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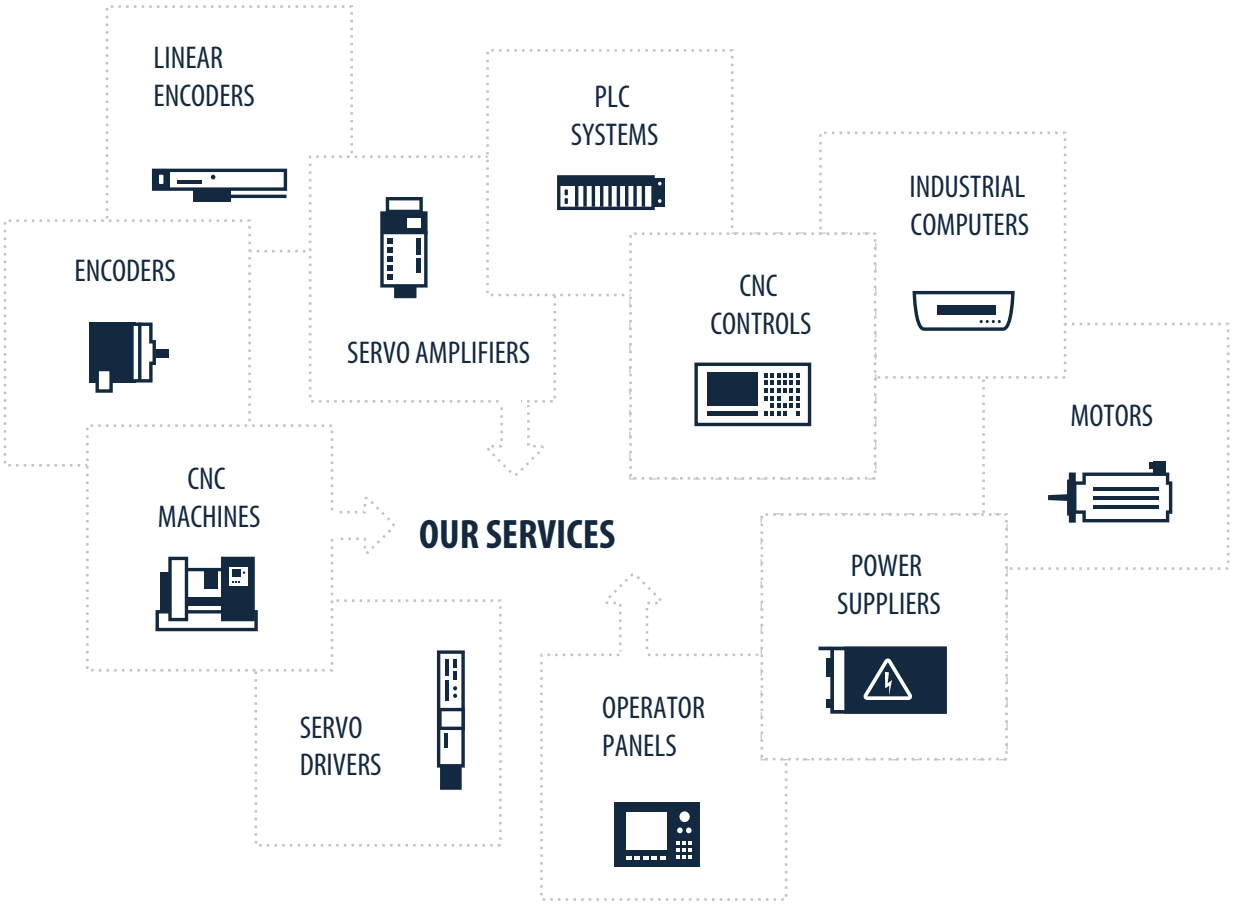
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FANUC

GE Fanuc Automation

Computer Numerical Control Products

Series 15i Model B
Series 150i Model B

Maintenance Manual

GFZ-63785EN/01 *June 2002*

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Warnings, Cautions, and Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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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 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.**

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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.

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WARNING

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

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

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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.

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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.

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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 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 2.10 of this manual.

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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 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.

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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.

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PREFACE

Description of this manual

1.Display and operation

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

2.Hardware

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

3.Data input/output

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

4.Interface between the CNC and PMC

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

5.Digital servo

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

6.AC spindles

These chapters describe the spindle amplifier checkpoints, as well as the spindle tuning screen.

7.Trouble shooting

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 BOOT SYSTEM
B ALARM LIST

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Applicable models

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

Pruduct name	Abbreviation	
FANUC Series 15*i*–MB	15*i*–MB	Series 15*i*
FANUC Series 150*i*–MB	150*i*–MB	Series 150*i*

NOTE
Some function described in this manual may not be applied to some products.
For details, refer to the DESCRIPTIONS manual (B–63782EN)

Related manuals

The table below lists manuals related to FANUC Series 15*i*/150*i*–MODEL B.
In the table, this manual is marked with an asterisk(*).

Table 1 Related manuals

Manual name	Specification number	
DESCRIPTIONS	B–63782EN	
CONNECTION MANUAL (HARDWARE)	B–63783EN	
CONNECTION MANUAL (FUNCTION)	B–63783EN–1	
OPERATOR'S MANUAL (PROGRAMMING)	B–63784EN	
OPERATOR'S MANUAL (OPERATION)	B–63784EN–1	
MAINTENANCE MANUAL	B–63785EN	*
PARAMETER MANUAL	B–63790EN	

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1 SCREEN INDICATIONS AND OPERATIONS

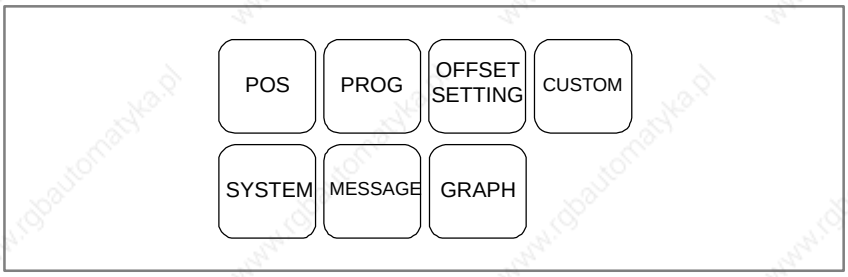
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1.1 FUNCTION KEYS AND SOFT KEYS

1.1.1 Indication Procedure for General Screens

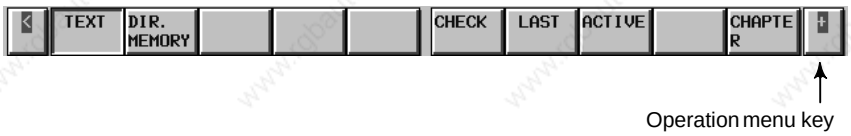
(1) Press a function key on the MDI panel to show the soft keys for chapter selection related to the function.



(2) Press one of the indicated soft keys for chapter selection to display the corresponding screen.

(3) Press an operation menu key to perform an operation on the displayed chapter screen.

When you press the PROG key, for example, the following soft keys for chapter selection are shown.
When the screen is first displayed, the first chapter is selected. (In this example, “TEXT” is selected.)
To show an operation selection menu on this screen, press an operation menu key at the rightmost position.



(4) To return to the indications of the chapter–menu keys for chapter selection while the operation selection menu is being displayed, press the CHAPTER key.



The foregoing indication procedure is for general screens.
An actual indication procedure depends on each screen.
For specific operations, see each operation description.

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1.1.2 Types of Function Keys

Use a function key to select the corresponding function.
The following function keys are provided for the MDI panel.



Press this key to show an actual position screen.



Press this key to show a program screen.



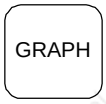
Press this key to show an offset/setting screen.



Press this key to show a system screen.



Press this key to show a message screen.



Press this key to show a graphic screen.

1.1.3 Soft Keys

A screen can be selected with the corresponding soft key instead of the corresponding function key.
Soft keys are also used to perform actual operations.
A function menu and a list of chapter selection menus are shown below.

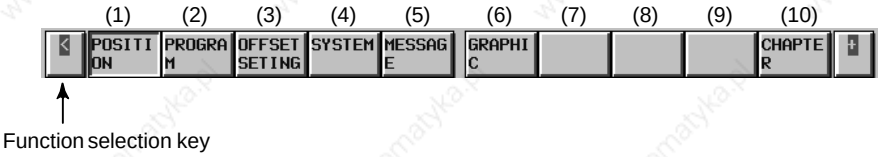
NOTE
All soft keys described below are not necessarily shown. Some soft keys are not shown according to a set option.

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1.1.4 Function Selection Keys

To select a function with the corresponding soft key, press the function menu key first to set soft keys to a function selection key state, and then press the desired function selection key.

Function selection is allowed in any mode.
Use a chapter selection key to specify detailed function selection.
The following function selection keys are provided.



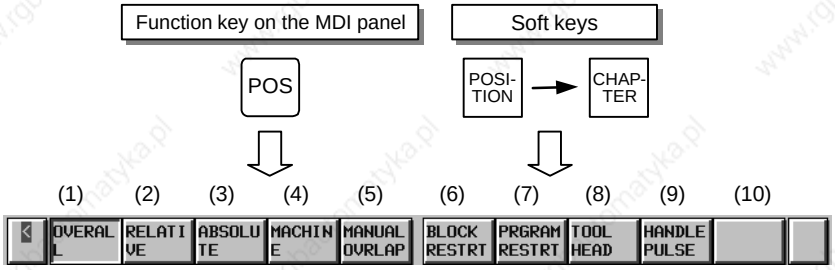
No.	Function key (MDI panel)	Function selection key (soft key)	Description
(1)	POS	POSITION	Selects a current–position information screen, including absolute coordinates, machine coordinates, relative coordinates, and a remaining movement distance.
(2)	PROG	PROGRAM	Selects a part program screen or a program check screen.
(3)	OFFSET SETTING	OFFSETSETING	Selects a tool offset screen or a workpiece origin offset screen.
(4)	SYSTEM	SYSTEM	Selects a parameter screen, a diagnosis screen, or a PMC screen.
(5)	MESSAGE	MESSAGE	Selects a screen for alarm messages and operator messages.
(6)	GRAPH	GRAPHIC	Selects a graphic screen.

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1.1.5 Chapter Selection Keys

Use function selection keys to select items (functions).
Each item is further divided into subitems (chapters). Use a chapter selection key to select the corresponding subitem (chapter).
To select a chapter, press the CHAPTER key to set the soft keys to a chapter selection key state, and then press the desired chapter selection key.
Alternatively, press a hardware function key repeatedly to change a chapter selection.
The list of chapters included in each function is shown below.

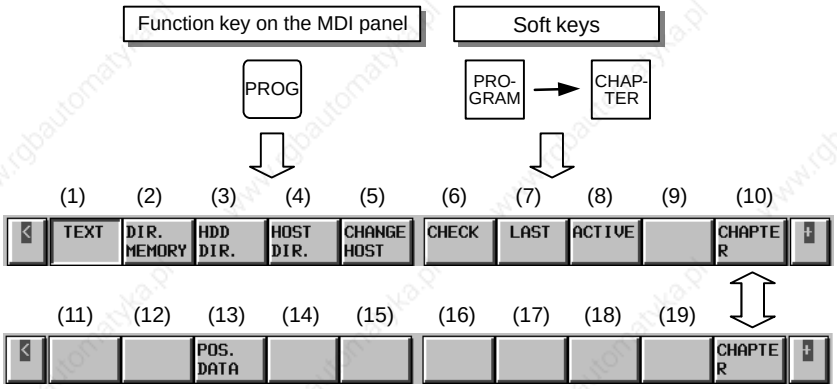
1.1.5.1 Position



No.	Chapter menu	Description
(1)	OVERALL	Selects an overall position indication screen.
(2)	RELATIVE	Selects a relative position indication screen.
(3)	ABSOLUTE	Selects a position indication screen in a workpiece coordinate system.
(4)	MACHINE	Selects a position indication screen in a machine coordinate system.
(5)	MANUALOVRLAP	Selects an operation screen for performing an operation with manual handle interruption.
(6)	BLOCK RESTRT	Selects an operation screen for restarting the operation from the suspended block.
(7)	PROGRAM-RESTRT	Selects an operation screen for restarting the suspended programoperation.
(8)	TOOL HEAD	Indicates the absolute coordinates and the actual speed of the tool head in tool direction handle feed, tool normal direction handle feed, and rotational handle feed around tool tip.
(9)	HANDLEPULSE	Indicates a handle–pulse interruption amount in three–dimensional handle feed.

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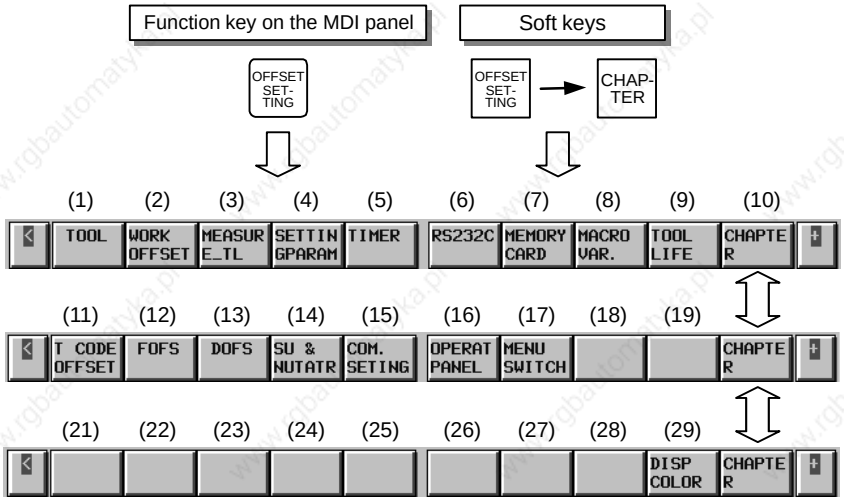
1.1.5.2 Program



No.	Chapter menu	Description
(1)	TEXT	Selects a screen for indicating the contents of the currently selected part program.
(2)	DIR. MEMORY	Selects a screen for indicating the list of currently registered part programs.
(3)	HDD DIR.	Selects a screen for indicating the list of files stored in the hard disk on the data server.
(4)	HOST DIR.	Selects a screen for indicating the list of files stored in the host computer.
(5)	CHANGE HOST	Selects a screen for changing connected host computer.
(6)	CHECK	Selects a screen for indicating a program, a position, and modal information at the same time.
(7)	LAST	Selects a screen for indicating a specified value in the last block currently being executed, and modal values such as G codes and F codes specified until then, among specified values.
(8)	ACTIVE	Selects a screen for indicating a specified value in the block currently being executed, and modal values such as G codes and F codes specified until then, among specified values.
(13)	POS. DATA	Selects a screen for indicating information related to position compensation.

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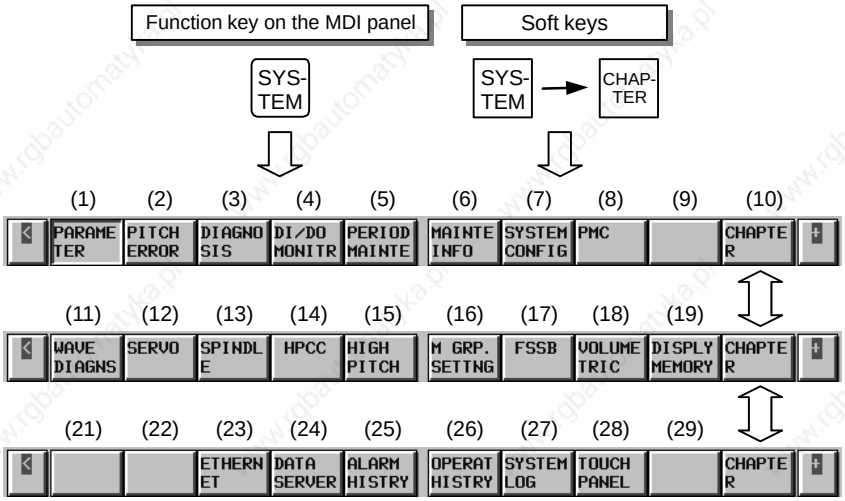
1.1.5.3 Offset/setting



No.	Chapter menu	Description
(1)	TOOL	Selects a screen for setting a tool offset value.
(2)	WORK OFFSET	Selects a screen for setting an offset in the workpiece coordinate system.
(3)	MEASURE_TL	Selects a screen for measuring a tool length.
(4)	SETTINGPARAMETER	Selects a screen for specifying setting parameters.
(5)	TIMER	Selects a screen for indicating information related to the number of machined parts and the operation time period.
(6)	RS232C	Selects a screen for operating a unit connected to the RS–232C interface.
(7)	MEMORYCARD	Selects a screen for performing an operation related to a memory card.
(8)	MACRO VAR.	Selects a screen for setting a macro variable.
(9)	TOOL LIFE	Selects a screen for performing a setting related to tool life management.
(11)	T CODEOFFSET	Selects a screen for setting a tool number, a pot number, and a tool offset value in tool offset by the tool number.
(12)	FOFS	Selects a fixture offset screen.
(13)	DOFS	Selects a dynamic tool offset screen.
(14)	SU & NUTATR	Selects an SU & NUTATR offset screen.
(15)	COM. SETING	Selects a screen for performing a setting related to RS 232C and RS 422.
(16)	OPERATPANEL	Selects a screen for operating a part of the operation switches on the machine operator's panel as soft switches.
(17)	MENU SWITCH	Selects a screen for setting a part of input switch signals input by a signal from the machine, in CNC operations.
(29)	ETHERNET	Selects a screen for performing a setting related to an Ethernet board.

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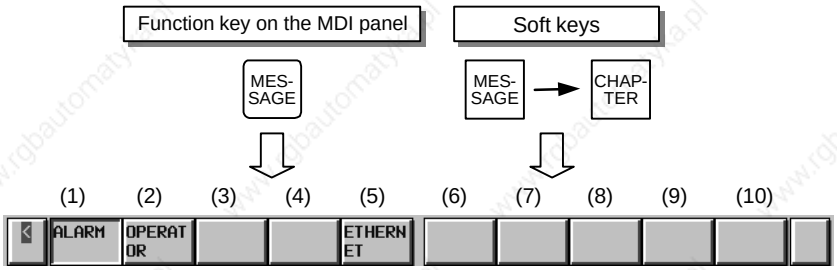
1.1.5.4 System



No.	Chapter menu	Description
(1)	PARAMETER	Selects a screen for setting a parameter.
(2)	PITCH ERROR	Selects a screen for setting pitch error compensation.
(3)	DIAGNOSIS	Selects a screen for showing information indicating a CNC state.
(4)	DI/DO MONITOR	Selects a screen for showing status information of signal.
(5)	PERIODMAINTE	Selects a screen for setting a maintenance item to be periodically controlled.
(6)	MAINTEINFO	Selects a screen for setting information in maintenance.
(7)	SYSTEMCONFIG	Selects a screen for showing the current system state.
(8)	PMC	Selects a screen related to PMC.
(11)	WAVE DIAGNS	Selects a screen for showing data, such as a servo position error, torque, and a machine signal, in a graph.
(12)	SERVO	Selects a screen for performing servo setting.
(13)	SPINDLE	Selects a screen for performing spindle setting.
(14)	HPCC	Selects a screen for performing a setting related to high–precision contour control.
(17)	FSSB	Selects a screen for performing a setting related to a high–speed serial bus (FSSB: Fanuc serial servo bus).
(18)	VOLUMETRIC	Selects a screen for setting three–dimensional error compensation.
(19)	DISPLYMEMORY	Selects a screen for showing the contents of the current CNC memory.
(23)	ETHERNET	Selects a screen for maintenance and setting of the Ethernet board.
(24)	DATA SERVER	Selects the screen for Data server maintenance and setting.
(25)	ALARM HISTRY	Selects a screen for showing the contents of a previously generated alarm.
(26)	OPERAT HISTORY	Selects a screen for showing operation history.
(27)	SYSTEMLOG	Selects a screen for showing the contents of a previously generated system alarm.
(28)	TOUCH PANEL	Selects a screen for setting a touch panel.

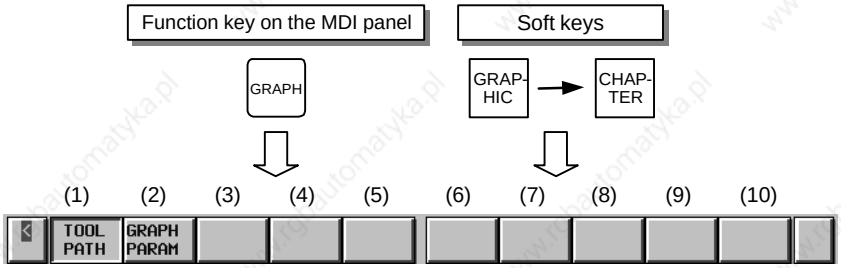
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1.1.5.5 Messages



No.	Chapter menu	Description
(1)	ALARM	Selects an alarm message screen.
(2)	OPERATOR	Selects an operator message screen.
(5)	ETHERNET	Selects a screen for showing logging information on Ethernet board.

1.1.5.6 Drawing

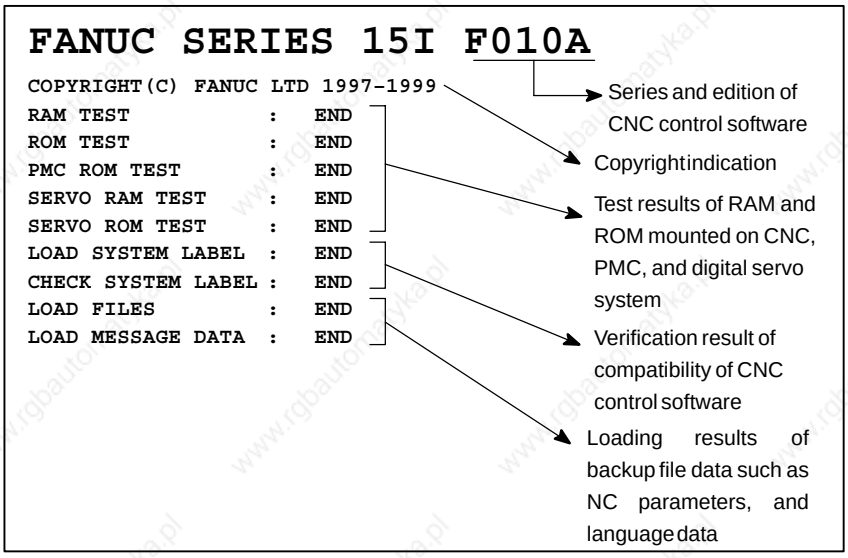


No.	Chapter menu	Description
(1)	TOOL PATH	Selects a screen for graphic indication of a tool path.
(2)	GRAPH PARAM	Selects a screen for performing a setting of tool–path drawing.

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1.2 SCREEN INDICATIONS AT POWER ON

The test results of hardware (RAM and ROM), and the check results of control software and file data are indicated on the screen at power on.



CAUTION

If a hardware error is detected in the RAM and ROM tests for the CNC, PMC, and digital servo system, power–on processing is stopped.

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1.3 DIAGNOSIS FUNCTION

If an error occurs, or if a machine operation stops for some reason such as an external–signal wait state without an error and it seems as if an error occurs, it is necessary to check the cause from the internal CNC state and an interface state between the CNC and PMC or between the CNC and the machine.

The CNC performs various checks during its operation.

1. Detection–system error
2. Position–control–section error
3. Serve–system error
4. Overheat
5. CPU error
6. ROM error
7. RAM error
8. Program–memory error
9. Data–input error
10. Error in data transfer with PMC

In addition, an internal CNC state is checked. The state can be shown on the screen.

- **Cause for not operating even if a command is given**

1000	Internal CNC state 1

[Data type] Bit type

[Unit of data] None

Name	Internal state when “1” is indicated
Imposition Check	The imposition check is being performed.
Feedrate Override 0%	The feedrate override is 0%.
Jog Feed Override 0%	The jog feedrate override is 0%.
Inter/Start Lock on	The interlock/start lock is on.
Speed Arrival on	It is being awaited that the speed arrival signal is turned on.
Wait Revolution	The spindle one–revolution signal is awaited in threading.
Stop Position Coder	It is awaited that the position coder rotates in spindle feed per revolution.
Feed Stop	The feed stop is being performed.

1001	Internal CNC state 2

[Data type] Bit type

[Unit of data] None

Name	Internal state when “1” is indicated
Foreground Reading	Foreground data is being input.
Background Reading	Background data is being input.

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- **Cause for not starting**

	#7	#6	#5	#4	#3	#2	#1	#0
1005						OTH	RPO	JMD

Bit	Name	Internal state when “1” is indicated
#0	JMD	DI and DO signals are incorrect in a manual numeric command (*1).
#1	RPO	DI and DO signals are incorrect in repositioning for tool retraction and recovery (*2).
#2	OTH	Others (*3).

	#7	#6	#5	#4	#3	#2	#1	#0
1006	RVS	PTR	MDI	NOP	EDT	SRN	ALM	*SP

Bit	Name	Internal state when “1” is indicated
#0	*SP	The automatic–operation stop signal (*SP) is “0.”
#1	ALM	An alarm is generated.
#2	SRN	The SRN signal or the BRN signal is “1.”
#3	EDT	An attempt was made to execute a program being background edited.
#4	NOP	The device is not ready in the DNC mode.
#5	MDI	The contents which the MDI executed is remaining.
#6	PTR	The tool retraction signal (TRESC) is “1.” Alternatively, the tool is not returned to the position where the tool retraction signal was input.
#7	RVS	Reverse operation of the program cannot be performed.

If a bit becomes “1,” remove the cause and then restart.
Multiple bits cannot become “1.” Even if multiple causes happen, the bit corresponding to the last cause becomes “1.”

NOTE
1 The DEN signal or the IPEN signal of DO is “1.”
Constant surface speed control is being executed.
The state of HEAD1/2 of DI is wrong in the MDI mode (only for TT series).
2 The OP signal of DO is “0” in a repositioning operation of tool retraction and recovery.
The MLK signal of DI is “1.”
The STL signal of DO is “1.”
3 A retraction operation is being performed in the hobbing machine.
In the bed grinding machine, an alarm is being generated or the MLK signal of DI is “1.”
The axis to be jog retracted is at a position where movement cannot be started.

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- **Alarm classification**

The diagnostic data 1007 and 1008 indicates classification information of a generated alarm. When the alarm is released, the data becomes “0.”

	#7	#6	#5	#4	#3	#2	#1	#0
1007			PW	IO	PC	OT	SV	SW

Bit	Name	Internal state when “1” is indicated
#0	SW	Parameter writing switch on
#1	SV	Servo alarm
#2	OT	Overtravel
#3	PC	PMC error
#4	IO	I/O error
#5	PW	Input of parameter which requires power off
#6		(Not used)
#7		(Not used)

	#7	#6	#5	#4	#3	#2	#1	#0
1008						SR	BG	PS

Bit	Name	Internal state when “1” is indicated
#0	PS	Program operation alarm
#1	BG	Background editing alarm
#2	SR	Severe program–operation alarm
#3		(Not used)
#4		(Not used)
#5		(Not used)
#6		(Not used)
#7		(Not used)

- **Warning state**

	#7	#6	#5	#4	#3	#2	#1	#0
1009								WRN

Bit	Name	Internal state when “1” is indicated
#0	WRN	A warning is generated.

When the warning is released, the data becomes “0.”

- **Reset/feed hold state**

	#7	#6	#5	#4	#3	#2	#1	#0
1010					RST	ERS	RRW	ESP

Bit	Name	Internal state when “1” is indicated
#0	ESP	During emergency stop
#1	RRW	The reset and rewind signal is “1.”
#2	ERS	The external reset signal is “1.”
#3	RST	The reset key is being pressed.

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- **Cause of turning off of the cycle start lamp**

	#7	#6	#5	#4	#3	#2	#1	#0
1011	HLD	STP	MOD	ALM	RST	ERS	RRW	ESP

Bit	Name	Internal state when “1” is indicated
#0	ESP	During emergency stop
#1	RRW	The reset and rewind signal is “1.”
#2	ERS	The external reset signal is “1.”
#3	RST	The reset key is being pressed.
#4	ALM	An alarm is being generated.
#5	MOD	The mode has been changed to another mode.
#6	STP	Single–block stop
#7	HLD	During feed hold

- **TH alarm state**

The diagnostic data 1100 to 1111 indicates the state of a TH alarm.

1100	Position of character where a TH alarm was generated (foreground)

[Data type] Integer type

[Unit of data] None

The position of a character where a TH alarm was generated in foreground input is indicated by the number of characters from the top of the block.

1101	Code of character which caused a TH alarm (foreground)

[Data type] Bit type

[Unit of data] None

The bit pattern of the character which caused a TH alarm in foreground input is indicated.

1110	Position of character where a TH alarm was generated (background)

[Data type] Integer type

[Unit of data] None

The position of a character where a TH alarm was generated in background input is indicated by the number of characters from the top of the block.

1111	Code of character which caused a TH alarm (background)

[Data type] Bit type

[Unit of data] None

The bit pattern of the character which caused a TH alarm in background input is indicated.

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- **Serial spindle**

The diagnostic data 1500 to 1505 indicates serial–spindle information.

	#7	#6	#5	#4	#3	#2	#1	#0
1500	SALMI		CALM	CMER	CER	SNER	FRER	CRER

[Data type] Bit spindle type

Bit	Name	Internal state when “1” is indicated
#0	CRER	A CRC error occurred (warning).
#1	FRER	A framing error occurred (warning).
#2	SNER	A transmission/receiving mate is wrong.
#3	CER	A receiving error occurred.
#4	CMER	A return is not received during automatic scanning.
#5	CALM	A communication alarm was generated in the spindle amplifier.
#6		(Not used)
#7	SALMI	A system alarm was generated in the spindle amplifier.

1504	Torque data of spindle motor

[Data type] Integer spindle type

[Unit of data] %

1505	Speed data of spindle motor

[Data type] Integer spindle type

[Unit of data] $\min^{-1}$

- **Serial spindle detailed information**

1561	Spindle status error number

[Data type] Integer spindle

Displays the status error number transferred from the spindle amplifier which supports SIC5.

1562	Spindle warning number

[Data type] Integer spindle

Displays the warning number transferred from the spindle amplifier which supports SIC5.

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1563	Spindle motor temperature information

[Data type] Integer axis

[Unit of data] °C

[Valid data range] 0 to 255

Displays the temperature of the winding of the α*i* spindle motor when the α*i* spindle I/F is used. The temperature at which overheating occurs differs depending on the motor.

NOTE
The temperature at which overheating occurs may have the following error:
At 160°C or less: Up to 5°C
At 160 to 180°C: Up to 10°C

- **Servo position error**

3000	Servo position error

[Data type] Integer axis type

[Unit of data] Detection unit

3001	Servo position error amount + FAD error amount

[Data type] Integer axis number

[Unit of data] Detection unit

Displays the sum of the servo position error and the number of FAD accumulated pulses if fine acceleration/deceleration (FAD) is used.

- **Reference position return**

3008	Distance from the position where the deceleration dog is released to the first grid position

[Data type] Integer axis type

[Unit of data] Detection unit

The distance from the position where the deceleration dog is released to the first grid position is indicated in the reference position shift function.

- **Servo control information**

Number	Description of indicated data
3010 to 3023	Servo control information of first axis
3030 to 3043	Servo control information of second axis
3050 to 3063	Servo control information of third axis
3070 to 3083	Servo control information of fourth axis
3090 to 3103	Servo control information of fifth axis
3110 to 3123	Servo control information of sixth axis
3130 to 3143	Servo control information of seventh axis
3150 to 3163	Servo control information of eighth axis
3170 to 3183	Servo control information of ninth axis

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- **Digital servo alarm**

The diagnostic data 3014 and 3015 indicates alarm information when an alarm is generated in digital servo.

	#7	#6	#5	#4	#3	#2	#1	#0
3014	OVL	LVAL	OVC	HCAL	HVAL	DCAL	FBAL	OFAL

First axis: 3014
Second axis: 3034
Third axis: 3054
(The subsequent axes correspond to data numbers each increased by 20 in that order.)

Bit	Name	Internal state when “1” is indicated
#0	OFAL	An overflow alarm is being generated inside the digital servo.
#1	FBAL	A pulse–coder disconnection alarm is being generated.
#2	DCAL	A regenerative discharge circuit alarm is being generated in the servo amplifier (the “DC” LED of the servo amplifier is on).
#3	HVAL	An overvoltage alarm is being generated in the servo amplifier (the “HV” LED of the servo amplifier is on).
#4	HCAL	An abnormal current alarm is being generated in the servo amplifier (the “HC” LED of the servo amplifier is on).
#5	OVC	An overcurrent (overload) alarm is being generated in the servo amplifier.
#6	LVAL	A low voltage alarm is being generated in the servo amplifier (the “LV” LED of the servo amplifier is on).
#7	OVL	An overload alarm is being generated in the servo motor or the servo amplifier. If the alarm is generated in the servo amplifier, overheat occurs in the servo amplifier, the separate discharge unit, or the power transformer (the “OH” LED of the servo amplifier is on).

	#7	#6	#5	#4	#3	#2	#1	#0
3015	ALDF			EXPC				

First axis: 3015
Second axis: 3035
Third axis: 3055
(The subsequent axes correspond to data numbers each increased by 20 in that order.)

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- Identification of disconnection alarms and overload alarms
  Disconnection alarms and overload alarms can be identified as shown in the following table by the diagnostic data 3014 and 3015.

Alarm type	3014#7 OVL	3014#1 FBAL	3015#7 ALDF	3015#4 EXPC
Overheat	1	0	1	0
Amplifier overheat	1	0	0	0
Disconnection (hardware) of built–in pulse coder	0	1	1	0
Disconnection (hardware) of separate pulse coder	0	1	1	1
Disconnection (software) of pulse coder	0	1	0	0

- **Absolute position detection alarm**

If an SV101 data error alarm (ABS PCDR) or an OT032 reference position return alarm (ABS PCDR) is generated, the contents of the alarm are indicated.

	#7	#6	#5	#4	#3	#2	#1	#0
3018	APMVAL	APPER	APFER	APTER	APCER	APBATZ	APPLSM	APNZRN

First axis: 3018
Second axis: 3038
Third axis: 3058
(The subsequent axes correspond to data numbers each increased by 20 in that order.)

Bit	Name	Internal state when “1” is indicated
#0	APNZRN	The reference position does not correspond to the value of the absolute–position detection counter. (Action: Make correspondence between the reference position and the absolute–position detection.)
#1	APPLSM	A pulse error alarm was generated. (Action: Make correspondence between the reference position and the absolute–position detection.)
#2	APBATZ	The battery voltage of the absolute–position detector became 0. (Action: Replace the battery and make correspondence between the reference position and the absolute–position detection.)
#3	APCER	A communication error occurred during data transmission. (Action: Replace the pulse coder.)
#4	APTER	A time over error occurred during data transmission. (Action: Replace the pulse coder.)
#5	APFER	A framing error occurred during data transmission. (Action: Replace the pulse coder.)
#6	APPER	A parity error occurred during data transmission. (Action: Replace the pulse coder.)

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#7	APMVAL	An excessive motor displacement alarm was generated. It is generated when the machine moves largely at power on and the pulse count in detection units exceeds 24,000. (Action: Take a measure in the machine so that the machine does not move at power on.)

- **HIGH SPEED HRV status**

	#7	#6	#5	#4	#3	#2	#1	#0
3022							ERVOK	HRVON

First axis: 3022
Second axis: 3042
Third axis: 3062
(n–th axis: 3022 + 20 x (n – 1)

Bit	Name	Internal status assumed when “1” is displayed
#0	HRVON	The motor is controlled in HIGH SPEED HRV mode.
#1	HRVOK	When the parameter HR3 (No.1707#0) is set to “1”, HIGH SPEED HRV is enabled (as determined with the status of the servo software, servo control card, servo amplifier, and Separate Detector I/F Unit).

- **Servo synchronization error**

3500	Amount of servo synchronization error

[Data type] Integer axis type

[Unit of data] Detection unit

The positional difference (the amount of synchronization error) between the master axis and the slave axis in synchronization control is indicated. It is indicated at the location corresponding to the axis number of the slave axis.

3501	Amount of servo synchronization error compensation

[Data type] Integer axis type

[Unit of data] Detection unit

The accumulated value (the amount of synchronization error compensation) of the compensation pulses output to the slave axis in synchronization control is indicated.
It is indicated at the location corresponding to the axis number of the slave axis.

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- **Dual position feedback**

3510	Error amount of dual position feedback

[Data type] Integer axis type

[Unit of data] Detection unit

The difference (the positional difference between the machine and the motor) between the feedback of the closed loop and the feedback of the semi–closed loop is indicated.

3511	Sum of compensation amounts in dual position feedback

[Data type] Integer axis type

[Unit of data] Detection unit

The sum of the output compensation pulses in dual position feedback is indicated.

3512	Error counter in the closed loop

[Data type] Integer axis type

[Unit of data] Detection unit

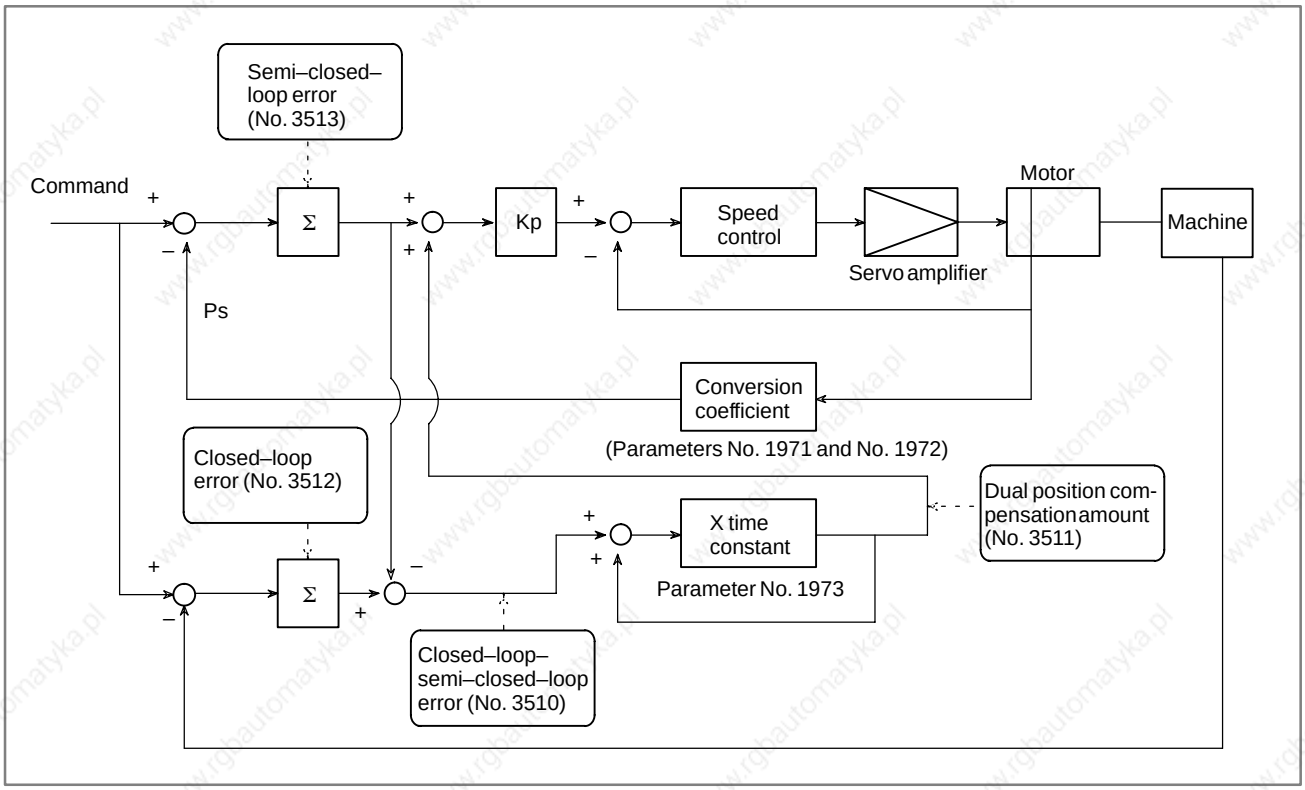
3513	Error counter in the semi–closed loop

[Data type] Integer axis type

[Unit of data] Detection unit

Data items indicated on the diagnosis screen correspond to the following locations.

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- **αi servo motor temperature output function**

The αi series servo motor contains thermistors instead of thermostats contained in conventional models. This function can receive thermistor data and convert it to a temperature (°C) to provide ”motor temperature” information.
The αi servo motor has two thermistors: one for detecting the motor winding temperature and the other for detecting the pulse coder temperature. When the motor winding temperature reaches 140°C or the temperature of the printed circuit board in the pulse coder reaches 100°C, a motor overheat alarm is issued.

3520	Servo motor temperature information

[Data type] Integer axis

[Unit of data] °C

Displays the temperature of the winding of the αi servo motor. When the temperature reaches 140°C, a motor overheat alarm is issued.

NOTE
The temperature at which an overheat alarm is issued may have an error of up to 5°C.

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3521	Pulse coder temperature information

[Data type] Integer axis

[Unit of data] °C

Displays the temperature of the printed circuit board in the α*i* pulse coder. When the temperature reaches 100°C (the ambient temperature in the pulse coder is about 85°C), a motor overheat alarm is issued.

NOTE
The temperature at which an overheat alarm is issued may have an error of up to 5°C.

- **Three–dimensional error compensation**

3530	Three–dimensionalerror compensation amount

[Data type] Integer axis type

[Unit of data] Detection unit

- **OVC level**

3540	OVC level

[Data type] %

[Meaning] The ratio of the soft thermal (OVC) level to the alarm generation level is indicated.

- **Absolute–position detection in Inductosyn method**

3700	Shift between the motor absolute position and the offset data in the absolute–position detection function with the Inductosyn method

[Data type] Integer axis type

[Unit of data] Detection unit

The remainder of (motor absolute position – offset data)/(one–pitch interval) is indicated.

3701	Offset data from the Inductosyn in the absolute–position detection function with the Inductosyn method

[Data type] Integer axis type

[Unit of data] Detection unit

The offset data which the CNC received at machine–position calculation is indicated.

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- **Coordinate related data**

4100	Shift to the coordinate system by manual operation

[Data type] Real–number axis type

[Unit of data] Input unit

The movement distance along each axis by manual operation in a case in which the manual absolute signal is “0” is indicated.

4101	Amount of intervention by manual interruption in simultaneous automatic and manual operations

[Data type] Real–number axis type

[Unit of data] Input unit

The amount of intervention by manual interruption for each axis is indicated.

4102	Offset to the coordinate system by G92 workpiece coordinate system setting

[Data type] Real–number axis type

[Unit of data] Input unit

The offset to the coordinate system by a G92 command for each axis is indicated.

4103	Offset to the coordinate system by G52 local coordinate system setting

[Data type] Real–number axis type

[Unit of data] Input unit

The offset to the coordinate system by a G52 command for each axis is indicated.

4104	Shift to the coordinate system in a machine lock state

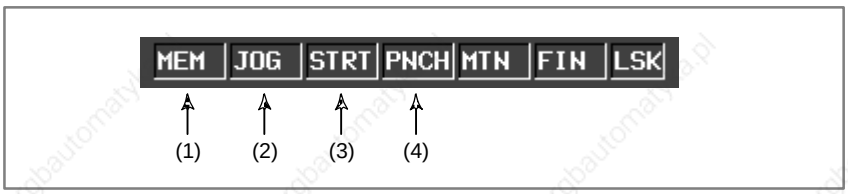
[Data type] Real–number axis type

[Unit of data] Input unit

The shift to the coordinate system by a move command in a machine lock state for each axis is indicated.

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1.4 CNC STATE INDICATIONS



(1) Automatic–operation mode selection
The selected operation mode in automatic operation is indicated.

MDI: MDI operation
MEM: Memory operation
DNC: DNC operation
EDIT: Memory editing
****: Automatic operation is not selected.

(2) Manual–operation mode selection
The selected operation mode in manual operation is indicated.

JOG: Jog feed
REF: Manual reference position return
HND: Manual handle feed
INC: Incremental feed
AGJ: Manual desired–angle feed
J+H: Jog feed + manual handle feed
I+H: Incremental feed + manual handle feed
****: Manual operation is not selected.

(3) Automatic–operation state
The state of automatic operation is indicated.

RSET: Being reset
STOP: Automatic–operation stop state
HOLD: Automatic–operation hold state
STRT: Automatic–operation start state
MSTR: Manual–numeric–command start state
NSRC: Sequence number being searched for

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(4) Program–editing state
The state of program editing is indicated.

READ: Being registered

PNCH: Program being output

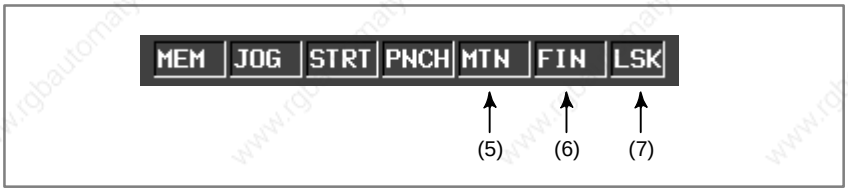
VRFY: Being verified

SRCH: Being searched for

COND: Memory being rearranged

EDIT: Being edited in another way (such as INSERT or ALTER)

****: Editing is not performed.



(5) State of movement along axis, dwell, or emergency stop
The state of movement along axis, dwell, or emergency stop is indicated.

MTN: Being moved along the axis

DWL: During dwell

EMG: During emergency stop

***: None of the above states

(6) MSTB state
Whether a miscellaneous function such as MSTB is being executed is indicated.

FIN: Miscellaneous function such as MSTB being executed (waiting for a completion signal from the PMC)

***: Miscellaneous function such as MSTB not being executed

(7) Alarm state and label–skip state
The state of an alarm, a warning, the battery, or a label skip is indicated.

ALM : Alarm being generated (reverse indication and blinking)

WRN : Warning message being indicated (reverse indication and blinking)

BAT : Battery life nearly running out (reverse indication and blinking)

LSK: Label–skip state in data input

(blank): None of the above states

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1.5 WAVEFORM DIAGNOSIS FUNCTION

This function traces data such as a servo position error, torque, and a machine signal and shows a change in the data as a waveform. This facilitates the adjustment of a servo motor and a spindle motor and finding of a possible cause in a problem.

This function traces the following data.

(1) Servo–related items
Position error of a servo motor along each axis, pulse count after distribution, torque, pulse count after acceleration and deceleration, actual speed, specified current, and thermal simulation data

(2) Combined speed for all axes

(3) Spindle–related items
Spindle–motor speed and load meter indication

(4) State of on (“1”)/off (“0”) of machine signal

A total of four items among the servo–related items, the combined speed for all axes, and the spindle–related items, and four machine signals can be traced at a time.
The waveforms of all traced data items can be displayed at the same time.

Tracing can be performed by the following three conditions.

(1) Data at a predetermined timing

(2) Data immediately after the specified event occurs

(3) Data immediately before the specified event occurs

Traced data can be output to an external input and output unit. Output data can also be read.

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Waveform–diagnosis graphic screen

- **Waveform–diagnosis graphic screen**

Display the waveform–diagnosis graphic screen according to the procedure described in II 2.6 Soft Keys in the FANUC Series 15*i*/150*i*–MA Operator's Manual (Operation) (B–63324EN–1).

The wave–form diagnosis graphic screen provides data tracing operations and the waveform indications of traced data.

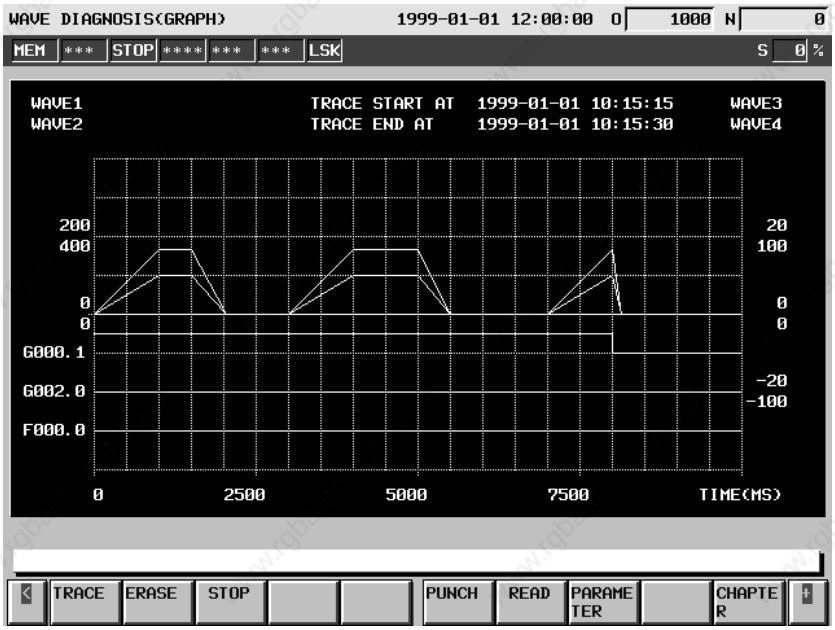


Fig. 1.5 (a) Waveform–diagnosis graphic screen

The waveforms of a total of four items among the servo–related items, the combined speed for all axes, and the spindle–related items are drawn with colors specified for the items.
At the left–hand side of the screen, the graduations of the first waveform and the second waveform are indicated by the same colors as for the waveforms. At the right–hand side of the screen, the graduations of the third waveform and the fourth waveform are indicated in the same way.
The addresses of traced machine signals are indicated at the right–hand side of the screen. The waveforms of the machine signals are drawn in white.
The tracing start time and the tracing end time of traced data are indicated at the top of the screen. While data is being traced, a message of "Tracing" is indicated.

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Waveform–diagnosis parameter screen

Press the [PARAMETER] soft key on the waveform–diagnosis graphic screen to show the waveform–diagnosis parameter screen.

The waveform–diagnosis parameter screen provides the settings of various parameters related to data tracing and waveform indications.
The waveform–diagnosis parameter screen has three pages.

- **Page 1 of waveform–diagnosis parameter screen**

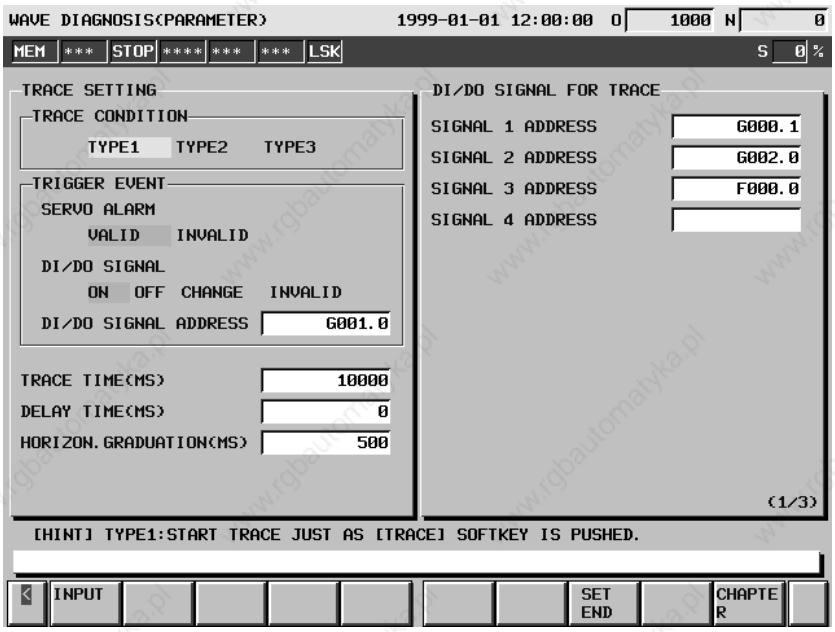


Fig. 1.5 (b) Waveform–diagnosis parameter screen (Page 1)

On Page 1 of the waveform–diagnosis parameter screen, set parameters common to the entire diagnosis, such as a tracing condition, a trigger event, and a tracing time.
Also set the addresses of machine signals to be traced, on Page 1.

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- **Page 2 of waveform–diagnosis parameter screen**

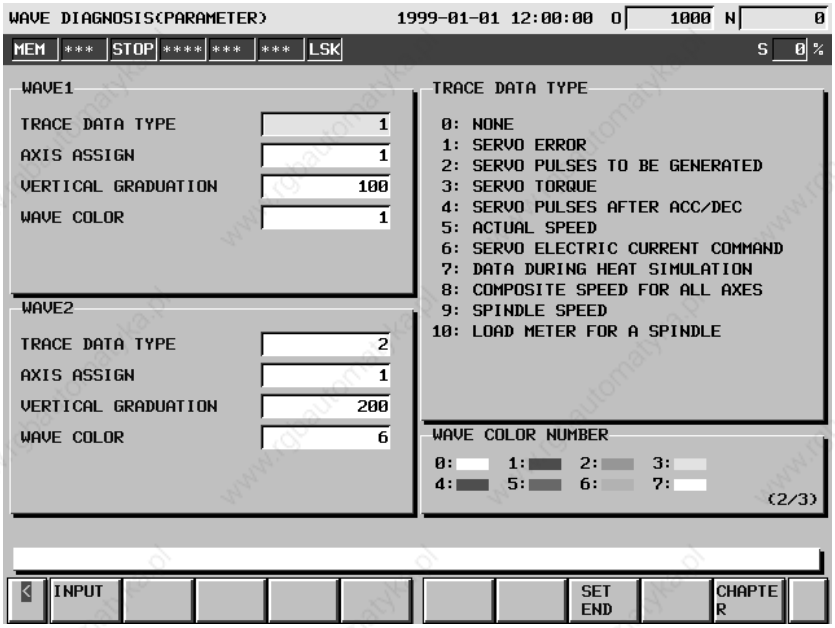


Fig. 1.5 (c) Waveform–Diagnosis Parameter Screen (Page 2)

On Page 2 of the waveform–diagnosis parameter screen, set each parameter related to the first waveform and the second waveform.
At the right half of the screen, the types of trace data and waveform–color numbers are indicated as lists.
On Page 3 of the waveform–diagnosis parameter screen, perform the same settings for the third waveform and the fourth waveform.

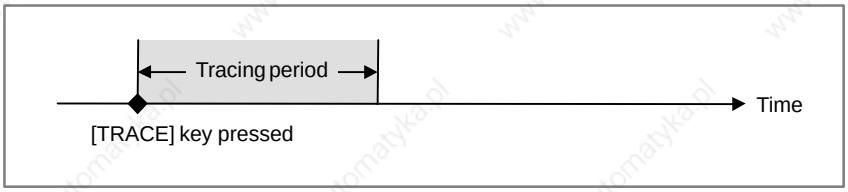
Waveform–diagnosis parameters

Waveform–diagnosis parameters are required to be set on the waveform–diagnosis parameter screen in order to trace data.

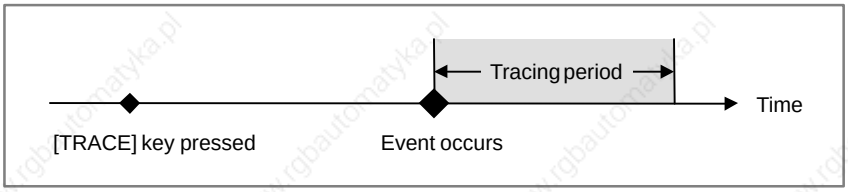
- **TRACE CONDITION**

One of the following three conditions can be selected according to a condition for tracing start/end.

TYPE 1: Traces data for the specified time period from when the [TRACE] soft key is pressed.

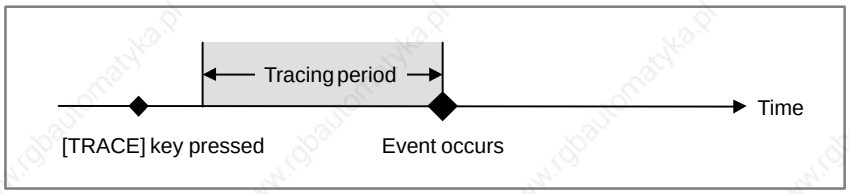


TYPE 2: Traces data for the specified time period from when the specified trigger event occurs after the [TRACE] soft key is pressed.



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TYPE 3: Traces data for the specified time period until the specified trigger event occurs after the [TRACE] soft key is pressed.



● TRIGGER EVENT

Set a trigger event for the type–2 or type–3 tracing condition.
In the type–2 tracing condition, when the specified trigger event occurs, tracing starts. In the type–3 tracing condition, tracing ends when the specified trigger event occurs.

SERVO ALARM

Specify whether a servo alarm serves as a trigger event.
VALID: A servo alarm serves as a trigger event.
INVALID: A servo alarm does not serve as a trigger event.

DI/DO SIGNAL

Specify whether the specified machine signal serves as a trigger event.
ON: An ON transition of the specified machine signal serves as a trigger event.
OFF: An OFF transition of the specified machine signal serves as a trigger event.
CHANGE: A change of the specified machine signal serves as a trigger event.
INVALID: A machine signal does not serve as a trigger event.

DI/DO SIGNAL ADDRESS

Set the address of the machine signal when the machine–signal setting above is ON, OFF, or CHANGE.

● TRACE TIME

Set the data tracing period in a range of 10 ms to 80000 ms.
A tracing cycle is determined according to the tracing period as shown below.

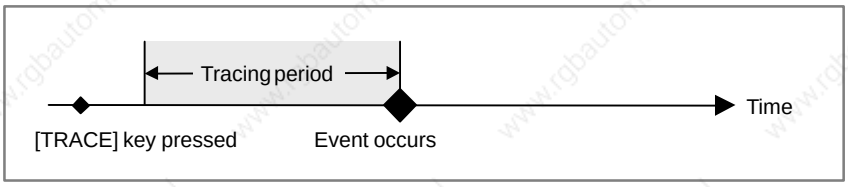
Tracing period	Tracing cycle	
	Servo–related items, combined speed, and spindle–related items	Machine signal
10 to 10000ms	2ms	8ms
to 20000ms	4ms	8ms
to 40000ms	8ms	8ms
to 80000ms	16ms	16ms

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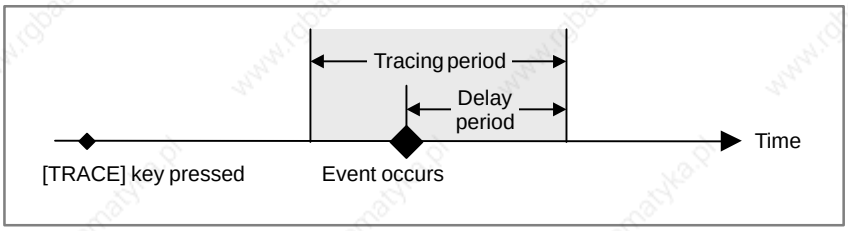
- **DELAY TIME**

In the type–3 tracing condition, the tracing end time can be delayed by the specified time period after the event occurs. Set the time period in a range of 0 ms to 160000 ms.

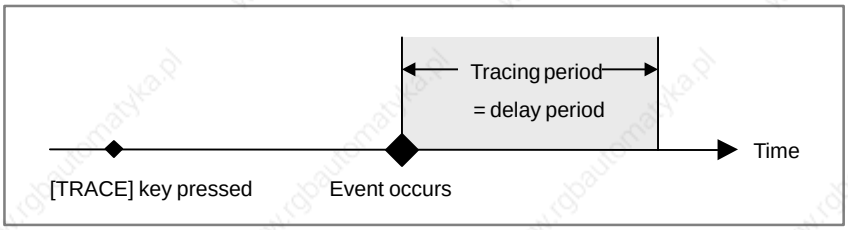
(1) Delay period of 0



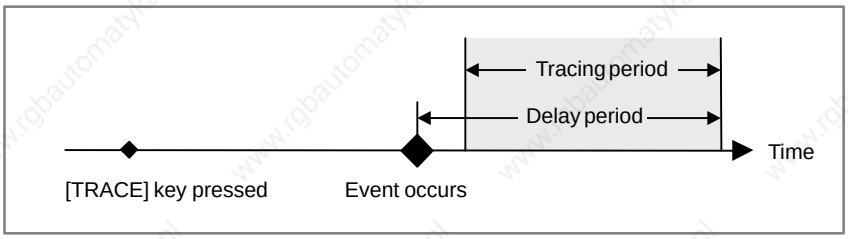
(2) 0 < delay period < tracing period
Data is traced before and after the event occurs.



(3) Delay period = tracing period
Tracing starts when the event occurs (equivalent to type 2)



(4) Delay period > tracing period
Tracing starts when a time elapses after the event occurs.



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- **TRACE DATA TYPE**

Specify the number of the data to be traced.

Data number	Type	Unit
0	No tracing	
1	Servo position error	Pulse (detection unit)
2	Servo pulse count after distribution	Pulse (detection unit)
3	Servo torque	%
4	Servo pulse count after acceleration and deceleration	Pulse (detection unit)
5	Servo actual speed	Pulse (detection unit)
6	Specified servo current	%
7	Thermal–simulation data of servo	%
8	Combined speed for all axes	MM/MIN,INCH/MIN,RPM
9	Spindle speed	min^{-1}
10	Spindle load meter	%

NOTE
1 The combined speed for all axes does not include the speed along the axis which is excluded by the DI signal *ACTF for axis selection in actual speed indications.
2 The servo torque and the specified servo current are indicated in percentage (%) of the parameter values (No. 1979)

- **AXIS ASSIGN**

Specify an axis number according to the type of the data to be traced, as shown below.

Data number	Type	Axis number
1	Servo position error	Servo axis number (1 or greater)
2	Servo pulse count after distribution	
3	Servo torque	
4	Servo pulse count after acceleration and deceleration	
5	Servo actual speed	
6	Specified servo current	
7	Thermal–simulation data of servo	
8	Combined speed for all axes	Head number (1 or greater), specify in TT series
9	Spindle speed	Spindle number (1 or greater)
10	Spindle load meter	

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- **HORIZON.GRADUATION**

  Specify a graduation of the horizontal axis (time axis) in a range of 25 ms to 800 ms.

- **VERTICAL GRADUATION**

  Specify a graduation of the vertical axis in a range of 1 to 500000 for each trace data. Set this parameter for servo–related items, the combined speed for all axes, and spindle–related items.

- **DI/DO SIGNAL**

  When the on (“1”)/off (“0”) state of a machine signal is traced, specify the address of the machine signal. Up to four machine signals can be specified. If no trace is made, input “0.”

- **WAVE COLOR**

  Specify a waveform color for each data to be traced as shown below.

  0: White 1: Red 2: Green 3: Yellow
  4: Blue 5: Purple 6: Light blue 7: White

  This parameter is effective for the waveform of each data of the servo–related items, the combined speed for all axes, and the spindle–related items. The waveform of the on (“1”)/off (“0”) state of a machine signal is drawn in white.

Setting waveform–diagnosis parameters

- **Moving the cursor**

  Use the page keys [PAGE↑] and [PAGE↓] and cursor keys [↑] and [↓] to move the cursor to the parameter to be set.
  In setting “TRACE CONDITION,” “TRIGGER EVENT – SERVO ALARM,” and “TRIGGER EVENT – DI/DO Signal” on Page 1, use cursor keys [←] and [→] to move the cursor in order to select the desired settings.

- **Inputting a setting**

  Method 1

  (1) Press the [INPUT] soft key.
  (2) Type the desired value.
  (3) Press the [EXEC] soft key.

  Method 2

  (1) Type the desired value.
  (2) Press the [INPUT] soft key.

  Method 3

  (1) Type the desired value.
  (2) Press the [INPUT] key.

  A waveform–diagnosis parameter cannot be set during tracing. Specify a parameter after tracing or after tracing is stopped.

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Tracing data

- **Starting tracing**

Data tracing starts.

(1) Display the waveform–diagnosis graphic screen.

(2) Press the [TRACE] soft key.

At the top of the screen, “Tracing” is indicated. When tracing ends, “Tracing” is deleted.
Tracing continues even if the screen is changed during tracing.

> **NOTE**
> In the type–1 tracing condition, waveform drawing starts immediately after the [TRACE] soft key is pressed.
> In the type–2 tracing condition, waveform drawing starts immediately after the specified trigger event occurs.
> In the type–3 tracing condition, waveform drawing starts immediately after the delay period elapses after the specified trigger event occurs.

- **Stopping tracing/drawing**

Tracing or waveform drawing is stopped.

(1) Display the waveform–diagnosis graphic screen.

(2) Press the [STOP] soft key.

If tracing is being performed, it is stopped. If a waveform is being drawn, drawing is stopped.

- **Deleting waveform**

The traced data is deleted and drawing is cleared.

(1) Display the waveform–diagnosis graphic screen.

(2) Press the [ERASE] soft key.

Traced data cannot be deleted during tracing. When tracing starts, the preceding data is automatically deleted.

Waveform movement/enlargement/reduction

On the waveform–diagnosis graphic screen, soft–key operations allow a waveform to be moved and to be enlarged/reduced in the horizontal and vertical directions.
These operations can be performed during tracing.

- **Moving waveform**

Press the [WAVE1 ↑], [WAVE1 ↓], [WAVE2 ↑], [WAVE2 ↓], [WAVE3 ↑], [WAVE3 ↓], [WAVE4 ↑], and [WAVE4 ↓] soft keys to move the corresponding waveforms up and down.
Press the [TIME →] and [TIME ←] soft keys to move the entire waveforms right and left.

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- **Enlarging/reducing waveform**

Press the [EXPAND(V)] and [REDUCE(V)] soft keys to enlarge and reduce the entire waveforms in the vertical direction. The height of a waveform is doubled by the [EXPAND(V)] soft key, and the height of a waveform is halved by the [REDUCE(V)] soft key.

Press the [EXPAND(H)] and [REDUCE(H)] soft keys to enlarge and reduce the entire waveforms in the horizontal direction. The width of a waveform is doubled by the [EXPAND(H)] soft key, and the width of a waveform is halved by the [REDUCE(H)] soft key.

When a waveform enlargement/reduction operation is performed, the vertical–axis graduation and the horizontal–axis graduation in the waveform–diagnosis parameters are automatically changed accordingly.

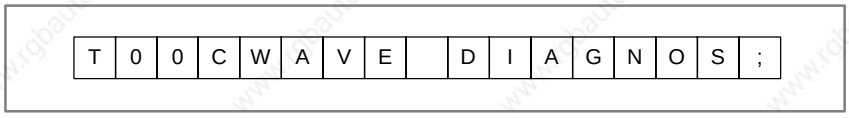
Data input/output

The traced data can be output to an external input and output unit. Output data can be read again.

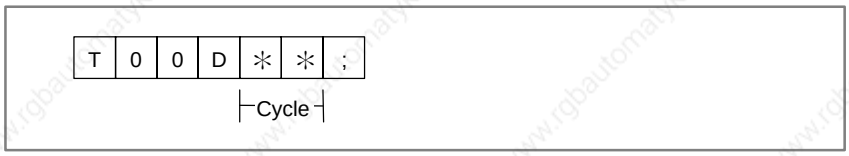
- **Input and output format**

The traced data is input or output as a text file having the following format.

(1) Header

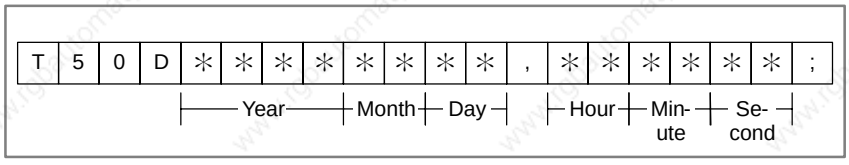


(2) Tracing cycle

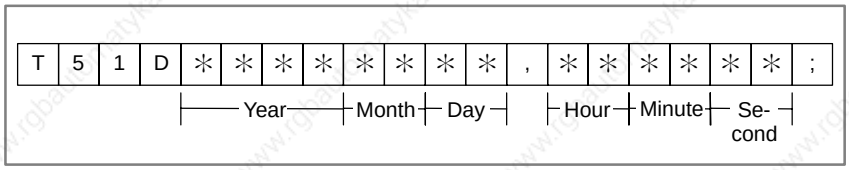


(3) Date and time of tracing start/end

- Date and time of start



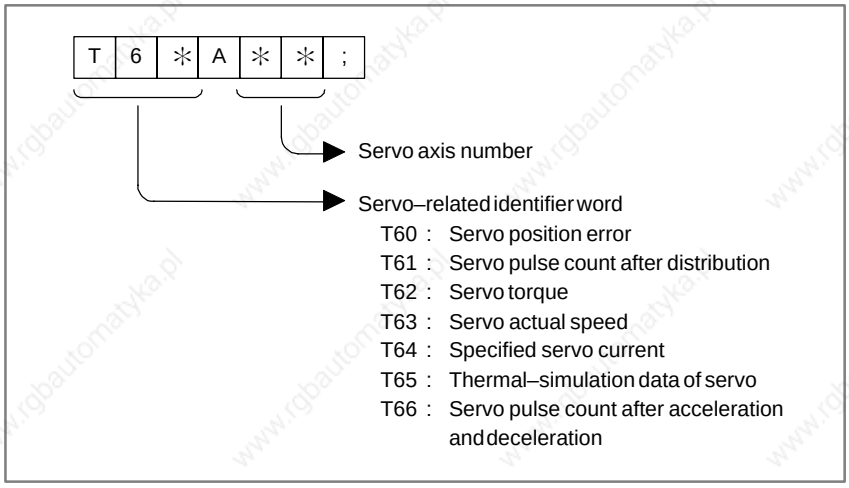
- Date and time of End



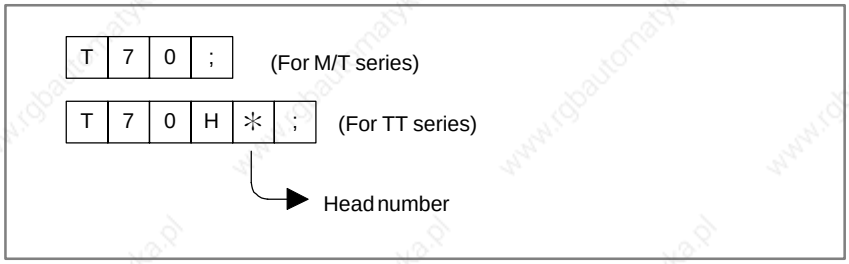
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(4) Data type

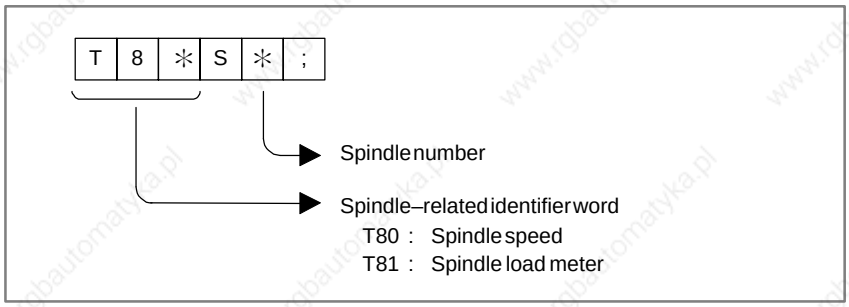
- Servo–related items



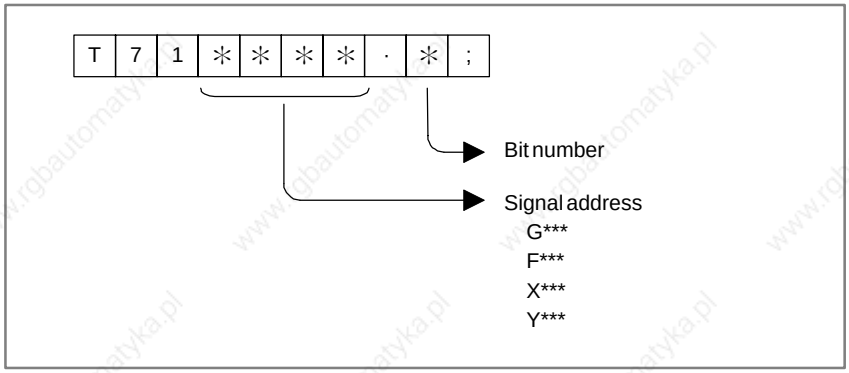
- Combined speed for all axes



- Spindle–related items

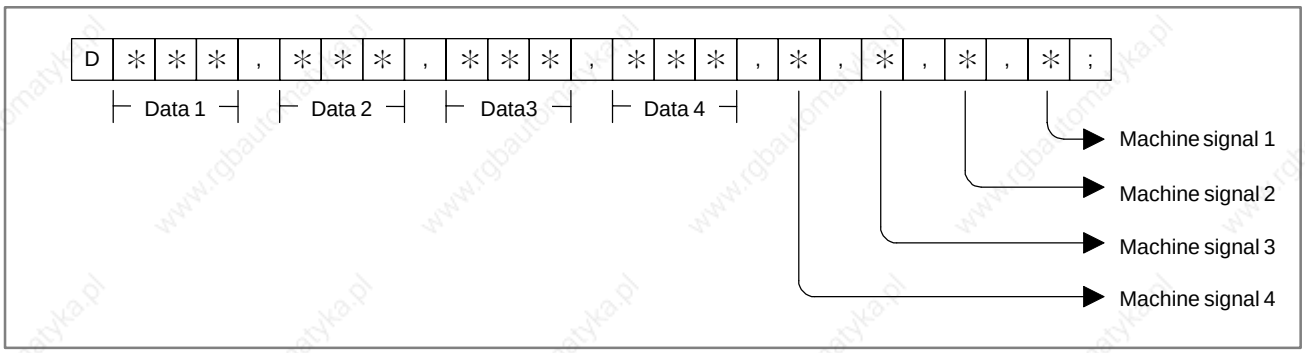


- Machine signal



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(5) Data block



NOTE
1 The data input and output format is subject to change without notice.
2 Set the parameter No. 4600 to “1” to output data in the FS15B format. Usually set it to “0” to output data in the above format.
3 A file having the FS15B format can be input. In this case, the CNC automatically determines the format and read the file.

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● Data output example

```
%                                          – Record start
T00CWAVEDIAGNOS;                           – Header
T50D19990115,151500;                       – Tracing start time
T51D19990115,151515;                       – Tracing end time
T02D4;                                     – Tracing cycle
T60A1,T61A1,,,T71G100.7,F001.5,Y127.7,;
                                           – Trace data type
D100,200,,,0,0,1,;
D101,201,,,0,0,1,;                         – Data block
.
.
D149,249,,,1,0,0,;
D150,250,,,1,0,0,;
%                                          – Record end
```

- Tracing start time
  15:15:00 on January 15th, 1999
- Tracing end time
  15:15:15 on January 15th, 1999
- Tracing cycle
  4 ms
- Trace data type
  Wave 1: First–axis servo position error
  Wave 2: First–axis servo pulse count after distribution
  Wave 3: No trace
  Wave 4: No trace
  DI/DO signal 1: G100.7
  DI/DO signal 2: F001.5
  DI/DO signal 3: Y127.7
  DI/DO signal 4: No trace

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- **Data output procedure**

Method 1 (without specifying an output file name and a file number)

(1) Press the [PUNCH] soft key.
(2) Press the [EXEC] soft key

Method 2 (with an output file name being specified)

(1) Press the [PUNCH] soft key.
(2) Press the [“FILE NAME] soft key.
(3) Type the file name.
(4) Press the [FILE NAME”] soft key.
(5) Press the [EXEC] soft key.

Method 3 (case 1 with a file number being specified)

(1) Press the [PUNCH] soft key.
(2) Press the [(FILE#)] soft key.
(3) Type the file number.
(4) Press the [EXEC] soft key.

Method 4 (case 2 with a file number being specified)

(1) Press the [PUNCH] soft key.
(2) Press the address key N .
(3) Type the file number.
(4) Press the [EXEC] soft key.

Method 5 (case 3 with a file number being specified)

(1) Press the address key N .
(2) Type the file number.
(3) Press the [PUNCH] soft key.

NOTE
Data cannot be output in the following cases.
· When data is not traced
· When the traced data is deleted
· While data is being traced

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- **Data input procedure**

Method 1 (without specifying an input file name and a file number)

(1) Press the [READ] soft key.
(2) Press the [EXEC] soft key

Method 2 (with an input file being specified by its file name)

(1) Press the [READ] soft key.
(2) Press the [“FILE NAME] soft key.
(3) Type the file name.
(4) Press the [FILE NAME”] soft key.
(5) Press the [EXEC] soft key.

Method 3 (case 1 with an input file being specified by its file number)

(1) Press the [READ] soft key.
(2) Press the [(FILE#)] soft key.
(3) Type the file number.
(4) Press the [EXEC] soft key.

Method 4 (case 2 with an input file being specified by its file number)

(1) Press the [READ] soft key.
(2) Press the address key N .
(3) Type the file number.
(4) Press the [EXEC] soft key.

Method 5 (case 3 with an input file being specified by its file number)

(1) Press the address key N .
(2) Type the file number.
(3) Press the [READ] soft key.

NOTE
Data being traced cannot be input.

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1.5.1 Enhancement of Waveform Diagnosis Function

In the waveform diagnosis function, the contents of specified memory locations are added as traceable data.
For details of the waveform diagnosis function, refer to the Section 1.5.1.

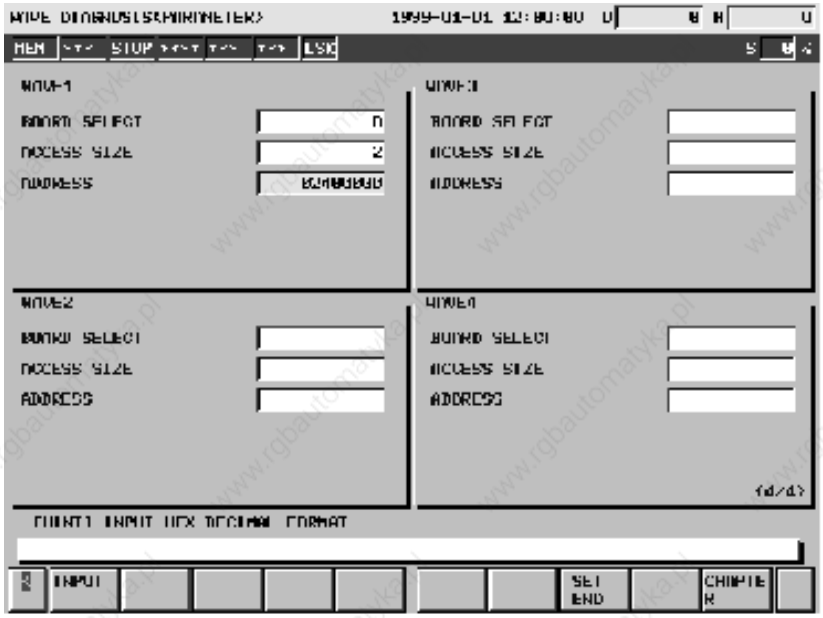
Setting

Display the internal position compensation data screen using either of the following procedures:

- **Trace data setting**

To select the contents of specified memory locations, set 11 as the trace data type on pages two and three of the wave diagnosis (parameter) screen.

On page 4 of the wave diagnosis (parameter) screen, set the memory to be traced.



- **Board selection**

Set the target board for tracing.
0 : CNC main board

- **Access size**

Set the memory access size for tracing.
0 : One byte (signed)
1 : One byte (unsigned)
2 : Two bytes (signed)
3 : Two bytes (unsigned)
4 : Four bytes (signed)

- **Address**

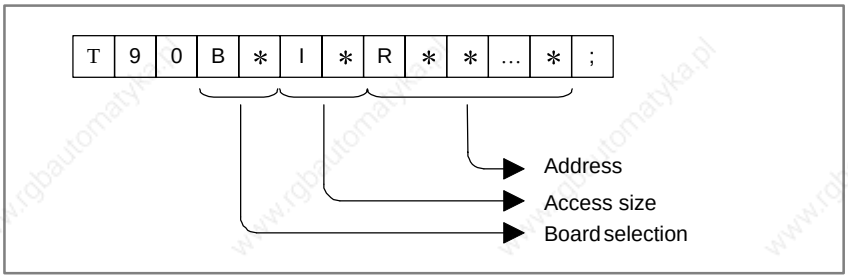
Set the target memory address for tracing in hexadecimal notation.

NOTE
1 If an illegal address or access size is set, a system alarm may be issued.
2 The board selection, access size, and address cannot be set unless 11 is set as the trace data type.

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- **Input/output format**

The following type is added to the data types:



NOTE
1 The traced data is clamped within the following range:
–999999999 ≦ data ≦ 999999999
2 Depending on the access size, the lowest bit of the address is restricted as follows:
One byte: Not restricted.
Two bytes: Address 0, 2, 4, 6, 8, A, C, or E
Four bytes: Address 0, 4, 8, or c
3 When outputting trace data of the memory contents to an external device, select the FS15I type. If the FS15B type is selected, a warning is issued.

Parameters

4730 Target board specification 1

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 1

In trace data 1 of waveform diagnosis function, the target board for the tracing of specified memory is specified.
0: CNC main board
1: Customer’s board

4731 Access size specification 1

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 4

In trace data 1 of waveform diagnosis function, the access size for the tracing of specified memory is specified.
0: One byte (signed)
1: One byte (unsigned)
2: Two bytes (signed)
3: Two bytes (unsigned)
4: Four bytes (signed)

NOTE
If an illegal access size is specified, a system alarm may be issued.

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4732	Memory address specification 1

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 999999999

In trace data 1 of waveform diagnosis function, the memory address for the tracing of specified memory is specified.

NOTE
Specify an existing address.
If an illegal address is specified, a system alarm may be issued.

4733	Target board specification 2

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 1

In trace data 2 of waveform diagnosis function, the target board for the tracing of specified memory is specified.

0: CNC main board
1: Customer’s board

4734	Access size specification 2

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 4

In trace data 2 of waveform diagnosis function, the access size for the tracing of specified memory is specified.

0: One byte (signed)
1: One byte (unsigned)
2: Two bytes (signed)
3: Two bytes (unsigned)
4: Four bytes (signed)

NOTE
If an illegal access size is specified, a system alarm may be issued.

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4735	Memory address specification 2

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 999999999

In trace data 2 of waveform diagnosis function, the memory address for the tracing of specified memory is specified.

NOTE
Specify an existing address.
If an illegal address is specified, a system alarm may be issued.

4736	Target board specification 3

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 1

In trace data 3 of waveform diagnosis function, the target board for the tracing of specified memory is specified.

0: CNC main board
1: Customer’s board

4737	Access size specification 3

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 4

In trace data 3 of waveform diagnosis function, the access size for the tracing of specified memory is specified.

0: One byte (signed)
1: One byte (unsigned)
2: Two bytes (signed)
3: Two bytes (unsigned)
4: Four bytes (signed)

NOTE
If an illegal access size is specified, a system alarm may be issued.

4738	Memory address specification 3

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 999999999

In trace data 3 of waveform diagnosis function, the memory address for the tracing of specified memory is specified.

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NOTE
Specify an existing address.
If an illegal address is specified, a system alarm may be issued.

4739	Target board specification 4

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 1
In trace data 4 of waveform diagnosis function, the target board for the tracing of specified memory is specified.
0: CNC main board
1: Customer's board

4740	Access size specification 4

[Input type] [Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 4
In trace data 4 of waveform diagnosis function, the access size for the tracing of specified memory is specified.
0: One byte (signed)
1: One byte (unsigned)
2: Two bytes (signed)
3: Two bytes (unsigned)
4: Four bytes (signed)

NOTE
If an illegal access size is specified, a system alarm may be issued.

4741	Memory address specification 4

[Input type] Parameter input

[Data type] Integer

[Valid data range] 0 – 999999999
In trace data 4 of waveform diagnosis function, the memory address for the tracing of specified memory is specified.

NOTE
Specify an existing address.
If an illegal address is specified, a system alarm may be issued.

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1.6 DISPLAYING INTERNAL POSITION COMPENSATION DATA

Information related to position compensation for each of the following functions is displayed:

- Cutter compensation
- Tool length offset
- Drilling canned cycle
- Coordinate system rotation
- Three–dimensional coordinate conversion
- Programmable mirror image
- Scaling
- Three–dimensional tool compensation
- Three–dimensional cutter compensation

Display

Display the internal position compensation data screen using either of the following procedures:

Procedure 1

Press the PROG function key several times until the internal position compensation data screen appears.

Procedure 2

(1) Press the PROG function key.

(2) Press the [POS. DATA] soft key.

On the right half of the screen, current position display (selected among the relative, absolute, and machine coordinates), remaining distance, modal value, and actual cutting feedrate are displayed like the program check screen. On the left half of the screen, information related to position compensation and the current program for each function are displayed.

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Cutter compensation

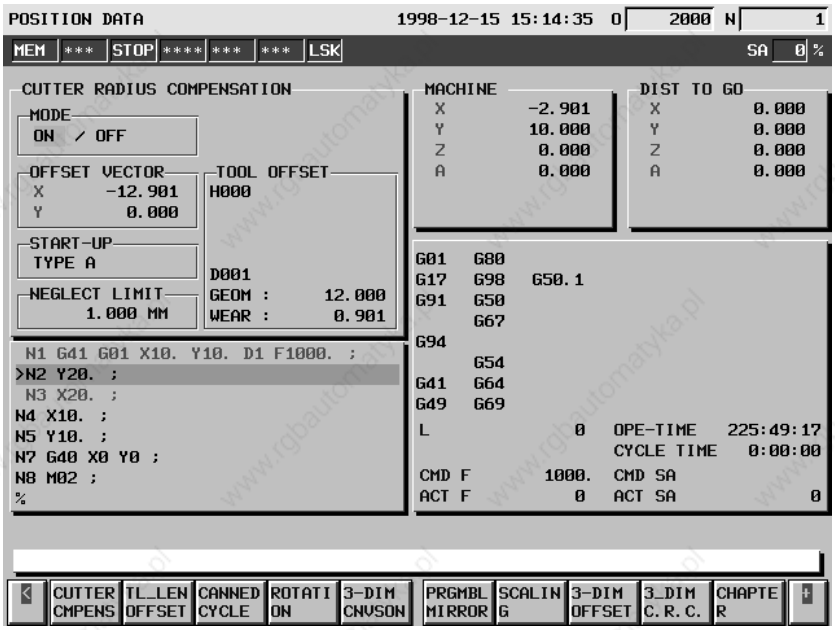


Fig. 1.6 (a) Cutter compensation

MODE

ON is reversed in the cutter compensation mode. In other cases, OFF is reversed.

OFFSET VECTOR

The cutter compensation vector created for each block is displayed.

START–UP

The startup cancel type is displayed.

NEGLECT LIMIT

The limit to the small travel distance created by compensation that can be neglected (parameter No. 6010) is displayed.

TOOL OFFSET

The currently selected tool compensation number and tool offset value are displayed.

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Tool length offset

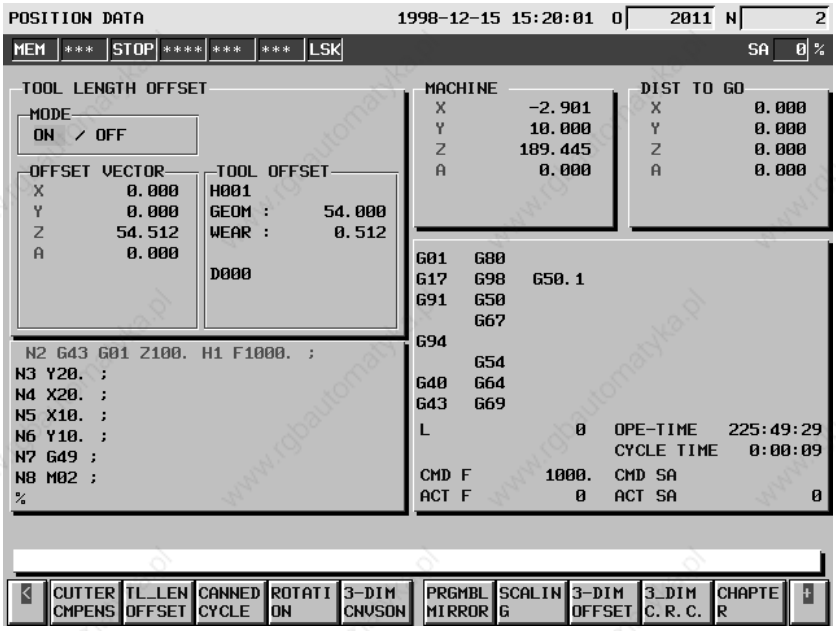


Fig. 1.6 (b) Tool length offset

MODE

ON is reversed in the tool length offset mode. In other cases, OFF is reversed.

OFFSET VECTOR

The tool length offset vector created for each block is displayed. The offset vectors for all axes may be displayed because every axis may be the target of tool length offset depending on parameter settings.

TOOL OFFSET

The currently selected tool compensation number and tool offset value are displayed.

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Drilling canned cycle

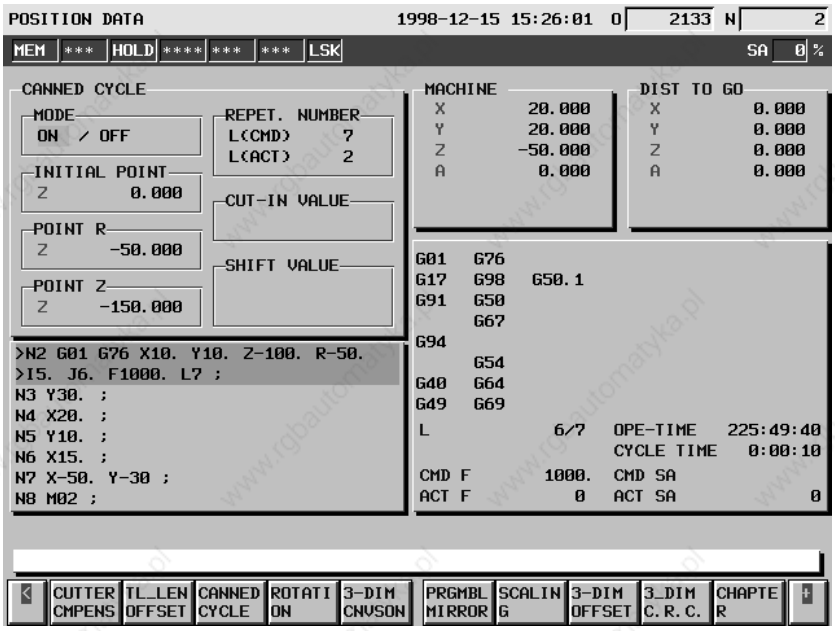


Fig. 1.6 (c) Drilling canned cycle

MODE

ON is reversed in the drilling canned cycle mode. In other cases, OFF is reversed.

INITIAL POINT

The absolute coordinate value at the initial point is displayed.

POINT R

The absolute coordinate value at point R is displayed.

POINT Z

The absolute coordinate value at point Z is displayed.

REPET. NUMBER

The specified (CMD) and current (ACT) repetition counts are displayed.

CUT–IN VALUE

The depth of cut for G73 or G83 is displayed.

SHIFT VALUE

The shift value for G76 or G87 is displayed.

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Coordinate system rotation

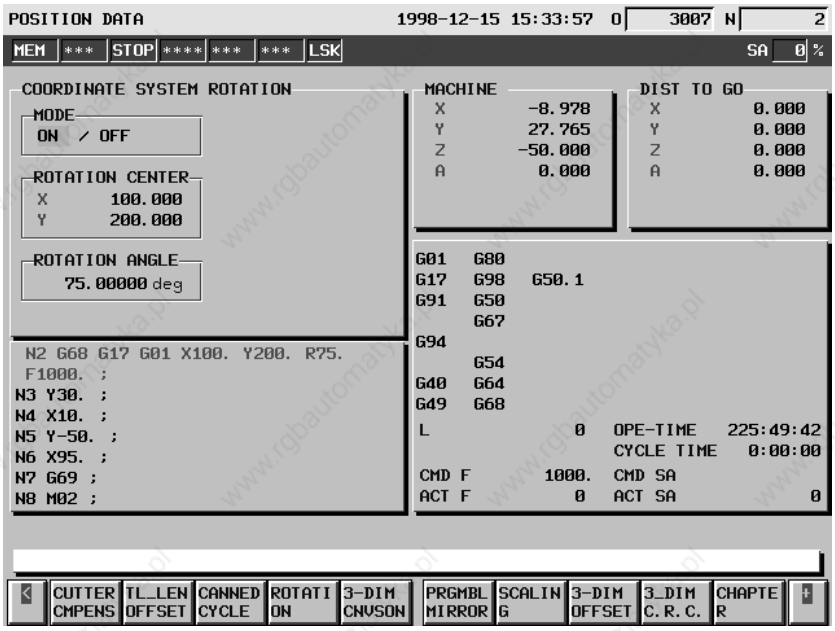


Fig. 1.6 (d) Coordinate system rotation

MODE

ON is reversed in the coordinate system rotation mode. In other cases, OFF is reversed.

ROTATION CENTER

The absolute coordinate values of the rotation center of coordinate system rotation are displayed.

ROTATION ANGLE

The rotation angle of coordinate system rotation is displayed.

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Three–dimensional coordinate conversion

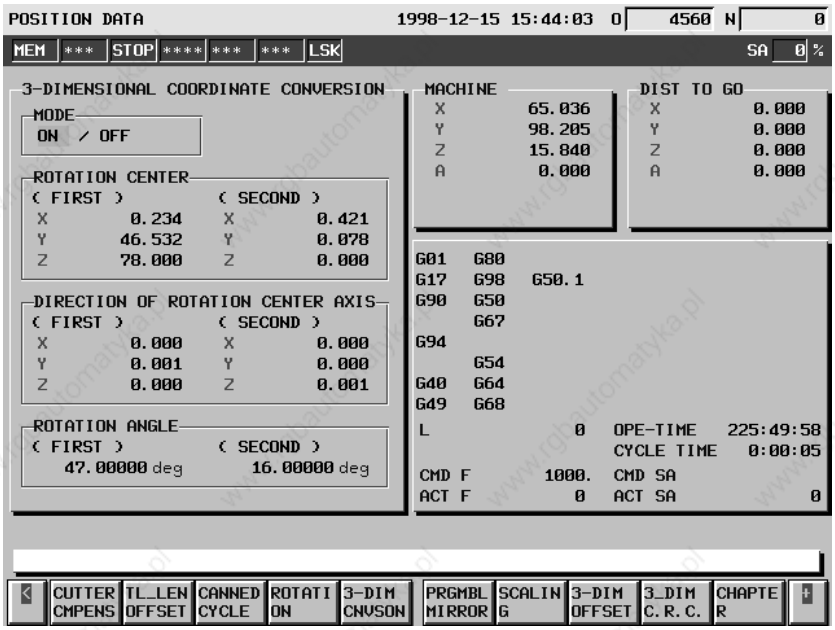


Fig. 1.6 (e) Three–dimensional coordinate conversion

MODE

ON is reversed in the three–dimensional coordinate conversion mode. In other cases, OFF is reversed.

ROTATION CENTER

The absolute coordinate values of the rotation center of three–dimensional coordinate conversion are displayed.

DIRECTION OF ROTATION CENTER AXIS

The direction of the rotation center axis of three–dimensional coordinate conversion is displayed.

ROTATION ANGLE

The rotation angle of three–dimensional coordinate conversion is displayed.

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Programmable mirror image

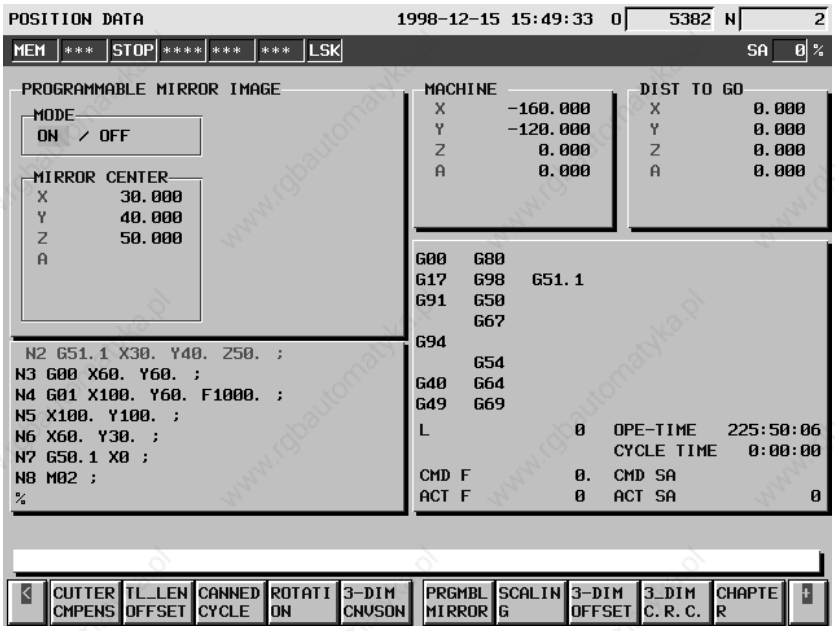


Fig. 1.6 (f) Programmable mirror image

MODE

ON is reversed in the programmable mirror image mode. In other cases, OFF is reversed.

MIRROR CENTER

The absolute coordinate values of the mirror center are displayed. The value is not displayed for an axis for which programmable mirror is not specified. Therefore, when a value of 0 is displayed, the mirror center is at position 0.

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Scaling

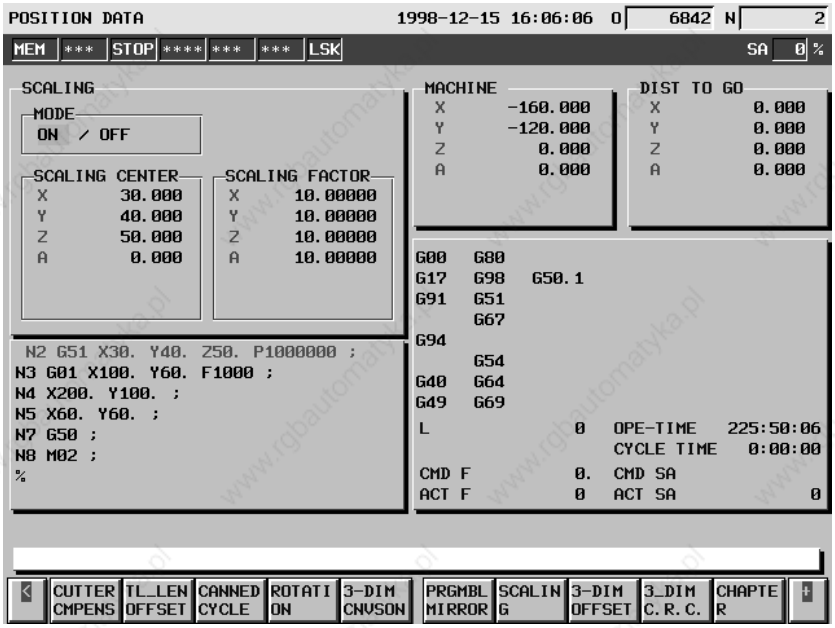


Fig. 1.6 (g) Scaling

MODE

ON is reversed in the scaling mode. In other cases, OFF is reversed.

SCALING CENTER

The absolute coordinate values of the scaling center are displayed.

SCALING FACTOR

The scaling factor for each axis is displayed.

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Three–dimensional tool compensation

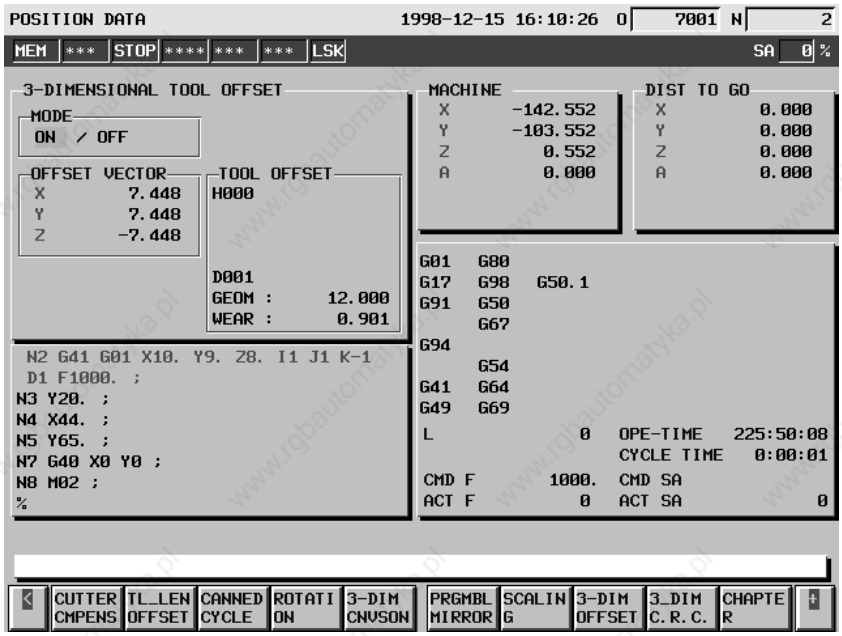


Fig. 1.6 (h) Three–dimensional tool compensation

MODE

ON is reversed in the three–dimensional tool compensation mode. In other cases, OFF is reversed.

OFFSET VECTOR

The three–dimensional tool compensation vector created for each block is displayed.

TOOL OFFSET

The currently selected tool compensation number and tool offset value are displayed.

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Three–dimensional cutter compensation

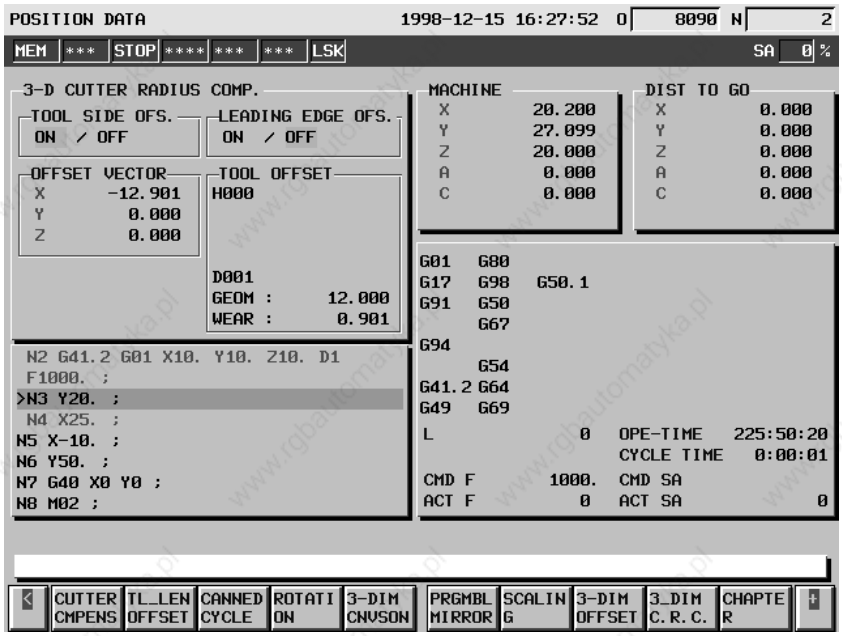


Fig. 1.6 (i) Three–dimensional cutter compensation

MODE

The three–dimensional cutter compensation has two modes: TOOL SIDE OFS. and LEADING EDGE OFS. When either mode is selected, the corresponding ON display is reversed. The OFF display for the other mode is also reversed.

OFFSET VECTOR

The three–dimensional cutter compensation vector created for each block is displayed.

TOOL OFFSET

The currently selected tool compensation number and tool offset value are displayed.

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1.7 OPERATIONS

Classification	Function	Data protection key	PWE=1 (Data number 8000)	Mode	Function selection key	
Clear	Tool offset value	KEY1 on			OFFSET SETTING	Operation menu key → [ALL CLEAR] → {[ALL], [Wear], or [Geometry]}
Input from tape	1. Program registration (without changing the program number)	KEY3 on		EDIT mode	PROG	Operation menu key → [READ] key → [1_PROGRAM] key → [NEW] key
	1. Program registration (with changing the program number)	KEY3 on		EDIT mode	PROG	Operation menu key → [READ] key → [(PROG#)] key → Program number → [EXEC] key
	Program addition	KEY3 on		EDIT mode	PROG	Operation menu key → [READ] key → [1_PROGRAM] key → [ADD] key
	All program registration	KEY3 on		EDIT mode	PROG	Operation menu key → [READ] key → [ALL] key
	Pitch error compensation		○	Emergency stop on	SYSTEM	[PITCH ERROR] → [READ] → [PITCH ERROR]
Input from MDI	Parameter input		○	MDI mode or emergency stop on	SYSTEM	[PARAMETER] → [NO. SEARCH] → Data number → [ON:1] / [OFF:0] → [INPUT] → Data → [EXEC]; [+INPUT] → Data → [EXEC]
	Offset input	KEY1 on			OFFSET SETTING	Operation menu key → [INPUT] (absolute value input) / [+INPUT] (incremental value input) → Offset value → [EXEC]
	Setting data input	KEY2 on		MDI mode	OFFSET SETTING	[SETTING-PARAMETER] → [NO. SEARCH] → Data number → [EXEC] → [ON:1] / [OFF:0] / [INPUT] → Data → [EXEC] / [+INPUT] → Data → [EXEC]
	Communication setting	KEY2 on		MDI mode	OFFSET SETTING	[COM. SETTING] → [VALUE SETTING+] / [VALUE SETTING–]
Output	Parameter or pitch error data output				SYSTEM	Operation menu key → [PUNCH] key → [ALL] / [PARAMETER] / [PITCH ERROR]
	Offset data output				OFFSET SETTING	Operation menu key → [PUNCH] key → [TOOL]
	All program output	KEY3 on		EDIT mode	PROG	Operation menu key → [PUNCH] key → [ALL] key
	Program output	KEY3 on		EDIT mode	PROG	Operation menu key → [PUNCH] key → [THIS] key or [PUNCH] key → [(PROG#)] key → Program number → [EXEC] key

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Classification	Function	Data protection key	PWE=1 (Data number 8000)	Mode	Function selection key	
Search	Program number search (for a program stored in memory)	KEY3 on		EDIT or MEMORY mode	PROG	Operation menu key → FRWRD SEARCH / BKWRD SEARCH → (PROG#) → Program number → EXEC
	Sequence number search (for a block stored in memory)	KEY3 on		MEMORY mode	PROG	Operation menu key → FRWRD SEARCH / BKWRD SEARCH → (SEQ#) → Sequence number → EXEC
	Sequence number search (for NC tape)			TAPE mode	PROG	Operation menu key → FRWRD SEARCH → (SEQ#) → Sequence number → EXEC
	Word search	KEY3 on		MDI or EDIT mode	PROG	Operation menu key → FRWRD SEARCH / BKWRD SEARCH → (WORD) → Word to be searched for → EXEC
	Address search	KEY3 on		MDI or EDIT mode	PROG	Operation menu key → FRWRD SEARCH / BKWRD SEARCH → (WORD) → Address to be searched for → EXEC
	Repeated word or address search	KEY3 on		MDI or EDIT mode	PROG	Operation menu key → FRWRD SEARCH / BKWRD SEARCH → REPEAT
Editing	All program deletion	KEY3 on		EDIT mode	PROG	Operation menu key → DELETEPRGRAM key → ALL key → EXEC key
	Program deletion — Currently selected program	KEY3 on		EDIT mode	PROG	Operation menu key → DELETEPRGRAM key → THIS key
	Program deletion — Specified program					Operation menu key → DELETEPRGRAM key → PROG# key → Program number → EXEC key
	Cancellation of program deletion	KEY3 on		EDIT mode	PROG	Operation menu key → UNDEL PRGRAM key → EXEC
	Multiple program deletion	KEY3 on		EDIT mode	PROG	Operation menu key → DELETEPRGRAM key → (PROG#) → Number of the first program to be deleted → (PROG#) → Number of the last program to be deleted → EXEC
	Program copy	KEY3 on		EDIT mode	PROG	Operation menu key → COPY PRGRAM key → (PROG#) → Copy destination program number → EXEC
	Copy destination program number	KEY3 on		EDIT mode	PROG	Operation menu key → MERGE PRGRAM key → (PROG#) → Program number → EXEC
	Word deletion	KEY3 on		EDIT mode	PROG	<DELETE> key
	Word alteration	KEY3 on		EDIT mode	PROG	Word to be altered → <ALTER> key
	Word insertion	KEY3 on		EDIT mode	PROG	Word to be inserted → <INSERT> key
	Multiple word deletion	KEY3		EDIT mode	PROG	Operation menu key → SELECT → Specify a range by moving the cursor → DELETE
	Multiple word copy	KEY3		EDIT mode	PROG	Operation menu key → SELECT → Specify a range by moving the cursor → COPY → Move the cursor to the copy destination. → PASTE → HERE

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Classification	Function	Data protection key	PWE=1 (Data number 8000)	Mode	Function selection key	
Editing	Word moving	KEY3		EDIT mode	PROG	Operation menu key → SELECT → Specify a range by moving the cursor → DELETE → Move the cursor to the move destination. → PASTE → HERE
	Word replacement (with confirmation)	KEY3		EDIT mode	PROG	Operation menu key → ALTER → Word to be replaced → ,(WORD) → New word → EXEC SINGLE → EXEC SINGLE SKIP EXEC STOP
	Word replacement (without confirmation)	KEY3		EDIT mode	PROG	Operation menu key → ALTER → Word to be replaced → ,(WORD) → New word → EXEC → EXEC STOP
	Address replacement (with confirmation)	KEY3		EDIT mode	PROG	Operation menu key → ALTER → Word to be replaced → ,(ADDRESS) → New address → EXEC SINGLE → EXEC SINGLE SKIP EXEC STOP
	Address replacement (without confirmation)	KEY3		EDIT mode	PROG	Operation menu key → ALTER → Word to be replaced → ,(ADDRESS) → New address → EXEC → EXEC STOP
	Cancellation of word editing	KEY3		EDIT mode	PROG	Operation menu key → UNDO → EXEC → EXEC
	Compression of memory for all programs	KEY3 on		EDIT mode	PROG	Operation menu key → CONDENSE key → ALL key
	Compression of memory for the currently selected program	KEY3 on		EDIT mode	PROG	Operation menu key → CONDENSE key → THIS key
	Compression of memory for the specified program	KEY3 on		EDIT mode	PROG	Operation menu key → CONDENSE key → (PROG#) key → Program number → EXEC key
Verification	Verification of memory for all programs on tape			EDIT mode	PROG	Operation menu key → VERIFY key → ALL key
	Verification of memory for a program on tape			EDIT mode	PROG	Operation menu key → VERIFY key → 1_PROGRAM key
	Verification starting from the current point on tape			EDIT mode	PROG	Operation menu key → VERIFY key → HERE key

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Classification	Function	Data protection key	PWE=1 (Data number 8000)	Mode	Function selection key	
Input/output to a FANUC cassette	Program registration	KEY3 on		EDIT mode	PROG	Operation menu key → [READ] key → [(FILE#)] key → File number → [EXEC] Operation menu key → [READ] key → [(PROG#)] key → Program number → [EXEC] Operation menu key → [READ] key → [“(FILE NAME)] key → Program number → [(FILE NAME)”] → [EXEC]
	All program output	KEY3 on		EDIT mode	PROG	Operation menu key → [PUNCH] key → [ALL] key
	Program output	KEY3 on		EDIT mode	PROG	[PUNCH] key → [THIS] key or [PUNCH] key → [(PROG#)] key → Program number → [EXEC] Operation menu key → [PUNCH] key → [“(FILE NAME)] key → Program number → [(FILE NAME)”] → [EXEC] Operation menu key → [PUNCH] key → [(FILE#)] key → File number → [EXEC]
Manual operation	Manual reference position return			REF mode		Turn the “reference position return switch” on. → Turn “+X,” “–X,” “+Y,” and “–Y” on. → The “reference position return completion lamp” comes on.
	Jog feed			JOG mode		Turn “+X,” “–X,” “+Y,” and “–Y” on. → Set the feedrate using “JOG FEEDRATE.” → To perform rapid traverse, press the “rapid traverse button.”
	Incremental feed			INC mode		Select a travel distance using the “travel distance selection switch.” → Turn “+X,” “–X,” “+Y,” and “–Y” on. → To perform rapid traverse, press the “rapid traverse button.”
	Manual handle feed			HANDLE mode		Select an axis along which the tool is to be fed using the “axis selection switch.” → Rotates the “handle.” → Select a magnification using the “handle magnification switch.” During rapid traverse, rapid traverse override is effective.
Graphics function	Parameter setting				GRAPH	[GRAPH PARAM]
	Drawing screen selection				GRAPH	[Tool Path]
	Start and stop of drawing				GRAPH	[START] → Automatic or manual operation → [STOP]
	Erasing of the drawing screen				GRAPH	[ERASE]
	Graphic enlargement				GRAPH	[ENLARGE]
	Graphic moving				GRAPH	[SHIFT]
Displaying of the self–diagnosis screen						[Diagnosis] 1. Page switch keys<↓> <↑> 2. Number of diagnostic data → [NUMBER SELECT] 3. [PRV_GRP] or [NEXT GROUP] 4. [SELECTGROUP] → [PRVGRP] → [SELECTEND] [SELECTGROUP] → [NEXT GROUP] → [SELECTEND] [SELECTGROUP] → [NO. SEARCH] → Group number → [SELECTEND]

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1.8 WARNING SCREEN FOR OPTION CHANGE

- **Warning screen**

With this CNC, if the configuration of those options that use the SRAM area is changed, a warning screen appears.

```
FANUC SERIES 15I F010A
COPYRIGHT(C) FANUC LTD 1997-1999

FORMAT SYSTEM LABEL : END
 6 : PROG-DIR.DAT
 7 : PROG.DAT
CLEAR FILE OK?
```

NOTE

Pressing the “Y” key clears the target data and changes the option configuration.
Pressing the “N” key neither clears the target data nor changes the option configuration. When data must be backed up, press the “N” key to return the system to the status existing before the change, perform the required processing, then modify the option configuration.

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- **Allocation error screen**

When an option using the SRAM area is added, the SRAM space required by the system software may exceed the size of the SRAM installed in the system. In this case, an allocation error screen appears at option change and the system is returned to the status existing before option change.

```
FANUC SERIES 15I F010A
COPYRIGHT(C) FANUC LTD 1997-1999

CHECK SYSTEM LABEL : FILE ALLOCATION ERROR
IPL MENU
 0. END IPL
 1. DUMP MEMORY
 2. DUMP FILE
 3. CLEAR FILE
 4. MEMORY CARD UTILITY
 5. SYSTEM ALARM UTILITY
 6. FILE SRAM CHECK UTILITY
?
```

NOTE

Note the following points when replacing the SRAM to clear an allocation error:

1 Replacing the SRAM results in the loss of all data (such as NC parameters and offset data) that is battery–backed up by the CNC. Back up all required data before replacing the SRAM.

2 After replacing the SRAM, perform an all–clear operation on the SRAM area at the first power–on. (Turn on the power while holding down the 7 and 9 keys.)

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1.9 WARNING SCREEN FOR SYSTEM–SOFTWARE REPLACEMENT (SYSTEM–LABEL CHECK ERROR)

When the power to the CNS is turned on after system–software replacement, the new system software may not be compatible with the old system software. In this case, the screen shown below appears and the system does not start:

```
FANUC SERIES 15I F010A
COPYRIGHT(C) FUNUC LTD 1997-1999
RAM TEST : END
ROM TEST : END
PMC ROM TEST : END
SERVO RAM TEST : END
SERVO ROM TEST : END
LOAD SYSTEM LABEL : END
CHECK SYSTEM LABEL : SYSTEM LABEL ERROR
IPL MENU
 0. END IPL
 1. DUMP MEMORY
 2. DUMP FILE
 3. CLEAR FILE
 4. MEMORY CARD UTILITY
 5. SYSTEM ALARM UTILITY
 6. FILE SRAM CHECK UTILITY
?
```

When the above screen appears and the system fails to start, perform a memory–all–clear operation (press the 7 and 9 MDI keys at power–on) or replace the system software with the old version.

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1.10 MAINTENANCE INFORMATION SCREEN

The maintenance information screen can be used to keep a history of maintenance work by FANUC and machine tool builder service personnel.

The maintenance information screen has the following features:

- Half–size alphanumeric and kana characters can be entered using the MDI keys.
  Half–size kana characters can be entered only when the Japanese–language display is selected.
- The screen can be scrolled in line and page units.
- Edited maintenance information data can be input and output.
- Edited maintenance information can be saved into flash memory.
- Full–size characters can be displayed using shift–JIS codes.
  Full–size characters cannot be entered using the MDI keys. Data edited on a personal computer can be input directly.

1.10.1 Display

There are the following two types of maintenance information screens: the reference screen which displays maintenance information, and the edit screen which is used for editing.

Reference screen

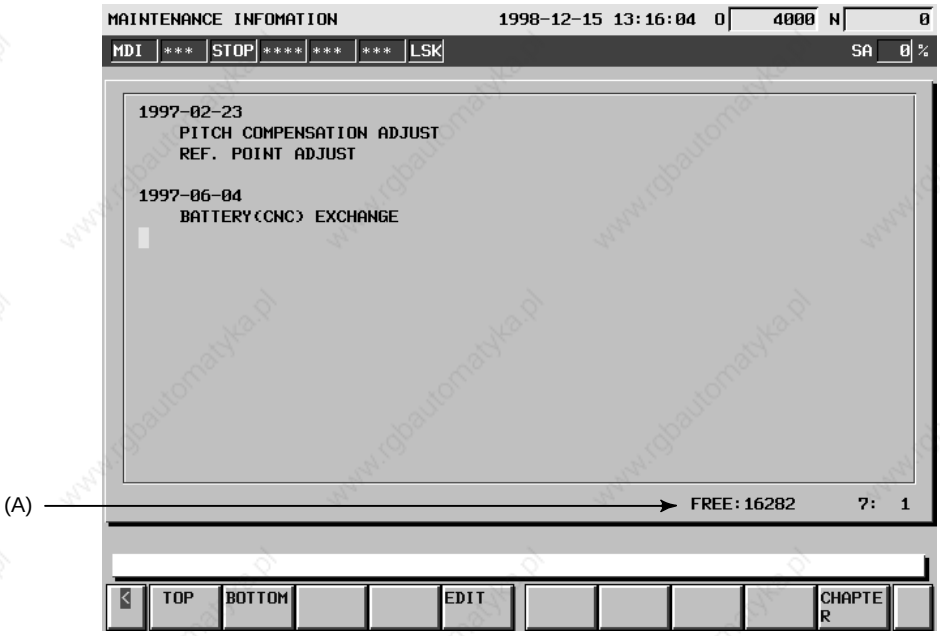


Fig. 1.10.1 (a) Reference screen

The reference screen displays maintenance information. Maintenance information is displayed using 18 lines, each line having 72 characters. The latest information (end of data) is displayed when this screen is selected for the first time.

At the bottom of the screen (portion (A)), the amount of free memory (in units of characters) and the cursor position (line/column) appear.

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Edit screen

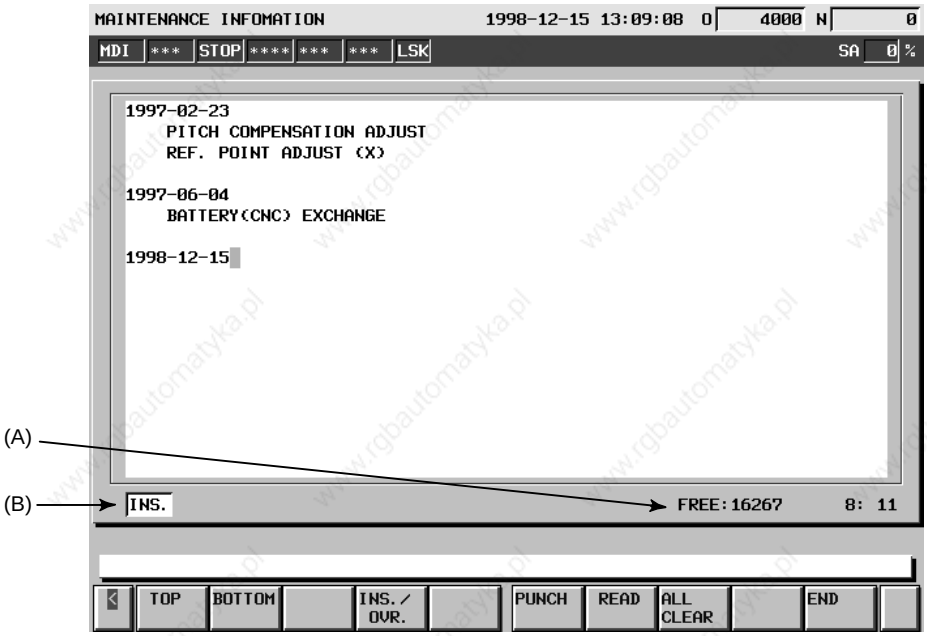


Fig. 1.10.1 (b) Edit screen

The edit screen is used to edit or input/output maintenance information. In portion (A) at the bottom of the screen, the amount of free memory (in units of characters) and the cursor position (line/column) appear.

