FANUC Series 30*i*/300*i*/300*i*s-MODEL A
FANUC Series 31*i*/310*i*/310*i*s-MODEL A5
FANUC Series 31*i*/310*i*/310*i*s-MODEL A
FANUC Series 32*i*/320*i*/320*i*s-MODEL A

MAINTENANCE MANUAL

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".

This manual contains the program names or device names of other companies, some of which are registered trademarks of respective owners. However, these names are not followed by ® or ™ in the main body.

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.

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1.1 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.

1.2 **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.

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.

1.3   **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.

1.4   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.

1.5   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 CRT 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 this manual.

⚠ 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 Section 2.10 of this manual.

⚠ **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

The manual consists of the following chapters:

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. **LCD-MOUNTED TYPE SERIES 30*i* HARDWARE**

3. **LCD-MOUNTED TYPE SERIES 300*is*/310*is*/320*is* HARDWARE**

4. **STAND-ALONE TYPE 30*i* SERIES HARDWARE**

5. **MATTERS COMMON TO BOTH LCD-MOUNTED TYPE AND STAND-ALONE TYPE (HARDWARE)**
   Chapters 2 to 5 describes the configuration of the hardware, lists the hardware units, and explains how to replace printed-circuit boards.

6. **INPUT AND OUTPUT OF DATA**
   This chapter describes the input/output of data, including programs, parameters, and tool compensation data, aswell as the input/output procedures for conversational data.

7. **INTERFACE BETWEEN CNC AND PMC**
   This chapter describes the PMC specifications, the system configuration, and the signals used by the PMC.

8. **EMBEDDED ETHERNET FUNCTION**
   This chapter describes the embedded Ethernet.

9. **DIGITAL SERVO**
   This chapter describes the servo tuning screen and how to adjust the reference position return position.

10. **AC SPINDLE**
    This chapter describes the spindle tuning screen.

11. **TROUBLESHOOTING**
    This chapter describes the procedures to be followed in the event of certain problems occurring, for example, if the power cannot be turned on or if manual operation cannot be performed. Countermeasures to be applied in the event of alarms being output are also described.

APPENDIX
   A. ALARM LIST
   B. LIST OF MAINTENANCE PARTS
   C. BOOT SYSTEM
   D. MEMRY CARD SLOT
   E. LED DISPLAY
   F. MAINTENANCE OF OPEN CNC (BOOT-UP AND IPL)
   G. MEMORY CLEAR
   H. PANEL *i* BIOS SETUP

This manual does not provide a parameter list. If necessary, refer to the separate PARAMETER MANUAL.

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Applicable models

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

Model name	Abbreviation	
FANUC Series 30*i*-MODEL A	30*i* –A	Series 30*i*
FANUC Series 300*i*-MODEL A	300*i*–A	Series 300*i*
FANUC Series 300*i*s-MODEL A	300*i*s–A	Series 300*i*s
FANUC Series 31*i*-MODEL A	31*i* –A	Series 31*i*
FANUC Series 31*i*-MODEL A5	31*i* –A5	
FANUC Series 310*i*-MODEL A	310*i*–A	Series 310*i*
FANUC Series 310*i*-MODEL A5	310*i*–A5	
FANUC Series 310*i*s-MODEL A	310*i*s–A	Series 310*i*s
FANUC Series 310*i*s-MODEL A5	310*i*s–A5	
FANUC Series 32*i*-MODEL A	32*i* –A	Series 32*i*
FANUC Series 320*i*-MODEL A	320*i*–A	Series 320*i*
FANUC Series 320*i*s-MODEL A	320*i*s–A	Series 320*i*s

> **NOTE**
> Some function described in this manual may not be applied to some products.For details, refer to the DESCRIPTIONS manual (B-63942EN).

Related manuals of
Series 30*i*/300*i*/300*i*s- MODEL A
Series 31*i*/310*i*/310*i*s- MODEL A
Series 31*i*/310*i*/310*i*s- MODEL A5
Series 32*i*/320*i*/320*i*s- MODEL A

The following table lists the manuals related to Series 30*i*/300*i* /300*i*s-A, Series 31*i*/310*i* /310*i*s-A, Series 31*i*/310*i* /310*i*s-A5, Series 32*i*/320*i* /320*i*s-A. This manual is indicated by an asterisk(*).

Table 1 Related manuals

Manual name	Specification number	
DESCRIPTIONS	B-63942EN	
CONNECTION MANUAL (HARDWARE)	B-63943EN	
CONNECTION MANUAL (FUNCTION)	B-63943EN-1	
USER'S MANUAL (Common to T series/M series)	B-63944EN	
USER'S MANUAL (T series)	B-63944EN-1	
USER'S MANUAL (M series)	B-63944EN-2	
MAINTENANCE MANUAL	B-63945EN	*
PARAMETER MANUAL	B-65950EN	
Programming		
Macro Compiler / Macro Executor PROGRAMMING MANUAL	B-63943EN-2	
Macro Compiler OPERATOR'S MANUAL	B-66264EN	
C Language Executor OPERATOR'S MANUAL	B-63944EN-3	
PMC		
PMC PROGRAMMING MANUAL	B-63983EN	
Network		
PROFIBUS-DP Board OPERATOR'S MANUAL	B-63994EN	
Fast Ethernet / Fast Data Server OPERATOR'S MANUAL	B-64014EN	
DeviceNet Board OPERATOR'S MANUAL	B-64044EN	
Operation guidance function		
MANUAL GUIDE *i* OPERATOR'S MANUAL	B-63874EN	
MANUAL GUIDE *i* Set-up Guidance OPERATOR'S MANUAL	B-63874EN−1	

Related manuals of SERVO MOTOR α*i*s/α*i*/β*i*s/β*i* series

The following table lists the manuals related to SERVO MOTOR α*i*s/α*i*/β*i*s/β*i* series

Table 2 Related manuals

Manual name	Specification number
FANUC AC SERVO MOTOR α*i*s series FANUC AC SERVO MOTOR α*i* series DESCRIPTIONS	B-65262EN
FANUC AC SPINDLE MOTOR α*i* series DESCRIPTIONS	B-65272EN
FANUC AC SERVO MOTOR β*i*s series DESCRIPTIONS	B-65302EN
FANUC AC SPINDLE MOTOR β*i* series DESCRIPTIONS	B-65312EN
FANUC SERVO AMPLIFIER α*i* series DESCRIPTIONS	B-65282EN
FANUC SERVO AMPLIFIER β*i* series DESCRIPTIONS	B-65322EN
FANUC SERVO MOTOR α*i*s series FANUC SERVO MOTOR α*i* series FANUC AC SPINDLE MOTOR α*i* series FANUC SERVO AMPLIFIER α*i* series MAINTENANCE MANUAL	B-65285EN
FANUC SERVO MOTOR β*i*s series FANUC AC SPINDLE MOTOR β*i* series FANUC SERVO AMPLIFIER β*i* series MAINTENANCE MANUAL	B-65325EN
FANUC AC SERVO MOTOR α*i*s series FANUC AC SERVO MOTOR α*i* series FANUC AC SERVO MOTOR β*i*s series PARAMETER MANUAL	B-65270EN
FANUC AC SPINDLE MOTOR α*i* series FANUC AC SPINDLE MOTOR β*i* series PARAMETER MANUAL	B-65280EN

Any of the servo motors and spindles listed above can be connected to the CNC described in this manual. However, α*i* series servo amplifiers can only be connected to α*i* series SVMs (for 30*i*/31*i*/32*i*).

This manual mainly assumes that the FANUC SERVO MOTOR α*i* series of servo motor is used. For servo motor and spindle information, refer to the manuals for the servo motor and spindle that are actually connected.

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 status for each function key are described below:

1.1.1   Soft Key Structure

The function keys are used to select the type of screen (function) to be displayed. When a soft key (section select soft key) is pressed immediately after a function key, the screen (section) corresponding to the selected function can be selected.

1.1.2   **General Screen Operations**

- Procedure

1   By pressing a function key on the MDI panel, the chapter selection soft keys that belong to the function are displayed.

Example 1)

Operation selection key

| | | | | | | ABS | REL | ALL | | ⟨OPRT⟩ | + |

Chapter selection soft keys   Continuous menu key
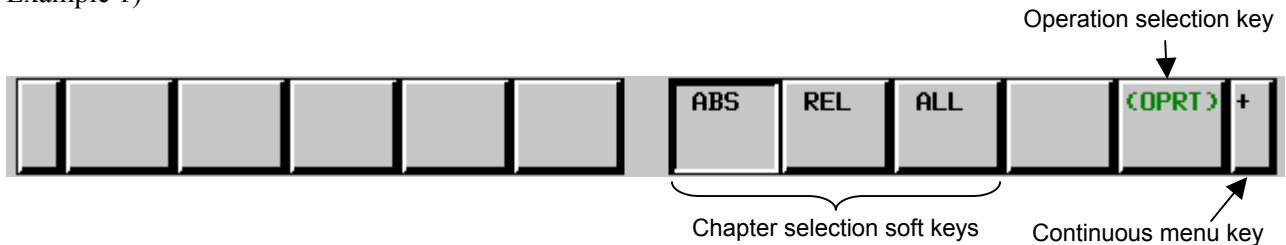
2   When one of the chapter selection soft keys is pressed, the screen of the chapter is displayed.   If the soft key of a desired chapter is not displayed, press the continuous menu key.
In a chapter, a further choice may be made from multiple chapters.

3   When the screen of a desired chapter is displayed, press the operation selection key to display operations to be performed.

4   Select a desired operation with the operation selection soft key.
Depending on the operation to be executed, an auxiliary menu of soft keys is displayed.   Perform an operation according to the indications on the auxiliary menu.

Example 2)

| ⟨ | | | | | | PRESET | ORIGIN | | PTSPRE | RUNPRE | |

Return menu key   Operation selection soft keys

Example 3)

| ⟨ | | | | | | | | ALL AX IS | | EXEC | |

Auxiliary menu
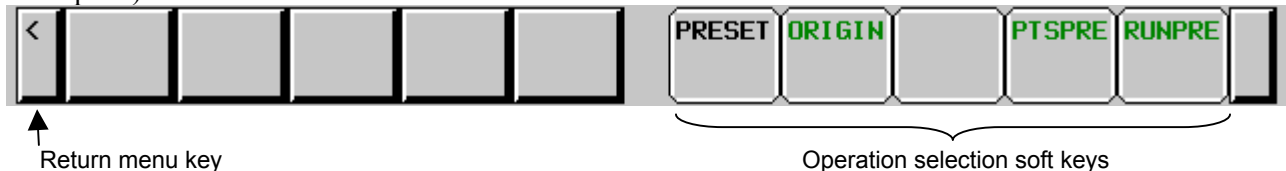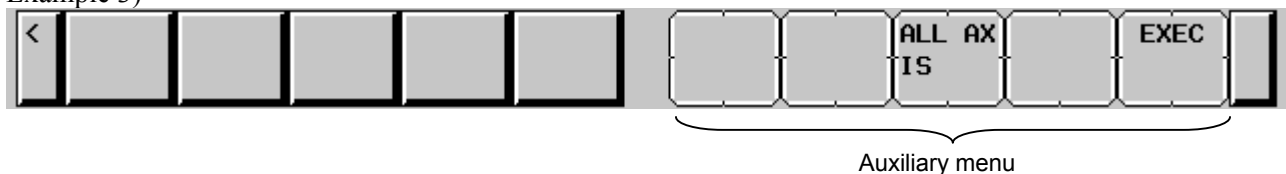
5   To return to the display of chapter selection soft keys, press the return menu key.

A general screen display procedure is provided above.
The actual display procedure varies from one screen to another.
For details, see each description of operation.

- Button design change depending on soft key state

The soft keys assume one of the following states, depending on the selection target:

- Chapter selection soft keys
- Operation selection soft keys
- Auxiliary menu of operation selection soft keys

Depending on the state, the button images of the soft keys change.
From the button images, which state the soft keys are assuming can be known.

Example)

- Chapter selection soft keys

| ABS | REL | ALL | | (OPRT) | + |

- Operation selection soft keys

| PRESET | ORIGIN | | PTSPRE | RUNPRE | |

- Auxiliary menu of operation selection soft keys

| | | ALL AXIS | | EXEC | |
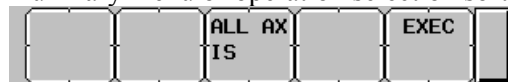
1.1.3   **Function Keys**

Function keys are provided to select the type of screen to be displayed. The following function keys are provided on the MDI panel:

POS

Press this key to display the position screen.

PROG

Press this key to display the program screen.

OFFSET
SETTING

Press this key to display the offset/setting screen.

SYSTEM

Press this key to display the system screen.

MESSAGE

Press this key to display the message screen.
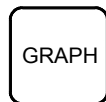
GRAPH

Press this key to display the graphics screen.

CUSTOM1

Press this key to display the custom screen (conversational macro screen).

CUSTOM2

Unused.

1.1.4   **Soft Keys**

By pressing a soft key after a function key, the corresponding screen of the function can be displayed.

The chapter selection soft keys of each function are described below. The horizontal four keys on the right-hand side are assigned to chapter selection soft keys.   When multiple pages are used for chapter selection soft keys, [+] is displayed on the continuous menu key (rightmost soft key).   Press the continuous menu key to switch between chapter selection soft keys.

NOTE
1   Press function keys to switch between screens that are used frequently.
2   Some soft keys are not displayed depending on the option configuration.

If position indications are provided on the left half of the screen when a key other than the function key | POS | is pressed, the left half of the soft keys is displayed as follows at all times:
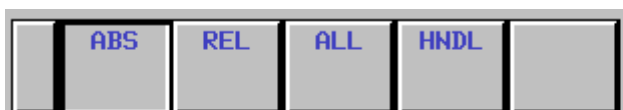
	ABS	REL	ALL	HNDL	

Position display screen

The chapter selection soft keys that belong to the function key $\boxed{\text{POS}}$ and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	ABS	REL	ALL	HNDL	(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	MONI	5AXMAN			(OPRT)	+

Table 1.1.4 (a)   Position display screen

No.	Chapter menu	Description
(1)	ABS	Selects the absolute coordinate display screen.
(2)	REL	Selects the relative coordinate display screen.
(3)	ALL	Selects the overall coordinate display screen.
(4)	HNDL	Selects the operation screen for manual handle operation.
(6)	MONI	Selects the screen for displaying the servo axis load meter, serial spindle load meter, and speedometer.
(7)	5AXMAN	Displays a handle pulse interrupt amount in manual feed for 5-axis machining.

Program screen

The chapter selection soft keys that belong to the function key [PROG]

and the function of each screen are described below.

```
        (1)          (2)          (3)          (4)          (5)

      ┌─────────┬──────────┬─────────┬──────────┬──────────┬──────┐
Page 1│ PROGRA  │ FOLDER   │  NEXT   │  CHECK   │  (OPRT)  │  +   │
      │   M     │          │         │          │          │      │
      └─────────┴──────────┴─────────┴──────────┴──────────┴──────┘

        (6)          (7)          (8)          (9)          (10)

      ┌─────────┬──────────┬─────────┬──────────┬──────────┬──────┐
Page 2│  RSTR   │   JOG    │         │          │  (OPRT)  │  +   │
      │         │          │         │          │          │      │
      └─────────┴──────────┴─────────┴──────────┴──────────┴──────┘
```
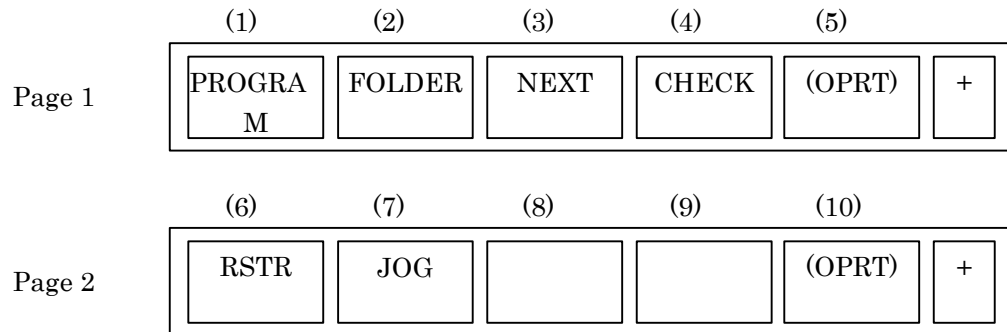
Table 1.1.4 (b)   Program

No.	Chapter menu	Description
(1)	PROGRAM	Selects the screen for displaying a list of part programs currently registered.
(2)	FOLDER	Selects the screen for displaying a list of part programs currently registered.
(3)	NEXT	Selects the screen for displaying the command values of the block currently executed and the next block to be executed among the command values.
(4)	CHECK	Selects the screen for displaying programs, position data, modal information, and so forth simultaneously.
(6)	TIME	Selects the screen for displaying executed program operation time.
(7)	JOG	Selects the screen for executing, in the JOG mode, data specified in the program format from the MDI.
(8)	RSTR	Selects the operation screen for restarting an interrupted program operation.

Offset/setting screen

The chapter selection soft keys that belong to the function key [OFFSET SETTING] and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	OFFSET	SETTING	WORK		(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	MACRO		OPR	TOOL MANAGER	(OPRT)	+

	(11)	(12)	(13)	(14)	(15)	
Page 3	OFST.2	W.SHFT	GEOM.2		(OPRT)	+

	(16)	(17)	(18)	(19)	(20)	
Page 4		PR-LV			(OPRT)	+

	(21)	(22)	(23)	(24)	(25)	
Page 5	CHUCK TAIL	LANG.	PROTECT	GUARD	(OPRT)	+

	(26)	(27)	(28)	(29)	(30)	
Page 6				TOOL LIFE	(OPRT)	+

	(31)	(32)	(33)	(34)	(35)	
Page 7	WRK ERR COMP				(OPRT)	+

Table 1.1.4 (c)   Offset

No.	Chapter menu	Description
(1)	OFFSET	Selects the screen for setting tool offset values.
(2)	SETTING	Selects the screen for setting the setting parameters.
(3)	WORK	Selects the screen for setting a workpiece coordinate system offset.
(6)	MACRO	Selects the screen for setting macro variables.
(8)	OPR	Selects the screen for operating some operation switches on the machine operator's panel as soft switches.
(9)	TOOL MANAGER	Selects the screen for setting data related to tool management.
(11)	OFST.2	Selects the screen for setting a Y-axis offset.
(12)	W.SHFT	Selects the screen for setting a workpiece coordinate system shift value.
(13)	GEOM.2	Selects the screen for setting a second geometry offset.
(17)	PR-LV	Selects the screen for setting a precision level.
(21)	CHUCK TAIL	Selects the chuck tail stock barrier screen.
(22)	LANG.	Selects the screen for setting a display language.
(23)	PROTECT	Selects the screen for setting data protection.
(24)	GUARD	Selects the screen for setting wrong operation prevention.
(29)	TOOL LIFE	Selects the screen for operations and setting related to tool life management.
(31)	WRK ERR COMP	Selects the screen for setting errors related to workpiece mounting position.

System screen

The chapter selection soft keys that belong to the function key $\boxed{\text{SYSTEM}}$ and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	PARAM	DGNOS	SERVO GUIDEM	SYSTEM	(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	MEMORY	PITCH	SERVO PARAM	SP.SET	(OPRT)	+

	(11)	(12)	(13)	(14)	(15)	
Page 3	PMC MAINTE	PMC LADDER	PMC CONFIG		(OPRT)	+

	(16)	(17)	(18)	(19)	(20)	
Page 4	MCNG TUNING	ALL IO	ALL IO	OPEHIS	(OPRT)	+

	(21)	(22)	(23)	(24)	(25)	
Page 5	COLOR	MAINTE	M-INFO	W. DGNS	(OPRT)	+

	(26)	(27)	(28)	(29)	(30)	
Page 6		FSSB	PRMTUN		(OPRT)	+

	(31)	(32)	(33)	(34)	(35)	
Page 7	EMBEDDED PORT	PCMCIA LAN	ETHNET BOARD	PROFI-BUS MST	(OPRT)	+

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	(36)	(37)	(38)	(39)	(40)	
Page 8	REMOTE DIAG	M CODE			(OPRT)	+

	(41)	(42)	(43)	(44)	(45)	
Page 9	PROFI SLAVE	DEVNET MASTER			(OPRT)	+

	(46)	(47)	(48)	(49)	(50)	
Page 10	DUAL CHECK	R.TIME MACRO			(OPRT)	+

Table 1.1.4 (d)   System

No.	Chapter menu	Description
(1)	PARAM	Selects the screen for setting parameters.
(2)	DGNOS	Selects the screen for displaying CNC state.
(3)	SERVO GUIDEM	Selects the screen for displaying the servo guide mate.
(4)	SYSTEM	Selects the screen for displaying the current system status.
(6)	MEMORY	Selects the screen for displaying the contents of memory.
(7)	PITCH	Selects the screen for setting pith error compensation.
(8)	SERVO PARAM	Selects the screen for setting the servo-related parameters.
(9)	SP.SET	Selects the screen for spindle-related setting.
(11)	PMC MAINTE	Selects the screen related to PMC maintenance such as PMC signal state monitoring and tracing, and PMC parameter display/editing.
(12)	PMC LADDER	Selects the screen related to ladder display/editing.
(13)	PMC CONFIG	Displays the screen for displaying/editing data other than ladders that makes up a sequence program and for setting the PMC function.
(16)	MCNG TUNING	Displays the screen for setting the parameter set for emphasis on speed (LV1) or emphasis on precision (LV10).
(17)	ALL IO	Selects the screen for data I/O.
(18)	ALL IO	Selects the screen for data input to and output from the memory card.
(19)	OPEHIS	Selects the screen for displaying the history of operations performed by the operator and issued alarms.
(21)	COLOR	Selects the screen for setting colors to be used on the screen.
(22)	MAINTE	Selects the screen for setting maintenance items to be managed periodically.

No.	Chapter menu	Description
(23)	M-INFO	Selects the screen for displaying information about maintenance performed.
(24)	W.DGNS	Selects the screen for displaying data such as servo positional deviation values, torque values, machine signals, and so forth as graphs.
(27)	FSSB	Selects the screen for making settings related to the high-speed serial servo bus (FSSB: Fanuc Serial Servo Bus).
(28)	PRMTUN	Selects the screen for setting parameters necessary for start-up and tuning.
(31)	EMBEDDED PORT	Selects the screen for making settings related to the embedded Ethernet (embedded port).
(32)	PCMCIA LAN	Selects the screen for making settings related to the embedded Ethernet (PCMCIA Ethernet card).
(33)	ETHNET BOARD	Selects the screen for making settings related to the fast Ethernet/fast data server.
(34)	PROFI-BUS MST	Selects the screen for making settings related to the profi-bus master function.
(37)	M CODE	Selects the screen for setting an M code group.
(41)	PROFI SLAVE	Selects the screen for making settings related to the profi-bus slave function.
(42)	DEVNETMASTER	Selects the screen for making settings related to the DeviceNet master function.
(46)	DUAL CHECK	Selects the screen for making settings related to the dual check safety function.
(47)	R.TIMEMACRO	Selects the screen for making settings related to the real-time custom macro function.

Message screen

The chapter selection soft keys that belong to the function key MESSAGE and the function of each screen are described below.

	(1)	(2)	(3)	(4)	(5)	
Page 1	ALARM	MSG	HISTRY	MSGHIS	(OPRT)	+

	(6)	(7)	(8)	(9)	(10)	
Page 2	BUILT-IN LOG	PCMCIA LOG	BOARD LOG		(OPRT)	+
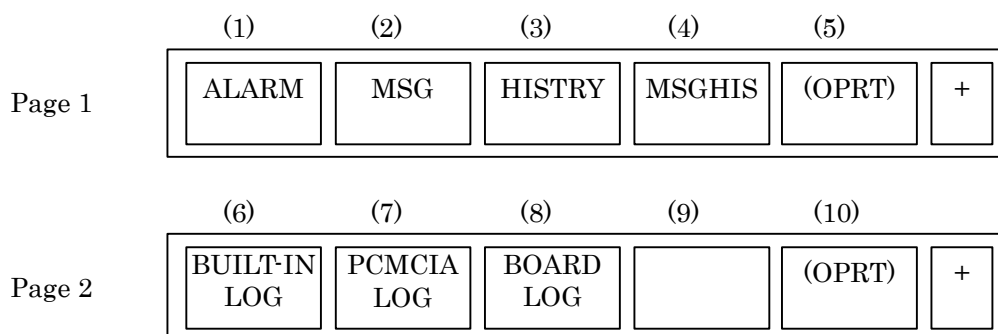
Table 1.1.4 (e)   Message

No.	Chapter menu	Description
(1)	ALARM	Selects the alarm message screen.
(2)	MSG	Selects the operator message screen.
(3)	HISTRY	Selects the screen for displaying the details of alarms issued so far.
(4)	MSGHIS	Selects the external operator message screen.
(6)	BUILT-IN LOG	Selects the screen for displaying error messages related to the embedded Ethernet (embedded port).
(7)	PCMCIA LOG	Selects the screen for displaying error messages related to the embedded Ethernet (PCMCIA Ethernet card).
(8)	BOARD LOG	Selects the screen for displaying error messages related to the fast Ethernet/fast data server.

Graphic screen

The chapter selection soft keys that belong to the function key ⌷GRAPH⌷ and the function of each screen are described below.

(1)	(2)	(3)	(4)	(5)

Page 1

PARAM	GRAPH			(OPRT)	+
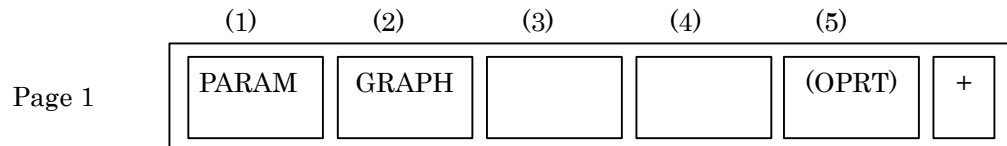
Table 1.1.4 (f)   Graphic

No.	Chapter menu	Description
(1)	PARAM	Selects the screen for setting graphic parameters.
(2)	GRAPH	Selects the screen for graphically displaying the tool path.

1.2   **SYSTEM COMFIGURATION SCREEN**

After the system has started normally, you can find the types of installed printed circuit boards and software types by displaying a system configuration screen.

1.2.1   **Display Method**

1   Press the ⎮SYSTEM⎮ key.

2   Press the [SYSTEM] soft key.

3   Two types of system configuration screen, the hardware screen and software screen, are provided, and you can switch between these screens by using the ⎡PAGE⎤⎡PAGE⎤ page keys.

When all information cannot be displayed on one page of the screen, you can switch to the next page by using the ⎡PAGE⎤⎡PAGE⎤ keys.

1.2.2   **Hardware Configuration Screen**

・**Screen display**

```
ACTUAL POSITION                         O0123 N00000
              ABSOLUTE              F                        0 MM/MIN
       X        0.000        PARTS COUNT                          0
       Y        0.000        RUN TIME                      0H 0M 0S
                             CYCLE TIME                    0H 0M 0S
       Z        0.000             SYSTEM CONFIG(HARDWARE)
       B        0.000              NAME      ID-1    ID-2   SLOT
       C        0.000        MAIN BOARD
                             MAIN BOARD    00301 20 2
              MODAL          CPU CARD      00407 10 2 70000203
    G00  G80  G50.1 F      M SERVO CARD    00101 00 0
    G97  G67  G49           PMC MODULE    00700 10 0
    G69  G54  G15    H       FROM/SRAM     C2/03
    G98  G64  G5.5   D      OPTION BOARD
    G21  G18                ADD AXIS       00121 00 0          1
    G40  G69.1         T     DISPLAY
    G25  G50.2               DISP ID       1010
    G22  G13.1         S     OTHERS
                             MDI ID        20
                             B.UNIT ID     10
    S             0/MIN      A>

                             MEM  STOP *** ***     12:00:00
    <  ABSOLU RELATI ALL  HANDLE  SYSTEM SERVO SPINDL      <OPRT>
       TE     VE                         INFO  E INFO
```

・**Displayed information**

The following explains the displayed information:

1. NAME
    MAIN BOARD
     -     Displays information on the main board, and cards and modules on the main board.
    OPTION BOARD
     -     Displays information on the board installed in the option slot.
    DISPLAY
     -     Displays information on the display unit.
    OTHERS
     -     Displays information on other components (such as an MDI and a basic unit).

2. ID-1 / ID-2
     -     Displays ID information.

3. SLOT
     -     Displays the number of the slot in which the option board is inserted.

1.2.3   **Software Configuration Screen**

- Screen display

```
ACTUAL POSITION                          O0123 N00000

              ABSOLUTE          F                    0 MM/MIN
   X        0.000        PARTS COUNT              0
                                 RUN TIME           0H 0M 0S
   Y        0.000        CYCLE TIME         0H 0M 0S
   Z        0.000           SYSTEM CONFIG(SOFTWARE)
   B        0.000        SYSTEM    SERIES  EDITION
   C        0.000        CNC(BASIC)    G001    0026
                                 CNC(OPT A1)   G001    0026
                                 CNC(OPT A2)   G001    0026
              MODAL             CNC(OPT A3)   G001    0026
                                 CNC(MSG ENG)  G001    0026
 G00  G80  G50.1 F        M      CNC(MSG JPN)  G001    0026
 G97  G67  G49                   CNC(MSG DEU)  G001    0026
 G69  G54  G15      H            CNC(MSG ITA)  G001    0026
 G98  G64  G5.5     D            BOOT          60W1    0001
 G21  G18                        PMC(SYSTEM1)  406N    0001
 G40  G69.1         T            GRAPHIC1      60V8    03.0
 G25  G50.2                      NET CONTROL   656F    0002
 G22  G13.1         S            EMBED ETHER   656E    0003
                                 A>
 S              0/MIN
                                 MEM  STOP *** ***   12:00:00
 <  ABSOLU RELATI  ALL  HANDLE        SYSTEM SERVO SPINDL      <OPRT>
    TE     VE                                INFO  E INFO
```

- Displayed information

The following explains the displayed information:

       SYSTEM : Software type

       SERIES: Software series

       EDITION: Software edition

・ **Displayed systems and corresponding software types**

The following lists the correspondence between displayed systems and software:

System	Software type
CNC(BASIC)	CNC basic software
CNC(OPT A1)	Option assembly A1
CNC(OPT A2)	Option assembly A2
CNC(OPT A3)	Option assembly A3
CNC(MSG ENG)	Language indication (English)
CNC(MSG JPN)	Language indication (Japanese)
CNC(MSG DEU)	Language indication (German)
CNC(MSG FRA)	Language indication (French)
CNC(MSG CHT)	Language indication (Chinese (complicated characters))
CNC(MSG ITA)	Language indication (Italian)
CNC(MSG KOR)	Language indication (Korean)
CNC(MSG ESP)	Language indication (Spanish)
CNC(MSG NLD)	Language indication (Dutch)
CNC(MSG DAN)	Language indication (Danish)
CNC(MSG PTG)	Language indication (Portuguese)
CNC(MSG PLK)	Language indication (Polish)
CNC(MSG HUN)	Language indication (Hungarian)
CNC(MSG SVE)	Language indication (Swedish)
CNC(MSG CSY)	Language indication (Czech)
CNC(MSG CHS)	Language indication (Chinese (simplified characters))
BOOT	Boot system
PMC(SYSTEM)	PMC function
PMC(LADDER1)	PMC ladder for path 1
PMC(LADDER2)	PMC ladder for path 2
PMC(LADDER3)	PMC ladder for path 3
PMC(LAD DCS)	Dual check safety PMC ladder
CLB(SYSTEM)	System software for C board
CLB(USER)	User software for C board
SERVO	Digital servo software (up to ten programs displayed)
SPINDLE-1	Spindle 1
SPINDLE-2	Spindle 2
SPINDLE-3	Spindle 3
SPINDLE-4	Spindle 4
SPINDLE-5	Spindle 5
SPINDLE-6	Spindle 6
SPINDLE-7	Spindle 7
SPINDLE-8	Spindle 8
GRAPHIC	Graphic function
GRAPHIC1	15" display control software 1

System	Software type
GRAPHIC2	15" display control software 2
MACRO EXE1	Macro executor 1
MACRO EXE2	Macro executor 2
MACRO EXE3	Macro executor 3
MACRO EXE4	Macro executor 4
MACRO EXE5	Macro executor 5
MACRO EXE6	Macro executor 6
MACRO EXE7	Macro executor 7
MACRO EXE8	Macro executor 8
MACRO EXE9	Macro executor 9
MACRO EXE10	Macro executor 10
MACRO EXE11	Macro executor 11
MACRO EXE12	Macro executor 12
MACRO EXE13	Macro executor 13
MACRO EXE14	Macro executor 14
MACRO EXE15	Macro executor 15
MACRO EXE16	Macro executor 16
MACRO EXE17	Macro executor 17
MACRO EXE18	Macro executor 18
MACRO EXE19	Macro executor 19
MACRO EXE20	Macro executor 20
MACRO MGI-M	Manual guide i (macro executor for M series)
MACRO MGI-T	Manual guide i (macro executor for T series)
CEXELIB	Library for C executor
CEXEAPL	Application for C executor
MGILIB	Library for manual guide i
MGIAPL	Application for manual guide i
NET CONTROL	Communication management software
EMBED ETHER	Control software for embedded Ethernet function
PROFI SOFT	Software for profi-bus function
PROFI MASTER	Control software for profi-bus master function
ETHER/DTSVR	Control software for fast data server

- Display of digital servo software
  When multiple programs are loaded, up to ten types are displayed.
  For the type of servo software used for each axis, check parameter No. 1024.
- Display of spindle software
  The series and edition of software are displayed for each spindle.
  This information is displayed for up to eight spindles.
- Display of macro executor
  The series and edition are displayed for each number specified at the time of P-CODE macro creation.
  Up to 20 types of macro executor are displayed.

1.2.4   **Outputting System Configuration Data**

When you press the [(OPRT)] soft key on the system configuration screen, the [PUNCH] soft key appears.   You can output data to an input/output device by pressing the [PUNCH] soft key then [EXEC].
Set the output destination in parameter No. 0020.
Data is output to a file named SYS_CONF.TXT.

1.3 DIAGNOSIS FUNCTION

1.3.1 Displaying Diagnosis Screen

(1) Press [SYSTEM] key.

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

1.3.2 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 DWELLDWELL	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**

		1	0	0	0	1	0	0
020	CUT SPEED UP /DO	1	0	0	0	1	0	0
021	RESET BUTTON ON	0	0	1	0	0	0	0
022	RESET AND REWIND ON	0	0	0	1	0	0	0
023	EMERGENCY STOP ON	1	0	0	0	0	0	0
024	RESET ON	1	1	1	1	0	0	0
025	STOP MOTION OR DWELL	1	1	1	1	1	1	0

Input of emergency stop signal

Input of external reset signal

Reset button On of MDI

Input of reset & rewind

Servo alarm generation

Switching to other mode, Feed hold

Single block stop

- **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.

- **Details of serial Pulsecoder**

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	200	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

   OVL: Overload alarm
     LV: Insufficient voltage alarm
   OVC: Over current alarm
   HCA: Abnormal current alarm
   HVA: Overvoltage alarm
   DCA: Discharge alarm
   FBA: Disconnection alarm
   OFA: Overflow alarm

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	201	ALD			EXP				

	#7	#6	#5	#4	
Overload alarm	0	-	-	-	Motor overheat
	1	-	-	-	Amplifier overheat
Disconnec tion alarm	1	-	-	0	Built-in Pulsecoder (hard)
	1	-	-	1	Disconnection of separated type Pulsecoder (hard)
	0	-	-	0	Disconnection of Pulsecoder (software)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	202		CSA	BLA	PHA	RCA	BZA	CKA	SPH

   CSA: Hardware of serial Pulsecoder is abnormal
   BLA: Battery voltage is low (warning)
   PHA: Serial Pulsecoder or feedback cable is erroneous.
            Counting of feedback cable is erroneous.
   RCA: Serial Pulsecoder is faulty.
            Counting of feedback cable is erroneous.
   BZA: Battery voltage became 0.
            Replace the battery and set the reference position.
   CKA: Serial Pulsecoder is faulty.
            Internal block stopped.
   SPH: Serial Pulsecoder or feedback cable is faulty.
            Counting of feedback cable is erroneous.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	203	DTE	CRC	STB	PRM				

   DTE: Communication failure of serial Pulsecoder.
            There is no response for communication.
   CRC: Communication failure of serial Pulsecoder.
            Transferred data is erroneous.

STB: Communication failure of serial Pulsecoder.
       Transferred data is erroneous.

PRM: The alarm is detected by the servo, the values specified in the parameter is not correct.

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

OFS: Abnormal current value result of A/D conversion of digital
MCC: Contacts of MCC of servo amplifier is melted.
LDA: Serial Pulsecoder LED is abnormal
PMS: Feedback is not correct due to faulty serial Pulsecoder C or feedback cable.

● **Details of separate serial Pulsecoder alarms**

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

OHA: Overheat occurred in the separate Pulsecoder.
LDA: An LED error occurred in the separate Pulsecoder.
BLA: A low battery voltage occurred in the separate Pulsecoder.
PHA: A phase data error occurred in the separate linear scale.
CMA: A count error occurred in the separate Pulsecoder.
BZA: The battery voltage for the separate Pulsecoder is zero.
PMA: A pulse error occurred in the separate Pulsecoder.
SPH: A soft phase data error occurred in the separate Pulsecoder.

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

DTE: A data error occurred in the separate Pulsecoder.
CRC: A CRC error occurred in the separate Pulsecoder.
STB: A stop bit error occurred in the separate Pulsecoder.

● **Details of invalid servo parameter alarms (on the CNC side)**

When servo alarm No. 417 is issued, and diagnosis No. 203#4 = 0, its cause is indicated.
When diagnosis No. 203#4 = 1, see diagnosis No. 352.

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

MOT: The motor type specified in parameter No. 2020 falls outside the predetermined range.
PLC: The number of velocity feedback pulses per motor revolution, specified in parameter No. 2023, is zero or less. The value is invalid.
PLS: The number of position feedback pulses per motor revolution, specified in parameter No. 2024, is zero or less. The value is invalid.
DIR: The wrong direction of rotation for the motor is specified in parameter No. 2022 (the value is other than 111 or -111).

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	300	Position error of an axis in detection unit

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

• **Machine position**

DGN	301	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]   2-word axis
[Unit of data]   0.001mm (metric output), 0.0001inch (inch output)
[Valid data range]   0 to ±99999999

• **Reference counter**

DGN	304	Reference counter amount in each axis

[Data type]   2-word axis
[Unit of data]   Detection unit
[Valid data range]   –99999999 to 99999999

• **Cause that sets bit 4 (APZ) of parameter No. 1815 to 0**

You can find the cause that sets bit 4 (APZ) of parameter No. 1815 to 0 by checking diagnosis Nos. 310 and 311.
Once diagnosis No. 310 or 311 is set to 1, this setting is kept unchanged until the zero point of the absolute position detector of the corresponding axis is set again.   Possible causes that set APZ to 0 are as follows:

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

PR1:   One of the following parameters was changed:
No.1803#7, No.1815#1, No.1820, No.1821, No.1822, No.1823, No.1850, No.1874, No.1875, No.2022, No.2084, No.2085
PR2:   Bit 1 (ATS) of parameter No. 8303 was changed.   Alternatively, when bit 7 (SMA) of parameter No. 8302 was set to 1, APZ of the axis to be synchronized together was set to 0.
BZ1:   A battery voltage of 0 V was detected.   (Inductosyn)
BZ2:   A battery voltage of 0 V was detected.   (Separate position detector)
NOF: The inductosyn did not output offset data.

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ALP: The zero point was set by MDI when the α pulse coder had not rotate one or more turns.

DTH: An axis detach operation was performed by the controlled-axis detach signal DTCH (G124) or by setting bit 7 (RMV) of parameter No. 0012.

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

AL1: An SV alarm (SV301 to SV305) was issued.

AL2: Broken-wire alarm SV445 or SV447 was detected.

AL3: A battery voltage of 0 V was detected.   (Serial Pulsecoder)

AL4: Rotation count abnormality alarm RCAL was detected.

GSG: The status of broken-wire alarm ignore signal NDCAL (G202) changed from 1 to 0.

XBZ: A battery voltage of 0 V or a count error was detected.   (Separate serial position detector)

DUA: The difference in error between the semi-closed loop and closed loop became too large when the dual position feedback function was being used.

• **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 α*is*/α*i*/β*is* series Parameter Manual (B-65270EN).

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

Detail number	Parameter number	Cause	Measure
83	2019	Illegal learning control parameter → See Supplementary.	Correct the parameter setting so that each parameter is within a valid range.
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. Use the position feedback pulse conversion coefficient (No. 2185).
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 (No.2200#6) for changing the internal format of the velocity loop proportional gain. Alternatively, decrease the setting of this parameter.
0474 0475	2047	The internal value of the observer parameter (POA1) has overflowed.	Change the setting to: $(-1) \times$ (desired setting)/10
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.
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.
0843	2084	No positive value has been set for the flexible feed gear numerator. Alternatively, the following condition exists: Feed gear numerator > denominator × 16	Specify a positive value as the flexible feed gear numerator. Alternatively, satisfy the following condition: Feed gear numerator ≤ denominator × 16 (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.
0996	2099	The internal value for suppressing N pulses has overflowed.	Decrease the setting of the parameter listed at the left.
1033	2103	The retract distance related to an abnormal load differs between the L and M axes (if the same-axis retract function is in use).	Set the same value for both the L and M axes.
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 2078 2079	No dual position feedback conversion coefficient is set.	Set an AMR conversion coefficient.

Detail number	Parameter number	Cause	Measure
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.	Reset "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 $\pm$45.	Enlarge the AMR offset setting range (N2270#1=1) to input a value within a range of $\pm$60.
1493	2149	A value greater than 6 is set in this parameter.	A value not greater than 6 is permitted to be set in this parameter. Correct the setting with a value not greater than 6.
1503	2150	A value greater than or equal to 10 is set.	The setting must be less than 10.
1793	2179	A negative value or a value greater than the setting of parameter No. 1821 is set.	Set a positive value smaller than the setting of parameter No. 1821.
1853	2185	A negative value or a value greater than the setting of parameter No. 2023 is set.	Set a positive value smaller than the setting of parameter No. 2023.
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.
10016 10019	2200bit0	The internal value of a parameter used to detect runaway has overflowed.	Do not use the runaway detection function (specify bit 0 = 1).
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.

Supplementary: Details of an illegal learning control parameter
Set parameter No. 2115 to 0, and parameter No. 2151 to 6265 to change the value of DGN No. 353 to a binary number. You can find a detailed cause from the bit position of the obtained binary number at which 1 is set.

Position	Cause
B3	The band-pass filter (No. 2512) is not in the range.
B4	The profile number (No. 2511) is not in the range.
B5	The specified data period (No. 251, 2519, 2521, 2523, or 2525) is not in the range.
B6	The total number of profiles (No. 2510) is not in the range.
B7	This alarm is issued when G05 starts during a memory clear operation.
B8	This alarm is issued when the total number of profiles (No. 2510) is not 0, and the profile number (No. 2511) is 0.
B9	This alarm is issued when the automatically-set thinning shift value exceeds the range because the specified data period is too long.

DGN	355	Communication alarm ignore counter (separate type)

DGN	356	Link processing counter (built-in type)

DGN	357	Link processing counter (separate type)

The number of times a communication error occurred during serial communication with the detector is indicated.

Data transmitted during communication is guaranteed unless another alarm occurs. However, if the counter value indicated in this diagnosis information increases in a short period, there is a high probability that serial communication is disturbed by noise. So, take sufficient measures to prevent noise.

* For details, refer to a relevant manual on FANUC SERVO MOTOR αi series.

DGN	358	V ready-off information

This information is provided to analyze the cause of the V ready-off alarm (servo alarm SV0401).

Convert the indicated value to a binary representation, and check bits 5 to 14 of the binary representation.

When amplifier excitation is turned on, these bits are set to 1 sequentially from the lowest bit, which is bit 5. If the amplifier is activated normally, bits 5 to 14 are all set to 1.

Therefore, check the bits sequentially from the lowest bit to find the first bit that is set to 0. This bit indicates that the corresponding processing could not be completed and so the V ready-off alarm was caused.

#15	#14	#13	#12	#11	#10	#09	#08
	SRDY	DRDY	INTL		CRDY		

#07	#06	#05	#04	#03	#02	#01	#00
	*ESP						

#06（*ESP）　: Converter emergency stop state released

#10（CRDY）　: Converter ready

#12（INTL）　: DB relay released

#13（DRDY）　: Amplifier ready (amplifier)

#14（SRDY）　: Amplifier ready (software)

* For details, refer to a relevant manual on FANUC SERVO MOTOR αi series.

DGN	360	Cumulative value of specified pulses (NC)

[Data type]   2-word
[Unit of data]   Detection unit
[Valid data range]   -99999999 to 99999999

Cumulative value of move commands distributed from the CNC since power-on is indicated.

DGN	361	Compensation pulses (NC)

[Data type]   2-word
[Unit of data]   Detection unit
[Valid data range]   -99999999 to 99999999

Cumulative value of compensation pulses (backlash compensation, pitch error compensation, and so on) distributed from the CNC since power-on is indicated.

DGN	362	Cumulative value of specified pulses (SV)

[Data type]   2-word
[Unit of data]   Detection unit
[Valid data range]   -99999999 to 99999999

Cumulative value of move pulses and compensation pulses received by the servo system since power-on is indicated.

DGN	363	Cumulative feedback (SV)

[Data type]   2-word
[Unit of data]   Detection unit
[Valid data range]   -99999999 to 99999999

Cumulative value of positional feedback pulses the servo system received from the pulse coder since power-on is indicated.

● **Diagnosis data related to the Inductosyn absolute position detector**

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

[Data type]   2-word axis
[Unit of data]   Detection unit

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

The remainder resulting from the division is displayed.

DGN	381	Offset data from the Inductosyn

[Data type]   2-word axis
[Unit of data]   Detection unit

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

● **Diagnosis data related to the serial spindles**

DGN	403		Motor temperature of first spindle

[Data type]   Byte spindle
[Unit of data]   °C
[Valid data range] 0 to 255
                  The temperature of the winding of the spindle motor is indicated.
                  This information can be used to determine the overheat alarm of the spindle.
                  (The temperature that causes an overheat alarm varies from motor to motor.)

> **NOTE**
> 1 Temperature information has the following error:
>   • 50°C to 160°C   ±5°C
>   • 160°C to 180°C   ±10°C
> 2 The indicated temperature and the temperature causing an overheat alarm have the following error:
>   • For lower than 160°C   5°C maximum
>   • For 160 to 180°C   10°C maximum

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	408	SSA		SCA	CME	CER	SNE	FRE	CRE

CRE: A CRC error occurred (warning).
FRE: A framing error occurred (warning).
SNE: The sender or receiver is not correct.
CER: An abnormality occurred during reception.
CME: No response was returned during automatic scanning.
SCA: A communication alarm was issued on the spindle amplifier side.
SSA: A system alarm was issued on the spindle amplifier side.
      (The above conditions are major causes of alarm SP0749. These conditions are caused mainly by noise, a broken wire, a momentary failure of power, and so on.)

DGN	410		Spindle load meter indication [%]

[Data type]   Word spindle
[Unit of data]   %

DGN	411		Spindle load meter indication [min⁻¹]

[Data type]   Word spindle
[Unit of data] min^{-1}

DGN	417		Spindle position coder feedback information

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	418		Positional deviation of spindle in position loop mode

[Data type]   2-word spindle
[Unit of data]   Detection unit

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DGN	425	Spindle synchronization error

[Data type]   2-word spindle
[Unit of data]   Detection unit
When the spindles are in synchronization mode, the absolute value of the synchronization error when each spindle is set as the slave axis is indicated.

DGN	445	Spindle position data

[Data type]   Word spindle
[Unit of data]   Pulse
[Valid data range]   0 to 4095
This data is valid when bit 1 of parameter No. 3117 is set to 1.
To display spindle position data, spindle orientation must be performed once.

• **Diagnosis data related to rigid tapping**

DGN	450	Spindle position error during rigid tapping

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	451	Spindle distribution during rigid tapping

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	452	Difference in error amount between spindle and tapping axis during rigid tapping (momentary value)

[Data type]   2-word spindle
[Unit of data]   %

DGN	453	Difference in error amount between spindle and tapping axis during rigid tapping (maximum value)

[Data type]   2-word spindle
[Unit of data]   %

DGN	454	Accumulated spindle distribution during rigid tapping (cumulative value)

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	455	Difference in spindle-converted move command during rigid tapping (momentary value)

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	456	Difference in spindle-converted positional deviation during rigid tapping (momentary value)

[Data type]   2-word spindle
[Unit of data]   Detection unit

DGN	457	Width of synchronization error during rigid tapping (maximum value)

[Data type]   2-word spindle
[Unit of data] Detection unit

DGN	458	Tapping axis distribution amount during rigid tapping (cumulative value)

[Data type]   2-word spindle
[Unit of data] Detection unit

DGN	459	Selected spindle number during rigid tapping

[Data type]   2-word path

DGN	460	Difference in spindle-converted move command during rigid tapping (maximum value)

[Data type]   2-word spindle
[Unit of data] Detection unit

DGN	461	Difference in spindle-converted machine position during rigid tapping (momentary value)

[Data type]   2-word spindle
[Unit of data] Detection unit

DGN	462	Difference in spindle-converted machine position during rigid tapping (maximum value)

[Data type]   2-word spindle
[Unit of data] Detection unit

- **Diagnosis data related to the small-hole peck drilling cycle**

DGN	520	Total number of times a retraction operation has been performed during drilling since G83 was specified

DGN	521	Total number of times a retraction operation has been performed in response to the reception of the overload torque detection signal during drilling since G83 was specified

The total numbers of times output in Nos.520 and 521 are cleared to zero by a G83 command issued after the small-hole peck drilling cycle mode is entered.

DGN	522	Coordinate value of the drilling axis at which retraction operation starts (least input increment)

DGN	523	Difference between the coordinate value of the drilling axis at which the previous retraction operation started and the coordinate value of the drilling axis at which the current retraction operation starts (least input increment: previous value minus current value)

• **Diagnosis data related to the dual position feedback function**

DGN	550	Closed loop error

[Data type]   2-word axis
[Unit of data]   Detection unit
[Valid data range] -99999999 to +99999999

DGN	551	Semi-closed loop error

[Data type]   2-word axis
[Unit of data]   Detection unit
[Valid data range] -99999999 to +99999999

DGN	552	Error between semi-closed and closed loops

[Data type]   Word axis
[Unit of data]   Detection unit
[Valid data range] -32768 to +32767

DGN	553	Amount of dual position compensation

[Data type]   2-word axis
[Unit of data]   Detection unit
[Valid data range] -99999999 to +99999999

The data items displayed on the diagnosis screen are obtained at the following positions:
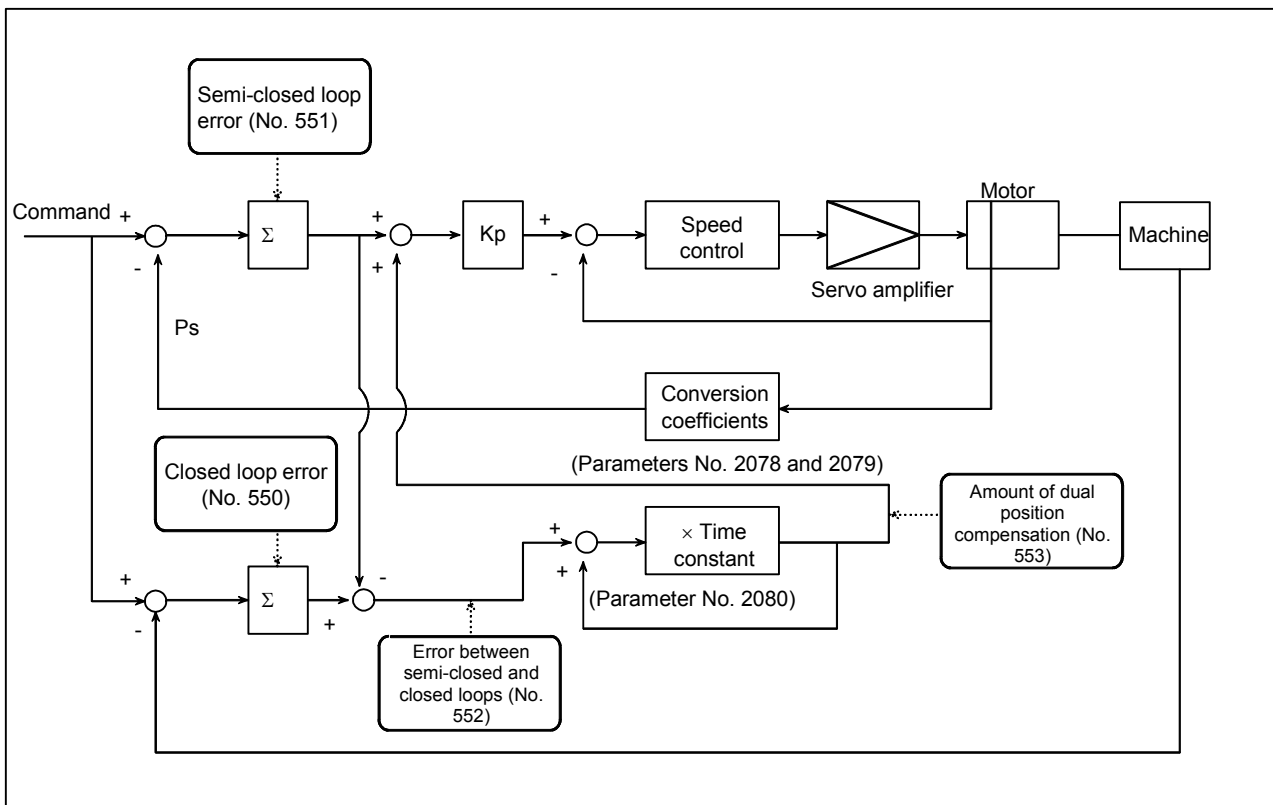
• State of high-speed HRV current control

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	**700**							HOK	HON

[Data type]   Bit axis

The state of high-speed HRV current control is displayed.

HON: The motor is controlled in the high-speed HRV current control mode.

HOK: This bit is set to 1 when high-speed HRV current control is enabled.

High-speed HRV current control is enabled when the following conditions are satisfied:
- Bit 0 (HR3) of parameter No. 2013 is set to 1.
- Servo software, servo modules, and servo amplifiers suitable for high-speed HRV current control are used.
- When a separate detector interface unit is used, the separate detector interface unit is suitable for high-speed HRV current control.

• Thermal growth compensation along tool vector

DGN	**705**	**Thermal growth compensation amount for each axis**

[Data type]   Word axis
[Unit of data]   Detection unit
[Valid data range] −32768 to +32767

The compensation amount for each axis in thermal growth compensation along the tool vector is indicated.

● Spindle error and warning states

DGN	**710**	**Spindle error state**

[Data type]   Word spindle

DGN	**712**	**Spindle warning state**

[Data type]   Word spindle

When an error (yellow LED ON + error number indication) or a warning occurs in a spindle amplifier module (SPM), the number is indicated on the diagnosis screen.

If neither error nor warning occurs, 0 is indicated.

For spindle errors, refer to "FANUC SERVO MOTOR α*i* series Maintenance Manual" (B-65285EN).

For warnings, see Subsection 10.1.4, "Spindle Warning Interface" in this manual.

• **Diagnosis data related to axis synchronous control**
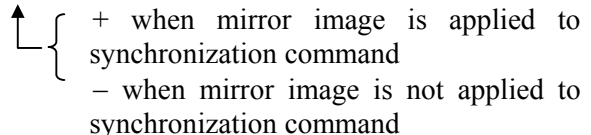
DGN	3500	Synchronization error amount

    [Data type]   2-word axis
    [Unit of data]   Detection unit
    [Valid data range]   −99999999 to +99999999
    The difference in position (synchronization error amount) between the master axis and slave axis is indicated.   This data is indicated for the slave axis.

DGN	3501	Synchronization error compensation value

    [Data type]   2-word axis
    [Unit of data]   Detection unit
    [Valid data range]   −99999999 to +99999999
    Cumulative value of compensation pulses (synchronization error compensation value) output to the slave axis is indicated.   This data is indicated for the slave axis.

• **Diagnosis data related to synchronous/mixture control**

DGN	3502	Indication of synchronization error amount for each axis

    [Data type]   2-word axis
    [Unit of data]   Detection unit
    [Valid data range]   −99999999 to +99999999
    When synchronization deviation is detected (SERx of parameter No. 8162 is set to 1), the positional deviation difference of the slave axis from the master axis is indicated.
    The positional deviation difference is:
    (Positional deviation of master axis) $\pm$ (positional deviation of slave axis)

        + when mirror image is applied to synchronization command
        − when mirror image is not applied to synchronization command

• **Diagnosis data related to linear scale with absolute address reference marks**

DGN	3545	Linear scale with absolute address reference marks measurement point 1

DGN	3546	Linear scale with absolute address reference marks measurement point 2

DGN	3547	Linear scale with absolute address reference marks measurement point 3

DGN	3548	Linear scale with absolute address reference marks measurement point 4

    [Data type]   2-word axis
    [Unit of data]   Detection unit
    [Valid data range]   -999999999 to 999999999

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DGN	3549	Linear scale with absolute address reference marks Status display

DGN	3550	Linear scale with absolute address reference marks Scale value

      [Data type]   2-word axis
     [Unit of data]   Detection unit
 [Valid data range]   -999999999 to 999999999

1.4   CNC STATE DISPLAY

- Description of each display
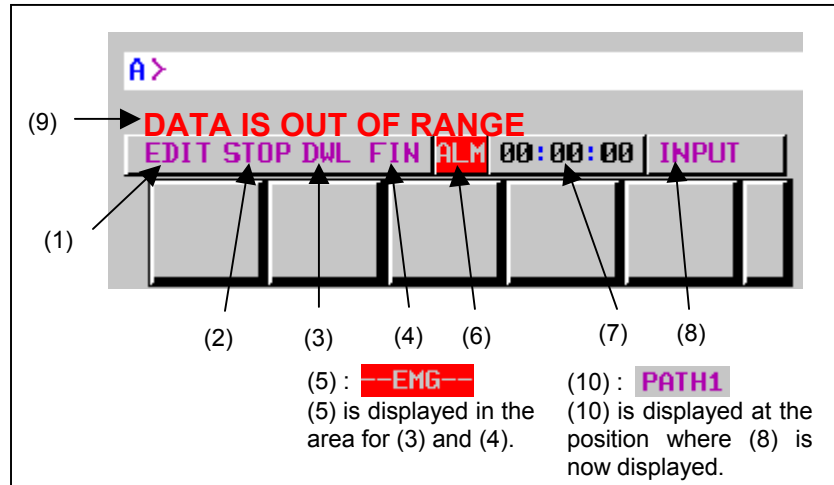
Fig. 1.3.2 (a)

(1) Current mode

MDI   : Manual data input, MDI operation
MEM   : Automatic operation (memory operation)
RMT   : Automatic operation (DNC operation, or such like)
EDIT : Memory editing
HND   : Manual handle feed
JOG   : Jog feed
INC   : Manual incremental feed
REF   : Manual reference position return
**** : Mode other than the above

(2) Automatic operation status

**** : Reset (When the power is turned on or the state in which program execution has terminated and automatic operation has terminated.)

STOP : Automatic operation stop (The state in which one block has been executed and automatic operation is stopped.)

HOLD : Feed hold (The state in which execution of one block has been interrupted and automatic operation is stopped.)

STRT : Automatic operation start-up (The state in which the system operates automatically)

MSTR : Manual numerical command start state (The state in which a manual numerical command is being executed)
Alternatively, tool retract and recover operation state (The state in which a recover operation and repositioning operation are being performed)

(3) Axis moving status/dwell status

> MTN : Indicates that the axis is moving.
> DWL : Indicates the dwell state.
> ***   : Indicates a state other than the above.

(4) State in which an auxiliary function is being executed

> FIN : Indicates the state in which an auxiliary function is being executed. (Waiting for the complete signal from the PMC)
> ***   : Indicates a state other than the above.

(5) Emergency stop or reset status

> --EMG--   : Indicates emergency stop.(Blinks in reversed display.)
> --RESET-- : Indicates that the reset signal is being received.

(6) Alarm status

> ALM : Indicates that an alarm is issued. (Blinks in reversed display.)
> BAT : Indicates that the battery is low. (Blinks in reversed display.)
> Space : Indicates a state other than the above.

> **NOTE**
> When one of the following occurs, the battery alarm state is displayed, indicating that it is time to replace the battery:
> 1 The voltage level of the lithium battery (the battery for CNC backup) becomes low.
> 2 The voltage level of the backup battery of the absolute pulse coder becomes low.

(7) Current time

> hh : mm : ss   -   Hours, minutes, and seconds

(8) Program editing status

> INPUT   : Indicates that data is being input.
> OUTPUT   : Indicates that data is being output.
> SEARCH   : Indicates that a search is being performed.
> EDIT   : Indicates that another editing operation is being performed (insertion, modification, etc.)
> LSK   : Indicates that labels are skipped when data is input.
> RSTR   :   Indicates that the program is being restarted
> COMPARE   : Indicates that a data comparison is being made.
> OFST   : Indicates that the tool length compensation amount measurement mode is set (for the machining center system) or that the tool length compensation amount write mode is set (for the lathe system).
> WOFS   : Indicates that the workpiece origin offset amount measurement mode is set.
> AICC1   : Indicates that operation is being performed in the AI contour control I mode.
> AICC2   : Indicates that operation is being performed in the AI contour control II mode.

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MEM-CHK : Indicates that a program memory check is being made.
WSFT : Indicates that the workpiece shift amount write mode is set.
LEN : Indicates that the active offset value change mode (tool length offset value of the M series) is set.
RAD : Indicates that the active offset value change mode (tool radius compensation amount of the M series) is set.
WZR : Indicates that the active offset value change mode (workpiece origin offset value) is set.
TOFS : Indicates that the active offset value change mode (tool offset value of the M series) is set.
OFSX : Indicates that the active offset value change mode (X-axis tool offset value of the T series) is set.
OFSZ : Indicates that the active offset value change mode (Z-axis tool offset value of the T series) is set.
OFSY : Indicates that the active offset value change mode (Y-axis tool offset value of the T series).
TCP : Indicates that operation is being performed in the tool center point control for 5-axis machining.
TWP : Indicates that operation is being performed in the tilted working plane command mode.
Space : Indicates that no editing operation is being performed.

(9) Warning for data setting or input/output operation

When invalid data is entered (wrong format, value out of range, etc.), when input is disabled (wrong mode, write disabled, etc.), or when input/output operation is incorrect (wrong mode, etc.), a warning message is displayed. In this case, the CNC does not accept the setting or input/output operation (retry the operation according to the message).

Example 1)

    When a parameter is entered

```
A > 1_
WRONG MODE
 EDIT STOP *** ***          12:00:00 PATH1
```
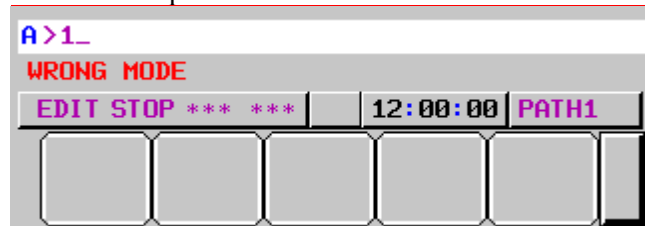
Example 2)

    When a parameter is entered

```
A > 99999999999_
TOO MANY DIGITS
 MDI  STOP *** ***          12:00:00 PATH1
```
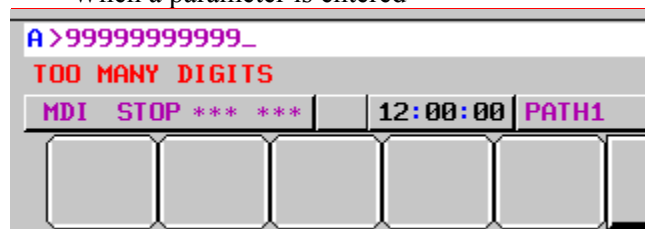
Example 3)

    When a parameter is output to an external input/output device

```
A > _
WRONG MODE
 MEM  STOP *** ***          12:00:00 PATH1
```
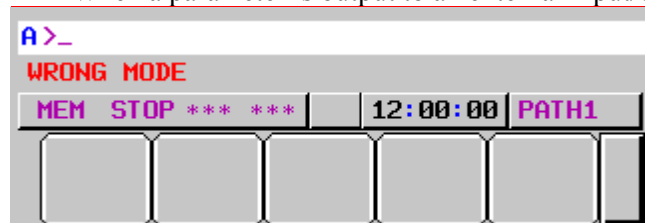
(10) Tool post name

The number of a path whose status is indicated is displayed.

PATH1 : Indicates that the status being indicated is for path 1.

        Other names can be used depending on the settings of parameters 3141 to 3147.

        The tool post name is displayed at the position where (8) is now displayed.
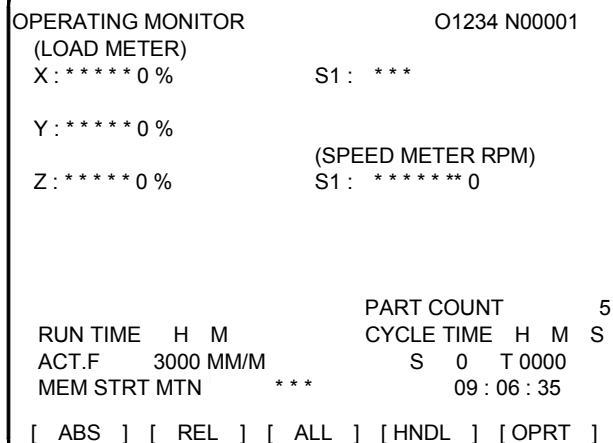
        While the program is edited, (8) is displayed.

1.5   OPERATING MONITOR

Load meter of the servo axis and the serial spindle and the speed meter can be displayed.

1.5.1   Display Method

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

```
OPERATING MONITOR                    O1234 N00001
 (LOAD METER)
 X : * * * * * 0 %              S1 :   * * *

 Y : * * * * * 0 %
                               (SPEED METER RPM)
 Z : * * * * * 0 %              S1 :   * * * * * * 0




                               PART COUNT          5
 RUN TIME   H   M               CYCLE TIME  H  M  S
 ACT.F      3000 MM/M                  S   0   T 0000
 MEM STRT MTN          * * *           09 : 06 : 35

 [  ABS  ]  [  REL  ]  [  ALL  ]  [ HNDL  ]  [ OPRT  ]
```

⚠ **CAUTION**
1 The bar graph for the load meter shows load up to 200%.
2 The bar graph for the speed meter shows the ratio of the current spindle speed to the maximum spindle speed (100%). Although the speed meter normally indicates the speed of the spindle motor, it can also be used to indicate the speed of the spindle by setting bit 6 (OPS) of parameter 3111 to 1.
3 The servo axes for their load meters are displayed are set to parameter No. 3151 to 3153. If parameters 3151 to 3153 are all zero, the load meter of the basic axes are displayed.

1.5.2   **Parameters**

		#7	#6	#5	#4	#3	#2	#1	#0
3111			OPS	OPM					

[Data type]   Bit

OPM   Operating monitor display is:
   0:   Disabled
   1:   Enabled

OPS   The speedometer on the operating monitor screen displays:
   0:   Spindle motor speed
   1:   Spindle speed

1.6   **WAVEFORM DIAGNOSIS DISPLAY**

The waveform diagnosis display function traces values of data such as servo positional deviation amount, torque, and machine signals and plots and displays a graph representing changes in the traced data. This function facilitates servo motor and spindle motor adjustment and fault location when trouble has occurred.

The waveform diagnosis function can trace the following data:
(1) Servo-related data
- Positional deviation amount
- Pulse amount after distribution
- Torque amount
- Pulse amount after acceleration/deceleration
- Current command value
- Heat simulation data
- Composite speed of all axes
(2) Spindle-related data
- Speed of each spindle
- Load meter value
- Spindle-converted positional deviation difference
(3) Machine signal
- ON/OFF state of the external I/O signal specified by a signal address

Up to four servo and spindle data items or up to 32 signals can be traced at the same time.

Data can be traced under the following three conditions:
(1) Data is acquired at any point of time.
(2) Data immediately after a specified event is acquired.
(3) Data immediately before a specified event is acquired.

In condition (1), the time to end tracing can be delayed by a specified time. This allows data before and after the occurrence of an event can be acquired.

Traced data can be output to an external input/output device.

1.6.1   **Waveform Diagnosis Graph Screen**

1   Press the MDI key [SYSTEM].

2   Pressing the [W.DGNS] soft key displays a screen as shown below.

3   Pressing the [(OPRT)] operation soft key displays the following soft keys:
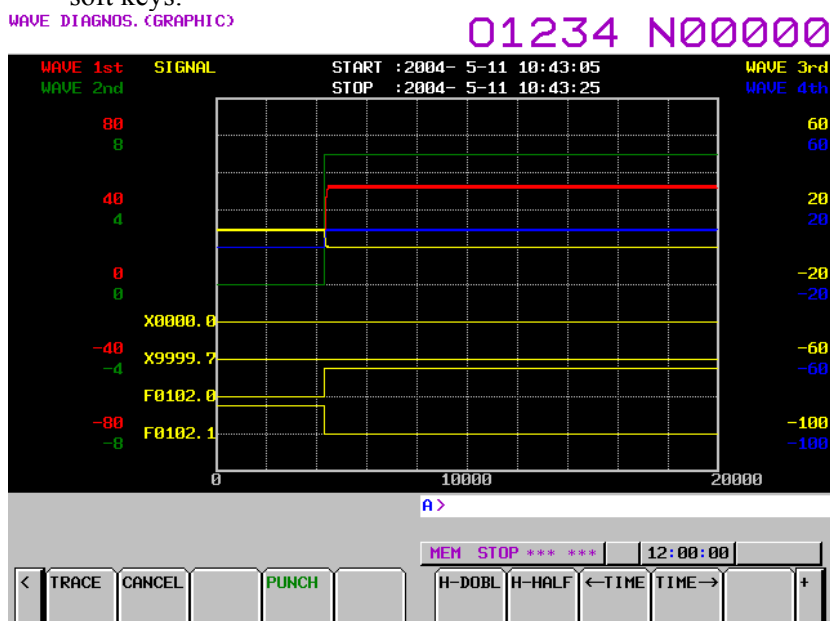
- Servo and spindle data

Each waveform is drawn in a specified color. The numbers and colors of the first and second waveforms are indicated in the upper left part, and the numbers and colors of the third and fourth waveforms are indicated in the upper right part.

- I/O signals

When displayed over the waveforms of servo and spindle data, up to four I/O signals are plotted in the lower half of the screen.

In this case, the addresses of the plotted signals are indicated in the second column on the left side.

When only signal data is displayed, up to nine signals are plotted in the entire screen.

The addresses of the plotted signals are indicated in the first column on the left side.

1.6.2   **Waveform Diagnosis Parameter Screen**

Display

1   Press the MDI key [SYSTEM].

2   Press the soft key [W.DGNS].

3   Pressing the soft key [PARAME] displays the waveform diagnosis parameter screen.

```
ACTUAL POSITION                        01234 N00000
             ABSOLUTE              F                      0MM/MIN
    X₁        318.213      PARTS COUNT              4112
                          RUN TIME              0H15M51S
    Y₁         40.000      CYCLE TIME             0H 0M46S
    Z₁          0.000        WAVEFORM DIAGNOSIS ( PARAMETER )
    A₁          0.000      TRACE SETTING
                             TRACE CONDITION            1
                             1:JUST    2:AFTER   3:BEFORE
             MODAL            SAMPLING CYCLE WAVE (ms)       4
G01  G80  G15   F    100 M    30              SIGNAL (ms)       4
G17  G98  G40.1              TRACE TIME (ms)           10000
G91  G50  G25   H           DELAY TIME (ms)
G22  G67  G160  D           HORIZONTAL GRID (ms)       1000
G94  G97  G13.1
G21  G54  G50.1
G40  G64  G54.2 S
G49  G69  G80.5
HD.T        NX.T            A>
S1      0   OV  0 LM  0
                           MEM  STRT *** FIN    12:00:00
< ABSOLU RELATI ALL              WAVE  WAVE            <OPRT>
  TE     VE                      GRAPH PARAM
```

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Editing

1   Follow the steps explained in "Display" to display the screen.

```
ACTUAL POSITION                                01234 N00000
                    ABSOLUTE        F                    0MM/MIN
X₁            318.213        PARTS COUNT              4112
Y₁             40.000        RUN TIME           0H15M51S
Z₁              0.000        CYCLE TIME          0H 0M46S
A₁              0.000        WAVEFORM DIAGNOSIS ( PARAMETER )
                             TRACE SETTING
                               TRACE CONDITION              1
                               1:JUST    2:AFTER   3:BEFORE
                               SAMPLING CYCLE WAVE (ms)      4
                    MODAL                 SIGNAL (ms)        4
G01  G80  G15   F    100 M    30   TRACE TIME (ms)       10000
G17  G98  G40.1                    DELAY TIME (ms)
G91  G50  G25   H                  HORIZONTAL GRID (ms)   1000
G22  G67  G160  D
G94  G97  G13.1
G21  G54  G50.1
G40  G64  G54.2
G49  G69  G80.5 S
HD.T       NX.T               A>
S1      0  OV  0 LM  0
                             MEM  STRT *** FIN    12:00:00
< ABSOLU RELATI  ALL              WAVE  WAVE              (OPRT)
  TE     VE                       GRAPH PARAM
```

2   Pressing the [↑][↓] cursor keys moves the cursor on the screen.

3   Press numeric keys, then press the |INPUT| MDI key or [INPUT] soft key to set the entered value.

4   Press the [(OPRT)] operation soft key to display the following operation soft keys:

```
INPUT                              EXPLAN  +
```

Pressing [+] displays the following soft keys:

```
TRACE   WAVE   SIGNAL                      +
```
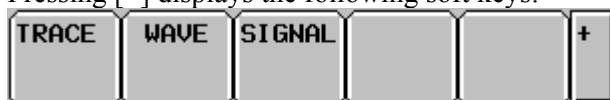
Pressing [TRACE] displays the trace setting screen of the waveform diagnosis parameter screen.
Pressing [WAVE] displays the waveform setting screen of the waveform diagnosis parameter screen.
Pressing [SIGNAL] displays the signal setting screen of the waveform diagnosis parameter screen.

Trace setting

```
┌────────────────────────────────────────┐
│   WAVEFORM DIAGNOSIS ( PARAMETER )      │
│ TRACE SETTING                           │
│                                         │
│   TRACE CONDITION                   1   │
│   1:JUST      2:AFTER    3:BEFORE       │
│                                         │
│   SAMPLING CYCLE WAVE (ms)          4   │
│                 SIGNAL (ms)         4   │
│                                         │
│   TRACE TIME (ms)               10000   │
│                                         │
│   DELAY TIME (ms)                       │
│                                         │
│   HORIZONTAL GRID (ms)           1000   │
│                                         │
└────────────────────────────────────────┘
```

- Trace condition

One of the following three trace conditions can be selected to start and end tracing:

Type 1 (1: JUST)
Data is traced only for a specified period of time immediately after the [TRACE] soft key is pressed.
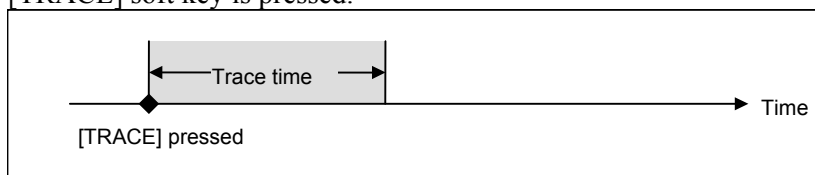
Type 2 (2: AFTER)
When the [TRACE] soft key has been pressed, data is traced only for a specified period of time immediately after a specified trigger event occurs.
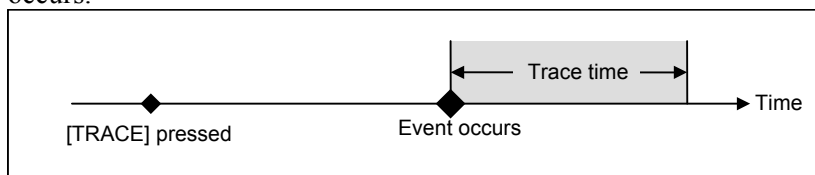
Type 3 (3: BEFORE)
When the [TRACE] soft key has been pressed, data is traced only for a specified period of time immediately before a specified trigger event occurs.

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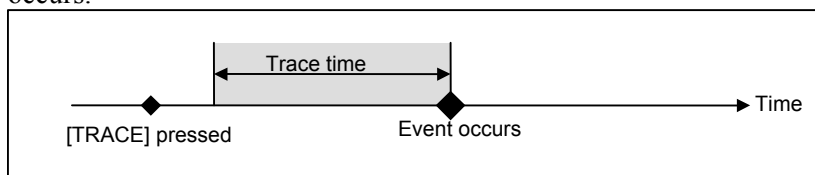
Setting	Trace condition
1	Type 1
2	Type 2
3	Type 3

- Sampling cycle

Set the sampling cycle period for waveforms and the sampling cycle for signals as follows:

Type	Setting
Waveform	Multiple of 2 ranging from 2 ms to 4096 ms
Signal	Multiple of 2 ranging from 2 ms to 4096 ms

- Trace time

Set the period for tracing data.

The trace time specifies a period of time during which tracing is to be performed for waveforms and signals. If the trace period is insufficient, increase the sampling cycle, or decrease the measurement items.

Approximately 32700 points of data can be traced. One point is used for each sampling cycle of one channel. For signal measurement, one channel is used regardless of the number of signals measured at the same time.

When one channel of waveform is traced with a sampling cycle of 4 ms, tracing can be performed for 130 s.

When one channel of waveform is traced with a sampling cycle of 4096 ms, tracing can be performed for 37 hours.

Valid data range: 2 to 133939200
Unit of data: msec
Example of maximum trace time determined by the sampling cycle and the number of channels

No. of channels / Cycle	1ch	4ch + signal
2 ms	65 s	13 s
4 ms	130 s	26 s
8 ms	261 s	52 s
4096 ms	37 hours and 12 minutes	7 hours and 26 minutes

- Delay time

When type 3 is selected as the trace condition, the end of tracing can be delayed by a specified time after the occurrence of an event.
Valid data range: 0 to 65528 (in 8-ms increments)
Unit of data: ms

> **NOTE**
> If the input numeric value is not a multiple of 8 ms, the value is rounded off to the nearest multiple of 8 ms.

- Graduation unit on the horizontal axis

Set an increment per graduation on the horizontal axis.
Valid data range : 1 to 100000000
Unit of data : ms

Trigger setting

```
WAVEFORM DIAGNOSIS ( PARAMETER )
TRIGGER SETTING

  TRIGGER KIND                        1
    1:ALM            2:SIG ON
    3:SIG OFF        4:SIG CHG
    5:ALM+SIG ON     6:ALM+SIG OFF
    7:ALM+SIG CHG

  ALARM KIND                          6
  ALARM No.                         452
  AXIS No.                            1
  SIGNAL ADDRESS
```

- Trigger type

If you specify the occurrence of an event as a trigger when selecting a trace condition in the trace setting of the waveform diagnosis parameter screen (2: AFTER or 3: BEFORE is specified as the trace condition), set the type of the trigger.

If 2 (AFTER) is selected as the trace condition, tracing starts when a set trigger event occurs. If 3 (BEFORE) is selected as the trace condition, tracing ends when the trigger event occurs.

Setting	Trigger type
1	Alarms only
2	A specified signal is turned on.
3	A specified signal is turned off.
4	The status of a specified signal changes.
5	An alarm is issued, or a specified signal is turned on.
6	An alarm is issued, or a specified signal is turned off.
7	An alarm is issued, or the status of a specified signal changes.

- Alarm type

When the issuance of an alarm is specified as a trigger in the setting of the trigger type (the trigger type is set to 1, 5, 6, or 7), set the type of alarms used as a trigger as listed in the table below. When a particular alarm type is not to be specified, use alarm signal AL as the trigger.

Setting	Alarm type
1	PW alarms
2	IO alarms
3	PS alarms
4	OT alarms
5	OH alarms
6	SV alarms
7	SR alarms
8	MC alarms
9	SP alarms
10	DS alarms
11	IE alarms
12	BG alarms
13	SN alarms
14	EX alarms
15	PC alarms

- Alarm No.

If 6 (SV alarms) or 9 (SP alarms) is specified as the alarm type, specify the target alarm number with an integer from 1 to 9999.

- Axis No.

If 6 (SV alarms) or 9 (SP alarms) is specified as the alarm type, specify the target axis for the alarm with an axis number.
To set all axes as the alarm target, set -1.

- Signal address

When use of a signal as a trigger is specified for the trigger type (the trigger type is set to 2, 3, 4, 5, 6, or 7), enter the address of the signal used as the trigger.
With a multi-path PMC, an address on a PMC path is set by specifying the path number together with the address.
Example: 2:F0001.1
As shown in the above example, set a PMC path number plus a colon (:) plus an address.   With the standard PMC, which has just one path, no path number needs to be specified.

NOTE
1   For PMC path numbers, refer to "Multi-Path PMC Function" in "FANUC Series 30*i*-MODEL-A PMC Programming Manual" (B-63983EN).
2   If the keyboard used does not have the ":" key, use ";" or "/" instead of ":".

Waveform setting

```
        WAVEFORM DIAGNOSIS ( PARAMETER )
TRACE WAVE SETTING
   WAVE 1st
      TRACE DATA KIND                              1
      AXIS No.                                     1
      VERTICAL GRID                                1
      COLOR                                        1
   WAVE 2nd
      TRACE DATA KIND                              2
      AXIS No.                                     2
      VERTICAL GRID                                2
      COLOR                                        2
```

```
        WAVEFORM DIAGNOSIS ( PARAMETER )
TRACE WAVE SETTING
   WAVE 3rd
      TRACE DATA KIND                              3
      AXIS No.                                     3
      VERTICAL GRID                                3
      COLOR                                        3
   WAVE 4th
      TRACE DATA KIND                              4
      AXIS No.                                     4
      VERTICAL GRID                                4
      COLOR                                        4
```

- Trace data type

Set the type number of data to be traced as listed below:

Setting	Type	unit
0	(Not traced)	
1	Servo positional deviation	Pulse (detection unit)
2	Servo pulses after distribution	Pulse (detection unit)
3	Servo torque	%
4	Servo pulses after acceleration/deceleration	Pulse (detection unit)
5	Actual servo speed	Pulse (detection unit)
6	Servo current command value	%
7	Servo heat simulation data	%
8	Composite speed of all axes	MM/MIN or RPM
9	Spindle speed	RPM
10	Spindle load meter	%
11	Difference in spindle-converted positional deviation	Pulse (detection unit)

> **NOTE**
> The servo torque and current command value are represented by percentages to parameter No. 2086 (rated current).

- Axis number/path number

Specify an axis number or path number according to the type of data to be traced as follows:

Type	Setting
Servo positional deviation	Controlled axis number (1 to 32)
Servo pulses after distribution	
Servo torque	
Servo pulses after acceleration/deceleration	
Actual servo speed	
Servo current command value	
Servo heat simulation data	
Composite speed of all axes	Path number (1 to 10)
Spindle speed	Controlled spindle number (1 to 8)
Spindle load meter	
Difference in spindle-converted positional deviation	

- Graduation unit on the axis

Set an increment per graduation on the vertical axis. This setting is valid for servo and spindle data.
Valid data range : 1 to 100000000

- Waveform color

Set the number of a color to be used for drawing the waveform as listed below.
The numbers represent associated system colors.

Setting	Default drawing color (Associated system color)
0	Black (Data display color)
1	Red (Alarm display color)
2	Green (Title display color)
3	Yellow (Cursor display color)
4	Blue (Subtitle display color)
5	Purple (Input key display color)
6	Blue (Color selection window bar display color)
7	White (Background color for specifiable data)

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Signal setting

```
┌──────────────────────────────────────────┐
│ WAVEFORM DIAGNOSIS ( PARAMETER )          │
│ SIGNAL                                    │
│   SIGNAL ADDRESS                          │
│       1│ 1:X0000.0 │  11│ 1:Y0000.0 │     │
│       2│ 1:X9999.7 │  12│ 1:Y9999.7 │     │
│       3│ 2:X0000.0 │  13│           │     │
│       4│ 2:X9999.7 │  14│           │     │
│       5│ 3:X0000.0 │  15│           │     │
│       6│ 3:X9999.7 │  16│           │     │
│       7│           │  17│           │     │
│       8│           │  18│           │     │
│       9│           │  19│           │     │
│      10│           │  20│           │     │
└──────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────┐
│ WAVEFORM DIAGNOSIS ( PARAMETER )          │
│ SIGNAL                                    │
│   SIGNAL ADDRESS                          │
│      21│ F0000.0   │  31│ G0000.0   │     │
│      22│ F9999.7   │  32│ G9999.7   │     │
│      23│           │                      │
│      24│           │                      │
│      25│           │                      │
│      26│           │                      │
│      27│           │                      │
│      28│           │                      │
│      29│           │                      │
│      30│           │                      │
└──────────────────────────────────────────┘
```

- Signal setting

When the ON/OFF state of an input/output signal is to be traced, set the address of the signal.

With a multi-path PMC, an address on a PMC path is set by specifying the path number together with the address.

Example: 2:F0001.1

As shown in the above example, set a PMC path number plus a colon (:) plus an address.   With the standard PMC, which has just one path, no path number needs to be specified.

> **NOTE**
> 1 For PMC path numbers, refer to "Multi-Path PMC Function" in "FANUC Series 30*i*-MODEL-A PMC Programming Manual" (B-63983EN).
> 2 If the keyboard used does not have the ":" key, use ";" or "/" instead of ":".
> 3 For signal data, even when just one signal address is input in an address 1 to 32, one channel is used.
> 4 When tracing is not performed, enter 0.
> 5 Up to 32 signals can be measured at the same time.

Guide to selecting items
- Alarm type

1   When the [(OPRT)] soft key is pressed with the cursor positioned at the alarm type in the trigger setting, the [EXPLAIN] soft key appears.

INPUT				EXPLAN	+

2   Pressing the [EXPLAIN] soft key displays a list of alarm types.

```
        WAVEFORM DIAGNOSIS ( PARAMETER )
 ALARM KIND

      1:PW alarm            2:IO alarm
      3:PS alarm            4:OT alarm
      5:OH alarm            6:SV alarm
      7:SR alarm            8:MC alarm
      9:SP alarm           10:DS alarm
     11:IE alarm           12:BG alarm
     13:SN alarm           14:EX alarm
     15:PC alarm
```
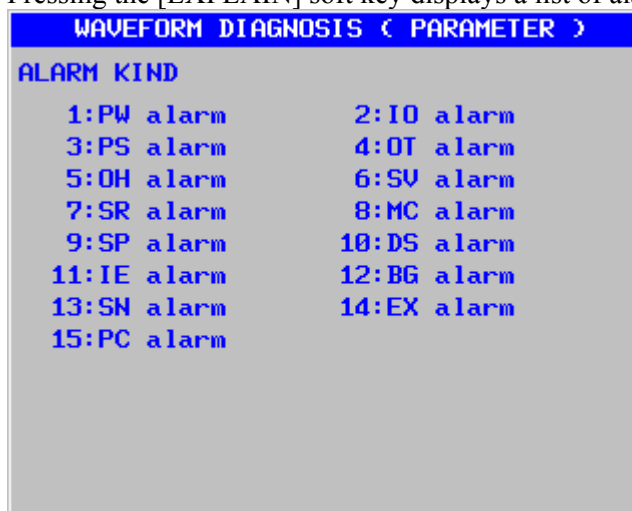
- Data type

1   When the [(OPRT)] soft key is pressed with the cursor positioned at the trace data type in the trace waveform setting, the [EXPLAIN] soft key appears.

2 Pressing the [EXPLAIN] soft key displays a list of trace data types.

```
WAVEFORM DIAGNOSIS ( PARAMETER )

TRACE DATA KIND

   1:SERVO POSITION ERROR
   2:SERVO PULSE AFTER DISTRIBUTION
   3:SERVO TORQUE
   4:SERVO PULSE AFTER ACC/DEC
   5:SERVO VELOCITY
   6:SERVO ELECTRIC CURRENT COMMAND
   7:DATA DURING HEAT SIMULATION
   8:COMPOSITE SPEED FOR ALL AXIS
   9:SPINDLE SPEED
  10:SPINDLE LOAD METER
  11:SPINDLE SYNCHRONOUS ERROR
```
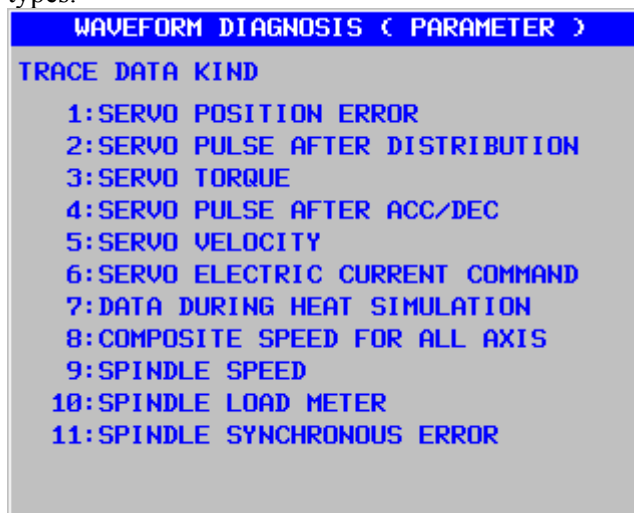
- Waveform color

1 When the [(OPRT)] soft key is pressed with the cursor positioned at the waveform color in the trace waveform setting, the [EXPLAIN] soft key appears.

2 Pressing the [EXPLAIN] soft key displays a list of waveform colors

```
WAVEFORM DIAGNOSIS ( PARAMETER )

COLOR

   0 :
   1 :
   2 :
   3 :
   4 :
   5 :
   6 :
   7 :
```

1.6.3   **Tracing Data**

Starting tracing

1   Display the waveform diagnosis graph screen.
2   Press the [TRACE] soft key to start tracing.

"Now Sampling…" appears in the upper part of the screen.   When tracing ends, the indication "Now Sampling…" disappears.
Even when the screen display is changed to another screen, tracing continues.
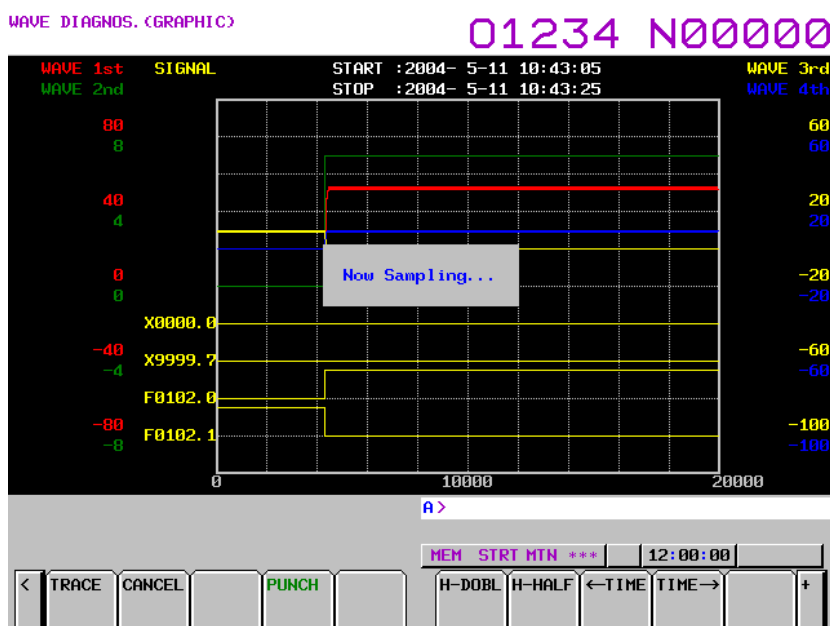
Canceling tracing

When the [CANCEL] soft key is pressed during tracing, tracing stops.

Moving, extending, and reducing a waveform

When [H-DOBL] or [H-HALF] is pressed, the length of the time axis on one screen is extended or reduced, respectively.
When a waveform cannot fit in one screen, the time axis can be moved by pressing [←TIME] or [TIME→].
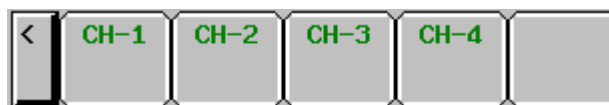
Furthermore, pressing [CH-1], [CH-2], [CH-3], or [CH-4], a submenu appears.

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<	WAV. EX	WAV. RE	WAV. ↑	WAV. ↓	
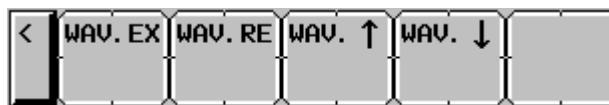
When [WAVE.EX] or [WAVE.RE] is pressed, the length of the time axis on one screen is extended or reduced, respectively. The graduation unit on the horizontal axis, which is a parameter, also changes automatically.

The graduation unit changes from 1 to 2 to 5 to 10 to 20 to 50 to 100, and so on.

When [WAVE.↑] or [WAVE.↓] is pressed, each waveform of servo and spindle data can be moved upward or downward.

Displaying signal data

SIG ↑	SIG ↓				+

Up to 32 signals can be measured at the same time. Up to nine signals can be displayed at the same time if only signal data is displayed, or up to four signals can be displayed if signal data is displayed over waveforms.

When [SIG.↑] or [SIG.↓] is pressed, the currently displayed signals are changed.

NOTE
Signal data cannot be moved.

1.6.4   **Outputting Data**

Waveform diagnosis data can be output to an input/output device.

Specifying a format

When outputting data, you can select one of the two formats, which are the FS16*i* compatible format (called the 16 compatible format hereinafter) and the FS30*i* format (called the 30 format hereinafter). If bit 0 (IOF) of parameter No. 10600 is set to 0, the 30 format is selected; if bit 0 (IOF) of parameter No. 10600 is set to 1, the 16 compatible format is selected.

Output format

Traced data is input or output as a text file with the following format:

- Identifiers

Identifier word (T)	Meaning
T0/T1	Header
T60	Servo positional deviation
T61	Servo pulses after distribution
T62	Servo torque
T63	Actual servo speed
T64	Servo current command value
T65	Servo heat simulation data
T68	Measurement item
T69	Date and time (start of measurement)
T70	Servo pulses after acceleration/deceleration
T75	Composite speed of all axes
T80	Spindle speed
T81	Spindle load meter
T82	Difference in spindle-converted positional deviation
T90	Measurement period (waveform)
T91	Measurement period (signal)
T92	Date and time (end of measurement)
T98	Signal data

(1) Header
     30 format

```
T  1  C  W  A  V  E     D  I  A  G  N  O  S  ;
```

16 compatible format

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

(2) Date and time of start/end of tracing
    -     Starting date and time

```
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│ T │ 6 │ 9 │ D │ * │ * │ * │ * │ * │ * │ * │ * │ , │ * │ * │ * │ * │ * │ * │ ; │
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
                ├──── Year ────┤─Month─┤─ Day ─┤   ├─ Hour ┤─ Min ─┤─ Sec ─┤
```

    -     Ending date and time

```
┌───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┬───┐
│ T │ 9 │ 2 │ D │ * │ * │ * │ * │ * │ * │ * │ * │ , │ * │ * │ * │ * │ * │ * │ ; │
└───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┴───┘
                ├──── Year ────┤─Month─┤─ Day ─┤   ├─ Hour ┤─ Min ─┤─ Sec ─┤
```

> **NOTE**
>   The ending date and time is output only in the 30 format.

(3) Waveform sampling cycle

```
┌───┬───┬───┬───┬───┬───┬───┬───┬───┐
│ T │ 9 │ 0 │ D │ * │ * │ * │ * │ ; │
└───┴───┴───┴───┴───┴───┴───┴───┴───┘
                    └──────┬──────┘
                           └──────► Waveform sampling cycle
```

(4) Signal sampling cycle

```
┌───┬───┬───┬───┬───┬───┬───┬───┬───┐
│ T │ 9 │ 1 │ D │ * │ * │ * │ * │ ; │
└───┴───┴───┴───┴───┴───┴───┴───┴───┘
                    └──────┬──────┘
                           └──────► Signal sampling peric
```

> **NOTE**
>   The waveform sampling cycle and signal sampling cycle are output only in the 30 format.

(5)   Selection items

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

	Measurement item	Axis No./path No./signal address
P0	Servo positional deviation	Controlled axis number (1 to 32)
P1	Servo pulses after distribution	
P2	Servo torque	
P3	Actual servo speed	
P4	Servo current command value	
P5	Servo heat simulation data	
P6	Servo pulses after acceleration/deceleration	
P10	Composite speed of all axes	Path number (1 to 10)
P20	Spindle speed	Controlled spindle number (1 to 8)
P21	Spindle load meter	
P22	Difference in spindle-convert positional deviation	
P30	Signal	Signal address

NOTE
   Items P6 to P30 are output only in the 30 format.

(6) 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 | * | * | , | * | * | , | ~ | * | * | ; |

| T | 7 | 0 | D | * | * | , | * | * | , | ~ | * | * | ; |

| T | 7 | 5 | D | * | * | , | * | * | , | ~ | * | * | ; |

| T | 8 | 0 | D | * | * | , | * | * | , | ~ | * | * | ; |

| T | 8 | 1 | D | * | * | , | * | * | , | ~ | * | * | ; |

| T | 8 | 2 | D | * | * | , | * | * | , | ~ | * | * | ; |

| T | 9 | 8 | D | * | * | , | * | * | , | ~ | * | * | ; |

D** ~ ** : Waveform diagnosis data × No. of axes/No. of
paths/No. of signals

Blocks are output in the following order:

Header	(16 compatible/30 format)
Date and time (start of measurement)	(16 compatible/30 format)
Date and time (end of measurement)	(30 format only)
Waveform measurement period	(30 format only)
Signal measurement period	(30 format only)
Selection item	(16 compatible/30 format)
Waveform diagnosis data	(16 compatible/30 format)

NOTE
Signal data of waveform diagnosis data is output
after all waveform data is output.

・**Sample file**

```
T01WAVE DIAGNOSE                    ◄───────────────── Header
T69D20040101,120125                 ◄───────────────── Start time
T92D20040101,120130                 ◄───────────────── End time
T90D2                    ◄──────────────────────────── Waveform period
T91D4                    ◄──────────────────────────── Signal period
T68P0D1,2                  ◄────────────────────────── Measurement item/axis
T68P4D1
T68P10D1
T68P30DG0010.4,G0010.5,G0010.6          ◄───────────── Measurement item/signal
T60D643,6420                  ◄──────────────────────── Waveform data
T64D270
T75D1855
T60D673,6451
T64D265
T75D1855
T60D702,6480
T64D268
T75D1855
   :
T75D1855
T98D0,0,1                  ◄────────────────────────── Signal data
T98D0,0,1
T98D0,0,1
   :
```

Outputting a file

1   Display the waveform diagnosis graph screen.
2   When the [(OPRT)] operation soft key is pressed, soft keys are displayed in the following operation selection state:

<	TRACE	CANCEL		PUNCH	

3   Change the mode to the EDIT mode.
4   Enter a file name in the key-in buffer, and press the [PUNCH] soft key.   If no file name is input, the file name is assumed to be WAVE-DGN.TXT by default.
5   Press the [EXEC] soft key shown below to start outputting data:

<				CAN	EXEC

6   When data output ends, or when the [CAN] soft key is pressed, the initial operation selection state is restored.

NOTE
  While data is being traced, data output is not
  allowed.

Parameter

10600	#7	#6	#5	#4	#3	#2	#1	#0
								IOF

[Input type]   Parameter input
[Type of data]   Bit

 # 0   **IOF**   The output format used for waveform diagnosis is:
0:   30*i* /31*i* /32*i* format (30 format).
1:   16*i* /18*i* /21*i* format (16 compatible format).

1.7   COLOR SETTING SCREEN

On the color setting screen, the colors of the VGA screen can be set.

1.7.1   Screen Display

1   Press the function key   SYSTEM   .
2   Press the continuous menu key   ▷   several times until the
     [COLOR] soft key is displayed.
3   Pressing the [COLOR] soft key displays the color setting screen.

```
COLORING                                    O0000   N00000

[ 1 ] ■  -ALARM                    8 ■  -SELECT WINDOW BAR

  2 ■  -TITLE      -SOFT KEY 1      9 ■  -NONE

  3 ■  -INPUT KEY -O/N NO.         10 ■  -TITLE BAR
        -STATUS                           -INPUT BAR
  4 ■  -CURSOR                     11 ■  -WINDOW BACKGROUND

  5 ■  -RESTART NO.                12 ■  -LIGHT
        -ABSOLUTE ORDER
  6 ■  -SUB TITLE                  13 ■  -ALTER POSSIBLE DATA
        -SOFT KEY 2
  7 ■  -DATA      -TIME            14 ■  -SHADOW

                                   15 □  -BACKGROUND


                           RED  00   GREEN  08    BLUE  00

                           COLOR SELECT NO.   1 (PARAMETER)

                           MEM  ****   ***   ***  *** 12:34:56

         COLOR  MAINTE M-INFO           (OPRT)  +
```

1.7.2   **Operations for Color Setting**

● **Modification to color settings (color palette values)**

1   Pressing the [(OPRT)] soft key displays the following operation
     soft keys:

RED	GREEN	BLUE	BRIGHT	DARK	+

2   Move the cursor to a color number whose color palette values are
     to be modified.
     The current color palette values of the individual color elements
     are displayed.
3   Select a color element to be modified, with the [RED], [GREEN],
     or [BLUE] operation soft key.
     Multiple color elements can be selected at a time.
     Each of the [RED], [GREEN], and [BLUE] soft keys toggles
     between selection and deselection each time the soft key is
     pressed.
     (The [RED], [GREEN], and [BLUE] soft keys, when not
     displayed, can be displayed by pressing the rightmost soft key.)
4   By pressing the [BRIGHT] or [DARK] operation soft key,
     modify the brightness of the selected color element.

● **Storing color settings (color palette values)**

Set color palette values can be stored.

MEMORY	RECALL	COLOR1	COLOR2	COLOR3	+

1   Select a storage area by pressing the [COLOR1], [COLOR2], or
     [COLOR3] operation soft key.
     Color 1─Color 1 (standard color) data parameters (Nos. 6581 to
     6595)
     Color 2┬Color 2 data parameters (Nos. 10421 to 10435)
     Color 3┘ Color 3 data parameters (Nos. 10461 to 10475)

2   Press the [STORE] operation soft key. The following operation
     soft keys are displayed:

			CAN	EXEC	+

3   Press the [EXEC] operation soft key. The current color palette
     values are stored in the selected area.
     Pressing the [CAN] operation soft key or the leftmost key does
     not store the current color palette values.

• **Calling color settings (color palette values)**

MEMORY	RECALL	COLOR1	COLOR2	COLOR3	+

1   Select an area for storing color palette values by pressing the
    [COLOR1], [COLOR2], or [COLOR3] operation soft key.
    (The [COLOR1], [COLOR2], and [COLOR3] soft keys, when
    not displayed, can be displayed by pressing the rightmost soft
    key.)

2   Press the [RECALL] operation soft key. The following operation
    soft keys are displayed:

			CAN	EXEC	+

3   Press the [EXEC] operation soft key. Color palette values are
    called from the selected area for modification to the color
    settings. This operation is invalid if no color palette values are
    stored.
    Pressing the [CANCEL] operation soft key or the leftmost key
    does not call color palette values.

1.7.3   **Parameter**

6581	**Standard color data of character color number 1**
6582	**Standard color data of character color number 2**
6583	**Standard color data of character color number 3**
6584	**Standard color data of character color number 4**
6585	**Standard color data of character color number 5**
6586	**Standard color data of character color number 6**
6587	**Standard color data of character color number 7**
6588	**Standard color data of character color number 8**
6589	**Standard color data of character color number 9**
6590	**Standard color data of character color number 10**
6591	**Standard color data of character color number 11**
6592	**Standard color data of character color number 12**
6593	**Standard color data of character color number 13**
6594	**Standard color data of character color number 14**
6595	**Standard color data of character color number 15**

[Data type]   2-word
[Unit of data] rrggbb 6-digit number
                (rr: Red data, gg: Green data, bb: Blue data)
                When a number shorter than 6 digits is specified, the unspecified
                higher digit or digits are treated as 0.

[Valid data range]   00 to 15 for each color data (same as the tone level on the color setting screen)
When a value equal to or greater than 16 is specified, the specification of 15 is assumed.

(Example)   When setting the color tone level as red = 1, green = 2, and blue = 3, specify "10203".

1.7.4   Notes

(1) Immediately after the power is turned on, color 1 (parameter) is used as the screen color.
If no color palette values are stored in color 1, the FANUC standard color is used for display.

(2) Do not modify the parameters of the standard color data by direct MDI key input. When modifying the parameters of the standard color data, be sure to perform a storage operation on the color setting screen.

(3) If the screen display becomes invisible because an incorrect value is input in a standard color data parameter, turn off the power then turn on the power again while holding down the DELETE + RESET keys. All stored color data is cleared, and the screen is displayed in the FANUC standard color.
This operation, however, clears all contents of the memory including parameters and programs. Take special care when performing this operation.

1.8   **POWER MATE CNC MANAGER FUNCTION**

When the I/O Link Option for the FANUC servo unit β series (called I/O Link β below) is used for CNC additional axes (slaves), the Power Mate CNC manager function can be used to display and set up various types of data of these slaves on the CNC.

The Power Mate CNC manager function enables the following display and setting operations:
Current position display (absolute/machine coordinates)
Parameter display and setting
Alarm display
Diagnosis data display
System configuration screen display

Up to eight slaves can be connected to each I/O Link channel.

1.8.1   **Screen Display**

1   Press the function key |SYSTEM|.

2   Press the continuous menu key |▷| several times until the
     | P. MATE MGR. | soft key is displayed.

| | | | | | | FSSB | PARAM TUNING | P.MATE MGR. | (OPRT) | + |

3   Pressing the [P.MATE MGR.] soft key displays the absolute
     coordinate screen, which is the initial screen of the Power Mate
     CNC manager.   On this screen, you can select each of the
     following items by pressing the corresponding soft key:
     ABS: Absolute coordinate display
     MACHIN: Machine coordinate display
     PARAM: Parameter screen
     MSG: Alarm list
     DGNOS: Diagnosis screen
     SYSTEM: System information
     To select another function after one of the functions listed above
     is selected, press the return menu key |◁| until the soft keys
     appear as shown above.   Then, select the desired function.

4   Terminating the Power Mate CNC manager function
     Press the return menu key once or twice.   The soft keys of the
     CNC system appear, and the Power Mate CNC manager
     terminates.
     Alternatively, you can select another function by pressing an
     MDI function key (|POS|, |PROG|, |MESSAGE|, etc.) to terminate the
     Power Mate CNC manager function.

Selecting a slave

When slaves are connected to multiple I/O Link channels, pressing
[NEXT CHANNEL] or [PREVIOUS CHANNEL] displayed by
pressing the [(OPRT)] soft key changes the displayed channel.
In the upper section of the screen, the following information items are
displayed for the connected slaves (up to eight slaves):
-    I/O Link group number (0 to 15)
-    Alarm status
The cursor is positioned at the number of the slave for which to
display information (active slave).   When multiple slaves are
connected, pressing the [NEXT SLAVE] or [PREVIOUS SLAVE]
changes the active slave.
You can display the slave status and select a slave on any screen of the
Power Mate CNC manager function.

Current position display screen

The current position display screen displays the current position and actual feedrate of the slave.

The following current position data is displayed:

Absolute coordinate (current position in the absolute coordinate system)

Machine coordinate (current position in the machine coordinate system)

- Display method

Press the [ABS] or [MACHIN] soft key. The absolute or machine coordinate screen appears as follows:
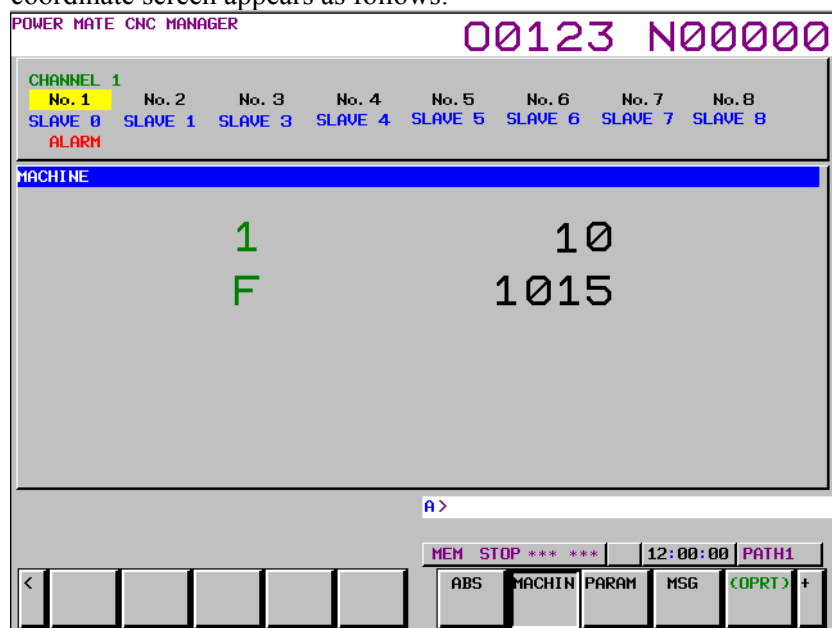
Power Mate CNC manager: Machine coordinate screen

Axis name display

You can change the axis name by setting it in the I/O Link β parameters (Nos. 0024 and 0025). Up to two characters can be set. (Use the ASCII codes of 0 to 9 and/or A to Z). When no axis name is set or the setting data is invalid, the axis name is set to 1.

This axis name is used only for position display of the Power Mate CNC manager function and irrelevant to the controlled axis on the CNC.

Parameter screen

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

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

This screen displays only the bit and decimal data. For details of the parameters, refer to FANUC SERVO MOTOR β series I/O Link Option Maintenance Manual.

- Selecting and searching for a parameter
  1. First, select the active slave.
  2. Press the [(OPRT)] soft key. The following soft keys appear:

  3. Enter a parameter number and press the [NO. SRH] soft key. The search starts.

     You can also select a desired parameter number by pressing the cursor keys ⬆ ⬇ ⬅ ➡ and page keys ⬆PAGE PAGE⬇ and moving the cursor.

- Setting a parameter
  You can directly set an I/O Link β parameter of the slave from the CNC.
  1   Select a desired parameter using either of the above methods.
  2   Press the [(OPRT)] soft key.   The following soft keys appear:

| < | NO. SRH | READ β→NC | PUNCH NC→β | | INPUT | NEXT SLAVE | PREV. SLAVE | | NEXT CH | PREV. CH | |

  3   Enter setting data.
  4   Press the [INPUT] soft key or MDI key INPUT .

Alarm screen

If an alarm is issued for the slave, "ALARM" is displayed in the slave status field in the upper section of the screen.
At this time, you can display the alarm screen to check the details of the alarm.
Up to 40 alarm codes are displayed on the screen.
For details of the alarms, refer to FANUC SERVO MOTOR β series I/O Link Option Maintenance Manual.

- Display method

Press the [MSG] soft key.   On the screen, only error codes are displayed.

POWER MATE CNC MANAGER   O0123 N00000

```
CHANNEL 1
  No. 1    No. 2    No. 3    No. 4    No. 5    No. 6    No. 7    No. 8
SLAVE 0  SLAVE 2  SLAVE 3  SLAVE 4  SLAVE 5  SLAVE 6  SLAVE 7  SLAVE 8
 ALARM

ALARM

        442           210           232
```

A>

MEM STOP *** ***   12:00:00 PATH1

| < | | | | | ABS | MACHIN | PARAM | MSG | (OPRT) | + |
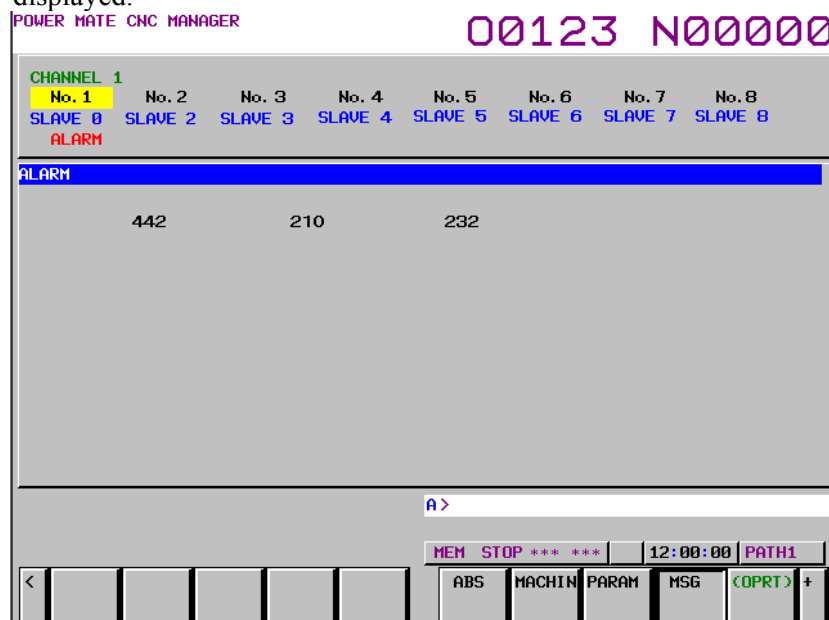
Example of displaying alarms for I/O Link β of slave 0

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Diagnosis screen

The diagnosis screen displays diagnosis information of the slave.
Diagnosis data is displayed in bit or integer (decimal) representation.
For details of diagnosis data, refer to FANUC SERVO MOTOR β series I/O Link Option Maintenance Manual.

- Display method

1   Press the continuous menu key ⊳.
2   Press the [DGNOS] soft key to select the diagnosis screen.
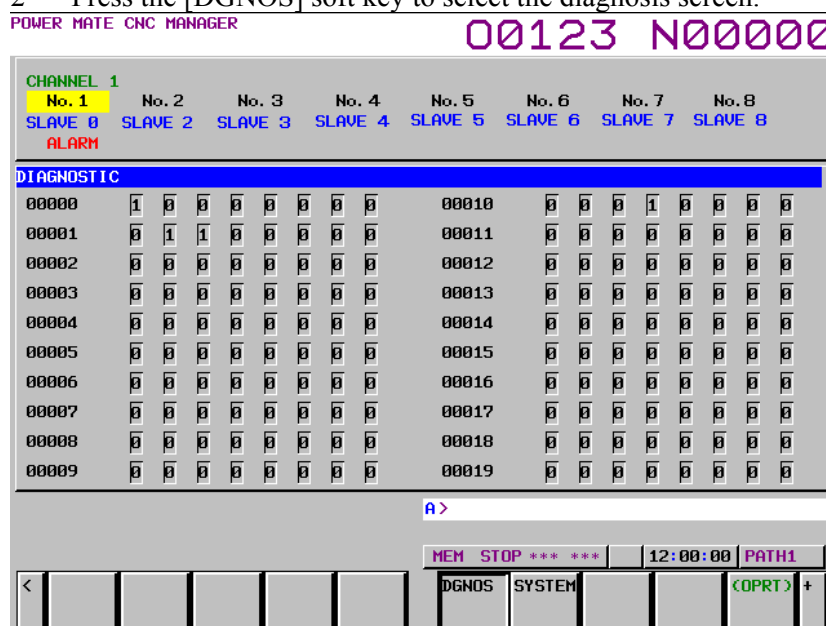
Searching for diagnosis data

1   First, select the active slave.
2   Press the [(OPRT)] soft key.   The following soft keys appear:
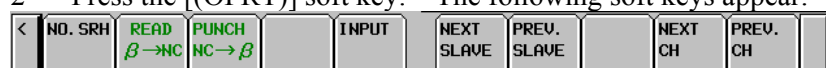
3   Enter a diagnosis number and press the [NO. SRH] soft key.
The search starts.
You can also select a desired parameter number by pressing the cursor keys ⬆ ⬇ and page keys PAGE⬆ PAGE⬇ and moving the cursor.

System configuration screen

The system configuration screen displays the system software information of the slave.

- Display method

1   Press the continuous menu key $\boxed{\triangleright}$.
2   Press the [SYSTEM] soft key to select the system configuration screen.

```
POWER MATE CNC MANAGER                    O0123  N00000

CHANNEL 1
 No.1      No.2      No.3      No.4      No.5      No.6      No.7      No.8
SLAVE 0   SLAVE 1   SLAVE 3   SLAVE 4   SLAVE 5   SLAVE 6   SLAVE 7   SLAVE 8
 ALARM

SYSTEM CONFIGURATION

  SYSTEM        SERVO AMPLIFIER UNIT β series

  SERIES        88A1

  EDITION       0026




                                         A>

                              MEM  STOP *** ***    12:00:00 PATH1
 <                            DGNOS SYSTEM              <OPRT> +
```
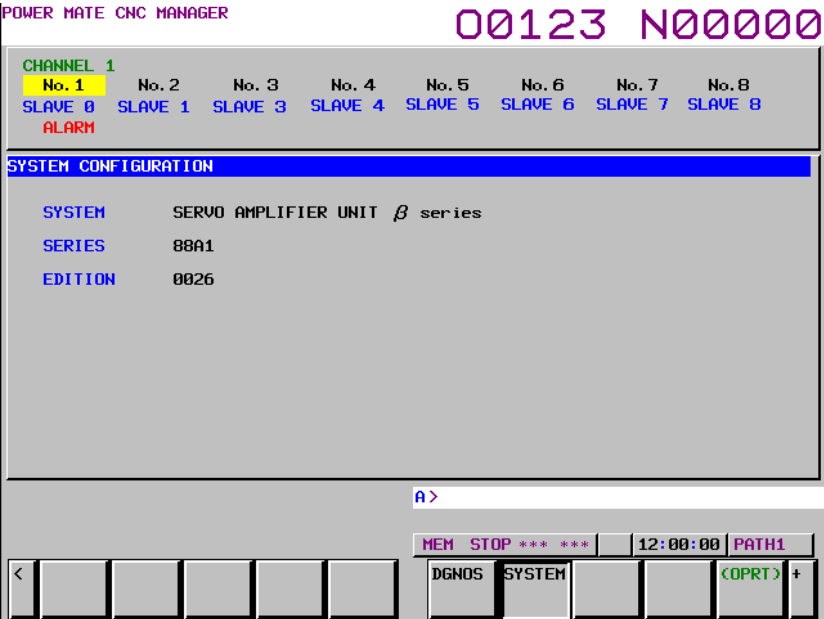
Series and edition of the I/O Link β system software

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1.8.2   Inputting and Outputting Parameters

Outputting parameters

Parameters are output to the CNC memory or a memory card as a data file in the program format.   Set the first registration program number in parameter No. 8760.   For each slave, program with a predetermined number is created.

When parameters are output to the CNC memory, a program with the specified program number is created.

When parameters are output to a memory card, a file is created, of which file name consists of the specified program number and an extension PMM.

Program number =   setting-of-parameter (parameter No. 8760) + (m - 1) $\times$ 100 + n $\times$ 10

    m: Channel number (1 to 4)

    n: Group number

Example: When parameter No. 8760 is set to 8000

    Channel 1 (I/O Link β: Group 0)

        8000 + 0*100 + 0*10 = 8000

    Channel 2 (I/O Link β: Group 1)

        8000 + 1*100 + 1*10 = 8110

    Channel 3 (I/O Link β: Group 2)

        8000 + 2*100 + 2*10 = 8220

    Channel 4 (I/O Link β: Group 3)

        8000 + 3*100 + 3*10 = 8330

The group number is the slave number displayed in the slave status field in the upper section of the screen in reverse video.

When bit 3 (PMO) of parameter No. 0961 is set to 1, the numbers of the parameters to be output can be set only with a group number.

Select a desired input device using bits 1 (MD1) and 2 (MD2) of parameter No. 0960.

Connect a memory card or check the unused area of the CNC memory, then follow the steps below:

1   For multipath control, display the Power Mate CNC manager screen from the screen for path 1.

2   Select the active slave.

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

| < | NO. SRH | READ β→NC | PUNCH NC→β | | INPUT | NEXT SLAVE | PREV. SLAVE | | NEXT CH | PREV. CH | |
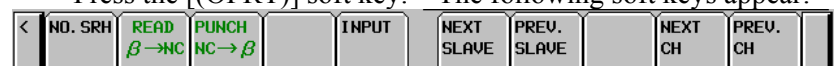
3   Press the [READ] soft key.   The following soft keys appear:

| < | | | | CAN | EXEC | | | | | | |

4   Press the [EXEC] soft key.

    During input, "INPUT" blinks in the message field.

> **NOTE**
> 1 Parameters can be saved in other than the MEM mode or in the emergency stop status.
> 2 To save parameters in a memory card, if a file with the same name is found in the memory card, the parameters cannot be saved.   Delete the file from the memory card or change the file name by setting parameter No. 8760.
>   To save parameters in a program area, save operation is performed according to the setting of bit 2 (REP) of parameter No. 3201.

Inputting parameters

A data file of parameters output to the CNC memory or a memory card as a program is input to the slave determined by the program number.   The program number and memory device are determined as described in "Outputting parameters."

1   For multipath control, display the Power Mate CNC manager screen from the screen for path 1.
2   Select the active slave.
3   Press the [(OPRT)] soft key.   The following soft keys appear:

| < | NO. SRH | READ β→NC | PUNCH NC→β | | INPUT | NEXT SLAVE | PREV. SLAVE | | NEXT CH | PREV. CH | |
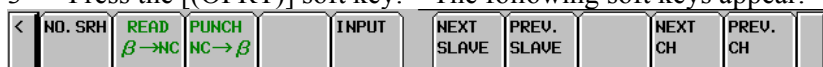
4   Press the [PUNCH] soft key.   The following soft keys appear:

| < | | | CAN | EXEC | | | | | | | |

5   Press the [EXEC] soft key.
    During output, "OUTPUT" blinks in the message field.

> **NOTE**
> 1 Parameters can be input in other than the MEM mode or in the emergency stop status.
> 2 For multipath control, parameters can be input and output only using the Power Mate CNC manager screen for path 1.   They can only be input from and output to the CNC memory for path 1.

1.8.3   **Parameters**

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

[Input type]   Setting input
[Data type]   Bit path

#1   **MD1**
#2   **MD2**   The slave parameters are input from and output to either of the following devices:

Parameter MD2	Parameter MD1	I/O destination
0	0	Program memory
0	1	Memory card

#3   **PMN**   The Power Mate CNC manager function is:
0:     Enabled.
1:     Disabled. (Communication with the slave is not performed.)

#4   **PPE**   Setting slave parameters using the Power Mate CNC manager:
0:     Can always be performed regardless of the setting of PWE.
1:     Follows the setting of PWE.

	#7	#6	#5	#4	#3	#2	#1	#0
0961					PMO			

[Input type]   Parameter input
[Data type]   Bit

#3   **PMO**   The O number of a program for saving and restoring the I/O LINK β parameter is set based on:
0:     Group number and channel number
1:     Group number only

8760	**Program number of data input/output (Power Mate CNC manager)**

[Input type]   Setting input
[Data type]   2-word path
[Valid data range]   0 to 99999999
                     This parameter sets the program numbers of programs to be used for inputting and outputting slave data (parameters) when the Power Mate CNC manager function is used.
                     For a slave specified with I/O LINK channel m and group n, the following program number is used:
                     Setting + (m - 1) × 100 + n × 10

                     If the setting is 0, the parameters of the slave specified with channel 1 and group 0 cannot be input from or output to the CNC memory because the program number is set to 0.   The parameters can be input from and output to a memory card.

(Set a value with which any used program number does not exceed 99999999.)

Warning

If an alarm is issued for the Power Mate CNC manager, a warning message is displayed.

Message	Description
DATA ERROR	An attempt was made to execute [PUNCH] (NC → β) for a program not found in the program area.
WRITE PROTECTED	An attempt was made to execute [READ] (β → NC) for a program area when the memory protection signal (KEY) is off.
EDIT REJECTED	An attempt was made to execute [READ] (β → NC) when the program area already contained a program with the same name as that to be created by executing [READ] (β → NC). An attempt was made to execute [READ] (β → NC) when the number of the program to be created by executing [READ] (β → NC) was selected. An attempt was made to execute [READ] (β → NC) when bit 0 (TVC) of CNC parameter No. 0000 was set to 1. (Parameters Nos. 0000 to 0019 are output, but parameter No. 0020 and subsequent parameters are not output.) An attempt was made to execute [PUNCH] (NC → β) when a memory card did not contain any program for which [PUNCH] (NC → β) could be executed. An attempt was made to execute [READ] (β → NC) for a protected memory card.
NO MORE SPACE	An attempt was made to execute [READ] (β → NC) when the program area did not have enough unused space.
FORMAT ERROR	Data other than digits, signs, CAN, and INPUT was entered as the setting of a parameter.
TOO MANY FIGURES	Data consisting of 9 or more digits was entered for a bit-type parameter.
DATA IS OUT OF RANGE	The setting exceeds the valid data range.

1.8.4   **Notes**

- Connecting an I/O Link

When I/O Link β is used as a slave of an I/O Link, the CNC assigns I/O addresses.   The slave data is input and output in 16-byte units. Therefore, be sure to specify 128 as the number of input/output points. Up to eight slaves can be connected.
The module name is OC021 (16-bit input) or OC020 (16-byte output). BASE is always 0 and SLOT is always 1.

- Function of ignoring the Power Mate CNC manager

After setting and checking data required for each slave connected, you can stop communication with the Power Mate CNC manager function to send a command from the CNC ladder to the slave.
When bit 3 (PMN) of parameter No. 960 is set to 1, communication between the CNC and the slave via the I/O Link is all open to the ladder.   While this bit is 1, the Power Mate CNC manager function does not operate.

- Data protection key

When the program data protection key of the CNC is on, no parameters can be input to the CNC program memory.

1.9   **SERVO GUIDE MATE**

The servo guide mate enables various types of data related to the servo motor and spindle motor to be displayed on the screen in the form of graphs. This allows you to readily measure the machine precision, thereby making it easy to grasp changes in precision resulting from the aging process, an earthquake, or collision of the machine.

Overview

Set up as outlined in Fig. 12.5(a), the servo guide mate displays graphs representing the feedback data related to the servo motor and spindle motor that are controlled through the execution of the program. It features such functions as drawing graphs representing chronological changes in data and the motor path, as well as displaying an enlarged view of error associated with the circular operation.
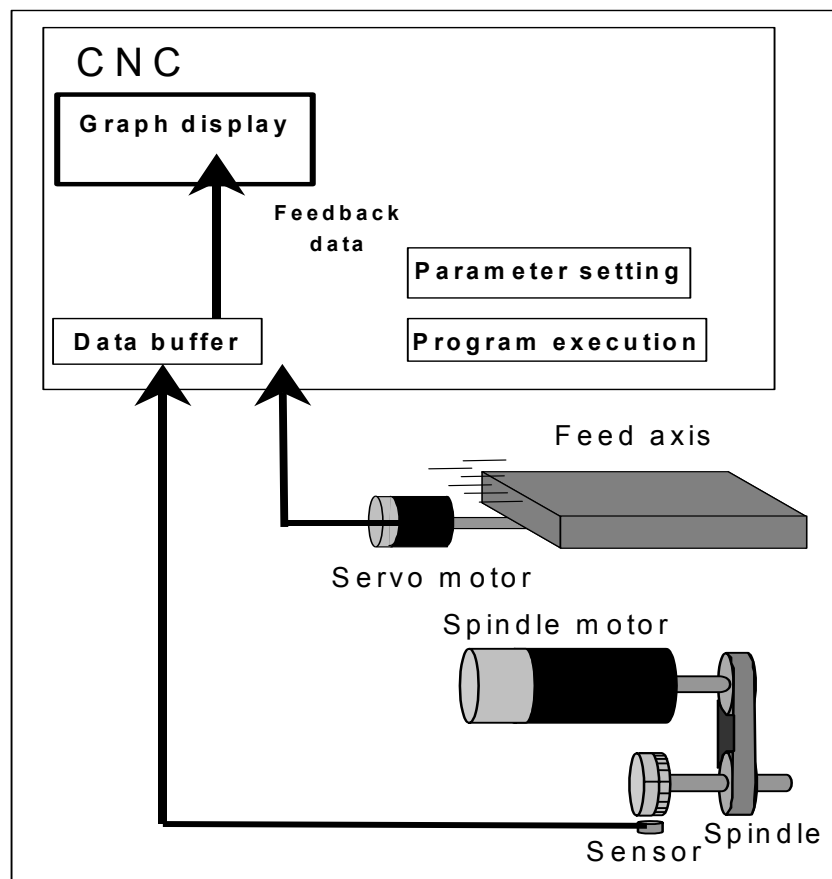
Fig. 1.9 (a)   Outline of the servo guide mate setup

1.9.1   **Wave Display**

The wave display function can acquire various types of data related to the servo motor and spindle motor and display graphs in several different drawing modes for the analysis of the measurement data.   A graph is made up of the two elements described below.   To display a graph, therefore, operations for the wave display need to be set, in addition to the measurement data.

1   Measurement data

This refers to raw data, such as position and torque, acquired from the CNC on a per-channel basis.

2   Operations

This collectively refers to the results of operations performed for measurement data.   A graph cannot be displayed unless necessary operations are set.

This denotes that the following relationship holds true:

Wave display (graph display) = measurement data + operations

In the remainder of this chapter, the term channel (CH) is used to refer to a specific set of measurement data and the term draw to refer to a specific displayed wave.

CH1   : Measurement data 1
Draw3 : Display waveform 3

A conceptual diagram of the wave display is shown below.
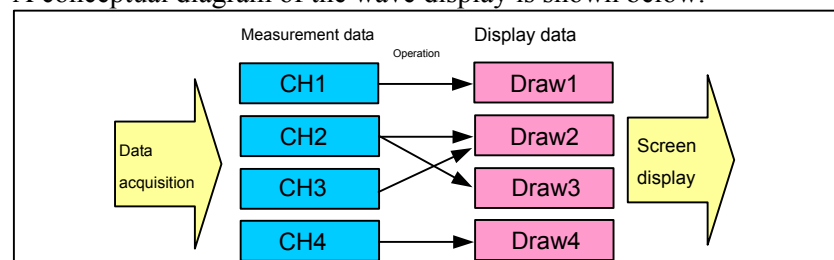
Measurements of both the servo motor and spindle motor can be made for up to four channels simultaneously.   Also, data can be measured at up to 10000 points per measurement item.

The following five drawing modes are available.

1   Y-time graph

This mode displays wave data along the time axis, as by an oscilloscope.

2   XY graph

This mode provides a 2-dimensional path display using 2-axis data.

3   Circle graph

This mode displays an enlarged view of the path deviation from the specified circle arising during circular cutting.

4   Fourier graph

This mode displays the frequency spectrum by performing digital Fourier conversion for the range of data displayed by the Y-time graph.

5   Bode graph

This mode displays a Bode diagram in the form of single logarithm graph for the horizontal axis.

1.9.1.1 **Y-time graph**

The Y-time graph displays wave data for the measurement data along the time axis, as by an oscilloscope.
Up to four draws can be displayed at a time.

Displaying and setting the Y-time graph

Procedure

The procedure for displaying the measurement data is described below.

1   Press the │SYSTEM│ function key.

2   Press the continuous menu key [▷] several times until [SERVO GUIDE MATE] is displayed.
3   Click the [SERVO GUIDE MATE] soft key.
4   Click the [Y-TIME] soft key.
     The wave display screen is displayed as shown below.

5   Click the [MEASUREMENT] soft key.
6   Click the [DATA IN] soft key.

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7   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123    N00000

 MEASURE SETTING

 DATA POINTS              :   10000        ┌CANDIDATE──────────────
 TRIGGER PATH             :     1          │  SAMPLING CYCLE (SERVO)
        SEQ.NO            :     0          │
 SAMPLING CYCLE (SERVO)   :     9          │     1 : 100 ms
             (SPINDLE)    :     7          │     2 : 50 ms
                                           │     3 : 20 ms
 AUTO-SCALING             :     1          │     4 : 10 ms
 SYNC.(SV-SP)             :     1          │     5 : 5 ms
 DATE         :   Mon Oct 21 2002          │     6 : 2 ms
 TIME                     : 09:01:11       │     7 : 1 ms
                                           │     8 : 500 us
                                           │     9 : 250 usec
                                           │    10 : 125 us
                                           │    11 : 62.5 us
                                           │
                                           └──────────────────────

                                           A>

                                 MEM  STOP *** ***    12:00:00 PATH1

 < │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │      │
   │GRAPH │      │NG    │      │      │      │      │      │      │      │
```

8   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

9   Enter data and then press the [INPUT] key.

10   Repeat steps 8 and 9 until you set all the parameters.
11   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     [↑ PAGE] or [PAGE ↓] key.

```
SERVO GUIDE MATE                    O0123    N00000

 SET CHANNEL
                      [ CH 1 ]   [ CH 2 ]
 AXIS          :        1           1        ┌CANDIDATE──────────────
 TYPE          :        2          16        │  TYPE
 UNIT          :       33          33        │   5 : POSF   20 : ROTOR
 CONV.COEF     :    100.000     100.000      │   1 : VCMD   21 : SIN_T
 CONV.BASE     :   7282.000    -7282.000     │   2 : TCMD   15 : FREQ
 ORIGIN VALUE  :      0.000       0.000      │   3 : SPEED  16 : FRTCM
 EXTENDED ADDRESS :                          │   4 : ERR    25 : OVCLV
 SHIFT         :                             │   7 : SYNC
 ┌EXPLANATIONS─────────────────────────┐     │   8 : ABS
 │ Torque command(TCMD)                │     │  22 : DTRQ
 │ Physical value is need to set max. current│  24 : DLTCM
 │ (Ap) of amplifier. Default value is 100 in│  23 : SFERR
 │ convention which convert measured data to p│  48 : IR
 │ ercent by max. torque.              │     │  49 : IS
 └─────────────────────────────────────┘     │  50 : IEFF
                                             └──────────────────────
                                             A>

                                 MEM  STOP *** ***    12:00:00 PATH1

 < │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │      │
   │GRAPH │      │NG    │      │      │      │      │      │      │      │
```

12   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

13   Enter data and the press the [INPUT] key.

14   Repeat steps 12 and 13 until you set all the parameters.
15   Click the [RE-DSPGRAPH] soft key.
16   Click the [OPERATION & GRAPH] soft key.
      The operation and graph setting screen is displayed as shown
      below.
      To set any draw other than the one currently displayed, display
      the setting screen for the desired draw by pressing the ⬆ PAGE or

      ⬇ PAGE key.

```
SERVO GUIDE MATE                      O0123   N00000

OPERATION & GRAPH


GRAPH MODE  ( Y-TIME )                      CANDIDATE
              [ Draw 1 ]   [ Draw 2 ]         OPERATION
OPERATION   :    2            2             1 : N / A
INPUT 1     :    1            2             2 : YT
INPUT 2     :    0            0             3 : DIFF 1
DISPLAY UNIT :   33           33            4 : DIFF 2
CONVERSION  :    1            1             5 : TANGENT
(deg)       :        0.000         0.000    6 : TANGENT N
              [ Draw 3 ]   [ Draw 4 ]       7 : SMOOTH
OPERATION   :    2            1             8 : SYNCRO
INPUT 1     :    3                          9 : BIT
INPUT 2     :    0
DISPLAY UNIT :   32
CONVERSION  :    1
(deg)       :        0.000
                             A>

                             MEM  STOP *** ***     12:00:00 PATH1

< RE-DSP
  GRAPH
```

17   Move the cursor to the parameter you want to set, by pressing the
      cursor key.

18   Enter data and the press the [INPUT] key.

19   Repeat steps 17 and 18 until you set all the parameters.
20   Click the [RE-DSPGRAPH] soft key.

21 Click the [SCALE SET] soft key.
    The scale setting screen is displayed as shown below.

```
SERVO GUIDE MATE                          O0123    N00000

SCALE ( Y-TIME )

  DRAW 1(ORIGIN)    :            0.000
        (DIVISION)  :           10.000      ┌─CANDIDATE─────
  DRAW 2(ORIGIN)    :            0.000      │
        (DIVISION)  :            5.000      │
  DRAW 3(ORIGIN)    :          600.000      │
        (DIVISION)  :          200.000      │
  DRAW 4(ORIGIN)    :            0.000      │
        (DIVISION)  :            1.000      │
  TIME  (ORIGIN)    :            0.000      │
        (DIVISION)  :          400.000      │
                                           │
                                           │
                                           │
                                           │
                                           │
                                           │
                                           └────────────

                                         A>

                                         MEM  STOP *** ***   │ 12:00:00 │PATH1

< │RE-DSP│      │      │      │      │      │      │      │      │
  │GRAPH │      │      │      │      │      │      │      │      │
```

22 Move the cursor to the parameter you want to set, by pressing the
    cursor key.

23 Enter data and the press the │INPUT│ key.

24 Repeat steps 22 and 23 until you set all the parameters.
25 Click the [RE-DSPGRAPH] soft key.
26 Click the [MEASUREMENT] soft key.
27 Click the [START] soft key.
28 Start the automatic or manual operation.
29 When the measurement is completed, the wave display screen is
    displayed as shown below.

- Changing the operation and graph setting screen

The procedure for changing the operation and graph setting screen as necessary is described below.

1   Click the [OPERATION & GRAPH] soft key.

The operation and graph setting screen is displayed as shown below.

To set any draw other than the one currently displayed, display the setting screen for the desired draw by pressing the ⬆PAGE or ⬇PAGE key.

```
SERVO GUIDE MATE                        O0123    N00000

  OPERATION & GRAPH


  GRAPH MODE  < Y-TIME >                   CANDIDATE
              [ Draw 1 ]    [ Draw 2 ]       OPERATION
  OPERATION  :    2             2          1 : N / A
  INPUT 1    :    1             2          2 : YT
  INPUT 2    :    0             0          3 : DIFF 1
  DISPLAY UNIT :  33            33         4 : DIFF 2
  CONVERSION :    1             1          5 : TANGENT
  (deg)      :       0.000         0.000   6 : TANGENT N
              [ Draw 3 ]    [ Draw 4 ]     7 : SMOOTH
  OPERATION  :    2             1          8 : SYNCRO
  INPUT 1    :    3                        9 : BIT
  INPUT 2    :    0
  DISPLAY UNIT :  32
  CONVERSION :    1
  (deg)      :       0.000
                                        A>

                                MEM STOP *** ***    12:00:00 PATH1
  <  RE-DSP
     GRAPH
```

2   Move the cursor to the parameter you want to set, by pressing the cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.

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5   Click the [RE-DSPGRAPH] soft key.
     Based on the new operation and graph settings, the wave display
     screen is displayed as shown below.

- Changing the scale screen

The procedure for changing the scale settings as necessary is
described below.

1   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.
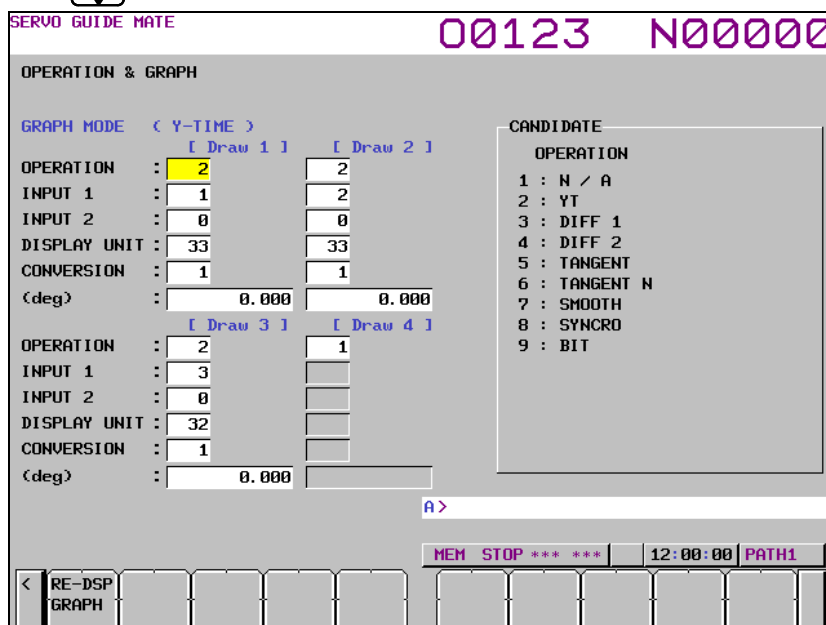
5   Click the [RE-DSPGRAPH] soft key.
     Based on the new scale settings, the wave display screen is
     displayed as shown below.

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- Manipulating the Y-time graph

By clicking the following soft keys, you can perform the operations corresponding to them.

[MEASUREMENT]	: Performs a measurement-related operation.
[←]	: Shifts the time axis to the right.
[→]	: Shifts the time axis to the left.
[H-AXIS EXP]	: Expands the time axis.
[H-AXIS RED]	: Reduces the time axis.
[DRAW 1UNDSP]	: Sets whether or not to display Draw 1.
[DRAW 1 ↑]	: Shifts Draw 1 downward.
[DRAW 1 ↓]	: Shifts Draw 1 upward.
[DRAW 1 V-EXP]	: Expands Draw 1.
[DRAW 1 V-RED]	: Reduces Draw 1.
[DRAW 2UNDSP]	: Sets whether or not to display Draw 2.
[DRAW 2 ↑]	: Shifts Draw 2 downward.
[DRAW 2 ↓]	: Shifts Draw 2 upward.
[DRAW 2 V-EXP]	: Expands Draw 2.
[DRAW 2 V-RED]	: Reduces Draw 2.
[DRAW 3UNDSP]	: Sets whether or not to display Draw 3.
[DRAW 3 ↑]	: Shifts Draw 3 downward.
[DRAW 3 ↓]	: Shifts Draw 3 upward.
[DRAW 3 V-EXP]	: Expands Draw 3.
[DRAW 3 V-RED]	: Reduces Draw 3.
[DRAW 4UNDSP]	: Sets whether or not to display Draw 4.
[DRAW 4 ↑]	: Shifts Draw 4 downward.
[DRAW 4 ↓]	: Shifts Draw 4 upward.
[DRAW 4 V-EXP]	: Expands Draw 4.
[DRAW 4 V-RED]	: Reduces Draw 4.
[AUTO SCALE]	: Enables auto scaling.
[V-AXIS EXP]	: Expands all draws.
[V-AXIS RED]	: Reduces all draws.
[OPE/G SET]	: Sets operations and graphs.

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[SCALE SET]   : Sets scales.
[COM1 INPUT]   : Inputs comment 1.
[COM2 INPUT]   : Inputs comment 2.
[XY]   : Switches to the XY graph.
[CIRCLE]   : Switches to the Circle graph.
[FOURIER]   : Switches to the Fourier graph.
[BODE]   : Switches to the Bode graph.

- Performing measurement

When you click the [MEASUREMENT] soft key, you can perform the operations corresponding to the menu items that follow.
[START]   : Starts measurement.
[ORIGIN]   : Sets the origin value.
[STOP]   : Stops measurement.
[DATA IN]   : Specifies measurement-related settings.

- Changing measurement settings

1   When you click the [MEASUREMENT] soft key and then the [DATA IN] soft key, you can perform the operations corresponding to the menu items that follow.
2   Click the [LIST] soft key.
     The list screen is displayed as shown below.
     To display any channel other than the one currently displayed, display the list screen for the desired channel by pressing the ⬆PAGE or PAGE⬇ key.

```
SERVO GUIDE MATE                        O0123   N00000

LIST
                              SAMPLING CYCLE (SERVO)   : 250 usec
DATA POINTS    : 16000                     (SPINDLE) : 1 ms
CH 1 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :TCMD         CONV.COEF:   100.000 / CONV.BASE:   7282.000
     UNIT :%            MEANING  :Torque command(TCMD)

CH 2 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :FRTCM        CONV.COEF:   100.000 / CONV.BASE:  -7282.000
     UNIT :             MEANING  :Vibration Torque command

CH 3 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :FREQ         CONV.COEF:     1.000 / CONV.BASE:      1.000
     UNIT :Hz           MEANING  :Vibration Frequency

CH 4 AXIS :             ORIGIN   :
     TYPE :             CONV.COEF:           / CONV.BASE:
     UNIT :             MEANING  :




                                A>

                                MEM  STOP *** ***     12:00:00 PATH1
 <  RE-DSP  LIST  SAMPLI CH SET
    GRAPH         NG
```

3   Check the current settings on the list screen.

4   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                         O0123    N00000

MEASURE SETTING


DATA POINTS            :    10000      ┌CANDIDATE─────────────────┐
TRIGGER PATH          :      1          SAMPLING CYCLE (SERVO)
        SEQ.NO        :      0
SAMPLING CYCLE (SERVO) :      9            1 : 100 ms
            (SPINDLE) :      7            2 : 50 ms
                                          3 : 20 ms
AUTO-SCALING          :      1            4 : 10 ms
SYNC.(SV-SP)          :      1            5 : 5 ms
DATE              :   Mon Oct 21 2002    6 : 2 ms
TIME                  : 09:01:11          7 : 1 ms
                                          8 : 500 us
                                          9 : 250 usec
                                         10 : 125 us
                                         11 : 62.5 us



                                       A>

                               MEM  STOP *** ***    12:00:00 PATH1
  ┌──────┐
 < RE-DSP  LIST  SAMPLI CH SET
  │GRAPH │       NG
```

5   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

6   Enter data and the press the INPUT key.

7   Repeat steps 5 and 6 until you set all the parameters.

8   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     PAGE↑ or PAGE↓ key.

```
SERVO GUIDE MATE                         O0123    N00000

SET CHANNEL
                      [ CH 1 ]   [ CH 2 ]
AXIS              :     1          1      ┌CANDIDATE─────────────┐
TYPE              :     2         16       TYPE
UNIT              :    33         33        5 : POSF   20 : ROTOR
CONV.COEF         :   100.000    100.000    1 : VCMD   21 : SIN_T
CONV.BASE         :  7282.000   -7282.000   2 : TCMD   15 : FREQ
ORIGIN VALUE      :     0.000      0.000    3 : SPEED  16 : FRTCM
EXTENDED ADDRESS :                          4 : ERR    25 : OVCLV
SHIFT             :                          7 : SYNC
┌EXPLANATIONS─────────────────────┐          8 : ABS
│ Torque command(TCMD)            │         22 : DTRQ
│ Physical value is need to set max. current 24 : DLTCM
│ (Ap) of amplifier. Default value is 100 in 23 : SFERR
│ convention which convert measured data to p 48 : IR
│ ercent by max. torque.          │         49 : IS
└─────────────────────────────────┘         50 : IEFF

                                       A>

                               MEM  STOP *** ***    12:00:00 PATH1
  ┌──────┐
 < RE-DSP  LIST  SAMPLI CH SET
  │GRAPH │       NG
```

9   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

10   Enter data and the press the INPUT key.

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11   Repeat steps 9 and 10 until you set all the parameters.
12   Click the [RE-DSPGRAPH] soft key.
     The wave display screen is displayed as shown below.

13   The new settings will take effect next time you perform
     measurement. Change the operation/graph settings and scale
     settings according to the new channel settings.

Explanation
- Setting the data-in screen

- Measurement data points
  Enter a numerical value between 1 and 10000. This setting
  represents the number of data points to be measured. The data
  measurement time is calculated by multiplying the data points by
  the sampling cycle. If different sampling cycles are set for the
  servo axis and spindle axis, the data points for the shorter
  sampling cycle apply. The data points for the longer sampling
  cycle is decreased according to the sampling cycle ratio.
- Trigger path and sequential number
  Enter numerical values - path number and sequential number -
  that specify when to trigger measurement. Numerical values
  that can be specified as path numbers are sequential, starting at
  Path 1, with the maximum value being the number of paths that
  are set to the CNC. The range of sequential numbers is from 0
  to 99999. If 0 is specified as the sequential number,
  measurement starts immediately after you click the
  [MEASUREMENT] soft key and then the [START] soft key.
- Sampling cycle (servo and spindle)
  Enter numerical values that specify the sampling cycles for the
  servo axis and spindle axis separately. The specifiable values
  are listed in Table 12.5.1.1(a), Sampling cycles.

Table 1.9.1.1 (g)   Sampling cycles

Input value	Meaning (sampling cycle)	Servo axis	Spindle axis
1	100ms	Specifiable	Specifiable
2	50ms	Specifiable	Specifiable
3	20ms	Specifiable	Specifiable
4	10ms	Specifiable	Specifiable
5	5ms	Specifiable	Specifiable
6	2ms	Specifiable	Specifiable
7	1ms	Specifiable	Specifiable
8	500μs	Specifiable	Specifiable
9	250μs	Specifiable	Unspecifiable
10	125μs	Specifiable	Unspecifiable
11	62.5μs	Specifiable	Unspecifiable

- Auto scaling
  Enter a numerical value that specifies whether to perform auto scaling each time a measurement is made.   The specifiable values are 1 (do not perform), 2 (perform only once), and 3 (perform each time).   When auto scaling is enabled, the wave scale is changed so that the entire wave can be displayed within the display range of the graph.   Therefore, when you want to monitor changes in the wave size, it is better to fix the scale, rather than using the auto scaling function.

- Synchronization mode selection
  The specifiable values are 1 (do not select) and 2 (select).
  This function may be useful in cases where data is not synchronized in terms of time due to different sampling cycles when interpolation between servo axis and spindle axis is performed through Cs contour control or other means.   (In some cases, the function may not produce any effect.)

- Date and time
  The date and time when data is measured are displayed.   (This is a read-only item.)

- **Setting the channel setting screen**

Up to four sets of measurement data can be specified per channel. Be sure to set measurement data starting with the smallest channel number.

- Axis

  Specify an axis number for the data to be specified. Use a positive control axis number when specifying a servo axis or a negative control axis number when specifying a spindle axis. The maximum number that can be specified is equal to the number of servo axes and spindle axes that are set to the CNC respectively. When enabling channels, be sure to specify the channel numbers sequentially, starting with the smallest channel number. Setting 0 disables the channel (not measured).

- Type

  When a servo axis is selected, the specifiable values are as shown in Table 12.5.1.1(b), Servo motor measurement data types. When a spindle axis is selected, the specifiable values are as shown in Table 12.5.1.1(c), Spindle motor measurement data types. Specify the type of data you want to measure.

Table 1.9.1.1 (h)   Servo motor measurement data types

Input value	Item name	Description
5	POSF	Position feedback integrated value
1	VCMD	Velocity command
2	TCMD	Torque command
3	SPEED	Motor speed
4	ERR	Position error
7	SYNC	Right tapping synchronization error (tap axis only)
8	ABS	Absolute position of the built-in pulse coder
22	DTRQ	Estimated disturbance torque
24	DLTCM	Synchronous axis torque difference
23	SFERR	Dual position feedback semi-full error
48	IR	R phase current value
49	IS	S phase current value
50	IEFF	Effective current
20	ROTOR	Rotor phase
21	SIN_T	Rotor position SINθ
15	FREQ	Disturbance input frequency (used to measure frequency characteristics)
16	FRTCM	Disturbance torque (used to measure frequency characteristics)
25	OVCLV	OVC level

Table 1.9.1.1 (i)   Spindle motor measurement data types

Input value	Item name	Description
1	SPEED	Motor speed
2	INORM	Motor current amplitude
3	TCMD	Torque command
4	VCMD	Velocity command
5	VERR	Velocity error
7	PERR1	Position error
8	ORERR	Orientation position error
9	PCPOS	Position feedback integrated value
10	MCMD	Command pulse per ITP cycle
11	PERR2	Position error
13	CSPOS	Position feedback integrated value
14	SPCMD	Velocity command data
15	SPCT1	Spindle control signal 1
16	SPCT2	Spindle control signal 2
17	SPST1	Spindle status signal 1
18	SPST2	Spindle status signal 2
19	ORSEQ	Orientation sequence data
20	FREQ	Vibration frequency
21	FRTCM	Vibration torque command

- Unit

  The specifiable values are as shown in Table 12.5.1.1(d), Measurement data units.   However, as shown in Table 12.5.1.1(e), Corresponding measurement data units, you cannot specify any unit other than that corresponding to the type of measurement data.   Under normal circumstances, the automatically set values do not need to be changed.   When performing polar coordinate conversion or other operation that requires information about the actual position of the rotation axis, deg needs to be selected as the unit.

Table 1.9.1.1 (j)   Measurement data units

Input value	Unit	Input value	Unit
4	mm	14	m/min
5	m	31	A(p)
6	μm	33	%
7	nm	34	pulse
8	inch	35	bit
9	deg	32	Hz
20	1/min	36	--

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Table 1.9.1.1 (k)   Corresponding measurement data units

Servo motor data type	Corresponding unit	Spindle motor data type	Corresponding unit
5 : POSF	4 : mm 6 : μm 8 : inch 9 : deg	1 : SPEED	20 : 1/min
1 : VCMD	20 : 1/min 14 : m/min	2 : INORM	36 : -- 31 : A(p)
2 : TCMD	31 : A(p) 33 : %	3 : TCMD	33 : % 31 : A(p)
3 : SPEED	20 : 1/min 14 : m/min	4 : VCMD	20 : 1/min
4 : ERR	4 : mm 6 : μm 8 : inch 9 : deg	5 : VERR	20 : 1/min
7 : SYNC	36 : --	7 : PERR1	9 : deg
8 : ABS	4 : mm 6 : μm 8 : inch 9 : deg	8 : ORERR	9 : deg 34 : pulse
22 : DTRQ	31 : A(p)	9 : PCPOS	9 : deg
24 : DLTCM	31 : A(p)	10 : MCMD	34 : pulse
23 : SFERR	4 : mm 6 : μm 8 : inch 9 : deg	11 : PERR2	34 : pulse
48 : IR	31 : A(p) 33 : %	13 : CSPOS	9 : deg
49 : IS	31 : A(p) 33 : %	14 : SPCMD	36 : --
50 : IEFF	31 : A(p) 33 : %	15 : SPCT1	36 : --
20 : ROTOR	9 : deg	16 : SPCT2	36 : --
21 : SIN_T	36 : --	17 : SPST1	36 : --
15 : FREQ	32 : Hz	18 : SPST2	36 : --
16 : FRTCM	31 : A(p)	19 : ORSEQ	36 : --
25 : OVCLV	33 : %	20 : FREQ	32 : Hz
		21 : FRTCM	31 : A(p)

- Conversion coefficient
  Set the weight of the data selected for each channel type (numerator = physical amount).   For POSF and other position-related data, specify the amount of travel per pulse. For VCMD and SPEED, specify 3750.   For TCMD, specify the maximum current value of the amplifier in use.
- Conversion base
  Set the weight of the data selected for each channel type (denominator = raw data unit).   Under normal circumstances, use the value that is automatically set when the type is selected. Usually, the system automatically sets 1 for POSF and other position-related data, 32768 for VCMD and SPEED, and 7282 for TCMD.

- Origin value
  Specify the value that is to be set as the initial value for each channel when you click the [MEASUREMENT] soft key and then the [ORIGIN] soft key.
- Extended address
  Under normal circumstances, this item is unspecifiable and not used.   (This is a read-only item.)
- Shift
  Under normal circumstances, this item is unspecifiable and not used. (A value may be set automatically when the type is selected.)

- Setting the operation and graph setting screen

In the operation and graph setting screen, up to four graphs can be set per draw.

- Operation
  The specifiable values are as shown in Table 12.5.1.1(f), Y-time graph operations.
  An operation cannot be specified if it does not meet the graph display conditions defined in Table 12.5.1.1(g), Y-time graph conditions.

Table 1.9.1.1 (l)   Y-time graph operations

Input value	Operation name	Description
1	N/A	Not displayed.
2	Y-Time	Normal display (The data of the sleeted channel is displayed as is, without performing any operations.) Input 1 is the vertical axis. All measurement channels are available to be selected.
3	Diff1 (VT)	First order differential display of position data (equivalent to velocity) Input 1 is the vertical axis. Only those channels whose positions have been measured can be selected.
4	Diff2 (AT)	Second order differential display of position data (equivalent to acceleration) Input 1 is the vertical axis. Only those channels whose positions have been measured can be selected.
5	Tangent	Tangent speed display Only those channels whose positions have been measured can be selected. The combined speed of input 1 and input 2 is displayed.
6	Tangent N	N axis tangent speed display Only those channels whose positions have been measured can be selected. The combined speed for the position data from the channel specified by input 1 to the channel specified by input 2 is displayed. All channels to be combined need to have position data.

Table 1.9.1.1 (l)   Y-time graph operations

Input value	Operation name	Description
7	Smooth	Feed smoothness display Only those channels whose positions have been measured can be selected. This item displays the deviation from the ideal position calculated on the assumption that the tool moves from the displayed start time (start point) to the end time (end point) at a constant speed.
8	Synchro	Synchronization error display Only those channels whose positions have been measured can be selected. This item displays the difference between input 1 and input 2. Currently, only 1-to-1 ratio is supported as the proportion of input 1 to input 2.
9	Bit	Bit display The status of the corresponding bit specified by input 2 is displayed, based on the measurement data for the channel specified by input 1.

Table 1.9.1.1 (m)   Y-time graph conditions

Operation	Coordinate conversion	Input 1	Input 2	Remarks
2 : Y-Time	1 : Normal	Channel whose position has been measured	Not specified	
	2 : Polar	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	
	3 : Angular	Channel whose position has been measured	Channel whose position has been measured	
3 : Diff1 (VT)	1 : Normal	Channel whose position has been measured	Not specified	
4 : Diff2 (AT)	1 : Normal	Channel whose position has been measured	Not specified	

Table 1.9.1.1 (m)   Y-time graph conditions

Operation	Coordinate conversion	Input 1	Input 2	Remarks
5 : Tangent	1 : Normal	Channel whose position has been measured	Channel whose position has been measured	
	2 : Polar	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	
	3 : Angular	Channel whose position has been measured	Channel whose position has been measured	
6 : Tangent N	1 : Normal	Channel whose position has been measured	Channel whose position has been measured	Make sure that the measured data unit is either mm, μm, or inch, or deg.
7 : Smooth	1 : Normal	Channel whose position has been measured	Not specified	
8 : Synchro	1 : Normal	Channel whose position has been measured	Channel whose position has been measured	
9 : Bit	1 : Normal	Channel whose position has been measured	Bit position	

- Input 1
  Specifiable values are sequential, with channel 1 being 1. The maximum value is the largest channel number for which measurement is set during the channel setting process. A value that does not meet the graph display conditions defined in Table 12.5.1.1(g), Y-time graph conditions cannot be specified in input 1.

- Input 2
  Specifiable values are sequential, with channel 1 being 1. The maximum value is the largest channel number for which measurement is set during the channel setting process. Note that, when Bit is specified as the operation, values are sequentially set, with bit position 0 being 10. In this case, the maximum value is 25, which indicates bit position 15. A value that does not meet the graph display conditions defined in Table 12.5.1.1(g), Y-time graph conditions cannot be specified in input 2.

- Display unit
  Specifiable values are as shown in Table 12.5.1.1(h), Display units.   The conditions for specifying these display units are as shown in Table 12.5.1.1(i), Y-time graph display units.

Table 1.9.1.1 (n)   Display units

Input value	Unit	Input value	Unit
1	sec	19	1/sec
2	msec	20	1/min
3	μsec	21	mm/sec/sec
4	mm	22	mm/min/min
5	m	23	m/sec/sec
6	μm	24	m/min/min
7	nm	25	inch/sec/sec
8	inch	26	inch/min/min
9	deg	27	deg/sec/sec
10	mdeg	28	deg/min/min
11	mm/sec	29	1/sec/sec
12	mm/min	30	1/min/min
13	m/sec	31	A(p)
14	m/min	32	Hz
15	inch/sec	33	%
16	inch/min	34	pulse
17	deg/sec	35	bit
18	deg/min	36	--

Table 1.9.1.1 (o)   Corresponding Y-time graph display units

Operation	Input 1 measurement data unit	Specifiable display unit
2 : Y-Time	4 : mm 5 : m 6 : μm 7 : nm 8 : inch	4 : mm 5 : m 6 : μm 7 : nm 8 : inch
	9 : deg	9 : deg
	14 : m/min	11 : mm/sec 12 : mm/min 13 : m/sec 14 : m/min 15 : inch/sec 16 : inch/min
	20 : 1/min	17 : deg/sec 18 : deg/min 19 : 1/sec 20 : 1/min
	31 : A(p)	31 : A(p)
	32 : Hz	32 : Hz
	33 : % 34 : pulse 35 : bit	33 : % 34 : pulse 35 : bit
	36 : --	36 : --

Table 1.9.1.1 (o)   Corresponding Y-time graph display units

Operation	Input 1 measurement data unit	Specifiable display unit
3 : Diff1 (VT)	4 : mm 5 : m 6 : μm 7 : nm 8 : inch	11 : mm/sec 12 : mm/min 13 : m/sec 14 : m/min 15 : inch/sec 16 : inch/min
	9 : deg	17 : deg/sec 18 : deg/min 19 : 1/sec 20 : 1/min
4 : Diff2 (AT)	4 : mm 5 : m 6 : μm 7 : nm 8 : inch	21 : mm/sec/sec 22 : mm/min/min 23 : m/sec/sec 24 : m/min/min 25 : inch/sec/sec 26 : inch/min/min
	9 : deg	27 : deg/sec/sec 28 : deg/min/min 29 : 1/sec/sec 30 : 1/min/min
5 : Tangent	4 : mm 5 : m 6 : μm 7 : nm 8 : inch 9 : deg	11 : mm/sec 12 : mm/min 13 : m/sec 14 : m/min 15 : inch/sec 16 : inch/min
6 : Tangent N	4 : mm 5 : m 6 : μm 7 : nm 8 : inch 9 : deg	11 : mm/sec 12 : mm/min 13 : m/sec 14 : m/min 15 : inch/sec 16 : inch/min
7 : Smooth	4 : mm 5 : m 6 : μm 7 : nm 8 : inch 9 : deg	4 : mm 5 : m 6 : μm 7 : nm 8 : inch 9 : deg
8 : Synchro	Not affected by the measurement unit.	4 : mm 5 : m 6 : μm 7 : nm 8 : inch 9 : deg 36 : --
9 : Bit	Not affected by the measurement unit.	Not specified.

- Coordinate conversion
Specifiable values are 1 (Normal; no coordinate conversion), 2 (Polar; coordinate conversion for polar coordinate interpolation), and 3 (Angular; coordinate conversion for angular axis control). The conditions for the specifiable coordinate conversion types are as shown in Table 12.5.1.1(j), Corresponding Y-time graph coordinate conversion types.   Note that no conditions are imposed for specifying Normal (no coordinate conversion).

Table 1.9.1.1 (p)   Corresponding Y-time graph coordinate conversion types

Operation	Input 1	Input 2	Specifiable coordinate conversion
2 : Y-Time 5 : Tangent	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	2 : Polar
	Channel whose position has been measured	Channel whose position has been measured	3 : Angular

- Inclination
Specify the inclination in degrees.   The specified value is effective only when Angular (coordinate conversion for angular axis control) is specified as the coordinate conversion type.

- Setting the scale screen

The scale screen lets you set up to four scales per draw and specify the graph scale with respect to the time axis.
- Start point
Set the center coordinate of the displayed data (Draw 1 to Draw 4; vertical axis).
Set the display start time for time (horizontal axis).
- Division
Set the value of the displayed data per grid (Draw 1 to Draw 4; vertical axis).
Set the amount of time per grid for time (horizontal axis).

- Operation for measurement

- Origin
Arrange that the origin value, set on a per-channel basis in the channel setting screen, will be the initial value for the measurement data when measurement is started.   This operation is effective only for those channels for which position measurement is set.

Limitation
  - Data update cycle

Position-related data is updated at intervals of 1 ms, and power-related data is updated at the current cycle.   Therefore, even if you specify a sampling cycle that is shorter than the data update cycle, the displayed data remains unchanged during the present data update cycle.

  - Sampling cycle and the number of channels measured

Regarding the sampling cycle and the number of channels measured, there are limitations as shown in Table 12.5.1.1(l).

Table 1.9.1.1 (q)   Sampling cycle and the number of channels measured

Sampling cycle	Maximum number of channels measured
1ms or more	4
500μs	4
250μs	4
125μs	4
62.5μs	2 (Channel 3 or later cannot be input.)

The following limitations are imposed on the servo axis and spindle axis.

Number of channels that can be acquired per servo DSP

- Up to four channels can be acquired when the sampling cycle is 1 ms or longer, 500 μs, or 250 μs.
- Up to two channels can be acquired when the sampling cycle is 125 μs.
- Only one channel can be acquired when the sampling cycle is 62.25 μs.

Number of channels that can be acquired per spindle axis

- Up to two channels can be acquired when the sampling cycle is1 ms or longer.
- Only one channel can be acquired when the sampling cycle is 500 ms.

1.9.1.2 XY graph

This graph provides a 2-dimensional path display of measurement data by using 2-axis data.
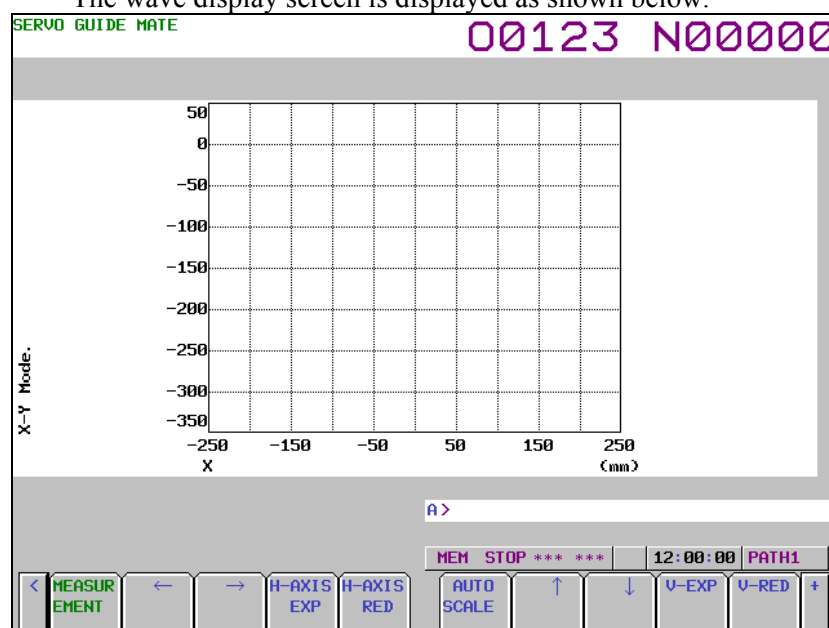Up to two draws can be displayed at a time.

Displaying and setting the XY graph

Procedure

The procedure for displaying the measurement data is described below.

1   Press the │SYSTEM│ function key.

2   Press the continuous menu key ▷ several times until [SERVO GUIDE MATE] is displayed.

3   Click the [SERVO GUIDE MATE] soft key.

4   Click the [XY] soft key.
     The wave display screen is displayed as shown below.

5   Click the [MEASUREMENT] soft key.

6   Click the [DATA IN] soft key.

7   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123   N00000

MEASURE SETTING


DATA POINTS              :   10000      ┌CANDIDATE──────────────────┐
TRIGGER PATH             :      1       │   SAMPLING CYCLE (SERVO)   │
        SEQ.NO           :      0       │                           │
SAMPLING CYCLE (SERVO)   :      9       │    1 : 100 ms             │
            (SPINDLE)    :      7       │    2 : 50 ms              │
AUTO-SCALING             :      1       │    3 : 20 ms              │
SYNC.(SV-SP)             :      1       │    4 : 10 ms              │
DATE          :    Mon Oct 21 2002      │    5 : 5 ms               │
TIME                     : 09:01:11     │    6 : 2 ms               │
                                        │    7 : 1 ms               │
                                        │    8 : 500 us             │
                                        │    9 : 250 usec           │
                                        │   10 : 125 us             │
                                        │   11 : 62.5 us            │
                                        └───────────────────────────┘

                                     A>

                             MEM  STOP *** ***   │ 12:00:00 │PATH1│
┌<─┐RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │
│  │GRAPH │      │ NG   │      │      │      │      │      │      │
```

8   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

9   Enter data and the press the │INPUT│ key.

10   Repeat steps 8 and 9 until you set all the parameters.

11   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     │↑ PAGE│ or │PAGE ↓│ key.

```
SERVO GUIDE MATE                    O0123   N00000

SET CHANNEL

                     [ CH 1 ]     [ CH 2 ]

AXIS           :       1            1         ┌CANDIDATE──────────────────┐
TYPE           :       2           16         │   TYPE                    │
UNIT           :      33           33         │                           │
CONV.COEF      :   100.000      100.000        │    5 : POSF   20 : ROTOR │
CONV.BASE      :  7282.000     -7282.000       │    1 : VCMD   21 : SIN_T │
ORIGIN VALUE   :     0.000        0.000        │    2 : TCMD   15 : FREQ  │
EXTENDED ADDRESS :                             │    3 : SPEED  16 : FRTCM │
SHIFT          :                               │    4 : ERR    25 : OVCLV │
 ┌EXPLANATIONS──────────────────────────┐      │    7 : SYNC             │
 │ Torque command(TCMD)                  │      │    8 : ABS              │
 │ Physical value is need to set max. current │  │   22 : DTRQ            │
 │ (Ap) of amplifier. Default value is 100 in │  │   24 : DLTCM           │
 │ convention which convert measured data to p│  │   23 : SFERR           │
 │ ercent by max. torque.                │      │   48 : IR              │
 └───────────────────────────────────────┘      │   49 : IS              │
                                               │   50 : IEFF            │
                                               └───────────────────────────┘
                                     A>

                             MEM  STOP *** ***   │ 12:00:00 │PATH1│
┌<─┐RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │
│  │GRAPH │      │ NG   │      │      │      │      │      │      │
```

12   Move the cursor to the parameter you want to set, by pressing the
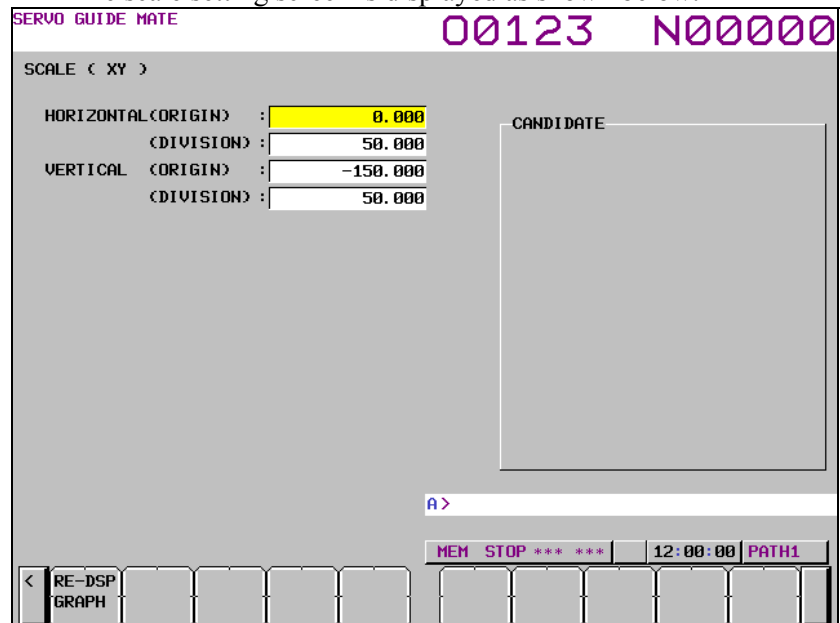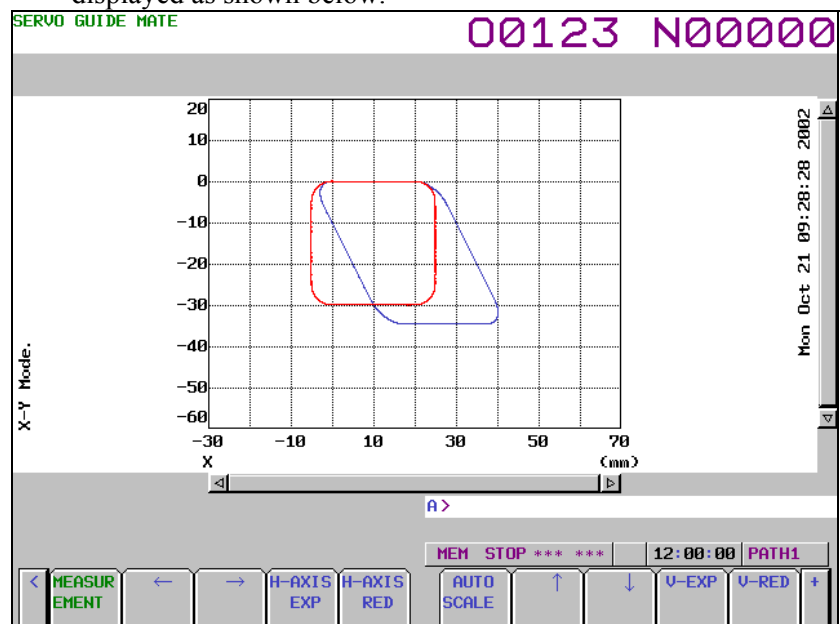   cursor key.

13   Enter data and the press the │INPUT│ key.

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14 Repeat steps 12 and 13 until you set all the parameters.
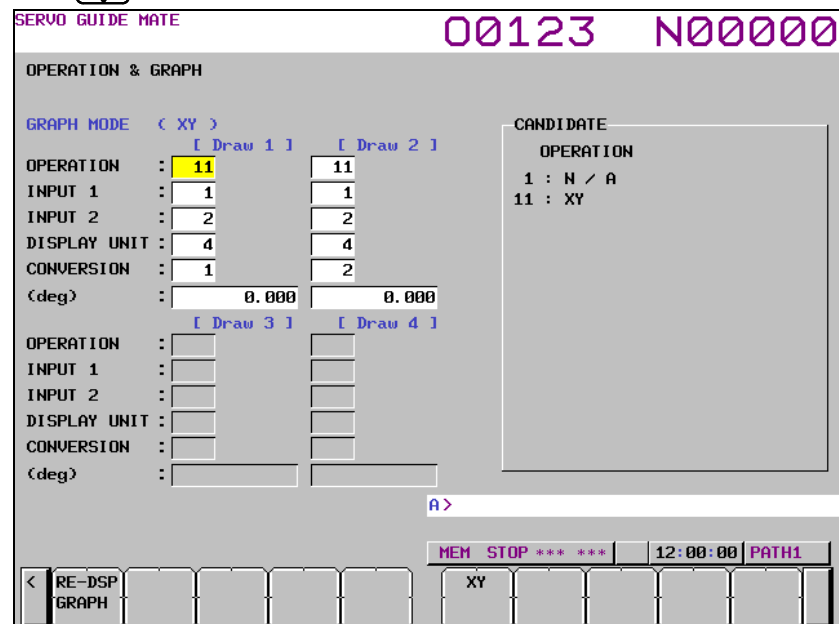15 Click the [RE-DSPGRAPH] soft key.
16 Click the [OPERATION & GRAPH] soft key.
    The operation and graph setting screen is displayed as shown below.
    To set any draw other than the one currently displayed, display
    the setting screen for the desired draw by pressing the $\boxed{\uparrow_{\text{PAGE}}}$ or
    $\boxed{\downarrow_{\text{PAGE}}}$ key.

