pressure busy
	SHTONL	Shutter on state
	SHTOFL	Shutter off state
	BEAM	Beam outputing
	CW, PULSE	Mode state output
	MWRN	Laser power alarm
	LARM	Laser alarm
	PCMD	Power control mode in progress
	LONC	Laser oscillator unconnection

● Laser relation

Laser relation	[PMC→CNC]	
	LRCS	Constant optical path length control start signal
	GAPG0 to GAPG2	Tracing gain override signal
	TBES	Teaching box exclusive use signal
	RVSLSR	Machining resume signal
	*TRIL	Tracing axis interlock signal
	TRMLK	Tracing axis machine lock
	ZTRM	Tracing axis selection
	ZAPR	Approach feed
	TCST	Tracing start
	TRCKM	Tracing check mode
	REST2	Program restart
	ALNAXS	Manual point fxing operation mode
	HNDCD	Hand coordinate mode
	NRSH	Proximity point search busy
	[CNC→PMC]	
	TRCL	Tracing operation
	TRALM	Tracing alarm
	TRERS	Tracing impossible start
	LNSR	Proximity point search
	LCIN	Constant optical path length control in progress signal
	CSTP	Constant optical path length control stop request signal
	RVSAPV	Reverse process finish signal
	RVSSKE	Skip finish signal
	RVSERR	Continuous machining disable signal
	RVSG08	Advance preview control resume signal

5 DIGITAL SERVO

This chapter describes servo tuning screen required for maintenance of digital servo and adjustment of reference position.

5.1 INITIAL SETTING SERVO PARAMETERS

This section describes how to set initial servo parameters, which is used for field adjustment of machine tool.

1. Turn on power at the emergency stop condition.
2. Set the parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

#0 (SVS) 0 : Servo tuning screen is not displayed.
1 : Servo tuning screen is displayed.

3. Turn off the power once then turn it on again.
4. Display the servo parameter setting screen by the following operation: [SYSTEM] key [▷] [SV.PARA].
5. Input data required for initial setting using the cursor and page key.

```
SERVO SETTING
                          X AXIS      Y AXIS
(1)INITIAL SET BIT     00000000    00000000   ⇦ PRM2000
(2)MOTOR ID NO.              47          47   ⇦ PRM2020
(3)amr                 00000000    00000000   ⇦ PRM2001
(4)cmr                        2           2   ⇦ PRM1820
(5)FEED GEAR N                1           1   ⇦ PRM2084
(6)       (N/M)  M          125         125   ⇦ PRM2085
(7)DIRECTION SET            111         111   ⇦ PRM2022
(8)VELOCITY PULSE NO.      8192        8192   ⇦ PRM2023
(9)POSITION PULSE NO.     12500       12500   ⇦ PRM2024
(10)REF.COUNTER            8000        8000   ⇦ PRM1821
```

(1) Initial set bit

	#7	#6	#5	#4	#3	#2	#1	#0
2000					PRMCAL		DGPRM	PLC01

#3 (PRMCAL) 1 : Turns to 1 when the initial setting is done.
The following parameters are set automatically in accordance with the no. of pulses of pulse coder:
PRM 2043(PK1V), PRM 2044(PK2V), PRM 2047(POA1),
PRM 2053(PPMAX),PRM 2054(PDDP),
PRM 2056(EMFCMP),
PRM 2057(PVPA), PRM 2059(EMFBAS),
PRM 2074(AALPH),PRM 2076(WKAC)

#1 (DGPRM)☆ 0 : Initial setting of digital servo parameter is done.
1 : Initial setting of digital servo parameter is not done.

#0 (PLC01) 0 : Values of parameter 2023 and 2024 are used as they are:
1 : Values of parameter 2023 and 2024 are multiplied by 10.

(2) Motor number

For α series servo motor

Model name	α 0.5	α 1/3000	α 2/2000	α 2.5/3000	α 3/3000
Drawing number	0113	0371	0372	0374	0123
Format number	13	61	46	84	15

Model name	α 6/2000	α 6/3000	α 12/2000	α 12/3000	α 22/1500
Drawing number	0127	0128	0142	0143	0146
Format number	16	17	18	19	27

Model name	α 22/2000	α 22/3000	α 30/1200	α 30/2000	α 30/3000
Drawing number	0147	0148	0151	0152	0153
Format number	20	21	28	22	23

Model name	α 40/FAN	α 40/2000	α 65	α 100	α 150
Drawing number	0158	0157	0331	0332	0333
Format number	29	30	39	40	41

For α L series servo motor

Model name	α L3/3000	α L6/2000	α L9/3000	α L25/3000	α L50/2000
Drawing number	0561	0562	0564	0571	0572
Format number	56 or 68	57 or 69	58 or 70	59	60

For α C series servo motor

Model name	α C3/2000	α C6/2000	α C12/2000	α C22/1500
Drawing number	0121	0126	0141	0145
Format number	7	8	9	10

For α HV series servo motor

Model name	α 12HV	α 22HV	α 30HV
Drawing number	0176	0177	0178
Format number	3	4	5

For α E and β series servo motor

Model name	α 0.5	β 1/3000 α E1/3000	β 2/3000 α E2/3000	β 3/3000 α E3/3000	β 6/2000 α E6/2000
Drawing number	0113	0101	0102	0105	0106
Format number	13	35	36	33	34

For α M series servo motor

Model name	α M2/3000	α M2.5/3000	α M3/3000	α M6/3000
Drawing number	0376	0377	0161	0162
Format number	97	98	24	25

Model name	α M9/3000	α M22/3000	α M30/3000	α M50/3000
Drawing number	0163	0165	0166	0169
Format number	26	100	101	108

Model name	α M6HV	α M9HV	α M22HV	α M30HV
Drawing number	0182	0183	0185	0186
Format number	104	105	106	107

For linear motor

Model name	1500A	3000B	6000B	9000B
Drawing number	0410	0411	0412	0413
Format number	90	91	92	93

(3) Arbitrary AMR function (for 5–0S to 3–0S)

		#7	#6	#5	#4	#3	#2	#1	#0	
PRM	2001	AMR7	AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0	For each axis

#7	#6	#5	#4	#3	#2	#1	#0	Motor model
1	0	0	0	0	0	1	0	5–0S
0	0	0	0	0	0	1	1	4–0S, 3–0S
0	0	0	0	0	0	0	0	other than above

NOTE
Set “00000000” for serial pulse coder C.

(4) CMR

PRM	1820	Command multiply ratio

1) When CMR is 1/2 to 1/27 $\text{Set value} = \frac{1}{\text{CMR}} + 100$

2) When CMR is 0.5 to 48 $\text{Set value} = 2 \times \text{CMR}$

(5) Turn off the power then back on.

(6) Feed gear N/M

PRM	2084	n for flexible feed gear
PRM	2085	m for flexible feed gear

1) For serial pulse coder A or B, and serial α pulse coder.

$$\frac{n}{m} = \frac{\text{Number of feedback pulses per revolution of motor}}{1000000}$$

NOTE
For serial pulse coder B, use a value not exceeding 250,000 as the number of feedback pulses per revolution.

<<Examples of calculation>>

		1/1000 mm	1/10000 mm
One revolution of motor	8mm	n=1/m=125	n=2/m=25
	10mm	n=1/m=100	n=1/m=10
	12mm	n=3/m=250	n=3/m=25

(7) Direction of travel

PRM	2022	Rotational direction of motor

111 : Normal (clockwise)–111 : Reverse (counterclockwise)

(8) Number of velocity pulses and position pulses

1) For serial pulse coder A or B, or serial α pulse coder

	Paramter No.	Increment system : 1/1000mm		Increment system : 1/10000mm	
		Closed loop	Semi–closed loop	Closed loop	Semi–closed loop
High resolution setting	2000	xxxx xxx 0		xxxx xxx 1	
Separate detector	1815	0010 0010	0010 0000	0010 0010	0010 0000
No. of velocity feedback pulses	2023	8192		819	
No. of position feedback pulses	2024	NS	12500	NS/10	1250

NOTE
1 NS is the number of position feedback pulses per one revolution of the motor (multiplied by four)
2 The 5–0S to 3–0S motors have different numbers of poles. Set parameter 2001.
3 Even if the system employs a closed loop, bit 3 of parameter 2002 is 1 and bit 4 is 0.

(9) Reference counter

PRM	1821	Reference counter capacity for each axis (0 – 99999999)

6. Turn off the power then back on.

(10) FSSB display and setting screen

Connecting the CNC control unit to servo amplifiers via a high–speed serial bus (FANUC Serial Servo Bus, or FSSB), which uses only one fiber optics cable, can significantly reduce the amount of cabling in machine tool electrical sections.
Axis settings are calculated automatically according to the interrelationships between axes and amplifiers entered on the FSSB setting screen. Parameter Nos. 1023, 1905, 1910 to 1919, 1936, and 1937 are specified automatically according to the results of the calculation.

- **Display**

The FSSB setting screen displays FSSB–based amplifier and axis information. This information can also be specified by the operator.

1. Press function key [SYSTEM] .
2. To display [FSSB], press continuous menu key [▷] several times.
3. Pressing soft key [FSSB] causes the AMP SET screen (or the previously selected FSSB setting screen) to appear, with the following soft keys displayed.

The FSSB setting screens include: AMP SET, AXIS SET, and AMP MAINTENANCE.

Pressing soft key **[AMP]** causes the AMP SET screen to appear.
Pressing soft key **[AXIS]** causes the AXIS SET screen to appear.
Pressing soft key **[MAINTE]** causes the AMP MAINTENANCE screen to appear.

1) Amplifier setting screen
The amplifier setting screen consists of two sections: the first section displays information about the slave, while the second section displays information about the pulse modules.

```
AMPLIFIER SETTING                    O1000 N00001
  NO.  AMP     SERIES  UNIT    CUR.   AXIS NAME
    1  A1-L       α    SVM-HV  40AL    1     X
    2  A1-M       α       SVM   12A     2     Y
    3  A2-L       β       SVM   40A     3     Z
    4  A3-L       α       SVM   20A     4     A
    5  A3-M       α       SVM   40A     5     B
    7  A4-L       α       SVU  240A     6     C


  NO.  EXTRA   TYPE   PCB ID
    6    M1      A    0000 DETECTOR(8AXES)
    8    M2      B    12AB
>_
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][(OPRT)]
```

The amplifier setting screen consists of the following items:

- NO. (slave number)

  The numbers of up to ten slaves (up to eight amplifiers and up to two pulse modules) connected via the FSSB are displayed sequentially, with the one nearest to the CNC being number 1.

- AMP (amplifier type)

  The amplifier type display consists of the letter A, which stands for “amplifier,” a number that indicates the placing of the amplifier, as counted from that nearest to the CNC, and a letter such as L (first axis) or M (second axis) indicating the placing of the axis in the amplifier.

- AXIS NO. (controlled axis number)

  The axis number of each controlled axis specified in parameters (Nos. 1920 to 1929) is displayed. If a number specified in these parameters falls outside the range of between 1 and the maximum number of controlled axes, 0 is displayed.

- NAME (controlled axis name)

  The axis name assigned to a parameter (No. 1020) corresponding to a particular controlled axis number is displayed. If the controlled axis number is 0, – is displayed.

- The following items are displayed as amplifier information:
  - UNIT (servo amplifier unit type)
  - SERIES (servo amplifier series)
  - CURRENT (maximum rating)

- The following items are displayed as pulse module information:
  - SEPARATE

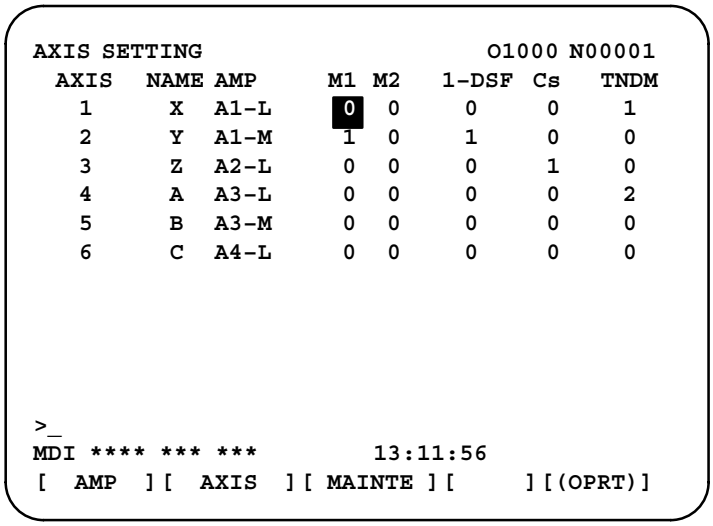
    This display consists of the letter M, which stands for “pulse module” and a number indicating the placing of the pulse module, as counted from that nearest to the CNC.
  - TYPE

    This display is a letter indicating the type of the pulse module.
  - PCB ID

    This display consists of four digits indicating the pulse module ID (hexadecimal). The pulse module ID is followed by DETECTOR (8 AXES) for the eight–axis separate detector module or DETECTOR (4 AXES) for the four–axis separate detector module.

2) Axis setting screen

The axis setting screen displays the information shown below:



This axis setting screen displays the following items:

- AXIS NO. (controlled axis number)

  This item is the placing of the NC controlled axis.
- NAME (controlled axis name)
- AMP (type of the amplifier connected to each axis)
- M1 (connector number for pulse module 1)

  This item is the number of the connector for pulse module 1, specified in parameter No. 1931.
- M2 (connector number for pulse module 2)

  This item is the number of the connector for pulse module 2, specified in parameter No. 1932.
- TWO AXES

  This item is the value specified in bit 0 (parameter 1 DSP) of parameter No. 1904. It is 1 for an axis (such as a learning control axis, high–speed current loop axis, or high–speed interface axis) that exclusively uses a DSP, which is usually shared by two axes.
- TANDEM

  This item is the number specified in parameter No. 1934. Consecutive odd and even numbers are displayed for the master and slave axes for tandem control.

3) Amplifier maintenance screen
The amplifier maintenance screen displays maintenance information for servo amplifiers. This screen consists of the following two pages, either of which can be selected by pressing the ↑ or ↓ key.

```
AMPLIFIER MAINTENANCE                O1000 N00001
  AXIS   NAME AMP    SERIES    UNIT   AXES   CUR.
    1      X  A1-L      α     SVM-HV    2    40AL
    2      Y  A1-M      α       SVM     2     12A
    3      Z  A2-L      β       SVM     1     40A
    4      A  A3-L      α       SVM     2     20A
    5      B  A3-M      α       SVM     2     40A
    6      C  A4-L      α       SVU     1    240A




MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][     ]
```

```
AMPLIFIER MAINTENANCE              O1000 N00001
  AXIS     NAME   EDITION    TEST   MAINTE-NO.
    1      X        01A     970123        01
    2      Y        01A     970123        01
    3      Z        01A     970123        01
    4      A        02B     970123        01
    5      B        02B     970123        01
    6      C        02B     970123        01




MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][     ]
```

The amplifier maintenance screen displays the following items:

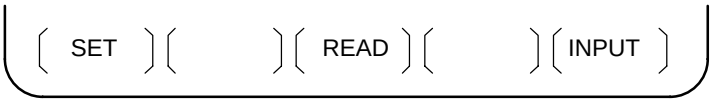
- AXIS NO. (controlled axis number)
- NAME (controlled axis name)
- AMP (type of amplifier connected to each axis)
- SERIES (servo amplifier series of an amplifier connected to each axis)
- UNIT (unit type of a servo amplifier connected to each axis)
- NO. OF AXES (maximum number of axes controlled by an amplifier connected to each axis)
- CURRENT (maximum rating for amplifiers connected to each axis)
- VERSION (unit version number of an amplifier connected to each axis)
- TEST DATE (date of test performed on an amplifier connected to each axis)

  Example) 970123 = January 23, 1997

- MAINTENANCE NO. (engineering change number for an amplifier connected to each axis)

- **Setting**

On an FSSB setting screen (other than the amplifier maintenance screen), pressing soft key [(OPRT)] displays the following soft keys:



To enter data, place the machine in MDI mode or the emergency stop state, position the cursor to the point where a desired item is to be input, then enter the desired data and press soft key **[INPUT]** (or the INPUT key on the MDI panel).
When soft key **[SET]** is pressed after data has been entered, a warning message is displayed if the entered data contains an error. When the data is satisfactory, the corresponding parameter is set up.
To restore the previous value of a parameter if, for example, an entered value is incorrect, press soft key **[READ]**.
When the power is turned on, values are read from the parameters and displayed on the screen.

CAUTION
1 For the parameters to be specified on the FSSB setting screen, do not attempt to enter values on the parameter screen using the MDI or a G10 command. Use only the FSSB screen to enter values for these parameters.
2 If pressing soft key **[SET]** results in a warning message being displayed, retry data entry, or press soft key **[READ]** to clear the warning message. Note that pressing the reset key does not clear the warning message.

1) Amplifier setting screen

```
AMPLIFIER SETTING                    O1000 N00001
  NO.  AMP     SERIES  UNIT    CUR.   AXIS NAME
    1  A1-L      α    SVM-HV  40AL    [1]    X
    2  A1-M      α       SVM   12A     2     Y
    3  A2-L      β       SVM   40A     3     Z
    4  A3-L      α       SVM   20A     4     A
    5  A3-M      α       SVM   40A     5     B
    7  A4-L      α       SVU  240A     6     C


  NO.  EXTRA   TYPE   PCB ID
    6    M1      A    0000 DETECTOR(8AXES)
    8    M2      B    12AB
>_
MDI **** *** ***         13:11:56
[SETTING][       ][ READ ][       ][ INPUT ]
```

The amplifier setting screen displays the following items:

- AXIS NO. (controlled axis number)

  For this item, enter a value of between 1 and the maximum number of controlled axes. If a number that falls outside this range is entered, the warning message **“INVALID FORMAT”** appears. If the entered controlled axis number is duplicate or 0, the warning message **“SPECIFIED DATA IS OUT OF RANGE”** appears when soft key **[SET]** is pressed to assert the entered value. In this case, no value can be entered for the parameter.

2) Axis setting screen

```
AXIS SETTING                          O1000 N00001
  AXIS   NAME AMP      M1  M2   1-DSF  Cs   TNDM
    1      X  A1-L     0   0      0     0     1
    2      Y  A1-M     1   0      1     0     0
    3      Z  A2-L     0   0      0     1     0
    4      A  A3-L     0   0      0     0     2
    5      B  A3-M     0   0      0     0     0
    6      C  A4-L     0   0      0     0     0




>_
MDI **** *** ***         13:11:56
[SETTING][       ][ READ ][       ][ INPUT ]
```

On the axis setting screen, the following items can be specified:

- M1 (connector number for pulse module 1)

  For an axis that uses pulse module 1, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 1. When pulse module 1 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message **“INVALID FORMAT”** is displayed.

- M2 (connector number for pulse module 2)

  For an axis that uses pulse module 2, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 2. When pulse module 2 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message **“INVALID FORMAT”** is displayed.

- TWO AXES

  Enter 1 for the following axes, each of which exclusively uses a DSP, which is usually shared by two axes. If a number other than 0 or 1 is entered, the warning message **“INVALID FORMAT”** is displayed.

  · Learning control axis

  · High–speed current loop axis

  · High–speed interface axis

- TANDEM

  Enter odd and even numbers for the master and slave axes for tandem control. These numbers must be consecutive and in the range of between 1 and 8. If a number that falls outside the valid range is entered, the warning message **"INVALID FORMAT"** is displayed.

When soft key **[SET]** is pressed on the axis setting screen after data entry, the warning message **"SPECIFIED DATA IS OUT OF RANGE"** is displayed if any of the following conditions is satisfied.

- Both M1 and M2 are nonzero for an axis.
- Any two of TWO AXES, Cs, and TANDEM are nonzero for an axis.
- A duplicate value is specified for M1.
- A duplicate value is specified for M2.
- A duplicate value is specified for Cs.
- A duplicate value is specified for TANDEM.
- An invalid master/slave axis pair is specified for TANDEM.

5.2 SERVO TUNING SCREEN

5.2.1 Parameter Setting

Set a parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

#0 (SVS) 0 : Servo tuning screen is not displayed.
1 : Servo tuning screen is displayed.

5.2.2 Displaying Servo Tuning Screen

1. Press [SYSTEM] key [▷] and soft key **[SV. PARA]** in this order.
2. Press soft key **[SV.TUN]** to select the servo tuning screen.

```
SERVO TUNING                              01234 N12345
 (PAMAMETER)                               (MONITOR)
(1) FUN.BIT          00000000      ALARM 1      00000000 (9)
(2) LOOP GAIN            3000      ALARM 2      00000000 (10)
(3) TURNING SET.            0      ALARM 3      10000000 (11)
(4) SET PERIOD             50      ALARM 4      00000000 (12)
(5) INT.GAIN              113      ALARM 5      00000000 (13)
(6) PROP.GAIN           -1015      LOOP GAIN        2999 (14)
(7) FILER                   0      POS ERROR         556 (15)
(8) VELOC.GAIN            125      CURRENT%           10 (16)
                                   SPEED RPM         100 (17)

[SV SET][SV TUN][      ][      ][ OPE ]
```

(1) Function bit : PRM 2003
(2) Loop gain : PRM 1825
(3) Tuning start : (Used by automatic servo tuning function)
(4) Set period : (Used by automatic servo tuning function)
(5) Integral gain : PRM 2043
(6) Proportional gain : PRM 2044
(7) Filter : PRM 2067
(8) Velocity gain $\text{Set value} = \frac{(\text{PRM } 2021)+256}{256} \times 100$
(9) Alarm 1 : DGN 200 (Details of alarm 400 and 414)
(10) Alarm 2 : DGN 201 (Details of disconnection alarm, overload)
(11) Alarm 3 : DGN 202 (Details of alarm 319)
(12) Alarm 4 : DGN 203 (Details of alarm 319)
(13) Alarm 5 : DGN 204 (Details of alarm 414)
(14) Loop gain : Actual loop gain
(15) Position error : Actual position error(DGN 300)
(16) Current(%) : Indicate current with % to the rated value.
(17) Speed RPM : Number of motor actual rotation

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm1	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

DGN (200) :

#7 (OVL) : Overload alarm

#6 (LV) : Insufficient voltage alarm

#5 (OVC) : Overcurrent alarm

#4 (HCA) : Abnormal current alarm

#3 (HVA) : Excessive voltage alarm

#2 (DCA) : Discharge alarm

#1 (FBA) : Disconnection alarm

#0 (OFA) : Overflow alarm

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm2	ALD			EXP				

DGN (201) ⇓ ⇓

Overload alarm	0	—	—	—	Amplifier overheat
	1	—	—	—	Motor overheat
Disconnection alarm	1	—	—	0	Built–in pulse coder disconnection (Hardware)
	1	—	—	1	Separate type pulse coder disconnection (Hardware)
	0	—	—	0	Pulse coder disconnection (software)

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm3		CSA	BLA	PHA	RCA	BZA	CKA	SPH

DGN (202) :

#6 (CSA) : Hardware of serial pulse coder is abnormal.

#5 (BLA) : Battery voltage is in low (warning).

#4 (PHA) : Serial pulse coder or feedback cable is abnormal.
Counting the feedback signal is in error.

#3 (RCA) : Serial pulse coder is faulty.
Counting is in error.
If the RCA bit is set to 1 when both the FBA bit (bit 1 of alarm 1) and ALD bit of alarm 2 are set to 1 and the EXP bit of alarm 2 (internal hardware disconnection) is set to 1, a count miss alarm (CMAL) occurs in the α pulse coder.

#2 (BZA) : Battery voltage becomes 0.
Replace batteries and set the reference position.

#1 (CKA) : Serial pulse coder is faulty.
Internal block has stopped.

#0 (SPH) : Serial pulse coder or feedback cable is faulty.
Counting the feedback signal is in error.

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm4	DTE	CRC	STB	PRM				

DGN (203) :

#7 (DTE) : Communication error of serial pulse coder.
There is no response.

#6 (CRC) : Communication error of serial pulse coder.
Transmitted data is in error.

#5 (STB) : Communication error of serial pulse coder.
Transmitted data is in error.

#4 (PRM) : An invalid parameter is detected on the digital servo side.

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm3		OFS	MCC	LDM	PMS			

DGN (204) :

#6 (OFS) : A/D conversion of current value of digital servo is abnormal.

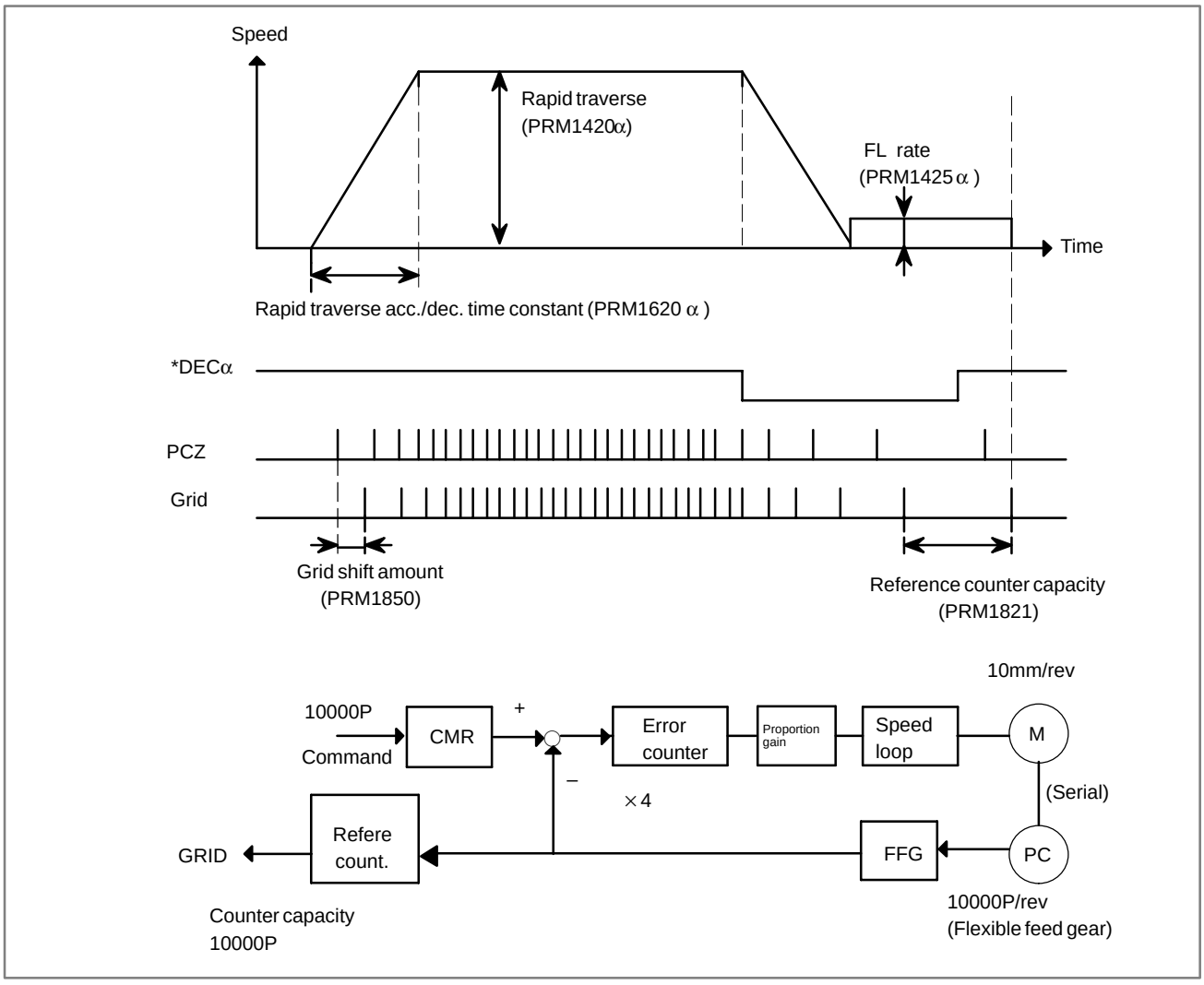
#5 (MCC) : Contacts of electro–magnetic contactor of servo amplifier is blown

#4 (LDM) : LED of serial pulse coder is abnormal.

#3 (PMS) : No. of feedback pulses are in error because serial pulse coder C or feedback cable is faulty.

5.3 ADJUSTING REFERENCE POSITION (DOG METHOD)

5.3.1 General



- **Parameter**

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1002							DLZ	

#1(DLZ)☆ 0 : Reference position return method is normal (dog).
1 : Dogless reference position setting is used.

PRM	1821	Reference counter capacity [P]

No. of feedback pulses or its division by an integer is set.

PRM	1850	Grid shift amount per axis [P]

When the resolution is 0.0001mm, set the value in the unit ten times the detection unit.

PRM	1815	#7	#6	#5	#4	#3	#2	#1	#0
				APC	APZ			OPT	

#5(APC) 0 : Position detector is other than absolute pulse coder.
1 : Position detector is absolute pulse coder.

#4(APZ) Zero position of absolute pulse coder is :

0 : Not established
1 : Established
(Turns to 1 after establishment)
To manually change the value of the APZ bit from 0 to 1 without first returning to the reference position
when using serial pulse coder α , follow this procedure: Back up the data with the battery and give the motor one or more turns.
Turn the power off then on again, then change the APZ bit setting from 0 to 1.

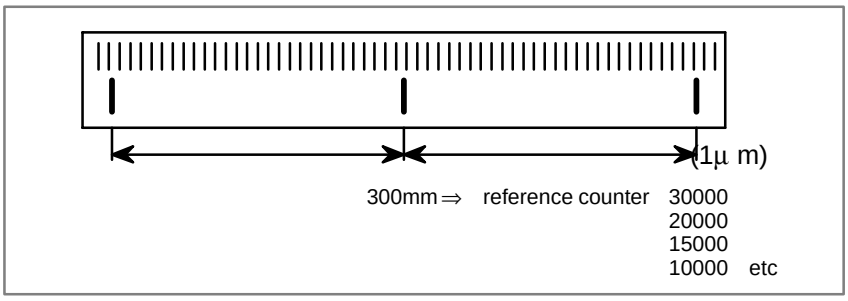
#1(OPT) 0 : Position detection is performed by the pulse coder built in the motor.
1 : Separate type pulse coder or linear scale is used.

- **Separate Type Pulse Coder or Linear Scale is Used**

PRM	1821	Reference counter capacity per axis [P]

Normally, the number of feedback pulses per motor revolution is set to the reference counter capacity.
When plural reference marks are on a linear scale, a quotient of the distance between the reference marks divided by an interfer may be used as a reference counter capacity:

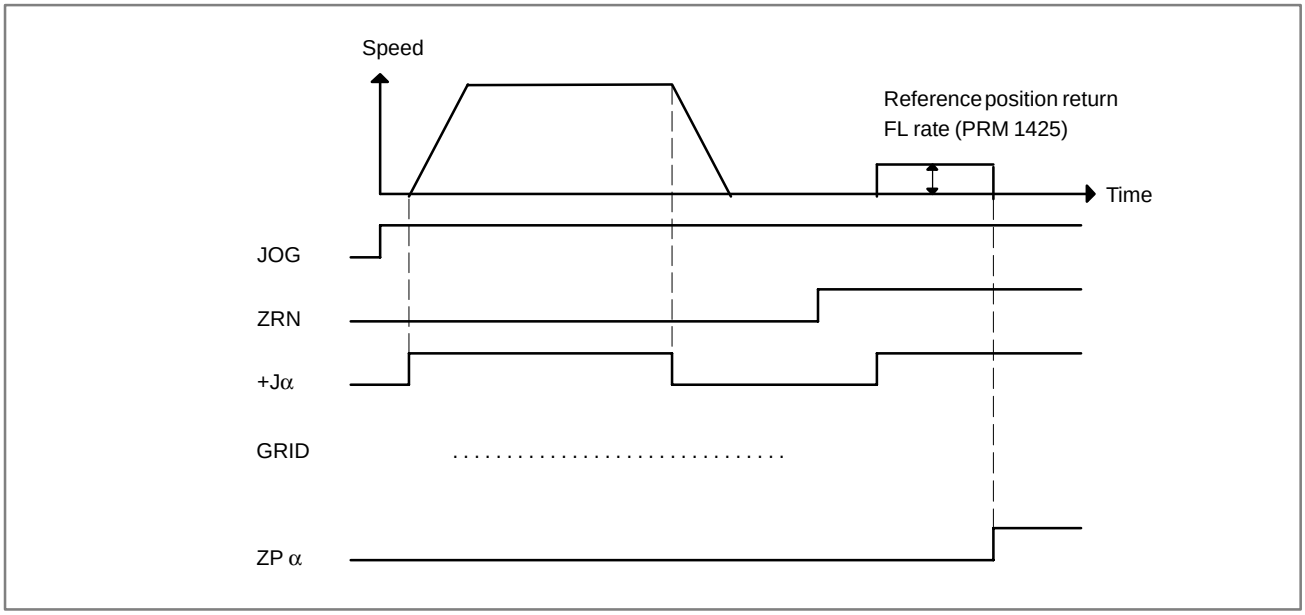
Example)



5.4 DOGLESS REFERENCE POSITION SETTING

When there are no dog nor limit switch for reference position return, this function enables the tool to return the reference position that is set by MTB.
When the absolute position detector is used, the reference position once set remains also during power off. When the absolute detector is replaced or absolute position is lost, perform this setting.

5.4.1 General



5.4.2 Operation

1 Move the tool near the reference position using a manual operation.
2 Select the reference position return mode or switch.
3 Press a button for an axis–and–direction–select–signal + or –, and the machine moves to the next grid, then stops.
(This position is set as the reference position).

* After the reference position has been set, select the reference position return mode (ZRN signal is 1) and turn on an axis–and–direction–select signal, then the tool returns to the reference position.

5.4.3 Associated Parameters

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1002							DLZ	

#1(DLZ) 0 : Dog is used for reference position return
1 : Dogless reference position setting

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1006			ZMI					

#5(ZMI) 0 : Reference position return and backlash initial direction is +.
1 : Reference position return and backlash initial direction is –.

* After ZRN signal becomes 1, manual feed direction is always the direction set by this parameter irrespective of an axis selection signal.

6 EMBEDDED ETHERNET

This chapter explains how to set the embedded Ethernet function for Series 16*i*–B.

The embedded Ethernet function can be used by selecting one of two types of devices: the embedded Ethernet port and PCMCIA Ethernet card.

The PCMCIA Ethernet card is to be inserted into the memory card slot to the left of the front LCD for temporary communication.

NOTE
1 Use the PCMCIA Ethernet card for temporary communication only. Do not use the PCMCIA Ethernet card for routine communication.
2 The PCMCIA Ethernet card is to be inserted into the memory card slot to the left of the LCD. This means that some part of the card is projected. When using the PCMCIA Ethernet card, be careful not to damage the card by hitting the card with an object.
After using the PCMCIA Ethernet card, remove the card immediately to prevent the card from being damaged.

6.1 SETTING THE EMBEDDED ETHERNET FUNCTION

This section describes the setting of the parameters for the embedded Ethernet function for Series 16*i*–B.

6.1.1 Parameter Setting of the FOCAS1/Ethernet Function

This subsection describes the settings required to operate the FOCAS1/Ethernet function (or DNC1/Ethernet function) when the embedded Ethernet function for Series 16*i*–B is used.

6.1.1.1 Notes on using the FOCAS1/Ethernet function for the first time

CAUTION

When using the embedded Ethernet function for the first time, make IP address settings and other settings carefully, and conduct a communication test sufficiently, consulting with your network manager.

Note that if an incorrect IP address is set, for example, the entire network can suffer from a communication error. So special care should be taken.

CAUTION

1 The FOCAS1/Ethernet function allows up to five FOCAS1/Ethernet clients to be connected to one CNC.
2 If multiple application programs or multiple personal computers access the CNC simultaneously, the communication load on the CNC can increase, resulting in decreased communication speed and degraded CNC screen display processing.

6.1.1.2 FOCAS1/Ethernet parameter setting screen

On the Ethernet parameter setting screen, set the parameters for operating the FOCAS1/Ethernet function.

Display

Procedure

1 Place the CNC in the MDI mode.

2 Press the SYSTEM function key.

3 Press the continuous menu key at the right end of the soft key display.

4 Press the [ETHPRM] soft key. The Ethernet parameter setting screen appears. The Ethernet functions currently available is displayed.

```
ETHERNET PARAMETER


AVAILABLE ETHERNET

  · EMBEDDED PORT
  · ETHERNET BOARD









[ SETTING ][    ][ EMBEDD ][ PCMCIA ][ SWITCH ]
```

The upper row indicates the usable embedded Ethernet function device. The embedded port or PCMCIA card is indicated.
The lower row indicates the usable Ethernet option boards. When no option board is installed, no information is displayed.

5 By pressing the [EMBEDD] soft key, the parameters for the embedded Ethernet port can be set.
By pressing the [PCMCIA] soft key, the parameters for the PCMCIA Ethernet card can be set.

CAUTION
The parameters for the embedded Ethernet port and the parameters for the PCMCIA Ethernet card are independent of each other.

6 Enter and update data by using the MDI keys and soft keys.

7 Switch the screen display with the  page keys.

When data is already present, it is displayed on the screen.

```
ETHERNET PARAMETER (EMBEDD)
                                    PAGE : 1/4

  MAC ADDRESS                     080019020014

  (COMMON PARAMETER)
  IP ADDRESS                     192.168.1.1

  SUBNET MASK                    255.255.255.0

  ROUTER IP ADDRESS              192.168.1.254



[ STRING ][ LOCK ][ INPUT ][ RETURN ][      ]
```

```
ETHERNET PARAMETER (EMBEDD)
                                    PAGE : 2/4

  (FOCAS1/ETHERNET)
  PORT NUMBER(TCP)               8193

  PORT NUMBER(UDP)               8192

  TIME INTERVAL                   100




[ STRING ][ LOCK ][ INPUT ][ RETURN ][      ]
```

Display and setting items

Display item related to the embedded Ethernet function

The item related to the embedded Ethernet function is displayed.

Item	Description
MAC address	Embedded Ethernet MAC address

CNC TCP/IP setting items

Set the TCP/IP–related items of the CNC.

Item	Description
IP address	Specify the IP address of the CNC. (Sample specification format: ”192.168.1.1”)
Subnet mask	Specify a mask address for the IP addresses of the network. (Sample specification format: ”255.255.255.0”)
Router IP address	Specify the IP address of the router. Specify this item when the network has a router. (Sample specification format: ”192.168.1.254”)

FOCAS1/Ethernet setting items

Set the items related to the FOCAS1/Ethernet function.

Item	Description
TCP port number	Specify a port number to be used with the FOCAS1/Ethernet function. The valid input range is 5001 to 65535. When using the DNC1/Ethernet function, refer to ”FANUC Personal Computer FA System Windows NT Version Operator’s Manual(B–75044EN)”.
UDP port number	Specify this item when using the DNC1/Ethernet function. Specify a UDP port number for transmitting UDP broadcast data. The valid input range is 5001 to 65535. For details, refer to ”FANUC Personal Computer FA System Windows NT Version Operator’s Manual (B–75044EN)”. When using the FOCAS1/Ethernet function, or when transmitting no UDP broadcast data, set 0.
Time interval (NOTE)	Set this item when using the DNC1/Ethernet function. Specify a time interval at which UDP broadcast data specified above with a UDP port number is transmitted. The unit is 10 ms. The valid input range is 10 to 65535. This means that a value less than 100 ms cannot be specified. When using the FOCAS1/Ethernet function or when transmitting no UDP broadcast data, set 0. Example: 100: Broadcast data is transmitted at intervals of one second [1000 ms] (= 100 x 10).

NOTE
1 When a small value is set for the item of time interval, communication load increases, and the performance of the network can adversely affected.
2 The parameters for the PCMCIA Ethernet card are factory–set to the following defaults:
IP address : 192.168.1.1
Subnet mask : 255.255.255.0
Router IP address : None
TCP port number : 8193
UDP port number : 0
Time interval : 0

Basic method of data input

The basic method of data input is described below, using an example of IP address input.

Procedure

1 Place the CNC in the MDI mode.

2 Display the Ethernet parameter screen.

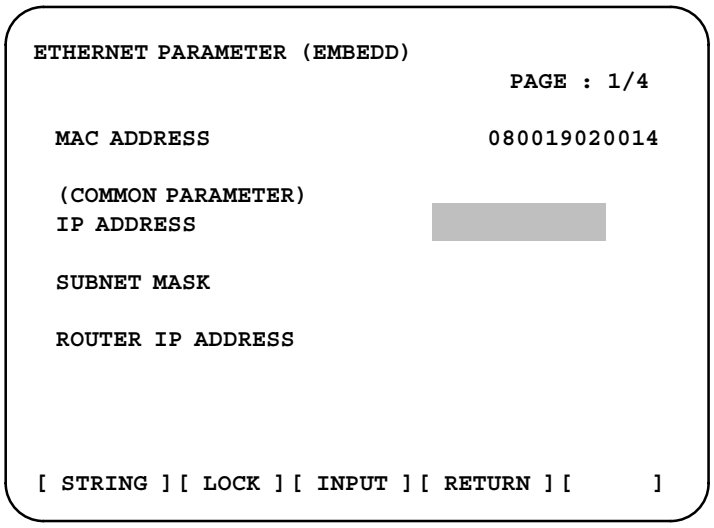
3 Place the cursor at a desired input item with the INPUT cursor move key.

4 Type data with MDI keys.

5 Input the data by pressing the [INPUT] soft key or a function key.

Example: Setting 192.168.1.1 as IP address data

(a) Place the cursor at the IP address item.



(b) Type 192.168.1.1 with the MDI keys.

```
ETHERNET PARAMETER (EMBEDD)
                                    PAGE : 1/4

 MAC ADDRESS                      080019020014

 (COMMON PARAMETER)
 IP ADDRESS

 SUBNET MASK

 ROUTER IP ADDRESS



> 192.168.1.1
[       ][       ][ INPUT ][ RETURN ][      ]
```

(c) Press the [INPUT] soft key or function key to input the data. This stores the parameter in the nonvolatile memory of the CNC.

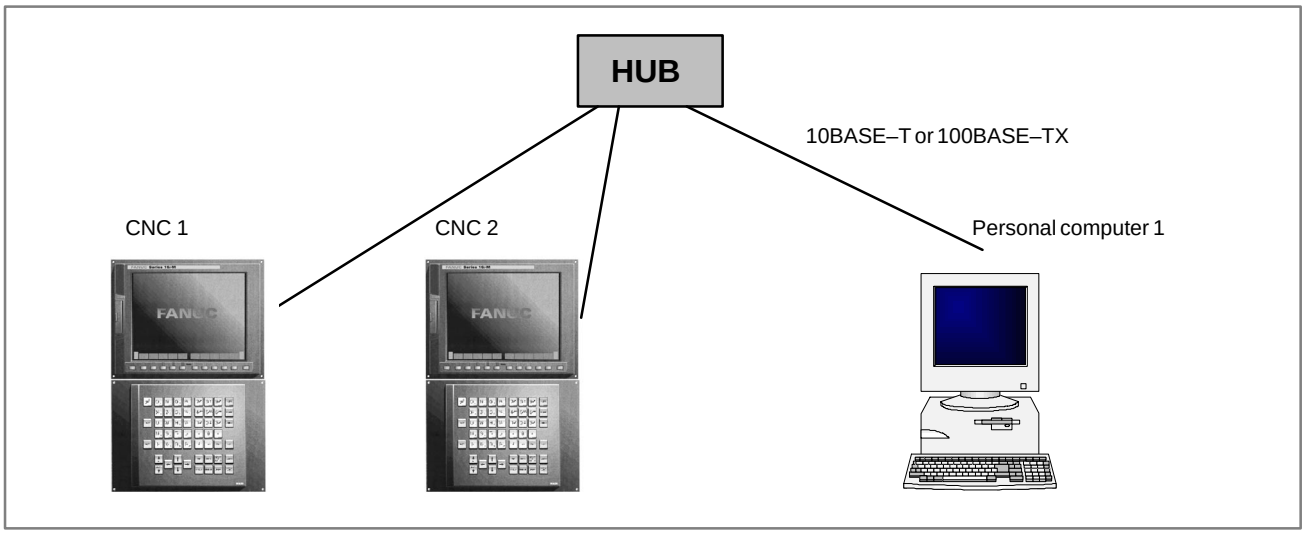
```
ETHERNET PARAMETER (EMBEDD)
                                    PAGE : 1/4

 MAC ADDRESS                      080019020014

 (COMMON PARAMETER)
 IP ADDRESS                       192.168.1.1

 SUBNET MASK

 ROUTER IP ADDRESS




[       ][       ][ INPUT ][ RETURN ][      ]
```

(d) To reset the settings of IP address, subnet mask, and router IP address to the unspecified state, enter spaces.

6.1.2 Using the FOCAS1/Ethernet Function on a Small Network

An example of minimum setting required to operate the FOCAS1/Ethernet function on a small network is provided below.
In this example, one personal computer is connected to two CNCs through FOCAS1/Ethernet.

- On personal computer 1, the client of the FOCAS1/Ethernet function operates.
- On CNC 1 and CNC 2, the server of the FOCAS1/Ethernet function operates.



	CNC 1	CNC 2
IP address	192.168.1.1	192.168.1.2
Subnet mask	255.255.255.0	255.255.255.0
Router IP address	None	None
TCP port number	8193	8193
UDP port number	0	0
Time interval	0	0

→ The Ethernet parameter screen is used for setting.

		Personal computer 1
IP address		192.168.1.101
Subnet mask		255.255.255.0
Default gateway		None
CNC 1	NC IP address	192.168.1.1
	NC TCP port number	8193
CNC 2	NC IP address	192.168.1.2
	NC TCP port number	8193

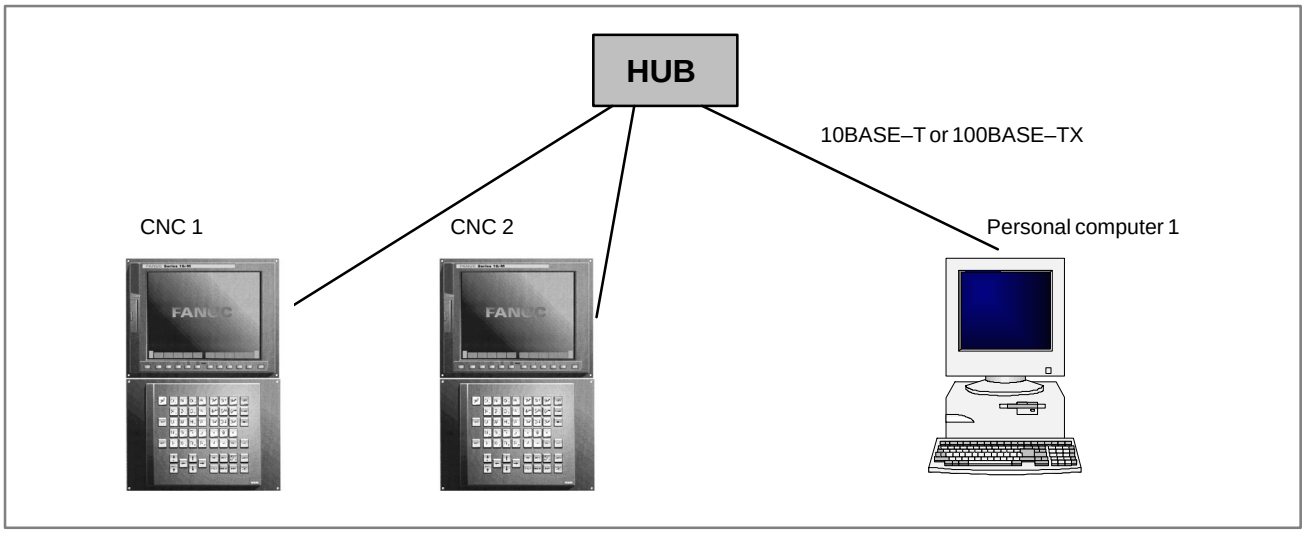
→ Microsoft TCP/IP property of the personal computer (Windows 95/98/NT/200) is used for setting.

→ The arguments of the data window library function CNC_allclibhndl3 are used for setting.

6.1.3 Using the DNC1/Ethernet Function on a Small Network

An example of minimum setting required to operate the DNC1/Ethernet function on a small network is provided below.
In this example, one personal computer is connected to two CNCs through DNC1/Ethernet.

- On personal computer 1, the client of the DMC1/Ethernet function operates.
- On CNC 1 and CNC 2, the server of the DNC1/Ethernet function operates.



	CNC 1	CNC 2
IP address	192.168.1.1	192.168.1.2
Subnet mask	255.255.255.0	255.255.255.0
Router IP address	None	None
TCP port number	8193	8193
UDP port number	8192	8192
Time interval	100	100

→ The Ethernet parameter screen is used for setting.

		Personal computer 1
IP address		192.168.1.101
Subnet mask		255.255.255.0
Default gateway		None
CNC 1		Machine number 1
	NC IP address	192.168.1.1
	NC TCP port number	8193
CNC 2		Machine number 2
	NC IP address	192.168.1.2
	NC TCP port number	8193

Microsoft TCP/IP property of the personal computer (Windows NT) is used for setting.

Refer to ”FANUMC Personal Computer FA System Windows NT Version Operator’s Manual”.

6.1.4 Configuring a Large Network

When configuring a large network or expanding an existing network, consult with your network manager to set an IP address, subnet mask, and router IP address.

6.2 SWITCHING BETWEEN THE EMBEDDED ETHERNET DEVICES

There are two types of embedded Ethernet devices: the embedded Ethernet port and the PCMCIA Ethernet card.
Screen operation is required to switch between these two devices.

Procedure

1 Place the CNC in the MDI mode.

2 Press the SYSTEM function key.

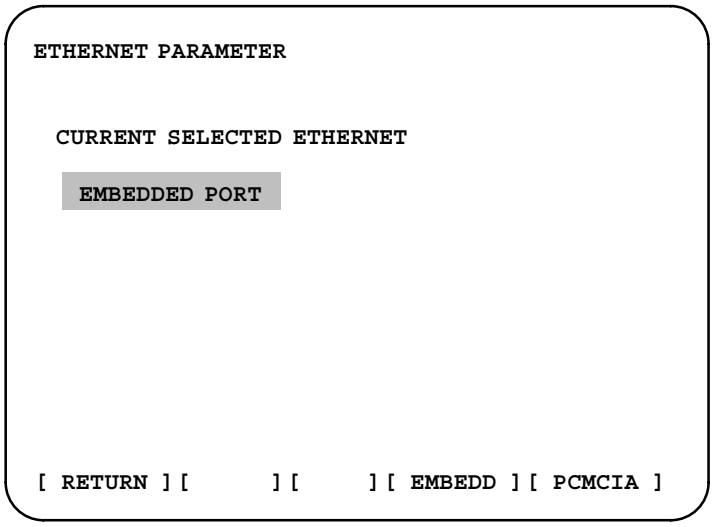
3 Press the continuous menu key at the right end of the soft key display.

4 Press the [ETHPRM] soft key. The Ethernet parameter setting screen appears. The Ethernet functions currently available are displayed.

```
ETHERNET PARAMETER


AVAILABLE ETHERNET

  · EMBEDDED PORT
  · ETHERNET BOARD









[      ][        ][       ][ EMBEDD ][       ]
```

The upper row indicates the usable embedded Ethernet function device. The embedded port or PCMCIA card is indicated.
The lower row indicates the usable Ethernet option boards. When no option board is installed, no information is displayed.

5 Press the [SWITCH] soft key. The screen for switching between the embedded Ethernet port and PCMCIA Ethernet card appears.



6 Press the [PCMCIA] soft key. A confirmation message appears. Press the [EXEC] soft key to switch the device.

NOTE
Information about the switched device is stored in the nonvolatile memory. So, when you turn on the power next time, the previously selected device can be used directly.

6.3 EMBEDDED ETHERNET ERROR MESSAGE SCREEN

If an error occurs with the FOCAS1/Ethernet function (or DNC1/Ethernet function), the error message screen for the embedded Ethernet function displays an error message.

Display

Procedure

1 Press the MESSAGE function key.

2 Press the continuous menu key at the right end of the soft key display.

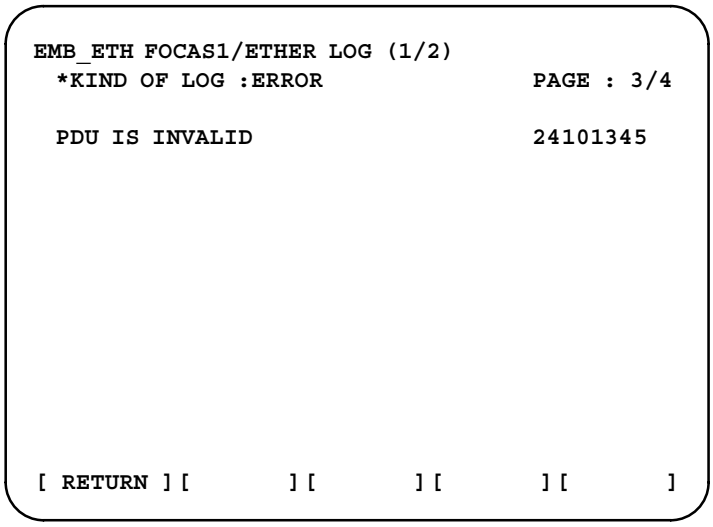
3 Press the [ETHLOG] soft key. The Ethernet log screen appears. The Ethernet functions currently available are displayed.

```
ETHERNET LOG


AVAILABLE ETHERNET

  · EMBEDDED PORT
  · ETHERNET BOARD









[ BOARD ][       ][ EMBEDD ][      ][       ]
```

The upper row indicates the usable embedded Ethernet function device. The embedded port or PCMCIA card is indicated.
The lower row indicates the usable Ethernet option boards. When no option board is installed, no information is displayed.

4 By pressing the [EMBEDD] soft key or the [PCMCIA] soft key, the error message screen for the embedded Ethernet function can be displayed. The error message screen does not differ between the embedded Ethernet port and PCMCIA Ethernet card. The same screen is shared.

5 Switch the screen display with the PAGE ↑ PAGE ↓ page keys.



[Tip]

The latest error message is displayed at the top of the screen. To the right of an error message, the date and time data of the occurrence of the error is indicated. The format of date and time data is ddhhmmss where dd represents a day, hh represents hours, mm represents minutes, and ss represents seconds.

Configuration

The embedded Ethernet log screens consist of the following screens:

(1) EMB_ETH MASTER CTRL LOG screen (2 screens)

Log screen for displaying the parameter setting of the embedded Ethernet function and error messages issued at the time of embedded Ethernet initialization.

(2) EMB_ETH FOCAS1/ETHER LOG screen (2 screens)

Log screen for displaying error messages of the FOCAS1/Ethernet function.

6.4 EMBEDDED ETHERNET MAINTENANCE SCREEN

With the embedded Ethernet function, a dedicated maintenance screen is available. The maintenance screen enables operations to be checked when the embedded Ethernet function operates abnormally.

Display

Procedure

1 Press the SYSTEM function key.

2 Press the continuous menu key at the right end of the soft key display.

3 Press the [ETHLOG] soft key. The Ethernet log screen appears. The Ethernet functions currently available are displayed.

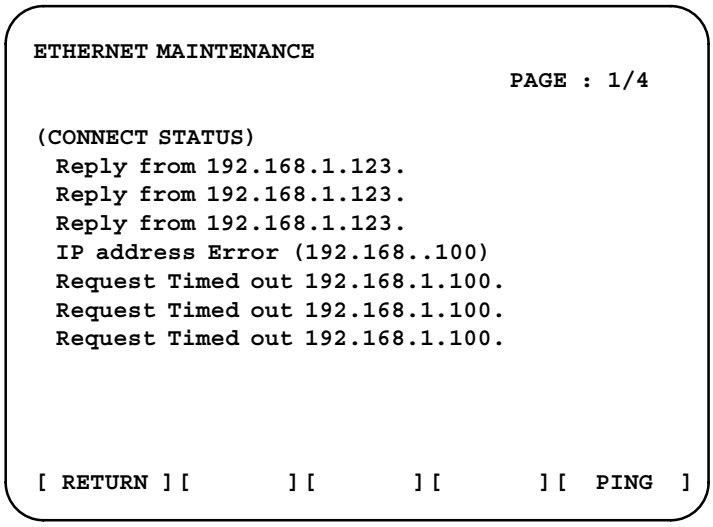
```
ETHERNET MAINTENANCE


AVAILABLE ETHERNET

  · EMBEDDED PORT
  · ETHERNET BOARD









[ BOARD ][      ][      ][ EMBEDD ][ PCMCIA ]
```

The upper row indicates the usable embedded Ethernet function device. The embedded port or PCMCIA card is indicated.
The lower row indicates the usable Ethernet option boards. When no option board is installed, no information is displayed.

4 By pressing the [EMBEDD] soft key or the [PCMCIA] soft key, the maintenance screen for the embedded Ethernet function can be displayed.
The maintenance screen does not differ between the embedded Ethernet port and PCMCIA Ethernet card. The same screen is shared.

5 Switch the screen display with the PAGE page keys.

6 The screen below is used to check the state of the communication cable and whether a communication destination exists.
Enter the IP address of a communication destination through MDI keys, then press the [PING] soft key. Then communication is performed three times with the specified communication destination, and the results are displayed.



Messages displayed:

Reply from IP–address

This message indicates that a response was received from the specified communication destination and that the specified communication destination exists on the network.

Request Timed out IP–address.

This message indicates that no response was received from the specified communication destination and that the specified communication destination does not exist on the network.

Check if the power to the communication destination equipment is turned on. Check also the parameter settings and network installation for errors.

IP address error (IP–address)

The specified IP address is illegal. Check the entered IP address.

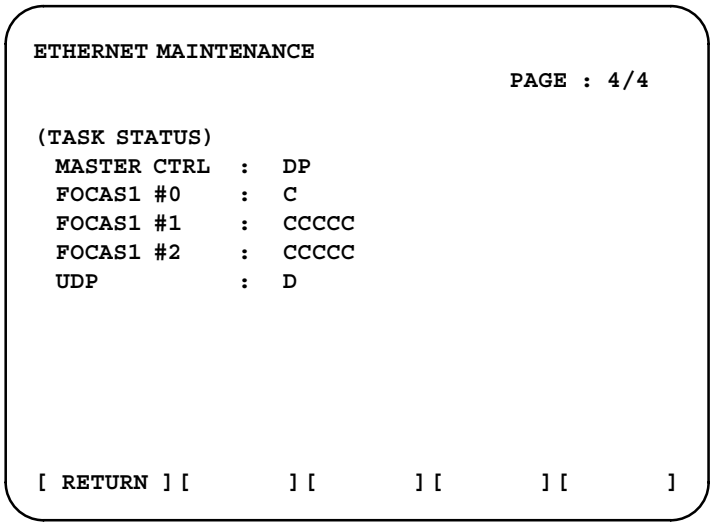
7 The screen below is used to check the communication state of the embedded Ethernet function and the error detection count of the Ethernet controller.

```
ETHERNET MAINTENANCE
                                    PAGE : 2/4

(NETWORK STATUS)
BAUDRATE              100MBPS / FULL DUPLEX
NETWORK DEVICE                EMBEDDED PORT

(NETWORK STATUS : SEND)
COLLISION                                  0
CARRIER SENSE LOST                         0
DELAY OVER                                 0
UNDERRUN ERROR                             0
SEND PARITY ERROR                          0


[ RETURN ][       ][ RESET ][ CLEAR ][       ]
```

```
ETHERNET MAINTENANCE
                                    PAGE : 3/4

(NETWORK STATUS)
BAUDRATE              100MBPS / FULL DUPLEX
NETWORK DEVICE                EMBEDDED PORT

(NETWORK STATUS : RECIEVE)
ALIGNMENT ERROR                            0
ORC ERROR                                  0
OVERFLOW                                   0
FRAME LENGTH ERROR                         0
RECIEVE PARITY ERROR                       0


[ RETURN ][       ][ RESET ][ CLEAR ][       ]
```

The screen consists of two pages: one page for an error detection count for transmission, and the other for an error detection count for reception.
By pressing the [CLEAR] soft key on the first page, the error detection counters for transmission and reception can be cleared to 0.
By pressing the [RESET] soft key, the current communication device can be initialized and communication can be performed from the initial state. Use this key to reset communication based on the embedded Ethernet function.

8 The screen below is used to check the state of each task of the built–in Ethernet function.



	Symbol	Meaning
MASTER CTRL	E	Ethernet controller being initialized
	D	Data being processed(NOTE)
	W	Waiting for data processing(NOTE)
	P	Waiting for parameter setting
	S	Parameters being set
FOCAS1 #0	X	Waiting for completion of Ethernet controllerinitialization
	E	Being activated
	C	Waiting for connection from the personal computer
	O	Connection being processed
	N	FOCAS1/Ethernetexecution disabled
FOCAS1 #1,#2	X	Waiting for completion of Ethernet controllerinitialization
	C	Waiting for connection from the personal computer
	D	Data being processed(NOTE)
	W	Waiting for data processing(NOTE)
UDP	X	Not executed yet. Waiting for completion of Ethernet controller initialization
	E	Being activated
	D	Data being processed(NOTE)
	W	Waiting for data processing(NOTE)

NOTE
A state change occurs between the states ”Data being processed” and ”Waiting for data processing” even when communication is not performed actually.

6.5 TROUBLESHOOTING

This section describes troubleshooting and check items associated with the embedded Ethernet function.

6.5.1 Check Items Related to Connection with the Hub

1) Is an STP cable used for connection between the hub and embedded Ethernet?
2) Is the STP cable connected correctly?
   In general, a straight cable is used for connection between the hub and communication device.
3) Is the power to the hub turned on?
4) The PCMCIA Ethernet card is used only with 10BASE–T. Is a hub for 10BASE–T used when the PCMCIA Ethernet card is used?
5) Is the link LED turned on when the embedded Ethernet port is used?
   The link LED is not turned on when the hub is not connected or the power to the hub is not turned on.
6) Is the LED (for link display) of the connected hub turned on? (Some hubs are not provided with a link LED.)
   The LED is not turned on when the hub is not connected with the embedded Ethernet or the power to the CNC is not turned on.

6.5.2 Check Items Related to Connection with a Backbone

This subsection can be ignored when a network is built only with a hub to which the embedded Ethernet is connected.
The general check items are listed below. For network installation, consult with vendors specialized in this area. Install cables away from noise sources.

When a 10BASE–5 backbone is used

1) Are transceivers connected to the backbone cable correctly?
   - If the transceivers are connected correctly, the resistance between the backbone shield and central conductor is about 25 ohms (when terminating resistors are attached).
   - A special tool may be required for transceiver installation. (The special tool varies from one vendor to another. For details, refer to the relevant manual of each vendor.)
   - At a location where a transceiver was once installed, do not install a transceiver again. (The backbone cable can be damaged.)
2) Are transceivers installed at correct intervals?
   - Transceivers need to be spaced from each other by 2.5 m or more. It is recommended that transceivers be installed at intervals of an integral multiple of 2.5 m. Usually, installation locations are marked on a backbone cable.
3) Are terminating resistors attached?
   - A terminating resistor (50 ohms) needs to be attached to each end of the backbone cable.

4) Is the length of the backbone cable 500 m or less?
5) Does the cable (transceiver cable) connecting a hub to a transceiver satisfy the specified length?
   - Usually, the maximum allowable length of a transceiver cable is 50 m. However, the maximum allowable length of some thin cables may be less than 50 m. Check the specification of the cable.

When a 10BASE–2 backbone is used

1) Is the length of one cable 0.5 m or more?
   - The minimum allowable span between nodes (devices) is 0.5 m.
2) Is the length of the backbone cable (total length of the cables) 185 mm or less?
3) Are terminating resistors attached?
   - A terminating resistor (50 ohms) needs to be attached to each end of the backbone cable.

6.5.3 Checking the Setting of Each Parameter

This subsection describes how to check the minimum settings required for communication.

Checking the settings on the embedded Ethernet side

1) Is the MAC address of the embedded Ethernet indicated?
   - The MAC address of a embedded Ethernet port is set for each CNC, and can be checked on the parameter setting screen.
   - A unique MAC address is assigned to each PCMCIA Ethernet card. When a PCMCIA Ethernet card is selected and inserted, MAC address display is provided.
2) Is a correct IP address set?
   - Check if an IP address already specified for another device is set.
3) Is a correct subnet mask set?
   - The subnet mask setting must match the subnet mask setting on the communication destination device.
4) Is a correct router IP address set when communication via a router is performed?

Checking the settings on the personal computer side

1) Is a correct IP address set?
   - Check if an IP address already specified for another device is set.
2) Is a correct subnet mask set?
   - The subnet mask setting must match the subnet mask setting of the communication destination device.
3) Is a correct router IP address set when communication via a router is performed?

6.5.4 Checking Communication

This subsection describes how to check the state of communication between the CNC and personal computer.

Checking the connection status and settings

If communication with the CNC is not satisfactory or fails from time to time, check the communication link by using the method described below. The ping command is used to check communication.

Checking from the embedded Ethernet side

See Step 6 of the procedure described in Section 6.4, ”EMBEDDED ETHERNET MAINTENANCE SCREEN”.

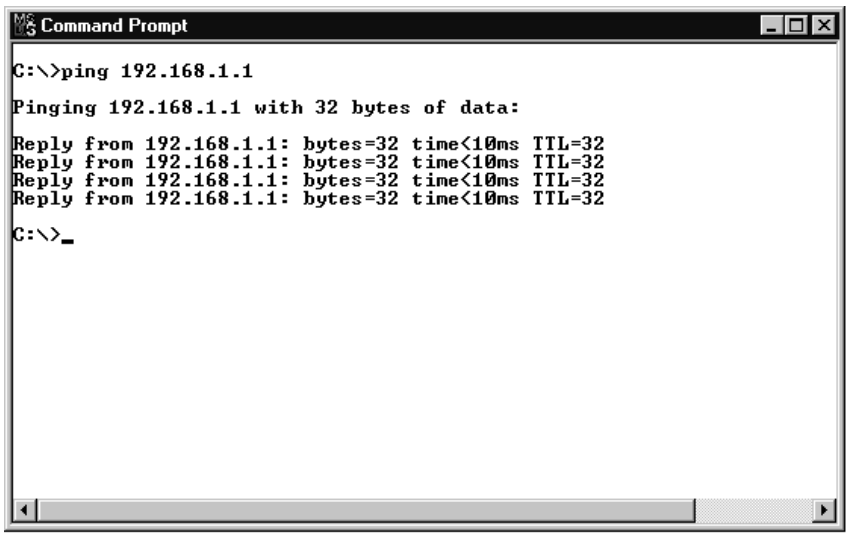
If no response is received from the personal computer, the cause is considered to be a hardware connection error and/or software setting error. Check the hardware connection and software settings.

Checking from the personal computer

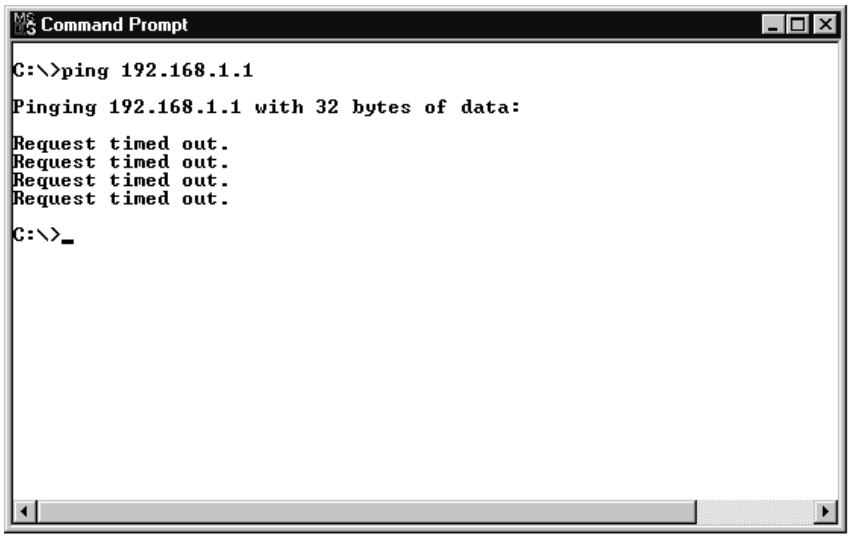
An example is given below, where a personal computer (OS: Windows NT 4.0) is used:

Method of checking:
Open the command prompt, and enter ping ”NC–IP–address”. If a response is received, a normal connection has been established.
The example below supposes that the IP address of the CNC is 192.168.1.1.

1) When a response is received (normal)



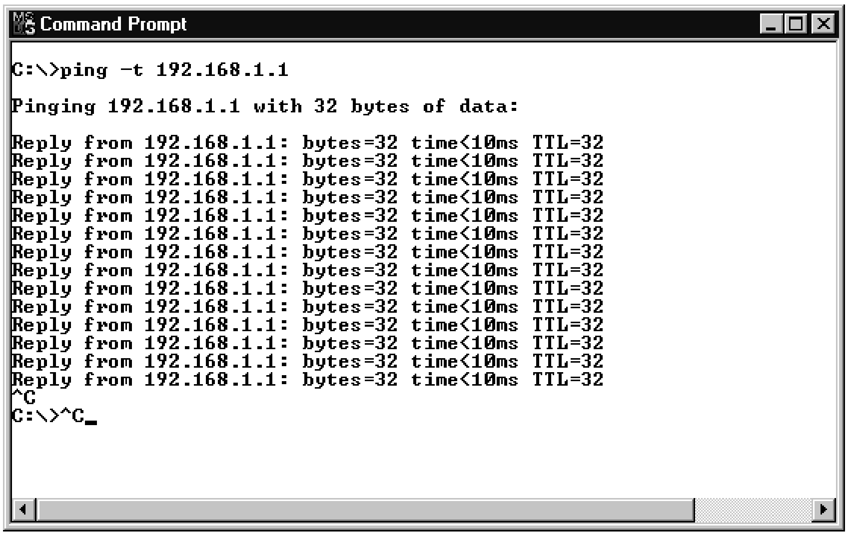
2) When no response is received (error)



If no response is received from the CNC, the cause is considered to be a hardware connection error and/or software setting error. Check the hardware connection and software settings.

Checking the influence of noise

The method of checking communication errors caused by noise is described below. The ping command is used for this checking as well. The –t option of the ping command is used. Until the Ctrl and C keys are pressed simultaneously, ping packets are transmitted.



1. Influence of noise from a peripheral machine (device)

1) Turn on the power to the machine with the embedded Ethernet function for which a noise influence check is to be made, and ensure that communication is enabled.

2) Press the emergency stop button of the machine to turn off servo/spindle amplifier activation, then issue a ping command from the personal computer.

3) Count the number of lost packets (to which no response is returned). If lost packets occur in this state, there is probably an influence of noise from a peripheral machine.
Action: Locate the noise source and recheck the cabling to eliminate the influence of noise.

2. Influence of noise from the installed machine

1) Next, release the emergency stop state of the machine to turn on servo/spindle amplifier activation, then issue another ping command from the personal computer.

2) Count the number of lost packets.
If this number is greater than the number of Item 1 above, the cause is considered to be noise generated by the machine itself. In general, the grounding of the machine or the grounding of the communication destination is defective.

Action: Check the grounding of the machine and the communication destination, and insulate the machine from the communication backbone.

6.6 ERROR MESSAGES

If an error occurs with the embedded Ethernet function, the log screen of the embedded Ethernet function displays an error message. This section describes error messages displayed on the log screen. The major error messages are described below.

If an error occurs, display the log screen, and check the error message to determine the cause of the error.
Multiple error messages may be displayed for an error. So, check the display times of error messages.

6.6.1 EMB_ETH MASTER CTRL Log Screen

`OWN IP ADDRESS IS NOTHING`

The IP address of the local node is not set. Set an IP address correctly.

`OWN IP ADDRESS(???) IS INVALID`

The setting (???) of the IP address of the local node is incorrect. Correct the IP address.

`SUBNET MASK IS NOTHING`

The subnet mask of the local node is not set. Set a correct subnet mask.

