FANUC Series 16*i*/160*i*/160*i*s-MODEL B
FANUC Series 18*i*/180*i*/180*i*s-MODEL B
FANUC Series 21*i*/210*i*/210*i*s-MODEL B

OPERATION AND MAINTENANCE HANDBOOK

B-63527EN/01

PREFACE

The Operation and Maintenance Handbook is for persons who are familiar with NC programs and operations. It is used to refer to necessary information quickly in operating or maintaining NC machine tools at a work site.
The Handbook only contains reference information. It does not contain other types of information, such as essential information or notes. Read the following manuals first.
The Handbook assumes that the reader is familiar with the information in the following manuals.
For safety precautions, be sure to read "SAFETY PRECAUTIONS," which follows the table of contents.

Related manuals of Series
16*i*/18*i*/21*i*/160*i*/180*i*/210*i*/160*i*s/180*i*s/210*i*s–MODEL B

Manual name	Specification number
DESCRIPTIONS	B–63522EN
CONNECTION MANUAL (HARDWARE)	B–63523EN
CONNECTION MANUAL (FUNCTION)	B–63523EN–1
Series 16*i*/18*i*/160*i*/180*i*–TB OPERATOR'S MANUAL	B–63524EN
Series 16*i*/160*i*/160*is*–MB, Series 18*i*/180*i*/180*is*–MB5, Series 18*i*/180*i*/180*is*–MB OPERATOR'S MANUAL	B–63534EN
Series 21*i*/210*i*–TB OPERATOR'S MANUAL	B–63604EN
Series 21*i*/210*i*–MB OPERATOR'S MANUAL	B–63614EN
MAINTENANCE MANUAL	B–63525EN
Series 16*i*/18*i*/160*i*/180*i*/160*i*s/180*i*s–MODEL B PARAMETER MANUAL	B–63530EN
Series 21*i*/210*i*–MODEL B PARAMETER MANUAL	B–63610EN
OPERATION AND MAINTENANCE HANDBOOK	B–63527EN
PROGRAMMING MANUAL	
Macro Compiler/Macro Executor PROGRAMMING MANUAL	B–61803E–1
C Language Executor PROGRAMMING MANUAL	B–62443EN–3
FANUC MACRO COMPILER (For Personal Computer) PROGRAMMING MANUAL	B–66102E
CAP (T series)	
FANUC Super CAP*i* T OPERATOR'S MANUAL	B–63284EN
FANUC Symbol CAP*i* T OPERATOR'S MANUAL	B–63304EN
MANUAL GUIDE For Lathe PROGRAMMING MANUAL	B–63343EN
MANUAL GUIDE For Lathe OPERATOR'S MANUAL	B–63344EN
CAP (M series)	
FANUC Super CAP*i* M OPERATOR'S MANUAL	B–63294EN
MANUAL GUIDE For Milling PROGRAMMING MANUAL	B–63423EN
MANUAL GUIDE For Milling OPERATOR'S MANUAL	B–63424EN

Related manuals of Series
16*i*/18*i*/21*i*/160*i*/180*i*/210*i*/160*i*s/180*i*s/210*i*s–MODEL B

Manual name	Specification number
PMC	
PMC Ladder Language PROGRAMMING MANUAL	B–61863E
PMC C Language PROGRAMMING MANUAL	B–61863E–1
FANUC LADDER–III OPERATOR'S MANUAL	B–66234EN
Network	
I/O Link–II OPERATOR'S MANUAL	B–62714EN
Profibus–DP Board OPERATOR'S MANUAL	B–62924EN
FAST Ethernet Board/FAST DATA SERVER OPERATOR'S MANUAL	B–63644EN
Ethernet Board/DATA SERVER Board OPERATOR'S MANUAL	B–63354EN
DeviceNet Board OPERATOR'S MANUAL	B–63404EN
PC function	
Screen Display Function OPERATOR'S MANUAL	B–63164EN

Related manuals of SERVO MOTOR αi series

Manual name	Specification number
FANUC AC SERVO MOTOR αi series DESCRIPTIONS	B–65262EN
FANUC AC SERVO MOTOR αi series PARAMETER MANUAL	B–65270EN
FANUC AC SPINDLE MOTOR αi series DESCRIPTIONS	B–65272EN
FANUC AC SPINDLE MOTOR αi series PARAMETER MANUAL	B–65280EN
FANUC SERVO AMPLIFIER αi series DESCRIPTIONS	B–65282EN
FANUC SERVO MOTOR αi series MAINTENANCE MANUAL	B–65285EN

Related manuals of SERVO MOTOR α series

Manual name	Specification number
FANUC AC SERVO MOTOR α series DESCRIPTIONS	B–65142E
FANUC AC SERVO MOTOR α series PARAMETER MANUAL	B–65150E
FANUC AC SPINDLE MOTOR α series DESCRIPTIONS	B–65152E
FANUC AC SPINDLE MOTOR α series PARAMETER MANUAL	B–65160E
FANUC SERVO AMPLIFIER α series DESCRIPTIONS	B–65162E
FANUC SERVO MOTOR α series MAINTENANCE MANUAL	B–65165E

The Operation and Maintenance Handbook provides information about the following CNC units. The following symbols and system names are used in the Handbook.

Model name	Abbreviation	
FANUC Series 16*i*–TB	16*i*–TB	T series or T series (2–path control) *1
FANUC Series 160*i*–TB	160*i*–TB	
FANUC Series 160*is*–TB	160*is*–TB	
FANUC Series 16*i*–MB	16*i*–MB	M series or M series (2–path control) *1
FANUC Series 160*i*–MB	160*i*–MB	
FANUC Series 160*is*–MB	160*is*–MB	
FANUC Series 18*i*–TB	18*i*–TB	T series or T series (2–path control) *1
FANUC Series 180*i*–TB	180*i*–TB	
FANUC Series 180*is*–TB	180*is*–TB	
FANUC Series 18*i*–MB5	18*i*–MB5	M series
FANUC Series 180*i*–MB5	180*i*–MB5	
FANUC Series 180*is*–MB5	180*is*–MB5	
FANUC Series 18*i*–MB	18*i*–MB	
FANUC Series 180*i*–MB	180*i*–MB	
FANUC Series 180*is*–MB	180*is*–MB	
FANUC Series 21*i*–TB	21*i*–TB	T series
FANUC Series 210*i*–TB	210*i*–TB	
FANUC Series 210*is*–TB	210*is*–TB	
FANUC Series 21*i*–MB	21*i*–MB	M series
FANUC Series 210*i*–MB	210*i*–MB	
FANUC Series 210*is*–MB	210*is*–MB	

*1) In the case of two–path control is added.

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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). Note that some precautions are related only to specific functions, and thus may not be applicable to certain CNC units.
Users must also observe the safety precautions related to the machine, as described in the relevant manual supplied by the machine tool builder. Before attempting to operate the machine or create a program to control the operation of the machine, the operator must become fully familiar with the contents of this manual and relevant manual supplied by the machine tool builder.

CONTENTS

1. DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution 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 damage of both the user being injured and the equipment being damaged if the approved procedure is not observed.

CAUTION

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

NOTE

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

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

2. GENERAL WARNINGS

WARNING

1. 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.

2. 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.

3. 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.

4. 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.

5. The parameters for the CNC and PMC are factory–set. Usually, there is not need to change them. When, however, there is not alternative other than to change a parameter, ensure that you fully understand the function of the parameter before making any change.
Failure to set a parameter correctly may result in the machine behaving unexpectedly, possibly causing damage to the workpiece and/or machine itself, or injury to the user.

WARNING

6. Immediately after switching on the power, do not touch any of the keys on the MDI panel until the position display or alarm screen appears on the CNC unit.
Some of the keys on the MDI panel are dedicated to maintenance or other special operations. Pressing any of these keys may place the CNC unit in other than its normal state. Starting the machine in this state may cause it to behave unexpectedly.

7. The this Handbook and other manuals supplied with a CNC unit provide an overall description of the machine's functions, including any optional functions. Note that the optional functions will vary from one machine model to another. Therefore, some functions described in the manuals may not actually be available for a particular model. Check the specification of the machine if in doubt.

8. Some functions may have been implemented at the request of the machine–tool builder. When using such functions, refer to the manual supplied by the machine–tool builder for details of their use and any related cautions.

NOTE

Programs, parameters, and macro variables are stored in nonvolatile memory in the CNC unit. Usually, they are retained even if the power is turned off. Such data may be deleted inadvertently, however, or it may prove necessary to delete all data from nonvolatile memory as part of error recovery.
To guard against the occurrence of the above, and assure quick restoration of deleted data, backup all vital data, and keep the backup copy in a safe place.

3. WARNINGS RELATED TO PROGRAMMING

This section covers the major safety precautions related to programming. Before attempting to perform programming, read the supplied operator's manual and programming manual carefully such that you are fully familiar with their contents.

WARNING

1. **Coordinate system setting**

If a coordinate system is established incorrectly, the machine may behave unexpectedly as a result of the program issuing an otherwise valid move command.
Such an unexpected operation may damage the tool, the machine itself, the workpiece, or cause injury to the user.

2. **Positioning by nonlinear interpolation**

When performing positioning by nonlinear interpolation (positioning by nonlinear movement between the start and end points), the tool path must be carefully confirmed before performing programming.
Positioning involves rapid traverse. If the tool collides with the workpiece, it may damage the tool, the machine itself, the workpiece, or cause injury to the user.

3. **Function involving a rotation axis**

When programming polar coordinate interpolation or normal–direction (perpendicular) control, pay careful attention to the speed of the rotation axis. Incorrect programming may result in the rotation axis speed becoming excessively high, such that centrifugal force causes the chuck to lose its grip on the workpiece if the latter is not mounted securely.
Such mishap is likely to damage the tool, the machine itself, the workpiece, or cause injury to the user.

4. **Inch/metric conversion**

Switching between inch and metric inputs does not convert the measurement units of data such as the workpiece origin offset, parameter, and current position. Before starting the machine, therefore, determine which measurement units are being used. Attempting to perform an operation with invalid data specified may damage the tool, the machine itself, the workpiece, or cause injury to the user.

WARNING

5. **Constant surface speed control**

When an axis subject to constant surface speed control approaches the origin of the workpiece coordinate system, the spindle speed may become excessively high. Therefore, it is necessary to specify a maximum allowable speed. Specifying the maximum allowable speed incorrectly may damage the tool, the machine itself, the workpiece, or cause injury to the user.

6. **Stroke check**

After switching on the power, perform a manual reference position return as required. Stroke check is not possible before manual reference position return is performed. Note that when stroke check is disabled, an alarm is not issued even if a stroke limit is exceeded, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the user.

7. **Tool post interference check**

A tool post interference check is performed based on the tool data specified during automatic operation. If the tool specification does not match the tool actually being used, the interference check cannot be made correctly, possibly damaging the tool or the machine itself, or causing injury to the user.
After switching on the power, or after selecting a tool post manually, always start automatic operation and specify the tool number of the tool to be used.

8. **Absolute/incremental mode**

If a program created with absolute values is run in incremental mode, or vice versa, the machine may behave unexpectedly.

9. **Plane selection**

If an incorrect plane is specified for circular interpolation, helical interpolation, or a canned cycle, the machine may behave unexpectedly. Refer to the descriptions of the respective functions for details.

10. **Torque limit skip**

Before attempting a torque limit skip, apply the torque limit. If a torque limit skip is specified without the torque limit actually being applied, a move command will be executed without performing a skip.

WARNING

11. **Programmable mirror image**

Note that programmed operations vary considerably when a programmable mirror image is enabled.

12. **Compensation function**

If a command based on the machine coordinate system or a reference position return command is issued in compensation function mode, compensation is temporarily canceled, resulting in the unexpected behavior of the machine.
Before issuing any of the above commands, therefore, always cancel compensation function mode.

4. WARNINGS RELATED TO HANDLING

This section presents safety precautions related to the handling of machine tools. Before attempting to operate your machine, read the supplied operator's manual and programming manual carefully, such that you are fully familiar with their contents.

WARNING

1. **Manual operation**

When operating the machine manually, determine the current position of the tool and workpiece, and ensure that the movement axis, direction, and feedrate have been specified correctly. Incorrect operation of the machine may damage the tool, the machine itself, the workpiece, or cause injury to the operator.

2. **Manual reference position return**

After switching on the power, perform manual reference position return as required. If the machine is operated without first performing manual reference position return, it may behave unexpectedly. Stroke check is not possible before manual reference position return is performed.
An unexpected operation of the machine may damage the tool, the machine itself, the workpiece, or cause injury to the user.

3. **Manual numeric command**

When issuing a manual numeric command, determine the current position of the tool and workpiece, and ensure that the movement axis, direction, and command have been specified correctly, and that the entered values are valid.
Attempting to operate the machine with an invalid command specified may damage the tool, the machine itself, the workpiece, or cause injury to the operator.

4. **Manual handle feed**

In manual handle feed, rotating the handle with a large scale factor, such as 100, applied causes the tool and table to move rapidly. Careless handling may damage the tool, workpiece, and/or machine, or cause injury to the user.

5. **Disabled override**

If override is disabled (according to the specification in a macro variable) during threading, rigid tapping, or other tapping, the speed cannot be predicted, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the operator.

WARNING

6. **Origin/preset operation**

Basically, never attempt an origin/preset operation when the machine is operating under the control of a program. Otherwise, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the tool, or causing injury to the user.

7. **Workpiece coordinate system shift**

Manual intervention, machine lock, or mirror imaging may shift the workpiece coordinate system. Before attempting to operate the machine under the control of a program, confirm the coordinate system carefully.
If the machine is operated under the control of a program without making allowances for any shift in the workpiece coordinate system, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the operator.

8. **Software operator's panel and menu switches**

Using the software operator's panel and menu switches, in combination with the MDI panel, it is possible to specify operations not supported by the machine operator's panel, such as mode change, override value change, and jog feed commands.
Note, however, that if the MDI panel keys are operated inadvertently, the machine may behave unexpectedly, possibly damaging the tool, the machine itself, the workpiece, or causing injury to the user.

9. **Manual intervention**

If manual intervention is performed during programmed operation of the machine, the tool path may vary when the machine is restarted. Before restarting the machine after manual intervention, therefore, confirm the settings of the manual absolute switches, parameters, and absolute/incremental command mode.

10. **Feed hold, override, and single block**

The feed hold, feedrate override, and single block functions can be disabled using custom macro system variable #3004. Be careful when operating the machine in this case.

11. **Dry run**

Usually, a dry run is used to confirm the operation of the machine. During a dry run, the machine operates at dry run speed, which differs from the corresponding programmed feedrate. Note that the dry run speed may sometimes be higher than the programmed feed rate.

WARNING

12. **Cutter and tool nose radius compensation in MDI mode**

Pay careful attention to a tool path specified by a command in MDI mode, because cutter or tool nose radius compensation is not applied. When a command is entered from the MDI to interrupt in automatic operation in cutter or tool nose radius compensation mode, pay particular attention to the tool path when automatic operation is subsequently resumed. Refer to the descriptions of the corresponding functions for details.

13. **Program editing**

If the machine is stopped, after which the machining program is edited (modification, insertion, or deletion), the machine may behave unexpectedly if machining is resumed under the control of that program. Basically, do not modify, insert, or delete commands from a machining program while it is in use.

5. WARNINGS RELATED TO DAILY MAINTENANCE

WARNING

1. **Memory backup battery replacement**

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.
Refer to the maintenance section of the operator's manual or programming manual for details of the battery replacement procedure.

WARNING

2. **Absolute pulse coder battery replacement**

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.
See FANUC SERVO MOTOR αi series Maintenance Manual (B–65285EN) or FANUC SERVO MOTOR α series Maintenance Manual (B–65165E).

3. **Fuse replacement**

For some units, the chapter covering daily maintenance in the operator's manual or programming manual describes the fuse replacement procedure.
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.

1. SCREEN DISPLAY AND OPERATION

1.1 Display Unit and Key Layout

(1) LCD display unit

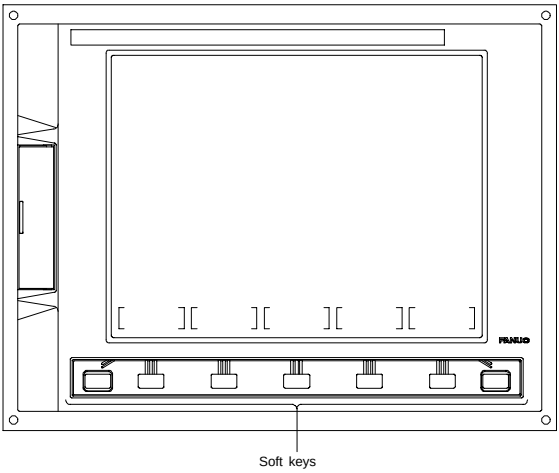


Fig.1.1 (a) 7.2″/8.4″ LCD unit

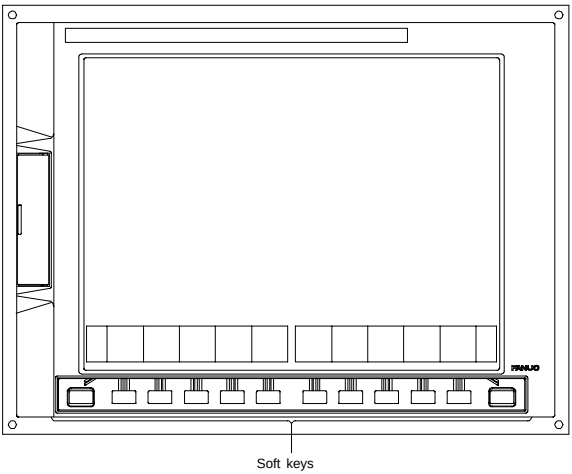


Fig.1.1 (b) 9.5″/10.4″ LCD unit

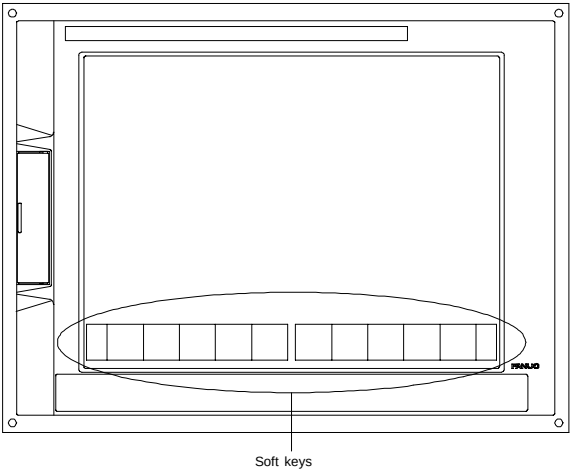


Fig. 1.1 (c) 10.4″ LCD unit with touch panel

(2) MDI keyboard on panel of T series CNC

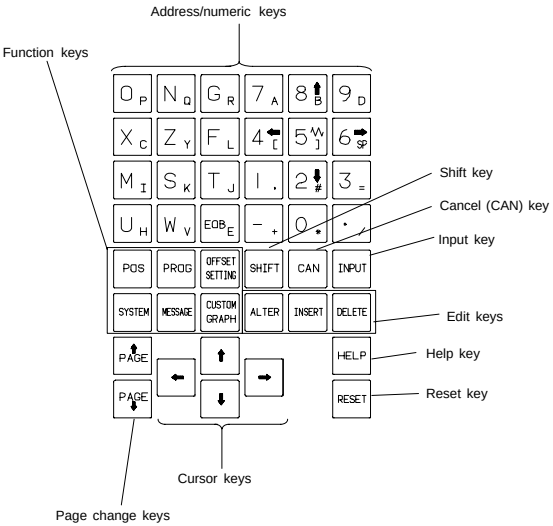


Fig.1.1 (d) Stand–alone type small MDI unit (T series)

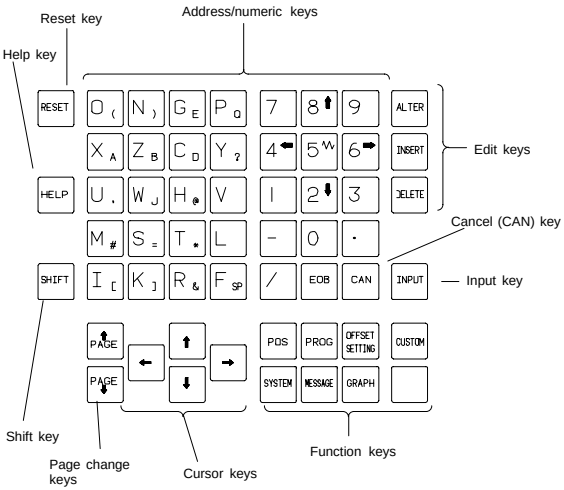


Fig.1.1 (e) Stand–alone type standard MDI unit (T series)

(3) MDI keyboard on panel of M series CNC

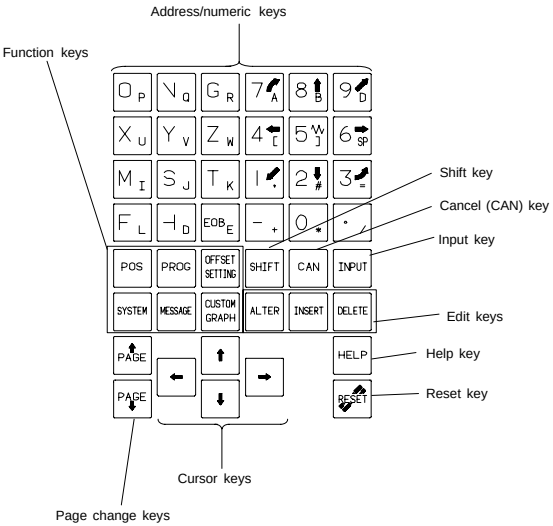


Fig.1.1 (f) Stand–alone type small MDI unit (M series)

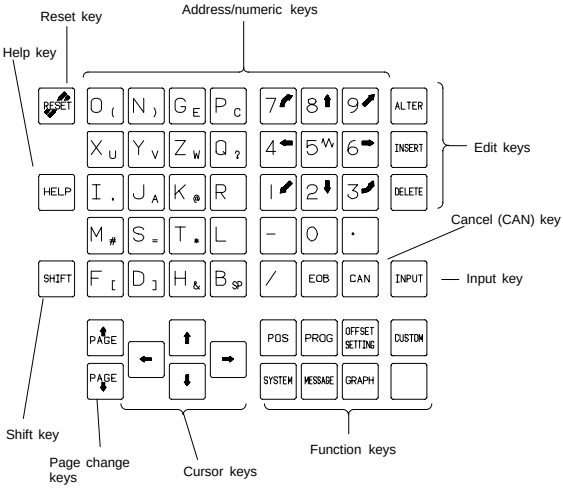


Fig.1.1 (g) Stand–alone type standard MDI unit (M series)

(4) MDI keyboard (61 fullkey)

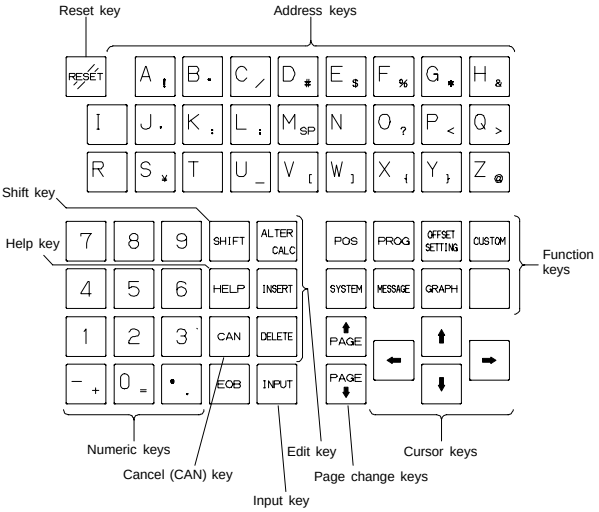
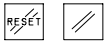
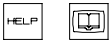
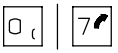
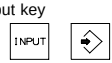
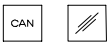
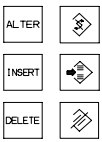
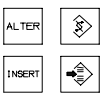
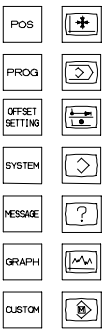
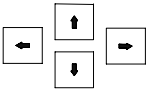


Fig. 1.1 (h) 61 fullkey MDI unit

(5) Explanation of keyboard

No.	Name	Functions
(1)	Reset key 	Press this key to reset the CNC, to cancel an alarm, etc.
(2)	Help key 	Press this button to use the help function when uncertain about the operation of an MDI key. (Help function)
(3)	Soft key	The soft key has various functions, according to the Applications. The soft key functions are displayed at the bottom of the screen.
(4)	Address/numeric keys 	Press these keys to input alphabetic, numeric, and other characters.
(5)	Shift key 	Some keys have two characters on their key-top. Pressing the Shift key switches the characters. Special character ^ is displayed on the screen when a character indicated at the bottom right corner on the keytop can be entered.
(6)	Input key 	When an address or a numeric key is pressed, the data is input to the key input buffer, and it is displayed on the LCD screen. To copy the data in the key input buffer to the offset register, etc., press the Input key. This key is equivalent to the [INPUT] key of the soft keys, and either can be pressed to produce the same result.
(7)	Cancel (CAN) key 	Press this key to delete the last character or symbol input to the key input buffer. Example: When the key input buffer displays N001X100Z and the Cancel key is pressed, Z is canceled and N001X100 is displayed.
(8)	Edit keys 	Press these keys when editing the program.  : Alter : Insert : Delete
(9)	Function keys 	Press these keys to switch display screens for each function.

No.	Name	Functions
(10)	Cursor keys 	There are four different cursor move keys.  : This key is used to move the cursor to the right or in the forward direction. The cursor is moved in short units in the forward direction.  : This key is used to move the cursor to the left or in the reverse direction. The cursor is moved in short units in the reverse direction.  : This key is used to move the cursor in a downward or forward direction. The cursor is moved in large units in the forward direction.  : This key is used to move the cursor in an upward or reverse direction. The cursor is moved in large units in the reverse direction.
(11)	Page change keys 	Two kinds of page change keys are described below.  : This key is used to changeover the page on the screen in the reverse direction.  : This key is used to changeover the page on the screen in the forward direction.

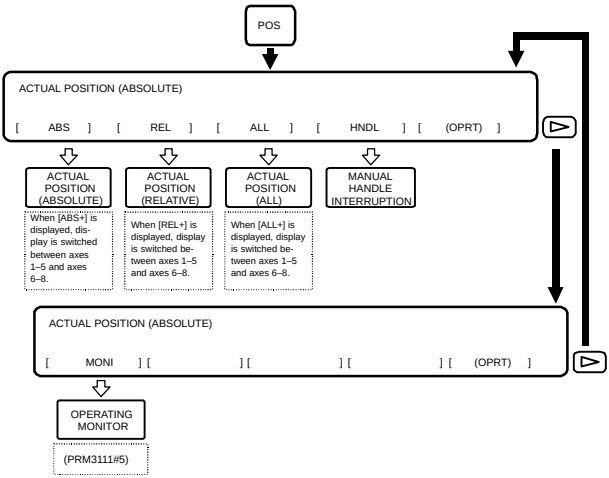
1.2 Display of Each Screen

1.2.1 Overview

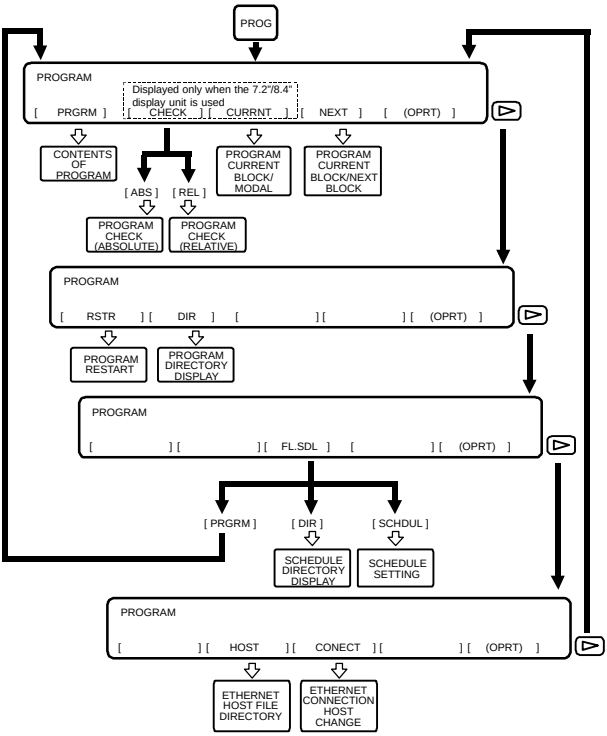
- For each MDI function key, multiple screens are available.
- Each screen can be displayed by selection operation using a soft key.
- The continuous menu key ▷ changes the display of soft keys.
- To display a desired screen, the continuous menu key ▷ may need to be pressed several times.
- Depending on the setting and optional function, some screens are not displayed.

The individual screens have their specific functions and operations.
For the screens for the basic functions, the operation method is described in the sections starting with Section 1.3.

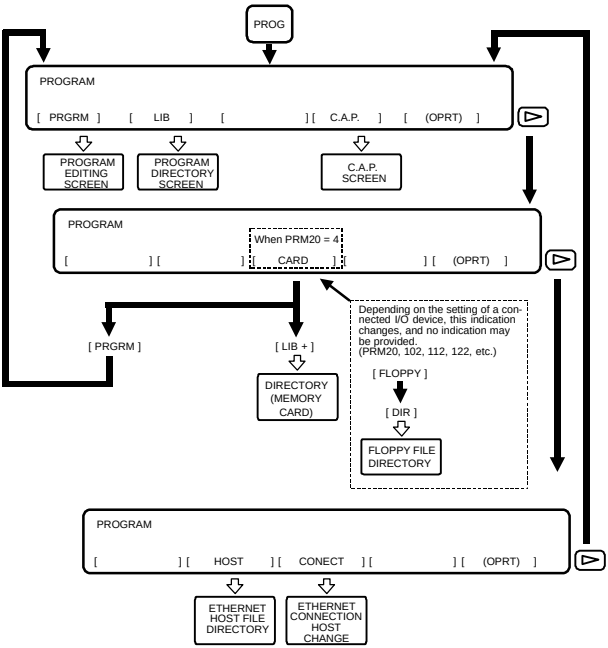
1.2.2 Screens included in POS



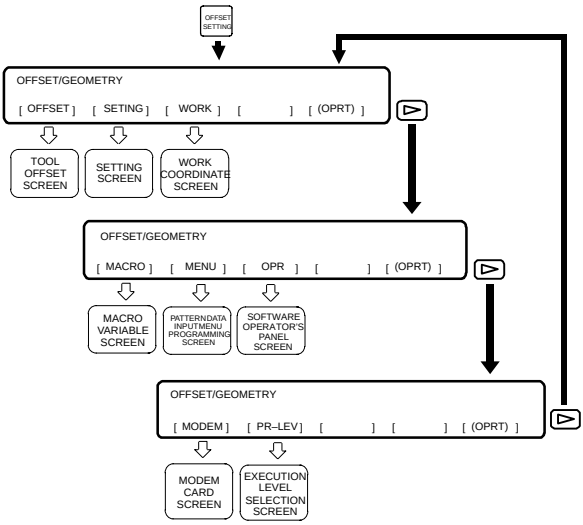
1.2.3 Screens included in [PROG] (MEM mode)



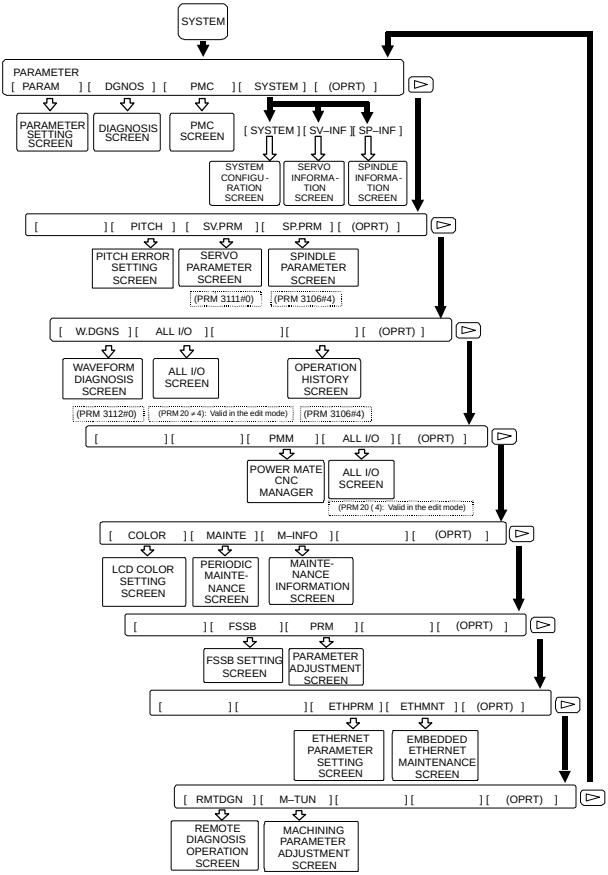
1.2.4 Screens included in PROG (EDIT mode)



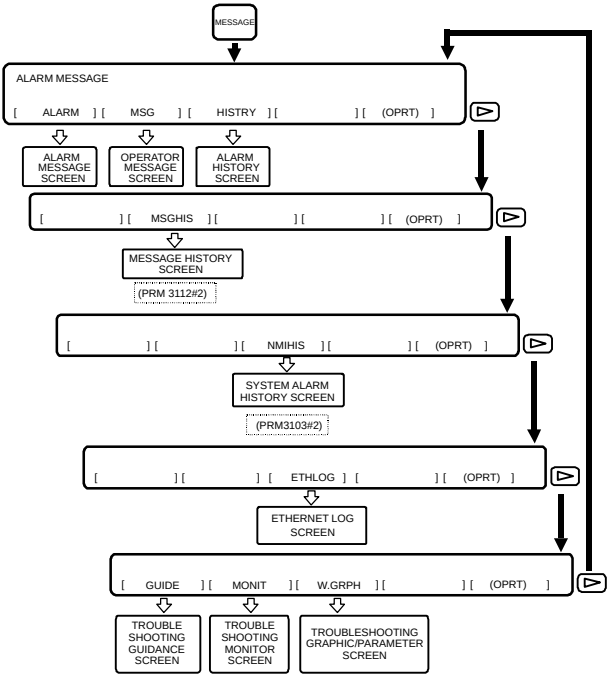
1.2.5 Screens included in OFFSET SETTING



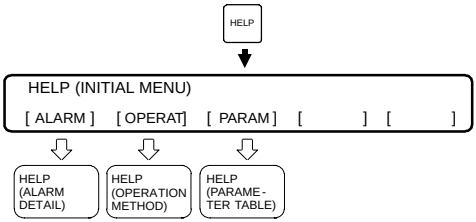
1.2.6 Screens included in SYSTEM



1.2.7 Screens included in [MESSAGE]



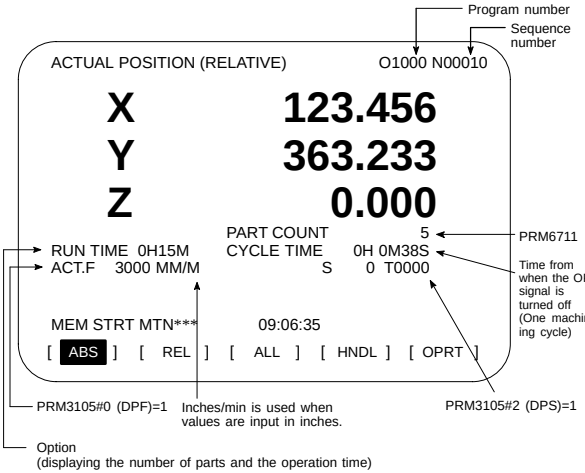
1.2.8 Screens included in [HELP]



1.3 Screen Operation Associated with POS

1.3.1 Displaying the position using absolute coordinates

(a) Press soft key [ABS].



(b) Operation

Soft key [(OPRT)] — [PTSPRE] [EXEC]
[RUNPRE] [EXEC]

(c) Related parameters

PRM3115#0 (NDP) : 0: The current position is displayed for each axis.
1: The current position is not displayed for each axis.

PRM6700#0 (PCM) : The total number of machined parts and the number of machined parts are incremented when the following M codes are specified.
0: M02, M03, and the M codes specified with PRM6710
1: The M codes specified with PRM6710

PRM6710: M code that counts the total number of machined parts and the number of machined parts in the current operation

PRM6711: Number of machined parts

PRM6751: Operation time (integrated time value during automatic operation) [ms]

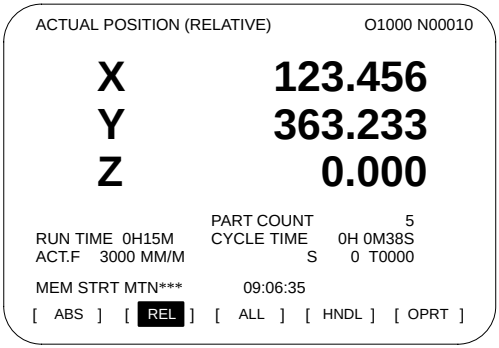
PRM6752: Operation time (integrated time value during automatic operation) [min]
NOTE Hours and minutes are displayed on the screen.

PRM6757: Operation time (integrated value in one automatic operation) [ms]

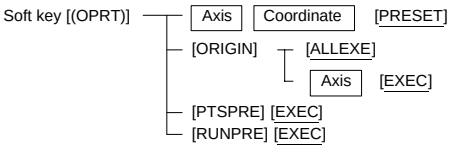
PRM6758: Operation time (integrated value in one automatic operation) [min]
NOTE Hours, minutes, and seconds are displayed on the screen.

1.3.2 Displaying the position using relative coordinates

(a) Press soft key [REL].

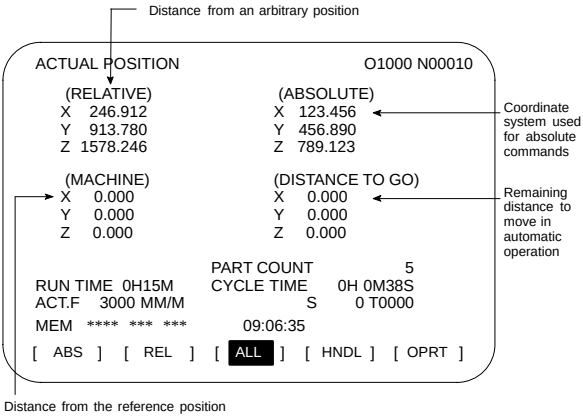


(b) Operation

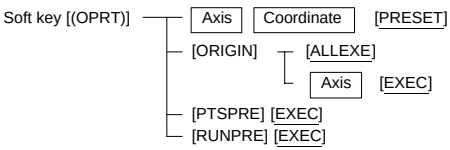


1.3.3 Overall display

(a) Press soft key [ALL].



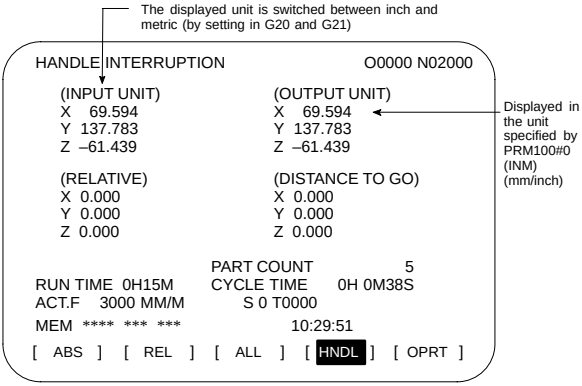
(b) Operation



1.3.4 Display for handle interrupt

(a) Press soft key [HNDL].

The distance traveled due to a handle interrupt is displayed.



(b) Operation

Soft key [(OPRT)] — [PTSPRE] [EXEC]
[RUNPRE] [EXEC]

(c) Related signals

DGN

	#7	#6	#5	#4	#3	#2	#1	#0
G041	HS2ID	HS2IC	HS2IB	HS2IA	HS1ID	HS1IC	HS1IB	HS1IA

DGN

	#7	#6	#5	#4	#3	#2	#1	#0
G042					HS3ID	HS3IC	HS3IB	HS3IA

NOTE HS3In <G042#3-#0> is effective only in the M series.

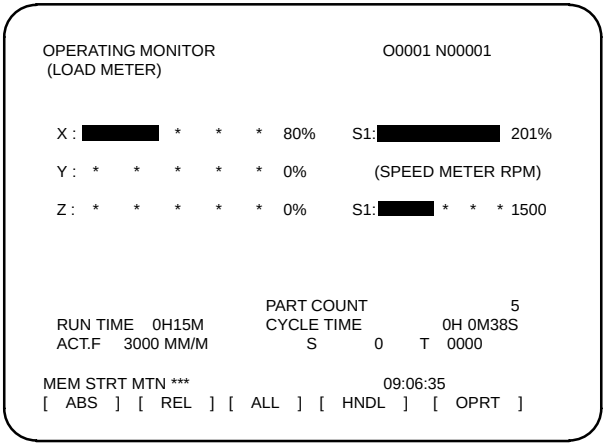
1.3.5 Operating monitor

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

(a) Set a parameter to display operating monitor. (PRM3115#5=1)

Press continuous menu key [▷], then soft key **[MONI]** is displayed.

Press the soft key **[MONI]**, then the operating monitor screen is displayed.



(b) Caution

1 The bar graph for the load meter shows load up to 200%.

2 The bar graph for the speedometer shows the ratio of the current spindle speed to the maximum spindle speed (100%). Although the speedometer normally indicates the speed of the spindle motor, it can also be used to indicate the speed of the spindle by setting PRM3111#6 (OPS) to 1.

3 The servo axes for their load meters are displayed are set to PRM3151–3153. If PRM3151–3153 are all zero, the load meter of the basic axes are displayed.

4 For color display unit, the bar of the load meter that exceed 100% shows purple color.

(c) Related parameters

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

[Data type] Bit

OPM Operating monitor display is:

0 : Disabled

1 : Enabled

OPS The speedometer on the operating monitor screen displays:

0 : Spindle motor speed

1 : Spindle speed

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

[Data type] Byte

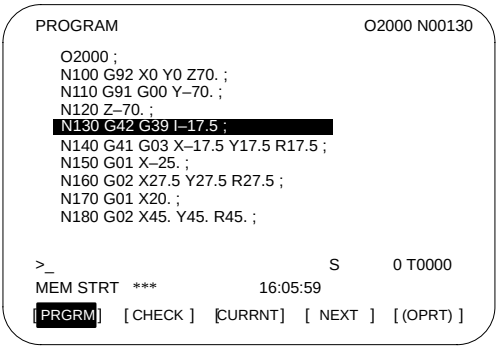
[Valid data range] 0, 1, ... number of controlled axes

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

1.4 Screen Operation Associated with PROG (in Memory Mode)

1.4.1 Program contents screen

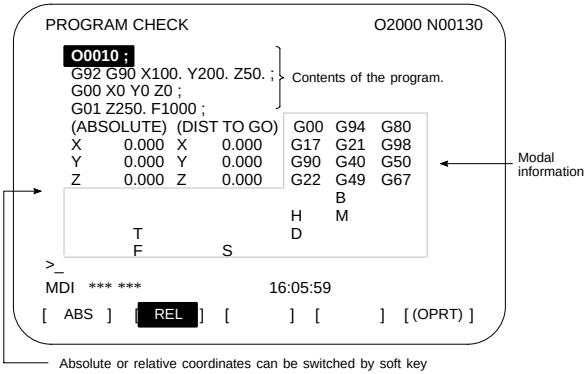
(a) Press soft key [PRGRM].



1.4.2 Program checking screen

(a) Press soft key [CHECK].

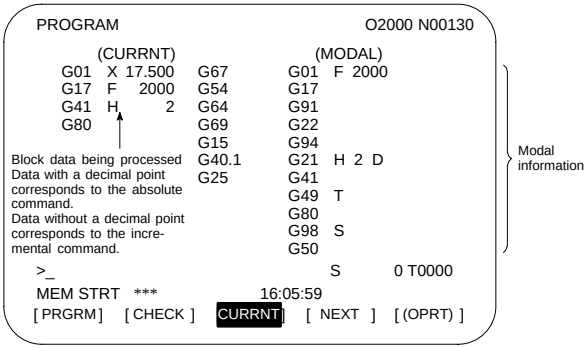
This operation is unnecessary for the 9.5”/10.4” display unit.



1.4.3 Screen displaying the contents of the program currently running

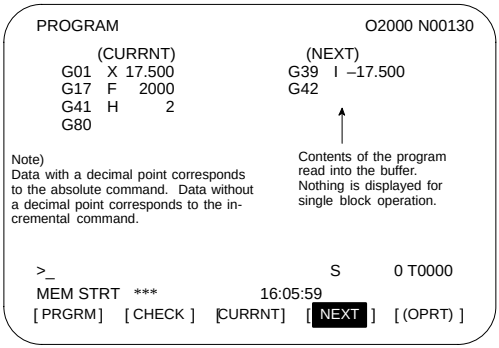
(a) Press soft key [CURRNT].

This operation is unnecessary for the 9.5”/10.4” display unit.



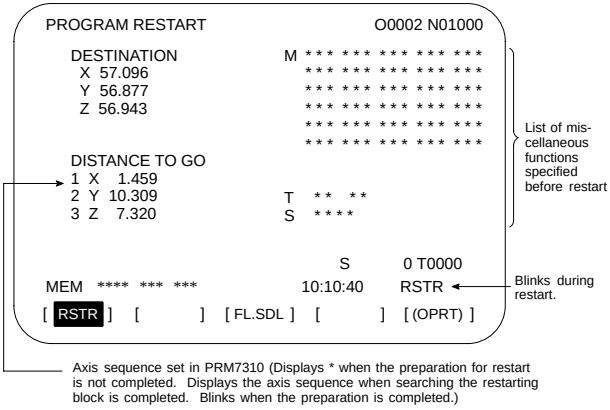
1.4.4 Screen displaying the current and next blocks

(a) Press soft key [NEXT].



1.4.5 Program restart screen

(1) Press soft key [RSTR].



(2) Operation

The program restart function restarts machining from the block whose sequence number is specified when a tool is damaged or when the power is turned on.

(a) P type (when a tool is damaged)

1 Press the feed hold button. Move the tool away from the workpiece in the manual mode and replace it with a new one.
Change the tool compensation value, if necessary.

2 Set the SRN signal to 1.

3 Display the program contents screen.

4 Press soft key [REWIND] to move the cursor to the top of the program.

5 Enter N followed by the sequence number of the program to be restarted. Press soft key [P TYPE] to search for the sequence number.

6 The program restart screen is displayed. The position at which machining is restarted and the specified M, S, T, and B codes are shown on the screen.

7 Set the SRN signal to 0.

8 Specify M, S, T, or B codes in the MDI mode, if necessary.

9 Return to the automatic operation mode and press the cycle start button.

(b) Q type (When machining is restarted after being stopped for some reason)

Used when machining is restarted after the power is turned off, the emergency stop button is pressed, or the operation is stopped to change the coordinate system.

1 Return the machine to the reference position, if necessary, after the power is turned on.

2 Move the machine to the restart point in the manual mode and set the restarting data and coordinate system.

3 Ensure that the offset value is correct.

4 Set the SRN signal to 1.

5 Display the program contents screen.
Press soft key [REWIND] to move the cursor to the start of the program.

6 Enter N followed by the sequence number of the program to be restarted. Press soft key [Q TYPE] to search for the sequence number.

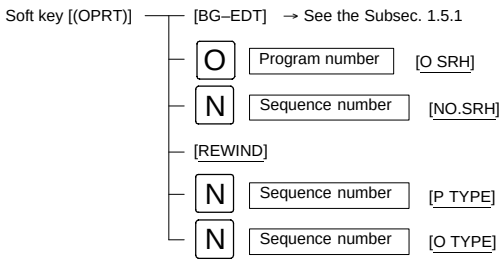
7 The program restart screen is displayed. The position at which machining is restarted and the specified M, S, T, and B codes are shown in the screen.

8 Set the SRN signal to 0.

9 Specify M, S, T, or B codes in the MDI mode, if necessary.

10 Return to the automatic operation mode and press the cycle start button.

(3) Operation



(4) Related parameter

PRM7310: The sequence of the axes along which the machine moves to the restart point after the program is restarted

(5) Related signal

SRN<G006#0>: Program restart

1.5 Screen Operation Associated with PROG (in Edit Mode)

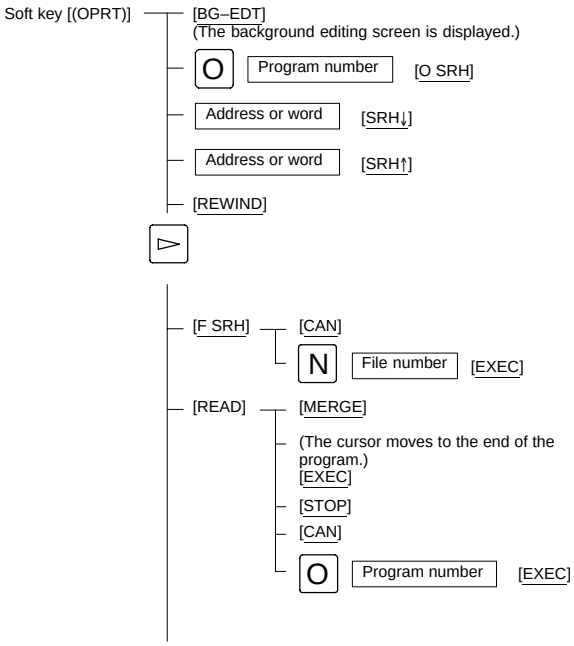
1.5.1 Editing the program

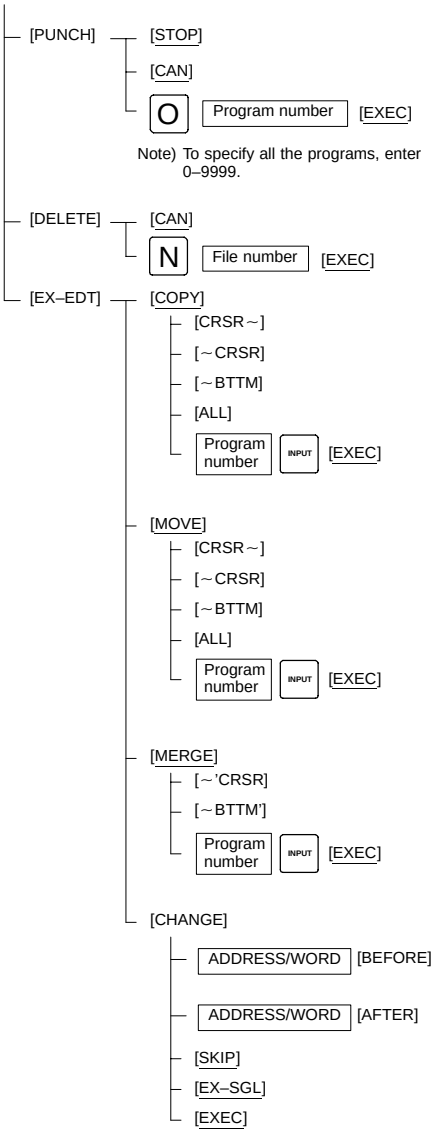
(1) Program editing screen (Press soft key [PRGRM].)

```
PROGRAM                                    O2000 N00130
    O2000 ;
    N100 G92 X0 Y0 Z70. ;
    N110 G91 G00 Y–70. ;
    N120 Z–70. ;
    N130 G42 G39 I–17.5 ;
    N140 G41 G03 X–17.5 Y17.5 R17.5 ;
    N150 G01 X–25. ;
    N160 G02 X27.5 Y27.5 R27.5 ;
    N170 G01 X20. ;
    N180 G02 X45. Y45. R45. ;

>_                                                S 0 T0000
MEM STRT  ***                 16:05:59
[PRGRM] [ CHECK ] [CURRNT] [ NEXT ] [ (OPRT) ]
```

(2) Operation

- Foreground editing screen




[PUNCH]
[STOP]
[CAN]
O
Program number
[EXEC]
Note) To specify all the programs, enter 0–9999.
[DELETE]
[CAN]
N
File number
[EXEC]
[EX–EDT]
[COPY]
[CRSR~]
[~CRSR]
[~BTTM]
[ALL]
Program number
INPUT
[EXEC]
[MOVE]
[CRSR~]
[~CRSR]
[~BTTM]
[ALL]
Program number
INPUT
[EXEC]
[MERGE]
[~'CRSR]
[~BTTM']
Program number
INPUT
[EXEC]
[CHANGE]
ADDRESS/WORD
[BEFORE]
ADDRESS/WORD
[AFTER]
[SKIP]
[EX–SGL]
[EXEC]

- Background editing screen

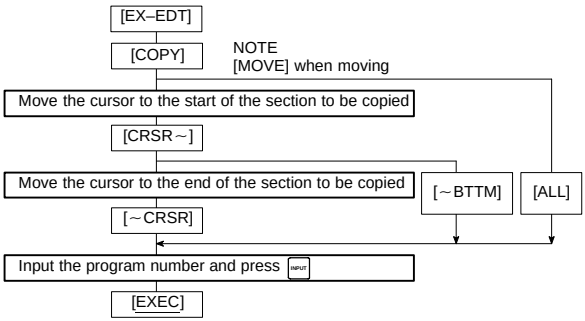
Soft key [(OPRT)] — [BG–END]
(Closes the background editing screen and returns to the foreground screen.)

The rest is the same as for the foreground editing screen.

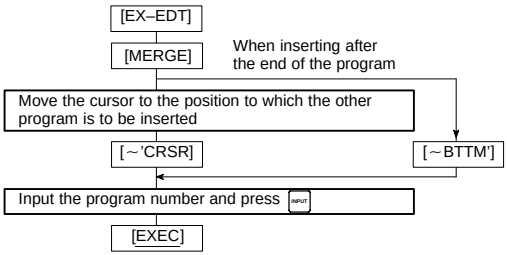
(Supplement) The background editing screen is also displayed to enable program editing when [BG–EDT] is pressed in the memory mode.

(3) Operation of expanded editing function

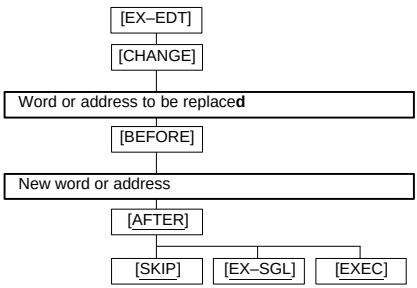
(a) When copying or moving the program



(b) When inserting another program in the program being edited

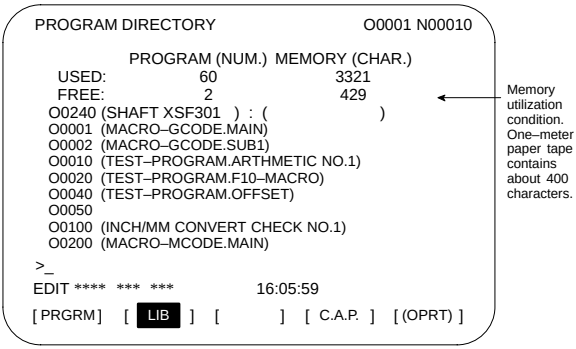


(c) When replacing an address or word

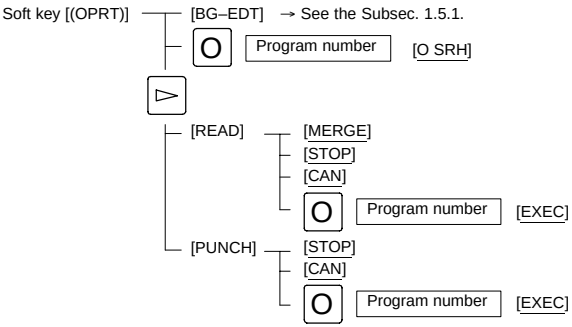


1.5.2 Displaying the program list

(1) Press soft key [LIB].



(2) Operation

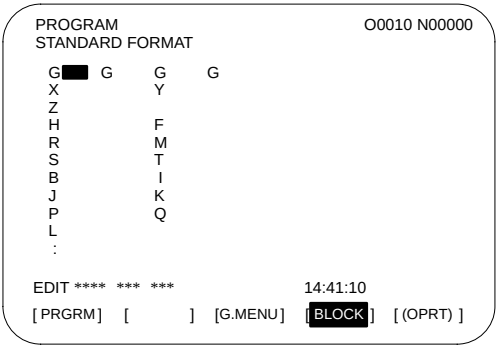


(3) Related parameters

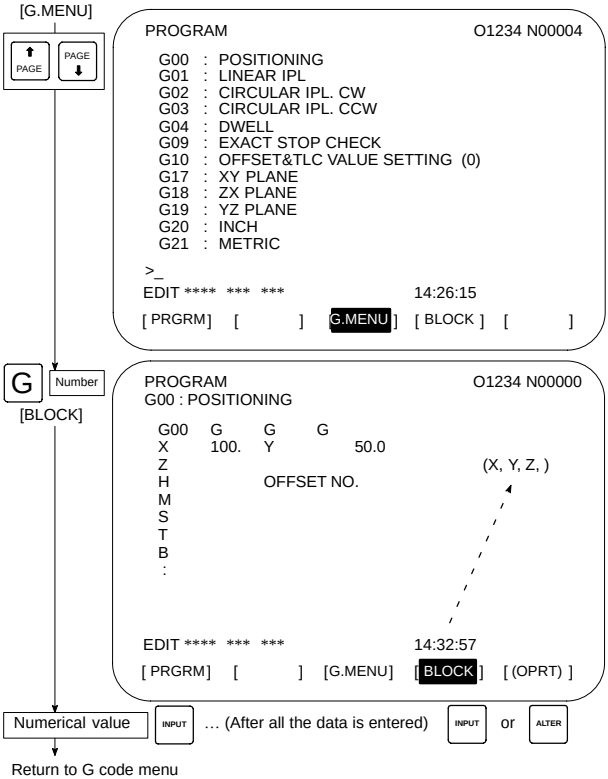
PRM3107#4 (SOR): Programs are listed in the order of registration/ in the order of program number.

1.5.3 Operation in the conversational programming menu

(1) Press soft key [C.A.P.].



(2) Operation



NOTE1 Pressing PAGE ↑ or PAGE ↓ key displays the previous or subsequent block.

NOTE2 Pressing soft key [PRGRM] returns to the program contents screen.

NOTE3 Pressing the DELETE key deletes a block.

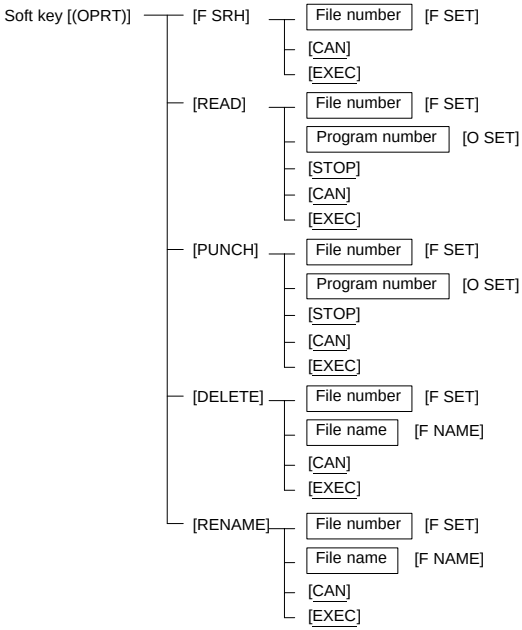
1.5.4 Transferring data to and from the floppy disk

(1) Press soft key [FLOPPY].

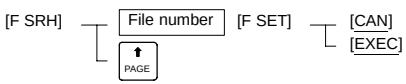
```
DIRECTORY (FLOPPY)                    O0001 N00000
  NO.  FILE NAME                      (METER) VOL
  0001 PARAMETER                          58.5
  0002 O0001                               1.9
  0003 O0002                               1.9
  0004 O0010                               1.3
  0005 O0040                               1.3
  0006 O0050                               1.9
  0007 O0100                               1.9
  0008 O1000                               1.9
  0009 O9500                               1.6


EDIT ****  ***  ***          11:53:04
[ F SRH ]  [ READ ]  [PUNCH ]  [DELETE ]  [        ]
```

(2) Operation

(a) Soft key configuration

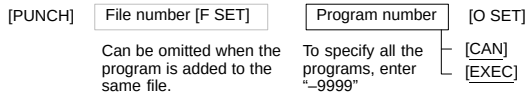


(b) To list the files

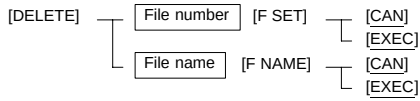


(c) To read the program

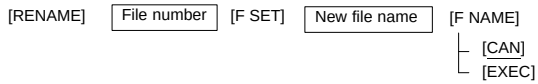
(d) To output the program



(e) To delete the program



(f) To rename the program



(3) Related parameters

Channel	I/O=0	I/O=1	I/O=2	I/O=3 (remote buffer)	
Common	PRM0100				
Output format	PRM101	PRM111	PRM121	PRM131	
Specification number	PRM102	PRM112	PRM122	PRM132	
Transfer rate	PRM103	PRM113	PRM123	PRM133	
Transfer method	Not defined			PRM135#3 (R42)=0	PRM135#2 (R42)=1
Connector	JD36A		JD36B	JD28A	JD6A

0020 — I/O channel selection

0: Channel 1 (JD36A on the motherboard)
1: Channel 1 (JD36A on the motherboard)
2: Channel 2 (JD36B on the motherboard)
3: Channel 3 (JD28A on the serial communication board)

0101

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

#0(SB2) 0: The number of stop bits is one.
1: The number of stop bits is two.
#3(ASI) 0: EIA or ISO code is used when data is input.
1: ASCII code is used when data is input.
#7(NFD) 0: The feed code is output when data is punched out.
1: The feed code is not output when data is punched out.

0102	Specification number of the input/output device

0	RS-232-C (Control codes DC1 to DC4 are used.)
1	FANUC Bubble Cassette B1/B2
2	FANUC Floppy Cassette F1
3	PROGRAM FILE Mate FANUC FA Card adapter FANUC Floppy Cassette adapter, FSP-H FANUC Handy File
4	RS–232C (Control codes DC1 to DC4 are not used.)
5	Portable tape reader
6	FANUC PPR, FSP-G, FSP-H

0103	Baud rate (set transfer rate)

7: 600 9: 2400 11: 9600
8: 1200 10: 4800 12: 19200 [BPS]

(4) Note

This screen is displayed when the floppy disk drive is specified as the input/output device for the unit for which the optional function for controlling the reader/puncher interface and floppy cassette directory display is provided.

1.6 Screen Operation Associated with OFFSET SETTING

1.6.1 Displaying and setting the tool compensation values

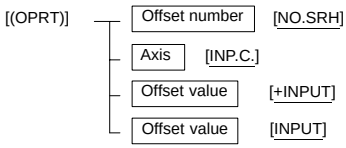
(1) Press soft key [OFFSET].

For tool compensation memory C

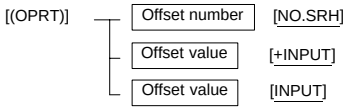
```
OFFSET                                        O0001 N00000
   NO .   GEOM(H)    WEAR(H)    GEOM(D)    WEAR(D)
   001                0.000      0.000      0.000
   002      –1.000    0.000      0.000      0.000
   003       0.000    0.000      0.000      0.000
   004      20.000    0.000      0.000      0.000
   005       0.000    0.000      0.000      0.000
   006       0.000    0.000      0.000      0.000
   007       0.000    0.000      0.000      0.000
   008       0.000    0.000      0.000      0.000
ACTUAL POSITION (RELATIVE)
     X      0.000          Y          0.000
     Z      0.000
>_
MDI ****  ***  ***              16:05:59
[OFFSET]  [ SETING ]  [ WORK ]  [          ]  [ (OPRT) ]
```

(2) Operation

(a) For tool length compensation (H code)



(b) For cutter compensation (D code)



(3) Related parameters

PRM3290#0 (WOE): Entering tool wear compensation values from the MDI panel is allowed/inhibited.

PRM3290#1 (GOF): Entering tool geometry compensation values from the MDI panel is allowed/inhibited.

(4) Related signal

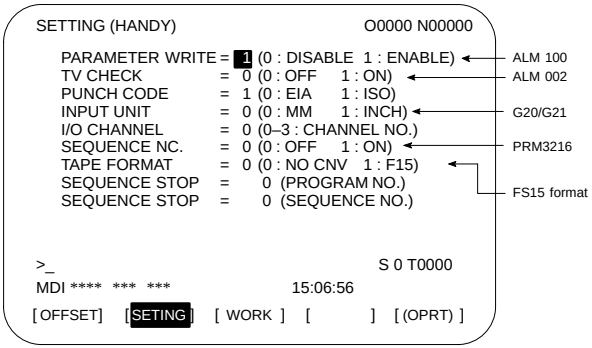
KEY1<G046#3>: Tool compensation values and offset values from the workpiece reference position can be input.

1.6.2 Displaying and setting the data

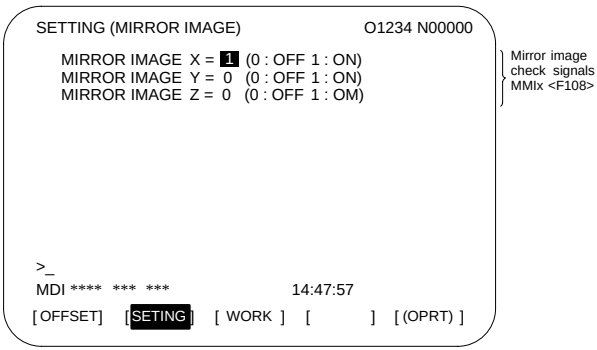
(1) Press soft key [SETING].

With [PAGE ↓] [↑ PAGE] and the cursor keys, screens Ⓐ to Ⓓ can be displayed.

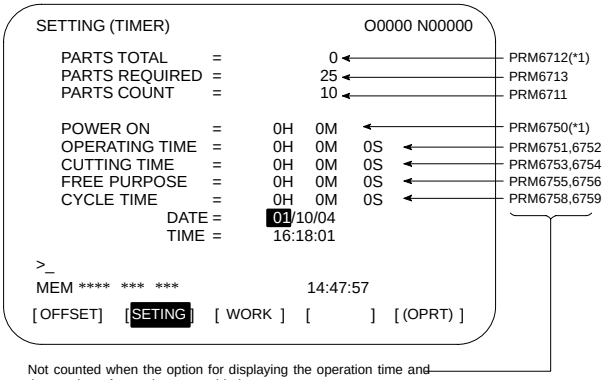
Ⓐ



Ⓑ

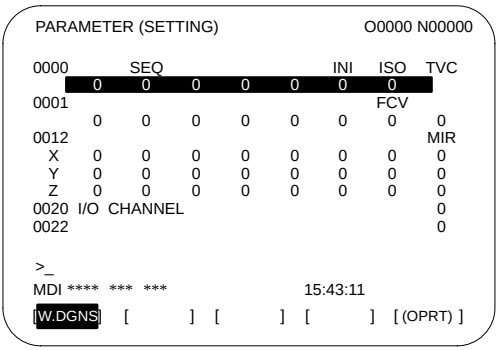


Ⓒ



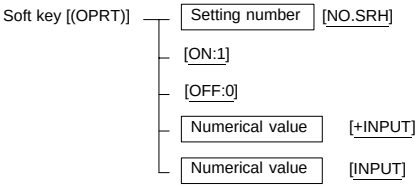
NOTE *1 Cannot be changed on this screen (but can be changed on the parameter screen).)

Ⓓ (There are several pages of parameters for setting input.)



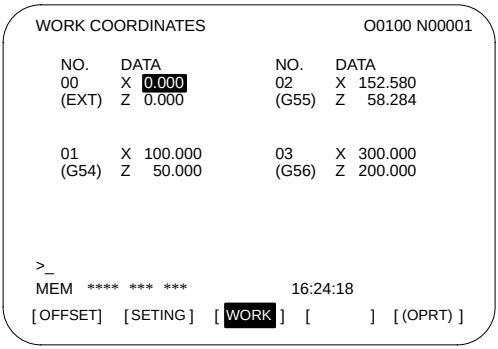
(2) Operation

The setting can be changed in the MDI mode or in the emergency stop state.

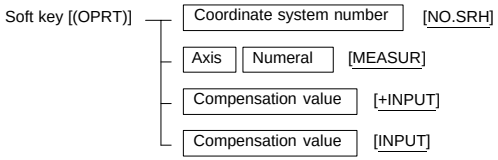


1.6.3 Displaying and setting the offset values for the workpiece coordinate system

(1) Press soft key [WORK].



(2) Operation



(3) Related parameters

PRM3290#3 (WZO): Entering shift values of the coordinate system (T series) or offsets from the workpiece reference position (M series) from the MDI panel is allowed/inhibited.

PRM1220: External shift value of the workpiece coordinate system (T series).
External offset from the workpiece reference position (M series)

PRM1221: Offset from the workpiece reference position for G54

PRM1222: Offset from the workpiece reference position for G55

PRM1223: Offset from the workpiece reference position for G56

PRM1224: Offset from the workpiece reference position for G57

PRM1225: Offset from the workpiece reference position for G58

PRM1226: Offset from the workpiece reference position for G59

1.6.4 Displaying and setting the custom macro variables

(1) Press soft key [MACRO].

```
VARIABLE                                        O0000 N00000

        NO.      DATA          NO.        DATA
        100    01000.000       108
        101    10000.000       109
        102    23000.000       110        –22000.00
        103                    111
        104    00120.000       112
        105                    113
        106    500000.00       114
        107                    115
        ACTUAL POSITION (RELATIVE)
           U         0.000     W          0.000

>_                                    S  0  T0000
MDI   ****  ***  ***             16:05:59
[MACRO]  [ MENU ]  [  OPR  ]  [        ]  [(OPRT)]
```

```
VAR. :                                          O1234 N00000   (*1)

        NO.      NAME        DATA       COMMENT
        500                123.456
        501                  0.000
        502                  3.210
        503
        504
        505
        506
        507
        ACTUAL POSITION (RELATIVE)
           X         0.000        Y       0.000
           Z         0.000
>_
MDI   ****  ***  ***             15:50:13
[MACRO]  [ MENU ]  [  OPR  ]  [        ]  [(OPRT)]
```

NOTE (*1) When the Pattern data input function is provided

(2) Operation

```
Soft key [(OPRT)] ─┬─ Variable number  [NO.SRH]
                   ├─ Axis  [INP.C.]
                   ├─ Variable value  [INPUT]
                   └─ [INPUT] : Delete the input value
```

(3) Related parameter

PRM3290#2 (MCV): Entering macro variables from the MDI panel is allowed/inhibited.

(4) Related signal

KEY2<G046#4>: Data and macro variables can be input.

1.6.5 Displaying and setting the data for the software operator's panel

(1) Press soft key [OPR].

With PAGE ↓ and PAGE ↑ and the cursor keys, screens Ⓐ to Ⓒ can be displayed.

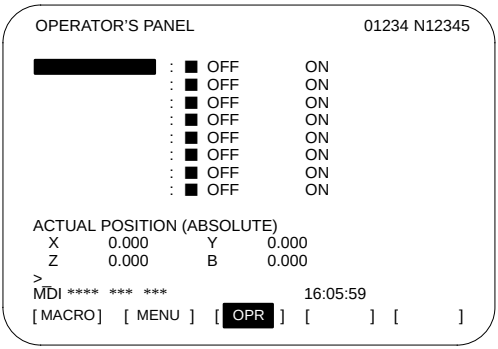
Ⓐ

```
OPERATOR'S PANEL                              O0000 N00000

MODE : MDI    AUTO  EDIT   STEP  JOG   ZRN

 STEP MULTI. :   *1    *10   *100
 RAPID OVRD.:   100%   50%   25%   F0
 JOG FEED    :    1.0%
              **********
 FEED OVRD.  :  140%
              ***
ACTUAL POSITION (ABSOLUTE)
  X       0.000              Z       0.000

>_                                      S    0 T0000
MDI ****  ***  ***                  16:05:59
[ MACRO ]  [ MENU ]  [ OPR ]  [       ]  [ (OPRT) ]
```

Ⓑ

```
OPERATOR'S PANEL                              O0000 N00000

BLOCK SKIP     : ■ OFF          ON
SINGLE BLOCK   :   OFF        ■ ON
MACHINE LOCK   : ■ OFF          ON
PROTECT KEY    : ■ PROTECT      RELEASE
FEED HOLD      : ■ OFF

ACTUAL POSITION (ABSOLUTE)
  X       0.000          Z       0.000




                                        S    0 T0000
MDI ****  ***  ***                  16:05:59
[ MACRO ]  [ MENU ]  [ OPR ]  [       ]  [ (OPRT) ]
```

Ⓒ (Software operator's panel general–purpose switch screen)



(2) Related signals

	#7	#6	#5	#4	#3	#2	#1	#0
F072	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
F073				ZRNO		MD4O	MD2O	MD1O
F075	SPO	KEYO	DRNO	MLKO	SBKO	BDTO		
F076			ROV2O	ROV1O			MP2O	MP1O
F077		RTO			HS1DO	HS1CO	HS1BO	HS1AO
F078	*FV7O	*FV6O	*FV5O	*FV4O	*FV3O	*FV2O	*FV1O	*FV0O
F079	*JV7O	*JV6O	*JV5O	*JV4O	*JV3O	*JV2O	*JV1O	*JV0O
F080	*JV15O	*JV14O	*JV13O	*JV12O	*JV11O	*JV10O	*JV9O	*JV8O
F081	–J4O	+J4O	–J3O	+J3O	–J2O	+J2O	–J1O	+J1O

(3) Cautions

- The function outputs the F signal according to screen operation. To control the machine actually, the corresponding ladder needs to be created.
- A feed operation (PRM7200#1, 7210–7217) along an axis with MDI keys such as [8↑] [2↓] [4←] [6→] is enabled only when the software operator's panel is displayed. (Output to <F081> is performed.)

(4) Related parameters

	#7	#6	#5	#4	#3	#2	#1	#0
7200		OP7	OP6	OP5	OP4	OP3	OP2	OP1

Selects an operation that uses (displays) the software operator's panel.

#0(OP1) Mode selection

#1(OP2) Manual feed axis selection and manual rapid traverse

#2(OP3) Selecting the axis and magnification for the manual pulse generator

#3(OP4) Manual feedrate override and rapid traverse override

#4(OP5) Optional block skip, single block operation, machine lock, and dry run

#5(OP6) Program protection

#6(OP7) Feed hold

7201	General–purpose switch	
#0 JPC : For the name of a general–purpose switch function on the software operator's panel, the use of full–size characters is not allowed (0)/ allowed (1)		
7210	Jog movement axis and its direction on software operator's panel ↑	
7211	Jog movement axis and its direction on software operator's panel ↓	
7212	Jog movement axis and its direction on software operator's panel →	
7213	Jog movement axis and its direction on software operator's panel ←	
7214	Jog movement axis and its direction on software operator's panel ↙	
7215	Jog movement axis and its direction on software operator's panel ↗	
7216	Jog movement axis and its direction on software operator's panel	M series
7217	Jog movement axis and its direction on software operator's panel	M series

7220	Name of general–purpose switch on software operator's panel	
	PRM7220 – 7227: SIGNAL 1 Sets the character code PRM7228 – 7235: SIGNAL 2 Sets the character code PRM7236 – 7243: SIGNAL 3 Sets the character code PRM7244 – 7251: SIGNAL 4 Sets the character code PRM7252 – 7259: SIGNAL 5 Sets the character code PRM7260 – 7267: SIGNAL 6 Sets the character code PRM7268 – 7275: SIGNAL 7 Sets the character code PRM7276 – 7283: SIGNAL 8 Sets the character code	
7283	Name of general–purpose switch on software operator's panel	
7284	Name of general–purpose switch on software operator's panel (extended)	
	PRM7284 – 7291: Set character codes for SIGNAL 9, shown above. PRM7292 – 7299: Set character codes for SIGNAL 10, shown above. PRM7352 – 7359: Set character codes for SIGNAL 11, shown above. PRM7360 – 7367: Set character codes for SIGNAL 12, shown above. PRM7368 – 7375: Set character codes for SIGNAL 13, shown above. PRM7376 – 7383: Set character codes for SIGNAL 14, shown above. PRM7384 – 7391: Set character codes for SIGNAL 15, shown above. PRM7392 – 7399: Set character codes for SIGNAL 16, shown above.	
7399	Name of general–purpose switch on software operator's panel (extended)	

To set "FANUC" as the name of general-purpose switch 1, set the parameters as follows: PRM7220 = 70, PRM7221 = 65, PRM7212 = 78, PRM7213 = 85, and PRM7214 = 67.

1.6.6 Character code list

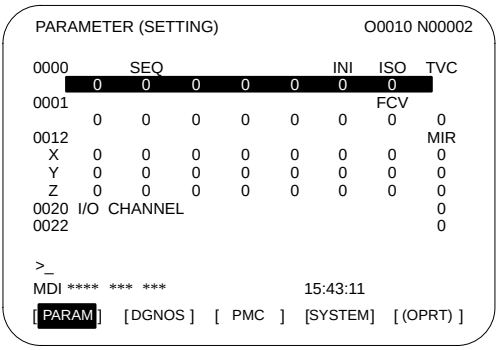
Character	Code	Comment	Character	Code	Comment
A	065		6	054	
B	066		7	055	
C	067		8	056	
D	068		9	057	
E	069			032	Space
F	070		!	033	Exclamation mark
G	071		”	034	Quotation marks
H	072		#	035	Shape
I	073		$	036	Dollar mark
J	074		%	037	Percent
K	075		&	038	Ampersand
L	076		’	039	Apostrophe
M	077		(	040	Left parenthesis
N	078		)	041	Right parenthesis
O	079		*	042	Asterisk
P	080		+	043	Positive sign
Q	081		,	044	Comma
R	082		–	045	Negative sign
S	083		.	046	Period
T	084		/	047	Slash
U	085		:	058	Colon
V	086		;	059	Semicolon
W	087		<	060	Left angle bracket
X	088		=	061	Equal sign
Y	089		>	062	Right angle bracket
Z	090		?	063	Question mark
0	048		@	064	Commercial at mark
1	049		[	091	Left square bracket
2	050		¥	092	Yen mark
3	051		]	093	Right square bracket
4	052		^	094	
5	053		_	095	Underline

1.7 Screen Operation Associated with SYSTEM

1.7.1 Displaying and setting the parameters

For details of the parameters, see Chapter 7.

(1) Press soft key [PARAM].



(2) Entering values from the MDI panel

1 Enter the MDI mode or emergency stop state.

2 Set PARAMETER WRITE to 1 in the setting screen.

3 Alarm 100 occurs. Press the CAN and RESET keys simultaneously to temporarily stop the alarm.

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

a) Enter a parameter number and press [NO.SRH]: Searches for the specified number.

b) Soft key [ON:1]: Sets the value at which the cursor is positioned to 1. (Only for bit parameters)

c) Soft key [OFF:0]: Sets the value at which the cursor is positioned to 0. (Only for bit parameters)

d) Soft key [+INPUT]: Adds the entered value to the value at which the cursor is positioned.

e) Soft key [INPUT]: Sets the value at which the cursor is positioned to theentered value.

f) Soft key [READ]: Inputs parameters from the reader/puncher interface or memory card. For a read operation, set the EDIT mode or the emergency stop state.

g) Soft key [PUNCH]: Outputs parameters to the reader/puncher interface or memory card. For a punch operation, set the EDIT mode.

An input operation can be performed with the MDI key INPUT as well.

5 Upon completion of parameter setting, reset PARAMETER WRITE to 0 on the setting screen.

(3) Convenient methods for entering data

(a) To change data in units of bits

Pressing [←] or [→] changes the cursor to 1-bit size, which enables setting in units of bits (only for bit parameters).

(b) Use [EOB] to continuously set data starting from the cursor position.

(Example1)

When [1] [2] [3] [4] [EOB] [4] [5] [6] [7] [EOB]
[9] [9] [9] [9] [INPUT] is entered,

0		1234
0	→	4567
0		9999
0		0

(Example2)

When [1] [2] [3] [4] [EOB] [EOB] [9] [9] [9] [9] [INPUT]

is entered,

0		1234
0	→	0
0		9999
0		0

(c) Use [=] to enter the same data.

(Example)

When [1] [2] [3] [4] [EOB] [=] [EOB] [=] [INPUT] is entered,

0		1234
0	→	1234
0		1234
0		0

(d) For bit parameters

(Example)

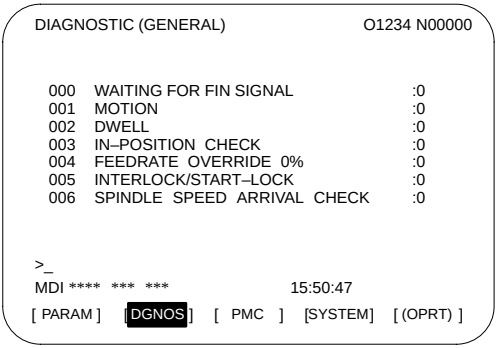
When [1] [1] [EOB] [=] [EOB] [=] [INPUT] is entered,

0 0 0 0 0 0 0 0	0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0	0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0	0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0

1.7.2 Displaying the internal state of the CNC (diagnostic screen)

See Chapter 13 for details of self-diagnosis.

(1) Press soft key[DGNOS].



(2) Operation

Soft key [(OPRT)] — Diagnosis number — [NO.SRH]

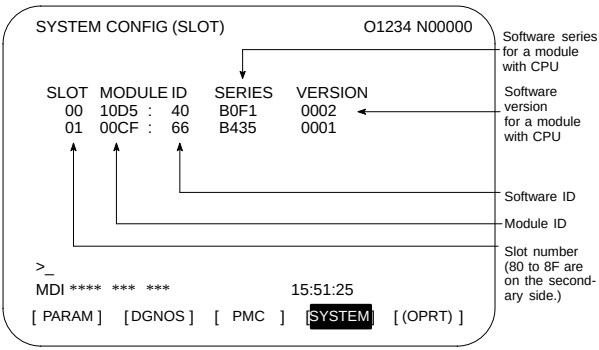
1.7.3 Displaying the system configuration

For details of the system configuration, see Chapter 18.

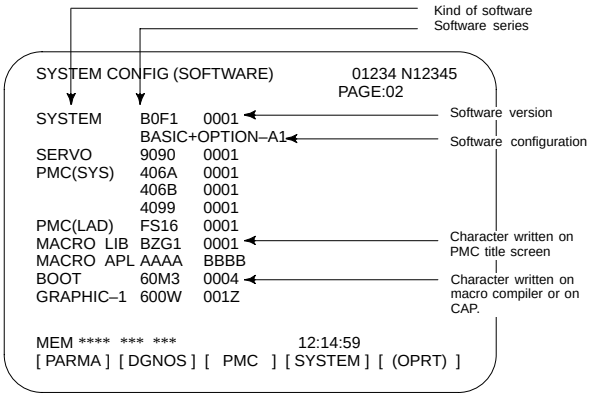
(1) Press soft key [SYSTEM].

With the page keys (PAGE ↓ , PAGE ↑), screens Ⓐ to Ⓒ are displayed.

Ⓐ Slot configuration screen

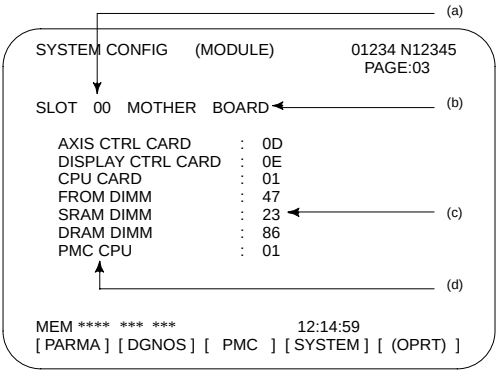


Ⓑ Software configuration screen



Ⓒ Module configuration screen

Displays the configuration of a module mounted on a printed circuit board.



Contents of display

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

(b) Type of PCB mounted

(c) Name of card PCB or DIMM module

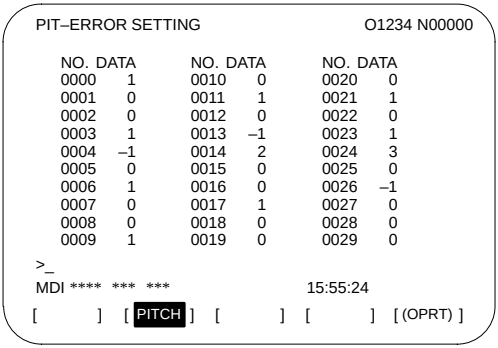
(d) Hardware ID of mounted card PCB or DIMM module

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

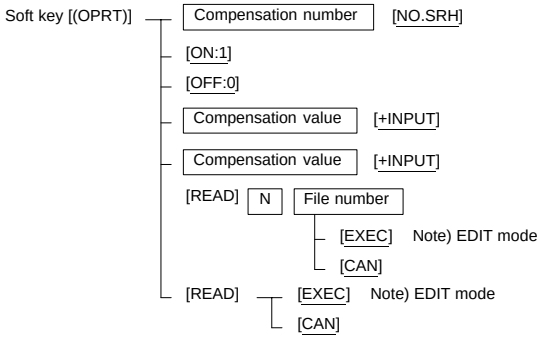
NOTE See the section on the configuration of the printed circuit boards in the control unit for the correspondence between each module and displayed item.

1.7.4 Displaying and setting the pitch error compensation values

(1) Press soft key [PITCH].



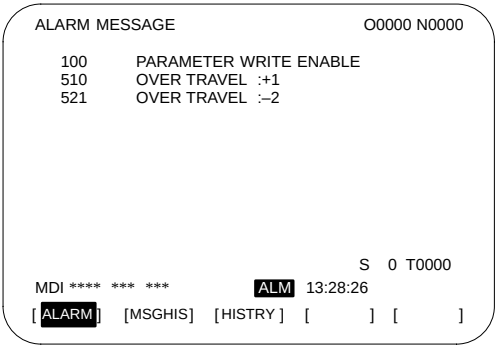
(2) Operation



1.8 Screen Operation Associated with MESSAGE

1.8.1 Displaying the alarm messages

(1) Press soft key [ALARM]

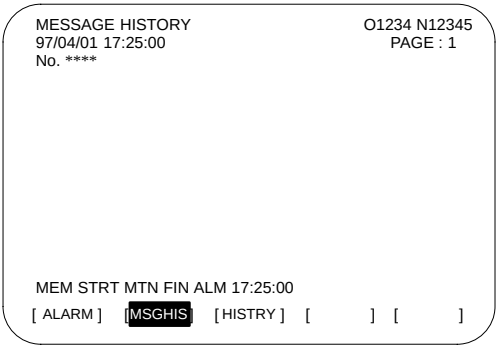


(2) Related parameter

PRM3117#7 (NPA): Switches (0)/does not switch (1) to the alarm screen when an alarm occurs.

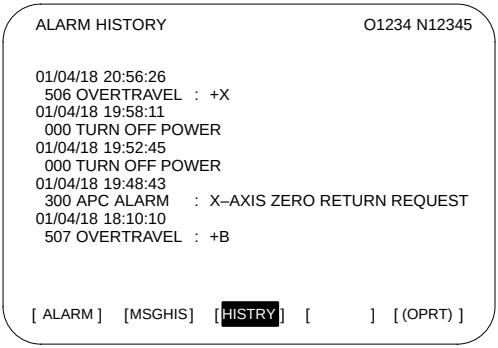
1.8.2 Displaying the operator messages

(1) Press soft key [MSGHIS].



1.8.3 Displaying the alarm history

(1) Press soft key [HISTRY].



(2) Deleting the alarm history

Press soft key [(OPRT)] and then [CLEAR].

(3) About alarms

- When the PRM3112#3=0

  1 Alarms generated by a custom macro

  The alarms have numbers in the range of 3000 to 3999 and are referred to as macro alarms in the message.

  (Example) #3000=1(ERROR1)

  →Found as 3001 macro alarm in the history

  2 Alarms generated by a DISP or DISPB instruction in the PMC

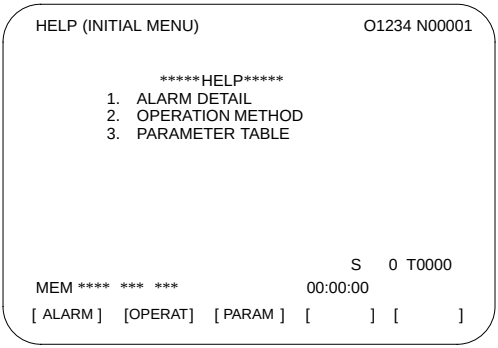
  The alarms have numbers in the range of 1000 to 1999 and are referred to as external alarms in the message.

  (Example) DISP instruction A000.0 1000 ERROR1

  →Found as 1000 external alarm in the history

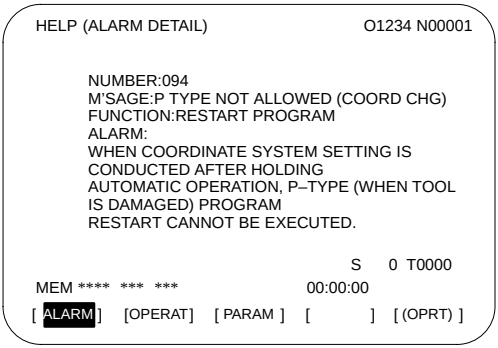
1.9 Help Function

1 Pressing [HELP] in any screen displays the help screen (except in the PMC screen).



1.9.1 Alarm detail screen

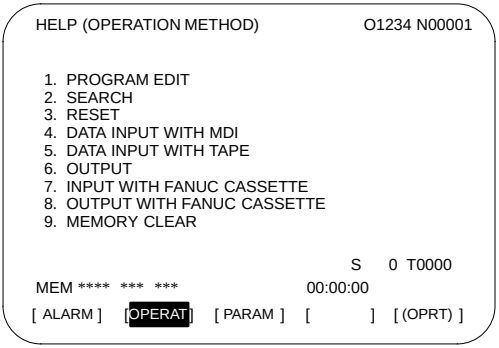
1 Pressing soft key [ALARM] while an alarm is generated displays the help message for the alarm.