In portion (B), the input mode (insert/overwrite and half–size alphanumeric/kana input) appear.

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1.10.2 Procedures

Displaying maintenance information

1 Display the maintenance information screen using either of the following procedures:

Procedure 1

Press the SYSTEM function key several times until the maintenance information screen appears.

Procedure 2

(1) Press the SYSTEM function key.

(2) Press the [MAINTEINFO] soft key.

Either of the following screens appears:

When the maintenance information screen appears for the first time after power–on: Last page of the reference screen
When the screen is redisplayed: Previously displayed screen

2 The reference screen supports the following key operations:

- Cursor keys ↑ ↓ ← →

  The cursor keys are used to position the cursor. When the cursor is positioned to the top or bottom line of the screen, the screen is scrolled in line units by moving the cursor up or down.

- Page keys PAGE↑ PAGE↓

  The page keys scroll the screen up or down in page units.

- Soft keys

  [TOP]: Positions the cursor to the top of the maintenance information data.

  [BOTTOM]: Positions the cursor to the bottom of the maintenance information data.

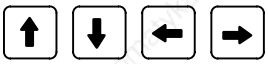
  [EDIT]: Switches from the maintenance information screen to the edit screen.

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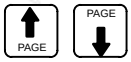
Editing maintenance information

1 Press the [EDIT] soft key on the reference screen. The edit screen appears.

2 On the edit screen, the following key operations are available:

- Cursor keys 

  The cursor keys are used to position the cursor. When the cursor is positioned to the top or bottom line of the screen, the screen is scrolled in line units by moving the cursor up or down.

- Page keys 

  The page keys scroll the screen up or down in page units.

- Alphabetic, numeric, and symbol keys
  These keys are used to input the corresponding characters into the key–in buffer. (For details of half–size kana input, see Section 1.10.3, “Half–size kana input.”)

-  key

  Pressing this key inputs the character string in the key–in buffer to the maintenance information screen. When the key–in buffer contains no data, a line–feed character is assumed to be input.

-  key

  Pressing this key deletes one character (backspace). In key–in buffer input mode, this key deletes one character in the key–in buffer.

-  key

  Pressing this key deletes the character at the edit cursor position. (In the key–in buffer input mode, this key does not delete the character.)

-  key

  Pressing this key switches the input mode (insert or overwrite).

- Soft keys

  [TOP]: Positions the cursor to the top of the maintenance information data.

  [BOTTOM]: Positions the cursor to the bottom of the maintenance information data.

  [INS./OVR.]: Switches the input mode (insert or overwrite).

  [ALPHANUMERIC/KANA]: Switches the input mode (half–size alphanumeric/kana). (Available only for the Japanese–language display)

  [READ]: Inputs maintenance information data from an external device.

  [PUNCH]: Outputs maintenance information data to an external device.

  [ALL CLEAR]: Deletes all maintenance information data.

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Terminating editing

At termination, the edited maintenance information can be saved into flash memory.

(1) Press the [END] soft key.

(2) When you want to save maintenance information into flash memory, place the system in the emergency stop state, then press the [SAVE] soft key.

(3) When you do not want to save any maintenance information, simply press the [QUIT] soft key.

(4) Pressing the [CANCEL] soft key cancels termination processing and returns the screen to edit mode.

NOTE
When the maintenance information is saved, current servo and spindle information is also saved.

Inputting and outputting maintenance information

In edit mode, maintenance information can be input from and output to the external device selected by a parameter.

• Inputting maintenance information

Procedure 1 (specifying neither the file name nor file number of any input file)

(1) Set the screen to edit mode.

(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.

(3) Press the [READ] soft key.

(4) Press the [MAINTEINFO] soft key.

Procedure 2 (specifying an input file with its file name)

(1) Set the screen to edit mode.

(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.

(3) Press the [READ] soft key.

(4) Press the [“FILE NAME] soft key.

(5) Key in a file name.

(6) Press the [FILE NAME”] soft key.

(7) Press the [MAINTEINFO] soft key.

Procedure 3 (specifying an input file with its file number [1])

(1) Set the screen to edit mode.

(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.

(3) Press the [READ] soft key.

(4) Press the [(FILE#)] soft key.

(5) Key in a file number.

(6) Press the [MAINTEINFO] soft key.

Procedure 4 (specifying an input file with its file number [2])

(1) Set the screen to edit mode.

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(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the [READ] soft key.
(4) Press the N address key.
(5) Key in a file number.
(6) Press the [MAINTEINFO] soft key.

Procedure 5 (specifying an input file with its file number [3])

(1) Set the screen to edit mode.
(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the N address key.
(4) Key in a file number.
(5) Press the [READ] soft key.

- **Outputting maintenance information**

Procedure 1 (specifying neither an output file name nor a file number)

(1) Set the screen to edit mode.
(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the [PUNCH] soft key.
(4) Press the [MAINTEINFO] soft key.

Procedure 2 (specifying an output file name)

(1) Set the screen to edit mode.
(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the [PUNCH] soft key.
(4) Press the [“FILE NAME] soft key.
(5) Key in a file name.
(6) Press the [FILE NAME”] soft key.
(7) Press the [MAINTEINFO] soft key.

Procedure 3 (specifying a file number [1])

(1) Set the screen to edit mode.
(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the [PUNCH] soft key.
(4) Press the [(FILE#)] soft key.
(5) Key in a file number.
(6) Press the [MAINTEINFO] soft key.

Procedure 4 (specifying a file number [2])

(1) Set the screen to edit mode.
(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.
(3) Press the [PUNCH] soft key.

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(4) Press the N address key.

(5) Key in a file number.

(6) Press the [MAINTEINFO] soft key.

Procedure 5 (specifying a file number [3])

(1) Set the screen to edit mode.

(2) Select half–size alphanumeric mode as the input mode only for the Japanese–language display.

(3) Press the N address key.

(4) Key in a file number.

(5) Press the [PUNCH] soft key.

NOTE

1 When maintenance information is output to a FANUC Handy File or memory card using procedure 1 (specifying neither an output file name nor file number), the file name is MAINTINF.TXT.

2 When maintenance information is to be input from or output to a FANUC Handy File, an input or output file can be specified with its file name or file number.

3 When maintenance information is to be input from or output to a memory card, an input or output file can be specified with its file name.

- **Input/output file**

An input/output file has the following data format:

```
. . . . . %%
|      ← Data →      | Termination code
```

- Full–size characters are input in shift–JIS code.
- Control codes other than TAB and LF (01H to 1FH) cannot be input.
- A TAB code is converted to one to four blanks at input.
- %% cannot be used as data. (This is because %% is assumed to be an input termination code.)
- Character codes that the CNC cannot recognize are not displayed correctly.

- **Inputting and outputting maintenance information using other screens**

Maintenance information can be input and output using the floppy list screen and memory card screen in addition to this screen. See Sections 3.3, “Floppy List Screen,” and 3.4, “Memory Card Screen.”

- **Erasing maintenance information**

All information on the screen and in flash memory is erased.

(1) Set parameter MDC (bit 3 of No. 2286) to 1.

(2) Place the system in the emergency stop state.

(3) Display the edit screen.

(4) Press the [ALL CLEAR] soft key.

(5) Press the [EXEC] soft key.

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1.10.3 Half–size Kana Input

When the CNC display language is set to Japanese, pressing the [ALPHANUMERIC/KANA] soft key can select the half–size kana input mode.
In half–size kana input mode, data entered using the MDI keys is converted to kana characters according to the half–size kana–Roman conversion table.

NOTE
1 The contents of the key–in buffer are cleared upon switching between the half–size alphanumeric and kana input modes.
2 When a screen other than the maintenance information edit screen is displayed in half–size kana input mode, the contents of the key–in buffer are restored to the status existing before conversion. (When the edit screen is displayed again, the screen is returned to half–size kana input mode.)

Half–Size Kana–Roman Conversion Table (1)

A	ｱ	KA	ｶ	SA	ｻ	TA	ﾀ	NA	ﾅ
I	ｲ	KI	ｷ	SI	ｼ	TI	ﾁ	NI	ﾆ
U	ｳ	KU	ｸ	SU	ｽ	TU	ﾂ	NU	ﾇ
E	ｴ	KE	ｹ	SE	ｾ	TE	ﾃ	NE	ﾈ
O	ｵ	KO	ｺ	SO	ｿ	TO	ﾄ	NO	ﾉ
HA	ﾊ	MA	ﾏ	YA	ﾔ	RA	ﾗ	WA	ﾜ
HI	ﾋ	MI	ﾐ	YI	ｲ	RI	ﾘ	WI	ｲ
HU	ﾌ	MU	ﾑ	YU	ﾕ	RU	ﾙ	WU	ｳ
HE	ﾍ	ME	ﾒ	YE	ｴ	RE	ﾚ	WE	ｴ
HO	ﾎ	MO	ﾓ	YO	ﾖ	RO	ﾛ	WO	ｦ
XA	ｧ	GA	ｶﾞ	ZA	ｻﾞ	DA	ﾀﾞ	BA	ﾊﾞ
XI	ｨ	GI	ｷﾞ	ZI	ｼﾞ	DI	ﾁﾞ	BI	ﾋﾞ
XU	ｩ	GU	ｸﾞ	ZU	ｽﾞ	DU	ﾂﾞ	BU	ﾌﾞ
XE	ｪ	GE	ｹﾞ	ZE	ｾﾞ	DE	ﾃﾞ	BE	ﾍﾞ
XO	ｫ	GO	ｺﾞ	ZO	ｿﾞ	DO	ﾄﾞ	BO	ﾎﾞ
PA	ﾊﾟ	FA	ﾌｧ	JA	ｼｬ	VA	ｳﾞｧ		
PI	ﾋﾟ	FI	ﾌｨ	JI	ｼﾞ	VI	ｳﾞｨ		
PU	ﾌﾟ	FU	ﾌ	JU	ｼｭ	VU	ｳﾞ		
PE	ﾍﾟ	FE	ﾌｪ	JE	ｼｪ	VE	ｳﾞｪ		
PO	ﾎﾟ	FO	ﾌｫ	JO	ｼｮ	VO	ｳﾞｫ		

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Half–Size Kana–Roman Conversion Table (2)

XYA	ャ	KYA	キャ	SYA	シャ	TYA	チャ	NYA	ニャ
XYI	ィ	KYI	キィ	SYI	シィ	TYI	チィ	NYI	ニィ
XYU	ュ	KYU	キュ	SYU	シュ	TYU	チュ	NYU	ニュ
XYE	ェ	KYE	キェ	SYE	シェ	TYE	チェ	NYE	ニェ
XYO	ョ	KYO	キョ	SYO	ショ	TYO	チョ	NYO	ニョ
HYA	ヒャ	MYA	ミャ	RYA	リャ	GYA	ギャ	ZYA	ジャ
HYI	ヒィ	MYI	ミィ	RYI	リィ	GYI	ギィ	ZYI	ジィ
HYU	ヒュ	MYU	ミュ	RYU	リュ	GYU	ギュ	ZYU	ジュ
HYE	ヒェ	MYE	ミェ	RYE	リェ	GYE	ギェ	ZYE	ジェ
HYO	ヒョ	MYO	ミョ	RYO	リョ	GYO	ギョ	ZYO	ジョ
DYA	ヂャ	BYA	ビャ	PYA	ピャ	FYA	フャ	JYA	ジャ
DYI	ヂィ	BYI	ビィ	PYI	ピィ	FYI	フィ	JYI	ジィ
DYU	ヂュ	BYU	ビュ	PYU	ピュ	FYU	フュ	JYU	ジュ
DYE	ヂェ	BYE	ビェ	PYE	ピェ	FYE	フェ	JYE	ジェ
DYO	ヂョ	BYO	ビョ	PYO	ピョ	FYO	フョ	JYO	ジョ
CYA	シャ	SHA	シャ	CHA	チャ	DHA	デャ	TSA	ツァ
CYI	シィ	SHI	シ	CHI	チ	DHI	ディ	TSI	ツィ
CYU	シュ	SHU	シュ	CHU	チュ	DHU	デュ	TSU	ツ
CYE	シェ	SHE	シェ	CHE	チェ	DHE	デェ	TSE	ツェ
CYO	ショ	SHO	ショ	CHO	チョ	DHO	デョ	TSO	ツォ

NN	ン
MM	ン
XTU	ッ
XTSU	ッ

For double consonant conversion, input the target consonant twice (other than N or M).
(Example) 「ＩＰＰＡＩ」→「イッパイ」

1.10.4 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
2286					MDC			

[Input classification] Parameter input

[Data type] Bit

Bit 3 MDC All clear of maintenance information data is:
0: Impossible.
1: Possible.

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1.11 PERIODIC MAINTENANCE SCREEN

The periodic maintenance screen can be used to set the life of each consumable which must be replaced regularly (examples: backup battery for the control unit and LCD unit backlight) and to check whether replacement and inspection are required.

1.11.1 Display

The periodic maintenance screen consists of the following three screens.

Status display screen

The status display screen can be used to check the status of each target item for periodic maintenance. The status of up to ten items is displayed.

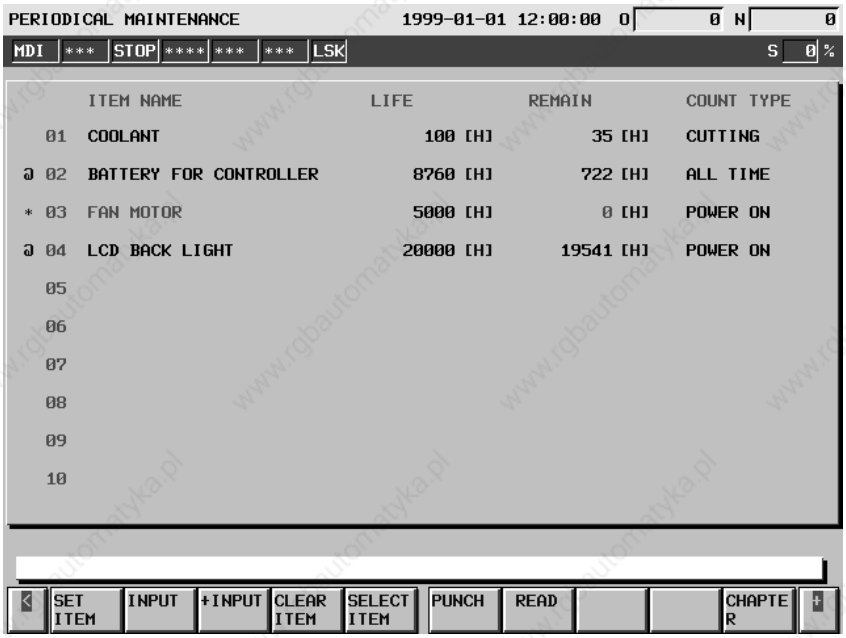


Fig. 1.11.1 (a) Status display screen

COUNTING STATUS

The mark displayed at the left of each item number indicates the counting status.

Indication	Counting status
None	Counting stops.
@	Counting in progress
*	End of the life

ITEM NUMBERS

Serial numbers from 01 to 10

ITEM NAME

The name of each target item for periodic maintenance is displayed. When the ratio of the remaining time to the total life becomes less than or equal to the ratio (%) specified by parameter No. 2239, the item name is displayed in red as a warning.

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LIFE

The life (unit: hours) of each target item for periodic maintenance is displayed.

REMAIN

The remaining life time (unit: hours) of each target of periodic maintenance is displayed. When the ratio of the remaining time to the total life becomes less than or equal to the ratio (%) specified by parameter No. 2239, the item name is displayed in red as a warning.

The remaining time is displayed in hours. Therefore, the displayed time does not include fractions of one hour. For example, when 20 [H] is displayed for Remain, the actual remaining time is longer than or equal to 20 hours but shorter than 21 hours.

COUNT TYPE

The type of life counting is displayed.

Indication	Meaning
None	Counting is not performed (stops).
ALL TIME	The time that has elapsed since the life was set is counted.
POWER ON	The power–on time is counted.
AUTO START	The automatic operation time is counted.
CUTTING	The cutting time is counted.

Item setting screen

The item setting screen can be used to set periodic maintenance data such as the time and count type for each selected item.

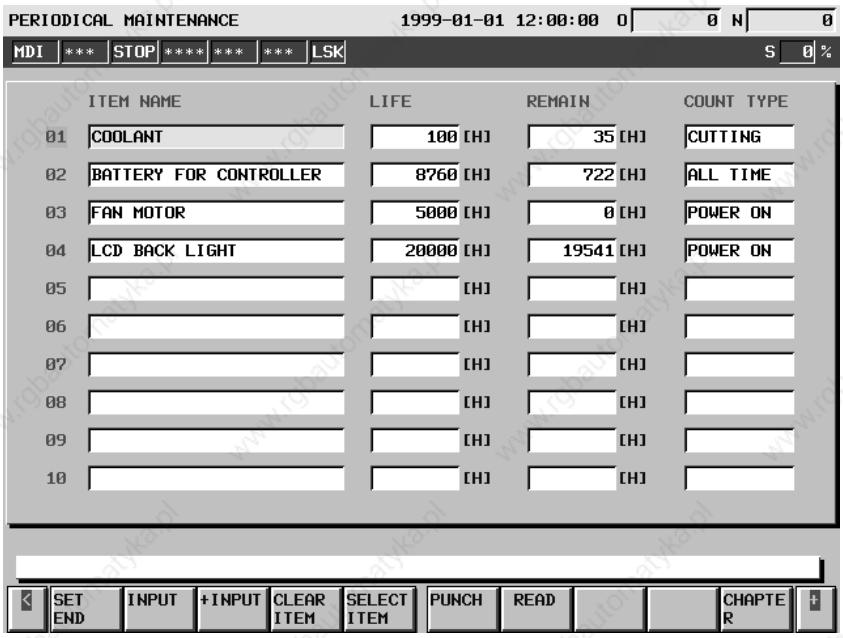


Fig. 1.11.1 (b) Item setting screen

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Item selection menu screen

The item selection menu screen can be used to create a list of items to be selected using the setting screen.

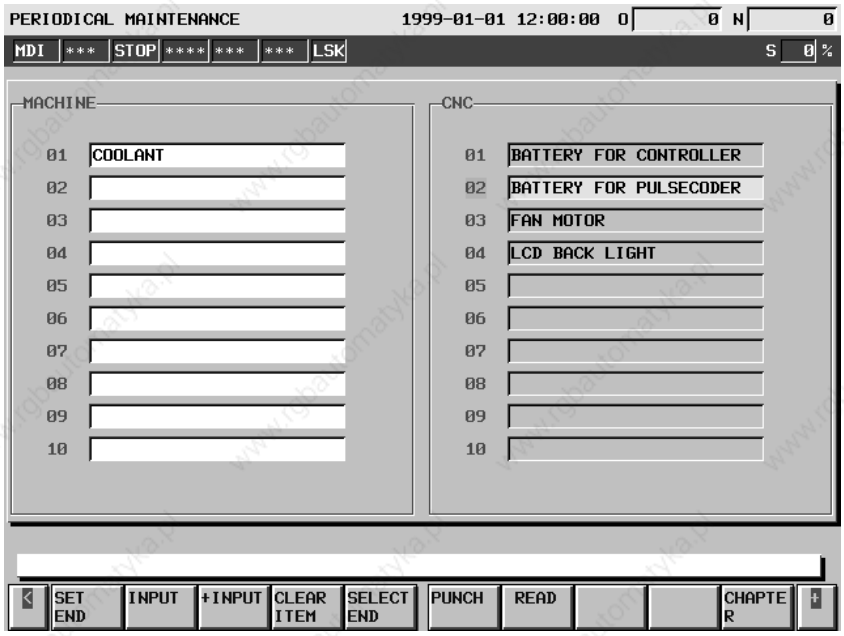


Fig. 1.11.1 (c) Item Selection menu screen

MACHINE

This menu can be used to set the item names.

CNC

This menu displays the fixed item names set by the system.

1.11.2 Procedures

Displaying the screens

- **Displaying the status display screen**

Method 1

Press the SYSTEM function key several times until the status display screen appears.

Method 2

(1) Press the SYSTEM function key.

(2) Press soft key [PERIOD MAINTE].

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- **Displaying the item setting screen**

  Press soft key [SET ITEM] on the status display screen.

- **Displaying the item selection menu screen**

  Press soft key [SELECT ITEM] on the item setting screen.

Setting an item name

Use the item setting screen.

- **Setting an item name by inputting it using the MDI keys**

  (1) Position the cursor to an item name to be set using the ↑ ↓ ← → cursor keys.

  (2) Key in the item name in the input format described below.

  (3) Press soft key [INPUT] or the INPUT key.
  The item name is set, and the life, remaining time, and count type are initialized.

  (4) When an item name is keyed in and soft key [+INPUT] is pressed, the item name is added to any previously set item name. In this case, the life, remaining time, and count type are not initialized.

- **Setting an item name by selecting it using the item selection menu screen**

  (1) Position the cursor to an item name to be set using the ↑ ↓ ← → cursor keys.

  (2) Press soft key [SELECT ITEM].
  The menu screen appears.

  (3) Position the cursor to an item name to be set that is registered on the item selection menu screen.

  (4) Press soft key [SELECT END].
  The item setting screen appears again, and the selected item name is set.

NOTE
1 When an item name is set by selecting it using the item selection menu screen, any already set item name cannot be overwritten. Delete the item name, then set it again.
2 When the battery for the control unit or pulse coder is selected and set, the life is managed using the life set using the periodic maintenance screen in the same way as for other data. The life management is not related to the battery alarms detected by the system.

- **Input format**

  .....*.....*.....
  (a) (b) (a)

  (a): Alphanumeric characters

  (b): Kanji and hiragana characters

Directly describe alphanumeric characters. Enclose the character codes of kanji and/or hiragana characters in asterisks (*). As the character code, FANUC or JIS code can be selected using bit 6 of parameter No. 2286 (JIS). A name can consist of up to 24 characters (a single kanji or hiragana character counts as two alphanumeric characters).

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Example) To register “αTABLE”
FANUC code : *6641*TABLE
JIS code : *2641*TABLE

NOTE
The following characters cannot be used in an item name: *, [,], (,), and ;.

Setting the life

(1) Position the cursor to the life to be set using the ↑ ↓ ← → cursor keys.
(2) Key in the time. Set a value of between 0 and 999999 (hours).
(3) Press soft key [INPUT] or the INPUT key.
The same value is set for both the life and remaining time, and the count type is initialized.
(4) When the time is keyed in and soft key [+INPUT] is pressed, the time is added to the previously set life. The time is also added to the remaining time.

NOTE
When no item name is set, the life is not set.

Setting the remaining time

(1) Position the cursor to the remaining time to be set using the ↑ ↓ ← → cursor keys.
(2) Key in the time. Set a value between 0 and 999999 (hours).
(3) Press soft key [INPUT] or the INPUT key.
(4) When the time is keyed in and soft key [+INPUT] is pressed, the time is added to the previously set remaining time.

NOTE
When no item name is set, the remaining time is not set.

Setting the count type

(1) Position the cursor to the count type to be set using the ↑ ↓ ← → cursor keys.
(2) Press soft key [NO COUNT], [ALL TIME], [POWER ON], [AUTO START], or [CUTTING] to select the count type.

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Deleting an item

(1) Press soft key [CLEAR ITEM].
(2) Key in an item number (1 to 10) to be deleted.
(3) Press soft key [EXEC].

Creating the item selection menu

Use the item selection menu screen.

- **Setting an item name**

(1) Position the cursor to an item name to be set using the ↑ ↓ ← → cursor keys. Only the Machine menu can be edited.
(2) Key in an item name in the input format described above.
(3) Press soft key [INPUT] or the INPUT key.
(4) When an item name is keyed in and soft key [+INPUT] is pressed, the item name is added to the previously set item name.
(5) Press soft key [SELECT END].
The item setting screen appears again.

- **Deleting an item name**

(1) Press soft key [CLEAR ITEM].
(2) Key in an item number (1 to 10) to be deleted.
(3) Press soft key [EXEC].
Only an item in the Machine menu can be deleted.

1.11.3 Inputting and Outputting Set Items

Periodic maintenance data and Machine menu can be input from or output to an external unit.

Inputting set items

Method 1 (Specifying neither the file name nor file number of an input file)

(1) Place the system in EDIT mode.
(2) To input periodic maintenance data, display the item setting screen. To input the Machine menu, display the item selection menu screen.
(3) Press soft key [READ].
(4) Press soft key [PERIOD MAINTE].

Method 2 (Specifying an input file with its file name)

(1) Place the system in EDIT mode.
(2) To input periodic maintenance data, display the item setting screen. To input the Machine menu, display the item selection menu screen.
(3) Press soft key [READ].
(4) Press soft key [”FILE NAME].
(5) Key in a file name.

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(6) Press soft key [FILE NAME”].
(7) Press soft key [PERIOD MAINTE].

Method 3 (Specifying an input file with its file number: 1)

(1) Place the system in EDIT mode.
(2) To input periodic maintenance data, display the item setting screen. To input the Machine menu, display the item selection menu screen.
(3) Press soft key [READ].
(4) Press soft key [(FILE#)].
(5) Key in a file number.
(6) Press soft key [PERIOD MAINTE].

Method 4 (Specifying an input file with its file number: 2)

(1) Place the system in EDIT mode.
(2) To input periodic maintenance data, display the item setting screen. To input the Machine menu, display the item selection menu screen.
(3) Press soft key [READ].
(4) Press address key N .
(5) Key in a file number.
(6) Press soft key [PERIO DMAINTE].

Method 5 (Specifying an input file with its file number: 3)

(1) Place the system in EDIT mode.
(2) To input periodic maintenance data, display the item setting screen. To input the Machine menu, display the item selection menu screen.
(3) Press address key N .
(4) Key in a file number.
(5) Press soft key [READ].

NOTE
1 When the item name of input data is omitted, data having the item number is deleted.
2 When data is to be input from a FANUC Handy File, an input file can be specified with either its file name or file number.
3 When data is to be input from a memory card, an input file can be specified with its file name.

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Outputting setting items

Method 1 (Specifying neither an output file name nor file number)

(1) Select EDIT mode.
(2) To output periodic maintenance data, display the item setting screen. To output the Machine menu, display the item selection menu screen.
(3) Press soft key [PUNCH].
(4) Press soft key [PERIODMAINTE].

Method 2 (Specifying an output file name)

(1) Select EDIT mode.
(2) To output periodic maintenance data, display the item setting screen. To output the Machine menu, display the item selection menu screen.
(3) Press soft key [PUNCH].
(4) Press soft key [”FILE NAME].
(5) Key in a file name.
(6) Press soft key [FILE NAME”].
(7) Press soft key [PERIOD MAINTE].

Method 3 (Specifying a file number: 1)

(1) Select EDIT mode.
(2) To output periodic maintenance data, display the item setting screen. To output the Machine menu, display the item selection menu screen.
(3) Press soft key [PUNCH].
(4) Press soft key [(FILE#)].
(5) Key in a file number.
(6) Press soft key [PERIOD MAINTE].

Method 4 (Specifying a file number: 2)

(1) Select EDIT mode.
(2) To output periodic maintenance data, display the item setting screen. To output the Machine menu, display the item selection menu screen.
(3) Press soft key [PUNCH].
(4) Press address key N .
(5) Key in a file number.
(6) Press soft key [PERIOD MAINTE].

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Method 5 (Specifying a file number: 3)

(1) Select EDIT mode.

(2) To output periodic maintenance data, display the item setting screen. To output the Machine menu, display the item selection menu screen.

(3) Press address key [N] .

(4) Key in a file number.

(5) Press soft key [PUNCH].

NOTE

1 Data having an item number for which no item name is set is not output.
2 An item which is selected from the CNC menu and set is not output.
3 When periodic maintenance data is output to a FANUC Handy File using method 1 for outputting set items (specifying neither an output file name nor file number), PMNTSTS.TXT is used as the file name.
4 When the Machine menu is output to a FANUC Handy File using method 1 for outputting set items (specifying neither an output file name nor file number), PMNTMCN.TXT is used as the file name.
5 When data is to be output to a FANUC Handy File, an output file can be specified with its file name or file number.
6 When data is to be output to a memory card, an output file can be specified with its file name.

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Input/output file format

Periodic maintenance data

```
G10   L60   P1   [n]   Aa   Rr   Qq;
G10   L60   P2   [n]   Aa   Rr   Qq;
G10   L60   P3   [n]   Aa   Rr   Qq;
                :
                :
                :
```

Item selection menu (Machine) data

```
G10   L61   P1   [n] ;
G10   L61   P2   [n] ;
G10   L61   P3   [n] ;
                :
                :
                :
```

G10 L60 : Periodic maintenance data specification

G10 L61 : Item selection menu (Machine) data specification

P : Item number (1 to 10)

[n] : Specifies an item name enclosed in brackets ([]). The input format described above is used as the item name format.

A : Life (0 to 999999)

R : Remaining time (0 to 999999)

Q : Count type

0 : No Count
1 : All Time
2 : Power On
3 : Auto Start
4 : Cutting

Inputting data using an NC program

An input/output file can also be executed as an NC program to input data.

NOTE
1 No macro statement can be specified in command block G10L60(61).
2 An item name must be specified following G10L60 (61). If an item name is specified in an invalid position, the item name is assumed to have been omitted and data with the item number is deleted.

Inputting and outputting data using other screens

Data to be input or output using the periodic maintenance screen can also be input and output using the floppy directory screen and memory card screen. For details, see Sections 3.3, “Floppy Directory Screen,” and 3.4, “Memory Card Screen.”

Alarm

Number	Message	Contents
SR0125	ILLEGAL EXPRESSION FORMAT	The screen displayed for inputting set items is not for the type of data to be input.

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1.12 SYSTEM LOG SCREEN

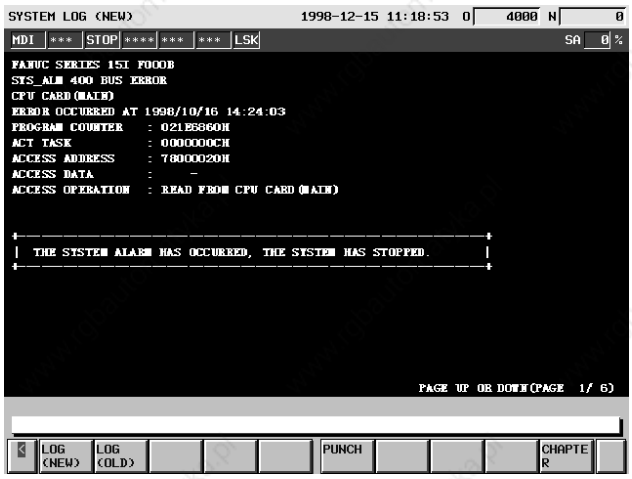
The information displayed when a system alarm occurs can be saved into backup memory. This information can also be checked and downloaded to a memory card or host computer after restarting the machine.

1.12.1 Display

The contents of the system log screen are almost the same as those displayed on the system alarm screen. The following shows each page of the system alarm screen (left) and the corresponding page of the system log screen (right).

- **Display of general information**

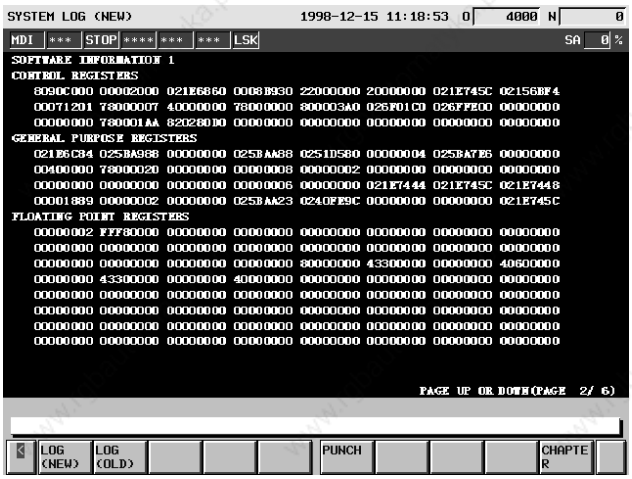




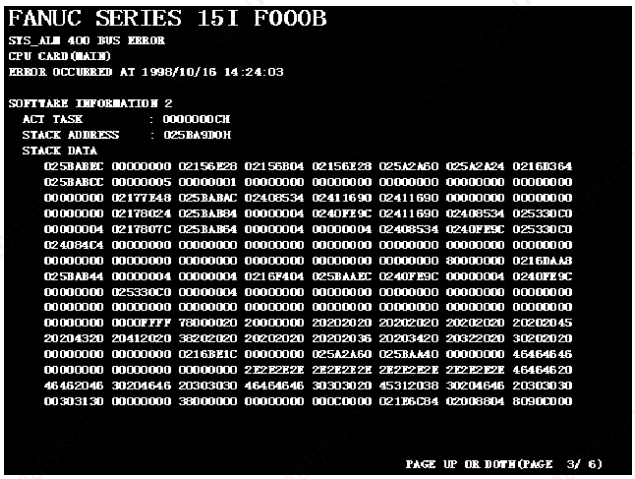
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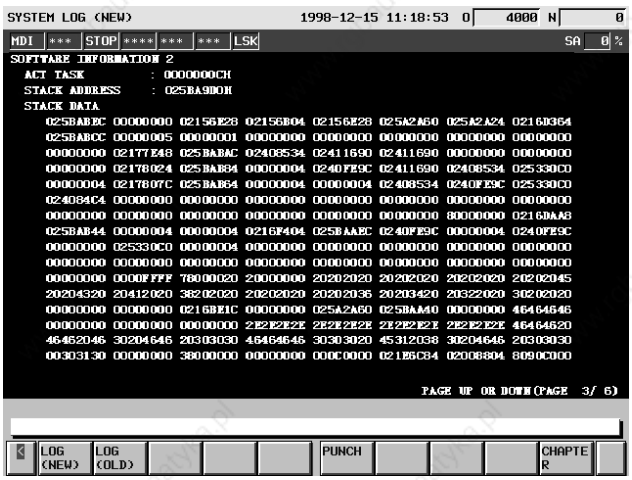
- **Display of software information 1 (register save data)**





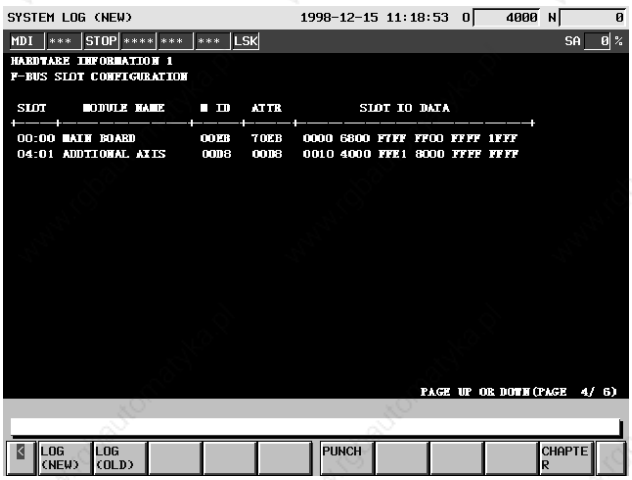
- **Display of software information 2 (stack information)**





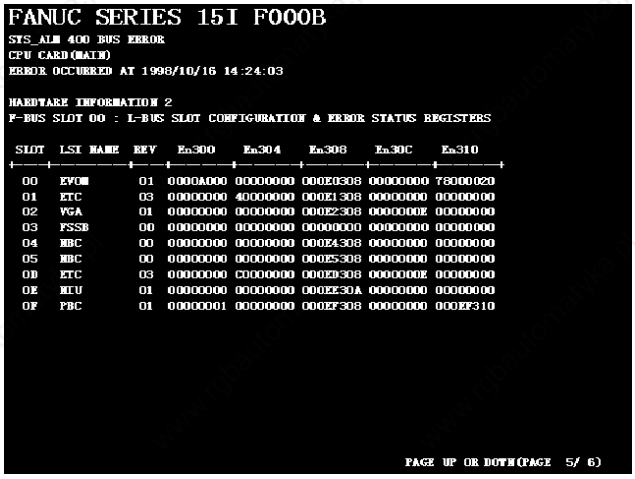
- **Display of hardware information 1 (F–BUS slot information)**

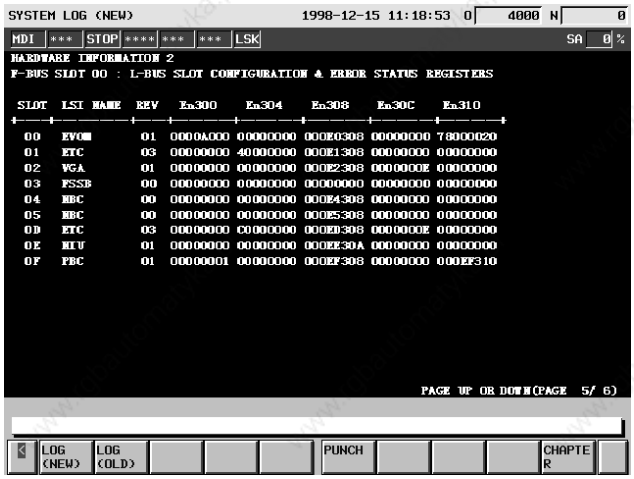




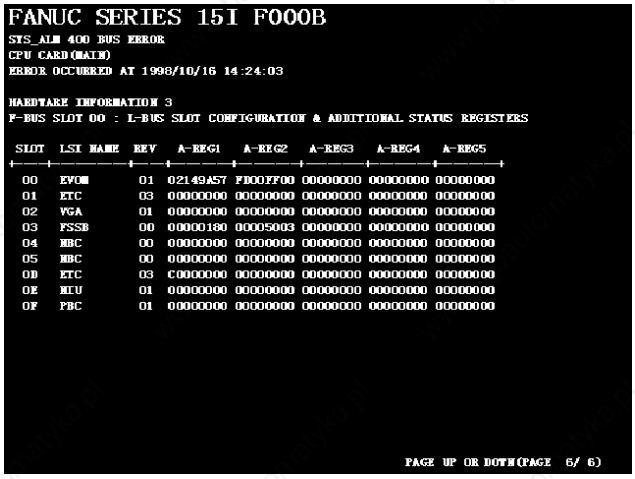
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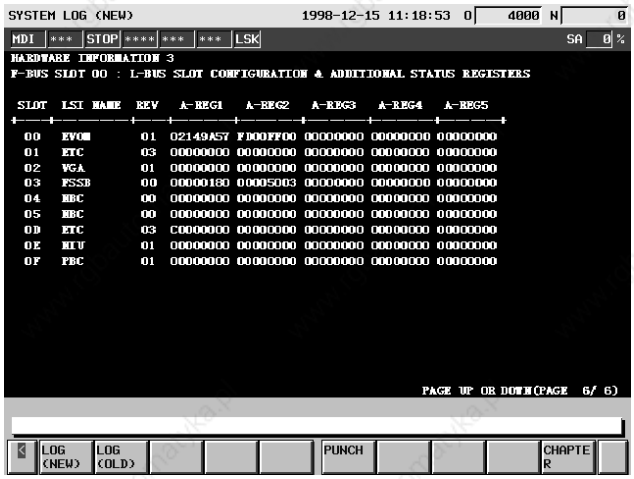
- **Display of hardware information 2 (L–BUS slot information)**





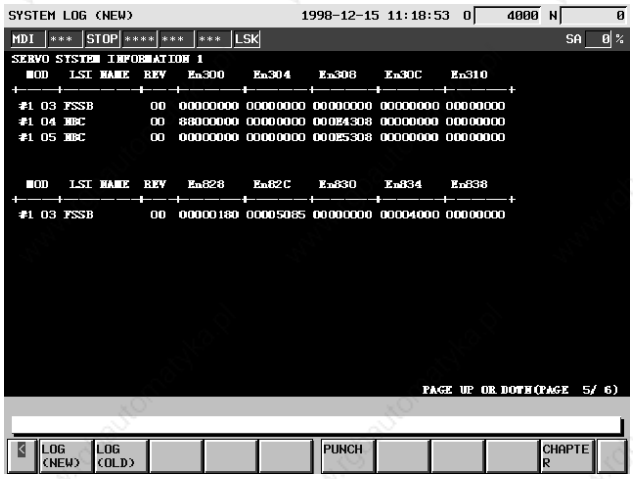
- **Display of hardware information 3 (L–BUS slot information)**





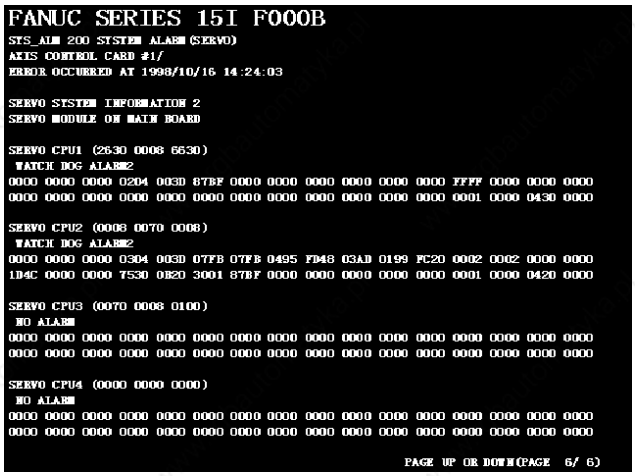
- **Display of general servo system information**

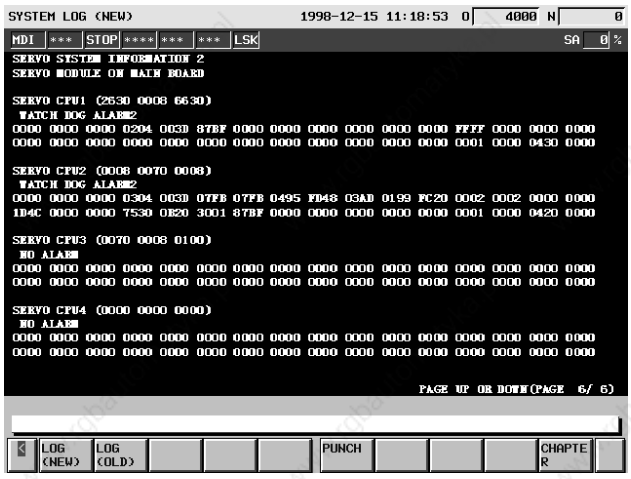




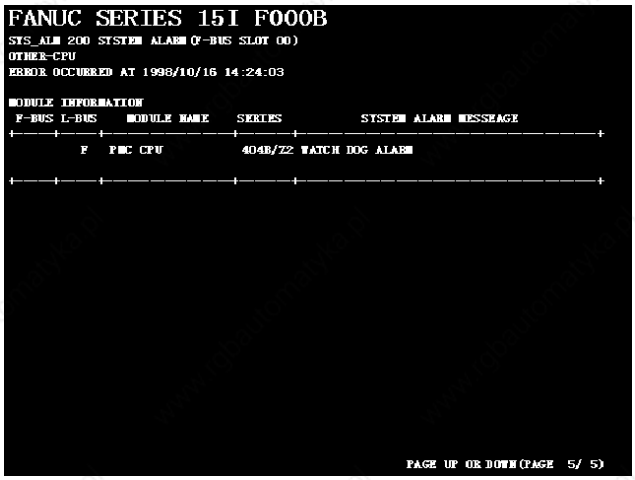
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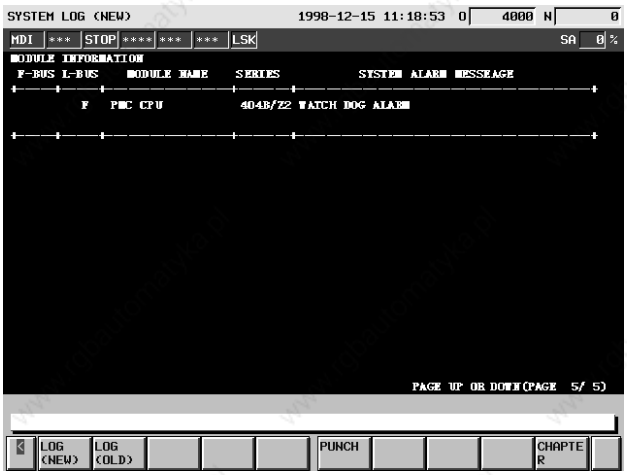
- **Display of detailed servo system information**





- **Display of other option boards**





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1.12.2 Procedures

Displaying the system log screen

(1) Set parameter DSL (bit 6 of No. 0013) to 1.

(2) Display the system log screen using either of the following procedures:

Procedure 1

Press the SYSTEM function key several times until the system log screen appears.

Procedure 2

(1) Press the SYSTEM function key.

(2) Press the [SYSTEMLOG] soft key.

Either of the following screens appears:
When the system log screen is displayed for the first time after power–on: First page of the latest system log
When the screen is redisplayed: Previously displayed screen

- **Page switch**

The previous or next page can be displayed using the PAGE ↑ or PAGE ↓ page switch key.

- **Selecting a system log**

The two most recent system logs are saved. To change the displayed system log, select the desired system log using the [LOG (NEW)] or [LOG (OLD)] soft key.

> **NOTE**
> If no system log has been saved into backup memory, the message “NO LOG DATA” is displayed. If the data in backup memory is invalid, the message “CAN NOT DISP LOG DATA” is displayed.

Outputting a system log

Procedure 1 (specifying neither an output file name nor file number)

(1) Press the [PUNCH] soft key.

(2) Press the [LOG (NEW)], [LOG (OLD)], [ALL], or [THIS DATA] soft key.

Procedure 2 (specifying an output file name)

(1) Press the [PUNCH] soft key.

(2) Press the [“FILE NAME] soft key.

(3) Key in a file name.

(4) Press the [FILE NAME”] soft key.

(5) Press the [LOG (NEW)], [LOG (OLD)], [ALL], or [THIS DATA] soft key.

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NOTE

1 The following data is output according to the [LOG (NEW)], [LOG (OLD)], [ALL], and [THIS DATA] soft keys:
[LOG (NEW)] or [LOG (OLD)]: The selected system log is output.
[ALL]: The new and old system logs are output to one file.
[THIS DATA]: The system log displayed at that time is output.

2 When system log data is output to a FANUC Floppy Cassette, FANUC FA Card, FANUC Handy File, or memory card using procedure 1 (specifying neither an output file name nor file number), the following file name is used:
System log (new): SYSLOG_N.TXT
System log (old): SYSLOG_O.TXT
When the new and old system logs are output to one file: SYSLOG_A.TXT

3 If no system log is saved into backup memory or if the saved data is invalid, “DATA NOT FOUND” appears as a warning.

Inputting and outputting a system log using other screens

In addition to this screen, a system log can also be input and output using the floppy list screen and memory card screen. For details, see Sections 3.3, “Floppy List Screen,” and 3.4, “Memory Card Screen.”

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Output format

As shown in the following example, the image on each page is output as is. When all data output is specified, the system log (new) is output first, followed by the system log (old).

```
%
==============================  SYSTEM ALARM FILE ==============================
FANUC SERIES 15I F000B
SYS_ALM 400 BUS ERROR
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:13:52
PROGRAM COUNTER : 021E6860H
ACT TASK : 0000000CH
ACCESS ADDRESS : 78000020H
ACCESS DATA : -
ACCESS OPERATION : READ FROM CPU CARD(MAIN)


+----------------------------------------------------------------+
| The system alarm had been occurred, the system was stopped.    |
+----------------------------------------------------------------+

================================================================================
SOFTWARE INFORMATION 1
  CONTROL REGISTERS
     8090C000 00002000 021E6860 0008B930 22000000 20000000 021E745C 02156BF4
     00071201 78000007 40000000 78000000 800003A0 026F01C0 026FFE00 00000000
     00000000 780001AA 820280D0 00000000 00000000 00000000 00000000 00000000
  GENERAL PURPOSE REGISTERS
     021E6C84 025BA988 00000000 025BAA88 0251D580 00000004 025BA7E6 00000000
     00400000 78000020 00000000 00000008 00000002 00000000 00000000 00000000
     00000000 00000000 00000000 00000006 00000000 021E7444 021E745C 021E7448
     00001889 00000002 00000000 025BAA23 0240FE9C 00000000 00000000 021E745C
  FLOATING POINT REGISTERS
     00000002 FFF80000 00000000 00000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 80000000 43300000 00000000 40600000
     00000000 43300000 00000000 40000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
     00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

================================================================================
SOFTWARE INFORMATION 2
  ACT TASK : 0000000CH
  STACK ADDRESS : 025BA9D0H
  STACK DATA
     025BABEC 00000000 02156E28 02156B04 02156E28 025A2A60 025A2A24 0216D364
     025BABCC 00000005 00000001 00000000 00000000 00000000 00000000 00000000
     00000000 02177E48 025BABAC 02408534 02411690 02411690 00000000 00000000
     00000000 02178024 025BAB84 00000004 0240FE9C 02411690 02408534 025330C0
     00000004 0217807C 025BAB64 00000004 00000004 02408534 0240FE9C 025330C0
                                          .
                                          .
                                          .
================================================================================
================================  END OF DATA ==================================
%
```

1.12.3 Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
0013		DSL						

[Input classification] Setting input

[Data type] Bit

Bit 6 DSL The system log screen is:
0: Not displayed.
1: Displayed.

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1.13 SYSTEM CONFIGURATION SCREEN

After the system starts normally, the system configuration screen can be displayed to check the types of mounted printed circuit boards and software components.

1.13.1 Displaying the System Configuration Screen

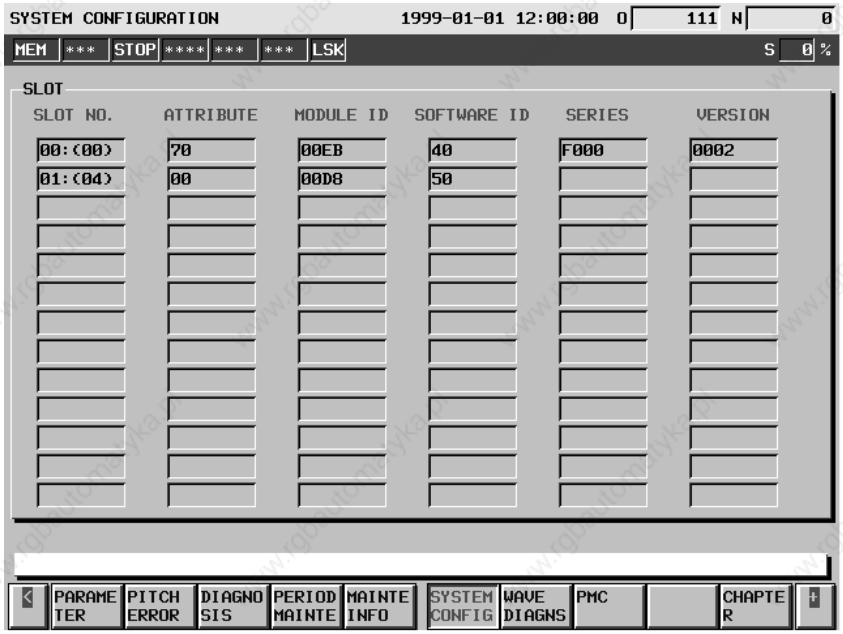
(1) Press the SYSTEM key.

(2) Press the [SYSTEMCONFIG] soft key.

(3) There are the following three types of system configuration screens. The screen can be changed using the PAGE ↑ or PAGE ↓ page switch key.

1.13.2 Printed Circuit Board Configuration Screen

(1) Screen display



The displayed information is explained below.

- SLOT NO.: Number of the logical slot into which each printed circuit board is inserted
  The number in parentheses indicates each physical slot number.
  Numbers 80 to 8F indicates a secondary slot.
- ATTRIBUTE: Attribute of each printed circuit board
- MODULE ID: Module ID of each printed circuit board
- SOFTWARE ID: Software ID of each printed circuit board
- SERIES: Series of the software on each printed circuit board with a CPU

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- VERSION: Version of the software on each printed circuit board with a CPU

(2) Module ID

The module IDs are listed below.

ID	Printed circuit board name
XXEB	Main CPU board
XXD8	Additional axis board
XXAA	HSSB interface board
XXFE	Data server board
XXE0	PMC C
XXE1	Serial communication board
XXE6	Ethernet board
XXEF	DeviceNet master board B
XXBF	DeviceNet master board C
XXFC	PROFIBUS –DP board (master)
XXE3	PROFIBUS DP board (slave)

(3) Software ID

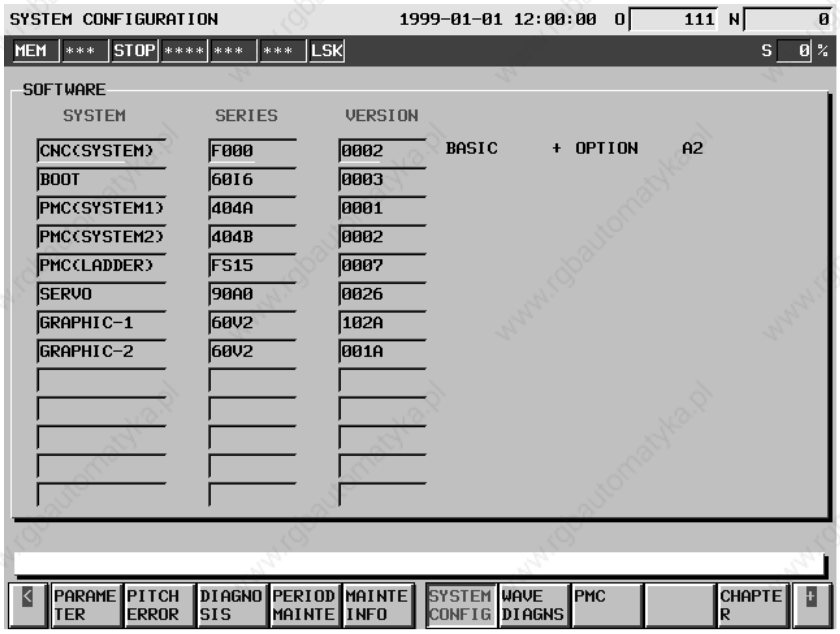
The software IDs are listed below.

ID	Printed circuit board name
40	Main CPU board
50	Additional axis board
65	HSSB interface board
61	Data server board
41	PMC C
4A	Serial communication board
69	PROFIBUS –DP board (slave)
6A	PROFIBUS –DP board (master)
70	DeviceNet master board B
79	DeviceNet master board C

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1.13.3 Software Configuration Screen

(1) Screen display



Displayed information is explained below.

- SYSTEM: Type of software
- SERIES: Series of software
- VERSION: Version of software

For CNC (SYSTEM), the software configuration is also displayed.

- BASIC: Basic
- OPTION A1: Option installation A1
- OPTION A2: Option installation A2
- OPTION A3: Option installation A3
- OPTION A4: Option installation A4

For PMC(LADDER), the character string entered using the PMC title screen is displayed.

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(2) System

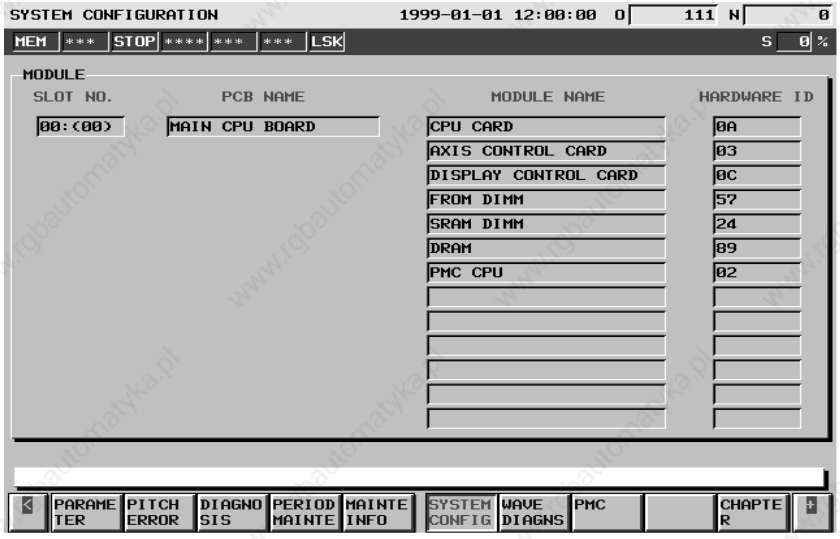
The systems are listed below.

System	Type of software
CNC(SYSTEM)	CNC system
BOOT	CNC boot
CNC(Help)	CNC help
PMC(SYSTEM1)	PMC system 1
PMC(SYSTEM2)	PMC system 2
PMC(LADDER)	PMC ladder
SERVO	Digital servo
GRAPHIC–1	Graphic system 1
GRAPHIC–2	Graphic system 2
SPINDLE	Serial spindle

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1.13.4 Module Configuration Screen

(1) Screen display



The displayed information is explained below.

- SLOT NO.: Number of the logical slot into which each printed circuit board is inserted
  (The number corresponds to the number displayed on the printed circuit board configuration screen.)
  The number in parentheses indicates the physical slot number.
  Numbers 80 to 8F indicates a secondary slot.
- PCB NAME: Type of printed circuit board
- MODULE NAME: Name of each mounted card PCB or DIMM module
- HARDWARE ID: Hardware ID of each mounted card PCB or DIMM module

For the relationships between module names, hardware IDs, and drawings, see Section 2.4.7, “Printed circuit boards in the control unit.”

Pressing PAGE ↑ or PAGE ↓ displays the module configuration of another printed circuit board.

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1.14 MEMORY CONTENTS INDICATIONS

The contents of CNC memory can be displayed starting from the specified address.

Memory contents screen

Display the memory contents screen using the procedure explained in Section 2.6, “Soft Keys,” in Part II of the “FANUC Series 15*i*/150*i*–MA Operator’s Manual (Operation)” (B–63324EN–1).

One of the following four formats can be selected as the memory contents display format:

Byte display (1–byte hexadecimal display)

Word display (2–byte hexadecimal display)

Long display (4–byte hexadecimal display)

Double display (8–byte decimal display—double–precision floating–point format display)

The entire contents of the 256–byte memory are displayed on the screen at one time.

- **Byte display**

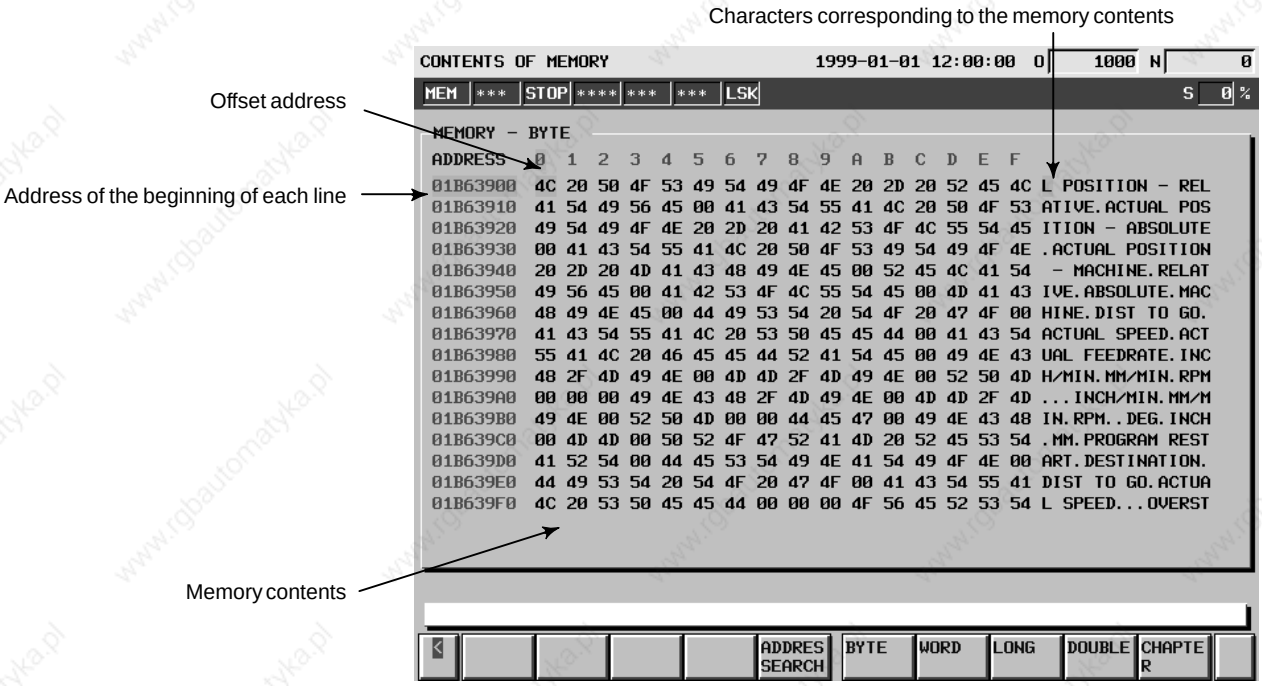


Fig. 1.14 (a) Memory contents screen (Byte display)

The memory contents are displayed in 1–byte units in hexadecimal. On the right of the screen, the memory contents are displayed in characters.

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- **Word display**

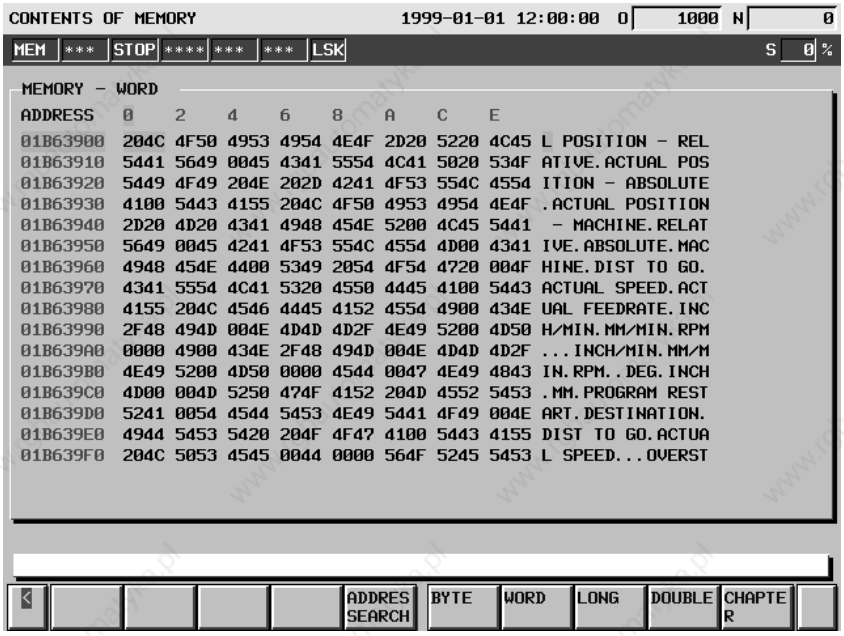


Fig. 1.14 (b) Memory contents screen (Word display)

The memory contents are displayed in 2–byte units in hexadecimal. On the right of the screen, the memory contents are displayed in units of characters.

- **Long display**

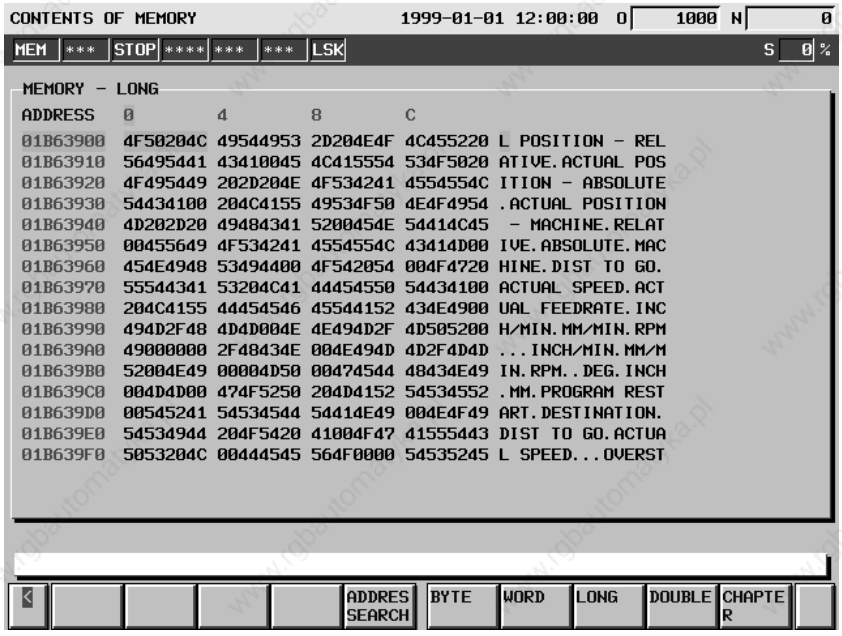


Fig. 1.14 (c) Memory contents screen (Long display)

The memory contents are displayed in 4–byte units in hexadecimal. On the right of the screen, the memory contents are displayed in units of characters.

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- **Double display**

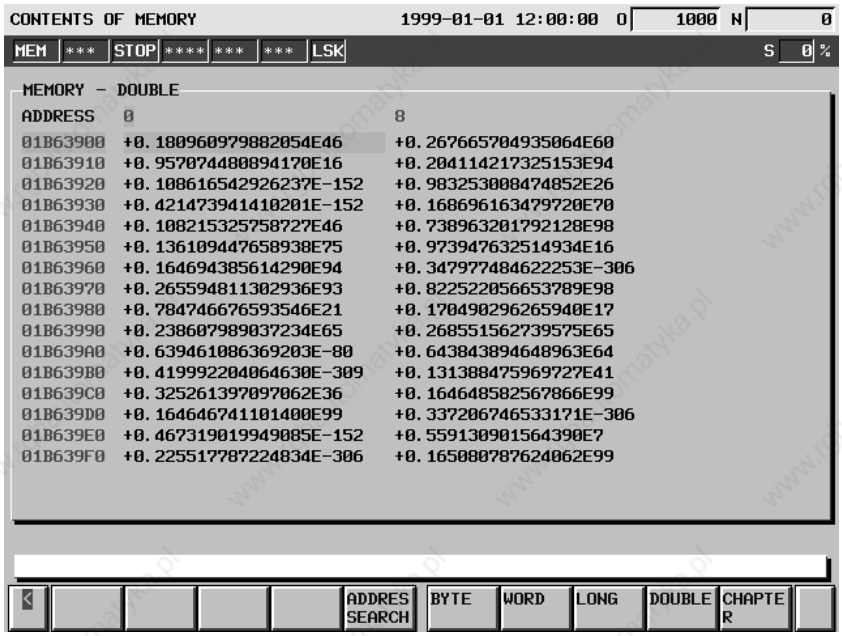


Fig. 1.14 (d) Memory contents screen (Double display)

The memory contents are displayed in decimal in double–precision floating–point format.

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Operations

• Selecting a format

To select a display format, use the corresponding soft key.
Pressing a soft key changes the screen to the corresponding display format.

Byte display [BYTE] soft key
Word display [WORD] soft key
Long display [LONG] soft key
Double display [DOUBLE] soft key

• Positioning the cursor

The cursor can be positioned using the ↑, ↓, ←, or → cursor key to scroll the page.
The start address on the screen can be moved back or forward by 256 bytes using the PAGE ↑ or PAGE ↓ page key. At this time, the cursor position on the screen remains as is.

• Address search

The contents of memory starting from the specified address can be displayed.

Procedure 1

(1) Press the [ADDRESSEARCH] soft key.
(2) Enter an address in hexadecimal.
(3) Press the [EXEC] soft key.

Procedure 2

(1) Enter an address in hexadecimal.
(2) Press the [ADDRESSEARCH] soft key.

WARNING
If the address of an access–inhibited memory area is entered for address search, a system alarm occurs.
Before address search, carefully check whether the desired address is accessible and whether a valid address is entered.

NOTE
1 The entered address need not end in “H” (indicating a hexadecimal number). If the address ends in H, a warning message indicating an invalid format appears.
2 In word display format, the entered address is rounded to the nearest 2–byte unit. In long or double display format, the address is rounded to the nearest 4–byte unit.

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1.15 TOUCH PANEL

General

A pen input device/touch panel manufactured by Fujitsu Limited can be connected to the indicator of the FANUC Series 15*i* (called "FS15*i*" below). The keys on the touch panel (screen display) can be used instead of the soft key buttons normally displayed below the indicator.

The reader puncher interface B option and the touch panel option are required.

Details of hardware

- **Connection**

Connect the touch panel controller to the RS–232C serial port on the FS15*i* indicator board.

- **Features**

The following outlines the hardware specifications. No special considerations are required during operation.

A point pressed on the touch panel is input as coordinate data from the touch panel controller to the FS15*i* via the RS–232C port. The specifications are shown below:

1 Coordinate system
   (1) Initial coordinate system
   Before applying compensation, the FS15*i* system automatically performs temporary compensation. This feature reduces the deviation without applying compensation.
   (2) Coordinate system after compensation
   Compensation described below can perform fine adjustment of the coordinate system and apply compensation for straightness. Compensation data is stored in nonvolatile memory.
2 Sampling period
   The sampling period for checking whether the touch panel is pressed is 32 msec.
3 Position precision
   When nine–point compensation, described below, is applied, a position precision of 2.5 mm can be obtained.

Compensation

Compensation is applied to:

(1) Compensate for straightness.

(2) Adjust the panel input position to the indicator display position.

Compensation is required when:

(1) A new panel is installed.

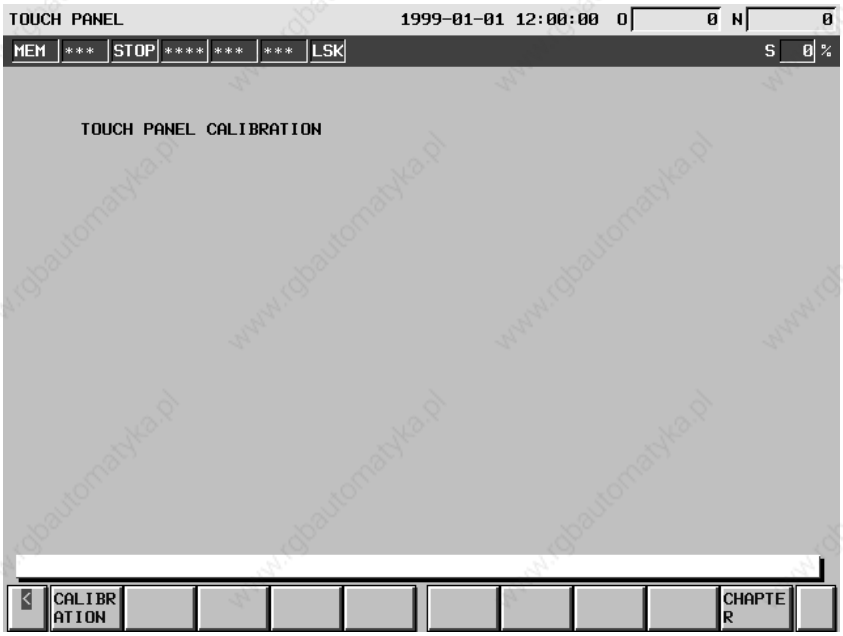
(2) A panel is replaced.

(3) All memory is cleared.

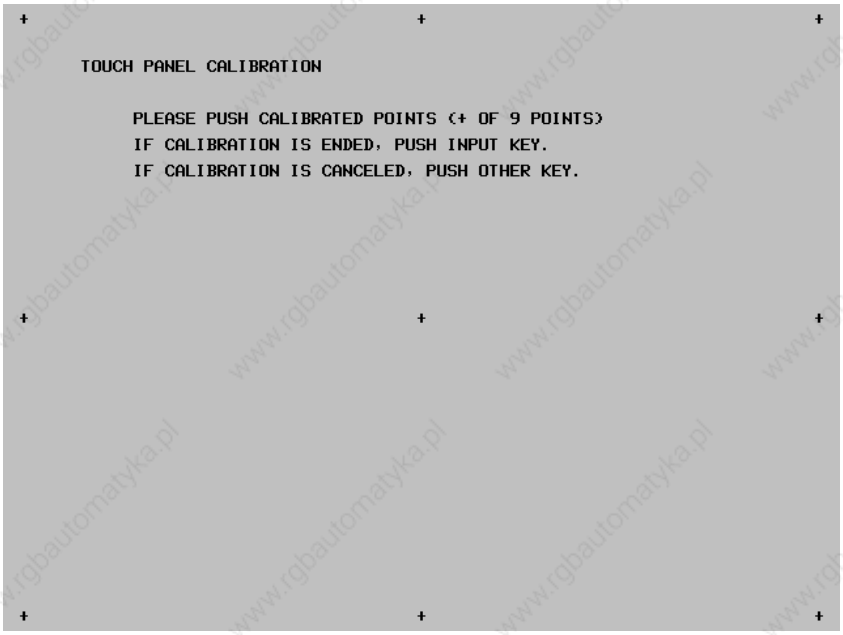
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- **Compensation procedure**

1. Place the system in MDI mode.
2. Validate the touch panel compensation function by setting bit 0 of parameter No. 2219 (TPC).
3. Display the following touch panel compensation screen by using the procedure described in Section 1.1.5.4, “System.”



4. Press soft key [COMPENSATION]. The following compensation screen appears.



5. Press all the compensation points (nine points) using the special pen. When the system detects that a normal compensation point is pressed, the “+” symbol for the compensation point changes to a “o” symbol. When the system does not detect that a compensation point is pressed, the message “The pressed point deviates from the compensation point. Press a point again.” appears.

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6. After inputting the compensation points (nine points), press the INPUT key. Compensation terminates. To cancel compensation, press a key other than the INPUT key.
7. When compensation terminates normally, the message “Compensation terminated.” appears. When compensation is canceled, the message “Compensation is canceled.” appears.
8. To prevent operator errors, invalidate the touch panel compensation function by setting bit 0 of parameter No. 2219 (TPC) after compensation terminates.

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1.16 BIOS SET–UP OF CNC DISPLAY UNIT WITH PC FUNCTIONS

1.16.1 What is “BIOS SET–UP”

“BIOS Set–up” is a program to set up BIOS settings, and operating environment for the CNC display unit with PC functions is defined by these BIOS setting.
It is unnecessary to run the set–up program normally because default BIOS settings are set at shipping.
And use CNC display unit with PC functions with this default environment as far as possible because an inadvertent change to the operating environment may cause a failure.



Use CNC display unit with PC functions with default BIOS settings as far as possible. Fanuc has not checked behavior of Intelligent Terminal in case that any BIOS setting is changed from default settings. So if any setting is changed, make sufficient confirmations.

BIOS Set–up is run by pressing F2 key on full keyboard from completing memory check till OS loading as of 22.Aug.2000.

BIOS parameters are stored in an SRAM chip on the CNC display unit with PC functions. The SRAM is backed up by a battery.



A full keyboard is necessary at BIOS setup.

1.16.2 Keys Used for Operation

The keys used for set–up have the following functions.

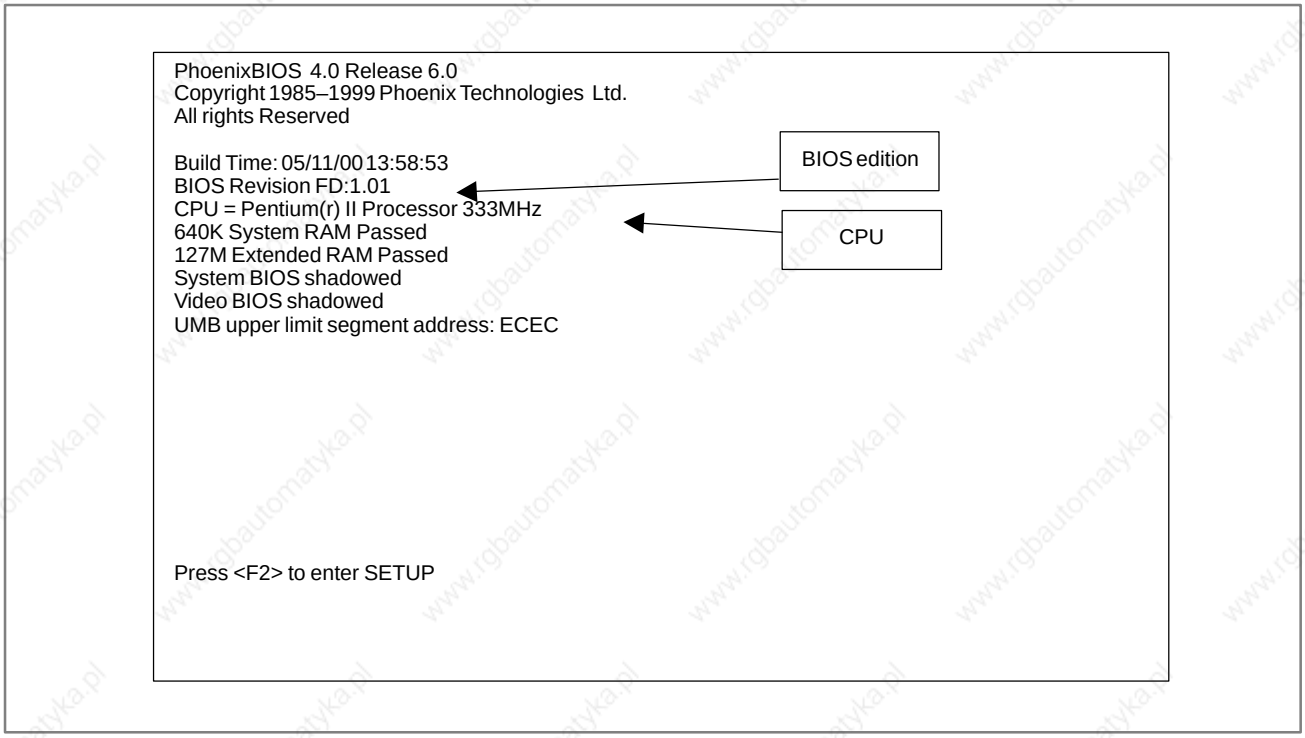
- [↑] [↓] keys : Move the cursor to the next or previous item.
- [←] [→] keys : Move the cursor to the next or previous menu.
- [Enter] key : Select the sub–menu of the item in case of Main, Advanced, and Power Savings Menu.
  : Execute command in case of Exit Menu.
- [ESC] key : Exit.
- [–] [+] keys : Change values.
- [F1] key : Display helps.
- [F9] key : Setup defaults.
- [F10] key : Setup previous values.

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1.16.3 How to Begin the “BIOS SET–UP”

1. Finish to work and store the data.
2. Turn off the power, and connect a full–keyboard, and turn on the power again.
3. BIOS set–up will run with pressing “F2 key from completing memory check till loading OS as of 22.Aug.2000.
   If battery is not supplied in such case that PC card is removed, CNC display unit with PC functions loads default BIOS settings, then restarts automatically.

   If BIOS set–up does not run, retry from step 2.
4. Menu screen is displayed. Change parameters if it is needed.



Initial screen (At normal booting)

1.16.4 How to End the “BIOS SET–UP”

Changed settings become effective after saving settings and restarting the system.
Select either one of the following methods for saving and restarting.

(Method 1) : Set Exit mode by pressing ESC key or selecting “EXIT item.
Then select “Exit Saving Changes” and press ENTER key.

(Method 2) : Press F10 key then message as “Save Configuration changes and exit now?” is displayed. Select “Yes” .

If you want to discard changes and restart the system, do as follows.

Set Exit mode by pressing ESC key or selecting “EXIT” item.
Select “Exit Discarding Changes” and press ENTER key.

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1.16.5 BIOS Diagnostic Message

After turn on the system, POST (Power On Self Test) is executed. Diagnosis messages as the following table may be displayed.

Marks in item “To be solved” represent as bellow.

O: Something of hardware is failure. Exchanging PC card or etc. is required.

1 : When battery supply is stopped, these messages are displayed once. If these are displayed time and again, something of hardware may be failure.

– : These message can be ignored in case that the message is a matter of course.

Error Code	To be solved	BIOS message	Description
0200	O	Failure Fixed Disk	Hard disk drive is defective.
0210	O	Stuck Key	Keyboard operation error. Confirm that keys are not pressed continuously
0211	O	Keyboard Error	Confirm connection of the keyboard.
0212	O	Keyboard Controller Failed	Failure of PC card. Exchange it.
0230	O	System RAM Failed at offset: yyyy	Failure of PC card or memory module. Exchange either of them.
0231	O	Shadow RAM Failed at offset: yyyy	Failure of PC card or memory module. Exchange either of them.
0232	O	Extended RAM Failed at offset: yyyy	Failure of PC card or memory module. Exchange either of them.
0251	1	System CMOS checksum bad Default configuration used.	Check sum of CMOS RAM is abnormal. Default values are loaded, then system restart automatically.
0260	O	System timer error	Failure of PC card.
0261	O	Real time clock error	Failure of PC card.
0271	1	Check date and time settings	Time data is not set. (This is happened in case that battery supply has been stopped.) Set correct date and time in BIOS Set–up or utilities.
0280	1	Previous boot incomplete – Default configuration used	System has not started up normally at latest start–up. So default values are loaded, then system start up.
0281	O	Memory Size found by POST differed from EISA CMOS	System detected memory size failure. Failure of PC card.
02B0 02B1	–	Diskette drive A[B] error	Floppy disk drive A[B] is error. If floppy disk drive is not connected, this message can be ignored.
02B2 02B3	O	Incorrect Drive A[B] type – run SETUP	Specified values about floppy disk drive in BIOS Setup are not proper. Run BIOS Setup, then set values again.
02D0	O	System cache error – Cache disabled	Cache memory error. Failure of PC card.
–	O	xxxx address conflict	Memory or I/O space of functions are conflicted. Failure of PC card.
–	O	Allocation Error for xxxx	Allocation of memory or I/O space about xxxx is error. Failure of PC card.

NOTE
1 These BIOS messages may be changed by the BIOS version.
2 As for CMOS, the contents of the BIOS setting value that a battery is being supported.

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1.17 αi SERVO INFORMATION SCREEN

In the αi 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.

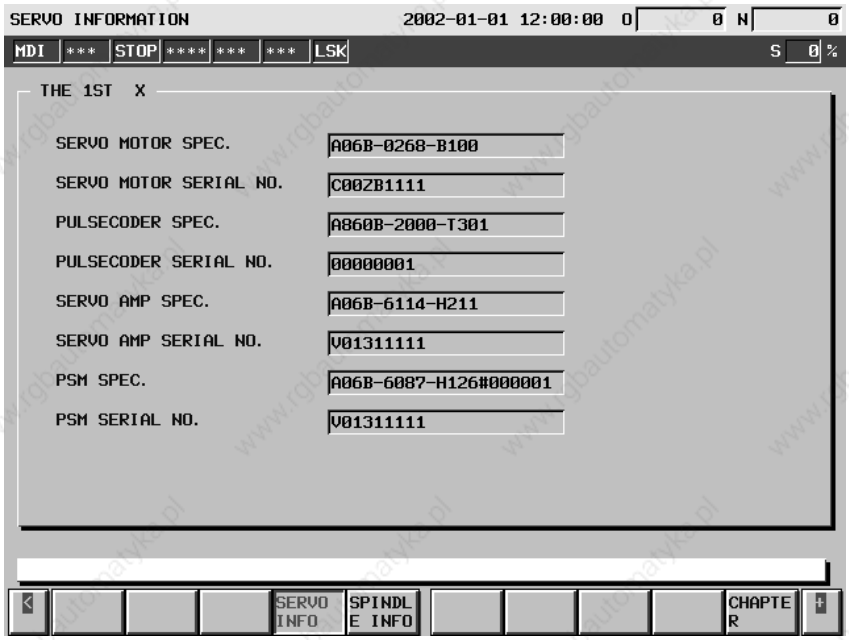
- Servo motor
- Pulsecoder
- Servo amplifier module
- Power supply module

Displaying the servo information screen

1 Press the [SYSTEM]soft key.

2 Press the [CHAPTER]soft key.

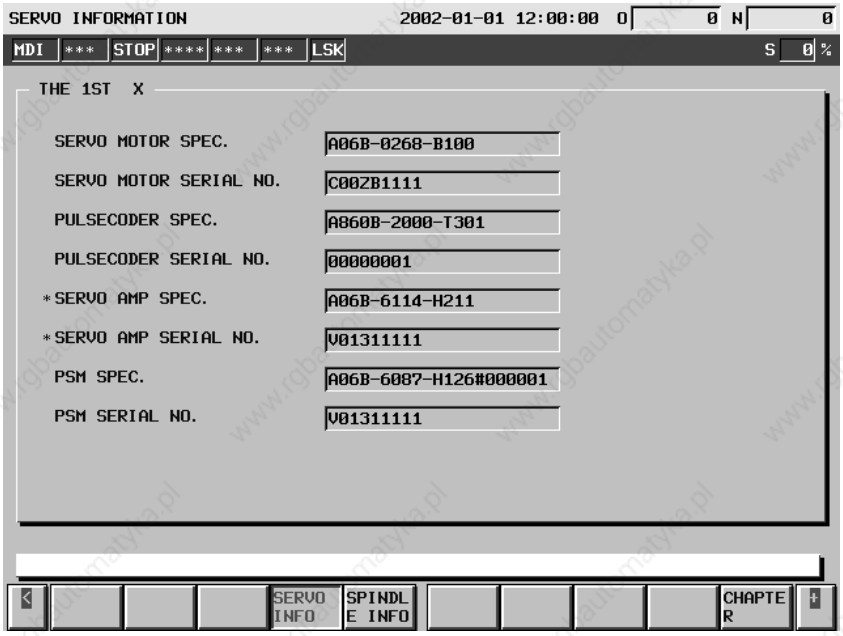
3 Press the [SV Information] soft key to display the screen as shown below.



The servo information screen displays ID information of each connected unit. Each ID information item can be changed. The changed ID information is saved in flash ROM. In this case, the changed data is displayed.

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g If there is a difference between the spindle information in flash ROM and the actual servo information, the corresponding items are preceded by *, as shown below.

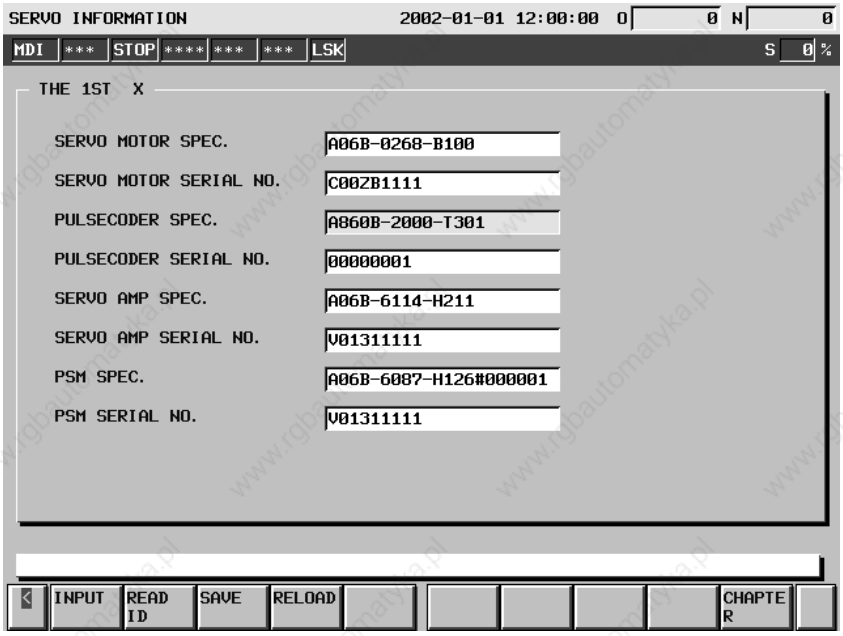


Editing the servo information screen

1 Assume that parameter No.0009#0(IDW) = 1.

2 Press the MDI switch on the machine operator's panel.

3 Follow the procedure described in "Displaying the servo information screen" to display the screen as shown below.



4 To move the cursor on the screen, use the ↑ and ↓ keys.

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Screen operation

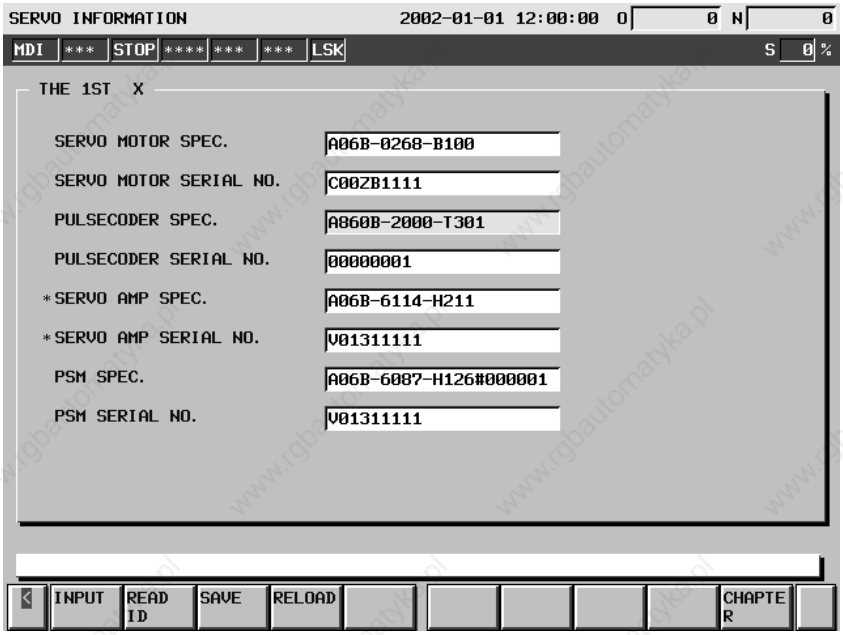
Mode	Key operation	Use
Viewing (g1)	Page key	Scrolls up or down on a screen–by–screen basis.
Editing (g2)	Soft key [INPUT]	Replace the selected ID information at the cursor posi–tionwith the character string in key–in buffer.
	[READ ID]	Transfers ID information of the selected connected unit at the cursor position to the key–in buffer. This soft key is valid only for an item at the left of which an asterisk (*)(g3) is displayed.
	[SAVE] (g4)	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 in-formation 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.

(g1) Viewing mode: when parameter IDW (No.0009#0) = 0

(g2) Editing mode: when parameter IDW (No.0009#0) = 1

(g3) Servo information is stored in flash ROM. If there is a difference between the servo information in flash ROM and the actual servo information, the corresponding items are preceded by *.

(g4) When the servo and spindle information is saved, current maintenance information is also saved.



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1.18 αi SPINDLE INFORMATION SCREEN

In the αi 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.

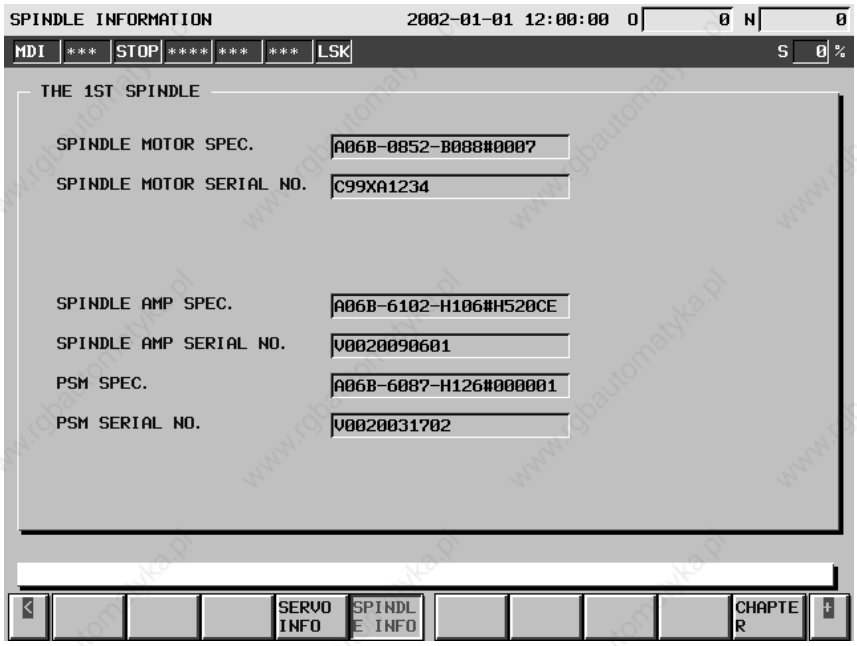
- Spindle motor
- Spindle amplifier
- Power supply module

Displaying the spindle information screen

1 Press the [SYSTEM]soft key.

2 Press the [CHAPTER]soft key.

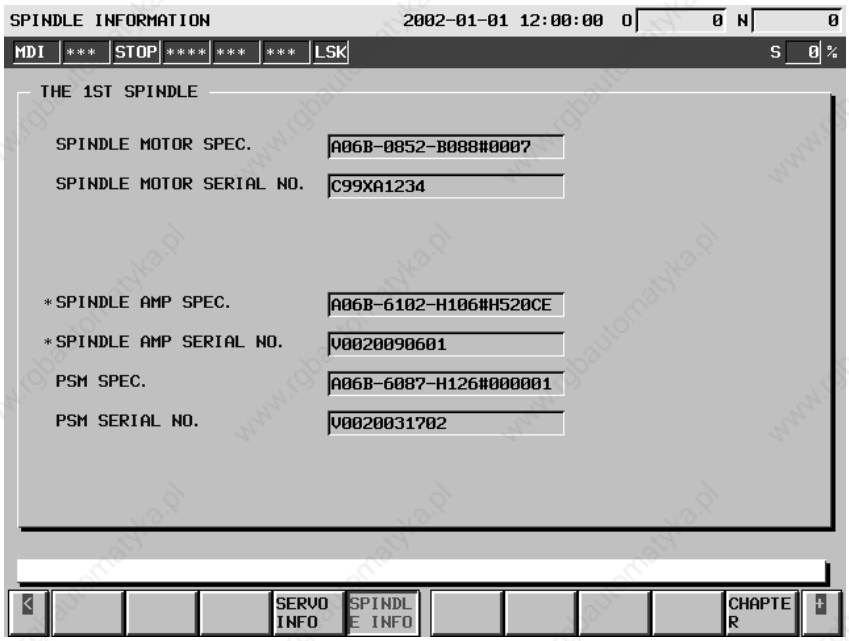
3 Press the [SP Information] soft key to display the screen as shown below.



The spindle information screen displays ID information of each connected unit. Each ID information item can be changed. The changed ID information is saved in flash ROM. In this case, the changed data is displayed.

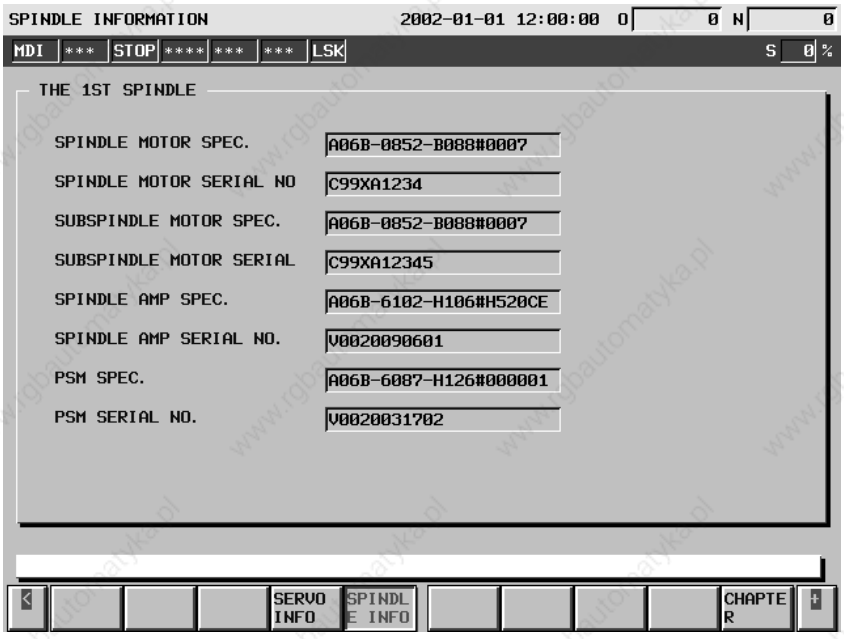
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g If there is a difference between the spindle information in flash ROM and the actual spindle information, the corresponding items are preceded by *, as shown below.



- **Spindle switching**

When the spindle switching control function is used, ID information of the subspindle is also displayed.



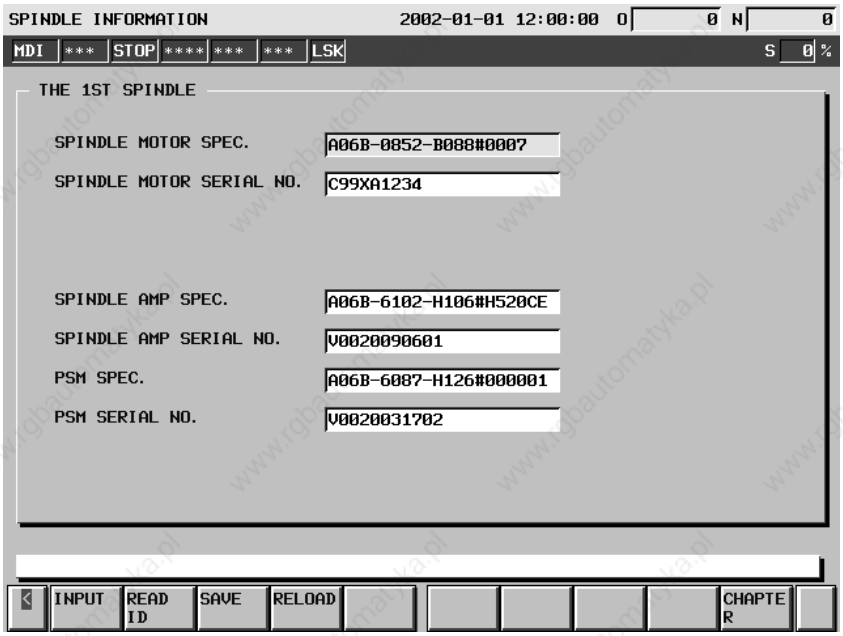
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Editing the spindle information screen

1 Assume that parameter No.0009#0(IDW) = 1.

2 Press the MDI switch on the machine operator's panel.

3 Follow the procedure described in "Displaying the spindle information screen" to display the screen as shown below.



4 To move the cursor on the screen, use the ↑ and ↓ keys.

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Screen operation

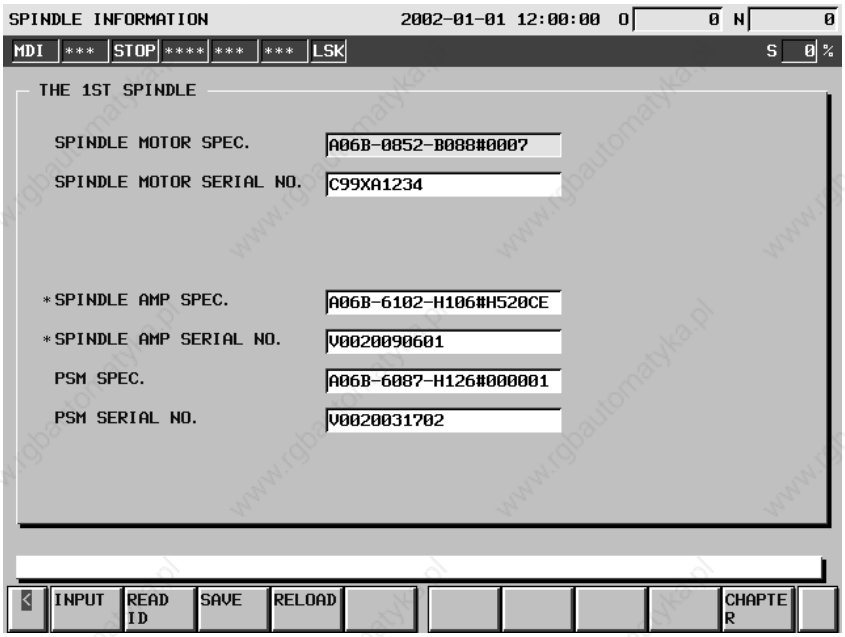
Mode	Key operation	Use
Viewing (g1)	Page key	Scrolls up or down on a screen–by–screen basis.
Editing (g2)	Soft key [INPUT]	Replace the selected ID information at the cursor posi–tionwith the character string in key–in buffer.
	[READ ID]	Transfers ID information of the selected connected unit at the cursor position to the key–in buffer. This soft key is valid only for an item at the left of which an asterisk (*)(g3) is displayed.
	[SAVE] (g4)	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 in-formation 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.

(g1) Viewing mode: when parameter IDW (No.0009#0) = 0

(g2) Editing mode: when parameter IDW (No.0009#0) = 1

(g3) Spindle information is stored in flash ROM. If there is a difference between the servo information in flash ROM and the actual spindle information, the corresponding items are preceded by *.

(g4) When the servo and spindle information is saved, current maintenance information is also saved.



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1.19 αi SPINDLE STATUS ERROR DISPLAY

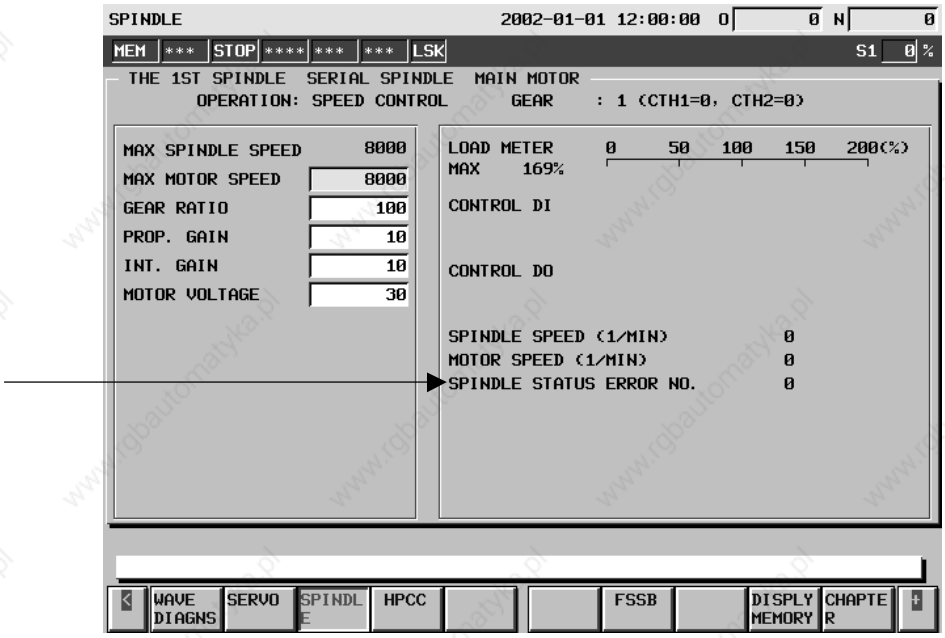
If the spindle enters the operation disable status due to an MC signal input error (such as when two operation modes are specified simultaneously), a status error is indicated only in that status. When a signal is input correctly, the spindle restarts normal operation.
Conventionally, a status error was displayed only on the LCD on the spindle amplifier. This function displays a status error number sent from SIC5 on the spindle screen and diagnosis screen.

Description of status errors

Status error number	Error
1	ESP or MRDY signal input error
3	Position sensor parameter setting error
4	Position sensor parameter setting error
5	Orientation parameter setting error
6	Output switching control parameter setting error
7	Cs contour control input signal error
8	Servo mode input signal error
9	Spindle synchronization input signal error
10	Cs contour control input signal error
11	Servo mode input signal error
12	Spindle synchronization input signal error
13	Orientation input signal error
14	SFR or SRV signal input error
15	Differential speed control parameter setting error
16	Differential speed control parameter setting error
17	Speed detector parameter setting error
18	Position sensor parameter setting error
24	Orientation input signal error
29	Orientation parameter setting error

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Spindle screen



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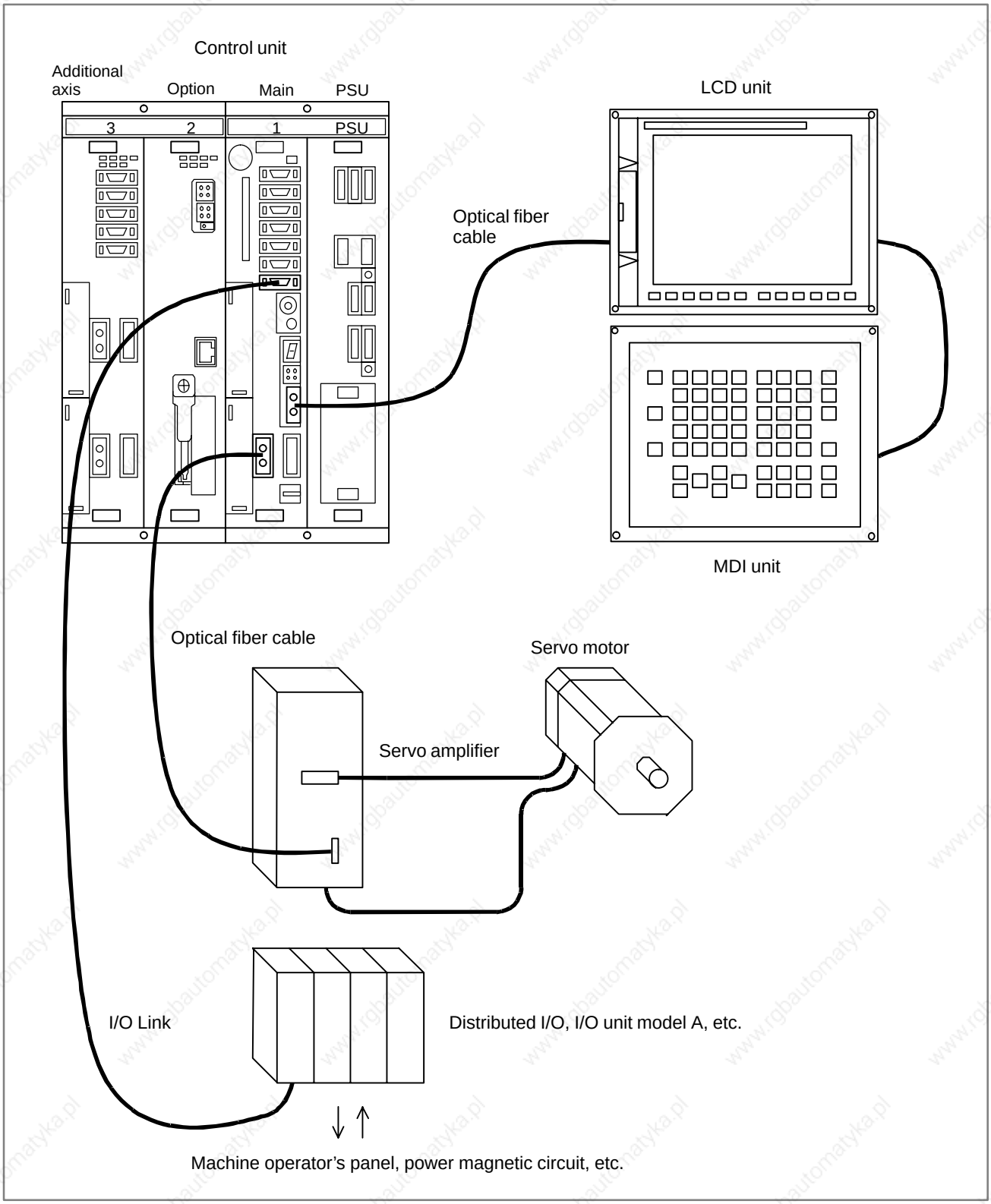
2 15*i* SERIES HARDWARE

This chapter describes the functions of the printed circuit boards of the 15*i* Series CNC control unit and the PCB cards mounted on those boards. It also provides other hardware explanations, including how to replace consumables.

2.1 HARDWARE CONFIGURATION 114
2.2 OVERVIEW OF HARDWARE 115
2.3 CONNECTOR LOCATIONS AND CARD CONFIGURATION FOR EACH PRINTED CIRCUIT BOARD 117
2.4 LIST OF THE UNITS AND PRINTED CIRCUIT BOARDS 155
2.5 REPLACING THE PRINTED CIRCUIT BOARDS 167
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2.1 HARDWARE CONFIGURATION

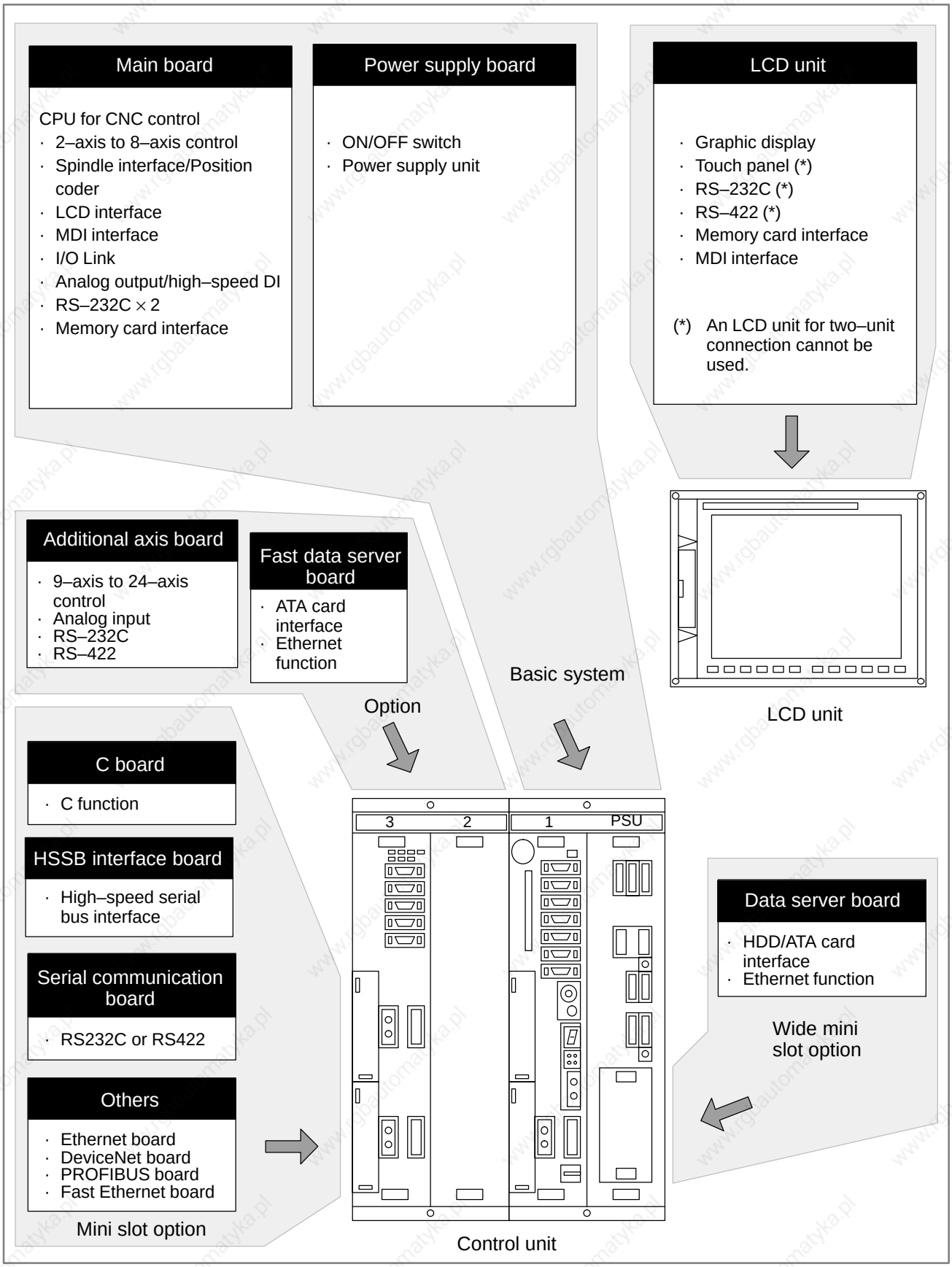


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2.2 OVERVIEW OF HARDWARE

2.2.1 Series 15*i*/150*i*

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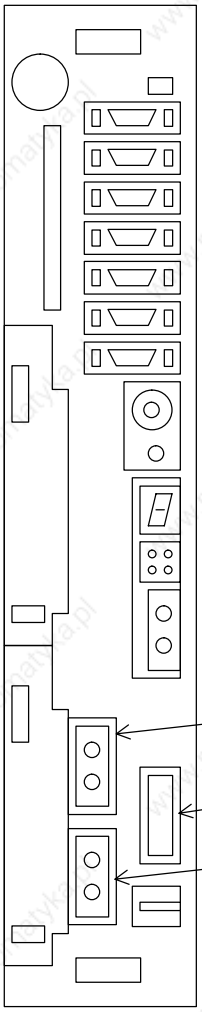
2.3 CONNECTOR LOCATIONS AND CARD CONFIGURATION FOR EACH PRINTED CIRCUIT BOARD

2.3.1 FS15*i*/150*i* Main Board

- **Specification**

Name	Specification
Series 15*i*/150*i* main CPU board	A16B–3200–0400

- **Mounting locations of connectors, LEDs, and etc.**



Name	Function	
BAT1	Battery	
JA2	MDI	
JD5A	Serial port 1 (RS–232C)	
JD5B	Serial port 2 (RS–232C)	
JA3	Manual pulse generator	
JA40	Analog spindle/HDI	
JA41	Serial spindle/position coder	
JD1A	I/O Link	
MTSW	Rotary switch	Used for maintenance by FANUC. Do not change the settings.
PSW	Push switch	
STATUS	LED display	
ALARM	LED display	
COP20A	Display interface	
COP10A–2	FSSB2 (to servo amplifier)	(*)
CA54	Servo check 1	
COP10A–1	FSSB1 (to servo amplifier)	

(*) This connector is provided only when an axis control card of FSSB 2–line type is used.

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● LED display

(1) In normal state and after normal power–on sequence

LED display ○ Off ● On

No.	LED display	NC status
1	STATUS 	0 Indicates a normal condition (LED indicator is lit steadily).
2	ALARM 	All LEDs off Normal condition

The dot of the STATUS LED indicator stays lit if the indicator is not a CNC–only indicator.

(2) Alarm conditions indicated by a non–flashing LED display
If the LED indicator remains in any of the conditions listed below when the power is switched on, it implies an alarm condition.

LED indicator (lit steadily) ○ Off ● On

No.	LED display	NC status
1	STATUS 	3 A graphic card is defective.
2	STATUS 	4 The CPU card (BOOT FROM) is defective
3	STATUS 	6 The CPU card or main CPU board is defective
4	STATUS 	8 A failure has occurred in any module on the F_Bus, or nothing has been done since the power was switched on.
5	STATUS 	8 and dot An optical cable leading to the indicator has broken, the LCD unit is defective, no power is being supplied to the LCD unit, or a set–up pin on the main CPU board is set incorrectly.
6	STATUS 	9 The CPU card is defective.
7	STATUS 	C The main CPU board is defective (waiting for the L–BUS module to be set up).
8	STATUS 	E Alarm condition designed to be detected in the hardware has occurred. See Item (4) (descriptions about LED indication related to error occurrence).

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No.	LED display	NC status
9	STATUS 	F The CPU card is defective (DRAM check error).
10	STATUS 	J The LCD control printed–circuit board is defective.
11	STATUS 	P No SRAM module has been installed, or one was installed incorrectly.
12	STATUS 	U The ID of the CPU card is incorrect.
13	STATUS 	b (lowercase) The main CPU board is defective (waiting for a PMC CPU request).
14	STATUS 	d (lowercase) No FROM module is installed, or a module has been installed incorrectly.

The dot of the STATUS LED indicator remains lit if the indicator is not a CNC–only indicator.

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(3) Alarms indicated by a blinking LED

LED display (blinking) ○ Off ● On

No.	LED display	NC status
1	STATUS 	0 A ROM parity error has occurred in the FROM, or the FROM module is faulty.
2	STATUS 	1 A parity error has occurred in the DRAM or the main CPU card is faulty.
3	STATUS 	2 An alarm condition has occurred on the axis control card.
4	STATUS 	3 An alarm condition has occurred on the main CPU card, or the card is faulty.
5	STATUS 	4 A required card has not yet been mounted, or the main board is faulty.
6	STATUS 	5 The main CPU card is faulty.
7	STATUS 	7 A failure has occurred in the display unit.
8	STATUS 	8 Other system alarms
9	STATUS 	8 and decimal point The optical fiber cable for the display unit is broken.
10	STATUS 	9 The C board is faulty.
11	STATUS 	Upper–case H A DRAM test error has occurred, or the main CPU card is faulty.

The dot of the STATUS LED indicator remains lit if the indicator is not a CNC–only indicator.

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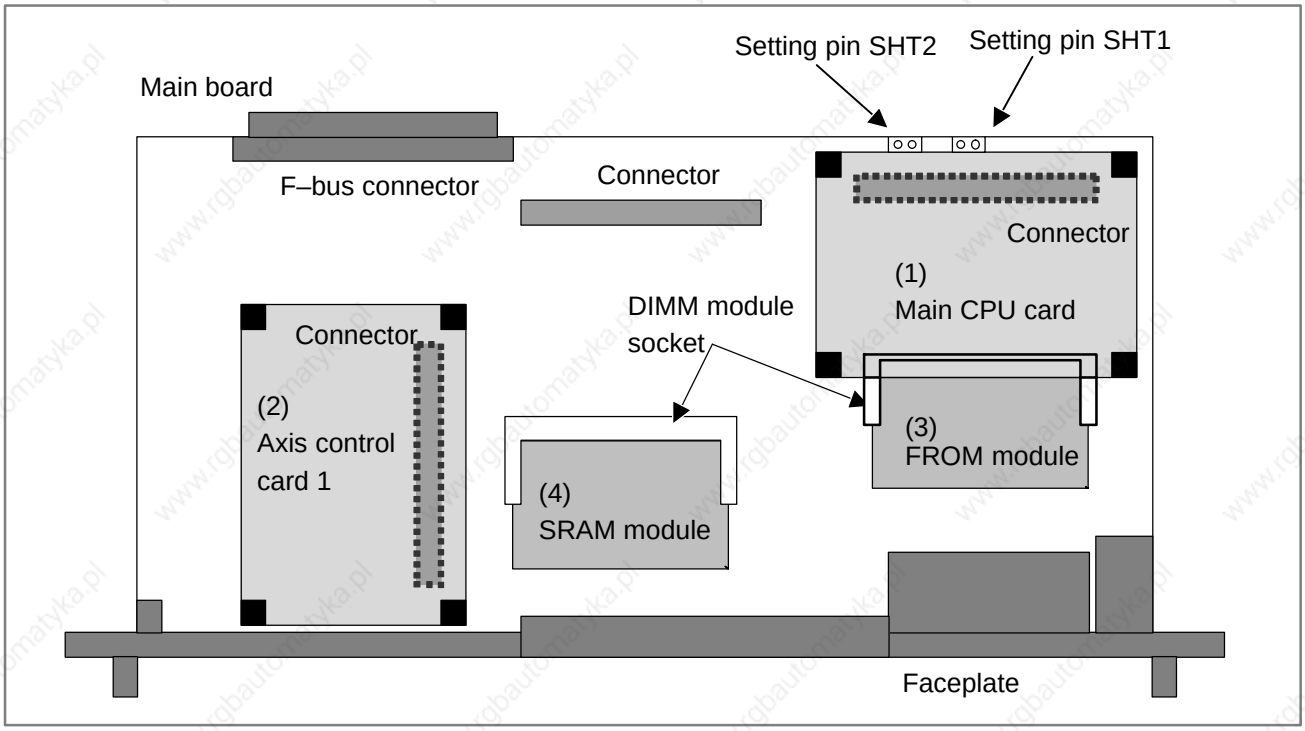
(4) LED display upon the occurrence of an error (ALARM LED: red)

○ Off ● On ☆ Blink

No.	LED display	NC status
1	ALARM ● ○ ○ ○	The voltage of the backup battery has fallen below a preset level.
2	ALARM ○ ○ ● ○	SYSFILE status (failure in any of the modules on the F–bus)
3	ALARM ● ○ ● ○	L–bus alarm
4	ALARM ○ ○ ○ ●	SYSEMG status (NMI in any of the modules on the F–bus)
5	ALARM ● ○ ○ ●	The display interface cable is broken or the display unit is faulty.
6	ALARM ○ ○ ● ●	A data error has occurred in the SRAM module.
7	ALARM ● ○ ● ●	A parity alarm condition has occurred in the DRAM module.
8	ALARM ○ ● ○ ○	A failure has occurred in the power supply circuit on the main CPU board.
9	ALARM ☆ ○ ○ ☆ ○ ○ ☆ ○	The display blinks in alternate patterns. At power–on, the cable for the LCD unit connection is detected as being broken.