```
SERVO GUIDE MATE                      O0123   N00000

OPERATION & GRAPH


GRAPH MODE  ( XY )                        ┌CANDIDATE─────────────┐
              [ Draw 1 ]   [ Draw 2 ]     │   OPERATION          │
OPERATION   :   11            11           │                      │
INPUT 1     :    1             1           │  1 : N / A           │
INPUT 2     :    2             2           │ 11 : XY              │
DISPLAY UNIT:    4             4           │                      │
CONVERSION  :    1             2           │                      │
(deg)       :      0.000         0.000     │                      │
              [ Draw 3 ]   [ Draw 4 ]      │                      │
OPERATION   :                              │                      │
INPUT 1     :                              │                      │
INPUT 2     :                              │                      │
DISPLAY UNIT:                              │                      │
CONVERSION  :                              │                      │
(deg)       :                              └──────────────────────┘
                            A >

                            MEM STOP *** ***    12:00:00 PATH1

< RE-DSP                          XY
  GRAPH
```
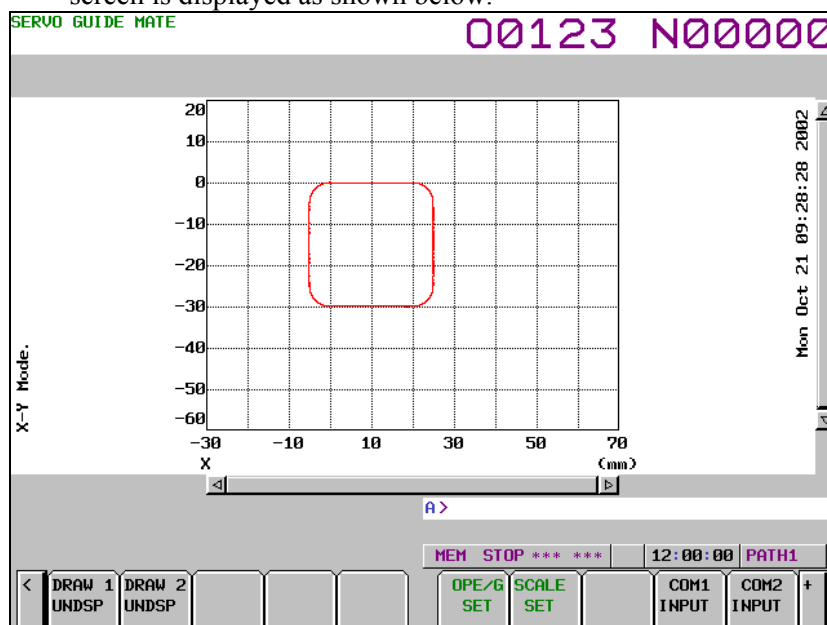
17 Move the cursor to the parameter you want to set, by pressing the cursor key.

18 Enter data and the press the $\boxed{\text{INPUT}}$ key.

19 Repeat steps 17 and 18 until you set all the parameters.
20 Click the [RE-DSPGRAPH] soft key.

21   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

22   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

23   Enter data and the press the [INPUT] key.

24   Repeat steps 22 and 23 until you set all the parameters.
25   Click the [RE-DSPGRAPH] soft key.
26   Click the [MEASUREMENT] soft key.
27   Click the [START] soft key.
28   Start the automatic or manual operation.
29   When the measurement is completed, the wave display screen is
     displayed as shown below.

- Changing the operation and graph setting screen

The procedure for changing the operation and graph setting screen as necessary is described below.

1   Click the [OPERATION & GRAPH] soft key.

The operation and graph setting screen is displayed as shown below.

To set any draw other than the one currently displayed, display the setting screen for the desired draw by pressing the $\boxed{\uparrow}_{\text{PAGE}}$ or $\boxed{\downarrow}_{\text{PAGE}}$ key.

```
SERVO GUIDE MATE                    O0123    N00000

OPERATION & GRAPH


GRAPH MODE   < XY >                         CANDIDATE
             [ Draw 1 ]   [ Draw 2 ]          OPERATION
OPERATION    :   11          11              1 : N / A
INPUT 1      :    1           1             11 : XY
INPUT 2      :    2           2
DISPLAY UNIT :    4           4
CONVERSION   :    1           2
(deg)        :      0.000       0.000
             [ Draw 3 ]   [ Draw 4 ]
OPERATION    :
INPUT 1      :
INPUT 2      :
DISPLAY UNIT :
CONVERSION   :
(deg)        :
                                    A>

                              MEM  STOP *** ***    12:00:00 PATH1
< RE-DSP                          XY
  GRAPH
```

2   Move the cursor to the parameter you want to set, by pressing the cursor key.

3   Enter data and the press the $\boxed{\text{INPUT}}$ key.

4   Repeat steps 2 and 3 until you set all the parameters.

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5   Click the [RE-DSPGRAPH] soft key.
     Based on the new operation and graph settings, the wave display
     screen is displayed as shown below.

- Changing the scale screen

The procedure for changing the scale settings as necessary is
described below.

1   Click the [SCALE   SET] soft key.
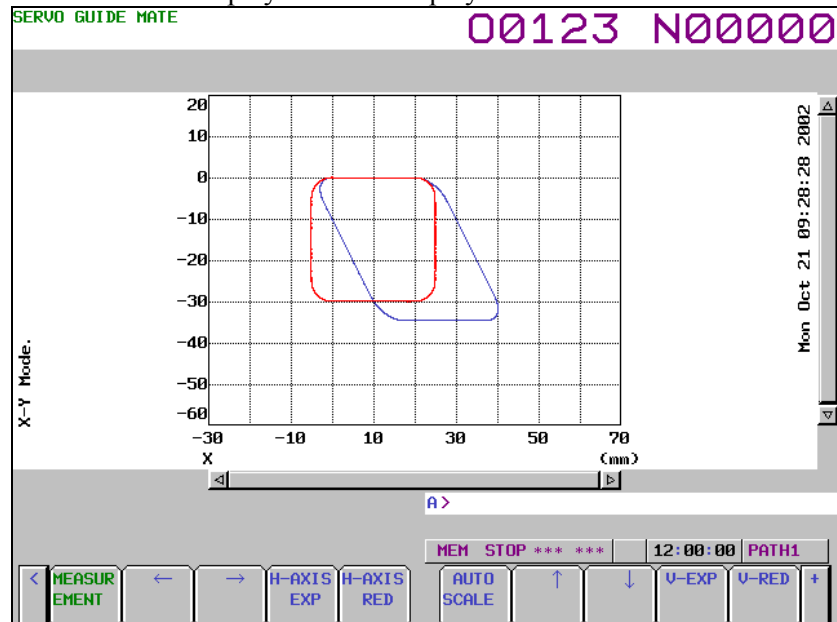   The scale setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.

5   Click the [RE-DSPGRAPH] soft key.
Based on the new scale settings, the wave display screen is
displayed as shown below.

- Manipulating the XY graph

By clicking the following soft keys, you can perform the operations
corresponding to them.

[MEASUREMENT]	: Performs a measurement-related operation.
[←]	: Shifts the horizontal axis to the right.
[→]	: Shifts the horizontal axis to the left.
[H-AXIS EXP]	: Expands the horizontal axis.
[H-AXIS RED]	: Reduces the horizontal axis.
[AUTO SCALE]	: Enables auto scaling.
[↑]	: Shifts the vertical axis downward.
[↓]	: Shifts the vertical axis upward.
[V-AXIS EXP]	: Expands the vertical axis.
[V-AXIS RED]	: Reduces the vertical axis.
[DRAW 1UNDSP]	: Sets whether or not to display Draw 1.
[DRAW 2UNDSP]	: Sets whether or not to display Draw 2.
[OPE/G SET]	: Sets operations and graphs.
[SCALE SET]	: Sets scales.
[COM1 INPUT]	: Inputs comment 1.
[COM2 INPUT]	: Inputs comment 2.
[Y-TIME]	: Switches to the Y-Time graph.
[CIRCLE]	: Switches to the Circle graph.
[FOURIER]	: Switches to the Fourier graph.
[BODE]	: Switches to the Bode graph.

- Performing measurement

When you click the [MEASUREMENT] soft key, you can perform the operations corresponding to the menu items that follow.

[START]   : Starts measurement.
[ORIGIN]   : Sets the origin value.
[STOP]   : Stops measurement.
[DATA IN]   : Specifies measurement-related settings.

- Changing measurement settings

1   When you click the [MEASUREMENT] soft key and then the [DATA IN] soft key, you can perform the operations corresponding to the menu items that follow.

2   Click the [LIST] soft key.
     The list screen is displayed as shown below.
     To display any channel other than the one currently displayed, display the list screen for the desired channel by pressing the

     ⬆ PAGE or PAGE ⬇ key.

```
SERVO GUIDE MATE                           O0123   N00000
LIST
                                 SAMPLING CYCLE (SERVO)    : 250 usec
DATA POINTS    : 16000                        (SPINDLE) : 1 ms
CH 1 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :TCMD        CONV.COEF:   100.000 / CONV.BASE:   7282.000
     UNIT :%           MEANING  :Torque command(TCMD)

CH 2 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :FRTCM       CONV.COEF:   100.000 / CONV.BASE:  -7282.000
     UNIT :            MEANING  :Vibration Torque command

CH 3 AXIS :SERVO 1      ORIGIN   :     0.000
     TYPE :FREQ        CONV.COEF:     1.000 / CONV.BASE:      1.000
     UNIT :Hz          MEANING  :Vibration Frequency

CH 4 AXIS :            ORIGIN   :
     TYPE :            CONV.COEF:          / CONV.BASE:
     UNIT :            MEANING  :


                              A>

                              MEM  STOP *** ***      12:00:00 PATH1
< RE-DSP  LIST  SAMPLI CH SET
  GRAPH         NG
```

3   Check the current settings on the list screen.

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4   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                         O0123   N00000

MEASURE SETTING

DATA POINTS              :   10000      CANDIDATE
TRIGGER PATH             :     1          SAMPLING CYCLE (SERVO)
        SEQ.NO          :     0            1 :  100 ms
SAMPLING CYCLE (SERVO)  :     9            2 :  50 ms
             (SPINDLE)  :     7            3 :  20 ms
                                          4 :  10 ms
AUTO-SCALING            :     1            5 :  5 ms
SYNC.(SV-SP)            :     1            6 :  2 ms
DATE                    :  Mon Oct 21 2002 7 :  1 ms
TIME                    : 09:01:11         8 :  500 us
                                          9 :  250 usec
                                         10 :  125 us
                                         11 :  62.5 us


                                      A>

                                      MEM STOP *** ***    12:00:00 PATH1

< RE-DSP LIST SAMPLI CH SET
  GRAPH      NG
```

5   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

6   Enter data and the press the [INPUT] key.

7   Repeat steps 5 and 6 until you set all the parameters.

8   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     [↑PAGE] or [PAGE↓] key.

```
SERVO GUIDE MATE                         O0123   N00000

SET CHANNEL
                   [ CH 1 ]    [ CH 2 ]
AXIS             :    1           1       CANDIDATE
TYPE             :    2          16         TYPE
UNIT             :   33          33          5 : POSF   20 : ROTOR
CONV.COEF        :  100.000     100.000      1 : VCMD   21 : SIN_T
CONV.BASE        : 7282.000   -7282.000      2 : TCMD   15 : FREQ
ORIGIN VALUE     :    0.000       0.000      3 : SPEED  16 : FRTCM
EXTENDED ADDRESS :                           4 : ERR    25 : OVCLV
SHIFT            :                           7 : SYNC
 EXPLANATIONS                                8 : ABS
 Torque command(TCMD)                       22 : DTRQ
 Physical value is need to set max. current 24 : DLTCM
 (Ap) of amplifier. Default value is 100 in 23 : SFERR
 convention which convert measured data to p 48 : IR
 ercent by max. torque.                     49 : IS
                                            50 : IEFF

                                      A>

                                      MEM STOP *** ***    12:00:00 PATH1

< RE-DSP LIST SAMPLI CH SET
  GRAPH      NG
```

9   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

10   Enter data and the press the [INPUT] key.

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11   Repeat steps 9 and 10 until you set all the parameters.
12   Click the [RE-DSPGRAPH] soft key.
     The wave display screen is displayed as shown below.

13   The new settings will take effect next time you perform
     measurement.   Change the operation/graph settings and scale
     settings according to the new channel settings.

Explanation

- Setting the data-in screen

See the Explanation section for the Y-time graph describing the
setting of the data-in screen.

- Setting the channel setting screen

See the Explanation section for the Y-time describing the setting of
the channel setting screen.

- **Setting the operation and graph setting screen**

In the operation and graph setting screen, up to two graphs can be set per draw.

- Operation

  The specifiable values are as shown in Table 12.5.1.2(a), XY graph operations.

  An operation cannot be specified if it does not meet the graph display conditions defined in Table 12.5.1.2(b), XY graph conditions.

Table 1.9.1.2 (a)   XY graph operations

Input value	Operation name	Description
1	N/A	Not displayed.
11	XY	XY display Input 1 is the horizontal axis. Input 2 is the vertical axis.

Table 1.9.1.2 (b)   XY graph conditions

Operation	Coordinate conversion	Input 1	Input 2	Remarks
11 : XY	1 : Normal	Channel whose position has been measured	Channel whose position has been measured	
	2 : Polar	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured ((only when the data unit is deg)	
	3 : Angular	Channel whose position has been measured	Channel whose position has been measured	

- Input 1

  Specifiable values are sequential, with channel 1 being 1.   The maximum value is the largest channel number for which measurement is set during the channel setting process.   A value that does not meet the graph display conditions defined in Table 12.5.1.2(b), XY graph conditions cannot be specified in input 1.

- Input 2

  Specifiable values are sequential, with channel 1 being 1.   The maximum value is the largest channel number for which measurement is set during the channel setting process.   A value that does not meet the graph display conditions defined in Table 12.5.1.2(b), XY graph conditions cannot be specified in input 2.

- Display unit

  The specifiable value is 4 (mm) only.

- Coordinate conversion
  Specifiable values are 1 (Normal; no coordinate conversion), 2 (Polar; coordinate conversion for polar coordinate interpolation), and 3 (Angular; coordinate conversion for angular axis control). The conditions for the specifiable coordinate conversion types are as shown in Table 12.5.1.2(c), Corresponding XY graph coordinate conversion types.

Table 1.9.1.2 (c)   Corresponding XY graph coordinate conversion types

Operation	Input 1	Input 2	Specifiable coordinate conversion
11 : XY	Channel whose position has been measured	Channel whose position has been measured	1 : Normal
	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	2 : Polar
	Channel whose position has been measured	Channel whose position has been measured	3 : Angular

- Inclination
  Specify the inclination in degrees.   The specified value is effective only when Angular (coordinate conversion for angular axis control) is specified as the coordinate conversion type.

- Setting the scale screen

- Start point
  Set the center coordinates of the horizontal axis and vertical axis of the displayed data, respectively.
- Division
  Set the value of one grid of the horizontal axis and vertical axis of the displayed data, respectively.

- Operation for measurement

See the Explanation section for the Y-time graph describing the operation for measurement.

Limitation

See the Limitation section for the Y-time graph.

1.9.1.3 Circle graph

This graph displays an enlarged view of the path deviation from the specified circle arising during circular cutting.

Only one draw can be displayed.

Displaying and setting the circle graph

Procedure

The procedure for displaying the measurement data is described below.

1　Press the ⌧SYSTEM function key.

2　Press the continuous menu key ▷ several times until [SERVO GUIDE MATE] is displayed.

3　Click the [SERVO GUIDE MATE] soft key.

4　Click the [CIRCLE] soft key.

The wave display screen is displayed as shown below.

5　Click the [MEASUREMENT] soft key.

6　Click the [DATA IN] soft key.

7   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123   N00000

MEASURE SETTING


DATA POINTS              :  10000      ┌CANDIDATE────────────────┐
TRIGGER PATH             :    1        │   SAMPLING CYCLE (SERVO) │
        SEQ.NO           :       0     │                          │
SAMPLING CYCLE (SERVO)   :    9        │    1 : 100 ms            │
          (SPINDLE)      :    7        │    2 : 50 ms            │
                                       │    3 : 20 ms            │
AUTO-SCALING             :    1        │    4 : 10 ms            │
SYNC.(SV-SP)             :    1        │    5 : 5 ms             │
DATE         :    Mon Oct 21 2002      │    6 : 2 ms             │
TIME                     : 09:01:11    │    7 : 1 ms             │
                                       │    8 : 500 us          │
                                       │    9 : 250 usec        │
                                       │   10 : 125 us          │
                                       │   11 : 62.5 us         │
                                       └──────────────────────────┘


                                       A>

                                       MEM  STOP ***  ***   12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │      │
  │GRAPH │      │NG    │      │      │      │      │      │      │      │
```

8   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

9   Enter data and the press the |INPUT| key.

10   Repeat steps 8 and 9 until you set all the parameters.
11   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     |↑PAGE| or |PAGE↓| key.

```
SERVO GUIDE MATE                    O0123   N00000

SET CHANNEL
                   [ CH 1 ]    [ CH 2 ]

AXIS            :    1            1       ┌CANDIDATE──────────────┐
TYPE            :    2           16       │   TYPE                │
UNIT            :   33           33       │                       │
CONV.COEF       :  100.000     100.000    │   5 : POSF   20 : ROTOR│
CONV.BASE       : 7282.000   -7282.000    │   1 : VCMD   21 : SIN_T│
ORIGIN VALUE    :    0.000       0.000    │   2 : TCMD   15 : FREQ │
EXTENDED ADDRESS :                        │   3 : SPEED  16 : FRTCM│
SHIFT           :                         │   4 : ERR    25 : OVCLV│
 ┌EXPLANATIONS────────────────────────┐   │   7 : SYNC            │
 │ Torque command(TCMD)               │   │   8 : ABS             │
 │ Physical value is need to set max. current │ 22 : DTRQ         │
 │ (Ap) of amplifier. Default value is 100 in │ 24 : DLTCM        │
 │ convention which convert measured data to p │ 23 : SFERR        │
 │ ercent by max. torque.             │   │  48 : IR             │
 └────────────────────────────────────┘   │  49 : IS             │
                                          │  50 : IEFF           │
                                          └───────────────────────┘

                                          A>

                                          MEM  STOP ***  ***   12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │      │
  │GRAPH │      │NG    │      │      │      │      │      │      │      │
```

12   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

13   Enter data and the press the |INPUT| key.

14   Repeat steps 12 and 13 until you set all the parameters.
15   Click the [RE-DSPGRAPH] soft key.
16   Click the [OPERATION & GRAPH] soft key.
      The operation and graph setting screen is displayed as shown
      below.

```
SERVO GUIDE MATE                    O0123   N00000

OPERATION & GRAPH


GRAPH MODE  ( CIRCLE )                      CANDIDATE
             [ Draw 1 ]    [ Draw 2 ]         OPERATION
OPERATION  :   21                            1 : N / A
INPUT 1    :    1                           21 : CIRCLE
INPUT 2    :    2
DISPLAY UNIT :  4
CONVERSION :    1
(deg)      :       0.000
             [ Draw 3 ]    [ Draw 4 ]
OPERATION  :
INPUT 1    :
INPUT 2    :
DISPLAY UNIT :
CONVERSION :
(deg)      :
                                     A>

                              MEM  STOP *** ***     12:00:00 PATH1

<  RE-DSP                            CIRCLE
   GRAPH
```

17   Move the cursor to the parameter you want to set, by pressing the
      cursor key.

18   Enter data and the press the |INPUT| key.

19   Repeat steps 17 and 18 until you set all the parameters.
20   Click the [RE-DSPGRAPH] soft key.
21   Click the [SCALE   SET] soft key.
      The scale setting screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123   N00000

SCALE ( CIRCLE )

  H-CENTER        :        0.000      CANDIDATE
  V-CENTER        :      -50.000
  RADIUS          :       50.000
  DIVISION        :        0.005
  ZOOM            :        1.000








                                     A>

                              MEM  STOP *** ***     12:00:00 PATH1

<  RE-DSP
   GRAPH
```
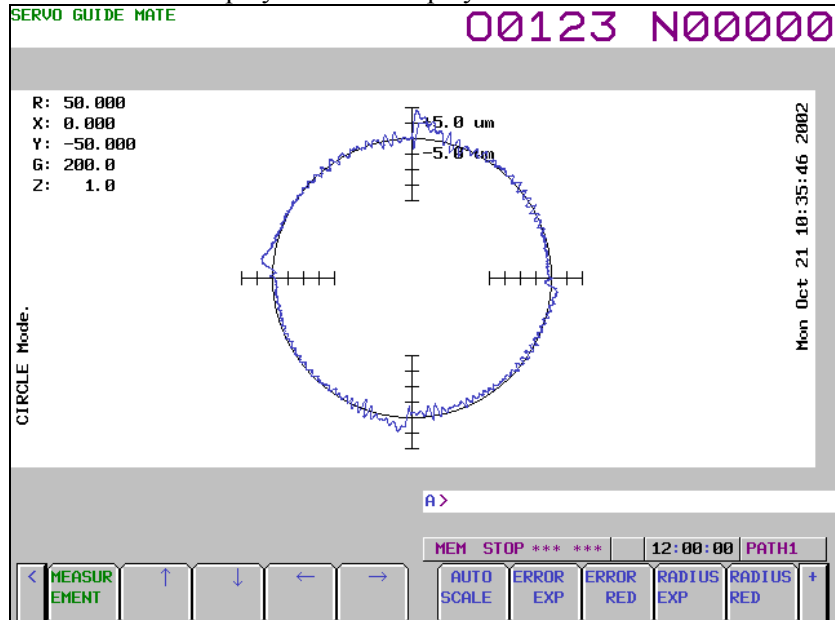
22   Move the cursor to the parameter you want to set, by pressing the
      cursor key.

23   Enter data and the press the ⌈INPUT⌉ key.
24   Repeat steps 22 and 23 until you set all the parameters.
25   Click the [RE-DSPGRAPH] soft key.
26   Click the [MEASUREMENT] soft key.
27   Click the [START] soft key.
28   Start the automatic or manual operation.
29   When the measurement is completed, the wave display screen is
      displayed as shown below.

- Changing the operation and graph setting screen

The procedure for changing the operation and graph setting screen as
necessary is described below.
1   Click the [OPERATION & GRAPH] soft key.
      The operation and graph setting screen is displayed as shown
      below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.
5   Click the [RE-DSPGRAPH] soft key.
     Based on the new operation and graph settings, the wave display
     screen is displayed as shown below.

- Changing the scale screen

The procedure for changing the scale settings as necessary is
described below.
1   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the ⌷INPUT⌷ key.
4   Repeat steps 2 and 3 until you set all the parameters.
5   Click the [RE-DSPGRAPH] soft key.
     Based on the new scale settings, the wave display screen is
     displayed as shown below.

- Manipulating the Circle graph

By clicking the following soft keys, you can perform the operations
corresponding to them.

[MEASUREMENT]	: Performs a measurement-related operation.
[←]	: Moves the center coordinate position to the left.
[→]	: Moves the center coordinate position to the right.
[↑]	: Moves the center coordinate position upward.
[↓]	: Moves the center coordinate position downward.
[AUTO SCALE]	: Enables auto scaling.
[ERROR EXP]	: Expands the error display.
[ERROR RED]	: Reduces the error display.
[RADIUSEXP]	: Expands the radius.
[RADIUSRED	: Reduces the radius.
[DRAW 1UNDSP]	: Sets whether or not to display Draw 1.
[ZOOM EXP]	: Expands the zoom.
[ZOOM RED]	: Reduces the zoom.
[OPE/G SET]	: Sets operations and graphs.
[SCALE SET]	: Sets scales.
[COM1 INPUT]	: Inputs comment 1.
[COM2 INPUT]	: Inputs comment 2.
[Y-TIME]	: Switches to the Y-time graph.
[XY]	: Switches to the XY graph.
[FOURIER]	: Switches to the Fourier graph.

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[BODE]   : Switches to the Bode graph.

- Performing measurement

When you click the [MEASUREMENT] soft key, you can perform the operations corresponding to the menu items that follow.

[START]   : Starts measurement.
[ORIGIN]   : Sets the origin value.
[STOP]   : Stops measurement.
[DATA IN]   : Specifies measurement-related settings.

- Changing measurement settings

1   When you click the [MEASUREMENT] soft key and then the [DATA IN] soft key, you can perform the operations corresponding to the menu items that follow.

2   Click the [LIST] soft key.
     The list screen is displayed as shown below.
     To display any channel other than the one currently displayed, display the list screen for the desired channel by pressing the ⬆PAGE or PAGE⬇ key.

```
SERVO GUIDE MATE                          O0123   N00000
LIST
                                SAMPLING CYCLE (SERVO)   : 250 usec
DATA POINTS      : 16000                   (SPINDLE) : 1 ms
CH 1 AXIS :SERVO 1     ORIGIN   :      0.000
     TYPE :TCMD        CONV.COEF:    100.000 / CONV.BASE:    7282.000
     UNIT :%           MEANING  :Torque command(TCMD)

CH 2 AXIS :SERVO 1     ORIGIN   :      0.000
     TYPE :FRTCM       CONV.COEF:    100.000 / CONV.BASE:   -7282.000
     UNIT :            MEANING  :Vibration Torque command

CH 3 AXIS :SERVO 1     ORIGIN   :      0.000
     TYPE :FREQ        CONV.COEF:      1.000 / CONV.BASE:       1.000
     UNIT :Hz          MEANING  :Vibration Frequency

CH 4 AXIS :            ORIGIN   :
     TYPE :            CONV.COEF:          / CONV.BASE:
     UNIT :            MEANING  :



                                A>

                                MEM  STOP *** ***    12:00:00 PATH1
< RE-DSP  LIST  SAMPLI CH SET
  GRAPH         NG
```

3   Check the current settings on the list screen.

4   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                      O0123    N00000
MEASURE SETTING

DATA POINTS              :   10000      ┌CANDIDATE─────────────────
TRIGGER PATH             :     1          SAMPLING CYCLE (SERVO)
         SEQ.NO          :     0
SAMPLING CYCLE (SERVO)   :     9            1 : 100 ms
              (SPINDLE)  :     7            2 : 50 ms
                                           3 : 20 ms
AUTO-SCALING             :     1            4 : 10 ms
SYNC.(SV-SP)             :     1            5 : 5 ms
DATE                     :  Mon Oct 21 2002 6 : 2 ms
TIME                     : 09:01:11         7 : 1 ms
                                           8 : 500 us
                                           9 : 250 usec
                                          10 : 125 us
                                          11 : 62.5 us


                                        A>

                                        MEM  STOP *** ***      12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │
  │GRAPH │      │NG    │      │      │      │      │      │      │
```

5   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

6   Enter data and the press the [INPUT] key.

7   Repeat steps 5 and 6 until you set all the parameters.

8   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     [↑PAGE] or [PAGE↓] key.

```
SERVO GUIDE MATE                      O0123    N00000
SET CHANNEL
                    [ CH 1 ]    [ CH 2 ]
AXIS            :      1           1       ┌CANDIDATE───────────────
TYPE            :      2          16         TYPE
UNIT            :     33          33          5 : POSF    20 : ROTOR
CONV.COEF       :   100.000     100.000       1 : VCMD    21 : SIN_T
CONV.BASE       :  7282.000   -7282.000       2 : TCMD    15 : FREQ
ORIGIN VALUE    :     0.000       0.000       3 : SPEED   16 : FRTCM
EXTENDED ADDRESS :                            4 : ERR     25 : OVCLV
SHIFT           :                             7 : SYNC
┌EXPLANATIONS─────────────────────┐           8 : ABS
│ Torque command(TCMD)            │          22 : DTRQ
│ Physical value is need to set max. current 24 : DLTCM
│ (Ap) of amplifier. Default value is 100 in 23 : SFERR
│ convention which convert measured data to p 48 : IR
│ ercent by max. torque.          │          49 : IS
└─────────────────────────────────┘          50 : IEFF

                                        A>

                                        MEM  STOP *** ***      12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│      │      │      │      │      │
  │GRAPH │      │NG    │      │      │      │      │      │      │
```

9   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

10   Enter data and the press the [INPUT] key.

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11   Repeat steps 9 and 10 until you set all the parameters.
12   Click the [RE-DSPGRAPH] soft key.
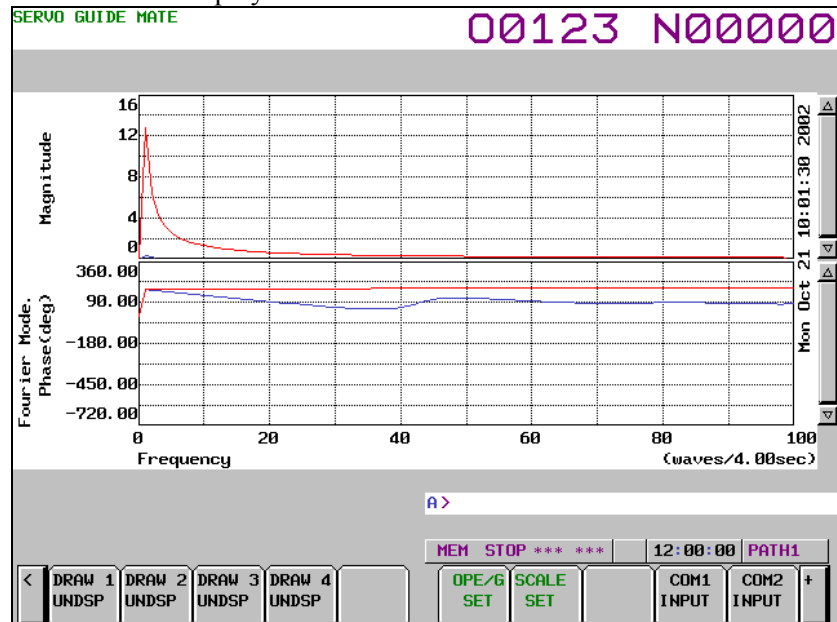   The wave display screen is displayed as shown below.

13   The new settings will take effect next time you perform
      measurement.   Change the operation/graph settings and scale
      settings according to the new channel settings.

Explanation

- Setting the data-in screen

See the Explanation section for the Y-time graph describing the
setting of the data-in screen.

- Setting the channel setting screen

See the Explanation section for the Y-time describing the setting of
the channel setting screen.

- Setting the operation and graph setting screen

The operation and graph setting screen lets you specify graph settings.

- Operation

  The specifiable values are as shown in Table 12.5.1.3(a), Circle graph operations.

  An operation cannot be specified if it does not meet the graph display conditions defined in Table 12.5.1.3(b), Circle graph conditions.

Table 1.9.1.3 (a)   Circle graph operations

Input value	Operation name	Description
1	N/A	Not displayed.
21	Circle	Circle error display Input 1 is the horizontal axis, and input 2 is the vertical axis. The reference circle used to calculate the error is set on the scale page.

Table 1.9.1.3 (b) Circle graph conditions

Operation	Coordinate conversion	Input 1	Input 2	Remarks
21 : Circle	1 : Normal	Channel whose position has been measured	Channel whose position has been measured	
	2 : Polar	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	
	3 : Angular	Channel whose position has been measured	Channel whose position has been measured	

- Input 1

  Specifiable values are sequential, with channel 1 being 1.   The maximum value is the largest channel number for which measurement is set during the channel setting process.   A value that does not meet the graph display conditions defined in Table 12.5.1.3(b), Circle graph conditions cannot be specified in input 1.

- Input 2

  Specifiable values are sequential, with channel 1 being 1.   The maximum value is the largest channel number for which measurement is set during the channel setting process.   A value that does not meet the graph display conditions defined in Table 12.5.1.3(b) Circle graph conditions cannot be specified in input 2.

- Display unit

  The specifiable value is 4 (mm) only.

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- Coordinate conversion
  Specifiable values are 1 (Normal; no coordinate conversion), 2 (Polar; coordinate conversion for polar coordinate interpolation), and 3 (Angular; coordinate conversion for angular axis control). The conditions for the specifiable coordinate conversion types are as shown in Table 12.5.1.3(c), Corresponding Circle graph coordinate conversion types.

Table 1.9.1.3 (c)   Corresponding Circle graph coordinate conversion types

Operation	Input 1	Input 2	Specifiable coordinate conversion
21 : Circle	Channel whose position has been measured	Channel whose position has been measured	1 : Normal
	Channel whose position has been measured (only when the data unit is mm, μm, or inch)	Channel whose position has been measured (only when the data unit is deg)	2 : Polar
	Channel whose position has been measured	Channel whose position has been measured	3 : Angular

- Inclination
  Specify the inclination in degrees. The specified value is effective only when Angular (coordinate conversion for angular axis control) is specified as the coordinate conversion type.

- Setting the scale screen

- Center
  Set the center coordinates of the circle (respective coordinates of the horizontal and vertical axes).
- Radius
  Set the radius of the circle.
- Division
  Set the scale of the circle display.
- Zoom
  Set the zoom percentage when expanding the display in the direction of the center angle at the quadrant change point (direction change point for each axis). This is effective for getting a detailed view of quadrant protrusions. Under normal circumstances, set this value to 1.0.

- Performing measurement

See the Explanation section for the Y-time graph describing the performing measurement.

Limitation

See the Limitation section for the Y-time graph.

1.9.1.4 **Fourier graph**

This graph displays the frequency spectrum by performing digital Fourier conversion for the range of data displayed by the Y-time graph.
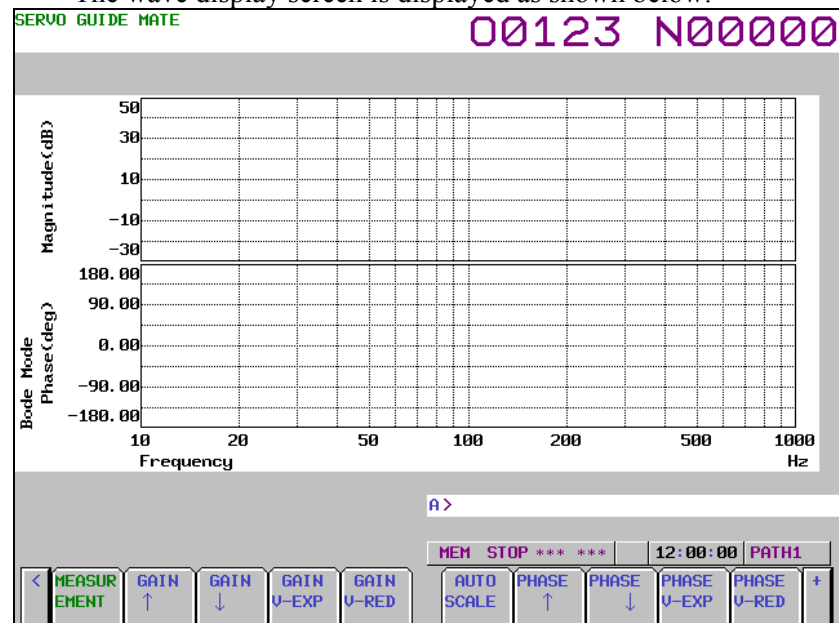Up to four draws can be displayed at a time.

Displaying and setting the Fourier graph

Procedure

The procedure for displaying the measurement data is described below.
1   Display the Y-time graph according to the relevant procedure.
2   Click the [FOURIER] soft key.
The wave display screen is displayed as shown below.
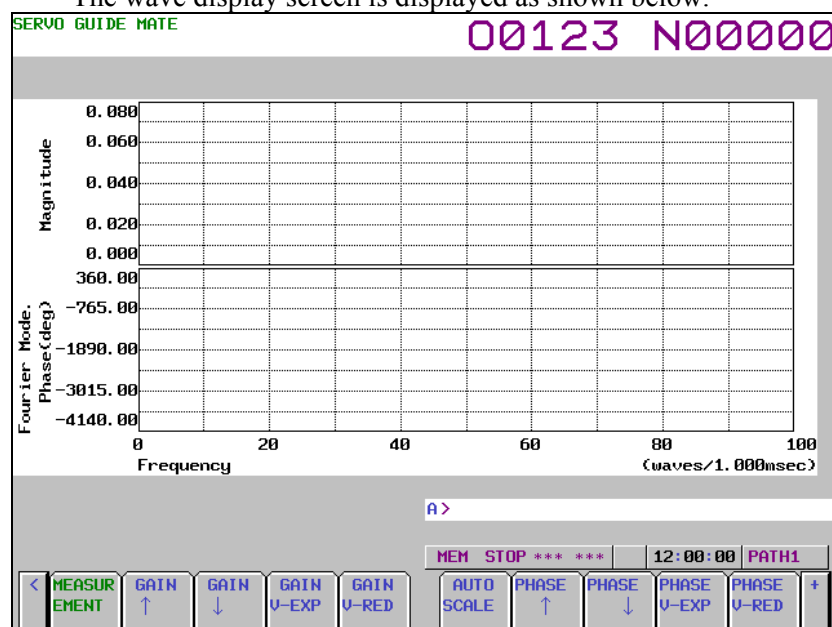
3   Click the [OPERATION & GRAPH] soft key.
     The operation and graph setting screen is displayed as shown
     below.

```
SERVO GUIDE MATE                    O0123    N00000

  OPERATION & GRAPH

  GRAPH MODE  ( FOURIER )                    CANDIDATE
                 [ Draw 1 ]   [ Draw 2 ]        OPERATION
  OPERATION   :   31            31
  INPUT 1     :                                 1 : N / A
  INPUT 2     :                                31 : FOURIER
  DISPLAY UNIT :
  CONVERSION  :
  (deg)       :
                 [ Draw 3 ]   [ Draw 4 ]
  OPERATION   :   31             1
  INPUT 1     :
  INPUT 2     :
  DISPLAY UNIT :
  CONVERSION  :
  (deg)       :
                                           A>

                                   MEM  STOP *** ***    12:00:00 PATH1
  < RE-DSP                           FOUR
    GRAPH                            IER
```

4   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

5   Enter data and the press the |INPUT| key.

6   Repeat steps 4 and 5 until you set all the parameters.

7   Click the [RE-DSPGRAPH] soft key.

8   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123    N00000

  SCALE ( FOURIER )

   GAIN     (ORIGIN)  :      200.000      CANDIDATE
            (DIVISION) :      50.000
   PHASE    (ORIGIN)  :     2610.000
            (DIVISION) :    1552.500
   FREQUENCY(MIN)     :        0.000
            (MAX)     :      100.000


                                           A>

                                   MEM  STOP *** ***    12:00:00 PATH1
  < RE-DSP
    GRAPH
```
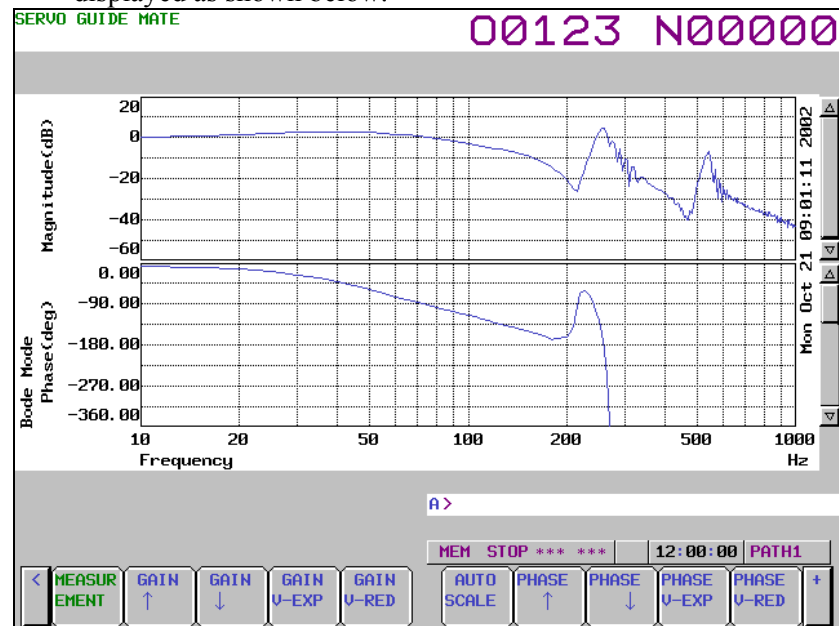
9   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

10   Enter data and the press the |INPUT| key.

11   Repeat steps 9 and 10 until you set all the parameters.

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12   Click the [RE-DSPGRAPH] soft key.
      The wave display screen is displayed as shown below.

- **Changing the operation and graph setting screen**

The procedure for changing the operation and graph setting screen as necessary is described below.
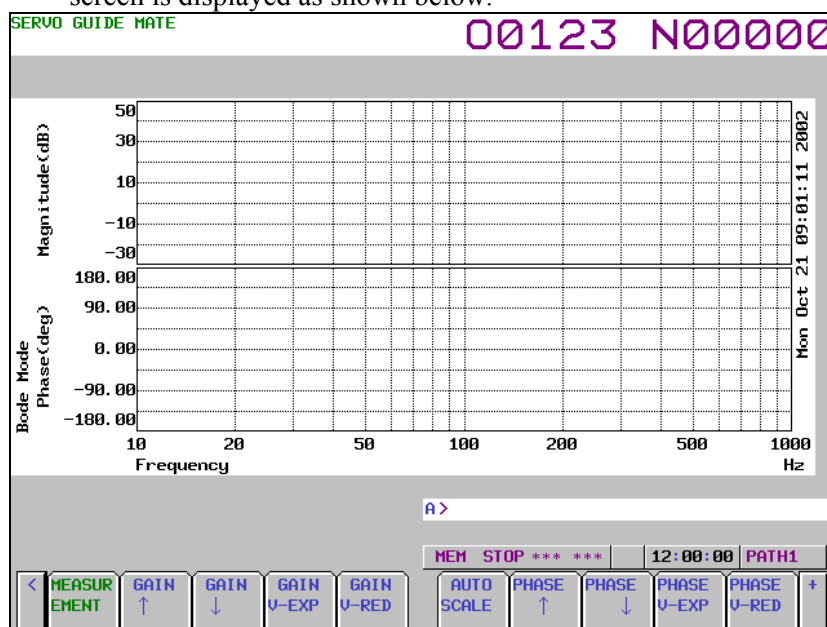
1   Click the [OPERATION & GRAPH] soft key.
      The operation and graph setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the cursor key.

3   Enter data and the press the |INPUT| key.

4   Repeat steps 2 and 3 until you set all the parameters.

5   Click the [RE-DSPGRAPH] soft key.
     Based on the new operation and graph settings, the wave display
     screen is displayed as shown below.

- Changing the scale screen

The procedure for changing the scale settings as necessary is
described below.

1   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.

5   Click the [RE-DSPGRAPH] soft key.
     Based on the new scale settings, the wave display screen is
     displayed as shown below.

- Manipulating the Fourier graph

By clicking the following soft keys, you can perform the operations
corresponding to them.

[MEASUREMENT]   : Performs a measurement-related operation.
[GAIN   ↑]   : Shifts the gain graph downward.
[GAIN   ↓]   : Shifts the gain graph upward.
[GAIN V-EXP]   : Expands the gain graph.
[GAIN V-RED]   : Reduces the gain graph.
[AUTO SCALE]   : Enables auto scaling.
[PHASE ↑]   : Shifts the phase graph downward.
[PHASE ↓]   : Shifts the phase graph upward.
[PHASE V-EXP]   : Expands the phase graph.
[PHASE V-RED]   : Reduces the phase graph.
[DRAW 1UNDSP]   : Sets whether or not to display Draw 1.
[DRAW 2UNDSP]   : Sets whether or not to display Draw 2.
[DRAW 3UNDSP]   : Sets whether or not to display Draw 3.
[DRAW 4UNDSP]   : Sets whether or not to display Draw 4.
[OPE/G SET]   : Sets operations and graphs.
[SCALE SET]   : Sets scales.
[COM1 INPUT]   : Inputs comment 1.
[COM2 INPUT]   : Inputs comment 2.
[Y-TIME]   : Switches to the Y-Time.
[XY]   : Switches to the XY graph.
[CIRCLE]   : Switches to the Circle graph.
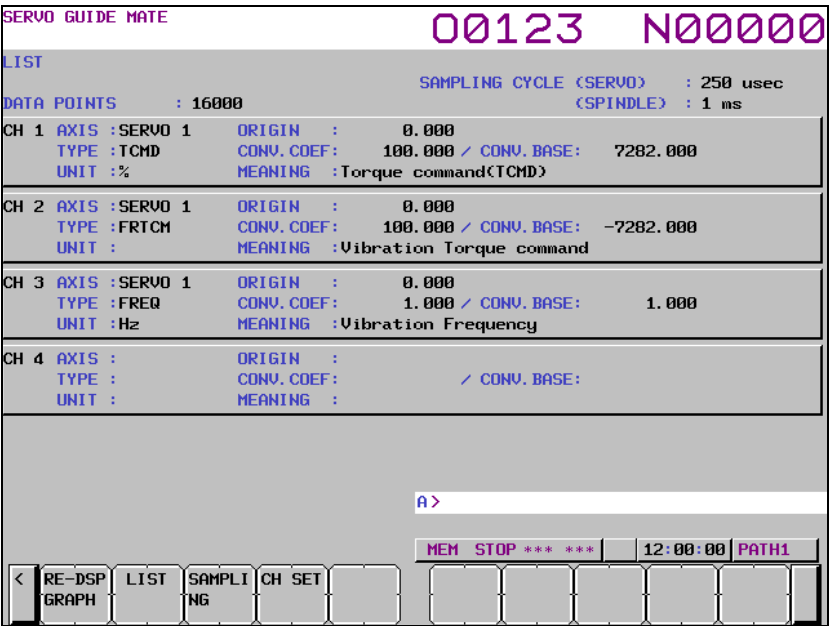[BODE]   : Switches to the Bode graph.

Explanation

- Setting the operation and graph setting screen

The operation and graph setting screen lets you specify up to four graph settings per draw.

- Operation

  The specifiable values are as shown in Table 12.5.1.4(a), Fourier graph operations.

  An operation cannot be specified if it does not meet the graph display conditions defined in Table 12.5.1.4(b), Fourier graph conditions.

Table 1.9.1.4 (a)   Fourier graph operations

Input value	Operation name	Description
1	N/A	Not displayed.
31	Fourier	Displays the frequency spectrum by performing digital Fourier conversion.

Table 1.9.1.4 (b)   Fourier graph conditions

Operation	Coordinate conversion	Remarks
31 : Fourier	Draws of the Y-time graph correspond to those of the Fourier graph on a one-to-one basis. The Fourier operation ca be set only when the corresponding Y-time graph draw is effective.	

- Setting the scale screen

- Start point

  Set gain and phase data values for the center of the graph.
- Division

  Set the value of one grid.
- Frequency

  Set the minimum and maximum values of the horizontal axis. Since the unit is dependent on the time range selected for the Y-time graph, 1 is not necessarily equal to 1 Hz.

  (Example)   When a 0.1-second time range is selected, 1 is equal to 1 Hz.

Limitation

See the Limitation section for the Y-time graph.

1.9.1.5   Bode graph

This graph displays a Bode diagram for the measurement data in the form of a horizontal axis logarithm graph.
Only one draw can be displayed at a time.

Displaying and setting the Bode graph

Procedure

The procedure for displaying the measurement data is described below.

1   Press the [SYSTEM] function key.

2   Press the continuous menu key [▷] several times until [SERVO GUIDE MATE] is displayed.

3   Click the [SERVO GUIDE MATE] soft key.

4   Click the [BODE] soft key.
     The wave display screen is displayed as shown below.

5   Click the [MEASUREMENT] soft key.

6   Click the [DATA IN] soft key.

7   Click the [SAMPLING] soft key.
     The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                        O0123    N00000

MEASURE SETTING

DATA POINTS              :   10000      ┌CANDIDATE────────────────┐
TRIGGER PATH             :      1           SAMPLING CYCLE (SERVO)
        SEQ.NO           :      0
SAMPLING CYCLE (SERVO)   :      9            1 : 100 ms
              (SPINDLE)  :      7            2 : 50 ms
                                            3 : 20 ms
AUTO-SCALING             :      1            4 : 10 ms
SYNC.(SV-SP)             :      1            5 : 5 ms
DATE           :   Mon Oct 21 2002          6 : 2 ms
TIME                     : 09:01:11         7 : 1 ms
                                            8 : 500 us
                                            9 : 250 usec
                                           10 : 125 us
                                           11 : 62.5 us
                                        └──────────────────────────┘

                                        A>

                                        MEM  STOP *** ***    12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│
  │GRAPH │      │NG    │
```

8   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

9   Enter data and the press the |INPUT| key.

10   Repeat steps 8 and 9 until you set all the parameters.

11   Click the [SET CHANNEL] soft key.
     The channel setting screen is displayed as shown below.
     To set any channel other than the one currently displayed,
     display the setting screen for the desired channel by pressing the
     |↑ PAGE| or |PAGE ↓| key.

```
SERVO GUIDE MATE                        O0123    N00000

SET CHANNEL

                       [ CH 1 ]    [ CH 2 ]
AXIS            :    1           1            ┌CANDIDATE──────────────┐
TYPE            :    2          16               TYPE
UNIT            :   33          33                5 : POSF   20 : ROTOR
CONV.COEF       : 100.000     100.000            1 : VCMD   21 : SIN_T
CONV.BASE       : 7282.000   -7282.000           2 : TCMD   15 : FREQ
ORIGIN VALUE    :   0.000       0.000            3 : SPEED  16 : FRTCM
EXTENDED ADDRESS :                               4 : ERR    25 : OVCLV
SHIFT           :                                7 : SYNC
                                                 8 : ABS
┌EXPLANATIONS──────────────────────────────┐    22 : DTRQ
│ Torque command(TCMD)                      │    24 : DLTCM
│ Physical value is need to set max. current│    23 : SFERR
│ (Ap) of amplifier. Default value is 100 in│    48 : IR
│ convention which convert measured data to p│   49 : IS
│ ercent by max. torque.                    │    50 : IEFF
└───────────────────────────────────────────┘ └───────────────────────┘

                                        A>

                                        MEM  STOP *** ***    12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│
  │GRAPH │      │NG    │
```

12   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

13   Enter data and the press the |INPUT| key.

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14   Repeat steps 12 and 13 until you set all the parameters.
15   Click the [RE-DSPGRAPH] soft key.
16   Click the [OPERATION & GRAPH] soft key.
      The operation and graph setting screen is displayed as shown
      below.

```
SERVO GUIDE MATE                        O0123   N00000

 OPERATION & GRAPH


 GRAPH MODE   ( BODE )
                 [ Draw 1 ]    [ Draw 2 ]        CANDIDATE
 OPERATION   :     41                              OPERATION
 INPUT 1     :                                    1 : N / A
 INPUT 2     :                                    41 : BODE
 DISPLAY UNIT :
 CONVERSION  :
 (deg)       :
                 [ Draw 3 ]    [ Draw 4 ]
 OPERATION   :
 INPUT 1     :
 INPUT 2     :
 DISPLAY UNIT :
 CONVERSION  :
 (deg)       :
                                      A >

                                  MEM  STOP *** ***    12:00:00 PATH1
 <  RE-DSP                             BODE
    GRAPH
```

17   Move the cursor to the parameter you want to set, by pressing the
      cursor key.

18   Enter data and the press the [INPUT] key.

19   Click the [RE-DSPGRAPH] soft key.
20   Click the [SCALE SET] soft key.
      The scale setting screen is displayed as shown below.

```
SERVO GUIDE MATE                        O0123   N00000

 SCALE ( BODE )

   GAIN      (ORIGIN)   :        10.000      CANDIDATE
             (DIVISION) :        10.000
   PHASE     (ORIGIN)   :         0.000
             (DIVISION) :        45.000
   FREQUENCY(MIN)       :        10.000
             (MAX)      :      1000.000






                                      A >

                                  MEM  STOP *** ***    12:00:00 PATH1
 <  RE-DSP
    GRAPH
```

21   Move the cursor to the parameter you want to set, by pressing the
      cursor key.

22   Enter data and the press the [INPUT] key.

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23 Repeat steps 21 and 22 until you set all the parameters.
24 Click the [RE-DSPGRAPH] soft key.
25 Click the [MEASUREMENT] soft key.
26 Click the [START] soft key.
27 Start the automatic or manual operation.
28 When the measurement is completed, the wave display screen is displayed as shown below.

- Changing the operation and graph setting screen

The procedure for changing the operation and graph setting screen as necessary is described below.

1 Click the [OPERATION & GRAPH] soft key.
   The operation and graph setting screen is displayed as shown below.

2 Move the cursor to the parameter you want to set, by pressing the cursor key.

3   Enter data and the press the [INPUT] key.

4   Click the [RE-DSPGRAPH] soft key.
     Based on the new operation and graph settings, the wave display
     screen is displayed as shown below.

- Changing the scale screen

The procedure for changing the scale settings as necessary is
described below.

1   Click the [SCALE   SET] soft key.
     The scale setting screen is displayed as shown below.

2   Move the cursor to the parameter you want to set, by pressing the
     cursor key.

3   Enter data and the press the [INPUT] key.

4   Repeat steps 2 and 3 until you set all the parameters.

- 137 -

5   Click the [RE-DSPGRAPH] soft key.
     Based on the new scale settings, the wave display screen is
     displayed as shown below.

- Manipulating the Bode graph

By clicking the following soft keys, you can perform the operations
corresponding to them.

[MEASUREMENT]	: Performs a measurement-related operation.
[GAIN ↑]	: Shifts the gain graph downward.
[GAIN ↓]	: Shifts the gain graph upward.
[GAIN V-EXP]	: Expands the gain graph.
[GAIN V-RED]	: Reduces the gain graph.
[AUTO SCALE]	: Enables auto scaling.
[PHASE ↑]	: Shifts the phase graph downward.
[PHASE ↓]	: Shifts the phase graph upward.
[PHASE V-EXP]	: Expands the phase graph.
[PHASE V-RED]	: Reduces the phase graph.
[DRAW 1UNDSP]	: Sets whether or not to display Draw 1.
[OPE/G SET]	: Sets operations and graphs.
[SCALE SET]	: Sets scales.
[COM1 INPUT]	: Inputs comment 1.
[COM2 INPUT]	: Inputs comment 2.
[Y-TIME]	: Switches to the Y-Time.
[XY]	: Switches to the XY graph.
[CIRCLE]	: Switches to the Circle graph.
[FOURIER]	: Switches to the Fourier graph.

- **Performing measurement**

When you click the [MEASUREMENT] soft key, you can perform the operations corresponding to the menu items that follow.

[START]	: Starts measurement.
[ORIGIN]	: Sets the origin value.
[STOP]	: Stops measurement.
[DATA IN]	: Specifies measurement-related settings.

- **Changing measurement settings**

1   When you click the [MEASUREMENT] soft key and then the [DATA IN] soft key, you can perform the operations corresponding to the menu items that follow.

2   Click the [LIST] soft key.

The list screen is displayed as shown below.

To display any channel other than the one currently displayed, display the list screen for the desired channel by pressing the

⬆ PAGE   or   PAGE ⬇   key.

```
SERVO GUIDE MATE                      O0123    N00000

LIST
                              SAMPLING CYCLE (SERVO)    : 250 usec
DATA POINTS      : 16000                      (SPINDLE) : 1 ms
CH 1 AXIS :SERVO 1      ORIGIN   :       0.000
     TYPE :TCMD        CONV.COEF:    100.000 / CONV.BASE:    7282.000
     UNIT :%           MEANING  :Torque command(TCMD)

CH 2 AXIS :SERVO 1      ORIGIN   :       0.000
     TYPE :FRTCM       CONV.COEF:    100.000 / CONV.BASE:  -7282.000
     UNIT :            MEANING  :Vibration Torque command

CH 3 AXIS :SERVO 1      ORIGIN   :       0.000
     TYPE :FREQ        CONV.COEF:      1.000 / CONV.BASE:       1.000
     UNIT :Hz          MEANING  :Vibration Frequency

CH 4 AXIS :            ORIGIN   :
     TYPE :            CONV.COEF:          / CONV.BASE:
     UNIT :            MEANING  :



                        A>


                        MEM  STOP *** ***    | 12:00:00|PATH1

<  RE-DSP  LIST  SAMPLI CH SET
   GRAPH         NG
```

3   Check the current settings on the list screen.

4 Click the [SAMPLING] soft key.
The data-in screen is displayed as shown below.

```
SERVO GUIDE MATE                    O0123    N00000

MEASURE SETTING

DATA POINTS              :   10000       ┌CANDIDATE─────────────────┐
TRIGGER PATH            :      1            SAMPLING CYCLE (SERVO)
        SEQ.NO          :      0
SAMPLING CYCLE (SERVO)  :      9            1 : 100 ms
              (SPINDLE) :      7            2 : 50 ms
                                           3 : 20 ms
AUTO-SCALING            :      1            4 : 10 ms
SYNC.(SV-SP)            :      1            5 : 5 ms
DATE                    :  Mon Oct 21 2002 6 : 2 ms
TIME                    : 09:01:11         7 : 1 ms
                                           8 : 500 us
                                           9 : 250 usec
                                          10 : 125 us
                                          11 : 62.5 us

                                        A>

                                    MEM  STOP ***  ***    12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│     │     │     │     │     │     │
  │GRAPH │      │NG    │      │     │     │     │     │     │     │
```

5 Move the cursor to the parameter you want to set, by pressing the cursor key.

6 Enter data and the press the [INPUT] key.

7 Repeat steps 5 and 6 until you set all the parameters.

11 Click the [SET CHANNEL] soft key.
The channel setting screen is displayed as shown below.
To set any channel other than the one currently displayed, display the setting screen for the desired channel by pressing the [↑ PAGE] or [PAGE ↓] key.

```
SERVO GUIDE MATE                    O0123    N00000

SET CHANNEL
                          [ CH 1 ]    [ CH 2 ]
AXIS            :      1          1        ┌CANDIDATE─────────────┐
TYPE           :      2         16           TYPE
UNIT           :     33         33            5 : POSF   20 : ROTOR
CONV.COEF      :  100.000    100.000          1 : VCMD   21 : SIN_T
CONV.BASE      : 7282.000  -7282.000          2 : TCMD   15 : FREQ
ORIGIN VALUE   :    0.000      0.000          3 : SPEED  16 : FRTCM
EXTENDED ADDRESS :                            4 : ERR    25 : OVCLV
SHIFT          :                              7 : SYNC
┌EXPLANATIONS─────────────────────────┐       8 : ABS
│ Torque command(TCMD)                │      22 : DTRQ
│ Physical value is need to set max. current  24 : DLTCM
│ (Ap) of amplifier. Default value is 100 in  23 : SFERR
│ convention which convert measured data to p 48 : IR
│ ercent by max. torque.              │      49 : IS
                                             50 : IEFF

                                        A>

                                    MEM  STOP ***  ***    12:00:00 PATH1
< │RE-DSP│ LIST │SAMPLI│CH SET│     │     │     │     │     │     │
  │GRAPH │      │NG    │      │     │     │     │     │     │     │
```

9 Move the cursor to the parameter you want to set, by pressing the cursor key.

10 Enter data and the press the [INPUT] key.

11   Repeat steps 9 and 10 until you set all the parameters.
12   Click the [RE-DSPGRAPH] soft key.
      The wave display screen is displayed as shown below.

13   The new settings will take effect next time you perform
      measurement. Change the operation/graph settings and scale
      settings according to the new channel settings.

Explanation

- Setting the data-in screen

See the Explanation section for the Y-time graph describing the
setting the data-in screen.

- Setting the channel setting screen

See the Explanation section for the Y-time graph describing the
setting the channel setting screen.
The content of the screen is completely the same. To display the
Bode graph, however, specify the channel settings exactly as shown in
Table 12.5.1.5(a), Bode graph channel settings. During this step, be
sure to disable channel 4 (set 0 for the channel 4 axis).

Table 1.9.1.5 (a)   Bode graph channel settings

	Channel 1	Channel 2	Channel 3
Axis	Specify the same servo motor axis.		
Type	2 : TCMD	16 : FRTCM	15 : FREQ
Unit	33 : %	33 : %	32 : Hz
Conversion coefficient	100	100	1
Conversion base	7282	-7282	1
Origin value	0	0	0

- Setting the operation and graph setting screen

The operation and graph setting screen lets you specify graph settings.

- Operation

  The specifiable values are as shown in Table 12.5.1.5(b), Bode graph operations.

  An operation cannot be specified if it does not meet the graph display conditions defined in Table 12.5.1.5(c), Bode graph conditions.

Table 1.9.1.5 (b)   Bode graph operations

Input value	Operation name	Description
1	N/A	Not displayed.
41	Bode	Displays a Bode diagram in the form of a horizontal axis logarithm graph.

Table 1.9.1 (c)   Bode graph conditions

Operation	Coordinate conversion			
41 : Bode	The measurement and channel settings must meet the following conditions.			
		CHANNEL 1	CHANNEL 2	CHANNEL 3
	AXIS	Specify the same servo motor axis.		
	TYPE	2 : TCMD	16 : FRTCM	15 : FREQ
	UNIT	33 : %	33 : %	32 : Hz
	CONV.COEF	100	100	1
	CONV.BASE	7282	-7282	1
	ORIGIN VALUE	0	0	0
	Channel 4 must be disabled (channel 4 axis must be set to0).			

- Setting the scale screen

- Start point

  Set gain and phase data values for the center of the graph.
- Division

  Set the value of one grid.
- Frequency

  Set the minimum and maximum values of the horizontal axis. The unit is Hz.

- Performing measurement

See the Explanation section for the Y-time graph describing the performing measurement.

Limitation

See the Limitation section for the Y-time graph.

2

LCD-MOUNTED TYPE Series 30*i* HARDWARE

2.1   **STRUCTURE**

Control/LCD unit

MDI unit

Optical cable

Servo motor

Servo amplifier

I/O Link

Distributed I/O module, I/O Unit MODEL-A

Machine operator's panel/
Power magnetics circuit etc.

2.2   **OVERVIEW OF HARDWARE**

Main board
- CPU for controlling CNC - Power supply - 2-axis to 24-axis control - Spindle interface - LCD/MDI interface - I/O Link - PMC control function - High-speed DI - RS-232C - Memory card interface - PC function   (300$_i$s/310$_i$s/320$_i$s)

Basic system

Data server board
Data server function Ethernet communication function

Additional axis board
Additional axis control function I/O Link

Additional spindle board
Additional spindle control function

HSSB interface board
High-speed serial bus interface

Various types of network boards
FL-net board Profibus master board Profibus slave board Device Net board

Options

Unit without optional slots
or
Unit having two optional slots

On a unit with optional slots, as many optional boards as the slots can be mounted.

2.3   TOTAL CONNECTION DIAGRAMS

When optional functions are provided

Optional slot

Fast data server board

ATA card   The user should provide an ATA card.

ETHERNET(CD38R) ⊐⊏ ———— ⊏ Ethernet

HSSB ボード

HSSB(COP21N) ⊐⊏ ———— Personal Computer
or PANEL *i*   (Note 1)

Profibus master board

PROFI(CN1) ⊐⊏ ———— Another NC
(another Profibus unit)

Profibus slave board

PROFI(CN2) ⊐⊏ ———— Another NC
(another Profibus unit)

DeviceNet board

DVNET(TBL) ⊐⊏ ———— Another NC
(another DeviceNet unit)

FL-net board

FLNET(CD38N) ⊐⊏ ———— FL-net unit

Note 1 The 30*i*/31*i*/32*i* model is still used when a
personal computer or PANEL *i* is
connected using an HSSB interface.

2.4 **CONFIGURATION OF PRINTED CIRCUIT BOARD CONNECTORS AND CARDS**

2.4.1 **Main Board**

- Specification

Name	CNC model	Specification
Main board for 7.2"/8.4"/10.4" display unit	30i-A, 31i-A5	A20B-8100-0980
	31i-A, 32i-A	A20B-8100-0981
	32i-A (without Ethernet)	A20B-8100-0982
Main board for 15" display unit	30i-A, 31i-A5	A20B-8101-0022
	31i-A, 32i-A	A20B-8101-0026

- **Connector mounting location**
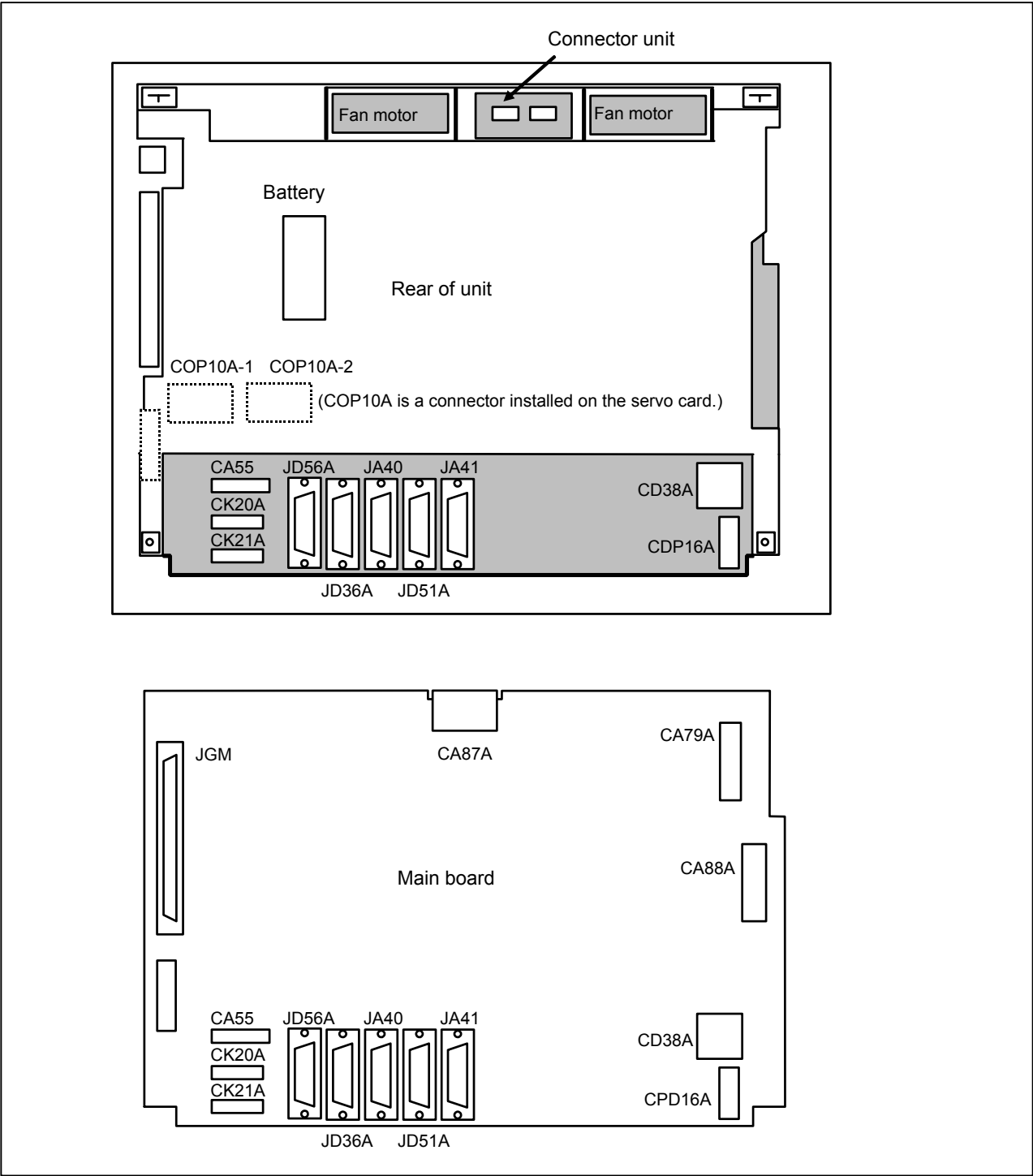
(1) Main board for 7.2"/8.4"/10.4" display unit

Connector number	Application
COP10A-1, COP10A-2	Servo amplifier (FSSB)
CA55	MDI
JD56A	RS-232C serial port 1/serial spindle
JD36A	RS-232C serial port 2
JA40	High-speed DI
JD51A	I/O Link
JA41	Serial spindle
CPD16A	DC24V-IN
JGM	Back panel interface
CA79A	Video signal interface
CA88A	PCMCIA interface
CK20A	Soft key (horizontal type)
CK21A	Soft key (vertical type)
CA87A	Inverter
CD38A	Ethernet

(2)   Main board for 15" display unit

Connector number	Application
COP10A-1, COP10A-2	Servo amplifier (FSSB)
CA55	MDI
JD56A	RS-232C SERIAL PORT 1/serial spindle
JD54	RS-232C SERIAL PORT 2
JA40	High-speed DI
JD51A	I/O Link
JA41	Serial spindle
CPD16A	DC24V-IN
JGM	Back panel interface
CA98	Video signal interface
CA88A	PCMCIA interface
CK20A	Soft key (horizontal type)
CK21A	Soft key (vertical type)
CA87A	Fan adapter
CD38S	Ethernet
TP2	Touch panel interface
CPD12	Inverter interface

- **Card and power supply mounting location**

(1) Main board for 7.2"/8.4"/10.4" display unit

No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B-3300-0445	HRV2 : Up to 4 axes HRV3 : Up to 3 axes HRV4 : Up to 1 axis	The maximum number of axes is also limited depending on the model. For the 32i, HRV4 is unapplicable.
		A20B-3300-0448	HRV2 : Up to 8 axes HRV3 : Up to 6 axes HRV4 : Up to 2 axes	
		A20B-3300-0447	HRV2 : Up to 12 axes HRV3 : Up to 9 axes HRV4 : Up to 3 axes	
		A20B-3300-0442	HRV2 : Up to 16 axes HRV3 : Up to 12 axes HRV4 : Up to 4 axes	
		A20B-3300-0440	HRV2 : Up to 24 axes HRV3 : Up to 18 axes HRV4 : Up to 6 axes	

No.	Name	Specification	Function	Remarks
(2)	CPU card	A20B-3300-0477	Standard version DRAM 32MB	
		A20B-3300-0474	Standard version DRAM 64MB	
		A20B-3300-0475	Standard version DRAM 128MB	
		A20B-3300-0470	High-speed version DRAM 64MB	
		A20B-3300-0471	High-speed version DRAM 128MB	
		A20B-3300-0491	Dedicated to the 32i DRAM 32MB	
		A20B-3300-0490	Dedicated to the 32i DRAM 64MB	
(3)	Power supply unit	A20B-8101-0010		

(2)   Main board for 15" display unit

No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B-3300-0445	HRV2 : Up to 4 axes HRV3 : Up to 3 axes HRV4 : Up to 1 axis	The maximum number of axes is also limited depending on the model. For the 32*i*, HRV4 is unapplicable.
		A20B-3300-0448	HRV2 : Up to 8 axes HRV3 : Up to 6 axes HRV4 : Up to 2 axes	
		A20B-3300-0447	HRV2 : Up to 12 axes HRV3 : Up to 9 axes HRV4 : Up to 3 axes	
		A20B-3300-0442	HRV2 : Up to 16 axes HRV3 : Up to 12 axes HRV4 : Up to 4 axes	
		A20B-3300-0440	HRV2 : Up to 24 axes HRV3 : Up to 18 axes HRV4 : Up to 6 axes	
(2)	CPU card	A20B-3300-0477	Standard version DRAM 32MB	
		A20B-3300-0474	Standard version DRAM 64MB	
		A20B-3300-0475	Standard version DRAM 128MB	
		A20B-3300-0470	High-speed version DRAM 64MB	
		A20B-3300-0471	High-speed version DRAM 128MB	
		A20B-3300-0491	Dedicated to the 32 i DRAM 32MB	
		A20B-3300-0490	Dedicated to the 32 i DRAM 64MB	

No.	Name	Specification	Function	Remarks
(3)	Display control card	A20B-3300-0420	For 15" color LCD display unit	
(4)	Power supply unit	A20B-8101-0010		

Configuration of the display control card
In the display control card, a compact flash card is installed.

Compact flash card

Connector

Display control card
Connector side
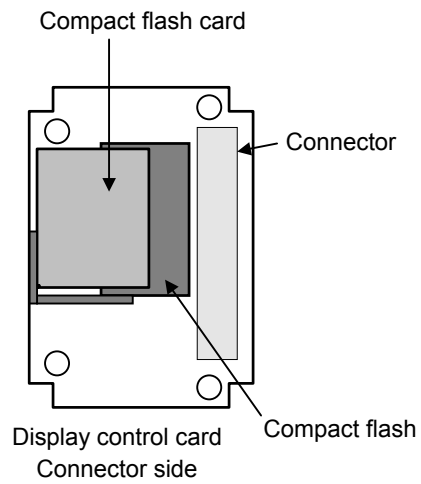
Compact flash

Name	Specification	Remarks
Compact flash card	A87L-0001-0173#032MBA	32MB

- **DIMM module mounting location**

(1)   Main board for 7.2"/8.4"/10.4" display unit

No.	Name	Specification	Function	Remarks
(1)	PMC module	A20B-3900-0200		
(2)	FROM/SRAM module	A20B-3900-0160	FROM 16MB SRAM 1MB	The FROM stores various control software programs, user software programs, and so forth. The SRAM is a battery-backed memory module.
		A20B-3900-0161	FROM 16MB SRAM 2MB	
		A20B-3900-0163	FROM 32MB SRAM 1MB	
		A20B-3900-0164	FROM 32MB SRAM 2MB	
		A20B-3900-0166	FROM 64MB SRAM 1MB	
		A20B-3900-0167	FROM 64MB SRAM 2MB	
		A20B-3900-0180	FROM 16MB SRAM 256kB	
		A20B-3900-0181	FROM 16MB SRAM 512kB	
		A20B-3900-0182	FROM 32MB SRAM 256kB	
		A20B-3900-0183	FROM 32MB SRAM 512kB	

(2)   Main board for 15" display unit

No.	Name	Specification	Function	Remarks
(1)	PMC module	A20B-3900-0200		
(2)	FROM/SRAM module	A20B-3900-0160	FROM 16MB SRAM 1MB	The FROM stores various control software programs, user software programs, and so forth. The SRAM is a battery-backed memory module.
		A20B-3900-0161	FROM 16MB SRAM 2MB	
		A20B-3900-0163	FROM 32MB SRAM 1MB	
		A20B-3900-0164	FROM 32MB SRAM 2MB	
		A20B-3900-0166	FROM 64MB SRAM 1MB	
		A20B-3900-0167	FROM 64MB SRAM 2MB	
		A20B-3900-0180	FROM 16MB SRAM 256kB	
		A20B-3900-0181	FROM 16MB SRAM 512kB	
		A20B-3900-0182	FROM 32MB SRAM 256kB	
		A20B-3900-0183	FROM 32MB SRAM 512kB	

- Block diagram

(1)   Main board for 7.2"/8.4"/10.4" display unit

(2)   Main board for 15" display unit

: Detachable card or module
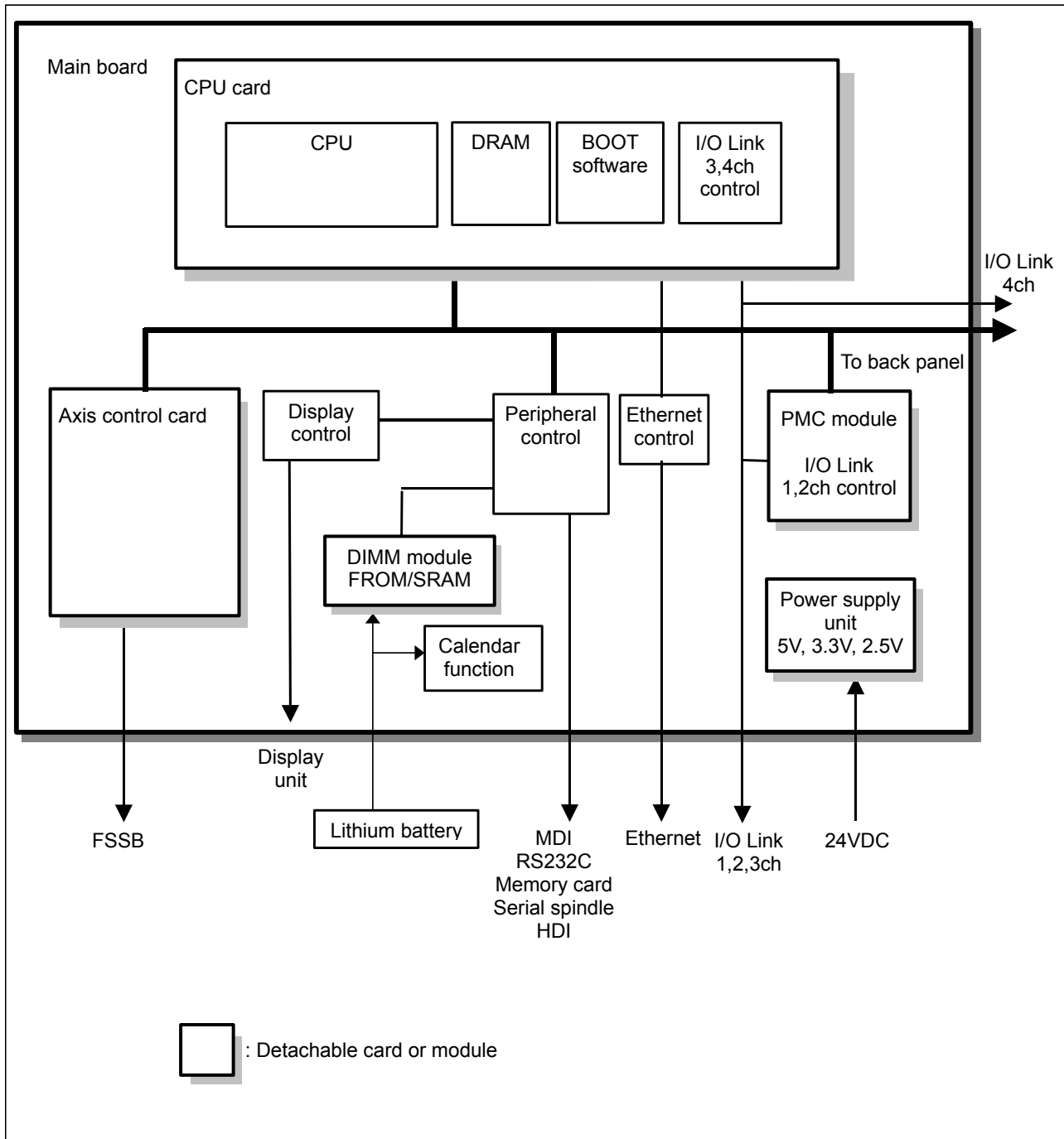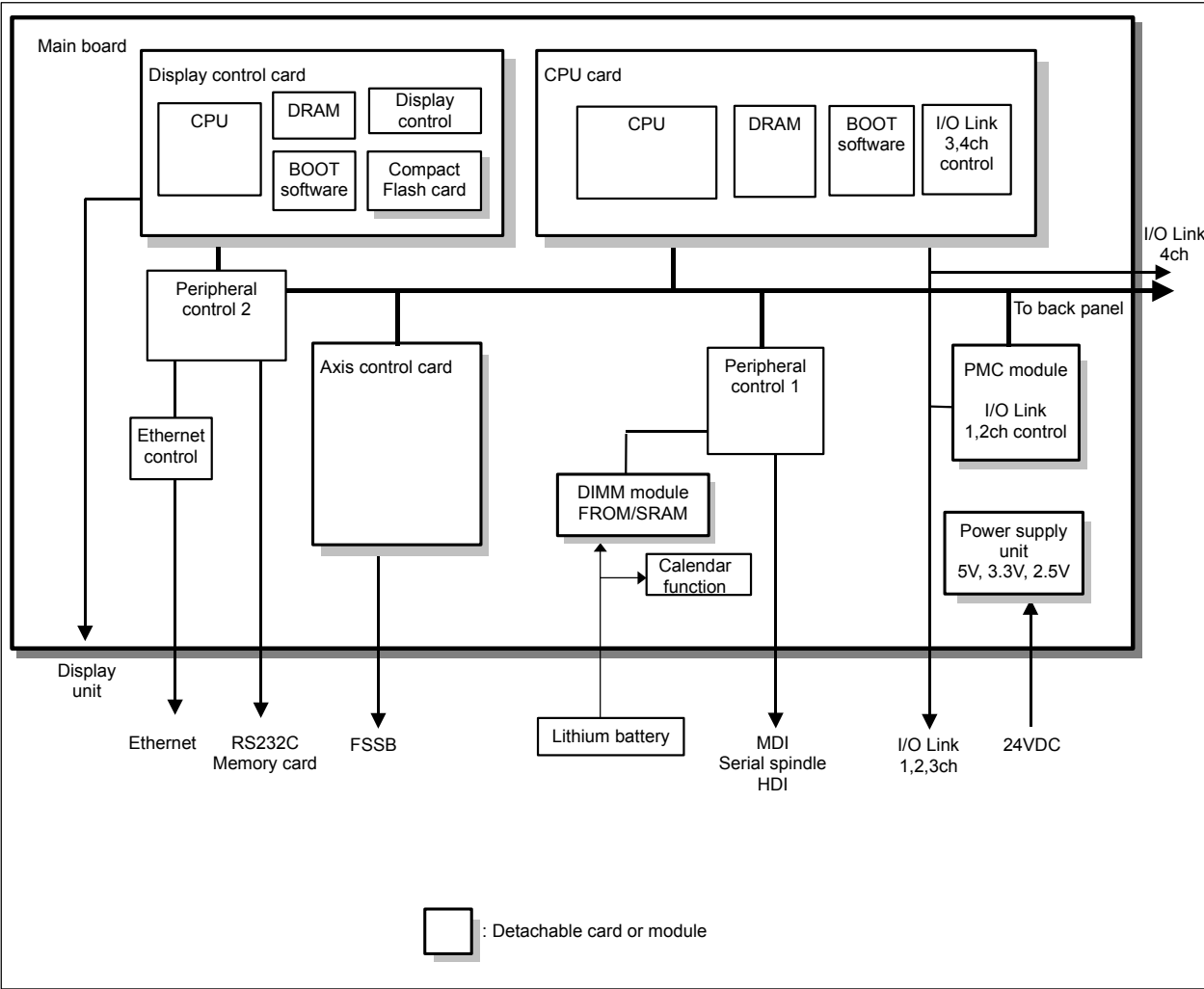
- LED display

(1) Main board for 7.2"/8.4"/10.4" display unit

Rear of unit

(a) Alarm (red)

ALM1	ALM2	ALM3	LOW

(b) Ethernet status (green)

LINK	COM
(green)	(yellow)

(c) 7-segment LED
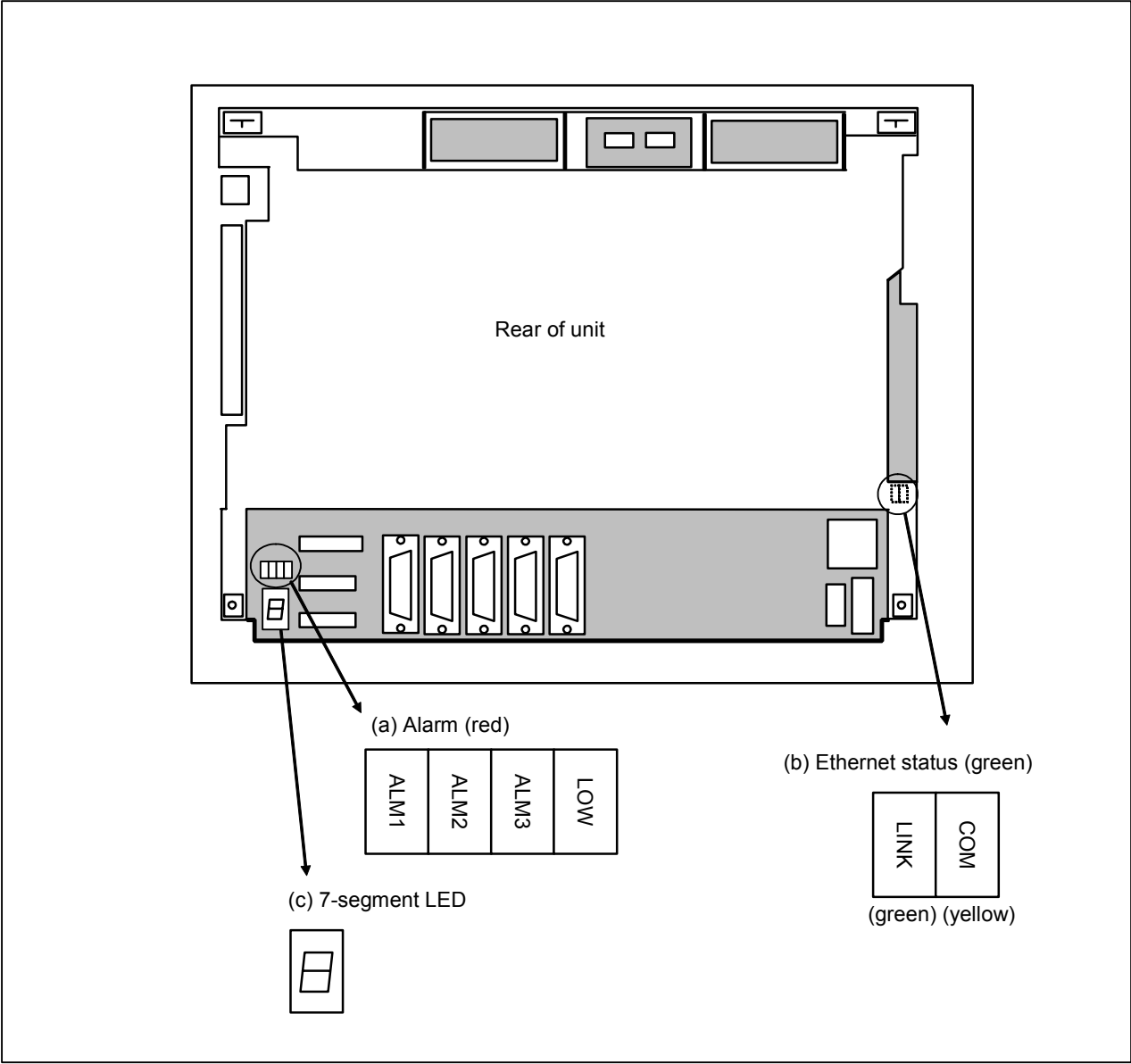
(a) Alarm LED (red) indication at system alarm occurrence
    If any of these LEDs lights, it is likely that the hardware is defective.

No.	Alarm LED 3　2　1			Meaning
1	□	■	□	Low battery voltage. The battery may be is running out.
2	□	■	■	Software detected an error and stopped the system.
3	■	□	□	Hardware detected a failure in the system.
4	■	□	■	An alarm was issued with the servo card on the main board. The servo card may be faulty, or the FSSB may be broken.
5	■	■	□	An error was detected in the data of the SRAM on the DIMM module. The DIMM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
6	■	■	■	Abnormal power supply operation. The cause may be noise or a power supply module failure.

■ : On □ : Off

Alarm LED	Meaning
LOW	The CPU card may be faulty.

(b) Ethernet statusLED

Alarm LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(c) 7-segment LED
    See Appendix E "LED Display".

(2)   Main board for 15" display unit

Rear of unit

Power supply module

(b) Display control status (green)

(c) Alarm (red)

DNV4

(d) Display control POWER (green)

DNV5

(f) 7-segment LED

DNV3

DNV2

DNV1

(a) CNC alarm (red)

LOW

ALM3

ALM2

ALM1

(e) Ethernet status

COM

(yellow)

LINK

(green)

(a) Alarm LED (CNC alarm red LED) indication at CNC system alarm occurrence
If any of these LEDs lights, it is likely that the hardware is defective.

No.	Alarm LED 3 2 1	Meaning
1	□ ■ □	Low battery voltage. The battery may be running out.
2	□ ■ ■	Software detected an error and stopped the system.
3	■ □ □	Hardware detected a failure in the system.
4	■ □ ■	An alarm was issued with the servo card on the main board. The servo card may be faulty, or the FSSB may be broken.
5	■ ■ □	An error was detected in the data of the SRAM on the DIMM module. The DIMM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
6	■ ■ ■	Abnormal power supply operation. The cause may be noise or a power supply module failure.

■ : On □ : Off

Alarm LED	Meaning
LOW	Turned on when the voltage inside the CPU card has dropped. The CPU card may be faulty.

(b) Changes in status LED at power-on time (Display control side status: Green LED)

No.	Status LED (DNV1 to 3) 3 2 1	Status
1	□ □ □	State where the power is not tuned on, or state where the system was started up successfully and is running normally
2	■ ■ ■	State immediately after the power is turned on
3	■ ■ □	The interface between the CPU card and display control card is being initialized. If the status does not proceed further beyond this indication, the CPU card, display card, or main board may be faulty.
4	□ ■ ■	Start-up on the display control card side is being awaited. If the status does not proceed further beyond this indication, the display card or main board may be faulty.
5	□ ■ □	The CPU card screen is being output to the display control card, or a RAM error occurred in the interface between the CPU card and display control card. If the status does not proceed further beyond this indication, the CPU card, display card, or main board may be faulty.

■ : On □ : Off

(c) LED (red) indication at display control system alarm occurrence
     If the LED lights, it is likely that the hardware is defective.

Alarm LED	Meaning
DNV4	Common RAM error. The main board may be faulty.

(d) Display control POWER (green LED) indicates that power is supplied to the display control card.

(e) Ethernet statusLED

Alarm LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(f) 7-segment LED
     See Appendix E "LED Display".

- **Jumper plug setting**

(1) Main board for 7.2"/8.4"/10.4" display unit

TMBB(Short)
Ensure that this is short-circuited.

Main board

(2) Main board for 15" display unit

Main board

Power supply module

TMIBB(Short)
Ensure that this is short-circuited.

RESERVE(OPEN)
Ensure that this is left open.
(The terminal may not be installed.)
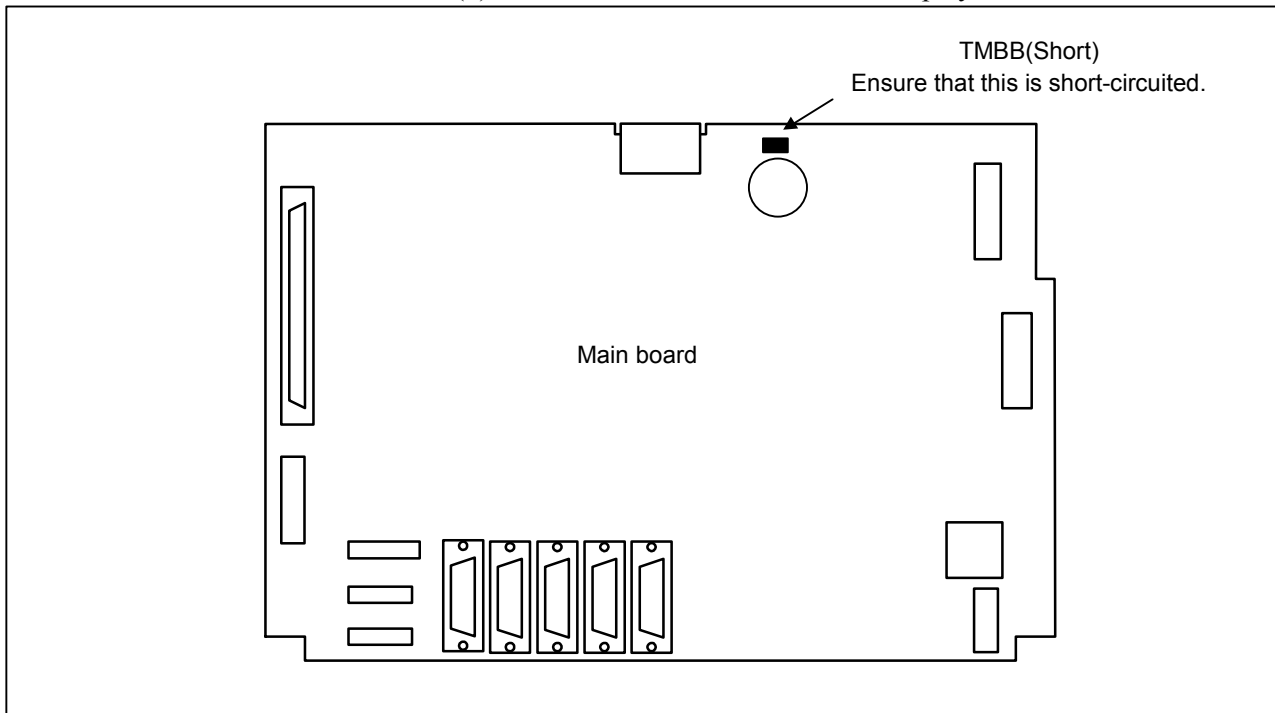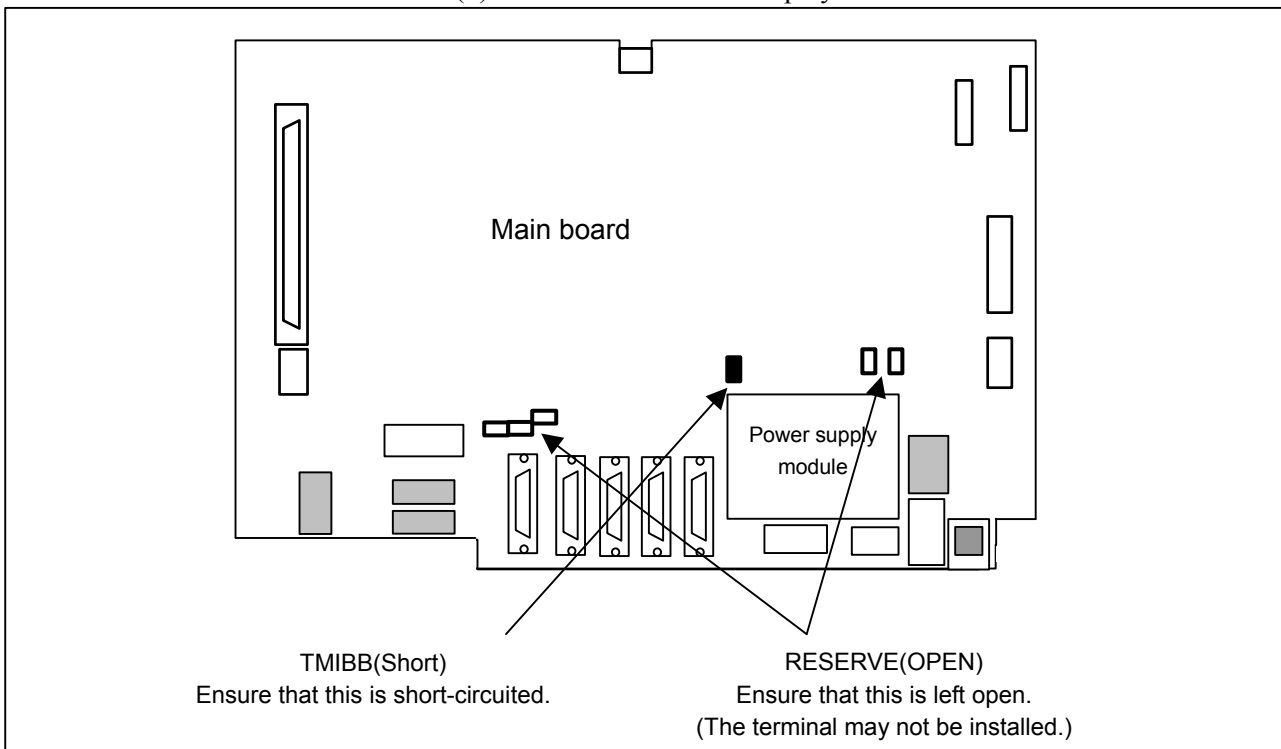
2.4.2   Inverter PCBs and Connector Units

Name		Specification
Inverter P.C.B.	For 7.2" color LCD	A20B-8100-0961
	For 15" color LCD	A20B-8100-0963
	For 15" color LCD	A20B-8100-0962
	For 15" color LCD	A14L-0143-0002#A
Fan adapter PCB	For 15" color LCD	A20B-8100-0969
Conversion cable	For 15" color LCD	A660-4042-T047
Connector unit		A15L-0001-0091

> **NOTE**
>   The connector unit is fastened to the case with self-tapping screws.

- Configuration of the inverter

For 7.2"/8.4"/10.4"LCD

| 10.4"LCD | Inverter (fan adapter as well) |
| CP1 | CN1 |

Main board

CA87A

CPD12(when A20B-8101-002x)

For 15.0"LCD

Fan adapter
CN1

15.0"LCD unit

Inverter
CN02   CN01
CN03
CN04
CN05
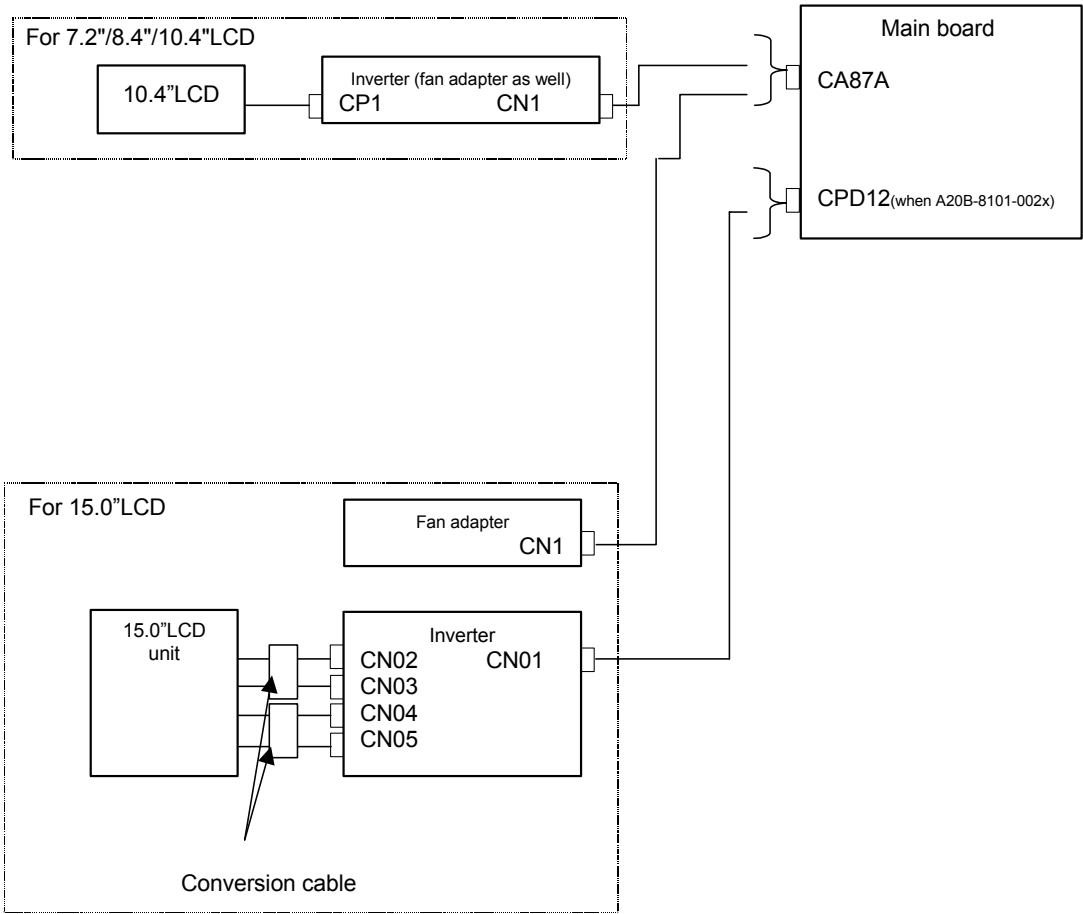
Conversion cable

- Locations of the inverter and connector unit for 7.2"/8.4"/10.4" LCD
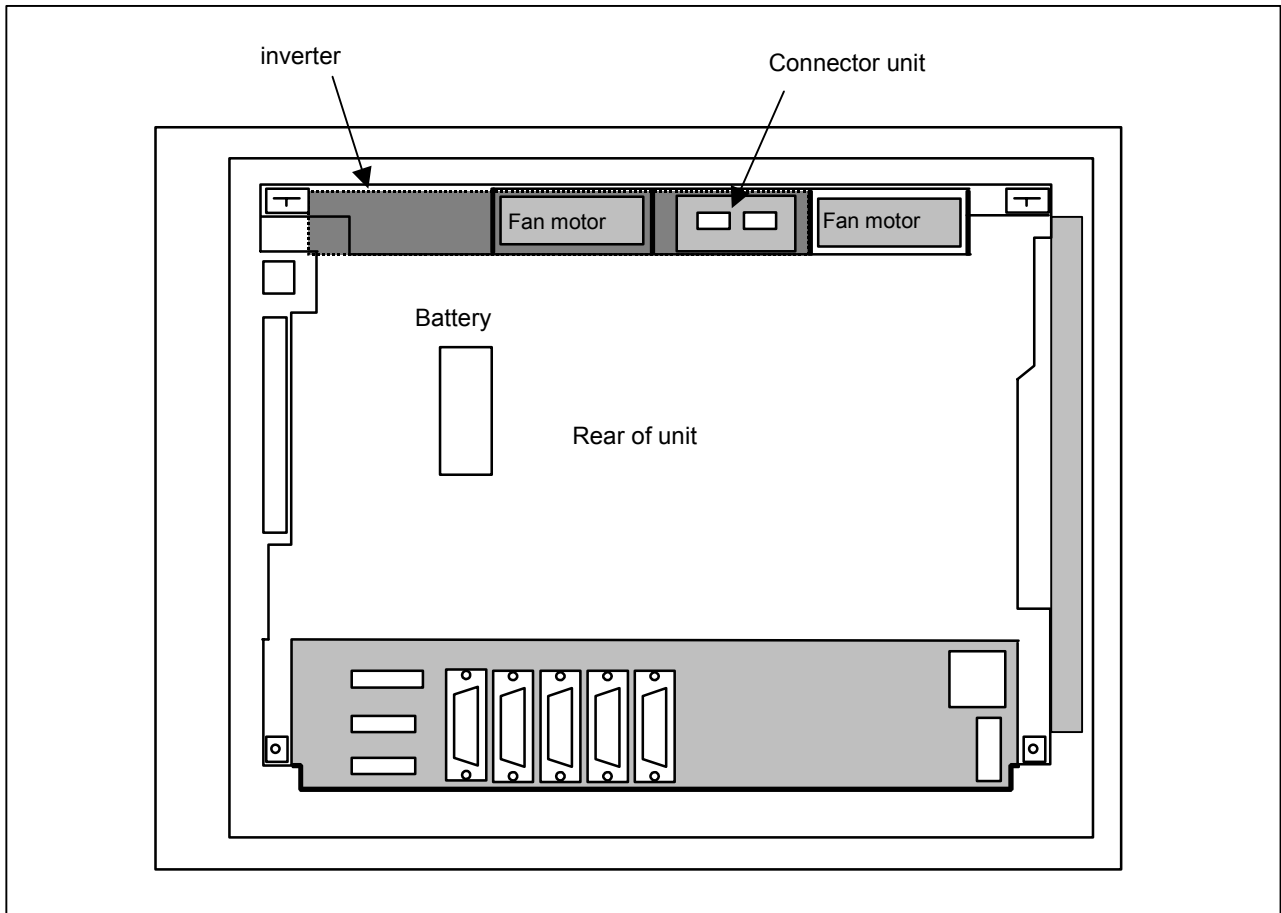
- **Locations of the inverter, fan adapter, and connector unit for 15" LCD**

Fan adaoter PCB   Connector unit

Inverter

Rear view

Rear of unit

COP10A-1

Power supply
module
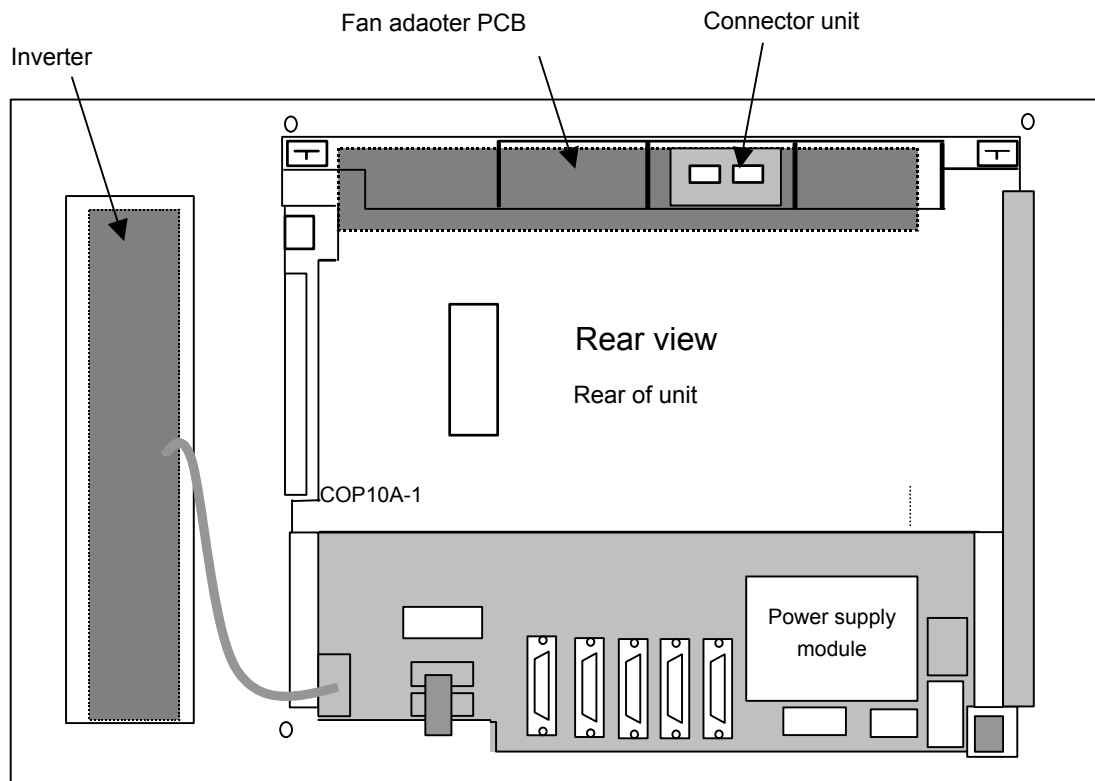
Conversion cable (A660-4042-T047)
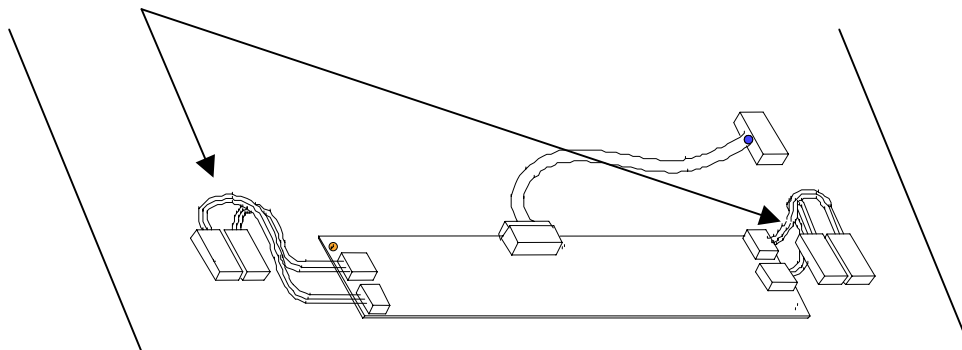
Two types of connectors are provided on the inverter.   Plug into a matching connector.

Each of the two cables from the LCD backlight section may be connected to either of the

two cables from the inverter.

2.5 LIST OF UNITS AND PRINTED CIRCUIT BOARDS

2.5.1 Basic Unit

Model	Name	Drawing number	Remarks
30*i*-A	Basic Unit (No slot)	A02B-0303-B500	
	Basic Unit (2 slots)	A02B-0303-B502	
31*i*-A5	Basic Unit (No slot)	A02B-0306-B500	
	Basic Unit (2 slots)	A02B-0306-B502	
31*i*-A	Basic Unit (No slot)	A02B-0307-B500	
	Basic Unit (2 slots)	A02B-0307-B502	
32*i*-A	Basic Unit (No slot)	A02B-0308-B500	
	Basic Unit (2 slots)	A02B-0308-B502	

Model	Name	Drawing number	Remarks
All models	Case (No slot)	A02B-0303-D100#0A	
	Case (2 slots)	A02B-0303-D100#2A	

2.5.2 Display Unit

Model	Name	Drawing number	ID	Remarks
All models	7.2" color LCD	A02B-0303-D504	1001	
	8.4" color LCD	A02B-0303-D503	1011	
	10.4" color LCD	A02B-0303-D500	1010	
	10.4" color LCD (with touch panel)	A02B-0303-D501		
	15" color LCD	A02B-0303-D513	0101	
	15" color LCD (with touch panel)	A02B-0303-D514		

2.5.3 MDI Unit

Model	Name	Drawing number	ID	Remarks
All models	T series/English/small keyboard For 7.2"/8.4", ONG	A02B-0303-C120#T	04	
	M series/English/small keyboard For 7.2"/8.4", ONG	A02B-0303-C120#M	08	
	T series/English/Standard keyboard For 7.2"/8.4", ONG	A02B-0303-C121#T	40	
	M series/English/Standard keyboard For 7.2"/8.4", ONG	A02B-0303-C121#M	02	
	T series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C125#T	40	
	M series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C125#M	02	
	T series/English/Standard keyboard Vertical type, ONG	A02B-0303-C126#T	40	
	M series/English/Standard keyboard Vertical type, ONG	A02B-0303-C126#M	02	
	English/Standard keyboard QWERTY	A02B-0303-C128	20	

2.5.4 **Printed Circuit Boards**

Name	Drawing number	ID	Remarks
30*i*-A, 31*i*-A5 main board (for 7.2"/8.4"/10.4" LCD)	A20B-8100-0980	00301	
31*i*-A, 32*i*-A main board (for 7.2"/8.4"/10.4" LCD)	A20B-8100-0981	00302	
32*i*-A main board (for 7.2"/8.4"/10.4" LCD, without Ethernet)	A20B-8100-0982	00303	
30*i*-A, 31*i*-A5 main board (for 15" LCD)	A20B-8101-0022	00306	
31*i*-A, 32i-A main board (for 15" LCD)	A20B-8101-0026	00312	
CPU card A1 (Standard version, DRAM 32MB)	A20B-3300-0477	0040C	
CPU card A2 (Standard version, DRAM 64MB)	A20B-3300-0474	0040D	
CPU card A3 (Standard version, DRAM 128MB)	A20B-3300-0475	0040E	
CPU card B2 (High-speed version, DRAM 64MB)	A20B-3300-0470	00406	
CPU card B3 (High-speed version, DRAM 128MB)	A20B-3300-0471	00407	
CPU card C1 (Dedicated to the 32*i*, DRAM 32MB)	A20B-3300-0491	00421	
CPU card C2 (Dedicated to the 32*i*, DRAM 64MB)	A20B-3300-0490	00420	
Axis control card B11 (FSSB 1-path)	A20B-3300-0445	00106	
Axis control card B12 (FSSB 1-path)	A20B-3300-0448	0010B	
Axis control card B13 (FSSB 1-path)	A20B-3300-0447	0010A	
Axis control card B24 (FSSB 2-path)	A20B-3300-0442	00103	
Axis control card B26 (FSSB 2-path)	A20B-3300-0440	00101	
FROM/SRAM module (FROM 16MB, SRAM 1MB)	A20B-3900-0160	FROM: C1 SRAM: 03	
FROM/SRAM module (FROM 16MB, SRAM 2MB)	A20B-3900-0161	FROM: C1 SRAM: 04	
FROM/SRAM module (FROM 32MB, SRAM 1MB)	A20B-3900-0163	FROM: C2 SRAM: 03	
FROM/SRAM module (FROM 32MB, SRAM 2MB)	A20B-3900-0164	FROM: C2 SRAM: 04	

Name	Drawing number	ID	Remarks
FROM/SRAM module (FROM 64MB, SRAM 1MB)	A20B-3900-0166	FROM: C3 SRAM: 03	
FROM/SRAM module (FROM 64MB, SRAM 2MB)	A20B-3900-0167	FROM: C3 SRAM: 04	
FROM/SRAM module (FROM 16MB, SRAM 256kB)	A20B-3900-0180	FROM: C1 SRAM: 01	
FROM/SRAM module (FROM 16MB, SRAM 512kB)	A20B-3900-0181	FROM: C1 SRAM: 02	
FROM/SRAM module (FROM 32MB, SRAM 256kB)	A20B-3900-0182	FROM: C2 SRAM: 01	
FROM/SRAM module (FROM 32MB, SRAM 512kB)	A20B-3900-0183	FROM: C2 SRAM: 02	
PMC module	A20B-3900-0200	00700	
Display control card	A20B-3300-0420	0000x1	
Additional axis board	A20B-8101-0070	00121	
Additional spindle board	A20B-8002-0320	0030C	
HSSB board	A20B-8101-0111	00611	
Fast data server board	A20B-8101-0030	00701	
FL-net board	A20B-8101-0031	00702	
Profibus master board	A20B-8101-0050	00705	
Profibus slave board	A20B-8101-0100	00705	
DeviceNet board	A20B-8101-0220	00706	
Back panel (No slot)	A20B-2003-0600	01	
Back panel (2 slots)	A20B-2003-0610	10	
Power supply unit	A20B-8101-0010	–	
Inverter (for 7.2" color LCD)	A20B-8100-0961	–	
Inverter (for 8.4" color LCD)	A20B-8100-0963	–	
Inverter (for 10.4" color LCD)	A20B-8100-0962	–	
Inverter (for 15" color LCD)	A14L-0143-0002#A	–	
Touch panel control board	A20B-8002-0310	–	

* Refer to Chapter 5 for details of Option board.

2.5.5   I/O

Name	Drawing number	Remarks
Distributed I/O connector panel I/O module A1	A20B-2002-0470	DI/DO: 72/56, DI=general 16, matrix 56, with MPG interface
Distributed I/O connector panel I/O module B1	A20B-2002-0520	DI/DO: 48/32, with MPG interface
Distributed I/O connector panel I/O module B2	A20B-2002-0521	DI/DO: 48/32
Distributed I/O connector panel I/O basic module	A03B-0815-C001	DI/DO: 24/16
Distributed I/O connector panel I/O expansion module A	A03B-0815-C002	DI/DO: 24/16, with MPG interface

Name	Drawing number	Remarks
Distributed I/O connector panel I/O expansion module B	A03B-0815-C003	DI/DO: 24/16
Distributed I/O connector panel I/O expansion module C	A03B-0815-C004	DO: 16 (2A output)
Distributed I/O connector panel I/O expansion module D	A03B-0815-C005	Analog input
Main panel machine operator's panel	A02B-0303-C231	
Sub panel A machine operator's panel	A02B-0236-C232	
Sub panel D machine operator's panel	A02B-0236-C244	
Operator's panel connector unit (Source type output A)	A16B-2202-0731	DI/DO: 64/32
Operator's panel connector unit (Source type output B)	A16B-2202-0730	DI/DO: 96/64
Handy machine operator's panel	A02B-0259-C221#A	
Interface unit for handy machine operator's panel	A02B-0259-C220	
FANUC I/O Link-AS-i converter (For AS-I Ver.2.0)	A03B-0817-C001	
FANUC I/O Link-AS-i converter (For AS-I Ver.2.1)	A03B-0817-C002	
I/O Link distributed adapter (2ch)	A20B-1007-0680	
I/O Link distributed adapter (3ch)	A20B-1008-0360	

2.5.6   Other Units

Name	Drawing number	Remarks
Separate detector interface unit (basic 4 axes)	A02B-0303-C205	
Separate detector interface unit (additional 4 axes)	A02B-0236-C204	
Analog input separate detector interface unit (basic 4 axes)	A06B-6061-C201	
Optical I/O Link adapter	A13B-0154-B001	
Optical adapter	A13B-0154-B003	For serial spindle
I/O Link connection unit A	A20B-2000-0410	
I/O Link connection unit B	A20B-2000-0411	
I/O Link connection unit C	A20B-2000-0412	
Spindle distributed adapter	A13B-0180-B001	
PC-side HSSB interface board (2CH.) Compatible with the PCI bus	A20B-8101-0162	
PC-side HSSB interface board (1CH.) Compatible with the PCI bus	A20B-8101-0163	

2.6   **REPLACING THE MAIN BOARD**

⚠ **WARNING**
Only those personnel who have received approved safety and maintenance training may perform this replacement work.
When opening the cabinet and replacing the board, 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.

⚠ **CAUTION**
Before starting replacement work, back up the contents (such as parameters and programs) of the SRAM memory of the CNC. Otherwise, the contents of the SRAM memory may be lost during replacement work.

Replacement procedure

1   Remove the LCD-mounted type control unit, referencing Section 5.13, "MOUNTING AND REMOVING LCD AND MDI UNITS."
2   Remove the two screws at the bottom of the case, then remove the case while pushing down the claws located on the upper side. At this time, the fan and battery cables need not be detached.

Claw

Screws   Note) The screws are locked so as not to be detached from
the case.
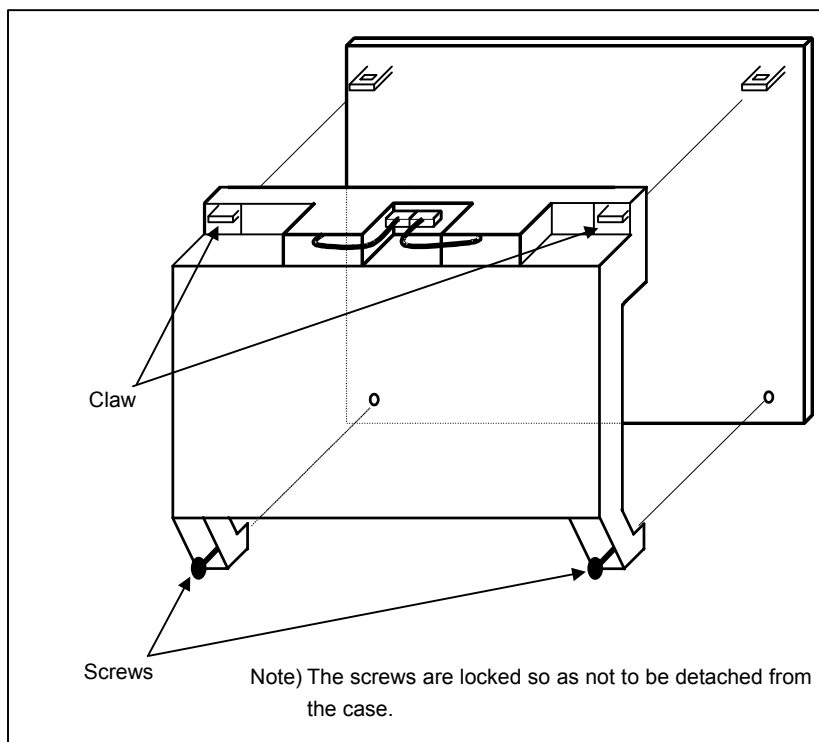
3   Detach the cables from the connectors CA88A (PCMCIA interface connector), CA79A (video signal interface connector), and CK20A and CK21A (connectors for soft keys) on the main board. Next, remove the screws used to secure the main board. The connector CA87A (connector for inverter connection) directly connects the main board with the inverter PCB. So, detach the main board by moving the main board downward.

CA87A

CA79A

Main board

CA88A

CK20A

CK21A
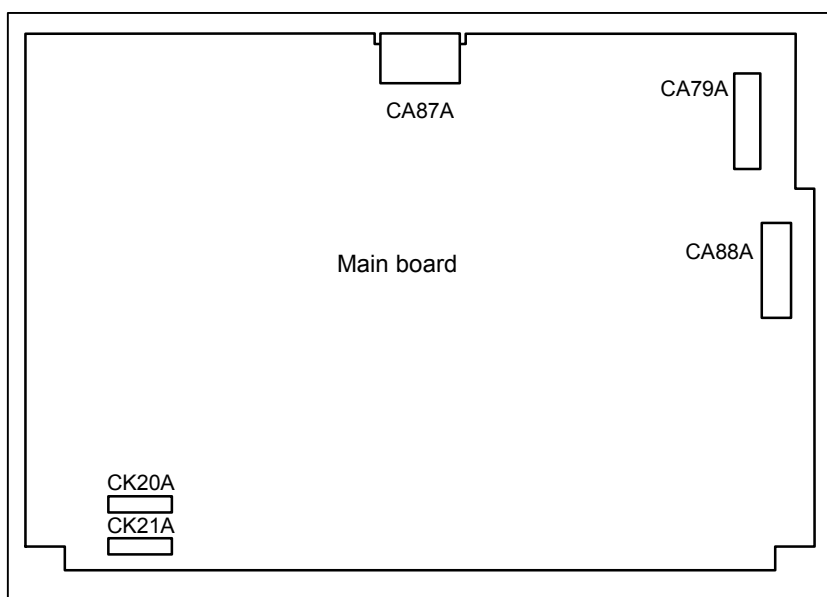
4   When mounting the main board, reverse steps 2 and 3.

2.7   **REPLACING FUSE ON CONTROL UNIT**

> ⚠ **WARNING**
> Before replacing a blown fuse, 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 replacement work.
> When opening the cabinet and replacing a fuse, 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.

- Fuse mounting location for 10.4" LCD

Rear of unit
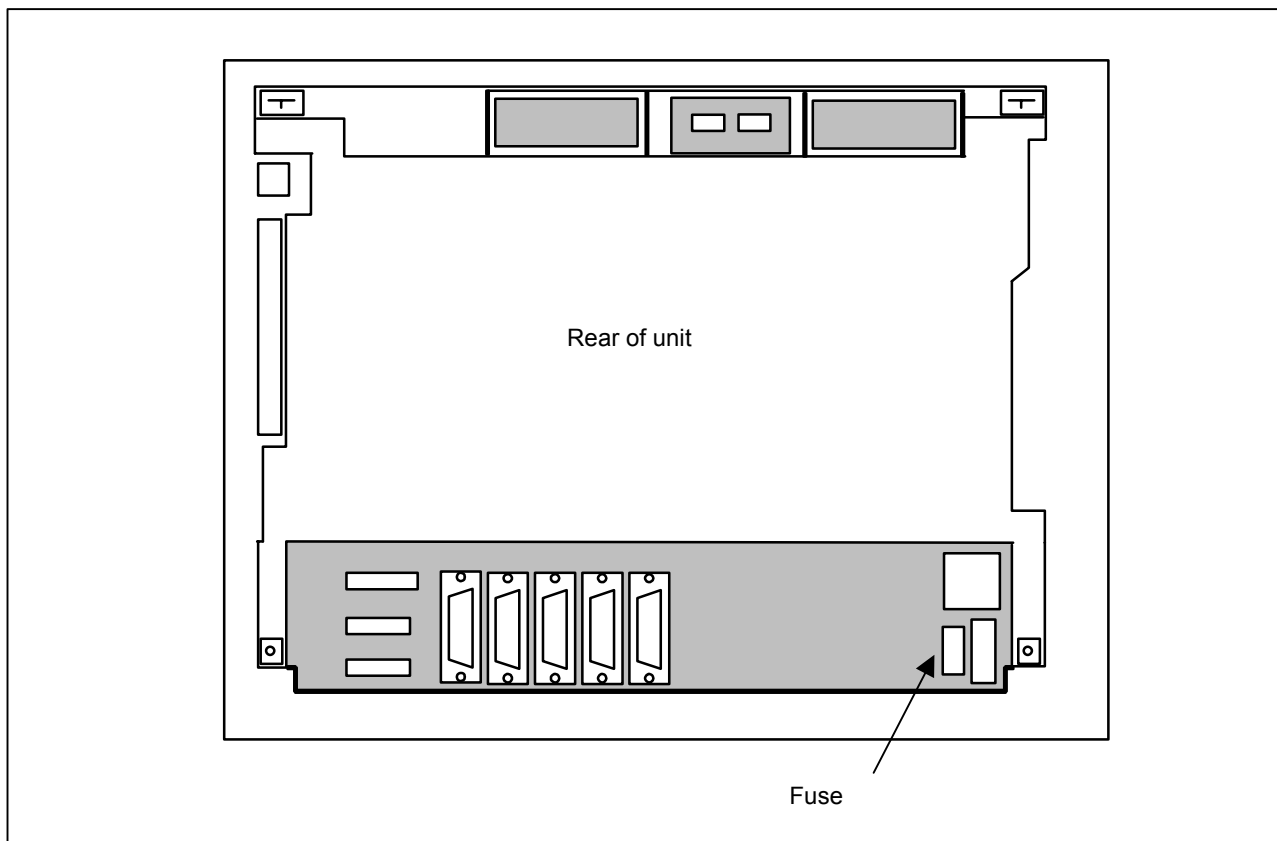
Fuse

Ordering code	Rating
A02B-0236-K100	5A

- Fuse mounting location for 15" LCD

Rear view

Rear of unit

Power supply
module

Fuse
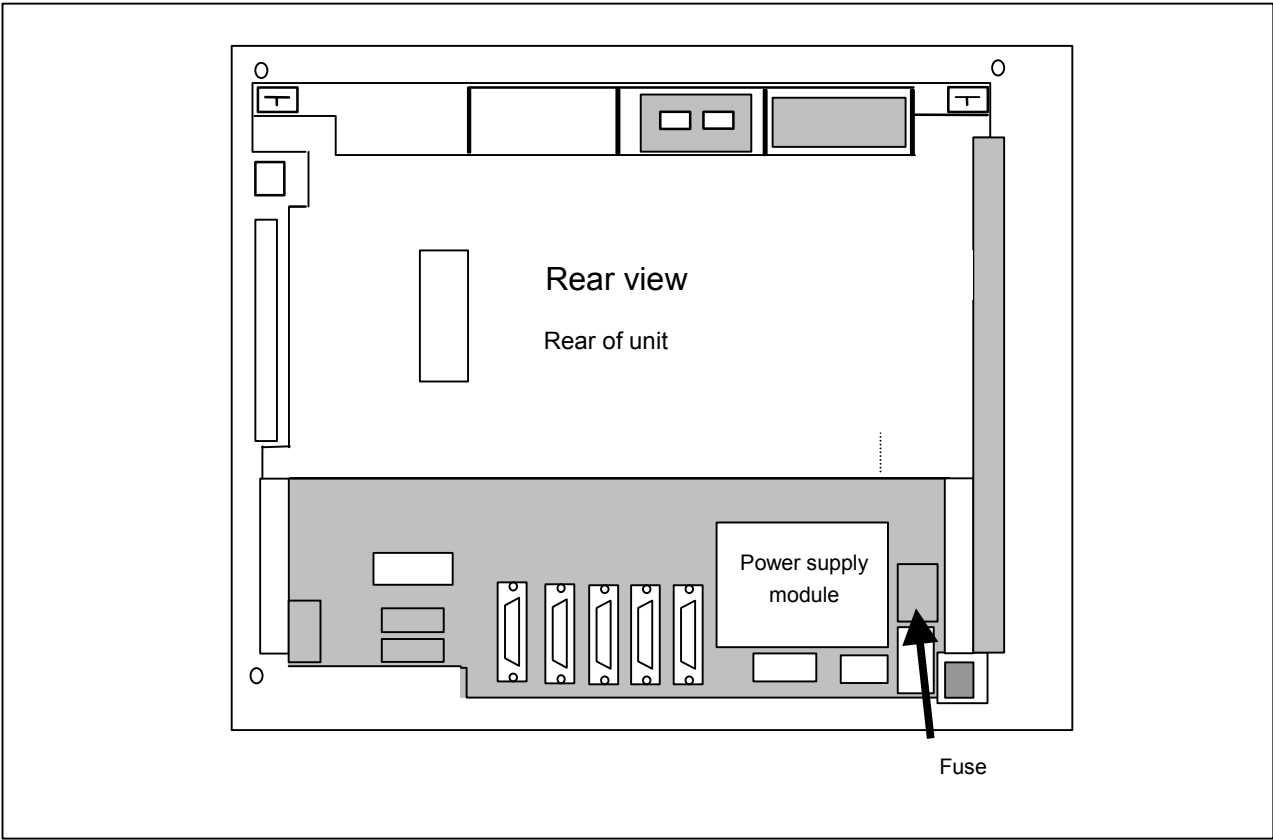
Ordering code	Rating
A02B-0236-K101	7.5A

2.8   **REPLACING BATTERY**

Offset data, and system parameters are stored in SRAM in the control unit. The power to the SRAM is backed up by a lithium battery mounted on the front panel of the control unit. The above data is not lost even when the main battery goes dead. The backup battery is mounted on the control unit at shipping. This battery can maintain the contents of memory for about a year.

When the voltage of the battery becomes low, alarm message "BAT" blinks on the display and the battery alarm signal is output to the PMC. When this alarm is displayed, replace the battery as soon as possible. In general, the battery can be replaced within two or three weeks, however, this depends on the system configuration.

If the voltage of the battery becomes any lower, memory can no longer be backed up. Turning on the power to the control unit in this state causes system alarm to occur because the contents of memory are lost. Clear the entire memory and reenter data after replacing the battery.

The following two kinds of batteries can be used.

- Lithium battery built into the CNC control unit.
- Two alkaline dry cells (size D) in the external battery case.

> **NOTE**
> A lithium battery is installed as standard at the factory.

- Replacement procedure

When a lithium battery is used

Prepare a new lithium battery (ordering code: A02B-0200-K102 (FANUC specification: A98L-0031-0012)).

1   Turn on the power to the CNC. After about 30 seconds, turn off the power.
2   Remove the battery from the rear of the CNC unit.
     First, unplug the connector, then take the battery out of its case. The connector is not latched. Pull the cable to unplug the connector.
     When a unit with no option slot is used, the battery case is located on the rear of the unit as shown in the figure below. When a unit with option slots is used, the battery case is located beside a fan on the top.
3   Insert a new battery and reconnect the connector.
4   Clamp the battery cables as shown in the figure below.
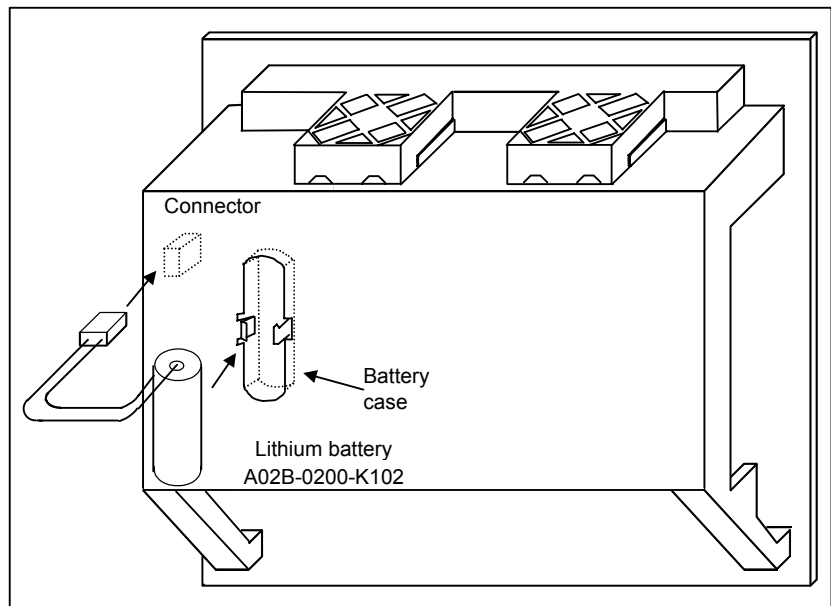
When a unit with no option slot is used

Connector

Battery
case

Lithium battery
A02B-0200-K102

When a unit with option slots is used

Battery
case

Connector

Lithium battery
A02B-0236-K102
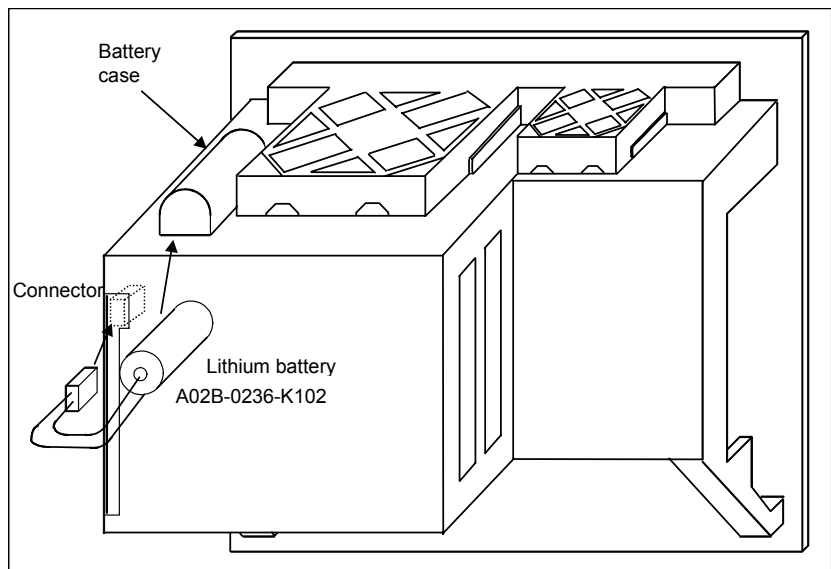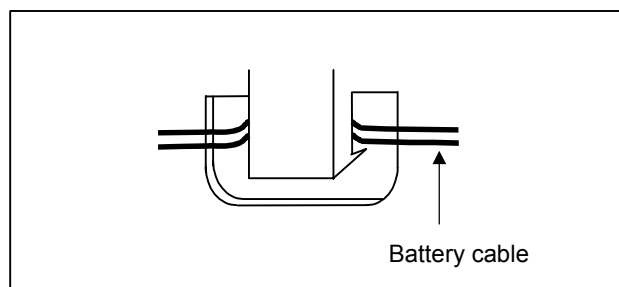
Battery cable

Clamping battery cables

⚠ **WARNING**
Using other than the recommended battery may result in the battery exploding. Replace the battery only with the specified battery (A02B-0200-K102).

⚠ **CAUTION**
Steps 1 to 3 should be completed within 30 minutes. Do not leave the control unit without a battery for any longer than the specified period. Otherwise, the contents of memory may be lost.
If steps 1 to 3 may not be completed within 30 minutes, save all contents of the SRAM memory to the memory card beforehand. Thus, if the contents of the SRAM memory are lost, the contents can be restored easily.
For the method of operation, refer to Section 4.9 or Appendix D.

When discarding a battery, observe the applicable ordinances or other rules of your local government. Also, cover the terminals of the battery with vinyl tape or the like to prevent a short-circuit.

When using commercial alkaline dry cells (size D)

- Method of connection

Power from the external batteries is supplied through the connector to which the lithium battery is connected.

The lithium battery, provided as standard, can be replaced with external batteries in the battery case (A02B-0236-C281) according to the battery replacement procedure described above.
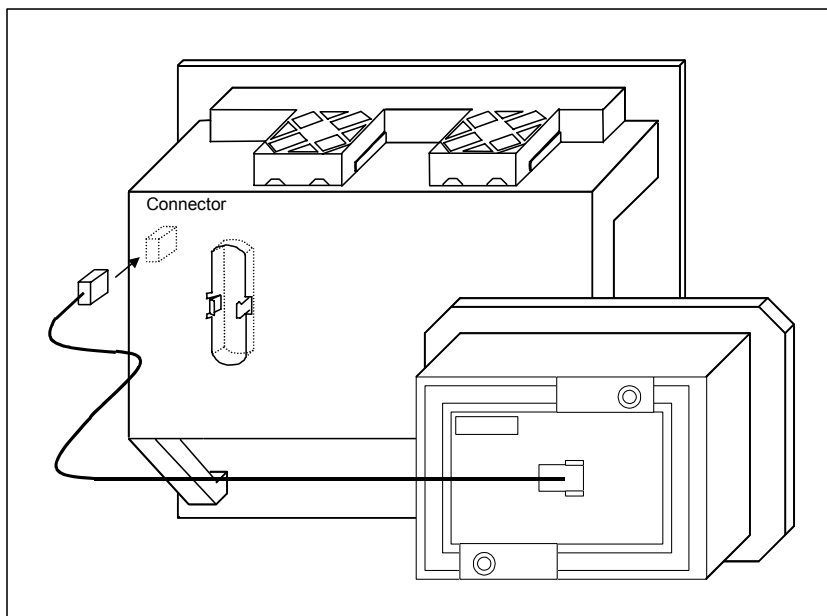
⚠ **CAUTION**
1 Install the battery case (A02B-0236-C281) in a location where the batteries can be replaced even when the power to the control unit is on.
2 The battery cable connector is attached to the control unit by means of a simple lock system. To prevent the connector from being disconnected due to the weight of the cable or tension within the cable, fix the cable section within 50 cm of the connector.

Replacing commercial alkaline dry cells (size D)

1   Prepare two alkaline dry cells (size D) commercially available.
2   Turn on the power to the control unit.
3   Remove the battery case cover.
4   Replace the cells, paying careful attention to their orientation.
5   Reinstall the cover onto the battery case.

> ⚠ **CAUTION**
> When replacing the alkaline dry cells while the
> power is off, use the same procedure as that for
> lithium battery replacement described above.

Alkaline dry cell × 2

Cover

Connection terminal
on the rear

Mounting hole × 4

Battery case
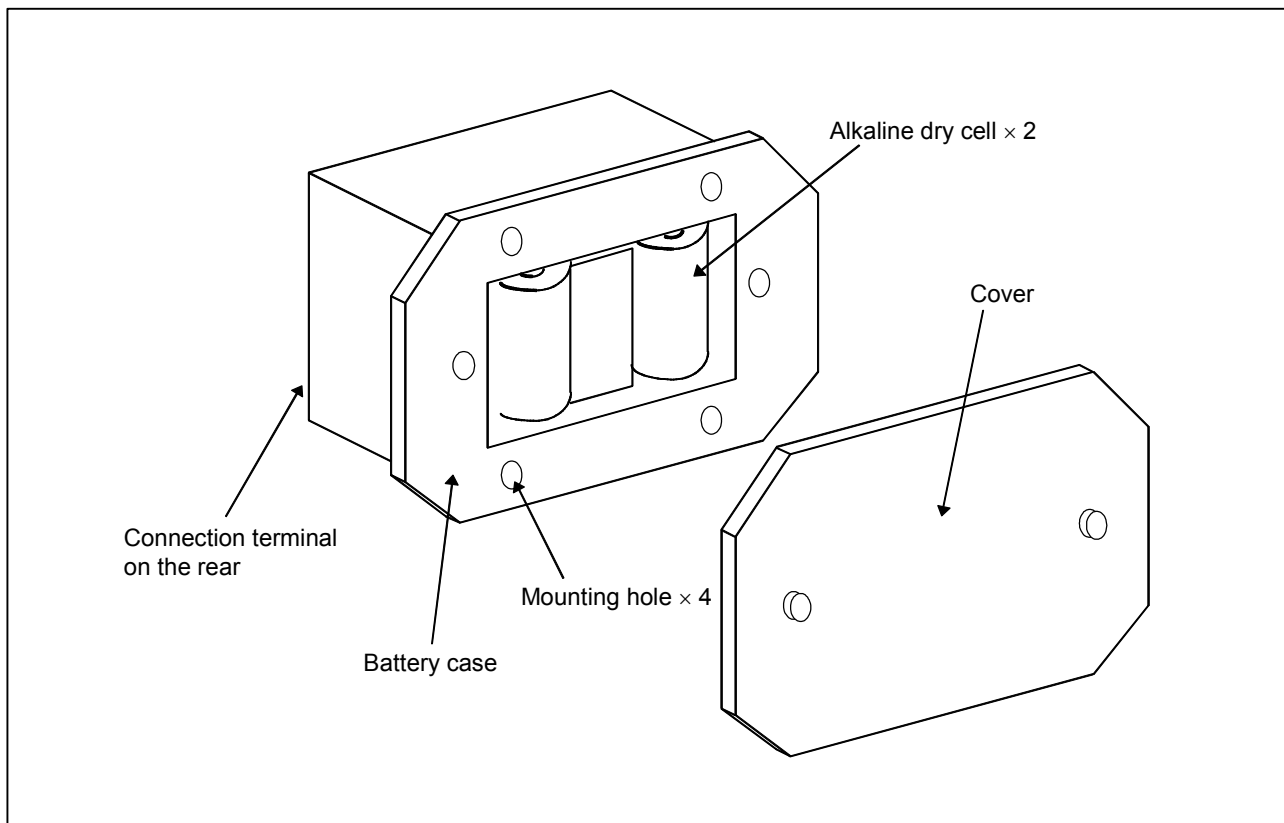
2.9   **REPLACING FAN MOTORS**

> ⚠ **WARNING**
> When opening the cabinet and replacing a fan
> motor, 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.

- Fan ordering information

	Ordering code	Remarks
Unit with no option slot	A02B-0303-K120	40 mm square, 2 units
Unit with 2 option slots	A02B-0303-K121	60 mm square, 1 unit 40 mm square, 1 unit

Replacement procedure

- For units with no expansion slots

1   Before replacing a fan motor, turn off the power to the CNC.
2   Unplug the connector of a fan motor to be replaced ((1) of Fig. a). The connector is latched.   Unplug the connector while holding down the latch placed at the upper part of the cable connector.
3   Detach the latch securing the fan motor, then demount the fan motor ((2) of Fig. a).
4   Insert a new fan motor into the fan case ((3) of Fig. a), then reconnect the connector.

Fig. a

(1) Connector

(2) Fan

(3) Fan case

Caution) Install a fan so that it flows air in the upward direction. (Face the label upward.)
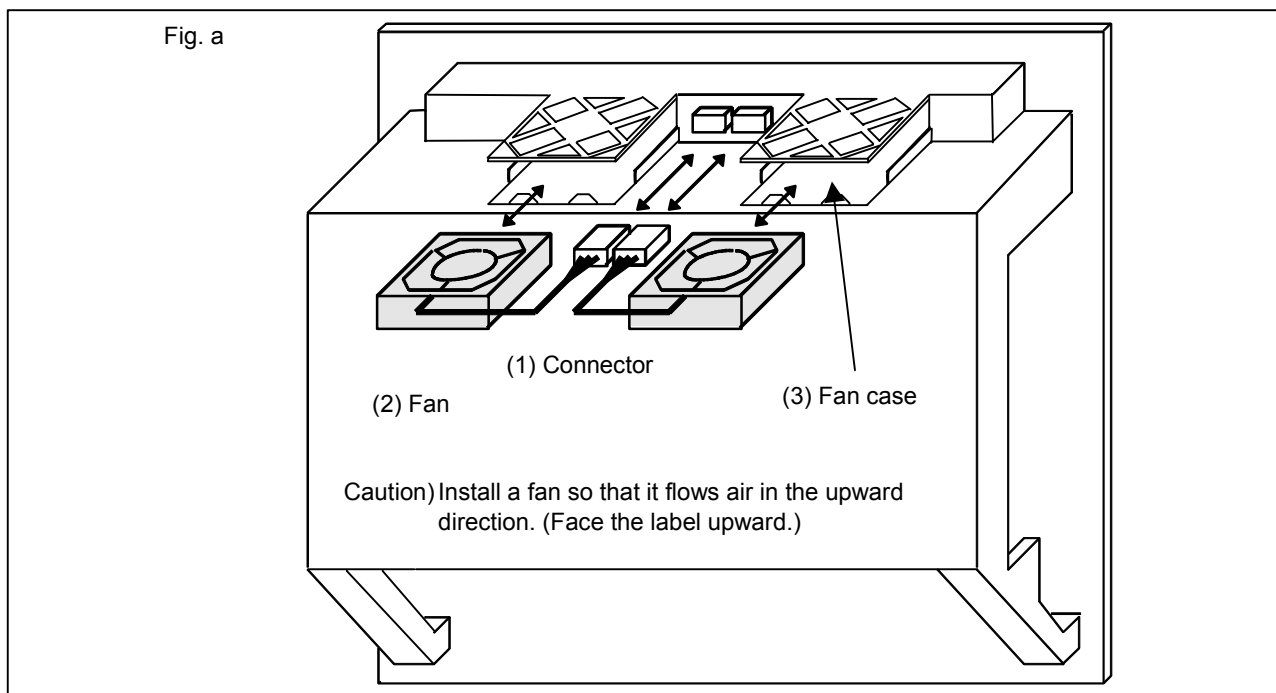
- **For units with 2 expansion slots**

1 Before replacing a fan motor, turn off the power to the CNC.

2 Unplug the connector of a fan motor to be replaced ((1) of Fig. b). The connector is latched. Unplug the connector while holding down the latch placed at the upper part of the cable connector.

3 Detach the latch securing the fan cover ((3) of Fig. b), then demount the fan cover from the unit.

4 The fan is secured to the fan cover. Detach the latch, then demount the fan motor ((2) of Fig. b).

5 Install a new fan motor onto the fan cover. Then, reinstall the fan cover onto the unit, and reconnect the connector.

Fig. b

(3) Fan cover   (1) Connector

(2) Fan
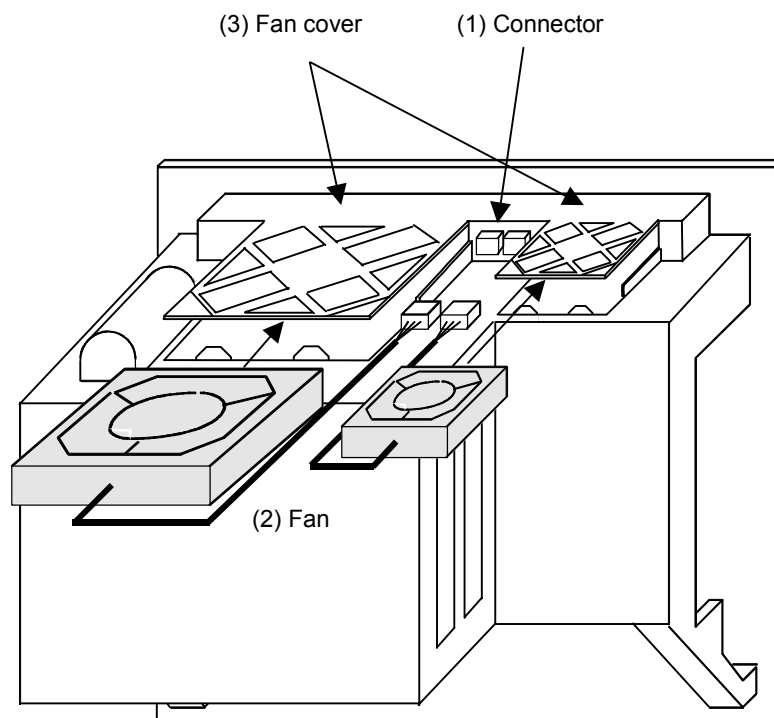
Cation) Install a fan so that it flows air in the upward direction. (Face the label upward.)

3

LCD-MOUNTED TYPE Series
300*i*s/310*i*s/320*i*s HARDWARE

This chapter describes the printed circuit boards in the LCD-mounted type Series 300*i*s/310*i*s/320*i*s control units, the functions of the card PCBs on the printed circuit boards, and the procedures for replacing consumables.

3.1　　HARDWARE CONFIGURATION

See section 2.1 for hardware configuration of Series 300*i*s/310*i*s/320*i*s.

3.2　　HARDWARE OVERVIEW

See section 2.2 for hardware overview of Series 300*i*s/310*i*s/320*i*s.

3.3   **TOTAL CONNECTION DIAGRAMS**

For the 300*i*s/310*i*s/320*i*s, the following connection is required, in addition to the connection common to the 30*i*/300*i*s/31*i*s/310*i*s/32*i*/310*i*s.

300*i*s/310*i*s/320*i*s
control unit

24V-IN(CPD16A)
SPDL (JA41)
I/O LINK(JD51A)
HDI(JA40)
MDI(CA55)
FSSB(COP10A-1)
FSSB(COP10A-2)

The functions and connections of the connectors on the left are the same as for the Series 30*i*.   See Section 2.3, "TOTAL CONNECTION DIAGRAMS."

R232-1/S.SPDL(JD56A)

RS-232-C I/O device

Serial spindle

R232-2/USB(JD54)

RS-232-C I/O device
Personal computer

USB printer
USB keyboard

Ethernet(CD38S)

HUB

Ethernet backbone cable

BACKUP POWER-IN
(CA75)

Backup unit

BUZZER for T.P.
(CA76)

Buzzer

See Section 2.3, "TOTAL CONNECTION DIAGRAMS" for connection other than the above.

3.4 CONFIGURATION OF PRINTED CIRCUIT BOARD CONNECTORS AND CARDS

3.4.1 Main Board

- **Specification**

Item	Specification
Series 300*i*s main board (10.4")	A20B-8101-0020
Series 300*i*s main board (12.1")	A20B-8101-0023
Series 300*i*s main board (15")	A20B-8101-0021
Series 310*i*s main board (10.4")	A20B-8101-0024
Series 310*i*s main board (12.1")	A20B-8101-0027
Series 310*i*s main board (15")	A20B-8101-0026
Series 310*i*s A5 main board (10.4")	A20B-8101-0020
Series 310*i*s A5 main board (12.1")	A20B-8101-0023
Series 310*i*s A5 main board (15")	A20B-8101-0021
Series 320*i*s main board (10.4")	A20B-8101-0024
Series 320*i*s main board (12.1")	A20B-8101-0027
Series 320*i*s main board (15")	A20B-8101-0026

- **Connector mounting location**
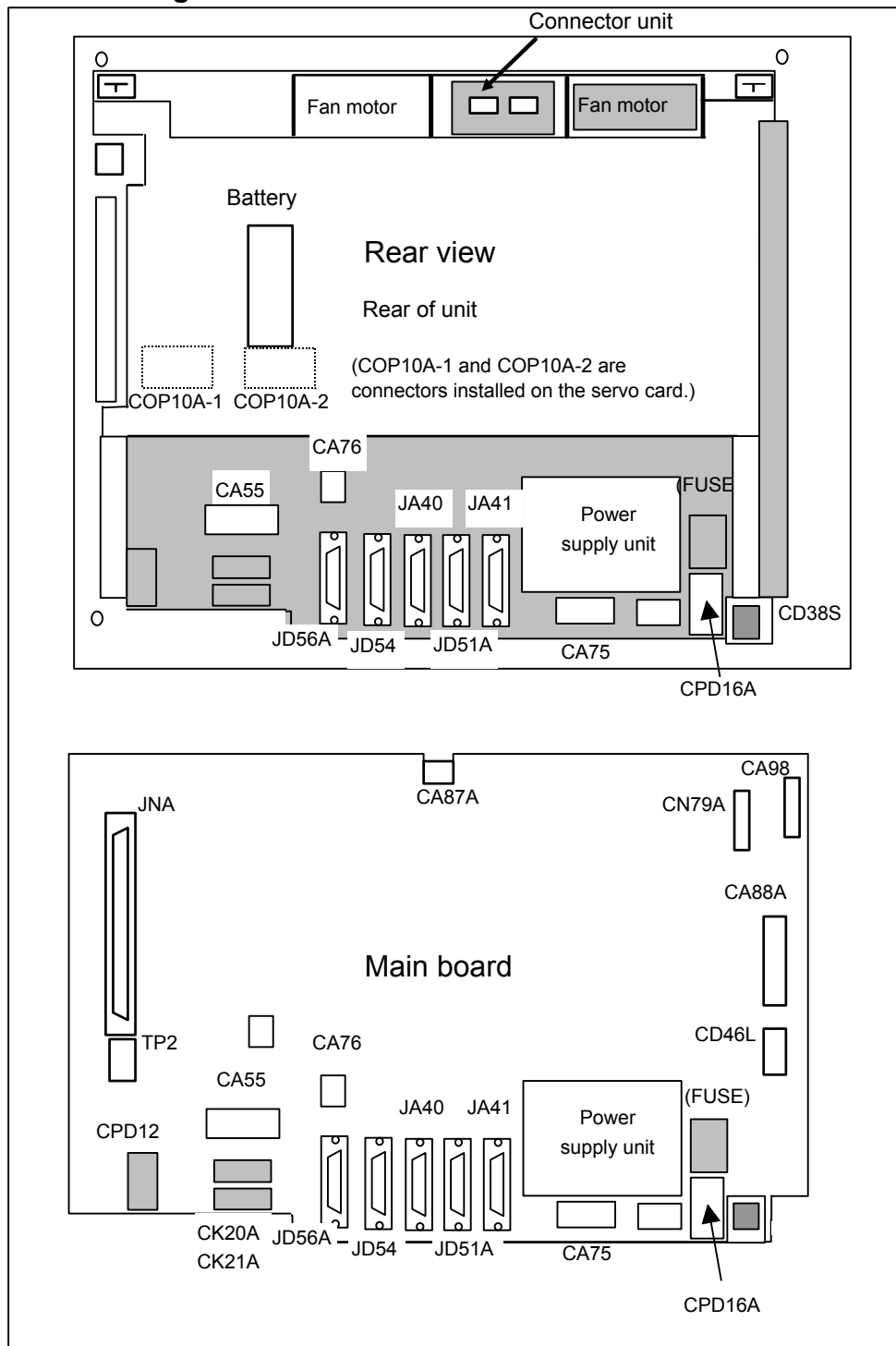
Connector number	Application
COP10A-1, COP10A-2	Servo amplifier (FSSB)
CA55	MDI
JD56A	RS-232C serial port 1/serial spindle
JD54	RS-232C serial port 2/USB
JA40	High-speed DI
JD51A	I/O link
JA41	Serial spindle
CPD16A	DC24V-IN
JGM	Back panel interface
CA79A	Video signal interface (10.4"/12.1"LCD only)
CA98	Video signal interface (15" LCD only)
CA88A	PCMCIA interface
CD46L	USB interface
CK20A	Soft key (horizontal type)
CK21A	Soft key (vertical type)
CA87A	Inverter (for 10.4" LCD) Fan adapter (for 12.1"/15"LCD)
CD38S	Ethernet
TP2	Touch panel interface
CPD12	Inverter interface (12.1"/15"LCD only)
CA75	Bach-up unit interface
CA76	Buzzer interface

- Card and power supply mounting location
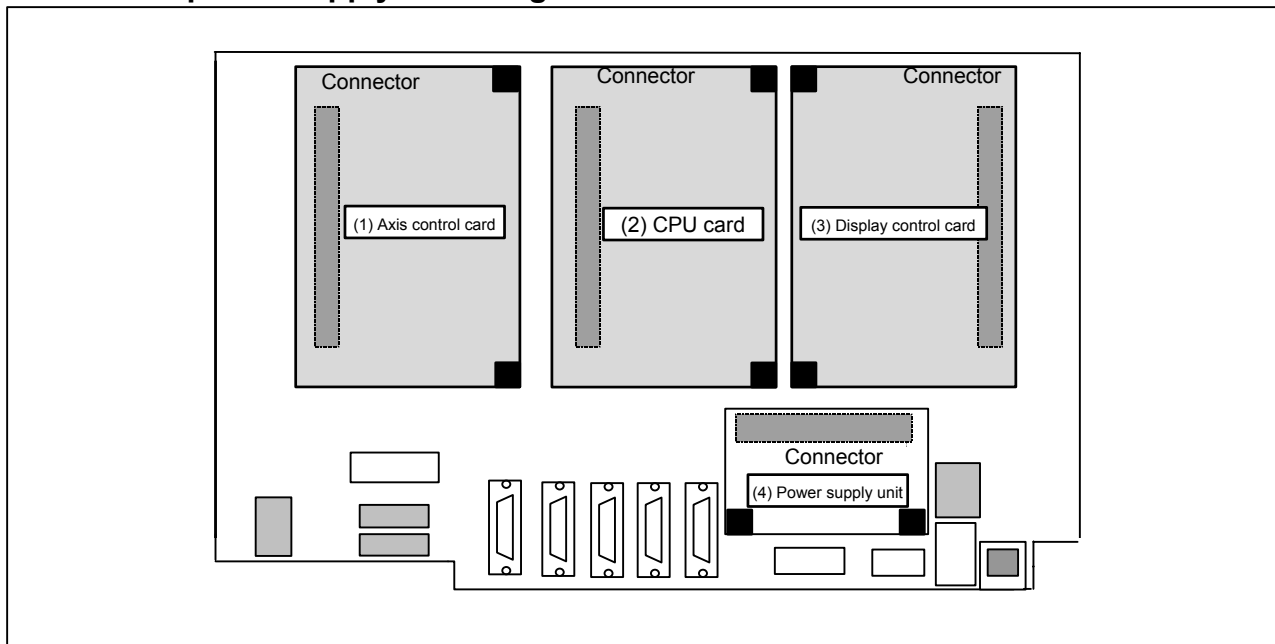
No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B-3300-0445	HRV2 : Up to 4 axes HRV3 : Up to 3 axes HRV4 : Up to 1 axis	The maximum number of axes is also limited depending on the model. For the 320*is*, HRV4 is unapplicable.
		A20B-3300-0448	HRV2 : Up to 8 axes HRV3 : Up to 6 axes HRV4 : Up to 2 axes	
		A20B-3300-0447	HRV2 : Up to 12 axes HRV3 : Up to 9 axes HRV4 : Up to 3 axes	
		A20B-3300-0442	HRV2 : Up to 16 axes HRV3 : Up to 12 axes HRV4 : Up to 4 axes	
		A20B-3300-0440	HRV2 : Up to 24 axes HRV3 : Up to 18 axes HRV4 : Up to 6 axes	
(2)	CPU card	A20B-3300-0477	Standard version, DRAM 32MB	
		A20B-3300-0474	Standard version, DRAM 64MB	
		A20B-3300-0475	Standard version, DRAM 128MB	
		A20B-3300-0470	High-speed version, DRAM 64MB	
		A20B-3300-0471	High-speed version, DRAM 128MB	
		A20B-3300-0491	Dedicated to the 32*i*, DRAM 32MB	
		A20B-3300-0490	Dedicated to the 32*i*, DRAM 64MB	
(3)	GUI card	A20B-3300-0420	10.4" /15"LCD 64MB	
		A20B-3300-0421	10.4" /15"LCD 128MB	
		A20B-3300-0422	12.1" LCD 64MB	
		A20B-3300-0423	12.1" LCD 128MB	
(4)	Power supply unit	A20B-8101-0010		

Configuration of GUI card

Compact flash card

Connector

GUI card
(connector side)

Compact flash
card socket

Name	Specification	Remarks
GUI card 1	A20B-3300-0420	10.4" /15"LCD 64MB
	A20B-3300-0421	10.4" /15"LCD 128MB
	A20B-3300-0422	12.1" LCD 64MB
	A20B-3300-0423	12.1"LCD 128MB
Compact flash card	A87L-0001-0173#032MBA	32MB
	A87L-0001-0173#064MB	64MB
	A87L-0001-0173#128MB	128MB
	A87L-0001-0173#256MB	256MB

- DIMM module mounting location

No.	Name	Specification	Function	Remarks
(1)	PMC module	A20B-3900-0200		
(2)	FROM/SRAM module	A20B-3900-0160	FROM 16MB SRAM 1MB	The FROM stores various control software programs, user software programs, and so forth. The SRAM is a battery-backed memory module.
		A20B-3900-0161	FROM 16MB SRAM 2MB	
		A20B-3900-0163	FROM 32MB SRAM 1MB	
		A20B-3900-0164	FROM 32MB SRAM 2MB	
		A20B-3900-0166	FROM 64MB SRAM 1MB	
		A20B-3900-0167	FROM 64MB SRAM 2MB	
		A20B-3900-0180	FROM 16MB SRAM 256kB	
		A20B-3900-0181	FROM 16MB SRAM 512kB	
		A20B-3900-0182	FROM 32MB SRAM 256kB	
		A20B-3900-0183	FROM 32MB SRAM 512kB	

- Block diagram

- LED display

(3) Alarm (red)

DNV4

DNV5

(4) GUI POWER (green)

(2) GUI status (green)

| DNV3 |
| DNV2 |
| DNV1 |

(5) 7-segment LED

(1) CNC alarm (red)

| LOW |
| ALM3 |
| ALM2 |
| ALM1 |

(1) Alarm LED (CNC alarm red LED) indication at CNC system alarm occurrence

If any of these LEDs lights, it is likely that the hardware is defective.

No.	CNC alarm LED			Status
	3	2	1	
1	□	■	□	Low battery voltage. The battery may be is running out.
2	□	■	■	Software detected an error and stopped the system.
3	■	□	□	Hardware detected a failure in the system.
4	■	□	■	An alarm was issued with the servo card on the main board. The servo card may be faulty, or the FSSB may be broken.
5	■	■	□	An error was detected in the data of the SRAM on the DIMM module. The DIMM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
6	■	■	■	Abnormal power supply operation. The cause may be noise or a power supply module failure.

■ : On □ : Off

Alarm LED	Meaning
LOW	The CPU card may be faulty.

(2) Changes in status LED (GUI side status: Green LED) indication at power-on time

No.	Status LED (DNV1 to 3)			Status
	3	2	1	
1	□	□	□	State where the power is not tuned on, or state where the system was started up successfully and is running normally
2	■	■	■	State immediately after the power is turned on
3	■	■	□	The interface between the CPU card and GUI card is being initialized. If the status does not proceed further beyond this indication, the CPU card, GUI card, or main board may be faulty.
4	□	■	■	Start-up on the GUI card side is being awaited. If the status does not proceed further beyond this indication, the GUI card or main board may be faulty.
5	□	■	□	The CPU card screen is being output to the GUI card, or a RAM error occurred in the interface between the CPU card and GUI card. If the status does not proceed further beyond this indication, the CPU card, GUI card, or main board may be faulty.

■ : On □ : Off

(3) Alarm LED (red) indication at GUI system alarm occurrence
If the LED lights, it is likely that the hardware is defective.

Alarm LED	Meaning
DNV4	Common RAM error. The main board may be faulty.

■ : On □ : Off

(4) GUI POWER (green LED) indicates that power is supplied to the
GUI card (at the time of back-up operation as well).

(5) 7-segment LED
See Appendix E "LED Display".
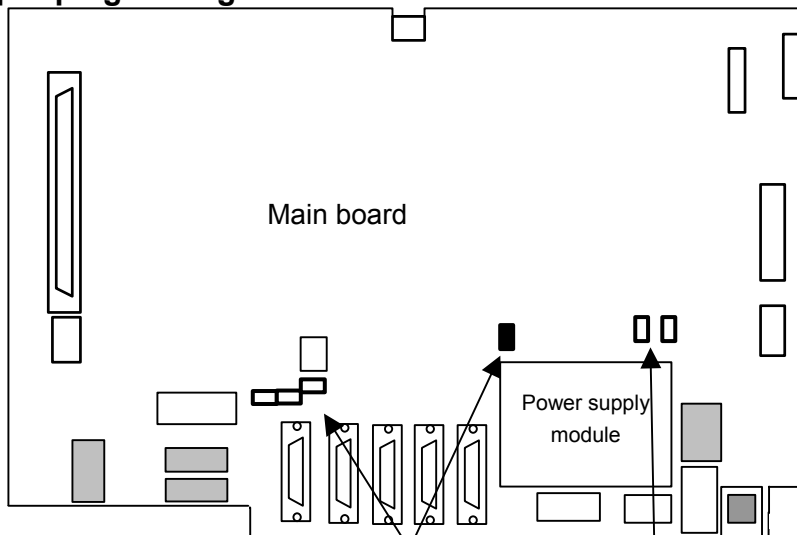
- Jumper plug setting

Main board

Power supply
module

TMIBB(Short)
Ensure that this is short-circuited.

RESERVE(OPEN)
Ensure that this is left open.
(The terminal may not be installed.)

3.4.2   Inverter PCBs, Connector Units, and Fan Adapter PCBs

Name		Specification
Inverter PCB	For 10.4" color LCD (Used also as the fan adapter)	A20B-8100-0962
	For 12" color LCD (With an inverter main board cable)	A14L-0143-0003#A
	For 15" color LCD (With an inverter main board cable)	A14L-0143-0002#A
Fan adapter PCBs	For 10.4" color LCD (Used also as the fan adapter)	Used also as the inverter above
	For 12" color LCD For 15" color LCD	A20B-8100-0969
Conversion cable	For 15" color LCD	A660-4042-T047
Connector unit		A15L-0001-0091

> **NOTE**
> The connector unit is fastened to the case with self-tapping screws.

- Details of the inverter
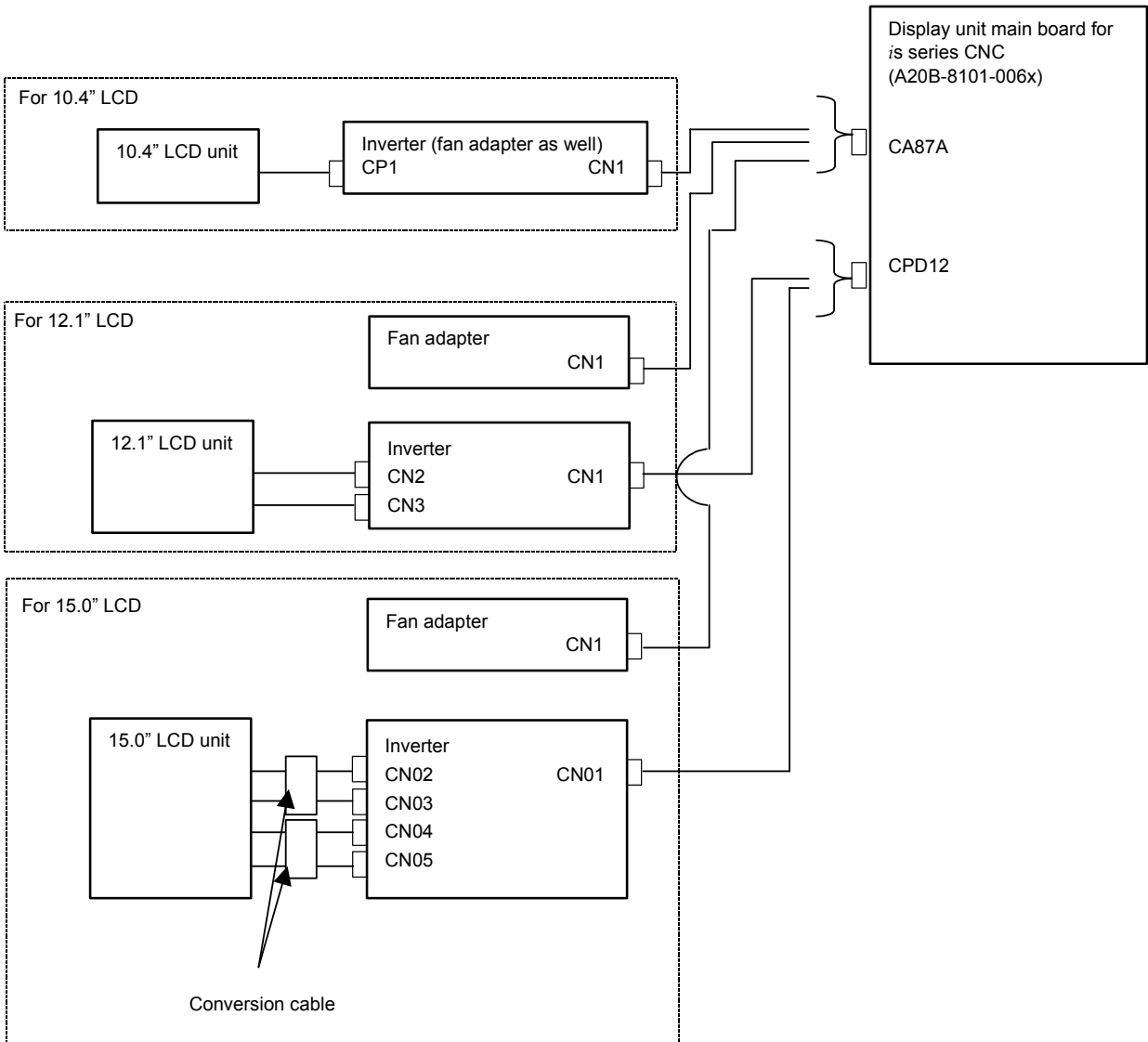
- Inverter PCBs, connector units, and fan adapter PCBs

(1) For 10.4" LCD
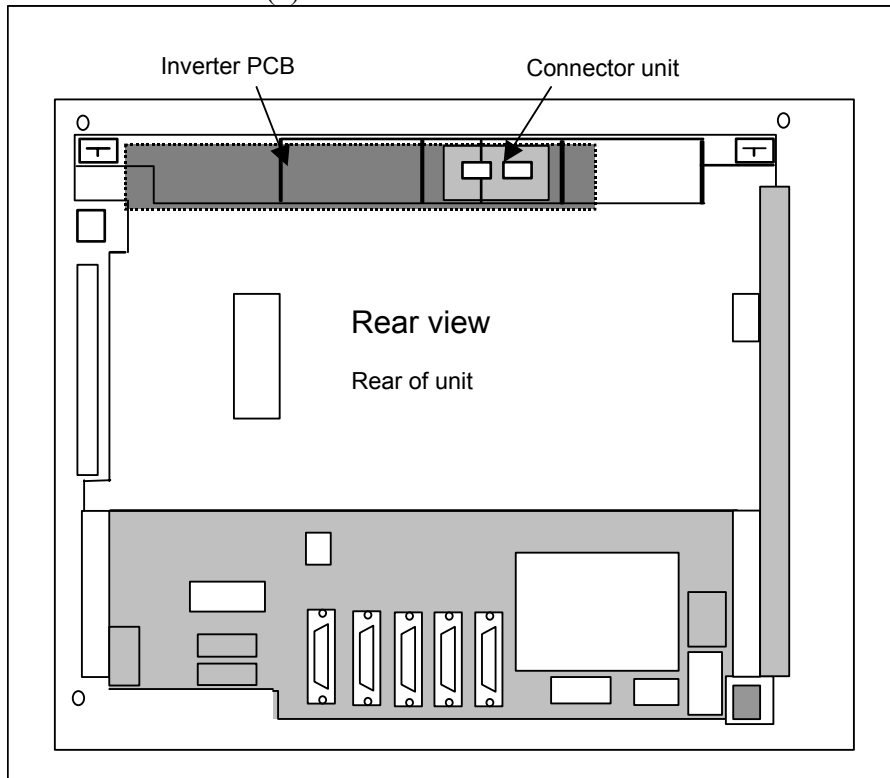
(2) For 12.1" LCD
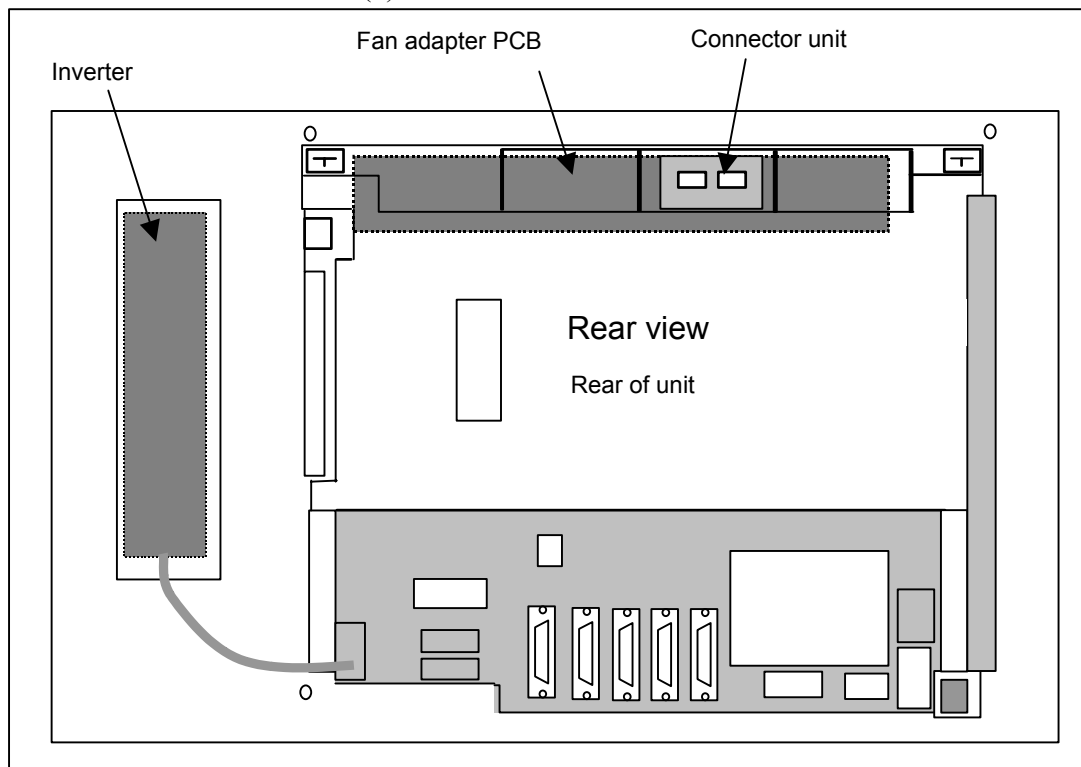
(3)   For 15" LCD
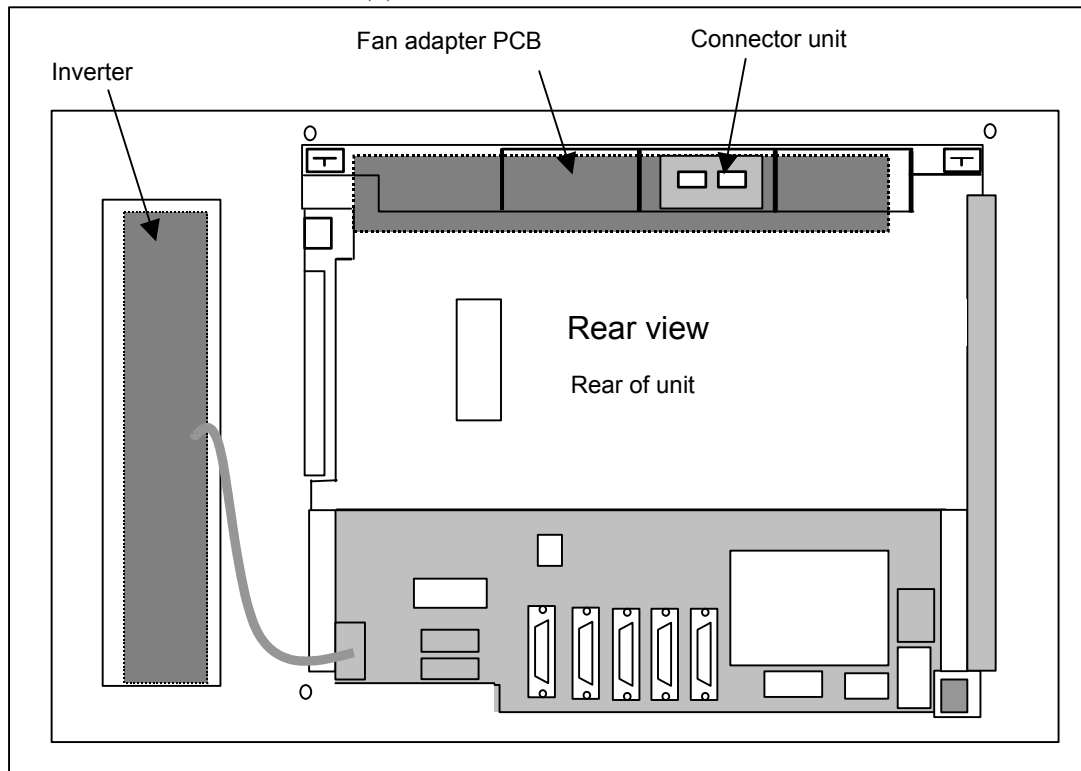
- Conversion cable for the inverter

When a 15" LCD is used, a conversion cable needs to be run between the LCD backlight cable and the inverter connector.

Two types of connectors are provided on the inverter PCB. Plug into a matching connector.

Each of the two cables from the LCD backlight section may be connected to either of the two cables from the inverter.

Conversion cable (A660-4042-T047)

- 204 -
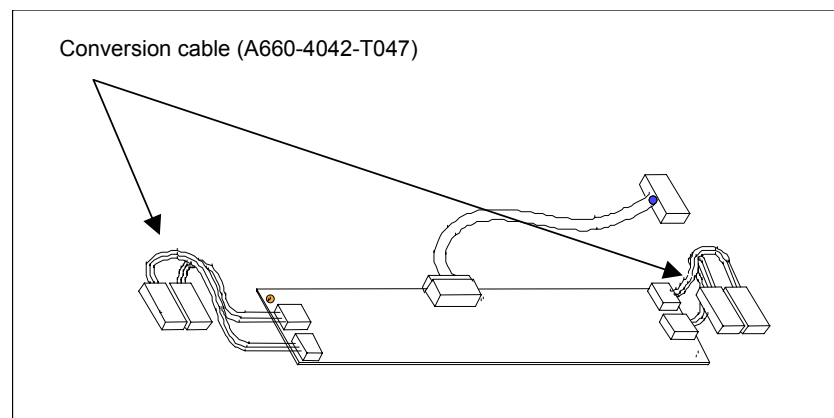
3.5   LIST OF PRINTED CIRCUIT BOARDS AND UNITS

3.5.1   List of Printed Circuit Boards

Name			Ordering code	Remarks
Main board	Series 300*is*	For 10.4" LCD	A20B-8101-0020	ID=00304
		For 12.1" LCD	A20B-8101-0023	ID=00307
		For 15" LCD	A20B-8101-0021	ID=00305
	Series 310*is*	For 10.4" LCD	A20B-8101-0024	ID=00310
		For 12.1" LCD	A20B-8101-0027	ID=00313
		For 15" LCD	A20B-8101-0025	ID=00311
	Series 310*is* A5	For 10.4" LCD	A20B-8101-0020	ID=00304
		For 12.1" LCD	A20B-8101-0023	ID=00307
		For 15" LCD	A20B-8101-0021	ID=00305
	Series 320*is*	For 10.4" LCD	A20B-8101-0024	ID=00310
		For 12.1" LCD	A20B-8101-0027	ID=00313
		For 15" LCD	A20B-8101-0025	ID=00311
GUI card	10.4" /15" LCD, 64MB		A20B-3300-0420	ID=0000X1
	10.4" /15" LCD, 128MB		A20B-3300-0421	ID=0001X1
	12.1" LCD, 64MB		A20B-3300-0422	ID=0000X0
	12.1" LCD, 128MB		A20B-3300-0423	ID=0001X0
Power supply unit			A20B-8101-0010	
Inverter printed circuit board	For 10.4" LCD		A20B-8100-0962	
	For 12,1" LCD (with an inverter main board cable）		A14L-0143-0003#A	
	For 15" LCD (with an inverter main board cable）		A14L-0143-0002#A	
Fan adapter	For 12.1"/15" LCD		A20B-8100-0969	
Backup unit printed circuit board			A20B-2100-0820	

3.5.2   List of Units

Name			Ordering code	Remarks
LCD unit	10.4"LCD	Without touch panel	A02B-0303-D505	ID=1111
		With touch panel	A02B-0303-D506	
	12.1"LCD	Without touch panel	A02B-0303-D509	ID=1110
		With touch panel	A02B-0303-D510	
	15"LCD	Without touch panel	A02B-0303-D515	ID=1101
		With touch panel	A02B-0303-D516	
Basic unit	No slot		A02B-0303-B600	
	2 slots		A02B-0303-B602	
Case unit	No slot		A02B-0303-D100#0A	
	2 slots		A02B-0303-D100#2A	

3.5.3   **Others**

Name		Ordering code	Remarks
Compact flash card	32MB	A87L-0001-0173#032MBA	
	64MB	A87L-0001-0173#064MB	
	128MB	A87L-0001-0173#128MB	
	256MB	A87L-0001-0173#256MB	
Conversion cable (for 15" LCD backlight)		A660-4042-T047	
Cable for backup unit		A02B-0281-K801	

> **NOTE**
> This section describes the printed circuit boards
> and units specific to the 300*i*s/310*i*s/320*i*s.   For
> the printed circuit boards and units common to the
> 300*i*s/310*i*s/320*i*s and 30*i*/31*i*/32*i*, see Section 2.5.

3.6   REPLACING THE MAIN BOARD

⚠ **WARNING**
Only those personnel who have received approved
safety and maintenance training may perform this
replacement work.
When opening the cabinet and replacing the board,
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.

⚠ **CAUTION**
Before starting replacement work, back up the
contents (such as parameters and programs) of the
SRAM memory of the CNC. Otherwise, the
contents of the SRAM memory may be lost during
replacement work.

3.6.1   Replacement Procedure

1   Remove the LCD-mounted type control unit, referencing Section 5.13, "MOUNTING AND REMOVING LCD AND MDI UNITS."

2   Remove the two screws at the bottom of the case, then remove the case while pushing down the claws located on the upper side. At this time, the fan and battery cables need not be detached.

Craw

Screws   Note) The screws are locked so as not to be detached from the case.
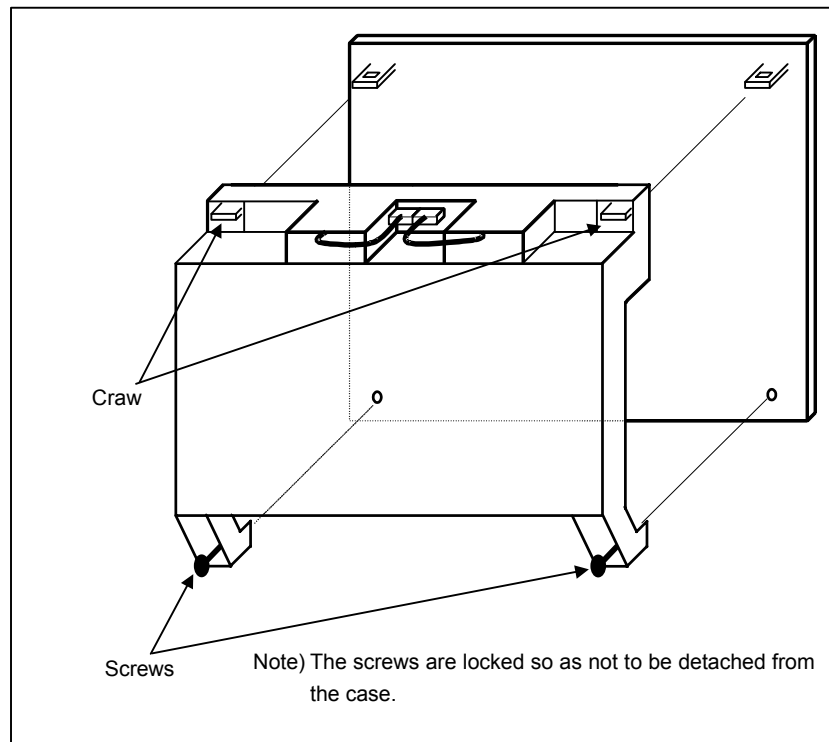
3   Detach the cables from the connectors CA88A (PCMCIA interface connector), CD46L (USB interface connector), and CK20A and CK21A (connectors for soft keys) on the main board.
When the 10.4" LCD is used, remove CA79A (video signal interface connector). When the 12.1" LCD is used, remove CA79A (video signal interface connector) and CPD12. When the 15" LCD is used, remove CA98 (video signal interface connector) and CPD12. When a touch panel is provided, remove TP2 (connector for the touch panel) as well.

4   Next, remove the screws used to secure the main board. The connector CA87A (connector for inverter connection) directly connects the main board with the inverter PCB. So, detach the main board by moving the main board downward.

CA87A

CA79A CA98

Main board

CA88A

TP2

CD46L

CDP12

CK20A

CK21A
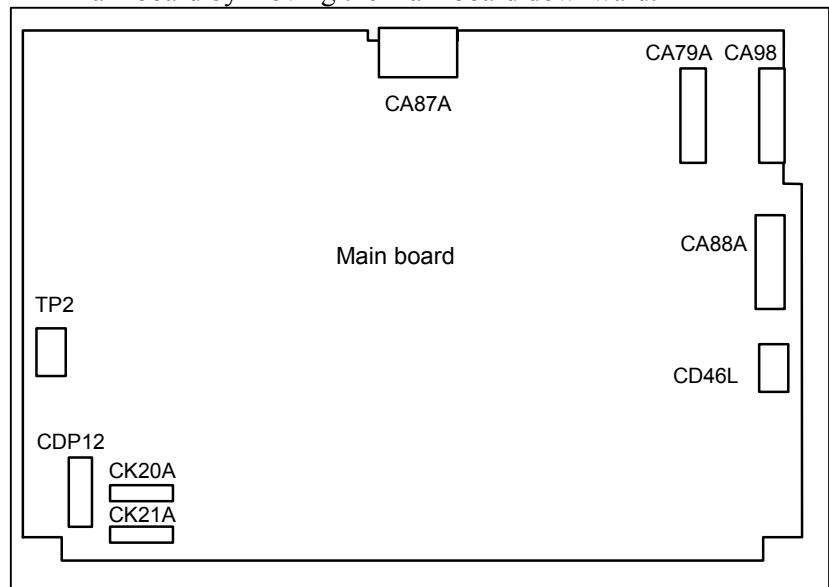
5   When mounting the main board, reverse steps 2 through 4.

3.7   **REPLACING FUSE ON UNIT**

> ⚠ **WARNING**
> Before replacing a blown fuse, 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 replacement work.
> When opening the cabinet and replacing a fuse, 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.

- Ordering codes of fuses

A02B-0236-K101

- Fuse mounting location

Fuse
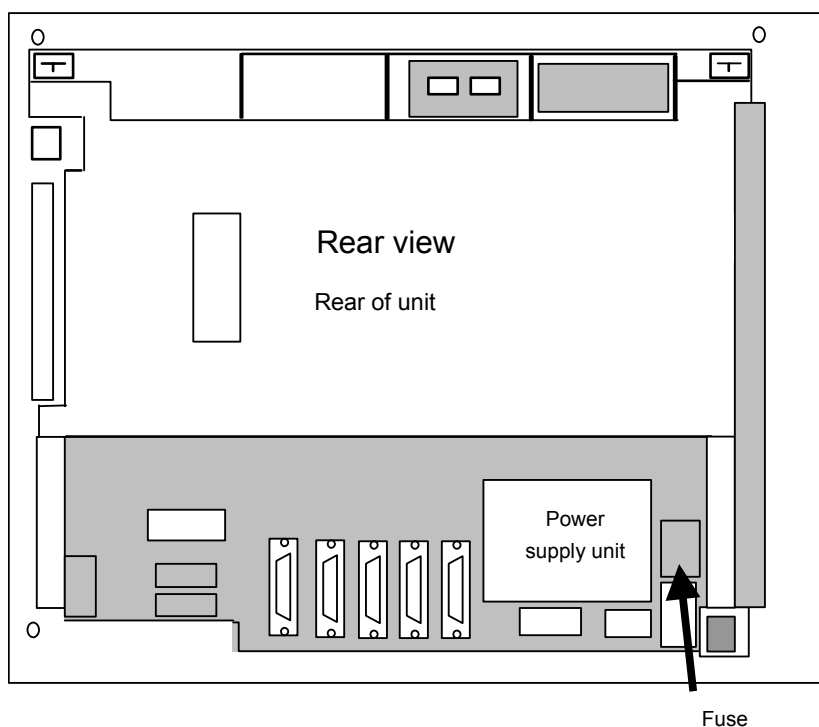
3.8   REPLACING THE BATTERY

See Section 2.8, "REPLACING THE BATTERY" for replacing the battery.

3.9   REPLACING THE FAN MOTOR

See Section 2.9, "REPLACING FAN MOTORS" for replacing the fan motor.

3.10   REPLACING THE TOUCH PANEL PROTECTION SHEET

For the LCD display unit with a touch panel, the surface of the touch panel is covered with the protection sheet to protect it. When there are flaws and contamination on this protection sheet that make the screen hard to read, replace the protection sheet. Prepare the following items.

Name		Ordering code
Touch panel protection sheet	For 10.4" LCD	A02B-0236-K110
	For 12.1" LCD	A02B-0236-K118
	For 15.0" LCD	A08B-0082-K020

3.10.1   Replacing Method

See Section 5.6.

3.11 BACKUP UNIT

- Specification

Name	Specification
Backup unit PCB	A20B-2100-0820
Backup unit cable	A02B-0281-K801

- Mounting positions of connectors

CN9

Backup unit PCB

Front view
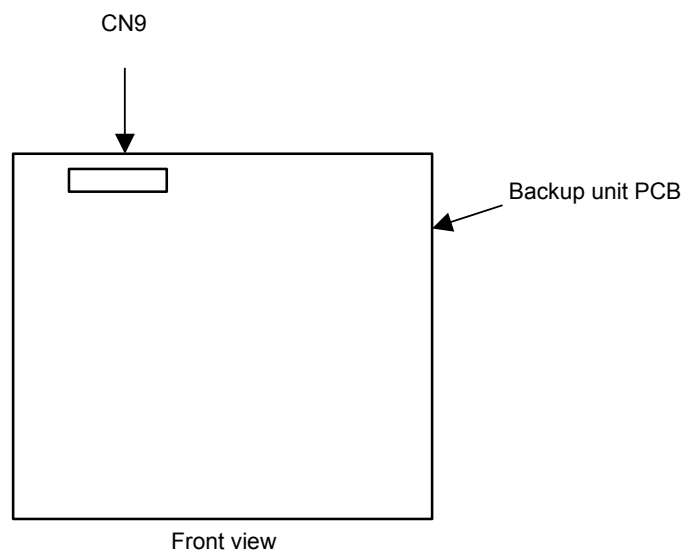
Connector name	Function
CN9	Supplying the backup power

When the LED (PC POWER) on the main printed circuit board lights, do not touch any parts in the basic unit and backup unit. The Series 300*i*s operates for about 12 seconds after the main power is turned off.

4

STAND-ALONE TYPE 30*i* SERIES HARDWARE

This chapter describes the printed circuit boards of the CNC control unit of the stand-alone type 30*i* series and card PCB functions on the printed circuit boards. The chapter also describes procedures for replacing consumable items.

4.1   HARDWARE CONFIGURATION

4.2 **HARDWARE OVERVIEW**

4 slot rack   2 slot rack

Main board

Slot 3   Slot 1

Slot 4   Slot 2

Options (Slot 1 to 4)
Data server board
Data server function
Additional axis board
Additional axis control function I/O Link
Additional spindle board
Additional spindle control function
HSSB interface board
High-speed serial bus interface board
Various types of network boards
FL-net board Profibus master board Profibus slave board Device Net board

Basic system
Main board
- CPU for controlling CNC - Power supply - 2-axis to 24-axis control - Spindle interface - DISPLAY interface - I/O Link - PMC control function - High-speed DI - RS-232C - Memory card interface

4.3 TOTAL CONNECTION DIAGRAMS

When optional functions are provided

Optional slot

Additional spindle board

SPDL(JA41L)

PSM

Position coder

SPM

7th spindle

To 8th spindle

Additional axis board

FSSB(COP10A-3)

COP10B
COP10A
SVM

Servo motor

COP10B
COP10A
SVM

Servo motor

COP10B
COP10A
SVM

Servo motor

COP10B
COP10A
SVM

Servo motor

Distributed
I/O board

Manual pulse generator

24VDC

CPD1   JA3

JD1B

JD1A

Operator's
panel

I/O Link(JD1A)

24VDC

CPD1

JD1B

JD1A

Distributed I/O
board, I/O unit,
etc.

Power
magnetics
cabinet

When optional functions are provided

Optional slot

Fast data server board

ATA card — The user should provide an ATA card.

ETHERNET(CD38R) — Ethernet

HSSB ボード

HSSB(COP21N) — Personal Computer or PANEL *i* (Note 1)

Profibus master board

PROFI(CN1) — Another NC (another Profibus unit)

Profibus slave board

PROFI(CN2) — Another NC (another Profibus unit)

DeviceNet board

DVNET(TBL) — Another NC (another DeviceNet unit)

FL-net board

FLNET(CD38N) — FL-net unit

Note 1 The 30*i*/31*i*/32*i* model is still used when a personal computer or PANEL *i* is connected using an HSSB interface.

For the *i*s series CNC display unit, the additional connection shown below is required on the unit.

CNC control unit

Main board
HSSB(COP21A)

MDI unit

(CK27)

Display unit for *i*s series CNC

MDI(CA55)

24VDC power supply

HSSB(COP21M)

24V-IN(CDP18)

R232-2/USB(JD54)

RS-232-C I/O device
Personal computer
USB keyboard
USB printer

R232-1(JD36)

RS-232-C I/O device

Ethernet(CD38S)

HUB

Ethernet backbone

BACKUP POWER-IN
(CA75)

Backup unit

BUZZER for T.P.
(CA76)

Buzzer
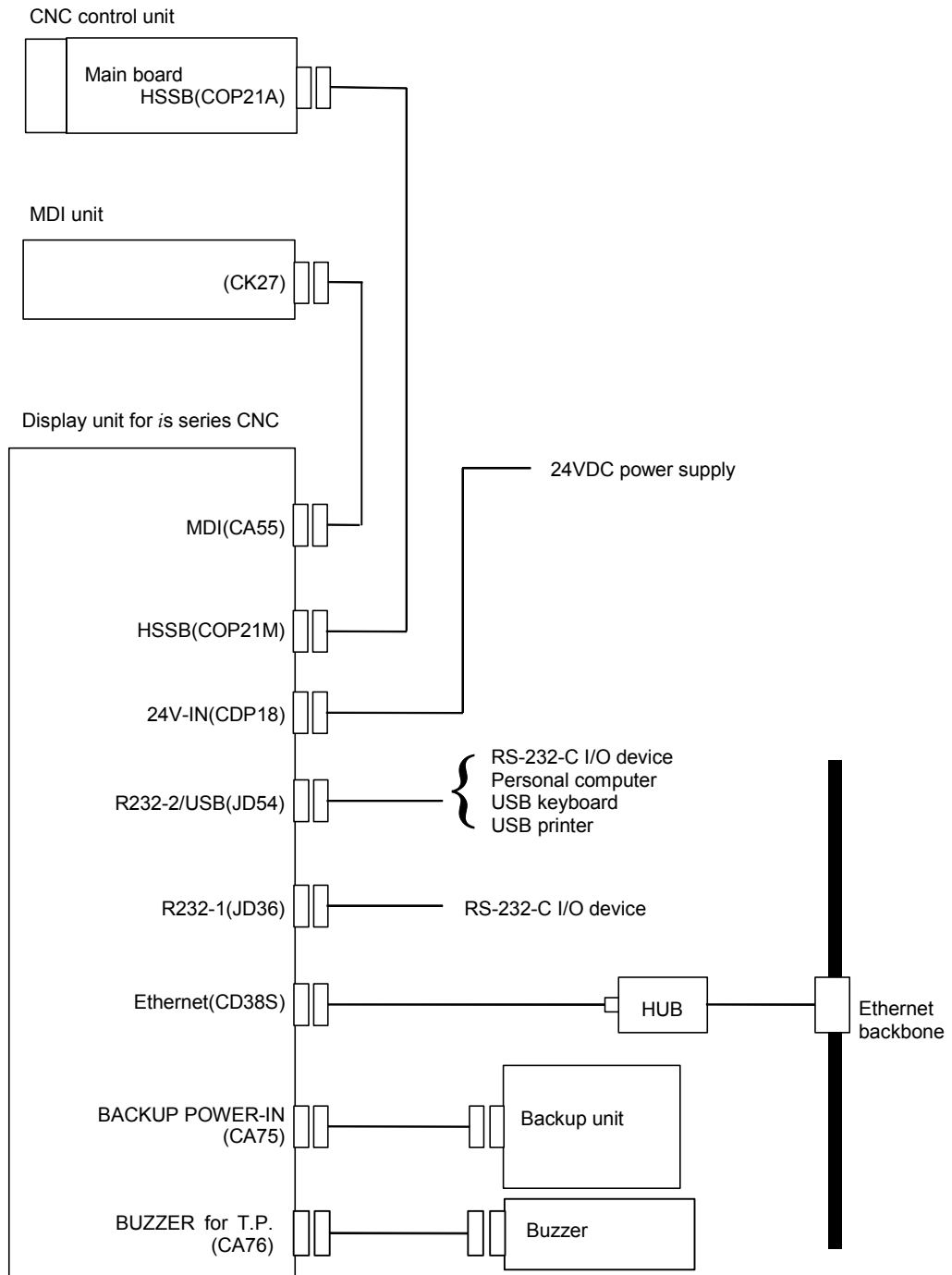
4.4 CONNECTOR AND CARD CONFIGURATIONS OF PRINTED CIRCUIT BOARDS

4.4.1 Main CPU Board of 30*i* series

- Specifications

Item	Ordering code
Main CPU board of 30*i*/300*i*/300*i*s-A Main CPU board of 31*i*/310*i*/310*i*s-A5	A16B-3200-0520
Main CPU board of 31*i*/310*i*/310*i*s-A Main CPU board of 32*i*/320*i*/320*i*s-A	A16B-3200-0521

- Mounting positions of connectors, LEDs, etc.

- 220 -
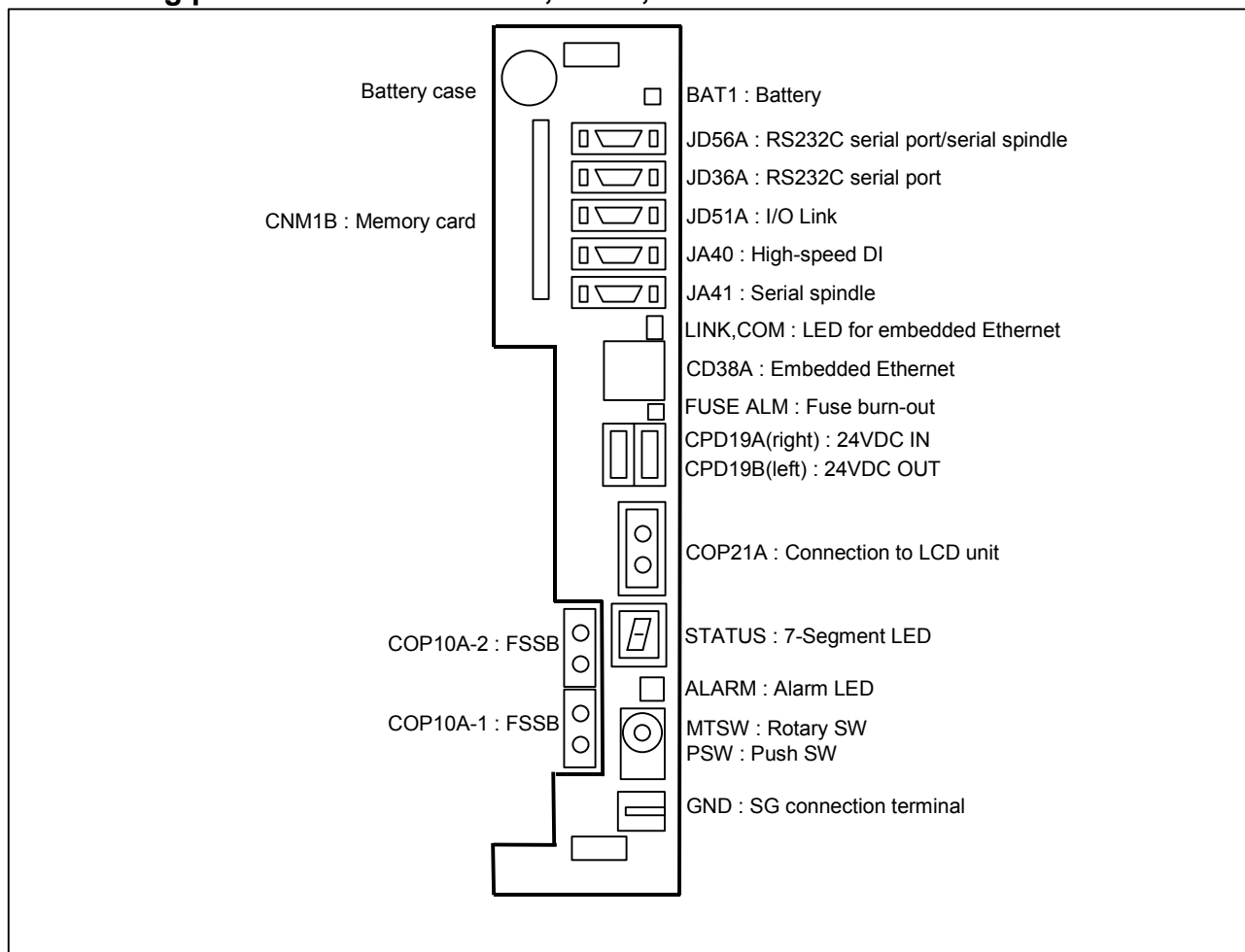
STATUS 7-segment LED: This LED usually indicates the state of the CNC. This LED is used also for setting and maintenance using the rotary switch MTSW and the push switch PSW.

MTSW rotary switch: This rotary switch is used for setting and maintenance operations, in combination with the STATUS 7-segment LED and the PSW push switch.

PSW push switch: This push switch is used for setting and maintenance operations, in combination with the STATUS 7-segment LED and the MTSW rotary switch.

- Mounting positions of cards and DIMM modules
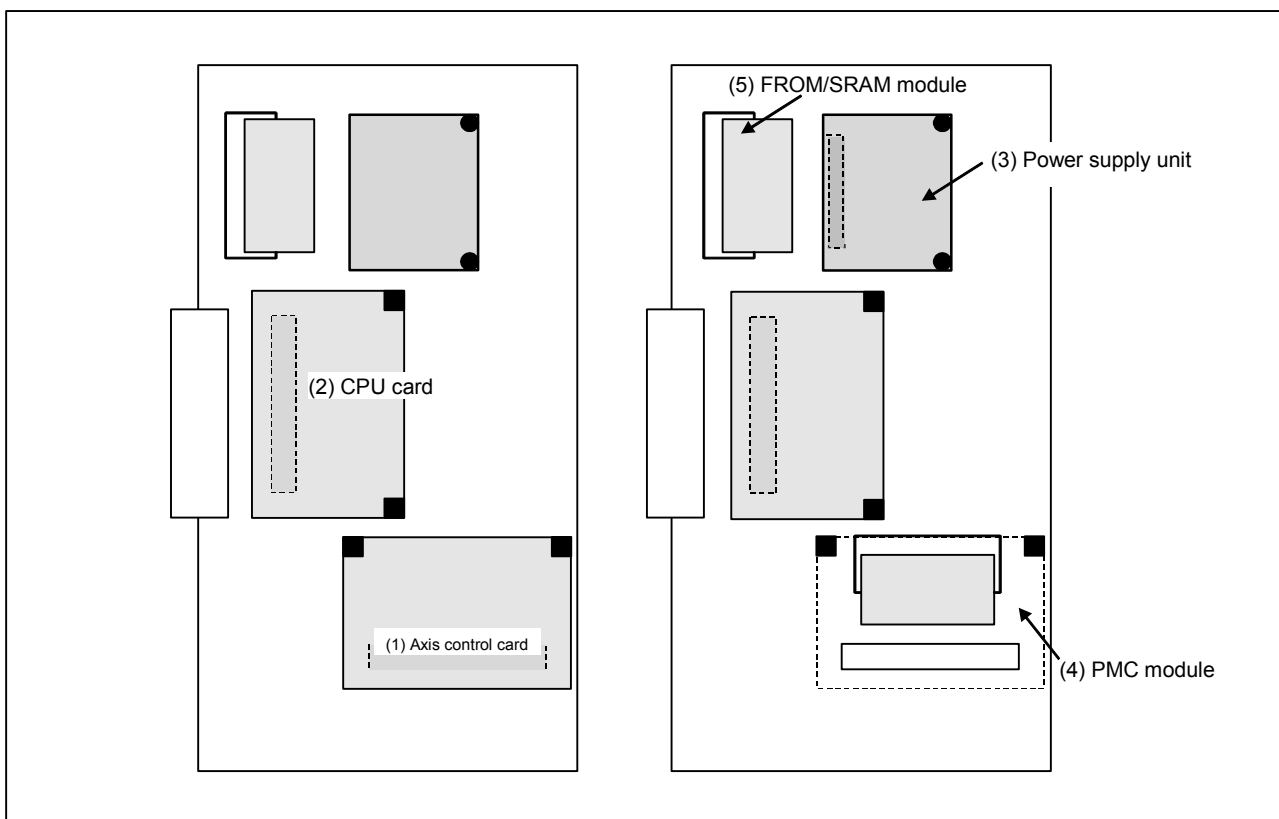
- Method of detaching the main CPU board

The main CPU board is secured to the control unit by the fan unit. So, when the fan unit is attached to the control unit, the main CPU board cannot be detached.

When attaching or detaching the main CPU board, be sure to detach the fan unit.

For the method of detaching the fan unit, see Section 4.8.

No.	Item	Ordering code	Function	Remarks
(1)	Axis control card	A20B-3300-0445	HRV2 : Up to 4 axes HRV3 : Up to 3 axes HRV4 : Up to 1 axis	The maximum number of axes is also limited depending on the model. For the 32*i*/320*i*/320*i*s, HRV4 is unapplicable.
		A20B-3300-0448	HRV2 : Up to 8 axes HRV3 : Up to 6 axes HRV4 : Up to 2 axes	
		A20B-3300-0447	HRV2 : Up to 12 axes HRV3 : Up to 9 axes HRV4 : Up to 3 axes	
		A20B-3300-0442	HRV2 : Up to 16 axes HRV3 : Up to 12 axes HRV4 : Up to 4 axes	
		A20B-3300-0440	HRV2 : Up to 24 axes HRV3 : Up to 18 axes HRV4 : Up to 6 axes	
(2)	CPU card	A20B-3300-0477	Standard version, DRAM 32MB	
		A20B-3300-0474	Standard version, DRAM 64MB	
		A20B-3300-0475	Standard version, DRAM 128MB	
		A20B-3300-0470	High-speed version, DRAM 64MB	
		A20B-3300-0471	High-speed version, DRAM 128MB	
		A20B-3300-0491	Dedicated to the 32*i*, DRAM 32MB	
		A20B-3300-0490	Dedicated to the 32*i*, DRAM 64MB	
(3)	Power supply unit	A20B-8101-0010		
(4)	PMC module	A20B-3900-0200		
(5)	FROM/SRAM module	A20B-3900-0160	FROM 16MB SRAM 1MB	FROM stores various control software products. SRAM is backed up by a battery.
		A20B-3900-0161	FROM 16MB SRAM 2MB	
		A20B-3900-0163	FROM 32MB SRAM 1MB	
		A20B-3900-0164	FROM 32MB SRAM 2MB	
		A20B-3900-0166	FROM 64MB SRAM 1MB	
		A20B-3900-0167	FROM 64MB SRAM 2MB	
		A20B-3900-0180	FROM 16MB SRAM 256kB	
		A20B-3900-0181	FROM 16MB SRAM 512kB	
		A20B-3900-0182	FROM 32MB SRAM 256kB	
		A20B-3900-0183	FROM 32MB SRAM 512kB	

- Block diagram

- LED display

LED for embedded Ethernet
LINK   (Upper, green)
COM   (Lower, yellow)

FUSE ALM : Fuse burn-out detection LED

STATUS : 7-Segment LED

ALARM : Alarm LED

1	4
2	3

(1) Alarm LED (red) display when a system alarm occurs
If any of these LEDs lights, it is likely that the hardware is defective.

No.	Alarm LED 3 2 1	Meaning
1	□ ■ □	Low battery voltage. The battery may be running out.
2	□ ■ ■	Software detected an error and stopped the system.
3	■ □ □	Hardware detected a failure in the system.
4	■ □ ■	An alarm was issued with the servo card on the main board. The servo card may be faulty, or the FSSB may be broken.
5	■ ■ □	An error was detected in the data of the SRAM on the DIMM module. The DIMM module may be faulty, the battery voltage may have dropped, or the main board may be faulty.
6	■ ■ ■	Abnormal power supply operation. The cause may be noise or a power supply module failure.

■ : On □ : Off

Alarm LED	Meaning
4 (LOW)	The CPU card may be faulty.

(2) Ethernet status LED

Alarm LED	Meaning
LINK (green)	Turned on when a connection is made with the hub correctly
COM (yellow)	Turned on when data is transferred

(3) 7-segment LED

Dot
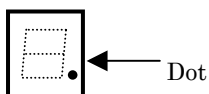
Alarm LED	Meaning
Dot	Lights if the indicator is not normally connected. It is likely that the optical cable may be broken, the indicator may not be supplied with power, or the indicator may be defective.

See Appendix E "LED Display" for others.

4.4.2 PANEL *i* Printed Circuit Board

- Specification

Item	Specification
Mainboard (for 10" LCD)	A20B-8100-0935
Mainboard (for 15" LCD)	A20B-8100-0936
Back panel	A20B-8002-0330
Power supply P.C.B.	A20B-2100-0920

- Connector and LED mounting location

(1) Main board

(2) Back panel

CA78B PCI Slot 2

LED2A LED1A

CA78A PCI Slot 1

HSSB Controller

PCI I/F

COP21M

JA64 PC Extension I/F

(3) Power supply P.C.B.

CPD14

CN3 CPE11B CPE11A

CPD11A

CPD11B

CPD11C

CPE11C

FUSE

CPD12
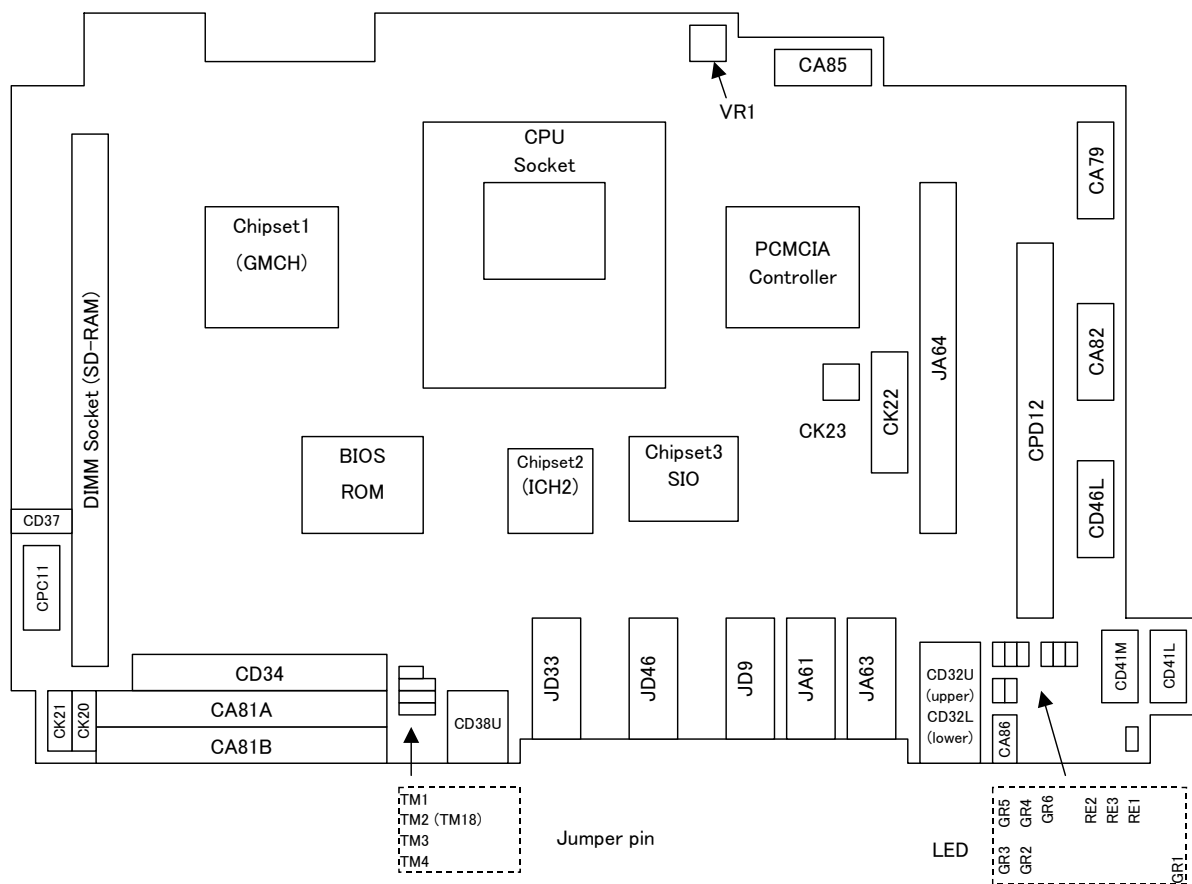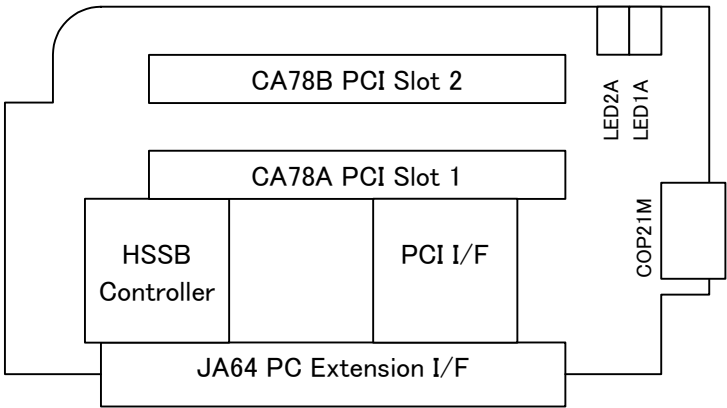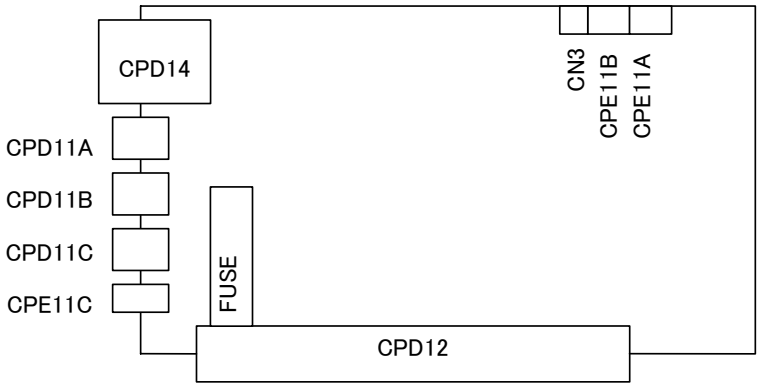
- Block diagram
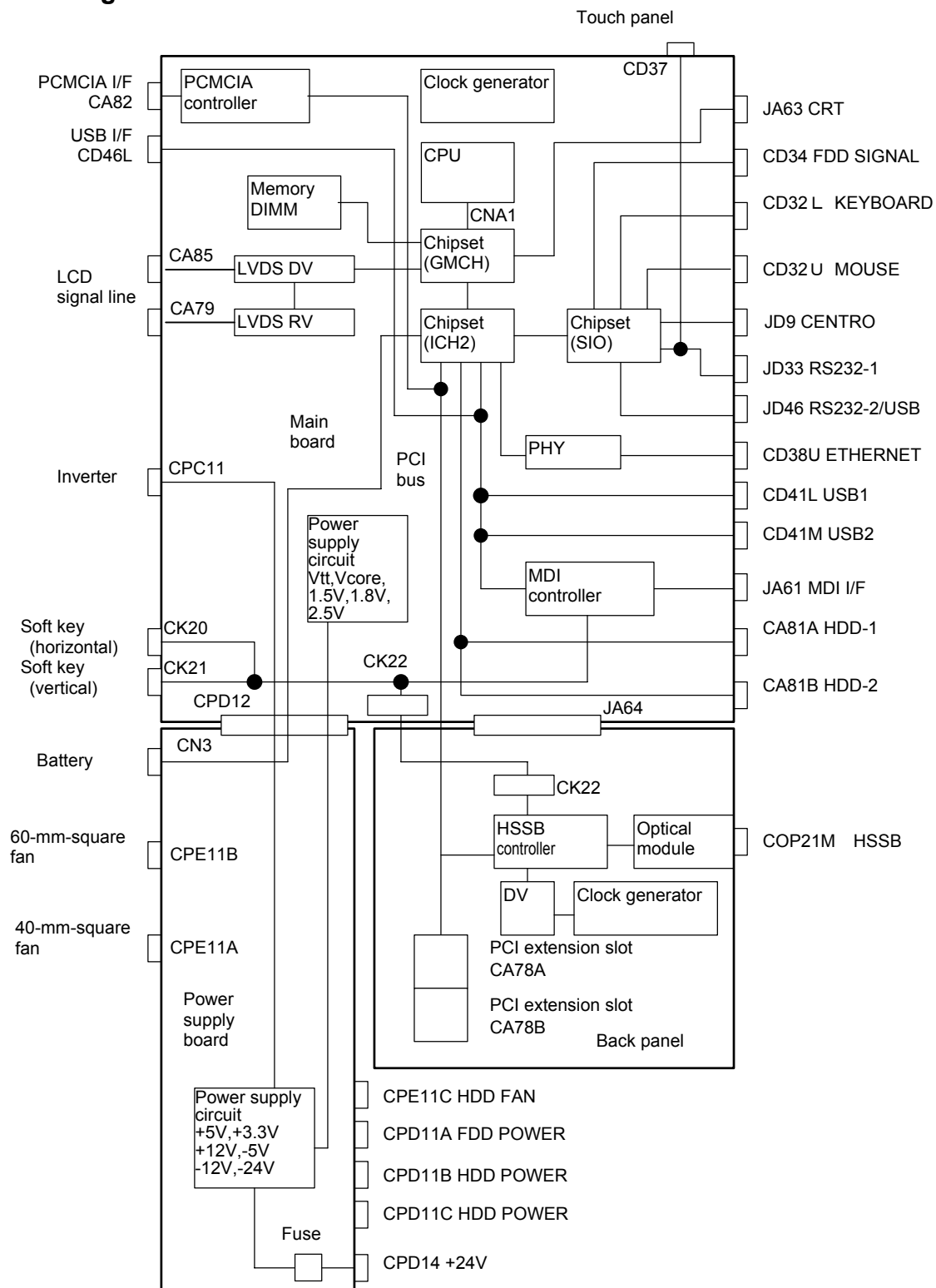
Setting and adjustment points

(1)   Jumper pin setting

Name	Meaning	Setting position		Description
TM1	FDD operation mode	▮ TM1	Short	To use this PANEL i FDD, select this setting. It is factory-selected.
		☐ TM1	Open	To use the conventional FANUC FDD, select this setting.
TM2(TM18) TM3	Reserved	☐▮ TM2 ▮☐ TM3	Up to board revision 03 ☐ : Open ▮ : Short	Leave these jumper pins factory-set no matter what the revision of the board is.
		▮ TM18 ▮☐ TM3	Board revision 04 or later	
TM4		▮☐ TM4	Left	If the unit fails to start after main-board replacement, turn off the power and keep TM4 at the right-side position for several seconds. After this, re-set it to the left-side position and turn on the power.

> **NOTE**
>   These jumper pins may be set up differently if the
>   unit is configured for some specific manufacturers.

(2)   Variable-resistor setting

⊕
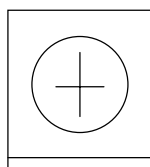
VR1

VR1:   This variable resistor is intended to adjust signals for the 15"
          LCD.   It is factory-set properly.   Do not change the setting.

(3)   LEDs on the main board
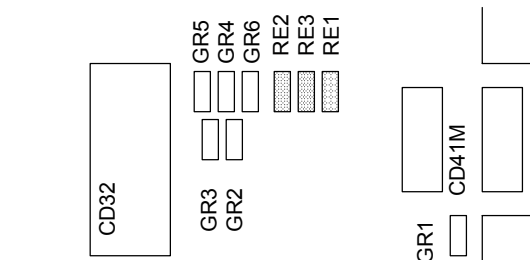
Name 1	Name 2	Color	Status
RE1	TRM	Red	Temperature alarm. It is issued if a temperature outside a specified range is detected.
RE2	BAT	Red	Battery alarm. It indicates that the battery be replaced.
RE3	FAN	Red	Indicates that one of the two basic-unit fans or the HDD fan has stopped. Replace it.
GR1	5V	Green	Indicates that the unit is powered.
GR2	HDD	Green	Indicates that the HDD is being accessed.
GR3	PCM	Green	Indicates that the PCMCIA card is being accessed.
GR4	LINK	Green	Indicates that the Ethernet link is running.
GR5	100M	Green	Indicates that the Ethernet link is running at 100 MHz.
GR6	ACT	Green	Indicates that the Ethernet network is running.

(4)   LEDs on the back panel

Name 1	Color	Status
LED1A	Red	A parity alarm has been issued on the backpanel.
LED1B	Green	Indicates that HSSB communication is normal.

4.4.3   Display Unit for *i*s Series CNC

4.4.3.1   Main board of display unit for *i*s series CNC

- Specification

Item	Specification
Main board of display unit for *i*s series CNC (15")	A20B-8101-0061
Main board of display unit for *i*s series CNC (10.4"/12.1")	A20B-8101-0063

- **Connector mounting location**

Connector unit

Fan motor

Fan motor

Rear of unit

CD38S

CA75

CK20A

COP21M

CK21A

CA55

CPD18

CPD12

JD54 JD36

CA87A

CA79A

CA98

CA76

Main board

CA95

CA88A

CD38S

CA75

CD46L

CK20A

COP21M

CK21A

CPD18

CA55

CPD12

JD54 JD36
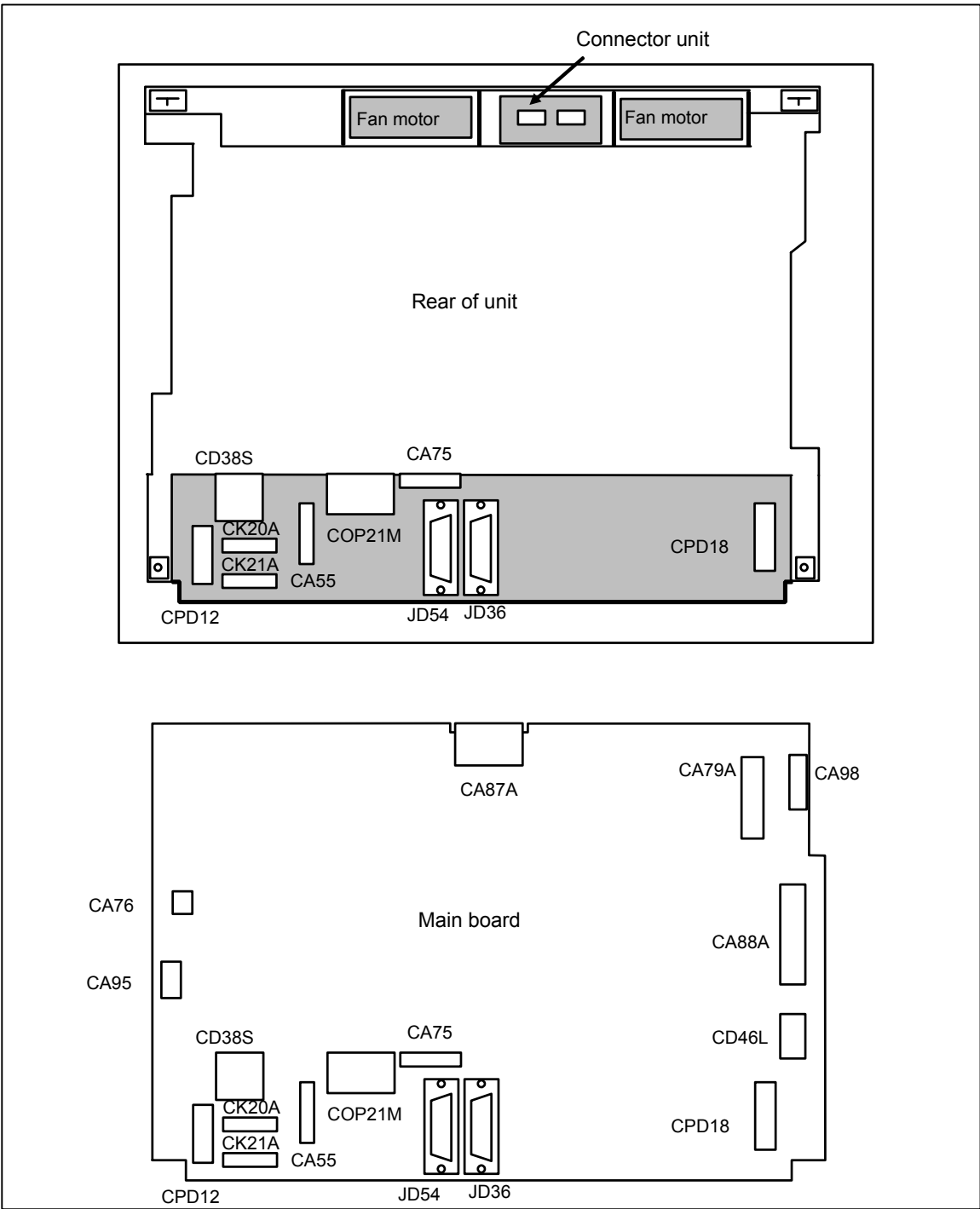
Connector number	Application
CA55	MDI
JD36	RS-232C serial port 1
JD54	RS-232C serial port 2/USB
CPD18	DC24V-IN
CA79A	Video signal interface (10.4"/12.1"LCD only)
CA98	Video signal interface (15" LCD only)
CA88A	PCMCIA interface
CD46L	USB interface
CK20A	Soft key (horizontal type)
CK21A	Soft key (vertical type)
CA87A	Inverter (for 10.4" LCD) Fan adapter (for 12.1"/15"LCD)
COP21M	HSSB interface
CD38S	Ethernet
CA95	Touch panel interface
CPD12	Inverter interface (12.1"/15"LCD only)
CA75	Bach-up unit interface
CA76	Buzzer interface

- **Card mounting location**
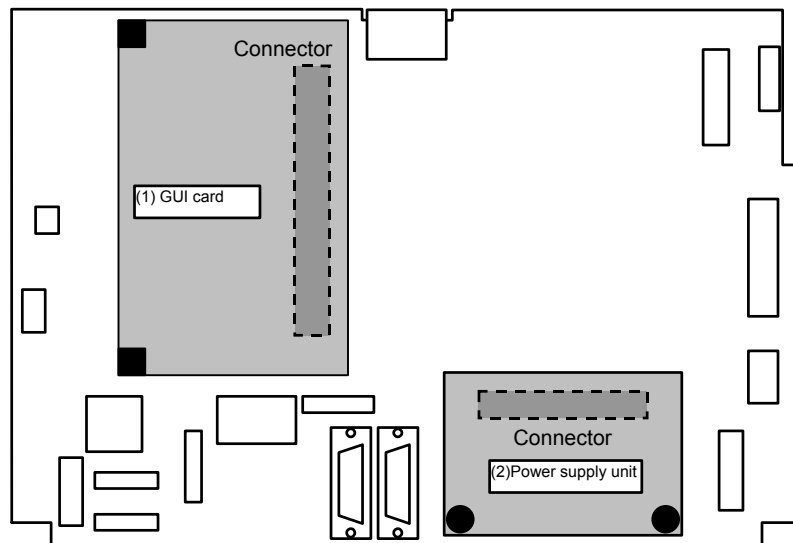
No.	Name	Specification	Function	Remarks
(1)	GUI card	A20B-3300-0420	10.4" /15"LCD 64MB	
		A20B-3300-0421	10.4" /15"LCD 128MB	
		A20B-3300-0422	12.1" LCD 64MB	
		A20B-3300-0423	12.1"LCD 128MB	
(2)	Power supply unit	A20B-8101-0010		

- Configuration of GUI card

Compact flash card

Connector

GUI card
(connector side)

Compact flash
card socket

Name	Specification	Remarks
GUI card 1	A20B-3300-0420	10.4" /15"LCD 64MB
	A20B-3300-0421	10.4" /15"LCD 128MB
	A20B-3300-0422	12.1" LCD 64MB
	A20B-3300-0423	12.1"LCD 128MB
Compact flash card	A87L-0001-0173#032MBA	32MB
	A87L-0001-0173#064MB	64MB
	A87L-0001-0173#128MB	128MB
	A87L-0001-0173#256MB	256MB

- Block diagram