2 Press soft key [(OPRT)], enter the alarm number, and then press soft key [SELECT] to display the help message for the alarm corresponding to the entered number.

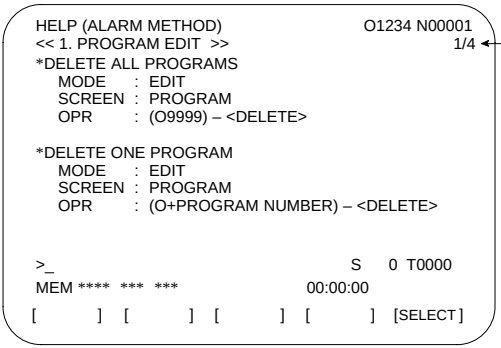
1.9.2 Operation method screen

1 Pressing soft key [OPERAT] displays the operation help message.



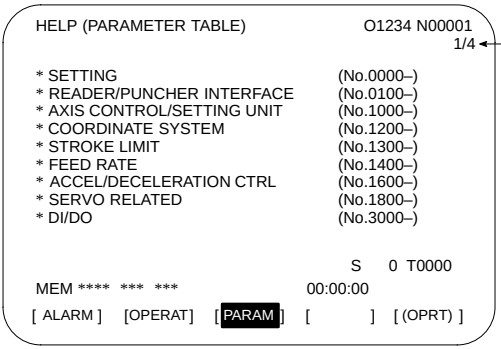
2 Press soft key [(OPRT)], enter the number of the item to be displayed, and then press soft key [SELECT] to display the operation method.

Use PAGE ↓ and PAGE ↑ to select another page.



1.9.3 Parameter contents

Pressing soft key [PARAM] displays the parameter contents.



Use PAGE ↓ and PAGE ↑ to select another page.

About the indication in following tables

* KEYSW: Memory protect signal KEY <G046...>
  = Enables writing (KEY signal = 1).
  × = Disables writing (KEY signal = 0).
  (Some machines are provided with a key or switch that can operate this signal.)
* PWE = 1: Sets PWE (Parameter Write Enable).
  (To be set on the setting screen)
  = Enables parameter rewriting (when PWE is set to 1).
  × = Disables parameter rewriting (when PWE is set to 0).
* [▷] represents the continuous menu key at the right end. On the screen, a + mark is indicated.
* How many times you need to press [▷] depends on the configuration and settings. So, when [▷] → [?] is indicated, press [▷] repeatedly until the [?] soft key appears. Depending on the configuration and settings, the [?] soft key may not appear.
* When “At power–up” is indicated for “Mode,” you need to turn on the power while holding down a key indicated for operation.
* When an input/output operation is performed using an I/O device (such as an RS–232C I/O device and memory card), parameter settings are separately required. (See PRM20 and related parameters.)

Reset

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Operating time			–	POS	[(OPRT)] [TIME: 0] → [EXEC]
Number of machined parts			–	POS	[(OPRT)] [PART: 0] → [EXEC]
OT alarm			At power-up	–	P and CAN
Alarm 100			–	–	RESET while pressing CAN

Registration from MDI

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter			MDI or emergency stop	SYSTEM	[PARAM] → Parameter No. → [NO.SRH] → Data → INPUT or [INPUT] → PWE = 0 → RESET
Offset			–	OFFSET SETTING	[OFFSET] → Offset No. → [NO. SRH] → Offset value → INPUT or [INPUT]
Setting data			MDI	OFFSET SETTING	[SETTING] → Setting No. → [NO. SRH]→Data→ INPUT or [INPUT]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
PMC parameter (Counter, data table)			MDI or emergency stop	SYSTEM (PMC)	[PMC] → [PMCPRM] → [COUNTR] or [DATA] → Data → INPUT
PMC parameter (timer, keep relay)			MDI or emergency stop	SYSTEM (PMC)	[PMC] → [PMCPRM] → [TIMER] or [KEEPRL] → Data → INPUT
Tool length measurement			JOG	POS → OFFSET SETTING	POS → [REL] (Relative coordinate system display) → Axis → [ORIGIN] → OFFSET SETTING → [OFFSET] → Jog the tool to measuring position → Offset number → [NO.SRH] → Axis → [INP.C.]
Pitch error compensation value			MDI or emergency stop	SYSTEM	▷ → [PITCH] → Compensation point number → [NO.SRH] → Data → INPUT or [INPUT]

NOTE mark shows the corresponding key is “1”.

Input from I/O device

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter			EDIT or emergency stop	SYSTEM	[PARAM] → [(OPRT)] → ▷ → [READ] → [EXEC]
PMC parameter (Supplement) When soft key [I/O] is not displayed [PMC] → [PARAM] → [SETING] → Move cursor to “ENABLE PROGRAMMER FUNCTION” → [YES]			Emergency stop	SYSTEM	[PMC] → ▷ → [I/O] → Move cursor to “DEVICE” → Set device with soft key. (Choose from [M–CARD] and [FDCAS], and so on. When setting an FD cassette, set a channel number as well.) → Move cursor to “FUNCTION” → [READ] → Move cursor to “FILE NO.” → File number or @+file–name → INPUT → [EXEC]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Pitch error compensation value			MDI or emergency stop	SYSTEM	▷ → [PITCH] → [(OPRT)] → ▷ → [READ] → [EXEC]
Offset			EDIT	OFFSET SETTING	[OFFSET] → [(OPRT)] → ▷ → [READ] → [EXEC]
Custom macro variable			EDIT	PROG	Read by assigning a temporary program number → Execute in MEM mode → Delete program
Program			EDIT	PROG	[(OPRT)] → ▷ → (O Program number) → [READ] → [EXEC]

NOTE mark shows the corresponding key is “1”.

Collation (Collation with data read through an I/O device)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Memory collation	×		EDIT	PROG	[(OPRT)] → ▷ → [READ] → [EXEC]

Output to I/O device

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter			EDIT or emergency	SYSTEM	[PARAM] → [(OPRT)] → ▷ → [PUNCH] → [ALL] → [NON–0]→ [EXEC]
PMC parameter (Supplement) When soft key [I/O] is not displayed [PMC] → [PARAM] → [SETING] → Move cursor to “ENABLE PROGRAMMER FUNCTION” → [YES]			EDIT	SYSTEM	[PMC] → ▷ → [I/O] → Move cursor to “DEVICE” → Set device with soft key. (Choose from [M–CARD] and [FDCAS], and so on. When setting an FD cassette, set a channel number as well.) → Move cursor to “FUNCTION” → [WRITE] → Move cursor to “DATA KIND” → [PARAM] → Move cursor to “FILE NO.” → File number or @+file–name → INPUT → [EXEC]
Pitch error compensation value			MDI or emergency stop	SYSTEM	▷ → [PITCH] → [(OPRT)] → ▷ → [PUNCH] → [EXEC]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Offset			EDIT	OFFSET SETTING	[OFFSET] → [(OPRT)] → ▷ → [PUNCH]→ [EXEC]
Custom macro variables			EDIT	OFFSET SETTING	▷ → [MACRO] → [(OPRT)] → ▷ → [PUNCH] → [EXEC]
All programs			EDIT	PROG	[(OPRT)] → ▷ → [PUNCH] → O –9999 → [EXEC]
One program			EDIT	PROG	[(OPRT)] → ▷ → [PUNCH] → O Program number → [EXEC]

Search

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Program number			MEM– or EDIT	PROG	O → Program No. → [O SRH]
Sequence number			MEM	PROG	N → Sequence No. → [N SRH]
Address/ word			EDIT	PROG	Word to be searched for → [SRH↑], [SRH ↓], ↑ , or ↓
Address only			EDIT	PROG	Address to be searched for → [SRH↑], [SRH ↓], ↑ , or ↓
Offset number			–	OFFSET SETTING	[OFFSET] → Offset No. → [NO.SRH]
Diagnostic number			–	SYSTEM	[DGNOS] → Diagnosis No. → [NO.SRH]
Parameter number			–	SYSTEM	[PARAM] → Parameter No. → [NO.SRH]

Program editing

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Deletion of all programs			EDIT	PROG	O → –9999 → DELETE
Deletion of one program			EDIT	PROG	O → Program No. → DELETE
Deletion of multiple blocks			EDIT	PROG	N → Sequence No. → DELETE (The blocks up to the one with a specified sequence number are deleted.)
Deletion of one block			EDIT	PROG	EOB → DELETE
Word deletion			EDIT	PROG	Search for word to be deleted → DELETE
Word alteration			EDIT	PROG	Search for word to be changed→ New data → ALTER
Word insertion			EDIT	PROG	Search for word immediately before insertion location → New data → INSERT

NOTE mark shows the corresponding key is “1”.

I/O to and from FANUC Cassette

Function	KEY SW	PWE = 1	Mode	Function key	Operation
File head search			EDIT	PROG	N → FILE No. → ▷ → [F SRH] → [EXEC]
File deletion			EDIT	PROG	N → FILE No. → ▷ → [DELETE] → [EXEC]
Program registration			EDIT	PROG	N → FILE No. → ▷ → [READ] → [EXEC]
Output of all programs			EDIT	PROG	O → –9999 → ▷ → [PUNCH] → [EXEC]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Output of one program			EDIT	PROG	O → Program No. → ▷ → [PUNCH] → [EXEC]
Program collation	×		EDIT	PROG	File head search → O Program No. → ▷ → [READ] → [EXEC]

NOTE mark shows the corresponding key is “1”.

Play-back

Function	KEY SW	PWE = 1	Mode	Function key	Operation
NC data input			TJOG THND	PROG	Move machine. → X Y or Z → INSERT → NC data → INSERT → EOB → INSERT

NOTE mark shows the corresponding key is “1”.

Clear

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Memory all clear			At power-up	–	RESET and DELETE
					Only for sub side of two-path control
					CAN and 2
					Only for loader side
					CAN and 5
Parameters/offset			At power-up	–	RESET
					Only for main side of two-path control
					RESET and 1
					Only for sub side of two-path control
					RESET and 2
					Only for loader side
					RESET and 5

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Program clear			At power-up	–	DELETE
					Only for main side of two-path control
					DELETE and 1
					Only for sub side of two-path control
					DELETE and 2
					Only for loader side
					DELETE and 5
Program being edited at power failure (PS101)			–	–	PROG and RESET (The program being edited is deleted.)
RAM for PMC ladder storage (Ladder programs are cleared from the memory for execution. The previous state is restored when the power is turned on again.)			At power-up		X and O
					Only for loader side
					X and 5
PMC nonvolatile memory (PMC parameters and so forth are cleared.)			At power-up		Z and O
					Only for loader side
					Z and 5

NOTE mark shows the corresponding key is “1”.

Manual operation

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Manual reference position return			JOG		Turn on Reference position return switch → [+X] [–X] [+Z] [–Z] or etc. → Reference position return lamp lit.
Jog feed			JOG		[+X] [–X] [+Z] or [–Z] → Set jog feedrate → (Rapid traverse button, if required)
Incremental feed			INC		(Move distance selection switch) → [+X] [–X] [+Z] [–Z] or etc. → (Rapid traverse button, if required)
Manual handle feed			HND		(Axis selection switch) → (Turn manual pulse generation) → (Handle magnification selection)

Display

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Program memory used			EDIT	PROG	[LIB]
Command			MEM or MDI	PROG	Current command, Modal command
					[CURRENT]
					Current command, Next command
					[NEXT]
					MDI command, Modal command
					[MDI]
					Current program in memory
					[PRGRM]
					Current block and Current position
					[CHECK]
Current position				POS	Position in workpiece coordinate
					[ABS]
					Position in relative coordinate
					[REL]
					Overall coordinate
					[ALL]
Alarm			–	MESSAGE	[ALARM] when an alarm is issued

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Alarm history				MESSAGE	[HISTRY]
System configuration				SYSTEM	[SYSTEM]
Servo information				SYSTEM	[SYSTEM] → [SV–INF]
Spindle information				SYSTEM	[SYSTEM] → [SP–INF]
Periodic maintenance screen				SYSTEM	[SYSTEM] → ▷ → [MAINTE]
Maintenance information screen				SYSTEM	[SYSTEM] → ▷ → [M–INFO]
Power mate CNC manager				SYSTEM	[SYSTEM] → ▷ → [PMM]
Screen clear			–	–	Press CAN and function key simultaneously. Press function key to redisplay.
Switching screen between NC and loader					SHIFT and HELP

NOTE mark shows the corresponding key is “1”.

Graphic function (T series)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter setting				GRAPH	[G.PRM]
Tool path				GRAPH	Selection of graphic screen: [GRAPH] Graphic start/end: Automatic or manual operation Erasing graphic screen: [OPRT]→ [ERASE] Magnification [ZOOM]

NOTE1 mark shows the corresponding key is “1”.

NOTE2 Function key GRAPH is CUSTOM GRAPH for small MDI.

Graphic function (M series)

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Parameter setting				GRAPH	[PARAM]
Tool path				GRAPH	Selection of graphic screen: [GRAPH] Graphic start/end: Automatic or manual operation
Data setting of dynamic path graphic				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [PARAM]→ numeric key → INPUT
Dynamic path graphic			MEM	GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [EXEC] → [(OPRT)]→ [AUTO] or [START] Temporary stop of graph [STOP] Execution after temporary stop: [START] Execution after temporary stop: Execution from program heading after temporary stop: [REWIND] → [START]
Partial enlargement path graphic				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [SCALE] → [(OPRT)] → [←] [→] [↑] [↓] → P or M → [EXEC]
Displaying tool position mark				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [POSITION]
Displaying solid graphic data				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → Enter numerics → INPUT

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying of blank figure				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [BLANK] → [(OPRT)] → [ANEW] → [+ROT][–ROT] [+TILT][–TILT]
Displaying solid graphic			MEM	GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [EXEC] → [(OPRT)] → [A.ST] or [F.ST]
					Temporary stop of graph [STOP]
					Execution after temporary stop [A.ST] or [F.ST]
					Display of head of part program after temporary stop [REWIND] → [A.ST] or [F.ST]
In the solid graphic where it drew, the direction of displaying is changed and it draws again.				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → [REVIEW] → [(OPRT)] → [ANEW] → [+ROT][–ROT] [+TILT][–TILT]
Tri-plane view displaying				GRAPH	Press GRAPH several times → PATH GRAPHIC screen → ▷ → [3-PLN] → [(OPRT)] → [↶] [←] [→] [↑] [↓]

NOTE1 mark shows the corresponding key is “1”.

NOTE2 Function key GRAPH is CUSTOM GRAPH for small MDI.

Help function

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying INITIAL MENU screen				HELP	HELP
Displaying ALARM DETAIL screen				HELP	[ALARM] → Alarm No. → [SELECT]
Displaying OPERATION METHOD screen				HELP	[OPERAT] → Item No. of operation method → [SELECT]
Displaying PARAMETER TABLE screen				HELP	[PARAM]

Self diagnosis function

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying DIAGNOSIS screen				SYSTEM	[DGNOS] ↓ 1. Page change keys ↑PAGE ↓PAGE 2. Number of the diagnosis data → [NO.SRH]

Screen hard copy

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Screen hard copy					PRM 20=4, PRM 3301#7=1 → Insert memory card → Display screen whose hard copy is to be produced → SHIFT key (5 seconds or more) Clock display stops. → Screen hard copy operation is executed. Clock display restarts. → Screen hard copy operation stops. Supplement: Copy operation can also be started with the signal <G67#7>.

P-CODE LOADER

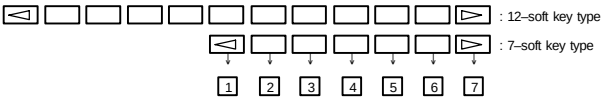
Function	KEY SW	PWE = 1	Mode	Function key	Operation
Starting P-CODE LOADER			At power-up	–	CAN and PROG

Boot

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Displaying system monitor screen			At power-up	–	▷ and the soft key to its left
Reading file from memory card					Move cursor to 1. SYSTEM DATA LOADING on system monitor screen → [SELECT] → Move cursor to file to be read → [SELECT] → [YES]
Displaying detail screen for flash ROM file list					Move cursor to 2. SYSTEM DATA CHECK on system monitor screen → [SELECT] → Move cursor to file of which to display details → [SELECT]
Deleting user file in flash ROM					Move cursor to 3. SYSTEM DATA DELETE on system monitor screen → [SELECT] → Move cursor to file to be deleted → [SELECT] → [YES]
Outputting user file in flash ROM to memory card					Move cursor to 4. SYSTEM DATA SAVE on system monitor screen → [SELECT] → Move cursor to file to be output → [SELECT] → [YES]
Batch output of SRAM data to memory card, Batch input of SRAM data from memory card					Move cursor to 5. SYSTEM DATA BACKUP on system monitor screen → [SELECT] → Move cursor to 1. SRAM BACKUP or 2. RESTORE SRAM → [SELECT] → [YES]
Deleting file in memory card					Move cursor to 6. MEMORY CARD FILE on system monitor screen → [SELECT] → Move cursor to file to be deleted → [SELECT] → [YES]

Function	KEY SW	PWE = 1	Mode	Function key	Operation
Formatting memory card					Move cursor to 7. MEMORY CARD FORMAT on system monitor screen → [SELECT] → [YES]
Exiting system monitor					Move cursor to 9. END on system monitor screen → [SELECT] → [YES]

Reference
If no soft key is available as with a touch panel, use the numeric keys on the MDI keypad to operate the BOOT/system monitor.



3.1 G Code (T Series)

There are three G code systems : A,B, and C. Select a G code system using PRM3401#6 (GSB) and #7 (GSC).

G code list (T series) (1/4)

G code			Group	Function	
A	B	C			
G00	G00	G00	01	Positioning (Rapid traverse)	
G01	G01	G01		Linear interpolation (Cutting feed)	
G02	G02	G02		Circular interpolation CW or Helical interpolation CW	
G03	G03	G03		Circular interpolation CCW or Helical interpolation CCW	
G04	G04	G04	00	Dwell	
G05	G05	G05		High–speed cycle cutting	
G07	G07	G07		Hypothetical axis interpolation	
G07.1 (G107)	G07.1 (G107)	G07.1 (G107)		Cylindrical interpolation	
G10	G10	G10		Programmable data input	
G10.6	G10.6	G10.6		Tool retract & recover	
G11	G11	G11		Programmable data input cancel	
G12.1 (G112)	G12.1 (G112)	G12.1 (G112)	21	Polar coordinate interpolation mode	
G13.1 (G113)	G13.1 (G113)	G13.1 (G113)		Polar coordinate interpolation mode cancel	
G17	G17	G17	16	XpYp plane selection	Xp: X axis or parallel axis
G18	G18	G18		ZpXp plane selection	Yp: Y axis or parallel axis
G19	G19	G19		YpZp plane selection	Zp: Z axis or parallel axis
G20	G20	G70	06	Input in inch	
G21	G21	G71		Input in metric	
G22	G22	G22	09	Stored stroke check function on	
G23	G23	G23		Stored stroke check function off	
G25	G25	G25	08	Spindle speed fluctuation detection off	
G26	G26	G26		Spindle speed fluctuation detection on	
G27	G27	G27	00	Reference position return check	
G28	G28	G28		Return to reference position	
G30	G30	G30		2nd, 3rd and 4th reference position return	
G30.1	G30.1	G30.1		Floating reference position return	
G31	G31	G31		Skip function, multi–step skip function, torque limit skip	

G code list (T series) (2/4)

G code			Group	Function
A	B	C		
G32	G33	G33	01	Thread cutting
G34	G34	G34		Variable–lead thread cutting
G35	G35	G35		Circular thread cutting CW
G36	G36	G36		Circular thread cutting CCW (When PRM3405#3 is set to 1.)
G36	G36	G36	00	Automatic tool compensation X (When PRM3405#3 is set to 0.)
G37	G37	G37		Automatic tool compensation Z
G37.1	G37.1	G37.1		Automatic tool compensation X
G37.2	G37.2	G37.2		Automatic tool compensation Z
G39	G39	G39		Corner circular interpolation
G40	G40	G40	07	Tool nose radius compensation cancel
G41	G41	G41		Tool nose radius compensation left
G42	G42	G42		Tool nose radius compensation right
G50	G92	G92	00	Coordinate system setting or maximum spindle speed setting
G50.3	G92.1	G92.1		Workpiece coordinate system preset
G50.2 (G250)	G50.2 (G250)	G50.2 (G250)	20	Polygonal turning cancel
G51.2 (G251)	G51.2 (G251)	G51.2 (G251)		Polygonal turning
G52	G52	G52	00	Local coordinate system setting
G53	G53	G53		Machine coordinate system setting
G54	G54	G54	14	Workpiece coordinate system 1 selection
G55	G55	G55		Workpiece coordinate system 2 selection
G56	G56	G56		Workpiece coordinate system 3 selection
G57	G57	G57		Workpiece coordinate system 4 selection
G58	G58	G58		Workpiece coordinate system 5 selection
G59	G59	G59		Workpiece coordinate system 6 selection
G60	G60	G60	00	Single direction positioning
G65	G65	G65		Macro calling
G66	G66	G66	12	Macro modal call
G67	G67	G67		Macro modal call cancel
G68	G68	G68	04	Mirror image for double turrets ON or balance cutting mode
G68.1	G68.1	G68.1	17	Coordinate system rotation start or three–dimensional coordinate system conversion mode on

G code list (T series) (3/4)

G code			Group	Function
A	B	C		
G69	G69	G69	04	Mirror image for double turrets OFF or balance cut mode cancel
G69.1	G69.1	G69.1	17	Coordinate system rotation cancel or three–dimensional coordinate system conversion mode off
G70	G70	G72	00	Finishing cycle
G71	G71	G73		Stock removal in turning
G72	G72	G74		Stock removal in facing
G73	G73	G75		Pattern repeating
G74	G74	G76		End face peck drilling
G75	G75	G77		Outer diameter/internal diameter drilling
G76	G76	G78		Multiple threading cycle
G71	G71	G72	01	Traverse grinding cycle (for grinding machine)
G72	G72	G73		Traverse direct constant–dimension grinding cycle (for grinding machine)
G73	G73	G74		Oscillation grinding cycle (for grinding machine)
G74	G74	G75		Oscillation direct constant–dimension grinding cycle (for grinding machine)
G80	G80	G80	10	Canned cycle for drilling cancel
G80.4	G80.4	G80.4	00	Hobbing function synchronous cancel
G81.4	G81.4	G81.4		Hobbing function synchronous start
G83	G83	G83	10	Cycle for face drilling
G84	G84	G84		Cycle for face tapping
G86	G86	G86		Cycle for face boring
G87	G87	G87		Cycle for side drilling
G88	G88	G88		Cycle for side tapping
G89	G89	G89		Cycle for side boring
G90	G77	G20	01	Outer diameter/internal diameter cutting cycle
G92	G78	G21		Thread cutting cycle
G94	G79	G24		Endface turning cycle
G96	G96	G96	02	Constant surface speed control
G97	G97	G97		Constant surface speed control cancel
G98	G94	G94	05	Per minute feed
G99	G95	G95		Per revolution feed
–	G90	G90	03	Absolute programming
–	G91	G90		Incremental programming
–	G98	G98	11	Return to initial level
–	G99	G99		Return to R point level

G code list (T series) (4/4)

G code			Group	Function
A	B	C		
G100	G100	G100		B axis control – Program registration completion
G101	G101	G101		B axis control – First program registration start
G102	G102	G102	00	B axis control – Second program registration start
G103	G103	G103		B axis control – Third program registration start
G110	G110	G110		B axis control – One motion operation programming

Explanation

1. If the CNC enters the clear state (see PRM3402#6 (CLR)) when the power is turned on or the CNC is reset, the modal G codes change as follows.
   (1) G codes marked with ◤ in the above table are enabled.
   (2) When the system is cleared due to power–on or reset, whichever specified, either G20 or G21, remains effective.
   (3) PRM3402#7 can be used to specify whether G22 or G23 is selected upon power–on. Resetting the CNC to the clear state does not affect the selection of G22 or G23.
   (4) Setting PRM3402#0 (G01) determines which code, either G00 or G01, is effective.
   (5) When G code system is B or C, setting PRM3402#3 (G91) determines which code, either G90 or G91, is effective.
2. G codes of group 00 except G10 and G11 are single–shot G codes.
3. ALM10 is displayed when a G code not listed in the G code list is specified or a G code without a corresponding option is specified.
4. G codes of different groups can be specified in the same block. If G codes of the same group are specified in the same block, the G code specified last is valid.
5. If a G code of group 01 is specified in a canned cycle, the canned cycle is canceled in the same way as when a G80 command is specified. G codes of group 01 are not affected by G codes for specifying a canned cycle.
6. When G code system A is used, absolute commands and incremental commands are distinguished from each other not by G codes (G90/G91) but by address words (X/U, Z/W, C/H, Y/V). When G code system A is used for a drilling canned cycle, only the initial level is provided at the return point.
7. G codes are displayed for each group number.

3.2 G Code (M Series)

G code list (M series) (1/4)

G code	Group	Function	
G00	01	Positioning	
G01		Linear interpolation	
G02		Circular interpolation/Helical interpolation CW	
G03		Circular interpolation/Helical interpolation CCW	
G02.2, G03.2		Involute interpolation	
G02.3, G03.3		Exponential interpolation	
G02.4, G03.4		Three–dimensional circular interpolation	
G04	00	Dwell, Exact stop	
G05		High–speed cycle machining, high–speed remote buffer A/B, high–precision contour control, AI high–precision contour control, AI nano high–precision contour control, high–speed linear interpolation	
G05.1		AI high–precision contour control, AI nano high–precision contour control, smooth interpolation	
G05.4		High–speed HRV mode on/off	
G06.2	01	NURBS interpolation	
G07	00	Hypothetical axis interpolation	
G07.1 (G107)		Cylindrical interpolation	
G08		Advanced preview control mode on/off	
G09		Exact stop	
G10		Programmable data input	
G10.6		Tool retract & recover	
G11		Programmable data input mode cancel	
G12.1	21	Polar coordinate interpolation mode	
G13.1		Polar coordinate interpolation mode cancel	
G15	17	Polar coordinates command cancel	
G16		Polar coordinates command	
G17	02	XpYp plane selection	Xp: X axis or its parallel axis
G18		ZpXp plane selection	Yp: Y axis or its parallel axis
G19		YpZp plane selection	Zp: Z axis or its parallel axis
G20	06	Input in inch	
G21		Input in metric	
G22	04	Stored stroke check function on	
G23		Stored stroke check function off	
G25	19	Spindle speed fluctuation detection off	
G26		Spindle speed fluctuation detection on	

G code list (M series) (2/4)

G code	Group	Function
G27	00	Reference position return check
G28		Return to reference position
G29		Return from reference position
G30		2nd, 3rd and 4th reference position return
G30.1		Floating reference position return
G31		Skip function, Multi–step skip function
G31.8		EGB skip function
G31.9		Continuous high–speed skip function
G33	01	Thread cutting
G37	00	Automatic tool length measurment
G39		Corner circular interpolation
G40	07	Cutter compensation cancel/Three–dimentional tool offset cancel
G41		Cutter compensation left side/Three–dimentional tool offset
G41.2		Three–dimensional cutter compensation (Tool side compensation) left side
G41.3		Three–dimensional cutter compensation (Leading edge offset)
G42		Cutter compensation right side
G42.2		Three–dimensional cutter compensation (Tool side compensation) right side
G40.1 (G150)	18	Normal direction control cancel mode
G41.1 (G151)		Normal direction control left side on
G42.1 (G152)		Normal direction control right side on
G43	08	Tool length compensation + direction
G44		Tool length compensation – direction
G45	00	Tool offset increase
G46		Tool offset decrease
G47		Tool offset double increase
G48		Tool offset double decrease
G49	08	Tool length compensation cancel
G50	**11**	Scaling cancel
G51		Scaling
G50.1	**22**	Programmable mirror image cancel
G51.1		Programmable mirror image
G52	00	Local coordinate system setting
G53		Machine coordinate system selection
G54	**14**	Workpiece coordinate system 1 selection
G54.1		Additional workpiece coordinate system selection
G54.2	23	Rotary table dynamic fixture offset

G code list (M series) (3/4)

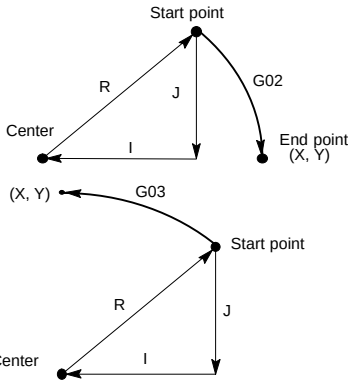
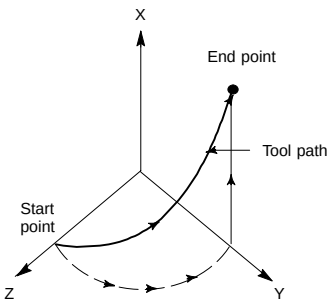
G code	Group	Function
G55	14	Workpiece coordinate system 2 selection
G56		Workpiece coordinate system 3 selection
G57		Workpiece coordinate system 4 selection
G58		Workpiece coordinate system 5 selection
G59		Workpiece coordinate system 6 selection
G60	00/01	Single direction positioning
G61	15	Exact stop mode
G62		Automatic corner override
G63		Tapping mode
G64		Cutting mode
G65	00	Macro call
G66	12	Macro modal call
G67		Macro modal call cancel
G68	16	Coordinate rotation/Three–dimensional coordinate conversion
G69		Coordinate rotation cancel/Three–dimensional coordinate conversion cancel
G72.1	00	Rotation copy
G72.2		Parallel copy
G73	09	Peck drilling cycle
G74		Counter tapping cycle
G75	01	Plunge grinding cycle (for grinding machine)
G76	09	Fine boring cycle
G77	01	Direct constant–dimension plunge grinding cycle (for grinding machine)
G78		Continuous–feed surface grinding cycle (for grinding machine)
G79		Intermittent–feed surface grinding cycle (for grinding machine)
G80	09	Canned cycle cancel/external operation function cancel
G80.5	24	Synchronization cancel of electronic gear box (EGB) (for two–pair programming)
G81	09	Drilling cycle, spot boring cycle, external operation function, hobbing machine function, simple electric gear box
G81.1		Chopping function
G81.5	24	Synchronization start of electronic gear box (EGB) (for two–pair programming)

G code list (M series) (4/4)

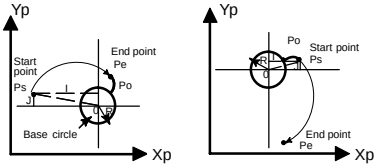
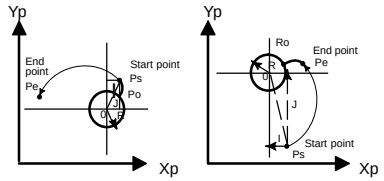
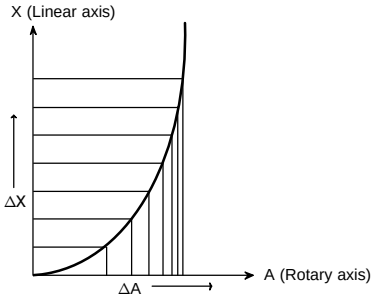
G code	Group	Function
G82	09	Drilling cycle or counter boring cycle
G83		Peck drilling cycle
G84		Tapping cycle
G85		Boring cycle
G86		Boring cycle
G87		Back boring cycle
G88		Boring cycle
G89		Boring cycle
◤ G90	03	Absolute command
◤ G91		Increment command
G92	00	Setting for workpiece coordinate system or maximum spindle speed
G92.1		Workpiece coordinate system preset
◤ G94	05	Feed per minute
G95		Feed per rotation
G96	13	Constant surface speed control
◤ G97		Constant surface speed control cancel
◤ G98	10	Return to initial point in canned cycle
G99		Return to R point in canned cycle
◤ G160	20	In–feed control function cancel (for grinding machine)
G161		In–feed control function (for grinding machine)

Explanation

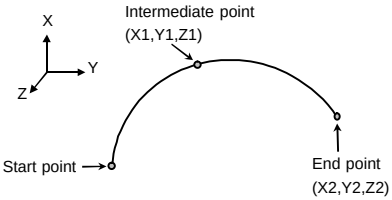
1. When the clear state (PRM3402#6 (CLR)) is set at power–up or reset, the modal G codes are placed in the states described below.
   (1) The modal G codes are placed in the states marked with ◤ as indicated in the above table.
   (2) G20 and G21 remain unchanged when the clear state is set at power–up or reset.
   (3) Which status G22 or G23 at power on is set by PRM3402#7 (G23). However, G22 and G23 remain unchanged when the clear state is set at reset.
   (4) The user can select G00 or G01 by setting PRM3402#0 (G01).
   (5) The user can select G90 or G91 by setting PRM3402#3 (G91).
   (6) The user can select G17, G18, or G19 by setting PRM3402#1 (G18) and #2 (G19).
2. G codes other than G10 and G11 are one–shot G codes.
3. When a G code not listed in the G code list is specified, or a G code that has no corresponding option is specified, ALM10 is output.
4. Multiple G codes can be specified in the same block if each G code belongs to a different group. If multiple G codes that belong to the same group are specified in the same block, only the last G code specified is valid.
5. If a G code belonging to group 01 is specified in a canned cycle, the canned cycle is cancelled. This means that the same state set by specifying G80 is set. Note that the G codes in group 01 are not affected by a G code specifying a canned cycle.
6. G codes are indicated by group.
7. The group of G60 is switched according to the setting of the PRM5431#0 (MDL). (When the MDL bit is set to 0, the 00 group is selected. When the MDL bit is set to 1, the 01 group is selected.)

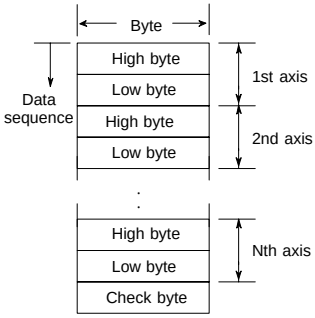
Function	Explanation
Positioning (G00)	
Linear interpolation (G01)	
Circular interpolation (G02, G03)	
Helical interpolation (G02, G03)	

Program format	T series	M series
G00 IP_ ;	○	○
G01IP _ F_ ;	○	○
G17 {G02 / G03} Xp_Yp_ {R_ / I_J_} F_ ; G18 {G02 / G03} Xp_Zp_ {R_ / I_K_} F_ ; G19 {G02 / G03} Yp_Zp_ {R_ / J_K_} F_ ;	○	○
Synchronously with arc of XpYp plane G17 {G02 / G03} Xp_Yp_ {I_J_ / R_} α_(β_)F_ ; Synchronously with arc of ZpXp plane G18 {G02 / G03} Xp_Zp_ {I_K_ / R_} α_(β_)F_ ; Synchronously with arc of YpZp plane G19 {G02 / G03} Yp_Zp_ {J_K_ / R_} α_(β_)F_ ; α, β : Any one axis where circular interpolation is not applied.	○	○

Function	Explanation
Involute interpolation (G02.2, G03.2)	 **Clockwise (G02.2)**  **Counterclockwise (G03.2)**
Exponential interpolation (G02.3, G03.3)	

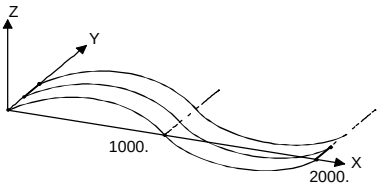
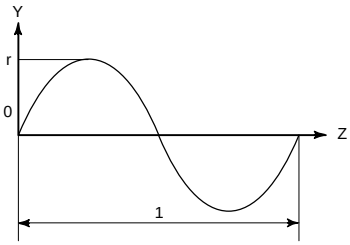
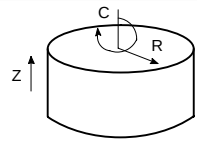
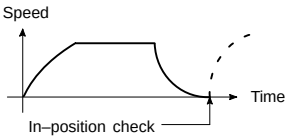
Program format	T series	M series
Involute interpolation on the X-Y plane G17 G02.2 X_Y_I_J_R_F_; G17 G03.2 X_Y_I_J_R_F_; Involute interpolation on the Z-X plane G18 G02.2 Z_X_K_I_R_F_; G18 G03.2 Z_X_K_I_R_F_; Involute interpolation on the Y-Z plane G19 G02.2 Y_Z_J_K_R_F_; G19 G03.2 Y_Z_J_K_R_F_; X, Y, Z : Involute curve end coordinate I, J, K : Center of the base circle for an involute curve viewed from the start point R : Base circle radius F : Cutting feedrate		○
Positive rotation G02.3 X_Y_Z_I_J_K_R_F_Q_; Negative rotation G03.3 X_Y_Z_I_J_K_R_F_Q_; X_; Specifies an end point with an absolute or incremental value. Y_; Specifies an end point with an absolute or incremental value. Z_; Specifies an end point with an absolute or incremental value. I_; Specifies angle I (from ±1 to ±89 deg in units of 0.001 deg). J_; Specifies angle J (from ±1 to ±89 deg in units of 0.001 deg). K_; Specifies the amount to divide the linear axis for exponential interpolation (span value). Specify a positive value. When no value is specified, the value specified in PRM 5643 is used. R_; Specifies constant R for exponential interpolation. F_; Specifies the initial feedrate. Specified in the same way as an ordinary F code. Specify a composite feedrate including a feedrate on the rotary axis. Q_; Specifies the feedrate at the end point. The same unit used for F is used. The CNC internally performs interpolation between the initial feedrate (F) and final feedrate(Q), depending on the travel distance on the linear axis.		○

Function	Explanation
Three–dimensional interpolation (G02.4, G03.4)	Three–dimensional circular interpolation is performed by specifying the intermediate point and end point of an arc. 
Dwell (G04)	(Example) G94 G04 P10; Dwell by 10 seconds G95 G04 X30; Dwell by 30 revolutions
High-speed cycle machining (G05)	(Example) Cycle 1: connection 2, repetition 1 Cycle 2: connection 3, repetition 3 Cycle 3: connection 0, repetition 1 G05P10001L2; Cycle is executed as 1, 2, 2, 2, 3, 1, 2, 2, 2, 3
High-speed remote buffer A (G05)	Specify G05 only in a block using normal NC command format. Then specify move data in the special format shown below. When zero is specified as the travel distance along all axes, normal NC command format can be used again for subsequent command specification.
High-speed remote buffer B (G05)	High-speed remote buffer A uses binary data. On the other hand, high-speed remote buffer B can directly use NC language coded with equipment such as an automatic programming unit to perform high-speed machining.

Program format	T series	M series
G02.4 X_{X1} Y_{Y1} Z_{Z1} $\alpha_{\alpha1}$ $\beta_{\beta1}$; First block (intermediate point of the arc) X_{X1} Y_{Y1} Z_{Z1} $\alpha_{\alpha1}$ $\beta_{\beta1}$; Second block (end point of the arc) α,β : Arbitrary axes other than the 3–dimensional circular interpolation axis (up to two axes) G03.4 can be specified instead of G02.4. There is no difference in operation.		○
G94 G04 { X_ / P_ } ; Dwell by second G95 G04 { X_ / P_ } ; Dwell by revolution	○	○
G05 P10 xxx L△△△ ; XXX : Start program number of called programs △△△ : Repetition time of machining cycle	○	○
● Binary input operation enabled : G05 ; ● Binary input operation disabled : The travel distance along all axes are set to zero ● Data format for binary input operation  All data must be specified in binary.	○	○
G05P01; Start high-speed machining X_Y_Z_; : G05P00; End high-speed machining		○

Function	Explanation
High-precision contour control AI high–precision contour control AI nano high–precision contour control (G05)	Some machining errors are due to the CNC. Such errors include machining errors caused by acceleration/deceleration after interpolation. To eliminate these errors, the following functions are performed at high speed by an RISC processor. (1) Function for multiple-block look-ahead acceleration/deceleration before interpolation. This function eliminates machining errors due to acceleration/deceleration. (2) Automatic speed control function which enables smooth acceleration/deceleration by considering changes in the figure and speed and allowable acceleration for the machine. This is performed by reading multiple blocks in advance.
Smooth interpolation (G05.1)	Either of two types of machining can be selected, depending on the program command. ● For those portions where the accuracy of the figure is critical, such as at corners, machining is performed exactly as specified by the program command. ● For those portions having a large radius of curvature where a smooth figure must be created, points along the machining path are interpolated with a smooth curve, calculated from the polygonal lines specified with the program command (smooth interpolation). Smooth interpolation can be specified in high–speed contour control, AI high–precision contour control, or AI nano high–precision contour control mode.
AI contour control AI nano contour control AI advanced preview control (G05.1)	Among machining errors, errors caused by acceleration/deceleration after interpolation are associated with the CNC. The functions below are used to eliminate these errors. (1) Multiple–block look–ahead acceleration/deceleration function before interpolation that eliminates machining errors caused by acceleration/deceleration (2) Automatic speed control that, by reading multiple blocks in advance, can realize smooth acceleration/deceleration considering figures, speed changes, and allowable machine acceleration/deceleration
High–speed HRV mode (G05.4)	By using a servo system that supports high–speed HRV, fast and high–precision high–speed HRV control can be exercised.

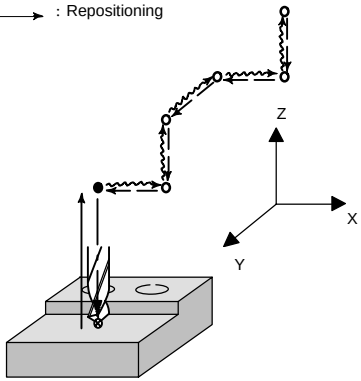
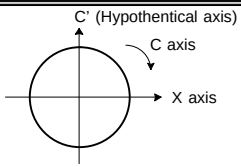
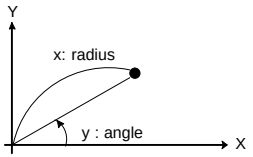
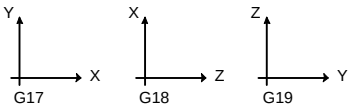
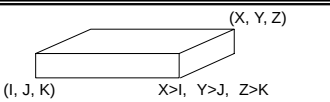
Program format	T series	M series
G05P10000; Start mode G05P0; End mode (Supplement) The same format is used to specify the start and end of AI contour control, AI nano contour control, and AI advanced preview control.		○
G05.1 Q2X0Y0Z0; Starting of smooth interpolation mode G05.1 Q0; Cancelation of smooth interpolation mode		○
G05.1 Q1 ; Start mode G05.1 Q0 ; End mode (Supplement) The same format is used to specify the start and end of AI contour control, AI nano contour control, and AI advanced preview control.		○
G05.4 Q1 ; Start mode G05.4 Q0 ; End mode (Supplement) ● Whether the servo system supports high–speed HRV can be checked using DGN700#1 (HOK). ● For details of the high–speed HRV mode, refer to the relevant servo system manual.		○

Function	Explanation
NURBS interpolation (G06.2)	A command can be sent to the CNC in the NURBS curve representation format. 
Hypothetical axis interpolation (G07)	
Cylindrical interpolation (G07.1)	
Advanced preview control (G08)	With this function, the delay due to acceleration/deceleration and the delay in the servo system which increase as the feedrate becomes higher can be suppressed. The tool can then follow specified values accurately and errors in the machining profile can be reduced.
Exact stop (G09, G61)	

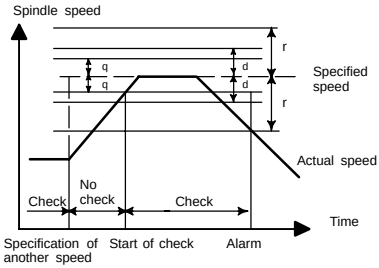
Program format	T series	M series
G05 P10000 ; ... G06.2 [P_] K_ X_ Y_ Z_ [R_] [F_] ; K_ X_ Y_ Z_ [R_] ; K_ X_ Y_ Z_ [R_] ; K_ X_ Y_ Z_ [R_] ; ... K_ X_ Y_ Z_ [R_] ; K_ ; ... K_ ; G01 ... ... G05 P0 ; G06.2 : Start NURBS interpolation mode P_ : Rank of NURBS curve X_ Y_ Z_: Control point R_ : Weight K_ : Knot F_ : Feedrate NURBS interpolation can be specified in the high–precision contour control/AI high–precision contour control/AI nano high–precision contour control mode.		○
G07 α 0; Hypothetical axis setting G07 α 1; Hypothetical axis cancel Where, α is any one of the addresses of the controlled axes.	○	○
G07.1 Cr ; Cylindrical interpolation mode C: Rotary axis name r: Radius of cylinder G07.1 C0 ; Cylindrical interpolation mode cancel	○	○
G08 P1; Turn on advanced preview control mode. G08 P0; Turn off advanced preview control mode.	○	○
G09IP ; G61 ;		○

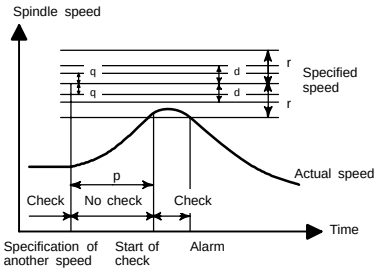
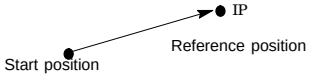
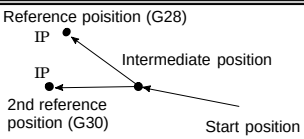
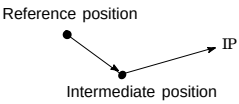
Function	Explanation
Change of offset values by program (G10)	The tool compensation amount can be set or changed with the G10 command. When G10 is used in absolute input (G90), the compensation amount specified in the command becomes the new tool compensation amount. When G10 is used in incremental input (G91), the compensation amount specified in the command is added to the amount currently set.
Programmable parameter input (G10, G11)	By specifying G10, parameters and pitch error compensation data can be set and modified. (Caution) Some parameters are not suitable for setting or modification, and an operation such as a reference position return operation may be required after a setting or modification.

Program format	T series	M series
G10P_X (U)_Y (V)_Z (W)_R (C)_Q_; For geometry offset amount P=10000+geometry offset number For wear offset amount P= wear offset number R : Tool nose radius offset amount Q : Imaginary tool nose number	○	
G10L_PpRr ; p : Offset No. r : Tool compensation amount Format (1) For tool compensation memory A G10L11P_R_; (2) For tool compensation memory B G10L10P_R_; (Setting/changing the geometric compensation amount) G10L11P_R_; (Setting/changing the wear compensation amount) (3) For tool compensation memory C G10 L10 P_ R_ ; (Setting/changing the geometry compensation amount for H code) G10 L11 P_ R_ ; (Setting/changing the geometry compensation amount for D code) G10 L12 P_ R_ ; (Setting/changing the wear compensation amount for H code) G10 L13 P_ R_ ; (Setting/changing the wear compensation amount for D code)		○
G10 L50 ; Parameter input mode on N_ R_ ; Parameter input (for a parameter of non–axis type) N_ P_ R_ ; Parameter input (for a parameter of axis type) | G11 ; Parameter input mode cancel N_ : Parameter number (5–digit) or pitch error compensation number +10000 (5–digit) R_ : Parameter setting (The decimal point must not be specified.) P_ : Axis number (1 to 8)	○	○

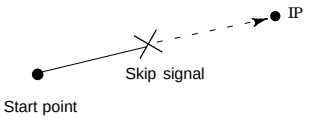
Function	Explanation
Tool retract and recover (G10.6)	⊗: Position where the TOOL RETRACT switch is turned on ●: Programmed position ○: Position to which the tool is retracted by manual operation : Retraction path : Manual operation (retraction path) : Recovery path : Repositioning 
Polar coordinate interpolation mode (G12.1, G13.1)	
Polar coordinate command mode (G15, G16)	
XpYp plane selection (G17) ZpXp plane selection (G18) YpZp plane selection (G19)	
Inch/metric conversion (G20, G21)	
Stored stroke check on (G22) Stored stroke check off (G23)	

Program format	T series	M series
G10.6 IP _; IP_: In incremental mode, retraction distance from the position where the retract signal is turned on In the absolute mode, retraction distance to an absolute position	○	○
G12.1 ; Polar coordinate interpolation mode G13.1 ; Polar coordinate interpolation mode cancel	○	○
G16 ; Polar coordinate command Xx Yy ; X: radius, Y: angle (°) G15 ; Polar coordinate command cancel		○
G17 ; G18 ; G19 ;	○	○
G20 ; Inch input G21 ; Metric input	○	○
G22X_Y_Z_I_J_K_ ; Stored stroke check on G23 ; Stored stroke check off	○	○

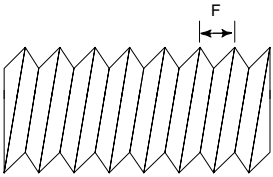
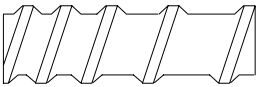
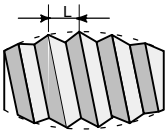
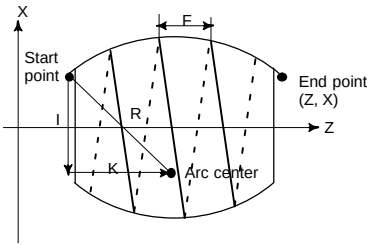
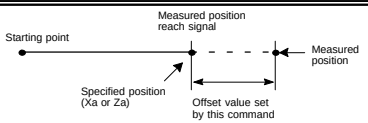
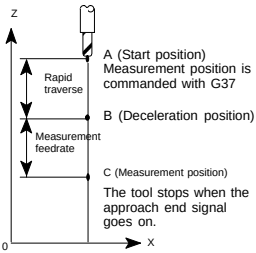
<table>
<tr><th>Function</th><th>Explanation</th></tr>
<tr><td>Spindle speed fluctuation detection on (G26)
Spindle speed fluctuation detection off (G25)</td><td>(Example)
(1) When an alarm is raised after a specified spindle speed is reached
 

(2) When an alarm is raised before a specified spindle speed is reached
 
</td></tr>
<tr><td>Reference position return check (G27)</td><td> 
</td></tr>
<tr><td>Reference position return (G28)
2nd, 3rd, 4th reference position return (G30)
Floating reference position return (G30.1)</td><td> 
</td></tr>
<tr><td>Return to reference position return start position (G29)</td><td> 
</td></tr>
</table>

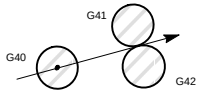
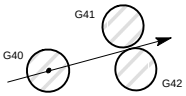
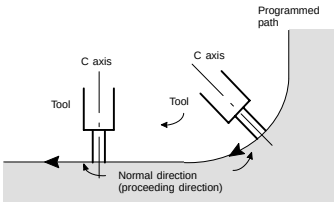
Program format	T series	M series
G26PpQqRr ; spindle fluctuation detection on G25 ; Spindle fluctuation detection off p: Time (in ms) from the issue of a new spindle rotation command (S command) to the start of checking whether the actual spindle speed is so fast that an overheat can occur. (When a specified speed is reached within the time period of P, a check is started at that time.) q : Tolerance (%) of a specified spindle speed (if a specified spindle speed lies within this range, it is regarded as having reached the specified value. Then, the checking of an actual spindle speed is started.) q= (1– actual spindle speed/specified spindle speed) × 100 r : Spindle speed fluctuation (%) at which the actual spindle speed is so fast that an overheat can occur r= (1–speed that can cause overheat/specified spindle speed) × 100	○	○
G27 IP_ ;	○	○
G28 IP_ ; G30 { P2 / P3 / P4 } IP_ ; G30.1 IP_ ; P2: 2nd reference position return P3: 3rd reference position return P4: 4th reference position return	○	○
G29 IP_ ;		○

Function	Explanation
Skip function (G31) Multi–step skip function (G31) Torque limit skip function (G31)	
Skip function for EGB axis (G31.8)	The skip function is enabled for a workpiece axis in the synchronization mode based on the EGB (electronic gear box). • Until the skip signal input count reaches a programmed value, the block is not stopped. • Each time the skip signal is input, the current machine coordinates are stored in a custom macro variable. This operation lasts until the block ends. • EGB–based synchronization does not stop.
Continuous high–speed skip function (G31.9)	Until the skip signal input count reaches a programmed value, the block is not stopped. Each time the skip signal is input, the current machine coordinates are stored in a custom macro variable. This operation lasts until the block ends.

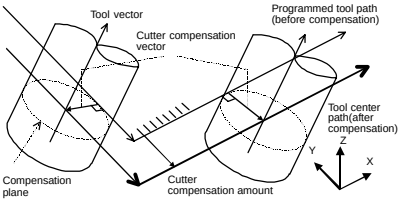
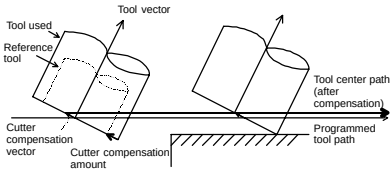
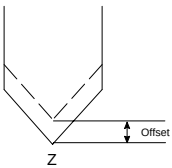
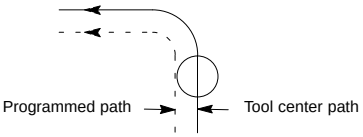
Program format	T series	M series
G31IP_F_ ;	○	○
Move command skip G31 IP_F_P_; F_: Feedrate P_: P1-P4 Dwell skip G04X (U, P)_(Q_); X(U, P)_: Dwell time Q_: Q1-Q4	○	○
G31 P99 IP_F_; (Skip when a torque limit is reached or the SKIP signal is sent) G31 P98 IP_F_; (Skip when a torque limit is reached) Note) Specify a torque limit before the command.	○	○
G81 T_ L_ ; (EGB mode on) G31.8 G91 α0 P_ Q_ R_ ; (EGB skip command) α : EGB axis (Workpiece axis) P : The top number of the consecutive custom macro variables in which the machine coordinate positions of the EGB axis (workpiece axis) at the skip signal inputs are stored. Q : The maximum allowable number of the skip signal inputs. (Range of command value: 1 – 200) R : The number of the custom macro variable in which the total number of the inputs is stored. This data is usually the same as the value specified by Q. Therefore this is not necessarily specified. Specify it when the total number should be confirmed.		○
G31.9 α_ P_ Q_ R_ F_ ; α : Skip axis move command P_ : Start number of a custom macro variable for storing the machine coordinates at skip signal input time Q_ : Number of skip signal input operations that can be performed during G31.9 execution (Specifiable range: 1 to 200) R_ : Axis number for which skip signal input count data is stored (1 to 8)		○

Function	Explanation
Equal lead thread cutting (G32) Thread cutting (G33)	
Variable lead thread cutting (G34)	
Circular thread cutting (G35, G36)	 Circular thread 
Automatic tool compensation (G36, G37) (G37.1, G37.2)	
Automatic tool length measurement (G37)	 Compensation value=(Current compensation value)+[(Coordinates of the point at which the tool is stopped)–(Coordinates of the programmed measurement position)]

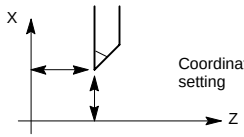
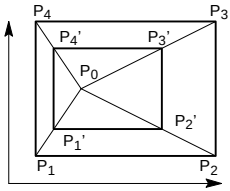
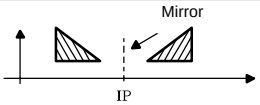
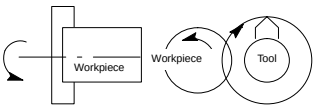
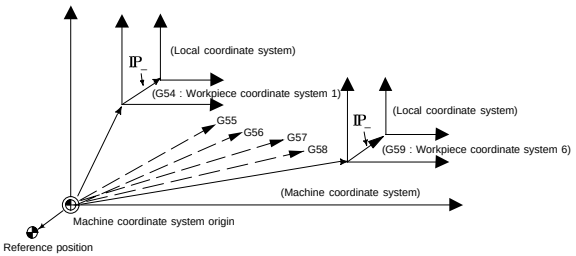
Program format	T series	M series
G32 IP_F_ ;	○	
G33 IP_F_ ;		○
G34 IP_FfKk ; f: longer axis lead at the start position k: Lead increase/decrease amount per spindle rotation	○	
{G35 / G36} X (U) _ Z (W) {I _ K _ / R _ _ _} F _ Q _ ; G35 : Clockwise circular threading command G36 : Counterclockwise circular threading command X (U) : Specify the arc end point (in the same way as for G02, G03). Z (W) I, K : Specify the arc center relative to the start point, using relative coordinates (in the same way as for G02, G03). R : Specify the arc radius. F : Specify the lead in the direction of the longer axis. Q : Specify the shift of the threading start angle (0 to 360° in units of 0.001°)	○	
G36(G37.1)X xa ; G37(G37.2)Z za ; Specified position	○	
G92 IP_; Sets the workpiece coordinate system. (It can be set with G54 to G59.) H○○; Specifies an offset number for tool length offset. After specifying the above, specify the following: G90 G37 IP_; Absolute command·G37 is valid only in the block in which it is specified. IP_ indicates the X-, Y-, Z-, or fourth axis.		○

Function	Explanation
Tool nose radius compensation (G40, G41, G42)	 G40 ; Programmed path G41 ; Left of programmed path G42 ; Right of programmed path
Cutter compensation B (G39 to G42) Cutter compensation C (G40 to G42)	 G40 ; Programmed path G41 ; Left of programmed path G42 ; Right of programmed path
Three–dimensional tool compensation (G40, G41)	━━ Programmed path —— Path after three–dimensional tool compensation → Three–dimensional tool compensation vector  The three–dimensional tool compensation vector is obtained from the following expressions: $Vx = \frac{i \cdot r}{p}$ (Vector component along the Xp–axis) $Vy = \frac{j \cdot r}{p}$ (Vector component along the Yp–axis) $Vz = \frac{k \cdot r}{p}$ (Vector component along the Zp–axis) In the above expressions, i, j, and k are the values specified in addresses I, J, and K in the block. r is the offset value corresponding to the specified offset number. p is the value obtained from the following expression: $p = \sqrt{i^2 + j^2 + k^2}$
Normal direction control (G40.1, G41.1 G42.1)	

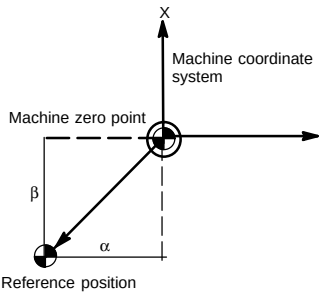
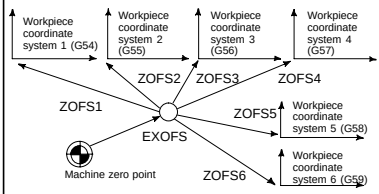
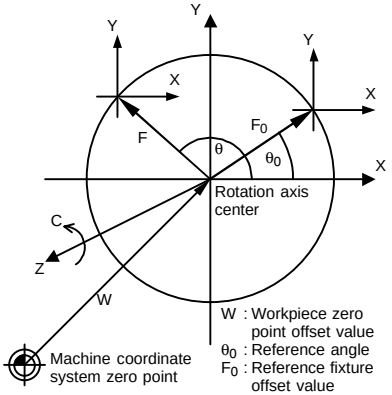
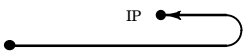
Program format	T series	M series
{G40 / G41 / G42} IP_ ;	○	
G39 IP ; Corner offset circular interpolation {G17 / G18 / G19} {G40 / G41 / G42} D(H)_ ; D(H): Tool offset number		○
G41 Xp_Yp_Zp_I_J_K_D_; (Start up) Xp: X-axis or a parallel axis Yp: Y-axis or a parallel axis Zp: Z-axis or a parallel axis G40 Xp_Yp_Zp_; (When canceling the or three-dimensional tool compensation mode and tool movement at the same time) or Xp_Yp_Zp_D00; G40; (When only canceling the vector) or D00;		○
G41.1 ; Normal direction control on (left) G42.1 ; Normal direction control on (right) G40.1 ; Normal direction control cancel		○

Function	Explanation
Three–dimensional cutter compensation Tool side compensation (G41.2, G42.2)	Three–dimensional compensation is performed on a plane perpendicular to the tool direction vector. 
Three–dimensional cutter compensation Leading edge offset (G41.3)	Compensation applicable when the tool edge is used for machining 
Tool length compensation A, B, C (G43, G44, G49)	 G43: + offset G44: – offset
Tool offset (G45 to G48)	

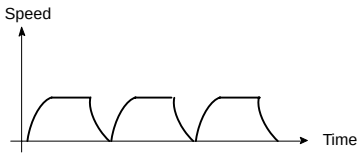
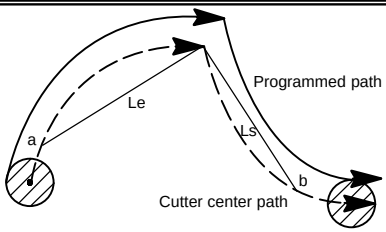
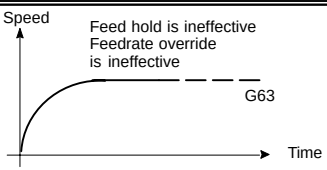
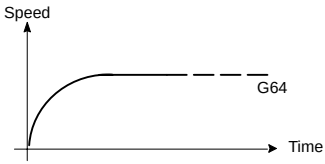
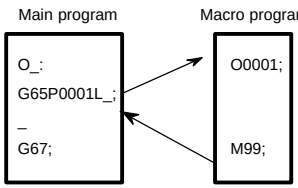
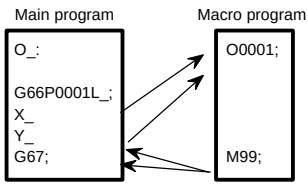
Program format	T series	M series
G41.2 X_Y_Z_D_ ; Tool side compensation (left) G42.2 X_Y_Z_D_ ; Tool side compensation (right) G40 X_Y_Z_ ; Tool side compensation cancel Note) When a startup/cancel operation of type C is specified, do not specify a move command such as X_Y_Z_ for the G41.2/G42.2 block.		○
G41.3 D_ ; Leading edge offset G40 ; Leading edge offset cancel		○
{ G43 / G44 } (Z_)H_ ; Tool length compensation A { G17 / G18 / G19 } { G43 / G44 } { X_ / Y_ / Z_ } H_; Tool length compensation B { G43 / G44 } α_H_ ; Tool length compensation C H: Offset number (H00 to H999) α : Arbitrary one axis G49 ; Tool length compensation cancel		○
{ G45 (increase) / G46 (decrease) / G47 (double increase) / G48 (double decrease) } IP_D_; IP_ ; Tool movement command D_ ; Tool offset number		○

Function	Explanation
Coordinate system setting Maximum spindle speed setting (G50)	 Coordinate system setting
Scaling (G50, G51)	 P_1 to P_4: Programmed shape P_1' to P_4': Scaled shape P0: Scaling center
Programmable mirror image (G50.1, G51.1)	
Polygon turning (G51.2, G50.2)	
Local coordinate system setting (G52)	

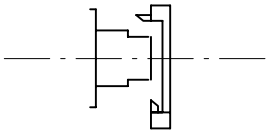
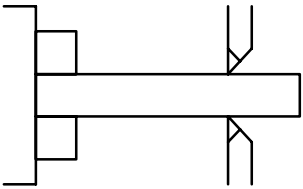
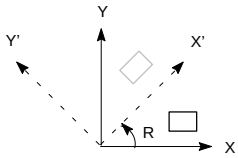
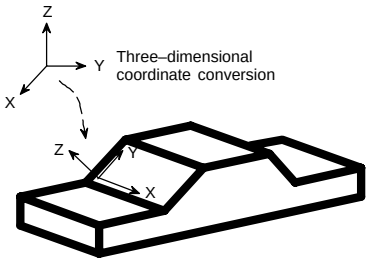
Program format	T series	M series
G50X_Z_ ; Coordinate system setting G50S_ ; Maximum spindle speed setting	○	
G51X_Y_Z_P_ (or I_J_K_) ; G50 ; Cancel X, Y, Z: Scaling center P: Magnification (I, J, and K are the scaling magnifications for the X-, Y-, and Z-axes respectively.)		○
G51.1 IP_ ; Setting a programmable image A mirror image of a command specified in these blocks is produced with respect to the axis of symmetry specified by G51.1 IP_;. G50.1 IP_ ; Canceling a programmable mirror image IP_ : Point (position) and axis of symmetry for producing a mirror image when specified with G51.1. Axis of symmetry for producing a mirror image when specified with G50.1. Point of symmetry is not specified.		○
G51.2P_Q_ ; Polygon turning G50.2 ; Polygon turning cancel P, Q: Rotation ratio of spindle and workpiece	○	
G52 IP _; Local coordinate system setting G52IP 0 ; Local coordinate system cancel	○	○

Function	Explanation
Machine coordinate system setting (G53)	
Workpiece coordinate system 1 to 6 selection (G54 to G59)	 EXOFS: External workpiece zero point offset ZOFS1 to ZOFS6: Zero point offset for workpiece coordinate system 1 to 6
Additional workpiece coordinate system selection (G54.1)	(Example) G54.1P12 ; Selecting additional workpiece coordinate system 12
Rotary table dynamic fixture offset (G54.2)	Even if the rotary table rotates, the workpiece coordinate system can be preserved dynamically.  W : Workpiece zero point offset value $θ_0$: Reference angle F_0 : Reference fixture offset value θ : Rotation axis angle F : Fixture offset value
Single direction positioning (G60)	

Program format	T series	M series
G53 IP_ ;	○	○
G54 IP_ ; Workpiece coordinate system 1 selection G55 IP_ ; Workpiece coordinate system 2 selection G56 IP_ ; Workpiece coordinate system 3 selection G57 IP_ ; Workpiece coordinate system 4 selection G58 IP_ ; Workpiece coordinate system 5 selection G59 IP_ ; Workpiece coordinate system 6 selection	○	○
G54.1 Pn; (n=1 to 300)		○
G54.2 Pn; Fixture offset command G54.2 P0; Fixture offset cancel command n : Reference fixture offset number (1 to 8)		○
G60 IP_ ;	○	○

Function	Explanation
Exact stop mode (G61)	
Automatic corner override (G62)	
Tapping mode (G63)	
Cutting mode (G64)	
Macro call (G65)	
Macro modal call (G66, G67)	

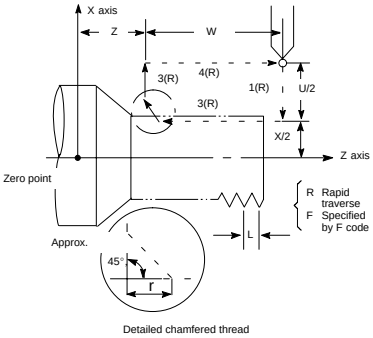
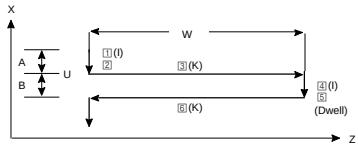
Program format	T series	M series
G61 ;		○
G62 ;		○
G63 ;		○
G64 ;		○
G65 P_L_ ; P: Program number L: Repetition count (1 to 9999)	○	○
G66 P_L_ ; G67; Cancel P: Program number L: Repetition count (1 to 9999)	○	○

Function	Explanation
Mirror image for double turrets (G68, G69)	
Balanced cutting (G68, G69) (For 2–path control only)	Cutting feed can be started on both tool posts simultaneously.  Tool post 1 program : G68 ; G01Z100.0 ; Z0 ; G69 ; : Tool post 2 program : G68 ; ← Balance cutting mode G01Z100.0 ; ← Balance cutting Z0 ; ← Balance cutting G69 ; ← Balance cutting mode cancel :
Coordinate system rotation (G68, G69) (G68.1, G69.1 in the case of T series)	
Three-dimensional coordinate conversion (G68, G69) (G68.1, G69.1 (T series))	Coordinate conversion about an axis can be carried out if the center of rotation, direction of the axis of rotation, and angular displacement are specified. 

Program format	T series	M series
G68 ; Mirror image for double turrets G69 ; Mirror image cancel	○	
G68 ; Balanced cutting mode G69 ; Balanced cutting mode cancel If cutting feed is specified in two–path control when G68 is specified in the programs for the two paths, the same timing for starting cutting feed is applied to both paths. • If G68 is specified for one path earlier than for the other path, the program stops until G68 is specified for the other path. • If G68 is specified for both paths, and cutting feed is specified for one path, the program stops until cutting feed is specified for the other path. Note) • This function is applicable only when two–path control is used. • This function cannot be used when mirror image of facing tool posts (option) is selected.	●	
{ G17 / G18 / G19 } G68 (G68.1) α_β_R_ ; G69 ; (G69.1) α, β: 2 axes corresponding to G17, G18, G19 R: Rotation angle	○	○
G68 Xp x_1 Yp y_1 Zp z_1 I i_1 J j_1 K k_1 R α ; • • Starting tree–dimensional coordinate conversion • • } Three–dimensional coordinate conversion mode G69.1 ; Canceling three–dimensional coordinate conversion Xp, Yp, Zp: Center of rotation (absolute coordinates) on the X, Y, and Z axis or parallel axes I, J, K : Direction of the axis of rotation R : Angular displacement	○	○

Function	Explanation
Figure copy (G72.1, G72.2)	Machining can be repeated after moving or rotating the figure using a subprogram.

Program format	T series	M series
Rotational copy Xp-Yp plane (specified by G17): G72.1 P_L_Xp_Yp_R_; Zp-Xp plane (specified by G18): G72.1 P_L_Zp_Xp_R_; Yp-Zp plane (specified by G19): G72.1 P_L_Yp_Zp_R_; P : Subprogram number L : Number of times the operation is repeated Xp : Center of rotation on the Xp axis (Xp: X-axis or an axis parallel to the X-axis) Yp : Center of rotation on the Yp axis (Yp; Y-axis or an axis parallel to the Y-axis) Zp : Center of rotation on the Zp axis (Zp: Z-axis or an axis parallel to the Z-axis) R : Angular displacement (A positive value indicates a counter-clockwise angular displacement. Specify an incremental value.)		○
Linear copy Xp-Yp plane (specified by G17): G72.2 P_L_I_J_; Zp-Xp plane (specified by G18): G72.2 P_L_K_I_; Yp-Zp plane (specified by G19): G72.2 P_L_J_K_; P : Subprogram number L : Number of times the operation is repeated I : Shift along the Xp axis J : Shift along the Yp axis K : Shift along the Zp axis		

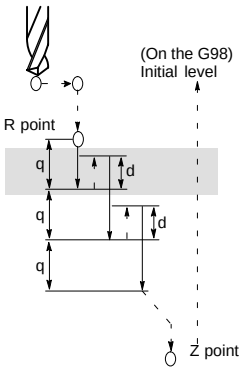
Function	Explanation
Canned cycle for lathes (G70 to G76) (G90, G92, G94)	Canned cycle G90: Outer diameter/internal diameter cutting cycle G92: Thread cutting cycle G94: End face turning cycle Multiple repetitive cycle G70: Finishing G71: Stock removal in turning G72: Stock removal in facing G73: Pattern repeating G74: End face peck drilling cycle G75: Outer diameter/internal diameter drilling cycle G76: Multiple thread cutting cycle (Example) G92  Detailed chamfered thread (The chamfered angle in the left figure is 45 degrees or less because of the delay in the servo system.)
Canned cycle for grinding (G71 – G74)	G71: Traverse grinding cycle G72: Traverse direct fixed-dimension grinding cycle G73: Oscillation grinding cycle G74: Oscillation direct fixed-dimension grinding cycle (Example) G71 G71A__B__W__U__I__K__H__ ; 

Program format	T series	M series
G70 P_Q_ ; G71 U_R_ ; G71 P_Q_U_W_F_S_T_ ; G72 W_ R_ ; G72 P_Q_U_W_F_S_T_ ; G73 W_ R_ ; G73 P_Q_U_W_F_S_T_ ; G74 R_ ; G74 X(u)_Z(w)_P_Q_R_F_ ; G75 R_ ; G75 X(u)_Z(w)_P_Q_R_F_ ; G76 R_ ; G76 X(u)_Z(w)_P_Q_R_F_ ; {G90 / G92} X_Z_I_F_ ; G94 X_Z_I_F_;	○	
G71 A__B__W__U__I__K__H__ ; G72 P__A__B__W__U__I__K__H__ ; G73 A__(B__)W__U__K__H__ ; G74 P__A__(B__)W__U__K__H__ ; P: Gauge number A: First depth of cut B: Second depth of cut W: Grinding range U: Dwell time Maximum specification time: 99999.999 seconds I: Feedrate of A and B K: Feedrate of W (G71/G72)/Feedrate (G73/G74) H: Number of repetitions Setting value: 1 to 9999	○	

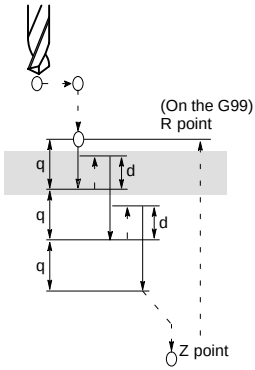
Function	Explanation
Canned cycle (G73, G74, G80 to G89)	G73: High-speed peck drilling cycle G74: Left-hand tapping cycle G76: Fine boring cycle G81: Drilling cycle, spot drilling cycle G82: Drilling cycle, counter boring cycle G83: Peck drilling cycle G84: Tapping cycle G85: Boring cycle G86: Boring cycle G87: Boring cycle, back boring cycle G88: Boring cycle G89: Boring cycle G80: Canned cycle cancel

Example

G73 (G98)



G73 (G99)



Canned grinding cycle
(G75, G77, G78, G79)

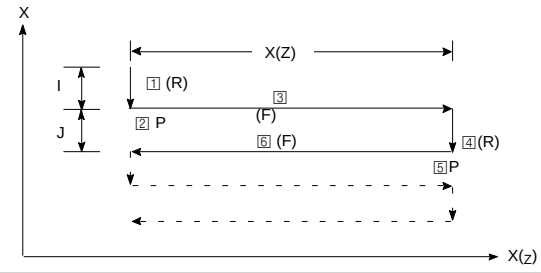
G75: Plunge grinding cycle

G77: Direct constant-dimension plunge grinding cycle

G78: Continuous-feed surface grinding cycle

G79: Intermittent-feed surface grinding cycle

(Example) For the G75
G75 I_J_K_X (Z)_R_F_P_L_ ;



Program format	T series	M series
G73 X__Y__Z__P__Q__R__F__K__ ; G74 X__Y__Z__P__Q__R__F__K__ ; G76 X__Y__Z__P__Q__R__F__K__ ; G81 X__Y__Z__P__Q__R__F__K__ ; G82 X__Y__Z__P__Q__R__F__K__ ; G83 X__Y__Z__P__Q__R__F__K__ ; G84 X__Y__Z__P__Q__R__F__K__ ; G85 X__Y__Z__P__Q__R__F__K__ ; G86 X__Y__Z__P__Q__R__F__K__ ; G87 X__Y__Z__P__Q__R__F__K__ ; G88 X__Y__Z__P__Q__R__F__K__ ; G89 X__Y__Z__P__Q__R__F__K__ ; G80 ; Cancel G□□ X__Y__Z__R__Q__P__F__K__ ; Drilling mode / Hole position data / Drilling data / Number of repeat		○

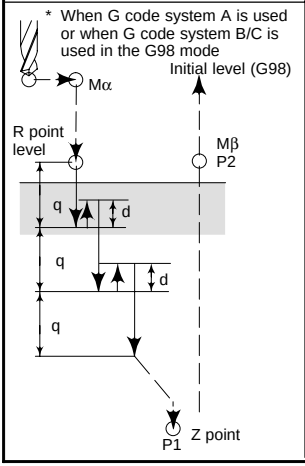
Item	Address	Explanation
Drilling mode	G□□	G73, G74, G76, G80 to G89
Hole position data	X, Y	Specifies the hole position by an incremental or absolute value.
Drilling data	Z	Specifies the distance from point R to the bottom of the hole.
	R	Specifies the distance from the initial level to point R.
	Q	Specifies each cut-in value with G73 and G83 or the shift value with G76 and G87. (Always specified with an incremental value.)
	P	Specifies the dwell time at the bottom of the hole.
	F	Specifies the feed rate.
Number of repeats	K	Specifies the number of repeats for a series of operation 1 to 6.

G75 I_J_K_X (Z)_R_F_P_L_ ; G77 I_J_K_X (Z)_R_F_P_L_ ; G78 I_J_K_X_R_F_P_L_ ; G79 I_J_K_X (Z)_R_F_P_L_ ;		○
I: Depth-of-cut 1 (A sign in the command specifies the direction of cutting.) J: Depth-of-cut 2 (A sign in the command specifies the direction of cutting.) K: Total depth of cut X (Z): Range of grinding (A sign in the command specifies the direction of grinding.) R: Feedrate for I and J F: Feedrate for X (Z) (G75/G77/G79)/Feedrate (G78) P: Dwell time L: Grinding-wheel wear compensation (only for continuous dressing)		

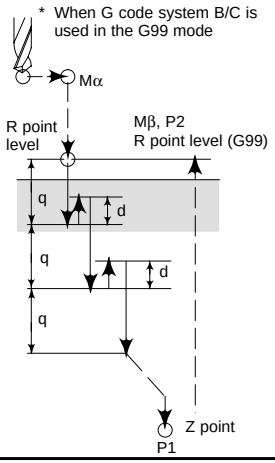
Function	Explanation
Canned cycle for drilling (G80 to G89)	G83: Front drilling cycle G84: Front tapping cycle G85: Front boring cycle G87: Side drilling cycle G88: Side tapping cycle G89: Side boring cycle G80: Drilling cycle cancel

Example

G83 (G87) (G98 mode)

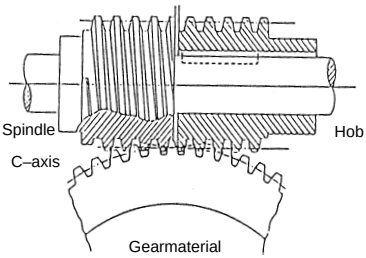


G83 (G87) (G99 mode)

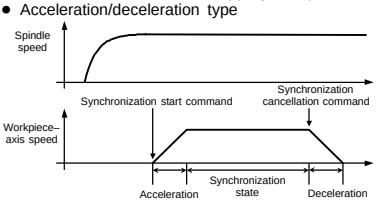
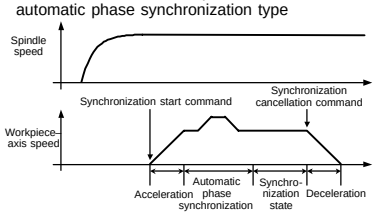
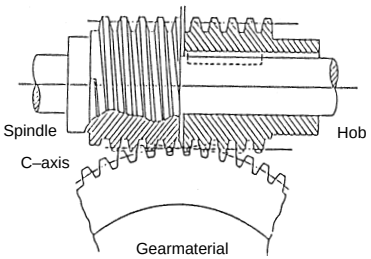


Program format	T series	M series
G83 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G84 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G86 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G87 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G88 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G89 X(Z)_C_Z(X)_R_Q_P_F_K_(M_) ; G80 ; Cancel G□□ X(Z)_C_Z(X)_R_Q_P_F_K_(M□□) ; M code of C axis clamp (PRM5110) Hole position data Number of repeat (PRM5102#5) Drilling mode Drilling data	○	

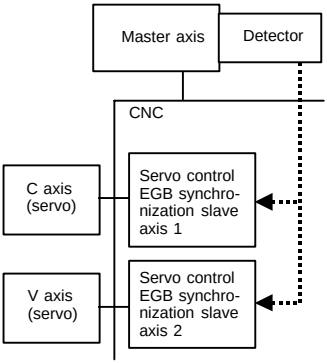
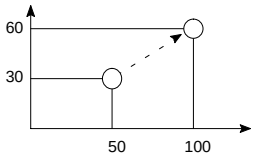
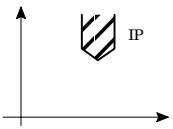
Designation	Address	Description
Drilling mode	G□□	G80, G83, G84, G86, G87, G88, G89
Hole position	X/U(Z/W)C/H	Specifies the hole position by an incremental or absolute value.
Drilling data	Z(X)	Specifies the distance from point R to the bottom of the hole.
	R	Specifies the distance from the initial level to point R level.
	Q	Specifies each cut-in value with G83 (G87). This value is always specified with an incremental value to specify radius.
	P	Specifies the dwell time at the bottom of the hole.
	F	Specifies the feedrate.
Number of repeats	K	Specifies the number of repeats for a series of operations. (PRM5102#5)
M code of C-axis clamp	M□□	M-code (specified by a parameter) of C-axis clamp. (PRM5110)

Function	Explanation
Function for hobbing machine (G81, G80)	A workpiece axis (such as the C axis) is rotated in synchronism with the rotation of a spindle (such as the hob axis). 
Simple electronic gear box (=EGB) (G81, G80)	By using the electronic gear box of the servo system, control is exercised to synchronize the rotation of a spindle (such as the hob axis) with a workpiece axis (such as the C axis).
Spindle electronic gear box (G81, G80)	By using the electronic gear box of the serial spindle, control is exercised to synchronize two spindles (Cs contour axes) with each other.

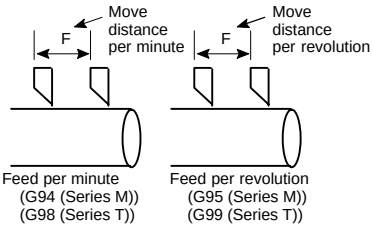
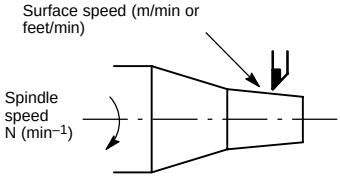
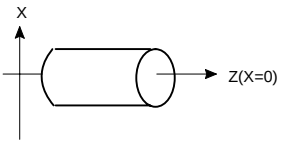
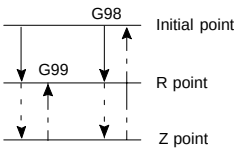
Program format	T series	M series
G81 R_ L_ Q_ P_ ; G80 ; Cancels synchronization between the hob axis and C–axis. R : Number of teeth (specifiable range : 1 to 5000) L : Number of hob threads (specifiable range : 1 to 30 with a sign) ● The sign of L specifies the direction of rotation of the C–axis. ● If L is positive, the C–axis rotates in the positive direction (+). ● If L is negative, the C–axis rotates in the negative direction (–). Q : Module or diametral pitch For metric input, specify a module. (Units = 0.00001 mm; specifiable range = 0.01 to 25.0 mm) For inch input, specify a diametral pitch. (Units = 0.00001 inch^{-1}; specifiable range = 0.01 to 250.0 inch^{-1}) P : Gear helix angle (Units = 0.0001 deg; specifiable range = –90.0 to +90.0 deg) P and Q must be specified when a helical gear is to be cut. (Supplement) The hob function is made available to the T series with G81.4.		○
G81 T_ L_ Q_ P_ ; Starts synchronization. S_ M03 (or M04) ; Starts tool axis rotation. M05 ; Stops tool axis rotation G80 ; Cancels synchronization. T : Number of teeth (Specifiable range: 1 to 1000) L : Number of hob threads (Specifiable range: –21 to +21 with 0 excluded) Q : Module or diametral pitch Specify a module in the case of metric input. (Unit: 0.00001 mm, Specifiable range: 0.01 to 25.0 mm) Specify a diametral pitch in the case of inch input. (Unit: 0.00001 inch^{-1}, Specifiable range: 0.01 to 25.0 inch^{-1}) P : Gear helix angle (Unit: 0.0001 deg, Specifiable range: –90.0 to 90.0 deg.) * When specifying Q and P, the user can use a decimal point.		○
G81 T_ L_ Q_ P_ ; Starts synchronization. G80 ; Cancels synchronization. T : Number of teeth (Specifiable range : 1 to 1000) L : Number of hob threads (Specifiable range : –200 to 200 with 0 excluded) Q : Module or diametral pitch Specify a module in the case of metric input. (Unit : 0.00001mm, Specifiable range : 0.01 to 25.0mm) Specify a diametral in the case of inch input. (Unit : 0.00001inch^{-1}, Specifiable range : 0.01 to 25.0inch^{-1}) P : Gear helix angle (Unit : 0.0001deg, Specifiable range : –90.0 to 90.0deg)		○

Function	Explanation
Electronic gear box automatic phase synchronization (G81, G80)	When EGB synchronization starts, control on acceleration/deceleration and phase synchronization is exercised. With this function, the synchronization ratio can be turned on and off without stopping the spindle. ● Acceleration/deceleration type  ● Acceleration/deceleration plus automatic phase synchronization type 
Chopping function (G81.1)	While an axis is being moved up and down, the contour program of the other axis can be executed.
Hobbing function (G81.4, G80.4)	In synchronism with the rotation of the spindle (hob axis), the workpiece axis (C axis) can be rotated. 

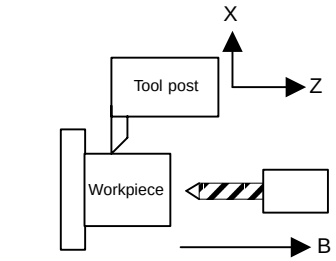
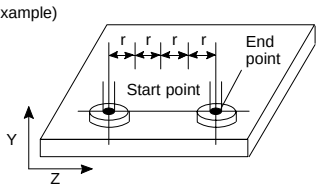
Program format	T series	M series
● Acceleration/deceleration type G81 T_ L_ R1 ; Synchronization start G80 R1 ; Synchronization end T : Number of teeth (range of valid settings: 1–1000) L : Number of hob threads (range of valid settings: –21 to +21, excluding 0) When L is positive, the direction of rotation about the workpiece axis is positive (+ direction). When L is negative, the direction of rotation about the workpiece axis is negative (– direction). ● Acceleration/deceleration plus automatic phase synchronization type G81 T_ L_ R2 ; Synchronization start G80 R2; Synchronization end T : Number of teeth (range of valid settings: 1–1000) L : Number of hob threads (range of valid settings: –21 to +21, excluding 0) When L is positive, the direction of rotation about the workpiece axis is positive (+ direction). When L is negative, the direction of rotation about the workpiece axis is negative (– direction).		○
G81.1 Z__ Q__ R__ F__ ; G80; Cancels chopping Z : Upper dead point (For an axis other than the Z–axis, specify the axis address.) Q : Distance between the upper dead point and lower dead point (Specify the distance as an incremental value, relative to the upper dead point.) R : Distance from the upper dead point to point R (Specify the distance as an incremental value, relative to the upper dead point.) F : Feedrate during chopping		○
G81.4 R_ L_ Q_ P_ ; G80.4 ; Cancels synchronization between the hob axis and C–axis. R : Number of teeth (specifiable range : 1 to 500) L : Number of hob threads (specifiable range : 1 to 30 with a sign) ● The sign of L specifies the direction of rotation of the C–axis. ● If L is positive, the C–axis rotates in the positive direction (+). ● If L is negative, the C–axis rotates in the negative direction (–). Q : Module or diametral pitch For metric input, specify a module. (Units = 0.00001 mm; specifiable range = 0.01 to 25.0 mm) For inch input, specify a diametral pitch. (Units = 0.00001 inch^{-1}; specifiable range = 0.01 to 250.0 inch^{-1}) P : Gear helix angle (Units = 0.0001 deg; specifiable range = –90.0 to +90.0 deg) P and Q must be specified when a helical gear is to be cut. (Supplement) The hobbling machine function is made available to the M series with G81.	○	

Function	Explanation
Electronic gear box 2 pair (G81.5, G80.5)	When a command for starting electronic gear box (EGB) synchronization is issued, a slave axis can be specified. Up to two sets of EGB synchronization can be implemented. (Example) 
Absolute/Incremental command (G90/G91)	(Example)  Absolute command G90X100Y60; Incremental command G91X50Y30;
Change of workpiece coordinate system Setting of maximum spindle speed (G92)	

Program format	T series	M series
G81.5 $\left\{\begin{matrix}T\,t\\P\,p\end{matrix}\right\}$ $\left\{\begin{matrix}\beta\,j\\\beta\,0\quad L\,l\end{matrix}\right\}$; Master–axis travel Slave–axis travel Specify the master–axis travel in either of the following ways. 1. Master–axis speed T t : Master–axis speed ($1 \leq t \leq 1000$) 2. Master–axis pulse count P p : Master–axis pulse count ($1 \leq p \leq 999999999$) Specify a pulse count on the condition that four pulses correspond to one period in the A and B phases. Specify the slave–axis travel in either of the following ways. 1. Slave–axis travel βj β : Slave–axis address j : Slave–axis travel indicated in units of the minimum travel increments (the range of valid settings for usual axis movement applies) When j = 0, the specified command is regarded as being a command for the slave–axis speed, described below. In this case, if L is not specified, an alarm is output. 2. Slave–axis speed β 0 L±l β : Slave–axis address l : Slave axis speed ($1 \leq l \leq 21$) G80.5 β0 ; Ends synchronization. β : Slave axis address Note) The start/end of synchronization cannot be specified for two slave axes with a single command.		○
G90_; Absolute command G91_; Incremental command G90_G91_; Change of workpiece coordinate system Note) With the T series, these commands are applicable when G code system B/C is used. When G code system A is used, a distinction between absolute and incremental commands is made by address specification as follows: X_ Z_ C_ : Absolute command U_ W_ H_ : Incremental command	○	○
G92IP_ ; Change of workpiece coordinate system G92 S_ ; Constant surface speed control Setting of maximum spindle speed		○

Function	Explanation
Workpiece coordinate system preset (G92.1) (G50.3 (T series))	The workpiece coordinate system preset function presets a workpiece coordinate system shifted by manual intervention to the pre-shift workpiece coordinate system. The latter system is displaced from the machine zero point by a workpiece zero point offset value.
Feed per minute Feed par revolution (G94, G95 (Series M)) (G98, G99 (Series T))	
Constant surface speed control (G96, G97)	
Constant surface speed control (G96, G97)	
Initial point return/ R point return (G98, G99)	

Program format	T series	M series
G92.1 IP 0; IP ; Specifies axis addresses subject to the workpiece coordinate system preset operation. Axes that are not specified are not subject to the preset operation. (Supplement) G50.3 when G code system A is used with the T series	○	○
G94 F_ ; (M series) Feed per minute G95 F_ ; (M series) Feed per revolution G98 F_ ; (T series) Feed per minute G99 F_ ; (T series) Feed per revolution Note) Even with the T series, G94/G95 is specified when G code system B/C is used.	○	○
G96 Ss ; G97 ; Cancel s: Surface speed (m/min or feet/min)	○	
G96 Ss Pα ; G97 ; Cancel P : Specify an axis on which constant surface speed control is to be exercised. α: 1 to 8 (X axis, Y axis, Z axis, 4th axis to 8th axis, axis set in the PRM3770 with P0) s: Surface speed (m/min or feet/min)		○
G98_ ; G99_ ; Note) With the T series, these commands are applicable when G code system B/C is used.	○	○

Function	Explanation
B axis control (G100, G101, G102, G103, G110)	By setting a B axis independently of the basic control axes (X, Z), the B axis can be controlled in parallel with the movements on the X axis and Z axis. 
Infeed control (G160, G161)	(Example) 

Program format	T series	M series
G101; Starts registration of the first program. [B axis operation command] G100; Ends program registration. Similarly, G102; Starts registration of the second program. G103; Starts registration of the third program. By programming a B axis operation between a G101/G102/G103 command and G100 command, programs (three types) for B axis control can be registered. Each registered program can be executed by specifying the M code set in PRM8251/8252/8253. G110 [one–motion move command]; Single movement Specifies and executes a one–motion movement.	○	
G161 Rr ; G160 ; Cancel r: Cut in depth		○

5.1 Types of Variables

Type of variable	Variable number
Local variable	#1 – #33
Common variable	#100 – #149 #500 – #531
Additional common variable (Note 1)	#100 – #199 #500 – #999
System variable (Note 2)	#1000 – #19988

NOTE1 Common variables #100 to #199 and #500 to #999 can be added.
NOTE2 Details are shown in 5.2.