`SUBNET MASK(???) IS INVALID`

The setting (???) of the subnet mask of the local node is incorrect. Correct the subnet mask.

`ROUTER IP ADDRESS(???) IS INVALID`

The setting (???) of the IP address of the router is incorrect. Correct the IP address of the router.

`TCP PORT NUMBER(???) IS INVALID`

The setting (???) of the TCP port number is incorrect. Correct the TCP port number.

`UDP PORT NUMBER(???) IS INVALID`

The setting (???) of the UDP port number is incorrect. Correct the UDP port number.

`UDP INTERVAL TIME(???) IS INVALID`

The setting (???) of the time interval for UDP transmission is incorrect. Correct the time interval.

6.6.2 EMB_ETH FOCAS1/ETHER Log Screen

`TCP PORT NUMBER(???) IS INVALID`

The setting (???) of the TCP port number is incorrect. Correct the TCP port number.

`Illegal Broadcast IP ADDRESS`

The broadcast address for UDP transmission is incorrect. Correct the subnet mask and IP address of the local node.

`Illegal Power-on Date or Time`

The current time setting of the CNC is incorrect. Correct the clock of the CNC.

`ALL TASKS(C1) ARE BUSY`

The FOCAS1/Ethernet or DNC1/Ethernet function is already engaged in communication with five applications. Terminate unnecessary communication applications on the personal computer.
If the cable is disconnected before communication is completed, the embedded Ethernet may need to be reset and initialized.

`Err accept() [???]`

An error occurred when a connection request from the personal computer is being awaited. The error code is [???]. This error message is output, for example, when the embedded Ethernet is reset.

`Err recv() [???]`

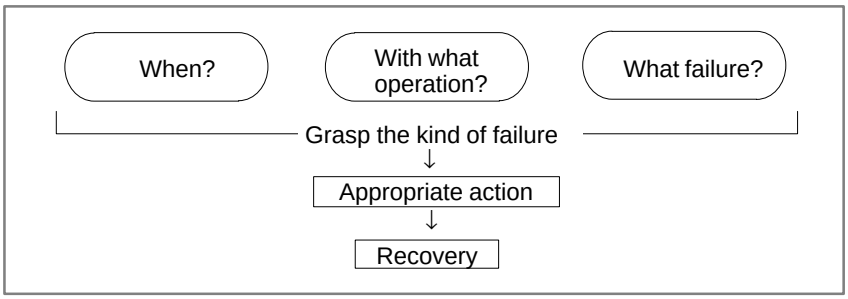
An error occurred during data reception. The error code is [???]. This error message is output, for example, when the embedded Ethernet is reset before communication is closed.

7 TROUBLESHOOTING

This chapter describes troubleshooting procedure.

7.1 CORRECTIVE ACTION FOR FAILURES

When a failure occurs, it is important to correctly grasp what kind of failure occured and take appropriate action, to promptly recover the machine.
Check for the failure according to the following procedure :



7.1.1 Investigating the Conditions under which Failure Occurred

(1) When and how many times (frequency of occurrences)
(2) With what operation
(3) What failure occurred

1 When did the failure occur?
- Date and time?
- Occurred during operation? (how long was the operation?)
- Occurred when the power was turned on?
- Was there any lightening surge, power failure, or other disturbances to the power supply?

How many times has it occurred
- Only once?
- Occurred many times ? (How many times per hour, per day, or per month?)

2 With what operation did it occur ?
- What was the NC mode when the failure occurred?
  Jog mode/memory operation mode /MDI mode /reference position return mode
- If during program operation,
  1) Where in the program ?
  2) Which program No. and sequence No. ?
  3) What program ?
  4) Occurred during axial movement ?
  5) Occurred during the execution of an M/S/T code ?
  6) Failure specific to the program ?
- Does the same operation cause the same failure ?
  (Check the repeatability of the failure.)
- Occurred during data input/output ?

<Feed axes>
- For a failure related to feed axis servo
  1) Occurred at both low feedrate and high feedrate ?
  2) Ocurred only for a certain axis ?

3 What failure occurred ?

- Which alarm was displayed on the alarm display screen ?
  (Check the axis along which an alarm has occurred for alarms 300 to 599.)
- For alarm 350 : Examine diagnostic 202
  For alarm 351 : Examine diagnostic 203
  For alarm 414 : What does diagnostic display 200,201,204 indicate ?
- For alarm 751 or 761 : Which spindle alarm is indicated ?
  (indicated by AL–XX (XX is a number))
- Is the screen correct ?
- If machining dimensions are incorrect
  1) How large is the error ?
  2) Is the position display on the CRT correct ?
  3) Are the offsets correct ?

4 Other information

- Is there noise origin around machine?
  If the failure has not occurred frequently, the cause may be external noise to the power supply or inductive noise on machinery cables. Operate other machines connected to the same power line and see if noise come from the relays or compressors.
- Is it taken any countermeasure for noise in machine side?
- Check the following for the input power supply voltage :
  1) Is there variation in the voltage ?
  2) Are the voltages different depending on the phase ?
  3) Is the standard voltage supplied ?
- How high is the ambient temperature of the control unit?
  (0°C to 45°C during operation without PC function, 5°C to 45°C during with PC function)
  Refer to manual about noise.
- Has excessive vibration been applied to the control unit?
  (0.5 G or less during operation)

5 When you contact our service center, specify the following items :

1) Name of the CNC unit
2) Name of the machine tool builder and type of machine
3) Software series/version of the CNC
4) Specifications of the servo amplifier and motor
   (for a failure related to the servo)

- See the drawing issued by the machine tool builder for the locations of the CNC unit and servo amplifiers.
- We use the following specification codes :
  Servo amplifier : A06B–□□□□–H□□□
  Servo motor : A06B–□□□□–B□□□
  (□ represents a number)

7.2 NO MANUAL OPERATION NOR AUTOMATIC OPERATION CAN BE EXECUTED

Points

(1) Execute the following procedure when no manual nor automatic operation is done
(2) Check whether position display shows correct position
(3) Check CNC status display
(4) Check CNC internal status using diagnostic function

Causes and Countermeasures

1. Position display (relative, absolute, machine coordinate) does not change

(1) Check CNC status display (Refer to Section 1.9 NC STATUS DISPLAY for detail.)

(a) Emergency stop status (Emergency stop signal is turned on)

If status display shows EMG the emergency stop signal is input.

Check the following signal using the PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
X1008				*ESP				
G0008				*ESP				

ESP=0 indicates that emergency stop signal is input.

(b) It is a reset status

When RESET is displayed, any of a reset is functioned. Check the following signal using the PMC's diagnostic funciton (PMCDGN).

1) An input signal from the PMC functions

	#7	#6	#5	#4	#3	#2	#1	#0
G0008	ERS	RRW						

When ERS is 1, external reset signal is input.
When RRW is 1, reset & rewing signal is input.

2) RESET key on the MDI keyboard functions

When the signals in 1) are 0, [RESET] key may be functioning.

Check the contact of [RESET] key using a tester.

When it is abnormal, change the keyboard.

(c) Confirm the status of modes

Operation mode status is displayed on the lower part of CRT as follows :
If nothing is displayed, mode select signal is not input. Check mode select signal using PMC's diagnostic function (PMCDGN).
For details, refer to section 1.9 CNC STATE DISPLAY.

(Example of display)

JOG : Manual operation (JOG) mode
HND : Manual handle (MPG) mode
MDI : Manual data input (MDI) mode
MEM : Automatic operation (Memory) mode
EDIT : EDIT (Memory edit) mode

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
Manual operation (JOG) mode						1	0	1
Manual handle (MPG) mode						1	0	0
Manual data input (MDI) mode						0	0	0
Automatic operation (Memory) mode						0	0	1
EDIT (Memory edit) mode						0	1	1

(2) Check diagnostic data 000 to 025 of the CNC Check an item for which 1 is displayed

	No.	Message	Display
	000	WAITING FOR FIN SIGNAL	: 0
	001	MOTION	: 0
	002	DWELL	: 0
a.	003	IN–POSITION CHECK	: 0
	004	FEEDRATE OVERRIDE 0%	: 0
b.	005	INTERLOCK / START LOCK	: 1(Example)
	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	010	PUNCHING	: 0
	011	READING	: 0
	012	WAITING FOR (UN) CLAMP	: 0
c.	013	JOG FEEDRATE OVERRIDE 0%	: 0
d.	014	WAITING FOR RESET, ESP, RRW OFF	: 0
	015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

Items with a to d relate with manual and automatic operation and its detail is shown below.

a. In–position check is being done

It shows that positioning is not yet completed. Check the contents of the following diagnostic number. (It is 1 in the following condition)

DGN 0300 [Position Error] >PARAM 1826
[In–position width]

1) Check the parameters according to the parameter list.

1825	Servo loop gain per axis (Normal : 3000)

2) Servo system may be abnormal. Refer to servo alarm 400, 410, and 411.

b. Interlock or start lock signal is input

There are a plural interlock signals. Check at first which interlock signal is used by the machine tool builder at the parameters shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX		ITL

#0 ITL=0 shows interlock signal *IT is effective. To 1)
#2 ITX=0 shows interlock signal *ITn is effective. To 2)
#3 DIT=0 shows interlock signal ±MITn is effective. To 3)
Check state of effective interlock signals using the diagnostic function (PMCDGN) of the PMC.

1) Interlock signal (*IT) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

2) Axis interlock signal (*ITn) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	+IT1

*ITn=0 shows interlock signal is input.

3) Interlock signal per axis and direction (+/– MITn) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0132					+MIT4	+MIT3	+MIT2	+MIT1
G0134					–MIT4	–MIT3	–MIT2	–MIT1

±MITn=1 shows interlock signal per axis and direction is input.

c. Jog feedrate override is 0%

Check the signals using PMC's diagnostic function (PMCDGN)

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G0011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

When the override is 0% all bits of the above address becomes 1111 . . . . . 1111 or 0000 . . . . . 0000.

*JV15 . . . . . JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
:	:
1101 1000 1110 1111	100.00%
:	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

d. NC is in a reset state

In this case, RESET is also displayed on the status display. Check it using the procedure of 1 above.

2. When machine coordinate value does not update on position display

(1) Machine lock signal (MLK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0044							MLK	
G0108	MLK8	MLK7	MLK6	MLK5	MLK4	MLK3	MLK2	MLK1

MLK : All axes machine lock

MLKn : Each axis machine lock

When the signal is 1, the corresponding machine lock signal is input.

7.3 JOG OPERATION CANNOT BE DONE

Points

(1) Check whether position display is operating.
(2) Check CNC status display.
(3) Check internal status using Diagnostic funciton.

Causes and Remedies

1. Position display (relative, absolute, machine cooordinate) does not change

(1) Check mode selection status (JOG mode is not selected).

When status display shows JOG, it is normal.
When status display does not show JOG, mode select signal is not selected correctly. Confirm the mode select signal using PMC's diagnostic function (PMCDGN).

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
Manual operation (JOG) mode						1	0	1

(2) Feed axis and direction select signal is not input Check the signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G0102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1

Example)
When +X button is pressed on the operator's panel, signal+J1 turns to 1.

* This signal is effected at its rise. If axis selection signal is input before JOG mode is selected, axis movement does not occur. Turn the signal to off, then on.

(3) Check CNC's diagnostic function 000 to 015. Check the items for which 1 is displayed at right side.

	No.	Message	Display
	000	WAITING FOR FIN SIGNAL	: 0
	001	MOTION	: 0
	002	DWELL	: 0
a.	003	IN–POSITION CHECK	: 0
	004	FEEDRATE OVERRIDE 0%	: 0
b.	005	INTERLOCK / START LOCK	: 1(Example)
	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	010	PUNCHING	: 0
	011	READING	: 0
	012	WAITING FOR (UN) CLAMP	: 0
c.	013	JOG FEEDRATE OVERRIDE 0%	: 0
d.	014	WAITING FOR RESET, ESP, RRW OFF	: 0
	015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

* Items with a to d relate with manual and automatic operation and its detail is shown below.

a. In–position check is being done

It shows that positioning is not yet completed. Check the contents of the following diagnostic number. (It is 1 in the following condition)

DGN 0300 [Position Error] >PARAM 1826 [In–position width]

1) Check the parameters according to the parameter list.

1825	Servo loop gain per axis (Normal : 3000)

2) Servo system may be abnormal. Refer to servo alarm 400, 410, and 411.

b. Interlock or start lock signal is input

There are a plural interlock signals. Check at first which interlock signal is used by the machine tool builder at the parameters shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX		ITL

#0 ITL=0 shows interlock signal *IT is effective. To 1)
#2 ITX=0 shows interlock signal *ITn is effective. To 2)
#3 DIT=0 shows interlock signal ±MITn is effective. To 3)
Check state of effective interlock signals using the diagnostic function (PMCDGN) of the PMC.

1) Interlock signal (*IT) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

2) Axis interlock signal (*ITn) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	+IT1

*ITn=0 shows interlock signal is input.

3) Interlock signal per axis and direction (+/– MITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0132					+MIT4	+MIT3	+MIT2	+MIT1
G0134					–MIT4	–MIT3	–MIT2	–MIT1

c. Jog feedrate override is 0%

Check the signals using PMC's diagnostic function (PMCDGN)

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G0011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

When the override is 0% all bits of the above address becomes
1111 . . . . . 1111 or 0000 . . . . . 0000.

*JV15 . . . . . JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
:	:
1101 1000 1110 1111	100.00%
:	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

d. NC is in a reset state

In this case, RESET is also displayed on the status display. Check it using the procedure of 1 above.

(4) Jog feed rate setting (Parameter) is not correct.

1423	Jog feedrate per axis

7.4 HANDLE OPERATION CANNOT BE DONE

Points

(1) Check another manual operation (JOG) is accepted.
(2) Check CNC status display.

Causes and Countermeasure

1 JOG operation is not acceptable, either

Consult with item 8.3 and 8.4.

2 When only handle operation (MPG) cannot be done

(1) Check CNC status display at lower left corner of the CRT.
(Refer to **1.9 CNC STATE DISPLAY** for details)
When the status display shows HND, mode selection is correct.
If it is not HND, mode select signal is not input correctly. Check the mode select signal using the PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
	Manuale handle mode					1	0	0

(2) Manual handle feed axis select signal is not input.
Check the signals using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0018	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A
G0019					HS3D	HS3C	HS3B	HS3A

When axis select switch for manual handle feed is selected on the machine operator's panel, if the signals are input as follows, it is normal.

Selected axis	HSnD	HSnC	HSnB	HSnA
no selection	0	0	0	0
1st axis	0	0	0	1
2nd axis	0	0	1	0
3rd axis	0	0	1	1
4th axis	0	1	0	0
5th axis	0	1	0	1
6th axis	0	1	1	0
7th axis	0	1	1	1
8th axis	1	0	0	0

* In the above table, n is the number of the manual pulse generator (MPG) and up to 3 MPGs can be used.
A feed axis is selected by 4–bit code of A to D.

(3) Manual handle feed multiplication is not correct

Check the following signals using PMC's PCDGN. Also confirm the following parameters based on the parameter list.

	#7	#6	#5	#4	#3	#2	#1	#0
G0019			MP2	MP1				

↓ ↓

MP2	MP1	Multiplication
0	0	×1
1	0	×10
0	1	×m
1	1	×n

7113	Magnification of handle feed m (1 to 127)
7114	Magnification of handle feed n (1 to 1000)

	#7	#6	#5	#4	#3	#2	#1	#0
7102								HNGx

#0(HNGx) Direction of MPG and travel of machine

0 : same direction

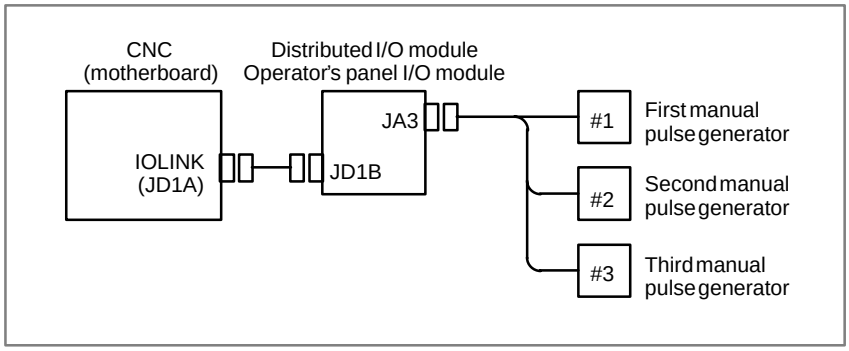
1 : reverse direction

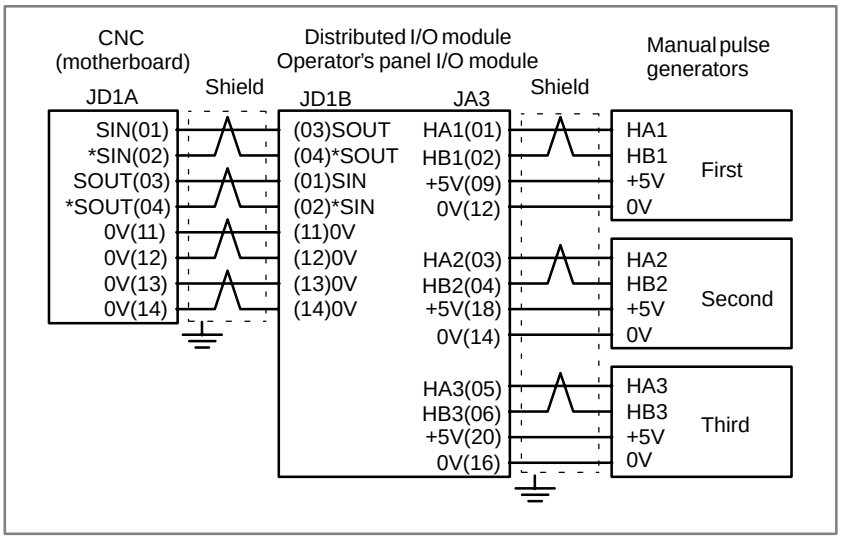
7110	No. of MPGs used (1 to 3)

(4) Checking manual pulse generator

(a) Incorrect of cable

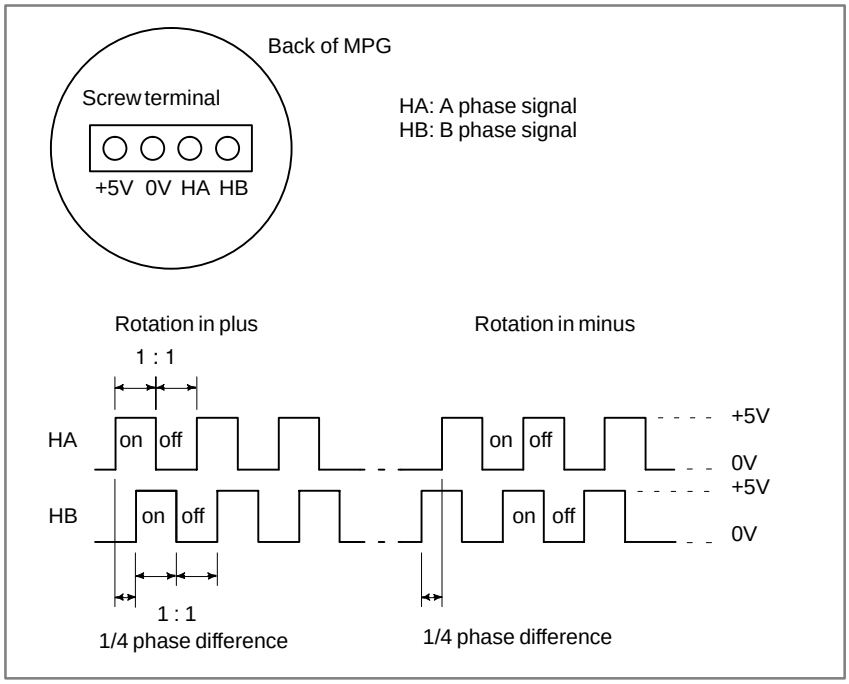
Check disconnection of cable or short circuit.





(b) Manual pulse generator is faulty

When you rotate the MPG, the following signal is output. Measure the signal with synchroscope at screw terminal on back of MPG. If no signal is output, measure +5V voltage.



Check on and off ratio and phase difference of HA and HB.

7.5 AUTOMATIC OPERATION CANNOT BE DONE

Points

(1) Check manual operation is possible.

(2) Check the status of cycle start LED on machine operator's manual.

(3) Check status of CNC.

Causes and Remedies

When manual operation is either impossible, perform countermeasure, based on the previous item "Jog operation cannot be done".
Confirm that a correct mode is selected according to the mode select status of CNC status display. Also, by confirming the automatic operation status it is possible to identify cycle operation, feed hold and cycle stop state.

1. When cycle operation is not started (Cycle start LED does not light)

"****" is displayed at status display on a screen.

(1) Mode select signal is not correct.

When the mode select signal is input correctly, following status display is done.
MDI :Manual data input mode (MDI)
MEM :Memory operation mode
RMT :Remote operation mode

If status display does not show a correct status, check the mode signal with following diagnosis function of PMC side (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0043			DNCI			MD4	MD2	MD1

DNCI	MD4	MD2	MD1	Mode select
–	0	0	0	Manual data input mode
0	0	0	1	Memory operation mode
1	0	0	1	Remote operation mode

(2) Cycle start signal is not input

This signal turns 1 when cycle start button is pressed and turns 0 when it is released. The cycle start actuates when it changes from 1 to 0.
Check the state of the signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0007						ST		

#2 (ST) : Cycle start signal

(3) Feed hold signal is input

Under normal state, the feed hold signal is 1 when the feed hold button is not pressed.
Check the state of this signal using the PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			*SP					

#5 (*SP) : Feed hold signal

2. When an automatic operation is in progress (Cycle start LED is lit)

CNC's status display shows "STRT" on the CRT.

(1) Check the contents of diagnostic nos. 000 to 015.

	No.	Message	Display
a.	000	WAITING FOR FIN SIGNAL	: 1(Example)
b.	001	MOTION	: 0
c.	002	DWELL	: 0
d.	003	IN–POSITION CHECK	: 0
e.	004	FEEDRATE OVERRIDE 0%	: 0
f.	005	INTERLOCK / START LOCK	: 0
g.	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	010	PUNCHING	: 0
	011	READING	: 0
	012	WAITING FOR (UN) CLAMP	: 0
h.	013	JOG FEEDRATE OVERRIDE 0%	: 0
i.	014	WAITING FOR RESET, ESP, RRW OFF	: 0
	015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

* Items with a to i relate with an automatic operation and their details are as follows :

a. An auxiliary function is being executed (waiting for FIN signal)

An auxiliary function (M/T/B) specified in a program is not ended. Check according to the following procedure.
At first, confirm the kind of interface of an auxiliary function.

	#7	#6	#5	#4	#3	#2	#1	#0
3001	HSIF							

#7(HSIF) 0 : M/T/B is of normal interface.
1 : M/T/B is of high–speed interface.

1) Normal interface

When the auxiliary function finish signal turns from 1 to 0, the auxiliary function is supposed to be ended and the next block is read for operation. Confirm the status of this signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0004					FIN			

#3 (FIN) : Auxiliary function finish signal

2) High–speed interface

The auxiliary function is supposed to be ended when the signals are in the following state. Confirm it using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0005	BFIN				TFIN			MFIN

#0(MFIN) : M function finish signal

#3(TFIN) : T function finish signal

#4(BFIN) : 2nd auxiliary function finish signal

	#7	#6	#5	#4	#3	#2	#1	#0
F0007	BF				TF			MF

#0(MF) : M function strobe signal

#3(TF) : T function strobe signal

#7(BF) : 2nd auxiliary function strobe signal

	#7	#6	#5	#4	#3	#2	#1	#0
G0004			MFIN3	MFIN2				

#4(MFIN2) : Second M function completion signal

#5(MFIN3) : Third M function completion signal

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			MF3	MF2				

#4(MF2) : Second M function strobe signal

#5(MF3) : Third M function strobe signal

* The second and third M functions are enabled only when bit 7 (M3B) of parameter No. 3404 is set to 1.

Signal	End state	
Finish signal	0	1
store signal	0	1

b. Travel command is being executed

CNC is reading an axis command (X,Y,Z,...) in a program and giving the command to the axis.

c. A dwell command is being executed

CNC is reading a dwell command (G04) in a program and is executing the dwell command.

d. In–position check (confirming positioning) is being done

Positioning (G00) to a specified position of a specified axis is not completed.
Whether positioning is completed or not is checked as the servo position error amount. Check it CNC's diagnostic function as follows:

DGN no.300 [Position Error] > PARAM 1826 [In–position width]

Position error amount almost becomes 0, when positioning of an axis completes and when the amount becomes within the in–posiiton width, it is assumed that positioning completes and the next block is exected.
If position error amount does not become within the in–position width, refer to servo alarm 400, 4n0 and 4n1.

e. Feedrate override is at 0%

Actual feedrate is overridden by the override signals to a programmed feedrate. Check the override signals using the PMC's diagnostic function (PMCDGN).

<Normal override signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0012	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0

***FVn** : Feedrate override

<2nd override signal (option)>
Feed rate is overridden more finely using the signals below:
See MTB's manual whether this feature is equipped.

	#7	#6	#5	#4	#3	#2	#1	#0
G0013	*AFV7	*AFV6	*AFV5	*AFV4	*AFV3	*AFV2	*AFV1	*AFV0

***AFVn** : 2nd feed rate override

<State of override signal>

*FV7·····*FV0	
1 1 1 1 1 1 1 1	0%
1 1 1 1 1 1 1 0	1%
:	:
1 0 0 1 1 0 1 1	100%
:	:
0 0 0 0 0 0 0 1	254%
0 0 0 0 0 0 0 0	0%

*AFV7·····*AFV0	
1 1 1 1 1 1 1 1	0%
1 1 1 1 1 1 1 0	1%
:	:
1 0 0 1 1 0 1 1	100%
:	:
0 0 0 0 0 0 0 1	254%
0 0 0 0 0 0 0 0	0%

f. Interlock signal or start lock signal is input

There are a plural number of interlock functions. Parameters are set by machine tool builders for which interlock function is used. Therefore, confirm the following parameters at first:

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX		ITL

#0 (ITL) 0 : Interlock signal(*IT) is valid.

#2 (ITX) 0 : Interlock signal (*ITn) is valid.

#3 (DIT) 0 : Interlock signal (± MITn) is valid.

Confirm which interlock signal is activated by the PMC's diagnostic function (PMCDGN) .

1) Interlock signal (*IT) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

#0 (*IT) : When this bit is 0, interlock signal is input.

2) Interlock signal per each axis (*ITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

***ITn** When the bit is 0, the corresponding axis's interlock signal is input.

3) Interlock signal per axis and direction(+/– MITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0132					+MIT4	+MIT3	+MIT2	+MIT1
G0134					–MIT4	–MIT3	–MIT2	–MIT1

4) Controlled axis detach function is running. A detached axis is specified for travelling.

*This function is valid when CNC parameter No.1005#7=1. For whether this function is running or not, confirm the following signal using PMC's diagnostic function (PMCDGN). Check the axis concerned.

	#7	#6	#5	#4	#3	#2	#1	#0
F0110	MDTCH8	MDTCH7	MDTCH6	MDTCH5	MDTCH4	MDTCH3	MDTCH2	MDTCH1

When signal MDTHn is "1" ,the axis detach function is in valid.
The control axis detach function becomes valid by the following signal issued from the PMC or a CNC side parameter. Check as in the following procedure :

<1> The control axis detach signal (DTCHn) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0124	DTCH8	DTCH7	DTCH6	DTCH5	DTCH4	DTCH3	DTCH2	DTCH1

If it is 1, the corresponding axis is detached.

<2> The following parameter enables the control axis detach function to the corresponding axis.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMVx							

#7(RMVx) 0 : Controlled axis is connected
1 : Controlled axis is detached

g. Manual feedrate override is 0% (dry run)

Normally manual feedrate override function is used for jog feed.
But when DRN(dry run) signal turns on during an auomatic operation,override values set with these signals become valid to the following speed set by a parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
G0046	DRN							

#7(DRN) : Dry run signal is input with this signal being 1.

1410	Dry run rate

The rate when the following override value is 100%.

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	+JV3	*JV2	*JV1	*JV0
						↓	↓	↓
G0011	*JV15	*JV14	*JV13	*JV12	+JV11	*JV10	*JV9	*JV8

When override value is 0%, all bits of the above address is [1111 . . . . 1111] or [0000 . . . . 0000].

*JV15 . . . . . JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
:	:
1101 1000 1110 1111	100.00%
:	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

h. NC is in a reset state

In this case, the CNC's status display shows RESET. Refer to item 1.

(2) Only rapid traverse in positioning (G00) does not function Confirm the following parameter and signals from the PMC.

(a) Setting value of rapid traverse rate

1420	Rapid traverse rate per axis

(b) Rapid traverse override signals

	#7	#6	#5	#4	#3	#2	#1	#0
G0014							ROV2	ROV1
G0096	HROV	*HROV6	*HROV5	*HROV4	*HROV3	*HROV2	*HROV1	*HROV0

(HROV–0) (HROV=1)

ROV1	ROV2	Override
0	0	100%
1	1	50%
0	1	25%
1	1	Fo

*HROV6						*HROV0	Override
1	1	1	1	1	1	1	0%
1	1	1	1	1	1	0	1%
				:			:
0	0	1	1	0	1	1	100%

1421	Rapid traverse override F0 rate

(3) Only feed (other than G00) does not function

(a) Maximum feedrate set by parameter is incorrect.

1422	Maximum feedrate

Feedrate is clamped at this upper feedrate.

(b) Feedrate is specified by feed per revolution (mm/rev)

1) Position coder does not rotate

Check the connection between spindle and position coder The following failure is considered:

- T iming belt is broken
- Key is removed
- Coupling is loose
- Connector of signal cable is loosened

2) Position coder is faulty

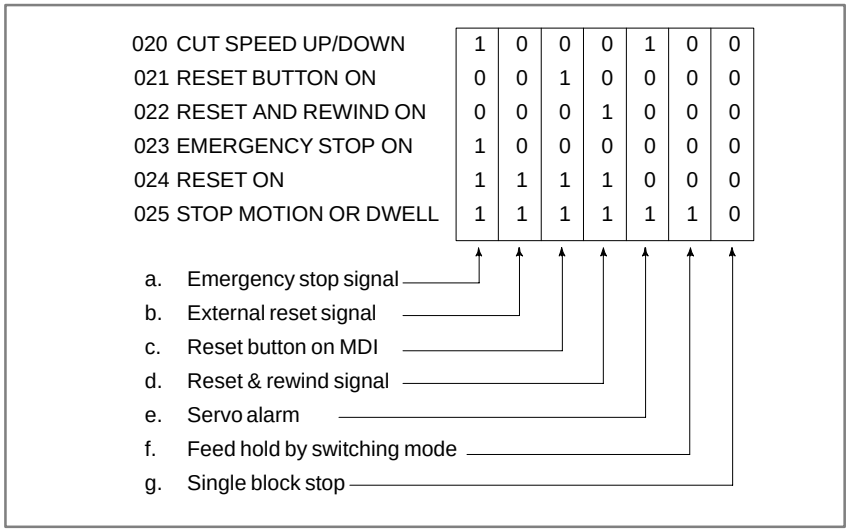
7.6 CYCLE START LED SIGNAL HAS TURNED OFF

Points

(1) After cycle operation is started, then stopped, check as follows:
(2) Confirm cycle start LED on machine operator's panel.
(3) Confirm CNC's diagnostic function.

Causes and Remedies

The reason why cycle start LED signal (STL) has turned off are displayed on CNC's diagnostic numbers 020 to 025 as follows:



Details of signals a to g are as follows:
Confirm the signals concerned using diagnostic function (PMCDGN).

a. Emergency stop is input

	#7	#6	#5	#4	#3	#2	#1	#0
X1008				*ESP				
	#7	#6	#5	#4	#3	#2	#1	#0
G0008				*ESP				

***ESP=0** : Emergency stop signal is input :

b. External reset signal is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008	ERS							

#7(ERS) : When the bit is 1, external reset signal is input.

* This signal is usually used for a confirmation signal of M02 when an M02 is specified in a program as the end of a program. Therefore, when M02 is executed, this signal is input.

c. Reset button on the MDI is pressed

An automatic operation is put into a reset status when RESET key on the MDI panel is pressed.

d. Reset & rewind signal is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008		RRW						

#6(RRW) : When this signal is 1, the reset & rewind signal is input.

* This signal is usually used for a confirmation signal of M30 when an M30 is specified in a program as the end of a program. Therefore, when M30 is executed, this signal is input.

e. Servo alarm has generated

When any servo alarm has generated, cycle operation is put into the reset state and operation stop.

f. Cycle operation is in a feed hold state

The cycle operation becomes feed hold state in the following cases:

1) Modes are switched from an automatic operation mode to a manual operation mode.
2) Feed hold signal is input.

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1

Automatic operation	memory edit(EDIT)	0	1	1
	Automatic operation (MEM)	0	0	1
	Manual data input (MDI)	0	0	0
Manual operation	Jog feed (JOG)	1	0	0
	Handle/step	1	0	1
	TEACH IN HANDLE	1	1	1
	TEACH IN JOG	1	1	0

<Feed hold signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			*SP					

#5(*SP) : When this signal is 0, the feed hold signal is input.

g. It become single block stop during automatic operation

	#7	#6	#5	#4	#3	#2	#1	#0
G0046							SBK	

#1(SBK) When this signal is 1, the single block signal is input.

7.7 NOTHING IS DISPLAYED ON THE LCD WHEN THE POWER IS TURNED ON

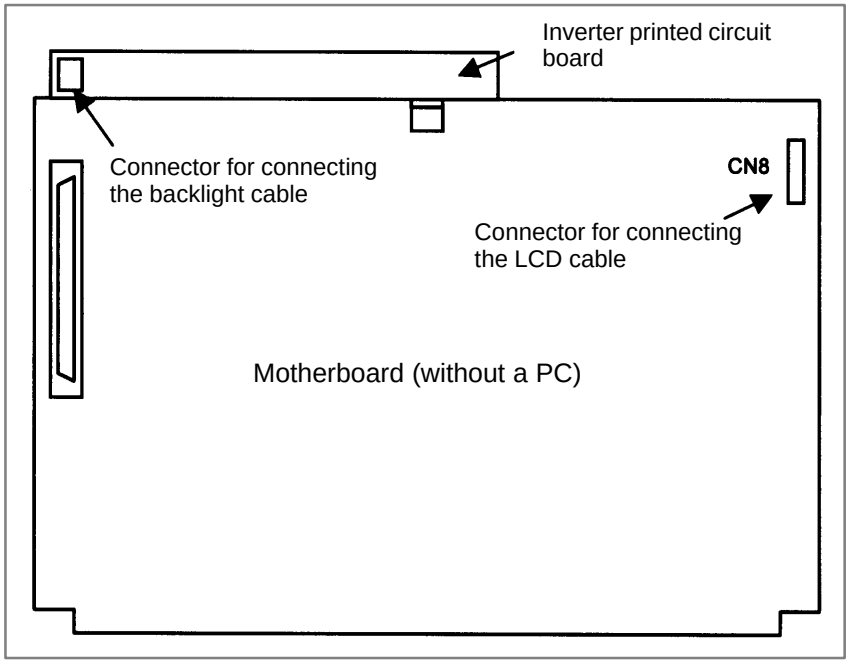
Causes and actions

If nothing is displayed on the LCD at power–up or if the LCD is locked with “GRAPHIC IS READY.” or the slot status screen displayed, the probable causes include the following:

- **For the LCD–mounted type**
  - The LCD cable or backlight cable is not connected.
  - The necessary software is not installed.
  - The motherboard, display control card, CPU card, or inverter board is defective.
- **For the stand–alone type**
  - The LCD unit is not connected to the power supply.
  - The LCD cable or backlight cable is not connected.
  - The LCD unit is not connected to the CNC with the optical cable or the cable is broken.
  - The necessary software is not installed.
  - The main CPU board, display control card, or LCD unit is defective.

If “GRAPHIC IS READY.BOOT START”. is displayed, this indicates that the display control circuit has started up normally but that the CNC has not started up.

[For the LCD–mounted type]



- **LCD display**

Referring to the hardware chapter, check the LCD on/off status of the motherboard.
If the motherboard has started up normally and the LCD display indicates normal operation, a probable cause is a fault of the display system, such as a cable not connected or a defective inverter board.
If the LCD display is locked in the middle of the startup process, the probable causes include defective hardware (or installation failure) and the necessary software not installed.

- **Connection of the LCD and backlight cables**

Check that the LCD and backlight cables are connected firmly to the corresponding connectors.
These cables are connected before shipment from FANUC. This check is, however, required because the cables may be disconnected during maintenance.

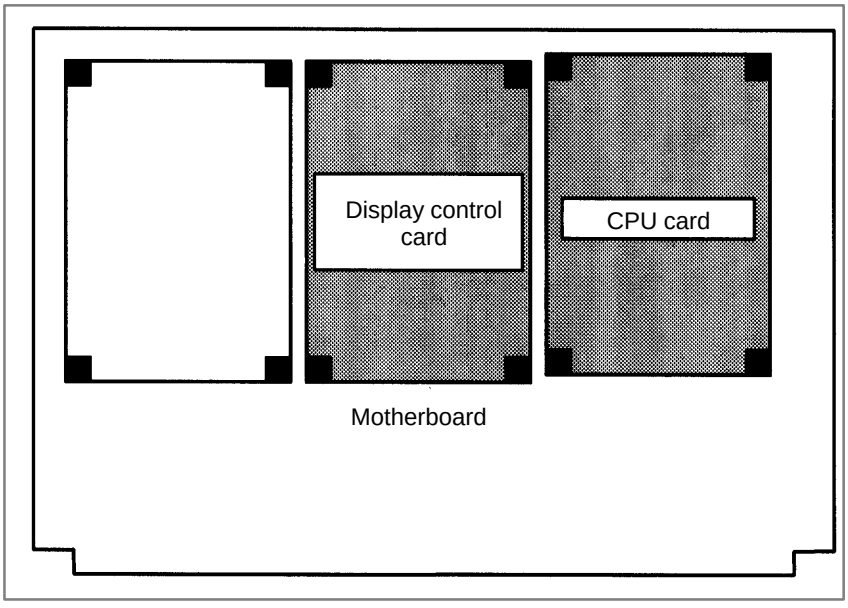
- **The necessary software is not installed**

If necessary software is not stored in the FROM module, the CNC may not start up.

- **Defective printed circuit board**

If the motherboard or display control card is defective or is not correctly installed, the CNC may not start up.
Check that the card PCBs are engaged firmly with the connectors on the motherboard.
If any of the above actions does not solve the problem, replace the display control card, CPU card, and motherboard.

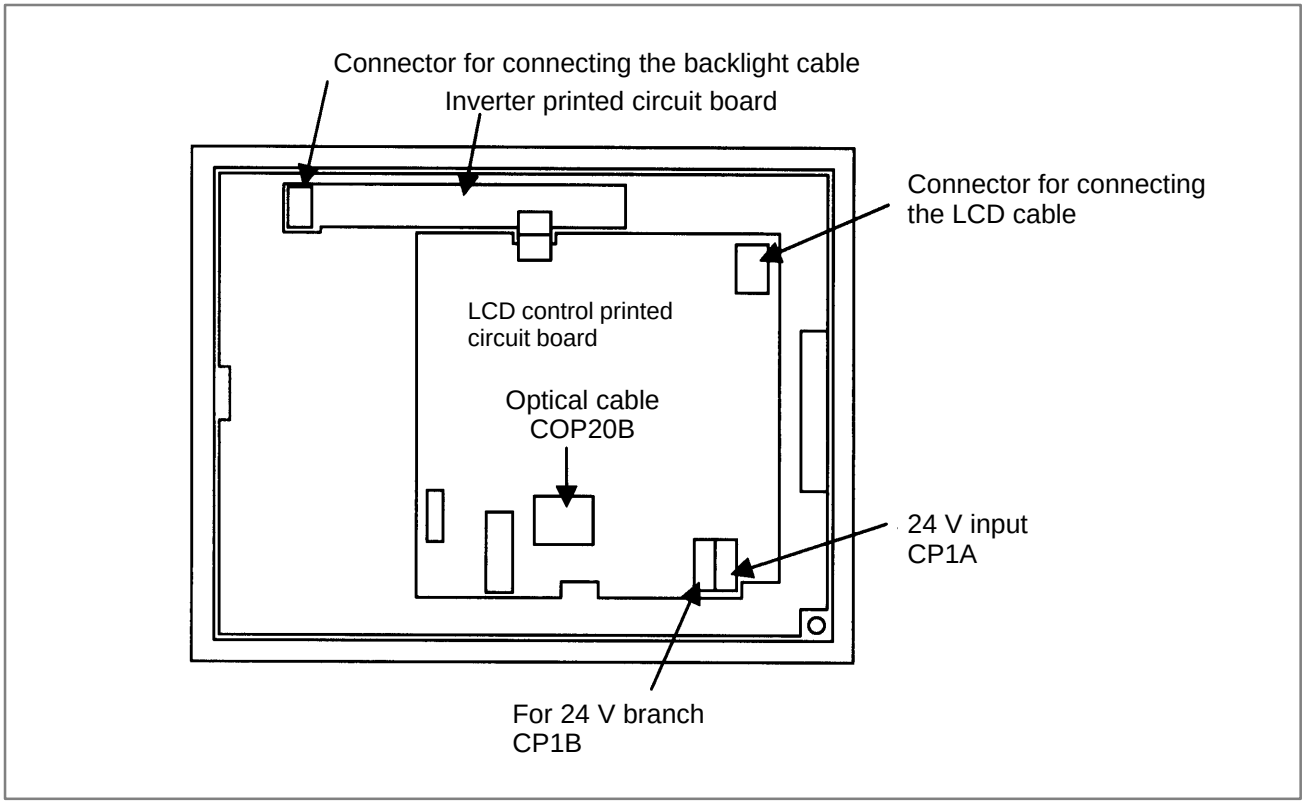
- **Installation positions of the display control card, and CPU card**



[For the stand–alone type]

- **Power supply of the LCD unit**

Check that the power cable is connected to the connector CP1A of the LCD unit.



- **LED display**

Referring to the hardware chapter, check the LED on/off status of the main CPU board.
If the main CPU board has started up normally and the LED display indicates normal operation, a probable cause is a fault of the display system, such as the cable of the LCD unit not connected or a defective inverter board.
If the LED display is locked in the middle of the startup process, the probable causes include defective hardware (or installation failure) and the necessary software not installed.

- **Optical cable**

Check that the optical cable is free from excessive force and that it is not excessively bent. Check that the optical cable is connected firmly.
If no problems are found with the connection of the optical cable, replace the optical cable.

- **Connection on the LCD unit**

Check that the backlight and LCD cables are connected firmly to the corresponding connectors.
These cables are connected before shipment from FANUC. This check is, however, required because the cables may be disconnected during maintenance.

- **Display control card**

Check that the display control card installed on the main CPU board is engaged with the connector. If it is engaged properly, replace this card.

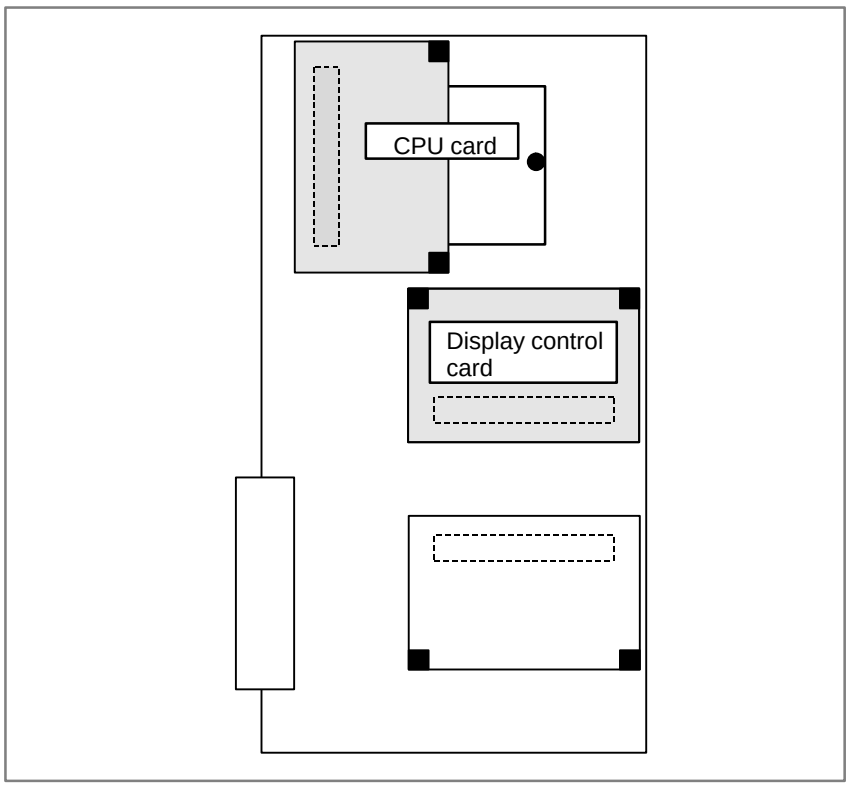
- **LCD unit**

Replace the LCD unit or the control printed circuit board located at the rear of the LCD unit

- **Main CPU board**

If any of the above actions does not solve the problem, replace the main CPU board and the CPU card.

- **Installation positions of the display control card and the CPU card**



7.8 THE DISPLAY ON THE LCD UNIT FLASHES

Causes and actions

This situation can occur only with the stand–alone type.
If a break is detected in the optical cable (HSSB) that connects the LCD unit to the main CPU board, the display on the LCD unit flashes.
The same situation occurs if the main CPU board is turned off while the power is on.

- **Power supply of the main CPU board**

  The display on the LCD unit flashes if the main CPU board is turned off, with the LCD kept on, while the power is on.

- **Break of the optical cable**

  Check that the optical cable is free from excessive force and that it is not excessively bent.
  If no problems are found with the connection of the cable, replace the optical cable.

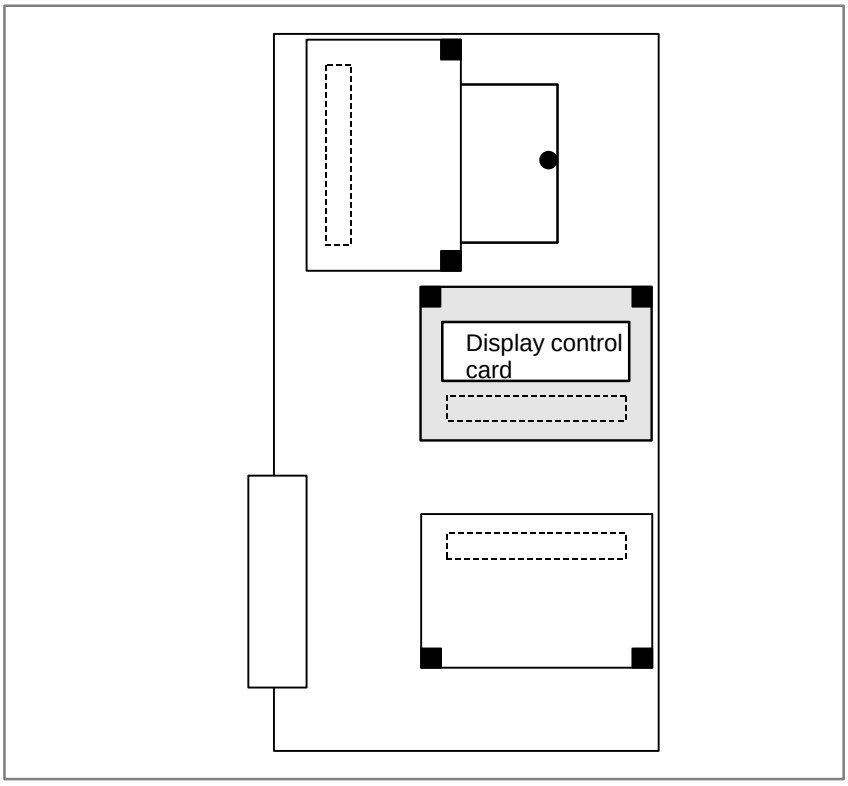
- **Display control card**

  Replace the display control card installed on the main CPU board.

- **LCD unit**

  Replace the LCD unit or the control printed circuit board located at the rear of the LCD unit

- **Installation position of the display control card**



7.9 INPUT FROM AND OUTPUT TO I/O DEVICES CANNOT BE PERFORMED INPUT/ OUTPUT CANNOT BE PERFORMED PROPERLY

Causes and actions

If the I/O Link is not established, if the signals from an I/O device cannot be input normally to the CNC, or if the signals from the CNC cannot be output to an I/O device, the probable causes include the following:

- The I/O device is not turned on, or the power supply is not at the appropriate voltage.
- The I/O Link cable is not connected correctly or appropriately.
- The input/output signals are not connected correctly.
- I/O Link allocation is not performed, or is not performed properly.

- **PMC alarm NO I/O DEVICE**

If "NO I/O DEVICE" is displayed on the alarm screen of the PMC, no I/O devices are recognized.

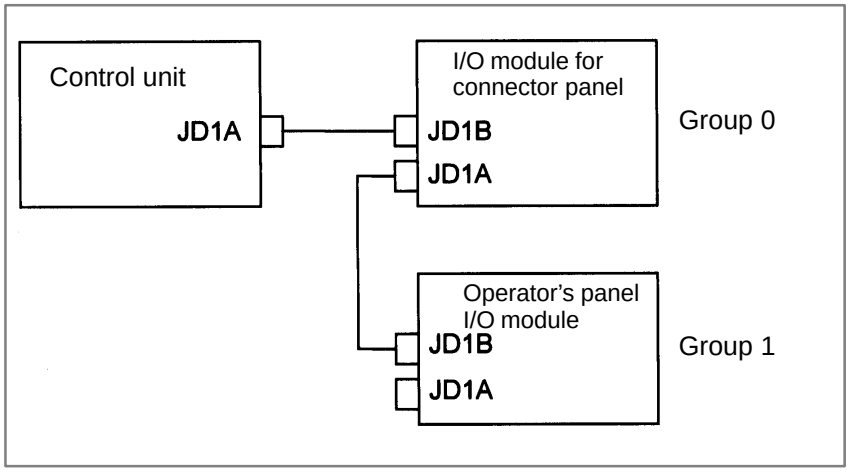
- **IOCHK screen of the PMC**

By selecting [PMCDGN], [IOCHK], and [IOLNK] in this order from the PMC screen, the I/O devices recognized by the CNC are displayed. From this screen, the devices that are connected normally can be determined.

Screen display example

GROUP	ID	KIND OF UNIT00
00	A9	I/O MODULE01
01	A8	OTHER UNIT

This example indicates that the I/O Link is as shown in the figure below.



- **Checking the power supplies of the I/O devices**

Check that the connected I/O devices are connected properly to the power supplies and that the voltages are as prescribed.
Check that the power–on sequence is correct.

Time at which an I/O device is to be turned on
Before the CNC is turned on or within 500 ms after the CNC is turned on

When the CNC is turned off, the I/O devices must also be turned off. (Otherwise, the I/O Link may not be established the next time the CNC is turned on.)

- **Connection of cables**

As in the example shown on the previous page, I/O Link cables are used to connect JD1As and JD1Bs.
JD1A represents an upper unit while JD1B represents a lower unit.
Check that the cables are connected correctly.

- **Connection of I/O signals**

Check that the input/output signals to be connected to each I/O device are connected correctly.
For operator's panel I/O modules and for connector panel I/O modules, also check that the 0 V or +24 V input signal is connected to the common pin and that the +24 V output signal is connected to the DO common pin.

- **I/O Link allocation**

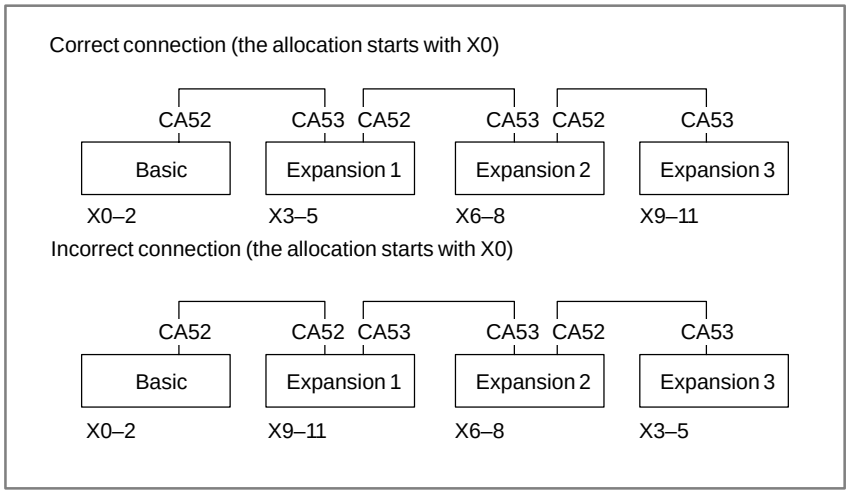
Check that I/O Link allocation has been performed correctly.
Selecting [EDIT] and then [MODULE] from the PMC screen causes the allocation edit screen to be displayed.
After editing allocation, write the changes to the FROM on the [I/O] screen. Otherwise, the changes will be lost when the power is turned off.
The checking of allocation requires a Ladder editing card.

7.10 IN A CONNECTOR PANEL I/O UNIT, DATA IS INPUT TO AN UNEXPECTED ADDRESS

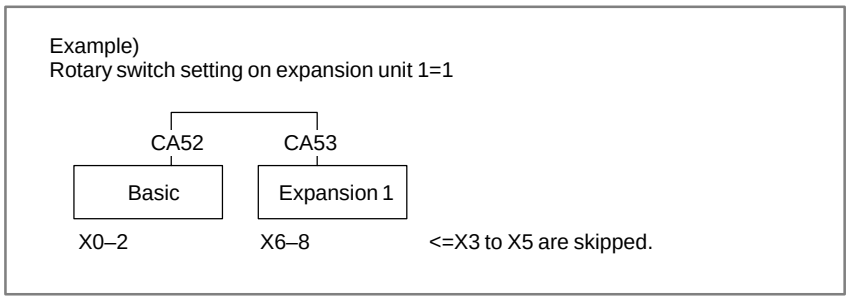
If data is input to an invalid address in a connector panel I/O unit (for example, data that should be input to X004 is actually input to X010 in a connector panel I/O unit), the most likely causes are as follows:

(1) The I/O Link allocation is wrong.

(2) The unit–to–unit cables (CA52–to–CA53) are not connected correctly.
If the connection is wrong, expansion unit 1 is allocated the address of expansion unit 3, as shown below.
→ Connect the unit–to–unit cables as shown below:



(3) The setting of the rotary switch on an expansion unit is wrong
If the rotary switch is set to 1, one unit number is skipped. If set to 2, two unit numbers are skipped. Usually, the setting must be 0. (For those units without a rotary switch, unit numbers cannot be skipped.)
→ See the following example and refer to the “FANUC Series 16*i*/18*i*/21*i*–B Connection Manual (Hardware)” (B–63523EN).



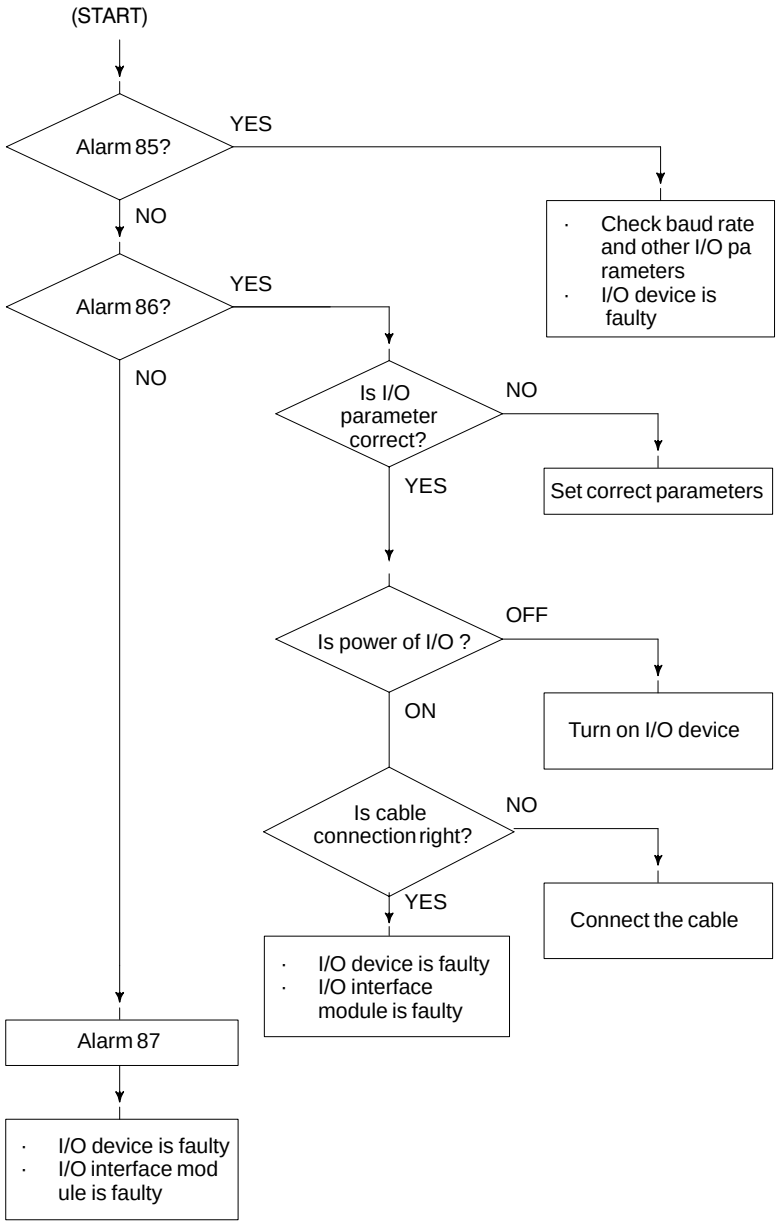
7.11 IN A CONNECTOR PANEL I/O UNIT, NO DATA IS OUTPUT TO AN EXPANSION UNIT

The most likely cause is that power is not being supplied to the expansion unit.

→ Check whether 24–V power is supplied to 18P and 50P of the expansion unit, DI and DO signals are not input and output.

→ Check whether 24–V power is supplied to 1P and 3P of the expansion unit, when DI signals are input and DO signals are not output.

7.12 ALARM 85 TO 87 (READER/PUNCHER INTERFACE ALARM)



Causes

(a) Parameters on reader/puncher interface are not correct.
Check the following setting data and parameters.

(b) External I/O device or host computer is faulty.

(c) I/O board is faulty.

(d) Cable between NC and I/O device is faulty.

Countermeasures

(a) Parameters on reader/puncher interface are not correct.
Check the following setting data and parameters:
<Setting>
PUNCH CODE=0 OR 1 (0: EIA,1:ISO)
Select ISO or EIA according to the type of I/O device.
If punch code does not match, alarm 86 will generate.

<Parameter>

Function \ Value of parameter 0020		0	1	2	3	
Feed		0101#7	0111#7	0121#7	0131#7	
Data input code		0101#3	0111#3	0121#3	0131#3	
Stop bit		0101#0	0111#0	0121#0	0131#0	
Type of I/O device		102	112	122	132	
Baud rate		103	113	123	133	
Communication method	0135#3	–	–	–	0	1
		RS–232C				RS–422
Connector		MOTHER BOARD			OPTION–1 BOARD	
		JD36A		JD36B	JD28A	JD6A

NOTE
1 Numbers in the table indicate parameters and bit numbers.
Example) 101#7:bit7 of parameter 101.
2 For data communications by RS–422, refer to parameters 134 and 135.

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2
0111								
0121								
0131								

#7(NFD) 0 : Feed is output before and after data in data output (FANUC PPR)
1 : Feed is not output (standard).

#3(ASI) 0 : Data input code is EIA or ISO (automatic recognition)
1 : Data input code is ASCII.

#0(SB2) 0 : No. of stop bits is 1.
1 : No. of stop bits is 2.

0102 0112 0122 0132	Type of I/O device

Value	TYPE OF I/O DEVICE
0	RS–232–C (for other than the following)
1	FANUC CASSETTE B1/B2 (bubble cassette)
2	FANUC CASSETTE F1 (Old type FLOPPY CASSETTE ADAPTOR)
3	FANUC PROGRAM FILE Mate, FANUC FA CARD ADAPTOR FANUC FLOPPY CASSETTE ADAPTOR, FANUC SYSTEM P–MODEL H, FANUC Handy File
4	Not used
5	Portable tape reader
6	FANUC PPR, FANUC SYSTEM P–MODEL G, FANUC SYSTEM P–MODEL H

0103 0113 0123 0133	Baud rete

Value	Baud rate
7	600
8	1200
9	2400
10	4800
11	9600
12	19200

When bit#3 of parameter no. 0135=1 (RS–422 interface), the following setting is also available.

Value	Baud rate
13	38400
14	76800
15	86400

Check the following parameters also, when parameter no.0020 is 3.

	#7	#6	#5	#4	#3	#2	#1	#0
0134			CLK	NCD		SYN	PRY	

#5(CLK) 0 : Internal clock is used for baud rate clock of RS–422 interface.
1 : External clock is used for baud rate clock of RS–422 interface.

#4(NCD) 0 : CD (signal quality detection) of RS–232C interface is checked.
1 : CD (signal quality detection) of RS–232C interface is not checked.

#2(SYN) 0 : In protocol B, NC reset/alarm is not informed to the host.
1 : In protocol B, NC reset/alarm is informed to the host by SYN and NAK code.

#1(PRY) 0 : No parity bit
1 : With parity bit

	#7	#6	#5	#4	#3	#2	#1	#0
0135	RMS				R42	PRA	ETX	ASC

#7(RMS) In protocol A, status of remote / tape operation of SAT command is

0 : Always transmitted by 0.
1 : Transmitted by the contents of remote / tape switching request issued by SET command from the CNC.

#3(R42) 0 : Interface is of RS–232C.
1 : Interface is of RS–422.

#2(PRA) 0 : Communication protocol is protocol A
1 : Communication protocol is protocol B

#1(ETX) 0 : End code of protocol A or extended protocol A is CR of ASCII/ISO.
1 : End code of protocol A or extended protocol A is ETX of ASCII/ISO.

#0(ASC) 0 : All the communication codes except for NC data is ISO code.
1 : All the communication codes except for NC data is ASCII code.

(b) External I/O device or Host computer is in trouble

(i) Check whether the setting on communication of external I/O device or host computer is the same as that of the CNC. (baud rate, stop bits,etc.) If they are not the same, change the setting.

(ii) When spare I/O device presents, check whether it is possible to realize communication using the spare I/O device.

(c) Spindle module or communication control module is faulty

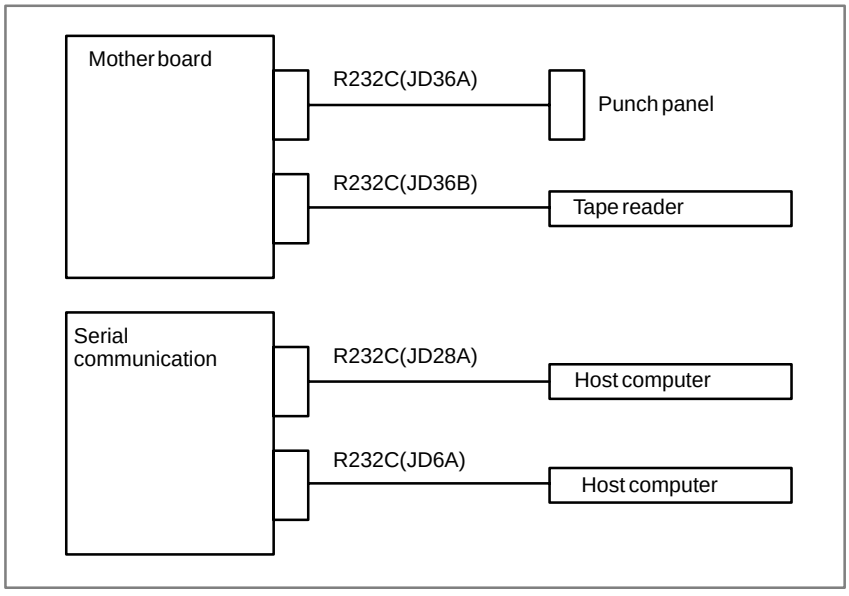
(i) When parameter no.0020 is 0 or 1 or 2 (JD36A,JD36B of Mother board) Replace the module since spindle module may be faulty.

(ii) When parameter no. 0020 is 3 (JD28A,JD6A of option 1 board) Because communication control module (5) may be faulty, replace the module.

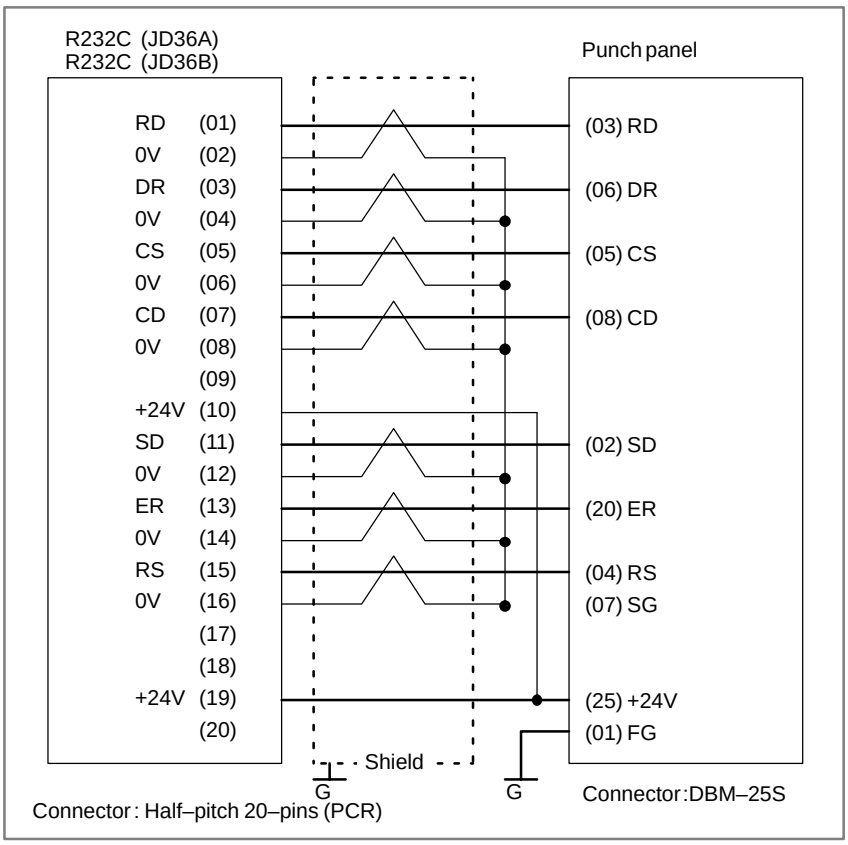
(d) Cable between NC and I/O device is faulty.

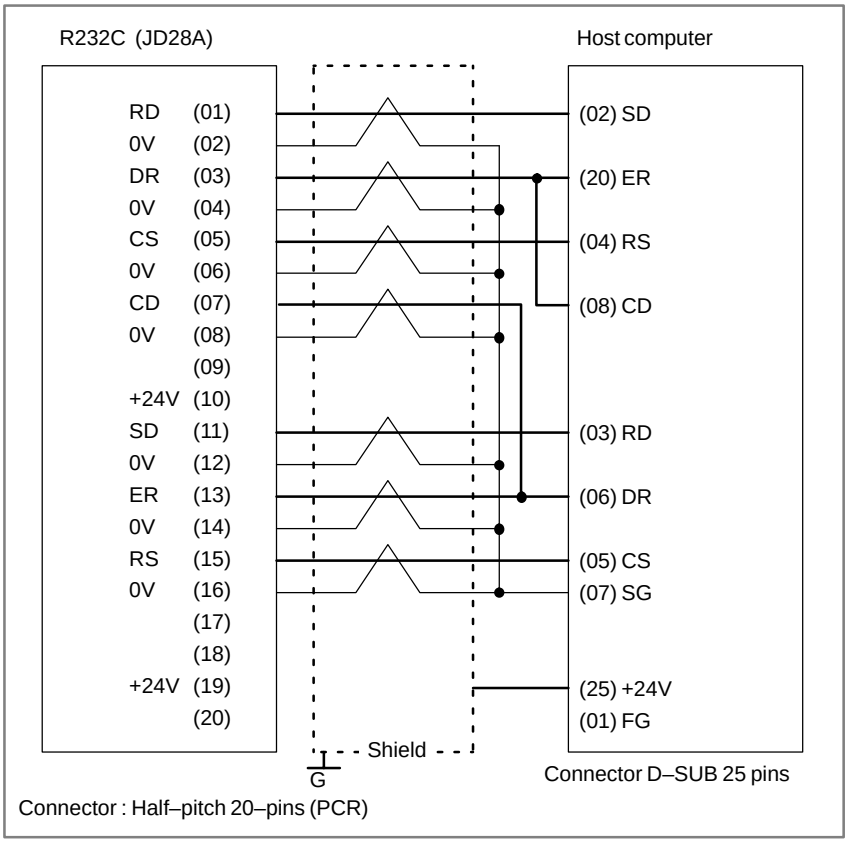
Check the cable for disconnection or wrong connection.

<Connection>

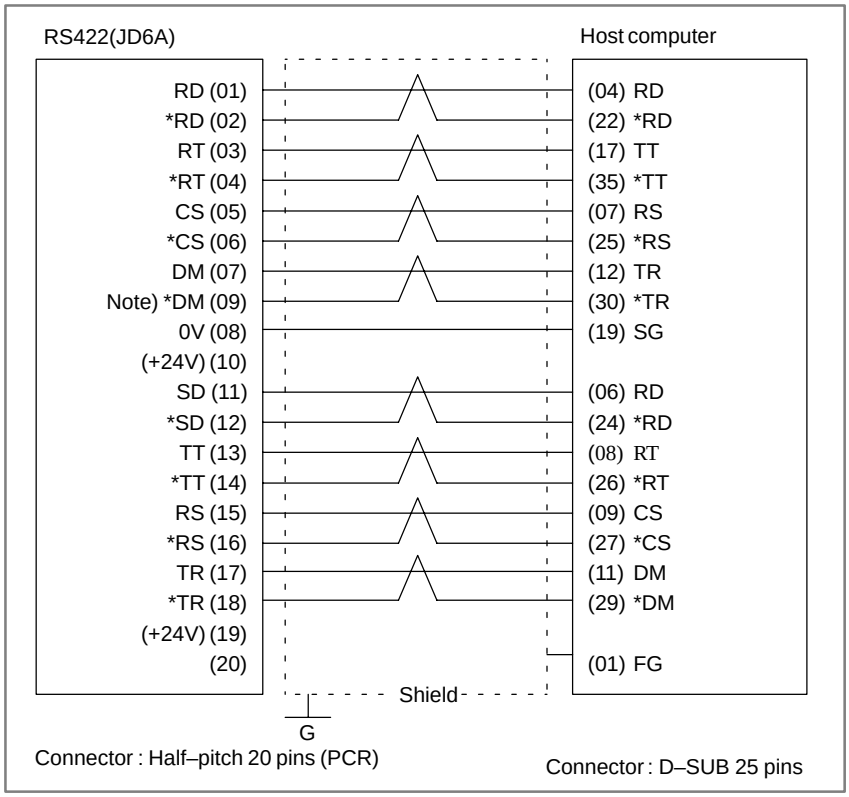


< Cable connection>





CAUTION
1 When CS is not used, connect it to RS.
2 For protocol A or extended protocol A: When DR is not used, connect it to ER. Always connect CD to ER.