```
Main board
  GUI card
    ┌──────┐   ┌──────────┐  ┌─────────────────┐
    │      │   │   DRAM   │  │ Display control │
    │ CPU  │   └──────────┘  └─────────────────┘
    │      │   ┌──────────┐  ┌─────────────────┐
    └──────┘   │  BOOT    │  │ Compact Flash   │
               │ software │  │     card        │
               └──────────┘  └─────────────────┘

    ┌────────────────┐      ┌──────────────┐    ┌──────────────────┐
    │  Peripheral    │      │  Peripheral  │    │ Power supply unit│
    │  control       │      │  control 1   │    │   5V, 3.3V,      │
    │     2          │      │              │    │     2.5V         │
    └────────────────┘      └──────────────┘    └──────────────────┘

    ┌────────────┐  ┌────────────┐
    │ USB control│  │  Ethernet  │
    │            │  │  control   │
    └────────────┘  └────────────┘

Display unit

     USB        Ethernet   RS232C       HSSB          24VDC
                           Memory card

                    ┌──────┐
                    │      │  :  Detachable card or module
                    └──────┘
```

- LED display

BSRDY (green)
ALM2 (red)
COM (orange)
LINK (green)
LEDP (green)
LED1 (green)
LED2 (green)
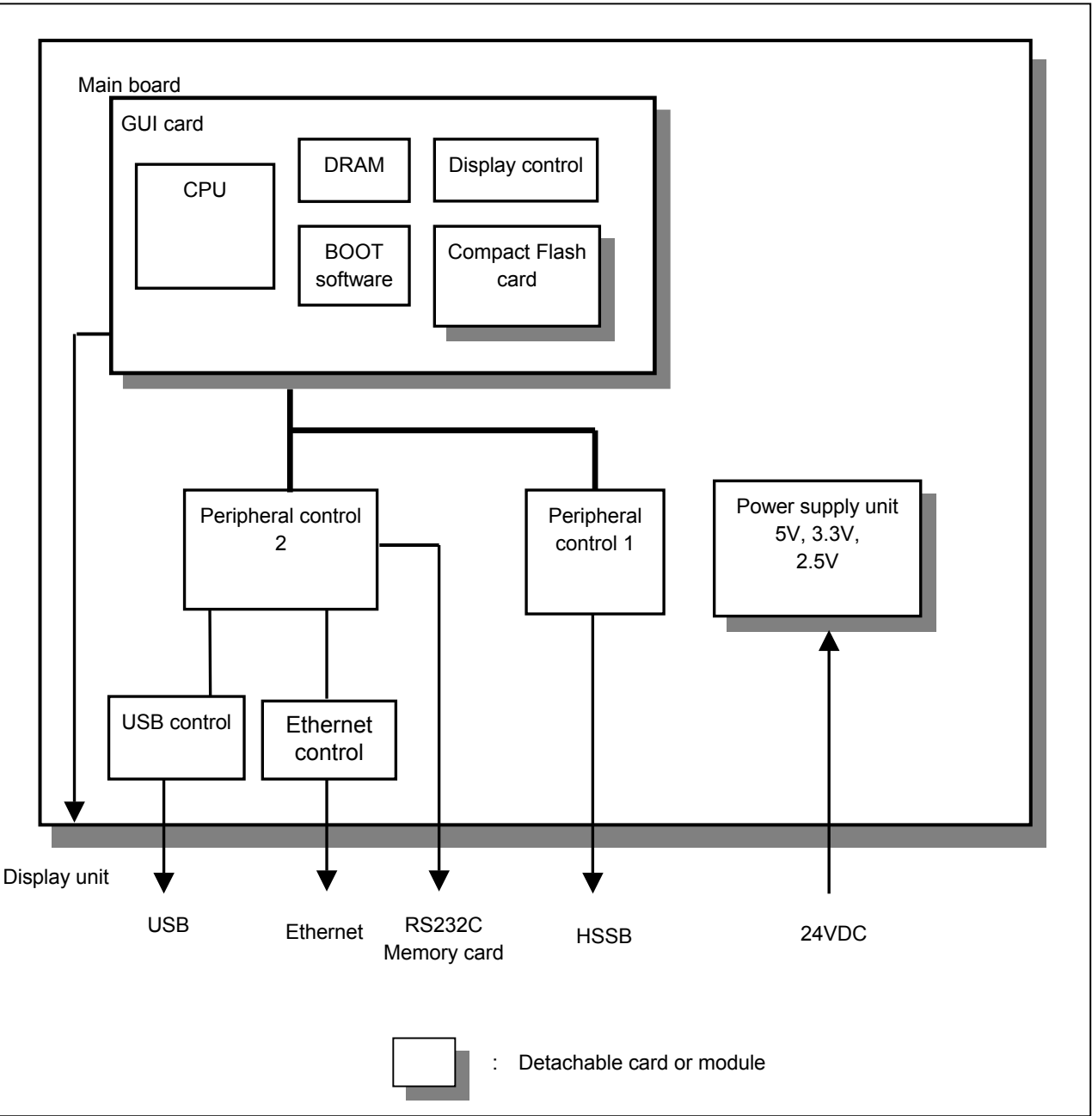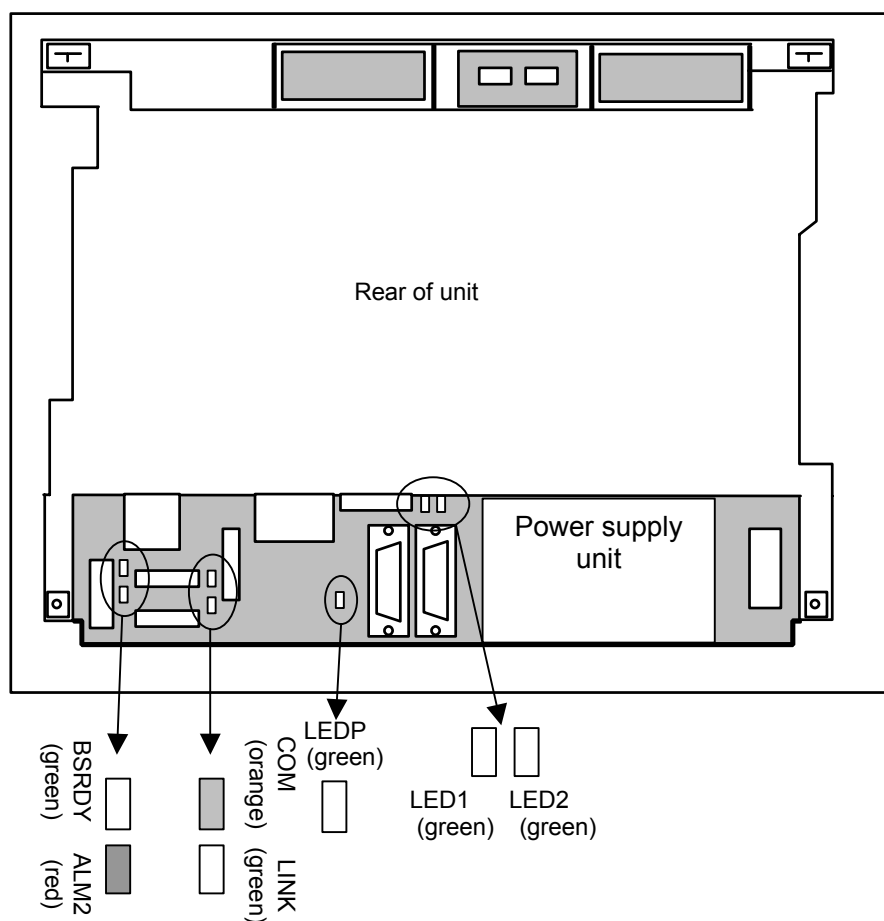
(1) LED display (HSSB)

LED name	Meaning
BSRDY (green LED)	Lights when the unit can communicate with the NC via the HSSB.
ALM2 (red LED)	Indicates a common RAM error. It is likely that the main board may be defective.

(2) LED display (Ethernet status)

LED name	Meaning
LINK (green LED)	Lights when the unit is connected normally with the HUB.
COM (orange LED)	Lights when data is being sent or received.

(3) LED display (PC)

LED name	Meaning
LEDP (green LED)	Indicates that the GUI card is supplied with power. (It also indicates that backup operation is under way.)
LED1 (green LED)	Reserved
LED2 (green LED)	Reserved

- **Jumper plug setting**
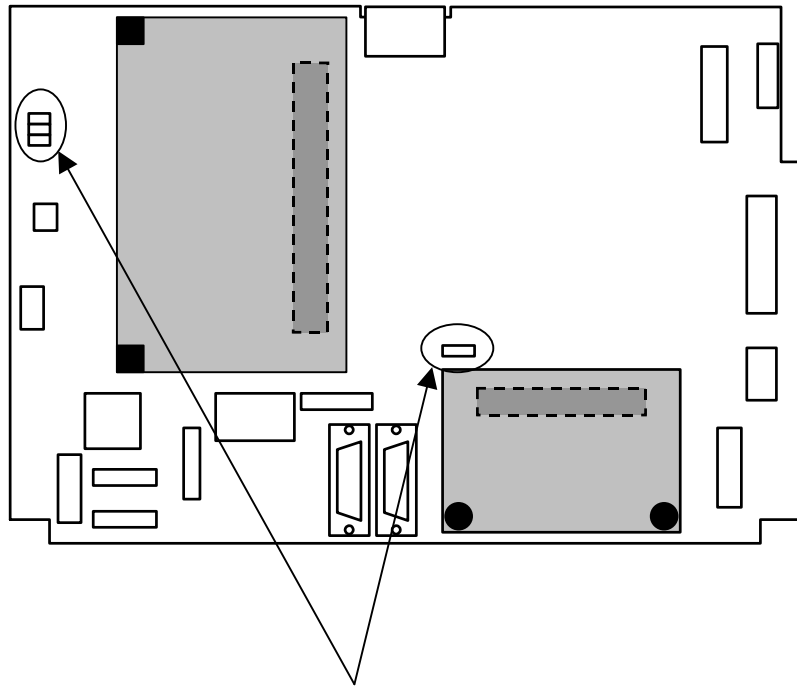
RESERVE(OPEN)
Ensure that this is left open.
(The terminal may not be installed.)

4.4.3.2   Inverter PCBs, Fan Adapter PCBs, and Connector Units

Name		Specification
Inverter PCB	For 10.4" color LCD (Used also as the fan adapter)	A20B-8100-0962
	For 12" color LCD (With an inverter main board cable)	A14L-0143-0003#A
	For 15" color LCD (With an inverter main board cable)	A14L-0143-0002#A
Fan adapter PCBs	For 12" color LCD For 15" color LCD	A20B-8100-0969
Conversion cable	For 15" color LCD	A660-4042-T047
Connector unit		A15L-0001-0091

> **NOTE**
> The connector unit is fastened to the case with self-tapping screws.

- Details of the inverter
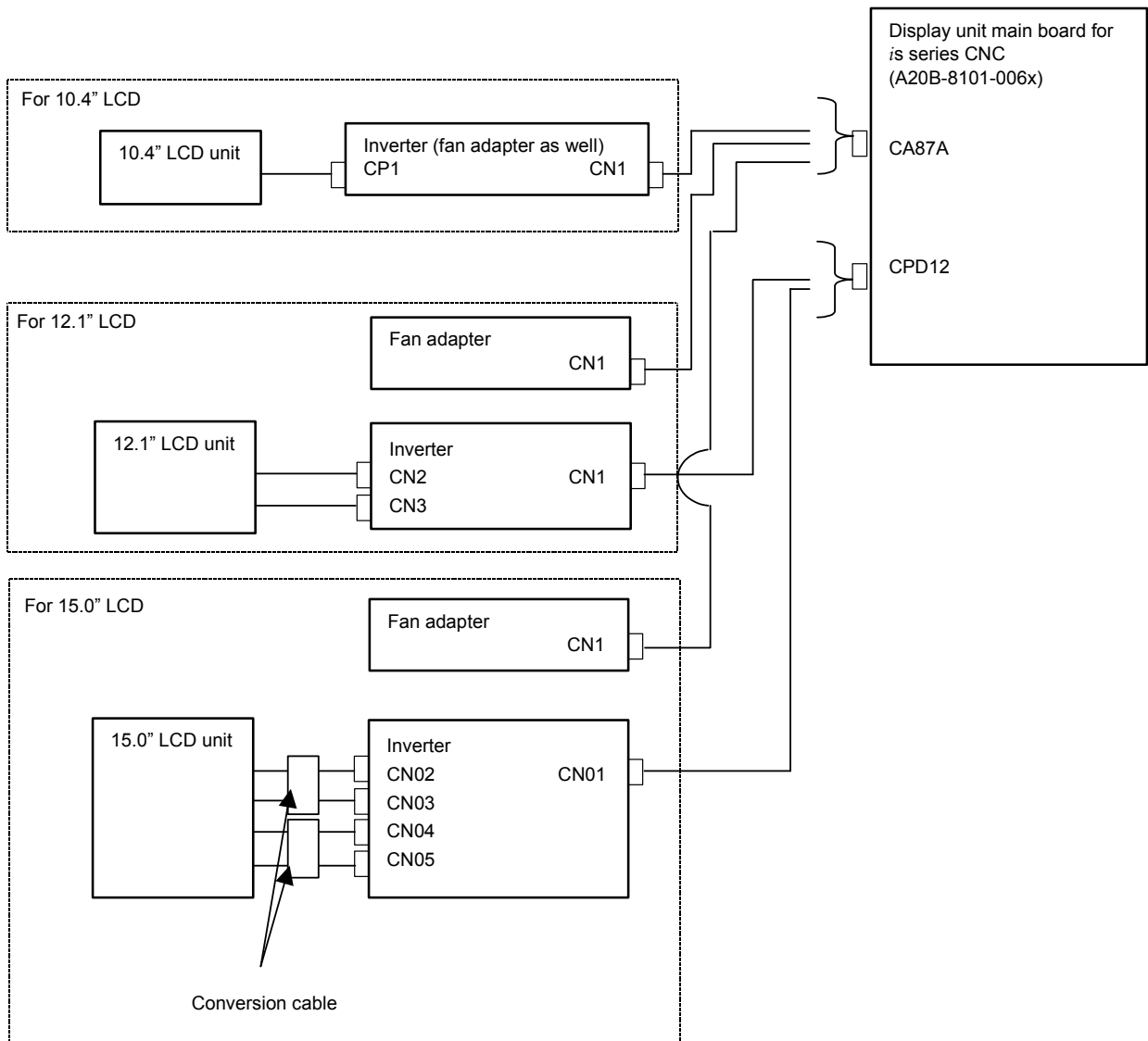
- Inverter and connector units for 10.4" LCD

Inverter PCB   Connector unit
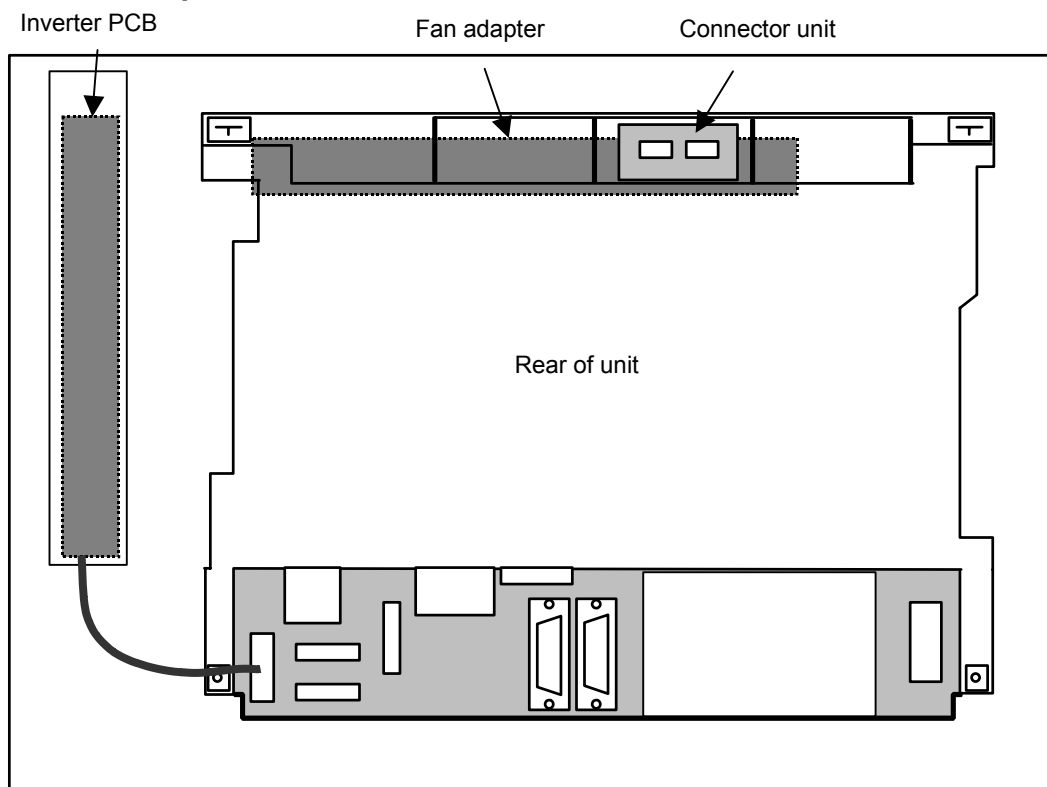
Rear of unit

- Inverter, fan adapter, and connector unit for 12.1" LCD

Inverter PCB   Fan adapter   Connector unit
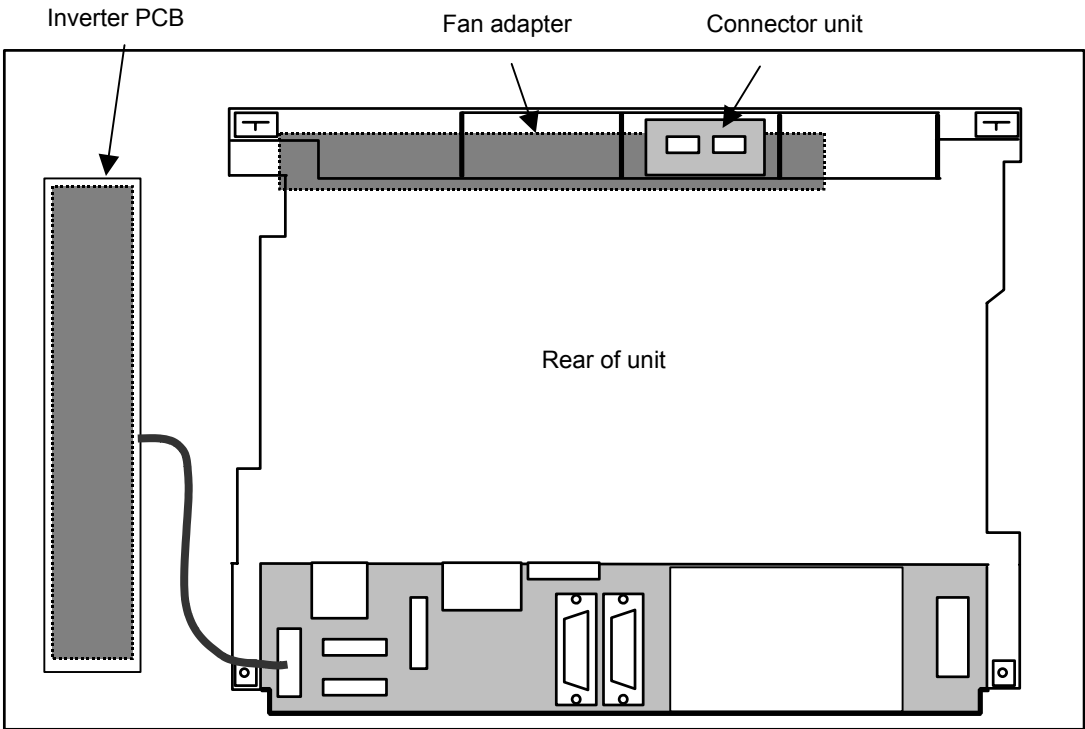
Rear of unit

- Inverter, fan adapter, and connector unit for 15" LCD

Inverter PCB Fan adapter Connector unit

Rear of unit

- Conversion cable for the inverter

When a 15" LCD is used, a conversion cable needs to be run between the LCD backlight cable and the inverter connector.

Two types of connectors are provided on the inverter PCB. Plug into a matching connector.

Each of the two cables from the LCD backlight section may be connected to either of the two cables from the inverter.

Conversion cable (A660-4042-T047)
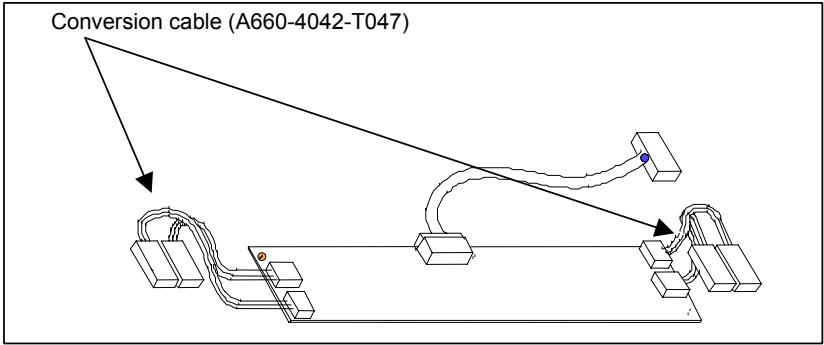
4.4.3.3 Backup Unit

- Specification

Name	Specification
Backup unit PCB	A20B-2100-0820

See Section 3.11 "Back-up Unit".

4.5   LIST OF UNITS AND PRINTED CIRCUIT BOARDS

4.5.1   List of Basic Units

Type	Item	Ordering code	Remarks
30*i*/300*i*/	Basic unit with 2 slots	A02B-0303-B802	
300*i*s-A	Basic unit with 4 slots	A02B-0303-B804	
31*i*/310*i*/	Basic unit with 2 slots	A02B-0306-B802	
310*i*s -A5	Basic unit with 4 slots	A02B-0306-B804	
31*i*/310*i*/	Basic unit with 2 slots	A02B-0307-B802	
310*i*s -A	Basic unit with 4 slots	A02B-0307-B804	
32*i*/320*i*/	Basic unit with 2 slots	A02B-0308-B802	
320*i*s -A	Basic unit with 4 slots	A02B-0308-B804	

4.5.2   List of Printed Circuit Boards of Control Unit

Item	Ordering code	ID	Remarks
30*i*/300*i*/300*i*s-A, 31*i*/310*i*/310*i*s-A5 Main CPU board	A16B-3200-0520	00308	
31*i*/310*i*/310*i*s-A、32*i*/320*i*/320*i*s-A Main CPU board	A16B-3200-0521	00309	
CPU card A1 (Standard version, DRAM 32MB)	A20B-3300-0477	0040C	
CPU card A2 (Standard version, DRAM 64MB)	A20B-3300-0474	0040D	
CPU card A3 (Standard version, DRAM 128MB)	A20B-3300-0475	0040E	
CPU card B2 (High-speed version, DRAM 64MB)	A20B-3300-0470	00406	
CPU card B3 (High-speed version, DRAM 128MB)	A20B-3300-0471	00407	
CPU card C1 (Dedicated to the 32i, DRAM 32MB)	A20B-3300-0491	00421	
CPU card C2 (Dedicated to the 32i, DRAM 64MB)	A20B-3300-0490	00420	
Axis control card B11 (FSSB 1 path)	A20B-3300-0445	00106	
Axis control card B12 (FSSB 1 path)	A20B-3300-0448	0010B	
Axis control card B13 (FSSB 1 path)	A20B-3300-0447	0010A	
Axis control card B24 (FSSB 2 path)	A20B-3300-0442	00103	
Axis control card B26 (FSSB 2 path)	A20B-3300-0440	00101	

Item	Ordering code	ID	Remarks
FROM/SRAM module (FROM 16MB, SRAM 1MB)	A20B-3900-0160	FROM: C1 SRAM: 03	
FROM/SRAM module (FROM 16MB, SRAM 2MB)	A20B-3900-0161	FROM: C1 SRAM: 04	
FROM/SRAM module (FROM 32MB, SRAM 1MB)	A20B-3900-0163	FROM: C2 SRAM: 03	
FROM/SRAM module (FROM 32MB, SRAM 2MB)	A20B-3900-0164	FROM: C2 SRAM: 04	
FROM/SRAM module (FROM 64MB, SRAM 1MB)	A20B-3900-0166	FROM: C3 SRAM: 03	
FROM/SRAM module (FROM 64MB, SRAM 2MB)	A20B-3900-0167	FROM: C3 SRAM: 04	
FROM/SRAM module (FROM 16MB, SRAM 256kB)	A20B-3900-0180	FROM: C1 SRAM: 01	
FROM/SRAM module (FROM 16MB, SRAM 512kB)	A20B-3900-0181	FROM: C1 SRAM: 02	
FROM/SRAM module (FROM 32MB, SRAM 256kB)	A20B-3900-0182	FROM: C2 SRAM: 01	
FROM/SRAM module (FROM 32MB, SRAM 512kB)	A20B-3900-0183	FROM: C2 SRAM: 02	
PMC module	A20B-3900-0200	00700	
Additional axis board	A20B-8101-0070	00121	
Additional spindle board	A20B-8002-0320	0030C	
HSSB board	A20B-8101-0111	00611	
Fast data server board	A20B-8101-0030	00701	
FL-net board	A20B-8101-0031	00702	
Profibus master board	A20B-8101-0050	00705	
Profibus slave board	A20B-8101-0100	00705	
DeviceNet board	A20B-8101-0220	00706	
Back panel (2 slots)	A20B-2003-0580	01	
Back panel (4 slots)	A20B-2003-0650	10	
Fan connetion unit	A20B-9002-0350	–	
Power supply unit	A20B-8101-0011	–	

*   Refer to Chapter 5 for details of Option board.

4.5.3   List of Display Unit for 30*i*/31*i*/32*i*

Item		Ordering code	ID	Remarks
10.4" color LCD	Without touch panel	A02B-0303-C071	1010	
10.4" color LCD	With touch panel	A02B-0303-C081		
15" color LCD	Without touch panel	A02B-0303-C091	0101	
15" color LCD	With touch panel	A02B-0303-C092		

4.5.4   List of Display Unit for 300*i*/310*i*/320*i* (PANEL *i*)

Main printed circuit boards

Unit	LCD type	Ordering code (main P.C.B.)	Parent specification (basic unit)
PANEL *i*	10.4"	A20B-8100-0935	A08B-0084-B501 to 4 A13B-0196-B502, -B504
	15.0"	A20B-8100-0936	A08B-0084-B521 to 4 A13B-0196-B522, -B524
PANEL *i* designed to auto maker's specification	15.0"		A08B-0084-B422 to 3, -B432 to 3 A13B-0196-B422 to 3, -B432 to 3

Inverter printed circuit boards

LCD type	Ordering code (main P.C.B.)	Parent specification (basic unit)	
10.4"	A14L-0132-0001#A	A08B-0084-B501 to 4	A13B-0196-B502, -B504
15.0"	A14L-0143-0002	A08B-0084-B422 to 3, -B432 to 3 A08B-0084-B521 to 4	A13B-0196-B422 to 3, -B432 to 3 A13B-0196-B522, -B524

Touch panel printed circuit boards

Unit	Ordering code (touch panel P.C.B.)	Parent specification (basic unit)	
PANEL *i*	A20B-8002-0310	A08B-0084-B504 A08B-0084-B524	A13B-0196-B504 A13B-0196-B524
PANEL *i* designed to auto maker's specification		A08B-0084-B422,-B423 A08B-0084-B432, -B433	A13B-0196-B422, -B423 A13B-0196-B432, -B433

Printed circuit boards of other units

Item	Unit	Ordering code (P.C.B. of other units)	Parent specification (basic unit)
Back panel printed-circuit board	(common)	A20B-8002-0330	(common)
Power supply printed-circuit board	(common)	A20B-2100-0920	(common)
I/O Link adapter 2 printed-circuit board	PANEL *i* designed to auto maker's specification	A20B-8002-0500	A08B-0084-B412 to 3 A08B-0084-B432 to 3 A13B-0196-B412 to 3 A13B-0196-B432 to 3

Drive units

Item	Unit	Maintenance drive unit drawing number	Parent specification	Remarks
3.5" HDD unit *1 *2	PANEL *i* designed to auto maker's specification	A08B-0084-C120#D	A08B-0084-H120	
	PANEL *i*	A08B-0084-C130#D	A08B-0084-H130	When 10.4" LCD and QWERTY MDI are used.
		A08B-0084-C131#D	A08B-0084-H131	When 10.4" LCD and QWERTY MDI are used.
FDD unit	(common)	A02B-0207-C009	-	Panel mounted type
FDD cable	(common)	A02B-0207-K801	-	Length : 1m
FDD drive unit	(common)	A08B-0084-K001	-	FDD
CD-ROM unit	PANEL *i* designed to auto maker's specification	A08B-0084-K010	-	CD-ROM drive

*1:   The maintenance HDD unit is subject to change.

*2: The maintenance HDD unit includes a HDD fan but not a signal cable or a power cord.

> ⚠ **CAUTION**
> A combination of hard disk, floppy disk, and CD-ROM drives may fail to operate normally if any of them is not recommended by FANUC.

Base unit

Unit	LCD type	I/O Link adapter	Soft key	Touch panel	Maintenance base unit drawing number *3	Parent specification	
PANEL *i*	10.4" LCD	Without I/O Link adapter	Without soft key	Without touch panel	A08B-0084-D501	A08B-0084-B501	
			With soft key	Without touch panel	A08B-0084-D502	A08B-0084-B502	A13B-0196-B502
			Without soft key	With touch panel	A08B-0084-D503	A08B-0084-B503	
			With soft key	With touch panel	A08B-0084-D504	A08B-0084-B504	A13B-0196-B504
	15.0" LCD	Without I/O Link adapter	Without soft key	Without touch panel	A08B-0084-D521	A08B-0084-B521	
			With soft key	Without touch panel	A08B-0084-D522	A08B-0084-B522	A13B-0196-B522
			Without soft key	With touch panel	A08B-0084-D523	A08B-0084-B523	
			With soft key	With touch panel	A08B-0084-D524	A08B-0084-B524	A13B-0196-B524
PANEL *i* designed to auto maker's specification	15.0" LCD	Without I/O Link adapter	With soft key	Without touch panel	A08B-0084-D402	A08B-0084-B422	A13B-0196-B422
			With soft key	With touch panel	A08B-0084-D403	A08B-0084-B403 A08B-0084-B423	A13B-0196-B403 A13B-0196-B423
		With I/O Link adapter	With soft key	Without touch panel	A08B-0084-D412	A08B-0084-B432	A13B-0196-B432
			With soft key	With touch panel	A08B-0084-D413	A08B-0084-B413 A08B-0084-B433	A13B-0196-B413 A13B-0196-B433

*3: Unlike the parent specification (basic unit), the maintenance base unit does not include any of the main printed-circuit board, backplane printed-circuit board, power supply printed-circuit board, cover, and inverter. It mainly consists of the base plate, LCD unit, ornamental frame, touch panel, and soft keys.

CPU and memory

Item		Maintenance drawing number	Parent specification
CPU	Celeron733MHz	A08B-0084-C210	A08B-0084-H010
	Pentium III 866MHz	A08B-0084-C220	A08B-0084-H020
	Pentium III 1260MHz	A08B-0084-C230	A08B-0084-H030
Main memory	128MB	A76L-0500-0020	A08B-0084-H001
	256MB	A76L-0500-0021	A08B-0084-H002
	512MB	A76L-0500-0022	A08B-0084-H003

Maintenance equipment

Maintaining the unit or installing applications in it requires the following equipment.

Item		Ordering number
Full-keyboard (PS/2 I/F)	101 key type	A86L-0001-0210
	106 key type	A86L-0001-0211
Mouse (PS/2 I/F)		A86L-0001-0212

4.5.5 Display Unit for 300*i*s/310*i*s/320*i*s

Item				Ordering number	Remarks
Printed circuit board	Display unit PCB	For 10.4"/12.1"LCD		A20B-8101-0063	
		For 15"LCD		A20B-8101-0061	
	GUI card	10.4" /15"LCD, 64MB		A20B-3300-0420	ID=0000X1
		10.4" /15"LCD, 128MB		A20B-3300-0421	ID=0001X1
		12.1" LCD·64MB		A20B-3300-0422	ID=0000X0
		12.1"LCD·128MB		A20B-3300-0423	ID=0001X0
	Power supply unit			A20B-8101-0010	
	Inverter PCB	For 10.4"LCD		A20B-8100-0962	
		For 12,1"LCD (inverter with main board cable)		A14L-0143-0003#A	
		For 15"LCD (inverter with main board cable)		A14L-0143-0002#A	
	Fan adapter	For 12.1"/15"LCD		A20B-8100-0969	
	Backup unit PCB			A20B-2100-0820	
Unit	LCD unit	10.4"LCD	Without touch panel	A02B-0303-D507	ID=1111
			With touch panel	A02B-0303-D508	
		12.1"LCD	Without touch panel	A02B-0303-D511	ID=1110
			With touch panel	A02B-0303-D512	
		15"LCD	Without touch panel	A02B-0303-D517	ID=1101
			With touch panel	A02B-0303-D518	
Others	Compact Flash Card	32MB		A87L-0001-0173 #032MBA	
		64MB		A87L-0001-0173 #064MB	
		128MB		A87L-0001-0173 #128MB	
		256MB		A87L-0001-0173 #256MB	
	Conversion cable (for 15" LCD backlight)			A660-4042-T047	
	Backup unit cable			A02B-0281-K801	

4.5.6 **MDI Unit**

Model	Item	Ordering number	ID	Remarks
30*i*/31*i*/32*i*/ 300*i*s/310*i*s/ 320*i*s	T series/English/Small keyboard For 7.2"/8.4", ONG	A02B-0303-C120#T	04	
	M series/English/Small keyboard For 7.2"/8.4", ONG	A02B-0303-C120#M	08	
	T series/English/Standard keyboard For 7.2"/8.4", ONG	A02B-0303-C121#T	40	
	M series/English/Standard keyboard For 7.2"/8.4", ONG	A02B-0303-C121#M	02	
	T series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C125#T	40	
	M series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C125#M	02	
	T series/English/Standard keyboard Vertical type, ONG	A02B-0303-C126#T	40	
	M series/English/Standard keyboard Vertical type, ONG	A02B-0303-C126#M	02	
	English/Standard keyboard QWERTY	A02B-0303-C128	20	
300*i*/310*i*/ 320*i*	T series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C320#T	40	
	M series/English/Standard keyboard Horizontal type, ONG	A02B-0303-C320#M	02	
	T series/English/Standard keyboard Vertical type, ONG	A02B-0303-C327#T	40	
	M series/English/Standard keyboard Vertical type, ONG	A02B-0303-C327#M	02	
	English/Standard keyboard QWERTY	A02B-0303-C328	20	
	FA full-keyboard (English)	A02B-0236-C131#EC		
	FA full-keyboard (Japanese)	A02B-0236-C131#JC		
	FA full-keyboard (English, with punch panel cover)	A08B-0082-C150#EC		
	FA full-keyboard (Japanese, with punch panel cover)	A08B-0082-C150#JC		
	FA full-keyboard (English, with punch panel)	A08B-0082-C151#EC		
	FA full-keyboard (Japanese, with punch panel)	A08B-0082-C151#JC		

4.5.7 **I/O**

Item	Ordering number	Remarks
Distributed I/O connector panel I/O module A1	A20B-2002-0470	DI/DO: 72/56, DI=general 16, matrix 56, with MPG interface
Distributed I/O connector panel I/O module B1	A20B-2002-0520	DI/DO: 48/32, with MPG interface
Distributed I/O connector panel I/O module B2	A20B-2002-0521	DI/DO: 48/32
Distributed I/O connector panel I/O basic module	A03B-0815-C001	DI/DO: 24/16
Distributed I/O connector panel I/O expansion module A	A03B-0815-C002	DI/DO: 24/16, with MPG interface
Distributed I/O connector panel I/O expansion module B	A03B-0815-C003	DI/DO: 24/16
Distributed I/O connector panel I/O expansion module C	A03B-0815-C004	DO: 16 (2A output)
Distributed I/O connector panel I/O expansion module D	A03B-0815-C005	Analog input
Main panel machine operator's panel	A02B-0303-C231	
Sub panel A machine operator's panel	A02B-0236-C232	
Sub panel D machine operator's panel	A02B-0236-C244	
Operator's panel connector unit (Source type output A)	A16B-2202-0731	DI/DO: 64/32
Operator's panel connector unit (Source type output B)	A16B-2202-0730	DI/DO: 96/64
Handy machine operator's panel	A02B-0259-C221#A	
Interface unit for handy machine operator's panel	A02B-0259-C220	
FANUC I/O Link-AS-i converter (For AS-I Ver.2.0)	A03B-0817-C001	
FANUC I/O Link-AS-i converter (For AS-I Ver.2.1)	A03B-0817-C002	
I/O Link distributed adapter (2ch)	A20B-1007-0680	
I/O Link distributed adapter (3ch)	A20B-1008-0360	

4.5.8   **Other Units**

Item	Ordering number	Remarks
Separate detector interface unit (4 basic axes)	A02B-0303-C205	
Separate detector interface unit (4 additional axes)	A02B-0236-C204	
Analog input separate detector interface unit (4 basic axes)	A06B-6061-C201	
Optical I/O Link adapter	A13B-0154-B001	
Optical adapter	A13B-0154-B003	For serial spindle
I/O Link connection unit A	A20B-2000-0410	
I/O Link connection unit B	A20B-2000-0411	
I/O Link connection unit C	A20B-2000-0412	
Spindle distributed adapter	A13B-0180-B001	
PC-side HSSB interface board (2CH.) Compatible with the PCI bus	A20B-8101-0162	
PC-side HSSB interface board (1CH.) Compatible with the PCI bus	A20B-8101-0163	
Fan unit for 2 slots	A02B-0303-C101	
Fan unit for 4 slots	A02B-0303-C102	

4.6   REPLACING THE FUSE OF THE CONTROL UNIT

> ⚠ **WARNING**
> Before starting the replacement of a fuse, remove the cause of the fuse burn-out.
> Accordingly, the replacement should be performed by a person fully trained in maintenance and safety.   If the cabinet is opened to replace the fuse, take extreme care not to touch any high-voltage area (marked with ⚠ and covered by a shock prevention cover). If the area is uncovered, direct contact with this area will result in an electric shock.

- Mounting position of the fuse of the control unit

The fuse of the control unit is mounted on the main board.
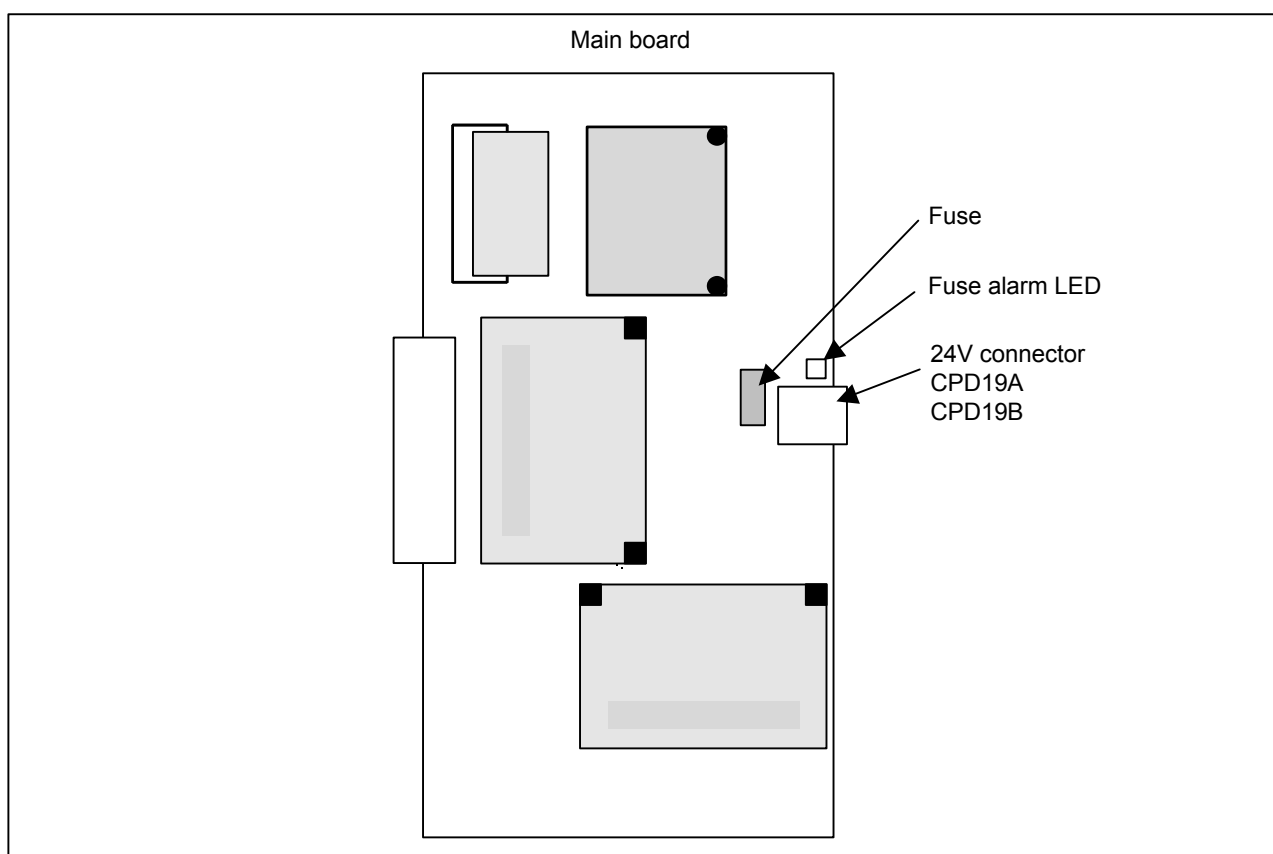
- Ordering code of the fuse

Ordering code	Rating	Individual information
A02B-0265-K100	7.5A	A60L-0001-0046#7.5

4.7 **REPLACING THE BATTERY**

Offset data, and system parameters are stored in SRAM in the control unit. The power to the SRAM is backed up by a lithium battery mounted on the front panel of the control unit. The above data is not lost even when the main battery goes dead. The backup battery is mounted on the control unit at shipping. This battery can maintain the contents of memory for about a year.

When the voltage of the battery becomes low, alarm message "BAT" blinks on the display and the battery alarm signal is output to the PMC. When this alarm is displayed, replace the battery as soon as possible. In general, the battery can be replaced within one or two weeks, however, this depends on the system configuration.

If the voltage of the battery becomes any lower, memory can no longer be backed up. Turning on the power to the control unit in this state causes system alarm to occur because the contents of memory are lost. Clear the entire memory and reenter data after replacing the battery.
The following two kinds of batteries can be used.
- Lithium battery built into the CNC control unit.
- Two alkaline dry cells (size D) in the external battery case.

> **NOTE**
> A lithium battery is installed as standard at the factory.

●**Replacing the battery**

If a lithium battery is used, have A02B-0200-K102 (FANUC internal code: A98L-0031-0012) handy.
1   Turn the CNC on.   About 30 seconds later, turn the CNC off.
2   Remove the battery from the top area of the CNC unit.
     Disconnect the connector first.   Then, remove the battery from the battery case.   The connector is not latched.   Simply pulling the cable detaches the connector.
     The battery case is provided in the top area of the face plate of the main CPU board.
3   Replace the battery, then connect the connector.
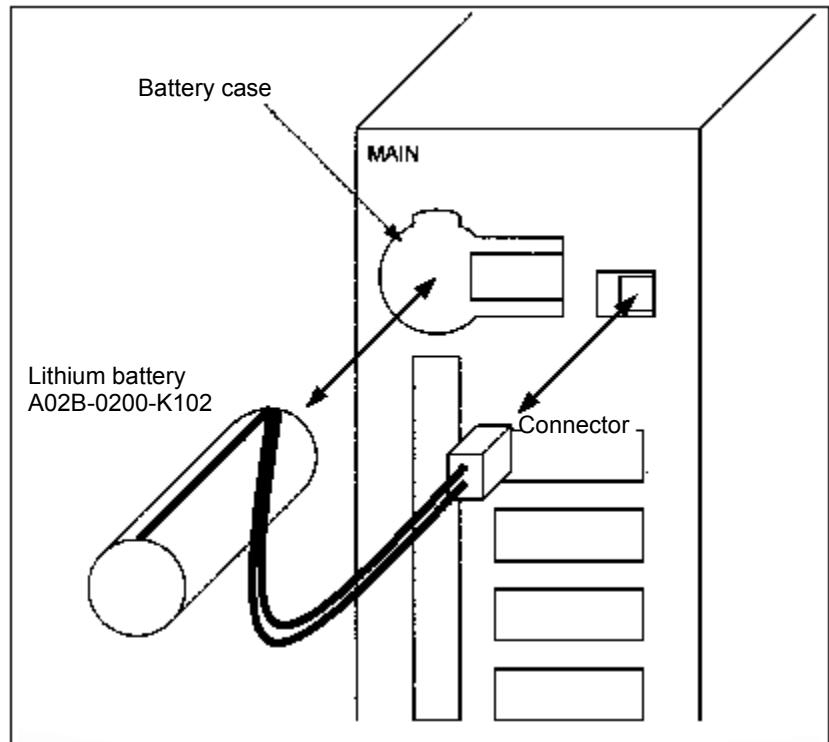
> ⚠ **WARNING**
> The incorrect mounting of the battery may cause
> an explosion. Avoid using any battery other than
> the one specified here (A02B-0200-K102).

> ⚠ **CAUTION**
> Complete steps 1 to 3 within 30 minutes.
> If the battery is left removed for a long time, the
> SRAM would lose the contents.
> If there is a danger that the replacement cannot be
> completed within 30 minutes, save the whole
> contents of the SRAM to a memory card.   The
> contents of the memory can be easily restored with
> the memory card in case the memory loses the
> contents.

Discard the dead battery, observing appropriate municipal rules and
regulations. When discarding the battery, insulate the terminal with a
tape so that no short-circuit would occur.

When using commercial D-size alkaline dry cells

● General method

Use the connector connected to the lithium battery for an external battery.

Following the battery replacement procedure described above, replace the standard lithium battery with an external battery in a battery case (A02B-0236-C281).
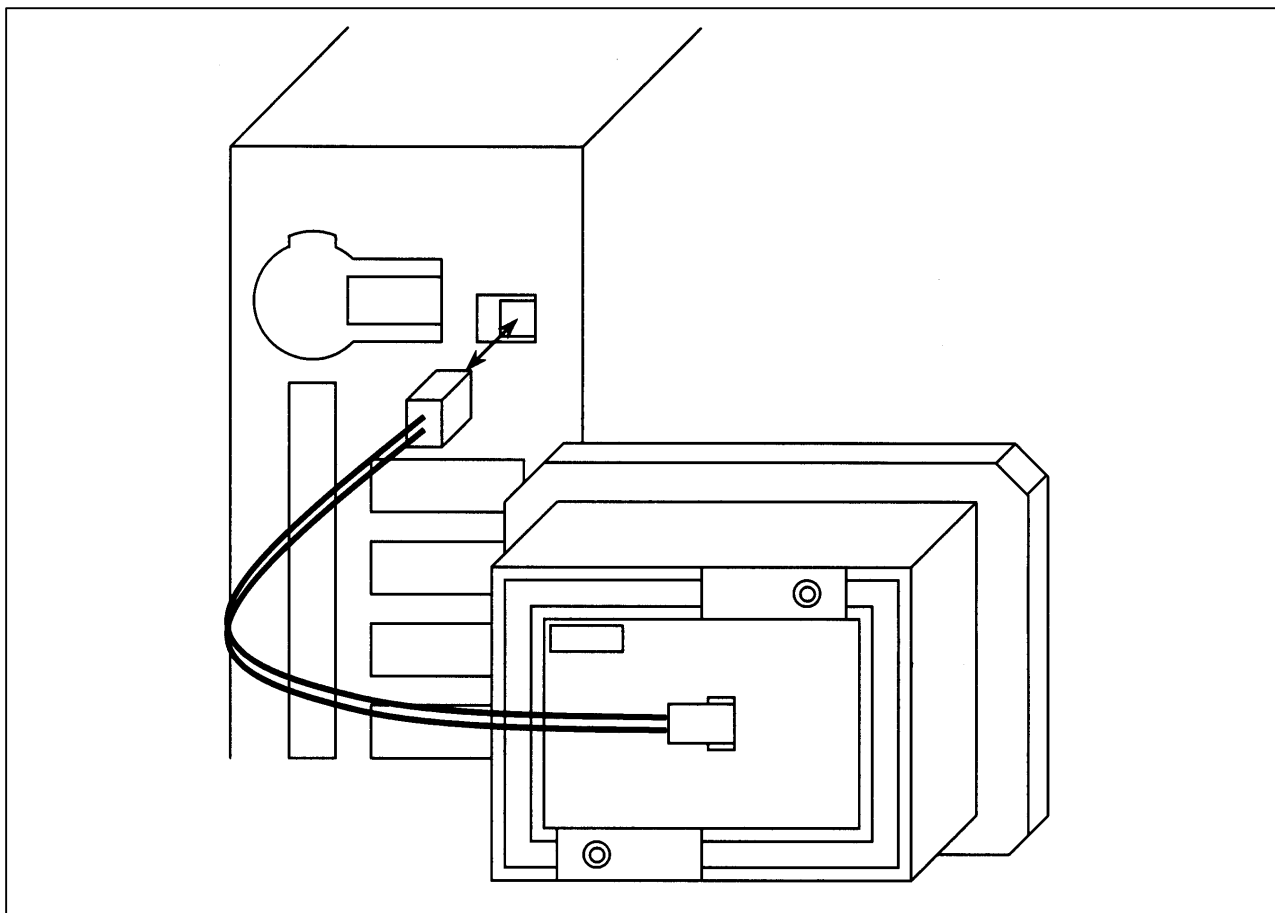
> ⚠ **CAUTION**
> 1 Place the battery case (A02B-0236-C281) in such a position that the battery can be replaced even while the control unit is active.
> 2 The connector of the battery cable uses a simple lock system. Fix the cable within an area of 50 cm from the connector, removing tension on the cable. This is required to prevent the connector from coming off because of the weight of the cable or tension on the cable.

● **Replacing the battery**

1   Have commercial D-size alkaline dry cells handy.
2   Turn the CNC on.
3   Remove the lid from the battery case.
4   Replace the old dry cells with new ones.   Mount the dry cells in
     a correct orientation.
5   Replace the lid on the battery case.

⚠ **CAUTION**
   In the power-off state, the battery should be
   replaced as in the case of the lithium battery, which
   is descried above.
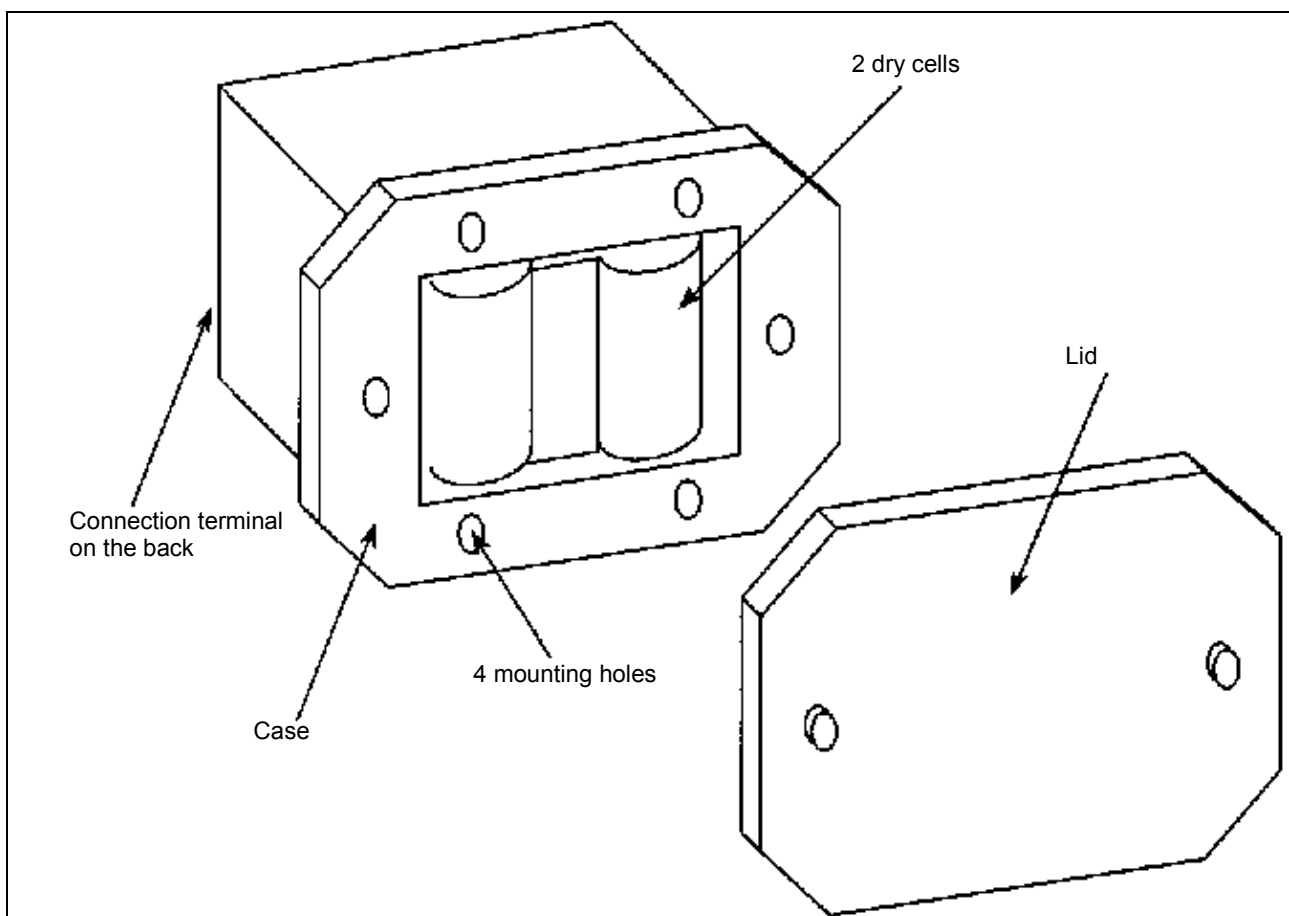
4.8 **REPLACING A FAN UNIT**

> ⚠ **WARNING**
> If the cabinet is opened to replace a fan unit, take extreme care not to touch any high-voltage area (marked with ⚠ and covered by a shock prevention cover).   If the area is uncovered, direct contact with this area will result in an electric shock.

- Ordering code of fan units

	Ordering code	Quantity
For 2-slot cabinet	A02B-0303-C101	1
For 4-slot cabinet	A02B-0303-C102	1

- Replacing a fan unit

Detaching a fan unit

<1> When replacing the fan motor, be sure to turn off the power to the machine (CNC).

<2> Push up the latch at the top of the unit until the latch is disengaged.

Push up the latch.

Latched   Unlatched
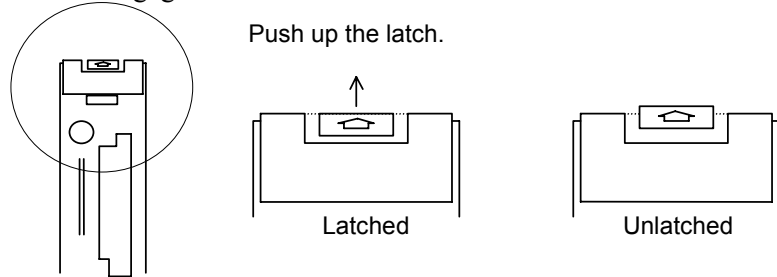
> ⚠ **CAUTION**
> Just disengage the latch.   Do not push up the latch
> after the latch is disengaged.   If you continue
> pushing up the latch forcibly, the latch can break.

<3> Place a finger at the bottom of the front of the fan unit then push up the fan unit.
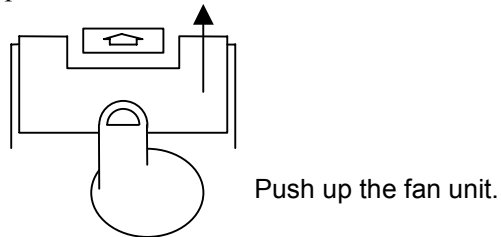
Push up the fan unit.

<4> Push up the fan unit until the fan unit is slanted by about 30 degrees.

<5> Pull out the fan unit toward you in the slanted direction.
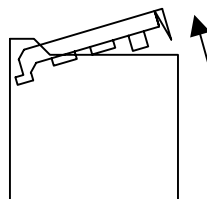
<4> Push up the fan unit until it is slanted by about 30 degrees.

<5> Pull out the fan unit toward you in the slanted direction.

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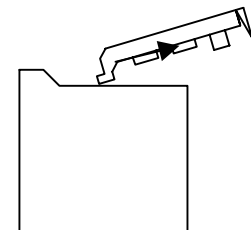
Attaching a fan unit

<1> Insert a fan unit deeply into the main unit at a slanted angle of about 30 degrees until the fan unit touches the wall of the main unit.

<2> Lower the fan unit slowly on the main unit.

<3> Push down the fan unit on the near side to couple the fan unit with the top of the main unit.

<1> Insert the fan unit at an angle of about 30 degrees.

<2> Lower the fan unit.

<3> Push down the fan unit to couple it with the main unit.
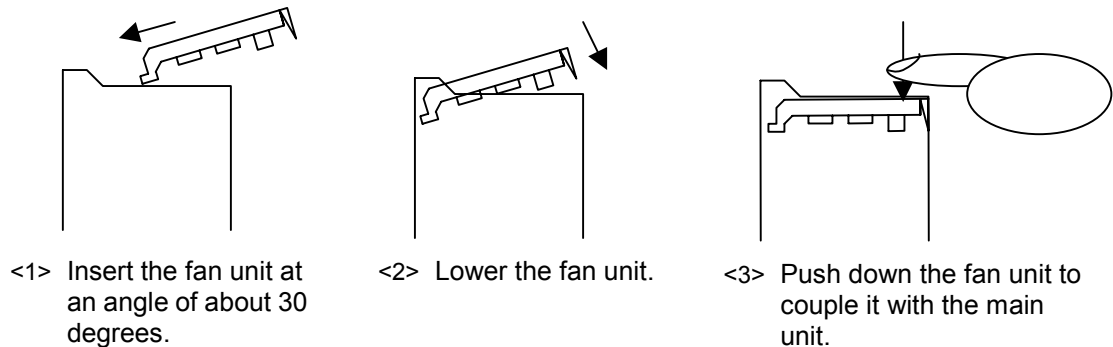
⚠ **CAUTION**
The fan unit and main unit are coupled directly with each other by a connector. The coupling section of the connector can break if the units are coupled incorrectly.

<4> Push down the latch at the top of the fan unit for latching.
Push down the latch.

Unlatched

Latched
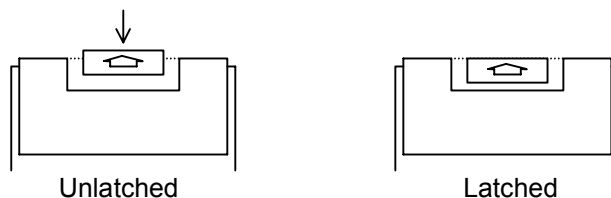
<5> Turn on the power, then check that no fan alarm is issued and that both fans are rotating.

NOTE
1 If the power is turned on when the fan unit and the main unit are not coupled correctly, the fans do not rotate or a fan alarm is issued even through the fans are rotating.
2 When a large amount of force is required to couple the fan unit with the main unit, check if pins of the connector of the base printed circuit board are bent and if the base printed circuit board is inserted correctly.

4.9   REPLACING THE FUSE OF THE DISPLAY UNIT

> ⚠ **WARNING**
> Before starting the replacement of a fuse, remove the cause of the fuse burn-out.
> Accordingly, the replacement should be performed by a person fully trained in maintenance and safety.   If the cabinet is opened to replace the fuse, take extreme care not to touch any high-voltage area (marked with ⚠ and covered by a shock prevention cover). If the area is uncovered, direct contact with this area will result in an electric shock.

Display unit for 30*i*/31*i*/32*i*

Fuse
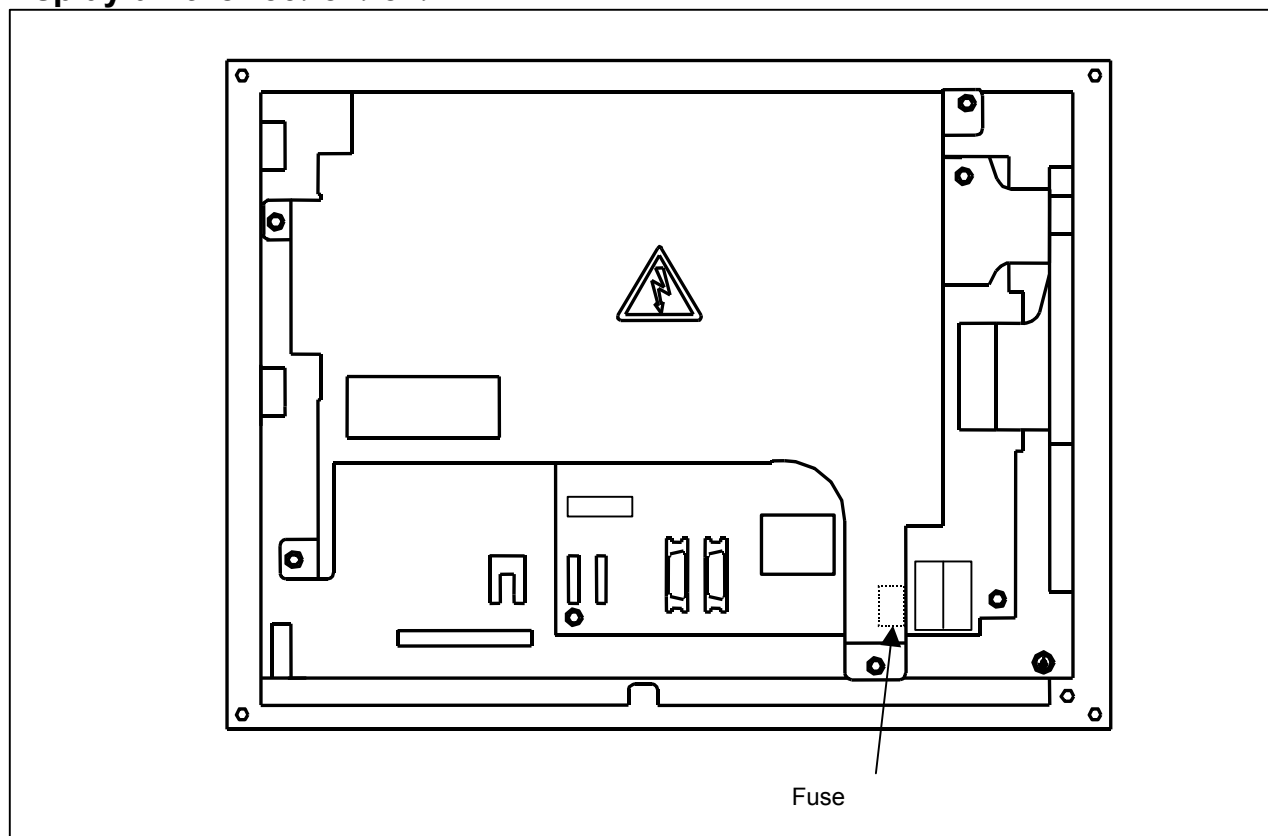
Ordering code	Rating
A02B-0303-K101	3.2A

Display unit for 30*i*/31*i*/32*i*
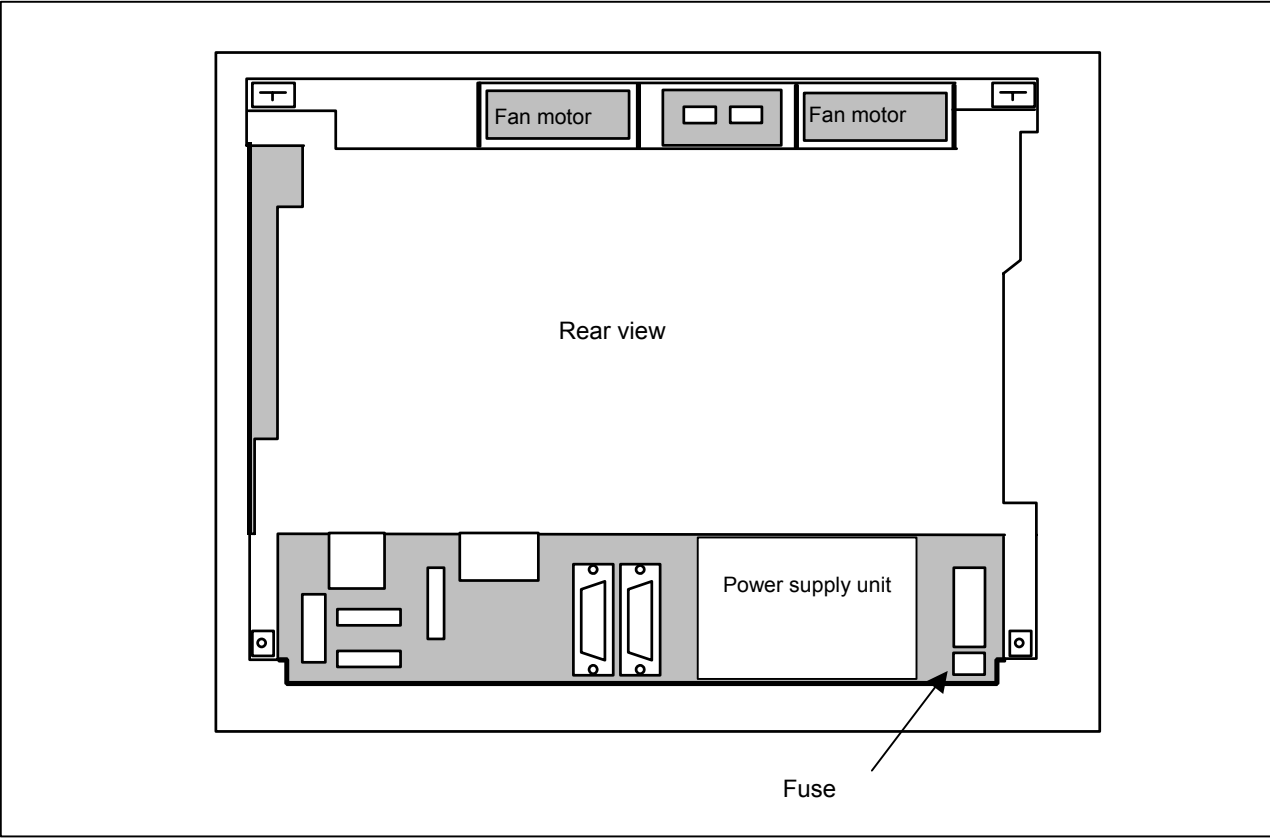
Ordering code	Rating
A02B-0236-K100	5A

4.10   REPLACING PANEL *i* MAINTENANCE PARTS

4.10.1   Replacing the Battery

> ⚠ **NOTE**
> Insert a new battery within 5 minutes after the old
> battery is removed from the connector.
> Usually, following the battery replacement
> procedure stated below will not lose the BIOS
> settings.   Should they be lost, the messages "251:
> System CMOS checksum bad – Default
> configuration used." and "Press <F2> to enter
> SETUP" appear when the power is turned on.
> If you have been using non-default BIOS settings
> for the PANEL *i*, re-set them up exactly.   Usually,
> the unit is used with the default settings.

1   After keeping the PANEL *i* turned on for at least 5 seconds, turn
     off the power, and detach it from the panel so that you can work
     from behind.
2   Remove the connector from the lithium battery and take out the
     battery from the battery holder.
3   Insert a new battery into the connector (BAT1) within 5 minutes,
     and put it into the battery holder.
4   Re-install the PANEL *i*.
5   Turn on the power, and make sure that the BIOS parameters are
     intact (no error occurs at startup).

Connector
(BAT1)

Lithium battery
A02B-0200-K102
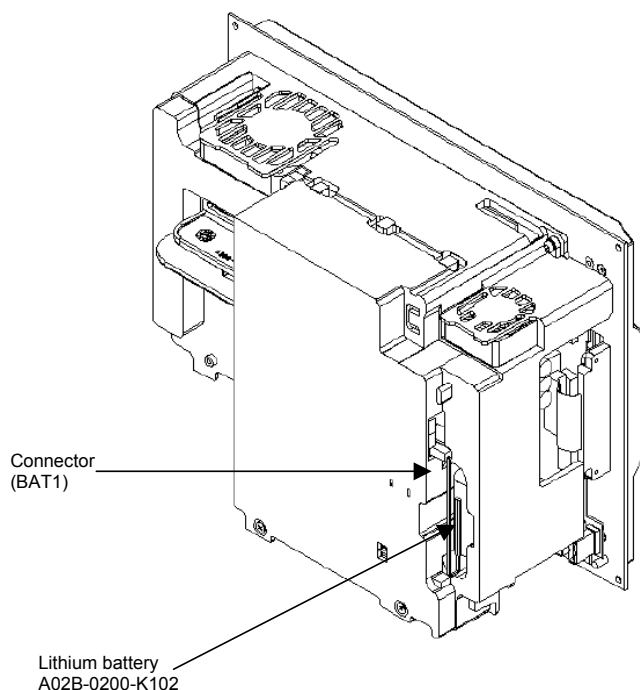
Fig. 4.10 Replacing the Battery

4.10.2   Removing the Case Cover

If you spend 5 minutes or more in removing the battery, it is likely that the BIOS settings may be lost.   Should they be lost, the messages "251: System CMOS checksum bad – Default configuration used." and "Press <F2> to enter BIOS" appear at restart.
If you are using the unit with non-default BIOS settings, check the settings before removing the case cover.   When the above messages appear, re-set up the BIOS.
If you are using the default settings (factory-set), just exit the BIOS setting procedure after the messages appear.

(1)   Removing the LCD cable (for the 15.0" LCD only)
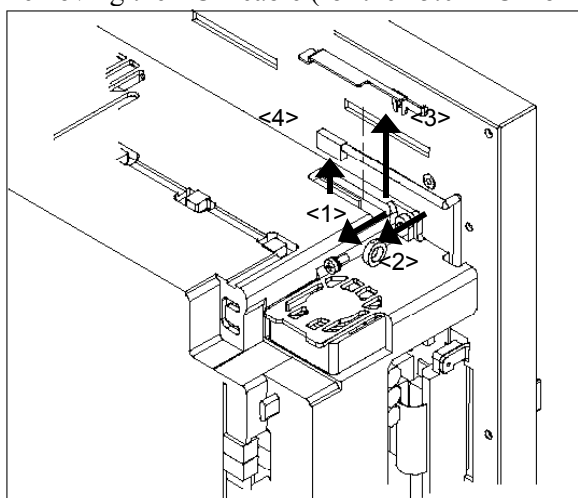
<1> Remove the screw from the upper right section of the unit.
<2> Cut the cable clamp.
<3> Remove the video connector fastener.
<4> Detach the video connector.

(2)   Pulling out the fan and battery cables
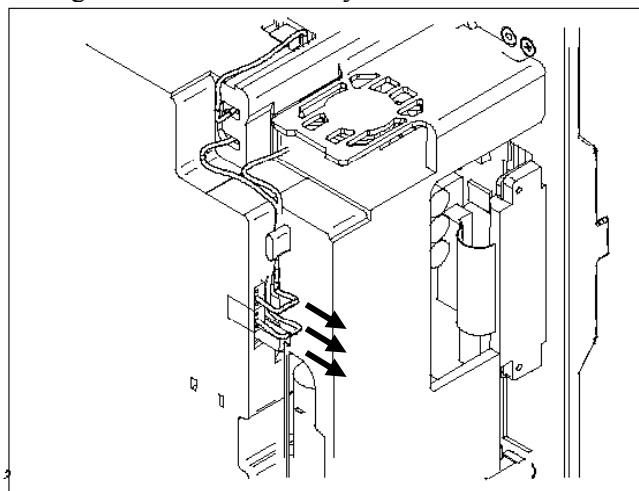
<1> Pull out the two fan cables.   The connectors are latched in a simple manner.   Pull them out by **holding down the latch with a flat-blade screwdriver**.
<2> Pull out the battery cable.

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(3) Detaching the PCI card
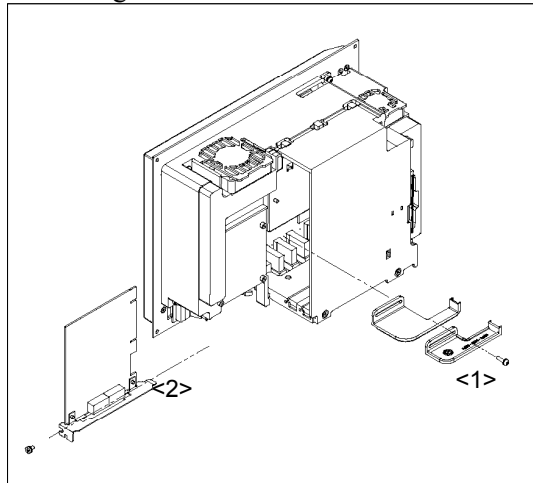
<1> Remove the PCI holding part.
<2> Remove the screw, and pull out the PCI card.

(4) Removing screws from the case

Note) Screws a to c are locked so that they will not drop off the case.
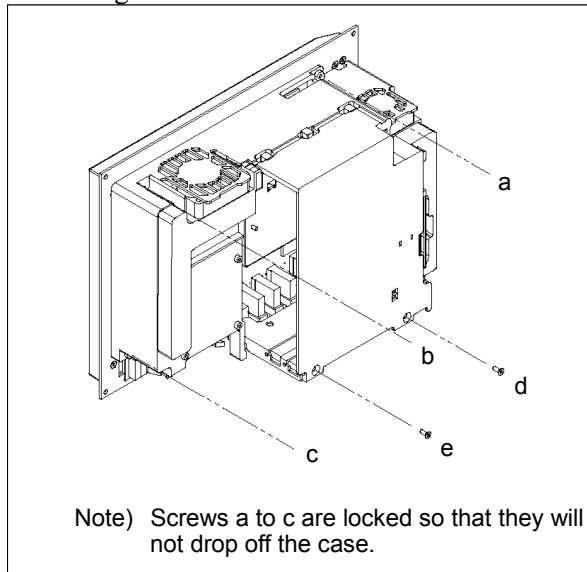
<1> For units other than the 15" LCD, remove the screw (a) from the upper right section of the unit.
<2> Remove the other screws (b to e) from the case.

(5) Checking the shape of the PCI holding plate at the bottom of the unit
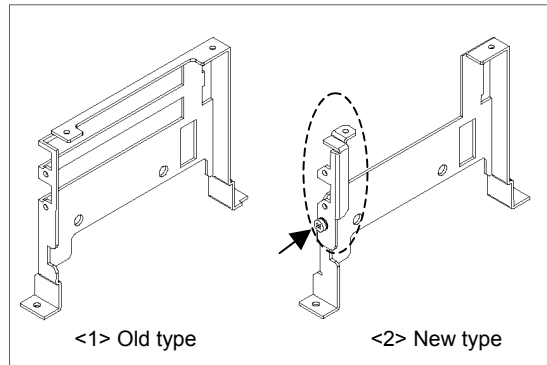
                <1> Old type   <2> New type

  <1> If the holding plate is an old type, remove it first.
  <2> If the holding plate is a new type, remove the screw indicated with an arrow, and loosen the fitting shown in a dotted circle.   Remove the cover as shown in (8).

(6) Removing the PCI holding plate 1 (for the old type only)
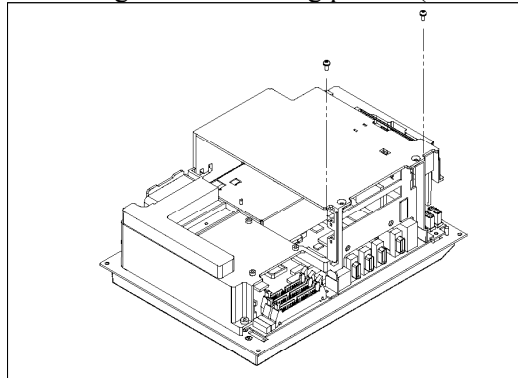
  <1> Remove two screws from the PCI holder.

(7) Removing the PCI holding plate 2 (for the old type only)
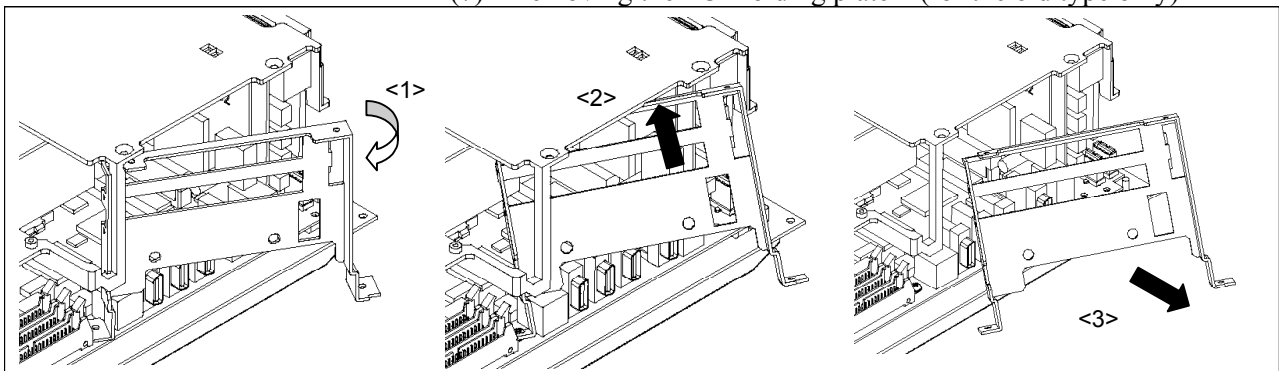
  <1> Open the PCI holding plate to about 30 degrees.
  <2> Tilt it a little to the far side.
  <3> Pull it out.

(8)   Removing the cover
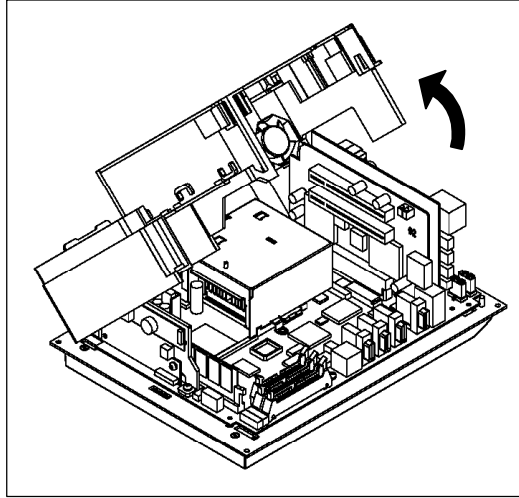
4.10.3   **Mounting the Case Cover**

(1) Position the upper side of the cover in the right place, and lower it.

Be careful.   They are tight.

Be careful not to have the case cover caught on the DIMM latch.

Make sure that the power supply PCB and backplane PCB get in grooves.
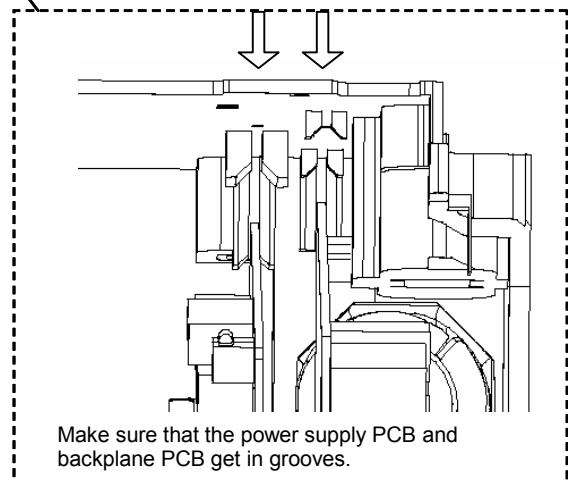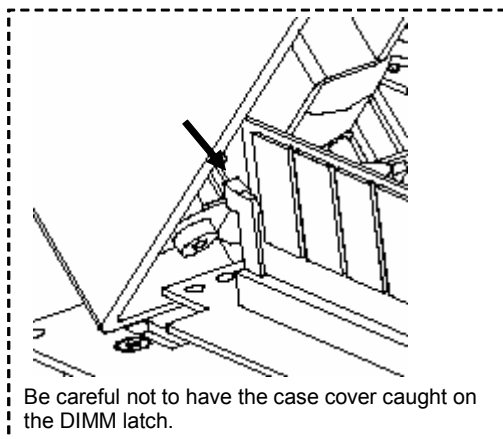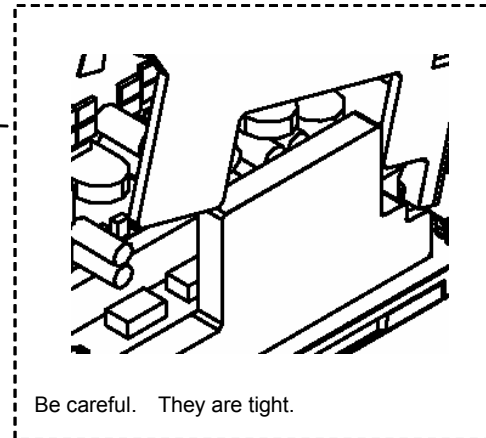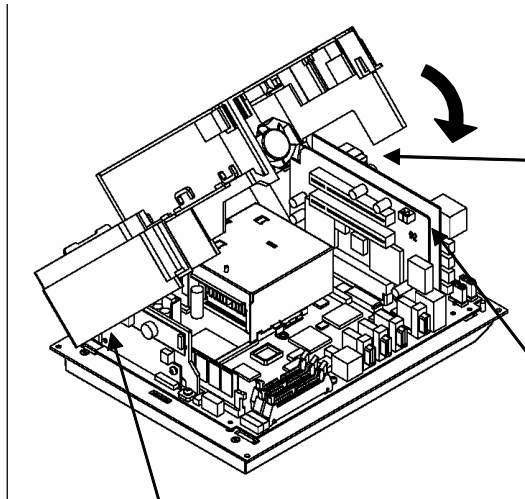
(2) Mount the PCI holder, and fasten the case cover with screws (4 or 5 places).

(3) Mount the PCI card and the PCI card holder.

(4) Attach the cable connector.

40-mm-square fan
60-mm-square fan
Battery
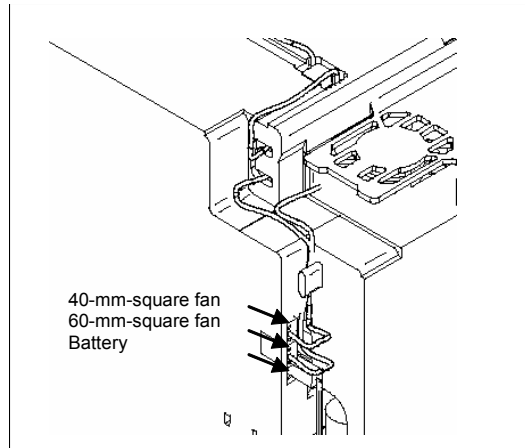
(5) Attach the LCD cable, and mount the metal fitting and cable clamp.
(For the 15.0" LCD unit only)
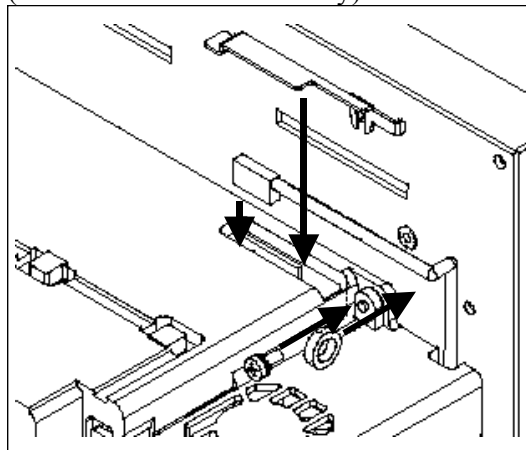
4.10.4   Replacing the Fuse

> ⚠ **NOTE**
> First find out what caused the fuse to blow, and then remove the cause.
> The fuse blows if there is a short-circuit in the PANEL *i* .   If the fuse has blown, check to see if:
> - A conductor has touched the main printed-circuit board.
> - The PCI expansion board is defective or inserted incorrectly.
> - The cable is connected incorrectly.
> If any fuse blows, it is likely that some failure or another may have occurred in the system.   Before turning on the power again, make sure that the system is intact by inspecting it visually and smelling it.   If you find any defective part, you need to have it replaced.

(1) Remove the connection cable, and take off the PANEL *i* from the cabinet.
(2) Remove the cover.   (See Subsection 5.13.2.)
(3) Remove the blown fuse, and install a new one securely.
(4) Mount the cover, and re-install the PANEL *i* (see Subsection 5.13.3).   Attach the cable.
(5) Turn on the power, and make sure that the PANEL *i* gets started.

Detaching/attaching the cover
(See Subsections 5.13.2 and 5.13.3.)
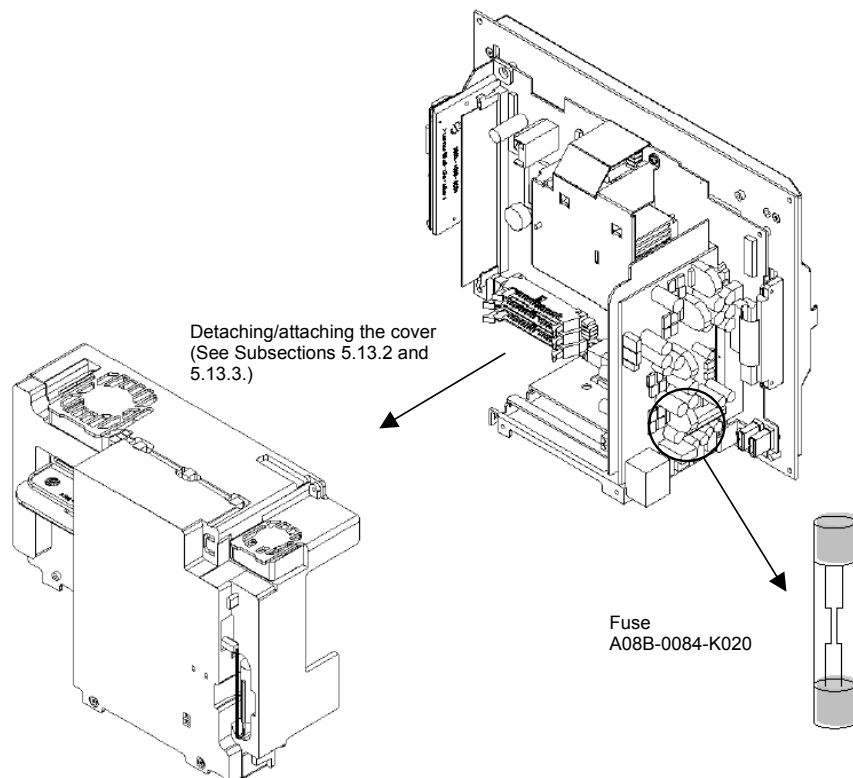
Fuse
A08B-0084-K020

Fig. 4.10.4 Replacing the fuse

4.10.5 Replacing the Fan

4.10.5.1 Replacing the fan in the PANEL *i*

1 Turn off the power to the PANEL *i*.
2 Get a new fan ready.
3 Detach the connector from the fan in the PANEL *i*. The connector is latched. Pull it out by unlatching it with a flat-blade screwdriver as shown below.
4 Replace the fan. Be careful not to mount it in the wrong orientation.
5 Attach the connector of the new fan correctly; 60-mm-square fan (-K101) to CPE11B and 40-mm-square fan (-K100) to CPB11A.
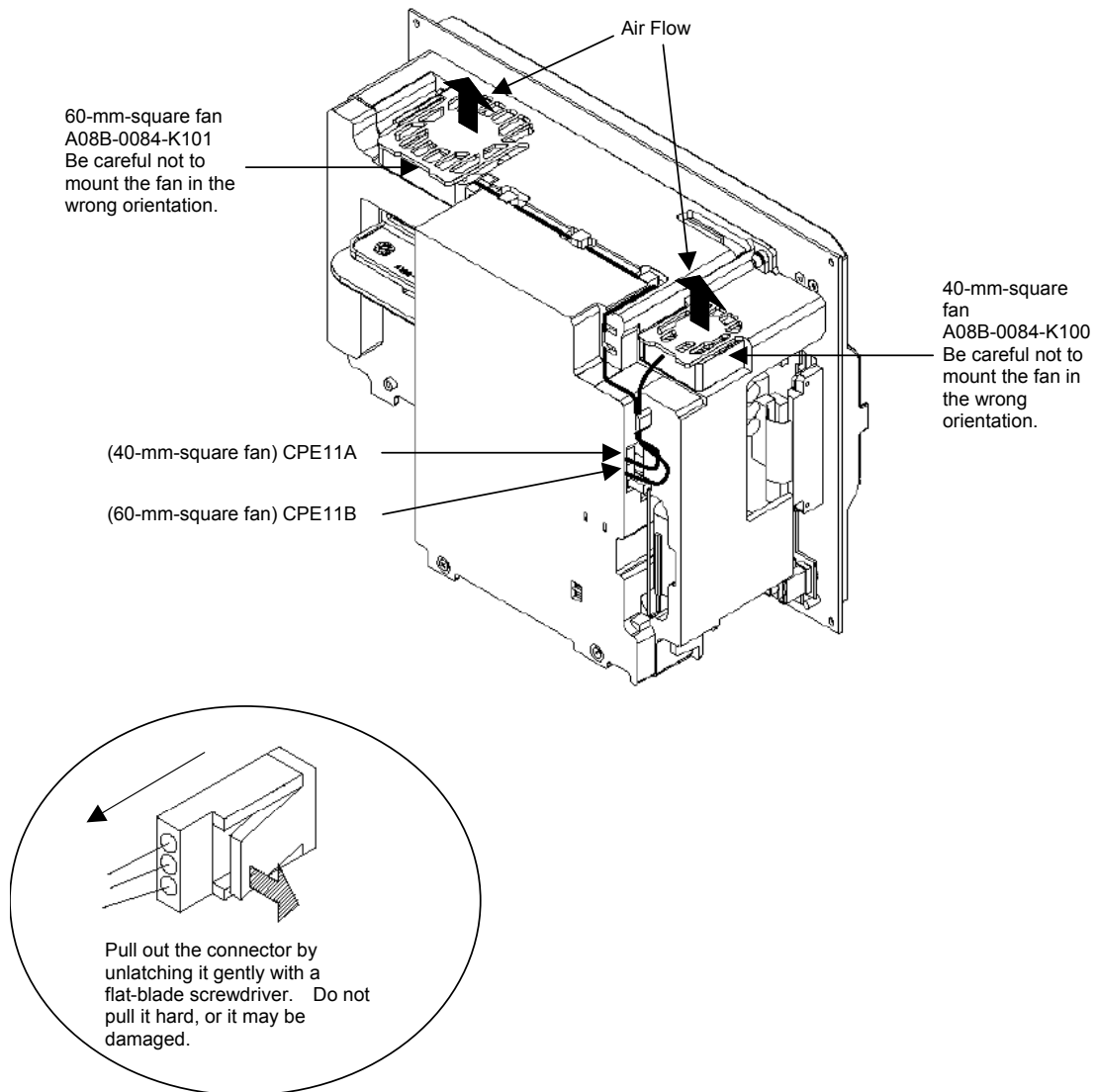
Fig. 4.10.5(a) Replacing the Fan

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4.10.5.2 **Replacing the fan for the HDD**

1   Turn off the power to the PANEL *i*.
2   Get a new fan ready.
3   Remove the fan connector (CPE11C) from the power supply board.   The connector is latched.   Detach it by pulling it up slightly to unlatch.
4   Remove the two fastening screws from the fan to detach the fan.
5   Fasten the new fan with two screws.   Attach it to the connector (CPE11C).   Be careful not mount it in the wrong orientation.

> **NOTE**
> Before replacing a fan in a unit designed to the auto maker's specification, remove the HDD unit.

To power supply P.C.B.
CPE11C (3 pins)

Fan
A08B-0084-K102
Be careful not to mount the fan in the wrong orientation.

Air Flow
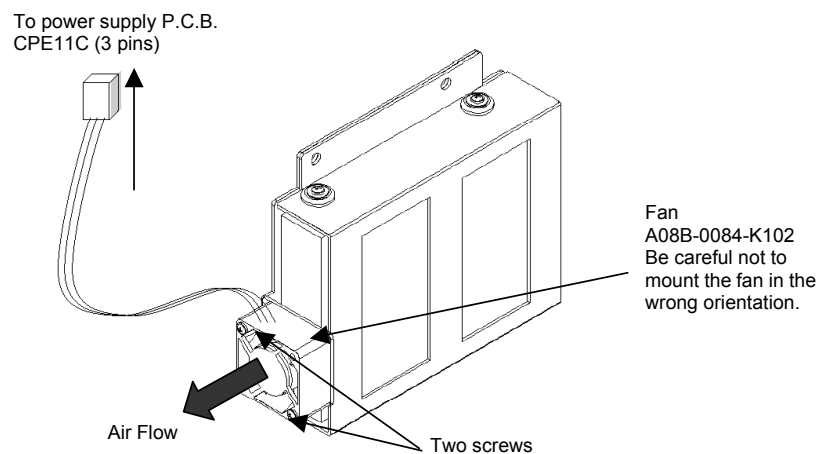
Two screws

Fig. 11.4.5(b)   Replacing the fan for the HDD
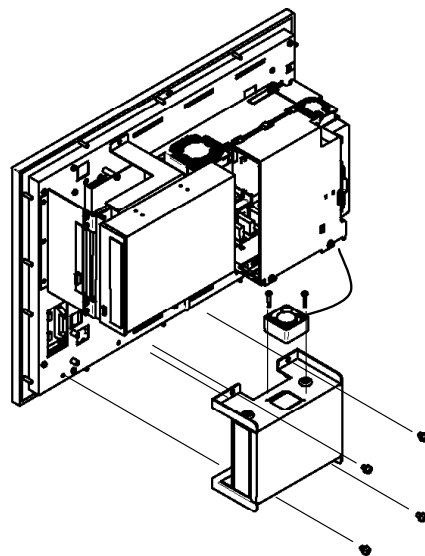
Fig. 11.4.5(c)   Replacing the fan for the HDD (for unit designed to auto maker's specification)

4.10.6   Replacing the CPU Unit

1   Turn off the power to the PANEL *i*.
2   Remove the cover.   (See Section 5.2.)
3   Remove two screws and the CPU holding plate (A).
4   Lift the CPU socket lever, and detach the CPU unit (B).
5   Mount a new CPU unit, and reverse the steps to re-assemble the unit.

B

A

CPU holding plate

Detaching/attaching the cover
(Refer to Subsections 5.13.2
and 5.13.3.)
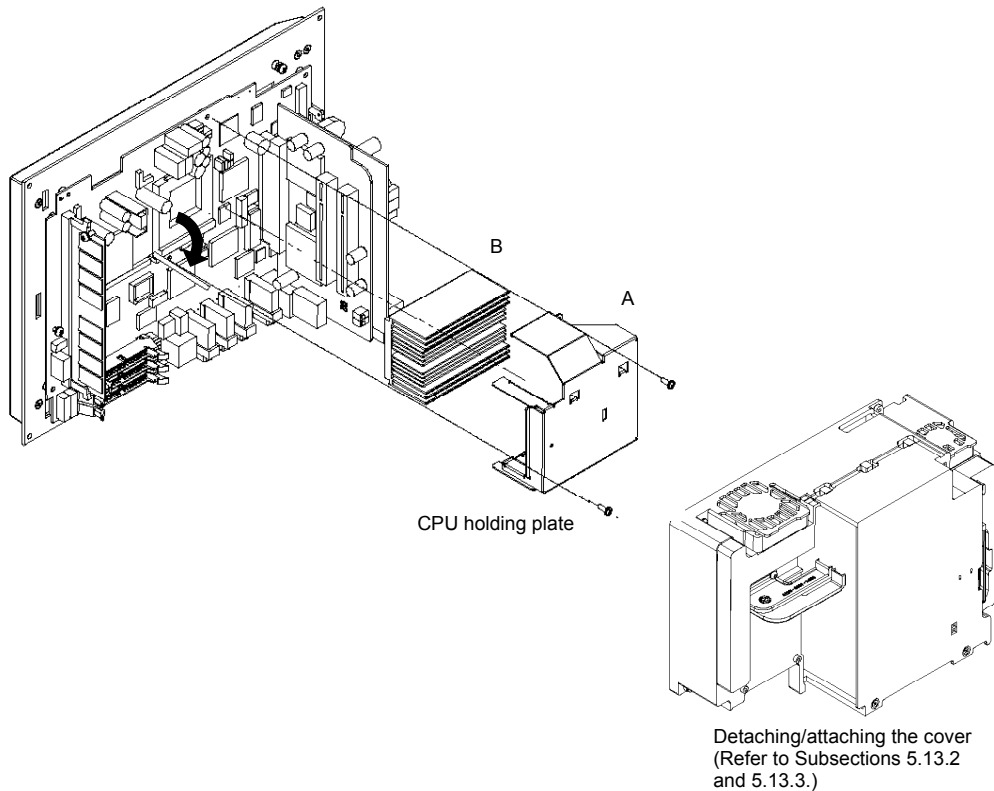
Fig. 4.10.6   Replacing the CPU unit

4.10.7   Replacing the LCD Backlight

> **NOTE**
> For the 15.0" LCD type, it is impossible to replace
> the backlight independently.   It must be replaced
> together with the maintenance base unit
> (A08D-0084-Dxxx).

4.10.7.1   Replacing the 10.4" LCD backlight

1   Turn off the power to the PANEL *i*.
2   Remove the cover.   (See Subsection 5.13.2.)
3   Detach the LCD backlight cable and the LCD signal cable.
4   If the unit is provided with a touch panel, remove the touch panel
     flat cable from the touch panel controller printed-circuit board
     connector CN1.

LCD signal cable

LCD backlight cable

Flat cable from the touch
panel

Detaching/attaching the cover
(Refer to Subsections 5.13.2
and 5.13.3.)
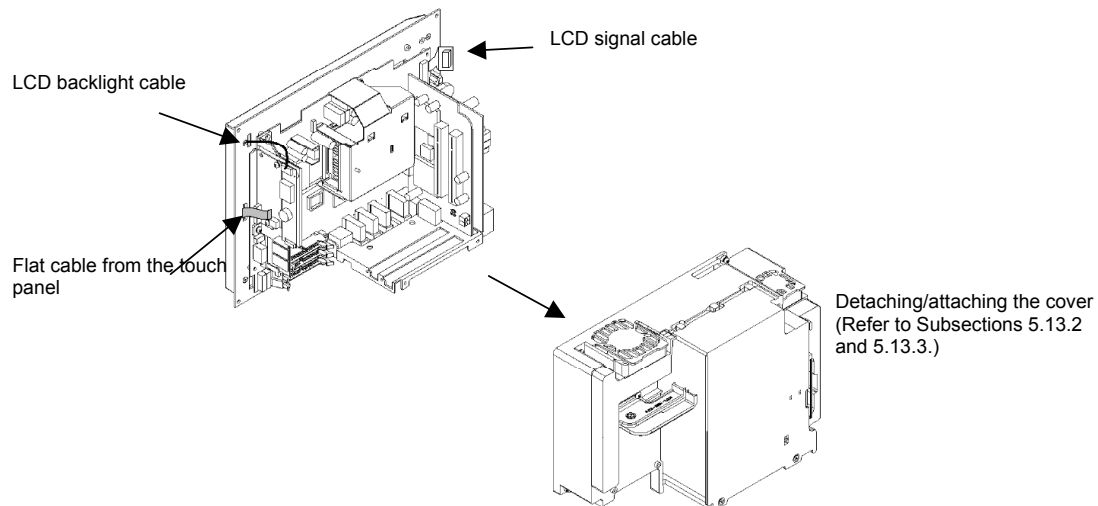
Fig. 4.10.7(a)   Replacing the 10.4" LCD backlight (1)

5   Remove two screws, and detach the CPU holding plate. Remove two screws, and detach the PCI holding plate (if it has not been detached).
Also remove three screws, the soft key cable, PCMCIA cable, and USB cable, and then detach the printed-circuit board.

Screw (three places)

PCMCIA cable
USB cable

Two screws   Two screws

Soft key cable

CPU holding plate   CPU holding plate
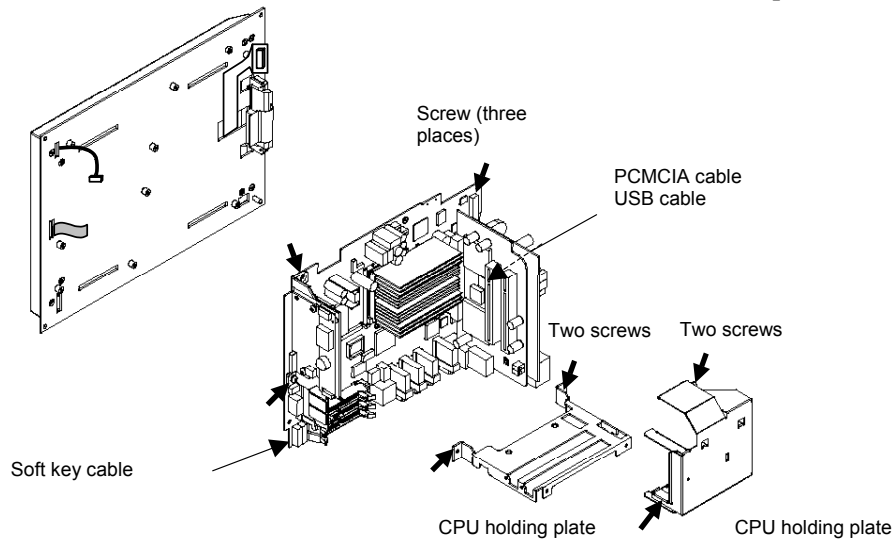
Fig. 4.10.7(b)   Replacing the 10.4" LCD backlight (2)

6   Remove screws, and detach the ornamental frame.

Four screws
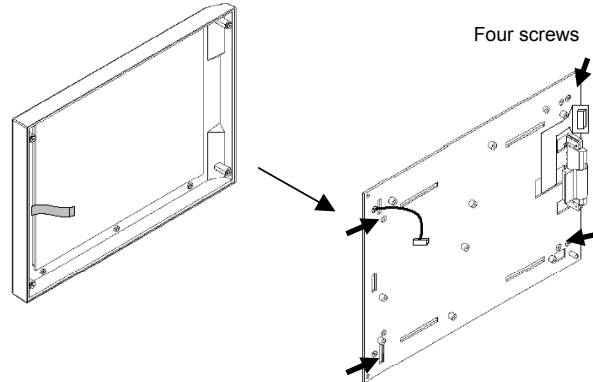
Fig. 4.10.7(c)   Replacing the 10.4" LCD backlight (3)

7   Remove screws, and detach the LCD unit.

ネジ
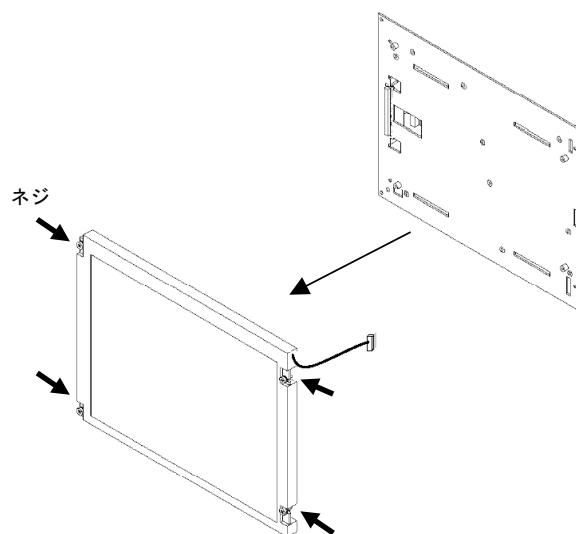
Fig. 4.10.7(d)   Replacing the 10.4" LCD backlight (4)

8   As shown below, unlock and pull out the case that contains the backlight, and then replace the backlight.

CP1

The lock is here.

Lift this portion gently, and pull out the backlight.   (For details, see the figure below.)

LCD   Rear view

Lock

Lift this portion.
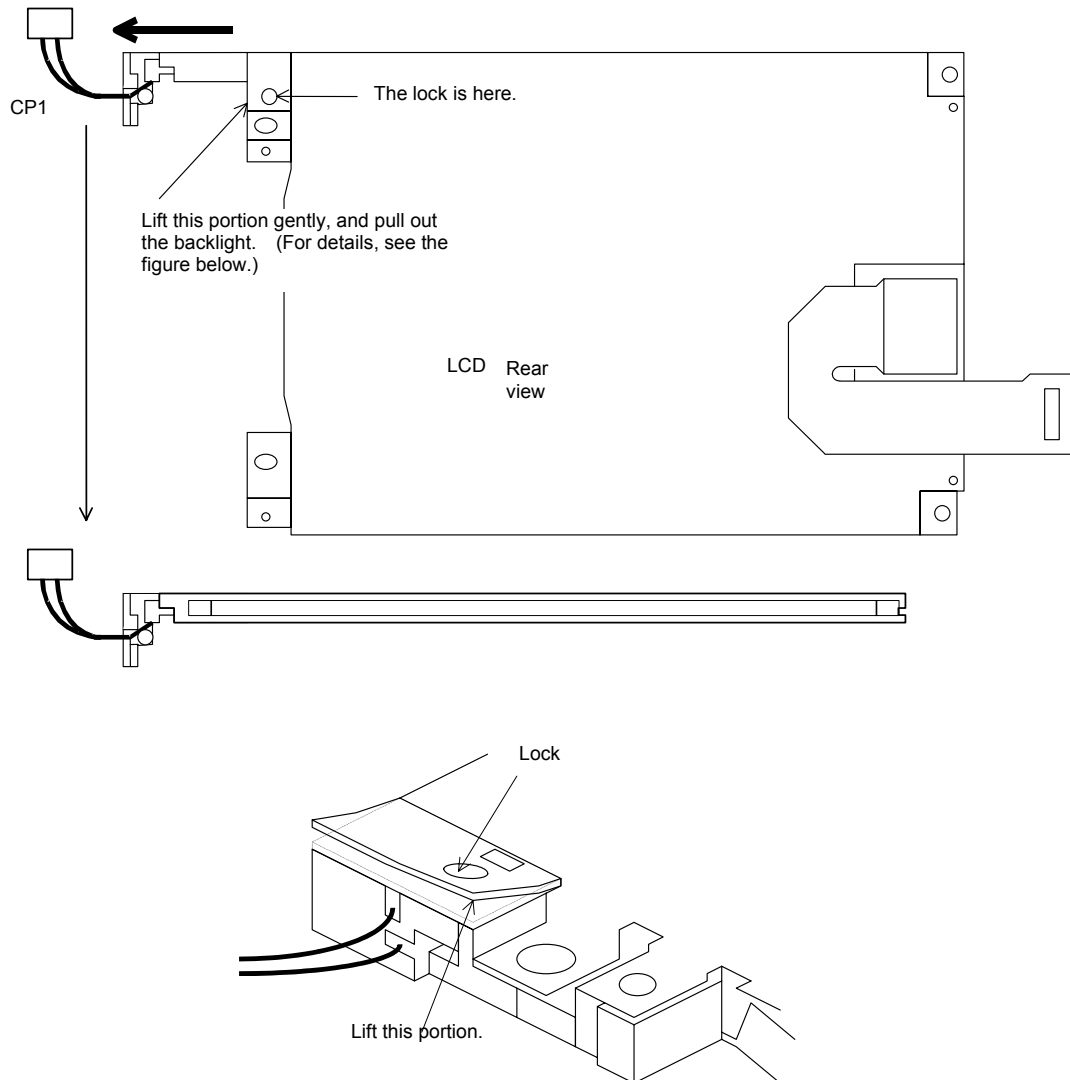
Fig. 4.10.7(e)   Replacing the 10.4" LCD backlight (5)

> ⚠ **CAUTION**
> When pulling out the backlight, do not pull the cable.

9   To re-assemble the unit, reverse the steps 1 to 8.
(Be careful not to get the cable caught under the holding plate or any other stuff.)

4.10.8   Replacing the Touch Panel Protective Sheet

If the PANEL *i* is provided with a touch panel, the touch panel surface is covered with protective sheet.   If the protective sheet is scratched or dirty to make the screen less visible, replace it with the spare listed below.

Item		Specification
Touch panel protective sheet	For 10.4" LCD	A02B-0236-K110
	For 15.0" LCD	A08B-0082-K020

Replacing procedure of touch panel protective sheet

1   Peel away the old protective sheet by holding it at the tab and pulling it.

Hold the sheet at this tab when replacing it
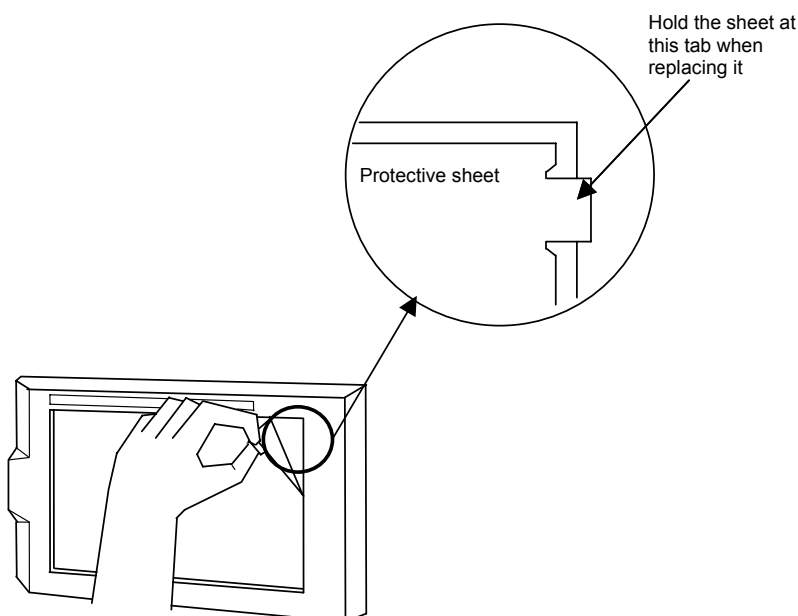
Protective sheet

2   Wipe dirt, moisture, grease, and protective sheet glue residual (if any) off the LCD surface carefully.
3   As shown in the figure at the lower left, fold the tab of the protective sheet toward the front side (to about 60 degrees).

4 As shown in the figure at the lower right, remove the backing film from the new protective sheet surface that is to face the LCD panel.
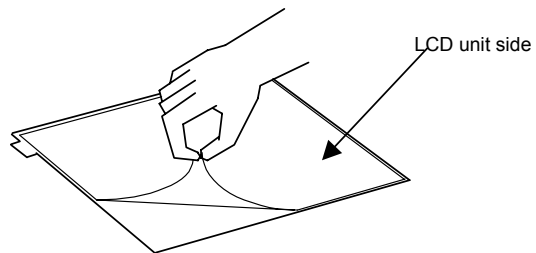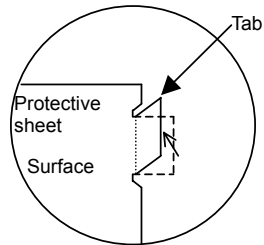
5 Paste the protective sheet with its tab at the upper right while being careful to protect the gap between the LCD panel and the protective sheet from dirt and any other foreign matter.
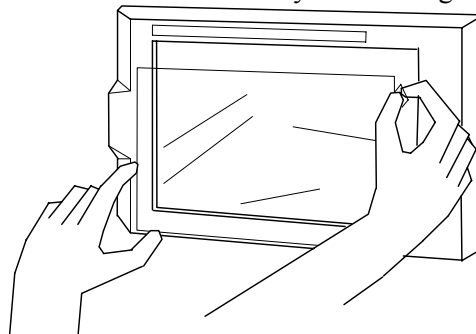
4.11 REPLACING *i*s SERIES CNC DISPLAY UNIT MAITENANCE PARTS

4.11.1 REPLACING THE MAIN BOARD

> ⚠ **WARNING**
> Only those personnel who have received approved safety and maintenance training may perform this replacement work.
> When opening the cabinet and replacing the board, 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.

1   Remove the LCD-mounted type control unit, referencing Section 5.13, "MOUNTING AND REMOVING LCD AND MDI UNITS."

2   Remove the two screws at the bottom of the case, then remove the case while pushing down the claws located on the upper side. At this time, the fan cable need not be detached.
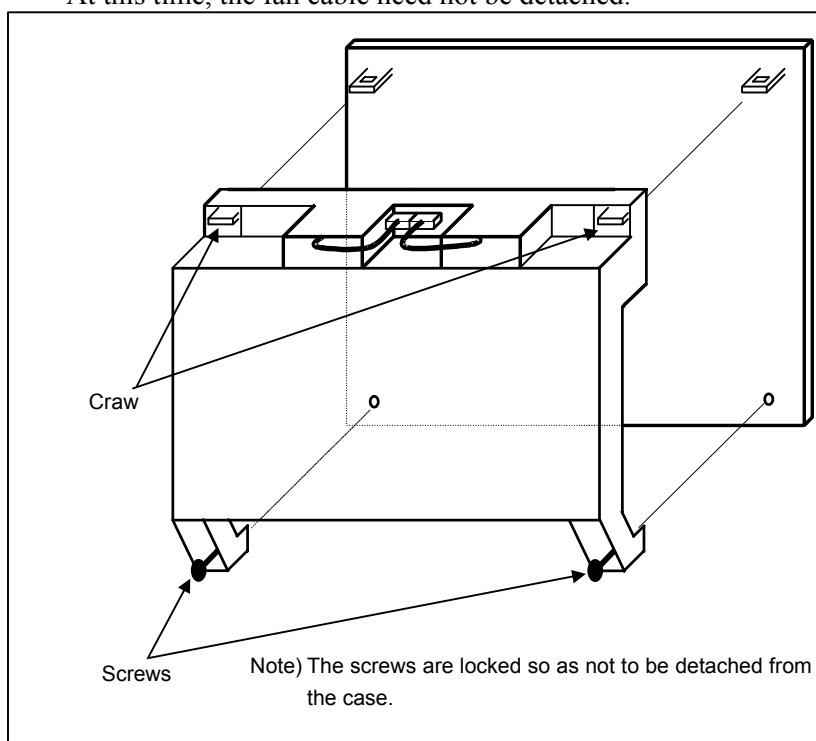
Craw

Screws

Note) The screws are locked so as not to be detached from the case.

3 Detach the cables from the connectors CA88A (PCMCIA interface connector), CD46L (USB interface connector), and CK20A and CK21A (connectors for soft keys) on the main board.
When the 10.4" LCD is used, remove CA79A (video signal interface connector). When the 12.1" LCD is used, remove CA79A (video signal interface connector) and CPD12. When the 15" LCD is used, remove the cable holding plate, then remove CA98 (video signal interface connector) and CPD12. When a touch panel is provided, remove TP2 (connector for the touch panel) as well.

4 Next, remove the screws used to secure the main board. The connector CA87A (connector for inverter connection) directly connects the main board with the inverter PCB. So, detach the main board by moving the main board downward.
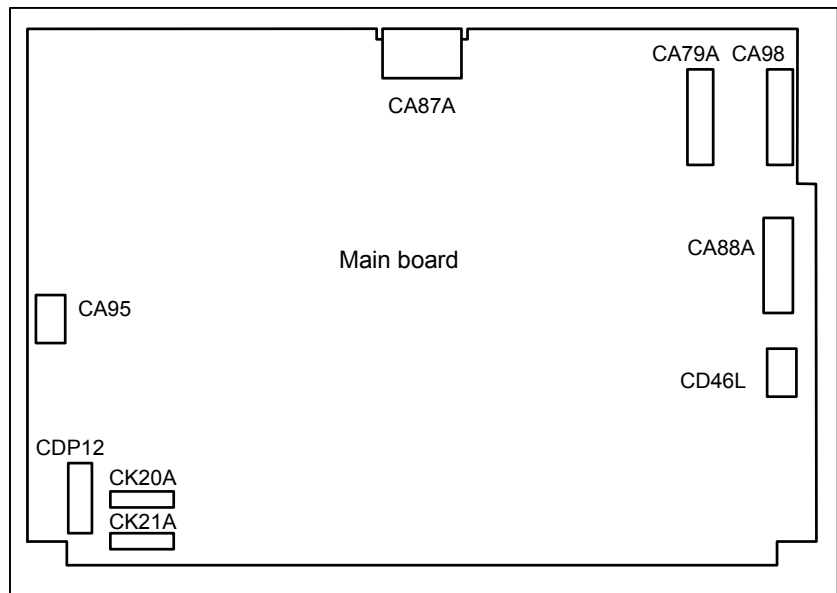
5 When mounting the main board, reverse steps 2 through 4.

4.12 Replacing the Fuse

> ⚠ **WARNING**
> Before starting the replacement of a fuse, remove the cause of the fuse burn-out.
> Accordingly, the replacement should be performed by a person fully trained in maintenance and safety. If the cabinet is opened to replace the fuse, take extreme care not to touch any high-voltage area (marked with ⚠ and covered by a shock prevention cover). If the area is uncovered, direct contact with this area will result in an electric shock.

- Ordering code of the fuse

Ordering code	Rating
A02B-0236-K100	5A

- Mounting position of the fuse

Rear of unit

Power supply unit

Fuse
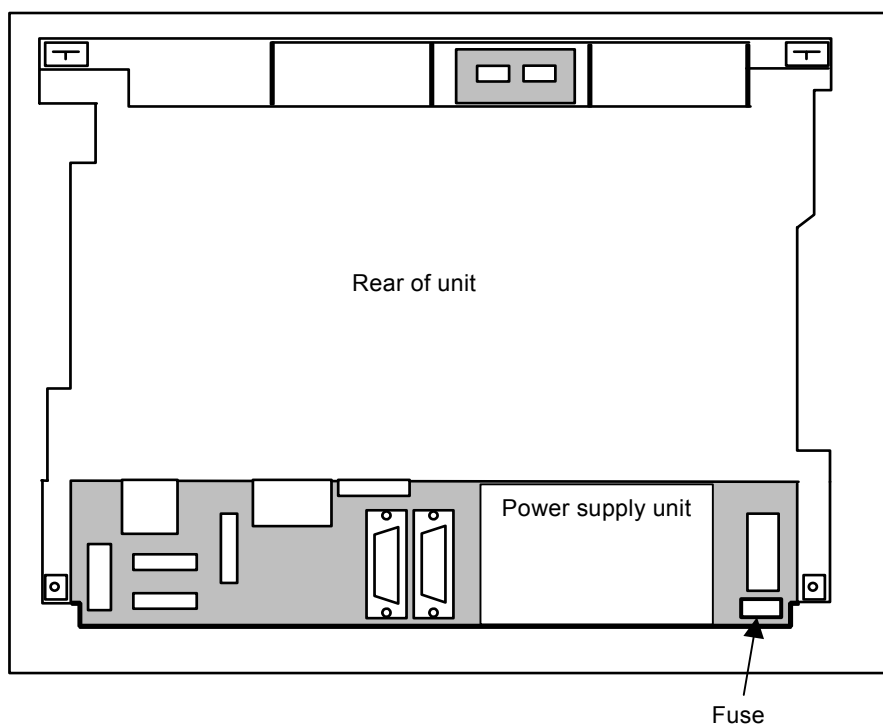
4.12.1 Replacing the Battery

No battery replacement is needed on the *is* series CNC display unit, because it has no battery.

4.12.2   **Replacing Fan Motor**

> ⚠ **WARNING**
> When opening the cabinet and replacing a fan
> motor, 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.

- Ordering code of fan motor

Ordering code	Remarks
A02B-0303-K120	40-mm-square fan (two)

- Replacement procedure of fan motor

See Section 2.9 "Replacing Fan Motors" for replacement procedure of
fan motor.

4.12.3   **Replacing the Touch Panel Protection Sheet**

For the LCD display unit with a touch panel, the surface of the touch
panel is covered with the protection sheet to protect it. When there are
flaws and contamination on this protection sheet that make the screen
hard to read, replace the protection sheet. Prepare the following items.

Name		Ordering code
Touch panel protection sheet	For 10.4" LCD	A02B-0236-K110
	For 12.1" LCD	A02B-0236-K118
	For 15.0" LCD	A08B-0082-K020

- Replacing Method

See Section 5.6.

5

MATTERS COMMON TO BOTH LCD-MOUNTED TYPE AND STAND-ALONE TYPE (HARDWARE)

This chapter describes printed-circuit boards and units common to LCD-mounted and stand-alone types.   It also explains conditions for installing them and how to replace their consumable parts.

5.1 OPTIONAL BOARD

5.1.1 Fast Data Server

- Specification

Item	Ordering code
Fast data server	A20B-8101-0030

- Connector mounting location

JG2
S-BUS back-plane connector
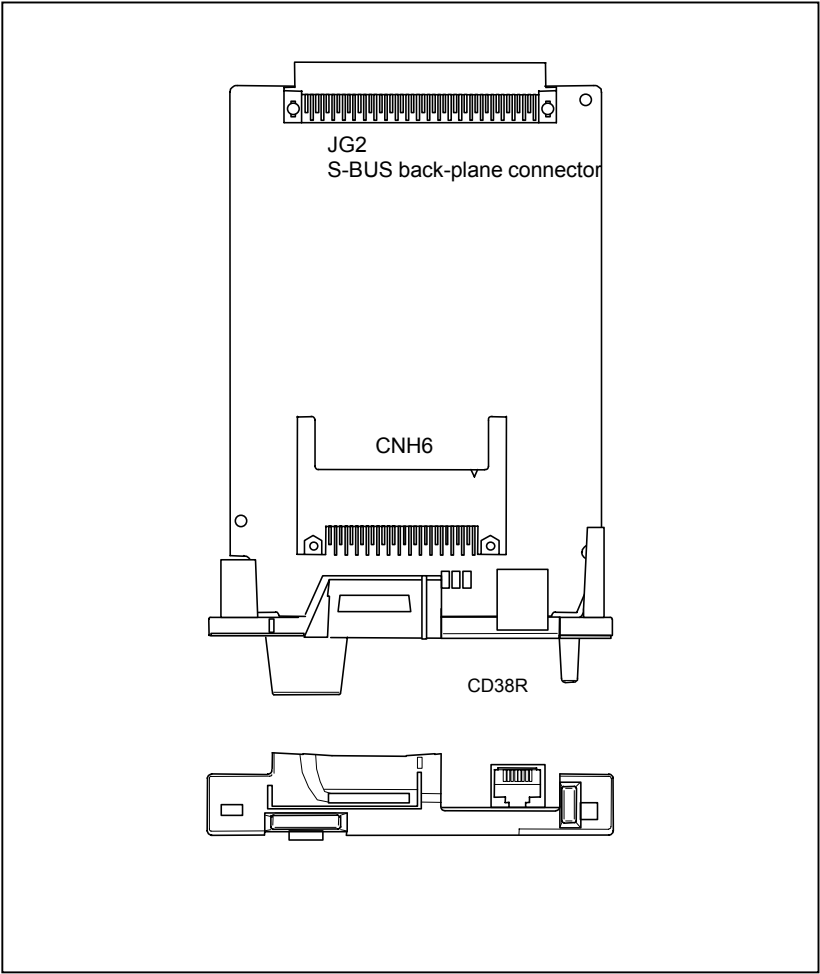
CNH6

CD38R

Connector number	Use
CNH6	ATA card interface
CD38R	100BASE-TX Ethernet interface

- LED indications

The board incorporates the following LEDs: Four green STATUS LEDs and one red ALARM LED for indicating the status. Three green LEDs and one red LED for indicating the communication status. The figure below shows the locations of these LEDs. The table below explains the LED lighting states.

In the following explanations, the LED lighting states are expressed as follows:

☐: Off   ■: On   ☆: Blinking   ◊: Don't care

Detailed view of LEDs

| ALM (red) | COM (yellow) | 4(S-TASUS) (green) | 3(STATUS) (green) | 2(STATUS) (green) | 1(STATUS) (green) | LIL (green) | COL (red) | BTX (green) | CD38R |

LED lighting sequence at power on

No.	LED indication 1234	Board state
1	STATUS □ □ □ □	Power off
2	STATUS ■ ■ ■ ■	Initial state after power on
3	STATUS ■ ■ ■ □	MPU initialized.
4	STATUS ■ ■ □ □	Firmware downloaded.
5	STATUS ■ □ □ □	Control migration to OS
6	STATUS □ ■ ■ ■	OS PHASE1
7	STATUS □ ■ ■ □	OS PHASE2
8	STATUS □ ■ □ ■	OS PHASE3
9	STATUS □ ■ □ □	OS PHASE4
10	STATUS □ □ □ ☆	Startup completed.

The system enters the No.10 status when the Fast Ethernet/Fast data server starts normally. This status is maintained until an error occurs.

STATUS LED indications if an error occurs

If an error occurs, the LEDs repeatedly flash "LONG" then "SHORT." (For "LONG," the LED lights for a long time. For "SHORT," the LED lights for a short time.)

| No. | STATUS LED indication | | Board state | |
	LONG 4 3 2 1	SHORT 4 3 2 1		
1	■ ■ □ □	□ □ ■ ■	Failure caused by this board	SDRAM parity alarm
2	■ □ ■ □	□ □ □ □		General invalid instruction
3	■ □ ■ □	□ □ □ ■		Invalid slot instruction
4	■ ■ □ □	□ □ □ ■	Failure caused by another board	NMI of another module

NOTE
If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

ALARM LED indications if an error occurs

No.	LED indication	Board state
1	ALM ■	Parity error occurred in memory.

LED indications related to communication status

No.	STATUS LED indication		Board state
1	COM	■	Lights when data is sent.
2	LIL	■	Lights when the Fast Ethernet/Fast data server is successfully connected to the hub.
3	COL	■	Lights if a data collision occurs.
4	BTX	■	Lights when a connection is made with 100BASE-TX.

NOTE
LIL :
　Communication is not performed while this LED is not lit. A probable reason for this is that the Fast Ethernet/Fast data server is not properly connected to the hub, or that the hub is off. This LED should be lit at all times while the Fast Ethernet/Fast data server is properly connected to the hub.
COL :
　This LED lights frequently if there is excessive traffic on the communication line or if there is excessive peripheral electrical noise.

5.1.2   Additional Axis Board

- Specification

Item	Ordering code
Additional axis board	A20B-8101-0070

- Connector mounting location
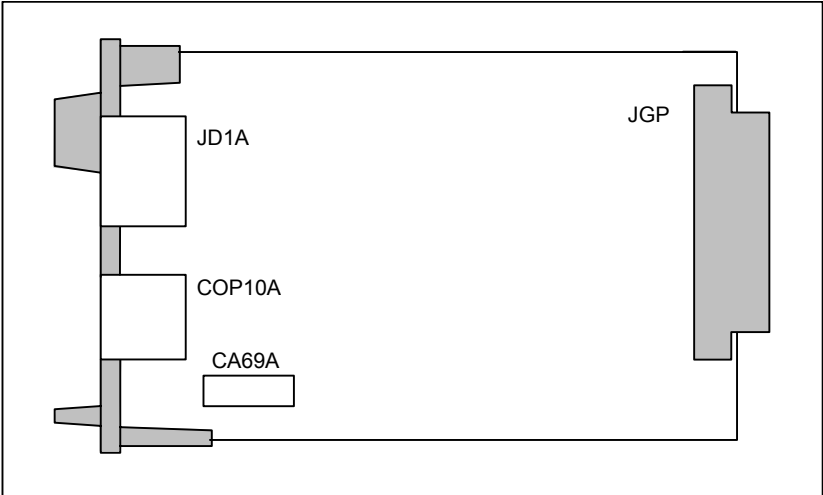
Connector number	Use
COP10A	FSSB
JD1A	I/O LINK
CA69A	Servo check

- Block diagram
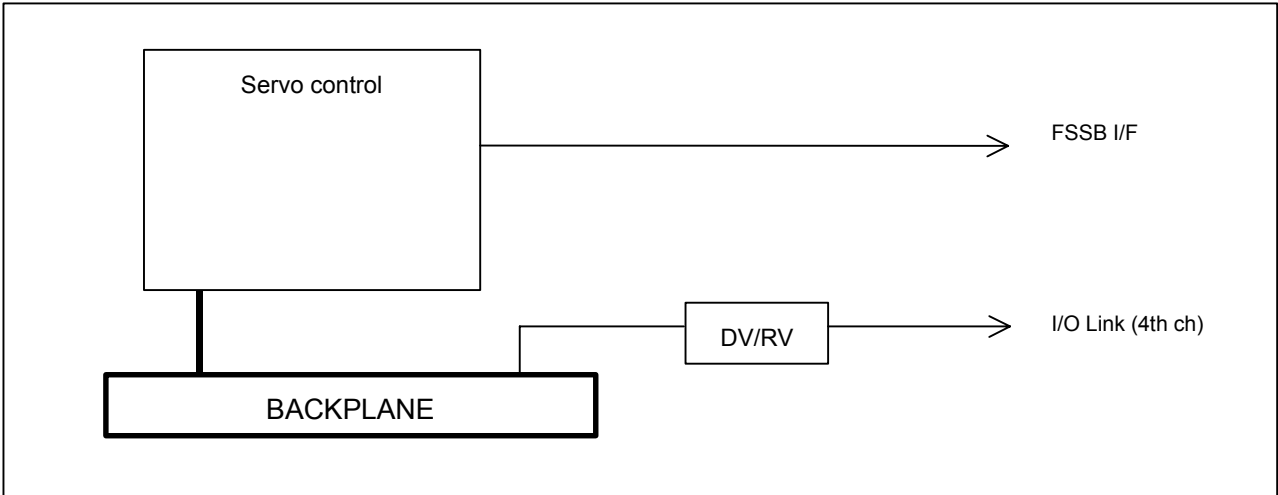
- LED display
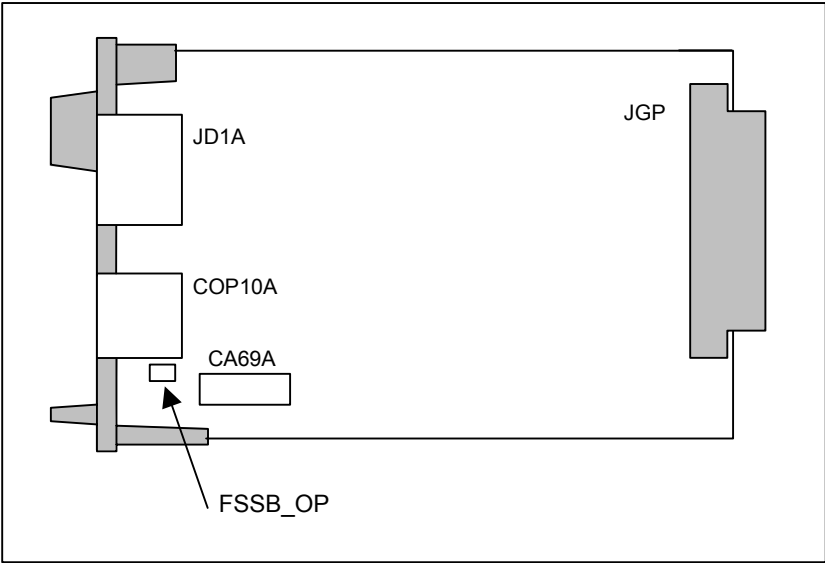
LED name	Meaning
FBBS_OP	ON: FSSB connected (FSSB OPEN)

5.1.3   **Additional Spindle Board**

- Specification

Item	Ordering code
Additional spindle board	A20B-8002-0320

- Connector mounting location
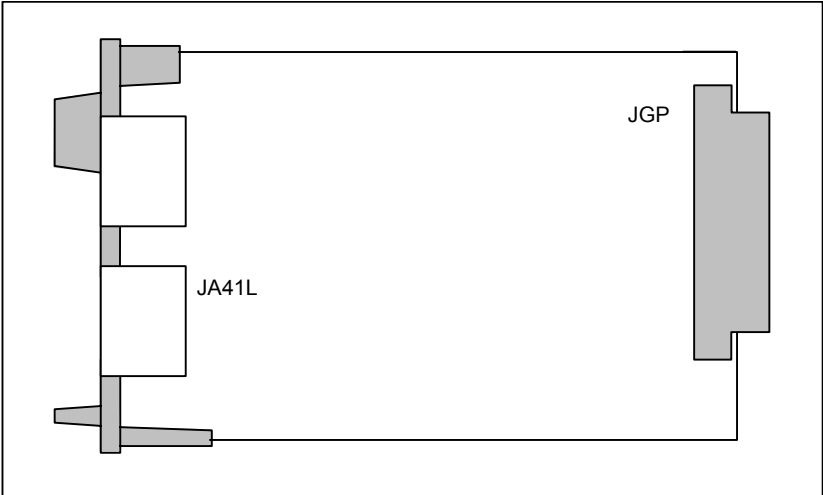
Connector number	Use
JA41L	Serial spindle and position coder

- Block diagram
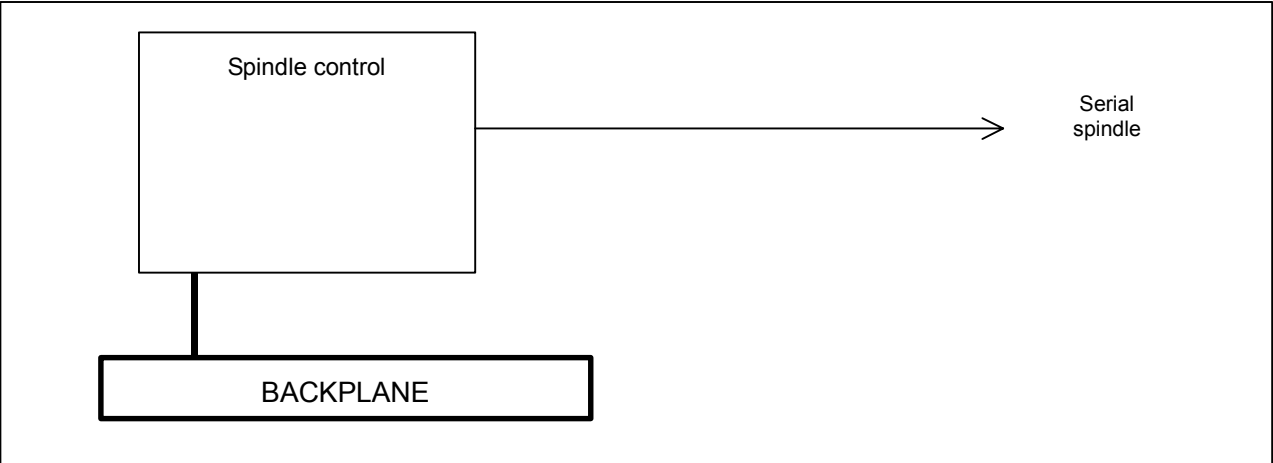
5.1.4   HSSB Interface Board

- Specification

Item	Function	Ordering code
HSSB interface board	HSSB × 1 channel	A20B-8101-0111

- Connector mounting location
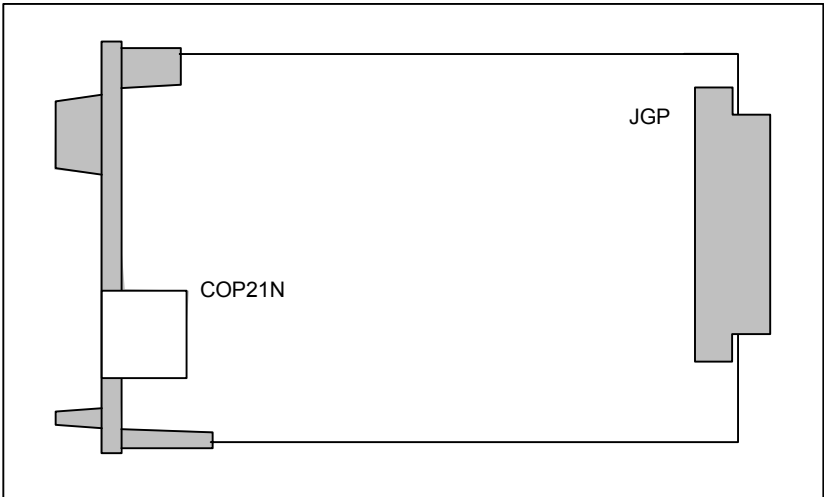
Connector number	Use
COP21N	High-speed serial bus interface

- Block diagram
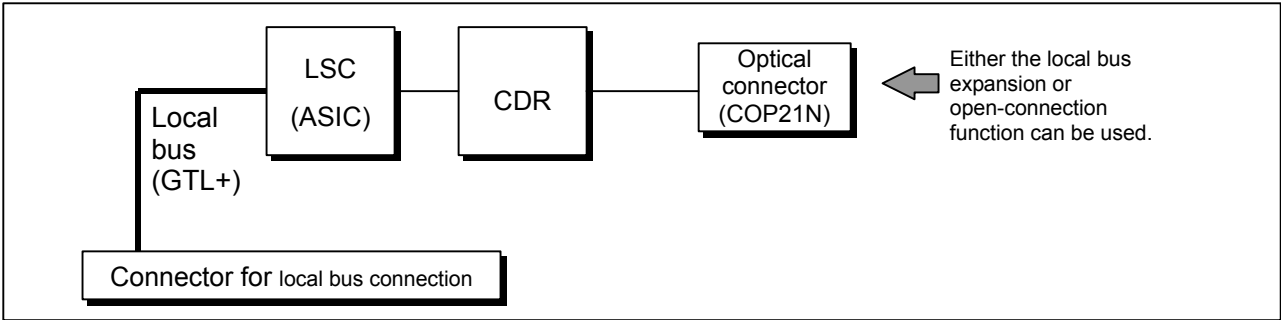
- LED display
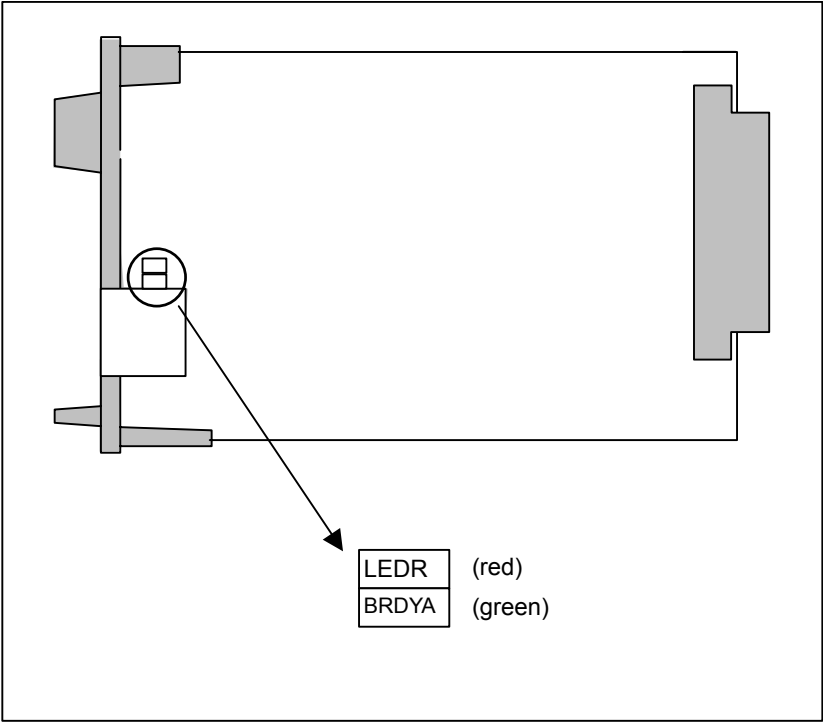
LED name	Meaning
LEDR	Lights to indicate a common RAM parity alarm condition in the LSC.
BRDYA	Lights to indicate that a link has been established.

5.1.5   FL-net Board

- Specification

Item	Ordering code
FL-net board	A20B-8101-0031

- Connector mounting location
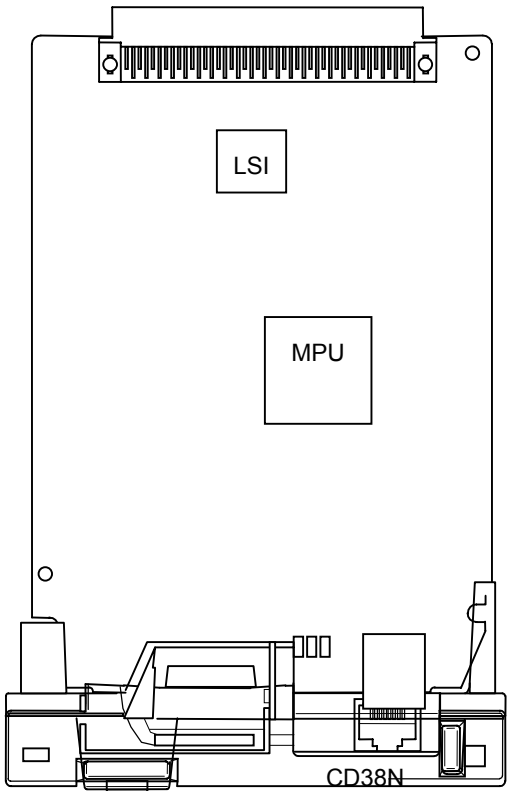
- LED indications

The board incorporates the following LEDs: Four green STATUS LEDs and one red ALARM LED for indicating the status. Three green LEDs and one red LED for indicating the communication status. The figure below shows the locations of these LEDs. The table below explains the LED lighting states.

In the following explanations, the LED lighting states are expressed as follows:

□: Off   ■: On   ☆: Blinking   ◊: Don't care
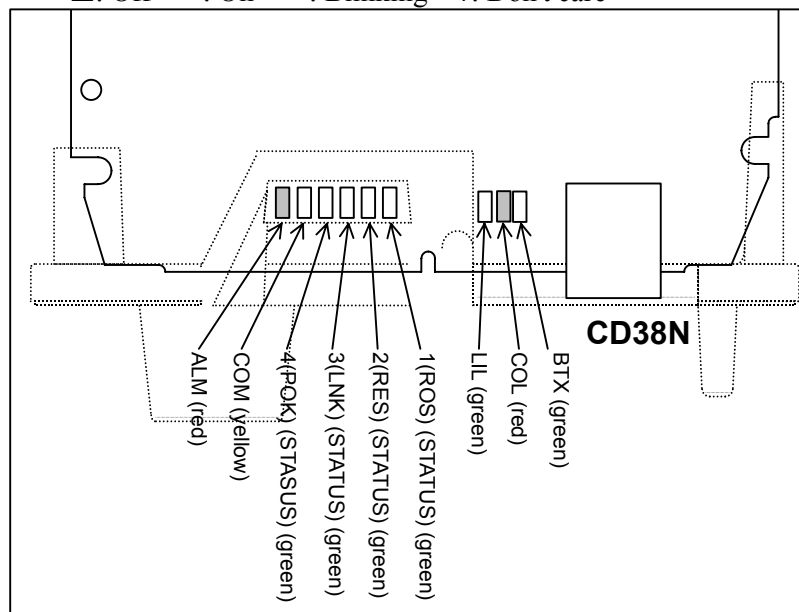
NOTE
The face plate is indicated with dotted line.

LED lighting sequence at power on

No.	LED indication 1234	Board state
1	STATUS □ □ □ □	Power off
2	STATUS ■ ■ ■ ■	Initial state after power on
3	STATUS ■ ■ ■ □	MPU initialized.
4	STATUS ■ ■ □ □	Firmware downloaded.
5	STATUS ■ □ □ □	Control migration to OS
6	STATUS □ ■ ■ ■	OS PHASE1
7	STATUS □ ■ ■ □	OS PHASE2
8	STATUS □ ■ □ ■	OS PHASE3
9	STATUS □ ■ □ □	OS PHASE4
10	STATUS □ □ □ ☆	Startup completed.

The system enters the No.10 status when the Fast Ethernet/Fast data server starts normally. This status is maintained until an error occurs.

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STATUS LED indications if an error occurs

If an error occurs, the LEDs repeatedly flash "LONG" then "SHORT." (For "LONG," the LED lights for a long time. For "SHORT," the LED lights for a short time.)

No.	STATUS LED indication		Board state	
	LONG 4 3 2 1	**SHORT** 4 3 2 1		
1	■ ■ □ □	□ □ ■ ■	Failure caused by this board	SDRAM parity alarm
2	■ □ ■ □	□ □ □ □		General invalid instruction
3	■ □ ■ □	□ □ □ ■		Invalid slot instruction
4	■ ■ □ □	□ □ □ ■	Failure caused by another board	NMI of another module

> **NOTE**
> If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

ALARM LED indications if an error occurs

No.	LED indication	Board state
1	ALM ■	Parity error occurred in memory.

LED indications for communication in progress

No.	LED indication	Status of communication
1	ROS ☆	Blinks at intervals of 1 second when the communication software on the FL-net board is running normally.
2	RES □	Usually stays on.
3	LNK ■	Lights when the board is in a session over the FL-net.
4	POK ■	Lights when all FL-net parameters are normal.

LED indications related to communication status

No.	STATUS LED indication	Board state
1	COM ■	Lights when data is sent.
2	LIL ■	Lights when the Fast Ethernet/Fast data server is successfully connected to the hub.
3	COL ■	Lights if a data collision occurs.

NOTE
LIL:
  Communication is not performed while this LED is
  not lit. A probable reason for this is that the Fast
  Ethernet/Fast data server is not properly
  connected to the hub, or that the hub is off. This
  LED should be lit at all times while the Fast
  Ethernet/Fast data server is properly connected to
  the hub.
COL:
  If this LED lights frequently, it is likely that a
  communication failure may have occurred due to
  noise or an Ethernet product other than the FL-net
  may have been connected, because the FL-net
  uses tokens to manage the right to send so that no
  collision will occur.

NOTE
  If an error, indicated by repeatedly flashing a
  LONG and SHORT combination other than the
  above, occurs, contact FANUC.

5.1.6   PROFIBUS Board

- Specification

Item	Ordering code	Remarks
PROFIBUS Master board	A20B-8101-0050	Master function only
PROFIBUS Slave board	A20B-8101-0100	Slave function only

- Connector mounting location

[PROFIBUS Master board]
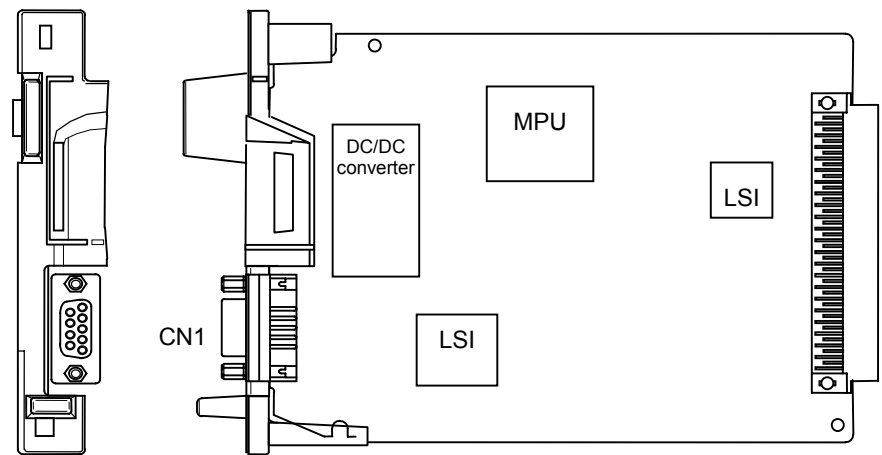
[PROFIBUS Slave board]
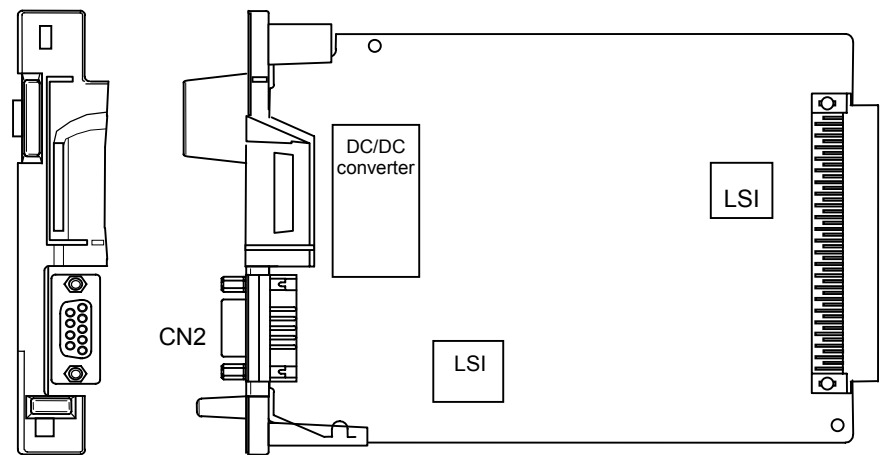
- LED indicators and their meanings

[LED indicators for DP-Master function]