5.2 System Variable

Variable number	Contents	Purpose	Series
#1000–#1015	Corresponds to UI000 to UI015 <G054, G055>	Interface input signal	T/M
#1032	Unified input of UI000 to UO015 <G054, G055>		
#1100–#1115	Corresponds to UO000 to UO015 <F054, F055>	Interface output signal	T/M
#1132	Unified output of UO000 to UO015 <F054, F055>		
#1133	Unified output of UO100 to UO131 <F056 to F059>		
#2001–#2064	Wear offset value (Offset No. 1–64)	X axis offset	T
#2701–#2749	Geometry offset value (Offset No. 1–49)		
#10001–#10099	Wear offset value (Offset No. 1–99)		
#15001–#15099	Geometry offset value (Offset No. 1–99)		
#2101–#2164	Wear offset value (Offset No. 1–64)	Z axis offset	T
#2801–#2849	Geometry offset value (Offset No. 1–49)		
#11001–#11099	Wear offset value (Offset No. 1–99)		
#16001–#16099	Geometry offset value (Offset No. 1–99)		
#2201–#2264	Wear offset value (Offset No. 1–64)	Tool nose radius compensation	T
#2901–#2964	Geometry offset value (Offset No. 1–64)		
#12001–#12099	Wear offset value (Offset No. 1–99)		
#17001–#17099	Geometry offset value (Offset No. 1–99)		

Variable number	Contents	Purpose	Series
#2301–#2364	Wear offset value (Offset No. 1–64)	Imaginary tool nose position	T
#2301–#2364	Geometry offset value (Offset No. 1–64)		
#13001–#13099	Wear offset value (Offset No. 1–99)		
#13001–#13099	Geometry offset value (Offset No. 1–99)		
#2401–#2449	Wear offset value (Offset No. 1–49)	Y axis offset	T
#2451–#2499	Geometry offset value (Offset No. 1–49)		
#14001–#14099	Wear offset value (Offset No. 1–99)		
#19001–#19099	Geometry offset value (Offset No. 1–99)		
#2001–#2200	Tool compensation (offset no. 1–200)	Tool compensation (offset memory A)	M
#10001–#10999	Tool compensation (offset no. 1–999)		
#2001–#2200	Wear offset value (offset no. 1–200)	Tool compensation (offset memory B)	M
#2201–#2400	Geometry offset value (offset no. 1–200)		
#10001–#10999	Wear offset value (offset no. 1–999)		
#11001–#11999	Geometry offset value (offset no. 1–999)		
#2001–#2200	Wear offset of H code (offset no. 1–200)	Tool compensation (offset memory C)	M
#2201–#2400	Geometry offset of H code (offset no. 1–200)		
#10001–#10999	Wear offset of H code (offset no. 1–999)		
#11001–#11999	Geometry offset of H code (offset no. 1–999)		
#12001–#12999	Wear offset of D code (offset no. 1–999)		
#13001–#13999	Geometry offset of D code (offset no. 1–999)		
#3000	Macro alarm #3000=1(NOT FOUND) ; → The alarm screen displays "3001 NOT FOUND".	Alarm	T/M
#3001	Clock 1 (unit: 1ms)	Clock	T/M
#3002	Clock 2 (unit: 1 hour)		
#3003	Automatic operation control (1)	Control of single block stop, wait signal for FIN	T/M
#3004	Automatic operation control (2)	Control of feed-hold, feedrate override, exact stop check	T/M
#3005	Setting data	Setting	T/M

Variable number	Contents	Purpose	Series
#3006	Stop with message (Example) #3006 = 1 (message); The machine stops after the execution of the immediately preceding program. The message is displayed on the external operator message screen.		T/M
#3007	Mirror image check signal	Status of mirror image	T/M
#3011	Year, month, day	Clock	T/M
#3012	Hour, minute, second		
#3901	No. of parts machined	No. of parts	T/M
#3902	No. of parts required		
#4001–#4022	G code (group 01–22)	Modal information	T/M
#4102	B code (M only)		
#4107	D code (M only)		
#4109	F code		
#4111	H code (M only)		
#4113	M code		
#4114	Sequence number		
#4115	Program number		
#4119	S code		
#4120	T code		
#4130	P code (Additional workpiece coordinate system number) (M only)		
#5001–#5008	1st axis block end position to 8th axis block end position	Block end position (Workpiece coordinate)	T/M
#5021–#5028	1st axis current position to 8th axis current position	Machine coordinate	T/M
#5041–#5048	1st axis current position to 8th axis current position	Workpiece coordinate	T/M
#5061–#5068	1st axis skip signal position to 8th axis skip signal position	Skip signal position (Workpiece coordinate)	T/M
#5081–#5088	1st axis tool offset value to 8th axis tool offset value	Tool offset value	T/M
#5101–#5108	1st axis servo position deviation to 8th axis servo position deviation	Servo position deviation	T/M
#2500 #2600 #2700 #2800	External workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M

Variable number	Contents	Purpose	Series
#2501 #2601 #2701 #2801	G54 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#2502 #2602 #2702 #2802	G55 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#2503 #2603 #2703 #2803	G56 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#2504 #2604 #2704 #2804	G57 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#2505 #2605 #2705 #2805	G58 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#2506 #2606 #2706 #2806	G59 workpiece zero point offset value	1st axis 2nd axis 3rd axis 4th axis	M
#5201–#5208	External workpiece zero point offset value	1st axis to 8th axis	T/M
#5221–#5228	G54 workpiece zero point offset value	1st axis to 8th axis	T/M
#5241–#5248	G55 workpiece zero point offset value	1st axis to 8th axis	T/M
#5261–#5268	G56 workpiece zero point offset value	1st axis to 8th axis	T/M
#5281–#5288	G57 workpiece zero point offset value	1st axis to 8th axis	T/M
#5301–#5308	G58 workpiece zero point offset value	1st axis to 8th axis	T/M
#5321–#5328	G59 workpiece zero point offset value	1st axis to 8th axis	T/M
#7001–#7008	G54.1 P1 workpiece zero point offset value	1st axis to 8th axis	M
#7021–#7028	G54.1 P2 workpiece zero point offset value	1st axis to 8th axis	M
:	:		
#7941–#7948	G54.1 P48 workpiece zero point offset value	1st axis to 8th axis	M
#14001–#14008	G54.1 P1 workpiece zero point offset value	1st axis to 8th axis	M
#14021–#14028	G54.1 P2 workpiece zero point offset value	1st axis to 8th axis	M
:	:		
#19981–#19988	G54.1 P48 workpiece zero point offset value	1st axis to 8th axis	M

5.3 Argument Assignment I/II

Correspondence Table between Argument Assignment I Addresses and Macro Variables

Argument Assignment I Addresses	Macro Variables
A	#1
B	#2
C	#3
D	#7
E	#8
F	#9
H	#11
I	#4
J	#5
K	#6
M	#13
Q	#17
R	#18
S	#19
T	#20
U	#21
V	#22
W	#23
X	#24
Y	#25
Z	#26

Correspondence Table between Argument Assignment II Addresses and Macro Variables

Argument Assignment II Addresses	Macro Variables
A	#1
B	#2
C	#3
I_1	#4
J_1	#5
K_1	#6
I_2	#7
J_2	#8
K_2	#9
I_3	#10
J_3	#11
K_3	#12
I_4	#13
J_4	#14
K_4	#15
I_5	#16
J_5	#17
K_5	#18
I_6	#19
J_6	#20
K_6	#21
I_7	#22
J_7	#23
K_7	#24
I_8	#25
J_8	#26
K_8	#27
I_9	#28
J_9	#29
K_9	#30
I_{10}	#31
J_{10}	#32
K_{10}	#33

- **Format**

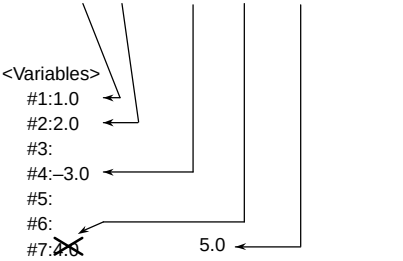
  G65 must be specified before any argument.

- **Mixture of argument specifications I and II**

  The CNC internally identifies argument specification I and argument specification II. If a mixture of argument specification I and argument specification II is specified, the type of argument specification specified later takes precedence.

Example

G65 A1.0 B2.0 I–3.0 I4.0 D5.0 P1000;



When both the I4.0 and D5.0 arguments are commanded for variable #7 in this example, the latter, D5.0, is valid.

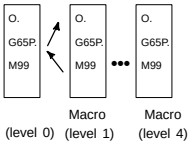
5.4 Arithmetic Commands

Purpose	Expression	Contents
Definition and substitution of variables	#i=#j	Definition, substitution
Addition arithmetic	#i=#j+#k	Sum
	#i=#j – #k	Subtraction
	#i=#jOR#k	Logical sum (at every bit of 32 bits)
	#i=#jXOR#k	Exclusive OR (at every bit of 32 bits)
Multiplication arithmetic	#i=#j*#k	Product
	#i=#j/#k	Quotient
	#i=#jAND#k	Logical product (at every bit of 32 bits)
Functions	#i=SIN [#j]	Sine (degree unit)
	#i=ASIN [#j]	Arcsine (degree unit)
	#i=COS [#j]	Cosine (degree unit)
	#i=ACOS [#j]	Arccosine (degree unit)
	#i=TAN [#j]	Tangent (degree unit)
	#i=ATAN [#j]/[#k]	Arctangent (degree unit)
	#i=SQRT [#j]	Square root
	#i=ABS [#j]	Absolute value
	#i=BIN [#j]	Conversion from BCD to BIN
	#i=BCD [#j]	Conversion from BIN to BCD
	#i=ROUND [#j]	Rounding off
	#i=FIX [#j]	Discard fractions less than 1
	#i=FUP [#j]	Add 1 for fractions less than 1
	#i=LN [#j]	Logarithm
	#i=EXP [#j]	Index
Combination of arithmetic operations	–	The above arithmetic operations and functions can be combined. The order of priority in an arithmetic operation is function, multiplication arithmetic then addition arithmetic.

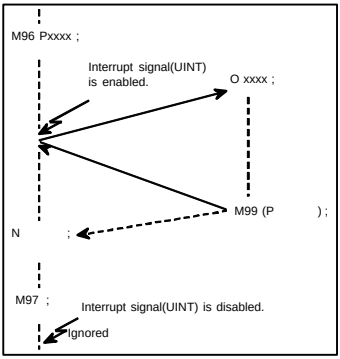
5.5 Control Command

Purpose	Expression	Kind of operation (operator)
Conditional branch	IF [<conditional expression>] GOTO n	#j EQ #k (=)
	Branch to sequence number n when the conditional expression is satisfied.	#j NE #k (≠)
		#j GT #k (>)
Conditional execution	IF [<conditional expression>] THEN st	#j LT #k (<)
	Execute the macro statement st when the conditional expression is satisfied.	#j GE #k (≧)
		#j LE #k (≦)
Iteration	WHILE [<conditional expression>] DO m (m = 1, 2, 3)	#j EQ #k (=)
	Note) If omitted conditional expression, blocks from DO m to END m are executed eternally.	#j NE #k (≠)
		#j GT #k (>)
		#j LT #k (<)
		#j GE #k (≧)
		#j LE #k (≦)

5.6 Macro Call

Name	Format	Program No.	Parameter No.	Remarks
Simple call	G65P (program number) L (repetition count) <argument assignment>;			Refer to 5.3 for argument assignment.
Modal call	G66P (program number) L (repetition count) <argument assignment>;			
Macro call by G code	Gxx <argument assignment>; Max. 10 G codes from G01–G64 and G68–G9999	9010 to 9019	6050 to 6059	Refer to 5.3 for argument assignment. Set G or M code that calls a program specified in the parameter.
Macro call by M code	Mxx <argument assignment>; Max. 10 M codes from M006 to M99999999	9020 to 9029	6080 to 6089	
Sub-program call by M code	Mxx ; Max. 9 M codes from M006–M99999999	9001 to 9009	6071 to 6079	Displayed on program check screen but no MF nor M code is sent. Set an M code that calls a sub-program specified by the parameter.
Sub-program call by T code	Tt ;	P9000 (Sub-program)	6001#5 (TCS)	Calls sub-program P9000. T code t is stored in common variable #149 as an argument.
Multi-plex call	Main program  			Can be called up to 4 loops including simple call and modal call. For each multiplexing level, a local variable of a level from 0 to 4 is available.

5.7 Interruption Type Custom Macro

Name	Format/Function	Others
Interruption type custom macro	M96 Pxxxx ; Interruption type custom macro is enabled. M97 ; Interruption type custom macro is disabled.  If M98 Pxxxx; is specified in a program, and the UINT signal is input afterwards, the program specified by Pxxxx is executed by interrupting the current program.	Signal Interrupt signal UINT <G053#3> Related parameter PRM6003#3 (TSE)

5.8 External Output Command

Name	Format	Description
Open command	POPEN	This command makes a connection with an external I/O device. Specify this command before executing a series of output data commands.
Data output command (binary)	BPRNT [a #b [c] a_1 #b_1 [c_1] ...] a: Output character string b: Number of a variable holding output data c: Specifies the number of significant decimal places of a variable.	This command outputs character strings and the contents of variables to an external I/O device (in binary).
Data output command (ISO/EIA)	DPRNT [a #b [cd] a_1 #b_1 [c_1 d_1] ...] a: Output character string b: Number of a variable holding output data c: Specifies the number of significant integer digits of a variable. d: Specifies the number of significant decimal places of a variable.	This command outputs character strings and the contents of variables to an external I/O device (in ISO/EIA according to the setting). Related parameter: PRM6001#1(PRT)
Close command	PCLOS	This command clears the connection with an external I/O device. Specify this command after all data output commands are executed.

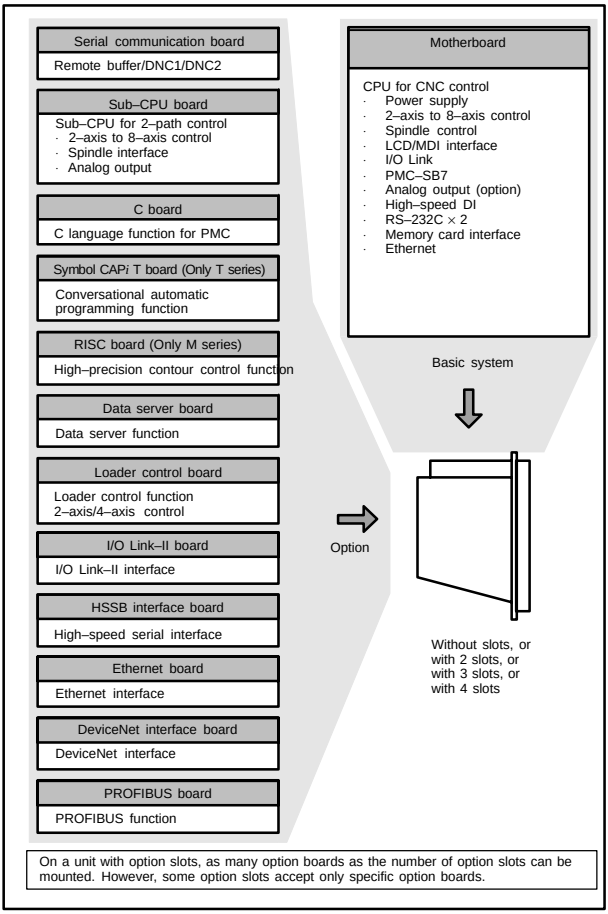
5.9 Command Range

Item	Contents	
Variables	Local variable:	#1–#33
	Common variable:	#100–#149, #500–#531
	Additional common variable:	#100–#199, #500–#999
	System variable:	#1000–#19988
Value of variables	Maximum value	$\pm 10^{47}$
	Minimum value	$\pm 10^{-29}$
Constant in expression	Maximum value	±99999999
	Minimum value	±0.0000001
	Decimal point possible	
Arithmetic precision	Decimal 8 digits	
Macro call duplex	Max. 4 loops	
Iteration classification no.	1 to 3	
Nesting	Max. 5 loops	
Nesting of subprograms	Max. 4 loops (8 loops including macro calls)	

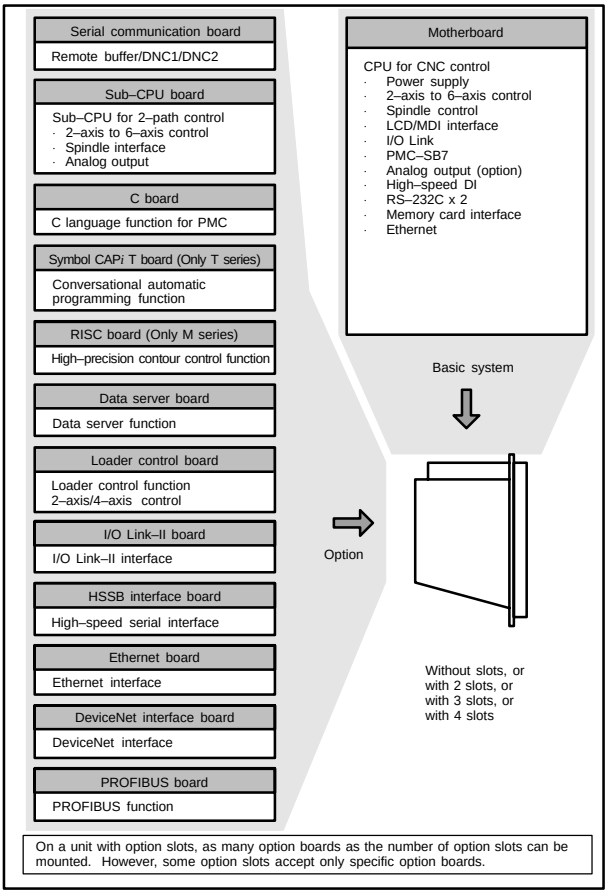
6.1 LCD–Mounted Type *i* Series Hardware

6.1.1 Overview of hardware

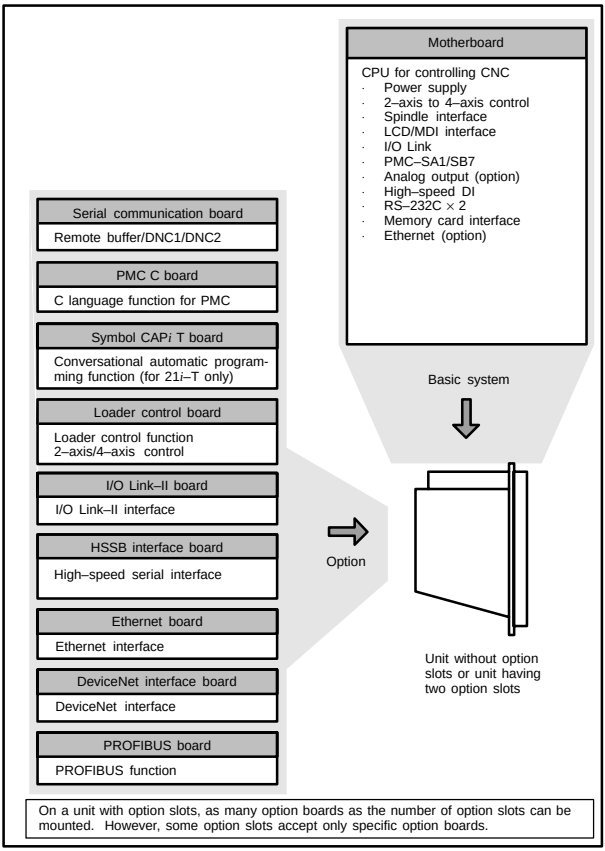
(1) Series 16*i*/160*i*s



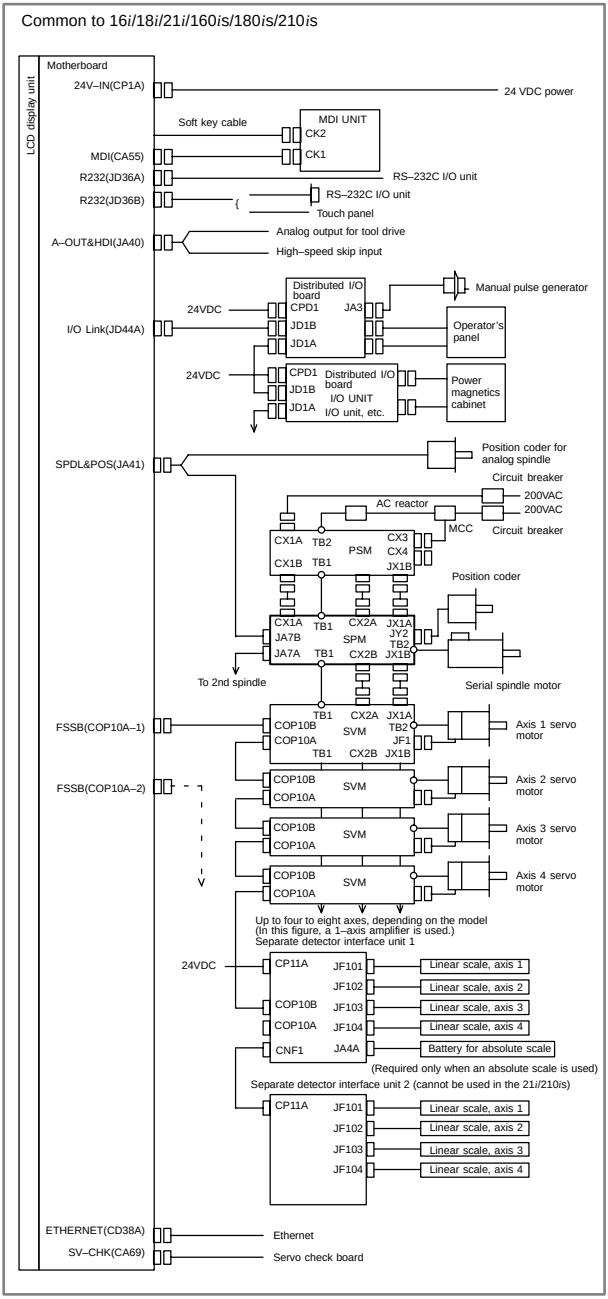
(2) Series 18*i*/180*i*s

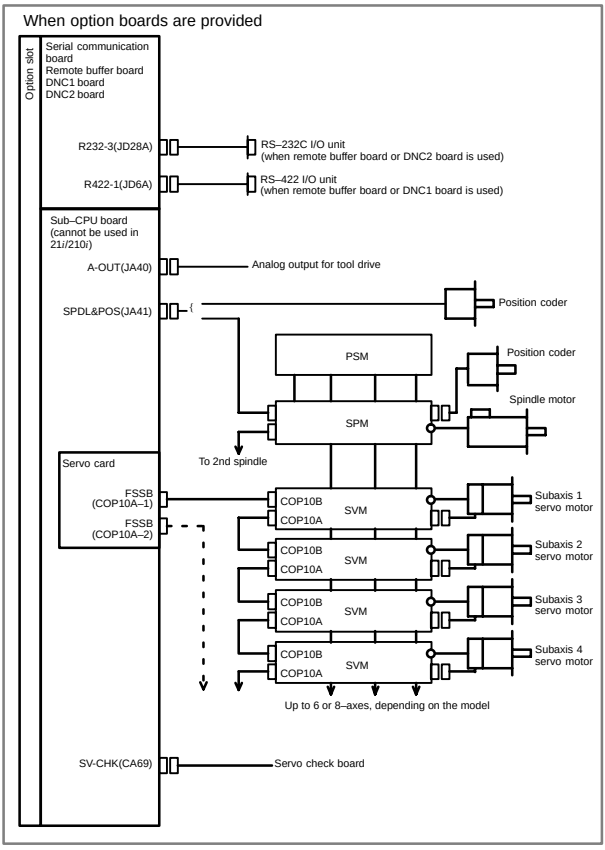


(3) Series 21*i*/210*i*s

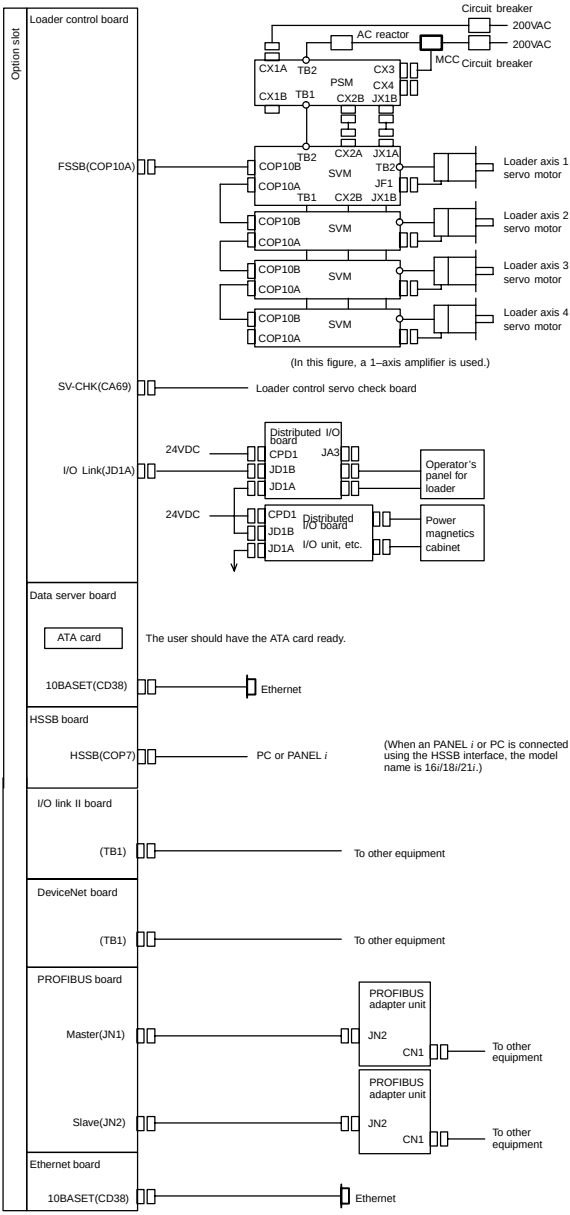


6.1.2 Total connection diagrams

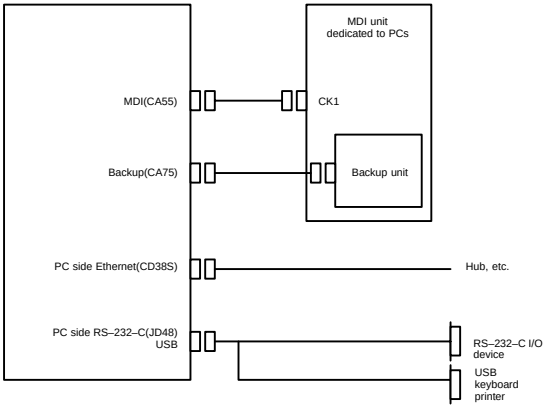



When option boards are provided
Option slot
Serial communication board
Remote buffer board
DNC1 board
DNC2 board
R232-3(JD28A)
RS–232C I/O unit
(when remote buffer board or DNC2 board is used)
R422-1(JD6A)
RS–422 I/O unit
(when remote buffer board or DNC1 board is used)
Sub–CPU board
(cannot be used in 21i/210i)
A-OUT(JA40)
Analog output for tool drive
SPDL&POS(JA41)
Position coder
PSM
Position coder
Spindle motor
SPM
To 2nd spindle
Servo card
FSSB
(COP10A–1)
FSSB
(COP10A–2)
COP10B
COP10A
SVM
Subaxis 1
servo motor
Subaxis 2
servo motor
Subaxis 3
servo motor
Subaxis 4
servo motor
Up to 6 or 8–axes, depending on the model
SV-CHK(CA69)
Servo check board

When option boards are provided



The following is the connection diagram specific to the 160*i*s/180*i*s/210*i*s.



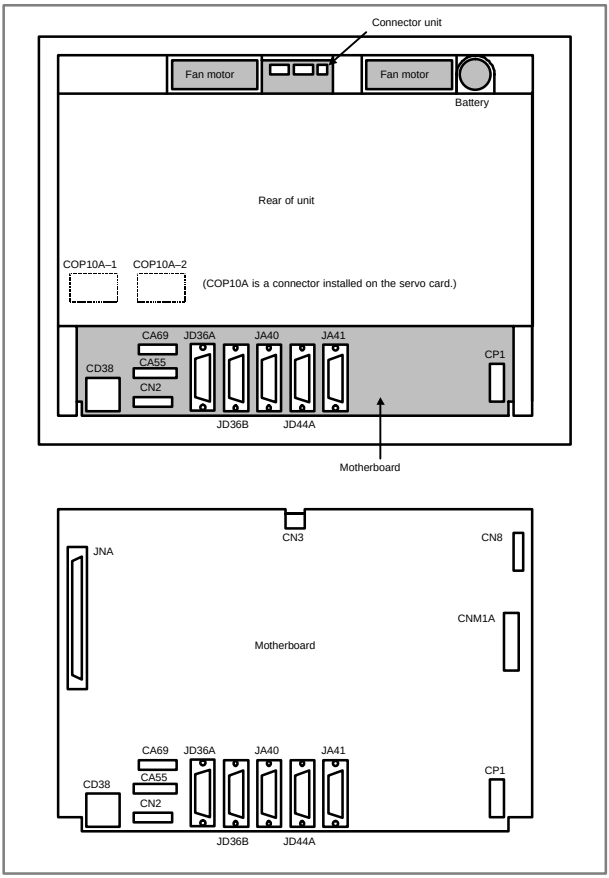
6.1.3 Configuration of printed circuit board connectors and cards

6.1.3.1 FS16*i*/18*i*/21*i* motherboard

- Specification

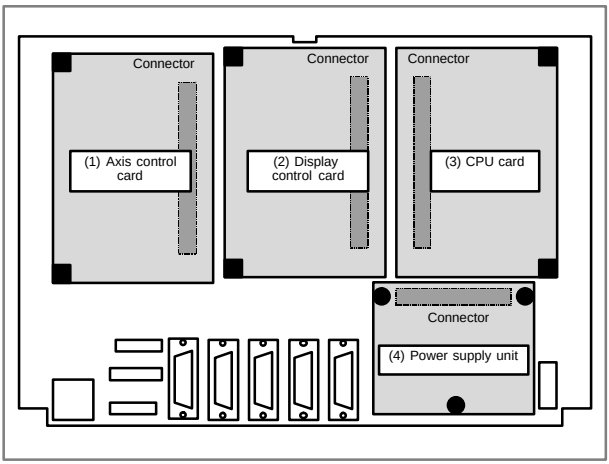
Name	Specification
Series 16*i*	A20B–8100–0660
Series 18*i*	A20B–8100–0661
Series 21*i* (without Ethernet function, PMC–SA1)	A20B–8100–0662
Series 21*i* (without Ethernet function, PMC–SB7)	A20B–8100–0663
Series 21*i* (with Ethernet function, PMC–SA1)	A20B–8100–0664
Series 21*i* (with Ethernet function, PMC–SB7)	A20B–8100–0665

- Connector mounting location



Connector number	Application
COP10A–1, COP10A–2	Servo amplifier (FSSB)
CA55	MDI
CA69	Servo check
JD36A	RS–232C serial port
JD36B	RS–232C serial port
JA40	Analog output/high–speed DI
JD44A	I/O link
JA41	Serial spindle/position coder
CP1	24VDC–IN
JNA	F–BUS interface
CN8	Video signal interface
CNM1A	PCMCIA interface
CN2	Soft key
CN3	Inverter
CD38A	Ethernet

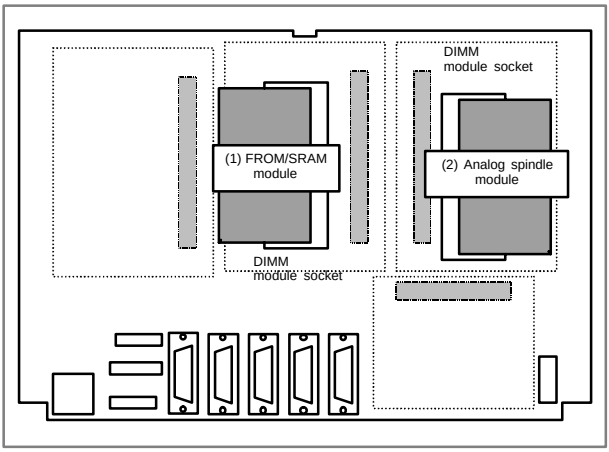
- Card and power supply mounting location



No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B–3300–0033	Axis control 2 axes	Applicable servo software: Series 9090 (21*i*)
		A20B–3300–0032	Axis control 4 axes	
		A20B–3300–0243	Axis control 2 axes	Applicable servo software: Series 90B0
		A20B–3300–0242	Axis control 4 axes	
		A20B–3300–0241	Axis control 6 axes	
		A20B–3300–0240	Axis control 8 axes	
		A20B–3300–0248	Axis control 4 axes	Applicable servo software: Series 90B0 (High–speed HRV)
		A20B–3300–0245	Axis control 6 axes	
		A20B–3300–0244	Axis control 8 axes	
		A20B–3300–0246	Learning–control axis control	Applicable servo software: Series 90B3/90B7
		A20B–3300–0247	Learning–control axis control	Applicable servo software: Series 90B3/90B7 (High–speed HRV)
		A17B–3300–0500	Applicable to Dual Check Safety Axis control 8 axes	Applicable serve software: 90B0 Applicable monitor software: 90B9
(2)	Display control card	A20B–3300–0280	10.4″ color LCD with graphic function and embedded Ethernet	Graphic software 60V6 series, embedded Ethernet control software series 656A
		A20B–3300–0281	8.4″ color LCD with graphic function and embedded Ethernet	
		A20B–3300–0282	9.5″ monochrome LCD with graphic function and embedded Ethernet	
		A20B–3300–0283	7.2″ monochrome LCD with graphic function and embedded Ethernet	
		A20B–3300–0300	9.5″ monochrome LCD with embedded Ethernet	Embedded Ethernet control software series 656A
		A20B–3300–0301	7.2″ monochrome LCD with embedded Ethernet	
		A20B–3300–0302	9.5″ monochrome LCD	
		A20B–3300–0303	7.2″ monochrome LCD	

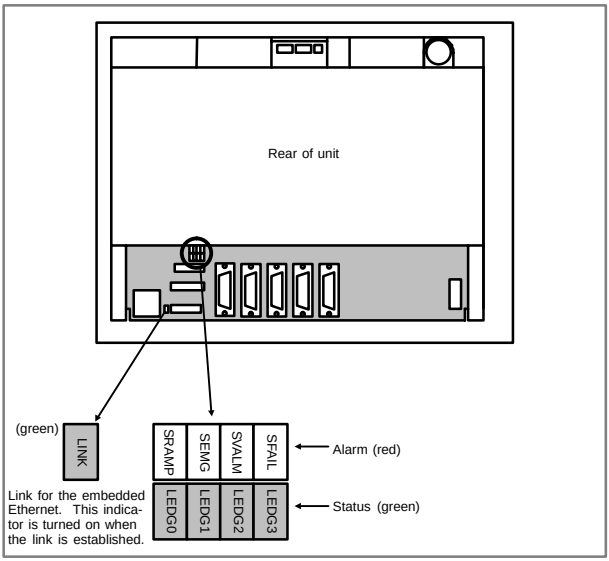
No.	Name	Specification	Function	Remarks
(3)	CPU card	A20B–3300–0310	DRAM 16MB for Series 16*i*/18*i*	
		A20B–3300–0311	DRAM 32MB for Series 16*i*/18*i*	
		A20B–3300–0291	DRAM 16MB for Series 21*i*	
		A20B–3300–0290	DRAM 32MB for Series 21*i*	
		A20B–3300–0312	DRAM 16MB for Series 21*i*	When embedded Ethernet function is used with Series 21*i*
		A20B–3300–0313	DRAM 32MB for Series 21*i*	
(4)	Power supply unit	A20B–8100–0720		

- DIMM module mounting location



No.	Name	Specification	Function	Remarks
(1)	FROM/ SRAM module	A20B–3900–0160	FROM 16MB SRAM 1MB	Various control software programs are stored in the FROM module. The SRAM is a battery–backed memory module.
		A20B–3900–0161	FROM 16MB SRAM 2MB	
		A20B–3900–0162	FROM 16MB SRAM 3MB	
		A20B–3900–0163	FROM 32MB SRAM 1MB	
		A20B–3900–0164	FROM 32MB SRAM 2MB	
		A20B–3900–0165	FROM 32MB SRAM 3MB	
		A20B–3900–0180	FROM 16MB SRAM 256kB	
		A20B–3900–0181	FROM 16MB SRAM 512kB	
		A20B–3900–0182	FROM 32MB SRAM 256kB	
		A20B–3900–0183	FROM 32MB SRAM 512kB	
(2)	Analog spindle module	A20B–3900–0170	Analog spindle position coder	

- LED display



(1) Changes in status LED (green) indication at power–on time

No.	Status LED	Status
1	□□□□	Power is not supplied.
2	■■■■	Initial status immediately after power is switched on; boot is running.
3	□■■■	System activation started.
4	■□■■	Waiting for each processor ID in the system to be set up.
5	□□■■	Each processor ID in the system has been set up.
6	■■□■	FANUC bus initialized.
7	□■□■	PMC initialized.
8	■□□■	Information about the hardware configuration of each printed–circuit board in the system has been set up.
9	□□□■	PMC ladder initialized.
10	□■■□	Waiting for digital servo to be initialized.
11	■■■□	Digital servo initialized.
12	■□□□	Initialization is completed, and normal operation is in progress.

■: On □: Off

(2) Alarm LED (red) indication at system alarm occurrence
If any of these LEDs lights, it is likely that the hardware is defective.

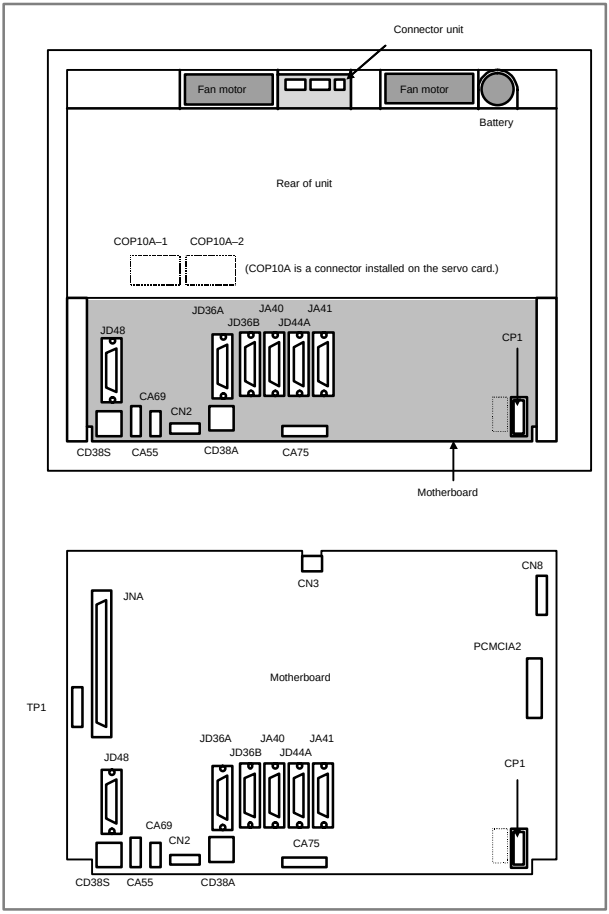
Alarm LED	Meaning
SVALM	Servo alarm.
SEMG	Lights when a system alarm occurs. The hardware has detected a failure in the system.
SFAIL	Lights when a system alarm occurs. Used by the software to stop the system. Lights while boot is under way.
SRAMP	RAM parity or ECC alarm.

6.1.3.2 FS160*is*/180*is*/210*is* motherboard

- Specifications

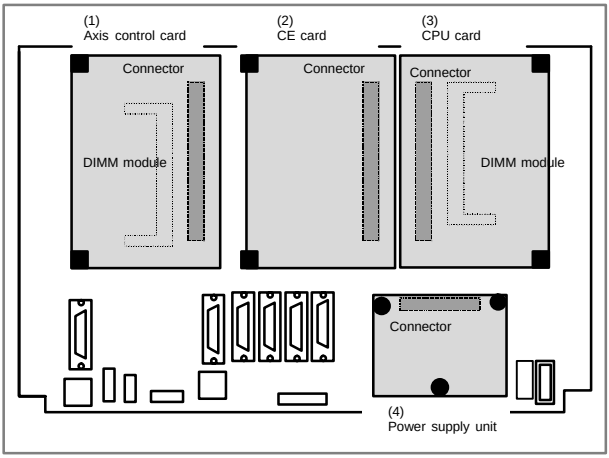
Item	Code
Series 160*is* motherboard	A20B–8100–0790
Series 180*is* motherboard	A20B–8100–0791
Series 210*is* motherboard (PMC–SA1)	A20B–8100–0794
Series 210*is* motherboard (PMC–SB7)	A20B–8100–0795

- Mounting positions of connectors



Connector number	Use
JD48	PC side RS232C, USB
COP10A–1, COP10A–2	Servo motor (FSSB)
CA55	MDI
CA69	Servo check
JD36A	RS232C serial port
JD36B	RS232C serial port
JA40	Analog output/High–speed DI
JD44A	I/O Link
JA41	Serial spindle/Position coder
CP1	24VDC–IN
CD38A	Ethernet(10BASE–T/100BASE–TX)
CD38S	PC side Ethernet(10BASE–T/100BASE–TX)
TP1	Touch panel
CA75	Backup unit
JNA	F–BUS interface
CN8	Video signal interface
PCMCIA2	PCMCIA interface

- Mounting positions of cards

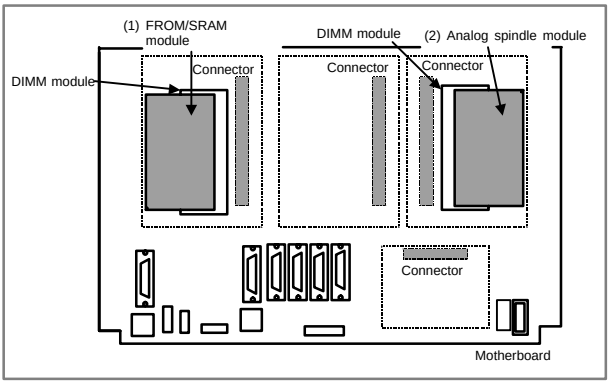


No.	Name		Code	Function	Remarks
(1)	Axis control card		A20B–3300–0033	Axis control 2–axes	Servo software series 9090 (210*i*s)
			A20B–3300–0032	Axis control 4–axes	
			A20B–3300–0243	Axis control 2–axes	Servo software series 90B0
			A20B–3300–0242	Axis control 4–axes	
			A20B–3300–0241	Axis control 6–axes	
			A20B–3300–0240	Axis control 8–axes	
			A20B–3300–0248	Axis control 4–axes	Servo software series 90B0 (High–speed HRV)
			A20B–3300–0245	Axis control 6–axes	
			A20B–3300–0244	Axis control 8–axes	
			A20B–3300–0246	Learning controlled axis control	Servo software series 90B3/90B7
			A20B–3300–0247	Learning controlled axis control	Servo software series 90B3/90B7(High–speed HRV)
			A17B–3300–0500	Applicable to Dual Check Safety Axis control 8–axes	Servo software series 90B0 Monitor software series 90B9
(2)	CE card	CE card 1	A20B–3300–0330	For 10.4″ color LCD	
		CE card 2	A20B–3300–0320	Win CE CPU	

No.	Name	Code	Function	Remarks
(3)	CPU card	A20B–3300–0310	For Series 160*i*s/180*i*s DRAM 16MB	
		A20B–3300–0311	For Series 160*i*s/180*i*s DRAM 32MB	
		A20B–3300–0291	For Series 210*i*s DRAM 16MB	
		A20B–3300–0290	For Series 210*i*s DRAM 32MB	
		A20B–3300–0312	For Series 210*i*s DRAM 16MB	When the series 210*i*s uses the PC's embedded Ethernet feature
		A20B–3300–0313	For Series 210*i*s DRAM 32MB	
(4)	Power supply unit	A20B–8100–0720		

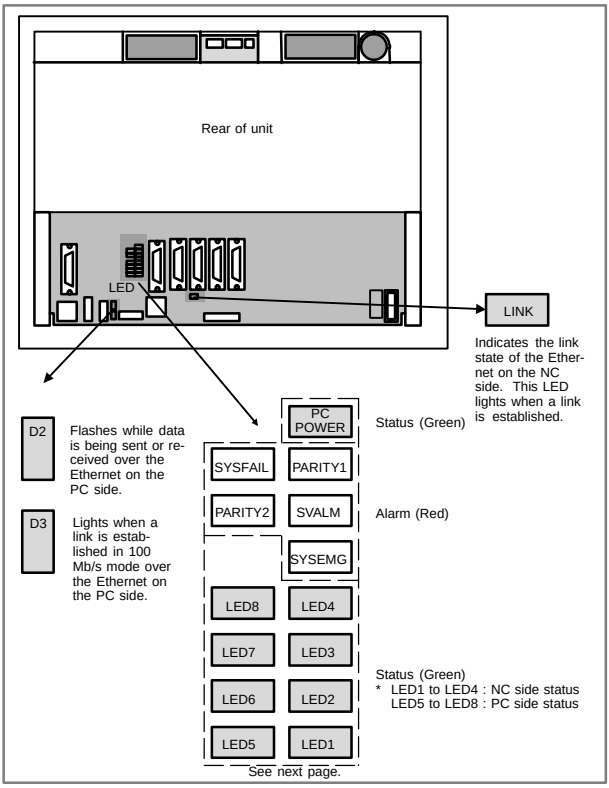
NOTE See Item 6.1.3.3, "CE CARD" for the configuration of the CE card.

- Mounting positions of DIMM module



No.	Name	Code	Function	Remarks
(1)	FROM/SRAM module	A20B–3900–0160	FROM 16MB SRAM 1MB	FROM contains various types of control software. SRAM is battery–backed memory.
		A20B–3900–0161	FROM 16MB SRAM 2MB	
		A20B–3900–0162	FROM 16MB SRAM 3MB	
		A20B–3900–0163	FROM 32MB SRAM 1MB	
		A20B–3900–0164	FROM 32MB SRAM 2MB	
		A20B–3900–0165	FROM 32MB SRAM 3MB	
		A20B–3900–0180	FROM 16MB SRAM 256kB	
		A20B–3900–0181	FROM 16MB SRAM 512kB	
		A20B–3900–0182	FROM 32MB SRAM 256kB	
		A20B–3900–0183	FROM 32MB SRAM 512kB	
(2)	Analog spindle module	A20B–3900–0170	Analog spindle position coder	

- LED display



(1) Changes in status LED (green) indication at power–on time (NC side status : Green LED)

No.	Status LED 1.2.3.4	Status
1	□□□□	Power is not supplied.
2	■■■■	Initial status immediately after power is switched on; boot is running.
3	□■■■	System activation started.
4	■□■■	Waiting for each processor ID in the system to be set up.
5	□□■■	Each processor ID in the system has been set up.
6	■■□■	FANUC bus initialized.
7	□■□■	PMC initialized.
8	■□□■	Information about the hardware configuration of each printed–circuit board in the system has been set up.
9	□□□■	PMC ladder initialized.
10	□■■□	Waiting for digital servo to be initialized.
11	■■■□	Digital servo initialized.
12	■□□□	Initialization completed, and usual operation under way.

■: On □: Off

(2) Changes in status LED (green) indication at power–on time (PC side status : Green LED)

No.	Status LED (LED 5 to 8) 5.6.7.8	Status
1	□□□□	Power is not supplied.
2	■■■■	Initial status immediately after power is switched on.
3	■■■□	The NC to PC interface is being initialized.
4	■■□■	Waiting for the PC to boot.
5	■■□□	The NC screen is displayed on the PC.
6	■□□□	Operating normally after starting up successfully.

■: On □: Off

(3) Alarm LED (red) indication at system alarm occurrence
If any of these LEDs lights, it is likely that the hardware is defective.

Alarm LED	Meaning
SVALM	Servo alarm
SYSEMG	Lights when a system alarm occurs. The hardware has detected a failure in the system.
SYSFAIL	Lights when a system alarm occurs. Used by the software to stop the system. Lights while boot is under way.
PARITY1	SRAM parity alarm
PARITY2	Common RAM parity alarm between NC and PC

(4) Status LED (red) indication at error occurrence (PC side status : Green LED)

Status LED (LED 5 to 8) 5.6.7.8	Status
□■□□	Common RAM parity alarm between NC and PC

■: On □: Off

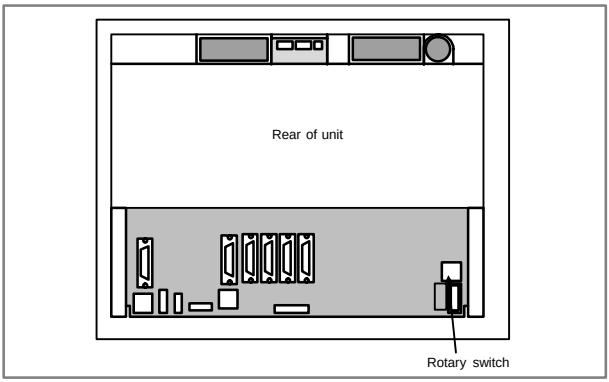
(5) PC POWER (green LED) lights when the CE card is powered on (including during backup operation).

- Rotary switch setting

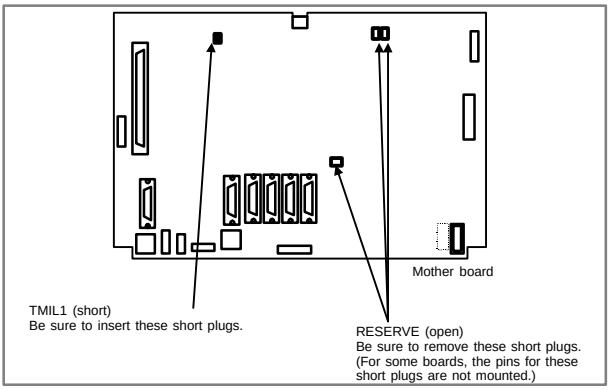
For the LCD–mounted type, the startup sequence used during power–up can be changed by the rotary switch on the mother board.

Rotary switch setting	Contents
0	Setting for maintenance. The start menu is displayed. It is possible to start boot and IPL from the PC.
1	Setting for usual operation. The start menu is not displayed. It is impossible to start boot or IPL from the PC.
2	Setting for maintenance. Normally, this position is not used.
7	Setting for maintenance. The start menu is displayed when MDI keys <6> and <7> are pressed. It is possible to start boot or IPL from the PC.

Mounting position of rotary switch (LCD–mounted type CNC)



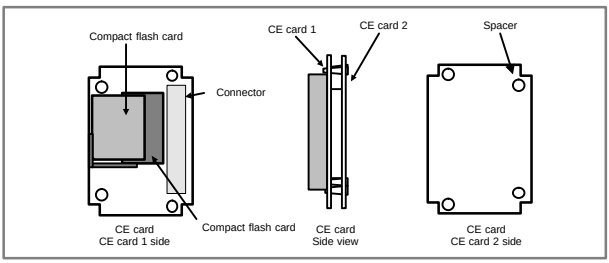
- Short plug settings



6.1.3.3 CE card

The CE card has a different configuration from other card printed–circuit boards.
CE cards 1 and 2 are combined and the compact flash card is attached.

- CE card configuration



Item	Cord	Remarks
CE card 1	A20B–3300–0330	10.4″ LCD
CE card 2	A20B–3300–0320	
Compact flash card	A87L–0001–0173#032MBA	32MB
	A87L–0001–0173#048MBA	48MB
	A87L–0001–0173#064MB	64MB
	A87L–0001–0173#096MB	96MB
Spacer	A98L–0005–0208	

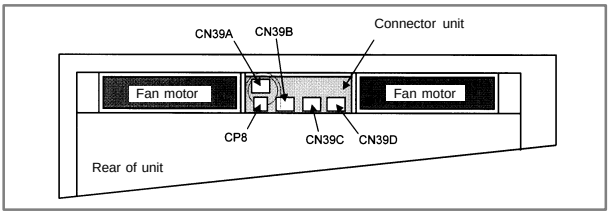
6.1.3.4 Inverter PCBs and connector units

Name		Specification
Inverter P.C.B	For monochrome LCD	A20B–8100–0710
	For 10.4″ color LCD	A20B–8001–0920
	For 8.4″ color LCD	A20B–8001–0922
Connector unit	For unit with no option slot	A15L–0001–0060#B
	For unit with two option slots	A15L–0001–0060#A
	For unit with three or four option slots	A15L–0001–0060#C

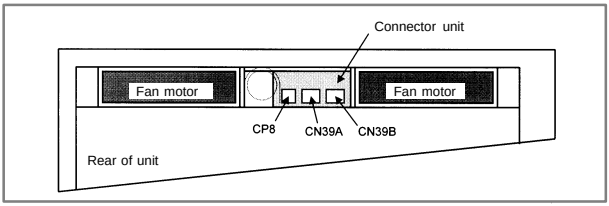
NOTE The connector unit is fastened to the case with self–tapping screws.

- Connector mounting location

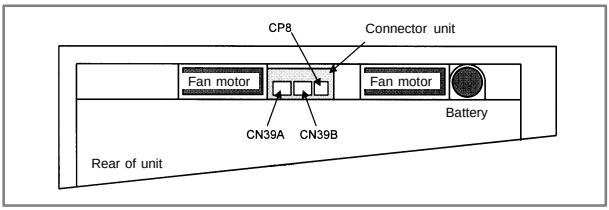
(1) With 3 or 4 slots



(2) With 2 slots

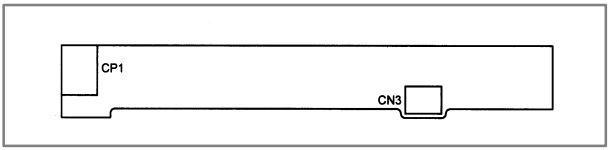


(3) With no slot

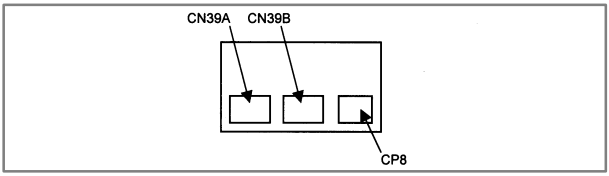


- Connector location (printed–circuit board)

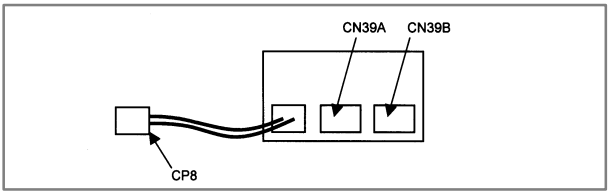
(1) Inverter PCB



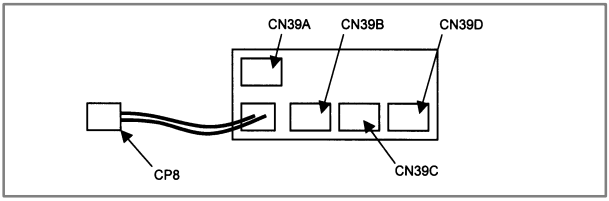
(2) Connector unit for no slot type



(3) Connector unit for 2–slot type



(4) Connector unit for 3–slot and 4–slot types



Connector number	Application
CN39A	Power supply for fans
CN39B	
CN39C	
CN39D	
CP8	Battery
CP1	Power supply for LCD backlight
CN3	Power supply for inverter PCB

6.1.3.5 C language board, serial communication board, Symbol CAP*i* T board, and PMC–SE board

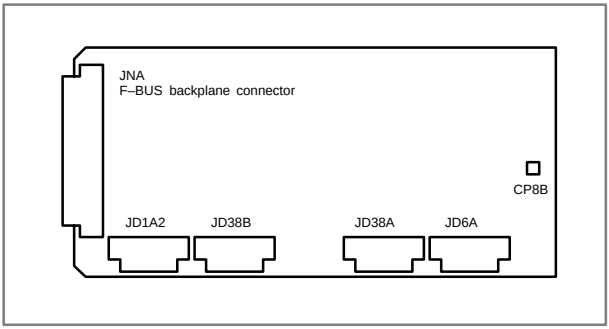
- Specification

Name		Specification
C language board		A20B–8100–0261
Serial communication board A	Remote buffer/DNC2	A20B–8100–0262
Serial communication board B	DNC1	A20B–8100–0263
Symbol CAP*i* T board		A20B–8100–0264
PMC–SE board		A20B–8100–0150

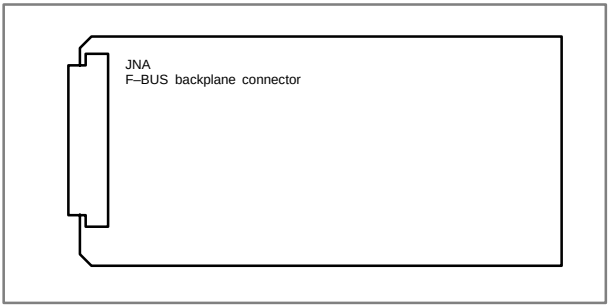
NOTE The PMC–SE board cannot fit into any of the following slots.
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector location

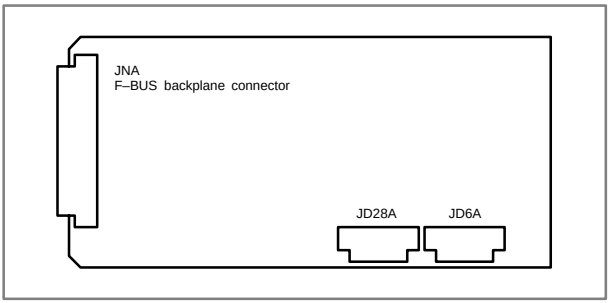
(1) PMC–SE board



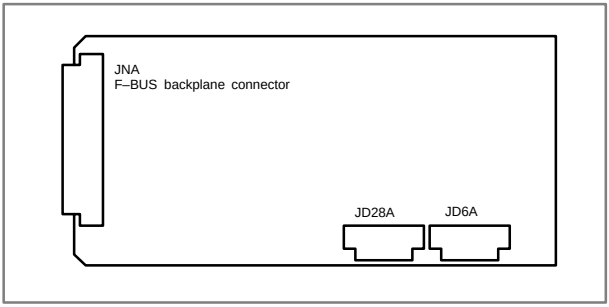
(2) C language board



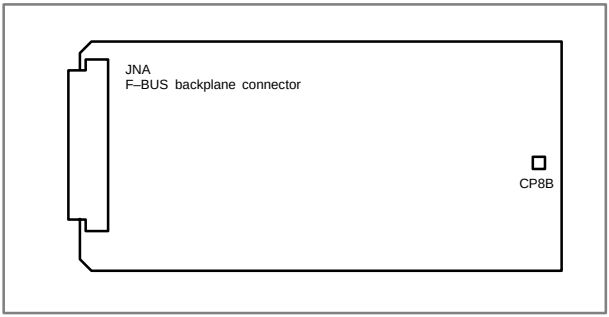
(3) Serial communication board A remote buffer/DNC2



(4) Serial communication board B/DNC1



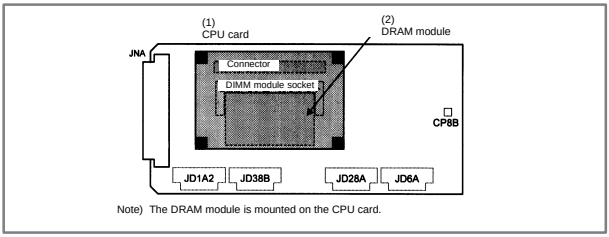
(5) CAP–II board/Symbol CAP*i* T board



Connector number	Application
JD1A2	I/O link
JD38B	RS–232C serial port
JD38A	RS–232C serial port
JD28A	RS–232C serial port
JD6A	RS–422 serial port
CP8B	SRAM backup battery (Normally, the connector is not used. To keep the contents of SRAM with the printed circuit board removed, connect the battery to this connector.)

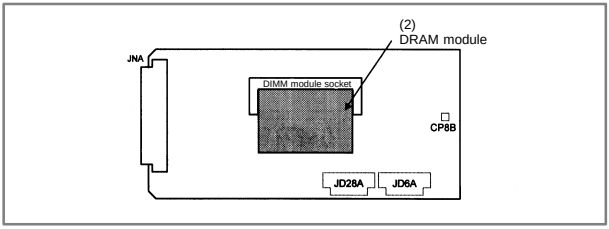
- Card and DIMM module locations

PMC–SE board



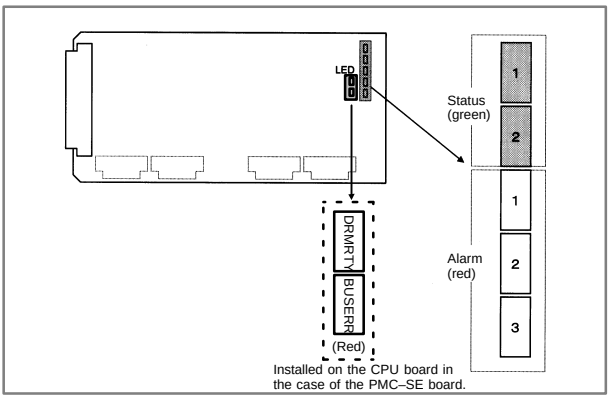
Note) The DRAM module is mounted on the CPU card.

C language board, serial communication board, Symbol CAP*i* T board



No.	Name	Specification	Function	Remarks
(1)	CPU card	A20B–3300–0070	PMC/ communication/ conversational function	
(2)	DRAM module	A20B–3900–0042	DRAM for PMC/ communication/ conversational function	4M/2M

- LED indication



Alarm LED (red) indication at system alarm occurrence

Alarm: 1 2 3	Cause
□□□	Usual operation under way
■□□	Bus error (L–bus alarm)
□■□	Bus error or DRAM parity (L–bus EMG)
■■□	Reset under way
□□■	I/O link error
■□■	(Reserved)
□■■	SRAM parity
■■■	I/O SRAM parity
Alarm LED	Cause
DRMPTY	DRAM PARITY
BUSERR	L–bus error (when the CPU peripheral control G/A is the master)

■: On □: Off

NOTE The alarm LED indicates that a reset is under way immediately after the power is turned on.

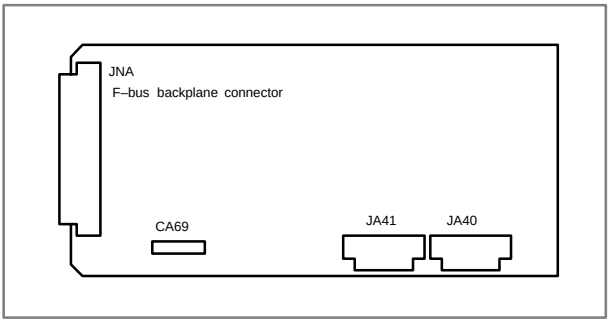
6.1.3.6 Sub–CPU board

- Specification

Name7	Specification
Sub–CPU board	A20B–8002–0190

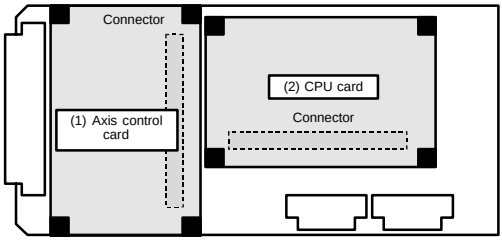
NOTE The sub–CPU board cannot fit into any of the following slots.
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector mounting location



Connector number	Application
CA69	Servo check
JA41	Serial spindle/position coder
JA40	Analog output

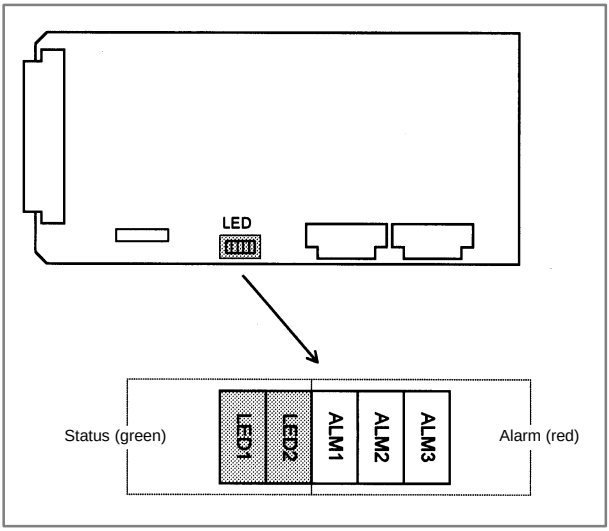
- Card and DIMM module locations



The DRAM module is mounted on the CPU card.

No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B–3300–0243	Axis control 2 axes	Applicable servo software: Series 90B0
		A20B–3300–0242	Axis control 4 axes	
		A20B–3300–0241	Axis control 6 axes	
		A20B–3300–0240	Axis control 8 axes	
		A20B–3300–0248	Axis control 4 axes	Applicable servo software: Series 90B0 (High–speed HRV)
		A20B–3300–0245	Axis control 6 axes	
		A20B–3300–0244	Axis control 8 axes	
		A20B–3300–0246	Learning–control axis control	Applicable servo software: Series 90B3/90B7
		A20B–3300–0247	Learning–control axis control	Applicable servo software: Series 90B3/90B7 (High–speed HRV)
(2)	CPU card	A20B–3300–0310		DRAM 16MB
		A20B–3300–0311		DRAM 32MB

- LED indication



(1) Changes in status LED (green) indication at power–on time

No.	Status LED (LED1, 2)	Status
1	□□	Power is not supplied.
2	■■	Initial status immediately after power is switched on; the sub–CPU has not started.
3	□■	RAM initialization.
4	■□	Waiting for system ID to be set up.
5	□□	Waiting for software initialization to be completed No. 1
6	■■	Waiting for software initialization to be completed No. 2
7	□■	Initialization of position coder, digital servo circuit, etc.
8	■□	Initialization completed, and usual operation under way

■: On □: Off

(2) Alarm LED (red) indication at system alarm occurrence

Alarm LED	Meaning
ALM1	Bus error on sub–CPU board.
ALM2	Servo alarm.
ALM3	On: DRAM parity or ECC alarm Blinking: L–bus error (when the CPU peripheral control G/A is the master)

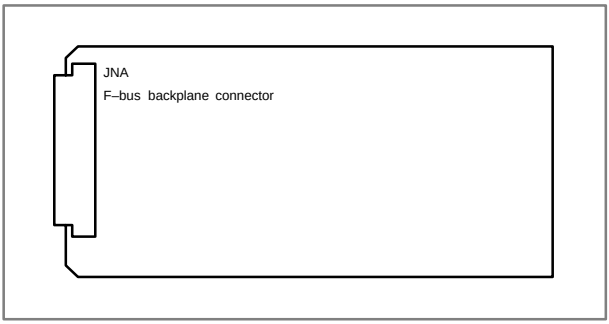
6.1.3.7 RISC board

- Specification

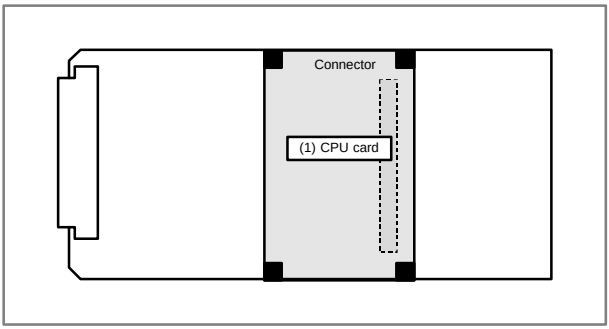
Name	Specification
RISC board	A20B–8100–0170

NOTE The RISC board cannot fit into any of the following slots.
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector mounting location

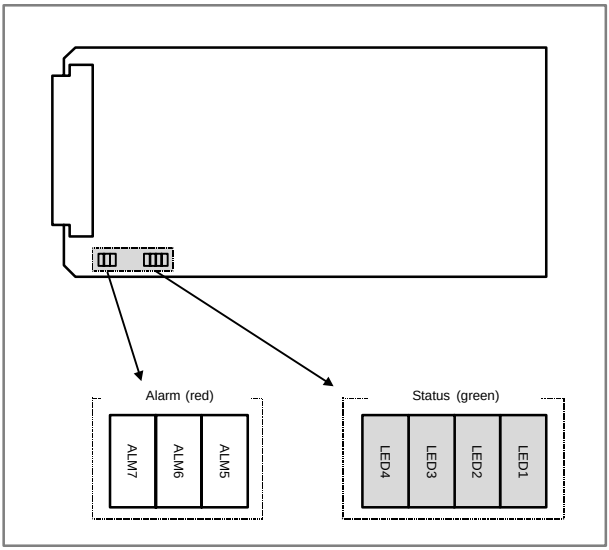


- Card mounting location



No.	Name	Specification	Function	Remarks
(1)	CPU card	A20B–3300–0102		Standard type
		A17B–3300–0401		High–speed type

- LED indication



(1) Status LED (green) indication (LED lighting)

Alarm LED (LED4 to LED1)	Status
□□□□	Power is not supplied.
■□□□	CNC wait (1) (Check the CNC for the cause.)
□■□□	Module ID error (Replace the printed circuit board or FROM module.)
■■□□	CNC wait (5) (Check the CNC for the cause.)
□□■□	ROM test error (Replace the printed circuit board or FROM module.)
■□■□	CNC wait (3) (Check the CNC for the cause.)
■■■□	System error (Replace the printed circuit board or FROM module.)
□□□■	RAM test error (Replace the printed circuit board.)
■□□■	CNC wait (2) (Check the CNC for the cause.)
□■□■	Parameter error (Replace the printed circuit board or FROM module.) (B437 series only)
□□■■	DRAM test error, interpolation cycle interrupt wait (Replace the printed circuit board.)
■□■■	CNC wait (4) (Check the CNC for the cause.) (B451 series only)
■■■■	Power was turned on, but the processor is not activated.

■: On □: Off

(2) Status LED (green) indication (LED blinking)

Alarm LED (LED4 to LED1)	Status
★□□□	Command execution in progress (reset)
□★★□	Command execution in progress (pre–processing, distribution)
□□□★	Command wait
□★□★	NC statement input wait
★★□★	Command execution in progress (parameter change) (B437 series only)
□□★★	Automatic operation is not activated. (Replace the printed circuit board.) (B451 series only)

★: Blinking □: Off

(3) Alarm LED (red) indication

Alarm LED (LED7 to LED6)	Status
■□□	DRAM parity error occurred.
□■□	Something unusual occurred in the power for the processor core.
□□■	Reserved

■: On □: Off

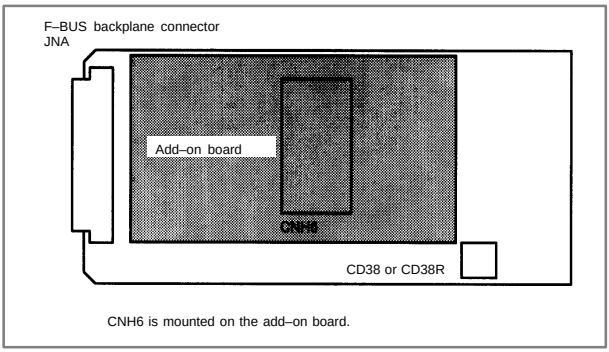
6.1.3.8 Data server board, fast data server board

- Specification

Name		Specification
Data server board (ATA card version)		A20B–8100–0271
Fast data server board (ATA card version)		A20B–8100–0770
	Add–on board	A20B–2002–0960

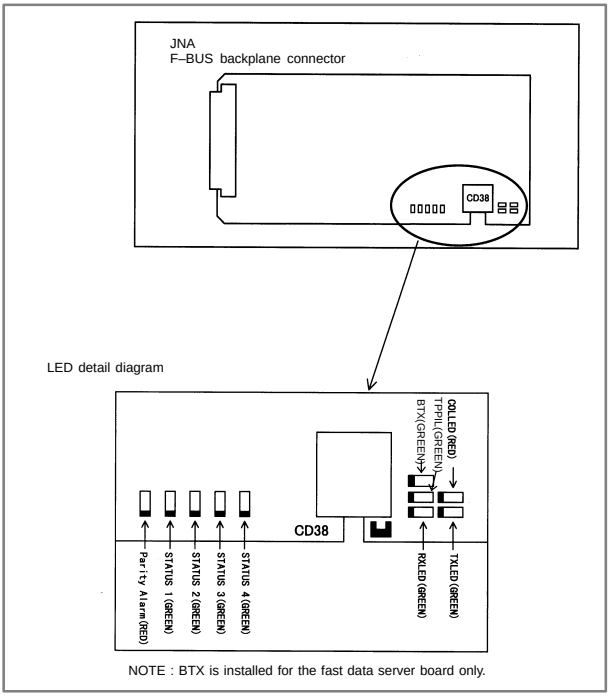
NOTE The data server board (ATA card version) cannot fit into any of the following slots.
- Option slot nearest to the LCD
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector mounting location



Connector number	Application
CNH6	ATA card interface
CD38 (for data server)	10BASE–T Ethernet interface
CD38R (for fast data server)	10/100 BASE–TX Ethernet interface

- LED indication



LED indication transition at power–on time

No.	LED indication 1234	Ethernet board status
1	STATUS □□□□	Power off.
2	STATUS ■■■■	Initial status immediately after power is switched 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 ☆□□□	Start sequence completed.

When the Ethernet board is started normally, the STATUS LEDs light as shown at No. 10. This condition is preserved unless an abnormal condition occurs.

Communication status LED indication

No.	LED indication	Ethernet communication status
1	RXLED ■	Lights during data reception.
2	TXLED ■	Lights during data transmission.
3	TPPIL ■	Lights to indicate normal connection with the hub.
4	COLLED ■	Lights to indicate a data collision.
5	BTX ■	Lights when a 100BASE–TX connection is made. (for fast data server)

NOTE

TPPIL: If this LED is off, communication does not occur. It is likely that the Ethernet board is not connected with the hub normally. The LED does not light also when the power to the hub is off. It remains to be on when the Ethernet board is connected to the hub normally.

COLLED: This LED lights frequently if Ethernet communication traffic (amount of communication) is heavy or noise in the surrounding is high.

LED indication (STATUS) at error occurrence
The STATUS LEDs repeat LONG and SHORT patterns. The LONG and SHORT patterns correspond to long and short lighting intervals, respectively.

- For data server board

No.	STATUS LED indication		Ethernet/data server board state	
	LONG 1234	SHORT 1234		
1	□□□■	■□□□	Failure caused by this board.	System reset
2	□□□■	□■□□		Machine check
3	□□■■	■□□□		DRAM parity alarm
4	□□■■	□■□□	Failure caused by another board.	NMI of another module

- For fast data server board

No.	STATUS LED indication		Board state	
	LONG 1234	SHORT 1234		
1	□□■■	■■□□	Failure caused by this board	SDRAM parity alarm
2	□■□■	□□□□		General invalid instruction
3	□■□■	■□□□		Invalid slot instruction
4	□□■■	■□□□	Failure caused by another board	NMI of another module

NOTE If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

LED indication (ALARM) at error occurrence

No.	LED indication	Ethernet communication status
1	Parity Alarm ■	A parity error has occurred in main memory. It is likely that the hardware is defective.

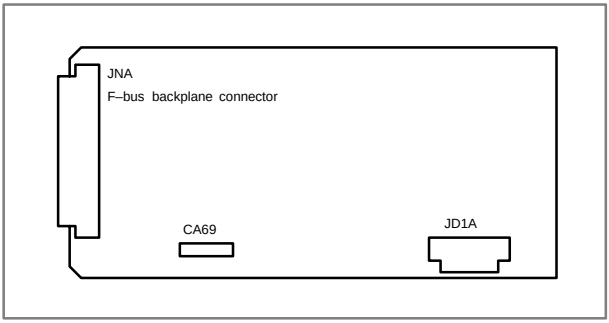
6.1.3.9 Loader control board

- Specification

Name	Specification
Loader control board	A20B–8100–0830

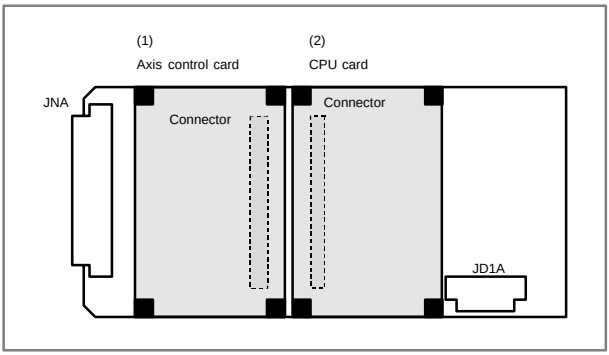
NOTE The loader control board cannot fit into any of the following slots.
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector mounting location



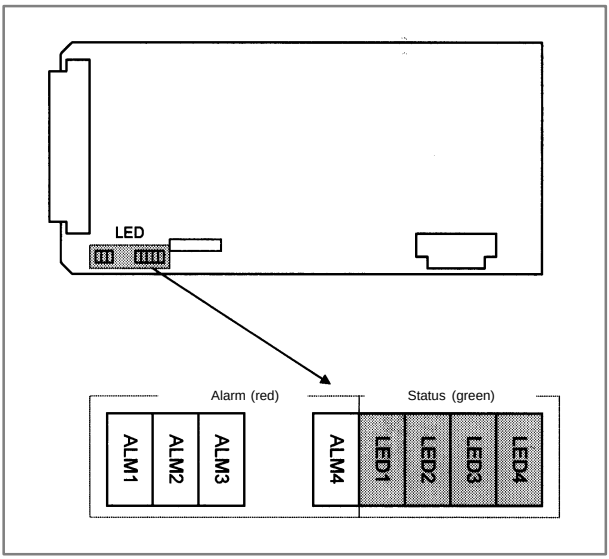
Connector number	Application
CA69	Servo check
JD1A	I/O link

- Card mounting location



No.	Name	Specification	Function	Remarks
(1)	Axis control card	A20B–3300–0033	Axis control 2 axes	Applicable servo software: Series 9090
		A20B–3300–0032	Axis control 4 axes	
(2)	CPU card	A20B–3300–0291		With DRAM 16MB

- LED indication



(1) Changes in status LED (green) indication at power–on time

No.	Status LED (LED1 to 4)	Status
1	□□□□	Power is not supplied.
2	■■■■	Initial status immediately after power is switched on; the loader CPU has not started.
3	■■■□	RAM initialization
4	■■□■	Waiting for system ID to be set up.
5	■■□□	Waiting for software initialization to be completed No. 1
6	■□■■	Waiting for software initialization to be completed No. 2
7	□■■□	Waiting for digital servo to be initialized.
9	□□□■	Initialization completed, and usual operation under way.

■: On □: Off

(2) Alarm LED (red) indication at system alarm occurrence
When any of these alarm LEDs lights, it is likely that the hardware is defective.

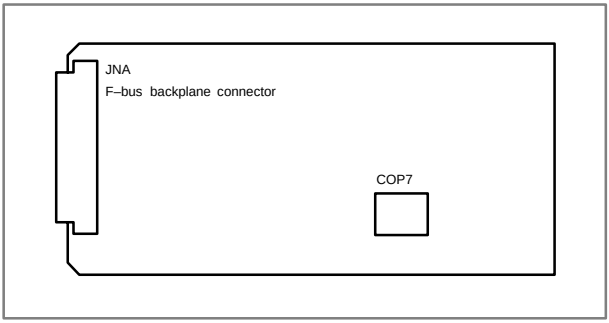
Alarm LED	Meaning
ALM1	SRAM parity alarm.
ALM2	Servo alarm.
ALM3	Lights when a system alarm occurs. Used by the software to stop the system.
ALM4	Lights when a system alarm occurs. The hardware has detected a failure in the system.

6.1.3.10 HSSB interface board

- Specification

Name	Specification
HSSB interface board	A20B–8001–0641

- Connector mounting location

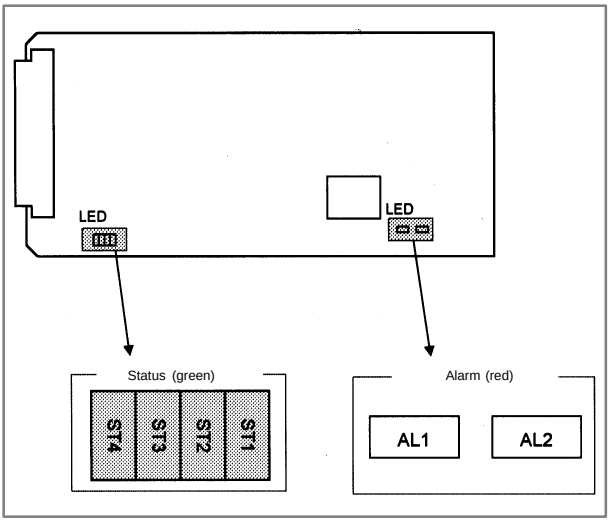


Connector number	Application
COP7	High–speed serial bus interface

- Card mounting location

No card is mounted on the HSSB interface board.

- LED indication



(1) Changes in status LED (green) indication at power–on time

No.	Status LED (ST4 to 1)	Status
1	□□□□	Power is not supplied.
2	■■■■	Initial status immediately after power is switched on.
3	■■■□	HSSB board being initialized.
4	■■□■	Waiting for PC boot to be executed.
5	■■□□	CNC screen being displayed on the PC.
6	■□□□	Initialization completed, and usual operation under way.

■: On □: Off

(2) Status LED (PC status, green) indication at error occurrence

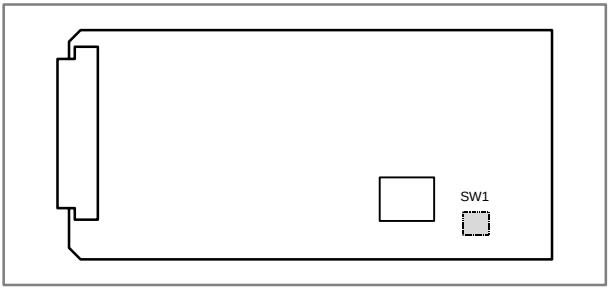
Status LED (ST4 to 1)	Status
□■■□	A thermal error has occurred at the PANEL *i*.
□■□■	HSSB communication was discontinued.
□■□□	Parity alarm in NC/PC common RAM.
□□■■	An HSSB communication error has occurred.
□□■□	A battery alarm has occurred at the PANEL *i*.

■: On □: Off

(3) Alarm LED (red) indication at error occurrence

Alarm LED	Meaning
AL1	HSSB communication was discontinued.
AL2	Parity alarm in NC/PC common RAM.

- Rotary switch (SW1) setting



Rotary switch setting when the PC or PANEL *i* is connected
By changing the rotary switch setting on the board, the startup sequence at power–up can be changed.

Rotary switch setting	Contents
0	Setting for maintenance. The start menu is displayed. It is possible to start boot and IPL from the PC or PANEL *i*.
1	Setting for usual operation. The start menu is not displayed. It is impossible to start boot or IPL from the PC or PANEL *i*.
2	The CNC and PC or PANEL *i* do not perform the handshake but start independently of each other. • CNC Even if the PC or PANEL *i* is not connected or turned on, just the CNC can be started and operated. (For this operation, a special display unit, MDI, operator's panel, and the like are necessary.) Even if the PC or PANEL *i* is connected and turned on, the startup menu does not appear. • PC or PANEL *i* Even if the CNC is connected or turned on, the startup menu does not appear. The boot or IPL operation cannot be performed from the PC or PANEL *i*. If an HSSB device driver for Windows 95/98, WindowsNT4.0, or Windows2000 is installed on the PC or PANEL *i*, just the PC or PANEL *i* or CNC can be turned on or off. For multi–connection, in which multiple CNC units are connected to a single PC or PANEL *i*, usually select this setting.

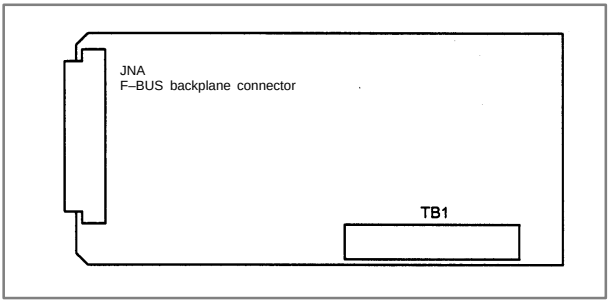
NOTE PANEL *i* used here represents hardware that can operate on a stand–alone basis (provide a stand–alone option).

6

6.1.3.11 I/O link–II board

Name	Specification
FANUC I/O Link–II board	A20B–8100–0250

- Connector location

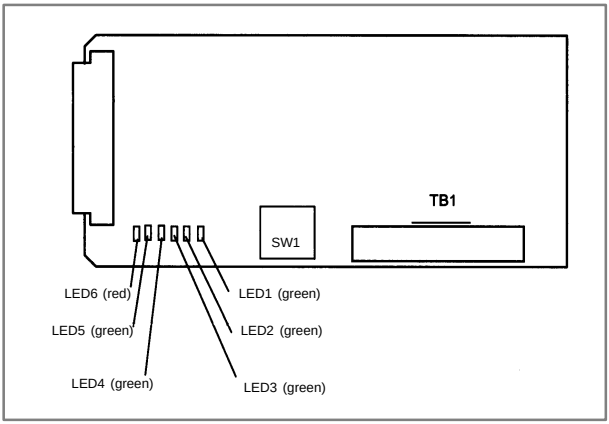


Connector number	Application
TB1	Terminal board for FANUC I/O Link–II interface

- Card location

No card is mounted on the FANUC I/O Link–II board.

- LED indication



(1) Hardware control LEDs

LED No.	Meaning
LED5	Lights when the CPU on the FANUC I/O Link–II board is running. When the LED is off, it means that the CPU has been reset.
LED6	Lights when a DRAM parity error is detected. It is likely that the hardware is defective.

(2) Soft control LEDs

Status LED (ST4 to 1)	Meaning
■■■■	Immediately after power is switched on.
■■□□	Communication board being initialized.
☆□□□	DI/DO data is being transferred normally.
□□□■	A RAM parity error has occurred. It is likely that the hardware is defective.
□□■■	An F–BUS error has occurred.
□□■□	An F–BUS system emergency condition has occurred. Alternatively, a communication error (FCS error, command error, frame length error, response time–out, etc.) has occurred.
☆□■□ ↓ ☆□□□	A communication error has occurred, resulting in error log being stored. Communication with a slave station has restarted. LED2 goes off when a log command (monitor function) is used. It goes off also when the communication error log is erased using a clear command.