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● Card mounting locations



No.	Name	Specification	Function	Remarks
(1)	Main CPU card	A17B–3300–0402	CNC control	
(2)	Axis control card 1	A20B–3300–0240	Axis control	8 axes, One optical connector
		A20B–3300–0244		8 axes, Two optical connectors
		A20B–3300–0241		6 axes, One optical connector
		A20B–3300–0245		6 axes, Two optical connectors
		A20B–3300–0242		4 axes, One optical connector
(3)	FROM module	A20B–3900–0070	CNC system, Servo system, PMC user program, etc.	16M
		A20B–3900–0071		12M
		A20B–3900–0072		8M
		A20B–3900–0073		6M
(4)	SRAM module	A20B–3900–0020	Backup SRAM, parameter, Program, etc.	3M
		A20B–3900–0060		2M
		A20B–3900–0061		1M
		A20B–3900–0052		512K
		A20B–3900–0053		256K

● Setting adjustments

Two setting pins (SHT1 and SHT2) are located as shown in the above figure.

SHT1: When a dedicated display unit is used with the CNC, this pin must be left open. Otherwise, this pin must be connected.

SHT2: This pin must be left open.

CAUTION
In the factory–configuration, SHT1 is set according to the specifications in the order in which they are received from the user, and SHT2 is left open.

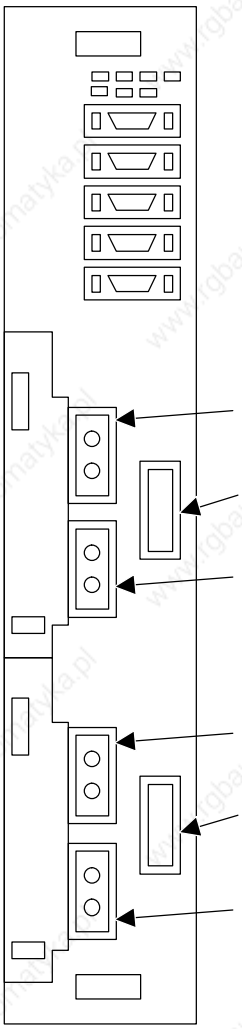
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2.3.2 FS15*i*/150*i* Additional Axis Board

- **Specification**

Name	Specification
Series 15*i*/150*i* additional axis board	A16B–2203–0340

- **Mounting locations of connectors, LEDs, and etc.**



Name	Function
STATUS/ALARM	LED display
JD6B	Serial port 2 (RS422)
JD5C	Serial port 4 (RS232–C)
JA52	
JA53	
JA6	Analog input
COP10A–6	FSSB6 (to servo amplifier) (*)
CA54	Servo check 3
COP10A–5	FSSB5 (to servo amplifier)
COP10A–4	FSSB4 (to servo amplifier) (*)
CA54	Servo check 2
COP10A–3	FSSB3 (to servo amplifier)

(*) This connector is provided only when an axis control card of FSSB 2–line type is used.

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- **LED display**

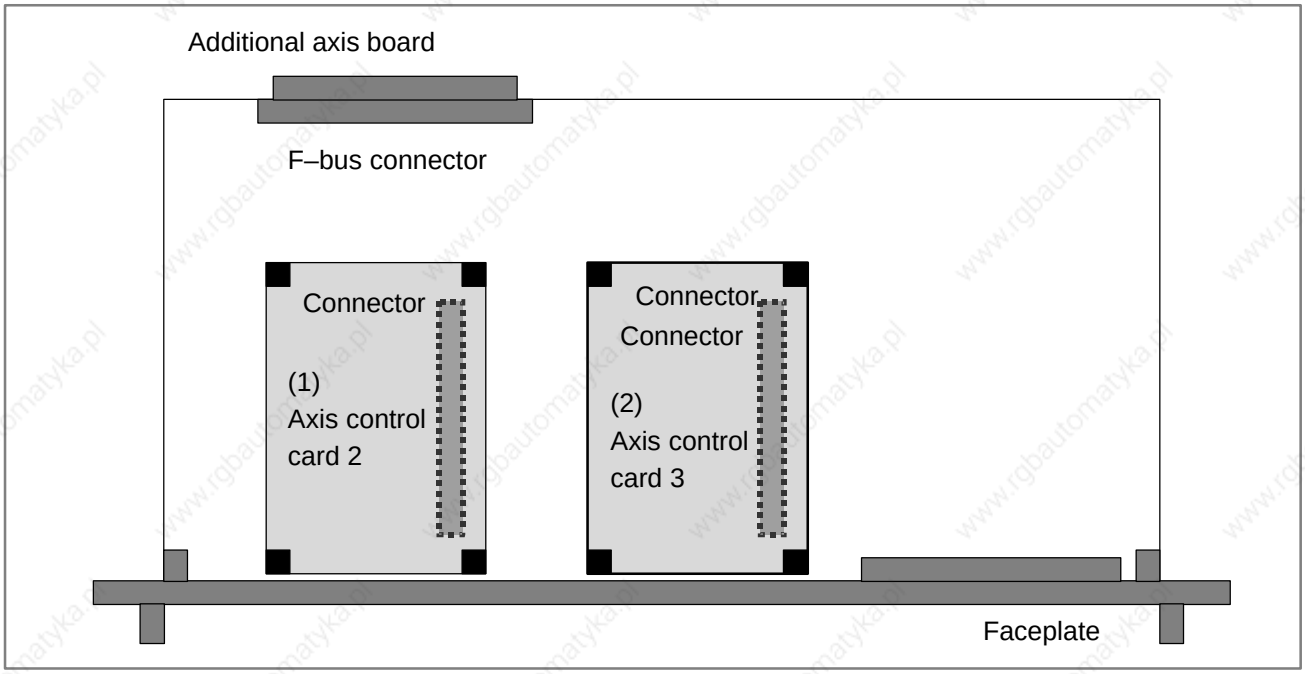
(1) LED display upon the occurrence of an error (ALARM LED: red)

□ Off ■ On ★ Blink

No.	LED display	NC status
1	ALARM ■□□	Servo alarm 2 (alarm on axis control card 2)
2	ALARM □■□	Servo alarm 3 (alarm on axis control card 3)
3	ALARM □□■	SYSEMG status (NMI in any of the modules on the F–bus)

NOTE
All status LEDs (green) are not always light

- **Card mounting locations**



No.	Name	Specification	Function	Remarks
(1)	Axis control card 2	A20B–3300–0240	Axis control	8 axes, One optical connector
		A20B–3300–0244		8 axes, Two optical connectors
		A20B–3300–0241		6 axes, One optical connector
		A20B–3300–0245		6 axes, Two optical connectors
		A20B–3300–0242		4 axes, One optical connector
		A20B–3300–0243		2 axes, One optical connector
(2)	Axis control card 3	A20B–3300–0240	Axis control	8 axes, One optical connector
		A20B–3300–0244		8 axes, Two optical connectors
		A20B–3300–0241		6 axes, One optical connector
		A20B–3300–0245		6 axes, Two optical connectors
		A20B–3300–0242		4 axes, One optical connector
		A20B–3300–0243		2 axes, One optical connector

- **Setting adjustments** No setting adjustment is required.

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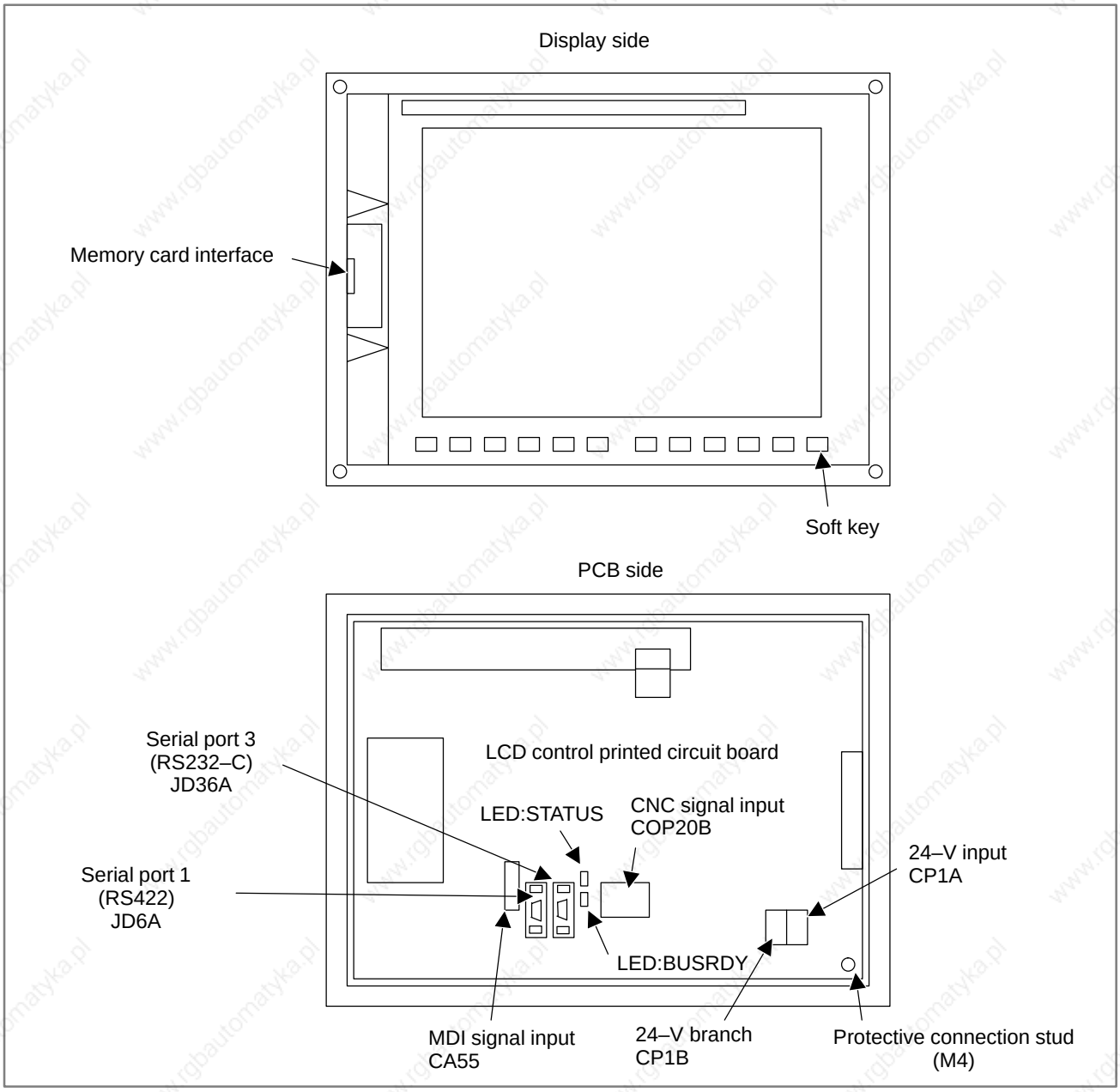
2.3.3
FS15*i*/150*i* LCD Unit

2.3.3.1
Connection for one unit

- **Specification**

Name	Specification
Series 15*i*/150*i* LCD control printed circuit board	A20B–8100–0415

- **Mounting locations of connectors, LEDs, and etc.**



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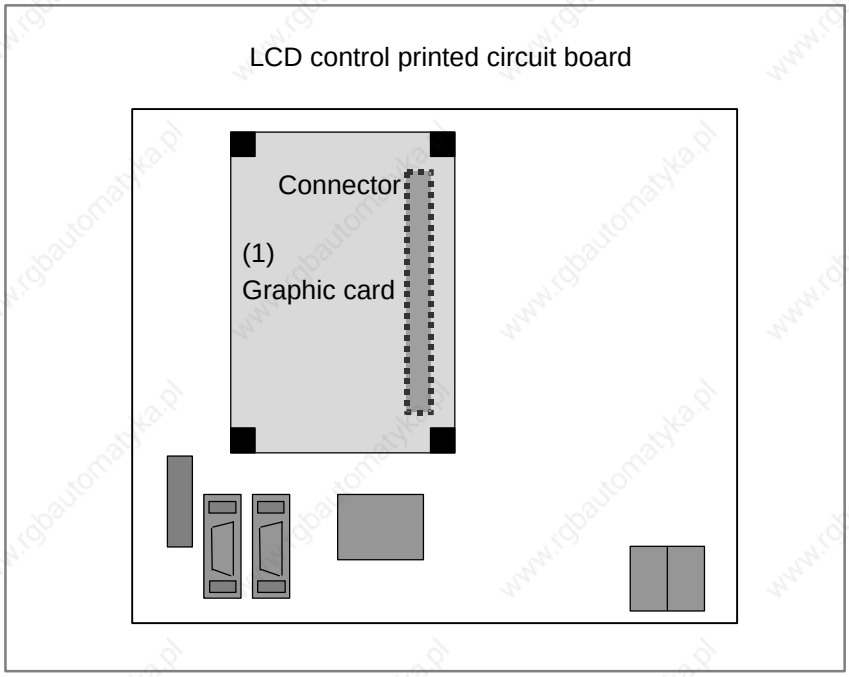
● LED display

(1) LED display upon the occurrence of an alarm condition (STATUS and BUSDRY: red)

■ On ☆ Blink

No.	LED display		LCD status
1	STSATUS	■	The display interface cable is broken.
2	BUSRDY	■	The display interface cable is broken, or the LCD unit has detected a failure.
		☆	At power–on, the breaking of cable is detected.

● Card mounting locations



No.	Name	Specification	Function	Remarks
(1)	Graphic card	A20B–3900–0150	Graphic display	Color
		A20B–3300–0153		Monochrome
		A20B–3300–0090	Character display	Monochrome

● Setting adjustments

No setting adjustment is required.

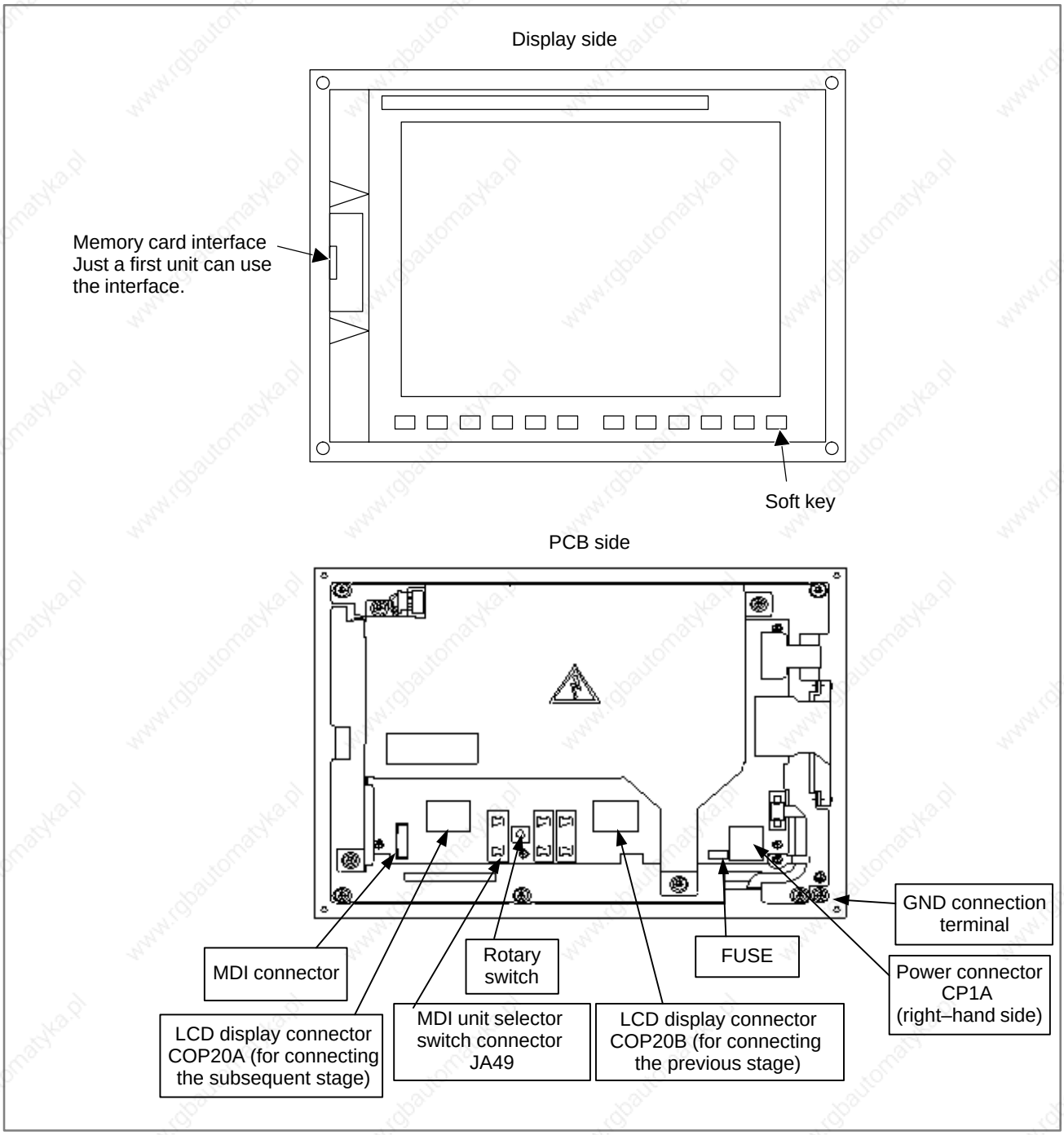
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2.3.3.2 Connection for two units (10.4”)

- **Specification**

Name	Specification
Series 15*i*/150*i* LCD control printed circuit board	A20B–8100–0630

- **Mounting locations of connectors, LEDs, and etc.**



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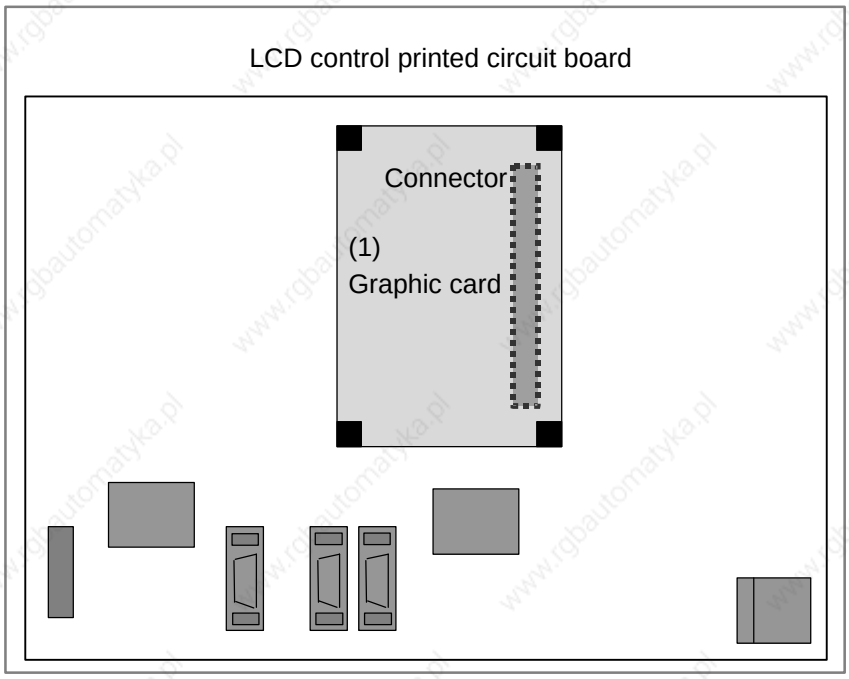
● LED display

(1) LED display upon the occurrence of an alarm condition (STATUS and BUSDRY: red)

■ On ☆ Blink

No.	LED display		LCD status
1	STSATUS	■	The display interface cable is broken.
2	BUSRDY	■	The display interface cable is broken, or the LCD unit has detected a failure.
		☆	At power–on, the breaking of cable is detected.

● Card mounting locations



No.	Name	Specification	Function	Remarks
(1)	Graphic card	A20B–3900–0150	Graphic display	Color

● Setting adjustments

Setting the rotary switch

The rotary switch is factory–set to 0 by FANUC.

Adjust the rotary switch setting as listed below, depending on the connection of the unit.

LCD unit	Rotary switch setting
Using the unit as the second LCD unit	0 to 3
Using the unit as the first LCD unit	8 to F
Connecting and using just the single LCD unit (in the maintenance mode)	4 to 7

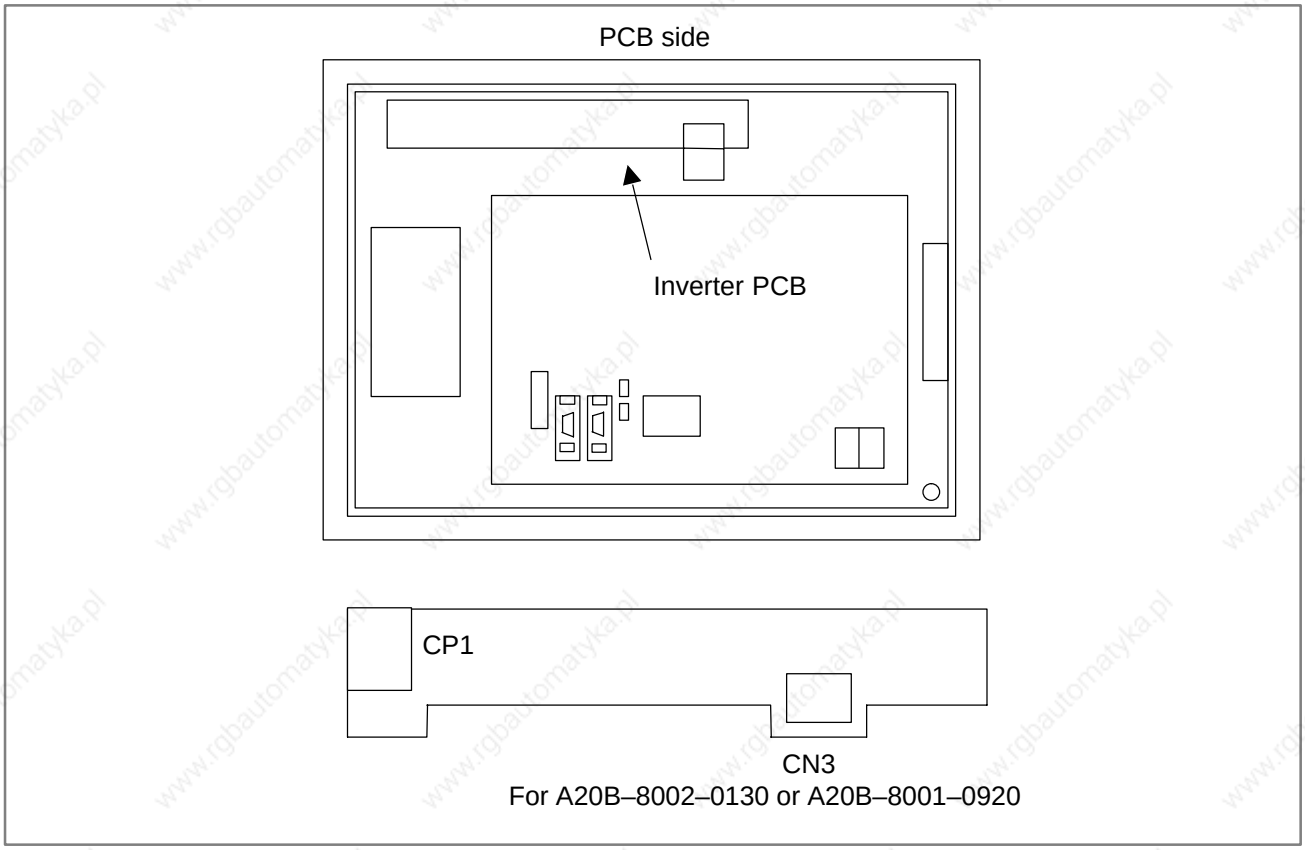
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2.3.4 FS15*i*/150*i* Inverter PCB

- **Specification**

Name		Specification
Inverter	10.4″, color	A20B–8001–0920
	9.5″, monochrome	A20B–8002–0130

- **Mounting locations of connectors**



Connector number	Application
CP1	Power to LCD backlight
CN3	Power to inverter PCB

- **Setting adjustments** No setting adjustment is required.

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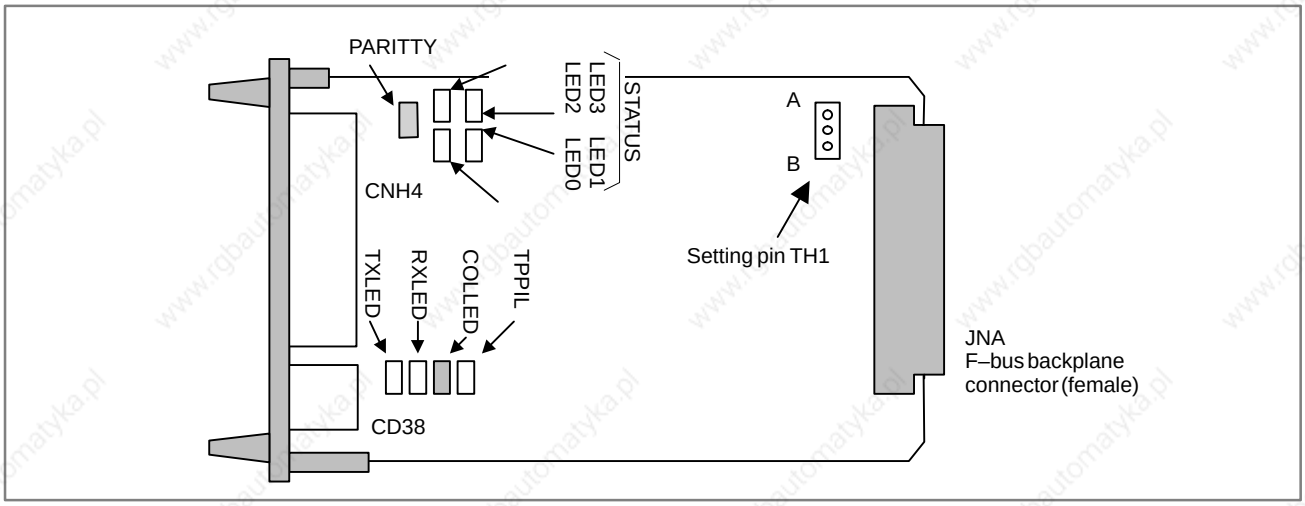
2.3.5 Data Server Board A1

- **Specification**

Name	Specification
Data server board A1	A20B–8100–0510

- **Board mounting location** The board is mounted in the wide mini slot.

- **Mounting locations of connector, LEDs, and etc.**



Connector number	Application
CNH4	Hard disk interface
CD38	Ethernet (TCP/IP) interface

- **LED display** LED display transition at power–on

No.	LED display 0 1 2 3	Data server board state
1	STATUS □□□□	Power–off state
2	STATUS ■■■■	Initial state immediately after power–on
3	STATUS □■■■	MPU initialization completed
4	STATUS □□■■	Firmware download completed
5	STATUS □□□■	Control passed to the OS
6	STATUS ■■■□	OS PHASE 1
7	STATUS □■■□	OS PHASE 2
8	STATUS ■□■□	OS PHASE 3
9	STATUS □□■□	OS PHASE 4
10	STATUS ☆□□□	Activation completed

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When the data server board is activated normally, the state of No. 10 is set. This state is maintained until an error occurs.

- **STATUS LED display (green) when an error occurs**

LED display upon the occurrence of an error (STATUS)
The STATUS LED alternately displays the LONG and SHORT patterns. The LONG patterns are displayed long, and the SHORT patterns are displayed short.

LED display (STATUS)		Data server board status	
LONG	SHORT		
4 3 2 1	4 3 2 1		
■ □ □ □	□ □ □ ■	Failure in Ethernet board	Reset
■ □ □ □	□ □ ■ □		General machine check exception, bus error, address error, etc.
■ ■ □ □	□ □ □ ■		DRAM Parity
■ ■ □ □	□ □ ■ □	Failure in another board	Other NMI

NOTE
If the LONG and SHORT patterns which are not listed above are repeatedly displayed, contact FANUC.

LED display upon the occurrence of an error (alarm)

No.	LED display	Data server board state
1	Parity Alarm ■	A parity error occurred in memory on the Data server.

LED display for communication status

No.	LED display	Data server board state
1	RXLED ■	Turned on when data is received.
2	TXLED ■	Turned on when data is sent.
3	TPPIL ■	Turned on when a connection with the hub is established.
4	COLLED ■	Turned on when a data collision occurs.

TPPIL : While this LED is off, communication is not being performed. Connection to the hub may not have been made normally. This LED will also be off when the power to the hub is not turned on. When a connection with the hub is established, this LED lights steadily.

COLLED : This LED lights frequently when there is a high level of noise or traffic in Ethernet communication.

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- **Setting adjustments**

Only one setting pin (TH1) is provided. It is located as shown in the figure above.

TH1 : Set this pin to A. This pin is factory–set to A.

2.3.6 Data Server Board A2

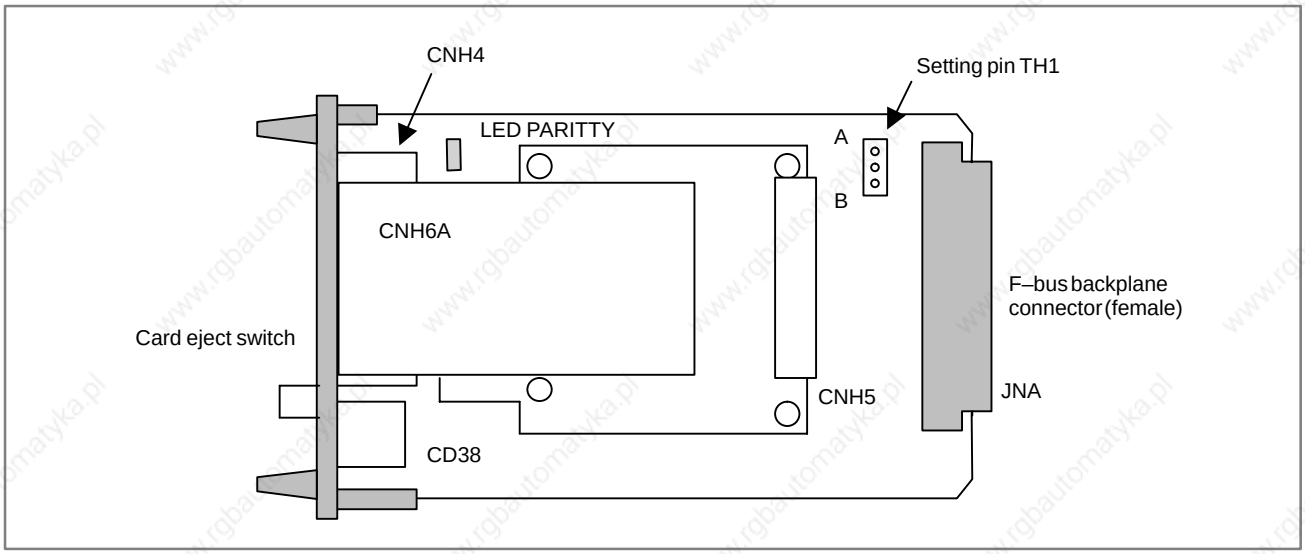
- **Specification**

Name	Specification
Data server board A2	A20B–8100–0511
ATA card interface board	A20B–2100–0500

- **Board mounting location**

The board is mounted in the wide mini slot.

- **Mounting locations of connectors, LEDs, and etc.**



Connector number	Application
CNH4A	Used for connection with the ATA card interface board
CNH5	Used for data server board connection
CNH6A	ATA card interface
CD38A	Ethernet (TCP/IP) interface

- **LED display**

For details on the LED mounting locations and LED tables, see Section 2.3.5.

- **Setting adjustments**

Only one setting location (TH1) is provided. It is located as shown in the figure above.

TH1 : Set this pin to A. This pin is factory–set to A.

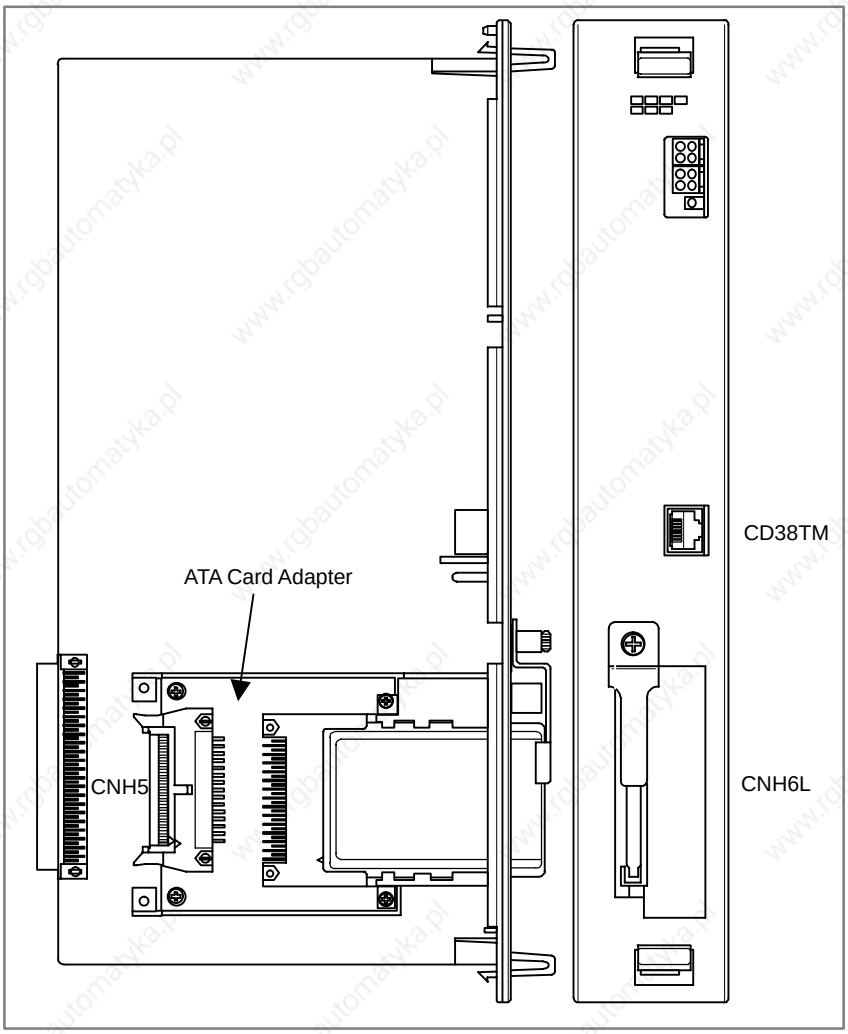
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2.3.7 Fast Data Server for Stand–Alone Type CNC

- **Specification**

Name	Specification	Remarks
Fast data server	A16B–3200–0462	
ATA Card Adapter	A20B–2100–0500	

- **Mounting locations of connector, LEDs, and etc.**



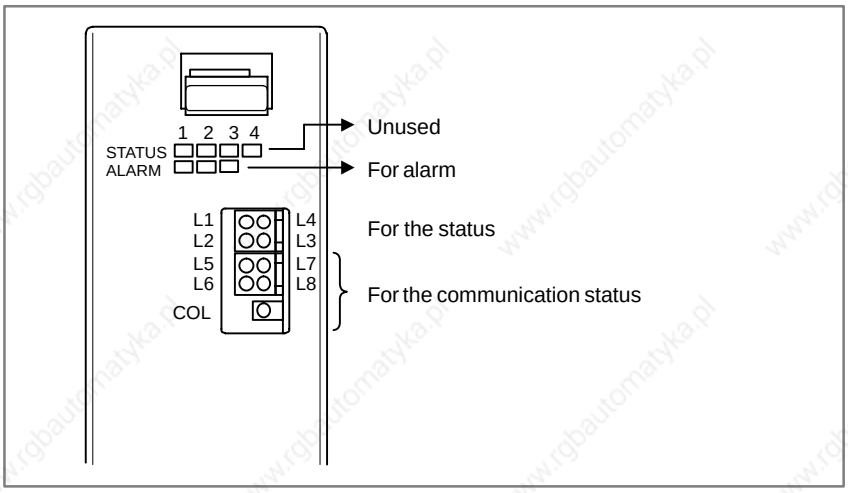
NOTE
The Fast data server consists of a Fast Ethernet board and ATA card adapter.
The ATA Card Adapter is mounted on the Fast data server. A flat cable is used for the connection between the adapter and the board.

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- **LED display**

The Fast data server for 15*i*–B incorporates the following LEDs: Four green STATUS LEDs and three red ALARM LEDs for indicating the status. Four 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



- **LED lighting sequence at power on**

No.	LED indication (L1 through L4)	Data server board state
1	○ ○ ○ ○	Power off
2	● ● ● ●	Initial state after power on
3	○ ● ● ●	MPU initialized.
4	○ ● ○ ●	Firmware downloaded.
5	○ ● ○ ○	Control migration to OS
6	● ○ ● ●	OS PHASE1
7	○ ○ ● ●	OS PHASE2
8	● ○ ○ ●	OS PHASE3
9	○ ○ ○ ●	OS PHASE4
10	☆ ○ ○ ○	Startup completed.

The system enters the No.10 status when the Fast Ethernet board starts normally. This status is maintained until an error occurs.

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- **STATUS LED indications if an error occurs (LEDs L1 through L4)**

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		Fast Ethernet/Fast data server state	
	LONG 1 2 3 4	SHORT 1 2 3 4		
1	○● ○●	●○ ●○	Failure caused by Fast data server	SDRAM paruty 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 1 2 3	Data server board state
1	□■■	A bus error occurred on the Fast data server.
2	□■■	Parity error occurred in memory.

- **LED indications related to communication status**

Communication status (LEDs L5 through L8)

No.	LED indication	Communication status
1	●◇ ◇◇	Lights when a connection is made with 100BASE–TX.
2	◇◇ ●◇	Lights when data is received.
3	◇◇ ◇●	Lights when data is received.
4	◇● ◇◇	Lights when the Fast data server is successfully connected to the hub.

Communication status (COL LED)

No.	LED indication	Communication status
1	●	Lights if a data collision occurs.

COL: This LED lights frequently if there is excessive traffic on the communication line or if there is excessive peripheral electrical noise.

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- **Setting pins**

On the board, the setting pins (TM3, TM4) are installed. Connect each jumper plug to side A (factory–set state). Do not remove a jumper plug, and do not change the setting of a jumper plug. Otherwise, the board does not operate normally.

2.3.8 HSSB Interface Board

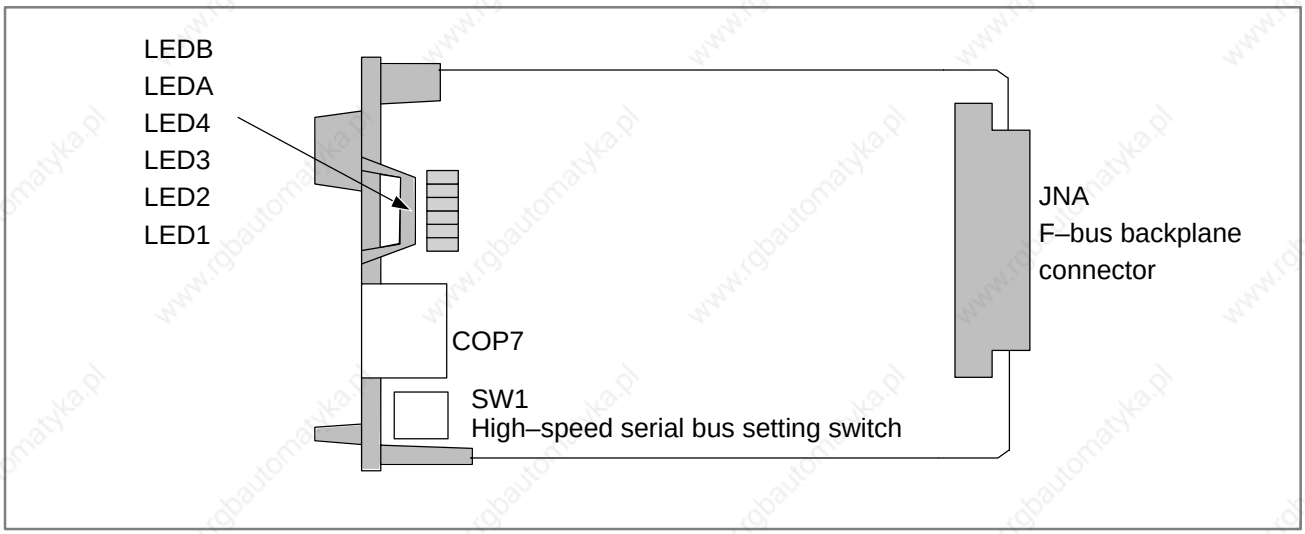
- **Specification**

Name	Specification
HSSB interface board	A20B–8001–0730

- **Board mounting location**

The board is mounted in the mini slot.

- **Mounting locations of connector, LEDs, and etc.**



Connector number	Application
COP7	High–speed serial bus (HSSB) interface

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- **LED display**

Status displayed by the red LEDs □ Off ■ On

LEDB	■	HSSB communication is suspended.
LEDA	■	A RAM parity alarm condition has occurred in the common RAM on the board.

Status displayed by the green LEDs □ Off ■ On

4 3 2 1	Status
■ ■ ■ ■	This indicates the status immediately after power–on.
■ ■ ■ □	The HSSB board is being initialized.
■ ■ □ ■	The CNC is waiting for the PC to be booted.
■ ■ □ □	The contents of the CNC screen are displayed on the PC screen.
■ □ □ □	The startup process has been completed successfully and normal operation is being performed.
□ ■ ■ □	A thermal error is detected by the thermal component in the CNC display unit with PC functions.
□ ■ □ ■	HSSB communication is suspended.
□ ■ □ □	A parity alarm condition has occurred in the common RAM.
□ □ ■ ■	A communication error has occurred.
□ □ ■ □	A battery alarm condition has occurred in the CNC display unit with PC functions.

- **Setting adjustments Rotary switch SW1 setting (for connection for to the PC)**

With the rotary switch SW1 on the board, the starting sequence at power–up can be changed.

SW1 setting	Description
0	Setting for maintenance purposes The starting menu is displayed, enabling you to boot or start IPL from the PC.
1	Setting for normal operation The start menu is not displayed, such that you cannot boot or start IPL from the PC.
2	While the PC is not connected or is not alive, the CNC alone can be started and operated. (For this operation, a display unit, MDI, and operator's panel intended for the CNC are needed.) With this setting, the start menu is not displayed even if the PC is connected and is alive. Booting or IPL cannot be performed from the PC. If software for Windows95, WindowsNT4.0, or Windows2000 is installed on the PC, this setting allows just the PC or CNC to be turned on or off. In the case of multi–connection, in which multiple CNC units are connected to a single PC, this setting is usually selected.

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- **Setting adjustments Rotary switch SW1 (for connecting an CNC display unit with PC functions)**

With the rotary switch SW1 on the board and the setting pin SW5 on the CNC display unit with PC functions, the starting sequence at power–up can be changed.

Rotary switch SW1 setting	Setting pin SW5 setting	Description
0	Open	Setting for maintenance purposes The start menu is displayed, and booting or IPL can be performed from the CNC display unit with PC functions.
1	Open	Setting for normal operation The start menu is not displayed. Booting or IPL cannot be performed from the CNC display unit with PC functions.
2	Shorted	The CNC and the CNC display unit with PC functions will be started independently of each other without handshaking. – CNC – Even if the CNC display unit with PC functions is not connected or turned on, it is possible to start the CNC only and operate it. (Its operation requires a display dedicated to the CNC, an MDI, an operator panel, and others.) – Even if the CNC display unit with PC functions is connected and turned on, the start menu is not displayed. – CNC display unit with PC functions – Even if the CNC is not connected or turned on, it is possible to start the CNC display unit with PC functions only and operate it. – The temperature control function of the CNC display unit with PC functions does not operate. Make sure that the CNC display unit with PC functions is in the recommended operating temperature range before using it. – Even if the CNC is connected and turned on, the start menu is not displayed. It is not possible to perform boot and IPL operations from the CNC display unit with PC functions. During normal operation, this setting is disabled. Use this setting during maintenance only.

NOTE
For the location of the setting pin SW5 of CNC display unit with PC functions, see the Section 2.15.2.

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2.3.9 PMC C Board

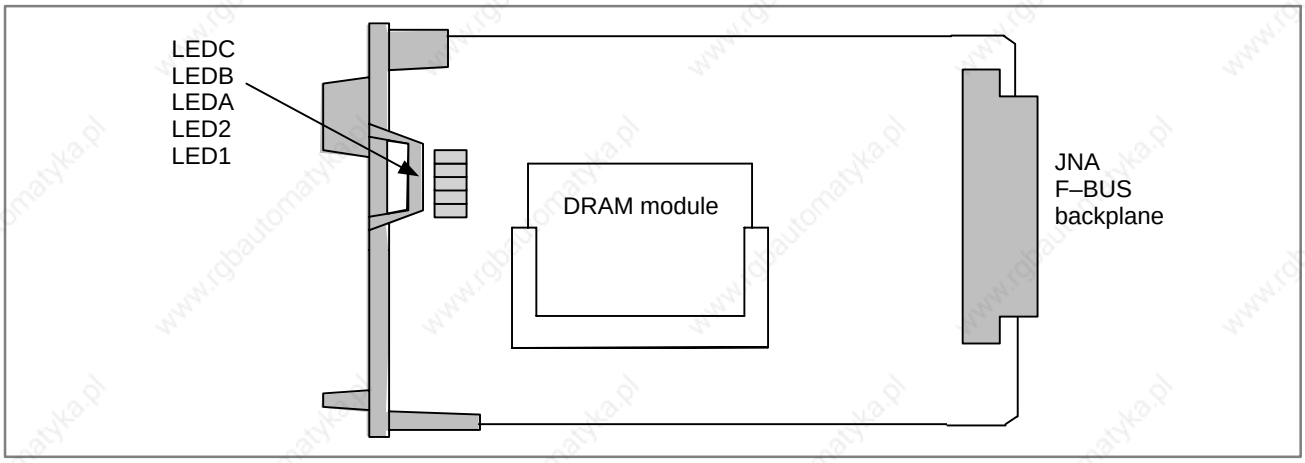
- **Specification**

Name	Specification
PMC C board	A20B–8100–0330

- **Board mounting location**

The board is mounted in the mini slot.

- **Mounting locations of connector, LCDs, and etc.**



- **LED display**

Red LED alarm display ☐ Off ■ On

C B A	Alarm
☐ ☐ ■	CPU reset state (immediately after power–on)
■ ■ ☐	A DRAM parity error occurred.
☐ ■ ☐	A bus error occurred in the CPU on this board.
■ ☐ ☐	An error occurred on the local bus on this board.

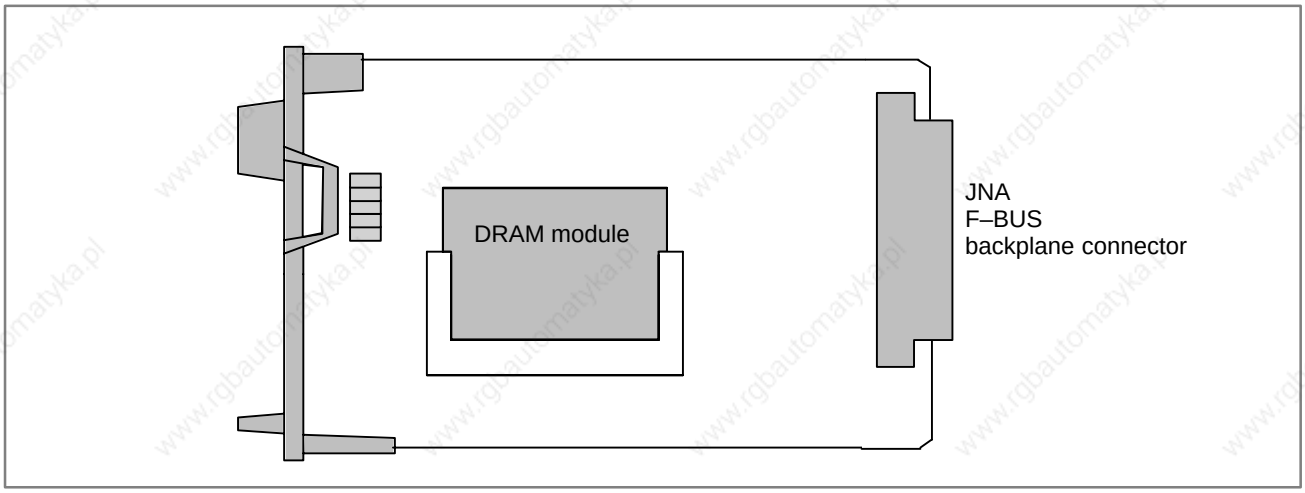
Green LED status display

☐ Off ■ On ★ Blink ★☆ On and blink alternately

2 1	Status
■ ■	CPU reset state (immediately after power–on)
■ ☐	Initialization is in progress.
☐ ■	Initialization is in progress, and the execution of a C program has started.
☐ ☐	Steady state
★ ★	An error occurred at a location other than this board.
★ ☐	A DRAM parity error occurred.
★ ☆	An error occurred on this board.

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- **Module mounting location**



Module name	Specification
DRAM module	A20B–3900–0042

- **Setting adjustments** No setting adjustment is required.

2.3.10 Serial Communication Boards A1 and A2

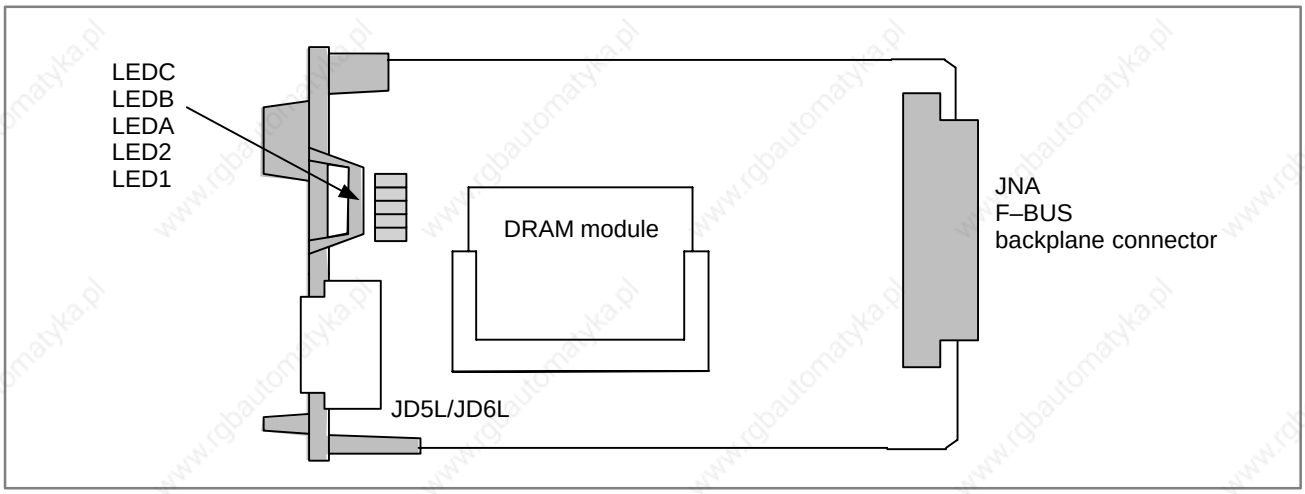
- **Specification**

Name	Specification
Serial communication board A1 (R.B./DNC2: RS–232C interface)	A20B–8100–0334
Serial communication board A2 (R.B./DNC2: RS–422 interface)	A20B–8100–0335

- **Board mounting location** The board is mounted in the mini slot.

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- **Mounting locations of connector, LCDs, and etc.**



Connector number	Specification
For serial communication board A1: JD5L	RS232C I/F
For serial communication board A2: JD6L	RS422 I/F

- **LED display**

Red LED alarm display ☐ Off ■ On

C B A	Alarm
☐ ☐ ■	CPU reset state (immediately after power–on)
■ ■ ☐	A DRAM parity error occurred.
☐ ■ ☐	A bus error occurred in the CPU on this board.
■ ☐ ☐	An error occurred on the local bus on this board.

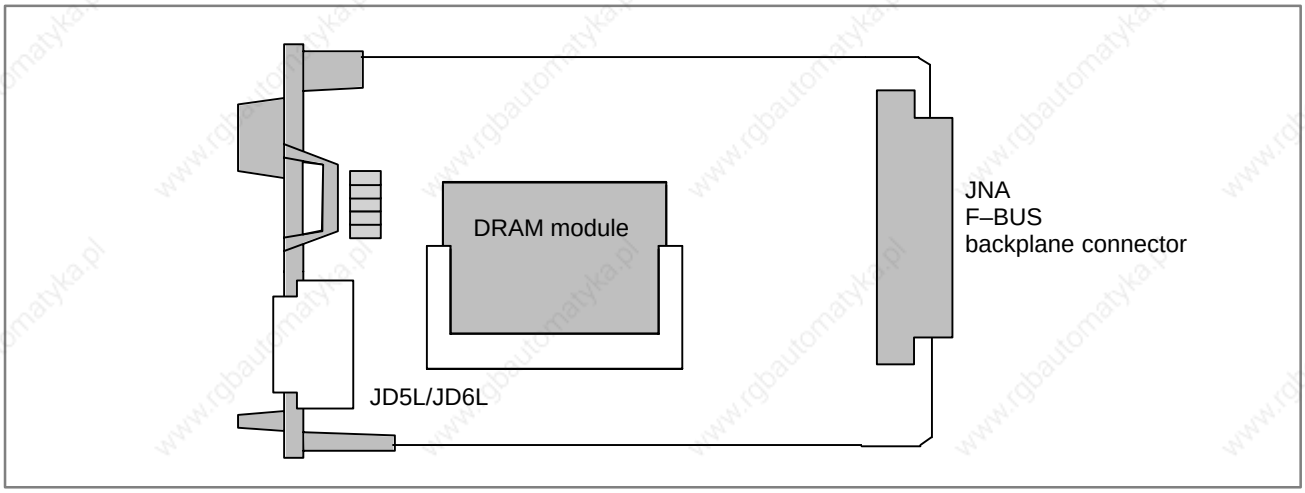
Green LED status display

☐ Off ■ On ★ Blink ★☆ On and blink alternately

2 1	Status
■ ■	CPU reset state (immediately after power–on), or state waiting for close processing by the CNC after accepting a stop request for a cause such as a reset, alarm, or program end.
☐ ☐	State waiting for the completion of initialization of all modules during power–on processing
☐ ■	Idle state waiting for a request (command) from the CNC
■ ☐	State in which a request (command) from the CNC has been accepted and is being executed
☐ ★	The contents of the DRAM on this board could not be read correctly. (Code area check error)
★ ☐	An NMI was generated in a module other than this board.
★ ☆	An error occurred. When this LED display is provided, a system alarm is output to the screen.

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- **Module mounting location**



Module name	Specification
DRAM module	A20B–3900–0042

- **Setting adjustments** No setting adjustment is required.

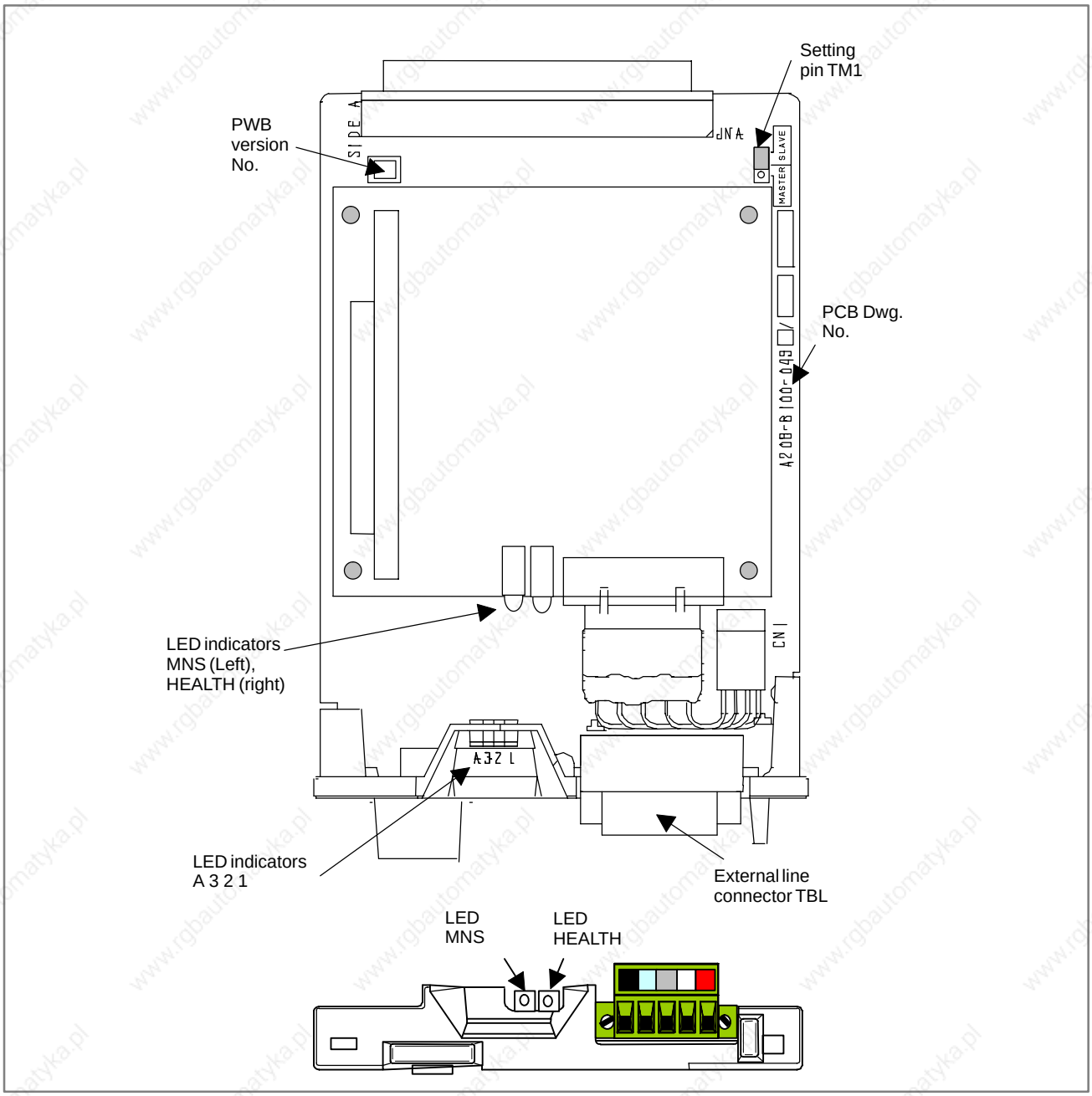
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2.3.11 DeviceNet Board B

- **Specification**

Name	Specification
DeviceNet slave board B	A20B–8100–0491

- **Mounting locations of connectors, LEDs, and etc.**



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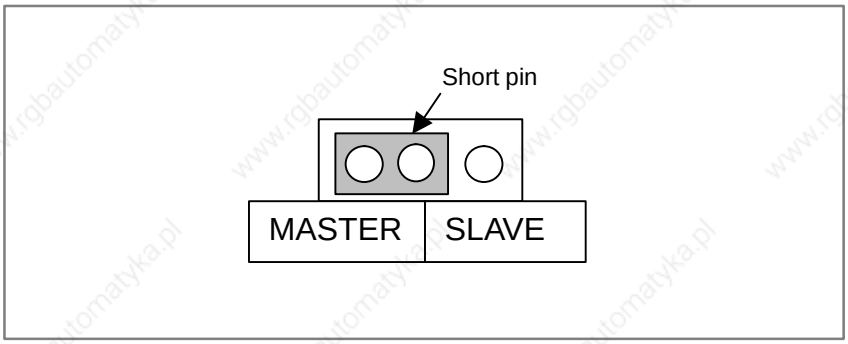
- **LED display**

This board has four statuOuts indicator LEDs (3 green, 1 red), and two LEDs that light in both the red and green colors on the internal daughter board. The table below describes the functions of these LEDs.

Name	Color	Meaning
LED1 to 3	Green	These LEDs indicate whether the DeviceNet board is a master board or a slave board. These LEDs go out when the power is turned ON. | | LED1 | LED2 | LED3 | | Master board | Lit | Out | Out | | Slave board | Lit | Lit | Out |
LEDA	Red	This LED lights when an error occurs on the internal daughter board, and goes out when the power is turned ON. When this LED lights, replace the DeviceNet board.
MNS	Red/Green	The LED indicates the DeviceNet module/network status. This LED indicates whether or not the DeviceNet board power is turned ON, and whether DeviceNet communications is being performed normally. For details of the meaning of the lit states of this LED, refer to the Specifications Manual issued by ODVA.
HEALTH	Red/Green	This LED indicates the status of the daughter board. It lights red after the power is turned ON. When the firmware is loaded to the internal daughter board, it lights green. It lights red if a failure occurs on the daughter board. If the LED lights red, replace the DeviceNet board.

- **Short Pin TM1**

This board has a 3–pin short pin TM1. TM1 indicates whether that board is used for DeviceNet slave functions or DeviceNet master functions.



Placing the jumper over MASTER causes this board to be used as the master for the DeviceNet.Usually, this jumper is set appropriately at a FANUC factory before delivery. Do not, therefore, change the setting.

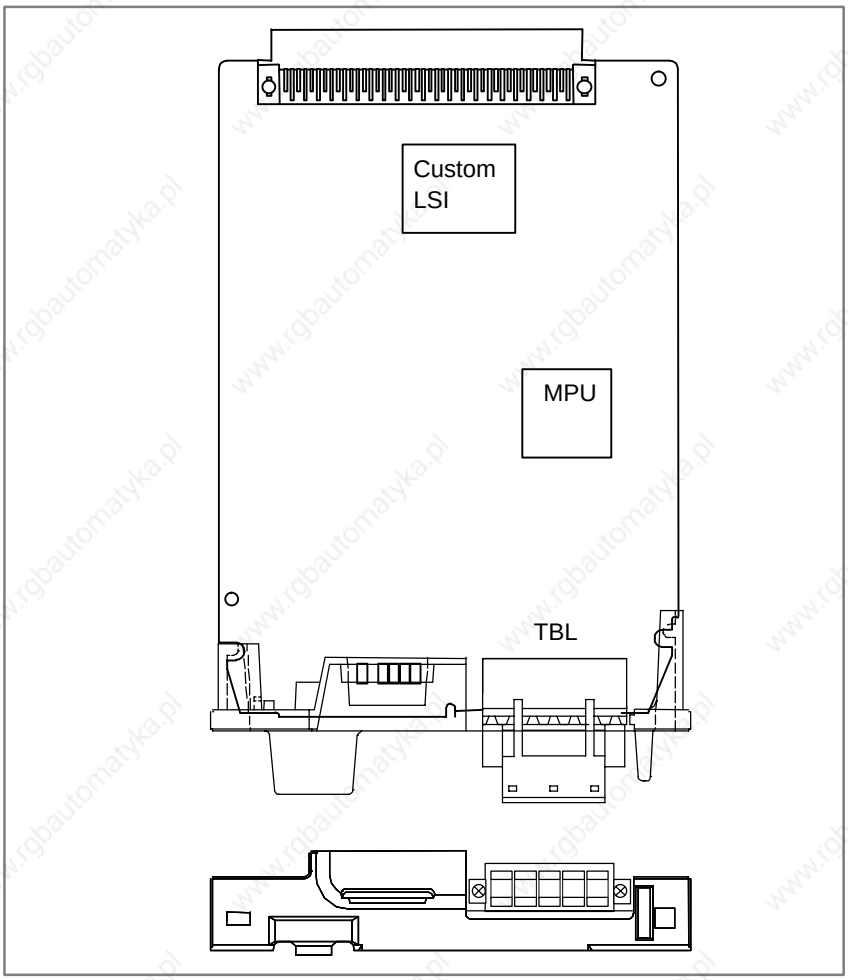
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2.3.12 DeviceNet Slave Board C

- **Specification**

Name	PCB DRW number	Remarks
DeviceNet slave board C	A20B–8100–0650	

- **Mounting locations of connectors, LEDs, and etc.**



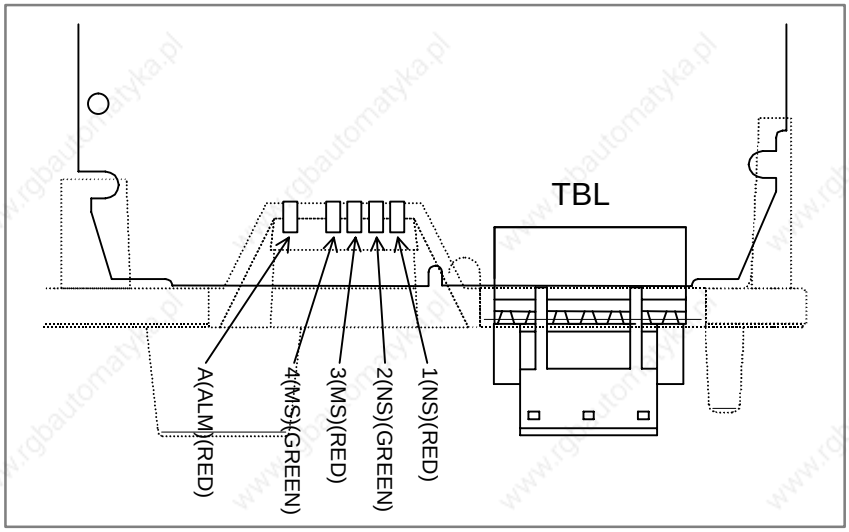
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LED display

This board has five status indicator LEDs (2 green (MS, NS), 3 red (ALM, MS, NS).

The locations of the indicator LEDs and their definitions are explained below.
In the following descriptions, the states of the indicator LEDs are represented as follows:

□ : Off ■ : On ☆ : Blinking ★ : Don't care



NOTE
The face plate is indicated using dotted lines.

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Status LED indicators

See FANUC DeviceNet Board Operator's Manual (B–63404EN) for details.

ALM

No.	LED indicator ALM (RED)	Board status
1	■	The board is reset, or an error has been detected on the board.

MS (This is a modular status LED of the DeviceNet. Refer to the specification document issued by ODVA.)

No.	LED indicator MS(GREEN),(RED)	Board status
1	■ □	The board is running normally.
2	☆ □	Not all parameters and the like are specified correctly. Re–specify them correctly.
3	□ ☆	
4	□ ■	The printed circuit board is faulty. (A ROM, DPRAM, or RAM error occurred.)
5	☆ ☆	Self–diagnosis is in progress.

NS (This is a network status LED of the DeviceNet. Refer to the specification document issued by ODVA.)

No.	LED indicator NS(GREEN),(RED)	Board status
1	□ □	The communication link is not on–line.
2	☆ □	The communication link is on–line, but no connection has been established.
3	■ □	The communication link is on–line, and a connection has been established.
4 (Note)	□ ☆	The connection is in the time–out state.
5 (Note)	□ ■	A network error was detected which disabled communication. (Duplicate node address or BUS–OFF error)
6 (Note)	☆ ☆	The board has detected a network access error, is in the Communication Faulted state, and has received an Identify Communication Faulted request.

NOTE

Error Nos. 4 to 6 are errors on the network. Check the following:

– Settings (such as parameter settings) of each device on the network
– Connection to the network
– Devices (to see if there are faulty ones)

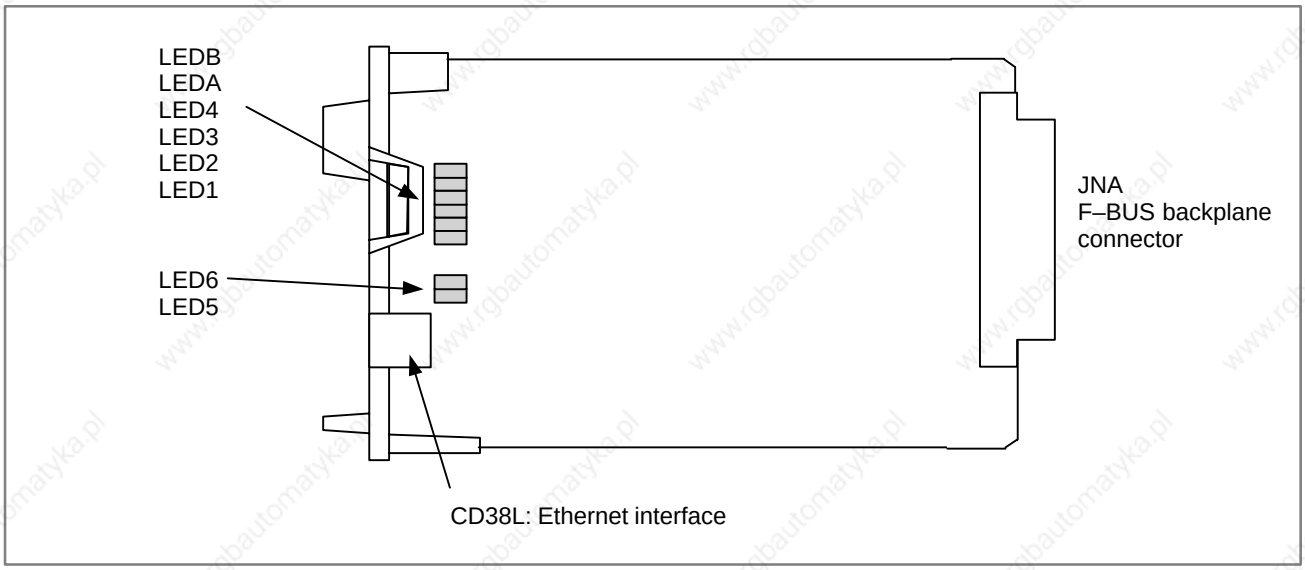
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2.3.13 Ethernet Board

- **Specifications**

Name	Code
Ethernet Board	A20B–8100–0450

- **Mounting positions of connectors, LEDs, etc.**



- **LED display**

- Status transition at power–up, displayed the green LEDs.

No.	4 3 2 1	Ethernet board status
1	□ □ □ □	Power off
2	■ ■ ■ ■	Initial state immediately after power–up
3	■ ■ ■ □	MPU initialization completed
4	■ ■ □ □	Control transferred to OS
5	■ □ □ □	OS PHASE1
6	□ ■ ■ ■	OS PHASE2
7	□ ■ ■ □	OS PHASE3
8	□ ■ □ ■	OS PHASE4
9	□ ■ □ □	OS PHASE5
10	□ □ □ ☆	Start–upcompleted

If the board has normally started up, the LEDs display the pattern of No.10. The LEDs keep this pattern until an error occurs.

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- **STATUS LED display (green) when an error occurs**

The STATUS LED alternately displays the LONG and SHORT patterns. The LONG patterns are displayed long, and the SHORT patterns are displayed short.

LED display (STATUS)		Ethernet board status	
LONG	SHORT		
4 3 2 1	4 3 2 1		
■ □ □ □	□ □ □ ■	Failure in Ethernet board	Reset
■ □ □ □	□ □ ■ □		General machine check exception, bus error, address error, etc.
■ ■ □ □	□ □ □ ■		DRAM Parity
■ ■ □ □	□ □ ■ □	Failure in another board	Other NMI

NOTE
If the LONG and SHORT patterns which are not listed above are repeatedly displayed, contact FANUC.

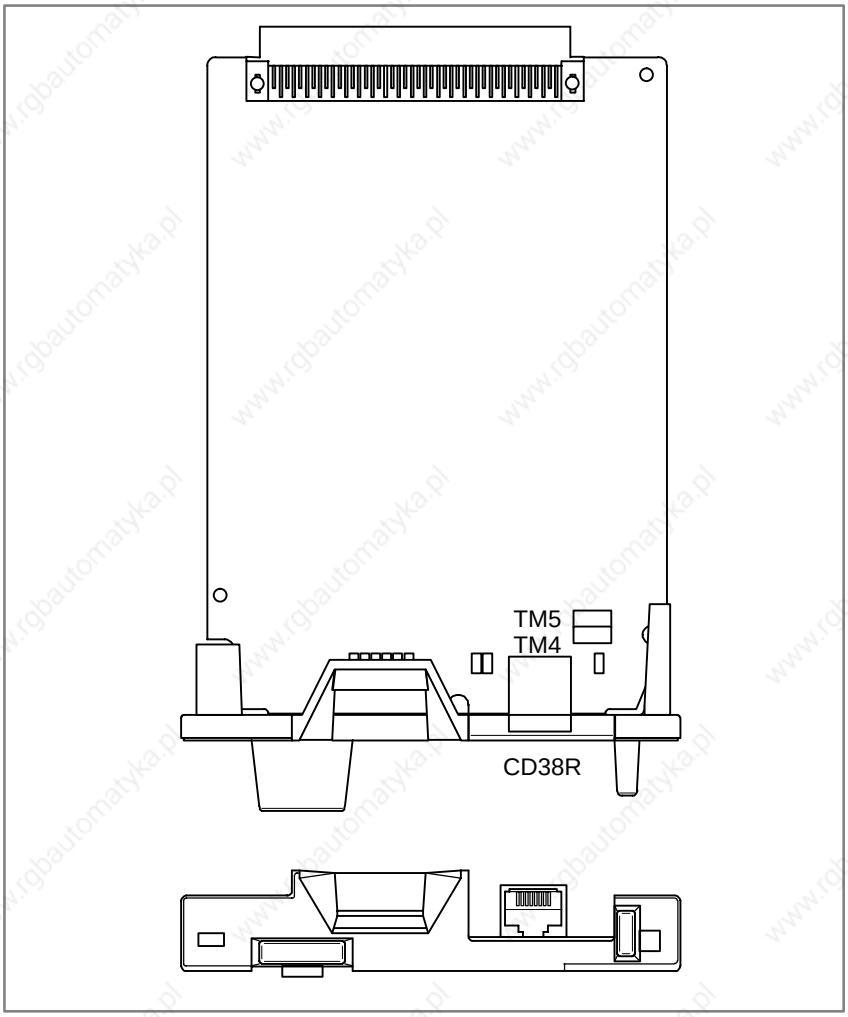
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2.3.14 Fast Ethernet Board for Stand–Alone Type CNC

- **Specification**

Name	Specification	Remarks
Fast Ethernet board	A20B–8100–0670	

- **Mounting position of connector, LCDs, and etc.**

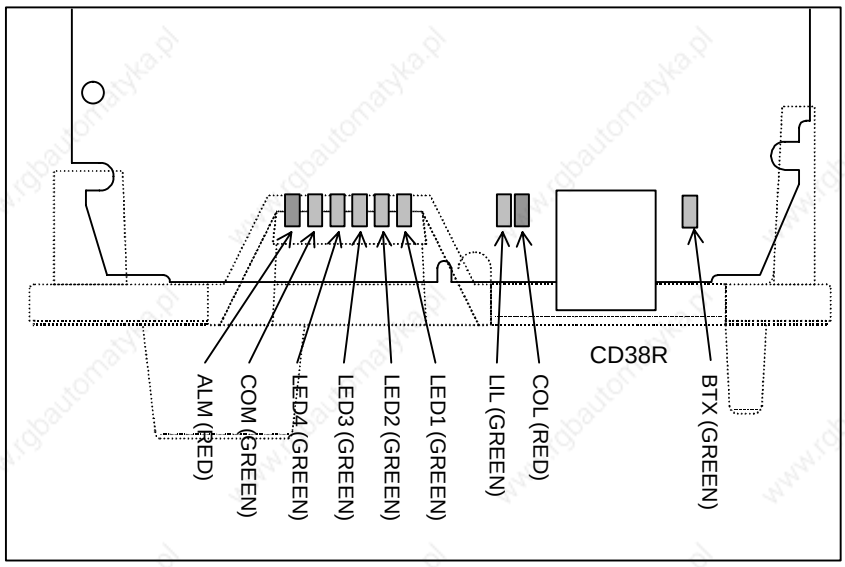


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● LED indications

The Fast Ethernet board for the Stand–alone type CNC has the following LEDs: Four green STATUS LEDs and one red ALARM LED for indicating the status. Two 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



The dashed lines indicate the faceplate.

No.	LED indication	Fast Ethernet 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 □□□☆	Start–up completed

The system enters No.10 status when the Fast Ethernet board starts up 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		Fast Ethernet/Fast data server state	
	LONG 1 2 3 4	SHORT 1 2 3 4		
1	■ ■ □ □	□ □ ■ ■	Failure caused by this board	SDRAM paruty 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	Fast Ethernet board state
1	ALM ■	Parity error occurred in main memory.

- **LED indications related to communication status**

No.	LED indication	Fast Ethernet communications status
1	COM ■	Lights when data is sent.
3	LIL ■	Lights when a connection is made correctly with the hub.
4	COL ■	Lights if a data collision occurs.
5	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 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.

- **Setting pins**

On the board, the setting pins (TM4, TM5) are installed. Connect each jumper plug to side A (factory–set state). Do not remove a jumper plug, and do not change the setting of a jumper plug. Otherwise, the board does not operate normally.

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- **Setting pins**

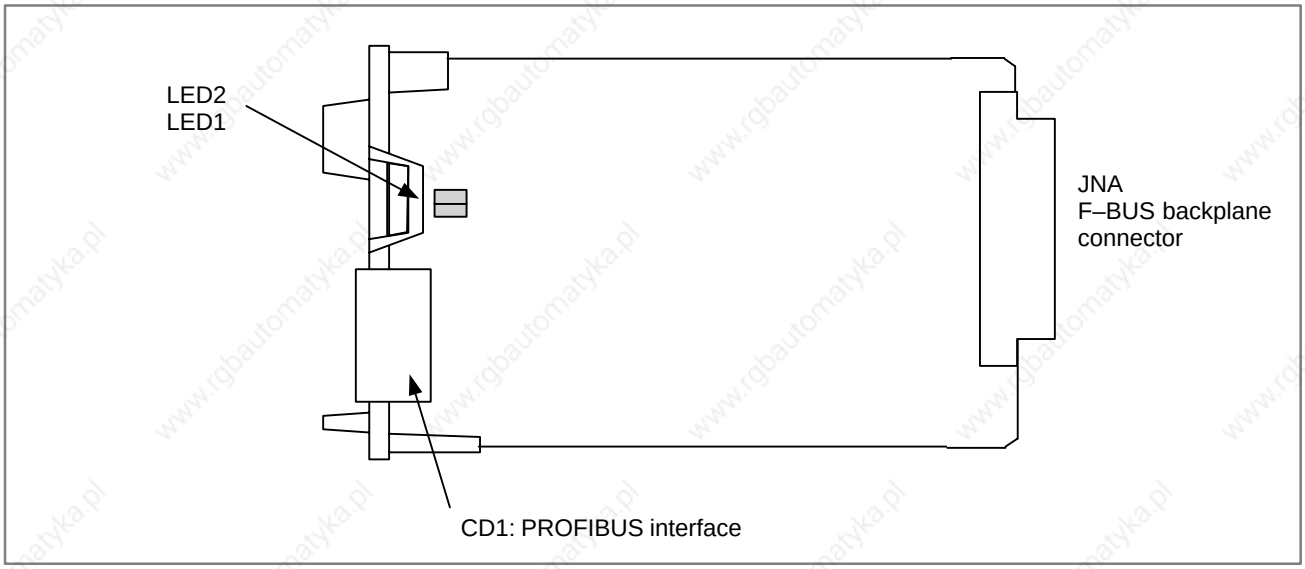
On the board, the setting pins (TM3, TM4) are installed. Connect each jumper plug to side A (factory–set state). Do not remove a jumper plug, and do not change the setting of a jumper plug. Otherwise, the board does not operate normally.

2.3.15 PROFIBUS–DP Board (Master)

- **Specifications**

Name	Code
PROFIBUS Board (master)	A20B–8100–0470

- **Mounting positions of connectors, LEDs, etc.**



- **LED display**

- Status LED display (green)

	State
LED1	Lit when this board is released from the reset state and starts operating. This LED is not lit at power–up.
LED2	Lit when the communication is normally performed. This LED is not lit at power–up.

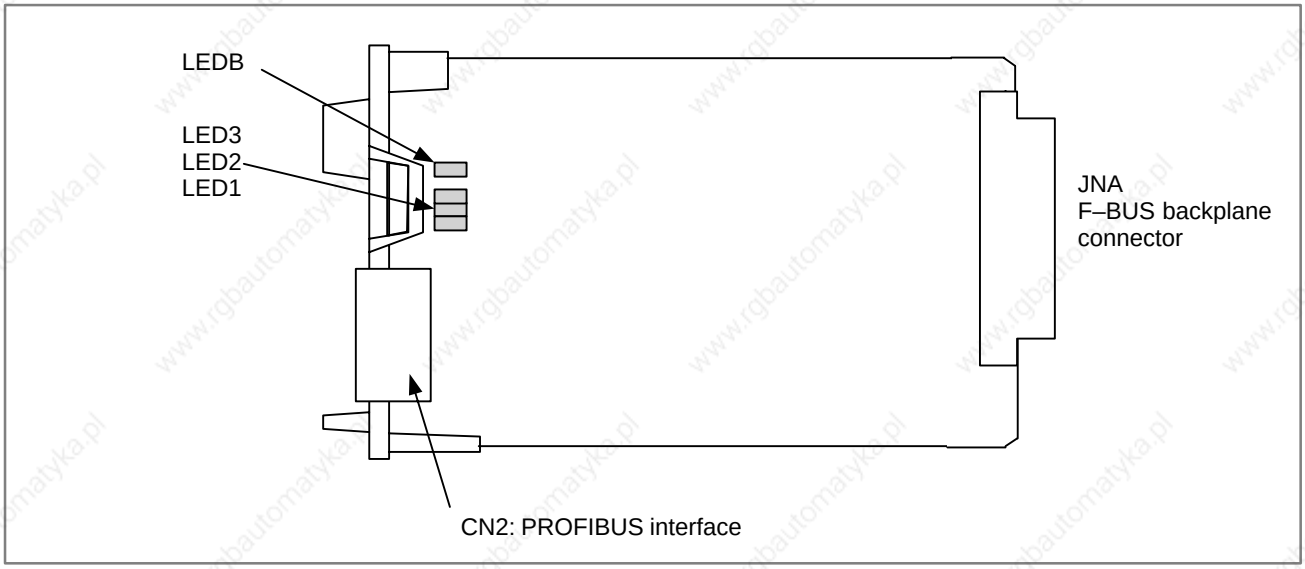
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2.3.16 PROFIBUS–DP Board (Slave)

- **Specifications**

Name	Code
PROFIBUS Board (slave)	A20B–8100–0440

- **Mounting positions of connectors, LEDs, etc.**



- **LED display**

- Status LED display (green)

	State
LED1	Lit when this board is released from the reset state and starts operating. This LED is not lit at power–up.
LED2	Lit when the communication starts. The LED is not lit at power–up. The LED is not lit also in the following cases: · When no parameter configuration data is received · When illegal parameter configuration data is received
LED3	Lit when the communication is normally performed. This LED is not lit at power–up.
LEDB	Lit when a RAM party alarm occurs on this board.

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2.4 LIST OF THE UNITS AND PRINTED CIRCUIT BOARDS

2.4.1 Basic Unit

Model	Name	Drawing number	Remarks
FS15*i*/150*i*	Basic unit	A02B–0261–C002	With 2 slots
		A02B–0261–C004	With 4 slots

2.4.2 Power Supply Unit

Model	Name	Drawing number	Remarks
FS15*i*/150*i*	Power supply unit	A16B–K2203–0370	

2.4.3 LCD Unit

Model	Name	Drawing number	Remarks
FS15*i*/150*i*	10.4″, color LCD unit Type A (without graphic display/touch panel)	A02B–0261–C101	With soft keys (10 + 2)
	10.4″, color LCD unit Type B (with graphic display/touch panel)	A02B–0261–C102	Without soft keys
	10.4″, color LCD unit Type AA (with graphic display, without touch panel, for connection to two units)	A02B–0265–C072	With soft keys (10 + 2)
	9.5″, monochrome LCD unit Type C (graphic display)	A02B–0261–C111	With soft keys (10 + 2)
	9.5″, monochrome LCD unit Type C (character display)	A02B–0261–C121	With soft keys (10 + 2)

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2.4.4 Stand–alone Type MDI Unit

Model	Name	Drawing number	Remarks
FS15*i*/150*i*	MDI unit with 56 keys (vertical type)	A02B–0261–C151#MCR	English keys
	MDI unit with 56 keys (horizontal type)	A02B–0261–C152#MCR	English keys
	MDI unit with 56 keys (vertical type)	A02B–0261–C151#MCS	Symbolic keys
	MDI unit with 56 keys (horizontal type)	A02B–0261–C152#MCS	Symbolic keys
	MDI unit with 61 keys (vertical type)	A02B–0261–C161#MCR	English keys
	MDI unit with 61 keys (horizontal type)	A02B–0261–C162#MCR	English keys
	MDI unit with 61 keys (vertical type)	A02B–0261–C161#MCS	Symbolic keys
	MDI unit with 61 keys (horizontal type)	A02B–0261–C162#MCS	Symbolic keys

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2.4.5 CNC Display Unit with PC Functions

2.4.5.1 CNC display unit with PC functions

- **Base unit**

Model	Name				Drawing number	Remarks (Parent specifications)
		LCD type	Soft key	Touch panel		
FS150*i*	Base unit A5	10.4”LCD	B	D	A08B–0082–D031	A13B–0193–B031 A13B–0193–B035
	Base unit A6		A	D	A08B–0082–D032	A13B–0193–B032 A13B–0193–B036
	Base unit A7		B	C	A08B–0082–D033	A13B–0193–B033 A13B–0193–B037
	Base unit A8		A	C	A08B–0082–D034	A13B–0193–B034 A13B–0193–B038
	Base unit B5	12.1”LCD	B	D	A08B–0082–D041	A13B–0193–B041 A13B–0193–B045
	Base unit B6		A	D	A08B–0082–D042	A13B–0193–B042 A13B–0193–B046
	Base unit B7		B	C	A08B–0082–D043	A13B–0193–B043 A13B–0193–B047
	Base unit B8		A	C	A08B–0082–D044	A13B–0193–B044 A13B–0193–B048
	Base unit C5	15.0”LCD	B	D	A08B–0082–D051	A13B–0193–B051 A13B–0193–B055
	Base unit C7		B	C	A08B–0082–D053	A13B–0193–B053 A13B–0193–B057

A: With soft keys, B : Without soft keys, C: With touch panel, D : Without touch panel

NOTE
The base unit for maintenance is the basic unit (conforming to the parent specifications) minus the main printed circuit board and its mounting screws.

- **Hard disk unit**

Model	Name	Drawing number	Remarks
FS150*i*	Hard disk unit (Including FAN for HDD)	A08B–0082–C100	A08B–0082–H100

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2.4.5.2 Other options for CNC display unit with PC functions

- **Stand–alone type FA full–keyboard**

Model	Name		Drawing number	Remarks
FS150 *i*	Separate type full–keyboard	For 10.4” LCD display type (A13B–0198–B031 to –B038)	A02B–0236–C131#EC	English
			A02B–0236–C131#JC	Japanese
		For 12.1” LCD display type (A13B–0193–B040 to –B048)	A02B–0236–C132#EC	English
			A02B–0236–C132#JC	Japanese
		For 15.0 LCD display type (A13B–0193–B051 to –B057)	A08B–0082–C150#EC	English
			A08B–0082–C150#JC	Japanese
		For 15.0 LCD display type (A13B–0193–B051 to –B057) Panch panel built–in	A08B–0082–C151#EC	English
			A08B–0082–C151#JC	Japanese

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- **Stand–alone type MDI unit**

Model	Name	Drawing number	Remarks
FS150*i*	MDI unit with 56 keys (vertical type) for 10.4″	A02B–0261–C153#MCR	English key
	MDI unit with 56 keys (horizontal type) for 10.4″	A02B–0261–C154#MCR	English key
	MDI unit with 56 keys (vertical type) for 10.4″	A02B–0261–C153#MCS	Symbolic key
	MDI unit with 56 keys (horizontal type) for 10.4″	A02B–0261–C154#MCS	Symbolic key
	MDI unit with 61 keys (vertical type) for 10.4″	A02B–0261–C163#MCR	English key
	MDI unit with 61 keys (horizontal type) for 10.4″	A02B–0261–C164#MCR	English key
	MDI unit with 61 keys (vertical type) for 10.4″	A02B–0261–C163#MCS	Symbolic key
	MDI unit with 61 keys (horizontal type) for 10.4″	A02B–0261–C164#MCS	Symbolic key
	MDI unit with 56 keys (vertical type) for 12.1″	A02B–0261–C155#MCR	English key
	MDI unit with 56 keys (horizontal type) for 12.1″	A02B–0261–C156#MCR	English key
	MDI unit with 56 keys (vertical type) for 12.1″	A02B–0261–C155#MCS	Symbolic key
	MDI unit with 56 keys (horizontal type) for 12.1″	A02B–0261–C156#MCS	Symbolic key
	MDI unit with 61 keys (vertical type) for 12.1″	A02B–0261–C165#MCR	English key
	MDI unit with 61 keys (horizontal type) for 12.1″	A02B–0261–C166#MCR	English key
	MDI unit with 61 keys (vertical type) for 12.1″	A02B–0261–C165#MCS	Symbolic key
	MDI unit with 61 keys (horizontal type) for 12.1″	A02B–0261–C166#MCS	Symbolic key

2.4.6 Data Server Hard Disk Unit

Model	Name	Drawing number	Remarks
FS15*i*/150*i*	Hard disk unit	A02B–0261–C174/A	

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2.4.7 Printed Circuit Boards of the Control Unit

Type	Name		Drawing number	ID	ID–2	Remarks
Master PCB	Main CPU board		A16B–3200–0400	EE		Mounted in slot 1
	Additional axis board		A16B–2203–0340	D8		Mounted in slot 3
Card PCB	CPU card		A17B–3300–0402	0A	BF	
	Axis control card		A20B–3300–0240	08		8 axes, One optical connector
			A20B–3300–0244	08		8 axes, Two optical connectors
			A20B–3300–0241	08		6 axes, One optical connector
			A20B–3300–0245	08		6 axes, Two optical connectors
			A20B–3300–0242	08		4 axes, One optical connector
			A20B–3300–0243	08		2 axes, One optical connector
DIMM module	FROM module	E	A20B–3900–0070	X7		16M
		D	A20B–3900–0071	X5		12M
		C	A20B–3900–0072	X3		8M
		B	A20B–3900–0073	X2		6M
	SRAM module	E	A20B–3900–0020	X5		3M
		D	A20B–3900–0060	X4		2M
		C	A20B–3900–0061	X3		1M
		B	A20B–3900–0052	X2		512K
		A	A20B–3900–0053	X1		256K
	DRAM module for serial communication board and C board		A20B–3900–0042	85		4MB

NOTE
X represents a character from 0 to 9 or from A to F.

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Type	Name		Drawing number	ID	Remarks
Option PCB	HSSB interface board	On CNC side	A20B–8001–0730	AA	Mounted in mini slot
		For 1 channel For ISA slot	A20B–8001–0583		On PC side
		For 2 channels For ISA slot	A20B–8001–0582		On PC side
		For 1 channel For PCI slot	A20B–8001–0961		On PC side
		For 2 channels For PCI slot	A20B–8001–0960		On PC side
	Data servo board	For HDD	A20B–8001–0510	FE	Mounted in wide mini slot
		For ATA card	A20B–8001–0511	FE	Mounted in wide mini slot
	ATA card interface board		A20B–2100–0500		Mounted on data server board
	Fast data server board		A16B–3200–0462	4E	Mounted in slot 2
	ATA card adapter		A20B–2100–0500		Mounted in fast data server board
	C language board		A20B–8100–0330	E0	Mounted in mini slot
	Serial communication board A1	RS232C I/F	A20B–8100–0334	E1	Mounted in mini slot
	Serial communication board A2	RS422 I/F	A20B–8100–0335	E1	Mounted in mini slot
	Ethernet board		A20B–8100–0450	E6	Mounted in mini slot
	Fast Ethernet board		A20B–8100–0670	96	Mounted in mini slot
	DeviceNet master board B		A20B–8100–0491	EF	Mounted in mini slot
	DeviceNet slave board C		A20B–8100–0650	BF	Mounted in mini slot
	PROFIBUS–DP board (master)		A20B–8100–0470	FC	Mounted in mini slot
	PROFIBUS–DP board (slave)		A20B–8100–0440	E3	Mounted in mini slot
Backpanel PCB	Backpanel		A20B–2002–0770		2 slots
			A20B–2002–0760		4 slots

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Type	Name		Drawing number	ID	Remarks
For LCD unit	LCD control PCB		A20B–8100–0415		
			A20B–8100–0630		For two LCD connection
	Display control card	10.4″ color	A20B–3300–0150		Graphics
		9.5″ monochrome	A20B–3300–0153		Graphics
			A20B–3300–0090		Characters only
	Inverter	10.4″ color	A20B–8001–0920		
		9.5″ monochrome	A20B–8002–0130		
	Touch panel interface		A20B–8001–0620		
	Soft key	10.4″ color	A86L–0001–0261 #A		
		9.5″ mono chrome	A20B–1007–0481		

Type	Name			Drawing number	Remarks (Parent specifications)
CNC display unit with PC functions	Main printed circuit board	Other OS than Windows95	For 10.4” LCD type	A20B–2100–0780	A13B–0193–B031 to –B034
			For 12.1” LCD type	A20B–2100–0781	A13B–0193–B041 to –B044
			For 15.0” LCD type	A20B–2100–0782	A13B–0193–B051 to –B053
		Windows95	For 10.4” LCD type	A20B–2100–0783	A13B–0193–B035 to –B038
			For 12.1” LCD type	A20B–2100–0784	A13B–0193–B045 to –B048
			For 15.0” LCD type	A20B–2100–0785	A13B–0193–B055 to –B057
	Inverter printed circuit board	For 10.4” LCD type		A14L–0132–0001 #B	A13B–0193–B031 to –B038
		For 12.1” LCD type		A14L–0143–0001 #B	A13B–0193–B041 to –B048
		For 15.0” LCD type		A14L–0143–0002 #B	A13B–0193–B051 to –B057
	Soft key printed circuit board	For 10.4” LCD type		A86L–0001–0261	
		For 12.1” LCD type		A20B–1007–0760	
	Touch panel controller printed circuit board			A20B–8001–0620	

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Type	Name			Drawing number	Remarks (Parent specifications)
CNC display unit with PC functions	PC card	MMX–Pentium 233MHz	For 10.4” LCD type	A08B–0082–H500#6141	A08B–0082–H010
			For 12.1” LCD type	A08B–0082–H500#6142	A08B–0082–H011
			15.0” LCD type	A08B–0082–H500#6143	A08B–0082–H012
		Celeron 400MHz	For 10.4” LCD type	A08B–0082–H512#613D	A08B–0082–H040
			For 12.1” LCD type	A08B–0082–H512#613E	A08B–0082–H041
			For 15.0” LCD type	A08B–0082–H512#613F	A08B–0082–H042
		PentiumIII 500MHz	For 10.4” LCD type	A08B–0082–H520#613G	A08B–0082–H050
			For 12.1” LCD type	A08B–0082–H520#613H	A08B–0082–H051
			For 15.0” LCD type	A08B–0082–H520#613J	A08B–0082–H052
	Main memory	For MMX–Pentium 233MHz	DRAM 32MB (*)	A76L–0500–0013 (Type: TOSHIBA THL64V4075BTG–5S)	A08B–0082–H001
			DRAM 64MB	A76L–0500–0014 (Type: TOSHIBA THL64V8015BTG–5S)	A08B–0082–H002
			DRAM 128MB	A76L–0500–0017 (Type: PFU PD–2261ADS)	A08B–0082–H003
		For Celeron 400MHz, PentiumIII 500MHz	SDRAM 64M	A76L–0500–0018 (Type: PFU PD–2261ACS)	A08B–0082–H004
			SDRAM 128M	A76L–0500–0019 (Type: PFU PD–2261ADSA)	A08B–0082–H005

(*) Main memory (DRAM 32MB) can be used with the MMX–Pentium only.

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Type	Name		Drawing number	Remarks
PCB connected via I/O Link	Operator's panel I/O module	Matrix input	A20B–2002–0470	
		1–to–1 input	A20B–2002–0520	With manual pulse generator interface
			A20B–2002–0521	Without manual pulse generator interface
	Connector panel I/O module	Basic module	A20B–2100–0150	
		Expansion module A	A20B–2100–0410	With manual pulse generator interface
		Expansion module B	A20B–2100–0411	Without manual pulse generator interface
		Expansion module C	A20B–2100–0320	2–A output module
		Expansion module D	A20B–2100–0190	Analog output module
	Connection unit 1		A20B–1005–0310	DI=96, DO=64
	Connection unit 2		A20B–1003–0200	DI=96, DO=64
	Operator's panel connection unit	Sink–type output A	A16B–2200–0661	DI=64, DO=32
		Sink–type output B	A16B–2200–0660	DI=96, DO=64
		Source–type output A	A16B–2200–0731	DI=64, DO=32
		Source–type output B	A16B–2200–0730	DI=96, DO=64
	Machine operator's panel interface unit		A16B–2201–0110	

2.4.8 Others

Name		Drawing number	Remarks
Separate detector interface unit	Basic 4 axes	A02B–0236–C205	Cerresponding to servo HRV3
	Additional 4 axes	A02B–0236–C204	
Connector panel I/O module	Basic module	A03B–0815–C001	
	Expansion module A	A03B–0815–C002	With manual pulse generator interface
	Expansion module B	A03B–0815–C003	Without manual pulse generator interface
	Expansion module C	A03B–0815–C004	2–A output module
	Expansion module D	A03B–0815–C005	Analog output module

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2.4.9 Maintenance Parts

Name		Drawing number	Remarks
Fan unit		A02B–0260–C021	Fan for basic unit
Fan unit for CNC display unit with PC functions		A08B–0082–K010	Fan for basic unit
Fan unit for CNC display unit with PC functions		A13B–0178–K001	Fan for 3.5” HDD
LCD backlight (for 9.5″ LCD)		A02B–0236–K114	
LCD backlight (for 10.4″ LCD)		A02B–0236–K116	
LCD backlight (for 12.1″ LCD)		A02B–0236–K117	
Fuse for power supply unit		A02B–0261–K111	
Fuse for LCD power		A02B–0265–K101	
Fuse for CNC display unit with PC functions		A02B–0236–K101	With 10.4” display
Fuse for CNC display unit with PC functions		A02B–0082–K001	With 12.1 or 15” display
Fuse for data server hard disk		A02B–0261–K121	
Fuse for operator’s panel I/O module power		A03B–0815–K001	
Fuse for connection panel I/O module power		A03B–0815–K002	
Fuse for connection unit 1 power		A02B–0072–K103	
Fuse for operator’s panel connection unit power		A02B–0163–K111	
Machine operator’s panel interface unit	Fuse	A02B–0120–K107	
	Relay terminal	A02B–0120–K341	
Battery (for CNC control unit and CNC display unit with PC functions)		A02B–0200–K102	One memory backup battery
External battery case for control unit		A02B–0236–C281	Without cells
For separate absolute pulse coder (when absolute pulse coder is used with separate detector interface)	Battery case	A06B–6050–K060	
	Battery	A06B–6050–K061	With four D–size alkaline dry cells
	Battery cable	A02B–0120–K809	5 m
For touch panel	10.4″ protective sheet	A02B–0236–K130	Replaceable protective sheet
	12.1″ protective sheet	A02B–0236–K118	Replaceable protective sheet
	15″ protective sheet	A02B–0082–K020	Replaceable protective sheet
	Pen	A02B–0236–K111	
Fuse for additional input unit power		A02B–0116–K102	
Fuse for separate detector interface unit		A02B–0261–K101	

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2.4.10 CNC Display Unit with PC Functions Maintenance Equipment

Name		Drawing number
Floppy disk	Drive	A02B–0207–C008(*3)
	Cable (1.0 meter long)	A02B–0207–K801
Full keyboard	101–key type	A86L–0001–0210
	106–key type	A86L–0001–0211
Mouse		A86L–0001–0212



***3:** When using a FANUC floppy disk drive for CNC display unit with PC functions, use a designated floppy disk drive. A combination with another FANUC floppy disk drive may not work.
The customer selects the floppy disk drive to be used for CNC display unit with PC functions.

2.4.11 Machine Operators Panel

Name	Drawing number	Remarks
Main panel A	A02B–0236–C230	
Main panel B	A02B–0236–C231	
Main panel A1	A02B–0236–C240	
Main panel B1	A02B–0236–C241	
Sub panel A	A02B–0236–C232	
Sub panel B	A02B–0236–C233	
Sub panel C	A02B–0236–C234	
Sub panel B1	A02B–0236–C235	
Adapter sheet metal A	A250–0892–T004	
Adapter sheet metal B	A250–0892–T005	
I/O board for main panel A,B,A1, or B1	A20B–8002–0020	

Maintenance parts

Name	Drawing number	Remarks
Fuse for main panel A,B,A1, or B1	A02B–0200–K104	Related current : 1A

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2.5 REPLACING THE PRINTED CIRCUIT BOARDS

WARNING

Only those personnel who have received approved safety and maintenance training may perform this replacement work.

Before opening the cabinet to replace a board, ensure that both the power to the CNC and the main power to the power magnetics cabinet are turned off. If only the CNC power is turned off, the servo unit may still be powered during the board replacement work, possibly causing damage to the board and peripheral units, as well as presenting the risk of electric shock to the user.

CAUTION

When replacing the printed circuit board, note the following:

(a) When demounting the board, be careful not to touch the semiconductor devices and other parts on the board.
(b) Ensure that the parts on the new board are correctly configured.
(c) Once the replacement work has been completed, adjust the board as necessary.
(d) Before replacing the power supply unit or main board (together with the mounted cards and modules), back up the data (such as parameters and programs) in the SRAM memory of the CNC to a media such as a memory card or floppy disk. Otherwise, the SRAM memory data may be lost during the replacement work.
(e) Reconnect any cables disconnected during the replacement work. If there is a chance of forgetting how the cables are connected, make a note before disconnecting them.

2.5.1 Replacing the Power Supply Unit, Main CPU Board, and Full–size Option Board

CAUTION

Before starting the replacement work, ensure that the main power to the control unit is turned off. The main board contains the battery–backed memory for data such as CNC parameters and programs. This data may be lost as a result of replacing the main board.

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2.5.1.1 Demounting the board

(1) Disconnect all the cables from the board. If any cable fouls the board as it is being pulled out, also disconnect that cable. (The battery cable of the main CPU board need not be disconnected.)

(2) Grip the two pulls.

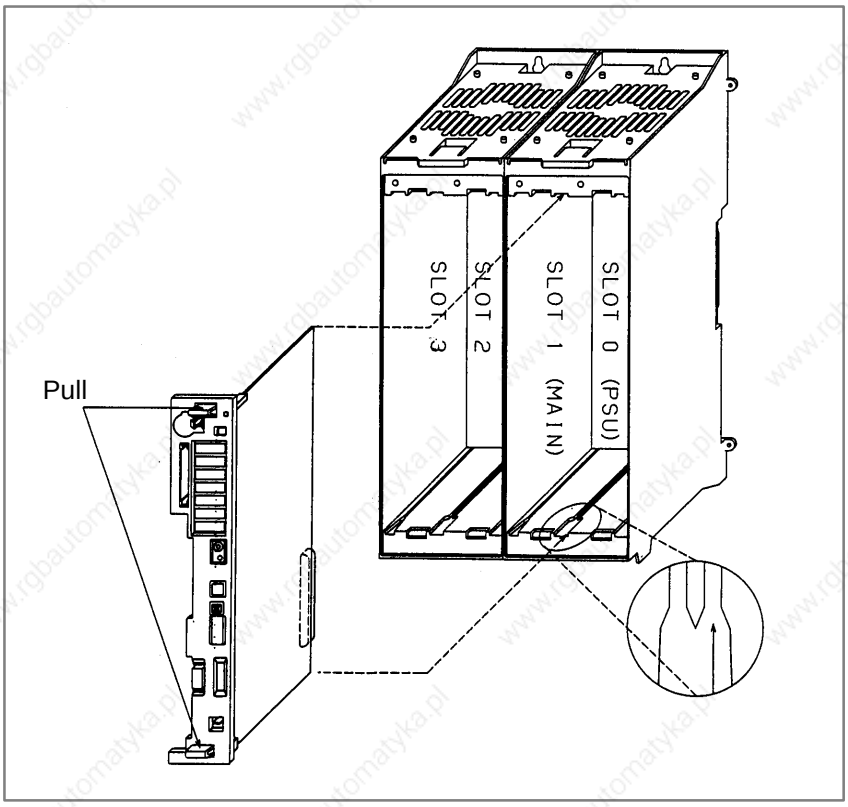
(3) While holding down the hooks in the pulls, pull the board towards you.

- The battery is pulled out together with the main CPU board, because it is mounted on a faceplate on the board.
- The main CPU board and full–size option board can be demounted without removing the mini slot option board. (If any cable connected to the mini slot option board fouls the option board as it is being pulled out, however, the cable must be disconnected.)

2.5.1.2 Mounting a board

(1) Mount a new board onto the rail on the rack, then slowly slide the board into the rack until it locks.
The main board slot (SLOT1) has two rails. Place the main board on the right rail.
The additional axis board slot (SLOT3) has two rails. Place an additional axis board on the left rail.

(2) Reconnect the cables.



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2.5.2 Replacing the Mini Slot Option Board and Wide Mini Slot Option Board

CAUTION
Before starting the replacement work, ensure that the main power to the control unit is turned off.

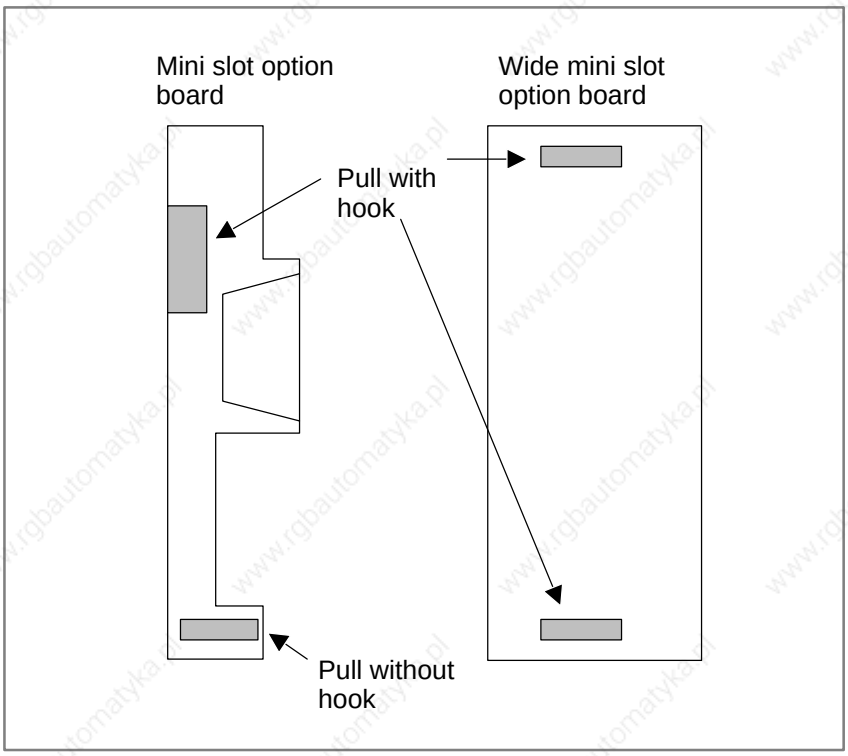
2.5.2.1 Demounting the board

(1) Disconnect all the cables from the board. If any cable fouls the board as it is being pulled out, also disconnect that cable.
(2) Grip the two pulls.
(3) While holding down the hooks in the pulls, pull the board towards you.

- The mini slot option board can be demounted without removing the main CPU board and full–size option board.
- The wide mini slot option board can be demounted without removing the power supply unit.

2.5.2.2 Mounting a board

(1) Place a new board on the rail on the rack, then slowly slide the board into the rack until it locks.
(2) Reconnect the cables.

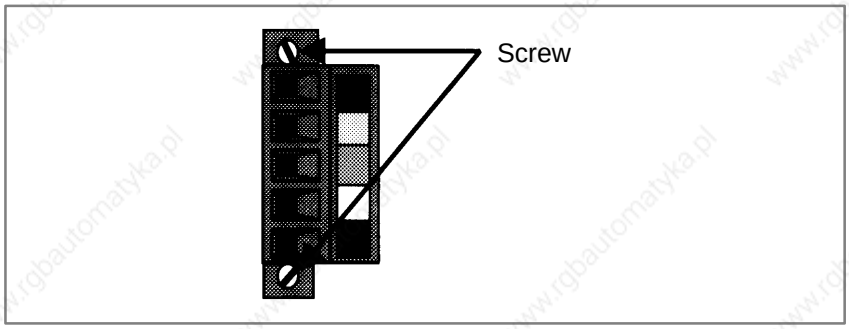


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2.5.3 Mounting and Removing the DeviceNet Board

2.5.3.1 Removing the board

(1) Remove the terminal block from the connector on the DeviceNet board. The terminal block can be pulled out after the screws on both sides are loosened. The terminal block can be removed with cables connected.



(2) Remove the main CPU board or additional axis board. The main CPU board or additional axis board can be removed after the terminal block of the DeviceNet connector is removed.

(3) While pressing the hook on the pull of the DeviceNet board, pull the board toward you.

NOTE
The DeviceNet board can be removed after the main CPU board or additional axis board is removed. If an attempt is made to pull out the DeviceNet board without removing the main CPU board, the printed board may be damaged.

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2.5.3.2 Mounting the board

(1) Before mounting the DeviceNet board, remove the main CPU board.

CAUTION
The DeviceNet board can be mounted after the main CPU board or additional axis board is removed. If an attempt is made to mount the DeviceNet board without removing the main CPU board or additional axis board, the printed circuit may be damaged.

(2) Remove the terminal block from the connector on the DeviceNet board. (See the removal procedure described above.)

(3) Mount the DeviceNet board in the cabinet without the main CPU board or additional axis board. Holding handles, insert the board into the cabinet until the connector on the back panel is connected.

(4) After mounting the DeviceNet board, mount the main CPU board or additional axis board.

(5) Mount the terminal block removed in (2) to the connector. Securely tighten the screws.

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2.6 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.

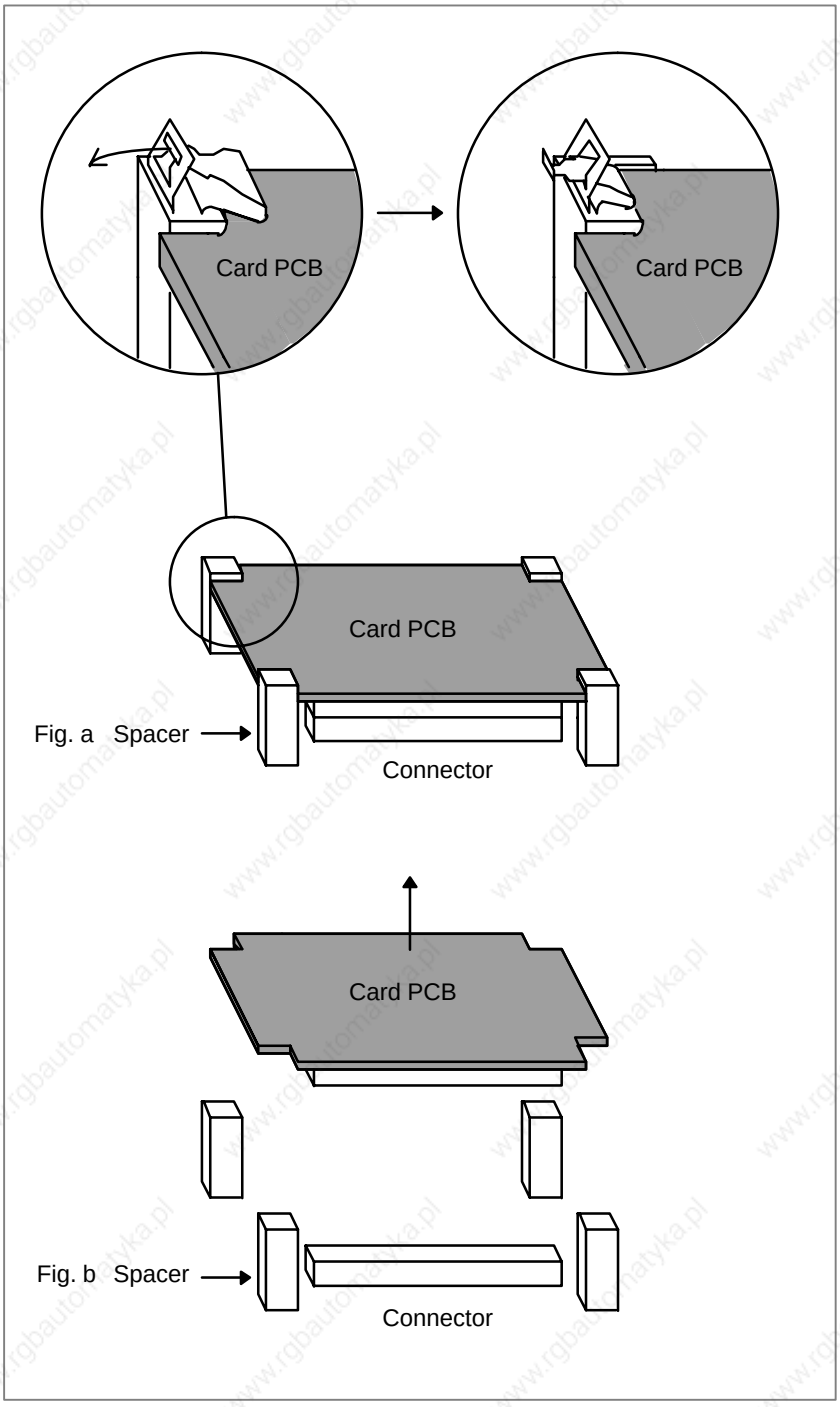
CAUTION

Before starting replacement work, back up the contents (such as parameters and programs) of the CMOS memory of the CNC. Otherwise, the contents of the CMOS memory may be lost during replacement work.

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2.6.1 Demounting a Card PCB

1) Pull outward the claw of each of the four spacers used to secure the card PCB, then release each latch. (See Fig. a.)
2) Extract the card PCB upward. (See Fig. b.)

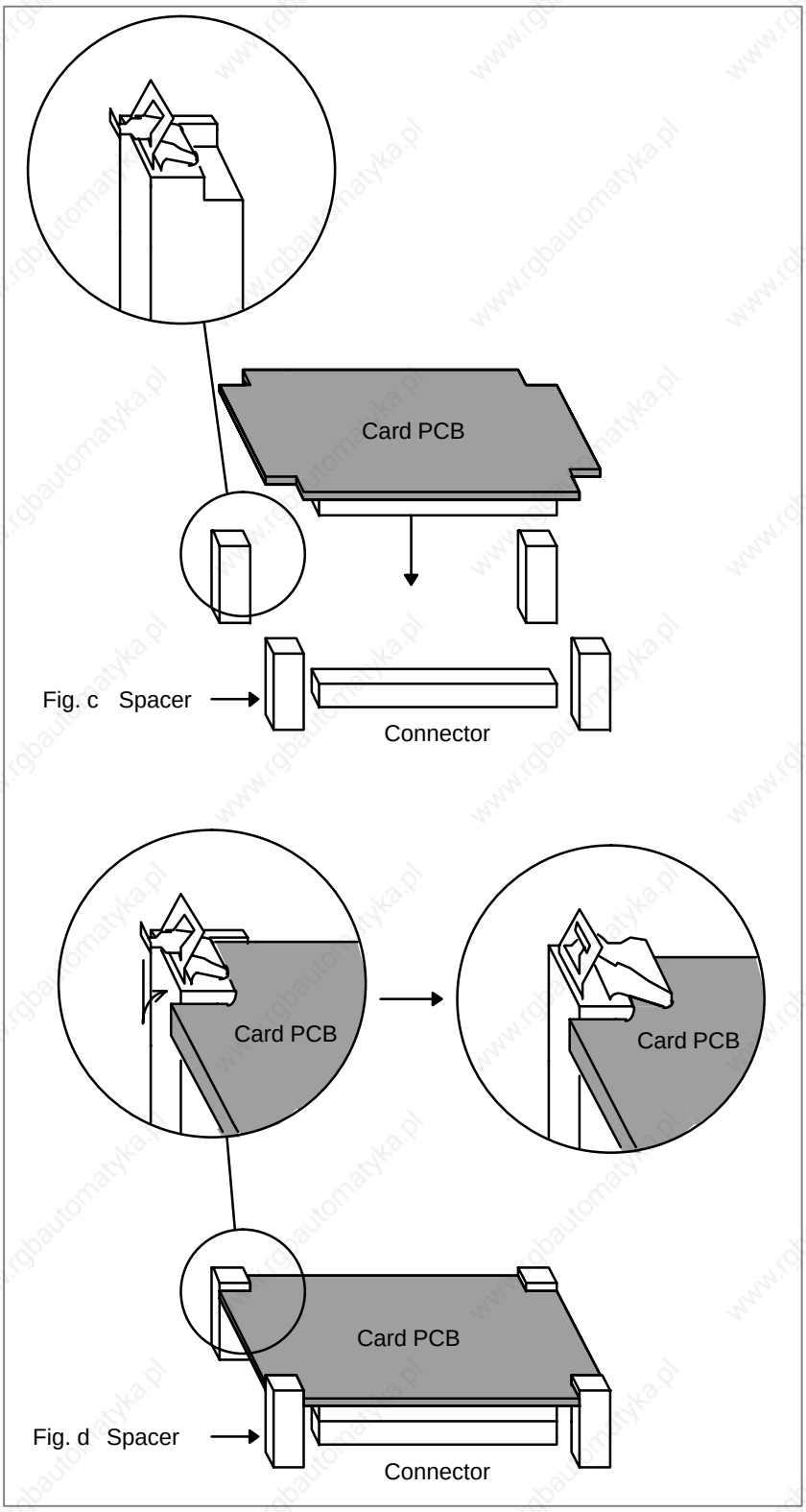


CAUTION
When pulling the card PCB upwards, hold the longer sides of the card PCB. If you hold the shorter sides, the card PCB may be damaged.

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2.6.2 Mounting a Card PCB

1) Check that the claw of each of the four spacers is latched outward, then insert the card PCB into the connector. (See Fig. c.)
2) Push the claw of each spacer downward to secure the card PCB. (See Fig. d.)



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2.7 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 contents (such as parameters and programs) of the CMOS memory of the CNC. Otherwise, the contents of the CMOS memory may be lost during replacement work.

Before replacing an SRAM module, be sure to back up the contents of the CMOS memory.

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2.7.1 Demounting a DIMM Module

1) Open the claw of the socket outward. (See Fig. a.)
2) Extract the module slantly upward. (See Fig. b.)

2.7.2 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.)

Fig. a

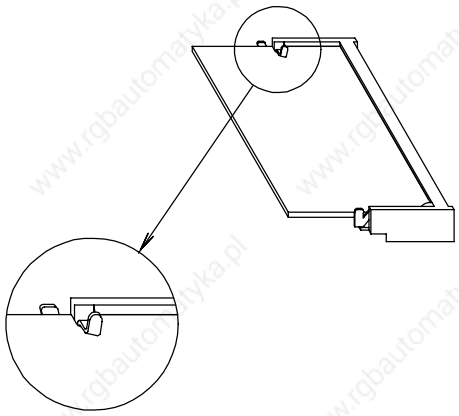


Fig. b

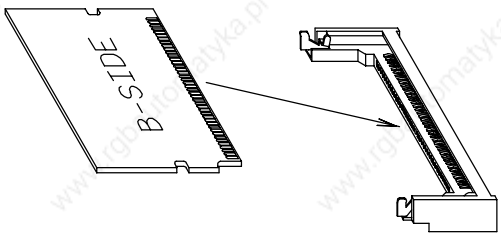
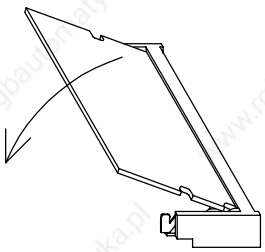


Fig. c



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2.8 REPLACING THE BACK PANEL

WARNING

Only those personnel who have received approved safety and maintenance training may perform this replacement work.

Before opening the cabinet to replace the board, ensure that both the power to the CNC and the main power to the power magnetics cabinet are turned off. If only the CNC power is turned off, the servo unit may still be powered during the board replacement work, possibly causing damage to the board and peripheral units, as well as presenting the risk of electric shock to the user.

CAUTION

When replacing the printed circuit board, note the following:

(a) Be careful not to touch the semiconductor devices and other parts on the board.

(b) Before demounting the power supply unit or main board (together with the mounted cards and modules), back up the data (such as parameters and programs) in the SRAM memory of the CNC to storage media, including memory cards and floppy disks. Otherwise, the SRAM memory data may be lost during the replacement work.

(c) Reconnect any cables disconnected during the replacement work. If there is a chance of forgetting how the cables are connected, make a note before disconnecting them.

2.8.1 Demounting the Back Panel

(1) Disconnect all the cables from the boards on the rack.