```
NOTE
   The face plate is indicated by the broken line.
```

LED name	Color	Description
LED1	Green	Indicates that the CPU on this board has started running. ON: RESET has been released, allowing the CPU to start running. The LED is turned off when the power is turned on.
LED2	Green	Indicates whether communication is being normally carried out. ON: Communication is being normally carried out. OFF: Communication is not being carried out. The LED is turned off when the power is turned on.

[LED indicators for DP-Slave function]

CN2

LEDB   LED3   LED2   LED1

```
NOTE
  The face plate is indicated by the broken line.
```

LED name	Color	Description
LED1	Green	Indicates that the CPU on this board has started running. ON: RESET has been released, allowing the CPU to start running. The LED is turned off when the power is turned on.
LED2	Green	Indicates that communication has started. ON: Communication has started. The LED is turned off when the power is turned on or if: - No parameter configuration data has been received. - Invalid parameter configuration data has been received.
LED3	Green	Indicates whether communication is being normally carried out. ON: Communication is being normally carried out. OFF: Communication is not being carried out. The LED is turned off when the power is turned on.
LEDB	Green	Indicates that a RAM parity alarm condition has occurred on this board. ON: A RAM parity alarm condition has occurred. The LED is turned off when the power is turned on. Once it has been turned on, it stays on until the power is turned off.

5.1.7   **DeviceNet Master Board**
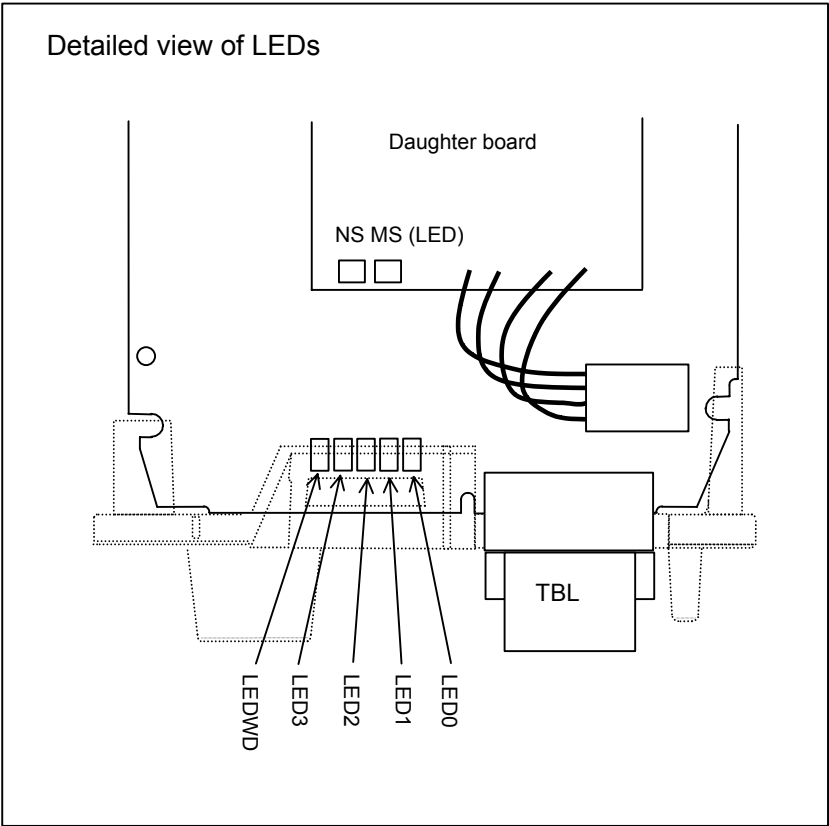
- Specification

Item	Ordering code
DeviceNet master board	A20B-8101-0220

- Connector mounting location
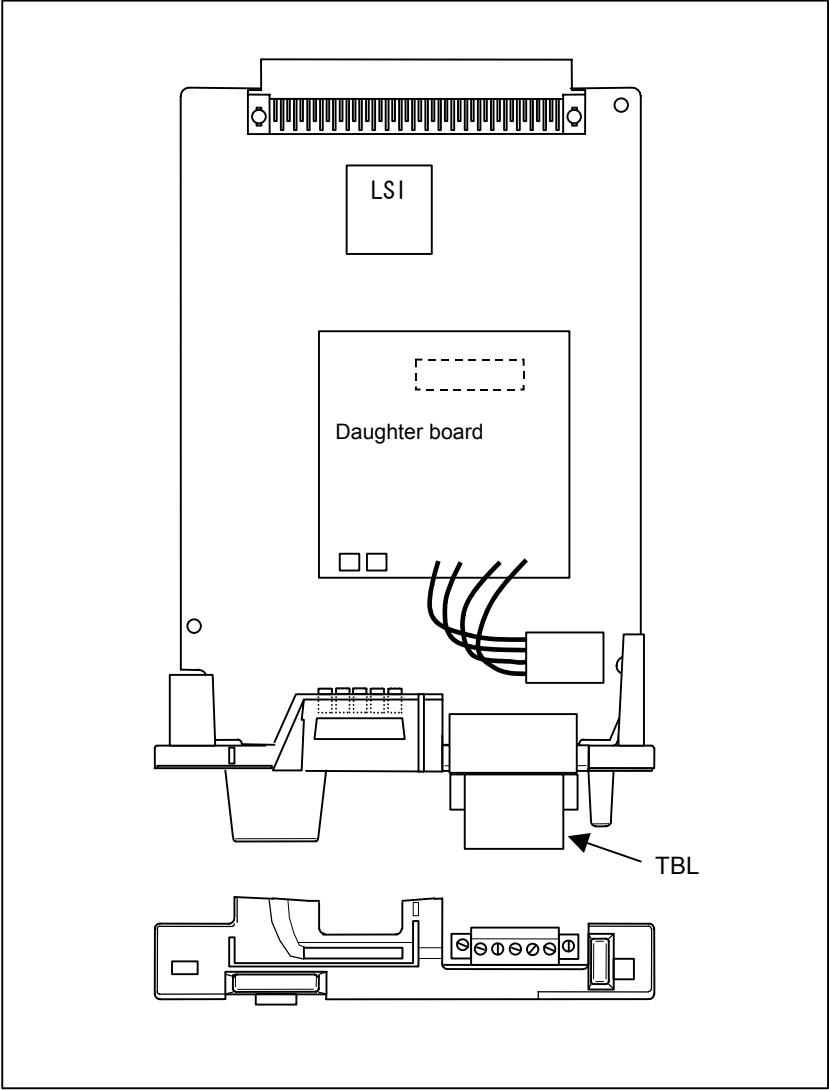
Connector number	Use
TBL	Outside-line connector

- LED indications

```
┌─────────────────────────────────────────────┐
│                                             │
│   Detailed view of LEDs                     │
│                                             │
│                    Daughter board           │
│                                             │
│              NS MS (LED)                     │
│              □ □                            │
│                                             │
│                                             │
│        ○                                    │
│                                             │
│            □□□□□            TBL             │
│            ↑↑↑↑↑                           │
│                                             │
│          L L L L L                          │
│          E E E E E                          │
│          D D D D D                          │
│          W 3 2 1 0                          │
│          D                                  │
│                                             │
└─────────────────────────────────────────────┘
```

This board provides four green LEDs (STATUS) and one red LED (ALARM) for status indication.
In addition, the internal daughter board has two LEDs that emit red and green light.

Name	Color	Description
LED0 to 3	Green	Indicates the activation state of the DeviceNet software.
LEDWD	Red	Indicates an error on the daughter board.
MS	Red/Green	MS (Module Status) indicates the states of nodes.
NS	Red/Green	NS (Network Status) indicates the state of the network.

In the following explanations, the LED lighting states are expressed as follows:
□: Off   ■: On   ☆: Blinking   ◊: Don't care

LED display transition for LED0, LED1, LED2, and LED3 (during power-on)

LED indication L3L2L1L0	State and cause when stopped after power-on	Action when stopped after power-on
□□□□	Power-off	
■■■■	After power-on, the DeviceNet application software does not start.	Store the DeviceNet application software in the flash ROM of the CNC.
□□□□	Initializing the firmware on the daughter board.	Replace the DeviceNet master board.
□□□■	Checking memory on the daughter board.	
□□■□	Recognizing the firmware on the daughter board.	
□□■■	Reading DeviceNet parameters.	Enable the DeviceNet master function (software option).
□■□□	Verifying that DeviceNet parameter "network" is set to "online."	Set DeviceNet parameter "network" to "online."
□■□■	Setting the bus parameter in DeviceNet parameters.	Replace the DeviceNet master board.
□■■□	Setting the slave parameter in DeviceNet parameters.	Set the slave parameter in DeviceNet parameters correctly. Or, replace the DeviceNet master board.
□■■■	Checking duplicate MAC IDs.	Check duplication with the MAC ID of a slave device. Check if cables are connected correctly. Check if power for communication is correctly supplied. Check if slave devices are turned on.
■□□□	The DeviceNet application software has been initialized and I/O communication starts.	

LED indication of LEDWD

LED indication	Status	Description
■	Daughter board failure	The daughter board failed. Replace the DeviceNet master board.

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LED indication of MS and NS (during normal operation)

LED indication	Status	Description
MS □ NS □	Immediately after power-on	The MPU on the daughter board is being reset.
MS ☆ Green NS □	Initializing	The firmware on the daughter board is making a initialization.
MS ■ Green NS □	Checking duplication of MAC IDs	The firmware on the daughter board is checking duplicated MAC IDs.
MS ■ Green NS ☆ Green	I/O communication stopped	The firmware on the daughter board is stopping I/O communication.
MS ■ Green NS ■ Green	I/O communication in advance	The firmware on the daughter board is successfully performing I/O communication.

LED indication of MS and NS (during occurrence of an error)

LED indication	Status	Error and action
MS ☆ Red NS ◊	Daughter board failure	The daughter board failed. Replace the DeviceNet master board.
MS ■ Red NS □	Daughter board failure	The daughter board failed. Replace the DeviceNet master board.
MS ◊ NS ■ Red	Duplicate MAC IDs	MAC IDs are duplicate. Verify the following: ✔ MAC IDs are not duplicate by check the MAC IDs of all nodes.
	Busoff detection	Communication stopped because a communication error occurred frequently. Verify the following: ✔ The communication rates of all nodes are set to the same value. ✔ The cable length is appropriate. ✔ The cable is not loose or broken. ✔ A terminal is placed on only both ends of the main line. ✔ There are not much noise.
MS ◊ NS □	Network power failure	Power for communication is not supplied. Verify the following: ✔ Power for communication is properly supplied.
	Transmission error	Transmission is not completed successfully. Verify the following: ✔ All slaves are turned on. ✔ There is no other master on the network. ✔ The communication rates of all nodes are set to the same value. ✔ The cable length is appropriate. ✔ The cable is not loose or broken. ✔ A terminal is placed on only both ends of the main line. ✔ There are not much noise.

LED indication	Status	Error and action
MS ◊ NS ☆ Red	Slave not present	No slaves are present. Verify the following: ✔ The slave is turned on. ✔ The communication rates of all nodes are set to the same value. ✔ The cable length is appropriate. ✔ The cable is not loose or broken. ✔ A terminal is placed on only both ends of the main line. ✔ There are not much noise.
	Slave I/O size mismatch	The slave I/O size setting does not match the setting of the actual slave. Verify the following: ✔ The slave I/O size setting matches the setting of the actual slave.
	I/O communica tion error	I/O communication timed out. Verify the following: ✔ The communication rates of all nodes are set to the same value. ✔ The cable length is appropriate. ✔ The cable is not loose or broken. ✔ A terminal is placed on only both ends of the main line. ✔ There are not much noise.

5.2 INSERTING AND EXTRACTING OPTION PCB

5.2.1 Method of Extraction

<1> Detach the cable connected to the option board and the cable that interferes when the option board is extracted.
<2> Pinch handles A and B for extraction.
<3> Pinch handle A, and extract the printed circuit board while disengaging the latch.

> **NOTE**
> The mini-slot option board can be extracted without extracting the main CPU board and full-size option board.

5.2.2 Method of Insertion

<1> Pinch handles A and B for extraction, then insert the option board until the option board plugs into the connector of the back panel.
<2> Plug the detached cables again correctly.

For LCD-mounted type control unit
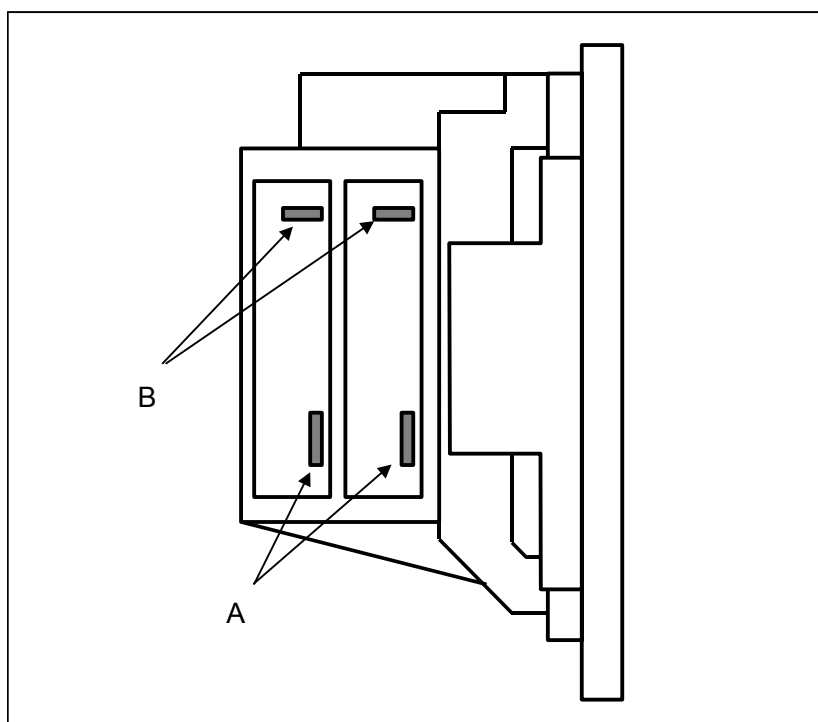
For stand-alone type control unit

5.3   MOUNTING AND DEMOUNTING CARD PCBS

> ⚠ **WARNING**
> Only those personnel who have received approved safety and maintenance training may perform this replacement work.
> When opening the cabinet and replacing a card PCB, 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.

> ⚠ **CAUTION**
> Before starting replacement work, back up the SRAM data of the CNC. Otherwise, the contents of the SRAM memory may be lost during replacement work. (See Appendix C.2.5.)

5.3.1   Method of Extraction

<1> Pull up the spacer metal fitting.

<2> A molded cover is attached to a corner of the servo card and CPU card although the shapes of the covers attached to the cards differ from each other. Insert a finger into the rear of the cover and pull up the cover slowly in the arrow direction shown in the figure below. (Note: At this time, hold the neighborhood of the main board on the opposite side with the other hand whenever possible. A force of 7 to 8 kgf is required for extraction. Be careful not to drop the card board due to the momentum of extraction.)

<3> When one side of the card board is raised slightly by pulling up the cover, do not fully extract the card board, but push back the cover softly.

<4> When the card board is pushed back to be parallel with the main board, pinch two sides of the card board and pull up the card board. This completes the extraction of the card board.

For extraction, insert a finger into the rear of this cover, then pull up the cover in the arrow direction.

Please put a finger in the reverse of this part and pull up this part when removing this PCB.

Connector side

240-pin connector on the back

Spacer side

Top view of the servo card

Push back the cover softly.

Step 2-2

Step 2-3

Side view

Connector side

240-pin connector on the back

Spacer side

Top view of the CPU card

5.3.2   **Method of Insertion**

<1> Check that the metal fittings of the spacers are raised.

<2> To align the card board insertion position, touch the spacer fixing end faces of the card board with the spacers as shown in the figure below. (At this time, the board can be touched with the spacers for easier position alignment by slightly holding up the connector side and lowering the spacer side only.)

<3> While aligning the card board with the spacers, lower the connector side slowly then cause the connectors to touch each other.

<4> The mating position can be determined more easily by moving the card board back and forth slightly in the arrow direction.

<5> Push the connector side of the card board slowly. At this time, push the card board against the board on the rear side of the connector. The force required for connector insertion is about 10 kgf. If the connector cannot be mated by a force of about 10 kgf or more, the card board may be aligned incorrectly, and the connector can break. In this case, realign the card board. (Note: Do not press the radiation fin installed on a CPU and LSI chip. Otherwise, the radiation fin can break.)

<6> Push in the spacer metal fittings.

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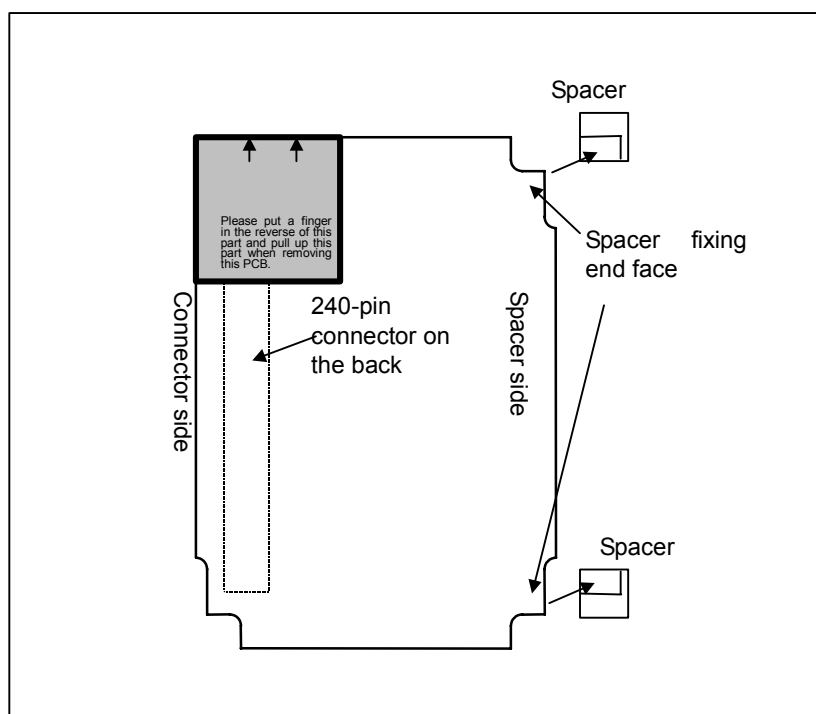
5.4 MOUNTING AND DEMOUNTING DIMM MODULES

> ⚠ **WARNING**
> Only those personnel who have received approved safety and maintenance training may perform this replacement work.
> When opening the cabinet and replacing a module, 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.

> ⚠ **CAUTION**
> Before starting replacement work, back up the SRAM data of the CNC. Otherwise, the contents of the SRAM memory may be lost during replacement work.
> Before replacing the SRAM module, make a backup copy of the SRAM data.   Restore it after replacement.   (See Appendix C.2.5.)

5.4.1   Demounting a DIMM Module

(1) Open the claw of the socket outward. (See Fig. a.)

(2) Extract the module slantly upward. (See Fig. b.)

5.4.2   Mounting a DIMM Module

(1) Insert the module slantly into the module socket, with side B facing upward. (See Fig. b.)

(2) Push the module downward until it is locked. (See Fig. c.)
    At this time, push it down with pushing two points of (*) in the figure.

Fig. a

Fig. b

B-SIDE

Fig. c

(*)

(*)
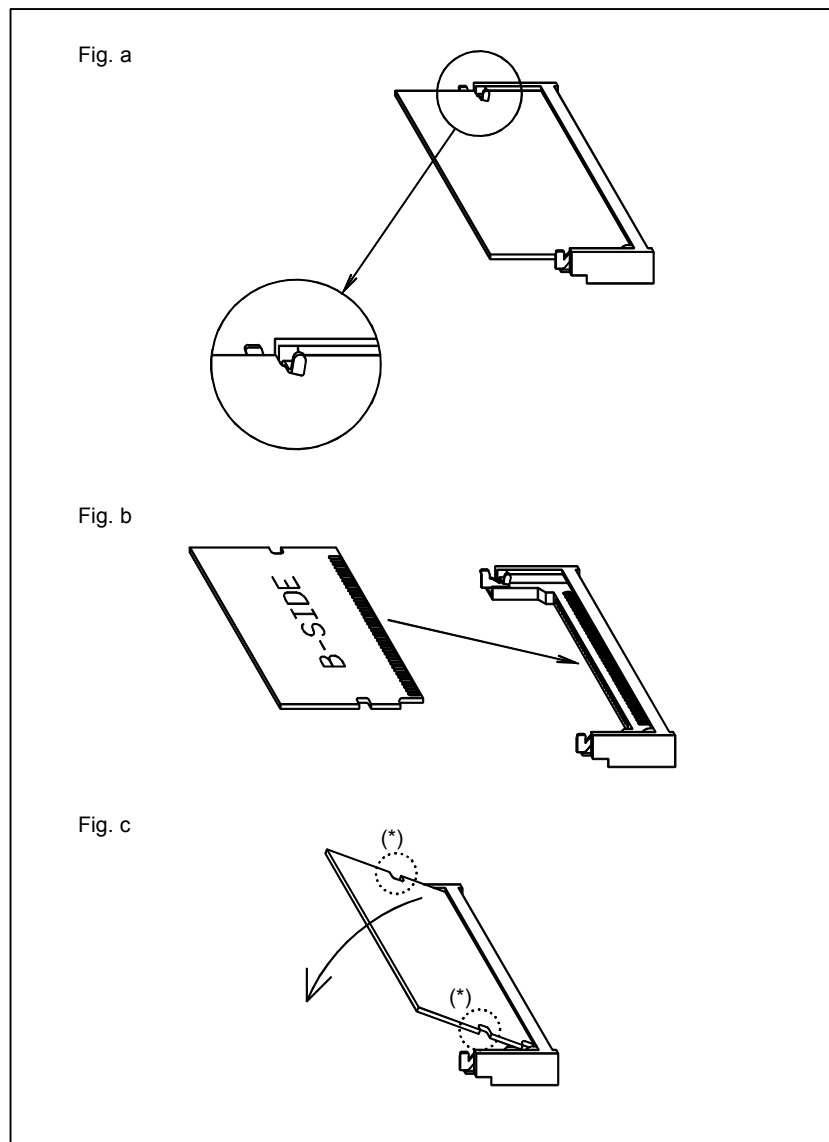
5.5   INSERTING AND EXTRACTING A COMPACT FLASH / GUI CARD ON THE DISPLAY CONTROL CARD

> ⚠ **WARNING**
> Only those personnel who have received approved safety and maintenance training may perform this replacement work.
> When opening the cabinet and replacing the module, 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.

> ⚠ **CAUTION**
> Before starting replacement work, back up the SRAM data of the CNC. Otherwise, the contents of the SRAM memory may be lost during replacement work. (See Appendix C.2.5.)

5.5.1   **Method of Extraction**

<1> Face side B of the display control / GUI card upward, then pull up the retainer of the socket.

<2> Turn the latch toward the far side, then extract the compact flash card.

5.5.2   **Method of Insertion**

<1> Pull up the retainer, then insert a compact flash card into the socket.

<2> Push the card until it is locked.

<3> Lower the retainer to hold the card.
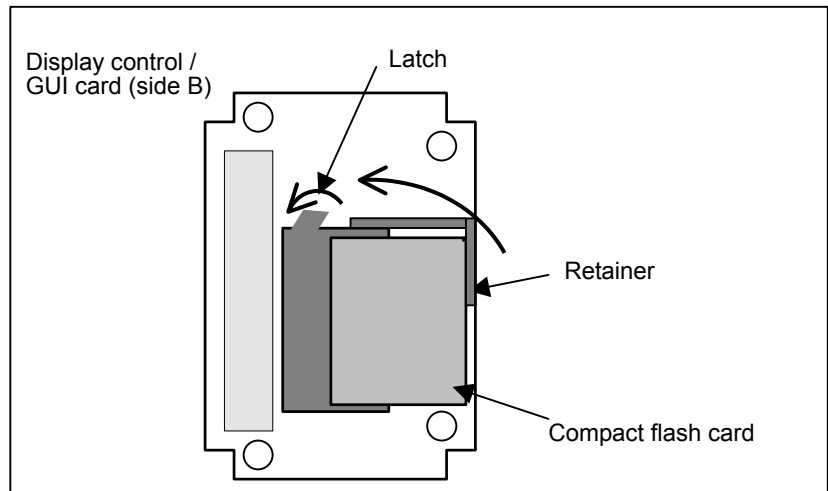
5.6 OTHER UNITS

5.6.1 Separate Detector Interface Unit

- **Specification**

Name	Specification
Basic unit	A02B-0303-C205
Additional unit	A02B-0236-C204

- **Connector mounting location**
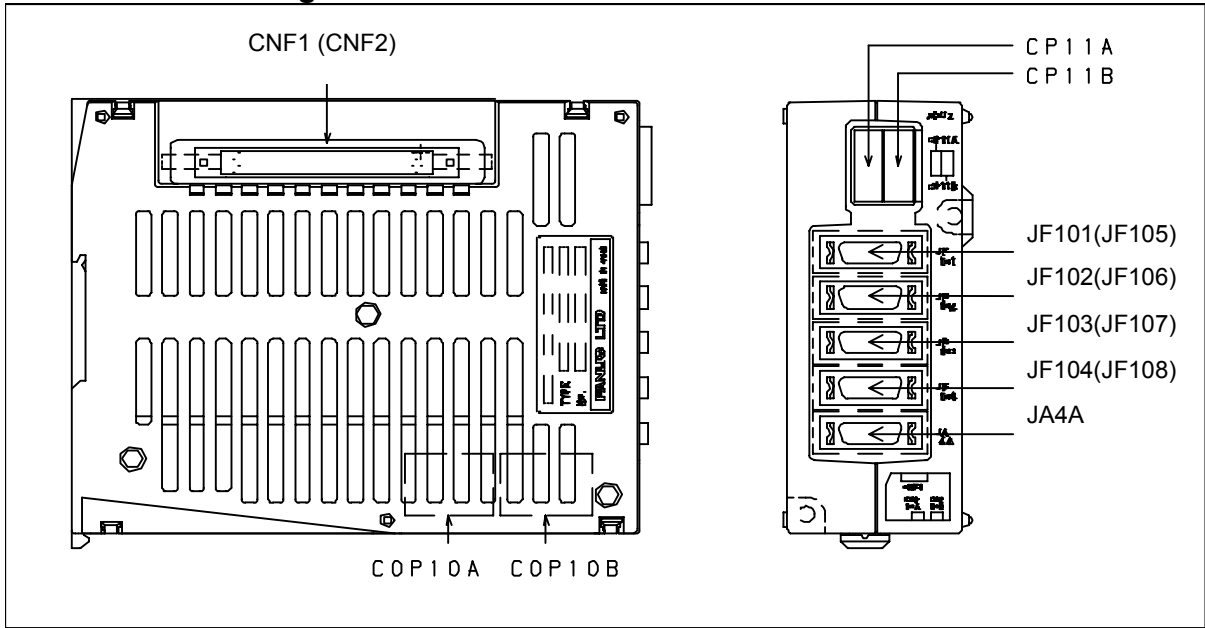
The parenthesized connector names are for the additional unit.

Connector number	Application
CP11A	24 VDC power input
CP11B	24 VDC power output
COP10A	Back stage of the FSSB interface
COP10B	Front stage of the FSSB interface
JF101 to JF104 (JF105 to JF108)	Separate detector interface
JA4A	Connection of a battery for the absolute detector
CNF1 (CNF2)	Connection of the additional unit

The parenthesized connector names are for the additional unit.

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- **LED display**

Status indication LEDs are installed on the board in the basic unit case. Two green LEDs (POWER and OPEN) and two red LEDs (ERR1 and ERR2) are provided. The locations and meanings of the LEDs are indicated below.
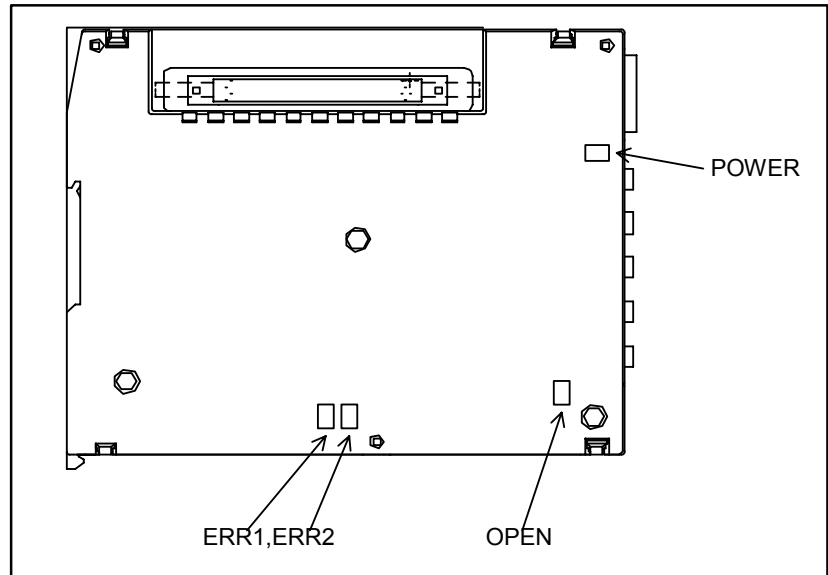
LED indication

No.	LED	Meaning
1	POWER	Turned on when the power is on
2	OPEN	Turned on when FSSB communication is performed
3	ERR1	Turned on when COP10A (back stage) is disconnected
4	ERR2	Turned on when COP10B (front stage) is disconnected

5.6.2   Analog Input Separate Detector Interface Unit

- Specification

Name	Specification
Basic unit	A06B-6061-C201

No dedicated additional unit is available for the analog input separate detector interface unit.   The additional unit A02B-0236-C204 mentioned in the previous subsection can be used with this interface unit.

- Connector mounting location
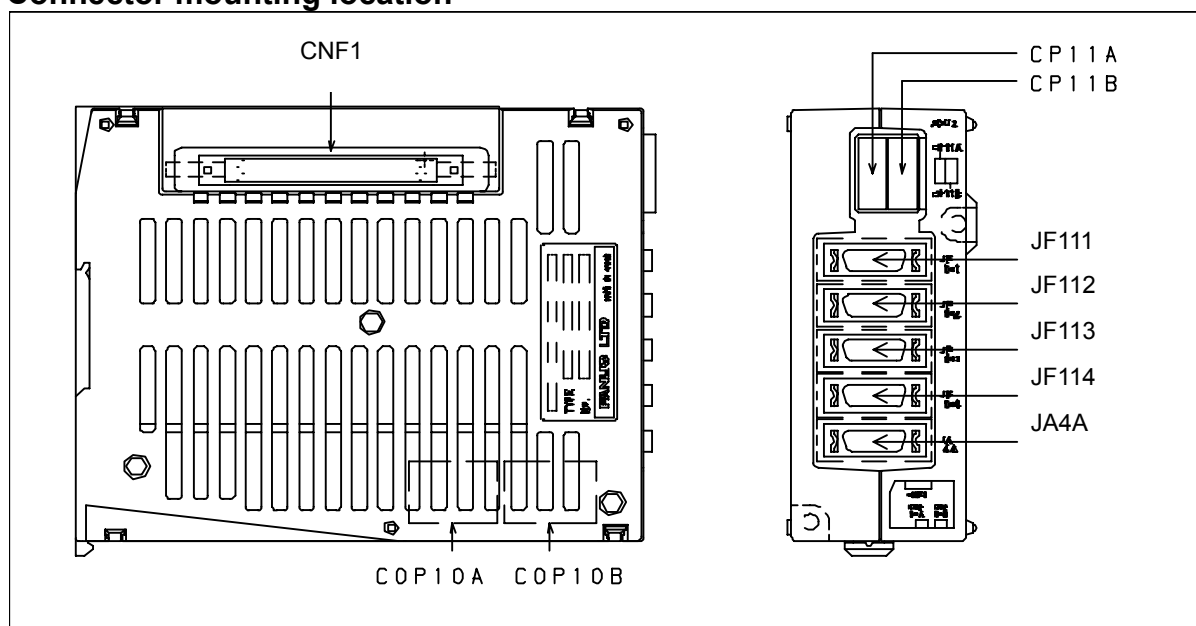
The parenthesized connector names are for the additional unit.

Connector number	Application
CP11A	24 VDC power input
CP11B	24 VDC power output
COP10A	Back stage of the FSSB interface
COP10B	Front stage of the FSSB interface
JF111 to JF114	Separate detector interface
JA4A	Connection of a battery for the absolute detector
CNF1	Connection of the additional unit

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- LED display

Status indication LEDs are installed on the board in the basic unit case. Two green LEDs (POWER and OPEN) and two red LEDs (ERR1 and ERR2) are provided. The locations and meanings of the LEDs are indicated below.
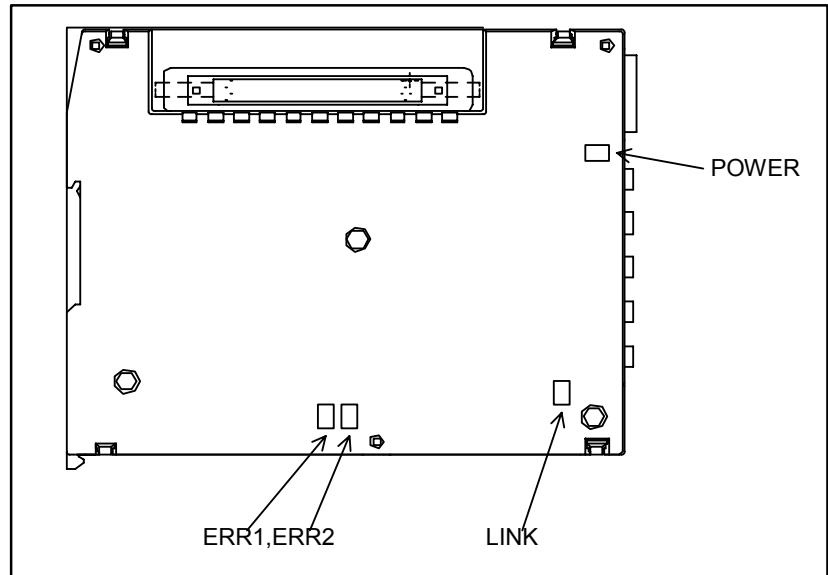
LED indication

No.	LED	Meaning
1	POWER	Turned on when the power is on
2	OPEN	Turned on when FSSB communication is performed
3	ERR1	Turned on when COP10A (back stage) is disconnected
4	ERR2	Turned on when COP10B (front stage) is disconnected

5.7   LIQUID CRYSTAL DISPLAY (LCD)

LCD with a touch panel

The touch panel is operated by directly touching the LCD screen. For this operation, be sure to use a FANUC-supplied pen (A02B-0236-K111) dedicated to the touch panel. If a sharp-pointed pen is used, for example, to touch the LCD screen, the LCD surface may be flawed or damaged. Moreover, do not touch the LCD screen directly with a finger. Otherwise, the operability of the LCD
may deteriorate, and the LCD screen may get dirty.

Protection sheet for the touch panel

A protection sheet is attached the face of an LCD with a touch panel to protect the thin film of the touch panel and LCD. If the protection sheet is damaged, it can be replaced. (The protection sheet is a consumable part.)

Replacing the protection sheet

● Materials used

(1) Protection sheet
     A02B-0236-K110 : For 10.4" LCD with touch panel
     A02B-0236-K118 : For 12.1" LCD with touch panel
     A08B-0082-K020 : For 15.0" LCD with touch panel
(2) Neutral detergent (detergent that can clean oily dirt off = detergent for kitchen can be used)
(3) Soft cloth (such as towel)

● Replacement procedure

(1) Before replacement
     <1> Turn off the power to the machine.
     <2> Peel off the old protection sheet from the surface of the touch panel.
     <3> Wipe off adhesive residue if any on the screen surface with alcohol.
     <4> Use the detergent to remove oil or dirt stuck to the surface of the touch panel.
     <5> With a soft, damp cloth, wipe off detergent completely.
          ☞ If the touch panel surface becomes cloudy, oil is still left on the surface. Remove oil completely.
          ☞ If oil or detergent is left on the surface of the touch panel, the protection sheet cannot adhere to the panel completely and will sometimes peel off easily.
     <6> With a dry soft cloth, wipe off moisture completely.

(2) Applying the protection sheet
     <1> Fold the tab over the front side (the side opposite to the backing sheet).

Fold
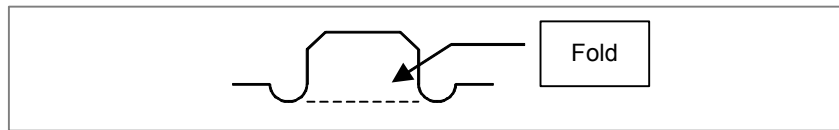
<2> Peel off the backing sheet.
<3> Position the sheet, then attach the upper and lower sides of the sheet first. Check that the sides of the protection sheet do not touch the escutcheon.

OK   NG
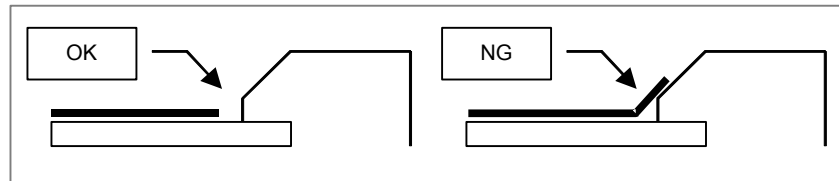
<4> Attach the right and left sides of the protection sheet while pushing out air between the touch panel and protection sheet.
☞ With part of the protection sheet kept stuck to the touch panel, do not attempt to correct the position of the protection sheet by pulling the sheet.
<5> Press the adhesive parts of the four sides, and attach the entire sheet completely.
☞ Check that the four corners and four sides of the protection sheet do not float.

(3) Checks after replacement
<1> Check that there is no wrinkle on the surface of the protection sheet.
<2> After power-on, check that there is no touch panel portion kept pressed.
<3> Press the touch panel, and check that correct operation takes place.

Touch panel calibration
- Conditions that require calibration

Touch panel calibration is needed under the following conditions:
(1) The LCD unit was replaced.
(2) The touch panel was replaced.
(3) The touch panel control printed-circuit board was replaced.
(4) Memory all clear was performed.

- Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
3113			DCL					

[Input type]   Parameter input
[Data type]   Bit

 # 5   **DCL**   The touch panel compensation screen is:
0:   Disabled.
1:   Enabled.
Set this parameter to 0 usually.   Touch panel compensation becomes necessary only when the panel is replaced or memory all clear operation is performed.   Set this parameter to 1 only when performing touch panel compensation.   Upon completion of compensation, set this parameter to 0.

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

[Input type]   Parameter input
[Data type]   Bit

 # 2   **DDS**   The touch panel is:
0:   Enabled.
1:   Disabled.
Set this parameter to 1 when disabling the touch panel temporarily, for example, at start-up time.

- Calibration method

Calibration procedure
<1> Enable the touch panel calibration screen.(Set bit 5 (DCL) of parameter No. 3113 to 1.)
<2> Press function key [SYSTEM].
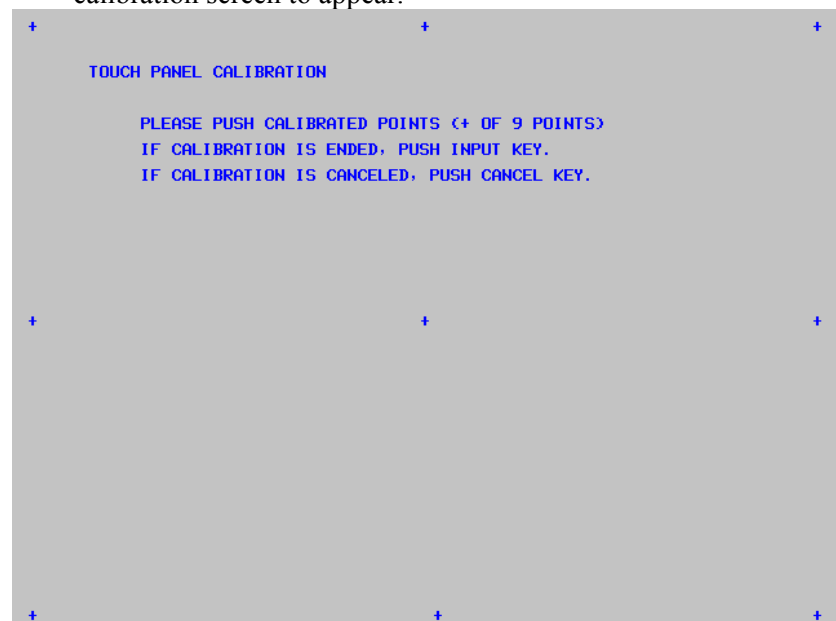<3> Press the continuous menu key [▷] several times. The [TOUCH PANEL] soft key is displayed.

<4> Press the [TOUCH PANEL] soft key then the [(OPRT)] soft key. The [TP CAL] soft key is displayed.
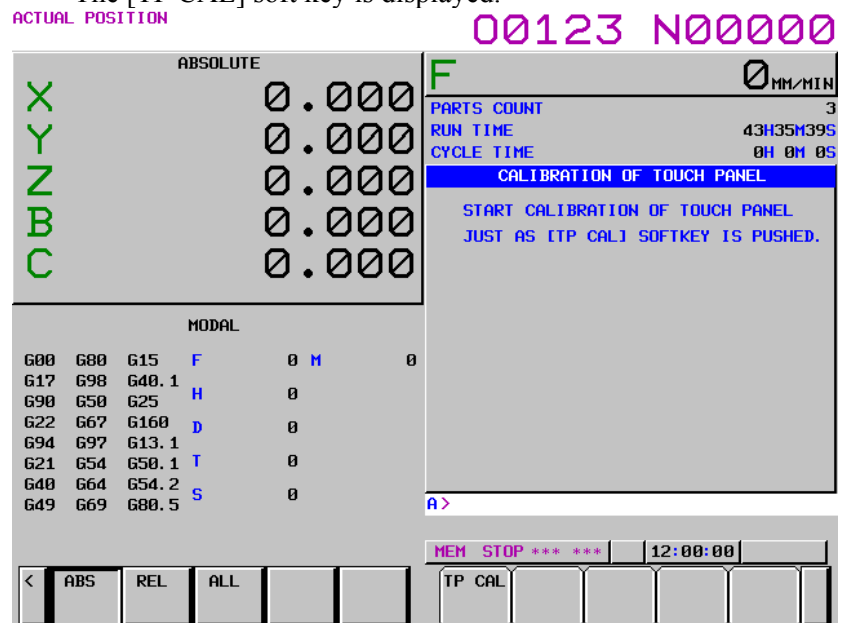
<5> Pressing the [TP CAL] soft key causes a full-screen touch panel calibration screen to appear.

<6> Click the 9 calibration points with a stylus pen.   The marker of a normally clicked point changes from "+" to "o".   If you fail to click right on a "+" mark, the message "Your stylus pen is not right on a "+" mark.   Click again." appears.

<7> After clicking all 9 calibration points, clicking the <INPUT> key completes calibration.   To quit or retry calibration, click the <CAN> key.   The previous screen appears again.   Before clicking 9 calibration points, clicking the <INPUT> key aborts calibration.

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<8> When calibration ends normally, the message "Calibration ended" appears.

<9> After completing calibration, disable the touch panel calibration screen (by resetting the DCL parameter (bit 5 of parameter No. 3113) to 0) to prevent operation mistake.

5.8   DISTRIBUTED I/O SETTING

By changing the setting (rotary switch) on an expansion module, a connection can be made to skip an expansion module or expansion modules as shown below.
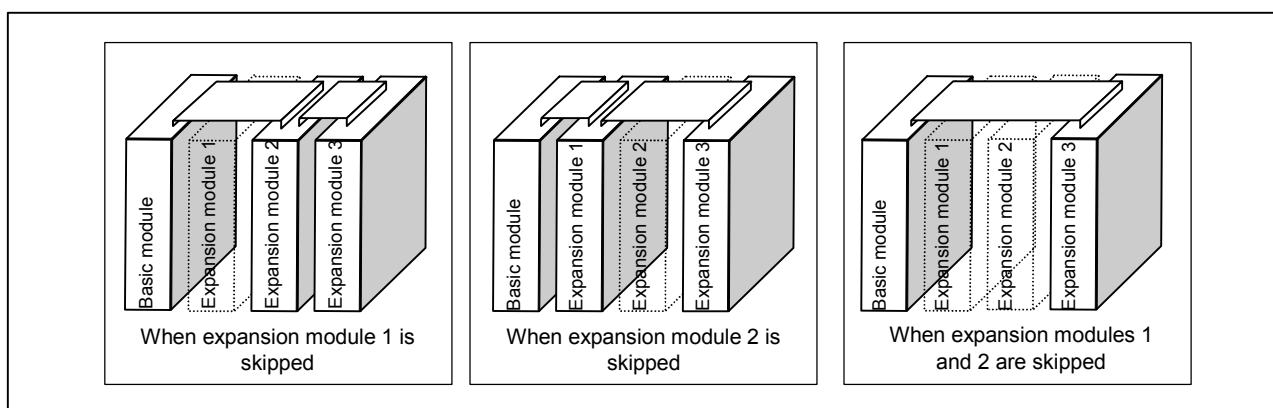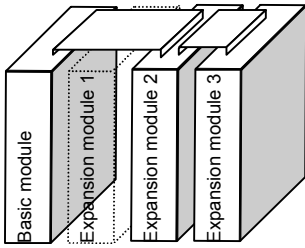

Method of setting (control and setting method)

A control (rotary switch) is provided on the location shown below of each expansion module. When changing the setting, turn the rotary switch with a flat-blade screwdriver with a tip diameter of about 2.5 mm.
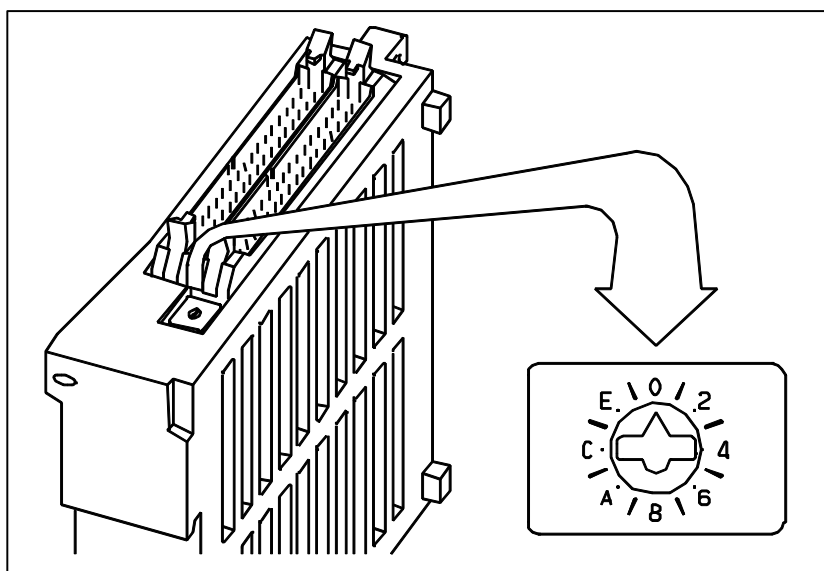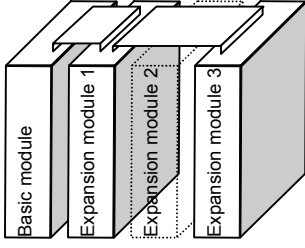
Each setting position of the rotary switch has the meaning as indicated below.

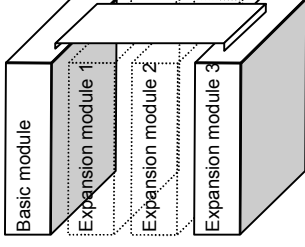| Setting position	Indication	Meaning of setting
0	0	Standard setting. The rotary switch is set to this position at the time of shipment from FANUC. This setting is not skipped an expansion module.
1	-	Set the rotary switch of an expansion module to this position when the one preceding expansion module is skipped.
2	2	Set the rotary switch of an expansion module to this position when the two preceding expansion modules are skipped.
3	-	Setting prohibited
4 to F	4, -, 6, -, 8, -, A, -, C, -, E, -,	4, 8, or C has the effect of 0. 5, 9, or D has the effect of 1. 6, A, or E has the effect of 2. 7, B, or F has the effect of 3. (u setting prohibited)

Examples of setting

 (When expansion module 1 is skipped)
Set the rotary switch of expansion module 2 to setting position = 1. Do not change the setting (setting position = 0) of expansion module 3.

(When expansion module 2 is skipped)
Set the rotary switch of expansion module 3 to setting position = 1. Do not change the setting (setting position = 0) of expansion module 1.

(When expansion module 1 and expansion module 2 are skipped)
Set the rotary switch of expansion module 3 to setting position = 2.

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This function was not available initially, but was recently added. This function became available, depending on the type of module, as indicated below.

Expansion module B (DI/DO = 24/16, without a manual pulse generator interface)	A03B-0815-C003	Available starting with shipment in June 1998 and later
Expansion module C (DO = 16, 24A output)	A03B-0815-C004	Available starting with shipment in August 1998 and later
Expansion module D (analog input)	A03B-0815-C005	Available starting with shipment in August 1998 and later

NOTE
To expansion module A (DI/DO = 24/16, with a manual pulse generator interface) (A03B-0815-C002), a rotary switch is added as the other modules are modified. However, expansion module A is always installed at the location of expansion module 1, so that the setting of expansion module A need not be changed.
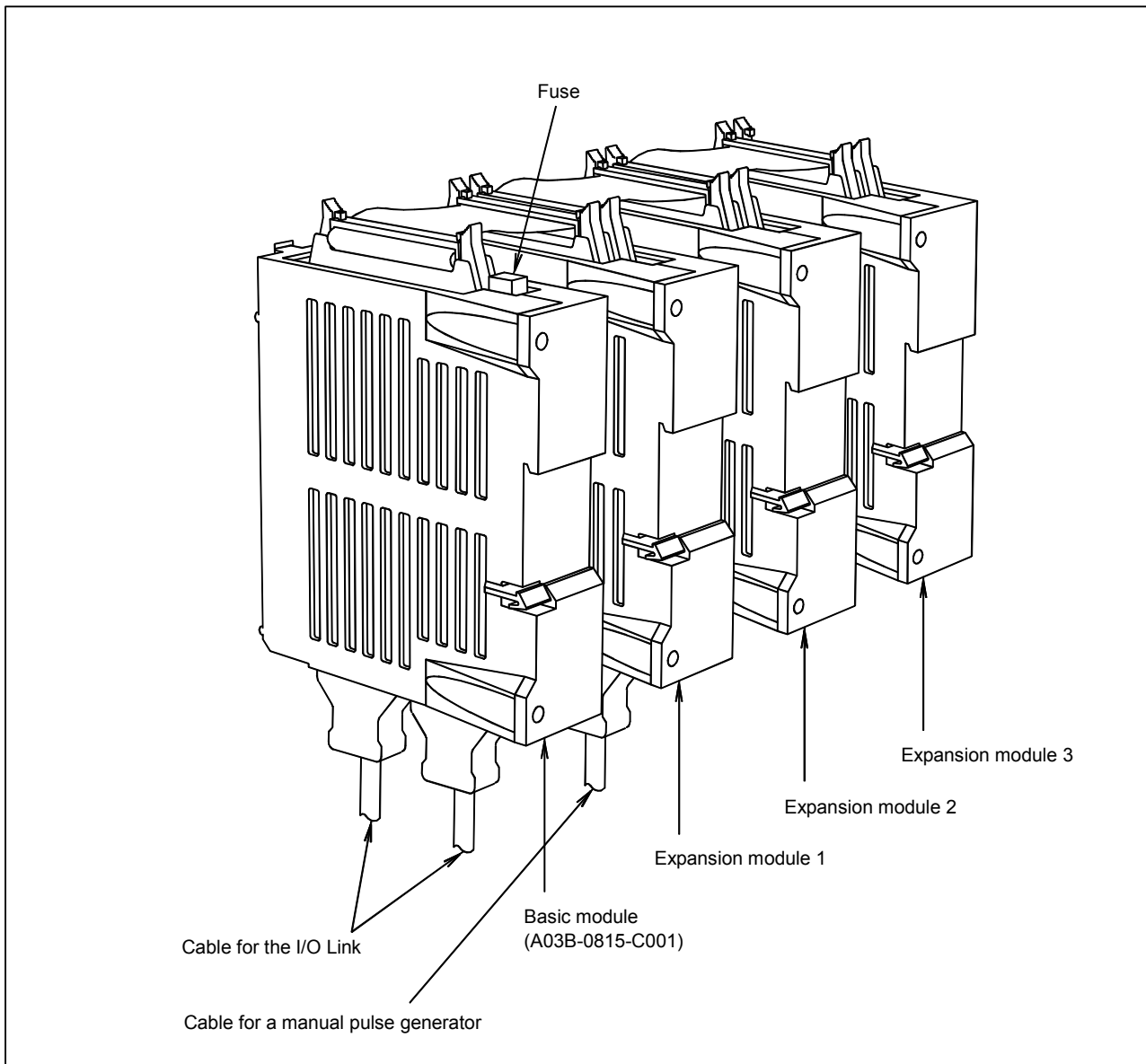
5.9   REPLACING FUSES ON VARIOUS UNITS

> ⚠ **WARNING**
> Before replacement of a blown fuse, the cause of
> the blown fuse must be corrected. So, fuse
> replacement work must be done only by a person
> who is trained in the related maintenance and
> safety requirements. When opening the cabinet
> and replacing a fuse inside, be careful not to touch
> the high-voltage circuits (marked with ⚠ and fitted
> with an insulating cover). Touching the uncovered
> high-voltage circuits presents an extremely
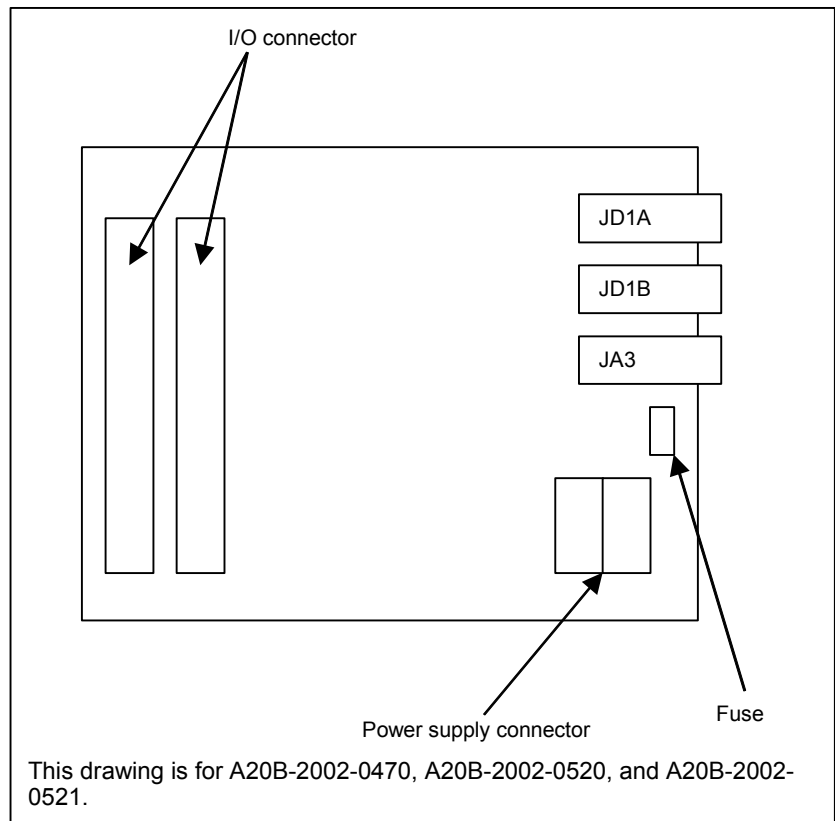> dangerous electric shock hazard.

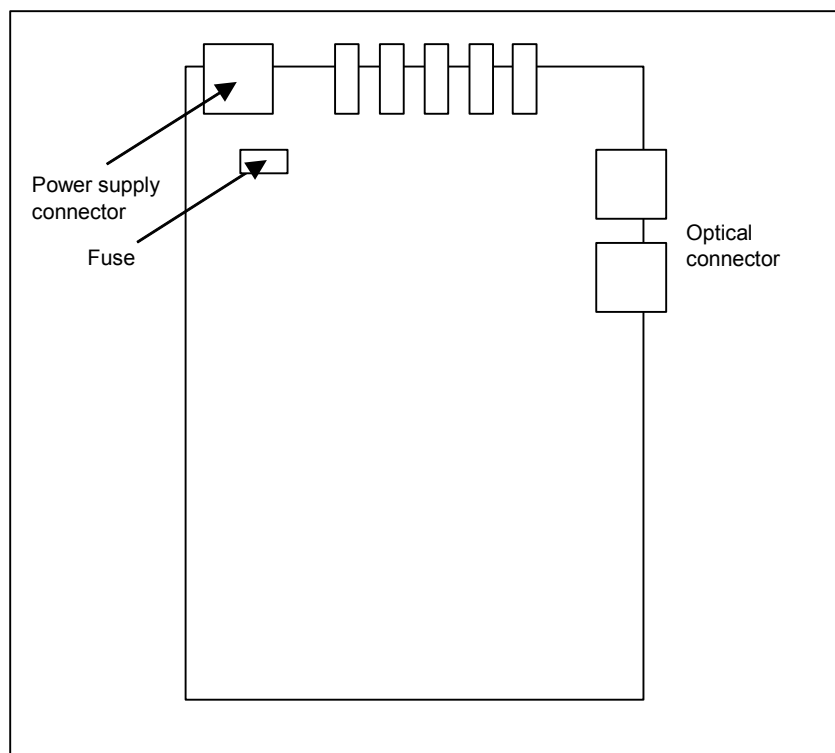For the specification of the fuse of each unit, see the list of
consumables in Appendix B.

- **Fuse mounting location on the connector panel I/O modules**

Fuse

Expansion module 3

Expansion module 2

Expansion module 1

Basic module
(A03B-0815-C001)

Cable for the I/O Link

Cable for a manual pulse generator

NOTE
No fuse is provided on the expansion modules. A
fuse is provided on the basic module only.

- Fuse mounting location on the operator's panel I/O modules

```
                    I/O connector

                                              JD1A

                                              JD1B

                                              JA3


                                                      Fuse


              Power supply connector

This drawing is for A20B-2002-0470, A20B-2002-0520, and A20B-2002-
0521.
```

- Fuse mounting location on the separate detector interface unit

```
              Power supply
              connector

                                                      Optical
              Fuse                                    connector
```

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5.10   ENVIRONMENTAL CONDITIONS OUTSIDE CABINET

The control units and various peripheral units supplied from FANUC are designed assuming that those units are accommodated in enclosed cabinets. The cabinets mentioned here include:

- Cabinet that is manufactured by a machine tool builder to house control units and peripheral units
- Operation pendant that is manufactured by a machine tool builder to house control units and an operator's panel
- Similar products

The table below indicates the environment conditions for installing control units in these cabinets.

	Condition	Display LCD-mounted type control unit and display unit (excluding units with a data server)	Display stand-alone type control unit
Ambient temperature of units	Operating	0 °C to 58 °C	0 °C to 55 °C
	Storage and transportation	-20 °C to 60 °C	
	Change in temperature	0.3 °C/minute max.	
Humidity	Normal	Relative humidity: 75% or less No condensation	
	Short term (not exceeding 1 month)	Relative humidity: 95% or less No condensation	

Vibration	Operating	0.5 G or less
		The evaluation test is performed under the following conditions.
		    10 to 58Hz : 0.075 mm (amplitude)
		    58 to 500Hz : 1 G
		    Direction of vibration: Each of X, Y, and Z
		    Sweep frequency: 10 cycles
		    The test conforms to IEC68–2–6.	

	Non-operating	1.0 G or less	
Height above sea level	Operating	Up to 1000m (Note)	
	Non-operating	Up to 12000m	
Atmosphere		The control units shall be kept from direct exposure to coolant, lubricant, and chippings. There shall be no corrosive gas.	

NOTE
When the CNC is installed at a height of more than 1000 m above the sear level, a restriction is imposed on the maximum allowable ambient temperature for the CNC inside the cabinet.
For every 100 m rise from 1000 m above the sea level, decrease the maximum allowable ambient temperature for the CNC by $1.0°C$.
Example: The maximum allowable ambient temperature for the CNC inside the cabinet installed at a height of 1750 m above the sea level is determined as follows:
$55°C - 1750/100 \times 1.0°C = 47.5°C$
So, the allowable ambient temperature range is $0°C$ to $47.5°C$.
When a hard disk is used, the following restrictions are imposed on the height of installation:
Height above the sea level for operation:
-60 m to 3000 m
Height above the sea level for non-operation:
-60 m to 12000 m

5.11   COUNTERMEASURES AGAINST NOISE

The CNC is becoming increasingly smaller as the surface mount technology and custom LSI technology advance.

In many cases, as the CNC becomes more compact, the mounting locations of its constituent units become closer to a noise source in the power magnetics cabinet.

In general, noise is generated by electrostatic coupling, electromagnetic induction, or a grounding loop, and is induced into the CNC.

The CNC incorporates sufficient countermeasures against external noise. However, it is difficult to measure the level and frequency of noise quantitatively, and many unknown factors are involved. So, to improve the operation stability of a CNC machine tool system, noise generation must be minimized, and the induction of generated noise into the CNC must be suppressed.

For design of equipment including a power magnetics cabinet, take these countermeasures on the machine side against noise into consideration.

5.11.1   Separation of Signal Lines

The cables used with a CNC machine tool are classified as indicated below. Handle the cables of each group according to the descriptions in the "Action" column.

Group	Signal	Action
A	Primary side AC power line Secondary side AC power line AC/DC power lines (including servo motor and spindle motor power lines) AC/DC solenoid AC/DC relay	Bind the cables of this group separately from the cables of groups B and C(*1), or electromagnetically shield the cables of this group from the cables of groups B and C(*2). According to the descriptions of noise suppressors in Section 5.8.4, attach a spark killer or diode to the solenoid and relay.
B	DC solenoid (24 VDC) DC relay (24 VDC) DI-DO cable between I/O unit power magnetics cabinets DI-DO cable between I/O unit machines 24-VDC input power cables for the control unit and its peripherals	Attach a diode to the DC solenoid and relay. Bind the cables of this group separately from the cables of group A, or electromagnetically shield the cables of this group from the cables of group A. Separate the cables of this group from the cables of group C as far as possible. Shielding is recommended.
C	CNC-I/O unit cable Cables for position loopback and velocity loopback CNC-spindle amplifier cable Position coder cable Manual pulse generator cable CNC-MDI cable (*3) RS-232C and RS-422 cables Battery cable Other cables whose shielding is specified	Bind the cables of this group separately from the cables of group A, or electromagnetically shield the cables of this group from the cables of group A. Separate the cables of this group from the cables of group B as far as possible. Shielding according to Section 5.8.5 is required.

> **NOTE**
> 1 Separate binding is to separate the bound cables of one group at least 10 cm from the bound cables of another group.
> 2 Electromagnetic shielding is to shield the bound cables of one group from the bound cables of another group with a grounded metal (iron) plate.
> 3 If the CNC-MDI cable is not longer than 30 cm, shielding is not required.
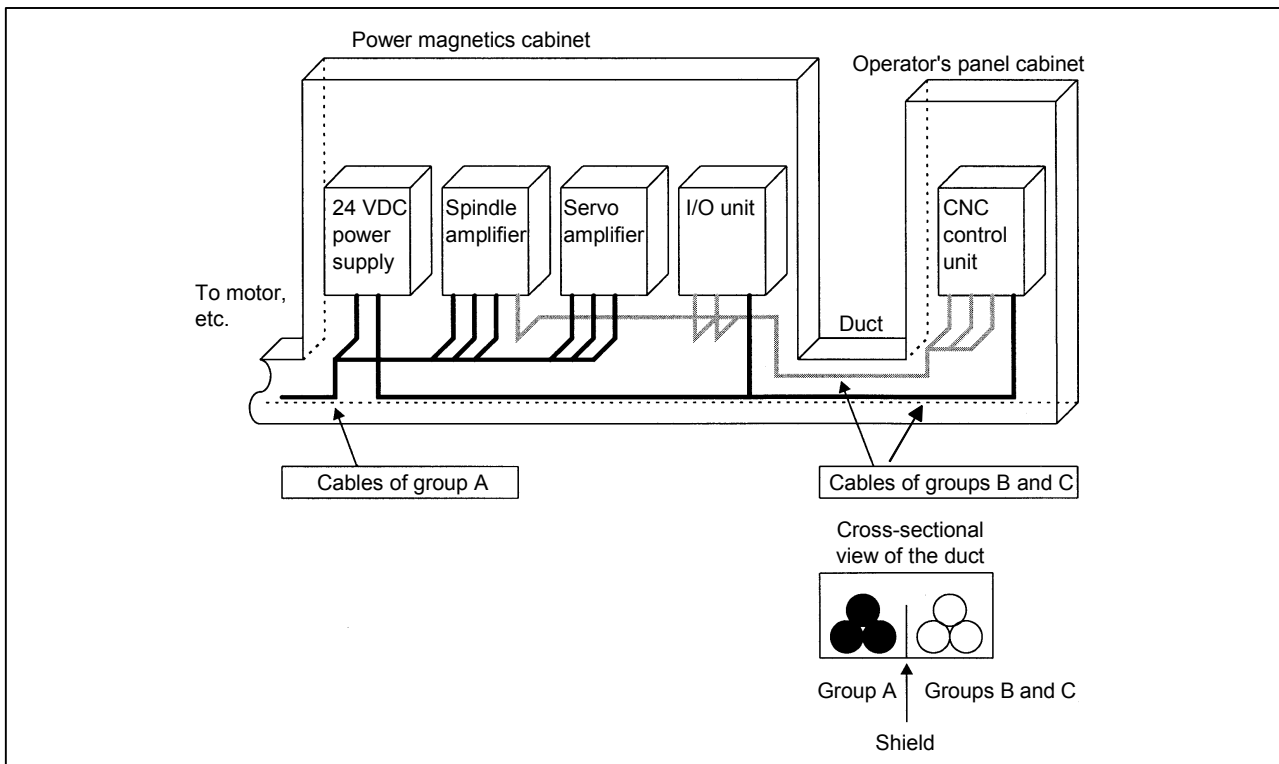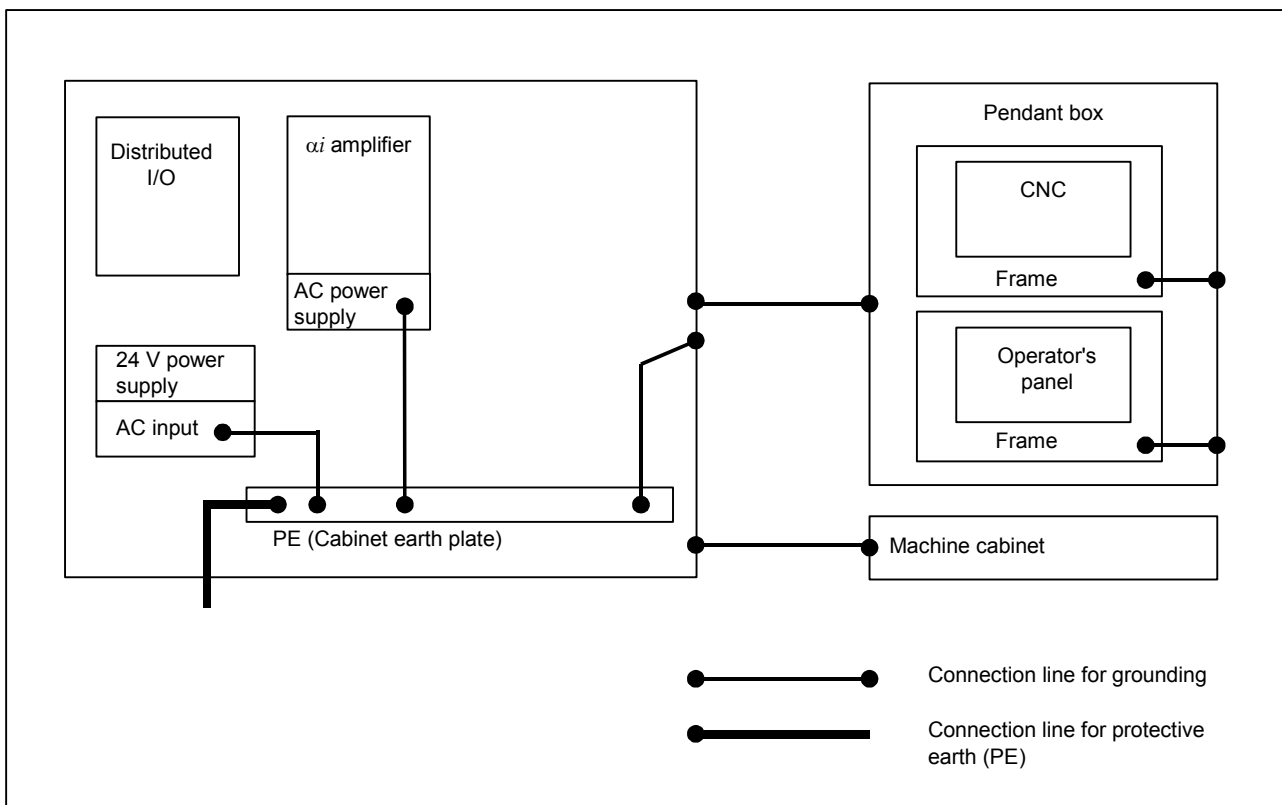
5.11.2   Grounding

With a CNC machine tool, three ground systems are used.
- Signal ground system (SG)
  Signal ground (SG) provides a reference voltage (0 V) for the electric signal system.
- Frame ground system (FG)
  The purposes of frame ground (FG) are to ensure safety and to provide shielding from external and internal noises. Specifically, the frames of equipment, unit cases, panels, inter-unit interface cables, and so forth are shielded.
- Protective earth (PE)
  The protective earth (PE) is designed so that the protective grounds provided between the units are connected to ground at one point from a system point of view.

Two CNC grounding methods are available for choice.

(1)   One-point grounding method

(2)   Method of grounding to a near plate
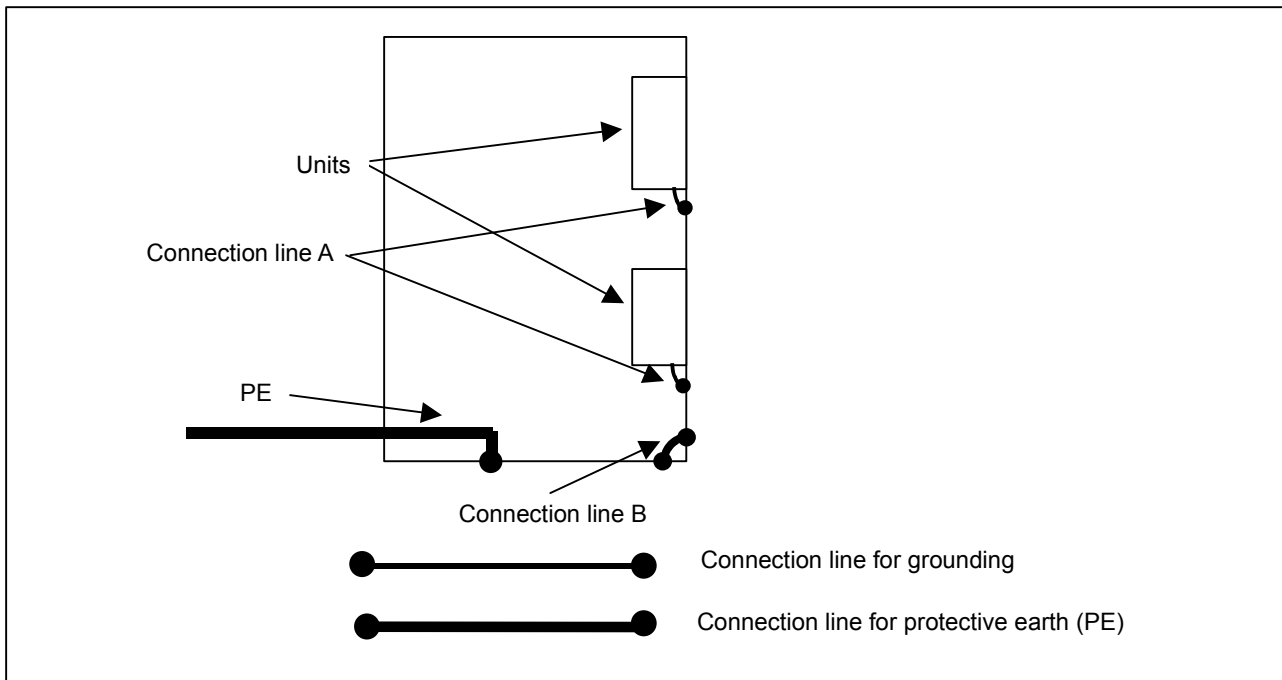
Notes on ground system wiring

- The grounding resistance of the protective earth (PE) must be 100 ohms or less (class-D grounding).
- The connection cable for the protective earth (PE) needs to have a cross-sectional area sufficient for flowing an accidental current that flows to the protective earth (PE) when an accident such as a short circuit occurs. (In general, a cross-sectional area equal to or greater than that of the AC power line is required.)
- As a connection cable for the protective earth (PE), use a cable integrated with an AC power line so that power is not fed when the ground wire is disconnected.
- A line for connecting a unit to a near plate (line A in the figure above) must be connected to the plate along the shortest path, and its cross-sectional area must satisfy the IEC condition described below. If the input current is limited by a circuit breaker, however, satisfaction of the current capacity of the circuit breaker is sufficient. If a cross-sectional area is specified in the manual of each unit, observe the specified value.
- For plate-to-plate connection, connect the metal plate to which the PE is connected with the metal plate to which units are connected, by using connection line B (as shown above). In this case, the thickness of the cable is determined by the AC input current capacity of each unit connected to the plate. If a cross-sectional area is specified in the manual of each unit, observe the specified value. If no cross-sectional area is specified, follow the table below. If the table indicates a thickness greater than the cross-sectional area of the connection cable for the protective earth (PE), however, use the cross-sectional area of the connection cable for the protective earth (PE).

Guideline for selecting a cross-sectional area of protective copper wire

Rated current of the fuse for protecting a circuit, or rated current of the overcurrent protective device [A]	Cross-sectional area of protective copper wire [mm²]
30	2 or more
50	3.5 or more
100	5.5 or more
150	8 or more
225	14 or more
400	22 or more
600	38 or more
800	50 or more
1000	60 or more
1200	80 or more
1600	100 or more
2000	125 or more
2500	150 or more
3200	200 or more
4000	250 or more

If the current is limited by a circuit breaker, satisfaction of the current capacity of the circuit breaker is sufficient. A connection made by welding is acceptable as long as the connection satisfies the current requirement.

* According to the IEC60204 requirement, a protective earth line must satisfy the following condition:
  Let S be the cross-sectional area of a connected power input line.
  $S \leq 16$ mm²   S
  16 mm²$<S \leq 35$ mm²   16 mm²
  35 mm²$<S$ S / 2

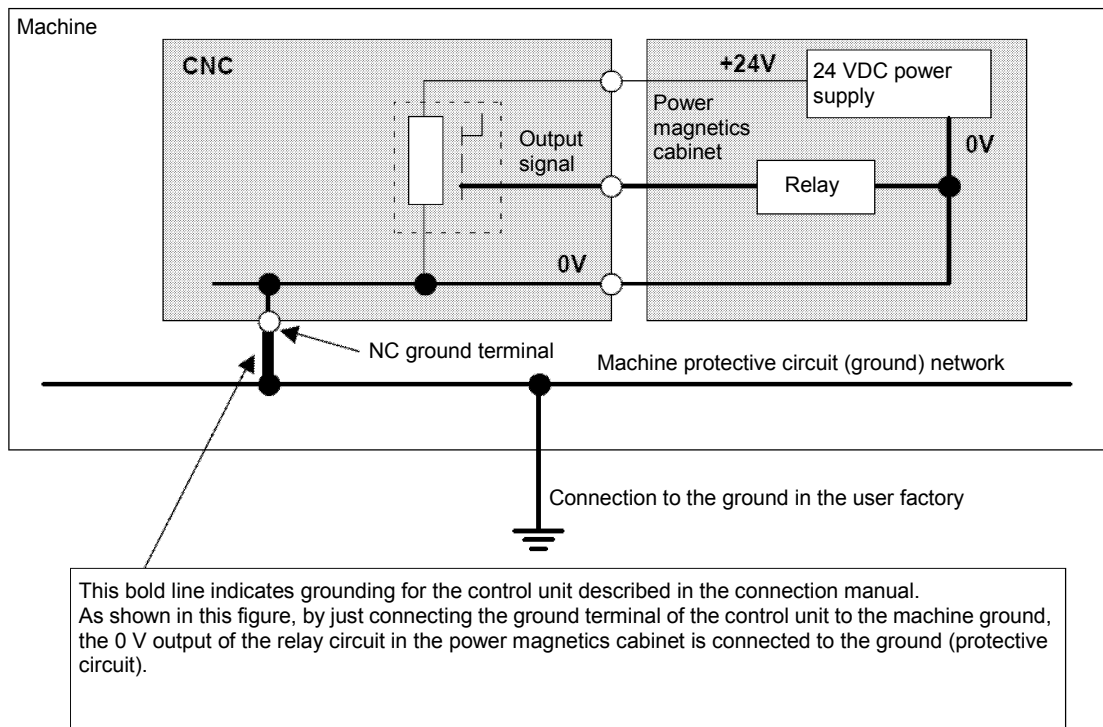## *5.11.3*   Signal Ground (SG) Connection of Control Unit

Connecting the 0 V output in the CNC to a protective circuit (ground)

The IEC 204-1 and JIS B 6015 standards specify the following:
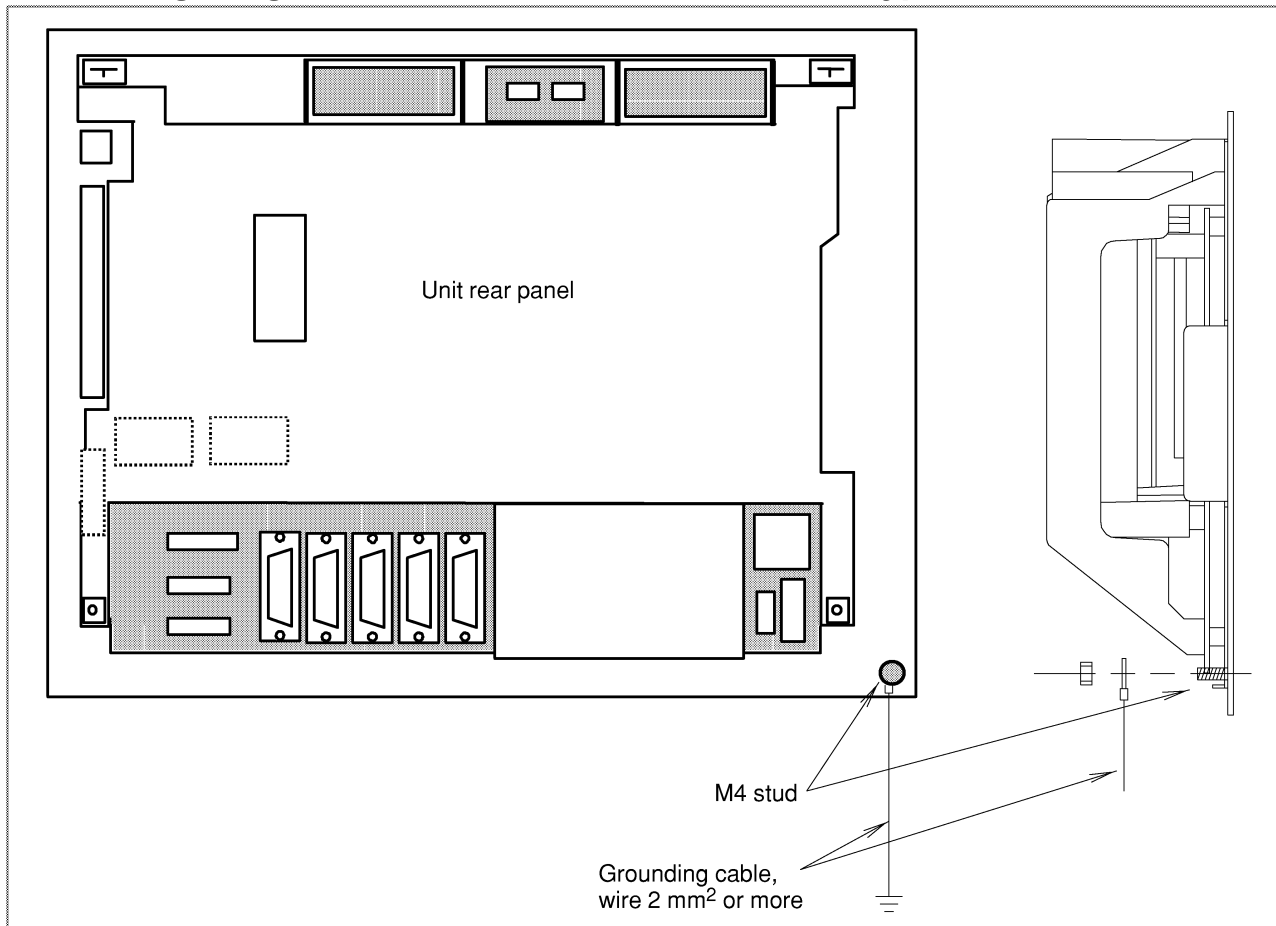- Protection against malfunctions due to ground faults

"To make the control circuit prevent malfunctions of a machine tool due to a ground fault and not to prevent the machine tool from stopping, either of the ground and electronic circuits shall be connected to a protective circuit."

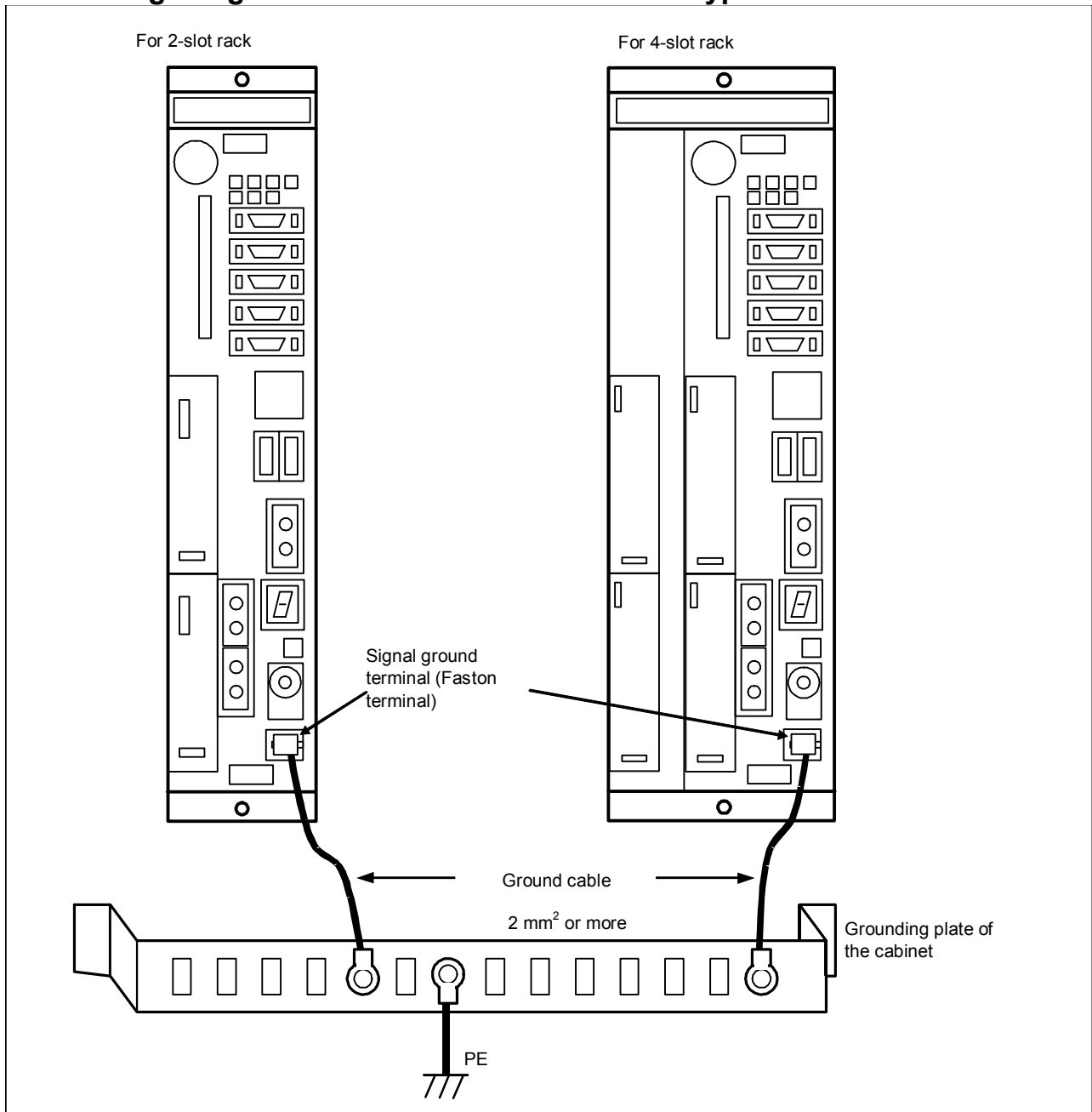Note that for each FANUC CNC, the 0V output in the CNC is connected to a protective circuit (ground).

This bold line indicates grounding for the control unit described in the connection manual.
As shown in this figure, by just connecting the ground terminal of the control unit to the machine ground, the 0 V output of the relay circuit in the power magnetics cabinet is connected to the ground (protective circuit).

Connecting the ground terminal of an LCD-mounted type control unit

Unit rear panel

M4 stud

Grounding cable,
wire 2 mm² or more

Connect the 0-V line in the control unit with the ground plate of the cabinet or a nearby plate via the protective grounding terminal (see above figure).

Connecting the ground terminal of a stand-alone type control unit

For 2-slot rack

For 4-slot rack

Signal ground
terminal (Faston
terminal)

Ground cable

2 mm^2 or more

Grounding plate of
the cabinet

PE

Connect the 0-V lines of the electronic circuits in the control unit to
the ground plate of the cabinet via the signal ground terminal.
Use the Faston terminal (FANUC specification: A02B-0166-K330).
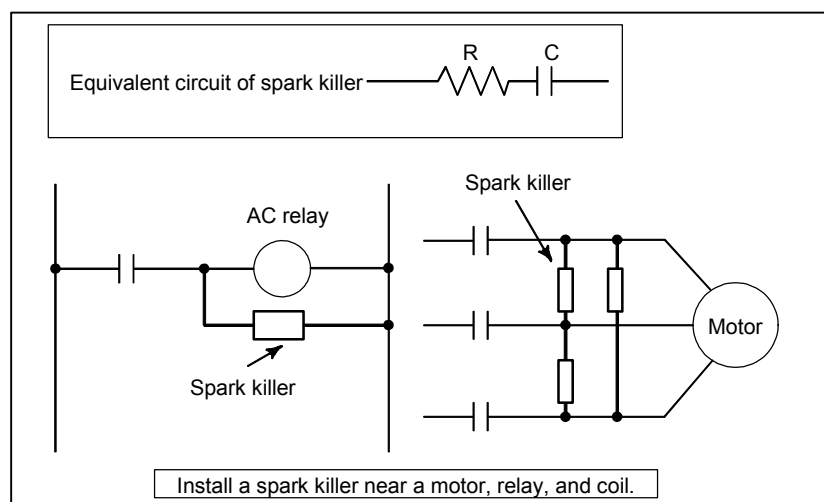
5.11.4   **Noise Suppressor**

With a power magnetics cabinet, components such as an AC/DC solenoid and AC/DC relay are used. When turned on and off, these components generate a high-energy pulse voltage due to coil inductance.

Such a pulse voltage is induced into cables, for example, and can interfere with electric circuitry.
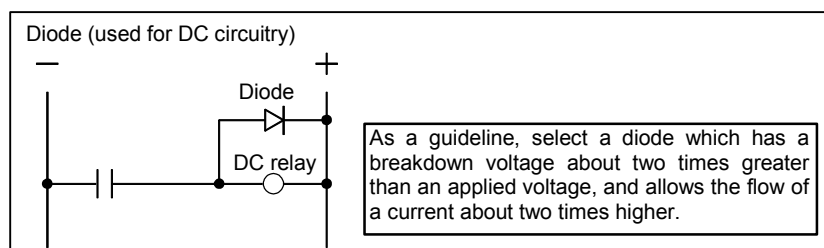
Notes on spark killer selection

- Select a CR-type spark killer (for use with AC circuitry) (A varistor has a function for clamping the peak voltage of a pulse voltage, but cannot suppress a spike-like voltage. For this reason, the use of a CR-type spark killer is recommended.)
- As the CR values of a spark killer, use the following with the steady-state coil current (I (A)) and DC resistance used as references:
  1) Resistance (R): Coil DC resistance

  2) Electrostatic capacitance (C): $\frac{I^2}{10}$ to $\frac{I^2}{20}$ (F)

     I : Coil steady-state current (A)

Equivalent circuit of spark killer

Install a spark killer near a motor, relay, and coil.

NOTE
Use a CR-type noise suppressor. A varistor has a function for clamping the peak voltage of a pulse voltage, but cannot suppress a spike-like voltage.

Diode (used for DC circuitry)

As a guideline, select a diode which has a breakdown voltage about two times greater than an applied voltage, and allows the flow of a current about two times higher.

5.11.5   Cable Clamping and Shielding

According to the figure below, clamp all cables that require shielding and are run to the CNC, servo amplifier, spindle amplifier, and so forth. This clamping method not only secures cables, but also shields cables. Cable clamping and shielding are a key to stable system operation. Always perform cable clamping and shielding according to the method described here.

As shown below, peel off a part of the outer sheath of each cable so that the shield cover is exposed, then press and retain the exposed part of the shield against the ground plate with a clamp.

Install a ground plate manufactured by the machine tool builder, as shown below.
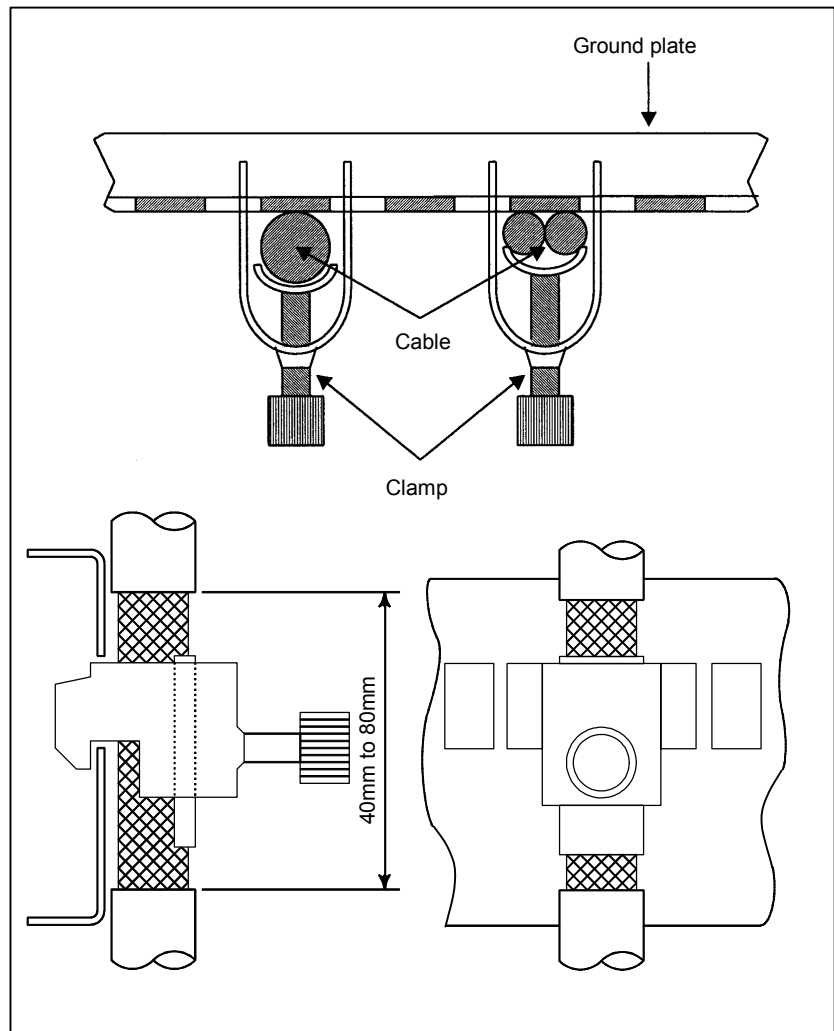
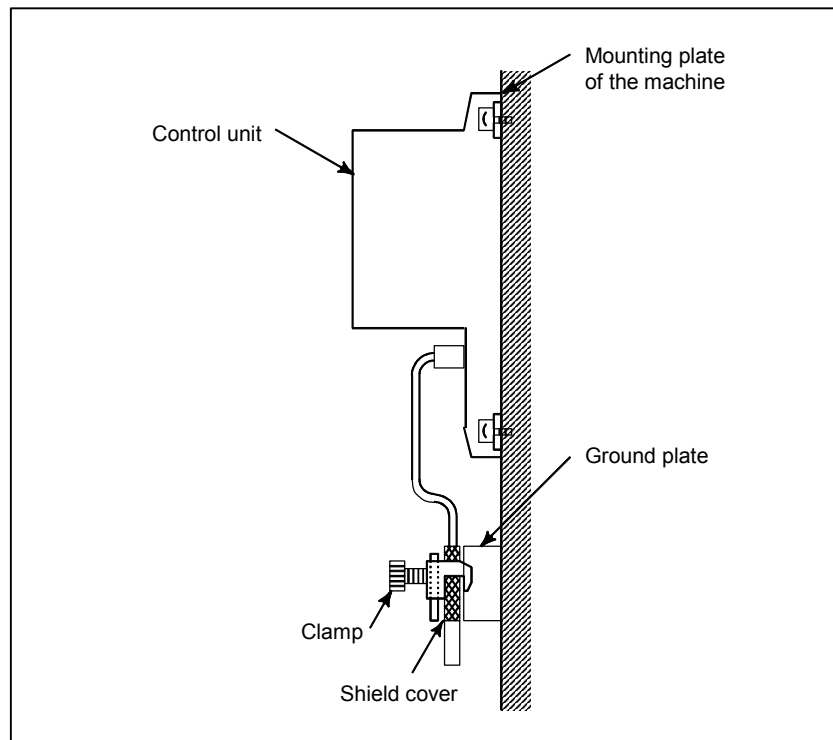

Fig. 5.11.5 (a) Cable clamp (1)

Fig. 5.11.5 (b) Cable clamp (2)

NOTE
Bring together the cables connected to a CNC or amplifier near the unit and shield them.
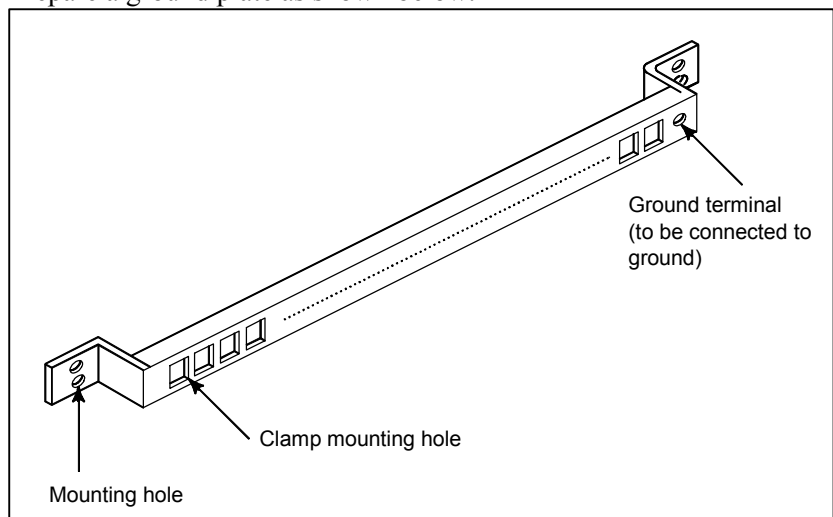
Prepare a ground plate as shown below.

Fig. 5.11.5 (c) Ground plate

For a ground plate, use an iron plate that is as thick as 2 mm or more and is plated with nickel.
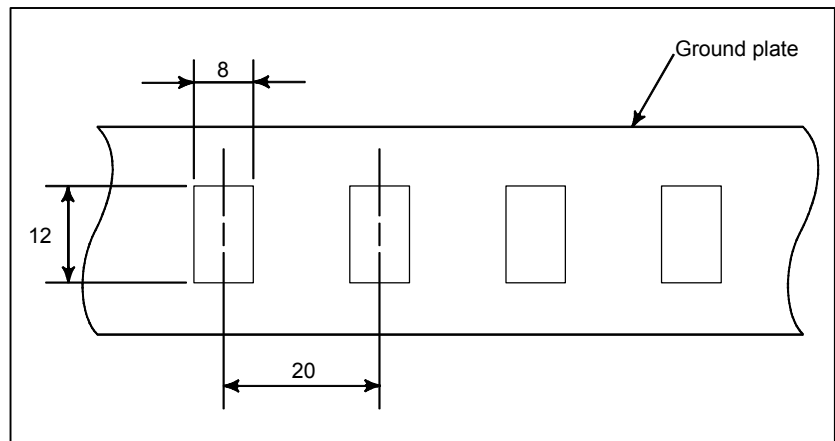
Fig. 5.11.5 (d) Ground plate hole diagram
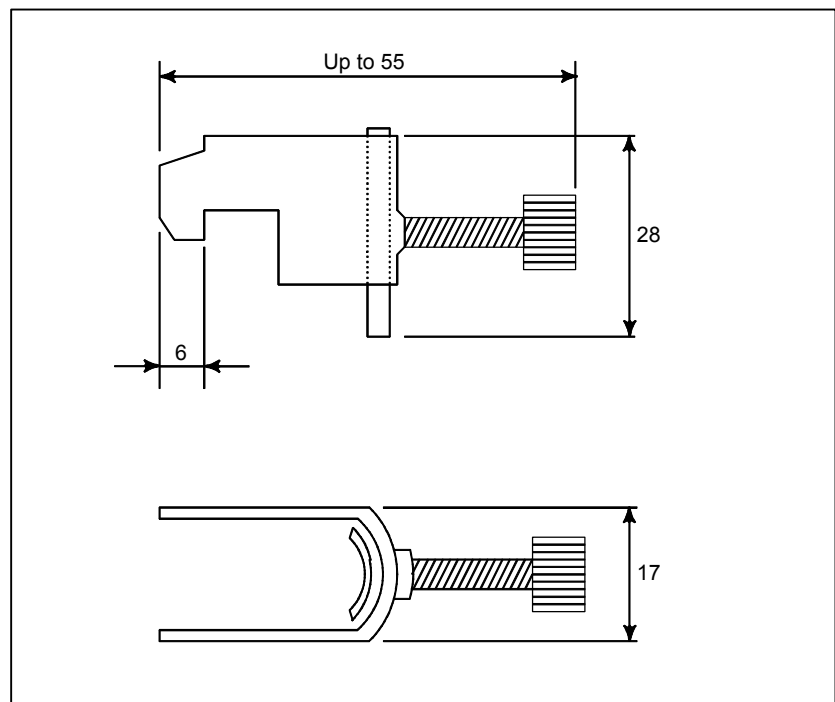
Reference: Outline drawing of the clamp

Fig. 5.11.5 (e) Outline drawing of clamp

Ordering code of the clamp:
   A02B-0124-K001 (set of 8 clamps)

5.12   BATTERY FOR ABSOLUTE PLUSE CODERS

(1) When the voltage of the battery for absolute Pulsecoders becomes low, DS alarms 306 to 308 occur.

(2) When DS alarm 307 (alarm indicating the voltage of the battery becomes low) occurs, replace the battery as soon as possible. In general, the battery should be replaced within one or two weeks, however, this depends on the number of Pulsecoders used.

(3) If the voltage of the battery becomes any lower, DS alarm 306 (battery zero alarm) occurs. In this case, the current positions for the Pulsecoders can no longer be maintained.
In this state, DS alarm 300 (reference position return request alarm) occurs. Return the tool to the reference position after replacing the battery.

(4) The service life of the batteries is about two years if they are used in a six-axis configuration with $\alpha i/\alpha is/\beta is$ series servo motors and one year if they are used in a six-axis configuration with α/β series servo motors. FANUC recommends that you replace the batteries periodically according to the battery service life.

(5) To connect the battery, use the battery case or incorporate the battery into the servo amplifier. Note that the attachment method of the battery depends on the connection method and the type of servo amplifier.

- Replacing batteries

To prevent absolute position information in absolute Pulsecoders from being lost, turn on the machine power before replacing the battery. The replacement procedure is described below. (Note: The turning-on step is not required when the αi or αis series servo motor or βis series servo motor ($\beta 0.4is$ to $\beta 22is$) is used.)

<1> Turn the servo unit (machine) on.
<2> Place the machine in the emergency stop state.
<3> Confirm that servo motors are not active.
<4> Make sure the DC link charge LED is off.
<5> Remove the old battery and then attach a new one.
<6> Now, replacement has been completed. The system power can be turned off.

NOTE

The absolute Pulsecoder of the $\alpha i/\alpha is/\beta is$ ($\beta 0.4is$ to $\beta 22is$) series servo motor is incorporated with a backup capacitor as standard. This backup capacitor enables an absolute position detection to be continued for about 10 minutes. Therefore, no zero point return need be performed if the time during which servo amplifier power is kept off for battery replacement is within 10 minutes. If battery replacement takes 10 minutes or more, the power must remain turned on.
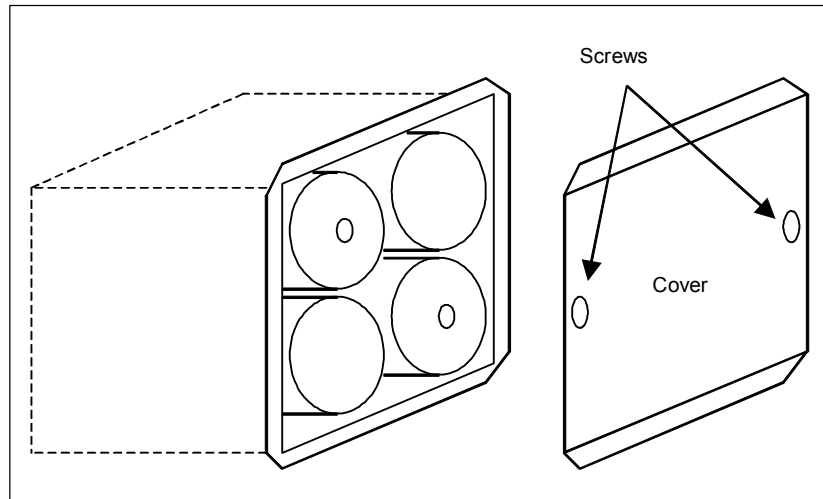
⚠ **CAUTION**
1 When replacing the battery, be careful not to touch bare metal parts in the panel. In particular, be careful not to touch any high-voltage circuits due to the electric shock hazard.
2 Before replacing the battery, make sure the DC link charge LED is off. Otherwise, an electric shock may be received.
3 Be sure to use the specified battery. If another type of battery is used, it may overheat, blow out, or catch fire.
4 Install the battery with correct polarity. If the battery is installed with incorrect polarity, it may overheat, blow out, or catch fire. Or, absolute position information in absolute Pulsecoders may be lost.
5 During attachment of the battery, insert the factory-attached protection socket into the CX5X or CX5Y connector, whichever is not used. If the +6 V pin and 0 V pin are short-circuited, the battery may overheat, blow out, or catch fire. Or, absolute position information in absolute Pulsecoders may be lost.

- Replacing D-size alkaline dry cells in the battery case

Replace four D-size alkaline batteries (A06B-6050-K061) in the battery case installed in the machine.

<1> Have four D-size alkaline batteries on hand.
<2> Loosen the screws on the battery case. Remove the cover.
<3> Replace the alkaline batteries in the case. Pay careful attention to the polarity of the alkaline batteries.
<4> Attach the cover.

> ⚠ **CAUTION**
> Install the battery with correct polarity. If the battery is installed with incorrect polarity, it may overheat, blow out, or catch fire. Or, absolute position information in absolute Pulsecoders may be lost.

- Attaching the built-in battery (α*i* series servo amplifier)

Attach the lithium battery (A06B-6073-K001) to the servo amplifier.

[Attachment procedure]
(1)   Remove a battery cover from the servo amplifier.
(2)   Attach the battery as shown below.
(3)   Re-attach the cover.
(4)   Connect the connector of battery with CX5X of the servo amplifier.
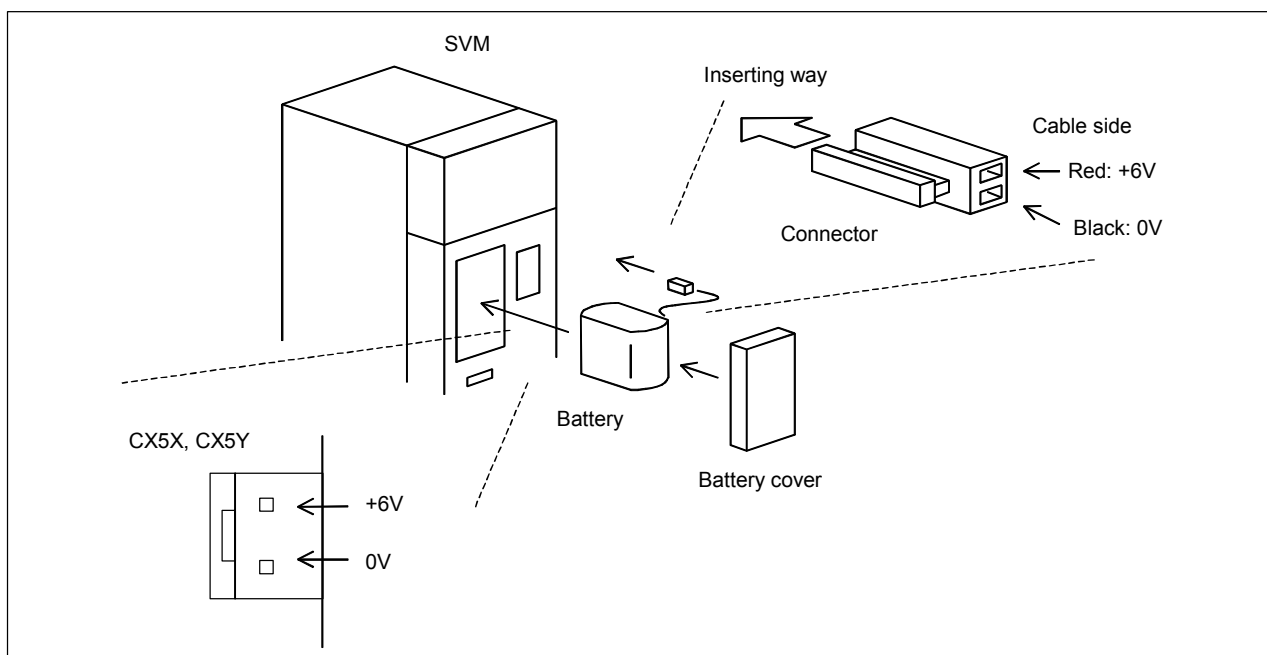
> ⚠ **CAUTION**
> Attaching the battery from the cable outlet applies tension to the cable. Therefore, attach the cable from another place to prevent the cable from being stretched. If this cable is connected on a stretch condition, a bad conductivity may be occurred.

- Attaching the built-in battery (β series servo amplifier)

Attach the lithium battery (A06B-6093-K001) to the servo amplifier.

[Attachment procedure]
(1)   In case of SVU-12 or SVU-20, remove the battery cover under the servo amplifier grasping its left and right sides. In case of SVU-40 or SVU-80, remove the cover attached on right side of the servo amplifier grasping its upper and lower sides.
(2)   Remove the connector of battery. (Connector CX5X or CX5Y)
(3)   Replace the battery and connect the connector.
(4)   Mount the battery cover.

SVU-12, SVU-20

Pass the battery cable to this slit.

SVU-40, SVU-80

> ⚠ **CAUTION**
> 1 The connector of the battery can be connected with either of CX5X and CX5Y.
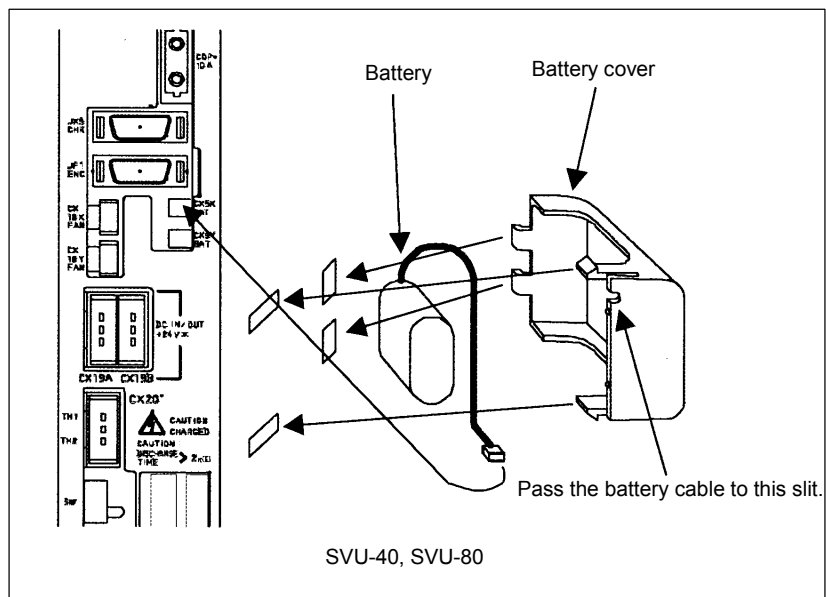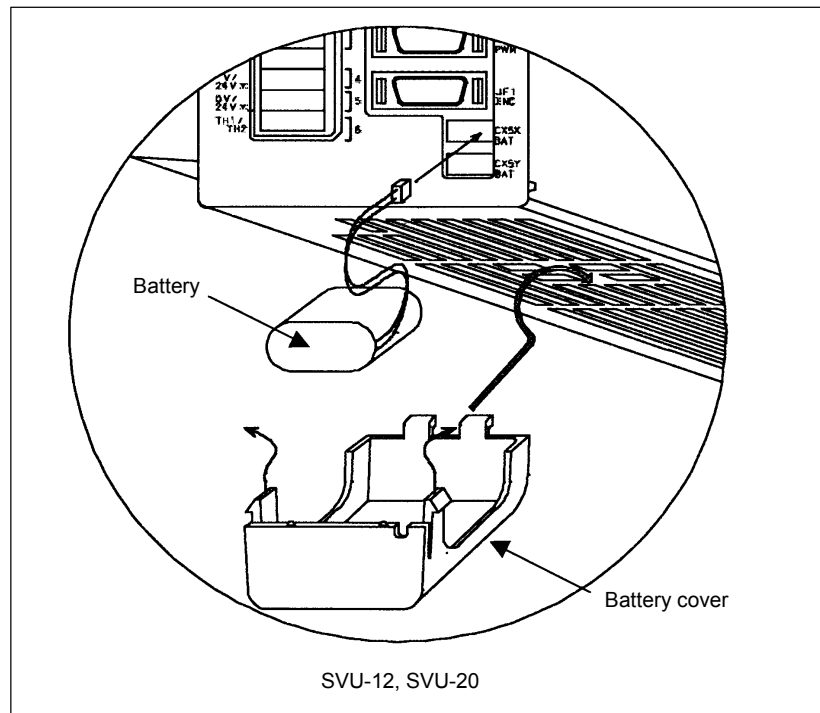> 2 Attaching the battery from the cable outlet applies tension to the cable. Therefore, attach the cable from another place to prevent the cable from being stretched. If this cable is connected on a stretch condition, a bad conductivity may be occurred.

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- Used batteries

Old batteries should be disposed as "INDUSTRIAL WASTES" according to the regulations of the country or autonomy where your machine has been installed.

5.13 ATTACHING AND DETACHING LCD/MDI UNITS

The 30*i* series LCD units (except the 15" LCD type) and MDI units are fastened with screws from the front surface. The screws are covered with screw caps.

5.13.1 Detaching

Slot

Screw caps (4 places)
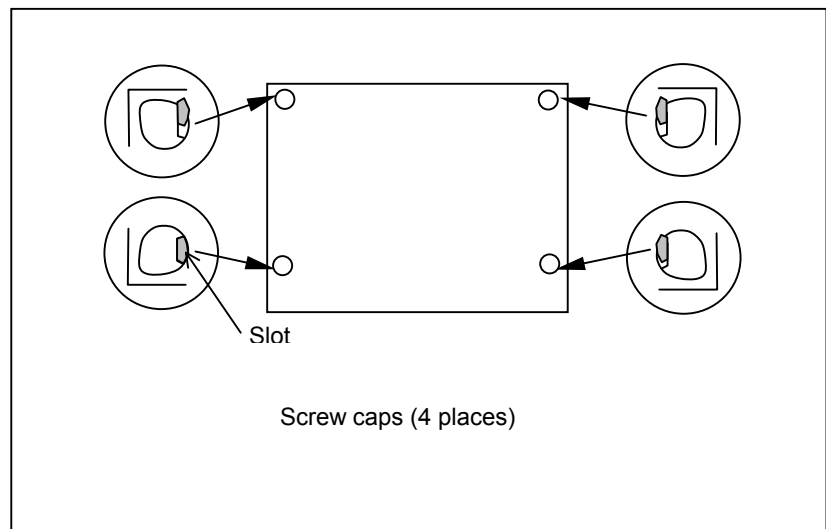
<1> Pull out each screw cap by inserting a precision flat-blade screwdriver into their slot.
<2> Rotate each screw under the screw cap to detach the unit.

5.13.2   Attaching

Only the type-A screw cap has a
boss (for discrimination purposes).
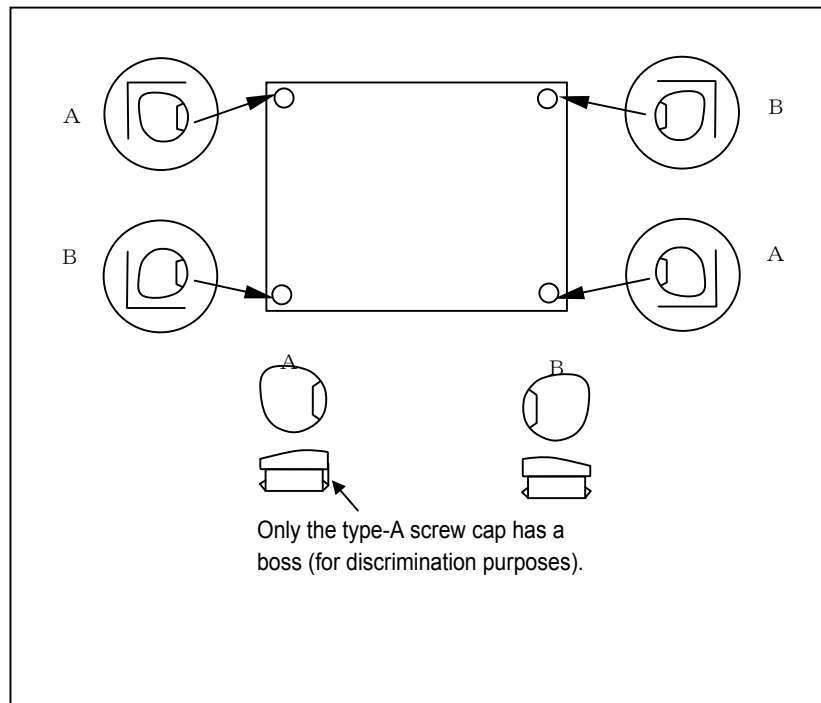
<1> Fasten the four corners with screws.
<2> There are two types of screw caps.   Attach each type as shown
    above.   Push them in until their top surface becomes flushed
    with the unit surface while paying attention to their orientation.

NOTE

If a screw cap is lost or damaged, order spares,
using the following ordering information:
A02B-0303-K190 :
  A set of 100 type-A screw caps and 100 type-B
  screw caps
A02B-0303-K191 :
  A set of 80 type-A screw caps and 100 type-B
  screw caps

6

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.

6.1   **SETTING PARAMETERS FOR INPUT/OUTPUT**

Setting procedure of parameters

Parameter writing is enabled with following steps 1 to 3.

1   Set to MDI mode or emergency stop state.

2   Press $\boxed{\text{OFFSET}\atop\text{SETTING}}$ key several times or press soft key [SETING] to display SETTING (HANDY) screen.

3   Set the cursor to PARAMETER WRITE and, press $\boxed{1}$ and $\boxed{\text{INPUT}}$ keys in this order. Here alarm 100 will be displayed.

4   Press $\boxed{\text{SYSTEM}}$ key several times to display the following screen.

```
PARAMETER    (SETTING)      O1234 N12345

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   ][ PUNCH ][DELETE ][        ]
```

To make the cursor display in bit unit, press the cursor key $\boxed{\rightarrow}$ or $\boxed{\leftarrow}$.
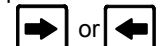
5   Press soft key[(OPRT)] and the following operation menu is displayed.
   <1> Soft key [NO. SRH] :
       Searched by number.
       Examination) $\boxed{\text{Parameter number}} \rightarrow$ [NO. SRH].
   <2> Soft key [ON : 1] :
       Item with cursor position is set to 1 (bit parameter)
   <3> 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 $\boxed{\text{RESET}}$ 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) ⟦1⟧ ⟦2⟧ ⟦3⟧ ⟦4⟧ ⟦EOB⟧ ⟦=⟧ ⟦EOB⟧ ⟦=⟧ ⟦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⟧ ⟦1⟧ ⟦EOB⟧ ⟦=⟧ ⟦EOB⟧ ⟦=⟧ ⟦INPUT⟧
   This key sequence sets data as follows:
   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 1 1 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
8   After the required parameters are set, set PARAMETER WRITE
   to 0.

6.2 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)

6.2.1 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 :
In addition, (*) indicates the standard setting for input/output devices made by FANUC. Change these settings according to the unit you actually use.
(Parameter can be changed in MDI mode or emergency stop status.)

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

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

0020	**Selection of I/O channel**

(*) 0 : Channel 1 (JD56A of mother board)
    1 :   Channel 1 (JD56A of mother board)
    2 :   Channel 2 (JD36A of mother board)
    4 :   Memory card interface

> **NOTE**
> An operation example shown here assumes that data input/ output is performed with an input/output unit connected to the JD56A. (I/O channel = 0)

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

NFD   0 :   Feed is output when data is output.
          1 :   Feed is not output when data is output.
ASI (*)   0 :   EIA or ISO code is used for input/output data.
          1 :   ASCII code is used.
SB2   0 :   No. of stop bits is 1.
(*)   1 :   No. of stop bits is 2.

0102	Pecification number of input/output device

Set value	Input/output device
0	RS-232-C (Used control codes DC1 to DC4)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File FANUC SYSTEM P-MODEL H
4	RS-232-C (Not used control codes DC1 to DC4)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL 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]
```

6.2.2   Outputting CNC Parameters

1   Enter EDIT mode or the emergency stop condition.

2   Press |SYSTEM| key and soft key [PRGRM] to select a program text.

3   Press soft key [(OPRT)] and soft key ⊳ .

4   Press soft key [PUNCH] and [EXEC],and the parameters are started to be output.

6.2.3 **Outputting Pitch Error Compensation Amount**

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

6.2.4 **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.

6.2.5 **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.

6.2.6   **Outputting Part Program**

1   Confirm the following parameters.   If this parameter is set to 1, rather than the value indicated by l, change to MDI mode and then reset to 0.
However, if you changed the parameter setting, restore the original value after finishing this work.

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

NE9   (*) 0:   Programs of 9000s are edited.
           1:    Programs of 9000s can be protected.
           (Protected programs are not output.)
NE8   (*) 0:   Programs of 8000s are edited.
           1:    Programs of 8000s can be protected.
           (Protected programs are not output.)

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.

6.2.7   **Inputting CNC Parameters**

1   Set to the emergency stop state.
2   Confirm that the patameters required to input data is correct.
In addition, (*) indicates the standard setting for input/output devices made by FANUC. Change these settings according to the unit you actually use.

   <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>

0020		Selectionof I/O channel

   (*) 0:   Channel 1 (JD56A of mother board)
        1:    Channel 1 (JD56A of mother board)
        2:    Channel 2 (JD36A of mother board)
        4:    Memory card interface

<5>

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

NFD   0:   Feed is output when punching out.
        1:   Feed is not output when punching out.
ASI   0:   EIA or ISO code is used.
        1:   ASCII code is used.
SB2   0:   No. of stop bits is 1.
    (*)1: No. of stop bits is 2.

<6>

0102	Specification number of I/O device

Set value	Input/output device
0	RS-232-C (Used control codes DC1 to DC4)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File FANUC SYSTEM P-MODEL H
4	RS-232-C (Not used control codes DC1 to DC4)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL 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 ▷.

4   Press soft key [READ] and [EXEC]. Then input of parameters are started.

5   Upon completion of parameter input, turn off the power then turn on the power again.

6   Alarm 300 is issued if the system employs an absolute pulse coder. In such a case, perform reference position return again.

6.2.8   **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 `SYSTEM` key several times, soft key [PARAM], `▷` and [PITCH] to select the screen for pitch error compensation amount.

5   Press the function key `SYSTEM` and `▷` several times, then press [PITCH] to select the pitch error compensation setting screen.

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.

6.2.9   **Inputting Custom Macro Variable Values**

*   If the system is equipped with the custom macro fucntion, input the variable values.

1   Select EDIT mode.

2   Press `PROG` key then soft key [PRGRM] to display program contents.

3   Press the function key `SYSTEM` and press `▷` several times, then press [PITCH] to select the pitch error compensation setting screen.

4   Press soft key [(OPRT)] and key `▷` .

5   Press soft key [READ] and [EXEC], then the pitch error compensation amount is started to be input.

6.2.10   **Inputting Tool Compensation Amount**

1   Select EDIT mode.

2   Turn off the program protect (KEY=1).

3   Press `OFFSET SETTING` key, and soft key [OFFSET] to display the tool compensation amount screen.

4   Press soft key [(OPRT)] and `▷` key.

5   Press [READ] key and [EXEC] key and data input is started.

6.2.11   Inputting Part Programs

Confirm the following parameters. If the setting is different from the value indicated by (*), reset to the specified value only during this work. (Change it in MDI mode).

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

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.
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

NE9 (*)0: Programs of 9000s can be edited.
   1:   Programs of 9000s are protected.
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 [READ] and [EXEC], then data input is started.

7

INTERFACE BETWEEN CNC AND PMC

7.1 WHAT IS PMC?

The programmable machine controller (PMC) is a programmable controller (PC) built into a CNC to perform sequence control for a machine tool (spindle rotation, tool change, machine operator's panel control, and so on).

Sequence control is to perform control steps successively in a predetermined sequence or according to the logic operation.

Programs for performing sequence control for machine tools are called sequence programs. Generally, sequence programs coded in the Ladder language are used.

7.1.1 Basic Configuration of PMC

The following is the basic configuration of the PMC:
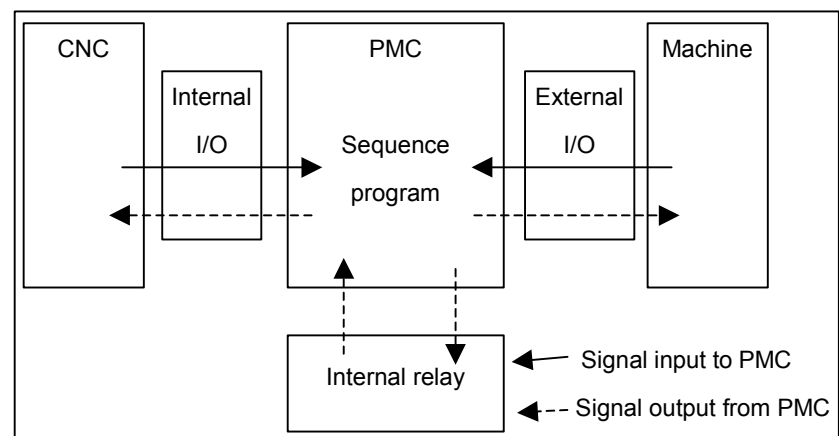
Fig. 7.1.1 Basic configuration of PMC

The sequence program reads input signals, performs operations, and outputs results in a predetermined sequence.

7.1.2 I/O Signals of PMC

Input signals of the PMC include signals input from the CNC (such as M and T function signals) and signals input from the machine (such as the cycle start button and feed hold signal button). Output signals of the PMC include signals output to the CNC (such as the cycle start command and feed hold signal command) and signals output to the machine (such as turret rotation and spindle stop). The PMC controls these I/O signals by executing a sequence program to control the machine tool.

7.1.3   **PMC Signal Addresses**

PMC signal addresses indicate the locations of I/O signals exchanged with the machine, I/O signals exchanged with the CNC, and signals for internal relays and data (PMC parameters) in nonvolatile memory. PMC addresses are roughly classified as shown in Fig. 7.1.3 (a).
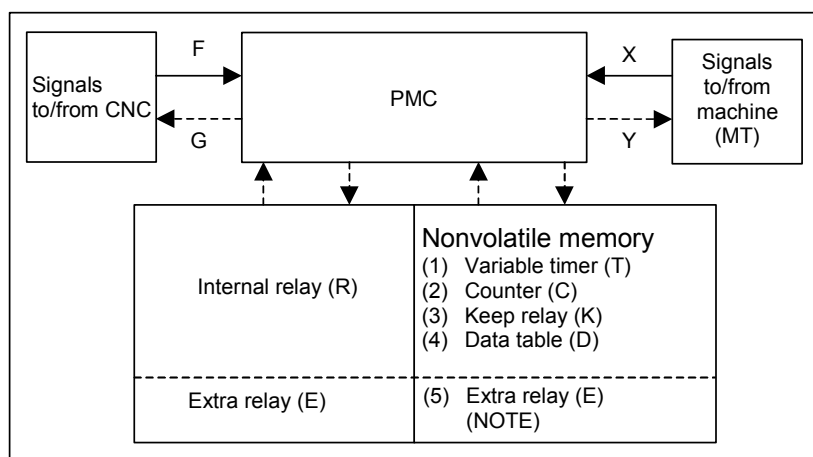
Fig. 7.1.3 (a) PMC-related addresses

NOTE
  Optionally, extra relays (E) may be assigned to nonvolatile memory locations.

The PMC signal address format consists of an address number and bit number (0 to 7) as follows:
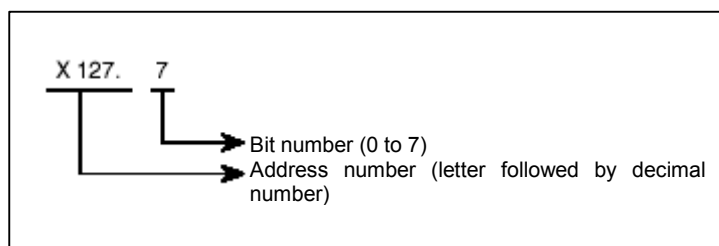
Fig. 7.1.3 (b) PMC address format

The first letter of an address number represents the type of the signal.
In sequence programs, an address of a byte may be specified. In the above example, specify X127 to specify a byte address. In this case, the period "." and bit number are unnecessary.

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Table 7.1.3 lists the address symbols and corresponding signals.

Table 7.1.3 Address Symbols and signal types

Symbol	Signal type
F	Input signal from CNC to PMC (CNC $\rightarrow$ PMC)
G	Output signal from PMC to CNC (PMC $\rightarrow$ CNC)
X	Input signal from machine to PMC (MT $\rightarrow$ PMC)
Y	Output signal from PMC to machine (PMC $\rightarrow$ MT)
R	Internal relay
E	Extra relay
A	Message display
T	Variable timer
C	Counter
K	Keep relay
D	Data table
L	Label number
P	Subprogram number

(1) Addresses of signals between the PMC and CNC (F and G)
These addresses are assigned to interface signals between the CNC and PMC. The relationships between the signals and addresses are defined by the CNC.
F indicates an input signal from the CNC to PMC.
G indicates an output signal from the PMC to CNC.

(2) Addresses of signals between the PMC and machine (X and Y)
I/O signals exchanged with an externally connected machine can be assigned to any addresses within an available range to control the machine.
X indicates an input signal from the machine to PMC.
Y indicates an output signal from the PMC to machine.

(3) Addresses of internal relays and extra relays (R and E)
These addresses are used to temporarily store operation results during sequence program execution processing.
Optionally, E addresses may be assigned to nonvolatile memory locations.
The address locations of internal relays also include a reserved area used by the PMC system software. The signals in the reserved area cannot be written by sequence programs.

(4) Signal addresses for message display (A)
Instruction "DISPB" used in sequence programs include instructions to display a message on the CNC screen. These addresses are used by such instructions.

(5) Nonvolatile memory addresses
The contents of these address locations are not erased even when the power is turned off.
These addresses are used for management of the data items listed below. These data items are called PMC parameters.

(a) Variable timer (T)

(b) Counter (C)

(c) Keep relay (K)
A reserved area used by the PMC system software is partly included.

(d) Data table (D)

(e) Extra relay (E)
Optionally, E addresses may be assigned to nonvolatile memory locations.
These addresses are used to temporarily store operation results during sequence program execution processing.

(6) Other addresses

(a) Label number (L)
Sequence program instructions include an instruction to cause a jump to a specified position in the middle of processing. This address indicates the jump destination used by this instruction. The contents of L address can not be read/written in sequence program.

(b) Subprogram number (P)
In sequence programs, a main program can call subprograms. P addresses indicate the numbers of these subprograms. The contents of P address can not be read/written in sequence program.

7.2   MULTI-PMC FUNCTION

The multi-PMC function allows one PMC system to execute multiple sequence programs at the same time.

PMC memory for each sequence program is basically independent, and the same PMC address can be used for different purposes of the individual PMCs.   Extra relays (E addresses) can be shared among PMCs as shared memory.   All PMCs can read from and write to this area, so the area can be used for the interface between the PMCs. M,N addresses can be also used for the interface between the PMCs.
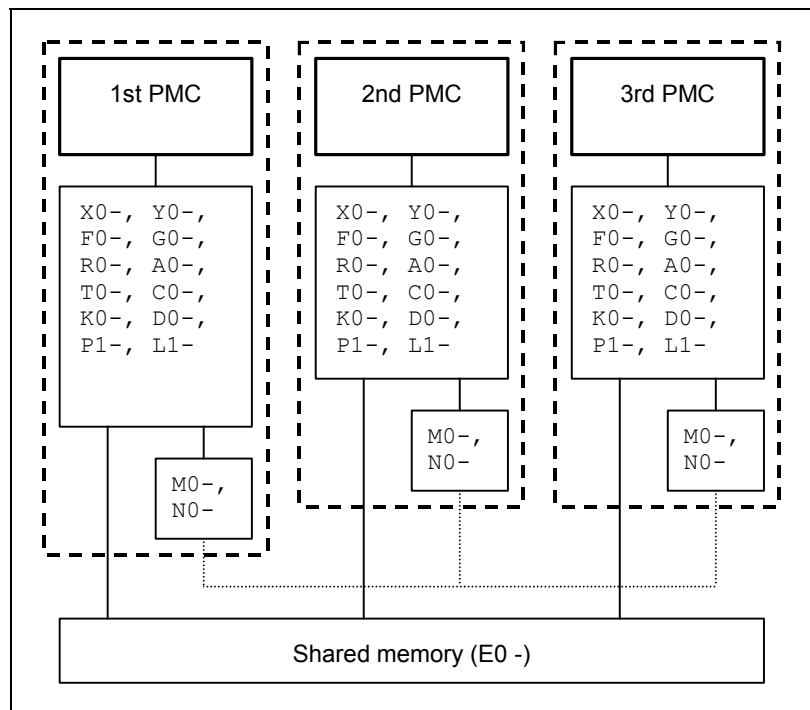
Fig. 7.2 (a) PMC memory of multi-PMC function

A program for each PMC is saved as an independent file and can be edited, updated, and backed up separately.

The CNC systems and the I/O Link channels to be controlled by PMCs can be changed by CNC parameter setting. In a parameter-set configuration, one PMC may control all CNC systems, or each PMC may control a different CNC system.

Fig. 7.2 (b) shows a configuration example.
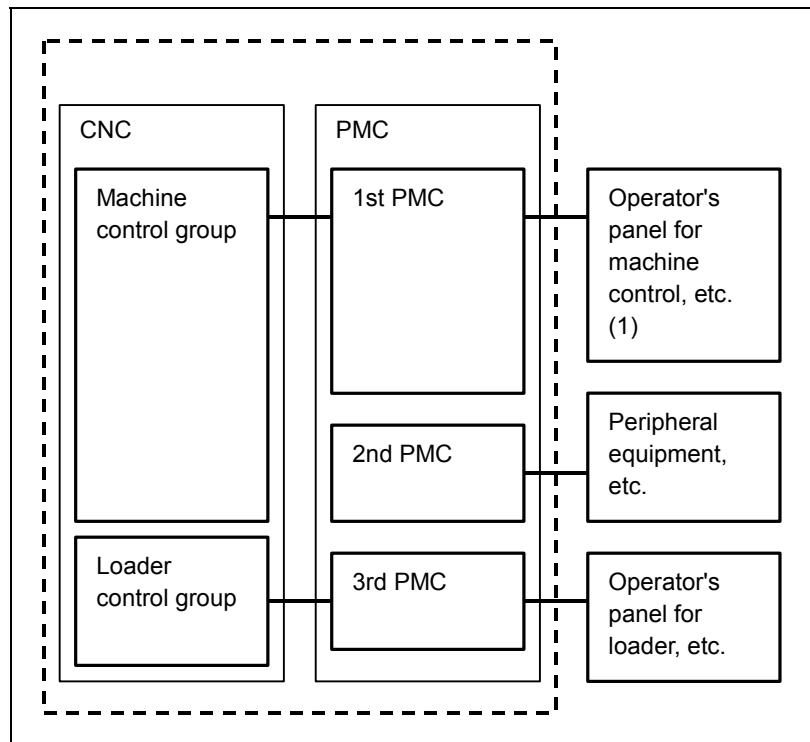
Fig. 7.2 (b) Multi-PMC function configuration example

If the Series 30i/31i/32i-A system is used to control more than one CNC path, some paths can be grouped to share data within a group and to stop all the paths in the group if an alarm condition occurs in one of the paths. The group is referred to as the machine group.
The system supports up to 3 machine groups. Each group has a separate emergency stop signal address.
A PMC is basically assigned to each machine group.

7.2.1   **Execution Order and Execution Time Percentage**

For the multi-PMC function, the order of PMC execution and execution time percentages of the PMCs can be set with CNC parameters.

Execution order

If parameters related to the execution order are not set (0 is set), the following order sequence is assumed by default:
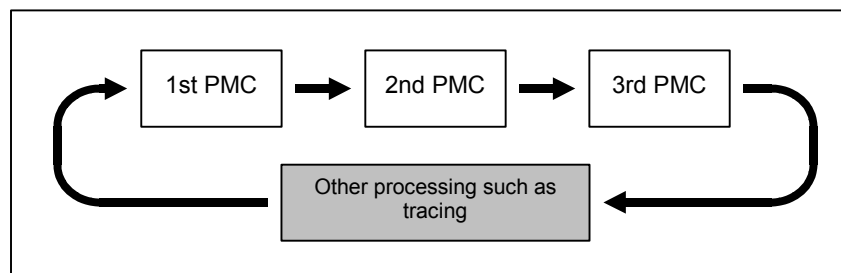
Fig. 7.2.1 (a) Default execution order of multiple PMCs

Execution time percentage

If parameters related to execution time percentages are not set (0 is set), the following execution time percentages are assumed by default:
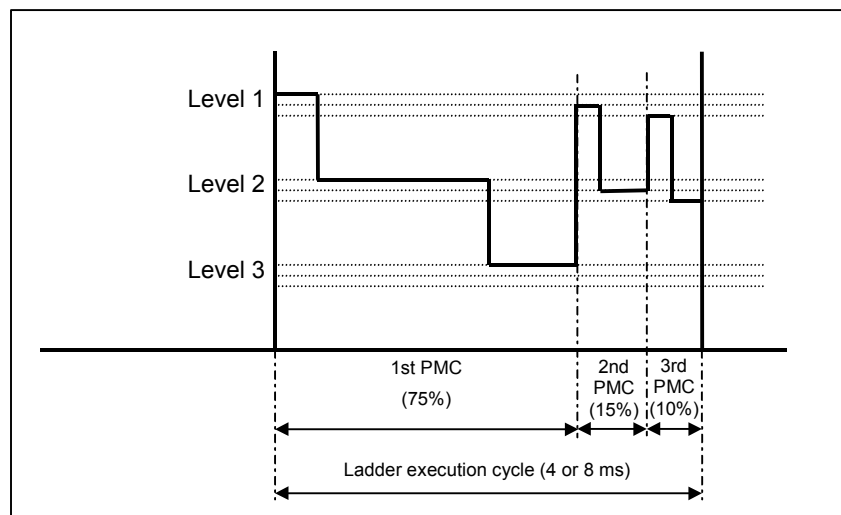
Fig. 7.2.1 (b) Execution time percentages of multiple PMCs

An example of changing the execution order and execution time percentages by setting CNC parameters is explained below. In the following, sequence programs are executed in the order from the third PMC to the first PMC to the second PMC with the execution time percentage of the third PMC set to 30%, the percentage of the first PMC to 50%, and the percentage of the second PMC to 20%:
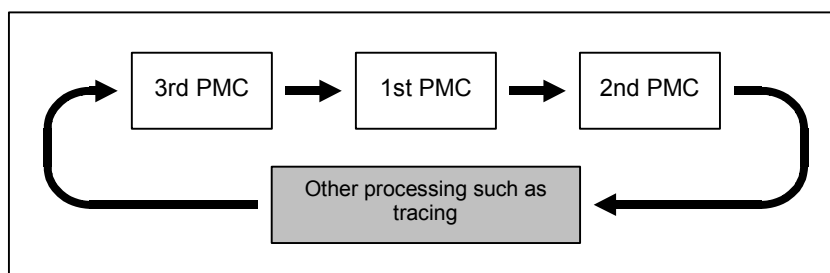
Fig. 7.2.1 (c) Example of setting execution order of multiple PMCs
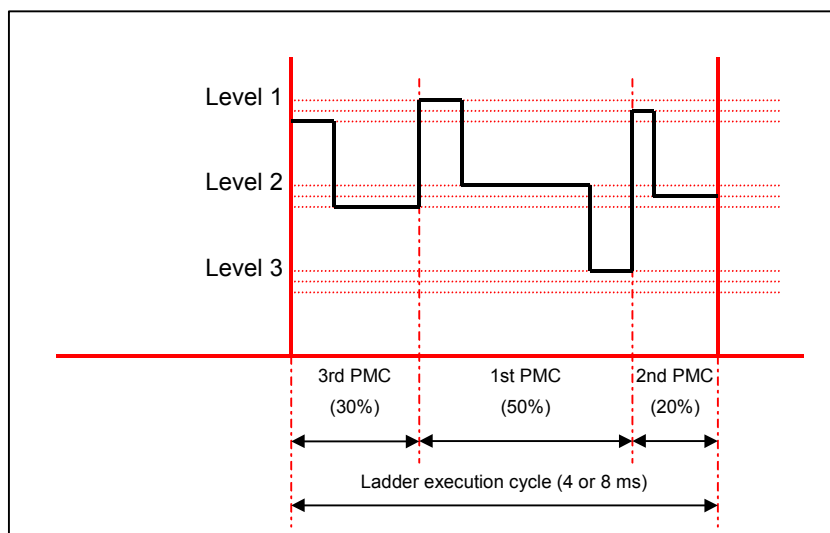
Fig. 7.2.1 (d) Example of setting execution time percentages of multiple PMCs

For details of parameter setting, see PMC PROGRAMMING MANUAL.

7.2.2   **Setting I/O Address for I/O Link**

The I/O addresses of I/O Link channels can be assigned with CNC parameters.

If these parameters are not set (0 is set), all channels are assigned to the first PMC by default as follows:
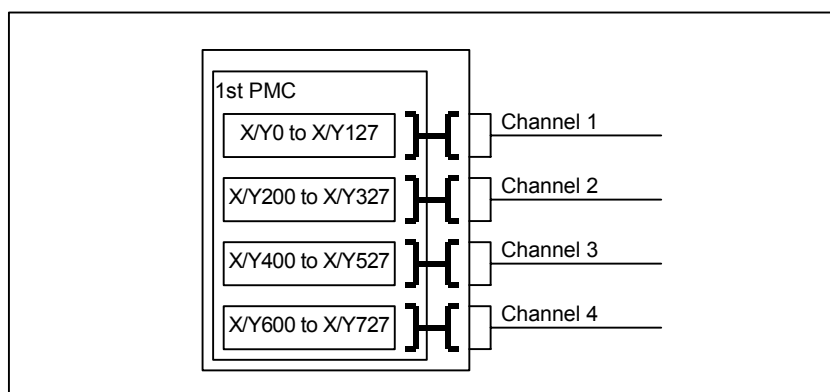
Fig. 7.2.2 (a) Default I/O addresses of I/O Link channels

In the following example, channel 1 is assigned to X/Y0 to X/Y127 of the first PMC, channel 2 is assigned to X/Y200 to X/Y327 of the first PMC, channel 3 is assigned to X/Y0 to X/Y127 of the second PMC, and channel 4 is assigned to X/Y0 to X/Y127 of the third PMC:
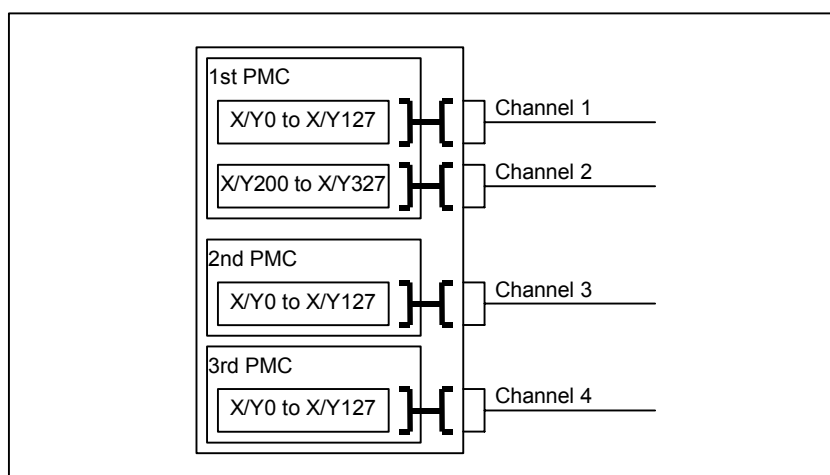
Fig. 7.2.2 (b) Example of I/O address assignment for I/O Link channels

For details of parameter setting, see PMC PROGRAMMING MANUAL.

7.2.3   Interface Between CNC and PMC

The PMC to control the interface between the CNC and PMC and PMC addresses (F/G addresses) can be set with CNC parameters.

With these parameter settings, a desired interface control system can be built, in which the entire CNC-PMC interface of the CNC may be controlled by a single PMC or the CNC-PMC interface may be controlled by multiple PMCs.

For the CNC-PMC interface, a memory area consisting of 10 blocks, each of which is an addressable, 768-byte DI/DO area, is provided.

When viewed from the ladder program in each PMC, these addresses begin with 0.

If these parameters are not set (0 is set), the initial settings are assumed, where the F/G addresses of the CNC equals the F/G addresses of the first PMC as follows:

CNC	1st PMC
F/G0 to F/G767 of CNC	F/G0 to F/G767 of 1st PMC
F/G1000 to F/G1767 of CNC	F/G1000 to F/G1767 of 1st PMC
F/G2000 to F/G2767 of CNC	F/G2000 to F/G2767 of 1st PMC
F/G3000 to F/G3767 of CNC	F/G3000 to F/G3767 of 1st PMC
F/G4000 to F/G4767 of CNC	F/G4000 to F/G4767 of 1st PMC
F/G5000 to F/G5767 of CNC	F/G5000 to F/G5767 of 1st PMC
F/G6000 to F/G6767 of CNC	F/G6000 to F/G6767 of 1st PMC
F/G7000 to F/G7767 of CNC	F/G7000 to F/G7767 of 1st PMC
F/G8000 to F/G8767 of CNC	F/G8000 to F/G8767 of 1st PMC
F/G9000 to F/G9767 of CNC	F/G9000 to F/G9767 of 1st PMC

Fig. 7.2.3 (a) Initial settings for CNC-PMC interface

In the following example, F/G0 to F/G767 and F/G1000 to F/G1767 of the CNC are assigned to F/G0 to F/G767 and F/G1000 to F/G1767 of the first PMC, and F/G3000 to F/G3767 of the CNC are assigned to F/G0 to F/G767 of the second PMC:
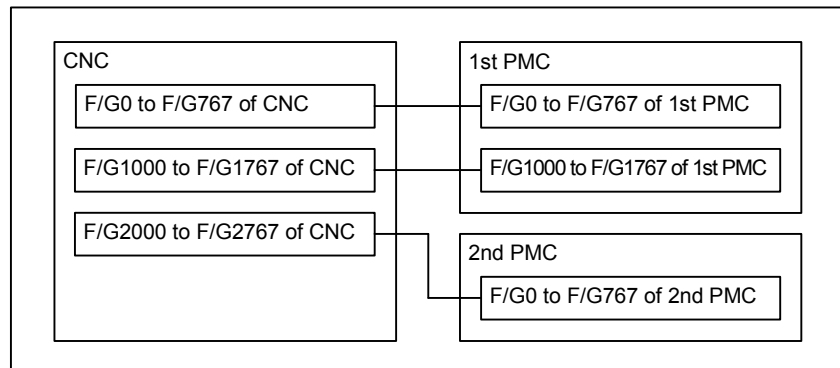
Fig. 7.2.3 (b) Setting example for CNC-PMC interface

7.2.4   Multi-Path PMC Interface

The multi-path PMC interface is the communication means between two PMC paths.

Generally, Each path of multi-path PMC system has individual PMC memory space except E address. And, E address can be used to share data of multi-path PMC system. However, this method has a risk that the memory is over written by other PMC path inappropriately.

When using this function, the input and output signals of each path become definitely. So, you can send or receive the data on between two PMC paths safely.
When you output data to N address at one of PMC paths, it can be referenced by M address in other PMC path.

Ex.) When using this function with 1st PMC and 2nd PMC :
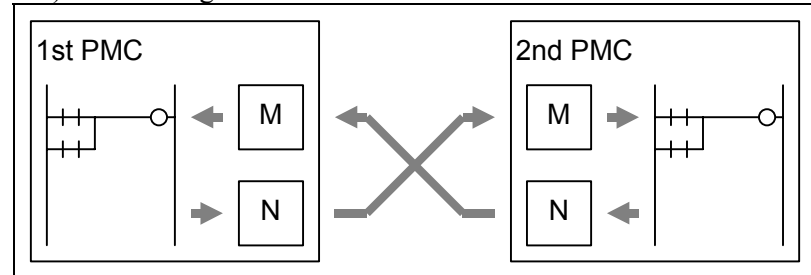
Moreover, signals of M address are synchronized during 1 scan of 2nd level program. Therefore, you can reference the same signal status on the first step and the last step of level2 program, like as X and F address.

7.2.5　　Internal Relay (System Area) Addresses (R)

Internal addresses (R) 9000s are an area managed by the system program.

Operation results of functional instructions

This area holds information necessary for individual ladder levels, such as the operation results of functional instructions. This information is saved/restored when the task is switched.

(1)　R9000 (operation output register for the ADDB, SUBB, MULB, DIVB, and COMPB functional instructions)
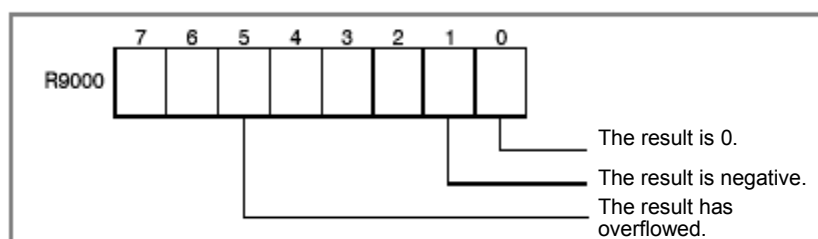
(2)　R9000 (error output for the EXIN, WINDR, and WINDW functional instructions)
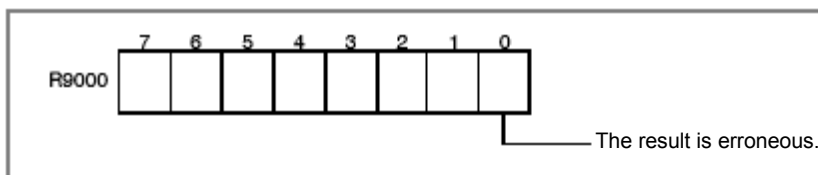
(3)　R9002 to R9005 (operation output registers for the DIVB functional instruction)
The remainder of a division performed with the DIVB functional instruction is output to these addresses.

System timers

Four signals can be used as system timers.
Their specifications are as follows.

```
            7   6   5   4   3   2   1   0
          ┌───┬───┬───┬───┬───┬───┬───┬───┐
R9091     │   │   │   │   │   │   │   │   │
          └───┴───┴───┴───┴───┴───┴───┴───┘
```

Normally OFF signal
Normally ON signal

200 ms cyclic signal
(104 ms ON and 96 ms OFF)

1 s cyclic signal
(504 ms ON and 496 m OFF)
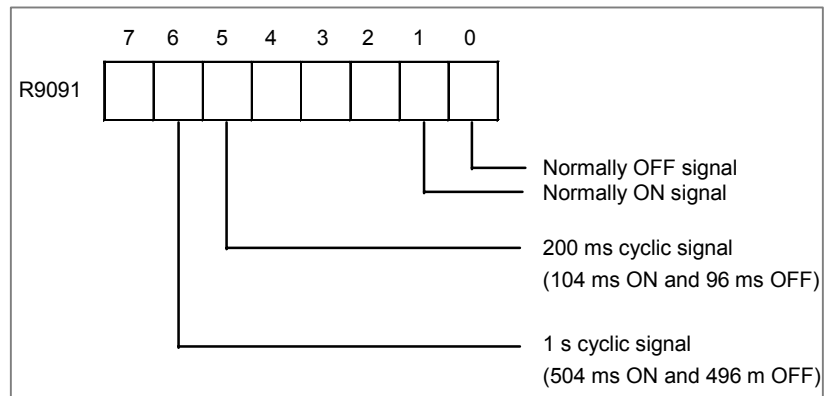
> ⚠ **CAUTION**
> 1 Each signal is initially OFF.
> 2 The signals R9091.0 and R9091.1 are set at the
>   beginning of the first ladder level on every cycle.
> 3 Each pulse signal (ON-OFF signal) has an error of
>   ±8 or 4 ms (ladder execution period).