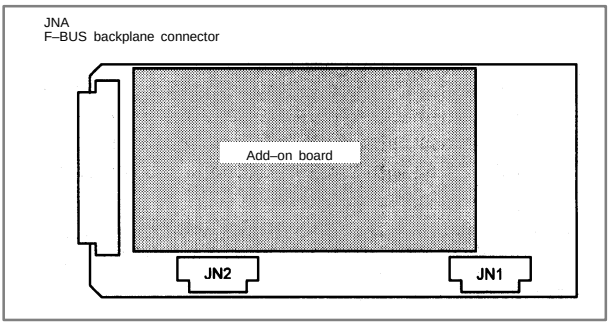
■: On □: Off ☆: Blinking

6.1.3.12 PROFIBUS board

Name		Specification
PROFIBUS board (master function)		A20B–8100–0430
	Add–on board (slave function)	A20B–2100–0430

NOTE The PROFIBUS board cannot fit into any of the following slots.
- Center slot of a unit with 3 option slots
- Option slot farthest from the LCD in a unit with 4 option slots

- Connector location

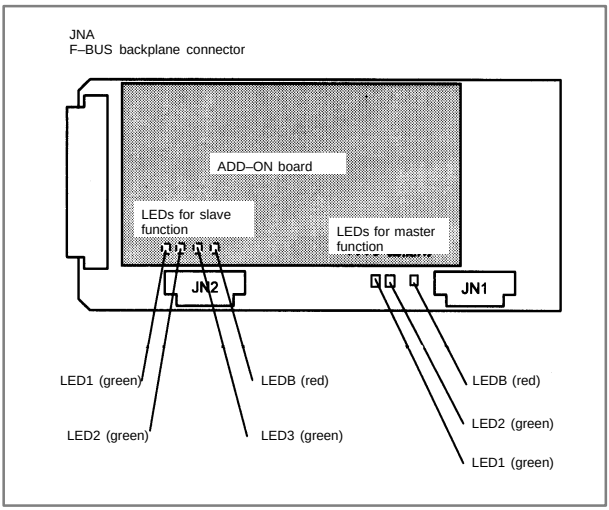


Connector number	Application
JN1	Adapter unit interface for master station
JN2	Adapter unit interface for slave station

- Card location

No card is mounted on the PROFIBUS board.

- LED indication



(1) LEDs for master function

LED No. (abbreviation)	Meaning
LED1 (CPU)	Lights to indicate the CPU for the master function is running.
LED2 (TOKEN)	Lights when the communication LSI (ASPC2) has a token (right to transmit).
LEDB (PALM)	Lights when a memory parity alarm occurs in the master function circuit. It is likely that the hardware is defective.

(2) LEDs for slave function (mounted on the add–on board)

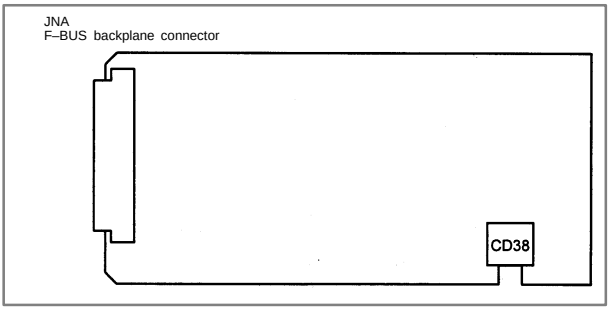
LED No. (abbreviation)	Meaning
LED1 (CPU)	Lights to indicate the CPU for the slave function is running.
LED2 (COMM)	Lights when PROFIBUS communication starts. It remains to be on after the PROFIBUS communication is suspended, however.
LED3 (RUN)	Lights to indicate that PROFIBUS communication is being performed normally.
LEDB (PALM)	Lights when a memory parity alarm occurs in the slave function circuit. It is likely that the hardware is defective.

6.1.3.13 Ethernet board, fast Ethernet board

Name	Specification
Ethernet board	A20B–8100–0271
Fast Ethernet board	A20B–8100–0770

NOTE The Ethernet board cannot fit into the option slot nearest to the LCD.

- Connector location

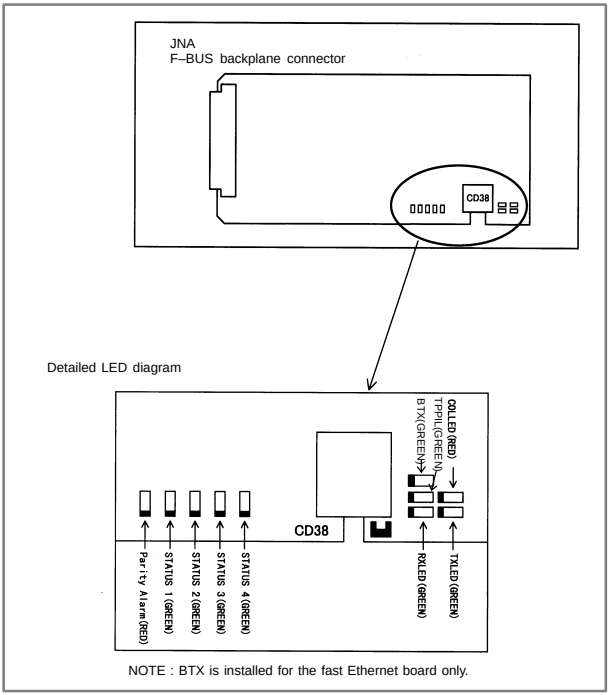


Connector number	Application
CD38 (for Ethernet board)	10BASE–T Ethernet interface
CD38R (for fast Ethernet board)	10/100BASE–TX Ethernet interface

- Card location

No card is mounted on the Ethernet board.

- LED indication



NOTE : BTX is installed for the fast Ethernet board only.

LED indication transition at power–on time

No.	LED indication 1234	Ethernet board status
1	STATUS □□□□	Power off
2	STATUS ■■■■	Initial status immediately after power is switched 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 ☆□□□	Start sequence completed.

When the Ethernet board is started normally, the STATUS LEDs light as shown at No. 10. This condition is preserved unless an abnormal condition occurs.

Communication status LED indication

No.	LED indication	Ethernet communication status
1	RXLED ■	Lights during data reception.
2	TXLED ■	Lights during data transmission.
3	TPPIL ■	Lights to indicate a normal connection with the hub.
4	COLLED ■	Lights to indicate a data collision.
5	BTX ■	Lights when a 100BASE–TX connection is made. (for fast Ethernet)

NOTE

TPPIL: If this LED is off, communication does not occur. It is likely that the Ethernet board is not connected with the hub normally. The LED does not light also when the power to the hub is off. It remains to be on when the Ethernet board is connected to the hub normally.

COLLED: This LED lights frequently if Ethernet communication traffic (amount of communication) is heavy. It also lights frequently if noise in the surrounding is high.

LED indication (STATUS) at error occurrence

The STATUS LEDs repeat LONG and SHORT patterns. The LONG and SHORT patterns correspond to long and short lighting intervals, respectively.

- For Ethernet board

No.	STATUS LED indication		Ethernet/data server board state	
	LONG 1234	SHORT 1234		
1	□□□■	■□□□	Failure caused by this board.	System reset
2	□□□■	□■□□		Machine check
3	□□■■	■□□□		DRAM parity alarm
4	□□■■	□■□□	Failure caused by another board.	NMI of another module

- For fast Ethernet board

No.	STATUS LED indication		Board state	
	LONG 1234	SHORT 1234		
1	□□■■	■■□□	Failure caused by this board	SDRAM parity alarm
2	□■□■	□□□□		General invalid instruction
3	□■□■	■□□□		Invalid slot instruction
4	□□■■	■□□□	Failure caused by another board	NMI of another module

NOTE If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

- LED indication (ALARM) at error occurrence

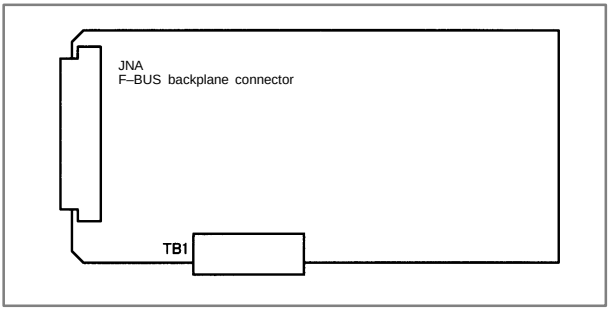
No.	LED indication	Ethernet board status
1	Parity Alarm ■	A parity error has occurred in main memory. It is likely that the hardware is defective.

6.1.3.14 DeviceNet interface board

Name	Specification
DeviceNet interface board	A20B–8001–0880

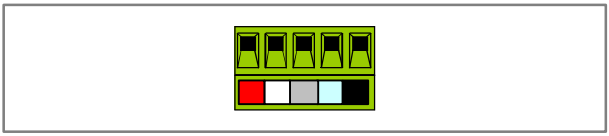
NOTE The DeviceNet board cannot fit into the center option slot of a unit with 3 option slots

- Connector mounting location



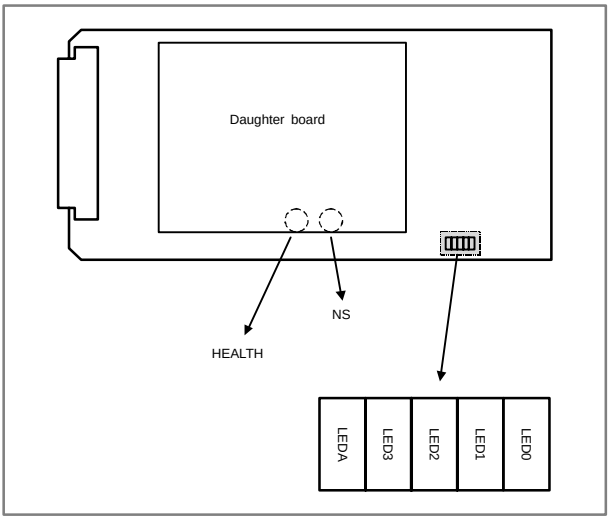
Connector number	Application
TB1	DeviceNet interface

The terminal plate can be removed from the DeviceNet board interface connector with the cable still connected. Remove the terminal plate by pulling it towards you.



NOTE The DeviceNet board cannot be removed unless the connector's terminal plate has been removed first.

- LED display



NS and HEALTH are mounted on the back of the daughter board.

- LED indication

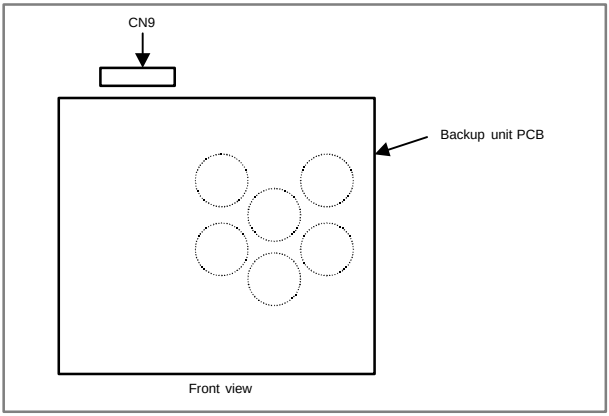
Name	Color	Description
LED0 to 3	Green	No special meaning
LEDA	Red	This LED glows when something unusual occurs in the internal daughter board. At power–up, the LED does not glow. If this LED glows, replace the DeviceNet board.
NS	Red/ green	DeviceNet module/network status LED. The LED indicates whether the DeviceNet board is turned on or whether DeviceNet communication is normally performed. For the meaning of this LED indication, refer to the specifications supplied by ODVA.
HEALTH	Red/ green	This LED indicates the status of the daughter board. At power–up, this LED glows in red. When the firmware is loaded to the internal daughter board, the LED turns green. Then, if something unusual occurs in the daughter board, the LED turns red. If the LED does not turn green, replace the DeviceNet board.

6.1.3.15 Backup unit

- Specifications

Item	Ordering number
Backup unit PCB	A20B–2100–0820
Backup unit cable	A02B–0281–K801

- Mounting positions of connectors



Connector name	Function
CN9	Supplying the backup power (main printed circuit board interface)

When the LED (PC POWER) on the main printed circuit board lights, do not touch any parts in the basic unit and backup unit. The FS160*i*s/FS180*i*s/FS210*i*s operates for about 12 seconds after the main power is turned off.

6.1.4 List of units and printed circuit boards

6.1.4.1 Basic unit

Model	Name	Drawing number	Remarks
16*i*	Basic unit (No slot)	A02B–0281–B500	
	Basic unit (2 slots)	A02B–0281–B502	
	Basic unit (3 slots)	A02B–0281–B503	
	Basic unit (4 slots)	A02B–0281–B504	
18*i*	Basic unit (No slot)	A02B–0283–B500	
		A02B–0297–B500	For 18*i*–MB5
	Basic unit (2 slots)	A02B–0283–B502	
		A02B–0297–B502	For 18*i*–MB5
	Basic unit (3 slots)	A02B–0283–B503	
		A02B–0297–B503	For 18*i*–MB5
	Basic unit (4 slots)	A02B–0283–B504	
		A02B–0297–B504	For 18*i*–MB5
21*i*	Basic unit (No slot)	A02B–0285–B500	
	Basic unit (2 slots)	A02B–0285–B502	
160*i*s	Basic unit (No slot)	A02B–0281–B600	
	Basic unit (2 slots)	A02B–0281–B602	
	Basic unit (3 slots)	A02B–0281–B603	
	Basic unit (4 slots)	A02B–0281–B604	
180*i*s	Basic unit (No slot)	A02B–0283–B600	
		A02B–0297–B600	18*i*–MB5
	Basic unit (2 slots)	A02B–0283–B602	
		A02B–0297–B602	18*i*–MB5
	Basic unit (3 slots)	A02B–0283–B603	
		A02B–0297–B603	18*i*–MB5
	Basic unit (4 slots)	A02B–0283–B604	
		A02B–0297–B604	18*i*–MB5
210*i*s	Basic unit (No slot)	A02B–0285–B600	
	Basic unit (2 slots)	A02B–0285–B602	

Model	Name	Drawing number	Remarks
16*i* 18*i* **21*i***	Case (No slot)	A02B–0236–D100#0C	
	Case (2 slots)	A02B–0236–D100#2C	
	Case (3 slots)	A02B–0236–D100#3C	
	Case (4 slots)	A02B–0236–D100#4C	
160*i*s 180*i*s **210*i*s**	Case (No slot)	A02B–0236–D100#0D	
	Case (2 slots)	A02B–0236–D100#2D	
	Case (3 slots)	A02B–0236–D100#3D	
	Case (4 slots)	A02B–0236–D100#4D	

6.1.4.2 Display unit

Model	Name	Drawing number	Soft key	Touch panel
16*i* 18*i* **21*i***	10.4″ color LCD	A02B–0281–D500	○	×
	10.4″ color LCD	A02B–0281–D501	×	○
	9.5″ monochrome LCD	A02B–0281–D502	○	×
	8.4″ color LCD	A02B–0281–D503	○	×
	7.2″ monochrome LCD	A02B–0281–D504	○	×
160*i*s 180*i*s **210*i*s**	10.4″ color LCD	A02B–0281–D505	○	×
	10.4″ color LCD	A02B–0281–D506	×	○
	10.4″ color LCD	A02B–0281–D507	○	○

6

6.1.4.3 MDI unit

Model	Name	Drawing number	Remarks
16*i* 18*i* 21*i* 160*i*s 180*i*s 210*i*s	T series/English/ Small keyboard Horizontal type, 200×140mm	A02B–0281–C120#TBR	
	T series/English/ Standard keyboard Vertical/Horizontal type, 200×260mm	A02B–0281–C121#TBR	
	T series/English/ Standard keyboard Horizontal type, 220×230mm	A02B–0281–C125#TBR	
	T series/English/ Standard keyboard Vertical type, 220×290mm	A02B–0281–C126#TBR	
	M series/English/ Small keyboard Horizontal type, 200×140mm	A02B–0281–C120#MBR	
	M series/English/ Standard keyboard Vertical/Horizontal type, 200×260mm	A02B–0281–C121#MBR	
	M series/English/ Standard keyboard Horizontal type, 220×230mm	A02B–0281–C125#MBR	
	M series/English/ Standard keyboard Vertical type, 220×290mm	A02B–0281–C126#MBR	
	61 fullkey/English Horizontal type, 220×230mm	A02B–0261–C162#MCR	
	61 fullkey/English Vertical type, 220×290mm	A02B–0261–C161#MCR	
	CAP*i* T key/English Horizontal type, 220×230mm	A02B–0281–C125#TFBR	

Model	Name	Drawing number	Remarks
16*i* 18*i* 21*i* 160*i*s 180*i*s 210*i*s	CAP*i* T key/English Vertical type, 220×290mm	A02B–0281–C126#TFBR	
	T series/Symbol/ Small keyboard Horizontal type, 200×140mm	A02B–0281–C120#TBS	
	T series/Symbol/ Standard keyboard Vertical/Horizontal type, 200×260mm	A02B–0281–C121#TBS	
	T series/Symbol/ Standard keyboard Horizontal type, 220×230mm	A02B–0281–C125#TBS	
	T series/Symbol/ Standard keyboard Vertical type, 220×290mm	A02B–0281–C126#TBS	
	M series/Symbol/ Small keyboard Horizontal type, 200×140mm	A02B–0281–C120#MBS	
	M series/Symbol/ Standard keyboard Vertical/Horizontal type, 200×260mm	A02B–0281–C121#MBS	
	M series/Symbol/ Standard keyboard Horizontal type, 220×230mm	A02B–0281–C125#MBS	
	M series/Symbol/ Standard keyboard Vertical type, 220×290mm	A02B–0281–C126#MBS	
	61 fullkey/Symbol Horizontal type, 220×230mm	A02B–0261–C162#MCS	
	61 fullkey/Symbol Vertical type, 220×290mm	A02B–0261–C161#MCS	
	CAP*i* T key/Symbol Horizontal type, 220×230mm	A02B–0281–C125#TFBS	
	CAP*i* T key/Symbol Vertical type, 220×290mm	A02B–0281–C126#TFBS	
160*i*s 180*i*s 210*i*s	FA full–keyboard	A02B–0281–C130#E	

6.1.4.4 Printed circuit boards of control units

Name	Drawing number	ID	Remarks
16*i* motherboard	A20B–8100–0660	3x08	
18*i* motherboard	A20B–8100–0661	3x09	
21*i* motherboard (without Ethernet function, PMC– SA1)	A20B–8100–0662	0x0A	

Name	Drawing number	ID	Remarks
21*i* motherboard (without Ethernet function, PMC–SB7)	A20B–8100–0663	1x0A	
21*i* motherboard (with Ethernet function, PMC–SA1)	A20B–8100–0664	2x0A	
21*i* motherboard (with Ethernet function, PMC–SB7)	A20B–8100–0665	3x0A	
160*i*s motherboard	A20B–8100–0790	3x10	
180*i*s motherboard	A20B–8100–0791	3x11	
210*i*s motherboard (with Ethernet function, PMC–SA1)	A20B–8100–0794	2x12	
210*i*s motherboard (with Ethernet function, PMC–SB7)	A20B–8100–0795	3x12	
CPU card (16*i*/18*i*, DRAM 16MB)	A20B–3300–0310	CPU : 11 DRAM : A9	
CPU card (16*i*/18*i*, DRAM 32MB)	A20B–3300–0311	CPU : 11 DRAM : AA	
CPU card (21*i*, DRAM 16MB)	A20B–3300–0312	CPU : 11 DRAM : A9	When the embedded Ethernet function is used with 21*i*/210*i*s.
CPU card (21*i*, DRAM 32MB)	A20B–3300–0313	CPU : 11 DRAM : AA	When the embedded Ethernet function is used with 21*i*/210*i*s.
CPU card (21*i*, DRAM 32MB)	A20B–3300–0290	CPU : 09 DRAM : 8A	
CPU card (21*i*, loader control, DRAM 16MB)	A20B–3300–0291	CPU : 09 DRAM : 89	
CPU card (standard type for RISC board)	A20B–3300–0102	0A	
CPU card (high–speed type for RISC board)	A17B–3300–0401	0A	
Display control card (10.4″ color LCD, graphic function, embedded Ethernet function)	A20B–3300–0280	0C	
Display control card (8.4″ color LCD, graphic function, embedded Ethernet function)	A20B–3300–0281	08	

Name	Drawing number	ID	Remarks
Display control card (9.5″ monochrome LCD, graphic function, embedded Ethernet function)	A20B–3300–0282	04	
Display control card (7.2″ monochrome LCD, graphic function, embedded Ethernet function)	A20B–3300–0283	00	
Display control card (9.5″ monochrome LCD, embedded Ethernet function)	A20B–3300–0300	07	
Display control card (7.2″ monochrome LCD, embedded Ethernet function)	A20B–3300–0301	03	
Display control card (9.5″ monochrome LCD)	A20B–3300–0302	07	
Display control card (7.2″ monochrome LCD)	A20B–3300–0303	03	
Axis control card (2 axes)	A20B–3300–0033	00	Applicable servo software : Series 9090 21*i*, Loader control
Axis control card (4 axes)	A20B–3300–0032	01	Applicable servo software : Series 9090 21*i*, Loader control
Axis control card (2 axes)	A20B–3300–0243	08	Applicable servo software : Series 90B0
Axis control card (4 axes)	A20B–3300–0242	08	Applicable servo software : Series 90B0
Axis control card (6 axes)	A20B–3300–0241	08	Applicable servo software : Series 90B0
Axis control card (8 axes)	A20B–3300–0240	08	Applicable servo software : Series 90B0
Axis control card (4 axes, high–speed HRV)	A20B–3300–0248	08	Applicable servo software : Series 90B0
Axis control card (6 axes, high–speed HRV)	A20B–3300–0245	08	Applicable servo software : Series 90B0
Axis control card (8 axes, high–speed HRV)	A20B–3300–0244	08	Applicable servo software : Series 90B0
Axis control card (Learning–control axis control)	A20B–3300–0246	08	Applicable servo software : Series 90B3/90B7

Name	Drawing number	ID	Remarks
Axis control card (Learning–control axis control, high–speed HRV)	A20B–3300–0247	08	Applicable servo software : Series 90B3/90B7
Axis control card (8 axes, applicable to Dual Check Safety)	A17B–3300–0500	08	Applicable servo software : Series 90B0 Applicable monitor software : Series 90B9
CE card (CE card1)	A20B–3300–0330	–	For 10.4″ color LCD
CE card (CE card2)	A20B–3300–0320	–	Windows CE CPU
Power supply unit	A20B–8100–0720	–	
FROM/SRAM module (FROM 16MB, SRAM 1MB)	A20B–3900–0160	FROM : C1 SRAM : 03	
FROM/SRAM module (FROM 16MB, SRAM 2MB)	A20B–3900–0161	FROM : C1 SRAM : 04	
FROM/SRAM module (FROM 16MB, SRAM 3MB)	A20B–3900–0162	FROM : C1 SRAM : 05	
FROM/SRAM module (FROM 32MB, SRAM 1MB)	A20B–3900–0163	FROM : C2 SRAM : 03	
FROM/SRAM module (FROM 32MB, SRAM 2MB)	A20B–3900–0164	FROM : C2 SRAM : 04	
FROM/SRAM module (FROM 32MB, SRAM 3MB)	A20B–3900–0165	FROM : C2 SRAM : 05	
FROM/SRAM module (FROM 16MB, SRAM 256kB)	A20B–3900–0180	FROM : C1 SRAM : 01	
FROM/SRAM module (FROM 16MB, SRAM 512kB)	A20B–3900–0181	FROM : C1 SRAM : 02	
FROM/SRAM module (FROM 32MB, SRAM 256kB)	A20B–3900–0182	FROM : C2 SRAM : 01	
FROM/SRAM module (FROM 32MB, SRAM 512kB)	A20B–3900–0183	FROM : C2 SRAM : 02	
Analog spindle module	A20B–3900–0170	–	

Name	Drawing number	ID	Remarks
DRAM module (4MB)	A20B–3900–0042	85	For optional board
PMC–SE board	A20B–8100–0150	1xCD	
C language board	A20B–8100–0261	0xCD	
Serial communication board A	A20B–8100–0262	2xCD	Remote buffer/DNC2
Serial communication board B	A20B–8100–0263	3xCD	DNC1
Symbol CAP*i* T board	A20B–8100–0264	4xCD	
Sub CPU board	A20B–8002–0190	1xCE	
RISC board	A20B–8002–0040	xxCA	
Data server board	A20B–8100–0271	3xDB	
Fast data server board	A20B–8100–0770	0x8E	
Data server ADD–ON board	A20B–2002–0960	–	
Loader control board	A20B–8100–0830	1xD3	
HSSB interface board	A20B–8001–0641	ExAA	
I/O Link–II board	A20B–8100–0250	0x95	
PROFIBUS board	A20B–8100–0430	0xBB	Master function
ADD–ON board	A20B–2100–0430	–	Slave function
Ethernet board	A20B–8100–0271	3xDB	
Fast Ethernet board	A20B–8100–0770	0x8E	
DeviceNet board	A20B–8001–0880	1xF3	
Backpanel (2 slots)	A20B–2003–0150	–	
Backpanel (3 slots)	A20B–2003–0230	–	
Backpanel (4 slots)	A20B–2003–0140	–	
Inverter PCB (For 9.5″/7.2″ monochrome LCD)	A20B–8100–0710	–	
Inverter PCB (For 10.4″ color LCD)	A20B–8001–0920	–	
Inverter PCB (For 8.4″ color LCD)	A20B–8001–0922	–	
PC–side HSSB interface board (2CH, applicable to ISA bus)	A20B–8001–0582	–	
PC–side HSSB interface board (1CH, applicable to ISA bus)	A20B–8001–0583	–	

Name	Drawing number	ID	Remarks
PC–side HSSB interface board (2CH, applicable to PCI bus)	A20B–8001–0960	–	
PC–side HSSB interface board (1CH, applicable to PCI bus)	A20B–8001–0961	–	
Touch panel control board	A20B–8001–0620	–	
Backup unit printed circuit board	A20B–2100–0820	–	

6.1.4.5 I/O

Name	Drawing number	Remarks
Distributed I/O connector panel I/O module A1	A20B–2002–0470	DI/DO= 72/56 DI=general 16, matrix 56, with MPG interface
Distributed I/O connector panel I/O module B1	A20B–2002–0520	DI/DO : 48/32 with MPG interface
Distributed I/O connector panel I/O module B1	A20B–2002–0521	DI/DO : 48/32
Distributed I/O connector panel I/O module basic module	A03B–0815–C001	DI/DO : 24/16
Distributed I/O connector panel I/O module expansion module A	A03B–0815–C002	DI/DO : 24/16 with MPG interface
Distributed I/O connector panel I/O module expansion module B	A03B–0815–C003	DI/DO : 24/16
Distributed I/O connector panel I/O module expansion module C	A03B–0815–C004	DO : 16 (2A output)
Distributed I/O connector panel I/O module expansion module D	A03B–0815–C005	Analog input
Distributed I/O machine operator's panel (Small, Symbol keysheet)	A02B–0236–C141#TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Small, English keysheet)	A02B–0236–C141#TBR	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Standard, Symbol keysheet)	A02B–0236–C140#TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Standard, English keysheet)	A02B–0236–C140#TBR	DI : 24 with MPG interface
Distributed I/O machine operator's panel (290mm–wide, Symbol keysheet)	A02B–0236–C150#TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (290mm–wide, English keysheet)	A02B–0236–C150#TBR	DI : 24 with MPG interface

Name	Drawing number	Remarks
Main panel A machine operator's panel (Symbol keyboard)	A02B–0236–C230	With MDI
Main panel A1 machine operator's panel (English keyboard)	A02B–0236–C240	With MDI
Main panel B machine operator's panel (Symbol keyboard)	A02B–0236–C231	Without MDI
Main panel B1 machine operator's panel (English keyboard)	A02B–0236–C241	Without MDI
Sub panel A machine operator's panel	A02B–0236–C232	
Sub panel B machine operator's panel	A02B–0236–C233	
Sub panel B1 machine operator's panel	A02B–0236–C235	
Sub panel C machine operator's panel	A02B–0236–C234	
Operator's panel connector unit (Sink type output A)	A16B–2200–0661	DI/DO : 64/32
Operator's panel connector unit (Sink type output B)	A16B–2200–0660	DI/DO : 96/64
Operator's panel connector unit (Source type output A)	A16B–2200–0731	DI/DO : 64/32
Operator's panel connector unit (Source type output B)	A16B–2200–0730	DI/DO : 96/64
Machine operator's panel interface unit	A16B–2201–0110	
Loader I/O board	A02B–0236–C160	
Loader I/O board	A02B–0236–C161	Matrix supported
FANUC I/O Link–AS–*i* converter	A03B–0817–C001	

6.1.4.6 Other units

Name		Drawing number	Remarks
Separate detector interface unit (basic 4 axes)		A02B–0236–C205	
Separate detector interface unit (additional 4 axes)		A02B–0236–C204	
Spindle distributed adapter		A13B–0180–B001	
I/O Link distributed adapter		A20B–1007–0680	
Optical I/O Link adapter		A13B–0154–B001	
Compact flash card for 160*is*/180*is*/210*is*	32MB	A87L–0001–0173#32MBA	
	48MB	A87L–0001–0173#48MBA	
	64MB	A87L–0001–0173#64MB	
	96MB	A87L–0001–0173#96MB	

Name	Drawing number	Remarks
Cable for back–up unit	A02B–0281–K801	
Cable for FA full–keyboard	A02B–0281–K802	

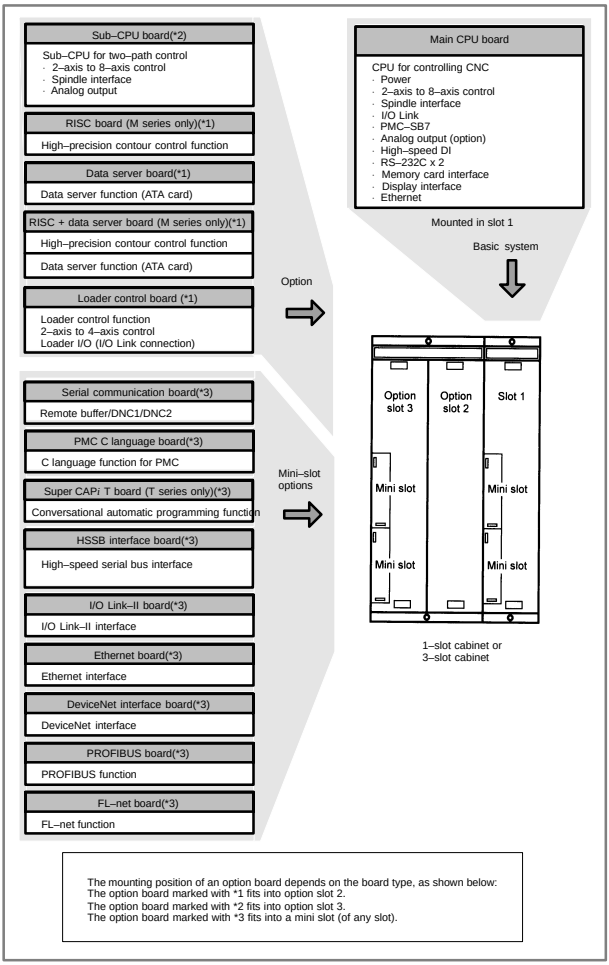
6.1.4.7 Expendable supplies

Name		Drawing number	Remarks
Fuse	For power supply of the FS16*i*/18*i*/21*i* control unit	A60L–0001–0290#LM50C	Rated at 5A
	For power supply of the FS160*i*s/180*i*s/210*i*s control unit	A60L–0001–0046#7.5	Rated at 7.5A
	For power supply of the distributed I/O connector panel I/O module For power supply of the distributed I/O machine operator's panel For power supply of the machine operator's panel main panel For power supply of the FANUC I/O Link–AS–*i* converter	A60L–0001–0290#LM10	Rated at 1A
	For power supply of the distributed I/O connector panel I/O module (basic)	A60L–0001–0172#DM10	Rated at 1A
	For power supply of the loader I/O board For power supply of the separate detector interface unit (basic)	A60L–0001–0290#LM20	Rated at 2A
Battery	For control unit memory backup	A98L–0031–0012	
Fan motor	For control unit (No slot)	A90L–0001–0441	30–mm type
	For control unit (3 slots)	A90L–0001–0441#100	30–mm type
	For control unit (2, 3, 4 slots)	A90L–0001–0506#135	60–mm type
Back-light	For 7.2″ LCD (manufactured by HITACHI)	A61L–0001–0142#BL	
	For 7.2″ LCD (manufactured by SHARP)	A61L–0001–0142#BLS	
	For 8.4″ LCD	A61L–0001–0176#BL	
	For 9.5″ LCD	A61L–0001–0154#BLC	
	For 10.4″ LCD	A61L–0001–0168#BL	
Touch panel protection sheet		A990–0165–0011	
Pen for touch panel		A99L–0164–0001	

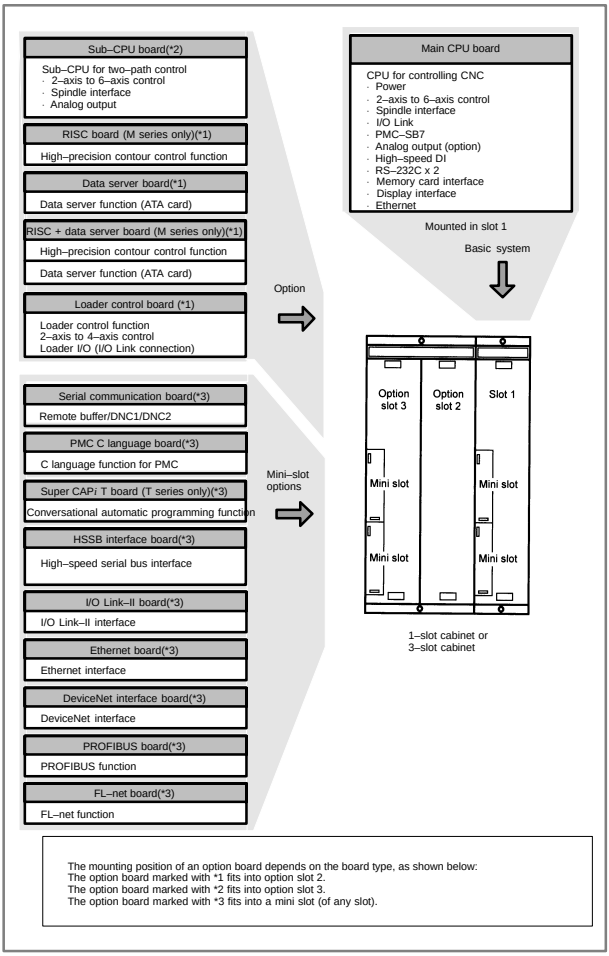
6.2 Stand–Alone Type *i* Series Hardware

6.2.1 Overview of hardware

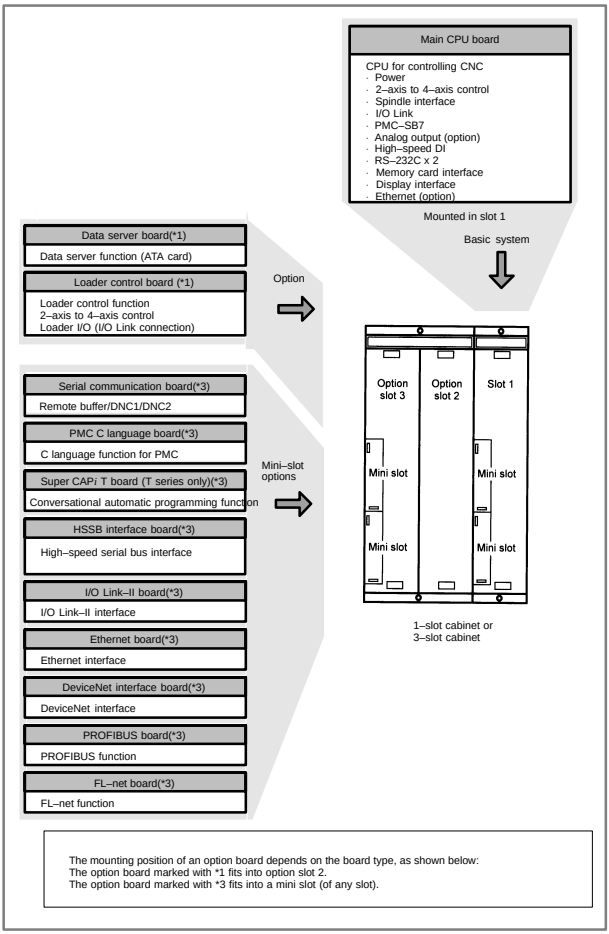
(1) Series 16*i*/160*i*/160*is*



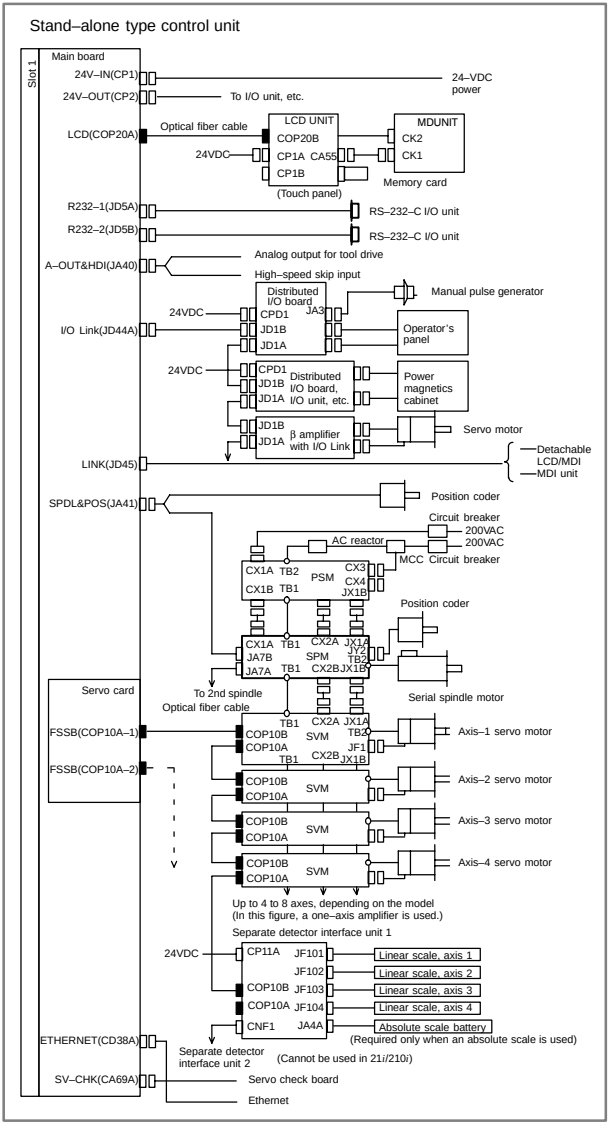
(2) Series 18*i*/180*i*/180*i*s

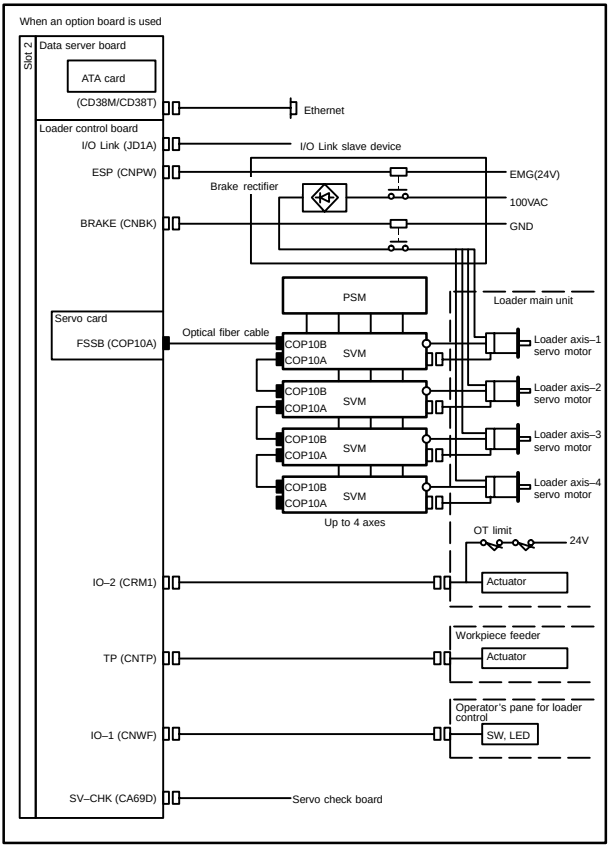


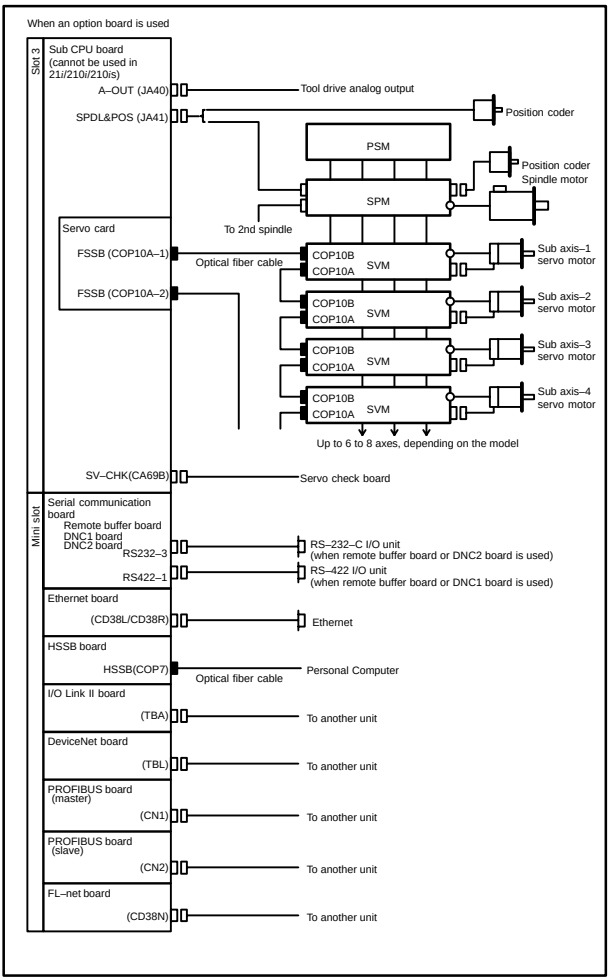
(3) Series 21*i*/210*i*/210*i*s



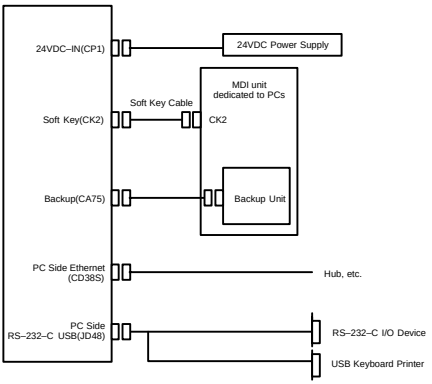
6.2.2 Total connection diagrams




When an option board is used
Slot 2
Data server board
ATA card
(CD38M/CD38T)
Ethernet
Loader control board
I/O Link (JD1A)
I/O Link slave device
ESP (CNPW)
Brake rectifier
EMG(24V)
100VAC
GND
BRAKE (CNBK)
PSM
Loader main unit
Servo card
FSSB (COP10A)
Optical fiber cable
COP10B
COP10A
SVM
Loader axis–1 servo motor
Loader axis–2 servo motor
Loader axis–3 servo motor
Loader axis–4 servo motor
Up to 4 axes
OT limit
24V
IO–2 (CRM1)
Actuator
Workpiece feeder
TP (CNTP)
Actuator
Operator's pane for loader control
IO–1 (CNWF)
SW, LED
SV–CHK (CA69D)
Servo check board


When an option board is used
Slot 3
Sub CPU board
(cannot be used in
21i/210i/210is)
A–OUT (JA40)
Tool drive analog output
SPDL&POS (JA41)
Position coder
PSM
Position coder
Spindle motor
SPM
To 2nd spindle
Servo card
FSSB (COP10A–1)
Optical fiber cable
COP10B
COP10A
SVM
Sub axis–1
servo motor
FSSB (COP10A–2)
Sub axis–2
servo motor
Sub axis–3
servo motor
Sub axis–4
servo motor
Up to 6 to 8 axes, depending on the model
SV–CHK(CA69B)
Servo check board
Mini slot
Serial communication
board
Remote buffer board
DNC1 board
DNC2 board
RS232–3
RS–232–C I/O unit
(when remote buffer board or DNC2 board is used)
RS422–1
RS–422 I/O unit
(when remote buffer board or DNC1 board is used)
Ethernet board
(CD38L/CD38R)
Ethernet
HSSB board
HSSB(COP7)
Personal Computer
Optical fiber cable
I/O Link II board
(TBA)
To another unit
DeviceNet board
(TBL)
To another unit
PROFIBUS board
(master)
(CN1)
To another unit
PROFIBUS board
(slave)
(CN2)
To another unit
FL–net board
(CD38N)
To another unit

For the *i*S series CNC display unit, the additional connection shown below is required on the unit.



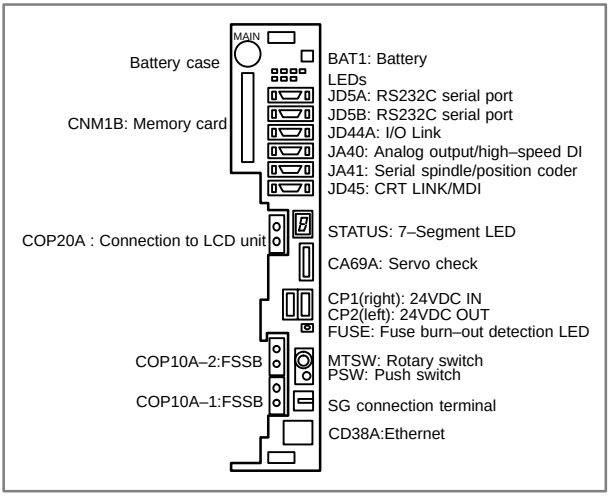
6.2.3 Connector and card configurations of printed circuit boards

6.2.3.1 Main CPU board of Series 16*i*/18*i*/21*i*/160*i*/180*i*/210*i*/160*is*/180*is*/210*is*

- Specifications

Item	Code
Main CPU board of Series 16*i*/160*i*/160*is*	A16B–3200–0420
Main CPU board of Series 18*i*/180*i*/180*is*	A16B–3200–0421
Main CPU board of Series 21*i*/210*i*/210*is*	A16B–3200–0425

- Mounting positions of connectors, LEDs, etc.

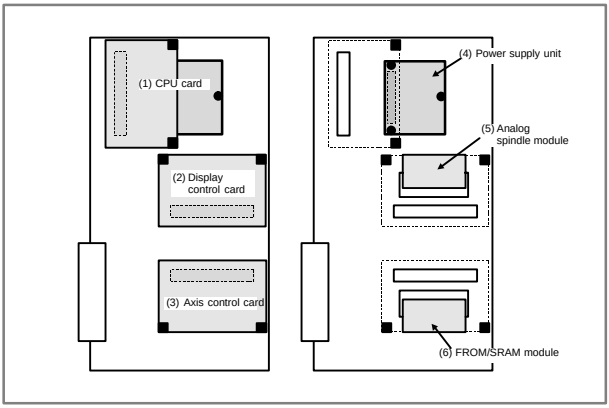


STATUS 7–segment LED: Used for setting and maintenance operations, in combination with the MTSW rotary switch and PSW push switch described below.

MTSW rotary switch: This rotary switch is used for setting and maintenance operations, in combination with the STATUS 7–segment LED and the PSW push switch.

PSW push switch: This push switch is used for setting and maintenance operations, in combination with the STATUS 7–segment LED and the MTSW rotary switch.

- Mounting positions of cards and DIMM modules



No.	Item	Code	Function	Remarks
(1)	CPU card	A20B–3300–0310	DRAM 16MB For Series 16*i*/18*i*/160*i*/180*i*/160*is*/180*is*	
		A20B–3300–0311	DRAM 32MB For Series 16*i*/18*i*/160*i*/180*i*/160*is*/180*is*	
		A20B–3300–0291	DRAM 16MB For Series 21*i*/210*i*/210*is*	
		A20B–3300–0290	DRAM 32MB For Series 21*i*/210*i*/210*is*	
		A20B–3300–0312	DRAM 16MB For Series 21*i*/210*i*/210*is*	When the embedded Ethernet is used with Series 21*i*/210*i*/210*is*
		A20B–3300–0313	DRAM 32MB For Series 21*i*/210*i*/210*is*	
(2)	Display control card	A20B–3300–0340	LCD/MDI Embedded Ethernet	
		A20B–3300–0360	Display link Embedded Ethernet	
		A20B–3300–0362	MDI Embedded Ethernet	
		A20B–3300–0364	Without display unit Embedded Ethernet	
		A20B–3300–0341	LCD/MDI	When the embedded Ethernet is not used with Series 21*i*/210*i*/**210*is***
		A20B–3300–0361	Display link	
		A20B–3300–0363	MDI	

No.	Item	Code	Function	Remarks
(3)	Axis control card	A20B–3300–0033	Axis control 2–axes	Servo software Series 9090 (21*i*)
		A20B–3300–0032	Axis control 4–axes	
		A20B–3300–0243	Axis control 2–axes	Servo software Series 90B0
		A20B–3300–0242	Axis control 4–axes	
		A20B–3300–0241	Axis control 6–axes	
		A20B–3300–0240	Axis control 8–axes	
		A20B–3300–0248	Axis control 4–axes	Servo software Series 90B0 (High–speed HRV)
		A20B–3300–0245	Axis control 6–axes	
		A20B–3300–0244	Axis control 8–axes	
		A20B–3300–0246	Learning controlled axis control	Servo software Series 90B3/90B7
		A20B–3300–0247	Learning controlled axis control	Servo software Series 90B3/90B7 (High–speed HRV)
		A17B–3300–0500	Applicable to Dual Check Safety Axis control 8–axes	Servo software Series 90B0 Monitor software Series 90B9
(4)	Power unit	A20B–8100–0851		
(5)	Analog spindle module	A20B–3900–0170	Analog spindle position coder	
(6)	FROM/ SRAM module	A20B–3900–0160	FROM 16MB SRAM 1MB	FROM stores various control software products. SRAM is backed up by a battery.
		A20B–3900–0161	FROM 16MB SRAM 2MB	
		A20B–3900–0162	FROM 16MB SRAM 3MB	
		A20B–3900–0163	FROM 32MB SRAM 1MB	
		A20B–3900–0164	FROM 32MB SRAM 2MB	
		A20B–3900–0165	FROM 32MB SRAM 3MB	
		A20B–3900–0180	FROM 16MB SRAM 256kB	
		A20B–3900–0181	FROM 16MB SRAM 512kB	
		A20B–3900–0182	FROM 32MB SRAM 256kB	
		A20B–3900–0183	FROM 32MB SRAM 512kB	

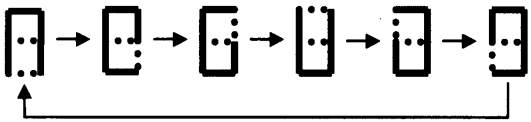
- LED display
- Fuse burn–out detection LED

FUSE (Red)	Lit if the fuse is blown.

- LED status transition at power–up □: Off ■: On

7–segment LED	STATUS	Status
Not lit	□□□□	Power off
8	■■■■	CPU not activated after power–up
F		NC system loading started by boot system
9	□■■■	NC system started–up and RAM initialization completed
8	■□■■	Waiting for system processor ID setting
7	□□■■	System processor ID setting completed Display circuit initialization completed
6	■■□■	FANUC bus initialization completed
5	□■□■	Loading from flash memory completed PMC initialization completed Series and edition screen displayed
4	■□□■	Hardware configuration information setting completed for each printed circuit board of the system
3	□□□■	PMC ladder initialization completed
2	□■■□	Waiting for digital servo and spindle initialization
1	■■■□	Digital servo and spindle initialization completed
0	■□□□	Initialization completed, normal operation state

- LED display during automatic operation start–up
  While automatic operation start–up in progress signal STL (F0.5) is held to 1, the 7–segment LED cyclically displays the following patterns:



- LED display when a battery alarm occurs

ALARM ■□□	SRAM backup battery is weak.

- LED display when a system alarm occurs □: Off ■: On ☆: Blink
  (if CPU card A20B–3300–031X is used)

ALARM □■□	System failure. The software detected an error and stopped the system.
ALARM ■■□	An error occurred on the local bus in the main CPU board.
ALARM □□■	System emergency. The hardware detected an error.
ALARM ■☆■	A disconnection was found in the optical fiber cable between the CNC and LCD. Alternatively, a printed circuit board on the LCD side is defective. If a disconnection occurs, the dot of the 7–segment LED is also lit. If a disconnection occurs, the display of the LCD unit blinks. 
ALARM □■■	An SRAM parity error or SRAM ECC error was detected.
ALARM ■■■	A DRAM parity was detected.
ALARM ☆☆☆	A bus error occurred in the main CPU.

(If CPU card A20B–3300–029X is used)

ALARM □■□	System failure. The software detected an error and stopped the system.
ALARM ■■□	An error occurred on the local bus in the main CPU board. Alternatively, a bus error occurred in the main CPU. Alternatively, a DRAM parity error was detected.
ALARM □□■	System emergency. The hardware detected an error. Alternatively, a bus error occurred in the main CPU. Alternatively, a DRAM parity error was detected.
ALARM ■□■	A disconnection was found in the optical fiber cable between the CNC and LCD. Alternatively, a printed circuit board on the LCD side is defective. If a disconnection occurs, the dot of the 7–segment LED is also lit. If a disconnection occurs, the display of the LCD unit blinks. 
ALARM □■■	An SRAM parity error or SRAM ECC error was detected.

NOTE1 If any of the system alarms occurs, the hardware may be defective.

NOTE2 If a disconnection is detected in the optical fiber cable between CNC and LCD at power–up, the ALARM LEDs alternately display these patterns: ■□■ → □■□

- 7–segment LED display when a system alarm occurs
  If a system alarm occurs, a number blinks as shown below, depending on the system alarm number.

7–segment LED	System alarm number	System alarm type
0	900 to 909	ROM parity alarm. System ROM parity stored in FROM
1	910 to 919	SRAM or DRAM parity alarm
2	920 to 929	Servo alarm
3	930 to 949	CPU interrupt or SRAM ECC error
5	950 to 959	PMC system alarm
7	970 to 979	Bus error or non–maskable interrupt
8	Others	Other system alarms

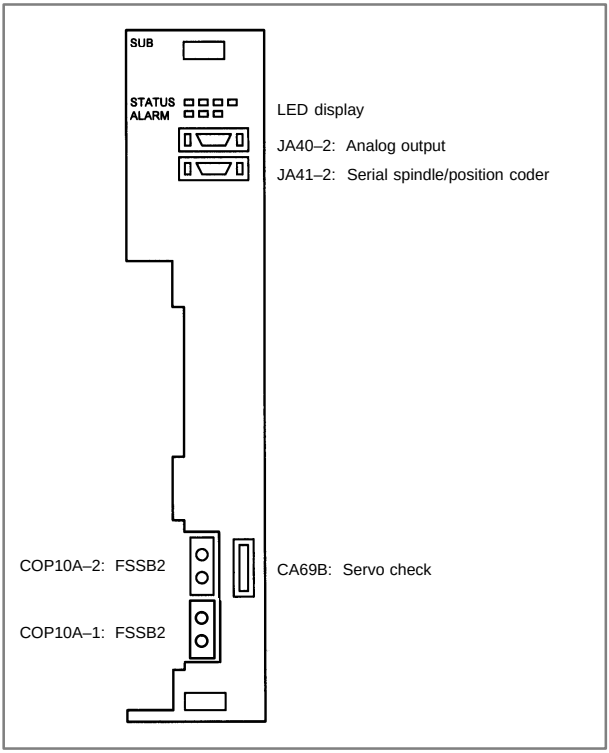
NOTE If any of the system alarms occurs, the hardware may be defective.

6.2.3.2 Sub–CPU board

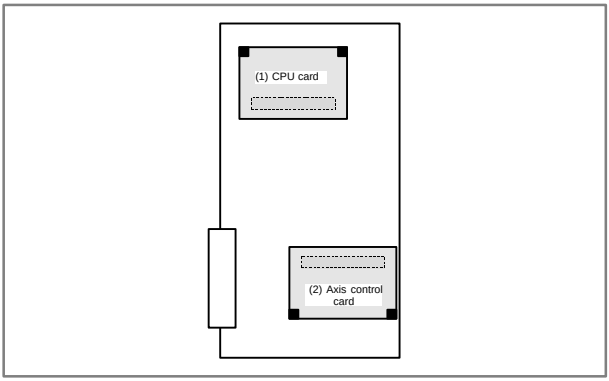
- Specifications

Item	Code
Sub–CPU board	A16B–2203–0751

- Mounting positions of connectors, LEDs, etc.



- Mounting positions of cards and DIMM module



No.	Item	Code	Function	Remarks
(1)	CPU card	A20B–3300–0310		DRAM 16MB
		A20B–3300–0311		DRAM 32MB
(2)	Axis control card	A20B–3300–0243	Axis control 2 axes	Servo software Series 90B0
		A20B–3300–0242	Axis control 4 axes	
		A20B–3300–0241	Axis control 6 axes	
		A20B–3300–0240	Axis control 8 axes	
		A20B–3300–0248	Axis control 4 axes	Servo software Series 90B0 (High–speed HRV)
		A20B–3300–0245	Axis control 6 axes	
		A20B–3300–0244	Axis control 8 axes	
		A20B–3300–0246	Learning controlled axis control	Servo software Series 90B3/90B7
		A20B–3300–0247	Learning controlled axis control	Servo software Series 90B3/90B7 (High–speed HRV)

- LED display
- LED display at power–up □: Off ■: On

STATUS □□□□	Power off
STATUS ■■■□	CPU not activated after power–up
STATUS ■□□□	Initialization completed, normal operation in progress

- LED display when a system alarm occurs □: Off ■: On ☆: Blink

ALARM □■□	Servo alarm
ALARM ■□□	A DRAM parity error was detected.
ALARM ☆□□	A bus error occurred in a sub–CPU.

NOTE If any of the system alarms occurs, the hardware may be defective.

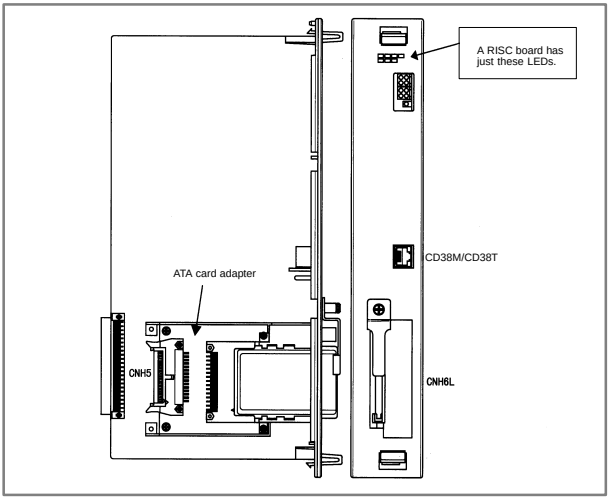
6.2.3.3 RISC board, data server board, RISC + data server board, fast data server board, RISC + fast data server board

The RISC function and data server function are provided on a single option board. If the RISC function alone is needed, a RISC board is used. If just the data server function is needed, a data server board is used. If the two functions are needed, a RISC + data server board is used.
If the data server function is used, an ATA card adapter is mounted on the board. This board and ATA card adapter are connected by a flat cable.

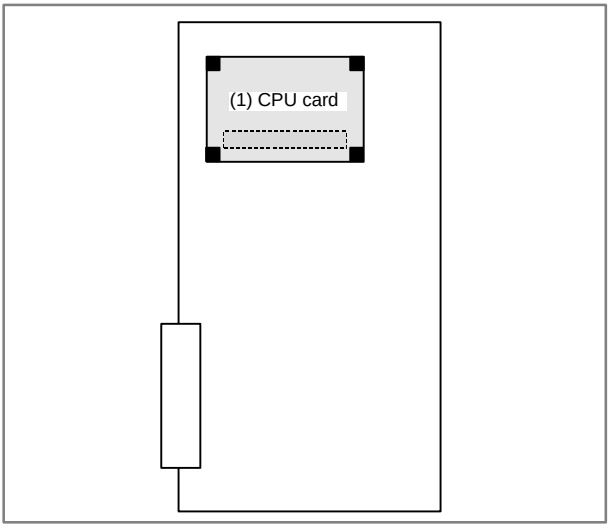
- Specifications

Item	Code
RISC + Data server board	A16B–3200–0390
RISC board	A16B–3200–0391
Data server board	A16B–3200–0352
CPU card (standard type)	A20B–3300–0102
ATA card adapter	A20B–2100–0500
RISC + Fast data server board	A16B–3200–0460
Fast data server board	A16B–3200–0462
CPU card (high–speed type)	A16B–3300–0401

- Mounting positions of connectors, LEDs, etc.



- Mounting position of card (For RISC card, RISC+DATA SERVER board)



No.	Item	Code	Function	Remarks
(1)	CPU card	A20B–3300–0102		Standard type
		A17B–3300–0401		High–speed type

- LED display of the RISC function

The RISC function uses the green STATUS LEDs and red ALARM LEDs in the upper part of the face plate. The red ALARM LEDs are used also by the data server function.

<1> Status LED indication (green LED turned on)

Alarm LED	State
□□□□	The power is not turned on.
■□□□	Waiting for the CNC (1) (Check the cause of the CNC.)
□■□□	Module ID error (Replace the printed circuit board or FROM.)
■■□□	Waiting for the CNC (5) (Check the cause of the CNC.)
□□■□	ROM test error (Replace the printed circuit board or FROM.)
■□■□	Waiting for the CNC (3) (Check the cause of the CNC.)
■■■□	System error (Replace the printed circuit board or FROM.)
□□□■	RAM test error (Replace the printed circuit board.)
■□□■	Waiting for the CNC (2) (Check the cause of the CNC.)
□■□■	Parameter error (Replace the printed circuit board or FROM.) (B437 series only)
□□■■	DRAM test error/waiting for interrupt at interpolation cycles (Replace the printed circuit board.)
■□■■	Waiting for the CNC (4) (Check the cause of the CNC.) (B451 series only)
■■■■	The power is turned on, but the processor is not started yet.

■ : ON □ : OFF

<2> Status LED indication (green LED blinking)

Alarm LED	State
★□□□	Command being executed (reset)
□★★□	Command being executed (preprocessing, distribution processing)
□□□★	Waiting for a command
□★□★	Waiting for NC statement input
★★□★	Command being executed (parameter modification) (B437 series only)
□□★★	Automatic operation is not started yet. (Replace the printed circuit board.) (B451 series only)

★ : Blinking □ : OFF

<3> Alarm LED indication (red LED)

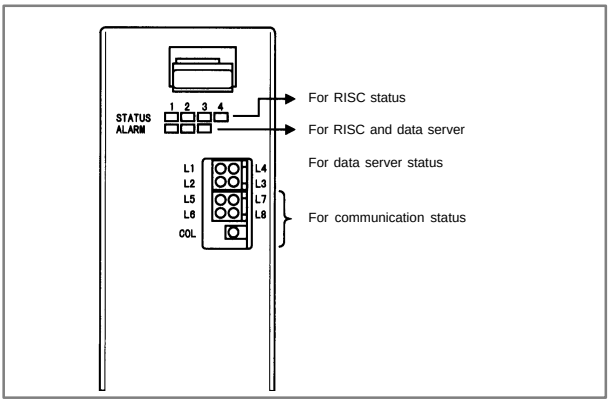
Alarm LED	State
■□■	The power supply for the processor core on the RISC board is defective.
□□■	A DRAM parity error occurred on the CPU card.
■■□	System emergency
□■□	(Reserved)

■ : ON □ : OFF

NOTE The LEDs display any other pattern if an error occurs in the data server option.

- LED display of the data server function

The data server board function uses four green STATUS LEDs for status display and red LEDs for alarm display (used also by the RISC function). The function uses other green LEDs and a single red LED for communication status display.



LED status transition at power–up

LED statuses ○: Off ●: On ☆: Blink ◇: Don't care

No.	LED display (L1 to L4)	Board status
1	○○ ○○	Power off
2	●● ●●	Initial state immediately after power–up
3	○● ●●	MPU initialization completed
4	○● ○●	Firmware downloading completed
5	○● ○○	Control transferred to OS
6	●○ ●●	OS PHASE 1
7	○○ ●●	OS PHASE 2
8	●○ ○●	OS PHASE 3
9	○○ ○●	OS PHASE 4
10	☆○ ○○	Activation completed

If the board is normally activated, the LEDs display the pattern of No.10 and keep this state until an error is detected.

LED display when an error occurs (STATUS L1 to L4)

The STATUS LEDs alternately display the LONG and SHORT patterns. The LONG pattern is held longer than the SHORT pattern.

- For data server board

LED statuses ○: Off ●: On

No.	STATUS LED indication		Board state	
	LONG	SHORT		
1	○● ○○	●○ ○○	Failure caused by this board	System reset
2	○● ○○	○○ ●○		Machine check
3	○● ○●	●○ ○○		DRAM parity alarm
4	○● ○●	○○ ●○	Failure caused by another board	NMI of another module

- For fast data server board

No.	STATUS LED indication		Board state	
	LONG	SHORT		
1	○● ○●	●○ ●○	Failure caused by this board	SDRAM parity alarm
2	○● ●○	○○ ○○		General invalid instruction
3	○● ●○	●○ ○○		Invalid slot instruction
4	○● ○●	●○ ○○	Failure caused by another board	NMI of another module

NOTE If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

LED display when an error occurs (ALARM)

LED statuses □: Off ■: On

No.	LED display 123	Board status
1	□■■	An MPU transfer error occurred.
2	■■■	A parity error occurred in the main memory.

NOTE Any other pattern is displayed if an error occurs in the RISC option.

LED display for communication status
Communication status (L5 to L8)

LED statuses ○: Off ●: On ☆: Blink ◇: Don't care

No.	LED display	Communication status
1	◇◇ ●◇	Data transmission in progress
2	◇◇ ◇●	Data reception in progress
3	◇● ◇◇	Hub normally connected
4	●◇ ◇◇	Lights when a 100BASE–TX connection is made. (for fast data server board)

Communication status (COL)

No.	LED display	Communication status
1	●	Lit when a data collision occurs.

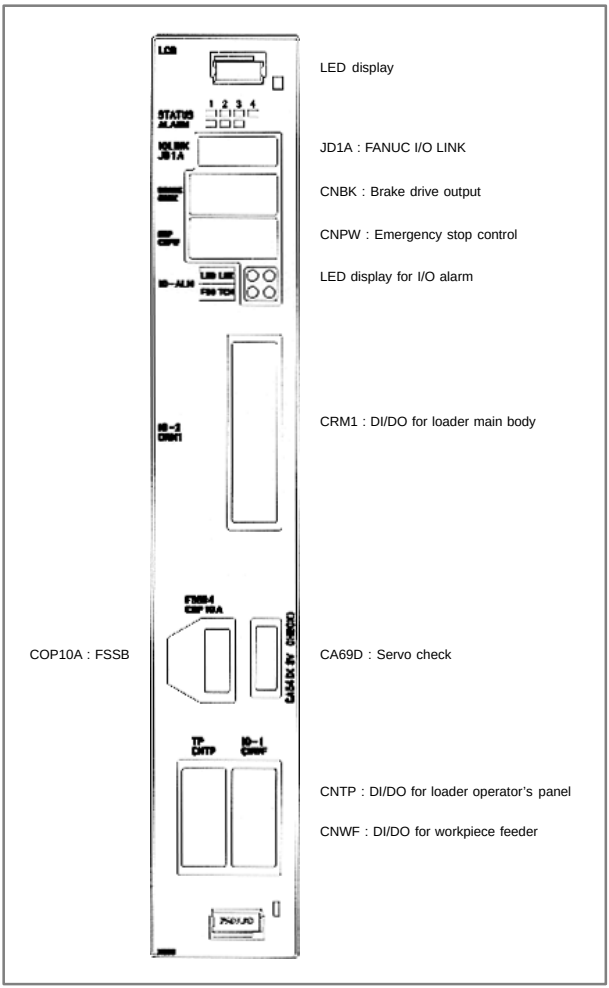
COL: This LED is frequently lit if the traffic of Ethernet communication is large or if the peripheral noise is large.

6.2.3.4 Loader control board

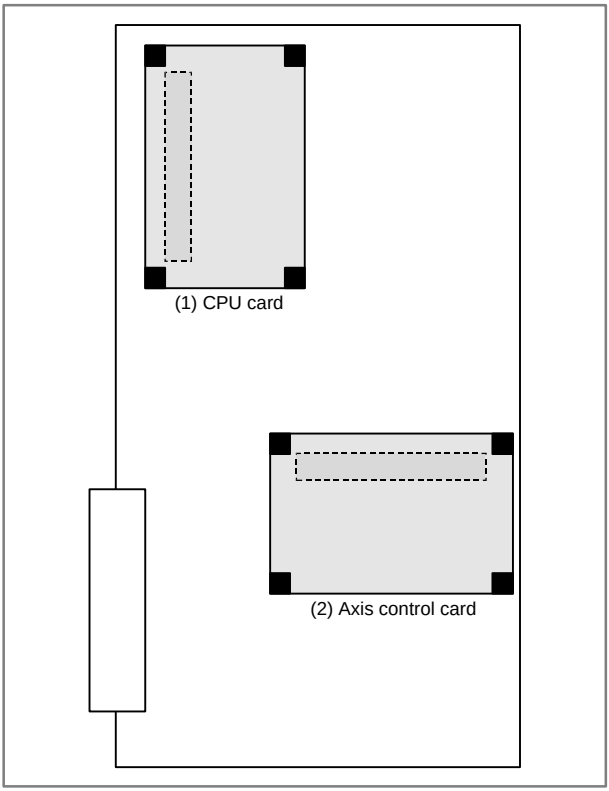
- Specifications

Name	Specification
Loader Control Board	A16B–2203–0740

- Connector location



- Card location



No.	Item	Code	Function	Remarks
(1)	CPU card	A20B–3300–0291	CNC control	
(2)	Axis control card	A20B–3300–0032	Axis control	4 axes
		A20B–3300–0033		2 axes

- LED display transition at power–up

NO.	LED display	NC Status
1	STATUS:□□□□	Power off
2	STATUS:■■■■	Startup status immediately after power is turned on
3	STATUS:□■■■	RAM initialized
4	STATUS:■□■■	Software ID set; keys initialized
5	STATUS:□□■■	Waiting for completion of software initialization 1
6	STATUS:■■□■	Waiting for completion of software initialization 2
7	STATUS:□■□■	Position coder initialized, etc.
8	STATUS:□■■□	Waiting for digital servo initialization
9	STATUS:■□□□	Initialization completed (steady state)

■ : ON □ : OFF
The STATUS LEDs are green.

- LED display when an error occurs

LED display	Description
ALM:□■□	System failure occurred. The software detects the error and stops the system.
ALM:■■□	Error in Local bus on the loader control board occurred.
ALM:□□■	System emergency occurred. Hardware detects the error.
ALM:□■■	SRAM parity error on the loader control board occurred.

■ : ON □ : OFF
The ALARM LEDs are red.

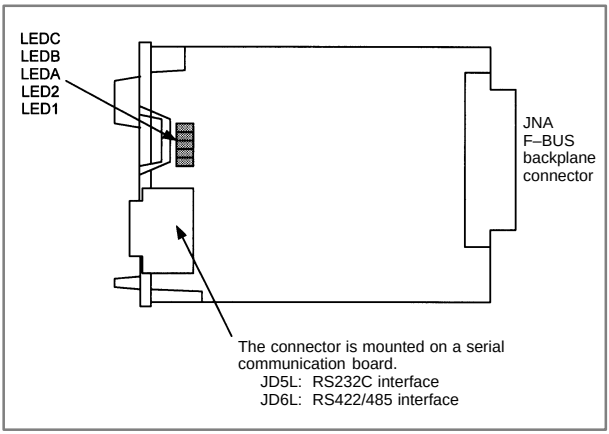
NOTE When two or more error occur simultaneously, the LED display shows the state of low side on the table above.

6.2.3.5 C language board, serial communication board

- Specifications

Item		Code
C language board		A20B–8100–0330
Serial communication board	R.B./DNC2: RS232C I/F	A20B–8100–0334
	R.B./DNC2: RS422 I/F	A20B–8100–0335
	DNC1: RS485 I/F	A20B–8100–0336

- Mounting positions of connectors, LEDs, etc.



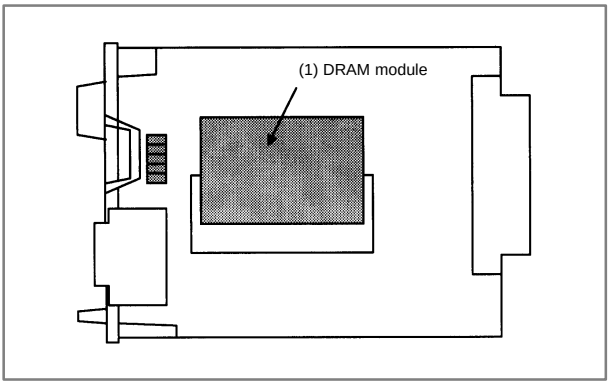
- LED display
- LED display when an error occurs □: Off ■: On

CBA	Status
□□■	The CPU is not yet started (reset state).(*1)
■■□	A DRAM parity error occurred.
□■□	A bus error occurred in the CPU on this board.
■□□	An error occurred in the local bus on this board.

NOTE1 The LEDs display this pattern because the CPU is in the reset state immediately after power–up.

NOTE2 If the LEDs display any of the patterns, the hardware may be defective (except in the reset state at power–up).

- Mounting positions of card and DIMM module



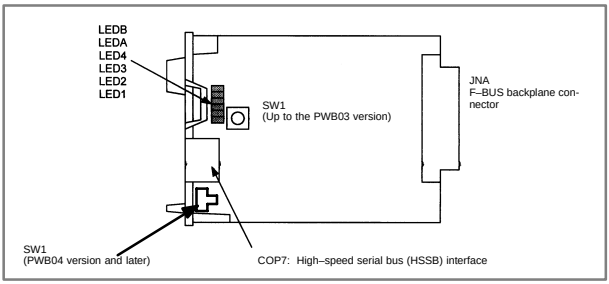
No.	Item	Code	Function	Remarks
(1)	DRAM module	A20B–3900–0042	System RAM	4MB

6.2.3.6 HSSB interface board

- Specifications

Item	Code
HSSB interface board	A20B–8001–0730

- Mounting positions of connectors, LEDs, etc.



- LED display

LEDB	Red	HSSB communication has been interrupted.
LEDA	Red	A RAM parity alarm occurred in the common RAM on the board. The common RAM is mounted on this board. The RAM is used to exchange information between the CNC and personal computer and is not battery–backed.

Status display of the green LEDs □: Off ■: On

4 3 2 1	Status
■■■■	Immediately after power–up
■■■□	HSSB board initialization in progress
■■□■	Waiting for the booting of the PC side
■■□□	CNC screen displayed on the PC
■□□□	Activation normally terminated, normal operation in progress
□■■□	Thermal error detected by the CNC display unit with PC functions or PANEL *i*
□■□■	HSSB communication interrupted
□■□□	Parity alarm in the common RAM
□□■■	Communication error
□□■□	Battery alarm in the CNC display unit with PC functions or PANEL *i*

NOTE The PC used in the above table includes PANEL *i*, CNC display unit with PC functions, and CNC display unit for the *i*s series CNC.

- Rotary switch

1) Setting of ROTARY SWITCH in case of connecting to PC or PANEL *i*

The power–on start sequence can be modified using rotary switch on the board.

setting of rotary switch	Description
0	Setting for maintenance. The start menu is displayed. It is possible to start boot and IPL from the PC or PANEL *i*.
1	Setting for usual operation. The start menu is not displayed. It is impossible to start boot or IPL from the PC or PANEL *i*.
2	The CNC and PC or PANEL *i* are started independently of each other without handshake. * CNC CNC is available if PC or PANEL *i* is not turned on or not connected. (Display for CNC and MDI or Operation panel etc. are needed to operate.) The start menu is not displayed if PC or PANEL *i* is connected and turned on. * PC or PANEL *i* The start menu is not displayed and it is impossible to start boot or IPL from the PC or PANEL *i* if CNC is connected and turned on. This setting makes PC or PANEL *i* or CNC be able to be turned on/off the power individually if HSSB device driver for Windows 95/98, NT4.0 or 2000 is installed. In case of Multi–connection (connecting some CNCs to one PC or PANEL *i*), please set to this setting usually.

NOTE PANEL *i* used here represents hardware that can operate on a stand–alone basis (provide a stand–alone option).

2) Setting of ROTARY SWITCH in case of connecting to CNC display unit with PC functions

The power–on start sequence can be modified using rotary switch on the board and short terminal (SW5) on CNC display unit with PC functions.

setting of rotary switch	short terminal (SW5)	Description
0	OPEN	Setting for maintenance. The start menu is displayed. It is possible to start boot and IPL from CNC display unit with PC functions or PANEL *i*.
1	OPEN	Setting for usual operation. The start menu is not displayed. It is impossible to start boot or IPL from CNC display unit with PC functions or PANEL *i*.
2	SHORT	The CNC and CNC display unit with PC functions or PANEL *i* are started independently of each other without handshake. * CNC – CNC is available if CNC display unit with PC functions or PANEL *i* is not turned on or not connected. (Display for CNC and MDI or Operation panel etc. are needed to operate.) – The start menu is not displayed if CNC display unit with PC functions or PANEL *i* is connected and turned on. * CNC display unit with PC functions or PANEL *i* – CNC display unit with PC functions or PANEL *i* is available if CNC is not turned on or not connected. – Temperature management function of CNC display unit with PC functions or PANEL *i* doesn't work. Please make sure that the temperature is proper for CNC display unit with PC functions or PANEL *i*. – The start menu is not displayed and it is impossible to start boot or IPL from CNC display unit with PC functions or PANEL *i* if CNC is connected and turned on. This position must be used at maintenance only.

3) Setting of ROTARY SWITCH in case of connecting to CNC display unit for *i*s series CNC
The power–on start sequence can be modified using rotary switch on the board. Normally, set this rotary switch to 1.

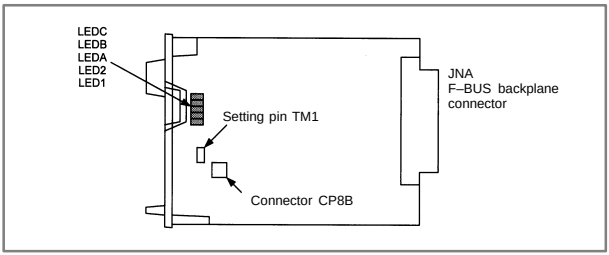
setting of rotary switch	Description
0	Setting for maintenance. The start menu is displayed. It is possible to start boot and IPL from the PC.
1	Setting for usual operation. The start menu is not displayed. It is impossible to start boot or IPL from the PC.
2	Setting for maintenance. Normally, this position is not used.
7	Setting for maintenance. The start menu is displayed when MDI keys <6> and <7> are pressed. It is possible to start boot or IPL from the PC.

6.2.3.7 Symbol CAP*i* T board

- Specifications

Item	Code
Symbol CAP*i* T board	A20B–8100–0560

- Mounting positions of connectors, LEDs, etc.



- LED display

Status display of the red LEDs □: Off ■: On

CAB	Status
□□■	An error occurred in the local bus on this board.
□■□	An error occurred in the local bus on this board. Alternatively, an error occurred on the main CPU board or another option board.
□■■	The CPU is not yet started (reset state).(*1)
■□□	A parity alarm occurred in the SRAM.
■□■	A bus error occurred in the CPU on this board.
■■□	A parity alarm occurred in the DRAM.

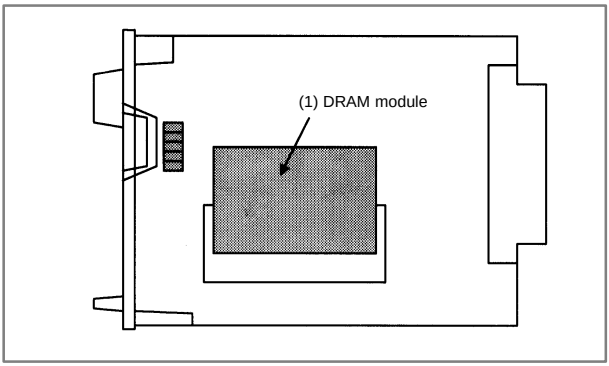
NOTE1 The LEDs display this pattern because the CPU is in the reset state immediately after power–up.

NOTE2 If the LEDs display any of the patterns, the hardware may be defective (except in the reset state at power–up).

- Setting pin TM1 and connector CP8B

Setting pin TM1 and connector CP8B are provided for testing at FANUC. The setting of the pin must not be changed.

- Mounting positions of card and DIMM module



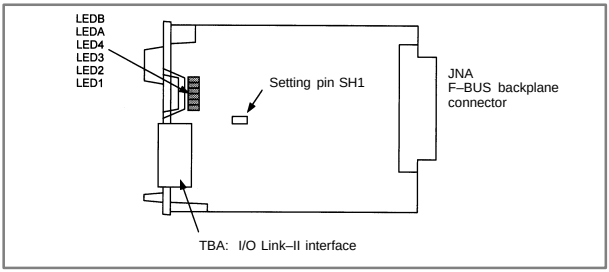
No.	Item	Code	Function	Remarks
(1)	DRAM module	A20B–3900–0042	System RAM	4MB

6.2.3.8 I/O Link–II board

- Specifications

Item	Code
I/O Link–II board	A20B–8100–0381

- Mounting positions of connectors, LEDs, etc.



- LED display
- Status LED display (green)

	Status
LED1	Lit when the board is released from the reset state and starts operating.
LED2	Lit when communication starts. This LED is left on until a reset occurs.
LED3	Lit each time transmission is performed. (Actually, this LED appears to be lit continuously.)
LED4	Reserved

- Alarm LED display (red)

	Status
LED1	Lit when the board is released from the reset state and starts operating.
LEDA	Lit if any of the following errors is detected when data is received. This LED goes off when normal data is received next. · Reception buffer overflow · Fractional bit data detection · Overrun error detection · CRC error detection · Abort error detection
LEDB	Lit when a parity alarm occurs in the DRAM on this board.

- Setting pin SH1

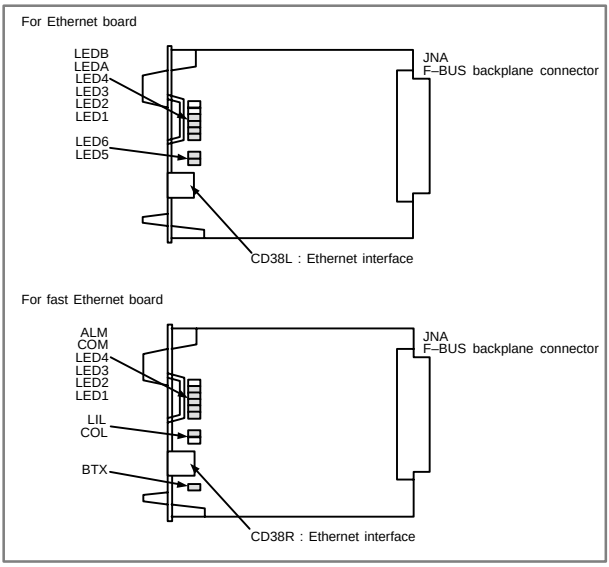
This pin is used to set the I/O Link–II board as the master or slave.

6.2.3.9 Ethernet board, fast Ethernet board

- Specifications

Item	Code
Ethernet board	A20B–8100–0450
Fast Ethernet board	A20B–8100–0670

- Mounting position of connectors, LEDs, etc.



- LED display
- Status transition at power–up, displayed by the green LEDs

No.	4 3 2 1	Board state
1	□□□□	Power off
2	■■■■	Initial state immediately after power–up
3	■■■□	MPU initialization completed
4	■■□□	Firmware downloading completed
5	■□□□	Control transferred to OS
6	□■■■	OS PHASE 1
7	□■■□	OS PHASE 2
8	□■□■	OS PHASE 3
9	□■□□	OS PHASE 4
10	□□□☆	Start–up completed

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

- Status LED display when an error occurs (green)
  The status LEDs alternately display the LONG and SHORT patterns. The LONG pattern is held longer than the SHORT pattern.

(1) For Ethernet board

No.	STATUS LED indication		Board state	
	LONG 4321	SHORT 4321		
1	■□□□	□□□■	Failure caused by this board.	System reset
2	■□□□	□□■□		Machine check
3	■■□□	□□□■		DRAM parity alarm
4	■■□□	□□■□	Failure caused by another board.	NMI of another module

(2) For fast Ethernet board

No.	STATUS LED indication		Board state	
	LONG 4321	SHORT 4321		
1	■■□□	□□■■	Failure caused by this board.	SDRAM parity alarm
2	■□■□	□□□□		General invalid instruction
3	■□■□	□□□■		Invalid slot instruction
4	■■□□	□□□■	Failure caused by another board.	NMI of another module

NOTE If an error, indicated by repeatedly flashing a LONG and SHORT combination other than the above, occurs, contact FANUC.

- Alarm LED display (red) when an alarm occurs

	Board state
LEDB ALM	Lit when a parity alarm occurs in the main memory on this board.

- Communication status LED display (Only LEDA (COL) is red.)

(1) For Ethernet board

	Communication status
LED5 (TX)	Lights when data is received.
LED6 (RX)	Lights when data is sent.
LEDA (COL)	Lights if a data collision occurs.

(2) For fast Ethernet board

	Communication status
COM	Lights when data is sent or received.
LIL	Lights when the Fast Ethernet is successfully connected to the hub.
COL	Lights if a data collision occurs.
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 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.

LEDA, COL :

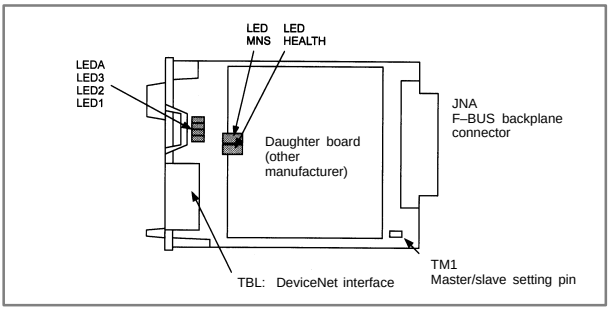
This LED lights frequently if there is excessive traffic on the communication line or if there is excessive peripheral electrical noise.

6.2.3.10 DeviceNet board

- Specifications

Item	Code
DeviceNet board	A20B–8100–0491

- Mounting positions of connectors, LEDs, etc.



- LED display
- Meaning of red LED

LEDA	Lit when an error occurs on the daughter board. If this LED is lit, replace the DeviceNet board.

- Meanings of green LEDs

3 2 1	Status
□□■	This board is set as the master.
□■■	This board is set as the slave.

- LEDs on the daughter board

MNS	DeviceNet module/network status LED This LED indicates whether the DeviceNet board is turned on and whether the DeviceNet communication is normally performed. For the meanings of statuses indicated by this LED, refer to the specifications supplied by ODVA.
HEALTH	Daughter board status LED After the board is turned on, the LED is lit in red. If the firmware is loaded into the internal daughter board, the LED is lit in green. This green state continues. If the LED is not lit in green, replace the DeviceNet board.

- Master/slave setting pin

This setting pin is used to switch around the master function and slave function of DeviceNet.

- Precautions

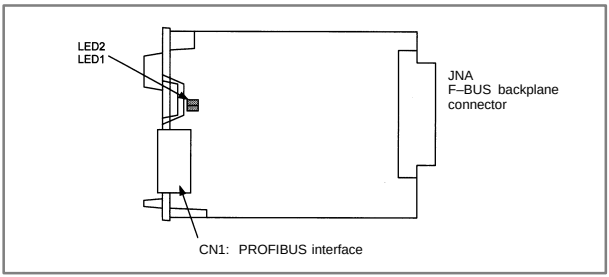
This DeviceNet board can be removed after the main CPU board is removed.
A daughter board of a different manufacturer is mounted on the DeviceNet board. The daughter board alone cannot be replaced.

6.2.3.11 PROFIBUS master board

- Specifications

Item	Code
PROFIBUS master board	A20B–8100–0470

- Mounting positions of connectors, LEDs, etc.



- LED display
- Status LED display (green)

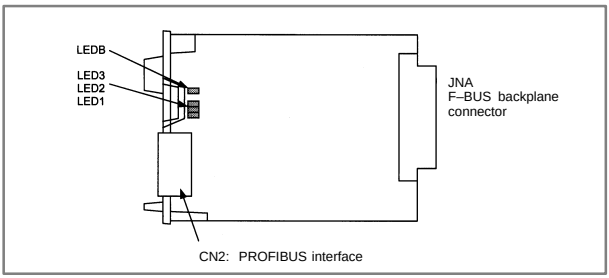
	State
LED1	Lit when this board is released from the reset state and starts operating. This LED is not lit at power–up.
LED2	Lit when the communication is normally performed. This LED is not lit at power–up.

6.2.3.12 PROFIBUS slave board

- Specifications

Item	Code
PROFIBUS slave board	A20B–8100–0440

- Mounting positions of connectors, LEDs, etc.



- LED display
- Status LED display (green)

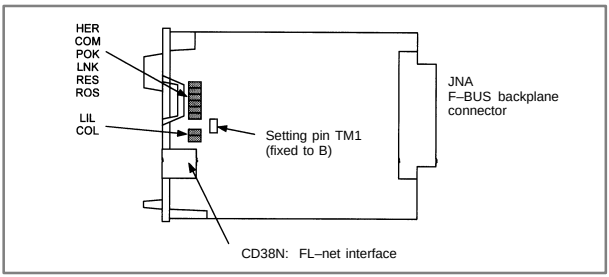
	State
LED1	Lit when this board is released from the reset state and starts operating. This LED is not lit at power–up.
LED2	Lit when the communication starts. The LED is not lit at power–up. The LED is not lit also in the following cases: · When no parameter configuration data is received · When illegal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

6.2.3.13 FL–net Board

- Specifications

Item	Code
FL–net board	A20B–8100–0530

- Mounting positions of connectors, LEDs, etc.