(2) Demount all the boards from the rack, as described in Section 2.5.

(3) Loosen the screws securing the top of the rack.

(4) Remove the screws securing the bottom of the rack. Slightly lift the rack, then remove it together with the top screws.

(5) Detach the fan connectors from the back panel.

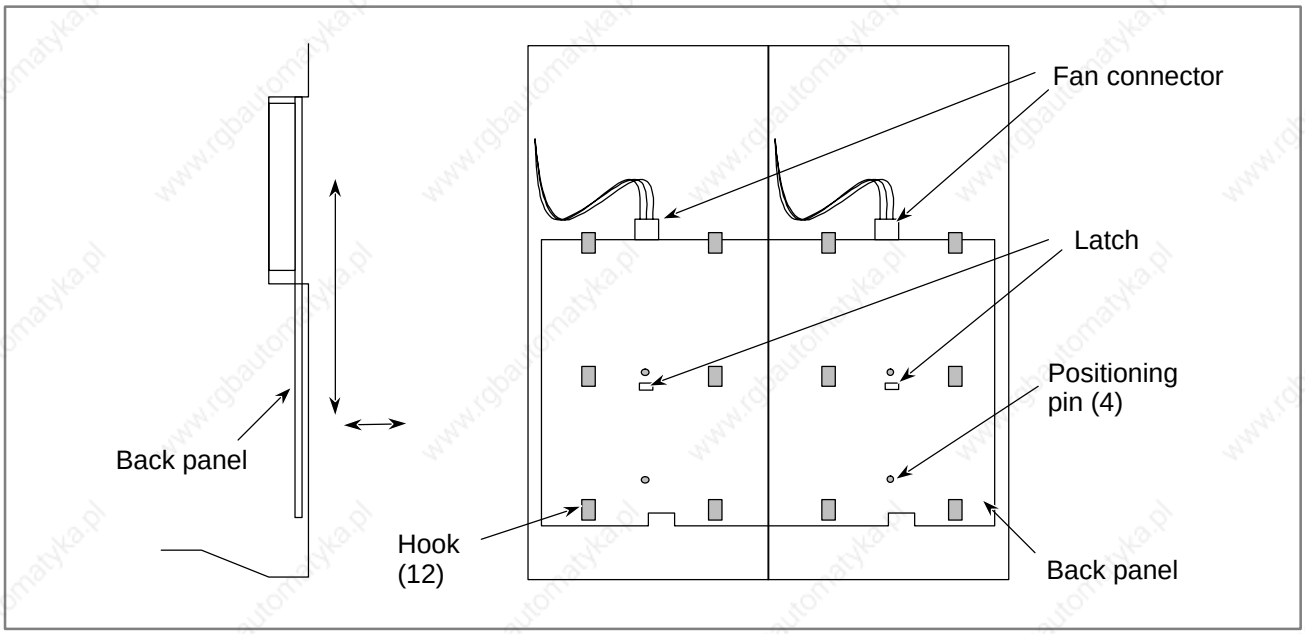
(6) While holding down the latches for the back panel with a tool such as a flatblade screwdriver, slide the back panel down.

(7) Slide the back panel until it unhooks, then pull it towards you.

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2.8.2 Mounting the Back Panel

(1) Press the back panel against the rack so that the positioning pins and hooks are align with the corresponding holes in the back panel.
(2) While pressing the back panel, slide it up until it latches.
(3) Reattach the fan connectors to the back panel.
(4) Reinstall the rack.
(5) Remount the boards in the rack, as described in Section 2.5.
(6) Reconnect the cables.



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2.9 REPLACING FUSE ON POWER UNIT

For the fuse of the power unit, F1, F3 and F4 are as follows.

F1 . . . AC Input: A60L–0001–0396#8.0A
F2 . . . +24E Output: A60L–0001–0046#7.5
F4 . . . +24V Output: A60L–0001–0046#7.5

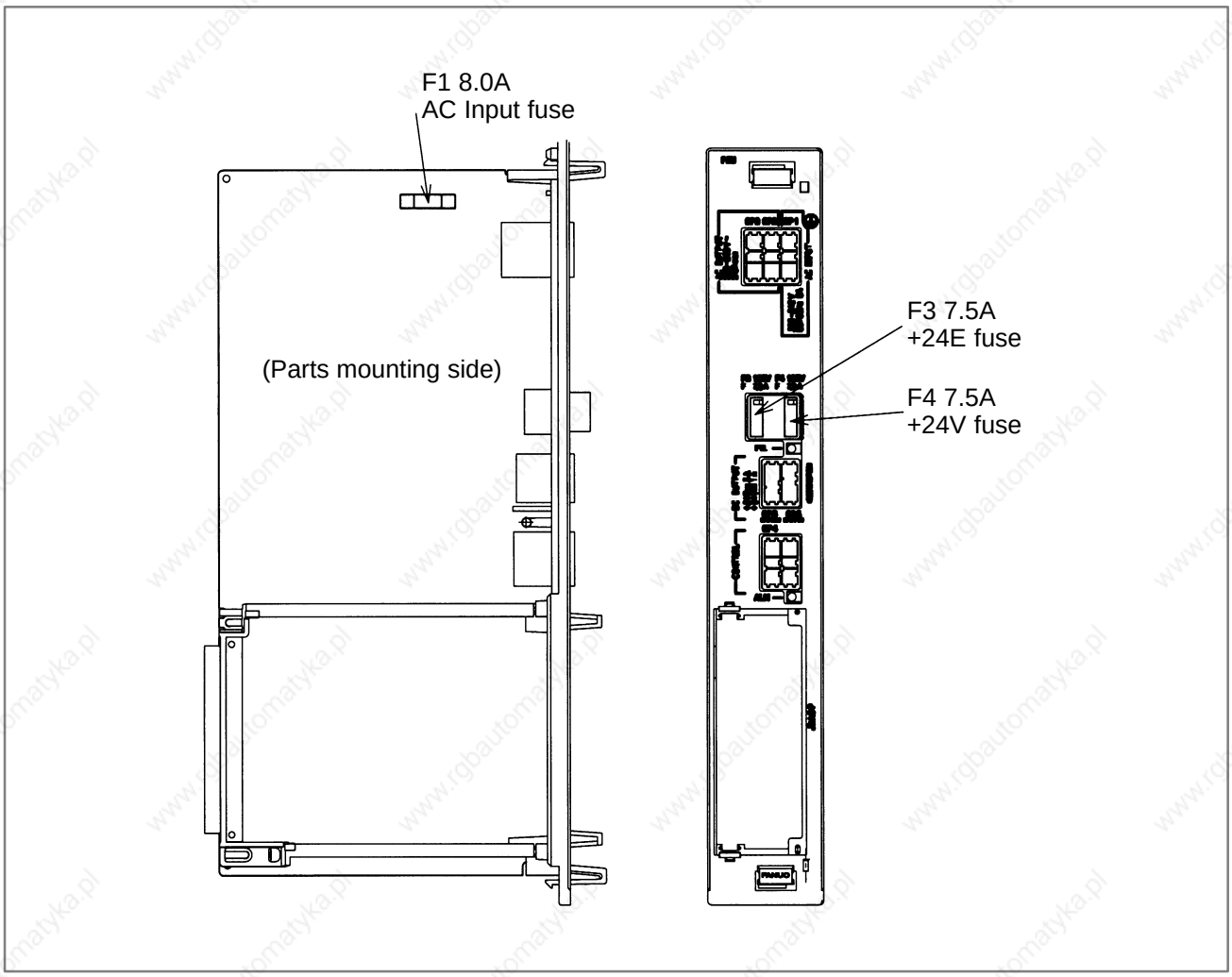


Fig. 2.9 Replacing fuse on power unit

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2.10 REPLACING THE BATTERY

Part programs, offset data, and system parameters are stored in the CMOS memory of the control unit. The power to the CMOS memory is backed up by the lithium battery installed on the front panel of the control unit. Therefore, data is not lost if the main power is turned off. The battery is factory–installed in the control unit.
If the battery voltage drops, "BAT" blinks on the LCD screen, and the battery alarm signal is output to the PMC. When this occurs, the battery should be replaced as soon as possible. Replace the battery within one week. Otherwise, the contents of memory will be lost. However, the actual remaining battery life depends on the system configuration. Note that the memory backup function is disabled when the battery voltage drops. Turning on the power to the control unit causes the output of a system alarm [screen display: RAM parity error (low battery)], because memory data has been lost. In this case, replace the battery, clear the memory, then reenter the data.
Before replacing the memory backup battery, ensure that the power to the control unit is turned off.

Either of the following two types of batteries may be used:

- Lithium battery installed on the main board of the Series 15*i*/150*i*
- Commercially available alkaline dry cells (D) contained in an external battery case

2.10.1 Replacing the Lithium Battery

Replacement procedure

(1) Obtain a new lithium battery (A02B–0200–K102).

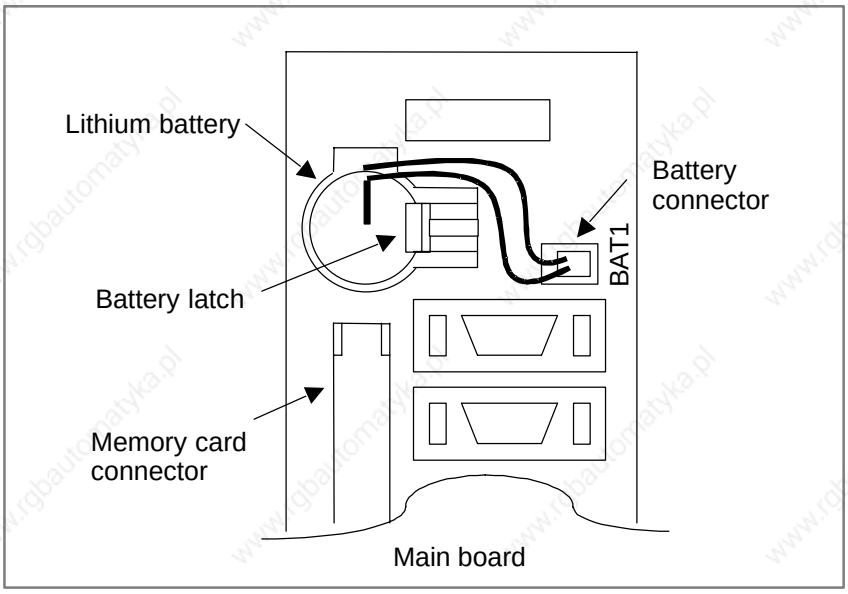
(2) Turn on the power to the control unit, then wait about 30 seconds.

(3) Turn off the power to the control unit.

(4) Remove the battery from the main board.
First, unlatch the battery, then remove it from the battery holder and detach its connector.
The battery holder is on the top of the faceplate (top of the memory card connector) on the main board.

(5) Insert a new battery into the battery holder and attach the connector. Ensure that the battery is latched firmly.

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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 (3) to (5) 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, for some reason, steps (3) to (5) cannot be completed within 30 minutes, save all contents of the CMOS memory to the memory card beforehand. Thus, if the contents of the CMOS memory are lost, they can be restored easily.

Dispose of used batteries as described below.

(1) Small quantities (several batteries)
Discharge the batteries and dispose of them as ordinary unburnable waste.

(2) Large quantities
Contact FANUC for the method of disposal.

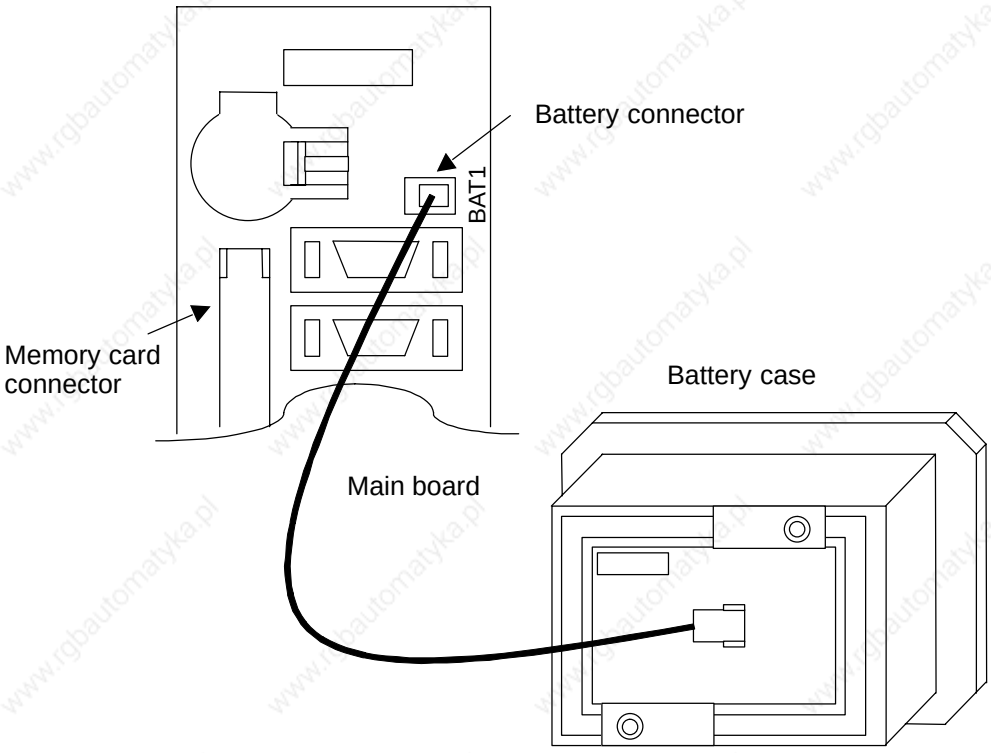
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2.10.2 When Using Alkaline Dry Cells

Instead of the lithium battery, two commercially available D–size alkaline dry cells may be used. It this case, a battery case is used to house the cells.

Connection method

Connect the battery case (A02B–0236–C281) containing the two D–size alkaline dry cells in place of the standard lithium battery according to the battery replacement procedure described earlier.



CAUTION

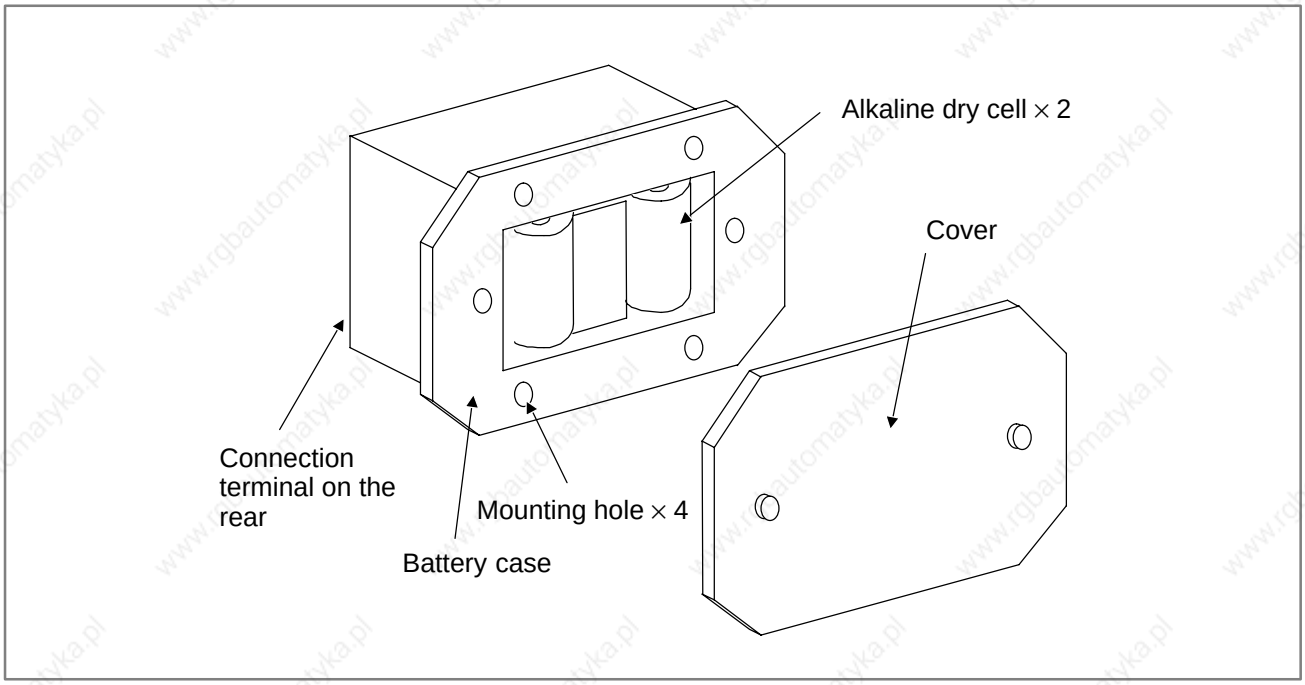
Install the battery case (A02B–0236–C281, cable length of 14 m) in a location where the cells can be replaced even when the power to the control unit is on.
The battery cable connector is attached to the control unit by means of a simple lock system. To prevent the connector from being detached due to the weight of or tension in the cable, secure the cable within 50 cm of the connector.

Procedure for replacing the dry cells once the battery case has been installed

(1) Obtain two D–size alkaline dry cells.
(2) Turn on the power to the Series 15*i*/150*i*.
(3) Remove the battery case cover.
(4) Replace the cells, being careful to observe the correct polarity.
(5) Reinstall the cover of the battery case.

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CAUTION
When replacing the alkaline dry cells while the power is off, use the same procedure as that for lithium battery replacement, described earlier.



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2.11 REPLACING THE FAN MOTORS

- **Fan ordering information**

Name	Ordering code
Fan unit	A02B–0260–C021

Fan motor replacement does not require any tools.
The fan unit is installed at the top of the basic unit.

(a) Before replacing the fan unit, ensure that the power to the CNC is turned off.

(b) Place your fingers into the hollows in the top of the fan unit, then pull the unit towards you until it unlatches.

(c) Lift the fan unit slightly, then remove it from the rack.

(d) Place a new fan unit onto the top of the rack, then slowly slide the unit into the rack until it latches.

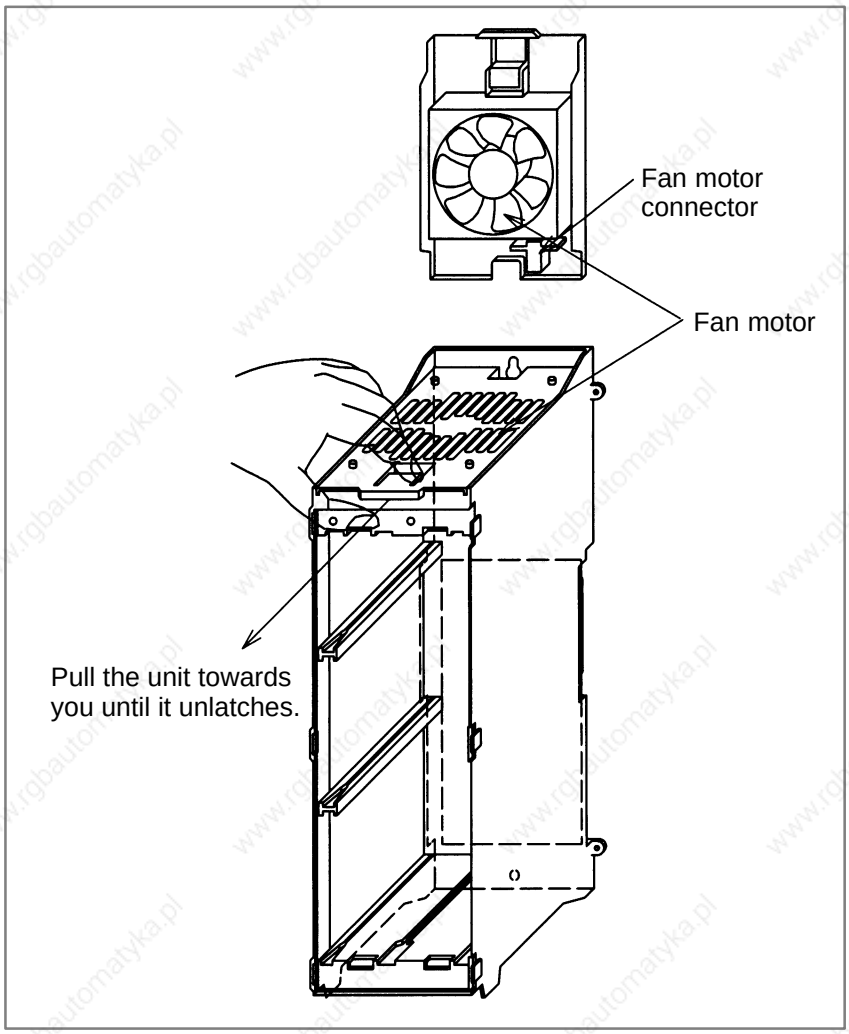


Fig. 2.11 Replacing fan motor of control unit

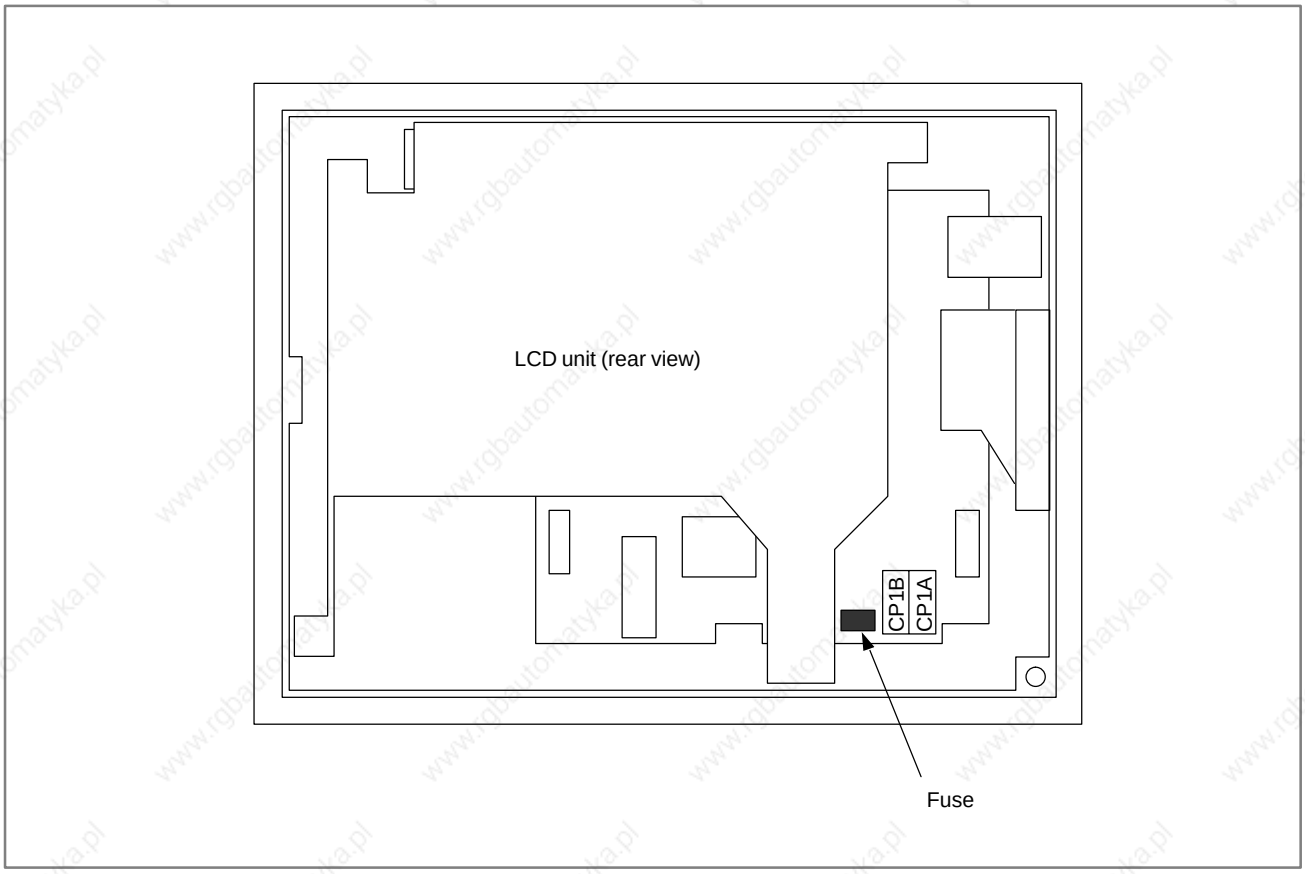
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2.12 LCD UNIT FUSE REPLACEMENT

WARNING

Before attempting to replace the fuse, determine and remove the cause of the fuse blowing. Do not attempt replacement unless you have received sufficient training in maintenance and safety practices. When opening the cabinet to replace the fuse, be careful not touch any high–voltage circuits (indicated by ⚠ and fitted with an anti–shock hazard cover). Note that removing the cover from a high–voltage circuit presents a serious danger of electric shock.

- **Fuse location**



- **Fuse specification**

Ordering information	:	A02B–0265–K101
Rating	:	2.0 A
Individual specification	:	A60L–0001–0290#LM20C

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2.13 LCD BACKLIGHT REPLACEMENT

WARNING

Do not attempt replacement unless you have received sufficient training in maintenance and safety practices. When opening the cabinet to remove the LCD backlight unit, be careful not touch any high–voltage circuits (indicated by ⚠ and fitted with an anti–shock hazard cover). Note that removing the cover from a high–voltage circuit presents a serious danger of electric shock.

CAUTION

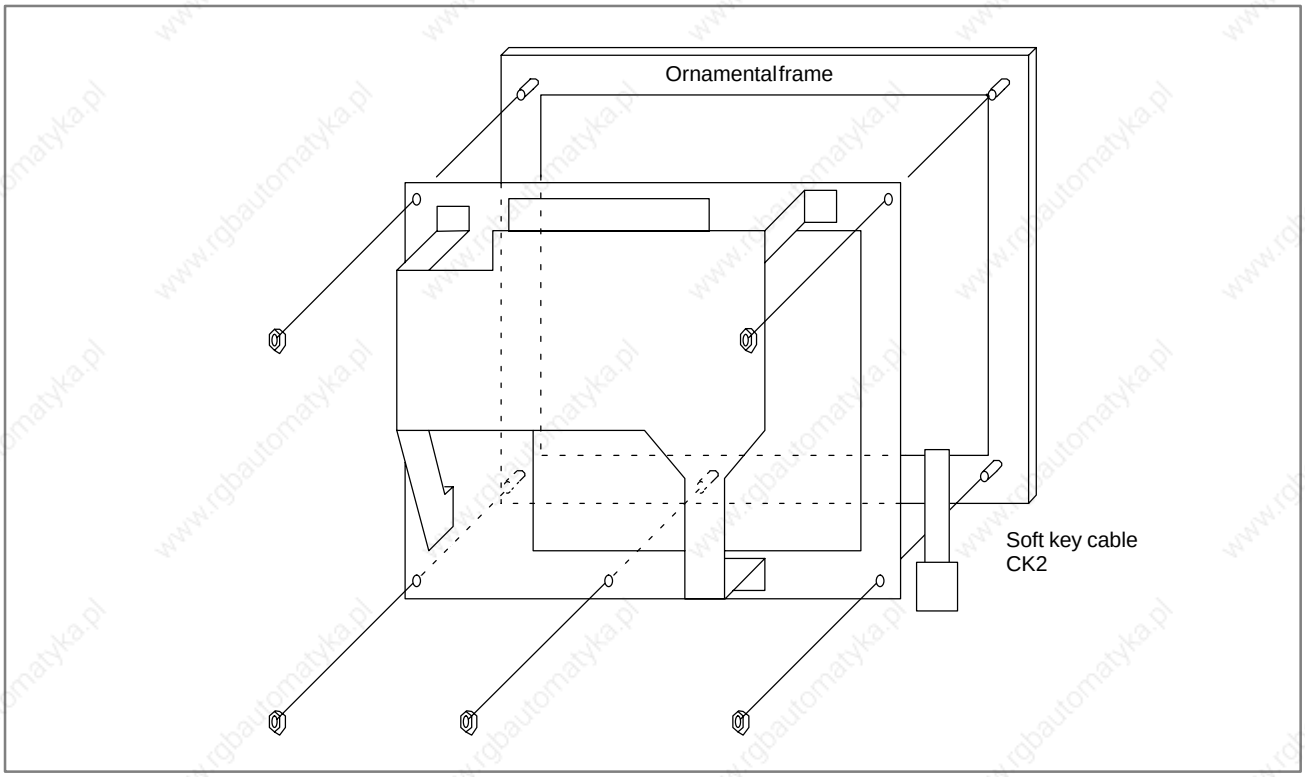
The screen of the LCD unit is easily scratched. Be very careful when handling the LCD unit. Do not touch the screen directly; otherwise, dirt or your skin's natural oils may soil the screen.

- **Backlight ordering information**

Backlight	Ordering information	Individual specification
Backlight for 9.5–inch LCD	A02B–0236–K114	A61L–0001–0154#BL
Backlight for 10.4–inch LCD	A02B–0236–K116	A61L–0001–0168#BL

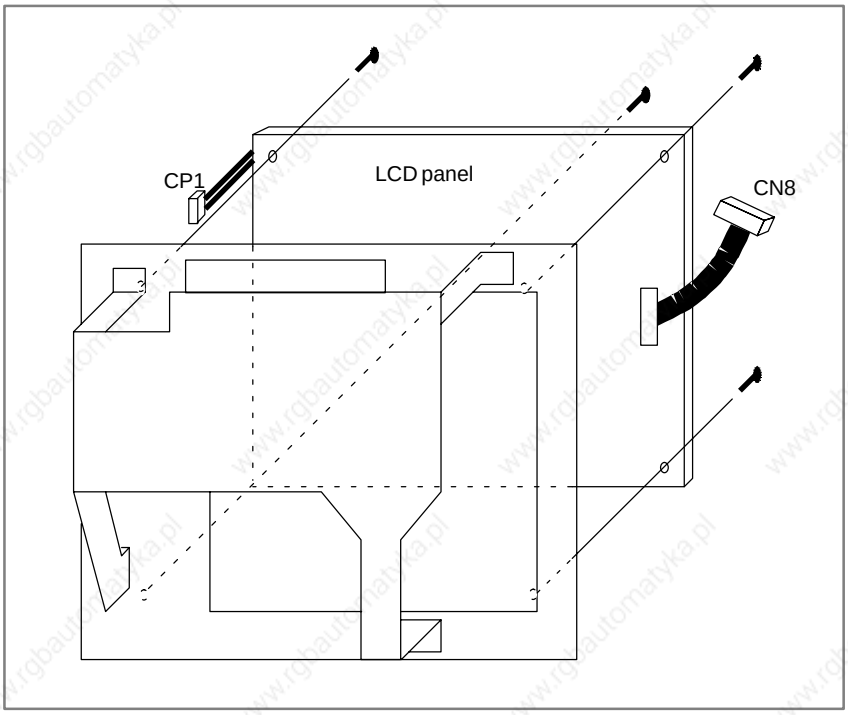
- **Replacement procedure**

(1) Detach soft key cable connector CK2, and remove the ornamental frame from the LCD unit.
If the LCD unit is equipped with a touch panel, also detach touch panel signal cable connector CN1.



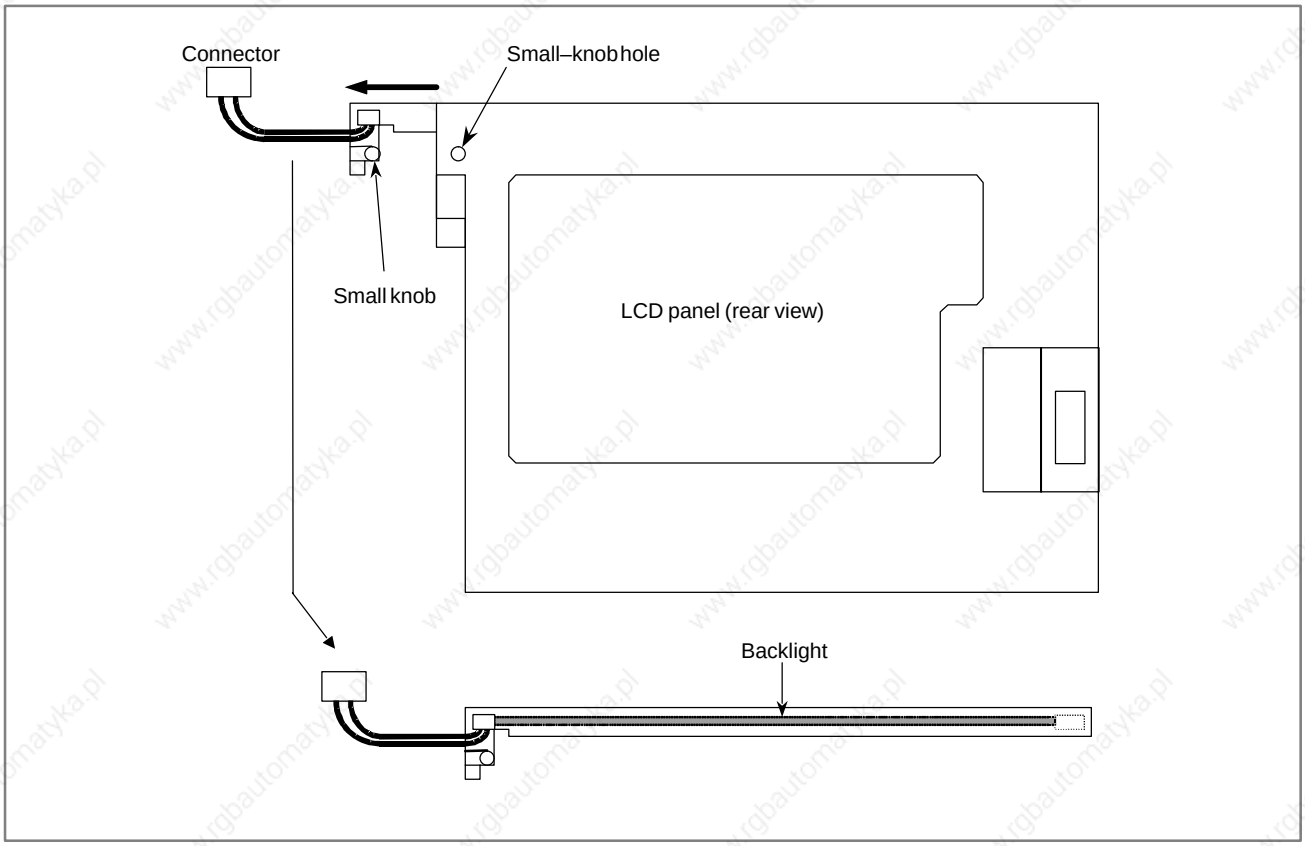
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(2) Detach inverter cable connector CP1 and video signal cable connector CN8, then dismount the LCD panel from the LCD unit.



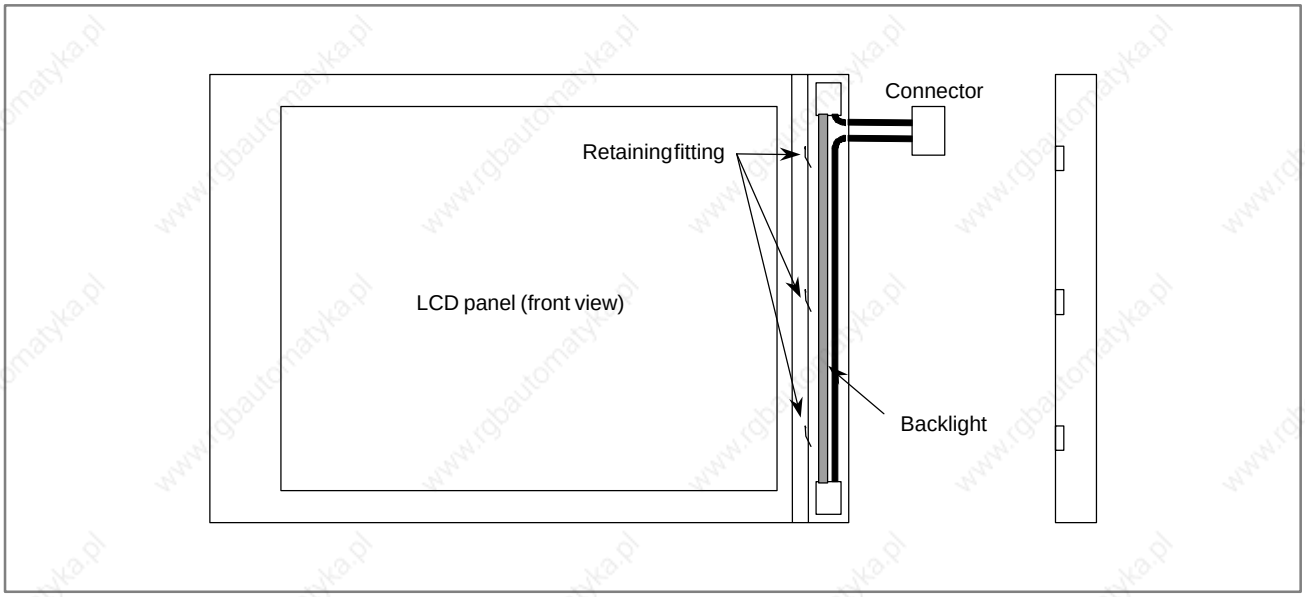
(3)–1 10.4–inch LCD (color)

As shown below, press the small knob to unlatch the backlight case. Then, pull out the backlight case and replace it.



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(3)–2 9.5–inch LCD (monochrome)



(4) After replacement, reverse the above steps to reassemble the unit.
Be careful not allow dirt or dust to enter the assembly.

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2.14 LIQUID CRYSTAL DISPLAY (LCD)

Brightness of monochrome LCD

The LCD screen display appears dim at low ambient temperatures, particularly immediately after power–up. This is not a failure but a characteristic of the LCD screen. As the ambient temperature rises, the LCD screen display brightens. A monochrome LCD is provided with a function for adjusting the brightness.

LCD with touch panel

The user can control the operation simply by touching an LCD screen equipped with a touch panel. The screen must, however, be touched using a special pen provided by FANUC (A02B–0236–K111). If a sharp–pointed pen is pressed against the LCD screen, the LCD surface may be damaged or destroyed. Avoid touching the LCD screen with your bare fingers. Doing so will ultinately degrade the ease of operation and will make the screen 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.

Name		Ordering number
Protection sheet for the touch panel	For 10.4” LCD	A02B–0236–K130
	For 12.1” LCD	A02B–0236–K118
	For 15” LCD	A02B–0082–K020

Replacing procedure

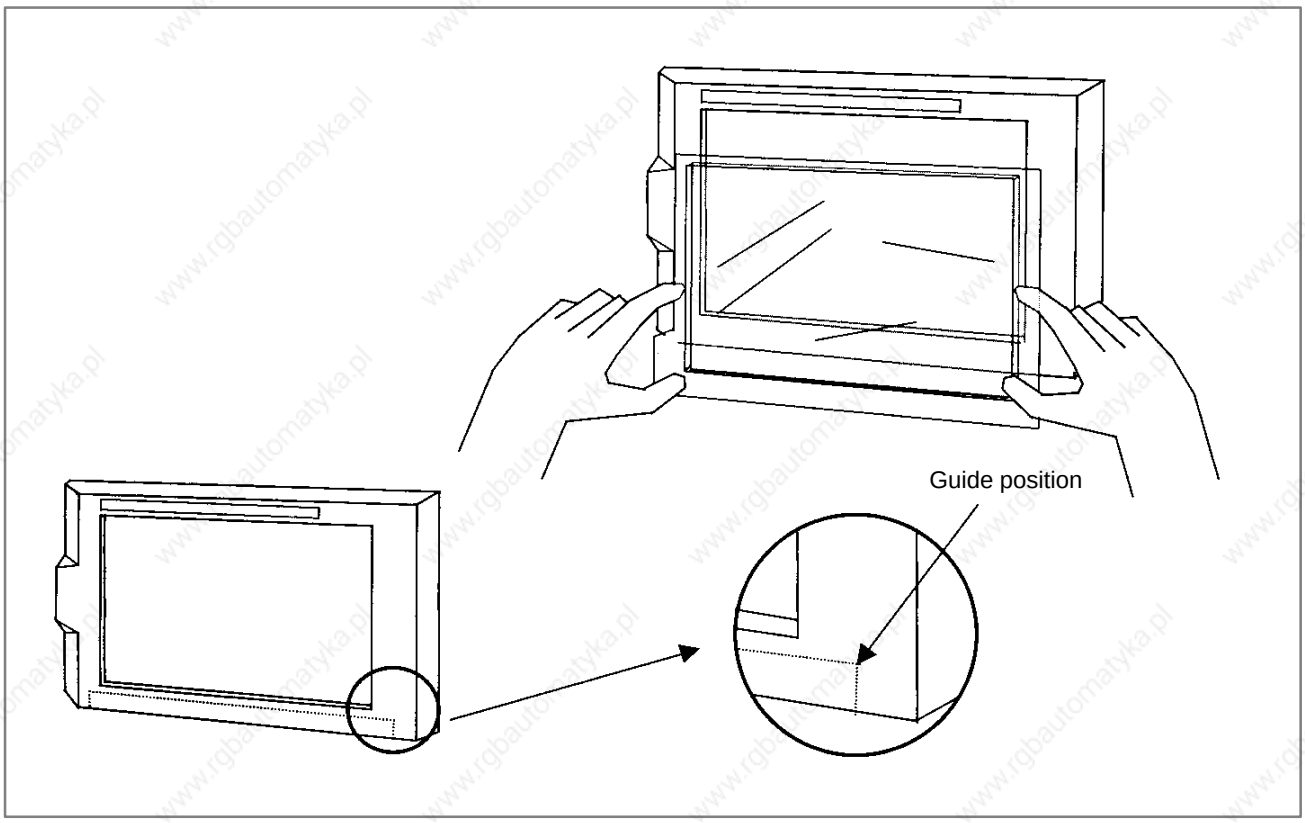
<1> First, remove the old protection sheet.

<2> Wipe moisture, dust, and grease on the surface of the LCD.

<3> Peel off the white film attached on the back (facing the LCD) of the new protection sheet.

<4> Attach the protection sheet so that it is to the lower–left of the replacement tab. At this time, align the overhang edge at bottom of the escutcheon with the corresponding part of the protection sheet. In addition, prevent dust from entering between the LCD and protection sheet.

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<5> Attach the four sides while pushing out air between the touch panel and protection sheet.
Do not pull the protection sheet to correct its position with the part of the sheet kept stuck to the touch panel.

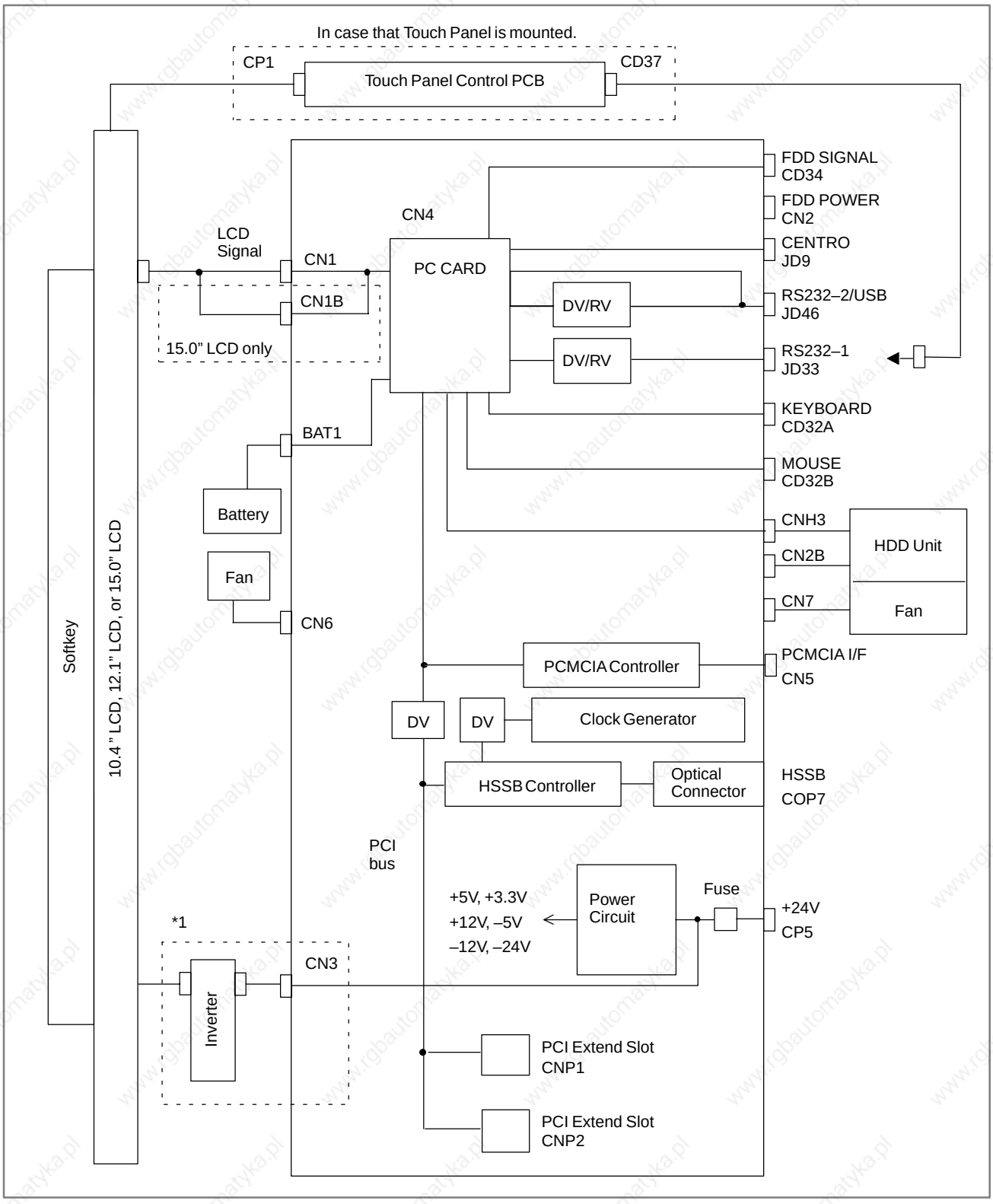
<6> Press the adhesive parts of the four sides, and attach the sheet completely.
Check that the four corners and four sides of the protection sheet do not float.

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2.15 CNC DISPLAY UNIT WITH PC FUNCTIONS

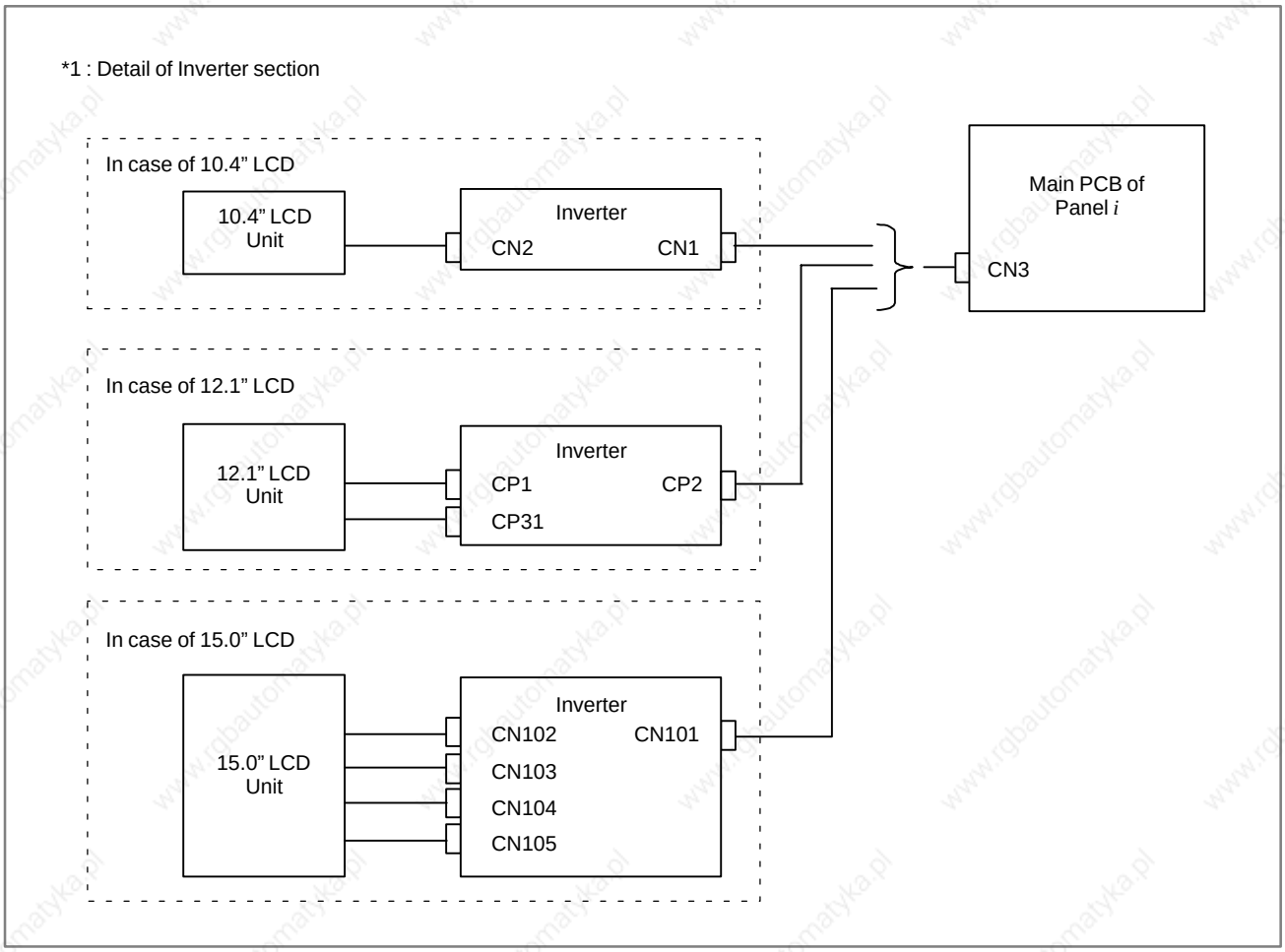
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2.15.1 System Block Diagram



*1 : Detail of Inverter section (See next page.)

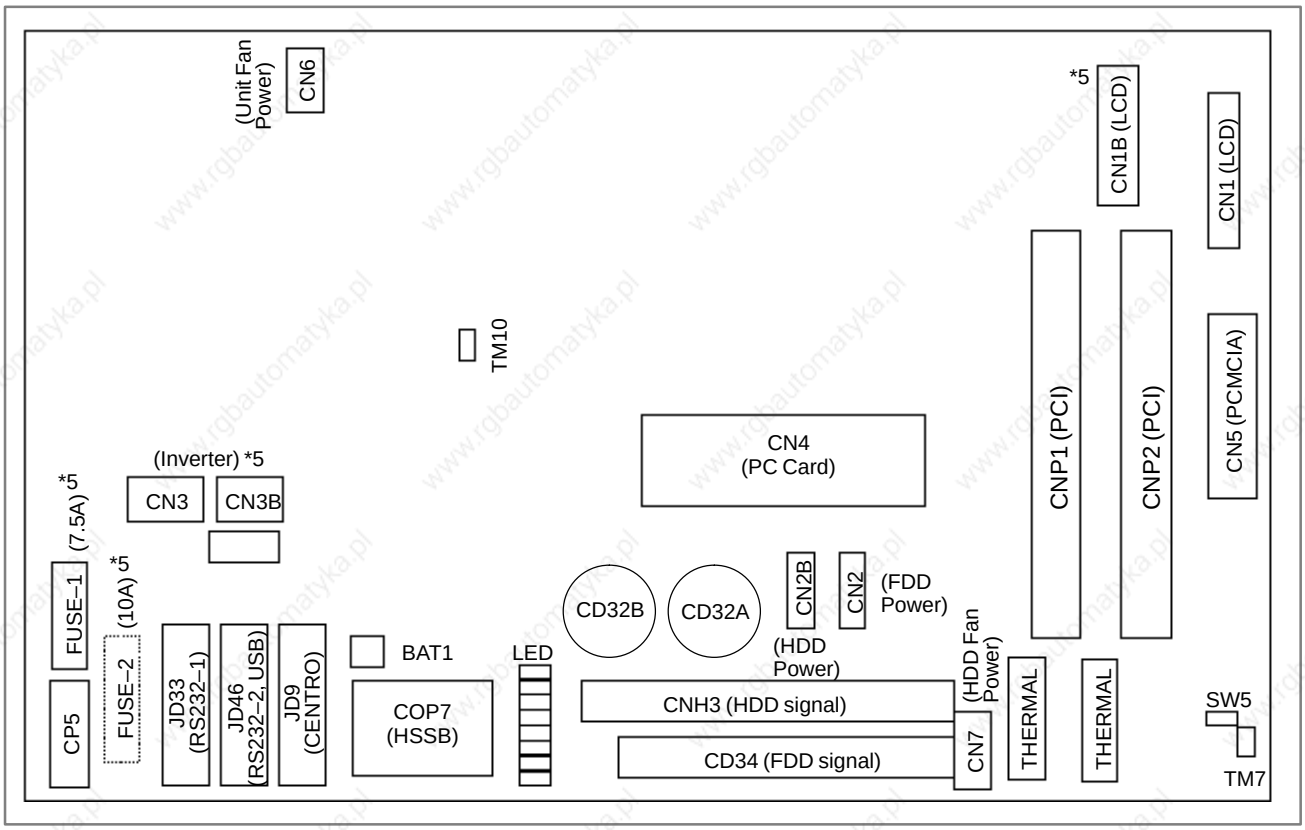
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2.15.2 Configuration of the PCB

2.15.2.1 Parts layout



*5: Part mounting at remarked.

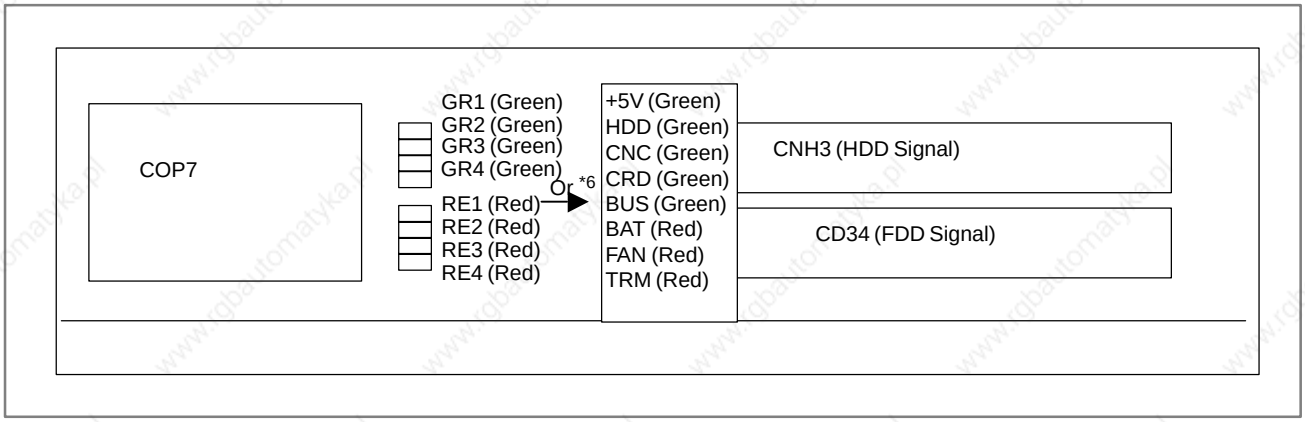
Parts \ LCD Unit Type (PCB Spec.)	10.4” LCD type (A20B–2100–0780, 3)	12.1” LCD type (A20B–2100–0781, 4)	15.0” LCD type (A20B–2100–0782, 5)	Fuse for maintenance
FUSE–1	Mounted	Not mounted	Not mounted	A02B–0236–K101
FUSE–2	Not mounted	Mounted	Mounted	A08B–0082–K001
CN3	Mounted	Mounted	Mounted	—
CN3B	Not mounted	Not mounted	Mounted	—
CN1B	Not mounted	Not mounted	Mounted	—

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2.15.2.2 Adjustment

Name	Meaning	Settings		
SW5 TM7 (A20B–2100–0780 to –0785)	Reserved	Default on manufacture. Never change.	SW5 TM7	: Short for the PANEL *i* Open for the CNC display unit with PC functions
TM10	Reserved	Test usage. Never remove.	TM10	: Short

2.15.2.3 LED display



Name1*6	Name2*6	Color	Status
GR1	+5V	GREEN	Power is turned on (+5V).
GR2	HDD	GREEN	HDD access LED.
GR3	CNC	GREEN	CNC status is normal.
GR4	CRD	GREEN	PCMCIA access LED.
RE1	BUS	RED	HSSB is not ready. The cause is as follows. – CNC power is not turned on. – Optical fiber cable is not connected or cable is broken. – Something goes wrong with the interface board for CNC. – Something goes wrong with the CNC display unit with PC functions or PANEL *i*.
RE2	BAT	RED	Battery alarm. The battery on CNC display unit with PC functions or PANEL *i* is exhausted. Please exchange it.
RE3	FAN	RED	FAN for basic unit or FAN for HDD is stopped. Please exchange either FAN.
RE4	TRM	RED	Thermal alarm. The CPU detected high temperature outside the use range. The speed of the CPU decreases.

*6: Printed name is different by the revision of the main board.

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2.15.3 Maintenance Supplies

2.15.3.1 Method of exchanging battery

The time from disconnecting the cable of old battery to connecting the cable of new battery should be shorter than 5 minutes.

BIOS settings are not erased when bellow procedures are done correctly. But if BIOS settings are erased, following massage is displayed at power–on, default BIOS settings are loaded and restart.
"251: System CMOS checksum bad – Default configuration used."
Therefore, please check whether BIOS settings were changed from default settings or not before exchanging battery. And, if this message is displayed unfortunately, you should modified BIOS setting.

(1) After CNC display unit with PC functions is turning on for 5 seconds or more, turn off the power of CNC display unit with PC functions, then enable to work from rear side of CNC display unit with PC functions by taking it out from panel, etc.

(2) Pull out battery connector (BAT1), then remove the battery from the holder.

(3) Put the connector (BAT1) of new battery within five minutes, then put the new battery in the holder.

(4) Mount CNC display unit with PC functions again.

(5) Turn on the power, then confirm that BIOS parameters have not been erased (confirm that error message is not displayed).

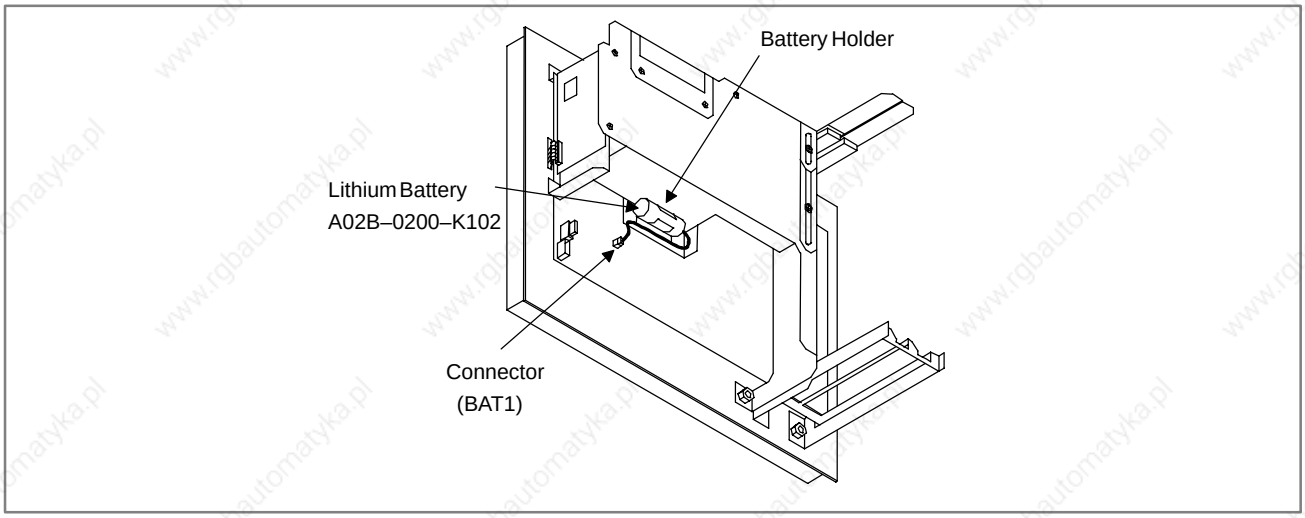


Fig. 2.15.3.1 Exchanging Lithium Battery

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2.15.3.2 Method of exchanging fuse

Investigate the cause that fuse is blown out at first, then remove it.

Fuse is blown out when power lines are shorted in CNC display unit with PC functions. If the fuse is blown out, check bellow points.

Any conductor is shorted to the main board.
Failure of PCI extended card or error at inserting PCI extended card.
Mis–connection of cables.

When fuse is blown out, any damage may be exist in the main board. And the damaged parts must be exchanged.

(1) Make sure that CNC display unit with PC functions is turned off the power.
(2) Enable to work from rear side of CNC display unit with PC functions by taking it out from panel, etc.
(3) Remove the old fuse, and put a new fuse to the socket exactly.
(4) Mount CNC display unit with PC functions again.
(5) Turn on the power, then confirm that CNC display unit with PC functions is turned on.

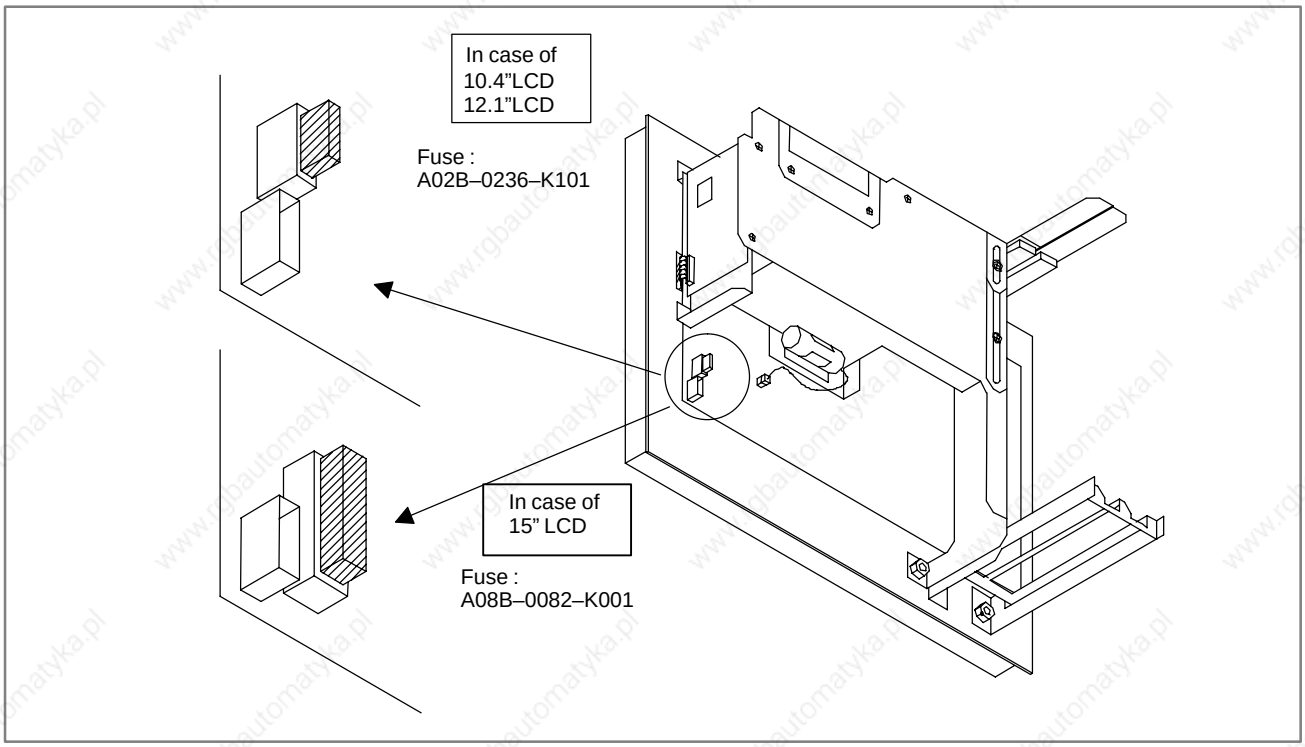


Fig. 2.15.3.2 Exchanging Fuse

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2.15.3.3 Method of exchanging FAN

(1) Method of Exchange FAN of the CNC display unit with PC functions

1. Make sure that CNC display unit with PC functions is turned off the power.
2. Prepare a new Fan (A08B–0082–K010).
3. Screw off at 2 points (A) then remove holding plate of the FAN.
4. Pull out the connector (CN6) of fan power. This connector has a latch. So release the latch and pull out the connector as below figure.
5. Screw off at 2 points (B) that are holding a fan to the plate.
6. Mount a new fan in a reverse order.
   Confirm the mounting direction of fan.

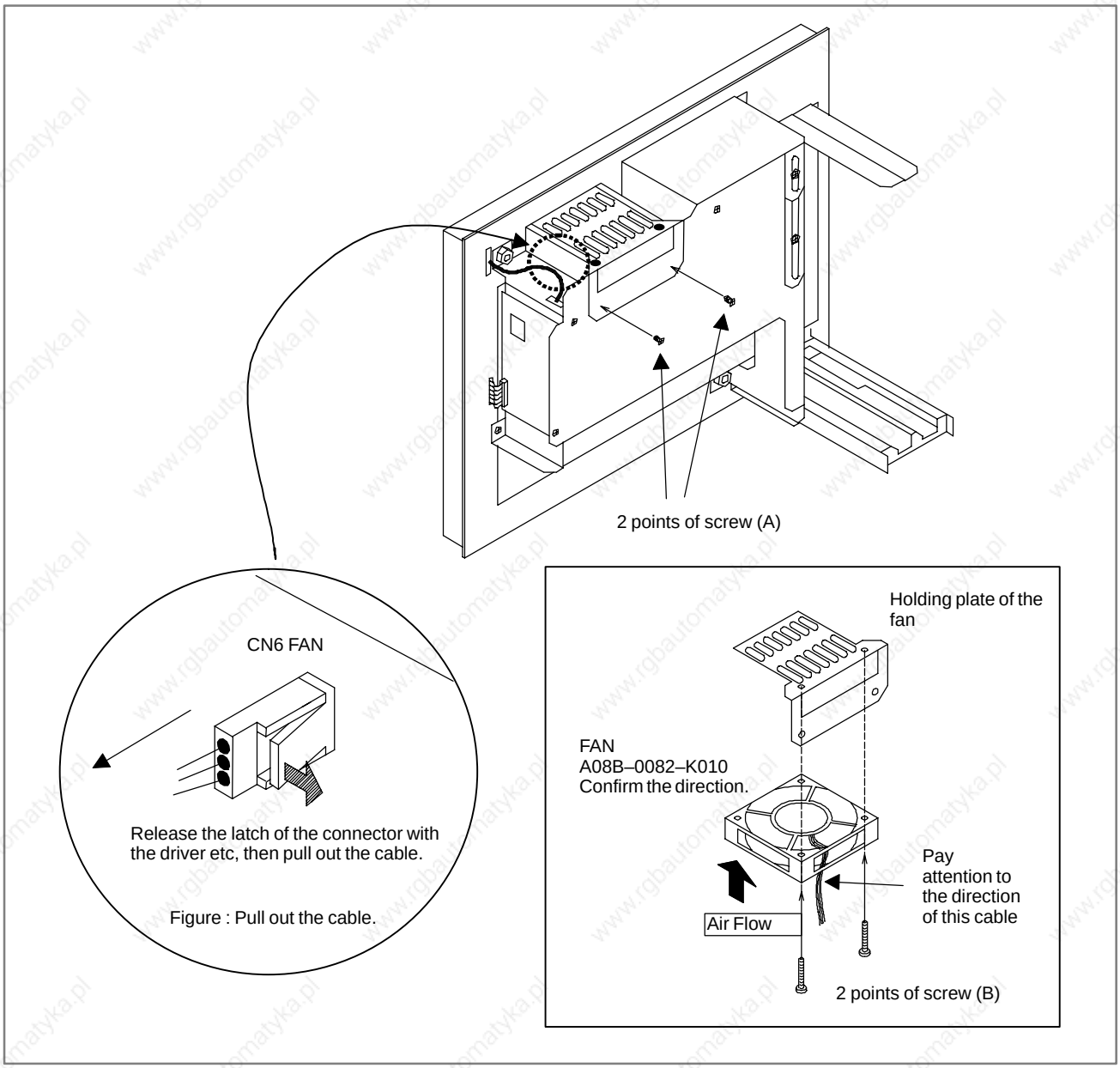


Fig. 2.15.3.3(a) Exchanging Fan of CNC Display Unit with PC Functions

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(2) Method of Exchanging FAN for the HDD unit

1. Make sure that CNC display unit with PC functions is turned off the power.
2. Prepare a new Fan (A13B–0178–K001). The connector is latched, and disconnect with raising upward the connector a little.
3. Disconnect the Fan connector from CN7
4. Screw off at 2 points fixing the Fan, and remove the old fan.
5. Screw the new Fan at 2 points, and connect the fan connector to CN7.

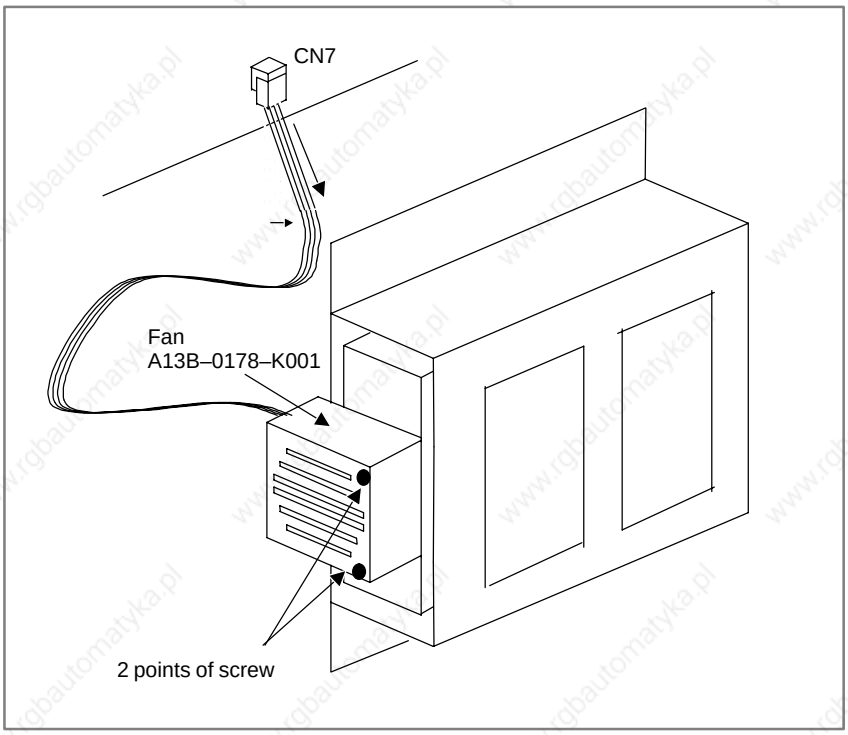


Fig. 2.15.3.3(b) Exchanging a Fan of HDD

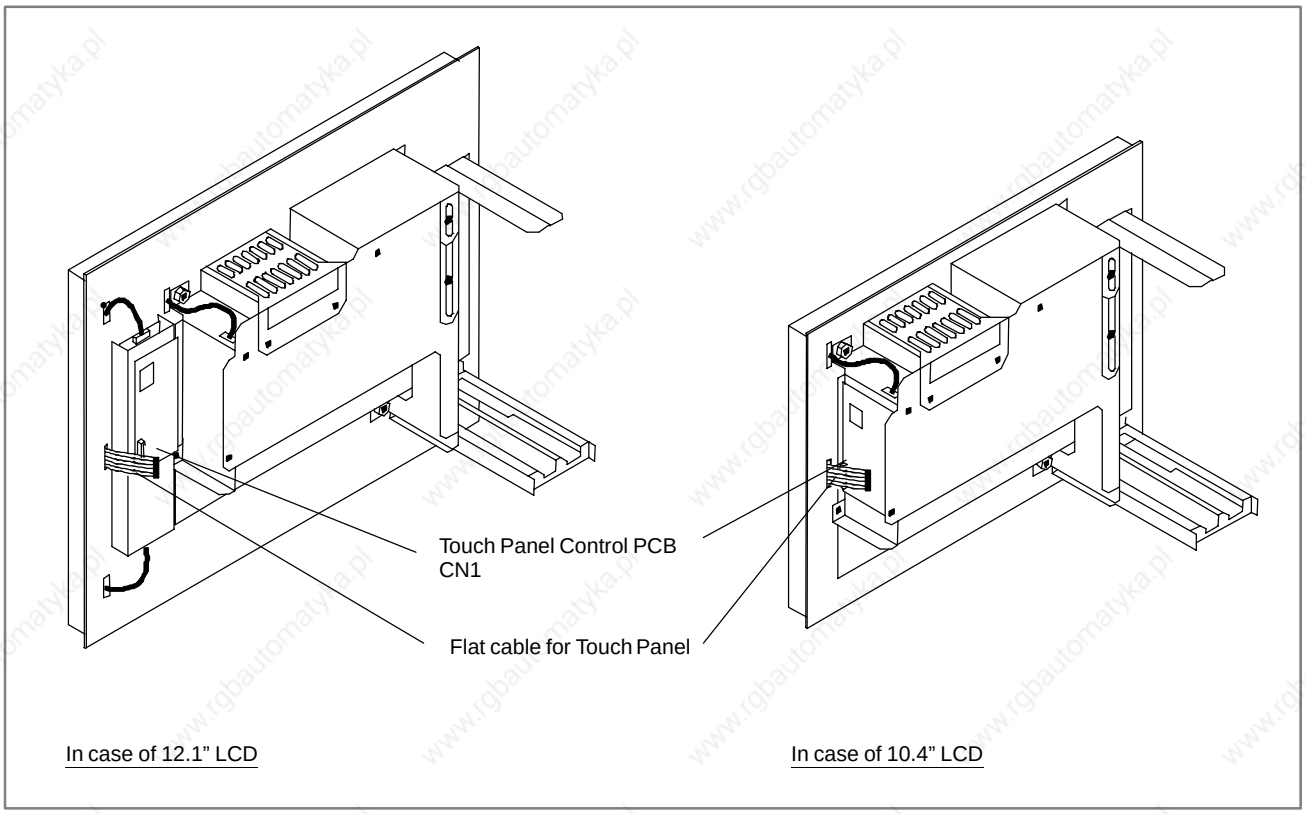
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2.15.3.4 Method of exchanging LCD backlight

Please exchange the backlight after taking off the basic unit from the cabinet or operation panel for prevention of dropping LCD unit or plastic panels.

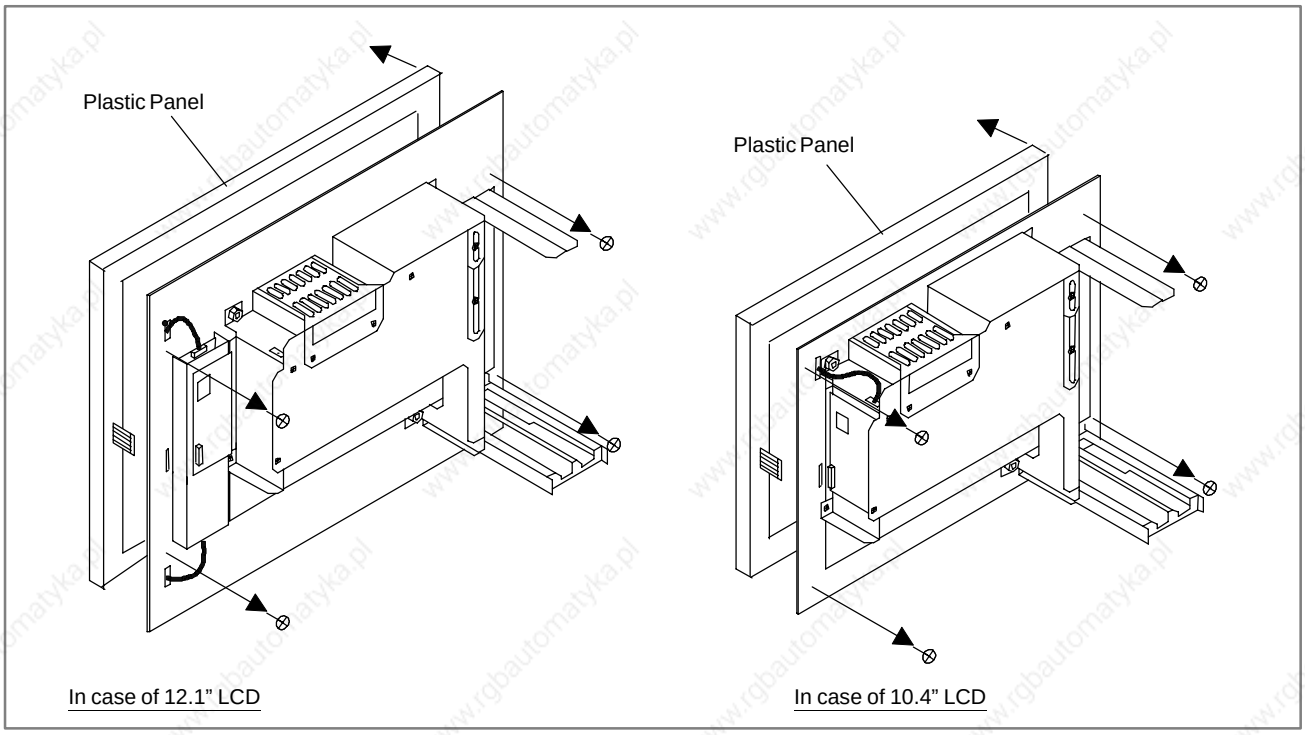
(1) Make sure that CNC display unit with PC functions is turned off the power.

(2) If CNC display unit with PC functions has the Touch Panel, pull out flat cable for Touch Panel from CN1 on the Touch Panel Controller PCB.

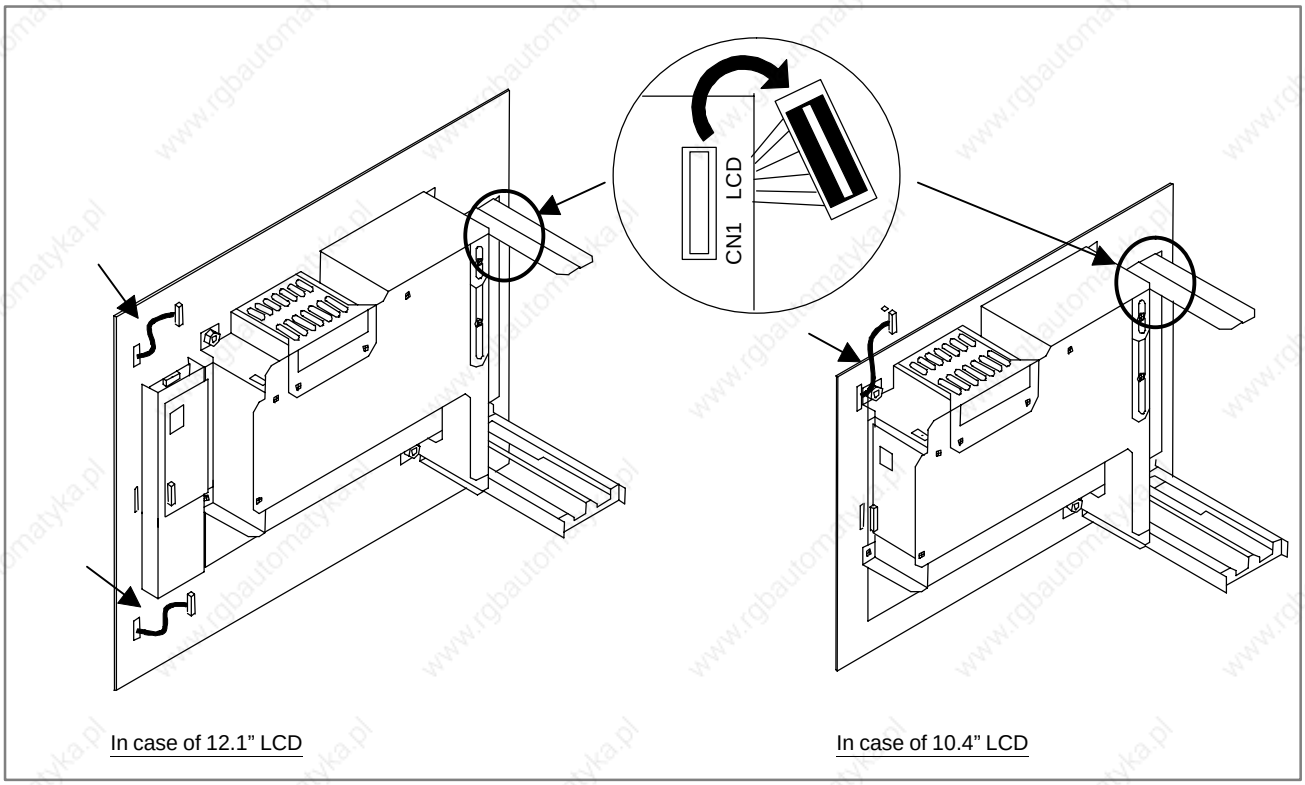


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(3) Screw off at 4 points and take off the plastic panel.

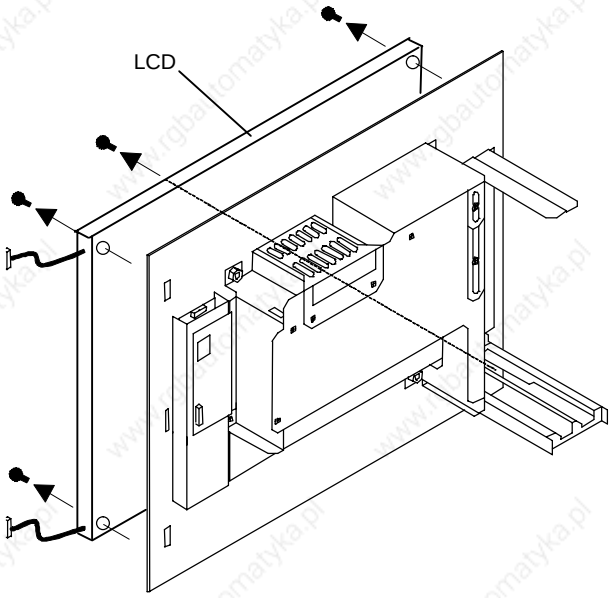


(4) Pull out cable(s) of the LCD backlight and LCD signal connecotr CN1.

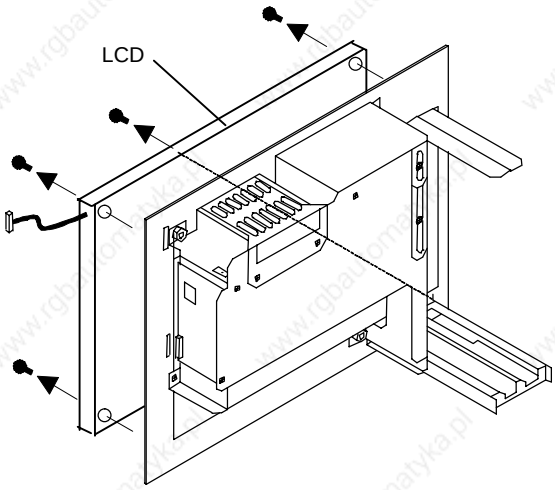


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(5) Screwed off at 4 points and remove LCD.



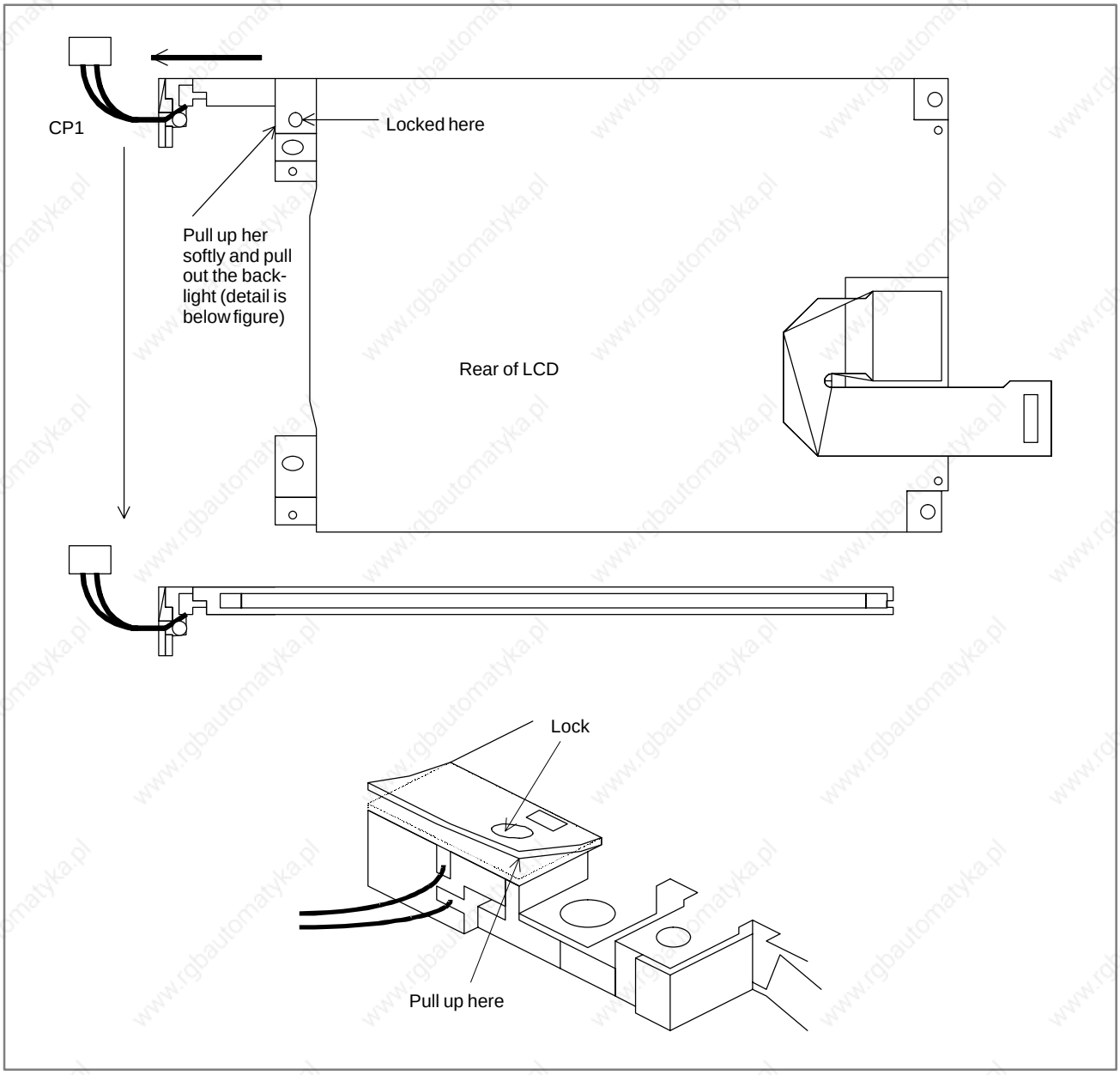
In case of 12.1" LCD



In case of 10.4" LCD

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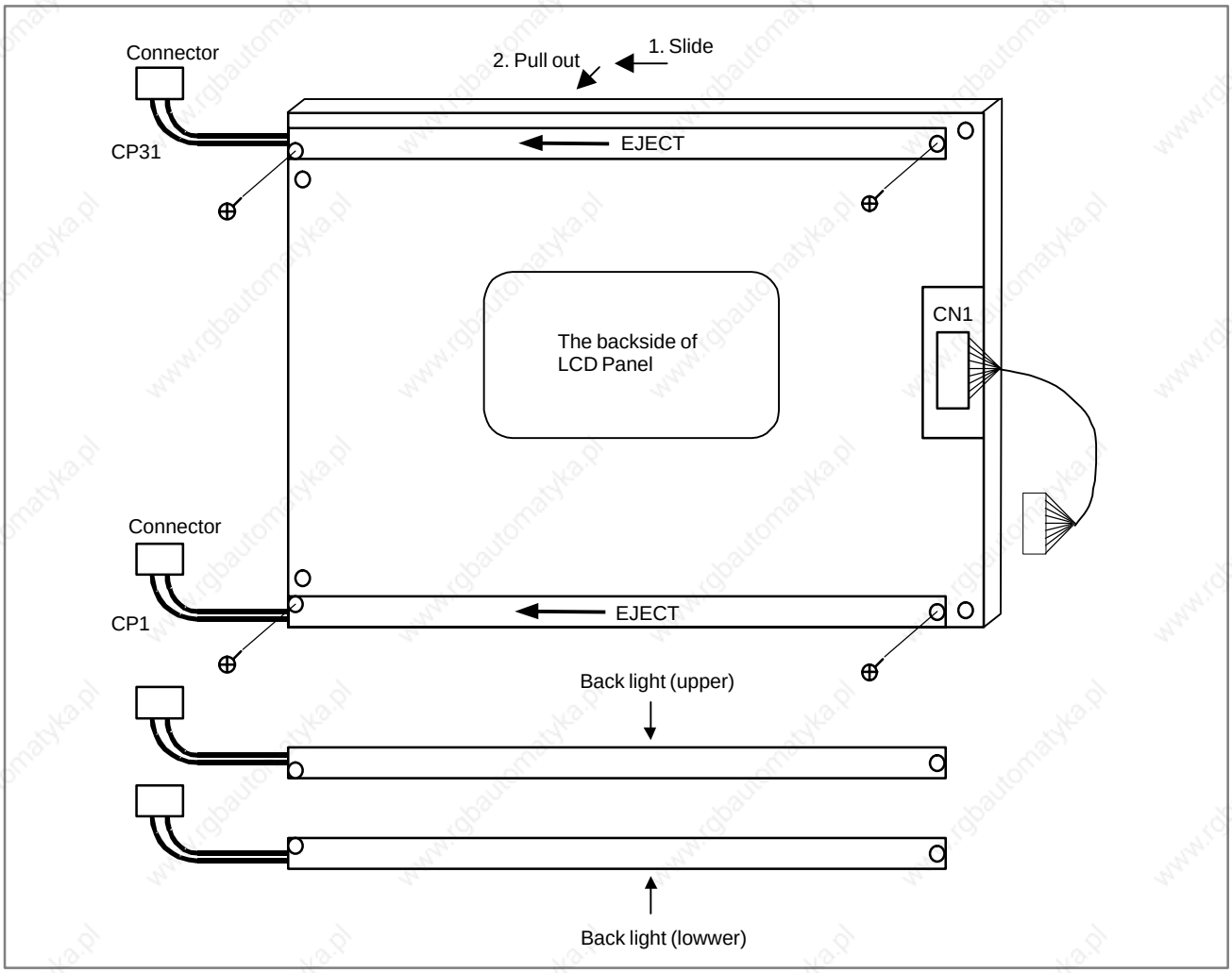
(6a) In case of 10.4”LCD type, Unlock like the below figure, pull out the case with the backlight, and exchange.
(Backlight specification: A02B–0236–K116)



Do not pull the cable when pull out the backlight.

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(6b) In case of 12.1”LCD type, screw off at 2 points. And slide and pull out the LCD Backlights as below figure, and exchange them. (Backlight specification: A02B–0236–K117)



Do not pull the cable when pull out the backlight.

(7) Assemble the unit in a reverse order of (1) – (6).
(Note that the cables don’t put between the plate and one, etc.)

NOTE
It is not possible to exchange only backlight of 15.0”LCD. Exchanging of LCD panel is available in case of 15.0”LCD.

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2.15.3.5 Method of exchanging touch panel protection sheet

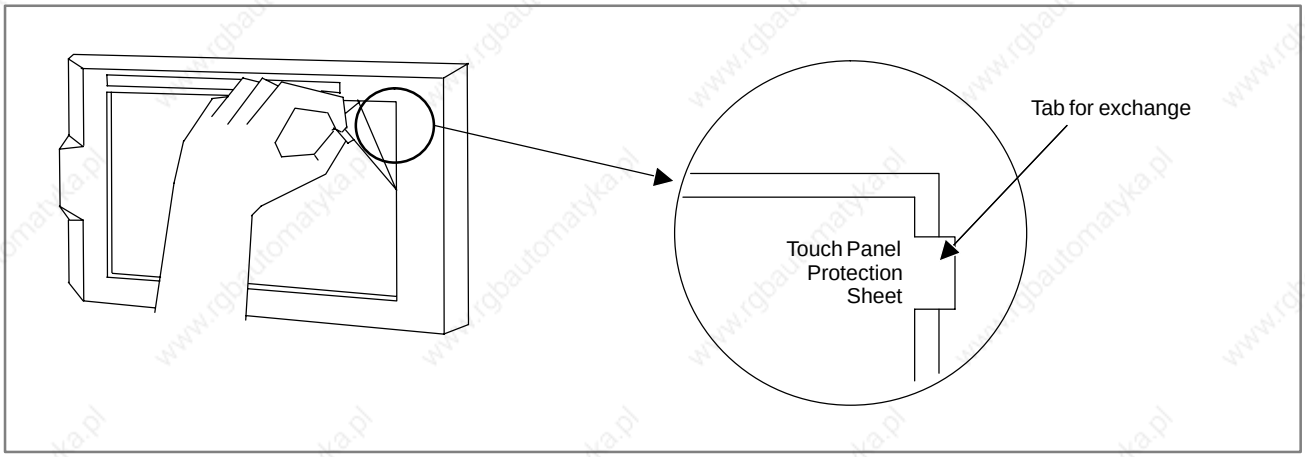
CNC display unit with PC functions has a Touch Panel Protection Sheet on the face of Touch Panel to protect the Touch Panel. When the screen cannot be watched clearly because of some damages or stains, exchange the Touch Panel Protection Sheet. Please prepare the following.

Name		Specification
Touch Panel Protection Sheet	for 10.4” LCD (with touch panel and soft keys)	A02B–0236–K110
	for 10.4” LCD (with touch panel and without soft keys)	A02B–0236–K130
	for 12.1” LCD	A02B–0236–K118
	for 15.0” LCD	A08B–0082–K020

How to exchanging touch panel protection sheet for 12.1” LCD and 15.0” LCD

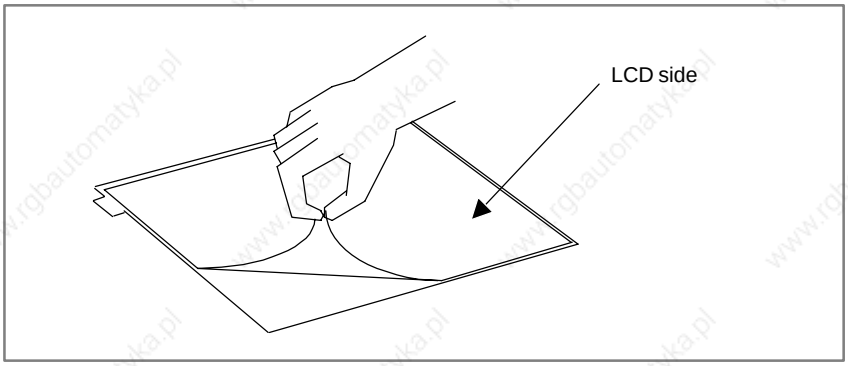
See Section 2.14 for exchanging touch panel protection sheet for 10.4” LCD.

(1) At first, strip the old Touch Panel Protection Sheet off.



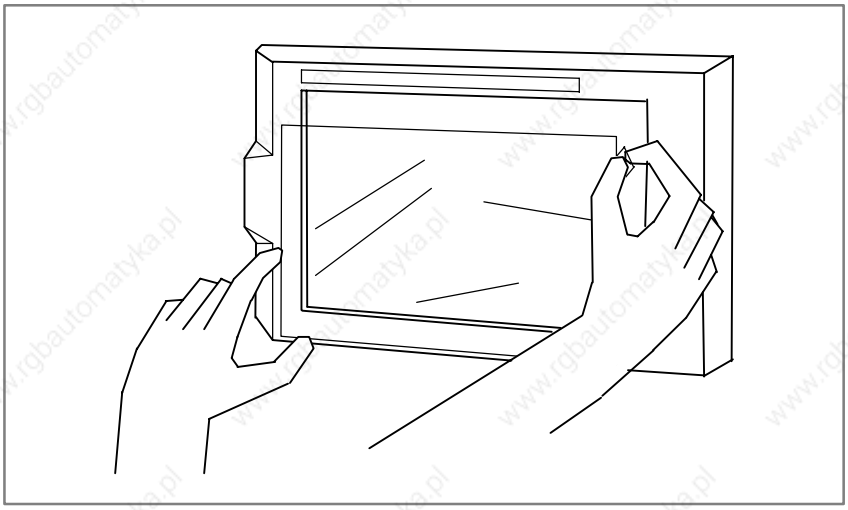
(2) Clean the face of the LCD well.

(3) Strip the white film on the back of the new Touch Panel Protection Sheet (this side is to stick on the LCD face) off.



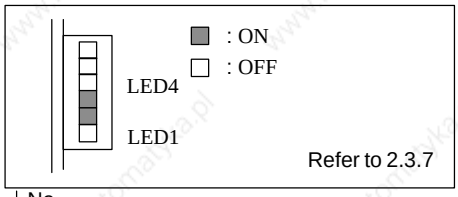
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(4) Put the tab on the upper right side of the new one, and stick it on the face of the LCD with care not to be entered the dust or etc. between the LCD and the Touch Panel Protection Sheet as it enters into the frame.



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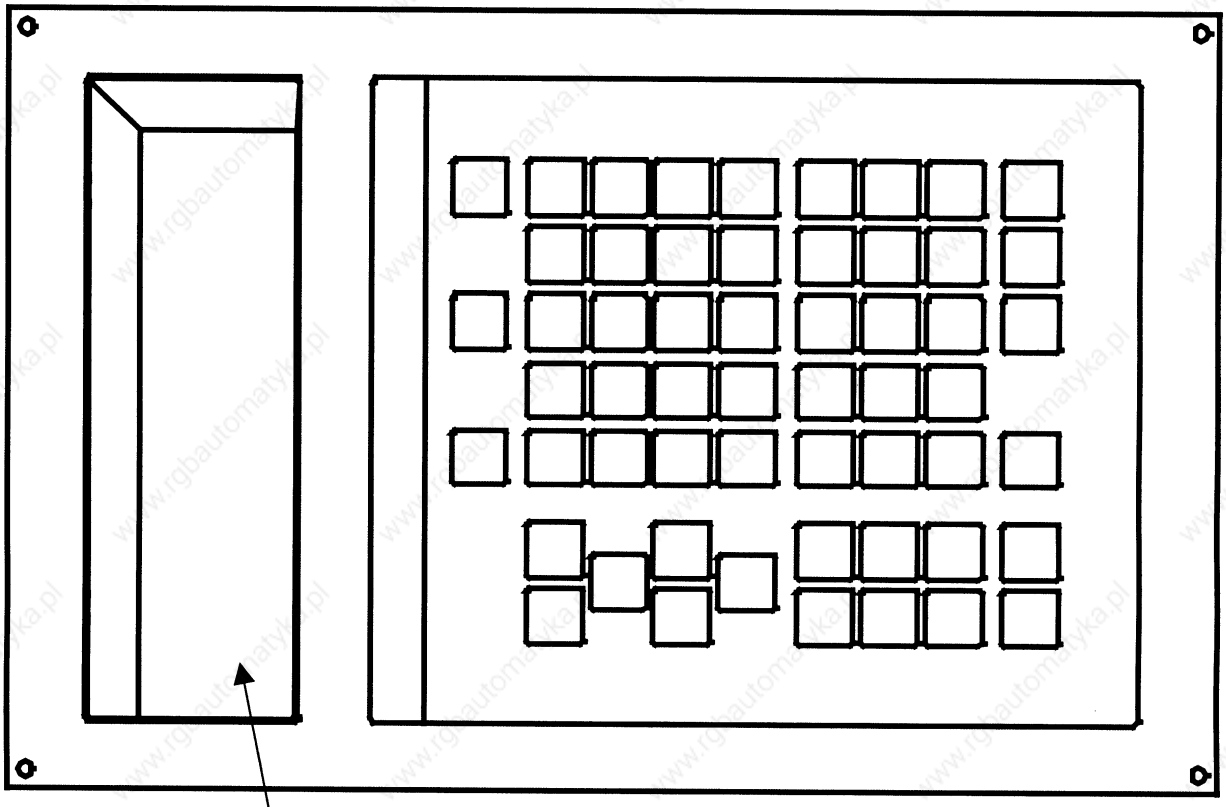
2.15.4 Trouble Shooting

No.	Trouble	Measure
1	Power supply is good, but nothing displayed.	– Are LED all off? → Yes: Go to 11 No ↓ – Is Option for Independently Use ordered? → Yes No ↓ – Is RE1 (Red, Refer to C.3.3) on? → Yes: Go to 2. No ↓ – Is RE2 on? → Yes: It is not in proper temperature. (Refer to C.3.3) Are LED displaying  No ↓
		– Are the SW5,SW7 and TM10 correct? → No: Change setting. Yes ↓ – If PCI extension cards are mounted , are they good? – If PC Card or Memory module is exchanged, are connections good? – Is the backlight of LCD good? – Is main board of CNC display unit with PC functions good?
2	HSSB is not ready. (RE1 is on.)	– Is the optical fiber cable connected? → No: Connect. Yes ↓ – Is the CNC on? → No: Turn on the CNC. Yes ↓ – Is the HSSB I/F board (CNC side) not good? – Is main board of CNC display unit with PC functions good? – Is optical cable good?
3	LCD Backlight blinks.	– Periodical blink indicates a fan alarm or a battery alarm. Check whether the fan is not rotating or a battery alarm occur (RE2 is on.) Refer to Maintenance 3.3.
4	COM, LPT is not usable.	– Check BIOS settings (Refer to Maintenance 4).
5	Boot up from CD–ROM.	When CD–ROM drive is connected to CNC display unit with PC functions and bootable CD–ROM is inserted to the drive, CNC display unit with PC functions starts up from CD–ROM. Please remove CD–ROM at starting up. (There is no item about boot device in BIOS settings).
11	Power is not good.	– Is the fuse blown out? → Yes: Exchange the fuse. No ↓ Check the cause. – If all user cables are disconnected, has the state been changed? → Yes: Check user cables. No ↓ – Is main board of CNC display unit with PC functions good?

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2.15.5 Notes on Using the MDI Unit

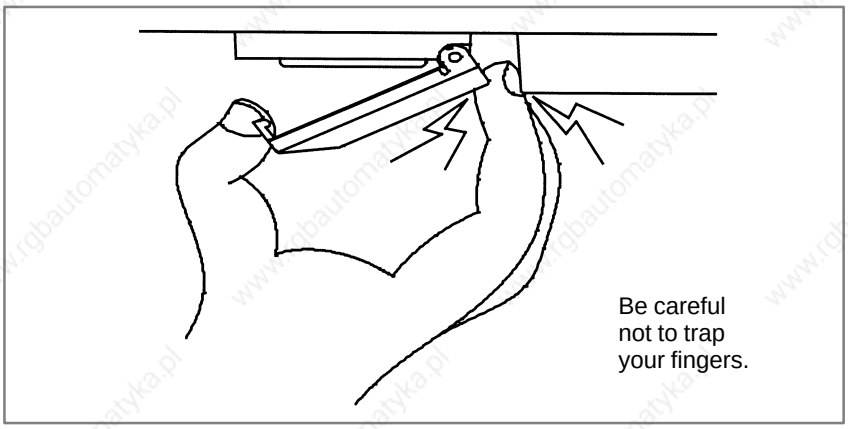
On an MDI unit usable with a 12.1″ LCD, a connector panel is provided to position the interface connectors on the front of the unit. The connector panel has a cover, which is opened and closed when the MDI unit is used. When opening and closing (particularly opening) the cover, be careful not to trap your fingers.



MDI unit : A02B–0261–C155#XXX
A02B–0261–C156#XXX
A02B–0261–C165#XXX
A02B–0261–C166#XXX

CAUTION
When opening and closing (particularly opening) the cover, be careful not to trap your fingers.

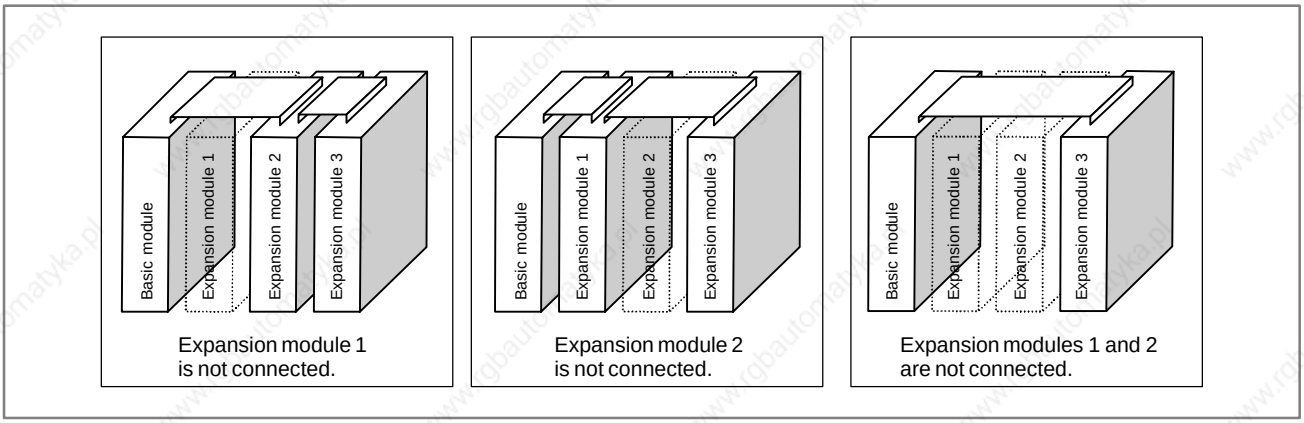
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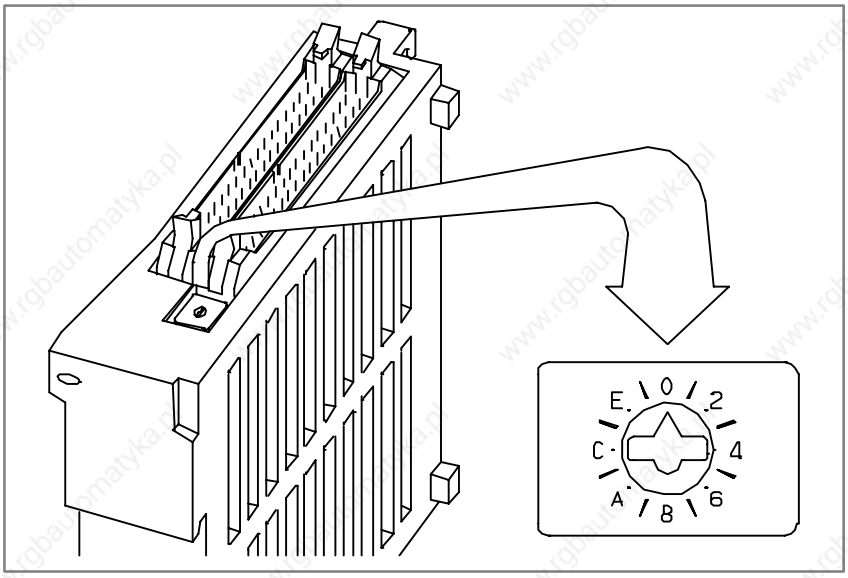
2.16 DISTRIBUTED I/O SETTING

One or two expansion modules can be left unconnected, as shown below, by setting the rotary switch on the expansion module accordingly.



Setting position and setting procedure

An expansion module has a rotary switch, as illustrated below. To change the setting, turn the rotary switch using a standard screwdriver with a blade tip about 2.5 mm wide.

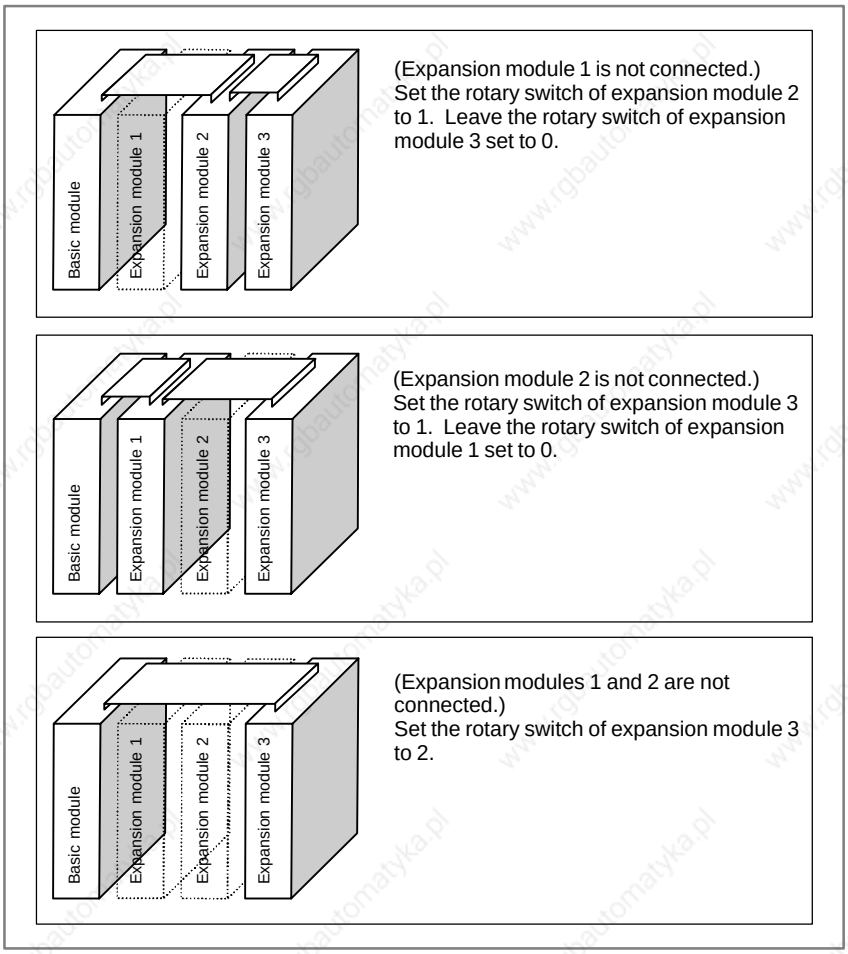


The rotary switch has the following settings:

Setting	Reading	Description
0	0	Factory–set standard setting. All expansion modules are connected.
1	—	Setting indicating that a preceding expansion module is not connected. Select this setting on an expansion module after one unconnected expansion module.
2	2	Setting indicating that two preceding expansion modules are not connected. Select this setting on an expansion module after two unconnected expansion modules.
3	—	Inhibited setting
4 to F	4, —, 6, —, 8, —, A, —, C. —, E, —	Setting 4, 8, or C is the same as setting 0. Setting 5, 9, or D is the same as setting 1. Setting 6, A, or E is the same as setting 2. Setting 7, B, or F is the same as setting 3. (Inhibited setting)

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Sample settings



This feature has not always been incorporated. The incorporation timing differs depending on the module, as listed below:

Expansion module B (DI/DO = 24/16, without MPG I/F)	A03B–0815–C003	Starting with those models delivered in June, 1998
Expansion module C (DO = 16, 2A output)	A03B–0815–C004	Starting with those models delivered in August, 1998
Expansion module D (analog input)	A03B–0815–C005	Starting with those models delivered in August, 1998

NOTE

Like the modules described above, expansion module A (A03B–0815–C002: DI/DO = 24/16, with MPG I/F) is provided with a rotary switch. However, the setting need not be changed because expansion module A is always connected as expansion module 1.

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2.17 REPLACING FUSE ON CONTROL UNIT

WARNING

Do not attempt replacement, unless you have received sufficient training in maintenance and safety practices. Before opening the cabinet to replace a board, ensure that both the CNC unit power and the power magnetics cabinet main power are off. If the CNC power is off, but the power magnetics cabinet main power is on, the servo section may remain powered, resulting in damage to boards and peripheral units during board replacement, as well as presenting a major shock hazard.

CAUTION

When detaching a printed–circuit board, observe the following:

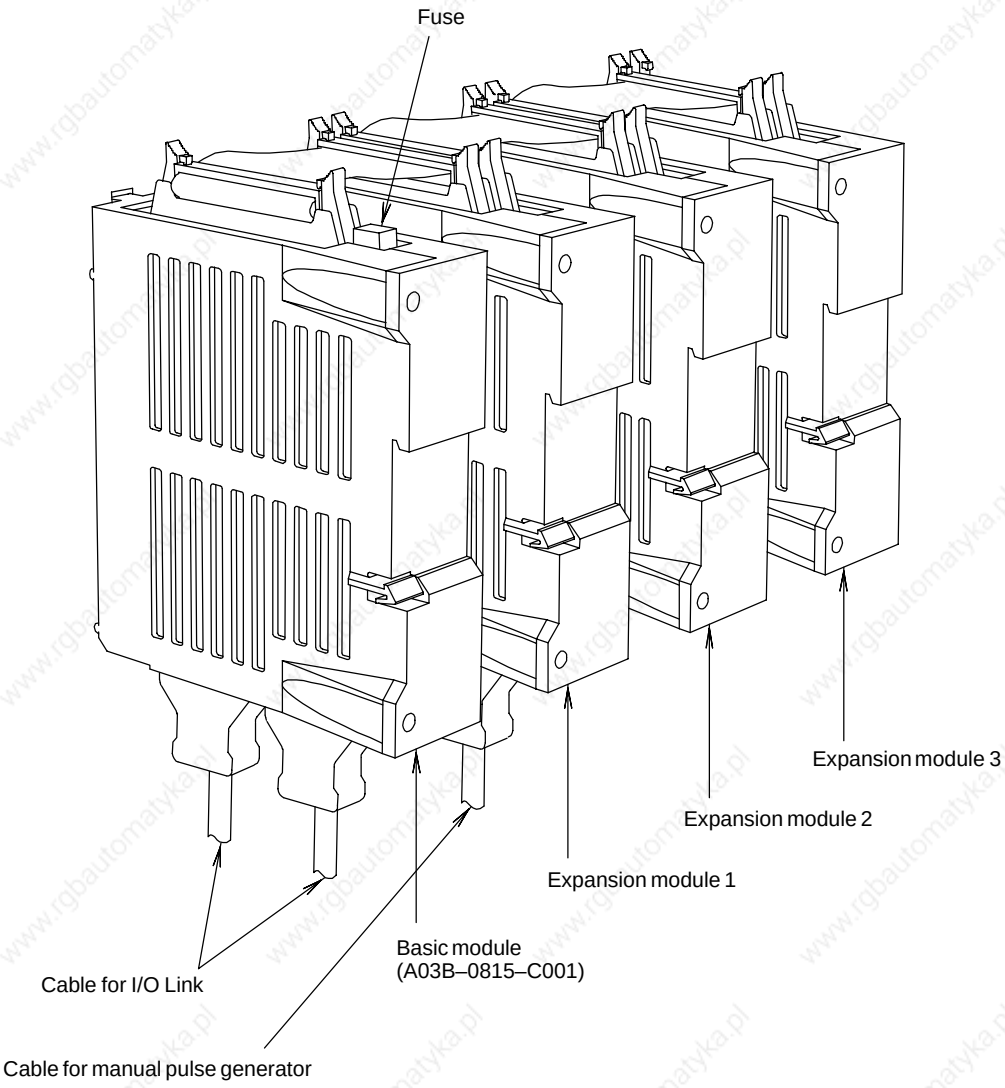
(a) Do not touch any semiconductor device on the board with your bare hands.

(b) Detaching the power unit and main CPU boards (including card and modules) may destroy the contents (parameters and programs) of the CMOS memory chips in the CNC. Therefore, make a backup copy of the CMOS memory contents on a memory card or floppy disk before detaching the power unit.

(c) Re–attach all cables in their original locations. For ease, FANUC recommends noting the position of each cable before detaching it.

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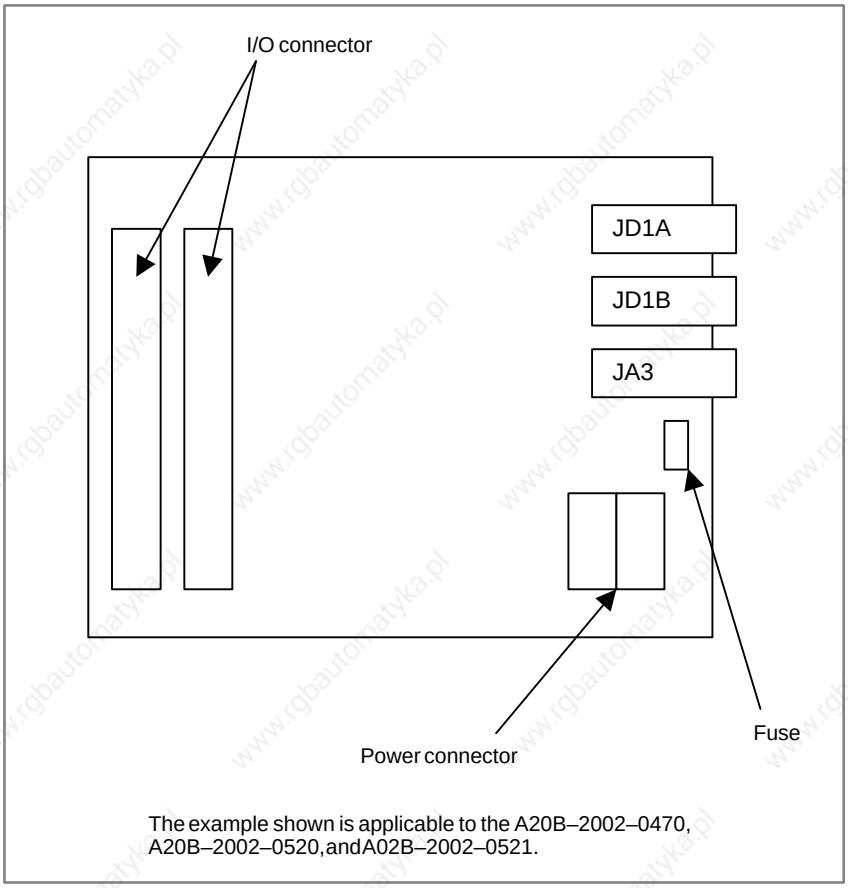
- **Fuse in the connector panel I/O module**



NOTE
Expansion modules have no fuse. Only the basic module is provided with a fuse.

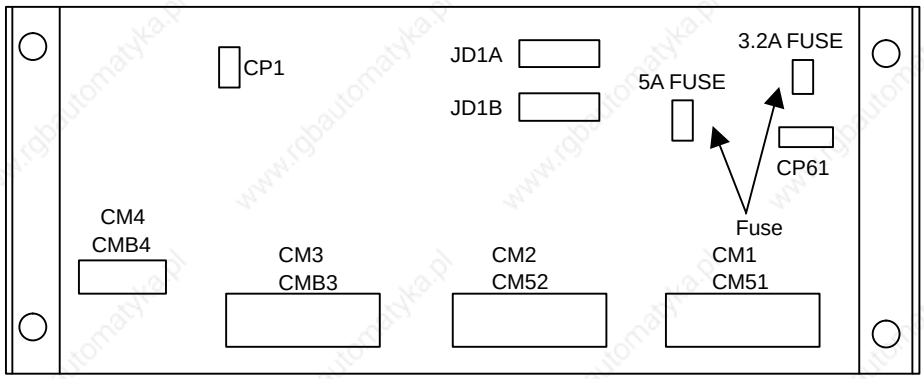
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- **Fuse in the operator's panel I/O module**



The example shown is applicable to the A20B–2002–0470, A20B–2002–0520, and A02B–2002–0521.