R9091.5

104ms | 96ms
200ms

R9091.6

504ms | 496ms
1s
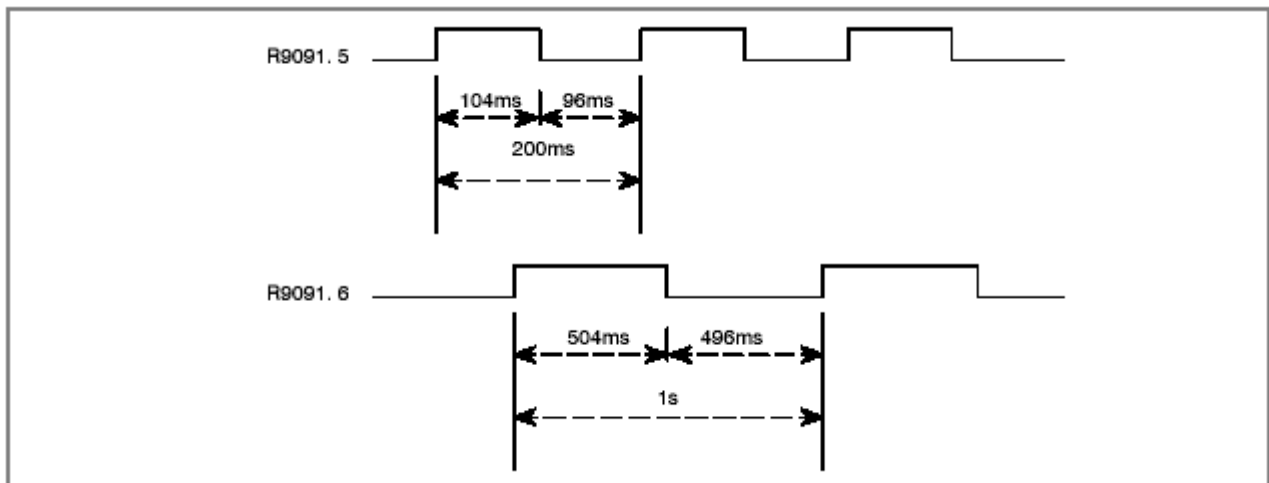
Ladder execution start signal
Ladder stop signal
Ladder execution status signal

Using the ladder execution start and stop signals in a ladder program can detect when the ladder program starts and stops.

Referencing the ladder execution status signal from an external system or program, such as the network board, C executor program, FOCAS1 Ethernet, or HSSB library, can detect the execution status of the ladder program.

R9015

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

R9015.0: "Ladder execution start signal" (can be referenced only from the ladder program)

R9015.1: "Ladder stop signal" (can be referenced only from the ladder program)

R9091

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

R9091.2: "1st Ladder execution status signal"
  0: Ladder at a stop
  1: Ladder being executed

R9091.3: "2nd Ladder execution status signal"
  0: Ladder at a stop
  1: Ladder being executed

R9091.4: "3rd Ladder execution status signal"
  0: Ladder at a stop
  1: Ladder being executed

Signal operation

Ladder execution status — Execution / Stop

R9015.0 "Ladder execution start signal" — 1 / 0

R9015.1 "Ladder stop signal" — 1 / 0

R9091.2 "Ladder execution status signal" — 1 / 0

One ladder scan cycle

One ladder scan cycle

(1) Ladder execution start signal (R9015.0)
When directed to start ladder program execution, the system software starts executing the ladder program, turns on this signal, and keeps it on for the first one scan cycle. Like R9000, this signal indicates the status of ladder execution corresponding to each ladder execution level. For this reason, this signal is securely turned on for the first one scan cycle after the start of execution no matter on what execution level the signal is referenced. This signal is turned on when:

(a) Ladder execution begins at power turn-on.

(b) The [RUN] soft key on the PMC screen is pressed.

(c) FANUC LADDER-III or a ladder editing package directs the ladder to start.

Referencing this signal in a ladder program can detect when ladder execution has begun, making it possible to program preprocessing related to ladder execution.

⚠ **CAUTION**
Reference this signal only within a ladder program.
Do not reference it from an external system or program as it indicates the status of ladder execution separately for each ladder execution level.

---

(2) Ladder stop signal (R9015.1)
When directed to stop ladder program execution, the system software turns off this signal and keeps it off for the last one scan before stopping ladder program execution. Like R9000, this signal indicates the status of ladder execution corresponding to each ladder execution level. For this reason, this signal is securely turned off for the last one scan before the stop of execution no matter on what execution level the signal is referenced. This signal is turned off when:

(a) The [EXIT] soft key on the PMC screen is pressed.

(b) FANUC LADDER-III or a ladder editing package directs the ladder to stop.

(c) On the PMC DATA I/O screen, the ladder program is loaded to the PMC.

(d) FANUC LADDER-III or a ladder editing package stores the ladder program to the PMC.

Referencing this signal in a ladder program can detect when ladder execution stops, making it possible to program postprocessing related to ladder execution (that is, preprocessing for ladder execution stop). Before the ladder is stopped, for example, it is possible to put signals in an proper state for safety purposes.

> ⚠ **CAUTION**
> 1 Reference this signal only within the ladder
>   program. Do not reference it from an external
>   system or program as it indicates the status of
>   ladder execution separately for each ladder
>   execution level.
> 2 If the power is turned off or a CNC system alarm
>   occurs, ladder execution and I/O signal transfer are
>   immediately stopped for safety purposes. In this
>   case, therefore, this signal cannot be used.

(3) Ladder execution status signal (R9091.2,R9091.3,R9091.4)
     Referencing this signal from an external system or program, such
     as the network board, C language executor program, FOCAS2
     Ethernet, or HSSB library, can detect the execution status of the
     ladder program.

(4) Example of using the signals
     (a) Example of calling a subprogram just before the ladder
          stops
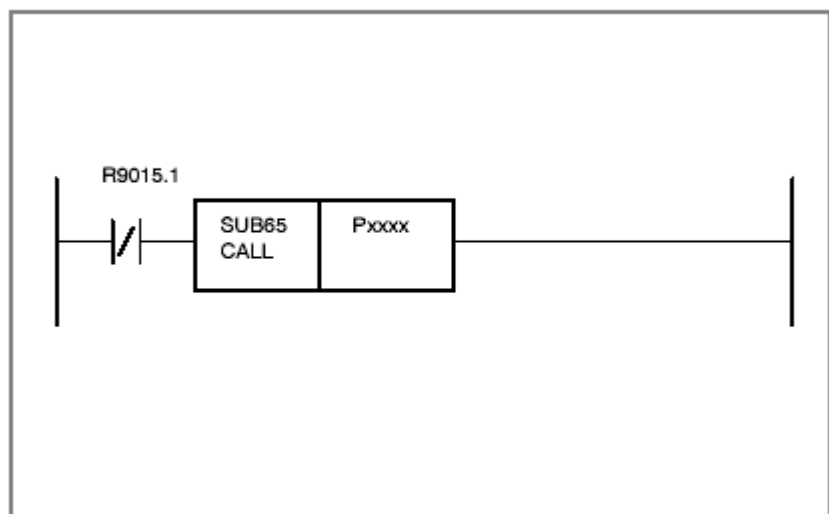
(b) Example of forcibly turning off an output signal programmed on the first ladder level just before the ladder stops
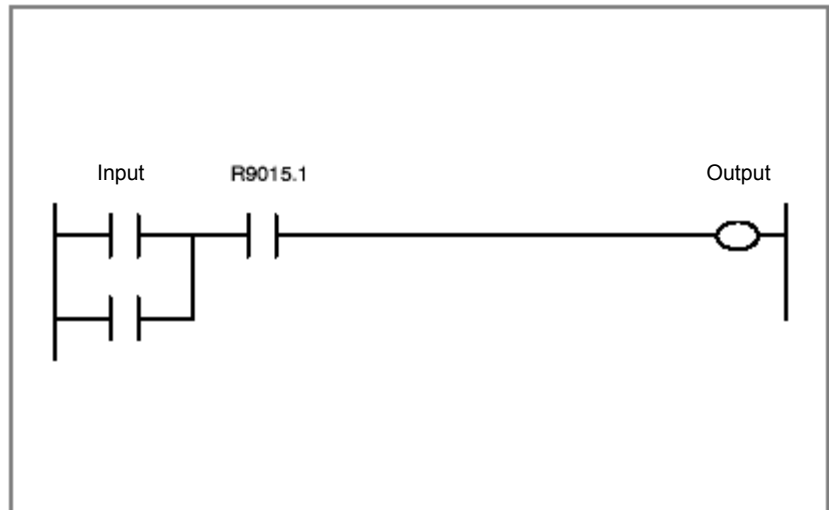
(c) Example of sending an execution-in-progress signal to the outside
Outputting the status of this signal as the DO signal (output address from the PMC) assigned to the I/O Link causes the CNC unit to be interlocked with an external system.
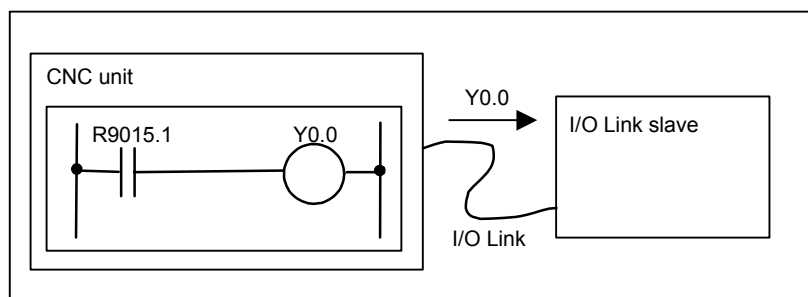
7.3 PMC SPECIFICATIONS

7.3.1 Basic Specifications

Table 7.3.1 (a) Basic specifications of the PMCs for the Series 30*i*/31*i*/32*i*-A

Function	30*i*/31*i*/32*i*-A			
	First PMC	**Second PMC (option)**	**Third PMC (option)**	**DCS PMC (Note 1)**
Programming language	Ladder	Ladder	Ladder	Ladder
Number of ladder levels	3	3	3	2 (Note 11)
Level 1 execution period (Note 2)	4 or 8 msec	4 or 8 msec	4 or 8 msec	4 or 8 msec
Basic instruction processing speed	25 nsec/step	25 nsec/step	25 nsec/step	1 μsec/step
Program capacity (Note 3)				
• Ladder	Up to about 64,000 steps	Up to about 64,000 steps	Up to about 64,000 steps	Up to about 3,000 steps
• Symbol/comment	At least 1 KB	At least 1 KB	At least 1 KB	At least 1 KB
• Message	At least 8 KB	At least 8 KB	At least 8 KB	At least 8 KB
Instructions				
• Basic instructions	14	14	14	14
• Functional instructions (Note 4)	69 (83)	69 (83)	69 (83)	63 (83)
• Variable timers	250 pieces	40 pieces	40 pieces	40 pieces
• Fixed timers	500 pieces	100 pieces	100 pieces	100 pieces
• Variable counters	100 pieces	20 pieces	20 pieces	20 pieces
• Fixed counters	100 pieces	20 pieces	20 pieces	20 pieces
• DIFUs/DIFDs	1000 pieces	256 pieces	256 pieces	256 pieces
PMC memory				
• Internal relay (R)				
• User area	8,000 bytes	1,500 bytes	1,500 bytes	1,500 bytes
• System area	500 bytes	500 bytes	500 bytes	500 bytes
• Extra relay (E)	10,000 bytes (Note 5)	10,000 bytes (Note 5)	10,000 bytes (Note 5)	-
• Message display (A)				
• Display requests	2,000 points	2,000 points	2,000 points	2,000 points
• Status displays	2,000 points	2,000 points	2,000 points	2,000 points
• Nonvolatile memory				
• Timer (T)				
• Variable timer	500 bytes	80 bytes	80 bytes	80 bytes
• Variable timer precision (Note 6)	500 bytes	80 bytes	80 bytes	80 bytes
• Counter (C)				
• Variable counter	400 bytes	80 bytes	80 bytes	80 bytes
• Fixed counter	200 bytes	40 bytes	40 bytes	40 bytes
• Keep relay (K)				
• User area	100 bytes	20 bytes	20 bytes	20 bytes
• System area	100 bytes	100 bytes	100 bytes	100 bytes
• Data table (D)	10,000 bytes	3,000 bytes	3,000 bytes	3,000 bytes

Table 7.3.1 (b)   Basic specifications of the PMCs for the Series 30i/31i/32i-A

Function	30i/31i/32i-A			
	First PMC	**Second PMC (option)**	**Third PMC (option)**	**Dual-check safety PMC (Note 1)**
PMC memory • Subprograms (P) • Labels (L)	5,000 pieces 9,999 pieces	512 pieces 9,999 pieces	512 pieces 9,999 pieces	512 pieces 9,999 pieces

CNC interface(Note 7)
  • Input (F)
  • Output (G)
	768 bytes × 10
	768 bytes × 10
		768 bytes × 10
		768 bytes × 10
			768 bytes × 10
			768 bytes × 10
				768 bytes
				768 bytes

DI/DO
• I/O Link(Note 8)
  • Inputs (X)
  • Outputs (Y)
	Up to 4,096 points
	Up to 4,096 points
		Up to 4,096 points
		Up to 4,096 points
			Up to 4,096 points
			Up to 4,096 points
				Up to 64 points
				Up to 64 points

Symbol/comment
  Number of symbol
  characters (Note 12)
  Number of comment
  characters (Note 10,12)
	40
	
	255
		40
		
		255
			40
			
			255
				40
				
				255

Program storage area (Note 9)	Up to 1.5 MB of flash ROM	Up to 768 KB of flash ROM	Up to 768 KB of flash ROM	128 KB of flash ROM

NOTE
1   This PMC is used for dual-check safety (DCS). It is used to watch both safety-related signals and ladder programs. Refer to "Dual Check Safety Operators Manual (B-64004EN)" for details.
2   NC parameter No. 11930 is used to specify a level-1 execution period. Refer to "PMC Programming Manual (B-63983EN)" for details. Note, however, that it is impossible to specify a level-1 execution period for each PMC separately.
3   The maximum overall program size (including the maximum number of ladder steps, symbols/ comments, and messages) varies depending on option settings. Refer to "PMC Programming Manual (B-63983EN)" for details.
4   For the number of functional instructions, each parenthesized number indicates the number of all functional instructions, and each non-parenthesized number, the number of valid functional instructions.
5   The extra relay is common memory for the multi-PMC function. To put it another way, its size covers all of the first, second, and third PMCs.
6   This area is used to specify the precision of the variable timer. Do not use this area in user programs.
7   It is possible to specify which program is used to control a specific CNC system. Refer to "PMC Programming Manual (B-63983EN)" for details.

NOTE

8 Series 30*i* can use up to four I/O Link channels (4,096 input points and 4,096 output points). Series 31i/32i can use up to three I/O Link channels (3,072 input points and 3,072 output points). However, only one I/O Link channel (1,024 input points and 1,024 output points) can be used in the basic function. Using more than one channel requires installing an I/O Link expansion option for each additional channel.
It is possible to specify which program is used to control a specific I/O Link channel.
Refer to "PMC Programming Manual (B-63983EN)" for details.

9 The capacity of the program storage area varies depending on option settings. Refer to "PMC Programming Manual (B-63983EN)" for details.

10 When you use only the full-size character. The number of comment character becomes half of the normal specification.

11 These instructions are intended to maintain source-level compatibility with programs for other models. A program can be created on level 3, but it is not executed.

12 These are the number for extended symbol and comment character. The number of basic symbol character is 16 and the number of comment character is 30. Refer to "PMC Programming Manual (B-63983EN)" for details.

7.3.2   Addresses

Table 7.3.2 (a)   Addresses of the PMCs for the Series 30*i*/31*i*/32*i*-A

Function	Symbol	30*i*/31*i*/32*i*-A			
		First PMC	**Second PMC (option)**	**Third PMC (option)**	**Dual-check safety PMC (option)**
Signal input to the PMC from the machine	X	X0 to X127 X200 to X327 X400 to X527 X600 to X727 X1000 to X1127 (Note 1)	X0 to X127 X200 to X327 X400 to X527 X600 to X727 X1000 to X1127 (Note 1)	X0 to X127 X200 to X327 X400 to X527 X600 to X727 X1000 to X1127 (Note 1)	X0 to X127
Signal output from the PMC to the machine	Y	Y0 to Y127 Y200 to Y327 Y400 to Y527 Y600 to Y727 Y1000 to Y1127 (Note 1)	Y0 to Y127 Y200 to Y327 Y400 to Y527 Y600 to Y727 Y1000 to Y1127 (Note 1)	Y0 to Y127 Y200 to Y327 Y400 to Y527 Y600 to Y727 Y1000 to Y1127 (Note 1)	Y0 to Y127
Signal input to the PMC from the CNC	F	F0 to F767 F1000 to F1767 F2000 to F2767 F3000 to F3767 F4000 to F4767 F5000 to F5767 F6000 to F6767 F7000 to F7767 F8000 to F8767 F9000 to F9767	F0 to F767 F1000 to F1767 F2000 to F2767 F3000 to F3767 F4000 to F4767 F5000 to F5767 F6000 to F6767 F7000 to F7767 F8000 to F8767 F9000 to F9767	F0 to F767 F1000 to F1767 F2000 to F2767 F3000 to F3767 F4000 to F4767 F5000 to F5767 F6000 to F6767 F7000 to F7767 F8000 to F8767 F9000 to F9767	F0 to F767
Signal output from the PMC to the CNC	G	G0 to G767 G1000 to G1767 G2000 to G2767 G3000 to G3767 G4000 to G4767 G5000 to G5767 G6000 to G6767 G7000 to G7767 G8000 to G8767 G9000 to G9767	G0 to G767 G1000 to G1767 G2000 to G2767 G3000 to G3767 G4000 to G4767 G5000 to G5767 G6000 to G6767 G7000 to G7767 G8000 to G8767 G9000 to G9767	G0 to G767 G1000 to G1767 G2000 to G2767 G3000 to G3767 G4000 to G4767 G5000 to G5767 G6000 to G6767 G7000 to G7767 G8000 to G8767 G9000 to G9767	G0 to G767
Signal input to other PMC path	M	M0 to M767	M0 to M767	M0 to M767	
Signal output from other PMC path	N	N0 to N767	N0 to N767	N0 to N767	
Internal relay • User area • System area	R	R0 to R7999 R9000 to R9499	R0 to R1499 R9000 to R9499	R0 to R1499 R9000 to R9499	R0 to R1499 R9000 to R9499
Extra relay	E	E0 to E9999	E0 to E9999 (Note 3)	E0 to E9999 (Note 3)	(Note 4)

Table 7.3.2 (b)   Addresses of PMCs for the Series 30*i*/31*i*/32*i*-A

Function	Symbol	30*i*/31*i*/32*i*-A			
		First PMC	**Second PMC (option)**	**Third PMC (option)**	**Dual-check safety PMC (option)**
Message display • Display request • Status display	A	A0 to A249 A9000 to A9249	A0 to A249 A9000 to A9249	A0 to A249 A9000 to A9249	A0 to A249 A9000 to A9249
Timer • Variable timer • Variable-timer precision (Note 2)	T	T0 to T499 T9000 to T9499	T0 to T79 T9000 to T9079	T0 to T79 T9000 to T9079	T0 to T79 T9000 to T9079
Counter • Variable counter • Fixed counter	C	C0 to C399 C5000 to C5199	C0 to C79 C5000 to C5039	C0 to C79 C5000 to C5039	C0 to C79 C5000 to C5039
Keep relay • User area • System area	K	K0 to K99 K900 to K999	K0 to K19 K900 to K999	K0 to K19 K900 to K999	K0 to K19 K900 to K999
Data table	D	D0 to D9999	D0 to D2999	D0 to D2999	D0 to D2999
Subprogram	P	P1 to P5000	P1 to P512	P1 to P512	P1 to P512
Label	L	L1 to L9999	L1 to L9999	L1 to L9999	L1 to L9999

> **NOTE**
> 1   This area is reserved for PMC management software.   No I/O can be allocated in this area.   Do not use it in user programs.
> 2   This area is used to specify the precision of a variable timer.
>   Don't modifiy the value of timer and precision except for same value when working the timer
>   -Don't set the value other than the following range.
>   If above rules are violated, the working of the timer is not guaranteed.
>   The rage other than from T9000 to T9499 are reserved.
>
>   The value of precision
>   0: Default (8msec or 4msec)
>   1: 1msec
>   2: 10msec
>   3: 100msec
>   4: 1sec
>   5: 1min
> 3   This area is common memory for the multi-PMC function.   It is possible for each program to read the same value from, and write it to, the area.
> 4   No extra relay is available for the dual-check safety PMC.

7.4 **OPERATING THE PMC SCREEN**

The basic configuration of the PMC screen is described below.
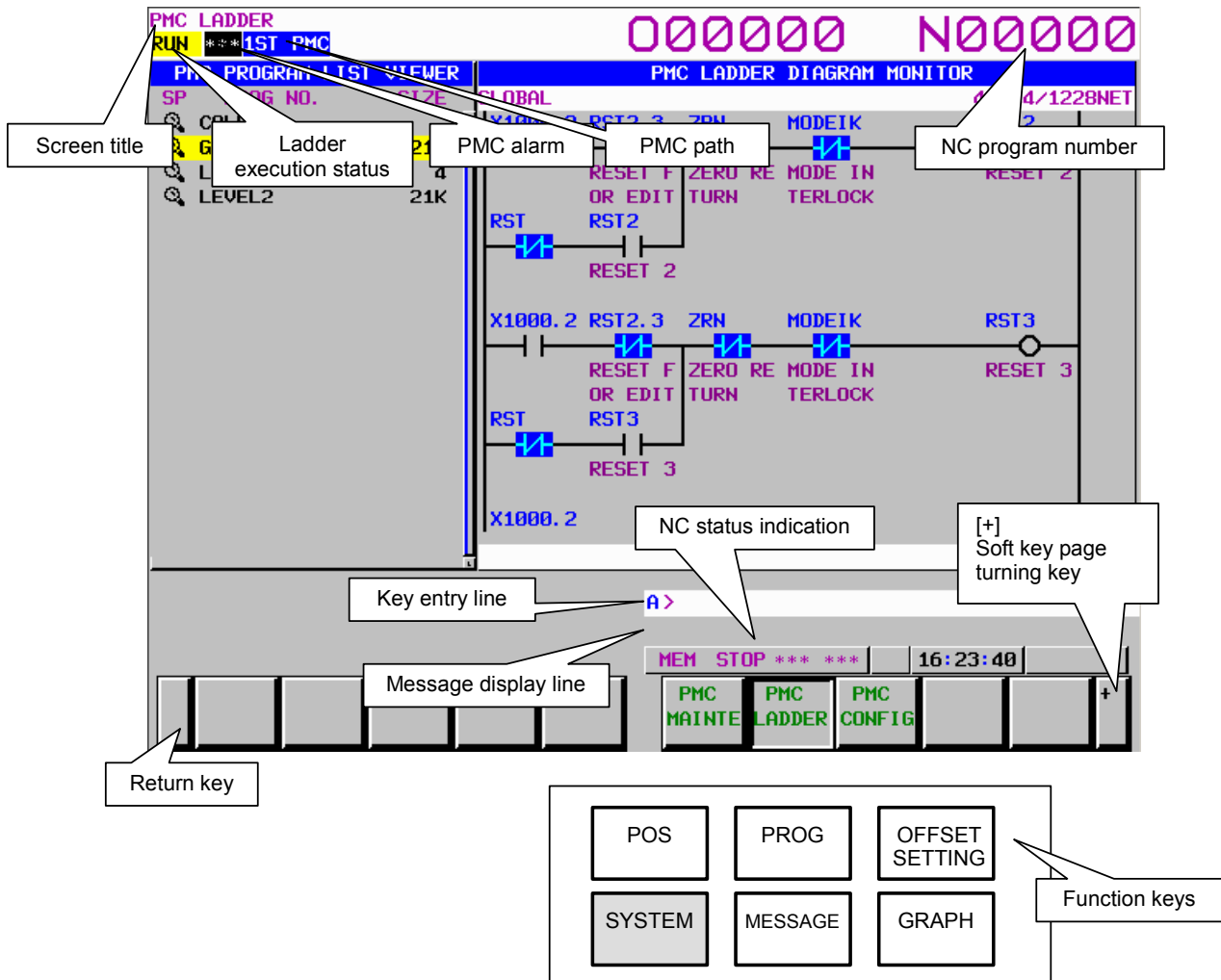
- Screen title: Displays the name of a specific submenu of the PMC.
- Ladder execution status: Displays the execution status of the ladder program.
- PMC alarm: Indicates whether any PMC alarm is occurring.
- PMC path: Displays the currently selected PMC.
- NC program number: Displays the number of the currently selected NC program.
- Key entry line: Line for entering a numerical value or character key string.
- Message display line: Displays an error or warning message.

- NC status indication: Displays the NC mode, the execution status of the NC program, the currently selected NC path number.
- Return key: Used to switch from the PMC operation menu to a specific PMC submenu or from a specific PMC submenu to the main menu of the PMC.
- Soft key page turning key: Used to turn soft key pages.

About the PMC screen
When you click the "SYSTEM" function key and then turn the soft key page by clicking the [+] soft key, the main menu of the PMC is displayed.
The PMC main menu offers the following three types of submenus, which are respectively used for specific purposes.
- PMC maintenance
- PMC ladder
- PMC configuration

Each of these PMC submenus is explained below.

(1) PMC maintenance menu
    This menu displays the screens related to the maintenance of the PMC, such as those for PMC signal status monitoring and traces and for PMC data display and editing.

(2) PMC ladder menu
    This menu displays the screens related to the display and editing of the ladder program.

(3) PMC configuration menu
    This menu displays the screens related to the display and editing of the data other than the ladder constituting the sequence program, as well as the screen for setting the PMC functions.

This manual briefly describes the screen of each of the PMC maintenance and PMC ladder menus. For detailed descriptions and the PMC configuration menu, refer to "FANUC Series 30*i*-MODEL A PMC Programming Manual."

7.4.1   **Transition of the PMC Screens**
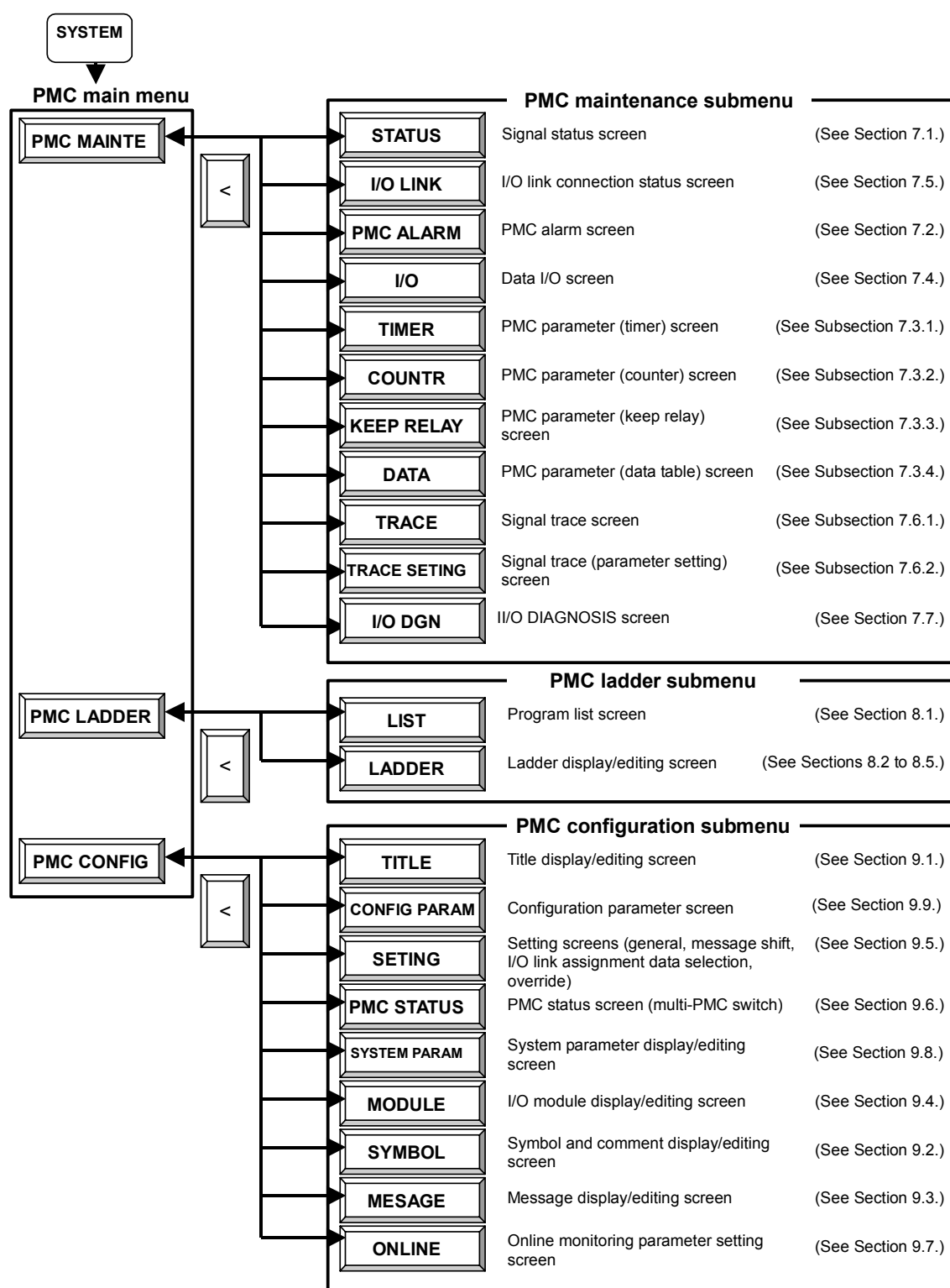
7.5 PMC DIAGNOSIS AND MAINTENANCE SCREENS ([PMC MAINTE])

7.5.1 Monitoring PMC Signal Status ([STATUS] Screen)

The SIGNAL STATUS screen displays the data at all addresses specified in the program. The data of each address consists of a bit pattern (0s and/or 1s) and a hexadecimal or decimal number at the rightmost position on a byte-by-byte basis.
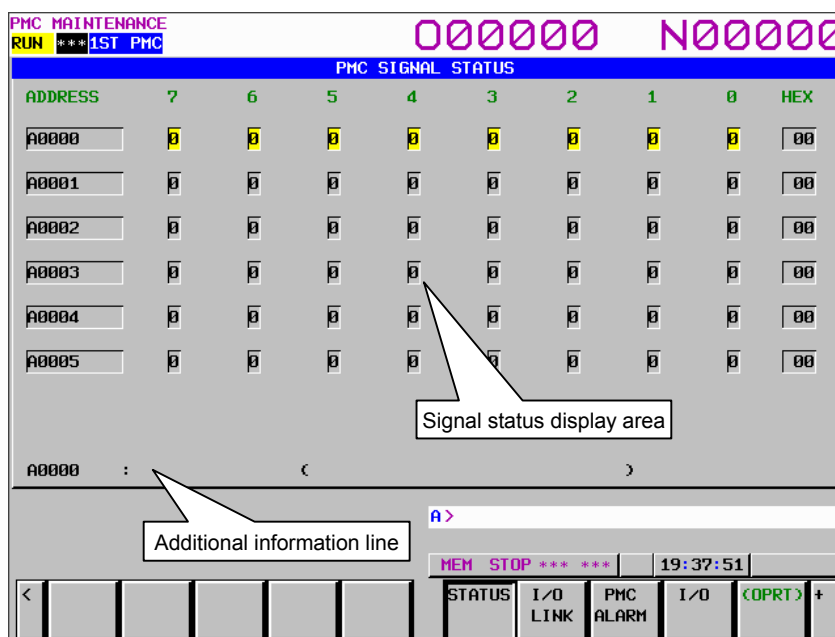
The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed. When the cursor is placed on a byte, the byte symbol and comment are displayed.
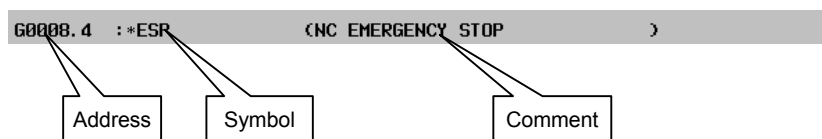
Table contents
- ADDRESS: Address referenced by a sequence program
- 0 to 7: Data at each bit position
- HEX: Display of each byte in hexadecimal
- DEC: Display of each byte in decimal

Operation procedure
(1) Press the [STATUS] soft key. The screen shown above appears.
(2) Key in an address whose data to be displayed, then press the [SEARCH] soft key.

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(3) The data starting at the input address is displayed as a bit pattern.
(4) To display the data at another address, press the cursor keys, page keys, or [SEARCH] soft key.
(5) To modify the status of a signal, switch to the forced I/O screen by pressing the [FORCE] soft key.

NOTE
   The [FORCE] soft key is displayed and usable
   when the forced I/O function is enabled. For details,
   see PMC PROGRAMMING MANUAL.

---

(6) On the forced I/O screen, an overridden X signal or Y signal is prefixed by a greater-than sign (>) to indicate the setting of override.

ADDRESS	7	6	5	4	3	2	1	0	HEX
X0000	0	>1	0	1	>0	0	>0	0	50

Soft keys on the Signal Status screen

Address search   Switching to the forced I/O screen   PMC path switching

< SEARCH DEC _ _ FORCE _ _ _ SWITCH PMC _

Switching to display in decimal

< SEARCH HEX _ _ FORCE _ _ _ SWITCH PMC _

Switching to display in hexadecimal
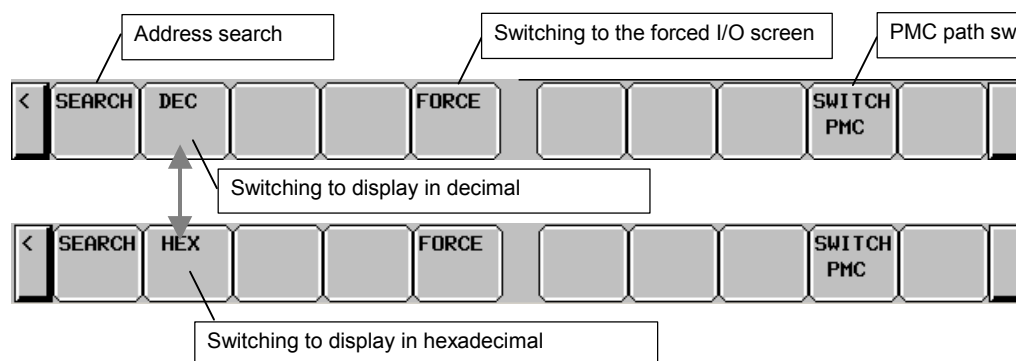
Fig. 7.5.1 (a) Soft keys on the SIGNAL STATUS screen

7.5.2   **Checking PMC Alarms ([PMC ALARM] Screen)**

On this screen, an alarm message output from the PMC is displayed. To move to the PMC alarm screen, press the [PMC ALARM] soft key.
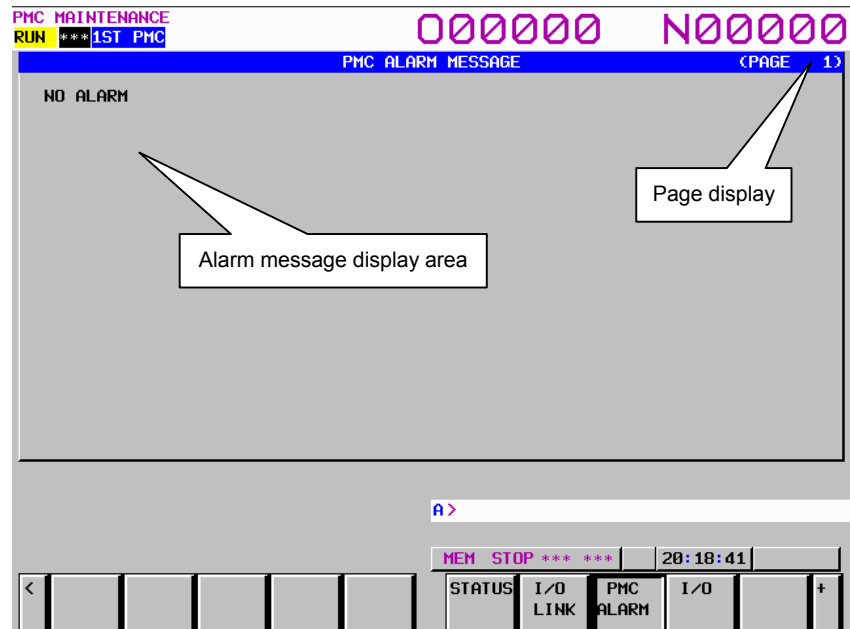
In the alarm message display area, an alarm message output from the PMC is displayed. When many alarm messages are output to two or more pages, the page keys can be used to switch from one page to another.

In the page display area to the right of the title, the number of the page currently displaying messages is indicated.

For information about messages displayed, see Appendix A "Alarm List."

7.5.3   Setting and Displaying Variable Timers ([TIMER] Screen)

This screen is used to set and display timer values for functional instruction variable timers (TMR:SUB 3). This screen can be used in one of two modes: the simple display mode and the comment display mode. To move to the TIMER screen, press the [TIMER] soft key.
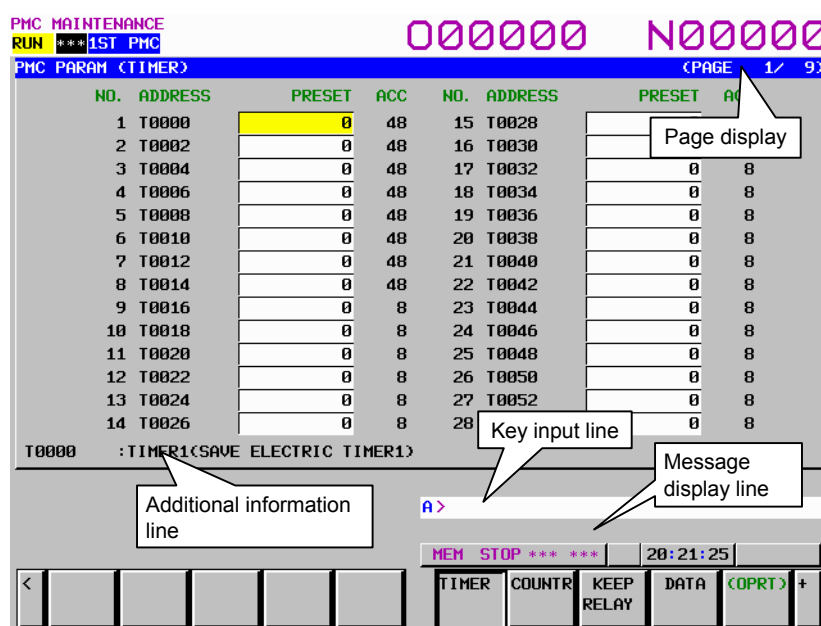
Simple display mode
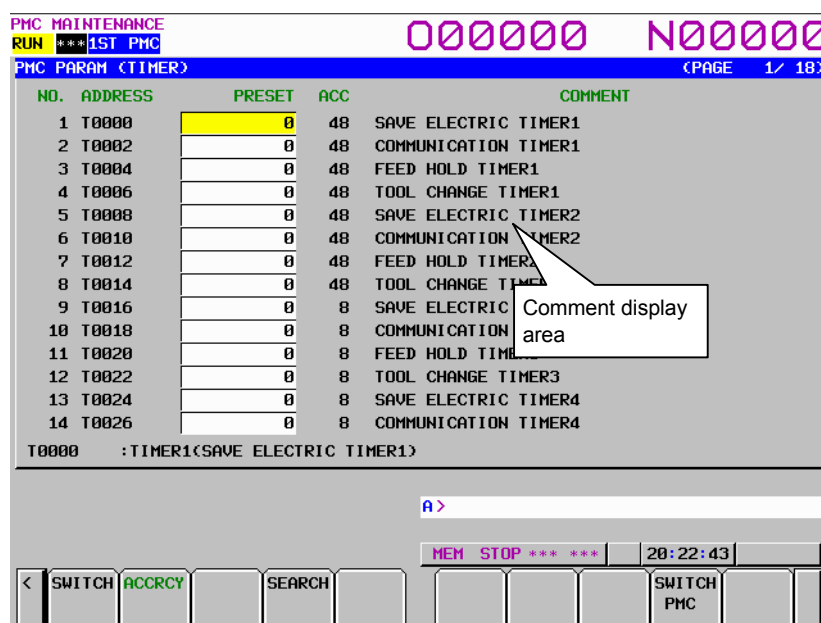
Comment display mode

Table contents
- NO.:   Timer number specified for a functional instruction timer.
- ADDRESS: Address referenced by a sequence program
- PRESET: Timer setting value
- ACC: Timer accuracy
- COMMENT: T address comment

In the PRESET column, timer setting values are displayed. When the timer accuracy is 8, 48, 1, 10, or 100 ms, only a numeric value is displayed. When the timer accuracy is the second or minute, a time value is displayed using H, M, and S with the separator "_" used to delimit one unit from another as follows:

    aaH_bbM_ccS

In the ACC column, timer accuracy values are displayed. The table below indicates the time setting values and notation of each accuracy value.

Timer No.	Accuracy notation	Minimum time setting	Maximum time setting
1 to 8	48 (initial value)	48 ms	1572.8 seconds
9 to 250	8 (initial value)	8 ms	262.1 seconds
1 to 250	1	1 ms	32.7 seconds
1 to 250	10	10 ms	327.7 seconds
1 to 250	100	100 ms	54.6 minutes
1 to 250	S	1 second	546 minutes
1 to 250	M	1 minute	546 hours

The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed.

Soft keys on the TIMER screen
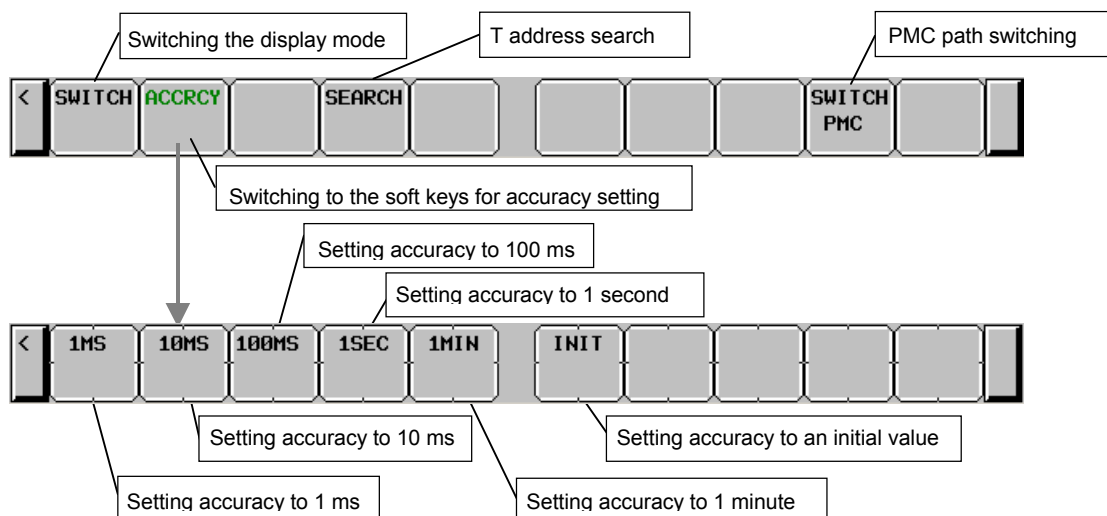
7.5.4　Setting and Displaying Counter Values ([COUNTR] Screen)

This screen is used to set and display the maximum and minimum counter values for functional instruction counters (CTR: SUB 5). This screen can be used in one of two modes: the simple display mode and the comment display mode. To move to the COUNTER screen, press the [COUNTR] soft key.
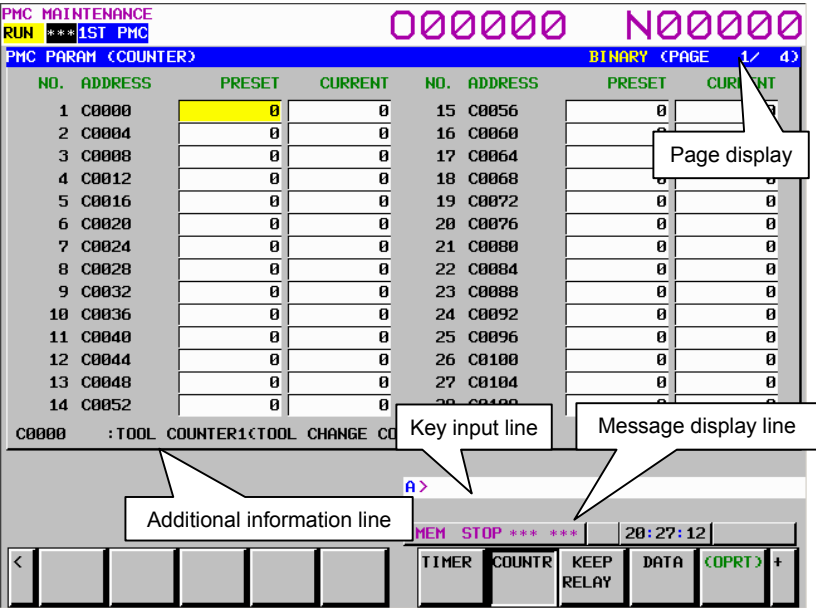
Simple display mode
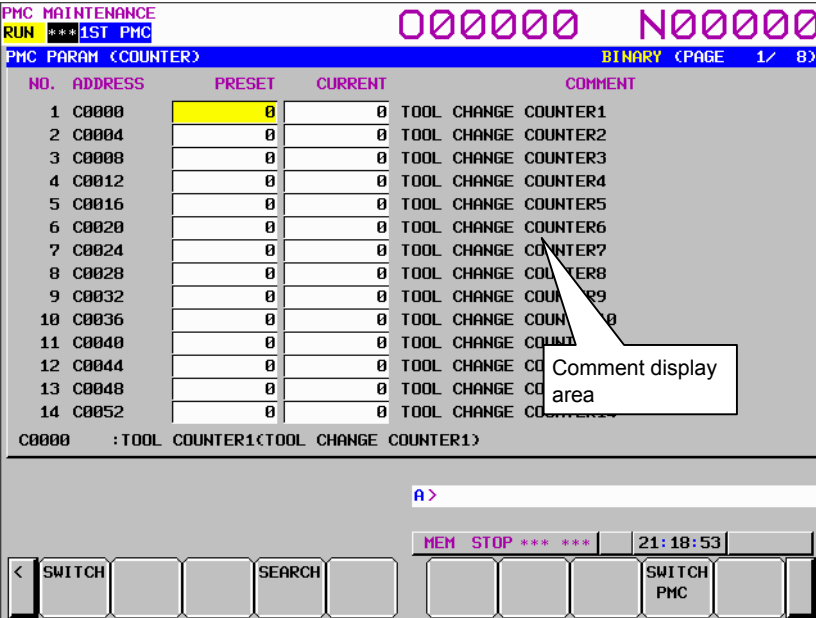
Comment display mode

Table contents

- NO.:   Counter number specified for a functional instruction counter
- ADDRESS: Address referenced by a sequence program
- PRESET: Maximum counter value (a minimum counter value is specified by a counter instruction)
- CURRENT: Current counter value
- COMMENT: Comment on the C address of a setting value

The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed. If the cursor is placed on a PRESET value, the symbol and comment of the address of the PRESET value are displayed. If the cursor is placed on a CURRENT value, the symbol and comment of the address of the CURRENT value are displayed.

Counter types and maximum values

Counter type	PRESET maximum value	CURRENT maximum value
BINARY	32767	32767
BCD	9999	9999

Soft keys on the COUNTER screen

Display mode switching   C address search   PMC path switching

| < | SWITCH | | | SEARCH | | | | | SWITCH PMC | | |

7.5.5   Setting and Displaying Keep Relays ([KEEP RELAY] Screen)

This screen is used for setting and displaying the Keep Relays. To move to the KEEP RELAY screen, press the [KEEP RELAY] soft key.
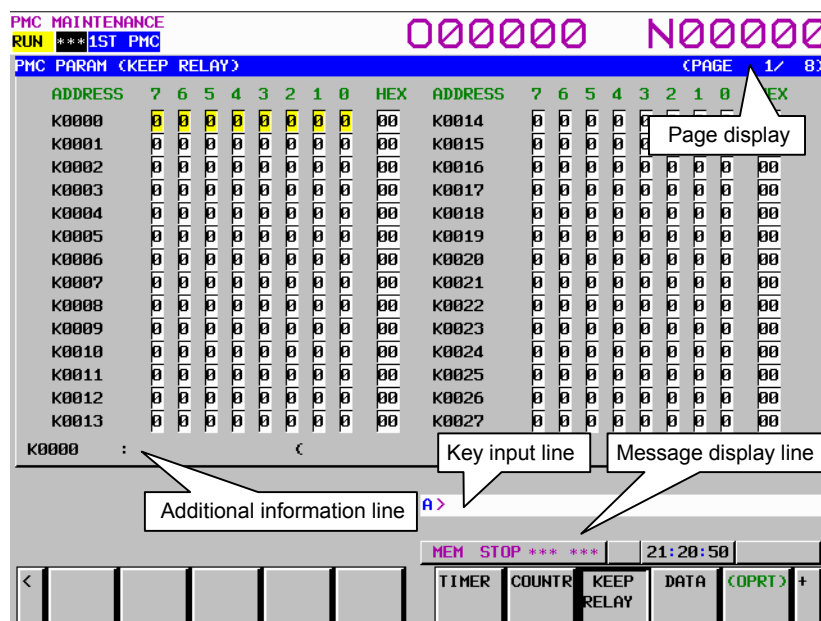
Contents of the table
- ADDRESS: Address refered by sequence Program
- 0 to 7:   Contents of each bit
- HEX: Value of the byte data in hexadecimal notation

The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed. When the cursor is placed on a byte, the byte symbol and comment are displayed.

Since Keep Relay is nonvolatile memory, the contents are not lost even if you turn off the power.

The Keep Relay area consists of parts as follows.

	30*i*/31*i*/32*i*-A			
	First PMC	**Second PMC (option)**	**Third PMC (option)**	**Dual check safety PMC**
User area	K0–K99	K0–K19	K0–K19	K0–K19
Area for management software	K900–K999	K900–K999	K900–K999	K900–K999

⚠ **CAUTION**
    If the area for the PMC management software is
    protected by the programmer protection function,
    the area is not displayed on the KEEP RELAY
    screen. For details, see FANUC Series 30*i*-MODEL
    A PMC PROGRAMMING MANUAL.

7.5.6 Setting and Displaying Data Tables ([DATA] Screen)

There are two data table types (data table control data table and data table). To move to the data screen, press the [DATA] soft key.

(1) DATA TABLE CONTROL screen ([List] screen)
Pressing the [DATA] soft key displays the DATA TABLE CONTROL screen for data table management. This screen can be used in one of two modes: the simple display mode and the comment display mode.

Simple display mode

Comment display mode
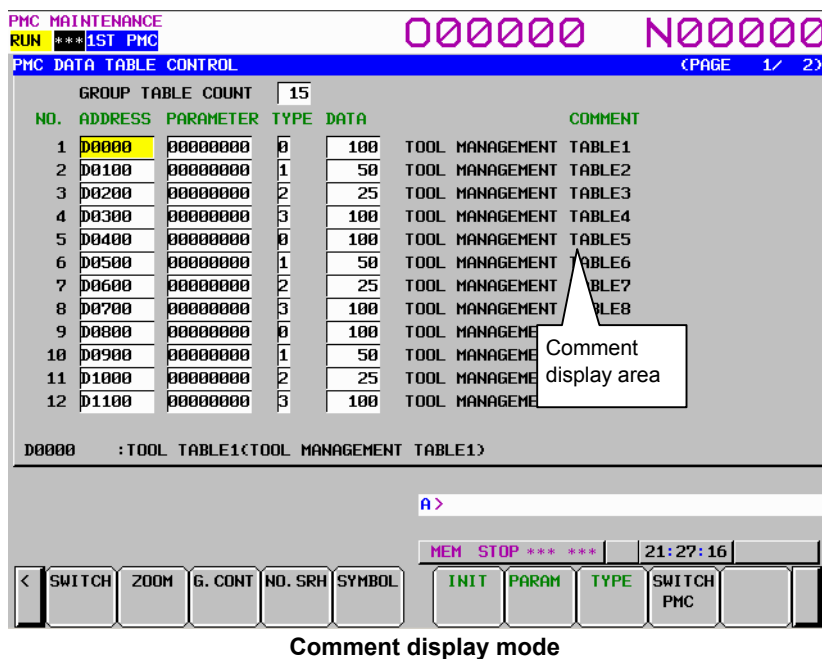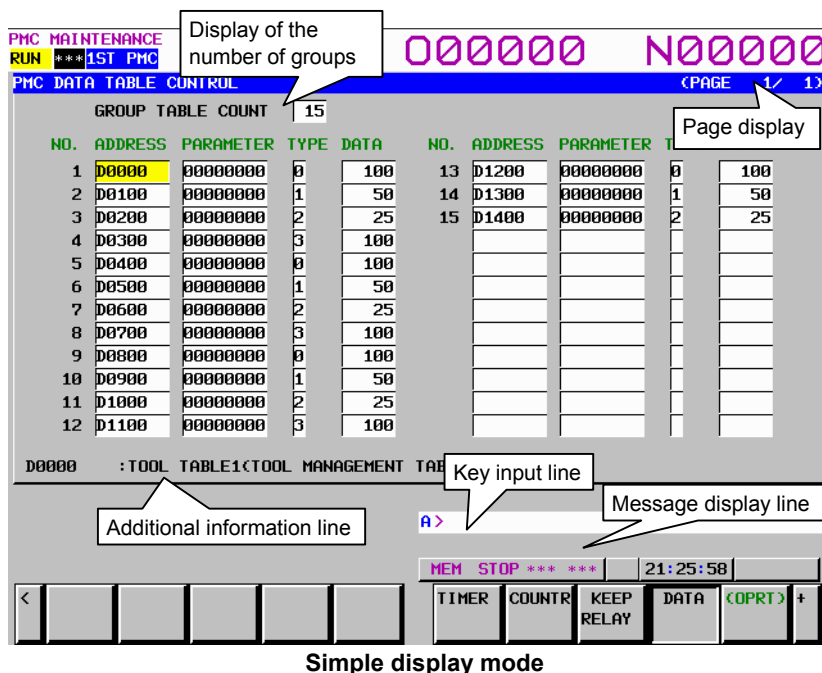
Table contents
- GROUP TABLE COUNT: Number of data items in the data table
- NO.:   Group number
- ADDRESS: Data table start address
- PARAMETER: Data table control parameter
- TYPE: Data length (0 = 1 byte, 1 = 2 bytes, 2 = 4 bytes, 3 = bit)
- DATA: Number of data items in each data table
- COMMENT: Comment on the start D address of each group

The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed. When the cursor is placed on the PARAMETER, TYPE, or DATA column, the current setting is displayed.

The ADDRESS column displays the start address of a data table. Multiple groups may share an address. When the [SYMBOL] soft key is pressed, the symbol of the start address is displayed.

NOTE
The data table control parameters have the following meanings:

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

```
                                        0:  Binary format
                                        1:  BCD format (Bits 2 and 3 are invalid.)
                                        0:  Without input protection
                                        1:  With input protection
                                        0:  Binary or BCD format (Bit 0 is valid.)
                                        1:  Hexadecimal format (Bits 0 and 3 are invalid.)
                                        0:  Signed (valid only when bits 0 and 2 are set to 0)
                                        1:  Unsigned (valid only when bits 0 and 2 are set to 0)
```

NOTE
1 When data table control data is protected by the programmer protection function, the data table control data screen is not displayed. For details, see PMC PROGRAMMING MANUAL.
2 When PMC parameters are output using the I/O screen (see Subsection 7.5.7), only the data of an address D area set in the data table control data is output from the data table screen. The data of an address D area not set in the data table control data is not output.

Soft keys on the DATA TABLE CONTROL screen

Display mode switching

Switching to the zoom screen

Data table control data initialization

Switching to the soft keys for parameter setting

| < | SWITCH | ZOOM | G. CONT | NO. SRH | SYMBOL | | INIT | PARAM | TYPE | SWITCH PMC | | |

Input of the number of groups

Group number search

Symbol display switching

Switching to the soft keys for data size setting

Address display switching

PMC path switching

| < | SWITCH | ZOOM | G. CONT | NO. SRH | ADRESS | | INIT | PARAM | TYPE | SWITCH PMC | | |

Soft keys for parameter setting

Setting for signed decimal

Setting for hexadecimal

| < | SGNDEC | USDEC | BCD | HEX | PROTECT | | | | | | | |

Setting for unsigned decimal

Setting for BCD

Protection state modification

Soft keys for data size setting

Setting for byte

Setting for bit

| < | BYTE | WORD | DWORD | BIT | | | | | | | | |

Setting for word

Setting for double word

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(2) DATA TABLE screen ([ZOOM] screen)

If the data table control data is specified, clicking the [ZOOM] soft key on the data table control data screen displays the data table setting screen. This screen can be used in one of three modes: the simple display mode, the comment display mode, and the bit display mode.

Simple display mode

Comment display mode
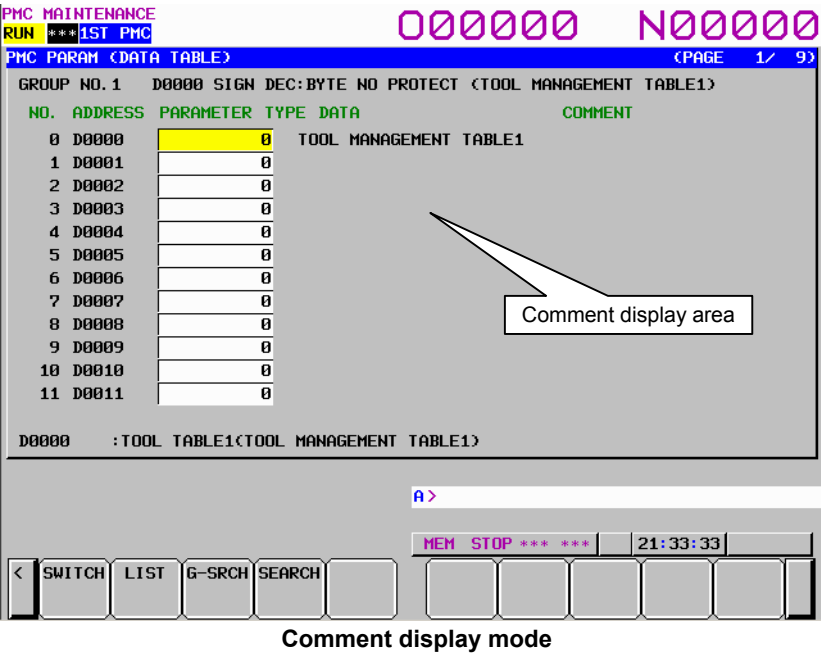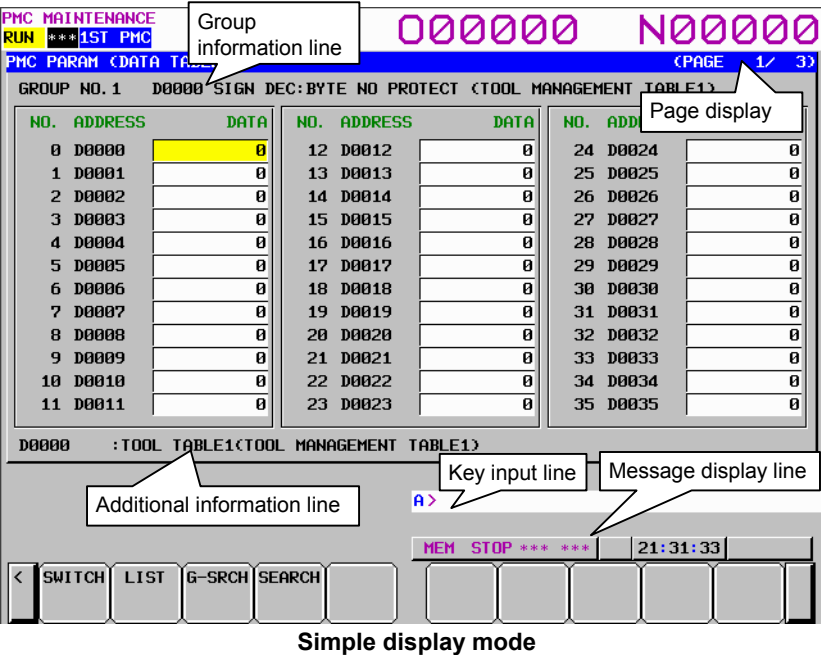
```
PMC MAINTENANCE                    000000   N00000
RUN ***1ST PMC
PMC PARAM <DATA TABLE>                          <PAGE   1/  5>
 GROUP NO.4   D0300 SIGN DEC:BIT NO PROTECT <TOOL MANAGEMENT TABLE4>

    ADDRESS 7 6 5 4 3 2 1 0  HEX  ADDRESS 7 6 5 4 3 2 1 0  HEX
    D0300   0 0 0 0 0 0 0 0  00   D0312   0 0 0 0 0 0 0 0  00
    D0301   0 0 0 0 0 0 0 0  00   D0313   0 0 0 0 0 0 0 0  00
    D0302   0 0 0 0 0 0 0 0  00   D0314   0 0 0 0 0 0 0 0  00
    D0303   0 0 0 0 0 0 0 0  00   D0315   0 0 0 0 0 0 0 0  00
    D0304   0 0 0 0 0 0 0 0  00   D0316   0 0 0 0 0 0 0 0  00
    D0305   0 0 0 0 0 0 0 0  00   D0317   0 0 0 0 0 0 0 0  00
    D0306   0 0 0 0 0 0 0 0  00   D0318   0 0 0 0 0 0 0 0  00
    D0307   0 0 0 0 0 0 0 0  00   D0319   0 0 0 0 0 0 0 0  00
    D0308   0 0 0 0 0 0 0 0  00   D0320   0 0 0 0 0 0 0 0  00
    D0309   0 0 0 0 0 0 0 0  00   D0321   0 0 0 0 0 0 0 0  00
    D0310   0 0 0 0 0 0 0 0  00   D0322   0 0 0 0 0 0 0 0  00
    D0311   0 0 0 0 0 0 0 0  00   D0323   0 0 0 0 0 0 0 0  00

 D0300    :TOOL TABLE4<TOOL MANAGEMENT TABLE4>


                                  A>

                                  MEM  STOP *** ***    21:35:05
 <  SWITCH  LIST  G-SRCH SEARCH
```

Bit display mode

Table contents
- NO.
- ADDRESS: Address used by the sequence program
- DATA: Data value of data table
- COMMENT: Comment on the D address
- 0 to 7:   Data of each bit
- HEX: Display of each byte in hexadecimal

The group information line at the top of the screen displays a group number, group start address, settings, and comment on the start address.

The additional information line at the bottom of the screen displays the symbol and comment of the address on which the cursor is placed. In the bit display mode, a bit symbol and comment, or a byte symbol and comment are displayed, depending on the cursor position.

Soft keys on the DATA TABLE screen

Display mode switching

Address search

```
 <  SWITCH  LIST  G-SRCH SEARCH
```

Switching to the list screen

Group number search

- 400 -
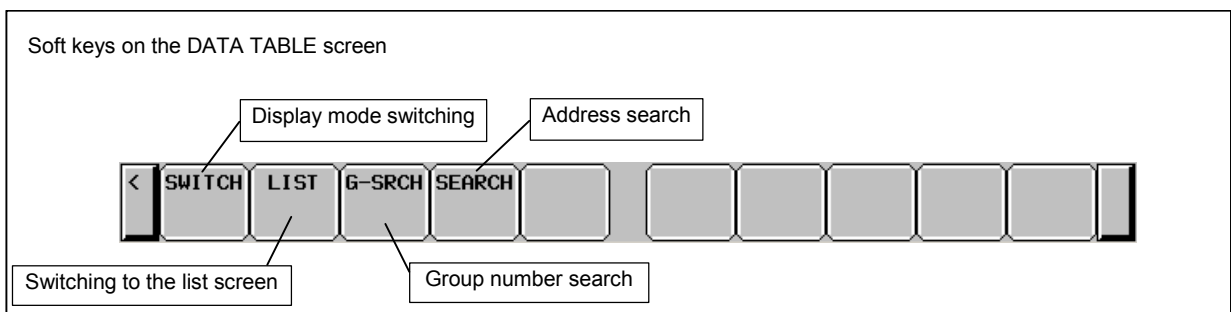
7.5.7   Data Input/Output ([I/O] Screen)

To move to the I/O screen, press the [I/O] soft key.

On this screen, sequence programs, PMC parameters and PMC message data for multi-language display can be written to the specified device, read from the device, and compared. The query selection cursor, which moves vertically from one question to another, is displayed, as is the option selection cursor, which moves horizontally from one option to another.

The following types of devices can be used for input/output. The desired device type can be selected by positioning the query selection cursor to "DEVICE" and moving the option selection cursor to that type.

- MEMORY CARD: Data can be output to and input from a memory card.
- FLASH ROM: Data can be output to and input from flash ROM.
- FLOPPY: Data can be output to and input from handy files or floppy cassettes.
- OTHERS: Data can be output to and input from other general-purpose RS-232C input/output devices.

The multi-path PMC system enables an I/O target PMC to be selected. In STATUS in the lower part of the screen, a detailed explanation of execution and the execution status are displayed. During write, read, and comparison, the size of the data already transferred is indicated as the execution (intermediate) result.

The following gives a display example shown when PMC parameters are written to a memory card:

```
PMC MAINTENANCE                       000000    N00000
RUN ***1ST PMC
                        PMC DATA I/O

PMC            = PMC1      / PMC2    / PMC3     / PMC DCS

DEVICE         = MEMORY CARD / FLASH ROM / FLOPPY / OTHERS

FUNCTION       = WRITE  / READ   / COMPARE / DELETE / FORMAT
KIND OF DATA   = SEQUENCE PROGRAM / PARAMETER

FILE NAME      = [            ]


STATUS : WRITING PMC PARAMETER

       EXECUTING


                                      5038 BYTE WRITTEN



                                A>

                                INC STOP *** ***    12:13:37

  <    CANCEL
```
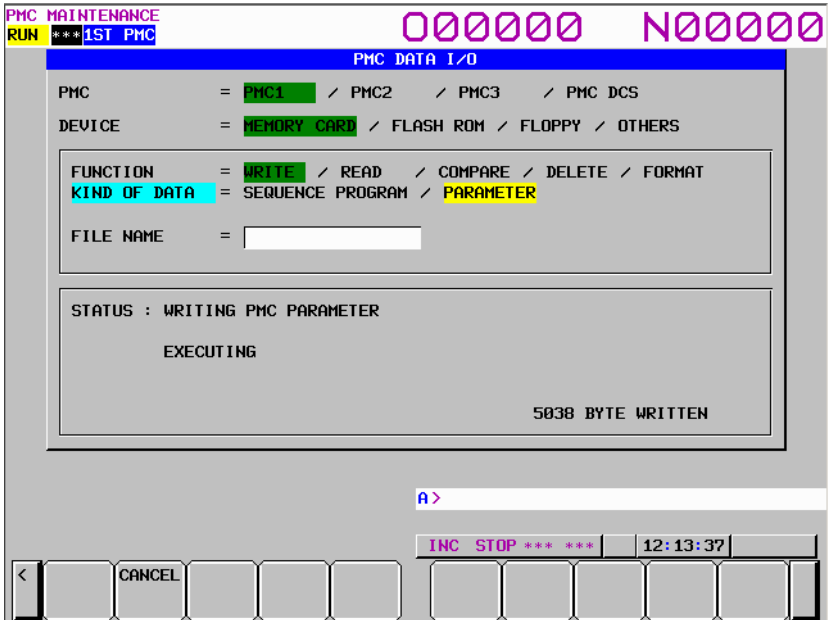
Soft keys on the I/O screen

Execution

Switching to the port setting screen

```
 <   EXEC        LIST  PORT
                       SETTING
```

Switching to the list screen

```
 <        CANCEL
```

Cancellation

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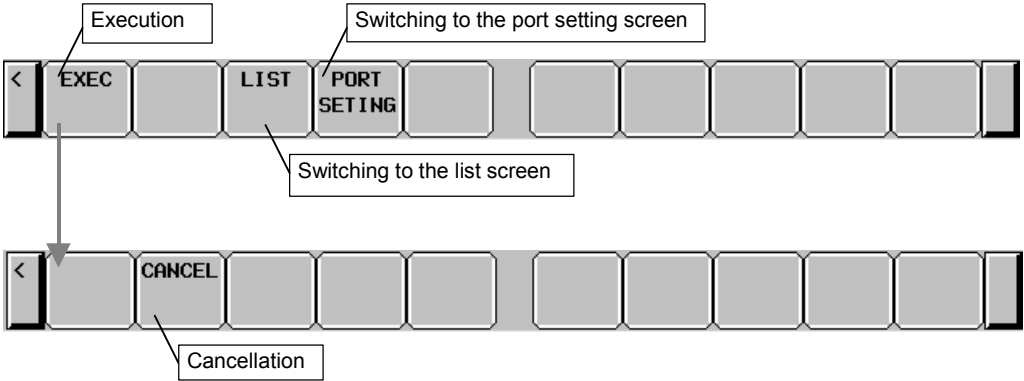
7.5.8   Displaying I/O Link Connection Status ([I/O LINK] Screen)

I/O LINK MONITOR screen shows the types and the ID codes of I/O Units that are connected to I/O Link in order of Group number.
To switch the screen display to the I/O LINK MONITOR screen, press the [I/O LINK] soft key.
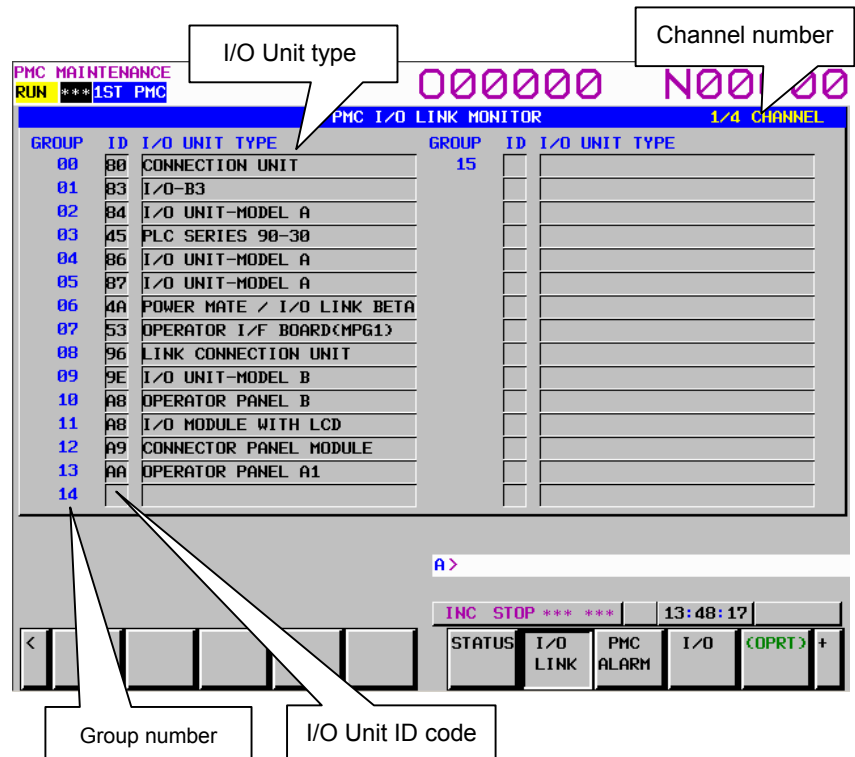
Table 7.5 Displayed type and true type of I/O Units

Displayed I/O Unit	ID	True I/O Unit
CONNECTION UNIT	80	Connection Unit
OPERATOR PANEL	82	Connection Unit for Operators Panel
I/O-B3	83	I/O B3
IO UNIT-MODEL A	84 86 87	I/O Unit-MODEL A
PLC SERIES 90-30	45	PLC SERIES 90-30
POWER MATE / I/O LINK BETA	4A	Power Mate or I/O Link β
SERIES 0	50	Series 0
OPERATOR I/F BOARD (MPG1)	53	Machine Operators Panel Interface
LINK CONNECTION UNIT	96	I/O Link Connecting Unit
I/O UNIT-MODEL B	9E	I/O Unit-MODEL B
R-J MATE	61	R-J Mate
CONNECTOR PANEL MODULE	A9	I/O module for connector panel
OPERATOR PANEL A1	AA	I/O module for operator's panel
OPERATOR I/F BOARD (MPG3)	6B	Operator Interface(with MPG)
LOADER I/O	AF	I/O Board for Loader
FRC DIF	B0	DIF Board for ROBOCUT

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Table 7.5 Displayed type and true type of I/O Units

Displayed I/O Unit	ID	True I/O Unit
FRC MIF	B1	MIF Board for ROBOCUT
I/O CARD	B2	I/O board
ROBOSHOT I/O CARD A	B3	I/O for ROBOSHOT
LOADER I/O (MATRIX)	B4	I/O Board for Loader(Matrix)
PROCESS I/O FA	B5	Process I/O for robot controller
PROCESS IO	89	Process I/O for robot controller
I/O LINK ADAPTER	8B	I/O Link adapter
ROBOT CONTROLLER	52	Controller for robot
GE Fanuc PLC	54	GE Fanuc PLC
OPERATOR PANEL	95	I/O for Series 0
LASER OSCILLATOR	97	Laser Oscillator
FIXED I/O TYPE A	98	I/O for Robot Type A
FIXED I/O TYPE B	99	I/O for Robot Type B
AS-I CONVERTER	77	AS-i Converter
OPERATOR PANEL B	A8	I/O Module(for Operator Panel 48/32)
MACHINE OPERATOR PANEL A	A8	I/O Module(for Machine Operator Panel of 0 Type)
CONNECTION UNIT C1 (MPG)	A8	Connection Unit C1(with MPG)
MACHINE OPERATOR PANEL B	A8	I/O Module (for Machine Operator Panel)
I/O MODULE WITH LCD	A8	LCD display embedded I/O
UNKNOWN UNIT	-	Unknown I/O Unit

> ⚠ **CAUTION**
> 1 IDs other than those for the I/O units listed in Table 7.5 represent undefined units.
> 2 I/O Units not for this CNC are written in Table 7.5.

Soft keys

Displays connection status of the previous channel

Displays connection status of the next channel
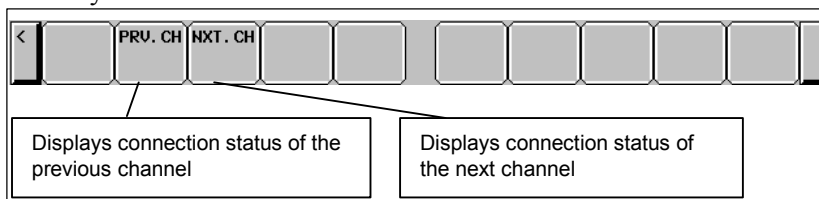
7.5.9   Signal Trace Function ([TRACE] Screen)
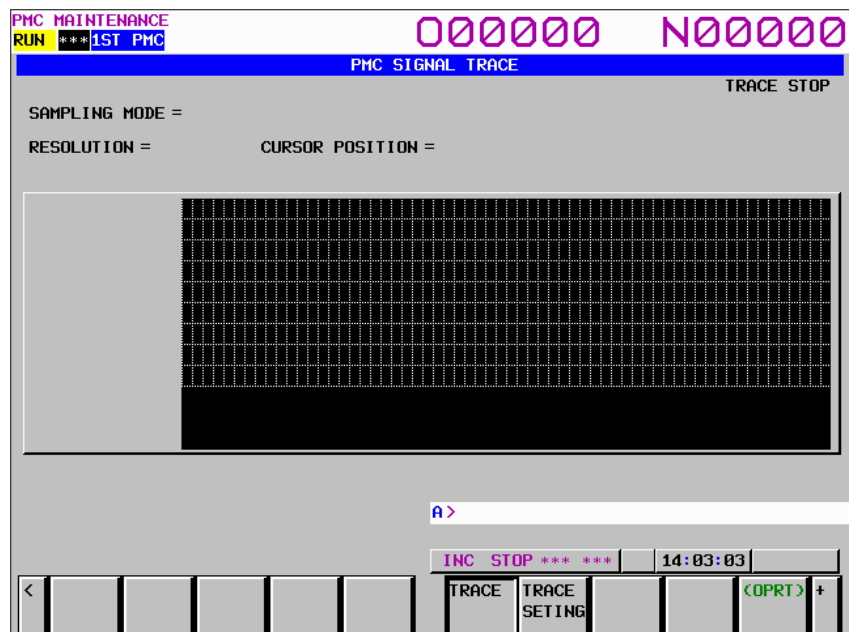
SIGNAL TRACE screen (initial screen)

Before trace operation can be executed, the trace parameters must be set. Press the [TRACE SETING] soft key to switch the screen display to the trace parameter setting screen.

By setting the PMC setting screen, the trace function can be automatically started after the power is turned on. In this case as well, the trace parameters must be set beforehand.

NOTE

For the setting to automatically start the trace function after the power is turned on, see Subsection 7.5.11.2.

7.5.10 Setting of Trace Parameter ([TRACE SETING] Screen)

On the trace parameter setting screen, a sampling condition can be set. The screen consists of two pages. Use the page keys to switch between the pages.

Trace parameter setting screen (first page)

(a) SAMPLING/ MODE
Determines the sampling mode.
- TIME CYCLE: Samples at every specified cycle time.
- SIGNAL TRANSITION: Monitors the signal at a set cycle and samples when the signal makes a transition.

(b) SAMPLING/ RESOLUTION
The resolution of sampling is inputted. The default value is the minimum sampling resolution (msec), which varies depending on the CNC.
Setting range: Minimum sampling resolution to 1000 (msec)
An input value is rounded off to a multiple of the minimum sampling resolution (msec) which is closest to but not greater than the input value.

(c) SAMPLING/ TIME
This parameter is displayed when "TIME CYCLE" is set on "SAMPLING/ MODE". The execution time of trace is inputted. The value of "SAMPLING/ RESOLUTION" or the number of specified signal address changes the range of the value that is able to input. The range is displayed on the right side.

(d) SAMPLING/ FRAME

This parameter is displayed when "SIGNAL TRANSITION" is set on SAMPLING/ MODE". The number of sampling is inputted. The value of "SAMPLING/ RESOLUTION" or the number of specified signal addresses changes the range of the value that is able to input. The range is displayed on the right side.

(e) STOP CONDITION

Determines the condition to stop the trace.

- NONE: Does not stop the tracing automatically.
- BUFFER FULL: Stops the tracing when the buffer becomes full.
- TRIGGER: Stops the tracing by trigger.

(f) STOP CONDITION/ TRIGGER/ ADDRESS

When "TRIGGER" is set on "STOP CONDITION", this parameter is enabled. Input signal address or symbol name as stop trigger.

A PMC number can be set for a trigger address by entering the PMC number at the time of address setting.

    Example: 2:R9200.1 + Input key

A setting can be made by entering "PMC number" + ":" + "address" as indicated above.

(g) STOP CONDITION/ TRIGGER/ MODE

When "TRIGGER" is set on "STOP CONDITION", this parameter is enabled. Determine the trigger mode when the trace is stopped.

- RISING EDGE: Stops the tracing automatically by rising up of the trigger signal.
- FALLING EDGE: Stops the tracing automatically by falling down of the trigger signal.
- BOTH EDGE: Stops the tracing automatically by rising up or falling down of the trigger signal.

h) STOP CONDITION/ TRIGGER/ POSITION

When "TRIGGER" is set on "STOP CONDITION", this parameter is enabled. Input the ratio of the sampling time or number which specifies the position where specified trigger condition is on. If you would like to examine the transitions of the signal before the trigger condition, you should set a big value in this parameter. If you would like to examine the transitions of the signal after the trigger condition, you should set a small value in this parameter.

Example: The case that sampling time is 10 seconds and trigger position is set as "10%".
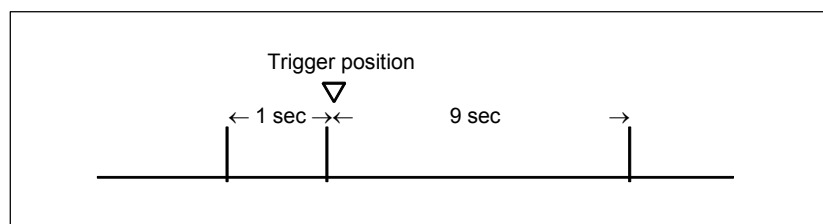
(i) SAMPLING CONDITION
When "SIGNAL TRANSITION" is set on "TRACE MODE", this parameter is enabled.
Determine the sampling condition.
- TRIGGER: Samples the status of specified signals when the specified sampling condition is on.
- ANY CHANGE: Samples the status of specified signals when the signals change.

(j) SAMPLING CONDITION/ TRIGGER/ ADDRESS
When "SIGNAL TRANSITION" is set on "TRACE MODE", and "TRIGGER" is set on "SAMPLING CONDITION", this parameter is enabled. Input signal address or symbol name as sampling trigger.
A PMC number can be set for a trigger address by entering the PMC number at the time of address setting.
     Example: 2:R9200.1 + Input key
A setting can be made by entering "PMC number" + ":" + "address" as indicated above.

(k) SAMPLING CONDITION/ TRIGGER/ MODE
When "SIGNAL TRANSITION" is set on "TRACE MODE", and "TRIGGER" is set on "SAMPLING CONDITION", this parameter is enabled. Input trigger mode that determines the condition of specified trigger.
- RISING EDGE: Samples the status of specified signals by rising up of the trigger signal.
- FALLING EDGE: Samples the status of specified signals by falling down of the trigger signal.
- BOTH EDGE: Samples the status of specified signals by rising up or falling down of the trigger signal.
- ON: Samples the status of specified signals during the trigger signal is on.
- OFF: Samples the status of specified signals during the trigger signal is off.

In page 2 of the PARAMETER SETTING screen, you can set the addresses or symbols that should be sampled.

Trace parameter setting screen (second page)

(a) Setting addresses

In case of inputting discrete bit addresses, any bit address can be inputted.

Moreover, when you input byte address, all bits of the address (bits 0 to 7) are set automatically. Maximum 32 points of signal address can be inputted.

With the multi-PMC system, an address can be set for a desired PMC by specifying its PMC number.

Example: 2:R9200.1 + Input key

A setting can be made by entering "PMC number" + ":" + "address" as indicated above.

When no PMC number is specified, the specification of the currently selected PMC is assumed. In this case, "PMC number" + ":" is automatically prefixed to a specified address.

When only one PMC is used as in the standard PMC system, no PMC number needs to be specified.

NOTE
1   For the PMC numbers, see Section 7.2.
2   If there is not ":" key in your keyboard, use ";" or "/".
3   The signals of the PMC for dual check safety
    cannot be traced.
4   Increasing the number of the signal address
    changes the capacity of "SAMPLING/ TIME" or
    "SAMPLING/ FRAME" in page 1. If the capacity is
    changed, the following warning message is
    displayed. (The "n" on the message means the
    maximum value that is able to input.)
    a) In case of "TIME CYCLE" mode
        "SAMPLING TIME IS REDUCED TO n SEC."
    b) In case of "SIGNAL TRANSITION" mode
        "SAMPLING FRAME IS REDUCED TO n."

---

b)   Soft keys
     Soft keys on the setting screen of sampling address are as follows
     • DELETE: Clears the value of the edit box on the
                        cursor.
     • SYMBOL/   Changes the address display to the symbol
       ADDRESS: display. However, display of the address
                        that is not defined the symbol does not
                        change. This soft key also changes to
                        "ADDRESS". The following soft keys are
                        displayed.
     • MOVE UP: Exchanges the signal indicated the cursor
                        for the signal above one line.
     • MOVE DOWN: Exchanges the signal indicated the cursor
                        for the signal below one line.
     • DELETE ALL: Clears all of the value of the edit box.

c)   Trigger setting
     When "SIGNAL TRANSITION" is set on "TRACE MODE" and
     "ANY CHANGE" is set on "SAMPLING CONDITION", it can
     be set whether to use the setting address as the signals that should
     trigger the sampling in the setting signals. As for the signal
     address where the trigger was set, "✓" is displayed right. Soft
     keys on the Trigger setting screen are as follows:
     • TRGON: Sets the Trigger on.
     • TRGOFF: Sets the Trigger off.
     The default setting is trigger on for all signals.

7.5.11   Execution of Trace

After the trace parameters are set, a trace operation can be started by pressing the [(OPRT)] soft key and the [RUN] soft key on the SIGNAL TRACE screen. The following is the screen examples of the trace execution by "TIME CYCLE" mode and "SIGNAL TRANSITION" mode.
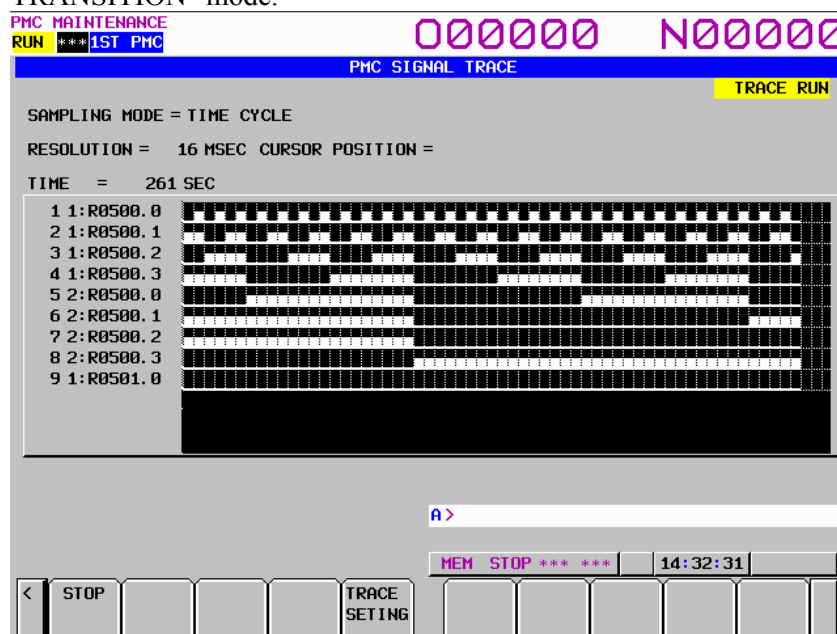
Execution of trace screen (TIME CYCLE mode)
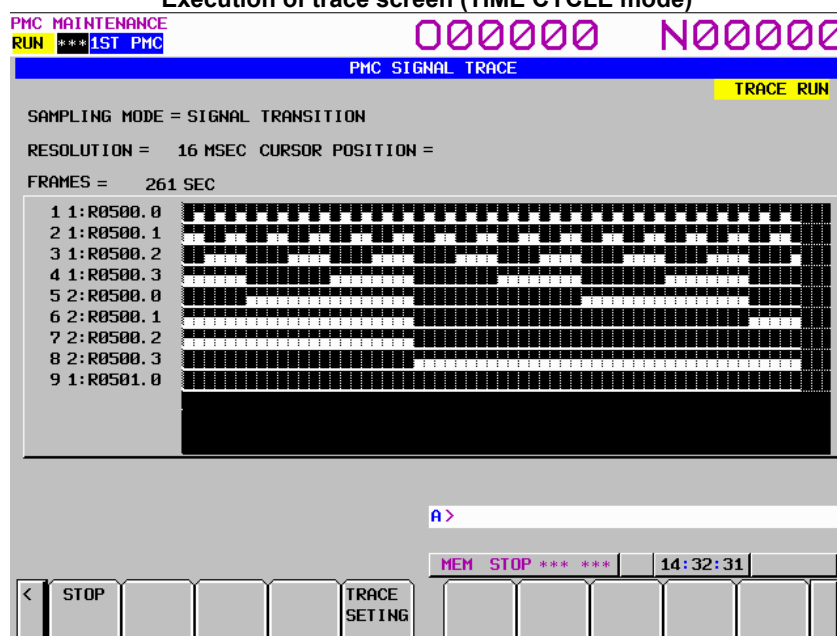
Execution of trace screen (SIGNAL TRANSITION mode)

The result of trace is immediately displayed during execution of the trace.

When the stop conditions that is set in parameter setting screen is satisfied the execution is finished. Pushing [STOP] soft key aborts the execution. In "SIGNAL TRANSITION" mode, graphic display is not refreshed until any signal for sampling trigger changes.

7.5.11.1 Operation after execution of trace

When the execution is finished, the result of trace is displayed. The followings are the screen examples of trace by "TIME CYCLE" and "SIGNAL TRANSITION" mode.
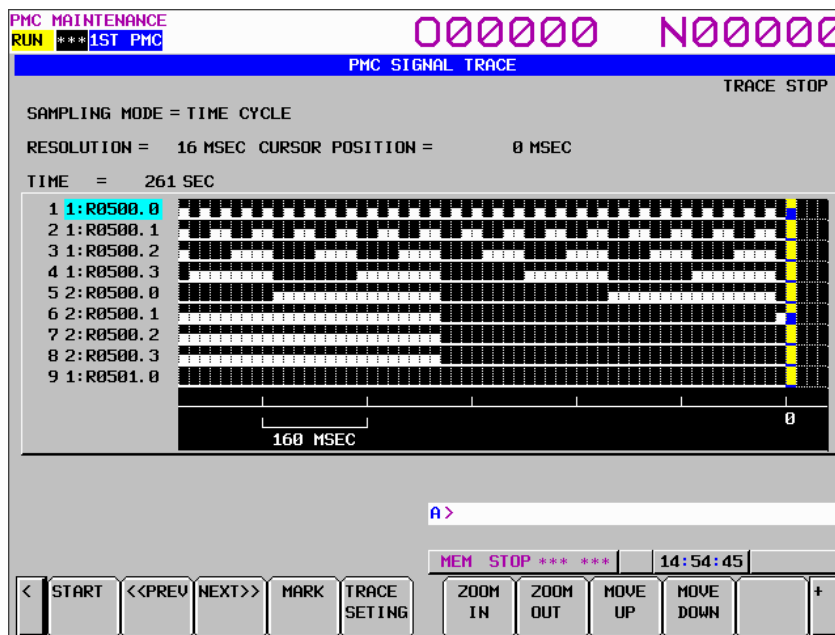
Result of trace screen (TIME CYCLE mode)
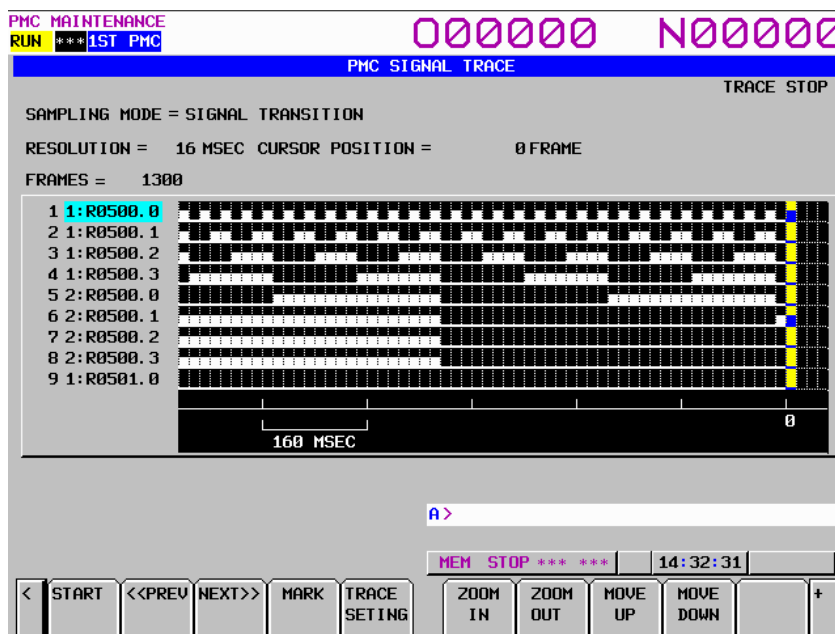
Result of trace screen (SIGNAL TRANSITION mode)

The cursor indicating current position is initially displayed on the original point (0 point). The position of the cursor is displayed in "CURSOR POSITION" in the upper of the screen. The cursor can move horizontally with the $<\leftarrow>$ or $<\rightarrow>$ key. After the execution, following operation is enabled.

a) Scroll of screen
   - Cursor up/down key and Page up/down key
     Enables the vertical scroll for the specified signal
   - Cursor right/left key, [NEXT>>] soft key and [<< PREV] soft key
     Enables the horizontal scroll of the graph.

b) Automatic calculation of the selected range
   Pushing [MARK] soft key marks the current position and displays the mark cursor.
   If the mark cursor duplicates with the current position cursor, the current position cursor has priority of display. The "MARK POSITION" that shows the position of the mark cursor and "RANGE" that shows the range between the mark cursor and the current position cursor are displayed in the upper of screen.
   Moving the current position cursor changes these values. Pushing [MARK] again releases the select range mode.
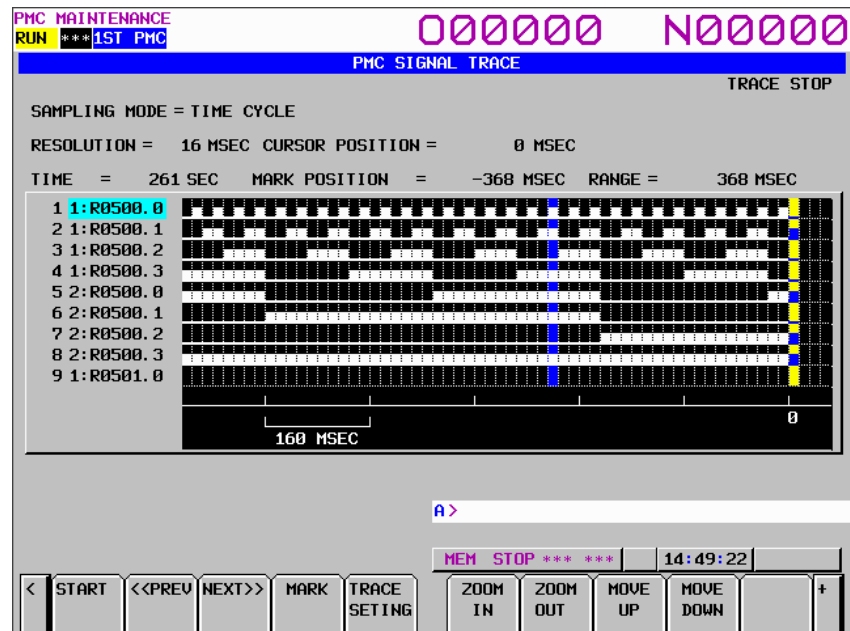
Result of trace screen (Mark cursor display)

c) Zoom in/Zoom out of waveform
   Pushing [ZOOM IN] soft key magnifies the display of chart. Pushing [ZOOM OUT] soft key reduces the display of chart. Pushing these soft keys also change the scale value of the graduation on the graph. When trace is just finished, the default zooming level was the most magnified level. In [ZOOM OUT] mode, "X" is displayed as following screen example when the transitions of signal cannot be expressed accurately enough. The limitation of [ZOOM OUT] displays all of result of the trace in one page.
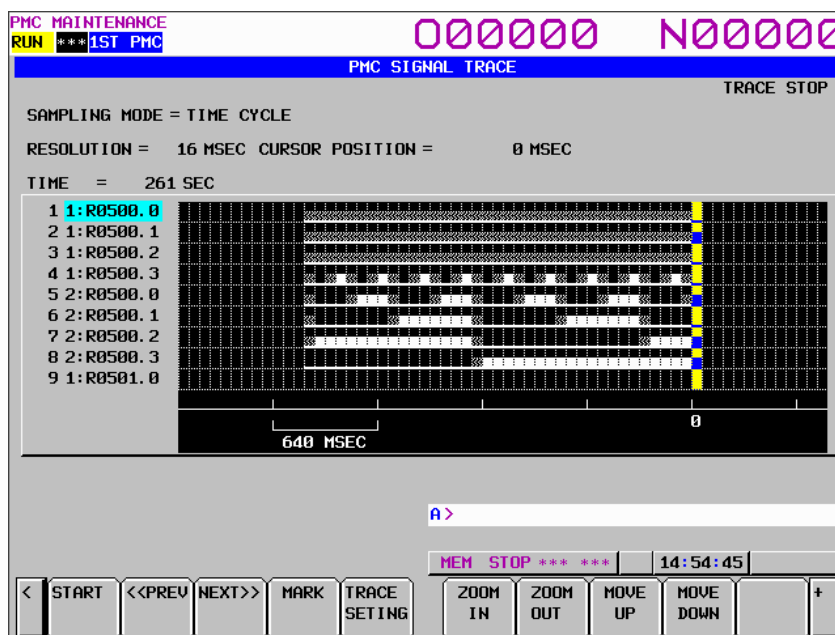
Result of trace screen (Zoom out display)

d) Exchange of sampling signal
    Pushing [MOVE UP] soft key exchanges the signal indicated by
    the signal cursor for the signal one line above. Pushing [MOVE
    DOWN] soft key exchanges the signal indicated by the signal
    cursor for the signal one line below. The result of the operation is
    cancelled by the execution of trace or putting the power off.
    When you would like to preserve the order of displayed signals
    against the executing or powering off, please change the order on
    "SAMPLING ADDRESS" screen.

7.5.11.2 Automatic start of trace setting

Trace execution is automatically started after power-on by setting a
PMC setting data.

•   TRACE START = MANUAL/AUTO

> **NOTE**
>   For details of the method of setting PMC setting
>   data, see PMC PROGRAMMING MANUAL
>   (B-63983EN).

7.5.12 MONITORING I/O DIAGNOSIS ([I/O DGN] SCREEN)

In I/O Diagnosis screen, you can check the status of each I/O variable. You can also check the configuration of I/O devices and the communication status with them.
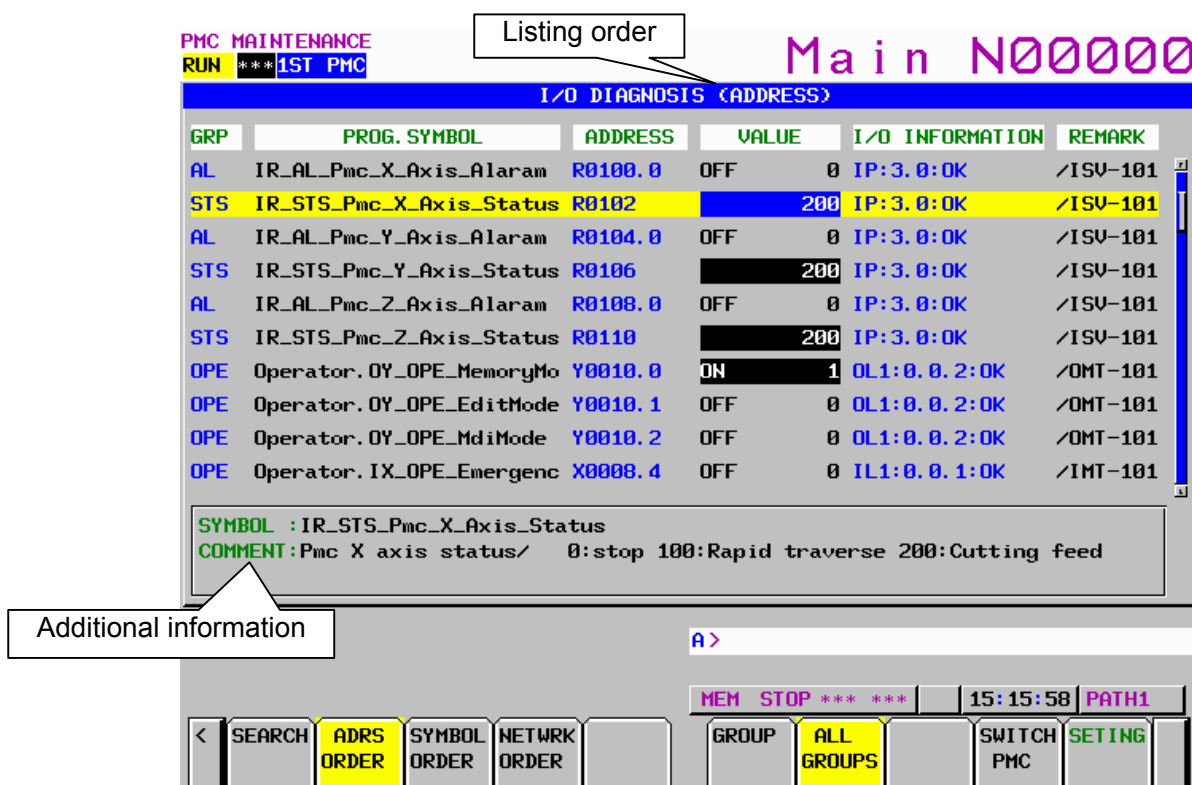
GRP (GROUP)
To include a specific string which means a kind of signals in a part of symbol string, these signals on I/O diagnosis screen are classified and you can easy to understand the status of signals.
The group names of the I/O variables are displayed, which are extracted (Max. 4 chars) out of their symbol names as configured in "GROUP FORMAT" in the setting screen.
The groups to be displayed can be specified by soft key.
[ALL GROUPS]   All groups are displayed.
[GROUP]   The group entered by key or the group under the cursor is selected to be displayed.

PROG.SYMBOL (SYMBOL)
The symbol names of the I/O variables are displayed.

ADDRESS
The actual locations of I/O variables are displayed.

VALUE
The current values of I/O variables are displayed as signed decimal, according to the data type of them (i.e. BOOL, BYTE, WORD, and DWORD).

I/O INFORMATION
The information related to I/O network is displayed in the display format below:

<I/O type><Network type> **:** *<Network address>* **:** *<status>*

I/O type:

Module type	Shown as
Input module	I
Output module	O
Other	*

Network type:

Network type	Shown as
PROFIBUS	P
I/O LINK	L*n* (*n*: channel number)

Network address:

Network type	Network address notation
PROFIBUS	*<Slave #>.<Slot #>*
I/O LINK	*<Group #>.<Base #>.<Slot #>*

NOTE
This screen shows the I/O information according to the network setting that became effective at the time of the last power-on.
The notes for each network device are as follows:

PROFIBUS
1. If you have changed some of the profibus parameters, you have to cycle the power once to make the changes take effect.

I/O LINK
1. Only the I/O Link assingments, which are made effective by the setting of "Machine Signal Interface" in Configuration Parameter menu and the setting of "Selectable I/O Link Assignment Function", are displayed.
2. If you have changed the following parameters, you have to cycle the power once to make them take effect:
   • "I/O module assignment data"
   • "Machine signal interface" in PMC configuration parameter
   • "Selectable I/O Link assignment function"
3. If you have stored new sequence program to PMC, its I/O Link assignment data will not take effect until you write it into Flash-ROM and cycle the power once.

Status: the status of communication
"OK" or "NG" is displayed.

REMARK
The remarks up to 8 characters extracted from comment data are displayed. To specify the remark at this field, set "100" to the attribute value of the comment, which you want to show in this field, on FANUC LADDER-III,

Additional information window
In this window, symbol and comment of the I/O variable under the cursor are displayed.   When language dependent comment attributes are specified, corresponding comment is displayed according to the current language setting of the CNC.
In FANUC LADDER-III, the attribute value of comment should be set to 0 to 15 to display language dependent comment

Attribute value: 0 to 15

0:	English	8:	Dutch
1:	Japanese	9:	Danish
2:	German	10:	Portuguese
3:	French	11:	Polish
4:	Chinese (Traditional)	12:	Hungarian
5:	Italian	13:	Swedish
6:	Korean	14:	Czech
7:	Spanish	15:	Chinese (Simplified)

NOTE
   In case of the extended symbol and comment, the comments on the screen will be switched dynamically another language when the language setting of CNC changes.

Soft key

Softkeys on the I/O Diagnosis screen

Search for data

Switch to the address order display

Switch to the specified group display

SEARCH | ADRS ORDER | SYMBOL ORDER | NETWRK ORDER | | GROUP | ALL GROUPS | | SWITCH PMC | SETING

Switch to the address order display

Switch PMC path

Screen settings

Switch to the address order display

Switch to the all group display
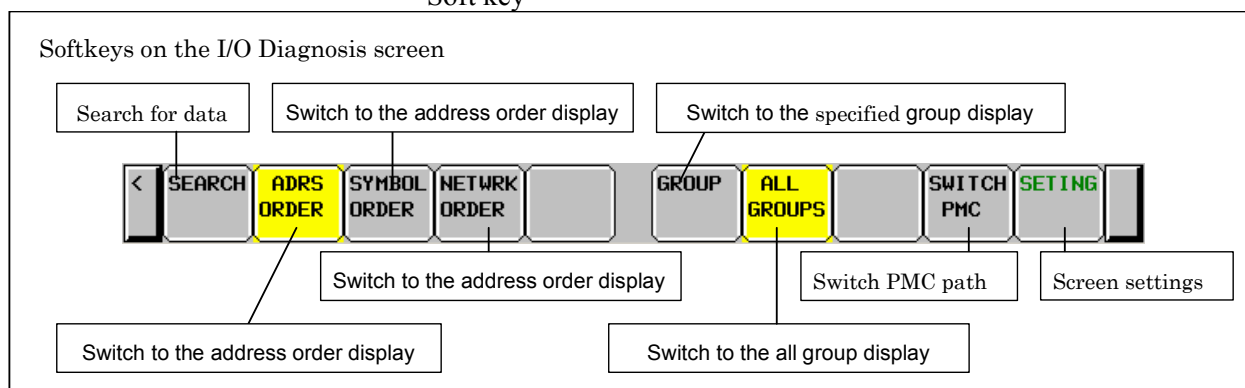
7.6 LADDER DIAGRAM MONITOR AND EDITOR SCREENS ([PMC LADDER])

The PMC LADDER menu contains the screens related to PMC Ladder diagrams, such as the program list screen and the LADDER DIAGRAM MONITOR/EDITOR screens.

You can switch to the PMC LADDER menu by operating on the "SYSTEM" key and then the [PMC LADDER] soft key.
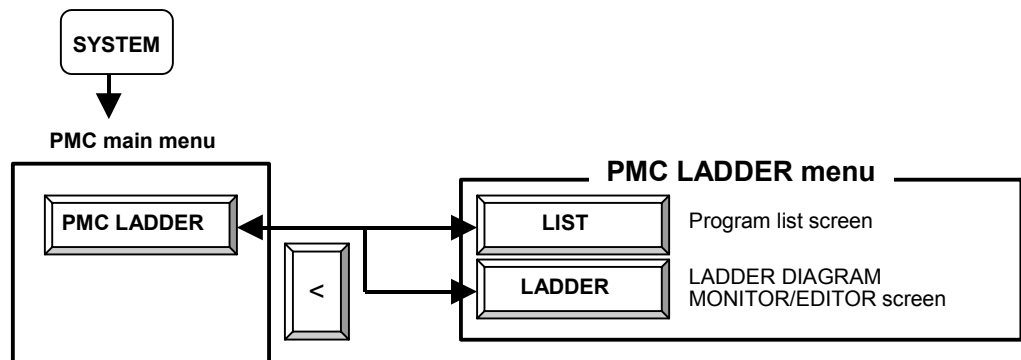
Clicking the [LADDER] soft key causes the sequence program to be dynamically displayed, allowing you to monitor operation. The editor screen allows you to make changes to relay and functional instructions in the sequence program to change the operation of the sequence program.

The ladder diagram display/editor functions consist of the following screens:

(1) Ladder diagram display screen (LADDER DIAGRAM MONITOR screen)

Displays ladder diagrams to monitor the current states of relays, coils, and so on.

(2) COLLECTIVE MONITOR screen

Displays only a selected ladder net to monitor the current states of relays, coils, and so on.

(3) LADDER DIAGRAM EDITOR screen

Allows you to edit a ladder diagram in units of nets.

(4) NET EDITOR screen

Allows you to edit a single net in a ladder diagram.

(5) PROGRAM LIST VIEWER screen

Allows you to select the subprogram to be displayed on the LADDER DIAGRAM MONITOR screen.

(6) PROGRAM LIST EDITOR screen

Allows you to edit a ladder program in units of subprograms. Also allows you to select the subprogram to be edited on the LADDER DIAGRAM EDITOR screen.

The following screens can be called from the LADDER DIAGRAM EDITOR screen:

(7) FUNCTIONAL INSTRUCTION DATA TABLE VIEWER screen

Allows you to view the contents of the data table for a data table attached functional instruction.

(8) FUNCTIONAL INSTRUCTION DATA TABLE EDITOR screen

Allows you to edit the contents of the data table for a data table attached functional instruction.

NOTE

You can protect these screens by using the programmer protection function. For details, see FANUC Series 30*i*-MODEL A PMC PROGRAMMING MANUAL.

You can change between screens as shown in the figure below.
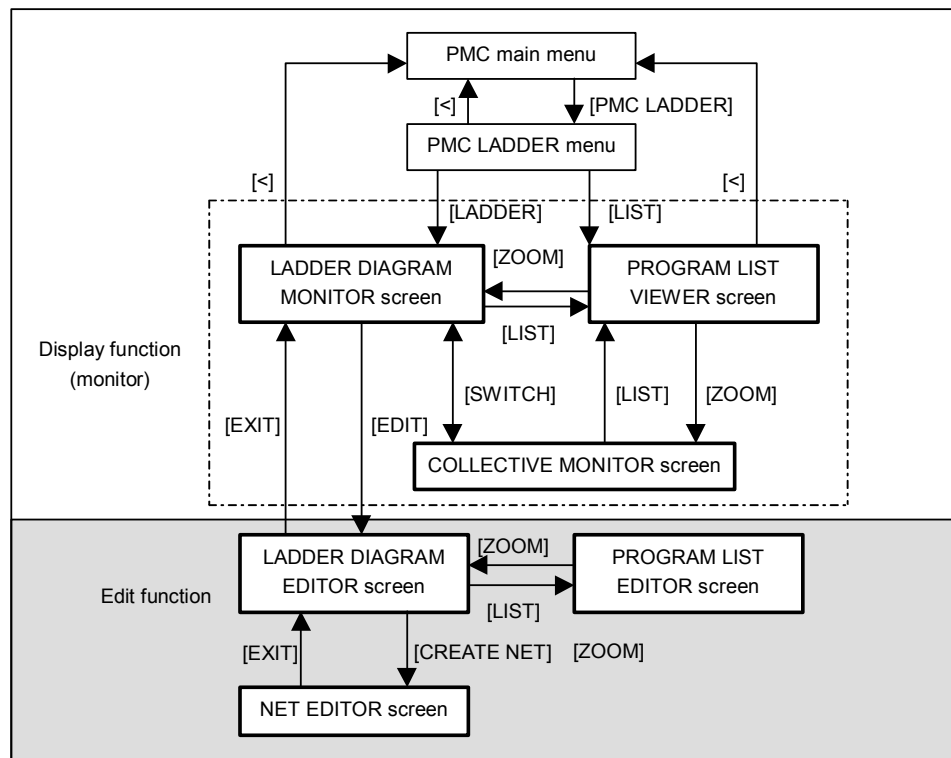
Fig. 7 Changes between screens

NOTE

The [EDIT] soft key on the LADDER DIAGRAM MONITOR screen is displayed so that it is available if the programmer protection function is enabled. While the online monitor function is enabled, you cannot move to the LADDER DIAGRAM EDITOR screen. (To stop the online monitor function, change the settings of "RS-232C" and "HIGH SPEED" to "NOT USE".

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7.6.1   **Displaying a Program List ([LIST] Screen)**

The PROGRAM LIST VIEWER screen shows program information such as the program size.
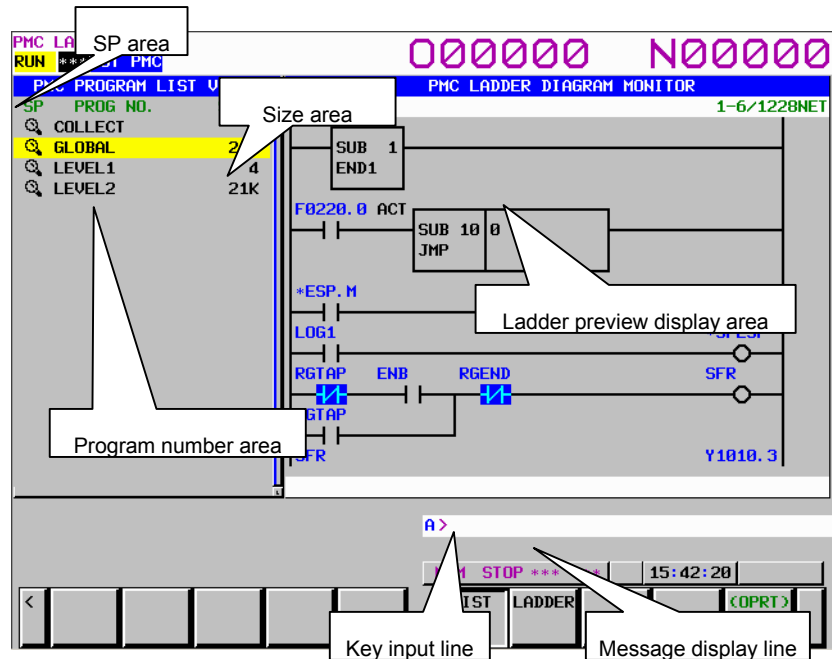
(1) Screen structures

(a) A program list is displayed on the left side of the screen; on the right side, the ladder diagram of the program currently indicated by the cursor on the program list is displayed.

(b) In the message line, error messages or inquiry messages will be displayed depending on the situation.

(c) The program list displays up to 18 programs at a time in the list display area.

(2) Area of program list

(a) In the "SP area", the protect information for subprograms is displayed, so are their program types.

🔒 (Key):   Ladder program, cannot be viewed, cannot be edited

🔍 (Magnifying glass): Ladder program, can be viewed, cannot be edited

✏ (Pencil):   Ladder program, can be viewed, can be edited

(b) Program name is displayed in the "PROG NO." field for each program.

There are three kinds of program names.

COLLECT: It means the collective program.

GLOBAL: It means the whole program.

LEVELn (n = 1, 2, 3): It means the Ladder level 1, 2 and 3.

Pm (m = subprogram number):

It means subprogram.

By changing the "ADDRESS NOTATION" item on the LADDER DIAGRAM MONITOR Setting screen to "SYMBOL", you can display symbols.

(c) The program size is displayed in the "SIZE" field for each program.

If the program size is not over 1024 byte, the unit is shown in byte.

If it is over 1024 byte, the unit is shown in kilo (1024) byte with "K".

Ex.)   The case that program size is not over 1024 byte.

1023 bytes: "1023" is shown.

Ex.)   The case that program size is over 1024 byte.

20000 bytes: "19K" is shown.

(Sizes are rounded off to whole numbers before being displayed.)

Soft key of PROGRAM LIST VIEWER screen

Switch PMC paths

< | ZOOM | SEARCH | | | | | | | SWITCH PMC | |

Search for program

Display the contents of program
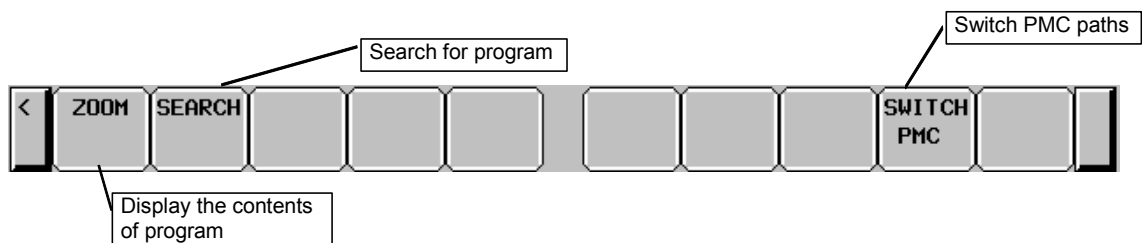
7.6.2   **Monitoring Ladder Diagrams ([LADDER] Screen)**

LADDER DIAGRAM MONITOR screen shows the on/off status of contacts and coils, and the contents of address specified for parameter of functional instructions.

From the PMC LADDER menu, you can switch to the LADDER DIAGRAM MONITOR screen by using the [LADDER] soft key. You can use following operation at this screen, including "Forced I/O function (Forcing mode)", by which you can force the relay or the address parameters of functional instructions to a new status or value.

- Switch subprogram to show   [LIST]
- Search for address or others   [SEARCH MENU]
- Show data table of functional instructions   [DATA TABLE]
- Go to COLLECTIVE MONITOR Screen   [SWITCH]
- Forced I/O function (Forcing mode)   "number" + INPUT key
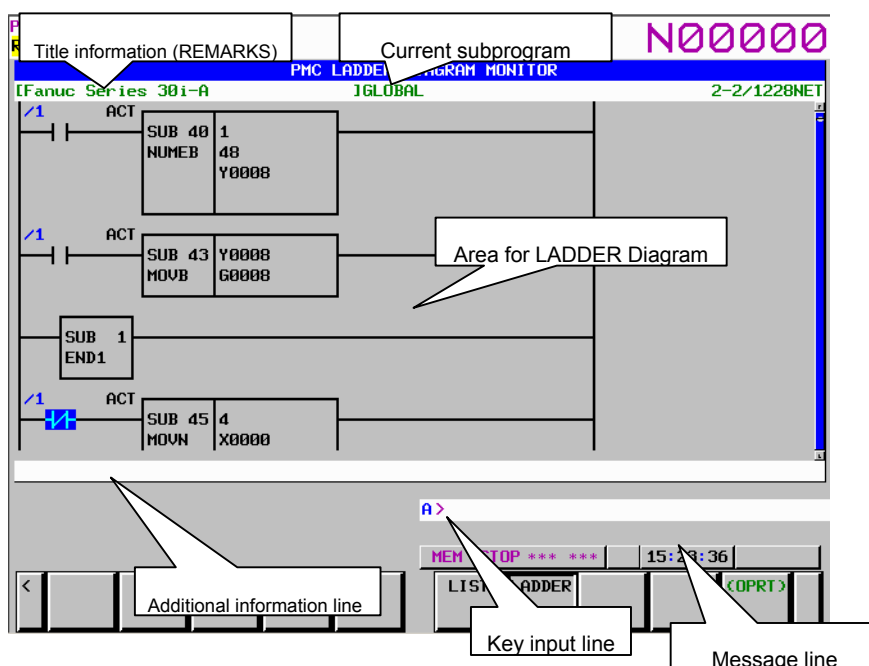
(1) Screen structures
   (a) Title information (REMARKS) of the LADDER Program, the current subprogram, and the current position information of the Diagram displayed in this screen, are displayed above the LADDER Diagram.

   When you select a subprogram to be displayed, range for search function is indicated at right of the top line as "LOCAL" or "GLOBAL". In case of "LOCAL", the range for search function is restricted within the current subprogram. In case of "GLOBAL", on the other hand, search function searches whole of LADDER program, and switch current subprogram automatically according to the result of searching.

(b) In the additional information line near the bottom of the screen, the following information of the address under the cursor when the cursor is shown.
- Net number of the net with the cursor
- Address and its symbol and comment information
- Current value

(c) In the message line, error messages or inquiry messages will be displayed depending on the situation.

(d) In the area for LADDER diagrams, 8×8, 8×6, 8×4, 7×8, 7×6, and 7×4 relays can be displayed (horizontally and vertically). For details, see 30*i*-MODEL A PMC PROGRAMMING MANUAL.

(e) The gage indicating the current display position in relation to the whole Ladder program is displayed at the right end of the screen.

(2) LADDER diagram

(a) Nets wider than the screen width are displayed as "Continuous Net" using continuous marks (">A1>"). Same continuous marks mean they are connected with each other.
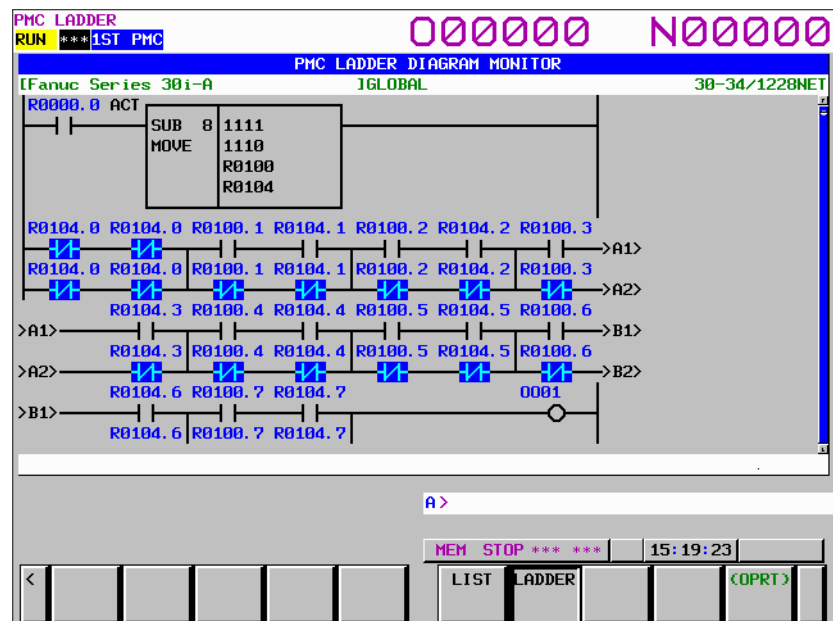
(3) Monitor

(a) Contacts and coils are displayed in different colors according to the status of the signal. The status of power flow is not displayed.

(b) Usually, the parameters of functional instructions are monitored and displayed. You can suppress the monitor and display by an appropriate setting. For details, see PMC PROGRAMMING MANUAL.

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(4) Displaying Symbols and Comments
  (a) Usually, addresses are displayed above contacts and coils.
       For an address with a symbol assigned, you can change the
       setting so that the symbol is displayed instead of the address.
       You can add colors to addresses. For details, see Subsection
       "Setting the Display Format of the LADDER DIAGRAM
       MONITOR Screen" in the PMC PROGRAMMING
       MANUAL.
  (b) If the address of a contact has a comment attached, the
       comment is displayed below the contact. You can change its
       display mode by changing the setting. You can add colors to
       comments. For details, see Subsection "Setting the Display
       Format of the LADDER DIAGRAM MONITOR Screen" in
       the PMC PROGRAMMING MANUAL.
  (c) If the address used with coil has a comment string assigned,
       the comment strings will be displayed at the right margin
       beside the coil. You can use this margin area to display an
       additional relay instead of the comment string by setting: at
       this setting, one more relay can be displayed in each
       diagram line. You can add colors to comments. For details,
       see Subsection "Setting the Display Format of the
       LADDER DIAGRAM MONITOR Screen" in the PMC
       PROGRAMMING MANUAL.
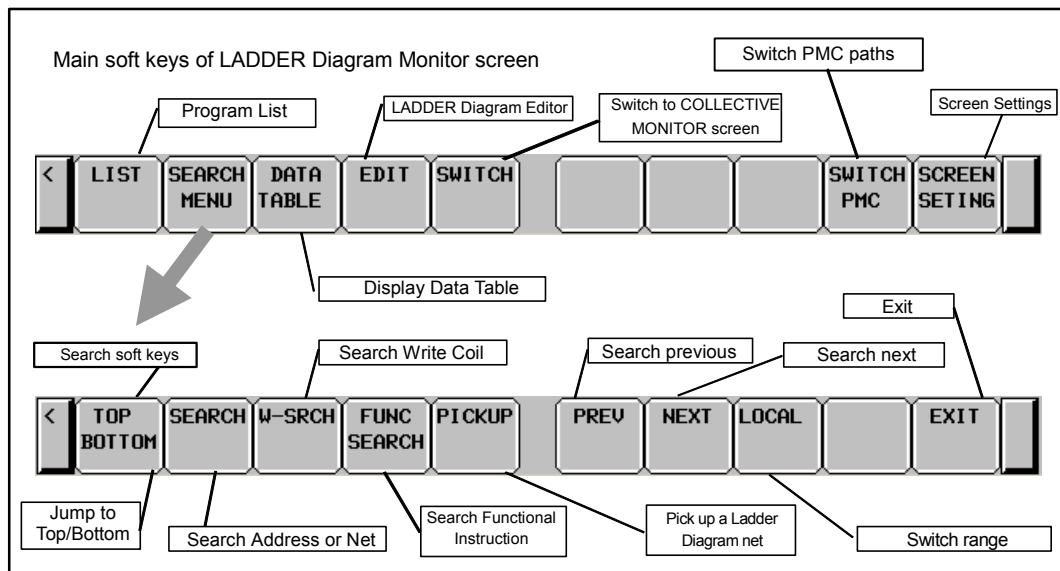
7.6.3   Editing Ladder Programs

At LADDER DIAGRAM EDITOR screen you can edit LADDER program to change its behavior.

To switch LADDER DIAGRAM EDITOR screen, press [EDIT] soft key at LADDER DIAGRAM MONITOR screen.

Following operations are available at LADDER DIAGRAM EDITOR screen.

- Delete by net   [DELETE]
- Move by net   [CUT] & [PASTE]
- Copy by net   [COPY] & [PASTE]
- Change address of contacts and coils
                                   "bit address" + INPUT key
- Change parameters of functional instructions
                                   "number" or "byte address"
                                   + INPUT key
- Add new net   [CREATE NET]
- Change construction of net   [ZOOM]
- Make changes effective   [UPDATE]
- Abandon changes   [RESTRE]
- Cancel edit   [CANCEL EDIT]
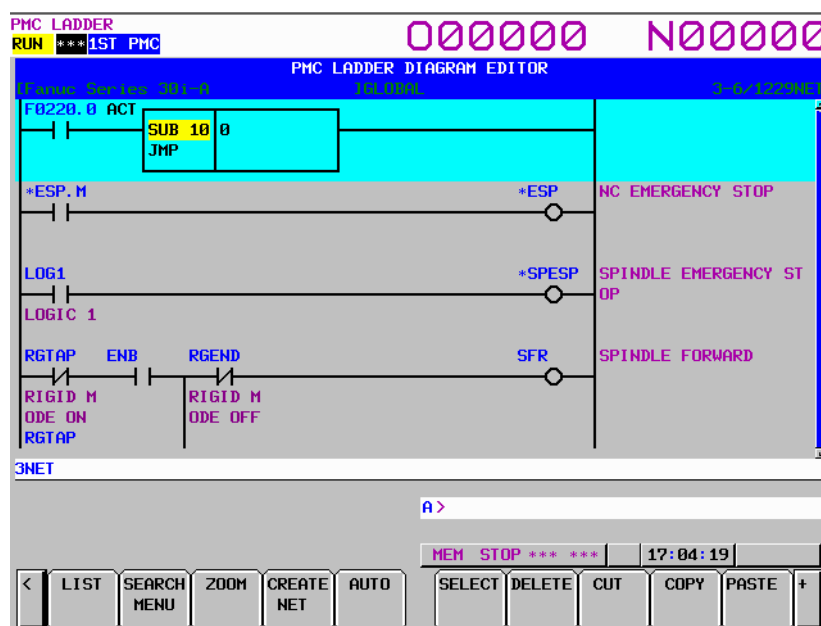
LADDER DIAGRAM EDITOR screen

> ⚠ **CAUTION**
> 1 You can edit ladder programs regardless of whether they are active or not. To execute a ladder program with the results of editing being reflected, you must update the ladder program. To do this, click the [UPDATE] soft key, or update the program when exiting from the LADDER DIAGRAM EDITOR screen. For details of the method of protecting editing, see "PMC PROGRAMMING MANUAL (B-63983EN)."
> 2 After you have edited a sequence program, the results of editing will be lost if the power is turned off without first writing the edited sequence program to flash ROM.
> Write the sequence program to flash ROM on the I/O screen. If you set "WRITE TO F-ROM(EDIT)" to "YES" on the general functions' setting parameter screen, a confirmation message will be displayed, prompting you to ask whether to write a sequence program to flash ROM after the end of editing. For details of this setting, see "PMC PROGRAMMING MANUAL (B-63983EN)."

(1) Screen structures
    (a) It is basically same with LADDER DIAGRAM MONITOR screen, except that no monitor displays of relays and parameters of functional instructions are displayed.
    (b) At right side of LADDER Diagram area, a position bar is always displayed, which indicates screen position within current subprogram: in LADDER DIAGRAM MONITOR screen, this position bar is exclusively displayed with comments of write coil. Sometimes, this position bar hides a part of write coil comments.

(2) LADDER Diagram
    (a) Style of LADDER Diagram is basically same with LADDER DIAGRAM MONITOR screen, except that functional instructions are drawn always in "COMPACT" format that has no monitor displays.
    (b) Cursor is shown always. And the net, which will be an object of following editing operations, is emphasized in screen.

Soft keys of LADDER Diagram Editor screen
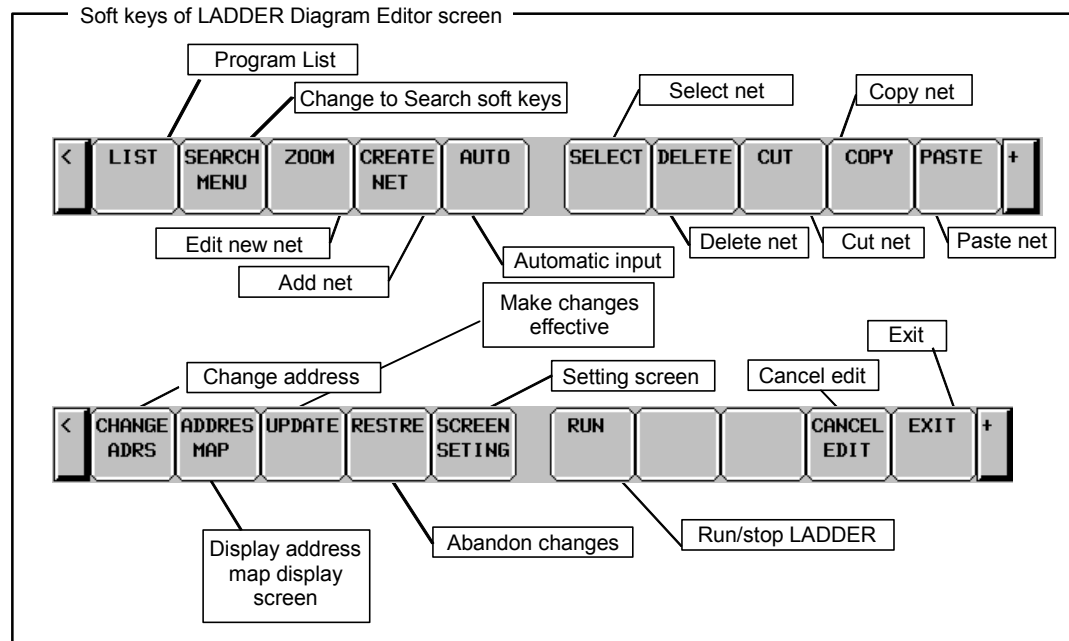
⚠WARNING
You have to pay special attention to modify running LADDER program. If you modify LADDER program in wrong way, or update LADDER program with the machine in improper status, it may cause unexpected reaction of the machine. You have to make it sure that modifications you make on LADDER program is appropriate, machine is in proper status, and nobody is near the machine, when you update LADDER program.

7.6.3.1 NET EDITOR screen

At NET EDITOR screen, you can create new net, and modify existing net.

- Changing existing nets
  If you move a net with the [ZOOM] soft key, you will enter a mode (Modify mode) in which you can add changes to the net currently indicated by the cursor.
- Adding a new net
  When [CREATE NET] soft key is used, this screen is in "New mode" to create new net from nothing.

Following operations are available at this screen:
- Place new contacts and coils "bit address" + [—| |—], [—O—], etc.
- Change type of contacts and coils [—| |—], [—O—], etc.
- Place new functional instructions [FUNC]
- Change type of functional instructions [FUNC]
- Erase contacts, coils, and functional instructions [······]
- Draw/erase connecting lines [————], [↑____], [____↑]
- Edit data table of functional instructions [DATA TABLE]
- Insert line/column [INSERT LINE], [INSERT COLUMN], [APPEND COLUMN]
- Change address of contacts and coils "bit address" + INPUT key
- Change parameters of functional instructions "number" or "byte address" + INPUT key
- Abandon modifications [CANCEL EDIT]
- Restore the net to the state it was before editing [RESTRE]
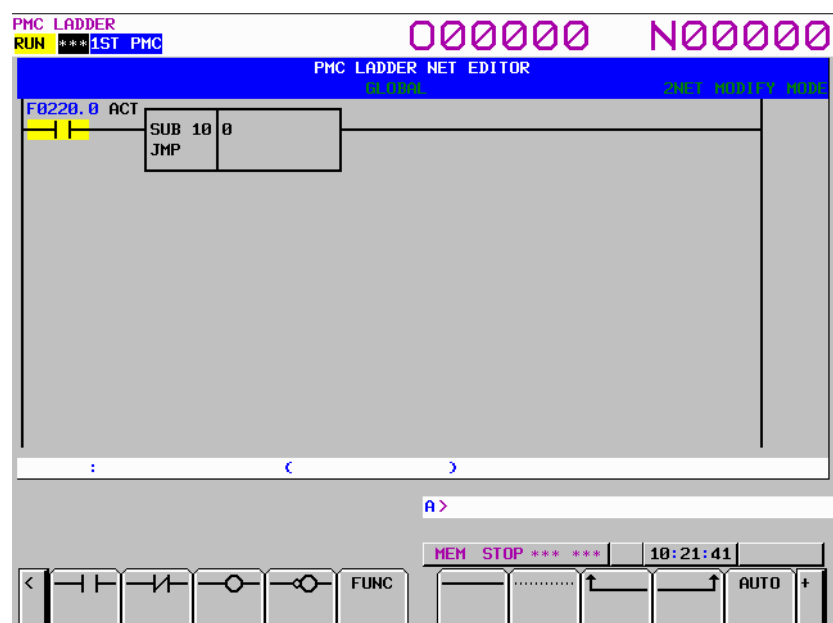
Fig. 7.6.3 (a) Structure of the NET EDITOR screen

(1) Screen structures

    (a) It is basically same with LADDER DIAGRAM EDITOR screen, except that only one net is in this screen, and that position bar at right edge of screen does not appear at this screen.

    (b) Current edit mode is indicated at right of the top line as "NEW MODE" or "MODFY MODE". When [ZOOM] soft key at LADDER DIAGRAM EDITOR screen is used to reach NET EDITOR screen, the screen is in Modify mode, and when [CREATE NET] soft key is used, it is in New mode.

    (c) Current net number is displayed at right of the top line. The net number is same with the net number in previous LADDER DIAGRAM EDITOR screen.

    (d) NET EDITOR screen expands image of net horizontally for a wider net according to its width, while LADDER DIAGRAM MONITOR/EDITOR screen folds nets wider than screen width. When net width is expanded over screen width, attempt to move cursor out of screen will scroll net image to the direction.

        The net of maximum size occupies area of 1024 elements, but actually available area may be little less for internal use according to the internal condition: "element" means the space that is occupied by single relay.

Soft keys of Net Editor screen

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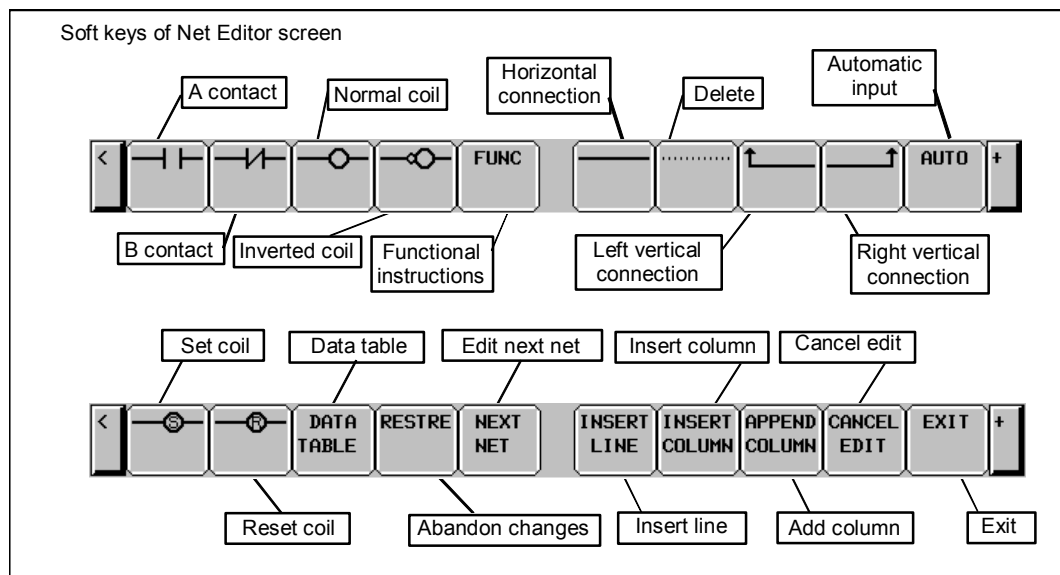
7.6.4   PROGRAM LIST EDITOR Screen

At PROGRAM LIST EDITOR screen you can create new program and delete a program in addition to the function of PROGRAM LIST VIEWER screen. To reach this screen, press [LIST] soft key at LADDER DIAGRAM EDITOR screen. Following operations are available at PROGRAM LIST EDITOR screen. For more detail of these operations, see the descriptions of each key to operate.

- Create new program   [NEW]
- Delete a program   [DELETE]
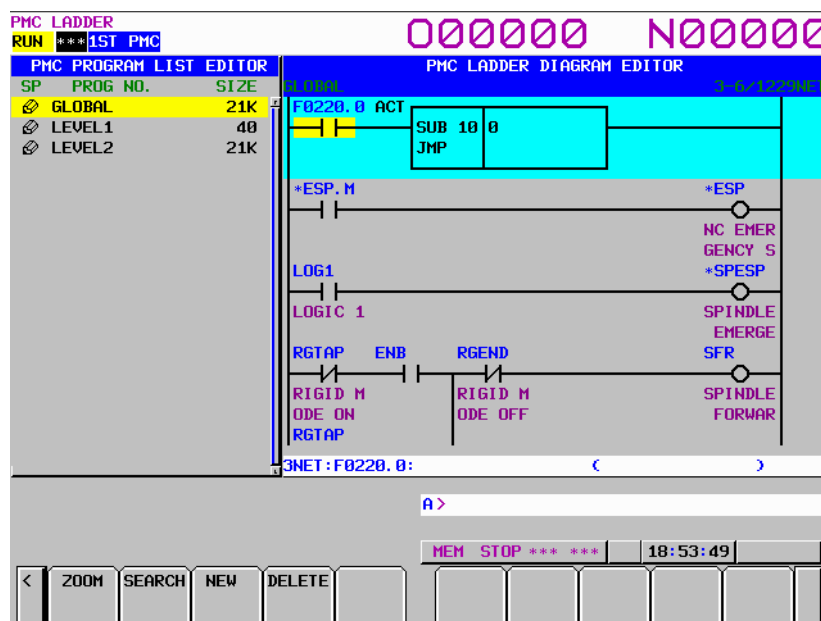
Fig. 7.6.4 PROGRAM LIST EDITOR screen

On the PROGRAM LIST EDITOR screen, a preview of the editor screen for the ladder program currently positioned by the cursor on the program list is displayed on the right of the screen.
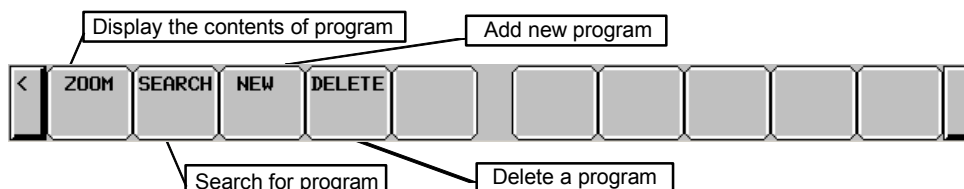
7.6.5 Collective Monitor Function

The COLLECTIVE MONITOR screen allows you to specify the ladder net containing the coils to be monitored, so that you can monitor only the necessary ladder net.

The COLLECTIVE MONITOR screen can be called in either of the following ways:

(1) Calling from the PROGRAM LIST VIEWER screen
    On the program list screen, move the cursor to the "COLLECT" program position, then click the [ZOOM] soft key.
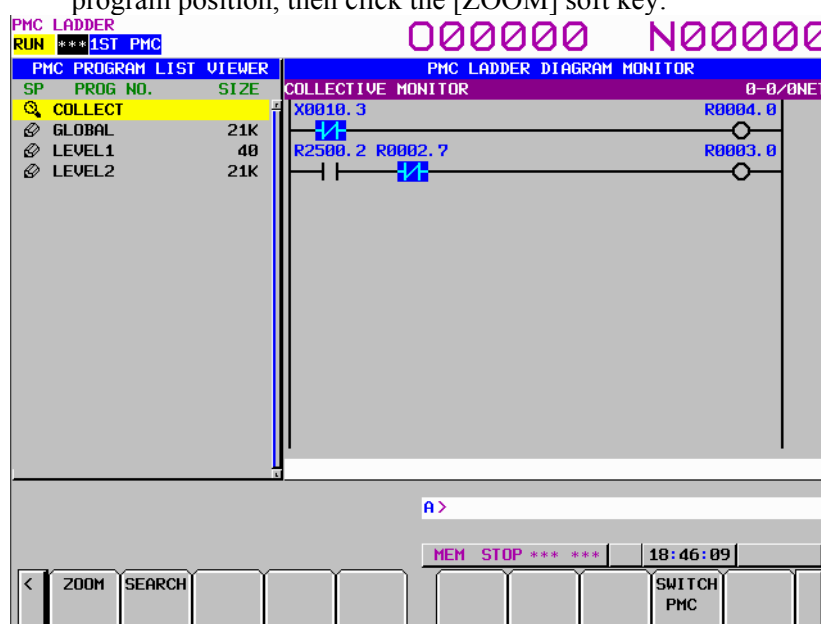
Fig. 7.6.5 (a) PROGRAM LIST VIEWER screen

(2) Calling from the LADDER DIAGRAM MONITOR screen
    On the LADDER DIAGRAM MONITOR screen, click the [SWITCH] soft key.
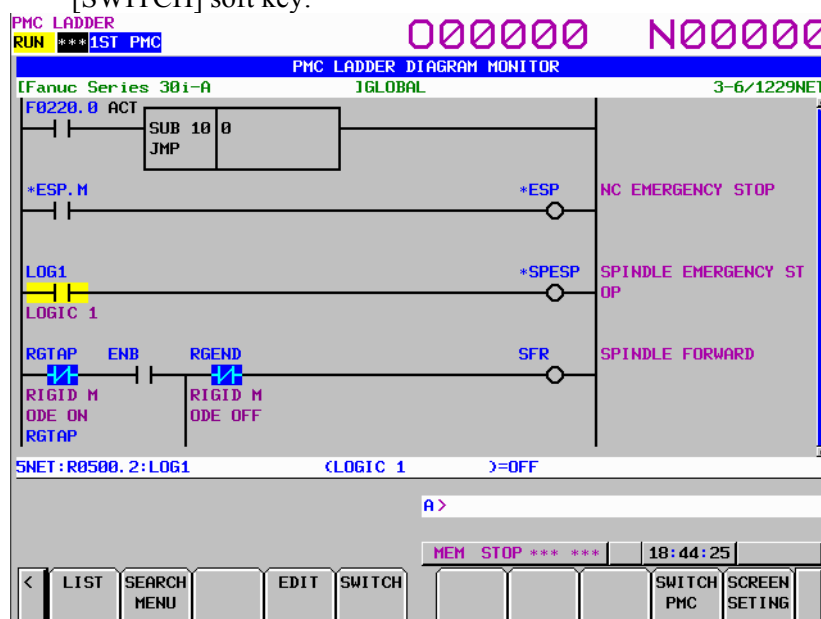
Fig. 7.6.5 (b) LADDER DIAGRAM MONITOR screen

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7.6.5.1   COLLECTIVE MONITOR function

The COLLECTIVE MONITOR screen is such as that shown below. At first, it does not display any ladder diagram. Ladder nets will be added to this screen as they are selected with coil search and pickup operations. Up to 128 nets can be added to the COLLECTIVE MONITOR screen. If an attempt is made to add more, the most recently added 128 nets will be displayed.
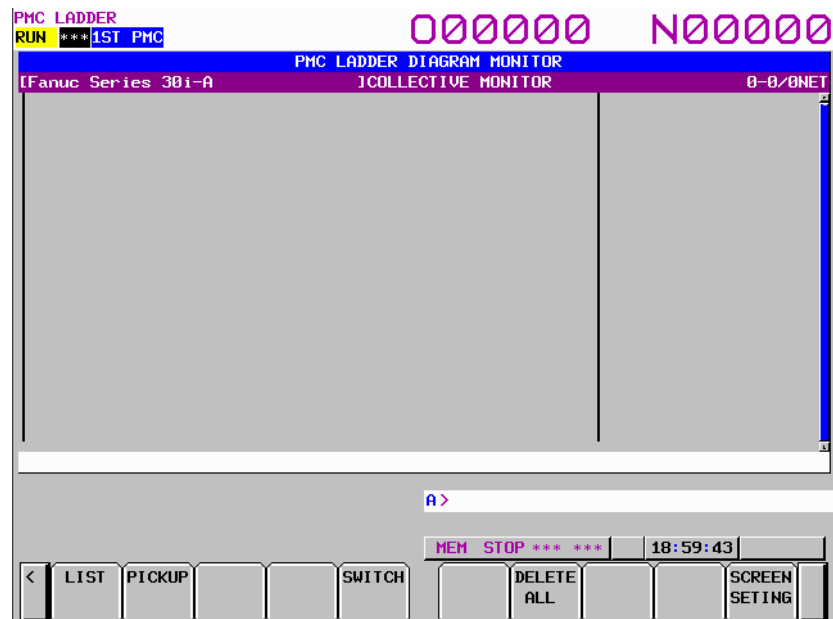
Fig. 7.6.5 (a) COLLECTIVE MONITOR screen (initial screen)

(1)   Operations using the soft keys
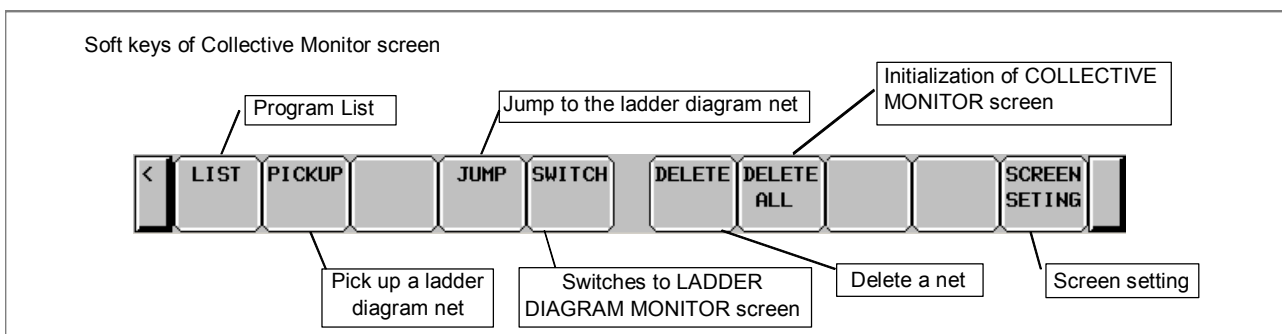
Fig. 7.6.5 (b) Soft keys of COLLECTIVE MONITOR screen

(2)   Specifying the ladder diagram to monitor
The operation for picking up ladder nets which you want to monitor on COLLECTIVE MONITOR screen is as follows.
(a)   Specification of ladder nets on COLLECTIVE MONITOR screen
• Specify the address by key input
Pick up a ladder net by keying in the address used by a coil.

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- Indication from a ladder net on the COLLECTIVE MONITOR screen
  Indicate a relay on an already picked up ladder net, with the cursor, to pick up the net that uses the relay address for the coil.

(b) Specifying a ladder net from the LADDER DIAGRAM MONITOR screen
    Specify a net from the LADDER DIAGRAM MONITOR screen to pick it and load it into the COLLECTIVE MONITOR screen.

(3) Picking up a ladder net on the COLLECTIVE MONITOR screen
    You can pick up a ladder net from the COLLECTIVE MONITOR screen. The procedure for picking up a ladder net is as described below.
    (a) Address specification
        (i)   Enter the address to monitor (for example, R10.1).
        (ii) Click the [PICKUP] soft key.
        (iii) The net in which a coil uses the address specified in (i) will be picked up and loaded at the beginning of the screen.
    (b) Specification of an address from a ladder net on the screen
        (i)   Move the cursor to a relay on the ladder net that uses the address you want to monitor.
        (ii) Click the [PICKUP] soft key.
        (iii) The net in which a coil uses the address specified in (i) will be picked up and loaded at the beginning of the screen, and the cursor moves to the specified coil position.
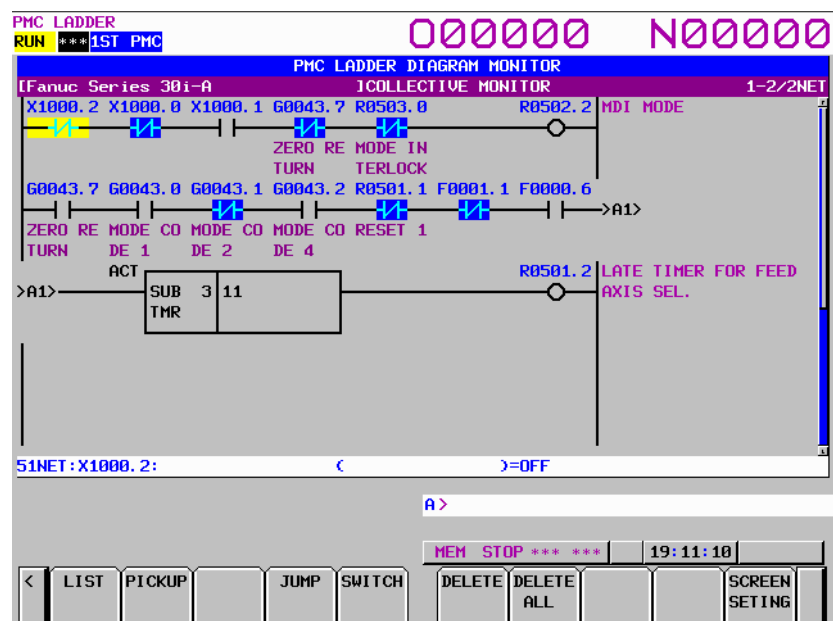
Fig. 7.6.5 (c) COLLECTIVE MONITOR screen

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(4) Picking up a ladder net from the LADDER DIAGRAM MONITOR screen

You can pick up a ladder net from the LADDER DIAGRAM MONITOR screen. The procedure for picking up a ladder net is as described below.

(a) From the LADDER DIAGRAM MONITOR screen, click the [SEARCH] soft key to display the soft keys for search.

(b) Move the cursor to the ladder net to pick up.

(c) Click the [PICKUP] soft key to pick up and load the net specified in (b) at the beginning of the COLLECTIVE MONITOR screen.

(d) For the ladder net picked up and loaded into the COLLECTIVE MONITOR screen, the "●" mark is displayed at the left end of the net.
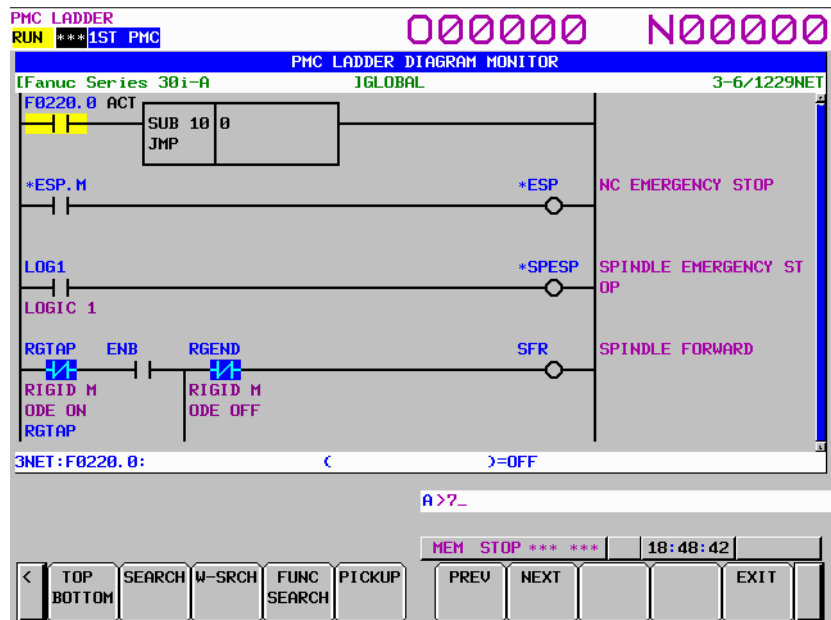
Fig. 7.6.5 (d) LADDER DIAGRAM MONITOR screen (search soft keys)

7.7   **LIST OF ADDRESSES**

Interface addresses among CNC and PMC are as follows:

[Example of controlling one path using one PMC]

```
                  G0000~              X000~
  ┌──────┐  ◄────────── ┌─────┐  ◄────────── ┌──────────┐
  │      │              │     │              │          │
  │ CNC  │              │ PMC │              │ Machine  │
  │      │              │     │              │  tool    │
  │      │  ──────────► │     │  ──────────► │          │
  └──────┘   F0000~     └─────┘   Y000~      └──────────┘
```
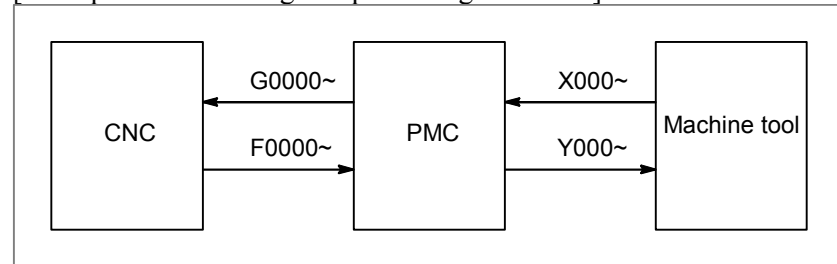
[Example of controlling three path using one PMC]

```
  ┌─────────┐                        ┌─────┐             ┌──────────┐
  │  CNC    │       G0000~           │     │    X000~    │          │
  │ ┌─────┐ │  ◄──────────────       │     │ ◄────────── │          │
  │ │Path1│ │       F0000~           │     │    Y000~    │          │
  │ └─────┘ │  ─────────────►        │     │ ──────────► │          │
  │         │       G1000~           │ PMC │             │ Machine  │
  │ ┌─────┐ │  ◄──────────────       │     │             │  tool    │
  │ │Path2│ │       F1000~           │     │             │          │
  │ └─────┘ │  ─────────────►        │     │             │          │
  │         │       G2000~           │     │             │          │
  │ ┌─────┐ │  ◄──────────────       │     │             │          │
  │ │Path3│ │       F2000~           │     │             │          │
  │ └─────┘ │  ─────────────►        └─────┘             └──────────┘
  └─────────┘
```
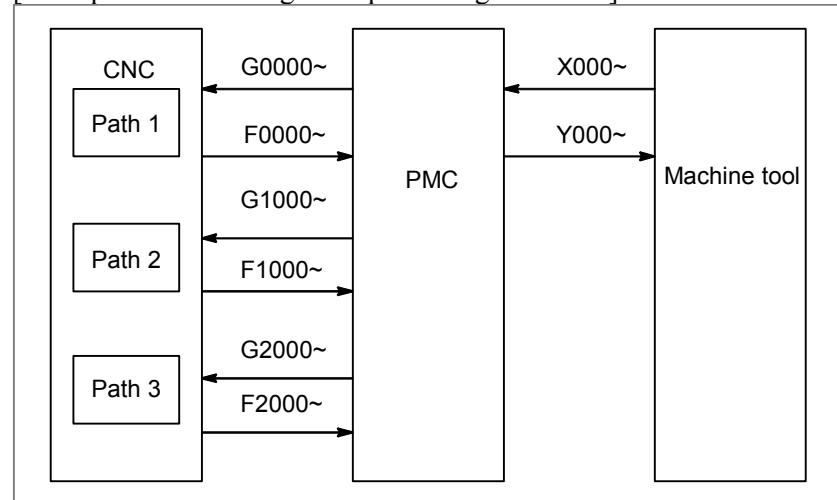
NOTE
1   For multipath control, one of the following
    superscripts is attached to the top right of a
    symbol depending on the signal type.
    - Path type (for path 1)   : #1
    - Path type (for path 2)   : #2
    - Path type (for path 3)   : #3
    - Path type   : #P
    - Controlled axis type   : #SV
    - Spindle type   : #SP
    - PMC axis control group type: #PX
    Refer to Appendix "List of Addresses" for details
2   For the signals, a single data number is assigned
    to 8 bits. Each bit has a different meaning.

[Example of controlling multipath CNC using PMC system]
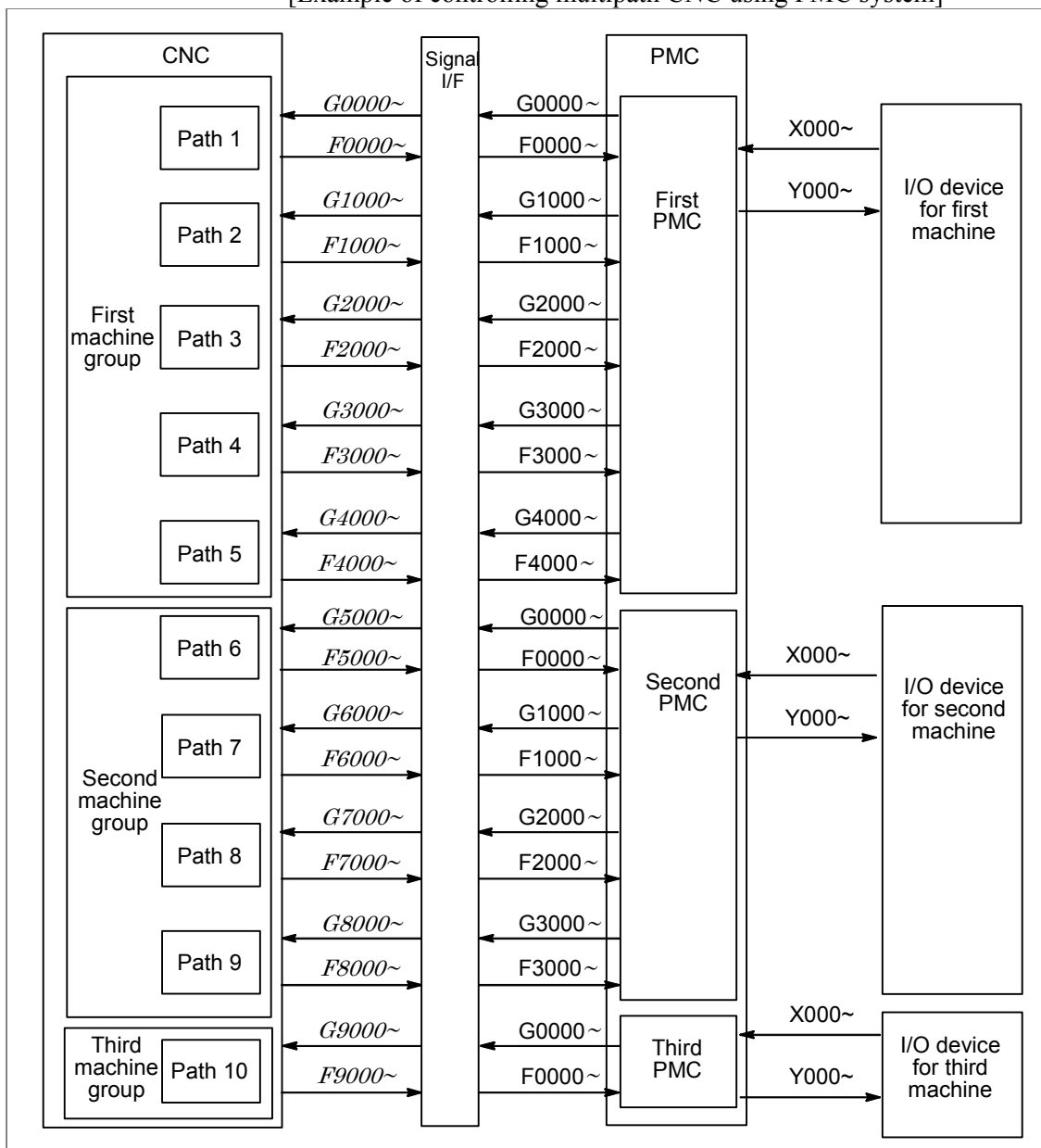
NOTE
Each PMC of a multipath PMC system has an independent signal area. The F, G, X, and Y signal addresses of each PMC begin with 0. On the other hand, the F and G signal addresses from the viewpoint of the CNC are fixed for each path number. Note that the F and G signal addresses used in programming of each ladder are different from those from the viewpoint of the CNC.

- Expression of signals

Symbol (#0 to #7 indicates bit position)

	#7	#6	#5	#4	#3	#2	#1	#0
Fn000	OP	SA	STL	SPL				RWD

In an item where both lathe system and machining center system are described, some signals are covered with shade (   ) in the signal address figure as shown below. This means either lathe system or machining center system does not have this signal. Upper part is for lathe system and lower part is for machining center system.

	#7	#6	#5	#4	#3	#2	#1	#0	
Gn053	*CDZ		ROVLP		UINT			TMRON	T series M series

[Example 1]
> The figure above indicates *CDZ is provided only for the lathe system while the other signals for both the lathe system and machining system.

In X addresses in the table, the emergency stop signal for each signal is *ESP<X008.4>, *ESP<X008.0>, and *ESP<X008.1>, respectively. In addition, #1, #2 or #3 attached to a signal indicates the signal is provided only for path 1, 2, or 3, respectively.
In G and F addresses in the table, #P, #SV, or #SP attached to a signal indicates the signal is provided for each path, each control axis, or each spindle, respectively. #PX attached to a signal indicates the signal is provided for each PMC axis control group.