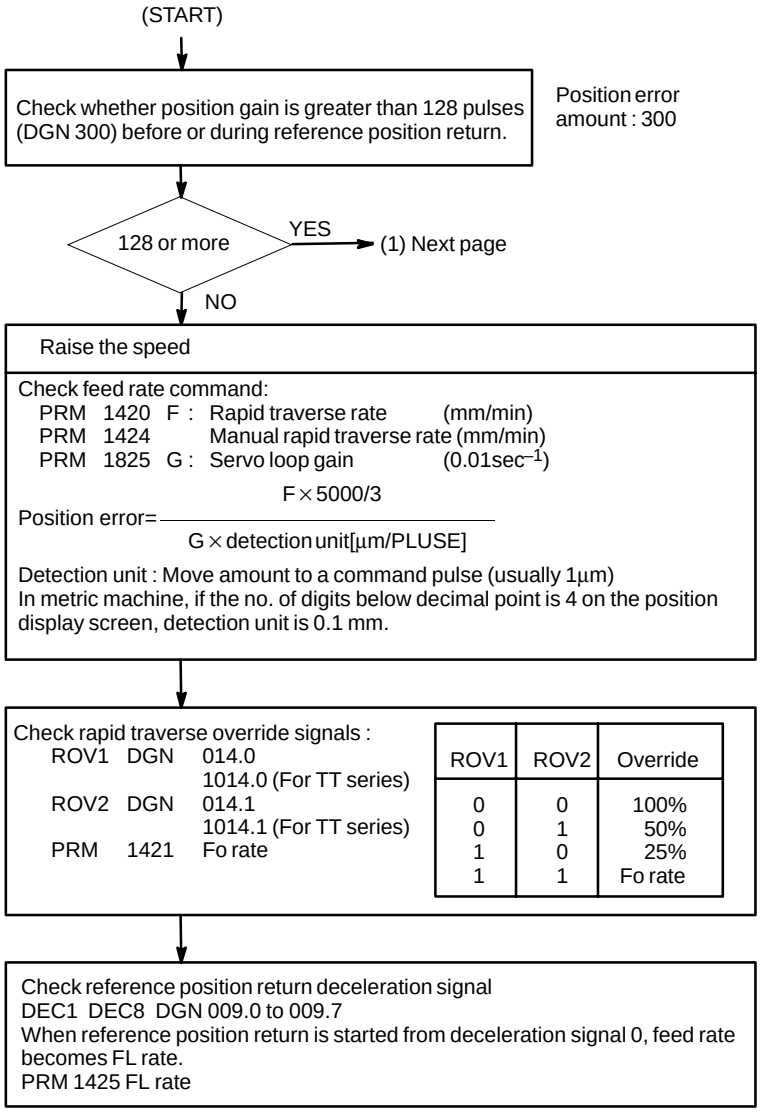
CAUTION
Always use a twisted pair cable.

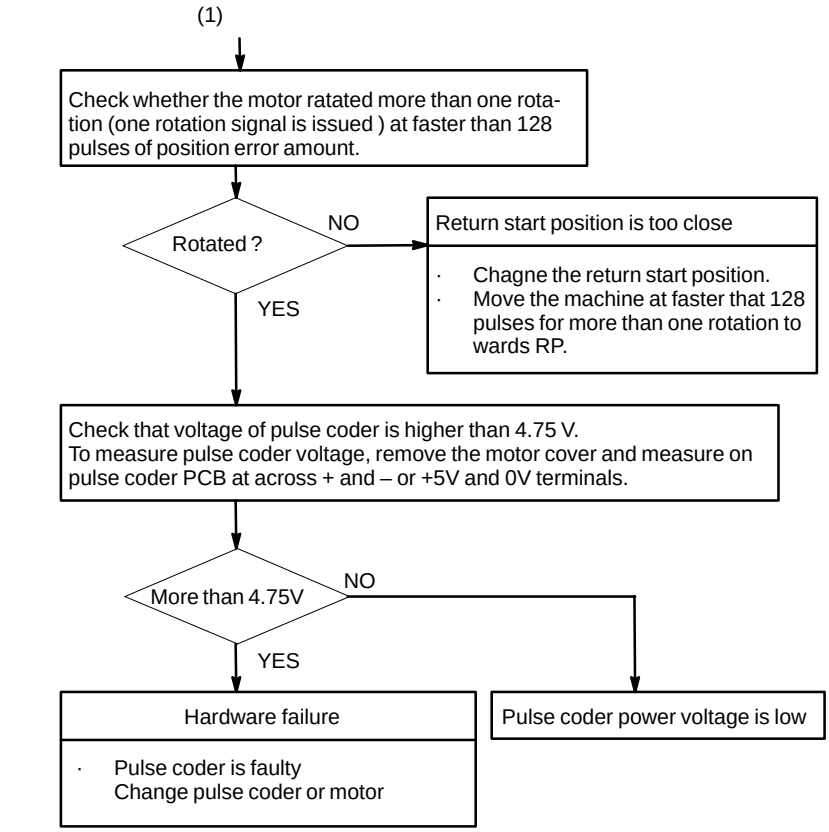
7.13 ALARM 90 (REFERENCE POSITION RETURN IS ABNORMAL)

Contents

Reference position return was executed when the following condition is not satisfied:
The CNC received one rotation signal at least one time when the axis is moving to the reference position at a speed higher than a speed equivalent to 128 pulses of position error amount (DGN300).

Countermeasures





CAUTION

After the pulse coder or motor is exchanged, reference position or machine's standard point may be different from former one. Please set it correctly.

- **Reference**

A speed more than 128 pulses is required because if speed is lower that this, one–rotation signal does not function stably, causing improper position detection.
If bit 0 of parameter No. 2000 is set to 1, a speed corresponding to a positional deviation of 1280 pulses or more is required.
Parameter No. 1836 can be set to 128 or less, as the minimum positional deviation with which reference position return is possible. (If the parameter is set to 0, 128 is assumed as the minimum positional deviation. If bit 0 of parameter No. 2000 is set to 1, a value equal to ten times the set value is used for checking.)

7.14 ALARM 300 (REQUEST FOR REFERENCE POSITION RETURN)

Absolute position data in the serial pulse coder was lost.
(This alarm will be generated when serial pulse coder is exchanged or position feedback signal cable of the serial pulse coder is disconnected).

Remedies

Machine position must be memorized using the following method:

- **When reference position return function is present**

  (1) Execute manual reference position return only for an axis for which this alarm was generated.When manual reference position return cannot be executed because of an another alarm, set parameter 1815#5 to 0 and release the alarm and perform manual operation.

  (2) Press RESET key at the end of reference position return to release the alarm.

- **When reference position return function is not present**

  Execute dogless reference position setting to memorize the reference position.

- **When serial pulse coder is changed**

  Since the reference position is different from the former one, change the grid shift value (PRM 1850) to correct the position.

Related parameters

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC x	APZx				

#5(APCx) 0 : Position detector is incremental pulse coder.
1 : Position detector is absolute pulse coder.

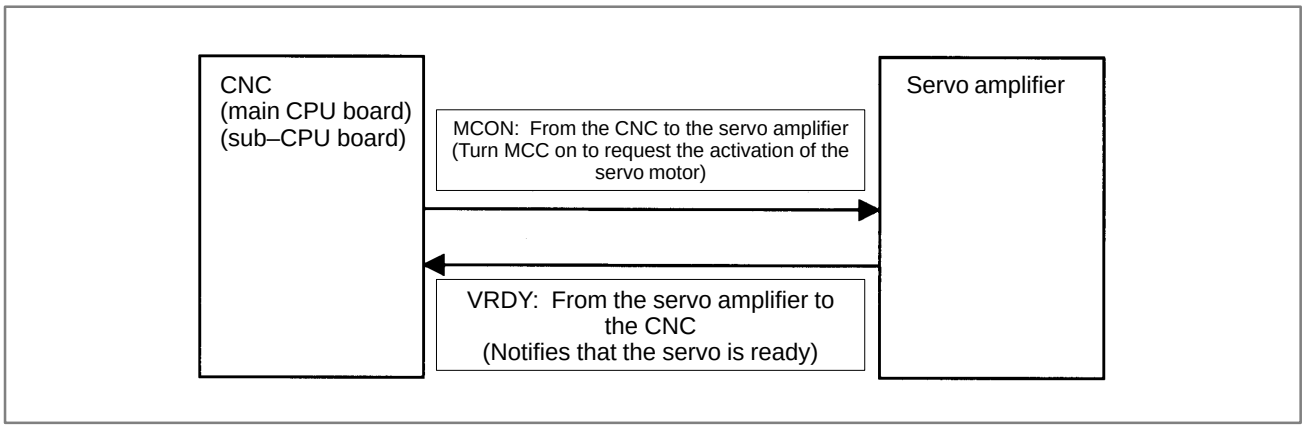
#4(APZx) Reference position of absolute pulse coder is :
0 : not established
1 : established

7.15 ALARM 401 (V READY OFF)

Causes and actions

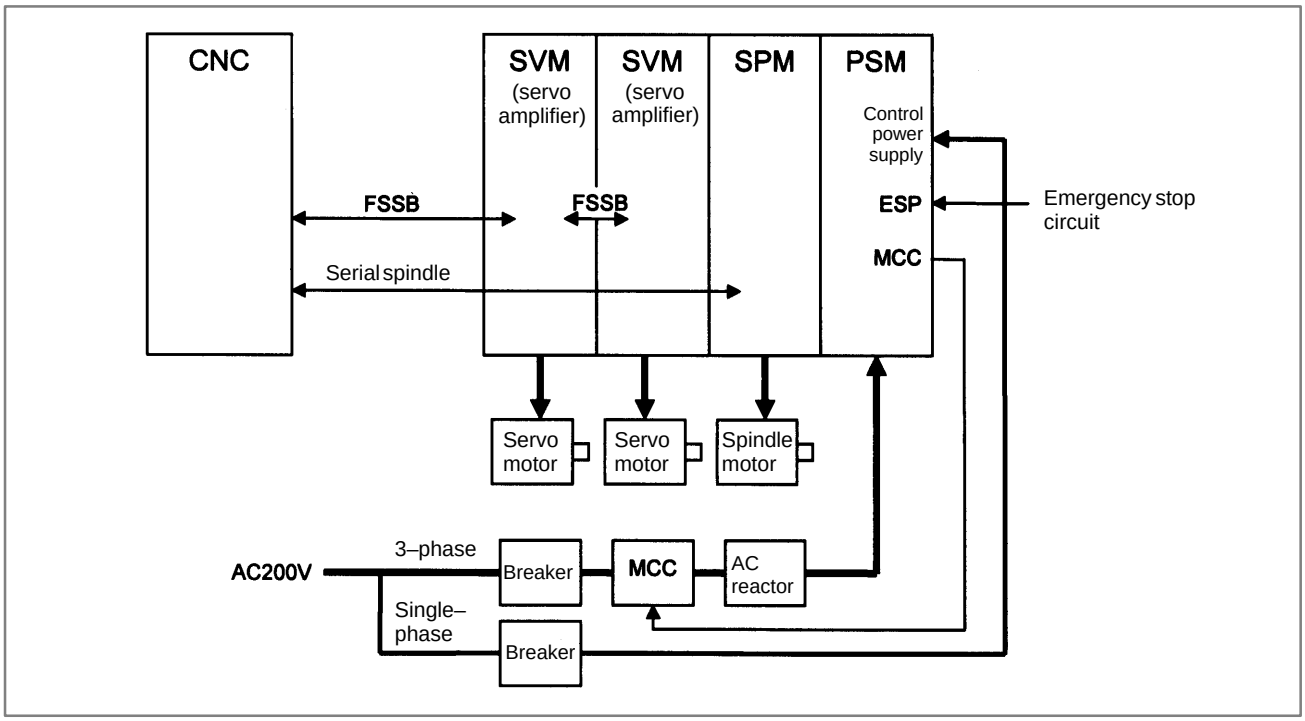
This alarm is issued if the servo ready signal (VRDY) of a servo amplifier does not turn on or if the signal turns off during operation.
There are cases in which this alarm is issued because another servo alarm is issued. If this occurs, first take the action for the first alarm.
Check the power magnetic circuit around the amplifier. The servo amplifier or the axis control cards on the CNC may be defective.

- **VRDY**



The exchange of this information is performed via the FSSB (optical cable).

- **Example of connection around the amplifier (Typical example)**



Check items

- Is the PSM control power supply on?
- Has an emergency stop been canceled?
- Is a terminating connector connected to the JX1B connector of the terminating amplifier?
- Is MCC on? If there is an external MCC sequence in addition to the MCC contact of the PSM, check that sequence also.
- Is the power for driving MCC supplied?
- Is the breaker on?
- Has some alarm been issued in the PSM or SPM?

- **Replacing the servo amplifier**

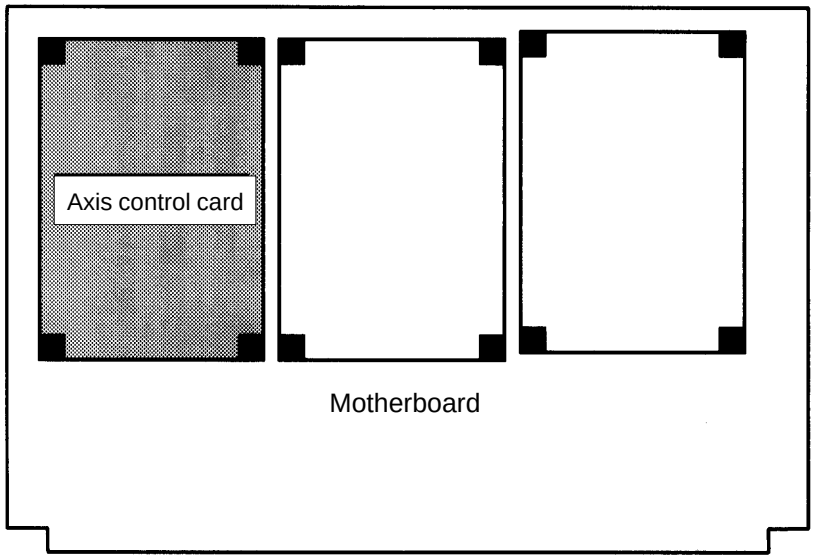
If no problem is found in the power magnetic circuit around the amplifier, replace the servo amplifier.

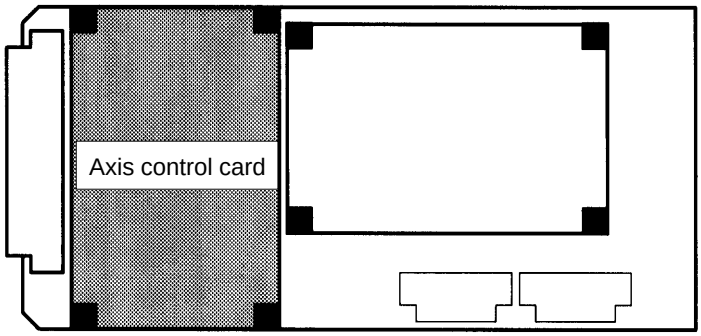
- **Replacing the axis control cards**

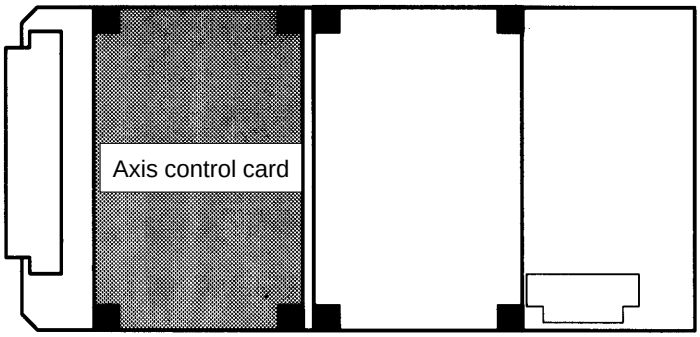
If the above action does not solve the problem, replace the axis control cards.

- **Installation positions of the axis control cards**

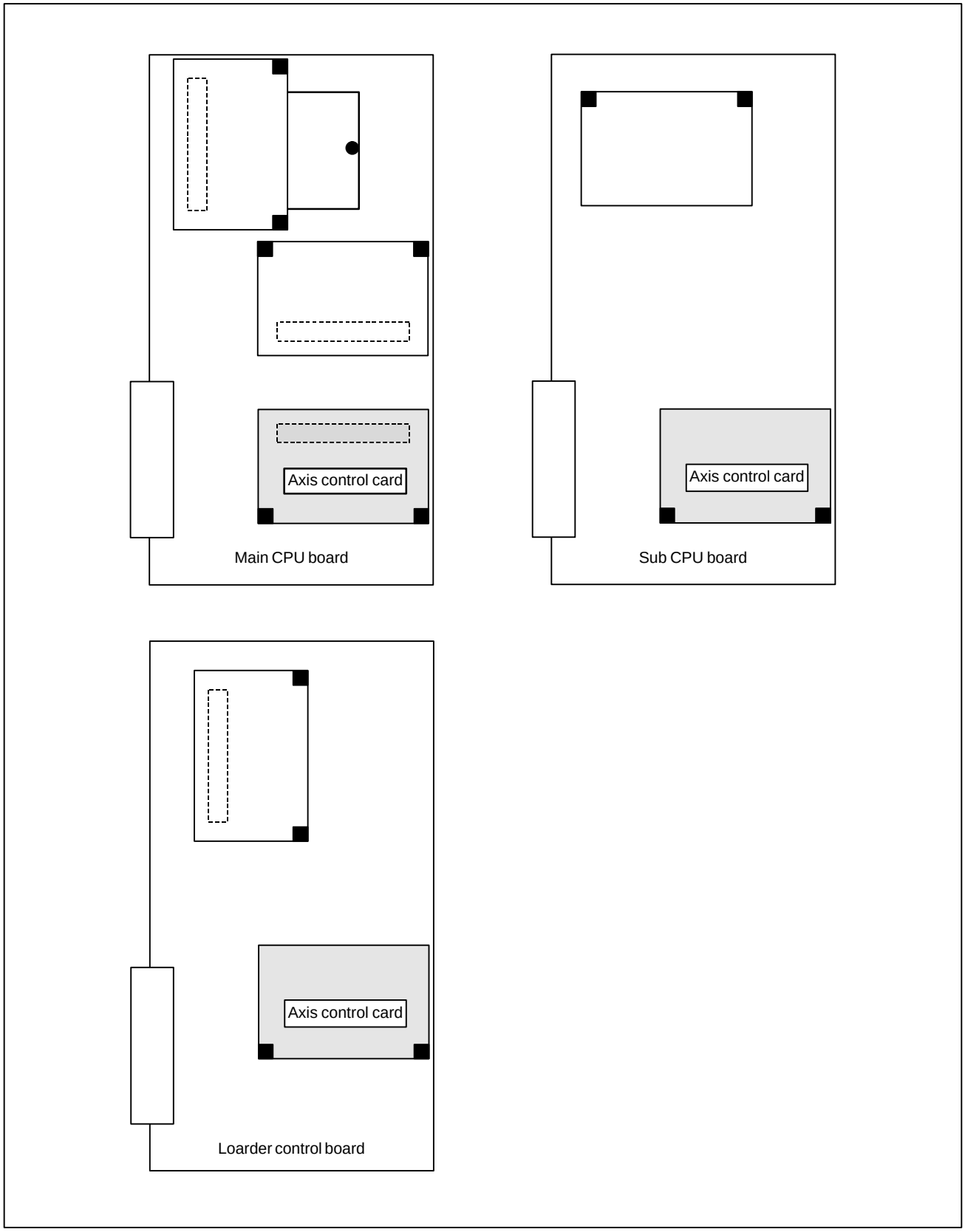
[For the LCD–mounted type]







[For the stand–alone type]

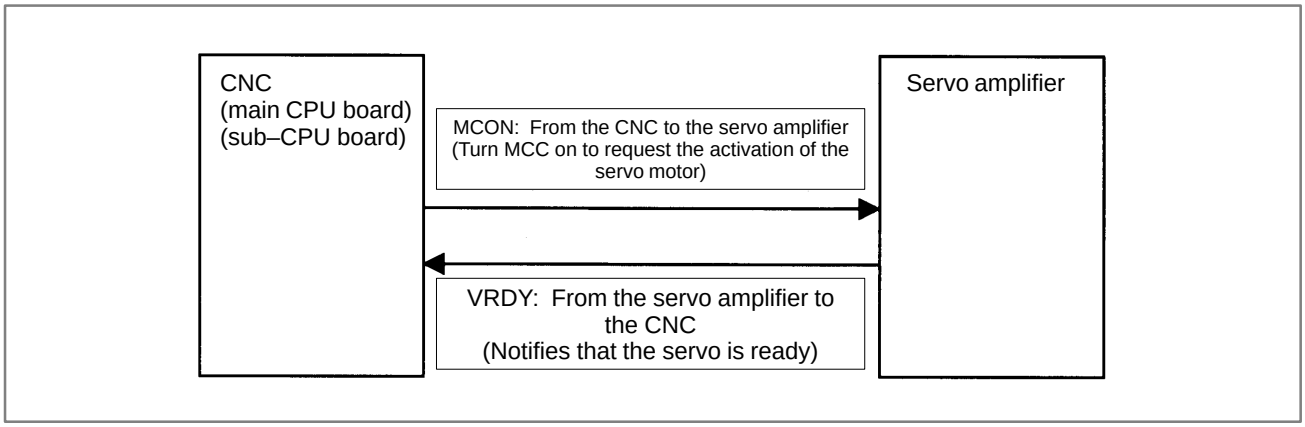


7.16 ALARM 404 (V READY ON)

Causes and actions

This alarm is issued if the servo ready signal (VRDY) of a servo amplifier remains on.
The servo amplifier or the axis control cards on the CNC may be defective.

- **VRDY**



The exchange of this information is performed via the FSSB (optical cable).
This alarm is issued if VRDY remains on when the CNC turns MCON off or if VRDY turns on before the CNC turns MCON on.

- **Replacing the servo amplifier**

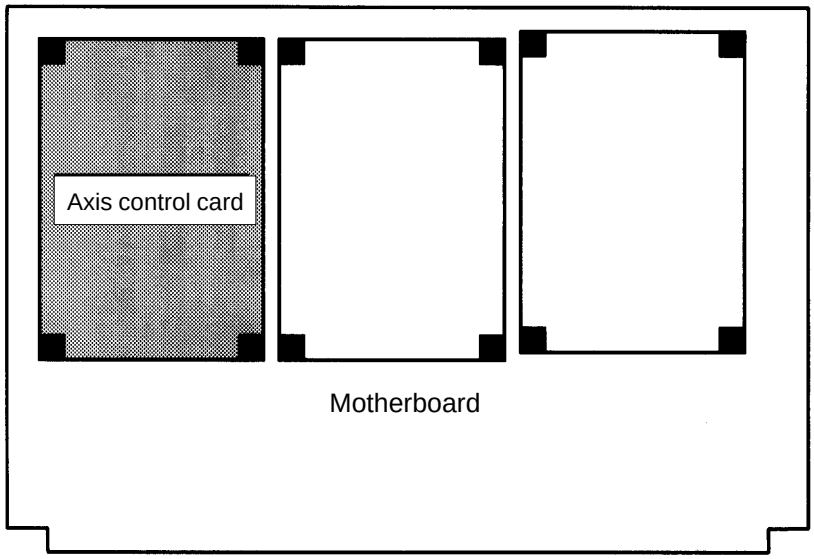
The servo amplifier may be defective. Replace the servo amplifier.

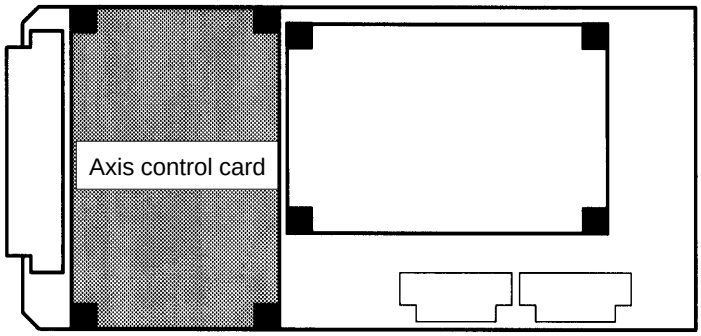
- **Replacing the axis control cards**

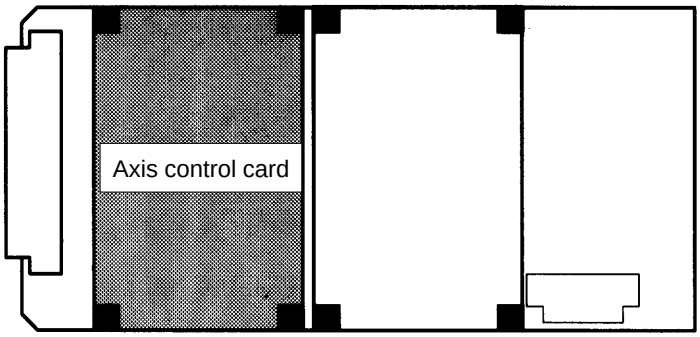
If replacing the servo amplifier does not solve the problem, replace the axis control cards.

- **Installation positions of the axis control cards**

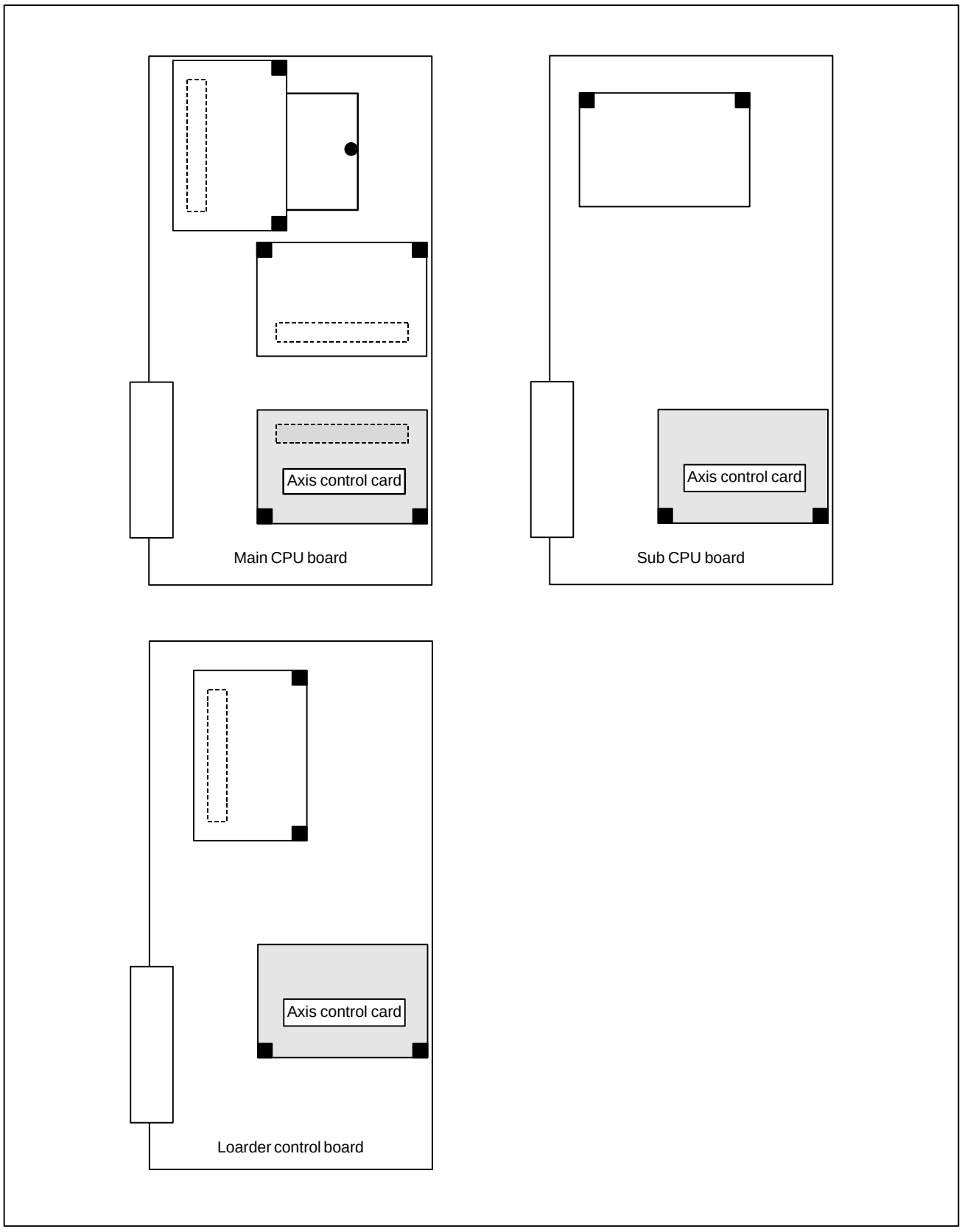
[For the LCD–mounted type]







[For the stand–alone type]



7.17 ALARM 462 (SEND CNC DATA FAILED)

ALARM 463 (SEND SLAVE DATA FAILED)

Causes and actions

Alarm 462 is issued if a slave (servo amplifier) cannot receive correct data due to an FSSB communication error.
Alarm 463 is issued if the CNC cannot receive correct data due to an FSSB communication error.
If these alarms are issued, the alarm message indicates the number of the defective axis (axis name).

- **Servo amplifier or optical cable**

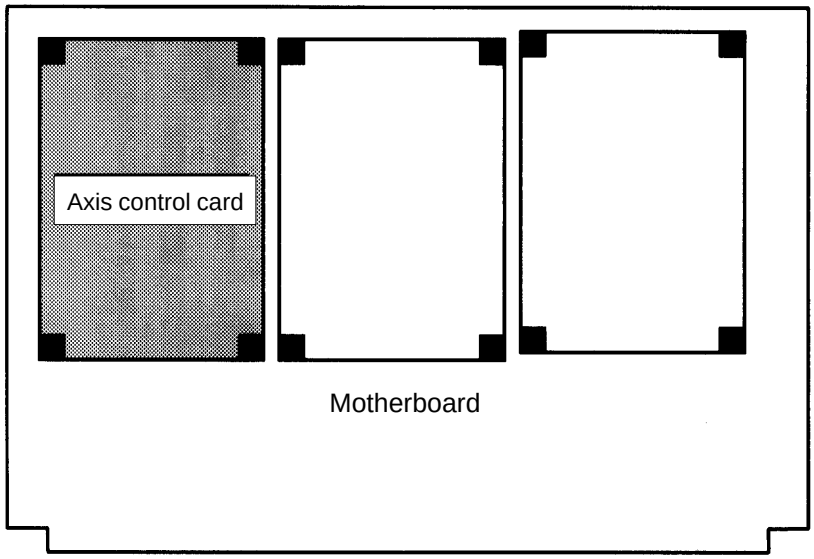
  Any of the optical cables between the CNC control unit and the amplifier corresponding to the axis number indicated in the alarm message may be defective.
  Or, any of the first amplifier to the amplifier corresponding to that axis number may be defective.

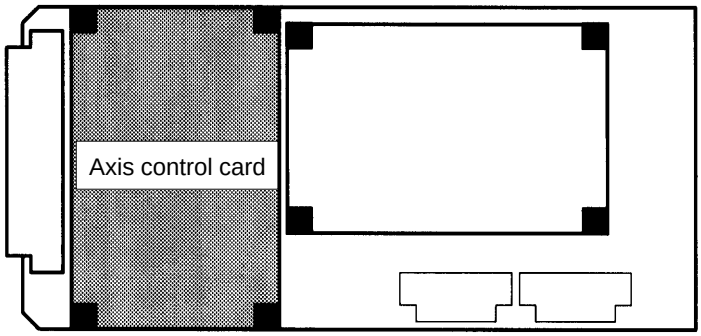
- **Axis control cards**

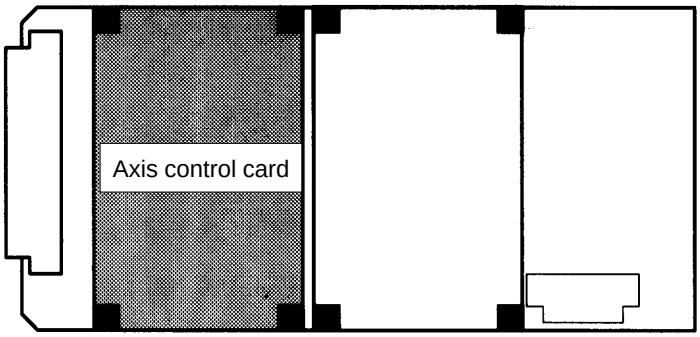
  The axis control cards installed on the CNC may be defective.

- **Installation positions of the axis control cards**

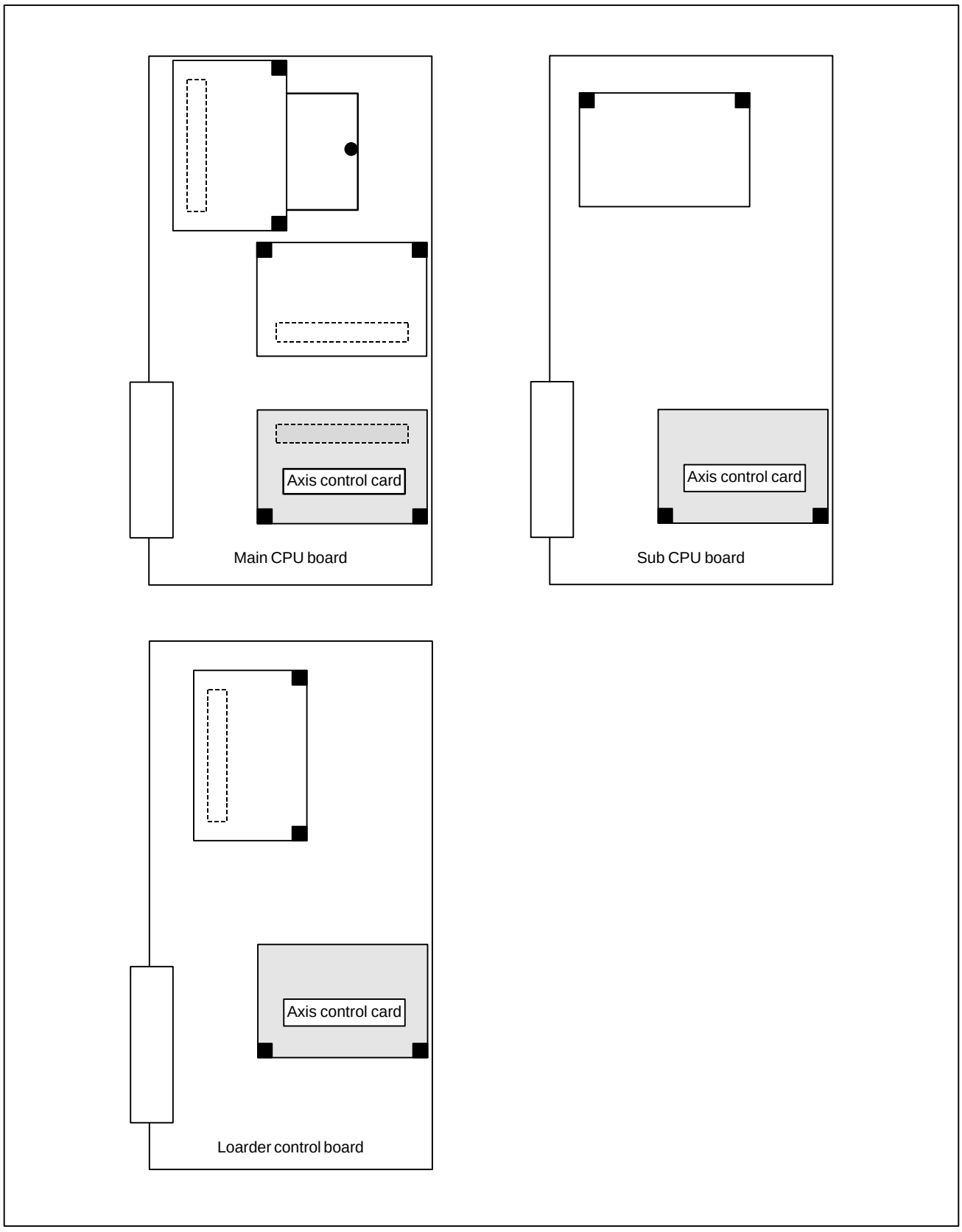
[For the LCD–mounted type]







[For the stand–alone type]



7.18 ALARM 417 (DIGITAL SERVO SYSTEM IS ABNORMAL)

Digital servo parameters are abnormal.
(Digital servo parameters are set incorrectly.)

- **Causes**

1 Confirm the setting value of the following parameters:
PRM 2020 : Motor format number
PRM 2022 : Motor rotation direction
PRM 2023 : Number of pulses of velocity feedbacks
PRM 2024 : Number of pulses of position feedback
PRM 1023 : Servo axis number
PRM 2084 : Flexible feed gear ratio
PRM 2085 : Flexible feed gear ratio
Confirm the details with diagnosis function of CNC side.
2 Change the setting of this parameter to 0.
PRM 2047 : Observer parameter
3 Perform initial setting of digital servo parameters.
Refer to setcion 5.1 “Initial Setting of Servo Parameters” .

This data indicates the cause of servo alarm No. 417, detected by the NC. If the alarm is detected by the servo, the PRM bit (bit 4 of DGN No. 0203) is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
0280		AXS		DIR	PLS	PLC		MOT

#0(MOT) : The motor type specified in parameter No. 2020 falls outside the predetermined range.

#2(PLC) : The number of velocity feedback pulses per motor revolution, specified in parameter No. 2023, is zero or less. The value is invalid.

#3(PLS) : The number of position feedback pulses per motor revolution, specified in parameter No. 2024, is zero or less. The value is invalid.

#4(DIR) : The wrong direction of rotation for the motor is specified in parameter No. 2022 (the value is other than 111 or –111).

#6(AXS) : In parameter No. 1023 (servo axis number), a value that falls outside the range of 1 to the number of controlled axes is specified. (For example, 4 is specified instead of 3.) Alternatively, the values specified in the parameter are not consecutive.

7.19 ALARM 700 (OVERHEAT: CONTROL UNIT)

Causes and actions

This alarm is issued if the ambient temperature of the CNC control unit is abnormally high. As an installation condition, the ambient temperature of the CNC must not exceed 58°C.

- **Ambient temperature**

A temperature monitoring circuit is installed on the motherboard (main CPU board), and causes this alarm to be issued if the ambient temperature is abnormally high.
Take appropriate action to the cabinet that houses the CNC control unit so that the temperature falls within the proper temperature range (0 to 58°C).
If it is obvious that the ambient temperature is not abnormal, the motherboard (main CPU board) may be defective.

7.20 ALARM 701 (OVERHEAT: FAN MOTOR)

Causes and actions

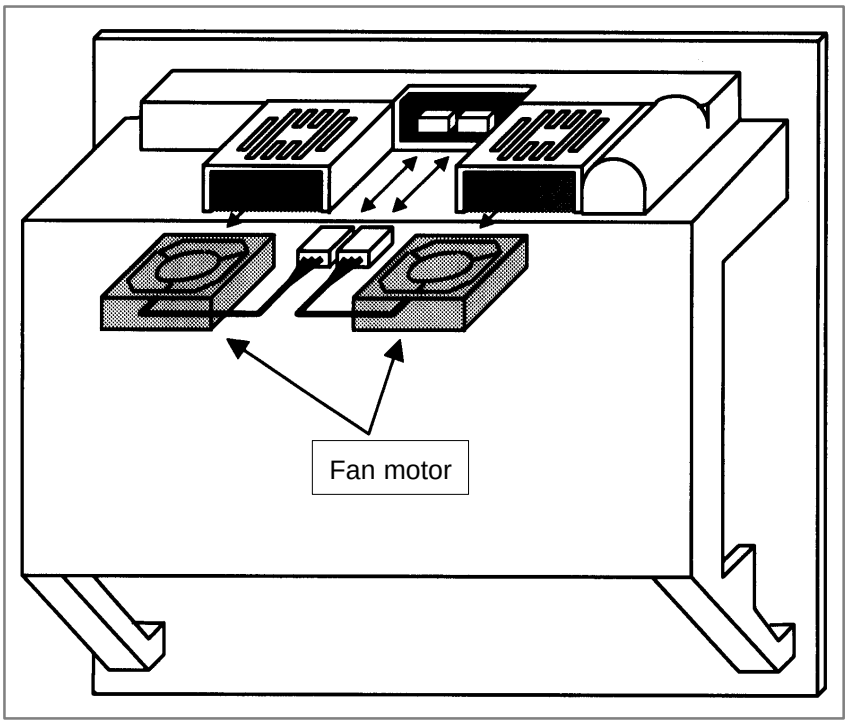
This alarm is issued if a fault occurs in any of the fan motors, such as the stoppage of a fan motor during the operation of the CNC.

- **Fan motors**

Fan motors are installed in the uppermost portion of the CNC control unit. Each fan motor is attached with an alarm detector circuit, which notifies the CNC of a fault such as the stoppage of the fan motor, thereby issuing this alarm.
If this alarm is issued, replace the fan motor.

[For the LCD–mounted type]

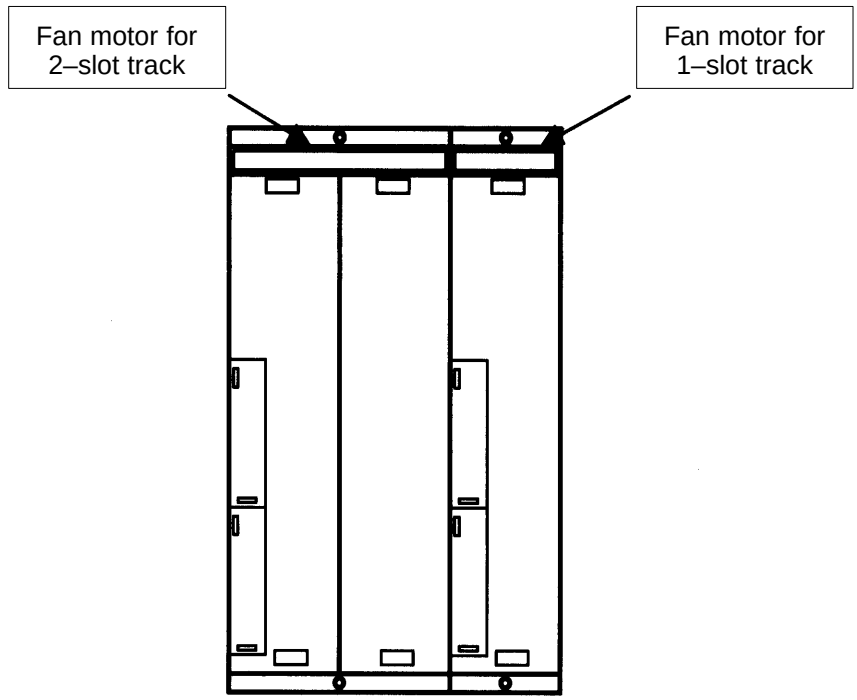
For units without option slots



Specifications of fan motors

	Ordering information	Quantity required
Unit without option slots	A02B–0236–K120	Two
Unit with two option slots	A02B–0281–K121	Two
Unit with three option slots	A02B–0281–K121	Two
	A02B–0236–K122	Two
Unit with four option slots	A02B–0281–K121	Four

[For the stand–alone type] For the stand–alone type, a fan can be replaced together with its case.



Specifications of fan motors

	Ordering information
For 1–slot track	A02B–0265–C101
For 2–slot track	A02B–0260–C021

7.21 ALARM 5134 (FSSB: OPEN READY TIME OUT)

ALARM 5135 (FSSB: ERROR MODE)

ALARM 5137 (FSSB: CONFIGURATION ERROR)

ALARM 5197 (FSSB: OPEN TIME OUT)

ALARM 5198 (FSSB: ID DATA NOT READ)

Causes and actions

These alarms are issued if any of the axis control cards and the slaves (such as servo amplifiers) and optical cables connected to the FSSB is defective.

No.	Message	Description
5134	FSSB: OPEN READY TIME OUT	The FSSB did not become ready to open during initialization.
5135	FSSB: ERROR MODE	The FSSB entered an error mode.
5137	FSSB: CONFIGURATION ERROR	The FSSB detected a configuration error.
5197	FSSB: OPEN TIME OUT	The FSSB did not open when the CNC had allowed the FSSB to open.
5198	FSSB: ID DATA NOT READ	The initial ID information for the amplifier cannot be read because of a failure in the temporary assignment.

- **Processing of the FSSB at power on**

The processing of the FSSB at power on is as described below:

1 The CNC initializes the FSSB and the servo.
2 The servo returns the first ready signal.
3 The first ITP interrupt is generated.
4 The CNC waits for the FSSB to become ready to open.
5 The CNC checks that the FSSB did not detect a configuration error.
6 The CNC allows the FSSB to open.
7 The CNC checks that the FSSB has opened.
8 The servo returns the second ready signal.
9 Normal operation

If the FSSB does not become ready to open in 4, alarm 5134 is issued.
If an error is detected in 5, alarm 5137 is issued.
If the FSSB does not open within a fixed period of time, alarm 5197 is issued.
If the ready signal is not returned within a fixed period of time, alarm 5198 is issued.

- **Checking the parameter settings**

  Check that the FSSB–related parameters are set correctly.

- **Power supplies of the servo amplifiers**

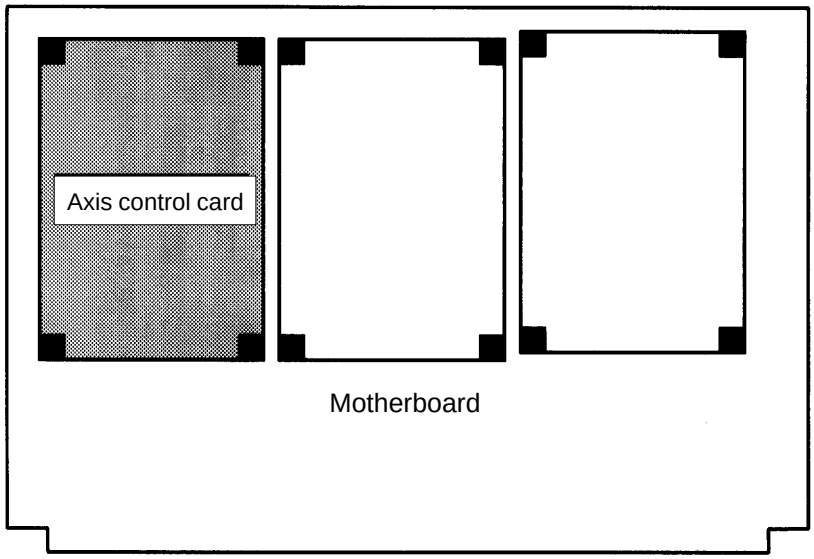
  Check the power supplies of the servo amplifiers connected to the FSSB.

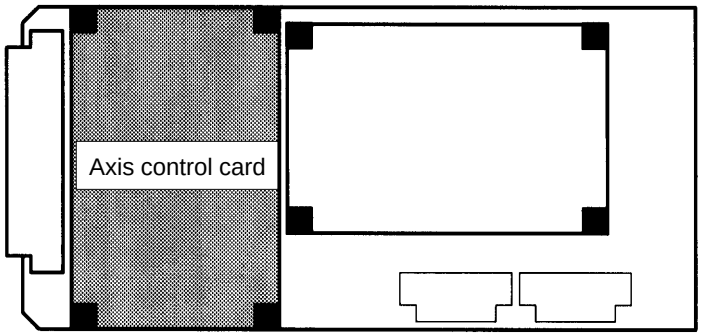
- **Replacing the axis control cards, optical cables, and servo amplifiers**

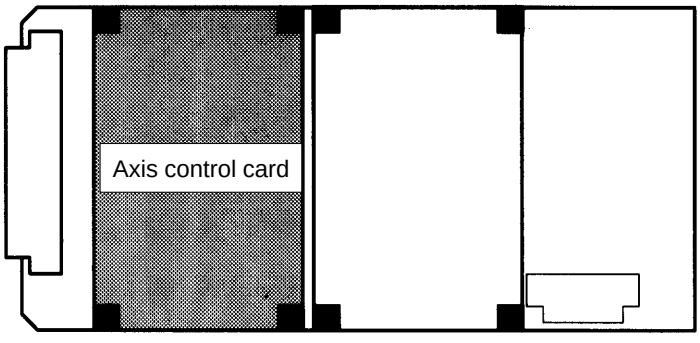
  Replace the axis control cards on the CNC.
  Replace the optical cables and servo amplifiers connected to the FSSB, one at a time, to identify the defective item.

- **Installation positions of the axis control cards**

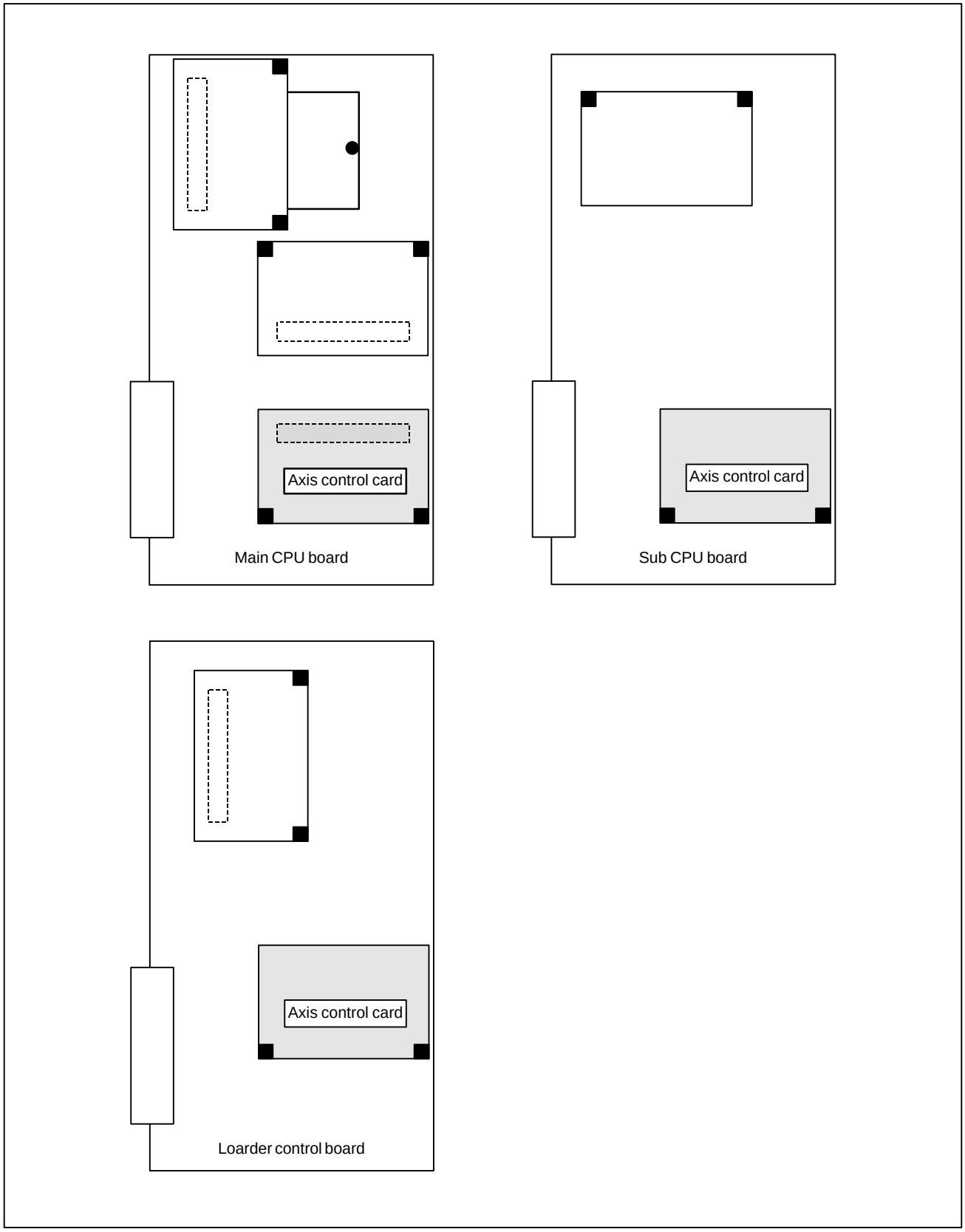
[For the LCD–mounted type]







[For the stand–alone type]



7.22 ALARM 5136 (FSSB: NUMBER OF AMPS IS SMALL)

Causes and actions

The number of servo amplifiers recognized by the FSSB is insufficient, compared with the number of controlled axes.

- **FSSB setting screen**

  If this alarm is issued, display the amplifier setting screen from the FSSB setting screen. Only the servo amplifiers recognized on the FSSB are displayed.

- **Optical cable or servo amplifier**

  The optical cable that connects together the last recognized amplifier and the next one may be defective.
  Or, either of the amplifiers connected together with that optical cable may be defective. Check the power supplies of the amplifiers.

- **Power fault of a servo amplifier**

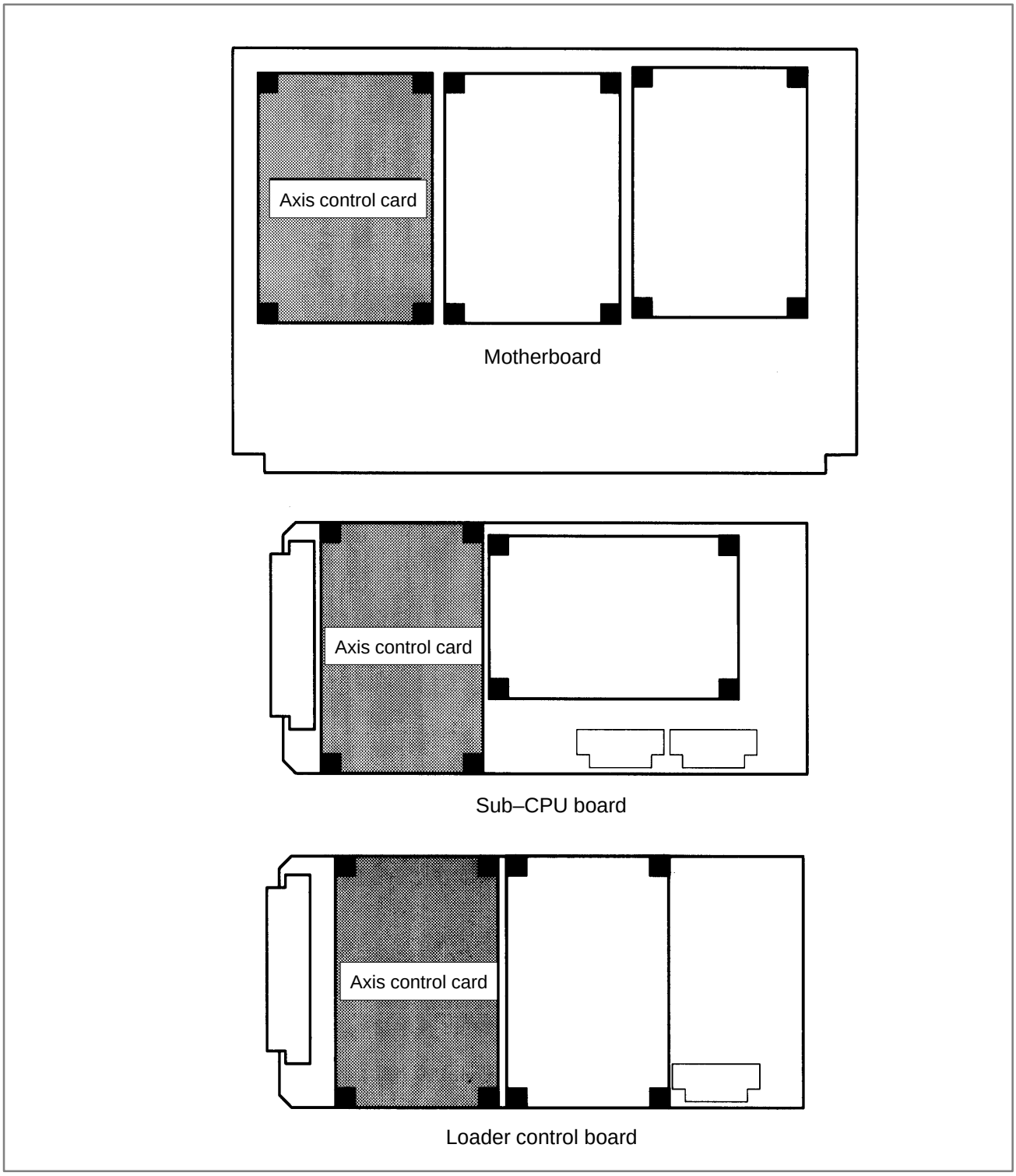
  This alarm may be issued if a power fault occurs in a servo amplifier. A power fault occurs if the amplifier control power supply voltage drops, if the +5 V conductor of the pulse coder cable is ground, or for other reasons.

- **Axis control cards**

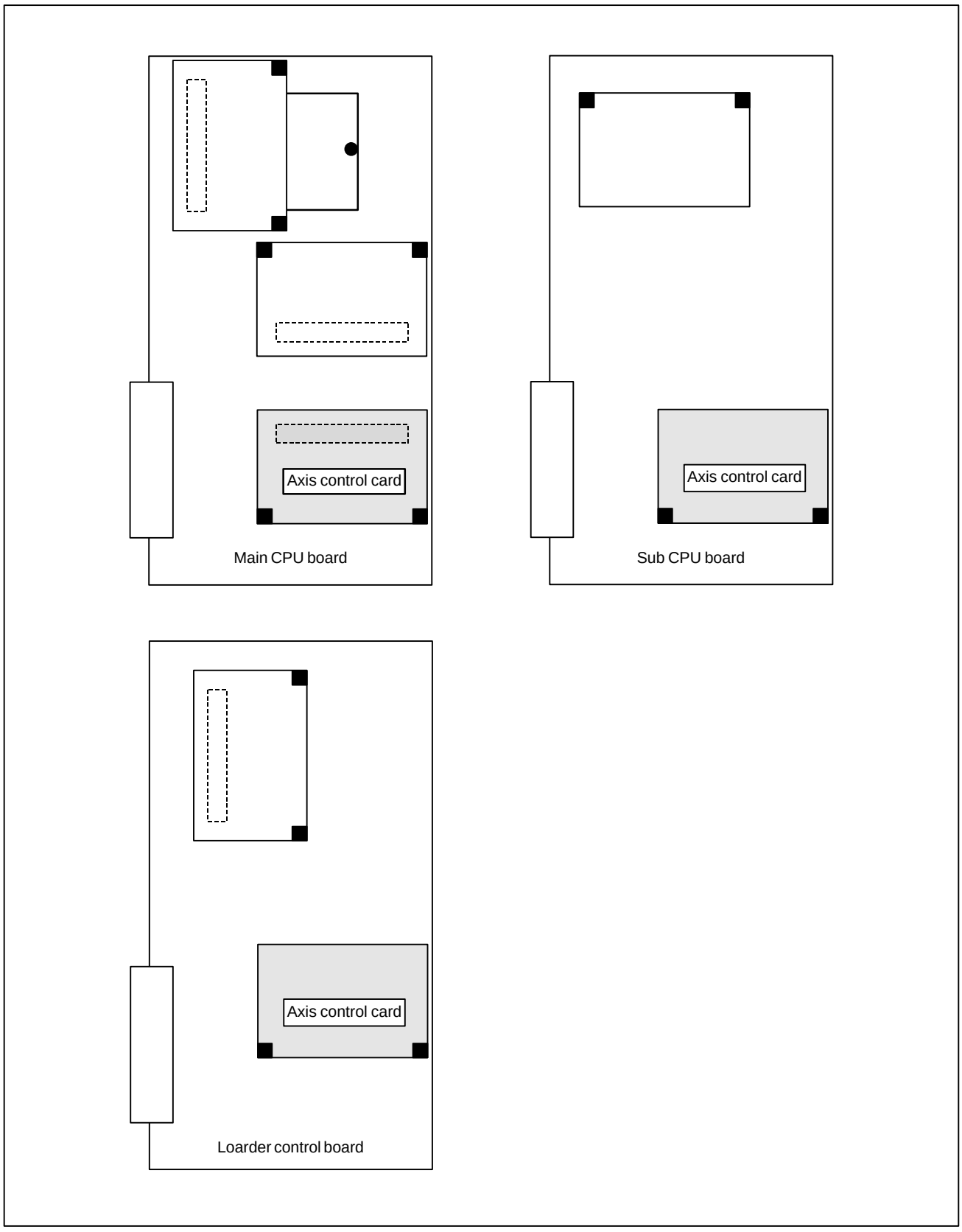
  The axis control cards installed on the CNC may be defective.

- **Installation positions of the axis control cards**

[For the LCD–mounted type]



[For the stand–alone type]



7.23 ALARM 900 (ROM PARITY)

Causes and actions

A ROM parity error occurred.

The software including the CNC system software, servo software, PMC management software, and PMC Ladder is stored in the flash memory on the FROM/SRAM module. It starts execution after being loaded into the RAM of the DRAM module or servo card at power on.
A ROM parity error occurs if the software stored in the FROM/SRAM module is destroyed.

- **Rewriting the software component**

On the screen, the series of the software in which a fault was detected is displayed. Rewrite the software using the boot system.
The software stored in the FROM/SRAM module includes a variety of FANUC software components, as well as those created by the MTB, such as the PMC Ladder.

- **Replacing the FROM/SRAM module**

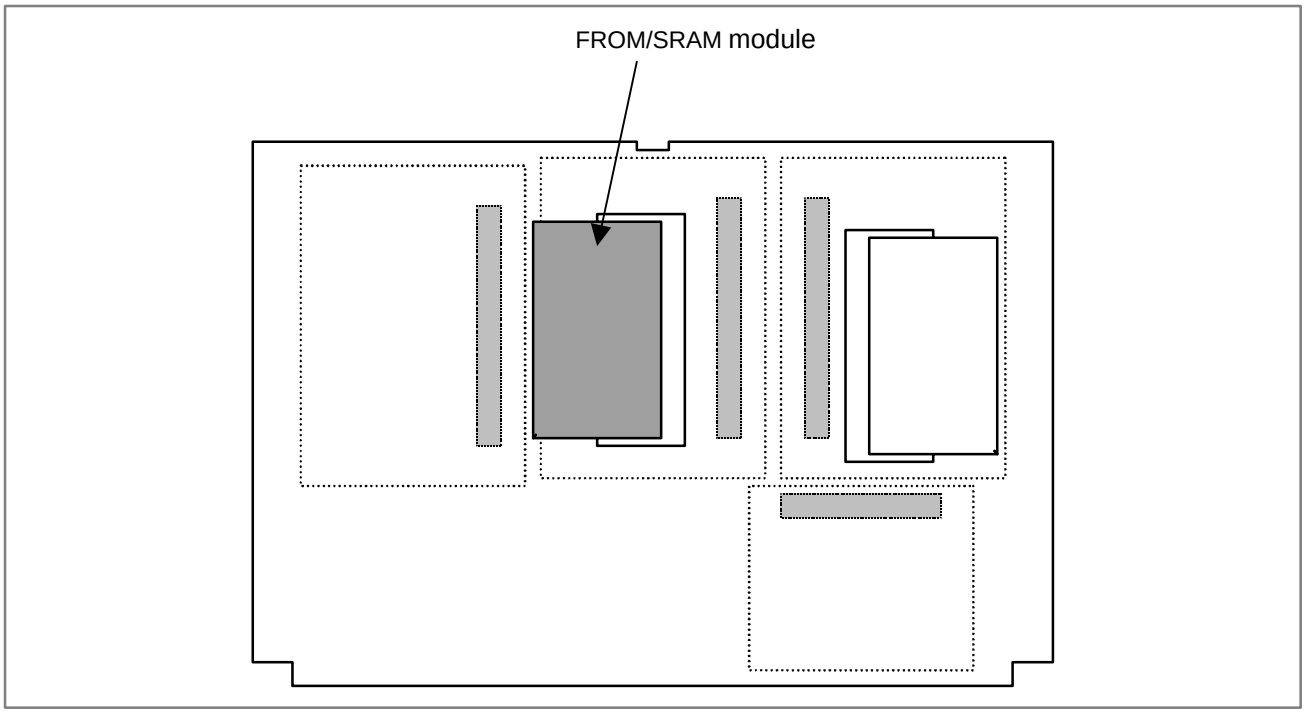
Replace the FROM/SRAM module
After replacement, all the software that was once stored must be written. Because the replacement clears the contents of the SRAM memory, the memory contents must be restored. For this operation, use the boot system.

- **Replacing the motherboard**

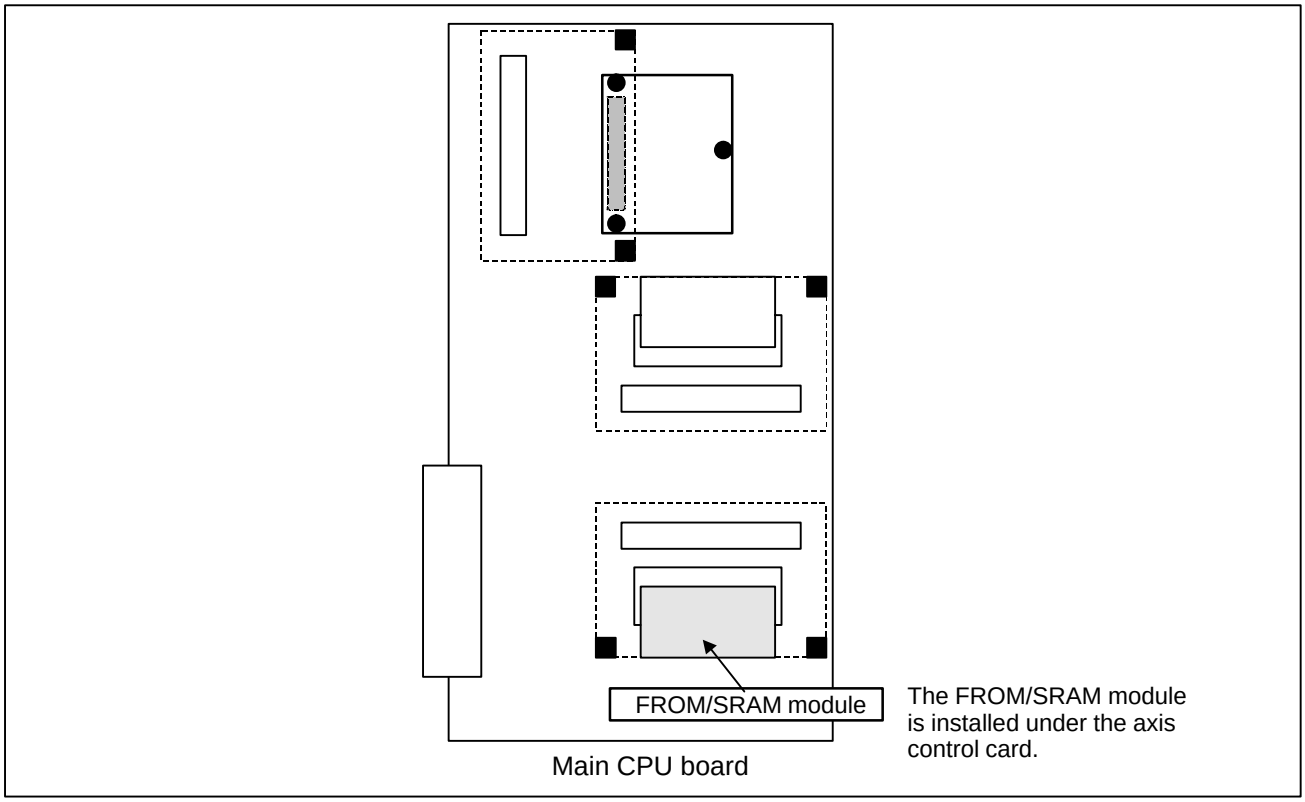
If any of the above actions does not solve the problem, replace the motherboard.

- **Installation position of the FROM/SRAM module**

[For the LCD–mounted type]



[For the stand–alone type]



7.24 ALARMS 910 AND 911 (SRAM PARITY)

Causes and actions

A parity error occurred in the SRAM used to store data such as parameters and machining programs.

This alarm is issued if the battery has run down or if the data in the SRAM is destroyed due to some external cause. Or, the SRAM module, motherboard, and option PCB may be defective.

- **Checking the battery**

The battery is rated 3 V. A battery alarm is issued and “BAT” flashes on the screen if the voltage of the battery drops to 2.6 V.
If a battery alarm is issued, replace the battery with a new one promptly.

- **Performing memory all clear**

Perform a memory all clear operation, then start up the CNC. Alternatively, if a backup of the data in the SRAM has been made, use the backup to restore the data. To back up and restore the data in the SRAM, use the boot system.

- **Replacing the FROM/SRAM module**

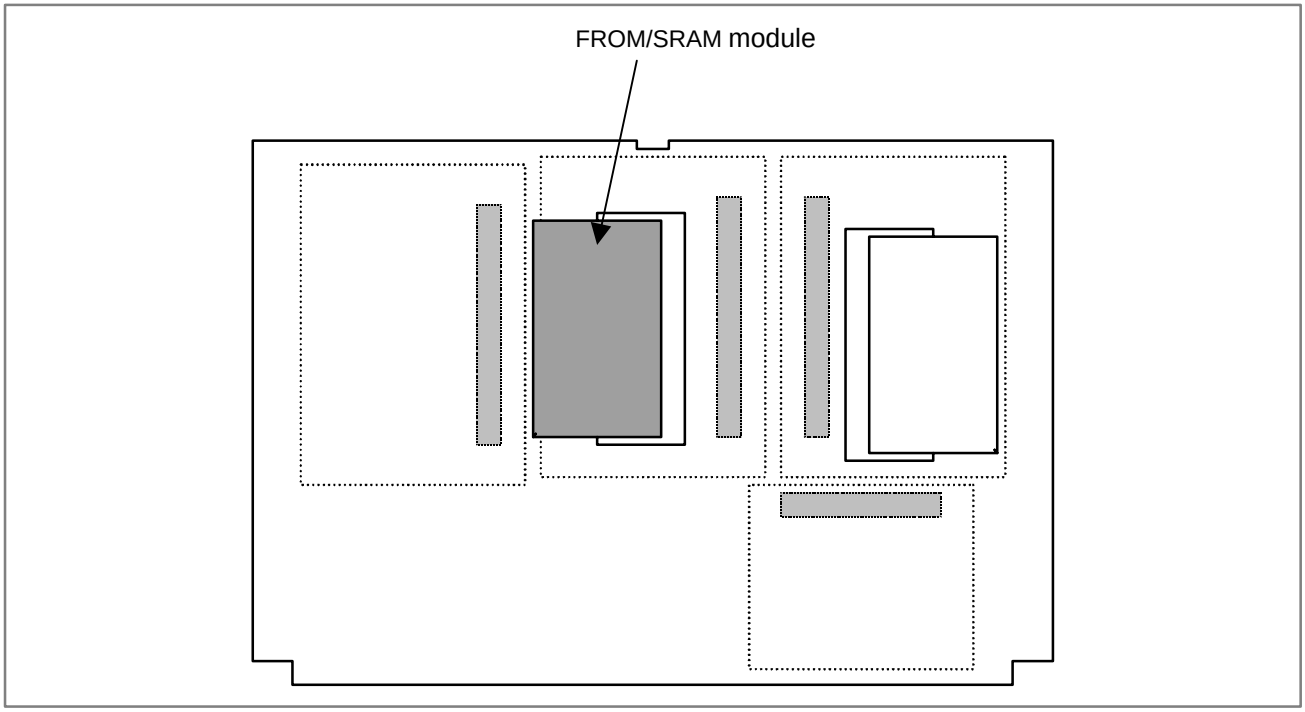
If memory all clear or the restoration of the data with a backup does not solve the problem, replace the FROM/SRAM module.
After replacing the FROM/SRAM module, perform a memory all clear operation and start up the CNC. All the data must be re–loaded.
If a backup is available, restore the data using the backup, then start up the CNC.