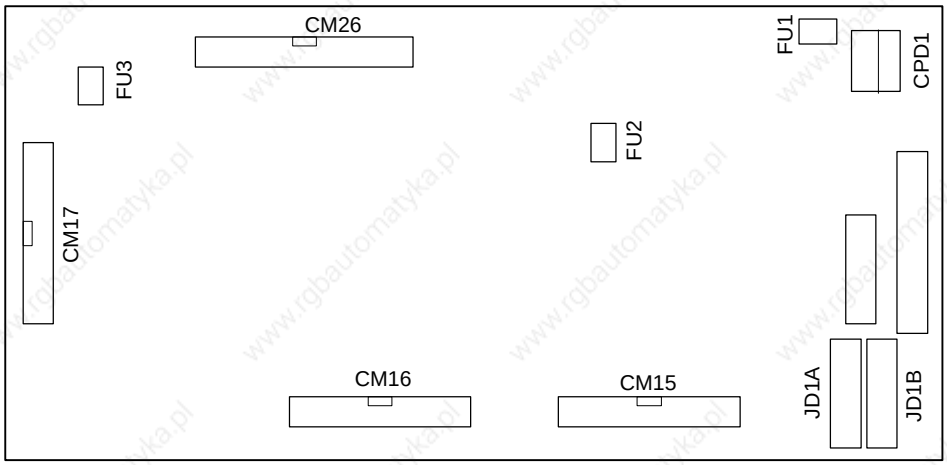
- **Fuse in the operator's panel connection**



This drawing is for A16B–2200–0660, A16B–2200–0661, A16B–2202–0730, and A16B–2202–0731.

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- **Fuse in the machine operator’s panel interface unit**

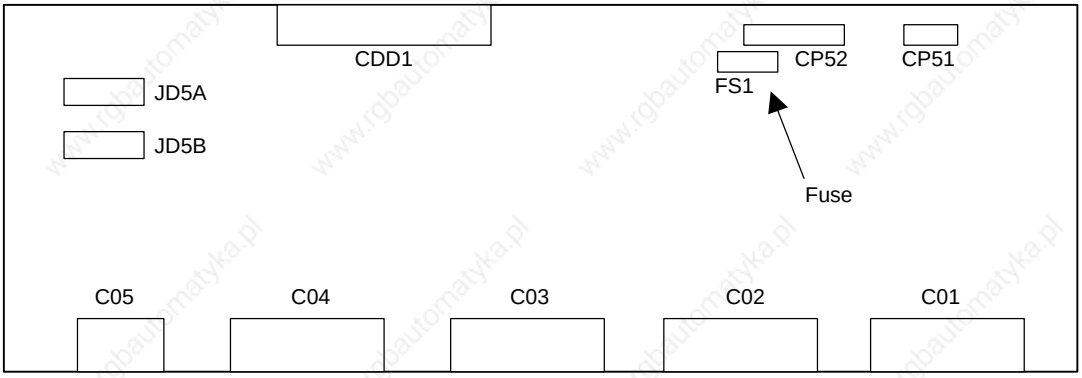


FU1: +24 V fuse (for protecting the general purpose DO and power supply of this printed circuit board)
FU2: +5 V fuse (for protecting the IC power supply and manual pulse generator)
FU3: +5 E fuse (for protecting general–purpose DI)

The example shown is applicable to the A16B–2201–0110.

NOTE
FU2 is not mounted on units of version 05A or above.

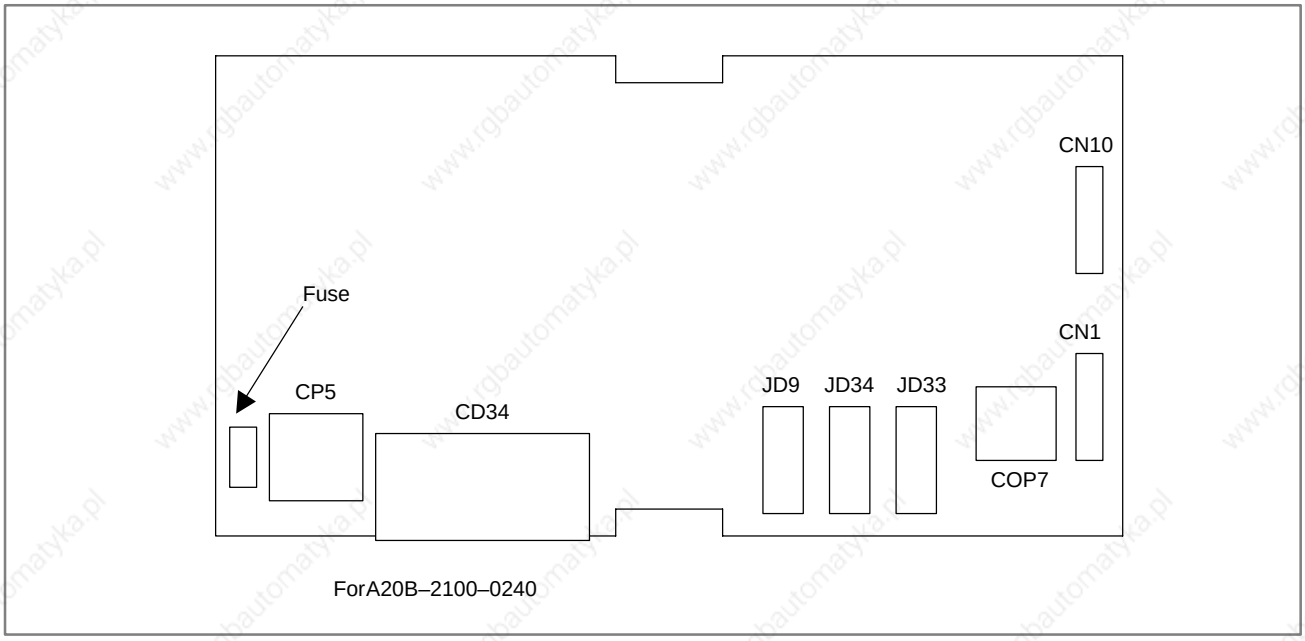
- **Fuse location in connection unit 1**



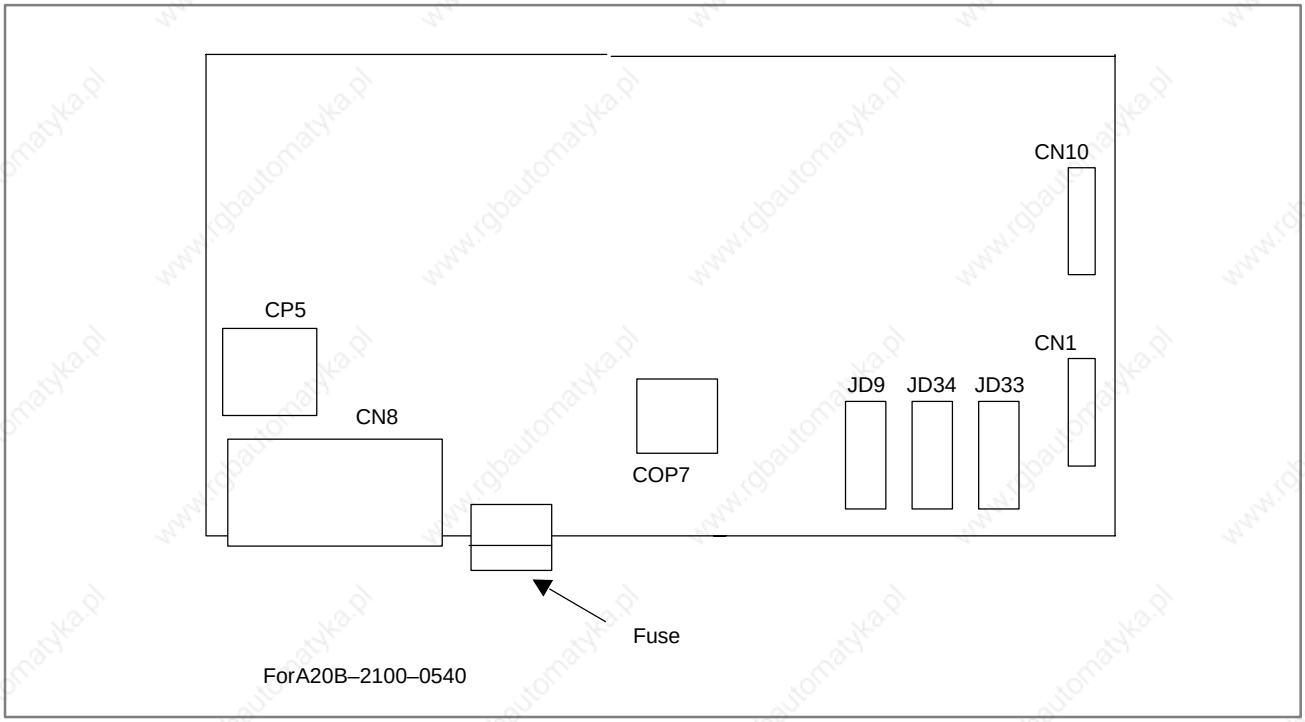
ForA20B–1005–0310

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- **Fuse location in the CNC display unit with PC functions**



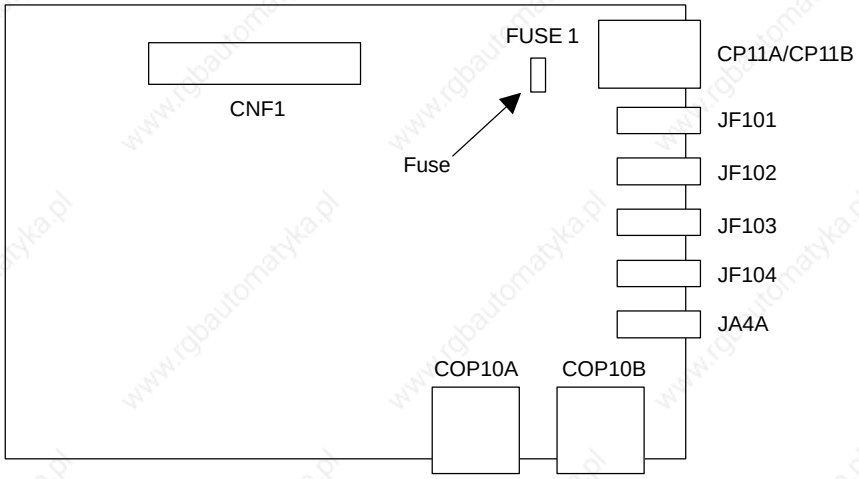
ForA20B–2100–0240



ForA20B–2100–0540

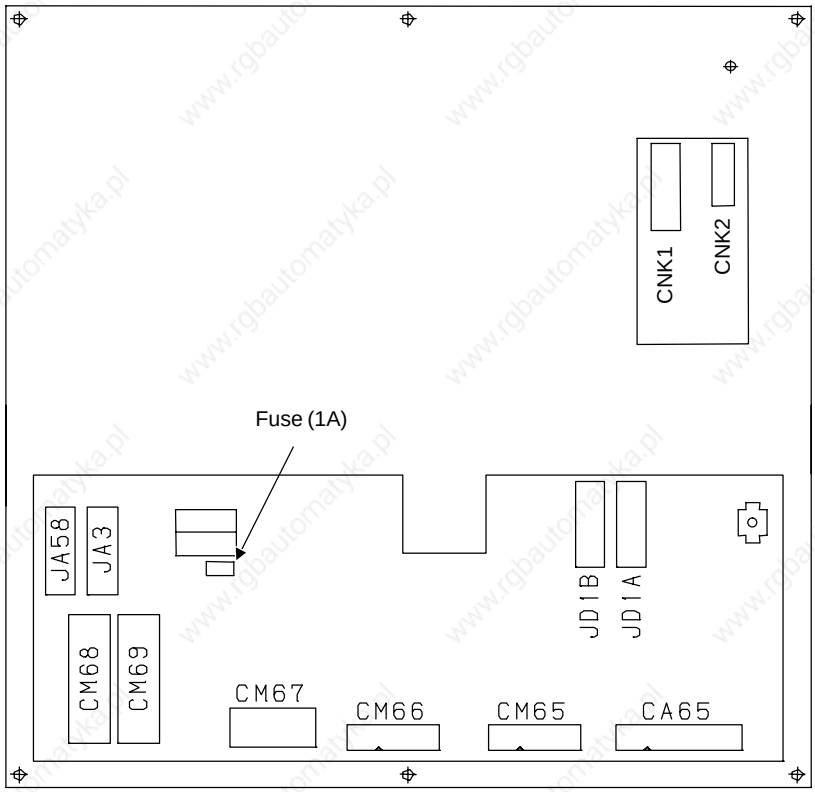
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- **Fuse mounting location of the separate detector interface unit**



This drawing is for the basic unit (A20B–2100–0270).
The additional unit (A20B–2002–0570) has no fuse.

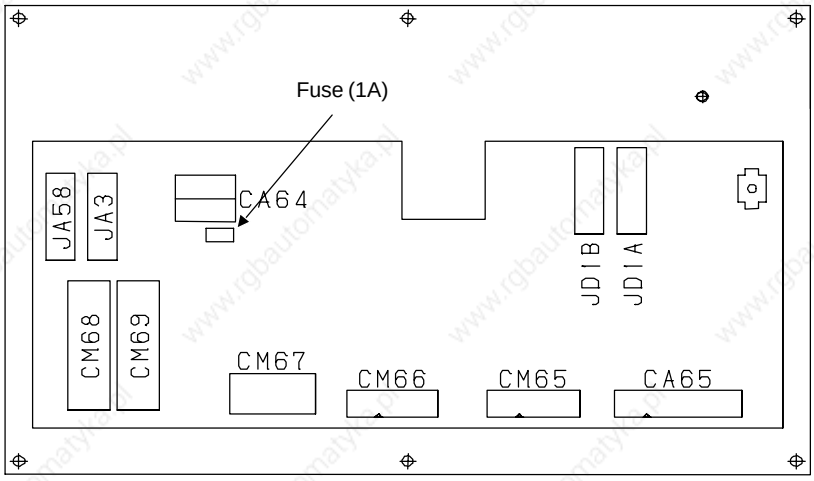
- **Fuse mounting location of the main panel A or A1 of the machine operator's panel**



For A02B–0236–C230 or –C240 (backpanel)

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- **Fuse mounting location of the main panel B or B1 of the machine operator’s panel**



For A02B–0236–C231 or –C241 (backpanel)

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2.18 ENVIRONMENTAL CONDITIONS OUTSIDE CABINET

The control units and various peripheral units provided by FANUC are designed to be accommodated in closed cabinets. Usable cabinets are as follows:

- Cabinets manufactured by machine tool builders to accommodate a control unit and peripheral units
- Cabinets for a flexible turnkey system provided by FANUC
- Operation pendant (manufactured by the machine tool builder) incorporating the control unit and operator's panel
- Other equivalent items

The table below lists the environmental conditions for the control unit within the cabinet.

	Condition	Series 15*i*/150*i*, (normal system)	When using heard disk
Ambient temperature of cabinet	Operating	0°C to 45°C	5°C to 40°C
	Storage, transportation	–20°C to 60°C	
Ambient temperature of unit	Operating	0°C to 55°C	5°C to 50°C
	Storage, transportation	–20°C to –60°C	
Temperature variation		1.1°C/minute maximum	0.3°C/minute maximum
Humidity	Usually	75% or less (relative humidity) No condensation	10% to 75% (relative humidity) No condensation
	Short term (within 1 month)	95% or less (relative humidity) No condensation	10% to 90% (relative humidity) No condensation
Vibration	Operating	0.5 G or less	
	Non–operating	1.0 G or less	
Altitude	Operating	Up to 1000 m	–60 to 1000 m
	Non–operating		–60 to 12,000 m
Atmosphere		Normal machining factory environment. (A separate study is required when the cabinets are used in an environment exposed to relatively high levels of dust, coolant, and organic solvents.)	

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2.19 POWER CONSUMPTION OF EACH UNIT

Product name		Heat dissipation	Remark
Control unit	Basic unit (2 slots)	64W	
	Basic unit (4 slots)	68W	
	Main CPU board	38W	
	Additional axis board	10W	
	HSSB board	4W	
	Data server board A1	6W	
	Data server board A2	6.3W	Includes 0.3 W for the ATA card (*1).
	Fast data server board	6.3W	Includes 0.3 W for the ATA card (*1).
	PMC C board	7W	
	Serial communication board	7W	
	DeviceNet board B	5W	
	DeviceNet board C	4W	
	PROFIBUS–DP board (master)	4W	
	PROFIBUS–DP board (slave)	6W	
	Fast Ethernet board	6W	
	Ethernet board	6W	
LCD unit	10.4″ color LCD unit	20W	
	9.5″ monochrome LCD unit	18W	
Hard disk unit for the data server		13W	
Separate detector unit	Basic unit	9W	(*2)
	Basic unit + additional unit	14W	(*2)
Connection unit	Connection unit 1	16 W + 0.18 W × (number of ON input points)	
	Connection units 1 + 2	25 W + 0.18 W × (number of ON input points)	
Operator’s panel connection unit		3.6 W + 0.18 W × (number of ON points)	
I/O unit model A	AIF01A, AIF01B	1.2W	
	AID32A, AID32B	1.2 W + 0.23 W × (number of ON points)	
	AID16A, AID16B	0.1 W + 0.21 W × (number of ON points)	
	AID32E, AID32F	0.1 W + 0.23 W × (number of ON points)	

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Product name		Heat dissipation	Remark
I/O unit model B	BIF04A1	1.6W	
	AIF02C	1.2W	
	BID16A1, BID16B1	1.5 W + 0.23 W × (number of ON input points)	
	BID16P1, BID16Q1	0.6 W + 0.23 W × (number of ON input points)	
	BOA12A1	0.9 W + (0.09 + 1.1 × IL^2) W × (number of ON output points)	
	BOD16A1	1.0 W + (0.13 + 0.3 × IL^2) W × (number of ON output points)	
	BOD16P1	0.3 W + (0.13 + 0.3 × IL^2) W × (number of ON output points)	
	BIA16P1	0.1 W + 0.21 W × (number of ON input points)	
	BMD88A1, BMD88B1	1.3 W + 0.23 W × (number of ON input points) + (0.13 + 0.3 × IL^2) W × (number of ON output points)	
	BMD88P1, BMD88Q1	0.4 W + 0.23 W × (number of ON input points) + (0.13 + 0.3 × IL^2) W × (number of ON output points)	
I/O model for operator's panel		3.6 W + 0.18 W × (number of ON input points)	
I/O model for connector panel	Basic unit	3.6 W + 0.18 W × (number of ON input points)	
	Expansion unit	3.6 W + 0.18 W × (number of ON input points)	
Control unit transformer (export model)		51W	
CNC 10.4" display unit with PC functions		40W	In normal operation (*3)
CNC 12.1" display unit with PC functions		52W	In normal operation (*3)
CNC 15.0" display unit with PC functions		52W	In normal operation (*3)

NOTE
1 The heat dissipation of the ATA flash card may change, depending on whether a large–capacity card is used and the card specifications.
2 Heat dissipated in the separate detector is not included.
3 The following components are included in normal operation:
CNC display unit with PC functions, main HDD unit, fan for the HDD unit, FDD unit, full keyboard, mouse
The following components are not included in normal operation:
PCMCIA card, PCI expansion board, serial interface expansion device, parallel interface connection device
Note that heat dissipation increases as a peripheral device or PCI expansion board is connected.

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2.20 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.

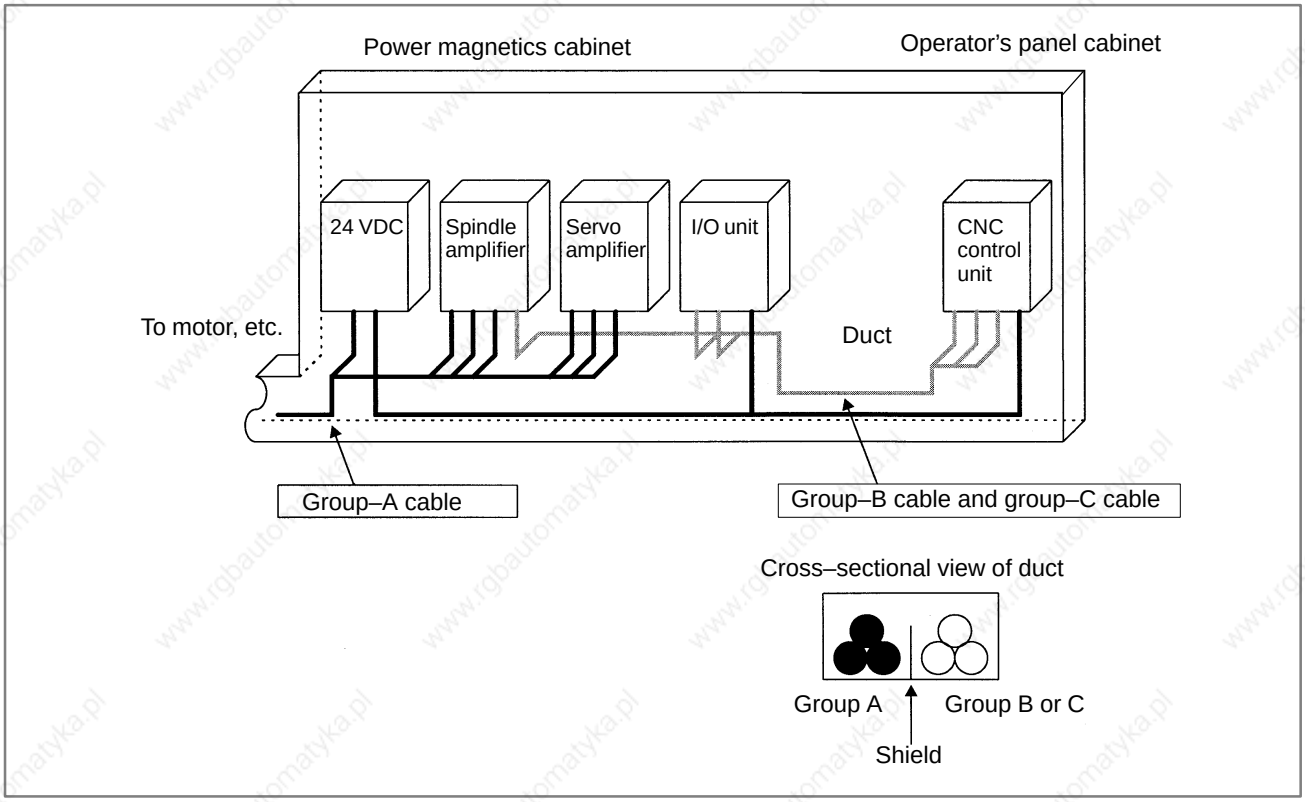
2.20.1 Separation of Signal Lines

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	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 2.15.4, attach a spark killer or diode to the solenoid and relay.
	Secondary side AC power line	
	AC/DC power lines (including servo motor and spindle motor power lines)	
	AC/DC solenoid	
	AC/DC relay	
B	DC solenoid (24 VDC)	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.
	DC relay (24 VDC)	
	DI–DO cable between I/O unit power magnetics cabinets	
	DI–DO cable between I/O unit machines	
C	CNC–I/O unit cable	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 2.15.5 is required.
	Cables for position loopback and velocity loopback	
	CNC–spindle amplifier cable	
	Position coder cable	
	Manual pulse generator cable	
	LCD unit–MDI cable or CNC–MDI cable(*3)	
	RS–232C and RS–422 cables	
	Battery cable	
	Other cables whose shielding is specified	

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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 50 cm, shielding is not required.

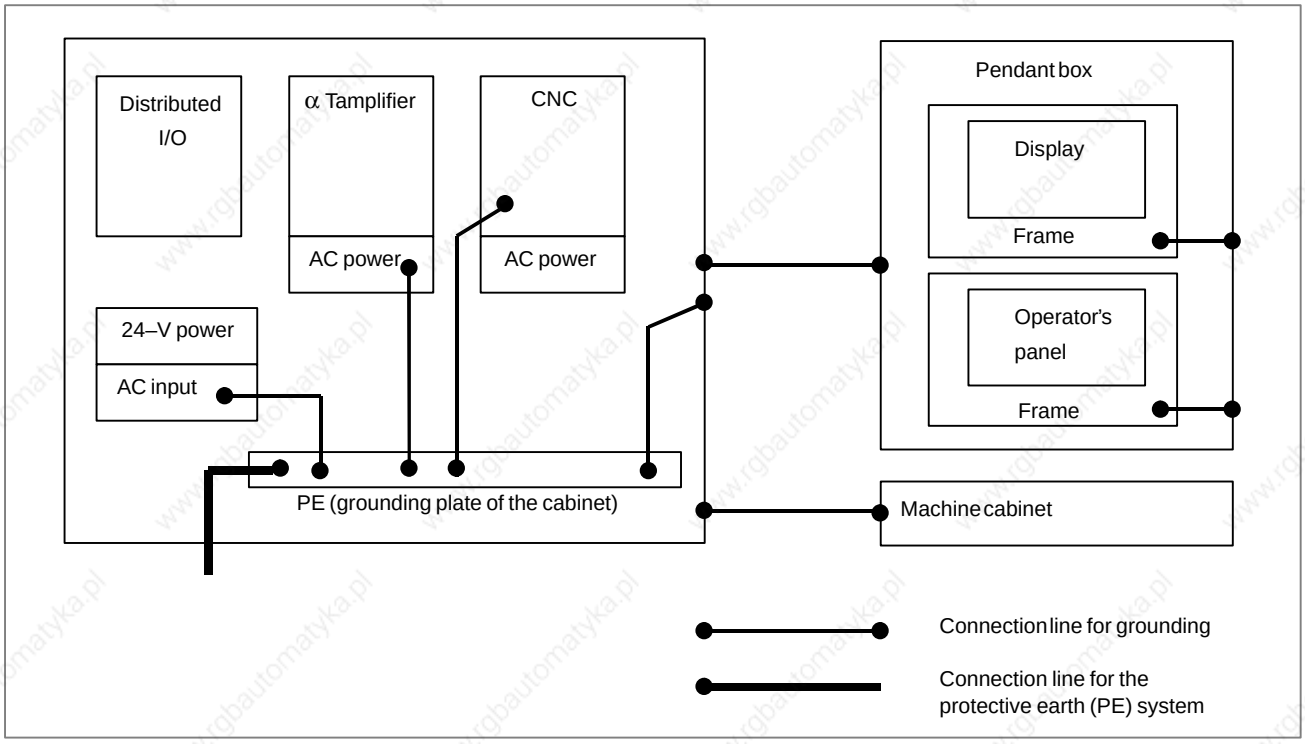


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2.20.2 Grounding

The CNC machine tool has three grounding systems:

- Grounding system for signals
  The grounding system for signals provides the reference potential (0 V) for the electric signal system.
- Protective grounding system
  The protective grounding system is intended to ensure safety and shield any external noise and internally–generated noise. It consists of device frames, unit cases, panels, as well as the shields of the interface cables connecting devices.
- Protective earth (PE) system
  The protective earth (PE) system connects the protective grounding system, which is provided for devices and units, to ground at a single location.



Notes on wiring for the grounding systems

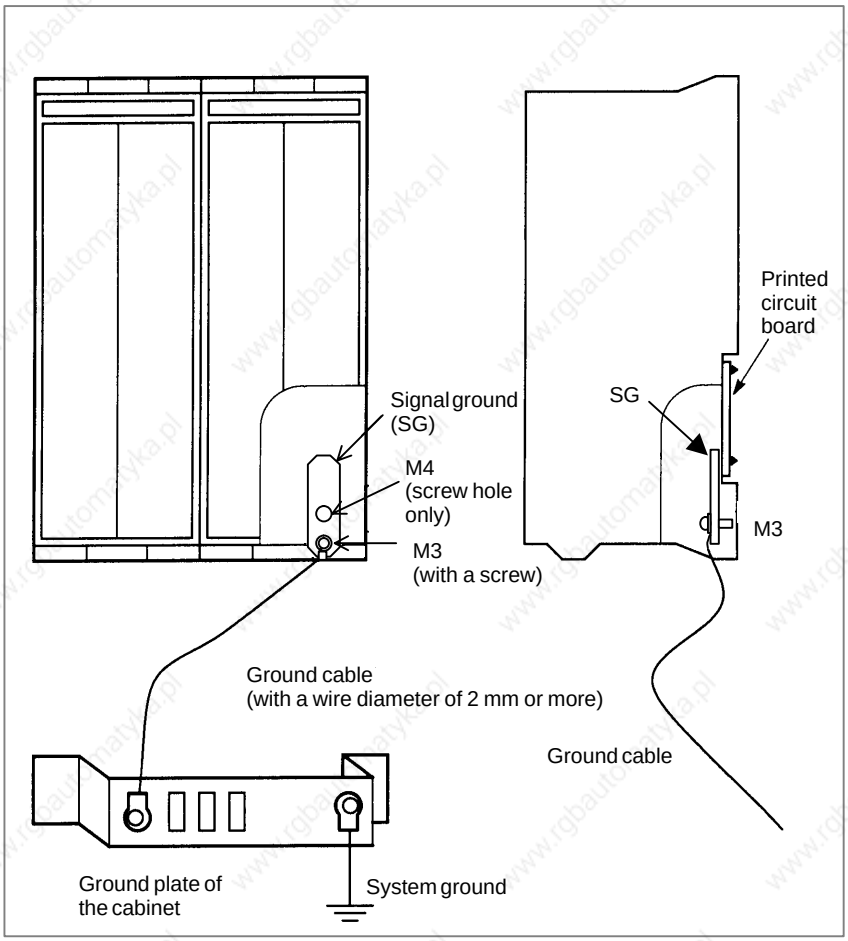
- The ground resistance of the protective earth (PE) system must be 100 Ω or less (as per class–D grounding).
- The connection cable for the protective earth (PE) system must be so large in cross section that the accidental current can flow through the protective earth (PE) system safely in the event of an accident such as a short–circuit.
  (In general, the cross section must be equal to or greater than that of the AC power line.)
- The connection cable for the protective earth (PE) system must be integral with the AC power line so that the power is not supplied when the grounding line is disconnected.

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2.20.3 Control Unit Grounding

(a) Control unit

Connect the 0 V line of the electronic circuits in the control unit to the grounding board of the cabinet through the signal ground (SG) terminal.



CAUTION

The grounding wire is a stranded wire no thinner than 2 mm^2. Keep the wire between the signal ground terminal and the cabinet grounding board as short as possible; otherwise the unit may become susceptible to noise.

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2.20.4 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.

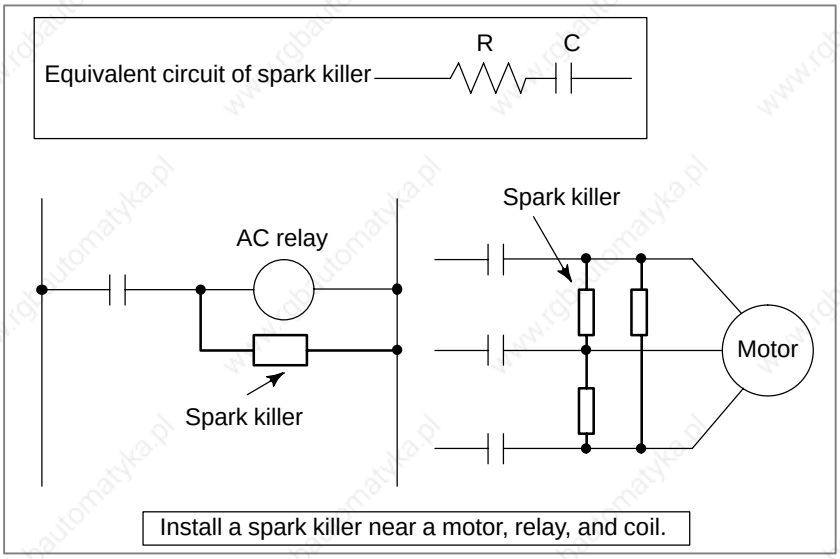
Notes on spark killer selection

- 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 $\frac{I^2}{20}$ (μF)

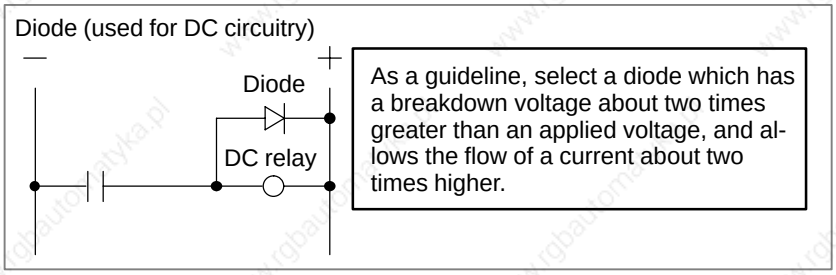
     I: Coil steady–state current (A)



Install a spark killer near a motor, relay, and coil.

CAUTION

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.



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2.20.5 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.

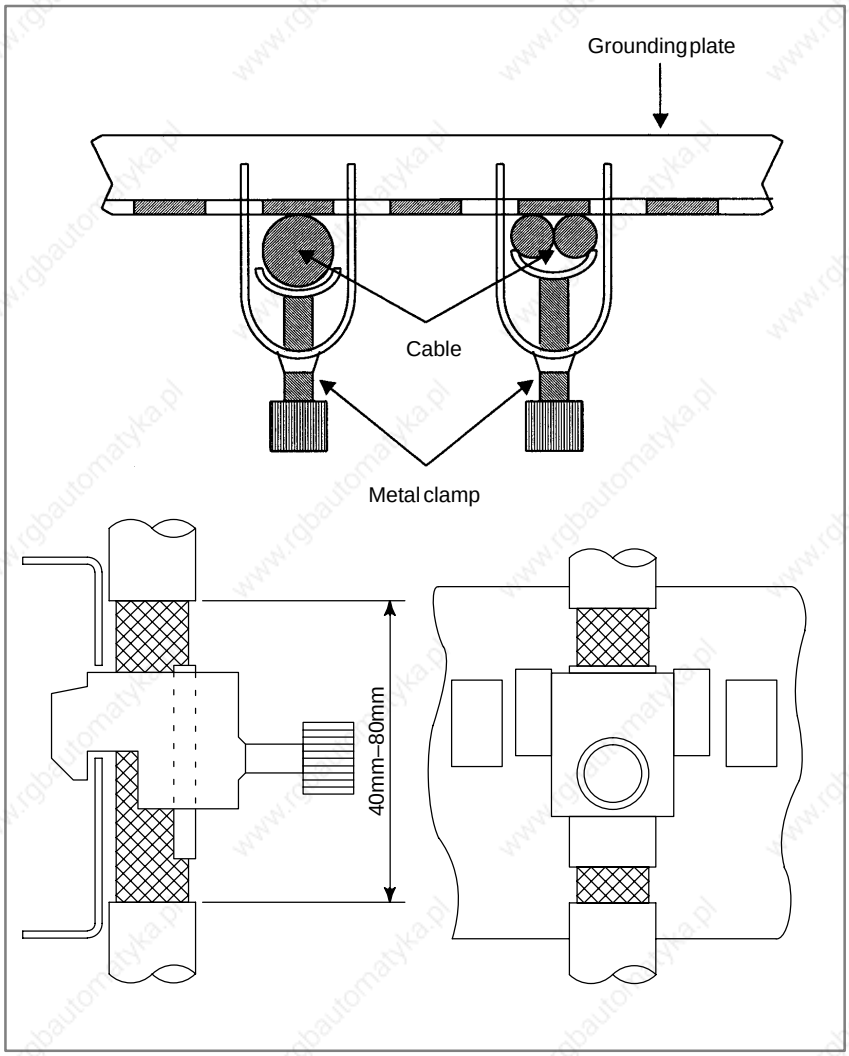


Fig. 2.20.5 (a) Cable clamp (1)

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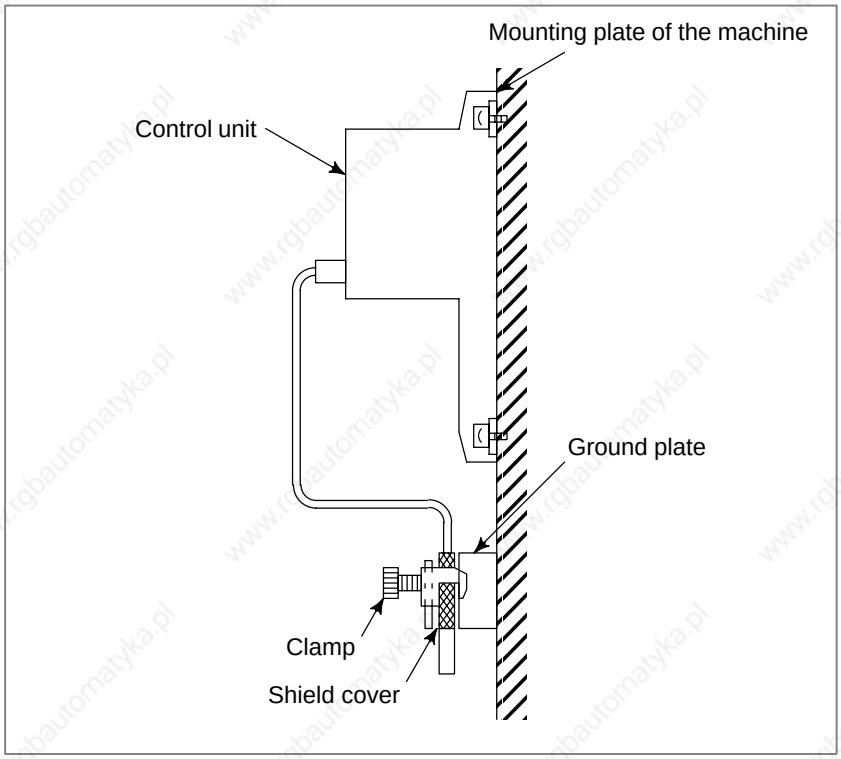


Fig. 2.20.5 (b) Cable clamp (2)

Prepare a ground plate as shown below.

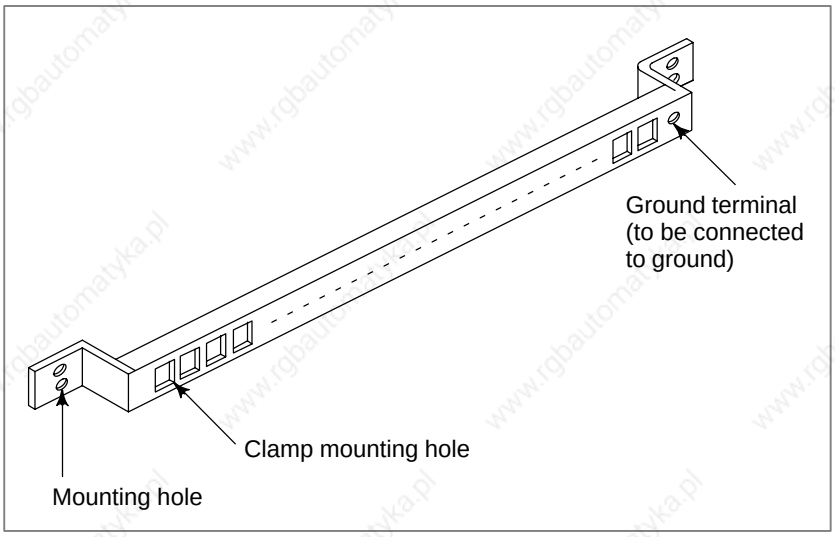


Fig. 2.20.5 (c) Ground plate

For a ground plate, use an iron plate that is as thick as 2 mm or more and is plated with nickel.

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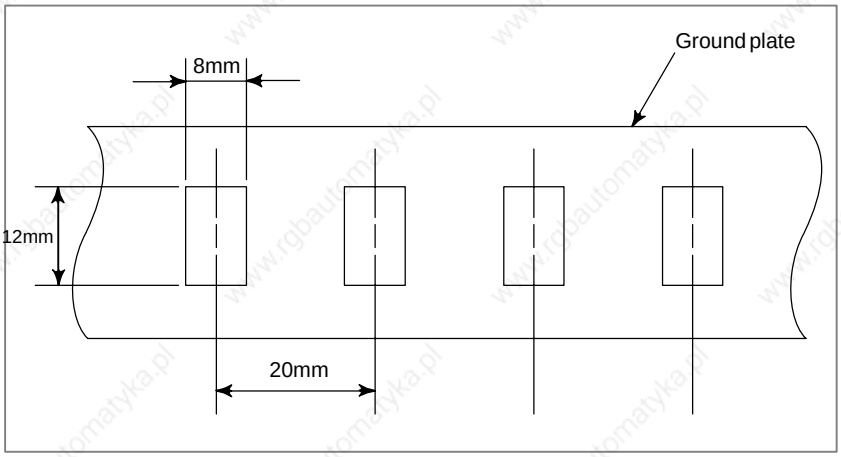


Fig. 2.20.5 (d) Ground plate hole diagram

Reference: Outline drawing of the clamp

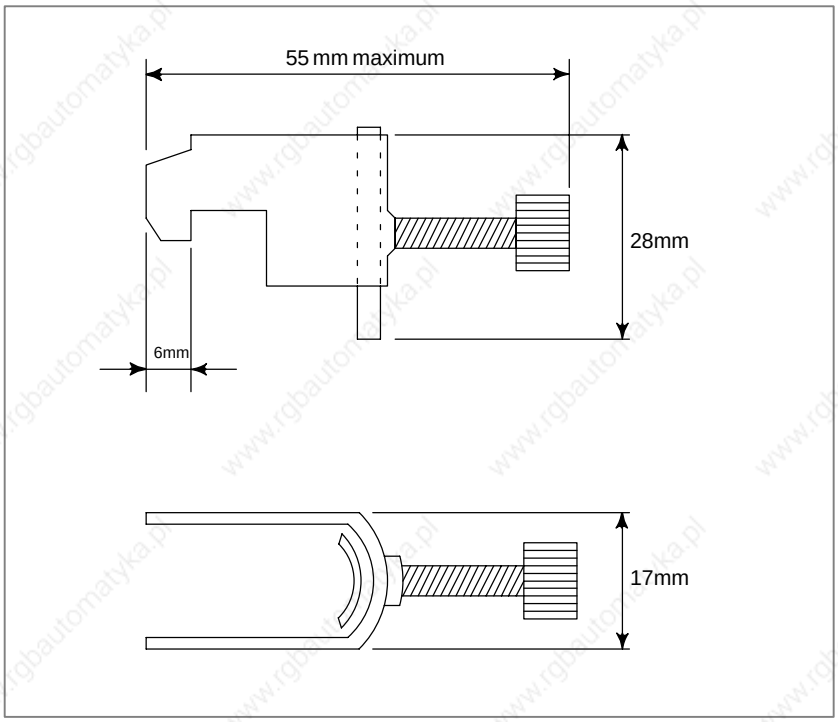


Fig. 2.20.5 (e) Outline drawing of clamp

Ordering code of the clamp: A02B–0124–K001 (set of 8 clamps)

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3 DATA INPUT/OUTPUT

After replacing the SRAM module, data must be set again. This chapter explains how to send and receive parameters, part programs, tool offset values, and other information to and from external I/O devices such as floppy disk drives.

3.1 SPECIFYING PARAMETERS REQUIRED FOR INPUT/OUTPUT 231
3.2 DATA INPUT/OUTPUT 235
3.3 FLOPPY DIRECTORY SCREEN 273
3.4 MEMORY CARD SCREEN 278

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3.1 SPECIFYING PARAMETERS REQUIRED FOR INPUT/OUTPUT

Follow the procedure described below to specify the parameters related to communication:

(1) On the setting parameter screen, enable parameter writing.

(2) On the communication setting screen, specify the parameters related to communication.

3.1.1 Setting Parameter Screen

Follow the procedure described below to enable parameter writing:

(1) Place the system in MDI mode or in the emergency stop state.

(2) Follow either of the procedures described below to display the setting parameter screen.

Method 1

Press the OFFSET SETTING function key several times, until the setting parameter screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [SETTINGPARAM] soft key.

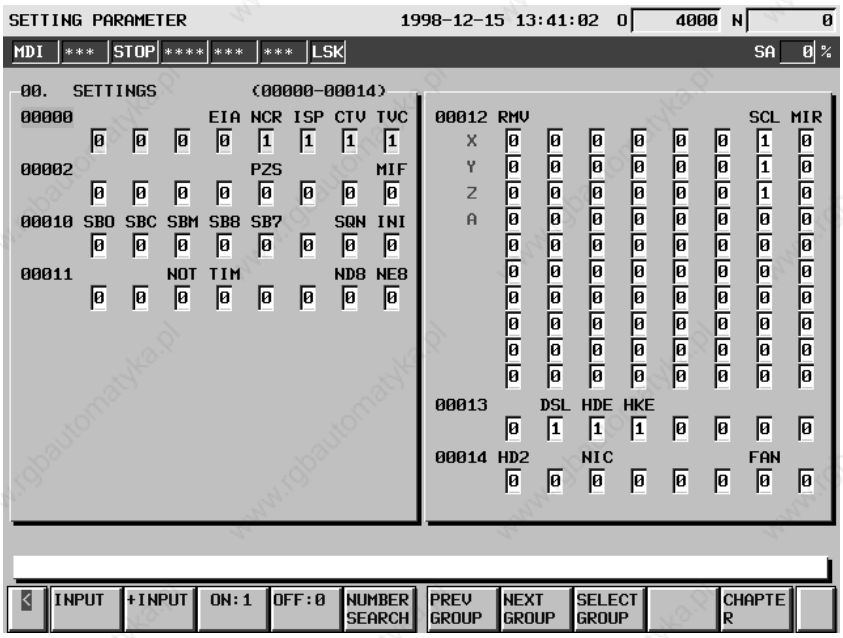


Fig. 3.1.1 Setting parameter screen

(3) Set PWE (bit 0 of parameter No. 8000) and PRA (bit 2 of parameter No. 8000).

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3.1.2 Communication Setting Screen

On this screen, specify the parameters related to communication.

Display

Follow either of the procedures described below to display the communication setting screen:

Method 1

Press the OFFSET SETTING function key several times, until the communication setting screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [COM. SETTING] soft key.

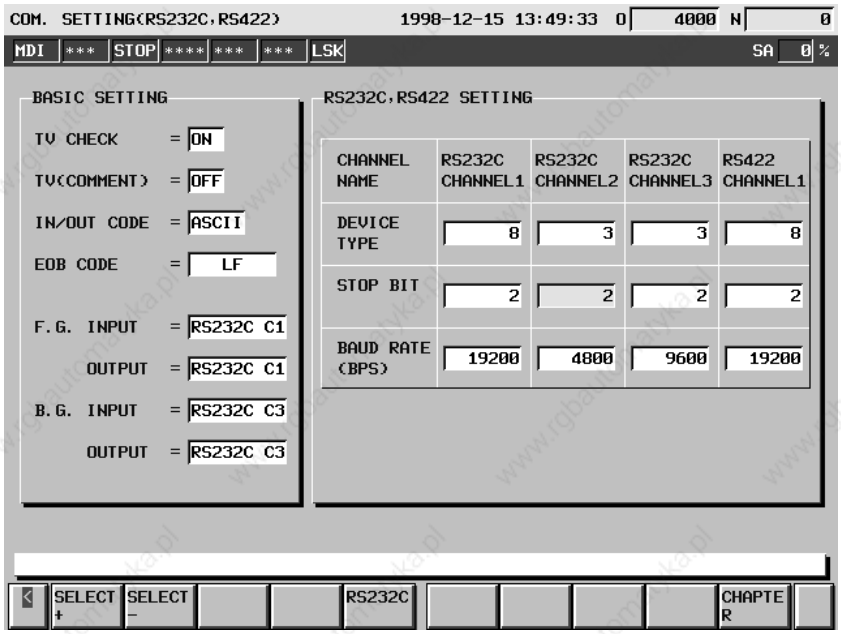


Fig. 3.1.2 Communication setting screen

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- **BASIC SETTING**

Specify the general items for the communication protocol. The table below lists the items, along with corresponding parameters.

Item name	Parameter	Option (parameter setting)
TV CHECK	TVC (No.0000#0)	ON (1)/OFF (0)
TV (COMMENT)	CTV (No.0000#1)	ON (0)/OFF (1)
IN/OUT CODE	ISP (No.0000#2) EIA (No.0000#4)	EIA (#2=0/1, #4=1) ISO (#2=0, #4=0) ASCII (#2=1, #4=0)
EOB CODE	NCR (No.0000#3)	LF CR CR(0)/LF(1)
F.G. INPUT F.G. OUTPUT B.G. INPUT B.G. OUTPUT	(No.0020) (No.0021) (No.0022) (No.0023)	RS232–C C1 (1) RS232–C C2 (2) RS232–C C3 (3) MEMCARD (8) RMTBUF (10) RS422 C1 (13) OPEN CNC1 (15) (DNC operational interface) OPEN CNC2 (16) (UP LOAD/DOWN LOAD interface) RS232–C C4 (20) RS422 C2 (21)

- **RS–232C, RS422 SETTING**

Set the communication conditions for each of RS–232C and RS–422 channels. The device type, number of stop bits, and baud rate are specified using the following parameter sets and are allocated to channels for which device numbers are set using parameters Nos. 5001 to 5003 and 5013.

Parameter set 1: parameters Nos. 5110, 5111, and 5112
Parameter set 2: parameters Nos. 5120, 5121, and 5122
.
.
.
Parameter set 9: parameters Nos. 5190, 5191, and 5192

Item name	Parameter	Setting
DEVICE TYPE	(No.5110, 5120, 5130) (No.5140, 5150, 5160) (No.5170, 5180, 5190)	1 to 8
STOP BIT	(No.5111, 5121, 5131) (No.5141, 5151, 5161) (No.5171, 5181, 5191)	1/2
BAUD RATE	(No.5112, 5122, 5132) (No.5142, 5152, 5162) (No.5172, 5182, 5192)	1 to 12 (50, 100, 110, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 19200 bps)

- **[HINT]**

Brief description of the item to which the cursor is positioned, such as the possible settings.

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Data setting

1) Enter MDI mode.
2) Use the cursor keys, [↑], [↓], [←], and [→], to position the cursor on the desired item.
3) Use the [SELECT +] and [SELECT –] soft keys to select the desired setting.

NOTE

1 For channels for which device numbers (parameters Nos. 5001 to 5003 and 5013) are not set, the following default parameter sets are selected:
RS232C CHANEL 1: Parameter set 1 (Nos. 5110, 5111, and 5112)
RS232C CHANEL 2: Parameter set 2 (Nos. 5120, 5121, and 5122)
RS323C CHANEL 3: Parameter set 3 (Nos. 5130, 5131, and 5132)
RS422 CHANEL 1: Parameter set 4 (Nos. 5140, 5141, and 5142)

2 If the values set for the STOP BIT and BAUD RATE parameters are out of range, the following default values are selected internally and displayed on the setting screen. These values are not, however, reflected in the parameters.
STOP BIT: 2
BAUD RATE: 9 (4800 bps)

3 If the value set for a DEVICE TYPE parameter is out of range, “UNKNOWN” appears.

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3.2 DATA INPUT/OUTPUT

The CNC stores data including the following items.

These data items must be output to an external input/output device while the CNC is operating normally.

(1) Part program (machining program, custom macro program, etc.)
(2) System parameter
(3) Workpiece origin offset data
(4) Pitch error compensation data
(5) Tool offset data
(6) Custom macro variable
(7) Volumetric compensation data
(8) Tool offset data by tool number
(9) Fixture offset data
(10) Rotary head dynamic tool compensation data
(11) Periodic maintenance data
(12) Item selection menu (machine system) data
(13) Maintenance information
(14) System configuration data
(15) System log data

NOTE
1 When sending and receiving data items to and from a FANUC Handy File, you can specify the input/output file with its file name or number.
2 When sending and receiving data items to and from a memory card, you can specify the input/output file with its file name.

3.2.1 Output of Part Programs

Setup for output

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the program text screen:

Method 1

Press the PROG function key several times, until the program text screen appears.

Method 2

(1) Press the PROG function key.
(2) Click the [TEXT] soft key.

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Outputting the currently displayed program

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.
(2) Click the [THIS] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [THIS] soft key.

Method 3 (the file number is specified, one of two methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [THIS] soft key.

Method 4 (the file number is specified, one of two methods)

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [THIS] soft key.

Outputting a specified single program

- **Methods in which neither the output file name nor number need be specified**

Method 1

(1) Click the [PUNCH] soft key.
(2) Click the [(PROG#)] soft key.
(3) Key in the program number.
(4) Click the [EXEC] soft key.

Method 2

(1) Click the [PUNCH] soft key.
(2) Click the O address key.
(3) Key in the program number.
(4) Click the [EXEC] soft key.

Method 3

(1) Click the O address key.
(2) Key in the program number.
(3) Click the [PUNCH] soft key.

- **Methods in which the output file name is specified**

Method 1

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.

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(5) Click the [(PROG#)] soft key.
(6) Key in the program number.
(7) Click the [EXEC] soft key.

Method 2

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the O address key.
(6) Key in the program number.
(7) Click the [EXEC] soft key.

- **Methods in which the file number is specified**

Method 1

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [(PROG#)] soft key.
(5) Key in the program number.
(6) Click the [EXEC] soft key.

Method 2

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file name.
(4) Click the O address key.
(5) Key in the program number.
(6) Click the [EXEC] soft key.

Method 3

(1) Click the N address key.
(2) Key in the file number.
(3) Click the O address key.
(4) Key in the program number.
(5) Click the [PUNCH] soft key.

Outputting specified multiple programs

- **Methods in which neither the output file name nor number need be specified**

Method 1

(1) Click the [PUNCH] soft key.
(2)Click the [(PROG#)] soft key.
(3) Key in the number of the first program to be output.
(4) Click the [,(PROG#)] soft key.
(5) Key in the number of the last program to be output.
(6) Click the [EXEC] soft key.

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Method 2

(1) Click the [PUNCH] soft key.
(2) Click the [O] address key.
(3) Key in the number of the first program to be output.
(4) Click the [,] address key.
(5) Click the [O] address key.
(6) Key in the number of the last program to be output.
(7) Click the [EXEC] soft key.

Method 3

(1) Click [O] address key.
(2) Key in the number of the first program to be output.
(3) Click the [,] address key.
(4) Click the [O] address key.
(5) Key in the number of the last program to be output.
(6) Click the [EXEC] soft key.

- **Methods in which the output file name is specified**

Method 1

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [(PROG#)] soft key.
(6) Key in the number of the first program to be output.
(7) Click the [,(PROG#)] soft key.
(8) Key in the number of the last program to be output.
(9) Click the [EXEC] soft key.

Method 2

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [O] address key.
(6) Key in the number of the first program to be output.
(7) Click the [,] address key.
(8) Click the [O] address key.
(9) Key in the number of the last program to be output.
(10) Click the [EXEC] soft key.

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- **Methods in which the file number is specified**

Method 1

(1) Click the [PUNCH] soft key.
(2) Click the [FILE#] soft key.
(3) Key in the file number
(4) Click the [(PROG#)] soft key.
(5) Key in the number of the first program to be output.
(6) Click the [,(PROG#)] soft key.
(7) Key in the number of the last program to be output.
(8) Click the [EXEC] soft key.

Method 2

(1) Click the [PUNCH] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [O] address key.
(5) Key in the number of the first program to be output.
(6) Click the [,] address key.
(7) Click the [O] address key.
(8) Key in the number of the last program to be output.
(9) Click the [EXEC] soft key.

Method 3

(1) Click the [N] address key.
(2) Key in the file number.
(3) Click the [O] address key.
(4) Key in the number of the first program to be output.
(5) Click the [,] address key.
(6) Click the [O] address key.
(7) Key in the number of the last program to be output.
(8) Click the [PUNCH] soft key.

Outputting all programs

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.
(2) Click the [ALL] SOFT KEY.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [ALL] soft key.

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Method 3 (the file number is specified, one of two methods)

(1) Click the [PUNCH] soft key.
(2) Click the [FILE#)] soft key.
(3) Key in the file number.
(4) Click the [ALL] soft key.

Method 4 (the file number is specified, one of two methods)

(1) Click the [PUNCH] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [ALL] soft key.

Outputting the currently displayed program, starting from a position other than the beginning

Method 1 (neither the output file name nor number need be specified)

(1) Position the cursor to the first position of the program that is to be punched out.
(2) Click the [PUNCH] soft key.
(3) Click the [HERE] soft key.

Method 2 (the output file name is specified)

(1) Position the cursor to the first position of the program that is to be punched out.
(2) Click the [PUNCH] soft key.
(3) Click the [”FILE NAME] soft key.
(4) Key in the file name.
(5) Click the [FILE NAME”] soft key.
(6) Click the [HERE] soft key.

Method 3 (the file number is specified, one of two methods)

(1) Position the cursor to the first position of the program that is to be punched out.
(2) Click the [PUNCH] soft key.
(3) Click the [(FILE#)] soft key.
(4) Key in the file number.
(5) Click the [HERE] soft key.

Method 4 (the file number is specified, one of two methods)

(1) Position the cursor to the first position of the program that is to be punched out.
(2) Click the [PUNCH] soft key.
(3) Click the [N] address key.
(4) Key in the file number.
(5) Click the [HERE] soft key.

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3.2.2 Output of System Parameters

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the parameter screen:

Method 1

Press the [SYSTEM] function key several times, until the parameter screen appears.

Method 2

(1) Press the [SYSTEM] function key.

(2) Click the [PARAMETER] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [PARAMETER] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [PARAMETER] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [PARAMETER] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [N] address key.

(3) Key in the file number.

(4) Click the [PARAMETER] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the [N] address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

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NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of system parameters,” is used to output system parameters to a FANUC Handy File and Memory card, the file name will be CNC–PARA.TXT.

3.2.3 Output of Workpiece Origin Offset Data

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the workpiece origin offset screen:

Method 1

Press the OFFSET SETTING function key several times, until the workpiece origin offset screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [WORK OFFSET] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [WORK OFFSET] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [WORK OFFSET] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [WORK OFFSET] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the N address key.

(3) Key in the file number.

(4) Click the [WORK OFFSET] soft key.

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Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

NOTE

When method 1 (in which neither the output file name nor number need be specified), described in “Output of workpiece origin offset data,” is used to output workpiece origin offset data to a FANUC Handy File and Memory card, the file name will be EXT–WKZ.TXT.

3.2.4 Output of Pitch Error Compensation Data

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the pitch error compensation screen:

Method 1

Press the SYSTEM function key several times, until the pitch error compensation screen appears.

Method 2

(1) Press the SYSTEM function key.

(2) Click the [PITCH ERROR] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [PITCH ERROR] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [PITCH ERROR] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [PITCH ERROR] soft key.

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Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [N] address key.

(3) Key in the file number.

(4) Click the [PITCH ERROR] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the [N] address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

NOTE

When method 1 (in which neither the output file name nor number need be specified), described in “Output of pitch error compensation data,” is used to output pitch error compensation data to a FANUC Handy File and Memory card, the file name will be PITCH.TXT.

3.2.5 Output of Tool Offset Data

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the tool offset screen:

Method 1

Press the [OFFSET SETTING] function key several times, until the tool offset screen appears.

Method 2

(1) Press the [OFFSET SETTING] function key.

(2) Click the [TOOL OFFSET] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [TOOL OFFSET] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [TOOL OFFSET] soft key.

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Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [TOOL OFFSET] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [TOOL OFFSET] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of tool offset data,” is used to output tool offset data to a FANUC Handy File and Memory card, the file name will be TOOL–OFS.TXT.

3.2.6 Output of Custom Macro Variables

Setup for output

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the macro variable screen:

Method 1

Press the OFFSET SETTING function key several times, until the macro variable screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [MACRO VAR.] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.
(2) Click the [COMMONNONVOL] soft key.

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Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [COMMONNONVOL] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [COMMONNONVOL] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [COMMONNONVOL] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of custom macro variables,” is used to output custom macro variables to a FANUC Handy File and Memory card, the file name will be MACRO.TXT.

3.2.7 Output of Volumetric Compensation Data

Setup for output

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the volumetric compensation data screen:

Method 1

Press the SYSTEM function key several times, until the volumetric compensation screen appears.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [VOLUMETRIC] soft key.

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Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.
(2) Click the [VOLUMETRIC] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [VOLUMETRIC] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [VOLUMETRIC] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [VOLUMETRIC] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the [N] address key.
(2) Key in the file number.
(3) Click the [PUNCH] soft key.

NOTE

When method 1 (in which neither the output file name nor number need be specified), described in “Output of volumetric compensation data,” is used to output volumetric compensation data to a FANUC Handy File and Memory card, the file name will be VOLCOMP.TXT.

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3.2.8 Output of Tool Offset Data by Tool Number

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the “tool offset by tool number” screen:

Method 1

Press the [OFFSET SETTING] function key several times, until the “tool offset by tool number” screen appears.

Method 2

(1) Press the [OFFSET SETTING] function key.

(2) Click the [T CODEOFFSET] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [T CODEOFFSET] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [T CODEOFFSET] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [T CODEOFFSET] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [N] address key.

(3) Key in the file number.

(4) Click the [T CODEOFFSET] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the [N] address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

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NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of tool offset data by tool number,” is used to output tool offset data to a FANUC Handy File and Memory card, the file name will be TOOL–DAT.TXT.

3.2.9 Output of Fixture Offset Data

Setup for output

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the fixture offset screen:

Method 1

Press the [OFFSET SETTING] function key several times, until the fixture offset screen appears.

Method 2

(1) Press the [OFFSET SETTING] function key.
(2) Click the [FOFS] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)
(1) Click the [PUNCH] soft key.
(2) Click the [FOFS] soft key.

Method 2 (the output file name is specified)
(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [FOFS] soft key.

Method 3 (the file number is specified, one of three methods)
(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [FOFS] soft key.

Method 4 (the file number is specified, one of three methods)
(1) Click the [PUNCH] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [FOFS] soft key.

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Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of fixture offset data,” is used to output fixture offset data to a FANUC Handy File and Memory card, the file name will be FOFS.TXT.

3.2.10 Output of Rotary Head Dynamic Tool Compensation Data

Setup for output

(1) Enter MDI mode.

(2) Follow either of the procedures described below to display the rotary head dynamic tool compensation screen:

Method 1

Press the OFFSET SETTING function key several times, until the rotary head dynamic tool compensation screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [DOFS] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [DOFS] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [DOFS] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [DOFS] soft key.

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Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [N] address key.

(3) Key in the file number.

(4) Click the [DOFS] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the [N] address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of rotary head dynamic tool compensation data,” is used to output rotary head dynamic tool compensation data to a FANUC Handy File and Memory card, the file name will be DOFS.TXT.

3.2.11 Output of Periodic Maintenance Data

Setup for output

(1) Enter EDIT mode.

(2) Follow either of the procedures described below to display the item setting screen of the periodic maintenance screen:

Method 1

Press the [SYSTEM] function key several times, until the periodic maintenance screen appears.

Method 2

(1) Press the [SYSTEM] function key.

(2) Click the [PERIODMAINTE] soft key.

(3) Click the [SET ITEM] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [PERIODMAINTE] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [PERIODMAINTE] soft key.

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Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of periodic maintenance data,” is used to output periodic maintenance data to a FANUC Handy File and Memory card, the file name will be PMNTSYS.TXT.

3.2.12 Output of Item Selection Menu (Machine System) Data

Setup for output

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the item selection menu on the periodic maintenance screen:

Method 1

(1) Press the SYSTEM function key several times, until the periodic maintenance screen appears.
(2) Click the [SET ITEM] soft key.
(3) Click the [SELECTITEM] soft key.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [PERIODMAINTE] soft key.
(3) Click the [SET ITEM] soft key.
(4) Click the [SELECTITEM] soft key.

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Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.
(2) Click the [PERIODMAINTE] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PERIODMAINTE] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [PUNCH] soft key.

NOTE

When method 1 (in which neither the output file name nor number need be specified), described in “Output of item selection menu (machine system) data,” is used to output item selection menu (machine system) data to a FANUC Handy File and Memory card, the file name will be PMNTMCN.TXT.

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3.2.13 Output of Maintenance Information

Setup for output

(1) Enter EDIT mode.

(2) Follow either of the procedures described below to display the maintenance information screen:

Method 1

(1) Press the SYSTEM function key several times, until the maintenance information screen appears.

(2) If the screen is in Japanese display mode, change the input mode to single–byte alphanumeric mode.

Method 2

(1) Press the SYSTEM function key.

(2) Click the [MAINTEINFO] soft key.

(3) If the screen is in Japanese display mode, change the input mode to single–byte alphanumeric mode.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [MAINTEINFO] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [MAINTEINFO] soft key.

Method 3 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [MAINTEINFO] soft key.

Method 4 (the file number is specified, one of three methods)

(1) Click the [PUNCH] soft key.

(2) Click the N address key.

(3) Key in the file number.

(4) Click the [MAINTEINFO] soft key.

Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

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NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of maintenance information,” is used to output maintenance information to a FANUC Handy File and Memory card, the file name will be MAINTINF.TXT.

3.2.14 Output of System Configuration Data

Setup for output

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the system configuration screen:
Method 1
Press the [SYSTEM] function key several times, until the system configuration screen appears.
Method 2
(1) Press the [SYSTEM] function key.
(2) Click the [SYSTEMCONFIG] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)
(1) Click the [PUNCH] soft key.
(2) Click the [SYSTEMCONFIG] soft key.
Method 2 (the output file name is specified)
(1) Click the [PUNCH] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [SYSTEMCONFIG] soft key.
Method 3 (the file number is specified, one of three methods)
(1) Click the [PUNCH] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [SYSTEMCONFIG] soft key.
Method 4 (the file number is specified, one of three methods)
(1) Click the [PUNCH] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [SYSTEMCONFIG] soft key.

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Method 5 (the file number is specified, one of three methods)

(1) Click the N address key.

(2) Key in the file number.

(3) Click the [PUNCH] soft key.

NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of system configuration data,” is used to output system configuration data to a FANUC Handy File and Memory card, the file name will be SYS_CONF.TXT.

3.2.15 Output of System Log Data

Setup for output

(1) Enter MDI mode.

(2) Set DSL (bit 6 of parameter No. 0013) to 1.

(3) Follow either of the procedures described below to display the system log screen.

Method 1

Press the SYSTEM function key several times, until the system log screen appears.

Method 2

(1) Press the SYSTEM function key.

(2) Click the [SYSTEMLOG] soft key.

Executing output

Method 1 (neither the output file name nor number need be specified)

(1) Click the [PUNCH] soft key.

(2) Click the [LOG (NEW)]/[LOG (OLD)]/[ALL]/[THIS DATA] soft key.

Method 2 (the output file name is specified)

(1) Click the [PUNCH] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [LOG (NEW)]/[LOG (OLD)]/[ALL]/[THIS DATA] soft key.

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NOTE
When method 1 (in which neither the output file name nor number need be specified), described in “Output of system log data,” is used to output system log data to a FANUC Handy File and Memory card, the file name will be as follows:
SYSTEM LOG (NEW): SYSLOG_N.TXT
SYSTEM LOG (OLD): SYSLOG_O.TXT
When both the new and old system logs are output at the same time: SYSLOG_A.TXT

3.2.16 Input of Part Programs

Setup for input

(1) Enter EDIT mode.

(2) Follow either of the procedures described below to display the program text screen:

Method 1

Press the PROG function key several times, until the program text screen appears.

Method 2

(1) Press the PROG function key.

(2) Click the [TEXT] soft key.

Registering a single program

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [1_PROGRAM] soft key.
(3) Click the [NEW] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [1_PROGRAM] soft key.
(6) Click the [NEW] soft key.

Method 3 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [1_PROGRAM] soft key.
(5) Click the [NEW] soft key.

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Method 4 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [1_PROGRAM] soft key.
(5) Click the [NEW] soft key.

Registering a program with a new program number

- **Methods in which neither the input file name nor number need be specified**

Method 1

(1) Click the [READ] soft key.
(2) Click the [PROG#] soft key.
(3) Key in the program number.
(4) Click the [EXEC] soft key.

Method 2

(1) Click the [READ] soft key.
(2) Click the [O] address key.
(3) Key in the program number.
(4) Click the [EXEC] soft key.

Method 3

(1) Click the [O] address key.
(2) Key in the program number.
(3) Click the [READ] soft key.

- **Methods in which the input file is specified with its file name**

Method 1

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PROG#] soft key.
(6) Key in the program number.
(7) Click the [EXEC] soft key.

Method 2

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [O] address key.
(6) Key in the program number.
(7) Click the [EXEC] soft key.

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- **Methods in which the input file is specified with its file number**

Method 1

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [(PROG#)] soft key.
(5) Key in the program number.
(6) Click the [EXEC] soft key.

Method 2

(1) Click the [READ] soft key.
(2) Click the [N] address key.
(3) Key in the file name.
(4) Click the [O] address key.
(5) Key in the program number.
(6) Click the [EXEC] soft key.

Method 3

(1) Click the [N] address key.
(2) Key in the file number.
(3) Click the [O] address key.
(4) Key in the program number.
(5) Click the [READ] soft key.

Registering multiple NC programs

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [ALL] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [ALL] soft key.

Method 3 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [ALL] soft key.

Method 4 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the [N] address key.
(3) Key in the file number.
(4) Click the [ALL] soft key.

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Registering an additional program

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [1_PROGRAM] soft key.
(3) Click the [ADD] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [1_PROGRAM] soft key.
(6) Click the [ADD] soft key.

Method 3 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [1_PROGRAM] soft key.
(5) Click the [ADD] soft key.

Method 4 (the input file is specified with its file number, one of two methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [1_PROGRAM] soft key.
(5) Click the [ADD] soft key.

3.2.17 Output of System Parameters

Setup for input

(1) Enter MDI mode.
(2) Place the system in the emergency stop state.
(3) Follow either of the procedures described below to display the parameter screen:

Method 1

Press the SYSTEM function key several times, until the parameter screen appears.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [PARAMETER] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [PARAMETER] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PARAMETER] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PARAMETER] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PARAMETER] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.18 Input of Workpiece Origin Offset Data

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the workpiece origin offset screen:

Method 1

Press the OFFSET SETTING function key several times, until the workpiece origin offset screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [WORK OFFSET] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [WORK OFFSET] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [WORK OFFSET] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [WORK OFFSET] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [WORK OFFSET] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.19 Input of Pitch Error Compensation Data

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the pitch error compensation screen:

Method 1

Press the SYSTEM function key several times, until the pitch error compensation screen appears.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [PITCH ERROR] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [PITCH ERROR] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PITCH ERROR] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PITCH ERROR] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PITCH ERROR] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.20 Input of Tool Offset Data

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the tool offset screen:

Method 1

Press the OFFSET SETTING function key several times, until the tool offset screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [TOOL] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [TOOL] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [TOOL] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [TOOL] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [TOOL] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.21 Input of Custom Macro Variables

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the macro variable screen:

Method 1

Press the OFFSET SETTING function key several times, until the macro variable screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [MACRO VAR.] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [COMMONNONVOL] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [COMMONNONVOL] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [COMMONNONVOL] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [COMMONNONVOL] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.22 Output of Volumetric Compensation Data

Setup for input

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the volumetric compensation data screen:

Method 1

Press the SYSTEM function key several times, until the volumetric compensation screen appears.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [VOLUMETRIC] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [VOLUMETRIC] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [VOLUMETRIC] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [VOLUMETRIC] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [VOLUMETRIC] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.23 Input of Tool Offset Data by Tool Number

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the tool offset by tool number screen:

Method 1

Press the OFFSET SETTING function key several times, until the tool offset by tool number screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [T CODEOFFSET] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [T CODEOFFSET] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [T CODEOFFSET] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [T CODEOFFSET] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [T CODEOFFSET] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.24 Input of Fixture Offset Data

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the fixture offset screen:

Method 1

Press the OFFSET SETTING function key several times, until the fixture offset screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [FOFS] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [FOFS] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [FOFS] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [FOFS] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [FOFS] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.25 Input of Rotary Head Dynamic Tool Compensation Data

Setup for input

(1) Enter MDI mode.
(2) Follow either of the procedures described below to display the rotary head dynamic tool compensation screen:

Method 1

Press the OFFSET SETTING function key several times, until the rotary head dynamic tool compensation screen appears.

Method 2

(1) Press the OFFSET SETTING function key.
(2) Click the [DOFS] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [DOFS] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [DOFS] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [DOFS] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [DOFS] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.26 Input of Periodic Maintenance Data

Setup for input

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the item setting screen of the periodic maintenance screen:

Method 1

Press the SYSTEM function key several times, until the periodic maintenance screen appears.

Method 2

(1) Press the SYSTEM function key.
(2) Click the [PERIODMAINTE] soft key.
(3) Click the [SET ITEM] soft key.

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Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [PERIODMAINTE] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PERIODMAINTE] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

3.2.27 Input of Item Selection Menu (Machine System) Data

Setup for input

(1) Enter EDIT mode.
(2) Follow either of the procedures described below to display the item selection menu on the periodic maintenance screen:

Method 1

(1) Press the SYSTEM function key several times, until the periodic maintenance screen appears.
(2) Click the [SET ITEM] soft key.
(3) Click the [SELECTITEM] soft key.

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Method 2

(1) Press the SYSTEM function key.
(2) Click the [PERIODMAINTE] soft key.
(3) Click the [SET ITEM] soft key.
(4) Click the [SELECTITEM] soft key.

Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.
(2) Click the [PERIODMAINTE] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.
(2) Click the [”FILE NAME] soft key.
(3) Key in the file name.
(4) Click the [FILE NAME”] soft key.
(5) Click the [PERIODMAINTE] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the [(FILE#)] soft key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.
(2) Click the N address key.
(3) Key in the file number.
(4) Click the [PERIODMAINTE] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.
(2) Key in the file number.
(3) Click the [READ] soft key.

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3.2.28 Input of Maintenance Information

Setup for input

(1) Enter EDIT mode.

(2) Follow either of the procedures described below to display the maintenance information screen:

Method 1

(1) Press the SYSTEM function key several times, until the maintenance information screen appears.

(2) If the screen is in Japanese–language display mode, change the input mode to single–byte alphanumeric mode.

Method 2

(1) Press the SYSTEM function key.

(2) Click the [MAINTEINFO] soft key.

(3) If the screen is in Japanese–language display mode, change the input mode to single–byte alphanumeric mode.

Executing input

Method 1 (neither the input file name nor number need be specified)

(1) Click the [READ] soft key.

(2) Click the [MAINTEINFO] soft key.

Method 2 (the input file is specified with its file name)

(1) Click the [READ] soft key.

(2) Click the [”FILE NAME] soft key.

(3) Key in the file name.

(4) Click the [FILE NAME”] soft key.

(5) Click the [MAINTEINFO] soft key.

Method 3 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.

(2) Click the [(FILE#)] soft key.

(3) Key in the file number.

(4) Click the [MAINTEINFO] soft key.

Method 4 (the input file is specified with its file number, one of three methods)

(1) Click the [READ] soft key.

(2) Click the N address key.

(3) Key in the file number.

(4) Click the [MAINTEINFO] soft key.

Method 5 (the input file is specified with its file number, one of three methods)

(1) Click the N address key.

(2) Key in the file number.

(3) Click the [READ] soft key.

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3.3 FLOPPY DIRECTORY SCREEN

The floppy directory screen provides the functions for using the FANUC Floppy Cassette, FANUC FA Card, FANUC Handy File, and FANUC PROGRAM FILE Mate connected to the serial interface (RS–232C or RS–422) and a variety of utilities.

1 Output data such as part programs and parameters to an external device
2 Input data such as part programs and parameters from an external device
3 List the files on an external unit

Display

Follow either of the procedures described below to display the floppy directory screen.

Method 1

(1) Press the OFFSET SETTING function key several times, until the floppy directory screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [RS232C] soft key.

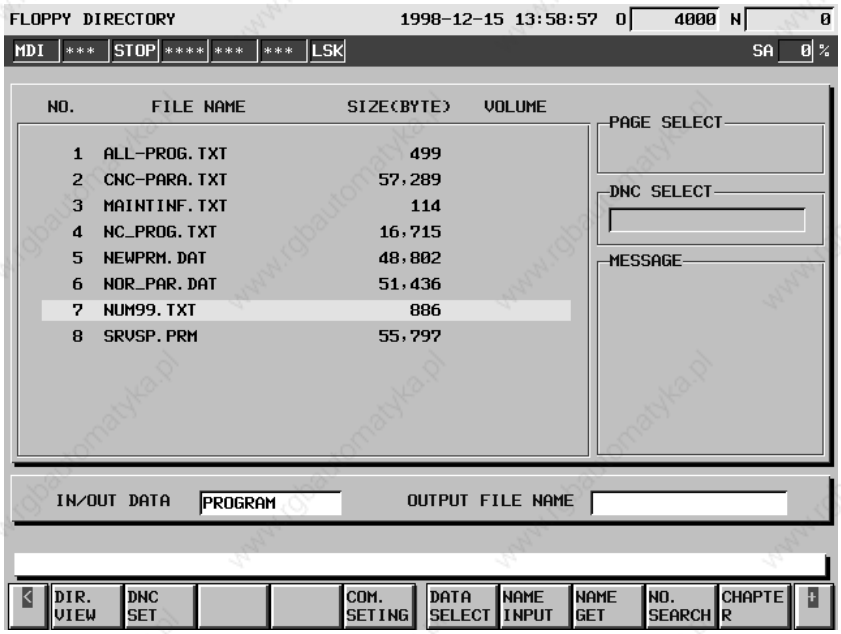


Fig. 3.3 Floppy directory screen

• Listing the files on a floppy

The files contained on the inserted floppy or FA card can be listed. Up to 12 files can be listed per page.

NO.: File number
FILE NAME: File name
SIZE: File size (in bytes)
VOLUME: Volume number of a multivolume file
A multivolume file is a file stored on multiple floppies. The volume numbers indicate the order of these floppies.

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- **PAGE SELECT** — Page information for the file list is displayed.
  If the list cannot be displayed on a single page, “Prev Page” and “Next Page” are displayed in PAGE SELECT to indicate that there are multiple pages.
- **DNC SELECT** — The names of the files to be loaded during DNC operation are displayed.
- **MESSAGE** — Messages are displayed as required.
- **IN/OUT DATA** — The types of data to be input and output are displayed.
- **OUTPUT FILE NAME** — The names of the files to be output at data output time are displayed.

Displaying a file list

1 Click the [DIR. VIEW] soft key.
A file list is displayed.

2 If the file list cannot be displayed on a single page, “Prev Page” and “Next Page” are displayed in PAGE SELECT to indicate that there are multiple pages. Press the PAGE ↑ or PAGE ↓ keys to display the specified page.

3 The display is updated when the [DIR. VIEW] soft key is clicked. If the floppy or FA card is replaced with another, click the [DIR. VIEW] soft key again to update the display.

Setting input/output data

1) Click the [DATA SELECT] soft key.
The items of data that can be input/output are displayed on soft keys. If the desired item is not displayed, click the [NEXT DATA] soft key to update the soft key display.

2) Click the soft key corresponding to the item to be input/output.

Soft key indicating an item of input/output data	Data type
PROGRAM	NC program
PARAMETER	System parameter
PITCH ERROR	Pitch error compensation data
TOOL COMPENSATION	Tool offset data
WORK OFFSET	Workpiece origin offset data
MACRO VAR.	Custom macro variable
SYSTEMLOG	System log data
PERIODMAINTE1	Periodic maintenance data
PERIODMAINTE2	Item selection menu (machine system) data
VOLUMETRIC	Volumetric compensation data
T CODEOFFSET	Tool offset data by tool number
FOFS	Fixture offset data
DOFS	Rotary head dynamic tool compensation data
SYSTEMCONFIG	System configuration data

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Setting the output file name

- **Entering the file name with the MDI keys**

1) Click the [NAME INPUT] soft key.
   File Name> is displayed in the key–in buffer.
2) Click the [”FILE NAME] soft key.
   ” is added to the key–in buffer.
3) Enter the file name with the MDI keys.
4) Click the [FILE NAME”] soft key.
   ” is added after the file name.
5) Click the [EXEC] soft key.
   The output file name is set.

- **Selecting a file from a file list**

1) Display a file list.
   See “Displaying a file list,” described earlier.
2) Position the cursor to the desired output file name.
3) Click the [NAME GET] soft key.
   The output file name is set.

Searching for a file

1) Click the [NO. SEARCH] soft key.
   NO. SEARCH> is displayed in the key–in buffer.
2) Click the [(FILE#)] soft key.
   N is added to the key–in buffer.
3) Key in the file number.
4) Click the [EXEC] soft key.
   File search is executed, and the cursor is positioned to the file having the specified number.

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Inputting/outputting data

- **Inputting data**

1) Set input/output data.
   See “Setting input/output data,” described earlier.
2) On the file list, position the cursor to the desired input file.
   See “Displaying a file list,” described earlier.
3) Perform the necessary operation, according to the table below:

Input data	Input operation
PROGRAM	To input all the programs in the file 1) Enter EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [ALL] soft key. To input a single program as is 1) Enter EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [1_PROGRAM] soft key. 4) Click the [NEW] soft key. To input a program with its program number changed 1) Click EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the program number. 5) Click the [EXEC] soft key.
PARAMETER	1) Enter MDI mode. 2) Place the system in the emergency stop state. 3) Click the [DATA READ] soft key. 4) Click the [EXEC] soft key.
PITCH ERROR TOOL COMPENSATION WORK OFFSET MACRO VAR. T CODEOFFSET FOFS DOFS	1) Enter MDI mode. 2) Click the [DATA READ] soft key. 3) Click the [EXEC] soft key.
VOLUMETRIC PERIODMAINTE1 PERIODMAINTE2	1) Enter EDIT mode. 2) Click the [DATA READ] soft key. 3) Click the [EXEC] soft key.
SYSTEMLOG SYSTEMCONFIG	Cannot be input.

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- **Outputting data**

1) Set input/output data.
   See “Setting input/output data,” described earlier.
2) Set the output file name.
   See “Setting the output file name,” described earlier.
3) Perform the necessary operation, according to the table below:

Output data	Output operation
PROGRAM	To output all programs 1) Enter EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [ALL] soft key. To output the currently selected program 1) Enter EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [THIS] soft key. To specify a single program and output it 1) Click EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the program number. 5) Click the [EXEC] soft key. To output the multiple programs specified with a range 1) Enter EDIT mode. 2) Click the [PROGRAM PUNCH] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the number of the first program in the range. 5) Click the [,(PROG#)] soft key. 6) Key in the number of the last program in the range. 7) Click the [EXEC] soft key.
PARAMETER PITCH ERROR TOOL COMPENSATION WORK ZERO COM-PENSATION MACRO VAR. SYSTEMLOG T CODEOFFSET FOFS DOFS SYSTEMCONFIG	1) Enter MDI mode. 2) Click the [DATA PUNCH] soft key. 3) Click the [EXEC] soft key.
VOLUMETRIC PERIODMAINTE1 PERIODMAINTE2	1) Enter EDIT mode. 2) Click the [DATA PUNCH] soft key. 3) Click the [EXEC] soft key.

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3.4 MEMORY CARD SCREEN

The memory card screen provides the functions for using a memory card as an external memory unit and a variety of utilities.

1 Output data such as part programs and parameters to a memory card
2 Input data such as part programs and parameters from a memory card
3 List the files on a memory card

Display

Follow either of the procedures described below to display the memory card screen.

Method 1

(1) Press the OFFSET SETTING function key several times, until the memory card screen appears.

Method 2

(1) Press the OFFSET SETTING function key.

(2) Click the [MEMCARD] soft key.

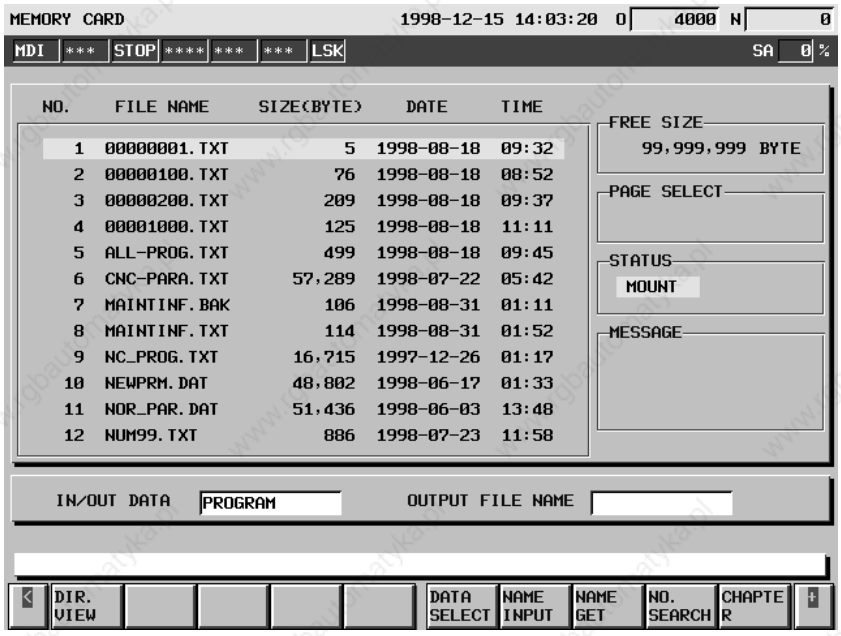


Fig. 3.4 Memory card screen

- **Listing the files on a memory card**

The files contained on the inserted memory card can be listed. Up to 12 files can be listed per page.

NO.: File number
FILE NAME: File name
SIZE: File size (in bytes)
DATE: Date on which the file was created
TIME: Time at which the file was created

- **FREE SIZE**

The size of the free space on the inserted memory card is displayed (in bytes). If the size exceeds 99999999 bytes, ******** is displayed.

- **PAGE SELECT**

Page information for the file list is displayed. If the list cannot be displayed on a single page, “Prev Page” and “Next Page” are displayed in PAGE SELECT to indicate that there are multiple pages.

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- **STATUS** The status of the memory card slot is displayed.
- **MESSAGE** Messages are displayed as required.
- **IN/OUT DATA** The types of data to be input and output are displayed.
- **OUTPUT FILE NAME** The names of the files to be output at data output time are displayed.

Displaying a file list

1 Click the [DIR. VIEW] soft key.
A list of files contained on the memory card is displayed.
2 If the file list cannot be displayed on a single page, “Prev Page” and “Next Page” are displayed in PAGE SELECT to indicate that there are multiple pages. Press the PAGE ↑ or PAGE ↓ keys to display the specified page.
3 The display is updated when the [DIR. VIEW] soft key is clicked. If the floppy or FA card is replaced with another, click the [DIR. VIEW] soft key again to update the display.

Setting input/output data

1) Click the [DATA SELECT] soft key.
The items of data that can be input/output are displayed on soft keys. If the desired item is not displayed, click the [NEXT DATA] soft key to update the soft key display.
2) Click the soft key corresponding to the item to be input/output.

Soft key indicating an item of input/output data	Data type
PROGRAM	NC program
PARAMETER	System parameter
PITCH ERROR	Pitch error compensation data
TOOL COMPENSATION	Tool offset data
WORK OFFSET	Workpiece origin offset data
MACRO VAR.	Custom macro variable
SYSTEMLOG	System log data
PERIODMAINTE1	Periodic maintenance data
PERIODMAINTE2	Item selection menu (machine system) data
VOLUMETRIC	Volumetric compensation data
T CODEOFFSET	Tool offset data by tool number
FOFS	Fixture offset data
DOFS	Rotary head dynamic tool compensation data
SYSTEMCONFIG	System configuration data
SRAM BACKUP	Battery backup memory

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Setting the output file name

- **Entering the file name with the MDI keys**

1) Click the [NAME INPUT] soft key.
   File Name> is displayed in the key–in buffer.
2) Click the [”FILE NAME] soft key.
   ” is added to the key–in buffer.
3) Enter the file name with the MDI keys.
4) Click the [FILE NAME”] soft key.
   ” is added after the file name.
5) Click the [EXEC] soft key.
   The output file name is set.

- **Selecting a file from a file list**

1) Display a file list.
   See “Displaying a file list,” described earlier.
2) Move the cursor to the desired output file name.
3) Click the [NAME GET] soft key.
   The output file name is set.

Searching for a file

1) Click the [NO. SEARCH] soft key.
   NO. SEARCH> is displayed in the key–in buffer.
2) Click the [(FILE#)] soft key.
   N is added to the key–in buffer.
3) Key in the file number.
4) Click the [EXEC] soft key.
   File search is executed, and the cursor is positioned to the file having the specified number.

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Inputting/outputting data

- **Inputting data**

1) Set input/output data.
   See “Setting input/output data,” described earlier.
2) On the file list, position the cursor to the desired input file.
   See “Displaying a file list,” described earlier.
3) Perform the necessary operation, according to the table below:

Input data	Input operation
PROGRAM	To input all the programs in the file 1) Enter EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [ALL] soft key. To input a single program as is 1) Enter EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [1_PROGRAM] soft key. 4) Click the [NEW] soft key. To input a program with its program number changed 1) Click EDIT mode. 2) Click the [PROG READ] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the program number. 5) Click the [EXEC] soft key.
PARAMETER	1) Enter MDI mode. 2) Place the system in the emergency stop state. 3) Click the [DATA READ] soft key. 4) Click the [EXEC] soft key.
PITCH ERROR TOOL COMPENSATION WORK OFFSET MACRO VAR. T CODEOFFSET FOFS DOFS	1) Enter MDI mode. 2) Click the [DATA READ] soft key. 3) Click the [EXEC] soft key.
VOLUMETRIC PERIODMAINTE1 PERIODMAINTE2	1) Enter EDIT mode. 2) Click the [DATA READ] soft key. 3) Click the [EXEC] soft key.
SYSTEMLOG SYSTEMCONFIG SRAM BACKUP	Cannot be input.

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- **Outputting data**

1) Set input/output data.
   See “Setting input/output data,” described earlier.
2) Set the output file name.
   See “Setting the output file name,” described earlier.
3) Perform the necessary operation, according to the table below:

Output data	Output operation
PROGRAM	To output all programs 1) Enter EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [ALL] soft key. To output the currently selected program 1) Enter EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [THIS] soft key. To specify a single program and output it 1) Click EDIT mode. 2) Click the [PROG PUNCH] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the program number. 5) Click the [EXEC] soft key. To output multiple programs specified with a range 1) Enter EDIT mode. 2) Click the [PROGRAM PUNCH] soft key. 3) Click the [(PROG#)] soft key. 4) Key in the number of the first program in the range. 5) Click the [,(PROG#)] soft key. 6) Key in the number of the last program in the range. 7) Click the [EXEC] soft key.
PARAMETER PITCH ERROR TOOL COMPENSATION WORK ZERO COM-PENSATION MACRO VAR. SYSTEMLOG T CODEOFFSET FOFS DOFS SYSTEMCONFIG	1) Enter MDI mode. 2) Click the [DATA PUNCH] soft key. 3) Click the [EXEC] soft key.
VOLUMETRIC PERIODMAINTE1 PERIODMAINTE2	1) Enter EDIT mode. 2) Click the [DATA PUNCH] soft key. 3) Click the [EXEC] soft key.
SRAM BACKUP	1) Enter MDI mode. 2) Set SBU (bit 6 of parameter No. 8001) to 1. 3) Click the [DATA PUNCH] soft key. 4) Click the [EXEC] soft key. 5) Return SBU (bit 6 of parameter No. 8001) to 0.

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CAUTION

- This control unit can use a memory card as its input/output unit. Any of the following can be used in the control unit:
  SRAM memory card
  Flash memory card
  Flash memory ATA card
  For details of these memory cards, refer to your ordering information list.
- A file on a memory card can be view–, read–, and write–accessed only when the file is in the root directory. If it is in a subdirectory, it cannot be accessed at all.
- The required data read/write time varies with the type of the memory card on which the data is stored and the way in which it is used.
- For writing, only those flash memory card types recommended by FANUC can be used. For reading, any flash memory card type can generally be used in the same manner as an SRAM card, provided that it supports FAT format. Note that the usable capacity of a flash memory card is actually 128 KB less than its original capacity. Note that individual files cannot be erased from a flash memory card; all files on the card must be erased simultaneously.
- The flash memory ATA card uses a quick format (both file allocation table and root directory information are cleared). If it has not yet been formatted, it must be formatted on a personal computer.

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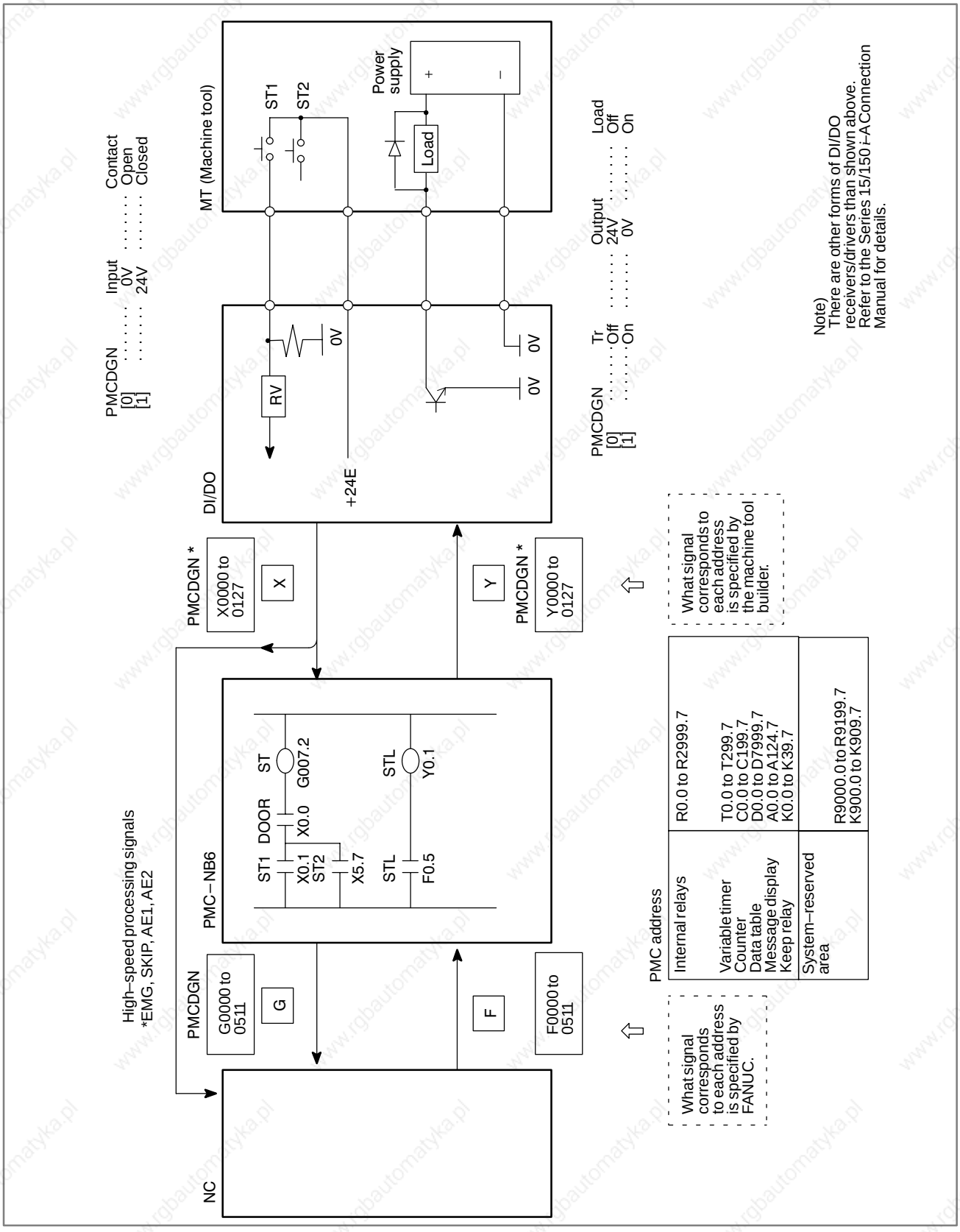
4 INTERFACE BETWEEN THE NC AND PMC

This chapter describes how to connect signals among the machine operator's panel, power magnetics cabinet, and PMC as well as those between the PMC and CNC. It also describes how to check whether these signals are on.
The chapter also explains how to display the PMC system configuration, parameters, ladder programs, and timing charts for showing the on/off state of the signals on the screen.
The chapter also discusses the PMC parameter input/output methods for external I/O units.

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4.1 INTERFACE OVERVIEW



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4.2 PMC SPECIFICATION

4.2.1 PMC Specification List

Model	FANUC Series 15*i*
	PMC–NB6
Program scheme	Ladder Step sequence (optional)
Number of ladder levels	3
First–level execution cycle	8ms
Basic–instruction execution time	0.085 μs/step
Program capacity • Ladder (steps) (Note 1) • Symbols/comments • Messages	 Up to about 32,000 steps 1 to 128KB 0.1 to 64KB
Instructions (basic instructions) (functional instructions)	14 64
Internal relay (R) Message requests (A) Battery–powered memory • Variable timer (T) • Counter (C) • Keep relay (K) • Data table (D) Subprograms (P) Labels (L) Fixed timer	3200byte 125byte (1000 points) 300byte (150 points) 200byte (50 points) 50byte 8000byte 2000 subprograms 9999 labels 100 timers (with a specified timer number)
Items related to I/O operation • I/O Link (X) (Note 2) (Y)	 Up to 1024 points Up to 1024 points
Sequence program storage medium	Flash ROM 128KB 256KB 384KB

NOTE
1 This capacity applies when the largest available storage medium is used.
2 The only I/O unit of the FANUC Series 15*i* is the I/O Link.

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4.2.2 Addresses

Symbol	Signal type	Model
		FANUC Series 15*i*
		PMC–NB6
X	Signal input to PMC from machine (MT→PMC)	X0 to X127
Y	Signal output from PMC to machine (PMC→MT)	Y0 to Y127
F	Signal input to PMC from NC (NC→PMC)	F0 to F511
G	Signal output from PMC to NC (PMC→NC)	G0 to G511
R	Internal relay	R0 to R2999 R9000 to R9199
A	Message request signal	A0 to A124
C	Counter	C0 to C199
K	Keep relay	K0 to K39 K900 to K909
T	Variable timer	T0 to T299
D	Data table	D0 to D7999
L	Level number	L1 to L9999
P	Subprogram number	P1 to P2000

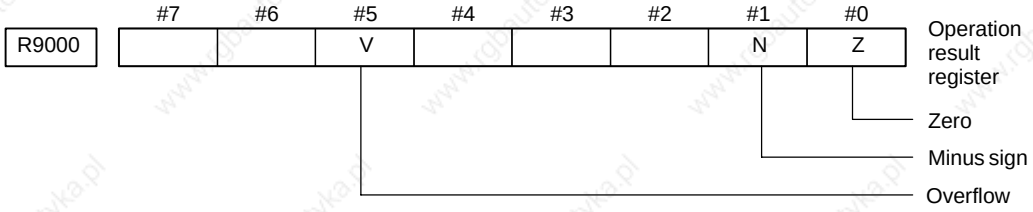
4.2.3 Built–in Debugging Functions

Function	Description
Diagnosis	• Title data display • Signal status display (with symbols usable for display) • PMC alarm display • Memory contents
Data setting and display	• Variable timer • Counter • Keep relay • Data table

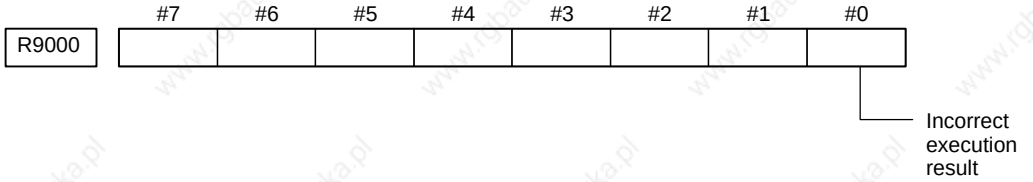
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4.2.4 Internal Relay System–reserved Area

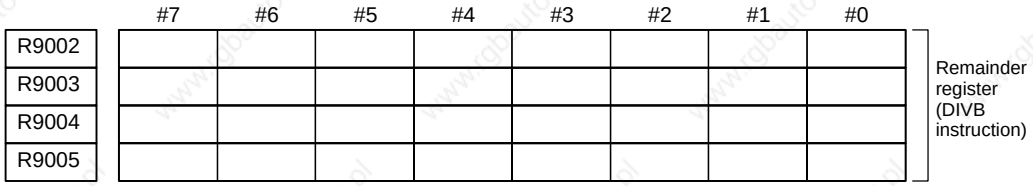
(1) Operation register for machine instructions ADDB, SUBB, MULB, DIVB, and COMPB



(2) Error output for machine instructions EXIN, WINDR, and WINDW

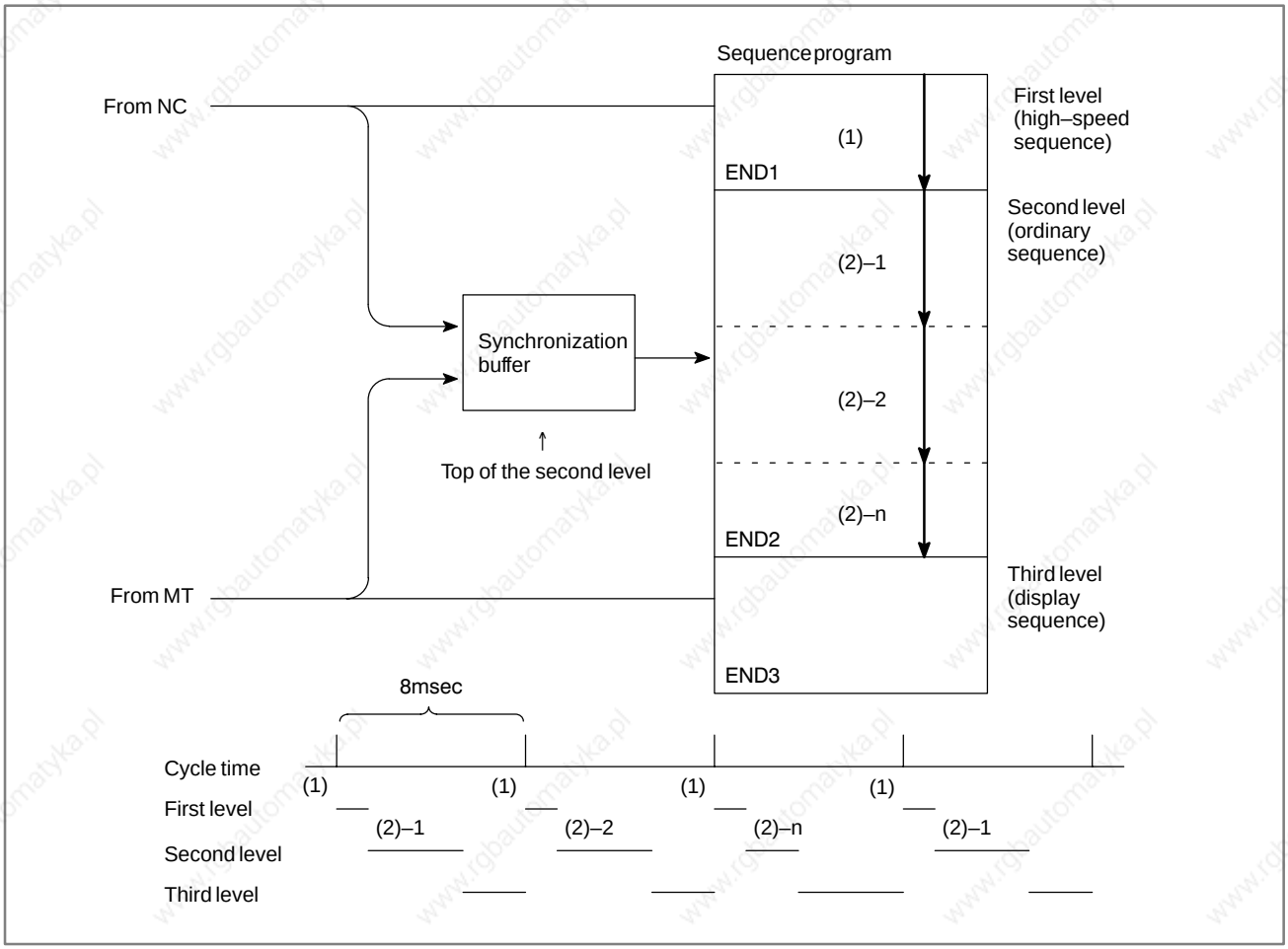


(3) Operation output register for machine instruction DIVB



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4.2.5
PMC Execution Cycle



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4.3 PMC DISPLAYS

4.3.1 Overview

In the NC system, clicking the [PMC] soft key in the [System] menu lets you set or view PMC–related data. The following screens can be used to set and view the PMC–related data.

(1) PMC input/output signal and internal relay displays (PMCDGN)
  (a) Title data screen
  (b) Status screen
  (c) Alarm screen

(2) PMC data setting and display (PMCPRM)
  (d) Timer
  (e) Counter
  (f) Keep relay
  (g) Data table

(3) Specifying PMC setting data (SETING)
  (h) General setting data
  (i) Setting data related to editing and debugging
  (j) Online monitor parameters

(4) Writing, reading, and collating (I/O) sequence programs and PMC parameters

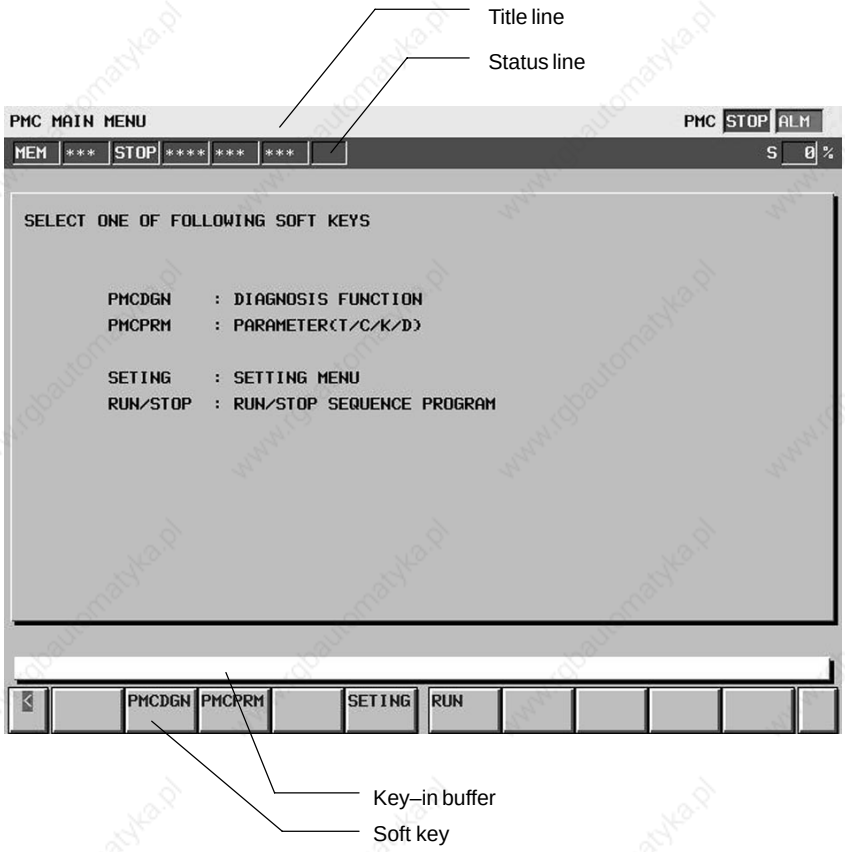
  ⋇ This is a PMC programmer function. For how to use this function, refer to III.12 in the PMC Ladder Language Programming Manual.

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4.3.2 PMC Menu Selection Procedure Based on Soft Keys

Pressing the <SYSTEM> function key on the LCD/MDI, then clicking the [PMC] soft key displays the following PMC basic menu.

4.3.2.1 PMC basic menu



(1) Title line

The title line displays the title of each PMC system screen. The status of the PMC system is displayed at the right end of the title line.

RUN STOP These messages indicate the execution status of the sequence program. [RUN] means that the sequence program is running. [STOP] means that the sequence program is not running.

ALM This message means that a PMC alarm condition has occurred.

(2) Status line

The status line displays various types of NC information. The information displayed on the status line is the same as displayed on the NC system screen.

(3) Key–in buffer

This field displays data entered using keys.

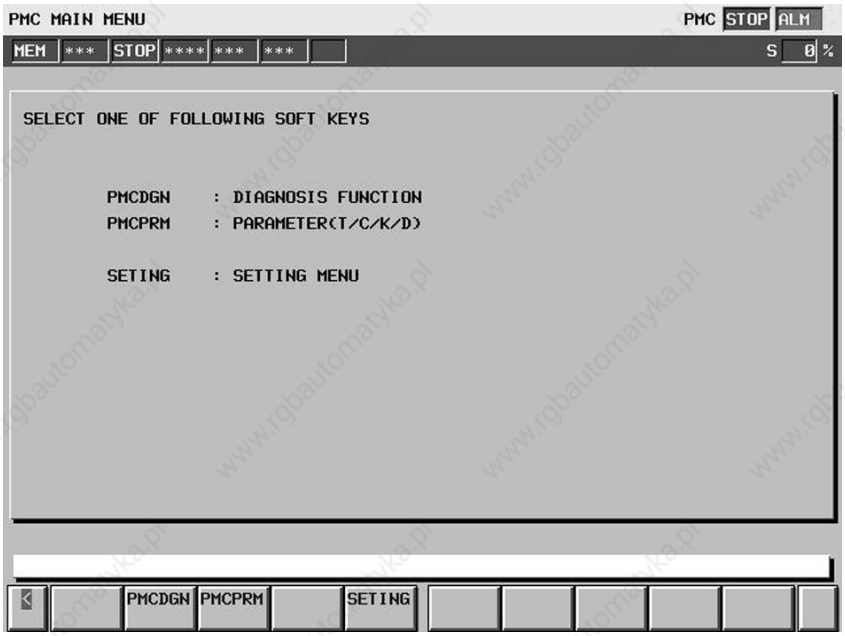
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(4) Soft keys

There are two types of soft keys; two end and ten middle keys. The left–end key has the following meaning:

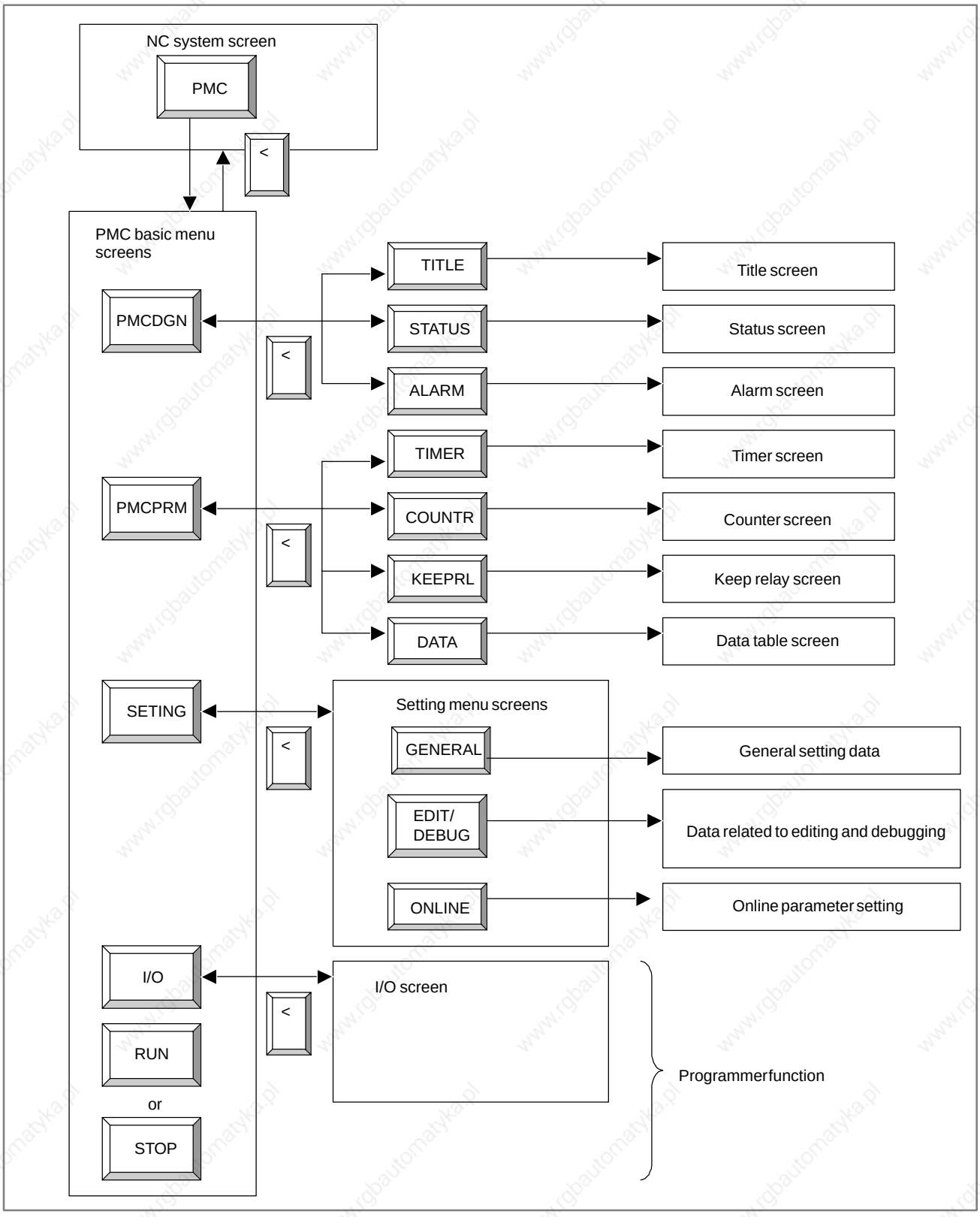

return key: Clicking this key brings you back to the previous menu.

If the built–in debug function is disabled (K900.1 = 0), the basic menu appears as follows:



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4.3.2.2 PMC screen transition flow and the related soft keys

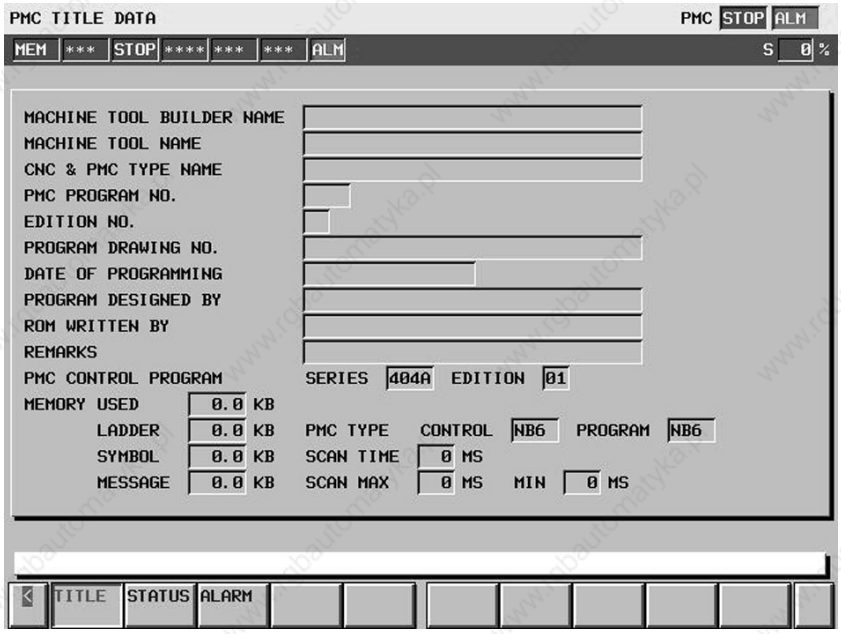


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4.3.3 PMC Input/Output Signal and Internal–relay Displays (PMCDGN)

4.3.3.1 Title data display (TITLE)

The title data corresponds to the title of each sequence program. It consists of the following ten items:



- Machine tool builder name (32 characters)
- Machine tool name (32 characters)
- NC and PMC type (32 characters)
- Sequence program number (4 characters)
- Edition number (2 characters)
- Sequence program drawing (32 characters)
- Date of sequence program creation (16 characters)
- Sequence program creator (32 characters)
- ROM data writing operator (32 characters)
- Comment (32 characters)

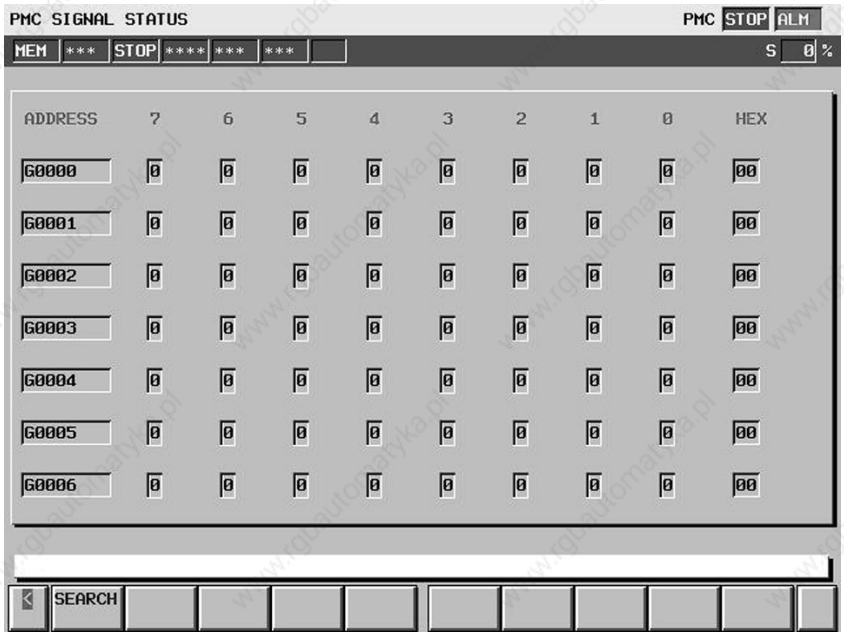
The following data is displayed:

- PMC basic software series and edition
- The amount of memory used by the sequence data and time required to execute the ladder program
- PMC basic software type and sequence program PMC type
- Current, maximum, and minimum execution time for the ladder program

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4.3.3.2 Signal status display (STATUS)

This screen displays the contents at all addresses (X, Y, F, G, R, A, C, T, K, D, M, and N) used in the program. The contents at each address are a bit pattern (0 and 1) accompanied by the hexadecimal representation of a byte at the right end.



Operating procedure

(1) Click the [STATUS] soft key to display the above screen.

(2) Enter a desired address, and click the [SEARCH] soft key.

(3) The display of consecutive bit patterns begins at the specified address.

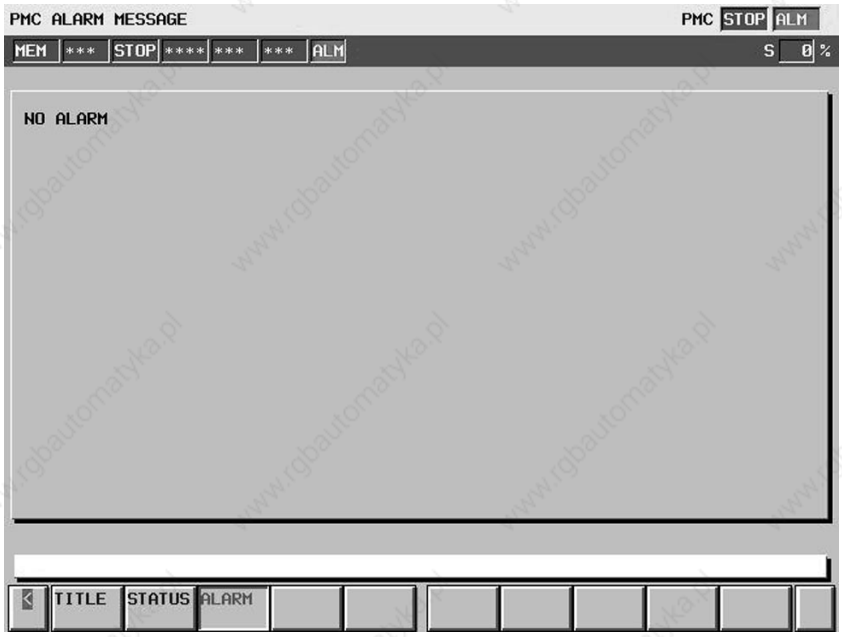
(4) To begin displaying at a different address, click the cursor key, page key, or [SEARCH] soft key.

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4.3.3.3 Alarm screen (ALARM)

If an alarm condition occurs in the PMC, clicking the [PMC] soft key in the NC system displays the following alarm message instead of the PMC basic menu. The soft keys displayed on this screen are the same as those on the PMC basic menu screen. The title line of the alarm screen turns on “ALM.”

If a fatal alarm condition occurs, it disables sequence program execution.



Refer to Appendix M of the PMC Ladder Language Programming Manual for what message is displayed.

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4.3.4 PMC Data Setting and Display (PMCPRM)

4.3.4.1 Overview

This function lets you enter and view parameters for the timer, counter, keep relay, and data table, which are all battery–powered memory.

To use this function, click the [PMCPRM] soft key in the PMC basic menu.

4.3.4.2 PMC parameter entry method

Usually, it is impossible to enter PMC parameters because of protection. To enable parameter entry, use either of the following methods:

- This method is used if the sequence program is running (RUN), that is, usually when the machine is operating.
  - (i) Place the NC in the MDI mode or bring it to an emergency stop state.
  - (ii) Enter 1 for “PWE” on the NC setting screen.
  - (iii) Alternatively, set the program protect signal (KEY4) to 1 (only for the counter and data table).
  - (iv) Protection is canceled, enabling parameter entry.