MT → CNC

Address   Bit number

Address	7	6	5	4	3	2	1	0
X000								
X001								
X002								
X003								
X004 T series	SKIP #1	ESKIP / SKIP6 #1	-MIT2 #1 / SKIP5 #1	+MIT2 #1 / SKIP4 #1	-MIT1 #1 / SKIP3 #1	+MIT1 #1 / SKIP2 #1	SKIP8 #1	SKIP7 #1
X004 M series	SKIP #1	ESKIP / SKIP6 #1	SKIP5 #1	SKIP4 #1	SKIP3 #1	SKIP2 #1	SKIP8 #1	SKIP7 #1
X005								
X006								
X007	*DEC8 #2	*DEC7 #2	*DEC6 #2	*DEC5 #2	*DEC4 #2	*DEC3 #2	*DEC2 #2	*DEC1 #2
X008				*ESP			(*ESP)	(*ESP)
X009	*DEC8 #1	*DEC7 #1	*DEC6 #1	*DEC5 #1	*DEC4 #1	*DEC3 #1	*DEC2 #1	*DEC1 #1
X010	*DEC8 #3	*DEC7 #3	*DEC6 #3	*DEC5 #3	*DEC4 #3	*DEC3 #3	*DEC2 #3	*DEC1 #3
X011 T series	SKIP #3	ESKIP #3 / SKIP6 #3	-MIT2 #3 / SKIP5 #3	+MIT2 #3 / SKIP4 #3	-MIT1 #3 / SKIP3 #3	+MIT1 #3 / SKIP2 #3	SKIP8 #3	SKIP7 #3
X011 M series	SKIP #3	ESKIP #3 / SKIP6 #3	-MIT2 #3 / SKIP5 #3	+MIT2 #3 / SKIP4 #3	-MIT1 #3 / SKIP3 #3	+MIT1 #3 / SKIP2 #3	SKIP8 #3	SKIP7 #3
X012								
X013 T series	SKIP #2	ESKIP #2 / SKIP6 #2	-MIT2 #2 / SKIP5 #2	+MIT2 #2 / SKIP4 #2	-MIT1 #2 / SKIP3 #2	+MIT1 #2 / SKIP2 #2	SKIP8 #2	SKIP7 #2
X013 M series	SKIP #2	ESKIP #2 / SKIP6 #2	SKIP5 #2	SKIP4 #2	SKIP3 #2	SKIP2 #2	SKIP8 #2	SKIP7 #2

PMC → CNC

Address   Bit number

	7	6	5	4	3	2	1	0
Gn000								
Gn001								
Gn002								
Gn003								
Gn004			MFIN3#P	MFIN2#P	FIN#P			
Gn005	BFIN#P	AFL#P			TFIN#P	SFIN#P		MFIN#P
Gn006		SKIPP#P		OVC#P		*ABSM#P		SRN#P
Gn007	RLSOT#P	EXLM#P	*FLWU#P	RLSOT3#P		ST#P	STLK#P	
Gn008	ERS#P	RRW#P	*SP#P	*ESP#P	*BSL#P		*CSL#P	*IT#P
Gn009								
Gn010	*JV7#P	*JV6#P	*JV5#P	*JV4#P	*JV3#P	*JV2#P	*JV1#P	*JV0#P
Gn011	*JV15#P	*JV14#P	*JV13#P	*JV12#P	*JV11#P	*JV10#P	*JV9#P	*JV8#P
Gn012	*FV7#P	*FV6#P	*FV5#P	*FV4#P	*FV3#P	*FV2#P	*FV1#P	*FV0#P
Gn013	*AFV7#P	*AFV6#P	*AFV5#P	*AFV4#P	*AFV3#P	*AFV2#P	*AFV1#P	*AFV0#P
Gn014							ROV2#P	ROV1#P
Gn015								
Gn016	F1D#P							
Gn017								
Gn018	HS2D#P	HS2C#P	HS2B#P	HS2A#P	HS1D#P	HS1C#P	HS1B#P	HS1A#P
Gn019	RT#P		MP2#P	MP1#P	HS3D#P	HS3C#P	HS3B#P	HS3A#P
Gn020								

Address	7	6	5	4	3	2	1	0
Gn021								
Gn022								
Gn023	ALNGH[#P]	RGHTH[#P]			HNDLF[#P]			
Gn024								
Gn025								
Gn026		*SSTP4[#SP]			SWS4[#SP]		PC4SLC[#P]	PC3SLC[#P]
Gn027	CON[#P]		*SSTP3[#SP]	*SSTP2[#SP]	*SSTP1[#SP]	SWS3[#SP]	SWS2[#SP]	SWS1[#SP]
Gn028	PC2SLC[#P]	SPSTPA[#SP]	*SCPFA[#SP]	*SUCPFA[#SP]		GR2[#SP]	GR1[#SP]	
Gn029		*SSTP[#P]	SOR[#P]	SAR[#P]	GR32[#SP]	GR31[#SP]	GR22[#SP]	GR21[#SP]
Gn030	SOV7[#P]	SOV6[#P]	SOV5[#P]	SOV4[#P]	SOV3[#P]	SOV2[#P]	SOV1[#P]	SOV0[#P]
Gn031	PKESS2[#P]	PKESS1[#P]	GR42[#SP]	GR41[#SP]				
Gn032	R08I[#SP]	R07I[#SP]	R06I[#SP]	R05I[#SP]	R04I[#SP]	R03I[#SP]	R02I[#SP]	R01I[#SP]
Gn033	SIND[#SP]	SSIN[#SP]	SGN[#SP]		R12I[#SP]	R11I[#SP]	R10I[#SP]	R09I[#SP]
Gn034	R08I2[#SP]	R07I2[#SP]	R06I2[#SP]	R05I2[#SP]	R04I2[#SP]	R03I2[#SP]	R02I2[#SP]	R01I2[#SP]
Gn035	SIND2[#SP]	SSIN2[#SP]	SGN2[#SP]		R12I2[#SP]	R11I2[#SP]	R10I2[#SP]	R09I2[#SP]
Gn036	R08I3[#SP]	R07I3[#SP]	R06I3[#SP]	R05I3[#SP]	R04I3[#SP]	R03I3[#SP]	R02I3[#SP]	R01I3[#SP]
Gn037	SIND3[#SP]	SSIN3[#SP]	SGN3[#SP]		R12I3[#SP]	R11I3[#SP]	R10I3[#SP]	R09I3[#SP]
Gn038	*BECLP[#P]	*BEUCP[#P]			SPPHS[#P]	SPSYC[#P]	SBRT[#P]	*PLSST[#P]
Gn039	GOQSM[#P]	WOQSM[#P]	OFN5[#P]	OFN4[#P]	OFN3[#P]	OFN2[#P]	OFN1[#P]	OFN0[#P]
Gn040	WOSET[#P]	PRC[#P]	S2TLS[#P]		OFN9[#P]	OFN8[#P]	OFN7[#P]	OFN6[#P]
Gn041	HS2ID[#P]	HS2IC[#P]	HS2IB[#P]	HS2IA[#P]	HS1ID[#P]	HS1IC[#P]	HS1IB[#P]	HS1IA[#P]
Gn042	DMMC[#P]				HS3ID[#P]	HS3IC[#P]	HS3IB[#P]	HS3IA[#P]

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn043	ZRN#P		DNCI#P			MD4#P	MD2#P	MD1#P
Gn044							MLK#P	BDT1#P
Gn045	BDT9#P	BDT8#P	BDT7#P	BDT6#P	BDT5#P	BDT4#P	BDT3#P	BDT2#P
Gn046	DRN#P	KEY4	KEY3	KEY2	KEY1		SBK#P	
Gn047								
Gn048	TLRST#P	TLRSTI#P	TLSKP#P					
Gn049	*TLV7#P	*TLV6#P	*TLV5#P	*TLV4#P	*TLV3#P	*TLV2#P	*TLV1#P	*TLV0#P
Gn050							*TLV9#P	*TLV8#P
Gn051	*CHLD#P	CHPST#P			*CHP8#P	*CHP4#P	*CHP2#P	*CHP1#P
Gn052								
Gn053	*CDZ#P		ROVLP#P		UINT#P			TMRON#P
Gn054	UI007#P	UI006#P	UI005#P	UI004#P	UI003#P	UI002#P	UI001#P	UI000#P
Gn055	UI015#P	UI014#P	UI013#P	UI012#P	UI011#P	UI010#P	UI009#P	UI008#P
Gn056	UI023#P	UI022#P	UI021#P	UI020#P	UI019#P	UI018#P	UI017#P	UI016#P
Gn057	UI031#P	UI030#P	UI029#P	UI028#P	UI027#P	UI026#P	UI025#P	UI024#P
Gn058								
Gn059	NSYNCA#P						TRRTN#P	TRESC#P
Gn060	*TSB#P							
Gn061	RGTSP4#SP	RGTSP3#SP	RGTSP2#SP	RGTSP1#SP				RGTAP#P
Gn062	HEAD2	RTNT#P						
Gn063	NMWT#P		NOZAGC#P		SLSPB#P	SLSPA#P	NOWT	HEAD
Gn064		ESRSYC#P			SLPCB#P	SLSPA#P		

Address	7	6	5	4	3	2	1	0
Gn065								
Gn066	EKSET			RTRCT#P				IGNVRY#P
Gn067	HCREQ	HCABT						
Gn068								
Gn069								
Gn070	MRDYA#SP	ORCMA#SP	SFRA#SP	SRVA#SP	CTH1A#SP	CTH2A#SP	TLMHA#SP	TLMLA#SP
Gn071	RCHA#SP	RSLA#SP	INTGA#SP	SOCNA#SP	MCFNA#SP	SPSLA#SP	*ESPA#SP	ARSTA#SP
Gn072	RCHHGA#SP	MFNHGA#SP	INCMDA#SP	OVRIDA#SP	DEFMDA#SP	NRROA#SP	ROTAA#SP	INDXA#SP
Gn073						MPOFA#SP	SLVA#SP	MORCMA#SP
Gn074	MRDYB#SP	ORCMB#SP	SFRB#SP	SRVB#SP	CTH1B#SP	CTH2B#SP	TLMHB#SP	TLMLB#SP
Gn075	RCHB#SP	RSLB#SP	INTGB#SP	SOCNB#SP	MCFNB#SP	SPSLB#SP	*ESPB#SP	ARSTB#SP
Gn076	RCHHGB#SP	MFNHGB#SP	INCMDB#SP	OVRIDB#SP	DEFMDB#SP	NRROB#SP	ROTAB#SP	INDXB#SP
Gn077						MPOFB#SP	SLVB#SP	MORCMB#SP
Gn078	SH07A#SP	SH06A#SP	SH05A#SP	SH04A#SP	SH03A#SP	SH02A#SP	SH01A#SP	SH00A#SP
Gn079					SH11A#SP	SH10A#SP	SH09A#SP	SH08A#SP
Gn080	SH07B#SP	SH06B#SP	SH05B#SP	SH04B#SP	SH03B#SP	SH02B#SP	SH01B#SP	SH00B#SP
Gn081					SH11B#SP	SH10B#SP	SH09B#SP	SH08B#SP
Gn082	EUI07#P	EUI06#P	EUI05#P	EUI04#P	EUI03#P	EUI02#P	EUI01#P	EUI00#P
Gn083	EUI15#P	EUI14#P	EUI13#P	EUI12#P	EUI11#P	EUI10#P	EUI09#P	EUI08#P
Gn084								
Gn085								
Gn086								

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn087								
Gn088								
Gn089								
Gn090	G2SLC$^{\#P}$	G2Y$^{\#P}$	G2Z$^{\#P}$	G2X$^{\#P}$		G2RVY$^{\#P}$	G2RVZ$^{\#P}$	G2RVX$^{\#P}$
Gn091								
Gn092								
Gn093								
Gn094								
Gn095								
Gn096	HROV$^{\#P}$	*HROV6$^{\#P}$	*HROV5$^{\#P}$	*HROV4$^{\#P}$	*HROV3$^{\#P}$	*HROV2$^{\#P}$	*HROV1$^{\#P}$	*HROV0$^{\#P}$
Gn097								
Gn098	EKC7	EKC6	EKC5	EKC4	EKC3	EKC2	EKC1	EKC0
Gn099								
Gn100	+J8$^{\#SV}$	+J7$^{\#SV}$	+J6$^{\#SV}$	+J5$^{\#SV}$	+J4$^{\#SV}$	+J3$^{\#SV}$	+J2$^{\#SV}$	+J1$^{\#SV}$
Gn101	*+ED28$^{\#SV}$	*+ED27$^{\#SV}$	*+ED26$^{\#SV}$	*+ED25$^{\#SV}$	*+ED24$^{\#SV}$	*+ED23$^{\#SV}$	*+ED22$^{\#SV}$	*+ED21$^{\#SV}$
Gn102	-J8$^{\#SV}$	-J7$^{\#SV}$	-J6$^{\#SV}$	-J5$^{\#SV}$	-J4$^{\#SV}$	-J3$^{\#SV}$	-J2$^{\#SV}$	-J1$^{\#SV}$
Gn103	*-ED28$^{\#SV}$	*-ED27$^{\#SV}$	*-ED26$^{\#SV}$	*-ED25$^{\#SV}$	*-ED24$^{\#SV}$	*-ED23$^{\#SV}$	*-ED22$^{\#SV}$	*-ED21$^{\#SV}$
Gn104	+EXL8$^{\#SV}$	+EXL7$^{\#SV}$	+EXL6$^{\#SV}$	+EXL5$^{\#SV}$	+EXL4$^{\#SV}$	+EXL3$^{\#SV}$	+EXL2$^{\#SV}$	+EXL1$^{\#SV}$
Gn105	-EXL8$^{\#SV}$	-EXL7$^{\#SV}$	-EXL6$^{\#SV}$	-EXL5$^{\#SV}$	-EXL4$^{\#SV}$	-EXL3$^{\#SV}$	-EXL2$^{\#SV}$	-EXL1$^{\#SV}$
Gn106	MI8$^{\#SV}$	MI7$^{\#SV}$	MI6$^{\#SV}$	MI5$^{\#SV}$	MI4$^{\#SV}$	MI3$^{\#SV}$	MI2$^{\#SV}$	MI1$^{\#SV}$
Gn107	*+ED38$^{\#SV}$	*+ED37$^{\#SV}$	*+ED36$^{\#SV}$	*+ED35$^{\#SV}$	*+ED34$^{\#SV}$	*+ED33$^{\#SV}$	*+ED32$^{\#SV}$	*+ED31$^{\#SV}$
Gn108	MLK8$^{\#SV}$	MLK7$^{\#SV}$	MLK6$^{\#SV}$	MLK5$^{\#SV}$	MLK4$^{\#SV}$	MLK3$^{\#SV}$	MLK2$^{\#SV}$	MLK1$^{\#SV}$

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn109	*-ED38#SV	*-ED37#SV	*-ED36#SV	*-ED35#SV	*-ED34#SV	*-ED33#SV	*-ED32#SV	*-ED31#SV
Gn110	+LM8#SV	+LM7#SV	+LM6#SV	+LM5#SV	+LM4#SV	+LM3#SV	+LM2#SV	+LM1#SV
Gn111								
Gn112	-LM8#SV	-LM7#SV	-LM6#SV	-LM5#SV	-LM4#SV	-LM3#SV	-LM2#SV	-LM1#SV
Gn113								
Gn114	*+L8#SV	*+L7#SV	*+L6#SV	*+L5#SV	*+L4#SV	*+L3#SV	*+L2#SV	*+L1#SV
Gn115								
Gn116	*-L8#SV	*-L7#SV	*-L6#SV	*-L5#SV	*-L4#SV	*-L3#SV	*-L2#SV	*-L1#SV
Gn117								
Gn118	*+ED8#SV	*+ED7#SV	*+ED6#SV	*+ED5#SV	*+ED4#SV	*+ED3#SV	*+ED2#SV	*+ED1#SV
Gn119								
Gn120	*-ED8#SV	*-ED7#SV	*-ED6#SV	*-ED5#SV	*-ED4#SV	*-ED3#SV	*-ED2#SV	*-ED1#SV
Gn121								
Gn122	DK8#SV	DK7#SV	DK6#SV	DK5#SV	DK4#SV	DK3#SV	DK2#SV	DK1#SV
Gn123								
Gn124	DTCH8#SV	DTCH7#SV	DTCH6#SV	DTCH5#SV	DTCH4#SV	DTCH3#SV	DTCH2#SV	DTCH1#SV
Gn125	IUDD8#SV	IUDD7#SV	IUDD6#SV	IUDD5#SV	IUDD4#SV	IUDD3#SV	IUDD2#SV	IUDD1#SV
Gn126	SVF8#SV	SVF7#SV	SVF6#SV	SVF5#SV	SVF4#SV	SVF3#SV	SVF2#SV	SVF1#SV
Gn127								
Gn128								
Gn129								
Gn130	*IT8#SV	*IT7#SV	*IT6#SV	*IT5#SV	*IT4#SV	*IT3#SV	*IT2#SV	*IT1#SV

Address	7	6	5	4	3	2	1	0
				Bit number				
Gn131								
Gn132	+MIT8#P	+MIT7#P	+MIT6#P	+MIT5#P	+MIT4#P	+MIT3#P	+MIT2#P	+MIT1#P
Gn133								
Gn134	-MIT8#P	-MIT7#P	-MIT6#P	-MIT5#P	-MIT4#P	-MIT3#P	-MIT2#P	-MIT1#P
Gn135								
Gn136	EAX8#SV	EAX7#SV	EAX6#SV	EAX5#SV	EAX4#SV	EAX3#SV	EAX2#SV	EAX1#SV
Gn137								
Gn138	SYNC8#SV	SYNC7#SV	SYNC6#SV	SYNC5#SV	SYNC4#SV	SYNC3#SV	SYNC2#SV	SYNC1#SV
Gn139								
Gn140	SYNCJ8#SV	SYNCJ7#SV	SYNCJ6#SV	SYNCJ5#SV	SYNCJ4#SV	SYNCJ3#SV	SYNCJ2#SV	SYNCJ1#SV
Gn141								
Gn142	EBUF#PX	ECLR#PX	ESTP#PX	ESOF#PX	ESBK#PX	EMBUF#PX	ELCKZ#PX	EFIN#PX
Gn143	EMSBK#PX	EC6#PX	EC5#PX	EC4#PX	EC3#PX	EC2#PX	EC1#PX	EC0#PX
Gn144	EIF7#PX	EIF6#PX	EIF5#PX	EIF4#PX	EIF3#PX	EIF2#PX	EIF1#PX	EIF0#PX
Gn145	EIF15#PX	EIF14#PX	EIF13#PX	EIF12#PX	EIF11#PX	EIF10#PX	EIF9#PX	EIF8#PX
Gn146	EID7#PX	EID6#PX	EID5#PX	EID4#PX	EID3#PX	EID2#PX	EID1#PX	EID0#PX
Gn147	EID15#PX	EID14#PX	EID13#PX	EID12#PX	EID11#PX	EID10#PX	EID9#PX	EID8#PX
Gn148	EID23#PX	EID22#PX	EID21#PX	EID20#PX	EID19#PX	EID18#PX	EID17#PX	EID16#PX
Gn149	EID31#PX	EID30#PX	EID29#PX	EID28#PX	EID27#PX	EID26#PX	EID25#PX	EID24#PX
Gn150	EDRN#P	ERT#P	EOVC#P				EROV2#P	EROV1#P
Gn151	*EFOV7#P	*EFOV6#P	*EFOV5#P	*EFOV4#P	*EFOV3#P	*EFOV2#P	*EFOV1#P	*EFOV0#P
Gn152								

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn153								
Gn154	EBUF#PX	ECLR#PX	ESTP#PX	ESOF#PX	ESBK#PX	EMBUF#PX	ELCKZ#PX	EFIN#PX
Gn155	EMSBK#PX	EC6#PX	EC5#PX	EC4#PX	EC3#PX	EC2#PX	EC1#PX	EC0#PX
Gn156	EIF7#PX	EIF6#PX	EIF5#PX	EIF4#PX	EIF3#PX	EIF2#PX	EIF1#PX	EIF0#PX
Gn157	EIF15#PX	EIF14#PX	EIF13#PX	EIF12#PX	EIF11#PX	EIF10#PX	EIF9#PX	EIF8#PX
Gn158	EID7#PX	EID6#PX	EID5#PX	EID4#PX	EID3#PX	EID2#PX	EID1#PX	EID0#PX
Gn159	EID15#PX	EID14#PX	EID13#PX	EID12#PX	EID11#PX	EID10#PX	EID9#PX	EID8#PX
Gn160	EID23#PX	EID22#PX	EID21#PX	EID20#PX	EID19#PX	EID18#PX	EID17#PX	EID16#PX
Gn161	EID31#PX	EID30#PX	EID29#PX	EID28#PX	EID27#PX	EID26#PX	EID25#PX	EID24#PX
Gn162			EOVC#PX					
Gn163	*EFOV7#P	*EFOV6#P	*EFOV5#P	*EFOV4#P	*EFOV3#P	*EFOV2#P	*EFOV1#P	*EFOV0#P f
Gn164								
Gn165								
Gn166	EBUF#PX	ECLR#PX	ESTP#PX	ESOF#PX	ESBK#PX	EMBUF#PX	ELCKZ#PX	EFIN#PX
Gn167	EMSBK#PX	EC6#PX	EC5#PX	EC4#PX	EC3#PX	EC2#PX	EC1#PX	EC0#PX
Gn168	EIF7#PX	EIF6#PX	EIF5#PX	EIF4#PX	EIF3#PX	EIF2#PX	EIF1#PX	EIF0#PX
Gn169	EIF15#PX	EIF14#PX	EIF13#PX	EIF12#PX	EIF11#PX	EIF10#PX	EIF9#PX	EIF8#PX
Gn170	EID7#PX	EID6#PX	EID5#PX	EID4#PX	EID3#PX	EID2#PX	EID1#PX	EID0#PX
Gn171	EID15#PX	EID14#PX	EID13#PX	EID12#PX	EID11#PX	EID10#PX	EID9#PX	EID8#PX
Gn172	EID23#PX	EID22#PX	EID21#PX	EID20#PX	EID19#PX	EID18#PX	EID17#PX	EID16#PX
Gn173	EID31#PX	EID30#PX	EID29#PX	EID28#PX	EID27#PX	EID26#PX	EID25#PX	EID24#PX
Gn174			EOVC#PX					

Address		Bit number						
	7	6	5	4	3	2	1	0
Gn175	*EFOV7#P	*EFOV6#P	*EFOV5#P	*EFOV4#P	*EFOV3#P	*EFOV2#P	*EFOV1#P	*EFOV0#P
Gn176								
Gn177								
Gn178	EBUF#PX	ECLR#PX	ESTP#PX	ESOF#PX	ESBK#PX	EMBUF#PX	ELCKZ#PX	EFIN#PX
Gn179	EMSBK#PX	EC6#PX	EC5#PX	EC4#PX	EC3#PX	EC2#PX	EC1#PX	EC0#PX
Gn180	EIF7#PX	EIF6#PX	EIF5#PX	EIF4#PX	EIF3#PX	EIF2#PX	EIF1#PX	EIF0#PX
Gn181	EIF15#PX	EIF14#PX	EIF13#PX	EIF12#PX	EIF11#PX	EIF10#PX	EIF9#PX	EIF8#PX
Gn182	EID7#PX	EID6#PX	EID5#PX	EID4#PX	EID3#PX	EID2#PX	EID1#PX	EID0#PX
Gn183	EID15#PX	EID14#PX	EID13#PX	EID12#PX	EID11#PX	EID10#PX	EID9#PX	EID8#PX
Gn184	EID23#PX	EID22#PX	EID21#PX	EID20#PX	EID19#PX	EID18#PX	EID17#PX	EID16#PX
Gn185	EID31#PX	EID30#PX	EID29#PX	EID28#PX	EID27#PX	EID26#PX	EID25#PX	EID24#PX
Gn186			EOVC#PX					
Gn187	*EFOV7#P	*EFOV6#P	*EFOV5#P	*EFOV4#P	*EFOV3#P	*EFOV2#P	*EFOV1#P	*EFOV0#P
Gn188								
Gn189								
Gn190	OVLS8#SV	OVLS7#SV	OVLS6#SV	OVLS5#SV	OVLS4#SV	OVLS3#SV	OVLS2#SV	OVLS1#SV
Gn191								
Gn192	IGVRY8#SV	IGVRY7#SV	IGVRY6#SV	IGVRY5#SV	IGVRY4#SV	IGVRY3#SV	IGVRY2#SV	IGVRY1#SV
Gn193								
Gn194								
Gn195								
Gn196	*DEC8#SV	*DEC7#SV	*DEC6#SV	*DEC5#SV	*DEC4#SV	*DEC3#SV	*DEC2#SV	*DEC1#SV

Address	7	6	5	4	3	2	1	0
Gn197								
Gn198								
Gn199							IOLBH2	IOLBH1
Gn200	EASIP8[#SV]	EASIP7[#SV]	EASIP6[#SV]	EASIP5[#SV]	EASIP4[#SV]	EASIP3[#SV]	EASIP2[#SV]	EASIP1[#SV]
Gn201								
Gn202	NDCAL8[#SV]	NDCAL7[#SV]	NDCAL6[#SV]	NDCAL5[#SV]	NDCAL4[#SV]	NDCAL3[#SV]	NDCAL2[#SV]	NDCAL1[#SV]
Gn203	RWFL	AOFS2[#P]	AOFS1[#P]	CHGAO[#P]				
Gn204	MRDYC[#SP]	ORCMC[#SP]	SFRC[#SP]	SRVC[#SP]	CTH1C[#SP]	CTH2C[#SP]	TLMHC[#SP]	TLMLC[#SP]
Gn205	RCHC[#SP]	RSLC[#SP]	INTGC[#SP]	SOCNC[#SP]	MCFNC[#SP]	SPSLC[#SP]	*ESPC[#SP]	ARSTC[#SP]
Gn206	RCHHGC[#SP]	MFNHGC[#SP]	INCMDC[#SP]	OVRIDC[#S]	DEFMDC[#SP]	NRROC[#SP]	ROTAC[#SP]	INDXC[#SP]
Gn207						MPOFC[#SP]	SLVC[#SP]	MORCMC[#SP]
Gn208	SH07C[#SP]	SH06C[#SP]	SH05C[#SP]	SH04C[#SP]	SH03C[#SP]	SH02C[#SP]	SH01C[#SP]	SH00C[#SP]
Gn209					SH11C[#SP]	SH10C[#SP]	SH09C[#SP]	SH08C[#SP]
Gn210								
Gn211								
Gn212								
Gn213								
Gn214								
Gn215								
Gn216								
Gn217								
Gn218								
Gn251							LCBS	

Address

Bit number

Address	7	6	5	4	3	2	1	0
Bit number	7	6	5	4	3	2	1	0
Gn263								
Gn264					ESSYC4#SP	ESSYC3#SP	ESSYC2#SP	ESSYC1#SP
Gn265					PKESE4#SP	PKESE3#SP	PKESE2#SP	PKESE1#SP
Gn266	MRDYD#SP	ORCMD#SP	SFRD#SP	SRVD#SP	CTH1D#SP	CTH2D#SP	TLMHD#SP	TLMLD#SP
Gn267	RCHD#SP	RSLD#SP	INTGD#SP	SOCND#SP	MCFND#SP	SPSLD#SP	*ESPD#SP	ARSTD#SP
Gn268	RCHHGD#SP	MFNHGD#SP	INCMDD#SP	OVRIDD#S	DEFMDD#SP	NRROD#SP	ROTAD#SP	INDXD#SP
Gn269						MPOFD#SP	SLVD#SP	MORC
Gn270	SH07D#SP	SH06D#SP	SH05D#SP	SH04D#SP	SH03D#SP	SH02D#SP	SH01D#SP	SH00D#SP
Gn271					SH11D#SP	SH10D#SP	SH09D#SP	SH08D#SP
Gn272	R08I4#SP	R07I4#SP	R06I4#SP	R05I4#SP	R04I4#SP	R03I4#SP	R02I4#SP	R01I4#SP
Gn273	SIND4#SP	SSIN4#SP	SGN4#SP		R12I4#SP	R11I4#SP	R10I4#SP	R09I4#SP
Gn274					CONS4#SP	CONS3#SP	CONS2#SP	CONS1#SP
Gn275								
Gn276	UI107#P	UI106#P	UI105#P	UI104#P	UI103#P	UI102#P	UI101#P	UI100#P
Gn277	UI115#P	UI114#P	UI113#P	UI112#P	UI111#P	UI110#P	UI109#P	UI108#P
Gn278	UI123#P	UI122#P	UI121#P	UI120#P	UI119#P	UI118#P	UI117#P	UI116#P
Gn279	UI131#P	UI130#P	UI129#P	UI128#P	UI127#P	UI126#P	UI125#P	UI124#P
Gn280	UI207#P	UI206#P	UI205#P	UI204#P	UI203#P	UI202#P	UI201#P	UI200#P
Gn281	UI215#P	UI214#P	UI213#P	UI212#P	UI211#P	UI210#P	UI209#P	UI208#P
Gn282	UI223#P	UI222#P	UI221#P	UI220#P	UI219#P	UI218#P	UI217#P	UI216#P
Gn283	UI231#P	UI230#P	UI229#P	UI228#P	UI227#P	UI226#P	UI225#P	UI224#P
Gn284	UI307#P	UI306#P	UI305#P	UI304#P	UI303#P	UI302#P	UI301#P	UI300#P

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn285	UI315#P	UI314#P	UI313#P	UI312#P	UI311#P	UI310#P	UI309#P	UI308#P
Gn286	UI323#P	UI322#P	UI321#P	UI320#P	UI319#P	UI318#P	UI317#P	UI316#P
Gn287	UI331#P	UI330#P	UI329#P	UI328#P	UI327#P	UI326#P	UI325#P	UI324#P
Gn288					SPSYC4#SP	SPSYC3#SP	SPSYC2#SP	SPSYC1#SP
Gn289					SPPHS4#SP	SPPHS3#SP	SPPHS2#SP	SPPHS1#SP
Gn290								
Gn291								
Gn292								
Gn293								
Gn294								
Gn295								
Gn296	DI8#SV	DI7#SV	DI6#SV	DI5#SV	DI4#SV	DI3#SV	DI2#SV	DI1#SV
Gn297		AOFS2#P	AOFS1#P	CHGAO#P				
Gn298						RNDH#P		TB BASE#P
Gn299								
Gn300								
Gn301								
Gn302								
Gn303								
Gn304								
Gn305								
Gn306								

Address	7	6	5	4	3	2	1	0
				Bit number				
Gn307								
Gn308								
Gn309								
Gn310								
Gn311								
Gn312								
Gn313								
Gn314								
Gn315								
Gn316								
Gn317								
Gn318								
Gn319								
Gn320								
Gn321								
Gn322								
Gn323								
Gn324								
Gn325								
Gn326								
Gn327								
Gn328	TLRSTI4[#P]	TLRSTI3[#P]	TLRSTI2[#P]	TLRSTI1[#P]	TLRST4[#P]	TLRST3[#P]	TLRST2[#P]	TLRST1[#P]

Address	7	6	5	4	3	2	1	0
				Bit number				
Gn329	TLNCT4[#P]	TLNCT3[#P]	TLNCT2[#P]	TLNCT1[#P]	TLSKP4[#P]	TLSKP3[#P]	TLSKP2[#P]	TLSKP1[#P]
Gn330			TKEY5[#P]	TKEY4[#P]	TKEY3[#P]	TKEY2[#P]	TKEY1[#P]	TKEY0[#P]
Gn331								
Gn332								
Gn333								
Gn334								
Gn335								
Gn336								
Gn337								
Gn338								
Gn339								
Gn340								
Gn341	*+ED48[#SV]	*+ED47[#SV]	*+ED46[#SV]	*+ED45[#SV]	*+ED44[#SV]	*+ED43[#SV]	*+ED42[#SV]	*+ED41[#SV]
Gn342	*-ED48[#SV]	*-ED47[#SV]	*-ED46[#SV]	*-ED45[#SV]	*-ED44[#SV]	*-ED43[#SV]	*-ED42[#SV]	*-ED41[#SV]
Gn343	*+ED58[#SV]	*+ED57[#SV]	*+ED56[#SV]	*+ED55[#SV]	*+ED54[#SV]	*+ED53[#SV]	*+ED52[#SV]	*+ED51[#SV]
Gn344	*-ED58[#SV]	*-ED57[#SV]	*-ED56[#SV]	*-ED55[#SV]	*-ED54[#SV]	*-ED53[#SV]	*-ED52[#SV]	*-ED51[#SV]
Gn345								
Gn346								
Gn347								
Gn348								
Gn349								
Gn350								

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn351								
Gn352	*FHRO7#P	*FHRO6#P	*FHRO5#P	*FHRO4#P	*FHRO3#P	*FHRO2#P	*FHRO1#P	*FHRO0#P
Gn353	FHROV#P						*FHRO9#P	*FHRO8#P
Gn354	THD07#P	THD06#P	THD05#P	THD04#P	THD03#P	THD02#P	THD01#P	THD00#P
Gn355	THD15#P	THD14#P	THD13#P	THD12#P	THD11#P	THD10#P	THD09#P	THD08#P
Gn356							THSTB#P	THML#P
Gn395								
Gn396								
Gn397								
Gn398								
Gn399								
Gn400					*SUCPFD#SP	*SUCPFC#SP	*SUCPFB#SP	
Gn401					*SCPFD#SP	*SCPFC#SP	*SCPFB#SP	
Gn402					SPSTPD#SP	SPSTPC#SP	SPSTPB#SP	
Gn403			SLPCD#P	SLPCC#P			SLSPD#P	SLSPC#P
Gn404								
Gn405								
Gn406	ITF08#P	ITF07#P	ITF06#P	ITF05#P	ITF04#P	ITF03#P	ITF02#P	ITF01#P
Gn407							ITF10#P	ITF09#P
Gn408						HEAD4	HEAD3	STCHK#P
Gn409								
Gn410								

Address	Bit number							
	7	6	5	4	3	2	1	0
Gn411	HS4IE#P	HS3IE#P	HS2IE#P	HS1IE#P	HS4E#P	HS3E#S	HS2E#P	HS1E#P
Gn412								
Gn413								
Gn414								
Gn415								
Gn416								
Gn417								
Gn418								
Gn419								
Gn420								
Gn421								
Gn422	SKIP4#P	SKIP3#P	SKIP2#P					
Gn423								
Gn424								
Gn425								
Gn426								
Gn427								
Gn428								
Gn429								
Gn430								
Gn431								
Gn432								

Address | Bit number

	7	6	5	4	3	2	1	0
Gn433								
Gn434								
Gn435								
Gn436								
Gn437								
Gn438								
Gn439								
Gn440								
Gn441								
Gn442								
Gn443								
Gn444								
Gn445								
Gn446								
Gn447								
Gn448								
Gn449								
Gn450								
to								
Gn516	SEMI8#SV	SEMI7#SV	SEMI6#SV	SEMI5#SV	SEMI4#SV	SEMI3#SV	SEMI2#SV	SEMI1#SV
to								
Gn767								

CNC → PMC

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn000	OP#P	SA#P	STL#P	SPL#P				RWD#P
Fn001	MA#P		TAP#P	ENB#SP	DEN#P	BAL#P	RST#P	AL#P
Fn002	MDRN#P	CUT#P		SRNMV#P	THRD#P	CSS#P	RPDO#P	INCH#P
Fn003		MEDT#P	MMEM#	MRMT#P	MMDI#P	MJ#P	MH#P	MINC#P
Fn004			MREF#P	MAFL#P	MSBK#P	MABS#P	MMLK#P	MBDT1#P
Fn005	MBDT9#P	MBDT8#P	MBDT7#P	MBDT6#P	MBDT5#P	MBDT4#P	MBDT3#P	MBDT2#P
Fn006								
Fn007	BF#P				TF#P	SF#P		MF#P
Fn008			MF3#P	MF2#P				
Fn009	DM00#P	DM01#P	DM02#P	DM30#P				
Fn010	M07#P	M06#P	M05#P	M04#P	M03#P	M02#P	M01#P	M00#P
Fn011	M15#P	M14#P	M13#P	M12#P	M11#P	M10#P	M09#P	M08#P
Fn012	M23#P	M22#P	M21#P	M20#P	M19#P	M18#P	M17#P	M16#P
Fn013	M31#P	M30#P	M29#P	M28#P	M27#P	M26#P	M25#P	M24#P
Fn014	M207#P	M206#P	M205#P	M204#P	M203#P	M202#P	M201#P	M200#P
Fn015	M215#P	M214#P	M213#P	M212#P	M211#P	M210#P	M209#P	M208#P
Fn016	M307#P	M306#P	M305#P	M304#P	M303#P	M302#P	M301#P	M300#P
Fn017	M315#P	M314#P	M313#P	M312#P	M311#P	M310#P	M309#P	M308#P
Fn018								
Fn019								
Fn020								

Address	|	7	6	5	4	3	2	1	0
		|	|	|	Bit number	|	|	|	|

Address	7	6	5	4	3	2	1	0
Fn021								
Fn022	S07#P	S06#P	S05#P	S04#P	S03#P	S02#P	S01#P	S00#P
Fn023	S15#P	S14#P	S13#P	S12#P	S11#P	S10#P	S09#P	S08#P
Fn024	S23#P	S22#P	S21#P	S20#P	S19#P	S18#P	S17#P	S16#P
Fn025	S31#P	S30#P	S29#P	S28#P	S27#P	S26#P	S25#P	S24#P
Fn026	T07#P	T06#P	T05#P	T04#P	T03#P	T02#P	T01#P	T00#P
Fn027	T15#P	T14#P	T13#P	T12#P	T11#P	T10#P	T09#P	T08#P
Fn028	T23#P	T22#P	T21#P	T20#P	T19#P	T18#P	T17#P	T16#P
Fn029	T31#P	T30#P	T29#P	T28#P	T27#P	T26#P	T25#P	T24#P
Fn030	B07#P	B06#P	B05#P	B04#P	B03#P	B02#P	B01#P	B00#P
Fn031	B15#P	B14#P	B13#P	B12#P	B11#P	B10#P	B09#P	B08#P
Fn032	B23#P	B22#P	B21#P	B20#P	B19#P	B18#P	B17#P	B16#P
Fn033	B31#P	B30#P	B29#P	B28#P	B27#P	B26#P	B25#P	B24#P
Fn034	SRSRDY#P	SRSP1R#SP	SRSP2R#SP	SRSP3R#SP	SRSP4R#SP	GR3O#P	GR2O#P	GR1O#P
Fn035								
Fn036	R08O#SP	R07O#SP	R06O#SP	R05O#SP	R04O#SP	R03O#SP	R02O#SP	R01O#SP
Fn037					R12O#SP	R11O#SP	R10O#SP	R09O#SP
Fn038					ENB3#SP	ENB2#SP	SUCLPA#SP	SCLPA#SP
Fn039					CHPCYL#	CHPMD#P	ENB4#SP	MSPOSA#SP
Fn040	AR07#SP	AR06#SP	AR05#SP	AR04#SP	AR03#SP	AR02#SP	AR01#SP	AR00#SP
Fn041	AR15#SP	AR14#SP	AR13#SP	AR12#SP	AR11#SP	AR10#SP	AR09#SP	AR08#SP
Fn042								

Address	Bit number 7	6	5	4	3	2	1	0
Fn043					SYCAL4#SP	SYCAL3#SP	SYCAL2#SP	SYCAL1#SP
Fn044				SYCAL#P	FSPPH#P	FSPSYC#P	FSCSL#P	
Fn045	ORARA#SP	TLMA#SP	LDT2A#SP	LDT1A#SP	SARA#SP	SDTA#SP	SSTA#SP	ALMA#SP
Fn046	MORA2A#SP	MORA1A#SP	PORA2A#SP	SLVSA#SP	RCFNA#SP	RCHPA#SP	CFINA#SP	CHIPA#SP
Fn047							INCSTA#SP	PC1DEA#SP
Fn048								
Fn049	ORARB#SP	TLMB#SP	LDT2B#SP	LDT1B#SP	SARB#SP	SDTB#SP	SSTB#SP	ALMB#SP
Fn050	MORA2B#SP	MORA1B#SP	PORA2B#SP	SLVSB#SP	RCFNB#SP	RCHPB#SP	CFINB#SP	CHIPB#SP
Fn051							INCSTB#SP	PC1DEB#SP
Fn052								
Fn053	EKENB						PRGDPL	INHKY
Fn054	UO007#P	UO006#P	UO005#P	UO004#P	UO003#P	UO002#P	UO001#P	UO000#P
Fn055	UO015#P	UO014#P	UO013#P	UO012#P	UO011#P	UO010#P	UO009#P	UO008#P
Fn056	UO107#P	UO106#P	UO105#P	UO104#P	UO103#P	UO102#P	UO101#P	UO100#P
Fn057	UO115#P	UO114#P	UO113#P	UO112#P	UO111#P	UO110#P	UO109#P	UO108#P
Fn058	UO123#P	UO122#P	UO121#P	UO120#P	UO119#P	UO118#P	UO117#P	UO116#P
Fn059	UO131#P	UO130#P	UO129#P	UO128#P	UO127#P	UO126#P	UO125#P	UO124#P
Fn060								
Fn061					HCEXE	HCAB2	*BCLP#P	*BUCLP#P
Fn062	PRTSF#P			S2MES#P	S1MES#P			AICC#P
Fn063	PSYN#P	WATO#P		COSP2#P	COSP1#P	PSAR#P	PSE2#P	PSE1#P
Fn064	TIALM#P	TICHK#P	COSP#P		TLCHB#P	TLCHI#P		TLCH#P

Address				Bit number				
	7	6	5	4	3	2	1	0
Fn065		SYNMOD#		RTRCTF#P		RSMAX#P	RSPM#P	RSPP#P
Fn066			PECK2#P				RTPT#P	
Fn067								
Fn068								
Fn069								
Fn070	PSW08#P	PSW07#P	PSW06#P	PSW05#P	PSW04#P	PSW03#P	PSW02#P	PSW01#P
Fn071								
Fn072	OUT7#P	OUT6#P	OUT5#P	OUT4#P	OUT3#P	OUT2#P	OUT1#P	OUT0#P
Fn073			ZRNO#P			MD4O#P	MD2O#P	MD1O#P
Fn074	OUT15#P	OUT14#P	OUT13#P	OUT12#P	OUT11#P	OUT10#P	OUT9#P	OUT8#P
Fn075	SPO#P	KEYO	DRNO#P	MLKO#P	SBKO#P	BDTO#P		
Fn076			ROV2O#P	ROV1O#P	RTAP#P		MP2O#P	MP1O#P
Fn077		RTO#P			HS1DO#P	HS1CO#P	HS1BO#P	HS1AO#P
Fn078	*FV7O#P	*FV6O#P	*FV5O#P	*FV4O#P	*FV3O#P	*FV2O#P	*FV1O#P	*FV0O#P
Fn079	*JV7O#P	*JV6O#P	*JV5O#P	*JV4O#P	*JV3O#P	*JV2O#P	*JV1O#P	*JV0O#P
Fn080	*JV15O#P	*JV14O#P	*JV13O#P	*JV12O#P	*JV11O#P	*JV10O#P	*JV9O#P	*JV8O#P
Fn081	-J4O#P	+J4O#P	-J3O#P	+J3O#P	-J2O#P	+J2O#P	-J1O#P	+J1O#P
Fn082								
Fn083								
Fn084	EUO07#P	EUO06#P	EUO05#P	EUO04#P	EUO03#P	EUO02#P	EUO01#P	EUO00#P
Fn085	EUO15#P	EUO14#P	EUO13#P	EUO12#P	EUO11#P	EUO10#P	EUO09#P	EUO08#P
Fn086								

Address	7	6	5	4	3	2	1	0
				Bit number				
Fn087								
Fn088								
Fn089								
Fn090					ABTSP3 #SP	ABTSP2 #SP	ABTSP1 #SP	ABTQSV #P
Fn091				ABTSP4 #SP				
Fn092			TRSPS #P	TRMTN #P	TRACT #P			
Fn093	SVWRN4 #P	SVWRN3 #P	SVWRN2 #P	SVWRN1 #P				
Fn094	ZP8 #SV	ZP7 #SV	ZP6 #SV	ZP5 #SV	ZP4 #SV	ZP3 #SV	ZP2 #SV	ZP1 #SV
Fn095								
Fn096	ZP28 #SV	ZP27 #SV	ZP26 #SV	ZP25 #SV	ZP24 #SV	ZP23 #SV	ZP22 #SV	ZP21 #SV
Fn097								
Fn098	ZP38 #SV	ZP37 #SV	ZP36 #SV	ZP35 #SV	ZP34 #SV	ZP33 #SV	ZP32 #SV	ZP31 #SV
Fn099								
Fn100	ZP48 #SV	ZP47 #SV	ZP46 #SV	ZP45 #SV	ZP44 #SV	ZP43 #SV	ZP42 #SV	ZP41 #SV
Fn101								
Fn102	MV8 #SV	MV7 #SV	MV6 #SV	MV5 #SV	MV4 #SV	MV3 #SV	MV2 #SV	MV1 #SV
Fn103								
Fn104	INP8 #SV	INP7 #SV	INP6 #SV	INP5 #SV	INP4 #SV	INP3 #SV	INP2 #SV	INP1 #SV
Fn105								
Fn106	MVD8 #SV	MVD7 #SV	MVD6 #SV	MVD5 #SV	MVD4 #SV	MVD3 #SV	MVD2 #SV	MVD1 #SV
Fn107								
Fn108	MMI8 #SV	MMI7 #SV	MMI6 #SV	MMI5 #SV	MMI4 #SV	MMI3 #SV	MMI2 #SV	MMI1 #SV

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn109								
Fn110	MDTCH8#SV	MDTCH7#SV	MDTCH6#SV	MDTCH5#SV	MDTCH4#SV	MDTCH3#SV	MDTCH2#SV	MDTCH1#SV
Fn111								
Fn112	EADEN8#SV	EADEN7#SV	EADEN6#SV	EADEN5#SV	EADEN4#SV	EADEN3#SV	EADEN2#SV	EADEN1#SV
Fn113								
Fn114	TRQL8#SV	TRQL7#SV	TRQL6#SV	TRQL5#SV	TRQL4#SV	TRQL3#SV	TRQL2#SV	TRQL1#SV
Fn115								
Fn116	FRP8#SV	FRP7#SV	FRP6#SV	FRP5#SV	FRP4#SV	FRP3#SV	FRP2#SV	FRP1#SV
Fn117								
Fn118	SYN80#SV	SYN70#SV	SYN60#SV	SYN50#SV	SYN40#SV	SYN30#SV	SYN20#SV	SYN10#SV
Fn119								
Fn120	ZRF8#SV	ZRF7#SV	ZRF6#SV	ZRF5#SV	ZRF4#SV	ZRF3#SV	ZRF2#SV	ZRF1#SV
Fn121								
Fn122								
Fn123								
Fn124	+OT8#SV	+OT7#SV	+OT6#SV	+OT5#SV	+OT4#SV	+OT3#SV	+OT2#SV	+OT1#SV
Fn125								
Fn126	-OT8#SV	-OT7#SV	-OT6#SV	-OT5#SV	-OT4#SV	-OT3#SV	-OT2#SV	-OT1#SV
Fn127								
Fn128								
Fn129	*EAXSL#P		EOV0#P					
Fn130	EBSYA#PX	EOTNA#PX	EOTPA#PX	EGENA#PX	EDENA#PX	EIALA#PX	ECKZA#PX	EINPA#PX

Address	7	6	5	4	3	2	1	0
Fn131					EMF3A#PX	EMF2A#PX	EABUFA#PX	EMFA#PX
Fn132	EM28A#PX	EM24A#PX	EM22A#PX	EM21A#PX	EM18A#PX	EM14A#PX	EM12A#PX	EM11A#PX
Fn133	EBSYB#PX	EOTNB#PX	EOTPB#PX	EGENB#PX	EDENB#PX	EIALB#PX	ECKZB#PX	EINPB#PX
Fn134					EMF3B#PX	EMF2B#PX	EABUFB#PX	EMFB#PX
Fn135								
Fn136	EBSYC#PX	EOTNC#PX	EOTPC#PX	EGENC#PX	EDENC#PX	EIALC#PX	ECKZC#PX	EINPC#PX
Fn137					EMF3C#PX	EMF2C#PX	EABUFC#PX	EMFC#PX
Fn138								
Fn139	EBSYD#PX	EOTND#PX	EOTPD#PX	EGEND#PX	EDEND#PX	EIALD#PX	ECKZD#PX	EINPD#PX
Fn140					EMF3D#PX	EMF2D#PX	EABUFD#PX	EMFD#PX
Fn141								
Fn142								
Fn143								
Fn144								
Fn145								
Fn146								
Fn147								
Fn148								
Fn149								
Fn150								
Fn151								
Fn152								

Bit number

Address	7	6	5	4	3	2	1	0
Fn153								
Fn154								
Fn155								
Fn156								
Fn157								
Fn158								
Fn159								
Fn160	MSP07#P	MSP06#P	MSP05#P	MSP04#P	MSP03#P	MSP02#P	MSP01#P	MSP00#P
Fn161	MSP15#P	MSP14#P	MSP13#P	MSP12#P	MSP11#P	MSP10#P	MSP09#P	MSP08#P
Fn162								
Fn163								
Fn164								
Fn165								
Fn166								
Fn167								
Fn168	ORARC#SP	TLMC#SP	LDT2C#SP	LDT1C#SP	SARC#SP	SDTC#SP	SSTC#SP	ALMC#SP
Fn169	MORA2C#SP	MORA1C#SP	PORA2C#SP	SLVSC#SP	RCFNC#SP	RCHPC#SP	CFINC#SP	CHIPC#SP
Fn170							INCSTC#SP	PC1DEC#SP
Fn171								
Fn172	PBATL#P	PBATZ#P						
Fn173								
Fn174								

Address	\#7	6	5	4	3	2	1	0
Fn175								
Fn176								
Fn177								
Fn178								
Fn179								
Fn180								
Fn181								
Fn182	EACNT8$^{\#SV}$	EACNT7$^{\#SV}$	EACNT6$^{\#SV}$	EACNT5$^{\#SV}$	EACNT4$^{\#SV}$	EACNT3$^{\#SV}$	EACNT2$^{\#SV}$	EACNT1$^{\#SV}$
Fn183								
Fn184	ABDT8$^{\#SV}$	ABDT7$^{\#SV}$	ABDT6$^{\#SV}$	ABDT5$^{\#SV}$	ABDT4$^{\#SV}$	ABDT3$^{\#SV}$	ABDT2$^{\#SV}$	ABDT1$^{\#SV}$
Fn185								
Fn186								
Fn187								
Fn188	AMRST8$^{\#SV}$	AMRST7$^{\#SV}$	AMRST6$^{\#SV}$	AMRST5$^{\#SV}$	AMRST4$^{\#SV}$	AMRST3$^{\#SV}$	AMRST2$^{\#SV}$	AMRST1$^{\#SV}$
Fn189								
Fn190	TRQM8$^{\#SV}$	TRQM7$^{\#SV}$	TRQM6$^{\#SV}$	TRQM5$^{\#SV}$	TRQM4$^{\#SV}$	TRQM3$^{\#SV}$	TRQM2$^{\#SV}$	TRQM1$^{\#SV}$
Fn191								
Fn192								
Fn193								
Fn194								
Fn195								
Fn196								

Address	7	6	5	4	3	2	1	0
				Bit number				
Fn197								
Fn198								
Fn199			MCHAO[#P]					
Fn200	R08O2[#SP]	R07O2[#SP]	R06O2[#SP]	R05O2[#SP]	R04O2[#SP]	R03O2[#SP]	R02O2[#SP]	R01O2[#SP]
Fn201					R12O2[#SP]	R11O2[#SP]	R10O2[#SP]	R09O2[#SP]
Fn202	AR072[#SP]	AR062[#SP]	AR052[#SP]	AR042[#SP]	AR032[#SP]	AR022[#SP]	AR012[#SP]	AR002[#SP]
Fn203	AR152[#SP]	AR142[#SP]	AR132[#SP]	AR122[#SP]	AR112[#SP]	AR102[#SP]	AR092[#SP]	AR082[#SP]
Fn204	R08O3[#SP]	R07O3[#SP]	R06O3[#SP]	R05O3[#SP]	R04O3[#SP]	R03O3[#SP]	R02O3[#SP]	R01O3[#SP]
Fn205					R12O3[#SP]	R11O3[#SP]	R10O3[#SP]	R09O3[#SP]
Fn206	AR073[#SP]	AR063[#SP]	AR053[#SP]	AR043[#SP]	AR033[#SP]	AR023[#SP]	AR013[#SP]	AR003[#SP]
Fn207	AR153[#SP]	AR143[#SP]	AR133[#SP]	AR123[#SP]	AR113[#SP]	AR103[#SP]	AR093[#SP]	AR083[#SP]
Fn208	EGBM8[#P]	EGBM7[#P]	EGBM6[#P]	EGBM5[#P]	EGBM4[#P]	EGBM3[#P]	EGBM2[#P]	EGBM1[#P]
Fn209								
Fn210	SYNMT8[#P]	SYNMT7[#P]	SYNMT6[#P]	SYNMT5[#P]	SYNMT4[#P]	SYNMT3[#P]	SYNMT2[#P]	SYNMT1[#P]
Fn211	SYNOF8[#P]	SYNOF7[#P]	SYNOF6[#P]	SYNOF5[#P]	SYNOF4[#P]	SYNOF3[#P]	SYNOF2[#P]	SYNOF1[#P]
Fn212								
Fn213								
Fn214								
Fn215								
Fn216								
Fn217								
Fn218								

Address   Bit number

	7	6	5	4	3	2	1	0
Fn241								
Fn242								
Fn243								
Fn244								
Fn245								
Fn246								
Fn247								
Fn248								
Fn249								
Fn250								
Fn251								
Fn252								
Fn253								
Fn254				ALR12[#P]	ALR11[#P]	ALR10[#P]	ALR9[#P]	ALR8[#P]
Fn255								
Fn256								
Fn257								
Fn258								
Fn259								
Fn260								
Fn261								
Fn262								

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn263								
Fn264	SPWRN8#P	SPWRN7#P	SPWRN6#P	SPWRN5#P	SPWRN4#P	SPWRN3#P	SPWRN2#P	SPWRN1#P
Fn265								SPWRN9#P
Fn266	ORARD#SP	TLMD#SP	LDT2D#SP	LDT1D#SP	SARD#SP	SDTD#SP	SSTD#SP	ALMD#SP
Fn267	MORA2D#SP	MORA1D#SP	PORA2D#SP	SLVSD#SP	RCFND#SP	RCHPD#SP	CFIND#SP	CHIPD#SP
Fn268							INCSTD#SP	PC1DED#SP
Fn269								
Fn270	R08O4#SP	R07O4#SP	R06O4#SP	R05O4#SP	R04O4#SP	R03O4#SP	R02O4#SP	R01O4#SP
Fn271					R12O4#SP	R11O4#SP	R10O4#SP	R09O4#SP
Fn272	AR074#SP	AR064#SP	AR054#SP	AR044#SP	AR034#SP	AR024#SP	AR014#SP	AR004#SP
Fn273	AR154#SP	AR144#SP	AR134#SP	AR124#SP	AR114#SP	AR104#SP	AR094#SP	AR084#SP
Fn274					FCSS4#SP	FCSS3#SP	FCSS2#SP	FCSS1#SP
Fn275								
Fn276	UO023#P	UO022#P	UO021#P	UO020#P	UO019#P	UO018#P	UO017#P	UO016#P
Fn277	UO031#P	UO030#P	UO029#P	UO028#P	UO027#P	UO026#P	UO025#P	UO024#P
Fn278								
Fn279								
Fn280	UO207#P	UO206#P	UO205#P	UO204#P	UO203#P	UO202#P	UO201#P	UO200#P
Fn281	UO215#P	UO214#P	UO213#P	UO212#P	UO211#P	UO210#P	UO209#P	UO208#P
Fn282	UO223#P	UO222#P	UO221#P	UO220#P	UO219#P	UO218#P	UO217#P	UO216#P
Fn283	UO231#P	UO230#P	UO229#P	UO228#P	UO227#P	UO226#P	UO225#P	UO224#P
Fn284	UO307#P	UO306#P	UO305#P	UO304#P	UO303#P	UO302#P	UO301#P	UO300#P

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn285	UO315#P	UO314#P	UO313#P	UO312#P	UO311#P	UO310#P	UO309#P	UO308#P
Fn286	UO323#P	UO322#P	UO321#P	UO320#P	UO319#P	UO318#P	UO317#P	UO316#P
Fn287	UO331#P	UO330#P	UO329#P	UO328#P	UO327#P	UO326#P	UO325#P	UO324#P
Fn288					FSPSY4#SP	FSPSY3#SP	FSPSY2#SP	FSPSY1#SP
Fn289					FSPPH4#SP	FSPPH3#SP	FSPPH2#SP	FSPPH1#SP
Fn290								
Fn291								
Fn292								
Fn293	HPS08#P	HPS07#P	HPS06#P	HPS05#P	HPS04#P	HPS03#P	HPS02#P	HPS01#P
Fn294	HPS16#P	HPS15#P	HPS14#P	HPS13#P	HPS12#P	HPS11#P	HPS10#P	HPS09#P
Fn295								
Fn296	DM8#SV	DM7#SV	DM6#SV	DM5#SV	DM4#SV	DM3#SV	DM2#SV	DM1#SV
Fn297			MCHAO#P					
Fn298								
Fn299								
Fn300								
Fn301								
Fn302								
Fn303								
Fn304								
Fn305								
Fn306								

Address   Bit number

	7	6	5	4	3	2	1	0
Fn307								
Fn308								
Fn309								
Fn310								
Fn311								
Fn312								
Fn313								
Fn314								
Fn315	TLMEM#P	TMFNFD#P		TLMOT#P		TLMG10#P	TLMSRH#P	TLSKF#P
Fn316								
Fn317								
Fn318								
Fn319								
Fn320								
Fn321								
Fn322								
Fn323								
Fn324								
Fn325								
Fn326								
Fn327								
Fn328	TLCHI4#P	TLCHI3#P	TLCHI2#P	TLCHI1#P	TLCH4#P	TLCH3#P	TLCH2#P	TLCH1#P

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn329	TLCHB4#P	TLCHB3#P	TLCHB2#P	TLCHB1#P	TLSKF4#P	TLSKF3#P	TLSKF2#P	TLSKF1#P
Fn330								
Fn331								
Fn332								
Fn333								
Fn334								
Fn335								
Fn336								
Fn337								
Fn338								
Fn339								
Fn340								
Fn341	SYCM8#SV	SYCM7#SV	SYCM6#SV	SYCM5#SV	SYCM4#SV	SYCM3#SV	SYCM2#SV	SYCM1#SV
Fn342	SYCS8#SV	SYCS7#SV	SYCS6#SV	SYCS5#SV	SYCS4#SV	SYCS3#SV	SYCS2#SV	SYCS1#SV
Fn343	MIXO8#SV	MIXO7#SV	MIXO6#SV	MIXO5#SV	MIXO4#SV	MIXO3#SV	MIXO2#SV	MIXO1#SV
Fn344	OVMO8#SV	OVMO7#SV	OVMO6#SV	OVMO5#SV	OVMO4#SV	OVMO3#SV	OVMO2#SV	OVMO1#SV
Fn345	OVSO8#SV	OVSO7#SV	OVSO6#SV	OVSO5#SV	OVSO4#SV	OVSO3#SV	OVSO2#SV	OVSO1#SV
Fn346	SMPK8#SV	SMPK7#SV	SMPK6#SV	SMPK5#SV	SMPK4#SV	SMPK3#SV	SMPK2#SV	SMPK1#SV
Fn347								
Fn348								
Fn349								
Fn350								

Address	Bit number							
	7	6	5	4	3	2	1	0
Fn356							THREND#P	MTHML#P
Fn395								
Fn396								
Fn397								
Fn398								
Fn399								
Fn400					SUCLPD#SP	SUCLPC#SP	SUCLPB#SP	
Fn401					SCLPD#SP	SCLPC#SP	SCLPB#SP	
Fn402					MSPOSD#SP	MSPOSC#SP	MSPOSB#SP	
Fn403								SYNER#P
Fn404							COSP4#P	COSP3#P
Fn405								
Fn406								
Fn407								
Fn408								
Fn409								
Fn410								
Fn411								
Fn412								
Fn413								
Fn414								
Fn415								

Address   Bit number

	7	6	5	4	3	2	1	0
Fn416								
Fn417								
Fn418								
Fn419								
Fn414								

to

Fn516	MSEMI8#SV	MSEMI7#SV	MSEMI6#SV	MSEMI5#SV	MSEMI4#SV	MSEMI3#SV	MSEMI2#SV	MSEMI1#SV
Fn517	RP18	RP17	RP16	RP15	RP14	RP13	RP12	RP11
Fn518	RP28	RP27	RP26	RP25	RP24	RP23	RP22	RP21
Fn519								

to

Fn767								

8

EMBEDDED ETHERNET FUNCTION

This chapter describes the specifications of the embedded Ethernet function.

8.1 EMBEDDED ETHERNET PORT AND PCMCIA ETHERNET CARD

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 for temporary communication.

⚠ **CAUTION**
1 When using the embedded Ethernet function for the first time, set an IP address and other items carefully as instructed by the network administrator, then perform a sufficient communication test.
   Note that an incorrect IP address or other setting may cause a communication failure on the entire network.
2 A unit such as a PC situated in the same network can increase the communication processing load on the CNC even if the unit is not communicating with the CNC.
   Avoid connecting the CNC to a factory-wide network.   Use a router or the like to separate the network including the CNC from the other networks.

NOTE
1 The built-in Ethernet port of FANUC Series 32*i*-A is available as an option.
2 Use the PCMCIA Ethernet card designated by FANUC.   General Ethernet cards available on the market cannot be used.
3 The PCMCIA Ethernet card is used for FANUC LADDER-   or a servo guide.
4 Use the PCMCIA Ethernet card just for temporary communication as described above.   Avoid using the card for continuous communication.
5 The PCMCIA Ethernet card is inserted into a memory card slot, with a part of the card left uninserted.   When using the PCMCIA Ethernet card, take great care not to damage the card by hitting the protruding part of the card.
   When the card becomes unnecessary, remove the card immediately, in order to prevent any damage to the card.

8.2 SETTING UP THE EMBEDDED ETHERNET FUNCTION

This section describes the setting of parameters for the embedded Ethernet function.

8.2.1 Parameter Setting of the FOCAS2/Ethernet Function

This subsection describes the settings required to operate the FOCAS2/Ethernet function.

Notes on using the FOCAS2/Ethernet function for the first time

> **NOTE**
> 1 When running user's original application software created by using the FOCAS2/Ethernet function, use the built-in Ethernet port.
> 2 The FOCAS2/Ethernet function allows up to five FOCAS2/Ethernet clients to be connected to one CNC.
> 3 Concurrent access by multiple applications or personal computers may overload the CNC, reducing the communication speed.

Operation on the FOCAS2/Ethernet setting screen

On the Ethernet parameter setting screen, set the parameters for operating the FOCAS2/Ethernet function.

Procedure

1 Press the function key [SYSTEM].
2 Soft keys [EMBED] and [PCMCIA LAN] appear.
   (When there is no soft keys, press the continue key.)
3 To display the Ethernet Setting screen for the embedded Ethernet port or the PCMCIA Ethernet card, press soft key [EMBED] or [PCMCIA LAN], respectively.
4 Press soft keys [COMMON] and [FOCAS2] and then enter parameters for the items that appear.

> **NOTE**
> 1 The parameters for the embedded Ethernet port and the parameters for the PCMCIA Ethernet card are independent of each other.
> 2 The settings of the FOCAS2/Ethernet function for the PCMCIA Ethernet card are made when a connection to the Servo Guide and FANUC LADDER-III is established.

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Settings of the FOCAS2/Ethernet function

- Settings on the COMMON screen

Item	Description
IP ADDRESS	Specify the IP address of the embedded Ethernet. (Example of specification format: "192.168.0.100")
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format: "255.255.255.0")
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this item when the network contains a router. (Example of specification format: "192.168.0.253")

- Display items on the COMMON screen

Item	Description
MAC ADDRESS	Embedded Ethernet MAC address
AVAILABLE DEVICE	Enabled device of the embedded Ethernet. Either the embedded Ethernet port or the PCMCIA Ethernet card is displayed.

```
          COMMON: Setting[EMBEDDED]
  BASIC
    MAC ADDRESS          080019000001
    IP ADDRESS           192.168.0.100
    SUBNET MASK          255.255.255.0
    ROUTER IP ADDRESS    192.168.0.253




    AVAILABLE DEVICE   EMBEDDED      1/ 2
  A>


  MEM  STOP *** ***    | 15:40:05 |
  COMMON FOCAS2 FTP              (OPRT) +
               TRANS
```

COMMON screen

- FOCAS2/Ethernet setting items

Item	Description
PORT NUMBER (TCP)	Specify a port number to be used with the FOCAS2/Ethernet function. The valid input range is 5001 to 65535.
PORT NUMBER (UDP)	Set this item to 0 when it is used as the FOCAS2/Ethernet function.
TIME INTERVAL	Set this item to 0 when it is used as the FOCAS2/Ethernet function.

FOCAS2 screen

NOTE
1 When a connection to the *i* CELL is established, set the UDP port number and time interval above as described in the FANUC CIMPLICITY *i* CELL Operator's Manual (B-75074).
2 The unit of the time interval is 10 ms. The allowable range is between 10 and 65535.   A time interval less than 100ms cannot be set.
3 Decreasing the time interval setting increases the communication load and can affect the network performance.
     Example) If the interval is set to 100 (100 x 10 ms = 1 second), broadcast data is sent every 1 second.

- Initial setting of the PCMCIA Ethernet card

The PCMCIA Ethernet card is factory-set to the following default values, for ease of connection with a servo guide or FANUC LADDER-III.

IP ADDRESS	: 192.168.1.1
SUBNET MASK	: 255.255.255.0
ROUTER IP ADDRESS	: None
PORT NUMBER (TCP)	: 8193
PORT NUMBER (UDP)	: 0
TIME INTERVAL	: 0

If a specified IP address is changed to a blank (space), the specified setting is reset to the default value.

The built-in Ethernet port does not have a default value.

Example of setting the FOCAS2/Ethernet function

The following shows a setting example required for the FOCAS2/Ethernet function to operate.

In this example, one personal computer is connected to two CNCs through FOCAS2/Ethernet.
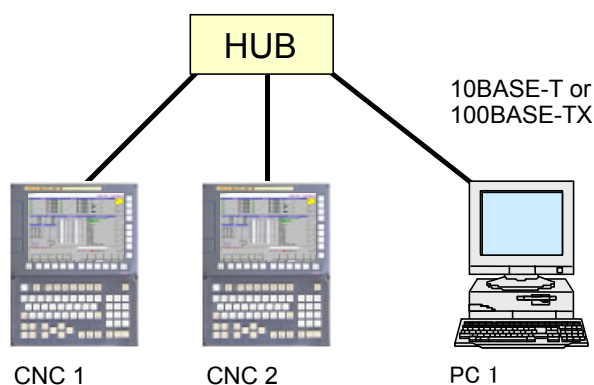
	CNC 1	CNC 2
IP address	192.168.0.100	192.168.0.101
Subnet mask	255.255.255.0	255.255.255.0
Router IP address	None	None
TCP port number	8193	8193
UDP port number	0	0
Time interval	0	0

The Ethernet parameter screen is used for setting.

		PC 1
IP address		192.168.0.200
Subnet mask		255.255.255.0
Default gateway		None
CNC 1	NC IP address	192.168.0.100
	NC TCP port number	8193
CNC 2	NC IP address	192.168.0.101
	NC TCP port number	8193

"Microsoft TCP/IP property" of the personal computer (Windows 95/98/NT/2000/XP) is used for setting.

The arguments of the data window library function cnc_allclibhndl3 are used for setting.

8.2.2   Setting Parameters for The FTP File Transfer Function

This section describes the settings required for the FTP file transfer function to operate using the embedded Ethernet function.

Notes on using the FTP file transfer function for the first time

> **NOTE**
> 1 When using the FTP file transfer function, use the built-in Ethernet port.
> 2 The number of FTP communications to which one CNC can be connected using the FTP file transfer function is one.

Operation on the FTP file transfer setting screen

On the Ethernet setting screen, set the parameters for operating the FTP file transfer function.

Procedure

1   Press the function key [SYSTEM].
2   Soft keys [EMBED] appear.
    (When there is no soft keys, press the continue key.)
3   By pressing the [EMBED] soft key, the Ethernet Setting screen for the embedded Ethernet port is displayed.
4   Press soft keys [COMMON] and [FTP TRANS] and then enter parameters for the items that appear.

> **NOTE**
> The parameters for the embedded Ethernet port and the parameters for the PCMCIA Ethernet card are independent of each other.
> If the [PCMCIA LAN] soft key is pressed, the PCMCIA Ethernet card can be set up.   However, the card setup is carried out for maintenance and is not necessary usually.

Settings for the FTP file transfer function

- Settings on the COMMON screen

Item	Description
IP ADDRESS	Specify the IP address of the embedded Ethernet. (Example of specification format: "192.168.0.100")
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format: "255.255.255.0")
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this item when the network contains a router. (Example of specification format: "192.168.0.253")

- Display items on the COMMON screen

Item	Description
MAC ADDRESS	Embedded Ethernet MAC address
AVAILABLE DEVICE	Enabled device of the embedded Ethernet. Either the embedded Ethernet port or the PCMCIA Ethernet card is displayed.

COMMON screen

Settings on the FTP transfer screen

Page keys [↑ PAGE] [↓ PAGE] can be used to make settings for the three host computers for connection destinations 1 to 3.

FTP transfer screen (1st page)

FTP transfer screen (2nd page)

Item	Description
HOST NAME	Specify the IP address of the host computer. (Example of specification format: "192.168.0.200")
PORT NUMBER	Specify a port number to be used with the FTP file transfer function. An FTP session is used, so that "21" is to be specified usually.
USERNAME	Specify a user name to be used for logging in to the host computer with FTP. (Up to 31 characters can be specified.)
PASSWORD	Specify a password for the user name specified above. (Up to 31 characters can be specified.) Be sure to set a password.
LOGIN FOLDER	Specify a work folder to be used when logging in to the host computer. (Up to 127 characters can be specified.) If nothing is specified, the home folder specified in the host computer becomes the log-in folder.

Changing the host computer to be connected for the FTP file transfer function

Select a destination.

1   Pressing the [(OPRT)] soft key causes soft key [HOST SELECT]
     to be displayed.   Pressing this soft key causes soft keys
     [CONECT 1], [CONECT 2], and [CONECT 3] to be displayed.
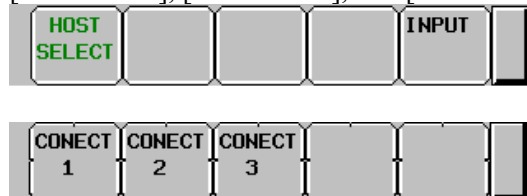
2   Depending on the host computer to be connected, press soft key
     [CONECT 1], [CONECT 2], or [CONECT 3].   Destination 1, 2,
     or 3 is highlighted in the screen title field.   The computer
     corresponding to the highlighted destination is selected as the
     target computer to be connected.

When destination 1 is selected

Related NC parameters

The NC parameters related to the FTP file transfer function are described below.

0020	I/O CHANNEL : Input/output device selection

[Data type] Byte
[Valid data range] 9 : Select the embedded Ethernet as the input/output device.

For built-in Ethernet port

	#7	#6	#5	#4	#3	#2	#1	#0
14880							PCHK	

[Data type] Bit
PCHK At the start of communication of the FTP file transfer function, checking for the presence of the FTP server using PING is:
1: Not performed.
0: Performed.

> **NOTE**
> Usually, set "Performed" (0).
> When the presence of the FTP server is not checked using PING (this parameter is set to 1), it may takes several tens of seconds until an error (absence of the FTP server in the network) can be recognized.
> For mainly security reasons, a personal computer may be set so that it does not respond to the PING command.   When this function is to communicate with such a personal computer, set "Not performed" (1).

Example of setting the FTP file transfer function

The following shows a setting example required for the FTP file transfer function to operate.
(WindowsXP Professional is used as the OS for the personal computer).
In this example, one personal computer is connected to two CNCs through the FTP file transfer function.

- On Personal Computer 1, the FTP server function operates.
- On CNC 1 and CNC 2, the FTP client operates as the FTP file transfer function.
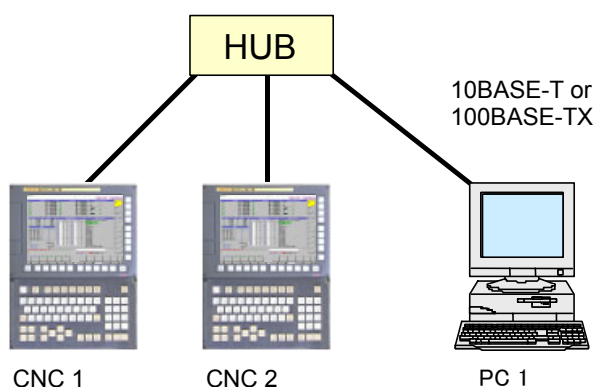
		CNC 1	CNC 2
IP address		192.168.0.100	192.168.0.101
Subnet mask		255.255.255.0	255.255.255.0
Router IP address		None	None
Connection host 1	Port number	21	21
	IP address	192.168.0.200	192.168.0.200
	User name	user	user
	Password	user	user
	Login DIR	None	None
NC parameter No. 20		9	9

The Ethernet parameter screen is used for setting.

The parameter screen is used for setting.

	PC 1
IP address	192.168.0.200
Subnet mask	255.255.255.0
Default gateway	None
User name	user
Password	user
Login DIR	Default

"Microsoft TCP/IP property" of the personal computer (WindowsXP) is used for setting.

"User acount of the personal computer (WindowsXP) is used for setting.

"Internet service manager" of the personal computer (WindowsXP) is used for setting.

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8.2.3 Setting Up the DNS/DHCP Function

The DHCP/DNS function is set up by using the COMMON screen (detail) and NC parameters.

8.2.3.1 Setting up DNS
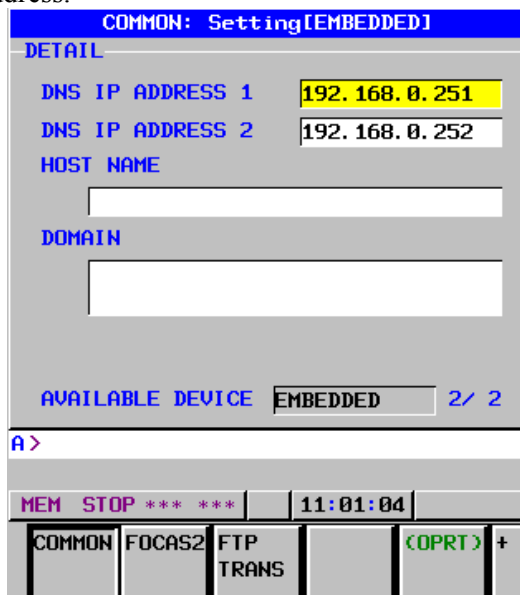
This subsection describes the procedure for setting up a DNS.

Procedure

1 Enable the DNS function, with reference to "Related NC Parameters," which will be seen later.
2 Set up the DNS server of the host computer.
3 Connect the host computer on which the DNS server is working (hereafter referred to as a DNS server), reboot the CNC, then press function key [SYSTEM] .
4 Press soft keys [EMBED] and [COMMON] in that order. The COMMON screen (detail) appears.
5 Enter the IP address of the DNS server in the corresponding DNS IP address field.

COMMON screen

After pressing soft key [COMMON], press either page key [↑PAGE] [PAGE↓] to call a desired data server common setting screen (detail). Specify a DNS IP address.

COMMON screen (detail)

Display item

Item	Description
DNS IP ADDRESS 1, 2	Up to two DNS IP addresses can be specified. The CNC searches for the DNS server using DNS IP addresses 1 and 2 in that order.

8.2.3.2 Setting up DHCP

This subsection describes the procedure for setting up a DHCP.

Procedure

1 Enable the DHCP function, with reference to "Related NC Parameters," which will be seen later.
2 Set up the DHCP server of the host computer.
3 Connect the host computer on which the DHCP server is working (hereafter referred to as a DHCP server), reboot the CNC, then press function key │SYSTEM│ .
4 Press soft keys [EMBED] and [COMMON] in that order. The COMMON screen appears.
5 If the DHCP function of the CNC has been enabled and if the DHCP server is connected successfully, the DHCP server automatically specifies the following items.
    - IP ADDRESS
    - SUBNET MASK
    - ROUTER IP ADDRESS
    - DNS IP ADDRESS
    - DOMAIN
    If the DHCP server cannot be connected, "DHCP ERROR" is displayed in each field.
6 If the DNS function has also been enabled and if the DHCP server and the DNS server work together (if the DNS server supports dynamic DNS), enter a host name.

COMMON screen

After pressing soft key [COMMON], press either page key to call a desired Ethernet common setting screen (basic, detail).

If the DHCP server is connected successfully and if the setting data can be obtained, the screen is displayed as shown below.

When the DHCP server is connected successfully

If the host name is not specified, the CNC automatically assigns a host name in the "NC-<MAC-address>" format.

Example of automatically assigned host name

If the DHCP server cannot be connected, the screen is displayed as shown below.

When the DHCP server cannot be connected

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Check item

Item	Description
IP ADDRESS	If the DHCP server is connected successfully,
SUBNET MASK	the items obtained from the DHCP server are
ROUTER IP ADDRESS	displayed.
DNS IP ADDRESS 1,2	If the DHCP server cannot be connected,
DOMAIN	"DHCP ERROR" is displayed.

Setting item

Item	Description
HOST NAME	Enter the host name of the CNC. If a DHCP server and a DNS server work together, the DHCP server notifies the DNS server of this host name. If the host name is left blank, a host name is automatically assigned in the "NC-<MAC-address>" format. Example of automatically assigned host name: NC-080019000001

Display item

Item	Description
MAC ADDRESS	MAC address of embedded Ethernet

Related NC parameters

For built-in Ethernet port

	#7	#6	#5	#4	#3	#2	#1	#0
14880		DHCP	DNS		D1ET			

[Data type] Bit

 # 6 DHCP The DHCP function is:
0: Used.
1: Not used.

 # 5 DNS The DHCP function is:
0: Used.
1: Not used.

 # 3 D1ET When the DHCP function is used:
0: The default parameters for the FOCAS1/Ethernet function are specified.
PORT NUMBER (TCP)   8193
PORT NUMBER (UDP)   0
TIME INTERVAL   0
1: The default parameters for *i* CELL are specified.
PORT NUMBER (TCP)   8193
PORT NUMBER (UDP)   8192
TIME INTERVAL   50

A change in these parameters becomes effective after the power is turned off and on or after the embedded Ethernet function is restarted.

8.3 SWITCHING BETWEEN THE EMBEDDED ETHERNET DEVICES

There are two types of embedded Ethernet devices: the embedded Ethernet port and PCMCIA Ethernet card.

Screen operation is required to switch between these two types of devices.

Procedure

1   Press the function key [SYSTEM] .

2   Soft keys [EMBED] and [PCMCIA LAN] appear.
     (When there is no soft keys, press the continue key.)

3   Press soft key [EMBED] or [PCMCIA LAN], press soft key [COMMON], and then press [(OPRT)] to display soft key [EMB/PCMCIA].

4   Pressing soft key [EMB/PCMCIA] switches between enabled devices.

> **NOTE**
> Information on a switched device is stored in nonvolatile memory.
> On the next power-up, the device last selected can be used as is.

8.4   **EMBEDDED ETHERNET OPERATIONS**

8.4.1   **FTP File Transfer Function**

The operation of the FTP file transfer function is described below.

Host file list display

A list of the files held on the host computer is displayed.

Procedure

1   Press the function key [PROG] .

2   Press the [FOLDER] soft key. The program folder screen appears. (If the soft key does not appear, press the continuous menu key.)
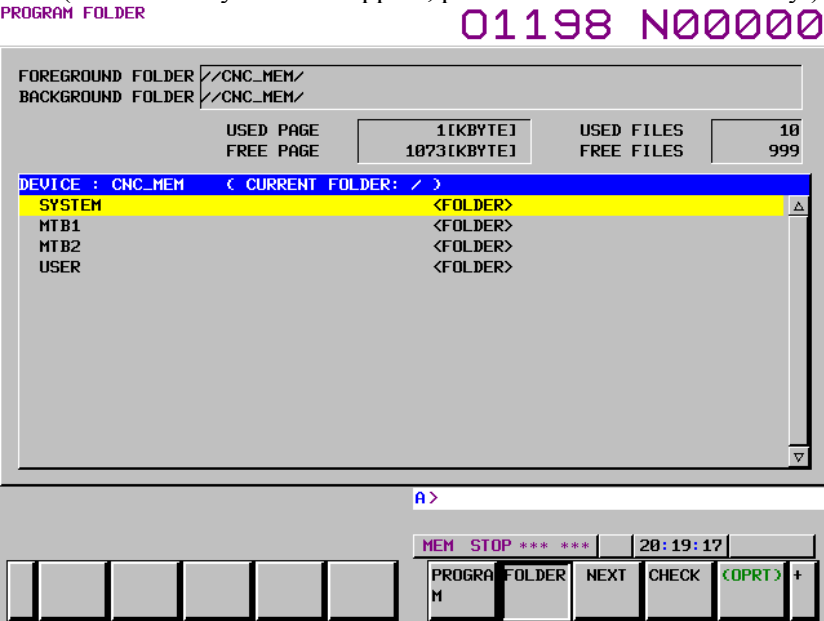
3   Press soft keys [(OPRT)] and [DEVICE CHANGE] in that order. The soft keys for selectable devices appear.

4 Press soft key [EMB ETHER]. The program directory screen is changed to the contents of the hard disk on the host computer (embedded Ethernet host file list screen). On this screen, you can operate files.

Embedded Ethernet host file list screen
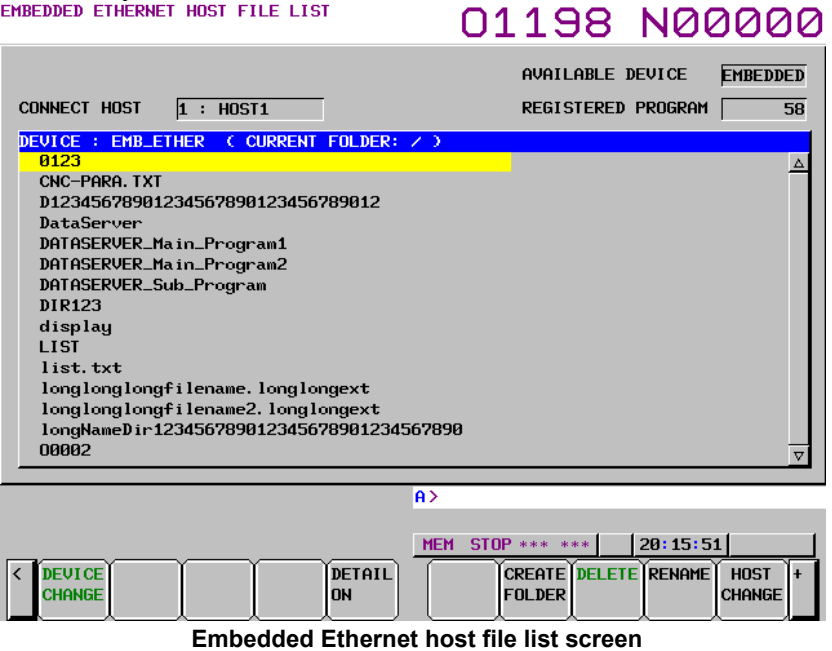
> **NOTE**
> When using the FTP file transfer function, check that the valid device is the embedded Ethernet port. The two conditions below determine a connection destination on the host file list screen:
> (1) Check that the valid device is the embedded Ethernet port. Make a selection in "DEVICE SELECTION" on the Ethernet setting screen.
> (2) A host computer can be selected from connection destinations 1, 2, and 3. Make a selection according to the [HOST] soft key described later.

5 When a list of files is larger than one page, the screen display can be switched using the page keys ⬆PAGE ⬇PAGE.

Display item

AVAILABLE DEVICE

The currently selected device is displayed.
Check that the embedded Ethernet port is selected currently.

CONNECT HOST

Number of the currently connected host of the host computer

REGISTERED PROGRAM

The number of programs in the current folder.

DEVICE

Current device.   When the embedded Ethernet host file list is selected, "EMB_ETHER" is displayed.

CURRENT FOLDER

Current work folder in the host computer

FILE LIST

Information of the files and folders in the host computer

Operation list

DETAIL ON, DETAIL OFF

Switches between the outline and detailed file lists.

CREATE FOLDER

Creates a new subfolder in the current work folder.

DELETE

Deletes a file or folder.

RENAME

Renames a file or folder.

HOST CHANGE

Changes the connected host computer.

SEARCH

Searches the current folder for a file.

REFRESH

Updates the information displayed on the embedded Ethernet host file list screen.

8.4.1.1 **Displaying and operating the file list**

REFRESH, DETAIL ON, DETAIL OFF

Update the file list data or change the file list type.
1   Press soft key [REFRESH] to update the file list data.
2   Press soft key [DETAIL ON] to display only file names.
3   Press soft key [DETAIL OFF] to display file attributes, sizes, dates, and file names.

> **NOTE**
> The items displayed in the detailed list depend on the FTP server setting on the host computer.

Moving a folder

Move a folder.
1   Select a folder you want to move using cursor keys [↓] and [↑].
2   Press soft key [INPUT].

CREATE FOLDER

Create a new folder.
1   Move to a folder in which you want to create a new folder.
2   Enter a folder name.
3   Press soft key [CREATE FOLDER].

DELETE

Delete a file or folder.
1   Select a file or folder you want to delete using cursor keys [↓] and [↑].
2   Press soft key [DELETE].
    -    To execute the deletion, press soft key [EXEC].
    -    To cancel the deletion, soft key [CANCEL].

DELETE (multiple files)

Delete multiple files at a time.
1   Press soft key [SELECT START].
2   Select a file or folder you want to delete using cursor keys [↓]
     and [↑].
3   Press soft key [SELECT].
     The selected file is highlighted.
     Repeat steps 2 and 3 for each file you want to delete.
4   Press soft key [DELETE].
     -    To execute the deletion, press soft key [EXEC].
     -    To cancel the deletion, soft key [CANCEL].

RENAME

Rename a file or folder.
1   Select a file or folder you want to rename using cursor keys
     [↓] and [↑].
2   Enter a new file or folder name.
3   Press soft key [RENAME].

SEARCH

Search the current work folder for a file.
1   Enter a file name.
2   Press soft key [SEARCH].

HOST CHANGE

Change the connected host computer.
1   Press soft key [HOST CHANGE].
     The connected host number changes from 1 to 2 to 3, then back to
     1.

8.5   RESTART OF THE EMBEDDED ETHERNET

Communication using the embedded Ethernet can be restarted.

Procedure

1   Press the function key SYSTEM .

2   Soft keys [EMBED] and [PCMCIA] appear.
     (When there is no soft keys, press the continue key.)

3   Press soft key [EMBED] or [PCMCIA LAN], press soft key
     [COMMON], and then press [(OPRT)] to display soft key
     [EMB/PCMCIA].

4   Pressing soft key [RSTART] resets embedded Ethernet
     communication and then restarts it.

NOTE
1   Pressing soft key [RSTART] forcibly interrupts
    communication even when it is in progress.
2   This function makes a restart by software.   An
    actual restart may be impossible under some
    conditions.

8.6 **MAINTENANCE SCRESSN FOR EMBEDDED ETHERNET FUNCTION**

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.

Displaying and operating the PING screen
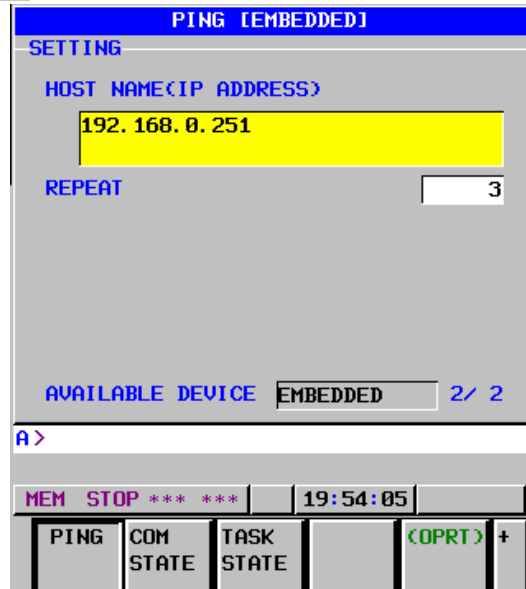
Procedure

1   Press the function key │SYSTEM│ .

2   Soft keys [EMBED] and [PCMCIA LAN] appear.
    (When there is no soft keys, press the continue key.)

3   By pressing the [EMBED] soft key, the Ethernet Setting screen for the embedded Ethernet is displayed.
    By pressing the [PCMCIA LAN] soft key, the Ethernet Setting screen for the PCMCIA Ethernet card can be set.

4   Press soft key [PING] and then press [(OPRT)].

5   To send the PING command to connection destination 1 for FTP file transfer, press soft key [PING FTP1].ftp://ftp1]/ Similarly, to send the PING command to connection destination 2 or 3, press [PING FTP2] or [PING FTP3], respectively.
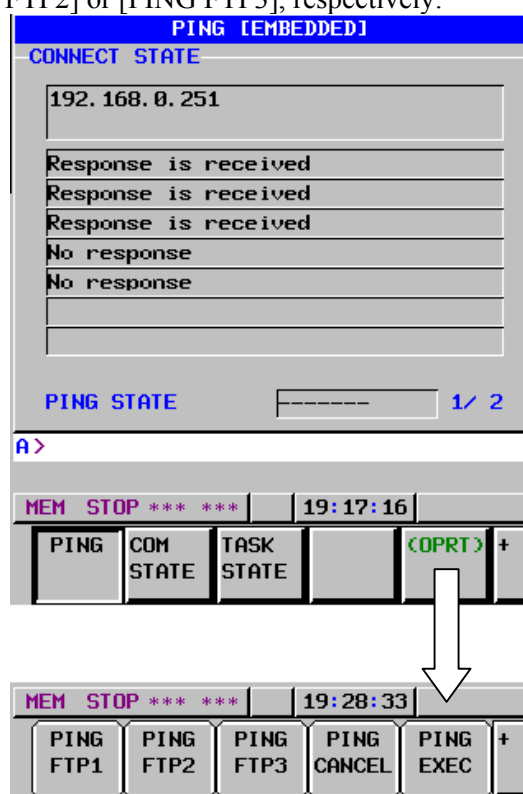
PING connection status screen

6   To send the PING command to the desired destination, enter the address of the destination on the PING setting screen. (Page keys

[↑ PAGE] [PAGE ↓]   are used for switching.)

PING connection status screen

7   After entering the address and the REPEAT count, press the soft key [PING].   The specified number of PING commands are sent to the specified destination.
8   To cancel the PING command currently being sent, press soft key [PING CANCEL].

___

Displaying Communication status screen

Procedure

1. Press the function key [SYSTEM].

2. Soft keys [EMBED] and [PCMCIA LAN] appear.
   (When there is no soft keys, press the continue key.)

3. By pressing the [EMBED] soft key, the Ethernet Setting screen for the embedded Ethernet is displayed.
   By pressing the [PCMCIA LAN] soft key, the Ethernet Setting screen for the PCMCIA Ethernet card can be set.

4. To display the communication status of the embedded Ethernet, press soft key [COM STATE].
   Page keys [PAGE↑] [PAGE↓] can be used to switch between the sending state and the receiving state.

COM STATE [EMBEDDED]	
COM STATE : SEND	
BAUDRATE	10Mbps / Half duplex
SEND PACKET	8
COLLISION	0
CARRIER SENSE LOST	0
DELAYOVER	0
UNDERRUN	0
SEND PARITY ERROR	0
AVAILABLE DEVICE	EMBEDDED 1/ 2

A>

MEM STOP *** *** | 12:02:49 |

| PING | COM STATE | TASK STATE | | (OPRT) | + |

COM STATE [EMBEDDED]	
COM STATE : RECEIVE	
BAUDRATE	10Mbps / Half duplex
RECEIVE PACKET	17254
ALIGNMENT ERROR	0
CRC ERROR	0
OVERRUN ERROR	0
FRAME LENGTH ERROR	0
RECV PARITY ERROR	0
AVAILABLE DEVICE	EMBEDDED 2/ 2

A>

MEM STOP *** *** | 12:03:06 |

| PING | COM STATE | TASK STATE | | (OPRT) | + |

Communication status screen

Displaying a software status screen

Procedure

1 Press the function key ⌷SYSTEM⌷.
2 Soft keys [EMBED] and [PCMCIA LAN] appear.
  (When there is no soft keys, press the continue key.)
3 To display the Ethernet Setting screen for the embedded Ethernet port or the PCMCIA Ethernet card, press soft key [EMBED] or [PCMCIA LAN], respectively.
4 Pressing soft key [TASK STATUS] causes the task status of the embedded Ethernet function to be displayed.

```
            TASK STATE [EMBEDDED]

COMMON              DDDDWDW
FOCAS2 #0           C
FOCAS2 #1           XXXXX
FOCAS2 #2           XXXXX
UDP                 X
PMC                 X
FTP                 C



                                      1/ 1

A>


MEM  STOP *** ***       12:01:07
 PING   COM    TASK                        +
        STATE  STATE
```
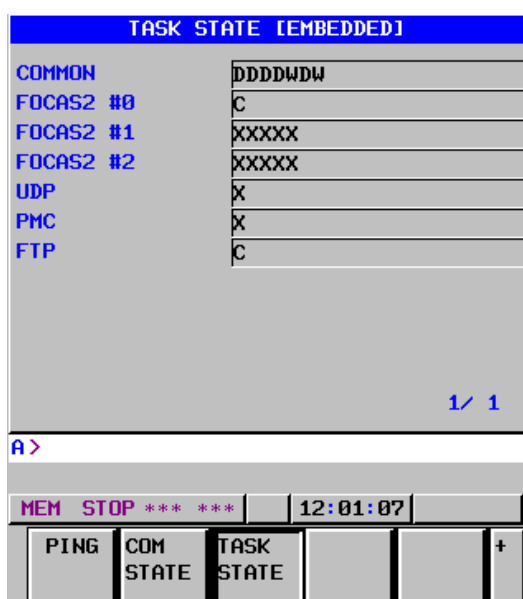
Software status screen

The following symbols are used.

	Symbol and meaning
FOCAS2 #0	C: Waiting for a connection from the host
	W: Data processing in progress (1)
	D: Data processing in progress (2)
	N: FOCAS2 out of service
FOCAS2 #1,#2	W: Data processing in progress (1)
	D: Data processing in progress (2)
	X: Not yet executed
PMC	W: Data processing in progress (1)
	D: Data processing in progress (2)
	X: Not yet executed
UDP	W: Data processing in progress (1)
	D: Data processing in progress (2)
	X: Not yet executed
FTP	C: Execution wait
	W: Data processing in progress (1)
	D: Data processing in progress (2)
	X: Not yet executed

8.7   LOG SCREEN OF THE EMBEDDED ETHERNET FUNCTION

This screen displays the log of the embedded Ethernet function.

Displaying the log screen

Procedure

1   Press the function key [SYSTEM].

2   To display the log screen for the embedded Ethernet port or PCMCIA Ethernet, press soft key [EMBED LOG] or [PCMCIA LOG], respectively. (When there is no soft keys, press the continue key.)
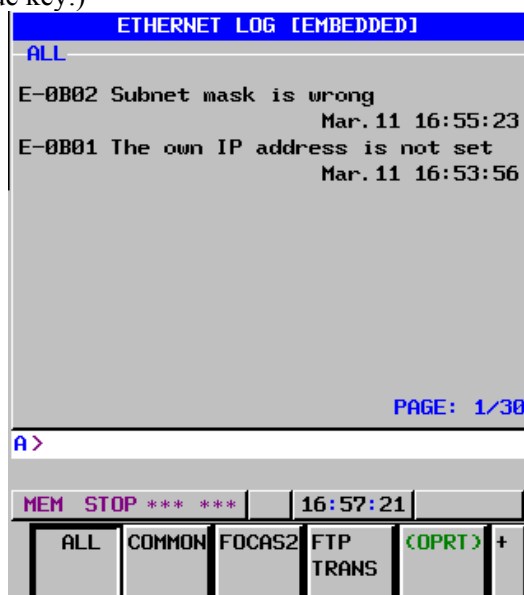
LOG screen

The newest error log appears at the top of the screen.   The date and time when an error occurred are displayed at the right end of the line. The format of date and time data is "MMM.DD   hh:mm:ss" where MMM represents a month, dd represents a day, hh represents hours, mm represents minutes, and ss represents seconds.

The date and time of the upper item shown above is August 4, 13:57:23.

To clear the log, press soft keys [(OPRT)] and [CLEAR] in that order.

The log for each function can be displayed by using soft keys on the embedded Ethernet log screen.

(1)   Soft key [ALL]

Displays all log related to the embedded Ethernet.

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(2) Soft key [COMMON]
Displays the log related to the parameter settings of the embedded Ethernet function and the basic communication function.
(3) Soft key [FOCAS2]
Displays the log related to the FOCAS2/Ethernet function.
(4) Soft key [FTP TRANS]
Displays the log related to FTP file transfer.

Error and message

Error No.	Log message	Description and necessary action
E-0118 E0119	Error occurred while wait for FOCAS2 pdu	A communication error has occurred because of any of the following: The network quality has been lowered to such a level that data cannot be received from a PC at the other end. The communication channel has been logically shut down. Software running on a PC at the other end has logically shut down the communication channel. The Ethernet cable has been disconnected.
E-011A	All communication paths are busy	All the FOCAS2/Ethernet communication channels are busy.
E-0200	Received message from FTP server	A message sent by the FTP server is directly displayed.
E-0202	Connection failed with FTP server	Software of the FTP server may not be running. Start the software of the FTP server.
E-0207	The router is not found	The specified IP address of the router may be wrong. Alternatively, the router may be turned off. Check whether the IP address of the router has been correctly specified and whether the router is turned on.
E-0208	The FTP server is not found	The specified IP address of the FTP server may be wrong. Alternatively, the FTP server may be turned off. Check whether the IP address of the FTP server has been correctly specified and whether the FTP server is turned on.
E-020B	Cannot login into FTP server	Check whether a correct user name and password are specified when logging into the FTP server.
E-020C	The parameters of FTP server are wrong	Check whether a correct user name and password are specified when logging into the FTP server.
E-020D	Changing a work folder of host failed	Check the work folder logging into the FTP server.
E-041A	Frame transmission failed (TCP)	A communication error has occurred because of any of the following: The network quality has been lowered to such a level that data cannot be received from a PC at the other end. The communication channel has been logically shut down. Software running on a PC at the other end has logically shut down the communication channel. The Ethernet cable has been disconnected.
E-0901	Cannot read MAC address	The MAC address is not written in the hardware. Alternatively, the hardware has been damaged.

Error No.	Log message	Description and necessary action
E-0A06	Network is too busy	An excessive amount of data is flowing over the network. One possible solution is to divide the network.
E-0B00	The own IP address is wrong	Specify a correct IP address in the designated format.
E-0B01	The own IP address is not set	Specify an IP address.
E-0B02	Subnet mask is wrong	Specify a correct subnet mask in the designated format.
E-0B03	Subnet mask is not set	Specify a subnet mask.
E-0B04	Router IP address is wrong	There may be class disagreement between the IP address of the local node and the IP address of the router.
E-0B05	IP address of DNS server is wrong	There may be class disagreement between the IP address of the local node and the IP address of the DNS server.
E-0B06	The own host name is wrong	Check whether a correct host name is specified.
E-0B07	The own domain name is wrong	Check whether a correct domain name is specified.
E-0B08	TCP port number is wrong	A value beyond the permissible setting range may be specified.
E-0B09	UDP port number is wrong	A value beyond the permissible setting range may be specified.
E-0B0B	IP address of remote FTP server is wrong	Specify a correct IP address in the designated format.
E-0B0C	Port NO of a remote FTP server is wrong	A value beyond the permissible setting range may be specified.
E-0B0D	User name of remote FTP server is wrong	The specified user name may contain a prohibited character.
E-0B0E	Password of remote FTP server is wrong	The specified password may contain a prohibited character.
E-0B0F	Login folder of remote FTP srv is wrong	The specified log-in folder name may contain a prohibited character.
E-0B18	Cannot set because DHCP is available	To allow a set-up, disable the DHCP client function.
E-0B19 E-0B1A	Embedded Ethernet hardware isn't found	The software or hardware of embedded Ethernet function cannot be recognized. Check whether the software has been incorporated. Check whether the hardware is sound.
E-XXXX	(No message)	An internal error has occurred. Make a notification of the error number.

9

DIGITAL SERVO

This chapter describes servo tuning screen required for maintenance of digital servo and adjustment of reference position.

9.1   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.

```
ACTUAL POSITION                        O0123 N00000
              ABSOLUTE          F                      0 MM/MIN
      X          0.000    PARTS COUNT                    953
      Y          0.000    RUN TIME                 12H15M33S
      Z          0.000    CYCLE TIME                 0H 0M 0S
      B          0.000         SERVO SETTING
      C          0.000          X  AXIS  Y  AXIS  Z  AXIS
                            INITIAL SET 00000010 00000010 00000010  <= PRM  2000
                            MOTOR ID NO.     252      252      252  <= PRM  2020
               MODAL        AMR         00000000 00000000 00000000  <= PRM  2001
                            CMR                2        2        2  <= PRM  1820
  G00  G80  G15  F      M      0
  G17  G98  G40.1            FEEDGEAR  N       8        8        8  <= PRM  2084
  G90  G50  G25   H     0    (N/M)     M     100      100      100  <= PRM  2085
  G22  G67  G160  D     0    DIRECTION SE    111      111      111  <= PRM  2022
  G94  G97  G13.1           VELOCITY PUL    8192     8192     8192  <= PRM  2023
  G21  G54  G50.1  T    0    POSITION PUL   12500    12500    12500  <= PRM  2024
  G40  G64  G54.2           REF.COUNTER    10000    10000    10000  <= PRM  1821
  G49.1G69  G80.5  S    0    A>

                           MEM  STOP *** ***    12:00:00 PATH1
  <   ABS   REL   ALL  HNDL           ON:1  OFF:0       INPUT  +
```

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(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.
#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 parameters No.2023 and No.2024 are used as they are:
                1 :   Values of parameters No.2023 and No.2024 are multiplied by 10.

(2) Motor ID No.
     Select the motor ID No. of the servo motor to be used, according
     to the motor model and drawing number (the middle four digits
     of A06B-XXXX-BXXX) listed in the tables on subsequent
     pages.

Table 9.1 (a)   αis series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
α2/5000is	0212	262	A	A
α4/5000is	0215	265	A	A
α8/4000is	0235	285	A	A
α12/4000is	0238	288	A	A
α22/4000is	0265	315	A	A
α30/4000is	0268	318	A	A
α40/4000is	0272	322	A	A
α50/4000is	0274	324	B	B
α50/3000is FAN	0275-Bx1x	325	A	A
α100/2500is	0285	335	A	A
α200/2500is	0288	338	A	A
α300/2000is	0292	342	A	A
α500/2000is	0295	345	A	A

Loading is possible with the servo software of the series and edition
listed above or subsequent editions. The value for an x varies
depending on whether an option is provided or not.

Table 9.1 (b)   αi series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
α1/5000i	0202	252	A	A
α2/5000i	0205	255	A	A
α4/4000i	0223	273	A	A
α8/3000i	0227	277	A	A
α12/3000i	0243	293	A	A
α22/3000i	0247	297	A	A
α30/3000i	0253	303	A	A
α40/3000i	0257	307	A	A
α40/3000i FAN	0258-Bx1x	308	A	A

Loading is possible with the servo software of the series and edition
listed above or subsequent editions. The value for an x varies
depending on whether an option is provided or not.

Table 9.1 (c)   α(HV)*i*s series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
α2/5000HV*i*s	0213	263	A	A
α4/5000HV*i*s	0216	266	A	A
α8/4000HV*i*s	0236	286	A	A
α12/4000HV*i*s	0239	289	A	A
α22/4000HV*i*s	0266	316	A	A
α30/4000HV*i*s	0269	319	A	A
α40/4000HV*i*s	0273	323	A	A
α50/3000HV*i*s FAN	0276-Bx1x	326	A	A
α50/3000HV*i*s	0277	327	B	B
α100/2500HV*i*s	0286	336	A	A
α200/2500HV*i*s	0289	339	A	A
α300/2000HV*i*s	0293	343	A	A
α500/2000HV*i*s	0296	346	A	A
α1000/2000HV*i*s	0298	348	A	A

Loading is possible with the servo software of the series and edition listed above or subsequent editions. The value for an x varies depending on whether an option is provided or not.

Table 9.1 (d)   α(HV)*i* series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
α4/4000HV*i*	0225	275	A	A
α8/3000HV*i*	0229	279	A	A
α12/3000HV*i*	0245	295	A	A
α22/3000HV*i*	0249	299	A	A

Loading is possible with the servo software of the series and edition listed above or subsequent editions.

Table 9.1 (e)   αC*i*s series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
α/3000*i*	0221	271	A	A
αC8/2000*i*	0226	276	A	A
αC12/2000*i*	0241	291	A	A
αC22/2000*i*	0246	296	A	A
αC30/1500*i*	0251	301	A	A

Loading is possible with the servo software of the series and edition listed above or subsequent editions.

Table 9.1 (f)   β*i*s series servo motor

Motor model	Motor specification	Motor type No.	90D0	90E0
β0.2/5000*i*s	0111	260	A	A
β0.3/5000*i*s	0112	261	A	A
β0.4/5000*i*s	0114	280	A	A
β0.5/5000*i*s	0115	281	A	A
β1/5000*i*s	0116	282	A	A
β2/4000*i*s	0061	253	B	B
β4/4000*i*s	0063	256	B	B

Motor model	Motor specification	Motor type No.	90D0	90E0
β8/3000*i*s	0075	258	B	B
β12/3000*i*s	0078	272	B	B
β22/2000*i*s	0085	274	B	B

Loading is possible with the servo software of the series and edition listed above or subsequent editions.

Table 9.1 (g) Linear motor

Motor model	Motor specification	Motor type No.	90D0	90E0
L300A1/4*i*s(200V)	0441-B200	351	-	-
L300A1/4*i*s(400V)	0441-B200	352	-	-
L600A1/4*i*s(200V)	0442-B200	353	-	-
L600A1/4*i*s(400V)	0442-B200	354	-	-
L900A1/4*i*s(200V)	0443-B200	355	-	-
L900A1/4*i*s(400V)	0443-B200	356	-	-
L1500B1/4*i*s(200V)	0444-B210	357	-	-
L1500B1/4*i*s(400V)	0444-B210	358	-	-
L3000B2/2*i*s(200V)	0445-B110	359	-	-
L3000B2/2*i*s(400V)	0445-B110	360	-	-
L3000B2/4*i*s(200V)	0445-B210	361	-	-
L4500B2/2HV*i*s(400V)	0446-B010	362	-	-
L4500B2/2*i*s(200V)	0446-B110	363	-	-
L4500B2/2*i*s(400V)	0446-B110	364	-	-
L6000B2/2*i*s(200V)	0447-B110	366	-	-
L6000B2/2*i*s(400V)	0447-B110	367	-	-
L6000B2/4*i*s(200V)	0447-B210	368	-	-
L7500B2/2HV*i*s(400V)	0448-B010	369	-	-
L7500B2/2*i*s(200V)	0448-B110	370	-	-
L7500B2/2*i*s(400V)	0448-B110	371	-	-
L9000B2/2*i*s(200V)	0449-B110	373	-	-
L9000B2/2*i*s(400V)	0449-B110	374	-	-
L9000B2/4*i*s(200V)	0449-B210	375	-	-
L3300C1/2*i*s(200V)	0451-B110	376	-	-
L3300C1/2*i*s(400V)	0451-B110	377	-	-
L9000C2/2*i*s(200V)	0454-B110	379	-	-
L9000C2/2*i*s(400V)	0454-B110	380	-	-
L9000C2/4*i*s(200V)	0454-B210	381	-	-
L11000C2/2*i*s(200V)	0455-B110	382	-	-
L11000C2/2*i*s(400V)	0455-B110	383	-	-
L15000C2/3HV*i*s(400V)	0456-B010	385	-	-
L15000C2/2*i*s(200V)	0456-B110	386	-	-
L15000C2/2*i*s(400V)	0456-B110	387	-	-
L15000C2/3*i*s(200V)	0456-B210	388	-	-
L15000C2/3*i*s(400V)	0456-B210	389	-	-
L10000C3/2*i*s(200V)	0457-B110	390	-	-
L10000C3/2*i*s(400V)	0457-B110	391	-	-
L17000C3/2*i*s(200V)	0459-B110	392	-	-
L17000C3/2*i*s(400V)	0459-B110	393	-	-
300D/4(200V)	0421-B801	124 (*)	A	A
600D/4(200V)	0422-B801	125 (*)	A	A
900D/4(200V)	0423-B801	126 (*)	A	A
1500A/4(200V)	0410-B901	90 (*)	A	A
3000B/2(200V)	0411-B911	91 (*)	A	A
3000B/4(200V)	0411-B811	120 (*)	A	A

Motor model	Motor specification	Motor type No.	90D0	90E0
6000B/2(200V)	0412-B911	92 (*)	A	A
6000B/4(200V, 160A)	0412-B811	127 (*)	A	A
9000B/2(200V, 160A)	0413-B911	128 (*)	A	A
9000B/4(200V, 360A)	0413-B811	129 (*)	A	A
15000C/2(200V, 160A)	0414-B911	130 (*)	A	A
15000C/3(200V)	0414-B811	123 (*)	A	A

Loading is possible with the servo software of the series and edition listed above or subsequent editions.

The hyphen "-" indicates that loading is not possible as of December 2003.

A motor type number marked with (*) is used to load parameters for HRV1. The servo software for the Series 30*i* supports only HRV2 or later. So, perform initialization with the motor type numbers above, then make the following changes before use:

No.2004=00000011
No.2040=(loaded value)×0.8
No.2041=(loaded value)×1.6

(3) Arbitrary AMR function

	#7	#6	#5	#4	#3	#2	#1	#0	
2001	AMR7	AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0	(Axis)

*   Set "00000000".

(4) CMR

1820	Command multiply ratio

   1)   When CMR is 1/2 to 1/27
       Set value=1/CMR+100
   2)   When CMR is 0.5 to 48
       Set value=2×CMR

1822	Value of the numerator of arbitrary command multiplier n/m

1823	Value of the denominator of arbitrary command multiplier n/m

To set an arbitray command multiplier, the corresponding option is required.

(5) Turn off the power then back on.

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(6)   N/M of feed gear (F·FG)

2084	n for flexible feed gear

2085	m for flexible feed gear

Setting for the α Pulsecoder in the semi-closed mode

$$\frac{\text{F·FG numerator } (\leq 32767)}{\text{F·FG denominator } (\leq 32767)} = \frac{\text{Necessary position feedback pulses per motor revolution}}{1{,}000{,}000 \text{ (Note 2)}} \quad \text{(as irreducible fraction)}$$

(Note 1)

NOTE
1   For both F·FG number and denominator, the maximum setting value (after reduced) is 32767.
2   αi Pulsecoders assume one million pulses per motor revolution, irrespective of resolution, for the flexible feed gear setting.
3   If the calculation of the number of pulses required per motor revolution involves p, such as when a rack and pinion are used, assume π to be approximately 355/113.

[Example] For detection in 1 mm units, specify as follows:

Ball screw lead (mm/rev)	Number of necessary position pulses (pulses/rev)	F·FG
10	10000	1/100
20	20000	2/100 or 1/50
30	30000	3/100

[Example]
    If the machine is set to detection in 1,000 degree units with a gear reduction ratio of 10:1 for the rotation axis, the table rotates by 360/10 degrees each time the motor makes one turn.
    1000 position pulses are necessary for the table to rotate through one degree.
    The number of position pulses necessary for the motor to make one turn is:
    $360/10 \times 1000 = 36000$ with reference counter =36000

$$\frac{\text{F·FG numerator}}{\text{F·FG denominator}} = \frac{36000}{1{,}000{,}000} = \frac{36}{1000}$$

Setting for use of a separate detector (full-closed)

$$\frac{\text{F·FG numerator } (\leq 32767)}{\text{F·FG denominator } (\leq 32767)} = \frac{\begin{array}{c}\text{Number of position pulses}\\\text{corresponding to a}\\\text{predetermined amount of travel}\end{array}}{\begin{array}{c}\text{Number of position pulses}\\\text{corresponding to a}\\\text{predetermined amount of travel}\\\text{from a separate detector}\end{array}} \text{(as irreducible fraction)}$$

[Example]
To detect a distance of 1 μm using a 0.5 μm scale, set the following:

$$\frac{\text{Numerator of F·FG}}{\text{Denominator of F·FG}} = \frac{L/1}{L/0.5} = \frac{1}{2}$$

<<Examples of calculation>>

		1/1000 mm	1/10000 mm
One	8 mm	n = 1/m = 125	n = 2/m = 25
revolution of	10 mm	n = 1/m = 100	n = 1/m = 10
motor	12 mm	n = 3/m = 250	n = 3/m = 25

(7) Direction of travel

2022	Rotational direction of motor

111 : Normal (clockwise)   -111 : Reverse (counterclockwise)

Number of speed pulses, Number of position pulses

	Semi-closed loop	Closed loop		
		Parallel type	Serial linear scale	Serial rotary scale
Command unit (μm)	1/0.1	1/0.1	1/0.1	1/0.1
Initial bit setting	b0=0	b0=0	b0=0	b0=0
Number of speed pulses	8192	8192	8192	8192
Number of position pulses	12500(*1)	(*2 - Example 1)	(*2 - Example 1)	(*2 - Example 2)

Set 8192 as the number of speed pulses. For the linear motor, make settings according to "Linear Motor Parameter Setting" in the α*i* series parameter manual.

NOTE
1   Setting of the number of position pulses for the semi-closed loop (indicated by (*1) in the above table)
    Set 12500.
2   As the number of position pulses, set the number of pulses fed back from a separate detector when the motor makes one revolution. (The flexible feed gear has no relevance to the calculation of the number of position pulses.)
    Example 1:
    When a ball screw (direct connection) with a 10-mm lead and a separate detector with a resolution of 0.5 μm per pulse are used
    When the motor makes one revolution, the following pulses are fed back from the separate detector:
    10/0.0005 = 20,000
    Accordingly,
    Number of position pulses = 20,000
    Example 2:
    When a serial rotary scale with a resolution of 1,000,000 pulses per revolution is used, the number of position feedback pulses is exceptionally calculated by the following:
    12500 × (deceleration ratio between the motor and table)
    When the deceleration ratio between the motor and table is 10:1, for example, the number of position pulses is:
    12,500 × (1/10) = 1250
3   When the set number of position pulses is greater than 32767
    With the conventional NC, bit 0 (high resolution bit) to be initially set was changed according to the command unit as required. With the Series 30i, there is no dependency between the command unit and bit 0 to be initially set.
    The conventional way of setting poses no problem, but the method described below makes the setting much easier.

With a position feedback pulse conversion coefficient, the number of position pulses is set using the product of two parameters.

2185	Conversion coefficient for the number of position feedback pulses

(Example of setting)
When a linear scale with a minimum resolution of 0.1 (m is used and the travel distance per motor revolution is 16 mm:
Ns = (travel distance per motor revolution (mm))/(minimum resolution of detector (mm))
= 16 mm/0.0001 mm = 160000 (>32767) = 10000 × 16
So, set the following:
A: 10000
B: 16

NOTE
  If the detector of the motor is an αi pulse coder (the number of speed pulses = 8192), select a power of 2 (such as 2, 4, 8, and so on) as a conversion coefficient whenever possible. (The position gain value used inside the software becomes more accurate.)

---

(9)   Reference counter

1821	Reference counter capacity for each axis (0 to 99999999)

(a)   For the semi-closed loop

Reference counter = Number of position pulses required per motor revolution or the same number divided by an integer

---

NOTE
  If the rotation ratio between the motor and table is not an integer when a rotation axis is used, a reference counter capacity needs to be set so that the point where reference counter = 0 (grid point) always appears at the same position relative to the table.

Example of setting)
αi Pulsecoder, semi-closed loop (1 μm detection)

Lead of ball screw (mm/revolution)	Required number of position pulses (pulses/revolution)	Reference counter	Grid width (mm)
10	10000	10000	10
20	20000	20000	20
30	30000	30000	30

If there is an error between the required number of position pulses per motor revolution and the setting of the reference counter, the reference position varies, depending on the start point.

Such an error needs to be eliminated by changing the detection unit. In this case, a reference counter capacity may be set using a fraction.

Example of setting)
System with detection unit = 1 μm, ball screw lead = 20 mm/revolution, and deceleration ratio = 1/17

(i)   Method of setting a reference counter capacity as a fraction
       Required number of position pulses per motor revolution = 20000/17
       Set the parameters as follows:

1821	Reference counter capacity of each axis (numerator) (0 to 99999999)

2179	Reference counter capacity of each axis (denominator) (0 to 32767)

The parameter for a denominator is not presently displayed on the servo screen. So, a denominator needs to be set on the parameter screen.
In this example, set numerator = 20000, and denominator = 17.

NOTE
> The reference counter assumes only an integer. So, if a fraction is set for a reference counter capacity, the gap to the point where reference counter = 0 is compensated for.
> (In pulse control theory, a position less than one pulse cannot be controlled. So, grid interval compensation is performed so that a grid point error is less than one detection unit at all times.)

(ii) Method of changing the detection unit
       Required number of position pulses per motor revolution = 20000/17
       The values of all of the following parameters are multiplied by 17 to change the detection unit to 1/17 μm:

Parameter to be changed	Series 30*i*
FFG × 17	Servo screen
CMR × 17	Servo screen
Reference counter × 17	Servo screen
Effective area × 17	No. 1826, 1827
Positional deviation limit value during movement × 17	No. 1828
Positional deviation limit value during a stop × 17	No. 1829
Backlash amount × 17	No. 1851, 1852

As the detection unit is changed from 1 μm to 1/17 μm, the values of all parameters to be set using the detection unit must be multiplied by 17.

> ⚠ **CAUTION**
> In addition to the parameters listed above, there are
> parameters to be set using the detection unit.

This change eliminates an error between the required number of
position pulses per motor revolution and the reference counter.
Required number of position pulses per motor revolution =
20000
Reference counter = 20000

(b) For the closed loop

> Reference counter = Z phase (reference position) interval/detection unit or
> the same number divided by an integer

If the reference counter does not assume an integer, see the
example of semi-closed loop.

> **NOTE**
> If the rotation ratio between the separate detector
> and table is not an integer when a rotation axis is
> used, a reference counter capacity needs to be set
> so that the point where reference counter = 0 (grid
> point) always appears at the same position relative
> to the table.

Example of setting)
Example 1)
    When Z phase interval = 50 mm and detection unit = 1 μm
    Reference counter = 50,000/1 = 50,000
Example 2)
    When detection unit = 0.001° with a rotation axis
    Reference counter = 360/0.001 = 360,000
Example 3)
    When there is only one Z phase as in the case of a linear scale
    Set a simple number such as 10000 and 50000 for the reference
    counter.

6.   Turn off the power then back on.

9.2   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, 1936 to 1939, 14340 to 14375, and 14376 to 14407 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.

| < | ABS | REL | ALL | HANDLE | | AMP | AXIS | MAINTE | | (OPRT) |

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 separate detector interface units.

```
ACTUAL POSITION                        O0123 N00000
           ABSOLUTE
  X₁        0.000    PARTS COUNT                957
  Y₁        0.000    RUN TIME             12H44M58S
  Z₁        0.000    CYCLE TIME            0H 0M 0S
                         AMPLIFIER SETTING
  B₁        0.000    NO.  AMP  SERIES UNIT CUR.  AXIS  NAME
  X₂        0.000    1-01 A1-L  αi   SVM  20A    01    X1
                     1-02 A1-M  αi   SVM  20A    02    Y1
           MODAL     1-03 A2-L  αi   SVM  20A    03    Z1
                     1-04 A2-M  αi   SVM  20A    04    B1
 G00  G80  G15   F 1000.000 M      0  2-01 A3-L  αi   SVM  20A    05    X2
 G17  G98  G40.1                      2-02 A3-M  αi   SVM  20A    06    Y2
 G90  G50  G25   H         0          2-03 A4-L  αi   SVM  20A    07    Z2
 G22  G67  G160  D         0          2-04 A4-M  αi   SVM  20A    08    B2
 G94  G97  G13.1
 G21  G54  G50.1 T         0
 G40  G64  G54.2 S         0       A>
 G49.1G69  G80.5
                                   MDI  STOP *** ***    12:00:00
  <   ABS  REL  ALL  HANDLE     AMP   AXIS  MAINTE          <OPRT>
```

```
ACTUAL POSITION                        O00123   N00000
           ABSOLUTE
  X₁        0.000    PARTS COUNT                957
  Y₁        0.000    RUN TIME             12H44M58S
  Z₁        0.000    CYCLE TIME            0H 0M 0S
                         AMPLIFIER SETTING
  B₁        0.000    NO. EXTRA  TYPE  PCB ID
  X₂        0.000
                     1-5   M1    A    SDU (4AXES)
           MODAL     1-6   M2    A    SDU (4AXES)
                     2-5   M3    A    SDU (4AXES)
 G00  G80  G15   F 1000.000 M      0  2-6   M4    A    SDU (4AXES)
 G17  G98  G40.1
 G90  G50  G25   H         0
 G22  G67  G160  D         0
 G94  G97  G13.1
 G21  G54  G50.1 T         0
 G40  G64  G54.2 S         0       A>
 G49.1G69  G80.5
                                   MDI  STOP *** ***    12:00:00
  <   ABS  REL  ALL  HANDLE     AMP   AXIS  MAINTE          <OPRT>
```

The amplifier setting screen consists of the following items:
- NO. (slave number)
  Up to 18 slaves (up to 16 amplifiers and up to 2 separate detector interface units) connected to each FSSB line with serial numbers assigned starting with the slave closest to the CNC are displayed.
  A slave number on the amplifier setting screen consists of a number representing an FSSB line (1 or 2) followed by a

hyphen (-) and the number of a slave unit connected to the FSSB in the order of connections closer to the CNC.

If slaves are connected to the second FSSB line, the slaves are displayed after the slaves connected to the first FSSB line.

- 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), M (second axis), or N (third axis) indicating the placing of the axis in the amplifier.

- AXIS NO. (controlled axis number)

  The controlled axis number set in each of parameters Nos. 14340 to 14375 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 an extended axis name is valid, the axis name in the parameter (No. 1025/1026) is also 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 name)
  - CURRENT (maximum rating)

- The following items are displayed as separate detector interface unit information:
  - SEPARATE

    This display consists of the letter M, which stands for "separate detector interface unit" 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 separate detector interface unit.
  - PCB ID

    This display consists of four digits indicating the separate detector interface unit ID (hexadecimal). The separate detector interface uni ID is followed by SDU (8-AXES) for the eight-axis separate detector module or SDU (4-AXES) for the four-axis separate detector module.

<2> Axis setting screen
The axis setting screen displays the information shown below:

```
ACTUAL POSITION                        000123   N00000
                 ABSOLUTE
 X₁            0.000        PARTS COUNT                    957
 Y₁            0.000        RUN TIME                  12H44M58S
 Z₁            0.000        CYCLE TIME                 0H 0M 0S
 B₁            0.000              AXIS SETTING
 X₂            0.000        AXIS NAME AMP    M    1-  CS TNDM
                                          1 2 3 4  DSP
                  MODAL         1   X1  A1-L  1 0 0 0  3  0  0
                               2   Y1  A1-M  0 1 0 0  3  0  1
 G00  G80  G15  F 1000.000 M     0   3   Z1  A2-L  2 0 0 0  3  0  0
 G17  G98  G40.1                4   B1  A2-M  0 0 0 0  0  1  0
 G90  G50  G25  H         0      5   X2  A3-L  0 0 1 0  3  0  0
 G22  G67  G160 D         0      6   Y2  A3-M  0 3 0 0  3  0  2
 G94  G97  G13.1                7   Z2  A4-L  0 2 0 0  3  0  0
 G21  G54  G50.1 T        0      8   B2  A4-M  0 0 0 0  0  2  0
 G40  G64  G54.2 S        0
 G49.1G69  G80.5                A>

                               MDI  STOP *** ***   12:00:00
  <  ABS  REL  ALL  HANDLE       AMP   AXIS  MAINTE      <OPRT>
```

This axis setting screen displays the following items:
- AXIS (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 separate detector interface uni 1)
  The connector number for separate detector interface unit 1 stored in the SRAM is displayed.
- M2 (connector number for separate detector interface uni 2)
  The connector number for separate detector interface unit 2 stored in the SRAM is displayed.
- M3 (connector number for separate detector interface uni 3)
  The connector number for separate detector interface unit 3 stored in the SRAM is displayed.
- M4 (connector number for separate detector interface uni 4)
  The connector number for separate detector interface unit 4 stored in the SRAM is displayed.
- 1-DSF
  If the number of servo HRV3 and HRV4 controlled axes that can be controlled by one DSP is limited, the number of axes controllable by one DSP stored in the SRAM is displayed. When 0 is displayed, no limitation is imposed.
- Cs (Cs contour controlled axis)
  The value stored in the SRAM is displayed. It is spindle number for the Cs contour controlled axis.
- TNDM
  The value stored in the SRAM is displayed. 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.

```
ACTUAL POSITION                    O00123   N00000
              ABSOLUTE
X₁          0.000    PARTS COUNT              957
Y₁          0.000    RUN TIME           12H44M58S
                     CYCLE TIME          0H 0M 0S
Z₁          0.000    ▐ AMPLIFIER MAINTENANCE ▌
B₁          0.000    AXIS  NAME   AMP   SERIES UNIT AXES CUR.
X₂          0.000     1    X1    A1-L   αi   SVM   2   20A
                      2    Y1    A1-M   αi   SVM   2   20A
                      3    Z1    A2-L   αi   SVM   2   20A
              MODAL   4    B1    A2-M   αi   SVM   2   20A
                      5    X2    A3-L   αi   SVM   2   20A
G00 G80 G15  F 1000.000 M    0    6 Y2 A3-M αi SVM 2 20A
G17 G98 G40.1                     7    Z2    A4-L   αi   SVM   2   20A
G90 G50 G25  H          0         8    B2    A4-M   αi   SVM   2   20A
G22 G67 G160 D          0
G94 G97 G13.1
G21 G54 G50.1 T         0
G40 G64 G54.2
G49.1G69 G80.5 S        0    A>
                            MDI  STOP *** ***   12:00:00
< ▐ ABS ▌ REL  ALL HANDLE    AMP  AXIS MAINTE
```

```
ACTUAL POSITION                    O00123   N00000
              ABSOLUTE
X₁          0.000    PARTS COUNT              957
Y₁          0.000    RUN TIME           12H44M58S
                     CYCLE TIME          0H 0M 0S
Z₁          0.000    ▐ AMPLIFIER MAINTENANCE ▌
B₁          0.000    AXIS  NAME EDITION  TEST   MAINTE-NO.
X₂          0.000     1    X1    1A    030123     4
                      2    Y1    1A    030123     4
                      3    Z1    1A    030123     4
              MODAL   4    B1    1A    030123     4
                      5    X2    1A    030123     4
G00 G80 G15  F 1000.000 M    0    6 Y2 1A 030123 4
G17 G98 G40.1                     7    Z2    1A    030123     4
G90 G50 G25  H          0         8    B2    1A    030123     4
G22 G67 G160 D          0
G94 G97 G13.1
G21 G54 G50.1 T         0
G40 G64 G54.2
G49.1G69 G80.5 S        0    A>
                            MDI  STOP *** ***   12:00:00
< ▐ ABS ▌ REL  ALL HANDLE    AMP  AXIS MAINTE
```

The amplifier maintenance screen displays the following items:
- AXIS (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)

- AXES (maximum number of axes controlled by an amplifier connected to each axis)
- CUR. (maximum rating for amplifiers connected to each axis)
- EDITION (unit version number of an amplifier connected to each axis)
- TEST (date of test performed on an amplifier connected to each axis)
  Example) 030123 = January 23, 2003
- MAINTE-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:

| < | ABS | REL | ALL | HANDLE | | SETTIN G | | CANCEL | | INPUT | + |

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 (No. 1023, 1905, 1936 to 1939, 14340 to 14375, or 14376 to 14407) and displayed on the screen.

> ⚠ **CAUTION**
> 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.

<1> Amplifier setting screen


```
ACTUAL POSITION                    O00123   N00000
                 ABSOLUTE
  X₁          0.000    PARTS COUNT              957
  Y₁          0.000    RUN TIME           12H44M58S
  Z₁          0.000    CYCLE TIME          0H 0M 0S
  B₁          0.000        AMPLIFIER SETTING
  X₂          0.000    NO.  AMP  SERIES UNIT CUR. AXIS NAME
                       1-01 A1-L  αi   SVM  20A   01  X1
                 MODAL 1-02 A1-M  αi   SVM  20A   02  Y1
                       1-03 A2-L  αi   SVM  20A   03  Z1
 G00  G80  G15  F 1000.000 M    0
 G17  G98  G40.1              1-04 A2-M  αi   SVM  20A   04  B1
 G90  G50  G25  H        0    2-01 A3-L  αi   SVM  20A   05  X2
 G22  G67  G160 D        0    2-02 A3-M  αi   SVM  20A   06  Y2
 G94  G97  G13.1             2-03 A4-L  αi   SVM  20A   07  Z2
 G21  G54  G50.1 T       0    2-04 A4-M  αi   SVM  20A   08  B2
 G40  G64  G54.2
 G49.1G69  G80.5 S       0
                             A>
                             MDI  STOP *** ***  12:00:00
 <   ABS   REL   ALL  HANDLE     SETTIN      CANCEL     INPUT  +
                                 G
```

The amplifier setting screen displays the following items:
- 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

```
ACTUAL POSITION                    O00123   N00000
            ABSOLUTE
 X₁           0.000    PARTS COUNT                    957
 Y₁           0.000    RUN TIME                 12H44M58S
 Z₁           0.000    CYCLE TIME                 0H 0M 0S
 B₁           0.000             AXIS SETTING
 X₂           0.000    AXIS NAME AMP     M      1-  CS TNDM
                                        1 2 3 4  DSP

             MODAL       1   X1   A1-L  1 0 0 0   3   0   0
 G00  G80  G15  F 1000.000 M  0
 G17  G98  G40.1            2   Y1   A1-M  0 1 0 0   3   0   1
 G90  G50  G25  H      0    3   Z1   A2-L  2 0 0 0   3   0   0
 G22  G67  G160 D      0    4   B1   A2-M  0 0 0 0   0   1   0
 G94  G97  G13.1            5   X2   A3-L  0 0 1 0   3   0   0
 G21  G54  G50.1 T     0    6   Y2   A3-M  0 3 0 0   3   0   2
 G40  G64  G54.2            7   Z2   A4-L  0 2 0 0   3   0   0
 G49.1G69  G80.5 S     0    8   B2   A4-M  0 0 0 0   0   2   0

                           A>

                           MDI  STOP *** ***   12:00:00
 <  ABS   REL   ALL  HANDLE    SETTING   CANCEL      INPUT  +
```

On the axis setting screen, the following items can be specified:
- M1 (connector number for separate detector interface uni 1)
  M2 (connector number for separate detector interface uni 2)
  M3 (connector number for separate detector interface uni 3)
  M4 (connector number for separate detector interface uni 4)
  For an axis on which to use each separate detector interface unit, enter a connector number with a number 1 to 8 (maximum number of connectors on a separate detector interface unit).
  When a separate detector interface unit is not connected and a number that falls outside the valid range is entered, the warning message "ILLEGAL DATA" is displayed. When a separate detector interface unit is connected and a number that falls outside the valid range is entered, the warning message "DATA IS OUT OF RANGE" is displayed.
- 1-DSF
  If the number of servo HRV3 and HRV4 controlled axes that can be controlled by one DSP is limited, set the number of axes controllable by one DSP.
  Number of servo HRV3 controlled axes   Setting: 3
  Number of servo HRV4 controlled axes   Setting: 1
  The same value is set for axes other than Cs contour controlled axes.
  If a value other than 0, 1, and 3 is input, the warning "INVALID FORMAT" is output.
- Cs (Cs contour controlled axis)
  Enter spindle number (1 to 8) for the Cs contour controlled axis. If a number other than 0 to 8 is entered, the warning message "DATA IS OUT OF RANGE" is displayed.

- 523 -

- TNDM
  Enter odd and even numbers for axes for tandem control or EGB. These numbers must be consecutive and within a range between 1 and the number of controlled axes. If a number that falls outside the valid range is entered, the warning message "DATA IS OUT OF RANGE" is displayed.

When soft key [SET] is pressed on the axis setting screen after data entry, the warning message "DATA IS OUT OF RANGE" is displayed if any of the following conditions is satisfied.

- The setting disables the connection of controlled axes with amplifiers and separate detector interface units.
- With an axis, a value other than 0 is set for two or more of M1, M2, M3, and M3.
- A value other than 0 is specified for both CS and TNDM for an axis.
- 1-DSP is 1 and TNDM is not 0 for an axis.
- 1-DSP is 3 and TNDM is specified for a multiple of four for an axis.
- A duplicate value is specified for M1.
- A duplicate value is specified for M2.
- A duplicate value is specified for M3.
- A duplicate value is specified for M4.
- A duplicate value is specified for Cs.
- A duplicate value is specified for TNDM.
- An invalid master/slave axis pair is specified for TNDM.

9.3   SERVO TUNING SCREEN

9.3.1   Parameter Setting

Set a parameter to display the servo tuning screen.

3111	#7	#6	#5	#4	#3	#2	#1	#0
								SVS

#0   SVS   0 :   Servo tuning screen is not displayed.
               1 :   Servo tuning screen is displayed.

9.3.2   Displaying Servo Tuning Screen

1   Press $\boxed{\text{SYSTEM}}$ key $\boxed{\rhd}$ and soft key [SV. PARA] in this order.

2   Press soft key [SV.TUN] to select the servo tuning screen.
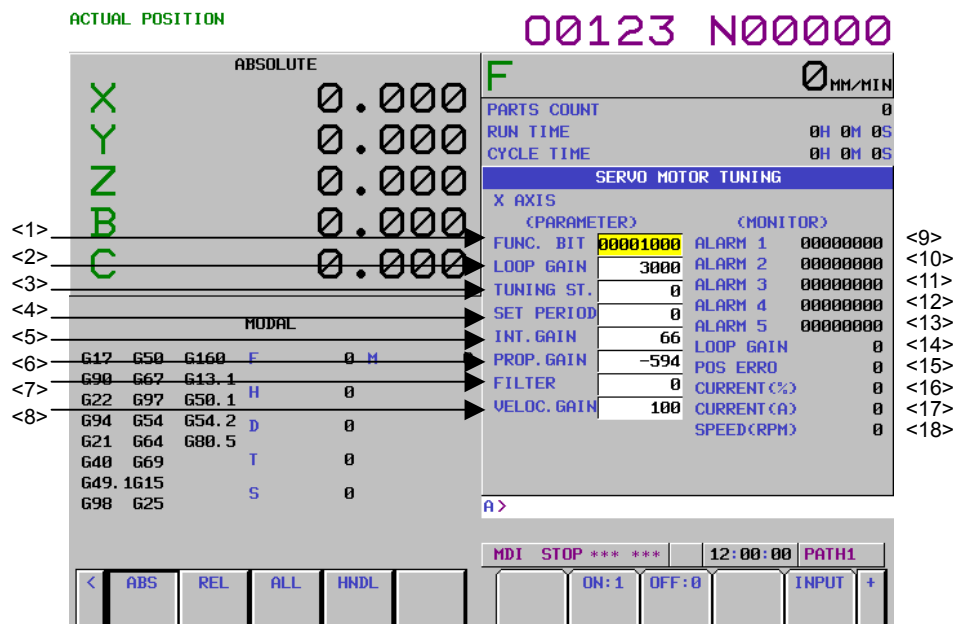
(1)   Function bit : Parameter (No.2003)
(2)   Loop gain : Parameter (No.1825)
(3)   Tuning start :
(4)   Set period :
(5)   Integral gain : Parameter (No.2043)
(6)   Proportional gain : Parameter (No.2044)
(7)   Filter : Parameter (No.067)
(8)   Velocity gain Set value= ((Parameter (No.2021))+256 / 256) × 100
(9)   Alarm 1 : Diagnosis No.200
(10)   Alarm 2 : Diagnosis No.201
(11)   Alarm 3 : Diagnosis No.202
(12)   Alarm 4 : Diagnosis No.203
(13)   Alarm 5 : Diagnosis No.204

(14) Loop gain : Actual loop gain
(15) Position error : Actual position error (Diagnosis No.300)
(16) Current(%) : Indicate current with % to the rated value.
(17) Current(A) : Indicate current with A (peak value).
(18) Speed RPM : Number of motor actual rotation

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm 1	OVL	LVA	OVC	HCA	HVA	DCA	FBA	OFA
Alarm 2	ALD			EXP				
Alarm 3		CSA	BLA	PHA	RCA	BZA	CKA	SPH
Alarm 4	DTE	CRC	STB	PRM				
Alarm 5		OFS	MCC	LDM	PMS	FAN	DAL	ABF
Alarm 6					SFA			
Alarm 7	OHA	LDA	BLA	PHA	CMA	BZA	PMA	SPH
Alarm 8	DTE	CRC	STB	SPD				
Alarm 9		FSD			SVE	IDW	NCE	IFE

> **NOTE**
> The empty fields do not represent alarm codes.

9.3.3   **Alarms Related to Amplifiers and Motors**

Alarm 1							Alarm 5		Alarm 2		Description	Action
OVL	LVA	OVC	HCA	HVA	DCA	FBA	MCC	FAN	ALD	EXP		
			1						0	0	Overcurrent alarm (PSM)	
			1						0	1	Overcurrent alarm (SVM)	1
			1						0	1	Overcurrent alarm (software)	1
				1							Overvoltage alarm	
					1						Excessive regenerative discharge alarm	
	1								0	0	Power supply undervoltage (PSM)	
	1								1	0	DC link undervoltage (PSM)	
	1								0	1	Control power supply undervoltage (SVM)	
	1								1	1	DC link undervoltage (SVM)	
1									0	0	Overheat (PSM)	2
1									1	0	Motor overheat	2
							1				MCC welding, precharge	
								1	0	0	Fan stop (PSM)	
								1	0	1	Fan stop (SVM)	
		1									OVC alarm	3

> **NOTE**
> For the alarms with no action number, see the
> maintenance manual of the servo amplifier.

Action 1: Related to overcurrent alarms

An overcurrent alarm is issued when an excessively large current flows in the main circuit.

If an overcurrent alarm is always issued after the emergency stop state is canceled or at the time of gradual acceleration/ deceleration, the cause may be a defective amplifier, cable connection error, broken cable, or parameter setting error.

First, check if the servo parameters indicated below are set to the standard values. If the servo parameters (No.2004, No.2040, and No.2041) are set to the standard values, check the amplifier and cable connections according to the maintenance manual of the amplifier.

No.2004		No.2040		No.2041

If an overcurrent alarm is issued only at the time of abrupt acceleration/deceleration, the use condition is too severe. Increase the time constant and see what happens.

⚠ **CAUTION**
If the emergency stop state is canceled when the power line to the motor is disconnected, an overcurrent alarm (software) may be issued. If this poses a problem, set the following parameter to 1: Bit 0 of parameter No. 2207: Ignores an overcurrent alarm (software).

Action 2: Related to overheat alarms

If an overheat alarm is issued after a long-time continuous operation, the temperature of the motor or amplifier may be high. Stop the operation for a while and see what happens. If an overheat alarm is still issued about 10 minutes after the power is turned off, the hardware is probably faulty.

If an overheat alarm is issued intermittently, increase the time constant or increase stop times in the program to suppress an increase in temperature.

Action 3: Related to an OVC alarm

If an OVC alarm is issued, check if the parameters indicated below are set to the standard values.
No.1877, No.1878, No.1893
No.2062, No.2063, No.2065
No.2161, No.2162, No.2163, No.2164
If the parameters are set to the standard values, increase the time constant or increase stop times in the program to suppress an increase in temperature.

9.3.4   Alarms related to the Pulsecoder and Separate Serial Pulsecoder

(1) For the α*i* Pulsecoder
An alarm is identified from the data of alarms 1, 2, 3, and 5. The meaning of each bit is indicated below.

Alarm 3							Alarm 5		1	Alarm 2		Description	Action
CSA	BLA	PHA	RCA	BZA	CKA	SPH	LDM	PMS	FBA	ALD	EXP		
						1						Soft phase alarm	2
				1								Battery voltage zero	1
			1						1	1	0	Count error alarm	2
		1										EEPROM error alarm	
	1											Battery undervoltage (warning)	1
								1				Pulse error alarm	
							1					LED error alarm	

> ⚠ **CAUTION**
> The alarms with no action number are considered to be caused by a Pulsecoder failure. Replace the Pulsecoder.

(2) For the separate serial detector coder
An alarm is identified from the data of alarm 7. The meaning of each bit is indicated below.

Alarm 7								Description	Action
OHA	LDA	BLA	PHA	CMA	BZA	PMA	SPH		
							1	Soft phase alarm	2
						1		Pulse error alarm	
					1			Battery voltage zero	1
				1				Count error alarm	2
			1					Phase alarm	2
		1						Battery undervoltage (warning)	1
	1							LED error alarm	
1								Separate detector overheat alarm	

> ⚠ **CAUTION**
> The alarms with no action number are considered to be caused by a detector failure. Replace the detector.

Action 1: Battery-related alarms
Check if a battery is connected. When the power is turned on for the first time after a battery is connected, a battery voltage zero alarm is issued. In such a case, turn off the power then turn on the power again. If a battery voltage zero alarm is still issued, check the battery voltage. If a battery undervoltage alarm is issued, check the voltage and replace the battery.

Action 2: Alarms that may be caused by noise

If an alarm is issued intermittently or an alarm is issued after the emergency stop state is canceled, the cause of the alarm is probably noise. In this case, provide sufficient noise protection. If an alarm is issued even after noise protection is provided, replace the detector.

9.3.5 Alarms Related to Serial Communication

An alarm is identified from the data of alarm 4 and alarm 8.

Alarm 4				Alarm 8				Description
DTE	CRC	STB	PRM	DTE	CRC	STB	SPD	
1								
	1							Serial Pulsecoder communication alarm
		1						
				1				
					1			Separate serial Pulsecoder communication alarm
						1		

Action:

An error occurred in serial communication. Check if the cable is connected correctly and also check if the cable is not disconnected and broken. If a CRC or STB error occurs, the cause may be noise. In this case, provide noise protection. If an alarm is always issued after the power is turned on, the Pulsecoder, amplifier control board (*i* series), or separate detector interface unit (*i* series) may be faulty.

9.3.6 Alarms Related to Disconnection

An alarm is identified from the data of alarms 1, 2, and 6.

Alarm 1							Alarm 2		6	Description	Action
OVL	LVA	OVC	HCA	HVA	DCA	FBA	ALD	EXP	SFA		
						1	1	1	0	Hard disconnection (separate A/B phase disconnection)	1
						1	0	0	0	Soft disconnection (closed loop)	2
						1	0	0	1	Soft disconnection (α Pulsecoder)	3

Action 1:

This alarm is issued when a separate A/B phase scale is used. Check if the A/B phase detector is connected correctly.

Action 2:

This alarm is issued when the position feedback pulse change is smaller than the velocity feedback pulse change. This means that this alarm is not issued in a semi-closed loop. Check if the

separate detector outputs position feedback pulses correctly. If the separate detector outputs position feedback pulses correctly, such a situation that only the motor makes turns in the reverse direction at the start of machine movement because of a large backlash between the motor position and scale position is considered to have occurred.

	#7	#6	#5	#4	#3	#2	#1	#0
2003							TGAL	

#1   TGAL 1:   The parameter-set detection level is used for a soft disconnection alarm.

2064	**Soft disconnection alarm level**

Standard setting 4:   An alarm is issued when the motor makes a 1/8 revolution.
Increase the setting of this parameter.

Action 3:
This alarm is issued when synchronization between phase data and absolute position data sent from the built-in Pulsecoder is lost. While the power to the NC is turned off, unplug the Pulsecoder cable, then plug the cable once again after about 10 minutes. If this alarm is still issued, replace the Pulsecoder.

9.3.7   **Alarm Related to Invalid Parameter Settings**

An alarm is identified from the data of alarm 4.

Alarm 4				Description
DTER	**CRC**	**STB**	**PRM**	
			1	Invalid parameter detected by the servo software

When PRM = 1, an invalid parameter is detected by the servo software. Read the value indicated by diagnosis 352, and troubleshoot according to "FANUC AC SERVO MOTOR $\alpha is/\alpha i$ series Parameter Manual".

When PRM = 0, read the bit value indicated by diagnosis 280, and determine the cause according to the following:
Diagnosis 280#0 = 1: In parameter (No. 2020) used for motor module specification, a value not within the specifiable range is specified.
Diagnosis 280#2 = 1: In parameter (No. 2023), an incorrect value such as a value equal to or less than 0 is set.
Diagnosis 280#3 = 1: In parameter (No. 2024), an incorrect value such as a value equal to or less than 0 is set.
Diagnosis 280#4 = 1: In parameter (No. 2022), a correct value (111 or -111) is not set.
Diagnosis 280#6 = 1: In parameter (No. 2023), an incorrect value is set.

9.3.8   **Others**

An alarm is identified from the data of alarm 5. The meaning of each bit is indicated below.

Alarm 5							Description	Action
OFS	MCC	LDM	PMS	FAN	DAL	ABF		
						1	Feedback mismatch alarm	1
					1		Semi-closed/closed loop excessive error alarm	2
1							Current offset error alarm	3

Action 1:

This alarm is issued when the move direction of the position detector becomes opposite to the move direction of the speed detector. Check the rotation direction of the separate detector. If the rotation direction of the separate detector is opposite to the rotation direction of the motor, take the following action:

For the A/B phase detector:

Exchange the connections of A and $\overline{A}$ with each other.

For the serial detector:

Reverse the signal direction setting of the separate detector.

Even with the A/B phase detector, the signal direction can be reversed by setting the parameter below. (This method cannot be used when absolute position communication is required.)

	#7	#6	#5	#4	#3	#2	#1	#0
2018								RVRSE

#0   RVRSE   Whether to reverse the signal direction of the separate detector can be set.

0: Does not reverse the signal direction of the separate detector.
1: Reverses the signal direction of the separate detector.

If there is a large twist between the motor and separate detector, this alarm may be issued in abrupt acceleration/deceleration. In such a case, change the detection level.

	#7	#6	#5	#4	#3	#2	#1	#0
2201							RNLV	

#1   RNLV   The detection level of a feedback mismatch alarm can be changed.

1: Detected at 1000 min^{-1} or more
0: Detected at 600 mm^{-1} or more

Action 2:

This alarm is issued when the difference between the motor position and separate detector position exceeds the semi-closed/closed loop excessive error level. Check if the dual position feedback conversion coefficient is set correctly. If the dual position feedback conversion coefficient is set correctly,

increase the alarm level. If this alarm is still issued after changing
the level, check the connection direction of the scale.

2078	Dual position feedback conversion coefficient (numerator)

2079	Dual position feedback conversion coefficient (denominator)

2118	Dual position feedback semi-closed/closed loop error level

[Setting] Detection unit. When 0 is set, no detection operation is performed.

Action 3:
The current offset value (equivalent to the current value during
an emergency stop) of the current detector becomes abnormally
high. If this alarm is still issued after the power is turned off then
back on, the current detector is considered to be faulty. When
using the α*i* series, replace the amplifier.

9.4   ADJUSTING REFERENCE POSITION (DOG METHOD)

Overview
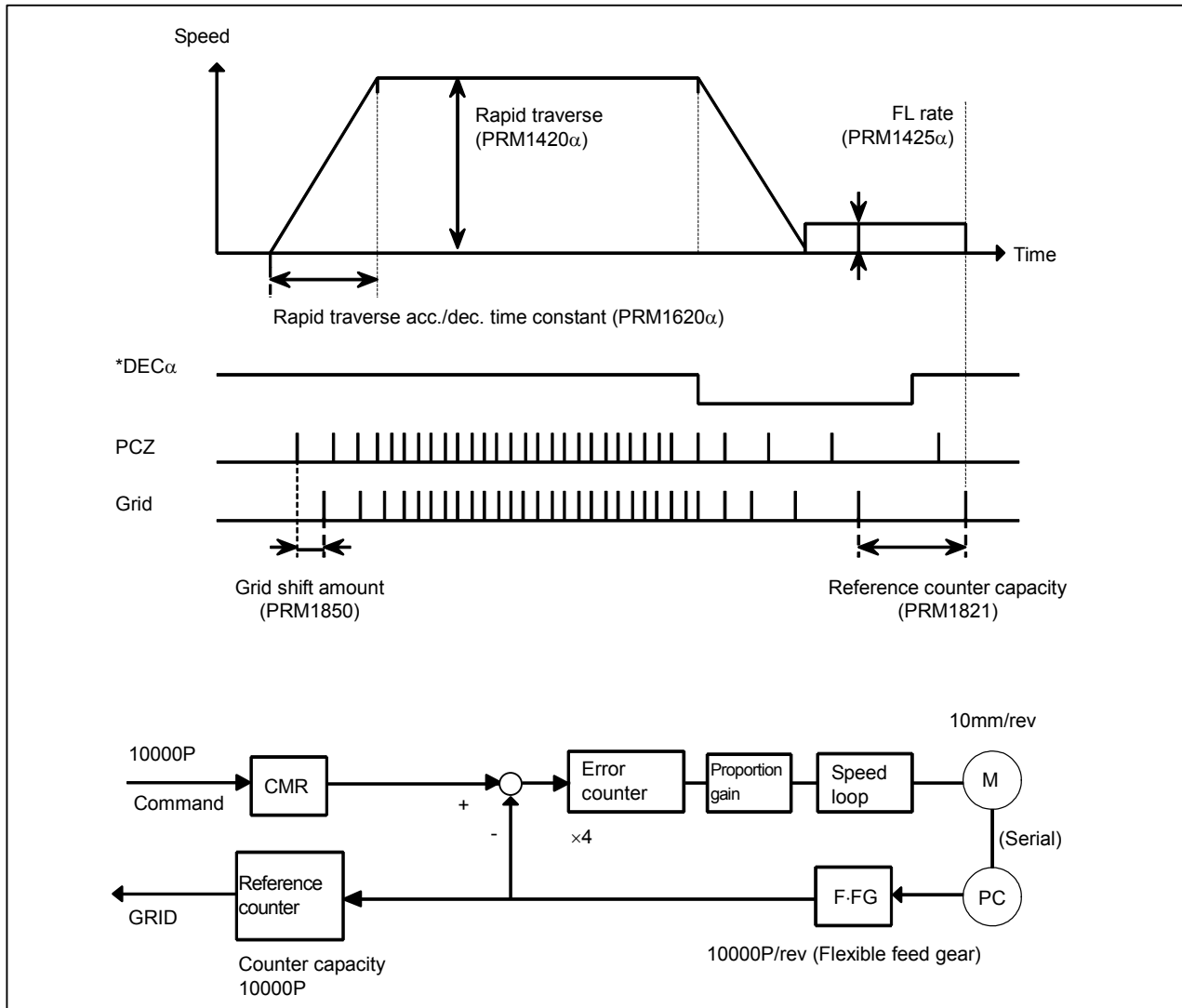
Parameter

There are the following related parameters.

	#7	#6	#5	#4	#3	#2	#1	#0
1005							DLZx	

#1   DLZx   0 :   The normal method (dog) is used for reference position return.
        1 :   Reference position setting without dogs is used (axis by axis).

> **NOTE**
> A reference position can be set axis by axis by setting parameter DLZx. Reference position setting without dogs cannot be used for a spindle positioning axis and Cs contour axis. When these axes are involved, use parameter DLZx.

1821	Reference counter capacity [P]

No. of feedback pulses or its division by an integer is set.

1850	Grid shift amount per axis [P]

*   When the resolution is 0.0001mm, set the value in the unit ten times the detection unit.

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC	APZ			OPT	

#5   APC   0:   Position detector is other than absolute Pulsecoder.
        1:    Position detector is absolute Pulsecoder.

#4   APZ   Zero position of absolute Pulsecoder 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 αi/βi Pulsecoder, 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 Pulsecoder built in the motor.
        1:    Separate type Pulsecoder or linear scale is used.

- Separate type Pulsecoder or linear scale is used

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)

300mm $\Rightarrow$ reference counter   (1μm)

30000
20000
15000
10000   etc
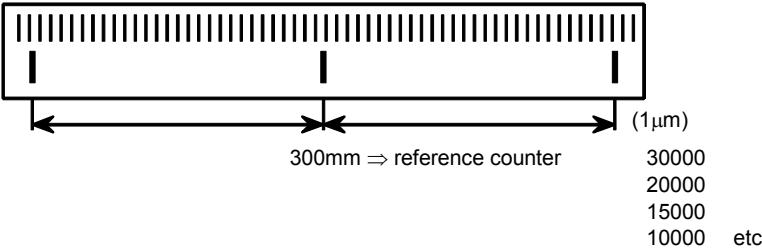
9.5 DOGLESS REFERENCE POSITION SETTING

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.

Overview
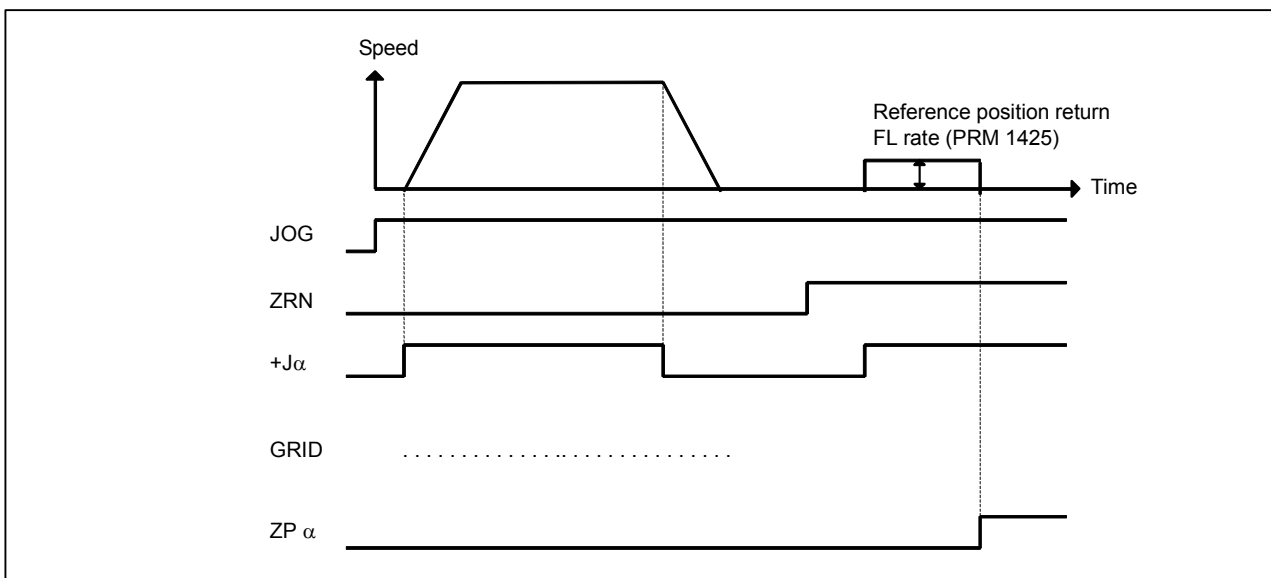
Operation

<1> Move the tool along an axis for setting the reference position in the reference position return direction in jog feed and position the tool near the reference position.
<2> Select the manual reference position return mode and set the feed axis and direction select signal (+ or – direction) for the axis for setting the reference position to 1.
<3> The tool is positioned at the nearest grid (electric grid based on the one-rotation signal of the position detector) in the reference position return direction specified in bit 5 (ZMIx) of parameter No. 1006 from the current position. This position is set as the reference position.
<4> After the in-position status is confirmed, the reference position return completion signal (ZP1) and reference position establishment signal (ZRF1) are set to 1.

*   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.

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
1005							DLZx	

#1   DLZx   0 : The normal method (dog) is used for reference position return.
                1 : Reference position setting without dogs is used (axis by axis).

> **NOTE**
> A reference position can be set axis by axis by
> setting parameter DLZx. Reference position setting
> without dogs cannot be used for a spindle
> positioning axis and Cs contour axis. When these
> axes are involved, use parameter DLZx.

	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMIx					

#5   ZMIx   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.

9.6   α*i* **SERVO WARNING INTERFACE**

Overview

The α*i* servo system can report the warning status before one of the following target alarms occurs.
When the warning status is entered, a report to the PMC is issued.
For example, this signal can be used by the machine for retracting tools from the time a warning occurs by the time a servo alarm occurs.

Signal

Servo warning detail signals   SVWRN1 to 4 <F093#4 to #7>

[Classification]   Output signal
[Function]   Reports the warning signal corresponding to the state of the servo amplifier.
[Output condition]   The following table shows the warning statuses of the servo amplifier and their corresponding warning signals.

Corresponding alarm messages	Warning status signals (F93)				Time from when a warning state signal is issued to until an alarm occurs
	SVWRN4 (#7)	SVWRN3 (#6)	SVWRN2 (#5)	SVWRN1 (#4)	
444 n AXIS: INV. COOLING FAN FAILURE	1	0	0	0	Until overheat occurs (inconstant)
601 n AXIS: INV. RADIATOR FAN FAILURE	1	0	0	1	Until overheat occurs (inconstant)
443 n AXIS: CNV. COOLING FAN FAILURE	1	1	0	0	Until overheat occurs (inconstant)
606 n AXIS: CNV. RADIATOR FAN FAILURE	1	1	0	1	Until overheat occurs (inconstant)
431 n AXIS: CNV. OVERLOAD	1	1	1	0	One minute
607 n AXIS: CNV. SINGLE PHASE FAILURE	1	1	1	1	PSMR: Five seconds, PSM: One minute

A timing chart for handling a warning is shown below.
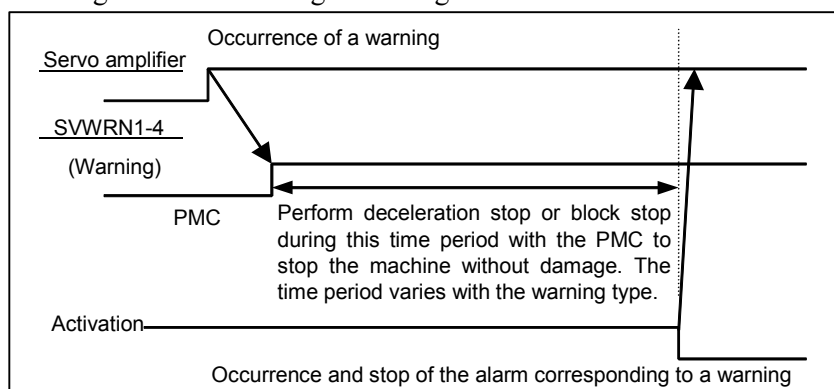
Signal address

	#7	#6	#5	#4	#3	#2	#1	#0
F093	SVWRN4	SVWRN3	SVWRN2	SVWRN1				

9.7   α*i* SERVO INFORMATION SCREEN

Overview

In the α*i* servo system, ID information output from each of the connected units is obtained and output to the CNC screen.
The units that have ID information are shown below.
(Remark: Some instances of these units do not have ID information.)

- Servo motor
- Pulsecoder
- Servo amplifier module
- Power supply module

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During the second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)
The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

13112	#7	#6	#5	#4	#3	#2	#1	#0
							SVI	IDW

[Data type]   Bit
#0   IDW   The edit of the servo information screen or the spindle information screen is:
               0:   Prohibited
               1:   Allowed
#1   SVI   The servo information screen is:
               0:   Displayed
               1:   Not displayed

Displaying the servo information screen

1   Press the $\boxed{\text{SYSTEM}}$ function key, then press the [SYSTEM] soft key.

2   Press the [SERVO INFO] soft key to display the screen as shown below.

```
ACTUAL POSITION                              O0123 N00000
              ABSOLUTE              F                    0 MM/MIN
   X           0.000      PARTS COUNT                        0
   Y           0.000      RUN TIME                    0H 0M 0S
                          CYCLE TIME                  0H 0M 0S
   Z           0.000           SERVO INFORMATION
   B           0.000        X  AXIS
   C           0.000      SERVO MOTOR SPEC A06B-0268-B100
                          SERVO MOTOR S/N  C00ZB1111
              MODAL       PULSECODER SPEC. A860B-2000-T301
 G00  G80  G15  F      M  PULSECODER S/N   00000001
 G17  G98  G40.1         SERVO AMP SPEC.   A06B-6114-H211
 G90  G50  G25   H      SERVO AMP S/N     V01311111
 G22  G67  G160  D      PSM SPEC.          A06B-6078-H126#000001
 G94  G97  G13.1
 G21  G54  G50.1 T      PSM S/N            V01311111
 G40  G64  G54.2 S
 G49  G69  G80.5
                          A>

                          MEM  STOP *** ***    12:00:00
 <  ABSOLU RELATI  ALL            SYSTEM SERVO SPINDL        <OPRT>
    TE     VE                            INFO  E INFO
```

  *   Servo information is stored in flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *, as shown below.

```
ACTUAL POSITION                              O0123 N00000
              ABSOLUTE              F                    0 MM/MIN
   X           0.000      PARTS COUNT                        0
   Y           0.000      RUN TIME                    0H 0M 0S
                          CYCLE TIME                  0H 0M 0S
   Z           0.000           SERVO INFORMATION
   B           0.000        X  AXIS
   C           0.000      SERVO MOTOR SPEC A06B-0268-B100
                          SERVO MOTOR S/N  C00ZB1111
              MODAL       PULSECODER SPEC. A860B-2000-T301
 G00  G80  G15  F      M  PULSECODER S/N   00000001
 G17  G98  G40.1        *SERVO AMP SPEC.   A06B-6114-H211
 G90  G50  G25   H     *SERVO AMP S/N     V01311111
 G22  G67  G160  D      PSM SPEC.          A06B-6078-H126#000001
 G94  G97  G13.1
 G21  G54  G50.1 T      PSM S/N            V01311111
 G40  G64  G54.2 S
 G49  G69  G80.5
                          A>

                          MEM  STOP *** ***    12:00:00
 <  ABSOLU RELATI  ALL            SYSTEM SERVO SPINDL        <OPRT>
    TE     VE                            INFO  E INFO
```

> **Additional Information**
>
> Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement.
> To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.
> (1) Make the registered data editable. (Parameter IDW (No. 13112#0) = 1)
> (2) On the edit screen, place the cursor on the item from which you want to delete the * mark.
> (3) Operate the soft keys [READ ID], [INPUT], and [SAVE] in that order.

Editing the servo information screen

1   Assume that parameter IDW (No.13112#0) = 1.
2   Press the MDI switch on the machine operator's panel.
3   Follow the steps shown in "Displaying the servo information screen" to display the screen as shown below.

```
ACTUAL POSITION                        O0123 N00000

                    ABSOLUTE      F                         0 MM/MIN
   X        0.000          PARTS COUNT                    0
                                 RUN TIME              0H 0M 0S
   Y        0.000          CYCLE TIME            0H 0M 0S
                                      SERVO INFORMATION
   Z        0.000             X  AXIS
   B        0.000          SERVO MOTOR SPEC A06B-0268-B100
                                 SERVO MOTOR S/N  C00ZB1111
   C        0.000          PULSECODER SPEC. A860B-2000-T301
                                 PULSECODER S/N   00000001
                    MODAL         SERVO AMP SPEC.  A06B-6114-H211
 G00  G80  G15  F        M    SERVO AMP S/N    V01311111
 G17  G98  G40.1              PSM SPEC.        A06B-6078-H126#000001
 G90  G50  G25   H           PSM S/N          V01311111
 G22  G67  G160  D
 G94  G97  G13.1
 G21  G54  G50.1 T
 G40  G64  G54.2            A>
 G49  G69  G80.5 S

                              MDI  STOP *** ***      12:00:00

 <  ABSOLU RELATI  ALL              INPUT  READ   SAVE  RELOAD
    TE     VE                              ID
```

4   To move the cursor on the screen, use the [↑] and [↓] keys.

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Screen operation

Mode	Key operation	Use
Viewing (*1)	Page key	Scrolls up or down on a screen-by-screen basis.
Editing (*2)	Soft key	
	[INPUT]	Replace the selected ID information at the cursor position with the character string in key-in buffer.
	[CANCEL]	Deletes the character string in key-in buffer.
	[READ ID]	Transfers the ID information the connected device at the cursor has to the key-in buffer. Only the items preceded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the servo information screen in flash ROM.
	[RELOAD]	Cancels the ID information that has been changed on the servo information screen and loads ID information from flash ROM.
	Page key	Scrolls up or down on a screen-by-screen basis.
	Cursor key	Scrolls up or down the selection of ID information.

*1   Viewing mode: when parameter IDW (No.13112#0) = 0
*2   Editing mode: when parameter IDW (No.13112#0) = 1
*3   If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.

```
ACTUAL POSITION                    O0123 N00000
                 ABSOLUTE       F                    0 MM/MIN
   X      0.000    PARTS COUNT                   0
   Y      0.000    RUN TIME               0H 0M 0S
   Z      0.000    CYCLE TIME             0H 0M 0S
   B      0.000         SERVO INFORMATION
   C      0.000      X  AXIS
                       SERVO MOTOR SPEC A06B-0268-B100
                       SERVO MOTOR S/N  C00ZB1111
                 MODAL PULSECODER SPEC. A860B-2000-T301
 G00  G80  G15   F    M PULSECODER S/N  00000001
 G17  G98  G40.1       *SERVO AMP SPEC. A06B-6114-H211
 G90  G50  G25   H     *SERVO AMP S/N   V01311111
 G22  G67  G160  D      PSM SPEC.        A06B-6078-H126#000001
 G94  G97  G13.1        PSM S/N          V01311111
 G21  G54  G50.1 T
 G40  G64  G54.2 S
 G49  G69  G80.5
                       A>
                       MDI STOP *** ***    12:00:00
 <  ABSOLU RELATI ALL          INPUT READ  SAVE RELOAD
    TE     VE                        ID
```

NOTE
   For axes that are not used by the αi servo system, ID information of connected units cannot be obtained.

10 AC SPINDLE

This chapter outlines the serial interface spindle amplifiers and explains related parameters.

10.1 SERIAL INTERFACE AC SPINDLE

10.1.1 Outline of Spindle Control
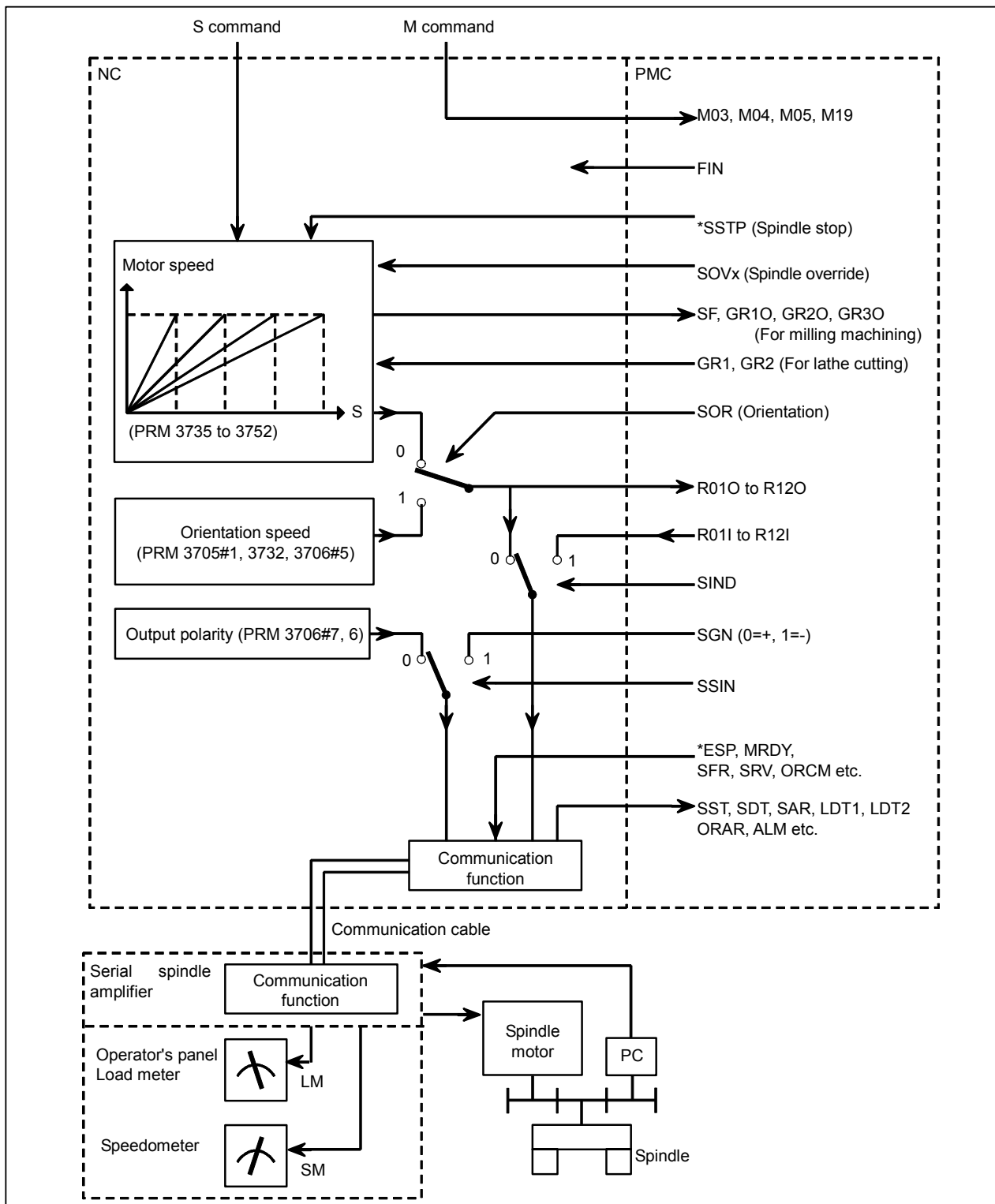
10.1.1.1 Method A of gear change for M series
(Parameter No. 3705#2=0)
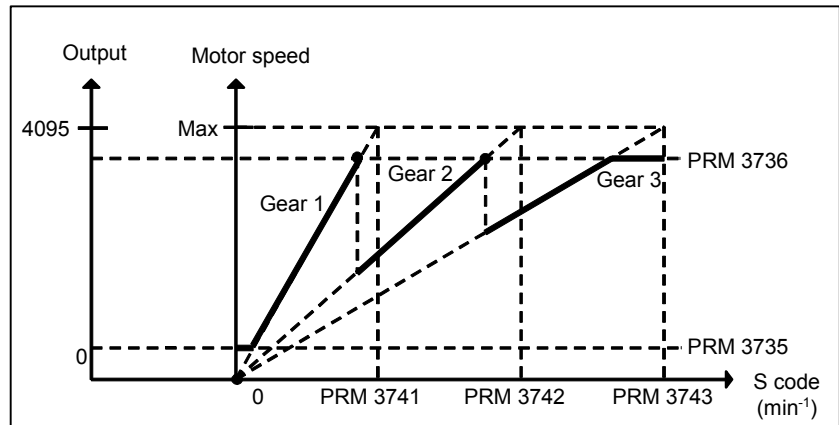
10.1.1.2 Method B of gear change for M series
(Parameter No. 3705#2=1)
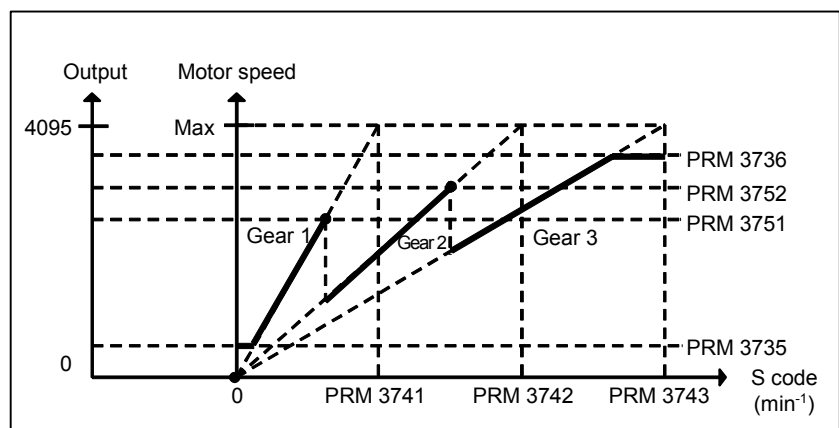
10.1.1.3 T series
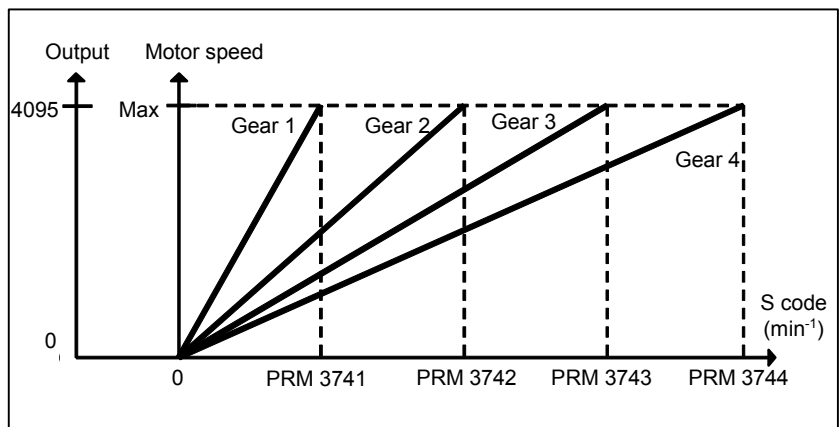
10.1.2   **Spindle Setting and Tuning Screen**

10.1.2.1   **Display method**

(1)   Confirm the parameters

	#7	#6	#5	#4	#3	#2	#1	#0
3111							**SPS**	

#1   SPS   0:   The spindle tuning screen is not displayed.
1:   The spindle tuning screen is displayed.

(2)   Press the [SYSTEM] key to select the screen for setting parameters and other data.

(3)   Press the continuous menu key [▷].

(4)   Press the soft key [SP.PRM]. Then, the spindle setting and tuning screen appears.

(5)   The following screens are provided. These screens can be selected using soft keys.
<1> [SP.SET] : Spindle setting screen
<2> [SP.TUN] : Spindle tuning screen
<3> [SP.MON] : Spindle monitor screen

(6)   With the page keys [↑ PAGE] [PAGE ↓], a spindle to be displayed can be selected (only when multiple serial spindles are connected).

10.1.2.2 **Spindle setting screen**

```
ACTUAL POSITION                           O0123 N00000
                ABSOLUTE            F              0.00 INCH/M
X              0.000      PARTS COUNT                      71
Y              0.000      RUN TIME                   1H57M55S
Z              0.000      CYCLE TIME                  0H 0M 0S
                                       SPINDLE SETTING
B              0.000      GEAR SELECT   :1
C              0.000      SPINDLE       :S11

                MODAL      <PARAMETER>
                           GEAR RATIO              100
G00  G22  G50    F     0 M      0   MAX SPINDLE SPEED       500
G97  G80  G50.2                     MAX MOTOR SPEED        4000
G90  G98  G13.1  H     0            MAX C AXIS SPEED        100
G69  G67  G50.1  D     0
G95  G54  G49.1
G20  G64         T     0
G40  G18
G25  G69.1       S     0   A>

                                    MEM STOP *** ***    12:00:00 PATH1
 < | ABS | REL | ALL |    |    |    |    |    |    | INPUT |
```

- Gear selection

The gear select status on the machine side is displayed.

Indication	CTH1	CTH2
1	0	0
2	0	1
3	1	0
4	1	1

- Spindle

Select a spindle for which data is to be set.

S11 :   Main spindle amplifier for the 1st spindle
S12 :   Subspindle amplifier for the 1st spindle
S21 :   Main spindle amplifier for the 2nd spindle
S22 :   Subspindle amplifier for the 2nd spindle

- Parameters

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Gear ratio (HIGH)	4056	4216	4056	4216
Gear ratio (MIDIUM HIGH)	4057		4057	
Gear ratio (MIDIUM LOW)	4058	4217	4058	4217
Gear ratio (LOW)	4059		4059	
Max. spindle speed (gear1)	3741		3741	
Max. spindle speed (gear2)	3742		3742	
Max. spindle speed (gear3)	3743		3743	
Max. spindle speed (gear4)	3744		3744	
Max. motor speed	4020	4196	4020	4196
Max. C axis speed	4021	None	4021	None

10.1.2.3 **Spindle tuning screen**

- Operation mode

1	:	Normal operation
2	:	Orientation
3	:	Synchronization control
4	:	Rigid tapping
5	:	Cs contour control
6	:	Spindle positioning control

- Displayed parameters

The displayed parameters vary depending on the operation mode.

Spindle positioning control	Normal operation	Orientation	Synchronization control	Rigid tapping	Cs contour control
Proportional gain	Proportional gain	Proportional gain	Proportional gain	Proportional gain	Proportional gain
Integral gain	Integral gain	Integral gain	Integral gain	Integral gain	Integral gain
Loop gain	Motor voltage	Loop gain	Loop gain	Loop gain	Loop gain
Motor voltage	Regenerative power	Motor voltage	Motor voltage	Motor voltage	Motor voltage
ZRN gain (%)		ORAR gain (%)	Acceleration/ deceleration constant (%)	ZRN gain	ZRN gain (%)
Shift reference position		Shift spindle stop position	Shift reference position	Shift reference position	Shift reference position
		Shift reference position			

*1) For the parameter numbers corresponding to the displayed parameter items, see Section 10.1.2.5.

- Displayed monitoring items

The displayed monitoring items vary depending on the operation mode.

Spindle positioning control	Normal operation	Orientation	Synchronization control	Rigid tapping	Cs contour control
Motor speed Feedrate Position deviation S	Motor speed Spindle speed	Motor speed Spindle speed Position deviation S	Motor speed Spindle speed Position deviation S1 Position deviation S2 Synchronous deviation	Motor speed Spindle speed Position deviation S Position deviation Z Synchronous deviation	Motor speed Spindle speed Position deviation S

*1)

$$\text{Motor speed [min}^{-1}\text{]} = \frac{|\text{Spindle data}|}{16383} \times \text{Max. motor speed (*)}$$

(*) Parameter No. 4020: Main spindle
Parameter No. 4196: Subspindle

*2) The spindle speed in Cs contour control mode is in degrees/min.

10.1.2.4   Spindle monitor screen

```
ACTUAL POSITION                          O0123 N00000
              ABSOLUTE            F              0.00 INCH/M
  X          0.000      PARTS COUNT                      71
  Y          0.000      RUN TIME                    1H57M55S
                        CYCLE TIME                   0H 0M 0S
  Z          0.000            SPINDLE MONITOR
  B          0.000      ALARM       :
  C          0.000      OPERATION   :SPEED CONTROL
                        SPINDLE SPEED :        0 RPM
                        MOTOR SPEED   :        0 RPM
              MODAL     SPINDLE     :S1
                                     0   50  100  150  200(%)
  G00  G22  G50  F     0 M    0    LOAD METER
  G97  G80  G50.2               0%
  G90  G98  G13.1 H    0       CONTROL INPUT :SFR  MRDY *ESP
  G69  G67  G50.1 D    0
  G95  G54  G49.1               CONTROL OUTPUT:
  G20  G64       T     0
  G40  G18
  G25  G69.1     S     0       A>

                                MEM  STOP *** ***    12:00:00 PATH1

  <   ABS   REL   ALL                SP.SET SP.TUN SP.MON
```

- Spindle alarm

1	:	Motor overheat	43	:	Signal of the differential speed control position coder disconnected	79	:	Initial test operation error
2	:	Excessive speed deviation				80	:	Alarm in SPM communication destination
3	:	DC link fuse blown	46	:	Threading position sensor one-rotation signal detection error			
4	:	Input fuse blown				81	:	Motor sensor one-rotation signal detection error
6	:	Temperature sensor disconnection	47	:	Converted speed in differential speed			
7	:	Excessive speed	49		mode overflow	82	:	Motor sensor one-rotation signal undetected
9	:	Main circuit overload	50	:	Position coder signal error			
11	:	DC link overvoltage		:	Excessive speed command calculation value under spindle	83	:	Motor sensor signal error
12	:	DC link overcurrent				84	:	Spindle sensor disconnection
13	:	CPU internal data memory error	51		synchronization	85	:	Spindle sensor one-rotation signal detection error
15	:	Output switch/spindle switch alarm	52	:	Converter DC link overvoltage			
16	:	RAM error	53	:	ITP signal error I	86	:	Spindle sensor one-rotation signal undetected
18	:	Sum check error	54	:	ITP signal error II			
19	:	Excessive U phase current offset	55	:	Overload current alarm	87	:	Spindle sensor signal error
20	:	Excessive V phase current offset	56	:	Power line switch state error	88	:	Radiator cooling fan stopped
21	:	Position sensor polarity setting error	57	:	Internal cooling fan stopped	89	:	SSM error
24	:	Transfer data error/stop		:	Excessive converter deceleration	110	:	Error in communication between amplifier modules
27	:	Position coder disconnection	58		power			
29	:	Short-time overload	59	:	Converter main circuit overload	111	:	Converter control power supply undervoltage
30	:	Input section overcurrent	61	:	Alarm of position feedback error			
31	:	Speed detection disconnection	65		between semi-closed and closed	112	:	Excessive converter regenerative power
32	:	Transfer RAM error			modes			
33	:	DC link charge error	66	:	Travel distance error during magnetic	113	:	Converter cooler radiation fan stopped
34	:	Parameter setting error			pole determination			
35	:	Gear ratio parameter setting error	67	:	Converter cooling fan stopped	120	:	Communication data alarm
36	:	Error counter overflow	69	:	Reference position return command	121	:	Communication data alarm
37	:	Speed detector setting error			error in FSC/EGB mode	122	:	Communication data alarm
41	:	Position coder one-rotation signal	70	:	Inter-SPM communication alarm	123	:	Spindle switch circuit error
		detection error	71	:	Safety speed exceeded	124	:	Invalid speed specified for learning control
42	:	Position coder one-rotation signal	72	:	Axis data error			
		undetected	73	:	Safety parameter error	127	:	Invalid degree of dynamic characteristic compensation element for learning control
			74	:	Motor speed found mismatching			
			75	:	Motor sensor disconnection			
			76	:	CPU test alarm	127	:	Invalid learning cycle
			77	:	CRC test alarm			
			78	:	Safety function unexecuted			
				:	Axis number found mismatching			
				:	Safety parameter found mismatching			

- Operation

Following 6 modes are available:
a.   Normal operation
b.   Orientation
c.   Synchronous operation
d.   Rigid tapping
e.   Cs contour control
f.   Spindle positioning control

- Load meter

The load meter displays spindle load in a unit of 10%.

$$\text{Load meter [\%]} = \frac{\text{Load meter data}}{32767} \times \text{Max. output value of load meter (*)}$$

(*)   Parameter No. 4127: High-speed main winding

Parameter No. 4274: High-speed sub-winding
Parameter No. 4093: Low-speed main winding
Parameter No. 4279: Low-speed sub-winding

- Control input signal

Max.10 signals those are ON are displayed from the following signals:

TLML	Torque limit command (low)	SPSL	Spindle selection signal
TLMH	Torque limit command (high)	MCFN	Power line switching
CTH1	Gear signal 1	SOCN	Soft start/stop cancel
CTH2	Gear signal 2	RSL	Output switching request
SRV	Spindle reverse rotation	RCH	Power line state confirm
SFR	Spindle forward rotation	INDX	Orientation stop pos. change
ORCM	Spindle orientation	ROTA	Rotation direction of ORCM
MRDY	Machine ready	NRRO	Short-cut of ORCM
ARST	Alarm reset signal	INTG	Speed integral control signal
*ESP	Emergency stop	DEFM	Referential mode command

- Control output signals

Max. 10 signals those are ON are displayed from the following signals:

ALM	Alarm signal	TLM5	Torque limitation
SST	Speed zero signal	ORAR	Orientation end signal
SDT	Speed detecting signal	CHP	Power line switched signal
SAR	Speed arrival signal	CFIN	Spindle switch complete
LDT1	Load detecting signal 1	RCHP	Output switch signal
LDT2	Load detecting signal 2	RCFN	Output switch complete signal

10.1.2.5 Correspondence between operation mode and parameters on spindle tuning screen

- Normal operation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4040	4206	4040	4206
Proportional gain (LOW)	4041	4207	4041	4207
Integral gain (HIGH)	4048	4212	4048	4212
Integral gain (LOW)	4049		4049	
Motor voltage	4083	4236	4083	4236
Regenerative power	4080	4231	4080	4231

- Orientation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4042	4208	4042	4208
Proportional gain (LOW)	4043	4209	4043	4209
Integral gain (HIGH)	4050	4213	4050	4213
Integral gain (LOW)	4051		4051	
Loop gain (HIGH)	4060	4218	4060	4218
Loop gain (MID.HIGH)	4061		4061	
Loop gain (MID.LOW)	4062	4219	4062	4219
Loop gain (LOW)	4063		4063	
Motor voltage	4084	4237	4084	4237
Gain change upon completion of orientation	4064	4220	4064	4220
Stop position shift	4077	4228	4077	4228
PC-type orientation stop position	4031	4204	4031	4204

- Synchronization control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIGH)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
Acc./Dec. time constant	4032		4032	
Shift amount	4034		4034	

- Rigid tapping mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIGH)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Grid shift amount at servo mode	4073	4223	4073	4223

- Cs contour control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4046		4046	
Proportional gain (LOW)	4047		4047	
Integral gain (HIGH)	4054		4054	
Integral gain (LOW)	4055		4055	
Loop gain (HIGH)	4069		4069	
Loop gain (MID.HIGH)	4070		4070	
Loop gain (MIDL.OW)	4071		4071	
Loop gain (LOW)	4072		4072	
Motor voltage	4086		4086	
ZRN gain %	4092		4092	
Reference position shift	4135		4135	

- Spindle positioning control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain (HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Loop gain (HIGH)	4065	4221	4065	4221
Loop gain (MID.HIG)	4066		4066	
Loop gain (MID.LOW)	4067	4222	4067	4222
Loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Reference position shift	4073	4223	4073	4223

10.1.3   **Automatic Setting of Standard Parameters**

The standard parameters related to each motor model can be set automatically.

* The specifications for controlling a motor depend on the specifications defined by the machine tool builder. The parameters defined by the machine tool builder are set as the standard values (initial values) by this automatic setting function. Therefore, when performing automatic operation, always set parameters properly according to the parameter list (parameters 4000 and later).

1   Turn on the power in the emergency stop state.
2   Set bit 7 of parameter 4019 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
4019	**LDSP**							

#7   LDSP   The parameters for the serial interface spindle are:
0:   Not set automatically.
(*)1: Set automatically.

3   Set a motor model code.

4133	**Motor model code**

Code	Motor model	Amplifier
301	α0.5/10000i (3000/10000min^{-1})	SPM-2.2i
302	α1/10000i (3000/10000min^{-1})	SPM-2.2i
304	α1.5/10000i (1500/10000min^{-1})	SPM-5.5i
305	α1.5/15000i (3000/150000min^{-1})	SPM-15i
306	α2/10000i (1500/10000min^{-1})	SPM-5.5i
307	α2/15000i (3000/15000min^{-1})	SPM-22i
308	α3/10000i (1500/10000min^{-1})	SPM-5.5i
309	α3/12000i (1500/12000min^{-1})	SPM-11i
310	α6/10000i (1500/10000min^{-1})	SPM-11i
311	α0.5/10000HVi (3000/10000min^{-1})	SPM-5.5HVi
312	α8/8000i (1500/8000min^{-1})	SPM-11i
313	α1/10000HVi (3000/10000min^{-1})	SPM-5.5HVi
314	α12/7000i (1500/7000min^{-1})	SPM-15i
315	α1.5/10000HVi (1500/10000min^{-1})	SPM-5.5HVi
316	α15/7000i (1500/7000min^{-1})	SPM-22i
317	α2/10000HVi (1500/10000min^{-1})	SPM-5.5HVi
318	α18/7000i (1500/7000min^{-1})	SPM-22i
319	α3/10000HVi (1500/10000min^{-1})	SPM-5.5HVi
320	α22/7000i (1500/7000min^{-1})	SPM-26i
321	α6/10000HVi (1500/10000min^{-1})	SPM-11HVi
322	α30/6000i (1150/6000min^{-1})	SPM-45i
323	α40/6000i (1500/6000min^{-1})	SPM-45i
324	α50/4500i (1150/4500min^{-1})	SPM-55i
325	α8/8000HVi (1500/8000min^{-1})	SPM-11HVi
326	α12/7000HVi (1500/7000min^{-1})	SPM-15HVi
327	α15/7000HVi (1500/7000min^{-1})	SPM-30HVi

Code	Motor model	Amplifier
328	α22/7000HVi (1500/7000min^{-1})	SPM-30HVi
329	α30/6000HVi (1150/6000min^{-1})	SPM-45HVi
401	α6/12000i (1500/12000, 4000/12000min^{-1})	SPM-11i
402	α8/10000i (1500/10000, 4000/10000min^{-1})	SPM-11i
403	α12/10000i (1500/10000, 4000/10000min^{-1})	SPM-15i
404	α15/10000i (1500/10000, 4000/10000min^{-1})	SPM-22i
405	α18/10000i (1500/10000, 4000/10000min^{-1})	SPM-22i
406	α22/10000i (1500/10000, 4000/10000min^{-1})	SPM-26i
407	α12/6000iP (500/1500, 750/6000min^{-1})	SPM-11i
408	α15/6000iP (500/1500, 750/6000min^{-1})	SPM-15i
409	α18/6000iP (500/1500, 750/6000min^{-1})	SPM-15i
410	α22/6000iP (500/1500, 750/6000min^{-1})	SPM-22i
411	α30/6000iP (400/1500, 575/6000min^{-1})	SPM-22i
412	α40/6000iP (400/1500, 575/6000min^{-1})	SPM-26i
413	α50/6000iP (575/1500, 1200/6000min^{-1})	SPM-26i
414	α60/4500iP (400/1500, 750/4500min^{-1})	SPM-30i
415	α100/4000HVi (1000/3000, 2000/4000min^{-1})	SPM-75HVi
418	α40/6000HViP (400/1500, 575/6000min^{-1})	SPM-30HVi

4　　Turn off the power then back on. Then, the parameters are read.

10.1.4   **Warning Interface**

Overview

The warning state can be reported before an alarm is issued. When the warning state is entered, a report to the PMC is sent.