- LED display
- Meanings of red LEDs

HER	Lit when a parity alarm occurs in the DRAM on the FL–net board. The board may be defective.
COL	Lit if a data collision occurs on the line.

- Meanings of green LEDs

COM	Lit during data transmission or reception.
POK	Lit when the parameters are normally set.
LNK	This LED indicates the link state and is lit if the board participates in the FA link.
RES	Reserved. This LED is normally lit.
ROS	Blink while the OS is running on the FL–net board.
LIL	Lit when a hub is normally connected.

- Setting pin TM1

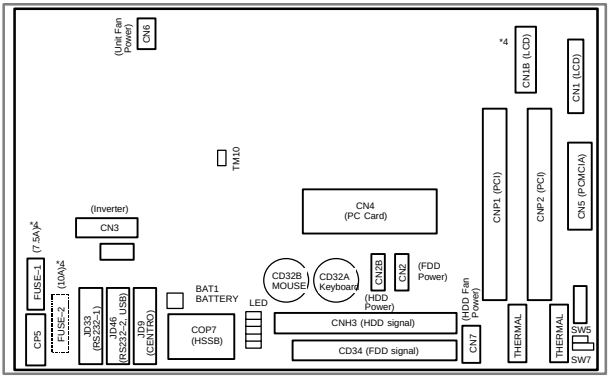
This setting pin is always set to position B. The setting should not be changed.

6.2.3.14 Main CPU board of CNC display unit with PC functions and PANEL *i*

- Specifications

Item			Code
Main CPU board (For basic unit A08B–0082–B001 to –B004, –B011 to –B014, –B021 to –B024)	For Windows95	For 10.4″/12.1″ LCD	A20B–2100–0690
		For 15.0″ LCD	A20B–2100–0691
	For OS except for Windows95	For 10.4″/12.1″ LCD	A20B–2100–0692
		For 15.0″ LCD	A20B–2100–0693

- Mounting positions of connectors, LEDs, etc.



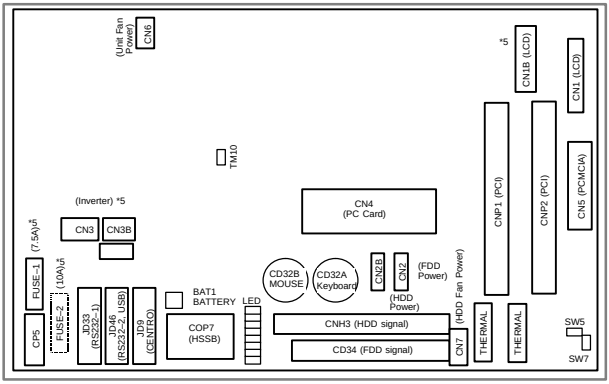
Mounting positions of the parts in the location indicated by *4

LCD Unit Type (Code of PC board) / Parts	10.4″/ 12.1″LCD (A20B–2100–0690, –0692)	15.0″LCD (A20B–2100–0691, –0693)	Fuse for maintenance
FUSE–1	Provided	None	A02B–0236–K101
FUSE–2	None	Provided	A08B–0082–K001
CN1B	None	Provided	—

- Specifications

Item			Code
Main CPU board (For basic unit A08B–0082–B031 to –B038, –B041 to –B048, –B051 to –B057) (For basic unit A13B–0193– B031 to –B038, –B041 to –B048, –B051 to –B057)	For Windows95	For 10.4″ LCD	A20B–2100–0780
		For 12.1″ LCD	A20B–2100–0781
		For 15.0″ LCD	A20B–2100–0782
	For OS except for Windows95	For 10.4″ LCD	A20B–2100–0783
		For 12.1″ LCD	A20B–2100–0784
		For 15.0″ LCD	A20B–2100–0785

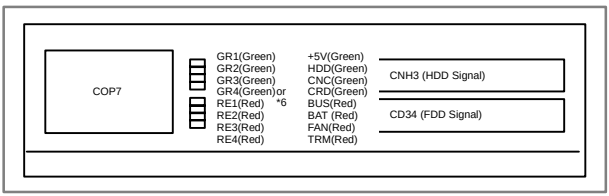
- Mounting positions of connectors, LEDs, etc.



Mounting positions of the parts in the location indicated by *5

LCD Unit Type (Code of PC board) / Parts	10.4″LCD (A20B–2100–0780, –0783)	12.1″LCD (A20B–2100–0781, –0784)	15.0″LCD (A20B–2100–0782, –0785)	Fuse for maintenance
FUSE–1	Provided	None	None	A02B–0236–K101
FUSE–2	None	Provided	Provided	A08B–0082–K001
CN3	Provided	Provided	Provided	—
CN3B	None	None	Provided	—
CN1B	None	None	Provided	—

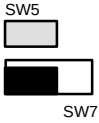
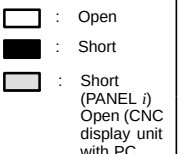
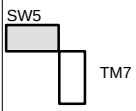
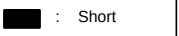
- LED display



Name 1(*6)	Name 2(*6)	Color	Status
GR1	+5V	Green	Lights when +5V is supplied.
GR2	HDD	Green	Lights when the HDD is accessed.
GR3	CNC	Green	Lights when the CNC operates normally.
GR4	CRD	Green	Lights when PCMCIA is accessed.
RE1	BUS	Red	Lights when transfer over the HSSB is interrupted. Possible causes are shown below. • The CNC unit is not powered. • The optical fiber cable is not connected. • The interface on the CNC side failed. • The CNC display unit with PC functions or the PANEL *i* failed.
RE2	BAT	Red	Indicates a battery alarm. Replace the battery installed in the CNC display unit with PC functions or in the PANEL *i*.
RE3	FAN	Red	Lights when the basic unit fan or HDD fan stops. Replace the failed fan.
RE4	TRM	Red	Indicates a temperature alarm. This LED lights when the CPU detects a high temperature that falls outside the use range. (This decreases the operating speed of the CPU.)

*6: These labels may vary with the drawing number or version number of the main board.

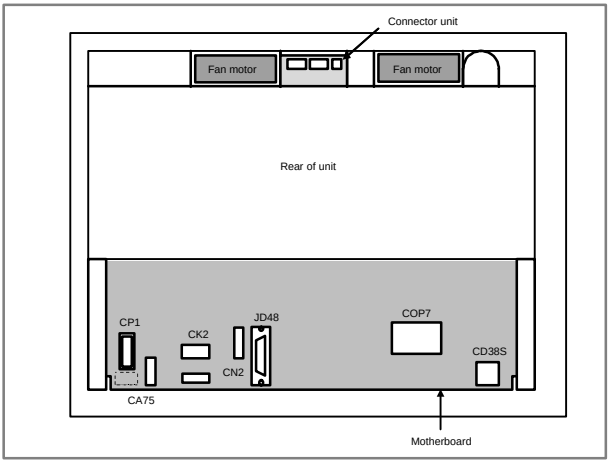
- Short plug settings

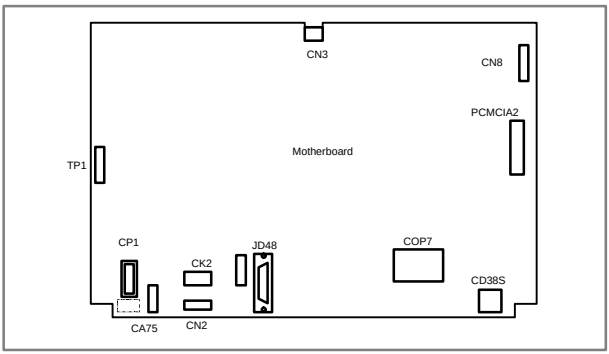
Short plug	Settings	Location		
SW5 SW7 (A20B–2100–0690 to –0693)	Reserved	Do not change the factory–set defaults.		
SW5 TM7 (A20B–2100–0780 to –0785)	Reserved	Do not change the factory–set defaults.		
TM10	Reserved	This short plug is provided for testing purpose. Be sure to insert this plug.		

6.2.3.15 Motherboard of CNC display unit for *i*s series

Item	Code
Mother Board of CNC display unit for *i*s series	A20B–8100–0800

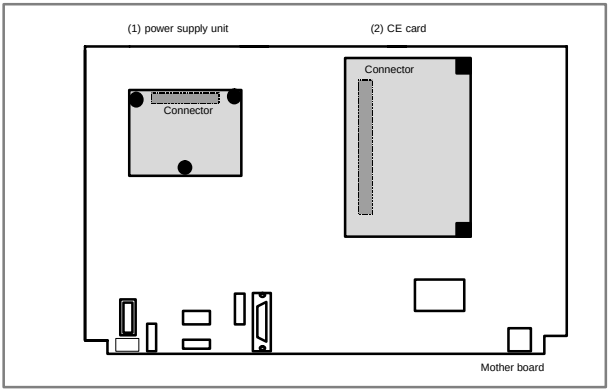
- Mounting positions of connectors





Connector number	Use
JD48	PC side RS232C,USB
COP7	High–speed optical communication(HSSB)
CN2,CK2	Soft key
CP1	24VDC–IN
CD38S	PC side Ethernet(10BASE–T/100BASE–TX)
TP1	Touch panel
CA75	Backup unit
CN8	Video signal interface
PCMCIA2	PCMCIA interface

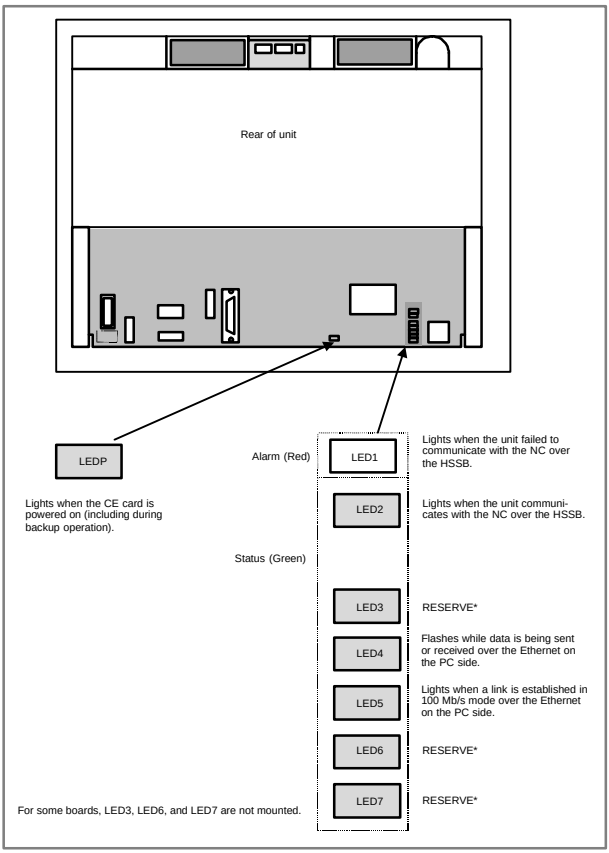
- Mounting position of cards



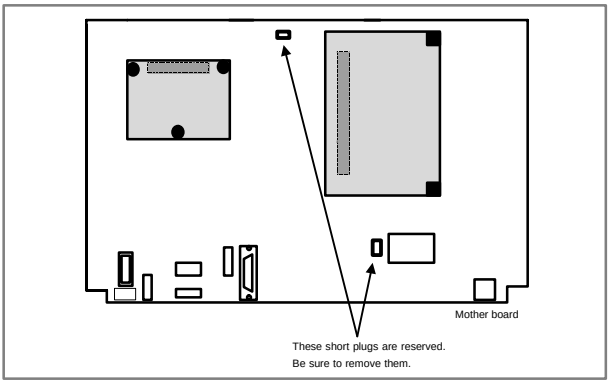
No.	Item		Code	Remarks
(1)	CE card	CE card 1	A20B–3300–0330	10.4″ color LCD
		CE card 2	A20B–3300–0320	
(2)	Power supply unit		A20B–8100–0720	

NOTE See Item 6.1.3.3, “CE CARD” for the configuration of the CE card.

- LED display



- Short plug settings



6.2.4 List of units and printed circuit boards

6.2.4.1 Basic unit

Model	Name	Drawing number	Remarks
16*i*/160*i*/160*i*s	Basic Unit (1 slot)	A02B–0281–B801	
	Basic Unit (3 slots)	A02B–0281–B803	
18*i*/180*i*/180*i*s	Basic Unit (1 slot)	A02B–0283–B801	
		A02B–0297–B801	For 18*i*–MB5 For 180*i*–MB5 For 180*i*s–MB5
	Basic Unit (3 slots)	A02B–0283–B803	
		A02B–0297–B803	For 18*i*–MB5 For 180*i*–MB5 For 180*i*s–MB5
21*i*/210*i*/210*i*s	Basic Unit (1 slot)	A02B–0285–B801	
	Basic Unit (3 slots)	A02B–0285–B803	

6.2.4.2 Printed circuit boards of control units

Name	Drawing number	ID	Remarks
16*i*/160*i*/160*i*s main CPU board	A16B–3200–0420	3x0C	
18*i*/180*i*/180*i*s main CPU board	A16B–3200–0421	3x0D	
21*i*/210*i*/210*i*s main CPU board	A16B–3200–0425	3x0E	
CPU card (16*i*/160*i*/160*i*s/18*i*/180*i* /180*i*s, DRAM 16MB)	A20B–3300–0310	CPU : 11 DRAM : A9	
CPU card (16*i*/160*i*/160*i*s/18*i*/180*i* /180*i*s, DRAM 32MB)	A20B–3300–0311	CPU : 11 DRAM : AA	
CPU card (21*i*/210*i*/210*i*s, DRAM 16MB)	A20B–3300–0312	CPU : 11 DRAM : A9	When the embedded Ethernet function is used with 21*i*/210*i*/210*i*s.
CPU card (21*i*/210*i*/210*i*s, DRAM 32MB)	A20B–3300–0313	CPU : 11 DRAM : AA	
CPU card (21*i*/210*i*/210*i*s, DRAM 32MB)	A20B–3300–0290	CPU : 09 DRAM : 8A	
CPU card (21*i*/210*i*/210*i*s, Loader control, DRAM 16MB)	A20B–3300–0291	CPU : 09 DRAM : 89	
CPU card (standard type for RISC board)	A20B–3300–0102	0A	
CPU card (high–speed type for RISC board)	A17B–3300–0401	0A	
Display control card (LCD/MDI)	A20B–3300–0340	–	

Name	Drawing number	ID	Remarks
Display control card (for CRT LINK)	A20B–3300–0360	–	
Display control card (MDI only)	A20B–3300–0362	–	
Display control card (without a display unit)	A20B–3300–0364	–	
Display control card (LCD/MDI)	A20B–3300–0341	–	When the embedded Ethernet function is used with 21*i*/210*i*/210*i*s.
Display control card (for CRT LINK)	A20B–3300–0361	–	
Display control card (MDI only)	A20B–3300–0363	–	
Axis control card (2 axes)	A20B–3300–0033	00	Applicable servo software : Series 9090 21*i*/210*i*/210*i*s, Loader control
Axis control card (4 axes)	A20B–3300–0032	01	Applicable servo software : Series 9090 21*i*/210*i*/210*i*s, Loader control
Axis control card (2 axes)	A20B–3300–0243	08	Applicable servo software : Series 90B0
Axis control card (4 axes)	A20B–3300–0242	08	Applicable servo software : Series 90B0
Axis control card (6 axes)	A20B–3300–0241	08	Applicable servo software : Series 90B0
Axis control card (8 axes)	A20B–3300–0240	08	Applicable servo software : Series 90B0
Axis control card (4 axes, high–speed HRV)	A20B–3300–0248	08	Applicable servo software : Series 90B0
Axis control card (6 axes, high–speed HRV)	A20B–3300–0245	08	Applicable servo software : Series 90B0
Axis control card (8 axes, high–speed HRV)	A20B–3300–0244	08	Applicable servo software : Series 90B0
Axis control card (Learning–control axis control)	A20B–3300–0246	08	Applicable servo software : Series 90B3/90B7
Axis control card (Learning–control axis control, high–speed HRV)	A20B–3300–0247	08	Applicable servo software : Series 90B3/90B7

Name	Drawing number	ID	Remarks
Axis control card (8 axes, applicable to Dual Check Safety)	A17B–3300–0500	08	Applicable servo software : Series 90B0 Applicable monitor software : Series 90B9
Axis control card (LCD unit side, 10.4″ color)	A20B–3300–0280	–	Graphic function
Axis control card (LCD unit side, 9.5″monochrome)	A20B–3300–0282	–	Graphic function
Axis control card (LCD unit side, 9.5″ monochrome)	A20B–3300–0302	–	Characters only
Power supply unit	A20B–8100–0720	–	
FROM/SRAM module (FROM 16MB, SRAM 1MB)	A20B–3900–0160	FROM : C1 SRAM : 03	
FROM/SRAM module (FROM 16MB, SRAM 2MB)	A20B–3900–0161	FROM : C1 SRAM : 04	
FROM/SRAM module (FROM 16MB, SRAM 3MB)	A20B–3900–0162	FROM : C1 SRAM : 05	
FROM/SRAM module (FROM 32MB, SRAM 1MB)	A20B–3900–0163	FROM : C2 SRAM : 03	
FROM/SRAM module (FROM 32MB, SRAM 2MB)	A20B–3900–0164	FROM : C2 SRAM : 04	
FROM/SRAM module (FROM 32MB, SRAM 3MB)	A20B–3900–0165	FROM : C2 SRAM : 05	
FROM/SRAM module (FROM 16MB, SRAM 256kB)	A20B–3900–0180	FROM : C1 SRAM : 01	
FROM/SRAM module (FROM 16MB, SRAM 512kB)	A20B–3900–0181	FROM : C1 SRAM : 02	
FROM/SRAM module (FROM 32MB, SRAM 256kB)	A20B–3900–0182	FROM : C2 SRAM : 01	
FROM/SRAM module (FROM 32MB, SRAM 512kB)	A20B–3900–0183	FROM : C2 SRAM : 02	
Analog spindle module	A20B–3900–0170	–	
DRAM module (4MB)	A20B–3900–0042	85	For optional board
Sub CPU board	A16B–2203–0751	1xC0	
Loader control board	A16B–2203–0740	1x97	
RISC+Data server board	A16B–3200–0390	0x81 3xF5	

Name	Drawing number	ID	Remarks
RISC+Fast data server board	A16B–3200–0460	0x81 0x4E	
RISC board	A16B–3200–0391	0x81	
Data server board	A16B–3200–0352	3xF5	
Fast data server board	A16B–3200–0462	0x4E	
ATA card adapter	A20B–2100–0500	–	For data server
Serial communication board (RB/DNC2, RS232C I/F)	A20B–8100–0334	1xE1	
Serial communication board (RB/DNC2, RS422 I/F)	A20B–8100–0335	2xE1	
Serial communication board (DNC1)	A20B–8100–0336	3xE2	
C language board	A20B–8100–0330	0xE0	
HSSB interface board	A20B–8001–0730	xxAA	
Symbol CAP*i* T board	A20B–8100–0560	0x1F	
I/O Link–II board	A20B–8100–0381	xxF9	
Ethernet board	A20B–8100–0450	xxE6	
Fast Ethernet board	A20B–8100–0670	xx96	
DeviceNet board	A20B–8100–0491	xxEF	
DeviceNet board C	A20B–8100–0650	xxBF	
PROFIBUS Master board	A20B–8100–0470	xxFC	
PROFIBUS Slave board	A20B–8100–0440	xxE3	
FL–net board	A20B–8100–0530	xx59	
Backpanel (1 slot)	A20B–2003–0270	–	
Backpanel (3 slots)	A20B–2003–0280	–	
LCD control printed circuit board	A20B–8100–0820	–	
Inverter PCB (for 9.5″ monochrome LCD)	A20B–8100–0710	–	
Inverter PCB (10.4″ color LCD)	A20B–8001–0920	–	
Touch panel control board	A20B–8001–0620	–	
PC–side HSSB interface board (2CH, applicable to ISA bus)	A20B–8001–0582	–	
PC–side HSSB interface board (1CH, applicable to ISA bus)	A20B–8001–0583	–	

Name	Drawing number	ID	Remarks
PC–side HSSB interface board (2CH, applicable to PCI bus)	A20B–8001–0960	–	
PC–side HSSB interface board (1CH, applicable to PCI bus)	A20B–8001–0961	–	

6.2.4.3 I/O

Name	Drawing number	Remarks
Distributed I/O connector panel I/O module A1	A20B–2002–0470	DI/DO= 72/56 DI=general 16, matrix 56, with MPG interface
Distributed I/O connector panel I/O module B1	A20B–2002–0520	DI/DO : 48/32 with MPG interface
Distributed I/O connector panel I/O module B1	A20B–2002–0521	DI/DO : 48/32
Distributed I/O connector panel I/O module (basic module)	A03B–0815–C001	DI/DO : 24/16
Distributed I/O connector panel I/O module (expansion module A)	A03B–0815–C002	DI/DO : 24/16 with MPG interface
Distributed I/O connector panel I/O module (expansion module B)	A03B–0815–C003	DI/DO : 24/16
Distributed I/O connector panel I/O module (expansion module C)	A03B–0815–C004	DO : 16 (2A output)
Distributed I/O connector panel I/O module (expansion module D)	A03B–0815–C005	Analog input
Distributed I/O machine operator's panel (Small, Symbol keysheet)	A02B–0236–C141# TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Small, English keysheet)	A02B–0236–C141# TBR	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Standard, Symbol keysheet)	A02B–0236–C140# TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (Standard, English keysheet)	A02B–0236–C140# TBR	DI : 24 with MPG interface
Distributed I/O machine operator's panel (290mm–wide, Symbol keysheet)	A02B–0236–C150# TBS	DI : 24 with MPG interface
Distributed I/O machine operator's panel (290mm–wide, English keysheet)	A02B–0236–C150# TBR	DI : 24 with MPG interface

Name	Drawing number	Remarks
Main panel A machine operator's panel (Symbol keyboard)	A02B–0236–C230	With MDI
Main panel A1 machine operator's panel (English keyboard)	A02B–0236–C240	With MDI
Main panel B machine operator's panel (Symbol keyboard)	A02B–0236–C231	Without MDI
Main panel B1 machine operator's panel (English keyboard)	A02B–0236–C241	Without MDI
Sub panel A machine operator's panel	A02B–0236–C232	
Sub panel B machine operator's panel	A02B–0236–C233	
Sub panel B1 machine operator's panel	A02B–0236–C235	
Sub panel C machine operator's panel	A02B–0236–C234	
Operator's panel connector unit (Sink type output A)	A16B–2200–0661	DI/DO : 64/32
Operator's panel connector unit (Sink type output B)	A16B–2200–0660	DI/DO : 96/64
Operator's panel connector unit (Source type output A)	A16B–2200–0731	DI/DO : 64/32
Operator's panel connector unit (Source type output B)	A16B–2200–0730	DI/DO : 96/64
Machine operator's panel interface unit	A16B–2201–0110	
FANUC I/O Link–AS–i converter	A03B–0817–C001	

6.2.4.4 LCD/MDI unit

Name	Drawing number	Remarks
9.5″ monochrome LCD unit	A02B–0281–C061	
9.5″ monochrome LCD unit	A02B–0281–C066	Characters only
10.4″ color LCD unit	A02B–0281–C071	
10.4″ color LCD unit	A02B–0281–C081	With a touch panel

Name			Drawing number	Remarks
For display link	7.2″ monochrome LCD unit		A02B–0166–C251	
	7.2″ monochrome LCD/MDI unit	T series	A02B–0166–C261 #TR	English keyboard
			A02B–0166–C261 #TS	Symbol keyboard
		M series	A02B–0166–C261 #R	English keyboard
			A02B–0166–C261 #S	Symbol keyboard
	Detachable 7.2″ monochrome LCD/MDI unit	T series	A02B–0166–C271 #TR	English keyboard
			A02B–0166–C271 #TS	Symbol keyboard
		M series	A02B–0166–C271 #R	English keyboard
			A02B–0166–C271 #S	Symbol keyboard
	Stand–alone type MDI	T series	A02B–0166–C210 #TR	English keyboard
			A02B–0166–C210 #TS	Symbol keyboard
		M series	A02B–0166–C210 #R	English keyboard
			A02B–0166–C210 #S	Symbol keyboard
Stand–alone type MDI standard keyboard (horizontal type) 220×230mm		T series	A02B–0281–C125 #TBR	English keyboard
			A02B–0281–C125 #TBS	Symbol keyboard
		M series	A02B–0281–C125 #MBR	English keyboard
			A02B–0281–C125 #MBS	Symbol keyboard
Stand–alone type MDI standard keyboard (vertical type) 220×290mm		T series	A02B–0281–C126 #TBR	English keyboard
			A02B–0281–C126 #TBS	Symbol keyboard
		M series	A02B–0281–C126 #MBR	English keyboard
			A02B–0281–C126 #MBS	Symbol keyboard
Stand–alone type MDI CAP*i* T keyboard (horizontal type) 220×230mm			A02B–0281–C125 #TFBR	English keyboard
			A02B–0281–C125 #TFBS	Symbol keyboard

Name	Drawing number	Remarks
Stand–alone type MDI CAP*i* T keyboard (vertical type) 220×290mm	A02B–0281–C126 #TFBR	English keyboard
	A02B–0281–C126 #TFBS	Symbol keyboard
61 fullkey (horizontal type) 220×230mm	A02B–0261–C162 #MCR	English keyboard
	A02B–0261–C162 #MCS	Symbol keyboard
61 fullkey (vertical type) 220×290mm	A02B–0261–C161 #MCS	English keyboard
	A02B–0261–C161 #MCR	Symbol keyboard

6.2.4.5 Other units

Name	Drawing number	Remarks
Separate detector interface unit (basic 4 axes)	A02B–0236–C205	
Separate detector interface unit (additional 4 axes)	A02B–0236–C204	
Spindle distributed adapter	A13B–0180–B001	
I/O Link distributed adapter	A20B–1007–0680	
Optical I/O Link adapter	A13B–0154–B001	
Fan unit (for 1 slot)	A02B–0265–C001	
Fan unit (for 2 slots)	A02B–0260–C021	

6.2.4.6 CNC display unit with PC functions and PANEL *i*

Type	Item			Drawing No.
Printed circuit board for CNC display unit with PC functions and PANEL *i*	Main printed circuit board (For basic unit A08B–0082–B001 to –B004, –B011 to –B014, –B021 to –B024)	For Windows95	For 10.4″/ 12.1″ LCD	A20B–2100–0690
			For 15.0″ LCD	A20B–2100–0691
		For OS except for Windows95	For 10.4″/ 12.1″LCD	A20B–2100–0692
			For 15.0″ LCD	A20B–2100–0693
	Main printed circuit board (For basic unit A08B–0082–B031 to –B038, –B041 to –B048, –B051 to –B057) (For basic unit A13B–0193– B031 to –B038, –B041 to –B048, –B051 to –B057)	For OS except for Windows95	For 10.4″LCD	A20B–2100–0780
			For 12.1″LCD	A20B–2100–0781
			For 15.0″LCD	A20B–2100–0782
		For Windows95	For 10.4″LCD	A20B–2100–0783
			For 12.1″LCD	A20B–2100–0784
			For 15.0″LCD	A20B–2100–0785
	Inverter printed circuit board (For basic unit A08B–0082–B001 to –B004, –B011 to –B014, –B021 to –B024)	For 10.4″ LCD		A14L–0132–0001
		For 12.1″ LCD		A20B–2002–0890
		For 15.0″ LCD		A14L–0143–0002
	Inverter printed circuit board (For basic unit A08B–0082– B031 to –B038, –B041 to –B048, –B051 to –B057) (For basic unit A13B–0193– B031 to –B038, –B041 to –B048, –B051 to –B057)	For 10.4″ LCD		A14L–0132–0001 #B
		For 12.1″ LCD		A14L–0143–0001 #B
		For 15.0″ LCD		A14L–0143–0002 #B
	Soft key printed circuit board	For 10.4″ LCD		A86L–0001–0261
		For 12.1″ LCD		A20B–1007–0760
	Printed circuit board for touch panel controller			A20B–8001–0620

Type	Item				Drawing number of unit for maintenance	Main drawing number (Basic unit)
Printed circuit board for CNC display unit with PC functions and PANEL *i*	Base unit	LCD	Soft key	Touch panel		
		10.4″ LCD	×	×	A08B–0082–D001	A08B–0082–B001
			○	×	A08B–0082–D002	A08B–0082–B002
			×	○	A08B–0082–D003	A08B–0082–B003
			○	○	A08B–0082–D004	A08B–0082–B004
		12.1″ LCD	×	×	A08B–0082–D011	A08B–0082–B011
			○	×	A08B–0082–D012	A08B–0082–B012
			×	○	A08B–0082–D013	A08B–0082–B013
			○	○	A08B–0082–D014	A08B–0082–B014
		15.0″ LCD	×	×	A08B–0082–D021	A08B–0082–B021
			×	○	A08B–0082–D023	A08B–0082–B023
		10.4″ LCD	×	×	A08B–0082–D031	A08B–0082–B031 A08B–0082–B035 A13B–0193–B031 A13B–0193–B035
			○	×	A08B–0082–D032	A08B–0082–B032 A08B–0082–B036 A13B–0193–B032 A13B–0193–B036
			×	○	A08B–0082–D033	A08B–0082–B033 A08B–0082–B037 A13B–0193–B033 A13B–0193–B037
			○	○	A08B–0082–D034	A08B–0082–B034 A08B–0082–B038 A13B–0193–B034 A13B–0193–B038

Type	Item				Drawing number of unit for maintenance	Main drawing number (Basic unit)
Printed circuit board for CNC display unit with PC functions and PANEL *i*	Base unit	LCD	Soft key	Touch panel		
		12.1″ LCD	×	×	A08B–0082–D041	A08B–0082–B041 A08B–0082–B045 A13B–0193–B041 A13B–0193–B045
			○	×	A08B–0082–D042	A08B–0082–B042 A08B–0082–B046 A13B–0193–B042 A13B–0193–B046
			×	○	A08B–0082–D043	A08B–0082–B043 A08B–0082–B047 A13B–0193–B043 A13B–0193–B047
			○	○	A08B–0082–D044	A08B–0082–B044 A08B–0082–B048 A13B–0193–B044 A13B–0193–B048
		15.0″ LCD	×	×	A08B–0082–D051	A08B–0082–B051 A08B–0082–B055 A13B–0193–B051 A13B–0193–B055
			×	○	A08B–0082–D053	A08B–0082–B053 A08B–0082–B057 A13B–0193–B053 A13B–0193–B057
	3.5″ HDD unit (including the FAN for HDD)				A08B–0082–C100	A08B–0082–H100

○: Provided ×: Not provided

NOTE The base unit for maintenance consists of the components of the basic unit from which the main printed circuit board and its retaining screws are excluded.

Type	Item			Drawing number for maintenance	Main drawing number
Printed circuit board for PC function of CNC display unit with PC functions and PANEL *i*	PC card	MMX–Pentium 233MHz	For 10.4″ LCD	A08B–0082–H500#6141	A08B–0082–H010
			For 12.1″ LCD	A08B–0082–H500#6142	A08B–0082–H011
			For 15.0″ LCD	A08B–0082–H500#6143	A08B–0082–H012
		PentiumII 333MHz	For 10.4″ LCD	A08B–0082–H511#6138	A08B–0082–H020
			For 12.1″ LCD	A08B–0082–H511#6139	A08B–0082–H021
			For 15.0″ LCD	A08B–0082–H511#6140	A08B–0082–H022
		Celeron 400MHz	For 10.4″ LCD	A08B–0082–H512#613D	A08B–0082–H040
			For 12.1″ LCD	A08B–0082–H512#613E	A08B–0082–H041
			For 15.0″ LCD	A08B–0082–H512#613F	A08B–0082–H042
		PentiumIII 500MHz	For 10.4″ LCD	A08B–0082–H520#613G	A08B–0082–H050
			For 12.1″ LCD	A08B–0082–H520#613H	A08B–0082–H051
			For 15.0″ LCD	A08B–0082–H520#613J	A08B–0082–H052
Memory	Main memory (For MMX–Pentium 233MHz and PentiumII 333MHz)		DRAM 32MB (*)	A76L–0500–0013 (Specification: TOSHIBA THL64V4075BTG–5S)	A08B–0082–H001
			DRAM 64MB	A76L–0500–0014 (Specification: TOSHIBA THL64V8015BTG–5S)	A08B–0082–H002
			DRAM 128MB	A76L–0500–0017 (Specification: PFU PD–2261ADS)	A08B–0082–H003
	Main memory (For Celeron 400MHz and PentiumIII 500MHz)		SDRAM 64M	A76L–0500–0018 (Specification: PFU PD–2261ACS)	A08B–0082–H004
			SDRAM 128M	A76L–0500–0019 (Specification: PFU PD–2261ADSA)	A08B–0082–H005

*: DRAM 32 MB can be used only for the MMX–Pentium 233MHz.

6.2.4.7 CNC display unit for *i*s series CNC

Printed circuit boards

Name		Drawing number
Motherboard		A20B–8100–0800
CE card	CE card 1	A20B–3300–0330
	CE card 2	A20B–3300–0320
Power supply unit		A20B–8100–0720
Printed circuit board of Inverter		A20B–8001–0920
Printed circuit board of backup unit		A20B–2100–0820

Units

Name			Drawing number
10.4″ LCD unit	Soft keys	Touch panel	
	○	×	A02B–0281–D500
	×	○	A02B–0281–D501
	○	○	A02B–0281–D508
FA full–keyboard			A02B–0281–C130#E

Others

Name		Drawing number
Case		A02B–0236–D100#0C
Compact flash card	32MB	A87L–0001–0173#32MBA
	48MB	A87L–0001–0173#48MBA
	64MB	A87L–0001–0173#64MB
	96MB	A87L–0001–0173#96MB
Cable for backup unit		A02B–0281–K801
Cable for FA full–keyboard		A02B–0281–K802

6.3 Matters Common to Both LCD–Mounted Type and Stand–Alone Type *i* Series

6.3.1 Liquid crystal display (LCD)

Brightness of the monochrome LCD

When the ambient temperature is low, the brightness of the LCD decreases. (The LCD screen is dark particularly immediately after the power is turned on.) This phenomenon is not a failure but is a property specific to the LCD. When the ambient temperature increases, the LCD screen becomes brighter. The monochrome LCD has a brightness control function.

LCD with a touch panel

The touch panel is operated by directly touching the LCD screen. For this operation, be sure to use a FANUC–supplied pen (A02B–0236–K111) dedicated to the touch panel. If a sharp–pointed pen is used, for example, to touch the LCD screen, the LCD surface may be flawed or damaged. Moreover, do not touch the LCD screen directly with a finger. Otherwise, the operability of the LCD may deteriorate, and the LCD screen may get dirty.

Protection sheet for the touch panel

A protection sheet is attached the face of an LCD with a touch panel to protect the thin film of the touch panel and LCD. If the protection sheet is damaged, it can be replaced. (The protection sheet is a consumable part.)

Replacing the protection sheet

- Materials used

1) Protection sheet — A02B–0236–K110 : For 10.4″ LCD with touch panel and soft key
   A02B–0236–K130 : For 10.4″ LCD with touch panel
2) Neutral detergent — (detergent that can clean oily dirt off = detergent for kitchen can be used)
3) Soft cloth — (such as towel)

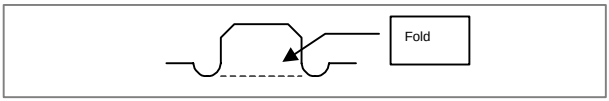
- Replacement procedure

1) Before replacement
   <1> Turn off the power to the machine.
   <2> Peel off the old protection sheet from the surface of the touch panel.
   <3> Wipe off adhesive residue if any on the screen surface with alcohol.
   <4> Use the detergent to remove oil or dirt stuck to the surface of the touch panel.
   <5> With a soft, damp cloth, wipe off detergent completely.
      - If the touch panel surface becomes cloudy, oil is still left on the surface. Remove oil completely.
      - If oil or detergent is left on the surface of the touch panel, the protection sheet cannot adhere to the panel completely and will sometimes peel off easily.
   <6> With a dry soft cloth, wipe off moisture completely.

2) Applying the protection sheet

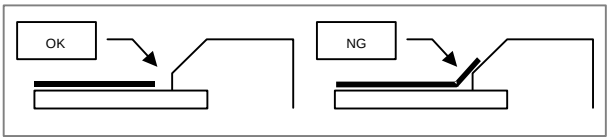
2–1)For A02B–0236–K110

<1> Fold the tab over the front side (the side opposite to the backing sheet).



<2> Peel off the backing sheet.

<3> Position the sheet, then attach the upper and lower sides of the sheet first. Check that the sides of the protection sheet do not touch the escutcheon.



<4> Attach the right and left sides of the protection sheet while pushing out air between the touch panel and protection sheet.

- With part of the protection sheet kept stuck to the touch panel, do not attempt to correct the position of the protection sheet by pulling the sheet.

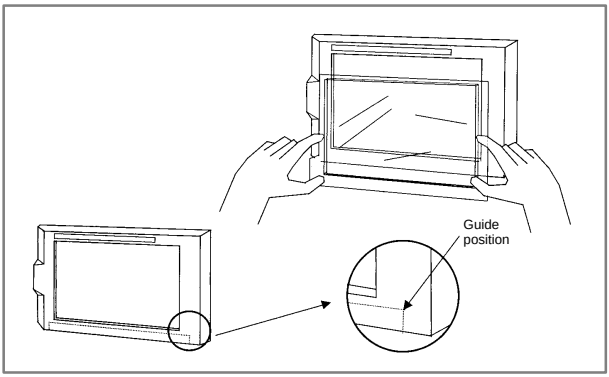
<5> Press the adhesive parts of the four sides, and attach the entire sheet completely.

- Check that the four corners and four sides of the protection sheet do not float.

2–2)For A02B–0236–K130

<1> Peel off the white film attached on the back (facing the LCD) of the new protection sheet.

<2> 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 the protection sheet.



<3> Attach the four sides while pushing out air between the touch panel and the protection sheet.

- Do not pull the protection sheet to correct its position with the part of the sheet kept stuck to the touch panel.

<4> 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.

3) Checks after replacement

<1> Check that there is no wrinkle on the surface of the protection sheet.

<2> After power–on, check that there is no touch panel portion kept pressed.

<3> Press the touch panel, and check that correct operation takes place.

Touch panel compensation

- Condition that requires compensation

Touch panel compensation is required:

1 When the LCD unit is replaced

2 When the touch panel is replaced

3 When the touch panel control printed circuit board is replaced

4 Memory is all cleared.

- Parameter setting

	#7	#6	#5	#4	#3	#2	#1	#0
3113			DTPCL					

[Data type] Bit

#5 (DTPCL) The compensation function for the touch panel on the display is:

0 : Disabled

1 : Enabled

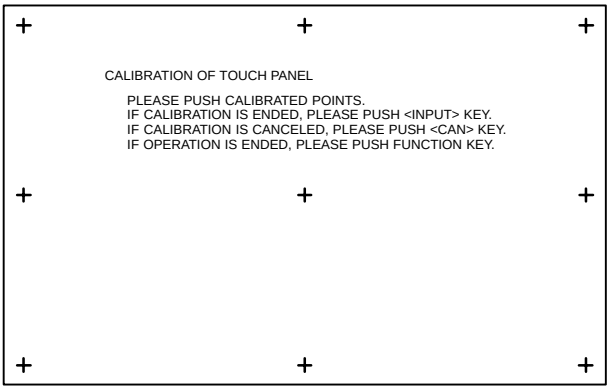
- Method of compensation

1 Set PRM3113#5 (DTPCL) to 1.

2 Press function key <SYSTEM>.

3 Pressing the continuous menu key several times displays soft key [TP CAL].

4 Pressing soft key [TP CAL] displays the touch panel compensation screen.



5 Press the nine compensation points (marked with +) with touch panel pen. You may press the nine points in any order. When you press a + mark correctly, the + mark blinks. When you press a + point incorrectly, the message “CALIBRATED POINT DOES NOT MATCH, PLEASE PUSH AGAIN.” appears.

6 After pressing all of the nine compensation points, press the <INPUT> key to terminate compensation. To cancel compensation or start all over again, press the <CAN> key.

7 Upon normal termination, the message “CALIBRATION WAS ENDED.” appears.

8 Pressing the function key exits from the touch panel compensation screen, and terminates or stops compensation operation.

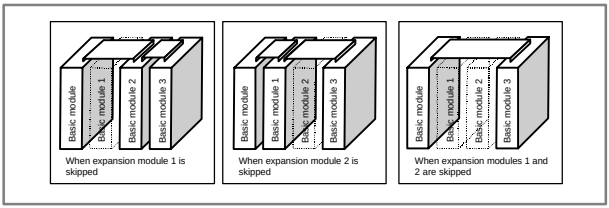
9 Upon termination of compensation operation, set PRM3113#5 (DTPCL) to 0.

NOTE Touch panel of the CNC display unit with PC functions is compensated by the exclusive program.

When compensating the touch panel for the *i*s series, select [Start] → [Settings] → [Control Panel] → [Adjusting Stylus], instead of using the above method.

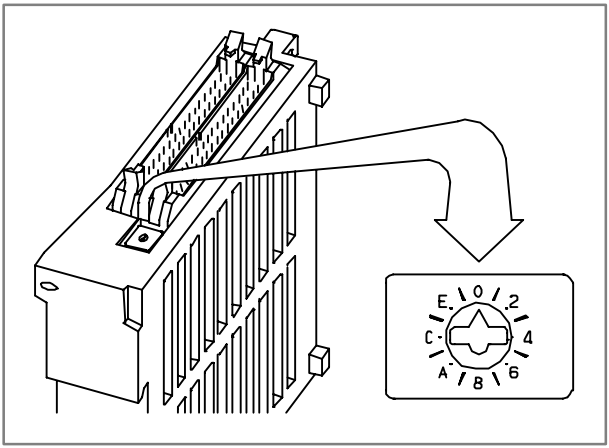
6.3.2 Distributed I/O setting

By changing the setting (rotary switch) on an expansion module, a connection can be made to skip an expansion module or expansion modules as shown below.



Method of setting (control and setting method)

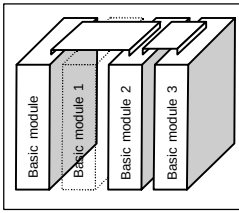
A control (rotary switch) is provided on the location shown below of each expansion module. When changing the setting, turn the rotary switch with a flat–blade screwdriver with a tip diameter of about 2.5 mm.



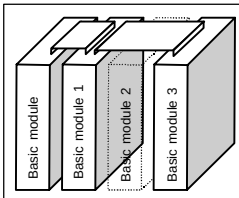
Each setting position of the rotary switch has the meaning as indicated below.

Setting position	Indication	Meaning of setting
0	0	Standard setting. The rotary switch is set to this position at the time of shipment from FANUC. This setting is not skipped an expansion module.
1	–	Set the rotary switch of an expansion module to this position when the one preceding expansion module is skipped.
2	2	Set the rotary switch of an expansion module to this position when the two preceding expansion mod-ules are skipped.
3	–	Setting prohibited
4 to F	4, –, 6, –, 8, –, A, –, C, –, E, –,	4, 8, or C has the effect of 0. 5, 9, or D has the effect of 1. 6, A, or E has the effect of 2. 7, B, or F has the effect of 3. (←setting prohibited)

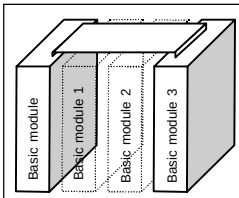
Examples of setting



(When expansion module 1 is skipped)
Set the rotary switch of expansion module 2 to setting position = 1. Do not change the setting (setting position = 0) of expansion module 3.



(When expansion module 1 and expansion module 2 are skipped)
Set the rotary switch of expansion module 3 to setting position = 2.



(When expansion module 2 is skipped)
Set the rotary switch of expansion module 3 to setting position = 1. Do not change the setting (setting position = 0) of expansion module 1.

6

This function was not available initially, but was recently added. This function became available, depending on the type of module, as indicated below.

Expansion module B (DI/DO = 24/16, without a manual pulse generator interface)	A03B–0815–C003	Available starting with shipment in June 1998 and later
Expansion module C (DO = 16, 24A output)	A03B–0815–C004	Available starting with shipment in August 1998 and later
Expansion module D (analog input)	A03B–0815–C005	Available starting with shipment in August 1998 and later

NOTE To expansion module A (DI/DO = 24/16, with a manual pulse generator interface) (A03B–0815–C002), a rotary switch is added as the other modules are modified. However, expansion module A is always installed at the location of expansion module 1, so that the setting of expansion module A need not be changed.

7.1 How to Enter the Parameters

(1) Enabling writing the parameters

1 Enter the MDI mode or emergency stop state.

2 Press the OFFSET SETTING key several times to display the handy screen for setting.

3 Move the cursor to the PARAMETER WRITE field and enter 1 and then INPUT.

4 Alarm 100 occurs. Press the CAN and RESET keys simultaneously to temporarily stop the alarm.

(2) Entering the parameters

1 Press the SYSTEM key on the MDI panel several times to select the parameter screen.

```
PARAMETER (SETTING)                          O1234 N12345

0000             SEQ                 INI   ISO   TVC
       0    0    0    0    0    0    0    0
0001                                       FCV
       0    0    0    0    0    0    0    0
0012  RMV                                        MIR
  X    0    0    0    0    0    0    0    0
  Y    0    0    0    0    0    0    0    0
  Z    0    0    0    0    0    0    0    0
  B    0    0    0    0    0    0    0    0
0020   I/O  CHANNEL                                0
                                   S      0   T0000

  REF  **** *** ***                10:15:30
[PARAM]   [DGNOS]   [PMC]   [SYSTEM]   [(OPRT)]
```

2 Pressing soft key [(OPRT)] displays the operation menu including the items below.

Enter a parameter number and press [NO.SRH] : Searches for the specified number.

Soft key [ON:1] : Sets the value at which the cursor is positioned to 1. (Only for bit parameters)

Soft key [OFF:0] : Sets the value at which the cursor is positioned to 0. (Only for bit parameters)

Soft key [+INPUT] : Adds the entered value to the value at which the cursor is positioned.

Soft key [INPUT] : Sets the value at which the cursor is positioned to the entered value.

Soft key [READ] : Inputs parameters from the reader/punch interface.

Soft key [PUNCH] : Outputs parameters to the reader/punch interface.

3 Convenient methods for entering data

3–1 To change data in units of bits

Pressing [←] or [→] changes the cursor to 1-bit size, which enables setting data in units of bits (only for bit parameters).

3–2 Use [EOB] to continuously set data starting from the cursor position.

(Example 1)

When [1] [2] [3] [4] [EOB] [4] [5] [6] [7] [EOB] [9] [9] [9] [9] [INPUT] is entered,

0		1234
0		4567
0	→	9999
0		0

(Example 2)

When [1] [2] [3] [4] [EOB] [EOB] [9] [9] [9] [9] [INPUT] is entered,

0		1234
0		0
0	→	9999
0		0

3–3 Use [=] to enter the same data.

(Example)

When [1] [2] [3] [4] [EOB] [=] [EOB] [=] [INPUT] is entered,

0		1234
0		1234
0	→	1234
0		0

3–4 For bit parameters

(Example)

When [1] [1] [EOB] [=] [EOB] [=] [INPUT] is entered,

0 0 0 0 0 0 0 0		0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0		0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0	→	0 0 0 1 1 0 0 0
0 0 0 0 0 0 0 0		0 0 0 0 0 0 0 0

4 After all necessary parameters are entered, reset the PARAMETER WRITE field to 0 on the SETTING screen.

7.2 Parameter List

Data Types and Valid Data Ranges of Parameters

Data Type	Valid data range
Bit	0 or 1
Bit axis	
Byte	–128 to 127 or 0 to 255
Byte axis	

Data Type	Valid data range
Word	–32768 to 32767
Word axis	
2–word	–99999999 to 99999999
2–word axis	

NOTE1 There is something to which the range of setting is limited depending on the parameter No.

NOTE2 A part of the parameter can be input with the setting screen.

NOTE3 In the description of a bit-type parameter, the explanation written at the left-hand side of a slash (/) corresponds to setting 0, and that at the right-hand side corresponds to setting 1.

NOTE4 <Axis> indicated at the right column in a parameter list shows that the corresponding parameters are specified for each axis.

NOTE5 “T series” in the right–side column of the parameter table indicates the parameters that can be used only in the T series. Similarly, “M series” indicates those that can be used only in the M series.

1) For setting (These parameters can be set at “Setting screen”.)

00000	Setting	
#0 TVC : #1 ISO : #2 INI : #5 SEQ :	TV check is not performed (0)/performed (1) Data output by EIA code (0)/by ISO code (1) Input increment by mm (0)/by inch (1) Automatic insertion of sequence No. is, not performed (0)/performed (1)	PRM3216
00001	Tape format	
#1 FCV :	FS16 standard (0)/FS15 Tape format (1)	
00002	Reference position returns, remote diagnosis	
#0 RDG :	Remote diagnosis is, not performed (0)/performed (1)	This parameter need not be set when a modem card is used
#7 SJZ :	For manual reference position return, deceleration dogs are used when a reference position is not established, and positioning is performed when a reference position is established (0)/deceleration dogs are used at all times (1)	M series PRM 1005#3=1
00012	Axis detaching, movement command, mirror image	<Axis>
#0 MIR : #4 AIC : #7 RMV :	Setting of mirror image for each axis is OFF (0)/ON (1) An axis–specified travel distance, follows a specified address (0)/is incremental at all times (1) Detach of the each axis is not performed (0)/performed (1)	PRM 1005#7 T series

00020	Selection of an input/output device or selection of input device in the foreground	PRM110#0

Setting value Description (I/O device selected)

- 0 Channel 0 (RS–232–C serial port 1)
- 1 Channel 1 (RS–232–C serial port 1)
- 2 Channel 2 (RS–232–C serial port 2)
- 3 Remote buffer
- 4 Memory card
- 5 Data server
- 6 The DNC operation is performed or M198 is specified by FOCAS1/Ethernet or DNC1/Ethernet.
- 10 DNC1/DNC2 interface, OSI Ethernet
- 12 DNC1 interface #2
- 15 M198 is specified by FOCAS1/HSSB. (PRM8706#1=1)
- 16 The DNC operation is performed or M198 is specified by FOCAS1/HSSB (port 2).
- 20 to 35 Data is transferred between the CNC and a power mate CNC in group n (n: 0 to 15) via the FANUC I/O Link. [Setting value 20 → Group 1]

Related parameter list

Setting value	Common setting	Output format	Specification number	Transfer rate	Transfer method	Connector
0	PRM100	PRM101	PRM102	PRM103	Not set	JD36A
1		PRM111	PRM112	PRM113		
2		PRM121	PRM122	PRM123		JD36B
3 Remote buffer		PRM131	PRM132	PRM133	PRM135 #3=0 #3=1	JD28A (RS–232–C) JD6A (RS–422)

00021	Setting of the output device in the foreground	PRM110#0
00022	Setting of the input device in the background	PRM110#0
00023	Setting of the output device in the background	PRM110#0
00024	Port for communication with the PMC ladder development tool (FAPT LADDER–III)	

- 0 : According to the setting on the PMC online screen
- 1 : RS–232–C serial port 1 (JD36A)
- 2 : RS–232–C serial port 2 (JD36B)
- 10 : High–speed interface (HSSB(COP7) or Ethernet)
- 11 : High–speed interface or RS–232–C serial port 1
- 12 : High–speed interface or RS–232–C serial port 2

2) For reader/puncher interface

00100	Common to each channel	
#1 CTV : TV check in the comment section of a program is performed (0)/not performed (1) #2 CRF : When an EOB is output by ISO code, the setting of PRM100#3 (NCR) is followed (0)/CR and LF are used (1) #3 NCR : When output EOB by ISO code, LF, CR, CR (0)/CR output (1) #5 ND3 : DNC operation is performed to read blocks one by one (0)/until the buffer becomes full (1). #6 IOP : Input/output of an NC program is stopped by resetting the CNC (0)/by pressing the [STOP] soft key (1). #7 ENS : Reading of data by EIA code, if NULL code is red in the data, ignore it (0)/make alarm (1)		ALM001
00101	Parameter relating to CHANNEL 1 (I/O CHANNEL=0)	
#0 SB2 : Number of stop bit is 1 bit (0)/2 bits (1) #1 HAD : The alarm issued on a built–in Handy File, is ALM86 (0)/provides a detail indication (1) #3 ASI : Data input by EIA or ISO code (0)/ASCII code (1) #7 NFD : FEED before & after of data is output (0)/not output (1)		M series
00102	Spec. No. of I/O devices of CHANNEL 1 (I/O CHANNEL=0)	
0 : RS-232-C (Used control codes DC1 to DC4) 1 : CASSETTE B1/B2 (Bubble cassette) 2 : FLOPPY CASSETTE ADAPTER F1 3 : PROGRAM FILE Mate, FA Card, FSP-H, FLOPPY CASSETTE, Handy File 4 : RS-232-C (Control codes DC1 to DC4 are not used.) 5 : PORTABLE TAPE READER 6 : PPR, FSP-G, FSP-H		
00103	Baud rate setting of CHANNEL 1 (I/O CHANNEL=0)	
1 : 50 bps 7 : 600 bps 2 : 100 bps 8 : 1200 bps 3 : 110 bps 9 : 2400 bps 4 : 150 bps ☆ 10 : 4800 bps 5 : 200 bps 11 : 9600 bps 6 : 300 bps 12 : 19200 bps		
00110	Separate control of I/O channel number	
#0 IO4 : Separate control of I/O channel numbers is, not performed(0)/performed(1)		PRM20 to 23

00111	Parameter relating to CHANNEL 1 (I/O CHANNEL=1)	PRM101
00112	Spec. No. of I/O devices of CHANNEL 1 (I/O CHANNEL=1)	PRM102
00113	Baud rate setting of CHANNEL 1 (I/O CHANNEL=1)	PRM103
00121	Parameter relating to CHANNEL 2 (I/O CHANNEL=2)	PRM101
00122	Spec. No. of I/O devices of CHANNEL 2 (I/O CHANNEL=2)	PRM102
00123	Baud rate setting of CHANNEL 2 (I/O CHANNEL=2)	PRM103
00131	Parameter relating to CHANNEL 3 (I/O CHANNEL=3)	PRM101
00132	Spec. No. of I/O devices of CHANNEL 3 (I/O CHANNEL=3)	PRM102
00133	Baud rate setting of CHANNEL 3 (I/O CHANNEL=3)	PRM103
00134	Remote buffer	
#1 PRY : Without parity bit (0)/With parity bit (1) #2 SYN : "SYN", "NAK" code in protocol B is not controlled (0)/controlled (1) #4 NCD : CD (Signal quality detection) of RS-232-C interface, checked (0)/not checked (1) #5 CLK : Baud rate clock of RS-422 interface is used, inner clock (0)/outer clock (1)		
00135	Remote buffer	
#0 ASC : Communication code except of NC data is ISO code (0)/ASCII code (1) #1 ETX : The END CODE for protocol A is, CR code (0)/ EXT code (1) in ASCII/ISO #2 PRA : Communication protocol is B (0)/A (1) #3 R42 : Interface is, RS-232-C (0)/RS-422 (1) #7 RMS : In case of extended protocol A, the byte location of SAT data part is, usually not appointed 0 (0)/ send back unconditionally (1)		

00138	Memory card I/O, loader I/O	
#0 MDP :	To a file name output in memory card input/output operation, path information is, not added (0)/added (1) Example: When parameters are output 1st path = CNCPARAM.DAT (same as when this parameter = 0) 2nd path = CNCPARAM.P–2 Loader = CNCPARAM.P–L	PRM20=4
#1 FNL :	In data output by RS–232C of the loader control function, the series information is, not added to the output file name(0)/added to the output file name(1)	
#7 MDN :	The DNC operation function by a memory card is, disabled(0)/enabled(1)	PRM20=4

3) For DNC1/DNC2 interface

00140	DNC2 interface	Dedicated to the DNC2 interface
#0 BCC : #2 NCE : #3 ECD :	A BCC value is checked (0)/not checked (1) The ER (RS–232C) and TR (RS422) signals are, checked(0)/not checked(1) To a negative response, a hexadecimal four–digit error code is added (0)/no error code is added (1)	
00141	System for connection between the CNC and host (DNC1 interface) (1: PTP, 2: Multi-point)	
00142	Station address of the CNC (DNC1 interface) (2 to 52)	
00143	Time limit specified for the timer monitoring a response (1 to 60) [sec]	
00144	Time limit specified for the timer monitoring the EOT signal (1 to 60) [sec]	
00145	Time required for switching RECV and SEND (1 to 60) [sec]	
00146	Number of times the system retries holding communication (1 to 10) [Number of times]	
00147	Number of times the system sends the message in response to the NAK signal (1 to 10) [Number of times]	
00148	Number of characters in overrun (10 to 255) [Characters]	
00149	Number of characters in the data section of the communication packet (80 to 256) [Characters]	

4) For M–NET interface

00161	Communication method	
#2 SRL : #4 SRP : #5 PEO : #7 SRS :	The serial interface character consists of 7 bits (0)/8 bits (1). A vertical parity check is not made (0)/made (1). Vertical parity is based on odd parity (0)/even parity (1). The number of stop bits is 1 (0)/2 (1).	When PRM161#4 =1
00171	Number of data items transferred from the PLC to CNC (1 to 32).	
00172	Number of data items transferred from the CNC to PLC (1 to 32).	
00173	Station address (1 to 15)	
00174	Baud rate	
1 : 2400 3 : 9600 5 : 38400 7 : 76800 [bps] 2 : 4800 4 : 19200 6 : 57600		
00175	Monitoring timer used from the completion of local station connection preparation sequence to the start of a normal sequence	1–32767 [msec]
00176	Polling time monitoring timer	
00177	Monitoring timer used from the start of SAI transmission to the end of BCC transmission	
00178	Timer used from the completion of reception to the start of transmission	

5) For remote diagnosis

00200	Remote diagnosis	PRM2#0
#0 SB2 : #1 ASC : #2 NCR : #6 MCB :	The number of stop bits is, 1(0)/2(1) The code to be used for data output is, ISO code(0)/ASCII code(1) EOB (end of block) is output as, ”LF” ”CR” ”CR”(0)/just as ”LF”(1) The baud rate setting for data input/output between the modem card and CNC is, 9600 bps (fixed)(0)/determined by the setting of PRM203(1)	=0 =1 =1

00203	Baud rate of remote diagnosis	PRM200#6
When using an RS–232C serial port (PRM200#6=0) 1 : 50bps 2 : 100bps 3 : 110bps 4 : 150bps 5 : 200bps 6 : 300bps 7 : 600bps 8 : 1200bps 9 : 2400bps 10 : 4800bps 11 : 9600bps 12 : 19200bps When using a modem card (PRM200#6=1) 1 : 28800bps 2 : 38400bps 3 : 57600bps 4 : – 5 : – 6 : 300bps 7 : 600bps 8 : 1200bps 9 : 2400bps 10 : 4800bps 11 : 9600bps 12 : 19200bps		
00204	Channel of remote diagnosis	
0 : RS-232-C serial port 1 (Channel 1) 1 : RS-232-C serial port 1 (Channel 1) 2 : RS-232-C serial port 2 (Channel 2)		
00211	Password 1 for remote diagnosis	PRM221
00212	Password 2 for remote diagnosis	PRM222
00213	Password 3 for remote diagnosis	PRM223
00221	Keyword 1 for remote diagnosis	PRM211
00222	Keyword 2 for remote diagnosis	PRM212
00223	Keyword 3 for remote diagnosis	PRM213

6) For DNC1 interface #2

00231	Output format for DNC1 interface #2	PRM101
00233	Baud rate for DNC1 interface #2	PRM103
00241	System for connection between the CNC and host (DNC1 interface #2) (1 : PTP, 2 : Multi–point)	
00242	Station address of the CNC (DNC1 interface #2) (2 to 52)	

7) For CNC screen display function

00300	CNC screen display function, memory card interface	
#0 PCM :	When a memory card interface is provided on the NC side (HSSB connection), and the CNC screen display function is activated, the memory card on the NC side is used (0)/the memory card interface on the personal computer side is used (1)	(When this parameter is set to 0, the setting of PRM20 is used.)

8) For FACTOLINK

00801	Communication format for the FACTOLINK	
#0 SB2 : The number of stop bits is: 1 bit (0)/2 bits (1)		
00802	Communication channel for the FACTOLINK	
00803	Communication baud rate for the FACTOLINK	
00810	Display the FACTOLINK	
#0 BGS : When the FACTOLINK screen is not displayed, alarm task communication is, not activated(0)/activated(1) #1 FAS : When the Answer or AnswerEx command is used with the FACTOLINK, the answer column, displays answer number "A01." (0)/does not display answer number "A01." (1) #2 FCL : The FACTOLINK clock is, not displayed in reverse video(0)/displayed in reverse video(1) #3 FYR : In the FACTOLINK clock display, years in the 01/01/23 00:00 format are represented, by a two–digit number(0)/by a four–digit number(1) #4 FTM : The FACTOLINK clock is displayed in this format, "Wed Nov 12 00:00:00"(0)/"02/11/12 00:00:00"(1) #5 FAS : The FACTOLINK screen is displayed, in color(0)/with two levels of gray(1)		PRM810#4
00811	Logging type for the FACTOLINK	
00812	PMC address of logging data for the FACTOLINK	
00813	Logging data length for the FACTOLINK	
00814	Logging wait address for the FACTOLINK	
00815	FACTOLINK logging data transmission interval	
00820	FACTOLINK device address (1)	
00821	FACTOLINK device address (2)	
00822	FACTOLINK device address (3)	
00823	FACTOLINK device address (4)	
00824	FACTOLINK device address (5)	
00825	FACTOLINK device address (6)	
00826	FACTOLINK device address (7)	
00827	FACTOLINK device address (8)	
00828	FACTOLINK device address (9)	

9) For data server

00900	Data server function	
#0 DSV : The data server function is enabled (0)/ disabled (1) #1 ONS : When the O number of the data server file name and the O number in an NC program do not match: file name (0)/NC program (1)		
00911	Alternate MDI character	
00912	Character not provided in MDI keys	
00921	OS selected for host computer 1 of data server	
00922	OS selected for host computer 2 of data server	
00923	OS selected for host computer 3 of data server	
0 : Windows®95/98/NT 1 : UNIX,VMS		
00924	Latency setting for DNC1/Ethernet or FOCAS1/Ethernet [msec]	

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10) For Ethernet

00931	Special character code corresponding to soft key [CHAR–1]	
00932	Special character code corresponding to soft key [CHAR–2]	
00933	Special character code corresponding to soft key [CHAR–3]	
00934	Special character code corresponding to soft key [CHAR–4]	

00935	Special character code corresponding to soft key [CHAR–5]	

When entering a user name, password, login DIR and so forth, use these codes for those characters that cannot be entered through the MDI keys. The special character codes correspond to ASCII codes.

Sample special character codes

Special character	Code	Special character	Code	Special character	Code
Blank	32	)	41	<	60
!	33	*	42	>	62
"	34	+	43	?	63
#	35	,	44	@	64
$	36	–	45	[	91
%	37	.	46	^	92
&	38	/	47	¥	93
'	39	:	58	]	94
(	40	;	59	–	95

11) For power mate CNC manager

00960	Power mate CNC manager	

#0 SLV : When the power mate CNC manager is selected, the screen displays: one slave (0)/divided into four (1)

#1 MD1 :
#2 MD2 :

MD2	MD1	Input/output destination
0	0	Part program storage
0	1	Memory card

In either case, slave parameters are output in program format.

#3 PMN : The power mate CNC manager function is: enabled (0)/disabled (1)

12) For axis control, increment system

01001	Least input increment	

#0 INM : Least command increment on linear axis is, metric system (0)/inch system (1)

<table>
<tr><td>01002</td><td>Reference position return, number of simultaneous controlled axis in manual operation</td><td></td></tr>
<tr><td colspan="2">#0 JAX : Number of simultaneous controlled axis in manual operation is, 1 axis (0)/3 axis (1)
#1 DLZ : Reference position return function without dog is, disable (0)/enable (all axes) (1)
#2 SFD : The reference position shift function is, not used (0)/used (1).
#3 AZR : For G28, specified when a reference position has not yet been established, deceleration dogs are used (0)/ALM90 is issued (1).
#4 XIK : When an axis-by-axis interlock signal is applied during nonlinear positioning, only the interlock axis is stopped (0)/all axes are stopped (1).
#7 IDG : When the reference position is set without dogs, automatic setting of the PRM1012#0 is: not performed (0)/ performed (1)</td><td>PRM 1005#1
M series</td></tr>
<tr><td>01004</td><td>Least input increment</td><td></td></tr>
<tr><td colspan="2">#0 ISA :
#1 ISC :
<table>
<tr><th>ISC</th><th>ISA</th><th>CODE</th><th>Least input increment</th></tr>
<tr><td>0</td><td>1</td><td>IS–A</td><td>0.01 mm or 0.01 deg</td></tr>
<tr><td>0</td><td>0</td><td>IS–B</td><td>0.001 mm or 0.001 deg</td></tr>
<tr><td>1</td><td>0</td><td>IS–C</td><td>0.0001 mm or 0.0001 deg</td></tr>
</table>
#7 IPR : Least input increment of each axis is set to 1 time (0)/10 times (1) as of least command increment</td><td>M series</td></tr>
<tr><td>01005</td><td>Controlled axis detach, external deceleration, reference position return</td><td><Axis></td></tr>
<tr><td colspan="2">#0 ZRN : A command is issued in automatic operation before a return to reference position has not been performed since the power was turned on, an alarm is generated (0)/alarm is not generated (1)
#1 DLZ : Function for setting the reference position without dogs disabled (0)/enabled (1)
#3 HJZ : For manual reference position return when a reference position is established, deceleration dogs are used (0)/the setting of PRM2#7 is followed.
#4 EDP : External deceleration in the positive (+) direction is applicable to rapid traverse (0)/ rapid traverse and cutting feed (1).
#5 EDM : External deceleration in the negative (–) direction is applicable to rapid traverse (0)/ rapid traverse and cutting feed (1).
#6 MCC : At axis removal, the MCC is turned off (0)/only motor activation is turned off (1).
#7 RMB : Setting to detach of axis control for each axis is not effective (0)/effective (1)</td><td>PRM 1002#1
M series
PRM1426, 1427
PRM1426, 1427
PRM 0012#7</td></tr>
</table>

<table>
<tr><td>01006</td><td colspan="3">Controlled axes</td><td><Axis></td></tr>
<tr><td>#0 ROT :
#1 ROS :</td><td colspan="3"><table>
<tr><th>ROSx</th><th>ROTx</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>Linear axis
(1) Inch/metric conversion is done.
(2) All coordinate values are linear axis type. (Is not rounded in 0 to 360°)
(3) Stored pitch error compensation is linear axis type (Refer to PRM3624)</td></tr>
<tr><td>0</td><td>1</td><td>Rotation axis (A type)
(1) Machine coordinate values are rounded in 0 to 360°. Absolute coordinate values are rounded or not rounded by PRM1008#0, #2.</td></tr>
<tr><td>1</td><td>0</td><td>Setting is invalid (unused)</td></tr>
<tr><td>1</td><td>1</td><td>Rotation axis (B type)
(1) Machine coordinate values, absolute coordinate values and relative coordinate values are linear axis type. (Is not rounded in 0 to 360°)</td></tr>
</table></td><td></td></tr>
<tr><td>#3 DIA :
#5 ZMI :</td><td colspan="3">The command of amount of travel for each axis is made by radius (0)/diameter (1)
Initial set for direction of reference position return and backlash compensation is, + direction (0)/ – direction (1)</td><td>T series</td></tr>
<tr><td>01007</td><td colspan="3">Command of rotation axis</td><td></td></tr>
<tr><td>#3 RAA :</td><td colspan="3">Absolute commands for a rotation axis conform to bit 1 of PRM1008#1 (0)/the end point coordinate is the absolute value of the command value while the rotation direction is determined from the sign of the command value (1).</td><td>Rotary axis control</td></tr>
</table>

01008	Setting of rotation axis	<Axis>
#0 ROA : The roll over function of a rotation axis is invalid (0)/valid (1) #1 RAB : In the absolute commands, the axis rotates in the direction in which the distance to the target is longer (0)/shorter (1) #2 RRL : Relative coordinates are not rounded by the amount of the shift per one rotation (0)/are rounded by the amount of the shift per one rotation (1) #3 RAA : The rotation direction and end point coordinates specified by an absolute command follow the setting of #1 (0)/the end point coordinates are represented by the absolute values of specified values, and the direction is represented by the sign of the specified values (1).		PRM 1006#0=1 PRM1260 Rotary axis control
01010	Setting of number of CNC controlled axis (1 to number of controlled axes)	
01012	Reference position again	<Axis>
#0 IDGx: The function for setting the reference position again, without dogs, is, not inhibited (0)/ inhibited (1)		PRM 1002#7
01015	Inch/metric conversion, reference position return, simple synchronous control	<Axis>
#0 NOA : When the machine is not positioned at the reference position along all axes at inch/metric conversion, no alarm is generated(0), ALM092 is generated(1) #1 NOL : After inch/metric conversion, the movement from the center point according to the first G28 command for the rotation axis is, same as for the manual reference position(0)/to the reference position at the rapid traverse rate(1) #2 OKI : After completion of reference position return in butt–type reference position setting ALM000 is, generated(0)/not generated(1) → #2 = 1, butt–type reference position setting is made usable even when the detector is not an absolute–position detector. #3 RHR : After increment system (inch/metric) switching, for the rotation axis, the first G28 command causes reference position return, at a low speed(0)/at a high speed(1) #4 ZRL : For high–speed reference position return according to G28, second to fourth reference position return according to G30, and G53 command, non–linear type positioning is performed(0)/linear type positioning is performed(1) #5 SVS : When the servo along an axis is turned off, simple synchronous control is, released(0)/not released(1)		PRM 1401#1=1 (#4 ZRL) T series (#5 SVS)

01020	Setting of name of each axis used for programming	
	X : 88 Y : 89 Z : 90 A : 65 B : 66 C : 67 U : 85 V : 86 W : 87	<Axis> PRM3405 for T series
01022	Setting of each axis in the basic coordinate system	<Axis>
	0 : Neither the basic three axes nor a parallel axis 1 : X axis of the basic three axes 2 : Y axis of the basic three axes 3 : Z axis of the basic three axes 5 : Axis parallel to the X axis 6 : Axis parallel to the Y axis 7 : Axis parallel to the Z axis	
01023	Setting of axis number for each servo axis (1 to No. of controlled axis)	<Axis>

13) For coordinate system

01201	Coordinate system	
#0 ZPR :	When manual reference position return is performed the automatic coordinate system is not set (0)/set automatically (1) when a workpiece coordinate system option is not provided	
#1 ZPI :	The coordinate value of automatic coordinate system is set PRM1250 (0)/PRM1250, 1251 (1)	PRM1250, 1251
#2 ZCL :	When manual reference position return is performed the local coordinate system is, not canceled (0)/canceled (1)	
#3 FPC :	When the floating reference position is set, the relative position display is not preset (0)/is preset (1)	
#5 AWK :	When to change workpiece origin offset, value is changed from preprocessing step (0)/ changed immediately (1)	
#7 WZR :	Upon reset, the workpiece coordinate system is not returned (0)/returned (1) to that specified with G54	T series

01202	Workpiece origin offset	
#0 EWD : #1 EWS : #2 G50 : #3 RLC : #4 G52 :	The shift direction of the external workpiece origin offset is the same as the sign (0)/ opposite to the sign (1). The meanings of the workpiece shift value and external workpiece origin offset value are the same (0)/different (1). When the workpiece coordinate system function is selected, coordinate system setting is executed (0)/an alarm is issued (1). Upon reset, the local coordinate system is not canceled (0)/canceled (1). In local coordinate system setting (G52), a cutter compensation vector is not considered (0)/considered (1)	T series T series ALM010 T series M series
01203	Extended external machine zero point shift, 3–dimensional coordinate system conversion	
#0 EMC : #4 WZP : #5 3DW :	The extended external machine zero point shift function is, disabled (0)/enabled (1) In the three–dimensional coordinate conversion mode, a modification to the workpiece coordinate system from the MDI is, not prohibited (0)/prohibited (1) If any of G54 to G59, G54.1, G50 (T series), G92 (M series), and G52 is used in the three–dimensional coordinate conversion mode, ALM049 alarm is issued (0)/no alarm is issued (1)	
01220	Offset of the external workpiece origin	<Axis>
01221	Offset of the workpiece origin in workpiece coordinate system 1 (G54) [Increment system]	<Axis> (These parameters can be set at “Offset screen”.)
01222	Offset of the workpiece origin in workpiece coordinate system 2 (G55) [Increment system]	
01223	Offset of the workpiece origin in workpiece coordinate system 3 (G56) [Increment system]	
01224	Offset of the workpiece origin in workpiece coordinate system 4 (G57) [Increment system]	
01225	Offset of the workpiece origin in workpiece coordinate system 5 (G58) [Increment system]	
01226	Offset of the workpiece origin in workpiece coordinate system 6 (G59) [Increment system]	

01240	Coordinate value of the first reference position on each axis in the machine coordinate system [Increment system]	<Axis>
01241	Coordinate value of the second reference position on each axis in the machine coordinate system [Increment system]	<Axis>
01242	Coordinate value of the third reference position on each axis in the machine coordinate system [Increment system]	<Axis>
01243	Coordinate value of the fourth reference position on each axis in the machine coordinate system [Increment system]	<Axis>
01244	Coordinate value of the floating reference position [Increment system]	<Axis> Set automatically
01250	Coordinate value of the reference position used when automatic coordinate system setting is performed (mm input) [Increment system]	<Axis> PRM 1201#1=0
01251	Coordinate value of the reference position on each axis used for setting a coordinate system automatically when input is performed in inches [Increment system]	<Axis> PRM 1201#1=1
01260	The amount of travel per rotation [Increment system]	<Axis>
01280	First address of the signal group used by the external machine zero point shift extension	(R signal)
01290	Distance between two opposed tool posts in mirror image [Increment system]	T series

14) For stored stroke check

01300	Stored stroke check	
#0 OUT :	An inhibition area of the second stored stroke check is set, inside (0)/outside (1)	
#1 NAL :	Specifies whether to issue an alarm related to stored stroke check 1, as follows, to issue an alarm(0)/not to issue an alarm; the stroke limit reached signal <F124> or <F126> is output (1)	(for manual operation)
#2 LMS :	The EXLM signal for switching stored stroke check is disable (0)/enable (1)	PRM1320, 1321, 1326, 1327
#5 RL3 :	Stored stroke check3 release signal RLSOT3 is disabled (0)/enabled (1)	
#6 LZR :	The stored stroke check are checked during the time from power-on to manual return to the reference position (0)/not checked (1)	
#7 BFA :	When a command that exceeds a stored stroke check is issued, an alarm is generated after the stroke check is exceeded (0)/before the check is exceeded (1)	

01301	Stored stroke check performed before movement	
#0 DLM : #2 NPC : #3 OTA : #4 OF1 : #5 OTS : #7 PLC :	The stored stroke limit switching signals <G104, G105> for each axial direction is, disabled(0)/enabled(1) As part of the stroke limit check performed before movement, the movement specified in G31 (skip) and G37 (automatic tool length measurement (for M series) or automatic tool compensation (for T series)) blocks is checked (0)/not checked (1) If the tool is already in the prohibited area at power–up (or when the conditions of interference check are satisfied), an alarm of stored stroke check 2 (inside), stored stroke limit 3, or interference check is, not raised before a movement is made(0)/immediately raised(1). If the tool is moved into the range allowed on the axis after OT alarm is raised by stored stroke check 1, the alarm is not canceled before a reset is made(0)/the OT alarm is immediately canceled(1) If the stored stroke limit alarm is issued when PRM1300#7 is set to 1, the stop position on the axis is, before the boundary (0)/on the boundary (1) (The manual linear/circular interpolation option is required.) Stored stroke check before movement is not performed (0)/performed (1)	M series
01310	Stored stroke check	<Axis>
#0 OT2 : #1 OT3 :	Stored stroke check 2 for each axis is, not checked (0)/ checked (1) Stored stroke check 3 for each axis is, not checked (0)/checked (1)	
01320	Coordinate value I of stored stroke check 1 in the positive direction on each axis [Increment system]	<Axis>
01321	Coordinate value I of stored stroke check 1 in the negative direction on each axis [Increment system]	<Axis>
01322	Coordinate value of stored stroke check 2 in the positive direction on each axis [Increment system]	<Axis>
01323	Coordinate value of stored stroke check 2 in the negative direction on each axis [Increment system]	<Axis>
01324	Coordinate value of stored stroke check 3 in the positive direction on each axis [Increment system]	<Axis>

01325	Coordinate value of stored stroke check 3 in the negative direction on each axis [Increment system]	<Axis>
01326	Coordinate value II of stored stroke check 1 in the positive direction on each axis (EXLM signal = 1)	<Axis> PRM 1300#2=1
01327	Coordinate value II of stored stroke check 1 in the negative direction on each axis (EXLM signal = 1)	<Axis> PRM 1300#2=1

15) For chuck and tailstock barrier

01330	Profile of a chuck 0 : Holds a workpiece on the inner surface. 1 : Holds a workpiece on the outer surface.	T series
01331	Dimensions of the claw of a chuck (L) [Increment system]	T series
01332	Dimensions of the claw of a chuck (W) [Increment system]	T series
01333	Dimensions of the part of a claw at which a workpiece is held (L1) [Increment system]	T series
01334	Dimensions of the part of a claw at which a workpiece is held (W1) [Increment system]	T series
01335	Chuck position CI along the X-axis (workpiece coordinate system) [Increment system]	T series
01336	Chuck position CZ along the Z-axis (workpiece coordinate system) [Increment system]	T series
01341	Length of a tailstock (L) [Increment system]	T series
01342	Diameter of a tailstock (D) [Increment system]	T series
01343	Length of a tailstock (L1) [Increment system]	T series
01344	Diameter of a tailstock (D1) [Increment system]	T series
01345	Length of a tailstock (L2) [Increment system]	T series
01346	Diameter of a tailstock (D2) [Increment system]	T series
01347	Diameter of the hole of a tailstock (D3) [Increment system]	T series
01348	Z coordinate of a tailstock (TZ) (Workpiece coordinate system) [Increment system]	T series

16) For feedrate

01401	Feedrate	
#0 RPD : #1 LRP : #2 JZR : #4 RF0 : #5 TDR : #6 RDR :	Manual rapid traverse before the completion of return to reference position is disable (0)/ enable (1) Positioning (G00) is nonlinear (0)/linear (1). Manual return to the reference position at Jog feedrate is not performed (0)/performed (1) When cutting feedrate override is 0% during rapid traverse, the machine tool does not stop moving (0)/stops moving (1) Dry run during thread cutting and canned cycle (G74, G84) is enable (0)/disable (1) Dry run for rapid traverse command is, disable (0)/enable (1)	T series
01402	Manual feed per revolution	
#0 NPC : #1 JOV : #3 OV2 : #4 JRV :	The feed per rotation command is ineffective when a position coder is not provided (0)/ provided (1) Job override is, enabled(0)/disabled (tied to 100%)(1) The secondary feedrate override value is 1% (0)/0.01% (1). Manual continuous feed (jog feed) is performed at feed per minute (0)/at feed per rotation (1)	T series
01403	Units used for feed per minute, threading retract	T series
#0 MIF : #7 RTV :	The unit of F for feed per minute is [mm/min] (0)/0.001 [mm/min] (1). Overriding during threading retraction is enabled (0)/disabled (1).	

01404	Helical interpolation, reference position return	
#0 HFC : #1 DLF : #2 F8A : #3 FRV : #5 EDR : #7 FC0 :	The feedrate for helical interpolation is: clamped along an arc and linear axis (0)/along an arc and linear axis (1) After a reference position has been established, a manual reference position return operation is performed at the rapid traverse rate (PRM1420) (0)/at the manual rapid traverse rate (PRM1424) (1). With inch input, Valid data range for an F command in feed per minute mode 9600 deg/min (0)/24000 deg/min (1) For inch input, the valid range of the feedrate specified for feed per revolution is: F9.999999 inches per revolution (0)/F50.000000 inches per revolution (1) The external deceleration speed in liner interpolation type positioning is set in, PRM1426(0)/PRM1427, for the first axis(1) If a cutting block with a feedrate (F command) of 0 is specified in automatic operation, ALM11 alarm is issued, and the block is not executed (0)/the block is executed at a feedrate of 0 (1)	PRM1422, 1430 T series
01408	Feedrate of rotation axis	<Axis>
#0 RFD :	The feedrate about a rotation axis is controlled, in the usual method(0)/by converting the rotation speed about the rotation axis into the travel speed on the circumference of a virtual circle(1) (Set the radius of the virtual circle in PRM1465.)	M series
01410	Dry run rate (feedrate of jog override is 100%) The jog feedrate for manual linear or circular interpolation [mm/min]	
01411	Cutting feedrate in the automatic mode at power-on [mm/min]	M series
01414	Feedrate for reverse movement by the retrace function [mm/min]	M series 0: Programmed command
01420	Rapid traverse rate for each axis (Rapid traverse override is 100%) [mm/min]	<Axis>
01421	F0 rate of rapid traverse override for each axis [mm/min]	<Axis>
01422	Maximum cutting feedrate [mm/min]	PRM1430
01423	Manual continuous feedrate for each axis (jog feedrate) [mm/min]	<Axis>
01424	Manual rapid traverse rate for each axis If 0 is set, the rate set in PRM1420 is assumed [mm/min]	<Axis> PRM1420

<table>
<tr><td>01425</td><td>FL rate of return to the reference position for each axis [mm/min]</td><td><Axis></td></tr>
<tr><td>01426</td><td>External deceleration rate of cutting feed for each axis [mm/min]</td><td rowspan="2"><Axis>
PRM 1005#4, 5</td></tr>
<tr><td>01427</td><td>External deceleration rate of rapid traverse for each axis [mm/min]</td></tr>
<tr><td>01428</td><td>Feedrate for reference position return before establishing reference position [mm/min]
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Before a reference position is set</td><td colspan="2">After a reference position is set</td></tr>
<tr><td>Feedrate for reference position return</td><td>Disabled</td><td>Enabled</td><td>Disabled</td><td>Enabled</td></tr>
<tr><td colspan="2">G28
G00</td><td>PRM1420</td><td rowspan="2">PRM1428</td><td colspan="2">PRM1420</td></tr>
<tr><td rowspan="2">Manual reference position return</td><td>Without dogs</td><td rowspan="2">PRM1424</td><td colspan="2">PRM1420 or PRM1424*2</td></tr>
<tr><td>With dogs</td><td>PRM1424</td><td>PRM1428</td></tr>
<tr><td colspan="2">Manual raped traverse</td><td colspan="2">PRM1423 or PRM1424*1</td><td colspan="2">PRM1424</td></tr>
</table>
*1 To be selected with bit 0 of PRM1401
*2 To be selected with bit 1 of PRM1404</td><td><Axis>
M series</td></tr>
<tr><td>01430</td><td>Maximum cutting feedrate for each axis [mm/min]</td><td><Axis>
M series
PRM1422</td></tr>
<tr><td>01431</td><td>Maximum cutting feedrate for all axes in the advanced preview control mode [mm/min]</td><td>M series</td></tr>
<tr><td>01432</td><td>Maximum cutting feedrate for each axis in the advanced preview control mode [mm/min]</td><td><Axis>
M series
PRM1431</td></tr>
<tr><td>01450</td><td>Change of feedrate for one graduation on the manual pulse generator during F1 digit feed
$\Delta F = \frac{\text{Fmax1 or Fmax2}}{100} \times (\text{PRM1450})$
Fmax1=PRM1460
Fmax2=PRM1461</td><td>M series</td></tr>
<tr><td>01451</td><td>Feedrate for F1 digit command F1 [0.1mm/min]</td><td rowspan="9">M series
These parameters can be set at “setting screen”.
It is possible to increase and decrease according to F1D signal.</td></tr>
<tr><td>01452</td><td>Feedrate for F1 digit command F2 [0.1mm/min]</td></tr>
<tr><td>01453</td><td>Feedrate for F1 digit command F3 [0.1mm/min]</td></tr>
<tr><td>01454</td><td>Feedrate for F1 digit command F4 [0.1mm/min]</td></tr>
<tr><td>01455</td><td>Feedrate for F1 digit command F5 [0.1mm/min]</td></tr>
<tr><td>01456</td><td>Feedrate for F1 digit command F6 [0.1mm/min]</td></tr>
<tr><td>01457</td><td>Feedrate for F1 digit command F7 [0.1mm/min]</td></tr>
<tr><td>01458</td><td>Feedrate for F1 digit command F8 [0.1mm/min]</td></tr>
<tr><td>01459</td><td>Feedrate for F1 digit command F9 [0.1mm/min]</td></tr>
</table>

01460	Upper limit of feedrate for F1 digit command (F1 to F4) [mm/min]	M series
01461	Upper limit of feedrate for F1 digit command (F5 to F9) [mm/min]	
01465	Virtual radius for feedrate about rotation axis [Increment system]	M series PRM 1408#0

17) For acceleration/deceleration control

01601	Acceleration/deceleration control	
#2 OVB :	Cutting feed block overlap is not performed (0)/ is performed (1).	M series
#4 RTO :	Block overlap in rapid traverse is not performed (0)/performed (1)	PRM1722
#5 NCI :	Imposition check at deceleration is performed (0)/not performed (1)	
#6 ACD :	Automatic corner deceleration function is used (0)/not used (1)	M series
01602	Acceleration/deceleration control	
#0 FWB :	Linear acceleration/deceleration before interpolation is type A (0)/type B (1)	
#2 COV :	The outer arc cutting feedrate change function of the automatic corner override function is: not used (0)/used (1)	
#3 BS2 :	Acceleration/deceleration before interpolation for cutting feed in the advanced preview mode/high–precision contour control mode is, of exponential or linear type as specified by PRM1602#6 (0)/of bell–shaped type (1)	M series
#4 CSD :	Automatic corner deceleration is controlled by angle (0)/feedrate (1).	M series
#5 G8S :	Serial spindle advanced preview control is, disabled(0)/enabled(1)	
#6 LS2 :		M series

BS2	LS2	Acceleration/deceleration
0	0	Exponential acceleration/deceleration after interpolation
0	1	Linear acceleration/deceleration after interpolation
1	0	Bell–shaped acceleration/deceleration after interpolation

<table>
<tr><td>01603</td><td>Acceleration/deceleration control</td><td></td></tr>
<tr><td colspan="2">#3 SBL : In high–precision contour control, the bell–shaped acceleration/deceleration before interpolation is performed, with a constant acceleration change(0)/with a constant acceleration time(1) (Set the time constant in PRM8416.)</td><td>M series</td></tr>
<tr><td colspan="2">#4 RPT : The acceleration/deceleration of interpolation–type rapid traverse is performed, with a constant inclination(0)/with a constant time(1)</td><td></td></tr>
<tr><td colspan="2">#6 RBL : In the AI contour control mode, acceleration/deceleration of rapid traverse is, linear acceleration/deceleration(0)/bell–shaped acceleration/deceleration(1)</td><td>M series</td></tr>
<tr><td colspan="2">#7 BEL : In AI contour control mode is linear acceleration/deceleration before look–ahead interpolation (0)/bell–shaped acceleration/deceleration before look–ahead interpolation (1)</td><td>M series</td></tr>
<tr><td>01610</td><td>Acceleration/deceleration control</td><td><Axis></td></tr>
<tr><td colspan="2">#0 CTL :
#1 CTB :
<table>
<tr><th>CTBx</th><th>CTBx</th><th>Acceleration/deceleration</th></tr>
<tr><td>0</td><td>0</td><td>Exponential acceleration/ deceleration</td></tr>
<tr><td>0</td><td>1</td><td>Linear acceleration/decel- eration after interpolation</td></tr>
<tr><td>1</td><td>0</td><td>Bell–shaped acceleration/ deceleration after interpola- tion</td></tr>
</table>
#4 JGL : Acceleration/deceleration for manual feed is exponential (0)/linear or bell-shaped (1).</td><td>PRM1622
PRM1622

PRM 1610#0,#1, 1624</td></tr>
<tr><td>01620</td><td>Time constant of linear acceleration/ deceleration in rapid traverse for each axis or time constant T1 of bell–shaped acceleration/deceleration in rapid traverse for each axis [msec]</td><td><Axis></td></tr>
<tr><td>01621</td><td>Time constant T2 used in bell-shaped acceleration/deceleration in rapid traverse for each axis [msec]</td><td><Axis></td></tr>
<tr><td>01622</td><td>Time constant of exponential function acceleration/deceleration in cutting feed for each axis [msec]</td><td><Axis></td></tr>
<tr><td>01623</td><td>FL rate of exponential function acceleration/ deceleration in cutting feed for each axis [mm/min]</td><td><Axis></td></tr>
<tr><td>01624</td><td>Time constant of exponential function acceleration/deceleration in jog feed for each axis [msec]</td><td><Axis></td></tr>
</table>

01625	FL rate of exponential function acceleration/ deceleration in jog feed for each axis [mm/min]	<Axis>
01626	Time constant of exponential function acceleration/deceleration in the thread cutting cycle for each axis [msec]	<Axis> T series
01627	FL rate of exponential function acceleration/ deceleration in the thread cutting cycle for each axis [mm/min]	<Axis> T series
01630	Maximum machining speed during linear acceleration/deceleration before interpolation [mm/min]	In advanced preview control mode, PRM1770, 1771 are enabled
01631	Time until the machining speed reaches the maximum speed during acceleration/ deceleration before interpolation [msec]	
01710	Minimum deceleration ratio (MDR) of the inner circular cutting rate in automatic corner override [%]	Automatic corner override
01711	Angle (θp) to recognize the inner corner in automatic override [deg]	
01712	Amount of automatic override for an inner corner [%]	
01713	Distance Le from the starting point in inner corner automatic override	
01714	Distance Ls up to the ending point in inner corner automatic override	
01722	Rapid traverse deceleration ratio when blocks in rapid traverse are overlapped [%]	<Axis> PRM 1601#4
01730	Maximum allowable feedrate for arc radius R	M series Feedrate clamping for feedrate based on an arc radius
01731	Arc radius R for a maximum allowable feedrate based on an arc radius	
01732	Minimum allowable clamping feedrate for feedrate based on an arc radius	
01740	Critical angle subtended by two blocks specifying automatic corner deceleration [0.001 deg]	M series
01741	Feedrate for terminating automatic corner deceleration (for acceleration/deceleration after interpolation)	<Axis> M series
01762	Time constant of exponential acceleration/ deceleration in cutting feed in advanced preview control mode [msec]	<Axis> M series

01763	FL rate for exponential acceleration/ deceleration in cutting feed in advanced preview control mode [mm/min]	<Axis> M series
01768	Time constant of linear acceleration/ deceleration in cutting feed in advanced preview control mode [msec]	M series
01770	Maximum machining speed during linear acceleration/deceleration before interpolation [mm/min]	Acceleration/ deceleration before interpolation (advanced preview control mode) M series
01771	Time needed until the machining speed reaches the maximum machining speed during acceleration/deceleration before interpolation [msec]	
01772	Time constant for bell–shaped acceleration/ deceleration of acceleration time fixed type before look–ahead interpolation [ms]	M series
01773	Time constant T or T1 used for linear acceleration/deceleration or bell–shaped acceleration/deceleration in rapid traverse of optimum torque acceleration/deceleration [ms]	<Axis> M series PRM 19504#0, 1420, 1620, 1774
01774	Time constant T2 used for bell–shaped acceleration/deceleration in rapid traverse of optimum torque acceleration/deceleration [ms]	<Axis> M series PRM 19504#0, 1621, 1774
01775	(Must not be used)	
01776	(Must not be used)	
01777	Minimum allowable feedrate for automatic corner deceleration (for acceleration/ deceleration before interpolation)	<Axis> M series
01778	Minimum speed of for the automatic corner deceleration function (for linear acceleration/ deceleration before interpolation)	<Axis> M series
01779	Critical angle subtended by two blocks for automatic corner deceleration (for advanced preview control)	M series
01780	Allowable feedrate difference for the corner deceleration function based on a feedrate difference (acceleration/deceleration before interpolation)	M series

01781	Allowable feedrate difference for the corner deceleration function based on a feedrate difference (acceleration/deceleration after interpolation)	M series <Axis>
01783	Allowable error in automatic corner deceleration based on a feedrate difference (linear acceleration/deceleration after interpolation)	M series <Axis>
01784	Feedrate for overtravel alarm deceleration during acceleration/deceleration before interpolation (stroke check 1)	
01785	Parameter for determining an allowable acceleration when the feedrate is set by acceleration [ms]	M series <Axis>

18) For servo

01800	Backlash compensation applied separately for cutting feed and rapid traverse, DRDY alarm	
#1 CVR :	When velocity control ready signal VRDY is set ON before position control ready signal PRDY comes ON generated (0)/is not generated (1)	ALM404
#2 OZR :	If manual reference position return is performed using the feed hold function when there is a remaining distance to travel, a miscellaneous function is being executed, a dwell operation is being performed, or a canned cycle is being executed, ALM091 is issued (0)/not issued (1).	
#3 FFR :	The feed-forward function is enabled for cutting only (0)/cutting and rapid traverse (1).	
#4 RBK :	Backlash compensation applied separately for cutting feed and rapid traverse is not performed (0)/performed (1)	PRM1851, 1852
#5 TRC :	The servo trace function is disabled (0)/ enabled (1).	PRM1870

01801	In–position width at cutting	

#0 PM1 : Spindle-to-motor gear ratio when the speed control function based on the servo motor is used — T series

#1 PM2 : Spindle-to-motor gear ratio when the speed control function based on the servo motor is used — T series

PM2	PM1	Magnification
0	0	1/1
0	1	1/2
1	0	1/4
1	1	1/8

$$\text{Magnification} = \frac{\text{spindle speed}}{\text{motor speed}}$$

#4 CCI : In-position width parameter setting when a block for cutting is followed by another block for cutting

#5 CIN : In-position width parameter setting when a block for cutting is followed by another block for cutting

CIN	CCI	PRM1826	PRM1827
0	0	Same as rapid traverse	(Not used)
0	1	When the next block specifies an operation other than cutting	When the next block also specifies cutting
1	1	When rapid traverse is to be performed regardless of what is specified by the next block	When cutting feed is to be performed regardless of what is specified by the next block

1802	Servo control	
#0 CTS : #1 DC4 : #2 DC2 : #4 B15 : #5 DPS : #7 FWC :	Speed control based on the servo motor is not applied (0)/applied (1). When the reference position is established on the linear scale with reference marks. An absolute position is established by detecting three reference marks (0)/four reference marks (1) The reference position on the linear scale with absolute addressing reference marks is established, as determined by PRM1802#1(0)/by establishing the absolute position through detection of two reference marks(1) In backlash compensation, the travel direction is determined, without consideration of the compensation amount (pitch error, straightness, external machine coordinate shift, etc.)(0)/in consideration of the compensation amount (FS15 format)(1) In speed control based on the servo motor, a position coder is used (0)/not used (1). Command multiplication (CMR) processing is performed, after acceleration/deceleration after interpolation (0)/before acceleration/ deceleration after interpolation (1)	T seres T series M series
01803	Torque control	
#0 TQI : #1 TQA : #4 TQF :	While torque restriction is applied, in–position check is performed (0)/not performed (1) While torque restriction is applied, checking for an excessive error in the stopped state/during movement is performed (0)/not performed (1) When torque control is performed by an axis control command of the PMC axis control function, follow–up operation is not performed (0)/performed (1)	

01804	VRDY OFF ignore signal	
#1 BLC : #4 IVO : #5 ANA : #6 SAK :	During circular interpolation by jog feed (manual circular interpolation function), the backlash acceleration function is, disabled (0)/ enabled (1) When an attempt is made to release an emergency stop while the VRDY OFF alarm ignore signal is 1, the emergency stop state is not released until the VRDY OFF alarm ignore signal is set to 0 (0)/the emergency stop state is released (1) When an abnormal load is detected for an axis: movement along all axes is stopped, and a servo alarm is output (0)/no servo alarm is output, and movement along only the axes of the group containing the axis with the abnormal load is stopped in interlock mode (1) When the IGNVRY signal is 1 or the IGNVRYx signal for each axis is 1, SA is set to 0 (0)/ 1 (1).	PRM1881 <G066#0, G192>
01805	Torque control command of PMC axis	
#1 TQU :	If follow–up is not performed by the torque control command of PMC axis control, the servo error counter is, updated(0)/not updated(1)	PRM 1803#4
01815	Position detector	<Axis>
#1 OPT : #2 DCL : #3 DCR : #4 APZ : #5 APC : #6 NRT :	A separate pulse coder is not used (0)/ used (1) As a separate position detector, the linear scale with absolute addressing reference marks is: not used (0)/used (1) As the scale with absolute addressing reference marks, the linear scale is used(0)/the rotary encoder is used(1) When the absolute position detector is used, machine position and absolute position transducer is not corresponding (0)/ corresponding (1) Position transducer is incremental position transducer (0)/absolute pulse coder (1) When the machine coordinates have passed the 0–degree value or the machine coordinate rounding value (360 degrees or PRM1260) on a rotation axis, reference position updating is, performed (0)/not performed (1) (Set this parameter when using a separate scale that does not hold rotation data.)	PRM 1815#1 PRM1860, 1861

01816	Detection multiply ratio (DMR)	<Axis>

#4 DM1 :
#5 DM2 :
#6 DM3 :

DM3	DM2	DM1	DMR	DM3	DM2	DM1	DMR
0	0	0	1/2	1	0	0	5/2
0	0	1	1	1	0	1	3
0	1	0	3/2	1	1	0	7/2
0	1	1	2	1	1	1	4

Detection unit =

$$\frac{\text{Move amount per one rotation of the motor}}{\text{Position feedback pulse per one rotation of the motor} \times \text{DMR}}$$

To be set with the flexible feed gear parameters PRM2084 and PRM2085

01817	Tandem control, linear scale with absolute address reference mark	<Axis>

#4 SCP : If PRM1802#2 is set to 1, the scale zero point of the linear scale with absolute addressing reference marks is, on the negative direction side(0)/on the positive direction side.(1)
#6 TAN : Tandem control is not applied (0)/applied (1).