	PWE	KEY4
Timer	○	
Counter	○	○
Keep relay	○	
Data table	○	○

  - (v) After completing parameter entry, reset “PWE” or the KEY4 signal to the previous state.
- This method is used if the sequence program can be stopped (STOP), for example, during sequence program debugging.
  - (i) Stop the sequence program.
  - (ii) Protection is canceled, enabling parameter entry.

WARNING
If the sequence program is stopped when the machine is operating, the machine may behave in an unexpected fashion. Before stopping the sequence program, ensure that there is none near the machine and that the tool or workpiece will not hit the machine. Incorrect handling may cause death or injury to the operator and damage the tool, workpiece, and machine.

An attempt to specify a parameter when protection is active results in the error message “WRITE PROTECT” being displayed.

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4.3.4.3 Continuous data entry

In the timer, counter, keep relay, and data table screens, it is possible to enter data continuously. The cursor will rest at the last data entered.

- Entry method

  (a) Use ";" (EOB) as a data delimiter.

  (Example) "100; 200; 300;"+"INPUT" key

  (b) Use ";=" to enter the same data as the preceding one.

  (Example) "100;=;=;200;="+"INPUT" key results in: 100,100,100,200,200

  (c) Use ";;" to skip an address.

  (Example) "100;;100"+"INPUT" key keeps the second item from being entered.

4.3.4.4 Timer screen (TIMER)

The timer screen is used to set and view the time value in a functional instruction timer (SUB3).

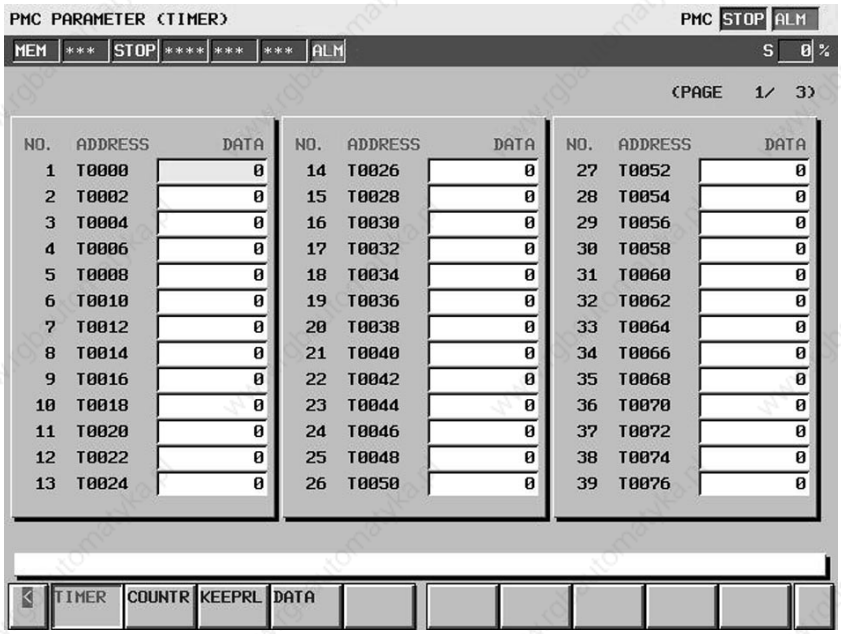


Table contents

- NO.: Timer number specified for the functional instruction timer
- ADDRESS: Address referenced by the sequence program
- DATA: Time set in the timer

Timer number	Minimum set time	Maximum set time
1 to 8	48ms	1572.8 s
9 to 150	8ms	262.1 s

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4.3.4.5 Counter screen (COUNTR)

The counter screen is used to set and view the maximum and current value in a functional instruction counter (SUB5).

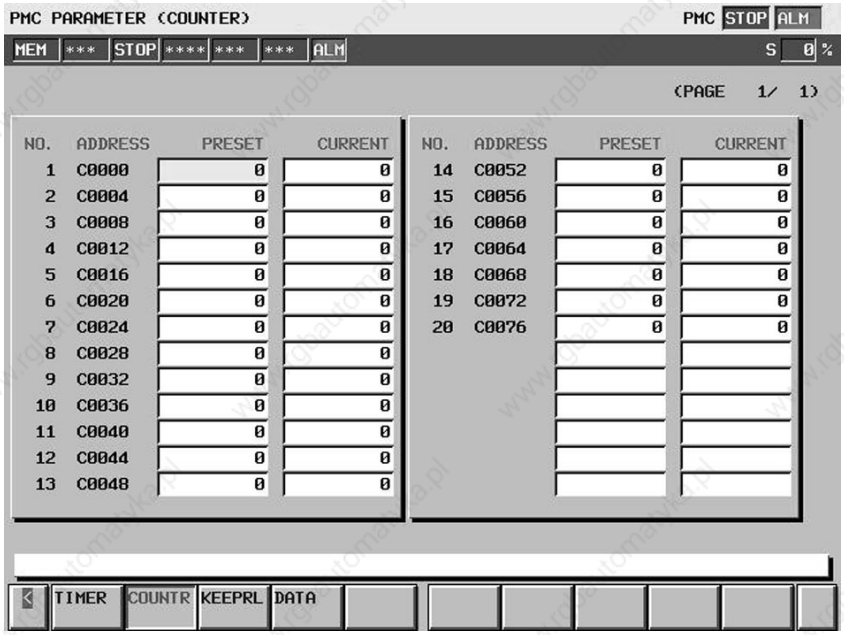


Table contents

- NO.: Timer number specified for the functional instruction timer
- ADDRESS: Address referenced by the sequence program
- PRESET: Maximum value in the counter (the minimum value is specified within the counter instruction.)
- CURRENT: Current value in the counter

Counter types and their maximum value

Counter type	Maximum value for PRESET	Maximum value for CURRENT
BINARY	32767	32767
BCD	9999	9999

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4.3.4.6 Keep relay screen (KEEPRL)

The keep relay screen is used to set and view the keep relay.

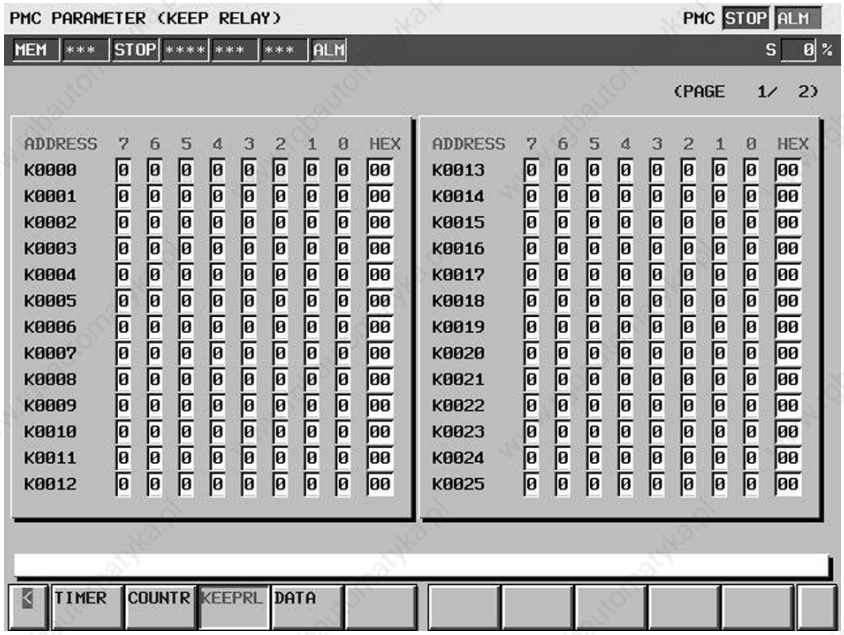


Table contents

- ADDRESS: Address referenced by the sequence program
- DATA (0 to 7): Data (in bit representation)
- HEX: Data (in hexadecimal representation)

Because the keep relay is battery–powered memory, switching off the power will not erase the data in it.

Each PMC–NB6 area is as listed below:

Area available to the user	K0 to K39
Area used by management software (Note)	K900 to K909

WARNING
Area used by PMC management software
Because this keep relay is used by the PMC management software, it cannot be used by the sequence program. Any area left unused should be reset to 0.

See (4) in Section 6.1, Chapter 6, Part 1 for details.

(1) Area used by the management software (addresses K900 to K909)

Model	NB6
PMC management software data 1	K900
Not used	K901
Not used	K902
Not used	K903 to K909

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	#7	#6	#5	#4	#3	#2	#1	#0
K900	DTBLDSP			MEMINP		AUTORUN	PRGRAM	LADMASK

#7 DTBLDSP 0 : Displays the PMC parameter data table control screen.

1 : Does not display the PMC parameter data table control screen.

#4 MEMINP 0 : Disables data entry on the signal status screen.

1 : Enables data entry on the signal status screen.

⁎ The signal status screen is displayed by the online function of FAPT LADDER–II or ladder editing package.

#2 AUTORUN 0 : The sequence program is executed automatically after the power is switched on.

1 : The sequence program execution soft key is used to start the sequence program.

#1 PRGRAM 0 : Disables the built–in debug function.

1 : Enables the built–in debug function.

#0 LADMASK 0 : Activates the ladder dynamic display.

1 : Deactivates the ladder dynamic display.

⁎ The ladder dynamic display screen is displayed by the online function of FAPT LADDER–II or ladder editing package.

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4.3.4.7 Data table (DATA)

The data table screen is further divided into two sections, data table control data and data table.

(1) Data table control data screen (C.DATA)

Clicking the [DATA] soft key displays the data table control data setting screen (for managing the data table).

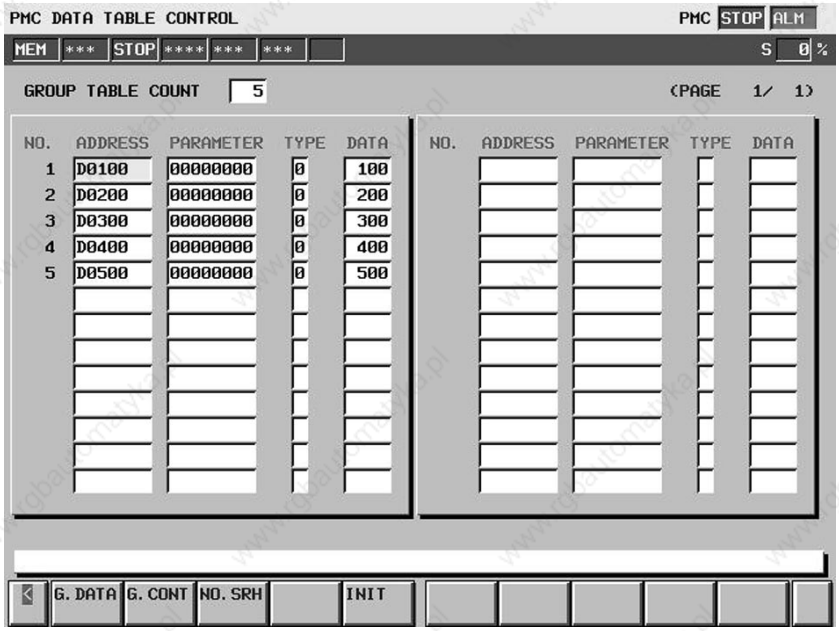


Table contents

- GROUP TABLE COUNT: The number of data items in the data table
- NO.: Group number
- ADDRESS: Data table start address (two or more groups can specify the same address.)
- PARAMETER: Table parameter (Note)
- TYPE: Data length (0 = 1 byte; 1 = 2 bytes; 2 = 4 bytes)
- DATA: Number of data items in each data table

Meanings of the soft keys

[G.DATA]: Clicking this soft key displays the data table data setting and display screen.

[G.CONT]: After the number of groups is entered, clicking this soft key sets the number of groups in the data table.

[NO.SRH]: After a group number is entered, clicking this soft key moves the cursor to the specified group.

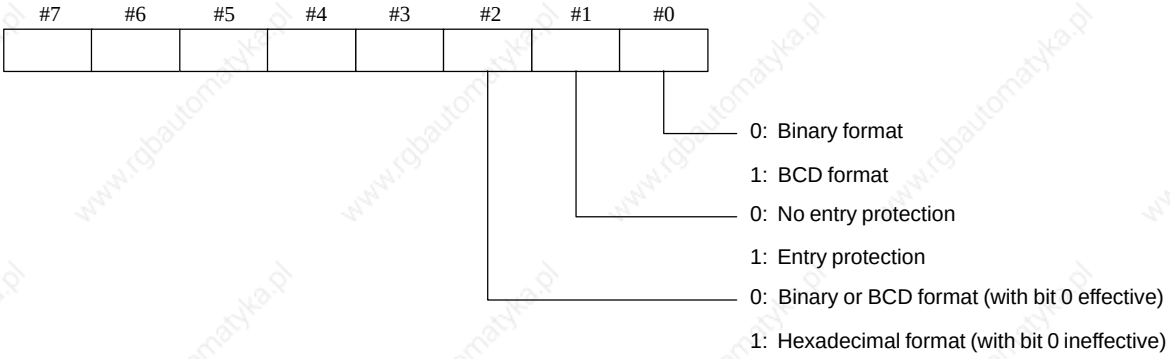
[INIT]: Clicking this soft key initializes the data table.

⁎ The initial data of the data table is as follows:

NO	ADDRESS	PARAMETER	TYPE	DATA
001	D0000	00000000	0	8000

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Note) The meanings of the table parameter is as follows:



(2) Data table screen

If data table control data is specified, clicking the [G.DATA] soft key on the data table control data screen displays the data table setting screen.

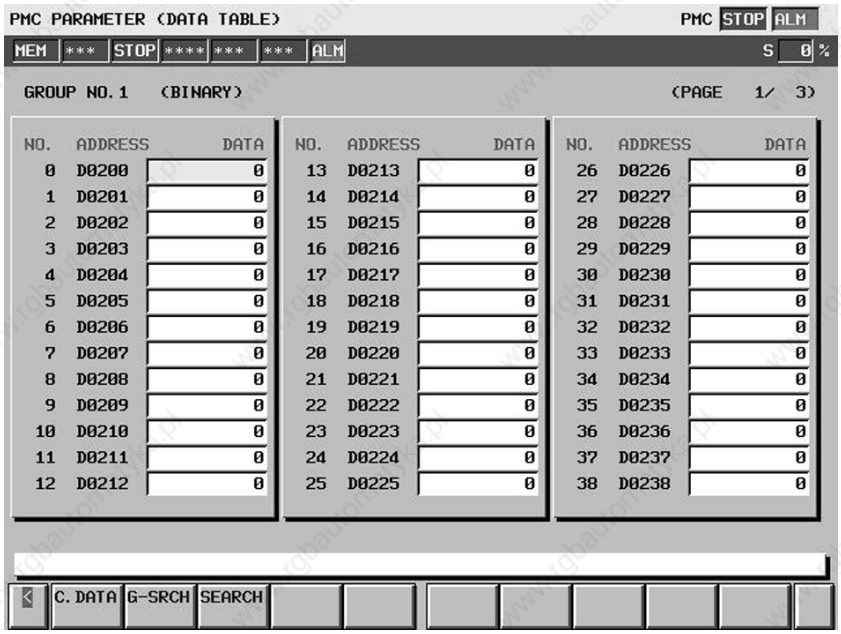


Table contents

- NO.:
- ADDRESS: Address used by the sequence program
- DATA:

Meanings of the soft keys

[C.DATA]: Clicking this soft key selects the data table control data screen.

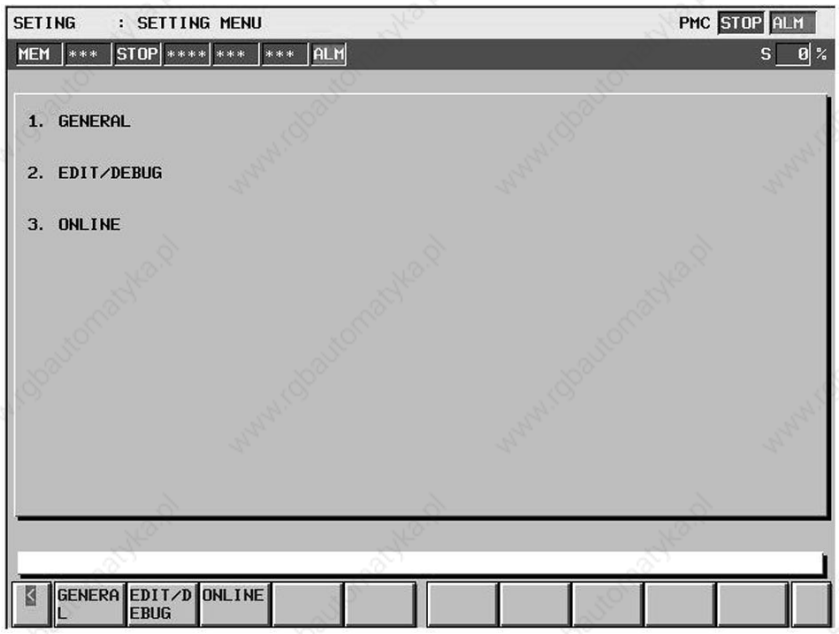
[G–SRCH]: If you want to search the data table for another group, click this soft key to move the cursor to the top of the specified group.

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[SEARCH]: After an address is entered, clicking this soft key moves the cursor to the specified address in the currently selected group. The first letter D can be omitted when entering an address. For example, after 101 is entered, clicking this soft key moves the cursor to data using D101.

4.3.5 Setting Menu (SETING)

Clicking the [SETING] soft key on the PMC basic menu screen displays the following setting menu screen.



Menu contents

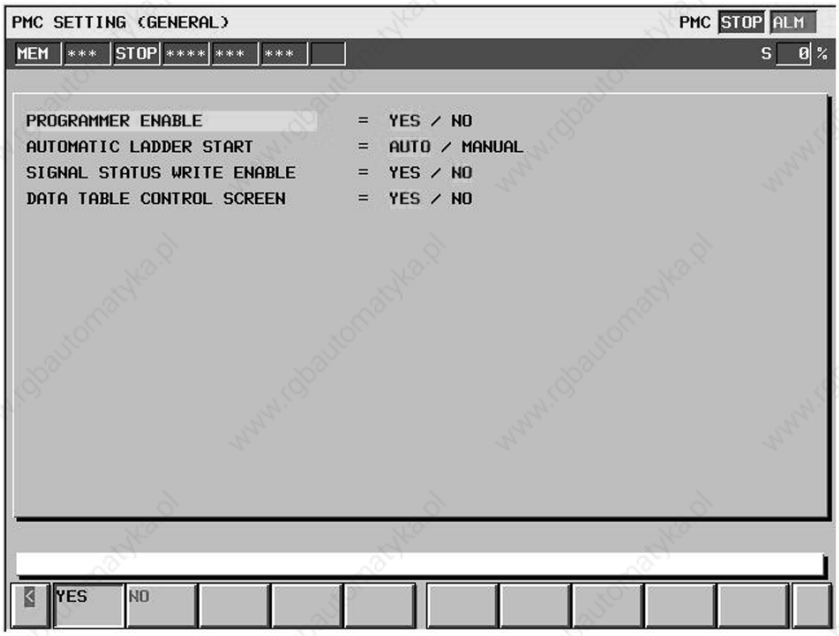
1. GENERAL: Screen on which general setting data is displayed.
2. EDIT/DEBUG: Screen on which setting data related to editing and debugging is displayed
3. ONLINE: Screen on which communication parameters are set up for the online function. (This is displayed by selecting YES for PROGRAMMER ENABLE on the GENERAL screen.)

Clicking a soft key displays the corresponding setting screen. Some values set on this screen are stored in the keep relay. The settings stored in the keep relay can be protected from changes on this screen by writing such that in the keep relay using the sequence program.

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4.3.5.1 General–setting data display screen (GENERAL)

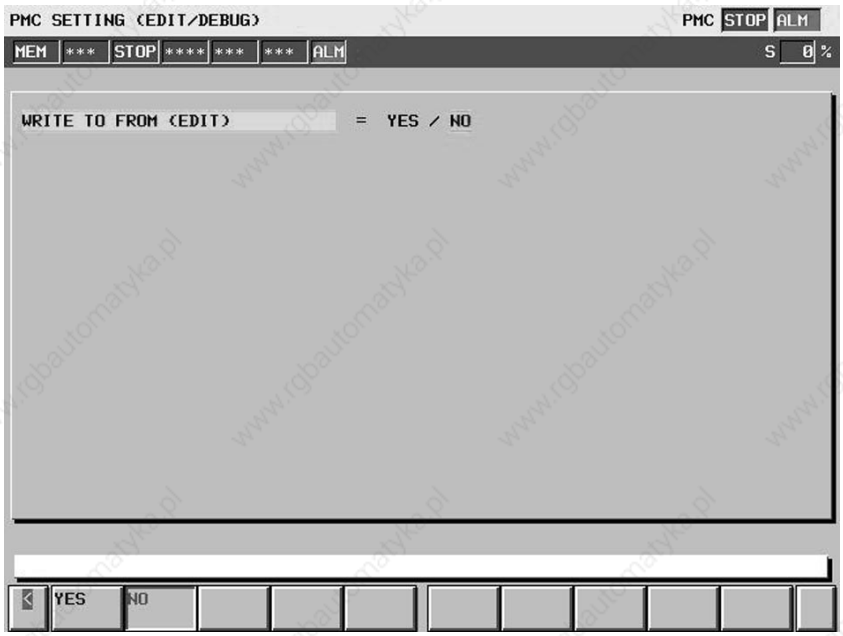
Clicking the [GENERAL] soft key displays the following screen.



- PROGRAMMER ENABLE
  YES: Enables the built–in debug function.
  NO: Disables the built–in debug function.
- AUTOMATIC LADDER START
  AUTO: Causes the sequence program to be executed automatically when the power is switched on.
  MANUAL: The sequence program execution soft key is used to start the sequence program.
- SIGNAL STATUS WRITE ENABLE
  YES: Enables data entry on the signal status screen for the online function.
  NO: Disables data entry on the signal status screen for the online function.
- DATA TABLE CONTROL SCREEN
  YES: Displays the PMC parameter data table control screen.
  NO: Does not display the PMC parameter data table control screen.

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4.3.5.2 Screen for displaying setting data related to editing and debugging



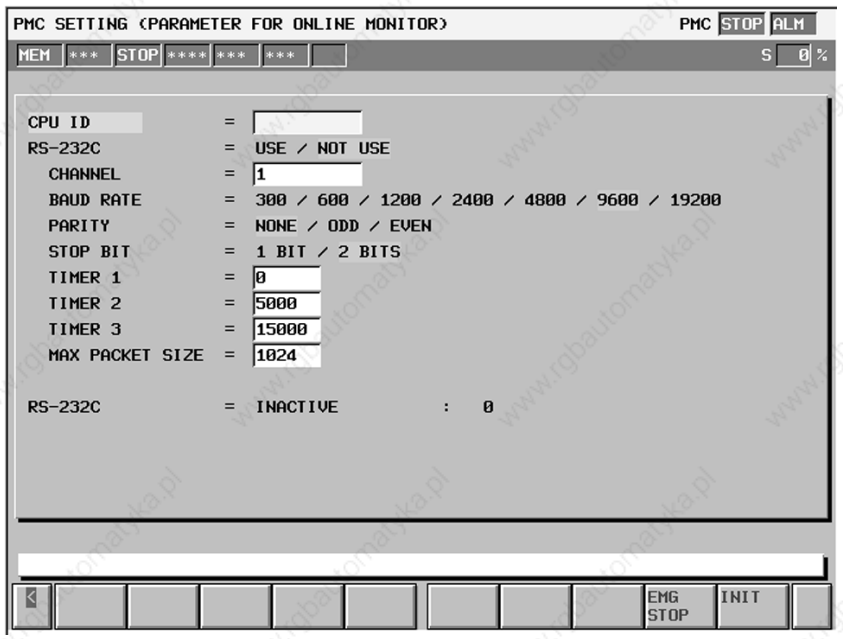
- WRITE TO FROM (EDIT)

  YES: Triggers automatic writing to FROM after ladder editing.

  NO: Does not trigger automatic writing to FROM after ladder editing.

4.3.5.3 Online monitor parameter display/setting screen (ONLINE)

Selecting YES for PROGRAMMER ENABLE on the GENERAL screen displays the [ONLINE] soft key on the setting menu screen. Clicking this soft key displays the following screen.



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Menu description

- CPU ID

  The CPU ID is displayed in this field. It can also be entered using this field. Usually, however, it is unnecessary to specify anything in this field.

- RS–232C (prompt)

  USE: Enables the RS–232C port to be connected to FAPT LADDER–II.

  NOT USE: Specifies not to use the RS–232C port.

CAUTION
Select “NOT USE” if you do not want to connect to FAPT LADDER–II.

- CHANNEL

  The number of a channel to be used is displayed in this field. It can also be entered using this field.

- BAUD RATE

  300: Specifies that the baud rate be set to 300.

  600: Specifies that the baud rate be set to 600.

  900: Specifies that the baud rate be set to 900.

  1200: Specifies that the baud rate be set to 1200.

  2400: Specifies that the baud rate be set to 2400.

  4800: Specifies that the baud rate be set to 4800.

  9600: Specifies that the baud rate be set to 9600.

  19200: Specifies that the baud rate be set to 19200.

- PARITY

  NONE: Specifies no parity.

  ODD: Specifies odd parity.

  EVEN: Specifies even parity.

- STOP BIT

  1 BIT: Specifies to set the number of stop bits to 1.

  2 BITS: Specifies to set the number of stop bits to 2.

- TIMER 1

  A value for communication parameter timer 1 is displayed in this field. It can also be entered using this field. Usually, however, it is unnecessary to specify anything in this field.

- TIMER 2

  A value for communication parameter timer 2 is displayed in this field. It can also be entered using this field. Usually, however, it is unnecessary to specify anything in this field.

- TIMER 3

  A value for communication parameter timer 3 is displayed in this field. It can also be entered using this field. Usually, however, it is unnecessary to specify anything in this field.

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- MAX PACKET SIZE

  A value for the maximum packet length (communication parameter) is displayed in this field. It can also be entered using this field. Usually, however, it is unnecessary to specify anything in this field.

- RS–232C (status display)

  The status of the RS–232C port is displayed in this field.

  INACTIVE: The RS–232C port is not in use.

  STOPPING: The RS–232C port is closed.

  STARTING: The RS–232C port is open.

  STAND–BY: The RS–232C port is ready to be connected to FAPT LADDER–II.

  CONNECTED: The RS–232C port is connected to FAPT LADDER–II.

If the system configuration allows use of the ladder editing package, the F–BUS prompt menu appears above the RS–232C status display menu, and the F–BUS status display menu appears below the RS–232C status display menu.

- F–BUS (prompt)

  USE: Enables the F–BUS port to be connected to the ladder editing package.

  NOT USE: Disables the F–BUS port from being connected to the ladder editing package.

- F–BUS (status display)

  The status of the F–BUS port is displayed in this field.

  INACTIVE: The F–BUS port is not in use.

  STOPPING: The F–BUS port is closed.

  STARTING: The F–BUS port is open.

  STAND–BY: The F–BUS port is ready to be connected to ladder editing package.

  CONNECTED: The F–BUS port is connected to ladder editing package.

Soft key description

EMG STOP: Forcibly terminates communication. This soft key is used if communication cannot be terminated normally because of abnormality.

INIT: Initializes the parameters to their default values.

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4.4 DI/DO MONITOR FUNCTION

If a failure occurs, or the machine halts while waiting for an external signal such that it appears as if a failure has occurred, it is necessary to check the internal status of the CNC using the CNC self–diagnosis function, or to find the cause from the status of the interface between the CNC and PMC using the DI/DO monitor function.

The DI/DO monitor function displays the status of the DI/DO signals using the following two formats.

- 8–bit binary number, in sequence of signal addresses
- Signal–by–signal decimal number by assembling signals that extend over multiple bits

4.4.1 DI/DO Monitor Screen

Display the DI/DO monitor screen according to Section 1.1.5.4, “System procedure”.

- **Bit display**

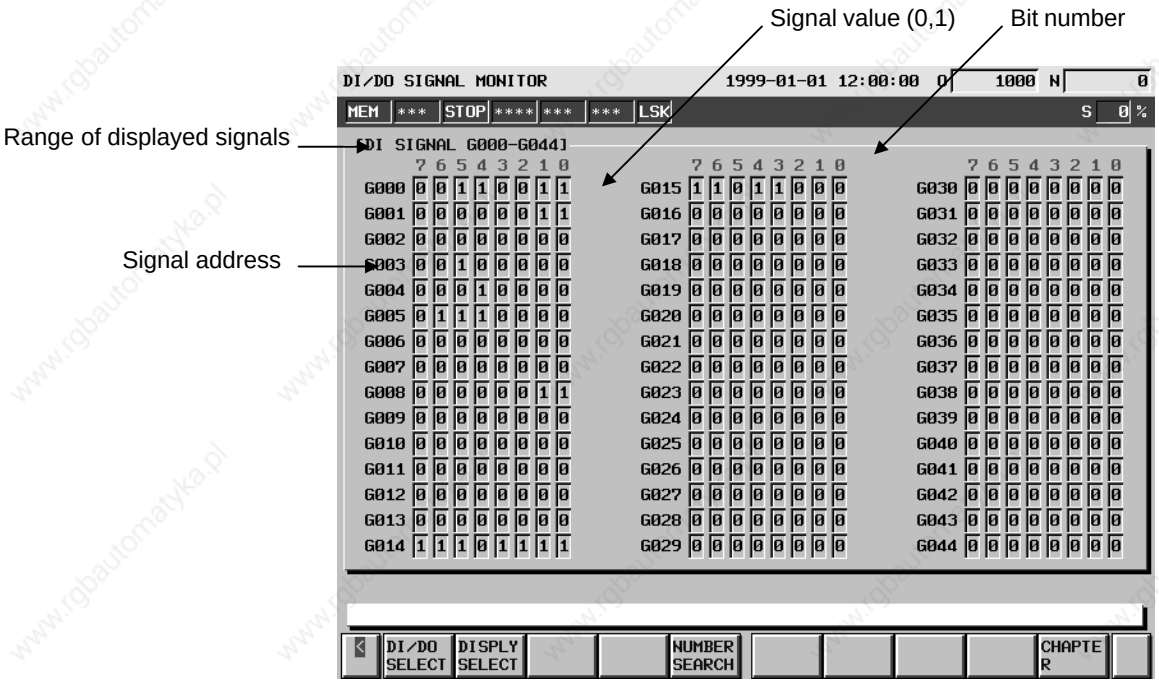


Fig. 4.4.1 (a) DI/DO Monitor screen (Bit Display)

DI/DO signals are displayed using an eight–bit (one–byte) binary number in sequence of their addresses.

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- **Signal–by–signal display**

A signal extending over more than one bit is displayed using a single decimal number (one–bit signals are displayed using binary numbers (0 and 1), however). In addition, axis type signals are grouped by axis, and spindle type signals are grouped by spindle.

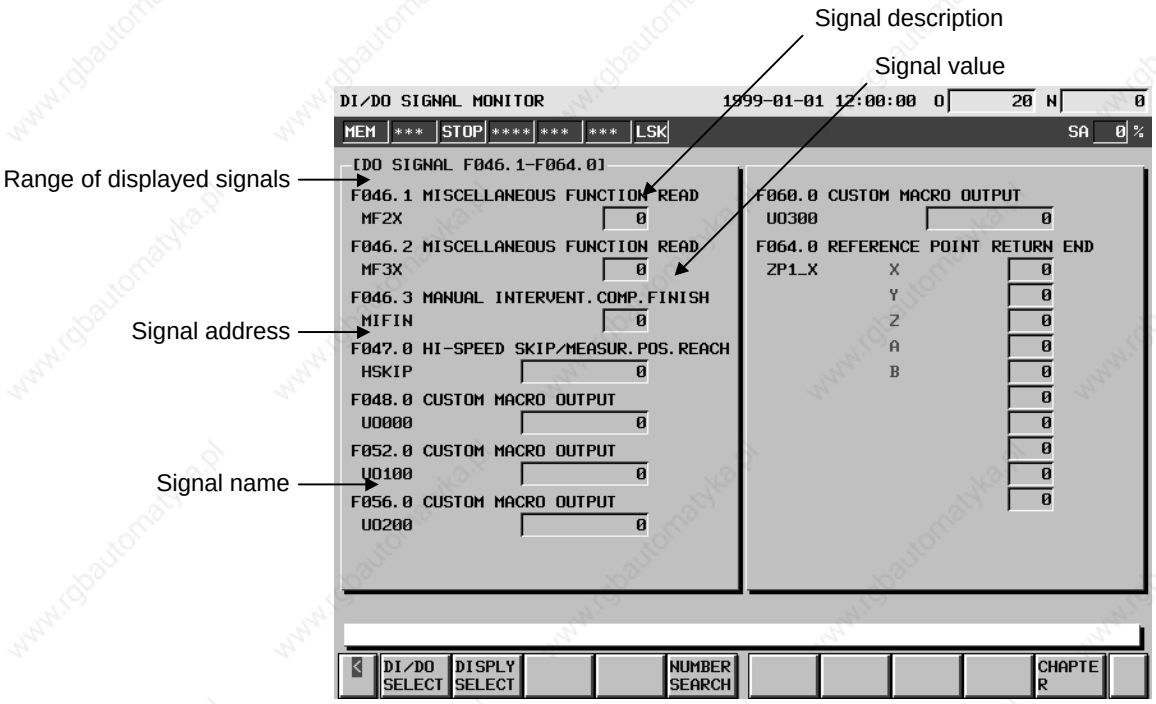


Fig. 4.4.1 (b) DI/DO monitor screen (Signal–by–signal display)

1. Bit type signal

A one–bit signal is displayed as 0 or 1.



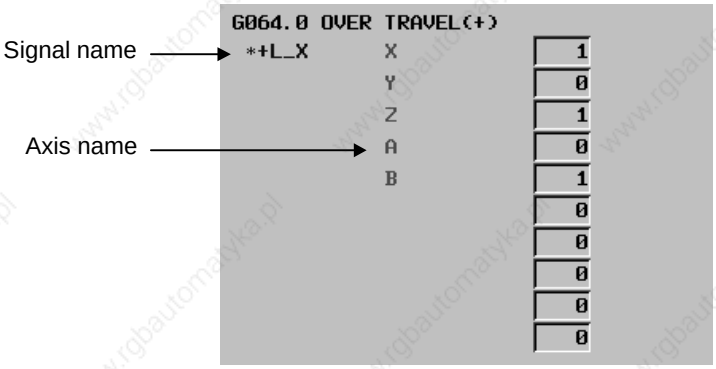
2. Integer type signal

Signals extending over more than one bit are displayed as a single decimal number. The start address and bit number are displayed as the signal address.



3. Bit axis type signal

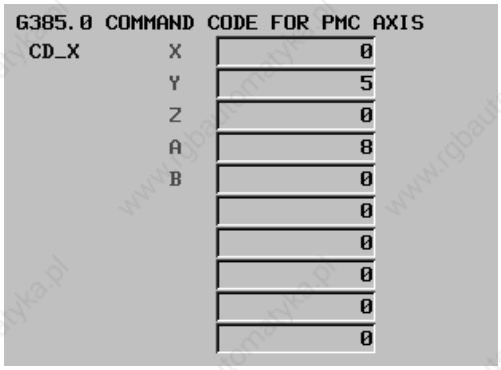
This is a one–bit axis type signal. Its start address and bit number for the first axis are displayed as the signal address.



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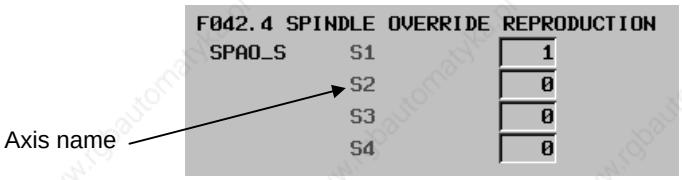
4. Integer axis type signal

This is an integer type signal extending over more than one bit. Its first–axis address and bit number are displayed as the signal address.



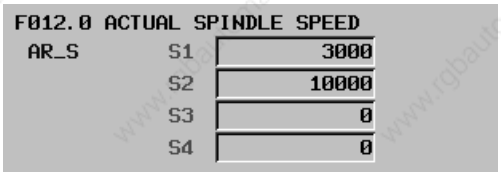
5. Bit spindle type signal

This is a one–bit spindle type signal. Its first–axis start address and bit number are displayed as the signal address.1



6. Integer spindle type signal

This is an integer type signal extending over more than one bit. Its first–axis address and bit number are displayed as the signal address.



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4.4.2 Screen Manipulation

- **DI/DO signal switching**

  To switch the display from DI signals to DO signals or vice versa, press soft key [DI/DO CHANGE].

- **Display switching**

  To switch the display format between bit display and signal–by–signal display, press soft key [DISPLY SELECT].

- **Page switching**

  A display page can be selected using the page keys.

- **Display of a specified signal**

  A signal can be displayed by specifying its address.

  Method 1

  (1) Press soft key [NUMBER SEARCH].
  (2) Enter the address of a signal to be displayed.
  (3) Press soft key [EXEC].

  Method 2

  (1) Enter the address of a signal to be displayed.
  (2) Press soft key [NUMBER SEARCH].

Example of address entry

1. Address entry for bit display
   “G67” A page containing signals related to G67 appears.
   “67” If DI signals are displayed, a page containing signals related to G67 appears.
   If DO signals are displayed, a page containing signals related to F67 appears.
   (For bit displays, it is unnecessary to enter bit numbers.)
2. Address entry for signal–by–signal display
   “G5.4” A page containing signals related to G5.4 appears.
   “G5” A page containing signals related to G5.0 appears.
   “5.4” If DI signals are displayed, a page containing signals related to G5.4 appears.
   If DO signals are displayed, a page containing signals related to F5.4 appears.

NOTE

If an address that does not correspond to a signal is entered for signal–by–signal display, a page containing a signal whose address is higher than and nearest to the entered address appears.

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5 DIGITAL SERVO

This chapter describes the displays on the servo adjustment screens, which are necessary to maintain digital servos. It also explains how to make reference position return adjustments.

5.1 SERVO PARAMETER INITIALIZATION PROCEDURE 314
5.2 SETTING THE FSSB 319
5.3 SERVO SCREENS 331
5.4 REFERENCE POSITION RETURN ADJUSTMENT (BASED ON DOGS) 339
5.5 SETTING THE REFERENCE POSITION WITHOUT DOGS 342

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5.1 SERVO PARAMETER INITIALIZATION PROCEDURE

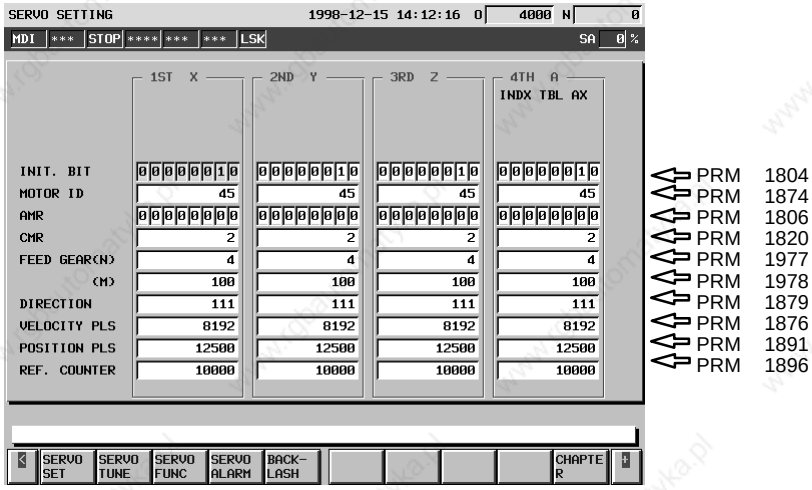
This section explains how to initialize digital servo parameters just after the machine tool is installed.

1. Make sure that the machine is at an emergency stop, then switch on the power.
2. Set up the parameter needed to display the servo setting screen. When the parameter is 0, the screen can be displayed. So, it is unnecessary to change the parameter from the initial state.

	#7	#6	#5	#4	#3	#2	#1	#0
0015								SVS

#0 (SVS) 0: Displays the servo adjustment screens.
1: Does not display the servo adjustment screens.

3. Switch the power off and on again.
4. Displays the servo parameter setting screen according to the procedure in II 2.5 of the applicable operator's manual (B–63324EN–1).
5. Enter the data necessary for parameter initialization, using the cursor and page keys.



(1) INIT. BIT

	#7	#6	#5	#4	#3	#2	#1	#0
1804							DGPRM	PLC01

#1 (DGPRM)☆ 0: Initializes the digital servo parameters.
1: Does not initialize the digital servo parameters.

#0 (PLC01) 0 Specifies use of the current values in PRM 1876 and 1891 without modifying them.
1: Specifies use of the current values in PRM 1876 and 1891 multiplied by 10.

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(2) Motor ID

α series servo motors

Motor model	α 0.5	α 1/3000	α 2/2000	α 2.5/3000	α 3/3000
Drawing number	0113	0371	0372	0374	0123
Motor type number	13	61	46	84	15

Motor model	α 6/2000	α 6/3000	α 12/2000	α 12/3000	α 22/1500
Drawing number	0127	0128	0142	0143	0146
Motor type number	16	17	18	19	27

Motor model	α 22/2000	α 22/3000	α 30/1200	α 30/2000	α 30/3000
Drawing number	0147	0148	0151	0152	0153
Motor type number	20	21	28	22	23

Motor model	α 40/FAN	α 40/2000	α 65	α 100	α 150
Drawing number	0158	0157	0331	0332	0333
Motor type number	29	30	39	40	41

α L series servo motors

Motor model	α L3/3000	α L6/2000	α L9/3000	α L25/3000	α L50/2000
Drawing number	0561	0562	0564	0571	0572
Motor type number	56 or 68	57 or 69	58 or 70	59	60

α C series servo motors

Motor model	α C3/2000	α C6/2000	α C12/2000	α C22/1500
Drawing number	0121	0126	0141	0145
Motor type number	7	8	9	10

α HV series servo motors

Motor model	α 12HV	α 22HV	α 30HV
Drawing number	0176	0177	0178
Motor type number	3	4	5

α E, β series servo motors

Motor model	α 0.5	β 1/3000 α E1/3000	β 2/3000 α E2/3000	β 3/3000 α E3/3000	β 6/2000 α E6/2000
Drawing number	0113	0101	0102	0105	0106
Motor type number	13	35	36	33	34

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αM series servo motors

Motor model	αM2/3000	αM2.5/3000	αM3/3000	αM6/3000	αM9/3000
Drawing number	0376	0377	0161	0162	0163
Motor type number	97	98	24	25	26

Motor model	αM22/3000	αM30/3000	αM50/3000
Drawing number	0165	0168	0169
Motor type number	100	101	108

Motor model	αM6HV	αM9HV	αM22HV	αM30HV
Drawing number	0182	0183	0185	0186
Motor type number	104	105	106	107

Linear motors

Motor model	1500A	3000B	6000B	9000B
Drawing number	0410	0411	0412	0413
Motor type number	90	91	92	93

(3) Optional AMR function (to be specified when 5–0S to 3–0S are used)

		#7	#6	#5	#4	#3	#2	#1	#0	
PRM	1806	AMR7	AMR6	AMR5	AMR4	AMR3	AMR2	AMR1	AMR0	Axial

#7	#6	#5	#4	#3	#2	#1	#0	Motor types
1	0	0	0	0	0	1	0	5–0S
0	0	0	0	0	0	1	1	4–0S, 3–0S
0	0	0	0	0	0	0	0	Other than above

* Reset PRM 1806 to 00000000 for serial pulse coder C.

(4) CMR

	#7	#6	#5	#4	#3	#2	#1	#0
1816	ACM							

#7 ACM Specifies whether to use an optional command multiplication ratio 1/N.
0: Not to use 1/N.
1: To use 1/N.
This parameter is valid only when the optional command multiplication ratio is available.

1820	Axial command multiplication (CMR)

(i) To set command multiplication ratio = 0.5 to 48:
Reset parameter ACM (bit 7 of parameter No. 1816) to 0, then set parameter No. 1820 to the following value:
Setting = (command multiplication ratio)*2
Valid data range: 1 to 96

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(ii) To set command multiplication ratio = 1/2 to 1/27:
(The optional command multiplication function is needed.)
Set parameter ACM (bit 7 of parameter No. 1816) to 1, then set parameter No. 1820 to the following value:
Setting = 1/(command multiplication ratio)
Valid data range: 1 to 27

	1821	Axial command multiplication numerator (optional command multiplication)

Specifies an axial command multiplication numerator value. The optional command multiplication function is needed.

	1822	Axial command multiplication denominator (optional command multiplication)

Specifies an axial command multiplication denominator value. The optional command multiplication function is needed.
Setting parameter Nos. 1821 and 1822 to a nonzero value makes the setting of the optional command multiplication ratio n/m (n in 1821 and m in 1822) effective.

(5) Switch the power off and on again.

(6) Feed gear N/M

PRM	1977	n in flexible feed gear ratio
PRM	1978	m in flexible feed gear ratio

(i) Feed gear ratio for serial pulse coder A or serial α pulse coder

$$\frac{n}{m} = \frac{\text{Number of feedback pulses per motor rotation}}{1000000}$$

<<Example calculation>>

		1/1000 mm	1/10000 mm
One motor rotation	8 mm	n=1/m=125	n=2/m=25
	10 mm	n=1/m=100	n=1/m=10
	12 mm	n=3/m=250	m=3/m=25

(7) Direction of movement

PRM	1879	Direction of motor rotation

111 : Positive (clockwise) rotation
–111 : Negative (counterclockwise) rotation

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(8) Number of speed and position pulses

(i) Number of pulses for serial pulse coder A or serial α pulse coder

	Paramter No.	Increment system : 1/1000mm		Increment system : 1/10000mm	
		Full–closed loop	Semi–closed loop	Full–closed loop	Semi–closed loop
High–resolutionsetting	1804#0	0		1	
Separate detector	1815#1 1807#3	1	0	1	0
Number of speed feedback pulses	1876	8192		819	
Number of position feedback pulses	1891	NS	12500	NS/10	1250

* “NS” stands for the number of position feedback pulses per motor rotation (after multiplied by 4)

* Motors 5–0S to 3–0S have a different number of poles from others; so set PRM 1806.

(9) Reference counter

PRM	1896	Axial reference counter capacity (0 to 99999999)

6. Switch the power off and on again.

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5.2 SETTING THE FSSB

Overview

Connecting the CNC control unit to servo amplifiers via a high–speed serial servo 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.
In a system employing the FSSB, the following parameters must be specified to set axes. (Other parameters must be specified as usual.)

- Parameters No. 1023, 1027, and 1028
- Parameters No. 1080 to 1089 (For a system using 11 or more controlled axes, parameters No. 1100 to 1109 and 1110 to 1119 must also be specified. Hereafter, the description “parameters No. 1080 to 1089” is assumed to include parameters No. 1100 to 1109 and 1110 to 1119 for any system using 11 or more controlled axes.)
- Parameters No. 1092 to 1097

To specify these parameters, any of the following three methods can be used:

1. Default setting
   Default setting is performed for the axes in the order in which they are connected to amplifiers. Parameters No. 1023, 1027, 1028, 1080 to 1089, and 1092 to 1097 need not be set and automatic setting is not performed. Note that some functions cannot be used when default setting is used.
2. Automatic setting
   Parameters No. 1023, 1027, 1028, 1080 to 1089, and 1092 to 1097 are specified automatically according to the interrelationships between axes and amplifiers entered on the FSSB setting screen.
3. Manual setting
   Enter data directly into parameters No. 1023, 1027, 1028, 1080 to 1089, and 1092 to 1097. Before doing this, take the time to become fully familiar with the use of the parameters.

Description

• Slave

In a system employing the FSSB, connection is established between the CNC and servo amplifiers or pulse modules through a fiber optics cable. Such servo amplifiers or pulse modules are called slaves. A two–axis amplifier consists of two slaves while a three–axis amplifier consists of three slaves. Slaves are assigned a number (slave number) from 1 to 10, where 1 is assigned to the slave nearest to the CNC, 2 to the second nearest, and so on.

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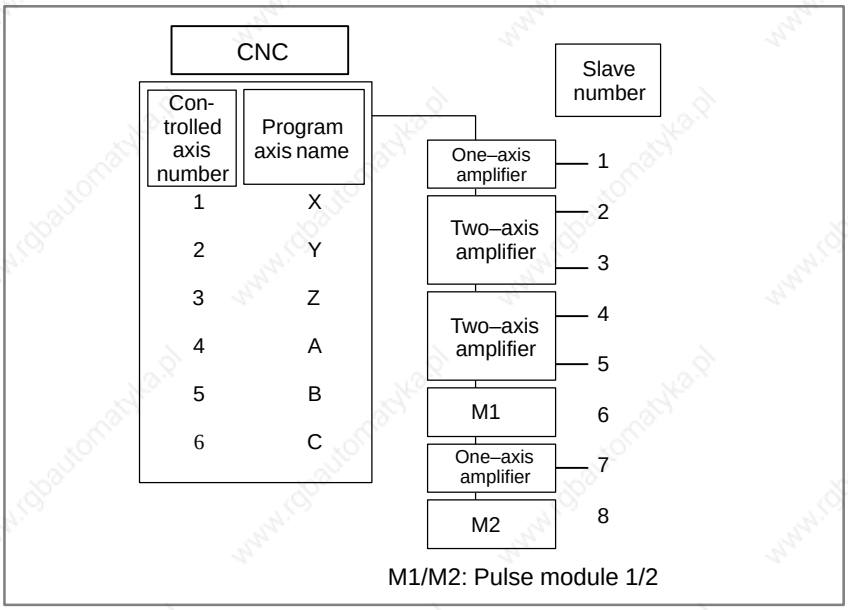


Fig. 5.2 (a)

- **Default setting**

Default setting is used if the power is turned on to the system when both of parameters FMD (bit 0 of parameter No. 1090) and ASE (bit 1 of parameter No. 1090) are set to 0, such as after initializing parameters. By default, servo axis numbers (parameter No. 1023) correspond to slave numbers. For example, the axis for which parameter No. 1023 is set to 1 is connected to the amplifier having slave number 1 (which is nearest to the CNC).

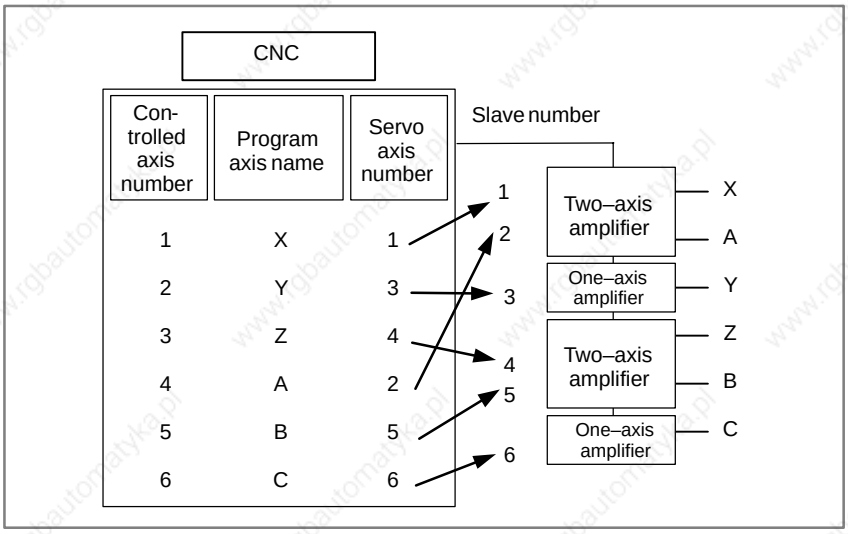


Fig. 5.2 (b)

When default setting is used, restrictions are imposed on some functions. The default setting function is used for making temporary settings during installation. Normally, execute automatic setting on the FSSB setting screen before operating the servo motor.

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- **Restrictions imposed by default setting**

  - No pulse module can be used. Therefore, a separate position detector cannot be used.
  - The setting for parameter No. 1023 must be performed in ascending numerical order in that parameter. For example, if 2 is not assigned to any axis, 3 cannot be assigned.
  - The following servo functions cannot be used:
    - High–speed current loop
    - High–speed interface axis
    - Electronic gear box (EGB)
    - Tandem control

- **Automatic control**

When both parameters FMD (bit 0 of parameter No. 1090) and ASE (bit 1 of parameter No. 1090) are set to 0, automatic setting can be used on the FSSB setting screen.

To perform automatic setting on the FSSB setting screen, follow the procedure below.

1 On the amplifier setting screen, information relating to servo amplifiers and pulse modules is displayed in the order of the slave numbers.
2 For each slave, set the number of the controlled axis to be connected. The corresponding controlled axis name appears the next to the number (except for pulse modules).
3 Select the axis control screen and set the function data including the connector numbers of a pulse module for each controlled axis.
4 Press soft key SETTING to perform automatic setting. If the set data is invalid, a warning is output. Set valid data.

The above operation automatically sets parameters No. 1023, 1027, 1028, 1080 to 1089, and 1092 to 1097. Parameter ASE (bit 1 of parameter No. 1090) is set to 1, indicating that the setting of each parameter is completed. When the power is turned off and then back on, axis setting is performed as specified in each parameter.

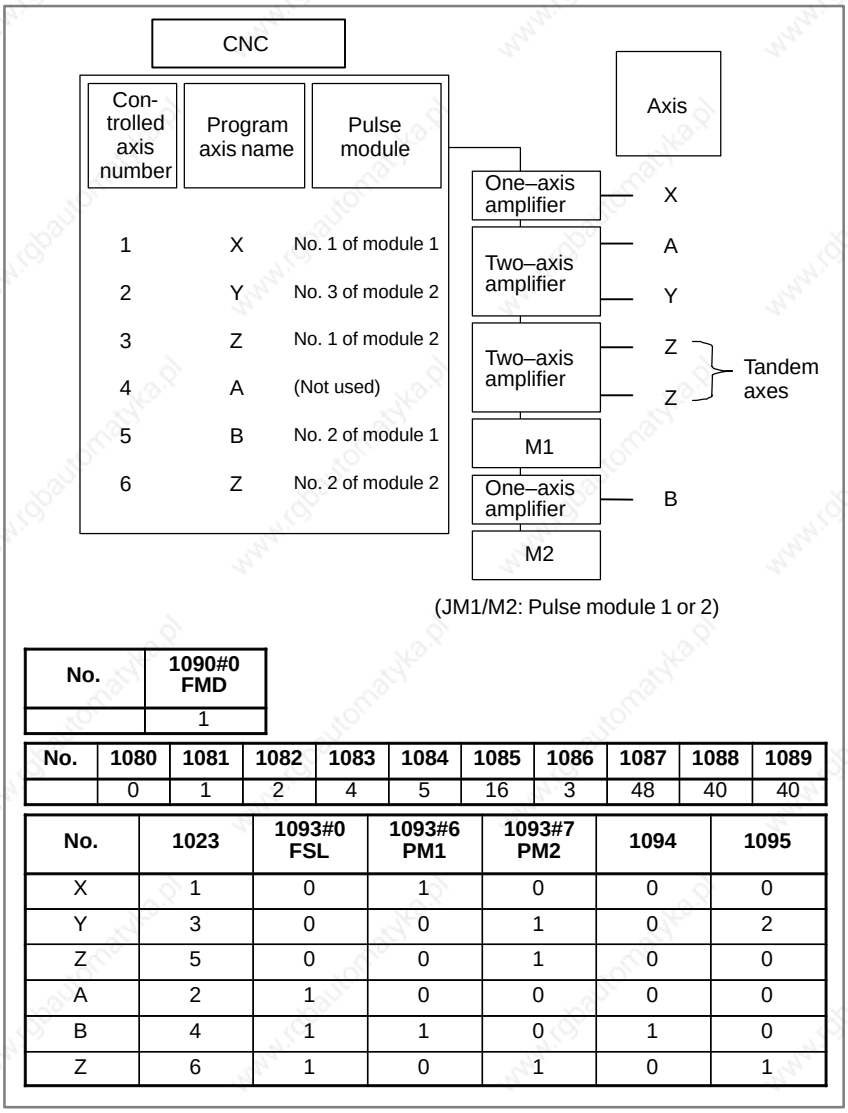
For details of the FSSB setting screen, see the FSSB data display and setting procedures, described later.

NOTE
1 To use the electronic gear box (EGB) function, make the required settings for the EGB axes (set bit 0 of parameter No. 1955 to 1) before executing automatic setting on the FSSB setting screen. If automatic setting is performed using the FSSB setting screen without first setting the EGB axes, the setting will be incorrect.
2 To use tandem control, in the same way as when using the EGB function, make the required settings for the tandem control axes (set bit 6 of parameter No. 1817 to 1) before executing automatic setting.
3 To set spindle positioning and Cs contour control, spindle–related parameters must be set in addition to the automatic setting of axes.

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- **Manual setting**

When parameter FMD (bit 0 of parameter No. 1090) is set to 1 or upon the completion of automatic setting (parameter ASE (bit 1 of parameter No. 1090) is set to 1), FSSB setting parameters (No. 1023, 1027, 1028, 1080 to 1089, and 1092 to 1097) can be set directly by MDI input from the parameter screen. The manual setting function is used only when specific axis setting, which cannot be set by the automatic setting function, is required. Normally, use the automatic setting function.



No.	1090#0 FMD
	1

No.	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089
	0	1	2	4	5	16	3	48	40	40

No.	1023	1093#0 FSL	1093#6 PM1	1093#7 PM2	1094	1095
X	1	0	1	0	0	0
Y	3	0	0	1	0	2
Z	5	0	0	1	0	0
A	2	1	0	0	0	0
B	4	1	1	0	1	0
Z	6	1	0	1	0	1

Fig. 5.2 (c) Axis configuration and parameter setting when using manual setting
(See the parameter explanations for the meaning of each parameter.)

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Displaying FSSB data

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 soft key [CHAPTER] several times.

3 Pressing soft key [FSSB] causes the AMP SET screen (or the previously selected FSSB setting screen) to appear.

The FSSB setting screens include AMP SET, AXIS SET, and AMP MAINTENANCE. To select these screens, use the page switching keys PAGE PAGE .

● Amplifier setting screen

The amplifier setting screen consists of two sections: the first section displays slave information about the amplifiers, while the second section displays slave information about the pulse modules. Specify the number of the controlled axis to be assigned to each amplifier on this screen.

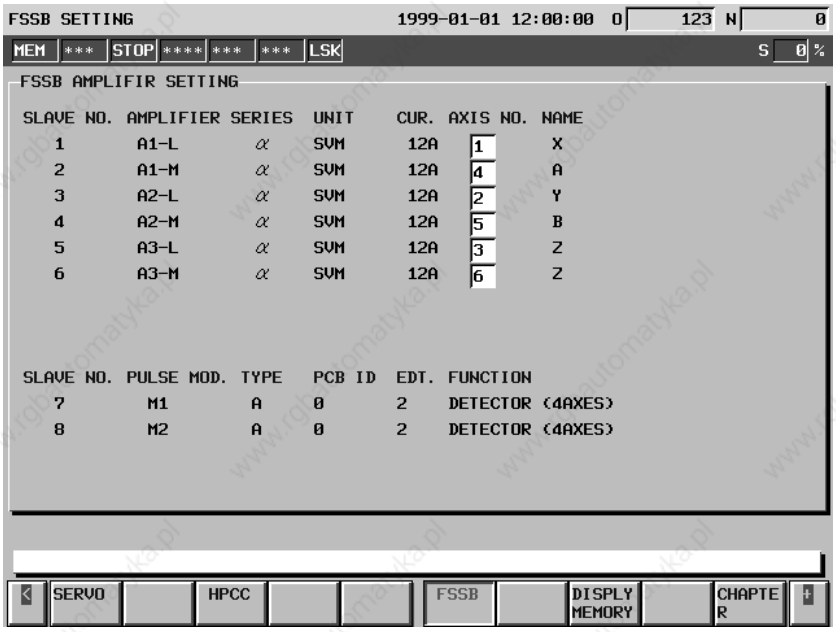


Fig. 5.2 (d)

The amplifier setting screen consists of the following items:

- SLAVE NO.
  Each slave unit connected via the FSSB has a slave number, with the slave unit nearest to the CNC being number 1. Up to ten slave units (up to eight amplifiers and up to two pulse modules) can be connected. For a system having eleven or more controlled axes, up to 30 slave units including up to 24 amplifiers and up to six pulse modules can be connected.
- AMP
  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.

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- The following items are displayed as amplifier information:
  - SERIES (servo amplifier series name)
  - UNIT (servo amplifier unit type)
  - CURRENT (maximum rating)
- AXIS NO.
  The axis number of each controlled axis specified in parameters (No. 1080 to 1089) is displayed. If a number specified in these parameters falls outside the range of 1 to the maximum number of controlled axes, 0 is displayed. When automatic setting is used, fill in this field with a controlled axis number to be assigned to each servo amplifier.
- NAME
  The axis name assigned to a parameter (No. 1020) corresponding to a particular controlled axis number is displayed. If the controlled axis number is 0, nothing is displayed.
- The following items are displayed as pulse module information:
  - PULSE MOD.
    This display consists of the letter M, which stands for “pulse module” and a number indicating the placing of the pulse module, as counted from that nearest to the CNC.
  - TYPE
    This display is a letter indicating the type of the pulse module.
  - PCB ID
    This display consists of four digits indicating the pulse module ID (hexadecimal).
  - VERSION
    This display indicates the version of the pulse module.
  - FUNCTION
    This displays “DETECTOR (8AXES)” for the eight–axis separate detector interface module or “DETECTOR (4AXES)” for the four–axis separate detector interface module.

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- **Axis setting screen**

The axis setting screen displays axis information.

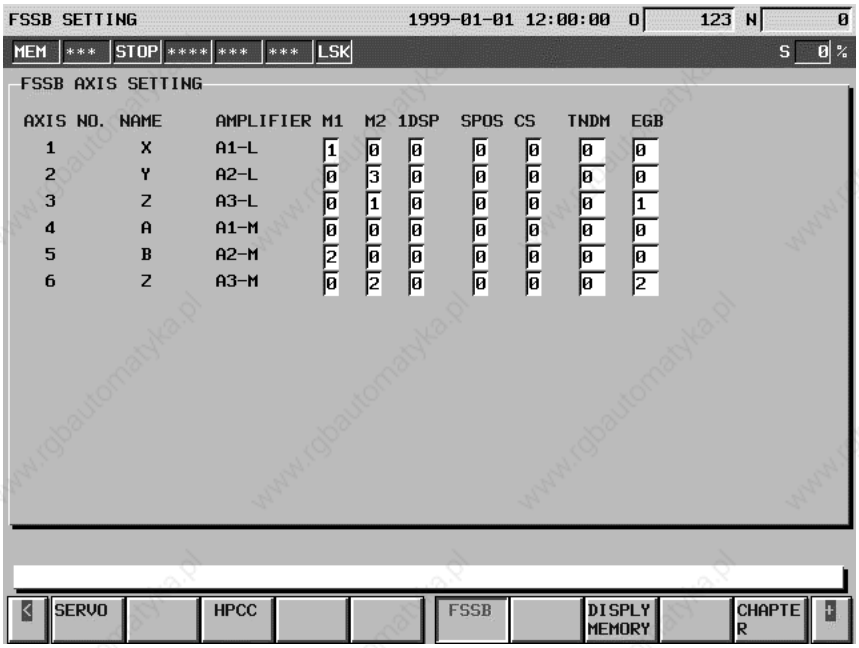


Fig. 5.2 (e)

The axis setting screen displays the following items:

- AXIS NO.
  This item is the placing of the NC controlled axis.
- NAME
  This item is the name of the corresponding controlled axis.
- AMP
  This items is the type of the amplifier connected to each axis.
- M1
  This item is the number of the connector for pulse module 1, specified in parameter No. 1094.
- M2
  This item is the number of the connector for pulse module 2, specified in parameter No. 1095.
- 1DSP
  This item is the value specified in bit 0 (parameter 1DSP) of parameter No. 1092. It is 1 for an axis (such as a high–speed current loop axis or high–speed interface axis) that exclusively uses hardware, which is usually shared by two axes.
- SPOS
  This item is the value specified in parameter No. 1027. A value other than 0 is displayed for the controlled axes used for spindle positioning.
- Cs AXIS
  This item is the value specified in parameter No. 1028. A value other than 0 is displayed for the axes used for Cs contour control.
- TANDEM
  This item is the value specified in parameter No. 1097. Consecutive odd and even numbers are displayed for the master and slave axes for tandem control.

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- EGB
  This item is the value specified in parameter No. 1096. Consecutive odd and even numbers are displayed for the slave and dummy axes when using the EGB function.

● Amplifier maintenance screen

The amplifier maintenance screen displays maintenance information for servo amplifiers.

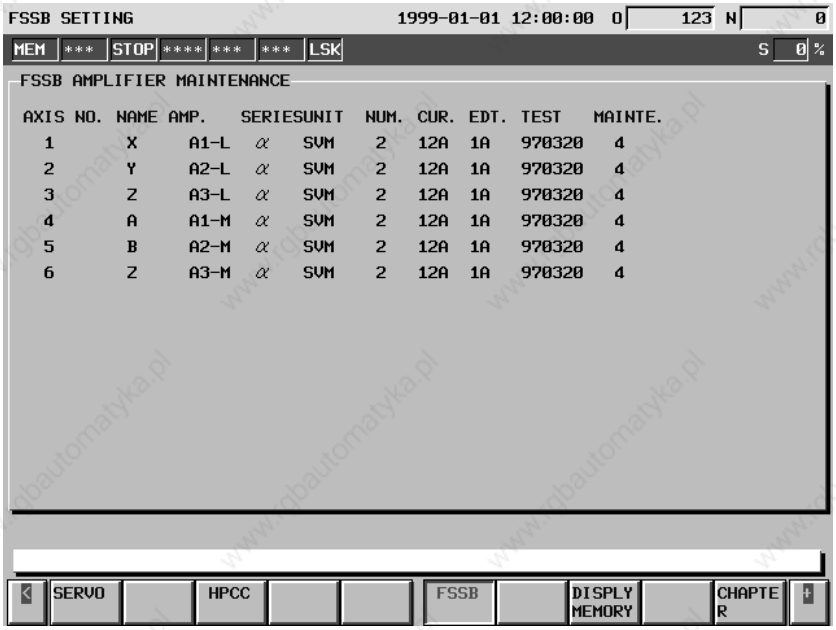


Fig. 5.2 (f)

The amplifier maintenance screen displays the following items:

- AXIS NO. (controlled axis number)
- NAME (controlled axis name)
- AMP (type of amplifier connected to each axis)
- SERIES (servo amplifier series of an amplifier connected to each axis)
- UNIT (unit type of a servo amplifier connected to each axis)
- NO. OF AXES (maximum number of axes controlled by an amplifier connected to each axis)
- CURRENT (maximum rating for amplifiers connected to each axis)
- VERSION (unit version number of an amplifier connected to each axis)
- TEST (date of test performed on an amplifier connected to each axis)
  Example) 970320 = March 20, 1997
- MAINTENANCE (engineering change number for an amplifier connected to each axis)

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FSSB data setting procedure

On the FSSB setting screen, pressing rightmost soft key [+] displays the following soft keys:

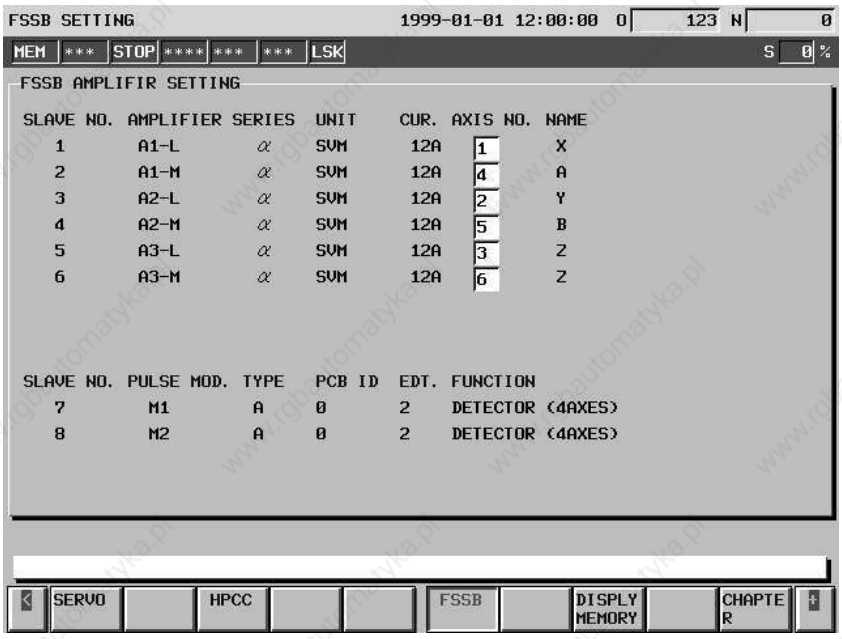


Fig. 5.2 (g)

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 [AUTO SET] is pressed after data entry, the corresponding parameter is automatically set, provided the entered data is valid. If the entered data contains an error, warning message “DATA IS INCORRECT” is displayed.
To restore the previous value of a parameter if, for example, an entered value is incorrect, press soft key [RESET].
When the power is turned on, values are read from the parameters and displayed on the screen.

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If using the servo card for HRV3

On the amplifier setting screen, each slave number is preceded by the number identifying an FSSB line (1 or 2) and a hyphen (–). The slave numbers of the slave units connected to the first FSSB line are displayed starting with that of the slave unit nearest the CNC.

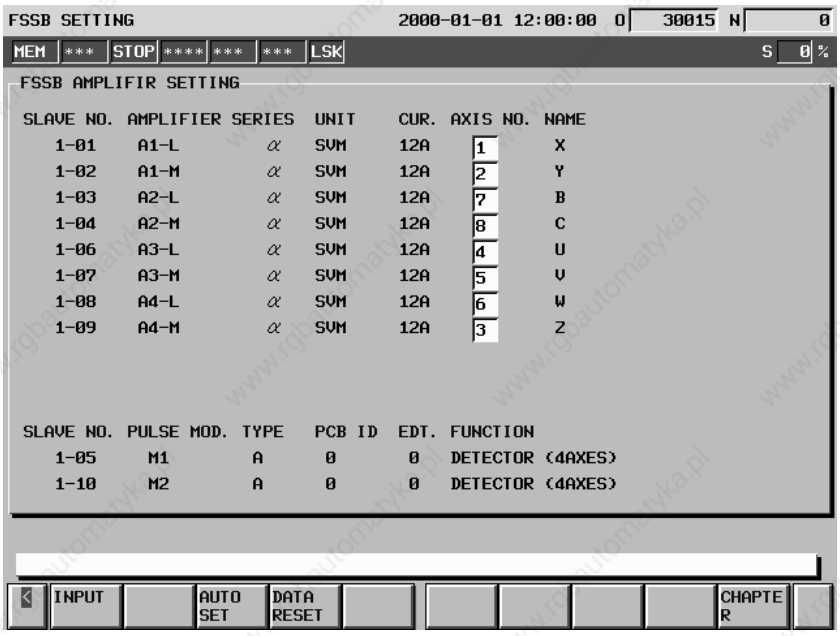


Fig. 5.2 (h) If a single FSSB line is used

If there are slaves connected to the second FSSB line (type B card), their numbers are displayed after the numbers of the slaves connected to the first.

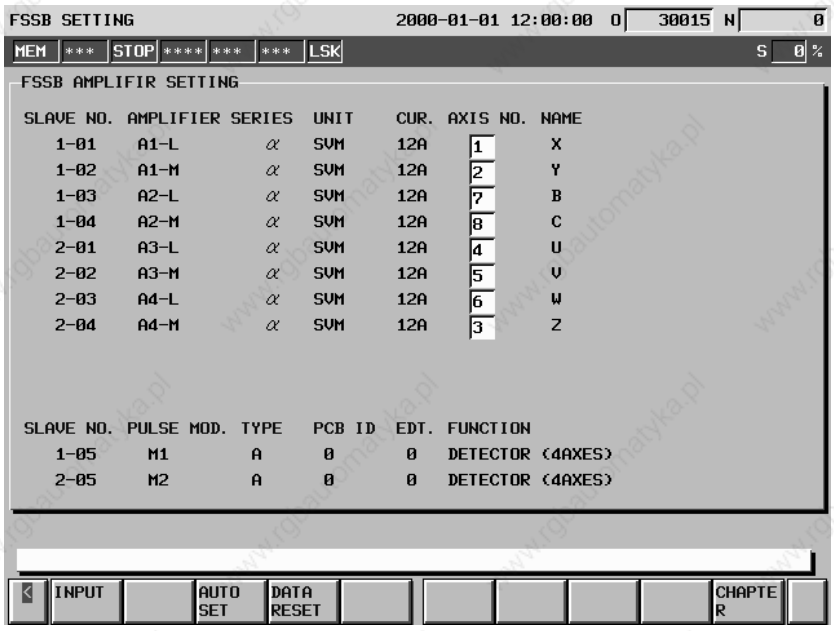


Fig. 5.2 (i) If two FSSB lines are used

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- **Amplifier setting screen**

On the amplifier setting screen, the following item can be specified:

- AXIS NO. (controlled axis number)
  For this item, enter a value between 0 and the maximum number of controlled axes. If a number that falls outside this range is entered, the warning message “DATA IS OUT OF RANGE” appears. After entering controlled axis numbers using the amplifier setting screen, enter data using the axis setting screen. If the entered controlled axis number is duplicate, the warning message “DATA IS INCORRECT” appears when soft key [AUTO SET] is pressed to assert the entered value. In this case, no value can be entered for the parameter.

- **Axis setting screen**

On the axis setting screen, the following items can be specified:

- M1 (connector number for pulse module 1)
  For an axis that uses pulse module 1, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 1. For an axis that does not use pulse module 1, enter 0. If a number that falls outside the valid range is entered, the warning message “DATA IS OUT OF RANGE” is displayed.
- M2 (connector number for pulse module 2)
  For an axis that uses pulse module 2, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 2. When pulse module 2 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message “DATA IS OUT OF RANGE” is displayed.
- 1DSP
  When the functions listed below are used, enter 1 for the following axes, each of which exclusively uses hardware which would normally be shared by two axes. If a number other than 0 or 1 is entered, the warning message “DATA IS OUT OF RANGE” is displayed.
  - High–speed current loop axis
  - High–speed interface axis
- SPOS
  Enter a spindle number (1 to 4) for setting a spindle positioning axis. If a number other than 0 to 4 is entered, the warning message “DATA IS OUT OF RANGE” is displayed.
- Cs AXIS
  Enter a spindle number (1 to 4) for setting the Cs contour controlled axis. If a number other than 0 to 4 is entered, the warning message “DATA IS OUT OF RANGE” is displayed.
- TANDEM
  Enter odd and even numbers for the master and slave axes for tandem control. These numbers must be consecutive and in the range of between 1 and 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.
- EGB
  Enter odd and even numbers for the master and slave axes when using the EGB function. These numbers must be consecutive and in the range of 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.

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When soft key [AUTO SET] is pressed on the axis setting screen after data entry, the warning message “DATA IS INCORRECT” is displayed if any of the following conditions is satisfied.

- Both M1 and M2 are nonzero for an axis.
- Any two of 1DSP, SPOS, Cs AXIS, TANDEM, and EGB are nonzero for an axis.
- A duplicate value is specified for M1.
- A duplicate value is specified for M2.
- A duplicate value is specified for SPOS.
- A duplicate value is specified for Cs AXIS.
- A duplicate value is specified for TANDEM.
- An invalid master/slave axis pair is specified for TANDEM.
- A duplicate value is specified for EGB.
- An invalid slave/dummy axis pair is specified for EGB.

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5.3 SERVO SCREENS

5.3.1 Parameter Setting

	#7	#6	#5	#4	#3	#2	#1	#0
00015								SVS

[Data type] Bit

Parameter entry

SVS: Specifies whether to display the servo screens.

0: To display

1: Not to display

5.3.2 Displaying Servo Screens

The servo screens are used to set servo parameters or monitor the status of operation. On these screens, it is possible to specify or view parameter settings without concern about the parameter and diagnostic data numbers.

The servo screens are one type of system screens. Five different servo screens are used because there are many to be set or displayed.

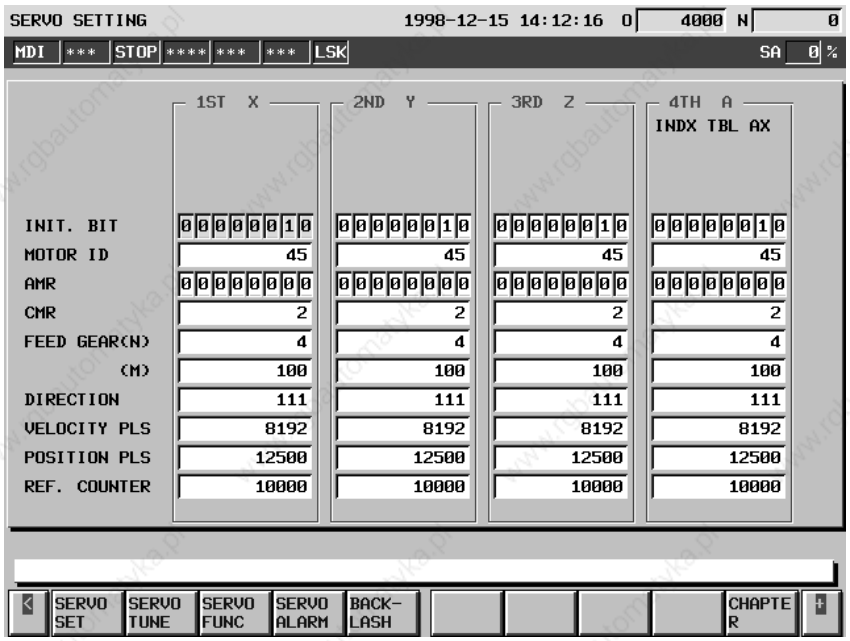
System screen — **Servo screen**

- **Servo setting screen**
  Used to set basic servo parameters.
- **Servo tuning/monitor screen**
  Used to set the parameters needed to tune the basic characteristics of the servo motors, and monitor the settings of the parameters.
- **Servo function screen**
  Used to set parameters related to various servo functions.
- **Servo alarm screen**
  Used to monitor possible alarm conditions related to the servo functions.
- **Servo Backlash tuning screen**
  Used to set the parameters related to backlash compensation.

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Servo setting screen

This screen contains a collection of parameters necessary for servo motor initialization. One page of the screen displays parameters for four axes.



(1) The axis types are displayed, but cannot be specified. The following parameter settings are displayed for each axis type.

Display	Axis type	Parameter
Synchronization: Master	Synchronization control master axis	Synchronization control option No. 7702
Synchronization: Slave	Synchronization control slave axis	Synchronization control option No. 7702 ≠ 0
Twin: Master	Twin table control master axis	Twin table option No. 7702
Twin: Slave	Twin table control slave axis	Twin table option No. 7702 ≠ 0
Tandem: Main	Tandem control main motor	No. 1817#6 = 1 No. 1023 = 1, 3, 5
Tandem: Sub	Tandem control sub–motor	No. 1817#6 = 1 No. 1023 = 2, 4, 6
Parallel: Master	Parallel axis master axis	Axis with the smallest axis number among axes having the same name
Parallel: Slave	Parallel axis slave axis	Axes having the same name other than the above
EGB: Slave	EGB slave axis	No. 1955#0 = 1 No. 1023 = 1, 3, 5, …
EGB: Dummy	EGB dummy axis	No. 1955#0 = 1 No. 1023 = 2, 4, 6, …
Index table indexing	Index table axis	No. 7631 Fourth axis for 0
Chopping	Chopping axis	No. 1191

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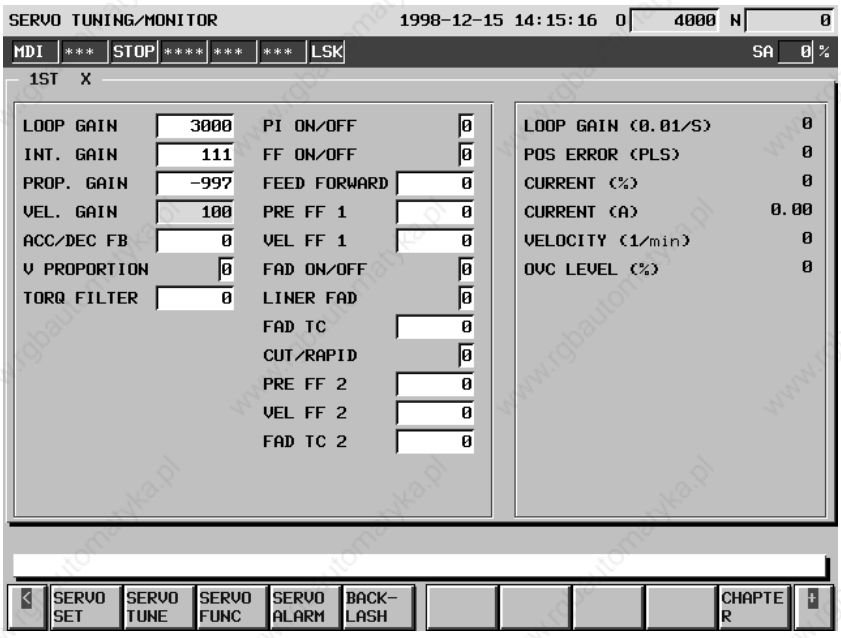
Display	Axis type	Parameter
Spindle positioning	Spindle positioning axis	No. 1027 ≠ 0
Cs contour control axis	Cs contour control axis	No. 1028 ≠ 0

(2) The following table lists the data that can be set on this screen and the corresponding parameters.

INIT. BIT	: No. 1804
MOTOR ID	: No. 1874
AMR	: No. 1806
CMR	: No. 1820
FEED GEAR (N)	: No. 1977
FEED GEAR (M)	: No. 1978
DIRECTION	: No. 1879
VELOCITY PLS	: No. 1876
POSITION PLS	: No. 1891
REF. COUNTER	: No. 1896

Servo tuning/monitor screen

This screen contains a collection of parameters necessary to tune the basic characteristics of servo motors.



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(1) The following table lists the data that can be set on this screen and the corresponding parameters.

LOOP GAIN	: No. 1825
INT. GAIN	: No. 1855
PROP. GAIN	: No. 1856
VEL. GAIN	: No. 1875 The displayed value is (parameter/256 + 1) × 100. Before reflected in the parameter, the entered value is converted using: (Entered value/100 – 1) × 256.
ACC/DEC FB	: No. 1894
V PROPORTION	: No. 1959#7
TORQ FILTER	: No. 1895
PI ON/OFF	: No. 1808#3
FF ON/OFF	: No. 1883#1
FEED FORWARD	: No. 1961
PRE FF 1	: No. 1985
VEL FF 1	: No. 1962
FAD ON/OFF	: No. 1951#7
LINEAR FAD	: No. 1749#2
FAD TC	: No. 1702
CUT/RAPID	: No. 1742#0
PRE FF 2	: No. 1767
VEL FF 2	: No. 1768
FAD TC 2	: No. 1766

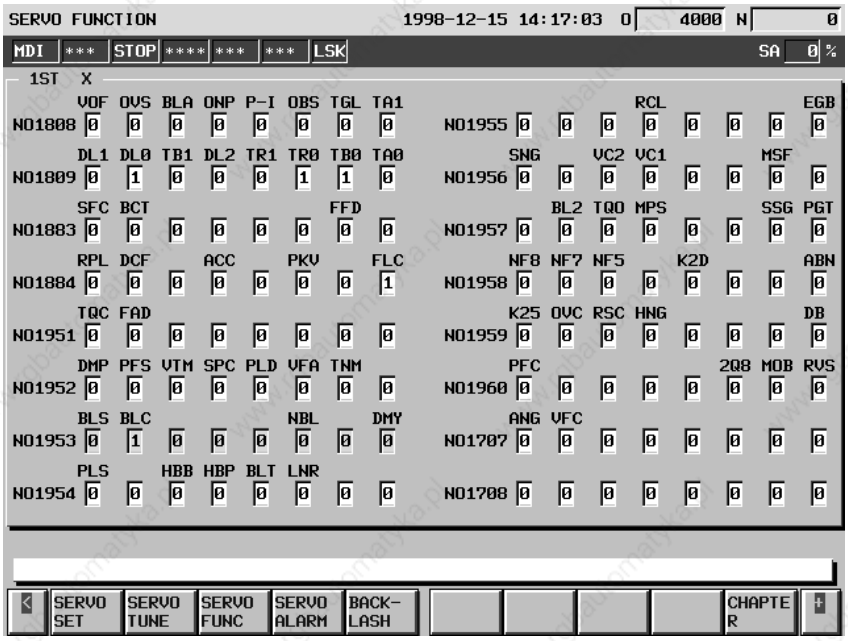
(2) The following table lists the correspondence between the data being monitored and the diagnostic data.

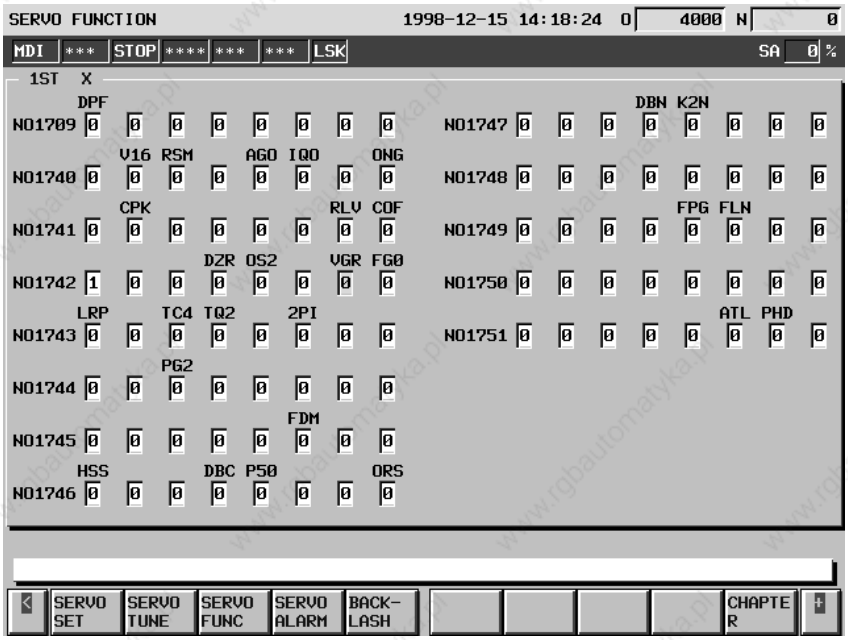
LOOP GAIN	: Value obtained from the output pulse and position error.
POS ERROR	:
CURRENT	: The % display is calculated using: Actual current data/parameter No. 1979 × 100
VELOCITY	: Speed or actual cutting feedrate of each motor
OVC LEVEL	:

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Servo function screen

This screen is a collection of parameters used to specify various servo motor functions. Two pages are used to display and set all parameters for one axis.



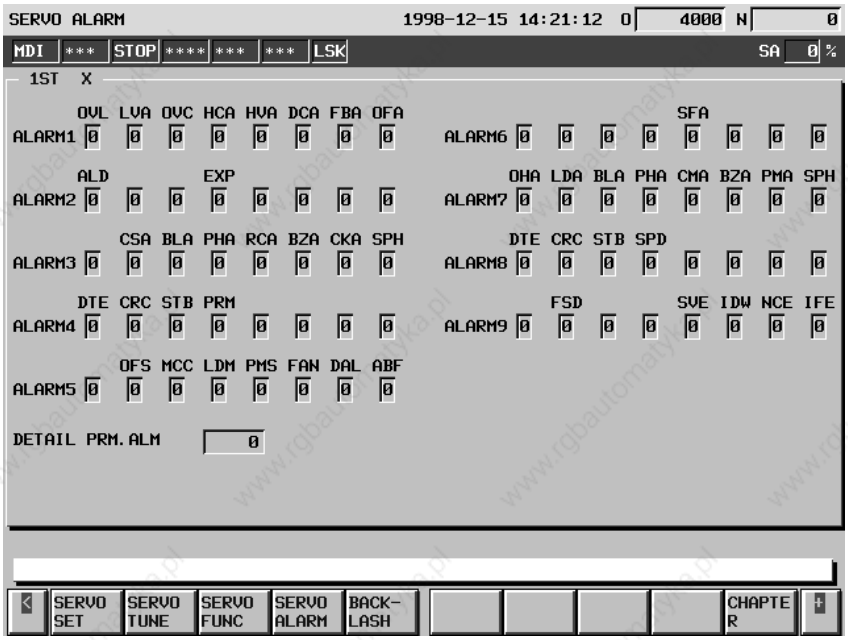


Refer to the applicable FANUC AC servo operator’s manual for the function that can be specified using each parameter.

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Servo alarm screen

This screen is used to display the status of servo motor alarms.



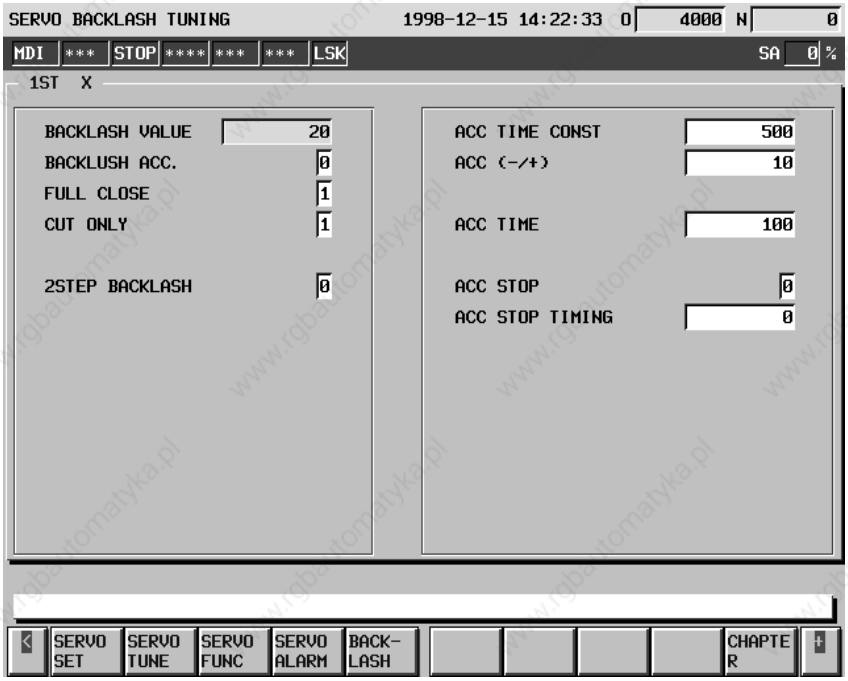
Refer to the applicable FANUC AC servo related manual for what is displayed on this screen.

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Servo Backlash tuning screen

This screen is used to display and set the parameters related to backlash compensation. The number of parameters on this screen varies according to whether 2–step backlash acceleration is used.

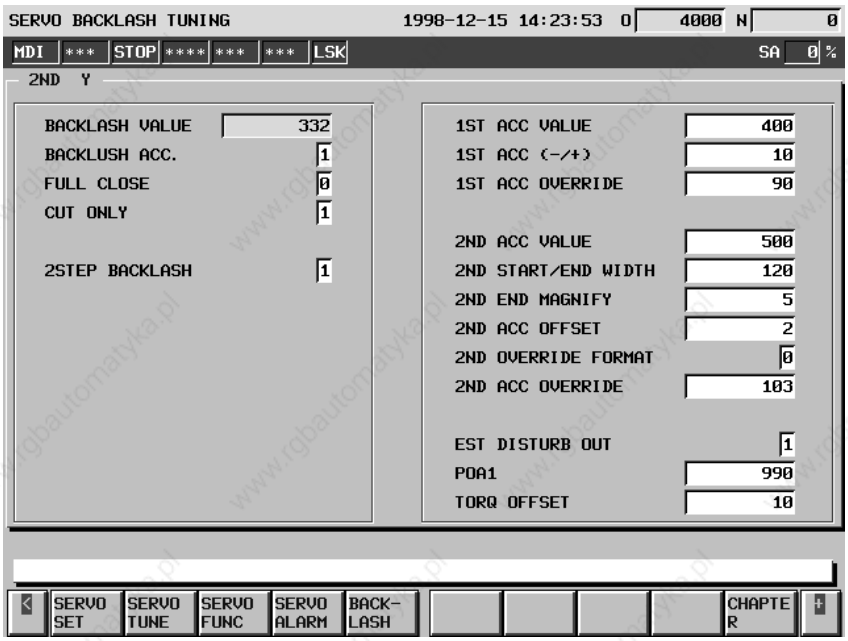
(1) If 2–step backlash acceleration is not used



BACKLASH VALUE	: No. 1851
BACKLASH ACC.	: No. 1808#5
FULL CLOSE	: No. 1884#0
CUT ONLY	: No. 1953#6 0: Backlash acceleration is always available. 1: Backlash acceleration is available only for cutting feed.
2STEP BACKLASH	: No. 1957#6
ACC TIME CONST	: No. 1860
ACC (–/+)	: No. 1987
ACC TIME	: No. 1964
ACC STOP	: No. 1953#7
ACC STOP TIMING	: No. 1975

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(2) If 2–step backlash acceleration is used

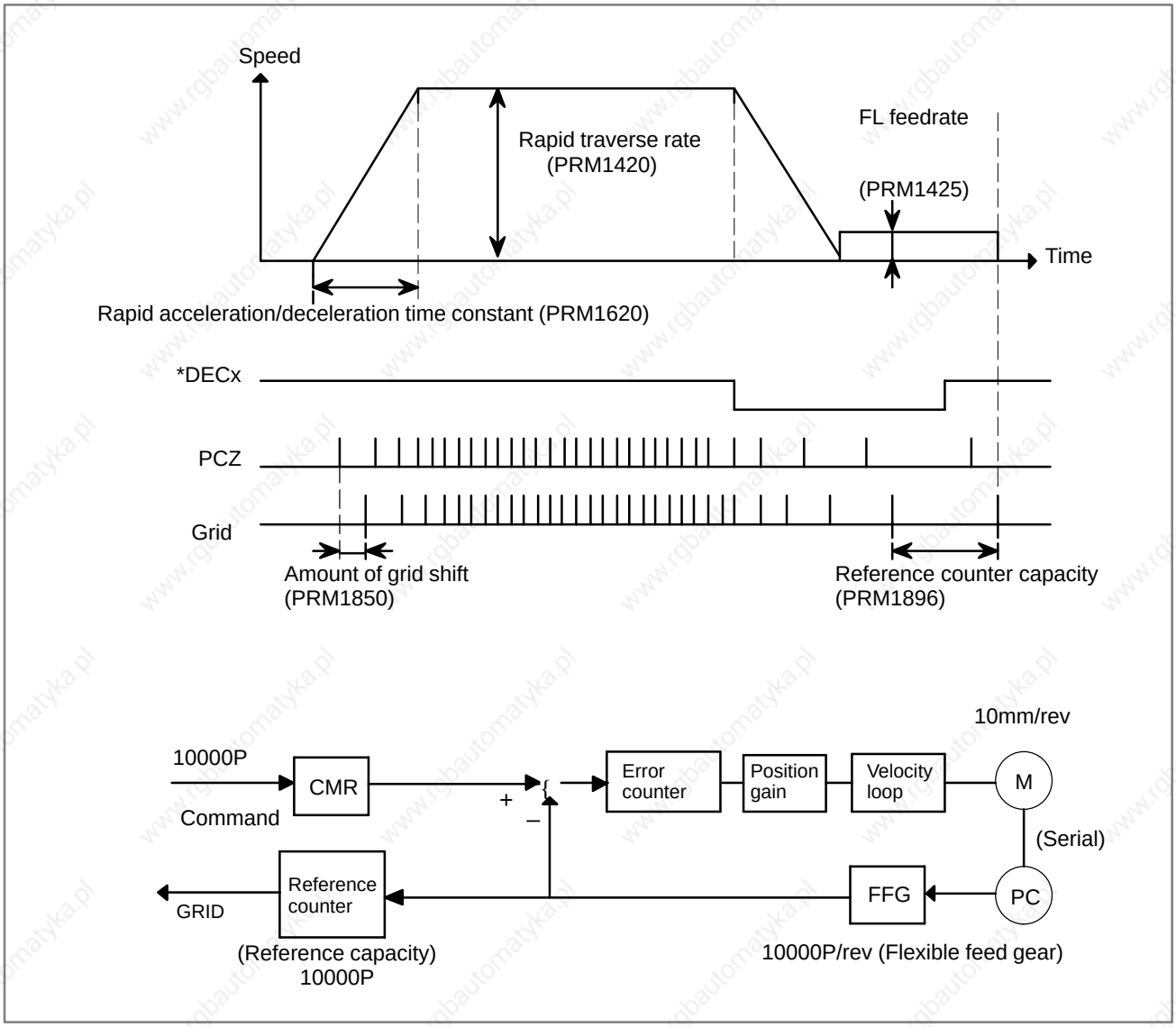


BACKLASH VALUE	: No. 1851
BACKLASH ACC.	: No. 1808#5
FULL CLOSE	: No. 1884#0
CUT ONLY	: No. 1953#6 0: Backlash acceleration is always available. 1: Backlash acceleration is available only for cutting feed.
2STEP BACKLASH	: No. 1957#6
1ST ACC VALUE	: No. 1860
1ST ACC (–/+)	: No. 1987
1ST ACC OVERRIDE	: No. 1760
2ND ACC VALUE	: No. 1724
2ND START/END WIDTH	: No. 1975
2ND END MAGNIFY	: No. 1982
2ND ACC OFFSET	: No. 1790
2ND OVERRIDE FORMAT	: No. 1960#2
2ND ACC OVERRIDE	: No. 1725
EST DISTURB OUT	: No. 1957#5
POA1	: No. 1859
TORQ OFFSET	: No. 1980

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5.4 REFERENCE POSITION RETURN ADJUSTMENT (BASED ON DOGS)

5.4.1 Overview



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[Related parameters]

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1007	DOG							

#1(DOG) 0 : The reference position return method used is an ordinary one (dog).

1 : Reference position setting with no dog is used.

PRM	1896	Axial reference counter capacity [P]

This parameter is set with the number of feedback pulses per motor rotation or that number divided by an integer.

PRM	1850	Amount of axial grid shift [P]

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1815			APC	APZ			OPT	

#5(APC) 0 : An absolute pulse coder is not used as the position detector.

1 : An absolute pulse coder is used as the position detector.

#4(APZ) Indicates whether the zero point of the absolute pulse coder has been set up.

0 : The zero point of the absolute pulse coder has not been set up.

1 : The zero point of the absolute pulse coder has been set up.
(The parameter is set to 1 automatically when the zero point of the absolute pulse coder is set up.)
When the serial pulse coder is in use, if you want to set the APZ parameter to 1 manually (without making a reference position return), do so after making at least one turn of the motor and switching the power off and on again with battery backup activated.

#1(OPT) 0 : The pulse coder incorporated in the motor is used for position detection.

1 : A separate pulse coder and linear scale are used for position detection.

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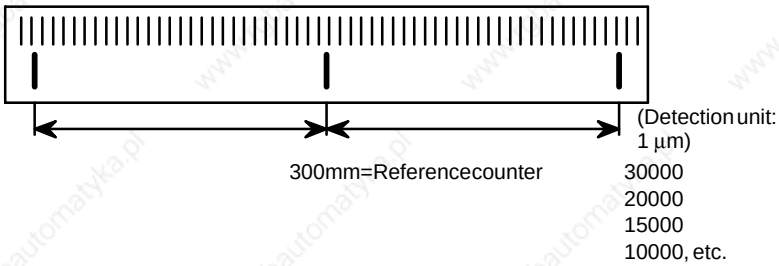
[Separate pulse coder/linear scale combination]

PRM	1896	Axial reference counter capacity [P]

Usually, this parameter is set with the number of feedback pulses per motor rotation.

* If the linear scale has more than one reference mark, a value obtained by dividing the distance between the reference marks by an integer may be set as the reference counter capacity.

(Example)



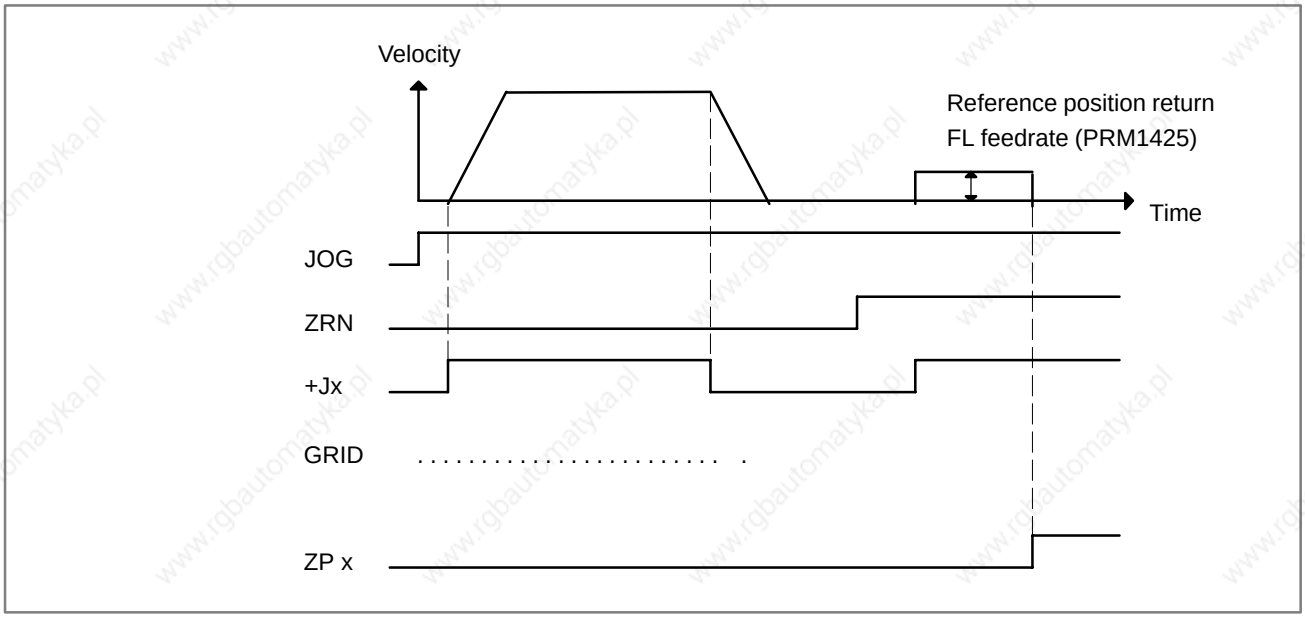
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5.5 SETTING THE REFERENCE POSITION WITHOUT DOGS

Even if a movable part of the machine is not equipped with a reference position return dog or deceleration limit switch, this function enables making a reference position return to a position set up by the machine tool builder.

If the machine has an absolute position detector, a reference position, once set up, is retained even after the power is switched off. This function can be used, if the absolute position detector is replaced or if the absolute position is lost.

5.5.1 Overview



5.5.2 Operating Procedure

(1) Set the movable axis near the reference position manually.

(2) Select the reference position return mode (or switch).

(3) Pressing the feed axis direction selection signal “+” or “–” button sets the axis at the next grid position, which is then set as the reference position.

* Once the reference position is set up, setting the ZRN signal to 1, then supplying the axis direction signal manually makes a reference position return.

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5.5.3 Related Parameters

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1007	DOG							

#1(DOG) 0 : The reference position return method used is an ordinary one (with dogs).

1 : Reference position setting with no dog is used.

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	1006			ZMI					

#5(ZMI) 0 : The initial direction for a reference position return and backlash is positive.

1 : The initial direction for a reference position return and backlash is negative.

* Once the ZRN signal is set to 1, the direction set up with this parameter is valid as the manual feed direction regardless of the direction selection signal.

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6 AC SPINDLES

This chapter briefly describes the serial interface/analog interface spindle amplifiers. It also explains the related parameters.

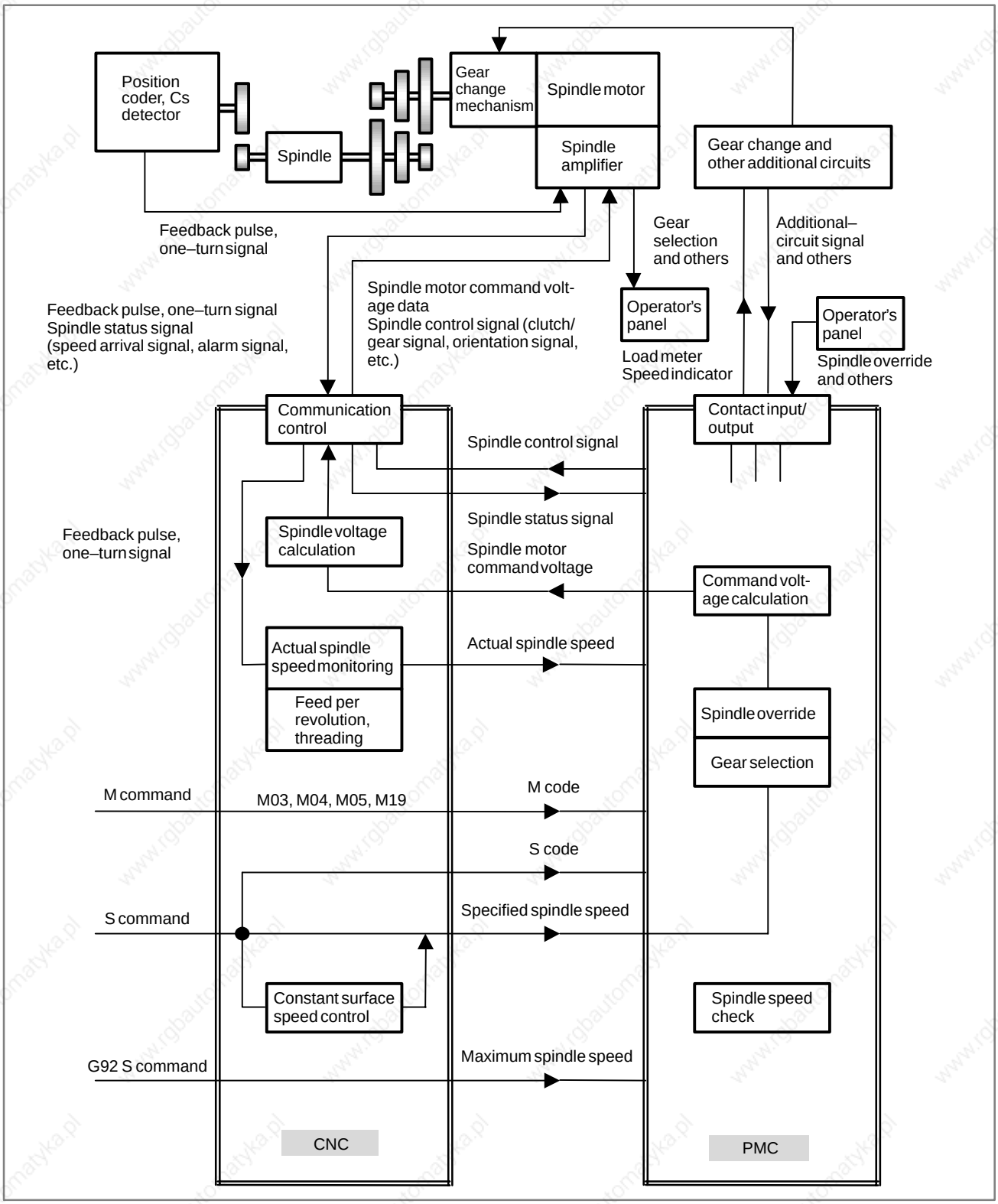
6.1 SERIAL INTERFACE AC SPINDLE 345
6.2 ANALOG INTERFACE AC SPINDLE 358

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6.1 SERIAL INTERFACE AC SPINDLE

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6.1.1 Spindle Control Overview



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Conversion from the specified spindle speed (or S code), which is a command for specifying the rotation speed of the spindle, to the spindle motor command voltage signal, which is an actual command for specifying the rotation speed of the motor, is performed totally in the PMC. The CNC controls the specified voltage using the spindle motor command voltage signal regardless of the specified spindle speed (or S code).

The PMC performs conversion by taking the following into account:

(1) Spindle maximum/minimum rotation speed clamp
(2) Gear selection
(3) Spindle override
(4) Special control modes such as constant surface speed control
(5) Spindle normal/reverse rotation and stop commands
(6) Spindle orientation and other special commands

6.1.2 Spindle Screens

6.1.2.1 Parameters

	#7	#6	#5	#4	#3	#2	#1	#0
00015							SPS	

[Data type] Bit
Parameter entry
SPS: Specifies whether to display the spindle screens.
0: To display
1: Not to display

	#7	#6	#5	#4	#3	#2	#1	#0
05820	SVP							

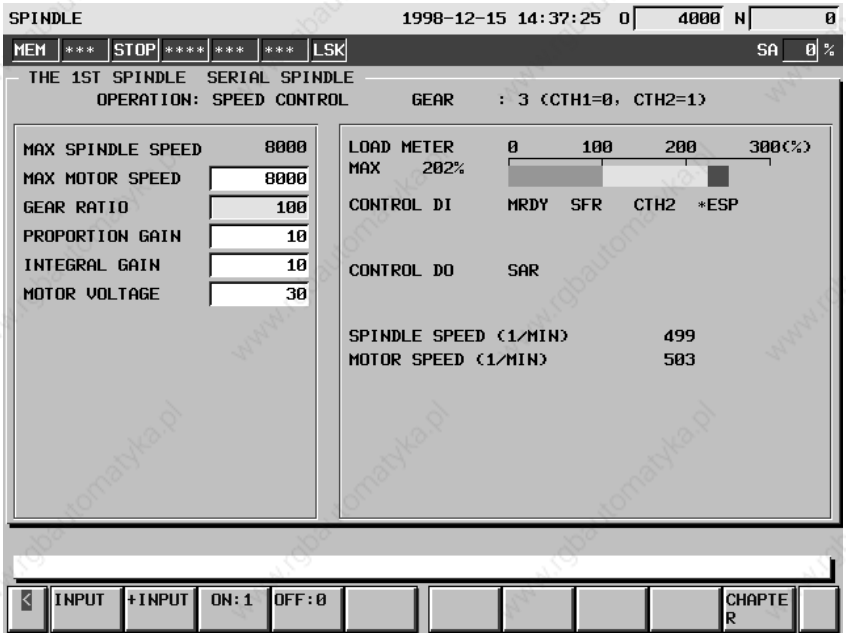
[Data type] Bit
Parameter entry
SVP: Specifies which of the following is to be used in synchronous error display for rigid tapping, spindle synchronous control, and other types of control.
0: A monitored value is displayed.
1: A held peak value is displayed.

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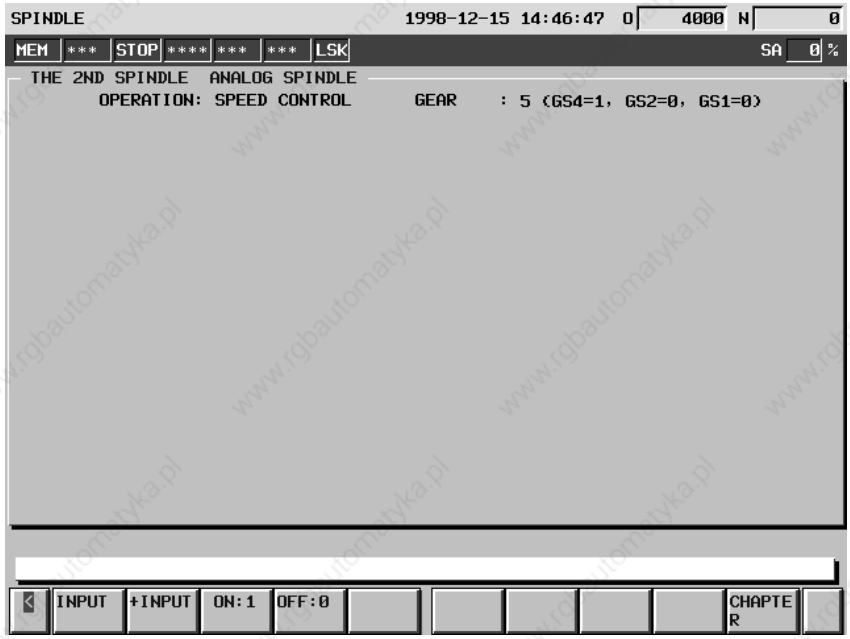
6.1.2.2 Spindle screens

A spindle screen is a collection of parameters needed to set up a spindle. It may also display monitored data. The analog spindle screen, however, does not display parameters or monitored data.

(1) Serial spindle



(2) Analog spindle



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Items common to both serial and analog spindles

SPINDLE: Indicates the type of a motor each spindle uses.

Serial/analogspindle	:	Serial/analog spindle: Indicates a serial or analog spindle.
Mainmotor/submotor	:	Indicates the motor type (main or sub) that has been selected, if the serial spindle is provided with a two–spindle changeoverfunction.
High–/low–speedwinding	:	Indicates the winding type (high– or low–speed) that has been selected, if the motor for the serial spindle is provided with an output changeover function.

OPERATION: Indicates the status of the spindle.

Speed control	:	Carried out according to the RIxx DI signal.
Rigid tap		
Spindlepositioning		
Cs contouring	:	Serial spindle only
Synchronous	:	Serial spindle only
Orientation	:	Serial spindle only

GEAR: Indicates the state of the gear selection signal.

Serial Spindle	:	Indicates the state of CTH1s and CTH2s. First to fourth stages.
Analog Spindle	:	Indicates the state of GR1s, GR2s, and GR4s. First to eight stages.

Parameters and monitored spindle data (for serial spindle only)

The parameters that can be displayed and updated vary with the items, such as operation, main motor/submotor, high–/low–speed winding, and gear selection. The monitored spindle data varies with the operation mode and motor type.

• Items common to all operation modes

			α series	α C series
MAX MOTOR SPEED	Main motor		No. 3020	←
	Submotor		No. 3196	—
GEAR RATIO	Main motor	First stage	No. 3056	←
		Second stage	No. 3057	←
		Third stage	No. 3058	←
		Fourth stage	No. 3059	←
	Submotor	First and second stages	No. 3216	—
		Third and fourth stages	No. 3217	—

LOAD METER		
CONTROL DI CONTROL DO	:	Indicates up to 15 ON signals from the following list.

Control DI signals

MRDY	ORCM	SFR	SRV	CTH1	CTH2	TLMH	TLML	RCH	RSL
INTG	SOCN	MCFN	SPSL	*ESP	ARST	RCHHG	MFNHG	INCMD	OVR
DEFMD	NRRO	ROTA	INDX	SORSL	MPOF	SLV	MORCM		

Control DO signals

ORAR	TLM	LDT2	LDT1	SAR	SDT	SST	ALM	MOAR2	MOAR1
POAR2	SLVS	RCFN	RCHP	CFIN	CHP	SOREN	MSOVR	INCST	PC1DT

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● Speed control

			α series	α C series
PROPORTION GAIN	Main motor	First and second stages	No. 4040	←
		Third and fourth states	No. 4041	←
	Submotor	First and second stages	No. 4206	—
		Third and fourth states	No. 4207	—
INTEGRAL GAIN	Main motor	First and second stages	No. 4048	←
		Third and fourth states	No. 4049	←
	Submotor		No. 4212	—
MOTOR VOLTAGE	Main motor	High–speed winding	No. 4083	←
		Low–speed winding	No. 4136	—
	Submotor	High–speed winding	No. 4236	—
		Low–speed winding	No. 4284	—

MAX SPINDLE SPEED	: Indicates gear ratio × maximum rotation speed/100.
SPINDLE SPEED	
MOTOR SPEED	

● Rigid tap

			α series	α C series
Loop gain	Main motor	First stage	No. 4065	←
		Second stage	No. 4066	←
		Third stage	No. 4067	←
		Fourth stage	No. 4068	←
	Submotor	First and second stages	No. 4221	—
		Third and fourth stages	No. 4222	—
Proportion gain	Main motor	First and second stages	No. 4044	←
		Third and fourth stages	No. 4045	←
	Submotor	First and second stages	No. 4210	—
		Third and fourth stages	No. 4211	—
Integral gain	Main motor	First and second stages	No. 4052	←
		Third and fourth stages	No. 4053	←
	Submotor		No. 4214	—
Motor voltage	Main motor	High–speed winding	No. 4085	←
		Low–speed winding	No. 4137	—
	Submotor	High–speed winding	No. 4238	—
		Low–speed winding	No. 4285	—
ZRN gain	Main motor		No. 4091	←
	Submotor		No. 4239	—
ZRN velocity			No. 4074	—
Ref. point shift	Main motor		No. 4073	←
	Submotor		No. 4223	—
Delay time			No. 4099	No. 4097

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Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Loop gain	
Spindle POS err	
Tap axis POS err	
Synchronous error	: Error related to synchronization between the tap axis and spindle. Either the value being monitored or the held peak value can be selected, using the SVP parameter (bit 7 of parameter No. 5820).

• Spindle positioning

			α series	α C series
Loop gain	Main motor	First stage	No. 3065	←
		Second stage	No. 3066	←
		Third stage	No. 3067	←
		Fourth stage	No. 3068	←
	Submotor	First and second stages	No. 3221	—
		Third and fourth stages	No. 3222	—
Proportion gain	Main motor		No. 3044	←
			No. 3045	←
	Submotor	First and second stages	No. 3210	—
		Third and fourth stages	No. 3211	—
Integral gain	Main motor	First and second stages	No. 3052	←
		Third and fourth stages	No. 3053	←
	Submotor		No. 3214	—
Motor voltage	Main motor	High–speed winding	No. 3085	←
		Low–speed winding	No. 3137	—
	Submotor	High–speed winding	No. 3238	—
		Low–speed winding	No. 3285	—
ZRN gain	Main motor		No. 3091	←
	Submotor		No. 3239	—
ZRN velocity			No. 3074	—
Ref. point shift	Main motor		No. 3073	←
	Submotor		No. 3223	—
Delay time			No. 3099	No. 3097

Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Loop gain	
Spindle POS err	

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● Cs contouring

		α series	α C series
Max Cs axis speed		No. 3021	—
Position gain	First stage	No. 3069	—
	Second stage	No. 3070	—
	Third stage	No. 3071	—
	Fourth stage	No. 3072	—
Proportion gain	First and second stages	No. 3046	—
	Third and fourth stages	No. 3047	—
Integral gain	First and second stages	No. 3054	—
	Third and fourth stages	No. 3055	—
Acc. FB gain		No. 3094	—
Spdl velo. FB gain		No. 3097	—
Motor voltage		No. 3086	—
ZRN gain		No. 3092	—
ZRN velocity		No. 3074	—
Ref. point shift		No. 3135	—
Delay time		No. 3099	—

Actual feedrate	: Feedrate specified for the Cs axis
Motor speed	
Loop gain	
Spindle. POS err	

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● Synchronous

			α series	α C series
Loop gain	Main motor	First stage	No. 3065	←
		Second stage	No. 3066	←
		Third stage	No. 3067	←
		Fourth stage	No. 3068	←
	Submotor	First and second stages	No. 3221	
		Third and fourth stages	No. 3222	
Proportion gain	Main motor	First and second stages	No. 3044	←
		Third and fourth stages	No. 3045	←
	Submotor	First and second stages	No. 3210	
		Third and fourth stages	No. 3211	
Integral gain	Main motor	First and second stages	No. 3052	←
		Third and fourth stages	No. 3053	←
	Submotor		No. 3214	
Motor voltage	Main motor	High–speed winding	No. 3085	←
		Low–speed winding	No. 3137	←
	Submotor	High–speed winding	No. 3238	
		Low–speed winding	No. 3285	
Acc/Dec constant			No. 3032	←
Ref. point shift	Main motor		No. 3034	←
	Submotor		No. 3375	

Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Loop gain	
SP1 POS error	: Position error for spindle 1 in pair with the displayed spindle
SP2 POS error	: Position error for spindle 2 in pair with the displayed spindle
Synchronous error	: Either the value being monitored or the held peak value can be selected, using the SVP parameter (bit 7 of parameter No. 5820).