For example, this signal can be used for retracting tools or reducing cutting load from the time a warning occurs by the time an overheat alarm occurs. In addition, diagnostic information also contains warning numbers.

Signal

Spindle warning detailed signals SPWRN1 to SPWRN9 <F264#0 to #7, F265#0>

[Classification]   Output

[Function]   Reports the warning number corresponding to the state of the α*i* spindle amplifier.

[Output condition]   When the α*i* spindle is in the warning state, a warning number consisting of SPWRN1 to SPWRN9 is output as nine-bit binary data.

If warnings occurred on multiple α*i* spindle amplifiers, the warning number of the ai spindle having the smallest axis number is output.

The warning numbers and their descriptions are shown below.

Warning number	Contents	Details
56	Internal fan stopped	If the internal fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.
88	Radiator cooling fan stopped	If the radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the main circuit overheats, an alarm occurs.
04	Open-phase detected in the converter main power supply	If an open-phase is detected in the main power supply, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute (for the PSM) or about five seconds (for the PSMR) after the warning signal is output, an alarm occurs.
58	Converter main circuit overloaded	If the main circuit of the PSM is overloaded, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.
59	Converter cooling fan stopped	If the PSM cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.

Warning number	Contents	Details
113	Converter radiator cooling fan stopped	If the PSM radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the PSM main circuit overheats, an alarm occurs.

Signal address

	#7	#6	#5	#4	#3	#2	#1	#0
F264	SPWRN8	SPWRN7	SPWRN6	SPWRN4	SPWRN4	SPWRN3	SPWRN2	SPWRN1

	#7	#6	#5	#4	#3	#2	#1	#0
F265								SPWRN9

Diagnosis screen

The status of a warning is displayed on the following diagnostic screen.

712	Warning status of spindle

[Data type] Word spindle
The number of a warning caused on each spindle is indicated.
If there is no warning, 0 is indicated.

10.1.5 **Spindle Information Screen**

Overview

In the α*i* spindle system, ID information output from each of the connected units is obtained and output to the CNC screen.

The units that have ID information are shown below.

(Remark: Some instances of these units do not have ID information.)

- Spindle motor
- Spindle amplifier
- Power supply module

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)

The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
13112						SPI		IDW

[Data type] Bit

IDW The edit of the servo information screen or the spindle information screen is:
0 :   Prohibited
1 :   Allowed

SPI The spindle information screen is:
0 :   Displayed
1 :   Not displayed

Displaying the spindle information screen

1   Press the |SYSTEM| function key, then press the [SYSTEM] soft key.

2   Press the [SPINDLE INFO] soft key to display the screen as shown below.

```
ACTUAL POSITION                         O0123 N00000
              ABSOLUTE          F                      0 MM/MIN
   X              0.000         PARTS COUNT                    0
   Y              0.000         RUN TIME              0H 0M 0S
                               CYCLE TIME            0H 0M 0S
   Z              0.000             SPINDLE INFORMATION
   B              0.000          S1 AXIS
                                SP MOTOR SPEC.   A06B-0852-B088#0007
   C              0.000         SP MOTOR S/N     C99XA1234
                                SP AMP SPEC.     A06B-6102-H106#H520CE
              MODAL             SP AMP S/N       V0020090601
 G00  G80  G15   F       M      PSM SPEC.        A06B-6087-H126#000001
 G17  G98  G40.1                PSM S/N          V0020031702
 G90  G50  G25   H
 G22  G67  G160  D
 G94  G97  G13.1
 G21  G54  G50.1 T
 G40  G64  G54.2
 G49  G69  G80.5 S              A>

                                MEM  STOP *** ***    12:00:00
 < ABSOLU RELATI  ALL           SYSTEM SERVO SPINDL       <OPRT>
   TE     VE                           INFO  E INFO
```

*   Spindle information is stored in flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *, as shown below.

```
ACTUAL POSITION                         O0123 N00000
              ABSOLUTE          F                      0 MM/MIN
   X              0.000         PARTS COUNT                    0
   Y              0.000         RUN TIME              0H 0M 0S
                               CYCLE TIME            0H 0M 0S
   Z              0.000             SPINDLE INFORMATION
   B              0.000          S1 AXIS
                                SP MOTOR SPEC.   A06B-0852-B088#0007
   C              0.000         SP MOTOR S/N     C99XA1234
                               *SP AMP SPEC.     A06B-6102-H106#H520CE
              MODAL            *SP AMP S/N       V0020090601
 G00  G80  G15   F       M      PSM SPEC.        A06B-6087-H126#000001
 G17  G98  G40.1                PSM S/N          V0020031702
 G90  G50  G25   H
 G22  G67  G160  D
 G94  G97  G13.1
 G21  G54  G50.1 T
 G40  G64  G54.2
 G49  G69  G80.5 S              A>

                                MEM  STOP *** ***    12:00:00
 < ABSOLU RELATI  ALL           SYSTEM SERVO SPINDL       <OPRT>
   TE     VE                           INFO  E INFO
```

- **Spindle switch control**

When spindle switch control is used, the ID information of the subspindle is also displayed.

```
ACTUAL POSITION                        O0123 N00000
              ABSOLUTE          F                      0MM/MIN
   X       0.000     PARTS COUNT                     0
   Y       0.000     RUN TIME                  0H 0M 0S
                          CYCLE TIME                0H 0M 0S
   Z       0.000           SPINDLE INFORMATION
   B       0.000       S1 AXIS
                          SP MOTOR SPEC.   A06B-0852-B088#0007
   C       0.000     SP MOTOR S/N     C99XA1234
                          SUBSP MOTOR SPEC A06B-0852-B088#0007
              MODAL              SUBSP MOTOR S/N  C99XA1235
  G00  G80  G15  F       M       SP AMP SPEC.     A06B-6102-H106#H520CE
  G17  G98  G40.1                SP AMP S/N       V0020090601
  G90  G50  G25  H               PSM SPEC.        A06B-6087-H126#000001
  G22  G67  G160 D               PSM S/N          V0020031702
  G94  G97  G13.1
  G21  G54  G50.1 T
  G40  G64  G54.2
  G49  G69  G80.5 S              A>

                                 MEM  STOP *** ***      12:00:00
 <  ABSOLU RELATI  ALL               SYSTEM SERVO SPINDL        <OPRT>
    TE     VE                               INFO  E INFO
```

Additional Information
> Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement.
> To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.
> (1) Make the registered data editable. (Parameter IDW (No. 13112#0) = 1)
> (2) On the edit screen, place the cursor on the item from which you want to delete the * mark.
> (3) Operate the soft keys [READ ID], [INPUT], and [SAVE] in that order.

Editing the spindle information screen

1   Assume that parameter No.13112#0(IDW) = 1.
2   Press the MDI switch on the machine operator's panel.
3   Follow the steps shown in "Displaying the spindle information screen" to display the screen as shown below.

```
ACTUAL POSITION                          O0123 N00000
              ABSOLUTE        F                    0 MM/MIN
    X          0.000    PARTS COUNT                   0
    Y          0.000    RUN TIME              0H 0M 0S
    Z          0.000    CYCLE TIME            0H 0M 0S
    B          0.000        SPINDLE INFORMATION
    C          0.000      S1 AXIS
                          SP MOTOR SPEC.   A06B-0852-B088#0007
              MODAL       SP MOTOR S/N     C99XA1234
 G00  G80  G15   F     M  SP AMP SPEC.     A06B-6102-H106#H520CE
 G17  G98  G40.1         SP AMP S/N       V0020090601
 G90  G50  G25   H        PSM SPEC.        A06B-6087-H126#000001
 G22  G67  G160  D        PSM S/N          V0020031702
 G94  G97  G13.1
 G21  G54  G50.1  T
 G40  G64  G54.2
 G49  G69  G80.5  S
                          A>
                          MDI  STOP *** ***     12:00:00
 <  ABSOLU RELATI  ALL       INPUT READ  SAVE RELOAD
    TE     VE                      ID
```

4   To move key-in buffer on the screen, use the ⬆[PAGE] and [PAGE]⬇ keys.

Screen operation on the editing screen

Mode	Key operation	Use
Viewing (*1)	Page key	Scrolls up or down on a screen-by-screen basis.
Editing (*2)	Soft key [INPUT]	Replace the selected ID information at the cursor position with the character string in key-in buffer.
	[CANCEL]	Deletes the character string in key-in buffer.
	[READ ID]	Transfers the ID information the connected device at the cursor has to the key-in buffer. Only the items preceded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the spindle information screen in flash ROM.
	[RELOAD]	Cancels the ID information that has been changed on the spindle information screen and loads ID information from flash ROM.
	Page key	Scrolls up or down on a screen-by-screen basis.
	Cursor key	Scrolls up or down the selection of ID information.

*1   Viewing mode: when parameter IDW (No.13112#0) = 0
*2   Editing mode: when parameter IDW (No.13112#0) = 1
*3   Spindle information is stored in flash ROM. If there is a difference between the ID information in screen and the actual ID information, the corresponding items are preceded by *.

11 TROUBLESHOOTING

This chapter describes troubleshooting procedure.

11.1 CORRECTIVE ACTION FOR FAILURES

When a failure occurs, it is important to correctly grasp what kind of failure occurred and take appropriate action, to promptly recover the machine.

Check for the failure according to the following procedure :
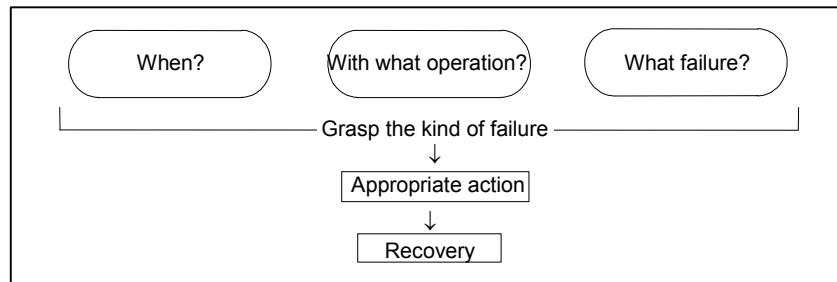
11.1.1 Investigating the Conditions under which Failure Occurred

> (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, Where in the program ? Which program No. and sequence No. ? What program ? Occurred during axial movement ? Occurred during the execution of an M/S/T code ? 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 and spindles>
- For a failure related to feed axis servo

(1) Occurred at both low feedrate and high feedrate ?
(2) Occurred only for a certain axis ?
-    For a failure related to spindles
     When did the failure occur ? (during power-on, acceleration, deceleration, or constant rotation)

3   What failure occurred ?
-    Which alarm was displayed on the alarm display screen?
     (Check the axis along which an alarm has occurred for alarms SV alarms, OT alarms, or SP alarms.)
-    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?
   Refer to manual about noise.
- Has excessive vibration been applied to the control unit?

5   When you contact our service center, specify the following items :
(1) Name of the NC unit
(2) Name of the machine tool builder and type of machine
(3) Software series/version of the NC
(4) Specifications of the servo amplifier and motor
     (for a failure related to the servo)
(5) Specifications of the spindle amplifier and spindle motor
     (for a failure related to a spindle)
     -    See the drawing issued by the machine tool builder for the locations of the NC unit and servo/spindle amplifiers.
     -    We use the following specification codes :
          Servo /spindle amplifier   : A06B-xxxx-Hxxx
          Servo/spindle amplifier   : A06B-xxxx-Bxxx

NOTE
The mark 'x' represents a number.

11.2 **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 diagnosis function

Causes and Countermeasures

1 Position display (relative, absolute, machine coordinate) does not change

(1) Check CNC status display (Refer to Section 1.9 CNC 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 diagnosis function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
X0008				*ESP				

	#7	#6	#5	#4	#3	#2	#1	#0
G0008				*ESP				

*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 diagnosis function (PMCDGN).

(i) An input signal from the PMC functions

	#7	#6	#5	#4	#3	#2	#1	#0
G0008	ERS	RRW						

ERS   :   When ERS is 1, external reset signal is input.
RRW   :   When RRW is 1, reset & rewing signal is input.

(ii) 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
     screen as follows :
     If nothing is displayed, mode select signal is not input.
     Check mode select signal using PMC's diagnosis function
     (PMCDGN).
     For details, refer to section 1.9 CNC STATUS 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 diagnosis functions 0000 and 1010 of the CNC. Check the
     items for which 1 is displayed at right side.

```
0000
 A.  Inposition Check            0
     Feedrate Override 0%        0
 B.  Jog Feed Override 0%        0
 C.  Inter/Start Lock on         1
     Speed Arrival on            0
     Wait Revolution             0
     Stop Position Coder         0
     Feed Stop                   0
```

```
1010                RST ERS RRW ESP
 D.   0   0   0   0   0   0   0   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 diagnosis number. (It is 1 in the
     following condition)
     DGN0300 Position Error > PARAM1826 In-position width

(i)   Check the parameters according to the parameter list.

1825	Servo loop gain per axis (Normal : 3000)

(ii)   Servo system may be abnormal. Refer to servo alarm
       SV0400, SV0410, and SV0411.

(b)   Jog feedrate override is 0%
       Check the signals using the PMC's signal status screen.

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0

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

(c)   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						ITX		ITL

#0 (ITL)   ITL=0 shows interlock signal *IT is effective. To 1)
#2 (ITX)   ITX=0 shows interlock signal *ITn is effective. To 2)

Check state of effective interlock signals using the PMC's
signal status screen.

(i)   Interlock signals (*IT, *CSL, and *BSL) are input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008					*BSL		*CSL	*IT

*IT=0, *CSL=0, and *BSL=0 show that interlock
signal is input.

(ii)   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.

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(d) The NC is in the reset state.
In this state, "RESET" is display as the state indication of
the previous item 1-(1)-(b). So, not only manual operation
but also all automatic operations are disabled. So, referring
to the item "Manual and automatic operations are disabled",
make an investigation.

2 When machine coordinate value does not update on position display

Machine lock signal (MLK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0044							MLK	

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

11.3   JOG OPERATION CANNOT BE DONE

Points

(1)   Check whether position display is operating.
(2)   Check CNC status display.
(3)   Check internal status using Diagnostic function.

Causes and Countermeasures

1 Position display (relative, absolute, machine coordinate) 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 the PMC's signal status screen.

\<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 the PMC's signal status screen.

	#7	#6	#5	#4	#3	#2	#1	#0
G0100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1

	#7	#6	#5	#4	#3	#2	#1	#0
G0102	-J8	-J7	-J6	-J5	-J4	-J3	-J2	-J1

When a bit is "1", the corresponding feed axis direction selection signal has been entered.

```
+   J
        ┌ 1  : Feed along the 1st axis
        :
        └ 8  : Feed along the 2nd axis
    ┌ +  : Feed in the + direction
    └ -  : Feed in the - direction
```
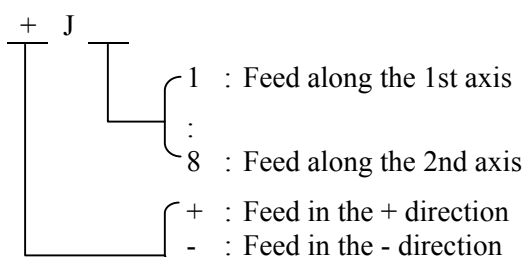
Example)
In the normal state, pressing the "+X" button on the operator's panel causes the signal +Jn to be displayed as "1".

* This signal becomes effective when the rise of the signal is detected. If, therefore, the direction selection signal has been entered before jog mode selection, axis movement is not performed; set the bit "0" and then re-check the signal.

(3) Check diagnosis functions 0000 and 1010 of the CNC. Check the items for which 1 is displayed at right side.

```
0000
  A.  Inposition Check        0
      Feedrate Override 0%     0
  B.  Jog Feed Override 0%     0
  C.  Inter/Start Lock on      1
      Speed Arrival on         0
      Wait Revolution          0
      Stop Position Coder      0
      Feed Stop                0
```

```
1010                    RST ERS RRW ESP
  D.   0   0   0   0   0   0   0   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 diagnosis number. (It is 1 in the following condition)
DGN0300 Position Error>Parameter No.1826 In-position width

(i) Check the parameters according to the parameter list.

1825	Servo loop gain per axis (Normal : 3000)

(ii) Servo system may be abnormal. Refer to servo alarm SV0400, SV0410, and SV0411.

(b) Jog feedrate override is 0%
Check the signals using the PMC's signal status screen.

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0

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

(c) 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						ITX		ITL

#0 (ITL)   ITL=0 shows interlock signal *IT is effective. To 1)
#2 (ITX)   ITX=0 shows interlock signal *ITn is effective. To 2)

Check state of effective interlock signals using the PMC's signal status screen.

(i) Interlock signal (*IT) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

(ii) 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.

(d) NC is in a reset state
In this state, not only manual operation but also automatic operation is disabled. Make an investigation according to the item of "Manual operation and automatic operation are disabled."

(4) Jog feed rate setting (Parameter) is not correct.

1423	Jog feedrate per axis

(5) Manual feed per revolution is selected
     This function feeds an axis synchronized with spindle rotation
     and whether this function is used or not is selected by the
     following parameter:

	#7	#6	#5	#4	#3	#2	#1	#0
1402					JRV			

JRV   Jog feed and incremental feed are :
       0 : Of feed per minute
       1 : Of feed per revolution

       (a) When parameter JRV is set to 1, feed rate of the axis is
            calculated by synchronizing with rotation of the spindle.
            Therefore, rotate the spindle.

       (b) If the axis does not move even when the spindle is rotated,
            check the detector of the spindle (position coder) and the
            cable between the position coder and the CNC if it is
            short-circuited or ungrounded.

(6) The specified axis is the index table indexing axis. <M series>
     For the index table indexing axis (B-axis), jog feed, incremental
     feed, and manual handle feed cannot be performed.

11.4   HANDLE OPERATION CANNOT BE DONE

Points

If manual handle operation cannot be performed, the probable causes include the following:
- The servo is not activated.
- Manual pulse generators are not connected properly to the I/O module.
- The I/O link of the I/O module is not allocated, or is not allocated properly.
- A related input signal is not input due to a parameter setting error.

Also use CNC diagnosis functions to check the internal status.

Causes and Countermeasures
1 The servo is not activated

Check that the LED on the servo amplifier indicates "0". If a number other than "0" is indicated, the servo is not activated. In this state, even JOG operation and automatic operation cannot be operated.
Check the servo-related parameters and the wiring.

2 Checking the manual pulse generators

(1) Cable failures (such as breaks)

Examine the cables for faults such as breaks and short-circuits, referring to the figure below.
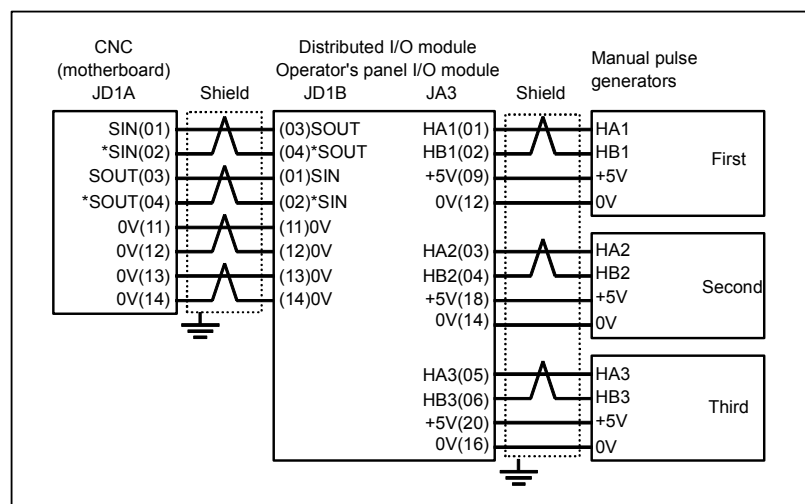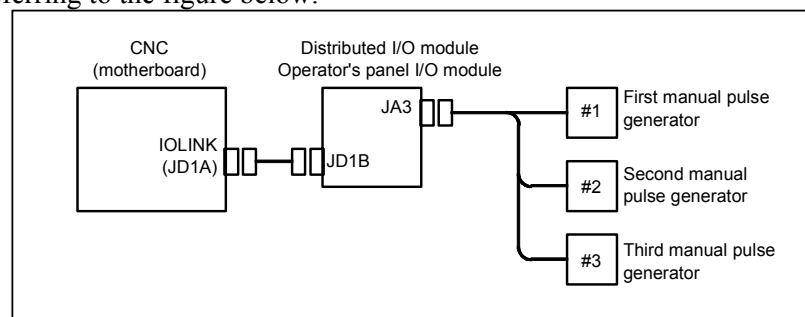
(2) Manual pulse generator failures

When rotated, a manual pulse generator generates the signals shown below.

Using an oscilloscope, measure the signals from the screw terminal block located at the rear of a manual pulse generator. If no signals are output, measure the +5 V voltage.
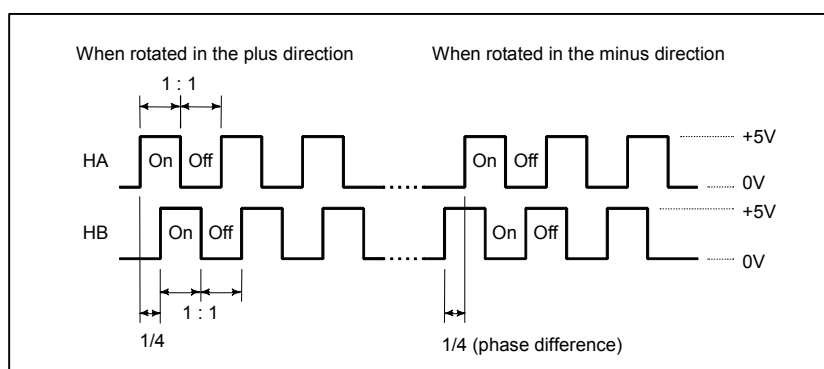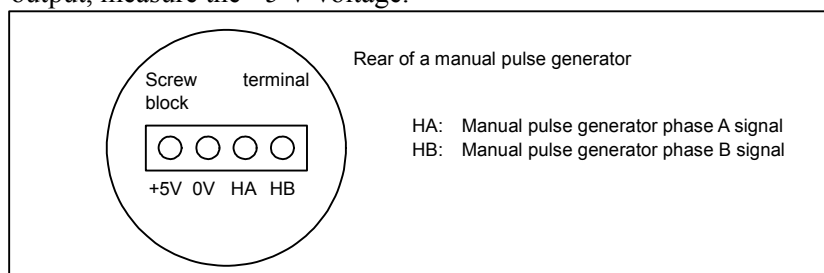
Check the on/off ratio and the phase difference between HA and HB.

3 Checking the parameters and input signals

See Section "CNC STATE DISPLAY."

(1) Check CNC status display at lower left corner of the screen.

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 signal status screen.

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
		Manual handle mode				1	0	0

(2) Manual handle feed axis select signal is not input.

Check the signals using the PMC's signal status screen.

	#7	#6	#5	#4	#3	#2	#1	#0
G0018	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A

	#7	#6	#5	#4	#3	#2	#1	#0
G0019					HS3D	HS3C	HS3B	HS3A

	#7	#6	#5	#4	#3	#2	#1	#0
G0411						HS3E	HS2E	HS1E

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	HSnE	HSnD	HSnC	HSnB	HSnA
no selection	0	0	0	0	0
1st axis	0	0	0	0	1
2nd axis	0	0	0	1	0
3rd axis	0	0	0	1	1
4th axis	0	0	1	0	0
5th axis	0	0	1	0	1
6th axis	0	0	1	1	0
7th axis	0	0	1	1	1
8th axis	0	1	0	0	0
9th axis	0	1	0	0	1
10th axis	0	1	0	1	0
11th axis	0	1	0	1	1
12th axis	0	1	1	0	0
13th axis	0	1	1	0	1
14th axis	0	1	1	1	0
15th axis	0	1	1	1	1
16th axis	1	0	0	0	0
17th axis	1	0	0	0	1
18th axis	1	0	0	1	0
19th axis	1	0	0	1	1
20th axis	1	0	1	0	0

Selected axis	HSnE	HSnD	HSnC	HSnB	HSnA
21st axis	1	0	1	0	1
22nd axis	1	0	1	1	0
23rd axis	1	0	1	1	1
24th axis	1	1	0	0	0

> **NOTE**
> 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 E.

(3) Manual handle feed multiplication is not correct

Check the following signals using the PMC's signal status screen. Also confirm the following parameters based on the parameter list.

	#7	#6	#5	#4	#3	#2	#1	#0
G0019			MP2	MP1				

In handle mode, the travel distance per step can be changed.

MP2	MP1	Step feed	Handle feed
0	0	× 1	× 1
0	1	× 10	× 10
1	0	× 100	× Mn
1	1	× 1000	× Nn

(4) The specified axis is the index table indexing axis. <M series>

For the index table indexing axis (B-axis), jog feed, incremental feed, and manual handle feed cannot be performed.

4 Checking the CNC diagnosis functions

(1) Check diagnosis functions 0000 and 1010 of the CNC. Check the items for which 1 is displayed at right side.

```
0000
  A.  Inposition Check           0
      Feedrate Override 0%       0
      Jog Feed Override 0%       0
  B.  Inter/Start Lock on        1
      Speed Arrival on           0
      Wait Revolution            0
      Stop Position Coder        0
      Feed Stop                  0
```

```
1010                  RST ERS RRW ESP
  C.   0    0    0    0    0    0    0    0
```

*   Items with a to c 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 diagnosis number. (It is 1 in the
     following condition)

DGN0300 | Position Error | >Parameter No.1826 | In-position width |

(i) Check the parameters according to the parameter list.

1825	**Servo loop gain per axis (Normal : 3000)**

(ii) Servo system may be abnormal. Refer to servo alarm
      SV0410 and SV0411.

(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						ITX		ITL

#0 (ITL)   ITL=0 shows interlock signal *IT is effective. To 1)
#2 (ITX)   ITX=0 shows interlock signal *ITn is effective. To 2)

Check state of effective interlock signals using the PMC's
signal status screen.

(i) Interlock signal (*IT) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

(ii) 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.

(c) NC is in a reset state
     In this state, not only manual operation but also automatic
     operation is disabled. Make an investigation according to
     the item of "Manual operation and automatic operation are
     disabled."

11.5   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 Countermeasures

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 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 PMC's signal status screen.

	#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	Automatic operation (memory) 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 diagnosis function(PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0007						ST		

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.

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Check the state of this signal using the PMC's diagnosis function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			*SP					

*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 screen.

(1)   Check the contents of diagnosis nos. 002 to 014. Check the items for which 1 is displayed at right side.

	No.	Message	Display
a.	002	DWELL	: 1 (Example)
b.	003	IN-POSITION CHECK	: 0
c.	004	FEEDRATE OVERRIDE 0%	: 0
d.	005	INTERLOCK / START LOCK	: 0
e.	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	011	READING	: 0
f.	013	JOG FEEDRATE OVERRIDE 0%	: 0
g.	014	WAITING FOR RESET,ESP,RRW OFF	: 0

*   Items with a to g relate with an automatic operation and their details are as follows :

(a)   A dwell command is being executed
CNC is reading a dwell command (G04) in a program and is executing the dwell command.

(b)   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 diagnosis function as follows:
DGN 300 Position error > PARAM1826 In-position width
Position error amount almost becomes 0, when positioning of an axis completes and when the amount becomes within the in-position width, it is assumed that positioning completes and the next block is executed.
If position error amount does not become within the in-position width, refer to alarm SV0410 or SV411.

(c)   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 signal status screen.

● **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		*AFV7 . . . *AFV0	
1 1 1 1 1 1 1 1	0%	1 1 1 1 1 1 1 1	0%
1 1 1 1 1 1 1 0	1%	1 1 1 1 1 1 1 0	1%
:	:	:	:
1 0 0 1 1 0 1 1	100%	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 1	254%
0 0 0 0 0 0 0 0	0%	0 0 0 0 0 0 0 0	0%

    (d)   Interlock 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						ITX		ITL

ITL   0:   Interlock signal(*IT) is valid.

ITX   0:   Interlock signal (*ITn) is valid.

               Confirm which interlock signal is activated by the PMC's signal status screen.

        (i)   Interlock signals (*IT, *CSL, and *BSL) are input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

               *IT=0, *CSL=0, and *BSL=0 show that interlock signal is input.

        (ii)   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

               When the bit is 0, the corresponding axis's interlock signal is input.

        (iii)   Controlled axis detach function is running. A detached axis is specified for travelling.

*   This function is valid when CNC parameter RMBx
     (No.1005#7)=1. For whether this function is running
     or not, confirm the following signal using the PMC's
     signal status screen. Check the axis concerned.

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

DTCHn   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							

RMVx   Releasing the assignment of the control axis for each axis
        0:   Not released
        1:   Released
        (Equivalent to the control axis detachment signals DTCH1,
        DTCH2, and so forth)

(e) CNC is waiting for spindle speed arrival signal to be input
     Actual spindle speed does not arrive at a speed specified in
     a program.
     Confirm the signal state using the PMC's signal status
     screen.

		#7	#6	#5	#4	#3	#2	#1	#0
G0029					SAR				

When this signal is 0, spindle speed does not arrive at the specified
speed.
*   This function is valid when the parameter SAR (No.3708#0)=1.

(f) 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 automatic
     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							

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%

(g) 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)

ROV1	ROV2	Override
0	0	100%
1	1	50%
0	1	25%
1	1	Fo

(HROV=1)

*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.
Feedrate (other than G00) is clamped at this upper feedrate.

1430		Maximum feedrate in each axis

(b) Feedrate is specified by feed per revolution (mm/rev)

(i) Position coder does not rotate
Check the connection between spindle and position
coder

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The following failure is considered:
- Timing belt is broken
- Key is removed
- Coupling is loose
- Connector of signal cable is loosened

(ii) Position coder is faulty

(c) Thread cutting does not operate

(i) Position coder does not rotate
Check the connection between spindle and position coder
The following failure is considered:
- Timing belt is broken
- Key is removed
- Coupling is loose
- Connector of signal cable is loosened

(ii) Position coder is faulty
Position coder is connected to the spindle amplifier when serial interface spindle is used or connected to the CNC when analog interface spindle is used.
For details of connection, refer to the following.

Whether A/B phase signals from the position coder are read correctly, can be judged also by the spindle speed display on the screen (position screen).
(However, it is not displayed when parameter DPS (No. 3105#2) is se to 0).

● α*i* series spindle amplifier
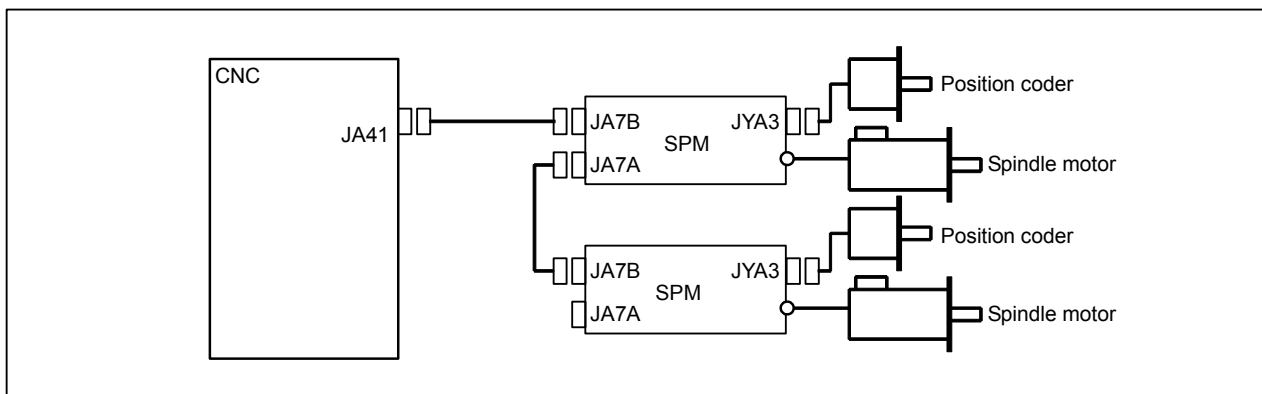
(d) A cutting feed block containing a feedrate command (F command) with a feedrate of 0 is specified.
If the parameter FCO (No.1404#7) is set to 1, alarm PS0011 is not issued even if a feedrate command (F command) with a feedrate of 0 is issued.

11.6   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 diagnosis function.

Causes and Countermeasures

The reason why cycle start LED signal (STL) has turned off are displayed on CNC's diagnosis numbers 020 to 025 as follows:

020 CUT SPEED UP/DOWN	1	0	0	0	1	0	0
021 REST BUTTON ON	0	0	1	0	0	0	0
022 RESET AND REWIND ON	0	0	0	1	0	0	0
023 EMERGENCY STOP ON	1	0	0	0	0	0	0
024 RESET ON	1	1	1	1	0	0	0
025 STOP MOTION OR DWELL	1	1	1	1	1	1	0

a.   Emergency stop signal
b.   External reset signal
c.   Reset button on MDI
d.   Reset & rewind signal
e.   Servo alarm
f.   Feed hold by switching mode
g.   Single block stop

*   Details of signals a to g are as follows:
Confirm the signals concerned using the PMC's signal status screen.

a. Emergency stop is input

	#7	#6	#5	#4	#3	#2	#1	#0
X0008				*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
						↓	↓	↓

		MD4	MD2	MD1
Automatic operation	Memory edit(EDIT)	0	1	1
	Automatic operation (AUTO)	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.

11.7   NOTHING IS DISPLAYED ON THE LCD WHEN THE POWER IS TURNED ON

Causes and Countermeasures

If nothing is displayed on the LCD at power-up or if the LCD is locked with "LOADING GRAPHIC SYSTEM", 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 "LOADING GRAPHIC SYSTEM" is displayed on a 15" display for the 30*i*/31*i*/32*i*, this indicates that the display control circuit has started up normally, but the CNC has not started up or communication with the CNC has not been established.

- LED display

Referring to the Section "LED display", check the LCD on/off status of the main board.

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 main board 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 main board.

- Installation positions of the display control card and CPU card

Referring to the chapter for card installation, check the installation status.

11.8 INPUT FROM AND OUTPUT TO I/O DEVICES CANNOT BE PERFORMED INPUT/OUTPUT CANNOT BE PERFORMED PROPERLY

Causes and Countermeasures

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
ER32 NO I/O DEVICE

If "ER32 NO I/O DEVICE" is displayed on the alarm screen of the PMC, no I/O devices are recognized.

ER97 IO LINK FAILURE

If "ER97 IO LINK FAILURE(CHx yyGROUP)" is displayed on the alarm screen of the PMC, the number of I/O devices connected to channel xx of the I/O Link is not the same as the number of devices allocated to the I/O Link.

- I/O Link screen of the PMC

From the function key [SYSTEM] menu, select [PMC MAINTE] and [I/O LINK] in that order. 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

```
PMC MAINTENANCE                                    O0123 N00000
STOP ***
                        PMC I/O LINK MONITOR              CHANNEL 1
 GROUP  ID I/O UNIT TYPE              GROUP  ID I/O UNIT TYPE
  00   A9 CONNECTOR PANEL MODULE       15
  01   AA OPERATOR PANEL A1
  02
  03
  04
  05
  06
  07
  08
  09
  10
  11
  12
  13
  14

                                     A>

                                     MEM  STOP *** ***    12:00:00
 <                        STATUS I/O    PMC    I/O  <OPRT> +
                                 LINK  ALARM
```

This example indicates that the I/O Link is as shown in the figure below.
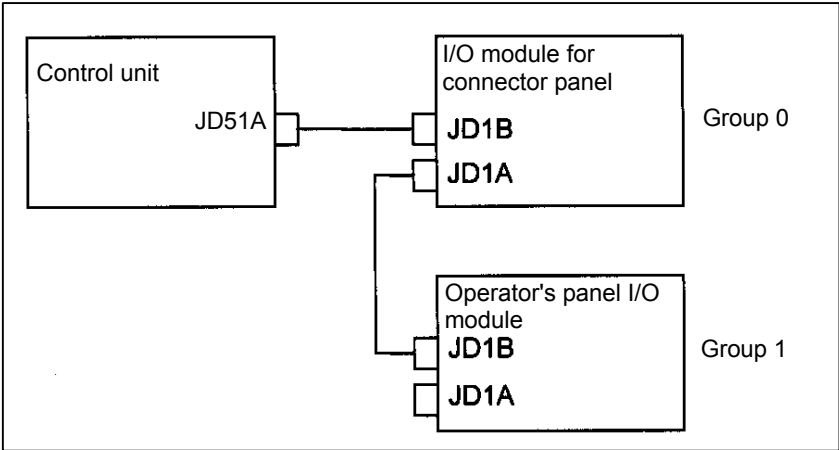
- Checking the power supplies of the I/O devices

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.

（Refer to Section 4.2 "TURNING ON AND OFF THE POWER TO THE CONTROL UNIT" in the CONNECTION MANUAL (HARDWARE) (B-63943EN) for details）

- Connection of cables

As in the example shown on the previous page, I/O Link cables are used to connect JD1A (JD51A) and JD1Bs.
JD1A (JD51A) represents an upper unit while JD1B represents a lower unit.
Check that the cables are connected correctly.

- Connection of ground wires

Check that the ground wires are connected and are not loose.

- 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.

From the function key $\boxed{\text{SYSTEM}}$ menu, select [PMC CONF], [MODULE],

and [EDIT] in that order. The allocation edit screen appears.
After editing allocation, be sure to write the sequence program onto the flash ROM using the PMC data I/O screen. Otherwise, the changes will be lost when the power is turned off.

11.9   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.
→   Perform the check described in Section 11.8.

(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:

```
Correct connection (the allocation starts with X0)

         CA52        CA53 CA52        CA53 CA52        CA53
       ┌───────┐   ┌───────────┐   ┌───────────┐   ┌───────────┐
       │ Basic │   │Expansion 1│   │Expansion 2│   │Expansion 3│
       └───────┘   └───────────┘   └───────────┘   └───────────┘
         X0-2          X3-5            X6-8            X9-11

Incorrect connection (the allocation starts with X0)

         CA52        CA52 CA53        CA53 CA52        CA53
       ┌───────┐   ┌───────────┐   ┌───────────┐   ┌───────────┐
       │ Basic │   │Expansion 1│   │Expansion 2│   │Expansion 3│
       └───────┘   └───────────┘   └───────────┘   └───────────┘
         X0-2          X9-11           X6-8            X3-5
```
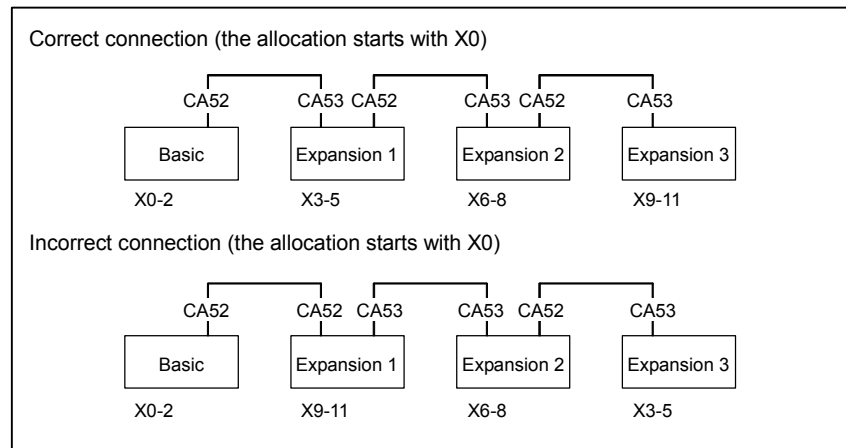
(3)   The setting of the rotary switch on an expansion unit is wrong
If the rotary switch is set to 1, one unit number is skipped. If set to 2, two unit numbers are skipped. Usually, the setting must be 0. (For those units without a rotary switch, unit numbers cannot be skipped.)
→   See the following example and refer to the Connection Manual (Hardware) (B-63943EN).

```
Example) Rotary switch setting on expansion unit 1=1

         CA52        CA53
       ┌───────┐   ┌───────────┐
       │ Basic │   │Expansion 1│
       └───────┘   └───────────┘
         X0-2          X6-8       ⇐ X3 to X5 are skipped.
```
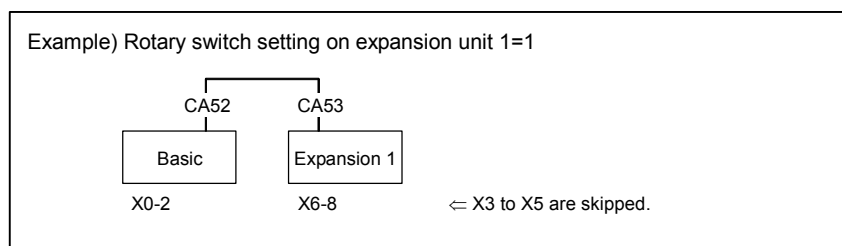
11.10 IN A CONNECTOR PANEL I/O UNIT, NO DATA IS OUTPUT TO AN EXPANSION UNIT

The most likely cause is that power is not being supplied to the expansion unit.

→   Check whether +24-V power is supplied to No. 18 pin and No. 50 pin of the expansion unit, DI and DO signals are not input and output.

→   Check whether +24-V power is supplied to No. 1 pin and No. 3 pin of the expansion unit, when DI signals are input and DO signals are not output.

11.11 ALARM SR0085 TO SR0087 (READER/PUNCHER INTERFACE ALARM)
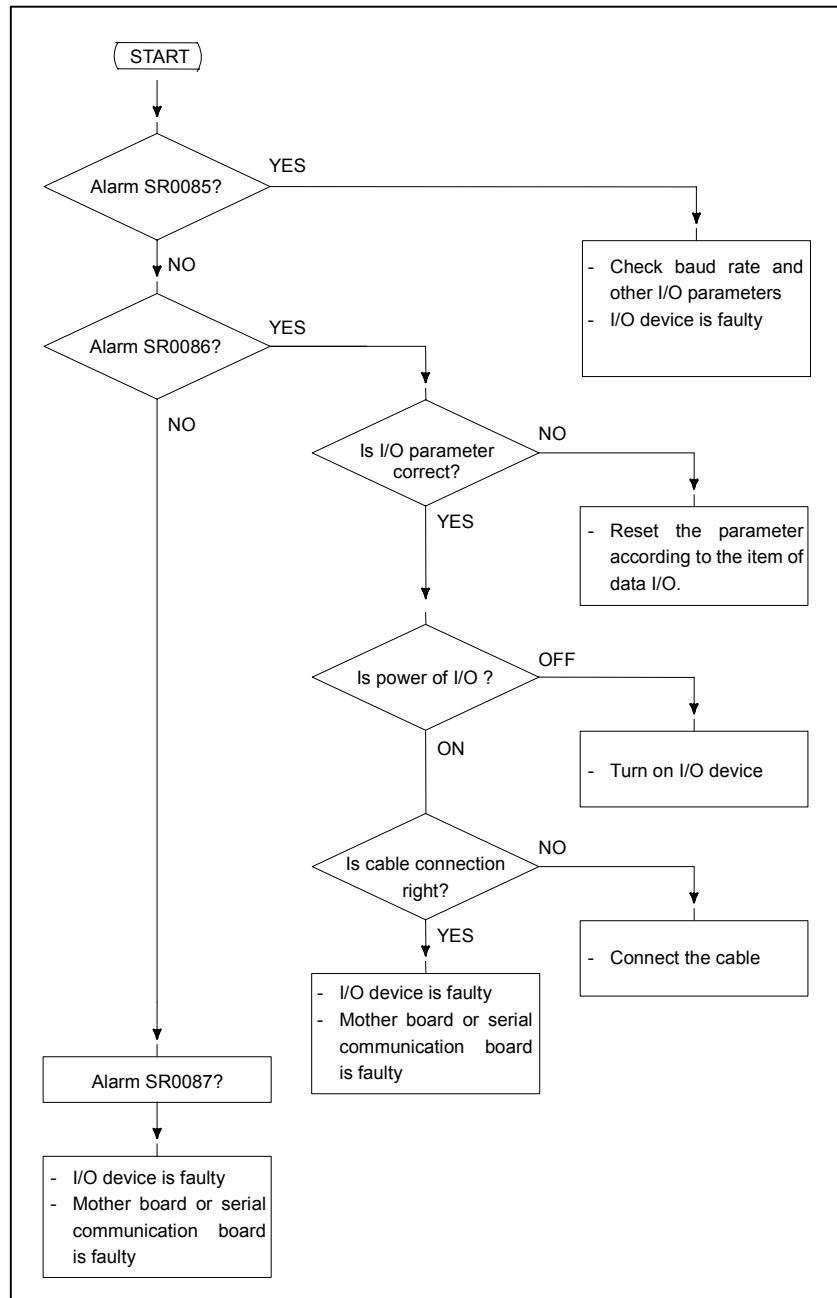
```
                        ┌─────────┐
                        │  START  │
                        └────┬────┘
                             │
                             ▼
                        ╱─────────╲          YES
                       ╱  Alarm    ╲──────────────────────────┐
                       ╲ SR0085?   ╱                          │
                        ╲─────────╱                           ▼
                             │ NO                   ┌──────────────────────┐
                             ▼                      │ - Check baud rate and│
                        ╱─────────╲          YES    │   other I/O parameters│
                       ╱  Alarm    ╲───────┐        │ - I/O device is faulty│
                       ╲ SR0086?   ╱       │        └──────────────────────┘
                        ╲─────────╱        ▼
                             │ NO    ╱───────────╲     NO
                             │      ╱ Is I/O      ╲──────────┐
                             │      ╲ parameter   ╱          │
                             │       ╲ correct?  ╱           ▼
                             │        ╲─────────╱   ┌──────────────────────┐
                             │            │ YES     │ - Reset the parameter│
                             │            │         │   according to the   │
                             │            │         │   item of data I/O.  │
                             │            ▼         └──────────────────────┘
                             │       ╱───────────╲     OFF
                             │      ╱ Is power of ╲──────────┐
                             │      ╲   I/O ?     ╱          │
                             │       ╲─────────╱            ▼
                             │            │ ON      ┌──────────────────────┐
                             │            │         │ - Turn on I/O device │
                             │            ▼         └──────────────────────┘
                             │       ╱───────────╲     NO
                             │      ╱ Is cable    ╲──────────┐
                             │      ╲ connection   ╱         │
                             │       ╲  right?    ╱          ▼
                             │        ╲─────────╱   ┌──────────────────────┐
                             │            │ YES     │ - Connect the cable  │
                             │            ▼         └──────────────────────┘
                             │   ┌──────────────────┐
                             │   │ - I/O device is  │
                             │   │   faulty         │
                             │   │ - Mother board or│
                             │   │   serial         │
                             │   │   communication  │
                             │   │   board is faulty│
                             │   └──────────────────┘
                             ▼
                   ┌──────────────────┐
                   │  Alarm SR0087?   │
                   └────────┬─────────┘
                            ▼
                   ┌──────────────────┐
                   │ - I/O device is  │
                   │   faulty         │
                   │ - Mother board or│
                   │   serial         │
                   │   communication  │
                   │   board is faulty│
                   └──────────────────┘
```

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) Mother board or serial communication 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 SR0086 will generate.

- Parameter

Value of parameter 0020 / Function		0	1	2
Feed		0101#7	0111#7	0121#7
Data input code		0101#3	0111#3	0121#3
Stop bit		0101#0	0111#0	0121#0
Type of I/O device		102	112	122
Baud rate		103	113	123
Communication method	0135#3	-	-	-
		RS-232C		
Connector		MOTHER BOARD		
		JD56A		JD36A

> **NOTE**
> Numbers in the table indicate parameters and bit
> numbers.
> Example) 0101#7: bit7 of parameter No. 0101.

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2
0111								
0121								

NFD   0:   Feed is output before and after data in data output
            (FANUC PPR)
      1:   Feed is not output (standard).
ASI   0:   Data input code is EIA or ISO (automatic recognition)
      1:   Data input code is ASCII.
SB2   0:   No. of stop bits is 1.
      1:   No. of stop bits is 2.

0102	Type of I/O device		
0112			
0122	**Value**	**TYPE OF I/O DEVICE**	
	0	RS–232–C (Used control codes DC1 to DC4)	
	1	1 FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)	
	2	2 FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)	
	3	FANUC PROGRAM FILE Mate, FANUC FA CARD ADAPTOR FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File, FANUC SYSTEM P-MODEL H	
	4	RS–232–C (Not used control codes DC1 to DC4)	
	5	Portable tape reader	
	6	FANUC PPR, FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H	

0103	Baud rate		
0113			
0123	**Value**	**Baud rate**	

Value	Baud rate
7	600
8	1200
9	2400
10	4800

11	9600
12	19200

(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) Main board or serial communication control module is faulty

    (i) When parameter No.0020 is 0, 1, or 2 (JD56A, JD36A of Main board)
Replace the module since main board may be faulty.

(d) Cable between CNC and I/O device is faulty.
Check the cable for disconnection or wrong connection.

- Connection
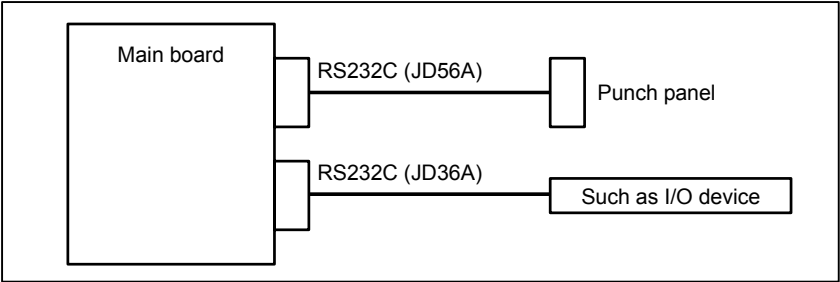
- Cable connection
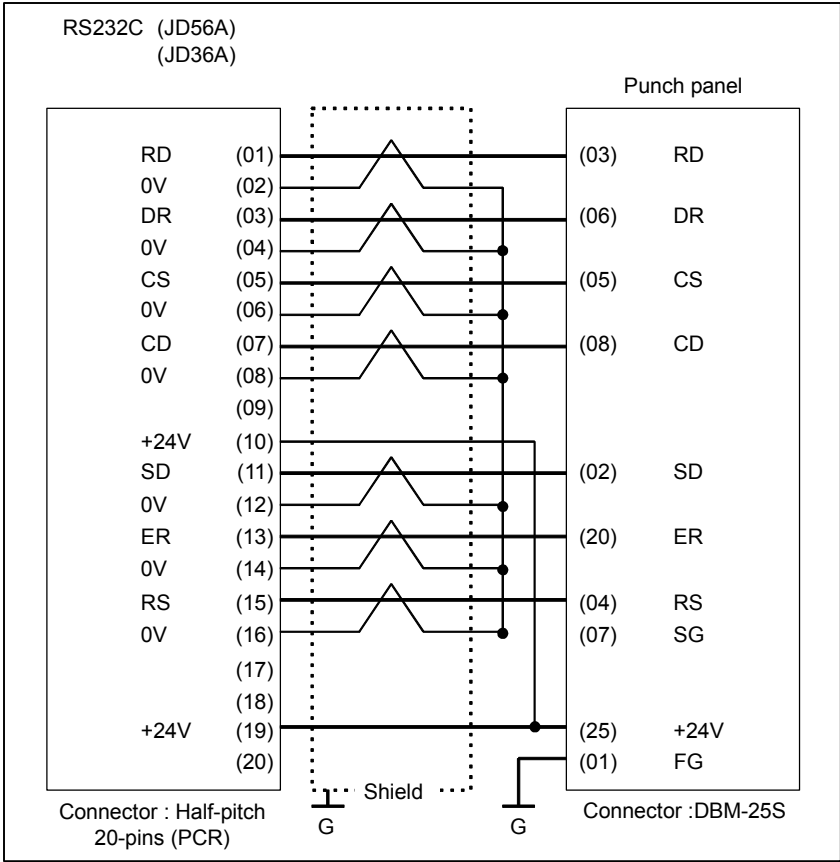
11.12 ALARM PS0090 (REFERENCE POSITION RETURN IS ABNORMAL)

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

```
                    ┌──────────────┐
                    │    START     │
                    └──────┬───────┘
                           │
   ┌───────────────────────────────────────────┐
   │ Check whether position gain is greater than 128 │   Position error amount :
   │ pulses (DGN 300) before or during reference position │   DGN 300
   │ return.                                     │
   └───────────────────┬───────────────────────┘
                       │
                       │              YES
                    ◇ 128 or more ◇ ──────► (1) Next page
                       │ NO
```

Raise the speed

Check feed rate command:
  PRM   1420 F : Rapid traverse rate   [mm/min]
  PRM   1424   Manual rapid traverse rate   [mm/min]
  PRM   1825 G : Servo loop gain   [0.01sec⁻¹]

$$\text{Position error} = \frac{F \times 5000/3}{G \times \text{detection unit } [\mu m/PLUSE]}$$

Detection unit   : Move amount to a command pulse (usually 1μm)
                    In metric machine, if the no. of digits below decimal point is 4 on the position display screen, detection unit is 0.1 μm.

Check rapid traverse override signals :
  ROV1 DGN   014.0

  ROV2 DGN   014.1

  PRM   1421   Fo rate

ROV1	ROV2	Override
0	0	100%
0	1	50%
1	0	25%
1	1	Fo rate

Check reference position return deceleration signal
*DEC1 to *DEC8   DGN 009.0 to 009.7
    When reference position return is started from deceleration signal 0, feed rate becomes FL rate.
    PRM 1425 FL rate

```
                              (1)
                               │
                               ▼
          ┌────────────────────────────────────────────┐
          │ Check whether the motor rotated more than one │
          │ rotation (one rotation signal is issued ) at faster than │
          │ 128 pulses of position error amount.          │
          └────────────────────────────────────────────┘
                               │
                               ▼
                                      NO    ┌──────────────────────────────────┐
                    ◇◇◇◇◇◇◇◇◇◇ ──────────▶ │ Return start position is too close │
                    ◇ Rotated ? ◇           ├──────────────────────────────────┤
                    ◇◇◇◇◇◇◇◇◇◇              │ - Change the return start position. │
                         │                   │ - Move the machine at faster that 128 │
                         │ YES               │   pulses for more than one rotation to │
                         ▼                   │   wards RP.                          │
          ┌────────────────────────────────────────────┘──────────────────────┘
          │ Check that voltage of Pulsecoder is higher than 4.75 V.              │
          │ To measure Pulsecoder voltage, remove the motor cover and measure on │
          │ pulse coder PCB at across + and - or +5V and 0V terminals.           │
          └──────────────────────────────────────────────────────────────────┘
                               │
                               ▼
                                      NO
                    ◇◇◇◇◇◇◇◇◇◇◇◇ ──────────────────────────────────┐
                    ◇ More than 4.75V ◇                              │
                    ◇◇◇◇◇◇◇◇◇◇◇◇                                     │
                         │ YES                                       │
                         ▼                                           ▼
          ┌─────────────────────────────┐      ┌──────────────────────────────────┐
          │ Hardware failure            │      │ Pulse coder power voltage is low  │
          ├─────────────────────────────┤      └──────────────────────────────────┘
          │ - Pulse coder is faulty     │
          │   Change Pulsecoder or motor │
          └─────────────────────────────┘
```

⚠ **CAUTION**
(1) After the Pulsecoder 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.)

11.13 ALARM DS0300 (REQUEST FOR REFERENCE POSITION RETURN)

Absolute position data in the serial Pulsecoder was lost.
(This alarm will be generated when serial Pulsecoder is exchanged or position feedback signal cable of the serial Pulsecoder is disconnected).

Countermeasures

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 APCx (No.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 Pulsecoder is changed

Since the reference position is different from the former one, change the grid shift value (parameter No. 1850) to correct the position.

Related parameters

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APCx	APZx				

APCx   Position detector
    0:    Other than absolute position detector
    1:    Absolute position detector (absolute Pulsecoder)
APZx   Machine position and position on absolute position detector when the absolute position detector is used
    0:    Not corresponding
    1:    Corresponding

11.14 ALARM SV0401 (V READY OFF)

Causes and Countermeasures

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
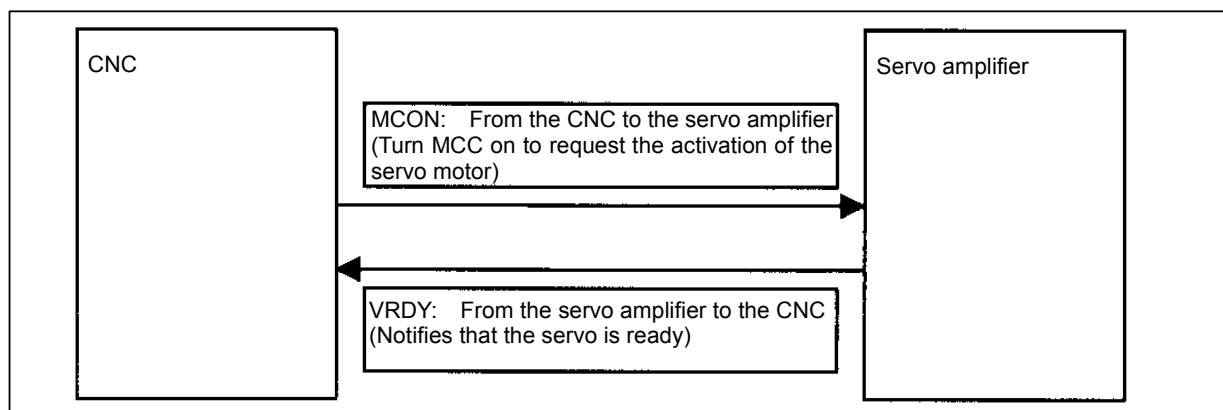
The exchange of this information is performed via the FSSB (optical cable).

- Example of connection around the amplifier (Typical example)
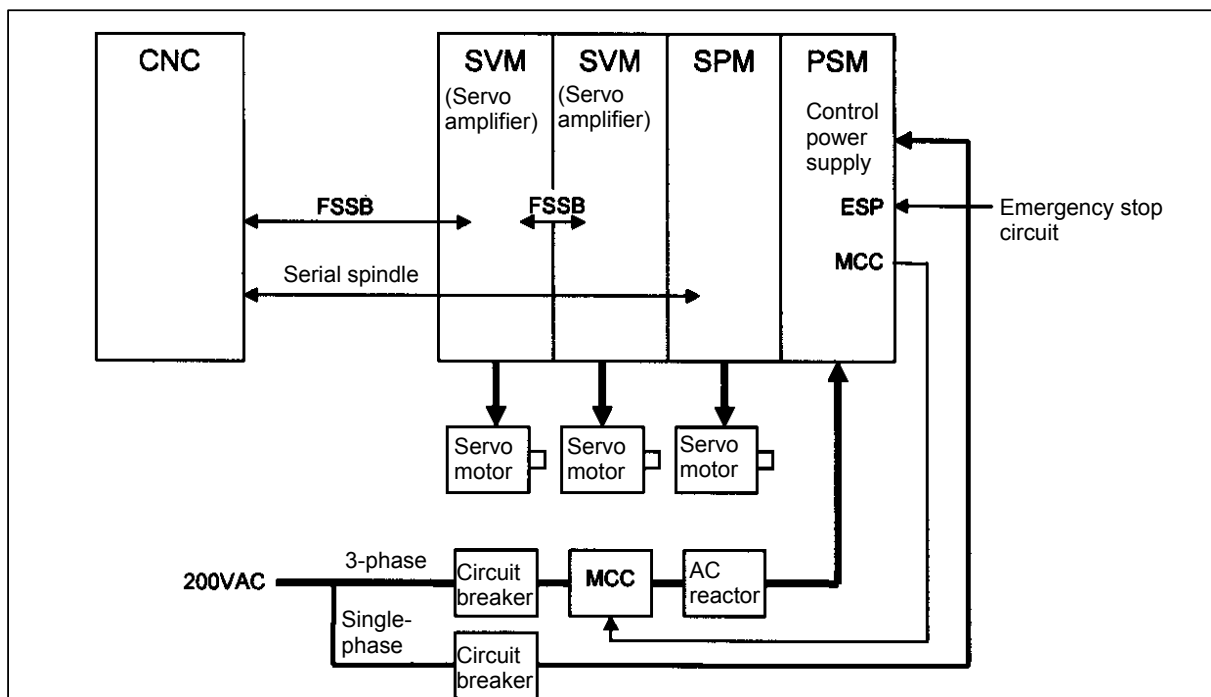
Check items
- Is the PSM control power supply on?
- Has an emergency stop been canceled?
- Is a terminating connector connected to the JX1B connector of the terminating amplifier?
- Is MCC on? If there is an external MCC sequence in addition to the MCC contact of the PSM, check that sequence also.
- 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.
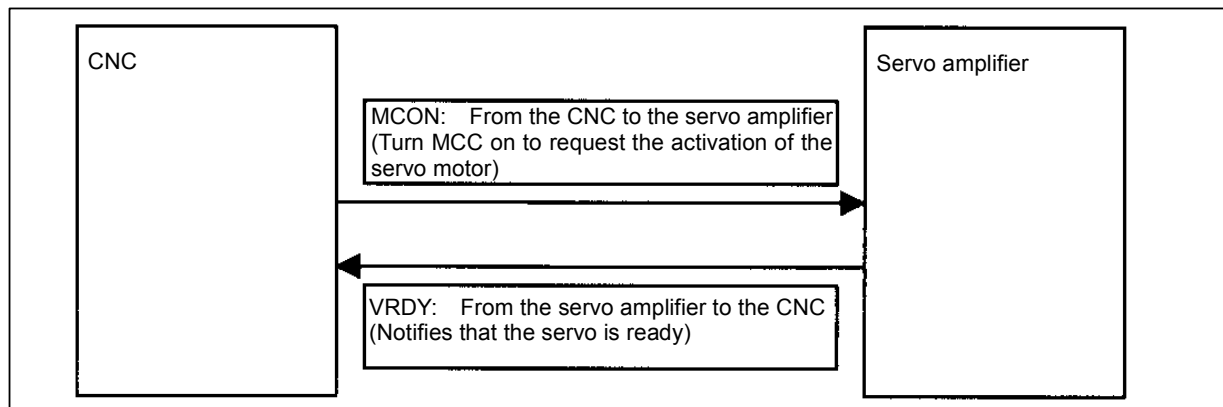
11.15   ALARM SV0404 (V READY ON)

Causes and Countermeasures

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.

11.16 ALARM SV0462 (SEND CNC DATA FAILED)
ALARM SV0463 (SEND SLAVE DATA FAILED)

Causes and Countermeasures

Alarm SV0462 is issued if a slave (servo amplifier) cannot receive correct data due to an FSSB communication error.

Alarm SV0463 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.

11.17   ALARM SV0417 (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:
    Parameter No. 2020 : Motor format number
    Parameter No. 2022 : Motor rotation direction
    Parameter No. 2023 : Number of pulses of velocity feedbacks
    Parameter No. 2024 : Number of pulses of position feedback
    Parameter No. 1023 : Servo axis number
    Parameter No. 2084 : Flexible feed gear ratio
    Parameter No. 2085 : Flexible feed gear ratio
    Confirm the details with diagnosis function of CNC side.

2   Change the setting of this parameter to 0.
    Parameter No. 2047   : Observer parameter

3   Perform initial setting of digital servo parameters.
    Refer to section 9.1 "Initial Setting of Servo Parameters" .

11.18   ALARM OH0700 (OVERHEAT: CONTROL UNIT)

Causes and Countermeasures

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 (for LCD-mounted type CNC) or 55°C (for stand-alone type CNC).

- Ambient temperature

A temperature monitoring circuit is installed on the main 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 (for LCD-mounted type CNC) or 0 to 55°C (for stand-alone type CNC)).

If it is obvious that the ambient temperature is not abnormal, the main board may be defective.

11.19   ALARM OH0701 (OVERHEAT: FAN MOTOR)

Causes and Countermeasures

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 according to "Replacing the fan motor".

11.20 ALARM SV5134 (FSSB: OPEN READY TIME OUT)
ALARM SV5137 (FSSB: CONFIGURATION ERROR)
ALARM SV5197 (FSSB: OPEN TIME OUT)

Causes and Countermeasures

These alarms are issued due to a failure in the optical cable, axis control card, or a slave such as a servo amplifier connected to the FSSB.

No.	Message	Description
SV5134	FSSB:OPEN READY TIME OUT	In the initialization, the FSSB could not be in an open ready sate. The axis card is thought to be defective.
SV5137	FSSB:CONFIGURATION ERROR	An FSSB configuration error occurred. The connecting amplifier type is incompatible with the FSSB setting value.
SV5197	FSSB:OPEN TIME OUT	The initialization of the FSSB was completed, but it could not be opened. Or, the connection between the CNC and the amplifier in is incorrect.

- 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.

11.21 ALARM SV5136 (FSSB: NUMBER OF AMPS IS SMALL)

Causes and Countermeasures

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 Pulsecoder cable is ground, or for other reasons.

- Axis control cards

The axis control cards installed on the CNC may be defective.

11.22 SERVO ALARMS

For an explanation of the following servo alarms, refer to the FANUC SERVO MOTOR α*i* series Maintenance Manual (B-65285EN).

Number	Message	Contents
SV0417	ILL DGTL SERVO PARAMETER	A digital serve parameter setting is incorrect.
SV0420	SYNC TORQUE EXCESS	In feed axis synchronization control, for synchronization, the difference value of torque between a master and slave axes exceeded the parameter (No. 2031) setting value. This alarm occurs for a master axis.
SV0421	EXCESS ERROR(SEMI-FULL)	The difference between the feedback from the semi and full sides exceeded the setting of parameter No.1729.
SV0422	EXCESS VELOCITY IN TORQUE	In torque control, the commanded permissible velocity was exceeded.
SV0423	EXCESS ERROR IN TORQUE	In torque control, the total permissible move value specified as a parameter was exceeded.
SV0430	SV MOTOR OVERHEAT	The servo motor has overheated.
SV0431	CNV. OVERLOAD	PSM : Overheat β series SVU : Overheat
SV0432	CNV. LOW VOLT CONTROL	PSM : The control power supply voltage has dropped. PSMR : The control power supply voltage has dropped. β series SVU : The control power supply voltage has dropped.
SV0433	CNV. LOW VOLT DC LINK	PSM : Low DC link voltage PSMR : Low DC link voltage α series SVU : Low DC link voltage β series SVU : Low DC link voltage
SV0434	INV. LOW VOLT CONTROL	SVM : Low control power voltage
SV0435	INV. LOW VOLT DC LINK	SVM : Low DC link voltage
SV0436	SOFTTHERMAL(OVC)	The digital servo software detected a software thermal (OVC).
SV0437	CNV. OVERCURRENT POWER	PSM : Overcurrent on input circuit section.
SV0438	INV. ABNORMAL CURRENT	SVM : Motor overcurrent α series SVU : Motor overcurrent β series SVU : Motor overcurrent
SV0439	CNV. OVER VOLT DC LINK	PSM : The DC link voltage is too high. PSMR : The DC link voltage is too high. β series SVU : The DC link voltage is too high.
SV0440	CNV. EX DECELERATION POW.	PSMR : Excessive generative discharge α series SVU : Excessive generative discharge, or abnormal error in generative power circuit
SV0441	ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
SV0442	CNV. CHARGE FAILURE	PSM : The spare charge circuit for the DC link is abnormal. PSMR : The spare charge circuit for the DC link is abnormal.
SV0443	CNV. COOLING FAN FAILURE	PSM : Internal cooling fan failure. PSMR : Internal cooling fan failure. β series SVU : Internal cooling fan failure.
SV0444	INV. COOLING FAN FAILURE	SVM : Internal cooling fan failure.
SV0445	SOFT DISCONNECT ALARM	The digital servo software detected a disconnected Pulsecoder.

Number	Message	Contents
SV0446	HARD DISCONNECT ALARM	The hardware detected a disconnected built–in Pulsecoder.
SV0447	HARD DISCONNECT(EXT)	The hardware detected a disconnected separate detector.
SV0448	UNMATCHED FEEDBACK ALARM	The sign of the feedback signal from the standalone detector is opposite to that from the feedback signal from the built–on Pulsecoder.
SV0449	INV. IPM ALARM	SVM : The IPM (Intelligent Power Module) detected an alarm. α series SVU : The IPM (Intelligent Power Module) detected an alarm.
SV0453	SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the α Pulsecoder. Turn off the power to the CNC, then remove and insert the Pulsecoder cable. If this alarm is issued again, replace the Pulsecoder.
SV0454	ILLEGAL ROTOR POS DETECT	The magnetic pole detection function terminated abnormally. The magnetic pole could not be detected because the motor did not run.
SV0456	ILLEGAL CURRENT LOOP	An attempt was made to set the current loop that could not be set. The amplifier or separate detector interface in use does not comply with HIGH SPEED HRV. Or, requirements to control are not satisfied in the system.
SV0457	ILLEGAL HI HRV(250US)	An attempt was made to set up HIGH SPEED HRV control for use when the current loop was set to 250 μs.
SV0458	CURRENT LOOP ERROR	The specified current loop differs from the actual current loop.
SV0459	HI HRV SETTING ERROR	For two axes whose servo axis numbers (parameter No. 1023) are consecutively even and odd numbers, HIGH SPEED HRV control is possible for one axis and impossible for the other.
SV0460	FSSB DISCONNECT	The FSSB connection was discontinued. Or, the FSSB connection cable was disconnected or broken. The amplifier was turned off . In the amplifier, the low-voltage alarm occurred.
SV0462	SEND CNC DATA FAILED	The correct data could not be received on a slave side because of the FSSB communication error.
SV0463	SEND SLAVE DATA FAILED	The correct data could not be received in the servo software because of the FSSB communication error.
SV0464	WRITE ID DATA FAILED	An attempt was made to write maintenance information on the amplifier maintenance screen, but it failed.
SV0465	READ ID DATA FAILED	A read of the ID information for the amplifier has failed at power-on.
SV0466	MOTOR/AMP. COMBINATION	The maximum current of an amplifier is different to that of a motor. Or, the connection command for an amplifier is incorrect. The parameter setting is incorrect
SV0468	HI HRV SETTING ERROR(AMP)	An attempt was made to set up HIGH SPEED HRV control for use when the controlled axis of an amplifier for which HIGH SPEED HRV control could not be used.
SV0600	INV. DC LINK OVER CURRENT	SVM : DC link overcurrent. β SVU : DC link overcurrent.
SV0601	INV. RADIATOR FAN FAILURE	SVM : Radiator cooling fan failure. β SVU : Radiator cooling fan failure.
SV0602	INV. OVERHEAT	SVM : The servo motor has overheated.

Number	Message	Contents
SV0603	INV. IPM ALARM(OH)	SVM : The IPM (Intelligent Power Module) detected an overheat alarm. β SVU : The IPM (Intelligent Power Module) detected an overheat alarm.
SV0604	AMP. COMMUNICATION ERROR	The communication between SVM and PSM is in error.
SV0605	CNV. EX. DISCHARGE POW.	PSMR : The motor regenerative power is too much.
SV0606	CNV. RADIATOR FAN FAILURE	PSM : External radiator cooling fan failure. PSMR : External radiator cooling fan failure.
SV0607	CNV. SINGLE PHASE FAILURE	PSM : The input power supply has a missing phase. PSMR : The input power supply has a missing phase.

If the hardware on the CNC is suspected to be defective as a result of examination, replace the axis control cards.

11.23 SPC ALARMS

For an explanation of the following SPC alarms (serial Pulsecoder alarms), refer to the FANUC SERVO MOTOR α*i* series Maintenance Manual (B-65285EN).

Number	Message	Contents
SV0360	ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built-in Pulsecoder.
SV0361	ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built-in Pulsecoder.
SV0364	SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built-in Pulsecoder.
SV0365	BROKEN LED (INT)	An LED error occurred in the built-in Pulsecoder.
SV0366	PULSE MISS (INT)	A pulse error occurred in the built-in Pulsecoder.
SV0367	COUNT MISS (INT)	A count error occurred in the built-in Pulsecoder.
SV0368	SERIAL DATA ERROR (INT)	Communication data from the built-in Pulsecoder cannot be received.
SV0369	DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built-in Pulsecoder.
SV0380	BROKEN LED (EXT)	An LED error occurred in the separate detector.
SV0381	ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate linear scale.
SV0382	COUNT MISS (EXT)	A pulse error occurred in the separate detector.
SV0383	PULSE MISS (EXT)	A count error occurred in the separate detector.
SV0384	SOFT PHASE ALARM (EXT)	The digital servo software detected invalid data in the separate detector.
SV0385	SERIAL DATA ERROR (EXT)	Communication data from the separate detector cannot be received.
SV0386	DATA TRANS. ERROR (EXT)	A CRC or stop bit error occurred in the communication data being received from the separate detector.
SV0387	ABNORMAL ENCODER (EXT)	An error occurs in the separate detector. For details, contact the manufacturer of the scale.

11.24 **SPINDLE ALARMS**

For an explanation of the following spindle alarms, refer to the FANUC SERVO MOTOR α*i* series Maintenance Manual (B-65285EN).

Number	Contents
SP9001 to later: Spindle_n	n-th spindle alarm (SPM display 01 or larger)

11.25 SYSTEM ALARMS

11.25.1 Overview

The FANUC 30*i* series makes a transition to the special processing state called the system alarm state when a state that disables the continuation of normal system operation is detected.

When the system alarm state is entered, the CNC screen display is switched and the following operations are performed:

- Servo and spindle amplifier excitation is turned off.
- Disconnection of I/O link communication

Example of system alarm screen

Types of System Alarms

System alarms are classified into three types according to the following causes:

- Software causes
- Hardware causes
- Others

- Software causes

Mainly, the CNC system software detects software errors.
Typical causes are as follows:

- Conflict in processing/data detected by the internal state monitoring software
- Access to outside of the valid data/instruction ranges
- Division by zero
- Stack overflow
- Stack underflow
- DRAM checksum error

- Hardware causes

Mainly, hardware detects hardware errors.
Typical causes are as follows:
- Parity error (DRAM, SRAM, cache)
- Bus error
- Power supply alarm
- FSSB cable disconnection

- Others

Moreover, system alarms are caused by the following:
- Causes detected by peripheral software
  Servo software (such as watchdog)
  PMC software (such as an I/O link communication error)

11.25.2 Operations on the System Alarm Screen

Description of system alarm screen

When a system alarm is issued, the screen display is switched to a screen as shown below.

This screen is referred to as the system alarm screen.

```
SERIES 30I G001Z
SYS_ALM198 SOFTWARE SYSTEM ERROR
CPU CARD<MAIN>
ERROR OCCURRED AT 2003/06/25 09:04:23
PROGRAM COUNTER  : 7000B260H
ACT TASK         : 00000000H
ACCESS ADDRESS   :      -
ACCESS DATA      :      -
ACCESS OPERATION :      -


+-------------------------------------------------------+
+  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.  +
+-------------------------------------------------------+









                                  PAGE UP OR DOWN <PAGE  1/ 3>
```

The system alarm screen consists of several pages of information.

The following key operations are used:

    [PAGE UP],[PAGE DOWN]

        Switches between pages.

    [RESET]

        Executes the IPL monitor.

Saving of system alarm information

Various information items related to a system alarm are saved in the SRAM.

The SRAM can store information about the latest two system alarms.

If a third system alarm is issued when information about the latest two system alarms is stored, the information about the oldest system alarm is discarded, and information about the new system alarm is saved.

Saved system alarm information can be output from the IPL screen to the memory card.   (This function is available only with the FANUC Series 30*i* /31*i* /32*i* .)

Output of system alarm information

With the FANUC Series 30*i* /31*i* /32*i*, saved system alarm information can be output from the IPL screen to the memory card.

(When using the FANUC Series FANUC Series 300*i* /310*i* /320*i* /300*i*s /310*i*s /320*i*s, use the SRAM batch save function of the NC BOOT32 function to save system alarm information to external media.)

1. Start the IPL monitor.
    If the system alarm screen is displayed when a system alarm is issued, press the reset key.
    If the power is turned off, turn on the power while holding down "-" and ".".

2. On the IPL monitor screen, enter 5 to select "5. SYSTEM ALARM UTILITY".
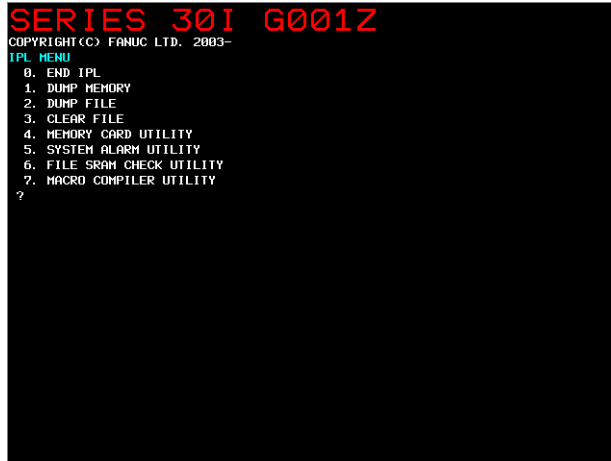
3. Enter 2 to select "2. OUTPUT SYSTEM ALARM FILE".

4. If the IPL monitor is executed on the system alarm screen, enter 2 to select "2. OUTPUT SYSTEM ALARM FILE FROM DRAM".
    If the power is turned off, enter 1 to select "1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM".

```
SERIES 30I G001Z
COPYRIGHT(C) FANUC LTD. 2003-
CHECK SYSTEM LABEL : END

OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ?
```

5. If 1 is selected in step 4, a list of saved system alarms is displayed. Enter the number of a file to be output.

```
SERIES 30I G001Z
COPYRIGHT(C) FANUC LTD. 2003-
CHECK SYSTEM LABEL : END

OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ? 1

SYSTEM ALARM FILE INFORMATION
 0. END
 1. SYS_ALM128 FSSB ALARM(UNKOWN)
    ERROR OCCURRED AT 2003/01/01 12:00:00
 2. SYS_ALM199 NON MASK INTERRUPT
    ERROR OCCURRED AT 2003/01/01 12:00:00
 ?
```

6. Enter the file name to output the file.

```
SERIES 30I G001Z
COPYRIGHT(C) FANUC LTD. 2003-
CHECK SYSTEM LABEL : END

OUTPUT SYSTEM ALARM FILE MENU
 0. END
 1. OUTPUT SYSTEM ALARM FILE FROM FILE-RAM
 2. OUTPUT SYSTEM ALARM FILE FROM DRAM
 ? 1

SYSTEM ALARM FILE INFORMATION
 0. END
 1. SYS_ALM128 FSSB ALARM(UNKOWN)
    ERROR OCCURRED AT 2003/01/01 12:00:00
 2. SYS_ALM199 NON MASK INTERRUPT
    ERROR OCCURRED AT 2003/01/01 12:00:00
 ? 1

MEM_CARD FILE NAME ? SYS_ALM1.TXT
```

11.25.3 **System Alarms Detected by Hardware**

System alarm 400 and subsequent system alarms indicate errors detected by hardware.
The basic screen configuration is shown below:

```
① SERIES 30I G001Z
② SYS_ALM401 EXTERNAL BUS INVALID ADDRESS
③ MAIN BOARD
④ 2003/04/22 17:09:53

⑤ PROGRAM COUNTER : 1000B52CH
│ ACT TASK        : 01000010H
│ ACCESS ADDRESS  :     -
│ ACCESS DATA     :     -
↓ ACCESS OPERATION:     -


⑥ BUS MASTER PCB  : MAIN BOARD
│   +--+----------+----------------------------------------------------+
│    02 MAIN BOARD 03012003 22110000 80010000 00000000 00010000 00000000
│                  FFFFFFFF FFFFFFFF 68C08216 70FE0000 00000000 00000000
│                  00000000 00000000 00000000 00000000 00000000
│
│ BUS SLAVE PCB   : CPU CARD
│   +--+----------+----------------------------------------------------+
│    00 CPU CARD   02071004 20100000 00000000 00000000 00000000 00000000
│                  FFFFFFFF FFFFFFFF 10B0FC00 CFF90001 68C30061 82160010
│                  000000F0 00000000 00010000 00000000 00000000
│
│ INFORMATION REGISTER
│   +--+----------+----------------------------------------------------+
↓    02 MAIN BOARD 00000000 00000000 00000000 00000000

                                    PAGE UP OR DOWN (PAGE  1/8)
```

[Description of the message screen]
①: Device name, and series and edition of CNC system software
②: System alarm number and error message
③: Most possibly faulty component
④: Date and time when the error occurred
⑤: Software error and other information when the error occurred
⑥: Bus information when the error occurred

Item ③ indicates the most possibly faulty component.   Mainly, check the component to see whether it is defective.
Main errors are described on the following pages.

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11.25.4 System Alarm 401 (EXTERNAL BUS INVALID ADDRESS)

```
SERIES 30I G001Z
SYS_ALM401 EXTERNAL BUS INVALID ADDRESS
MAIN BOARD
2004/04/21 20:34:16

PROGRAM COUNTER : 1000B52CH
ACT TASK        : 01000010H
ACCESS ADDRESS  :     -
ACCESS DATA     :     -
ACCESS OPERATION:     -


BUS MASTER PCB  : MAIN BOARD
  +--+---------+-------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 80010000 00000000 00010000 00000000
                 FFFFFFFF FFFFFFFF 68C08216 70FE0000 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : CPU CARD
  +--+---------+-------------------------------------------------+
   00 CPU CARD   02071004 20100000 00000000 00000000 00000000 00000000
                 FFFFFFFF FFFFFFFF 10B0FC00 CFF90001 68C30061 82160010
                 000000F0 00000000 00010000 00000000 00000000

INFORMATION REGISTER
  +--+---------+-------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                   PAGE UP OR DOWN (PAGE  1/8)
```

Description

A problem occurred on a CNC bus.

Causes

The printed circuit board may be defective or external noise may affect the bus.

Countermeasures

Replace the displayed most possibly faulty component.   In addition, the main board, or "MASTER PCB" or "SLAVE PCB" displayed on the system alarm screen may be defective.
This error may also be caused by external noise.
Check whether there is a noise origin around the machine and whether the machine is grounded properly.

11.25.5 **System Alarm 404 (S-BUS TIME OUT ERROR)**

```
SERIES 30I G001Z
SYS_ALM441 S-BUS TIME OUT ERROR
MAIN BOARD
2004/04/21 21:24:12

PROGRAM COUNTER : 102FD028H
ACT TASK        : 01000010H
ACCESS ADDRESS  :      -
ACCESS DATA     :      -
ACCESS OPERATION:      -


BUS MASTER PCB  : CPU CARD
  +--+----------+-------------------------------------------------------+
   00 CPU CARD   02071004 20100000 00000000 00000000 00040000 00000000
                 FFFFFFFF FFFFFFFF 00A88820 C3F90000 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : MAIN BOARD
  +--+----------+-------------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00000000 00000000
                 FFFFFFFF FFFFFFFF 00A88820 C3010000 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

INFORMATION REGISTER
  +--+----------+-------------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                          PAGE UP OR DOWN (PAGE  1/8)
```

Description

A problem occurred on a CNC bus.

Causes

The printed circuit board may be defective.

Countermeasures

Replace the displayed most possibly faulty component.   In addition, the main board, or "MASTER PCB" or "SLAVE PCB" displayed on the system alarm screen may be defective.

11.25.6 System Alarm 404 (ECC UNCORRECTABLE ERROR)

```
SERIES 30I G001Z
SYS_ALM404 ECC UNCORRECTABLE ERROR
CPU CARD
2003/04/22 17:09:53

PROGRAM COUNTER : 100DB2E0H
ACT TASK        : 0100FFFBH
ACCESS ADDRESS  :     -
ACCESS DATA     :     -
ACCESS OPERATION:     -


BUS MASTER PCB  : MAIN BOARD
  +--+---------+---------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 80010000 00000000 00080000 00000000
                 FFFFFFFF FFFFFFFF 68C08216 70FE0000 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : CPU CARD
  +--+---------+---------------------------------------------------+
   00 CPU CARD   02071004 20100000 00000000 00000000 00000000 00000000
                 FFFFFFFF FFFFFFFF 10B0FC00 CFF90001 68C30061 82160010
                 000000F0 00000000 00010000 00000000 00000000

INFORMATION REGISTER
  +--+---------+---------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                     PAGE UP OR DOWN (PAGE  1/8)
```

Description

A problem occurred on a CNC bus.

Causes

The printed circuit board may be defective or external noise may affect the bus.

Countermeasures

Replace the displayed most possibly faulty component.   In addition, the main board, or "MASTER PCB" or "SLAVE PCB" displayed on the system alarm screen may be defective.
This error may also be caused by external noise.
Check whether there is a noise origin around the machine and whether the machine is grounded properly.

11.25.7 **System Alarm 500 (SRAM DATA ERROR(SRAM MODULE))**

```
SERIES 30I G001Z
SYS_ALM500 SRAM DATA ERROR(SRAM MODULE)
FROM/SRAM MODULE
2004/04/21 21:26:52

PROGRAM COUNTER : 1000C0C4H
ACT TASK        : 30000001H
ACCESS ADDRESS  :     -
ACCESS DATA     :     -
ACCESS OPERATION:     -


BUS MASTER PCB  : MAIN BOARD
  +--+----------+-----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00002000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : MAIN BOARD
  +--+----------+-----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00004000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

INFORMATION REGISTER
  +--+----------+-----------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                    PAGE UP OR DOWN (PAGE  1/8)
```

Description

Data could not be transferred to the SRAM on the FROM/SRAM module normally.

Causes

The module may be defective or the connector may not be connected securely.

Countermeasures

Replace the FROM/SRAM module.
If the machine does not recover from the error after replacement, replace the main board.

11.25.8 System Alarm 502 (NOISE ON POWER SUPLY)

```
SERIES 30I G001Z
SYS_ALM502 NOISE ON POWER SUPLY
POWER SUPPLY MODULE
2004/04/21 21:26:52

PROGRAM COUNTER : 1000C0C4H
ACT TASK        : 30000001H
ACCESS ADDRESS  :     -
ACCESS DATA     :     -
ACCESS OPERATION:     -


BUS MASTER PCB  : MAIN BOARD
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00001000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : MAIN BOARD
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00004000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

INFORMATION REGISTER
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                   PAGE UP OR DOWN (PAGE  1/8)
```

Description

Noise or an instantaneous power failure occurred in the CNC power supply.

Causes

A power fault occurs.

Countermeasures

Find and remove the cause of the error.
This error may damage SRAM data.

11.25.9 System Alarm 503 (NOISE ON POWER SUPLY)

```
SERIES 30I G001Z
SYS_ALM503 NOISE ON POWER SUPLY
ABNORMAL POWER SUPPLY(MAIN BOARD)
2004/04/21 21:26:52

PROGRAM COUNTER : 1000C0C4H
ACT TASK        : 30000001H
ACCESS ADDRESS  :     -
ACCESS DATA     :     -
ACCESS OPERATION:     -


BUS MASTER PCB  : MAIN BOARD
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00001000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

BUS SLAVE PCB   : MAIN BOARD
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 03012003 22110000 A0000000 00000000 00004000 00000000
                 FFFFFFFF FFFFFFFF 822088A3 C3FE0001 00000000 00000000
                 00000000 00000000 00000000 00000000 00000000

INFORMATION REGISTER
  +--+----------+----------------------------------------------------+
   02 MAIN BOARD 00000000 00000000 00000000 00000000

                                     PAGE UP OR DOWN (PAGE  1/8)
```

Description

A fault occurred in the power supply on the main board.

Causes

The power supply module is defective.

Countermeasures

Replace the power supply module.

*11.25.10*System Alarms 114 to 130 (Alarms on the FSSB)

Causes

An alarm was detected on the FSSB.

> **NOTE**
> ”/LINEx” following a message if displayed indicates the number of an optical connector on an axis control card.
> LINE1 : COP10A-1 on the servo card
> LINE2 : COP10A-2 on the servo card
> LINE3 : COP10A-3 on the additional axis board

SYS_ALM114 FSSB DISCONNECTION (MAIN -> AMP1) /LINEx	114: Communication between the axis control card and 1st servo amplifier failed.
SYS_ALM115 FSSB DISCONNECTION (MAIN -> PULSE MODULE1) /LINEx	115: Communication between the axis control card and 1st separate detector interface unit failed.
SYS_ALM116 FSSB DISCONNECTION (AMPn -> AMPm) /LINEx	116: Communication between the nth and mth servo amplifiers failed.
SYS_ALM117 FSSB DISCONNECTION (AMPn -> PULSE MODULEm) /LINEx	117: Communication between the nth servo amplifier and mth separate detector interface unit failed.
SYS_ALM118 FSSB DISCONNECTION (PULSE MODULEn -> AMPm) /LINEx	118: Communication between the nth separate detector interface unit and mth servo amplifier failed.
SYS_ALM119 FSSB DISCONNECTION (PULSE MODULE1 -> PULSE MODULE2) /LINEx	119: Communication between the 1st and 2nd separate detector interface units failed.
SYS_ALM120 FSSB DISCONNECTION (MAIN <- AMP1) /LINEx	120: Communication between the axis control card and 1st servo amplifier failed.
SYS_ALM121 FSSB DISCONNECTION (MAIN <- PULSE MODULE1) /LINEx	121: Communication between the axis control card and 1st separate detector interface unit failed.
SYS_ALM122 FSSB DISCONNECTION (AMPn <- AMPm) /LINEx	122: Communication between the nth and mth servo amplifiers failed.
SYS_ALM123 FSSB DISCONNECTION (AMPn <- PULSE MODULEm) /LINEx	123: Communication between the nth servo amplifier and mth separate detector interface unit failed.
SYS_ALM124 FSSB DISCONNECTION (PULSE MODULEn <- AMPm) /LINEx	124: Communication between the nth separate detector interface unit and mth servo amplifier failed.
SYS_ALM125 FSSB DISCONNECTION (PULSE MODULE1 <- PULSE MODULE2) /LINEx	125: Communication between the 1st and 2nd separate detector interface units failed.
	Replace the optical cable for the relevant connection. If the error still occurs after replacement, replace the relevant axis control card, servo amplifier(s), and/or separate detector interface unit(s). When the arrow points to the left, a power fault may occur in the servo amplifier or separate detector interface unit at the base of the arrow. Check the +24 V power supply input to the relevant unit and the +5 V power supply for the pulse coder output from the relevant unit for an error such as a ground fault.

SYS_ALM126 FSSB INTERNAL DISCONNECTION (AMPn) -> /LINEx SYS_ALM127 FSSB INTERNAL DISCONNECTION (AMPn) <- /LINEx	126: Internal communication in the nth servo amplifier failed. 127: Internal communication in the nth servo amplifier failed. Replace the relevant servo amplifier.
SYS_ALM129 ABNORMAL POWER SUPPLY (SERVO:AMPn) /LINEx SYS_ALM130 ABNORMAL POWER SUPPLY (SERVO:PULSE MODULEn) /LINEx	129: A fault was detected in the power supply of the nth servo amplifier. 130: A fault was detected in the power supply of the nth separate detector interface unit. Check the power supply of the relevant servo amplifier or separate detector interface unit.
SYS_ALM134 FSSB LINE DATA ERROR (AMPn) > .. > MAIN /LINEx SYS_ALM135 FSSB LINE DATA ERROR (PULSE MODULEn) > .. > MAIN /LINEx	134: A data error occurred on the FSSB line and the nth servo amplifier received abnormal data. 135: A data error occurred on the FSSB line and the nth separate detector interface unit received abnormal data. Replace the relevant servo amplifier or separate detector interface unit. If the machine does not recover from the error after replacement, also replace the slave preceding the relevant slave. If the error still occurs, replace the servo card (or additional axis board).

11.26 SYSTEM ALARMS RELATED TO THE PMC AND I/O LINK

SYS_ALM197 EMBEDDED SOFTWARE SYSTEM ERROR
⋮
EMBEDDED SOFTWARE SYSTEM ERROR:(406N-0010)
⟵
PCxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxx   (Alarm No.)
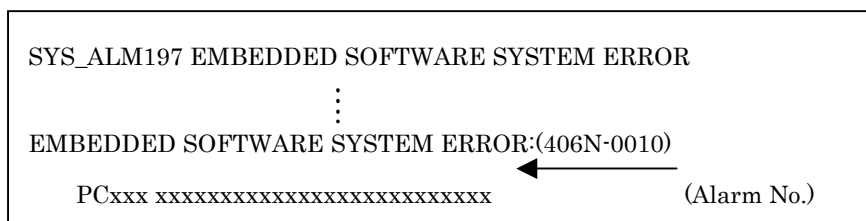
When an alarm message as shown above is displayed, a system alarm related to the PMC and I/O Link occurs.   Possible causes include an I/O link communication error and a fault in the PMC control circuit. Details are listed in the following table.

Alarm number	Contents	Faulty location/corrective action
PC004 CPU ERR xxxxxxxx:yyyyyyyy PC006 CPU ERR xxxxxxxx:yyyyyyyy PC009 CPU ERR xxxxxxxx:yyyyyyyy PC010 CPU ERR xxxxxxxx:yyyyyyyy PC012 CPU ERR xxxxxxxx:yyyyyyyy	A CPU error occurred in the PMC system. xxxxxxxx and yyyyyyyy are internal error codes.	This alarm may be due to a software/hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.
PC030 RAM PARI xxxxxxxx:yyyyyyyy	A RAM parity error occurred in the PMC system. xxxxxxxx and yyyyyyyy are internal error codes.	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.
PC050 IOLINK ER1 CHz:GRyy:xx	An I/O Link communication error occurred. z is a channel number. yy is a group number. xx is an internal error code. There is a possibility that some problem occurs at the I/O Link device or the neighborhood. However, please note that It may not show a accurate group number with some conditions of the problem. But in any case, this indicated number helps you to solve the problem.	Check the I/O device which is located at group number yy (0-15) in channel number z (1-4) with the following point of view. <1> The power of the I/O Link master and/or slave devices is faulty. – instantaneous power failure – unstable power line <2> The power cable of the I/O Link master and/or slave devices is faulty. – faulty wiring – incomplete contact <3> The communication cable to the I/O Link device is faulty. – faulty wiring – incomplete contact <4> The I/O Link device is faulty.

Alarm number	Contents	Faulty location/corrective action

PC060 BUS xxxxxxxx:yyyyyyyy	A bus error occurred in the PMC system.	<1> When you use a I/O Unit-Model A, no base extension unit is connected corresponding to a I/O assignment data. Check connection of I/O devices and I/O assignment data.
		<2> When you use Power Mate as I/O Link slave device and/or Servo Motor Beta series I/O Link option, some system alarm occurs in such devices.
		<3> A Communication may be influenced by noise. Check the ground wire and the shield of the communication cables.
		<4> The output of the I/O Link devices is short-circuited.
		<5> The power of the I/O Link master and/or slave devices is faulty.
		  – instantaneous power failure
		  – unstable power line
		<6> The power cable of the I/O Link master and/or slave devices is faulty.
		  – faulty wiring
		  – incomplete contact
		<7> The communication cable to the I/O Link device is faulty.
		  – faulty wiring
		  – incomplete contact

PC060 BUS xxxxxxxx:yyyyyyyy	A bus error occurred in the PMC system.	This alarm may be due to a software/hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.
PC070 LADDER SPE (PMCn)	A stack error occurred with the SPE functional instruction of the ladder program of n path.	Check the correspondence between the CALL or CALLU instruction and the SPE instruction.
PC097 LADDER PARITY ERR(PMCn) PC098 CODE PARITY ERR	A RAM check error occurred.	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.).

Alarm number	Contents	Faulty location/corrective action
PC501 NC/PMC INTERFACE ERR PATHn	The read or write operation between CNC and PMC failed.	Contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.).
PC502 LADDER SUBaaa (PMCn)	The sequence program uses the SUBaaa functional instruction that is not supported in PMCn.	Correct the sequence program so that the SUBaaa functional instruction will not be used.

APPENDIX

A ALARM LIST

A.1   ALARM LIST (CNC)

(1) Alarms on program and operation (PS alarm)
(2) Background edit alarms (BG alarm)
(3) Communication alarms (SR alarm)

Alarm numbers are common to all these alarm types.
Depending on the state, an alarm is displayed as in the following examples:

PS"alarm number"   Example: PS0003
BG"alarm number"   Example: BG0085
SR"alarm number"   Example: SR0001

Number	Message	Description
0001	TH ERROR	A TH error was detected during reading from an input device. The read code that caused the TH error and how many statements it is from the block can be verified in the diagnostics screen.
0002	TV ERROR	An error was detected during the single–block TV error. The TV check can be suppressed by setting TVC parameter No. 0000#0 to "0".
0003	TOO MANY DIGIT	Data entered with more digits than permitted in the NC instruction word. The number of permissible digits varies according to the function and the word.
0004	INVALID BREAK POINT OF WORDS	NC word(s) address + numerical value not in word format. This alarm is also generated when a custom macro does not contain a reserved word, or does not conform to the syntax.
0005	NO DATA AFTER ADDRESS	NC word(s) address + numerical value not in word format. This alarm is also generated when a custom macro does not contain a reserved word, or does not conform to the syntax.
0006	ILLEGAL USE OF MINUS SIGN	A minus sign (–) was specified at an NC instruction word or system variable where no minus signal may be specified.
0007	ILLEGAL USE OF DECIMAL POINT	A decimal point (.) was specified at an address where no decimal point may be specified, or two decimal points were specified.
0009	IMPROPER NC-ADDRESS	An illegal address was specified, or parameter 1020 is not set.
0010	IMPROPER G-CODE	An unusable G code is specified.
0011	FEED ZERO (COMMAND)	The cutting feedrate instructed by an F code has been set to 0. This alarm is also generated if the F code instructed for the S code is set extremely small in a rigid tapping instruction as the tool cannot cut at the programmed lead.
0014	CAN NOT COMMAND G95	A synchronous feed is specified without the option for threading / synchronous feed. Modify the program.
0015	TOO MANY SIMULTANEOUS AXES	A move command was specified for more axes than can be controlled by simultaneous axis control. Either add on the simultaneous axis control extension option, or divide the number of programmed move axes into two blocks.

Number	Message	Description
0020	OVER TOLERANCE OF RADIUS	An arc was specified for which the difference in the radius at the start and end points exceeds the value set in parameter No. 2410. Check arc center codes I, J and K in the program. The tool path when parameter No. 2410 is set to a large value is spiral.
0021	ILLEGAL PLANE SELECT	The plane selection instructions G17 to G19 are in error. Reprogram so that same 3 basic parallel axes are not specified simultaneously. This alarm is also generated when an axis that should not be specified for plane machining is specified, for example, for circular interpolation or involute interpolation. To enable programming of 3 or more axes, the helical interpolation option must be added to each of the relevant axes.
0022	R OR I,J,K COMMAND NOT FOUND	The command for circular interpolation lacks arc radius R or coordinate I, J, or K of the distance between the start point to the center of the arc.
0025	CIRCLE CUT IN RAPID (F0)	F0 (rapid traverse in inverse feed or feed specified by an F code with 1–digit number) was specified during circular interpolation (G02, G03) or involute interpolation (G02.2, G03.2).
0027	NO AXES COMMANDED IN G43/G44	No axis is specified in G43 and G44 blocks for the tool length offset type C. Offset is not canceled but another axis is offset for the tool length offset type C. Multiple axes were specified for the same block when the tool length compensation type is C.
0028	ILLEGAL PLANE SELECT	The plane selection instructions G17 to G19 are in error. Reprogram so that same 3 basic parallel axes are not specified simultaneously. This alarm is also generated when an axis that should not be specified for plane machining is specified, for example, for circular interpolation or involute interpolation. To enable programming of 3 or more axes, the helical interpolation option must be added to each of the relevant axes.
0029	ILLEGAL OFFSET VALUE	Illegal offset No.
0030	ILLEGAL OFFSET NUMBER	An illegal offset No. was specified. This alarm is also generated when the tool shape offset No. exceeds the maximum number of tool offset sets in the case of tool offset memory B.
0031	ILLEGAL P COMMAND IN G10	The relevant data input or option could not be found for the L No. of G10. No data setting address such as P or R was specified. An address command not concerned with data setting was specified. An address varies with the L No. The sign or decimal point of the specified address is in error, or the specified address is out of range.
0032	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.
0033	NO INTERSECTION AT CUTTER COMPENSATION	The intersection cannot be obtained by the intersection calculation in cutter or tool-nose radius compensation. Modify the program.
0034	NO CIRC ALLOWED IN STUP/EXT BLK	In cutter or tool-nose radius compensation, a startup or cancellation is performed in the G02 or G03 mode. Modify the program.

Number	Message	Description
0035	CAN NOT COMMANDED G31	- G31 cannot be specified. This alarm is generated when a G code (such as for cutter or tool-nose radius compensation) of group 07 is not canceled. - A torque limit skip was not specified in a torque limit skip command (G31P98 or P99). Specify the torque limit skip in the PMC window or the like. Or, specify the torque limit override by address Q.
0037	CAN NOT CHANGE PLANE IN G41/G42	The compensation plane G17/G18/G19 was changed during cutter or tool-nose radius compensation. Modify the program.
0038	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.
0039	CHF/CNR NOT ALLOWED IN G41,G42	Chamfering or corner R was specified with a start-up, a cancel, or switching between G41 and G42 in G41 and G42 commands (cutter compensation or tool nose radius compensation). The program may cause overcutting to occur in chamfering or corner R. Modify the program.
0041	INTERFERENCE IN CUTTER COMPENSATION	In cutter or tool-nose radius compensation, excessive cutting may occur. Modify the program.
0042	G45/G48 NOT ALLOWED IN CRC	Tool offset (G45 to G48) is commanded in tool compensation or three-dimensional cutter compensation. Modify the program.
0043	ILLEGAL T-CODE COMMAND	On a system with a DRILL-MATE ATC installed, M06 is not specified in a block that specifies a T code. Alternatively, a T code beyond the allowable range is specified.
0044	G27-G30 NOT ALLOWED IN FIXED CYC	One of G27 to G30 is commanded in canned cycle mode. Modify the program.
0045	ADDRESS Q NOT FOUND (G73/G83)	In a high-speed peck drilling cycle (G73) or peck drilling cycle (G83), the amount of each-time cutting is not specified by address Q, or Q0 is specified. Modify the program.
0046	ILLEGAL REFERENCE RETURN COMMAND	A command for a return to the second, third or fourth reference position is error. (The address P command is in error.) Although an option for a return to the third or fourth reference position was not set, 3 or 4 was specified in address P.
0047	ILLEGAL AXIS SELECT	Two or more parallel axes (in parallel with a basic axis) have been specified upon start-up of three-dimensional tool compensation or three-dimensional coordinate conversion.
0048	BASIC 3 AXIS NOT FOUND	Start-up of three-dimensional tool compensation or three-dimensional coordinate conversion has been attempted, but the three basic axes used when Xp, Yp, or Zp is omitted are not set in parameter No. 1022.
0049	ILLEGAL COMMAND(G68,G69)	When three-dimensional coordinate conversion (G68 or G69) was specified, the tool compensation was not canceled. Or, programs of three-dimensional coordinate conversion (G68, G69) and tool compensation (G43, G44 or G49) were not nested. Or, the three-dimensional coordinate conversion was specified during the tool length compensation and another tool length compensation was specified.
0050	CHF/CNR NOT ALLOWED IN THRD BLK	Chamfering or corner R is commanded in the thread cutting block. Modify the program.
0051	MISSING MOVE AFTER CNR/CHF	Improper movement or the move distance was specified in the block next to the chamfering or corner R block. Modify the program.
0052	CODE IS NOT G01 AFTER CHF/CNR	The block next to the chamfering or corner R block is not G01 (or vertical line). Modify the program.

Number	Message	Description
0053	TOO MANY ADDRESS COMMANDS	In the chamfering and corner R commands, two or more of I, J, K and R are specified.
0054	NO TAPER ALLOWED AFTER CHF/CNR	A block in which chamfering in the specified angle or the corner R was specified includes a taper command. Modify the program.
0055	MISSING MOVE VALUE IN CHF/CNR	In chamfering or corner R block, the move distance is less than chamfer or corner R amount. Modify the program.
0056	NO END POINT & ANGLE IN CHF/CNR	In direct dimension drawing programming, both an end point and an angle were specified in the block next to the block in which only an angle was specified (Aa). Modify the program.
0057	NO SOLUTION OF BLOCK END	Block end point is not calculated correctly in direct dimension drawing programming. Modify the program.
0058	END POINT NOT FOUND	Block end point is not found in direct dimension drawing programming. Modify the program.
0060	SEQUENCE NUMBER NOT FOUND	[External data input/output] The specified number could not be found for program number and sequence number searches. Although input/output of a pot number of tool data or offset input was requested, no tool number was input after power on. The tool data corresponding to the entered tool number could not be found. [External workpiece number search] The program corresponding to the specified workpiece number could not be found. [Program restart] In the program restart sequence number specification, the specified sequence number could not be found.
0061	P OR Q COMMAND IS NOT IN THE MULTIPLE REPETIVE CYCLES BLOCK	Address P or Q is not specified in multiple repetitive cycle (G70, G71, G72, or G73) command.
0062	THE CUTTING AMOUNT IS ILLEGAL IN THE ROUGH CUTTING CYCLE	A zero or a negative value was specified in a multiple repetitive canned rough-cutting cycle (G71 or G72) as the depth of cut.
0063	THE BLOCK OF A SPECIFIED SEQUENCE NUMBER IS NOT FOUND	The sequence number specified by addresses P and Q in multiple repetitive cycle (G70, G71, G72, or G73) command cannot be searched.
0064	THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE(FIRST AXES)	In a shape program for the multiple repetitive canned rough-cutting cycle (G71 or G72), the command for the first plane axis was not a monotonous increase or decrease.
0065	G00/G01 IS NOT IN THE FIRST BLOCK OF SHAPE PROGRAM	In the first block of the shape program specified by P of the multiple repetitive canned cycle (G70, G71, G72, or G73), G00 or G01 was not specified.
0066	UNAVAILABLE COMMAND IS IN THE MULTIPLE REPETIVE CYCLES BLOCK	An unavailable command was found in a multiple repetitive canned cycle (G70, G71, G72, or G73) command block.
0067	THE MULTIPLE REPETIVE CYCLES IS NOT IN THE PART PROGRAM STORAGE	A multiple repetitive canned cycle (G70, G71, G72, or G73) command is not registered in a tape memory area.
0069	LAST BLOCK OF SHAPE PROGRAM IS AN ILLEGAL COMMAND	In a shape program in the multiple repetitive canned cycle (G70, G71, G72, or G73), a command for the chamfering or corner R in the last block is terminated in the middle.
0070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary programs, then retry.

Number	Message	Description
0071	DATA NOT FOUND	- The address to be searched was not found. - The program with specified program number was not found in program number search. - In the program restart block number specification, the specified block number could not be found. Check the data.
0072	DATA NOT FOUND	The number of programs to be stored exceeded 63 (basic), 125 (option), 200 (option), 400 (option) or 1000 (option). Delete unnecessary programs and execute program registration again.
0073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registration again.
0074	PROGRAM NUMBER ALREADY IN USE	The program number is other than 1 to 9999. Modify the program number.
0075	PROTECT	An attempt was made to register a program whose number was protected. In program matching, the password for the encoded program was not correct.
0076	PROGRAM NOT FOUND	The specified program is not found in the subprogram call, macro call or graphic copy. The M, G, T or S codes are called by a P instruction other than that in an M98, G65, G66, G66.1 or interrupt type custom macro, and a program is called by a No. 2 auxiliary function code. This alarm is also generated when a program is not found by these calls.
0077	TOO MANY SUB,MACRO NESTING	The total number of subprogram and macro calls exceeds the permissible range. Another subprogram call was executed during an external memory subprogram call.
0078	SEQUENCE NUMBER NOT FOUND	The specified sequence No. was not found during sequence number search. The sequence No. specified as the jump destination in GOTO— and M99P— was not found.
0079	PROGRAM NOT MATCH	The program in memory does not match the program stored on tape. Multiple programs cannot be matched continuously when parameter No. 2200#3 is set to "1". Set parameter No. 2200#3 to "0" before executing a match.

0080	G37 MEASURING POSITION REACHED SIGNAL IS NOT PROPERLY INPUT	- For machining center series
		  When the tool length measurement function (G37) is performed, a measuring position reached signal goes 1 in front of the area determined by the ε value specified in parameter No.6254. Alternatively, the signal does not go 1.
		- For lathe
		  When the automatic tool compensation function (G36, G37) is used, a measuring position reached signals (XAE1, XAE2) does not go 1 within the range determined by the ε value specified in parameters No.6254 and No.6255.

Number	Message	Description
0081	G37 OFFSET NO. UNASSIGNED	- For machining center series The tool length measurement function (G37) is specified without specifying an H code. Correct the program. - For lathe The automatic tool compensation function (G36, G37) is specified without specifying an T code. Correct the program.
0082	G37 SPECIFIED WITH H CODE	- For machining center series The tool length measurement function (G37) is specified together with an H code in the same block. Correct the program. - For lathe The automatic tool compensation function (G36, G37) is specified together with an T code in the same block. Correct the program.
0083	G37 IMPROPER AXIS COMMAND	- For machining center series An error has been found in axis specification of the tool length measurement function (G37). Alternatively, a move command is specified as an incremental command. Correct the program. - For lathe An error has been found in axis specification of the automatic tool compensation function (G36, G37). Alternatively, a command is specified as an incremental command. Correct the program.
0085	OVERRUN ERROR	The next character was received from the I/O device connected to reader/punch interface 1 before it could read a previously received character.
0086	DR OFF	During I/O process by reader/punch interface 1, the data set ready input signal of the I/O device (DR) was OFF. Possible causes are an I/O device not turn on, a broken cable, and a defective printed circuit board.
0087	BUFFER OVERFLOW	During a read by reader/punch interface 1, although a read stop command was issued, more than 10 characters were input. The I/O device or printed circuit board was defective.
0090	REFERENCE RETURN INCOMPLETE	1. 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. 2. An attempt was made to set the zero position for the absolute position detector by return to the reference position when it was impossible to set the zero point. Rotate the motor manually at least one turn, and set the zero position of the absolute position detector after turning the CNC and servo amplifier off and then on again.
0091	MANUAL REFERENCE POSITION RETURN IS NOT PERFORMED IN FEED HOLD	Manual return to the reference position cannot be performed when automatic operation is halted. Perform the manual return to the reference position when automatic operation is stopped or reset.
0092	ZERO RETURN CHECK (G27) ERROR	The axis specified in G27 has not returned to zero. Reprogram so that the axis returns to zero.

Number	Message	Description
0094	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 the User's manual.
0095	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.) Perform the correct operation according to the User's manual.
0096	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.) Perform the correct operation according to the User's manual.
0097	P TYPE NOT ALLOWED (AUTO EXEC)	P type cannot be directed when the program is restarted. (After power ON, after emergency stop or alarms 0094 to 0097 reset, no automatic operation is performed.) Perform automatic operation.
0098	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.
0099	MDI EXEC NOT ALLOWED AFT. SEARCH	After completion of search in program restart, a move command is given with MDI.
0101	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.
0109	FORMAT ERROR IN G08	A value other than 0 or 1 was specified after P in the G08 code, or no value was specified.
0110	OVERFLOW :INTEGER	An integer went out of range during arithmetic calculations.
0111	OVERFLOW :FLOATING	A decimal point (floating point number format data) went out of range during arithmetic calculations.
0112	ZERO DIVIDE	An attempt was made to divide by zero in a custom macro.
0113	IMPROPER COMMAND	A function which cannot be used in custom macro is commanded. Modify the program.
0114	ILLEGAL EXPRESSION FORMAT	The format used in an expression in a custom macro statement is in error. The parameter tape format is in error.
0115	VARIABLE NO. OUT OF RANGE	A number that cannot be used for a local variable, common variable, or system variable in a custom macro is specified. In the EGB axis skip function (G31.8), a non-existent custom macro variable number is specified. Or, the number of custom macro variables used to store skip positions is not sufficient.
0116	WRITE PROTECTED VARIABLE	An attempt was made in a custom macro to use on the left side of an expression a variable that can only be used on the right side of an expression.
0118	TOO MANY BRACKET NESTING	Too many brackets "[ ]" were nested in a custom macro. The nesting level including function brackets is 5.
0119	ARGUMENT VALUE OUT OF RANGE	The value of an argument in a custom macro function is out of range.
0122	TOO MANY MACRO NESTING	Too many macro calls were nested in a custom macro.
0123	ILLEGAL MODE FOR GOTO/WHILE/DO	A GOTO statement or WHILE–DO statement was found in the main program in the MDI or DNC mode.
0124	MISSING END STATEMENT	The END instruction corresponding to the DO instruction was missing in a custom macro.

Number	Message	Description
0125	MACRO STATEMENT FORMAT ERROR	The format used in a macro statement in a custom macro is in error.
0126	ILLEGAL LOOP NUMBER	DO and END Nos. in a custom macro are in error, or exceed the permissible range (valid range: 1 to 3).
0127	DUPLICATE NC,MACRO STATEMENT	An NC statement and macro statement were specified in the same block.
0128	ILLEGAL MACRO SEQUENCE NUMBER	The specified sequence No. could not be found for sequence number search. The sequence No. specified as the jump destination in GOTO-- and M99P-- could not be found.
0129	USE 'G' AS ARGUMENT	G is used as an argument in a custom macro call. G can be specified as an argument only in an every-block call (G66.1).
0130	NC AND PMC AXIS ARE CONFLICTED	The NC command and the PMC axis control command were conflicted. Modify the program or ladder.
0136	SPOS AXIS - OTHER AXIS SAME TIME	The spindle positioning axis and another axis are specified in the same block.
0137	M-CODE & MOVE CMD IN SAME BLK.	The spindle positioning axis and another axis are specified in the same block.
0138	SUPERIMPOSED DATA OVERFLOW	The total distribution amount of the CNC and PMC is too large during superimposed control for PMC axis control.
0139	CANNOT CHANGE PMC CONTROL AXIS	The PMC axis was selected for the axis for which the PMC axis is being controlled.
0140	PROGRAM NUMBER ALREADY IN USE	In the background, an attempt was made to select or delete the program being selected in the foreground. Perform the correct operation for the background edition.
0141	CAN NOT COMMAND G51 IN 3-D OFFSET	G51 (Scaling ON) is commanded in the three-dimensional tool offset mode. Modify the program.
0142	ILLEGAL SCALE RATE	The scaling rate is 0 times or 10000 times or more. Modify the setting of the scaling rate. (G51P_ … or G51I_J_K_ … or parameter (No. 5411 or 5421))
0143	COMMAND DATA OVERFLOW	An overflow occurred in the storage length of the CNC internal data. This alarm is also generated when the result of internal calculation of scaling, coordinate rotation and cylindrical interpolation overflows the data storage. It also is generated during input of the manual intervention amount.
0144	ILLEGAL PLANE SELECTED	The coordinate rotation plane and arc or cutter compensation C plane must be the same. Modify the program.
0145	ILLEGAL USE OF G12.1/G13.1	The axis No. of plane selection parameter No. 5460 (linear axis) and No. 5461(axis of rotation) in the polar coordinate interpolation mode is out of range (1 to number of controlled axes).
0146	ILLEGAL USE OF G-CODE	The modal G code group contains an illegal G code in the polar coordinate interpolation mode or when a mode was canceled. Only the following G codes are allowed: G40, G50, G69.1 An illegal G code was specified while in the polar coordinate interpolation mode. The following C codes are not allowed: G27, G28, G30, G30.1, G31 to G31.4, G37 to G387.3, G52, G92, G53, G17 to G19, G81 to G89, G68 In the 01 group, G codes other than G01, G02, G03, G02.2 and G03.2 cannot be specified.

Number	Message	Description
0148	SETTING ERROR	Automatic corner override deceleration rate is out of the settable range of judgement angle. Modify the parameters (No.1710 to No.1714).
0154	NOT USING TOOL IN LIFE GROUP	H99 or D99 is specified when no tool management data number is assigned to the spindle position. Correct the program.
0160	MISMATCH WAITING M-CODE	A waiting M-code is in error. <1> When different M codes are specified for path 1 and path 2 as waiting M codes without a P command. <2> When the waiting M codes are not identical even though the P commands are identical <3> When the waiting M codes are identical and the P commands are not identical (This occurs when a P command is specified with binary value.) <4> When the number lists in the P commands contain a different number even though the waiting M codes are identical (This occurs when a P command is specified by combining path numbers.) <5> When a waiting M code without a P command (2-path waiting) and a waiting M code with a P command (3-or-more-path waiting) were specified at the same time <6> When a waiting M code without a P command was specified for 3 or more paths.
0161	ILLEGAL P OF WAITING M-CODE	P in a waiting M-code is incorrect. <1> When address P is negative <2> When a P value inappropriate for the system configuration was specified <3> When a waiting M code without a P command (2-path waiting) was specified in the system having 3 or more paths.
0163	ILLEGAL COMMAND IN G68/G69	G68 and G69 are not independently commanded in balance cut. An illegal value is commanded in a balance cut combination (address P).
0169	ILLEGAL TOOL GEOMETRY DATA	Incorrect tool figure data in interference check. Set correct data, or select correct tool figure data.
0175	ILLEGAL G07.1 AXIS	An axis which cannot perform cylindrical interpolation was specified. More than one axis was specified in a G07.1 block. An attempt was made to cancel cylindrical interpolation for an axis that was not in the cylindrical interpolation mode. For the cylindrical interpolation axis, set not "0" but one of 5, 6 or 7 (parallel axis specification) to parameter No. 1022 to instruct the arc with axis of rotation (ROT parameter No. 1006#1 is set to "1" and parameter No. 1260 is set) ON.
0176	ILLEGAL G-CODE USE(G07.1 MODE)	A G code was specified that cannot be specified in the cylindrical interpolation mode. This alarm also is generated when an 01 group G code was in the G00 mode or code G00 was instructed. Cancel the cylindrical interpolation mode before instructing code G00.
0179	PARAM. (NO.7510) SETTING ERROR	The number of controlled axes set by the parameter No. 7510 exceeds the maximum number. Modify the parameter setting value.
0190	ILLEGAL AXIS SELECTED (G96)	An illegal value was specified in P in a G96 block or parameter No. 5844.

Number	Message	Description
0194	SPINDLE COMMAND IN SYNCHRO-MODE	A Cs contour control mode, spindle positioning command, or rigid tapping mode was specified during the spindle synchronous control mode or simple spindle synchronous control mode.
0197	C-AXIS COMMANDED IN SPINDLE MODE	The program specified a movement along the Cs-axis when the Cs contour control switching signal was off.
0199	MACRO WORD UNDEFINED	Undefined macro word was used. Modify the custom macro.
0200	ILLEGAL S CODE COMMAND	In the rigid tap, an S value was out of range or was not specified. The parameter (Nos. 5241 to 5243) setting is an S value which can be specified for the rigid tap. Correct the parameters or modify the program.
0201	FEEDRATE NOT FOUND IN RIGID TAP	The command F code for a cutting feedrate is a zero. If the value of F command is much smaller than that of the S command, when a rigid tap command is specified, this alarm is generated. This is because cutting is not possible by the lead specified by the program.
0202	POSITION LSI OVERFLOW	In the rigid tap, spindle distribution value is too large. (System error)
0203	PROGRAM MISS AT RIGID TAPPING	In the rigid tap, position for a rigid M code (M29) or an S command is incorrect. Modify the program.
0204	ILLEGAL AXIS OPERATION	In the rigid tap, an axis movement is specified between the rigid M code (M29) block and G84 (or G74) block. Modify the program.
0205	RIGID MODE DI SIGNAL OFF	Although a rigid M code (M29) is specified in rigid tapping, the rigid mode DI signal (DGN G061.0) is not ON during execution of the G84 (or G74) block. Check the PMC ladder diagram to find the reason why the DI signal is not turned on.
0206	CAN NOT CHANGE PLANE (RIGID TAP)	Plane changeover was instructed in the rigid mode. Modify the program.
0207	RIGID DATA MISMATCH	The specified distance was too short or too long in rigid tapping.
0210	CAN NOT COMMAND M198/M99	1 The execution of an M198 or M99 command was attempted during scheduled operation. Alternatively, the execution of an M198 command was attempted during DNC operation. Modify the program. 2 The execution of an M99 command was attempted by an interrupt macro during pocket machining in a multiple repetitive canned cycle.
0212	ILLEGAL PLANE SELECT	The direct drawing dimensions programming is commanded for the plane other than the Z-X plane. Correct the program.
0213	ILLEGAL COMMAND IN SYNCHRO-MODE	In feed axis synchronization control, the following errors occurred during the synchronous operation. 1) The program issued the move command to the slave axis. 2) The program issued the manual operation to the slave axis. 3) The program issued the automatic reference position return command without specifying the manual reference position return after the power was turned on.
0214	ILLEGAL COMMAND IN SYNCHRO-MODE	Coordinate system is set or tool compensation of the shift type is executed in the synchronous control. Correct the program.
0217	DUPLICATE G51.2(COMMANDS)	G51.2 is further commanded in the G51.2 mode. Modify the program.

Number	Message	Description
0218	NOT FOUND P/Q COMMAND	P or Q is not commanded in the G51.2 block, or the command value is out of the range. Modify the program. For a polygon turning between spindles, more information as to why this alarm occurred is indicated in DGN No. 471.
0219	COMMAND G51.2/G50.2 INDEPENDENTLY	G51.2 and 50.2 were specified in the same block for other commands. Modify the program in another block.
0220	ILLEGAL COMMAND IN SYNCHR-MODE	In the synchronous operation, movement is commanded by the NC program or PMC axis control interface for the synchronous axis. Modify the program or check the PMC ladder.
0221	ILLEGAL COMMAND IN SYNCHR-MODE	Polygon machining synchronous operation and axis control or balance cutting are executed at a time. Modify the program.
0222	DNC OP. NOT ALLOWED IN BG-EDIT	Input and output are executed at a time in the background edition. Execute a correct operation.
0224	ZERO RETURN NOT FINISHED	Reference position return has not been performed before the automatic operation starts. Perform reference position return only when the parameter ZRNx (No. 1005#0) is set to 0.
0231	ILLEGAL FORMAT IN G10 L52	Errors occurred in the specified format at the programmable-parameter input.
0232	TOO MANY HELICAL AXIS COMMAND	Three or more axes were specified as helical axes in the helical interpolation mode. Five or more axes were specified as helical axes in the helical interpolation B mode.
0233	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.
0239	BP/S ALARM	While punching was being performed with the function for controlling external I/O units ,background editing was performed.
0240	BP/S ALARM	Background editing was performed during MDI operation.
0241	ILLEGAL FORMAT IN G02.2/G03.2	The end point of an involute curve on the currently selected plane, or the center coordinate instruction I, J or K of the corresponding basic circle, or basic circle radius R was not specified.
0242	ILLEGAL COMMAND IN G02.2/G03.2	An illegal value was specified in the involute curve. The coordinate instruction I, J or K of the basic circle on the currently selected plane or the basic circle radius R is "0", or the start and end points are not inside the basic circle.
0243	OVER TOLERANCE OF END POINT	The end point is not positioned on the involute curve that passes through the start point, and this error exceeds the permissible error limit (parameter No. 2510).
0244	P/S ALARM	In torque control, the total permissible move value specified as a parameter is exceeded.
0245	T-CODE NOT ALLOWED IN THIS BLOCK	One of the G codes, G50, G10, and G04, which cannot be specified in the same block as a T code, was specified with a T code.
0247	THE MISTAKE IS FOUND IN THE OUTPUT CODE OF DATA.	When an encrypted program is output, EIA is set for the output code. Specify ISO.
0250	TOOL CHANGE ILLEGAL Z AXIS COMMAND	A Z-axis move command was performed in the same block for M06 command.
0251	TOOL CHANGE ILLEGAL T COMMAND	An unusable T code was specified in M06Txx.
0253	G05 CAN NOT BE COMMANDED	A binary operation was specified during advanced preview control mode.

Number	Message	Description
0300	ILLEGAL COMMAND IN SCALING	An illegal G code was specified during scaling. Modify the program. For the T system, one of the following functions is specified during scaling, this alarm is generated. - finishing cycle (G70 or G72) - outer surface rough-cutting cycle (G71 or G73) - end side rough-cutting cycle (G72 or G74) - closed loop cutting cycle (G73 or G75) - end side cutting-off cycle (G74 or G76) - outer surface or inner surface cutting-off cycle (G75 or G77) - multiple repetitive threading cycle (G76 or G78) - face drill cycle (G83 or G83) - face tap cycle (G84 or G84) - face boring cycle (G85 or G85) - side drill cycle (G87 or G87) - side tap cycle (G88 or G88) - side boring cycle (G89 or G89) - outer surface turning cycle or inner surface boring cycle (G77 or G20) - threading cycle (G78 or G21) - end side turning cycle (G79 or G24) (Specify G codes for systems B and C in that order.)
0301	RESETTING OF REFERENCE RETURN IS INHIBITED	Although parameter No. 1012#0 (IDGx) was set to 1 to inhibit the reference position from being set again for a return to the reference position without a dog, an attempt was made to perform a manual return to the reference position.
0302	SETTING THE REFERENCE POSITION WITHOUT DOG IS NOT PERFORMED	The reference position could not be set for a return to the reference position without a dog. Possible causes are: - The axis was not moved in the direction of a return to the reference position for jog feeding. - The axis was moved in the direction opposite to the direction of a manual return to the reference position.
0303	REFERENCE POSITION RETURN IS NOT PERFORMED	When the setting of a reference position at any position was possible in Cs contour control (parameter CRF (No. 3700#0) = 1), a G00 command was issued for the Cs contour axis without a return to the reference position after the serial spindle was switched to Cs contour control mode. Perform a reference position return with a G28 command before issuing a G00 command.
0304	G28 IS COMMANDED WITHOUT ZERO RETURN	Although a reference position was not set, an automatic return to the reference position (G28) was commanded.
0305	INTERMEDIATE POSITION IS NOT ASSIGNED	Although a G28 (automatic return to the reference position), G30 (return to the second, third, or fourth reference position), or G30/1 (return to the floating reference position) command was not issued after power-up, G29 (return from the reference position) was commanded.
0306	MISMATCH AXIS WITH CNR/CHF	The correspondence between the moving axis and the I, J, or K command is incorrect in a block in which chamfering is specified.
0307	CAN NOT START REFERENCE RETURN WITH MECHANICAL STOPPER SETTING	An attempt was made to set a butt-type reference position for an axis for which to use the function to set a reference position without a dog.
0308	G72.1 NESTING ERROR	G72.1 was specified again during G72.1 rotation copying.
0309	G72.2 NESTING ERROR	G72.2 was specified again during G72.2 parallel copying.

Number	Message	Description
0310	FILE NOT FOUND	The specified file could not be found during a subprogram or macro call.
0311	CALLED BY FILE NAME FORMAT ERROR	An invalid format was specified to call a subprogram or macro using a file name.
0312	ILLEGAL COMMAND IN DIRECT DRAWING DIMENSIONS PROGRAMMING	Direct input of drawing dimensions was commanded in an invalid format. An attempt was made to specify an invalid G code during direct input of drawing dimensions. Two or more blocks not to be moved exist in consecutive commands that specify direct input of drawing dimensions. Although non-use of commas (,) (parameter No. 3405#4 = 1) was specified for direct input of drawing dimensions, a comma was specified.
0313	ILLEGAL LEAD COMMAND	The variable-lead threading increment specified in address K exceeds the specified maximum value in variable-lead threading. Or, a negative lead value was specified.
0314	ILLEGAL SETTING OF POLYGONAL AXIS	An axis was specified invalidly in polygon turning. For polygon turning: A tool rotation axis is not specified. (Parameter No. 7610) For polygon turning between spindles: Valid spindles are not specified. (Parameter Nos. 7640 to 7643) - A spindle other than the serial spindle. - A spindle is not connected.
0315	ILLEGAL NOSE ANGLE COMMAND IS IN THE THREAD CUTTING CYCLE	An invalid tool tip angle is specified in a multiple repetitive canned threading cycle (G76).
0316	ILLEGAL CUTTING AMOUNT IS IN THE THREAD CUTTING CYCLE	An minimum depth of cut higher than the thread height is specified in a multiple repetitive canned threading cycle (G76).
0317	ILLEGAL THREAD COMMAND IS IN THE THREAD CUTTING CYCLE	A zero or a negative value is specified in a multiple repetitive canned threading cycle (G76) as the thread height or the depth of cut.
0318	ILLEGAL RELIEF AMOUNT IS IN THE DRILLING CYCLE	Although an escape directions is set in a multiple repetitive canned cutting-off cycle (G74 or G75), a negative value is specified for Δd.
0319	THE END POINT COMMAND IS ILLEGAL IN THE DRILLING CYCLE	Although the Δi or Δk travel distance is set to 0 in a multiple repetitive canned cutting-off cycle (G74 or G75), a value other than 0 us specified for a U or W.
0320	ILLEGAL MOVEMENT AMOUNT/CUTTING AMOUNT IS IN THE DRILLING CYCLE	A negative value is specified in a multiple repetitive canned cutting-off cycle (G74 or G75) as Δi or Δk (travel distance/the depth of cut).
0321	ILLEGAL REPEATED TIME IS IN THE PATTERN REPEATING CYCLE	A zero or a negative value is specified in a multiple repetitive canned closed loop cycle (G73) as a repeated time.
0322	FINISHING SHAPE WHICH OVER OF STARTING POINT	An invalid shape which is over the cycle starting point is specified in a shape program for a multiple repetitive canned rough-cutting cycle (G71 or G72).
0323	THE FIRST BLOCK OF SHAPE PROGRAM IS A COMMAND OF TYPE II	Type II is specified in the first block of the shape program specified by P in a multiple repetitive canned rough-cutting cycle (G71 or G72). Z (W) command is for G71. X (U) command is for G72.
0324	THE INTERRUPTION TYPE MACRO WAS DONE IN THE MULTIPLE REPETIVE CYCLES	An interruption type macro was issued during the multiple repetitive canned cycle (G70, G71, G72, or G73).

Number	Message	Description
0325	UNAVAILABLE COMMAND IS IN SHAPE PROGRAM	An usable command was issued in a shape program for a multiple repetitive canned cycle (G70, G71, G72, or G73).
0326	LAST BLOCK OF SHAPE PROGRAM IS A DIRECT DRAWING DIMENSIONS	In a shape program in the multiple repetitive canned cycle (G70, G71, G72, or G73), a command for direct input of drawing dimensions in the last block is terminated in the middle.
0327	MODAL THAT MULTIPLE REPETIVE CYCLES CANNOT BE DONE	A multiple repetitive canned cycle (G70, G71, G72, or G73) was commanded in a modal state in which a multiple repetitive canned cycle could not be commanded.
0328	ILLEGAL WORK POSITION IS IN THE TOOL NOSE RADIUS COMPENSATION	The specification for the blank side for a tool-nose radius compensation (G41 or G42) is incorrect in a multiple repetitive canned cycle (G71 or G72).
0329	THE FINISHING SHAPE IS NOT A MONOTONOUS CHANGE(SECOND AXES)	In a shape program for the multiple repetitive canned rough-cutting cycle (G71 or G72), the command of the second plane axis was not a monotonous increase or decrease.
0330	ILLEGAL AXIS COMMAND IS IN THE TURNING CANNED CYCLE	An axis other than the plane is specified n a canned cycle(G90, G92, or G94).
0331	ILLEGAL AXIS NUMBER IN AX[]	An illegal value is specified for an AX[] axis number.
0332	ILLEGAL AXIS ADDRESS IN AXNUM[]	An illegal value is specified for an AXNUM[] axis address.
0333	TOO MANY SPINDLE COMMANDS	Multiple spindle commands could be found in the same block in using an expansion spindle name. Only one spindle could be commanded in the same block.
0334	OFFSET IS OUT OF EFFECTIVE RANGE	An offset data which was out of the effective range was specified. (malfunction prevention function)
0335	PLURAL M CODE	Multiple M codes are commanded simultaneously in a block for a wait function with peripheral devices by an M code.
0336	TOOL COMPENSATION COMMANDED MORE TWO AXES	For a tool length compensation C, an attempt was made to command the offset to other axes without canceling the offset. Or, for a tool length compensation C, multiple axes are specified in G43 or G44 block.
0337	EXCESS MAXIMUM INCREMENTAL VALUE	The command value exceeded the maximum amount of incremental. (malfunction prevention function)
0338	CHECK SUM ERROR	An incorrect value was detected in a check sum. (malfunction prevention function)
0340	ILLEGAL RESTART(NANO SMOOTHING)	With manual absolute turned on, an attempt was made to restart the operation in nano smoothing mode after performing the manual interaction.
0341	TOO MANY COMMAND BLOCK (NANO SMOOTHING)	There are more blocks than can be commanded consecutively in nano smoothing mode.
0342	CUSTOM MACRO INTERRUPT ENABLE IN NANO SMOOTHING	A custom macro interrupt was enabled in nano smoothing mode. Or, nano smoothing mode was commanded with a custom macro interrupt enabled.
0343	ILLEGAL COMMAND IN NANO SMOOTHING	G43, G44, or G49 was commanded during a nano smoothing.
0344	CANNOT CONTINUE NANO SMOOTHING	An illegal command or operation by which a nano smoothing could not be continued was performed.
0345	TOOL CHANGE ILLEGAL Z AXIS POS	A tool change position on the Z-axis is incorrect.
0346	TOOL CHANGE ILLEGAL TOOL NUM	A tool change position is not set.
0347	TOOL CHANGE ILLEGAL COMMAND IN SAME BLK.	Tool changing is commanded twice or more in the same block.

Number	Message	Description
0348	TOOL CHANGE Z AXIS POS NOT ESTABLISHED	A tool change spindle on the Z-axis is not set.
0349	TOOL CHANGE SPINDLE NOT STOP	A tool change spindle stop is not stopped.
0350	PARAMETER OF THE INDEX OF THE SYNCHRONOUS CONTROL AXIS SET ERROR.	An illegal synchronization control axis number (parameter No. 8180) is set.
0351	BECAUSE THE AXIS IS MOVING, THE SYNC CONTROL IS CAN'T BE USED.	While the axis being subject to synchronization control was moving, an attempt was made to start or cancel the synchronization control by a synchronization control axis selection signal.
0352	SYNCHRONOUS CONTROL AXIS COMPOSITION ERROR.	This error occurred when: 1) An attempt was made to perform synchronization control for the axis during a synchronization, composition, or superposition. 2) An attempt was made to synchronize a further great-grandchild for a parent-child-grandchild relation. 3) An attempt was made to operate synchronization control although a parent-child-grandchild relation was not set.
0353	THE INSTRUCTION WAS DONE FOR THE AXIS WHICH WAS NOT ABLE TO MOVE.	This error occurred when: - For synchronization 1) A move command was issued to the axis for which parameter No. 8163#7NUMx is set to 1. 2) A move command was issued to the slave axis. - For composition 1) A move command was issued to the axis for which parameter No. 8163#7NUMx is set to 1. 2) A move command was issued to the axis for which parameter No. 8162#7MUMx is set to 1.
0354	THE G28 WAS INSTRUCTED IN WITH THE REF POS NOT FIXED IN SYNC MODE	This error occurred when G28 was specified to the master axis being parking during synchronization control, but an axis reference position is not set for the slave axis.
0355	PARAMETER OF THE INDEX OF THE COMPOSITE CONTROL AXIS SET ERROR.	An illegal composite control axis number (parameter No. 8183) is specified.
0356	BECAUSE THE AXIS IS MOVING, THE COMP CONTROL IS CAN'T BE USED.	While the axis being subject to composite control was moving, an attempt was made to start or cancel the composite control by a composite control axis selection signal.
0357	COMPOSITE CONTROL AXIS COMPOSITION ERROR.	This error occurred when an attempt was made to perform composite control for the axis during a synchronization, composition, or superposition.
0359	THE G28 WAS INSTRUCTED IN WITH THE REF POS NOT FIXED IN COMP MODE	This error occurred when G28 was specified to the composite axis during composite control, but a reference position is not set to the other part of the composition.
0360	PARAMETER OF THE INDEX OF THE SUPERPOS CONTROL AXIS SET ERROR.	An illegal superposition control axis number (parameter No. 8186) is specified.
0361	BECAUSE THE AXIS IS MOVING, THE SUPERPOS CONTROL IS CAN'T BE USED.	While the axis being subject to superposition control was moving, an attempt was made to start or cancel the superposition control by a superposition control axis selection signal.

Number	Message	Description
0362	SUPERPOSITION CONTROL AXIS COMPOSITION ERROR.	This error occurred when: 1) An attempt was made to perform superposition control for the axis during a synchronization, composition, or superposition. 2) An attempt was made to synchronize a further great-grandchild for a parent-child-grandchild relation.
0363	THE G28 WAS INSTRUCTED IN TO THE SUPERPOS CONTROL SLAVE AXIS.	This error occurred when G28 was specified to the superposition control slave axis during superposition control.
0364	THE G53 WAS INSTRUCTED IN TO THE SUPERPOS CONTROL SLAVE AXIS.	This error occurred when G53 was specified to the slave axis being moved during superposition control.
0365	TOO MANY MAXIMUM SV/SP AXIS NUMBER PER PATH	The maximum control axis number or maximum control spindle number which could be used within a path was exceeded. (For a loader path, this alarm is generated if the number of axis per path is set to 5 or greater.)
0366	IMPROPER G-CODE IN TURRET METHOD	When the turret change tools method was selected (parameter No. 5040#3 (TCT) = 0), G43, G43.1, G43.4, G43.5, or G43.7 was commanded.
0367	3-D CONV. WAS COMMANDED IN SYNC MODE AS THE PARAMETER PKUx(NO.8162#2) IS 0.	A three-dimensional coordinate conversion was commanded during synchronization control when the parameter PKUx (No.8162#2) was 0.
0368	OFFSET REMAIN AT OFFSET COMMAND	When the ATC change tools method was selected (parameter No. 5040#3 (TCT) = 1) during G43, G43.1, G43.4, or G43.5 mode, G43.7 was commanded. Or, G43, G43.1, G43.4, or G43.5 was commanded during G43.7 mode.
0369	G31 FORMAT ERROR	- No axis is specified or tow or more axes are specified in the torque limit switch instruction (G31P98/P99). - The specified torque Q value in the torque limit switch instruction is out of range. The torque Q range is 1 to 99.
0370	G31P/G04Q ERROR	The specified address P value for G31 is out of range. The address P range is 1 to 4 in a multistage skip function. The specified address Q value for G04 is out of range. The address Q range is 1 to 4 in a multistage skip function. Or, P1-4 for G31, or Q1-4 for G04 was commanded without a multistage skip function option.
0371	ILLEGAL FORMAT IN G10 OR L50	In a command format for a programmable parameter input, an attempt was made to change the parameter for an encryption (No. 3220), key (No. 3221), or protection range (No.3222 or No.3223) as a "the encryption function for the key and program." Modify the program.
0372	REFERENCE RETURN INCOMPLETE	An attempt was made to perform an automatic return to the reference position on the orthogonal axis before the completion of a return to the reference position on the angular axis. However, this attempt failed because a manual return to the reference position during angular axis control or an automatic return to the reference position after power-up was not commanded. First, return to the reference position on the angular axis, then return to the reference position on the orthogonal axis.
0373	ILLEGAL HIGH-SPEED SKIP SIGNAL	In the skip commands (G31, G31P1 to G31P4) and dwell commands (G04, G04Q1 to G04Q4), the same high-speed signal is selected in different paths.

Number	Message	Description
0374	ILLEGAL REGISTRATION OF TOOL MANAGER(G10)	G10L75 or G10L76 data was registered during the following data registration: - From the PMC window. - From the FOCAS2. - By G10L75 or G10L76 in another system. Command G10L75 or G10L76 again after the above operation is completed.
0375	CAN NOT ANGULAR CONTROL(SYNC:MIX:OVL)	Angular axis control is disabled for this axis configuration. 1) When some related axes under angular axis control are not in synchronous control mode or when one angular axis is not paired with the other angular axis or one Cartesian axis is not paired with the other Cartesian axis in synchronous control 2) When some related axes under composite control are not in composite control mode or when one angular axis is not paired with the other angular axis or one Cartesian axis is not paired with the other Cartesian axis in composite control 3) When related axes under angular axis control is switched to superposition control mode1)
0376	SERIAL DCL: ILLEGAL PARAMETER	1. When Parameter No.1815#1 is set to "1", parameter No.2002#3 is set to "0" 2. The absolute-position detection function is enabled. (Parameter No.1815#5 is set to "1".)
0387	ILLEGAL RTM DI/DO VAR	There is no DI/DO variable that has a specified signal address (alphabet, number).
0389	ILLEGAL RTM SIGNAL BIT	Bits other than bits 0 to 7 cannot be specified with a DI/DO signal.
0391	RTM BRANCH OVER	The number of branches supported with real time custom macros was exceeded.
0392	TOO MANY SENTENCE CONTROL	Many reserved words (ZONCE, ZEDGE, ZWHILE, ZDO, ZEND, G65, M99) for RTM control were used in a real time macro command.
0393	NO SENTENCE CONTROL	In a real time macro command, there is no data to be assigned.
0394	ILLEGAL SENTENCE CONTROL	The matching of reserved words (ZONCE, ZEDGE, ZWHILE, ZDO, ZEND, G65, M99) for RTM control is incorrect.
0395	ILLEGAL NC WORD CONTROL	Control code G65 or M99 for calling a subprogram or returning from a subprogram is not coded correctly.
0396	ILLEGAL RTM SENTENCE CONTROL	In other than a real time macro command, a reserved word (ZONCE, ZEDGE, ZWHILE, ZDO, or ZEND) for RTM control is used.
0397	RTM BUFFER OVER	There is no buffer available for real time macro commands. Too many blocks read in advance are buffered as triggers used by real time macro commands.
0398	'ID OVER IN BUFFER	In blocks read in advance, there are too many real time macro commands with the same ID.
0399	'ID EXECUTION IN SAME TIME	An attempt was made to execute real time macro commands with the same ID by using the same NC statement as a trigger.
0400	ONESHOT CMDOVER	Too many one-shot real time macro commands are specified.
0401	EXEC CMD NUM OVER IN SAME TIME	The number of real time macro commands that can be executed simultaneously was exceeded
0402	ILLEGAL TOKEN FOR RTM	A token, variable, or function that is not supported by the real time custom macro function was detected.
0403	ACCESS TO RTM PROTECT VAR	An attempt was made to access a protected variable.

Number	Message	Description
0404	RTM ERROR	An error related to a real time macro command occurred.
0406	CODE AREA SHORTAGE	The storage size of the real time macro area is insufficient.
0407	DOULE SLASH IN RTM MODE	In the compile mode, an attempt was made to set the compile mode again.
0408	G90 IS NOT PERMITTED	The absolute command cannot be specified.
0409	ILLEGAL AXIS NO	An invalid axis number is specified.
0410	MIDDLE POINT IS NOT ZERO	An intermediate point other than 0 is specified with G28.
0411	SIMULTANEOUSLY AXES OVER	The maximum number of axes that can be controlled simultaneously was exceeded.
0412	ILLEGAL G CODE	An unusable G code was used.
0413	ILLEGAL ADDRESS	An unusable address was used.
0414	ILLEGAL PMC AXIS NO.	An invalid PMC axis number is specified.
0415	GROUP IS IN USE	The group to which the specified axis belongs is already in used.
0416	UNABLE TO USE THE AXIS	The specified axis cannot be used.
0417	AXIS IS UNABLE TO MOVE	The specified axis is placed in the inoperative state.
0418	ILLEGAL FEED SETTING	An incorrect feedrate is set.
0419	ILLEGAL DISTANCE SETTING	A travel distance beyond the specifiable range is specified.
0420	CONSTANT NUMBER P	A subprogram is specified not by using a constant.
0421	ILLEGAL ARGUMENT G54	With G65, an invalid argument, L, is used.
0422	ILLEGAL ARGUMENT G54	With G65, an invalid argument is used.
0423	NO PMC AXIS CONTROL OPTION	The option for PMC axis control is missing.
0424	MULTIPLE AXES IN ONE GROUP	Multiple axes are using one group.
0425	ONE AXIS USE MULTIPLE GROU	One axis is using multiple groups.
0429	ILLEGAL COMMAND IN G10.6	When retract was started in a threading block, a retract command had been issued for the long axis direction of threading.
1014	ILLEGAL FORMAT OF PROGRAM NO.	Address O or N is not followed by a number.
1016	EOB NOT FOUND	EOB (End of Block) code is missing at the end of a program input in the MDI mode.
1018	M99 IN MAIN PROGRAM	A M99 was commanded during main program when the parameter AMM (No. 7712#4) = 1 was set.
1059	COMMAND IN BUFFERING MODE	The manual intervention compensation request signal MIGET became "1" when a advanced block was found during automatic operation. To input the manual intervention compensation during automatic operation, a sequence for manipulating the manual intervention compensation request signal MIGET is required in an M code instruction without buffering.
1077	PROGRAM IN USE	An attempt was made in the foreground to execute a program being edited in the background. The currently edited program cannot be executed, so end editing and restart program execution.
1079	PROGRAM FILE NOT FOUND	The program of the specified file No. is not registered in an external device. (external device subprogram call)
1080	DUPLICATE DEVICE SUB PROGRAM CALL	Another external device subprogram call was made from a subprogram after the subprogram called by the external device subprogram call.
1081	EXT DEVICE SUB PROGRAM CALL MODE ERROR	The external device subprogram call is not possible in this mode.

Number	Message	Description
1091	DUPLICATE SUB-CALL WORD	More than one subprogram call instruction was specified in the same block.
1092	DUPLICATE MACRO-CALL WORD	More than one macro call instruction was specified in the same block.
1093	DUPLICATE NC-WORD & M99	An address other than O, N, P or L was specified in the same block as M99 during the macro modal call state.
1095	TOO MANY TYPE-2 ARGUMENT	More than ten sets of I, J and K arguments were specified in the type–II arguments (A, B, C, I, J, K, I, J, K, ...) for custom macros.
1096	ILLEGAL VARIABLE NAME	An illegal variable name was specified. A code that cannot be specified as a variable name was specified. [#_OFSxx] does not match the tool offset memory option configuration.
1097	TOO LONG VARIABLE NAME	The specified variable name is too long.
1098	NO VARIABLE NAME	The specified variable name cannot be used as it is not registered.
1099	ILLLEGAL SUFFIX [ ]	A suffix was not specified to a variable name that required a suffix enclosed by [ ]. A suffix was specified to a variable name that did not require a suffix enclosed by [ ]. The value enclosed by the specified [ ] was out of range.
1100	CANCEL WITHOUT MODAL CALL	Call mode cancel (G67) was specified even though macro continuous–state call mode (G66) was not in effect.
1101	ILLEGAL CNC STATEMENT IRT.	An interrupt was made in a state where a custom macro interrupt containing a move instruction could not be executed.
1115	READ PROTECTED VARIABLE	An attempt was made in a custom macro to use on the right side of an expression a variable that can only be used on the left side of an expression.
1120	ILLEGAL ARGUMENT FORMAT	The specified argument in the argument function (ATAN, POW) is in error.
1124	MISSING DO STATEMENT	The DO instruction corresponding to the END instruction was missing in a custom macro.
1125	ILLEGAL EXPRESSION FORMAT	The description of the expression in a custom macro statement contains an error. A parameter program format error. The screen displayed to enter periodic maintenance data or item selection menu (machine) data does not match the data type.
1128	SEQUENCE NUMBER OUT OF RANGE	The jump destination sequence No. in a custom macro statement GOTO instruction was out of range (valid range: 1 to 99999999).
1131	MISSING OPEN BRACKET	The number of left brackets ([) is less than the number of right brackets (]) in a custom macro statement.
1132	MISSING CLOSE BRACKET	The number of right brackets (]) is less than the number of left brackets ([) in a custom macro statement.
1133	MISSING '='	An equal sign (=) is missing in the arithmetic calculation instruction in a custom macro statement.
1134	MISSING ','	A delimiter (,) is missing in a custom macro statement.
1137	IF STATEMENT FORMAT ERROR	The format used in the IF statement in a custom macro is in error.
1138	WHILE STATEMENT FORMAT ERROR	The format used in the WHILE statement in a custom macro is in error.
1139	SETVN STATEMENT FORMAT ERROR	The format used in the SETVN statement in a custom macro is in error.

Number	Message	Description
1141	ILLEGAL CHARACTER IN VAR. NAME	The SETVN statement in a custom macro contacts a character that cannot be used in a variable name.
1142	TOO LONG V-NAME (SETVN)	The variable name used in a SETVN statement in a custom macro exceeds 8 characters.
1143	BPRNT/DPRNT STATEMENT FORMAT ERROR	The format used in the BPRINT statement or DPRINT statement is in error.
1144	G10 FORMAT ERROR	The G10 L No. contains no relevant data input or corresponding option. Data setting address P or R is not specified. An address not relating to the data setting is specified. Which address to specify varies according to the L No. The sign, decimal point or range of the specified address are in error.
1145	G10.1 TIME OUT	The response to a G10.1 instruction was not received from the PMC within the specified time limit.
1146	G10.1 FORMAT ERROR	The G10.1 instruction format is in error.
1152	G31.9/G31.8 FORMAT ERROR	The format of the G31.9 or G31.8 block is erroneous in the following cases: - The axis was not specified in the G31.9 or G31.8 block. - Multiple axes were specified in the G31.9 or G31.8 block. - The P code was specified in the G31.9 or G31.8 block.
1153	CANNOT USE G31.9	G31.9 cannot be specified in this modal state. This alarm is also generated when G31.9 is specified when a group 07 G code (e.g. cutter compensation) is not canceled.
1160	COMMAND DATA OVERFLOW	An overflow occurred in the position data within the CNC. This alarm is also generated if the target position of a command exceeds the maximum stroke as a result of calculation such as coordinate conversion, offset, or introduction of a manual intervention amount.
1180	ALL PARALLEL AXES IN PARKING	All of the axis specified for automatic operation are parked.
1196	ILLEGAL DRILLING AXIS SELECTED	An illegal axis was specified for drilling in a canned cycle for drilling. If the zero point of the drilling axis is not specified or parallel axes are specified in a block containing a G code in a canned cycle, simultaneously specify the parallel axes for the drilling axis.
1200	PULSCODER INVALID ZERO RETURN	The grid position could not be calculated during grid reference position return using the grid system as the one–revolution signal was not received before leaving the deceleration dog. This alarm is also generated when the tool does not reach a feedrate that exceeds the servo error amount preset to parameter No. 1841 before the deceleration limit switch is left (deceleration signal *DEC returns to "1").
1202	NO F COMMAND AT G93	F codes in the inverse time specification mode (G93) are not handled as modal, and must be specified in individual blocks.
1223	ILLEGAL SPINDLE SELECT	An attempt was made to execute an instruction that uses the spindle although the spindle to be controlled has not been set correctly.
1282	ILLEGAL COMMAND IN 3-D OFFSET	An illegal G code was specified in the three–dimensional tool offset mode.
1283	ILLEGAL IJK IN 3-D OFFSET	When bit 0 (ONI) of parameter No. 6029 is set to 1, I, J, and K commands are specified without the decimal point in three–dimensional tool compensation mode.

Number	Message	Description
1298	ILLEGAL INCH/METRIC CONVERSION	An error occurred during inch/metric switching.
1300	ILLEGAL ADDRESS	The axis No. address was specified even though the parameter is not an axis–type while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. Axis No. cannot be specified in pitch error compensation data.
1301	MISSING ADDRESS	The axis No. was not specified even though the parameter is an axis–type while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. Or, data No. address N, or setting data address P or R are not specified.
1302	ILLEGAL DATA NUMBER	A non–existent data No. was found while loading parameters or pitch error compensation data from a tape or by entry of the G10 parameter. An invalid address R value is specified in a pattern program for each machining purpose on the high–speed high–precision setting screen. This alarm is also generated when illegal word values are found.
1303	ILLEGAL AXIS NUMBER	An axis No. address exceeding the maximum number of controlled axes was found while loading parameters from a tape or by entry of the G10 parameter.
1304	TOO MANY DIGIT	Data with too many digits was found while loading parameters or pitch error compensation data from a tape.
1305	DATA OUT OF RANGE	Out–of–range data was found while loading parameters or pitch error compensation data from a tape. The values of the data setting addresses corresponding to L Nos. during data input by G10 was out of range. This alarm is also generated when NC programming words contain out–of–range values.
1306	MISSING AXIS NUMBER	A parameter which requires an axis to be specified was found without an axis No. (address A) while loading parameters from a tape.
1307	ILLEGAL USE OF MINUS SIGN	Data with an illegal sign was found while loading parameters or pitch error compensation data from a tape, or by entry of the G10 parameter. A sign was specified to an address that does not support the use of signs.
1308	MISSING DATA	An address not followed by a numeric value was found while loading parameters or pitch error compensation data from a tape.
1329	ILLEGAL MACHINE GROUP NUMBER	An machine group No. address exceeding the maximum number of controlled machine groups was found while loading parameters from a tape or by entry of the G10 parameter.
1330	ILLEGAL SPINDLE NUMBER	An spindle No. address exceeding the maximum number of controlled spindles was found while loading parameters from a tape or by entry of the G10 parameter.
1331	ILLEGAL PATH NUMBER	An path No. address exceeding the maximum number of controlled path was found while loading parameters from a tape or by entry of the G10 parameter.
1332	DATA WRITE LOCK ERROR	Could not load data while loading parameters, pitch error compensation data and work coordinate data from tape.
1333	DATA WRITE ERROR	Could not write data while loading data from tape.

Number	Message	Description
1360	PARAMETER OUT OF RANGE (TLAC)	Illegal parameter setting. (Set value is out of range.)
1361	PARAMTER SETTING ERROR 1 (TLAC)	Illegal parameter setting. (axis of rotation setting)
1362	PARAMETER SETTING ERROR 2 (TLAC)	Illegal parameter setting (tool axis setting)
1370	PARAMETER SETTING ERROR (DM3H-1)	Out–of–range data was set during setting of the three–dimensional handle feed parameter.
1371	PARAMETER SETTING ERROR (DM3H-2)	An illegal axis of rotation was set during setting of the three–dimensional handle feed parameter.
1372	PARAMETAR SETTING ERROR (DM3H-3)	An illegal master axis was set during setting of the three–dimensional handle feed parameter.
1373	PARAMETER SETTING ERROR (DM3H-4)	An illegal parallel axis or twin table was set during setting of the three–dimensional handle feed parameter.
1470	G40.1 –G42.1 PARAMETER MISS	A parameter setting related to normal direction control is illegal. The axis number of a normal direction controlled axis is set in parameter No. 5480, but that axis number is in the range of the number of controlled axes. The axis set as a normal direction controlled axis is not set as a rotation axis (ROTx, bit 0 of parameter No. 1006) = 1 and No.1022=0). Set the feedrate at which to insert rotation about a normal direction controlled axis in parameter No. 5481, in the range of 1 to 15000 mm/min.
1508	DUPLICATE M-CODE (INDEX TABLE REVERSING)	A function to which the same code as this M code is set exists. (index table indexing)
1509	DUPLICATE M-CODE (SPOS AXIS ORIENTATION)	A function to which the same code as this M code is set exists. (spindle positioning, orientation)
1510	DUPLICATE M-CODE (SPOS AXIS POSITIONING)	A function to which the same code as this M code is set exists. (spindle positioning, positioning)
1511	DUPLICATE M-CODE (SPOS AXIS RELEASE)	A function to which the same code as this M code is set exists. (spindle positioning, mode cancel)
1531	ILLEGAL USE OF DECIMAL POINT (F-CODE)	When the feedrate instruction contains valid data below the decimal point, the alarm is set and the F code contains valid data below the decimal point.
1532	ILLEGAL USE OF DECIMAL POINT (E-CODE)	When the feedrate instruction contains valid data below the decimal point, the alarm is set and the E code contains valid data below the decimal point.
1533	ADDRESS F UNDERFLOW (G95)	The feedrate for the hole drilling axis calculated from the F and S codes is too slow in the feed per single rotation mode (G95).
1534	ADDRESS F OVERFLOW (G95)	The feedrate for the hole drilling axis calculated from the F and S codes is too fast in the feed per single rotation mode (G95).
1535	ADDRESS E UNDERFLOW (G95)	The feedrate for the hole drilling axis calculated from the E and S codes is too slow in the feed per single rotation mode (G95).
1536	ADDRESS E OVERFLOW (G95)	The feedrate for the hole drilling axis calculated from the E and S codes is too fast in the feed per single rotation mode (G95).
1537	ADDRESS F UNDERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too slow.
1538	ADDRESS F OVERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too fast.
1539	ADDRESS E UNDERFLOW (OVERRIDE)	The speed obtained by applying override to the E instruction is too slow.
1540	ADDRESS E OVERFLOW (OVERRIDE)	The speed obtained by applying override to the E instruction is too fast.

Number	Message	Description
1541	S-CODE ZERO	"0" has been instructed as the S code.
1542	FEED ZERO (E-CODE)	"0" has been instructed as the feedrate (E code).
1543	ILLEGAL GEAR SETTING	The gear ratio between the spindle and position coder, or the set position coder number of pulses is illegal in the spindle positioning function.
1544	S-CODE OVER MAX	The S command exceeds the maximum spindle rotation number.
1548	ILLGAL AXIS MODE	The spindle positioning axis/Cs contour control axis was specified during switching of the controlled axis mode.
1561	ILLEGAL INDEXING ANGLE	The specified angle of rotation is not an integer multiple of the minimum indexing angle.
1564	INDEX TABLE AXIS – OTHER AXIS SAME TIME	The index table indexing axis and another axis have been specified in the same block.
1567	INDEX TABLE AXIS DUPLICATE AXIS COMMAND	Index table indexing was specified during axis movement or on an axis for which the index table indexing sequence was not completed.
1580	ENCODE ALARM (PSWD&KEY)	When an attempt was made to read a program, the specified password did not match the password on the tape and the password on tape was not equal to 0. When an attempt was made to punch an encrypted tape, the password was not in the range 0 to 99999999. The password parameter is No. 2210.
1581	ENCODE ALARM (PARAMETER)	When an attempt was made to punch an encrypted tape, the punch code parameter was set to EIA. Set parameter ISO (No. 0000#1) to "0". An incorrect instruction was specified for program encryption or protection. This alarm is generated if an attempt is made to perform program editing, deletion, or range-specified punch-out in the protected range in the lock state. Or, a program outside the protected range is specified in rage specification punch-out in the unlock state. The protected range is defined from the program No. preset by parameter No. 3222 up to the program No. preset to parameter No. 3223. When both parameters are set to "0", the protected range becomes O9000 to O9999.
1590	TH ERROR	A TH error was detected during reading from an input device. The read code that caused the TH error and how many statements it is from the block can be verified in the diagnostics screen.
1591	TV ERROR	An error was detected during the single–block TV error. The TV check can be suppressed by setting TVC parameter No. 0000#0 to "0".
1592	END OF RECORD	The EOR (End of Record) code is specified in the middle of a block. This alarm is also generated when the percentage at the end of the NC program is read. For the program restart function, this alarm is generated if a specified block is not found.

Number	Message	Description
1593	EGB PARAMETER SETTING ERROR	Error in setting a parameter related to the EGB (1) The setting of SYN, bit 0 of parameter No. 2011, is not correct. (2) The slave axis specified with G81 is not set as a rotation axis. (ROT, bit 0 of parameter No. 1006) (3) Number of pulses per rotation (Parameter (No. 7772 or No. 7773) or (No. 7782 or 7783) is not set.) (4) For a hobbing-machine-compatible command, parameter No. 7710 is not specified.
1594	EGB FORMAT ERROR	Error in the format of the block of an EGB command (1) T (number of teeth) is not specified in the G81 block. (2) In the G81 block, the data specified for one of T, L, P, and Q is out of its valid range. (3) n the G81 block, only one of P and Q is specified. (4) In the G81.5 block, there is no command for the master or slave axis. (5) In the G81.5 block, data out of the specified range is specified for the master or slave axis.
1595	ILL-COMMAND IN EGB MODE	During synchronization with the EGB, a command that must not be issued is issued. (1) Slave axis command using G27, G28, G29, G30,G30.1, G33, G53, etc. (2) Inch/metric conversion command using G20, G21, etc.
1596	EGB OVERFLOW	An overflow occurred in the calculation of the synchronization coefficient.
1597	EGB AUTO PHASE FORMAT ERROR	Format error in the G80 or G81 block in EGB automatic phase synchronization (1) R is outside the permissible range.
1598	EGB AUTO PHASE PARAMETER SETTING ERROR	Error in the setting of a parameter related to EGB automatic phase synchronization (1) The acceleration/deceleration parameter is not correct. (2) The automatic phase synchronization parameter is not correct.
1805	ILLEGAL COMMAND	[I/O Device] An attempt was made to specify an illegal command during I/O processing on an I/O device. [G30 Zero Return] The P address Nos. for instructing No. 2 to No. 4 zero return are each out of the range 2 to 4. [Single Rotation Dwell] The specified spindle rotation is "0" when single rotation dwell is specified. [Three–dimensional Tool Offset] A G code that cannot be specified was specified in the three–dimensional tool offset mode. Scaling instruction G51, skip cutting G31 and automatic tool length measurement G37 were specified.
1806	DEVICE TYPE MISS MATCH	An operation not possible on the I/O device that is currently selected in the setting was specified. This alarm is also generated when file rewind is instructed even though the I/O device is not a FANUC Cassette.

Number	Message	Description
1807	PARAMETER SETTING ERROR	An I/O interface option that has not yet been added on was specified. The external I/O device and baud rate, stop bit and protocol selection settings are erroneous.
1808	DEVICE DOUBLE OPENED	An attempt was made to open a device that is being accessed.
1809	ILLEGAL COMMAND IN G41/G42	Specified direction tool length compensation parameters are incorrect. A move instruction for a axis of rotation was specified in the specified direction tool length compensation mode.
1823	FRAMING ERROR(1)	The stop bit of the character received from the I/O device connected to reader/punch interface 1 was not detected.
1830	DR OFF(2)	The data set ready input signal DR of the I/O device connected to reader/punch interface 2 turned OFF.
1832	OVERRUN ERROR(2)	The next character was received from the I/O device connected to reader/punch interface 2 before it could read a previously received character.
1833	FRAMING ERROR(2)	The stop bit of the character received from the I/O device connected to reader/punch interface 2 was not detected.
1834	BUFFER OVERFLOW(2)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 2 even though the NC sent a stop code (DC3) during data reception.
1889	ILLEGAL COMMAND IN G54.3	An illegal command was issued in G54.3 block. (1) An attempt was made to command G54.3 in a mode in which it cannot be accepted. (2) The command was not issued in a single block.
1898	ILLEGAL PARAMETER IN G54.2	An illegal parameter (Nos. 6068 to 6076) was specified for fixture offset.
1912	V-DEVICE DRIVER ERROR (OPEN)	An error occurred during device driver control.
1960	ACCESS ERROR (MEMORY CARD)	Illegal memory card accessing This alarm is also generated during reading when reading is executed up to the end of the file without detection of the EOR code.
1961	NOT READY (MEMORY CARD)	The memory card is not ready.
1962	CARD FULL (MEMORY CARD)	The memory card has run out of space.
1963	CARD PROTECTED (MEMORY CARD)	The memory card is write–protected.
1964	NOT MOUNTED (MEMORY CARD)	The memory card could not be mounted.
1965	DIRECTORY FULL (MEMORY CARD)	The file could not be generated in the root directory for the memory card.
1966	FILE NOT FOUND (MEMORY CARD)	The specified file could not be found on the memory card.
1967	FILE PROTECTED (MEMORY CARD)	The memory card is write–protected.
1968	ILLEGAL FILE NAME (MEMORY CARD)	Illegal memory card file name
1969	ILLEGAL FORMAT (MEMORY CARD)	Check the file name.
1970	ILLEGAL CARD (MEMORY CARD)	This memory card cannot be handled.
1971	ERASE ERROR (MEMORY CARD)	An error occurred during memory card erase.
1972	BATTERY LOW (MEMORY CARD)	The memory card battery is low.
1973	FILE ALREADY EXIST	A file having the same name already exists on the memory card.
1990	SPL:ILLEGAL AXIS COMMAND	The axis specified by the smooth interpolation (G5.1Q2) is illegal.
1993	SPL:CAN'T MAKE VECTOR	The end point and the 2 previous point are the same in generation of the 3–dimensional tool offset vector by the end point for smooth interpolation.

Number	Message	Description
1995	ILLEGAL PARAMETER IN G41.2/G42.2	The parameter settings (parameter Nos. 6080 to 6089) for determining the relationship between the axis of rotation and the rotation plane are incorrect.
1999	ILLEGAL PARAMETER IN G41.3	The parameter settings (parameter Nos. 6080 to 6089) for determining the relationship between the axis of rotation and the rotation plane are incorrect.
2002	NO KNOT COMMAND (NURBS)	Knot has not been specified, or a block not related to NURBS interpolation was specified in the NURBS interpolation mode.
2003	ILLEGAL AXIS COMMAND (NURBS)	An axis not specified as a control point was specified in the No. 1 block.
2004	ILLEGAL KNOT	There is an insufficient number of knot individual blocks.
2005	ILLEGAL CANCEL (NURBS)	The NURBS interpolation mode was turned OFF even though NURBS interpolation was not completed.
2006	ILLEGAL MODE (NURBS)	A mode that cannot be paired with the NURBS interpolation mode was specified.
2007	ILLEGAL MULTI-KNOT	Nested knots for each level can be specified for the start and end points.
2051	#200-#499ILLEGAL P-CODE MACRO COMMON INPUT(NO OPTION)	An attempt was made to enter a custom macro common variable not existing in the system.
2052	#500-#549P-CODE MACRO COMMON SELECT(CANNOT USE SETVN)	The variable name cannot be entered. The SETVN command cannot be used with the P-CODE macro common variables #500 to #549.
2053	THE NUMBER OF #30000 IS UNMATCH	An attempt was made to enter a P-CODE-only variable not existing in the system.
2054	THE NUMBER OF #40000 IS UNMATCH	An attempt was made to enter an extended P-CODE-only variable not existing in the system.
2060	ILLEGAL PARAMETER IN G43.4/G43.5	The parameter for the pivot tool length compensation is incorrect.
2061	ILLEGAL COMMAND IN G43.4/G43.5	An illegal command was specified in tool center point control. - A rotation axis command was specified in tool center point control (type 2) mode. - With a table rotary type or mixed-type machine, a I, J, or K command was specified in the tool center point control (type 2) command (G43.5) block. - A command that does not move the tool center point (only a rotation axis is moved) was specified for the workpiece in the G02 mode. - G43.4 or G43.5 was specified in the tool center point control mode. - When the workpiece coordinate system is set as the programming coordinate system (bit 5 (WKP) of parameter No. 19696 is 1), G02 or G03 was specified while the rotation axis was not perpendicular to the plane.
4010	ILLEGAL REAL VALUE OF OBUF :	The real value for a output buffer is in error.
5006	TOO MANY WORD IN ONE BLOCK	The number of words in a block exceeds the maximum. The maximum is 26 words. However, this figure varies according to NC options. Divide the instruction word into two blocks.
5007	TOO LARGE DISTANCE	Due to compensation, point of intersection calculation, interpolation or similar reasons, a movement distance that exceeds the maximum permissible distance was specified. Check the programmed coordinates or compensation amounts.
5009	PARAMETER ZERO (DRY RUN)	The dry run feedrate parameter No. 1410 or maximum cutting feedrate parameter No. 1422 for each axis has been set to 0.

Number	Message	Description
5010	END OF RECORD	The EOR (End of Record) code is specified in the middle of a block. This alarm is also generated when the percentage at the end of the NC program is read.
5011	PARAMETER ZERO (CUT MAX)	The maximum cutting feedrate parameter No. 1430 has been set to 0.
5014	TRACE DATA NOT FOUND	A transfer could not be made because of no trace data.
5015	NO ROTATION AXIS	No rotation axis was found in a handle feed in the tool axis direction or in the tool axis right angle direction.
5016	ILLEGAL COMBINATION OF M CODES	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.
5018	POLYGON SPINDLE SPEED ERROR	In G51.2 mode, the speed of the spindle or polygon synchronous axis either exceeds the clamp value or is too small. The specified rotation speed ratio thus cannot be maintained. For polygon turning between spindles: More information as to why this alarm occurred is indicated in DGN No. 471.
5020	PARAMETER OF RESTART ERROR	The setting of parameter No. 7310 for specifying the order of the axes on which to move to the machining restart position in a dry run is invalid. The valid range is from 1 to the number of controlled axes.
5043	TOO MANY G68 NESTING	Three-dimensional coordinate conversion has been specified three or more times. To perform another coordinate conversion, perform cancellation, then specify the coordinate conversion.
5044	G68 FORMAT ERROR	Errors for three-dimensional coordinate conversion command are: (1) No I, J, or K command was issued in three-dimensional coordinate conversion command block. (without coordinate rotation option) (2) All of I, J, or K command were 0 in three-dimensional coordinate conversion command block. (3) No rotation angle R was not commanded in three-dimensional coordinate conversion command block.
5046	ILLEGAL PARAMETER (S-COMP)	The setting of a parameter related to straightness compensation contains an error. Possible causes include: - A non-existent axis number is set in a moving or compensation axis parameter. - More than 128 pitch error compensation points are set between the furthest points in the negative and position regions. - The straightness compensation point numbers do not have correct magnitude relationships. - No straightness compensation point is found between the furthest pitch error compensation point in the negative region and that in the positive region. - The compensation per compensation point is either too large or too small.
5050	ILL-COMMAND IN G81.1 MODE	During chopping, a move command has been issued for the chopping axis.

Number	Message	Description
5058	G35/G36 FORMAT ERROR	A command for switching the major axis has been specified for circular threading. Alternatively, a command for setting the length of the major axis to 0 has been specified for circular threading.
5060	ILLEGAL PARAMETER IN G02.3/G03.3	The axis parameter setting to perform an exponential interpolation is in error. Parameter No. 5641: A liner axis number for performing an exponential interpolation Parameter No. 5642: A rotation axis number for performing an exponential interpolation The settable value is 1 to the number of control axes, but it must not be duplicated.
5061	ILLEGAL FORMAT IN G02.3/G03.3	The exponential interpolation command (G02.3/G03.3) has a format error. The command range for address I or J is -89.0 to -1.0 or +1.0 to +89.0. No I or J is specified or out-of -range value is specified. No address R, or 0 is specified.
5062	ILLEGAL COMMAND IN G02.3/G03.3	The value specified in an exponential interpolation command (G02.3/03.3) is illegal. A value that does not allow exponential interpolation is specified. (For example, the value for In is 0 or negative.)
5064	DIFFERRENT AXIS UNIT	Circular interpolation has been specified on a plane consisting of axes having different increment systems.
5065	DIFFERRENT AXIS UNIT(PMC AXIS)	Axes having different increment systems have been specified in the same DI/DO group for PMC axis control. Modify the setting of parameter No. 8010.
5066	RESTART ILLEGAL SEQUENCE NUMBER	A sequence number from 7000 to 7999 was read during the search for the next number in a restart program for the back or restart function.
5068	FORMAT ERROR IN G31P90	No travel axis was specified. Two or more travel axes were specified.
5073	NO DECIMAL POINT	No decimal point has been specified for an address requiring a decimal point.
5074	ADDRESS DUPLICATION ERROR	The same address has been specified two or more times in a single block. Alternatively, two or more G codes in the same group have been specified in a single block.
5085	SMOOTH IPL ERROR 1	A block for specifying smooth interpolation contains a syntax error.
5115	ILLEGAL ORDER (NURBS)	There is an error in the specification of the rank.
5116	ILLEGAL KNOT VALUE (NURBS)	Monotone increasing of knots is not observed.
5117	ILLEGAL 1ST CONTROL POINT (NURBS)	The first control point is incorrect. Or, it does not provide a continuity from the previous block.
5118	ILLEGAL RESTART (NURBS)	After manual intervention with manual absolute mode set to on, NURBS interpolation was restarted.

Number	Message	Description
5122	ILLEGAL COMMAND IN SPIRAL	A spiral interpolation or conical interpolation command has an error. Specifically, this error is caused by one of the following: 1) L = 0 is specified. 2) Q = 0 is specified. 3) R/, R/, C is specified. 4) Zero is specified as height increment. 5) Zero is specified as height difference. 6) Three or more axes are specified as the height axes. 7) A height increment is specified when there are two height axes. 8) Q is specified when radius difference = 0. 9) Q < 0 is specified when radius difference > 0. 10) Q > 0 is specified when radius difference < 0. 11) A height increment is specified when no height axis is specified.
5123	OVER TOLERANCE OF END POINT IN SPIRAL	The difference between a specified end point and the calculated end point exceeds the allowable range (parameter 3471).
5124	CAN NOT COMMAND SPIRAL	A spiral interpolation or conical interpolation was specified in any of the following modes: 1) Scaling 2) Polar coordinate interpolation 3) In cutter compensation C mode, the center is set as the end point.
5130	NC AND SUPERIMPOSE AXIS CONFLICT	In the PMC superposition axis control, the NC command and The PMC axis control command were conflicted. Modify the program and the ladder.
5131	NC COMMAND IS NOT COMPATIBLE	The PMC axis control and three-dimensional coordinate conversion or a polar coordinate interpolation were specified simultaneously.
5132	CANNOT CHANGE SUPERIMPOSED AXIS	The superposition axis was selected for the axis for which the PMC superposition axis is being controlled.
5195	DIRECTION CAN NOT BE JUDGED	For a one–contact input touch sensor used with the tool compensation amount measurement value direct input B function, stored pulse directions are not unified. - The machine is at a stop in the offset write mode. - The servo power is off. - Pulse directions are diverse. Alternatively, the tool is moving along two axes (X–axis and Z–axis) simultaneously.
5196	ILLEGAL AXIS OPERATION	During HPCC or during the execution of a 5-axis-related function, an unavailable function was used.
5220	REFERENCE POINT ADJUSTMENT MODE	In case of distance coded linear scale I/F, the reference point auto setting parameter (No.1819#2) is set to "1". Move the machine to reference position by manual operation and execute manual reference return.
5257	G41/G42 NOT ALLOWED IN MDI MODE	Cutter compensation or tool nose radius compensation was specified in MDI mode. (Depending on the setting of the parameter MCR (No. 5008#4))
5303	TOUCH PANEL ERROR	The touch panel is not connected correctly, or the touch panel cannot be initialized when the power is turned on. Correct the cause then turn on the power again.