- **Motherboard**

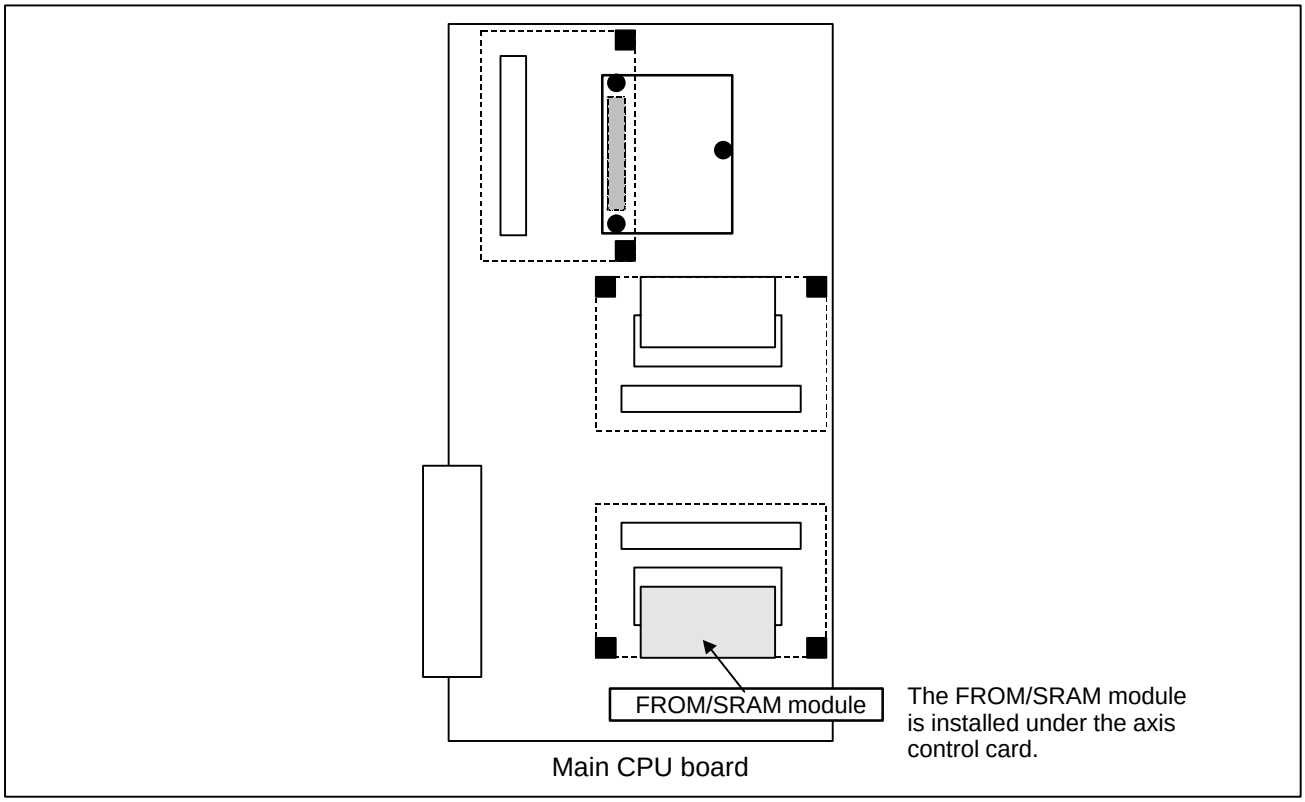
If any of the above actions does not solve the problem, replace the motherboard.

- **Installation position of the FROM/SRAM module**

[For the LCD–mounted type]



[For the stand–alone type]



- **SRAM parity on the loader control board**

If alarm 972 is issued, indicating on the screen that an SRAM parity error occurred on the loader, take appropriate action on the loader control board.
The SRAM for the loader control board is installed on the boards themselves.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    910 SRAM PARITY : (BYTE 0) <LC
```

7.25 ALARMS 912 TO 919 (DRAM PARITY)

Causes and actions

The management software for the CNC is loaded from the FROM to the DRAM at power on, so that it is executed on the DRAM.

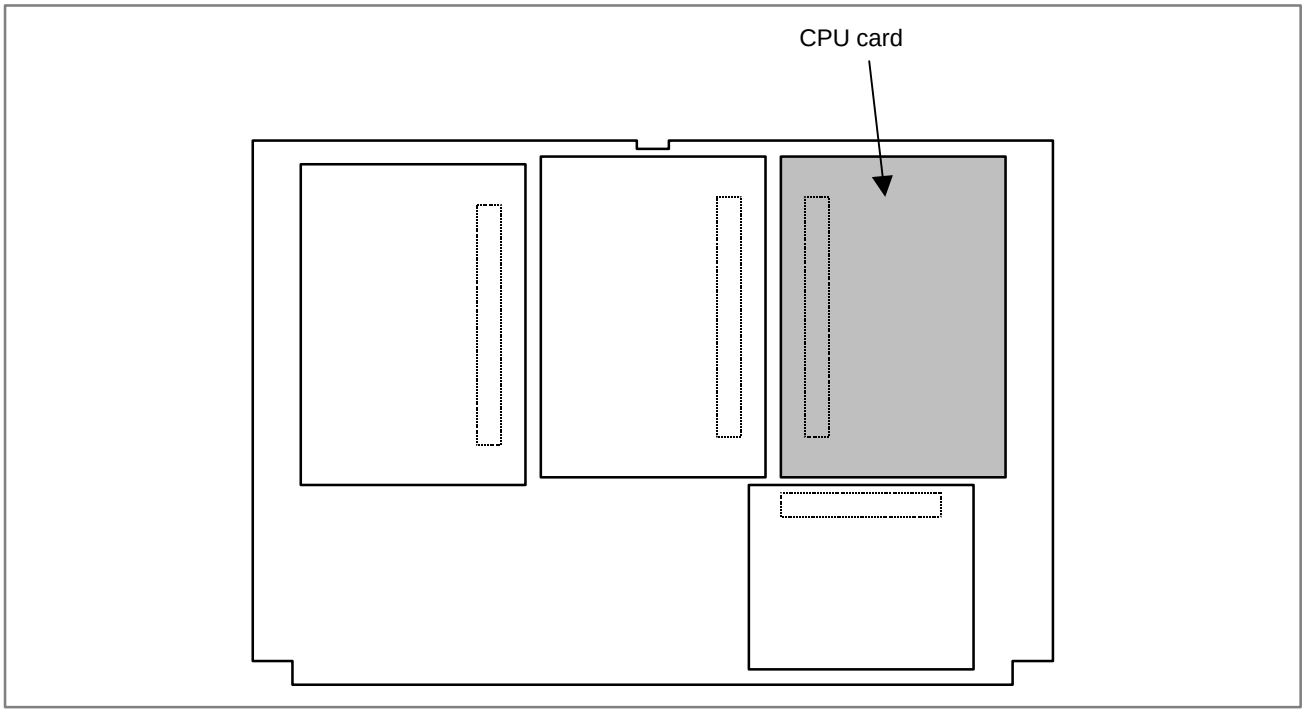
A parity error occurred on this DRAM.
These alarms occur if the data on the DRAM is destroyed due to some external cause or if the CPU card is defective.

- **Replacing the CPU card.**

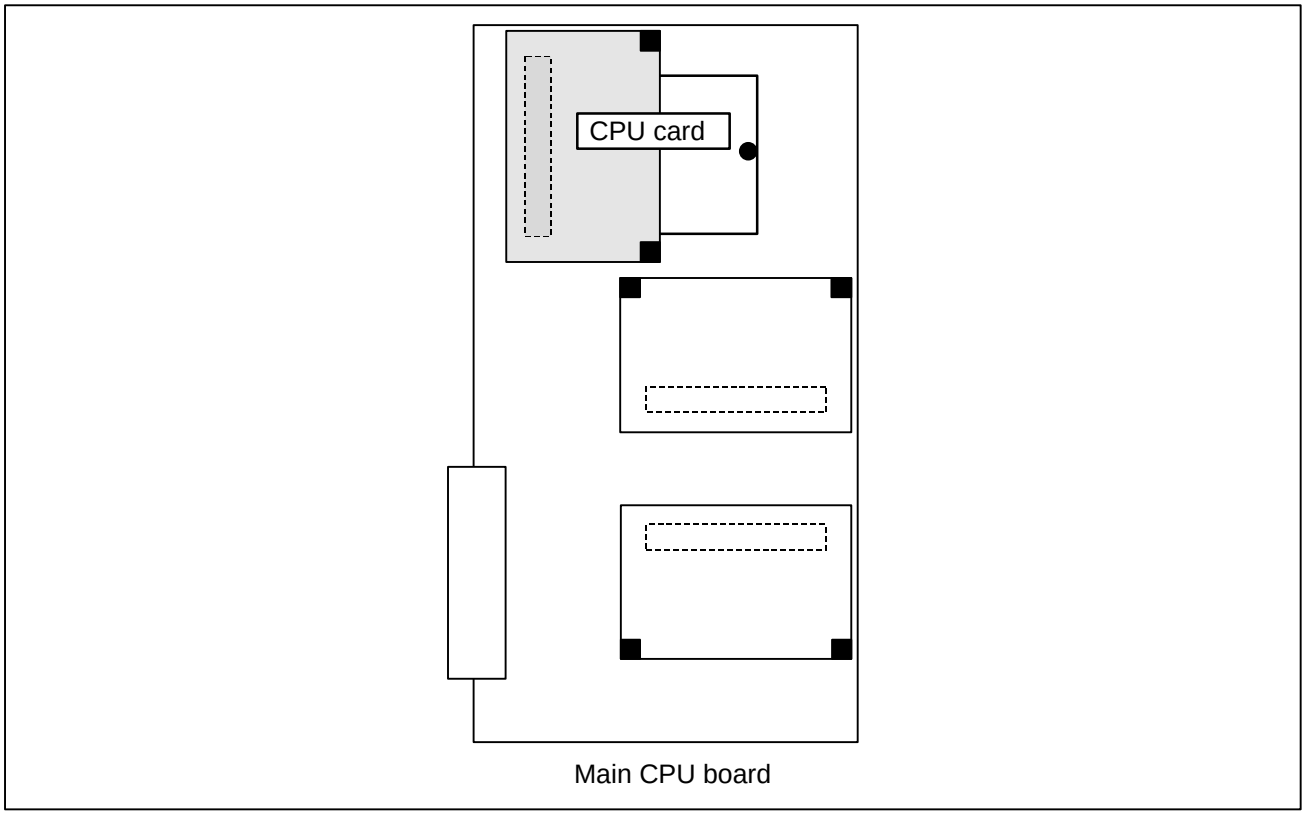
  Replace the CPU card.

- **Installation position of the CPU card**

[For the LCD–mounted type]



[For the stand–alone type]



- **DRAM parity on an option board**

If alarm 972 is issued, indicating on the screen that a DRAM parity error occurred on an option board, take appropriate action on the option board on which the DRAM parity error occurred.
Some option boards have a circuit equivalent to the CPU card installed on the boards themselves. See the hardware chapter for details.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    DRAM PARITY : (BYTE 0) <SUB
```

7.26 ALARMS 920 AND 921 (SERVO ALARMS)

Causes and actions

A watchdog error or RAM parity error occurred in the circuit on an axis control card.

Alarm 920 indicates that either of the above errors occurred in the control circuit for axes 1 to 4. Alarm 921 indicates that either of the above errors occurred in the control circuit for axes 5 to 8.
The optical cable, axis control cards, CPU card, or motherboard may be defective.

- **Watchdog error**

  The servo control circuit monitors the operation of the main CPU. If a fault occurs in the CPU or its peripheral circuit, so that the watchdog timer is not reset, a watchdog error occurs.

- **Replacing the optical cable**

  Replace the optical cable. A defective optical cable may cause this problem.

- **Replacing the axis control cards**

  Replace the axis control cards.

- **Replacing the CPU card**

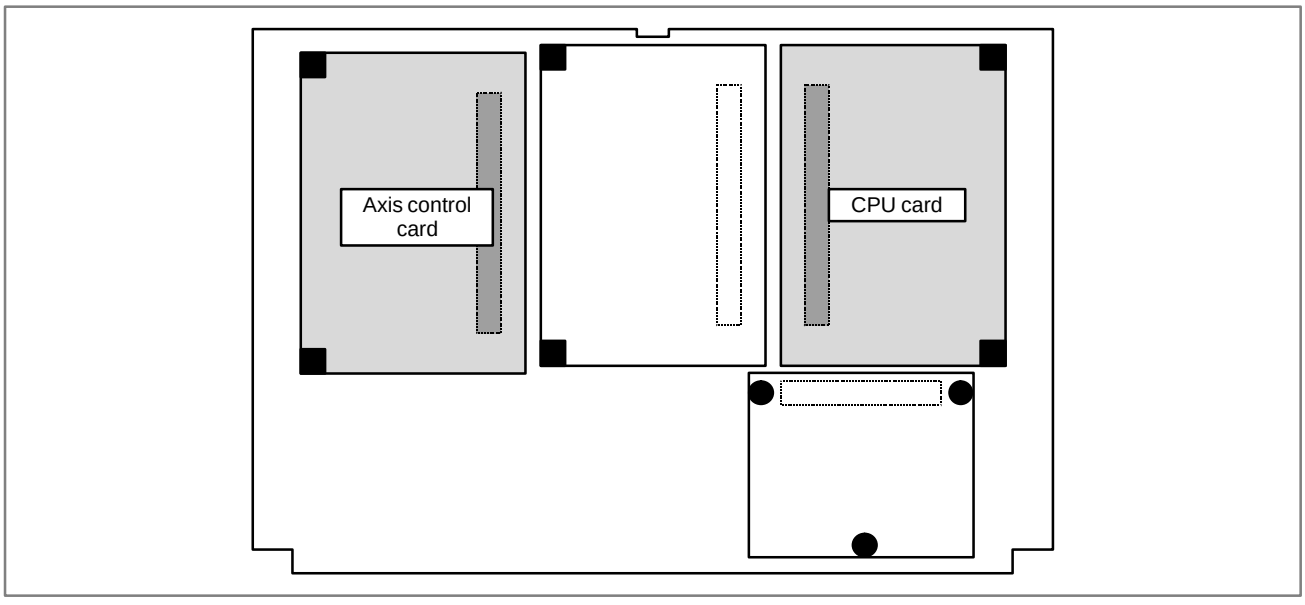
  Replace the CPU card.

- **Replacing the motherboard (main CPU board)**

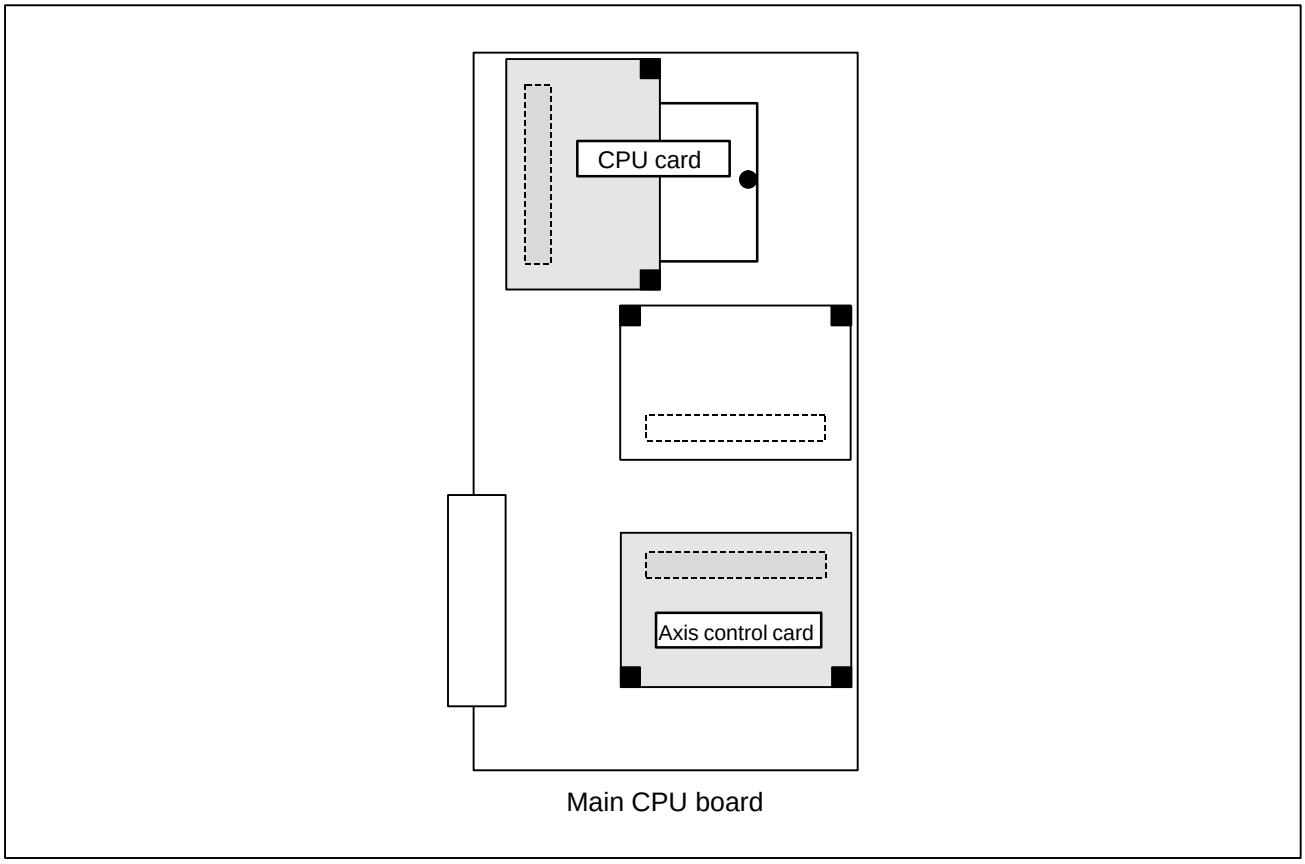
  If any of the above actions does not solve the problem, replace the motherboard.

- **Installation position of each card**

[For the LCD–mounted type]



[For the stand–alone type]



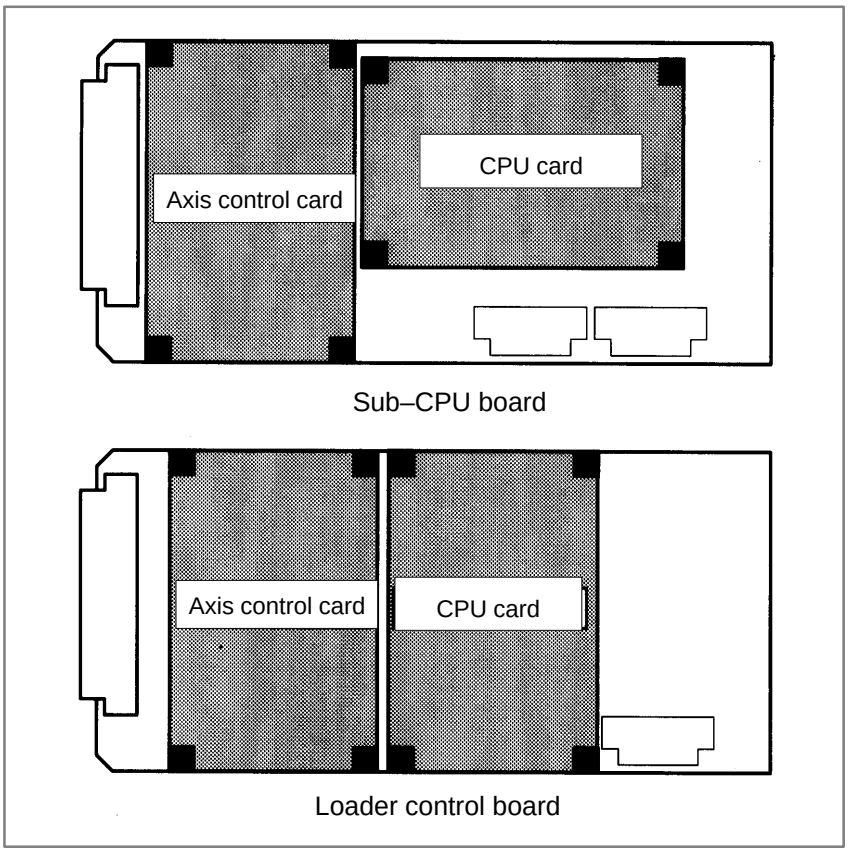
- **Servo alarm on the sub–CPU board or loader control board**

If alarm 972 is issued, indicating on the screen that a servo alarm occurred on the sub–CPU or loader, take appropriate action on the sub–CPU board or loader control board.

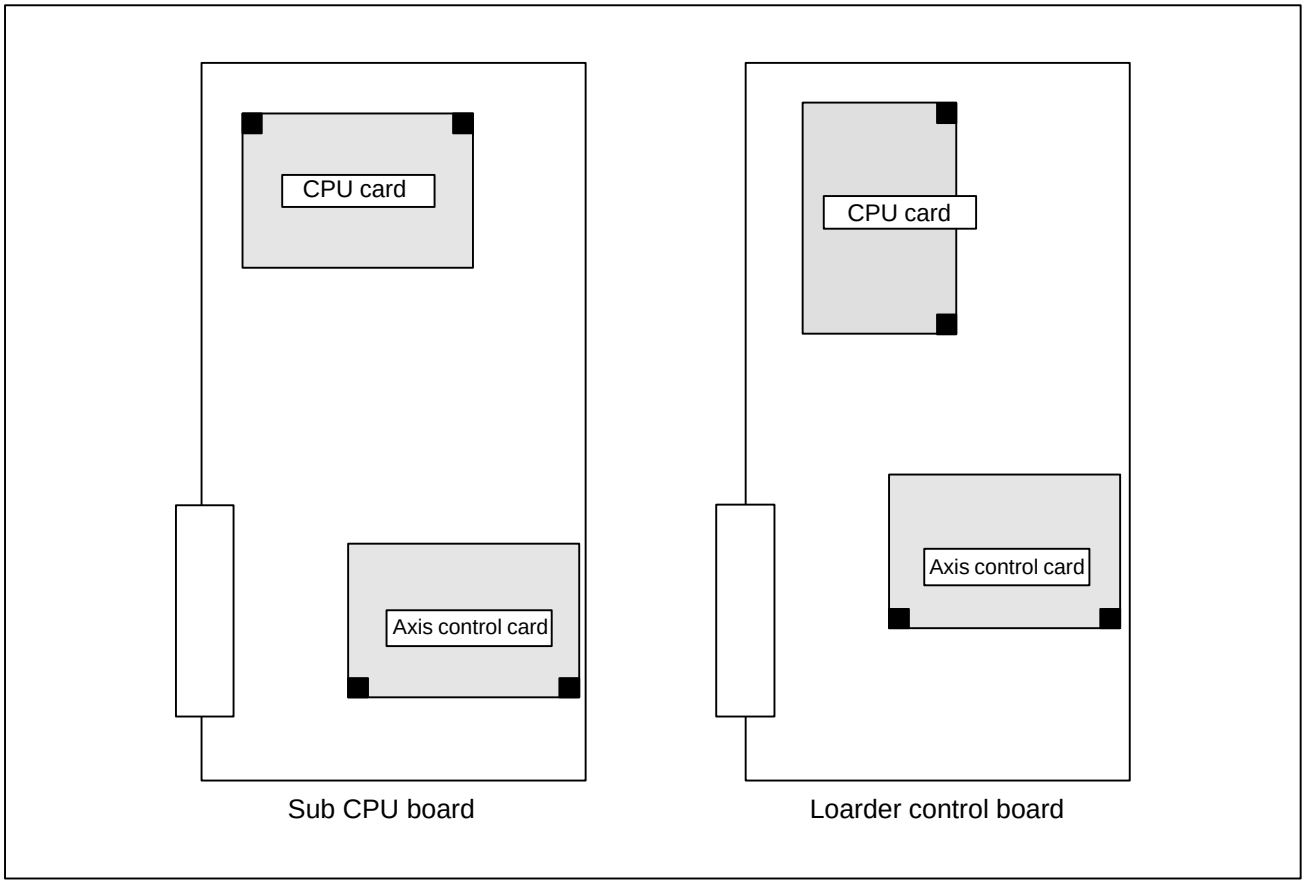
Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    920 SERVO ALARM <SUB
```

[For the LCD–mounted type]



[For the stand–alone type]



7.27
ALARM 926 (FSSB ALARM)

Causes and actions

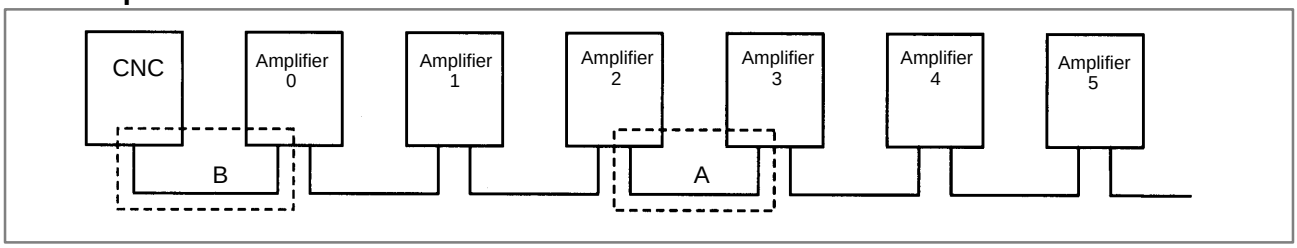
A fault occurred on the FSSB (serial servo bus) that connects servo amplifiers to the CNC.

This alarm is issued if a fault occurs in any of the axis control cards making up the FSSB, optical cables, and servo amplifiers.

- **Identifying the defective location**

Use the LEDs on the servo amplifiers.
Using the 7–segment LEDs installed on the servo amplifiers, the defective location can be identified.

FSSB connection example



If portion A, indicated by dotted line, contains the defective location, the LEDs on the servo amplifiers will be as shown in the table below.

Amplifier No.	Amplifier 0	Amplifier 1	Amplifier 2	Amplifier 3	Amplifier 4	Amplifier 5
LED display	"–"	"–"	"L" or "–"	"U"	"U"	"U"

In this case, any of the following locations may be defective:

(1) Optical cable connecting together the servo amplifier whose LED is "L" or "–" and that whose LED is "U". In the above figure, the optical cable in portion A may be defective.

(2) Either of the servo amplifier whose LED is "L" or "–" and that whose LED is "U". In the above figure, either amplifier 2 or 3 may be defective.

If portion B, indicated by dotted line, contains the defective location, the LEDs on the servo amplifiers will be as follows:

Amplifier No.	Amplifier 0	Amplifier 1	Amplifier 2	Amplifier 3	Amplifier 4	Amplifier 5
LED display	"–" or "U"					

In this case, any of the following locations may be defective:

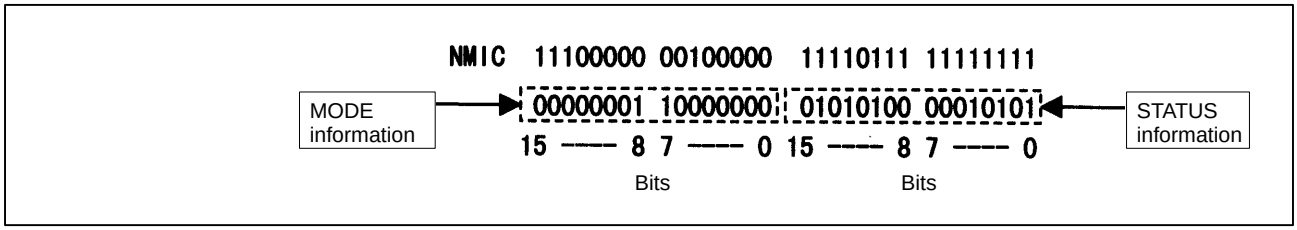
(1) Optical cable connected to the CNC. In the above figure, the optical cable in portion B may be defective.

(2) Any of the axis control cards in the CNC

(3) First servo amplifier connected. In the above figure, amplifier 0 may be defective.

- **Identifying the defective location**

Use the display on the CNC screen
If alarm 926 is issued, information such as the following is displayed at the bottom of the CNC screen. It can be used to identify the defective location.



Bits 12 to 15 of the MODE information indicate the number of the slave in which the alarm occurred. The unit nearest the CNC (such as a servo amplifier) is assigned a slave number of “0”. For a 2–axis amplifier, for example, one number is assigned for the first axis, and the next number is assigned for the second.

Details of the MODE information

Bit	15	14	13	12	11 ◄——► 0
Description	Number of the slave in which the alarm occurred				No meaning

0000: Indicates that the alarm occurred in slave 0.
0001: Indicates that the alarm occurred in slave 1.
:
:
Indicates that the alarm occurred in slave 9.

Using the bits of the STATUS information, the fault can be estimated.

Details of the STATUS information

Bit	15 ◄► 12	11	10	9	87	6	5	4	3 ◄► 0
Description	No meaning	External alarm	Broken master port	Broken slave port	No meaning	Broken master port	No meaning	Error on slave	No meaning
A	xxxx	0	0	0	x x	1	x	0	xxxx
A	xxxx	0	1	0	x x	0	x	1	xxxx
B	xxxx	0	0	1	x x	0	x	1	xxxx
C	xxxx	1	0	0	x x	0	x	1	xxxx

The STATUS information matches any of the patterns A, B, and C.
(x indicates a bit that may be either 0 or 1.)

If the pattern of the STATUS information is A

(1) The optical cable that connects together the slave corresponding to bits 12 to 15 of the MODE information and the preceding slave may be defective. Or, either of the slaves connected together with that optical cable may be defective.

(2) The voltage of the power supplied to the slave amplifier dropped, or a power fault occurred in the amplifier.

(3) Any of the axis control cards in the CNC may be defective.

If the pattern of the STATUS information is B

(1) The optical cable that connects together the slave corresponding to bits 12 to 15 of the MODE information and the preceding slave may be defective. Or, either of the slaves connected together with that optical cable may be defective.

(2) The voltage of the power supplied to the slave amplifier dropped, or a power fault occurred in the amplifier.

If the pattern of the STATUS information is C

(1) The slave corresponding to bits 12 to 15 of the MODE information may be defective.

(2) The voltage of the power supplied to the slave amplifier dropped, or a power fault occurred in the amplifier.

- **Power fault in a servo amplifier**

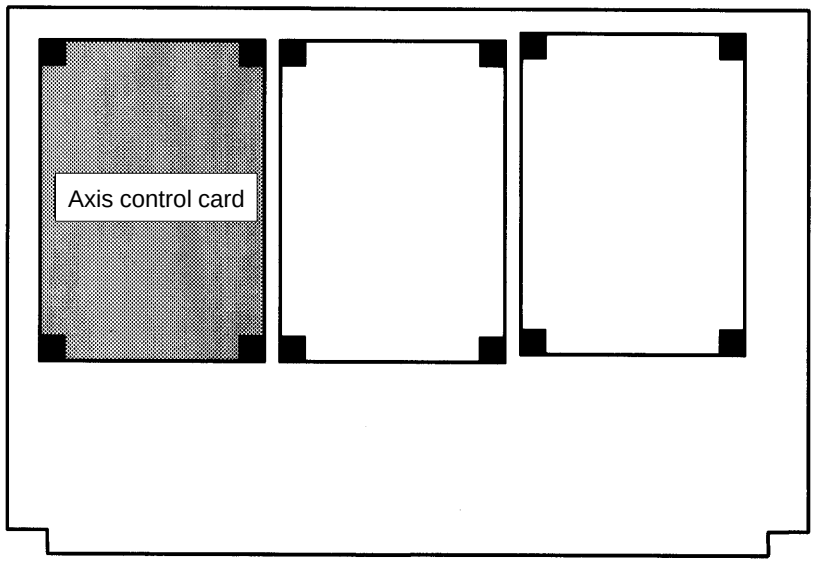
If a power fault occurs in a servo amplifier, the FSSB alarm is issued. A power fault occurs, causing the FSSB alarm to be issued, if the amplifier control power supply voltage drops, if the +5 V conductor of the pulse coder cable is ground, or for other reasons.

- **Replacing the axis control card**

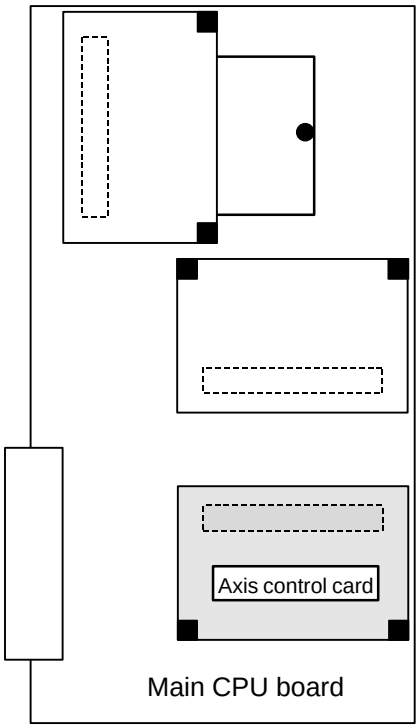
If any of the axis control cards are found defective because of the above diagnosis, replace the axis control card on the motherboard (main CPU board).

- **Installation position of the axis control card**

[For the LCD–mounted type]



[For the stand–alone type]



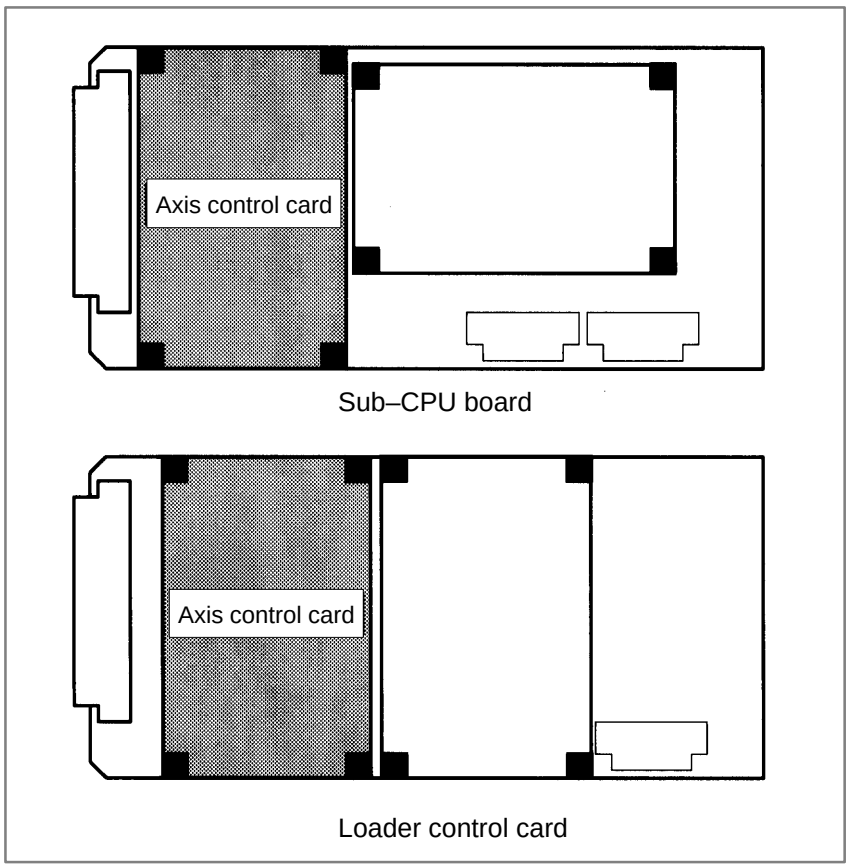
- **FSSB alarm on the sub–CPU board or loader control board**

If alarm 972 is issued, indicating on the screen that an FSSB alarm occurred on the sub–CPU or loader, take appropriate action on the sub–CPU board or loader control board.

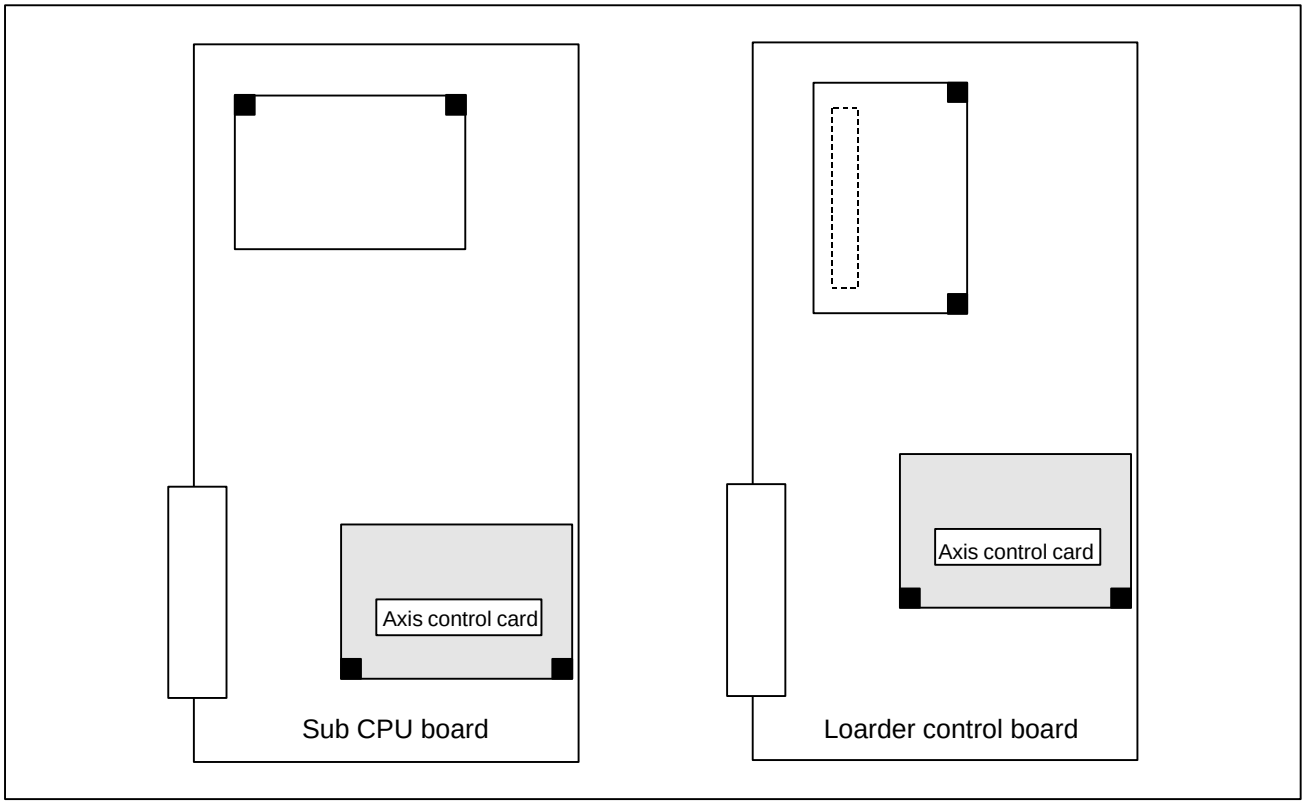
Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    926 FSSB ALARM <SUB
```

[For the LCD–mounted type]



[For the stand–alone type]



7.28 ALARM 930 (CPU INTERRUPT)

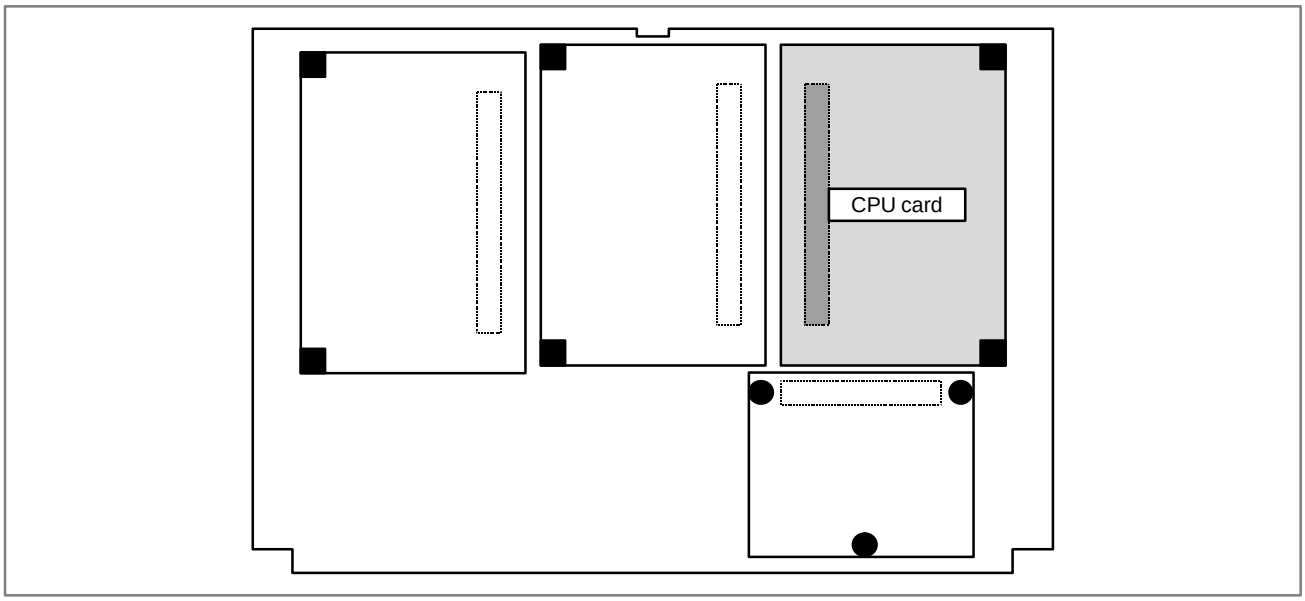
Causes and actions

An interrupt that can never be generated during normal operation was generated.
The cause of the fault cannot be identified, but the fault may have occurred in the peripheral circuit of the CPU.

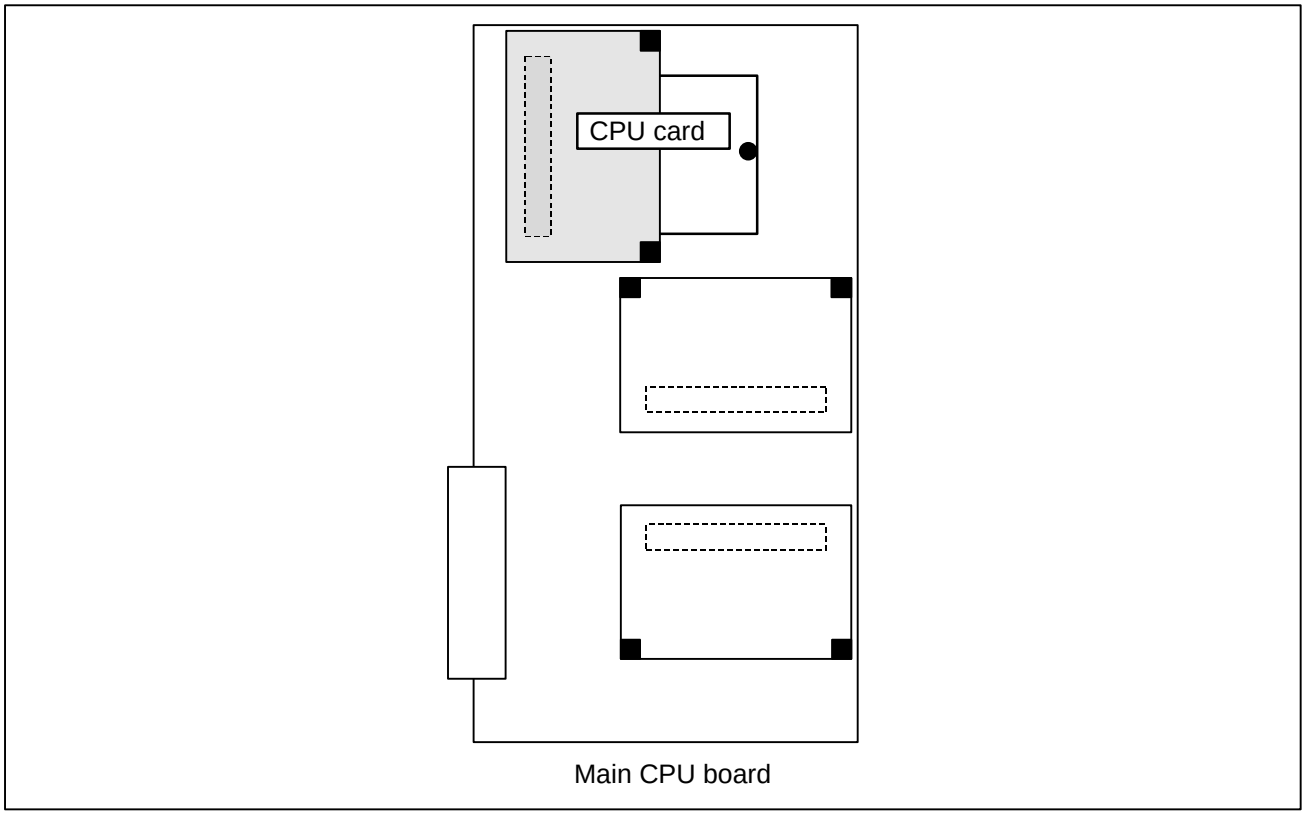
If the problem is solved by turning the power off and then on again, the problem may be attributable to noise.

- **Replacing the CPU card, motherboard**
- **Installation position of each card**

[For the LCD–mounted type]



[For the stand–alone type]



- **Examining the noise environment**

See the section on the measures against noise, examine the noise environment of the CNC.

- **CPU interrupt on an option board**

If alarm 972 is issued, indicating on the screen that a CPU interrupt was generated on an option board, take appropriate action on the option board on which the CPU interrupt was generated.
Some option boards have a circuit equivalent to the CPU card installed on the boards themselves. See the hardware chapter for details.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    930 CPU INTERRUPT <SUB
```

7.29 ALARM 935 (SRAM ECC ERROR)

Causes and actions

An ECC error occurred in the SRAM used to store data such as parameters and machining programs.

This alarm is issued if the battery has run down or if the data in the SRAM is destroyed due to some external cause. Or, the FROM/SRAM module or motherboard may be defective.

- **ECC check**

  This is the method of checking the data stored in the SRAM. It has been employed instead of the conventional parity check.
  With the ECC check method, 8–bit correction data is provided for 16–bit data, so that if a data error occurs in one of these 16 bits, the error is automatically corrected with the correction data, allowing the CNC to continue operation. This alarm is issued if a data error occurs in two or more bits.
  With the conventional parity check method, a system alarm is issued if a data error occurs even in one bit.

- **Checking the battery**

  The battery is rated 3 V. A battery alarm is issued and “BAT” flashes on the screen if the voltage of the battery drops to 2.6 V.
  If a battery alarm is issued, replace the battery with a new one promptly.

- **Performing memory all clear**

  Perform a memory all clear operation, then start up the CNC. Alternatively, if a backup of the data in the SRAM has been made, use the backup to restore the data. To back up and restore the data in the SRAM, use the boot system.

- **Replacing the FROM/SRAM module**

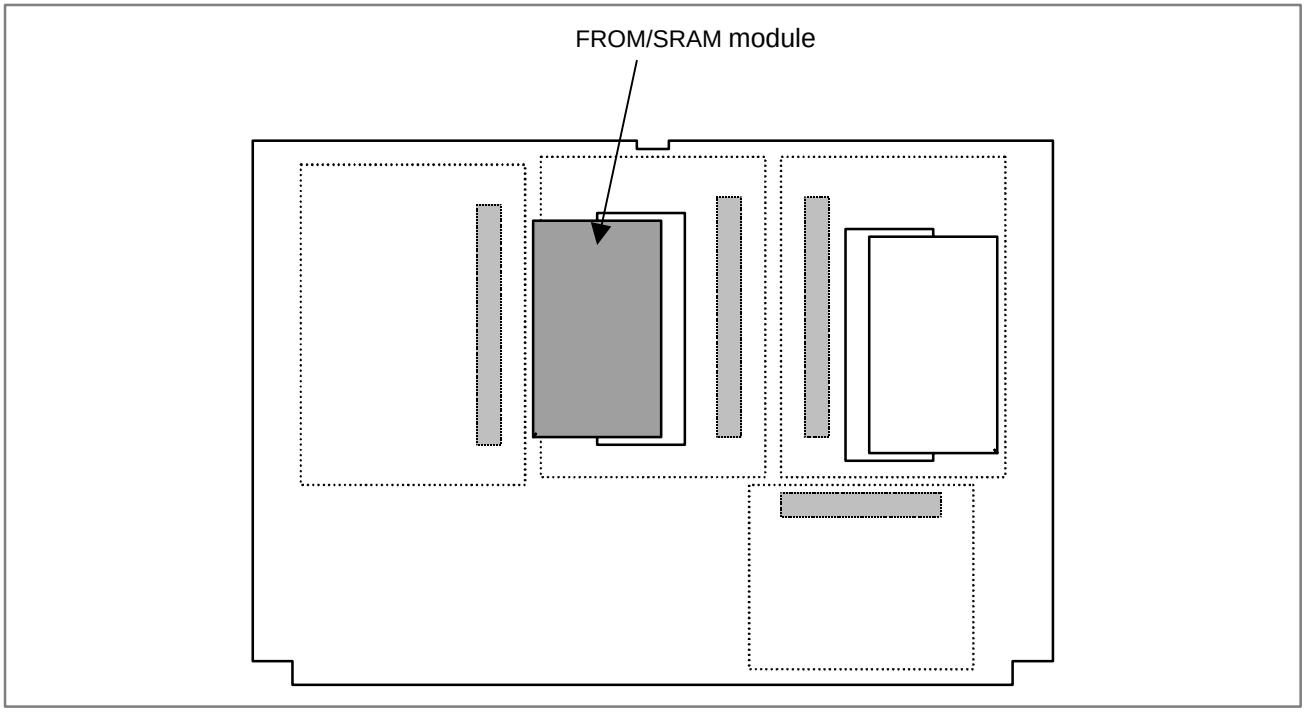
  If memory all clear or the restoration of the data with a backup does not solve the problem, replace the FROM/SRAM module. Take a backup copy in advance. All the software must be restored after the replacement.
  After replacing the FROM/SRAM module, perform a memory all clear operation and start up the CNC. All the data must be re–loaded.
  If a backup is available, restore the data using the backup, then start up the CNC.

- **Motherboard**

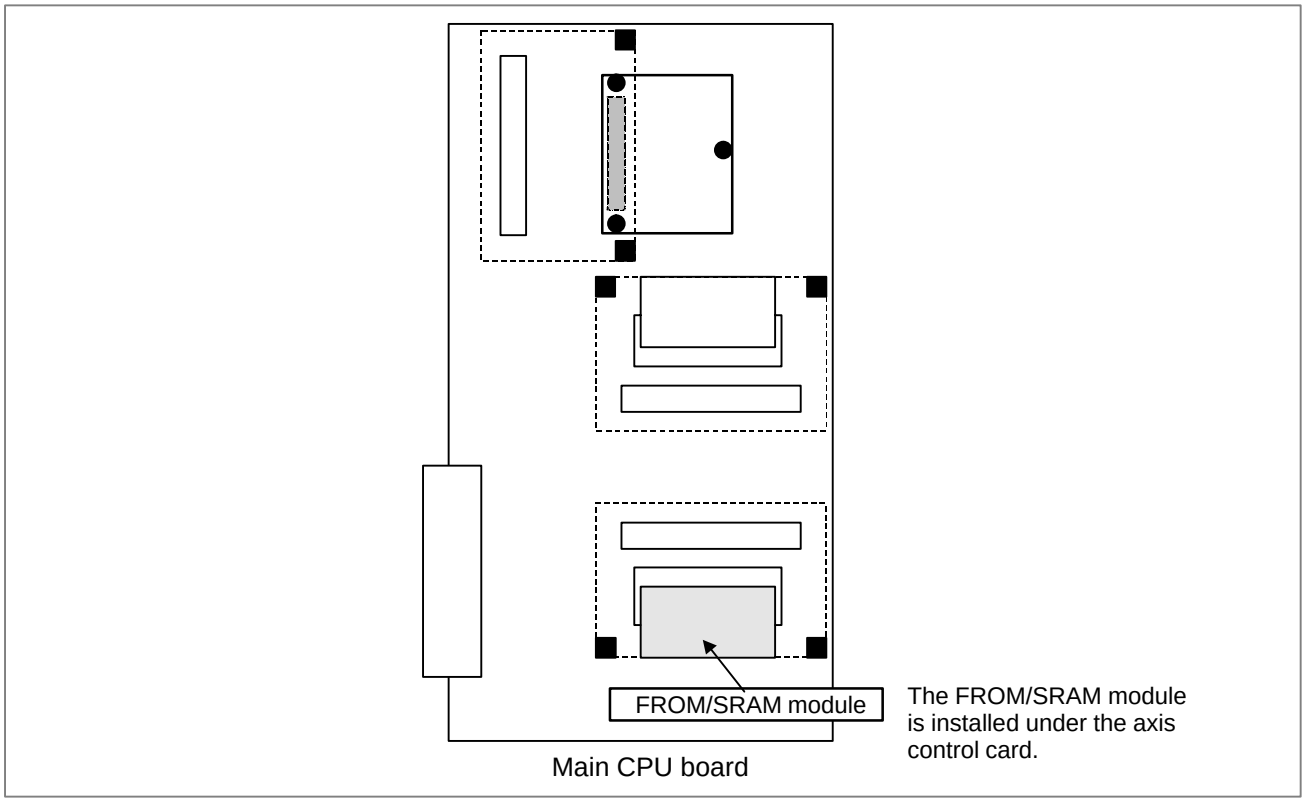
  If any of the above actions does not solve the problem, replace the motherboard.

- **Installation position of the FROM/SRAM module**

[For the LCD–mounted type]



[For the stand–alone type]



7.30 ALARM 950 (PMC SYSTEM ALARM)

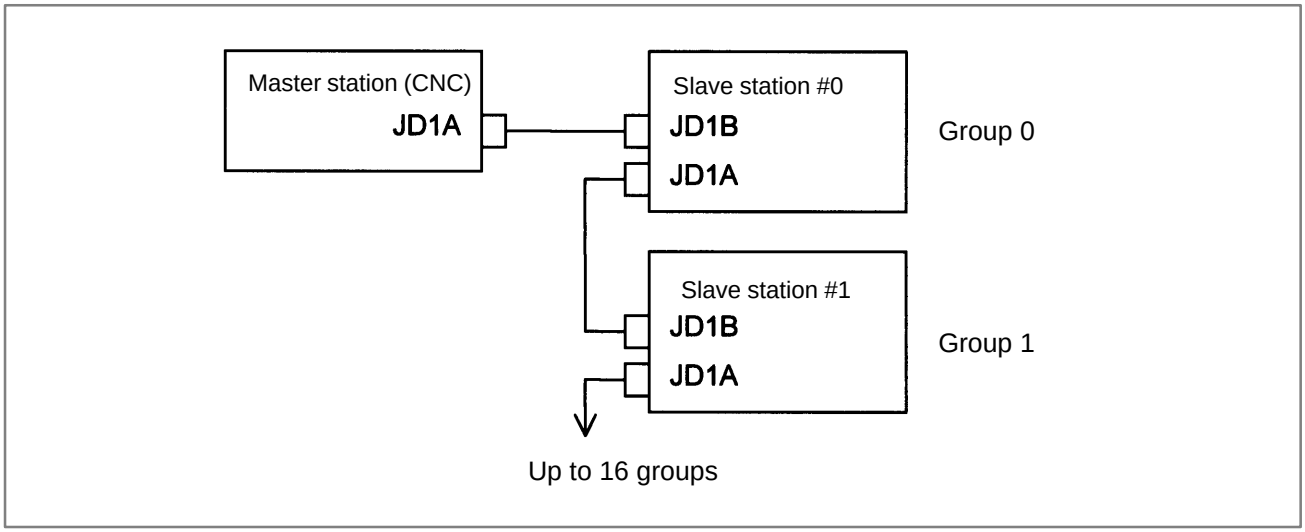
Causes and actions

This alarm is issued if a fault is detected in the PMC.

The probable causes include an I/O link communication error and a defective PMC control circuit

• Connecting the I/O Link

The I/O Link is a serial interface that connects the CNC to various I/O devices and allows transfers of I/O signals between devices at high speed. When multiple devices are connected using the I/O Link, there forms a relationship that a certain device is a master and the other devices are slaves. The states of the input signals from the slaves are transferred to the master at fixed intervals. The output signals from the master are transferred to the slaves at fixed intervals. In a CNC system, the master is the CNC (motherboard or main CPU board).
The I/O signals transferred via the I/O link can be used with the PMC Ladder.



• I/O Link communication error PC050

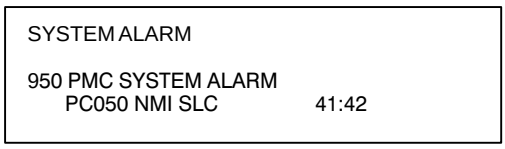
If alarm 950 is issued, displaying “PC050” on the screen, an I/O link communication error may have occurred.

Screen display example

```
SYSTEM ALARM

950 PMC SYSTEM ALARM
    PC050 NMI SLCxx:yy
```

In this screen display example, the cause of the alarm can be estimated using xx:yy. xx and yy are hexadecimal representations.

1) If bit 0 of the binary representation of xx is “1”, this indicates that the master station (CNC) received invalid communication data. For example, assume that the following is displayed on the screen:



xx is equal to 41, or “01000001” in binary notation. Bit 0, which is the lowest (rightmost) bit, is “1”.
In this case, check the following:

(1) Noise environment of the I/O Link cable
Noise may disturb the data on the I/O Link and may result in a problem.

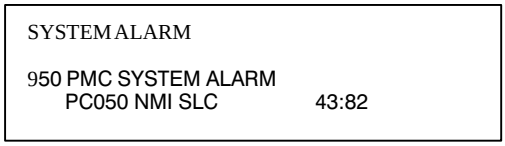
(2) Contact of the I/O Link cable
Check that the I/O link cable is in contact. Check that the cable is not loose and is latched firmly.

(3) Cable failure
Check that the I/O Link cable is connected properly.

(4) Device failure
The motherboard or any of the I/O devices connected to the I/O Link may be defective. Replace the devices, one at a time, to identify the defective device.

Refer to 2) if bit 1 (second bit from the right) is also “1”.

2) If bit 1 of the binary representation of xx is “1”, this indicates that an error was detected on a slave station (I/O device). For example, assume that the following is displayed on the screen:



xx is equal to 43, or “01000011” in binary notation. Bit 1 (second bit from the right) is “1”.
In this case, yy indicates the following:

Number equal to the number indicated by bits 0 to 4 of yy minus 1:
Group number of the slave station on which an error was detected

Bit 5 of yy:
Invalid communication data was detected on the slave.

Bit 6 of yy:
Another error was detected on the slave.

Bit 7 of yy:
A watchdog or parity error was detected on the slave.

In the example shown in the figure above, yy is equal to 82, or “10000010” in binary notation. Bits 0 to 4 are “00010” (2 in decimal notation). The number “1”, which is equal to that number minus 1, is the group number of the slave station on which an error was detected. Bit 7 is “1”. Thus, a watchdog or parity error was detected on the slave station in group 1.

In this case, check the following:

(1) If bit 5 of yy is “1”
Perform examination with the same procedure as that in 1).

(2) If bit 6 of yy is “1” or if bit 7 of yy is “1”
First, replace the device of the slave station of the indicated group number.
If the problem is not solved, perform examination with the same procedure as that in 1) to identify the defective location.

3) If bit 2 of the binary representation of xx is “1”, this indicates that the link between the master station (CNC) and the slave station was canceled. For example, assume that the following is displayed on the screen:

```
SYSTEM ALARM

950 PMC SYSTEM ALARM
    PC050 NMI SLC          84:00
```

xx is equal to 84, or “1000100” in binary notation. Bit 2, which is the third bit from the right, is “1”.
In this case, check the following:

(1) Disconnection of the slave station from the power supply
Check that the slave station is not turned off, that there are no instantaneous power failures, and that the capacity of the power supply is enough.

(2) Disconnection of the I/O link cable
Check that the I/O link cable has not fallen off or has not been disconnected.

(3) If the problem is not solved, perform a check with the same procedure as that in 1).

4) If bit 3 or 4 of the binary representation of xx is “1”, this indicates that a parity error occurred in the PMC control circuit on the motherboard. In this case, replace the motherboard (main CPU board).

- **Other cases**

The motherboard may be defective. Replace the motherboard.

- **PMC system alarm on the loader control board**

For sequence control on the loader control board, a PMC control circuit is installed on the loader control board.
If alarm 972 is issued, indicating on the screen that a PMC system alarm occurred on the loader, take appropriate action on the loader control board.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    950 PMC SYSTEM ALARM >LC
```

7.31 ALARM 951 (PMC WATCHDOG ALARM)

Causes and actions

This alarm is issued if a fault (watchdog alarm) is detected in the PMC. A probable cause is that the MC control circuit is defective.

- **Replacing the motherboard**

The PMC control circuit is installed on the motherboard. Replace the motherboard.

- **PMC watchdog alarm on the loader control board**

For sequence control on the loader control board, a PMC control circuit is installed on the loader control board.
If alarm 972 is issued, indicating on the screen that a PMC watchdog alarm occurred on the loader, take appropriate action on the loader control board.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    951 PMC WATCH DOG ALARM >LC
```

7.32 ALARM 972 (NMI ALARM ON AN OPTION BOARD)

Causes and actions

This alarm indicates that an error was detected on an option board, not on the main CPU board.

- **Screen display**

If alarm 972 is issued, the following is displayed on the screen:

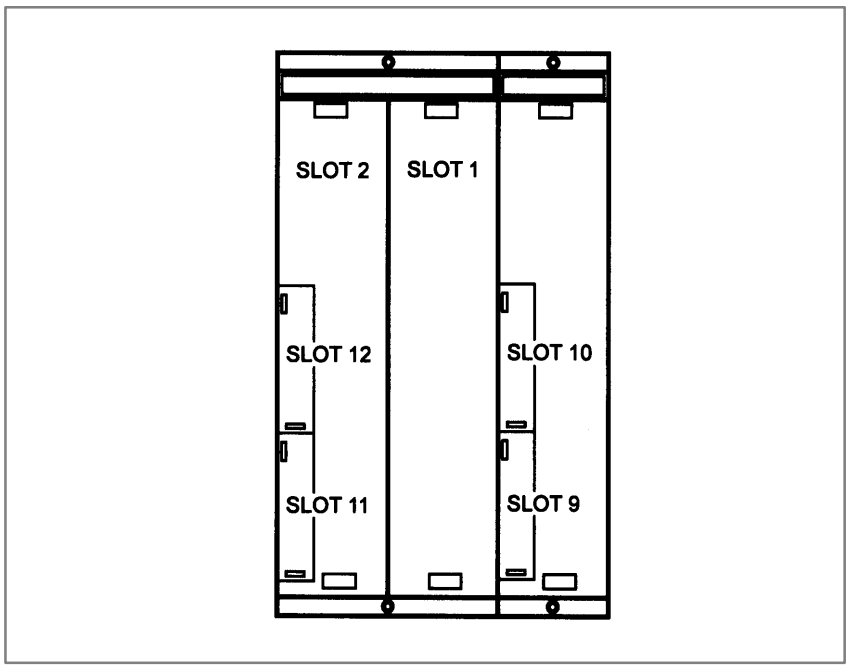
Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 02
    930 CPU INTERRUPT <SUB
```

"SLOT" indicates the number of the slot into which the option board is inserted. Alternatively, it may indicate the number of the alarm that occurred on the option board. Take the action related to that alarm to the option board. In the above example, alarm 930 occurred on the sub–CPU board.

- **Slot number**

The slot number of each option slot is as shown in the figure below.



- **Replacing the option board**

Replace the option board inserted into the slot with the indicated slot number.

7.33 ALARM 973 (NMI ALARM WITH AN UNKNOWN CAUSE)

Causes and actions

An error that can never occur during normal operation occurred. The cause of the error cannot be identified.

- **Replacing printed circuit boards**

Replace all the printed circuit boards installed (including cards, modules, and the back panel), one at a time, to identify the defective printed circuit board.
Replace the CPU card, motherboard, and other printed circuit boards, one at a time.

7.34 ALARM 974 (F–BUS ERROR)

Causes and actions

A bus error occurred on the FANUC–BUS connecting each option board.

This alarm indicates that a fault occurred during the exchange of data between the main CPU and an option board.

- **Replacing the CPU card**

  Replace the CPU card on the motherboard.

- **Replacing the motherboard**

  Replace the motherboard.

- **Replacing the option boards**

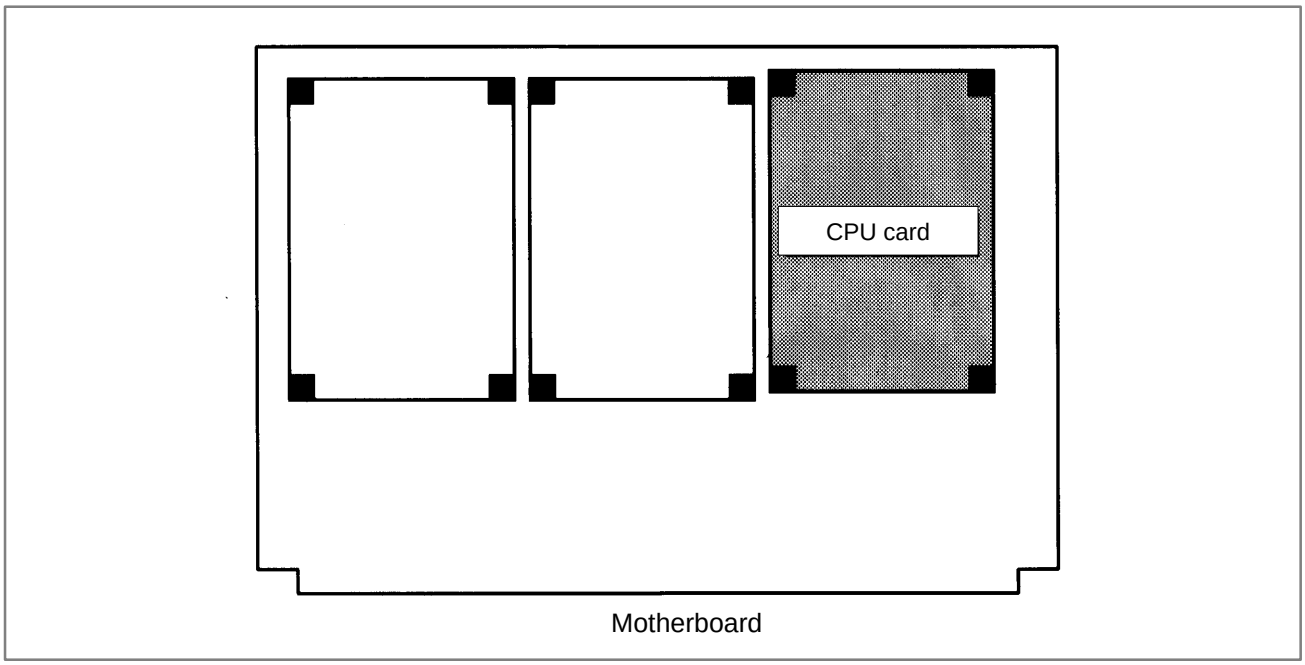
  Replace the installed option boards, one at a time.

- **Replacing the back panel**

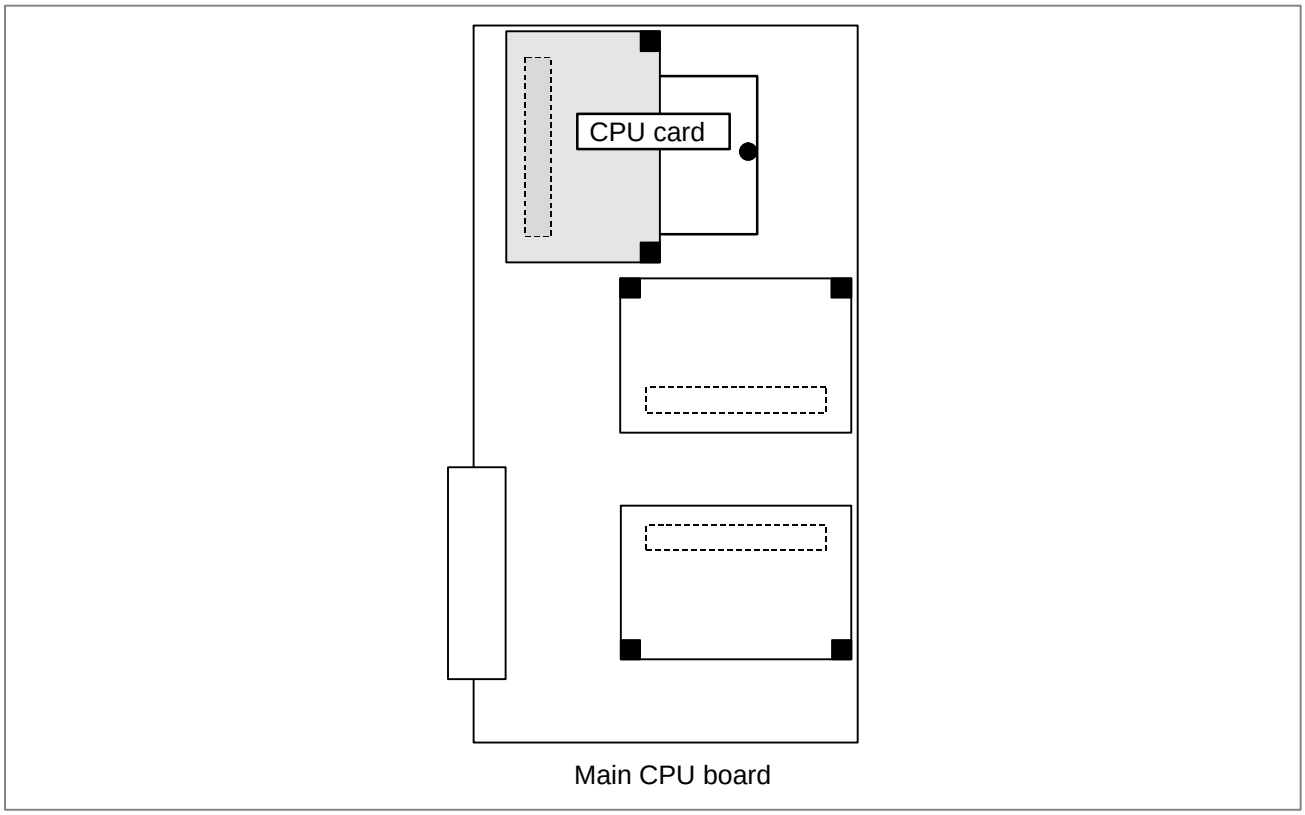
  Replace the back panel.

- **Installation position of the CPU card**

[For the LCD–mounted type]



[For the stand–alone type]



- **F–BUS error on an option board**

If alarm 972 is issued, indicating on the screen that an F–BUS error occurred on an option board, replace the CPU card on the option board on which the F–BUS error occurred or the option board itself.
Some option boards have a circuit equivalent to the CPU card installed on the boards themselves. See the hardware chapter for details.
In this case, the back panel or motherboard may be defective. Take the actions described on the previous page.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    974 F-BUS ERROR <SUB
```

7.35 ALARM 975 (BUS ERROR)

Causes and actions

A bus error occurred on the motherboard. This alarm indicates that an error occurred during the exchange of data within the motherboard.

- **Replacing the CPU card**

  Replace the CPU card on the motherboard.

- **Replacing other cards and modules**

  Replace the display control card, axis control cards, and FROM/SRAM module, one at time.

- **Replacing the motherboard**

  Replace the motherboard.

- **BUS error on an option board**

  If alarm 972 is issued, indicating on the screen that a BUS error occurred on an option board, replace the CPU card on the option card, DRAM module, axis control cards, and option card, one at a time.
  Some option boards have a circuit equivalent to the CPU card installed on the boards themselves. See the hardware chapter for details.

  Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    975 F-BUS ERROR <SUB
```

7.36 ALARM 976 (LOCAL BUS ERROR)

Causes and actions

A bus error occurred on the local bus on the motherboard.

This alarm indicates that an error occurred during the exchange of data within the motherboard.

- **Replacing the CPU card**

  Replace the CPU card on the motherboard (main CPU board).

- **Replacing other cards and modules**

  Replace the display control card, axis control cards, and FROM/SRAM module, one at a time.