01818	Linear scale I/F with absolute address reference mark	<Axis>

#0 RFS : On an axis using a linear scale with absolute addressing reference marks, if an automatic reference position return (G28) is made before the reference position is established, the reference position is established first, then a movement to the reference position is made(0)/a movement to the reference position is not made, but the operation is completed(1)
#1 RF2 : On an axis using a linear scale with absolute addressing reference marks, if an automatic reference position return (G28) is made after the reference position is established, a movement to the reference position is made(0)/a movement to the reference position is not made, but the operation is completed(1)
#2 DG0 : On an axis using a linear scale with absolute addressing reference marks, a reference position return by jog feed or a rapid traverse command is, disabled(0)/enabled(1)

01819	Follow-up, feed-forward, linear scale with absolute address reference mark	<Axis>
#0 FUP : When the servo system is turned off, a follow-up operation is performed based on *FLWU (0)/is not performed (1). #1 CRF : When servo alarm ALM445 (software disconnection), ALM446 (hardware disconnection), ALM447 (hardware disconnection (separate type)), or ALM421 (excessive dual position feedback error) is issued, the reference position setting remains as is (0)/the system enters the reference position undefined state (1) #2 DAT : On a linear scale with absolute addressing reference marks, the automatic setting of PRM1883, 1884 is, not performed (0)/ performed (1) (This parameter is automatically set to 0 when the manualreference position return is completed.) #7 NAH : In advanced preview control mode, the advance feed-forward function is used (0)/not used (1).		M series
01820	Command multiply for each axis (CMR) $\text{CMR} = \dfrac{\text{Least command increment}}{\text{Detection unit}}$ CMR $<$ 1 Setting value = (1/CMR) +100 CMR $\geqq$ 1 Setting value = 2 × CMR	<Axis>
01821	Reference counter capacity for each axis [Detection unit]	<Axis>
01825	Servo loop gain for each axis [0.01 sec^{-1}]	<Axis> Std=3000
01826	Inposition width for each axis [Detection unit]	<Axis>
01827	Inposition width for successive cutting feed blocks for each axis [Detection unit]	<Axis> PRM 1801#4
01828	Positioning deviation limit for each axis in movement [Detection unit] Setting value = $\dfrac{\text{Rapid traverse}}{60 \times \text{PRM1825}} \times \dfrac{1}{\text{Detecting unit}} \times 1.2$	<Axis> PRM1420 PRM1825
01829	Positioning deviation limit for each axis in the stopped state [Detection unit]	<Axis>
01830	Axis–by–axis positional deviation limit at servo–off time [Detection unit]	<Axis> PRM1829
01832	Feed stop positioning deviation for each axis [Detection unit]	<Axis>

01836	Servo error amount where reference position return is possible [Detection unit]	<Axis> PRM 2000#0
01850	Grid shift for each axis [Detection unit]	<Axis>
01851	Backlash compensation value for each axis [Detection unit]	<Axis>
01852	Backlash compensation value used for rapid traverse for each axis [Detection unit]	<Axis> PRM 1800#4=1
01870	Program number for storing servo trace data	
01871	Program number where servo trace data is stored (when the program number is 8 digits)	
01874	Numerator of the conversion coefficient for inductosyn position detection	<Axis>
01875	Denominator of the conversion coefficient for inductosyn position detection	<Axis>
01876	One-pitch interval of the inductosyn	<Axis>
01877	Amount of inductosyn shift	<Axis>
01880	Abnormal load detection alarm timer [ms]	
01881	Group number when an abnormal load is detected	<Axis> PRM 1804#5
01882	Space between the mark–2 indications on the linear scale with absolute addressing reference marks [Detection unit]	<Axis>
01883	Distance from the zero point of the linear scale with absolute addressing reference marks to the reference position [Detection unit]	<Axis>
01884	Distance 2 from the zero point of the linear scale with absolute addressing reference marks to the reference position [Detection unit]	<Axis>
01885	Maximum allowable value for total travel during torque control [Detection unit]	<Axis>
01886	Positional deviation when torque control is canceled [Detection unit]	<Axis> PRM 1803#4
01890	Detection speed of the servo motor speed detection function [min^{-1}]	
01891	Signal output address of the servo motor speed detection function [min^{-1}]	<Y_n, Y_{n+1}>
01895	Servo motor axis number used for a milling tool	

01896	Number of gear teeth on the servo motor axis side	
01897	Number of gear teeth on the milling axis side	
01902	FSSB Setting	
#0 FMD : The FSSB setting mode is, automatic setting mode (0)/manual setting 2 mode (1) #1 ASE : When automatic setting mode is selected for FSSB setting (when the FMD parameter (bit 0 of parameter No.1902) is set to 0), automatic setting is, not completed (0)/completed (1)		PRM 1902#0
01904	Using status of DSP	<Axis>
#0 DSP : Two axes use one DSP (0)/one axis uses one DSP (1)		
01905	Type of servo interface	<Axis>
#0 FSL : The type of interface used between the servo amplifier and servo software is, fast type (0)/slow type (1) #4 IO1 : A first I/O module supporting FSSB is, not used(0)/used(1) #5 IO2 : A second I/O module supporting FSSB is, not used(0)/used(1) #6 PM1 : The first separate detector interface unit is, not used (0)/used (1) #7 PM2 : The second separate detector interface unit is, not used (0)/used (1)		
01910	Address conversion table value for slave 1 (ATR)	
01911	Address conversion table value for slave 2 (ATR)	
01912	Address conversion table value for slave 3 (ATR)	
01913	Address conversion table value for slave 4 (ATR)	
01914	Address conversion table value for slave 5 (ATR)	
01915	Address conversion table value for slave 6 (ATR)	
01916	Address conversion table value for slave 7 (ATR)	
01917	Address conversion table value for slave 8 (ATR)	
01918	Address conversion table value for slave 9 (ATR)	

01919	Address conversion table value for slave 10 (ATR)	
01920	Controlled axis number for slave 1 (dedicated to the FSSB setting screen)	
01921	Controlled axis number for slave 2 (dedicated to the FSSB setting screen)	
01922	Controlled axis number for slave 3 (dedicated to the FSSB setting screen)	
01923	Controlled axis number for slave 4 (dedicated to the FSSB setting screen)	
01924	Controlled axis number for slave 5 (dedicated to the FSSB setting screen)	
01925	Controlled axis number for slave 6 (dedicated to the FSSB setting screen)	
01926	Controlled axis number for slave 7 (dedicated to the FSSB setting screen)	
01927	Controlled axis number for slave 8 (dedicated to the FSSB setting screen)	
01928	Controlled axis number for slave 9 (dedicated to the FSSB setting screen)	
01929	Controlled axis number for slave 10 (dedicated to the FSSB setting screen)	
01931	Connector number for the first separate detector interface unit (dedicated to the FSSB setting screen)	<Axis>
01932	Connector number for the second separate detector interface unit (dedicated to the FSSB setting screen)	<Axis>
01933	Cs contour control axis (dedicated to the FSSB setting screen)	<Axis>
01934	Master and slave axis numbers subject to tandem control (dedicated to the FSSB setting screen)	<Axis>
01936	Connector number of the first separate detector interface unit	<Axis>
01937	Connector number of the second separate detector interface unit	<Axis>
01970	Value of address translation table corresponding to slave 1 of the second path (ATR)	
01971	Value of address translation table corresponding to slave 2 of the second path (ATR)	

01972	Value of address translation table corresponding to slave 3 of the second path (ATR)	
01973	Value of address translation table corresponding to slave 4 of the second path (ATR)	
01974	Value of address translation table corresponding to slave 5 of the second path (ATR)	
01975	Value of address translation table corresponding to slave 6 of the second path (ATR)	
01976	Value of address translation table corresponding to slave 7 of the second path (ATR)	
01977	Value of address translation table corresponding to slave 8 of the second path (ATR)	
01978	Value of address translation table corresponding to slave 9 of the second path (ATR)	
01979	Value of address translation table corresponding to slave 10 of the second path (ATR)	
02000	Initial setting, feedback pulse	<Axis>
#0 PLC0 : The values of PRM2023 and 2024 are, directly used (0)/multiplied by 10 internally (1) #1 DGPR : When the power is turned on, the digital servo parameter specific to the motor is set (0)/not set (1). #3 PRMC : #4 PGEx : Position gain range is not expanded (0)/ expanded by 8 times (1)		PRM2023, 2024 See Chapter 16 Need not changed
02001	Arbitrary DMR	<Axis>

#0 AMR0:
#1 AMR1:
#2 AMR2:
#3 AMR3:
#4 AMR4:
#5 AMR5:
#6 AMR6:
#7 AMR7:

#7	#6	#5	#4	#3	#2	#1	#0	Motor type
1	0	0	0	0	0	1	0	AC5-0
0	0	0	0	0	0	1	1	4-0S
0	0	0	0	0	0	0	0	AC3-0S
0	0	0	0	0	0	0	0	$\alpha i/\alpha/\beta$

02002	Separate detector	<Axis>
#3 PFSE : A separate position detector is, not used (0)/ used (1) #7 VFSE : A separate position detector is, not used (0)/ used (1)		PRM 1815#1 automatically set PRM 1815#1 automatically set

02003	Digital servo function	<Axis>
#1 TGAL : The detecting level of the motor rotation without feedback alarm is set to standard (0)/ set by other parameter (1)		PRM2064
#2 OBEN: Velocity control observer is not used (0)/used (1)		PRM2047, 2050, 2051
#3 PIEN : Velocity control by I–P control (0)/PI control (1)		
#4 NPSP: The N pulse suppression function is, not used (0)/used (1)		
#5 BLEN : In speed control, backlash compensation is, not improved (0)/proved (1)		PRM2048
#6 OVSC: Overshoot compensation is invalidated (0)/ validated (1)		PRM2045
#7 VOFS: VCMD is not offset (0)/offset (1)		
02004	PWM dead zone	<Axis>
#6 DLY0 : The PWM dead zone is, set to 8 μs (0)/set to 16 μs (1)		
02005	Digital servo function	<Axis>
#1 FEED: Feed forward function is ineffective (0)/ effective (1)		PRM2068, 2069, 2092
#6 BRKC: Gravity shaft break control function is ineffective (0)/effective (1)		PRM2083
#7 SFCM: The static friction compensation function is, not used (0)/used (1)		
02006	Digital servo function	<Axis>
#0 FCBL : In fully closed feedback, backlash compensation pulses are dealt normally (0)/ not used (1)		PRM2048
#1 SBSM: An amplifier whose input voltage is 200 V (standard) or 60 V is used, 200 V (0)/60 V (1)		
#2 PKVE : Speed–dependent current loop gain variable function is, not used (0)/used (1)		PRM2074
#3 SPVE : A separate position detector is, not used (0)/ used (1)		
#4 ACCF : Acceleration feedback while stopping function is ineffective (0)/effective (1)		
#6 DCBE: While decelerating, back electromotive force compensation is ineffective (0)/ effective (1)		Need not changed
02007	Fine acceleration/deceleration	<Axis>
#6 FAD : The fine acceleration/deceleration function is, not used (0)/used (1)		
#7 FRCA: Torque control is, not exercised (0)/exercised (1)		

02008	Tandem control	<Axis>
#1 TNOM	Tandem axis setting	Automatically set by PRM 1817#6
#2 VFBA	Velocity feedback averaging function invalidated (0)/validated (1)	Set the Main axis only
#3 SPPR	Full preload function invalidated (0)/validated (1)	Set the Main axis only
#4 SPPC	The motor output torque polarities are as follows, outputs only the positive polarity to the main axis, and outputs only the negative polarity to the sub–axis (0)/outputs only the negative polarity to the main axis, and outputs only the positive polarity to the sub–axis (1)	Set the Main axis only
#5 VCTM	Velocity command tandem control, invalidated (0)/validated (1)	Set the Main axis only
#6 PFBS	Position feedback according to the direction of a torque command, not used (0)/used (1)	Set the Main axis only
#7 LAXD	Damping compensation for the sub–axis only (0)/damping compensation with both the main axis and sub–axis (1)	Set the Main axis only Usually, set this bit to 1

02009	Backlash acceleration/deceleration, dummy function	<Axis>
#0 SERD	Dummy function for the serial pulse coder is not used (0)/used (1)	
#1 IQOB	Effect of voltage saturation in abnormal load detection invalidated (0)/validated (1)	Only 9066 series PRM 2200#2
#2 ADBL	New type backlash acceleration stop function is ineffective (0)/effective (1)	PRM2048, 2087
#6 BLCU	Backlash acceleration stop function in cutting mode is ineffective (0)/effective (1)	PRM2066, 2082
#7 BLST	Backlash acceleration stop function is ineffective (0)/effective (1)	

<table>
<tr><td>02010</td><td>Backlash acceleration, switching the punch and laser</td><td><Axis></td></tr>
<tr><td colspan="3">#2 LINE : Controls a linear motor, invalidated (0)/ validated (1)
#3 BLTE : Multiply backlash acceleration amount is ×1 (0)/×10 (1)
#4 HBPE : A pitch error compensation is added to the error counter of, full–closed loop (0)/ semi–closed loop (1)
#5 HBBL : A backlash compensation amount is added to the error counter of, semi–closed loop (0)/ full–closed loop (1)
#7 POLE : Function for switching the punch and laser is not used (0)/used (1)</td><td>PRM2048</td></tr>
<tr><td>02011</td><td>Torque limit variable function</td><td><Axis></td></tr>
<tr><td colspan="3">#5 RCCL : The actual current torque limit variable function is not used (0)/used (1)</td><td>Need not changed</td></tr>
<tr><td>02012</td><td>Digital servo function</td><td><Axis></td></tr>
<tr><td colspan="3">#1 MSFE: Machine velocity feedback function is ineffective (0)/effective (1)
#4 VCM1:
#5 VCM2:
<table>
<tr><th>VCM2</th><th>VCM1</th><th>Rotation/5V</th></tr>
<tr><td>0</td><td>0</td><td>0.9155 min^{-1}/5V</td></tr>
<tr><td>0</td><td>1</td><td>14 min^{-1}/5V</td></tr>
<tr><td>1</td><td>0</td><td>234 min^{-1}/5V</td></tr>
<tr><td>1</td><td>1</td><td>3750 min^{-1}/5V</td></tr>
</table>
#7 STNG: In velocity command mode, a software disconnection alarm is, detected (0)/ignored (1)</td></tr>
<tr><td>02015</td><td>High-speed positioning function</td><td><Axis></td></tr>
<tr><td colspan="3">#0 PGTW : Polygonal lines for the position gain are not used (0)/used (1)
#1 SSG1 : Integration function at low speed is not used (0)/used (1)
#5 TDOU : Between channels 2 and 4 on the check board TCMD is output (0)/estimated load torque is output (1)
#6 BLAT : The two–stage backlash acceleration function is not used (0)/used (1)</td><td>PRM2028
PRM2029, 2030</td></tr>
<tr><td>02016</td><td>Abnormal load detection function</td><td><Axis></td></tr>
<tr><td colspan="3">#0 ABNT : The abnormal load detection function is not used (0)/used (1)
#3 K2VC : The function for changing the proportional gain in the stop state is not used (0)/used (1)
#5 NFL5 : Cut–off area = 0.8 × (center frequency) to 1.25 × (center frequency)
#6 NFL7 : Cut–off area = 0.7 × (center frequency) to 1.4 × (center frequency)
#7 NFL8 : Cut–off area = 0.5 × (center frequency) to 2.0 × (center frequency)</td></tr>
</table>

02017	Stop distance reduction function	<Axis>
#0 DBST : The stop distance reduction function is not used (0)/used (1) #4 HTNG : In velocity command mode, the hardware disconnection alarm of a separate detector is: detected (0)/ignored (1) #5 RISC : When RISC is used, the feed–forward response characteristics remain as is (0)/ improved (1) #6 OVCR : The OVC alarm remains as is (0)/improved (1) #7 PK25 : High–speed velocity loop proportional processing is not used (0)/used (1)		
02018	Observer stop time disable function	<Axis>
#1 MOVO : The observer stop time disable function is: not used (0)/used (1) #7 PFBC : The motor feedback signal for the main axis is shared by the sub–axis (0)/is not shared by the sub–axis (1)		
02019	Digital servo function	<Axis>
#4 SPSY : A separate velocity detector is not used (0)/ used(1) #7 DPFB : The dual feedback function is not used (0)/ used (1).		
02020	Motor model	<Axis> See Chapter 16
02021	Load inertia ratio	<Axis>
02022	Motor rotation direction 111=CCW, –111=CW	<Axis>
02023	No. of speed pulses	<Axis> PRM 2000#0

	PRM 2000#0=0	PRM 2000#0=1
Serial PC A/α PC	8192	819

<table>
<tr><td>02024</td><td>No. of position pulses</td><td><Axis>
PRM
2000#0,
2185
See
Chapter 16</td></tr>
<tr><td colspan="3">1 Position detecting by built-in type of pulse coder
<table><tr><td></td><td>PRM
2000#0=0</td><td>PRM
2000#0=1</td></tr><tr><td>Serial PC /α PC</td><td>12500</td><td>1250</td></tr></table>2 In case of separate type of position detector, Setting value=the feedback pulse/motor one revolution ×4
When bit 0 of parameter No. 2000 is 1, use the value obtained by dividing, by 10, the value used when this bit is 0.</td></tr>
<tr><td>02028</td><td>Speed at which the position gain is switched</td><td><Axis>
PRM
2015#0</td></tr>
<tr><td>02029</td><td>Acceleration–time velocity enabling integration function for low speed.</td><td rowspan="2"><Axis>
PRM
2015#1</td></tr>
<tr><td>02030</td><td>Deceleration–time velocity enabling integration function for low speed</td></tr>
<tr><td>02033</td><td>Number of position feedback pulses</td><td><Axis></td></tr>
<tr><td>02034</td><td>Vibration–damping control gain</td><td><Axis></td></tr>
<tr><td>02039</td><td>Second–stage acceleration of the two–stage backlash acceleration function</td><td><Axis></td></tr>
<tr><td>02040</td><td>Current loop integral gain (PK1)</td><td><Axis>
Need not changed</td></tr>
<tr><td>02041</td><td>Current loop proportional gain (PK2)</td><td><Axis></td></tr>
<tr><td>02042</td><td>Current loop gain (PK3)</td><td><Axis>
Need not changed</td></tr>
<tr><td>02043</td><td>Velocity loop integral gain (PK1V)</td><td><Axis>
Need not changed</td></tr>
<tr><td>02044</td><td>Velocity loop proportional gain (PK2V)</td><td><Axis></td></tr>
<tr><td>02045</td><td>Velocity loop incomplete integral gain (PK3V)</td><td><Axis></td></tr>
<tr><td>02046</td><td>Velocity loop gain (PK4V)</td><td><Axis>
Need not changed</td></tr>
<tr><td>02047</td><td>Observer parameter (POA1)</td><td><Axis>
Need not changed</td></tr>
</table>

02048	Backlash acceleration amount	<Axis>
02049	Maximum zero width of dual feedback	<Axis>
02050	Observer gain (POK1)	<Axis> Need not changed
02051	Observer gain (POK2)	<Axis> Need not changed
02052	Not used	<Axis> Need not changed
02053	Current dead band compensation (PPMAX)	<Axis> Need not changed
02054	Current dead band compensation (PDDP)	<Axis> Need not changed
02055	Current dead band compensation (PHYST)	<Axis> Need not changed
02056	Back electromotive force compensation (EMFCMP)	<Axis> Need not changed
02057	Current phase compensation (PVPA)	<Axis> Need not changed
02058	Current phase compensation (PALPH)	<Axis> Need not changed
02059	Back electromotive force compensation (EMFBAS)	<Axis> Need not changed
02060	Torque limit	<Axis> Need not changed
02061	Back electromotive force compensation (EMFLMT)	<Axis> Need not changed
02062	Overload protection coefficient (OVC1)	<Axis> Need not changed
02063	Overload protection coefficient (OVC2)	<Axis> Need not changed

02064	Software alarm level disconnection	<Axis> PRM 2003#1
02065	Overload protection coefficient (OVCLMT)	<Axis> Need not changed
02066	250 μ sec acceleration feedback	<Axis>
02067	Torque command filter	<Axis>
02068	Feed forward coefficient	<Axis>
02069	Speed feed forward coefficient	<Axis>
02070	Backlash acceleration timing	<Axis>
02071	Time during which backlash acceleration is effective	<Axis>
02072	Static–friction compensation	<Axis>
02073	Stop time determination parameter	<Axis>
02074	Velocity depending type current loop gain	<Axis> Need not changed
02076	1msec acceleration feedback gain	<Axis>
02077	Overshoot prevention counter	<Axis>
02078	Numerator of dual position feedback conversion coefficient	<Axis>
02079	Denominator of dual position feedback conversion coefficient	<Axis>
02080	Primary delay time constant of dual position feedback	<Axis>
02081	Zero width of dual position feedback	<Axis>
02082	Backlash acceleration stop amount	<Axis>
02083	Gravity axis break control timer [msec]	<Axis> PRM 2005#6
02084	Flexible feed gear numerator n	<Axis>
02085	Flexible feed gear denominator m	<Axis>

$$\frac{n}{m} = \frac{\text{Position feedback pulses/motor rev.}}{1{,}000{,}000}$$

02086	Rated current parameter	<Axis> Need not changed
02087	Torque offset	<Axis>
02088	Machine velocity feedback gain	<Axis> PRM 2012#2
02089	Base pulse for backlash acceleration	<Axis>
02091	Nonlinear control parameter	<Axis>
02092	Advance feed-forward coefficient [0.01%]	<Axis>
02097	Static–friction compensation stop parameter	<Axis>
02098	Current phase compensation coefficient	<Axis>
02099	N pulse suppress level	<Axis>
02101	Overshoot compensation valid level	<Axis>
02102	Final clamp value of the actual current limit	<Axis>
02103	Track back amount applied when an abnormal load is detected	<Axis>
02104	Threshold of abnormal load detection in cutting	<Axis>
02105	Torque constant	<Axis>
02109	Fine acceleration/deceleration time constant [msec]	<Axis>
02110	Magnetic saturation compensation (base/coefficient)	<Axis>
02111	Deceleration torque limit (base/coefficient)	<Axis>
02112	AMR conversion coefficient 1	<Axis>
02113	Notch filter center frequency [Hz]	<Axis>
02116	Abnormal load detection dynamic friction cancel	<Axis>
02118	Dual position feedback Semi–closed/full–closed error overestimation level	<Axis>
02119	Function for changing the proportional gain in the stop state: Stop level	<Axis>
02121	Conversion coefficient for number of feedback pulses	<Axis>
02122	Detection resistance conversion coefficient	<Axis>
02126	Position feedback switching time constant τ	<Axis>

02127	Non–interactive control coefficient	<Axis>
02128	Weak magnetic flux compensation (coefficient)	<Axis>
02129	Weak magnetic flux compensation (base/limit)	<Axis>
02130	Correction of two thrust ripples per magnetic pole pair	<Axis>
02131	Correction of four thrust ripples per magnetic pole pair	<Axis>
02132	Correction of six thrust ripples per magnetic pole pair	<Axis>
02138	AMR conversion coefficient 2	<Axis>
02142	Abnormal load detection threshold in rapid traverse	<Axis>
02143	Fine acceleration/deceleration time constant 2 [msec]	<Axis>
02144	Position feed–forward coefficient for cutting [0.01%]	<Axis>
02145	Velocity feed–forward coefficient for cutting [%]	<Axis>
02165	Maximum amplifier current	<Axis>
02185	Position pulse conversion coefficient	<Axis> See Chapter 16.
02200	Abnormal load detection	<Axis>
#2 IQOB : Effect of voltage saturation on abnormal load detection is not eliminated (0)/ eliminated (1) #3 ABGO : When an abnormal load is detected, a threshold is not set (0)/set (1) for cutting and rapid traverse		PRM 2009#1
02201	Function for obtaining current offset	<Axis>
#0 CROF: The function for obtaining current offsets upon an emergency stop is not used (0)/used (1) #4 SPVC: Without using the conversion coefficient (SBPDNL), the number of velocity pulses is not set (0)/set (1) #6 CPEE: The actual current display peak hold function is not used (0)/used (1)		

02202	Fine acceleration/deceleration	<Axis>
#0 FAGO : The fine acceleration/deceleration function, used separately for cutting and rapid traverse, is not used (0)/used (1) #3 OVS1 : Overshoot compensation is valid only once after the termination of a move command (1) #4 DUAL : Zero width is determined only by setting = 0 (0)/by setting (1)		
02203	Torque control	<Axis>
#4 FRC2 : Torque control type 2 is not exercised (0)/ exercised (1)		
02209	FAD	<Axis>
#2 FADL : FAD bell–shaped type (0)/FAD linear type (1)		

19) For DI/DO

03001	High–speed M, S, and T interface, RWD signal	
#2 RWM : RWD signal is put out only when the tape reader is being rewound (0)/ when a program in memory is being rewound (1) #7 MHI : Exchange of strobe and completion signals for the M, S, T and B codes are normal (0)/ high speed (1)		
03002	Override polarity	
#4 IOV : For the feedrate override signal, second feedrate override signal, and rapid traverse override signal uses negative logic (0)/positive logic (1).		
03003	Interlock signals	
#0 ITL : Interlock signal is enable (0)/ disable (1) #2 ITX : Interlock signals for each axis is, enable (0)/ disable (1) #3 DIT : Interlock for each axis direction is, enable (0)/ disable (1) #4 DAU : When bit 3 of PRM3003 = 0, the axis direction dependent interlock signal is valid, during manual operation only (0)/during manual operation and automatic operation (1) #5 DEC : Deceleration signals (*DEC1 to *DEC8) for manual reference position return specify deceleration when they are 0 (0)/when they are 1 (1) #6 MVX : The axis movement in-progress signal is set to 0 at the time of distribution completion (0)/ in-position (1). #7 MVG : During dynamic graphic processing, the axis movement in-progress signal is output (0)/not output (1).		*IT, STLK (T) *IT1 - *IT8 +MIT1 - –MIT4 T series T series

03004	Overtravel	
#0 BSL : The block start interlock signal *BSL and cutting are: disabled (0)/enabled (1) #1 BCY : When more than one operation is performed by one block command such as a canned cycle, the block start interlock signal is checked only at the beginning of the first cycle (0)/checked at the beginning of every cycle (1) #5 OTH : The hardware overtravel function is used (0)/ not used (1).		
03006	Reference position return deceleration signal	
#0 GDC : The address of the reference position return deceleration signal is X009, X007 (0)/G196, G197 (1). #1 EPN : Workpiece number search signals are assigned to PN1, PN2, PN4, PN8, and PN16 <G009> (0)/EPN0 to EPN13 <G024, G025> (1) #2 EPS : When a program is searched using the workpiece number search function, it is started by automatic operation start signal ST (when automatic operation (memory operation) is started) (0)/workpiece number search start signal EPNS. (Search is not started by ST.) (1)		
03010	Delay time of strobe signals MF, SF, TF, BF [msec]	
03011	Acceptable width of M, S, T and B function completion signal (FIN) [msec]	
03017	Output time of reset signal RST [16 msec]	
03030	Allowable number of digits for the M code (1 to 8)	
03031	Allowable number of digits for the S code (1 to 5)	
03032	Allowable number of digits for the T code (1 to 8)	
03033	Allowable number of digits for the B code (1 to 8)	

20) For display and edit (1/2)

03100	MDI panel	
#1 CEM : #2 SKY : #3 FKY : #4 FPT : #7 COR :	On screens such as the operation history screen and help screen, keys on the MDI panel are indicated in English (0)/with graphics qualifying for CE marking (1) MDI keyboard uses, standard keyboard (0)/ small keyboard (1) MDI keyboard uses, small keyboard (0)/ standard keyboard (1) The Symbol CAP*i* T (CAP-II) keyboard is not used (0)/used (1). Display is used as a monochrome display (0)/ color display (1)	 When the 9.5”/10.4” LCD unit is used When the 7.2”/8.4” LCD unit is used T series
03101	Display	
#1 KBF : #4 BGD : #7 SBA :	At screen or mode switching, the key buffer is cleared (0)/not cleared (1). The display of a foreground program in the background is disabled (0)/enabled (1). The current positions are displayed in the order of tool post 1 then tool post 2 (0)/tool post 2 then tool post 1 (1).	 2-path control
03102	The selection of language used in the display (Option)	
#0 JPN : #1 GRM: #2 FRN : #3 CHI : #4 ITA : #5 HNG : #6 SPN :	Japanese German French Chinese (Taiwanese) Italian Korean (Hangul character) Spanish	When all the bits are set to 0, English is used. PRM3119
03103	Current position display order, system alarm history	
#1 DIP : #2 NMH: #7 ABR :	When two–path control is applied, the current position display screen in display format displays two paths (0)/a path (1) The system alarm history screen is, not displayed(0)/displayed(1) When the absolute/relative display of the current position extends over two screens, the first screen displays the first tool post and the second screen displays the second tool post (0)/the first screen displays the selected tool post and the second screen displays the unselected tool post (1)	T series T series (2-path control)

03104	Position display	
#0 MCN : #3 PPD : #4 DRL : #5 DRC : #6 DAL : #7 DAC :	The machine position display is not displayed according to the unit of input (0)/displayed according to the unit of input (1) When a coordinate system is set, the relative position display is not preset (0)/preset (1) For displaying relative positions, tool length compensation (M series) or tool offset (T series) is considered (0)/not considered (1) For displaying relative positions, cutter compensation (M series) or tool-tip radius compensation (T series) is considered (0)/not considered (1) For displaying absolute positions, tool length compensation (M series) or tool offset (T series) is considered (0)/not considered (1) For displaying absolute positions, cutter compensation (M series) or tool-tip radius compensation (T series) is considered (0)/not considered (1)	PRM 0000#2
03105	Data display	
#0 DPF : #1 PCF : #2 DPS : #7 SMF :	Actual speed is, not displayed (0)/displayed (1) The movement of the PMC controlled axes are added to the actual speed display (0)/not added (1) Actual spindle speed and T code are not always displayed (0)/always displayed (1) During simplified synchronous control, movement along a slave axis is included (0)/ not included (1) in the actual speed display.	M series
03106	Operation history	
#1 GPL : #3 SPD : #4 OPH : #5 SOV : #6 DAK : #7 OHS :	On the program list screen, the list–by–group function is disabled1 (0)/enabled (1). Names for actual spindle speed values are displayed regardless (0)/depending (1) of the selected spindle position coder. The operation history screen is not displayed (0)/displayed (1). A spindle override value is not displayed (0)/ displayed (1). For absolute coordinate display in three-dimensional coordinate conversion, programmed coordinates are displayed (0)/ coordinates in the workpiece coordinate system are displayed (1). Operation history sampling is performed (0)/not performed (1).	T series PRM 3105#2 M series

03107	Program display	
#2 DNC : #4 SOR : #7 MDL :	Upon reset, the program display for DNC operation is not cleared (0)/cleared (1) In the Display of the program directory, programs are listed in the order of registration (0)/in the order of program number (1) Display of the modal state on the program display screen is, not displayed (0)/displayed (1)	
03108	T code display	
#2 PCT : #4 WCI : #6 SLM : #7 JSP :	For T code display, programmed T numbers are displayed (0)/PMC T numbers are displayed (1). On the workpiece coordinate system screen, a counter input is disabled (0)/enabled (1) The spindle load meter is not displayed (0)/ displayed (1) On the current position display screen and program check screen, jog feed is not displayed (0)/displayed (1)	M series
03109	Display of tool compensation	
#1 DWT : #2 IKY : #5 RHD : #6 BGO :	At the display of tool wear/geometry compensation, the character “G”, “W” is displayed at the left of each number (0)/not displayed (1) On the tool compensation screen, the [INPUT] soft key is displayed (0)/not displayed (1). When a manual handle interrupt is generated, the relative position display is not updated (0)/ updated (1) When the <OFFSET/SETTING> function key on the background drawing screen is pressed, the machining screen is displayed (0)/background drawing data is displayed (1).	Com-pensation memory B T series M series
03110	Alarm history clear, axis names on the offset screen	
#0 OFA : #2 AHC :	The axis names on the offset screen and Y–axis offset screen are, always X, Z, and Y(0)/as specified by PRM1020(1) With a soft key, the alarm history, can be cleared(0)/cannot be cleared(1)	T series

03111	Adjustment screen, screen switching	
#0 SVS : The servo setting screen is displayed (0)/not display (1) #1 SPS : The spindle setting screen is not displayed (0)/ displayed (1) #2 SVP : The synchronization errors displayed on the spindle adjustment screen is the instant values (0)/peak hold values (1) #5 OPM : The operating monitor is not displayed (0)/ displayed (1) #6 OPS : The speedometer on the operating monitor screen indicates the spindle motor (0)/speed of the spindle (1) #7 NPA : When an alarm is generated, the display shifts to the alarm screen (0)/does not shift (1)		
03112	Wave form diagnosis function (servo waveform display)	
#0 SGD : Generally used graphic display (0)/servo waveform display (1) #2 OMH : The history of external operator messages is not displayed (0)/displayed (1). #3 EAH : As alarm history information, macro alarm and external alarm messages are recorded (0)/not recorded (1). #5 OPH : The operation history log function is enabled (0)/ disabled (1).		
03113	External operator message	
#0 MHC : The external operator message history can be deleted (0)/cannot be deleted (1). #4 TCH : Cursor movement on the touch panel is disabled (0)/enabled (1) #5 DCL : The compensation function for the touch panel on the display is disabled (0)/enabled (1) #6 MS0 : #7 MS1 :		

MS1	MS0	Number of characters	Number of history items
0	0	255	8
0	1	200	10
1	0	100	18
1	1	50	32

03114	Changing the screens	
#0 IPO #1 IPR #2 IOF #3 ISY #4 IMS #5 IUS #6 ICS	: When the <POS> function key is pressed while the position display screen is being displayed : the screen is changed (0)/the screen is not changed (1). : When the <PROG> function key is pressed while the program screen is being displayed : the screen is changed (0)/the screen is not changed (1) : When the <OFFSET/SETTING> function key is pressed while the offset/setting screen is being displayed : the screen is changed (0)/ the screen is not changed (1). : When the <SYSTEM> function key is pressed while the system screen is being displayed : the screen is changed (0)/the screen is not changed (1). : When the <MESSAGE> function key is pressed while the message screen is being displayed : the screen is changed (0)/the screen is not changed (1). : When the <GRAPH> or <CUSTOM/GRAPH> function key is pressed while the user or graph screen is being displayed : the screen is changed (0)/ the screen is not changed (1). : When the <CUSTOM> function key is pressed while the custom screen is being displayed : the screen is changed (0)/the screen is not changed (1).	
03115	Current position display	<Axis>
#0 NDP #1 NDA #2 SFM #3 NDF #6 D10	: The current position for each axis is, displayed (0)/not displayed (1) : Absolute coordinates and relative coordinates are displayed (0)/not displayed (only machine coordinates being displayed) (1). : In current position display, axis name subscripts are provided for all coordinates (0)/ machine coordinates only (1). : To the actual speed display, axis movement data is added (0)/not added (1) : The current positions and workpiece zero–point offset are displayed as usual (Not multiplied by ten) (0)/multiplied by ten, and displayed (1)	T series 2-path control M series

03116	Clear of ALM100, setting of screen display	
#2 PWR: #4 FOV : #5 COA : #6 T8D : #7 MDC :	ALM100 (parameter enable) is cleared by <CAN> + <RESET> key (0)/<RESET> key (1) In the field of specified feedrate F on the program check screen, the specified feedrate is displayed(0)/(Specified feedrate) × (override) is displayed(1) While an external alarm state is present or while an external message is being displayed, automatic screen erasure is, performed(0)/not performed(1) T codes that are always displayed are displayed with, four digits(0)/eight digits(1) Maintenance information by operating soft key, all clear disable(0)/all clear enable(1)	
03117	Setting of screen display	
#0 SMS : #1 SPP : #7 P9D :	On the program check screen, the soft key to enable or disable the graph of spindle speed and load is, not displayed(0)/displayed(1) On the diagnostic screen, spindle position data is not displayed (0)/ displayed (1) (DGN445 to 447) The format of the screen displayed on the PC side by the CNC screen display function is, 14–inch type(0)/9–inch type(1) (This parameter is valid when the NC is not equipped with a display unit.)	M series T series
03118	Actual spindle speed and maintenance information display	
#0–4 AS1–AS4 :	When the actual spindle speeds (SACT) of the first to fourth spindles are displayed, each value is the value calculated from the position coder (0)/the value calculated from the spindle motor speed (1)	
03119	Displayed language, touch panel	T series
#0 DAN : #1 POR : #2 DDS : #3 TPA : #4 F2K : #7 NVG :	Display in Danish is disabled (0)/enabled (1) Display in Portuguese is disabled (0)/enabled (1) The support of the touch panel on the display is enabled (0)/disabled (1) Touch panel connection is disabled (0)/enabled (1) As the LCD/MDI keyboard, Symbol CAP*i* T combined with a unified standard keyboard is, not used(0)/used(1) When a color display device is used, VGA mode is used (0)/not used (1) (conventional type)	PRM3102 T series
03120	Time from the output of an alarm to the termination of sampling [msec]	

03122	Time interval used to record time data in operation history [minute]	
03123	Time until screen clear function is applied [minute]	
03124	Modal G code display	
#0 D01 : On program check screen display, the 01 group G code is display (0)/not displayed (1) #1 D02 : On program check screen display, the 02 group G code is display (0)/not displayed (1) #2 D03 : On program check screen display, the 03 group G code is display (0)/not displayed (1) #3 D04 : On program check screen display, the 04 group G code is display (0)/not displayed (1) #4 D05 : On program check screen display, the 05 group G code is display (0)/not displayed (1) #5 D06 : On program check screen display, the 06 group G code is display (0)/not displayed (1) #6 D07 : On program check screen display, the 07 group G code is display (0)/not displayed (1) #7 D08 : On program check screen display, the 08 group G code is display (0)/not displayed (1)		
03125	Modal G code display	
#0 D09 : On program check screen display, the 09 group G code is display (0)/not displayed (1) #1 D10 : On program check screen display, the 10 group G code is display (0)/not displayed (1) #2 D11 : On program check screen display, the 11 group G code is display (0)/not displayed (1) #3 D12 : On program check screen display, the 12 group G code is display (0)/not displayed (1) #4 D13 : On program check screen display, the 13 group G code is display (0)/not displayed (1) #5 D14 : On program check screen display, the 14 group G code is display (0)/not displayed (1) #6 D15 : On program check screen display, the 15 group G code is display (0)/not displayed (1) #7 D16 : On program check screen display, the 16 group G code is display (0)/not displayed (1)		

03126	Modal G code display	
#0 D17 : On program check screen display, the 17 group G code is display (0)/not displayed (1) #1 D18 : On program check screen display, the 18 group G code is display (0)/not displayed (1) #2 D19 : On program check screen display, the 19 group G code is display (0)/not displayed (1) #3 D20 : On program check screen display, the 20 group G code is display (0)/not displayed (1) #4 D21 : On program check screen display, the 21 group G code is display (0)/not displayed (1) #5 D22 : On program check screen display, the 22 group G code is display (0)/not displayed (1) #6 D23 : On program check screen display, the 23 group G code is display (0)/not displayed (1) #7 D24 : On program check screen display, the 24 group G code is display (0)/not displayed (1)		
03127	Modal G code display	
#0 D25 : On program check screen display, the 25 group G code is display (0)/not displayed (1)		
03130	Axis display order for current position display screens	T series 2-path control
03131	Subscript for the name of each axis	2-path control
03132	Axis name (absolute coordinate) for current position display	
03133	Axis name (relative coordinate) for current position display	
03134	Axis display order on workpiece coordinate system screen and workpiece shift screen	
03140	Display color for tool post name	
03141	Name of the path (first character)	2-path control
⋮	⋮	
03147	Name of the path (seventh character)	
03151	Number of the axis for which the first load meter for the servo motor is used	PRM 3111#5
⋮	⋮	
03158	Number of the axis for which the eighth load meter for servo motor is used	
03163	Time required to smooth the spindle load meter readings [32 msec]	

03181	Blinking character in high–precision contour control mode (1st character)	Setting by using character codes. When 0 is set, HPCC blinks.
03182	Blinking character in high–precision contour control mode (2nd character)	
03183	Blinking character in high–precision contour control mode (3rd character)	
03184	Blinking character in high–precision contour control mode (4th character)	
03185	Blinking character in high–precision contour control mode (5th character)	
03186	Blinking character in high–precision contour control mode (6th character)	
03187	Blinking character in high–precision contour control mode (7th character)	
03191	Setting of screen display	
#0 FPS :	The unit function (feed per revolution) for actual cutting feedrate display displays numerals of, feedrate per minute(0)/feedrate per spindle revolution (during feed per revolution)(1)	T series
#2 WKI :	On the workpiece coordinate system setting screen, the soft key [INPUT] is, displayed(0)/not displayed(1)	M series
#3 STS :	When data is input on the setting screen, a confirmation message is, not displayed(0)/displayed(1)	
#5 FSS :	When PRM3191#0 = 1, the switching of feedrate display is based on, the operation mode (feed per minute/feed per revolution) (0)/feedrate per spindle revolution at all times (1)	T series

03192	Touch panel, setting of screen display	
#0 TTP : Under multi–path control, on the parameter screen and diagnosis screen of paths 1 and 2, numbers are, checked(0)/not checked(1) #1 T2P : If two points are pressed on the touch panel, it is assumed that, a mid point is pressed(0)/the first point is pressed(1) #2 TRA : If a point on the touch panel is kept pressed for a time specified in PRM3197 or longer, an alarm is not raised(0)/an alarm 5303 is raised(1) #3 TBZ : If a point on the touch panel is pressed, the buzzer does not sound(0)/the buzzer sounds(1) #4 TB2 : If PRM3191#3 = 1, the buzzer sounds, when you press anywhere on the touch panel (0)/only when the pressing of a key is recognized (1)		T series ALM5303 This improvement is valid if the hardware is equipped with a separate buzzer.
03197	Detection time of continuous pressing on touch panel [s]	PRM 3192#2
03201	Program registration	
#0 RDL : In case of program registration by MINP signal, the new program is registered following the programs already registered (0)/all registered programs are deleted, then the new program is registered (1) #1 RAL : In case of the program registration, all programs are registered (0)/only one program is registered (1) #2 REP : When program registration, if the program number is same as an existing one, an alarm is generated (0)/the existing program is deleted then the new program is registered (1) #3 PUO : When address O of a program number is output in ISO code ":" is output (0)/"O" is output (1) #5 N99 : When an M99 block is specified, program registration is terminated (0)/not terminated (1) #6 NPE : At the program registration, M02, M30 and M99 is assumed as completion of registration (0)/ not assumed (1) #7 MIP : Program registration by external start signal (MINP) not performed (0)/performed (1)		EXRD signal PRM 3201#6=0

03202	Program protect	
#0 NE8 : #1 OLV : #2 CND : #3 OSR : #4 NE9 : #5 CPD : #6 PSR :	Editing of programs with program numbers 8000 to 8999 are not inhibited (0)/inhibited (1) When a program other than the selected program is deleted or output the display of the selected program is not held (0)/held (1). With the [ARRANGE] soft key, main program arrangement is not performed (0)/performed (1). In programming number search, when pressing soft key [O.SRH] without inputting program number by key search the following program number (0)/operation is invalid (1) Editing of programs with program numbers 9000 to 9999 are not inhibited (0)/inhibited (1) When an NC program is deleted, a confirmation message and confirmation soft key are not output (0)/output (1) Search for the program number of a protected program is disabled (0)/enabled (1)	
03203	MDI operation	
#4 PIO : #5 MIE : #6 MER : #7 MCL :	Program input/output is performed on a tool-post-by-tool-post basis (0)/on a two-path basis (1). During MDI operation, program editing is enabled (0)/disabled (1). When MDI operation is terminated in single block mode, program deletion is not performed (0)/performed (1). Whether a program coded in the MDI mode is cleared by reset (0)/not cleared (1)	T series (2-path control)
03204	Small MDI	
#0 PAR : #2 EXK : #3 P8E : #4 P9E : #5 SPR : #6 MKP :	With the small MDI panel, [,] is used without modification (0)/used as (,) (1). The [C–EXT] soft key is not used (0)/used (1) Editing of 80000000 to 89999999 is not inhibited (0)/inhibited (1) Editing of 90000000 to 99999999 are not inhibited (0)/inhibited (1) Program numbers in the 9000 range for specific programs are not added (0)/added (1) with 90000000 When M02, M30, or EOR(%) is executed during MDI operation, the created MDI program is erased automatically (0)/not erased automatically (1)	

03205	Change function of the extended edit, setting of screen display	
#0 COL : #1 CHG : #2 CMO: #3 PNS : #4 OSC : #7 MCK :	Any colons (:) in the comments of the program are converted to letter O (0)/displayed or output as is (1) When the change function of the extended edit function is used, the cursor is moved to the target position after choosing (0)/before choosing (1) In extended tape editing, the copy or move operation, is performed in the usual way(0)/can also copy or move data from a program to a keyin buffer in units of words(1) On the program screen, a search by a cursor key is, performed(0)/not performed(1) On the offset screen, offset value erasure by a soft key is, enabled(0)/disabled(1) The system tape memory check function is: not used (0)/used (1)	Must not be used
03206	Program copy operation between two paths, setting of history functions	
#0 PCP : #1 MIF : #4 PHS :	Program copy operation between two paths is disable (0)/enable (1) Editing of the maintenance information screen is, not prohibited(0)/prohibited(1). The selection of an operation history signal and PRM12801–12900 are, not linked(0)/linked(1)	
03207	Display of the external operator message	
#0 OM4 :	A message displayed on the external operator message screen can have, up to 256 characters, and just a single message can be displayed(0)/up to 64 characters, and up to four messages can be displayed(1)	
03208	Automatic screen erase	
#0 SKY : #1 COK :	The function key on the MDI panel is, enabled(0)/disabled(1) The automatic screen erase function is, enabled(0)/disabled(1)	PRM3123
03209	Display of the program number	
#0 MPD :	When a subprogram is executed, the main program number is, not displayed (0)/ displayed (1)	
03210	Password	O9000 to O9999 PRM 3202#4
03211	Keyword	
03216	Increment in sequence numbers inserted automatically	PRM 0000#5

03218	Program number to be registered in synchronous input/output operation (4–digit program number)	M series
03219	Program number to be registered in synchronous input/output operation (8–digit program number)	M series
03220	Password (Encrypt keys and programs)	
03221	Keyword (Encrypt keys and programs)	
03222	Program protection range (minimum value)	
03223	Program protection range (maximum value)	
03241	Character blinking in the AI contour control mode (first character)	M series Set character codes When 0 is set for all, "AICC" is displayed
03242	Character blinking in the AI contour control mode (second character)	
03243	Character blinking in the AI contour control mode (third character)	
03244	Character blinking in the AI contour control mode (fourth character)	
03245	Character blinking in the AI contour control mode (fifth character)	
03246	Character blinking in the AI contour control mode (sixth character)	
03247	Character blinking in the AI contour control mode (seventh character)	
03251	Character blinking in the AI nano contour control mode (first character)	M series Set character codes When 0 is set for all, "AI NANO" is displayed
03252	Character blinking in the AI nano contour control mode (second character)	
03253	Character blinking in the AI nano contour control mode (third character)	
03254	Character blinking in the AI nano contour control mode (fourth character)	
03255	Character blinking in the AI nano contour control mode (fifth character)	
03256	Character blinking in the AI nano contour control mode (sixth character)	
03257	Character blinking in the AI nano contour control mode (seventh character)	

03260	Two LCD units are connected	
#0 LCH :	At power–up, the function to connect two LCD units selects, MDI of the LCD unit specified in PRM3270(0)/MDI of the LCD unit that was last selected, before power–down(1)	PRM3270, 3271
03270	Number of the LCD unit of which MDI is selected at power–up	PRM 3260#0
03271	Number of the LCD unit of which MDI is being selected	
Setting/displayed value = 0: First unit/1: Second unit		
03290	Protect of data input	
#0 WOF: #1 GOF : #2 MCV : #3 WZO: #4 IWZ : #6 MCM: #7 KEY :	Input of a tool wear compensation value with MDI keys is not inhibited (0)/inhibited (1) Input of a tool geometry compensation value with MDI keys is not inhibited (0)/inhibited (1) Input of Macro variables with MDI keys is, not inhibited (0)/inhibited (1) Input of workpiece origin offset with MDI keys is not inhibited (0)/inhibit (1) During operation, workpiece origin offset and workpiece shift value modification are enabled (0)/disabled (1). Macro variable input from the MDI panel is enabled regardless of which mode is set (0)/ enabled in MDI mode only. The KEY1 to KEY4 signals are used (0)/KEY1 is used for program protection (1).	
03291	Memory protection	
#0 WPT :	The input of the tool wear offset amount is enabled according to signal KEY1 (0)/enabled regardless (1)	M series
03292	Data input protection	
#7 PKP :	The KEYPRM signal (memory protection signal, parameter write setting) is, Disabled(0)/Enabled(1)	KEYPRM <G046#0>
03294	Start number of tool offset values whose input by MDI is disabled	
03295	Number of tool offset values (from the start number) whose input by MDI is disabled	

03301	Setting for screen hard copy	A memory card is required.
#0 HCC : #2 HCA : #3 HCG : #7 HDC :	In the VGA–compatible mode display, a 256–color of the screen hard copy is created(0)/a 16–color of the screen hard copy is created. An alarm message related to hard copy is, not displayed(0)/displayed(1) In a monochrome bit map, black and white are not inverted(0)/black and white are inverted(1) A screen hard copy is, not provided(0)/provided(1) (Started by pressing the SHIFT key for about 5 seconds)	

21) For programs

03401	G code, calculation type	
#0 DPI : #1 FCD : #4 MAB : #5 ABS : #6 GSB : #7 GSC :	When a decimal point is omitted in an address, the least input increment is assumed (0)/the unit of mm, inches, or sec. is assumed (1) When an F code is specified before a G code, a feedrate is determined by the modal G code (0)/G code in the same block (1). When in the MDI operation, switching between the absolute and incremental commands is performed by G90 or G91 (0)/depending on the ABS setting in parameter 3401#5 (1) When in the MDI operation, program command is assumed as an incremental command (0)/ absolute command (1) The G code system of lathe is A/B/C type The G code system of lathe is A/B/C type	Calculation type T series M series M series PRM 3401#4=1 T series T series

GSC	GSB	G code
0	0	G code system A
0	1	G code system B
1	0	G code system C

03402	G code at the initial status	
#0 G01 : When the power is turned, the mode is G00 (0)/G01 (1) #1 G18 : When the power is turned, the mode is G17/G18/G19 #2 G19 : When the power is turned, the mode is G17/G18/G19 #3 G91 : When the power is turned, the mode is G90 (0)/G91 (1) #4 FPM : When the power is turned on, feed per revolution on(0)/feed per minute mode(1) #6 CLR : Cause reset state the CNC with Reset signal(0)/cause clear state (1) #7 G23 : Upon power-up, G22 is set (0)/G23 is set (1).		M series M series T series

G19	G18	G17, G18, or G19 mode
0	0	G17 mode (plane XY)
0	1	G18 mode (plane ZX)
1	0	G19 mode (plane YZ)

03403	Circular interpolation	
#5 CIR : When R, I, J, and K are not specified for circular interpolation, a linear movement is made (0)/an alarm is issued (1). #6 AD2 : Specification of the same address two or more times in a block is enabled (0)/disabled (1)		ALM022 ALM5074

03404	M function	
#0 NOP : In program execution, only O, EOB, and N are not ignored (0)/ignored (1). #1 POL : For a command address allowing a decimal point, omission of the decimal point is enabled (0)/disabled (1) #2 SBP : An address P of the block including M198 is indicating a file number (0)/a program number (1) #4 M30 : When M30 is read, the cursor returns to the beginning of the program (0)/does not return to the beginning of the program (1). #5 M02 : The cursor returns to the beginning of the program when M02 is read (0)/not return (1) #6 EOR : When EOR(%) is read, an alarm is issued (0)/ not issued (1). #7 M3B : The number of M code that can be specified in one block is one (0)/up to three (1)		M series ALM5073 PRM6030 ALM5010

03405	Direct drawing dimension program, passing point signal output	
#0 AUX :	The least increment of the command of the second miscellaneous function specified with a decimal point is assumed to be 0.001 (0)/ depending on the input increment (1)	
#1 DWL :	Dwell operation is performed on an every-second basis at all times (0)/on an every-rotation basis during feed per rotation (1).	
#2 PPS :	Passing point signal output is not used (0)/used (1).	T series
#3 G36 :	G code for automatic tool compensation is G36/G37 (0)/G37.1/G37.2 (1).	T series
#4 CCR :	The addresses for chamfering and corner rounding are, “I”, “K”, “R”, and “C” (0)/“C”, “R”, and “A” (1)	T series
#5 DDP :	An angle commands by direct drawing dimension programming is normal specification (0)/a supplementary angle is given (1)	T series
#6 QLG :	A remaining distance to travel, specified by the passing point signal output, represents a total distance along all axes (0)/distance along a major axis (1).	T series
#7 QAB :	Passing point signal output specifies a remaining distance to travel (0)/coordinate along a major axis (1).	T series
03406	G code clear	PRM 3402#6=1
#1 C01 :	Upon reset, the G codes in group 01 are cleared (0)/not cleared (1).	
#2 C02 :	Upon reset, the G codes in group 02 are cleared (0)/not cleared (1).	
#3 C03 :	Upon reset, the G codes in group 03 are cleared (0)/not cleared (1).	
#4 C04 :	Upon reset, the G codes in group 04 are cleared (0)/not cleared (1).	
#5 C05 :	Upon reset, the G codes in group 05 are cleared (0)/not cleared (1).	
#7 C07 :	Upon reset, the G codes in group 07 are cleared (0)/not cleared (1).	

03407	G code clear	PRM 3402#6=1
#0 C08 : Upon reset, the G codes in group 08 are cleared (0)/not cleared (1). #1 C09 : Upon reset, the G codes in group 09 are cleared (0)/not cleared (1). #2 C10 : Upon reset, the G codes in group 10 are cleared (0)/not cleared (1). #3 C11 : Upon reset, the G codes in group 11 are cleared (0)/not cleared (1). #5 C13 : Upon reset, the G codes in group 13 are cleared (0)/not cleared (1). #6 C14 : Upon reset, the G codes in group 14 are cleared (0)/not cleared (1). #7 C15 : Upon reset, the G codes in group 15 are cleared (0)/not cleared (1).		M series M series M series
03408	G code clear	PRM 3402#6=1
#0 C16 : Upon reset, the G codes in group 16 are cleared (0)/not cleared (1). #1 C17 : Upon reset, the G codes in group 17 are cleared (0)/not cleared (1). #2 C18 : Upon reset, the G codes in group 18 are cleared (0)/not cleared (1). #3 C19 : Upon reset, the G codes in group 19 are cleared (0)/not cleared (1). #4 C20 : Upon reset, the G codes in group 20 are cleared (0)/not cleared (1).		M series M series M series M series
03409	Clear	PRM 3402#6=1
#0 C24 : Upon reset, the G codes in group 24 are cleared (0)/not cleared (1). #7 CFH : Upon reset, F, H, and D (M series) or F and T (T series) are cleared (0)/not cleared (1).		M series
03410	Tolerance of arc radius [Increment system]	
03411	M code preventing buffering 1	
03412	M code preventing buffering 2	
⋮	⋮	
03419	M code preventing buffering 9	
03420	M code preventing buffering 10	
03421	Minimum value 1 of M code preventing buffering	
03422	Maximum value 1 of M code preventing buffering	
03423	Minimum value 2 of M code preventing buffering	

03424	Maximum value 2 of M code preventing buffering	
03425	Minimum value 3 of M code preventing buffering	
03426	Maximum value 3 of M code preventing buffering	
03427	Minimum value 4 of M code preventing buffering	
03428	Maximum value 4 of M code preventing buffering	
03429	Minimum value 5 of M code preventing buffering	
03430	Maximum value 5 of M code preventing buffering	
03431	Minimum value 6 of M code preventing buffering	
03432	Maximum value 6 of M code preventing buffering	
03441	Start number of the M codes corresponding to the set numbers 100 to 199	
03442	Start number of the M codes corresponding to the set numbers 200 to 299	
03443	Start number of the M codes corresponding to the set numbers 300 to 399	
03444	Start number of the M codes corresponding to the set numbers 400 to 499	
03450	Second miscellaneous function command	
#0 AUP :	When a command for the second miscellaneous function contains a decimal point or negative sign the command is invalid (0)/valid (1).	M series
#3 CQD :	The method used for determining the amount of travel in circular interpolation is Series 16 type (0)/Series 15 type (1)	
#4 NPS :	A block that contains M98 Pxxx or M99, and which contains no addresses other than O and N functions as a one–block NC statement involving no movement (0)/as a macro statement (1)	T series
#7 BDX :	A decimal point specified with address B is handled, in the conventional way(0)/in the same way as in a system equipped with the second auxiliary function(1)	M series PRM 3405#0, 3450#0

<table>
<tr><td>03451</td><td>Program–related setting</td><td></td></tr>
<tr><td>#0 GQS :</td><td>When G33 is specified, the threading start angle shift function (Q) is, disabled(0)/enabled(1)</td><td>M series</td></tr>
<tr><td>#2 SDP :</td><td>The function to specify an S command with decimal point is, not used(0)/used(1)
(Round off the number to the nearest integer.)</td><td>M series</td></tr>
<tr><td>#3 CCK :</td><td>If chamfering or corner R is enabled and if the end point specified in an arc command is not complete, no alarm is raised(0)/an alarm is raised(1)</td><td>M series
ALM058</td></tr>
<tr><td>#4 NBN :</td><td>If PRM3404#0 is set to 1, a block including just N (sequence number) is, ignored(0)/not ignored but handled as a single block(1)</td><td>M series</td></tr>
<tr><td>03453</td><td>Chamfering or corner R, and direct drawing dimension input</td><td></td></tr>
<tr><td>#0 CRD :</td><td>If the functions of chamfering or corner R and direct drawing dimension programming are both enabled, chamfering or corner R is enabled(0)/direct drawing dimension programming is enabled(1)
(Selection is possible also on the setting screen.)</td><td>T series</td></tr>
<tr><td>03455</td><td>Handling of the decimal point</td><td><Axis></td></tr>
<tr><td>#0 AXD :</td><td>If a decimal point is omitted for an address with which a decimal point can be used, the value is determined, in accordance with the least input increment(0)/in millimeters, inches, or seconds. (calculator–type decimal point input)(1)
(This parameter is valid if PRM3401#0 is set to 0.)</td><td>M series</td></tr>
<tr><td>03460</td><td>Address for second miscellaneous function
<table><tr><td>Addres</td><td>A</td><td>B</td><td>C</td><td>U</td><td>V</td><td>W</td></tr><tr><td>Set value</td><td>65</td><td>66</td><td>67</td><td>85</td><td>86</td><td>87</td></tr></table>Address B is assumed when a value other than the above is set.</td><td>M series</td></tr>
<tr><td>03471</td><td>Allowable difference between the specified end position and the end position obtained from the increase/decrease and frequency in spiral interpolation or conic interpolation</td><td><Axis>
M series</td></tr>
<tr><td>03472</td><td>Minimum radius needed to maintain the actual speed in spiral or conic interpolation</td><td>M series</td></tr>
</table>

22) For pitch error compensation

03601	Cs contour control axis pitch error compensation during simple spindle synchronization	
#1 EPC :	The pitch error compensation on an axis of Cs contour control on the slave side during simple synchronous spindle control is, the same as that on the master axis(0)/just for the slave axis(1)	T series PRM 3661–3674, 3676–3684
03605	Error compensation function setting	<Axis>
#0 BPD : #2 IST :	Bi–direction pitch error compensation is, not used(0)/used(1) (This parameter is valid if PRM3401#0 is set to 0.) When the interpolated straightness compensation option is added, the function to select is, 128–point straightness compensation(0)/interpolated straightness compensation(1)	PRM5700 or later, 13381 or later
03620	Pitch error compensation point number for the reference position for each axis	<Axis> Valid data range : 0 - 1023
03621	Pitch error compensation point number of negative direction for each axis	
03622	Pitch error compensation point number of positive direction for each axis	
03623	Magnification for pitch error compensation for each axis (0 to 100)	<Axis>
03624	Interval between pitch error compensation points for each axis [Increment system]	<Axis>
03625	Travel distance per revolution in pitch error compensation of rotation axis type [Detection unit]	<Axis>
03626	Number of pitch error compensation point at the farthest end in the negative direction (for movement in the negative direction)	<Axis>
03627	Pitch error compensation (absolute value) at reference position when a movement to the reference position is made from the direction opposite to the direction of reference position return [Detection unit]	<Axis> PRM 1006#5

03661	Number of pitch error compensation point in the reference position if pitch error compensation is carried out on an axis of Cs contour control on the slave side during simple synchronous spindle control	(for the first spindle)	T series
03662		(for the second spindle)	PRM 3601#1
03663		(for the third spindle)	
03664		(for the fourth spindle)	
03666	Number of pitch error compensation point at the farthest end in the negative direction if pitch error compensation is carried out on an axis of Cs contour control on the slave side during simple synchronous spindle control	(for the first spindle)	T series
03667		(for the second spindle)	PRM 3601#1
03668		(for the third spindle)	
03669		(for the fourth spindle)	
03671	Number of pitch error compensation point at the farthest end in the positive direction if pitch error compensation is carried out on an axis of Cs contour control on the slave side during simple synchronous spindle control	(for the first spindle)	T series
03672		(for the second spindle)	PRM 3601#1
03673		(for the third spindle)	PRM 3605#0
03674		(for the fourth spindle)	
03676	Number of compensation point at the farthest end in the negative direction in a movement in the negative direction if both–direction pitch error compensation is carried out on an axis of Cs contour control on the slave side during simple synchronous spindle control	(for the first spindle)	T series
03677		(for the second spindle)	PRM 3601#1
03678		(for the third spindle)	PRM 3605#0
03679		(for the fourth spindle)	
03681	Pitch error compensation at the reference position if a movement to the reference position is made from the direction opposite to the direction of reference position return	(for the first spindle)	T series
03682		(for the second spindle)	PRM 3601#1
03683		(for the third spindle)	PRM 3605#0
03684		(for the fourth spindle)	

23) For spindle control

03700	Cs axis contour control	
#1 NRF :	At the first G00 command after the serial spindle is switched to C axis contour control mode, the positioning is done after returning to the reference position (0)/with normal positioning (1)	Serial spindle
03701	Connections in serial spindle control	
#1 ISI : #4 SS2 : #5 SS3 :	Specifies whether the serial spindle interface is used (0)/note used (1) The second spindle is not used (0)/used (1) The third spindle is not used (0)/used (1)	PRM 3704#1
03702	Spindle orientation function	
#0 OR3 : #1 EMS :	The spindle orientation function based on an externally set stop position is not used (0)/ used (1) by the third spindle motor. Multi–spindle control function is used (0)/not used (1)	T series (2-path control)
#2 OR1 :	The stop position external-setting type orientation function O.S.S is not used at the first spindle motor (0)/used (1)	
#3 OR2 :	The stop position external-setting type orientation function O.S.S is not used at the second spindle motor (0)/used (1)	
#4 ESI :	The spindle positioning function is used (0)/not used (1).	T series (2-path control)
#5 EAS :	With path 1, S analog output is used (0)/not used (1).	2-path control
#6 ESS :	With path 1, a serial output is used (0)/not used (1).	2-path control
#7 ECS :	With path 1, Cs contour control is used (0)/not used (1).	2-path control
03703	Number of spindles	T series
#0 2SP :	1 spindle control (0)/2 spindle control (1)	2-path control
#1 RSI :	Spindle command selection affects (0)/does not affect (1) commands from SIND for the first spindle	2-path control
#2 3SP :	In three–path control, spindle control is, exercised not on the third path (0)/exercised on each path (1)	T series
#3 MPP :	Under multi–spindle control, the spindle is not selected by a spindle signal, and a programmed command (address P) is, not used (0)/used (1)	T series PRM 3781–3784

03704	Setting related to control on multiple spindles	
#1 SS4 :	The fourth serial spindle is, not used(0)/used(1)	PRM 3701#4, #5
#2 OR4 :	For the fourth serial spindle, the function for controlling the spindle orientation of the stop position external setting type is, not used(0)/used(1)	
#4 SSS :	Synchronous spindle control by each spindle is, not performed(0)/performed(1)	PRM 4831–4834
#5 SSY :	Simple synchronous spindle control by each spindle is, not performed(0)/performed(1)	PRM 4821–4824
#6 PCS :	Under multi–spindle control, the third or fourth position coder selection signal <G026#0, #1> is, not used(0)/used(1)	
#7 CSS :	On the second to fourth spindles, Cs contour control is, not performed(0)/performed(1)	PRM1023
03705	Gear shift of spindle	
#0 ESF :	The SF signal output condition is such that S codes and SF are output with all S commands (0)/not output when constant surface speed control is used or the spindle speed is clamped (1).	PRM 3705#5
#1 GST :	The SOR signal is used for spindle orientation (0)/gear shift (1)	M series PRM3751, 3752
#2 SGB :	The gear switching method is method A (PRM3741–3743) (0)/ method B (PRM3751–3752) (1)	M series
#3 SGT :	The gear switching method during G84 and G74 is method A (0)/method B (1)	M series PRM3761, 3762
#4 EVS :	With an S command, S codes and SF are not output (0)/output (1).	T series
#5 NSF :	When an S code command is issued in constant surface-speed control, SF is output (0)/not output (1)	M series
#6 SFA :	The SF signal is output when gears are switched (0)/irrespective of whether gears are switched (1)	M series

03706	Voltage polarity of spindle, gear ratio of spindle to position coder	

#0 PG1 : The gear ratio of spindle to position coder (see table below.)
#1 PG2 : The gear ratio of spindle to position coder (see table below.)
#3 PCS : When multi-spindle control is used, feedback signal selection, independent of the position coder selection signal of the other tool post, is disabled (0)/enabled (1).

T series (2-path control) SLPCA signal SLPCB signal

#4 GTT : Spindle gear selection is based on M type (0)/ T type (1).

M series PRM 3705#0

#5 ORM : The voltage polarity during spindle orientation is positive (0)/negative (1)
#6 CWM : The voltage polarity when the spindle speed voltage is output
#7 TCW : The voltage polarity when the spindle speed voltage is output

	PG2	PG1	TCW	CWM	Volt. polarity
×1	0	0	0	0	M03, M04 = +
×2	0	1	0	1	M03, M04 = –
×4	1	0	1	0	M03 = +, M04 = –
×8	1	1	1	1	M03 = –, M04 = +

03707	Gear ratio of spindle to position coder	

#0 P21 : The gear ratio of spindle to second position coder
#1 P22 : The gear ratio of spindle to second position coder
#2, #3 P31, P32 : The gear ratio of spindle to position coder (for third spindle)

PRM 3704#6

#4, #5 P41, P42 : The gear ratio of spindle to position coder (for fourth spindle)

PRM 3704#6

Pα2	Pα1	Magnification
0	0	×1
0	1	×2
1	0	×4
1	1	×8

α = 2, 3, 4

$$\text{Magnification} = \frac{\text{Number of spindle revolutions}}{\text{Number of position coder revolutions}}$$

03708	Spindle speed arrival signal, spindle speed fluctuation detection	
#0 SAR :	The spindle speed arrival signal is not checked (0)/checked (1)	
#1 SAT :	The check of the spindle speed arrival signal at the start of executing the thread cutting block is performed with PRM3708#0=1 (0)/always performed (1)	T series
#3 SSP :	The spindle read from the spindle speed read window (PRM138) is, the spindle specified by the spindle feedback selection signal <G64#2,#3> (0)/the spindle of the path specified by the signal SPW <G195#0> (1)	
#4 SVD :	When the SIND signal is on, the detection of spindle speed fluctuation is disable (0)/enable (1)	SAR signal
#5 SOC :	During constant surface speed control (G96 mode), the speed clamp by the maximum spindle speed clamp command is carried out, before spindle speed override(0)/after spindle speed override.	PRM3772
#6 TSO :	During a threading or tapping cycle (excluding rigid tapping), the spindle override is, disabled (tied to 100%) (0)/enabled (1)	
03709	Spindle speed, multi–spindle	
#0 SAM :	The sampling frequency to obtain the average spindle speed is 4 (0)/1 (1)	T series
#1 RSC :	In the constant surface speed control mode, the surface speed of a rapid traverse block is calculated, in accordance with the coordinates of the end point (0)/in accordance with the current value, as in cutting feed (1)	
#2 MSI :	The SIND signal in multi-spindle control is valid only when the first spindle is selected (0)/for each spindle (1)	
#3 MRS :	Actual spindle speed signals and S 12–bit code signals to be output when multi–spindle control is performed, signals common to the first and second spindles are used (0)/separate signals are used (1)	T series
#4 SMC :	The function to check a large S command is, not used (0)/used (1)	M series PRM 3741–3743
03711	Virtual Cs axis	
#0 CDM :	The axis of Cs contour control of this path is, Not set as a virtual Cs axis (0)/set as a virtual Cs axis (1)	T series
03715	Confirmation of the spindle speed signal	
#0 NSAx :	This parameter specifies an axis for which confirmation of the spindle speed reached signal (SAR) is necessary (0)/unnecessary (1)	

03730	Data used for adjusting the gain of the analog output of spindle speed [0.1%]	
03731	Compensation value for the offset voltage of the analog output of the spindle speed	
03732	The number of spindle revolutions during spindle orientation or the spindle motor velocity during spindle gear shift [min^{-1}] For a serial spindle $\text{Set value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 16383$ For an analog spindle $\text{Set value} = \frac{\text{Spindle motor speed during spindle gear shift}}{\text{Maximum spindle motor speed}} \times 4095$	PRM 3705#1
03735	Minimum clamp speed of the spindle motor $\text{Set value} = \frac{\text{Minimum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$	M series
03736	Maximum clamp speed of the spindle motor $\text{Set value} = \frac{\text{Maximum clamp speed of the spindle motor}}{\text{Maximum spindle motor speed}} \times 4095$	M series
03740	Time elapsed prior to checking the spindle speed arrival signal [msec]	
03741	Maximum spindle speed for gear 1 [min^{-1}]	
03742	Maximum spindle speed for gear 2 [min^{-1}]	
03743	Maximum spindle speed for gear 3 [min^{-1}]	
03744	Maximum spindle speed for gear 4 [min^{-1}]	T series
03751	Spindle motor speed when switching from gear 1 to gear 2	M series PRM 3705#2=1
03752	Spindle motor speed when switching from gear 2 to gear 3 $\text{Set value} = \frac{\text{Spindle motor speed when the gears are switched}}{\text{Maximum spindle motor speed}} \times 4095$	
03761	Spindle speed when switching from gear 1 to gear 2 during tapping [min^{-1}]	M series PRM 3705#3=1
03762	Spindle speed when switching from gear 2 to gear 3 during tapping [min^{-1}]	
03770	Axis as the calculation reference in constant surface speed control	M series

03771	Minimum spindle speed in constant surface-speed control mode (G96) [min^{-1}]	
03772	Maximum spindle speed [min^{-1}]	
03781	P code for selecting the first spindle in multi–spindle control	T series PRM 3703#3
03782	P code for selecting the second spindle in multi–spindle control	
03783	P code for selecting the third spindle in multi–spindle control	
03784	P code for selecting the fourth spindle in multi–spindle control	
03802	Maximum speed of the second spindle [min^{-1}]	
03811	Maximum spindle speed for gear 1 of the 2nd spindle [min^{-1}]	
03812	Maximum spindle speed for gear 2 of the 2nd spindle [min^{-1}]	
03820	Gain adjustment data for the 3rd spindle [0.1%]	
03821	Velocity offset compensation value for the 3rd spindle	
03822	Maximum speed of the third spindle [min^{-1}]	
03831	Maximum spindle speed for gear 1 of the 3rd spindle [min^{-1}]	
03832	Maximum spindle speed for gear 2 of the 3rd spindle [min^{-1}]	
03850	Maximum speed of the 4th spindle [min^{-1}]	
03851	Maximum spindle speed for gear 1 of the 4th spindle [min^{-1}]	
03852	Maximum spindle speed for gear 2 of the 4th spindle [min^{-1}]	

03900	Number of the servo axis whose loop gain is to be changed when the Cs contour axis is controlled (Set value 0 to 8)	1st group for the 1st spindle
03901	Loop gain for the servo axis when the spindle gear 1 selection	
03902	Loop gain for the servo axis when the spindle gear 2 selection	
03903	Loop gain for the servo axis when the spindle gear 3 selection	
03904	Loop gain for the servo axis when the spindle gear 4 selection	
03910	Number of the servo axis whose loop gain is to be changed when the Cs contour axis is controlled (Set value 0 to 8)	2nd group for the 1st spindle
03911	Loop gain for the servo axis when the spindle gear 1 selection	
03912	Loop gain for the servo axis when the spindle gear 2 selection	
03913	Loop gain for the servo axis when the spindle gear 3 selection	
03914	Loop gain for the servo axis when the spindle gear 4 selection	
03920	Number of the servo axis whose loop gain is to be changed when the Cs contour axis is controlled (Set value 0 to 8)	3rd group for the 1st spindle
03921	Loop gain for the servo axis when the spindle gear 1 selection	
03922	Loop gain for the servo axis when the spindle gear 2 selection	
03923	Loop gain for the servo axis when the spindle gear 3 selection	
03924	Loop gain for the servo axis when the spindle gear 4 selection	

03930	Number of the servo axis whose loop gain is to be changed when the Cs contour axis is controlled (Set value 0 to 8)	4th group for the 1st spindle
03931	Loop gain for the servo axis when the spindle gear 1 selection	
03932	Loop gain for the servo axis when the spindle gear 2 selection	
03933	Loop gain for the servo axis when the spindle gear 3 selection	
03934	Loop gain for the servo axis when the spindle gear 4 selection	
03940	Number of the servo axis whose loop gain is to be changed when the Cs contour axis is controlled (Set value 0 to 8)	5th group for the 1st spindle
03941	Loop gain for the servo axis when the spindle gear 1 selection	
03942	Loop gain for the servo axis when the spindle gear 2 selection	
03943	Loop gain for the servo axis when the spindle gear 3 selection	
03944	Loop gain for the servo axis when the spindle gear 4 selection	

[Parameters for serial spindle (α series spindle amplifier)]

04000	Setting of rotation direction of spindle	
#0 ROTA1	: The spindle and the spindle motor rotate to the same direction (0)/ to the opposite direction each other (1)	From spindle side
#1 ROTA2	: The spindle rotate to CCW with +command (0)/to CW (1)	
#2 POSC1	: The spindle and the position coder rotate the same direction (0)/ the opposite direction each other (1)	
#3 RETRN	: The direction of return to reference position is CCW (0)/ CW (1)	
#4 RETSV	: The direction of reference position return in the servo mode is, counterclockwise (0)/clockwise (1)	
#5 DEFMOD	: The differential speed function is not used (0)/used (1)	
#6 DEFDRT	: The direction to which the differential speed function is applied and the direction specified in the feedback signal is the same (0)/reversed (1)	

04001	Cs contour control, magnetic sensor, position coder, MRDY signal	

#0 MRDY1 : The MRDY signal is not used (0)/used (1)
#2 POSC2 : The position coder is not used (0)/used (1)
#3 MGSEN: The magnetic sensor and the spindle rotate to the same direction (0)/opposite direction each other (1)
#5 CAXIS1: Not use the position coder of Cs axis control (0)/use (1)
#6 CAXIS2: The position coder signal for Cs axis control is not used to detection of speed (0)/used (1)
#7 CAXIS3: The position coder of Cs axis control and the spindle rotate to the same direction (0)/ to opposite direction each other (1)

04002	Cs contour control	

#0 CSDET1 :
#1 CSDET2 :
#2 CSDET3 :

CSDE T3	CSDE T2	CSDE T1	Number of pulses
0	0	0	360000 p/rev
0	0	1	180000
0	1	0	120000
0	1	1	90000
1	0	0	60000
1	0	1	40000
1	1	0	20000
1	1	1	10000

#4 CSDRCT : When Cs contour control is applied, the rotation direction function is enabled (0)/ disabled (1).
#5 SVMDRT : In servo mode, the rotation direction function is enabled (0)/disabled (1).
#6 SYCDRT : When spindle synchronous control is applied, the rotation direction function is enabled (0)/disabled (1).
#7 PCEN : In servo mode, CMR is disabled (0)/ enabled (1).

04003	Position coder, orientation	

#0 PCMGSL : The system of the orientation is position coder system (0)/magnetic sensor system (1)
#1 PCCNCT : A motor's built-in sensor is not used (0)/ used (1).
#2 DIRCT1 : The direction of rotation at the spindle orientation
#3 DIRCT2 : The direction of rotation at the spindle orientation

DIRECT 2	DIRECT 1	
0	0	Direction of rotation immediately before spindle orientation
0	1	Direction of rotation immediately before spindle orientation
1	0	The counter-clockwise in view of the motor shaft
0	1	The clockwise in view of the motor shaft

#4 PCTYPE : Position coder signal setting (See the table below.)
#6 PCPL1 : Position coder signal setting (See the table below.)
#7 PCPL2 : Position coder signal setting (See the table below.)

PCPL2	PCPL1	PCTYPE	Built-in sensor	High-resolution magnetic pulse coder	Remarks
0	0	0	256 λ/rev	65 ϕ	Position coder, high-resolution position coder
0	0	1	128 λ/rev	–	–
0	1	0	512 λ/rev	130 ϕ	–
0	1	1	64 λ/rev	–	–
1	0	0	–	195 ϕ	–
1	1	0	384 λ/rev	97.5 ϕ	–

04004	Detector selection	

#0 HRPC : A high-resolution position coder is not used (0)/used (1).
#1 SPDBIS : A separate built-in sensor is not used (0)/ used (1).
#2 EXTRF : The external one-rotation signal is not used (0)/used (1).
#3 REFTYP : The external one-rotation signal is detected on its rising edge (0)/falling edge (1).
#4 BISGAN : A standard built-in sensor is used (0)/a built-in sensor with a non-standard gain is used (1).

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04006	Gear ratio resolution	
#1 GRUNIT : The gear ratio resolution is 0.01 (0)/0.001 (1). #2 SPDUNT : The unit of motor speed is 1 min^{-1} (0)/10 min^{-1} (1). #3 SYCREF : In spindle synchronization, the one-rotation signal is automatically detected (0)/not detected (1). #5 ALGOVR : The spindle analog override value is 0% to 100% (0)/0% to 120% (1). #6 PRMCHK : Parameters are transferred from the NC (0)/the data being used currently is checked (1). #7 BLTRGD : Rigid tapping using a motor's built-in sensor is not performed (0)/performed (1).		PRM4056 to 4059
04007	Alarms related to the position coder signal	
#5 PCLS : Disconnection of a high-resolution magnetic pulse coder and position coder is detected (0)/not detected (1). #6 PCALCL : Alarms related to the position coder signal are detected (0)/not detected (1). #7 PHAICL : Motor voltage pattern when no load is applied		
04009	Velocity loop gain	
#0 VLPGAN : The setting of a velocity loop gain is used without modification (0)/used after division by 16 (1). #1 RVSVCM : In slave operation, the sub-spindle and main spindle rotate in the same direction (0)/opposite directions (1). #2 ALSP : When a serial communication alarm is issued, the power is not turned off until the motor has stopped (0)/the power is turned off immediately (1). #3 PCGEAR : The arbitrary gear function between the spindle and position coder is disabled (0)/ enabled (1). #4 LDTOUT : During acceleration/deceleration, the load detection signal is not output (0)/output (1). #5 TRSPRM : Output compensation method #6 OVRTYP : Analog override is of linear function type (0)/quadratic function type (1).		Depends on the motor model.

04011	Number of speed detector pulses	

#0 VDT1 : Speed detector setting (Following table)
#1 VDT2 : Speed detector setting (Following table)
#2 VDT3 : Speed detector setting (Following table)

VDT3	VDT2	VDT1	Number of pulse
0	0	0	64 λ/rev
0	0	1	128 λ/rev
0	1	0	256 λ/rev
0	1	1	512 λ/rev
1	0	0	192 λ/rev
1	0	1	384 λ/rev

#3 POLE1: The number of motor poles is 2 (0)/4 (1).
#4 MXPW : Setting of maximum power during acceleration/deceleration (for each model)
#5 ADJG : Acceleration/deceleration status determination condition (for each model)
#7 POLE2: The number of motor poles is set by bit 3 (0)/ is 8 (1).

04012	PWM setting	

#0 PWM1 :
#1 PWM2 : } PWM setting (Set 00 usually.)