Number	Message	Description
5305	ILLEGAL SPINDLE NUMBER	In a spindle select function by address P for a multiple spindle control, 1) Address P is not specified. 2) Parameter No.3781 is not specified to the spindle to be selected. 3) An illegal G code which cannot be commanded with an S_P_; command is specified. 4) A multi spindle cannot be used because the parameter EMS (No. 3702#1) is 1.
5312	ILLEGAL COMMAND IN G10 L75/76/77	One of formats in G10L75, G10L76, or G10L77 to G11 commands is in error, or the command value is out of data range. Modify the program.
5316	TOOL TYPE NUMBER NOT FOUND	A tool with the specified tool-type number could not be found. Modify the program or register the tool.
5317	ALL TOOL LIFE IS OVER	The lives of all tools with the specified tool-type number have expired. Replace the tool.
5320	DIA./RAD. MODE CAN'T BE SWITCHED .	In any of the following states, diameter/radius specification was switched: 1) When a buffered program is being executed 2) When a movement is being made on the axis
5329	M98 AND NC COMMAND IN SAME BLOCK	A subprogram call which is not a single block was commanded during canned cycle mode.
5360	TOOL INTERFERENCE CHECK ERROR	This alarm is issued when interference with another tool is caused by a data modification based on G10 data input or file reading or when an attempt is made to modify the tool figure data of a tool registered in the cartridge.
5361	ILLEGAL MAGAZINE DATA	Tools stored in the cartridge are interfering with each other. Reregister the tools in the cartridge, or modify the tool management data or tool figure data. If this alarm is issued, no tool interference check is made when tools are registered in the cartridge management table. Moreover, empty pot search operation does not operate normally. If this alarm is issued, the power must be turned off before operation is continued.
5406	G41.3/G40 FORMAT ERROR	(1) The G41.3 or G40 block contains a move command. (2) The G41.3 block contains a G or M code that suppresses buffering.
5407	ILLEGAL COMMAND IN G41.3	(1) In the G41.3 mode, a G code of group 01 other than G00 and G01 is specified. (2) In the G41.3 mode, an offset command (a G code of group 07) is specified. (3) The block next to G41.3 (startup) specifies no movement.
5408	G41.3 ILLEGAL START_UP	(1) In a mode of group 01 other than G00 and G01, G41.3 (startup) is specified. (2) The included angle between the tool vector and move vector is 0 or 180 degrees at the time of startup.
5420	ILLEGAL PARAMETER IN G43.4/G43.5	A parameter related to tool center point control is illegal.

Number	Message	Description
5421	ILLEGAL COMMAND IN G43.4/G43.5	An illegal command was specified in tool center point control. - A rotation axis command was specified in tool center point control (type 2) mode. - With a table rotary type or mixed-type machine, a I,J,K command was specified in the tool center point control (type 2) command (G43.5) block. - A command that does not move the tool center point (only a rotation axis is moved) was specified for the workpiece in the G02 mode. - G43.4 or G43.5 was specified in the tool center point control mode. - When the workpiece coordinate system is set as the programming coordinate system (bit 5 (WKP) of parameter No. 19696 is 1), G02 or G03 was specified while the rotation axis was not perpendicular to the plane.
5422	EXCESS VELOCITY IN G43.4/G43.5	An attempt was made to make a movement at an axis feedrate exceeding the maximum cutting feedrate by tool center point control.
5425	ILLEGAL OFFSET VALUE	The offset number is incorrect.
5430	ILLEGAL COMMAND IN 3-D CIR	In a modal state in which three-dimensional circular interpolation cannot be specified, a three-dimensional circular interpolation (G02.4/G03.4) is specified. Alternatively, in three-dimensional circular interpolation mode, a code that cannot be specified is specified.
5432	G02.4/G03.4 FORMAT ERROR	A three-dimensional circular interpolation command (G02.4/G03.4) is incorrect.
5433	MANUAL INTERVENTION IN G02.4/G03.4 (ABS ON)	In three-dimensional circular interpolation mode (G02.4/G03.4), manual intervention was made when the manual absolute switch was on.
5435	PARAMETER OUT OF RANGE（TLAC）	Illegal parameter setting. (Set value is out of range.)
5436	ILLEGAL PARAMETER SETTING OF ROTARY AXIS(TLAC）	Illegal parameter setting. (axis of rotation setting)
5437	ILLEGAL PARAMETER SETTING OF MASTER ROTARY AXIS(TLAC）	Illegal parameter setting. (master axis of rotation setting)
5445	CAN NOT COMMAND MOTION IN G39	Corner circular interpolation (G39) of cutter compensation or tool nose radius compensation is not specified alone but is specified with a move command.
5446	NO AVOIDANCE AT G41/G42	Because there is no interference evade vector, the interference check evade function of cutter compensation or tool nose radius compensation cannot evade interference.
5447	DANGEROUS AVOIDANCE AT G41/G42	The interference check evade function of cutter compensation or tool nose radius compensation determines that an evade operation will lead to danger.
5448	INTERFERENCE TO AVD. AT G41/G42	In the interference check evade function of cutter compensation or tool nose radius compensation, a further interference occurs for an already created interference evade vector.
5456	TOO MANY G68.2 NESTING	Tilted working plane command G68.2 was specified more than once. To perform another coordinate conversion, perform cancellation, then specify the coordinate conversion.
5457	G68.2 FORMAT ERROR	A G68.2 format error occurred.
5458	ILLEGAL USE OF G53.1	G53.1 was specified before the G68.2 command.

Number	Message	Description
5459	MACHINE PARAMETER INCORRECT	- A machine configuration parameter (parameter No. 19665 to No.19667 or 19680 to 19714 or No.12321) is illegal. - The axis which is specified in parameter No.19681 or No.19686 is not a rotation axis. - The basic three axes are not specified in the parameter No.1022. - In tool center point control (type 2) or cutter compensation for 5-axis machining (type 2) or tilted working plane command, the end point of rotation axis can not exist within the region specified by parameters No.19741 to No.19744. - In tool center point control (type 2) or cutter compensation for 5-axis machining (type 2), the end point of rotation axis can not exist. Check the machine configuration and the program. - Tool center point control (type 2) or cutter compensation for 5-axis machining (type 2) is specified when hypothetical axis is used. - Tool center point control (type 2) or cutter compensation for 5-axis machining (type 2) is specified when the programming coordinate system is the workpiece coordinate system.

Number	Message	Description
5460	ILLEGAL USE OF TRC FOR 5-AXIS MACHINE	- In the cutter compensation mode for 5-axis machining (except the tool side offset function for a tool rotation type machine), a move command other than G00/G01 is specified. - With a table rotation type machine, when bit 1 (PTD) of parameter No. 19746 is set to 1, a plane selection is made with an axis other than the basic three axes at the start of cutter compensation for 5-axis machining. - When bit 1 (SPG) of parameter No. 19607 is set to 1, there is a discrepancy between the machine type set in parameter No. 19680 and a G code specifying cutter compensation for 5-axis machining (G41.2, G42.2, G41.4, G42.4, G41.5, or G42.5). - With a machine that is not of the tool rotation type, G41.3 is specified. - When bit 5 (WKP) of parameter No. 19696 is set to 0, and bit 4 (TBP) of parameter No. 19746 is set to 0, cutter compensation for 5-axis machining and tool center point control for 5-axis machining are used at the same time. - A rotation axis command is specified in the cutter compensation (type 2) mode for 5-axis machining. - With a table rotation type or mixed type machine, IJK is specified in a block that specifies cutter compensation (type 2) for 5-axis machining (G41.6/G42.6). - An illegal G code is specified in the cutter compensation mode for 5-axis machining. - When cutter compensation for 5-axis machining is specified, the modal state is illegal. - When the table coordinate system is set as the programming coordinate system, table rotation then cutter compensation for 5-axis machining are specified after the start of tool center point control for 5-axis machining. - There is a difference in type1/type 2 specification between cutter compensation for 5-axis machining and tool center point control for 5-axis machining. - When cutter compensation for 5-axis machining and tool center point control for 5-axis machining are used at the same time, one of these functions that is specified earlier than the other is canceled earlier.
5461	ILLEGAL USE OF G41.2/G42.2/G41.5/G42.5	A move command other than G00 or G01 was performed during cutter compensation for 5-axis machining in a mixed-type machine.
5463	ILLEGAL PARAMETER IN TRC FOR 5-AXIS MACHINE	A parameter related to cutter compensation for 5-axis machining is illegal. - Acceleration/deceleration before interpolation is disabled. Set parameter No. 1660. - Rapid traverse acceleration/deceleration before interpolation is disabled. Set bit 1 (LRP) of parameter No. 1401, bit 5 (FRP) of parameter No. 19501, and parameter Nos. No.1671 and 1672.

(4) Parameter writing alarm (SW alarm)

Number	Message	Description
SW0100	PARAMETER ENABLE SWITCH ON	The parameter setting is enabled (PWE, one bit of parameter No. 8000 is set to "1"). To set the parameter, turn this parameter ON. Otherwise, set to OFF.

(5) Servo alarms (SV alarm)

Number	Message	Description
SV0001	SYNC ALIGNMENT ERROR	In feed axis synchronization control, the amount of compensation for synchronization exceeded the parameter (No. 8325) setting value. This alarm occurs only for a slave axis.
SV0002	SYNC EXCESS ERROR ALARM 2	In feed axis synchronization control, the amount of synchronization error exceeded the parameter (No. 8332) setting value. When the synchronization is not completed after power-up, the determination is made by the parameter value (No. 8332) multiplied by the parameter (No. 8330) multiplier. This alarm occurs only for a slave axis only.
SV0003	SYNCHRONOUS/COMPOSITE/SUPERIMPOSED CONTROL MODE CAN'T BE CONTINUED	Since as axis in synchronization, composition, or superposition mode caused a servo alarm, the mode could not be continued, If one of the axes in a mode causes a servo alarm, all axes relating to the axis enter the servo-off state. This alarm is generated to enable the cause of the servo-off state to be checked.
SV0004	EXCESS ERROR (G31)	The amount of positional deviation during torque limit skip command operation exceeded the limit value of the parameter No.6287.
SV0005	SYNC EXCESS ERROR (MCN)	In feed axis synchronization control, for synchronization, the difference value of the machine coordinate between a master and slave axes exceeded the parameter (No. 8314) setting value. This alarm occurs for a master or slave axis.
SV0301	APC ALARM: COMMUNICATION ERROR	Since the absolute-position detector caused a communication error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0302	APC ALARM: OVER TIME ERROR	Since the absolute-position detector caused an overtime error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0303	APC ALARM: FRAMING ERROR	Since the absolute-position detector caused a framing error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0304	APC ALARM: PARITY ERROR	Since the absolute-position detector caused a parity error, the correct machine position could not be obtained. (data transfer error) The absolute-position detector, cable, or servo interface module is thought to be defective.
SV0305	APC ALARM: PULSE ERROR	Since the absolute-position detector caused a pulse error, the correct machine position could not be obtained. The absolute-position detector, or cable is thought to be defective.
SV0306	APC ALARM: OVER FLOW ERROR	Since the amount of positional deviation overflowed, the correct machine position could not be obtained. Check to see the parameter No. 2084 or No. 2085.

Number	Message	Description
SV0307	APC ALARM: MOVEMENT EXCESS ERROR	Since the machine moved excessively, the correct machine position could not be obtained.
SV0360	ABNORMAL CHECKSUM(INT)	The checksum alarm occurred on the built–in Pulsecoder.
SV0361	ABNORMAL PHASE DATA(INT)	The phase data abnormal alarm occurred on the built–in Pulsecoder.
SV0362	ABNORMAL REV. DATA(INT)	The speed count abnormal alarm occurred on the built-in Pulsecoder.
SV0363	ABNORMAL CLOCK(INT)	The clock alarm occurred on the built–in Pulsecoder.
SV0364	SOFT PHASE ALARM(INT)	A digital servo soft detected an abnormality on the built in Pulsecoder.
SV0365	BROKEN LED(INT)	The digital servo software detected abnormal data on the built–in Pulsecoder.
SV0366	PULSE MISS(INT)	A pulse error occurred on the built–in Pulsecoder.
SV0367	COUNT MISS(INT)	A count error occurred on the built–in Pulsecoder.
SV0368	SERIAL DATA ERROR(INT)	The communications data could not be received from the built–in Pulsecoder.
SV0369	DATA TRANS. ERROR(INT)	A CRC error or stop bit error occurred in the communications data from the built–in Pulsecoder.
SV0380	BROKEN LED(EXT)	Separate detector error
SV0381	ABNORMAL PHASE (EXT)	An abnormal alarm in the position data occurred on the separate linear scale.
SV0382	COUNT MISS(EXT)	A count error occurred on the separate detector.
SV0383	PULSE MISS(EXT)	A pulse error occurred on the separate detector.
SV0384	SOFT PHASE ALARM(EXT)	The digital servo software detected abnormal data on the separate detector.
SV0385	SERIAL DATA ERROR(EXT)	The communications data could not be received from the separate detector.
SV0386	DATA TRANS. ERROR(EXT)	A CRC error or stop bit error occurred in the communications data from the standalone detector.
SV0387	ABNORMAL ENCODER(EXT)	An abnormality occurred on a separate detector. For more information, contact the scale manufacturer.
SV0401	IMPROPER V_READY OFF	Although the ready signal (PRDY) of the position control was ON, the ready signal (VRDY) of the velocity control was OFF.
SV0404	IMPROPER V_READY ON	Although the ready signal (PRDY) of the position control was OFF, the ready signal (VRDY) of the velocity control was ON.
SV0407	EXCESS ERROR	The difference value of the amount of positional deviation for the synchronization axis exceeded the setting value. (during synchronization control only)
SV0409	DETECT ABNORMAL TORQUE	An abnormal load was detected on the servo motor, or during Cs axis or spindle positioning. The alarm can be canceled by RESET.
SV0410	EXCESS ERROR (STOP)	The amount of positional deviation during stopping exceeded the parameter (No. 1829) setting value. In a dual check safety function, an alarm occurs during safety monitoring (when the safety monitoring start signal SEV or SEP is 1), but the alarm cannot be canceled by a reset.
SV0411	EXCESS ERROR (MOVING)	The amount of positional deviation during traveling became excessive than the parameter setting value. (Generally, in the parameter No.1828, the dual check safety function during safety monitoring (when he safety monitoring start signal SEV or SEP is 1) is the parameter No. 1838.) In a dual check safety function, an alarm occurs during safety monitoring, but the alarm cannot be canceled by a reset.

Number	Message	Description
SV0413	LSI OVERFLOW	The counter for the amount of positional deviation overflowed
SV0415	MOTION VALUE OVERFLOW	The velocity exceeding the travel velocity limit was commanded.
SV0417	ILL DGTL SERVO PARAMETER	A digital serve parameter setting is incorrect.
SV0420	SYNC TORQUE EXCESS	In feed axis synchronization control, for synchronization, the difference value of torque between a master and slave axes exceeded the parameter (No. 2031) setting value. This alarm occurs for a master axis.
SV0421	EXCESS ERROR(SEMI-FULL)	The difference between the feedback from the semi and full sides exceeded the setting of parameter No.1729.
SV0422	EXCESS VELOCITY IN TORQUE	In torque control, the commanded permissible velocity was exceeded.
SV0423	EXCESS ERROR IN TORQUE	In torque control, the total permissible move value specified as a parameter was exceeded.
SV0430	SV MOTOR OVERHEAT	The servo motor has overheated.
SV0431	CNV. OVERLOAD	PSM : Overheat β series SVU : Overheat
SV0432	CNV. LOW VOLT CONTROL	PSM : The control power supply voltage has dropped. PSMR : The control power supply voltage has dropped. β series SVU : The control power supply voltage has dropped.
SV0433	CNV. LOW VOLT DC LINK	PSM : Low DC link voltage PSMR : Low DC link voltage α series SVU : Low DC link voltage β series SVU : Low DC link voltage
SV0434	INV. LOW VOLT CONTROL	SVM : Low control power voltage
SV0435	INV. LOW VOLT DC LINK	SVM : Low DC link voltage
SV0436	SOFTTHERMAL(OVC)	The digital servo software detected a software thermal (OVC).
SV0437	CNV. OVERCURRENT POWER	PSM : Overcurrent on input circuit section.
SV0438	INV. ABNORMAL CURRENT	SVM : Motor overcurrent α series SVU : Motor overcurrent β series SVU : Motor overcurrent
SV0439	CNV. OVER VOLT DC LINK	PSM : The DC link voltage is too high. PSMR : The DC link voltage is too high. β series SVU : The DC link voltage is too high.
SV0440	CNV. EX DECELERATION POW.	PSMR : Excessive generative discharge α series SVU : Excessive generative discharge, or abnormal error in generative power circuit
SV0441	ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
SV0442	CNV. CHARGE FAILURE	PSM : The spare charge circuit for the DC link is abnormal. PSMR : The spare charge circuit for the DC link is abnormal.
SV0443	CNV. COOLING FAN FAILURE	PSM : Internal cooling fan failure. PSMR : Internal cooling fan failure. β series SVU : Internal cooling fan failure.
SV0444	INV. COOLING FAN FAILURE	SVM : Internal cooling fan failure.
SV0445	SOFT DISCONNECT ALARM	The digital servo software detected a disconnected Pulsecoder.
SV0446	HARD DISCONNECT ALARM	The hardware detected a disconnected built–in Pulsecoder.
SV0447	HARD DISCONNECT(EXT)	The hardware detected a disconnected separate detector.

Number	Message	Description
SV0448	UNMATCHED FEEDBACK ALARM	The sign of the feedback signal from the standalone detector is opposite to that from the feedback signal from the built–on Pulsecoder.
SV0449	INV. IPM ALARM	SVM : The IPM (Intelligent Power Module) detected an alarm. α series SVU : The IPM (Intelligent Power Module) detected an alarm.
SV0453	SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the α Pulsecoder. Turn off the power to the CNC, then remove and insert the Pulsecoder cable. If this alarm is issued again, replace the Pulsecoder.
SV0454	ILLEGAL ROTOR POS DETECT	The magnetic pole detection function terminated abnormally. The magnetic pole could not be detected because the motor did not run.
SV0456	ILLEGAL CURRENT LOOP	An attempt was made to set the current loop that could not be set. The amplifier pulse module in use does not comply with HIGH SPEED HRV. Or, requirements to control are not satisfied in the system.
SV0458	CURRENT LOOP ERROR	The specified current loop differs from the actual current loop.
SV0459	HI HRV SETTING ERROR	For two axes whose servo axis numbers (parameter No. 1023) are consecutively even and odd numbers, HIGH SPEED HRV control is possible for one axis and impossible for the other.
SV0460	FSSB DISCONNECT	The FSSB connection was discontinued. Probable causes are: 1. The FSSB connection cable was disconnected or broken. 2. The amplifier was turned off . 3. In the amplifier, the low-voltage alarm occurred.
SV0462	SEND CNC DATA FAILED	The correct data could not be received on a slave side because of the FSSB communication error.
SV0463	SEND SLAVE DATA FAILED	The correct data could not be received in the servo software because of the FSSB communication error.
SV0465	READ ID DATA FAILED	A read of the ID information for the amplifier has failed at power-on.
SV0466	MOTOR/AMP. COMBINATION	The maximum current of an amplifier is different to that of a motor. Probable causes are: 1. The connection command for an amplifier is incorrect. 2. The parameter (No.2165) setting is incorrect
SV0468	HI HRV SETTING ERROR(AMP)	An attempt was made to set up HIGH SPEED HRV control for use when the controlled axis of an amplifier for which HIGH SPEED HRV control could not be used.
SV0600	INV. DC LINK OVER CURRENT	SVM : DC link overcurrent. β SVU : DC link overcurrent.
SV0601	INV. RADIATOR FAN FAILURE	SVM : Radiator cooling fan failure. β SVU : Radiator cooling fan failure.
SV0602	INV. OVERHEAT	SVM : The servo motor has overheated.
SV0603	INV. IPM ALARM(OH)	SVM : The IPM (Intelligent Power Module) detected an overheat alarm. β SVU : The IPM (Intelligent Power Module) detected an overheat alarm.

Number	Message	Description
SV0604	AMP. COMMUNICATION ERROR	The communication between SVM and PSM is in error.
SV0605	CNV. EX. DISCHARGE POW.	PSMR : The motor regenerative power is too much.
SV0606	CNV. RADIATOR FAN FAILURE	PSM : External radiator cooling fan failure. PSMR : External radiator cooling fan failure.
SV0607	CNV. SINGLE PHASE FAILURE	PSM : The input power supply has a missing phase. PSMR : The input power supply has a missing phase.
SV1025	V_READY ON (INITIALIZING)	The ready signal (VRDY) of the velocity control which should be OFF is ON while the servo control is ON.
SV1026	ILLEGAL AXIS ARRANGE	The parameter for servo axis arrange is not set correctly. A negative value, duplicate value, or greater value than the number of control axes was set to the parameter No. 1023 "The servo axis number of each axis."
SV1055	ILLEGAL TANDEM AXIS	In tandem control, the setting of the parameter No. 1023 is incorrect.
SV1056	ILLEGAL TANDEM PAIR	In tandem control, the setting of the parameter No. 1020, No. 1025, No. 1026 or TDM (No.1817#6) is incorrect.
SV1067	FSSB:CONFIGURATION ERROR(SOFT)	An FSSB configuration error occurred (detected by software). The connected amplifier type is incompatible with the FSSB setting value.
SV1100	S-COMP. VALUE OVERFLOW	The amount of compensation for the straightness exceeded a maximum value of 32767.
SV5134	FSSB:OPEN READY TIME OUT	In the initialization, the FSSB could not be in an open ready sate. The axis card is thought to be defective.
SV5136	FSSB:NUMBER OF AMP. IS INSUFFICIENT	The number of amplifier identified by the FSSB is insufficient than the number of control axes. Or, the setting of the number of axes or the amplifier connection is in error.
SV5137	FSSB:CONFIGURATION ERROR	An FSSB configuration error occurred. The connecting amplifier type is incompatible with the FSSB setting value.
SV5139	FSSB:ERROR	Servo initialization has not completed successfully. It is probable that an optical cable failed or a connection between the amplifier and another module failed.
SV5197	FSSB:OPEN TIME OUT	The initialization of the FSSB was completed, but it could not be opened. Or, the connection between the CNC and the amplifier in is incorrect.
SV5197	FSSB:OPEN TIME OUT	The FSSB could not be opened although the CNC permitted the opening of the FSSB. Check the connection between the CNC and the amplifier.
SV5311	FSSB:ILLEGAL CONNECTION	1. This alarm is issued if axes, whose servo axis numbers (parameter No. 1023) are even and odd numbers, are allocated to the amplifiers connected to the FSSBs of different paths. 2. This alarm is issued if an attempt is made to set up for use of the pulse modules connected to the FSSBs of different paths. And the system did not satisfy the requirements for performing HIGH SPEED HRV control.

(6) Overtravel alarms (OT alarm)

Number	Message	Description
OT0500	+ OVERTRAVEL (SOFT 1)	Exceeded the positive side stored stroke check 1.
OT0501	- OVERTRAVEL (SOFT 1)	Exceeded the negative side stored stroke check 1.
OT0502	+ OVERTRAVEL (SOFT 2)	Exceeded the positive side stored stroke check 2. Or, in the chuck tail stock barrier, an entry to the inhibited area was made during movement in the positive direction.
OT0503	- OVERTRAVEL (SOFT 2)	Exceeded the negative side stored stroke check 2. Or, in the chuck tail stock barrier, an entry to the inhibited area was made during movement in the negative direction.
OT0504	+ OVERTRAVEL (SOFT 3)	Exceeded the positive side stored stroke check 3.
OT0505	- OVERTRAVEL (SOFT 3)	Exceeded the - side stored stroke check 3.
OT0506	+ OVERTRAVEL (HARD)	The stroke limit switch in the positive direction was triggered. This alarm is generated when the machine reaches the stroke end. When this alarm is not generated, feed of all axes is stopped during automatic operation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0507	- OVERTRAVEL (HARD)	The stroke limit switch in the negative direction was triggered. This alarm is generated when the machine reaches the stroke end. When this alarm is not generated, feed of all axes is stopped during automatic operation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0508	INTERFERENCE:+	A tool moving in the positive direction along the n axis has fouled another tool post.
OT0509	INTERFERENCE:-	A tool moving in the negative direction along the n axis has fouled another tool post.
OT0510	+ OVERTRAVEL (PRE-CHECK)	The tool exceeded the limit in the negative direction during the stroke check before movement.
OT0511	- OVERTRAVEL (PRE-CHECK)	The tool exceeded the limit in the positive direction during the stroke check before movement.
OT1710	ILLEGAL ACC. PARAMETER (OPTIMUM TORQUE ACC/DEC)	The permissible acceleration parameter for the optimum torque acceleration/deceleration is in error. A possible cause is either of the following: (1) The ratio of a negative acceleration to a positive acceleration is not more than the limit value. (2) The time to reduce to a velocity of 0 exceeded the maximum time.

(7) Memory file alarms (IO alarm)

Number	Message	Description
IO1001	FILE ACCESS ERROR	The resident–type file system could not be accessed as an error occurred in the resident–type file system.
IO1002	FILE SYSTEM ERROR	The file could not be accessed as an error occurred in the CNC file system.
IO1030	CHECK SUM ERROR	The checksum of the CNC part program storage memory is incorrect.
IO1032	MEMORY ACCESS OVER RANGE	Accessing of data occurred outside the CNC part program storage memory range.

(8) Alarms requiring power to be turned off (PW alarm)

Number	Message	Description
PW0000	POWER MUST BE OFF	A parameter was set for which the power must be turned OFF then ON again.
PW0001	X-ADDRESS(*DEC) IS NOT ASSIGNED.	The X address of the PMC could not be assigned correctly. This alarm may occur in the following case: - During the setting of parameter No. 3013, the X address could not be assigned correctly for the deceleration dog (*DEC) for a return to the reference position.
PW0002	PMC address is not correct(AXIS).	The address to assign the axis signal is incorrect. This alarm may occur in the following case: - The parameter No.3021 setting is incorrect.
PW0003	PMC address is not correct(SPINDLE).	The address to assign the spindle signal is incorrect. This alarm may occur in the following case: - The parameter No.3022 setting is incorrect.
PW0004	SETTING THE LOADER SYSTEM PATH IS NOT CORRECT.	The loader system could not be assigned correctly. The parameter No. 984 setting is incorrect. - The number of loader systems and the number of systems specified to the loader system in the parameter No. 984#0(LCP) does not match. - The parameter No. 984#0 of the system 1 is set to 1.
PW0006	POWER MUST BE OFF (ILL-EXEC-CHK)	The malfunction prevention function detected an alarm to require the power off.
PW0007	X-ADDRESS(SKIP) IS NOT ASSIGNED	The X address of PMC could not be assigned correctly. Possible causes are: - During the set of parameter No. 3012, the skip signal of the X address was not assigned correctly. - During the set of parameter No. 3019, the address other than the skip signal of the X address was not assigned correctly.
PW1102	ILLEGAL PARAMETER (I-COMP.)	The parameter for setting slope compensation is incorrect. This alarm occurs in the following cases: - When the number of pitch error compensation points on the axis on which slope compensation is executed exceeds 128 between the most negative side and most positive side - When the size relationship between the slope compensation point Nos. is incorrect - When the slope compensation point is not located between the most negative side and most positive side of pitch error compensation - When the compensation per compensation point is too small or too great.
PW1103	ILLEGAL PARAMETER (S-COMP.128)	The parameter for setting 128 straightness compensation points or the parameter compensation data is incorrect,
PW5046	ILLEGAL PARAMETER (S-COMP.)	The parameter for setting straightness compensation is incorrect.

(9) Spindle alarms (SP alarm)

Number	Message	Description
SP0740	RIGID TAP ALARM : EXCESS ERROR	The positional deviation of the stopped spindle has exceeded the set value during rigid tapping.
SP0741	RIGID TAP ALARM : EXCESS ERROR	The positional deviation of the moving spindle has exceeded the set value during rigid tapping.
SP0742	RIGID TAP ALARM : LSI OVERFLOW	An LSI overflow has occurred for the spindle during rigid tapping.
SP0752	SPINDLE MODE CHANGE ERROR	This alarm is generated if the system does not properly terminate a mode change. The modes include the Cs contour control, spindle positioning, rigid tapping, and spindle control modes. The alarm is activated if the spindle control unit does not respond correctly to the mode change command issued by the NC.
SP0754	ABNORMAL TORQUE	An abnormal load was detected in a spindle motor. The alarm can be canceled by RESET.
SP0755	SAFETY FUNCTION ERROR	The CNC CPU detected that the safely function of the n-th spindle was not executed.
SP0756	ILLEGAL AXIS DATA	The CNC CPU detected that the connection state and the hardware setting of the spindle amplifier were incompatible on the n-th spindle. If an alarm occurs because of the configuration change of the spindle amplifier , set the spindle amplifier correctly.
SP0757	SAFETY SPEED OVER	The CNC CPU detected that during safety monitoring (the safety monitoring start signal SEV or SEP is 0), the spindle motor speed was greater than the safety speed (parameter No. 4372, 4438, 4440, or 4442) on the n-th spindle. Operate within the safety speed.
SP1202	SPINDLE SELECT ERROR	In a multi spindle control, the spindle number other than the valid spindle number was selected by a position coder select signal. An attempt was made to select the spindle number of the system having no valid spindle.
SP1210	TOOL CHANGE SP MOTION OVERFLOW	The amount of distribution to a spindle is too much. (specific to the FANUC ROBODRILL)
SP1211	TOOL CHANGE SP ORTN EXCESS ERROR	During a tool change, a too much orientation error was detected for the spindle. (specific to the FANUC ROBODRILL)
SP1212	TOOL CHANGE SP MOVE EXCESS ERROR	During a tool change, a too much moving error was detected for the spindle. (specific to the FANUC ROBODRILL)
SP1213	TOOL CHANGE SP STOP EXCESS ERROR	During a tool change, a too much stop error was detected for the spindle. (specific to the FANUC ROBODRILL)
SP1214	TOOL CHANGE SP ILLEGAL SEQUENCE	During changing tools, an abnormal spindle sequence was detected. (specific to the FANUC ROBODRILL)
SP1220	NO SPINDLE AMP.	Either the cable connected to a serial spindle amplifier is broken, or the serial spindle amplifier is not connected.
SP1221	ILLEGAL MOTOR NUMBER	The spindle No. and the motor No. are incorrectly matched.
SP1224	ILLEGAL SPINDLE-POSITION CODER GEAR RATIO	The spindle–position coder gear ratio was incorrect.
SP1225	CRC ERROR (SERIAL SPINDLE)	A CRC error (communications error) occurred in communications between the CNC and the serial spindle amplifier.

Number	Message	Description
SP1226	FRAMING ERROR (SERIAL SPINDLE)	A framing error occurred in communications between the CNC and the serial spindle amplifier.
SP1227	RECEIVING ERROR (SERIAL SPINDLE)	A receive error occurred in communications between the CNC and the serial spindle amplifier.
SP1228	COMMUNICATION ERROR (SERIAL SPINDLE)	A communications error occurred between the CNC and the serial spindle amplifier.
SP1229	COMMUNICATION ERROR SERIAL SPINDLE AMP.	A communications error occurred between serial spindle amplifiers (motor Nos. 1 and 2, or motor Nos. 3–4).
SP1231	SPINDLE EXCESS ERROR (MOVING)	The position deviation during spindle rotation was greater than the value set in parameters.
SP1232	SPINDLE EXCESS ERROR (STOP)	The position deviation during spindle stop was greater than the value set in parameters.
SP1233	POSITION CODER OVERFLOW	The error counter/speed instruction value of the position coder overflowed.
SP1234	GRID SHIFT OVERFLOW	Grid shift overflowed.
SP1240	DISCONNECT POSITION CODER	The analog spindle position coder is broken.
SP1241	D/A CONVERTER ERROR	The D/A converter for controlling analog spindles is erroneous.
SP1243	ILLEGAL SPINDLE PARAMETER SETTING(GAIN)	The setting for the spindle position gain is incorrect.
SP1244	MOTION VALUE OVERFLOW	The amount of distribution to a spindle is too much
SP1245	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1246	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1247	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP1969	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1970	SPINDLE CONTROL ERROR	Initialization of spindle control ended in error.
SP1971	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1972	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1974	ANALOG SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1975	ANALOG SPINDLE CONTROL ERROR	An position coder error was detected on the analog spindle.
SP1976	SERIAL SPINDLE COMMUNICATION ERROR	The amplifier No. could not be set to the serial spindle amplifier.
SP1977	SERIAL SPINDLE COMMUNICATION ERROR	An error occurred in the spindle control software.
SP1978	SERIAL SPINDLE COMMUNICATION ERROR	A time–out was detected during communications with the serial spindle amplifier.
SP1979	SERIAL SPINDLE COMMUNICATION ERROR	The communications sequence was no longer correct during communications with the serial spindle amplifier.
SP1980	SERIAL SPINDLE AMP. ERROR	Defective SIC–LSI on serial spindle amplifier
SP1981	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the analog spindle amplifier side.
SP1982	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the serial spindle amplifier side.
SP1983	SERIAL SPINDLE AMP. ERROR	Could not clear on the spindle amplifier side.
SP1984	SERIAL SPINDLE AMP. ERROR	An error occurred during re–initialization of the spindle amplifier.
SP1985	SERIAL SPINDLE CONTROL ERROR	Failed to automatically set parameters
SP1986	SERIAL SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1987	SERIAL SPINDLE CONTROL ERROR	Defective SIC–LSI on the CNC
SP1988	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1989	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.

Number	Message	Description
SP1996	ILLEGAL SPINDLE PARAMETER SETTING	The spindle was assigned incorrectly. Check to see the following parameter. (No.3716 or 3717)
SP1998	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP1999	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.

(10) Overheat alarms (OH alarm)

Number	Message	Description
OH0700	LOCKER OVERHEAT	CNC cabinet overheat
OH0701	FAN MOTOR STOP	PCB cooling fan motor abnormality

(11) Other alarms (DS alarm)

Number	Message	Description
DS0001	SYNC EXCESS ERROR (POS DEV)	In feed axis synchronization control, the difference in the amount of positional deviation between the master and slave axes exceeded the parameter (No. 8323) setting value. This alarm occurs only for the slave axis.
DS0002	SYNC EXCESS ERROR ALARM 1	In feed axis synchronization control, the difference in the amount of synchronization between the master and slave axes exceeded the parameter (No. 8331) setting value. This alarm occurs only for the slave axis.
DS0003	SYNCHRONIZE ADJUST MODE	The system is in the synchronize adjust mode.
DS0004	EXCESS MAXIMUM FEEDRATE	The malfunction prevention function detected the command in which a value exceeding the maximum speed was specified.
DS0005	EXCESS MAXIMUM ACCELERATION	The malfunction prevention function detected the command in which a value exceeding the maximum acceleration was specified.
DS0014	TOOL CHANGE DETECT MACHINE LOCK	A machine lock is turned on for the Z axis for which the tool is being changed.
DS0015	TOOL CHANGE DETECT MIRROR IMAGE	A mirror image is turned on for the Z axis for which the tool is being changed.
DS0020	REFERENCE RETURN INCOMPLETE	An attempt was made to perform an automatic return to the reference position on the perpendicular axis before the completion of a return to the reference position on the angular axis. However, this attempt failed because a manual return to the reference position during angular axis control or an automatic return to the reference position after power-up was not commanded. First, return to the reference position on the angular axis, then return to the reference position on the perpendicular axis.
DS0024	MISMATCH OF ANGULAR AXIS(D.C.S)	On angular axis control, one of the angular/perpendicular axes is the scale with ref-pos, and the other of them is not the scale with ref-pos. Such system is not admired.
DS0026	MISMATCH OF ANGULAR AXIS(D.C.S)	On angular axis control, one of the angular/perpendicular axes is the scale with ref-pos, and the other of them is not the scale with ref-pos. Such system is not admired.
DS0027	MISMATCH OF SYNCHRONOUS AXIS(D.C.S)	Master/slave axes of feed axis synchronization control, one of them is the linear scale with distance-coded reference marks, and the other of them is not the linear scale with distance-coded reference marks. Please establish reference position with the input signal SYNCn<G138>, SYNCJn<G140> or parameter setting to 0.

DS0059	SPECIFIED NUMBER NOT FOUND	[External data I/O]
		  The No. specified for a program No. or sequence No. search could not be found.
		  There was an I/O request issued for a pot No. or offset (tool data), but either no tool numbers have been input since power ON or there is no data for the entered tool No.
		[External workpiece No. search]
		  The program corresponding to the specified workpiece No. could not be found.

Number	Message	Description
DS0131	TOO MANY MESSAGE	An attempt was made to display an external operator message or external alarm message, but five or more displays were required simultaneously.
DS0132	MESSAGE NUMBER NOT FOUND	An attempt to cancel an external operator message or external alarm message failed because the specified message number was not found.
DS0133	TOO LARGE NUMBER	A value other than 0 to 4095 was specified as the external operator message or the external alarm message number.
DS0300	APC ALARM: NEED REF RETURN	A setting to zero position for the absolute position detector (association with reference position and the counter value of the absolute position detector) is required. Perform the return to the reference position. This alarm may occur with other alarms simultaneously. In this case, other alarms must be handled first.
DS0306	APC ALARM: BATTERY VOLTAGE 0	The battery voltage of the absolute position detector has dropped to a level at which data can no longer be held. Or, the power was supplied to the Pulsecoder for the first time. The battery or cable is thought to be defective. Replace the battery with the machine turned on.
DS0307	APC ALARM: BATTERY LOW 1	The battery voltage of the absolute position detector has dropped to a level at which a replacement is required. Replace the battery with the machine turned on.
DS0308	APC ALARM: BATTERY LOW 2	The battery voltage of the absolute position detector dropped to a level at which a replacement was required in the past. (including during power off) Replace the battery with the machine turned on.
DS0309	APC ALARM: REF RETURN IMPOSSIBLE	An attempt was made to set the zero point for the absolute position detector by MDI operation when it was impossible to set the zero point. Rotate the motor manually at least one turn, and set the zero position of the absolute position detector after turning the CNC and servo amplifier off and then on again.
DS0310	NOT ON RETURN POINT	The return position recorded during retraction is not reached during recovery. The position may be displaced during recovery due to a machine lock or mirror image. Perform the operation again after making a reset.
DS0405	ZERO RETURN END NOT ON REF	The axis specified in automatic zero return was not at the correct zero point when positioning was completed. Perform zero return from a point whose distance from the zero return start position to the zero point is 2 or more revolutions of the motor. Other probable causes are: - The positional deviation after triggering the deceleration dog is less than 128. - Insufficient voltage or malfunctioning Pulsecoder.
DS1120	UNASSIGNED ADDRESS (HIGH)	The upper 4 bits (EIA4 to EIA7) of an external data I/O interface address signal are set to an undefined address (high bits).
DS1121	UNASSIGNED ADDRESS (LOW)	The lower 4 bits (EIA0 to EIA3) of an external data I/O interface address signal are set to an undefined address (low bits).
DS1124	OUTPUT REQUEST ERROR	OUTPUT REQUEST ERROR An output request was issued during external data output, or an output request was issued for an address that has no output data.

Number	Message	Description
DS1127	DI.EIDHW OUT OF RANGE	The numerical value input by external data input signals EID32 to EID47 has exceeded the permissible range.
DS1128	DI.EIDLL OUT OF RANGE	The numerical value input by external data input signals EID0 to EID31 has exceeded the permissible range.
DS1130	SEARCH REQUEST NOT ACCEPTED	No requests can be accepted for a program No. or a sequence No. search as the system is not in the memory mode or the reset state.
DS1131	EXT-DATA ERROR (OTHER)	[External Data I/O] An attempt was made to input tool data for tool offset by a tool No. during loading by the G10 code.
DS1150	A/D CONVERT ALARM	A/D converter malfunction
DS1184	PARAMETER ERROR IN TORQUE	An invalid parameter was set for torque control. The torque constant parameter is set to "0".
DS1185	OVER MAXIMUM FEED	The maximum cutting feedrate or rapid traverse feedrate was exceeded in G54.3.
DS1448	ILLEGAL PARAMETER (D.C.S.)	The setting value of parameter for reference marks is satisfied the following any conditions. - The absolute-position detection function is enabled. - Either parameter 1821 (mark-1 interval) or parameter 1882 (mark-2 interval) is set to 0. - Parameters 1821 and 1882 have identical settings. - The difference between the settings made for parameters 1821 and 1882 is greater than or equal to twice either setting. - The setting value of parameters 1883 and 1884 are over the valid data range.
DS1449	REFERENCE MARK ARE DIFFERENT FROM PARAMETER	In case of distance coded linear scale I/F, the actual interval of reference marks is different from parameter (No.1821,1882) setting value.
DS1450	ZERO RETURN NOT FINISHED	1st reference position return (CDxX7 to CDxX0: 17h (Hex)) was specified when the manual reference position return was not executed with the reference position return function enabled (parameter ZRN (No. 1005#0) set to "0").
DS1451	IMPROPER PMC AXIS COMMAND	The PMC axes cannot be controlled in this state.
DS1512	EXCESS VELOCITY	The feedrate of the linear axis during polar coordinate interpolation exceeded the maximum cutting feedrate.
DS1514	ILLEGAL MOTION IN G12.1 MODE	In a hypothetical axis direction compensation during the polar coordinate interpolation mode, an attempt is made to travel to the area in which the travel cannot be made.
DS1553	EXCESS VELOCITY IN G43.4/G43.5	The axis rate was attempt to exceed the maximum cutting feedrate and travel by the pivot tool length compensation.
DS1710	ILLEGAL ACC. PARAMETER (OPTIMUM TORQUE ACC/DEC)	There are errors in the parameters of permissible acceleration for Optimum Torque Acceleration/Deceleration. One of the following is the cause. 1) The ratio of the acceleration for deceleration to the acceleration for the acceleration is lower than the limited value. 2) The time to decelerate to 0 is larger than the maximum.
DS1931	MACHINE PARAMETER INCORRECT	One of parameters Nos. 19665 to 19667 and Nos.19680 to 19744 used to configure the machine contains an error.
DS1932	DI.THML SIGNAL ON	One of the parameters used to configure the machine is rewritten while the tool direction thermal displacement compensation function is enabled.

Number	Message	Description
DS1933	NEED REF RETURN(SYNC:MIX:OVL)	The relation between a machine coordinate of an axis in synchronization, composition, or superposition control, and the absolute, or relative coordinate was displaced. Perform the manual return to the reference position.

(12) Malfunction prevention function alarms (IE alarm)

Number	Message	Description
IE0001	+ OVERTRAVEL (SOFT 1)	The malfunction prevention function detected that stored stroke check 1 on the positive side was exceeded.
IE0002	- OVERTRAVEL (SOFT 1)	The malfunction prevention function detected that stored stroke check 1 on the negative side was exceeded.
IE0003	+ OVERTRAVEL (SOFT 2)	The malfunction prevention function detected that stored stroke check 2 on the positive side was exceeded.
IE0004	- OVERTRAVEL (SOFT 2)	The malfunction prevention function detected that stored stroke check 2 on the negative side was exceeded.
IE0005	+ OVERTRAVEL (SOFT 3)	The malfunction prevention function detected that stored stroke check 3 on the positive side was exceeded.
IE0006	- OVERTRAVEL (SOFT 3)	The malfunction prevention function detected that stored stroke check 3 on the negative side was exceeded.
IE0007	EXCESS MAXIMUM REV. DATA	The malfunction prevention function detected the command in which a value exceeding the maximum speed was specified.
IE0008	ILLEGAL ACC/DEC	The malfunction prevention function detected the acceleration/deceleration error.
IE0009	ILLEGAL MCN COODINATE	The malfunction prevention function detected the displacement of a machine coordinate in the check point.

A.2 ALARM LIST (PMC)

A.2.1 Messages That May Be Displayed on the PMC Alarm Screen

The following table lists the PMC alarm messages that may be displayed on the PMC alarm screen.

Alarm number	Faulty location/corrective action	Contents
ER01 PROGRAM DATA ERROR	<1> Enter the sequence program again. <2> If this error recurs even after you have entered the sequence program again, the error may be due to a hardware fault. In that case, contact us.	The sequence program is invalid.
ER02 PROGRAM SIZE OVER	<1> Reduce the size of the sequence program. <2> Contact us, and specify a ladder step count option that allows you to set a larger program size.	The sequence program is too large. The sequence program is invalid.
ER03 PROGRAM SIZE ERROR(OPTION)	<1> Reduce the size of the sequence program. <2> Contact us, and specify a ladder step count option that allows you to set a larger program size.	The sequence program exceeds the size specified by the ladder step count option.
ER04 PMC TYPE UNMATCH	Change the sequence program so that it specifies the adequate PMC type, by using the programmer.	The PMC type specified in the sequence program does not match the type of the PMC actually in use.
ER07 NO OPTION(LADDER STEP)	<1> Restore the backup CNC parameter data. <2> Contact us, and specify a ladder step count option that allows you to set a larger program size.	No ladder step count option is found.
ER08 OBJECT UNMATCH	Contact us.	An unsupported function is used in the sequence program.
ER09 PMC LABEL CHECK ERROR	<1> Turn on the power of the CNC again, by holding down the 'O' and 'Z' keys at the same time. <2> Replace the backup batteries.	The nonvolatile memory of the PMC system needs to be initialized in such cases as when you have changed the PMC model.
ER17 PROGRAM PARITY	<1> Enter the sequence program again. <2> If this error recurs even after you have entered the sequence program again, the error may be due to a hardware fault. In that case, contact us.	The parity of the sequence program is invalid.
ER18 PROGRAM DATA ERROR BY I/O	Enter the sequence program again.	An interrupt was specified while the sequence program was being read.
ER19 LADDER DATA ERROR	Display the LADDER DIAGRAM EDITOR screen again, and terminate the editing operation by pressing the [EXIT] soft key.	A function key was pressed during the editing of the ladder program, causing a switch to the CNC screen.
ER20 SYMBOL/COMMENT DATA ERROR	Display the SYMBOL & COMMENT EDITOR screen again, and terminate the editing operation by pressing the [EXIT] soft key.	A function key was pressed during the editing of the symbol/comment data, causing a switch to the CNC screen.

Alarm number	Faulty location/corrective action	Contents
ER21 MESSAGE DATA ERROR	Display the MESSAGE DATA EDITOR screen again, and terminate the editing operation by pressing the [EXIT] soft key.	A function key was pressed during the editing of the message data, causing a switch to the CNC screen.
ER22 NO PROGRAM	Enter the sequence program again.	The sequence program is empty.
ER27 LADDER FUNC. PRM IS OUT OF RANGE	Correct the sequence program; change the parameter number specified in a functional instruction to a value that is within the allowable range.	An out-of-range parameter number is specified in the TMR, TMRB, CTR, CTRB, DIFU, or DIFD functional instruction.
ER28 NO OPTION(I/O LINK CHx)	Contact us; specify the I/O Link point count expansion option for the indicated channel.	The I/O Link point count expansion option is not specified for CHx.
ER32 NO I/O DEVICE	<1> Check whether the power of each I/O device is on. <2> Check whether the power of each I/O device has been turned on before the CNC. <3> Check cable connections.	None of the I/O devices, such as the I/O Link, connection unit, and Power Mate, is connected.
ER33 I/O LINK ERROR or ER33 I/O LINK ERROR(CHn)	Contact us; replace the faulty hardware.	The LSI for the I/O Link is faulty.
ER34 I/O LINK ERROR(xx) or ER34 I/O LINK ERROR(CHn xx)	<1> Check the cable connections to the devices of group xx. <2> Check whether the power of each I/O device has been turned on before the CNC. <3> Replace any device of group xx in which the PMC control module is embedded.	An I/O device communication error occurred on the slave side of group xx.
ER35 TOO MUCH OUTPUT DATA IN GROUP(xx) or ER35 TOO MUCH OUTPUT DATA IN GROUP(CHn xx)	Reduce the output data count of group xx.	The output data count of I/O Link group xx exceeds the upper limit (33 bytes). The superfluous data is regarded as invalid.
ER36 TOO MUCH INPUT DATA IN GROUP(xx) or ER36 TOO MUCH INPUT DATA IN GROUP(CHn xx)	Reduce the input data count of group xx.	The input data count of I/O Link group xx exceeds the upper limit (33 bytes). The superfluous data is regarded as invalid.
ER37 TOO MUCH SLOT IN BASE or ER37 TOO MUCH SLOT IN BASE(CHn)	Correct the slot number to a value of 10 or less.	The slot number for the I/O Link exceed the upper limit (10). The slot number larger than 11 is regarded as invalid.
ER38 MAX SETTING OUTPUT DATA OVER(xx) or ER38 MAX SETTING OUTPUT DATA OVER(CHn xx)	Reduce the total amount of output data of all groups to 128 bytes or less.	The I/O area for the I/O Link is insufficient. (The area allocated to the group xx and later on the output side is regarded as invalid.)
ER39 MAX SETTING INPUT DATA OVER(xx) or ER39 MAX SETTING INPUT DATA OVER(CHn xx)	Reduce the total amount of input data of all groups to 128 bytes or less.	The I/O area for the I/O Link is insufficient. (The area allocated to the group xx and later on the input side is regarded as invalid.)
ER50 PMC EXECUTION ORDER ERROR	Check CNC parameter Nos. 11900 to 11902.	The set execution order of the multi-PMC function is invalid.

Alarm number	Faulty location/corrective action	Contents
ER51 PMC EXECUTION PERCENTAGE ERROR	Check CNC parameter Nos. 11905 to 11907.	The set execution percentage of the multi-PMC function is invalid.
ER52 IOLINK CHANNEL ASSIGNMENT ERROR	Check CNC parameter Nos. 11910 to 11913.	The I/O Link channel assignment to the PMC system is invalid.
ER53 IOLINK CHANNEL DEVIDE ERROR	Check CNC parameter Nos. 11915 to 11918.	The I/O Link channel division function setting is invalid.
ER54 NC-PMC I/F ASSIGNMENT ERROR	Check CNC parameter Nos. 11920 to 11929.	The interface assignment between NC and PMC is invalid.
ER55 LEVEL1 EXECUTION CYCLE ERROR	Check CNC parameter No. 11930.	The set ladder level 1 execution cycle is invalid.
ER97 IO LINK FAILURE(CHx yyGROUP)	<1> Check the cable connections to the I/O devices of group yy. <2> Check the power of each I/O device. <3> Check the parameter settings for the selectable I/O Link assignment function.	The I/O module assignment of group yy does not match the number of the I/O devices that are actually connected. No I/O device that is connected to the channel associated with this alarm will be linked. The ladder program runs regardless of the occurrence of this alarm.
WN02 OPERATE PANEL ADDRESS ERROR	Correct the Series 0 operator's panel address that is set in the PMC system parameter.	The Series 0 operator's panel address that is set in the PMC system parameter is invalid.
WN03 ABORT NC-WINDOW/EXIN	<1> Check the ladder program to verify that it is free from errors, and then restart the ladder program (press the RUN key). <2> Turn on the power of the CNC again.	The ladder program was stopped while communication was in progress between CNC and PMC. This alarm may cause the WINDR, WINDW, EXIN, and DISPB functional instructions to malfunction.
WN07 LADDER SP ERROR(STACK)	Correct the sequence program so that the subprogram has eight or fewer levels of nesting.	There are too many levels of nesting (levels more than 8) for the CALL or CALLU functional instruction to call the subprogram.
WN09 SEQUENCE PROGRAM IS NOT WRITTEN TO FLASH ROM	If you want to use a changed sequence program again next time you power on the system, write the sequence program to flash ROM. If you have made any unwanted change to the sequence program by mistake, read the original sequence program from flash ROM.	You have changed the sequence program using the LADDER DIAGRAM EDITOR screen or DATA I/O screen, but you have not yet written the changed sequence program to flash ROM. If you shut down the system without writing the changed sequence program to flash ROM, the changes you have made will be nowhere next time you turn on the power.
WN10 NO OPTION(STEP SEQUENCE)	<1> Add the step sequence option. <2> Arrange so that the step sequence subprogram will not be called.	No step sequence option was found when the system attempted to execute a step sequence.

A.2.2 **PMC System Alarm Messages**

Alarm number	Faulty location/corrective action	Contents
PC004 CPU ERR xxxxxxxx:yyyyyyyy PC006 CPU ERR xxxxxxxx:yyyyyyyy PC009 CPU ERR xxxxxxxx:yyyyyyyy PC010 CPU ERR xxxxxxxx:yyyyyyyy PC012 CPU ERR xxxxxxxx:yyyyyyyy	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	A CPU error occurred in the PMC system. xxxxxxxx and yyyyyyyy are internal error codes.
PC030 RAM PARITY aa:bb	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	A RAM parity error occurred in the PMC system. aa and bb are internal error codes.
PC050 IOLINK CHn aabb:xxyy	<1> Check whether the I/O assignment data matches the actual I/O device connections. <2> Check whether all the cables are connected properly. <3> Check the cable specifications. <4> Replace the interface module, cable, master printed circuit board, and/or other components of the I/O device, as appropriate.	An I/O Link communication error occurred. n is a channel number. aabb and xxyy are internal error codes. The possible causes of this alarm are as follows: (1) No base is connected even if data is assigned for base extension when I/O Unit-Model A is used. (2) One or more cables are connected improperly. (3) One or more cables are faulty. (4) One or more I/O devices (I/O Unit, Power Mate, etc.) are faulty. (5) The power of the master and/or slave I/O Link device is faulty. (6) The DO output of the I/O device is short-circuited. (7) The master printed circuit board is faulty.
PC060 FBUS xxxxxxxx:yyyyyyyy PC061 FL-R xxxxxxxx:yyyyyyyy	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	A bus error occurred in the PMC system.
PC070 SUB65 CALL (STACK)	Check the correspondence between the CALL or CALLU instruction and the SPE instruction.	A stack error occurred with the CALL or CALLU functional instruction of the ladder program.

Alarm number	Faulty location/corrective action	Contents
PC090 NMI(___) xxxxxxx:yyyyyyyy	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	An NMI event occurred in the PMC control software for an unknown reason.
PC092 USER TRAP aa:xxxxxxxx	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	An attempt was made to execute a TRAP instruction that was not used in the PMC control software.
PC093 INT(SYS) xxxxxxx:yyyyyyyy PC094 INT(TRAP) xxxxxxx:yyyyyyyy PC095 INT(EX) xxxxxxx:yyyyyyyy PC096 INT(IN) xxxxxxx:yyyyyyyy	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	An interrupt occurred in the PMC control software for an unknown reason.
PC087 PARITY ERR (LADDER-2) PC097 PARITY ERR (LADDER) PC098 PARITY ERR (DRAM)	This alarm may be due to a hardware fault; contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.) as well as the displayed internal error codes.	A RAM check error occurred.
PC501 NC/PMC INTERFACE ERR PATH_	Contact us with information on the circumstances under which the alarm occurred (displayed message, system configuration, operation suspected of causing the alarm, timing of alarm occurrence, frequency of occurrence, etc.).	The read or write operation between CNC and PMC failed.
PC502 ILLEGAL FUNCTION (SUB xx)	Correct the sequence program so that the xx functional instruction will not be used.	The sequence program uses the xx functional instruction that is not supported.

A.2.3 **Operation Errors**

Error messages that may be displayed on the PMC LADDER DIAGRAM VIEWER screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Input a valid address or numeric value.	The input address or numeric value is invalid.
PROGRAM IS PROTECTED BY PASSWORD	Enter the password.	The screen cannot be displayed because the program is protected by the password.
ILLEGAL SUBPROGRAM NAME	Input a existent subprogram number or symbol.	A nonexistent subprogram number or symbol is specified.
SYMBOL UNDEFINED	Input a defined symbol or bit address.	An undefined symbol character string is specified.
THE NET IS NOT FOUND		The specified net is not found.
THE ADDRESS IS NOT FOUND		The specified address is not found.
THE FUNCTIONAL INSTRUCTION IS NOT FOUND		The specified functional instruction is not found.
WRITE COIL NEEDS BIT ADDRESS	Specify a bit address for the write coil search.	You entered a byte address when specifying an address used for the write coil search.
SOME NETS ARE DISCARDED	The system cannot pick up all the nets. Choose the nets to pick up, by using the LADDER DIAGRAM VIEWER display screen, and then perform the net pickup operation manually.	The system failed to pick up all the nets because there were 128 nets or more to be picked up.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III. Stop other applications from accessing the ladder data.	The ladder data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the ladder data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the PMC LADDER DIAGRAM EDITOR screen

Alarm number	Faulty location/corrective action	Contents
THIS NET IS PROTECTED		When you are editing data on a per-subprogram basis, you cannot edit the subprogram frame nets (END1, END2, END3, SP, and SPE).
TOO LARGE DATA TO COPY	Reduce the range of data to copy. Perform the copy operation several times, copying a smaller range of data at a time.	The selected range of data exceeds the size of the copy buffer.
TOO LARGE DATA TO PASTE	Reduce the size of data to paste.	An attempt was made to paste data whose size exceeded the free space of the sequence program.
BIT ADDRESS IS REQUIRED	Make sure that the address types match for the alteration operation.	An attempt was made to alter a bit address to a byte address.
BYTE ADDRESS IS REQUIRED	Make sure that the address types match for the alteration operation.	An attempt was made to alter a byte address to a bit address.
ILLEGAL PMC ADDRESS	Check the address to be input, and then enter it correctly.	• A character string was entered that was unacceptable as a PMC address. • A wildcard (*) was specified in an inappropriate manner. • Ether "OLD ADDRESS" or "NEW ADDRESS" was not entered.
THE ADDRESS IS READ-ONLY	Enter a write-permitted address.	• An attempt was made to alter a write coil address to a write-prohibited bit address. • An attempt was made to alter an address set in an output parameter of a functional instruction to a write-prohibited bit address.
THE ADDRESS TYPE ARE MISMATCHED	Check the types of the address in "OLD ADDRESS" and "NEW ADDRESS" and, if necessary, enter the correct address or addresses.	The type of the addresses in "OLD ADDRESS" does not match that in "NEW ADDRESS".
***** DOSE NOT HAVE SYMBOL	Define symbol data in "OLD ADDRESS".	No symbol data is defined in "OLD ADDRESS".
***** ALREADY HAS SYMBOL	Make sure that the address types match for the alteration operation.	Symbol data is already defined in "NEW ADDRESS".

Error messages that may be displayed on the PMC LADDER DIAGRAM EDITOR screen (when updating)

Alarm number	Faulty location/corrective action	Contents
OVERLAPPED COM	If COME is missing, add it in proper position. If the COM is unnecessary, remove it.	There is no COME that corresponds to this COM.
END IN COM END1 IN COM END2 IN COM	If COME is missing, add it in proper position. If COM is unnecessary, remove it.	END,END1,END2, or END3 is found between COM and COME.
JMPE IN COM	JMPE and corresponding JMP must have same COM/COME status. Review JMP range and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMPE is found between COM and COME, and JMP and corresponding JMPE have different COM/COME status.
SP/SPE IN COM	If COME is missing, add it in proper position. If the COM is unnecessary, remove it.	SP or SPE is found between COM and COME.
COME WITHOUT COM	If COM is missing, add it in proper position. If the COME is unnecessary, remove it.	There is no COM that corresponds to this COME.
DUPLICATE CTR NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural CTRs have the same number as their parameter. (This is warning.)
ILLEGAL CTR NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	CTR has parameter number that is out of range.
DUPLICATE DIFU/DIFD NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural DIFUs or DIFDs have the same number as their parameter. (This is warning.)
ILLEGAL DIFU/DIFD NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	DIFU or DIFD has parameter number that is out of range.

Alarm number	Faulty location/corrective action	Contents
NO END NO END1 NO END2 NO END3	Add END, END1, END2 or END3 in proper position.	END, END1, END2 or END3 is not found.
DUPLICATE END1 DUPLICATE END2 DUPLICATE END3	Remove extra END1, END2 or END3.	Multiple END1, END2 or END3 are found.
GARBAGE AFTER END GARBAGE AFTER END2 GARBAGE AFTER END3	Remove unnecessary nets, and move necessary nets to proper position so that they will be executed.	There are some nets after END, END2 or END3, which will not be executed.
OVERLAPPED JMP	If JMPE is missing, add it in proper position. If the JMP is unnecessary, remove it.	There is no JMPE that corresponds to this JMP.
JMP/JMPE TO BAD COM LEVEL	JMP and corresponding JMPE must have same COM/COME status. Review JMP range and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMP and corresponding JMPE have different COM/COME status.
COME IN JMP	COME and corresponding COM must have same JMP/JMPE status. Review COM range and JMP range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	COME is found between JMP and JMPE, and COM and corresponding COME have different JMP/JMPE status.
END IN JMP END1 IN JMP END2 IN JMP END3 IN JMP	If JMPE is missing, add it in proper position. If JMP is unnecessary, remove it.	END,END1,END2, or END3 is found between JMP and JMPE.
SP/SPE IN JMP	If JMPE is missing, add it in proper position. If the JMP is unnecessary, remove it.	SP or SPE is found between JMP and JMPE.
JMPB OVER COM BORDER	JMPB and its destination must have same COM/COME status. Review range of JMPB and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMPB and its destination differ in COM/COME status.
JMPB OVER LEVEL	JMPB can only jump to the same program level, or within a subprogram. If the JMPB is unnecessary, remove it. If LBL for the JMPB is missing, add it in proper position. If it should be JMPC, correct it.	JMPB jumps to different program level.
LBL FOR JMPB NOT FOUND	If JMPB is unnecessary, remove it. If LBL is missing, add it in proper position.	Can not find proper LBL for JMPB.
JMPC IN BAD LEVEL	JMPC is used to jump from a subprogram to level 2. If the JMPC is unnecessary, remove it. If it should be JMPB or JMP, correct it.	JMPC is used in other than subprogram.
LBL FOR JMPC NOT FOUND	If JMPC is unnecessary, remove it. If LBL is missing, add it in proper position: JMPC jumps into level 2.	Can not find proper LBL for JMPC.

Alarm number	Faulty location/corrective action	Contents
LBL FOR JMPC IN BAD LEVEL	JMPC is used to jump from a subprogram to level 2. If the JMPC is unnecessary, remove it. If another LBL of same L-address that the JMPC is intended to jump exists in the subprogram, assign different L-address to these two LBLs. If it should be JMPB or JMP, correct it.	Destination of JMPC is not level 2.
JMPC INTO COM	LBL for JMPC must be located out of any COM and COME pair. If the JMPC is unnecessary, remove it. If the LBL is located wrong, move it to correct position. If the L-address of JMPC is wrong, correct it.	JMPC jumps to LBL between COM and COME.
JMPE WITHOUT JMP	If JMP is missing, add it in proper position. If the JMPE is unnecessary, remove it.	There is no JMP that corresponds to this JMPE.
TOO MANY LBL	Remove unnecessary LBLs. If this error still occurs, adjust the construction of program to use less LBLs.	There are too many LBLs.
DUPLICATE LBL	If some of these LBLs are unnecessary, remove them. If all of these LBLs is necessary, assign other L-addresses to them to make all LBLs unique.	Same L-address is used in plural LBLs.
OVERLAPPED SP	If SPE is missing, add it in proper position. If the SP is unnecessary, remove it.	There is no SPE that corresponds to this SP.
SPE WITHOUT SP	If SP is missing, add it in proper position. If the SPE is unnecessary, remove it.	There is no SP that corresponds to this SPE.
END IN SP	If SPE is missing, add it in proper position. If END is in wrong place, move it to proper position.	END is found between SP and SPE.
DUPLICATE P ADDRESS	If some of these SPs are unnecessary, remove them. If all of these SPs is necessary, assign other P-addresses to them to make all SPs unique.	Same P-address is used in plural SPs.
DUPLICATE TMRB NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural TMRBs have the same number as their parameter. (This is warning.)
ILLEGAL TMRB NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	TMRB has parameter number that is out of range.

Alarm number	Faulty location/corrective action	Contents
DUPLICATE TMR NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural TMRs have the same number as their parameter. (This is warning.)
ILLEGAL TMR NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	TMR has parameter number that is out of range.
NO SUCH SUBPROGRAM	If it calls wrong subprogram, correct it. If the subprogram is missing, create it.	Subprogram that is called by CALL/CALLU is not found.
UNAVAILABLE INSTRUCTION	Confirm that this ladder program is correct one. If this program is correct one, all these unsupported instructions have to be removed.	Unsupported instruction for this PMC model is found.
SP IN BAD LEVEL	SP can be used at top of a subprogram. Correct it so that no SP exists in other place.	SP is found in wrong place.
LADDER PROGRAM IS BROKEN	This ladder program must be all cleared once, and remake ladder program.	Ladder program may be broken by some reason.
NO WRITE COIL	Add proper write coil.	Write coil is necessary, but is not found.
CALL/CALLU IN BAD LEVEL	CALL/CALLU must be used in Level 2 or in subprograms. Do not use any other places.	CALL/CALLU is used in wrong place.
SP IN LEVEL3	If END3 is located wrong, move it to correct position. If the SP is unnecessary, remove it.	SP is found in level 3.

Error messages that may be displayed on the PMC NET EDITOR screen

Alarm number	Faulty location/corrective action	Contents
ILLEGAL FUNCTIONAL INSTRUCTION NAME	Specify the name of an available functional instruction.	The entered name of functional instruction is invalid.
TOO MANY FUNCTIONAL INSTRUCTIONS IN ONE NET	Only one functional instruction is allowed to constitute a net. If necessary, divide the net into plural nets.	Too many functional instructions are in one net.
TOO LARGE NET	Divide the net into plural nets so that step number in a net may become small.	Net is too large. When a net is converted into the object, the net exceeds 256 steps.
NO INPUT FOR OPERATION	Coil without input, or coil connected to output of functional instruction that has no output, causes this error. If coil is not necessary, remove it. If necessary, connect it to meaningful input.	No signal is provided for logical operation.
OPERATION AFTER FUNCTION IS FORBIDDEN	Output of functional instruction can not be connected to a contact, nor to conjunction with other signal that will be implemented by logical-or operation.	No logical operation with functional instruction output is permitted, except write coils.
WRITE COIL IS EXPECTED	Write coil is not found even if it is expected. Add proper write coil to the net.	Write coil is expected, but not found.
BAD COIL LOCATION	Coil can be located only at rightmost column. Any coil located at other place must be erased once, and place necessary coils in correct place.	Coil is located in bad position.
SHORT CIRCUIT	Find contact with terminals connected by short circuit, and correct connections.	Some contacts are connected with short circuit. CTR has a parameter number that is out of the range.
FUNCTION AFTER DIVERGENCE IS FORBIDDEN	Functional instruction can not be used in output section of net. If necessary, divide the net into plural nets.	Functional instruction is used in output section of net.
ALL COIL MUST HAVE SAME INPUT	Left terminals of all coils in a net must be connected to same input point.	When a net contains more than one coil, the coils should not have any contact beside them affects only of the coils.
BAD CONDITION INPUT	Check the connection of all condition inputs of the functional instruction. Especially for functional instruction that has more than one condition input, check if connections to condition inputs interfere with each other.	Some condition input of functional instruction is not connected correctly.
NO CONNECTION	Find gap that is expected to be connected, and correct the connection.	There is signal connected to nowhere.
NET IS TOO COMPLICATED	Examine every connection, and find unnecessarily bending connection, or coils that are connected to different point.	Net is too complicated to analyze.
PARAMETER IS NOT SUPPLIED	Enter all of the relay addresses, and parameters of functional instructions.	Relay with blank address, or blank parameter of functional instruction, is found.

Error messages that may be displayed on the TITLE DATA EDITOR screen

Alarm number	Faulty location/corrective action	Contents
TOO MANY CHARACTERS	Make sure that the entered character string is within the allowable input length.	The number of characters in the entered character string exceeds the allowable input length. Some of the characters are discarded.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III. Stop other applications from accessing the title data.	The title data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the title data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the SYMBOL & COMMENT DATA EDITOR screen

Alarm number	Faulty location/corrective action	Contents
TOO MANY CHARACTERS	Make sure that the entered address is within the allowable input length.	The number of characters in the entered address exceeds the allowable address input length.
ADDRESS IS REQUIRED	Enter data in a batch correctly, as instructed in "Editing a set of symbol and comment data" in Subsection 9.2.2.	No address was entered during the batch input of address, symbol, and comment data using the SYMBOL & COMMENT EDITOR screen.
ILLEGAL PMC ADDRESS	Enter an address correctly.	The specified address is invalid, or the entered address character string contains a space or spaces.
THE ADDRESS ALREADY HAS AN ENTRY	Specify another address.	An already registered address was entered.
THE SYMBOL NAME IS ALREADY USED	Specify another symbol.	An already registered symbol was entered.
PMC ADDRESS MUST BE ENTERED	Enter a PMC address in the ADDRESS field.	No PMC address was entered when new symbol/comment data is registered.
TOO LONG SYMBOL NAME	Make sure that the symbol consists of 16 characters or less.	The entered symbol exceeds the specified number of characters.
TOO LONG COMMENT STRING	Make sure that the comment consists of 30 characters or less.	The entered comment exceeds the specified number of characters.
BAD SYMBOL NAME	Define a symbol that contains no space.	The entered symbol contains a space or spaces.
THE STRING IS NOT FOUND	Specify another character string for the search.	The search was done for the specified character string but did not find it.
OUT OF SPACE	Create free space for the sequence program, by deleting unnecessary ladder or message data.	The symbol/comment editing area has no free space.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III. Stop other applications from accessing the symbol/comment data.	The symbol/comment data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the symbol/comment data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the MESSAGE DATA EDITOR screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Enter ";" in the 5th digit position in the batch message input process.	The delimiter code - semicolon (;) - was not entered in the batch message input process.
ILLEGAL NUMBER	Enter a four-digit number as the message number.	The entered message number contains any nonnumeric character, or a number shorter than four digits was entered.
THE NUMBER IS OUT OF RANGE	Make sure that the entered message number is in the range between 1000 and 9999.	The entered message number is out of the 1000-9999 range.
CLOSING "@" IS NOT FOUND	When entering kana or other Japanese characters, make sure that they are enclosed within a pair of @ signs.	One of the @ sign pair is missing.
BAD NUMBER OF CHARACTERS IN "@-@"	Enter a character string correctly between a pair of @ signs.	The number of characters entered between the pair of @ signs is not even.
ILLEGAL CHARACTER IN "@-@"	Enter a character string correctly between a pair of @ signs.	One or more invalid character codes exist between the pair of @ signs.
BAD NUMBER OF CHARACTERS FOR 2-BYTE CODE	Enter a two-byte code correctly between @02 and 01@.	The number of characters in the two-byte code (characters entered between @02 and 01@) is not a multiple of four.
ILLEGAL 2-BYTE CODE	Enter a two-byte code correctly between @02 and 01@.	The two-byte code (characters entered between @02 and 01@) contains one or more characters other than the JIS codes.
CLOSING CONTROL CODE "01" IS NOT FOUND	Enter the closing control code.	The two-byte code (characters entered between @02 and 01@) lacks the closing control code (01).
CONTROL CODE "XX" IS REPEATED	Remove any repeated control code.	The starting control code (02), closing control code (01), and/or umlaut code (0D) is repeated.
CLOSING "]" IS NOT FOUND	Make sure that the "[" and "]" codes are entered in pairs.	The delimiter codes for numerical data are not entered in pairs.
BAD NUMERICAL DATA FORMAT	Specify the numerical data correctly.	The format of the numerical data is invalid.
BAD PMC ADDRESS FOR NUMERIAL DATA	Enter an available address.	The address section of the numerical data is invalid.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III. Stop other applications from accessing the message data.	The message data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the message data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the I/O MODULE EDITOR screen

Alarm number	Faulty location/corrective action	Contents
GROUP NUMBER IS TOO LARGE	Specify 15 or a smaller value as the group number.	The entered group number is too large.
BASE NUMBER IS TOO LARGE	Specify base number 0 for I/O Unit-B (##, #1 - #10).	The entered base number is too large.
SLOT NUMBER IS TOO LARGE	Specify 30 or a smaller value as the slot number for I/O Unit-B (##, #1 - #10). For other I/O units, specify 10 or a smaller value.	The entered slot number is too large.
SLOT NUMBER IS TOO SMALL	Specify 0 or a large value as the slot number for I/O Unit-B (##, #1 - #10). For other I/O units, specify 1 or a larger value.	The entered slot number is too small.
I/O UNIT NAME MISMATCH	Check the I/O unit name or address.	The input I/O unit is assigned to the Y address, or the output I/O unit is assigned to the X address.
ILLEGAL I/O UNIT NAME	Enter an I/O unit that is listed in Tables 3.2 (a) to 3.2 (c) in Chapter 3.	The entered I/O unit name is invalid.
NOT ENOUGH SPACE	Enter the data again after creating free space by deleting the data allocated behind the current cursor position or by other adequate means.	There is not enough free address space for the size of the I/O unit you are going to assign. This error also occurs if you attempt to assign the I/O unit to an already allocated address space.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III.　Stop other applications from accessing the I/O module data.	The I/O module data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the I/O module data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the SYSTEM PARAMETER screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Enter a numerical value correctly, as instructed in Section 9.8.	The entered numerical value or its input format is invalid.
SYMBOL UNDEFINED	Enter a defined symbol or bit address.	An undefined symbol character string was entered.
PROGRAM IS BEING MODIFIED	Disconnect the online communication with FANUC LADDER-III.　Stop other applications from accessing the system parameter data.	The system parameter data cannot be displayed because online communication with FANUC LADDER-III is in progress or another application is accessing the system parameter data.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the SIGNAL STATUS screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Enter a numerical value correctly, as instructed in "Screen operations using other keys" in Subsection 7.1.2.	The entered numerical value or its input format is invalid.
SYMBOL UNDEFINED	Enter a defined symbol or bit address.	An undefined symbol character string was entered.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the PMC PARAM screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Enter a numerical value correctly, as instructed in Section 7.3.	The entered numerical value or its input format is invalid.
THIS FUNCTION IS PROTECTED	Cancel the protection by the programmer protection function or 8-level protection function.	This function is protected by the programmer protection function or 8-level protection function.

Error messages that may be displayed on the SIGNAL TRACE screen

Alarm number	Faulty location/corrective action	Contents
TRACE FUNCTION IS ALREADY IN USE	Wait until FANUC LADDER-III or some other application finishes using the trace function before executing it.	FANUC LADDER-III or some other application is currently using the trace function.
NO SAMPLING ADDRESS	Specify a bit address as a sampling address in the trace parameter.	No sampling address is specified in the trace parameter.
NO STOP TRIGGER ADDRESS	Specify a bit address as the stop trigger address in the trace parameter.	The stop trigger address is not specified in the trace parameter.
NO SAMPLING TRIGGER ADDRESS	Specify a bit address as the sampling trigger address in the trace parameter.	The sampling trigger address is not specified in the trace parameter.

Error messages that may be displayed on the trace setting screen

Alarm number	Faulty location/corrective action	Contents
INPUT INVALID	Enter a numerical value that is within the specified data range of the relevant trace parameter.	A nonnumeric value or an out-of-range parameter value was entered.
SYMBOL UNDEFINED	Enter a defined symbol or bit address.	An undefined symbol character string was entered.
BIT ADDRESS IS REQUIRED	Specify a bit address as the stop or sampling trigger address.	A byte address was specified as the stop or sampling trigger address.
INVALID STOP TRIGGER ADDRESS	Enter a PMC signal address that can be used as the stop trigger address.	The bit address entered as the stop trigger address is invalid.
INVALID SAMPLING TRIGGER ADDRESS	Enter a PMC signal address that can be used as the sampling trigger address.	The bit address entered as the sampling trigger address is invalid.

A.2.4 I/O Communication Error Messages

The error messages that may appear on the I/O screen and their meanings and actions are listed below.

Error messages displayed during memory card I/O operation

Alarm number	Faulty location/corrective action	Contents
MEMORY CARD IS NOT READY	Check whether a memory card is installed.	No memory card is installed.
MEMORYCARD IS FULL	Delete files to create available space.	There is no available space in the memory card.
MEMORYCARD IS WRITE PROTECTED	Release the write protection of the memory card.	The memory card is write-protected.
MEMORYCARD IS NOT FORMATTED	Format the memory card.	The memory card cannot be recognized.
TOO MANY FILES IN MEMORYCARD	Delete unnecessary files to reduce the number of files.	There are too many files.
FILE NOT FOUND	On the list screen, check the file name or file number.	The specified file cannot be found.
FILE IS READ-ONLY	Check the attributes of the file.	Write to the specified file is not permitted.
FILE NAME IS INVALID	Specify the file name in MS-DOS form.	The file name is illegal.
COULD NOT FORMAT MEMORY CARD	The NC cannot format this memory card. Use another unit such as a personal computer to format the memory card.	The memory card cannot be formatted.
UNSUPPORTED MEMORYCARD	Replace the memory card with another one.	This memory card is not supported.
CAN NOT DELETE FILE	Check the attributes of the file.	An error occurred when a file was deleted from the memory card.
MEMORYCARD BATTERY ALARM	Replace the battery of the memory card.	The battery of the memory card has become weak.
THIS FILE NAME IS ALREADY USED	Change the file name to another one.	The file name is already used.
MEMORYCARD ACCESS ERROR	Replace the memory card with another one.	The memory card cannot be accessed.
DIFFERENCE FOUND		File comparison detected a mismatch.
MEMORY CARD IS LOCKED BY OTHER FUNCTION	Wait until the PMC user completes processing, then retry.	Another PMC user is using the memory card.
MEMORY CARD HEADER ROM DATA ID IS ILLEGAL	This file cannot be read. Check the type of the file.	An attempt was made to read a file, but its ROM data ID was illegal.
FILE NUMBER CAN NOT SELECTED	If the file does not exist, the key entry is invalid. If this error occurs even when the cursor is placed at a file name, contact the FANUC service center.	The file number cannot be selected.
THE FILE NUMBER DOES NOT EXIST	Check the total number of files on the list screen.	The entered file number is not present. The entered number exceeds the total number of files.
FILE NUMBER IS RESTRICTED TO "128"	Enter a numeric value not exceeding 128.	A value up to 128 can be entered as the file number.

Alarm number	Faulty location/corrective action	Contents
MEMORY CARD IS USED BY OTHER FUNCTION	Retry after terminating the other function that is currently using the memory card.	Some other function is currently using the memory card.
MEMORY CARD IS WRITE PROTECTED	Cancel the write protection of the memory card, or use another memory card that is not write protected.	The memory card is write protected.
UNSUPPORTED MEMORY CARD	Use another memory card.	This is an unsupported type of memory card.
COULD NOT DELETE FILE	Check the read/write permission attribute of the file.	The file cannot be deleted.
TRACE FILE NUMBER IS OVER	Delete unnecessary old trace result file or files.	No more trace result file can be created because the maximum trace result file number (file extension) has been reached.
INTERNAL ERROR (xxxxxxxxxx)	Contact the FANUC service center, and report the displayed message correctly.	An error due to an internal factor occurred. Details on the error are displayed in parentheses.

Error messages displayed during flash ROM I/O operation

Alarm number	Faulty location/corrective action	Contents
NOT IN EMG STOP MODE	Place the system in the emergency stop state.	The system is not in the emergency stop state.
INVALID LADDER PROGRAM	Check the program.	The transfer program is illegal.
DIFFERENCE FOUND		A file comparison detected a mismatch.
FLASH ROM IS LOCKED BY OTHER FUNCTION	Wait until the PMC user completes processing, then retry.	Another PMC user is using the flash ROM.
FLASH ROM HEADER ROM DATA ID IS ILLEGAL	This file cannot be read. Check the type of the file.	An attempt was made to read a file, but its ROM data ID was illegal.
FLASH ROM IS USED BY OTHER FUNCTION	This file cannot be read. Check the type of the file.	The ROM data ID of the file you attempted to read is invalid.
INTERNAL ERROR (xxxxxxxxxx)	Contact the FANUC service center, and report the displayed message correctly.	An error due to an internal factor occurred. Details on the error are displayed in parentheses.

Error messages displayed during FLOPPY or other input/output device I/O operation.

Alarm number	Faulty location/corrective action	Contents
ILLEGAL PMC PARAMETER FORMAT	Specify a file of the PMC parameter format. Also, check the specified file to see whether its content is not disrupted.	The specified file is not of the PMC parameter format.
ILLEGAL HANDY FILE FORMAT	Specify a file of the handy file format. Also, check the specified file to see whether its content is not disrupted.	The specified file is not of the handy file format.
UNKNOWN FILE FORMAT	Specify file of recognizable format such as PMC parameter format, or check the contents of the file.	Can not recognize the format of specified file.
FILE NAME OR FILE NUMBER IS REQUIRED	Specify file name or file number for the operation.	Need file name or file number to identify file to read, compare, or delete.
COMMUNICATION TIMEOUT	Check the communication parameters such as baud rate, and retry to communicate.	Communication with the I/O device has been timeout.
I/O DEVICE IS NOT ATTACHED OR IN ERROR STATUS	Check the power of I/O device is ON. Check the I/O device is connected. Check the cable that connects I/O device with PMC is correct one. If some error has occurred in I/O device, solve it.	Any I/O device is not connected, or some error has occurred in it.
RECEIVED BAD DATA: CHECK THE COMMUNICATION PARAMETERS	Check the PMC's communication parameters such as baud rate match the ones of I/O device.	Invalid data has been received.
RECEIVED DATA HAS OVERRUN	Check the communication parameters about flow control.	Too many data have received at once.
OTHERS FUNCTION IS USING THIS CHANNEL	Use the other channel, or stop the function.	Others function is using this channel.
BAD COMMUNICATION PARAMETER	Check the communication parameters such as baud rate.	Setting parameters of communication are not correct.
OTHER FUNCTION IS USING I/O FUNCTION	Wait until function that using I/O function do finish, or stop the function.	Another function such as FANUC LADDER-III is using I/O function.
UNKNOWN HANDY FILE FORMAT DATA	Check the file.	The received data is not a program of the PMC system or is a program of some other incompatible type.
ILLEGAL BAUD RATE SETTING	Set a valid baud rate.	The set baud rate is invalid.
ILLEGAL CHANNEL NUMBER	Set a valid channel number.	The set channel number is invalid.
ILLEGAL PARITY BIT SETTING	Set a valid parity bit.	The set parity bit is invalid.
ILLEGAL STOP BIT SETTING	Set a valid stop bit.	The set stop bit is invalid.
ILLEGAL WRITE CODE SETTING	Set a valid output code.	The set output code is invalid.
SEQUENCE PROGRAM IS IN USE BY ONLINE FUNCTION	Wait until On-line function, do finish the using I/O function. In general, both of I/O function and On-line function should not be used at the same time.	Can not input/output of sequence program, because On-line function is using sequence program.

Common error messages that may be displayed on individual devices during the I/O operations

Alarm number	Faulty location/corrective action	Contents
ERROR OCCURS IN LADDER PROGRAM	Check the PMC alarm screen and correct the indicated program error accordingly.	Data cannot be output because there is an error in the ladder program.
UNKNOWN DATA TYPE	Check the file.	The PMC type of the input data is unknown.
THIS FUNCTION IS NOT ALLOWED	Check the related settings.	There are not all the settings that are needed to use this function.
PMC PARAMETER IS LOCKED BY OTHER FUNCTION	Retry after terminating the other function that is currently using the PMC parameter.	The PMC parameter is currently used by some other function and cannot be referenced by this function.
THIS DEVICE IS USED BY OTHER FUNCTION	Retry after terminating the other function that is currently using the specified device.	The specified device is currently used by some other function and cannot be used by this function.
PMC PARAMETER IS PROTECTED BY OTHER FUNCTION	Retry after terminating the other function that is currently using the PMC parameter.	The PMC parameter is currently used by some other function and cannot be changed by this function.
LADDER TYPE UNMATCH	Specify a program of a valid type.	The specified program is of a different type and cannot be read.
TOO LARGE LADDER PROGRAM	Check the file. Or, change to a step number option that allows you to set a larger program size.	The ladder program is too large to read.
LADDER PROGRAM IS USED BY OTHER FUNCTION	Retry after terminating the other function that is currently displaying the ladder program.	The ladder program is currently used by some other function and cannot be referenced by this function.

A.3 **ALARM LIST (SERIAL SPINDLE)**

When a serial spindle alarm occurs, the following number is displayed on the CNC.

> **NOTE**
> * 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 "Error Codes (Serial Spindle)."

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9001	SSPA:01 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.
SP9002	SSPA:02 EX DEVIATION SPEED	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.
SP9003	SSPA:03 DC-LINK FUSE IS BROKEN	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.
SP9004	SSPA:04 POWER SUPPLY ERROR	04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (PSM alarm 5)
SP9006	THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9007	SSPA:07 OVER SPEED	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.)
SP9009	SSPA:09 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
SP9011	SSPA:11 OVERVOLT POWER 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.)
SP9012	SSPA:12 OVERCURRENT POWER 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
SP9013	SSPA:13 CPU DATA MEMORY FAULT	13	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM within the SPM is abnormal.)
SP9015	SSPA:15 SPINDLE SWITCHING FAULT	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.
SP9016	SSPA:16 RAM ERROR	16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
SP9018	SSPA:18 SUMCHECK ERROR PROGRAM ROM	18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
SP9019	SSPA:19 EXCESS 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.)
SP9020	SSPA:20 EXCESS 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.)

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9021	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.
SP9024	SSPA:24 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.
SP9027	SSPA:27 DISCONNECT POSITION 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.)
SP9029	SSPA:29 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.)
SP9030	SSPA:30 OVERCURRENT INPUT 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.)
SP9031	SSPA:31 MOTOR LOCK OR DISCONNECT DETECTOR	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.
SP9032	SSPA:32 SIC-LSI RAM FAULT	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.)
SP9033	SSPA:33 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).
SP9034	SSPA:34 ILLEGAL PARAMETER	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.

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9036	SSPA:36 OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.
SP9037	SSPA:37 ILLEGAL SETTING VELOCITY DETECTOR	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.
SP9041	SSPA:41 ILLEGAL 1REV SIGN OF POSITION CODER	41	1 Check and correct the parameter. 2 Replace the cable. 3 Re-adjust the BZ sensor signal. 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
SP9042	SSPA:42 NO 1REV SIGN OF POSITION CODER	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.
SP9043	SSPA:43 DISCONNECT POSITION CODER DEF. SPEED	43	Replace the cable.	The differential speed position coder signal (connector JY8) in SPM type 3 is abnormal.
SP9046	SSPA:46 ILLEGAL 1REV SIGN OF SCREW CUT	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.
SP9047	SSPA:47 ILLEGAL SIGNAL OF POSITION CODER	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).
SP9049	SSPA:49 DEF. SPEED IS OVER VALUE	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).
SP9050	SSPA:50 SYNCRONOUS VALUE IS OVER SPEED	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).

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9051	SSPA:51 LOW VOLT POWER CIRCUIT	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)
SP9052	SSPA:52 ITP FAULT 1	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).
SP9053	SSPA:53 ITP FAULT 2	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).
SP9054	SSPA:54 OVERCURRENT	54	Review the load state.	An overload current was detected.
SP9055	SSPA:55 ILLEGAL POWER LINE	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.
SP9056	COOLING FAN FAILURE	56	Replace the SPM unit.	The cooling fan in the SPM control circuit stopped.
SP9057	CONV. EX. DECELERATION POW.	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.
SP9058	CNV. OVERLOAD	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)
SP9059	CNV. COOLING FAN FAILURE	59	Replace the PSM unit.	The cooling fan in the PSM stopped. (PSM alarm indication: 2)
SP9061	SSPA:61 DECODED ALARM	61	Check parameter settings.	The error between the semi-closed and full-closed sides when the dual position feedback function is used is too large.
SP9065	SSPA:65 DECODED ALARM	65	1 Check parameter settings. 2 Check sensor connections and signals. 3 Check power line connections.	The move distance is too long when the magnetic pole is confirmed (synchronization spindle)
SP9066	COM. ERROR BETWEEN SP AMPS	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication between amplifiers.

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9069	SAFETY SPEED OVER	69	1 Check the specified speed. 2 Check parameter settings. 3 Check the sequence.	In the state in which safety speed monitoring was enabled, the system detected that the motor speed exceeded the safety speed or detected an error during a free-run stop.
SP9070	ILLEGAL AXIS DATA	70	1 Check connections (JA7A of the second spindle requires a dedicated connector). 2 Replace the SPM control printed-circuit board.	An error was detected in an axis number check.
SP9071	SAFETY PARAMETER ERROR	71	Replace the SPM control printed-circuit board.	An error was detected in an axis parameter check.
SP9072	MISMATCH RESULT OF MOTOR SPEED CHECK	72	1 Replace the SPM control printed-circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	A mismatch was detected between the safety speed check results of the SPM and those of the CNC.
SP9073	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.
SP9074	CPU TEST ERROR	74	Replace the SPM control printed-circuit board.	An error was detected in a CPU test.
SP9076	INEXECUTION OF SAFETY FUNCTIONS	76	Replace the SPM control printed-circuit board.	The SPM detected that safety functions were not executed.
SP9077	MISMATCH RESULT OF AXIS NUMBER CHECK	77	1 Replace the SPM control printed-circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	A mismatch was detected between the axis number check results of the SPM and those of the CNC.
SP9078	MISMATCH RESULT OF SAFETY PARAMETER CHECK	78	1 Replace the SPM control printed-circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	A mismatch was detected between the safety parameter check results of the SPM and those of CNC.
SP9080	ALARM AT THE OTHER SP AMP.	80	Remove the cause of the alarm of the remote SPM.	During inter-SPM communication, an alarm was generated on the remote SPM.
SP9081	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.
SP9082	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.
SP9083	MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal.

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9084	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.
SP9085	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.
SP9086	NO 1-ROT SPNDL SENSOR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one-rotation signal of the spindle sensor is not generated.
SP9087	SPNDL SENSOR SIGNAL ERROR	87	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a spindle sensor feedback signal.
SP9088	COOLING RADI FAN FAILURE	88	Replace the SPM external cooling fan.	The external cooling fan stopped.
SP9089	SSPA:89 DECODED ALARM	89	1 Check the connection between the SPM and the submodule SM (SSM). 2 Replace the submodule SM(SSM). 3 Replace the SPM control printed-circuit board.	Submodule SM (SSM) error (synchronous spindle)
SP9110	AMP COMMUNICATION ERROR	b0	1 Replace the communication cable between amplifier and module. 2 Replace the SPM or PSM control printed circuit board.	Communication error between amplifier and module
SP9111	CONV. LOW VOLT CONTROL	b1	Replace the PSM control printed circuit board.	Low converter control power supply voltage (PSM indication = 6)
SP9112	CONV. EX. DISCHARGE POW.	b2	1 Check the regenerative resistance. 2 Check the motor selection. 3 Replace the PSM	Excessive converter regenerative power (PSM indication = 8)
SP9113	CONV. COOLING FAN FAILURE	b3	Replace the cooling fan.	Stopped cooling fan of the converter radiator (PSM indication = A)
SP9120	COMMUNICATION DATA ERROR	C0	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm

Number	Message	SPM indication (*1)	Faulty location and remedy	Description
SP9121	COMMUNICATION DATA ERROR	C1	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm
SP9122	COMMUNICATION DATA ERROR	C2	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm
SP9123	SSPA:C3 DECODED ALARM	C3	Replace the submodule SW(SSW).	Submodule SW (SSW) error (spindle switching)

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. An error
>   code is indicated in the CNC diagnosis, No.712.
>   When the red LED is on, the SPM indicates the
>   number of an alarm generated in the serial spindle.
>   → See "(10) Serial spindle alarms (SP alarm)."

SPM indication (*1)	Faulty location and remedy	Description
01	Although neither *ESP (emergency stop signal; there are two types of signals including the input signal and PSM contact signal) nor MRDY (machine ready signal) is input, SFR (forward rotation signal)/SRF (reverse rotation signal)/ORCM (orientation command) is input.	Check the *ESP and MRDY sequence. For MRDY, pay attention to the parameter setting regarding the use of the MRDY signal (parameter No. 4001#0).
03	The parameter settings are such that a position sensor is not used (position control not performed) (bits 3, 2, 1, 0 of parameter No. 4002 = 0, 0, 0, 0), but a Cs contour control command is input. In this case, the motor is not excited.	Check the parameter settings.
04	The parameter settings are such that a position sensor is not used (position control not performed) (bits 3, 2, 1, 0 of parameter No.4002 = 0, 0, 0,), but a servo mode (rigid tapping, spindle positioning, etc.) or spindle synchronization command is input. In this case, the motor is not excited.	Check the parameter settings.
05	The orientation function option parameter is not specified, but ORCM (orientation command) is input.	Check the orientation function parameter settings.
06	The output switching control function option parameter is not specified, but low-speed characteristic winding is selected (RCH = 1).	Check the output switching control function parameter settings and the power line state check signal (RCH).
07	A Cs contour control command is input, but SFR (clockwise rotation command)/SRV (counterclockwise rotation command) is not input.	Check the sequence.
08	A servo mode (rigid tapping, spindle positioning, etc.) control command is input, but SFR (clockwise rotation command)/SRV (counterclockwise rotation command) is not input.	Check the sequence.
09	A spindle synchronization command is input, but SFR (clockwise rotation command)/SRV (counterclockwise rotation command) is not input.	Check the sequence.

SPM indication (*1)	Faulty location and remedy	Description
10	A Cs contour control command is input, but another mode (servo mode, spindle synchronization, or orientation) is specified.	Do not switch to another mode during a Cs contour control command. Before moving to another mode, cancel the Cs contour control command.
11	A servo mode (rigid tapping, spindle positioning, etc.) command is input, but another mode (Cs contour control, spindle synchronization, or orientation) is specified.	Do not switch to another mode during a servo mode command. Before moving to another mode, cancel the servo mode command.
12	A spindle synchronization command is input, but another mode (Cs contour control, servo mode, or orientation) is specified.	Do not switch to another mode during a spindle synchronization command. Before moving to another mode, cancel the spindle synchronization command.
14	Both SFR (clockwise rotation command) and SRV (counterclockwise rotation command) are input at the same time.	Issue either of them.
17	The speed detector parameter settings (bits 2, 1, and 0 of parameter No. 4011) are not valid. ☆ There is no corresponding speed detector.	Check the parameter settings.
18	The parameter settings are such that a position sensor is not used (position control not performed (bits 3, 2, 1, and 0 of parameter No. 4002), but position coder system orientation is issued.	Check the parameter settings and the input signal.
24	If index is performed continuously in position coder system orientation, an incremental operation is performed first (INCMD = 1), then an absolute position command (INCMD = 0) is input.	Check INCMD (incremental command). If an absolute position command is to follow, be sure to perform absolute position command orientation first.
29	The parameter settings are such that the shortest-time orientation function is used (bit 6 of parameter No. 4018 = 0, Nos. 4320 to 4323 $\neq$ 0).	In the αi series spindle amplifier, the shortest-time orientation function cannot be used. Use normal-system orientation.
31	The hardware configuration is such that the spindle FAD function cannot be used. In this case, the motor is not activated.	Check the CNC model.
33	The hardware configuration is such that the spindle EGB function cannot be used. In this case, the motor is not activated.	Check the CNC model.
34	Both the spindle FAD function and the spindle EGB function are enabled. In this case, the motor is not activated.	The two functions cannot be used at the same time. Enable either function only.
34	The submodule SM (SSM) is faulty or the connection between SPM and SSM is in error.	Submodule SM (SSM) error (synchronous spindle)

> ***2**
> *2 PSM contact signal
>   Between ESP1 and ESP2 on the PSM
>   Contact open: Emergency stop
>   Contact closed: Normal operation

B LIST OF MAINTENANCE PARTS

Fuse and fan

Item			Ordering information	Remarks
Fuse	LCD-mounted type	For *i* series control unit (7.2"/8.4"/10.4")	A02B-0236-K100	
		For *i* series control unit (15") For *i*s series control unit	A02B-0236-K101	
	Stand-alone type	For control unit	A02B-0265-K100	
		For *i* series display unit (10.4")	A02B-0303-K101	
		For *i* series display unit (15") For *i*s series display unit	A02B-0236-K100	
		For PANEL *i*	A08B-0084-K020	
	Others	For operator's panel I/O module For standard machine operator's panel	A03B-0815-K001	
		For connector panel I/O module	A03B-0815-K002	
		For operator's panel connection unit	A02B-0163-K111	
Fan motor	LCD-mounted type	For basic unit (no-slot)	A02B-0303-K120	
		For basic unit (two-slot)	A02B-0303-K121	
	Stand-alone type	For basic unit (two-slot) For *i*s series display unit	A02B-0303-K120	
		For basic unit (four-slot)	A02B-0303-K122	
		For PANEL *i* (40-mm square)	A08B-0084-K100	
		For PANEL *i* (60mm square)	A08B-0084-K101	
		For PANEL *i* (for HDD unit)	A08B-0084-K102	

Others

Item		Ordering information	Remarks
Battery	For LCD-mounted and stand-alone type control unit memory backup, For PANEL *i*	A02B-0200-K102	
	For separate absolute pulse coder	A06B-6050-K061	
Touch panel protection sheet	For 10.4" LCD	A02B-0236-K110	
	For 12.1" LCD	A08B-0236-K118	
	For 15" LCD	A08B-0082-K020	
Pen for touch panel		A02B-0236-K111	

C BOOT SYSTEM

C.1   **OVERVIEW**

The boot system load the CNC system software (flash RAM $\rightarrow$ 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)   Checking a file (series and edition) in Memory card
(4)   Deleting a file from Flash ROM
(5)   Deleting a file from Memory card
(6)   Saving a file in Flash ROM to a Memory card
(7)   Batch saving and restoration of files of parameters and programs backed up by battery (SRAM area), to and from a Memory card
(8)   Formatting of 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**
1   This control unit supports the use of a Memory card as an input/output device. The Flash ATA card is available:
    See the order list for details of the supported Memory card types.
2   On a Memory card, only those files that are in the root directory can be accessed for display, reading, and writing. Those in subdirectories cannot be used.
3   The time required to read or write each data item varies depending on the Memory card type, the status of use, and other factors.
4   For flash ATA cards, only those recommended by FANUC are available.
5   When formatting a flash ATA card, use the quick formatting method, which clears the file allocation table and the directory information on the root directory. An unformatted flash ATA card cannot be used without being formatted with a personal computer.

C.1.1 **Displaying the Power ON Sequence**

```
(1)  RAM TEST :END
(2)  ROM TEST :END [60W1A]
(3)  DRAM ID  :xxxxxxxx
(4)  SRAM ID  :xxxxxxxx
(5)  FROM ID  :xxxxxxxx



     *** MESSAGE ***
(7)  LOADING CNC DATA-1      xxxxxx/xxxxxx
     END
```

```
     RAM TEST :END
(2)  ROM TEST :ERROR
```
Processing is stopped in the event of an error

```
     *** MESSAGE ***
(6)  ROM PARITY ERROR:NC BASIC. HIT SELECT.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```
SELECT key → SYSTEM MONITOR

Details of display items

(1) WORK RAM test results are displayed. In the event of an error, however, the sequence is not displayable, and LED indication is conducted without error display.

(2) BOOT ROM parity test results are displayed. During normal operation, the series and edition are displayed. In the event of an error, processing is stopped.

(3) The ID of the DRAM MODULE installed in the CNC is displayed.

(4) The ID of the SRAM MODULE installed in the CNC is displayed.

(5) The ID of the FROM MODULE installed in the CNC is displayed.

(6) The CNC BASIC software in flash memory is checked for validity and, in the event of an error, an error is displayed. In the event of an error, clicking the [SELECT] soft key allows you to select the SYSTEM MONITOR screen.

(7) This message indicates that the CNC BASIC software is being transferred to flash memory to DRAM.

C.1.2   **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. If no soft keys are provided as with a touch panel, use MDI numeric keys 6 and 7.
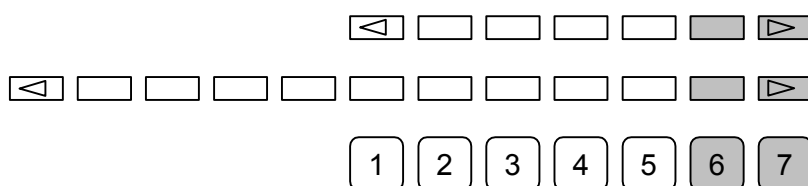
After an FROM ID and other items are displayed on the CNC screen, releasing the key brings you to the SYSTEM MONITOR screen.

(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.1.3   **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.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      60W1 - 01

(2)  1.END
(3)  2.USER DATA LOADING
(4)  3.SYSTEM DATA LOADING
(5)  4.SYSTEM DATA CHECK
(6)  5.SYSTEM DATA DELETE
(7)  6.SYSTEM DATA SAVE
(8)  7.SRAM DATA BACKUP
(9)  8.MEMORY CARD FORMAT


     *** MESSAGE ***
(10) SELECT MENU AND HIT SELECT KEY.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title. The series and edition of the BOOT SYSTEM are displayed at the right end.
(2) Function for terminating the boot system and starting the CNC.
(3) Function for writing data to Flash ROM.
(4) Function for writing data to Flash ROM.
(5) Function for checking the edition of a file in ROM.
(6) Function for deleting a file from Flash ROM or Memory card.
(7) Function for making a backup copy of the data stored on the Memory card.
(8) Function for backing up and restoring the SRAM area
(9) Function for formatting a Memory card.
(10) Simple operating instructions and error messages are displayed.

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

```
┌─────────────────┐    ┌─────────────────┐    ┌─────────────────┐
│Position the cursor.│ → │Select a function│ → │Check the selection│
│     [ UP ]      │    │    [SELECT]     │    │     [ YES ]     │
│    [ DOWN ]     │    │                 │    │     [ NO ]      │
└─────────────────┘    └─────────────────┘    └─────────────────┘

┌─────────────────┐    ┌─────────────────┐    ┌─────────────────┐
│  Execute the    │ → │                 │ → │Return to original│
│   function      │    │   Select END    │    │     state       │
└─────────────────┘    └─────────────────┘    └─────────────────┘
```
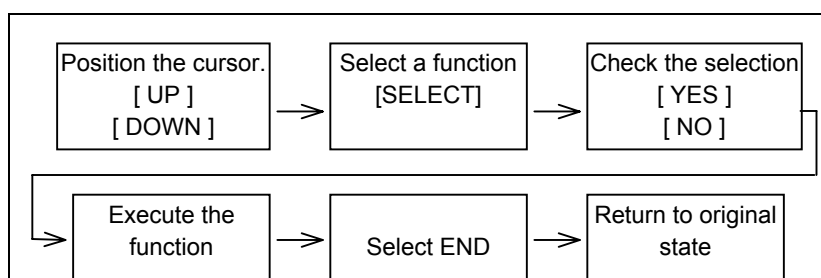
C.2.1   **USER DATA LOADING/SYSTEM DATA LOADING Screen**

Description

This screen is used to read a system or user file from a Memory card into Flash ROM.

The USER DATA LOADING screen is used to load ROM data from a Memory card to flash memory.

The SYSTEM DATA LOADING screen is used to check the contents of the ROM card installed in a Memory card and then load ROM data from the Memory card to flash memory.

Screen configuration

```
(1) SYSTEM DATA LOADING
(2) MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
(3)  1 G001A_B1.MEM 1048704 2003-01-01 12:00
     2 G001A_B2.MEM 1048704 2003-01-01 12:00
(4)  3 END

    *** MESSAGE ***
(5) SELECT MENU AND HIT SELECT KEY.

    [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.

(4) Returning to the MAIN MENU.

(5) 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 ten file names.
- If the Memory card contains ten 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) When you select a file from the USER DATA LOADING screen, you are prompted for confirmation.

```
SYSTEM DATA LOADING
MEMORY CARD DIRECTORY  (FREE[KB]:  5123)
 1 G001A_B1.MEM 1048704 2003-01-01 12:00
 2 G001A_B2.MEM 1048704 2003-01-01 12:00
 3 END



*** MESSAGE ***
LOADING OK ? HIT YES OR NO.

[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) When you select a file from the SYSTEM DATA LOADING screen, a ROM data confirmation screen is displayed for confirmation.

```
SYSTEM DATA CHECK & DATA LOADING
G001A_B1.MEM
 1 G001 001A
 2 G001 021A
 3 G001 041A
 4 G001 061A
 5 G001 081A
 6 G001 0A1A
 7 G001 0C1A
 8 G001 0E1A


*** MESSAGE ***
LOADING OK ? HIT YES OR NO.


[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(4) To start loading, press the [YES] soft key. To cancel, press the [NO] key.

```
*** MESSAGE ***
LOADING FROM MEMORY CARD xxxxxx/xxxxxx

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(5) When loading terminates normally, the system displays the following message. Press the [SELECT] soft key. If an error occurs, see C.3

```
*** MESSAGE ***
LOADING COMPLETE.
HIT SELECT KEY.
[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

C.2.2   SYSTEM DATA CHECK Screen

Description

This screen is used to list files in Flash ROM or Memory card, together with the corresponding numbers of management units in each file and the series and edition of the software.

Screen configuration

```
(1)  SYSTEM DATA CHECK                              (1) Screen title.

(2)   1.FROM SYSTEM                                 (2) Select the FROM SYSTEM screen.
(3)   2.MEMORY CARD SYSTEM                          (3) Select  the  MEMORY  CARD  SYSTEM
(4)   3.END                                             screen.
                                                    (4) Returning to the MAIN MENU.


     *** MESSAGE ***
(5)  SELECT MENU AND HIT SELECT KEY.                (5) Message

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

Screen configuration (FROM SYSTEM screen)

```
(1)  SYSTEM DATA CHECK                              (1) Screen title.
     FROM DIRECTORY
(2)   1 NC BAS-1(0008)                              (2) Names  of  files  in  Flash  ROM  The
      2 NC BAS-2(0008)                                  number    of    management    units
      3 NC BAS-3(0008)                                  constituting  each  file  appears  in
      4 NC BAS-4(0008)                                  parentheses to the right of the filename.
      5 DGD0SRVO(0003)
      6 PS0B    (0006)
(3)   7 END                                         (3) Returning to the MAIN MENU.


     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.                (4) Message

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

Screen configuration (MEMORY CARD SYSTEM screen)

```
(1)  SYSTEM DATA CHECK
(2)  MEMORY CARD DIRECTORY  (FREE[KB]: 5123)
(3)   1 G001A_B1.MEM 1048704 2003-01-01 12:00
      2 G001A_B2.MEM 1048704 2003-01-01 12:00
(4)   3 END


     *** MESSAGE ***
(5)  SELECT FILE AND HIT SELECT KEY.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.
(4) Returning to the MAIN MENU.

(5) Message

Operating procedure

(1) Select either the FROM SYSTEM or MEMORY CARD SYSTEM screen.
(2) Select the file that you want to confirm (for example, "NC BAS-1 (0008)").
(3) For the selected file, the management unit numbers are listed, together with the series and editions of the management units. After checking the listed data, select the [SELECT] soft key to return to the file selection screen.

```
(1)  SYSTEM DATA CHECK
     NC BAS-1(0008)
(2)   1 G001 001A 0000
      2 G001 021A 0001
      3 G001 041A 0002
      4 G001 061A 0003
      5 G001 081A 0004
      6 G001 0A1A 0005
      7 G001 0C1A 0006
      8 G001 0E1A 0007


     *** MESSAGE ***

     HIT SELECT KEY.
     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.

(2) The following items are displayed for each management unit:
- Series
- ROM number and edition
- Internal management-unit number
If a check result cannot be displayed, a "@" is displayed.

Others (Parity information for the system file and user file)

The NC BAS-1, DGD0SRVO, 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 PMC1, 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 or Memory card.

Screen configuration

```
(1)  SYSTEM DATA DELETE

(2)   1.FROM SYSTEM
(3)   2.MEMORY CARD SYSTEM
(4)   3.END



     *** MESSAGE ***
(5)  SELECT MENU AND HIT SELECT KEY.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.

(2) Select the FROM SYSTEM screen.
(3) Select the MEMORY CARD SYSTEM screen.
(4) Returning to the MAIN MENU.

(5) Message

Screen configuration (FROM SYSTEM screen)

```
(1)  SYSTEM DATA DELETE
     FROM DIRECTORY
(2)   1 NC BAS-1(0008)
      2 NC BAS-2(0008)
      3 NC BAS-3(0008)
      4 NC BAS-4(0008)
      5 DGD0SRVO(0003)
      6 PS0B   (0006)
      7 PMC1   (0001)
(3)   8 END

     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.

(2) Names of files in Flash ROM
The number of management units constituting each file appears in parentheses to the right of the filename.

(3) Returning to the MAIN MENU.

(4) Message

Screen configuration (MEMORY CARD SYSTEM screen)

```
(1)  SYSTEM DATA DELETE
(2)  MEMORY CARD DIRECTORY  (FREE[KB]: 5123)
(3)   1 G001A_B1.MEM 1048704 2003-01-01 12:00
      2 G001A_B2.MEM 1048704 2003-01-01 12:00
(4)   3 END


     *** MESSAGE ***
(5)  SELECT FILE AND HIT SELECT KEY.

     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.
(2) The size of the free space of the Memory card is displayed.
(3) A list of files in the Memory card is displayed.
(4) Returning to the MAIN MENU.

(5) Message

Operating procedure

(1) Select either the FROM SYSTEM or MEMORY CARD SYSTEM screen.

(2) Select the file you want to delete.

(3) The following message is displayed for confirmation.

```
*** MESSAGE ***
DELETE OK ? HIT YES OR NO.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(4) Click the [YES] soft key to start reading. Click [NO] to cancel reading.

```
*** MESSAGE ***
EXECUTING
ADDRESS xxxx:
[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(5) Upon normal termination, a message such as that shown below is displayed. Click the [SELECT] soft key. In the event of an error, see the list of error messages and corrective actions, given later.

```
*** MESSAGE ***
DELETE COMPLETE. HIT SELECT KEY.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

Others (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 USER DATA LOADING / 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)  SYSTEM DATA SAVE
     FROM DIRECTORY
(2)  1 NC BAS-1(0008)
     2 NC BAS-2(0008)
     3 NC BAS-3(0008)
     4 NC BAS-4(0008)
     5 DGD0SRVO(0003)
     6 PS0B   (0006)
     7 PMC1   (0001)
(3)  8 END


     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.


     [SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(1) Screen title.

(2) Names of files in Flash ROM
    The number of management units constituting each file appears in parentheses to the right of the filename.

(3) Returning to the MAIN MENU.

(4) Message

Operating procedure

(1) Select the file you want to save.

(2) The system displays the following confirmation message :

```
*** MESSAGE ***
SYSTEM DATA SAVE OK ? HIT YES OR NO.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(3) To start saving, press the [YES] key. To cancel, press [NO].

```
*** MESSAGE ***
STORE TO MEMORY CARD

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(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 COMPLETE. HIT SELECT KEY.
SAVE FILE NAME : PMC1.000
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

Saving ATA PROG

A file whose file name is ATA PROG contains an NC program. Even if you want to save this file, if the boot software is of the 60W1/07 edition or later, you cannot save it on this SYSTEM DATA SAVE screen, because it is saved together with SRAM data on the SRAM DATA UTILITY screen.

Others (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.
Files saved from Flash ROM to a Memory card have the following names :

Header ID in Flash ROM		File name in Memory card
PMC1	→	PMC1.xxx
PD010.5M	→	PD0105M.xxx
PD011.0M	→	PD0110M.xxx

"xxx" is replaced by one of 32 numbers "000", "001", ,,, and "031". For example, if you attempt to save the file "PMC1   " from Flash ROM to a Memory card, it will be saved with a name of "PMC1.000" if no file with a name of "PMC1.000" is found on the Memory card. If, however, that file is saved to a Memory card that already contains a file named PMC1.000, the saved file is named PMC1.001. As files are added, the extension is incremented up to a maximum of PMC1.031. Any no-longer used numbers in the sequence of the extension numbers are used in as sending 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, tool compensation memories, and other data, retained after the CNC power in SRAM is turned off, to and from a Memory card.

Screen configuration

```
(1)  SRAM DATA BACKUP                              (1) Screen title.

(2)  1.SRAM BACKUP  ( CNC -> MEMORY CARD )         (2) Menu
     2.RESTORE SRAM ( MEMORY CARD -> CNC )
(3)  3.END                                         (3) Returning to the MAIN MENU.

(4)   SRAM FILE SIZE :  1MBYTE                      (4) The SRAM file size is displayed.
                                                       (Displayed after a processing option is
                                                       selected.)
(5)   SRAMBAK.001                                  (5) The name of the file currently being
                                                       saved or loaded is displayed. (Displayed
     *** MESSAGE ***                                   after a processing option is selected.)
     SET MEMORY CARD NO.001
     ARE YOU SURE ? HIT YES OR NO.
     [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]

     *** MESSAGE ***
(6)  SELECT MENU AND HIT SELECT KEY.               (6) Message

     [SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

Operating procedure (Backing up data)

(1) Select "1.SRAM BACKUP" The following confirmation message is displayed. Click [YES] to start backup.

(2) If the data cannot be saved entirely onto a single Memory card, a message such as that shown below is displayed. With the power still on, insert the second Memory card and click the [YES] key. Press the [NO] key to cancel saving.

```
*** MESSAGE ***
SET MEMORY CARD NO.002
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) In this way, you can divide SRAM data onto a maximum of 999 Memory card for backup.

(4) Upon the termination of backup, a message such as that shown below is displayed. Click the [SELECT] key to terminate the operation.

```
*** MESSAGE ***
SRAM BACKUP COMPLETE. HIT SELECT KEY.


[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

Operating procedure (Restoring the data)

(1) Select "2.RESTORE SRAM" The following confirmation message is displayed. Click [YES] to start restoration.

(2) A message such as that shown below is displayed. Insert the first Memory card containing SRAMBACK.001 and click the [YES] key. Click the [NO] key to cancel restoration.

```
*** MESSAGE ***
SET MEMORY CARD INCLUDING SRAMBAK.001
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(3) If another Memory card is required, a message such as that shown below is displayed. With the power still on, insert the second Memory card and click the [YES] key. Press the [NO] key to cancel restoration.

```
*** MESSAGE ***
SET MEMORY CARD INCLUDING SRAMBAK.002
ARE YOU SURE ? HIT YES OR NO.
[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

(4) Replace the second card with another, if required. Repeat this step until backing up all data.

(5) Upon the termination of restoration, a message such as that shown below is displayed. Click the [SELECT] key to terminate the operation.

```
*** MESSAGE ***
SRAM RESTORE COMPLETE. HIT SELECT KEY.


[SELECT][ YES  ][  NO  ][  UP  ][ DOWN ]
```

CAUTION
1   Backup files will be created with a file name of
    SRAMBAK.xxx, where xxx is replaced with a
    number between 001 and 999 sequentially.
    On the first Memory card, a backup file is created
    with a name of SRAMBAK.001. If all data is not
    contained on the single card, a backup file
    containing the excess data is created with a name
    of SRAMBAK.002 on the second Memory card.
    In this way, you can divide data onto a maximum
    of 999 Memory card for saving.
2   <u>Check that the Memory card used for backup does</u>
    <u>not contain a file with a name of SRAMBAK.xxx</u>
    <u>before performing a BACKUP operation.</u> You can
    check a list of file names on a Memory card by
    using the SYSTEM DATA LOADING function.
3   For backup, use a formatted Memory card for
    backup.
4   Depending on the boot software edition, the file
    contents to be backed up and the file name differ:
    -   60W1/06 edition or earlier
        File contents: SRAM data
        File name: SRAMBAK.xxx
    -   60W1/07 edition or later
        File contents: SRAM data, NC program (ATA
    PROG in flash ROM)
        File name: SRAM_BAK.xxx
    Data previously backed up by an older edition of
    boot software can be restored by a newer one.

C.2.6 **MEMORY CARD FORMAT Screen**

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 8.MEMORY CARD FORMAT."

(2) The system displays the following confirmation message. Press the [YES] key.

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(3) The system displays the following message asking whether to delete all data on the Memory card. To format the Memory card, press the [YES] key.

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.
ALL DATA IN THE MEMORY CARD IS LOST.
[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(4) The system displays the following message during formatting :

```
*** MESSAGE ***
FORMATTING MEMORY CARD.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

(5) When a card has been formatted normally, the system display the following message.
Press the [SELECT] key.

```
*** MESSAGE ***
FORMAT COMPLETE. HIT SELECT KEY.

[SELECT][ YES ][ NO ][ UP ][ DOWN ]
```

C.2.7 **LOAD BASIC SYSTEM**

Description

The function is used to terminate the boot system and activate the CNC.

Operating procedure

From the MAIN MENU screen, select "1. 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 ]
```

C.2.8　Cautions

> ⚠ **CAUTION**
> Bear the following cautions in mind if using boot software of the 60W1/06 edition or later:
>
> When restoring the following data in this system, be sure to restore a pair of SRAM data and ATA PROG data which were backed up at the same time.
> (ATA PROG data is in flash ROM.)
>   - Restoring SRAM data
>   - Restoring ATA PROG data
>
> SRAM data and ATA PROG data are related to each other.　Storing either data would impair data consistency.　(This may result in events such as destruction of program files.)
> If, for some reason, you need to restore either SRAM or ATA PROG data only, be sure to initialize program files (perform a clear operation) before restoration.

C.3   ERROR MESSAGES AND REQUIRED ACTIONS

The following table lists and explains error messages in alphabetical order.

	Message	Description and required action
D	DEVICE ERROR (xxxx)	An attempt to write data to Flash ROM was unsuccessful. Turn the power off and back on again. If the second attempt also fails, the Flash ROM may have been damaged or destroyed. Replace the Flash ROM module.
F	FILE CLOSE 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.
	FILE DELETE 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.
	FILE OPEN 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.
	FILE READ 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.
	FILE SAVE 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.
	FLASH MEMORY NO SPACE. HIT SELECT KEY.	There is insufficient free Flash ROM to store the selected file. Delete any unnecessary files from Flash ROM. Alternatively, replace the Flash ROM module with another with a larger size.
I	ILLEGAL FORMAT FILE. HIT SELECT KEY.	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 SRAM MODULE. HIT SELECT KEY.	The SRAM module ID is illegal. Check the drawing No. of the SRAM module.
M	MAX EXTENSION OVER. HIT SELECT KEY.	The extension number added to a file name exceeds 031. Either replace the Memory card or delete any unnecessary backup files.
	MEMORY CARD BATTERY ALARM. HIT SELECT KEY.	The Memory card's battery is exhausted. Replace the battery.
	MEMORY CARD DISMOUNT 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 FORMAT ERROR	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.

	Message	Description and required action
M	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 MOUNT ERROR. HIT SELECT KEY.	The Memory card could not be accessed. Check that the Memory card has been FAT-formatted.
	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.
	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.
R	ROM PARITY ERROR:NC BASIC. HIT SELECT.	NC BASIC data is not correct. Use SYSTEM DATA CHECK to check that CNC system software is installed.
S	SRAM TEST ERROR (ECC)	An error was detected in the SRAM module. You can start up the system because data has been automatically restored. Replace the SRAM module, however, just in case that the data may be disarranged in the future.

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 configuration	Card slot on LCD unit	Card slot on control unit
Type 1	Provided	No card slot
Type 2	Provided	Provided (This slot, however, cannot be used.)
Type 3	No card slot (See NOTE given below.)	Provided

(Supplementary)
- Types 1 to 3 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**
> When the hardware configuration is type 3, software write operation and other operations are implemented by open CNC functions.

D.2   **MEMORY CARD TYPES (FUNCTIONS)**

Flash ATA card (Data I/O)
Compact flash card (Data I/O)
Modem card (for remote diagnosis)

> **NOTE**
> For details of the types of usable memory cards,
> see the CONNECTION MANUAL (HARDWARE)
> (B-63943EN).

Using the compact flash card adapter

1. Insertion
   - Set a compact flash card in the compact flash card adapter (A02B-0303-K150) (hereinafter referred to as the CF adapter).
   - Check that lock lever A is lifted, then insert the CF adapter into the memory card interface.
   - Lower lock lever A.
   - Close the memory card interface cover.

> **NOTE**
> 1 For continuous operation with a CF adapter
>   inserted, be sure to lower lock lever A and close the
>   memory card interface cover.
> 2 The lock function is enabled only when a CF
>   adapter (A02B-0303-K150) is used.
> 3 Insert a CF adapter so that the plane bearing the
>   label faces the screen.

2. Extraction
   - Open the cover of the memory card interface.
   - Push up lock lever A.
   - Push eject button B once. The button protrudes.
   - Push eject button B again. The CF adapter is ejected.
   - Hold the CF adapter with fingers and pull it out.
   - Close the memory card interface cover.

> **NOTE**
> When the lock lever is lowered (locked), the eject
> button cannot be pushed.

Lock lever A

Compact flash card

Eject button B

Compact flash card adapter
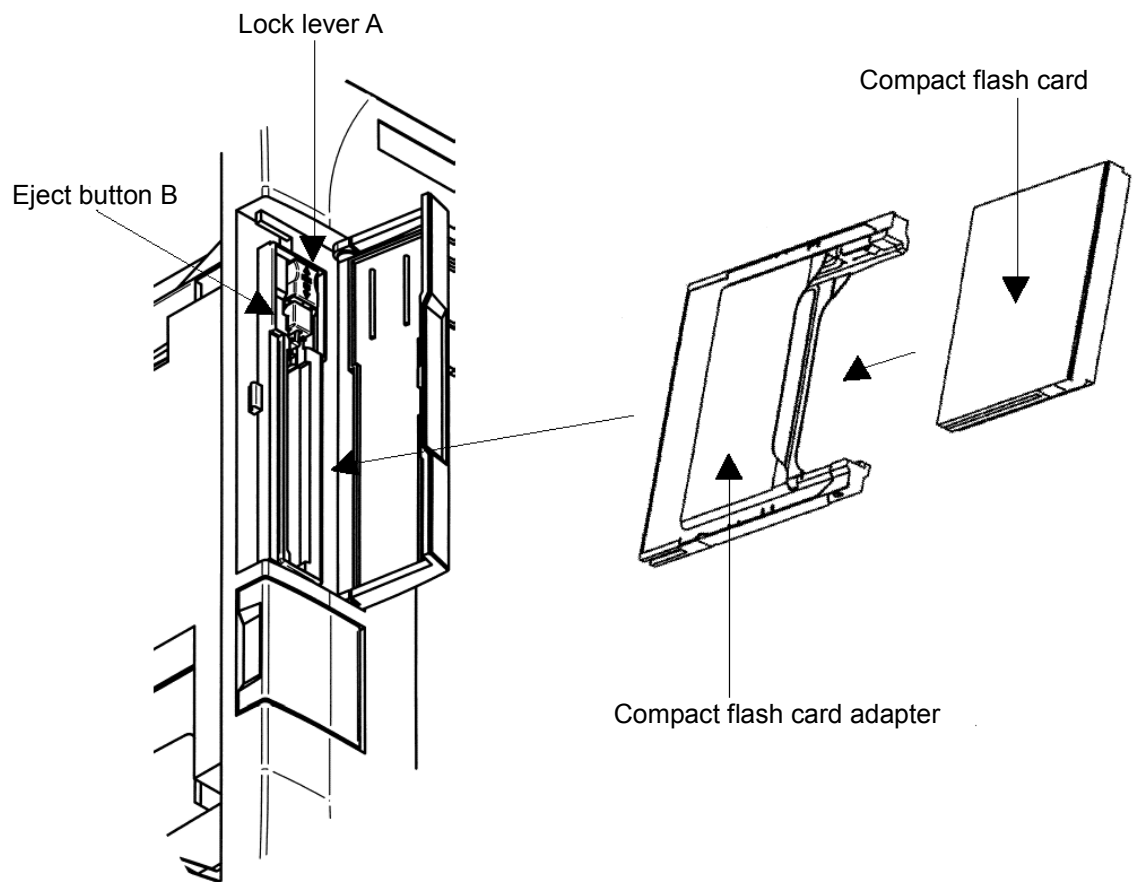
D.3   **HARDWARE CONFIGURATION**

- **Type 1**

LCD-mounted type
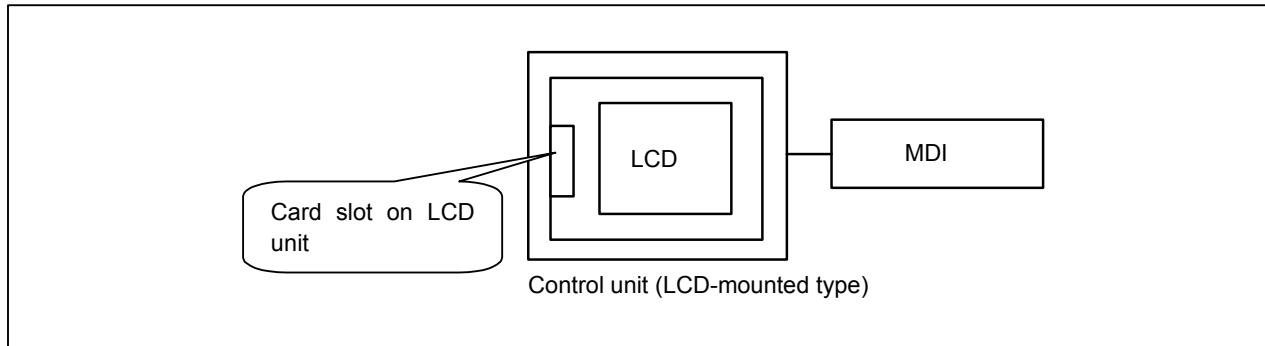
- **Type 2**

Stand-alone type (with an LCD unit)
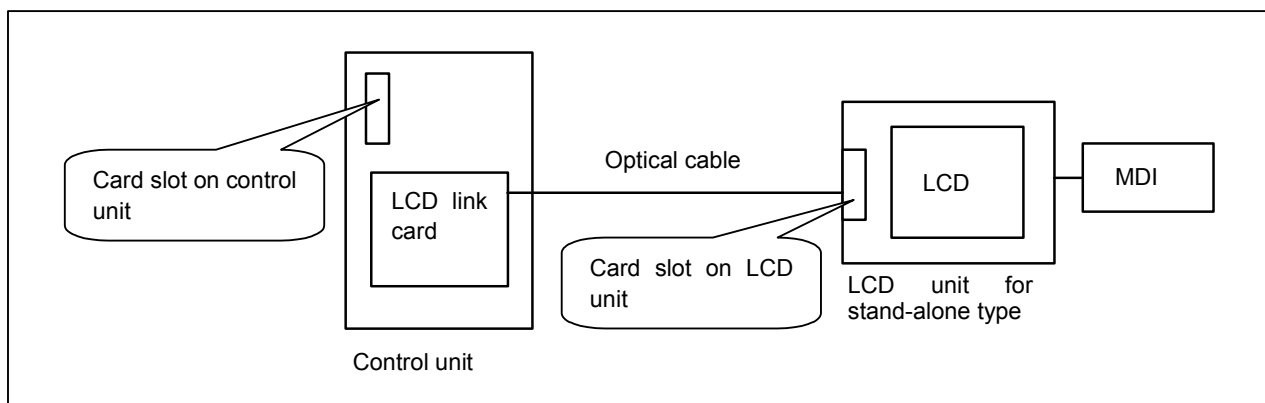
- **Type 3**

Stand-alone type (with CNC display unit with PC functions, an PANEL *i*, or PC)

E

LED DISPLAY

E.1   OVERIVIEW

On the CNC, a 7-segment LED is installed.

The 7-segment LED indication changes according to the operating status of the CNC.

The 7-segment LED indications provided after the power is turned on until the CNC is ready for operation and when system errors occur are described below.
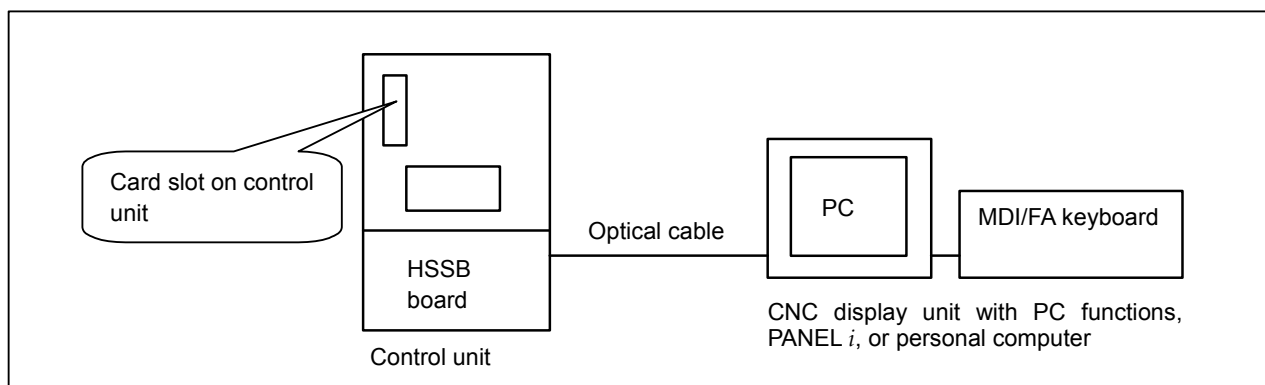
E.2 **7-SEGMENT LED INDICATIONS (TURNED ON)**

表 E.1   **Meanings of LED Indications**

LED Display	Meaning
	Power not turned on (power-off state)
0	Initialization completed and ready for operation
1	CPU started up (BOOT system)
2	Initialization of G/A (BOOT system)
3	Initialization of various functions
4	Task initialization
5	System configuration parameter check Additional board waiting 2
6	Installation of various drivers All files cleared
7	Title display System ROM test
8	State where the CPU is not started after the power is turned on (BOOT system)
9	BOOT system ended, NC system started (BOOT system)
A	FROM initialization
b	Loading of embedded software
C	Loading of software for optional boards
c	IPL monitoring in progress
d	DRAM test error (BOOT system, NC system)
E	BOOT system error (BOOT system)
F	File cleared Optional board waiting 1

LED Display	Meaning
H	Loading of basic system software (BOOT system)
(LED)	Optional board waiting 3 Optional board waiting 4
L	Final system operation check
P	Indicator initialization (BOOT system)
U	FROM initialization (BOOT system) OPEN CNC BOOT (NCBOOT32) being executed
(LED)	BOOT monitoring in progress (BOOT system)

If processing stops during startup due to a CNC error, and the system alarm screen is not displayed, take corrective action referring to Table E.2.

表 E.2   **Faulty Regions and Check Items If Processing Stops during Startup**

LED display	Faulty region and check item
(LED)	The power supply (24V) or the power module may be faulty.
2	The main board or the stand-alone type display may be faulty.
8	Check the alarm LED "LOW" (Note 1) on the main board. If "LOW" is lit: The CPU card may be faulty. If "LOW" is not lit: The main board or the CPU card may be faulty.
9	The main board may be faulty.
E	The CPU card may be faulty.
H	The SRAM/FROM module or the main board may be faulty.
P	The main board or the stand-alone type display may be faulty.
L	The CPU card may be faulty.

> **NOTE**
> Refer to Section 2.4 for LCD-mounted type
> 30*i*/31*i*/32*i*.
> Refer to Section 3.4 for LCD-mounted type
> 300*i*s/310*i*s/320*i*s.
> Refer to Section 4.4 for stand-alone. (The name is
> alarm LED "4".)

E.3 7-SEGMENT LED INDICATIONS (BLINKING)

LED Display	Meaning / Action
0	ROM PARITY error
	The SRAM/FROM module may be faulty.
2	An FROM file for program memory cannot be created.
	The state of the file for program memory on the FROM is checked with the BOOT system. Rearrange the FROM. Check the FROM size.
3	Software-detected system alarm
	If it is generated during startup: Use BOOT to check the state of the built-in software in FROM, and check the size of DRAM. In other cases: Check the error on the alarm screen and take corrective action.
4	The DRAM/SRAM/FROM ID is invalid. (BOOT system, NC system)
	The CPU card or the SRAM/FROM module may be faulty.
5	A servo CPU timeout occurred.
	Check the state of servo software on the FROM with the BOOT system. The servo card or the additional axis board may be faulty.
6	An error occurred when embedded software is incorporated.
	Check the state of embedded software on the FROM with the BOOT system.
7	The indicator cannot be recognized.
	The display may be faulty.
8	Hardware-detected system alarm
	Check the error on the alarm screen and take corrective action.
9	Software for optional boards could not be loaded.
	Check the state of software for optional boards on the FROM with the BOOT system.
A	An error occurred in waiting for an optional board.
	The option board or the PMC module may be faulty.
b	The BOOT FROM was updated. (BOOT system)
	Turn on the power again.
d	DRAM test error
	The CPU card may be faulty.
c	The ID of the indicator is invalid.
	Check the indicator.

F
MAINTENANCE OF OPEN CNC (BOOT-UP AND IPL)

F.1   **OVERVIEW**

When the Series 300*i*/310*i*/320*i*/300*i*s/310*i*s/320*i*s is used or the CNC is connected to the PC over HSSB, Ncboot32.exe can be used for the maintenance of the CNC.

> **NOTE**
> When the CNC is connected to the PC over
> Ethernet, use the standard LCD/MDI for the
> maintenance of the CNC.

Unless otherwise specified, the following examples assume the use of Ncboot32.exe of the Windows 2000/XP version.
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
- Saving and restoration of auto backup data (for the Series 300*i*s only)

For Windows 2000/XP, Ncboot32.exe is copied to the System 32 folder of Windows during driver installation.
For Windows CE.NET (Series 300*i*s/310*i*s/320*i*s), it has been installed in the Storage Card\FANUC folder.
At the start of Windows, Ncboot32.exe starts automatically, and resides in the system tray.
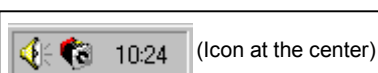
Supplementary 1: Multi-connection (Windows 2000/XP only)
Ncboot32.exe supports HSSB multi-connection. The CNCs connected by HSSB are managed as nodes. The boot, IPL, and system alarm screens are displayed in windows that are opened independently for each node.

Supplementary 2: Termination method
Normally, Ncboot32.exe need not be terminated. If you need to terminate it, however, see the "System tray" explanation, below:
Display the popup menu and select "End".
When the Ncboot32.exe window is open, End cannot be selected.

System tray (Series 300*i*/310*i*/320*i*)

Right-click the icon in the system tray, and the popup menu, shown below, appears at the lower left corner of the screen.

Selecting [Open] causes the status screen to open.
Selecting [About] causes the version information dialog box to appear.
Selecting [End] causes Ncboot32.exe to terminate.

Double-clicking the icon in the system tray causes Open in the menu to be automatically selected.

System tray (Series 300*i*s/310*i*s/320*i*s)

Keep tapping the icon in the system tray for one second or longer, and the popup menu, shown below, appears at the lower left corner of the screen.

For equipment without a touch panel, the popup menu can be displayed by restarting "\Storage Card\FANUC\Ncboot32.exe" with the icon having been registered in the system tray.
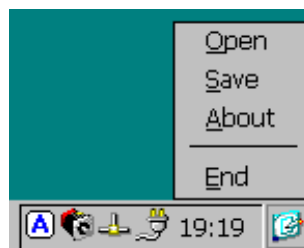
Selecting [Open] causes the option setting screen to open.
Selecting [Save] causes the contents of the Registry to be stored and causes the registered files to be saved in the "\Storage Card\Backup" folder. If auto backup fails, the files in this folder are used for recovery.
Selecting [About] causes the version information dialog box to appear.
Selecting [End] causes Ncboot32.exe to terminate.

Double-clicking the icon in the system tray causes Open in the menu to be automatically selected.

> **NOTE**
> Depending on when to tap, the popup menu may not be displayed normally. If this occurs, repeat tapping until it is displayed normally.

F.2   CHANGING START SEQUENCES

By pressing the MDI keys 6 and 7 and turning the power ON or by setting the rotary switch provided on the main board of the CNC main unit (for the LCD-mounted type Series 300*i*s) to the F position, you can perform maintenance work using the BOOT and IPL screens.

During normal operation
1. The CNC starts without waiting for communication to be established.
2. After communication is established, the PC performs initialization described below.
3. Start FOCAS2.
4. Start a registered application program.
5. Perform monitoring for communication errors and CNC system alarms.

During 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. Start FOCAS2.
6. Start a registered application program.
7. Perform monitoring for communication errors and CNC system alarms.

● **Location of rotary switch**

● LCD-mounted type Series 300*i*s/310*i*s/320*i*s
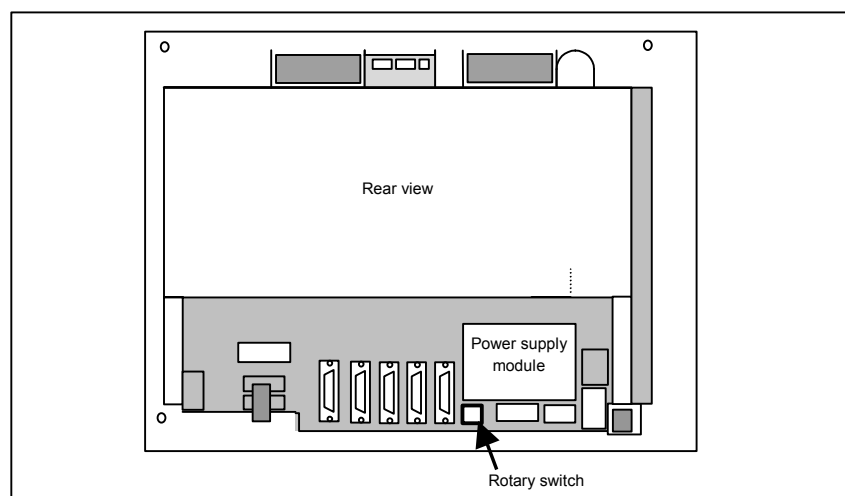
F.3   **EXPLANATION OF SCREENS**

> **NOTE**
> To open each screen of Ncboot32.exe, you are
> recommended to use either the mouse or touch
> panel.

F.3.1   **BOOT Screen**
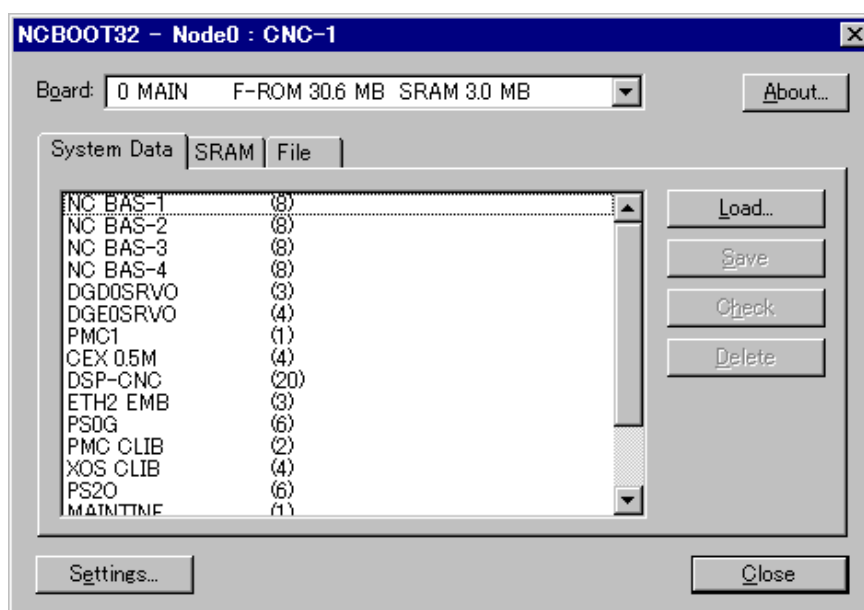
The area where the file is to be placed can be changed by using the
[Setting...] button.
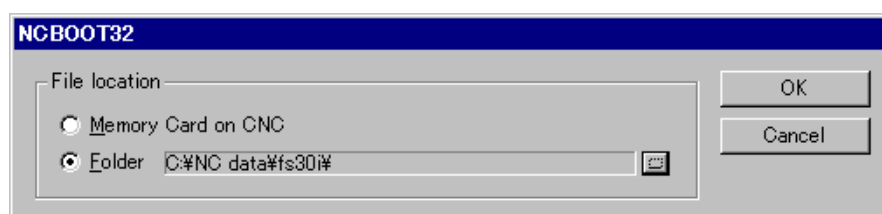
Select the memory card on the CNC or a PC folder. The file location
may be changed at any time.

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.
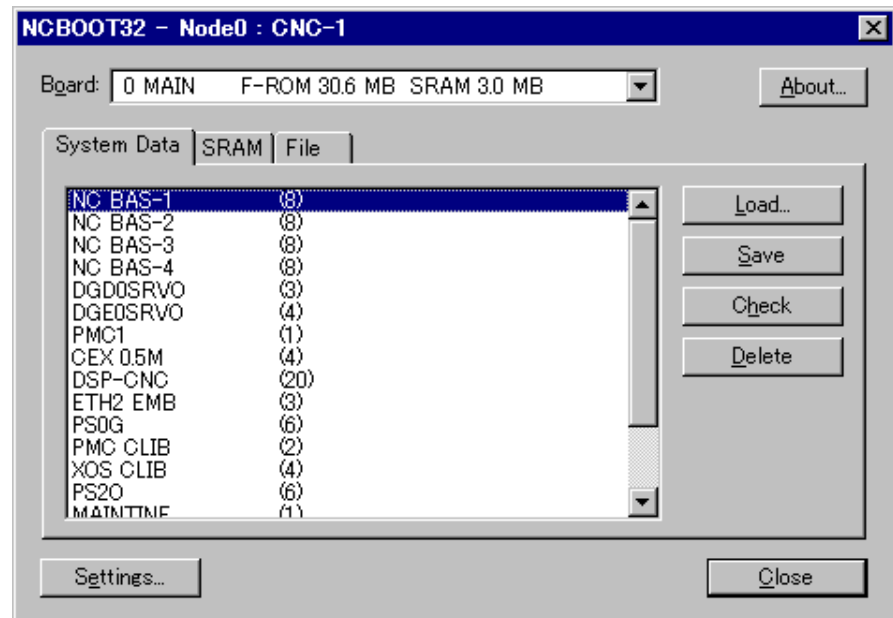
[Load...] opens the file selection screen. Specify a file to be loaded.
[Save] saves the selected NC system data in a file.
[Check] checks the selected NC system data.
[Delete] deletes the selected NC system data.

F.3.1.2   **SRAM operation**

This screen is used to store and restore NC SRAM data.
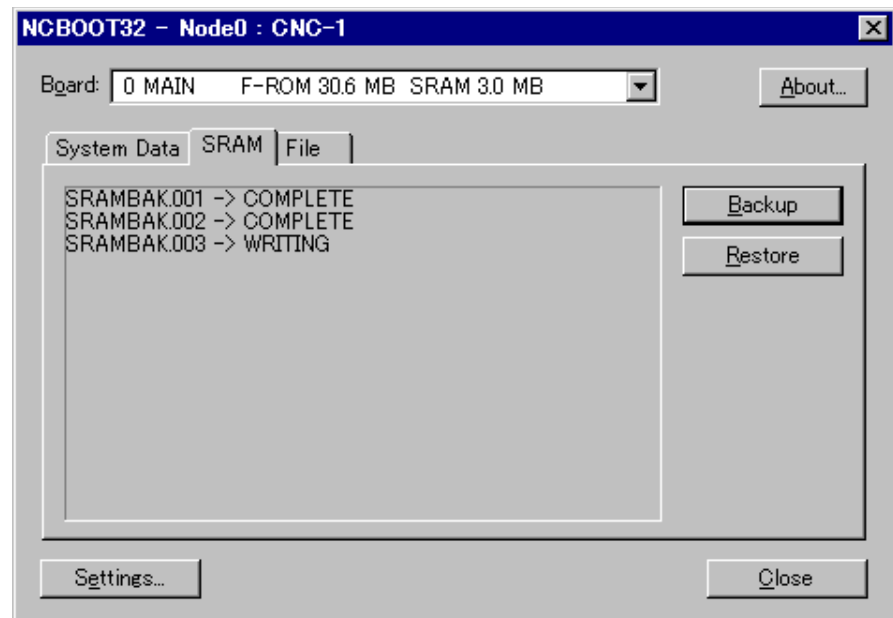
[Backup] stores SRAM data, and [Restore] restores SRAM data. In the center of the screen, the progress status is displayed. As with the NC, the backup file name is determined automatically from the SRAM size, and cannot be renamed.

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.
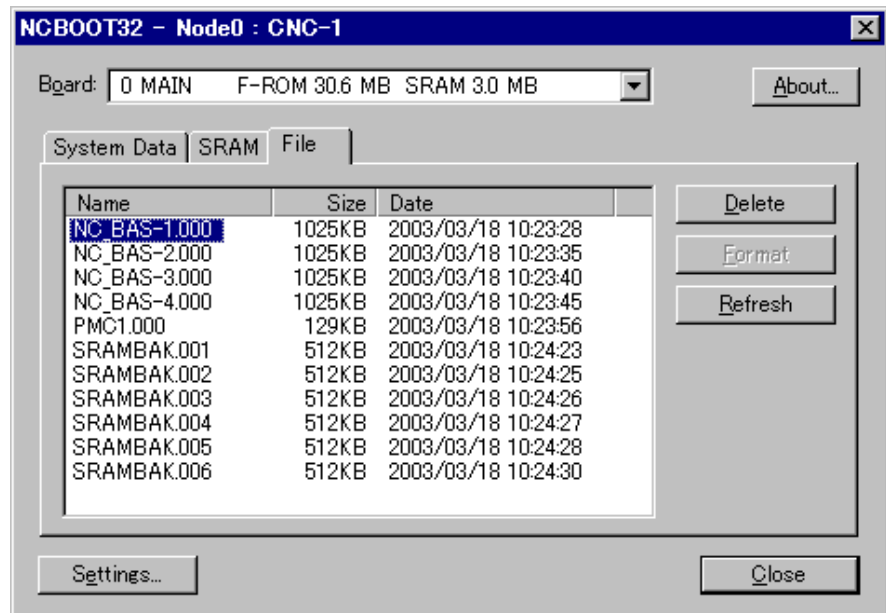
[Delete] deletes a selected file.

[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**

```
NCBOOT32 - Node0 : CNC-1                                    _ □ ✕


SYSTEM SERVICE MENU
  0. END
  1. IPL MONITOR
  2. BACK-UP CNC DATA ALL CLEAR
  3. LOCKED PROGRAM ALL CLEAR
?
```
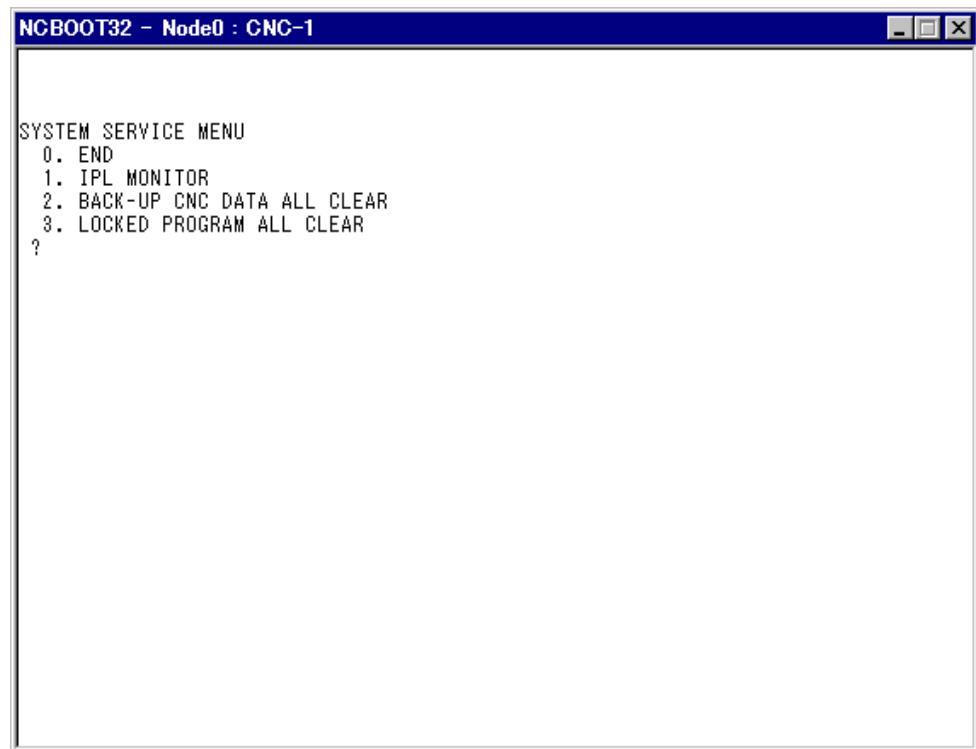
> **NOTE**
> The contents of the IPL screen vary depending on
> the CNC model. Follow the instructions displayed in
> the menu.

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.
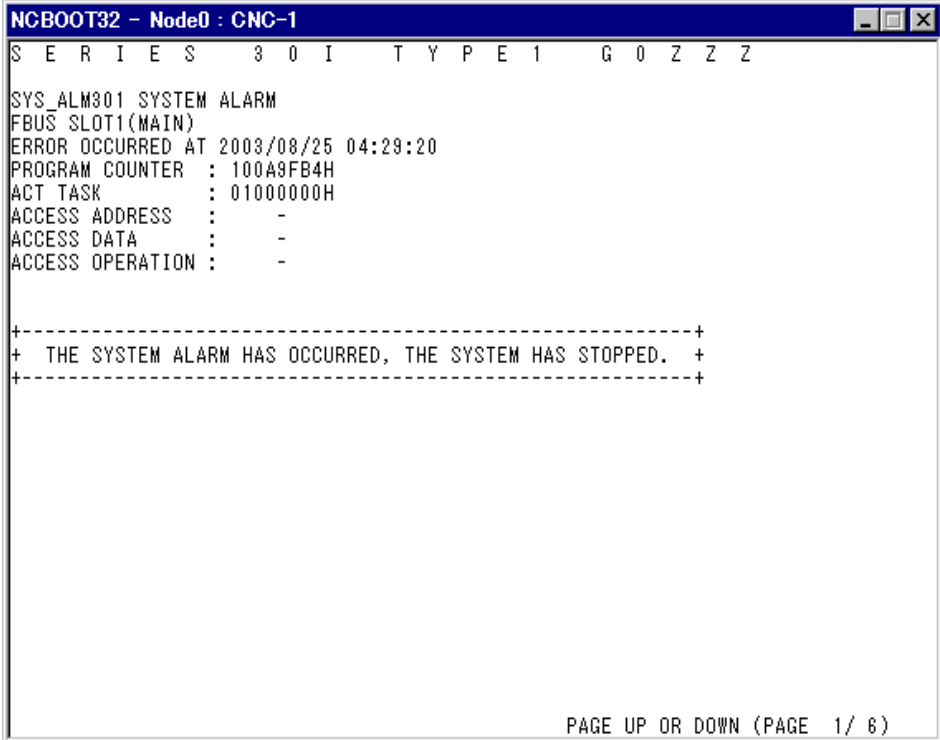
F.3.2.1   Functions on the IPL screen

Title on IPL screen	Corresponding MDI key operation at power-on (Operation with a standard CNC)
0. EXIT	
1. IPL MONITOR	<-> + <.>
2. BACK-UP CNC DATA ALL CLEAR	<DELETE> + <RESET>
3. LOCKED PROGRAM ALL CLEAR	<M> + <0>

F.4   OTHER SCREENS

F.4.1   CNC Alarm Screen

```
NCBOOT32 - Node0 : CNC-1                                    _ □ ✕
S  E  R  I  E  S     3  0  I     T  Y  P  E  1     G  0  Z  Z  Z

SYS_ALM301 SYSTEM ALARM
FBUS SLOT1(MAIN)
ERROR OCCURRED AT 2003/08/25 04:29:20
PROGRAM COUNTER  : 100A9FB4H
ACT TASK         : 01000000H
ACCESS ADDRESS   :      -
ACCESS DATA      :      -
ACCESS OPERATION :      -


+----------------------------------------------------------+
+  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.  +
+----------------------------------------------------------+




                                         PAGE UP OR DOWN (PAGE  1/ 6)
```

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 (Series 300*i*/310*i*/320*i* only)

To open the status screen, double-click the icon in the system tray. Alternatively, in the menu popped up by right-clicking, click OPEN.
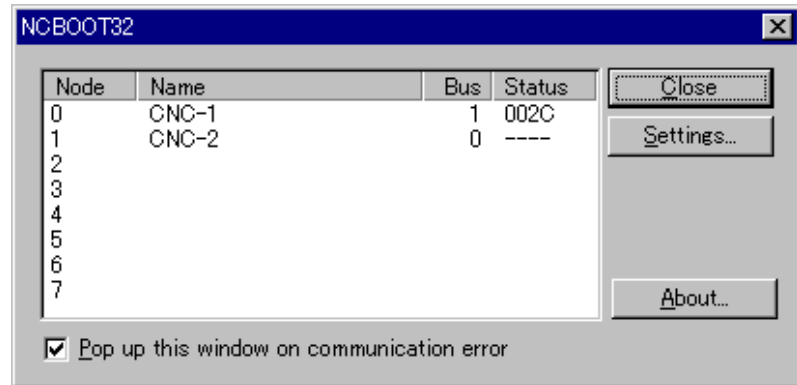
Node:　Node number

Name:　Node name. (Define the node name in advance by using the HSSB applet on the control panel.)

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 5: Display of 30 lines on IPL/system alarm screen
　　　　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.

> **NOTE**
> The Series 300*i*s/310*i*s/320*i*s does not provide a status screen.

F.4.3   **Option Setting Screen**

On the option setting screen, application programs can be registered.
Any programs for use with FOCAS2 will not run unless they are
started after FOCAS2 starts. By registering these programs in
Ncboot32.exe, they can be executed in synchronization with the start
of FOCAS2.

For the Series 300*i*s, it is possible to perform auto backup and
configure MDI keys.

F.4.3.1   **Option setting screen (Series 300*i*/310*i*/320*i*)**

Clicking the [Settings...] button on the status screen causes the option
setting screen to open. On the option setting screen, an application
must be registered with each node that requires it.
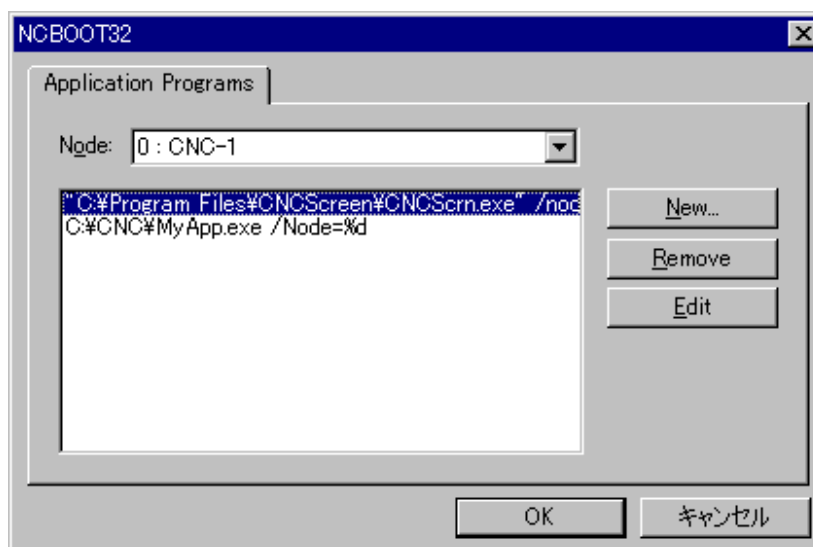
[Node] selects a node.   In the list box in the center of the screen, the
programs registered for the selected node are displayed.
[New...] registers a new program. When a blank character is included
in the path, it is enclosed with double quotation marks.
[Remove] deletes a selected line.
[Edit] allows 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 the CNC screen display function after FOCAS2
          starts at that node, code the following:
              "C:\Program Files\CNCScreen\CNCScrn.exe" /Node=%d

- 760 -

F.4.3.2   **Option setting screen (Series 300*i*s/310*i*s/320*i*s)**

To open the option setting screen, double-tap the icon in the system tray. Alternatively, select [Open] from the popup menu of the system tray.

> **NOTE**
> For any changes made on the option setting screen of the Series 300*i*s/310*i*s/320*i*s to take effect, you must turn the power off and back on.

CNC setting screen
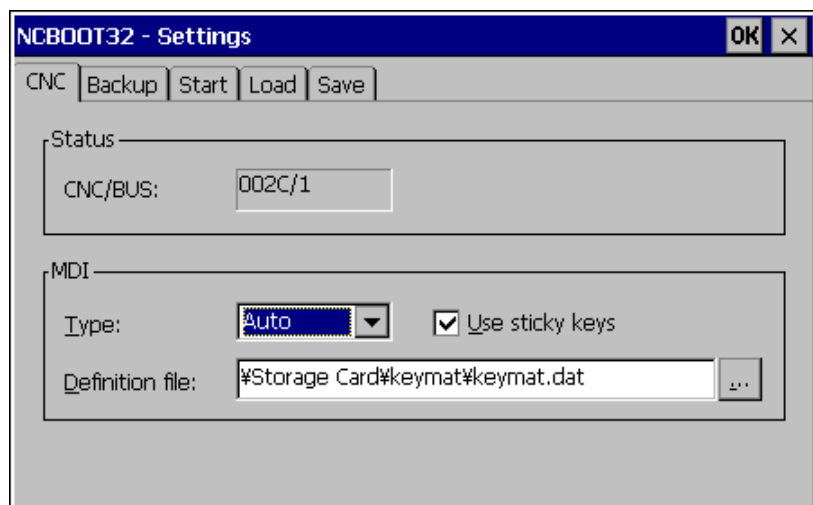
[Status]-[CNC] : Status (in hexadecimal)
Bit1 : Rotary switch position 1
Bit2 : End of boot processing
Bit3 : End of IPL processing
Bit4 : Rotary switch position 2
Bit5 : Display of 30 lines on IPL/system alarm screen
Bit8 : CNC system alarm

[Status]-[Bus] :
Hardware communication status (0: Communication error, 1: Communication established)

[MDI]-[Type] allows you to select an MDI key type.
Auto :
QWERTY MDI key type, M and T series standard MDI key type
M series : MDI keyboard for M series
T series : MDI keyboard for T series

Selecting [MDI]-[Use sticky keys] allows you to use the functions of the Shift, Ctrl, and Alt keys without pressing these keys in combination with other keys. For example, you can press Alt first and then 'F' instead of pressing Alt and 'F' at the same time. If you remove the check mark, you must press Alt and 'F' at the same time.

[MDI]-[Definition file] allows you to specify a customized MDI key definition file.

Device setting screen
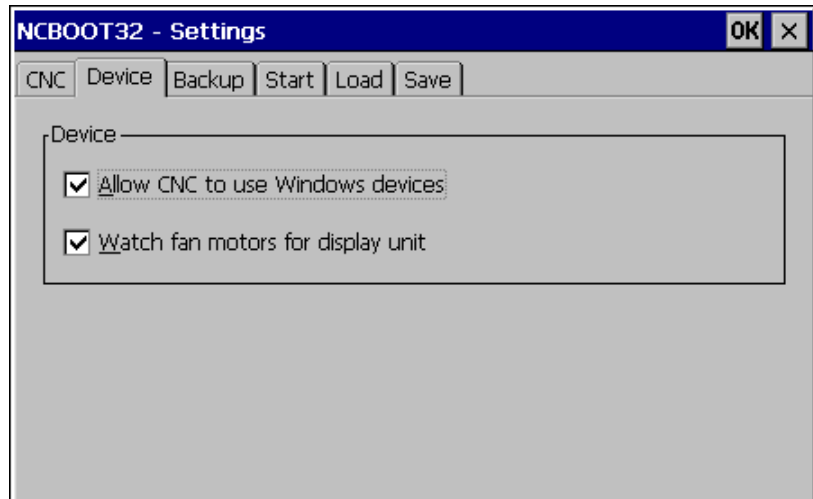
Place a check mark next to [Allow CNC to use Windows devices] to make the devices on Windows (Ethernet, serial, and PCMCIA devices) usable by the CNC.
Place a check mark next to [Watch fan motors for display unit] to check the operation of the display unit of the stand-alone type CNC; if an error is detected, an error message is displayed.

Backup setting screen
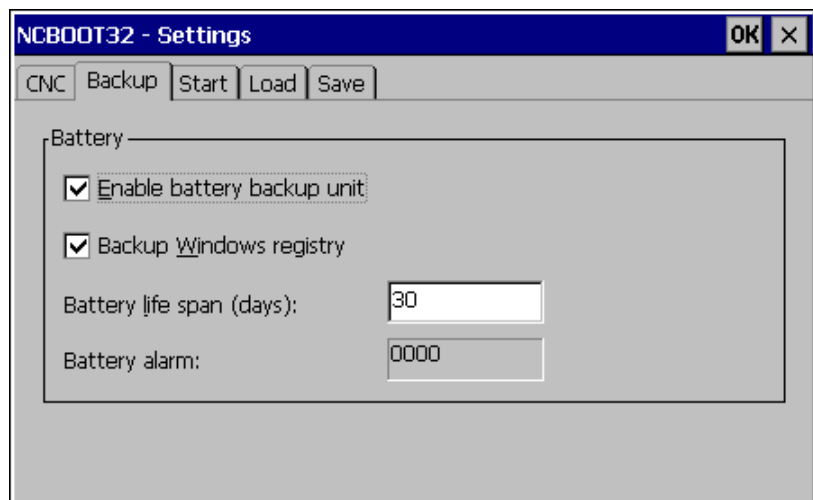
Place a check mark next to [Enable battery backup unit] to automatically save the contents of the Registry and files when the power is turned off. A dedicated battery is used to supply power during a saving operation after the power is turned off.
Place a check mark next to [Backup Windows registry] to automatically save the contents of the Registry when the power is turned off.

> **NOTE**
> Usually, the contents of the Registry are not
> changed and, therefore, no problems will arise if
> they are not automatically saved. You are
> recommended to remove the check mark next to
> Auto saving of Registry just in case.

[Battery life span] allows you to set the number of days after which a
message prompting you to save manually is to be displayed during
long-period operation.

[Battery alarm] indicates the state of the battery dedicated for backup
(in hexadecimal notation).

     0000 : Normal
     0001 : The previous auto saving not completed
     Other : Battery hardware error value

Start/Load/Save setting screen
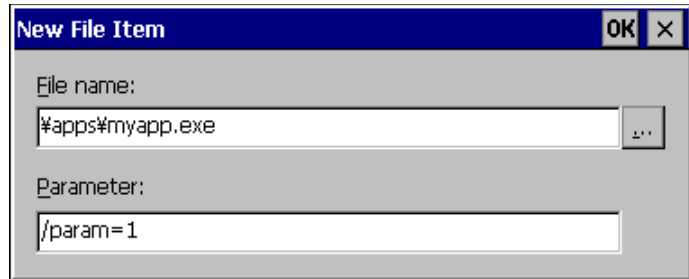
This screen allows you to edit save, restore, and start files and to
check execution results. Start allows you to select the file to be started
when the power is turned off. Save allows you to select the file to be
saved when the power is turned off. Load allows you to select the file
to be restored when the power is turned off.

The following shows the Save screen as an example. The screen
layout and the main operating instructions are common to the Start,
Load, and Save screens.
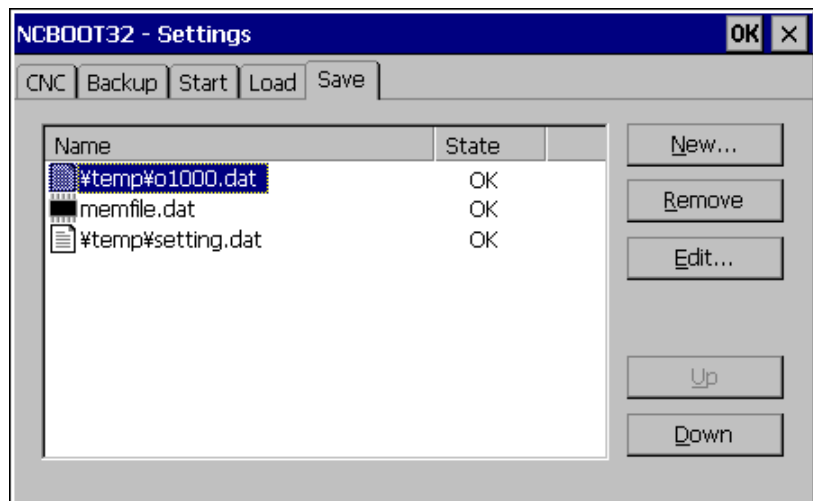
The [New...] button is used to register a new file. Pressing the button
causes the following dialog box to appear, allowing you to specify a
file.

- Start screen

New File Item   OK ✕

File name:

¥apps¥myapp.exe   ...
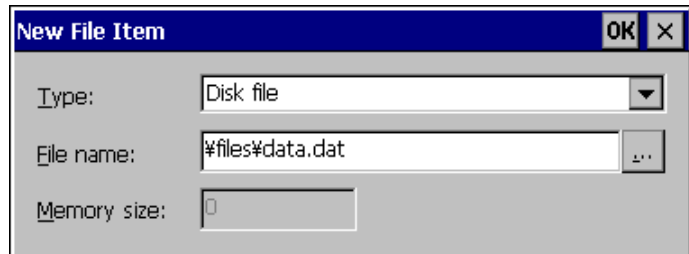
Parameter:

/param=1

In the [File name] field, specify a full path name of the file to be executed.
In the [Parameter] field, specify the program argument.

- Load/Save screen

New File Item   OK ✕

Type: Disk file   ▼

File name: ¥files¥data.dat   ...

Memory size: 0

[Type] is used to specify whether the file is on the Disk (object store) or it is a memory mapped file.
In the [File name] field, specify the full path name if the file is on the Disk; specify the name of the file mapping object if it is a memory mapped file.

NOTE
> The name of a file mapping object is used as a temporary file for use during saving and restoration. You must, therefore, specify a string characters effective as a file name.

In the [Memory size] field, specify the size of the memory mapped file. For a file on the Disk, you need not specify the size because it is calculated from the actual file name.

The [Remove] button allows you to cancel the registration of the selected line.
The [Edit...] button allows you to change the changes made with the [New...] button.
The [Up] button is used to move a selected line up in the registration sequence.
The [Down] button is used to move a selected line down in the registration sequencer.

G

MEMORY CLEAR

G.1 OVERVIEW

If an unexpected error occurs, such as the "SYSTEM LABEL CHECK ERROR" at system startup or the "SYSTEM ALARM", which may be generated suddenly, this function can start up the CNC system in its initial state to return the system to the state in which restoration work can be performed, by clearing all data stored in CNC memory.

G.2 OPERATION METHOD

1. Starting method

<1> For FS30*i*-A

When turning the power ON to the CNC, turn the power ON while pressing the MID keys [RESET] and [DELET] at the same time and holding them down. Keep holding them down until the memory all clear approval screen is displayed.

<2> For FS300*i*-A/ FS300*is*-A

Use the NC BOOT32 function to display the IPL menu.
From the IPL menu, select "2. BACK-UP CNC DATA ALL CLEAR".
For details, see the chapter on "Maintenance Operations (Boot and IPL) for Open CNC".

```
NCBOOT32 - Node0 : CNC-1                    _ □ ✕

SYSTEM SERVICE MENU
  0. END
  1. IPL MONITOR
  2. BACK-UP CNC DATA ALL CLEAR
  3. LOCKED PROGRAM ALL CLEAR
?
```
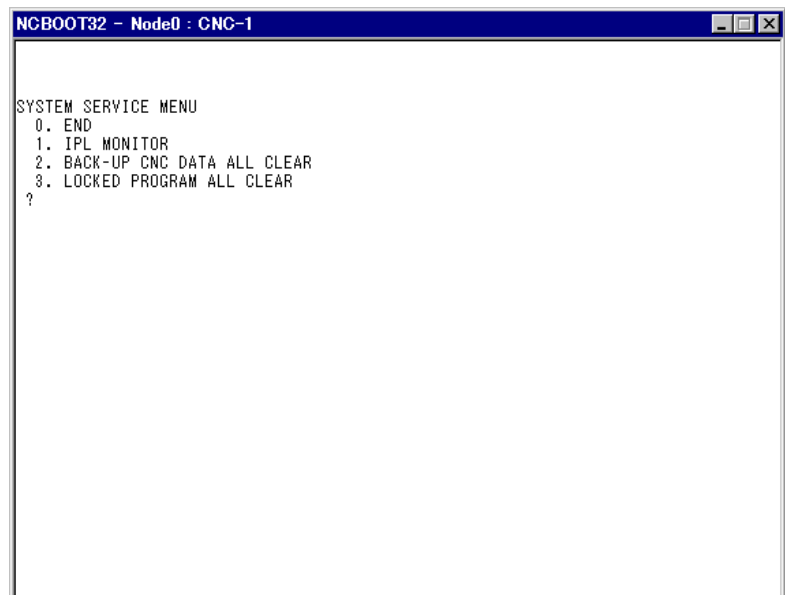
2. Memory all clear approval screen
   Performing the operation in 1. causes the following screen to be displayed, asking you whether to execute all clear.


```
SERIES 30I G001A
COPYRIGHT(C) FANUC LTD. 2003-
RAM TEST : END
ROM TEST : END (G001A)
HELP ROM TEST : NOTHING
SERVO RAM TEST : END
ALL FILE INITIALIZE OK ? (NO=0,YES=1)
```

Memory All Clear Approval Screen

From the screen shown above, select between the following operation and execute it:
-   If you do not want to execute memory all clear, press the numeric key "0".   All clear will be canceled.
-   To execute memory all clear, press the numeric key "1". All clear will be executed.

⚠ **WARNING**
1   When this operation is performed, the CNC system enters a state (initial state) in which it can start up by itself.   To restore various function operations, therefore, you must reconfigure cleared data.
2   This operation can be performed only by personnel who have been trained in maintenance and safety.

G.3   DATA TYPES TO BE CLEARED

The various data types to be cleared by this operation are as follows:

Data type	Data area
System label	SRAM
Option parameters	SRAM
Data related to C language executor (such as SRAM disk data)	SRAM
Data related to macro executor (such as P code variables, extended P code variables, user file data)	SRAM
NC parameters	SRAM
Pitch error compensation data	SRAM
Custom macro variables, variable name	SRAM
Data related to PMC (such as parameters, KEEP relay value)	SRAM
Data related to part program (such as program main body, folder data)	SRAM/ FROM
Tool offset data	SRAM
Default folder data	SRAM
Workpiece coordinate system addition data	SRAM
Tool life management data	SRAM
Rotary table dynamic fixture offset data	SRAM
System alarm history data	SRAM
Software operator's panel data	SRAM
Three-dimensional error compensation data	SRAM
Periodic maintenance data	SRAM
Extended keep memory data	SRAM
Interpolation type straightness compensation data	SRAM
M code group data	SRAM
Data related to Fast Data Server / Fast Ethernet (such as parameters)	SRAM
Operation history data	SRAM
Bi-directional pitch error compensation data Extended bi-directional pitch error compensation data	SRAM
Touch panel data	SRAM
Profibus master/slave function data	SRAM
Data related to customer's board (such as parameters)	SRAM
DeviceNet master function data	SRAM
FL-net function data	SRAM
Rigid tapping retraction data	SRAM
Y-axis offset data	SRAM
Tool nose radius compensation value data	SRAM
Cutter compensation value data	SRAM
Second tool geometry offset data	SRAM
Data of interference check for each path	SRAM
Workpiece shift value data	SRAM
Embedded Ethernet data	SRAM
Data of protection of Data at Eight Levels	SRAM
Various data of tool management function	SRAM
Real time custom macro data	SRAM

Data type	Data area
FSSB data	SRAM
MNUAL GUIDE i data	SRAM
Dual check safety data	SRAM
Data related to C language board function	SRAM

> ⚠ **CAUTION**
> The types of data stored in SRAM/FROM differ
> depending on the system configuration.
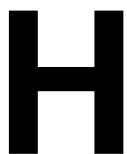
H PANEL *i* BIOS SETUP

What is "BIOS setup"?

BIOS setup is the program to specify BIOS settings. Based on the settings, the operating environment is defined.

Before shipment from the factory, Default values are set and, usually, these settings need not be changed. Changing the settings may cause troubles to occur. We recommend that you use the Default settings unless they present problems.

Settings made by BIOS setup are stored in internal memory. This memory stores these values with a battery.

△ **CAUTION**
1 Use the Default BIOS settings (state before shipment from the factory) unless they present problems.
   FANUC does not conduct evaluation with BIOS settings other than the Default ones. If changing the BIOS settings for some reason or other, therefore, you are required to perform sufficient operation confirmation.
2 BIOS setup requires an input device. Get ready either of the input devices below:
   - PS/2 keyboard connected to the PS/2 port of this device
   - USB keyboard connected to the USB port of this device
   - Standard front panel of a device for automakers
   The MDI unit and soft keys cannot be used with BIOS setup. Connect a separate keyboard to this device.

Roles of keys on the setup screen

The roles of the key used with the setup screen are as follows:
- [↓] [↑] keys : Each moves the cursor.
- [←] [→] keys : Each switches menus.
- [ENTER] key : Selects the item at the cursor position.
- [ESC] key   : Cancels the current setting.
- [-] [+] keys   : Each changes the setting of the item.
- [F1] key   : Shows the entire help text for BIOS/SETUP.
- [F9] key   : Returns all menu settings to standard ones.
- [F10] key   : Saves the settings and exits from BIOS setup.

Starting setup

1. Terminate your work and save data.
2. Turn the power OFF, connect an input device such as a full keyboard, and start up the system again.
3. While "Press <F2> to enter SETUP" appears at the bottom of the screen, press the "F2" key, then BIOS setup starts and the menu screen is displayed.
4. The menu screen is displayed.   Change BIOS settings as desired.

```
PhoenixBIOS 4.0 Release 6.0
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FANUC BIOS, 6150/03
Copyright 2002, FANUC LTD
All rights Reserved

CPU = Intel (R) Pentium(R) III processor 866MHz
639K System RAM Passed
253M Extended RAM Passed
System BIOS shadowed
Video BIOS shadowed
Fixed Disk 0 : -----




Press <F2> to enter SETUP
```

Ending setup

Changes made with BIOS setup (including loaded default values) take effect after you save the settings and restart the system.   Use either of the following methods to save the settings and restart the system.
(Method 1)
> Press the ESC key or select the EXIT item with a cursor key, then the EXIT selection screen is displayed.
> Then, select "Exit Saving Changes" and press the Enter key.

(Method 2)
> Press the F10 key and the message "Save Configuration changes and exit now?" is displayed.   Select "Yes".

To end setup without saving changes, use the following method:
Press the ESC key or select the EXIT item with a cursor key, then the EXIT selection screen is displayed.
Then, select "Exit Discarding Changes" and press the Enter key.

BIOS messages

When the power is turned ON, Power On Self Test is executed.   If an error is detected, any of the following BIOS message may be displayed.
Message with a circle in the Solution required column   Some hardware error may have occurred.   Solve the problem.

Message with a triangle in the Solution required column   This message may be displayed if battery supply is stopped, for example. If it is displayed several times, some action is required.

Error code	Solution required	BIOS message	Meaning
	○	CPU Temperature Exceeds the Upper Limit – FATAL	The CPU temperature is too high. The radiator FIN may not be in proper contact with the CPU.
	○	Ambient Temperature Exceeds the Upper Limit –FATAL	The ambient temperature is too high. The heat radiation of the cabinet may not be performed correctly.
	○	Ambient Temperature Exceeds the Lower Limit –HDD stopped	The ambient temperature is too low. Wait until the temperature rises. (In the BIOS06 edition or later, the system automatically starts when the temperature rises. In an earlier edition of BIOS, turn on the power.)
	○	CPU Fan Failure. – FATAL	The FAN for the 60-square base unit is stopped.
	○	Case Fan Failure.	The FAN for the 40-square base unit is stopped.
	○	HDD Fan Failure.	The FAN for the HDD is stopped.
	○	CMOS Battery Failure.	The battery is removed or has run down.
0200	○	Failure Fixed Disk	The hard disk cannot be recognized correctly.
0210	○	Stuck Key	Keyboard operation error. Check to see if a key on the keyboard is held down.
0211		Keyboard Error or not connected	Keyboard error. Check the connection.
0251	△	System CMOS checksum bad – Default configuration used.	Because the results of a CMOS data check were not correct, the system is started with standard settings.
0271	△	Check date and time settings	The date and time settings are not set. (This message is generated if battery supply is stopped.) Use BIOS setup or the setting function on the OS to set the correct date and time.
0280	△	Previous boot incomplete – Default configuration used	The system could not be started normally the last time and, therefore, it is started with standard settings.

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Revision Record

FANUC Series 30*i*/300*i*/300*is*-MODEL A, Series 31*i*/310*i*/310*is*-MODEL A, Series 31*i*/310*i*/310*is*-MODEL A5, Series 31*i*/310*i*/310*is*-MODEL A, Series 32*i*/320*i*/320*is*-MODEL A   MAINTENANCE MANUAL (B-63945EN)

Edition	Date	Contents
02	Jun, 2004	Addition of functions Addition of following models - Series 31*i* /310*i* /310*is*-MODEL A5 - Series 31*i* /310*i* /310*is*-MODEL A - Series 32*i* /320*i* /320*is*-MODEL A
01	May, 2003	
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