- **Replacing the motherboard**

  Replace the motherboard.

- **Local BUS error on an option board**

  If alarm 972 is issued, indicating on the screen that a local BUS error occurred on an option board, replace the CPU card on the option card, DRAM module, axis control cards, and option card, one at a time.
  Some option boards have a circuit equivalent to the CPU card installed on the boards themselves. See the hardware chapter for details.

  Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    976 L-BUS ERROR <SUB
```

7.37 SERVO ALARMS

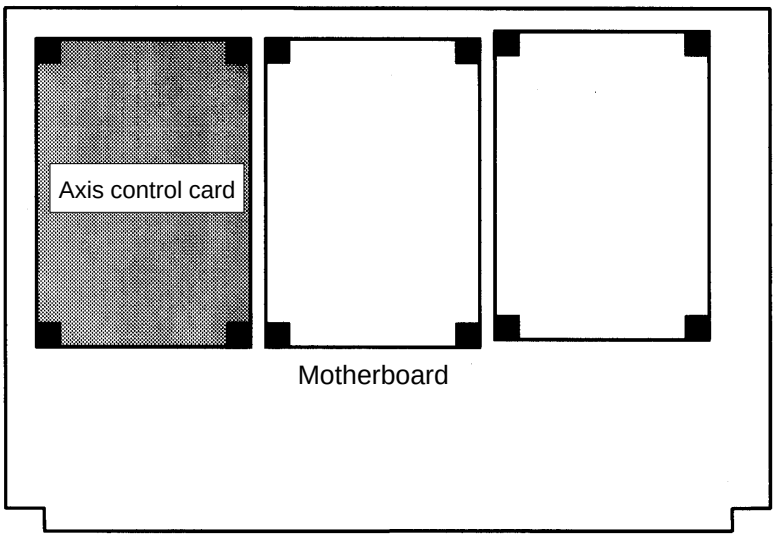
For an explanation of the following servo alarms, refer to the FANUC SERVO MOTOR α Series Maintenance Manual (B–65165E).

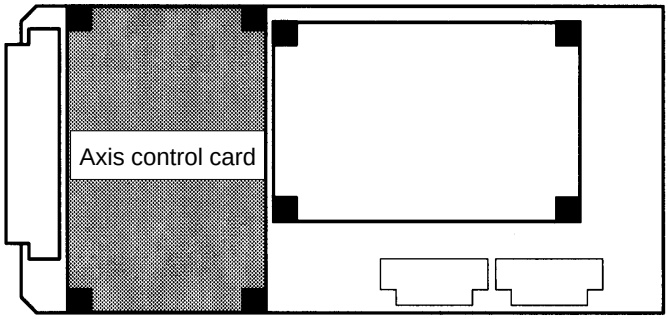
Number	Message	Contents
417	n–TH AXIS–PARAMETER INCORRECT	The setting of a servo–related parameter is incorrect.
430	n AXIS: SV. MOTOR OVERHEAT	A servo motor overheat occurred.
431	n AXIS: CNV. OVERLAOD	PSM: Overheat occurred.
432	n AXIS: CNV. LOWVOLT CON./ POWERFAULT	PSM: Phase missing occurred in the input voltage. PSMR: The control power supply voltage has dropped.
433	n AXIS: CNV. LOW VOLT DC LINK	PSM: The DC link voltage has dropped. PSMR: The DC link voltage has dropped.
434	n AXIS: INV. LOW VOLT CONTROL	SVM: The control power supply voltage has dropped.
435	n AXIS: INV. LOW VOLT DC LINK	SVM: The DC link voltage has dropped.
436	n AXIS: SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
437	n AXIS: CNV. OVERCURRENT POWER	PSM: Overcurrent flowed into the input circuit.
438	n AXIS: INV. ABNORMAL CURRENT	SVM: The motor current is too high.
439	n AXIS: CNV. OVERVOLT POWER	PSM: The DC link voltage is too high.
440	n AXIS: CNV. EX DECELERATION POW.	PSMR: The regenerative discharge amount is too large.
441	n AXIS: ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
442	n AXIS: CNV. CHARGE FAULT/INV. DB	PSM: The spare discharge circuit of the DC link is abnormal. PSMR: The spare discharge circuit of the DC link is abnormal.
443	n AXIS: CONV. COOLING FAN FAILURE	PSM: The internal stirring fan failed. PSMR: The internal stirring fan failed.
444	n AXIS: INV. COOLING FAN FAILURE	SVM: The internal stirring fan failed.
445	n AXIS: SOFT DISCONNECT ALARM	The digital servo software detected a broken wire in the pulse coder.
446	n AXIS: HARD DISCONNECT ALARM	A broken wire in the built–in pulse coder was detected by hardware.

If the hardware on the CNC is suspected to be defective as a result of examination, replace the axis control cards.

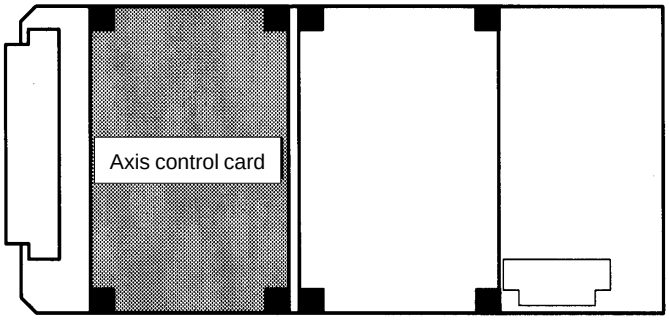
- **Installation positions of the axis control cards**

[For the LCD–mounted type]



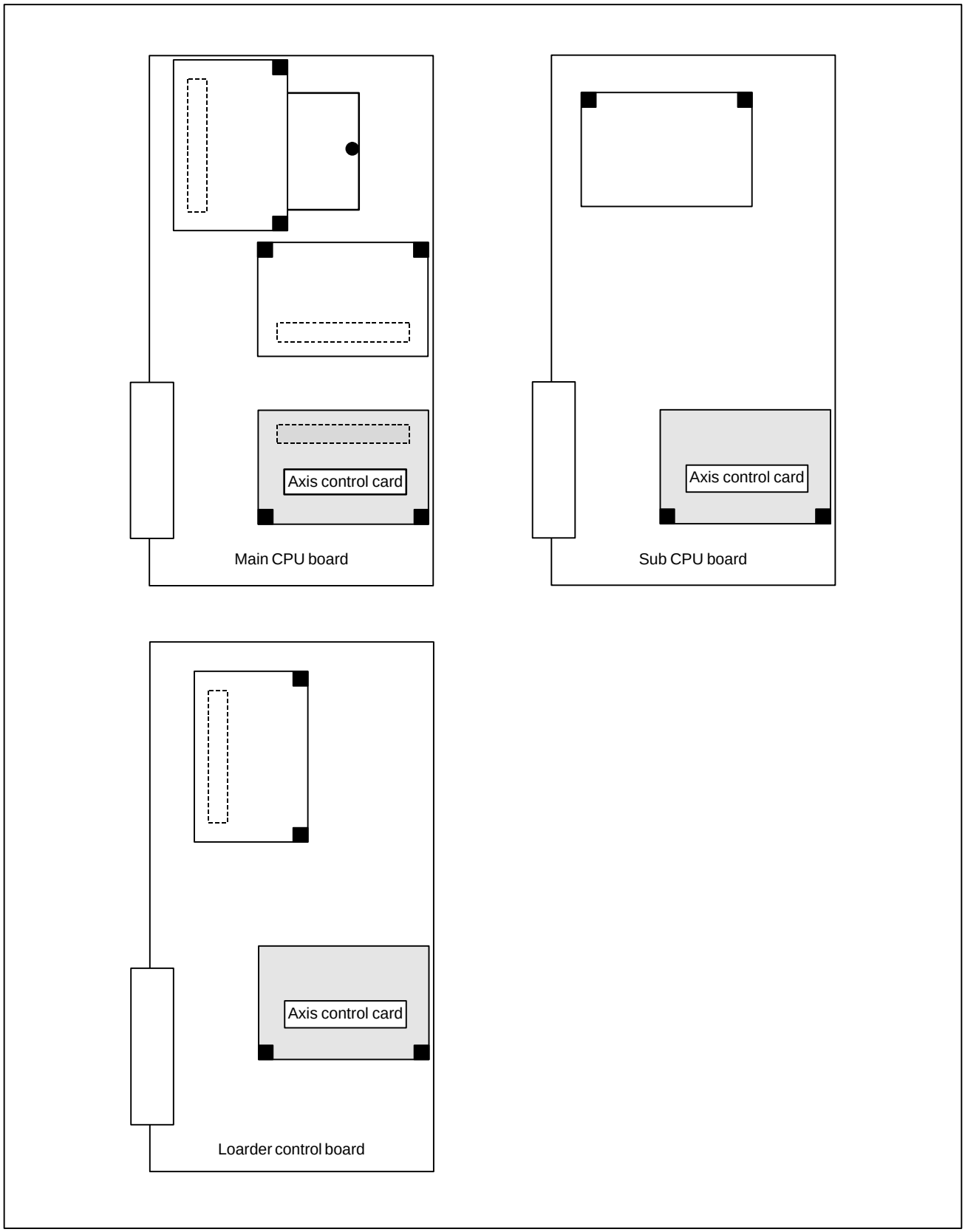


Sub–CPU board



Loader control card

[For the stand–alone type]



7.38 SPC ALARMS

For an explanation of the following SPC alarms (serial pulse coder alarms), refer to the FANUC SERVO MOTOR α Series Maintenance Manual (B–65165E).

Number	Message	Contents
360	n AXIS: ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS: ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS: ABNORMAL REV. DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS: ABNOMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS: SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built–in pulse coder.
365	n AXIS: BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS: PULSE MISS (INT)	An LED error occurred in the built–in pulse coder.
367	n AXIS: COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS: SERIAL DATA ERROR (INT)	Communication data from the built–in pulse coder cannot be received.
369	n AXIS: DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built–in pulse coder.

APPENDIX

A ALARM LIST

A.1 LIST OF ALARM CODES

1) Program errors (P/S alarm)

Number	Message	Contents
000	PLEASE TURN OFF POWER	A parameter which requires the power off was input, turn off power.
001	TH PARITY ALARM	TH alarm (A character with incorrect parity was input). Correct the tape.
002	TV PARITY ALARM	TV alarm (The number of characters in a block is odd). This alarm will be generated only when the TV check is effective.
003	TOO MANY DIGITS	Data exceeding the maximum allowable number of digits was input. (Refer to the item of max. programmable dimensions.)
004	ADDRESS NOT FOUND	A numeral or the sign " – " was input without an address at the beginning of a block. Modify the program .
005	NO DATA AFTER ADDRESS	The address was not followed by the appropriate data but was followed by another address or EOB code. Modify the program.
006	ILLEGAL USE OF NEGATIVE SIGN	Sign " ." input error (Sign " – " was input after an address with which it cannot be used. Or two or more " – " signs were input.) Modify the program.
007	ILLEGAL USE OF DECIMAL POINT	Decimal point " – " input error (A decimal point was input after an address with which it can not be used. Or two decimal points were input.) Modify the program.
009	ILLEGAL ADDRESS INPUT	Unusable character was input in significant area. Modify the program.
010	IMPROPER G–CODE	An unusable G code or G code corresponding to the function not provided is specified. Modify the program.
011	NO FEEDRATE COMMANDED	Feedrate was not commanded to a cutting feed or the feedrate was inadequate. Modify the program.
015	TOO MANY AXES COMMANDED	The number of the commanded axes exceeded that of simultaneously controlled axes.
020	OVER TOLERANCE OF RADIUS	In circular interpolation (G02 or G03), difference of the distance between the start point and the center of an arc and that between the end point and the center of the arc exceeded the value specified in parameter No. 3410.
021	ILLEGAL PLANE AXIS COMMANDED	An axis not included in the selected plane (by using G17, G18, G19) was commanded in circular interpolation. Modify the program.
022	NO CIRCULAR RADIUS	When circular interpolation is specified, neither R (specifying an arc radius), nor I, J, and K (specifying the distance from a start point to the center) is specified.
025	CANNOT COMMAND F0 IN G02/G03	F0 (fast feed) was instructed by F1 –digit column feed in circular interpolation. Modify the program.
028	ILLEGAL PLANE SELECT	In the plane selection command, two or more axes in the same direction are commanded. Modify the program.
029	ILLEGAL OFFSET VALUE	The offset values specified by H code is too large. Modify the program.
030	ILLEGAL OFFSET NUMBER	The offset number specified by D/H code for cutter compensation is too large. Alternatively, the number of the additional workpiece coordinate system specified by a P code is too large. Modify the program.
031	ILLEGAL P COMMAND IN G10	In setting an offset amount by G10, the offset number following address P was excessive or it was not specified. Modify the program.
032	ILLEGAL OFFSET VALUE IN G10	In setting an offset amount by G10 or in writing an offset amount by system variables, the offset amount was excessive.
033	NO SOLUTION AT CRC	A point of intersection cannot be determined for cutter compensation C. Modify the program.
034	NO CIRC ALLOWED IN ST–UP / EXT BLK	The start up or cancel was going to be performed in the G02 or G03 mode in cutter compensation C. Modify the program.

Number	Message	Contents
036	CAN NOT COMMANDED G31	Skip cutting (G31) was specified in cutter compensation mode. Modify the program.
037	CAN NOT CHANGE PLANE IN CRC	The plane selected by using G17, G18 or G19 is changed in cutter compensation C mode. Modify the program.
038	INTERFERENCE IN CIRCULAR BLOCK	Overcutting will occur in cutter compensation C because the arc start point or end point coincides with the arc center. Modify the program.
041	INTERFERENCE IN CRC	Overcutting will occur in cutter compensation C. Two or more blocks are consecutively specified in which functions such as the auxiliary function and dwell functions are performed without movement in the cutter compensation mode. Modify the program.
042	G45/G48 NOT ALLOWED IN CRC	Tool offset (G45 to G48) is commanded in cutter compensation. Modify the program.
046	ILLEGAL REFERENCE RETURN COMMAND	Other than P2, P3 and P4 are commanded for 2nd, 3rd and 4th reference position return command.
051	MISSING MOVE AFTER CHF/CNR	Improper movement or the move distance was specified in the block next to the chamfering or corner R block. Modify the program.
052	CODE IS NOT G01 AFTER CHF/ CNR	The block next to the chamfering or corner R block is not G01,G02,or G03. Modify the program.
053	TOO MANY ADDRESS COMMANDS	For systems without the arbitary angle chamfering or corner R cutting, a comma was specified. For systems with this feature, a comma was followed by something other than R or C Correct the program.
055	MISSING MOVE VALUE IN CHF/ CNR	In the arbitrary angle chamfering or corner R block, the move distance is less than chamfer or corner R amount. Alternatively, an arc end–point command has been omitted.
058	END POINT NOT FOUND	In a arbitrary angle chamfering or corner R cutting block, a specified axis is not in the selected plane. Correct the program.
059	PROGRAM NUMBER NOT FOUND	In an external program number search, a specified program number was not found. Otherwise, a program specified for searching is being edited in background processing. Check the program number and external signal. Or discontinue the background eiting.
060	SEQUENCE NUMBER NOT FOUND	Commanded sequence number was not found in the sequence number search. Check the sequence number.
070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary programs, then retry.
071	DATA NOT FOUND	The address to be searched was not found. Or the program with specified program number was not found in program number search. Check the data.
072	TOO MANY PROGRAMS	The number of programs to be stored exceeded 125 (basic), 200 (option), 400 (option), or 1000 (option). Delete unnecessary programs and execute program registeration again.
073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registeration again.
074	ILLEGAL PROGRAM NUMBER	The program number is other than 1 to 9999. Modify the program number.
075	PROTECT	An attempt was made to register a program whose number was protected.
076	ADDRESS P NOT DEFINED	Address P (program number) was not commanded in the block which includes an M98, G65, or G66 command. Modify the program.
077	SUB PROGRAM NESTING ERROR	The subprogram was called in five folds. Modify the program.
078	NUMBER NOT FOUND	A program number or a sequence number which was specified by address P in the block which includes an M98, M99, M65 or G66 was not found. The sequence number specified by a GOTO statement was not found. Otherwise, a called program is being edited in background processing. Correct the program, or discontinue the background editing.
079	PROGRAM VERIFY ERROR	In memory or program collation,a program in memory does not agree with that read from an external I/O device. Check both the programs in memory and those from the external device.

Number	Message	Contents
085	COMMUNICATION ERROR	When entering data in the memory by using Reader / Puncher interface, an overrun, parity or framing error was generated. The number of bits of input data or setting of baud rate or specification No. of I/O unit is incorrect.
086	DR SIGNAL OFF	When entering data in the memory by using Reader / Puncher interface, the ready signal (DR) of reader / puncher was off. Power supply of I/O unit is off or cable is not connected or a P.C.B. is defective.
087	BUFFER OVERFLOW	When entering data in the memory by using Reader / Puncher interface, though the read terminate command is specified, input is not interrupted after 10 characters read. I/O unit or P.C.B. is defective.
088	LAN FILE TRANS ERROR (CHANNEL–1)	File data transfer over the OSI–Ethernet was terminated as a result of a transfer error.
089	LAN FILE TRANS ERROR (CHANNEL–2)	File data transfer over the OSI–Ethernet was terminated as a result of a transfer error.
090	REFERENCE RETURN INCOMPLETE	The reference position return cannot be performed normally because the reference position return start point is too close to the reference position or the speed is too slow. Separate the start point far enough from the reference position, or specify a sufficiently fast speed for reference position return.
091	REFERENCE RETURN INCOMPLETE	In the automatic operation halt state, manual reference position return cannot be performed.
092	AXES NOT ON THE REFERENCE POINT	The commanded axis by G27 (Reference position return check) did not return to the reference position.
094	P TYPE NOT ALLOWED (COORD CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the coordinate system setting operation was performed.) Perform the correct operation according to th operator's manual.
095	P TYPE NOT ALLOWED (EXT OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the external workpiece offset amount changed.)
096	P TYPE NOT ALLOWED (WRK OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the workpiece offset amount changed.)
097	P TYPE NOT ALLOWED (AUTO EXEC)	P type cannot be directed when the program is restarted. (After power ON, after emergency stop or P/S alarm 94 to 97 were reset, no automatic operation is performed.) Perform automatic operation.
098	G28 FOUND IN SEQUENCE RETURN	A command of the program restart was specified without the reference position return operation after power ON or emergency stop, and G28 was found during search. Perform the reference position return.
099	MDI EXEC NOT ALLOWED AFT. SEARCH	After completion of search in program restart, a move command is given with MDI.
100	PARAMETER WRITE ENABLE	On the PARAMETER(SETTING) screen, PWE(parameter writing enabled) is set to 1. Set it to 0, then reset the system.
101	PLEASE CLEAR MEMORY	The power turned off while rewriting the memory by program edit operation. If this alarm has occurred, press <RESET> while pressing <PROG>, and only the program being edited will be deleted. Register the deleted program.
109	FORMAT ERROR IN G08	A value other than 0 or 1 was specified after P in the G08 code, or no value was specified.
110	DATA OVERFLOW	The absolute value of fixed decimal point display data exceeds the allowable range. Modify the program.
111	CALCULATED DATA OVERFLOW	The result of calculation is out of the allowable range (-10^{47} to -10^{-29}, 0, and 10^{-29} to 10^{47}).
112	DIVIDED BY ZERO	Division by zero was specified. (including tan 90°)
113	IMPROPER COMMAND	A function which cannot be used in custom macro is commanded. Modify the program.
114	FORMAT ERROR IN MACRO	There is an error in other formats than <Formula>. Modify the program.

Number	Message	Contents
115	ILLEGAL VARIABLE NUMBER	A value not defined as a variable number is designated in the custom macro or in high–speed cycle cutting. The header contents are improper in a high–speed cycle cutting. This alarm is given in the following cases: 1. The header corresponding to the specified machining cycle number called is not found. 2. The cycle connection data value is out of the allowable range (0 – 999). 3. The number of data in the header is out of the allowable range (0 – 32767). 4. The start data variable number of executable format data is out of the allowable range (#20000 – #85535). 5. The storing data variable number of executable format data is out of the allowable range (#85535). 6. The storing start data variable number of executable format datais overlapped with the variable number used in the header. Modify the program.
116	WRITE PROTECTED VARIABLE	The left side of substitution statement is a variable whose substitution is inhibited. Modify the program.
118	PARENTHESIS NESTING ERROR	The nesting of bracket exceeds the upper limit (quintuple). Modify the program.
119	ILLEGAL ARGUMENT	The SQRT argument is negative, BCD argument is negative, or other values than 0 to 9 are present on each line of BIN argument. Modify the program.
122	QUADRUPLICATE MACRO MODAL–CALL	A total of four macro calls and macro modal calls are nested. Correct the program.
123	CAN NOT USE MACRO COMMAND IN DNC	Macro control command is used during DNC operation. Modify the program.
124	MISSING END STATEMENT	DO – END does not correspond to 1 : 1. Modify the program.
125	FORMAT ERROR IN MACRO	<Formula> format is erroneous. Modify the program.
126	ILLEGAL LOOP NUMBER	In DOn, $1 \leqq n \leqq 3$ is not established. Modify the program.
127	NC, MACRO STATEMENT IN SAME BLOCK	NC and custom macro commands coexist. Modify the program.
128	ILLEGAL MACRO SEQUENCE NUMBER	The sequence number specified in the branch command was not 0 to 9999. Or, it cannot be searched. Modify the program.
129	ILLEGAL ARGUMENT ADDRESS	An address which is not allowed in <Argument Designation > is used. Modify the program.
130	ILLEGAL AXIS OPERATION	An axis control command was given by PMC to an axis controlled by CNC. Or an axis control command was given by CNC to an axis controlled by PMC. Modify the program.
131	TOO MANY EXTERNAL ALARM MESSAGES	Five or more alarms have generated in external alarm message. Consult the PMC ladder diagram to find the cause.
132	ALARM NUMBER NOT FOUND	No alarm No. concerned exists in external alarm message clear. Check the PMC ladder diagram.
133	ILLEGAL DATA IN EXT. ALARM MSG	Small section data is erroneous in external alarm message or external operator message. Check the PMC ladder diagram.
138	SUPERIMPOSED DATA OVERFLOW	In PMC–based axis control, the increment for pulse distribution on the CNC and PMC side are too large when the superimposed control extended function is used.
139	CAN NOT CHANGE PMC CONTROL AXIS	An axis is selected in commanding by PMC axis control. Modify the program.
141	CAN NOT COMMAND G51 IN CRC	G51 (Scaling ON) is commanded in the tool offset mode. Modify the program.
142	ILLEGAL SCALE RATE	Scaling magnification is commanded in other than 1 – 999999. Correct the scaling magnification setting (G51 Pp . . or parameter 5411 or 5421).
143	SCALED MOTION DATA OVERFLOW	The scaling results, move distance, coordinate value and circular radius exceed the maximum command value. Correct the program or scaling mangification.

Number	Message	Contents
144	ILLEGAL PLANE SELECTED	The coordinate rotation plane and arc or cutter compensation C plane must be the same. Modify the program.
145	ILLEGAL CONDITIONS IN POLAR COORDINATE INTERPOLATION	The conditions are incorrect when the polar coordinate interpolation starts or it is canceled. 1) In modes other than G40, G12.1/G13.1 was specified. 2) An error is found in the plane selection. Parameters No. 5460 and No. 5461 are incorrectly specified. Modify the value of program or parameter.
146	IMPROPER G CODE	G codes which cannot be specified in the polar coordinate interpolation mode was specified. See section polar coordinate interpolation and modify the program.
148	ILLEGAL SETTING DATA	Automatic corner override deceleration rate is out of the settable range of judgement angle. Modify the parameters (No.1710 to No.1714)
160	G72.1 NESTING ERROR	Code G72.1 was specified in a sub–program after the same code had already been specified for copying with rotation.
161	G72.2 NESTING ERROR	Code G72.2 was specified in a sub–program after the same code had already been specified for parallel copying.
175	ILLEGAL G107 COMMAND	Conditions when performing cylindrical interpolation start or cancel not correct. To change the mode to the cylindrical interpolation mode, specify the command in a format of “G07.1 rotation–axis name radius of cylinder.”
176	IMPROPER G–CODE IN G107	Any of the following G codes which cannot be specified in the cylindrical interpolation mode was specified. 1) G codes for positioning, such as G28 including the codes specifying the rapid traverse cycle 2) G codes for setting a coordinate system: G52,G92, 3) G code for selecting coordinate system: G53 G54–G59 Modify the program.
177	CHECK SUM ERROR (G05 MODE)	Check sum error Modify the program.
178	G05 COMMANDED IN G41/G42 MODE	G05 was commanded in the G41/G42 mode. Correct the program.
179	PARAM. (PRM NO. 7510) SETTING ERROR	The number of controlled axes set by the parameter 7510 exceeds the maximum number. Modify the parameter setting value.
180	COMMUNICATION ERROR (REMOTE BUF)	Remote buffer connection alarm has generated. Confirm the number of cables, parameters and I/O device.
199	MACRO WORD UNDEFINED	Undefined macro word was used. Modify the custom macro.
210	CAN NOT COMAND M198/M99	1) M198 and M99 are executed in the schedule operation. Or M198 is executed in the DNC operation. 2) In a multiple repetitive pocketing canned cycle, an interrupt macro was specified, and M99 was executed.
212	ILLEGAL PLANE SELECT	The arbitrary angle chamfering or a corner R is commanded or the plane including an additional axis. Correct the program.
213	ILLEGAL COMMAND IN SYNCHRO–MODE	Any of the following alarms occurred in the operation with the simple synchronization control. 1) The program issued the move command to the slave axis. 2) The program issued the manual continuous feed/manual handle feed/incremental feed command to the slave axis. 3) The program issued the automatic reference position return command without executing the manual reference position return after the power was turned on. 4) The difference between the position error amount of the master and slave axes exceeded the value specified in parameter No. 8313.
214	ILLEGAL COMMAND IN SYNCHRO–MODE	Coordinate system is set or cutter compensation of the shift type is executed in the synchronous control. Correct the program.
222	DNC OP. NOT ALLOWED IN BG.–EDIT	Input and output are executed at a time in the background edition. Execute a correct operation.
224	RETURN TO REFERENCE POINT	Reference position return has not been performed before the automatic operation starts. Perform reference position return only when parameter ZRN_X (No.1005#0) is 0.

Number	Message	Contents
231	ILLEGAL FORMAT IN G10 OR L50	Any of the following errors occurred in the specified format at the programmable–parameter input. 1) Address N or R was not entered. 2) A number not specified for a parameter was entered. 3) The axis number was too large. 4) An axis number was not specified in the axis–type parameter. 5) An axis number was specified in the parameter which is not an axis type. 6) An attempt was made to reset bit 4 of parameter 3202 (NE9) or change parameter 3210 (PSSWD) when they are protected by a password. Correct the program.
232	TOO MANY HELICAL AXIS COMMANDS	Three or more axes (in the normal direction control mode two or more axes) were specified as helical axes in the helical interpolation mode.
233	DEVICE BUSY	When an attempt was made to use a unit such as that connected via the RS–232–C interface, other users were using it.
239	BP/S ALARM	While punching was being performed with the function for controlling external I/O units ,background editing was performed.
240	BP/S ALARM	Background editing was performed during MDI operation.
4000	P/S ALARM	Although the end of a record is reached, the near point is not found during near point search. ”END OF RECORD” was read during program restart (laser specification).
4001	P/S ALARM	The Z–axis is specified as the tracing axis during near point search or program restart (laser specification).
4002	G CODE UNAVAILABLE DURING SEARCH	G53 is specified in independent axis mode (bit 3 of PRM. 15600, MIA = 1) during near point search or program restart (laser specification).
4004	THREE–DIMENSIONAL COORDINATE CONVERSION ALARM	One or two of the I, J, and K commands are not specified or a command for the X, Y, Z, 4, or 5 axis is not specified.
4005	THREE–DIMENSIONAL COORDINATE CONVERSION ALARM	G27, G28, or G29 was issued during three–dimensional coordinate conversion.
4006	THREE–DIMENSIONAL COORDINATE CONVERSION ALARM	G68 was issued again during three–dimensional coordinate conversion.
4007	THREE–DIMENSIONAL COORDINATE CONVERSION ALARM	G12 (spatial circular interpolation) was issued during three–dimensional coordinate conversion.
4008	THREE–DIMENSIONAL COORDINATE CONVERSION ALARM	Scaling or coordinate rotation was specified during three–dimensional coordinate conversion.
4010	THREE–DIMENSIONAL TRANSFORM FORMAT ERROR	The G98 command format is invalid.
4011	MATRIX TRANSFORM ERROR	No matrix can be created during G98 processing.
4012	COORDINATE CONVERSION ERROR	Coordinate conversion cannot be performed for G98.
4016	P/S ALARM	The value of arc radius R specified in G33 mode is too large.
4017	P/S ALARM	A G code in group 01 other than G01 was issued in G33 mode. Cutter compensation was specified in G33 mode.
4021	P/S ALARM	A negative value is specified as the length of the nozzle. The nozzle length falls outside the specification range. The total of the second arm length and nozzle length must be a maximum of 500 mm (19.685 inches).
4025	P/S ALARM	The spatial arc or spatial corner rounding command specifies axis movement for an axis other than the first to fifth axes.
4700	PROGRAM ERROR (OT +)	The value specified in the X-axis move command exceeded the positive value of stored stroke limit 1. (Advance check)
4701	PROGRAM ERROR (OT –)	The value specified in the X-axis move command exceeded the negative value of stored stroke limit 1. (Advance check)
4702	PROGRAM ERROR (OT +)	The value specified in the Y-axis move command exceeded the positive value of stored stroke limit 1. (Advance check)

Number	Message	Contents
4703	PROGRAM ERROR (OT –)	The value specified in the Y-axis move command exceeded the negative value of stored stroke limit 1. (Advance check)
4704	PROGRAM ERROR (OT +)	The value specified in the Z-axis move command exceeded the positive value of stored stroke limit 1. (Advance check)
4705	PROGRAM ERROR (OT –)	The value specified in the Z-axis move command exceeded the negative value of stored stroke limit 1. (Advance check)
5000	ILLEGAL COMMAND CODE	The specified code was incorrect in the high–precision contour control (HPCC) mode. (HPCC: High–precision contour control)
5003	ILLEGAL PARAMETER (HPCC)	The parameter setting is incorrect.
5004	HPCC NOT READY	High–precision contour control is not ready.
5006	TOO MANY WORD IN ONE BLOCK	The number of words specified in a block exceeded 26 in the HPCC mode. (HPCC: High–precision contour control)
5007	TOO LARGE DISTANCE	In the HPCC mode, the machine moved beyond the limit. (HPCC: High–precision contour control)
5009	PARAMETER ZERO (DRY RUN)	The maximum feedrate (parameter No. 1422) or the feedrate in dry run (parameter No. 1410) is 0 in the HPCC mode. (HPCC: High–precision contour control)
5010	END OF RECORD	The end of record (%) was specified.
5011	PARAMETER ZERO(CUT MAX)	The maximum cutting feedrate (parameter No. 1422) is 0.
5012	G05 P10000 ILLEGAL START UP (HPCC)	G05 P10000 has been specified in a mode from which HPCC mode cannot be entered. (HPCC: High–precision contour control)
5013	HPCC:CRC OFS REMAIN AT CANCEL	G05P0 has been specified in G41/G42 mode or before cancellation axis is not found.
5014	TRACE DATA NOT FOUND	Trace data is not available, preventing transfer from being performed.
5016	ILLEGAL COMBINATION OF M CODE	M codes which belonged to the same group were specified in a block. Alternatively,an M code which must be specified without other M codes in the block was specified in a block with other M codes.
5020	PARAMETER OF RESTART ERROR	The parameter for specifying program restart is not set correctly.
5046	ILLEGAL PARAMETER (ST.COMP)	An illegal parameter has been specified for straightness compensation. Possible reasons are as follows: 1 There is no axis corresponding to the axis number specified in the move axis or compensation axis parameter. 2 More than 128 pitch error compensation points are not sequentially numbered. 3 The straightness compensation points are not sequentially numbered. 4 A specified straightness compensation point is outside the range between the pitch error compensation points having the maximum positive and negative coordinates. 5 The compensation value specified for each compensation point is too large or too small.
5051	M–NET CODE ERROR	When the chopping function is used, a move command was specified for a chopping axis in chopping mode (during reciprocation between a top dead point and bottom dead point).
5052	M–NET ETX ERROR	“ETX” code is abnormal.
5053	M–NET CONNECT ERROR	Connection time supervision error (parameter No.175)
5054	M–NET RECEIVE ERROR	Boring time supervision error (parameter No.176)
5055	M–NET PRT/FRM ERROR	Vertical parity or framing error detection

Number	Message	Contents
5057	M–NET BOARD SYSTEM DOWN	Transmit time–out error (parameter No. 177) ROM parity error CPU interruption detection of not listed above
5059	RADIUS VALUE OUTSIDE ALLOWABLE RANGE	When the center of the arc was specified by I, J, and K for circular interpolation, the length of the radius value exceeded nine digits.
5063	IS NOT PRESET AFTER REF.	This message is output when the position counter has not been preset before the start of plate thickness measurement. This alarm is issued in one of the cases below. 1) When an attempt was made to perform measurement before a reference position had been established. 2) When, after manual reference position return, an attempt was made to start measurement without first setting the position counter.
5064	DIFFERRENT AXIS UNIT (IS–B, IS–C)	Circular interpolation was specified for a plane formed by axes using different increment systems.
5065	DIFFERRENT AXIS UNIT (PMC AXIS)	In PMC–based axis control, axes using different increment systems are specified for the same DI/DO group. Modify parameter No. 8010.
5068	G31 P90 FORMAT ERROR	No axis is specified for movement. Two or more axes were specified for movement.
5073	NO DECIMAL POINT	A decimal point is not specified for a command for which a decimal point must be specified.
5074	ADDRESS DUPLICATION ERROR	The same address appears more than once in a block. Alternatively, a block contains two or more G codes belonging to the same group.
5082	DATA SERVER ERROR	Details are displayed on the data server message screen.
5110	IMPROPER G–CODE (G05.1 G1 MODE)	An illegal G code was specified in AI contour control mode.
5111	IMPROPER MODAL G–CODE (G05.1 G1)	An illegal G code is left modal when AI contour control mode was specified.
5112	G08 CAN NOT BE COMMANDED (G05.1 G1)	Look–ahead control (G08) was specified in AI contour control mode.
5113	CAN NOT ERROR IN MDI MODE (G05.1)	AI contour control (G05.1) was specified in MDI mode.
5114	NOT STOP POSITION (G05.1 Q1)	At the time of restart after manual intervention, the coordinates at which the manual intervention occurred have not been restored.
5134	FSSB : OPEN READY TIME OUT	Initialization did not place FSSB in the open ready state.
5135	FSSB : ERROR MODE	FSSB has entered error mode.
5136	FSSB : NUMBER OF AMPS IS SMALL	In comparison with the number of controlled axes, the number of amplifiers recognized by FSSB is not enough.
5137	FSSB : CONFIGURATION ERROR	FSSB detected a configuration error.
5138	FSSB : AXIS SETTING NOT COMPLETE	In automatic setting mode, axis setting has not been made yet. Perform axis setting on the FSSB setting screen.
5139	FSSB : ERROR	Servo initialization did not terminate normally. The optical cable may be defective, or there may be an error in connection to the amplifier or another module. Check the optical cable and the connection status.
5156	ILLEGAL AXIS OPERATION (AICC)	In AICC mode, the controlled axis selection signal (PMC axis control) changes. In AICC mode, the simple synchronous axis selection signal changes. (AICC: AI contour control)
5157	PARAMETER ZERO (AICC)	Zero is set in the parameter for the maximum cutting feedrate (parameter No. 1422 or 1432). Zero is set in the parameter for the acceleration/deceleration before interpolation (parameter No. 1770 or 1771). Set the parameter correctly. (AICC: AI contour control)

Number	Message	Contents
5196	ILLEGAL OPERATION (HPCC)	Detach operation was performed in HPCC mode. (If detach operation is performed in HPCC mode, this alarm is issued after the currently executed block terminates.) (HPCC: High–precision contour control)
5197	FSSB : OPEN TIME OUT	The CNC permitted FSSB to open, but FSSB was not opened.
5198	FSSB : ID DATA NOT READ	Temporary assignment failed, so amplifier initial ID information could not be read.
5199	FINE TORQUE SENSING PARAMETER	A parameter related to the fine torque sensing function is illegal. · The storage interval is invalid. · An invalid axis number is set as the target axis. Correct the parameter.
5212	SCREEN COPY : PARAMETER ERROR	There is a parameter setting error. Check that 4 is set as the I/O channel.
5213	SCREEN COPY : COMMUNICATION ERROR	The memory card cannot be used. Check the memory card. (Check whether the memory card is write–protected or defective.)
5214	SCREEN COPY : DATA TRANSFER ERROR	Data transfer to the memory card failed. Check whether the memory card space is insufficient and whether the memory card was removed during data transfer.
5218	ILLEGAL PARAMETER (INCL. COMP)	There is an inclination compensation parameter setting error. Cause: 1. The number of pitch error compensation points between the negative (–) end and positive (+) end exceeds 128. 2. The relationship in magnitude among the inclination compensation point numbers is incorrect. 3. An inclination compensation point is not located between the negative (–) end and positive (+) end of the pitch error compensation points. 4. The amount of compensation per compensation point is too large or too small. Correct the parameter.
5220	REFERENCE POINT ADJUSTMENT MODE	A parameter for automatically set a reference position is set. (Bit 2 of parameter No. 1819 = 1) Perform automatic setting. (Position the machine at the reference position manually, then perform manual reference position return.) Supplementary: Automatic setting sets bit 2 of parameter No. 1819 to 0.
5222	SRAM CORRECTABLE ERROR	The SRAM correctable error cannot be corrected. Cause: A memory problem occurred during memory initialization. Action: Replace the master printed circuit board (SRAM module).
5227	FILE NOT FOUND	A specified file is not found during communication with the built–in Handy File.
5228	SAME NAME USED	There are duplicate file names in the built–in Handy File.
5229	WRITE PROTECTED	A floppy disk in the built–in Handy File is write protected.
5231	TOO MANY FILES	The number of files exceeds the limit during communication with the built–in Handy File.
5232	DATA OVER–FLOW	There is not enough floppy disk space in the built–in Handy File.
5235	COMMUNICATION ERROR	A communication error occurred during communication with the built–in Handy File.

Number	Message	Contents
5237	READ ERROR	A floppy disk in the built–in Handy File cannot be read from. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5238	WRITE ERROR	A floppy disk in the built–in Handy File cannot be written to. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5242	ILLEGAL AXIS NUMBER (M series)	The axis number of the synchronous master axis or slave axis is incorrect. (This alarm is issued when flexible synchronization is turned on.) Alternatively, the axis number of the slave axis is smaller than that of the master axis.
5303	TOUCH PANEL ERROR	A touch panel error occurred. Cause: 1. The touch panel is kept pressed. 2. The touch panel was pressed when power was turned on. Remove the above causes, and turn on the power again.
5307	INTERNAL DATA OVER FLOW	In the following function, internal data exceeds the allowable range. 1) Improvement of the rotation axis feedrate

2) Background edit alarm

Number	Message	Contents
???	BP/S alarm	BP/S alarm occurs in the same number as the P/S alarm that occurs in ordinary program edit. (P/S alarm No. 070, 071, 072, 073, 074, 085 to 087) Modify the program.
140	BP/S alarm	It was attempted to select or delete in the background a program being selected in the foreground. **(NOTE)** Use background editing correctly.

NOTE
Alarm in background edit is displayed in the key input line of the background edit screen instead of the ordinary alarm screen and is resettable by any of the MDI key operation.

3) Absolute pulse coder (APC) alarm

Number	Message	Contents
300	nth–axis origin return	Manual reference position return is required for the nth–axis (n=1 to 8).
301	APC alarm: nth–axis communication	nth–axis (n=1 to 8) APC communication error. Failure in data transmission Possible causes include a faulty APC, cable, or servo interface module.
302	APC alarm: nth–axis over time	nth–axis (n=1 to 8) APC overtime error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
303	APC alarm: nth–axis framing	nth–axis (n=1 to 8) APC framing error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
304	APC alarm: nth–axis parity	nth–axis (n=1 to 8) APC parity error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
305	APC alarm: nth–axis pulse error	nth–axis (n=1 to 8) APC pulse error alarm. APC alarm.APC or cable may be faulty.
306	APC alarm: nth–axis battery voltage 0	nth–axis (n=1 to 8) APC battery voltage has decreased to a low level so that the data cannot be held. APC alarm. Battery or cable may be faulty.

Number	Message	Contents
307	APC alarm: nth–axis battery low 1	nth–axis (n=1 to 8) axis APC battery voltage reaches a level where the battery must be renewed. APC alarm. Replace the battery.
308	APC alarm: nth–axis battery low 2	nth–axis (n=1 to 8) APC battery voltage has reached a level where the battery must be renewed (including when power is OFF). APC alarm .Replace battery.
309	APC ALARM : n AXIS ZRN IMPOSSIBL	An attempt was made to perform reference position return without rotating the motor through one or more turns. Rotate the motor through one or more turns, turn off the power then on again, then perform reference position return.

4) Serial pulse coder (SPC) alarms

When either of the following alarms is issued, a possible cause is a faulty serial pulse coder or cable.

Number	Message	Description
360	n AXIS : ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS : ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS : ABNORMAL REV.DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS : ABNORMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS : SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built–in pulse coder.
365	n AXIS : BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS : PULSE MISS (INT)	A pulse error occurred in the built–in pulse coder.
367	n AXIS : COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS : SERIAL DATA ERROR (INT)	Communication data from the built–in pulse coder cannot be received.
369	n AXIS : DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built–in pulse coder.
380	n AXIS : BROKEN LED (EXT)	The separate detector is erroneous.
381	n AXIS : ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate linear scale.
382	n AXIS : COUNT MISS (EXT)	A pulse error occurred in the separate detector.
383	n AXIS : PULSE MISS (EXT)	A count error occurred in the separate detector.
384	n AXIS : SOFT PHASE ALARM (EXT)	The digital servo software detected invalid data in the separate detector.
385	n AXIS : SERIAL DATA ERROR (EXT)	Communication data from the separate detector cannot be received.
386	n AXIS : DATA TRANS. ERROR (EXT)	A CRC or stop bit error occurred in the communication data being received from the separate detector.
387	n AXIS : ABNORMAL ENCODER (EXT)	An error occurs in the separate detector. For details, contact the manufacturer of the scale.

- **The details of serial pulse coder alarm No.350**

The details of serial pulse coder alarm No. 350 (pulse coder alarm) are displayed in the diagnosis display (No. 202) as shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
202		CSA	BLA	PHA	PCA	BZA	CKA	SPH

SPH : The serial pulse coder or feedback cable is defective. Replace the serial pulse coder or cable.
CKA: The serial pulse coder is defective. Replace it.
BZA : The pulse coder was supplied with power for the first time. Make sure that the batteries are connected.
Turn the power off, then turn it on again and perform a reference position return. This alarm has nothing to do with alarm No. 350 (serial pulse coder alarm).
PCA : The serial pulse coder is defective. Replace it.
PHA : The serial pulse coder or feedback cable is defective. replace the serial pulse coder or cable.
BLA : The battery voltage is low. Replace the batteries. This alarm has nothing to do with alarm No. 350 (serial pulse coder alarm).
CSA : The serial pulse coder is defective. Replace it.

- **The details of serial pulse coder alarm No.351**

The details of serial pulse coder alarm No. 351 (communication alarm) are displayed in the diagnosis display (No. 203) as shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
203	DTE	CRC	STB	PRM				

PRM: An invalid parameter was found. Alarm No. 417 (invalid servo parameter) is also issued.
STB : the serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or NC–axis board.
CRC : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective. Replace the pulse coder, feedback cable, or NC–axis board.
DTE : The serial pulse coder encountered a communication error.
The pulse coder, feedbak cable, or feedback receiver circuit is defective. Replace the pulse coder, feedback cable, or NC–axis board

5) Servo alarms

Number	Message	Contents
401	SERVO ALARM: n–TH AXIS VRDY OFF	The n–th axis (axis 1 to 8) servo amplifier READY signal (DRDY) went off. Refer to procedure of trouble shooting.
402	SERVO ALARM: SV CARD NOT EXIST	The axis control card is not provided.
403	SERVO ALARM: CARD/SOFT MISMATCH	The combination of the axis control card and servo software is illegal. The possible causes are as follows: · A correct axis control card is not provided. · Correct servo software is not installed on flash memory.
404	SERVO ALARM: n–TH AXIS VRDY ON	Even though the n–th axis (axis 1 to 8) READY signal (MCON) went off, the servo amplifier READY signal (DRDY) is still on. Or, when the power was turned on, DRDY went on even though MCON was off. Check that the servo interface module and servo amp are connected.

Number	Message	Contents
405	SERVO ALARM: (ZERO POINT RETURN FAULT)	Position control system fault. Due to an NC or servo system fault in the reference position return, there is the possibility that reference position return could not be executed correctly. Try again from the manual reference position return.
407	SERVO ALARM: EXCESS ERROR	The following failure occurred during simplified synchronization control. 1) The difference in synchronous axis position deviation exceeded the value set in parameter No. 8314.
409	SERVO ALARM: n AXIS TORQUE ALM	Abnormal servo motor load has been detected.
410	SERVO ALARM: n–TH AXIS – EXCESS ERROR	Either of the following failures occurred. 1) The position deviation when the n axis stops exceeded the value set in parameter No. 1829. 2) The amount of compensation for synchronization exceeded the value set in parameter No. 8325 during simplified synchronization control. This alarm can be generated only for the slave axis.
411	SERVO ALARM: n–TH AXIS – EXCESS ERROR	The position deviation value when the n–th axis (axis 1 to 8) moves is larger than the set value.
413	SERVO ALARM: n–th AXIS – LSI OVERFLOW	The contents of the error register for the n–th axis (axis 1 to 8) exceeded $\pm 2^{31}$ power. This error usually occurs as the result of an improperly set parameters.
415	SERVO ALARM: n–TH AXIS – EXCESS SHIFT	A speed higher than 524288000 units/s was attempted to be set in the n–th axis (axis 1 to 8). This error occurs as the result of improperly set CMR.
417	SERVO ALARM: n–TH AXIS – PARAMETER INCORRECT	This alarm occurs when the n–th axis (axis 1 to 8) is in one of the conditions listed below. (Digital servo system alarm) 1) The value set in Parameter No. 2020 (motor form) is out of the specified limit. 2) A proper value (111 or –111) is not set in parameter No.2022 (motor revolution direction). 3) Illegal data (a value below 0, etc.) was set in parameter No. 2023 (number of speed feedback pulses per motor revolution). 4) Illegal data (a value below 0, etc.) was set in parameter No. 2024 (number of position feedback pulses per motor revolution). 5) Parameters No. 2084 and No. 2085 (flexible field gear rate) have not been set. 6) A value outside the limit of {1 to the number of control axes} or a non–continuous value (Parameter 1023 (servo axis number) contains a value out of the range from 1 to the number of axes, or an isolated value (for example, 4 not prceded by 3).was set in parameter No. 1023 (servo axisnumber). 7) A parameter is set incorrectly for PMC axis torque control. (The torque constant parameter is set to 0.)
420	SERVO ALARM: n AXIS SYNC TORQUE (M series)	During simple synchronous control, the difference between the torque commands for the master and slave axes exceeded the value set in parameter No. 2031.
421	SERVO ALARM: n AXIS EXCESS ER (D)	The difference between the errors in the semi–closed loop and closed loop has become excessive during dual position feedback. Check the values of the dual position conversion coefficients in parameters No. 2078 and 2079.
422	SERVO ALARM: n AXIS	In torque control of PMC axis control, a specified allowable speed has been exceeded.
423	SERVO ALARM: n AXIS	In torque control of PMC axis control, the parameter–set allowable cumulative travel distance has been exceeded.
430	n AXIS : SV. MOTOR OVERHEAT	A servo motor overheat occurred.
431	n AXIS : CNV. OVERLOAD	1) PSM: Overheat occurred. 2) β series SVU: Overheat occurred.
432	n AXIS : CNV. LOWVOLT CON./ POWFAULT	1) PSM: Phase missing occurred in the input voltage. 2) PSMR: The control power supply voltage has dropped. 3) α series SVU: The control power supply voltage has dropped.

Number	Message	Contents
433	n AXIS : CNV. LOW VOLT DC LINK	1) PSM: The DC link voltage has dropped. 2) PSMR: The DC link voltage has dropped. 3) α series SVU: The DC link voltage has dropped. 4) β series SVU: The DC link voltage has dropped.
434	n AXIS : INV. LOW VOLT CONTROL	SVM: The control power supply voltage has dropped.
435	n AXIS : INV. LOW VOLT DC LINK	SVM: The DC link voltage has dropped.
436	n AXIS : SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
437	n AXIS : CNV. OVERCURRENT POWER	PSM: Overcurrent flowed into the input circuit.
438	n AXIS : INV. ABNORMAL CURRENT	1) SVM: The motor current is too high. 2) α series SVU: The motor current is too high. 3) β series SVU: The motor current is too high.
439	n AXIS : CNV. OVERVOLT POWER	1) PSM: The DC link voltage is too high. 2) PSMR: The DC link voltage is too high. 3) α series SVU: The C link voltage is too high. 4) β series SVU: The link voltage is too high.
440	n AXIS : CNV. EX DECELERATION POW.	1) PSMR: The regenerative discharge amount is too large. 2) α series SVU: The regenerative discharge amount is too large. Alternatively, the regenerative discharge circuit is abnormal.
441	n AXIS : ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
442	n AXIS : CNV. CHARGE FAULT/INV. DB	1) PSM: The spare discharge circuit of the DC link is abnormal. 2) PSMR: The spare discharge circuit of the DC link is abnormal. 3) α series SVU: The dynamic brake circuit is abnormal.
443	n AXIS : CNV. COOLING FAN FAILURE	1) PSM: The internal stirring fan failed. 2) PSMR: The internal stirring fan failed. 3) β series SVU: The internal stirring fan failed.
444	n AXIS : INV. COOLING FAN FAILURE	SVM: The internal stirring fan failed.
445	n AXIS : SOFT DISCONNECT ALARM	The digital servo software detected a broken wire in the pulse coder.
446	n AXIS : HARD DISCONNECT ALARM	A broken wire in the built–in pulse coder was detected by hardware.
447	n AXIS : HARD DISCONNECT (EXT)	A broken wire in the separate detector was detected by hardware.
448	n AXIS : UNMATCHED FEEDBACK ALARM	The sign of feedback data from the built–in pulse coder differs from that of feedback data from the separate detector.
449	n AXIS : INV. IPM ALARM	1) SVM: IPM (intelligent power module) detected an alarm. 2) α series SVU: IPM (intelligent power module) detected an alarm.
453	n AXIS : SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the α pulse coder. Turn off the power to the CNC, then remove and insert the pulse coder cable. If this alarm is issued again, replace the pulse coder.
460	n AXIS : FSSB DISCONNECT	FSSB communication was disconnected suddenly. The possible causes are as follows: 1) The FSSB communication cable was disconnected or broken. 2) The power to the amplifier was turned off suddenly. 3) A low–voltage alarm was issued by the amplifier.
461	n AXIS : ILLEGAL AMP INTERFACE	The axes of the 2–axis amplifier were assigned to the fast type interface.
462	n AXIS : SEND CNC DATA FAILED	Because of an FSSB communication error, a slave could not receive correct data.

Number	Message	Contents
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the servo system could not receive correct data.
464	n AXIS : WRITE ID DATA FAILED	An attempt was made to write maintenance information on the amplifier maintenance screen, but it failed.
465	n AXIS : READ ID DATA FAILED	At power–up, amplifier initial ID information could not be read.
466	n AXIS : MOTOR/AMP COMBINATION	The maximum current rating for the amplifier does not match that for the motor.
467	n AXIS : ILLEGAL SETTING OF AXIS	The servo function for the following has not been enabled when an axis occupying a single DSP (corresponding to two ordinary axes) is specified on the axis setting screen. 1. Learning control (bit 5 of parameter No. 2008 = 1) 2. High–speed current loop (bit 0 of parameter No. 2004 = 1) 3. High–speed interface axis (bit 4 of parameter No. 2005 = 1)

- **Details of servo alarm No.414**

The details of servo alarm No. 414 are displayed in the diagnosis display (No. 200, No. 201, and No.204) as shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
200	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

OFA : An overflow alarm is being generated inside of digital servo.
FBA : A disconnection alarm is being generated.
(This bit causes servo alarm No.416.The details are indicated in diagnostic data No. 201)
DCA: A regenerative discharge circuit alarm is being generated in servo amp.
Check LED.
HVA : An overvoltage alarm is being generated in servo amp.
Check LED.
HCA: An abnormal current alarm is being generated in servo amp.
Check LED.
OVC: A overcurrent alarm is being generated inside of digital servo.
LV : A low voltage alarm is being generated in servo amp.
Check LED.
OVL: An overload alarm is being generated.
(This bit causes servo alarm No. 400. The details are indicated in diagnostic data No.201).

	#7	#6	#5	#4	#3	#2	#1	#0
201	ALD			EXP				

When OVL equal 1 in diagnostic data No.200

ALD 0 : Motor overheating
1 : Amplifier overheating

When FBA equal 1 in diagnostic data No.200

ALD	EXP	Alarm details
1	0	Built–in pulse coder disconnection (hardware)
1	1	Separately installed pulse coder disconnection (hardware)
0	0	Pulse coder is not connected due to software.

	#7	#6	#5	#4	#3	#2	#1	#0
204		OFS	MCC	LDA	PMS			

PMS : A feedback pulse error has occured because the feedback cable is defective.
LDA : The LED indicates that serial pulse coder C is defective
MCC : A magnetic contactor contact in the servo amplifier has welded.
OFS : A current conversion error has occured in the digital servo.

6) Over travel alarms

Number	Message	Contents
500	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke limit I. (Parameter No.1320 or 1326 **NOTE**)
501	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke limit I. (Parameter No.1321 or 1327 **NOTE**)
502	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke limit II. (Parameter No.1322)
503	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke limit II. (Parameter No.1323)
504	OVER TRAVEL : +n	Exceeded the n–th axis – side stored stroke limit III. (Parameter No.1324)
505	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke limit III. (Parameter No.1325)
506	OVER TRAVEL : +n	Exceeded the n–th axis + side hardware OT.
507	OVER TRAVEL : –n	Exceeded the n–th axis – side hardware OT.
510	OVER TRAVEL : +n	A stroke limit check, made before starting movement, found that the end point of a block falls within the plus (+) side inhibited area along the n–axis defined by a stroke limit. Correct the program.
511	OVER TRAVEL : –n	A stroke limit check, made before starting movement, found that the end point of a block falls within the minus (–) side inhibited area along the N–axis defined by a stroke limit. Correct the program.

NOTE
Parameters 1326 and 1327 are effective when EXLM (stroke limit switch signal) is on.

7) Overheat alarms

Number	Message	Contents
700	OVERHEAT: CONTROL UNIT	Control unit overheat Check that the fan motor operates normally, and clean the air filter.
701	OVERHEAT: FAN MOTOR	The fan motor on the top of the cabinet for the contorl unit is overheated. Check the operation of the fan motor and replace the motor if necessary.

8) Laser alarms

Number	Message	Contents
4050	CONTOUR DATA ERROR	In the interpolation mode, the value of S, P, or Q is out of command range.
4051	ASSIST GAS DATA ERR.	In the assist gas command, the value of P or Q is out of command range.
4052	TRACE DATA ERROR	In the gap control command, the value of P is out of command range.
4053	PIERCING DATA ERROR	In the piercing mode, the value of S, P, Q or R is out of command range.
4054	E CODE DATA ERROR	The value of E is out of command range.
4055	E CODE NOT COMMANDED	The laser cannot be output because E code is not commanded.
4056	OPT. PATH NOT SET	The optical path cannot be compensated. Please return the reference point.
4060	TRACE ERROR EXCESS	Excessive error in the gap control axis
4061	A/D CONVERTER–1	Failure in A/D converter 1
4062	A/D CONVERTER–2	Failure in A/D converter 2
4063	RF POWER SUPPLY	Failure in RF power supply
4065	SHUTTER ACTION	Abnormal operation of the shutter
4066	DISCHARGING	A discharge tube does not work.
4067	LASER CABINET OH	Internal cabinet temperature too high
4068	BEAM REFLECTION	The laser beam returns to inside the resonator.
4069	LASER IF PCB	Failure in the power supply for laser IF PCB.
4070	CHILLER NOT READY	The chiller unit is not ready.
4071	ASSIST GAS NOT READY	Assist gas is not ready.
4072	CHILL FLOW	Insufficient cooling water
4073	LASER GAS PRES.	Pressure of mixed gas too low
4074	ROOTS BLOWER TEMP.	The Roots blower overheated.
4075	CHILL TEMP.	Cooling water temperature too low
4076	LASER POWER DOWN	Laser power too low
4077	ABSORBER TEMP.	The beam absorber overheated.
4078	LASER TUBE PRES.	Abnormal pressure of mixed gas in discharge tube
4079	PUSH RESET KEY	The emergency stop button is pressed.
4080	LASER TUBE EXHAUST	Gas leak in discharge tubes or gas tubing
4081	GAS PRES. CONTROL	The gas pressure control was performed, but the gas did not reach the specified pressure within the specified time.
4082	TUBE PRES. SENSOR	Failure in the pressure sensor
4083	SHUTTER NOT OPEN	The shutter does not open when laser is output.
4085	MIRROR CLEANING	The mirrors are dirty.
4087	SHUTTER OH	The shutter overheated.
4088	LASER VOLTAGE DOWN	The voltage of the discharge tubes is decreasing.
4089	ASSIST GAS NO SELECT	Assist gas is not output when laser is output.
4090	LASER NOT GENERATE	The laser is not oscillated when laser is output.
4091	INVERTER	Abnormal inverter
4093	BLOWER GREASE	Grease up for turbo–blower. The vibration occurs for turbo–blower.
4094	VANE PUMP	Abnormal operating of the vacuum pump
4095	A/D CONVERTER–3	Failure in A/D converter 3
4096	UNDER TRACING	Changing the gap control axis select signal during the gap control mode.
4097	TRACE AXIS SELECT	The gap control axis select signal is not commanded correctly.
4098	TRACE AXIS & PLANE	The gap control axis is selected for cutting plane.

Number	Message	Contents
4099	GAS PRES. NOT REACH	Laser gas pressure is not reached the specified pressure at the base discharge state.
4100	INVERTER 1	Abnormal operation of the inverter 1 for blower.
4101	OUT OF FREQUENCY 1	Inverter frequency is not reached the specified frequency within 120sec after start the blower 1.
4102	OUT OF VIBRATION1	Vibration occurs for turbo–blower 1.
4103	T.B NOT STOPPING 1	Rotation of turbo–blower 1 does not drop within 120 sec after RUN–OFF.
4104	TURBO OVER CURRENT 1	Over current for turbo–blower 1
4105	TURBO TEMP. 1	Turbo–blower 1 overheated
4106	BLOWER OIL SHORTAGE	Blower oil is shortage.
4107	MIRROR NOT INSTALLED	The mirror is not installed.
4110	INVERTER 2	Abnormal operation of the inverter 2 for blower.
4111	OUT OF FREQUENCY 2	Inverter frequency is not reached the specified frequency within 120 sec after start the blower 2.
4112	OUT OF VIBRATION 2	Vibration occurs for turbo–blower 2.
4113	T. B NOT STOPPING 2	Rotation of turbo–blower 2 does not drop within 120 sec after RUN–OFF.
4114	TURBO OVER CURRENT 2	Over current for turbo–blower 2
4115	TURBO TEMP. 2	Turbo–blower 2 overheated
4130	STEP TIME NOT SET	Step time is not specified for high speed pierce
4131	INCORRECT STEP DISTANCE SETTING	The distance to travel has become shorter than the ramp–down distance under step control before the end of the ramp–up distance. Alternatively, the ramp–up distance has not ended with in one block.
4132	PARAMETER WAS CHANGED.	Parameter No. 15223, 15242, or 15243 was changed.
4136	INTERNAL PRESSURE TOO HIGH	The pressure inside the mixer is too high (1MPa).
4137	MIXER POWER FAILURE	A power failure occurred on the relay printed circuit board in the mixer.
4138	INSUFFICIENT DEGREE OF VACUUM	The specified degree of vacuum is not reached within the specified time during evacuation of the mixer.
4139	MIXER PRESSURE SWITCH ERROR	Although the laser gas supply pressure is reduced, the tank supply pressure is not reduced.

9) System alarms

(These alarms cannot be reset with reset key.)

Number	Message	Contents
900	ROM PARITY	A parity error occurred in the CNC, macro, or servo ROM. Correct the contents of the flash ROM having the displayed number.
910	SRAM PARITY : (BYTE 0)	A RAM parity error occurred in the part program storage RAM. Clear the RAM, or replace the SRAM module or motherboard. Subsequently, re–set the parameters and all other data.
911	SRAM PARITY : (BYTE 1)	
912	DRAM PARITY : (BYTE 0)	A RAM parity error occurred in the DRAM module. Replace the DRAM module.
913	DRAM PARITY : (BYTE 1)	
914	DRAM PARITY : (BYTE 2)	
915	DRAM PARITY : (BYTE 3)	
916	DRAM PARITY : (BYTE 4)	
917	DRAM PARITY : (BYTE 5)	
918	DRAM PARITY : (BYTE 6)	
919	DRAM PARITY : (BYTE 7)	
920	SERVO ALARM (1–4 AXIS)	Servo alarm (first to fourth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.
921	SERVO ALARM (5–8 AXIS)	Servo alarm (fifth to eighth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.
926	FSSB ALARM	FSSB alarm. Replace the axis control card.
930	CPU INTERRUPT	CPU error (abnormal interrupt). The motherboard or CPU card may be faulty.
935	SRAM ECC ERROR	An error occurred in RAM for part program storage. Action: Replace the master printed circuit board (SRAM module), perform all–clear operation, and set all parameter and other data again.
950	PMC SYSTEM ALARM	An error occurred in the PMC. The PMC control circuit on the motherboard may be faulty.
951	PMC WATCH DOG ALARM	An error occurred in the PMC. (Watchdog alarm) The motherboard may be faulty.
972	NMI OCCURRED IN OTHER MODULE	An NMI occurred on a board other than the motherboard. The option board may be faulty.
973	NON MASK INTERRUPT	An NMI occurred as a result of an unknown cause.
974	F–BUS ERROR	A bus error occurred on the FANUC bus. The motherboard or option board may be faulty.
975	BUS ERROR	A bus error occurred on the motherboard. The motherboard may be faulty.
976	L–BUS ERROR	A bus error occurred on the local bus. The motherboard may be faulty.

A.2 LIST OF ALARMS (PMC)

(1) Alarm messages (PMC)

Message	Contents and solution
ALARM NOTHING	Normal status
ER01 PROGRAM DATA ERROR	The sequence program in the ROM is not written correctly. (solution) Re–input the sequence program.
ER02 PROGRAM SIZE OVER	The size of sequence program exceeds the maximum size of LADDER(PMC–SC only). (solution) Please change MAX LADDER AREA SIZE at the SYSPRM screen and restart the system.
ER03 PROGRAM SIZE ERROR(OPTION)	The size of sequence program exceeds the option specification size. (solution) Please increase the option specification size. Or, reduce the size of sequence program.
ER04 PMC TYPE UNMATCH	The PMC model setting of the sequence program is not corresponding to an actual model. (solution) Please change the PMC model setting by the offline programmer.
ER05 PMC MODULE TYPE ERROR	The module type of the PMC engine is not correct. (solution) Please exchange the module of PMC engine for a correct one.
ER06 PMC CONTROL SOFT–WARE TYPE UNMATCH	The combination of CNC system configuration and PMC type is invalid. PMC–SB6 is used for a 3–path CNC system. (solution) Contact FANUC.
ER07 NO OPTION (LADDER STEP)	There is no step number option of LADDER.
ER10 OPTION AREA NOTHING (series name)	The management software for the PMC–SB has not been transferred. (solution) The software installation is not consistent with the order. Contact FANUC.
ER11 OPTION AREA NOTHING (series name)	The management software for the PMC C board has not been transferred. (solution) The software installation is not consistent with the order. Contact FANUC.
ER12 OPTION AREA ERROR (series name)	The series of the management software for the PMC–RB differs between BASIC and OPTION. (solution) Contact FANUC.
ER13 OPTION AREA ERROR (series name)	The series of the management software for the PMC C board differs between BASIC and OPTION. (solution) Contact FANUC.
ER14 OPTION AREA VERSIION ERROR (series name)	The edition of the management software for the PMC–RB differs between BASIC and OPTION. (solution) Contact FANUC.
ER15 OPTION AREA VERSIION ERROR (series name)	The edition of the management software for the PMC C board differs between BASIC and OPTION. (solution) Contact FANUC.
ER16 RAM CHECK ERROR (PROGRAM RAM)	The debugging RAM cannot be read/written normally. (solution) Please exchange the debugging RAM.

Message	Contents and solution
ER17 PROGRAM PARITY	The parity error occurred on ROM for sequence program or the debugging RAM. (solution) ROM: The deterioration of ROM may be deteriorated Please exchange ROM for the sequence program RAM: Please edit the sequence program once on PMC Still the error occurs, exchange the debugging RAM.
ER18 PROGRAM DATA ERROR BY I/O	Transferring the sequence program from offline programmer was interrupted by the power off etc. (solution) Please clear the sequence program and transfer the sequence program again.
ER19 LADDER DATA ERROR	Editing the LADDER was interrupted by the power off or by the switch to the CNC screen by the function key etc. (solution) Please edit LADDER once on PMC. Or, please input LADDER again.
ER20 SYMBOL/COMMENT DATA ERROR	Editing the symbol and comment was interrupted by the power off or by the switch to the CNC screen by the function key etc. (solution) Please edit symbol and comment once on PMC. Or, please input symbol and comment again.
ER21 MESSAGE DATA ERROR	Editing the message data was interrupted by the power off or the switch to the CNC screen by the function key etc. (solution) Please edit message data once on PMC. Or, please input message data again.
ER22 PROGRAM NOTHING	There is no sequence program
ER23 PLEASE TURN OFF POWER	There is a change in setting LADDER MAX AREA SIZE etc. (solution) Please restart the system to make the change effective.
ER24 LADDER, LANGUAGE AREA OVERLAP	The C program area overlaps the ladder program area. (solution) Adjust the address range assigned to C programs.
ER25 SOFTWARE VERSION ERROR (PMCAOPT)	The PMC–SB management software editions are inconsistent. (solution) Contact FANUC.
ER26 SOFTWARE VERSION ERROR (PMCAOPT)	The PMC–SB management software cannot be initialized. (solution) Contact FANUC.
ER27 LADDER FUNC. PRM IS OUT OF RANGE	The parameter number for function instruction TMR, TMRB, CTR, DIFU, or DIFD is not in the range. (solution) Correct the number so that it is within the range.

*When ER00 to ER27 occur, sequence program is not available.

Message	Contents and solution
ER32 NO I/O DEVICE	Any DI/DO unit of I/O Unit or the connection unit etc. is not connected. When built–in I/O card is connected, this message is not displayed. (solution) When built–in I/O card is used: Please confirm whether the built–in I/O card is certainly connected with. When I/O Link is used: Please confirm whether the DI/DO units turning on. Or please confirm the connection of the cable.
ER33 SLC ERROR	The LSI for I/O Link is defective. (solution) Please exchange the module of PMC engine.

Message	Contents and solution
ER34 SLC ERROR(xx)	The communication with the DI/DO units of the xx group failed. (solution) Please confirm the connection of the cable connected to the DI/DO units of the xx group. Please confirm whether the DI/DO units turned on earlier than CNC and PMC. Or, please exchange the module of PMC engine on the DI/DO units of the xx group
ER35 TOO MUCH OUTPUT DATA IN GROUP(xx)	The number of the output data in the xx group exceeded the max. The data, which exceed 32 bytes, become ineffective. (solution) Please refer to the following for the number of the data for each group. “FANUC I/O Unit–MODEL A connecting and maintenance manual” (B–61813E) “FANUC I/O Unit–MODEL B connecting manual”(B–62163E)
ER36 TOO MUCH INPUT DATA IN GROUP(xx)	The number of the input data in the xx group exceeded the max. The data, which exceed 32 bytes, become ineffective. (solution) Please refer to the following for the number of the data for each group. “FANUC I/O Unit–MODEL A connecting and maintenance manual” (B–61813E) “FANUC I/O Unit–MODEL B connecting manual”(B–62163E)
ER38 MAX SETTING OUTPUT DATA OVER(xx)	The assignment data for a group exceeds 128 bytes. (The assignment data of output side of xx group or later become ineffective.) (solution) Please reduce the assignment data to 128 bytes or less for the number of the output data of each group.
ER39 MAX SETTING INPUT DATA OVER(xx)	The assignment data for a group exceeds 128 bytes. (The assignment data of input side of xx group or later become infective.) (Solution) Please reduce the assignment data to 128 bytes or less for the number of the input data of each goup.
ER98 ILLEGAL LASER CONNECTION	An I/O unit for the laser and assigned data do not match. (solution) Check that the ladder assignment data and actual I/O units match.
ER99 X, Y96–127 ARE ALLOCATED	When the laser I/O link is provided, ladder I/O is assigned to X96–X127 and Y96–Y127. (solution) Delete the data assigned to X96–X127 and Y96–Y127.
WN02 OPERATE PANEL ADDRESS ERROR	The address setting data of the operator’s panel for FS–0 is illegal. (solution) Please correct the address setting data.
WN03 ABORT NC–WINDOW/ EXIN	LADDER was stopped while CNC and PMC were communicating. The functional instruction WINDR, WINDW, EXIN, DISPB, and etc. may not work normally. (solution) When restarting the system, this alarm will be released. Execute the sequence program(Press RUN key) after confirming whether there is a problem in LADDER or not.
WN04 UNAVAIL EDIT MODULE	The LADDER editing module cannot be recognized.(PMC–SAx/SBxx=1 to 3) (solution) Please confirm the slot position installed. Please confirm the installed module.
WN05 PMC TYPE NO CONVERSION	A ladder program for the PMC–SA3/SA5 was transferred to the PMC–SB5. (solution) Correct the ladder type.
WN06 TASK STOPPED BY DEBUG FUNC	Some user tasks are stopped by break point of the debugging function.
WN07 LADDER SP ERROR (STACK)	When functional instruction CALL(SUB65) or CALLU(SUB66) was executed, the stack of the LADDER overflowed. (solution) Please reduce the nesting of the subprogram to 8 or less.

Message	Contents and solution
WN17 NO OPTION (LANGUAGE)	There is no C language option.
WN18 ORIGIN ADDRESS ERROR	The LANGUAGE ORIGIN address of the system parameter is wrong (solution) Please set the address of symbol RC_CTLB_INIT in the map file to the LANGUAGE ORIGIN of the system parameter.
WN19 GDT ERROR (BASE,LIMIT)	The value of BASE, LIMIT or ENTRY of user defined GDT is illegal. (solution) Please correct the address in link control statement and build file.
WN20 COMMON MEM. COUNT OVER	The number of common memories exceeds 8. (solution) Please reduce the number of common memories to 8 or less. It is necessary to correct a link control statement,build file and the source file for the common memory.
WN21 COMMON MEM. ENTRY ERROR	GDT ENTRY of the common memory is out of range. (solution) Please correct the address of GDT ENTRY of the common memory in the link control statement.
WN22 LADDER 3 PRIORITY ERROR	The priority of LADDER LEVEL 3 is out of range. (solution) Please correct the value of LADDER LEVEL 3 in the link control statement within the range of 0 or 10–99 or –1.
WN23 TASK COUNT OVER	The number of user tasks exceeds 16. (solution) Please confirm TASK COUNT in the link control statement. When the number of tasks is changed, it is necessary to correct the link control statement, build file and the composition of the files to be linked.
WN24 TASK ENTRY ADDR ERROR	The selector of the entry address to the user task is out of range. (solution) Please correct the table of GDT in build file to the value within 32(20H)–95(5FH).
WN25 DATA SEG ENTRY ERROR	The entry address of the data segment is out of range. (solution) Please correct DATA SEGMENT GDT ENTRY in the link control statement and the table of GDT in build file within 32(20H)–95(5FH).
WN26 USER TASK PRIORITY ERROR	The priority of the user task is out of range. (solution) Please correct the TASK LEVEL in link control statement within the range of 10–99 or –1. Note: Only one task can have TASK LEVEL –1 (including LADDER LEVEL 3).
WN27 CODE SEG TYPE ERROR	The code segment type is illegal. The code segment of RENAMESEG in the binding control file is wrong. (solution) Please correct the entry of the code segment in the link control statement to correspond to the entry in the build file.
WN28 DATA SEG TYPE ERROR	The data segment type is illegal. The data segment of RENAMESEG in the binding control file is wrong. (solution) Please correct the entry of the code segment in the link control statement to correspond to the entry in the build file.
WN29 COMMON MEM SEG TYPE ERROR	The segment type of common memory is illegal. The segment of RENAMESEG in the building control file of the common memory is wrong. (solution) Please correct the entry of common memory in the link control statement to correspond to the entry in the build file.
WN30 IMPOSSIBLE ALLOCATE MEM.	The memories for the data and stack etc. cannot be allocated. (solution) Please confirm whether the value of code segment in build file and USER GDT ADDRESS in link control statement is correct or not. Or please reduce the value of MAX LADDER AREA SIZE of the system parameter and the size of the stack in link control statement at the least

Message	Contents and solution
WN31 IMPOSSIBLE EXECUTE LIBRARY	The library function cannot be executed. (solution) Please confirm the object model of the library. Or, system ROM of PMC must be replaced with one of later version.
WN32 LNK CONTROL DATA ERROR	Link control statement data is illegal. (solution) Please confirm whether the address of symbol RC_ CTLB_INIT in map file is set to LANGUAGE ORIGIN of the system parameter. Or, please make the link control statement again.
WN33 LNK CONTROL VER. ERROR	A link control statement data version error occurred. (Solution) Correct the link control statement in the C program.
WN34 LOAD MODULE COUNT OVER	The number of independent load modules exceeds eight. (solution) Decrease the number of independent load modules to eight or smaller.
WN35 CODE AREA OUT OF RANGE	The specified code area is beyond the address range. (solution) Correct the C program.
WN36 LANGUAGE SIZE ERROR (OPTION)	The size of a C program exceeds the option size. (solution) Decrease the size of the C program.
WN37 PROGRAM DATA ERROR (LANG.)	A C program is destroyed. (solution) Transfer the C program again.
WN38 RAM CHECK ERROR (LANG.)	A C program is destroyed. (solution) Transfer the C program again.
WN39 PROGRAM PARITY (LANG.)	A parity mismatch occurred in a C program. (solution) Transfer the C program again.
WN40 PROGRAM DATA ERROR BY I/O (LANG.)	Transfer of a C program was interrupted by, for example, a power failure. (solution) Clear the C program, then transfer the C program again.
WN41 LANGUAGE TYPE UNMATCH	A C program type mismatch occurred. (solution) Correct the C program.
WN42 UNDEFINE LANGUAGE ORIGIN ADDRESS	No language origin address is set. (solution) Set the language origin address.

NOTE
Alarms WN17 to WN42 indicate errors related to PMC user C programs.

(2) System alarm messages (PMC–SB7)

	Message	Contents and solution
1	PC004 CPU ERR xxxxxxxx:yyyyyyyy PC006 CPU ERR xxxxxxxx:yyyyyyyy PC009 CPU ERR xxxxxxxx:yyyyyyyy PC010 CPU ERR xxxxxxxx:yyyyyyyy	A CPU error occurred in the PMC. xxxxxxxx and yyyyyyyy indicate internal error code. If this error occurs, the motherboard may be faulty. Replace the motherboard, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) to FANUC.
2	PC030 RAM PARITY aa:bb	A RAM parity error occurred in the PMC. aa and bb indicate internal error code. If this error occurs, the motherboard may be faulty. Solution) Replace the motherboard, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) and the indicated internal error code to FANUC.
3	PC050 NMI SLC aa:bb	A communication error occurred in the I/O Link. aa and bb indicate internal error code. If this error occurs, the possible causes are as follows: (1) Although the base expansion is assigned when the I/O Unit A is used, the base is not connected. (2) A cable is not connected securely. (3) Cabling is faulty. (4) I/O equipment (I/O unit, Power Mate, etc.) is faulty. (5) The power to the master or slave unit of the I/O Link is disconnected. (6) A DO–pin short–circuit occurred in an I/O device. (7) The motherboard is faulty. Solution) (1) Check whether the I/O assignment data and the actual I/O equipment connection match. (2) Check whether the cables are connected correctly. (3) According to “FANUC I/O Unit–MODEL A Connection and Maintenance Manual” (B–61813E) or “FANUC I/O Unit–MODEL B Connection manual” (B–62163E), check for an error in the cable specifications. (4) Replace the I/O unit interface module, cable, or motherboard. Then, check whether the error still occurs.
4	PC060 FBUS xxxxxxxx:yyyyyyyy PC061 FL–R xxxxxxxx:yyyyyyyy PC062 FL–W aa: xxxxxxxx:yyyyyyyy	A bus error occurred in the PMC. aa, xxxxxxxx, and yyyyyyyy indicate internal error code. If this error occurs, the hardware may be faulty. Solution) Report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, tc.), the indicated internal error code, and the LED status on each board to FANUC.

	Message	Contents and solution
5	PC070 SUB65 CALL (STACK)	A stack error occurred during execution of ladder function instruction CALL/CALLU. Solution) Check the correspondence between the CALL/CALLU instruction and SPE instruction. If the error cannot be located, report the conditions under which the error occurred and the ladder program to FANUC.
6	PC080 SYS EMG xxxxxxxx:yyyyyyyy PC081 FL EMG xxxxxxxx:yyyyyyyy	A system alarm was caused by another software. Solution) Report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.), the indicated internal error code, and the LED status on each board to FANUC.
7	PC097 PARITY ERR (LADDER) PC098 PARITY ERR (DRAM)	A parity error occurred in the PMC system. If this error occurred, the motherboard may be faulty. Solution) Replace the motherboard, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) to FANUC.

(3) System alarm messages (for the C language board)

	Message	Contents and solution
1	PC1nn CPU INTERRT xxxxyyyyyy STATUS LED ☆★	CPU error (abnormal interrupt) nn : Exception code Exception code of the i80486. For details, refer to the relevant manual that describes the CPU. 00 Division error. For example, the divisor in a division instruction is 0. 12 Stack exception caused by, for example, stack segment limit viola tion 13 General protection exception generated when, for example, a seg ment limit is exceeded xxxx : Segment selector where the system error occurred A value 0103 to 02FB indicates the C execution area. yyyyyy : Offset address at which the system error occurred (Solution) If a C program is not used, or if the cause of the error cannot be determined even by checking the C program, contact FANUC.
2	PC130 RAM PRTY aa xxxxyyyyyy STATUS LED □★	A parity error occurred in user RAM or DRAM on the C language board. aa : RAM parity error occurrence information xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred
5	PC160 F–BUS ERROR xxxxyyyyyy PC161 F–BUS ERROR xxxxyyyyyy PC162 F–BUS ERROR xxxxyyyyyy STATUS LED ★□	A bus error occurred on the C language board. xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred

	Message	Contents and solution
6	PC170 F–BUS ERROR xxxxyyyyyy PC171 F–BUS ERROR xxxxyyyyyy PC172 F–BUS ERROR xxxxyyyyyy STATUS LED ★□	A bus error occurred on the C language board. xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred
7	PC199 ROM PARITY eeeeeeee STATUS LED ★☆	A parity error occurred in system ROM on the C language board. eeeeeeee : ROM parity error information

STATUS LED (green)
□ : Off ■ : On ☆★ : Blink

(4) Alarm messages (For EDIT 1)

Message	Contents and solution
ADDRESS BIT NOTHING	The address of the relay/coil is not set.
FUNCTION NOT FOUND	There is no functional instruction of the input number.
COM FUNCTION MISSING	The funcitonal instruction COM (SUB9) is not correctly dealt with. Correspondence of COM and COME (SUB29) is incorrect. Or, the number of coil controlled by COM is specified by the model which the number cannot be specified.
EDIT BUFFER OVER	There in no empty area of the buffer for the editing. (solution) Please reduce NET under editing.
END FUNCTION MISSING	Functional instruction END1,END2,END3 and END do not exist. Or, there are error net in END1,END2,END3,END. Or, order of END1,END2,END3, and END is not correct.
ERROR NET FOUND	There is an error net.
ILLEGAL FUNCTION NO.	The wrong number of the functional instruction is searched.
FUNCTION LINE ILLEGAL	The functional instruction is not correctly connected.
HORIZONTAL LINE ILLEGAL	The horizontal line of the net is not connected.
ILLEGAL NET CLEARED	Because the power had been turn off while editing LADDER, some net under editing was cleared.
ILLEGAL OPERATION	Operation is not correct. The value is not specified and only INPUT key was pushed. The address data is not correctly inputted. Because the space to display the instruction on screen is not enough, the functional instruction cannot be made.
SYMBOL UNDEFINED	The symbol which was inputted is not defined.
INPUT INVALID	There is an incorrect input data. Non–numerical value was inputted with COPY, INSLIN,C–UP,C–DOWN etc. The input address was specified for write coil. An illegal character was specified for the data table.
NET TOO LARGE	The input net is larger than the editing buffer. (solution) Please reduce the net under editing.

Message	Contents and solution
JUMP FUNCTION MISSING	The functional instruction JMP(SUB10) is not correctly dealt with. Correspondence of JMP and JMPE(SUB30) is incorrect. The number of coil to jump is specified by the model which the number of coil cannot specified. (It is possible to specify the coil number only on PMC–RB/RC.)
LADDER BROKEN	LADDER is broken.
LADDER ILLEGAL	There is an incorrect LADDER.
IMPOSSIBLE WRITE	You try to edit sequence program on the ROM.
OBJECT BUFFER OVER	The sequence program area was filled. (solution) Please reduce the LADDER.
PARAMETER NOTHING	There is no parameter of the functional instruction.
PLEASE COMPLETE NET	The error net was found in LADDER. (solution) After correcting the error net, please continue operating.
PLEASE KEY IN SUB NO.	Please input the number of the functional instruction. (solution) If you do not input the functional instruction, please push soft key “FUNC” again.
PROGRAM MODULE NOTHING	You tried to edit though there was neither RAM for debugging nor ROM for sequence program.
RELAY COIL FORBIT	There is an unnecessary relay or coil.
RELAY OR COIL NOTHING	The relay or the coil does not suffice.
PLEASE CLEAR ALL	It is impossible to recover the sequence program. (solution) Please clear the all data.
SYMBOL DATA DUPLICATE	The same symbol name is defined in other place.
COMMENT DATA OVERFLOW	The comment data area was filled. (solution) Please reduce the number of the commnet.
SYMBOL DATA OVERFLOW	The symbol data area was filled. (solution) Please reduce the number of the symbol.
VERTICAL LINE ILLEGAL	There is an incorrect vertical line of the net.
MESSAGE DATA OVERFLOW	The message data area was filled. (solution) Please reduce the number of the message.
1ST LEVEL EXECUTE TIME OVER	The 1st level of LADDER is too large to complete execution in time. (solution) Please reduce the 1st level of LADDER.
PARA NO. RANGE ERR:	The parameter number for a function instruction is not in the range. (solution) Correct the number so that it is within the range.
PARA NO. DUPLICATE:	The parameter number for a function instruction is used more than once. (solution) If the duplicate numbers pose the problem of simultaneous operation, change the parameter number to an unused number.

(5) Error Messages (at Automatic Write to Flash ROM after Ladder Editing)

Error message	Contents and solution
PROGRAM ALREADY EXISTS	A program already exists on flash ROM. (At BLANK)
PROGRAM ALREADY EXISTS (EXEC?)	A program already exists on flash ROM. (Remedy) When the message is displayed, pressing the EXEC key again causes write or erasure operation. (At write or erasure)
PROGRAM NOTHING	There is no program on flash ROM.
ERASE ERROR F–ROM WRITE ERROR 13 F–ROM WRITE ERROR 28	Flash ROM is abnormal. Replacement is required. Ask FANUC Service Representative for replacement.
WRITE ERROR F–ROM WRITE ERROR 12 F–ROM WRITE ERROR 29	
READ ERROR	
ANOTHER USED F–ROM WRITE ERROR 9 F–ROM WRITE ERROR 36	Flash ROM is used by other than PMC.
MUST BE IN EMG STOP NOT EMG STOP F–ROM WRITE ERROR 10 F–ROM WRITE ERROR 37	The CNC is not in the emergency stop state.
NO OPTION	There is no ROM cassette option.
SIZE ERROR IMPOSSIBLE WRITE (SIZE OVER) NO SPACE F–ROM WRITE ERROR 1 F–ROM WRITE ERROR 15 F–ROM WRITE ERROR 35	The sequence program is larger than the flash ROM size. (At write) (Remedy) Try the condense function. (EDIT/CLEAR screen) If the same phenomenon is still observed, the flash ROM size must be enlarged. The sequence program to be read is larger than the RAM size. (At read) (Remedy) RAM must be enlarged.

(6) Error Messages (at Assignment Data Editing)

Message	Contents and solution
ERR: GROUP NO. (0—15)	The group number must be 0 to 15.
ERR: BASE NO. (0—1)	The base number must be 0 or 1.
WARN: BASE NO. MUST BE 0	For I/O Unit–B, the base number must be 0. The base number was set to 0 forcibly.
ERR: SLOT NO. (1—10)	For I/O Unit–A, the slot number must be 1 to 10.
ERR: SLOT NO. (0, 1—30)	For I/O Unit–B, the slot number must be 0 or a number 1 to 30.
ERR: SLOT NO. MUST BE 0	When power on/off information for I/O Unit–B is set, the slot number must be 0.
ERR: ILLEGAL NAME	The input assignment name is illegal or not supported. Enter a correct name.
INPUT INVALID	The input character string is illegal. Enter a character string in a correct input format again.
IMPOSSIBLE WRITE	An attempt was made to edit ROM data. ROM data cannot be edited.
ERR: ADDRESS ALREADY ASSIGNED	The specified address is already assigned. Assign another address. Alternatively, delete the existing data, then set the address again.
ERR: ADDRESS OVER	A set address exceeds the maximum value (X127, Y127). Check the addresses dedicated to the unit to be set.
ERR: SLOT ALREADY DEFINED	The specified slot is already assigned. Check the existing data.
WARN: SLOT ALREADY DEFINED	The specified slot is already assigned. Check the existing data.
ERR: UNIT TYPE MISMATCH (IN OR OUT)	An output module cannot be allocated to an X address, or an input module cannot be allocated to a Y address.
ERR: UNIT TYPE MISMATCH (MODEL)	I/O Unit–A and I/O Unit–B are assigned to the same group. These units cannot exist together within the same group.

(7) Alarm messages (For I/O)

	Error message	Contents and solution
FLASH ROM	PROGRAM ALREADY EXISTS	A program already exists on flash ROM. (At BLANK)
	PROGRAM ALREADY EXISTS (EXEC ?)	A program already exists on flash ROM. Remedy) When the message is displayed, pressing the EXEC key again causes write or erasure operation. (At write or erasure)
	PROGRAM NOTHING	There is no program on flash ROM.
	ERASE ERROR	Flash ROM is abnormal. Replacement is required. Ask FANUC Service Representative for replacement.
	WRITE ERROR	
	READ ERROR	
	ANOTHER USED	Flash ROM is used by other than PMC.
	MUST BE IN EMG STOP NOT EMG STOP	The CNC is not in the emergency stop state.
	NO OPTION	There is no ROM cassette option.
	SIZE ERROR	The sequence program is larger than the flash ROM size. (At write) Remedy) Try the condense function. (EDIT/CLEAR screen) If the same phenomenon is still observed, the flash ROM size must be enlarged. The sequence program to be read is larger than the RAM size. (At read) Remedy) RAM must be enlarged.
HOST.FDCAS.OTHERS	I/O OPEN ERROR nn	nn = –1: RS–232C is used by other than PMC. Remedy) Check whether RS–232C is used by other than PMC. On the online setting screen (see Section 8.5.1 in III), check that “NOT USE” is indicated for RS–232C. nn = 6: The RS–232C option is not found. nn = 20: RS–232C connection is incorrect. Remedy) Check whether channel setting, connection, baud rate, and other settings are correct.
	I/O WRITE ERROR nn	nn = 20: RS–232C connection is incorrect. Remedy) Check whether channel setting, connection, baud rate, and other settings are correct. nn = 22: Communication cannot be performed correctly. Remedy) Check whether the cable is broken.
	I/O READ ERROR nn	nn = 20: RS–232C connection is incorrect. Remedy) Check whether channel setting, connection, baud rate, and other settings are correct. nn = 22: Communication cannot be performed correctly. Remedy) Check whether the cable is broken.
	ADDRESS IS OUT OF RANGE (xxxxxx)	Data for other than the PMC debugging RAM area was transferred. xxxxxx: Indicates the transfer address.
	DATA ERROR	Illegal data was read. Remedy) Check the cable and setting (speed). When a program in C was being read into the 16*i*/18*i*/21*i*: Remedy) Press soft keys [EDIT], [CLEAR], [CLRLNG], then [EXEC] to clear the C area.
	PROGRAM DATA ERROR	An attempt was made to output data, but the data was illegal. Remedy) Check the alarm on the alarm screen.

	Error message	Contents and solution
MEMORCARD	CREATE ERROR	The specified file name is illegal. Remedy) Specify a file name in the MS–DOS form. (See 7.2 (5))
	NO MORE SPACE or WRITE ERROR	There is not enough free space on the memory card. Remedy) Delete files to create free space.
	NOT READY	No memory card is installed. Remedy) Check whether a memory card is installed.
	MOUNT ERROR	Unformatted. Remedy) Perform formatting. (See 7.3.4 (a))
	WRITE PROTECT	The memory card is protected. Remedy) Set the protect switch of the memory card to OFF.
	BATTERY ALARM	The battery for the memory card is too weak. Remedy) Replace the memory card battery.
	FILE NOT FOUND	The specified file number or file name is not found. Remedy) With LIST, check the file name or file number.
	DELETE ERROR	The file cannot be deleted. Remedy) Change the file attribute.
	PROGRAM ALREADY EXISTS	There are duplicate file names. Remedy) Use another file name.
	I/O WRITE ERROR nn I/O READ ERROR nn I/O COMPARE ERROR nn I/O DELETE ERROR nn I/O LIST ERROR nn I/O FORMAT ERROR nn	nn = 30: No memory card is installed. Remedy) Check whether a memory card is installed. nn = 31: The memory card cannot be written to. Remedy) Set the protect switch of the memory card to OFF. Replace the memory card with an S–RAM card. nn = 32: The battery for the memory card is too weak. Remedy) Replace the memory card battery. nn = 102: There is not enough free space on the memory card. Remedy) Delete files to create free space. nn = 135: The memory card is unformatted. nn = 105: The memory card is unformatted. Remedy) Format the memory card. nn = 114: The specified file is not found. Remedy) With LIST, check the file name or file number. nn = 115: The specified file is protected. Remedy) Check the file attribute.
COMMON	COMPARE ERR XXXXXX=AA : BB CONT? (Y/N)	Data differs between the device and PMC. XXXXXX: Address aa: Data on the PMC bb: Data on the device Remedy) To continue operation, enter Y; otherwise, enter N. Then, press the INPUT key.
	DATA ERROR	Illegal data has been read. Remedy) Check the cable and setting (speed). When a program in C was being read into the 16*i*/18*i*/21*i*: Remedy) Press soft keys [EDIT], [CLEAR], [CLRLNG], then [EXEC] to clear the C area.
	PROGRAM DATA ERROR	An attempt was made to output data, but the data was illegal. Remedy) Check the alarm on the alarm screen.

A.3 ALARM LIST (SERIAL SPINDLE)

When a serial spindle alarm occurs, the following number is displayed on the CNC. n is a number corresponding to the spindle on which an alarm occurs. (n = 1: First spindle; n = 2: Second spindle; etc.)

NOTE*1
Note that the meanings of the SPM indications differ depending on which LED, the red or yellow LED, is on. When the red LED is on, the SPM indicates a 2–digit alarm number. When the yellow LED is on, the SPM indicates an error number that designates a sequence problem (for example, when a rotation command is entered with the emergency stop state not released).
→ See Appendix A.4, “Error Codes (Serial Spindle).”

Alarm Numbers and Alarms Displayed on the α Series Spindle Amplifier

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
(750)	SPINDLE SERIAL LINK ERROR	A0 A	1 Replace the ROM on the SPM control printed circuit board. 2 Replace the SPM control printed circuit board.	The program does not start normally. ROM series error or hardware abnormality on the SPM control printed circuit board
(749)	S–SPINDLE LSI ERROR	A1	Replace the SPM control printed circuit board.	An abnormality was detected in the CPU peripheral circuit of the SPM control circuit.
7n01	SPN_n_ : MOTOR OVERHEAT	01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The thermostat embedded in the motor winding operated. The internal temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
7n02	SPN_n_ : EX SPEED ERROR	02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No. 4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in parameter No. 4082 is insufficient.
7n03	SPN_n_ : FUSE ON DC LINK BLOWN	03	1 Replace the SPM unit. 2 Check the motor insulation status. 3 Replace the interface cable.	The PSM becomes ready (00 is indicated), but the DC link voltage is too low in the SPM. The fuse in the DC link section in the SPM is blown. (The power device is damaged or the motor is ground–fault.) The JX1A/JX1B connection cable is abnormal.
7n04	SPN_n_ : INPUT FUSE/ POWER FAULT	04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (PSM alarm 5)

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n06	SPN_n_ : THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.
7n07	SPN_n_ : OVERSPEED	07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, positional deviations were accumulated excessively (SFR and SRV were turned off during spindle synchronization.)
7n09	SPN_n_ : OVERHEAT MAIN CIRCUIT	09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the SPM unit.	Abnormal temperature rise of the power transistor radiator
7n11	SPN_n_ : OVERVOLT POW CIRCUIT	11	1 Check the selected PSM. 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200–V system) or 530 VAC (for the 400–V system), improve the power supply impedance.	Overvoltage of the DC link section of the PSM was detected. (PSM alarm indication: 7) PSM selection error. (The maximum output specification of the PSM is exceeded.)
7n12	SPN_n_ : OVERCURRENT POW CIRCUIT	12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the SPM unit.	The motor output current is abnormally high. A motor–specific parameter does not match the motor model. Poor motor insulation
7n15	SPN_n_ : SP SWITCH CONTROL ALARM	15	1 Check and correct the ladder sequence. 2 Replace the switching MC.	The switch sequence in spindle switch/output switch operation is abnormal. The switching MC contact status check signal and command do not match.
7n16	SPN_n_ : RAM FAULT	16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
7n18	SPN_n_ : SUMCHECK ERROR PGM DATA	18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
7n19	SPN_n_ : EX OFFSET CURRENT U	19	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value for the U phase current detection circuit is abnormal.)
7n20	SPN_n_ : EX OFFSET CURRENT V	20	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value of the V phase current detection circuit is abnormal.)
7n21	SPN_n_ : POS SENSOR POLARITY ERROR	21	Check and correct the parameters. (No. 4000#0, 4001#4)	The polarity parameter setting of the position sensor is wrong.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n24	SPN_n_ : SERIAL TRANSFER ERROR	24	1 Place the CNC–to–spindle cable away from the power cable. 2 Replace the cable.	The CNC power is turned off (normal power–off or broken cable). An error is detected in communication data transferred to the CNC.
7n26	SPN_n_ : DISCONNECT C–VELO DETECT	26	1 Replace the cable. 2 Re–adjust the pre–amplifier.	The signal amplitude of the detection signal (connector JY2) on the Cs contour control motor side is abnormal. (Unconnected cable, adjustment error, etc.)
7n27	SPN_n_ : DISCONNECT POS–CODER	27	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The spindle position coder (connector JY4) signal is abnormal. 2 The signal amplitude (connector JY2) of the MZ or BZ sensor is abnormal. (Unconnected cable, adjustment error, etc.)
7n28	SPN_n_ : DISCONNECT C–POS DETECT	28	1 Replace the cable 2 Re–adjust the pre–amplifier.	The position detection signal (connector JY5) for Cs contour control is abnormal. (Unconnected cable, adjustment error, etc.)
7n29	SPN_n_ : SHORTTIME OVERLOAD	29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)
7n30	SPN_n_ : OVERCURRENT POW CIRCUIT	30	Check and correct the power supply voltage.	Overcurrent is detected in PSM main circuit input. (PSM alarm indication: 1) Unbalanced power supply. PSM selection error (The maximum PSM output specification is exceeded.)
7n31	SPN_n_ : MOTOR LOCK OR V–SIG LOS	31	1 Check and correct the load status. 2 Replace the motor sensor cable (JY2 or JY5).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.) Abnormality in the speed detection signal.
7n32	SPN_n_ : RAM FAULT SERIAL LSI	32	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (The LSI device for serial transfer is abnormal.)
7n33	SPN_n_ : SHORTAGE POWER CHARGE	33	1 Check and correct the power supply voltage. 2 Replace the PSM unit.	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor in the amplifier is turned on (such as open phase and defective charging resistor).

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n34	SPN_n_ : PARAMETER SETTING ERROR	34	Correct a parameter value according to the manual. If the parameter number is unknown, connect the spindle check board, and check the indicated parameter.	Parameter data exceeding the allowable limit is set.
7n35	SPN_n_ : EX SETTING GEAR RATIO	35	Correct the value according to the parameter manual.	Gear ratio data exceeding the allowable limit is set.
7n36	SPN_n_ : OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.
7n37	SPN_n_ : SPEED DETECT PAR. ERROR	37	Correct the value according to the parameter manual.	The setting of the parameter for the number of pulses in the speed detector is incorrect.
7n39	SPN_n_ : 1–ROT Cs SIGNAL ERROR	39	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	An incorrect relationship between the 1–rotation signal and the number of AB phase pulses was detected during Cs contour control.
7n40	SPN_n_ : NO 1–ROT Cs SIGNAL DETECT	40	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	The 1–rotation signal is not generated during Cs contour control.
7n41	SPN_n_ : 1–ROT POS–CODER ERROR	41	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is abnormal. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is abnormal. 3 Parameter setting error
7n42	SPN_n_ : NO 1–ROT. POS–CODER DETECT	42	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is disconnected. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is disconnected.
7n43	SPN_n_ : DISCON. PC FOR DIF. SP. MODE	43	Replace the cable.	The differential speed position coder signal (connector JY8) in SPM type 3 is abnormal.
7n44	SPN_n_ : CONTROL CIRCUIT(AD) ERROR	44	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component was detected (A/D converter abnormality).
7n46	SPN_n_ : SCREW 1–ROT POS–COD. ALARM	46	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	An abnormality equivalent to alarm 41 was detected during thread cutting operation.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n47	SPN_n_ : POS–CODER SIGNAL ABNORMAL	47	1 Replace the cable. 2 Re–adjust the BZ sensor signal. 3 Correct the cable layout (vicinity of the power line).	1 The A/B phase signal of the spindle position coder (connector JY4) is abnormal. 2 The A/B phase signal (connector JY2) of the MZ or BZ sensor is abnormal. The relationship between the A/B phase and 1–rotation signal is incorrect (Pulse interval mismatch).
7n49	SPN_n_ : HIGH CONV. DIF. SPEED	49	Check whether the calculated differential speed value exceeds the maximum motor speed.	In differential speed mode, the speed of the other spindle converted to the speed of the local spindle has exceeded the allowable limit (the differential speed is calculated by multiplying the speed of the other spindle by the gear ratio).
7n50	SPN_n_ : SPNDL CONTROL OVERSPEED	50	Check whether the calculated value exceeds the maximum motor speed.	In spindle synchronization, the speed command calculation value exceeded the allowable limit (the motor speed is calculated by multiplying the specified spindle speed by the gear ratio).
7n51	SPN_n_ : LOW VOLT DC LINK	51	1 Check and correct the power supply voltage. 2 Replace the MC.	Input voltage drop was detected. (PSM alarm indication: 4) (Momentary power failure or poor MC contact)
7n52	SPN_n_ : ITP SIGNAL ABNORMAL I	52	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
7n53	SPN_n_ : ITP SIGNAL ABNORMAL II	53	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
7n54	SPN_n_ : OVERLOAD CURRENT	54	Review the load state.	An overload current was detected.
7n55	SPN_n_ : POWER LINE SWITCH ERROR	55	1 Replace the magnetic contactor. 2 Check and correct the sequence.	The power line state signal of the magnetic contactor for selecting a spindle or output is abnormal.
7n56	SPN_n_ : INNER COOLING FAN STOP	56	Replace the SPM unit.	The cooling fan in the SPM control circuit stopped.
7n57	SPN_n_ : EX DECELERATION POWER	57	1 Decrease the acceleration/deceleration duty. 2 Check the cooling condition (peripheral temperature). 3 If the cooling fan stops, replace the resistor. 4 If the resistance is abnormal, replace the resistor.	An overload was detected in the regenerative resistance. (PSMR alarm indication: 8) Thermostat operation or short–time overload was detected. The regenerative resistor was disconnected, or an abnormal resistance was detected.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n58	SPN_n_ : OVERLOAD IN PSM	58	1 Check the PSM cooling status. 2 Replace the PSM unit.	The temperature of the radiator of the PSM has increased abnormally. (PSM alarm indication: 3)
7n59	SPN_n_ : COOLING FAN STOP IN PSM	59	Replace the SPM unit.	The cooling fan in the PSM stopped. (PSM alarm indication: 2)
7n62	SPN_n_ : MOTOR VCMD OVERFLOWED	62	Check and correct the parameters. (No. 4021, 4056 to 4059)	The specified motor speed is too large.
7n66	SPN_n_ : AMP MODULE COMMUNICATION	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication between amplifiers.
7n73	SPN_n_ : MOTOR SENSOR DISCONNECTED	73	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Adjust the sensor.	The motor sensor feedback signal is not present.
7n74	SPN_n_ : CPU TEST ERROR	74	Replace the SPM control printed–circuit board.	An error was detected in a CPU test.
7n75	SPN_n_ : CRC ERROR	75	Replace the SPM control printed–circuit board.	An error was detected in a CRC test.
7n79	SPN_n_ : INITIAL TEST ERROR	79	Replace the SPM control printed–circuit board.	An error was detected in an initial test operation.
7n81	SPN_n_ : 1–ROT MOTOR SENSOR ERROR	81	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the motor sensor cannot be correctly detected.
7n82	SPN_n_ : NO 1–ROT MOTOR SENSOR	82	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the motor sensor is not generated.
7n83	SPN_n_ : MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal.
7n84	SPN_n_ : SPNDL SENSOR DISCONNECTED	84	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Check and correct the parameter. 5 Adjust the sensor.	The spindle sensor feedback signal is not present.
7n85	SPN_n_ : 1–ROT SPNDL SENSOR ERROR	85	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
7n86	SPN_n_ : NO 1–ROT SPNDL SENSOR ERROR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the spindle sensor is not generated.
7n87	SPN_n_ : SPNDL SENSOR SIGNAL ERROR	87	The one–rotation signal of the spindle sensor is not generated.	An irregularity was detected in a spindle sensor feedback signal.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
7n88	SPN_n_ : COOLING RADIFAN FAILURE	88	Replace the SPM external cooling fan.	The external cooling fan stopped.
7n97	SPN_n_ : OTHER SPINDLE ALARM	97	Replace the SPM.	Another irregularity was detected.
7n98	SPN_n_ : OTHER CONVERTER ALARM	98	Check the PSM alarm display.	A PSM alarm was detected.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9001	SPN_n_ : MOTOR OVERHEAT	01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The thermostat embedded in the motor winding operated. The internal temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
9002	SPN_n_ : EX SPEED ERROR	02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No. 4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in parameter No. 4082 is insufficient.
9003	SPN_n_ : FUSE ON DC LINK BLOWN	03	1 Replace the SPM unit. 2 Check the motor insulation status. 3 Replace the interface cable.	The PSM becomes ready (00 is indicated), but the DC link voltage is too low in the SPM. The fuse in the DC link section in the SPM is blown. (The power device is damaged or the motor is ground–fault.) The JX1A/JX1B connection cable is abnormal.
9004	SPN_n_ : INPUT FUSE/ POWER FAULT	04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (PSM alarm 5)
9006	SPN_n_ : THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.
9007	SPN_n_ : OVERSPEED	07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, positional deviations were accumulated excessively (SFR and SRV were turned off during spindle synchronization.)

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9009	SPN_n_ : OVERHEAT MAIN CIRCUIT	09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the SPM unit.	Abnormal temperature rise of the power transistor radiator
9011	SPN_n_ : OVERVOLT POW CIRCUIT	11	1 Check the selected PSM. 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200–V system) or 530 VAC (for the 400–V system), improve the power supply impedance.	Overvoltage of the DC link section of the PSM was detected. (PSM alarm indication: 7) PSM selection error. (The maximum output specification of the PSM is exceeded.)
9012	SPN_n_ : OVERCURRENT POW CIRCUIT	12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the SPM unit.	The motor output current is abnormally high. A motor–specific parameter does not match the motor model. Poor motor insulation
9015	SPN_n_ : SP SWITCH CONTROL ALARM	15	1 Check and correct the ladder sequence. 2 Replace the switching MC.	The switch sequence in spindle switch/output switch operation is abnormal. The switching MC contact status check signal and command do not match.
9016	SPN_n_ : RAM FAULT	16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
9018	SPN_n_ : SUMCHECK ERROR PGM DATA	18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
9019	SPN_n_ : EX OFFSET CURRENT U	19	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value for the U phase current detection circuit is abnormal.)
9020	SPN_n_ : EX OFFSET CURRENT V	20	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value of the V phase current detection circuit is abnormal.)
9021	SPN_n_ : POS SENSOR POLARITY ERROR	21	Check and correct the parameters. (No. 4000#0, 4001#4)	The polarity parameter setting of the position sensor is wrong.
9024	SPN_n_ : SERIAL TRANSFER ERROR	24	1 Place the CNC–to–spindle cable away from the power cable. 2 Replace the cable.	The CNC power is turned off (normal power–off or broken cable). An error is detected in communication data transferred to the CNC.
9026	SPN_n_ : DISCONNECT C–VELO DETECT	26	1 Replace the cable. 2 Re–adjust the pre–amplifier.	The signal amplitude of the detection signal (connector JY2) on the Cs contour control motor side is abnormal. (Unconnected cable, adjustment error, etc.)

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9027	SPN_n_ : DISCONNECT POS–CODER	27	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The spindle position coder (connector JY4) signal is abnormal. 2 The signal amplitude (connector JY2) of the MZ or BZ sensor is abnormal. (Unconnected cable, adjustment error, etc.)
9028	SPN_n_ : DISCONNECT C–POS DETECT	28	1 Replace the cable 2 Re–adjust the pre–amplifier.	The position detection signal (connector JY5) for Cs contour control is abnormal. (Unconnected cable, adjustment error, etc.)
9029	SPN_n_ : SHORTTIME OVERLOAD	29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)
9030	SPN_n_ : OVERCURRENT POW CIRCUIT	30	Check and correct the power supply voltage.	Overcurrent is detected in PSM main circuit input. (PSM alarm indication: 1) Unbalanced power supply. PSM selection error (The maximum PSM output specification is exceeded.)
9031	SPN_n_ : MOTOR LOCK OR V–SIG LOS	31	1 Check and correct the load status. 2 Replace the motor sensor cable (JY2 or JY5).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.) Abnormality in the speed detection signal.
9032	SPN_n_ : RAM FAULT SERIAL LSI	32	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (The LSI device for serial transfer is abnormal.)
9033	SPN_n_ : SHORTAGE POWER CHARGE	33	1 Check and correct the power supply voltage. 2 Replace the PSM unit.	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor in the amplifier is turned on (such as open phase and defective charging resistor).
9034	SPN_n_ : PARAMETER SETTING ERROR	34	Correct a parameter value according to the manual. If the parameter number is unknown, connect the spindle check board, and check the indicated parameter.	Parameter data exceeding the allowable limit is set.
9035	SPN_n_ : EX SETTING GEAR RATIO	35	Correct the value according to the parameter manual.	Gear ratio data exceeding the allowable limit is set.
9036	SPN_n_ : OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9037	SPN_n_ : SPEED DETECT PAR. ERROR	37	Correct the value according to the parameter manual.	The setting of the parameter for the number of pulses in the speed detector is incorrect.
9039	SPN_n_ : 1–ROT Cs SIGNAL ERROR	39	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	An incorrect relationship between the 1–rotation signal and the number of AB phase pulses was detected during Cs contour control.
9040	SPN_n_ : NO 1–ROT Cs SIGNAL DETECT	40	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	The 1–rotation signal is not generated during Cs contour control.
9041	SPN_n_ : 1–ROT POS–CODER ERROR	41	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is abnormal. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is abnormal. 3 Parameter setting error
9042	SPN_n_ : NO 1–ROT. POS–CODER DETECT	42	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is disconnected. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is disconnected.
9043	SPN_n_ : DISCON. PC FOR DIF. SP. MODE	43	Replace the cable.	The differential speed position coder signal (connector JY8) in SPM type 3 is abnormal.
9044	SPN_n_ : CONTROL CIRCUIT(AD) ERROR	44	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component was detected (A/D converter abnormality).
9046	SPN_n_ : SCREW 1–ROT POS–COD. ALARM	46	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	An abnormality equivalent to alarm 41 was detected during thread cutting operation.
9047	SPN_n_ : POS–CODER SIGNAL ABNORMAL	47	1 Replace the cable. 2 Re–adjust the BZ sensor signal. 3 Correct the cable layout (vicinity of the power line).	1 The A/B phase signal of the spindle position coder (connector JY4) is abnormal. 2 The A/B phase signal (connector JY2) of the MZ or BZ sensor is abnormal. The relationship between the A/B phase and 1–rotation signal is incorrect (Pulse interval mismatch).
9049	SPN_n_ : HIGH CONV. DIF. SPEED	49	Check whether the calculated differential speed value exceeds the maximum motor speed.	In differential speed mode, the speed of the other spindle converted to the speed of the local spindle has exceeded the allowable limit (the differential speed is calculated by multiplying the speed of the other spindle by the gear ratio).

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9050	SPN_n_ : SPNDL CONTROL OVERSPEED	50	Check whether the calculated value exceeds the maximum motor speed.	In spindle synchronization, the speed command calculation value exceeded the allowable limit (the motor speed is calculated by multiplying the specified spindle speed by the gear ratio).
9051	SPN_n_ : LOW VOLT DC LINK	51	1 Check and correct the power supply voltage. 2 Replace the MC.	Input voltage drop was detected. (PSM alarm indication: 4) (Momentary power failure or poor MC contact)
9052	SPN_n_ : ITP SIGNAL ABNORMAL I	52	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
9053	SPN_n_ : ITP SIGNAL ABNORMAL II	53	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
9054	SPN_n_ : OVERLOAD CURRENT	54	Review the load state.	An overload current was detected.
9055	SPN_n_ : POWER LINE SWITCH ERROR	55	1 Replace the magnetic contactor. 2 Check and correct the sequence.	The power line state signal of the magnetic contactor for selecting a spindle or output is abnormal.
9056	SPN_n_ : INNER COOLING FAN STOP	56	Replace the SPM unit.	The cooling fan in the SPM control circuit stopped.
9057	SPN_n_ : EX DECELERATION POWER	57	1 Decrease the acceleration/deceleration duty. 2 Check the cooling condition (peripheral temperature). 3 If the cooling fan stops, replace the resistor. 4 If the resistance is abnormal, replace the resistor.	An overload was detected in the regenerative resistance. (PSMR alarm indication: 8) Thermostat operation or short–time overload was detected. The regenerative resistor was disconnected, or an abnormal resistance was detected.
9058	SPN_n_ : OVERLOAD IN PSM	58	1 Check the PSM cooling status. 2 Replace the PSM unit.	The temperature of the radiator of the PSM has increased abnormally. (PSM alarm indication: 3)
9059	SPN_n_ : COOLING FAN STOP IN PSM	59	Replace the SPM unit.	The cooling fan in the PSM stopped. (PSM alarm indication: 2)
9062	SPN_n_ : MOTOR VCMD OVERFLOWED	62	Check and correct the parameters. (No. 4021, 4056~4059)	The specified motor speed is too large.
9066	SPN_n_ : AMP MODULE COMMUNICATION	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication between amplifiers.
9073	SPN_n_ : MOTOR SENSOR DISCONNECTED	73	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Adjust the sensor.	The motor sensor feedback signal is not present.

No.	Message	SPM indication(*1)	Faulty location and remedy	Description
9074	SPN_n_ : CPU TEST ERROR	74	Replace the SPM control printed–circuit board.	An error was detected in a CPU test.
9075	SPN_n_ : CRC ERROR	75	Replace the SPM control printed–circuit board.	An error was detected in a CRC test.
9079	SPN_n_ : INITIAL TEST ERROR	79	Replace the SPM control printed–circuit board.	An error was detected in an initial test operation.
9081	SPN_n_ : 1–ROT MOTOR SENSOR ERROR	81	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the motor sensor cannot be correctly detected.
9082	SPN_n_ : NO 1–ROT MOTOR SENSOR	82	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the motor sensor is not generated.
9083	SPN_n_ : MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal.
9084	SPN_n_ : SPNDL SENSOR DISCONNECTED	84	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Check and correct the parameter. 5 Adjust the sensor.	The spindle sensor feedback signal is not present.
9085	SPN_n_ : 1–ROT SPNDL SENSOR ERROR	85	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
9086	SPN_n_ : NO 1–ROT SPNDL SENSOR ERROR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
9087	SPN_n_ : SPNDL SENSOR SIGNAL ERROR	87	The one–rotation signal of the spindle sensor is not generated.	An irregularity was detected in a spindle sensor feedback signal.
9088	SPN_n_ : COOLING RADIFAN FAILURE	88	Replace the SPM external cooling fan.	The external cooling fan stopped.

A.4 ERROR CODES (SERIAL SPINDLE)

NOTE*1

Note that the meanings of the SPM indications differ depending on which LED, the red or yellow LED, is on. When the yellow LED is on, an error code is indicated with a 2–digit number. The error code is not displayed on the CNC screen.

When the red LED is on, the SPM indicates the number of an alarm generated in the serial spindle.

→ See Appendix A.3, “Alarms (Serial Spindle).”

Errors Displayed on the α Series Spindle Amplifier

SPM indication(*1)	Faulty location and remedy	Description
01	Check the *ESP and MRDY sequence. (For MRDY, pay attention to the parameter setting regarding the use of the MRDY signal (bit 0 of parameter No. 4001).)	Although neither *ESP (emergency stop signal; there are two types of signals including the PMC signal and PSM contact signal(*2)) nor MRDY (machine ready signal) is input, SFR (forward rotation signal)/SRF (reverse rotation signal)/ORCM (orientation command) is input.
02	Check the spindle motor speed detector parameter (bits 2, 1, and 0 of parameter No. 4011).	When the spindle motor has a high–resolution magnetic pulse coder (Cs sensor) (bits 6 and 5 of parameter No. 4001 are set to 0 and 1, respectively), 128 /rev is to be set for the speed detector (bits 2, 1, and 0 of parameter No. 4011 are set to 0, 0, and 1, respectively). However, a value other than 128 /rev is set. In this case, the motor is not excited.
03	Check the parameters for the detector for Cs contour control (bit 5 of parameter No. 4001 and bit 4 of parameter No. 4018).	Although use of a high–resolution magnetic pulse coder (bit 5 of parameter No. 4001 = 1) or use of the Cs contour control function by the sensor (bit 4 of parameter No. 4018 = 1) is not set, a Cs control command is input. In this case, the motor is not excited.
04	Check the position coder signal parameter (bit 2 of parameter No. 4001).	Although use of the position coder signal (bit 2 of parameter No. 4001 = 1) is not set, a servo mode (rigid tapping, spindle positioning) or spindle synchronization command is input. In this case, the motor is not excited.
05	Check the orientation software option.	Although the orientation option is not set, an orientation command (ORCM) is input.
06	Check the spindle output switching software option and power line status signal (RCH).	Although the output switching option is not set, the low–speed winding is selected (RCH = 1).
07	Check the sequence (CON, SFR, SRV).	Although the Cs contour control mode is specified, SFR/SRV is not input.
08	Check the sequence (SFR, SRV).	Although the servo mode (rigid tapping, spindle positioning) is specified, SFR/SRV is not input.
09	Check the sequence (SPSYC, SFR, SRV)	Although spindle synchronization mode is specified, SFR/SRV is not input.
10	During execution of the C–axis control command, do not specify another operation mode. Before entering another mode, cancel the Cs contour control command.	Although Cs contour control mode is set, another operation mode (servo mode, spindle synchronization, or orientation) is specified.
11	During execution of the servo mode command, do not specify another operation mode. Before entering another mode, cancel the servo mode.	Although servo mode (rigid tapping, or spindle positioning) is set, another operation mode (Cs contour control, spindle synchronization, or orientation) is specified.

SPM indication(*1)	Faulty location and remedy	Description
12	During execution of the spindle synchronization command, do not specify another operation mode. Before entering another mode, cancel the spindle synchronization command.	Although spindle synchronization is being performed, another operation mode (Cs contour control, servo mode, or orientation) is specified.
13	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the orientation command.	Although the orientation command is being executed, another operation mode (Cs contour control, servo mode, or synchronization) is specified.
14	Input the SFT or SRV signal.	The SFT and SRV signals are both input at the same time.
15	Check bit 5 of parameter No. 4000 and PMC signal (CON).	When bit 5 of parameter No. 4000 is set to 1 to indicate the presence of the differential speed mode function, Cs contour control is specified.
16	Check bit 5 of parameter No. 4000 and PMC signal (DEFMD).	When bit 5 of parameter No. 4000 is set to 0 to indicate the absence of the differential speed mode function, the differential speed mode command (DEFMD) is input.
17	Check bits 2, 1, and 0 of parameter No. 4011.	Setting of the speed detector parameter (bits 2, 1, and 0 of parameter No. 4011) is invalid. (The corresponding speed detector is not present.)
18	Check bit 2 of parameter No. 4001 and PMC signal (ORCM).	Although bits 2 of parameter No. 4001 is set to 0 not to use the position coder signal, a command for orientation by a position coder (ORCMA) is input.
19	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the orientation command.	Although orientation by a magnetic sensor is being performed, another operation mode is specified.
20	Check bit 5 of parameter No. 4001, bit 5 of parameter No. 4014, and bit 4 of parameter No. 4018.	When the use of the slave operation mode function is set (bit 5 of parameter No. 4014 = 1), the use of a high–resolution magnetic pulse coder (bit 5 of parameter No. 4001 = 1) or the use of the Cs contour control function by the sensor (bit 4 of parameter No. 4018 = 1) is specified. These items cannot be set at the same time.
21	Input the slave operation mode command (SLV) in normal operation mode.	Although position control (such as servo mode or orientation) is being performed, a slave operation mode command (SLV) is input.
22	Input the position control command in normal operation mode	Although slave operation mode is set (SLVS = 1), a position control command (such as servo mode or orientation) is input.
23	Check bit 5 of parameter No. 4014 and PMC signal (SLV).	Although bit 5 of parameter No. 4014 is set to 0 not to use the slave operation mode function, a slave operation mode command (SLV) is input.
24	Check the PMC signal (INCMD). Perform orientation by specifying an absolute position first.	Orientation is performed in incremental operation mode (INCMD = 1) first, then the absolute position command (INCMD = 0) is input.
25	Check the spindle amplifier specifications and parameter setting (bit 4 of parameter No. 4018).	Although the spindle amplifier SPM type 4 is not used, the use of the Cs contour control function by the sensor is set (bit 4 of parameter No. 4018 = 1).

NOTE*2

PSM contact signal

Between ESP1 and ESP2 on the PSM

Contact open: Emergency stop
Contact closed: Normal operation

B LIST OF MAINTENANCE PARTS

Item		Ordering information	Remarks
Fuse	Stand–alone type control unit	A02B–0265–K100	
	Stand–alone type LCD unit	A02B–0265–K101	
	LCD–mounted type control unit (without PC)	A02B–0236–K100	
	Separate detector interface unit	A60L–0001–0290#LM20	Rated at 2 A
	I/O module for operator's panel	A03B–0815–K001	
	Connector panel I/O module	A03B–0815–K002	
	Distributed I/O machine operator's panel	A60L–0001–0290#LM10	
	Interface unit of machine operator's panel	A02B–0120–K107	
	Connection unit of operator's panel	A02B–0163–K111	
Battery	For control unit memory backup	A02B–0200–K102	
Fan motor for LCD–mounted type	For control unit with no expansion slot	A02B–0236–K120	
	For control unit with expansion slot	A02B–0281–K121	
	For control unit with three expansion slots	A02B–0236–K122	
Backlight	For 7.2″ LCD	A02B–0236–K112	
	For 8.4″ LCD	A02B–0236–K119	
	For 9.5″ LCD	A02B–0281–K114	
	For 10.4″ LCD	A02B–0236–K116	
Touch panel protection sheet		A02B–0236–K110	
Pen for touch panel		A02B–0236–K111	

C BOOT SYSTEM

C.1 OVERVIEW

The boot system load the CNC system software (flash RAM→DRAM), then starts it so that software can be executed.
The boot system provides the following maintenance functions for the CNC:

(1) Registering a file in flash ROM
- Reads a file from a memory card, in FAT format, into flash ROM.

(2) Checking a file (series and edition) in flash ROM

(3) Deleting a file from flash ROM

(4) Batch saving and restoration of files of parameters and programs backed up by battery (SRAM area), to and from a memory card

(5) Saving a file in flash ROM to a memory card

(6) Formatting of a memory card

(7) Deleting a file from a memory card

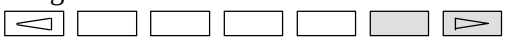
This manual describes the activation of the boot system, as well as the screen displays and operation for the functions listed above.

CAUTION
This control unit supports the use of a memory card as an input/output device. When a flash card is used, however, data can be written to a FANUC–recommended card only. Data can be read in the same way as with an ordinary SRAM card, provided the data has been saved in FAT format. Note that, when a flash card is used, the card capacity is reduced by 128KB.
See the order list for details of the supported memory card types.

C.1.1 Starting the Boot System

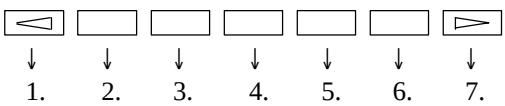
In ordinary system activation, the boot system automatically transfers files from flash ROM to DRAM in the background.
The user is not aware of this operation. However, the boot system must be operated manually, from menu screen, when maintenance is to be carried out or when the flash ROM does not contain a required file.

1 In system maintenance, for example, to replace a file in ROM
Operation : Turn the power on by simultaneously pressing the two soft keys at the right end.



Hold down the two keys until the boot system screen appears.

If soft keys are not provided (for example, when a touch pad is being used), use the MDI numeric keys. Hold down the 6 and 7 keys until the boot system screen appears.



2 When the flash memory does not contain a file required to start the CNC

Immediately after the CNC is turned on, the boot system starts transferring files from flash ROM to DRAM. If, for some reason, a file required to start the CNC (NC basic) is not in flash ROM or has been destroyed, the boot system is automatically started.

C.1.2 System Files and User Files

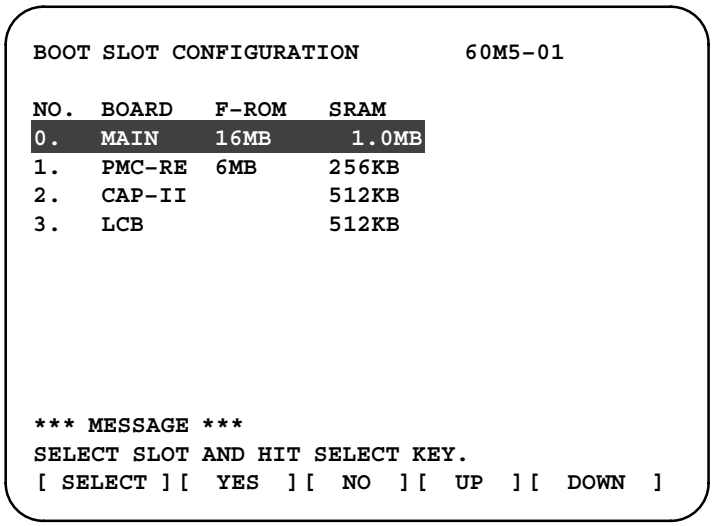
The boot system organizes files in flash ROM into two main groups : system files and user files. These two file types have the following characteristics :

- **System files** — CNC and servo control software provided by FANUC
- **User files** — PMC sequence program (ladder), P–CODE macro program, and other user–created files

C.1.3 Boot Slot Configuration Screen

When CAP–II board or LCB (loader control board) is mounted on the CNC, we have to access to SRAM that mounted on additional board. So, the boot system displays BOOT SLOT CONFIGURATION screen that to select a access board.

- **Screen configuration**



(1): Screen title.

(2): Flash memory size and SRAM size of each board.

(3): Message

- **Operation**

Press the **[UP]** or **[DOWN]** soft key to move the cursor, and select board to press the **[SELECT]** soft key.

C.2 SCREEN CONFIGURATION AND OPERATING PROCEDURE

When the boot system is first started, the MAIN MENU screen is displayed. This screen is described below :

- **MAIN MENU screen**