04013	Data of the dead zone of current	

#0 ESEC : The position coder one-rotation signal is detected on either edge (0)/on the rising edge at all times (1).
#1 ESED : The Cs contour control one-rotation signal is detected on either edge (0)/on the rising edge at all times (1).
#2 DS1 :
#3 DS2 :
#4 DS3 :
#5 DS4 :
#6 DS5 : } The data of the dead zone of current (Set automatically)
#7 PWM3K: Setting of a PWM carrier wave in the output switching low-speed characteristics area (for each model)

04014	Spindle switching, MCC confirmation	

#0 AXISSL : The spindle switching function is disabled (0)/enabled (1).
#1 AXSUB : During sub-spindle rotation, the spindle switching function is disabled (0)/enabled (1).
#2 AXSLCT : The spindle switching (between the main spindle and sub-spindle) MCC contact check function is disabled (0)/enabled (1).
#3 CHGCLT: Output switching (between high speed and low speed) is checked using the RCH signal (0)/the MCC contact signal (1).
#5 SLVEN : The slave operation function is disabled (0)/enabled (1).

04015	Output switching, orientation	
#0 ORIENT : The orientation function is not provided (0)/ provided (1) #1 SPLDMT: The spindle load monitor function is disabled (0)/enabled (1). #2 SPDSW : The output switching function is not provided (0)/provided (1)		
04016	One-rotation signal error detection function	
#3 FFSMTH: The feed-forward smoothing function is disabled (0)/enabled (1). #4 CMTVL : Cs contour control setting (Usually 0.) #5 RFCHK1: The Cs contour control one-rotation signal error detection function is disabled (0)/ enabled (1). #6 RFCHK2: The position coder one-rotation signal error detection function is disabled (0)/enabled (1). #7 RFCHK3: In spindle orientation, spindle synchronization, or rigid tapping reference position return mode, the position coder one-rotation signal is not detected again (0)/detected again (1).		
04017	One-rotation signal error detection function	
#2 RFCHK4 : During normal rotation, the position coder one-rotation signal error detection function is disabled (0)/enabled (1). #7 NRROEV : With an orientation command from the stop state, the shortcut function is disabled (0)/enabled (1).		
04019	Cs contour control dead zone compensation, automatic parameter setting	
#0DTTMCS : Cs contour control dead zone compensation is disabled (0)/enabled (1). #2 SSTTRQ : When the speed is 0, speed clamping is disabled (0)/enabled (1). #4 SDTCHG : In output switching, the function for switching at a speed detection level or lower operates independently of speed detection (0)/at the speed detection level or lower (1). #7 PRLOAD : Automatic parameter setting is not performed (0)/performed (1).		
04020	Maximum motor speed [min^{-1}]	
04021	Maximum speed when the Cs axis is controlled [min^{-1}]	
04022	Speed arrival detection level [0.1%]	
04023	Speed detection level [0.1%]	
04024	Speed zero detection level [0.01%]	

04025	Torque limit value [%]	
04026	Load detection level 1 (LDT1 signal) [%]	
04027	Load detection level 2 (LDT2 signal) [%]	
04028	Output limit pattern	
04029	Output limit value [%]	
04030	Soft start (0)/stop time (1) [min^{-1}/sec]	
04031	Position coder method orientation stop position	
04032	Acceleration deceleration time constant when the spindle synchronization is controlled [min^{-1}/sec]	
04033	Arrival level for the spindle synchronization speed [min^{-1}]	
04034	Shift amount when the spindle phase synchronization is controlled [p]	
04035	Spindle phase synchronization compensation data [p]	
04036	Feed forward factor	
04037	Velocity loop feed forward factor	
04038	Spindle orientation speed [min^{-1}]	
04039	Slip compensation gain	
04040	Normal velocity loop proportional gain (High gear)	
04041	Normal velocity loop proportional gain (Low gear)	
04042	Velocity loop proportional gain during orientation (High gear)	
04043	Velocity loop proportional gain during orientation (Low gear)	
04044	Velocity loop proportional gain in servo mode/ synchronous control (High gear)	
04045	Velocity loop proportional gain in servo mode/synchronous control (Low gear)	
04046	Velocity loop proportional gain when the Cs axis is controlled (High gear)	
04047	Velocity loop proportional gain when the Cs axis is controlled (Low gear)	
04048	Normal velocity loop integral gain (High gear)	

04049	Normal velocity loop integral gain (Low gear)	
04050	Velocity loop integral gain during orientation (High gear)	
04051	Velocity loop integral gain during orientation (Low gear)	
04052	Velocity loop integral gain in servo mode/synchronous control (High gear)	
04053	Velocity loop integral gain in servo mode/synchronous control (Low gear)	
04054	Velocity loop integral gain when the Cs axis is controlled (High gear)	
04055	Velocity loop integral gain when the Cs axis is controlled (Low gear)	
04056	Number of motor rotation in one revolution of the spindle (High gear) [×100]	
04057	Number of motor rotation in one revolution of the spindle (Medium high gear) [×100]	
04058	Number of motor rotation in one revolution of the spindle (Medium low gear) [×100]	
04059	Number of motor rotation in one revolution of the spindle (Low gear) [×100]	
04060	Position gain during orientation (High gear)	
04061	Position gain during orientation (Medium high gear)	
04062	Position gain during orientation (Medium low gear)	
04063	Position gain during orientation (Low gear)	
04064	Position gain change ratio when orientation is completed [%]	
04065	Position gain in servo mode/synchronous control (High gear)	
04066	Position gain in servo mode/synchronous control (Medium high gear)	
04067	Position gain in servo mode/synchronous control (Medium low gear)	
04068	Position gain in servo mode/synchronous control (Low gear)	
04069	Position gain when the Cs axis is controlled (High gear)	

04070	Position gain when the Cs axis is controlled (Medium high gear)	
04071	Position gain when the Cs axis is controlled (Medium low gear)	
04072	Position gain when the Cs axis is controlled (Low gear)	
04073	Grid shift amount in servo mode/synchronous control [0 – 4095p]	
04074	Reference position return speed in Cs contouring control mode or servo mode [min^{-1}]	
04075	Orientation completion signal detection level	
04076	Motor velocity limit value during orientation [%]	
04077	Orientation stop position shift amount [%]	
04078	MS signal constant (Magnetic senser system orientation)	
04079	MS signal gain adjustment (Magnetic senser system orientation)	
04080	Regenerative power limit	
04081	Delay time prior motor power shut-off [msec]	
04082	Acceleration/deceleration time setting [sec]	
04083	Motor voltage during normal rotation [%]	
04084	Motor voltage during orientation [%]	
04085	Motor voltage in servo mode/synchronous control [%]	
04086	Motor voltage when the Cs axis is controlled [%]	
04087	Over-speed detection level [%]	
04088	Excessive velocity deviation detection level when the motor is constrained [0.01%]	
04089	Excessive velocity deviation detection level when the motor is rotated [0.1%]	
04090	Overload detection level [%]	
04091	Position gain change ratio when returning to the origin in the servo mode [%]	
04092	Position gain change ratio when returning to the reference position in Cs axis control [%]	
04094	Disturbance torque compensation constant	

04095	Speedometer output voltage adjustment value [0.1%]	
04096	Load meter output voltage adjustment value [0.1%]	
04097	Spindle velocity feedback gain	
04098	Speed that enables position coder signal detection [min^{-1}]	
04099	Delay time for energizing the motor [msec]	
04100	Base velocity of the motor output specification [min^{-1}]	
04101	Limit value of the motor output specification [%]	
04102	Base speed [min^{-1}]	
04103	Magnetic flux weakening start velocity [min^{-1}]	
04104	Current loop proportional gain during normal operation	
04105	Current loop proportional gain when the Cs axis is controlled	
04106	Current loop integral gain during normal operation	
04107	Current loop integral gain when the Cs axis is controlled	
04108	Zero point of current loop integral gain	
04109	Current loop proportional gain velocity factor [%]	
04110	Current conversion constant	
04111	Secondary current factor for exciting current	
04112	Current expectation constant	
04113	Slip constant	
04114	High-speed rotation slip compensation constant	
04115	Compensation constant of voltage applied to motor in the dead zone [%]	
04116	Electromotive force compensation constant [%]	
04117	Electromotive force phase compensation constant [%]	
04118	Electromotive force compensation velocity factor [%]	

04119	Time constant of voltage filter for electromotive force compensation [msec]	
04120	Dead zone compensation data [%]	
04121	Time constant for changing the torque [msec]	
04122	Time constant for velocity filter [0.1 msec]	
04123	Overload detection time setting [sec]	
04124	Voltage compensation factor during deceleration	
04125	Time during automatic operation [0.1sec]	
04126	Velocity command during automatic operation [min^{-1}]	
04127	Load meter displayed value for maximum output [%]	
04128	Maximum output zero point [min^{-1}]	
04129	Secondary current factor during rigid tapping	
04130	Constant for compensating for the phase of the electromotive force at deceleration	
04131	Time constant of the speed detection filter at the Cs contour control	
04132	Conversation constant of the phase-V current	
04133	Motor model code	
04135	Grid shift amount when the Cs axis is controlled	

[Parameter for low speed driving when the output switching function is used] (PRM4136–4175)

04136	Motor voltage during normal rotation [%]	
04137	Motor voltage in the servo mode/synchronous control [%]	
04138	Base speed of the motor output specifications [min^{-1}]	
04139	Limit value of the motor output specifications [%]	
04140	Base speed [min^{-1}]	
04141	Magnetic flux weakening start velocity [min^{-1}]	
04142	Current loop proportional gain during normal operation	
04143	Current loop integral gain during normal operation	

04144	Zero speed of the current loop integral gain	
04145	Velocity factor of the current loop proportional gain [%]	
04146	Current conversion constant	
04147	Secondary current factor for activating current	
04148	Current expectation constant	
04149	Slip constant	
04150	High–speed rotation slip compensation constant	
04151	Compensation constant for voltage applied to motor in the dead zone [%]	
04152	Electromotive force compensation constant [%]	
04153	Electromotive force phase compensation constant [%]	
04154	Voltage factor of the electromotive force compensation [%]	
04155	Voltage compensation factor during deceleration	
04156	Slip compensation gain	
04157	Time constant for changing the torque [msec]	
04158	Maximum output zero speed [min^{-1}]	
04159	Secondary current factor during rigid tapping	
04160	Hysteresis of the speed detection level	
04161	Constant for compensating for the phase of the electromotive for at deceleration	
04162	Velocity loop integral gain (High) in Cs contour control cutting feed	
04163	Velocity loop integral gain (Low) in Cs contour control cutting feed	
04164	Conversion constant of phase V current	
04165	Time constant of voltage filter for eletro motive force compensation	
04166	Regenerative power limit	
04167	Reserved	
04168	Overload current alarm detection level (for low speed characteristic)	

04169	Overload current alarm detection time constant	
04170	Overload current alarm detection level (for high speed characteristic)	
04171	Arbitrary gear data between spindle and position coder (HIGH no. of teeth on the spindle)	
04172	Arbitrary gear data between spindle and position coder (HIGH no. of teeth on PC)	
04173	Arbitrary gear data between spindle and position coder (LOW no. of teeth on spindle)	
04174	Arbitrary gear data between spindle and position coder (LOW no. of teeth on PC)	
04175	Delay timer at ON of electromagnetic contactor in unit (S series) Spindle analog override zero level (α series)	

[Parameters for spindle switching function is used (Sub–spindle)] (PRM4176–4283)

04176 to 04190	Bit parameter	
04191	Bit parameter (User can not set)	
04192 to 04194	Bit parameter	
04195	Bit parameter (Automatic setting by parameter)	
04196	Maximum motor speed	
04197	Reached speed level	
04198	Speed detection level	
04199	Speed zero detection level	
04200	Torque limit value	
04201	Load detection level 1	
04202	Output limit pattern	
04203	Output limit value	
04204	Position coder method orientation stop position	
04205	Orientation speed	
04206	Proportional gain (HIGH) of the normal velocity loop	

04207	Proportional gain (LOW) of the normal velocity loop	
04208	Velocity loop proportional gain during orientation (HIGH)	
04209	Velocity loop proportional gain during orientation (LOW)	
04210	Velocity loop proportional gain in the servo mode (HIGH)	
04211	Velocity loop proportional gain in the servo mode (LOW)	
04212	Normal velocity loop integral gain during normal operation	
04213	Velocity loop integral gain during orientation	
04214	Velocity loop integral gain in the servo mode	
04215	Reserved	
04216	Gear ratio (HIGH)	
04217	Gear ratio (LOW)	
04218	Position gain during orientation (HIGH)	
04219	Position gain during orientation (LOW)	
04220	Position gain change ratio when orientation is completed	
04221	Position gain in the servo mode (HIGH)	
04222	Position gain in the servo mode (LOW)	
04223	Grid shift amount in the servo mode	
04224	Reserved	
04225	Reserved	
04226	Detection level of orientation completion signal	
04227	Motor velocity limit value during orientation	
04228	Shift amount of orientation stop position	
04229	MS signal constant = $(L/2)/(2\times\pi\times H)\times 4096$	
04230	MS signal gain adjustment	
04231	Regenerative power limit	
04232	Delay time up to motor power shut–off	
04233	Acceleration/deceleration time setting	
04234	Spindle load monitor observer gain 1	

04235	Spindle load monitor observer gain 2	
04236	Motor voltage during normal rotation	
04237	Motor voltage during orientation	
04238	Motor voltage in the servo mode	
04239	Position gain change ratio when returning to the origin in the servo mode	
04240	Feed forward coefficient	
04241	Feed forward coefficient in velocity loop	
04242	Reserved	
04243	Arbitrary gear data between spindle and position coder (HIGH no. of teeth on spindle)	
04244	Arbitrary gear data between spindle and position coder (HIGH no. of teeth on PC)	
04245	Arbitrary gear data between spindle and position coder (LOW no. of teeth on spindle)	
04246	Arbitrary gear data between spindle and position coder (LOW no. of teeth on PC)	
04247	Spindle load monitor magnetic flux compensation time constant (for high–speed characteristic on the MAIN side)	
04248	Spindle load motor torque constant (for high–speed characteristic on the MAIN side)	
04249	Spindle load monitor observer gain 1 (on the MAIN side)	
04250	Spindle load monitor observer gain 2 (on the MAIN side)	
04251	Spindle load monitor magnetic flux compensation time constant (for low–speed characteristic on the MAIN side)	
04252	Spindle load monitor magnetic flux compensation time constant (for high–speed characteristic)	
04253	Spindle load monitor magnetic flux compensation time constant (for low–speed characteristic)	
04254	Slip correction gain (for high–speed characteristic)	
04255	Slip correction gain (for low–speed characteristic)	
04256	Base velocity of the motor output specifications	

04257	Limit value for the motor output specifications	
04258	Base speed	
04259	Magnetic flux weakening start velocity	
04260	Current loop proportional gain during normal operation	
04261	Current loop integral gain during normal operation	
04262	Zero point of current loop integral gain	
04263	Velocity factor of current loop proportional gain	
04264	Current conversion constant	
04265	Secondary current factor for excitation current	
04266	Current expectation constant	
04267	Slip constant	
04268	Compensation constant for high–speed rotation slip	
04269	Compensation constant for voltage applied to motor in the dead zone	
04270	Electromotive force compensation constant	
04271	Phase compensation constant of electromotive force	
04272	Compensation velocity factor for electromotive force	
04273	Time constant for changing the torque	
04274	Displayed value of load meter for maximum output	
04275	Maximum output zero speed	
04276	Secondary current factor in rigid tapping	
04277	Constant for compensating for the phase of the electromotive force at deceleration	
04278	Time constant of the speed detection filter	
04279	Reserved	
04280	Time constant of voltage filter for electromotive force compensation	
04281	Spindle load monitor torque constant (for low–speed characteristic on the MAIN side)	

04282	Spindle load monitor torque constant (for high–speed characteristic)	
04283	Spindle load monitor torque constant (for low–speed characteristic)	

[For low–speed characteristics when the output switch function is also used on the sub–spindle side in the case where the spindle switch function is provided]
(PRM4284–4351)

04284	Motor voltage during normal rotation	
04285	Motor voltage in the servo mode	
04286	Base speed of the motor output specifications	
04287	Limit value for the motor output specifications	
04288	Base speed	
04289	Magnetic flux weakening start velocity	
04290	Current loop proportional gain during normal operation	
04291	Current loop integral gain during normal operation	
04292	Zero point of current loop integral gain	
04293	Velocity factor of current loop proportional gain	
04294	Current conversion constant	
04295	Secondary current factor for excitation current	
04296	Current expectation constant	
04297	Slip constant	
04298	Compensation constant for high–speed rotation slip	
04299	Compensation constant for voltage applied to motor in the dead zone	
04300	Electromotive force compensation constant	
04301	Phase compensation constant for electromotive force	
04302	Compensation velocity factor for electromotive force	
04303	Time constant for changing the torque	
04304	Maximum output zero speed	
04305	Secondary current factor in rigid tapping	
04306	Constant for compensating for the phase of the electromotive force at deceleration	

04307	Limit of regenerative power	
04308	Time constant of voltage filter for electromotive voltage compensation	
04309	Motor model code	
04310	Reserved	
04311	Reserved	
04312	Position coder method orientation end signal width 2 (MAIN)	
04313	Magnetic sensor method orientation end signal width 1 (MAIN)	
04314	Magnetic sensor method orientation end signal width 2 (MAIN)	
04315	Magnetic sensor method orientation stop position shift amount (MAIN)	
04316	Position coder method orientation end signal width 2 (SUB)	
04317	Magnetic sensor method orientation end signal width 1 (SUB)	
04318	Magnetic sensor method orientation end signal width 2 (SUB)	
04319	Magnetic sensor method orientation stop position shift amount (SUB)	
04320	Spindle orientation deceleration constant (MAIN/HIGH)	
04321	Spindle orientation deceleration constant deceleration (MAIN/MEDIUM HIGH)	
04322	Spindle orientation deceleration constant deceleration (MAIN/MEDIUM LOW)	
04323	Spindle orientation deceleration constant deceleration (MAIN/LOW)	
04324	Spindle orientation deceleration constant deceleration (SUB/HIGH)	
04325	Spindle orientation deceleration constant deceleration (SUB/LOW)	
04326	Width of pulses when switching to the spindle orientation control mode (MAIN)	
04327	Width of pulses when switching to the spindle orientation control mode (SUB)	
04328	Position coder–based spindle orientation command multiplication (MAIN)	
04329	Position coder–based spindle orientation command multiplication (SUB)	

04330	Motor excitation delay time at spindle orientation (MAIN)	
04331	Motor excitation delay time at spindle orientation (SUB)	
04332	Reserved	
04333	Reserved	
04334	No. of arbitrary pulses of speed detector (MAIN)	
04335	No. of arbitrary pulses of speed detector (SUB)	
04336	Magnetic flux change point for spindle synchronous acc./dec. time calculation.	
04337	Velocity compensation factor of velocity loop gain (MAIN)	
04338	Velocity compensation factor of velocity loop gain (SUB)	
04339	Torque clamp level	
04340	Bell–shaped acceleration/deceleration time constant for spindle synchronization	
04341	Abnormal load detection level	
04342	Reserved	
04343	Reserved	
04344	Look–ahead feed forward coefficient	
04345	Spindle motor speed command detection level	
04346	Incomplete integral coefficient	
04347	Detection level for spindle 1–to–2 speed difference at slave operation	
04348	Overload current alarm detection level (for low speed characteristic)	
04349	Overload current alarm detection time constant	
04350	Overload current alarm detection level (for high speed characteristic)	
04351	Compensation for current detection offset	

04800	Synchronization control of serial spindle	
#0–#3 ND1–ND4: In controlling the spindle synchronization, the direction of the first to fourth spindle motors rotation is the direction indicated by the command sign (0)/the opposite direction (1) #6 EPZ : If an axis of Cs contour control is used under simple synchronous spindle control, positioning to an axis of Cs contour control immediately after the parking signal is switched is performed by, usual positioning operation(0)/positioning operation including reference position return(1). #7 SPK : As the parking signals for simple spindle synchronous control PKESS1 <G122#6> and PKESS2 <G122#7> are used (0)/PKESS1 <G031#6> and PKESS2 <G031#7> are used (1)		
04810	Error pulse between two spindles when phase synchronizing in the serial spindle synchronization control mode	
04811	Allowable error count for the error pulse between two spindles in the serial spindle synchronization control mode	
04821	Master axis of first spindle under simple synchronous spindle control	PRM 3704#5
04822	Master axis of second spindle under simple synchronous spindle control	
04823	Master axis of third spindle under simple synchronous spindle control	
04824	Master axis of fourth spindle under simple synchronous spindle control	
04826	Permissible synchronization error under simple synchronous spindle control in which the first spindle is the slave axis	PRM 3704#5
04827	Permissible synchronization error under simple synchronous spindle control in which the second spindle is the slave axis	<F043 #0–#3>
04828	Permissible synchronization error under simple synchronous spindle control in which the third spindle is the slave axis	
04829	Permissible synchronization error under simple synchronous spindle control in which the fourth spindle is the slave axis	

04831	Master axis of first spindle under synchronous spindle control	PRM 3704#4
04832	Master axis of second spindle under synchronous spindle control	
04833	Master axis of third spindle under synchronous spindle control	
04834	Master axis of fourth spindle under synchronous spindle control	
04900	Spindle fluctuation detection	
#0 FLR : The allowable rate and fluctuation rate of PRM4911 and 4912 are indicated in 1% steps (0)/0.1% steps (1).		T series
04911	Ratio of the spindle speed which is assumed to the specified spindle speed	
04912	Spindle speed fluctuation ratio for which no alarm is activated in the spindle speed fluctuation detection function	
04913	Spindle speed fluctuation value for which no alarm is activated in the spindle speed fluctuation detection function	
04914	Time elapsed from when the commanded spindle speed is changed to the start of spindle speed fluctuation detection	
04950	Spindle positioning	T series
#0 IOR : Resetting the system in the spindle positioning mode does not releases the mode (0)/releases the mode (1) #1 IDM : The positioning direction for the spindle using a M code is the positive direction (0)/the negative direction (1) #2 ISZ : When an M code for orientation is specified, orientation by canceling rotation mode is performed (0)/not performed (1). #5 TRV : Rotation direction of spindle positioning is set to the positive direction (0)/the reverse direction (1) #6 ESI : Spindle positioning conforms to the conventional specification (0)/extended specification (1). #7 IMB : Semi-fixed angle positioning by M code follows specification A (0)/specification B (1).		
04960	M code specifying the spindle orientation	T series
04961	M code releasing the spindle positioning mode	T series
04962	M code specifying the angle for the spindle positioning	T series

04963	Basic rotation angle specified by a M code in the spindle positioning mode	T series
04964	Number of M codes for specifying a spindle positioning angle	T series
04970	Servo loop gain of the spindle	T series
04971	Servo loop gain multiplier of the spindle for gear 1	T series
04972	Servo loop gain multiplier of the spindle for gear 2	T series
04973	Servo loop gain multiplier of the spindle for gear 3	T series
04974	Servo loop gain multiplier of the spindle for gear 4	T series

24) For tool compensation

05000	Cutter compensation in HPCC mode	M series
#0 SBK : For a block that is internally created by cutter compensation in HPCC mode, single block mode is disabled (0)/enabled (1).		
05001	Tool compensation	M series
#0 TLC : Tool length compensation A·B (0)/Tool length compensation C (1) (Move command axis) #1 TLB : Tool length compensation axis is always Z axis (0)/axis perpendicular to plane specification (1) #2 OFH : The address to appoint the offset number of tool length and tool radius is D (0)/H (1) #3 TAL : In the tool length compensation C, generates an alarm when two or more axes are offset (0)/ not generate (1) #4 EVR : When a tool compensation value is changed in cutter compensation C mode the next D or H code is specified (0)/buffering is next performed (1) #5 TPH : Specifies whether address D or H is used as the address of tool offset number (G45 to G48). Address is, D (0)/H (1) #6 EVO : When the offset value is changed with tool length compensation A or B, the block where the change takes effect is, the next H code (0)/the next buffering block (1)		PRM 5001#1

05002	Tool offset	T series
#0 LD1 :	Wear offset number of tool offset is specified using the lower two digits of a T code (0)/lower one digit of a T code (1)	
#1 LGN :	Geometry offset number of tool offset is the same as wear offset number (0)/executed by the tool selection number (1)	PRM 5002#0
#2 LWT :	Tool wear compensation is performed by moving the tool (0)/shifting the coordinate system (1)	PRM 5002#4=0
#4 LGT :	Tool geometry compensation is compensated by the shift of the coordinate system (0)/by the tool movement (1)	
#5 LGC :	Tool geometry compensation is not canceled by offset number 0 (0)/canceled (1)	
#6 LWM :	Tool offset is executed in the T code block (0)/ together with the axis movement (1)	PRM 5002#4=1
#7 WNP :	Specifies whether the valid direction of the virtual tool used for tool-tip radius compensation is specified with a geometry offset number (0)/a wear offset number (1) when the tool geometry and wear compensation option is selected.	
05003	Start up/reset in cutter compensation	
#0 SUP :	Start up in cutter compensation C is type A (0)/ B (1)	M series
#1 SUV :	When G40,G41,G42 are specified independently, the start up conforms to the standard specification (0)/moves by a distance corresponding to the offset vector which is vertical to the next block movement (1)	M series
#2 CCN :	During movement to a middle point in automatic reference position return operation, the offset vector is canceled (0)/not canceled (1).	
#3 ICK :	In HPCC mode, a cutter compensation interference check is made (0)/not made (1).	M series
#4 BCK :	When a cutter compensation interference check finds that the direction of movement differs from the offset direction of machining by 90 to 270 degrees, an alarm is issued (0)/not issued (1).	M series
#6 LVC :	Tool compensation vector is not cleared by reset (0)/cleared by reset (1)	T series
#6 LVK :	Tool length compensation vector is cleared by reset (0)/not cleared (1)	M series
#7 TGC :	Tool geometry compensation is not cleared by reset (0)/cleared by reset (1)	T series PRM 5003#6=1

05004	Tool offset	
#1 ORC : #2 ODI : #3 TS1 : #7 Y03 :	Tool offset value is set by the diameter specification (0)/set by the radius specification (1) The cutter compensation value is a radius value (0)/diameter value (1). When the tool offset measurement value direct input B function is used, touch sensor contact detection is based on four–contact input (0)/ one–contact input (1) Y axis offset is used for 4th axis (0)/3rd axis (1)	T series M series T series T series
05005	Tool compensation	T series
#0 CNI : #2 PRC : #5 QNI : #6 TLE :	On the offset screen, Y-axis offset screen, and macro screen, [INP.C] is displayed (0)/not displayed (1). Direct input of tool offset value and workpiece coordinate-system shift value not use a PRC signal (0)/uses a PRC signal (1) In the function of input of offset value measured B not automatically select the tool offset number (0)/automatically selects a tool offset number (1) When the tool offset measurement value direct input B function is used, a tool offset value, set by the offset write signal, is always received (0)/received only in offset write mode and during movement along an axis (1)	0: PRM5020
05006	Inch/metric conversion of tool compensation	
#0 OIM : #1 TGC :	Inch/metric conversion of tool compensation values is not performed (0)/performed (1). A T code, specified in a block containing G50, G04, or G10, is valid (0)/causes ALM254 to be issued (1).	T series
05007	3–dimensional coordinate system conversion	
#6 3OC : #7 3OF :	If tool length compensation is not cancelled before three–dimensional coordinate conversion is specified, an alarm is, not raised (0)/raised (1) If the commands of three–dimensional coordinate conversion and tool length compensation are not nested, an alarm is, not raised (0)raised (1)	M series ALM049 M series ALM049

05008	Cutter compensation C, tool nose radius compensation	
#0 CNI :	Interference check for cutter compensation C (M series) or tool nose radius compensation (T series) is performed (0)/not performed (1).	
#1 CNC :	During interference check for cutter compensation C (M series) or tool nose radius compensation (T series), when the direction of movement after application of the offset differs from the programmed direction by between 90° and 270° an alarm (0)/no alarm (1) is issued.	
#2 G39 :	The corner rounding function (G39) in cutter compensation C mode is disabled (0)/enabled (1)	M series
#3 CNV :	The interference check and vector erasure of cutter compensation C (M series) or tool nose radius compensation (T series) are, performed (0)/not performed (1)	
#4 MCR :	If G41/G42 (cutter compensation C (M series) or tool nose radius compensation (T series)) is specified in the MDI mode, an alarm is, not raised (0)/raised (1)	ALM5257
#5 QCR :	The travel distance of circular interpolation in cutter compensation C (M series) or tool nose radius compensation (T series) is judged, in the FS16 format (0)/in the FS15 format (1)	
#6 GCS :	If G49 and G40 are specified in a single block, the tool length compensation is cancelled, in the next block (0)/in the specified block (1)	M series
05009	Tool compensation direct input B	
#0 GSG :	In the mode of tool compensation direct input B, the offset write input signal is, <G004#2–#5> (0)/<G132#0, #1, G134#0, #1> (1)	T series
05010	Limit value that ignores the vector when a tool moves on the outside of a corner during tool nose radius compensation	T series
	Limit value that ignores the vector when a tool moves on the outside of a corner during cutter compensation C	M series
05011	Denominator constant for finding a three–dimensional tool compensation vector	M series
05013	Maximum value of tool wear compensation	
05014	Maximum value of incremental input for tool wear compensation	

05015	Distance (XP) between reference position and X axis + contact surface	T series
05016	Distance (XM) between reference position and X axis – contact surface	
05017	Distance (ZP) between reference position and Z axis + contact surface	
05018	Distance (ZM) between reference position and Z axis – contact surface	
05020	Tool compensation number in the measured tool compensation value direct input B function	T series PRM 5005#5=0
05021	Number of pulse interpolation cycles memorized prior to contacting the touch sensor	T series
05030	Minimum acceptable diameter of the grinding wheel for wear check	M series
05040	Tool compensation	T series
#0 OWD : #1 O2D :	When PRM5004#1 is set to 1, tool offset values of both geometry compensation and wear compensation are specified by radius (0)/tool offset value of geometry compensation is specified by radius and tool offset value of wear compensation is specified by diameter, for an axis of diameter programming (1) When the number of tool offsets is 400 or 999, a 3–digit tool offset number is used (0)/a 2–digit tool offset number is used (1)	
05051	Tool setter function for 1–turret, 2–spindle lathes	T series
#0 DSN : #1 WN1 :	When the tool setter function for 1–turret, 2–spindle lathes is used one touch sensor (0)/ two touch sensors (1) When a workpiece reference point offset value is set in workpiece coordinate system memory with the tool setter function for 1–turret, 2–spindle lathes, the value is set at the current cursor position (0)/a memory is automatically selected (1)	
05053	Bias for tool offset numbers for measured tool offset value setting	T series
05054	Workpiece coordinate system memory for spindle 1	T series
05055	Workpiece coordinate system memory for spindle 2	T series
05056	X–axis + (distance to contact surface) on the touch sensor 2 side (XP)	T series

05057	X–axis – (distance to contact surface) on the touch sensor 2 side (XM)	T series
05058	Z–axis + (distance to contact surface) on the touch sensor 2 side (ZP)	T series
05059	Z–axis – (distance to contact surface) on the touch sensor 2 side (ZM)	T series

25) For grinding–wheel wear compensation

05071	Number of first axis for grinding–wheel wear compensation	M series
05072	Number of second axis for grinding–wheel wear compensation	
05081	Coordinate of first compensation center along first axis on compensation plane	
05082	Coordinate of first compensation center along second axis on compensation plane	
05083	Coordinate of second compensation center along first axis on compensation plane	
05084	Coordinate of second compensation center along second axis on compensation plane	
05085	Coordinate of third compensation center along first axis on compensation plane	
05086	Coordinate of third compensation center along second axis on compensation plane	

26) For canned cycle

05101	Canned cycle	
#0 FXY :	The drilling axis in drilling canned cycle is always Z axis (0)/an axis selected using program (1)	
#1 EXC :	An external operation command (EF) is, not sent out by G81 (0)/sent out by G81 (1)	M series
#2 RTR :	G83 and G87 specify a high-speed peck drilling cycle (0)/specify a peck drilling cycle (1)	T series PRM5114
#3 ILV :	The initial point position in drilling canned cycle is not updated by reset (0)/updated by reset (1)	T series
#4 RD1 :	Set the axis and direction in which the tool in G76 and G87 is got free	M series
#5 RD2 :	Set the axis and direction in which the tool in G76 and G87 is got free	M series

RD2	RD1	G17	G18	G19
0	0	+X	+Z	+Y
0	1	–X	–Z	–Y
1	0	+Y	+X	+Z
1	1	–Y	–X	–Z

#6 M5T :	In tapping cycles G74 and G84, not output M05 (0)/output M05 (1) before the spindle rotation direction is turned to reverse	T series
#6 M5T :	In tapping cycles G74 and G84, output M05 (0)/not output M05 (1) before the spindle rotation direction is turned to reverse	M series
#7 M5B :	In drilling canned cycles G76 and G87, output M05 before an oriented spindle stop (0)/not output (1)	M series

05102	Canned cycle	T series
#1 MRC :	With G71/72, a command other than for monotone increase or decrease does not issue an alarm (0)/issues an alarm (1).	ALM064
#2 QSR :	Before execution of G70 to G73, a Q sequence number check is not made (0)/made (1).	
#3 F16 :	In a canned cycle for drilling, the FS15 format is enabled (0)/disabled (1).	
#4 RFC :	For the semifinish figure of G71 or G72 and for a cutting pattern of G73, tool nose radius compensation is, not performed (0)/performed (1)	T series
#5 K0E :	When K0 is specified in a hole machining canned cycle hole machining is performed once (0)/hole machining is not performed (1)	
#6 RAB :	In the FS15 format, R in a canned cycle for drilling is incremental (0)/absolute with G code system A, or depends on G90/G91 for G code systems B and C (1).	
#7 RDI :	In the FS15 format, R in a canned cycle for drilling specifies a radius (0)/axis (1).	

05103	Canned cycle	
#0 SIJ : #1 TFD : #1 QZA : #2 P15 : #3 PNA : #6 TCZ :	In the FS15 format, a shift value in a boring canned cycle G76 or G87 is specified by address Q (0)/address I, J, or K (1). During a threading cycle, feed forward is, enabled (0)/disabled (1) When the specification of the depth of cut (Q) for each time is omitted, or if Q0 is specified in a high–speed peck drilling canned cycle (G73) or peck drilling canned cycle (G83) no alarm is issued (0)/an alarm is issued (1) When the FS15 command format is used, the machining sequence for pocketing using multiple repetitive canned cycle G71 or G72 follows FS16 specification (0)/FS15 specification (1) If the FS15 tape format is used and if a plane without an axis is specified in the canned cycle mode of drilling, an alarm is, raised (0)/not raised (1) In a tapping cycle (excluding rigid tapping), an accumulated zero check in the tapping step is, not performed (0)/performed (1)	M series T series ALM045 M series T sereis T sereis ALM028
05104	Canned cycle	T series
#1 BCR : #2 FCK :	In a boring cycle, retraction is made, at a cutting feedrate (0)/at a rapid traverse rate (1) In a multiple repetitive canned cycle (G71/G72), the machining profile is, not checked (0)/checked (1)	ALM062
05110	C-axis clamp M code in drilling canned cycle	T series
05111	Dwell time when C axis unclamping is specified in drilling canned cycle	T series
05112	Spindle forward-rotation M code in drilling canned cycle	T series
05113	Spindle reverse-rotation M code in drilling canned cycle	T series
05114	Return and clearance of drilling canned cycle G83	T series PRM 5101#2
	Return of high-speed, peck drilling cycle G73	M series
05115	Clearance of canned cycle G83	M series
05121	Override value for retraction in boring cycle (G85, G89) [%]	T series
05130	Chamfering in thread cutting cycles G76 and G92	T series
05131	Chamfering angle in threading cycle [deg]	T series

05132	Depth of cut in multiple repetitive canned cycles G71 and G72	T series
05133	Escape in multiple repetitive canned cycles G71 and G72	
05135	Escape in multiple repetitive canned cycle G73 in X axis direction	
05136	Escape in multiple repetitive canned cycle G73 in Z axis direction	
05137	Division count in multiple repetitive canned cycle G73	
05139	Return in multiple canned cycle G74 and G75	
05140	Minimum depth of cut in multiple repetitive canned cycle G76	
05141	Finishing allowance in multiple repetitive canned cycle G76	
05142	Repetition count of final finishing in multiple repetitive canned cycle G76	
05143	Tool nose angle in multiple repetitive canned cycle G76	
05160	Peck drilling cycle of a small diameter	M series
#1 OLS : When an overload torque signal is received in a peck drilling cycle of a small diameter, the feed and spindle speed are not changed (0)/ changed (1) #2 NOL : When the depth of cut per action is satisfied in a peck drilling cycle of a small diameter, the feed and spindle speed are not changed (0)/ changed (1)		

05163	M code that specifies the peck drilling cycle mode of a small diameter	M series
05164	Percentage of the spindle speed to be changed when the tool is retracted after an overload torque signal is received [%]	
05165	Percentage of the spindle speed to be changed when the tool is retracted without an overload torque signal received [%]	
05166	Percentage of cutting feedrate to be changed when the tool is retracted after an overload torque signal is received [%]	
05167	Percentage of the cutting feedrate to be changed when the tool is retracted without an overload torque signal received [%]	
05168	Lower limit of the percentage of the cutting feedrate in a peck drilling cycle of a small diameter [%]	
05170	Number of the macro variable to which the total number of retractions during cutting is output	
05171	Number of the macro variable to which the total umber of retractions because of an overload signal is output	
05172	Speed of retraction to point R when no address I is issued [mm/min]	
05173	Speed of advancing to the position just before the bottom of a hole when no address I is issued [mm/min]	
05174	Clearance in a peck drilling cycle of a small diameter [0.001mm]	

27) For rigid tapping

05200	Rigid tapping	
#0 G84 :	M codes for rigid tapping mode command are, used (0)/not used (1)	PRM5210
#1 VGR :	Any gear ration between spindle and position coder in rigid tapping is not used (0)/used (1)	PRM3706, 5221 to 5234
#2 CRG :	When a rigid mode cancel command is specified, the rigid mode is not canceled before RGTAP signal is set low (0)/canceled (1)	
#3 SIG :	When gears are changed for rigid tapping, the use of SIND is not permitted (0)/permitted (1)	
#4 DOV :	Override during extraction in rigid tapping is invalidated (0)/validated (1)	PRM5211
#5 PCP :	In rigid tapping, a high-speed peck tapping cycle is used (0)/not used (1)	M series PRM5213
#6 FHD :	Feed hold and single block in rigid tapping are validated (0)/invalidated (1)	
#7 SRS :	When multi-spindle control is used, the spindle selection signal is G027.0 and G027.1 (0)/ G061.4 and G061.5 (1).	T series
05201	Rigid tapping	
#0 NIZ :	Rigid tapping smoothing processing is disabled (0)/enabled (1).	M series
#2 TDR :	Cutting time constant in rigid tapping uses a same parameter during cutting and extraction (0)/not use a same parameter (1)	PRM5261 to 5264, 5271 to 5274
#3 OVU :	The increment unit of the override PRM5211 is 1% (0)/ 10% (1)	
#4 OV3 :	Overriding by program is disabled (0)/enabled (1)	
05202	Rigid tapping	
#0 ORI :	When rigid tapping is started, orientation is not performed (0)/performed (1).	M series

05203	Rigid tapping by the manual handle	
#0 HRG : #1 HRM :	Rigid tapping by the manual handle is disabled (0)/enabled (1). When the tapping axis moves in the negative direction, the direction in which the spindle rotates is determined as follows: In G84 mode, the spindle rotates in a normal direction (0)/reverse (1). In G74 mode, the spindle rotates in reverse (0)/ a normal direction (1).	M series M series
#2 RFF :	In a movement from the initial point to point R during rigid tapping, feed–forward is, disabled (0)/enabled and advanced preview control is automatically turned off during rigid tapping (1)	
#3 RGS :	PRM1403#0 is set to 1 and rigid tapping is specified in feed–per–minute mode, the spindle speed becomes, 1/1000 of the specified speed(0)/1/1 of the specified speed.	T series
#4 OVS :	In rigid tapping, the feedrate override signal and the override cancel signal is, disabled(0)/enabled(1)	T series ALM028
#5 RBL :	As acceleration/deceleration for rigid tapping cutting feed, linear acceleration/deceleration is used(0)/bell–shaped acceleration/deceleration is used(1)	M series
05204	Rigid tapping	
#0 DGN : #1 SPR :	The diagnosis screen displays a rigid tapping synchronization error (0)/spindle and tapping axis error ratio difference (1). In rigid tapping, the parameters are not changed on a spindle–by–spindle basis (0)/ changed (1)	
05205	Rigid tapping	
#0 RCK : #1 NRV :	In rigid tapping, an excessive error during movement/at stop is, checked regardless of whether mode is cutting or rapid traverse (0)/checked only in cutting mode (1) In a return operation from the bottom of a hole during rigid tapping, the spindle rotation direction is, reversed (0)/not reversed (1) Caution) During rigid tapping, this parameter must not be set to 1.	M series
05210	Rigid tapping mode specification M code	0=M29
05211	Override value during rigid tapping extraction [1%/10%]	PRM 5200#4, 5201#3
05212	M code that specifies a rigid tapping mode (0 – 65535)	PRM5210
05213	Escape or cutting start point in peck tapping cycle	M series PRM 5200#5

05214	Rigid tapping synchronization error width [Detection unit]	ALM411
05215	An allowable rigid tapping synchronization error range for the second spindle [Detection unit]	
05126	An allowable rigid tapping synchronization error range for the third spindle [Detection unit]	
05221	Number of gear teeth on the spindle side in rigid tapping (first–stage gear)	PRM 5200#1
05222	Number of gear teeth on the spindle side in rigid tapping (second–stage gear)	
05223	Number of gear teeth on the spindle side in rigid tapping (third–stage gear)	
05224	Number of gear teeth on the spindle side in rigid tapping (fourth–stage gear)	T series
05225	Number of second spindle gear teeth (first–stage gear)	
05226	Number of second spindle gear teeth (second–stage gear)	
05227	Number of third spindle gear teeth (first–stage gear)	
05228	Number of third spindle gear teeth (second–stage gear)	
05231	Number of gear teeth on the position coder side in rigid tapping (first–stage gear)	
05232	Number of gear teeth on the position coder side in rigid tapping (second–stage gear)	
05233	Number of gear teeth on the position coder side in rigid tapping (third–stage gear)	
05234	Number of gear teeth on the position coder side in rigid tapping (fourth–stage gear)	T series
05235	Number of position coder gear teeth for the second spindle (first–stage gear)	
05236	Number of position coder gear teeth for the second spindle (second–stage gear)	
05237	Number of position coder gear teeth for the third spindle (first–stage gear)	
05238	Number of position coder gear teeth for the third spindle (second–stage gear)	

05241	Maximum spindle speed in rigid tapping (first–stage gear) [min^{-1}]	
05242	Maximum spindle speed in rigid tapping (second–stage gear) [min^{-1}]	
05243	Maximum spindle speed in rigid tapping (third–stage gear) [min^{-1}]	
05244	Maximum spindle speed in rigid tapping (fourth–stage gear) [min^{-1}]	T series
05245	Maximum spindle speed in rigid tapping using the second spindle (first–stage gear) [min^{-1}]	
05246	Maximum spindle speed in rigid tapping using the second spindle (second–stage gear) [min^{-1}]	
05247	Maximum spindle speed in rigid tapping using the third spindle (first–stage gear) [min^{-1}]	
05248	Maximum spindle speed in rigid tapping using the third spindle (second–stage gear) [min^{-1}]	
05261	Linear acceleration/deceleration time constant for the spindle and tapping axis (first–stage gear)	PRM 5201#2
05262	Linear acceleration/deceleration time constant for the spindle and tapping axis (second–stage gear)	
05263	Linear acceleration/deceleration time constant for the spindle and tapping axis (third–stage gear)	
05264	Linear acceleration/deceleration time constant for the spindle and tapping axis (fourth–stage gear)	T series
05265	Linear acceleration/deceleration time constant for the second spindle and tapping axis (first–stage gear) [ms]	
05266	Linear acceleration/deceleration time constant for the second spindle and tapping axis (second–stage gear) [ms]	
05267	Linear acceleration/deceleration time constant for the third spindle and tapping axis (first–stage gear) [ms]	
05268	Linear acceleration/deceleration time constant for the third spindle and tapping axis (second–stage gear) [ms]	

05271	Time constant for the spindle and tapping axis in extraction operation (first–stage gear) [ms]	PRM 5201#2
05272	Time constant for the spindle and tapping axis in extraction operation (second–stage gear) [ms]	
05273	Time constant for the spindle and tapping axis in extraction operation (third–stage gear) [ms]	
05274	Time constant for the spindle and tapping axis in extraction operation (fourth–stage gear) [ms]	T series
05280	Position control loop gain of spindle and tapping axis in rigid tapping (Common in each gear)	PRM5281 to 5284
05281	Position control loop gain of spindle and tapping axis in rigid tapping (first–stage gear)	PRM 5280=0
05282	Position control loop gain of spindle and tapping axis in rigid tapping (second–stage gear)	
05283	Position control loop gain of spindle and tapping axis in rigid tapping (third–stage gear)	
05284	Position control loop gain of spindle and tapping axis in rigid tapping (fourth–stage gear)	T series
05291	Spindle loop gain multiplier in the rigid tapping mode (first–stage gear)	
05292	Spindle loop gain multiplier in the rigid tapping mode (second–stage gear)	
05293	Spindle loop gain multiplier in the rigid tapping mode (third–stage gear)	
05294	Spindle loop gain multiplier in the rigid tapping mode (fourth–stage gear) Loop gain multiplier = $2048 \times E/L \times \alpha \times 1000$ E : Voltage in the velocity command at 1000 min^{-1} L : Rotation angle of the spindle per one rotation of the spindle motor α : Unit used for the detection	T series
05300	In–position width of tapping axis in rigid tapping [Detection unit]	
05301	In–position width of spindle in rigid tapping [Detection unit]	
05302	Tapping axis in–position width in rigid tapping using the second spindle [Detection unit]	
05303	Spindle in–position width in rigid tapping using the second spindle [Detection unit]	

05304	Tapping axis in–position width in rigid tapping using the third spindle [Detection unit]	
05305	Spindle in–position width in rigid tapping using the third spindle [Detection unit]	
05308	In–position width at point R in rigid tapping (tapping axis) [Detection unit]	
05310	Limit value of tapping axis positioning deviation during movement in rigid tapping	PRM5314
05311	Limit value of spindle positioning deviation during movement in rigid tapping	
05312	Limit value of tapping axis positioning deviation during stop in rigid tapping	
05313	Limit value of spindle positioning deviation during stop in rigid tapping	
05314	Limit of position deviation during movement along the tapping axis for rigid tapping (0 to 99999999)	PRM5310 when 0 is specified
05321	Spindle backlash in rigid tapping (first–stage gear)	T series
	Spindle backlash in rigid tapping	M series
05322	Spindle backlash in rigid tapping (second–stage gear)	T series
05323	Spindle backlash in rigid tapping (third–stage gear)	T series
05324	Spindle backlash in rigid tapping (fourth–stage gear)	T series
05325	Spindle backlash in rigid tapping using the second spindle (first–stage gear)	T series
	Spindle backlash in rigid tapping using the second spindle	M series
05326	Spindle backlash in rigid tapping using the second spindle (second–stage gear)	T series
05327	Spindle backlash in rigid tapping using the third spindle (first–stage gear)	T series
	Spindle backlash in rigid tapping using the third spindle	M series
05328	Spindle backlash in rigid tapping using the third spindle (second–stage gear)	T series
05335	Time constant for the spindle and tapping axis in second spindle extraction operation (first–stage gear) [ms]	

05336	Time constant for the spindle and tapping axis in second spindle extraction operation (second–stage gear) [ms]	
05337	Time constant for the spindle and tapping axis in third spindle extraction operation (first–stage gear) [ms]	
05338	Time constant for the spindle and tapping axis in third spindle extraction operation (second–stage gear) [ms]	
05341	Position loop gain for the spindle and tapping axis in rigid tapping using the second spindle (common to all the gears)	
05342	Position loop gain for the spindle and tapping axis in rigid tapping using the second spindle (first–stage gear)	
05343	Position loop gain for the spindle and tapping axis in rigid tapping using the second spindle (second–stage gear)	
05344	Position loop gain for the spindle and tapping axis in rigid tapping using the third spindle (common to all the gears)	
05345	Position loop gain for the spindle and tapping axis in rigid tapping using the third spindle (first–stage gear)	
05346	Position loop gain for the spindle and tapping axis in rigid tapping using the third spindle (second–stage gear)	
05350	Positional deviation limit imposed during tapping axis movement in rigid tapping using the second spindle [Detection unit]	
05351	Positional deviation limit imposed during spindle movement in rigid tapping using the second spindle [Detection unit]	
05352	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the second spindle [Detection unit]	
05353	Positional deviation limit imposed while the spindle is stopped in rigid tapping using the second spindle [Detection unit]	
05354	Positional deviation limit imposed during tapping axis movement in rigid tapping using the third spindle [Detection unit]	
05355	Positional deviation limit imposed during spindle movement in rigid tapping using the third spindle [Detection unit]	

05356	Positional deviation limit imposed while the tapping axis is stopped in rigid tapping using the third spindle [Detection unit]	
05357	Positional deviation limit imposed while the spindle is stopped in rigid tapping using the third spindle [Detection unit]	
05365	Bell–shaped acceleration/deceleration time constant for the first spindle in rigid tapping (first–stage gear) [ms]	M series
05366	Bell–shaped acceleration/deceleration time constant for the first spindle in rigid tapping (second–stage gear) [ms]	
05367	Bell–shaped acceleration/deceleration time constant for the first spindle in rigid tapping (third–stage gear) [ms]	
05369	Bell–shaped acceleration/deceleration time constant for the second spindle in rigid tapping (first–stage gear) [ms]	M series
05370	Bell–shaped acceleration/deceleration time constant for the second spindle in rigid tapping (second–stage gear) [ms]	
05373	Bell–shaped acceleration/deceleration time constant for the third spindle in rigid tapping (first–stage gear) [ms]	M series
05374	Bell–shaped acceleration/deceleration time constant for the third spindle in rigid tapping (second–stage gear) [ms]	
05381	Override value during rigid tapping return [1%/10%]	M series PRM 5200#4, 5201#3
05382	Amount of return for rigid tapping return	M series

28) For scaling, coordinate rotation

05400	Scaling, coordinate rotation	
#0 RIN : #2 D3R : #3 D3C : #4 RCW: #6 XSC : #7 SCR :	Angle command of coordinate rotation is specified by an absolute method (0)/by an incremental method (G90/G91) (1) The three–dimensional coordinate conversion mode can be cancelled by a reset operation (0)/not cancelled (1) In a hole machining canned cycle during three–dimensional coordinate conversion, rapid traverse operation is performed in, rapid traverse mode (0)/cutting mode (1) When a workpiece or local coordinate system command is issued in coordinate system rotation mode, no alarm is issued (0)/an alarm is issued (1) Axis scaling and programmable mirror image are invalidated (0)/validated (1) Scaling magnification unit is 0.00001 times (0)/ 0.001 times (1)	ALM5302 M series PRM 5401#0 M series
05401	Scaling	M series
#0 SCL :	Scaling for each axis is invalidated (0)/ validated (1)	PRM5421
05410	Angle used when coordinate rotation angle is not specified	
05411	Magnification used when scaling magnification is not specified	M series PRM 5400#7
05412	Rapid traverse rate for a hole machining cycle in three–dimensional coordinate conversion mode	
05421	Scaling magnification for each axis	<Axis> M series PRM 5400#7

29) For single direction positioning

Number	Contents	Remarks
05431	Single direction positioning	
#0 MDL : #1 PDI :	Specifies whether the G code for single direction positioning (G60) is included in one-shot G codes (00 group) (0)/modal G codes (01 group) (1) When the tool is stopped before or after a specified end point with the single direction positioning function, no in–position check is performed (0)/an in–position check is performed (1)	
05440	Positioning direction and approach in single direction positioning for each axis [Detection unit]	

30) For polar coordinate interpolation

05450	Automatic speed control	
#0 AFC : #2 PLS :	In polar coordinate interpolation mode, automatic speed control is not applied (0)/ applied (1). The polar coordinate interpolation shift function is, not used (0)/used (1)	ALM5302
05460	Axis (linear axis) specification for polar coordinate interpolation	
05461	Axis (rotary axis) specification for polar coordinate interpolation	
05462	Maximum cutting feedrate during polar coordinate interpolation [mm/min]	
05463	Allowable automatic override percentage in polar coordinate interpolation	

31) For normal direction control

05480	Number of the axis for controlling the normal direction	M series
05481	Rotation speed of normal direction control axis	M series
05482	Limit value that ignores the rotation insertion of direction control axis	M series
05483	Limit value of movement that is executed at the normal direction angle of a preceding block	M series

05484	Normal direction control	M series
#0 SDC : #1 CTI : #2 ANM :	In normal direction control if the amount of C–axis movement is smaller than the value set in PRM5485, a C–axis movement is inserted (0)/not inserted before a block (1) If such an arc that the vector from the center of the arc to a start point rotates in the reverse direction after cutter compensation is specified during normal direction control in the cutter compensation C mode, an alarm is issued (0)/the command is executed (1) In AI contour control mode, the normal direction control function is, disabled (0)/enabled (1)	 ALM041
05485	Limit imposed on the insertion of a single block for rotation about the normal direction control axis	M series

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32) For index table indexing

05500	Index table indexing	M series
#0 DDP : #1 REL : #2 ABS : #3 INC : #4 G90 : #6 SIM : #7 IDX :	Decimal point input method is conventional method (0)/electronic calculator method (1) Relative position display is not rounded by 360 degrees (0)/rounded by 360 degrees (1) Displaying absolute coordinate value is not rounded by 360 degrees (0)/rounded by 360 degrees (1) Rotation in the G90 mode is not set to the shorter way around the circumference (0)/set to the shorter way around the circumference (1) Indexing command is judged according to the G90/G91 mode (0)/judged by an absolute command (1) When the same block includes a command for an index table indexing axis and a command for another controlled axis, an alarm is issued (0)/the commands are executed (1) Index table indexing sequence is Type A (0)/ Type B (1)	PRM 3401#0=0 PRM 5500#3 PRM 5511=0 ALM136
05511	Negative-direction rotation command M code	M series
05512	Unit of index table indexing angle	M series

33) For involute interpolation

05610	Limit of initial permissible error during involute interpolation [0.001mm]	M series
05611	Radius of curvature at cutting point for starting basic circle neighborhood override 1	
05612	Radius of curvature at cutting point for starting basic circle neighborhood override 2	
05613	Radius of curvature at cutting point for starting basic circle neighborhood override 3	
05614	Radius of curvature at cutting point for starting basic circle neighborhood override 4	
05615	Radius of curvature at cutting point for starting basic circle neighborhood override 5	
05616	Override value for starting basic circle neighborhood override 2 [%]	
05617	Override value for starting basic circle neighborhood override 3 [%]	
05618	Override value for starting basic circle neighborhood override 4 [%]	
05619	Override value for starting basic circle neighborhood override 5 [%]	
05620	Lower override limit during involute interpolation [%]	
05621	Allowable acceleration while constant acceleration control is applied during involute interpolation [msec]	
05622	Minimum speed while constant acceleration control is applied during involute interpolation [msec]	

34) For exponential interpolation

05630	Distribution amount	M series
#0 SPN : A distribution amount along a linear axis in exponential interpolation is specified by PRM5643 (0)/K in G02.3 or G03.3 (1).		
05641	Number of a linear axis subject to exponential interpolation	M series
05642	Number of a rotation axis subject to exponential interpolation	M series
05643	Distribution amount (span value) for a linear axis subject to exponential interpolation	M series

35) For flexible synchronization

05660	Master axis number (group A)	M series
05661	Slave axis number (group A)	
05662	Master axis number (group B)	
05663	Slave axis number (group B)	
05664	Master axis number (group C)	
05665	Slave axis number (group C)	
05666	Master axis number (group D)	
05667	Slave axis number (group D)	
05670	M code number for turning flexible synchronization mode on (group A)	
05671	M code number for turning flexible synchronization mode off (group A)	
05672	M code number for turning flexible synchronization mode on (group B)	
05673	M code number for turning flexible synchronization mode off (group B)	
05674	M code number for turning flexible synchronization mode on (group C)	
05675	M code number for turning flexible synchronization mode off (group C)	
05676	M code number for turning flexible synchronization mode on (group D)	
05677	M code number for turning flexible synchronization mode off (group D)	

05680	Numerator for determining the gear ratio for flexible synchronization (group A)	M series Numerator:q Denominator:P When the exponent of the denominator is k, the gear ratio is: $q/(p \times 10^k)$
05681	Denominator for determining the gear ratio for flexible synchronization (group A)	
05682	Numerator for determining the gear ratio for flexible synchronization (group B)	
05683	Denominator for determining the gear ratio for flexible synchronization (group B)	
05684	Numerator for determining the gear ratio for flexible synchronization (group C)	
05685	Denominator for determining the gear ratio for flexible synchronization (group C)	
05686	Numerator for determining the gear ratio for flexible synchronization (group D)	
05687	Denominator for determining the gear ratio for flexible synchronization (group D)	
05690	Exponent for the denominator of the gear ratio for flexible synchronization (group A)	
05691	Exponent for the denominator of the gear ratio for flexible synchronization (group B)	
05692	Exponent for the denominator of the gear ratio for flexible synchronization (group C)	
05693	Exponent for the denominator of the gear ratio for flexible synchronization (group D)	

36) For straightness compensation

05700	Straightness compensation	
#0 RTS : #1 ST6 : #2 SMT :	When compensation is rewritten for the straightness compensation function, it is enabled, after power–off (0)/immediately (1) Combination of moving axis and compensation axis is, 3 combinations (0)/6 combinations (1) When two or more move axes are set using the same axis number, the valid magnification of straightness compensation is, the setting of the parameter for the first set move axis (0)/the setting of the parameter for each axis (1)	PRM 5761–5784 PRM 13391–13396
05711	Axis number of moving axis 1	
05712	Axis number of moving axis 2	
05713	Axis number of moving axis 3	
05714	Axis number of moving axis 4	
05715	Axis number of moving axis 5	

05716	Axis number of moving axis 6	
05721	Axis number of compensation axis 1 for moving axis 1	
05722	Axis number of compensation axis 2 for moving axis 2	
05723	Axis number of compensation axis 3 for moving axis 3	
05724	Axis number of compensation axis 4 for moving axis 4	
05725	Axis number of compensation axis 5 for moving axis 5	
05726	Axis number of compensation axis 5 for moving axis 6	
05731	Compensation point number a of moving axis 1	
05732	Compensation point number b of moving axis 1	
05733	Compensation point number c of moving axis 1	
05734	Compensation point number d of moving axis 1	
05741	Compensation point number a of moving axis 2	
05742	Compensation point number b of moving axis 2	
05743	Compensation point number c of moving axis 2	
05744	Compensation point number d of moving axis 2	
05751	Compensation point number a of moving axis 3	
05752	Compensation point number b of moving axis 3	
05753	Compensation point number c of moving axis 3	
05754	Compensation point number d of moving axis 3	
05761	Compensation corresponding compensation point number a of moving axis 1 [Detection unit]	
05762	Compensation corresponding compensation point number b of moving axis 1 [Detection unit]	
05763	Compensation corresponding compensation point number c of moving axis 1 [Detection unit]	
05764	Compensation corresponding compensation point number d of moving axis 1 [Detection unit]	

05771	Compensation corresponding compensation point number a of moving axis 2 [Detection unit]	
05772	Compensation corresponding compensation point number b of moving axis 2 [Detection unit]	
05773	Compensation corresponding compensation point number c of moving axis 2 [Detection unit]	
05774	Compensation corresponding compensation point number d of moving axis 2 [Detection unit]	
05781	Compensation corresponding compensation point number a of moving axis 3 [Detection unit]	
05782	Compensation corresponding compensation point number b of moving axis 3 [Detection unit]	
05783	Compensation corresponding compensation point number c of moving axis 3 [Detection unit]	
05784	Compensation corresponding compensation point number d of moving axis 3 [Detection unit]	

37) For inclination compensation

05861	Compensation point number a	<Axis> Note) To be set to satisfy a<b<c<d
05862	Compensation point number b	
05863	Compensation point number c	
05864	Compensation point number d	
05871	Compensation α at compensation point number a for each axis [Detection unit]	<Axis>
05872	Compensation β at compensation point number b for each axis [Detection unit]	
05873	Compensation γ at compensation point number c for each axis [Detection unit]	
05874	Compensation ε at compensation point number d for each axis [Detection unit]	

38) For custom macro

06000	Single block	
#0 G67 : #1 MGO: #2 HMC : #3 V15 : #4 HGO : #5 SBM : #7 SBV :	A G67 specified in modal call cancel mode issues an alarm (0)/is ignored (1). When a GOTO statement is executed, a high–speed branch to 20 sequence numbers executed from the start of the program is, a high–speed branch is not caused (0)/a high–speed branch is caused (1) A custom macro is executed, at a normal speed (0)/at a high–speed (1) The system variables for tool compensation are the standard those used with FS16 (0)/ FS15 (1). When a GOTO statement is executed a high–speed branch is not caused (0)/a high–speed branch is caused (1) In the custom macro statement, the single block stop is not valid (0)/valid (1) When execution is controlled with the system variable #3003, single block stop in a macro statement is, disabled (0)/enabled (1)	M series PRM 6000#7 PRM 6000#5=0
06001	Variable initialization, T code call, PRINT command	
#1 PRT : #3 PV5 : #4 CRO : #5 TCS : #6 CCV : #7 CLV :	When data is output using a DPRINT command, outputs a space for reading zero (0)/outputs no data (1) The output macro variables are #500 and up (0)/#100 and up and #500 and up (1). When ISO code is used in the B/D PRINT mode, output only “LF” (0)/output “LF” and “CR” (1) Custom macro is not called using a T code (0)/ called (1) Common variables #100 through #149 (to 199) are cleared to “vacant” by reset (0)/not cleared by reset (1) Local variables #1 through #33 are cleared to “vacant” by reset (0)/not cleared by reset (1)	O9000

06003	Interrupt–type custom macro	
#1 MSK : #2 MIN : #3 TSE : #4 MPR : #5 MSB : #6 MCY : #7 MUS :	Absolute coordinate during custom macro interrupt is not set to the skip coordinate (0)/set (1) Custom macro interrupt is Type I (0)/Type II (1) Interrupt signal UNIT uses edge trigger method (0)/status trigger method (1) M code for custom macro interrupt valid/invalid is standard (M96/M97) (0)/using parameter setting (1) The local variable of interrupt program is macro type (0)/subprogram type (1) Custom macro interrupt during cycle operation is not performed (0)/performed (1) Interrupt-type custom macro is not used (0)/ used (1)	M96: PRM6033 to 6034
06004	Operation results of trigonometric functions	
#0 NAT : #1 MFZ : #2 VHD : #5 DI5 :	Specification of the results of custom macro functions ATAN and ASIN ATAN = 0 to 360.0 ASIN = 270.0 to 0 to 90.0 (0)/ATAN = –180 to 0 to 180.0 ASIN = –90.0 to 0 to 90.0 (1) If the angle of a operation command SIN, COS, or TAN is 1.0×10**–8 or below or if the result of operation is not accurately 0, the operation result is, handled as underflow (0)/normalized to 0 (1) With system variables #5121 through #5128 tool position offset values (geometry offset values) are read (0)/the amount of interrupt shift caused by a manual handle interrupt is read (1) When tool compensation memory C is used, for reading or writing tool offset values (for up to offset number 200) for D code (tool radius), the same system variables, #2401 through #2800, as Series 15 are not used (0)/used (1)	T series M series
06005	Subprogram call	
#0 SQC : #1 ADR :	Calling a subprogram with its sequence number by the subprogram call function is, disabled (0)/enabled (1) Calling a subprogram with address E by the subprogram call function using a custom macro and macro executor special code is, disabled (0)/enabled (1)	M series
06006	Logic operation in conditional decision statements	
#0 MLG :	In conditional decision statements in custom macros, logical operations, cannot be used (0)/can be used (1)	
06010	Setting of hole pattern “*” of EIA code (*0 to *7)	

06011	Setting of hole pattern “=” of EIA code (=0 to =7)	
06012	Setting of hole pattern “#” of EIA code (#0 to #7)	
06013	Setting of hole pattern “ [” of EIA code ([0 to [7)	
06014	Setting of hole pattern “] ” of EIA code (]0 to]7)	
06030	M code that calls the program entered in file	M198
06033	M code that validates a custom macro interrupt	PRM 6003#4=1
06034	M code that invalidates a custom macro interrupt	
06036	Number of custom macro variables common to paths (100 - 199)	2-path control
06037	Number of custom macro variables common to paths (500 - 599)	2-path control
06050	G code that calls the custom macro of program number 9010	
06051	G code that calls the custom macro of program number 9011	
06052	G code that calls the custom macro of program number 9012	
06053	G code that calls the custom macro of program number 9013	
06054	G code that calls the custom macro of program number 9014	
06055	G code that calls the custom macro of program number 9015	
06056	G code that calls the custom macro of program number 9016	
06057	G code that calls the custom macro of program number 9017	
06058	G code that calls the custom macro of program number 9018	
06059	G code that calls the custom macro of program number 9019	
06071	M code that calls the subprogram of program number 9001	
06072	M code that calls the subprogram of program number 9002	
06073	M code that calls the subprogram of program number 9003	

06074	M code that calls the custom macro of program number 9004	
06075	M code that calls the custom macro of program number 9005	
06076	M code that calls the custom macro of program number 9006	
06077	M code that calls the custom macro of program number 9007	
06078	M code that calls the custom macro of program number 9008	
06079	M code that calls the custom macro of program number 9009	
06080	M code that calls the custom macro of program number 9020	
06081	M code that calls the custom macro of program number 9021	
06082	M code that calls the custom macro of program number 9022	
06083	M code that calls the custom macro of program number 9023	
06084	M code that calls the custom macro of program number 9024	
06085	M code that calls the custom macro of program number 9025	
06086	M code that calls the custom macro of program number 9026	
06087	M code that calls the custom macro of program number 9027	
06088	M code that calls the custom macro of program number 9028	
06089	M code that calls the custom macro of program number 9029	
06090	ASCII code that calls the subprogram of program number 9004	
06091	ASCII code that calls the subprogram of program number 9005	

39) For one touch macro

06095	Number of programs used for simple macro calls	
06096	Number of the first program of programs used for simple macro calls	
06097	Start address of signals (R signals) used for simple macro calls	

40) For pattern data input

06101	First variable number displayed on pattern data screen 1	
06102	First variable number displayed on pattern data screen 2	
06103	First variable number displayed on pattern data screen 3	
06104	First variable number displayed on pattern data screen 4	
06105	First variable number displayed on pattern data screen 5	
06106	First variable number displayed on pattern data screen 6	
06107	First variable number displayed on pattern data screen 7	
06108	First variable number displayed on pattern data screen 8	
06109	First variable number displayed on pattern data screen 9	
06110	First variable number displayed on pattern data screen 10	

41) For positioning by optimum acceleration

06131	Positioning by optimum acceleration	<Axis>
#0 OAD : The function for positioning by optimum acceleration is used (0)/not used (1) #1 EOA : For a movement along the PMC axis, the function for positioning by optimum acceleration is, disabled (0)/enabled (1)		PRM 6131#0=1
06132	Positioning by optimum acceleration	
#0 ILP : For the function for positioning by optimum acceleration, loop gain switching is, performed (0)/not performed (1)		PRM 13391–13396
06136	Distance D1 for level 1 [Increment system]	<Axis>

06096	Distance D2 for level 2 [Increment system]	<Axis>
06097	Distance D3 for level 3 [Increment system]	<Axis>
06141	Distance D1 for level 1 (metric input)	
06142	Distance D2 for level 2 (metric input)	
06143	Distance D3 for level 3 (metric input)	
06144	Distance D4 for level 4 (metric input)	
06145	Distance D5 for level 5 (metric input)	
06146	Distance D6 for level 6 (metric input)	
06151	Distance D1 to the first stage (for inch input)	
06152	Distance D2 to the second stage (for inch input)	
06153	Distance D3 to the third stage (for inch input)	
06154	Distance D4 to the fourth stage (for inch input)	
06155	Distance D5 to the fifth stage (for inch input)	
06156	Distance D6 to the sixth stage (for inch input)	
06161	First–stage rapid traverse rate	<Axis>
06162	Second–stage rapid traverse rate	<Axis>
06163	Third–stage rapid traverse rate	<Axis>
06164	Fourth–stage rapid traverse rate	<Axis>
06165	Fifth–stage rapid traverse rate	<Axis>
06166	Sixth–stage rapid traverse rate	<Axis>
06167	Seventh–stage rapid traverse rate	<Axis>
06171	First–stage rapid traverse time constant [msec]	<Axis>
06172	Second–stage rapid traverse time constant [msec]	<Axis>
06173	Third–stage rapid traverse time constant [msec]	<Axis>
06174	Fourth–stage rapid traverse time constant [msec]	<Axis>
06175	Fifth–stage rapid traverse time constant [msec]	<Axis>
06176	Sixth–stage rapid traverse time constant [msec]	<Axis>

06177	Seventh–stage rapid traverse time constant [msec]	<Axis>
06181	First–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06182	Second–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06183	Third–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06184	Fourth–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06185	Fifth–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06186	Sixth–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06187	Seventh–stage rapid traverse servo loop gain [0.01sec^{-1}]	<Axis>
06191	Time constant T2 for bell–shaped acceleration/deceleration for first–stage rapid traverse [msec]	<Axis>
06192	Time constant T2 for bell–shaped acceleration/deceleration for second–stage rapid traverse [msec]	<Axis>
06193	Time constant T2 for bell–shaped acceleration/deceleration for third–stage rapid traverse [msec]	<Axis>
06194	Time constant T2 for bell–shaped acceleration/deceleration for fourth–stage rapid traverse [msec]	<Axis>
06195	Time constant T2 for bell–shaped acceleration/deceleration for fifth–stage rapid traverse [msec]	<Axis>
06196	Time constant T2 for bell–shaped acceleration/deceleration for seventh–stage rapid traverse [msec]	<Axis>
06197	Time constant T2 for bell–shaped acceleration/deceleration for eighth–stage rapid traverse [msec]	<Axis>

42) For skip function

06200	Skip function	
#0 GSK :	For skip, SKIPP (G06.6) is disabled (0)/ enabled (1).	T series
#1 SK0 :	SKIP and the multi-step skip signal are valid when set to 1 (0)/0 (1).	X004
#3 MIT :	For skip, the MIT signal is disabled (0)/enabled (1).	T series
#4 HSS :	The high-speed skip signal is not used (0)/used (1)	
#5 SLS :	For multi-step skip, high-speed skip is not used (0)/used (1).	PRM6202, to 6206
#6 SRE :	The edge of the high-speed skip signal which triggers skipping is the rising edge (0)/falling edge (1)	
#7 SKF :	Dry run, override and automatic acceleration/deceleration for G31 skip command are disabled (0)/enabled (1)	
06201	High-speed skip, skip function	
#0 SEA :	When a high speed skip signal goes on, acceleration/deceleration and servo delay are not considered (0)/considered (1) compensation	
#1 SEB :	When a high speed skip signal goes on, acceleration/deceleration and servo delay are not considered (0)/considered (1) compensation	
#2 TSE :	When the skip function, based on the torque limit arrival signal is used, the skip position stored in a system variable is a position reflecting a servo system delay (0)/a position independent of a servo system delay (1).	
#3 TSA :	When the torque limit skip is used, torque limit arrival is monitored for : All axes (0) those axes that are specified in G31.	
#4 IGX :	For high-speed skip, SKIP (X4.7), SKIPP (G06.6), and +MIT1 to –MIT2 (X4.2 to X4.5) are enabled (0)/disabled (1).	
#5 CSE :	For repetitive high–speed skip command G31P90, either the rising or falling edge of the high–speed skip signal is effective depending on the setting of PRM6200#6 (0)/ both edges are effective (1).	M series
#7 SPE :	For the skip function, the skip signal <X004#7> is, disabled (0)/enabled (1)	

06202	High-speed skip signal, multi-step skip signal selection	
#0 1S1 : For high-speed skip, the HD10 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP signal is not used (0)/used (1). #1 1S2 : For high-speed skip, the HD11 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP2 signal is not used (0)/used (1). #2 1S3 : For high-speed skip, the HD12 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP3 signal is not used (0)/used (1). #3 1S4 : For high-speed skip, the HD13 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP4 signal is not used (0)/used (1). #4 1S5 : For high-speed skip, the HD14 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP5 signal is not used (0)/used (1). #5 1S6 : For high-speed skip, the HD15 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP6 signal is not used (0)/used (1). #6 1S7 : For high-speed skip, the HD16 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP7 signal is not used (0)/used (1). #7 1S8 : For high-speed skip, the HD17 signal is not used (0)/used (1). Alternatively, for G31 P1/ G04 Q1, the SKIP8 signal is not used (0)/used (1).		
06203	Multi-step skip signal selection	
#0 2S1 : For G31 P2/G04 Q2, the SKIP signal is not used (0)/used (1). #1 2S2 : For G31 P2/G04 Q2, the SKIP2 signal is not used (0)/used (1). #2 2S3 : For G31 P2/G04 Q2, the SKIP3 signal is not used (0)/used (1). #3 2S4 : For G31 P2/G04 Q2, the SKIP4 signal is not used (0)/used (1). #4 2S5 : For G31 P2/G04 Q2, the SKIP5 signal is not used (0)/used (1). #5 2S6 : For G31 P2/G04 Q2, the SKIP6 signal is not used (0)/used (1). #6 2S7 : For G31 P2/G04 Q2, the SKIP7 signal is not used (0)/used (1). #7 2S8 : For G31 P2/G04 Q2, the SKIP8 signal is not used (0)/used (1).		

06204	Multi-step skip signal selection	
#0 3S1 : For G31 P3/G04 Q3, the SKIP signal is not used (0)/used (1). #1 3S2 : For G31 P3/G04 Q3, the SKIP2 signal is not used (0)/used (1). #2 3S3 : For G31 P3/G04 Q3, the SKIP3 signal is not used (0)/used (1). #3 3S4 : For G31 P3/G04 Q3, the SKIP4 signal is not used (0)/used (1). #4 3S5 : For G31 P3/G04 Q3, the SKIP5 signal is not used (0)/used (1). #5 3S6 : For G31 P3/G04 Q3, the SKIP6 signal is not used (0)/used (1). #6 3S7 : For G31 P3/G04 Q3, the SKIP7 signal is not used (0)/used (1). #7 3S8 : For G31 P3/G04 Q3, the SKIP8 signal is not used (0)/used (1).		
06205	Multi-step skip signal selection	
#0 4S1 : For G31 P4/G04 Q4, the SKIP signal is not used (0)/used (1). #1 4S2 : For G31 P4/G04 Q4, the SKIP2 signal is not used (0)/used (1). #2 4S3 : For G31 P4/G04 Q4, the SKIP3 signal is not used (0)/used (1). #3 4S4 : For G31 P4/G04 Q4, the SKIP4 signal is not used (0)/used (1). #4 4S5 : For G31 P4/G04 Q4, the SKIP5 signal is not used (0)/used (1). #5 4S6 : For G31 P4/G04 Q4, the SKIP6 signal is not used (0)/used (1). #6 4S7 : For G31 P4/G04 Q4, the SKIP7 signal is not used (0)/used (1). #7 4S8 : For G31 P4/G04 Q4, the SKIP8 signal is not used (0)/used (1).		
06206	Multi-step skip signal selection	
#0 DS1 : For G04, the SKIP signal is not used (0)/used (1). #1 DS2 : For G04, the SKIP2 signal is not used (0)/used (1). #2 DS3 : For G04, the SKIP3 signal is not used (0)/used (1). #3 DS4 : For G04, the SKIP4 signal is not used (0)/used (1). #4 DS5 : For G04, the SKIP5 signal is not used (0)/used (1). #5 DS6 : For G04, the SKIP6 signal is not used (0)/used (1). #6 DS7 : For G04, the SKIP7 signal is not used (0)/used (1). #7 DS8 : For G04, the SKIP8 signal is not used (0)/used (1).		

06208	Continuous high-speed skip signal selection	M series
#0 9S1 : For continuous high-speed skip, the HD10 signal is not used (0)/used (1). #1 9S2 : For continuous high-speed skip, the HD11 signal is not used (0)/used (1). #2 9S3 : For continuous high-speed skip, the HD12 signal is not used (0)/used (1). #3 9S4 : For continuous high-speed skip, the HD13 signal is not used (0)/used (1). #4 9S5 : For continuous high-speed skip, the HD14 signal is not used (0)/used (1). #5 9S6 : For continuous high-speed skip, the HD15 signal is not used (0)/used (1). #6 9S7 : For continuous high-speed skip, the HD16 signal is not used (0)/used (1). #7 9S8 : For continuous high-speed skip, the HD17 signal is not used (0)/used (1).		
06210	High–speed skip, skip function	
#0 CS3 : As the continuous high–speed skip command, G31 P90 is used (0)/G31.9 is used (1) #1 ROS : When the skip position goes beyond the roll–over range, the skip signal position: (system variables #5061 to #5068), are not rolled over (0)/are rolled over (1)		M series
06215	Torque limit skip function for Cs contour controlled axis	<Axis>
#0 CST : For the Cs contour controlled axis, the torque limit skip function is, disabled (0)/enabled (1)		PRM 4009#4=1
06220	Period during which input is ignored for continuous high–speed skip signal [8msec]	M series

43) For automatic tool compensation (T series) and automatic tool length measurement (M series)

06240	Signal logic	
#0 AE0 : A measuring position is assumed to be reached when XAE, YAE, ZAE, or AZE is 1 (0)/ 0 (1).		
06241	Feedrate during measurement of automatic tool compensation	T series
	Feedrate during measurement of automatic tool length compensation	M series
06251	γ value on X axis during automatic tool compensation	T series
	γ value during automatic tool length compensation	M series
06252	γ value on Z axis during automatic tool compensation	T series

06254	ε value on X axis during automatic tool compensation	T series
	ε value during automatic tool length compensation	M series
06255	ε value on Z axis during automatic tool compensation	T series

44) For external data input/output

06300	External program number search	
#3 ESC :	When a reset is input between input of the external data input read signal ESTB and execution of a search, the external program number search function, performs a search (0)/does not perform a search (1)	When multiple paths are used, the setting of the first path is employed.
#4 ESR :	External program number search is disabled (0)/ enabled (1)	
#7 EEX :	PMC EXIN function is conventional specifications (0)/extended specifications (1)	

45) For fine torque sensing

06350	Fine torque sensing	

#0 TQ1 : Setting of the buffering interval
#1 TQ2 : Setting of the buffering interval

TQ2	TQ1	Interval
0	0	8ms
0	1	16ms
1	0	32ms
1	1	Disabled

#2 FTM : Model machining is, not monitored (0)/monitored (1)
#3 FTP : Absolute coordinates are, not monitored (0)/monitored (1)
#4 FTA : The detection level in the torque monitor screen is, not associated with the threshold value for an abnormal load detection alarm(0)/associated with it.
(Tip: Threshold parameter = Servo: PRM2104/Spindle: PRM4341)
#7 FTS : As spindle data for fine torque sensing, disturbance load torque data is used (0)/all torque data (data for the load meter) is used (1)

06360	Target axis 1	To be set according to the following: Servo = 1 to 8 Spindle = –1 to –4
06361	Target axis 2	
06362	Target axis 3	

46) For manual handle retrace

06400	Manual handle retrace	T series
#0 HRP : With the manual handle retrace function, the rapid traverse rate is clamped, assuming that, an override of 10% is used (0)/an override of 100% is used (1) #1 HFW : With the manual handle retrace function, program execution can be performed, in both forward and backward directions (0)/only in the forward direction (1) #2 HM5 : Sets the number of M code groups and the number of M codes in each group. #3 HM8 : Sets the number of M code groups and the number of M codes in each group. #4 HMP : When reverse or backward movement is disabled for a path, reverse or backward movement is, not disabled for other paths (0)/also disabled for other paths (1)		PRM 6411–6490
06410	Travel distance per pulse generated from the manual pulse generator for the manual handle retrace function [%]	T series

HM8	HM5	M code group setting
0	0	Standard (20 groups of four)
0	1	16 groups of five
1	0	10 groups of eight

06411	M code (xx) in group (yy) for backward movement by the manual handle retrace function	T series The values of PRM6411 to 6490 are determined by the settings of PRM 6400#2 and #3. In this table, group name (yy) and the number of M codes (xx) are indicated.
⋮	⋮	
06490	M code (xx) in group (yy) for backward movement by the manual handle retrace function	

In a forward movement, the M code command set in the same group is stored. In a backward movement, the M code is output. This parameter can be used to reproduce a modal state such as spindle rotation.
When this parameter is not set, an M code is output as specified.
(Example)

In a forward movement:

```
      ↓
  M03 ; (Forward spindle rotation command)
    : (The spindle rotates.)
  M05 ; (Spindle stop command)
    :
      ↓
```

[When this parameter is not used]
In a backward movement:

```
      ↑
  M03 ;
    : (The spindle stops.)
  M05 ;
    :
      ↑
```

[When this parameter is set]
(M03 and M05 are set in the same group.)
In a backward movement:

```
      ↑
  M03 ;
    : (The spindle rotates.)
  M05 ; → M03 is output.
    :
      ↑
```

47) For graphic display

06500	Current position display display	
#0 GRL : #1 SPC : #2 GUL : #3 DPA : #5 DPO : #6 NZM : 	Graphic display Tool post 1 is displayed on the left, and tool post 2 is displayed on the right (0) Tool post 1 is displayed on the right, and tool post 2 is displayed on the left (1) Graphic display (2–path control) is done on two spindles and two tool posts (0)/on one spindle and two tool posts (1) The positions of X1– and X2–axes are not replaced (0)/are replaced (1) with each other in the coordinate system specified with PRM6509. Current position display is the actual position to ensure tool nose radius compensation (0)/ programmed position (1) Current position is not appear on the machining profile drawing or tool path drawing screen (0)/ appear (1) The screen image is not enlarged (0)/enlarged (1) by specifying the center of the screen and magnification.	T series (2-path control) T series (2-path control) T series (2-path control) T series M series T series
06501	Graphic display	
#0 ORG : #1 TLC : #2 3PL : #3 RID : #4 FIM : #5 CSR : 	Drawing when coordinate system is altered during drawing, draws in the same coordinate system (0)/draws in the new coordinate system (1) In solid drawing, the tool length compensation is not executed (0)/executed (1) Tri-plane drawing in solid drawing is drawn by the third angle projection (0)/first angle projection (1) In solid drawing, a plane is drawn without edges (0)/with edges (1) Machining profile drawing in solid drawing is displayed in the coarse mode (0)/fine mode (1) Center position of tool in tool path drawing is marked with ■ (0)/with × (1)	M series M series M series M series M series
06503	Check drawing	
#1 MST : #2 CYG :	In check drawing (animated simulation) using the dynamic graphic display function, the M, S, and T code commands in the program are ignored (0)/output to the machine in the same way (1) The CY–axis drawing coordinate system is, not set (0)/set (1)	M series T series PRM 6500#1
06509	Coordinate system for drawing a single spindle	T series (2–path control)
06510	Drawing coordinate system	T series

06511	Right margin in solid drawing	M series
06512	Left margin in solid drawing	
06513	Upper margin in solid drawing	
06514	Lower margin in solid drawing	
06515	Change in cross-section position in tri-plane drawing	
06520	C-axis number for dynamic graphic display	T series
06561	Standard color data for graphic color number 1	
06562	Standard color data for graphic color number 2	
06563	Standard color data for graphic color number 3	
06564	Standard color data for graphic color number 4	
06565	Standard color data for graphic color number 5	
06566	Standard color data for graphic color number 6	
06567	Standard color data for graphic color number 7	
06568	Standard color data for graphic color number 8	
06569	Standard color data for graphic color number 9	
06570	Standard color data for graphic color number 10	
06571	Standard color data for graphic color number 11	
06572	Standard color data for graphic color number 12	
06573	Standard color data for graphic color number 13	
06574	Standard color data for graphic color number 14	
06575	Standard color data for graphic color number 15	
06581	Standard color data for character color number 1	
06582	Standard color data for character color number 2	
06583	Standard color data for character color number 3	
06584	Standard color data for character color number 4	

06585	Standard color data for character color number 5	
06586	Standard color data for character color number 6	
06587	Standard color data for character color number 7	
06588	Standard color data for character color number 8	
06589	Standard color data for character color number 9	
06590	Standard color data for character color number 10	
06591	Standard color data for character color number 11	
06592	Standard color data for character color number 12	
06593	Standard color data for character color number 13	
06594	Standard color data for character color number 14	
06595	Standard color data for character color number 15	

48) For displaying operation time and number of parts

06700	Number of parts	
#0 PCM :	M code that counts the number of machined parts are specified by M02, M30 and PRM6710 (0)/only M code specified by PRM6710 (1)	PRM6710
06710	M code that counts the total number of machined parts and the number of machined parts	
06711	Number of machined parts	
06712	Total number of machined parts	
06713	Number of required parts	PRTSF signal <F062#7>
06750	Integrated value of power-on period [Minute]	
06751	Operation time [msec] (Integrated value of time during automatic operation) I	

06752	Operation time [Minute] (Integrated value of time during automatic operation) II	
06753	Integrated value of cutting time I [msec]	
06754	Integrated value of cutting time II [Minute]	
06755	Integrated value of general-purpose [msec] integrating meter drive signal (TMRON) ON time I	<G053#0>
06756	Integrated value of general-purpose [Minute] integrating meter drive signal (TMRON) ON time II	<G053#0>
06757	Operation time [msec] (Integrated value of one automatic operation time) I	
06758	Operation time [Minute] (Integrated value of one automatic operation time) II	

49) For tool life management

06800	Tool life management	

#0 GS1 : Setting the combination of the number of tool life groups and the number of tools

#1 GS2 : Setting the combination of the number of tool life groups and the number of tools

GS2	GS1	M series		T series	
		Group count	Tool count	Group count	Tool count
0	0	1–16 1–64	1–16 1–32	1–16 1–16	1–16 1–32
0	1	1–32 1–28	1–8 1–16	1–32 1–32	1–8 1–16
1	0	1–64 1–256	1–4 1–8	1–64 1–64	1–4 1–8
1	1	1–128 1–512	1–2 1–4	1–16 1–128	1–16 1–4

The values on the lower row in the table apply when the 512–(M series) or 128–(T series) –tool–life–management–group option is provided.