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● Orientation

(1) α series/High speed ORNT = 0

High speed ORNT	Main motor Submotor		No. 3018#6 No. 3194#6
Loop gain	Main motor	First stage Second stage Third stage Fourth stage	No. 3060 No. 3061 No. 3062 No. 3063
	Submotor	First and second stages Third and fourth stages	No. 3218 No. 3219
Proportion gain	Main motor	First and second stages Third and fourth stages	No. 3042 No. 3043
	Submotor	First and second stages Third and fourth stages	No. 3208 No. 3209
Integral gain	Main motor	First and second stages Third and fourth stages	No. 3050 No. 3051
	Submotor		No. 3213
Motor voltage	Main motor Submotor		No. 3084 No. 3237
Motor speed limit	Main motor Submotor		No. 3076 No. 3227
ORAR gain	Main motor Submotor		No. 3064 No. 3220
Ref. point shift	Main motor Submotor		No. 3077 No. 3228

Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Spindle POS err	

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(2) α series/High speed ORNT = 1

High speed ORNT	Main motor Submotor		No. 3018#6 No. 3194#6
Loop gain	Main motor	First stage Second stage Third stage Fourth stage	No. 3060 No. 3061 No. 3062 No. 3063
	Submotor	First and second stages Third and fourth stages	No. 3218 No. 3219
Proportion gain	Main motor	First and second stages Third and fourth stages	No. 3042 No. 3043
	Submotor	First and second stages Third and fourth stages	No. 3208 No. 3209
Integral gain	Main motor	First and second stages Third and fourth stages	No. 3050 No. 3051
	Submotor		No. 3213
Motor voltage	Main motor Submotor		No. 3084 No. 3237
Dec. constant	Main motor	First stage Second stage Third stage Fourth stage	No. 3320 No. 3321 No. 3322 No. 3323
	Submotor	First and second stages Third and fourth stages	No. 3324 No. 3325
Ref. point shift	Main motor Submotor		No. 3077 No. 3228

Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Spindle POS err	

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(3) αC series

Loop gain	First stage Second stage Third stage Fourth stage	No. 3060 No. 3061 No. 3062 No. 3063
Proportion gain	First and second stages Third and fourth stages	No. 3042 No. 3043
Integral gain	First and second stages Third and fourth stages	No. 3050 No. 3051
Motor voltage		No. 3084
Dec. constant	First stage Second stage Third stage Fourth stage	No. 3092 No. 3093 No. 3094 No. 3095
Motor speed limit		No. 3076
Ref. point shift		No. 3077

Max Spindle speed	: Indicates gear ratio × maximum rotation speed/100.
Spindle speed	
Motor speed	
Spindle POS err	

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6.1.3 Automatic Setting of Standard Parameters

The standard motor parameters for each model can be set up automatically.

* Because the way each motor is controlled varies with the specification determined by the machine tool builder, this function sets a standard (initial) value for any parameter specified by the machine tool builder. Therefore, automatic operation requires that the parameters be set up correctly according to the parameter list (No. 3000 to No. 3393).

1 Switch the power on with the machine at an emergency stop.

2 Reset the PLD parameter (bit 0 of parameter 5607) to 0.

	#7	#6	#5	#4	#3	#2	#1	#0
5607								PLD

0#(PLD) Specifies whether to perform automatic setting for the serial interface spindle parameters.

1 : Not to perform automatic setting.
0 : To perform automatic setting.

3 Specify the motor model.

3133	Motor model code

Code	Motor model	Amplifier
100	α0.5 (3000/8000min^{-1})	SPM–2.2
101	α1 (3000/8000min^{-1})	SPM–2.2
102	α1.5 (1500/8000min^{-1})	SPM–5.5
103	α2 (1500/8000min^{-1})	SPM–5.5
104	α2/1500 (3000/1500min^{-1})	SPM–5.5
105	α3 (1500/8000min^{-1})	SPM–5.5
106	α6 (1500/8000min^{-1})	SPM–11
107	α8 (1500/6000min^{-1})	SPM–11
108	α12 (1500/6000min^{-1})	SPM–15
109	α15 (1500/6000min^{-1})	SPM–22
110	α18 (1500/6000min^{-1})	SPM–22
111	α22 (1500/6000min^{-1})	SPM–26
112	αP8 (750/6000min^{-1})	SPM–11
113	αP12 (750/6000min^{-1})	SPM–11
114	αP15 (750/6000min^{-1})	SPM–15
115	αP18 (750/6000min^{-1})	SPM–15
116	αP22 (750/6000min^{-1})	SPM–22
117	αP30 (575/4500min^{-1})	SPM–22

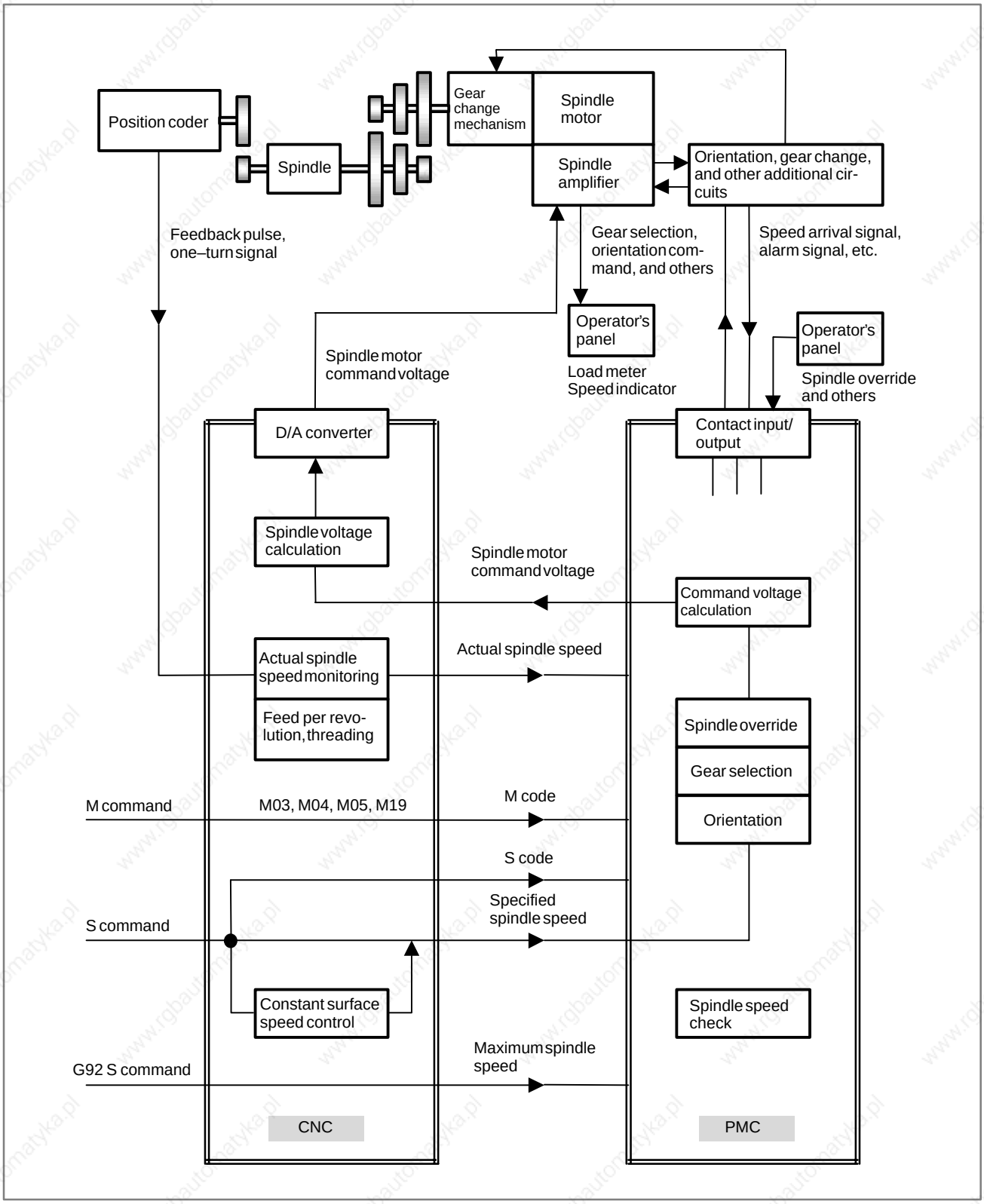
4 Switch the power off and on again.
The parameters (No. 3000 to No. 3393) are loaded, and the PLD parameter (bit 0 of parameter No. 5607) is set to 1.

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6.2 ANALOG INTERFACE AC SPINDLE

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6.2.1 Spindle Control Overview



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Conversion from the specified spindle speed (or S code), which is a command for specifying the rotation speed of the spindle, to the spindle motor command voltage signal, which is an actual command for specifying the rotation speed of the motor, is performed totally in the PMC. The CNC controls the specified voltage using the spindle motor command voltage signal regardless of the specified spindle speed (or S code).

The PMC performs conversion by taking the following into account:

(1) Spindle maximum/minimum rotation speed clamp
(2) Gear selection
(3) Spindle override
(4) Special control modes such as constant surface speed control
(5) Spindle normal/reverse rotation and stop commands
(6) Spindle orientation and other special commands

6.2.2 S Analog Voltage (D/A Converter) Adjustments

For the analog spindle, it is necessary to adjust the offset voltage and gain of the D/A converter.

(1) D/A converter offset adjustment
Offset voltage adjustment is needed if the spindle creeps (rotates at a low speed) even when the specified spindle speed is 0 min^{-1}.
A symptom listed below may occur if the offset voltage is poorly adjusted.
1) Specifying 0 rpm as the spindle speed cannot keep the spindle from creeping.
2) Specifying a very slow speed causes the spindle to rotate in the reverse direction.
3) There is a mismatch between the specified spindle speed and actual spindle speed; the amount of speed mismatch does not change regardless of whether the specified speed is low or high.

[Adjustment procedure] Follow the steps below.

1) Reset parameter number 5613 to 0 (standard value).
2) Specify the spindle speed that corresponds to a spindle speed analog output of 0.
3) Measure the output voltage.
4) Set the parameter (No. 5613) to the following value:

$$\text{Value} = \frac{-8191 \times \text{Voltage measurement (V)}}{12.5}$$

5) Specify the spindle speed that corresponds to a spindle speed analog output of 0 again, and make sure that the output voltage is 0 V.

(2) D/A converter gain adjustment
Before gain adjustment, offset voltage adjustment should be completed. Gain adjustment must be performed if there is a mismatch between the specified spindle speed and actual spindle speed. If this adjustment has not been performed correctly, the following symptom occurs.

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1) A mismatch between the specified spindle speed and actual spindle speed occurs; the amount of speed mismatch is small when the specified spindle speed is low, but becomes larger as the specified spindle speed increases.

[Adjustment procedure] Follow the steps below.

1) Set parameter number 5614 to 800 (standard value).
2) Specify the spindle speed that corresponds to a maximum spindle speed analog output of 10 V.
3) Measure the output voltage.
4) Set the parameter (No. 5614) to the following value:
5) Specify the spindle speed that corresponds to the maximum spindle speed analog output again, and make sure that the output voltage is 10 V.

$$\text{Value} = \frac{10\ (\text{V})}{\text{Voltage measurement}\ (\text{V})} \times 800$$

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7.1 BOTH MANUAL AND AUTOMATIC OPERATIONS ARE IMPOSSIBLE

[Point]

(1) If both manual and automatic operations are impossible, use this procedure to determine the cause.
(2) Check whether the position display works.
(3) Check the status display on the CNC.
(4) Check the internal status, using the CNC diagnostic function.

[Cause and action]

1. If the position display (relative, absolute, and machine coordinate system) also does not work

(1) CNC status display check (see the description of the status display for details.)

a. Emergency stop condition (emergency stop signal is on.)
If the EMG display appears, it implies that the emergency stop signal is active. So, check the following signals, using the PMC diagnostic function (PMCDGM).

	#7	#6	#5	#4	#3	#2	#1	#0
X0006				*ESP				

	#7	#6	#5	#4	#3	#2	#1	#0
G0000				*ESP				

*ESP = 0 means that the emergency stop signal is active.

b. Reset condition (the reset signal is on.)
If the ”RESET” display appears, it means that a reset is active. So, check the following signals, using the PMC diagnostic function (PMCDGN).

1 The input signal from the PMC works.

	#7	#6	#5	#4	#3	#2	#1	#0
G0000	ERS	RRW						

ERS = 1 means that an external reset signal is active.
RRW = 1 means that the reset & rewind signal is active.

2 The RESET key on the MDI keypad is on.
If the signal mentioned in 1, above, is off, it is likely that the RESET key is on. Check the contacts of the key, using a multimeter. If the key is found to be defective, replace the keypad.

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c. Check the status display for mode selection.
The display of the machine operator's panel mode status appears in the upper section of the screen as shown below. If it does not appear, it implies that the corresponding mode selection signal is not being input correctly. Check the mode selection signal, using the PMC diagnostic function (PMCDGN). (See Section 1.6, "Displaying the NC State" for details.)

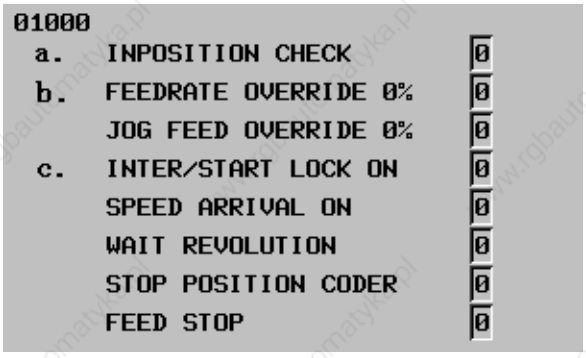
(Example displays)

JOG : Manual operation (JOG) mode
HND : Manual handle (HND) mode
MDI : Manual data input (MDI) mode
MEM : Automatic operation (memory) mode
EDIT : EDIT (memory editing) mode

<Mode selection signals>

	#7	#6	#5	#4	#3	#2	#1	#0
G003		EDT	MEM	T	D	J	H	S
	↓	↓	↓	↓	↓	↓	↓	↓
Incremental (INC) mode	0	0	0	0	0	0	0	1
Manual handle (HND) mode	0	0	0	0	0	0	1	0
Jog (JOG) mode	0	0	0	0	0	1	0	0
Manual data input (MDI) mode	0	0	0	0	1	0	0	0
DNC operation (DNC) mode	0	0	0	1	0	0	0	0
Automatic operation (memory) mode	0	0	1	0	0	0	0	0
EDIT (memory editing) mode	0	1	0	0	0	0	0	0

(2) Make a check according to CNC diagnostic function numbers 1000 and 1001.
Specifically, check those items with "1" displayed on the right.



a. In–position check (checking for positioning) is under way.
This implies that axis movement has not been completed. Check the contents of the following diagnostic number. (It becomes "1" under the following condition.)
Diagnosis 3000 position error > parameter (No. 1827) in–position check effective area

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1 Check the parameter settings with the parameter list.

1825	Individual–axis servo loop gain	(Standard value : 3000)

2 It is likely that the servo system is abnormal. Make a check by referring to the descriptions of servo alarms SV023, SV008, and SV009.

b. The override value for the manual feedrate is 0%.
Check the following signals, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G014	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G015	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

If the override value is 0%, all bits at the addresses shown above become 111.....111 or 000.....000.

c. The interlock/start lock signal is active.
Check the following signal, using the PMC diagnostic function (PMCDGN).

1 The interlock signal (*IT) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000								*IT

The interlock signal with *IT = 0 is active.

2 The individual–axis interlock signal (*ITn), servo–off signal (*SVFn), or control signal detach signal (DTCHn) is on.

	#7	#6	#5	#4	#3	#2	#1	#0	
G064	DTCH1	*SVF1		*IT1					(First axis)

The address of the nth axis is calculated as follows:
64 + (n – 1)*4
The interlock signal with *ITn, *SVFn = 0, and DTCHn = 1 is active.

3 The automatic operation all–axis interlock (*AIT) or the block start interlock signal (*BSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G001							*BSL	*AIT

The interlock signal with *AIT and *BSL = 0 is active.

4 The cutting block start interlock signal (*CSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000							*CSL	

The interlock signal with *CSL = 0 is active.

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5 Check the parameter settings for controlled–axis detaching.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMV							

RMV Specifies whether to make individual–axis controlled–axis detaching valid.

0 : Do not make valid.
1 : Make valid.

	#7	#6	#5	#4	#3	#2	#1	#0
1005	RMB							

RMB Specifies whether the settings of the individual–axis controlled–axis detach signal (DTCHn) and parameter RMV (bit 7 of No. 12) are valid.

0 : Invalid
1 : Valid

When both of these parameters are set to 1, the interlock/start lock state is set.

(3) If the index table indexing option is available, check the setting of the index table indexing axis. If the PMC sequence for index table indexing is incorrect, the servo section of the index table indexing axis goes off.

7631	Index table indexing controlled–axis number

If this parameter is 0, the fourth axis becomes the index table indexing axis.

2. If the position display “machine coordinate system” does not work

The machine lock signal (MLK) is active.

	#7	#6	#5	#4	#3	#2	#1	#0	
G004	MLK								
G065					MLK1				(First axis)

The address for the nth axis is calculated as follows:
65 + (n – 1)*4

MLK MLK All–axis machine lock

MLKn MLKn Individual–axis machine lock

Each machine lock signal is active when it is 1.

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7.2 MANUAL (JOG) OPERATION IS IMPOSSIBLE

[Point]

(1) Check whether the position display works.
(2) Check the status display on the CNC.
(3) Check the internal status, using the CNC diagnostic function.

[Cause and action]

1. If the position display (relative, absolute, and machine coordinate system) also does not work

(1) Check the status display for mode selection. If "JOG" appears, the mode selection is normal.
If not, it implies that the following mode selection signal is not selected correctly. Check the mode selection signal, using the PMC diagnostic function (PMCDGN).

<Mode selection signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G003						J		

(2) The feed axis direction selection signal is not active.
Check the signal, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0	
G065							–J1	+J1	(First axis)

The address for the nth axis is calculated as follows:
65 + (n – 1)*4

The feed axis direction selection signal is active when it is 1.

Example) In the normal state, pressing the "+X" button on the operator's panel causes the "+J" signal to be displayed as 1.

Note) This signal becomes effective at its rising edge. If the signal is already active when JOG mode is selected, axis movement does not occur. Turn the signal off and then on again to enable axis movement.

(3) Make a check according to CNC diagnostic function numbers 1000 and 1001.
Specifically, check those items with "1" displayed on the right.

```
01000
 a.   INPOSITION CHECK              0
 b.   FEEDRATE OVERRIDE 0%          0
      JOG FEED OVERRIDE 0%          0
 c.   INTER/START LOCK ON           0
      SPEED ARRIVAL ON              0
      WAIT REVOLUTION               0
      STOP POSITION CODER           0
      FEED STOP                     0
```


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a. In–position check (checking for positioning) is under way.
This implies that axis movement has not been completed. Check the contents of the following diagnostic number. (It becomes “1” under the following condition.)
Diagnosis 3000 (position error) > parameter (No. 1827)
(in–position check effective area)

1 Check the parameter settings against the parameter list.

1825	Individual–axis servo loop gain	(Standard value : 3000)

2 It is likely that the servo system is abnormal. Make a check by referring to the descriptions of servo alarms SV023, SV008, and SV009.

b. The override value for the manual feedrate is 0%.
Check the following signals, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G014	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G015	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

If the override value is 0%, all bits at the addresses shown above become 111.....111 or 000.....000.

c. The interlock/start lock signal is active.
Check the following signal, using the PMC diagnostic function (PMCDGN).

1 The interlock signal (*IT) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000								*IT

The interlock signal with *IT = 0 is active.

2 The individual–axis interlock signal (*ITn), servo–off signal (*SVFn), or control signal detach signal (DTCHn) is on.

	#7	#6	#5	#4	#3	#2	#1	#0	
G064	DTCH1	*SVF1		*IT1					(First axis)

The address for the nth axis is calculated as follows:
64 + (n – 1)*4
The interlock signal with *ITn, *SVFn = 0, and DTCHn = 1 is active.

3 The automatic operation all–axis interlock (*AIT) or the block start interlock signal (*BSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G001							*BSL	*AIT

The interlock signal with *AIT and *BSL = 0 is active.

4 The cutting block start interlock signal (*CSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000							*CSL	

The interlock signal with *CSL = 0 is active.

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(4) Check the parameter settings for controlled–axis detaching.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMV							

RMV Specifies whether to make individual–axis controlled–axis detaching valid.

0 : Do not make valid.
1 : Make valid.

	#7	#6	#5	#4	#3	#2	#1	#0
1005	RMB							

RMB Specifies whether the settings of the individual–axis controlled–axis detach signal (DTCHn) and parameter RMV (bit 7 of No. 12) are valid.

0 : Invalid
1 : Valid

(5) If the index table indexing option is supported, check the setting of the index table indexing axis. If the PMC sequence for index table indexing is incorrect, the servo section of the index table indexing axis turns off.

7631	Index table indexing controlled–axis number

If this parameter is 0, the fourth axis becomes the index table indexing axis.

(6) The manual feed feedrate (parameter) is incorrect.

1423	Individual–axis jog feed feedrate

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7.3 HANDLE FEED (MPG) OPERATION IS IMPOSSIBLE

[Point]

(1) Does the other type of manual operation (JOG) work?
(2) Check the CNC status display.

[Cause and action]

1. If the other type of manual operation (JOG) does not work

Make the same check as that described in Section 7.1, “Both Manual and Automatic Operations are Impossible” or 7.2, “Manual (JOG) Operation is Impossible”.

2. If manual handle operation (MPG) does not work but JOG does

(1) Check the CNC status display (in the left–hand part of the screen).

If “HND” appears when manual handle mode is selected, mode selection is normal.
If not, it implies that the following mode selection signal is not being input correctly. Check the mode selection signal, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G003							H	

(2) The manual handle feed axis selection signal has not been input.

Check the signal, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G010					HS3D	HS3C	HS3B	HS3A
G011	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A

If selecting the manual handle feed axis selection switch causes the above signals to be input as listed below, the operation is normal.

Selected axis	HSnD	HSnC	HSnB	HSnA
No axis	0	0	0	0
First	0	0	0	1
Second	0	0	1	0
Third	0	0	1	1
Fourth	0	1	0	0
Fifth	0	1	0	1
Sixth	0	1	1	0
Seventh	0	1	1	1
Eighth	1	0	0	0

NOTE
In the above table, “n” stands for the number for each manual pulse generator (MPG). It represents the selection signal for up to three manual pulse generators. A 4–bit code (A to D) is used for axis selection.

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(3) The selected scaling factor for manual handle feed is incorrect.

Check the corresponding signal, using the PMC diagnostic function (PCDGN). Also check the following related parameters against the parameter list.

	#7	#6	#5	#4	#3	#2	#1	#0
G006				MP4	MP2	MP1		

Manual handle feed movement amount selection signal			Movement amount (manual handle feed/interrupt)
MP4	MP2	MP1	
0	0	0	Least input increment × 1
0	0	1	Least input increment × 10
0	1	0	Least input increment × m *1
0	1	1	Least input increment × n *2
1	0	0	Least input increment × n
1	0	1	Least input increment × n
1	1	0	Least input increment × n
1	1	1	Least input increment × n

*1 Scaling factor m is specified in parameter No. 1414.

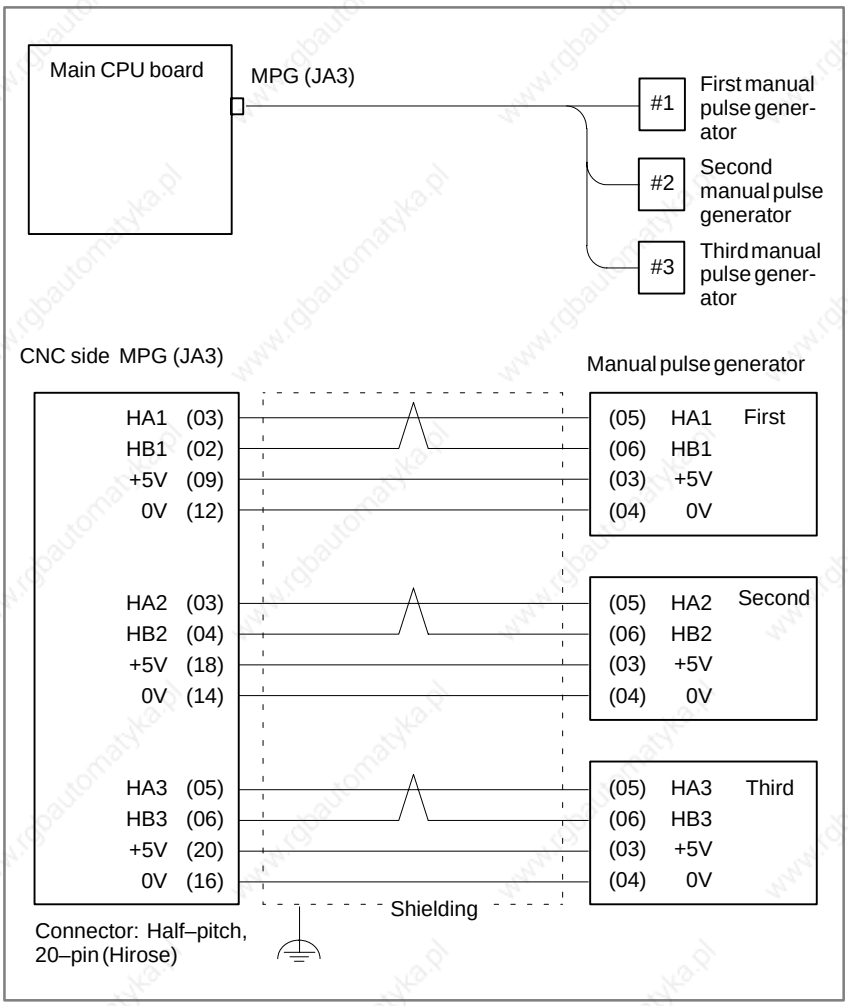
*2 Scaling factor n is specified in parameter No. 1418.

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(4) Check the manual pulse generator.

a. Defective cable (such as a broken wire)

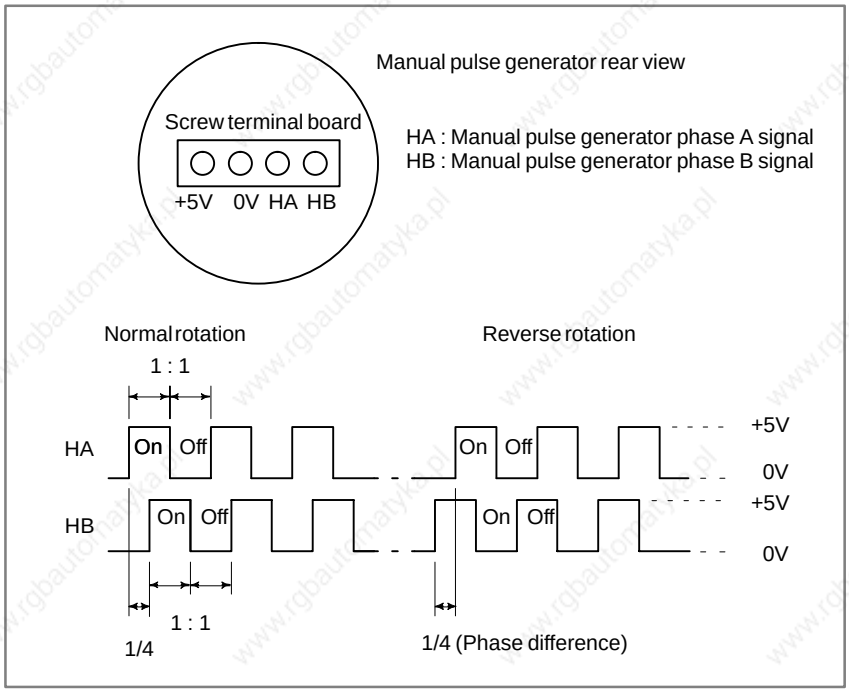
Check for broken wires and short–circuits by referencing the following diagram.



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b. Defective manual pulse generator

Rotating the manual pulse generator will cause it to generate the following signals. Check their output at the screw terminal board at the rear of the generator, using an oscilloscope. If they do not appear, also measure the +5V voltage.



Check the on–off ratio and HA/HB phase difference.

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7.4 AUTOMATIC OPERATION IS IMPOSSIBLE

[Point]

(1) Check whether manual operation is possible.
(2) Check the status of the start lamp on the machine operator's panel.
(3) Check the status display of the CNC.

[Cause and action]

If manual operation also does not work, make a check as described in Section 7.2, "Manual (JOG) Operation is Impossible".
Check the CNC status display "mode selection status" to determine whether the correct mode has been selected. Also check the "automatic operation status" to determine whether automatic operation is active, paused, or inactive.

1. If automatic operation cannot be started (the start lamp does not light)

The CNC status display on the screen will be: ****

(1) The mode selection signal is incorrect.
When the mode selection signal on the machine operator's panel is input correctly, the following display appears:
MDI: Manual data input (MDI) mode
MEM: Memory operation mode
DNC: DNC operation mode
If this display does not appear, check the mode signal, using the following PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G003			MEM	T	D			

MEM Memory operation mode

T DNC operation mode

D Manual data input (MDI) mode

(2) The automatic operation start signal is not active.
Pressing the automatic operation start button will make the signal 1, while releasing it will make the signal 0. Automatic operation starts when the signal turns from 1 to 0. Check the signal state, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G005								ST

ST Automatic operation start signal

(3) Automatic operation pause (feed hold) signal is active.
If the signal is 1 while the automatic operation pause button is not held down, the operation is normal. Check the signal state, using the PMC diagnostic function (PMCDGN).

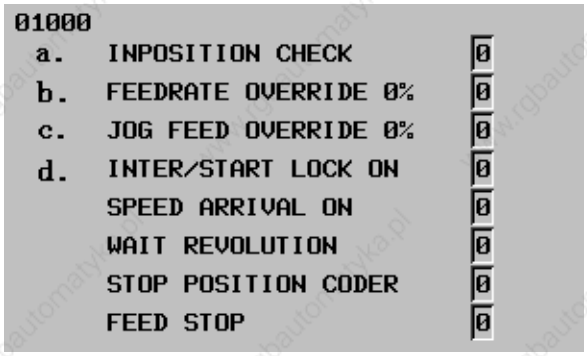
	#7	#6	#5	#4	#3	#2	#1	#0
G000			*SP					

***SP** Automatic operation pause (feed hold) signal

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2. If automatic operation is being performed (the start lamp is on)

(1) Make a check according to CNC diagnostic function numbers 1000 and 1001.
Specifically, check those items with “1” displayed on the right.



a. In–position check is being performed.
This implies that axis movement has not been completed. Check the contents of the following diagnostic number. (It becomes “1” under the following condition.)
Diagnosis 3000 position error > parameter (No. 1827) in–position check effective area

1 Check the parameter settings with the parameter list.

1825	Individual–axis servo loop gain (Standard value : 3000)

2 It is likely that the servo system is abnormal. Make a check by referring to the descriptions of servo alarms SV023, SV008, and SV009.

b. The override value for the manual feedrate is 0%.
Check the following signals, using the PMC diagnostic function (PMCDGN).

<Usual override signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G012	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0

<Second override signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G013	*AFV7	*AFV6	*AFV5	*AFV4	*AFV3	*AFV2	*AFV1	*AFV0

c. The manual feed feedrate override value is 0% (only for dry run).
If the dry run signal goes on during automatic operation, the following override values become effective for the dry run feedrate.
Check the following signals, using the PMC diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G014	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0

	#7	#6	#5	#4	#3	#2	#1	#0
G015	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

If the override value is 0%, all the bits at the addresses shown above become 111.....111 or 000.....000.

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d. The interlock/start lock signal is active.
Check the following signal, using the PMC diagnostic function (PMCDGN).

1 The interlock signal (*IT) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000								*IT

The interlock signal with *IT = 0 is active.

2 The individual–axis interlock signal (*ITn), servo–off signal (*SVFn), or control signal detach signal (DTCHn) is active.

	#7	#6	#5	#4	#3	#2	#1	#0	
G064	DTCH1	*SVF1		*IT1					(First axis)

The address for the nth axis is calculated as follows:
64 + (n – 1)*4
The interlock signal with *ITn, *SVFn = 0, and DTCHn = 1 is active.

3 The automatic operation all–axis interlock (*AIT) or the block start interlock signal (*BSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G001							*BSL	*AIT

The interlock signal with *AIT and *BSL = 0 is active.

4 The cutting block start interlock signal (*CSL) is active.

	#7	#6	#5	#4	#3	#2	#1	#0
G000							*CSL	

The interlock signal with *CSL = 0 is active.

(2) Check the parameter settings for controlled–axis detaching.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMV							

RMV Specifies whether to make individual–axis controlled–axis detaching valid.

0 : Do not make valid.
1 : Make valid.

	#7	#6	#5	#4	#3	#2	#1	#0
1005	RMB							

RMB Specifies whether the settings of the individual–axis controlled–axis detach signal (DTCHn) and parameter RMV (bit 7 of No. 12) are valid.

0 : Invalid
1 : Valid

(3) If the index table indexing option is supported, check the setting of the index table indexing axis. If the PMC sequence for index table indexing is incorrect, the servo section of the index table indexing axis goes off.

7631	Index table indexing controlled–axis number

If this parameter is 0, the fourth axis becomes the index table indexing axis.

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(4) If the only failure is in rapid traverse for positioning (G00), check the following parameter settings and signals from the PMC.

a. Rapid traverse rate setting

1420	Individual–axis rapid traverse rate

b. Settings related to the rapid traverse override signal

	#7	#6	#5	#4	#3	#2	#1	#0
G006		ROV2	ROV1					

Rapid traverse override		Override value
ROV2	ROV1	
0	0	100%
0	1	50%
1	0	Fm% *1
1	1	Fo% *2

*1 Fm is any value between 0% to 100%. It is specified in parameter No. 1412 (common to all axes).

*2 Fo is an absolute feedrate between 0 and the rapid traverse rate. It is specified in parameter No. 1421 (for individual axes).

	#7	#6	#5	#4	#3	#2	#1	#0
G040	1	*RV6B	*RV5B	*RV4B	*RV3B	*RV2B	*RV1B	*RV0B

$$\text{Override value} = \sum_{i=0}^{6} \{2^i \times Vi\} \ \%$$

where Vi = 0 if *RViB = 1, and Vi = 1 if *RViB = 0.

That is, each signal has the following weights:

*RV0B : 1% *RV4B : 16%
*RV1B : 2% *RV5B : 32%
*RV2B : 4% *RV6B : 64%
*RV3B : 8%

If all signals are 0, the override value is assumed to be 0%, similarly to when all signals are 1. If an attempt is made to specify a value greater than 100% as the override value, 100% is assumed.

The override type to use is specified with the following parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
1402								ROV

Parameter input

[Data type] Bit

ROV Specifies the override type as follows:

0 : Two input signals, ROV1 and ROV2, are used to specify the override value as FO, Fn, 50%, or 100%.

1 : Seven input signals, *RV0B to *RV6B, are used to specify the override value as any integer value between 0% and 100% (in 1% steps).

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(5) If the only failure is in cutting feed (except for G00)

a. The maximum cutting feedrate parameter is likely to have been set incorrectly.

1422	Individual–axis maximum cutting feedrate

The cutting feedrate (except for G00) is clamped at this maximum feedrate.

b. If the feedrate is specified as a feed per revolution (mm/rev)

1 The position coder is not rotating.
Check the linkage between the spindle and position coder.
Probable causes are:

- Broken timing belt
- Missing key
- Loose link
- Loose signal cable connector

2 Defective position coder

c. If thread cutting does not work

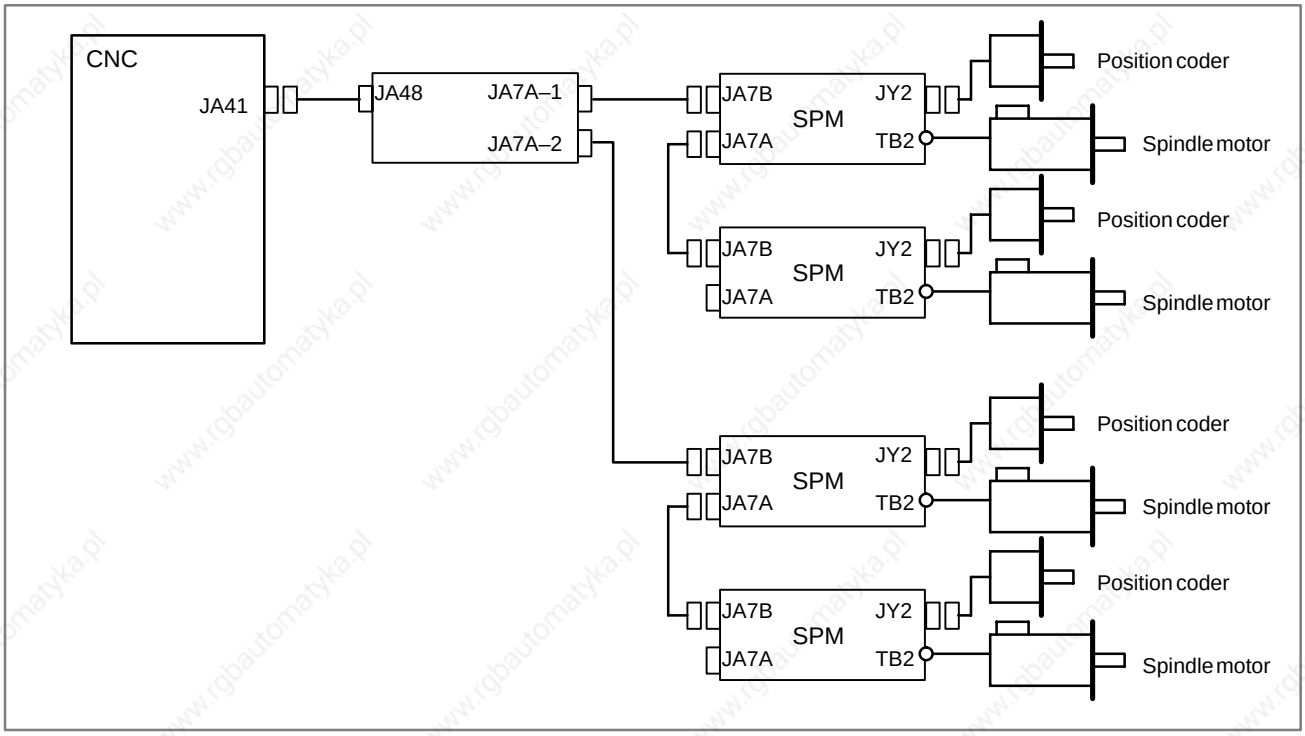
1 The position coder is not rotating
Check the linkage between the spindle and position coder.
Probable causes are:

- Broken timing belt
- Missing key
- Loose linkage
- Loose signal cable connector

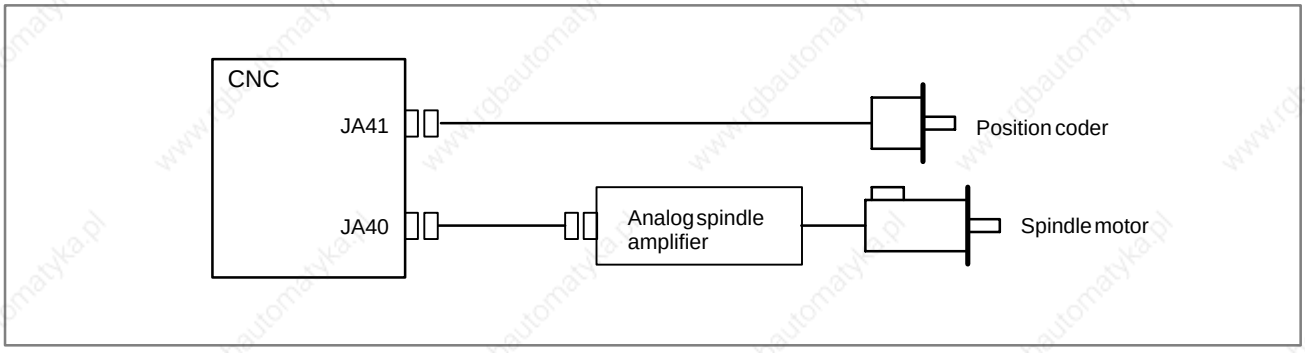
2 Defective position coder
If the machine uses a serial spindle servo, the position coder is connected to the spindle amplifier. If it uses an analog–interface amplifier, the position coder is connected to the CNC.
For details, see the following connection diagram.

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<If an α series spindle amplifier is used>



<If an analog–interface spindle amplifier is used>



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7.5 AUTOMATIC OPERATION START SIGNAL TURNED OFF

[Point]

(1) If automatic operation stops, determine the cause by applying the procedure explained below.

(2) Check the automatic operation start (cycle start) lamp on the machine operator's panel.

(3) Check the CNC diagnosis function.

[Cause and action]

(1) If the automatic operation start signal (STL) is turned off by a reset, diagnosis No. 1010 outputs data on the CNC as follows:

	#7	#6	#5	#4	#3	#2	#1	#0
1010					RST	ERS	RRW	ESP

If each item is set to 1, it has the following meaning:

a. ESP Emergency stop state

b. RRW The reset & rewind signal is on.

c. ERS The external reset signal is on.

d. RST The reset key is pressed.

Note) The following provides detailed information about items a to d, above. Check the status of the relevant signal by using the PMC (PMCDGN) diagnosis function.

a. The emergency stop signal has been input.

	#7	#6	#5	#4	#3	#2	#1	#0
X0006				*ESP				

	#7	#6	#5	#4	#3	#2	#1	#0
G0000				*ESP				

If *ESP is 0, the emergency stop signal is currently being input.

b. The reset & rewind signal has been input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0000		RRW						

If RRW is 1, the reset & rewind signal is currently being input.

Note) This signal is normally used as the confirmation signal sent from the PMC when M30 is specified at, for example, the termination of a program. Therefore, after program termination, the reset & rewind signal is input.

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c. The external reset signal has been input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0000	ERS							

If ERS is 1, the external reset signal is currently being input.

Note) This signal is normally used as the confirmation signal sent from the PMC when M02 is specified at, for example, the termination of a program. When M02 is executed, therefore, the external reset signal is input.

d. The MDI reset button has been pressed.
The RESET key on the MDI panel was pressed during automatic operation, causing automatic operation to be reset.

(2) A servo alarm was issued during automatic operation, causing automatic operation to be reset and stopped.
Check the alarm status on the message screen.

(3) Automatic operation is sometimes stopped temporarily.
The temporary stopped state may be set as a result of any of the following:

(a) A manual operation mode is selected during automatic operation.

Automatic operation	DNC operation (DNC)
	Automatic operation (MEM)
	Manual data input (MDI)
Manual operation	Jog feed (JOG)
	Handle/step feed

(b) The automatic operation stop (feed hold) signal is input.
<Automatic operation stop signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0000			*SP					

If *SP is 0, the automatic operation stop signal is currently being input.

(4) A single–block stop sometimes occurs during automatic operation.
Check the following signal:

	#7	#6	#5	#4	#3	#2	#1	#0
G004					SBK			

If SBK is 1, the single–block signal is currently being input.

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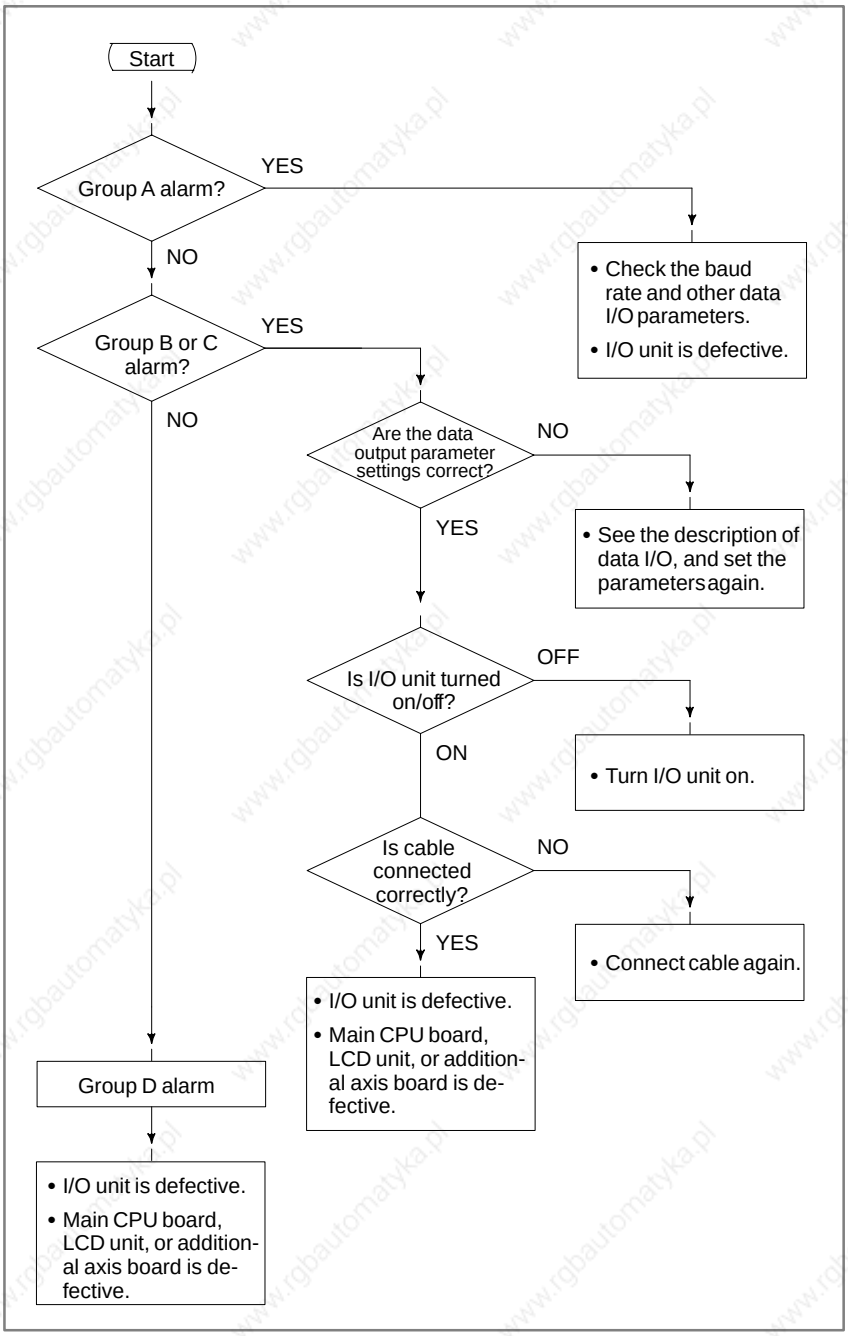
7.6 ALARMS SR820 TO SR854 (READER/PUNCH INTERFACE ALARMS)

Types of alarms

The following shows the alarms related to the reader/punch interface:

Group	Alarm type	RS–232–C channel 1	RS–232–C channel 2	RS–232–C channel 3	RS–232–C channel 4	RS–422 channel 1	RS–422 channel 2
A	DR signal OFF	SR820	SR830	SR840	SR870	SR850	SR880
B	Overrun error	SR822	SR832	SR842	SR872	SR852	SR882
C	Framing error	SR823	SR833	SR843	SR873	SR853	SR883
D	Buffer overflow	SR824	SR834	SR844	SR874	SR854	SR884

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Cause

(a) Parameters related to the reader/punch interface are not set correctly. Check the setting data and parameters listed below.

(b) The external input/output unit or host computer is defective.

(c) The main CPU board, LCD unit, or additional axis board is defective.

(d) The cable between the NC and I/O unit is defective.

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Action

(a) Parameters related to the reader/punch interface are not set correctly. Check the following items on the communication setting screen:

Setting item name	Parameter	Indication for setting item (parameter setting)
TV Check	TVC (No.0000#0)	ON (1)/OFF (0)
TV (Comment)	CTV (No.0000#1)	ON (0)/OFF (1)
In/Out Code	ISP (No.0000#2) EIA (No.0000#4)	EIA (#2=0/1, #4=1) ISO (#2=0, #4=0) ASCII (#2=1, #4=0)
EOB Code	NCR (No.0000#3)	LF CR CR (0)/LF (1)
F.G. Input F.G. Output B.G. Input B.G. Output	(No.0020) (No.0021) (No.0022) (No.0023)	RS232–C C1 (1) RS232–C C2 (2) RS232–C C3 (3) Memory Card (8) Remote Buffer (10) RS422 C1 (13) OPEN CNC 1 (15)(DNC operation interface) OPEN CNC 2 (16)(Upload/downloadinterface) RS232–C C4 (20) RS422 C2 (21)

Setting item name	Parameter	Setting
Device Type	(No.5110, 5120, 5130) (No.5140, 5150, 5160) (No.5170, 5180, 5190)	1 to 8
Stop Bit	(No.5111, 5121, 5131) (No.5141, 5151, 5161) (No.5171, 5181, 5191)	1/2
Baud Rate	(No.5112, 5122, 5132) (No.5142, 5152, 5162) (No.5172, 5182, 5192)	1 to 12 (50, 100, 110, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 19200bps)

(b) The external input/output unit or host computer is defective.

(i) Check that the settings related to communication with the external input/output unit or host computer are the same as those made for the NC (such as the baud rate and stop bit). If they do not match, correct the settings.

(ii) If there is a spare input/output unit, use it to check whether communication can be performed.

(c) The motherboard or serial communication board is defective.

(i) RS–232C channel 1 or 2 (JD5A or JD5B on the main CPU board)
The main CPU board may be defective. Replace it.

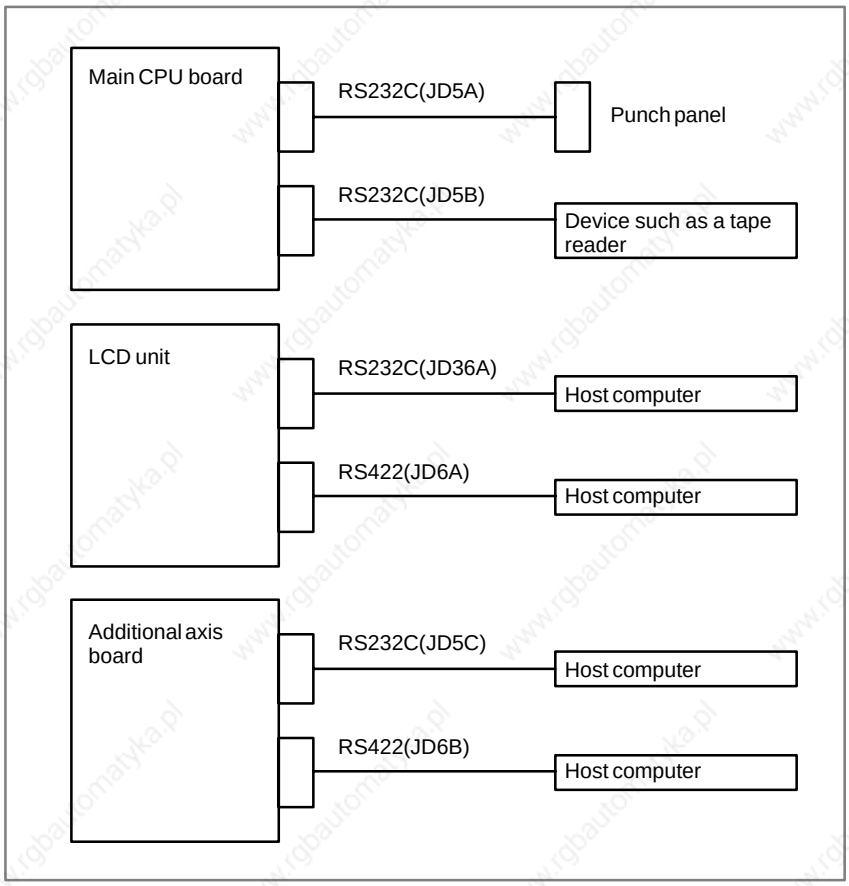
(ii) RS–232C channel 3 or RS–422 channel 1 (JD36A on the LCD unit)
The serial LCD unit may be defective. Replace it.

(iii) RS–232C channel 4 or RS–422 channel 2 (JD5C or JD6B on the additional axis board)
The additional axis board may be defective. Replace it.

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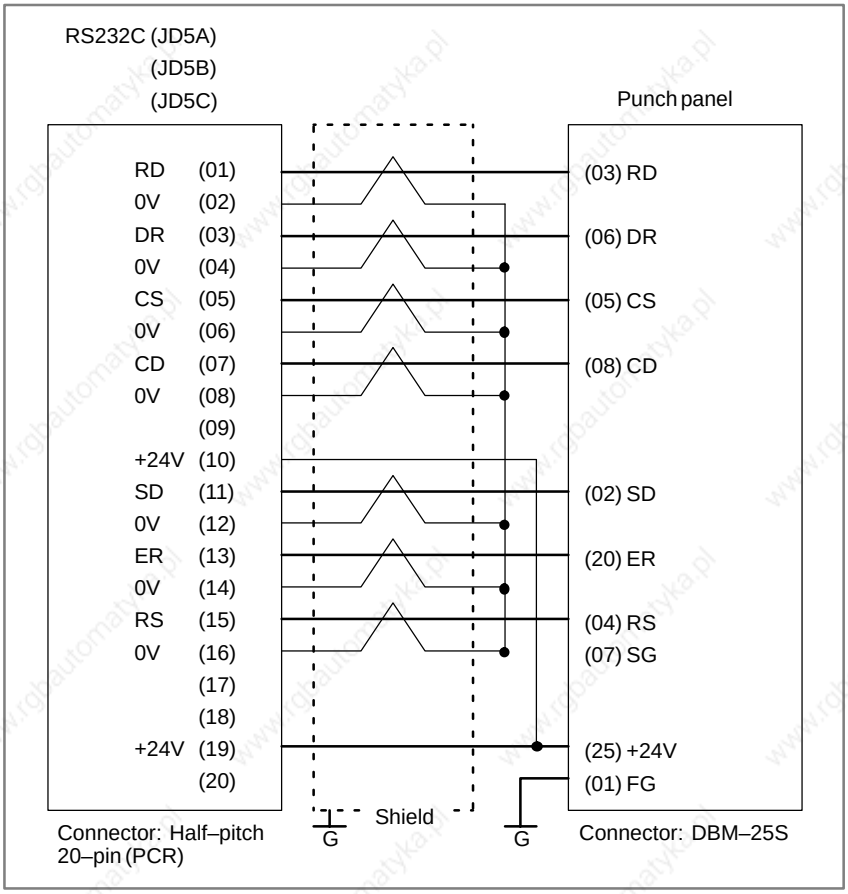
(d) The cable between the CNC and input/output unit is defective.
Check whether the cable between the CNC and input/output unit is broken and whether the cable is connected incorrectly.

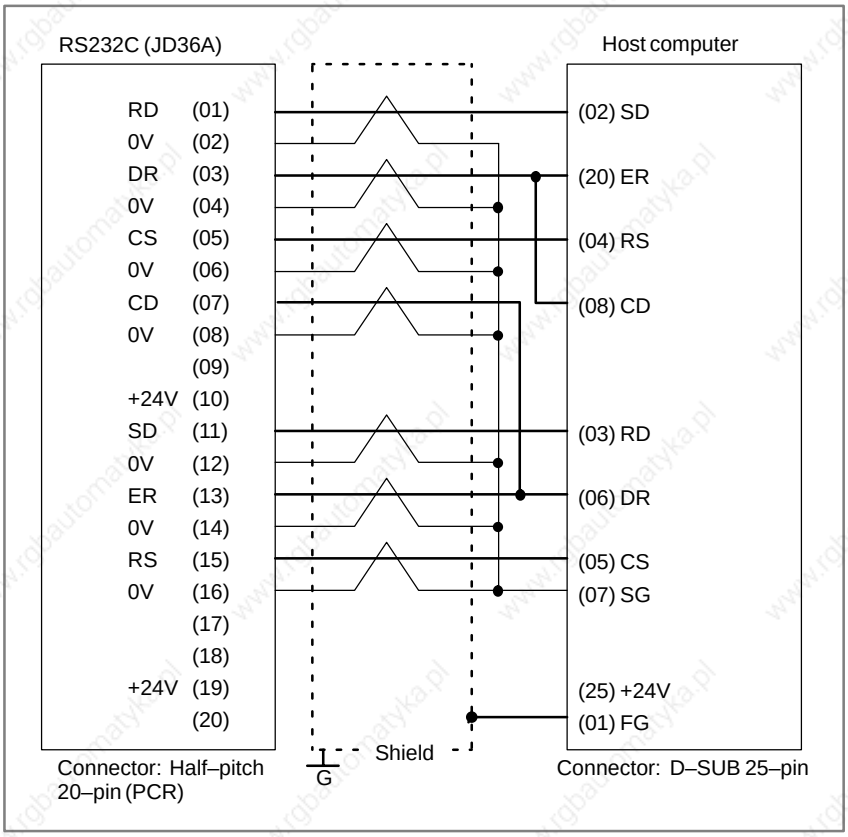
<Connection>



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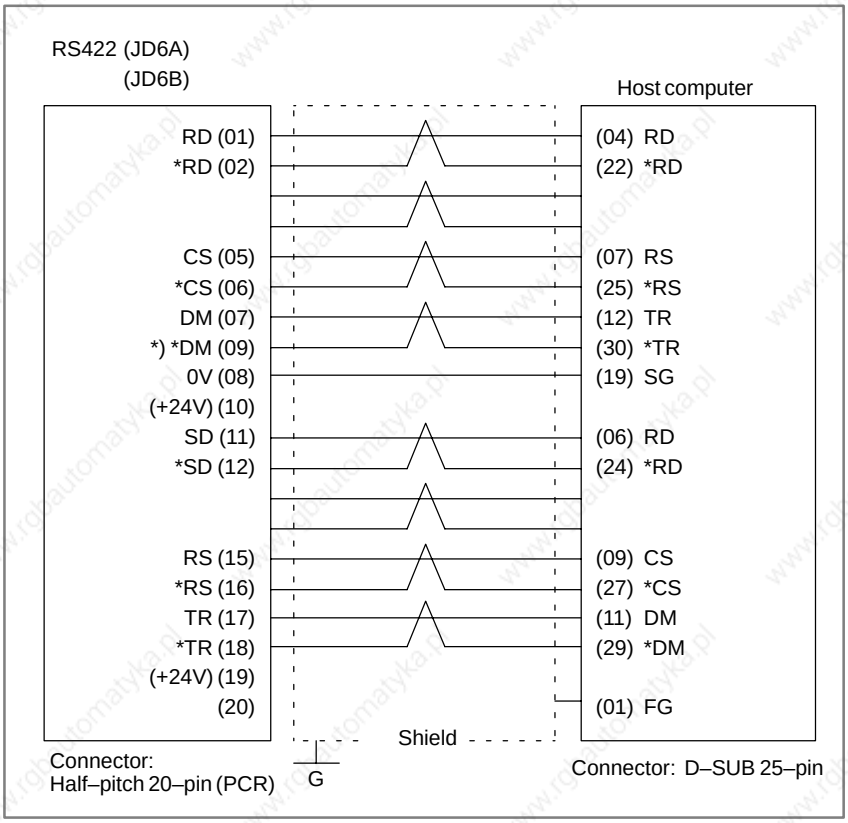
<Cable connection>





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CAUTION
1 When CS is not used, connect it to RS.
2 When protocol A or extended protocol A is used: When DR is not used, connect it to ER. Connect CD to ER.



CAUTION
Always use a twisted–pair cable.

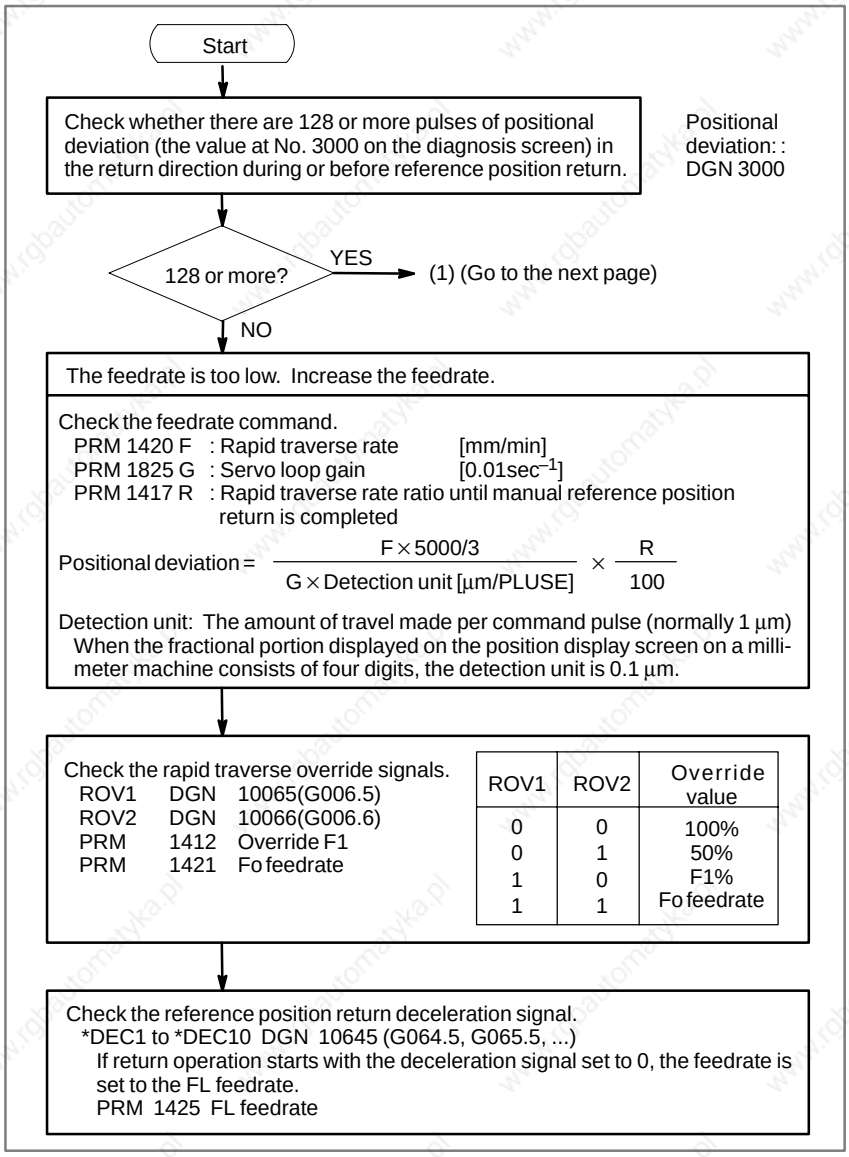
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7.7 ALARM PS200 (GRID SYNCHRONIZATION ERROR)

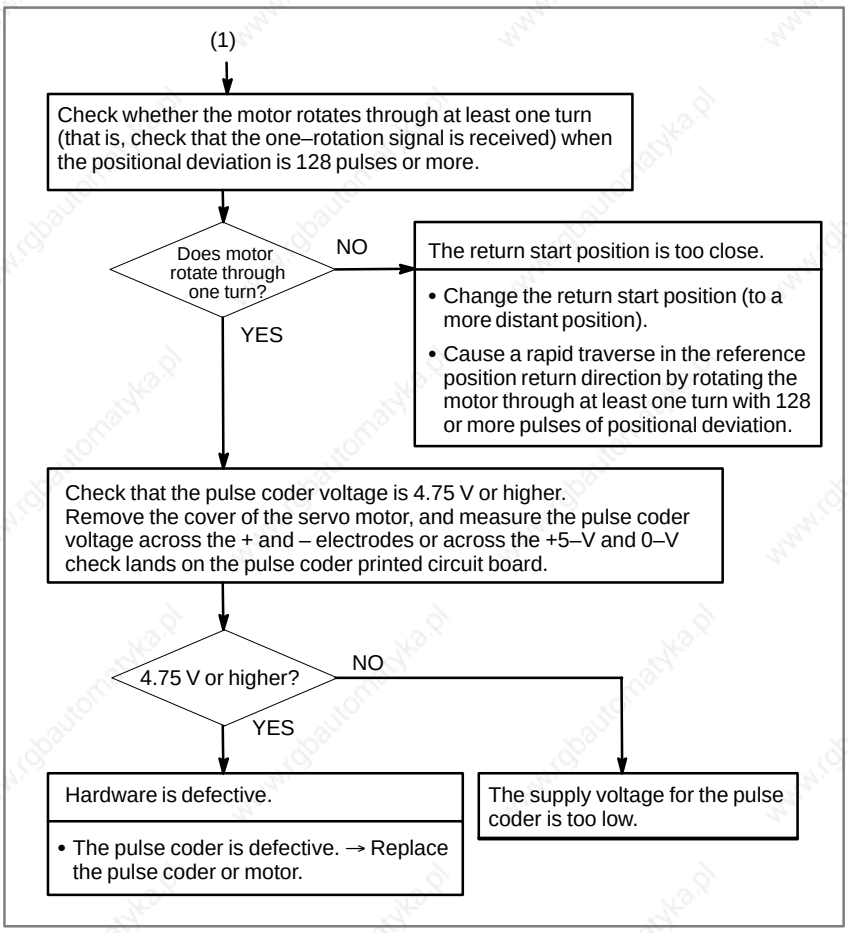
Description

Although the tool is being fed with 128 or more pulses of positional deviation (DGN3000) in the direction of reference position return, the one–rotation signal is not received at least once, a reference position return is performed.

Action



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CAUTION

(1) After the pulse coder or motor has been replaced, the reference positions and machine reference positions will differ from those used before the replacement. Therefore, adjustment and setting are required.

Tip:

A feedrate for at least 128 pulses of positional deviation is required because, if a lower feedrate is used, the one–rotation signal of the motor may fluctuate, disabling correct position detection.

In parameter No. 1841, a value of less than 128 can be set as the positional deviation with which reference position return is assumed to be possible. (If the setting is 0, 128 is assumed.)

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7.8 ALARM OT0032 (REFERENCE POSITION RETURN REQUEST)

Machine absolute position data in the serial pulse coder is lost.
(This alarm is issued when the serial pulse coder has been replaced or when the position feedback signal line of the serial pulse coder is detached.)

Action

The machine position must be recorded again by using the following method:

- **When the reference position return function is provided**

  1. Perform manual reference position return only for that axis for which the alarm was issued. If another alarm is also issued, such that manual reference positioning cannot be performed, change bit 5 of parameter No. 1815 to 0, release that alarm, then perform manual reference position return.
  2. After performing reference position return, press the RESET key to release the alarm.

- **When the reference position return function is not provided**

  Set the reference position without dogs to record the reference position.

- **When the serial pulse coder has been replaced**

  The stop position at the reference position differs from the old stop position. Change the grid shift amount in parameter No. 1850, and adjust the stop position properly.

Related parameter

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APCx	APZx				

APCx 0 : The position detector is an incremental pulse coder.
1 : The position detector is an absolute pulse coder.

APZx The reference position for the absolute pulse coder is:
0 : Not established.
1 : Established.

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7.9 ALARM SV027 (INVALID DIGITAL SERVO PARAMETER)

The settings made for the digital servo parameters are illegal.
There is an error in the settings made for the digital servo parameters.

Cause

(1) Check the settings made for the following parameters:
Parameter No. 1874: Motor type number
Parameter No. 1879: Direction of motor rotation
Parameter No. 1876: Number of feedrate feedback pulses
Parameter No. 1891: Number of position feedback pulses
Parameter No. 1023: Servo axis number
Parameter No. 1977: Flexible feed gear ratio
Parameter No. 1978: Flexible feed gear ratio

(2) To ensure safety, change the setting of the following parameter to 0:
Parameter No. 1859: Parameter for observer

(3) Initialize digital servo parameters.
→ See Section 5.1, “Initializing Servo Parameters.”

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7.10 ALARMS RELATED TO SPINDLE CONTROL

7.10.1 Alarm SP0201 (Duplicate Definition of Spindle Motor Number)

Motor numbers assigned to spindles are set incorrectly.

Cause and action

The same non–zero value appears more than once in parameter No. 5841. Check the parameter setting.

7.10.2 Alarm SP0202 (Invalid Spindle Selection)

An illegal number is set for a spindle to be controlled.

Cause and action

The value set in parameter No. 5850 falls outside the range of spindle numbers that can be controlled. Check the parameter setting.

7.10.3 Alarm SP0220 (no Spindle Amplifier)

A serial spindle could not be recognized.

Cause and action

When an alarm other than AL–24 is issued for the serial spindle amplifier, turn off the spindle amplifier, then turn on the CNC.
In other cases, check that the serial spindle is connected.

(1) Is the serial spindle amplifier powered?

(2) Is the cable to the serial spindle attached to the correct connector?

(3) Is the cable to the serial spindle broken?

If the above checks do not reveal any abnormality, the printed circuit board in the CNC or the spindle amplifier may be defective.

7.10.4 Alarm SP0221 (Illegal Spindle Motor Number) Alarm SP0996 (Illegal Spindle Parameter Setting)

The setting of the motor type for each spindle (analog or serial spindle) and the setting of a motor number assigned to each spindle are illegal.

Cause and action

There is an inconsistency between the motor type A/S set by bit 0 of parameter No. 6506 and the motor number assigned to each spindle in parameter No. 5841. Check the parameter settings.

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7.10.5 Alarm SP0225 (Serial Spindle CRC Error) Alarm SP0226 (Serial Spindle Framing Error) Alarm SP0227 (Serial Spindle Reception Error) Alarm SP0228 (Serial Spindle Communication Error) Alarm SP0229 (Communication Error between Serial Spindle and Spindle Amplifier)

A communication error occurred between the CNC and a serial spindle or between serial spindles.

Cause and action

Check the following:

(1) Is the serial spindle amplifier powered?
(2) Is the cable to the serial spindle attached to the correct connector?
(3) Is the cable to the serial spindle broken?
(4) Is there any source of noise near the system?
(5) Is the ground terminal of the CNC disconnected?
(6) Is the ground terminal of the spindle amplifier disconnected?

If the above checks do not reveal any abnormality, the printed circuit board in the CNC or the spindle amplifier may be defective.

7.10.6 Alarm SP0230 (Spindle Motor Number Outside Allowable Range)

The motor number assigned to a spindle is illegal.

Cause and action

A value beyond the allowable range is set in parameter No. 5841. Check the parameter setting.

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7.10.7 Alarm SP0241 (Abnormal D/A Converter)

The D/A converter for analog spindle control is abnormal.

Cause and action

Check whether condensation has formed on the CNC control printed circuit board. If the check does not reveal any abnormality, the printed circuit board in the CNC may be defective.

7.10.8 Alarm SP0975 (Analog Spindle Control Error)

An abnormality was detected in the position coder for an analog spindle.

Cause and action

Check that the position coder is connected correctly, and also check whether the position coder is out of order.
If the above checks do not reveal any abnormality, the position coder or the printed circuit board in the CNC may be defective.

7.10.9 Alarm SP0976 (Serial Spindle Communication Control Error) Alarm SP0978 (Serial Spindle Communication Control Error) Alarm SP0979 (Serial Spindle Communication Control Error)

An abnormality occurred during the control of communication between the CNC and a serial spindle.

Cause and action

If an alarm other than AL–24 is issued for the serial spindle amplifier, turn off the spindle amplifier, then turn on the CNC again.
In all other cases, check whether the serial spindle is connected.

(1) Is the serial spindle amplifier powered?

(2) Is the cable to the serial spindle attached to the correct connector?

(3) Is the cable to the serial spindle broken?

If the above checks do not reveal any abnormality, the printed circuit board in the CNC or the spindle amplifier may be defective.

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7.10.10 Alarm SP0980 (Serial Spindle Amplifier Error) Alarm SP0981 (Serial Spindle Amplifier Error) Alarm SP0982 (Serial Spindle Amplifier Error) Alarm SP0983 (Serial Spindle Amplifier Error) Alarm SP0984 (Serial Spindle Amplifier Error)

An abnormality occurred during data transfer between the CNC and a serial spindle.

Cause and action

Check whether the printed circuit board on the serial spindle side is abnormal.
If the above check does not reveal any abnormality, the printed circuit board on the serial spindle side may be defective.

7.10.11 Alarm SP0985 (Serial Spindle Control Error)

An abnormality occurred during initial parameter setting for a serial spindle.

Cause and action

Check whether the printed circuit boards in the CNC and spindle are abnormal.
If the above check does not reveal any abnormality, the printed circuit board in the CNC or the spindle amplifier may be defective.

7.10.12 Alarm SP0987 (Serial Spindle Control Error)

An abnormality occurred in the serial spindle control LSI device in the CNC.

Cause and action

Check whether the printed circuit board in the CNC is abnormal.
If the above check does not reveal any abnormality, the printed circuit board in the CNC may be defective.

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7.11 SYSTEM ALARMS AND CORRECTIVE ACTIONS

Corrective Actions for Individual System Alarms

7.11.1 System Alarm 100 (RAM PARITY ERROR)

- **Description**

A parity error occurred in the RAM on the CPU card.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 100 RAM PARITY ERROR
(1)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        :      -
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                    PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

The CPU card, for which the RAM PARITY ERROR has been detected, is displayed in (1).
The most likely cause is a defective CPU card. Replace the card.

The following message appears in (1):

- **CPU card mounting position**

The CPU card, indicated by the message “CPU CARD (MAIN),” is located on the main board in slot 1 of the rack.

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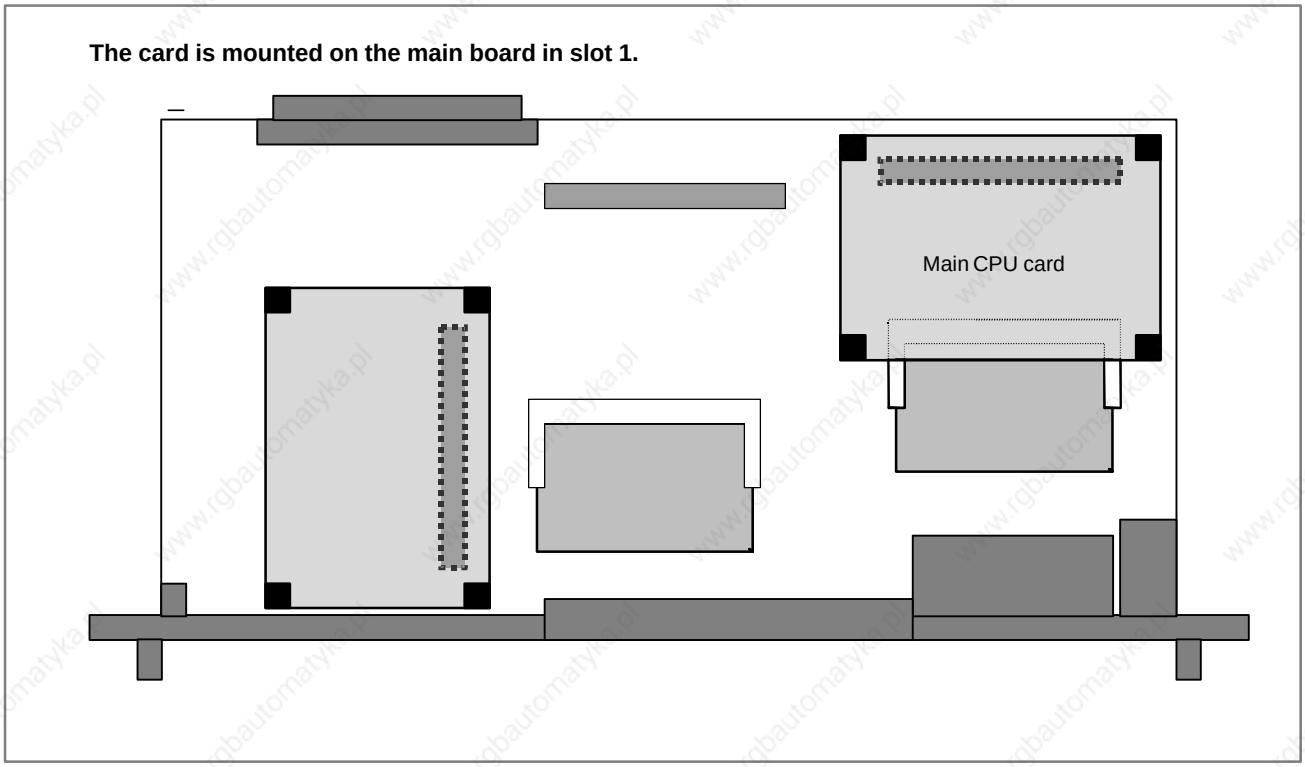


Fig. 7.11.1

7.11.2 System Alarm 103 (DRAM SUM ERROR)

- **Description**

An error was detected while the RAM mounted on the CPU card was being checked.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed, as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 103 DRAM SUM ERROR
(1)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                PAGE UP OR DOWN(PAGE  1/ 6)
```


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- **Cause and action**

  The CPU card, on which the DRAM SUM ERROR has been detected, is displayed in (1).
  The most likely cause is that the CPU card is defective. Replace the card.
  The following message appears in (1):

- **CPU card mounting position**

  See Fig. 7.11.1.

7.11.3 System Alarms 114 to 127 (FSSB Disconnection Alarms)

- **Description**

  A disconnection alarm was detected in FSSB.

- **Screen displayed upon the occurrence of the error**

  The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 116 FSSB DISCONNECTION(MAIN <- AMP1)(1)
AXIS CONTROL CARD (2)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                  PAGE UP OR DOWN(PAGE  1/ 6)
```


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- **Axis control card mounting position**

The main board having the axis control card is inserted into slot 1.

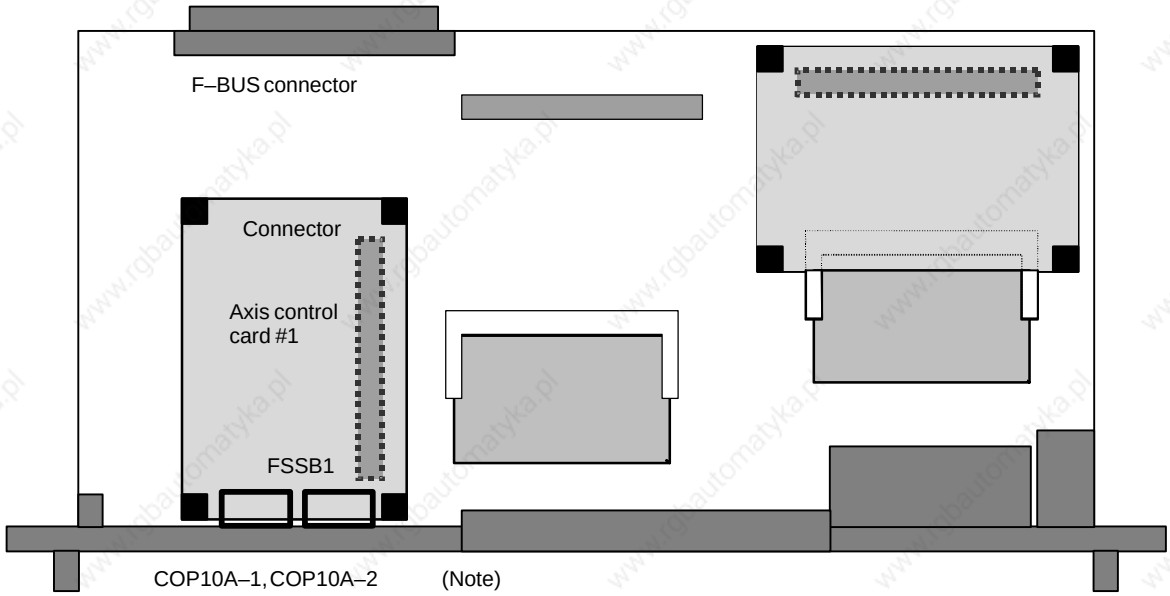


Fig. 7.11.3 (a)

The additional axis board having axis control cards is inserted into slot 3.

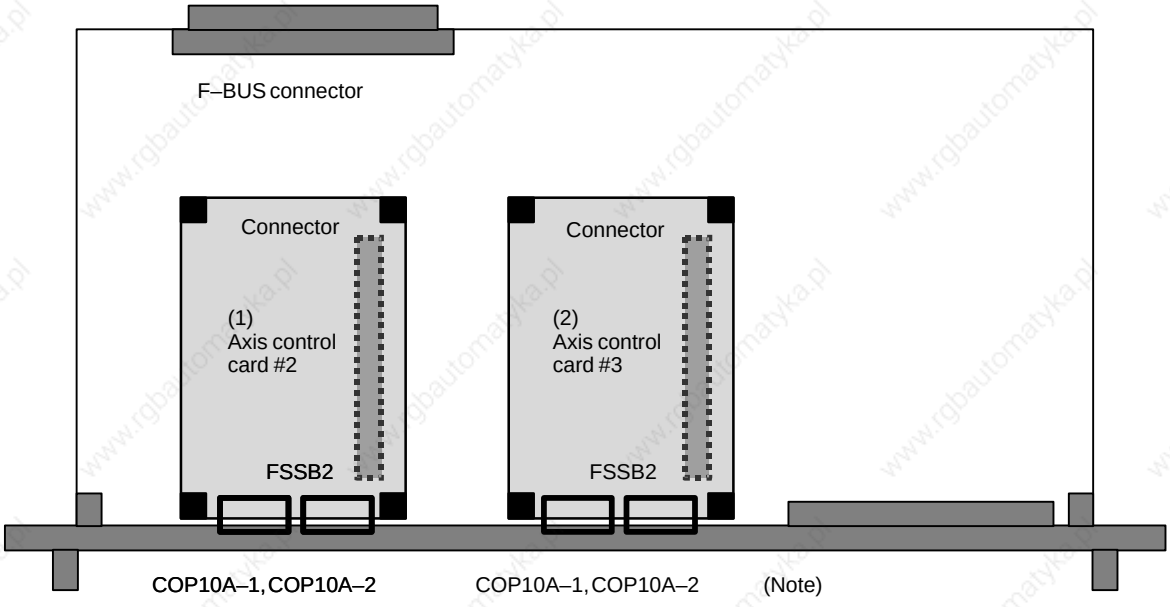


Fig. 7.11.3 (b)

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NOTE
COP10A–1 and COP10A–2 are optical connectors for FSSB lines. Just an axis control card of type B has COP10A–2.

- **Cause and action (1)**

The table below lists the messages that may appear in (1) on the screen. The cause and corrective action differ depending on the message.

NOTE
If #1 or #2 is displayed after a message, the number represents the optical connector causing the alarm on the axis control card. COP10A–1 and COP10A–2 in Figures 7.11.3 (a) and (b) respectively correspond to #1 and #2.

Alarm message	Cause	Action
FSSB DISCONNECTION (MAIN→AMP1)	Communicationbetween an axis control card and the first servo amplifier cannot be established.	Replace the optical cable connected to the axis control card. If this does not remove the alarm, replace the axis control card.
FSSB DISCONNECTION (MAIN→PULSE MODULE1)	Communicationbetween an axis control card and the first pulse module cannot be established.	
FSSB DISCONNECTION (AMPn→AMPm)	Communicationbetween the servo amplifiers n and m cannot be established. Communicationbetween servo amplifier n and the pulse module m cannot be established.	Replace the optical cable that connects servo amplifier or pulse module m to the servo amplifier n connected to the axis control card. If this does not clear the alarm, replace servo amplifier n.
FSSB DISCONNECTION (AMPn→PULSE MODULEm)		
FSSB DISCONNECTION (PULSE MODULEn→AMPm)	Communicationbetween pulse module n and servo amplifier m cannot be established.	Replace the optical cable that connects servo amplifier m to pulse module n connected to the axis control card. If this does not clear the alarm, replace pulse module n.
FSSB DISCONNECTION (PULSE MODULE1→PULSE MODULE2)	Communicationbetween the first and second pulse modules cannot be established.	Replace the optical cable that connects the second pulse module to the first pulse module connected to the axis control card. If this does not clear the alarm, replace the first pulse module.
FSSB DISCONNECTION (MAIN←AMP1)	Communicationbetween an axis control card and the first servo amplifier cannot be established.	Replace the optical cable connected to the axis control card. If this does not clear the alarm, replace the first servo amplifier.
FSSB DISCONNECTION (MAIN←PULSE MODULE1)	Communicationbetween an axis control card and the first pulse module cannot be established.	Replace the optical cable connected to the axis control card. If this does not clear the alarm, replace the first pulse module.

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Alarm message	Cause	Action
FSSB DISCONNECTION (AMPn←AMPm)	Communicationbetween servo amplifiers n and m cannot be established.	Replace the optical cable that connects servo amplifier or pulse module m to servo amplifier n connected to the axis control card. If this does not clear the alarm, replace servo amplifier or pulse module m.
FSSB DISCONNECFTION (AMPn←PULSE MODULEm)	Communicationbetween servo amplifier n and pulse module m cannot be established.	
FSSB DISCONNECTION (PULSE MODULEn←AMPm)	Communicationbetween pulse module n and servo amplifier m cannot be established.	Replace the optical cable that connects servo amplifier m to pulse module n connected to the axis control card. If this does not clear the alarm, replace servo amplifier m.
FSSB DISCONNECTION (PULSE MODULE1←PULSE MODULE2)	Communicationbetween the first and second pulse modules cannot be established.	Replace the optical cable that connects the second pulse module to the first pulse module connected to the axis control card. If this does not clear the alarm, replace the second pulse module.
FSSB INTERNAL DISCONNECTION (AMPn)	Communication cannot be established within servo amplifier n.	Replace servo amplifier n connected to the axis control card.

- **Cause and action (2)**

The number of the axis control card on which the error occurred is displayed in (2) on the screen, preceded by a # symbol.
The number can be:

#1:Axis control card mounted on the MAIN board

#2:First axis control card mounted on the additional axis board

#3:Second axis control card mounted on the additional axis board

Check the FSSB cable and the servo amplifier of the indicated axis control card, and so on.

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7.11.4 System Alarms 129 and 130 (ABNORMAL POWER SUPPLY (SERVO:AMPn) ABNORMAL POWER SUPPLY (SERVO:PULSE MODULEn))

- **Description**

An error occurred in a servo amplifier power supply.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 129 ABNORMAL POWER SUPPLY(SERVO:AMP1)
AXIS CONTROL CARD (1)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                  PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

The number of the axis control card on which the error occurred is displayed in (1), preceded by a # symbol.
The number can be:

#1:Axis control card mounted on the MAIN board

#2:First axis control card mounted on the additional axis board

#3:Second axis control card mounted on the additional axis board

Check the power supply of the servo amplifier or pulse module connected to the indicated axis control card via an FSSB cable.

- **Axis control card mounting position**

See Figs. 7.11.3 (a) and 7.11.3 (b).

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7.11.5 System alarm 133 (PARITY ALARM OF PERIPHERAL CONTROL LSI (MASTER))

- **Description**

A parity alarm is issued from the internal RAM mounted on the main board.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 133 PARITY ALARM OF PERIPHERAL CONTROL LSI(MASTER)
ETC LSI ON MAIN BOARD
ERROR OCCURRED AT 2002/01/01 12:00:00
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     :      -
ACCESS DATA        :      -
ACCESS OPERATION   :      -


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                   PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

Replace the main board.

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7.11.6 System Alarm 200 (SYSTEM ALARM (SERVO): Alarm on an Axis Control Card)

- **Description**

An alarm occurred on an axis control card.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 200 SYSTEM ALARM(SERVO)
AXIS CONTROL CARD (1)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                    PAGE UP OR DOWN(PAGE  1/ 5)
```

- **Cause and action**

The number of the axis control card on which the error occurred is displayed in (1), preceded by a # symbol.
The number can be:

#1:Axis control card mounted on the MAIN board

#2:First axis control card mounted on the additional axis board

#3:Second axis control card mounted on the additional axis board

Detailed information relating to the alarm that occurred on an axis control card is displayed on the SERVO SYSTEM INFORMATION 2 page, shown below.

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```
FANUC SERIES 15I F000B
SYS_ALM 200 SYSTEM ALARM(SERVO)
AXIS CONTROL CARD #1
ERROR OCCURRED AT 1998/10/16 14:24:03

SERVO SYSTEM INFORMATION 2
SERVO MODULE ON MAIN BOARD
SERVO CPU1 (2630 0008 6630)
 PARITY ALARM OF SERVO LOCAL RAM
0000 0000 0000 0204 003D 87BF 0000 0000 0000 0000 0000 0000 FFFF 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0001 0000 0100 0000
SERVO CPU2 (0008 0070 0008)
 PARITY ALARM OF SERVO LOCAL RAM
0000 0000 0000 0304 003D 07FB 07FB 0495 FD48 03AD 0199 FC20 0002 0002 0000 0000
1D4C 0000 0000 7530 0B20 3001 87BF 0000 0000 0000 0000 0000 0001 0000 0100 0000
SERVO CPU3 (0070 0008 0100)
 NO ALARM
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
SERVO CPU4 (0000 0000 0000)
 NO ALARM
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

If PARITY ALARM OF SERVO LOCAL RAM is displayed as shown above, a RAM parity occurred on the axis control card. Replace the axis control card.
For any other alarm related to the hardware, the corrective action cannot be determined precisely. Check with the servo to determine the corrective action.

- **Axis control card mounting position**

See Figs. 7.11.3 (a) and 7.11.3 (b).

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7.11.7 System Alarm 300 (SYSTEM ALARM: Alarm in Another Module)

- **Description**

An alarm occurred on an option board.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 300 SYSTEM ALARM(F-BUS SLOT (1))
OTHER-CPU
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                    PAGE UP OR DOWN(PAGE  1/ 5)
```

- **Cause and action**

The F–BUS slot number of the option card on which the alarm occurred is displayed in (1).
Detailed information for the alarm that occurred on the option board is displayed on the MODULE INFORMATION page, shown below. The most likely cause is that the option board indicated on this screen is defective.

```
FANUC SERIES 15I F000B
SYS_ALM 300 SYSTEM ALARM(F-BUS SLOT (1))
OTHER-CPU
ERROR OCCURRED AT 1998/10/16 14:24:03

MODULE INFORMATION
 F-BUS L-BUS    MODULE NAME    SERIES          SYSTEM ALARM MESSEAGE
+-----+-----+----------------+-------+-------------------------------------+
         F   PMC CPU           404B/Z2  WATCH DOG ALARM

+-----+-----+----------------+-------+-------------------------------------+









                                    PAGE UP OR DOWN(PAGE  2/ 5)
```

When PC050 is displayed as a system alarm message, see Section 7.15.
When PC030 is displayed, see Section 7.13.

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7.11.8 System Alarms 400 to 402 (BUS ERROR INTERNAL WRITE BUS ERROR A INTERNAL WRITE BUS ERROR B)

- **Description**

A BUS ERROR occurred.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 400 BUS ERROR
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH  (  (1)  )
ACCESS DATA        : xxxxxxxx xxxxxxxxH
ACCESS OPERATION   : xxxxxxxx


+-------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.  |
+-------------------------------------------------------+


                                PAGE UP OR DOWN(PAGE  1/ 5)
```

- **Cause and action**

The slot in which the alarm occurred is displayed in (1).
The most likely cause is that the board in the slot is defective.

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7.11.9 System Alarm 500 (SRAM DATA ERROR (SRAM MODULE))

- **Description**

An error was detected in the SRAM module.

- **Screen at the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 500 SRAM DATA ERROR(SRAM MODULE)
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        :      -
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                  PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

The most likely cause is that the SRAM module is defective.

- **Warning**

WARNING

This alarm indicates that the contents of program memory have been lost. If you change the contents (such as parameters) of program memory during normal operation, always make a backup to a medium such as a floppy disk.

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- **SRAM module mounting position**

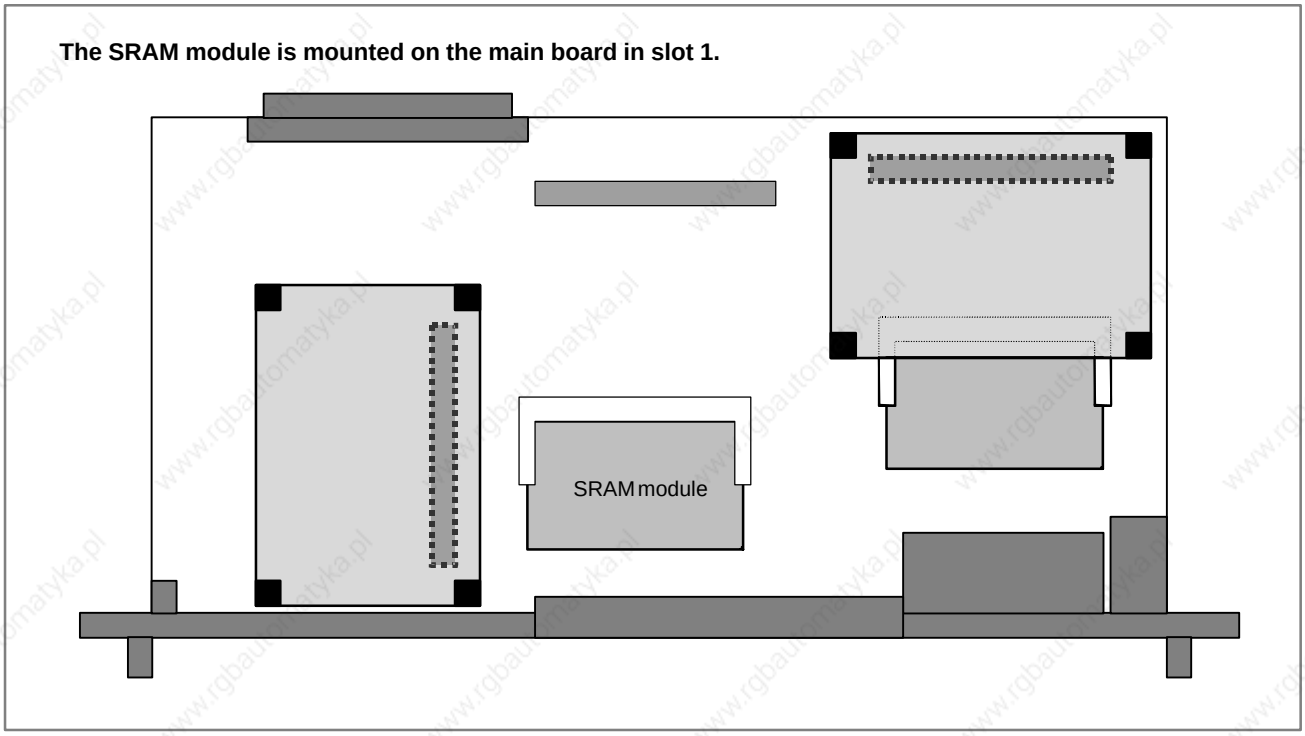


Fig. 7.11.9

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7.11.10 System Alarm 501 (SRAM DATA ERROR (BATTERY LOW))

- **Description**

The voltage of the SRAM module backup battery is low.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 501 SRAM DATA ERROR(BATTERY LOW)
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        :      -
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                  PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

Replace the backup battery.
If the above screen appears even after the backup battery has been replaced, the most likely cause is that one of the following module and board is defective:

- SRAM module
- MAIN board

- **Warning**

WARNING
This alarm indicates that the contents of program memory have been lost. If you change the contents (such as parameters) of program memory during normal operation, always make a backup to a medium such as a floppy disk.

- **SRAM module mounting position**

The SRAM module mounting position is shown in Fig. 7.11.9.
The main board is inserted into slot 1.

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7.11.11 System Alarm 502 (NOISE ON POWER SUPPLY)

- **Description**

Noise was generated in the power supply.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 502 NOISE ON POWER SUPPLY
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        :      -
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                    PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

Noise is present, which may have destroyed the contents of the SRAM module.
Identify and remove the source of the noise.

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7.11.12 System Alarm 503 (ABNORMAL POWER SUPPLY (MAIN BOARD))

- **Description**

An error occurred in the power supply on the MAIN board.

- **Screen displayed upon the occurrence of the error**

The first page of the system alarm is displayed as shown below:

```
FANUC SERIES 15I F000B
SYS_ALM 503 ABNORMAL POWER SUPPLY(MAIN BOARD)
CPU CARD(MAIN)
ERROR OCCURRED AT 1998/10/16 14:24:03
PROGRAM COUNTER    : xxxxxxxxH
ACT TASK           : xxxxxxxxH
ACCESS ADDRESS     : xxxxxxxxH
ACCESS DATA        :     -
ACCESS OPERATION   : xxxxxxxx


+-----------------------------------------------------------+
|  THE SYSTEM ALARM HAS OCCURRED, THE SYSTEM HAS STOPPED.   |
+-----------------------------------------------------------+


                                  PAGE UP OR DOWN(PAGE  1/ 6)
```

- **Cause and action**

The most likely cause is that the MAIN board is defective.

- **MAIN board mounting position**

The main board is inserted into slot 1.

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7.11.13 ROM TEST ERROR

- **Description**

  A ROM test detected an error.

- **Screen displayed upon the occurrence of the error**

  A screen like that shown below appears:

```
FANUC SERIES 15I F000B
COPYRIGHT(C) FANUC LTD 1997-1998
RAM TEST    : END
ROM TEST    : ERROR
ERROR ROM   : 801
```

- **Cause and action**

  The FROM field indicates the number of the ROM in which the test detected an error.
  The most likely cause is that the FROM module is defective.
  See Section x.x, “SYSTEM DATA CHECK” and check the contents of the ROM.

  ⁎ Note that data may have been written to the ROM MODULE by the machine tool builder.

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- **FROM/ROM module mounting position**

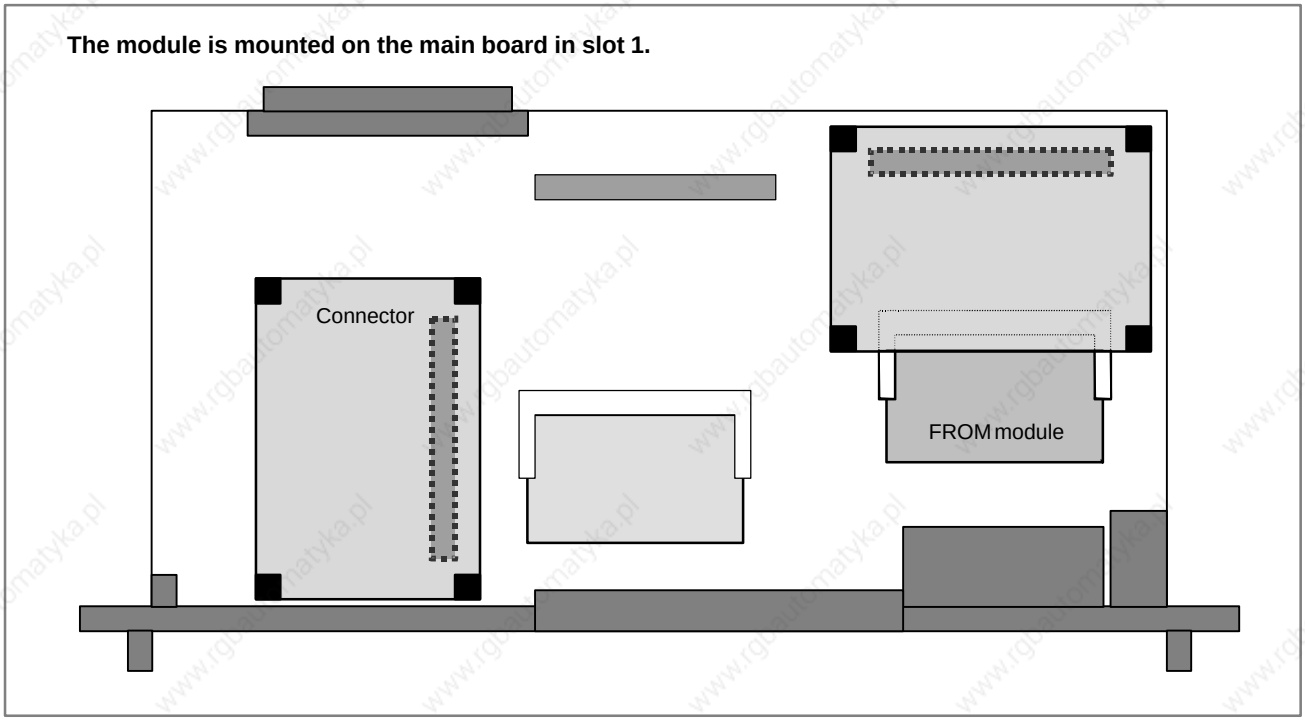


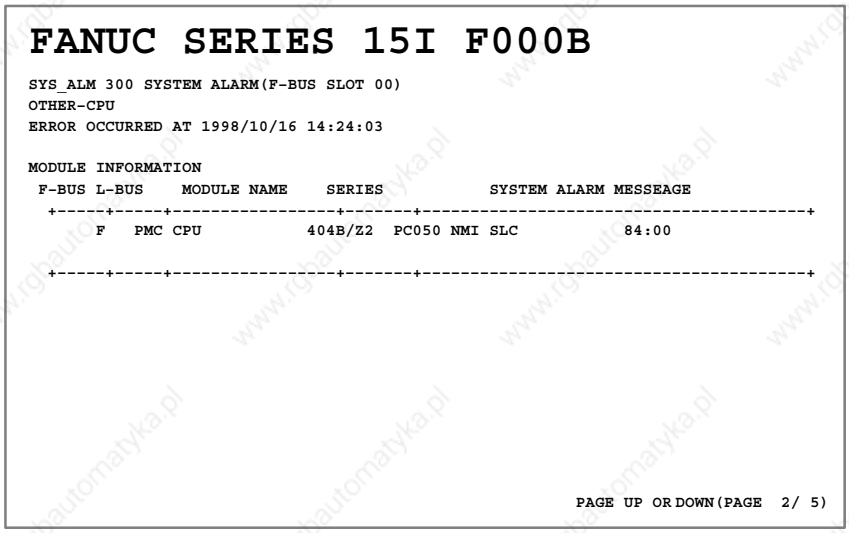
Fig. 7.11.13

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7.12 IO/LINK–RELATED SYSTEM ALARM

- **Screen displayed upon the occurrence of the error (second page)**

If the information displayed on the second page of system alarm 300 contains PC50 NMI SLC, this indicates that an IO/Link–related system alarm has occurred.



- **Cause and action**

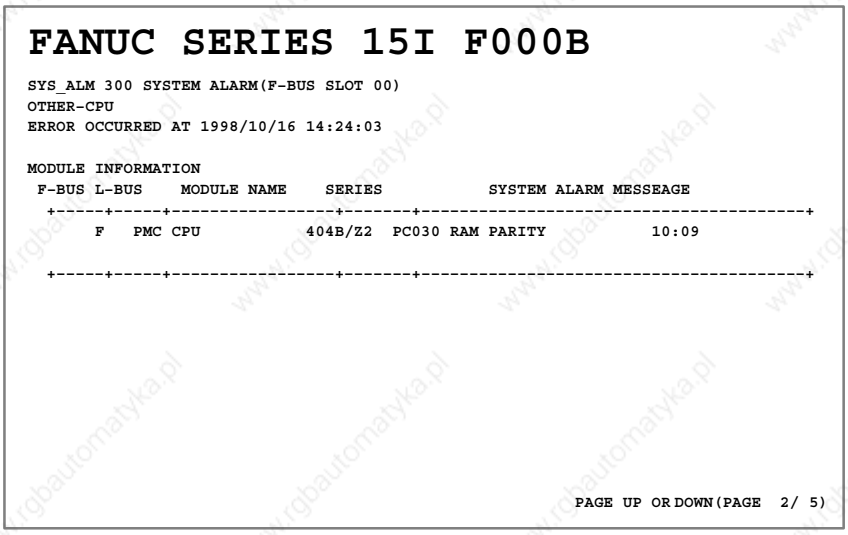
The most likely cause is that the IO/Link cable is disconnected or that the connected IO device is defective.
See Section 7.15, “Fault Trace Procedure (for I/O Link).”

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7.13 PMC RAM PARITY ALARM

If the information displayed on the second page of system alarm 300 contains PC30 RAM PARITY, a RAM PARITY alarm occurred in PMC control.
Even if the information displayed on the second page contains WATCHDOG ALARM, the actual cause may be PC30 RAM PARITY.

- **Screen displayed upon the occurrence of the error (second page)**



- **Cause and action**

The RAM for PMC control that is mounted on the main CPU board is defective. Replace the main CPU board.

- **MAIN board mounted position**

The main CPU board is inserted into slot 1.

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7.14 OTHER SYSTEM ALARMS

Besides the system alarms described in the preceding sections, those system alarms that are attributable to hardware or software can sometimes be issued.
If such an alarm is issued, display appropriate alarm information as described in Section 7.15, ”OUTPUTTING SYSTEM ALARM FILES” or Section 1.12, ”SYSTEM LOG SCREEN” and contact FANUC.

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7.15 SENDING A SYSTEM ALARM FILE

If a system alarm occurs, information on the system alarm can be sent to an external device.
There are two methods of sending information. Use the appropriate method depending on the situation in which the system alarm occurred.

• If a system alarm occurs when an attempt is made to start the system

If a system alarm occurs when an attempt is made to start the system, making it impossible to start the system successfully, the menu for sending information can be displayed from the system alarm screen, using the following procedure:

(1) While a system alarm is displayed, press the RESET key. The IPL screen menu appears.

CAUTION
To return from the IPL screen menu to the system alarm screen, select 'END IPL' to exit from the IPL screen menu.

(2) To select 'SYSTEM ALARM UTILITY' from the menu, enter 5 and then press the INPUT key.
(3) Insert a memory card into the card interface.
(4) To select 'OUTPUT SYSTEM ALARM FILE' from the 'SYSTEM ALARM UTILITY' menu, enter 2 and then press the INPUT key.
(5) To select 'OUTPUT SYSTEM ALARM FILE FROM DRAM' from the 'OUTPUT SYSTEM ALARM FILE' menu, enter 2 and then press the INPUT key.
(6) 'MEM_CARD FILE NAME?' appears. Enter a file name of up to ten characters and then press the INPUT key.
(7) 'OUTPUT FILE OK?' appears. To download the information to the card, press the Y key.
(8) For those users who are using a personal computer with a memory card interface, print out the system alarm file (text file) saved to the memory card and fax it to FANUC.
(9) For all users other than those in (8), mail the memory card to FANUC.

CAUTION
This method can be used only when a memory card is available.

• If a system alarm occurs during normal operation

Information relating to a system alarm can be sent using the procedure described in "If a system alarm occurs when an attempt is made to start the system." If, however, the system starts successfully when it is turned on after a system alarm has occurred, a history of system alarms that have occurred remains on the system log screen. You can use this screen to download information to a specified device.
For an explanation of using the system log screen, see Section 1.11, "System Log Screen."

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7.16 HOW TO REPLACE THE FUSES IN EACH UNIT

WARNING

Only those personnel who have received approved safety and maintenance training may perform this replacement. Before opening the cabinet and replacing a board, turn off both the power to the CNC unit and the main power to the power magnetics cabinet. If only the power to the CNC unit is turned off, the power to the servo may remain on, possibly damaging boards and peripheral units and presenting a danger of electric shock.

CAUTION

When removing a printed circuit board, note the following:

(a) Avoid touching the semiconductors and other parts on the board.

(b) Removing the power supply unit or main board (together with cards and modules) may cause the contents (parameters and programs) of CNC CMOS memory to be lost. Always make a backup to media such as memory cards or floppy disks before attempting such an operation.

(c) Disconnected cables must be reconnected to their original locations. If there is a chance of forgethering how the cables are connected, make a note before disconnecting them.

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7.17 FAULT TRACE PROCEDURE (FOR I/O LINK)

7.17.1 Failure to Input and Output I/O Link Data

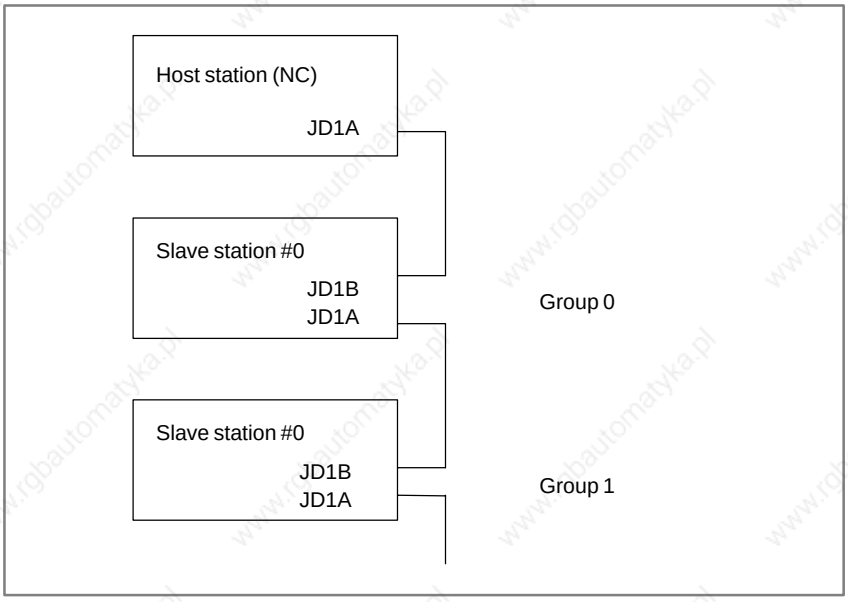
In the event of a failure upon inputting and outputting data to and from I/O Link slave stations (such as the connector panel I/O unit, operation board I/O unit, I/O Unit–A, I/O Unit–B, and Power Mate), identify the cause by applying the procedure below:

7.17.1.1 Checking whether hardware links have been established

First, check that the cables and the power supplies are all normal.

(1) If "NO I/O DEVICE" is displayed on the PMC alarm screen (displayed by selecting "PMCDGN" and then "ALARM"):
None of the slave stations are linked. The most likely causes are:

- The power–on timing of the slave stations differs from that of the NC.
  → Turn on the power to the slave stations first, then the master station (NC). Alternatively, turn on the power to all the stations simultaneously.
- The slave stations have not been turned off.
  → If the master station is turned off, all the slave stations must be turned off.
- The I/O Link cables are not connected correctly.
  → Check that the cables are connected as shown below:



- Other than the correct I/O Link cables are being used.
  → Refer to "FANUC I/O Link Connection" in the "FANUC Series 15*i*–B Connection Manual (Hardware)" (B–63783EN) for information on how to connect cables as well as their lengths.

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(2) If the names of all the slave stations of the connected groups are not displayed on the PMC I/O check screen (displayed by selecting “PMCDGN,” “IOCHK,” and “IOLNK”):

→ No link is established between the slave station displayed last and the next station. For the cable between the stations and for the preceding and succeeding slave stations, perform the checks described in (1) above.

7.17.1.2 Checking the I/O Link allocation

Next, check if the I/O Link allocation is correct.

(1) If data is input to the wrong X address and data is output from the wrong Y address:

→ The address allocation is wrong. On the I/O module screen, check the settings made for “GROUP,” “BASE,” “SLOT,” and “NAME” of each slave station.
For an explanation of how to change the settings, refer to “Connection between PMC and Machine” in the “FANUC PMC Ladder Language Programming Manual” (B–61863E) and “I/O Module Editing” in the “FAPT LADDER–II Instruction Manual” (B–66184E).”

(2) If a ladder program is input from the PMC “I/O” screen:

→ Write the input ladder program to F–ROM, then power off the NC.

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7.17.2 Occurrence of System Alarm PC050 NMI SLC xx:yy

This system alarm occurs when an I/O Link link is released. Identify the cause of the alarm, referring to xx:yy displayed on the screen.

Example) If NMI SLC 43:42 is displayed,
xx = 43 (hex), bit 0 of xx (written as xx#0 in the remainder of this manual) = 1, xx#1 = 1, xx#6 = 1
yy = 42 (hex), yy#6 = yy#6 = 1
First, identify the cause by referring to Section 7.5.2 since xx#0 = 1.

7.17.2.1 If “xx#0=1” in NMI SLC xx:yy

This indicates that the NC detected invalid communication data. The most likely causes are:

(1) Electrical noise

→ Refer to “FANUC I/O Link Connection” in the “FANUC Series 15*i*–B Connection Manual (Hardware)” (B–63783EN) for information on ground connection and measures against noise.

(2) Vibration

→ Check that the I/O Link cables are connected securely.
Refer to “FANUC I/O Link Connection” in the “FANUC Series 15*i*–B Connection Manual (Hardware)” (B–63783EN) for information on the requirements for installing each slave station.

(3) Defective hardware component

→ The most likely causes are a defective CNC, slave station, or cable. Replace these components, starting with whichever is one easiest to replace, to identify the defective component.

NOTE
If this alarm occurs intermittently, making it difficult to identify the defective hardware component, check PMC address R9051. If R9051 increments relatively frequently, check whether incrementing stops after replacing each hardware component. If incrementing stops, the corresponding hardware component may be defective.

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7.17.2.2 If “xx#1=1” in NMI SLC xx:yy

This indicates that a slave station detected an error. The group number of the slave station that detected the error is indicated by “(yy#0 to yy#4) – 1.” The error type is indicated by yy#5 to yy#7.
yy#5: The slave detected invalid communication data.
yy#6: The slave detected an error of another type.
yy#7: The slave detected a watchdog or timer error.

Example)
If yy = 83 (hex), yy#0 to yy#4 = 3 and yy#7 = 1.
Thus, “the slave station in group 4 (= 3 + 1) detected a watchdog or parity error.”

(1) If “yy#5 = 1” in NMI SLC xx:yy:
The slave having group number “(yy#0 to yy#4) – 1)” detected invalid communication data.
→ First, replace the slave station having the indicated group number. If the same alarm occurs even after replacement, identify the cause, using the procedure described in Section 7.5.2.

(2) If “yy#6 = 1” in NMI SLC xx:yy:
The slave having group number “(yy#0 to yy#4) – 1)” detected an error of another type.
→ First, replace the slave station having the indicated group number. If the same alarm occurs even after replacement, identify the cause, using the procedure described in Section 7.5.2.

(3) If “yy#7 = 1” in NMI SLC xx:yy:
The slave having group number “(yy#0 to yy#4) – 1)” detected a released link.
→ First, replace the slave station having the indicated group number. If the same alarm occurs even after replacement, identify the cause, using the procedure described in Section 7.5.2.3.

7.17.2.3 If “xx#2=1” in NMI SLC xx:yy

This indicates that a link between the NC and a slave has been released. The most likely causes are:

(1) The slave station was turned of.
→ The most likely causes are a momentary interruption of the slave station power supply or insufficient power supply capacity. Check whether each slave station’s power supply.

(2) The I/O Link cable was disconnected
→ The most likely cause is that the connector is defective. Check that the connector is inserted securely.

(3) Any other cause
→ Identify the cause, using the procedure described in Section 7.17.2.

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7.17.2.4 If “xx#3=1” or “xx#4=1” in NMI SLC xx:yy

This indicates that a RAM parity error occurred within the NC. Replace the NC main board.

7.17.3 Failure to Start the NC on the Host Station

If the BOOT screen is displayed on a slave station such as the Power Mate–H, I/O Link initialization has not been completed. The host NC may, therefore, enter the wait state and fail to start.

7.17.4 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:

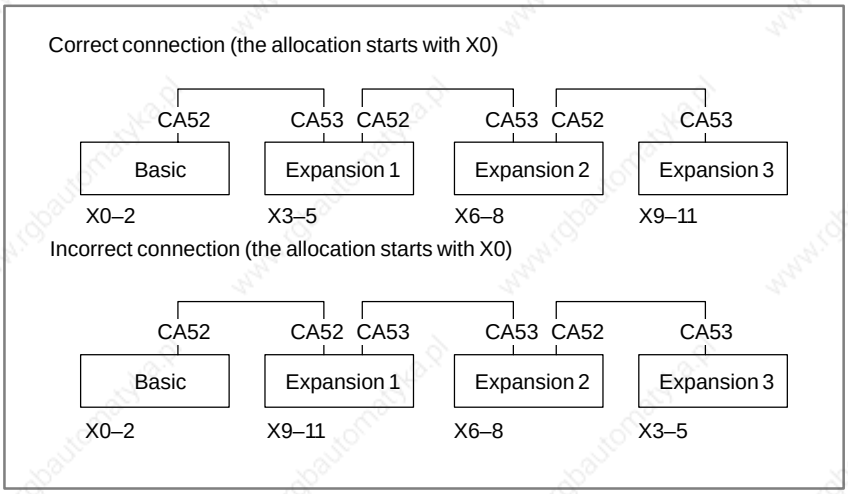
(1) The I/O Link allocation is wrong.

→ Perform the check described in Section 7.17.2.

(2) The unit–to–unit cables (CA52–to–CA53) are not connected correctly.

If the connection is wrong, expansion unit 1 is allocated the address of expansion unit 3, as shown below.

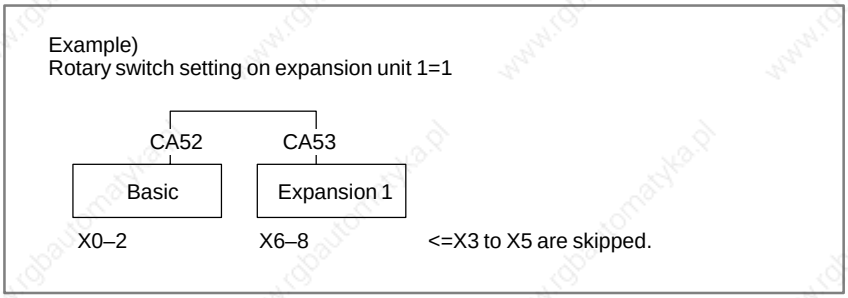
→ Connect the unit–to–unit cables as shown below:



(3) The setting of the rotary switch on an expansion unit is wrong

If the rotary switch is set to 1, one unit number is skipped. If set to 2, two unit numbers are skipped. Usually, the setting must be 0. (For those units without a rotary switch, unit numbers cannot be skipped.)

→ See the following example and refer to the “FANUC Series 15*i* Connection Manual (Hardware)” (B–63323).



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7.17.5 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 1P and 31P of the expansion unit.

7.17.6 If an I/O Link–related Error can not be Cleared

If any of the above procedures and the corrective actions described in the "FANUC Series 15*i* Connection Manual (Hardware)" (B–63323EN) fails to clear a problem, contact FANUC.
The following information is required. Collect this before contacting FANUC.

(1) Error

Examples)

- System alarm NMI SLC xx:yy occurred.
- No link was established.

(2) Time

Examples)

- During NC machining
- At power–on

(3) Frequency

Examples)

- The error occurs once or twice per week.
- The error occurs every time the machine is used.

(4) PMC system software series/version

Example)

- 404A series, version 01. (Can be checked by selecting "PMCDGN" and then "TITLE.")

(5) I/O Link configuration

Examples)

- Host: Series15*i*
- Group 0: Connector panel I/O unit
- Group 1: I/O Unit–A

(6) Allocated data

Example)

Address	Group	Base	Slot	Name
X000	0	0	1	CM16I
:				
X032	1	0	1	ID16D
:				
Y000	0	0	1	CM08O

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APPENDIX

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A BOOT SYSTEM

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A.1 OVERVIEW

The boot system is designed to load CNC system software from flash ROM to DRAM and then activate CNC software for execution.
The boot system also provides the following functions for CNC system maintenance.

(1) Loading files into flash ROM
- Reads files from a FAT–format memory card into flash memory.

(2) Checking files (series and editions) in flash ROM

(3) Checking files (series and editions) on a memory card

(4) Deleting files in flash ROM

(5) Simultaneously saving and restoring battery–backed–up data such as parameters and programs (in the SRAM area) to and from a memory card

(6) Saving files in flash ROM to a memory card

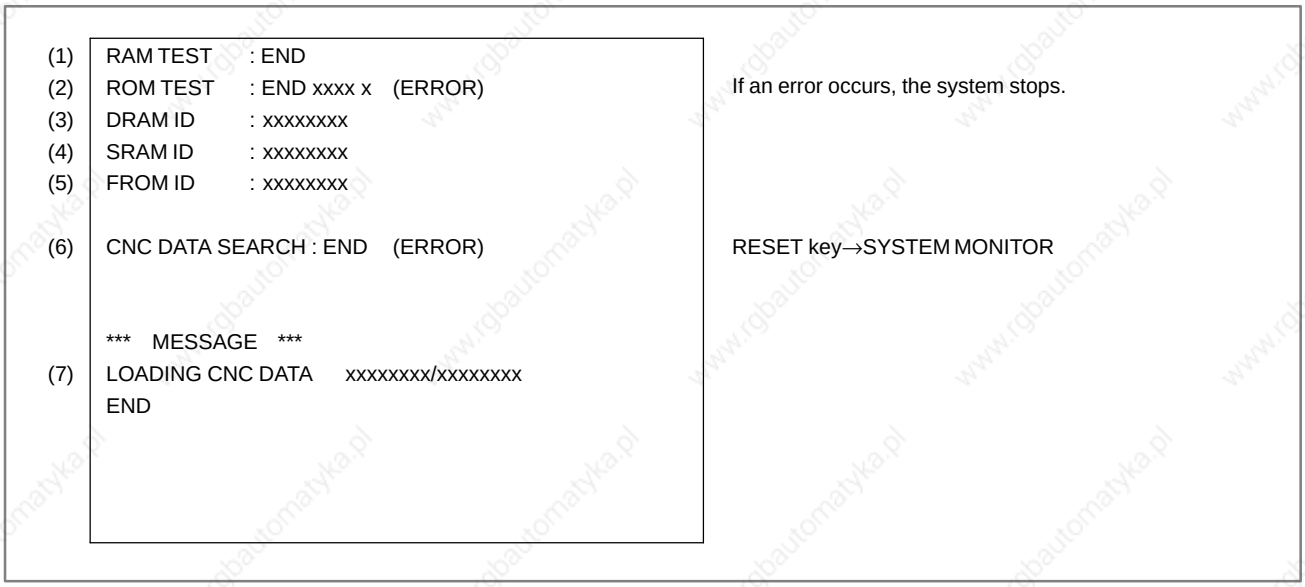
(7) Formatting a memory card

Appendix A shows the screen displayed when the boot system is activated and the screens for the boot system functions listed above. The appendix also explains the operations performed using these screens.

CAUTION
- This control unit supports the use of memory cards as input/output units. The following memory cards can be used:
  SRAM memory card
  Flash memory card
  ATA flash card
  For details of memory cards, refer to the ordering list.
- Only route directory areas of memory cards can be used for file display, read, and write operations.
  Subdirectories cannot be used.
- The time required for data read and write varies depending on the memory card type and use status.
- Data can be written on a flash memory card only if the flash memory card is a FANUC–recommended type. Any FAT–format flash memory card can be used for read operations in the same manner as SRAM cards.
  When using a flash memory card, note that the actually usable card space is 128KB less than the original card capacity.
  A single file on a flash memory card cannot be deleted.
  All the files recorded on the card must be erased at the same time.
- The ATA flash card must be formatted using the quick formatting method (where the file allocation table and directory information about the route directory are cleared).
  An unformatted ATA flash card must first be formatted using a personal computer.

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A.1.1 Power–on Sequence Display



- **Details of the display items**

(1) Displays the results of a WORK RAM test. If an error occurs, the results cannot be displayed. The error is not displayed here, but on the LED display. (See “LED display.”)

(2) Displays the results of a BOOT ROM parity test. If no error occurs, the series/version are displayed. If an error occurs, the system stops.

(3) Displays the ID of the DRAM MODULE mounted on the CNC.

(4) Displays the ID of the SRAM MODULE mounted on the CNC.

(5) Displays the ID of the FROM MODULE mounted on the CNC.

(6) The validity of the CNC BASIC software in flash memory is checked. This check is performed based on data identification information only. The parity check is performed when the CNC is turned on.

If an error occurs, pressing the RESET key causes the SYSTEM MONITOR screen to be selected.

(7) Indicates that the CNC BASIC software is being loaded from flash memory into DRAM.

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A.1.2 Starting the BOOT SYSTEM

When the system is started in the normal way, the BOOT SYSTEM automatically transfers files from flash ROM to DRAM, and the user need not be concerned with the BOOT SYSTEM. If maintenance is to be performed or if the flash ROM does not contain the necessary file, the BOOT SYSTEM must be operated by displaying the appropriate menu.

(1) "For system maintenance involving the replacement of files in flash ROM"

Operation: Press and hold down both the Page Up and Page Down keys, and turn on the power.

(2) "If flash ROM does not contain a file needed for the CNC to start"

As soon as the CNC is turned on, the BOOT SYSTEM starts transferring files from flash ROM to DRAM. If flash ROM does not contain the minimum file (NC BASIC) required for the CNC to start, or if this file has been destroyed, CNC DATA SEARCH:ERROR is displayed.

In this state, pressing the RESET key causes the SYSTEM MONITOR screen to appear.

A.1.3 System Files and User Files

The BOOT SYSTEM divides the files handled with flash ROM into two main types, "system file" and "user file" and manages these two types of files. The differences between the two types of files are as described below:

- **System files**

  Files containing FANUC–supplied software for controlling CNCs and servos.

- **User files**

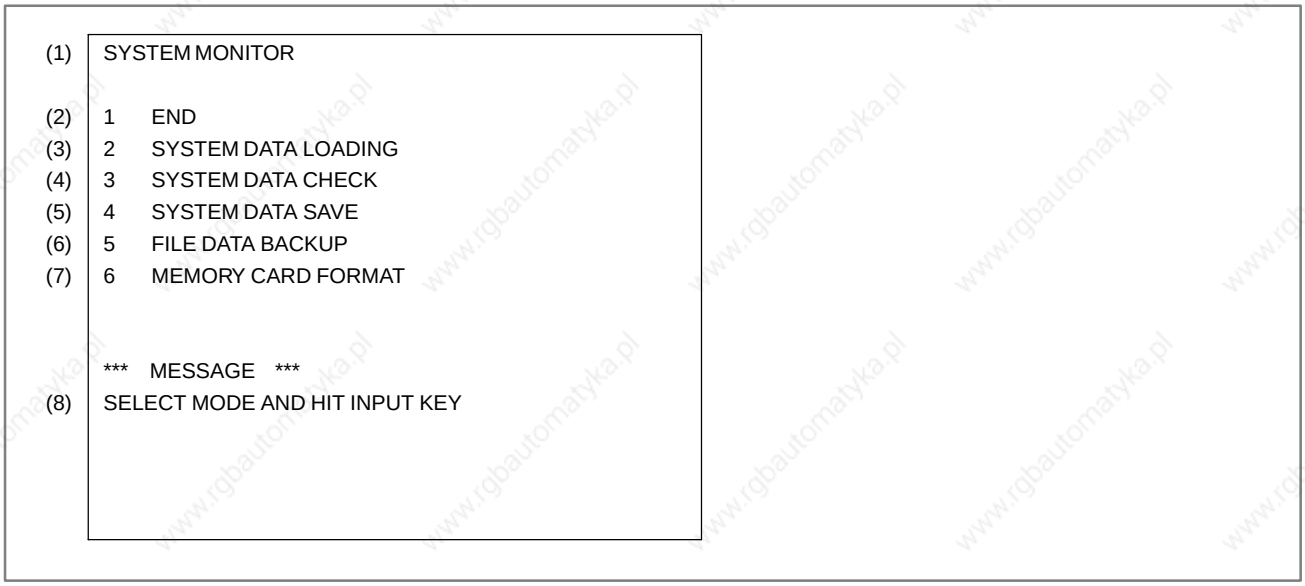
  User–created files such as those containing PMC sequence programs (ladder programs) and P–CODE macro programs

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A.2 SCREEN CONFIGURATION AND OPERATION

When the boot system is activated, the main menu screen appears first. The main menu screen is explained below.

- **Main menu screen**



- **Explanation of displayed lines**

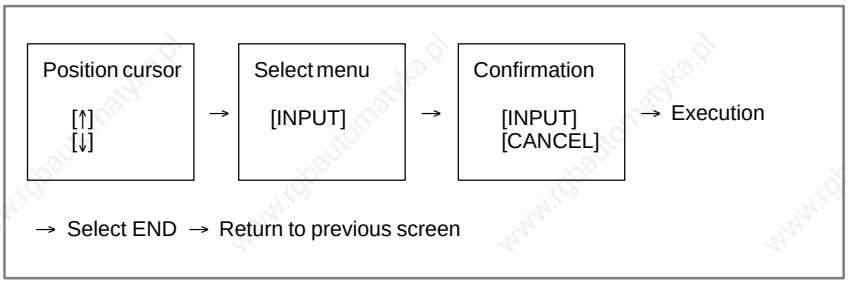
(1) Displays a title on this line.
(2) Terminates the system monitor.
(3) Loads ROM data (such as system software and user files) from the memory card into flash memory.
(4) Checks the ROM data contents stored in flash memory or on the memory card.
(5) Writes ROM data stored in flash memory to the memory card.
(6) Simultaneously saves/restores battery–backed–up files to and from the memory card.
(7) When selected from the menu, formats the memory card.
(8) Displays a message (such as a simple operation guide) on this line.

- **Operation**

Select a process by using the cursor keys ↑ and ↓. Position the cursor to the function you want to select, and then press the INPUT key. Before the function is executed, you may have to press the INPUT key or the CAN key for confirmation.

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- **Basic operation flow**



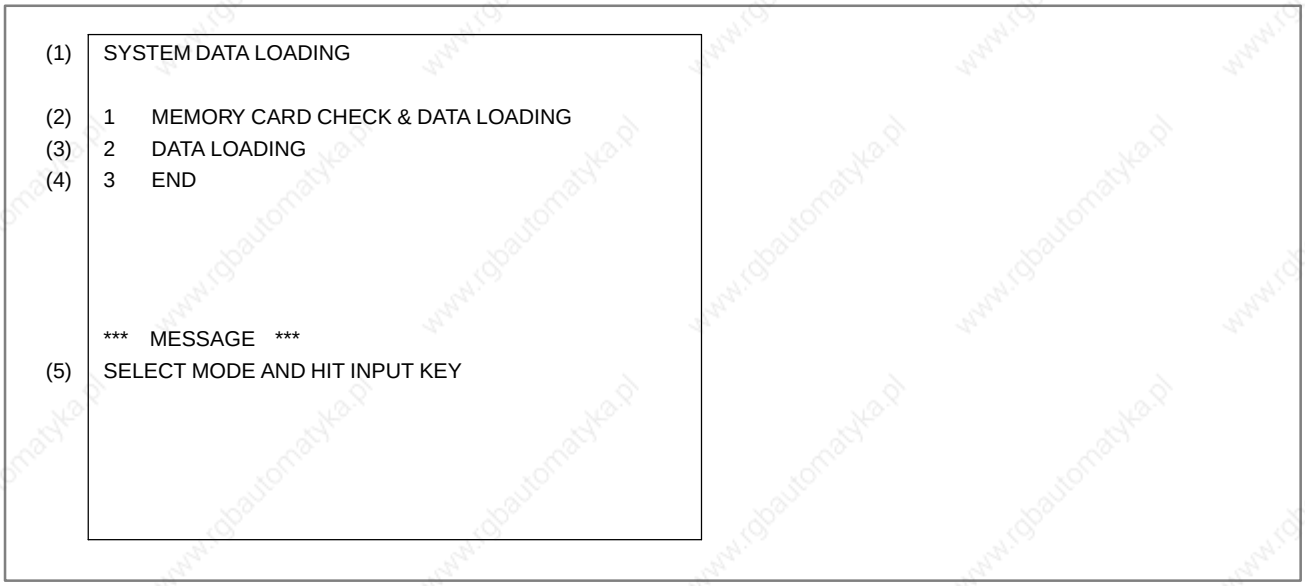
A.2.1 SYSTEM DATA LOADING Screen

- **Description**

This screen is used to load system and user files from a memory card into flash ROM.

- **Screen configuration**

Explanation of each display line



- **Explanation of each display line**

(1) Line displaying the title.
(2) Checks the ROM data stored to the memory card.
Then, loads the ROM data from the memory card into flash memory.
(3) Loads ROM data from the memory card into flash memory.
(4) Returns the system to the MAIN MENU.
(5) Line displaying a m SYSTEM essage (such as a simple operation guide).

- **Procedure**

Select the desired action using the cursor keys (↑ and ↓). The cursor moves according to the key operation. Position the cursor to the desired function and then press the INPUT key.

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A.2.1.1
MEMORY CARD CHECK & DATA LOADING screen