```
(1)  SYSTEM MONITOR MAIN MENU            60M5-01

(2)  1. SYSTEM DATA LOADING
(3)  2. SYSTEM DATA CHECK
(4)  3. SYSTEM DATA DELETE
(5)  4. SYSTEM DATA SAVE
(6)  5. SRAM DATA BACKUP
(7)  6. MEMORY CARD FILE DELETE
(8)  7. MEMORY CARD FORMAT


(9)  10. END

     *** MESSAGE ***
(10) SELECT MENU AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title. The series and edition of the boot system appear at the right end.

(2) : Function for writing data to flash ROM.

(3) : Function for checing the edition of a file in ROM.

(4) : Function for deleting a file from flash ROM.

(5) : Function for making a backup copy of the data stored on the memory card.

(6) : Function for making a backup copy of the data in SRAM.

(7) : Function for deleting a file from a memory card.

(8) : Function for formatting a memory card.

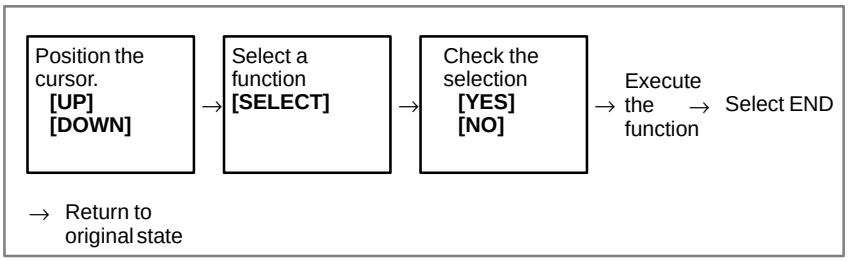
(9) : Function for terminating the boot system and starting the CNC.

(10) : Condensed guidance or error message

- **Operating procedure**

Press the **[UP]** or **[DOWN]** soft key to select the desired function. After positioning the cursor to the desired function, press the **[SELECT]** soft key. Before executing a function, the system my request confirmation from the operator by having him/her press the **[YES]** or **[NO]** soft key.

- **Basic operation**

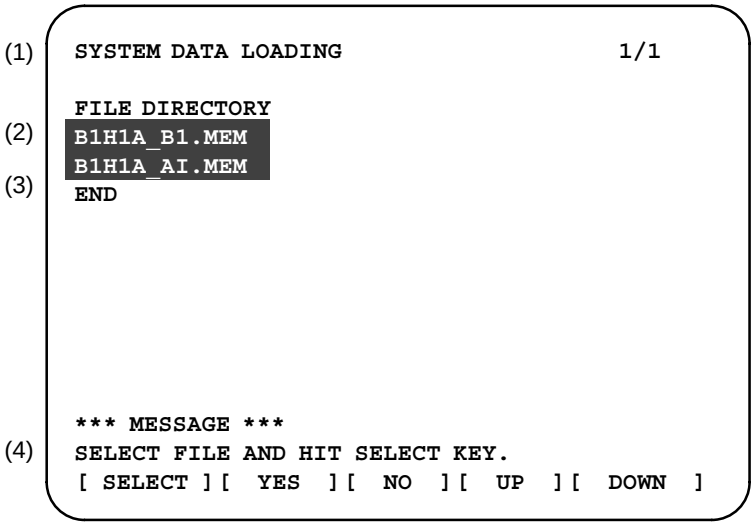


C.2.1 System Data Loading Screen

- **Description**

This screen is used to read a system or user file from a memory card into flash ROM.

- **Screen configuration**



(1): Screen title. The page number (n) and total number of pages (m) are displayed, in n/m format, at the right end.

(2): Files on the memory card

(3): Option for returning to previous menu Message

(4): Message

- **Operating procedure**

1 Position the cursor to the file to be read from the memory card and written to flash ROM. Then, press the **[SELECT]** soft key.

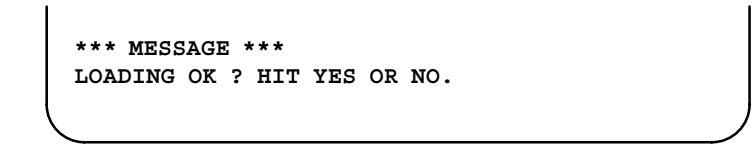
A single page can list up to eight file names. If the memory card contains nine or more files, the remaining files are displayed on another page.

To display the next page, press the [▷] soft key.

To display the previous page, press the [◁] soft key. The END option is displayed on the last page.

The END option is displayed on the last page.

2 After a file has been slected, the system asks whether that file is to be loaded.



3 To start loading, press the **[YES]** soft key. To cancel, press the **[NO]** key.

```
*** MESSAGE ***
LOADING FROM MEMORY CARD.
```

4 When loading terminates normally, the system displays the following message. Press the **[SELECT]** soft key. If an error occurs, see C.3

```
*** MESSAGE ***
LOADING COMPELETE. HIT SELECT KEY.
```

- **Others**

1 Counter display while a file is being loaded

While a file is being loaded, the address of the data currently being accessed is displayed.

```
*** MESSAGE ***
LOADING FROM MEMORY CARD.
ADDRESS 001:          ← The counter appears under the
    (1)                   message fild.
```

(1): Number of 128–KB management unit in flash ROM

2 File name in flash ROM

The boot system identifies a file in flash ROM by the first four characters of the ID in the header. If flash ROM has a file of the same type as a file to be read from the memory card, the file in flash ROM is deleted before the file on the memory card is read. The following table lists the IDs in the header and the contents. Note that these IDs are subject to change without prior notice.

File name	Contents	File type
NC BASIC	Basic 1	System file
NC 2BSIC	Basic 2	System file
DGB0SRVO	Servo	System file
GRAPHIC	Graphic	System file
NC□ OPTN	Optional□	System file
PS□****	PMC control software, etc.	System file
ETH2 EMB	Embedded ethernet	System file
PCD ****	P–CODE macro file/ OMM	User file
CEX ****	C–language executor	User file
PMC - ****	Ladder software	User file
PMC@****	Ladder software for the loader	User file

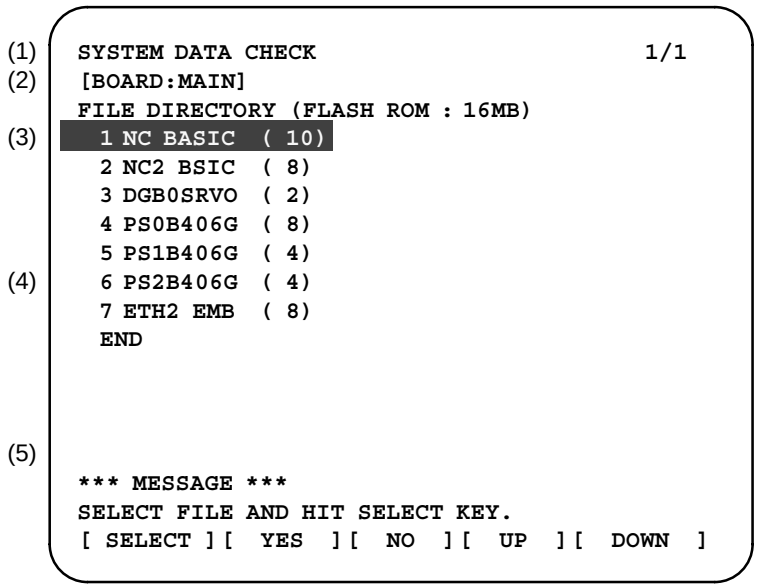
□ : A numeric character, * : An alphabetic character

C.2.2 System Data Check Screen

- **Description**

This screen is used to list files in flash ROM, together with the corresponding numbers of 128–KB management units in each file and the series and edition of the software.

- **Screen configuration**



(1): Screen title

(2): Names of accessing board

(3): Names of files in flash ROM The number of management units constituting each file appears in parentheses to the right of the file name.

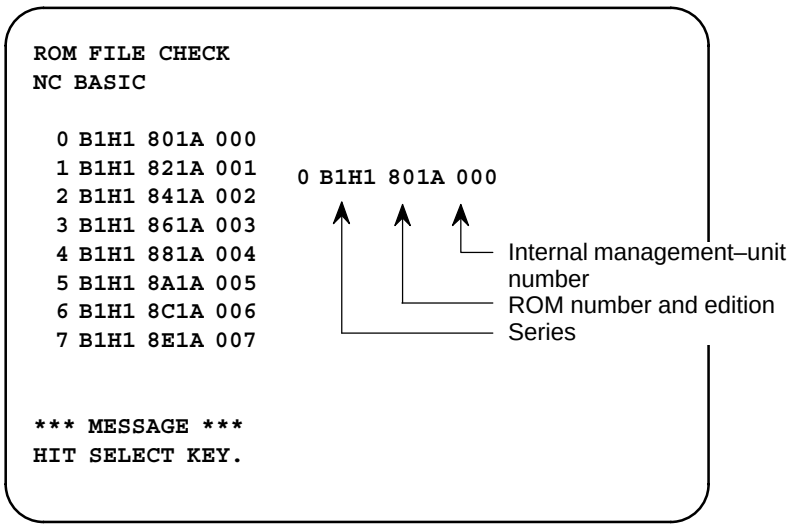
(4): Returning to the previous menu

(5): Message

- **Operating procedure**

1 Select the file whose details are required. For example, select “1 NC BASIC (10).”

2 The numbers of management units in the selected file are listed, together with the series and edition of the software in each management unit. After checking the listed data, select the **[SELECT]** soft key to return to the file selection screen.



- **Others**

Parity information for the system file and user file

The NC BASIC, DGB0SRVO, and other system files in flash ROM contain parity information in each management unit. If the file name field or parity field on the check screen contains a non–ASC II character or an “@” , the flash ROM may have been destroyed or a damaged file may have been read. Re–read the data from the memory card.

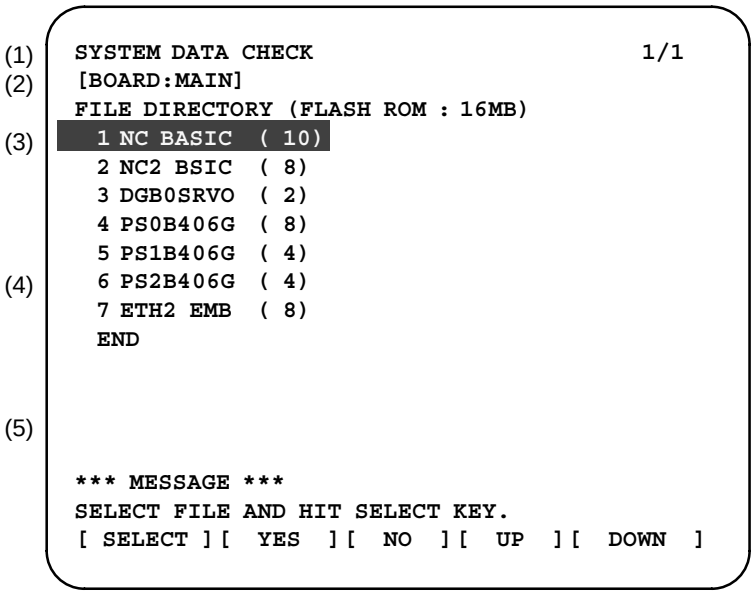
The PMC–SB, PCD 0.5M, and other user files do not contain parity information in each management unit. A non–ASCII character or an “@” may appear in the series/edition information. In this case, it does not indicate that the file has been damaged.

C.2.3 System Data Delete Screen

- **Description**

This screen is used to delete a user file from flash ROM.

- **Screen configuration**



(1): Screen title

(2): Names of accessing board

(3): Names of files in flash ROM The number of management units constituting each file appears in parentheses to the right of the file name.

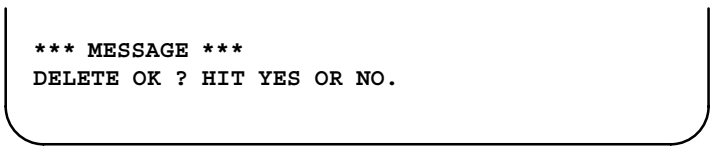
(4): Returning to the previous menu
If flash ROM contains many files, END is sometimes not displayed. In this case, press the continuous menu key (▷) of the soft key display several times. Then, END appears at the end of files.

(5): Message

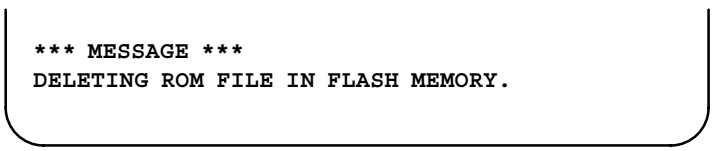
- **Operating procedure**

1 Position the cursor to the name of the file to be deleted. Press the **[SELECT]** soft key.

2 The system displays the following confirmation message :



3 To start the deletion, press the **[YES]** key. To cancel, press **[NO]**.



4 When deletion terminates normally, the system displays the following message. Press the **[SELECT]** key.

```
*** MESSAGE ***
DELETING COMPLETE. HIT SELECT KEY.
```

- **Others**

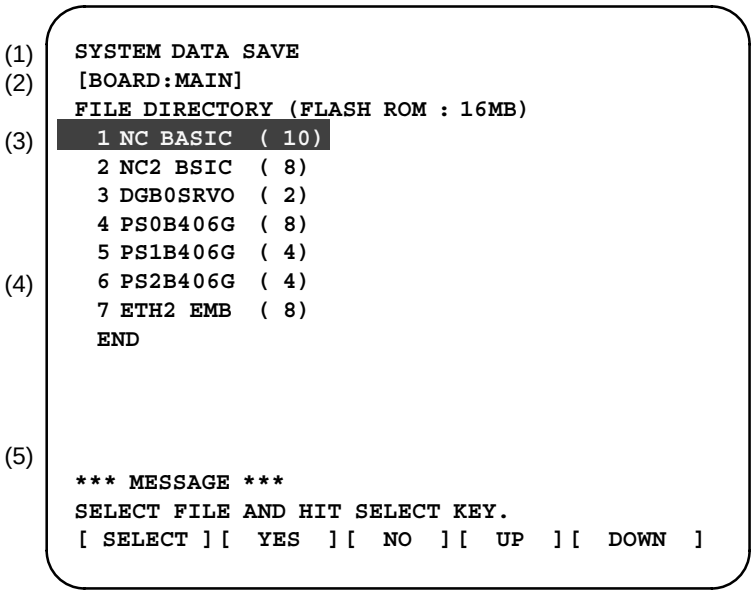
1 System files and user files on SYSTEM DATA DELETE screen
The system files are protected from accidental deletion. User files, however, are not protected. Protected system files can be overwritten from the SYSTEM DATA LOADING screen.

C.2.4 SYSTEM DATA SAVE Screen

- **Description**

This screen is used to write a user file in flash ROM to a memory card. Only user files can be saved from flash ROM to a memory card. System files cannot be saved.

- **Screen configuration**



(1): Screen title

(2): Names of accessing board

(3): Names of files in flash memory The number of management units constituting each file appears in parentheses to the right of the file name.

(4): Returning to the previous menu
If flash ROM contains many files, END is sometimes not displayed. In this case, press the continuous menu key (▷) of the soft key display several times. Then, END appears at the end of files.

(5): Message

- **Operating procedure**

1 Position the cursor to the name of the file to be deleted. Press the **[SELECT**] soft key.

2 The system displays the following confirmation message :

```
*** MESSAGE ***
SAVE OK ? HIT YES OR NO.
```

3 To start saving, press the **[YES]** key. To cancel, press **[NO]**.

```
*** MESSAGE ***
WRITING FLASH ROM FILE TO MEMORY CARD.
SAVE FILE NAME : PMC_RB.000
```

4 When saving terminates normally, the system displays the following message. Press the **[SELECT]** key. The names of files written to the memory card are listed. Check the file names by, for example, making a note of the list.

```
*** MESSAGE ***
FILE SAVE COMPELETE. HIT SELECT KEY.
SAVE FILE NAME : PMC_RB.000
```

- **Others**

1 System files and user files on SYSTEM DATA SAVE screen

The SYSTEM DATA SAVE function provides a safeguard against free copying of the system files.

User files, however, are not protected.

2 Names of saved files

Files saved from flash ROM to a memory card have the following names :

Flash ROM		File name in Memory card
PMC–SB	→	PMC_SB. XXX
PMC 0.5M	→	PCD_0.5M.XXX
PMC 1.0M	→	PCD_10M.XXX
PMC 1.5M	→	PCD_15M.XXX
CEX1.0M	→	CEX_10M.XXX
CEX 2.0M	→	CEX_20M.XXX

XXX corresponds to the file extension of MS–DOS format files. A number from 000 to 031 is specified for XXX. For example, if the PMC–RB file in flash ROM is saved to a memory card that does not yet contain a file whose name begins with “PMC–RB”, the saved file is named PMC–RB.000. If, however, that file is saved to a memory card that already contains a file named PMC–RB.000, the saved file is named PMC–RB.001. As files are added, the extension is incremented up to a maximum of PMC–RB.031. Any no–longer used numbers in the sequence of the extension numbers are used in as cending order. If two or more files having identical names but different extension numbers are normally saved to the memory card, check the file names displayed subsequently.

C.2.5 SRAM DATA BACKUP Screen

- **Description**

This screen is used to collectively save and restore parameters, programs, and other data, retained after the CNC power in SRAM is turned off, to and from a memory card.

- **Screen configuration**

Select “4 SRAM DATA BACKUP” on the SYSTEM MONITOR MAIN MENU screen. The following screen is displayed.

```
(1)  SRAM DATA BACKUP
(2)  [BOARD:MAIN]
(3)    1. SRAM BACKUP (CNC → MEMORY CARD)
       2. RESTORE SRAM (MEMORY CARD → CNC)
(4)    END

(5)    SRAM SIZE   :  256K (BASIC)
(6)    FILE NAME   :  SRAM256A. FDB




       *** MESSAGE ***
(7)  SELECT MENU AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1): Screen title
(2): Names of accessing board
(3): Menu
(4): Returning to the previous menu
(5): Size of SRAM mounted on the CNC
(6): File name
(7): Message

- **Operating procedure**

[Backing up data]

1 Select “1. SRAM BACKUP.” The following confirmation message is displayed. The backup file name may be displayed according to the SRAM capacity.

2 Press **[YES]** to start backup.

```
*** MESSAGE ***
BACKUP SRAM DATA OK ? HIT YES OR NO.
```

3 If a backup file is already on the memory card, you will be prompted to confirm whether to permit overwriting.

4 The name of the file being written to the memory card is displayed in the FILE NAME: field.

```
SRAM SIZE   : 0.5MB (BASIC)
FILE NAME   : SRAM0_5A.FDB  → MEMORY CARD
                                  ↖ Name of the file being saved

*** MESSAGE ***
SRAM DATA WRITING TO MEMORY CARD.
```

5 Upon terminating normally, the system displays the following message. Press the **[SELECT]** soft key.

```
*** MESSAGE ***
SRAM BACKUP COMPLETE. HIT SELECT KEY.
```

[Restoring the data]

1 Select “2. RESTORE SRAM.” The system displays the following message. Press the **[YES]** key.

```
*** MESSAGE ***
RESTORE SRAM DATA OK ? HIT YES OR NO.
```

2 The system displays the following message during restoration.

```
*** MESSAGE ***
RESTORE SRAM DATA FROM MEMORY CARD.
```

3 Upon terminating normally, the system displays the following message. Press the **[SELECT]** soft key.

```
*** MESSAGE ***
RESTORE COMPLETE. HIT SELECT KEY.
```

- **Others**

1 Name of backup file

The name of the backup file written to the memory card by the SRAM backup function depends on the size of the SRAM installed in the CNC.

When the size of SRAM is 1MB or larger, backup files are created in units of 512 KB.

Number of files / SRAM size	1	2	3	4	5	6
256KB	SRAM256A.FDB					
0.5MB	SRAM0_5A.FDB					
1.0MB	SRAM1_0A.FDB	SRAM1_0B.FDB				
2.0MB	SRAM2_0A.FDB	SRAM2_0B.FDB	SRAM2_0C.FDB	SRAM2_0D.FDB		
3.0MB	SRAM3_0A.FDB	SRAM3_0B.FDB	SRAM3_0C.FDB	SRAM3_0D.FDB	SRAM3_0E.FDB	SRAM3_0F.FDB

The backup file for SRAM on the PMC–RE, CAPII, or LCB board will have the following extension:

Board	MAIN	PMC–RE	CAPII	LCB
Extension	FDB	PMC	CAP	LCB

CAUTION

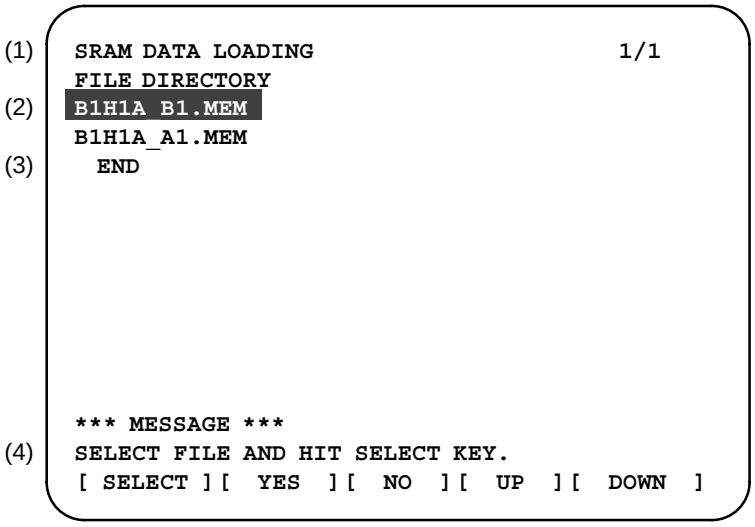
If data such as parameters was restored from a memory card to SRAM in a system using an absolute pulse coder, set bit 4 (APZ) of parameter No. 1815 to 0, and set the reference point again.

C.2.6 MEMORY CARD FILE DELETE Screen

- **Description**

This screen is used to delete a file from a memory card.

- **Screen configuration**



(1): Screen title. Tlhe current page number (n) and the total number of pages (m) are displayed, in n/m format, at the right end.

(2): Files on the memory card

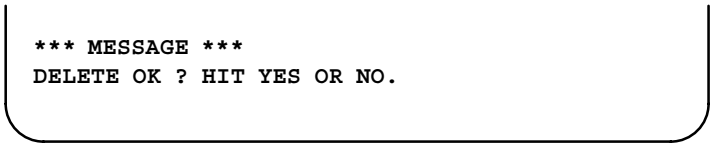
(3): Option for returning to the previous menu

(4): Message

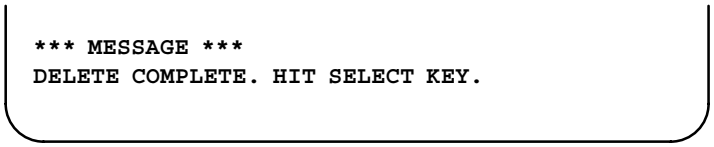
- **Operating procedure**

1 Press the **[SELECT]** key to select the name of the file to be deleted from the memory card.

2 The system displays the following confirmation message. Press the **[YES]** key.



3 When a file has been deleted normally, display the following message. Press the **[SELECT]** key.



C.2.7 MEMORY CARD FORMAT Function

- **Description**

This function is used to format a memory card. Memory cards must be formatted before they can be used for the first time or before they can be re–used after their data has been destroyed or lost because of, for example, battery failure.

- **Operating procedure**

1 From the SYSTEM MONITOR MAIN MENU screen, select “7. MEMORY CARD FORMAT.”
2 The system displays the following confirmation message. Press the **[YES]** key.

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.
```

3 The system displays the following message during formatting :

```
*** MESSAGE ***
FORMATTING MEMORY CARD.
```

4 When a card has been formatted normally, the system display the
   · following message.
   · Press the **[SELECT]** key.

```
*** MESSAGE ***
FORMAT COMPLETE. HIT SELECT KEY.
```

C.2.8 LOAD BASIC SYSTEM Function

- **Description**

The function is used to terminate the boot system and activate the CNC.

- **Operating procedure**

From the MAIN MENU screen, select “9. END.” The system displays the “ARE YOU SURE? HIT YES OR NO” message. To terminate the boot system and activate the CNC, press the **[YES]** soft key. Press the **[NO]** soft key, and you will be brought back to the main menu.

```
*** MESSAGE ***
ARE YOU SURE ? HIT YES OR NO.

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

1 After pressing the **[YES]** soft key

The system checks the NC BASIC system file in the flash ROM. The system displays the following message :

```
*** MESSAGE ***
CHECK CNC BASIC SYSTEM.

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

When the NC BASIC system file is found to be normal, the system sends the system file to DRAM and starts the NC basic system. During loading, the system blinks the following message.

```
*** MESSAGE ***
   LOADING BASIC TO DRAM

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

If the contents of the NC BASIC SYSTEM file are found to have been damaged or destroyed, the system returns to the processing selection state, in exactly the same way as when the **[NO]** soft key is pressed.

2 If the **[NO]** soft key is pressed, the system returns to the processing selection state as shown below :

```
SYSTEM MONITOR MAIN MENU            60M5-01

1. SYSTEM DATA LOADING
2. SYSTEM DATA CHECK
3. SYSTEM DATA DELETE
4. SYSTEM DATA SAVE
5. SRAM DATA BACKUP
6. MEMORY CARD FILE DELETE
7. MEMORY CARD FORMAT


10.END

*** MESSAGE ***
SELECT MENU AND HIT SELECT KEY.
[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

C.3 ERROR MESSAGES AND REQUIRED ACTIONS

The following table lists and explains error messages in alphabetical order.

	Message	Description and required action
B	BOOT ROM PARITY. PLEASE POWER OFF.	The contents of flash memory containing boot software was destroyed. Replace the CPU card.
C	CHANGE MEMORY CARD. AND HIT YES OR NO.	The memory card becomes full in the middle of SRAM backup operation. Replace the card with a memory card containing enough free space.
D	DELETE ERROR. HIT SELECT KEY.	An attempt to delete a file from flash ROM was unsuccessful. Retry the deletion. If the second attempt also fails, the flash ROM may have been damaged or destroyed. Replace the flash ROM module.
	DEVICE ERROR (CNC x)	An attempt to write data to flash ROM was unsuccessful. Retry the write operation. If the second attempt also fails, the flash ROM may have been damaged or destroyed. Repalce the flash ROM module.
F	FILE SAVE ERROR. HIT SELECT KEY.	An attempt to write a file to a memory card was unsuccessful. Check that the memory card is not damaged. Note) Check that the memory card's battery is not exhusted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	FLASH MEMORY NO SPACE	There is insufficient free flash ROM to store the selected file. Delete any unnecessary files from flash ROM.
	FLASH ROM MODULE NOT EXIST. HIT SELECT.	The flash ROM module is not mounted on that CNC system. Put the flash ROM module on the board.
G	GRAPHIC SOFT IS NOT FOUND. BOOT STOP.	Graphic software is required. Load appropriate graphic software for the hardware in flash ROM.
I	ILLEGAL FORMAT FILE	The selected file cannot be read into flash memory. The selected file or the header information for flash ROM may have been damaged or destroyed.
	ILLEGAL FROM MODULE. HIT SELECT KEY.	The flash ROM module ID is illegal. Check the drawing No. of the flash ROM module.
	ILLEGAL SRAM MODULE. HIT SELECT KEY.	The SRAM module ID is illegal. Check the drawing No. of the SRAM module.
L	LOADING ERROR. HIT SELECT KEY.	An error occurred while loading data into flash ROM. Do not touch the memory card while loading data.

	Message	Description and required action
M	MAX EXTENSION OVER. HIT SELECT KEY.	The extension number added to a file name exceeds 031. Delete any unnecessary backup files from the memory card.
	MEMORY CARD BATTERY ALARM. HIT SELECT.	The memory card's battery is exhausted. Replace the battery.
	MEMORY CARD FULL. HIT SELECT KEY.	The memory card is full. Delete any unnecessary files from the memory card. Alternatively, replace the memory card with another card having sufficient free space.
	MEMORY CARD IS NOT AVAILABLE. HIT SEL.	The use of this memory card is not supported. Use only FANUC–recommended memory cards, as described in the order list.
	MEMORY CARD MOUNT ERROR. HIT SELECT KEY	The memory card could not be accessed. Check that the memory card is normal.
	MEMORY CARD NOT EXIST. HIT SELECT KEY.	The memory card is not inserted into its slot. Check that the memory card is pushed fully home.
	MEMORY CARD PROTECTED.HIT SELECT KEY.	Although writing to the memory card was selected, the write inhibit switch is set. Disable the write inhibit switch. Note) Check that the memory card's battery is not exhusted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	MEMORY CARD TYPE IS NOT AVAILABLE.	Write has been attempted to an incompatible flash memory card. Use only the flash ROM cards recommended by FANUC. Recommended flash ROM cards are listed in the ordering list.
	MEMORY CARD RESET ERROR. HIT SELECT KEY.	Access to a memory card failed. The memory card's battery may have gone dead, the memory card may have been damaged electrically, or the memory card may not be inserted in the slot securely.
	MEMORY CARD WRITE ERROR. HIT SELECT KEY.	Access to the memory card has failed. Check whether the memory card is defective. Note) Check that the memory card's battery is not exhusted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
N	NMI OCCURRED. PLEASE POWER OFF.	A hardware or software error occurred. Determine the procedure which causes the error, and report it to FANUC together with the series and edition of the boot software.
P	PLEASE FORMAT FLASH TYPE CARD.HIT SEL.	It is not possible to delete only specific files from a flash ROM card, due to the characteristics of the memory used. To delete a file it is necessary to delete all files on the card, by using the FORMAT function.
R	ROM PARITY ERROR: NC BASIC. HIT SELECT.	The NC BASIC is parity error. Check whether NC BASIC is in flash ROM, using SYSTEM DATA CHECK.
S	SRAM DATA BACKUP ERROR. HIT SELECT KEY.	An attempt to write a backup file to a memory card failed. Check that the memory card is normal. Note) Check that the memory card's battery is not exhusted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	SRAM PARITY OCCURRED. PLEASE POWER OFF.	A parity error was detected during backup operation of SRAM (Caution).

CAUTION

1 Action to be taken when an SRAM parity error is detected during backup of SRAM in the boot system

The SRAM area of each CNC shipped from the factory is cleared and is free of parity errors. However, shock applied to the CNC during transportation may cause a parity error in the SRAM area. A parity error may also occur in the SRAM area when the CNC was kept switched off for one year or longer, and the battery has been exhausted. If a parity error occurs in the SRAM area, the data held in the SRAM area is not guaranteed. However, the CNC does not always use the entire SRAM area. A parity error is not detected by hardware unless the part containing the error is read. Therefore, if a parity error occurs in an area not accessed by the CNC, the CNC may operate normally. The SRAM backup function of the boot system reads the entire SRAM area. So, a parity error may occur in the middle of backup operation even when the CNC has operated normally. In this case, the SRAM data of the CNC is not guaranteed, and the data cannot be backed up using the SRAM backup function of the boot system. Nevertheless, the CNC may operate normally. So, it is recommended that necessary data be backed up using the Floppy Cassette or Handy File, data all clear operation be performed, then the backed up data be restored in the CNC. Once all clear operation is performed, the parity error can be removed. Then, the SRAM backup function of the boot system can be used.

D MEMRY CARD SLOT

D.1 OVERVIEW

Whether a memory card slot is provided or not depends on the hardware configuration. See the following table:

Hardware	Card slot on LCD unit	Card slot on control unit
Type 1	Provided	No card slot
Type 2 Type 6	Provided	Provided (This slot, however, cannot be used.)
Type 3	No card slot	Provided
Type 4 Type 5	No card slot (See NOTE given below.)	Provided

(Supplementary)

– Types 1 to 6 indicate hardware configuration. See Section D.3.
– When both the LCD unit and control unit have a memory card slot, only the memory card slot on the LCD unit can be used.

NOTE
Software write operation and other operations are implemented by open CNC functions.

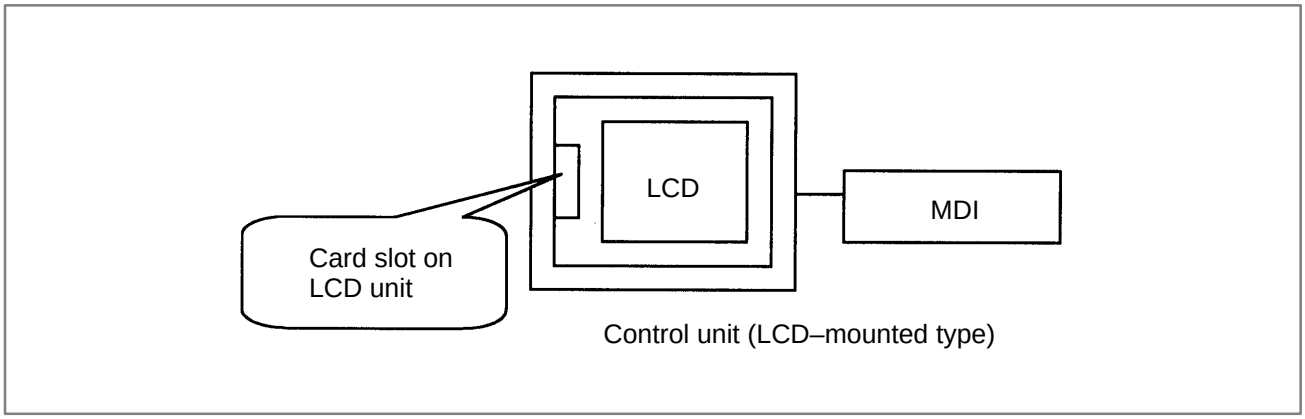
D.2 MEMORY CARD TYPES (FUNCTIONS)

SRAM memory card
FROM memory card — Data I/O
Flash ATA card
Modem card (for remote diagnosis)

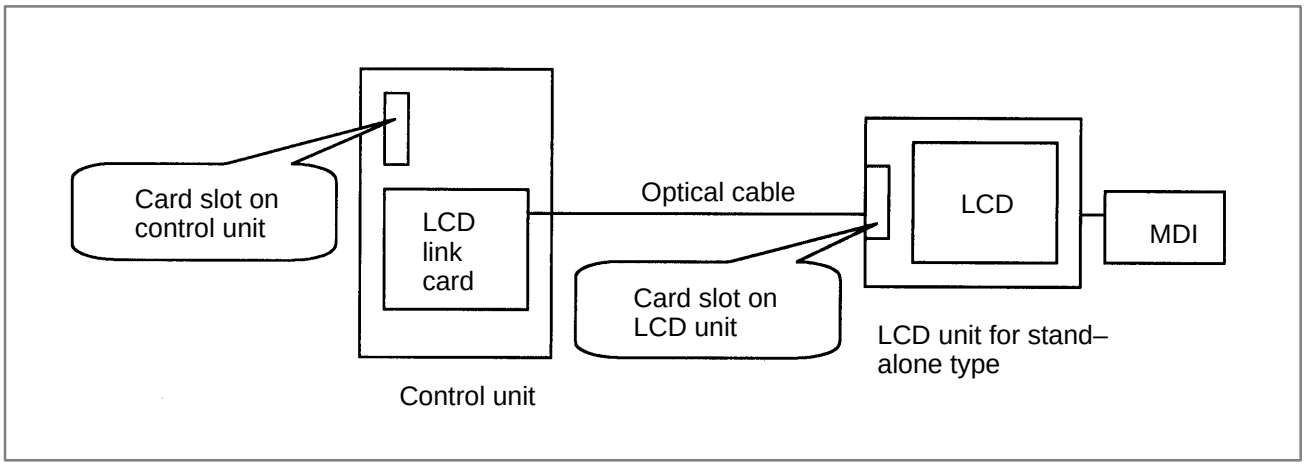
NOTE
For details of the types of usable memory cards, see the ordering list.

D.3 HARDWARE CONFIGURATION

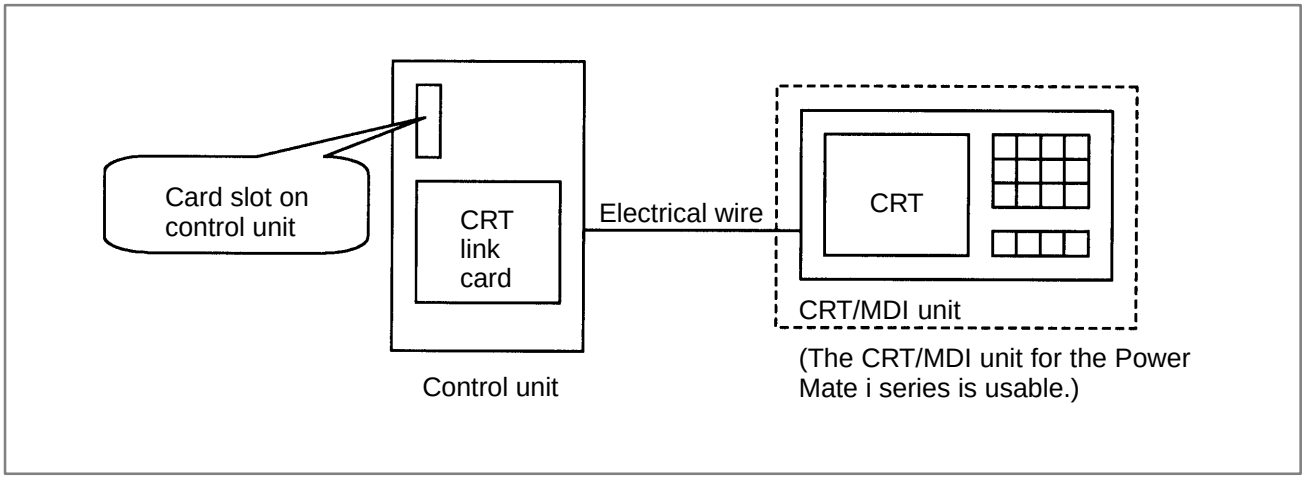
- **Type 1** LCD–mounted type



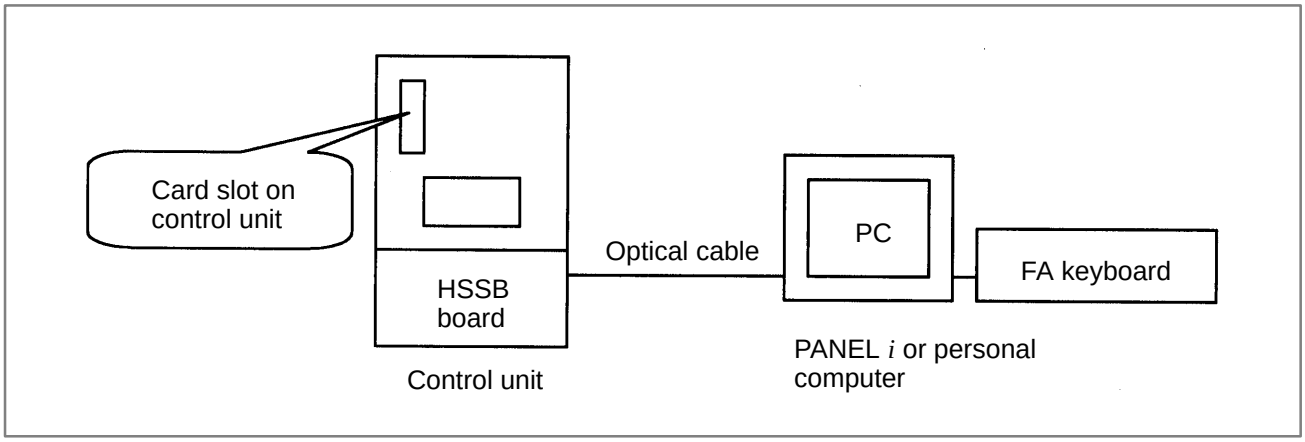
- **Type 2** Stand–alone type (with an LCD unit)



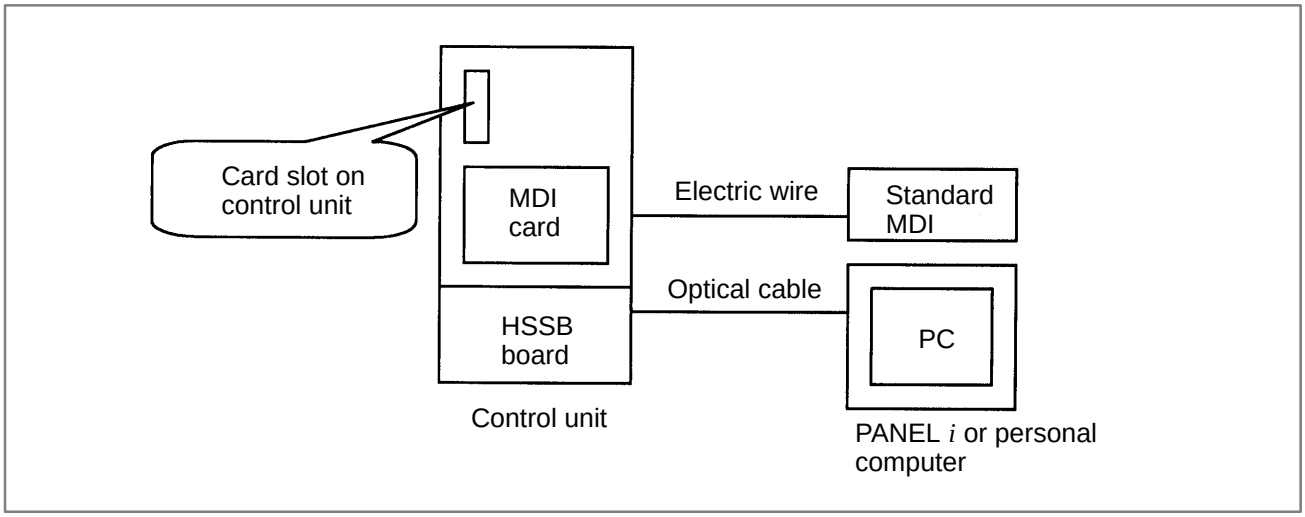
- **Type 3** Stand–alone type (with a CRT/MDI unit)



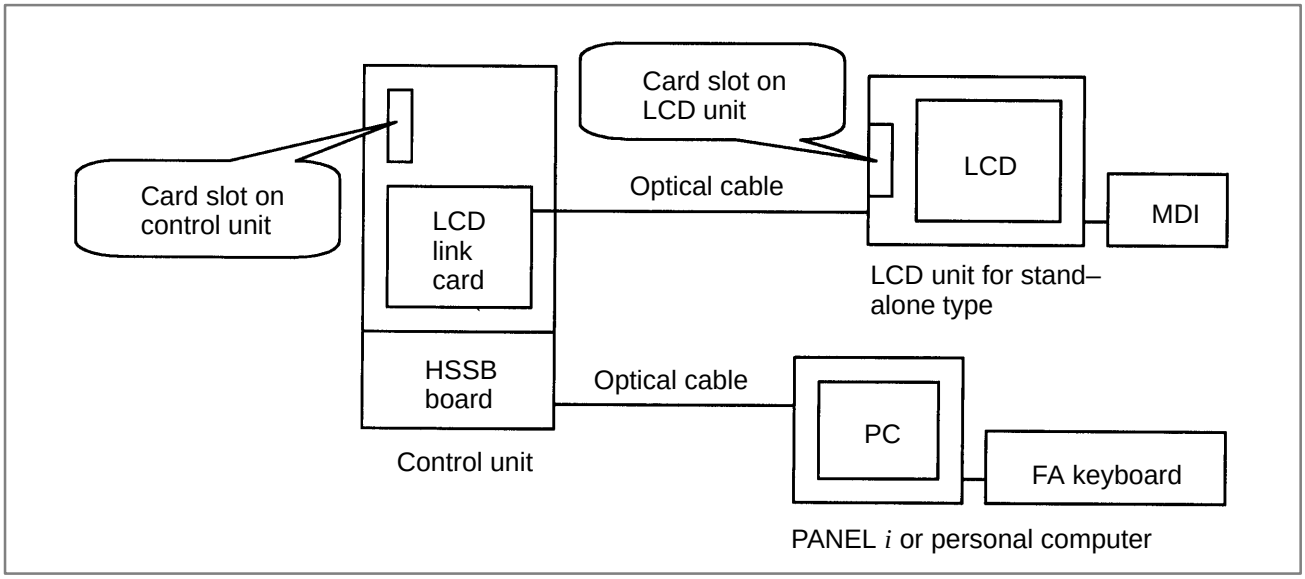
- **Type 4** Stand–alone type (with an PANEL *i* and FA keyboard)



- **Type 5** Stand–alone type (with an PANEL *i* and FA keyboard)



- **Type 6** Stand–alone type (with an LCD unit and MDI, and an PANEL *i* and FA keyboard)



E LED DISPLAY AND MAINTENANCE OF STAND–ALONE TYPE UNIT

E.1 OVERVIEW

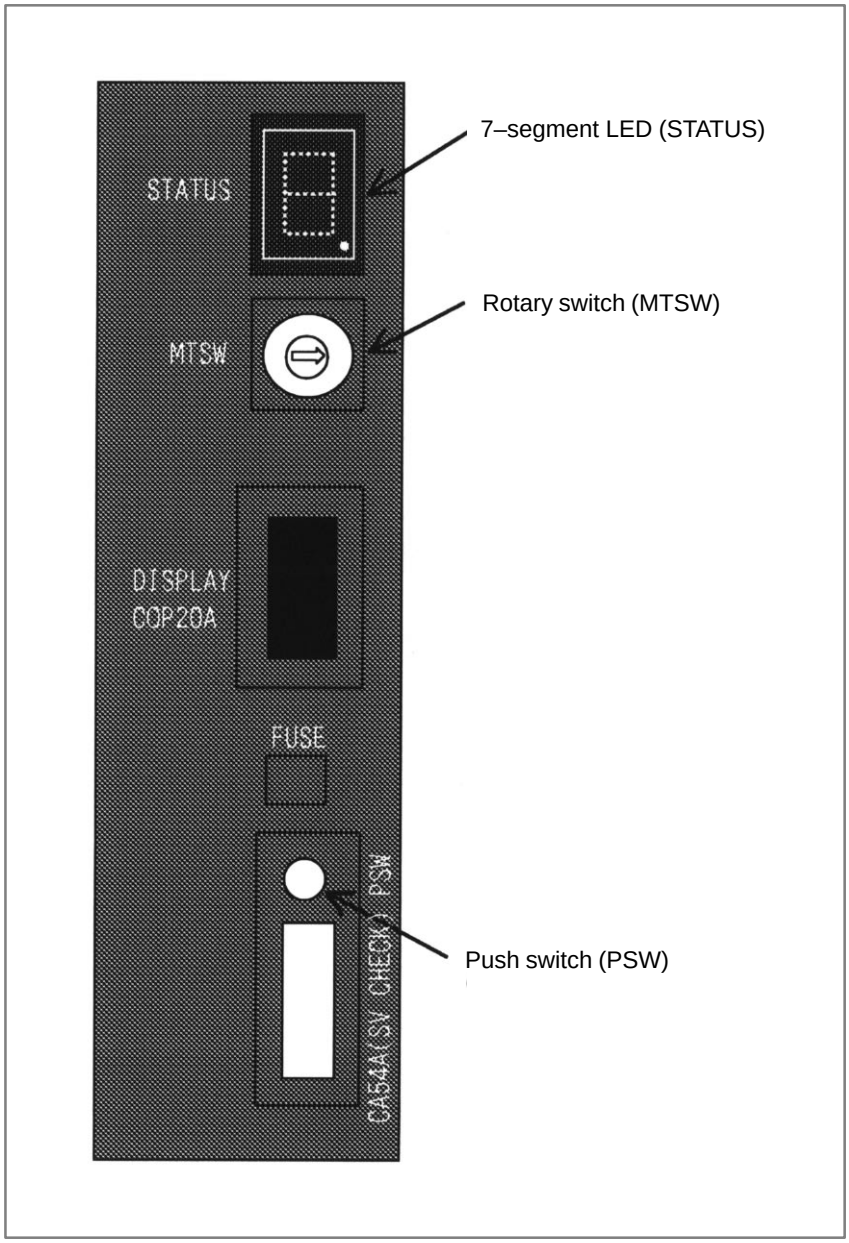
FANUC Series 16*i*/18*i*/21*i* (referred to as FS16*i* hereinafter) of stand–alone type is equipped with a 7–segment LED, rotary switch, and push switch.

When no MDI is included in the system configuration or when the MDI becomes defective and cannot be used, battery backed–up data can be saved and restored by using the rotary switch and push switch.

When the MDI can be used, use these switches for maintenance of the boot function.

E.2 LAYOUT OF THE 7–SEGMENT LED AND SWITCHES

The 7–segment LED, rotary switch, and push switch are located as shown below.



E.3 OPERATION

E.3.1 Operation Before Power–On

Before turning on the power, select a function number by using the rotary switch. When the power is turned on after the selection with the rotary switch, the number corresponding to the selected function number is indicated on the LED. The indication blinks at intervals of about one second.

E.3.2 Function Number

Each function is assigned a number. This number is called a function number hereinafter in this manual. The function numbers that can be selected with the rotary switch are listed below. Do not set the reserved function numbers. (If a reserved function number is set, the system operates as if function number 0 were selected.)

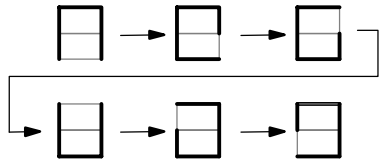
Function number	Explanation	Remarks
0	Normal state. After terminating maintenance operation, always set this number.	
1	Reserved	
2	Sets a device number for the display link function.	
3	Reserved	
4	Maintenance switch	
5	Memory all clear	
6	Reserved	
7	Reserved	
8	Saves battery backed–up main board data in a memory card at a time.	
9	Reserved	
A	Restores battery backed–up main board data from a memory card at a time.	
B	Reserved	
C	Reserved	
D	Reserved	
E	Reserved	
F	Reserved	

E.3.3 Seven–Segment LED Display

E.3.3.1 NC status display

Number displayed on LED	Blink/not blink	Description
	Not blink	Automatic operation is paused, stopped, or reset.
(Rotation of character )	Not blink	Automatic operation start signal When STL (F000#5) = 1
Number ( ~ )	Blink	System alarm status
Number ( ~ )	Not blink	Status change at power–on

E.3.3.2 LED display during automatic operation

LED indication	Description
	Automatic operation start signal When STL (F000#5) = 1

E.3.3.3 LED display when the push switch is pressed

Number displayed on LED	Blink/not blink	Description
	Not blink	The push switch has been pressed normally.

E.3.3.4 LED display when a system alarm is issued

When a system alarm is issued, a number blinks on the 7–segment LED.

Number on LED (blinking)	System alarm number	Type of system alarm
	In the 900's	ROM PARITY
	In the 910's	SRAM PARITY, DRAM PARITY
	In the 920's	SERVO ALARM
	In the 930's	CPU INTERRUPT, SRAM ECC ERROR
	In the 950's	PMC SYSTEM ALARM
	In the 970's	NON MASK INTERRUPT, BUS ERROR
	Others	Other system alarms

E.3.3.5 Display on the 7–segment LED at power–on

Number displayed on LED	On/off status of 4 LEDs	Meaning
	□□□□	Power is not on.
	■■■■	Power is turned on, but the CPU does not yet start.
	■■■■	NC system loading is started by the boot system.
	□■■■	The NC system has started, and RAM initialization has terminated.
	■□■■	Wait for ID setting for each board
	□□■■	ID setting for each board has terminated, and CRT initialization has terminated.
	■■□■	FANUC bus initialization has terminated.
	□■□■	Loading from F–ROM has terminated, PMC initialization has terminated, and the series/edition screen is displayed.
	■□□■	Hardware configuration information setting for each module has completed.
	□□□■	PMC ladder initialization has completed.
	□■■□	Wait for digital servo and spindle initialization
	■■■□	Digital servo and spindle initialization has completed.
	■□□□	Initialization has completed. In normal operation state.

□ : Off ■ : On

E.3.4 Operation of Each Function

- **Function number 2**

This function sets a device number for the display link function.

(1) Check that number 2 blinks on the LED, and press the push switch.

(2) Number 2 is displayed on the LED. Press the push switch.

(3) Sixteen numbers from 0 to F are displayed on the LED one by one at intervals of about one second. When the device number you want to set appears on the LED, press the push switch.

(4) The selected device number blinks on the LED. Press the push switch.

(5) The device number used for the display link function is displayed on the LED.

- **Function number 4**

This function allows the maintenance switches to be used to display data without using any display unit.

(1) Check that number 4 blinks on the LED. Press the push switch.

(2) Number 4 is displayed on the LED. Press the push switch.

(3) Number 0 is displayed on the LED. Press the push switch.

(4) Numbers 0 and 2 are displayed alternately on the LED at intervals of about one second. When 2 is displayed, press the push switch.

(5) The device number used for the display link function is displayed on the LED.

- **Function number 5**

This function clears all the battery backed–up SRAM data. The device number for the display link function is also cleared. Once the device number has been cleared, the device number is set to 0.

(1) Check that number 5 blinks on the LED. Press the push switch.

(2) Number 5 is displayed on the LED. Press the push switch.

(3) The display on the LED changes from – to F to 9 to 8 to 7 to 6 to 5 to 4 to 3 to 2 to 1 to 0 in this order.

(4) After all–clear operation terminates normally, the LED display stops changing at number 0.

(5) Turn off the power, set the rotary switch to 0 (normal state), then turn on the power again.

- **Function number 8**

This function saves battery backed–up main board data in a memory card at a time. The data saved using this function can be restored at a time by performing the operation for function number A or by using the SRAMDATABACKUP function of the boot function.

(1) In the memory card slot (MEMORY CARD CNM1B) of the control unit, insert a formatted memory card having at least 512 KB of available space.

(2) Check that number 8 blinks on the LED, and press the push switch.

(3) While data is being saved in the memory card, the LED indication turns clockwise.

(4) If the data cannot fit in one memory card, number 3 blinks. Replace the memory card with another one, and press the push switch.

(5) If the protect switch of the memory card is not released or if the battery capacity of the memory card is insufficient, number 2 blinks on the LED. Replace the memory card with another one, and press the push switch.

(6) When the data has been saved normally, number 0 is displayed on the LED. If the data cannot be saved normally, number 1 is displayed on the LED.

(7) If SRAM PARITY occurs during data save operation, number 1 blinks on the LED. In this case, it is impossible to save the data at a time. Back up individual data items one by one, then perform all–clear operation.

- **Function number A**

This function restores battery backed–up main board data from a memory card at a time.

(1) Insert the memory card in the memory card slot (MEMORY CARD CNM1B) of the control unit.

(2) Check that A blinks on the LED, and press the push switch.

(3) While data is being restored from the memory card, the LED indication turns counterclockwise.

(4) If the entire data cannot be restored from the single memory card, number 3 blinks. Replace the memory card with the next memory card, and press the push switch.

(5) If the memory card cannot be recognized correctly, number 2 blinks on the LED. Check the memory card status, and press the push switch.

(6) When the data has been restored normally, number 0 is displayed on the LED. If the data cannot be restored normally, number 1 is displayed on the LED.

F MAINTENANCE OF OPEN CNC (BOOT–UP AND IPL)

F.1 OVERVIEW

Ncboot32.exe provides the following functions:

- BOOT screen (for CNC system data maintenance, SRAM backup, and so forth)
- IPL screen (for clearing SRAM, and so forth)
- Display of the CNC power–on screen
- Display of CNC alarm screen
- Re–connection in case of the occurrence of a communication error
- Start of a registered application program

In the open CNC, CNC maintenance can be performed with Ncboot32.exe. Ncboot32.exe is copied in the System folder of Windows (System32 folder in Windows NT) at driver installation. At the start of Windows, Ncboot32.exe starts automatically, and resides in the system tray.

(Icon at the center)

Supplementary 1: Multi–connection

Ncboot32.exe supports HSSB multi–connection. The CNCs connected by HSSB are managed as nodes. The boot, IPL, and system alarm screens are displayed in windows that are opened independently for each node.

Supplementary 2: Termination method

Normally, Ncboot32.exe need not be terminated. However, to terminate Ncboot32.exe, right–click the icon in the system tray, and click End in the popup menu. When the Ncboot32.exe window is open, End cannot be selected.

F.2 CHANGING START SEQUENCES

With the rotary switch on the HSSB board on the CNC side (when the CNC does not have the PC function) or on the motherboard of the CNC (when the CNC has the PC function), the start sequence can be changed.

Position 0 can be selected as required to perform maintenance using the boot and IPL screens.

Position 0 (maintenance)

1. Wait until communication with the CNC is established.
2. Display the boot screen.
3. Display the IPL screen.
4. Display the CNC power–on screen.
5. Initialize the work area for the data window library.
6. Start a registered application program.
7. Perform monitoring for communication errors and CNC system alarms.

Position 1 (normal operation)

1. Wait until communication with the CNC is established.
2. Initialize the work area for the data window library.
3. Start a registered application program.
4. Perform monitoring for communication errors and CNC system alarms.

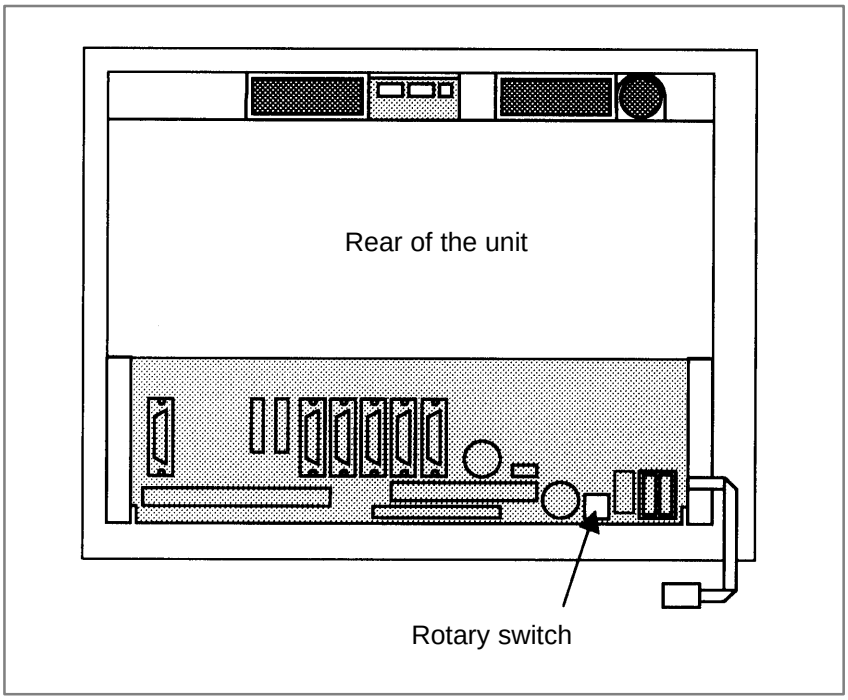
Position 2 (asynchronous start)

1. The CNC starts without waiting for communication to be established.
2. After communication is established, the PC performs initialization described below.
3. Initialize the work area for the data window library.
4. Start a registered application program.
5. Perform monitoring for communication errors and CNC system alarms.

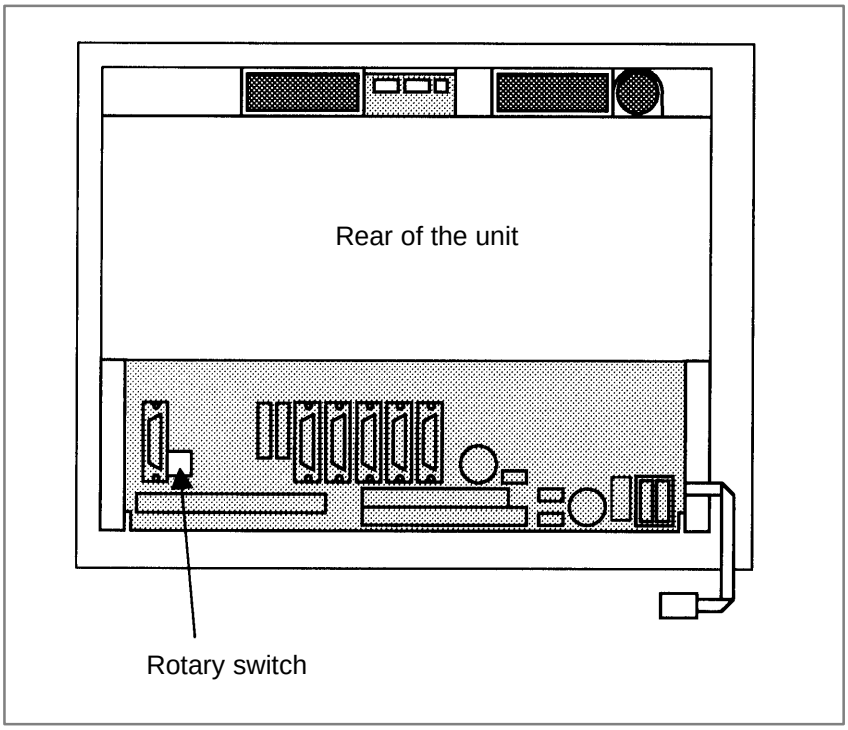
- **Rotary switch position**

- 160*i*/180*i*/210*i* motherboard with the PC function

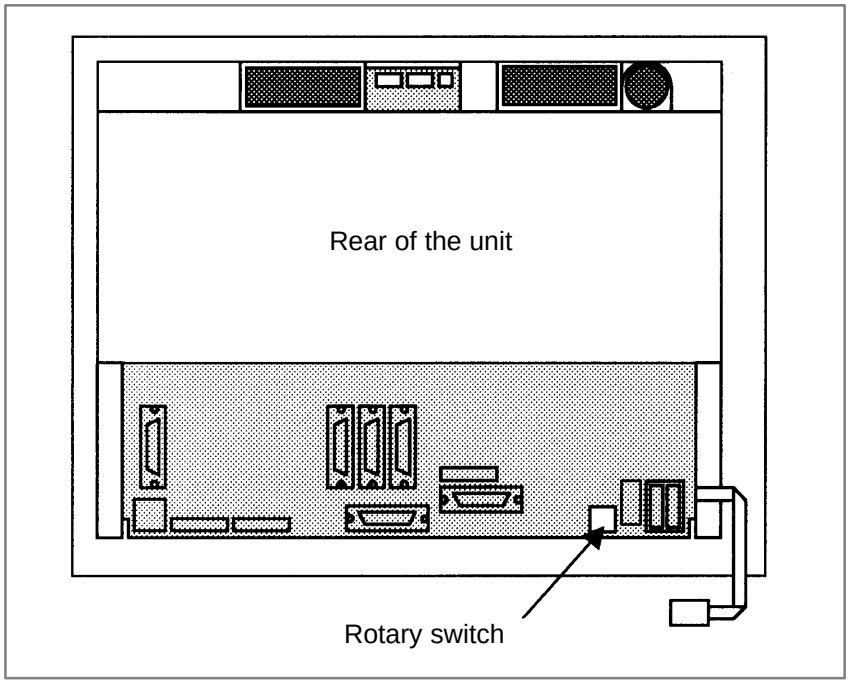
A20B–8100–014x



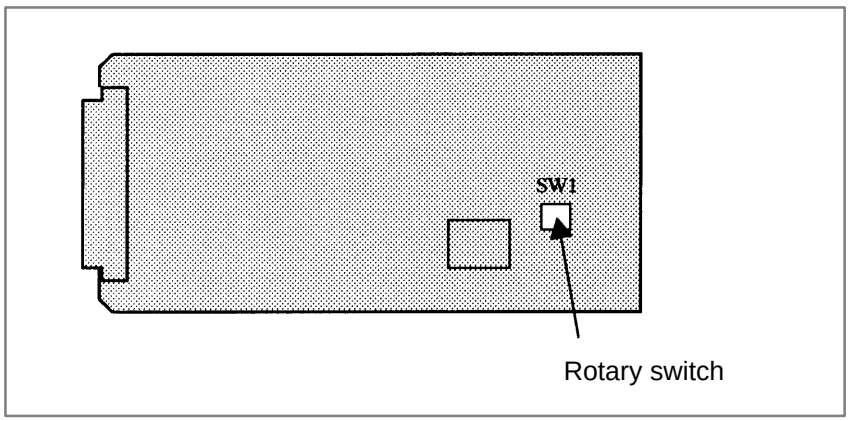
A20B–8100–046x



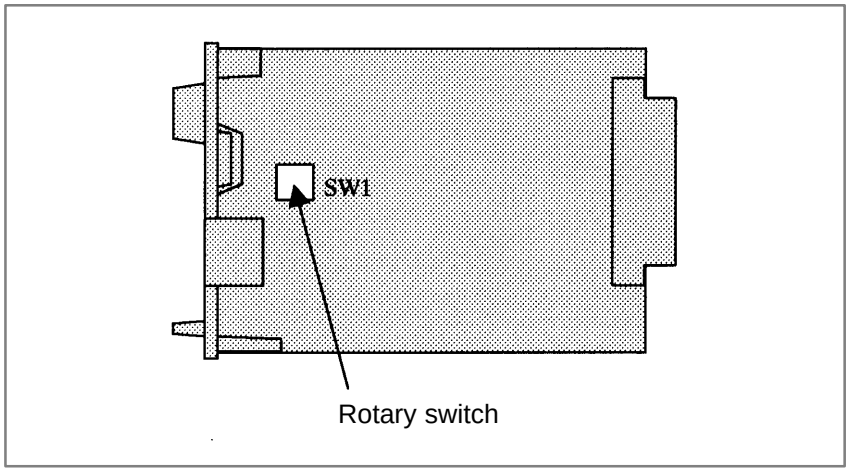
- 160*is*/180*is*/210*is* motherboard with PC function
  A20B–8100–054x



- HSSB interface board of 160*i*/180*i*/210*i* of LCD–mounted type



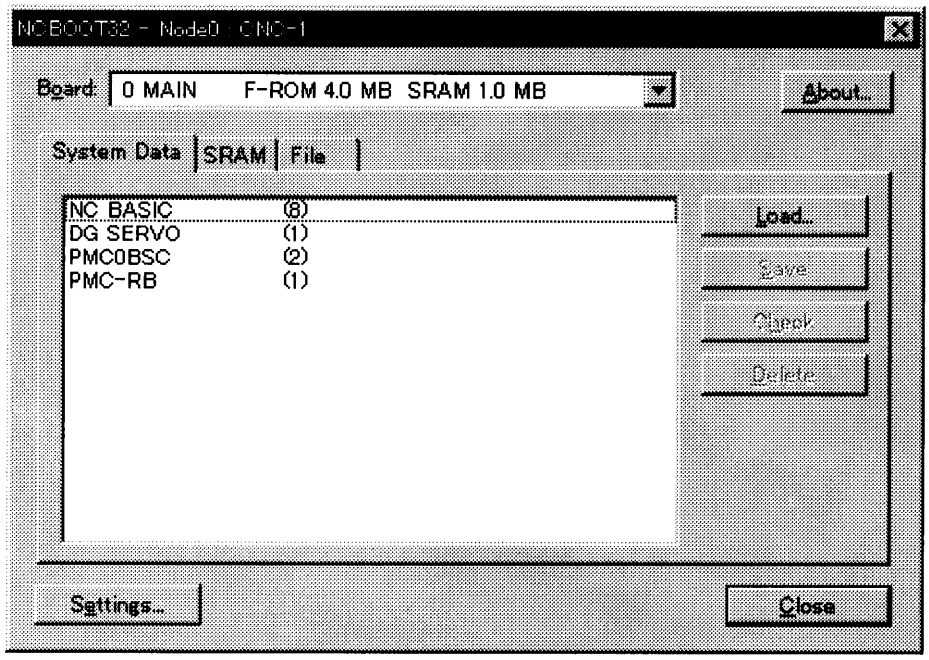
- HSSB interface board of 160*i*/180*i*/210*i* of stand–alone type



F.3 EXPLANATION OF SCREENS

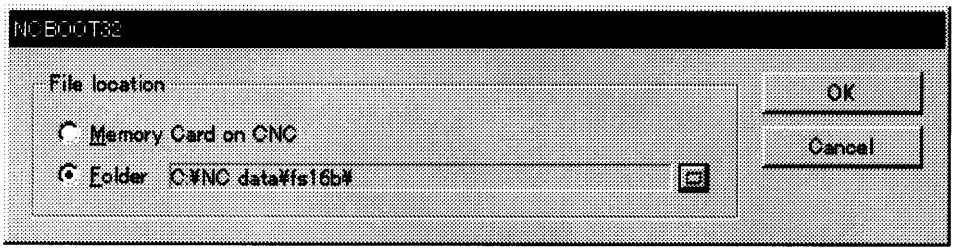
NOTE
A mouse is required to display Ncboot32.exe screens.

F.3.1 Boot Screen



When the sub–board is provided, select a board in the [Board] list.

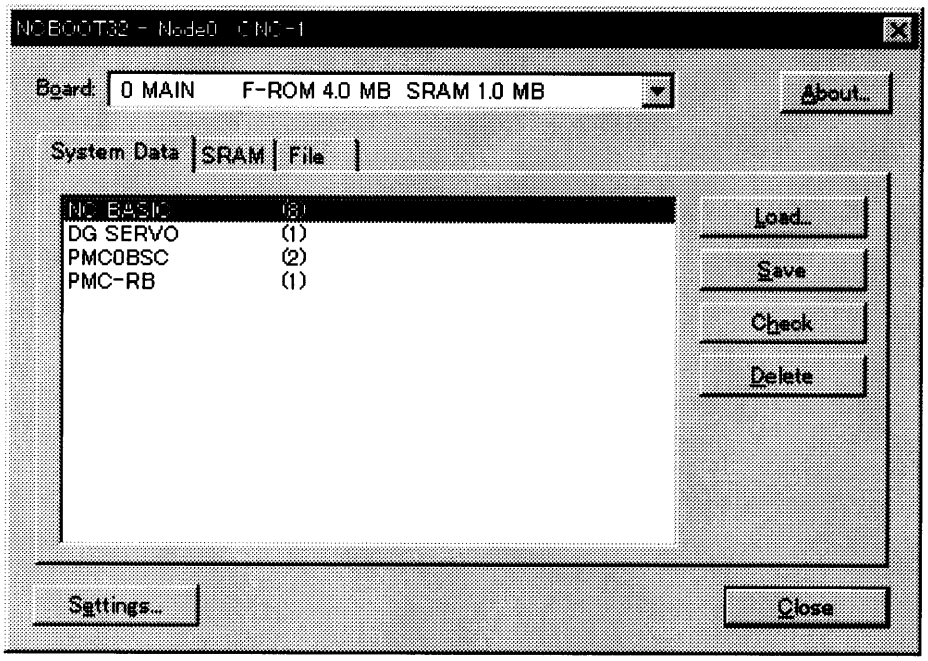
The area where the file is to be placed can be changed by using the [Setting...] button.



Select the memory card on the CNC or a PC folder. The file location may be changed at any time.

F.3.1.1 System data manipulation

The following screen is used for manipulating system data (including control software and ladder programs) on the NC.



[Load...] opens the file selection screen. Specify a file to be loaded.

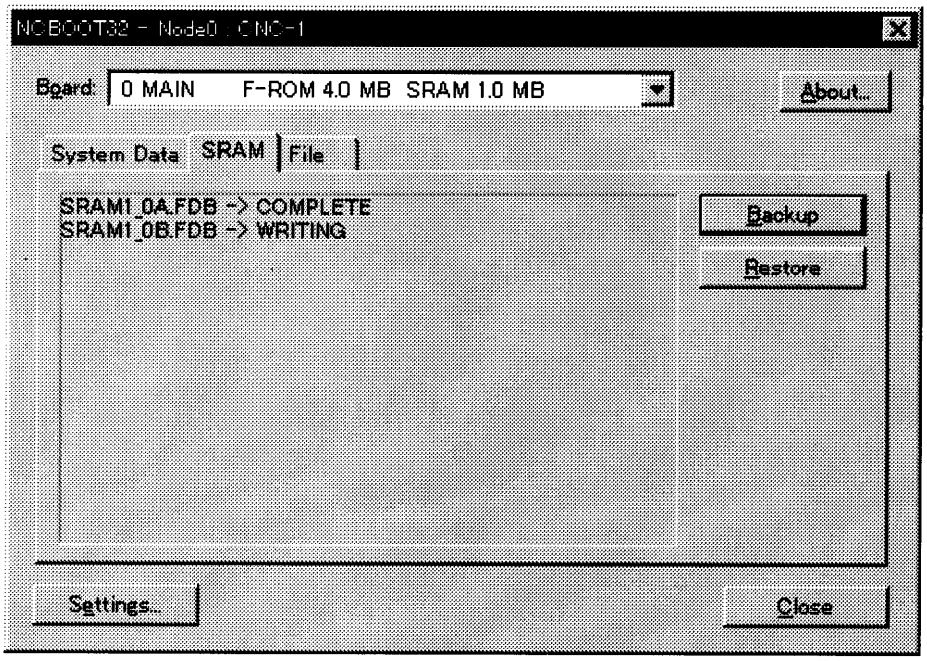
[Save] saves the selected NC system data in a file.

[Check] checks the selected NC system data.

[Delete] deletes the selected NC system data.

F.3.1.2 SRAM operation

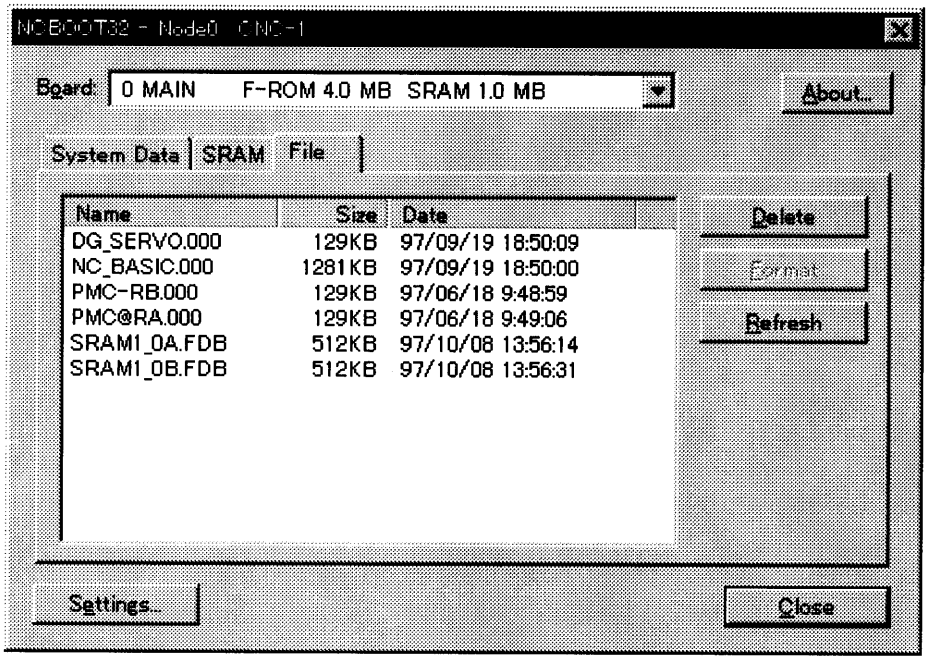
This screen is used to store and restore NC SRAM data.



[Backup] stores SRAM data, and [Restore] restores SRAM data. In the center of the screen, the progress status is displayed. As with the NC, the backup file name is determined automatically from the SRAM size, and cannot be renamed.

F.3.1.3 File operation

The following screen is used for operating files on a memory card in the CNC or in a folder of the PC.

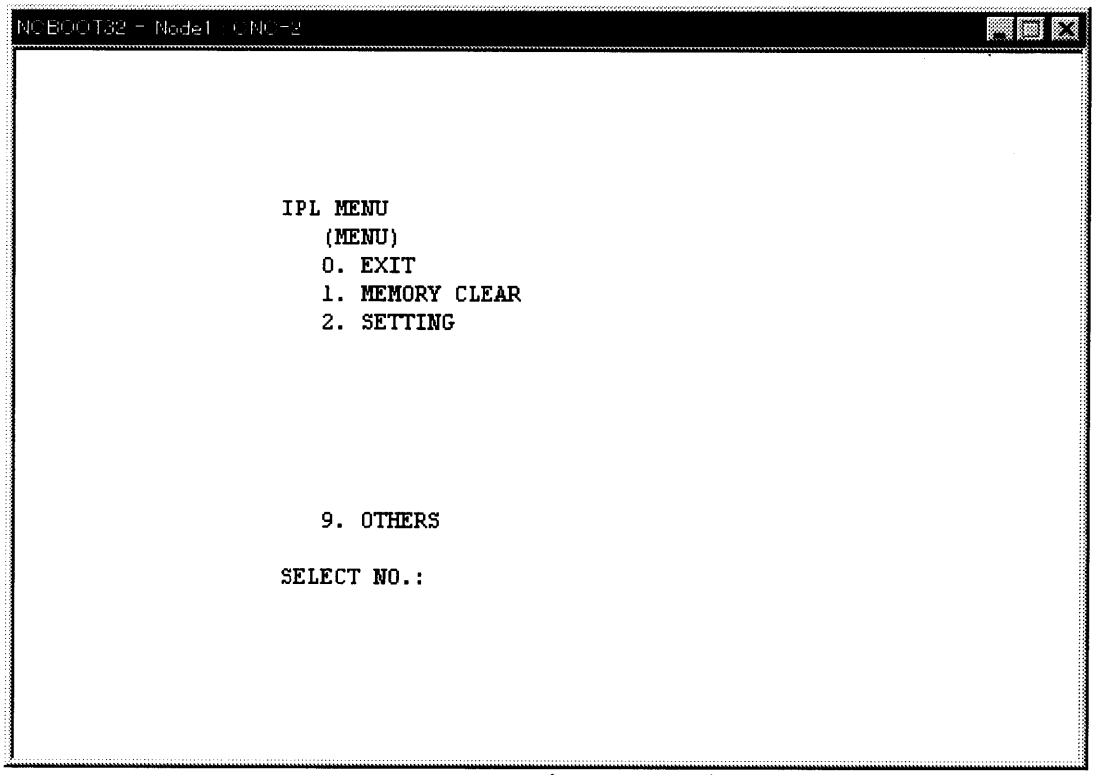


[Delete] deletes a selected file.

[Format] formats the memory card. This button is valid when the memory card is selected by [Setting...]

[Refresh] updates the file list to the latest state. After changing memory cards or floppy disks, click this button.

F.3.2 IPL Screen



NOTE
The contents of the IPL screen vary depending on the CNC model. Follow the instructions displayed in the menu.

The CNC allows functions to be performed according to the key status set at power–on.

The open CNC does not allow this operation. On the IPL screen, however, equivalent functions can be executed.

For details of the menu on the IPL screen and supported functions, see the table given in Section F.3.2.1.

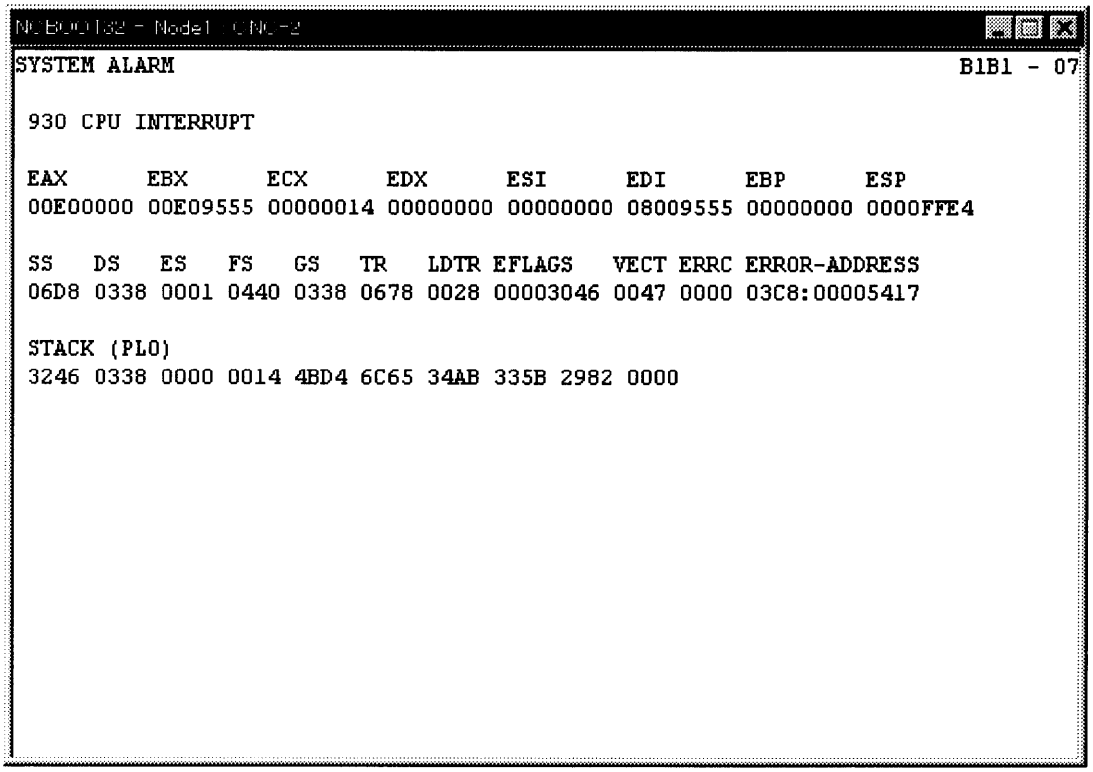
F.3.2.1 Functions on the IPL screen

Title on IPL screen				Corresponding MDI key operation at power–on (Operation with a standard CNC)
0. EXIT				
1. MEMORY CLEAR	0. CANCEL			
	1. ALL MEMORY		0. CANCEL 1. ALL 2. SUB 3. LOADER	 <DELETE> + <RESET> <CAM> + <2> <CAN> + <5>
	2. PARAMETER AND OFFSET		0. CANCEL 1. MAIN 2. SUB 3. LOADER	 <RESET> <RESET> + <2> <RESET> + <5>
	3. ALL PROGRAM		0. CANCEL 1. ALL 2. MAIN 3. SUB 4. LOADER	 <DELETE> <DELETE> + <1> <DELETE> + <2> <DELETE> + <5>
	4. ADDITIONAL SRAM		0. CANCEL 1. ALL 2. MAIN 3. SUB	 <O> + <DELETE> <O> + <1> <O> + <2>
	5. PMC	0. CANCEL		
		1. PARAMETER	0. CANCEL 1. CNC 2. LOADER	 <Z> + <O> <Z> + <5>
		2. PROGRAM	0. CANCEL 1. CNC 2. LOADER	 <Z> + <O> <Z> + <5>
	6. CAP–II		0. CANCEL 1. SUB MEMORY 2. CONVERSATIONNAL DATA	 <SP> <I>

Title on IPL screen			Corresponding MDI key operation at power–on (Operation with a standard CNC)
2. SETTING	0. CANCEL		
	1. IGNORE OVER TRAVEL ALARM	0. CANCEL 1. CNC 2. LOADER	 <CAN> + <P> <CAN> + <L>
	2. START WITHOUT LADDER	0. CANCEL 1. CNC SIDE 2. LOADER SIDE	 <CAN> + <Z> < . > + <5>
	3. CLANGUAGE EXECUTOR	0. CANCEL 1. MAKE VOID C–EXEC 2. BOOTS UP C–EXEC APL	 <M> + <0> <M> + <3>
9. OTHERS	0. CANCEL		
	1. P–CODE LOADER		<CAN> + <PROG>

F.4
OTHER SCREENS

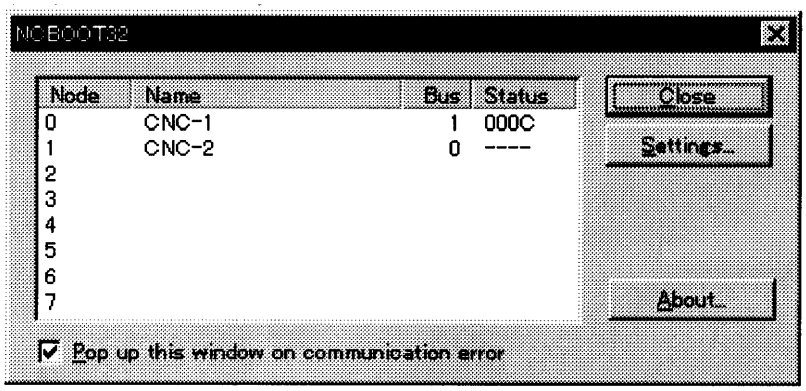
F.4.1
CNC Alarm Screen



This screen appears when a system alarm is issued in the CNC. (The above screen is an example. The displayed information varies depending on the system alarm issued in the CNC.)

F.4.2 Status Screen

To open the status screen, double–click the icon in the system tray. Alternatively, in the menu popped up by right–clicking, click OPEN.



Node: Node number

Name: Node name. (Define the node name in advance by using the device manager in Windows 95/98 or the HSSB applet on the control panel in Windows NT.)

Bus: Hardware communication status (0: Communication error, 1: Communication established)

Status: Status (in hexadecimal)

Bit 1: Rotary switch position 1
Bit 2: End of boot processing
Bit 3: End of IPL processing
Bit 4: Rotary switch position 2
Bit 8: CNC system alarm

Pop up this window on communication error: By checking this item, this screen is opened automatically when a communication error occurs.

Clicking the [Close] button closes the screen.

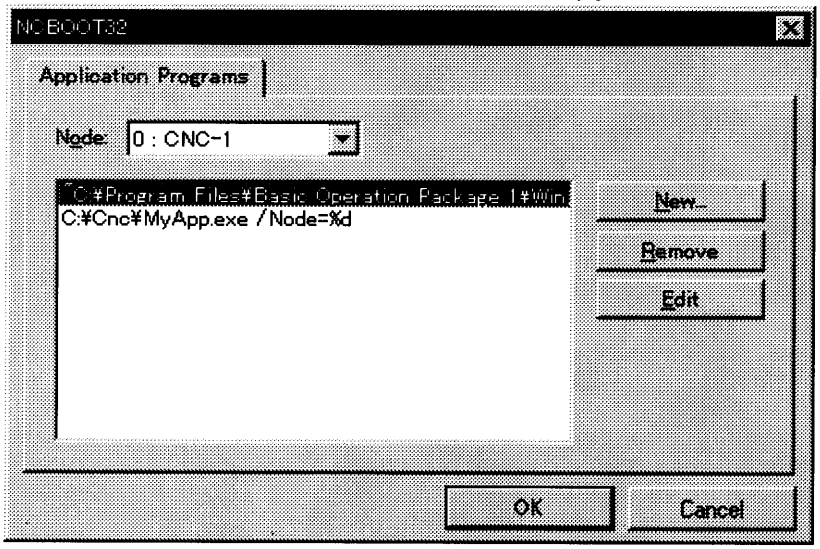
Clicking the [Setting...] button opens the option setting screen.

Clicking the [About...] button opens the version information screen.

F.4.3 Option Setting Screen

On the option setting screen, application programs can be registered. When a program uses the data window library, the program does not run unless it is started after the work area for the data window library is initialized. By registering such a program in Ncboot32.exe, it can be executed after the initialization of the work area for the data window library.

Application programs are registered for each node.



[Node] selects a node. In the list box in the center of the screen, the programs registered for the selected node are displayed.

[New...] registers a new program. When a blank character is included in the path, it is enclosed with double quotation marks.

[Remove] deletes a selected line.

[Edit] allows editing of a selected line. This button is used to edit arguments. The character string %d in the command line is replaced by a node number. To represent % itself, describe %%.

Example: To start basic operation package 1 after initialization of the work area for the data window library of the node, describe the following:

”C:\Program Files\Basic Operation Package 1\WinBOP32.exe” /Node=%d

G FSSB START–UP PROCEDURE/MATERIALS

G.1 OVERVIEW

With a system that uses the FSSB, the parameters below need to be set for axis setting. (Set other parameters as usually done.)

- No. 1023
- No. 1905
- No. 1910 to 1919
- No. 1936, 1937

For setting of these parameters, three methods are available.

1. Automatic setting

   By entering data including the relationship between axes and amplifiers on the FSSB setting screen, a calculation for axis setting is made automatically, and parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.

2. Manual setting 2

   Enter desired values directly in all of parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937.

   Before setting the parameters, fully understand the functions of the parameters.

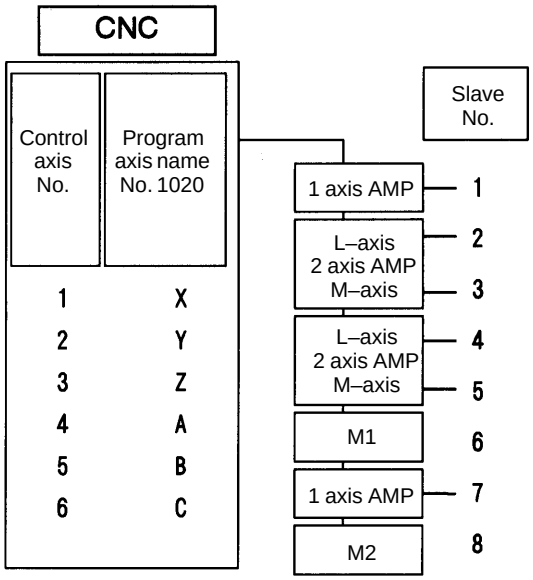
3. Manual setting 1(NOTE)

   Based on the setting of No. 1023, default axis setting is performed. Parameter Nos. 1905, 1910 through 1919, 1936, and 1937 need not be set. Automatic setting is not performed.

NOTE
With manual setting 1, usable functions are limited. So, when starting up the FSSB, use automatic setting or manual setting 2 whenever possible.

G.2 SLAVE

In a system using the FSSB, the CNC, servo amplifiers, and separate detector interface units are connected with each other via optical cables. These amplifiers and pulse modules are referred to as slaves. Assume that a 2–axis amplifier consists of two slaves, and a 3–axis amplifier consists of three slaves. Slave numbers (1, 2, 3, ..., 10) are assigned to the slaves in ascending order; a younger number is assigned to a slave that is closer to the CNC.



Note) M1/M2: Separate detector interface unit 1st/2nd

G.3 AUTOMATIC SETTING

When the following parameters are set, automatic setting can be performed using the FSSB setting screen:

Bit 0 of No. 1902 = 0
Bit 1 of No. 1902 = 0

For automatic setting on the FSSB setting screen, use the procedure below.

1 Set a servo axis number in No. 1023.

Be sure to match an axis number set in No. 1023 with the total number of axes of the servo amplifiers connected via optical cables.