```
(1)  SYSTEM DATA CHECK & DATA LOADING
(2)  MEMORY CARD DIRECTORY
(3)  1    aaaa.bbb      1234567  1997–02–10   11:22
     2    ccc.ddd          1111  1995–01–30   12:02
     3    eeeeeeee.ff       123  1996–12–01   09:03
     4    gg.hhh       ********  1997–01–02   08:40
(4)  5    END

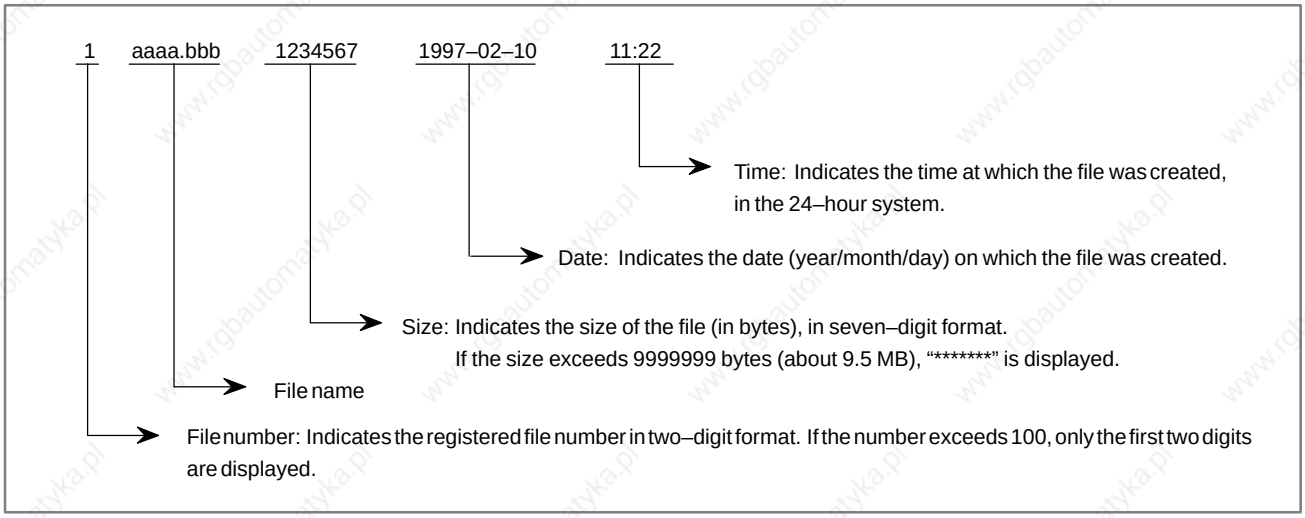
(5)                              5123 BYTES FREE
     *** MESSAGE ***
(6)  SELECT FILE & HIT INPUT KEY
     (CANCEL:RESET KEY)
```

- **Explanation of each display line**

(1) Line indicating the title.

(2) Line indicating that the screen is displaying the memory card directory.

(3) A list of files on the memory card is shown.



(4) Exits from this screen.

If the entire file list cannot be displayed, "END" is not displayed. To display the next page of the list, press the PAGE key [PAGE↓].

When the second or subsequent page is displayed, press the PAGE key [PAGE↑] to display the previous page.

(5) Displays the amount of free capacity on the memory card.

(6) Line indicating a message (such as a simple operation guide).

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- **Procedure**

Select the file to be loaded, using the cursor keys (↑ and ↓) and press the INPUT key.

The confirmation message “OK? INPUT/CANCEL” appears on the message line. To load the file, press the INPUT key. Otherwise, press the CAN key.

First, the ROM data on the memory card is checked.

The information displayed at this time is the same as that displayed by the MEMORY CARD SYSTEM ROM data check of the SYSTEM DATA CHECK function, described later.

The confirmation message “OK? INPUT/CANCEL” appears on the message line. If the result of the check is acceptable, press the INPUT key. Otherwise, press the CAN key. Pressing the INPUT key starts the loading of the file.

While loading is in progress, the following states are displayed:

(1) “LOADING FROM MEMORY CARD”: Data is being loaded from the memory card.
(2) “DEVICE TEST”: A device test is being conducted on the flash memory.
(3) “LOADING AND VERIFY”: Data is being written to the flash memory and verified.
(4) “LOADING COMPLETE”: Data has been written to the flash memory.

Once loading has been completed, the message “HIT INPUT KEY” appears. Press the INPUT key. Another file can be selected.

To exit from the screen, select “END” and press the INPUT key. The system returns to the MAIN MENU.

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A.2.1.2
DATA LOADING screen

```
(1) SYSTEM DATA LOADING
(2) MEMORY CARD DIRECTORY
(3) 1   aaaa.bbb      1234567  1997–02–10  11:22
    2   ccc.ddd          1111  1995–01–30  12:02
    3   eeeeeeee.ff       123  1996–12–01  09:03
    4   gg.hhh       ********  1997–01–02  08:40
(4) 5   END

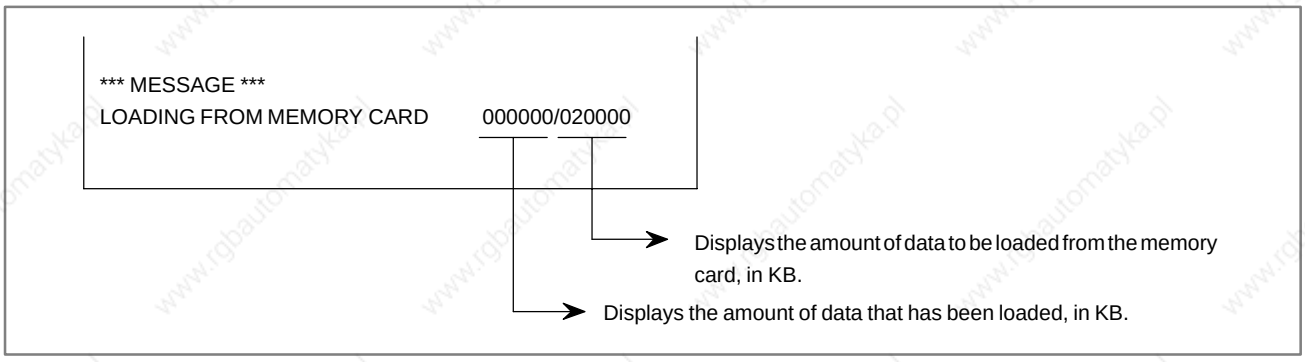
(5)                           5123 BYTES FREE
*** MESSAGE ***
(6) SELECT FILE & HIT INPUT KEY
(CANCEL:RESET KEY)
```

The explanation of each display line and the procedure are almost the same as those for the “MEMORY CARD CHECK & DATA LOADING screen,” described in Section A.2.1.1. They differ in whether the ROM data on the memory card is checked before it is written to flash memory. (The check is not performed on this screen.)

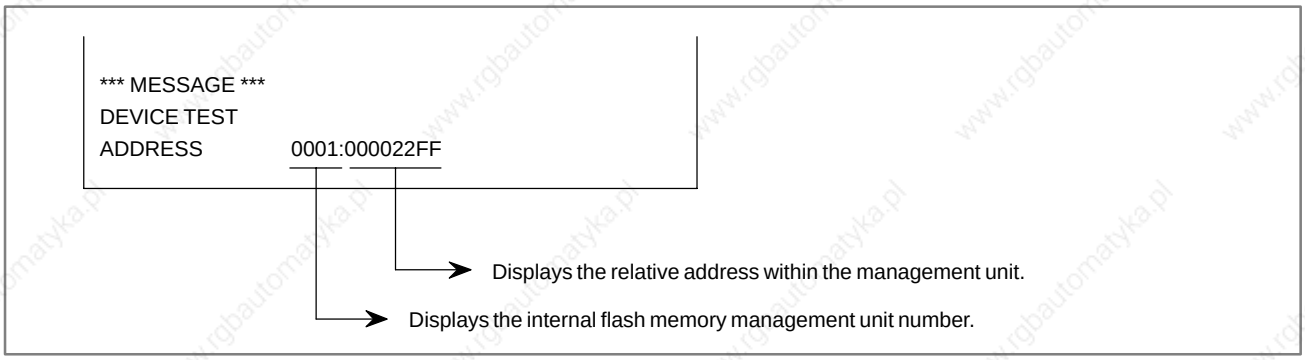
● Note

(1) Display of counters during the loading of SYSTEM DATA

- During access to the memory card



- During access to flash memory (FROM)



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(2) File name in flash ROM

The BOOT SYSTEM distinguishes between files in flash ROM based on the ID internal to the header. If flash ROM holds a file of the same type as the file to be read from the memory card, the file in flash ROM is deleted beforehand. The table below lists the IDs internal to the header and corresponding file types. These IDs are subject to change without notice.

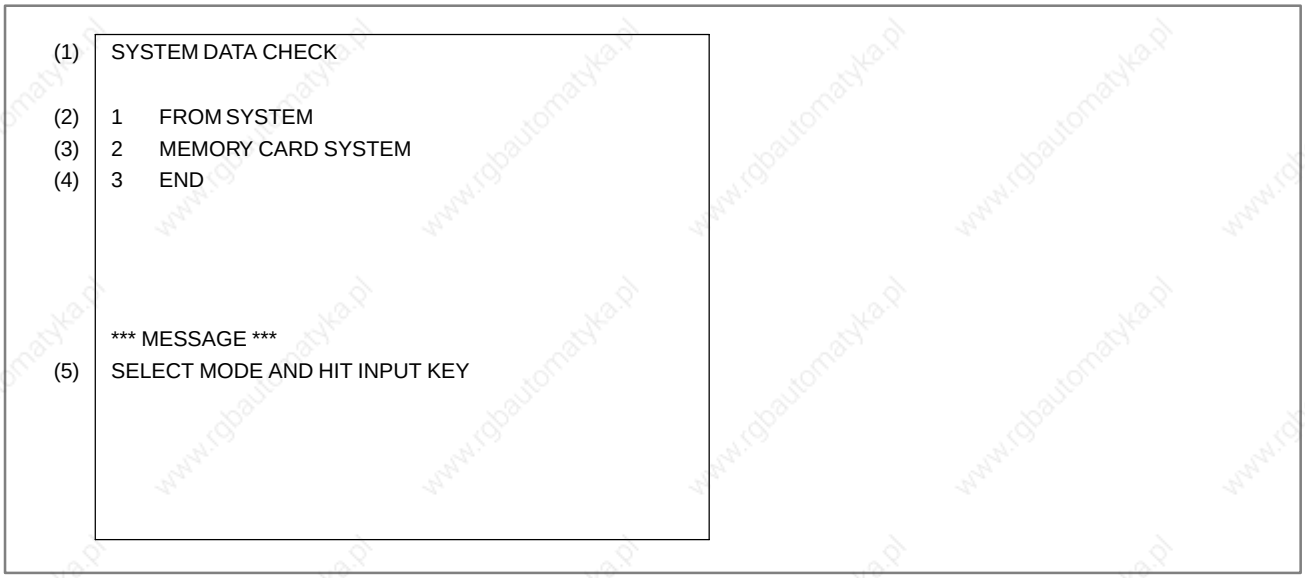
ID internal to the header	Type	File classification
NC BAS–1	CNC BASIC software 1	System file
NC BAS–2	CNC BASIC software 2	System file
DG2 SERVO	Digital servo software	System file
GRAPHIC	Graphics software	System file
NC–OPT □	CNC OPTION software	System file
PMC–NB0*	Ladder software	User file

A.2.2 SYSTEM DATA CHECK Screen

- **Description**

This screen displays a list of files in flash ROM or on a memory card, the number of 128KB management units of each file, and the software series/version.
In addition, it is used to delete user files from flash ROM.

- **Screen configuration**



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- **Explanation of each display line**

(1) Line indicating the title.
(2) Checks the ROM data stored in flash memory.
(3) Checks the ROM data stored on the memory card.
(4) Returns the system to the MAIN MENU.
(5) Line indicating a message (such as a simple operation guide).

- **Procedure**

Select the desired action using the cursor keys (↑ and ↓). The cursor moves according to the key operation. Position the cursor to the desired function and press the INPUT key.

A.2.2.1
FROM SYSTEM screen



- **Explanation of each display line**

(1) Line indicating the title.
(2) Line indicating that the screen is displaying the flash memory directory.
(3) ROM file names are displayed. When a file name is selected, detailed information is displayed.

The number enclosed in parentheses indicates the number of management units being used (128KB per management unit).

(4) Exits from the screen when selected.

If the entire file list cannot be displayed, “END” is not displayed. To display the next page of the list, press the PAGE key ↓ PAGE.

When the second or subsequent page is displayed, press the PAGE key ↑ PAGE to display the previous page.

(5) Line indicating a message (such as a simple operation guide).

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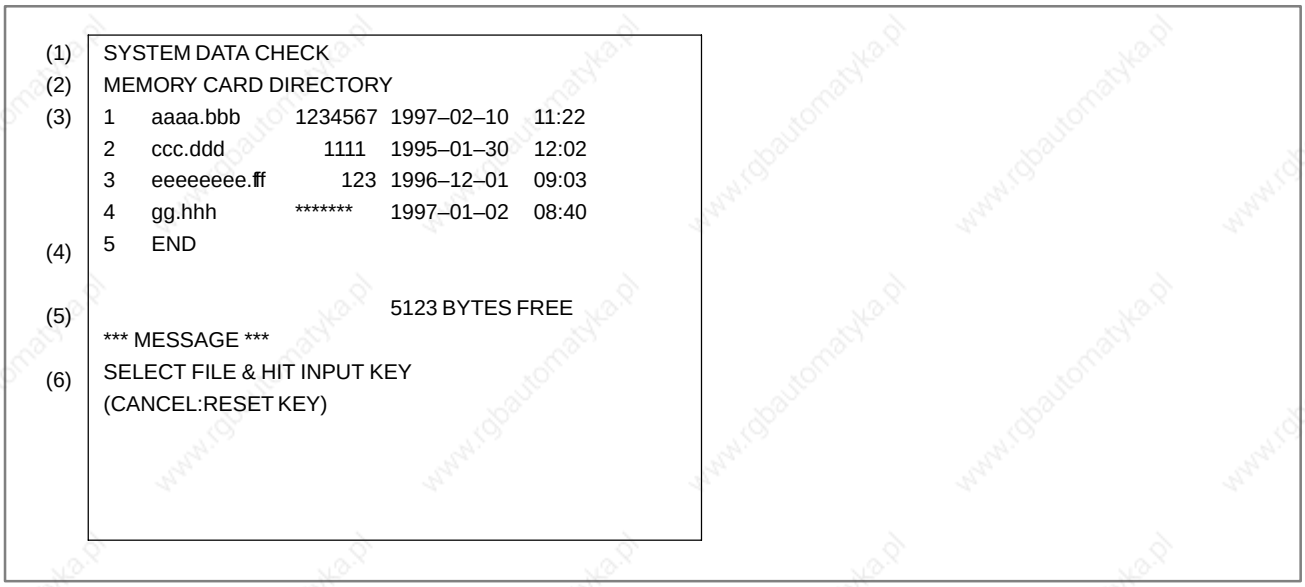
- **Procedure**

Select the file to be checked, using the cursor keys (↑ and ↓) and press the INPUT key.

The system switches to the ROM FILE CHECK screen, that indicates detailed information.

To exit from the menu, select “END” and press the INPUT key. The system returns to the MAIN MENU.

A.2.2.2 MEMORY CARD SYSTEM screen



- **Explanation of each display line**

(1) Line indicating the title.

(2) Line indicating that the screen displays the memory card directory.

(3) The names of the files stored on the memory card are displayed. When a file name is selected, detailed information is displayed. The file size, date, and other information are the same as those displayed on the SYSTEM DATA LOADING screen.

(4) Exits from this screen.

If the entire file list cannot be displayed, “END” is not displayed. To display the next page of the list, press the PAGE key ↓. When the second or subsequent page is displayed, press the PAGE key ↑ to display the previous page.

(5) Displays the amount of free capacity on the memory card.

(6) Line indicating a message (such as a simple operation guide).

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- **Procedure**

Select the file to be checked, using the cursor keys (↑ and ↓) and press the INPUT key.

The system switches to the ROM FILE CHECK screen, that displays detailed information.

To exit from the menu, select “END” and press the INPUT key. The system returns to the MAIN MENU.

A.2.2.3 ROM FILE CHECK screen

```
(1)  SYSTEM DATA CHECK
(2)  NC BAS–1
(3)  1    xxxx nnn y zzzz
     2    xxxx nnn y zzzz
     3    xxxx nnn y zzzz
     4    xxxx nnn y zzzz
     5    xxxx nnn y zzzz
     6    xxxx nnn y zzzz
     7    xxxx nnn y zzzz
     8    xxxx nnn y zzzz

     *** MESSAGE ***
(4)  HIT INPUT KEY
```

- **Explanation of each display line**

(1) Line indicating the title.

(2) Displays the name of the file to be checked.

(3) For each management unit, the following items of information are displayed:

xxxx: Series

nnn: ROM number

y: Version

zzzz: Internal management unit number (displayed for flash memory only)

The maximum number of management units that a single line can use is 16.

For a check result that cannot be displayed, “–” is displayed instead.

(4) Displays a message for exiting from this screen.

- **Procedure**

To exit from this screen, press the INPUT key.

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● **Note**

(1) Parity information for system and user files

System files on flash ROM, which have names such as “NC BAS–1” and “DG2SERVO,” have parity information embedded for each management unit. If non–ASCII code characters or an underscore “_” is displayed in the parity field when a file name is displayed on the check screen, the flash ROM may have been destroyed or a damaged file may have been loaded. Retry loading the file from the memory card.

User files, which have names such as “PMC–NB0A,” do not have any information embedded for any management unit. Non–ASCII code characters and an underscore “_” may be displayed in the series and version information display, but this does not indicate that the file is damaged.

A.2.2.4 Deleting user files from flash memory

User files can be deleted from flash memory.
System files are protected so that they are not erased accidentally. It is possible to overwrite system files using SYSTEM DATA LOADING.

(1) Select the SYSTEM DATA CHECK function of the system monitor, then select FROM SYSTEM to display a list of files in flash memory.

(2) Position the cursor to the user file to be erased, then press the DELETE key.

(3) The prompt “DELETE OK?” appears.

(4) To delete the file, press the INPUT key. Otherwise, press the CAN key.

When the INPUT key is pressed, the file is erased.

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A.2.3 SYSTEM DATA SAVE Screen

- **Description**

This screen is used to download user files from flash ROM to a memory card. Only user files can be downloaded from flash ROM to a memory card. System files cannot be saved.

- **Screen configuration**



- **Explanation of each display line**

(1) Line indicating the title

(2) Line indicating that the screen is displaying the flash memory directory

(3) ROM file names are displayed. After selecting a file name, perform the operation below.
The number enclosed in parentheses indicates the number of management units being used (128KB per management unit).

(4) Terminate processing upon selecting a menu.
If the entire file list cannot be displayed, “END” is not displayed. To display the next page of the list, press the PAGE key [PAGE↓].
When the second or subsequent page is displayed, press the PAGE key [PAGE↑] to display the previous page.

(5) Line indicating a message (such as a simple operation guide).

- **Procedure**

Select the file to be saved to a memory card, using the cursor keys ([↑] and [↓]) and press the [INPUT] key. The message line displays “INPUT FILE NAME (CAN:RESET).” Enter the file name that the file will be assigned on the memory card.

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If a file with the same file name already exists on the memory card, “ALREADY FILE EXIST” and “OK? INPUT/CANCEL” appear. To overwrite the file, press the INPUT key. Otherwise, press the CAN key.

To exit from the save screen, select “END” and press the INPUT key. The system returns to the MAIN MENU.

- **Notes**

(1) Difference between system files and user files on the SYSTEM DATA SAVE screen
System files cannot be saved using SYSTEM DATA SAVE. Only user files can be saved.

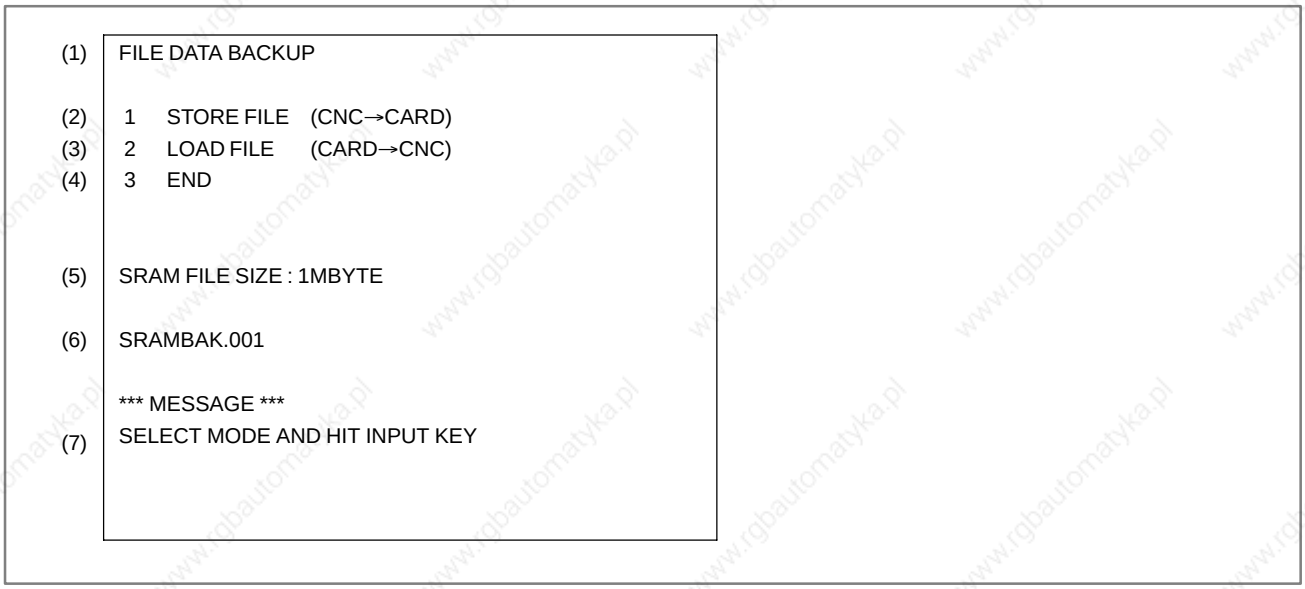
(2) Save file name
The same restrictions as those imposed on MS–DOS file names are imposed on the save file name. (File name of up to eight characters + Extension of up to three characters)

A.2.4 FILE DATA BACKUP Screen

- **Description**

With this screen, SRAM data (such as parameters and programs) that is held even when the power to the CNC is turned off, can be saved to or restored from the memory card in a batch.

- **Screen configuration**



- **Explanation of each display line**

(1) Line displaying the title
(2) When this item is selected, data is saved as a batch.
(3) When this item is selected, data is restored as a batch.
(4) When this item is selected, processing is terminated.
(5) The size of the file SRAM is displayed (after an action is selected.)

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(6) The name of the file currently being saved or loaded is displayed (after an action starts).

(7) Line indicating a message (such as a simple operation guide).

- **Procedure (outline)**

To save all the backup data files (file SRAM), select STORE FILE. To restore all the backup data files, select LOAD FILE. To exit from the screen, select END. Each action is executed by first selecting it using the cursor keys (↑ and ↓) and pressing the INPUT key.

When STORE FILE or LOAD FILE is selected, the size of the currently mounted file SRAM is displayed. To continue, press the INPUT key. Otherwise, press the CAN key.

CAUTIONS

1 A backup file is created with file name SRAMBAK.xxx, where xxx is a number between 001 and 999.
On the first memory card, a backup file is created as SRAMBAK.001. If all the backup data cannot be saved to a single card, the rest of the file is saved to the second memory card, as SRAMBAK.002.
In this way, data can be backed up to up to 999 memory cards.

2 Before saving backup data to a memory card, check that the memory card does not contain a file with file name SRAMBAK.xxx.
A list of file names on a memory card can be viewed by using the SYSTEM DATA LOADING function.

3 Use formatted memory cards for backup.

- **Save operation**

The following explains the procedure for saving all backup data.

(1) From the FILE DATA BACKUP screen, select STORE FILE.

(2) The message line displays “SET MEMORY CARD NO.001” and “HIT INPUT KEY.” Insert the first memory card and press the INPUT key. To cancel the save operation, press the RESET key.

(3) While data is being saved, “STORE TO MEMORY CARD” is displayed. Next to the message, the amount of data that has been saved and the total amount of backup data to be saved are displayed.
If all the data cannot be saved to a single memory card, the message line displays “SET MEMORY CARD NO.002” and “HIT INPUT KEY.” Without turning off the power, insert the second memory card and press the INPUT key. To cancel the save operation, press the RESET key.

(4) In this way, backup data can be saved to up to 999 memory cards.

(5) Once the save operation is complete, the message line displays “STORE FILE COMPLETE” and “HIT INPUT KEY.” Press the INPUT key to exit from the screen.

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CAUTIONS

1 Once the save operation has been started, the memory card replacement prompt appears (for up to 999 memory cards) until all the backup data can be saved normally.
To cancel the save operation once it is started, press the RESET key when “SET MEMORY CARD NO.xxx” and “HIT INPUT KEY” are displayed.
2 The files used to save backup data are assigned the following names:

First card	:	SRAMBAK.001
Second card	:	SRAMBAK.002
	:	
998th card	:	SRAMBAK.998
999th card	:	SRAMBAK.999

3 Check that none of the memory cards used for backup contains a file with the same name as the corresponding file.
4 For an explanation of the items displayed during the save operation, see “Save/restore display.”

- **Restore operation**

The following explains the procedure for restoring all backup data.

(1) From the FILE DATA BACKUP screen, select LOAD FILE.

(2) The message line displays “SET MEMORY CARD INCLUDING SRAMBACK.001” and “HIT INPUT KEY.” Insert the first memory card, which contains SRAMBAK.001, and press the INPUT key. To cancel the restore operation, press the RESET key.

If an error occurs, such as the absence of the specified file on the memory card, the error is displayed on the message line. Proceed according to the instructions indicated by the message.

(“HIT INPUT KEY” is displayed. By pressing the INPUT key, processing is resumed.)

(3) While data is being restored, “LOADING FROM MEMORY CARD” is displayed. Next to the message, the amount of data that has been loaded and the total amount of backup data to be loaded are displayed.

If all the data cannot be restored from a single memory card, the message line displays “SET MEMORY CARD INCLUDING SRAMBAK.002” and “HIT INPUT KEY.” Without turning the power off, insert the second memory card and press the INPUT key. To cancel the restore operation, press the RESET key.

(4) In this way, backup data can be restored from up to 999 memory cards.

(5) Once loading is complete, the message line displays “LOAD FILE COMPLETE” and “HIT INPUT KEY.” Press the INPUT key to exit from the screen.

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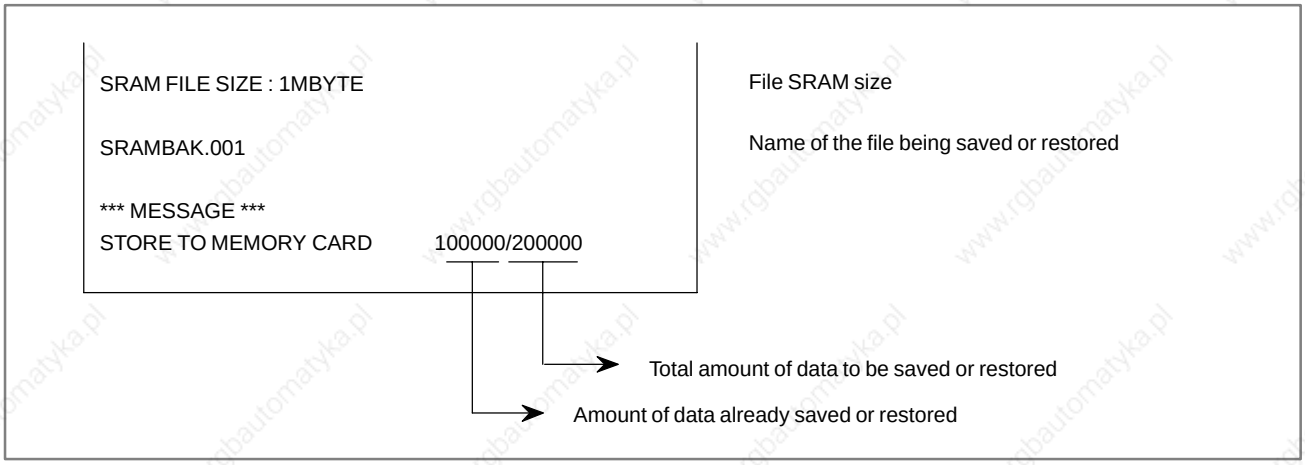
CAUTIONS

1 Once the restore operation is started, the memory card replacement prompt appears (for up to 999 memory cards) until all the backup data has been restored normally.
To cancel a restore operation once it is started, press the RESET key when “SET MEMORY CARD INCLUDING SRAMBAK.xxx” and “HIT INPUT KEY” are displayed.
2 If the power is turned off during restoration, the restore operation is not completed, leaving the contents of SRAM unstable. Should this occur, repeat the restore operation.
3 For an explanation of the items displayed during a restore operation, see “Save/restore display.”
4 The file SRAM save/restore functions that use the BOOT system assume that the size of the file SRAM upon a save operation is the same as that for the restore operation. Thus, use these functions in the following cases only:
(1) All the files are to be cleared for some reason, after which they are to be restored (the file SRAM is not replaced).
(2) The file SRAM is to be replaced for some reason, and the files are to be restored, provided that the new file SRAM is of the same size.

In other cases, the correct restoration of files cannot be guaranteed.

- **Save/restore display**

When “STORE FILE” or “LOAD FILE” is selected, the size of the file SRAM is displayed on the screen.
The total size of the memory cards used to save data must be larger than the displayed size. (As a rough guide, the total size of the memory cards used must be 1.2 times greater than the displayed size.)
While data is being saved or restored, the amount of data already saved or restored, the total amount of data to be saved or restored, and the file name are displayed on the screen.



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The file SRAM size and the amount of data to be saved or restored are associated as follows:

File SRAM size	Data size
256 Kbyte	040000
512 Kbyte	080000
1 Mbyte	100000
2 Mbyte	200000
3 Mbyte	300000

A.2.5 MEMORY CARD FORMAT Screen

- **Description**

This screen is used to format memory cards. New memory cards must be formatted before they can be used. Memory cards must also be formatted if their contents are destroyed as a result of, for example, a run–down battery.



- **Explanation of each display line**

(1) Line indicating the title

(2) Line warning that all data on the memory card will be lost if the memory card is formatted

(3) Line indicating a message (such as a simple operation guide)

- **Procedure**

(1) Insert the memory card to be formatted.
At this time, disable the write protect switch.

(2) The message line displays “OK? INPUT/CANCEL.” To format a memory card, press the INPUT key. Otherwise, press the CAN key.

(3) When the INPUT key is pressed, a warning indicating that all data on the memory card will be lost appears and the message line displays “OK? INPUT/CANCEL” again. To format the memory card, press the INPUT key. Otherwise, press the CAN key.

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(4) While formatting is in progress, the message line displays "EXECUTING."

(5) Once formatting is complete, the message line displays "MEMORY CARD FORMAT HAS FINISHED" and "HIT INPUT KEY." Press the INPUT key. The system returns to the MAIN MENU.

If the CNC BASIC software is not stored in flash memory correctly, the system returns to the main menu.

A.2.6 Load Basic System

- **Function**

The boot system is terminated, and the CNC is activated.

- **Operation**

When 1:END is selected from the main menu, the boot system is terminated, and then the CNC is activated.
If the CNC BASIC software is not stored into flash memory correctly, the main menu screen reappears.

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A.3 ERROR MESSAGES AND CORRECTIVE ACTIONS

This section explains the error messages that may be displayed and the corresponding corrective actions. The error messages are arranged in alphabetical order.

Error message	Explanation and corrective action
MEMORY CARD NOT READY	A memory card is not inserted into the slot. Check that the memory card is inserted correctly.
BATTERY ALARM (MEMORY CARD)	The battery in the memory card has run down. Replace the battery.
MEMORY CARD WRITE PROTECT	The protect switch on the memory card is set to the protect position. To write data to the memory card, set the protect switch to the enable position.
ILLEGAL FORMAT FILE	
FROM NO SPACE	There is not enough free space for loading. Delete any unnecessary files from flash ROM or install a larger FROM module.
MEMORY CARD MOUNT ERROR	
MEMORY CARD DISMOUNT ERROR	The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
FILE OPEN ERROR	The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
FILE CLOSE ERROR	The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
FILE READ ERROR	The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
FILE WRITE ERROR	An error occurred when writing files to the memory card. The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
FILE CREATE ERROR	An error occurred when writing files to the memory card. The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
DIRECTORY SEARCH ERROR	The directory cannot be found.
DEVICE ERROR (XXXX)	An attempt to erase an area in flash ROM failed. Turn off the power, then start the system again. If the same message is displayed after every attempt, the flash ROM module may have been destroyed. Replace the flash ROM module.
MEMORY CARD FORMAT ERROR	The most likely causes are a run–down card battery, electrical failure, or the memory card not being inserted correctly.
ILLEGAL FILE NAME	The file name is illegal. Observe the file name restrictions.
NO MORE SPACE IN MEMORY CARD	There is not enough free space on the memory card. Delete any unnecessary files from the memory card or replace it with a memory card having sufficient free space.

If an error occurs, an explanation of the error is displayed together with the message “HIT INPUT KEY.” Read the explanation, then press the INPUT key. The system returns to the MAIN MENU.

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CAUTION

If a device failure is detected in flash memory, the message “HIT INPUT KEY” does not appear but the system stops. (Hardware replacement is required.)

CAUTION

1 Corrective action to be taken if SRAM PARITY is detected during the FILE DATA BACKUP function of BOOT

At the factory, all CNCs have their SRAM areas cleared so that they are free from parity errors upon shipping. If the CNC is dropped or jolted during transit or if it is not used for an extended period of time, say one year or longer, causing the backup battery to run down, parity errors may occur in its SRAM area. The values of the data retained in the SRAM area for which a parity error has occurred cannot be guaranteed.

A CNC may not use the entire SRAM area. A parity error can be detected by hardware only after that portion in which the error has occurred is loaded. If, therefore, a parity error occurs in a portion that is not accessed by the CNC, the CNC may continue to operate normally. The FILE DATA BACKUP function of BOOT, however, loads the entire SRAM area, such that a parity error may be detected during backup even though the CNC operates without any problem.

Strictly speaking, if this occurs, the SRAM data for the CNC is not guaranteed, and the data cannot be backed up using the FILE DATA BACKUP function of BOOT. Since the CNC may operate normally, it is recommended that the necessary data be backed up using a floppy cassette or handy file, all data be cleared, and the backed up data be restored to the CNC. Once all the data is cleared, the parity error will be removed and the FILE DATA BACKUP function of BOOT can be used.

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B ALARM LIST

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B.1 PROGRAM ERRORS/ALARMS ON PROGRAM AND OPERATION (P/S ALARM)

Number	Message	Contents
PS0001	AXIS CONTROL MODE ILLEGAL	Illegal axis control mode
PS0003	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.
PS0006	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.
PS0007	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.
PS0010	IMPROPER G–CODE	An illegal Code was specified.
PS0011	IMPROPER NC–ADDRESS	An illegal address was specified, or parameter 1020 is not set.
PS0012	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.
PS0013	ILLEGAL POS. OF PROGRAM NO.	Address O or N is specified in an illegal location (e.g. after a macro statement).
PS0014	ILLEGAL FORMAT OF PROGRAM NO.	Address O or N is not followed by a number.
PS0015	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.
PS0016	EOB NOT FOUND	EOB (End of Block) code is missing at the end of a program input in the MDI mode.
PS0017	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.
PS0059	COMMAND IN BUFFERING MODE	The manual intervention compensation request signal MIGET became “1” when a SAKIYOMI 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.
PS0060	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.
PS0076	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.

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PS0077	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.
PS0079	PROGRAM FILE NOT FOUND	The program of the specified file No. is not registered in an external device. (external device subprogram call)
PS0080	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.
PS0081	EXT DEVICE SUB PROGRAM CALL MODE ERROR	The external device subprogram call is not possible in this mode.
PS0090	DUPLICATE NC, MACRO STATEMENT	An NC statement and macro statement were specified in the same block.
PS0091	DUPLICATE SUB–CALL WORD	More than one subprogram call instruction was specified in the same block.
PS0092	DUPLICATE MACRO–CALL WORD	More than one macro call instruction was specified in the same block.
PS0093	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.
PS0094	USE 'G' AS ARGUMENT	Address G was used as the argument of a custom macro call. Address G can be used as the argument in individual block call (G66.1).
PS0095	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.
PS0096	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.
PS0097	TOO LONG VARIABLE NAME	The specified variable name is too long.
PS0098	NO VARIABLE NAME	The specified variable name cannot be used as it is not registered.
PS0099	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.
PS0100	CANCEL WITHOUT MODAL CALL	Call mode cancel (G67) was specified even though macro continuous–state call mode (G66) was not in effect.
PS0101	ILLEGAL CNC STATEMENT IRT.	An interrupt was made in a state where a custom macro interrupt containing a move instruction could not be executed.
PS0110	OVERFLOW: INTEGER	An integer went out of range during arithmetic calculations.
PS0111	OVERFLOW: FLOATING	A decimal point (floating point number format data) went out of range during arithmetic calculations.
PS0112	ZERO DIVIDE	An attempt was made to divide by zero in a custom macro.
PS0114	VARIABLE NO. OUT OF RANGE	An illegal No. was specified in a local variable, common variable or a system variable in a custom macro. A non–existent custom macro variable No. was specified in the EGB axis skip function (G31.8), or there are not enough custom macro variables for storing the skip position.
PS0115	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.

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PS0116	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.
PS0118	TOO MANY BRACKET NESTING	Too many brackets “[ ]” were nested in a custom macro. The nesting level including function brackets is 5.
PS0119	ARGUMENT VALUE OUT OF RANGE	The value of an argument in a custom macro function is out of range.
PS0120	ILLEGAL ARGUMENT FORMAT	The specified argument in the argument function (ATAN, POW) is in error.
PS0121	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.
PS0122	TOO MANY MACRO NESTING	Too many macro calls were nested in a custom macro. The nesting level is 5.
PS0123	MISSING END STATEMENT	The END instruction corresponding to the DO instruction was missing in a custom macro.
PS0124	MISSING DO STATEMENT	The DO instruction corresponding to the END instruction was missing in a custom macro.
PS0125	ILLEGAL EXPRESSION FORMAT	The format used in an expression in a custom macro statement is in error. The parameter tape format is in error.
PS0126	ILLEGAL LOOP NUMBER	DO and END Nos. in a custom macro are in error, or exceed the permissible range (valid range: 1 to 3).
PS0128	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).
PS0131	MISSING OPEN BRACKET	The number of left brackets ([) is less than the number of right brackets (]) in a custom macro statement.
PS0132	MISSING CLOSE BRACKET	The number of right brackets (]) is less than the number of left brackets ([) in a custom macro statement.
PS0133	MISSING ‘=’	An equal sign (=) is missing in the arithmetic calculation instruction in a custom macro statement.
PS0134	MISSING ‘,’	A delimiter (,) is missing in a custom macro statement.
PS0135	MACRO STATEMENT FORMAT ERROR	The format used in a macro statement in a custom macro is in error.
PS0137	IF STATEMENT FORMAT ERROR	The format used in the IF statement in a custom macro is in error.
PS0138	WHILE STATEMENT FORMAT ERROR	The format used in the WHILE statement in a custom macro is in error.
PS0139	SETVN STATEMENT FORMAT ERROR	The format used in the SETVN statement in a custom macro is in error.
PS0141	ILLEGAL CHARACTER IN VAR. NAME	The SETVN statement in a custom macro contacts a character that cannot be used in a variable name.
PS0142	TOO LONG V–NAME (SETVN)	The variable name used in a SETVN statement in a custom macro exceeds 8 characters.
PS0143	BPRNT/DPRNT STATEMENT FORMAT ERROR	The format used in the BPRINT statement or DPRINT statement is in error.
PS0144	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.

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PS0145	G10.1 TIME OUT	The response to a G10.1 instruction was not received from the PMC within the specified time limit.
PS0146	G10.1 FORMAT ERROR	The G10.1 instruction format is in error.
PS0150	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.
PS0151	CANNOT USE G31	The alarm occurs in the following cases: · The G31 code cannot be specified. The G code in group 07 (e.g. cutter compensation) is not canceled. · The torque limit was not specified by the torque limit skip instruction (G31 P98/P99). Either specify the torque limit in the PMC window, or specify torque limit override by address Q.
PS0152	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.
PS0153	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.
PS0160	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.
PS0180	ALL PARALLEL AXES IN PARKING	All of the axis specified for automatic operation are parked.
PS0181	ZERO RETURN NOT FINISHED	A move instruction was issued to an axis in which the zero return instruction was instructed once after the power was turned ON. Execute operation after zero return by manual operation or the G28 code. This alarm can be suppressed for the machine–locked axis by setting parameter No. 1200#6 is set to “1”.
PS0182	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).
PS0183	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.
PS0184	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.
PS0185	ZERO RETURN CHECK (G27) ERROR	The axis specified in G27 has not returned to zero. Reprogram so that the axis returns to zero.

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PS0186	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 involuteinterpolation. To enable programming of 3 or more axes, the helical interpolation option must be added to each of the relevant axes.
PS0187	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 programmedlead.
PS0188	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.
PS0190	PARAMETER ZERO (CUT MAX)	The maximum cutting feedrate parameter No. 1422 has been set to 0.
PS0191	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.
PS0193	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.
PS0194	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 pulse coder.
PS0195	ILLEGAL AXIS SELECTED (G96)	An illegal value was specified in P in a G96 block or parameter No. 5844.
PS0196	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.
PS0200	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”).
PS0202	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.
PS0213	ILLEGAL USE OF G12.1/G13.1	The axis No. of plane selection parameter No. 1032 (linear axis) and No. 1033 (axis of rotation) in the polar coordinate interpolation mode is out of range (1 to number of controlled axes).

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PS0214	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 interpolationmode. 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.
PS0215	ILLEGAL COMMAND IN G10.6	The retract command was specified in the long axis for threading when retract was started by the threading block.
PS0217	ILLEGAL OFFSET VALUE	Illegal offset No.
PS0223	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.
PS0270	CRC: START_UP /CANCEL BY CIRCLE	An attempt was made to execute the cutter compensation startup or cancel block in the circular interpolation mode or involute interpolation mode.
PS0271	CRC: PLANE CHANGE	An attempt was made to change the plane in the cutter compensation mode. To change the plane, cancel the cutter compensation mode.
PS0272	CRC: INTERFERENCE	The depth of the cut is too great during cutter compensation. Check the program. The criteria for judging interference are as follows: (1) The direction of movement of the programmed block differs from the direction of movement of the corresponding tool center path block by 90° or more or 270° or less. The check in this case can be disabled by setting CNC parameter No. 6001#1 to “1”. (2) In the case of an arc, the difference in angle between the start and end points of the programmed block differs by 180° or more with the difference in angle between the start and end points of the corresponding tool center path block.
PS0273	CRC: MOTION IN G39	Corner circular interpolation (G93) during cutter compensation has been specified not as an individual instruction but together with a move instruction.
PS0275	CRC: MDI MODE	Cutter compensation has been specified in the MDI mode. This alarm is also generated when the AIM parameter AIM No. 6005#1 is set to 1.
PS0276	CRC: NO INTERSECTION	There is not point of intersection of the compensated tool center path during cutter compensation.
PS0277	CRC: NO AVOIDANCE	Interference cannot be avoided as there no interference avoidance vector has been specified for the interference check avoidance function during cutter compensation.
PS0278	CRC: DANGEROUS AVOIDANCE	Danger was judged when avoidance operation was executed by the interference check avoidance function during cutter compensation.
PS0279	CRC: INTERFERENCE TO AVD.	Interference occurred again even though the interference avoidance vector has been calculated by the interference check avoidance function during cutter compensation.
PS0280	ILLEGAL COMMAND IN SPIRAL	R was specified in the program block; 4 or more axes were specified in the program block; or the direction of the acceleration/deceleration vector on the specified radius is opposite to the direction of the end point.

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PS0281	OVER TOLERANCE OF END POINT IN SPIRAL	The distance between the positions of the specified end point and the end point calculated from the programmed block exceeds the value set to parameter No. 2511. Either change the end point to be specified, or set a larger value to parameter No. 2511.
PS0282	ILLEGAL COMMAND IN 3–D OFFSET	An illegal G code was specified in the 3–dimensional tool offset mode.
PS0283	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.
PS0298	ILLEGAL INCH/METRIC CONVERSION	An error occurred during inch/metric switching.
PS0299	ILLEGAL ZERO RETURN COMMAND	A value other than 2 to 4 was specified to address P in the No. 2 to No. 4 zero return instruction.
PS0300	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.
PS0301	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.
PS0302	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. This alarm is also generated when illegal word values are found. An invalid address R value is specified in a pattern program for each machining purpose on the high–speed high–precision setting screen.
PS0303	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.
PS0304	TOO MANY DIGIT	Data with too many digits was found while loading parameters or pitch error compensation data from a tape.
PS0305	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.
PS0306	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.
PS0307	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.
PS0308	MISSING DATA	An address not followed by a numeric value was found while loading parameters or pitch error compensation data from a tape.
PS0330	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.
PS0332	DATA WRITE LOCK ERROR	Could not load data while loading parameters, pitch error compensation data and work coordinate data from tape.
PS0333	DATA WRITE ERROR	Could not write data while loading data from tape.
PS0360	PARAMETER OUT OF RANGE (TLAC)	Illegal parameter setting. (Set value is out of range.)

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PS0361	PARAMTER SETTING ERROR 1 (TLAC)	Illegal parameter setting. (axis of rotation setting)
PS0362	PARAMETER SETTING ERROR 2 (TLAC)	Illegal parameter setting (tool axis setting)
PS0370	PARAMETER SETTING ERROR (DM3H–1)	Out–of–range data was set during setting of the 3–dimensional handle feed parameter.
PS0371	PARAMETER SETTING ERROR (DM3H–2)	An illegal axis of rotation was set during setting of the 3–dimensional handle feed parameter.
PS0372	PARAMETAR SETTING ERROR (DM3H–3)	An illegal master axis was set during setting of the 3–dimensional handle feed parameter.
PS0373	PARAMETER SETTING ERROR (DM3H–4)	An illegal parallel axis or twin table was set during setting of the 3–dimensional handle feed parameter.
PS0400	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.
PS0410	G37 IMPROPER AXIS COMMAND	No axis or 2 or more axes were specified in the automatic tool measurement instruction (G37) block.
PS0411	G37 SPECIFIED WITH H CODE	An H code was specified in the same block as an automatic tool–length measurement instruction (G37).
PS0412	G37 OFFSET NO. UNASSIGNED	No H code was specified in the automatic tool measurement instruction (G37) block.
PS0415	G37 MEASURING POSITION REACHED SIGNAL IS NOT PROPERLY INPUT	The measurement position arrival signal became “1” before or after the area specified by parameter No. 7331 in automatic tool length measurement (G37).
PS0421	SETTING COMMAND ERROR	The instruction for setting tool data (G10L70 to G11, G10L71 to G11) is in error.
PS0422	NOT FOUND TOOL DATA	The specified tool No. pot No. , for the tool No. , tool length compensation data, and cutter compensation data has not been set.
PS0423	TOOL DATA WRITE ERROR	Writing occurred simultaneously on tool set data by a tool No.
PS0424	OVER MAXIMUM TOOL DATA	An attempt was made to set tool data exceeding the maximum number of tool data sets.
PS0425	NOT DELETE TOOL DATA IN OPERATION	Tool data cannot be deleted.
PS0429	MISSING VALUE AT CNR, CHF	The specified movement distance is less than the specified chamfering or cornering amount in a block in which chamfering or cornering is specified. Review the program instructions.
PS0431	MISSING MOVE AFTER CNR, CHF	The move direction or distance in the block following the block in which chamfering or cornering is specified is illegal. Review the program instructions.
PS0437	ILLEGAL LIFE GROUP NUMBER	A tool group number exceeded the maximum value. The tool group No. (P after G10 L3:) or the group No. assigned by the T code instruction for tool life management in the machining program exceeded the maximum value.
PS0438	GROUP NOT FOUND AT LIFE DATA	A tool group specified in the machining program was not set in the tool life management data.
PS0439	OVER MAXIMUM TOOL NUMBER	The number of tool specified in a single tool group exceeds the maximum allowed number.

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PS0440	T COMMAND NOT FOUND	No T command was specified in a program which sets a tool group. The same block as M06 in the machining program does not contain a T command in tool change method D (parameters CT2=2, CT1=1: No. 7401#1/#0).
PS0441	NOT USING TOOL IN LIFE GROUP	An H99 instruction, D99 instruction or the H/D code specified in parameters (No. 7443, 7444) has been specified even though no tool that belongs to a group was being used.
PS0442	ILLEGAL T COMMAND AT M06	The tool group of the tool specified in the tool instruction (return tool group) after the M06 instruction in the machining program does not match the current tool group in tool change method A (parameters CT2=0, CT1=0: No. 7401#1/#0). This alarm can be suppressed by setting ABT parameter No. 7400#6 to “1”.
PS0443	P, L COMMAND NOT FOUND	No P (group No.) or L (tool life) was specified at the beginning of a program that sets a tool group when tool data in a group was being loaded during loading tool life management data.
PS0444	OVER MAXIMUM LIFE GROUP	The number of blocks in which P (group No.) or L (tool life) is instructed exceeding the maximum number of groups was found while loading tool life management data.
PS0445	ILLEGAL L COMMAND	An illegal range instructed in the L (tool life) instruction was found while loading tool life management data.
PS0446	ILLEGAL H, D, T COMMAND	A value specified by T (tool No.), D (cutter compensation No.) or H (tool length offset No.) exceeding the maximum value was found while loading tool life management data.
PS0448	ILLEGAL FORMAT AT LIFE DATA	An illegal address was specified in a program (G10 L3: to G11;) that sets a tool group. Allowable addresses are P (group No.), L (tool life) and T (tool No.).
PS0449	ILLEGAL TOOL LIFE DATA	Tool life management data is damaged for some reason. Reload the tool group and the corresponding tool data by G10 L3; or MDI input.
PS0450	IN PMC AXIS MODE	The PMC axis control mode, the CNC issued a move instruction for the PMC axis. A move instruction can be issued on one axis from only either the PMC or the CNC. This alarm is generated when a move instruction is issued from both. This alarm can be suppressed by setting NPA of parameter No. 2405#5 to “1”.
PS0470	G40.1 to G42.1 PARAMETER MISS	The normal line direction control axes parameter settings are erroneous. · Set the normal line direction control axis setting in NDC parameter No. 1006#6. Only one axis can be set to “1”; this is not possible for multiple axes. · Set the axis for which NDC parameter No. 1006#6 is set to “1” to axis of rotation (ROT parameter No. 1006#6=1, and parameter No. 1022=2). · Set the feedrate when rotation of the normal line direction control axis is set to parameter No. 1472 within the range 1 to 5000 degrees/min.
PS0472	ILL–COMMAND IN G81.1 MODE	Either G81.1 was instructed again while in the chopping mode, or a move instruction was issued to the chopping axis. To change the chopping conditions, cancel G80 and specify G81.1 again.
PS0508	DUPLICATE M–CODE (INDEX TABLE REVERSING)	A function to which the same code as this M code is set exists. (indexing of index table)
PS0509	DUPLICATE M–CODE (SPOS AXIS ORIENTATION)	A function to which the same code as this M code is set exists. (spindle positioning, orientation)

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PS0510	DUPLICATE M–CODE (SPOS AXIS POSITIONING)	A function to which the same code as this M code is set exists. (spindle positioning, positioning)
PS0511	DUPLICATE M–CODE (SPOS AXIS RELEASE)	A function to which the same code as this M code is set exists. (spindle positioning, mode cancel)
PS0531	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.
PS0532	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.
PS0533	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).
PS0534	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).
PS0535	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).
PS0536	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).
PS0537	ADDRESS F UNDERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too slow.
PS0538	ADDRESS F OVERFLOW (OVERRIDE)	The speed obtained by applying override to the F instruction is too fast.
PS0539	ADDRESS E UNDERFLOW (OVERRIDE)	The speed obtained by applying override to the E instruction is too slow.
PS0540	ADDRESS E OVERFLOW (OVERRIDE)	The speed obtained by applying override to the E instruction is too fast.
PS0541	S–CODE ZERO	“0” has been instructed as the S code.
PS0542	FEED ZERO (E–CODE)	“0” has been instructed as the feedrate (E code).
PS0543	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 position function and the rigid tapping function.
PS0548	ILLGAL AXIS MODE	The spindle positioning axis/Cs contour control axis was specified during switching of the controlled axis mode.
PS0551	DUPLICATE SPOS AXIS COMMAND	Two or more axes were specified on a single spindle positioning axis. (e.g. positioning by an M code or positioning by an axis address)
PS0552	SPOS AXIS – OTHER AXIS SAME TIME	The spindle positioning axis and another axis are specified in the same block.
PS0553	SPOS AXIS ILLEGAL SEQUENCE NUMBER	Operation sequence pattern setting parameter No. 5895 for spindle positioning is out of range.
PS0555	SPOS AXIS DUPLICATE AXIS COMMAND	The spindle positioning instruction has been issued to a spindle that is currently moving or which the instructed spindle positioning sequence has not completed.
PS0561	ILLEGAL INDEXING ANGLE	The specified angle of rotation is not an integer multiple of the minimum indexing angle.
PS0562	INDEX TABLE AXIS COMMAND CAN NOT START	The specified index table indexing sequence is illegal.
PS0563	EXCESS ERROR OF INDEXING ANGLE	The specified index table indexing angle is illegal.
PS0564	INDEX TABLE AXIS – OTHER AXIS SAME TIME	The index table indexing axis and another axis have been specified in the same block.

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PS0566	INDEX TABLE AXIS DUPLICATE AXIS MODE	A move instruction has been issued to an axis that is not an index table indexing axis.
PS0567	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.
PS0571	CS AXIS DUPLICATE AXIS MODE	The Cs contour control axis has been specified on an axis that is not in the Cs contour control mode.
PS0572	CS AXIS DUPLICATE AXIS COMMAND	A currently moving axis has been specified as the Cs contour control axis.
PS0580	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.
PS0581	ENCODE ALARM (PARAMETER)	When an attempt was made to punch an encrypted tape, the punch code parameter was set to EIA. Set EIA parameter No. 0#4 to “0”. An incorrect instruction was specified for program encryption or protection. This alarm is also generated when the protected range is edited or deleted in a program–locked state. The protected range is defined from the program No. preset by parameter No. 2212 up to the program No. preset to parameter No. 2213. When both parameters are set to “0”, the protected range becomes O9000 to O9999.
PS0590	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.
PS0591	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”.
PS0592	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.
PS0593	EGB PARAMETER SETTING ERROR	Erroneous EGB parameter setting (1) The setting of SYN parameter No. 1955#0 is incorrect. (2) The slave axes set by the G81 code are not set to rotary axes. (ROT and ROS parameter Nos. 1006#0, #1) (3) The number of pulses (parameter Nos. 5596, 5597) per rotation is not set. (4) Parameter No. 5995 is not set by the hobbing machine compatible instruction.
PS0594	EGB FORMAT ERROR	Format error in the block in which EGB was specified (1) Nothing is specified to the master axis or slave axes in the G81.5 block. (2) Out of range data is specified to the master axis or slave axes in the G81.5 block. (3) Number of threads T is not specified in the G81 block. (4) Out of range data is specified by one of T, L, P or Q codes in the G81 block. (5) Only one of P or Q codes is specified in the G81 block.

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Number	Message	Contents
PS0595	ILL–COMMAND IN EGB MODE	An illegal instruction was issued during synchronization by EGB. (1) Slave axis was specified by G27, G28, G29, G30, G30.1, G33 and G53 G codes. (2) Inch/metric conversion was specified by G20 or G21 G codes.
PS0596	EGB OVERFLOW	An overflow occurred during calculation of the synchronization coefficient.
PS0597	EGB AUTO PHASE FORMAT ERROR	Format error in block in which G80 or G81 was specified by EGB automatic phase alignment (1) R is data outside of the instruction range.
PS0598	EGB AUTO PHASE PARAMETER SETTING ERROR	Erroneous parameter settings relating to EGB automatic phase alignment (1) The acceleration/deceleration parameter is invalid. (2) The automatic phase alignment parameter is invalid.
PS0610	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.
PS0611	ILLEGAL G–CODE USE (G07.1 MODE)	A G code was specified that cannot be specified in the cylindrical interpolationmode. 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.
PS0618	ILLEGAL P–DATA (WHEEL WEAR COMPENSATION)	The P data for selecting the compensation center in grinding wheel wear compensation is illegal.
PS0619	ILLEGAL AXIS(WHEEL WEAR COMPENSATION)	A compensation axis has been changed in grinding wheel wear compensation mode or compensation vector maintenance mode. Alternatively, the settings in parameter Nos. 6056 and 6057 that determine the target axes for grinding wheel wear compensation are illegal.
PS0625	TOO MANY G68 NESTING	3–dimensional coordinate conversion was specified more than twice. Cancel 3–dimensional coordinate conversion before executing new coordinate conversion.
PS0626	G68 FORMAT ERROR	There is a format error in the 3–dimensional coordinate conversion block. The alarm occurs in the following cases: (1) When I, J or K is missing from the block in which 3–dimensional coordinate conversion is specified (when the coordinate rotation option is not available) (2) When I, J and K specified in the block in which 3–dimensional coordinate conversion is specified are all “0” (3) When angle of rotation R is not specified in the block in which 3–dimensional coordinate conversion is specified
PS0645	TOO MANY G68.2 NESTING	The feature coordinate system set command was issued twice or more. To set a new feature coordinate system, cancel the old feature coordinate system, then issue the set command for the new feature coordinate system.
PS0646	G68.2 FORMAT ERROR	A value of 0 is specified in the I, J, and K commands in a feature coordinate system command block.

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PS0647	ILLEGAL USE OF G53.1	(1) The tool axis direction control command was issued before the feature coordinate system set command. Issue the tool axis direction control command in a block following the block containing the feature coordinate system set command. (2) An angle solution is not found for the rotation axis by which the tool axis direction is controlled along the Z–axis in the feature coordinate system. Set a feature coordinate system in which an angle solution is found.
PS0710	ILLEGAL COMMAND IN 3–D CIR	In the modal state in which three–dimensional circular interpolation cannot be specified, three–dimensional circular interpolation (G02.4/G03.4) was specified. A code that cannot be specified in three–dimensional circular interpolation mode was specified.
PS0712	G02.4/G03.4 FORMAT ERROR	The three–dimensional circular interpolation command (G02.4/G03.4) contains an error.
PS0713	MANUAL INTERVENTION IN G02.4/G03.4 (ABS ON)	In three–dimensional circular interpolation mode (G02.4/G03.4), manual intervention was performed when the manual absolute switch was on.
PS0805	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. [3–dimensional Tool Offset A G code that cannot be specified was specified in the 3–dimensional tool offset mode. Scaling instruction G51, skip cutting G31 and automatic tool length measurement G37 were specified.
PS0806	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.
PS0807	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.
PS0808	DEVICE DOUBLE OPENED	An attempt was made to open a device that is being accessed.
PS0809	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.
PS0895	ILLEGAL PARAMETER IN G02.3/G03.3	The parameter setting that specifies the axis on which to execute exponential interpolation is incorrect. Parameter No. 7636: Linear axis No. on which exponential interpolation is executed Parameter No. 7637: Axis of rotation No. on which exponential interpolation is executed The setting is 1 to the number of controlled axes. The same axis Nos. must not be set.

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PS0896	ILLEGAL FORMAT IN G02.3/G03.3	The format for specifying exponential interpolation is incorrect. Addresses I slope angle, J excessive torsion and setting R in exponential interpolation are not specified, or are set to “0”. The setting ranges for I and J are –89.0 to +89.0 (excluding “0”). This alarm is also generated when addresses I and J are outside of this range. When CBK parameter No. 7610#7 is set to “0”, the linear axis span value is assigned by parameter No. 7685. When the CBK parameter is set to “1”, the span value is specified by address K in the G02.3/G03.3 block. This alarm is also generated when these span values are “0”.
PS0897	ILLEGAL COMMAND IN G02.3/G03.3	An illegal value was specified in exponential interpolation. The natural logarithm parameter fell to less than “0” during exponential interpolation calculation. Review the exponential interpolation instruction.
PS0898	ILLEGAL PARAMETER IN G54.2	An illegal parameter (Nos. 6068 to 6076) was specified for fixture offset.
PS0899	ILLEGAL PARAMETER IN G43.2	An illegal parameter was specified for dynamic tool offset. Set the controlled axis number in order from the 1st to the 3rd set in parameter Nos. 6059 to 6067. If setting up to the 3rd set is not required. set parameter No. 6065 to “0”.
PS0900	G72.1 NESTING ERROR	G72.1 was specified again during G72.1 rotation copying.
PS0901	G72.2 NESTING ERROR	G72.2 was specified again during G72.2 parallel copying.
PS0935	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.
PS0936	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.
PS0937	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).
PS0990	SPL: ILLEGAL AXIS COMMAND	An illegal axis was specified for spline interpolation or smooth interpolation. This alarm is also generated when an axis other than those used for spline interpolation is specified. An “axis used for spline interpolation” refers to the axis specified in the block following the block in which the G06.1 G code is specified. When smooth interpolation is executed, the axis specified by the G5.1Q2 G code is illegal.
PS0991	SPL: ILLEGAL COMMAND	A G06.1 code was specified in a G code mode in which the instruction is not supported.
PS0992	SPL: ILLEGAL AXIS MOVING	Movement was specified for an axis other than those used for spline interpolation. This alarm is also generated, for example, when movement is specified along the Z–axis when spline interpolation along the 2 axes, X and Y, is executed in the 3–dimensional tool offset mode in which the 3 axes, X, Y and Z, are set as the offset vector components.
PS0993	SPL: CAN’T MAKE VECTOR	A 3–dimensional tool offset vector cannot be generated. · In generation of the 3–dimensional tool offset vector from P2 onwards, the previous point and the following point are on the same line, and that line is parallel with the 3–dimensional tool offset vector for the previous point. · 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 and spline interpolation.

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Number	Message	Contents
PS0995	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.
PS0996	G41.3/G40 FORMAT ERROR	(1) A move instruction was specified in a block in which the G41.3 or G40 code is specified. (2) A G or M code which suppresses buffering was specified in the block in which the G41.3 code was specified.
PS0997	ILLEGAL COMMAND IN G41.3	(1) A G code other than G00 or G01 in group 01 was specified in the G41.3 mode. (2) An offset (G code in group 07) was specified in the G41.3 mode. (3) The block following the block in which G41.3 (startup) was specified did not contain a move command.
PS0998	G41.3 ILLEGAL START_UP	(1) The G41.3 G code (startup) was specified in a group 01 mode for other than G00 and G01. (2) The angle formed by the tool direction vector and the movement direction vector was 0° or 180° degrees at startup.
PS0999	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.
PS1001	ILLEGAL ORDER (NURBS)	The specified number of levels is incorrect.
PS1002	NO KNOT COMMAND (NURBS)	Knot has not been specified, or a block not related to NURBS interpolation was specified in the NURBS interpolation mode.
PS1003	ILLEGAL AXIS COMMAND (NURBS)	An axis not specified as a control point was specified in the No. 1 block.
PS1004	ILLEGAL KNOT	There is an insufficient number of knot individual blocks.
PS1005	ILLEGAL CANCEL (NURBS)	The NURBS interpolation mode was turned OFF even though NURBS interpolation was not completed.
PS1006	ILLEGAL MODE (NURBS)	A mode that cannot be paired with the NURBS interpolation mode was specified.
PS1007	ILLEGAL MULTI–KNOT	Nested knots for each level can be specified for the start and end points.
PS1008	ILLEGAL KNOT VALUE (NURBS)	Knot is not increased TANCHO.
PS1009	ILLEGAL 1ST CONTROL POINT (NURBS)	The No. 1 control point is erroneous, or there is no continuity with the previous block.
PS1010	ILLEGAL RESTART (NURBS)	An attempt was made to resume NURBS interpolation after manual intervention with manual absolute ON.
PS1070	ILLEGAL USE OF G41.5/G42.5	(1) The parameters related to three–dimensional cutter compensation for rotary table are not specified properly. (2) An attempt was made to issue the G39 command in the mode of three–dimensional cutter compensation for rotary table (G41.5/G42.5). (3) An attempt was made to issue a move command other than G00 and G01, such as G02, at the startup of three–dimensional cutter compensation for rotary table (G41.5/G42.5).
PS1100	ILLEGAL PARAMETER OF MACHINE COMPONENT	A machine component parameter (No. 6161 to 6195 or No. 7540 to 7548) is invalid.

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B.2 BACKGROUND EDIT ALARM

Number	Message	Contents
BG0590	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.
BG0591	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”.
BG0592	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.
BG0805	ILLEGAL COMMAND	An attempt was made to specify an illegal command during I/O processing on an I/O device.
BG0806	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.
BG0807	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.
BG0808	DEVICE DOUBLE OPENED	An attempt was made to open a device that is being accessed.
BG0820	DR OFF (1)	The data set ready input signal DR of the I/O device connected to reader/punch interface 1 turned OFF.
BG0822	OVERRUN ERROR (1)	The next character was received from the I/O device connected to reader/punch interface 1 before it could read a previously received character.
BG0823	FRAMING ERROR (1)	The stop bit of the character received from the I/O device connected to reader/punch interface 1 was not detected.
BG0824	BUFFER OVERFLOW (1)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 1 even though the NC sent a stop code (DC3) during data reception.
BG0830	DR OFF (2)	The data set ready input signal DR of the I/O device connected to reader/punch interface 2 turned OFF.
BG0832	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.
BG0833	FRAMING ERROR (2)	The stop bit of the character received from the I/O device connected to reader/punch interface 2 was not detected.
BG0834	BUFFER OVERFLOW (2)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 1 even though the NC sent a stop code (DC3) during data reception.
BG0840	DR OFF (3)	The data set ready input signal DR of the I/O device connected to reader/punch interface 3 turned OFF.
BG0842	OVERRUN ERROR (3)	The next character was received from the I/O device connected to reader/punch interface 3 before it could read a previously received character.

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Number	Message	Contents
BG0843	FRAMING ERROR (3)	The stop bit of the character received from the I/O device connected to reader/punch interface 3 was not detected.
BG0844	BUFFER OVERFLOW (3)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 3 even though the NC sent a stop code (DC3) during data reception.
BG0850	DR OFF (4)	The data set ready input signal DR of the I/O device connected to reader/punch interface 4 turned OFF.
BG0852	OVERRUN ERROR (4)	The next character was received from the I/O device connected to reader/punch interface 4 before it could read a previously received character.
BG0853	FRAMING ERROR (4)	The stop bit of the character received from the I/O device connected to reader/punch interface 4 was not detected.
BG0854	BUFFER OVERFLOW (4)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 4 even though the NC sent a stop code (DC3) during data reception.
BG0860	DR OFF (MODEM CARD)	The data set ready input signal DR of the modem card was turned off.
BG0862	OVERRUN ERROR (MODEM CARD)	Before a character received from the modem card could be read, the next character was received.
BG0863	FRAMING ERROR (MODEM CARD)	The stop bit of a character received from the modem card was not detected.
BG0864	BUFFER OVERFLOW (MODEM CARD)	Although the NC sent a stop code (DC3) to the modem card when receiving data, data consisting of more than 10 characters was received.
BG0910	DEVICE DRIVER ERROR (UNDEFINED)	An error occurred during device driver control.
BG0911	V–DEVICE DRIVER ERROR (DEVICE)	An error occurred during device driver control.
BG0912	V–DEVICE DRIVER ERROR (OPEN)	An error occurred during device driver control.
BG0913	V–DEVICE DRIVER ERROR (COMMAND)	An error occurred during device driver control.
BG0914	V–DEVICE DRIVER ERROR (RANGE)	An error occurred during device driver control.
BG0915	V–DEVICE DRIVER ERROR (TEST)	An error occurred during device driver control.
BG0950	DRIVER ERROR (MEMORY CARD)	An error occurred in the memory card device driver.
BG0960	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.
BG0961	NOT READY (MEMORY CARD)	The memory card is not ready.
BG0962	CARD FULL (MEMORY CARD)	The memory card has run out of space.
BG0963	CARD PROTECTED (MEMORY CARD)	The memory card is write–protected.
BG0964	NOT MOUNTED (MEMORY CARD)	The memory card could not be mounted.
BG0965	DIRECTORY FULL (MEMORY CARD)	The file could not be generated in the root directory for the memory card.
BG0966	FILE NOT FOUND (MEMORY CARD)	The specified file could not be found on the memory card.
BG0967	FILE PROTECTED (MEMORY CARD)	The memory card is write–protected.
BG0968	ILLEGAL FILE NAME (MEMORY CARD)	Illegal memory card file name
BG0969	ILLEGAL FORMAT (MEMORY CARD)	Check the file name.

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Number	Message	Contents
BG0970	ILLEGAL CARD (MEMORY CARD)	This memory card cannot be handled.
BG0971	ERASE ERROR (MEMORY CARD)	An error occurred during memory card erase.
BG0972	BATTERY LOW (MEMORY CARD)	The memory card battery is low.
BG0973	FILE ALREADY EXIST	A file having the same name already exists on the memory card.
BG1030	NOT READY (DATA SERVER)	With the Ethernet/data server function being used, the board was found to be not ready.
BG1032	BOARD ERROR (DATA SERVER)	With the Ethernet/data server function being used, an error was returned from the board.
BG1033	TIME OVER (DATA SERVER)	With the Ethernet/data server function being used, a CNC time–over occurred.
BG1034	CNC ERROR (DATA SERVER)	With the Ethernet/data server function being used, an error occurred in the CNC.
BG1035	SEQUENCE ERROR (DATA SERVER)	With the Ethernet/data server function being used, a conflict occurred in the CNC.
BG1036	MODE ERROR (DATA SERVER)	With the Ethernet/data server function being used, the mode cannot be changed.
BG1037	DOUBLE OPEN (DATA SERVER)	With the Ethernet/data server function being used, an attempt was made to open the same file twice.
BG1040	Device open error (Remote DGN.)	An error occurred upon attempting to open an I/O device for remote diagnosis.
BG1041	Illegal command (Remote DGN.)	An invalid command was specified for an I/O device for remote diagnosis.
BG1042	Data input error (Remote DGN.)	An error occurred in data input to an I/O device for remote diagnosis.
BG1043	Data output error (Remote DGN.)	An error occurred in data output from an I/O device for remote diagnosis.

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B.3
SR ALARM

Number	Message	Contents
SR0125	ILLEGAL EXPRESSION FORMAT	The description of the custom macro statement is erroneous. The format of the parameter data is erroneous.
SR0160	COMMAND DATA OVERFLOW	An overflow in the CNC internal positional data occurred. This error is also generated when the target position exceeds the maximum stroke as a result of calculating coordinate conversion, offset and manual intervention compensation inputs.
SR0421	SETTING COMMAND ERROR	The specified tool data setting (G10 L70 to G11, G10 L71 to G11) is erroneous.
SR0422	NOT FOUND TOOL DATA	The tool No. (pot No.) to which tool data delete was specified cannot be found.
SR0423	TOOL DATA WRITE ERROR	A write error occurred simultaneously on tool offset data by a tool No.
SR0424	OVER MAXIMUM TOOL DATA	An attempt was made to set tool data that exceeds the maximum number of tool data sets.
SR0425	NOT DELETE TOOL DATA IN OPERATION	An attempt was made to delete currently selected tool data.
SR0580	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.
SR0581	ENCODE ALARM (PARAMETER)	When an attempt was made to punch an encrypted tape, the punch code parameter was set to EIA. Set EIA parameter No. 0#4 to “0”. An incorrect instruction was specified for program encryption or protection. This alarm is also generated when the protected range is edited or deleted in a program–locked state. The protected range is defined from the program No. preset by parameter No. 2212 up to the program No. preset to parameter No. 2213. When both parameters are set to “0”, the protected range becomes O9000 to O9999.
SR0590	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.
SR0591	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”.
SR0592	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. This alarm is also generated when the specified block is not found by the program restart function.
SR0600	PARAMETER OF RESTART ERROR	An illegal value is set to parameter No. 7110 that specifies the order in which axes move when machining is restarted in the dry run. The setting range is 1 to the number of controlled axes.
SR0805	ILLEGAL COMMAND	An attempt was made to specify an illegal command during I/O processing on an I/O device.
SR0806	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.

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Number	Message	Contents
SR0807	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.
SR0808	DEVICE DOUBLE OPENED	An attempt was made to open a device that is being accessed.
SR0820	DR OFF (1)	The data set ready input signal DR of the I/O device connected to reader/punch interface 1 turned OFF.
SR0822	OVERRUN ERROR (1)	The next character was received from the I/O device connected to reader/punch interface 1 before it could read a previously received character.
SR0823	FRAMING ERROR (1)	The stop bit of the character received from the I/O device connected to reader/punch interface 1 was not detected.
SR0824	BUFFER OVERFLOW (1)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 1 even though the NC sent a stop code (DC3) during data reception.
SR0830	DR OFF (2)	The data set ready input signal DR of the I/O device connected to reader/punch interface 2 turned OFF.
SR0832	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.
SR0833	FRAMING ERROR (2)	The stop bit of the character received from the I/O device connected to reader/punch interface 2 was not detected.
SR0834	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.
SR0840	DR OFF (3)	The data set ready input signal DR of the I/O device connected to reader/punch interface 3 turned OFF.
SR0842	OVERRUN ERROR (3)	The next character was received from the I/O device connected to reader/punch interface 3 before it could read a previously received character.
SR0843	FRAMING ERROR (3)	The stop bit of the character received from the I/O device connected to reader/punch interface 3 was not detected.
SR0844	BUFFER OVERFLOW (3)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 3 even though the NC sent a stop code (DC3) during data reception.
SR0850	DR OFF (4)	The data set ready input signal DR of the I/O device connected to reader/punch interface 4 turned OFF.
SR0852	OVERRUN ERROR (4)	The next character was received from the I/O device connected to reader/punch interface 4 before it could read a previously received character.
SR0853	FRAMING ERROR (4)	The stop bit of the character received from the I/O device connected to reader/punch interface 4 was not detected.
SR0854	BUFFER OVERFLOW (4)	The NC received more than 10 characters of data from the I/O device connected to reader/punch interface 4 even though the NC sent a stop code (DC3) during data reception.
SR0855	DATA SET READY DOWN (RMT–BUF)	The data set ready signal of reader/punch interface 10 was turned off, or the CD signal (RS–232C only) was turned off.

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Number	Message	Contents
SR0856	BUFFER OVERFLOW (RMT–BUF)	Reader/punch interface 10 received data exceeding a limit (512 characters with protocol B or 2560 characters with extended protocol B) although the NC sent a stop code (DC3) when receiving data.
SR0860	DR OFF (MODEM CARD)	The data set ready input signal DR of the modem card was turned off.
SR0862	OVERRUN ERROR (MODEM CARD)	Before a character received from the modem card could be read, the next character was received.
SR0863	FRAMING ERROR (MODEM CARD)	The stop bit of a character received from the modem card was not detected.
SR0864	BUFFER OVERFLOW (MODEM CARD)	Although the NC sent a stop code (DC3) to the modem card when receiving data, data consisting of more than 10 characters was received.
SR0890	CHECK SUM ERROR (G05)	A checksum error occurred (in buffer transfer to remote buffer).
SR0891	ILLEGAL COMMAND G05	G05 was specified in a state in which G05 cannot be specified.
SR0910	DEVICE DRIVER ERROR (UNDEFINED)	An error occurred during device driver control.
SR0911	V–DEVICE DRIVER ERROR (DEVICE)	An error occurred during device driver control.
SR0912	V–DEVICE DRIVER ERROR (OPEN)	An error occurred during device driver control.
SR0913	V–DEVICE DRIVER ERROR (COMMAND)	An error occurred during device driver control.
SR0914	V–DEVICE DRIVER ERROR (RANGE)	An error occurred during device driver control.
SR0915	V–DEVICE DRIVER ERROR (TEST)	An error occurred during device driver control.
SR0940	COMMUNICATION ERROR (RMT_BUF)	Remote buffer software error
SR0941	COMMUNICATION ERROR (RMT_BUF)	The remote buffer board detected an invalid command (CNC error).
SR0944	COMMUNICATION ERROR (RMT_BUF)	With protocol A, a time–out occurred (host error).
SR0945	COMMUNICATION ERROR (RMT_BUF)	With protocol A, the number of retries exceeded the limit (host error).
SR0946	COMMUNICATION ERROR (RMT_BUF)	A framing error or overrun error occurred.
SR0947	COMMUNICATION ERROR (RMT_BUF)	With protocol A, an invalid response command was received (host error).
SR0948	COMMUNICATION ERROR (RMT_BUF)	With protocol A, a command error was detected (host error). The cause may be one of the following: 1. An END code was detected in the middle of a command name. 2. An undefined command was used. 3. Other than an expected command was received.
SR0949	COMMUNICATION ERROR (RMT_BUF)	The remote buffer is faulty. (Usually, the printed circuit board of the remote buffer is faulty.)
SR0950	DRIVER ERROR (MEMORY CARD)	An error occurred in the memory card device driver.
SR0960	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.
SR0961	NOT READY (MEMORY CARD)	The memory card is not ready.
SR0962	CARD FULL (MEMORY CARD)	The memory card has run out of space.
SR0963	CARD PROTECTED (MEMORY CARD)	The memory card is write–protected.
SR0964	NOT MOUNTED (MEMORY CARD)	The memory card could not be mounted.

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Number	Message	Contents
SR0965	DIRECTORY FULL (MEMORY CARD)	The file could not be generated in the root directory for the memory card.
SR0966	FILE NOT FOUND (MEMORY CARD)	The specified file could not be found on the memory card.
SR0967	FILE PROTECTED (MEMORY CARD)	The memory card is write–protected.
SR0968	ILLEGAL FILE NAME (MEMORY CARD)	Illegal memory card file name
SR0969	ILLEGAL FORMAT (MEMORY CARD)	Illegal memory card format
SR0970	ILLEGAL CARD (MEMORY CARD)	This memory card cannot be handled.
SR0971	ERASE ERROR (MEMORY CARD)	An error occurred during memory card erase.
SR0972	BATTERY LOW (MEMORY CARD)	The memory card battery is low.
SR0973	FILE ALREADY EXIST	A file having the same name already exists on the memory card.
SR1030	NOT READY (DATA SERVER)	The board is not ready in the Ethernet/data server board function.
SR1031	BUSY (DATA SERVER)	The board is busy in the Ethernet/data server board function.
SR1032	BOARD ERROR (DATA SERVER)	An error was returned from the board in the Ethernet/data server board function.
SR1033	TIME OVER (DATA SERVER)	The CNC registered a time–out in the Ethernet/data server board function.
SR1034	CNC ERROR (DATA SERVER)	An internal CNC error occurred by the Ethernet/data server board function.
SR1035	SEQUENCE ERROR (DATA SERVER)	A contradiction occurred in the CNC by the Ethernet/data server board function.
SR1036	MODE ERROR (DATA SERVER)	The mode could not be changed in the Ethernet/data server board function.
SR1037	DOUBLE OPEN (DATA SERVER)	An attempt was made to open the file twice in the Ethernet/data server board function.
SR1040	Device open error (Remote DGN.)	An error occurred in an attempt to open an I/O device for remote diagnosis.
SR1041	Illegal command (Remote DGN.)	An invalid command was specified for an I/O device for remote diagnosis.
SR1042	Data input error (Remote DGN.)	An error occurred during data input to an I/O device for remote diagnosis.
SR1043	Data output error (Remote DGN.)	An error occurred during data output from an I/O device for remote diagnosis.
SR1050	#200–#999ILLEGAL INPUT (UNMATCHED P–CODE MACRO COMMON)	The settings of parameters MV0 through MVA (bit 0 of No. 8503 through bit 3 of No. 8504) do not match the common variable data to be entered.
SR1051	#200–#499ILLEGAL P–CODE MACRO COMMON INPUT (NO OPTION)	An attempt was made to enter a custom macro common variable that is not used with the system.
SR1052	#500–#549P–CODE MACRO COMMON SELECT (CANNOT USE SETVN)	Variable names cannot be entered. SETVN cannot be specified for P–code macro common variables #500 through #549.
SR1053	THE NUMBER OF #30000 IS UNMATCH	An attempt was made to enter a P–code–dedicated variable that is not used with the system.
SR1054	THE NUMBER OF #40000 IS UNMATCH	An attempt was made to enter an extended P–code–dedicated variable that is not used with the system.

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B.4 PARAMETER ENABLE SWITCH ALARM (SW ALARM)

Number	Message	Contents
SW0000	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.

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B.5 SERVO ALARM (SV ALARM)

Number	Message	Contents
SV0008	EXCESS ERROR (STOP)	Position deviation during a stop is larger than the value set in parameter No. 1829. Check the value of the position deviation error limit in parameter No. 1829.
SV0009	EXCESS ERROR (MOVING)	The position deviation during movement is larger than the value set in parameter No. 1828.
SV0011	LSI OVERFLOW	The position deviation counter overflowed.
SV0012	MOTION VALUE OVERFLOW	A speed exceeding the travel speed limit was specified. The following travel speed limit applies: In acceleration/deceleration before look–ahead interpolation mode: 32767 pulses/ms (detection unit) When feed–forward is disabled in a mode other than acceleration/deceleration before look–ahead interpolation mode: 32767 pulses/ms (detection unit) When feed–forward is enabled in a mode other than acceleration/deceleration before look–ahead interpolation mode: 4095 pulses/ms (detection unit) By setting bit 1 (FFN) of parameter No. 1801 to 1, feed–forward can be enabled only in acceleration/deceleration before look–ahead interpolation mode. With this capability, the travel speed limit can be set to 32767 pulses/ms at all times.
SV0013	IMPROPER V_READY OFF	The speed control ready signal (VRDY) turned OFF even though the position control ready signal (PRDY) was ON.
SV0014	IMPROPER V_READY ON	The speed control ready signal (VRDY) turned ON even though the position control ready signal (PRDY) was OFF.
SV0024	SYNC EXCESS ERROR ALARM 2	The synchronous error amount is greater than the value set to parameter No. 1913 by the synchronize adjust function. When synchronization alignment has not completed after the power is turned ON, this error is judged by the value obtained of multiplying the value of parameter No. 1913 by the value of parameter No. 1910.
SV0025	V_READY ON (INITIALIZING)	During servo control, the speed control ready signal (VRDY) turned ON even though it is supposed to be OFF.
SV0026	ILLEGAL AXIS ARRANGE	The parameter for specifying the arrangement of the servo axes is set incorrectly. A minus value, duplicated value, or a value larger than the number of controlled axes has been set to parameter No. 1023 (servo No. axis for each axis).
SV0027	ILL DGTL SERVO PARAMETER	The setting of the digital servo parameter is illegal.
SV0030	EMERGENCY STOP	Emergency stop occurred. Whether or not this alarm is generated is determined by ENR parameter No. 2001#0). 1: The control is reset by an emergency stop. 0: This alarm is generated without reset by an emergency stop. An emergency stop is canceled by resetting the control.
SV0055	ILLEGAL TANDEM AXIS	The setting of parameter No. 1023 is illegal in tandem control.
SV0056	ILLEGAL TANDEM PAIR	The setting of parameter No. 1020 or TDM parameter No. 1817#6 is illegal in tandem control.
SV0060	FSSB: OPEN READY TIME OUT	The FSSB was not in a ready to open state during initialization. A probable cause is an axis card malfunction.

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Number	Message	Contents
SV0061	FSSB: ERROR MODE	The FSSB entered the error mode. Probable causes are an axis card or amplifier malfunction.
SV0062	FSSB: NUMBER OF AMP. IS INSUFFICIENT	The number of amplifiers identified by the FSSB is less than the number of controlled axes. The set number of axes or the amplifier connection is erroneous.
SV0063	FSSB: CONFIGURATION ERROR	The FSSB configuration error occurred. Or, there is a difference in the type of connected amplifier and FSSB setting.
SV0064	FSSB: AXIS SETTING NOT COMPLETE	Setting of axes was not completed in the automatic setting mode.
SV0065	FSSB: OPEN TIME OUT	FSSB did not open even though FSSB initialization was not completed. Or, the connection between the CNC and amplifier is incorrect.
SV0066	FSSB: ID DATA NOT READ	Amplifier information cannot be read as FSSB is not assigned. Or, the connection between the CNC and amplifier is incorrect.
SV0067	FSSB: CONFIGURATION ERROR (SOFT)	The FSSB configuration error occurred. (Detected in software). Or, there is a difference in the type of connected amplifier and FSSB setting.
SV0070	FSSB DISCONNECT	FSSB communications was broken; the FSSB communications cable was disconnected, or broken; the amplifier power supply turned OFF; or, the low voltage alarm occurred on the amplifier.
SV0071	ILLEGAL AMP. INTERFACE	The axes of a 2–axis amplifier were assigned to a fast–type interface; or, the axis setting was incorrect.
SV0072	SEND CNC DATA FAILED	An FSSB communications error prevented correct data from being sent or received by the slave.
SV0073	SEND SLAVE DATA FAILED	An FSSB communications error prevented correct data from being sent or received by the servo software.
SV0074	READ ID DATA FAILED	Failed to read amplifier ID information during power ON.
SV0075	MOTOR/AMP. COMBINATION	The maximum current of the motor is different from the maximum current of the amplifier; the connection between the axis and amplifier is incorrect; or, the parameter setting is incorrect.
SV0076	ILLEGAL SETTING OF AXIS	The setting is incorrect even though functions requiring hardware for 2 axes are built into one axis.
SV0100	S–COMP. VALUE OVERFLOW	The value set for straightness compensation has exceeded maximum value 32,767.
SV0101	DATA ERROR (ABS PCDR)	A correct machine position cannot be obtained as the absolute pulse coder has malfunctioned or the machine moved too far during power ON.
SV0109	EXCESS ERROR (G31)	The position deviation during execution of torque limit switch operation exceeds the limit setting of parameter No. 1843.
SV0119	ABNORMAL TORQUE (1ST SPDL)	An abnormal load was detected at the No. 1 spindle motor. This alarm is canceled by resetting the control.
SV0120	ABNORMAL TORQUE (2ND SPDL)	An abnormal load was detected at the No. 2 spindle motor. This alarm is canceled by resetting the control.
SV0125	EXCESS VELOCITY IN TORQUE	In torque control, the specified permissible speed was exceeded.
SV0126	EXCESS ERROR IN TORQUE	In torque control, the maximum accumulated speed specified in parameters was exceeded.
SV0127	ABNORMAL TORQUE (3RD SPDL)	An abnormal load was detected at the No. 3 spindle motor. This alarm is canceled by resetting the control.

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Number	Message	Contents
SV0128	ABNORMAL TORQUE (4TH SPDL)	An abnormal load was detected at the No. 24 spindle motor. This alarm is canceled by resetting the control.
SV0350	EXCESSIVE TORQUE DIFFERENCE	In synchronization control, the values specified by the torque commands for the master and slave axes exceeded the value set in parameter No. 1716. This alarm is generated only for the master axis.
SV0360	ABNORMAL CHECKSUM (INT)	The checksum alarm occurred on the built–in pulse coder.
SV0361	ABNORMAL PHASE DATA (INT)	The phase data abnormal alarm occurred on the built–in pulse coder.
SV0363	ABNORMAL CLOCK (INT)	The clock alarm occurred on the built–in pulse coder.
SV0364	SOFT PHASE ALARM (INT)	The digital servo software detected abnormal data on the built–in pulse coder.
SV0365	BROKEN LED (INT)	Abnormal LED on the built–in pulse coder
SV0366	PULSE MISS (INT)	A pulse error occurred on the built–in pulse coder.
SV0367	COUNT MISS (INT)	A count error occurred on the built–in pulse coder.
SV0368	SERIAL DATA ERROR (INT)	The communications data could not be received from the built–in pulse coder.
SV0369	DATA TRANS. ERROR (INT)	A CRC error or stop bit error occurred in the communications data from the built–in pulse coder.
SV0380	BROKEN LED (EXT)	Standalone detector error
SV0381	ABNORMAL PHASE (EXT LIN)	An abnormal alarm in the position data occurred on the standalone linear scale.
SV0382	COUNT MISS (EXT)	A count error occurred on the standalone detector.
SV0383	PULSE MISS (EXT)	A pulse error occurred on the standalone detector.
SV0384	SOFT PHASE ALARM (EXT)	The digital servo software detected abnormal data on the standalone detector.
SV0385	SERIAL DATA ERROR (EXT)	The communications data could not be received from the standalone detector.
SV0386	DATA TRANS. ERROR (EXT)	A CRC error or stop bit error occurred in the communications data from the standalone detector.
SV0409	DETECT ABNORMAL TORQUE	An abnormal load was detected on the servo motor, or during Cs axis or spindle positioning.
SV0421	EXCESS ERROR (SEMI–FULL)	The difference between the feedback from the semi and full sides exceeded the setting of parameter No.1729.
SV0430	SV MOTOR OVERHEAT	The servo motor has overheated.
SV0431	CNV. OVERLOAD	PSM: Overheat B series SVU: Overheat
SV0432	CNV. LOWVOLT CONTROL	PSM: The control power supply voltage has dropped. PSMR: The control power supply voltage has dropped. β SVU: The control power supply voltage has dropped.
SV0433	CNV. LOW VOLT DC LINK	PSM: Missing phase in input voltage PSMR: Low DC link voltage A series SVU: Low DC link voltage B series SVU: Low DC link voltage

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Number	Message	Contents
SV0434	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 A series SVU: Motor overcurrent B 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 SVU: The DC link voltage is too high.
SV0440	CNV. EX DECELERATION POW.	PSMR: Excessive generative discharge A 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 B 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 pulse coder.
SV0446	HARD DISCONNECT ALARM	The hardware detected a disconnected built–in pulse coder.
SV0447	HARD DISCONNECT (EXT)	The hardware detected a disconnected standalone 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 pulse coder.
SV0449	INV. IPM ALARM	SVM: The IPM (Intelligent Power Module) detected an alarm. A series SVU: The IPM (Intelligent Power Module) detected an alarm.
SV0455	SERVO SOFTWARE NOT FOUND	The specified servo program cannot be found. The setting of parameter No. 1043 is not correct, or the servo program does not exist.
SV0456	ILLEGAL CURRENT LOOP	The specified current loop is illegal. The system does safisfy the requirements for performing HIGH SPEED HRV control.
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 us.
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.
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.

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Number	Message	Contents
SV0469	PARAMETER SETTING ERROR(2683–2826)	The 2683–2826 parameters cannot be used. This alarm is generated only at power–on when edition of the servo software is old. This alarm is not generated by exchanging the servo software to new edition or adjusting the 2683–2826 parameters to 0.
SV0600	INV. DC LINK OVER CURRENT	SVM: The DC link current is too high. β SVU: The DC link current is too high.
SV0601	INV. RADIATOR FAN FAILURE	SVM: The heat sink cooling fan is defective. β SVU: The heat sink cooling fan is defective.
SV0602	INV. OVERHEAT	SVM: The servo amplifier is overheated.
SV0603	INV. IPM ALARM(OH)	SVM: The intelligent power module (IPM) has detected an overheat alarm condition. β SVU: The intelligent power module (IPM) has detected an overheat alarm condition.
SV0604	AMP. COMMUNICATION ERROR	Communication between the SVM and PSM is abnormal.
SV0605	CNV. EX. DISCHARGE POW.	PSMR: The motor regenerative power is too high.
SV0606	CNV. RADIATOR FAN FAILURE	PSM: The fan for cooling the external heat sink is defective. PSMR: The fan for cooling the external heat sink is defective.
SV0607	CNV. SINGLE PHASE FAILURE	PSM: One of the input power phases is abnormal. PSMR: One of the input power phases is abnormal.
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 Separate Detector I/F Units connected to the FSSBs of different paths. And the system did not satisfy the requirements for performing HIGH SPEED HRV control.

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B.6 OVERTRAVEL ALARM (OT ALARM)

Number	Message	Contents
OT0001	+ OVERTRAVEL (SOFT 1)	The tool entered the prohibited area of stored stroke check 1 during movement in the positive direction.
OT0002	– OVERTRAVEL (SOFT 1)	The tool entered the prohibited area of stored stroke check 1 during movement in the negative direction.
OT0003	+ OVERTRAVEL (SOFT 2)	The tool entered the prohibited area of stored stroke check 2 during movement in the positive direction.
OT0004	– OVERTRAVEL (SOFT 2)	The tool entered the prohibited area of stored stroke check 1 during movement in the negative direction.
OT0007	+ 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 automaticoperation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0008	– 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 automaticoperation. During manual operation, only the feed of the axis on which the alarm occurred is stopped.
OT0021	+ OVERTRAVEL (PRE–CHECK)	The tool exceeded the limit in the negative direction during the stroke check before movement.
OT0022	– OVERTRAVEL (PRE–CHECK)	The tool exceeded the limit in the positive direction during the stroke check before movement.
OT0030	SYNC EXCESS ERROR ALARM 1	The synchronous error amount is greater than the value set to parameter No. 1914 by the synchronize adjust function.
OT0031	SYNCHRONIZE ADJUST MODE	The system is in the synchronize adjust mode.
OT0032	NEED ZRN (ABS PCDR)	The reference position and the absolute pulse coder counter value do not match.
OT0034	BATTERY ZERO (ABS PCDR)	The battery voltage of the absolute position detector has fallen to “0”, or power is supplied to the pulse coder for the first time.
OT0035	IMPOSSIBLE ZRN (SERIAL)	An attempt was made to create correspondence between the reference position and the absolute position detector when the origin cannot be established.
OT0036	BATTERY DOWN (ABS PCDR)	Low absolute position detector battery voltage
OT0120	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).
OT0121	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).
OT0122	TOO MANY MESSAGE	Requests were made to display more than 4 external operator messages or external alarm messages at the same time.
OT0123	MESSAGE NUMBER NOT FOUND	An external operator message or external alarm message cannot be canceled as no message No. is specified.
OT0124	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.

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Number	Message	Contents
OT0125	TOO LARGE NUMBER	A numerical value outside the range 0 to 4095 was specified as the No. for the external operator message or an external alarm message.
OT0126	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.
OT0127	DI. EIDHW OUT OF RANGE	The numerical value input by external data input signals EID32 to EID47 has exceeded the permissible range.
OT0128	DI. EIDLL OUT OF RANGE	The numerical value input by external data input signals EID0 to EID31 has exceeded the permissible range.
OT0129	NEGATE POS CODER 1 REV ON	The CPU of the position coder or a peripheral circuit is malfunctioning. Replace the CPU or peripheral circuit.
OT0130	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.
OT0131	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.
OT0132	NOT ON RETURN_POINT	The tool did not arrive at the stored return position along the axis, or the position may have deviated by machine lock or mirror image operation during zero return.
OT0150	A/D CONVERT ALARM	A/D converter malfunction
OT0151	A/D CONVERT ALARM	A/D converter malfunction
OT0184	PARAMETER ERROR IN TORQUE	An invalid parameter was set for torque control. The torque constant parameter is set to “0”.
OT0449	ZERO RETURN NOT FINISHED	The interval of the actual match mark does not match the interval of the match mark set to the parameter on the match–marked linear scale.
OT0450	ZERO RETURN NOT FINISHED	No. 1 zero return (CDxX7 to CDxX0: 17h (Hex)) was specified when the manual reference zero return was not executed with the reference zero return function enabled (ZRN parameter No. 1005#0 set to “0”).
OT0451	IMPROPER PMC AXIS COMMAND	The PMC axes cannot be controlled in this state.
OT0512	EXCESS VELOCITY	The feedrate of the linear axis during polar coordinate interpolation exceeded the maximum cutting feedrate.
OT0513	SYNC EXCESS ERROR	The difference in the machine coordinate value during synchronize interpolation is equal to or greater than the synchronize error limit set in parameter No. 7723. Or, the offset during synchronize alignment by the machine coordinate values was equal to or greater than the maximum offset set in parameter No. 7724.
OT0553	EXCESS VELOCITY IN G43.4/G43.5	The tool attempted to move along an axis at a feedrate exceeding the maximum cutting feedrate according to tool center point control.
OT0710	ILLEGAL ACC. PARAMETER (OPTIMUM TORQUE ACC/DEC)	There are errors in the parameters of permissible acceleration for Optimum TorqueAcceleration/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. The time to decelerate to 0 is larger than the maximum.

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B.7 FILE ACCESS ALARM (IO ALARM)

Number	Message	Contents
IO0001	FILE ACCESS ERROR	The resident–type file system could not be accessed as an error occurred in the resident–type file system.
IO0002	FILE SYSTEM ERROR	The file could not be accessed as an error occurred in the CNC file system.
IO0030	CHECK SUM ERROR	The checksum of the CNC part program storage memory is incorrect.
IO0032	MEMORY ACCESS OVER RANGE	Accessing of data occurred outside the CNC part program storage memory range.

B.8 POWER MUST BE TURNED OFF ALARM (PW ALARM)

Number	Message	Contents
PW0000	POWER MUST BE OFF	A parameter was set for which the power must be turned OFF then ON again.
PW0100	ILLEGAL PARAMETER (S–COMP.)	The parameter for setting straightness compensation is incorrect.
PW0102	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.
PW0103	ILLEGAL PARAMETER (S–COMP.128)	The parameter for setting 128 straightness compensation points or the parameter compensation data is incorrect,

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B.9 SPINDLE ALARM (SP ALARM)

Number	Message	Contents
SP0001	SSPA: 01 MOTOR OVERHEAT	An alarm (AL–01) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0002	SSPA: 02 EX DEVIATION SPEED	An alarm (AL–02) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0003	SSPA: 03 DC–LINK FUSE IS BROKEN	An alarm (AL–03) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0004	SSPA: 04 POWER SUPPLY ERROR	An alarm (AL–04) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0005	SSPA: XX DECODED ALARM	An alarm (AL–05) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0006	THERMAL SENSOR DISCONNECT	An alarm (AL–06) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0007	SSPA: 07 OVER SPEED	An alarm (AL–07) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0008	SSPA: XX DECODED ALARM	An alarm (AL–08) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0009	SSPA: 09 OVERHEAT MAIN CIRCUIT	An alarm (AL–09) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0010	SSPA: 10 LOW VOLT INPUT POWER	An alarm (AL–10) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0011	SSPA: 11 OVERVOLT POWER CIRCUIT	An alarm (AL–11) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0012	SSPA: 12 OVERCURRENT POWER CIRCUIT	An alarm (AL–12) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0013	SSPA: 13 CPU DATA MEMORY FAULT	An alarm (AL–13) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0014	SSPA: XX DECODED ALARM	An alarm (AL–14) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0015	SSPA: 15 SPINDLE SWITCHING FAULT	An alarm (AL–15) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0016	SSPA: 16 RAM ERROR	An alarm (AL–16) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0017	SSPA: XX DECODED ALARM	An alarm (AL–17) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0018	SSPA: 18 SUMCHECK ERROR PROGRAM ROM	An alarm (AL–18) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0019	SSPA: 19 EXCESS OFFSET CURRENT U	An alarm (AL–19) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0020	SSPA: 20 EXCESS OFFSET CURRENT V	An alarm (AL–20) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0021	POS SENSOR POLARITY ERROR	An alarm (AL–21) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.

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SP0022	SSPA: XX DECODED ALARM	An alarm (AL–22) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0023	SSPA: XX DECODED ALARM	An alarm (AL–23) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0024	SSPA: 24 SERIAL TRANSFER ERROR	An alarm (AL–24) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0025	SSPA: 25 SERIAL TRANSFER STOP	An alarm (AL–25) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0026	SSPA: 26 DISCONNECT CS VELOCITY DETECTOR	An alarm (AL–26) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0027	SSPA: 27 DISCONNECT POSITION CODER	An alarm (AL–27) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0028	SSPA: 28 DISCONNECT CS POSITION DETECTOR	An alarm (AL–28) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0029	SSPA: 29 OVERLOAD	An alarm (AL–29) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0030	SSPA: 30 OVERCURRENT INPUT CIRCUIT	An alarm (AL–32) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0031	SSPA: 31 MOTOR LOCK OR DISCONNECT DETECTOR	An alarm (AL–31) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0032	SSPA: 32 SIC–LSI RAM FAULT	An alarm (AL–32) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0033	SSPA: 33 SHORTAGE POWER CHARGE	An alarm (AL–33) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0034	SSPA: 34 ILLEGAL PARAMETER	An alarm (AL–34) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0035	SSPA: 35 ILLEGAL GEAR RATIO PARAMETER	An alarm (AL–35) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0036	SSPA: 36 OVERFLOW ERROR COUNTER	An alarm (AL–36) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0037	SSPA: 37 ILLEGAL SETTING VELOCITY DETECTOR	An alarm (AL–37) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0038	SSPA: XX DECODED ALARM	An alarm (AL–38) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0039	SSPA: 39 ILLEGAL 1 REV SIGN OF CS DETECTOR	An alarm (AL–39) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0040	SSPA: 40 NO 1 REV SIGN OF CS DETECTOR	An alarm (AL–40) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0041	SSPA: 41 ILLEGAL 1 REV SIGN OF POSITION CODER	An alarm (AL–41) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0042	SSPA: 42 NO 1 REV SIGN OF POSITION CODER	An alarm (AL–42) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0043	SSPA: 43 DISCONNECT POSITION CODER DEF. SPEED	An alarm (AL–43) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.

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SP0044	SSPA: 44 ILLEGAL A/D CONVERT	An alarm (AL–44) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0045	SSPA: XX DECODED ALARM	An alarm (AL–45) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0046	SSPA: 46 ILLEGAL 1 REV SIGN OF SCREW CUT	An alarm (AL–46) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0047	SSPA: 47 ILLEGAL SIGNAL OF POSITION CODER	An alarm (AL–47) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0048	SSPA: XX DECODED ALARM	An alarm (AL–48) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0049	SSPA: 49 DEF. SPEED IS OVER VALUE	An alarm (AL–49) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0050	SSPA: 50 SYNCRONOUS VALUE IS OVER SPEED	An alarm (AL–50) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0051	SSPA: 51 LOW VOLT POWER CIRCUIT	An alarm (AL–51) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0052	SSPA: 52 ITP FAULT 1	An alarm (AL–52) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0053	SSPA: 53 ITP FAULT 2	An alarm (AL–53) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0054	SSPA: 54 OVERCURRENT	An alarm (AL–54) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0055	SSPA: 55 ILLEGAL POWER LINE	An alarm (AL–55) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0056	COOLING FAN FAILURE	An alarm (AL–56) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0057	CONV. EX. DECELERATION POW.	An alarm (AL–57) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0058	CNV. OVERLOAD	An alarm (AL–58) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0059	CNV. COOLING FAN FAILURE	An alarm (AL–59) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0062	MOTOR VCMD OVERFLOWED	An alarm (AL–62) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0066	COM. ERROR BETWEEN SP AMPS	An alarm (AL–66) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0073	MOTOR SENSOR DISCONNECTED	An alarm (AL–73) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0074	CPU TEST ERROR	An alarm (AL–74) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0075	CRC ERROR	An alarm (AL–75) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0079	INITIAL TEST ERROR	An alarm (AL–79) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.

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SP0080	ALARM AT THE OTHER SP AMP.	An alarm (AL–80) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0081	1–ROT MOTOR SENSOR ERROR	An alarm (AL–81) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0082	NO 1–ROT MOTOR SENSOR	An alarm (AL–82) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0083	MOTOR SENSOR SIGNAL ERROR	An alarm (AL–83) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0084	SPNDL SENSOR DISCONNECTED	An alarm (AL–84) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0085	1–ROT SPNDL SENSOR ERROR	An alarm (AL–85) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0086	NO 1–ROT SPNDL SENSOR	An alarm (AL–86) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0087	SPNDL SENSOR SIGNAL ERROR	An alarm (AL–87) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0088	COOLING RADI FAN FAILURE	An alarm (AL–88) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0097	OTHER SPINDLE ALARM	An alarm (AL–97) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0098	OTHER CONVERTER ALARM	An alarm (AL–98) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0110	AMP COMMUNICATION ERROR	An alarm (AL–B0) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0111	CONV. LOW VOLT CONTROL	An alarm (AL–B1) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0112	CONV. EX. DISCHARGE POW.	An alarm (AL–B2) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0113	CONV. COOLING FAN FAILURE	An alarm (AL–B3) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0120	COMMUNICATION DATA ERROR	An alarm (AL–C0) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0121	COMMUNICATION DATA ERROR	An alarm (AL–C1) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0122	COMMUNICATION DATA ERROR	An alarm (AL–C2) occurred on the spindle amplifier unit For details, refer to the Serial Spindle User's Manual.
SP0201	MOTOR NUMBER DUPLICATE	Two or more of the same motor Nos. other than "0" were set in parameter No. 5841.
SP0202	SPINDLE SELECT ERROR	A spindle No. exceeding the number of spindles were set in parameter No. 5850.
SP0220	NO SPINDLE AMP.	Either the cable connected to a serial spindle amplifier is broken, or the serial spindle amplifier is not connected.
SP0221	ILLEGAL MOTOR NUMBER	The spindle No. and the motor No. are incorrectly matched.
SP0222	CAN NOT USE ANALOG SPINDLE	The machine tool does not support analog spindles.

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Number	Message	Contents
SP0223	CAN NOT USE SERIAL SPINDLE	The machine tool does not support digital spindles.
SP0224	ILLEGAL SPINDLE–POSITION CODER GEAR RATIO	The spindle–position coder gear ratio was incorrect.
SP0225	CRC ERROR (SERIAL SPINDLE)	A CRC error (communications error) occurred in communications between the CNC and the serial spindle amplifier.
SP0226	FRAMING ERROR (SERIAL SPINDLE)	A framing error occurred in communications between the CNC and the serial spindle amplifier.
SP0227	RECEIVING ERROR (SERIAL SPINDLE)	A receive error occurred in communications between the CNC and the serial spindle amplifier.
SP0228	COMMUNICATION ERROR (SERIAL SPINDLE)	A communications error occurred between the CNC and the serial spindle amplifier.
SP0229	COMMUNICATION ERROR SERIAL SPINDLE AMP.	A communications error occurred between serial spindle amplifiers (motor Nos. 1 and 2, or motor Nos. 3–4).
SP0230	MOTOR NUMBER OUT OF RANGE	The setting of parameter No. 5841 is out of range.
SP0231	SPINDLE EXCESS ERROR (MOVING)	The position deviation during spindle rotation was greater than the value set in parameters.
SP0232	SPINDLE EXCESS ERROR (STOP)	The position deviation during spindle stop was greater than the value set in parameters.
SP0233	POSITION CODER OVERFLOW	The error counter/speed instruction value of the position coder overflowed.
SP0234	GRID SHIFT OVERFLOW	Grid shift overflowed.
SP0235	ORIENTATION COMMAND OVERFLOW	The orientation speed is too fast.
SP0236	DUPLICATE SPINDLE CONTROL MODE (CHANGING)	An attempt was made to change the spindle mode during spindle mode switching.
SP0237	DUPLICATE SPINDLE CONTROL MODE (SPOS)	An attempt was made to change the spindle mode during the spindle positioning mode.
SP0238	DUPLICATE SPINDLE CONTROL MODE (RIGID TAP)	An attempt was made to change the spindle mode during the rigid tapping mode.
SP0239	DUPLICATE SPINDLE CONTROL MODE (CS)	An attempt was made to change the spindle mode during the Cs contour control mode.
SP0240	DISCONNECT POSITION CODER	The analog spindle position coder is broken.
SP0241	D/A CONVERTER ERROR	The D/A converter for controlling analog spindles is erroneous.
SP0242	OVERHEAT	Overheating of the spindle was detected by a spindle speed variation. (1) In the case of heavy–load cutting, reduce the cutting load. (2) Check if the cutting tool has become dull. (3) The spindle amplifier may be faulty.
SP0245	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP0246	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP0247	COMMUNICATION DATA ERROR	A communication data error was detected on the CNC.
SP0968	SSPA: XX DECODED ALARM	An alarm occurred in the spindle amplifier unit for the serial spindle. For details, refer to the Serial Spindle User's Manual.
SP0969	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.

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Number	Message	Contents
SP0970	SPINDLE CONTROL ERROR	Initialization of spindle control ended in error.
SP0971	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0972	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0973	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0974	ANALOG SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0975	ANALOG SPINDLE CONTROL ERROR	An position coder error was detected on the analog spindle.
SP0976	SERIAL SPINDLE COMMUNICATION ERROR	The amplifier No. could not be set to the serial spindle amplifier.
SP0977	SERIAL SPINDLE COMMUNICATION ERROR	An error occurred in the spindle control software.
SP0978	SERIAL SPINDLE COMMUNICATION ERROR	A time–out was detected during communications with the serial spindle amplifier.
SP0979	SERIAL SPINDLE COMMUNICATION ERROR	The communications sequence was no longer correct during communications with the serial spindle amplifier.
SP0980	SERIAL SPINDLE AMP. ERROR	Defective SIC–LSI on serial spindle amplifier
SP0981	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the analog spindle amplifier side.
SP0982	SERIAL SPINDLE AMP. ERROR	An error occurred during reading of the data from SIC–LSI on the serial spindle amplifier side.
SP0983	SERIAL SPINDLE AMP. ERROR	Could not clear on the spindle amplifier side.
SP0984	SERIAL SPINDLE AMP. ERROR	An error occurred during re–initialization of the spindle amplifier.
SP0985	SERIAL SPINDLE CONTROL ERROR	Failed to automatically set parameters
SP0986	SERIAL SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0987	SERIAL SPINDLE CONTROL ERROR	Defective SIC–LSI on the CNC
SP0988	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0989	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0996	ILLEGAL SPINDLE PARAMETER SETTING	Illegal spindle and spindle motor setting
SP0997	SPINDLE CONTROL ERROR	The newly selected spindle No. by the spindle selection function could not be reflected in parameters.
SP0998	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.
SP0999	SPINDLE CONTROL ERROR	An error occurred in the spindle control software.

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B.10 OVERHEAT ALARM (OH ALARM)

Number	Message	Contents
OH0001	LOCKER OVERHEAT	CNC cabinet overheat
OH0002	FAN MOTOR STOP	OCB cooling fan motor abnormality

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