2 On the servo initialization screen, initialize the servo parameters.

3 Turn off then on the power to the CNC.

4 Press function key SYSTEM .

5 Pressing the continuous menu key ▷ several times displays [FSSB].

6 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen (or the FSSB setting screen selected previously), and displays the following soft keys:

```
[       ][       ][       ][       ][       ]
```

7 Press soft key [AMP].

8 On the amplifier setting screen, set a controlled axis number connected to each amplifier.

The amplifier setting screen lists the slaves in ascending order of slave numbers from top to bottom. So, when setting controlled axis numbers, consider which amplifier axis is to be connected to which CNC axis, sequentially, starting with the amplifier axis closest to the NC. On this setting screen, 0 and duplicate numbers cannot be entered.

```
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40AL   [ 1 ]   X
   2   A1-M    α    SVM     12A   [ 2 ]   Y
   3   A2-L    β    SVU     20A   [ 3 ]   Z
   4   A3-L    α    SVM     40A   [ 4 ]   A
   5   A3-M    α    SVM     80A   [ 5 ]   B
   7   A4-L    α    SVM    40AS   [ 6 ]   C


  NO.  EXTRA          PCB ID
   6    M1     A      0008 DETECTOR(4AXES)
   8    M2     A      0008 DETECTOR(4AXES)
>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

9 Press soft key [SETING]. (This soft key appears when a value is entered.)

10 Press function key SYSTEM .

11 Pressing the continuous menu key ▷ several times displays [FSSB].

12 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

13 Press soft key [AXIS].

14 On the axis setting screen, set information on each axis.

15 The axis setting screen lists the CNC axes in ascending order of axis numbers from top to bottom.
When any of the following is to be performed for each axis, the setting of this screen is required:

- Use of a separate detector
- Exclusive use of a DSP (CPU for servo control) by one axis (for use of a current loop period of 125 μs or learning control, for example)
- Use of a CS axis controlled axis
- Use of tandem control

```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  IDSP   Cs   TNDM
    1     X    A1-L   1    0     0    0      0
    2     Y    A1-M   0    1     0    0      0
    3     Z    A2-L   0    0     0    0      0
    4     A    A3-L   2    0     0    0      0
    5     B    A3-M   0    2     0    0      0
    6     C    A4-L   0    0     0    0      0




>
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

16 Press soft key [SETING]. (This soft key appears when a value is entered.)

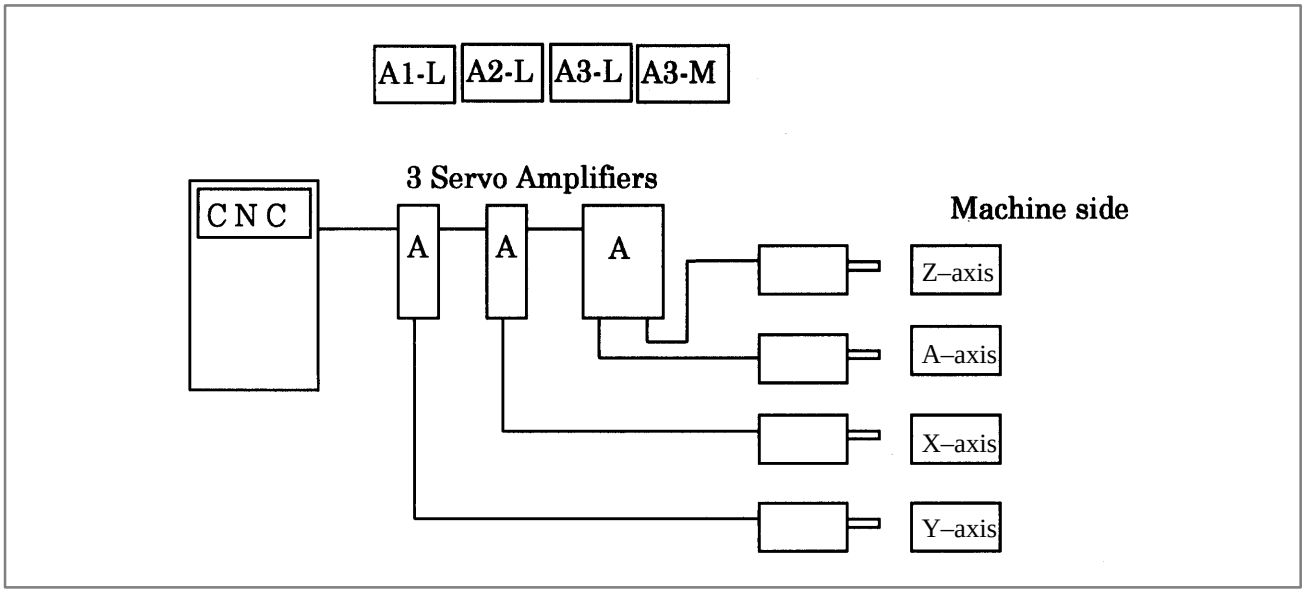
This operation starts an automatic calculation, and parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.

Bit 1 of parameter No. 1902 is set to 1 to indicate that each of these parameters has been set. When the power is turned off then back on, axis settings are made according to each parameter.

- Notes on using the simple electronic gear box (EGB) function

  When using the simple electronic gear box (EGB) function, perform EGB axis setting (parameter No. 7771) before automatic setting using the FSSB setting screen. Without EGB axis setting, correct values cannot be set by automatic setting using the FSSB setting screen.

G.3.1
[Sample Setting 1]
General Configuration
(Semi–Closed Loop)



Step 1 Set the following with parameter No. 1023:
X : 1
Y : 2
Z : 3
A : 4

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40A  [ 2 ]   Y
   2   A2-L    α    SVM    40A  [ 1 ]   X
   3   A3-L    α    SVM    40A  [ 4 ]   A
   4   A3-M    α    SVM    80A  [ 3 ]   Z
  NO.  EXTRA  TYPE   PCB ID




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

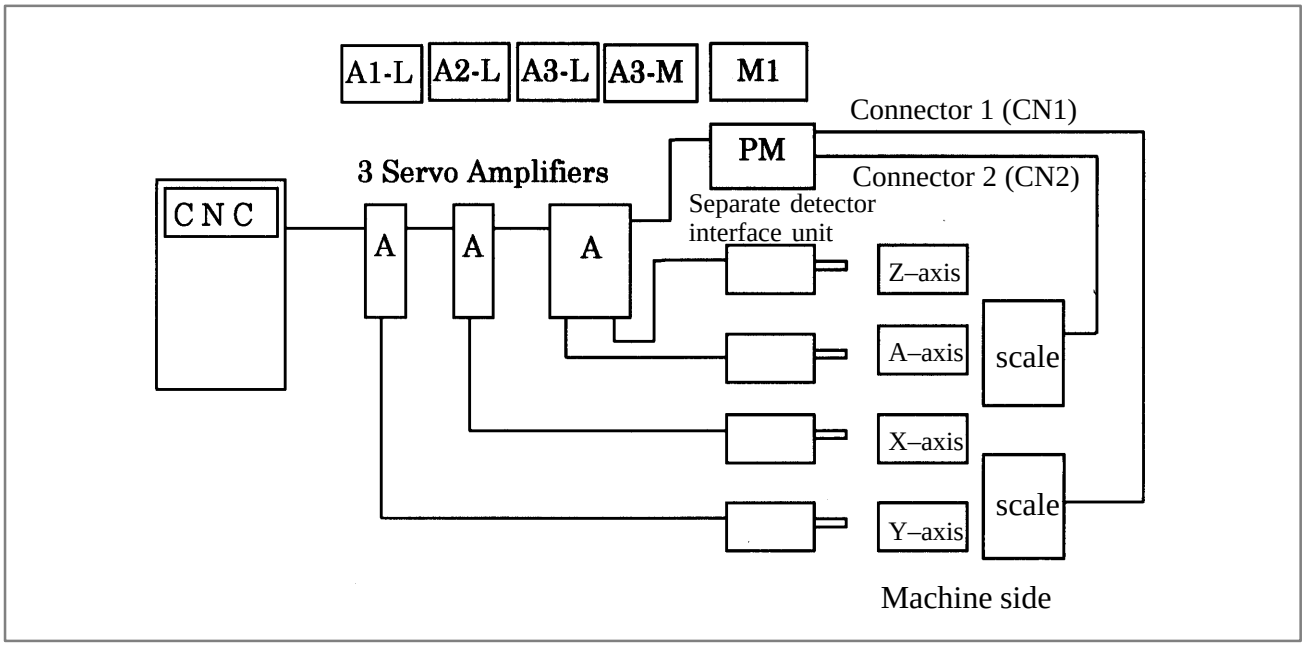
```
[ AMP ][ AXIS ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Press soft key [(OPRT)] without entering any data, then press soft key [SETING].

Step 11 Turn off then on the power to the CNC. This completes the setting.

G.3.2 [Sample Setting 2] General Configuration (Closed Loop)



Step 1 Set the following with parameter No. 1023:

X : 1

Y : 2

Z : 3

A : 4

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(Amplifier setting)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40A  [ 2 ]    Y
   2   A2-L    α    SVM    40A  [ 1 ]    X
   3   A3-L    α    SVM    40A  [ 4 ]    A
   4   A3-M    α    SVM    80A  [ 3 ]    Z
  NO.  EXTRA TYPE   PCB ID
   5    M1     A    0008 DETECTOR(4AXES)




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Set the separate detector on the axis setting screen. (Separate detector interface unit: M1/M2)

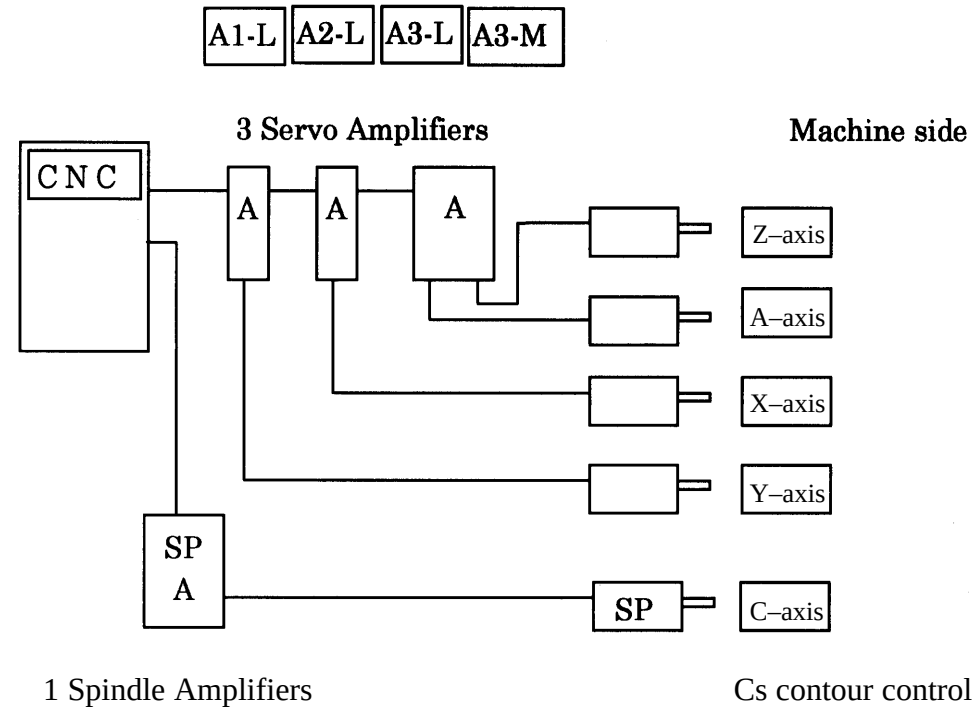
```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  1DSP   Cs   TNDM
   1     X    A2-L   0    0    0     0      0
   2     Y    A1-L   1    0    0     0      0
   3     Z    A3-M   0    0    0     0      0
   4     A    A3-L   2    0    0     0      0









>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 11 Press soft key [SETING]. (This soft key is displayed when a value is entered.)

Step 12 Set bit 1 of parameter No. 1815 to 1 for the Y–axis and A–axis.

Step 13 Turn off then on the power to the CNC. This completes the setting.

G.3.3 [Sample Setting 3] When the C–Axis is a Cs Axis



Step 1 Set the following with parameter No. 1023:
X : 1
Z : 2
C : –1
Y : 3
A : 4

Step 2 Initialize the servo parameters for each axis.

Step 3 Initialize the spindle parameters for the spindle.

Step 4 Turn on then off the power to the CNC.

Step 5 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40A  [ 2 ]    Z
   2   A2-L    α    SVM    40A  [ 1 ]    X
   3   A3-L    α    SVM    40A  [ 4 ]    A
   4   A3-M    α    SVM    80A  [ 3 ]    Y
  NO.  EXTRA  TYPE   PCB ID




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 6 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 7 Press function key SYSTEM .

Step 8 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 9 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 10 Press soft key [AXIS].

Step 11 Set the Cs contour axis on the axis setting screen. (Cs)

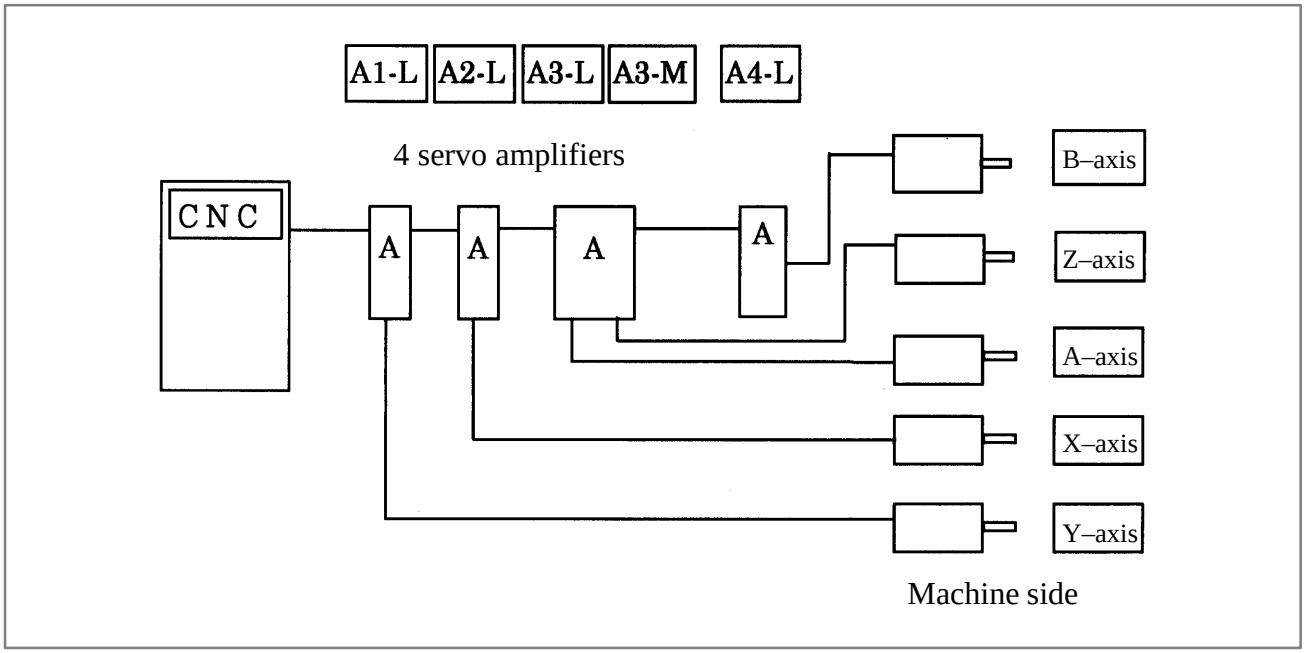
```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  1DSP   Cs   TNDM
   1     X    A2-L   0    0    0     0     0
   2     Z    A1-L   0    0    0     0     0
   3     C      -    0    0    0     1     0
   4     Y    A3-M   0    0    0     0     0
   5     A    A3-L   0    0    0     0     0




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 12 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 13 Turn off then on the power to the CNC. This completes the setting.

G.3.4 [Sample Setting 4] Tandem Control Configuration

The following two pairs of axes are tandem axes:
[The X–axis is a master axis, and the A–axis is a slave axis.]
[The Y–axis is a master axis, and the B–axis is a slave axis.]



Step 1 Set the following with parameter No. 1023:
X : 1
Y : 3
Z : 5
A : 2
B : 4
No.1010=3
No.1817#6=1 (X axis, A axis, Y axis, B axis)
Tandem control option

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40A  [ 2 ]    Y
   2   A2-L    α    SVM    40A  [ 1 ]    X
   3   A3-L    α    SVM    40A  [ 4 ]    A
   4   A3-M    α    SVM    80A  [ 3 ]    Z
   5   A4-L    α    SVM    40A  [ 5 ]    B
  NO.  EXTRA  TYPE   PCB ID

>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Set the tandem axes on the axis setting screen. (TNDM)

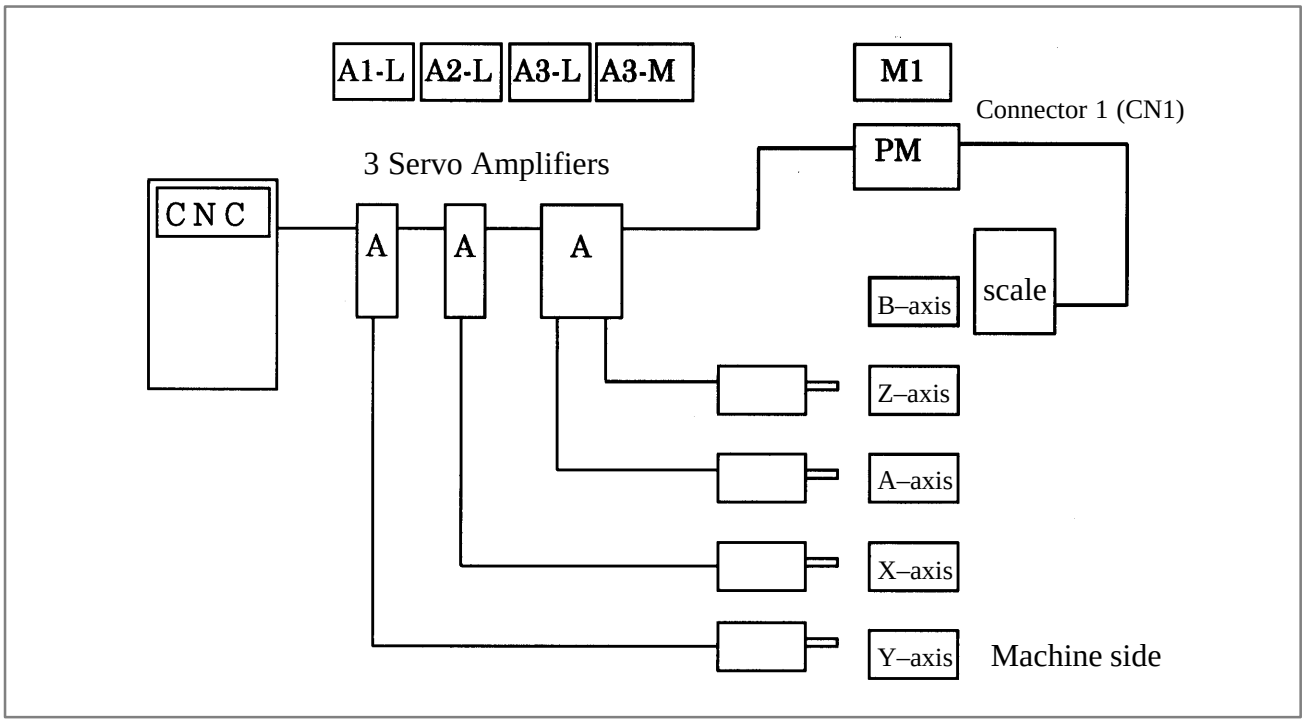
```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  1DSP   Cs   TNDM
   1     X    A2-L   0    0    0     0     1
   2     Y    A1-L   0    0    0     0     3
   3     Z    A3-M   0    0    0     0     0
   4     A    A3-L   0    0    0     0     2
   5     B    A4-L   0    0    0     0     4

>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 11 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 12 Turn off then on the power to the CNC. This completes the setting.

G.3.5 [Sample Setting 5] When the Simple Electronic Gear Box (EGB) Function is Used

[EGB workpiece axis: A–axis, EGB dummy axis: B–axis (No. 7771 = 5)]



Step 1 Set the following with parameter No. 1023:
X : 1
Y : 2
Z : 5
A : 3
B : 4
No.7771=5
No.7772, No.7773
No.2011#0=1 (A axis, B axis)
Option parameter

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L    α    SVM    40A  [ 2 ]    Y
   2   A2-L    α    SVM    40A  [ 1 ]    X
   3   A3-L    α    SVM    40A  [ 4 ]    A
   4   A3-M    α    SVM    80A  [ 3 ]    Z
  NO.  EXTRA  TYPE   PCB ID
   5    M1     A    0008 DETECTOR(4AXES)




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Set the EGB dummy axis on the axis setting screen. (M1)

```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  1DSP   Cs   TNDM
   1     X    A2-L   0    0    0     0     0
   2     Y    A1-L   0    0    0     0     0
   3     Z    A3-M   0    0    0     0     0
   4     A    A3-L   0    0    0     0     0
   5     B    --     1    0    0     0     0




>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 11 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 12 Turn off then on the power to the CNC. This completes the setting.

G.4 MANUAL SETTING 2

When the following parameters are set, each axis can be set manually:

No.1902#0=1
No.1902#1=0

When performing manual setting, set parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937, fully understanding their functions.

	#7	#6	#5	#4	#3	#2	#1	#0
1902							ASE	FMD

[Data type] Bit

#0 (FMD) The FSSB setting mode is:

0 : Automatic setting mode. (When data including the relationship between axes and amplifiers is set on the FSSB setting screen, parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.)
1 : Manual setting 2 mode. (Parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are set manually.)

#1 (ASE) When the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0), automatic setting is:

0 : Not completed.
1 : Completed.
(This bit is automatically set to 1 when automatic setting is completed.)

	#7	#6	#5	#4	#3	#2	#1	#0
1905	PM2	PM1						FSL

[Data type] Bit axis

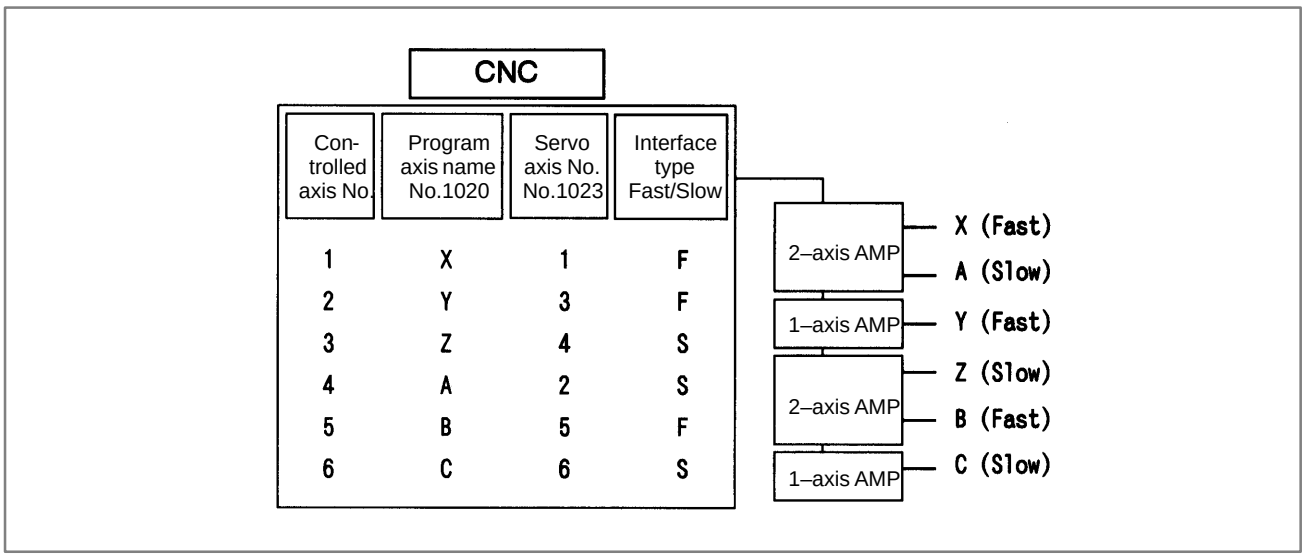
#0 (FSL) The type of interface between servo amplifiers and servo software is:

0 : Fast type.
1 : Slow type.

Two servo data transfer interface types are available: the fast type and slow type.

Set this bit so that the following conditions are satisfied:

- When a 1–axis amplifier is used, both of the fast and slow types can be used.
- When a 2–axis amplifier is used, the fast type must not be used for both axes. The slow type can be used for both axes.
- When a 3–axis amplifier is used, the first and second axes must satisfy the condition for a 2–axis amplifier, and the third axis must satisfy the condition for a one–axis amplifier.
- With an axis for which an odd number is set in parameter No. 1023, the fast type must be used. The slow type can also be used, however, for an EGB workpiece axis, learning–control axis, high–speed current loop axis, and high–speed interface axis.
- Only the slow type can be used with an axis for which an even number is set in parameter No. 1023. (Be sure to set this bit to 1).



#6 (PM1) The first separate detector interface unit is:

0 : Not used.
1 : Used.

#7 (PM2) The second separate detector interface unit is:

0 : Not used.
1 : Used.

This parameter is automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

When a separate detector interface unit is used, connector numbers (parameter Nos. 1936 and 1937) need to be set.

PRM	1910	Address conversion table value for slave 1 (ATR)
PRM	1911	Address conversion table value for slave 2 (ATR)
PRM	1912	Address conversion table value for slave 3 (ATR)
PRM	1913	Address conversion table value for slave 4 (ATR)
PRM	1914	Address conversion table value for slave 5 (ATR)
PRM	1915	Address conversion table value for slave 6 (ATR)
PRM	1916	Address conversion table value for slave 7 (ATR)
PRM	1917	Address conversion table value for slave 8 (ATR)
PRM	1918	Address conversion table value for slave 9 (ATR)
PRM	1919	Address conversion table value for slave 10 (ATR)

[Data type] Byte

[Valid data range] 0 to 7, 16, 40, 48

Set an address conversion table value for each of slave 1 through 10.

The slave is the generic name of a servo amplifier or separate detector interface unit connected to the CNC via an FSSB optical cable. The numbers from 1 to 10 are assigned to the slaves in ascending order; a younger number is assigned to a slave that is closer to the CNC. A 2–axis amplifier consists of two slaves, and a 3–axis amplifier consists of three slaves. Set each of the parameters as described below according to which of the three cases is applicable: the slave is an amplifier, the slave is a separate detector interface unit, or there is no slave.

- When the slave is an amplifier:

  Set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the axis to which the amplifier is assigned.

- When the slave is a separate detector interface unit:
  - For the first separate detector interface unit (closest to the CNC), set 16.
  - For the second separate detector interface unit (farthest from the CNC), set 48.

- When there is no slave:

  Set 40.

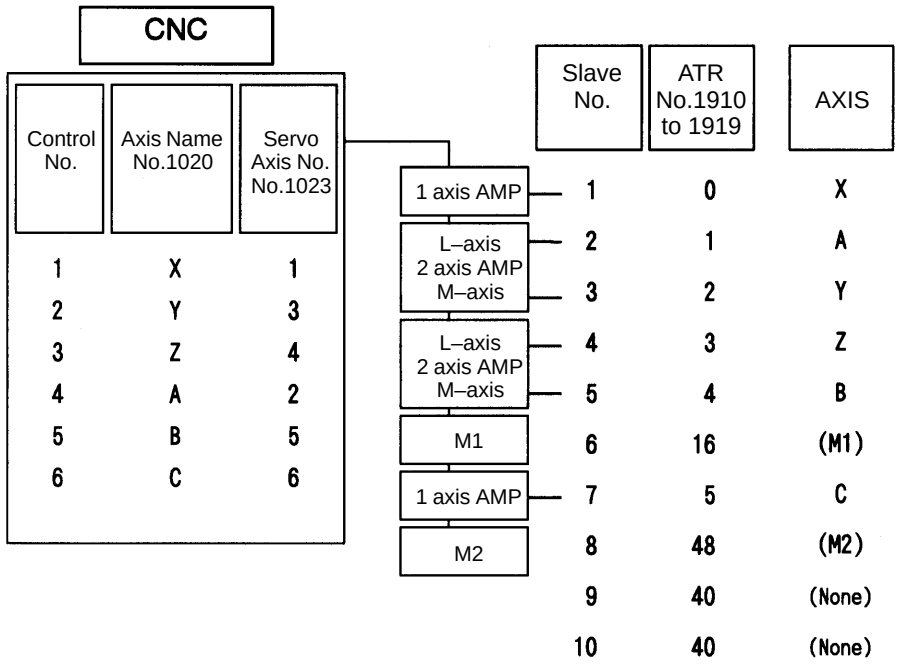
When using the simple electronic gear box (EGB) function, observe the note below.

NOTE

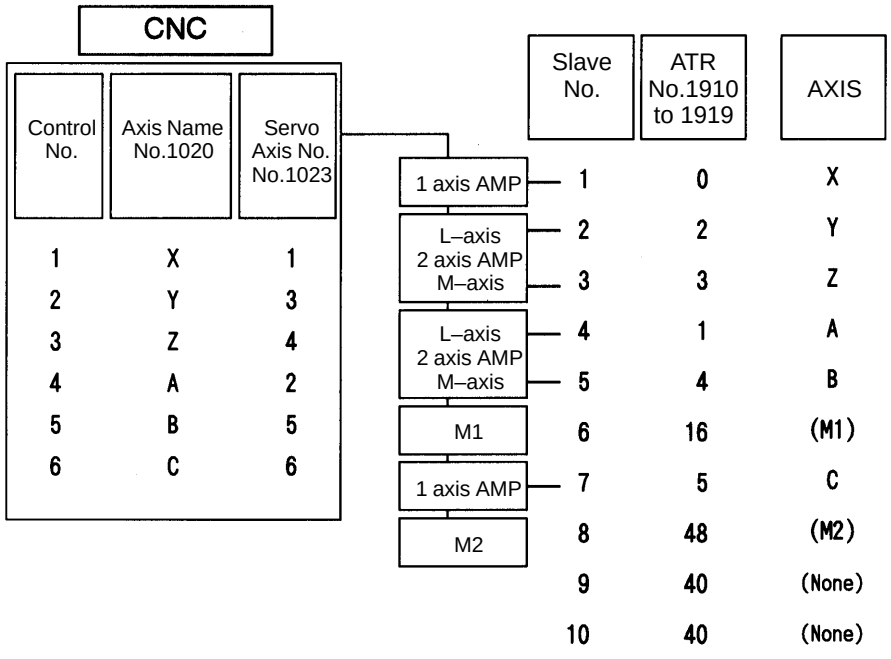
When using the simple electronic gear (EGB) function
An EGB axis (axis set in parameter No. 7771) actually requires no amplifier. However, make a setting, assuming that the EGB axis is connected to a dummy amplifier. That is, as the address conversion table value for a nonexistent slave, set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the EGB axis instead of 40.

These parameters are automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

❍ Axis configuration and example of parameter setting

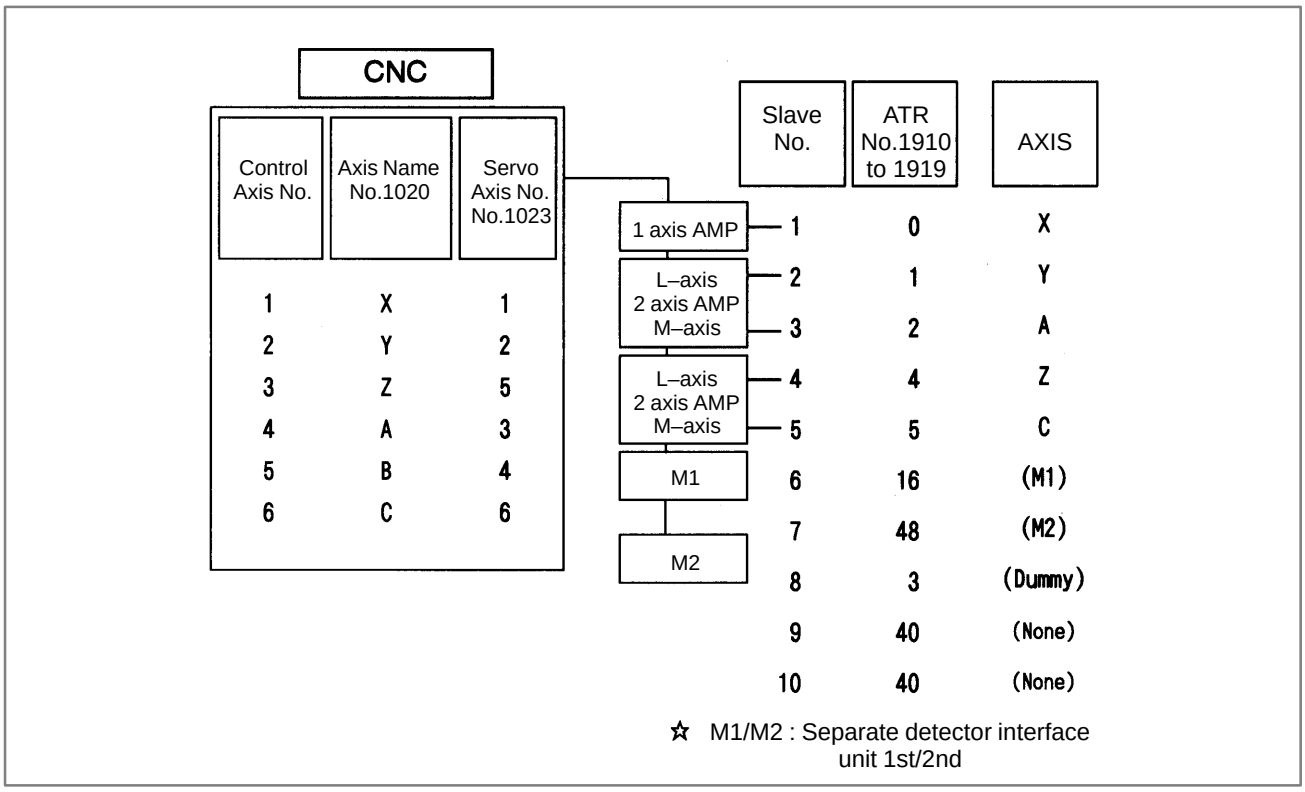


☆ M1/M2 : Separate detector interface unit 1st/2nd



☆ M1/M2 : Separate detector interface unit 1st/2nd

❍ Axis configuration and example of parameter setting when the simple electronic gear box (EGB) function is used
(EGB workpiece axis: A–axis, EGB axis: B–axis (parameter No. 7771 = 5))



PRM	1936	Connector number for the first separate detector interface unit
PRM	1937	Connector number for the second separate detector interface unit

[Data type] Byte axis

[Valid data range] 0 to 7

When using a pulse module, set a value obtained by subtracting 1 from the pulse module connector number for each axis. That is, for connector numbers 1 to 8, set the values 0 to 7. Moreover, set bits 6 and 7 of parameter No. 1905. Set 0 for an axis for which no pulse module is used.

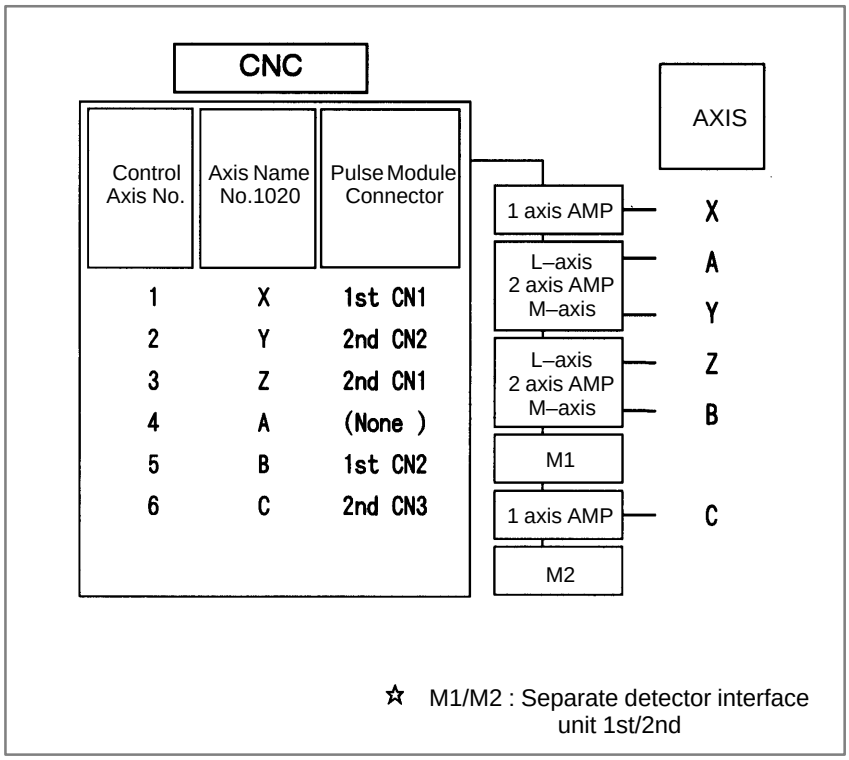
The user can freely determine which connector to use for which axis. Use connector numbers, starting with younger numbers. For example, connector number 4 cannot be used without using connector number 3.

Example:

Con-trolled axis	First con-nector number	Second connector number	No.1936	No.1937	No.1905 (#7,#6)
X	1	Not used	0	0	0,1
Y	Not used	2	0	1	1,0
Z	Not used	1	0	0	1,0
A	Not used	Not used	0	0	0,0
B	2	Not used	1	0	0,1
C	Not used	3	0	2	1,0

These parameters are automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

❍ Axis configuration and example of parameter setting in the manual setting 2 mode



No.	1902#0 FSBMD
	1

No.	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
	0	1	2	3	4	16	5	48	40	40

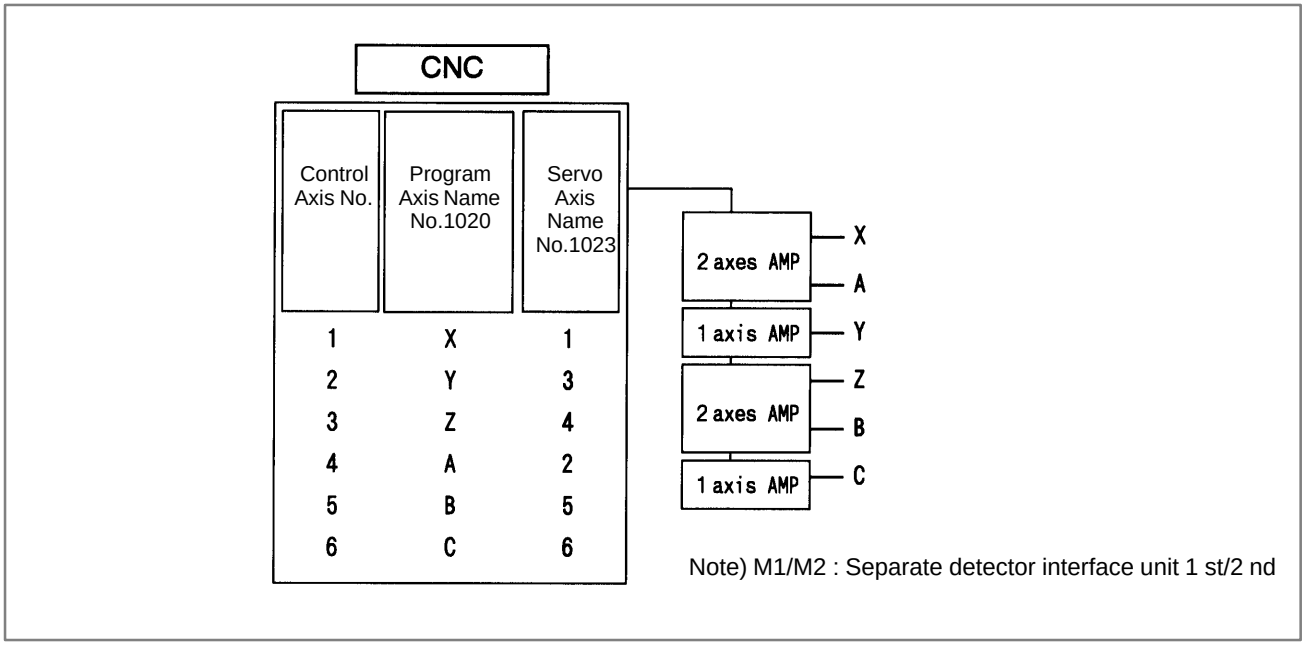
No.	1023	1905#0 FSBSL	1905#6 FSBM1	1905#7 FSBM2	1936	1937
X	1	0	1	0	0	0
Y	3	0	0	1	0	1
Z	4	1	0	1	0	0
A	2	1	0	0	0	0
B	5	0	1	0	1	0
C	6	1	0	1	0	2

G.5 MANUAL SETTING 1

When the following parameters are set, manual setting 1 is enabled:

Bit 0 of No. 1092 = 0
Bit 1 of No. 1902 = 0
Nos. 1910 through 1919 = 0 (all set to 0)

In manual setting 1, a setting is made at power–on so that the value set in parameter No. 1023 is assumed to be a slave number. That is, an axis for which the value of parameter No. 1023 is 1 is connected to the amplifier closest to the CNC. An axis for which the value of parameter No. 1023 is 2 is connected to the amplifier next closest to the CNC.



Note that some functions and settings cannot be used in manual setting 1 as described below.

- No separate detector interface unit can be used.
  This means that no separate position detector can be used.
- Set sequential numbers in parameter No. 1023.
  For example, 3 cannot be set for an axis without setting 2 for any axis.
- The following servo functions cannot be used:
  - ❑ Learning control
  - ❑ High–speed current loop
  - ❑ Simple electronic gear box (EGB)

G.6 ALARMS

Alarms related to pulse coders

NC alarm No.	Message	Description
360	n AXIS : ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS : ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS : ABNORMAL REV.DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS : ABNORMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS : SOFT PHASE ALARM (INT)	A soft phase data error occurred in the built–in pulse coder.
365	n AXIS : BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS : PULSE MISS (INT)	A feedback error occurred in the built–in pulse coder.
367	n AXIS : COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS : SERIAL DATA ERROR (INT)	A data error occurred in the built–in pulse coder.
369	n AXIS : DATA TRANS. ERROR (INT)	A CRC error or stop bit error occurred in the built–in pulse coder.
380	n AXIS : BROKEN LED (EXT)	An LED error occurred in the separate pulse coder.
381	n AXIS : ABNORMAL PHASE (EXT)	A phase data error occurred in the separate pulse coder.
382	n AXIS : COUNT MISS (EXT)	A count error occurred in the separate pulse coder.
383	n AXIS : PULSE MISS (EXT)	A feedback error occurred in the separate pulse coder.
384	n AXIS : SOFT PHASE ALARM (EXT)	A soft phase data error occurred in the separate pulse coder.
385	n AXIS : SERIAL DATA ERROR (EXT)	A data error occurred in the separate pulse coder.
386	n AXIS : DATA TRANS. ERROR (EXT)	A CRC error or stop bit error occurred in the separate pulse coder.

Alarms related to servo amplifiers

NC alarm No.	Message	Description
430	n AXIS : SV. MOTOR OVER-HEAT	A servo module overheat occurred.
431	n AXIS : CNV. OVERLOAD	A converter (PSM) overheat occurred.
432	n AXIS : CNV. LOWVOLT CON./POWFAULT	The control power supply voltage (24 V) has dropped.
433	n AXIS : CNV. LOW VOLT DC LINK	The DC link voltage has dropped.
436	n AXIS : SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
438	n AXIS : INV. ABNORMAL CURRENT	The current of the main circuit is too high.
439	n AXIS : CNV. OVERVOLT POWER	The DC link voltage is too high.
440	n AXIS : CNV. EX DECEL-ERATION POW.	The regenerative discharge amount is too high.
441	n AXIS : ABNORMAL CUR-RENT OFFSET	The digital servo software detected an ab-normality in the motor current detection cir-cuit.
443	n AXIS : CNV. COOLING FAN FAILURE	The internal stirring fan failed.
445	n AXIS : SOFT DISCON-NECT ALARM	The digital servo software detected a broken wire in the detector.
447	n AXIS : HARD DISCON-NECT (EXT)	A broken wire in the separate detector was detected by hardware.
448	n AXIS : UNMATCHED FEEDBACK ALARM	The sign of feedback data from the built–in pulse coder differs from the sign of the feed-back data from the separate detector.

Alarms related to servo amplifiers

NC alarm No.	Message	Description
460	n AXIS : FSSB DISCONNECT	FSSB communication was disconnected suddenly. The possible causes are as follows: 1) The FSSB communication cable is disconnected or broken. 2) The power to the amplifier dropped suddenly. 3) The amplifier issued a low–voltage alarm.
461	n AXIS : ILLEGAL AMP INTERFACE	Both axes of a 2–axis amplifier were assigned to the fast type interface.
462	n AXIS : SEND CNC DATA FAILED	Because of an FSSB communication error, a slave could not receive correct data.
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the servo system could not receive correct data.
464	n AXIS : WRITE ID DATA FAILED	An attempt to write maintenance information on the amplifier maintenance screen failed.
465	n AXIS : READ ID DATA FAILED	At power–up, initial amplifier ID information could not be read.
466	n AXIS : MOTOR/AMP COMBINATION	The maximum current value of the amplifier does not match the maximum current value of the motor.
467	n AXIS : ILLEGAL SETTING OF AXIS	The following servo functions are not enabled even when an axis using a DSP exclusively is set on the axis setting screen: 1) Learning control (bit 5 of parameter No. 2008 = 1) 2) High–speed current loop (bit 0 of parameter No. 2004 = 1) 3) High–speed interface axis (bit 4 of parameter No. 2005 = 1)

P/S alarms

NC alarm No.	Message	Description
5134	FSSB : OPEN READY TIME OUT	The FSSB did not become ready to open duringinitialization.
5135	FSSB : ERROR MODE	The FSSB entered an error mode.
5136	FSSB : NUMBER OF AMPS IS SMALL	The number of amplifiers recognized by the FSSB is insufficient, compared with the number of controlled axes.
5137	FSSB : CONFIGURATION ERROR	The FSSB detected a configuration error.
5138	FSSB : AXIS SETTING NOT COMPLETE	Axis setting has not been performed in automatic setting mode. Perform axis setting using the FSSB setting screen.
5139	FSSB : ERROR	The servo system could not be initialized normally. The cause may be an optical cable failure or incorrect connection with an amplifier and other modules.
5197	FSSB : OPEN TIME OUT	The FSSB did not open when the CNC had allowed the FSSB to open.
5198	FSSB : ID DATA NOT READ	The initial ID information for the amplifier cannot be read because of a failure in the temporaryassignment.

G.7 ACTIONS FOR TROUBLE ENCOUNTERED AT START–UP TIME

- MDI input is abnormal (each time data is entered, the power needs to be turned off).

  First, disconnect the optical cable of the NC, then turn off then on the power. Next, check the items below.

  (A) Check parameter No. 1902.

  Action: hen parameter
  No. 1902 = 00000000, set the following:
  No. 1905 = 00000000
  Nos. 1910 through 1919 = 0

  Action: hen parameter
  No. 1902 = 00000001 or 00000010, set the following:
  No. 1905 = Appropriate value
  Nos. 1910 through 1919 = Appropriate value

  (B) When bit 1 of parameter No. 1815 = 1, check parameter Nos. 1910 through 1919 to see if 16 or 48 is set.

  Action: If neither 16 nor 48 is set, set bit 1 of No. 1815 to 1.

  (C) Check if communication is open (the green LED is on).

  Action: If communication is not open, check the power supply for the amplifier and optical cable connection.

- The separate detector can be recognized, but feedback pulses from the separate detector are abnormal.

  (A) Check parameter No. 1902.

  Action: The setting of parameter
  No. 1902 = 00000000 is incorrect. When parameter
  No. 1902 = 00000001, set the following:
  No. 1905 = 01000000 or 10000000
  Nos. 1910 through 1919 = Appropriate value
  Nos. 1936 and 1937 = Appropriate value

  Action: When parameter No. 1902 = 00000010, set connector numbers for M0 and M1 in axis setting on the FSSB screen.

- In axis setting on the FSSB screen, connector numbers for M1 and M2 cannot be set.

  Action: Check the FSSB screen to see if separate detector interface unit IDs are read correctly. If pulse module IDs are not read correctly, check the separate detector interface unit connections.

- The settings on the FSSB screen are canceled when the power is turned off then back on.

  Action: After setting desired values, press soft key [SETING] on the amplifier setting screen and axis setting screen.

- P/S alarm 5138 “AXIS SETTING NOT COMPLETE” is issued.

  Action: Automatic setting on the FSSB screen is not terminated normally. Make settings correctly on the FSSB amplifier setting screen and axis setting screen, and press soft key [SETING] on both screens. At this time, be sure to make settings on the amplifier setting screen and the axis setting screen in this order.

Action: When automatic setting on the FSSB screen is not performed, set all of parameter Nos. 1902, 1905, 1910 through 1919, 1936, and 1937 to 0 before starting manual setting.

- The invalid amplifier/motor combination alarm (466) is issued.

  Action: Check if the maximum current value of the amplifier read on the ID screen matches the setting of parameter No. 2165. Recheck the amplifier/motor combination.

  Action: Initialize the servo parameters of each axis.

- When the power is turned off then back on after modifying parameter No. 1902, the system alarm (920) is issued.

  Action: Disconnect the optical cable of the CNC, then turn off then on the power.
  Set all of parameter Nos. 1902, 1905, 1910 through 1919, 1936, and 1937 to 0, then turn off then on the power, then make an FSSB setting all over again.

G.8 EXAMPLES OF SETTINGS USING OTHER CONNECTIONS

G.8.1 Example 1: Learning Control

- **Conceptual diagram of FSSB parameter setting for using learning control**

When learning control is used, one NC controlled axis uses one DSP (two axes of the servo axis card) exclusively.

(1) Set bit 0 of parameter No. 1902 to 1 to disable automatic setting.

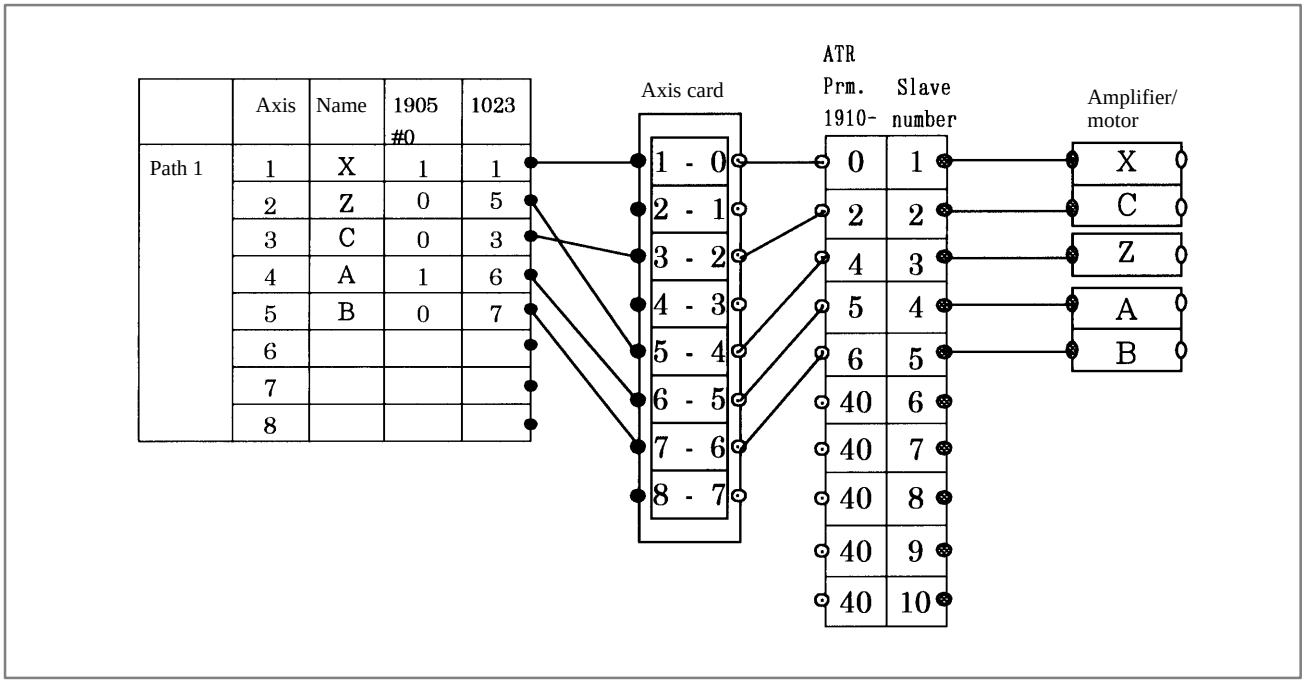
(2) Assign two axes of the axis card to each of learning control axes X and C. (Parameter No. 1023 X = 1, C = 3)

(3) Assign the remaining controlled axes to the axis card (Parameter No. 1023 Z = 5, A = 6, B = 7)

(4) Set bit 0 of parameter No. 1905 to 1 for the A–axis, for which an even number is set in parameter No. 1023.

(5) When using a 2–axis amplifier, one of the two axes must always be set for the slow type. So, set bit 0 of parameter No. 1905 to 1.

(6) Set the attributes of parameter Nos. 1910 through 1914 to 0, 2, 4, 5, and 6, and set the attributes of the remaining parameters to 40 (for absence of a slave).



G.8.2 Example 2: When a 2–Axis Amplifier is Shared by Two Paths

Example: FSSB setting for the following:

Hardware connection

Mother board – 2–axis amplifier (LX/LZ) – 2–axis amplifier (LA/RA) – 2–axis amplifier (LC/RC)
Sub–board – 2–axis amplifier (RX/RZ) – 2–axis amplifier (LY/RY)

Controlled axis configuration

Mother board: LX, LZ, LC, LA, LY
Sub–board: RX, RZ, RC, RA, RY

Method of setting

When the servo system of another path is controlled as in this example, automatic FSSB setting is not possible. Manual setting needs to be used.

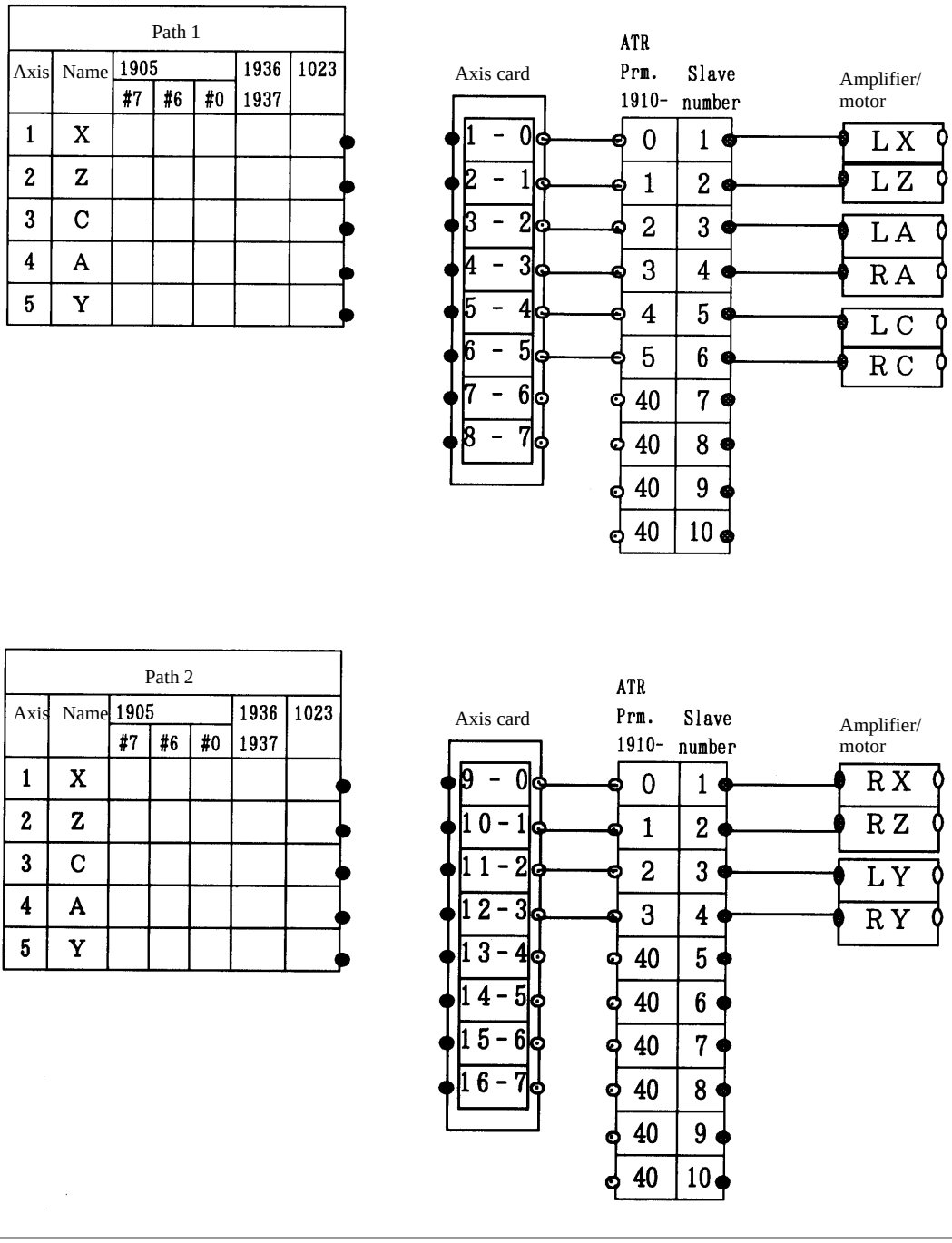
• FSSB setting procedure for controlling servo axes of another path in a multi–path system

When a motor connected to a path other than the local path is to be used in using a 2–axis amplifier, set the axis card number (DSP) of the remote path in parameter No. 1023.

Procedure for setting

(1) Set bit 0 of parameter No. 1902 to 1 to use the manual setting mode.

(2) By hardware connection, the slave number of each motor is determined. So, in parameter Nos. 1910 through 1919, set (slave number – 1) and 40 (for absence of a slave).

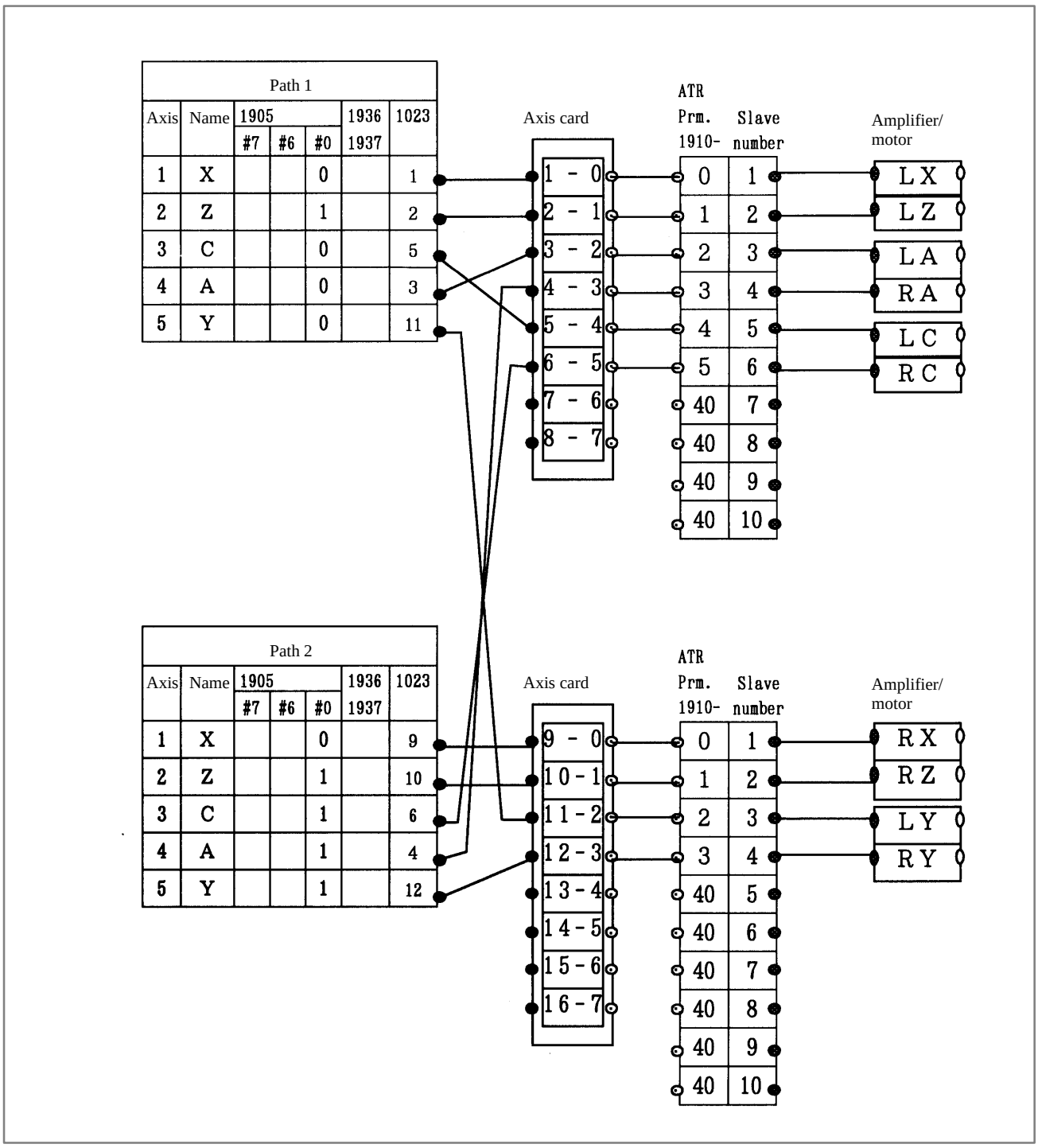


(3) Set an axis card number (DSP number) in parameter No. 1023 to connect an NC controlled axis with a motor.

(4) For an axis for which an even number is set in parameter No. 1023, set bit 0 of parameter No. 1905 to 1.

With the settings above, a servo motor connected to another path can be controlled.

When a separate detector interface unit is connected to use a separate scale, bits 7 and 6 of parameter No. 1905, and parameter Nos. 1936 and 1937 need also be set.


Path 1
Axis
Name
1905
#7
#6
#0
1936
1937
1023
1 X 0 1
2 Z 1 2
3 C 0 5
4 A 0 3
5 Y 0 11
Axis card
1 - 0
2 - 1
3 - 2
4 - 3
5 - 4
6 - 5
7 - 6
8 - 7
ATR
Prm.
1910-
Slave
number
0 1
1 2
2 3
3 4
4 5
5 6
40 7
40 8
40 9
40 10
Amplifier/
motor
LX
LZ
LA
RA
LC
RC
Path 2
1 X 0 9
2 Z 1 10
3 C 1 6
4 A 1 4
5 Y 1 12
9 - 0
10 - 1
11 - 2
12 - 3
13 - 4
14 - 5
15 - 6
16 - 7
RX
RZ
LY
RY

G.9 FSSB DATA DISPLAY

The FSSB setting screen displays FSSB–based amplifier and axis information, and allows amplifier and axis information to be set.

1 Press function key SYSTEM .

2 Pressing the continuous menu key ▷ several times displays [FSSB].

3 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen (or the FSSB setting screen selected previously), and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

There are three types of FSSB setting screens: the amplifier setting screen, axis setting screen, and amplifier maintenance screen.

Pressing soft key [AMP] switches the screen display to the amplifier setting screen.

Pressing soft key [AXIS] switches the screen display to the axis setting screen.Pressing soft key [MAINT] switches the screen display to the amplifier maintenance screen.

G.9.1 Amplifier Setting Screen

The amplifier setting screen displays slave information divided into amplifier information and separate detector interface unit information.

```
(AMPLIFIER SETTING)      O1000 N00001
  NO.
    1   A1-L      α    SVM-HV  40AL   1     X
    2   A1-M      α       SVM   12A   2     Y
    3   A2-L      β       SVM   40A   3     Z
    4   A3-L      α       SVM   20A   4     A
    5   A3-M      α       SVM   40A   5     B
    7   A4-L      α       SVU  240A   6     C


  NO.       PCB ID
    6    M1       A    0000 DETECTOR(8AXES)
    8    M2       B    12AB
>_
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

The amplifier setting screen displays the items below.

- NO.: Slave number

  The serial numbers for to up to ten slaves (up to eight amplifiers and up to two pulse modules) connected via the FSSB are displayed sequentially. A younger number is assigned to a slave closer to the CNC.

- AMP: Amplifier type

  Amplifier type information starts with the character A, which stands for “amplifier.” The character A is followed by the ordinal number of an amplifier counted from the amplifier closest to the CNC, then is followed by a letter indicating which axis of the amplifier is used (L for the first axis, and M for the second axis).

- AXIS NO: Controlled axis number

  The controlled axis numbers set in parameter Nos. 1920 through 1929 are displayed.

  When a value outside the range 1 to the maximum number of controlled axes is set, 0 is displayed.
- NAME: Controlled axis name

  The axis name set in the parameter No. 1020 corresponding to a controlled axis number is displayed. When the controlled axis number is 0, – is displayed.
- As amplifier information, the following information items are displayed:
  - UNIT: Type of servo amplifier unit
  - SERIES: Servo amplifier series
  - CURRENT: Maximum current value
- As separate detector interface unit information, the information items below are displayed.
  - EXTRA
    The character M, which stands for “separate detector interface unit,” is followed by the ordinal number of a separate detector interface unit counted from the separate detector interface unit closest to the CNC.
  - TYPE
    The type of a separate detector interface unit is displayed by a letter.
  - PCB ID
    The ID of a separate detector interface unit is displayed using four digits in hexadecimal. For a separate detector module (8 axes), DETECTOR (8AXES) is displayed after the separate detector interface unit ID. For a separate detector module (4 axes), DETECTOR (4AXES) is displayed after the separate detector interface unit ID.

G.9.2 Axis Setting Screen

The axis setting screen displays axis information.

```
(AXIS SETTING)                O1000 N00001
                       M1  M2          Cs
   1      X   A1-L     0   0     0     0     1
   2      Y   A1-M     1   0     1     0     0
   3      Z   A2-L     0   0     0     1     0
   4      A   A3-L     0   0     0     0     2
   5      B   A3-M     0   0     0     0     0
   6      C   A4-L     0   0     0     0     0





>_
MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

The axis setting screen displays the items below.

- AXIS NO: Controlled axis number

  The NC controlled axis numbers are displayed sequentially.
- NAME: Controlled axis name
- AMP: Type of amplifier connected to each axis
- M1: Connector number for separate detector interface unit 1

  The connector number for separate detector interface unit 1 set in parameter No. 1931 is displayed.
- M2: Connector number for separate detector interface unit 2

  The connector number for separate detector interface unit 2 set in parameter No. 1932 is displayed.
- 1DSP

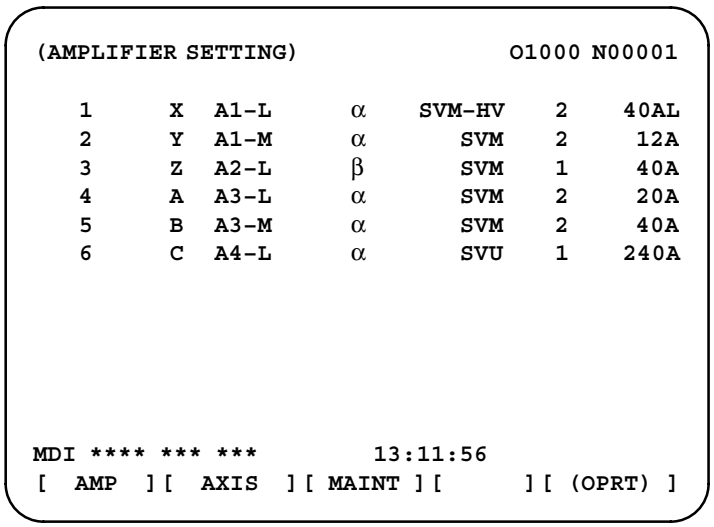
  The value set in bit 0 (1DSP) of parameter No. 1904 is displayed. The value 1 is displayed for an axis (leaning control axis, high–speed current loop axis, high–speed interface axis) that exclusively uses a DSP.
- CS: Cs contour control axis

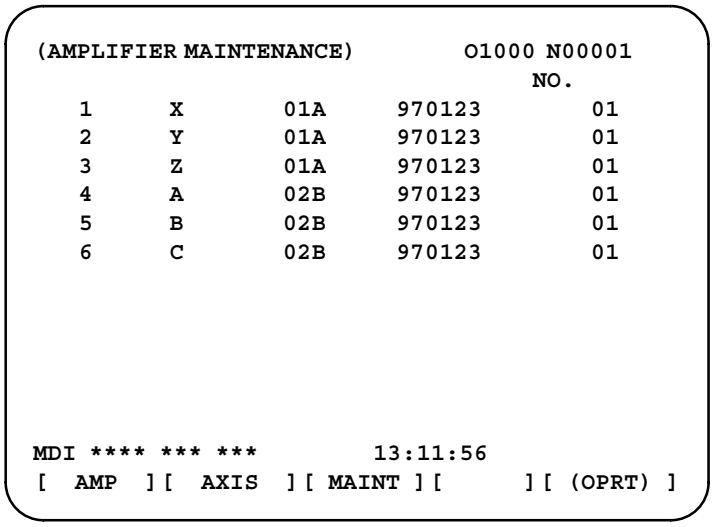
  The value set in parameter No. 1933 is displayed. The value 1 is displayed for a Cs contour control axis.
- TANDEM (M series only)

  The value set in parameter No. 1934 is displayed. For a master axis and slave axis used for tandem control, an odd number and a subsequent even number are displayed.

G.9.3 Amplifier Maintenance Screen

The amplifier maintenance screen displays servo amplifier maintenance information. There are two types of amplifier maintenance screens as shown below. The user can switch between the two screens with the page keys [↑] and [↓].





The amplifier maintenance screens display the following items:

- AXIS NO: Controlled axis number
- NAME: Controlled axis name
- AMP: Type of an amplifier connected to each axis
- SERIES: Series of a servo amplifier connected to each axis
- UNIT: Unit type of a servo amplifier connected to each axis
- NO. OF AXES: Maximum number of axes of an amplifier connected to each axis
- CURRENT: Maximum current value of an amplifier connected to each axis
- VERSION: Version of an amplifier unit connected to each axis
- TEST: Test date of an amplifier connected to each axis

  Example) 970123: January 23, 1997
- MAINTENANCE: Engineering change drawing number of an amplifier connected to each axis

H NOTATION OF MDI KEYS

Series 16*i*/160*i*–LB have two types of MDI keypads : English type and Symbolic type.
The table below shows correspondence between English keys and Symbolic keys.
This manual uses English type in the text.
Therefore when a user uses Symbolic type MDI keypads and encounters an English key in the text, please refer to the correspondence table shown below.

Name	English key	Symbolic key
CANCEL key	CAN	
POSITION key	POS	
PROGRAM key	PROG	
OFFSET/ SETTING key	OFFSET SETTING	
CUSTOM key	CUSTOM	
SYSTEM key	SYSTEM	
MESSAGE key	MESSAGE	
GRAPH key	GRAPH	
CNC/MMC key	CNC / MMC	
SHIFT key	SHIFT	

Name	English key	Symbolic key
INPUT key	INPUT	
ALTER key	ALTER	
INSERT key	INSERT	
DELETE key	DELETE	
PAGE UP key	⬆ PAGE	
PAGE DOWN key	PAGE ⬇	
HELP key	HELP	
RESET key	RESET	
CUSTOM/GRAPH key	CUSTOM GRAPH	

Index

[Symbols]

[A]

[B]

[C]

[D]

[E]

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[G]

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[P]

[S]

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[W]

Revision Record

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