#2 LTM : Tool life is specified by the number of times (0) /by time (1)

#3 SIG : Not input the group number using a tool group signal during tool skip (0)/input the group number (1)

#4 GRS : Data clear during the input of tool exchange reset signal clears only the execution data of specified groups (0)/the execution data of all entered groups (1)

#5 SNG : At the input of a tool skip signal when tools other than those under tool life management are selected, skips a tool that is used last or specified (0)/ignores a tool skip signal (1)

#6 IGI : Tool back number is not ignored (0)/ignored (1) — M series

#7 M6T : T code in the same block as M06 is judged as a back number (0)/as a next tool group command (1) — M series

06801	Tool life management	
#1 TSM :	When a tool takes several tool numbers, life is counted for each of the same tool numbers (0)/ for each tool (1)	T series
#2 LFV :	Specifies whether life count override is disabled (0) / enabled (1) when the extended tool life management function is used.	M series
#3 EMD :	Specifies when an asterisk (*) indicating that a tool has been exhausted is displayed. When the next tool is selected (0) / When the tool life is exhausted (1)	M series
#5 E1S :	When the life of a tool is measured in time–based units, the life is counted every four seconds (0)/every second (1)	PRM 6800#2
#6 EXG :	Using G10, tool life management data is registered after data for all tool groups has been cleared (0)/data can be added/modified/deleted for a specified group only (1).	T series
#6 EXT :	Specifies whether the extended tool life management function is not used (0) / is used (1)	M series
#7 M6E :	When T code is specified in the same block as M06, the T code is processed as a next selected group number/the tool group life is counted immediately	M series PRM 6800#7

06802	Tool change signal	
#0 T99 :	If a tool group whose life has expired is found to exist when M99 is executed in the main program, the tool change signal is not output (0)/the tool change signal is output (1)	
#1 TCO :	When function code 171 or 172 (tool life management data write) of the PMC window function is specified, tool data of a tool in the currently selected group that is currently not in use, cannot be cleared (0)/can be cleared (1)	M series
#2 E17 :	When the management data of the tool in use is cleared with code 171 or 172 (tool life management data rewrite) of the PMC window function, clear operation is not performed and the execution ends normally (0)/clear operation is not performed and completion code 13 is output (1)	M series
#3 GRP :	As management data for the tool life arrival notice signal <F064#3>, PRM6844 and 6845 are used (0)/the value set for each group with the extended tool life management function is used (1)	M series
#4 ARL :	The tool life arrival notice signal <F064#3> is, output for each tool (0)/output for the last tool in a group (1)	M series PRM 6802#3=1
#5 TGN :	In tool life management B, the arbitrary group number set function is, not used (0)/used (1)	M series
#6 TSK :	When the life is specified by time and the last tool in a group is skipped, the count for the last tool indicates the life value (0)/the count for the last tool is not changed (1)	M series
#7 RMT :	Specifies when to turn off the tool life arrival signal<F064#3> , as follows, the actual remaining life is longer than that specified in a parameter (0)/the actual remaining life is not equal to that specified in a parameter (1)	M series PRM6845
06803	Tool life management	
#0 LGR :	When the tool life management function is used, a tool life type is chosen based on the LTM parameter (bit 2 of parameter No.6800) for all groups (0)/set to either count or duration on a group–by–group basis (1)	T series PRM 6800#2
#1 LFE :	When a tool life is specified by count, a count value from 0 to 9999 can be specified (0)/a count value from 0 to 65535 can be specified (1)	
06804	Tool life management	
#0 TC1 :	During automatic operation, preset of the tool life counter is, disabled (0)/ enabled (1)	
#1 ETE :	In extended tool life management, as the mark indicating that the life of the last tool in a group has expired, "@" is also used (0)/"*" is used (1)	M series
06810	Tool life control ignored number	M series

06811	Tool life count restart M code	T series
06844	Remaining tool life (use count)	M series
06845	Remaining tool life (use duration) [Minute]	M series

50) For position switch functions

06901	Position switch	
#0 IGP : #1 EPS : #2 PCM : #3 PSF :	During follow–up for the absolute position detector, position switch signals are output (0)/ not output (1) The number of position switches is, up to 10 (0)/up to 16 (1) Position switch signals are output, Without considering acceleration/deceleration and servo delay (0)/with considering acceleration/deceleration and servo delay (1) In high–precision contour control mode, AI contour control mode, AI nano–contour control mode, or advanced preview control mode, position switches are, not used (0)/used (1) (By setting this parameter, the output timing of the position switch changes. So, be careful when setting this parameter.)	PRM 8501#1=0
06910	Axis corresponding to the 1st position switch	
06911	Axis corresponding to the 2nd position switch	
06912	Axis corresponding to the 3rd position switch	
06913	Axis corresponding to the 4th position switch	
06914	Axis corresponding to the 5th position switch	
06915	Axis corresponding to the 6th position switch	
06916	Axis corresponding to the 7th position switch	
06917	Axis corresponding to the 8th position switch	
06918	Axis corresponding to the 9th position switch	
06919	Axis corresponding to the 10th position switch	
06920	Axis corresponding to the 11th position switch	
06921	Axis corresponding to the 12th position switch	
06922	Axis corresponding to the 13th position switch	
06923	Axis corresponding to the 14th position switch	
06924	Axis corresponding to the 15th position switch	
06925	Axis corresponding to the 16th position switch	
06930	Maximum operation range of the 1st position switch	

06931	Maximum operation range of the 2nd position switch	
06932	Maximum operation range of the 3rd position switch	
06933	Maximum operation range of the 4th position switch	
06934	Maximum operation range of the 5th position switch	
06935	Maximum operation range of the 6th position switch	
06936	Maximum operation range of the 7th position switch	
06937	Maximum operation range of the 8th position switch	
06938	Maximum operation range of the 9th position switch	
06939	Maximum operation range of the 10th position switch	
06940	Maximum operation range of the 11th position switch	
06941	Maximum operation range of the 12th position switch	
06942	Maximum operation range of the 13th position switch	
06943	Maximum operation range of the 14th position switch	
06944	Maximum operation range of the 15th position switch	
06945	Maximum operation range of the 16th position switch	
06950	Minimum operation range of the 1st position switch	
06951	Minimum operation range of the 2nd position switch	
06952	Minimum operation range of the 3rd position switch	
06953	Minimum operation range of the 4th position switch	
06954	Minimum operation range of the 5th position switch	

06955	Minimum operation range of the 6th position switch	
06956	Minimum operation range of the 7th position switch	
06957	Minimum operation range of the 8th position switch	
06958	Minimum operation range of the 9th position switch	
06959	Minimum operation range of the 10th position switch	
06960	Minimum operation range of the 11st position switch	
06961	Minimum operation range of the 12nd position switch	
06962	Minimum operation range of the 13rd position switch	
06963	Minimum operation range of the 14th position switch	
06964	Minimum operation range of the 15th position switch	
06965	Minimum operation range of the 16th position switch	

51) For manual operation, automatic operation

07001	Manual intervention, return function	
#0 MIN : The manual intervention/return function is disabled (0)/enabled (1). #2 JST : During operation based on manual numerical specification, the automatic operation start in–progress signal STL is not output (0)/output (1) #3 JSP : For the manual numeric command function, spindle control by the CNC is, not enabled (0)/enabled (1) #7 MFM: For the manual linear or circular interpolation function, modifying a value specified with a command during jog feed in the guidance direction, immediately starts moving according to the new value (0)/stops moving (1).		

<table>
<tr><td>07002</td><td>Manual numerical specification</td><td></td></tr>
<tr><td colspan="2">#0 JMF : In manual numerical specification, M function specification is allowed (0)/not allowed (1)
#1 JSF : In manual numerical specification, S function specification is allowed (0)/not allowed (1)
#2 JTF : In manual numerical specification, T function specification is allowed (0)/not allowed (1)
#3 JBF : In manual numerical specification, B function specification is allowed (0)/not allowed (1)</td><td>M series</td></tr>
<tr><td>07010</td><td>Manual numerical specification</td><td><Axis></td></tr>
<tr><td colspan="2">#0 JMVx : In manual numerical specification, axis movement specification is: allowed (0)/not allowed (1)</td><td></td></tr>
<tr><td>07015</td><td>Least command increment setting for jog feed [Increment system]</td><td>When JGUNIT <G023#0> = 1</td></tr>
<tr><td>07050</td><td>Retrace function</td><td>M series</td></tr>
<tr><td colspan="2">#0 RV1 : When the tool moves backwards after feed hold during forward feed with the retrace function, the block is split at the feed hold position and stored (0)/stored without being split (1).
#5 MI0 : Set below value
#6 MI1 : Set below value
<table>
<tr><th>MI1</th><th>MI0</th><th>Fine acceleration/deceleration</th></tr>
<tr><td>0</td><td>0</td><td>Used</td></tr>
<tr><td>0</td><td>1</td><td>Not used</td></tr>
</table></td><td></td></tr>
<tr><td>07051</td><td>AI contour control</td><td>M series</td></tr>
<tr><td colspan="2">#3 ACR : When rigid tapping is specified in AI contour control mode, the mode is, not turned off (0)/turned off (1)</td><td>PRM 5200#2=0 There are additional conditions.</td></tr>
<tr><td>07052</td><td>AI contour control</td><td>M series</td></tr>
<tr><td colspan="2">#0 NMI : When using PMC–based axis control and the Cs axis in the AI contour control mode, set this parameter to 1.
When using the FAD function of the servo system, set this parameter to 0.</td><td></td></tr>
<tr><td>07053</td><td>AI contour control</td><td>M series</td></tr>
<tr><td colspan="2">#0 NAN : G5.1Q1 specifies, AI nano–contour control (0)/AI contour control (1)</td><td></td></tr>
</table>

07054	AI contour control	M series
#0 HPL :	If HPCC mode is specified in AI contour control mode and a command unavailable in HPCC mode is found, the NC processes the command, in normal mode (0)/in AI contour control mode (1)	
#1 AIR :	In AI contour control mode, the rapid traverse type is, linear interpolation type (0)/according to the setting of PRM1401#1 (1)	PRM 1401#1
#3 AZR :	In AI contour control mode, the G27, G28, G30, G30.1, and G53 commands are executed, in normal mode (0)/in AI contour control mode (1)	
#5 AIL :	When non–linear type positioning is specified in AI contour control mode and an axis–by–axis interlock signal is input, the tool stops along all axes (0)/the setting of parameter is used.	PRM 1002#4

07055	AI contour control	M series
#0 ACO :	In AI contour control mode, Automatic corner override and changing both internal and external circular feedrates are disabled (0)/automatic corner override and changing the internal circular feedrate are enabled, and whether to enable changing the external circular feedrate depends on the setting of 1602#2.	PRM 1602#2
#1 AFI :	During one–digit F code feed in AI contour control mode, changing the feedrate by the manual handle is, disabled (0)/enabled (1)	PRM 1401#1
#2 ALZ :	If no reference position has been established and G28 is specified in AI contour control mode, an alarm is issued (0)/AI contour control mode is turned off and the command is executed (1)	ALM090
#3 BCG :	The bell–shaped acceleration/deceleration time constant change function in AI contour control mode or AI nano contour control mode is, disabled (0)/enabled (1)	PRM 19501#6

07066	Acceleration/deceleration reference speed for the bell–shaped acceleration/deceleration time constant change function in AI contour control mode or AI nano contour control mode [Input unit]	M series PRM19520

52) For manual handle feed, manual handle Interruption, tool axis direction handle feed

07100	Use in the manual mode, and connection locations	
#0 JHD : Manual pulse generator in JOG mode is invalid (0)/valid (1) #1 THD : Manual pulse generator in TEACH IN JOG mode is invalid (0)/valid (1) #2 IHD : The travel increment for manual handle interrupt is output unit, and acceleration/ deceleration after interpolation is disabled (0)/input unit, and acceleration/deceleration after interpolation is enabled (1) #3 HCL : The clearing of a handle interrupt travel distance is invalid (0)/valid (1). #4 HPF : If the specified manual handle feedrate exceeds the rapid traverse rate, handle pulses exceeding the rapid traverse rate are ignored (0)/are not ignored such that the tool is moved then stopped (1).		
07102	Rotation direction	
#0 HNG : Axis movement direction for rotation direction of manual pulse generator is same in direction (0) / reverse in direction (1)		
07103	Manual handle	
#0 RHD : By a reset, the amount of manual handle interruption is, not canceled (0)/canceled (1) #2 HNT : The manual handle feed/incremental feed magnification is, multiplied by 1 (0)/multiplied by 10 (1) #3 HIT : The manual handle interruption magnification is, multiplied by 1 (0)/multiplied by 10 (1) #4 IBH : Manual handle feed for the β servo unit using an I/O link manual pulse generator is, disabled (0)/enabled (1)		PRM 7100#2=1

07104	Handle feed in the tool axis direction	
#0 TLX :	When the rotation axis is at the origin, the tool axis is in the Z direction (0)/X direction (1).	M series
#2 CXC :	Tool axis direction handle feed or perpendicular direction handle feed is performed with 5–axis machine (0)/4–axis machine (1).	M series
#3 3D1 :	For tool axis direction handle feed and right angle direction handle feed, the machine coordinates when the mode is set or when a reset is performed (0)/the coordinates specified with PRM7144 (1) are set as the coordinates of the first rotation axis.	M series
#4 3D2 :	For tool axis direction handle feed and right angle direction handle feed, the machine coordinates when the mode is set or when a reset is performed (0)/the coordinates specified with PRM7145 (1) are set as the coordinates of the second rotation axis.	M series
#5 HHI :	Manual handle interrupt during high–speed machining is disabled (0)/enabled (1)	
07110	Number of manual pulse generator used	
07113	Manual handle feed magnification m (1–127)	
07114	Manual handle feed magnification n (0–1000)	
07117	Allowable number of pulses that can be accumulated during manual handle feed	
07120	Axis configuration for using the tool axis direction handle feed or perpendicular direction handle feed 1: A-C 2: B-C 3: A-B (A: Master) 4: A-B (B: Master)	M series
07121	Axis selection in tool axis direction handle feed mode	M series
07141	Axis selection in the X direction for the radial tool axis handle feed	M series
07142	Axis selection in the Y direction for the radial tool axis handle feed	M series
07144	Coordinate of the first rotation axis for tool axis direction handle feed and radial tool axis handle feed	M series
07145	Coordinate of the second rotation axis for tool axis handle feed and radial tool axis handle feed	M series

53) For manual linear and circular functions

07160	Approach handle clamp feedrate [Increment system]	When the setting is 0, the feedrate is not clamped.
07161	Guidance handle clamp feedrate [Increment system]	

54) For butt-type reference position setting

07181	First withdrawal distance in butt-type reference position setting	PRM 1006#5
07182	Second withdrawal distance in butt-type reference position setting	PRM 1006#5
07183	First butting feedrate in butt-type reference position setting	
07184	Second butting feedrate in butt-type reference position setting	
07185	Withdrawal feedrate (common to the first and second butting operations) in butt-type reference position setting	
07186	Torque limit value in butt-type reference position setting	

55) For software operator's panel

07200	Function selection	
#0 OP1 : Mode selection is not performed on software operator's panel (0) /performed (1) #1 OP2 : JOG feed axis selection is not performed on software operator's panel (0) / performed (1) #2 OP3 : MPG's axis selection is not performed on software operator's panel (0) / performed (1) #3 OP4 : Override is not performed on software operator's panel (0) /performed (1) #4 OP5 : BDT,SBK,MLK,DRN are not performed on software operator's panel (0) / performed (1) #5 OP6 : Protect key is not performed on software operator's panel (0) / performed (1) #6 OP7 : Feed hold is not performed on software operator's panel (0) / performed (1)		
07201	General–purpose switch	
#0 JPC : For the name of a general–purpose switch function on the software operator's panel, the use of full–size characters is not allowed (0)/ allowed (1)		
07210	Jog movement axis and its direction on software operator's panel ↑	
07211	Jog movement axis and its direction on software operator's panel ↓	

07212	Jog movement axis and its direction on software operator's panel →	
07213	Jog movement axis and its direction on software operator's panel ←	
07214	Jog movement axis and its direction on software operator's panel ↙	
07215	Jog movement axis and its direction on software operator's panel ↗	
07216	Jog movement axis and its direction on software operator's panel ↗	M series

07217	Jog movement axis and its direction on software operator's panel	M series
07220	Name of general–purpose switch on software operator's panel	

PRM7220 – 7227: SIGNAL 1 Sets the character code
PRM7228 – 7235: SIGNAL 2 Sets the character code
PRM7236 – 7243: SIGNAL 3 Sets the character code
PRM7244 – 7251: SIGNAL 4 Sets the character code
PRM7252 – 7259: SIGNAL 5 Sets the character code
PRM7260 – 7267: SIGNAL 6 Sets the character code
PRM7268 – 7275: SIGNAL 7 Sets the character code
PRM7276 – 7283: SIGNAL 8 Sets the character code

07283	Name of general–purpose switch on software operator's panel	
07284	Name of general–purpose switch on software operator's panel (extended)	

PRM7284 – 7291: Set character codes for SIGNAL 9, shown above.
PRM7292 – 7299: Set character codes for SIGNAL 10, shown above.
PRM7352 – 7359: Set character codes for SIGNAL 11, shown above.
PRM7360 – 7367: Set character codes for SIGNAL 12, shown above.
PRM7368 – 7375: Set character codes for SIGNAL 13, shown above.
PRM7376 – 7383: Set character codes for SIGNAL 14, shown above.
PRM7384 – 7391: Set character codes for SIGNAL 15, shown above.
PRM7392 – 7399: Set character codes for SIGNAL 16, shown above.

07399	Name of general–purpose switch on software operator's panel (extended)	

56) For program restart

07300	Program restart	
#3 SJG : Return feedrate in program restart operation, dry run feedrate (0)/jog feedrate (1) #6 MOA : In program restart operation, before movement to a machining restart point after restart block search the last M, S, T, and B codes are output (0)/all M codes and the last S, T, and B codes are output (1) #7 MOU : In program restart operation, before movement to a machining restart point after restart block search: the M, S, T, and B codes are not output (0)/the last M, S, T, and B codes are output (1)		M series PRM 7300#7
07310	Movement sequence to program restart position	

57) For high-speed machining

07501	Interpolation period of the high–speed machining cycle	
#0 CSP : Cs contouring control function dedicated to a piston lathe is not used (0)/used (1). #4 IT0 : #5 IT1 : #6 IT2 : #7 IPC : The system does not monitor (0)/monitors (1) whether a distribution process is stopped with high–speed remote buffer or in a high–speed cycle.		T series

IT2	IT1	IT0	Interpolation period
0	0	0	Interpolates the G05 data in 8ms
0	0	1	Interpolates the G05 data in 4ms
0	1	0	Interpolates the G05 data in 2ms
0	1	1	Interpolates the G05 data in 1ms
1	0	0	Interpolates the G05 data in 16ms

<table>
<tr><td>07502</td><td>High–speed cycle machining retract</td><td></td></tr>
<tr><td colspan="2">#0 SUP : In high-speed remote buffer operation and high-speed cycle machining, acceleration/ deceleration is not used (0)/used (1).
#1 PMC : A PMC axis control command in high-speed machining is ignored (0)/executed (1).
#3 L8M : In high-speed machining with an interpolation period of 8 msec, learning control is not exercised (0)/exercised (1).
#4 LC1 : The servo learning function of the high–speed cycle machining retract function is enabled or disabled as indicated below
#5 LC2 : The servo learning function of the high–speed cycle machining retract function is enabled or disabled as indicated below
<table>
<tr><th>LC2</th><th>LC1</th><th>Description</th></tr>
<tr><td>0</td><td>0</td><td>Disables the servo learning function, after which retract operation starts.</td></tr>
<tr><td>0</td><td>1</td><td>Disables the servo learning function upon the completion of retract operation.</td></tr>
<tr><td>1</td><td>0</td><td>Disables the servo learning function upon the completion of a retract cycle.</td></tr>
</table></td><td>M series</td></tr>
<tr><td>07503</td><td>High–speed binary operation, retract function</td><td></td></tr>
<tr><td colspan="2">#1 BDC : In high–speed binary operation, the deceleration function is, disabled (0)/enabled (1)
#2 RNR : In the reset status after retract operation by the retract function in a high–speed remote buffer, the reset signal <F0001#1> is set to 1 (0)/0 (1)</td><td></td></tr>
<tr><td>07505</td><td>High–speed cutting</td><td><Axis></td></tr>
<tr><td colspan="2">#0 HSC : Not used (0)/used (1) for high–speed distribution in each axis.
#1 HUN : Unit of data to be distributed during machining a high–speed cycle is the same as the least input increment (0)/ten times the least input increment (1).</td><td></td></tr>
<tr><td rowspan="2">07510</td><td>Control axis count in high-speed remote buffer</td><td>T series</td></tr>
<tr><td>Maximum number of simultaneously controlled axes when G05 is specified during high-speed cycle machining (0) /control axis count in high-speed remote buffer (1)
Maximum number of controlled axes by RISC</td><td>M series</td></tr>
<tr><td>07514</td><td>Retract direction and retract feedrate in high–speed cycle machining retract operation</td><td><Axis></td></tr>
<tr><td>07515</td><td>Number of retract operation distributions in a high–speed cycle machining retract operation</td><td></td></tr>
</table>

07521	Retract time constant [msec]	<Axis>
07522	Retract amount [Increment system]	<Axis>
07523	Retract feedrate [Increment system]	<Axis>
07524	Reference axis for retraction	
07525	Absolute coordinate position of the reference axis for retraction [Increment system]	

58) For rotary table dynamic fixture offset

07570	Rotary table dynamic fixture offset	M series
#0 FTP : Fixture offset type setting is, movement type (The tool moves when the fixture offset changes.) (0)/shift type (The tool does not move when the fixture offset changes.) (1) #1 FK1 : When PRM3290#7 is set to 0, input of fixture offset data using MDI keys is, disabled when signal KEY1 is set to 0 or enabled when the signal is set to 1 (0)/enabled when signal KEY1 is set to 0 or disabled when the signal is set to 1 (1)		
07575	Rotary table dynamic fixture offset	<Axis> M series
#0 FAX : Fixture offset is, disabled (0)/enabled (1)		
07580	Rotary table dynamic fixture offset (first group)	M series
07581	Specification of linear axis 1 used for selecting a plane for fixture offset (first group)	
07582	Specification of linear axis 2 used for selecting a plane for fixture offset (first group)	
07583	Specification of a rotation axis for fixture offset (second group)	M series
07584	Specification of linear axis 1 used for selecting a plane for fixture offset (second group)	
07585	Specification of linear axis 2 used for selecting a plane for fixture offset (second group)	
07586	Specification of a rotation axis for fixture offset (third group)	M series
07587	Specification of linear axis 1 used for selecting a plane for fixture offset (third group)	
07588	Specification of linear axis 2 used for selecting a plane for fixture offset (third group)	

59) For polygon turning

07600	Reference position return	T series
#7 PLZ :	The sequence of returns to the reference position of synchronous axis using G28 command is same as a return to reference position manually (0)/by positioning (1)	
07602	Inter-spindle polygon function	T series
#0 MNG: #1 SNG : #2 HDR : #3 HSL : #4 HST : #5 COF :	In spindle polygon turning, the spindle rotation direction is not reversed (0)/reversed (1). In spindle polygon turning, the synchronization axis rotation direction is not reversed (0)/ reversed (1). The phase synchronization shift direction is not reversed (0)/reversed (1). For phase synchronization, the second spindle is shifted (0)/the first spindle is shifted (1). The spindle does not stop (0)/stops to set the polygon mode (1). In spindle polygon turning, phase control is exercised (0)/not exercised (1).	 7602#5=0 7602#5=0 7602#5=0
07603	Spindle–synchronized speed ratio control, inter-spindle polygon function	T series
#0 RPL : #1 QDR : #2 SBR : #3 PLR : #5 RDG : #7 PST :	Upon reset, spindle polygon mode is canceled (0)/not canceled (1). The synchronization axis rotation direction depends on the sign of Q (0)/the rotation direction of the first spindle (1). For spindle synchronization, speed ratio control is, disabled (0)/enabled (1) The machine coordinates of a tool axis for polygon turning are, rounded by the setting in PRM7620 (0)/rounded by 360 degrees (or the setting in PRM1260 when PRM1008#0 is set to 1). (1) As display of the phase command value R, the diagnosis screen displays a specified value (0)/actual shift pulse data (1). The polygon spindle stop signal *PLSST is not used (0)/used (1).	 ALM218 PRM7635, 7636 <G38#0>
07610	Control axis number of tool rotation axis for polygon turning	T series
07620	Movement of tool rotation axis per revolution	
07621	Upper-limit rotation speed of tool rotation axis	
07631	Allowable spindle speed deviation level in spindle polygon turning	
07632	Steady state confirmation time duration in spindle polygon turning	

07635	Set with the slave spindle multiplier (slave/master)	T series Integer from 1 to 9 PRM 7603#2
07636	Upper limit of the slave spindle speed [min^{-1}]	T series PRM 7603#2
07640	Master axis in spindle–spindle polygon turning	T series
07641	Polygon synchronous axis in spindle–spindle polygon turning	
Settings 1 to 4 : First to fourth serial spindles of the local path 11 to 14 : First to fourth serial spindles of path 1 21 to 24 : First to fourth serial spindles of path 2 31 to 34 : First to fourth serial spindles of path 3		

60) For the external pulse input

07681	Setting 1 for the ratio of an axis shift amount to external pulses (M)	M series
07682	Setting 2 for the ratio of an axis shift amount to external pulses (N)	

61) For the hobbing machine and electronic gear box

07700	Hobbing machine/electronic gear box	M series
#0 HBR : Performing a reset cancel (0)/does not cancel (1) synchronization of the C–axis to the hob axis (G81). #1 CMS : The position manually set with a single rotation signal is canceled (0)/not canceled (1) when a synchronization cancel command is issued. #2 HDR : Setting of the direction for compensating a helical gear (1 is usually specified.) #3 MLT : Unit of data for the magnification for compensating C–axis servo delay 0.001 (0)/ 0.0001 (1) #5 RTO : Gear ratio for the spindle and position coder specified in PRM3706 disabled (0)/ enabled (1) (Always specify 0.) #6 DPS : Display of actual spindle speed the hob–axis (0)/the spindle speed (1) speed is displayed.		PRM7714

<table>
<tr><td>07701</td><td colspan="2">Hobbing machine</td><td>M series</td></tr>
<tr><td colspan="3">#0 SM1 :
#1 SM2 :
#2 SM3 :
<table>
<tr><th>SM3</th><th>SM2</th><th>SM1</th><th>Number of times the pulse is sampled</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>2</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>16</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>32</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>4</td></tr>
</table>
#3 LZE : If L (number of hob threads) = 0 is specified at the start of EBG synchronization synchronization is started (0)/synchronization is not started (1)
#4 JHD : While the C–axis and hob axis are synchronized with each other, jogging and handle feeds around the C–axis are disabled (0)/enabled (1)
#5 DLY : Compensating C–axis servo delay with G84 is disabled (0)/enabled (1)</td><td></td></tr>
<tr><td>07702</td><td colspan="2">Simple electronic gear box</td><td>M series</td></tr>
<tr><td colspan="3">#0 TDP : The specifiable number of teeth, T, of the simple electronic gear box is 1 to 1000 (0)/0.1 to 100 (1)
#3 ART : The retract function executed when an alarm is issued is, disabled (0)/enabled (1)
#6 PHS : At the time of EGB synchronization start/cancellation, if the G81/G80 command includes no R command, acceleration/deceleration is not performed (0)/acceleration/deceleration is performed for automatic phase matching (1)
#7 PHD : Direction of movement for automatic EGB phase synchronization, positive (0)/negative (1)</td><td>PRM7750, 7751</td></tr>
<tr><td>07703</td><td colspan="2">Simple electronic gear box</td><td>M series</td></tr>
<tr><td colspan="3">#0 ERV : During EGB synchronization, feed per revolution is performed, for feedback pulses (0)/for pulses converted to the feedrate for the workpiece axis (1)</td><td></td></tr>
<tr><td>07709</td><td colspan="2">Number of the axial feed axis for a helical gear</td><td>M series</td></tr>
<tr><td>07710</td><td colspan="2">Number of the axis synchronized with the hob axis</td><td>M series</td></tr>
<tr><td>07711</td><td colspan="2">Gear ratio for the hob axis and position coder</td><td>M series</td></tr>
<tr><td>07712</td><td colspan="2">Time constant for C–axis acceleration/ deceleration during rotation with the hob axis and C–axis synchronized with each other
[msec]</td><td>M series</td></tr>
</table>

07713	FL speed of C–axis acceleration/deceleration during rotation with the hob axis and C–axis synchronized each other [deg/min]	M series
07714	Magnification 2 for compensation of C–axis servo delay by G83	M series PRM 7700#3
07715	Magnification 1 for compensation of C–axis servo delay by G83	M series PRM 7700#3
07730	Retraction function	<Axis> M series
#0 RTR : Specifies whether the retraction function is effective for each axis. Retraction is enable (0)/disable (1).		
07740	Feedrate during retraction for each axis [mm/min]	<Axis> M series
07741	Retracted distance for each axis [0.001mm]	<Axis> M series
07750	Feedrate during retraction performed when an alarm is issued [Increment system]	<Axis> M series PRM 7702#3=1
07751	Amount of retraction performed when an alarm is issued [Increment system]	<Axis> M series PRM 7702#3=1
07771	Number of EGB axis	M series
07772	Number of position detector pulses per rotation about tool axis [Detection unit]	M series
07773	Number of position detector pulses per rotation about workpiece axis [Detection unit]	M series
07776	Feedrate during automatic phase synchronization for the workpiece axis by the automatic EGB phase synchronization function [Increment system]	<Axis> M series
07777	Angle shifted from the spindle position (one–rotation signal position) the workpiece axis uses as the reference of phase synchronization by the automatic EGB phase synchronization function [Increment system]	M series

62) For attitude control

07941	Attitude control	M series
#0 INT : Interaction control is enabled (0)/disabled (1) #1 ATT : Attitude control is enabled (0)/disabled (1) #3 MIA : When attitude control B is used, G53 operation is placed in tip fix mode (0)/independent axis mode (1) #4 RNC : According to a rotation made on the α axis and β axis in manual reference position return operation, the X, Y, and Z coordinates (absolute) and relative coordinates are: updated (0)/not updated (1)		
07942	Attitude control	M series
#0 PA4 : This parameter must be set when rotation about the α axis is performed in the same direction (0)/in the opposite direction (1) #1 PA5 : This parameter must be set when rotation about the β axis is performed in the same direction (0)/in the opposite direction (1)		
07943	Interaction control	M series
#0 TGC : Interaction control on the α axis is exercised with the polarity opposite to that of the β axis command (0)/with the same polarity as that of the β axis command (1)		
07950	α axis machine zero–degree point offset [0.01deg]	M series
07951	β axis machine zero–degree point offset [0.01deg]	M series
07952	Upper limit on α axis machining speed [deg/min]	M series
07953	Upper limit on β axis machining speed [deg/min]	M series
07954	Length of the first arm	M series
07955	Length of the second arm	M series
07956	Number of α–axis interaction gears	
07957	Number of β–axis interaction gears	

63) For axis control by PMC

<table>
<tr><td>08001</td><td colspan="2">Function selection</td><td></td></tr>
<tr><td colspan="3">#0 MLE : Machine lock for PMC control axis is valid (0)/ invalid (1)
#2 OVE : Dry run and override signals use the same signal as CNC (0) / PMC particular signal (1)
#3 RDE : Dry run signal for rapid traverse command is invalid (0) / valid (1)
#5 NCC : If a program command is specified for a PMC–controlled axis, an alarm is issued if the axis is controlled by the PMC, the CNC command otherwise being valid (0)/an alarm is always issued (1).
#6 AUX : The number of bytes for the code of an auxiliary function (12H) command to be output is 1 (0 to 255) (0)/2 (0 to 65535) (1)
#7 SKE : Skip signal uses same as CNC (0) / PMC particular signal (1)</td><td>ALM139

SKIP/ ESKIP</td></tr>
<tr><td>08002</td><td colspan="2">Speed, acceleration/deceleration</td><td></td></tr>
<tr><td colspan="3">#0 RPD : Rapid traverse rate of PMC control axis is set by PRM1420 (0)/specified by rapid traverse rate (1)
#1 DWE: With IS-C, dwell is 1 msec (0)/0.1 msec (1).
#2 SUE : In external pulse synchronization, acceleration/deceleration is enabled (exponential) (0)/disabled (1).
#3 F10 : Sets the command unit of feedrate per minute 1mm/min (0)/10mm/min (1)
#4 PF1 : Set the the feedrate unit of feed per minute in PMC axis control
#5 PF2 :
<table>
<tr><th>PF2</th><th>PF1</th><th>Feedrate unit</th></tr>
<tr><td>0</td><td>0</td><td>1/1</td></tr>
<tr><td>0</td><td>1</td><td>1/10</td></tr>
<tr><td>1</td><td>0</td><td>1/100</td></tr>
<tr><td>1</td><td>1</td><td>1/1000</td></tr>
</table>
#6 FR1 : Set the feedrate unit for feed per revolution for an axis controlled by the PMC
#7 FR2 :
<table>
<tr><th>FR2</th><th>FR1</th><th>Metric input</th><th>Inch input</th></tr>
<tr><td>0</td><td>0</td><td rowspan="2">0.0001 mm/rev</td><td rowspan="2">0.000001 inch/rev</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>0.001 mm/rev</td><td>0.00001 inch/rev</td></tr>
<tr><td>1</td><td>0</td><td>0.01 mm/rev</td><td>0.0001 inch/rev</td></tr>
</table></td><td></td></tr>
<tr><td>08003</td><td colspan="2">Inch input/metric input, axis setting</td><td></td></tr>
<tr><td colspan="3">#0 PIM : When only the axes controlled by the PMC are used, the linear axis is influenced (0)/not influenced (1) by inch/millimeter input.
#1 PAX : When the number of CNC–controlled axes (PRM1010) is set to 0, all axes are assumed to be, CNC axes (0)/PMC axes (1)</td><td></td></tr>
</table>

08004	Axis control	
#0 CMW	: When a move command and auxiliary function are specified from the CNC, an alarm is issued from the PMC for the same axis (0)/an axis control command, is executed (1)	ALM130
#1 NMT	: If the PMC and NC specify commands at the same time, an alarm is issued (0)/no alarm is issued if the commands do not include a move command (1).	ALM130
#2 JFM	: A feedrate for continuous feed is normal (0)/ multiplied by 200 (1).	
#3 G8C	: For cutting feed along a PMC axis, advanced preview control is disabled (0)/enabled (1).	M series PRM 1819#7=0
#4 G8R	: For rapid traverse and cutting feed along a PMC axis, advanced preview control is disabled (0)/enabled (1).	M series PRM 1819#7=0
#5 DSL	: If axis switching is specified when axis switching is disabled, an alarm is issued (0)/ axis switching is valid for a system not specified (1).	ALM139
#6 NCI	: In deceleration, an in-position check is made (0)/not made (1).	
#7 NDI	: For PMC axis control, when diameter programming is specified the amount of travel and feedrate are each specified with a radius (0)/with a diameter (1)	PRM 1006#3=1

08005	Travel distance on PMC control axes	
#0 EDC	: In PMC–based axis control, an external deceleration signal is disabled (0)/enabled (1)	
#1 CDI	: If diameter input is specified for PMC–controlled axes, the amount of travel becomes double the specified value while the specified feedrate is used as is (0)/both the specified amount of travel and feedrate are used as is (1).	T series PRM 1006#3
#2 R10	: When the PRM8002#0 is set to 1, the unit for specifying a rapid traverse rate for the PMC axis is 1 mm/min (0)/10 mm/min (1)	
#3 DRR	: For cutting feed per rotation in PMC axis control, the dry run function is disabled (0)/ enabled (1)	
#5 IFV	: Override for each group in PMC axis control is, disabled (0)/enabled (1)	
#7 MFD	: Output by each auxiliary function of the PMC axis control function is disabled (0)/enabled (1)	

08006	Machine lock, in–position check	
#1 EML : #2 IPA :	When PRM8001#0 is set to 1, for PMC axes, the all axis machine lock signal and axis–by–axis machine lock signals are disabled (0)/the all axis machine lock signal is disabled and the axis–by–axis machine lock signals are enabled (1) For controlled axis at PMC axis control only, the in–position check is performed when no move command is issued for the PMC axis (0)/no in–position check is always performed (1)	PRM1010
08008	Mirror image	<Axis>
#0 MIR :	When a PMC axis control command is issued in mirror image mode, the mirror image is, not considered (0)/considered (1)	
08010	DI/DO group selection for each axis during PMC axis control	
08020	Low–speed feedrate at reference position return in axis control by PMC (FL) [Increment system]	<Axis> PRM1425
08021	Minimum speed of rapid traverse override in axis control by PMC (Fo) [Increment system]	<Axis>
08022	Upper-limit rate of feed per revolution during PMC axis control	
08028	Linear acceleration/deceleration time constant for speed commands for PMC axis control [ms/1000min^{-1}]	<Axis>

64) For two-path control

08100		2-path control
#0 RST : #1 IAL : #5 COF : #6 DSB :	Reset key on the MDI panel effective for both paths (0)/for the tool post selected by the path select signal (1) When an alarm is raised in one tool post in the automatic operation mode, the other path enters the feed hold state and stops (0)/ continues operation without stopping (1) A separate tool compensation memory area is used for each path (0)/a common tool compensation memory area is shared by the tool posts (1). The special single block function is disabled (0)/enabled (1).	T series T series T series
08110	Queuing M code range (minimum value)	2-path control
08111	Queuing M code range (maximum value)	

65) For checking Interference between tool posts (two–path control)

08140	Checking interference between tool posts (two–path control)	2-path control
	#0 TY0 : Specifies the relationship between the #1 TY1 : coordinate systems of the two tool posts. #2 IT0 : When offset number 0 is specified by the T code, checking interference between tool posts is stopped until an offset number other than 0 is specified by the next T code (0)/checking interference between tool posts is continued according to the previously specified offset number (1) #3 IFM : Specifies whether interference (two–path control) between tool post is checked (0)/is not checked (1) in the manual operation mode #4 IFE : Specifies whether interference (two–path control) between tool posts is checked (0)/is not checked (1) #5 ZCL : Specifies whether interference along the Z axis is checked (0)/is not checked (1)	T series T series T series T series
08141	Distance along the X–axis from a path–1 reference point to a path–2 reference point	M series (2-path control)
08142	Distance along the Y–axis from a path–1 reference point to a path–2 reference point	
08143	Distance along the Z–axis from a path–1 reference point to a path–2 reference point	
08144	Interference check area figure data AI (BI)	
08145	Interference check area figure data AJ (BJ)	
08146	Interference check area figure data AK (BK)	
08147	Interference check area figure data AX (BX)	
08148	Interference check area figure data AY (BY)	
08149	Interference check area figure data AZ (BZ)	
08151	Distance along the X axis between the reference positions of tool posts 1 and 2	T series (2-path control)
08152	Distance along the Z axis between the reference positions of tool posts 1 and 2	

66) For synchronous, composite, superimposed control

08160	Synchronous, composite, or superimposed control	T series (2-path control)
#0 MXC : #1 XSI : #2 ZSI : #5 NCS : #6 SPE : #7 NRS :	During mixed control of the X– or Z–axis, measurement direct input function B for tool compensation performs calculation based on: Machine coordinates for the path being controlled (0)/another path subject to mixed control (1) The machine coordinates along the X–axis for the other path subject to mixed control are fetched with the sign as is (0)/inverted (1) Machine coordinates along the Z–axis for the other path subject to mixed control are fetched with the sign as is (0)/inverted (1) When an OT alarm is issued from an axis under synchronization, composite, or superposition control, synchronization, composite, or superposition control is, cancelled (0)/not cancelled (1) The synchronization deviation is the difference between the positioning deviation of the master axis and that of the slave axis (0)/the slave axis plus the acceleration/deceleration delay (1) When the system is reset, synchronous, composite, or superimposed control is released (0)/not released (1)	PRM 8160#0 PRM 8160#0
08161	Synchronous, composite, superimposed control	T series (2-path control)
#0 NMR : #1 CZM : #4 CMW : #5 CRZ :	When an axis subject to mixed control is placed in servo–off state mixed control is stopped (0)/mixed control is not stopped to disable follow–up for the axis (1) When two Cs contour axes are subject to mixed control, the function for mixing zero point return commands for Cs contour axes is not used (0)/used (1) When the PRM8161#1 is set to 1 with the workpiece coordinate system set function, at completion of Cs zero point return, the coordinate system is set, based on the machine coordinate of the Cs contour axis on the same path (0)/based on the machine coordinate of the Cs contour axis of the composite destination (1) When the PRM8161#1 is set to 1, for a positioning command for a CS contour axis immediately after composite control switching between Cs contour axes, normal positioning operation is performed (0)/positioning operation including zero point return is performed (1)	

08162	Synchronous, composite, superimposed control	<Axis> T series (2-path control)
#0 SMR : #1 SER : #2 PKU : #3 OMR: #4 MPM: #5 MPS : #6 MCD: #7 MUM:	Synchronous mirror–image control is not applied (0)/applied (1) The synchronization deviation is not detected (0)/detected (1) In the parking state, The absolute, relative, and machine coordinates are not updated (0)/ The absolute and relative coordinates are updated. The machine coordinates are not updated (1) Superimposed mirror–image control is not applied (0)/applied (1) When composite control is started, the workpiece coordinate system is not set automatically (0)/set automatically (1) When composite control is terminated, the workpiece coordinate system is not set (0)/set (1) automatically When mixed control is applied, the coordinate system direction for the relevant axes remains the same without applying mirror image (0)/is reversed by applying mirror image (1). During axis recomposition, a movement along an axis is enabled (0)/disabled (1).	ALM226
08163	Composite control	<Axis> T series (2-path control)
#0 MDX : #1 SPM : #2 SPS : #3 SCM : #4 SCD : #7 NUM :	During axis recomposition, the coordinates of the local system are displayed (0)/the other system are displayed (1). When synchronous control is started, the coordinate system of the master axis is set (0)/not set (1). When synchronous control is terminated, the coordinate system of the master axis is set (0)/not set (1). Workpiece coordinates are calculated from the master axis and slave axis (0)/from the slave axis (1). In synchronous control, the coordinates of the master axis and slave axis are the same (0)/opposite (1). In cases other than synchronous axis recomposition, a command for movement along an axis can be specified (0)/cannot be specified (1).	

08164	Composite control	<Axis>
#0 MWS	: In automatic workpiece coordinate system setting, performed when composite control is started, a workpiece shift and position offset are: not considered (0)/considered (1)	PRM 8162#4
#1 MWE	: In automatic workpiece coordinate system setting, performed when composite control is canceled, a workpiece shift and position offset are: not considered (0)/considered (1)	PRM 8162#5
#2 MCS	: In automatic workpiece coordinate system setting, performed when composite control is started: a workpiece coordinate system is automatically set in the same way as normal (0)/the coordinate system of the other path subject to axis recomposition is used (1)	PRM 8162#4
#3 MCE	: In automatic workpiece coordinate system setting, performed when composite control is canceled: a workpiece coordinate system is automatically set in the same way as normal (0)/the coordinate system of the other path subject to axis recomposition is used (1)	PRM 8162#5
#4 SPN	: The workpiece coordinate and relative coordinate of a slave axis subject to synchronous control is updated (0)/not updated (1)	
#5 OPS	: When superimposed control is canceled, control in which an amount of movement along a master axis subject to superimposed control is added to the workpiece coordinate of a slave axis is not applied (0)/applied (1)	
#6 SOK	: If a master axis subject to superimposed control is also subject to synchronous control an alarm is issued (0)/no alarm is issued (1)	
08165	Synchronous, composite, superimposed control	T series (2–path control)
#0 SIC	: One–path superimposed control is, disabled (0)/enabled (1)	
#1 SVF	: For an axis under synchronous or composite control on the other path, the feed forward function and the cutting feed and rapid traverse switching function are, disabled (0)/enabled (1)	
08166	Three–path control	T series (3–path control)
#0 SYN	: Three–path synchronous control is, enabled (0)/disabled (1)	
#1 MIX	: Three–path composite control is, enabled (0)/disabled (1)	
#2 OVL	: Three–path superimposed control is, enabled (0)/disabled (1)	

08167	Composite control	T series (2–path control)
#0 NLS : For an axis under composite control, acceleration/deceleration with a constant time for linear interpolation type rapid traverse (PRM1603#4) is, enabled (0)/disabled (1) (When setting acceleration/deceleration for the composite destination motor, set it in the local parameter.)		
08180	Master axis with which an axis is synchronized under synchronous control	<Axis> T series (2-path control)
08181	Synchronization error limit of each axis [Detection unit]	
08182	Display of the synchronization error of an axis [Detection unit]	
08183	Axis under composite control in path 1 corresponding to an axis of path 2	
08184	Coordinates of the reference point of an axis on the coordinate system of another axis under composite control [0.001mm]	
08185	Workpiece coordinates at the reference position of each axis	
08186	Master axis under superimposed control	
08190	Rapid traverse rate of an axis under superimposed control [mm/min]	
08191	F0 velocity of rapid traverse override of an axis under superimposed control [mm/min]	
08192	Linear acceleration/deceleration time constant in rapid traverse of an axis under superimposed control [msec]	
08193	Maximum cutting feedrate under superimposed control [mm/min]	T series (2-path control)

67) For inclined axis control

08200	Inclined axis control	
#0 AAC : Does not perform (0)/performs (1) inclined axis control #2 AZR : The machine tool is moved (0)/is not moved (1) along the Z axis during manual reference position return along the Y axis under inclined axis control #3 AZP : When an inclined axis moves, the reference position return completion signal for the Cartesian axis, ZPx is, not cleared (0)/cleared (1)		ZPx <F094>

08201	inclined axis control	
#0 AOT : #1 AO2 : #2 AO3 : #5 ACL : #7 ADG :	When inclined axis control is enabled, the values indicating the area for stored stroke check 1 are treated as, coordinates in the inclined coordinate system (0)/coordinates in the Cartesian coordinate system (1) When inclined axis control is enabled, the values indicating the area for stored stroke check 2 are treated as, coordinates in the inclined coordinate system (0)/coordinates in the Cartesian coordinate system (1) When inclined axis control is enabled, the values indicating the area for stored stroke check 3 are treated as, coordinates in the inclined coordinate system (0)/coordinates in the Cartesian coordinate system (1) In linear interpolation type rapid traverse, the feedrate clamp function for inclined axis control is, enabled (0)/disabled (1) DGN306 and 307 are, in the order of inclined axis then Cartesian axis (0)/in the order of Cartesian axis then inclined axis (1)	PRM1320, 1321, 1326, 1327 PRM1322, 1323 PRM1324, 1325 PRM 1401#1=1
08210	Inclination angle for inclined axis control	
08211	Axis number of a slanted axis subject to inclined axis control	
08212	Axis number of a Cartesian axis subject to inclined axis control	

68) For B-axis function (T series)

08240	B–axis control	T series
#3 REF : #4 TEM : #5 SOV : #6 ABS : #7 MST :	Reference position return operation is the same as manual reference position return operation (0)/positioning is performed when a reference position is established (1). When offset movement is performed in a T block, a movement along the axis is made after the M function (0)/the M function is performed after a movement along the axis (1). G110 overlaps the next block (0)/does not overlap the next block (1). A B-axis command is incremental (0)/absolute (1). When an M command for starting B-axis operation is specified, FIN is awaited (0)/not awaited (1).	

08241	Miscellaneous function	T series
#0 FXC : #1 MDG: #2 MDF :	G84 rotates the spindle in the forward or reverse direction after M05 (0)/without M05 (1) When the execution of a B-axis operation command is started, G00 mode is set (0)/G01 mode is set (1). When the execution of a B-axis operation command is started, G98 mode is set (0)/G99 mode is set (1).	
08242	Offset value	T series
#0 COF : #1 BPF :	A separate B-axis offset value is used for each path (0)/a common B-axis offset value is shared by the tool posts (1). For feed per revolution with the B–axis control function, the PRM8002#6 and #7 are, valid (0)/invalid (1)	2-path control
08250	Axis number used for B-axis control	T series
08251	M code for specifying the start of first program operation (G101)	
08252	M code for specifying the start of second program operation (G102)	
08253	M code for specifying the start of third program operation (G103)	
08257	T code number for tool offset cancellation	
08258	Clearance, used in canned cycle G83, for the B–axis	

69) For simple synchronous control

08301	Synchronous control	M series
#4 SYA : #5 SYE : #7 SOF :	In the servo–off state in simple synchronous control, the limit of the difference between the positioning deviation of the master axis and that of the slave axis is not checked (0)/checked (1) During execution of synchronization, the limit of the difference between positioning deviations is, checked (0)/not checked (1) The synchronization function is not used (0)/ used (1).	PRM 8313, 8323

08302	Simple synchronous control	M series
#0 ATE : Automatic setting of grid positioning for simplified synchronous control one pair is disabled (0)/enabled (1) #1 ATS : Automatic setting of grid positioning for simplified synchronous control one pair is not started (0)/started (1) #3 SSE : In simple synchronization control, the external machine coordinate system shift function for the slave axis is, not used (0)/used (1) #7 SMA : When APZx (PRM1815#4) is turned off for one axis under simple synchronous control, APZx for the other axis under simple synchronous control is, not turned off (0)/turned off (1)		
08303	Simple synchronous control	<Axis> M series
#0 ATEx : In simple synchronous control, automatic setting for grid positioning is disabled (0)/ enabled (1) #1 ATSx : In simple synchronous control, automatic setting for grid positioning is not started (0)/ started (1) #7 SOFx : In simple synchronous control, the synchronization function is not used (0)/used (1)		
08304	Single directional synchronization function	<Axis> M series
#0 USD : In simple synchronous control, the single directional synchronization function uses axis of which machine coordinate is, larger as the reference (0)/smaller as the reference (1)		Set the same value for the master axis and slave axis.
08305	Single directional synchronization function	M series
#0 USC : In simple synchronous control, the single directional synchronization function is, not used (0)/used (1) #0 USE : In simple synchronous control, after emergency stop, the single directional synchronization function is, used (0)/not used (1)		PRM 8301#7=1 or 8303#7=1 PRM 8301#7=1 or 8303#7=1

<table>
<tr><td>08311</td><td>Axis number of the master axis for an axis subject to synchronous control
T series : Set the axis number (0 to 7) of the master axis for each axis.
<table><tr><td></td><td colspan="2">Setting</td></tr><tr><td></td><td>Tens digit</td><td>Units digit</td></tr><tr><td>Parameter for the first axis</td><td>Master axis for the second axis</td><td>Master axis for the first axis</td></tr><tr><td>Parameter for the second axis</td><td>Master axis for the fourth axis</td><td>Master axis for the third axis</td></tr><tr><td>Parameter for the third axis</td><td>Master axis for the sixth axis</td><td>Master axis for the fifth axis</td></tr><tr><td>Parameter for the fourth axis</td><td>Master axis for the eighth axis</td><td>Master axis for the seventh axis</td></tr></table>(Example) When the master axis for the fourth axis is the second axis, set 00, 20, 00, and 00.
M series: Set the axis number (1 to 8) of the master axis for each axis.</td><td><Axis></td></tr>
<tr><td>08312</td><td>Slave axis mirror image setting (100 or more: Reversed)</td><td><Axis>
T series</td></tr>
<tr><td>08313</td><td>Limit of the difference between the amount of positioning deviation of the master and slave axes (Synchronous control one pair) [Detection unit]</td><td>M series
ALM213</td></tr>
<tr><td>08314</td><td>Allowable error in synchronization error check</td><td><Axis>
M series
ALM407</td></tr>
<tr><td>08315</td><td>Maximum compensation value for synchronization (Synchronous control one pair) [Detection unit]</td><td><Axis>
M series
ALM410</td></tr>
<tr><td>08316</td><td>Difference between reference counters for master and slave axes (Synchronous control one pair) [Detection unit]</td><td>M series
PRM
8302#1</td></tr>
<tr><td>08317</td><td>Torque difference alarm detection time (Synchronous control one pair) [ms]</td><td>M series</td></tr>
<tr><td>08318</td><td>Detection timer for the limit of the difference between the positioning deviation of the master axis and that of the slave axis [8ms]</td><td>M series</td></tr>
<tr><td>08323</td><td>Maximum allowable difference between master axis and slave axis positional deviations [Detection unit]</td><td><Axis>
M series
ALM213</td></tr>
<tr><td>08325</td><td>Maximum compensation value for synchronization [Detection unit]</td><td><Axis>
M series
PRM
8303#7
ALM407</td></tr>
</table>

08326	Difference between master axis and slave axis reference counters [Detection unit]	<Axis> M series
08327	Torque difference alarm detection timer [ms]	<Axis> M series

70) For sequence number comparison and stop

08341	Program number subject to check termination	
08342	Sequence number subject to check termination	
08343	Program number where collation is to be stopped (when an 8–digit program number is used)	

71) For chopping

08360	Chopping	M series
#0 ROV :	A rapid traverse override for a section from the current position to the R point is determined as follows: a chopping override is enabled (0)/ an ordinary rapid traverse override is enabled (1)	
#1 CVC :	The feedrate along the chopping axis is changed, at the upper or lower dead point immediately after the feedrate change command is issued (0)/at the upper dead point immediately after the feedrate change command is issued (1)	
#7 CHF :	On the chopping screen, the chopping speed can be set (0)/not be set (1)	
08361	Chopping	M series
#0 CMX :	When the amount of shortage at the lower dead point becomes smaller than the value set in PRM8378, clamping at the maximum chopping feedrate, continues (0)/is not performed (1)	

08370	Chopping axis	M series
08371	Chopping reference point (R point) [Increment system]	
08372	Chopping upper dead point [Increment system]	
08373	Chopping lower dead point [Increment system]	
08374	Chopping speed [mm/min]	
08375	Maximum chopping feedrate [mm/min]	
08376	Chopping compensation scaling factor [%]	
08377	Compensation start tolerance [Increment system]	
08378	Amount of an error permissible for starting increase in speed [Increment system]	M series PRM 8361#0

72) For high–speed high–precision contour control by RISC (HPCC)

08400	Parameter 1 for determining a linear acceleration/deceleration before interpolation	M series
08401	Parameter 2 for determining a linear acceleration/deceleration before interpolation	M series
08402	Acceleration/deceleration before interpolation	M series
#1 NBL : #4 BLK : Be sure to set 0. #5 DST : Be sure to set 1. #7 BDO :		

BDO	NBL	Meaning
0	0	Linear type is used for acceleration/deceleration prior to pre–read interpolation
1	1	Bell–shape type is used for acceleration/deceleration prior to pre–read interpolation

08403	Stored stroke check	M series
#1 MSU : If A G00, M, S, T, or B code is specified in HPCC mode, an alarm is issued (0)/the command is executed (1). #2 LM1 : In HPCC mode, a stroke check before movement for stored stroke check 1 is not performed (0)/performed (1) #3 LM2 : In HPCC mode, a strokek check before movement for the stored stroke check –2 is not performed (0)/performed (1) #7 SG0 : When a G00 code is specified in the RISC mode, the setting of 8403#1 is followed (0)/G00 is executed in a simplified manner in HPCC mode (1).		PRM 8403#1=1

<table>
<tr><td>08404</td><td>Positioning</td><td>M series</td></tr>
<tr><td colspan="3">#0 STG : The positioning command (G00) is: executed with the RISC board in a simplified manner (0)/in the same way as normal (1)
#1 HG0 : This parameter must be set to 1 in case that G00 is executed with the RISC board in the same way as normal G00

<table>
<tr><th>Rapid traverse processing</th><th>MSU (8403#1)</th><th>SG0 (8403#7)</th><th>STG (8404#0)</th><th>HG0 (8404#1)</th></tr>
<tr><td>Processing by the CNC</td><td>1</td><td>0</td><td>0</td><td>–</td></tr>
<tr><td>Handled as G01 by RISC</td><td>–</td><td>1</td><td>0</td><td>–</td></tr>
<tr><td>Handled as G00 by RISC</td><td>–</td><td>1</td><td>1</td><td>Must be set to 1</td></tr>
</table>
When this parameter is set, fine acceleration/deceleration for rapid traverse in HPCC mode is disabled.

#7 RIT : In HPCC mode, the axis–by–axis interlock function is, not enabled (0)/enabled (1)</td><td>PRM 8162#4</td></tr>
<tr><td>08406</td><td>Lower limit of block movement time (for HPCC) [ms]</td><td>M series</td></tr>
<tr><td>08407</td><td>Lowest clamp speed of the deceleration function in accordance with the block movement time (for HPCC) [Increment system]</td><td>M series
PRM8406</td></tr>
<tr><td>08410</td><td>Allowable velocity difference in velocity determination considering the velocity difference at corners [mm/min]</td><td>M series</td></tr>
<tr><td>08412</td><td>NURBS interpolation</td><td>M series</td></tr>
<tr><td colspan="3">#0 EST : The simple NURBS interpolation start function is, disabled (0)/enabled (1)
#1 HIK : The high–precision knot command of NURBS interpolation is, disabled (0)/enabled (1)
#5 FDI : Parametric feedrate control of NURBS interpolation is, disabled (0)/enabled (1)</td></tr>
<tr><td>08416</td><td>Look-ahead bell-shaped acceleration/deceleration before interpolation</td><td>M series</td></tr>
<tr><td>08451</td><td>Automatic velocity control</td><td>M series</td></tr>
<tr><td colspan="3">#0 USE : Automatic velocity control is not applied (0)/ applied (1)
#2 TIM : The deceleration function based on block movement time is, not used (0)/used (1)
#4 ZAG : The velocity is not determined (0)/determined (1) according to the angle at which the machine descends along the Z–axis
#7 NOF : In a block where automatic velocity control is validated, the F command is validated (0)/ ignored (1)</td></tr>
</table>

<table>
<tr><td>08452</td><td>Range of velocity fluctuation to be ignored [%]
(Standard setting: 10)</td><td>M series</td></tr>
<tr><td>08456</td><td>Area–2 override [%] (Standard setting: 80)</td><td>M series</td></tr>
<tr><td>08457</td><td>Area–3 override [%] (Standard setting: 70)</td><td>M series</td></tr>
<tr><td>08458</td><td>Area–4 override [%] (Standard setting: 60)</td><td>M series</td></tr>
<tr><td>08459</td><td>Automatic velocity control</td><td>M series</td></tr>
<tr><td colspan="2">#0 CDC : Be sure to set to 0.
#1 CTY : Be sure to set to 1.
#3 OVR : In AI/AI nano high–precision contour control mode, the override for the functions of decelerating is, disabled (0)/enabled (1)</td><td></td></tr>
<tr><td>08464</td><td>Initial feedrate for automatic feedrate control</td><td>M series</td></tr>
<tr><td>08465</td><td>Maximum allowable feedrate for automatic feedrate control</td><td>M series</td></tr>
<tr><td>08470</td><td>Parameter for determining allowable acceleration in velocity calculation considering acceleration [msec]</td><td>M series</td></tr>
<tr><td>08475</td><td>Automatic velocity control</td><td>M series</td></tr>
<tr><td colspan="2">#2 BIP : The function of deceleration at corners. (Always set 1.)
#3 CIR : The function of automatic velocity control considering acceleration and deceleration during circular interpolation is not used (0)/ used (1)</td><td>PRM8470</td></tr>
<tr><td>08480</td><td>Interpolation period</td><td>M series</td></tr>
<tr><td colspan="2">#4 RI0 : This parameter must be set to type A or type B as indicated below.
#5 RI1 :
#6 RI2 :
<table>
<tr><th></th><th>RI2</th><th>RI1</th><th>RI0</th><th>Remarks</th></tr>
<tr><td>Type A</td><td>0</td><td>0</td><td>1</td><td>Setting for compatibility with older models</td></tr>
<tr><td>Type B</td><td>0</td><td>0</td><td>1</td><td>Recommended setting</td></tr>
</table>
For systems of model B, it is recommended to set type B.</td><td></td></tr>
<tr><td>08481</td><td>Rapid traverse rate in HPCC mode</td><td>M series
PRM
8403#7</td></tr>
</table>

08485	Smooth interpolation, scaling	M series
#0 G51 : #1 G81 : #2 G02 : #3 PRW: #4 INV : #5 CDS :	In high–precision contour control (HPCC) mode, scaling/coordinate system rotation is disabled (0)/enabled (1) In high–precision contour control (HPCC) mode, a hole machining canned cycle is disabled (0)/enabled (1) In high–precision contour control (HPCC) mode, helical interpolation is disabled (0)/ enabled (1) In high–precision contour control (HPCC) mode, parameter rewriting using the PMC window is disabled (0)/enabled (1) In high–precision contour control (HPCC) mode, involute interpolation is disabled (0)/ enabled (1) Disables (0)/enables (1) smooth interpolation in HPCC mode.	
08486	Maximum travel distance of a block where smooth interpolation is applied [Increment system]	M series
08487	Angle at which smooth interpolation is turned off [0.1deg]	M series If a value of 0 is set, the setting is assumed to be 10 degrees.
08490	Minimum travel distance of a block where smooth interpolation is applied [Increment system]	M series
08491	Maximum tolerance for a block where smooth interpolation is applied [Increment system]	M series
08492	Minimum tolerance for a block where smooth interpolation is applied (When the setting is 0 = 1/10 of PRM8491. When the setting is negative = 0) [Increment system]	M series

73) For high–speed position switch (1/2)

08500	Number of position switch	
#7 EPS :	The maximum number of high–speed position switches is, 6 (0)/16 (1)	

08501	Function setting	
#0 HPO : #1 HPE :	The output signal of a high–speed position switch is output to, address Y. (PRM8565) (0)/address F. <F293 or F294> (1) The current position used with the high–speed position switch of decision–by–direction type, considers a servo error (0)/does not consider a servo error (1)	PRM 8508, 8509
08504	Switch setting	
#0 HE1 : #1 HE2 : #2 HE3 : #3 HE4 : #4 HE5 : #5 HE6 : #6 HE7 : #7 HE8 :	The first high–speed position switch is, enabled (0)/disabled (1) The second high–speed position switch is, enabled (0)/disabled (1) The third high–speed position switch is, enabled (0)/disabled (1) The fourth high–speed position switch is, enabled (0)/disabled (1) The fifth high–speed position switch is, enabled (0)/disabled (1) The sixth high–speed position switch is, enabled (0)/disabled (1) The seventh high–speed position switch is, enabled (0)/disabled (1) The eighth high–speed position switch is, enabled (0)/disabled (1)	
08505	Switch setting	
#0 HE9 : #1 HEA : #2 HEB : #3 HEC : #4 HED : #5 HEE : #6 HEF : #7 HEG :	The ninth high–speed position switch is, enabled (0)/disabled (1) The tenth high–speed position switch is, enabled (0)/disabled (1) The eleventh high–speed position switch is, enabled (0)/disabled (1) The twelfth high–speed position switch is, enabled (0)/disabled (1) The thirteenth high–speed position switch is, enabled (0)/disabled (1) The fourteenth high–speed position switch is, enabled (0)/disabled (1) The fifteenth high–speed position switch is, enabled (0)/disabled (1) The sixteenth high–speed position switch is, enabled (0)/disabled (1)	

08508	Switch setting	
#0 HM1 : The output type of the first high–speed position switch is, normal (0)/decision by direction (1) #1 HM2 : The output type of the second high–speed position switch is, normal (0)/decision by direction (1) #2 HM3 : The output type of the third high–speed position switch is, normal (0)/decision by direction (1) #3 HM4 : The output type of the fourth high–speed position switch is, normal (0)/decision by direction (1) #4 HM5 : The output type of the fifth high–speed position switch is, normal (0)/decision by direction (1) #5 HM6 : The output type of the sixth high–speed position switch is, normal (0)/decision by direction (1) #6 HM7 : The output type of the seventh high–speed position switch is, normal (0)/decision by direction (1) #7 HM8 : The output type of the eighth high–speed position switch is, normal (0)/decision by direction (1)		
08509	Switch setting	
#0 HM9 : The output type of the ninth high–speed position switch is, normal (0)/decision by direction (1) #1 HMA : The output type of the tenth high–speed position switch is, normal (0)/decision by direction (1) #2 HMB : The output type of the eleventh high–speed position switch is, normal (0)/decision by direction (1) #3 HMC : The output type of the twelfth high–speed position switch is, normal (0)/decision by direction (1) #4 HMD : The output type of the thirteenth high–speed position switch is, normal (0)/decision by direction (1) #5 HME : The output type of the fourteenth high–speed position switch is, normal (0)/decision by direction (1) #6 HMF : The output type of the fifteenth high–speed position switch is, normal (0)/decision by direction (1) #7 HMG : The output type of the sixteenth high–speed position switch is, normal (0)/decision by direction (1)		

08512	Switch setting (Direction setting of direction decision type when the signal is on)	
#0 HA1 : #1 HA2 : #2 HA3 : #3 HA4 : #4 HA5 : #5 HA6 : #6 HA7 : #7 HA8 :	The passage direction in which the first high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the second high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the third high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the fourth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the fifth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the sixth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the seventh high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the eighth high–speed position switch is turned on is, – (0)/+ (1)	For the positions where the switches are turned on, see PRM8580 to 8587.
08513	Switch setting (Direction setting of direction decision type when the signal is on)	
#0 HA9 : #1 HAA : #2 HAB : #3 HAC : #4 HAD : #5 HAE : #6 HAF : #7 HAG :	The passage direction in which the ninth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the tenth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the eleventh high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the twelfth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the thirteenth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the fourteenth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the fifteenth high–speed position switch is turned on is, – (0)/+ (1) The passage direction in which the sixteenth high–speed position switch is turned on is, – (0)/+ (1)	For the positions where the switches are turned on, see PRM8588 to 8589 and 12221 to 12226.

08516	Switch setting (Direction setting of direction decision type when the signal is off)	
#0 HB1 : The passage direction in which the first high–speed position switch is turned off is, – (0)/+ (1) #1 HB2 : The passage direction in which the second high–speed position switch is turned off is, – (0)/+ (1) #2 HB3 : The passage direction in which the third high–speed position switch is turned off is, – (0)/+ (1) #3 HB4 : The passage direction in which the fourth high–speed position switch is turned off is, – (0)/+ (1) #4 HB5 : The passage direction in which the fifth high–speed position switch is turned off is, – (0)/+ (1) #5 HB6 : The passage direction in which the sixth high–speed position switch is turned off is, – (0)/+ (1) #6 HB7 : The passage direction in which the seventh high–speed position switch is turned off is, – (0)/+ (1) #7 HB8 : The passage direction in which the eighth high–speed position switch is turned off is, – (0)/+ (1)		For the positions where the switches are turned off, see PRM8590 to 8597.
08517	Switch setting (Direction setting of direction decision type when the signal is off)	
#0 HB9 : The passage direction in which the ninth high–speed position switch is turned off is, – (0)/+ (1) #1 HBA : The passage direction in which the tenth high–speed position switch is turned off is, – (0)/+ (1) #2 HBB : The passage direction in which the eleventh high–speed position switch is turned off is, – (0)/+ (1) #3 HBC : The passage direction in which the twelfth high–speed position switch is turned off is, – (0)/+ (1) #4 HBD : The passage direction in which the thirteenth high–speed position switch is turned off is, – (0)/+ (1) #5 HBE : The passage direction in which the fourteenth high–speed position switch is turned off is, – (0)/+ (1) #6 HBF : The passage direction in which the fifteenth high–speed position switch is turned off is, – (0)/+ (1) #7 HBG : The passage direction in which the sixteenth high–speed position switch is turned off is, – (0)/+ (1)		For the positions where the switches are turned off, see PRM8598 to 8599 and 12241 to 12246.
08565	Output address of the high–speed position switch signal (address Y)	PRM 8501#0=0

08570	Axis corresponding to the first high–speed position switch	PRM 8504#0–#7, 8505#0–#1 Set the 11th to 16th position switches in PRM12201 and up.
08571	Axis corresponding to the second high–speed position switch	
08572	Axis corresponding to the third high–speed position switch	
08573	Axis corresponding to the fourth high–speed position switch	
08574	Axis corresponding to the fifth high–speed position switch	
08575	Axis corresponding to the sixth high–speed position switch	
08576	Axis corresponding to the seventh high–speed position switch	
08577	Axis corresponding to the eighth high–speed position switch	
08578	Axis corresponding to the ninth high–speed position switch	
08579	Axis corresponding to the tenth high–speed position switch	
08580	Maximum value of the operation range of the first high–speed position switch or position where the first high–speed position switch is turned on [Detection unit]	PRM 8508#0
08581	Maximum value of the operation range of the second high–speed position switch or position where the second high–speed position switch is turned on [Detection unit]	PRM 8508#1
08582	Maximum value of the operation range of the third high–speed position switch or position where the third t high–speed position switch is turned on [Detection unit]	PRM 8508#2
08583	Maximum value of the operation range of the fourth high–speed position switch or position where the fourth high–speed position switch is turned on [Detection unit]	PRM 8508#3
08584	Maximum value of the operation range of the fifth high–speed position switch or position where the fifth high–speed position switch is turned on [Detection unit]	PRM 8508#4
08585	Maximum value of the operation range of the sixth high–speed position switch or position where the sixth high–speed position switch is turned on [Detection unit]	PRM 8508#5

08586	Maximum value of the operation range of the seventh high–speed position switch or position where the seventh high–speed position switch is turned on [Detection unit]	PRM 8508#6
08587	Maximum value of the operation range of the eighth high–speed position switch or position where the eighth high–speed position switch is turned on [Detection unit]	PRM 8508#7
08588	Maximum value of the operation range of the ninth high–speed position switch or position where the ninth high–speed position switch is turned on [Detection unit]	PRM 8509#0
08589	Maximum value of the operation range of the tenth high–speed position switch or position where the tenth high–speed position switch is turned on [Detection unit]	PRM 8509#1
08590	Minimum value of the operation range of the first high–speed position switch or position where the first high–speed position switch is turned off [Detection unit]	PRM 8508#0
08591	Maximum value of the operation range of the second high–speed position switch or position where the second high–speed position switch is turned off [Detection unit]	PRM 8508#1
08592	Maximum value of the operation range of the third high–speed position switch or position where the third t high–speed position switch is turned off [Detection unit]	PRM 8508#2
08593	Maximum value of the operation range of the fourth high–speed position switch or position where the fourth high–speed position switch is turned off [Detection unit]	PRM 8508#3
08594	Maximum value of the operation range of the fifth high–speed position switch or position where the fifth high–speed position switch is turned off [Detection unit]	PRM 8508#4
08595	Maximum value of the operation range of the sixth high–speed position switch or position where the sixth high–speed position switch is turned off [Detection unit]	PRM 8508#5
08596	Maximum value of the operation range of the seventh high–speed position switch or position where the seventh high–speed position switch is turned off [Detection unit]	PRM 8508#6
08597	Maximum value of the operation range of the eighth high–speed position switch or position where the eighth high–speed position switch is turned off [Detection unit]	PRM 8508#7

08598	Maximum value of the operation range of the ninth high–speed position switch or position where the ninth high–speed position switch is turned off [Detection unit]	PRM 8509#0
08599	Maximum value of the operation range of the tenth high–speed position switch or position where the tenth high–speed position switch is turned off [Detection unit]	PRM 8509#1

74) Others

08650	Setting for C language executor	
#0 RSK : #1 CNA : #2 EKY : #3 DMA : #4 CKM : #5 PGU :	Upon reset, key codes are not passed to the application (0)/passed to the application (1). If an NC alarm is issued while the C executor user screen is displayed, the screen is changed according to PRM3111#7 (0)/is not changed (1). When the C language executor is used, the extended portion of the MDI keys (9 to 11 lines) is, not read (0)/read (1) When the C language executor is used, transfer via RS–232–C is, not made as DMA transfer (0)/made as DMA transfer (1) When the C language executor is used, the bit matrix of the MDI keys is, not transferred to the NC (0)/transferred to the NC (1) When the user screen for the C executor is assigned as an NC program screen, the common screen number is used (0)/the screen number for each operation mode is used (1)	Usually set 0
08651	FACTOLINK software selection	
#0 CFS :	FACTOLINK software in, dedicated memory card is valid (0)/FROM is valid (1)	
08661	Size of the variable area of the C language executor [KByte]	
08662	Size of the SRAM disk of the C language executor [KByte]	
08663	Time zone used by the C language executor [s]	
08700	Direct operation	
#3 DMM:	In DNC operation from the PMC, OPEN CNC (HSSB), or C language executor, pre–reading is, not performed (0)/performed (1)	DMMC <G042#7>

08701	Read method	
#1 PLD : #2 WPR: #6 CTV :	Read operation is performed after the P-code loader is cleared (0)/without clearing the P-code loader (1). The function that allows parameters that are rewritten using the PMC window to be enabled during automatic operation is disabled (0)/ enabled (1) When Symbol CAP*i* T (CAP II) is provided, 1 must be specified.	T series
08702	Request–type program upload	
#7 LFM :	At the beginning of program uploading in response to a request using the data window library, ”LF+%” is not output (0)/ ”LF+%” is output (1)	
08703	MAP	
#0 DLF : #1 LCL :	If file transfer using MAP, for example, is terminated, an incomplete file is not deleted (0)/ deleted (1). A change in the internal state of the CNC is not reported to the host (0)/reported to the host (1).	
08706	DNC operation by FOCAS1/HSSB	
#0 HSD : #1 NWD:	Main machining during DNC operation with FOCAS1/HSSB is, Normal operation (0)/high–speed operation (1) (In general, high–speed operation is selected for a binary operation or miniature block program.) During DNC operation with FOCAS1/HSSB, new DNC functions are, not executed (0)/executed (1)	
08760	Number of a program transferred to the Power Mate by using the I/O Link	
08781	Amount of DRAM used with the C language executor [64k Byte]	Valid setting range is 16 to 64
08790	Timing for executing an auxiliary macro	
08801	Bit parameter 1 for machine tool builder	
08802	Bit parameter 2 for machine tool builder	
08811	2–word parameter 1 for machine tool builder	
08812	2–word parameter 2 for machine tool builder	
08813	2–word parameter 3 for machine tool builder	

75) For maintenance

08901	Maintenance	
#0 FAN : A fan motor error is detected (0)/not detected (1). (Use inhibited)		
08903	Periodic maintenance screen	
#0 PRN : A periodic maintenance expiration message is, not displayed (0)/displayed (1)		
08904	System alarm history	
#7 NMP : The system alarm history screen displays the history for, the first path (0)/the selected path (1)		PRM 3103#2
08911	Ratio of the items on the periodic maintenance screen to the respective lives [%]	
08940	Title character code 1	
08941	Title character code 2	
08942	Title character code 3	
08943	Title character code 4	
08944	Title character code 5	
08945	Title character code 6	
08946	Title character code 7	
08947	Title character code 8	
08948	Title character code 9	
08949	Title character code 10	
When the power to the CNC is turned on, the characters of set codes are displayed. Usable characters: 0 to 9, A to Z, negative sign, period, and space (Any unusable code is converted to a space.)		

76) For embedded macro

<table>
<tr><td>12001</td><td>Program registration</td><td></td></tr>
<tr><td colspan="2">#0 IMR : If an attempt is made to enter a program having the same program number as a embedded macro program that has already been entered, an alarm is raised (0)/the embedded program is deleted, then the new program is entered (1)
<table>
<tr><th>REP (PRM 3201#2)</th><th>IMREP (PRM 12001#0)</th><th>Program stored on tape</th><th>Built–in macro program</th></tr>
<tr><td>0</td><td>0</td><td>Alarm</td><td>Alarm</td></tr>
<tr><td>0</td><td>1</td><td>Alarm</td><td>Overwrite</td></tr>
<tr><td>1</td><td>0</td><td>Overwrite</td><td>Alarm</td></tr>
<tr><td>1</td><td>1</td><td>Overwrite</td><td>Overwrite</td></tr>
</table></td><td></td></tr>
<tr><td>12010</td><td>Embedded macro program referencing or editing enabled/disabled</td><td></td></tr>
<tr><td colspan="2">
<table>
<tr><th>PRM12010</th><th>Edit</th><th>Reference</th></tr>
<tr><td>0</td><td>×</td><td>×</td></tr>
<tr><td>1</td><td>×</td><td>○</td></tr>
<tr><td>2</td><td>○</td><td>○</td></tr>
</table></td><td></td></tr>
<tr><td>12011</td><td>First embedded macro program number</td><td></td></tr>
<tr><td>12012</td><td>Last embedded macro program number</td><td></td></tr>
<tr><td>12013</td><td>Password/keyword for embedded macro</td><td>Used as a password when an FROM file is saved, and used as a keyword in other cases.</td></tr>
<tr><td>12015</td><td>Series for embedded macro</td><td rowspan="2">Embedded in an FROM file and allows checking on the system configuration screen.</td></tr>
<tr><td>12016</td><td>Edition for embedded macro</td></tr>
<tr><td>12020</td><td>G code number for embedded macro (first set)</td><td rowspan="3"></td></tr>
<tr><td>12021</td><td>Program number for embedded macro (first set)</td></tr>
<tr><td>12022</td><td>G code macro count for embedded macro (first set)</td></tr>
</table>

12023	G code number for embedded macro (second set)	
12024	Program number for embedded macro (second set)	
12025	G code macro count for embedded macro (second set)	
12026	G code number for embedded macro (third set)	
12027	Program number for embedded macro (third set)	
12028	G code macro count for embedded macro (third set)	
12029	G code number for embedded macro (fourth set)	
12030	Program number for embedded macro (fourth set)	
12031	G code macro count for embedded macro (fourth set)	
12032	G code number for embedded macro (fifth set)	
12033	Program number for embedded macro (fifth set)	
12034	G code macro count for embedded macro (fifth set)	
12035	G code number for embedded macro (sixth set)	
12036	Program number for embedded macro (sixth set)	
12037	G code macro count for embedded macro (sixth set)	
12038	G code number for embedded macro (seventh set)	
12039	Program number for embedded macro (seventh set)	
12040	G code macro count for embedded macro (seventh set)	

12041	G code number for embedded macro (eighth set)	
12042	Program number for embedded macro (eighth set)	
12043	G code macro count for embedded macro (eighth set)	
12044	G code number for embedded macro (ninth set)	
12045	Program number for embedded macro (ninth set)	
12046	G code macro count for embedded macro (ninth set)	
12047	G code number for embedded macro (tenth set)	
12048	Program number for embedded macro (tenth set)	
12049	G code macro count for embedded macro (tenth set)	
Used to set G codes for embedded macros (Example) When G code number = 100, program number = 8000, and the number of G codes = 5, the G codes G100 to G104 correspond to O8000 to O8004. If multiple sets are used and a G code duplication occurs, a younger set has priority.		

77) For high–speed position switch (2/2)

12201	Axis corresponding to the eleventh high–speed position switch	PRM 8505#2–#7
12202	Axis corresponding to the twelfth high–speed position switch	
12203	Axis corresponding to the thirteenth high–speed position switch	
12204	Axis corresponding to the fourteenth high–speed position switch	
12205	Axis corresponding to the fifteenth high–speed position switch	
12206	Axis corresponding to the sixteenth high–speed position switch	

12221	Maximum value of the operation range of the eleventh high–speed position switch or position where the eleventh high–speed position switch is turned on [Detection unit]	PRM 8509#2
12222	Maximum value of the operation range of the twelfth high–speed position switch or position where the twelfth high–speed position switch is turned on [Detection unit]	PRM 8509#3
12223	Maximum value of the operation range of the thirteenth high–speed position switch or position where the thirteenth t high–speed position switch is turned on [Detection unit]	PRM 8509#4
12224	Maximum value of the operation range of the fourteenth high–speed position switch or position where the fourteenth high–speed position switch is turned on [Detection unit]	PRM 8509#5
12225	Maximum value of the operation range of the fifteenth high–speed position switch or position where the fifteenth high–speed position switch is turned on [Detection unit]	PRM 8509#6
12226	Maximum value of the operation range of the sixteenth high–speed position switch or position where the sixteenth high–speed position switch is turned on [Detection unit]	PRM 8509#7
12241	Maximum value of the operation range of the eleventh high–speed position switch or position where the eleventh high–speed position switch is turned off [Detection unit]	PRM 8509#2
12242	Maximum value of the operation range of the twelfth high–speed position switch or position where the twelfth high–speed position switch is turned off [Detection unit]	PRM 8509#3
12243	Maximum value of the operation range of the thirteenth high–speed position switch or position where the thirteenth t high–speed position switch is turned off [Detection unit]	PRM 8509#4
12244	Maximum value of the operation range of the fourteenth high–speed position switch or position where the fourteenth high–speed position switch is turned off [Detection unit]	PRM 8509#5
12245	Maximum value of the operation range of the fifteenth high–speed position switch or position where the fifteenth high–speed position switch is turned off [Detection unit]	PRM 8509#6
12246	Maximum value of the operation range of the sixteenth high–speed position switch or position where the sixteenth high–speed position switch is turned off [Detection unit]	PRM 8509#7

78) For operation history

12801	Number of a signal symbol table for selecting an operation history signal (01)	PRM 3206#4=1
12802	Number of a signal symbol table for selecting an operation history signal (02)	
12803	Number of a signal symbol table for selecting an operation history signal (03)	
12804	Number of a signal symbol table for selecting an operation history signal (04)	
12805	Number of a signal symbol table for selecting an operation history signal (05)	
12806	Number of a signal symbol table for selecting an operation history signal (06)	
12807	Number of a signal symbol table for selecting an operation history signal (07)	
12808	Number of a signal symbol table for selecting an operation history signal (08)	
12809	Number of a signal symbol table for selecting an operation history signal (09)	
12810	Number of a signal symbol table for selecting an operation history signal (10)	
12811	Number of a signal symbol table for selecting an operation history signal (11)	
12812	Number of a signal symbol table for selecting an operation history signal (12)	
12813	Number of a signal symbol table for selecting an operation history signal (13)	
12814	Number of a signal symbol table for selecting an operation history signal (14)	
12815	Number of a signal symbol table for selecting an operation history signal (15)	
12816	Number of a signal symbol table for selecting an operation history signal (16)	
12817	Number of a signal symbol table for selecting an operation history signal (17)	
12818	Number of a signal symbol table for selecting an operation history signal (18)	
12819	Number of a signal symbol table for selecting an operation history signal (19)	
12820	Number of a signal symbol table for selecting an operation history signal (20)	

12841	Number of a signal selected as an operation history signal (01)	PRM 3206#4=1
12842	Number of a signal selected as an operation history signal (02)	
12843	Number of a signal selected as an operation history signal (03)	
12844	Number of a signal selected as an operation history signal (04)	
12845	Number of a signal selected as an operation history signal (05)	
12846	Number of a signal selected as an operation history signal (06)	
12847	Number of a signal selected as an operation history signal (07)	
12848	Number of a signal selected as an operation history signal (08)	
12849	Number of a signal selected as an operation history signal (09)	
12850	Number of a signal selected as an operation history signal (10)	
12851	Number of a signal selected as an operation history signal (11)	
12852	Number of a signal selected as an operation history signal (12)	
12853	Number of a signal selected as an operation history signal (13)	
12854	Number of a signal selected as an operation history signal (14)	
12855	Number of a signal selected as an operation history signal (15)	
12856	Number of a signal selected as an operation history signal (16)	
12857	Number of a signal selected as an operation history signal (17)	
12858	Number of a signal selected as an operation history signal (18)	
12859	Number of a signal selected as an operation history signal (19)	
12860	Number of a signal selected as an operation history signal (20)	

	#7	#6	#5	#4	#3	#2	#1	#0	PRM 3206#4=1
12881									(01)
12882									(02)
12883									(03)
12884									(04)
12885									(05)
12886									(06)
12887									(07)
12888									(08)
12889									(09)
12890									(10)
12891									(11)
12892									(12)
12893									(13)
12894									(14)
12895									(15)
12896									(16)
12897									(17)
12898									(18)
12899									(19)
12900									(20)

Explanation:

PRM12801 to PRM12900 are used to set signal data for storing records in the operation history. When bit 4 of PRM3206 is set to 1, signal selection using the operation history signal selection screen interacts with these parameters to enable parameter setting.
The operation history signal selection screen allows easy setting without using the parameter screen.

Set a symbol table (area including signal addresses) in PRM12801 to PRM12820.
Set signal addresses (numbers in the symbol table) in PRM12841 to PRM12860.
Set the bit (1 in the bit position for storing operation history records) in PRM12881 to PRM12900.

Symbol table setting

1: G0 to 255 2: G1000 to 1255 3: F0 to 255 4: F1000 to 1255
5: Y0 to 127 6: X0 to 127 9: G2000 to 2255 10: F2000 to 2255

Example of setting:

When ZRN$^{\#2}$<G1043#7> is set to (01)
12801=2, 12841=43, 12881=10000000

79) For display and edit (2/2)

13112	Servo/spindle information screens	
#0 IDW : Editing on the servo information screen or spindle information screen is, prohibited (0)/not prohibited (1) #1 SVI : Servo information screen is, displayed (0)/not displayed (1) #2 SPI : Spindle information screen is, displayed (0)/not displayed (1)		

80) For interpolation type straightness compensation

13381	Number of straightness compensation point at extremely negative point of moving axis 1	PRM 3605#2 PRM5700 or later
13382	Number of straightness compensation point at extremely negative point of moving axis 2	
13383	Number of straightness compensation point at extremely negative point of moving axis 3	
13384	Number of straightness compensation point at extremely negative point of moving axis 4	
13385	Number of straightness compensation point at extremely negative point of moving axis 5	
13386	Number of straightness compensation point at extremely negative point of moving axis 6	
13381	Magnification of straightness compensation for moving axis 1	PRM 3605#2 PRM5700 or later
13382	Magnification of straightness compensation for moving axis 2	
13383	Magnification of straightness compensation for moving axis 3	
13384	Magnification of straightness compensation for moving axis 4	
13385	Magnification of straightness compensation for moving axis 5	
13386	Magnification of straightness compensation for moving axis 6	

81) For rotational area interference check

14900	Setting of rotation area interference check	
#0 IB1 : Setting of the group B move direction (first axis), the move direction of the first axis in the moving plane in group B is, the same as of the first axis in the moving plane in group A (0)/opposite to that of the first axis in the moving plane in group A (1) #1 IB2 : Setting of the group B move direction (second axis), the move direction of the second axis in the moving plane in group B is, the same as of the first axis in the moving plane in group A (0)/opposite to that of the second axis in the moving plane in group A (1) #2 IRA : Setting of the direction of rotation of the rotation axis for rotating group A : For the direction of rotation of the rotation axis for rotating group A, the direction of rotation from the positive direction of the first axis in the plane to that of the second axis in the plane is used, as the positive direction (0)/as the negative (1) direction. #3 IRB : Setting of the direction of rotation of the rotation axis for rotating group B : For the direction of rotation of the rotation axis for rotating group A, the direction of rotation from the positive direction of the first axis in the plane to that of the second axis in the plane is used, as the positive direction (0)/as the negative (1) direction.		
14910	Axis number of the first axis in the plane for moving group A	
14911	Axis number of the second axis in the plane for moving group A	
14912	Axis number of the rotation axis for rotating group A	
14913	Axis number of the first axis in the plane for moving group B	
14914	Axis number of the second axis in the plane for moving group B	
14915	Axis number of the rotation axis for rotating group B	
14920	Maximum point on the first axis of rectangle 1 in group A [Increment system]	
14921	Minimum point on the first axis of rectangle 1 in group A [Increment system]	

14922	Maximum point on the second axis of rectangle 1 in group A [Increment system]	
14923	Minimum point on the second axis of rectangle 1 in group A [Increment system]	
14924	Maximum point on the first axis of rectangle 2 in group A [Increment system]	
14925	Minimum point on the first axis of rectangle 2 in group A [Increment system]	
14926	Maximum point on the second axis of rectangle 2 in group A [Increment system]	
14927	Minimum point on the second axis of rectangle 2 in group A [Increment system]	
14928	Maximum point on the first axis of rectangle 3 in group A [Increment system]	
14929	Minimum point on the first axis of rectangle 3 in group A [Increment system]	
14930	Maximum point on the second axis of rectangle 3 in group A [Increment system]	
14931	Minimum point on the second axis of rectangle 3 in group A [Increment system]	
14932	Maximum point on the first axis of rectangle 4 in group A [Increment system]	
14933	Minimum point on the first axis of rectangle 4 in group A [Increment system]	
14934	Maximum point on the second axis of rectangle 4 in group A [Increment system]	
14935	Minimum point on the second axis of rectangle 4 in group A [Increment system]	
14936	Center of rotation of the first axis for rotating group A [Increment system]	
14937	Center of rotation of the second axis for rotating group A [Increment system]	
14938	Reference rotation angle for the rotation axis in group A [Increment system]	
14940	Maximum point on the first axis of rectangle 1 in group B [Increment system]	
14941	Minimum point on the first axis of rectangle 1 in group B [Increment system]	
14942	Maximum point on the second axis of rectangle 1 in group B [Increment system]	
14943	Minimum point on the second axis of rectangle 1 in group B [Increment system]	

14944	Maximum point on the first axis of rectangle 2 in group B [Increment system]	
14945	Minimum point on the first axis of rectangle 2 in group B [Increment system]	
14946	Maximum point on the second axis of rectangle 2 in group B [Increment system]	
14947	Minimum point on the second axis of rectangle 2 in group B [Increment system]	
14948	Maximum point on the first axis of rectangle 3 in group B [Increment system]	
14949	Minimum point on the first axis of rectangle 3 in group B [Increment system]	
14950	Maximum point on the second axis of rectangle 3 in group B [Increment system]	
14951	Minimum point on the second axis of rectangle 3 in group B [Increment system]	
14952	Maximum point on the first axis of rectangle 4 in group B [Increment system]	
14953	Minimum point on the first axis of rectangle 4 in group B [Increment system]	
14954	Maximum point on the second axis of rectangle 4 in group B [Increment system]	
14955	Minimum point on the second axis of rectangle 4 in group B [Increment system]	
14956	Center of rotation of the first axis for rotating group B [Increment system]	
14957	Center of rotation of the second axis for rotating group B [Increment system]	
14958	Reference rotation angle for the rotation axis in group B [Increment system]	
14960	Maximum point on the first axis of rectangle 1 in group C [Increment system]	
14961	Minimum point on the first axis of rectangle 1 in group C [Increment system]	
14962	Maximum point on the second axis of rectangle 1 in group C [Increment system]	
14963	Minimum point on the second axis of rectangle 1 in group C [Increment system]	
14964	Maximum point on the first axis of rectangle 2 in group C [Increment system]	
14965	Minimum point on the first axis of rectangle 2 in group C [Increment system]	

14966	Maximum point on the second axis of rectangle 2 in group C [Increment system]	
14967	Minimum point on the second axis of rectangle 2 in group C [Increment system]	
14968	Maximum point on the first axis of rectangle 3 in group C [Increment system]	
14969	Minimum point on the first axis of rectangle 3 in group C [Increment system]	
14970	Maximum point on the second axis of rectangle 3 in group C [Increment system]	
14971	Minimum point on the second axis of rectangle 3 in group C [Increment system]	
14972	Maximum point on the first axis of rectangle 4 in group C [Increment system]	
14973	Minimum point on the first axis of rectangle 4 in group C [Increment system]	
14974	Maximum point on the second axis of rectangle 4 in group C [Increment system]	
14975	Minimum point on the second axis of rectangle 4 in group C [Increment system]	

82) For AI/AI nano high–precision contour control and functions related for RISC processor operation

- AI/AI nano high–precision contour control

19500	Setting of AI/AI nano high–precision contour control	M series
#6 FNW :	When the feedrate is determined according to the feedrate difference and acceleration in AI/AI nano high–precision contour control, the maximum feedrate at which the allowable feedrate difference and acceleration for each axis are not exceeded is used (0)/the maximum feedrate at which the allowable feedrate difference and acceleration for each axis are not exceeded is used. The feedrate is determined so that the decreased feedrate is constant regardless of the move direction when the profile is the same (1)	
19501	Setting of AI/AI–nano high–precision contour control	M series
#5 FRP :	Acceleration/deceleration for rapid traverse in AI/AI nano high precision contour control mode is, acceleration/deceleration after interpolation (0)/acceleration/deceleration before interpolation (1) (When this parameter is set, rapid traverse is based on linear interpolation type positioning.)	
#6 BCG :	The bell–shaped acceleration/deceleration time constant change function in AI/AI nano High Precision contour control mode is, disabled (0)/enabled (1)	PRM 7055#3
19504	Setting of AI/AI nano high–precision contour control	M series
#0 HRB :	Acceleration/deceleration for rapid traverse in AI/AI nano high precision contour control mode is, linear acceleration/deceleration (0)/bell–shaped acceleration/deceleration (1)	
19510	Constant for determining the allowable acceleration for each axis for acceleration/deceleration before interpolation [ms]	<Axis> M series
19511	Lowest feedrate for the function of decelerating according to the acceleration in AI/AI nano high–precision contour control [Increment system]	M series

- Function of changing the time constant for bell–shaped acceleration/deceleration before interpolation

19520	Acceleration/deceleration reference speed for the bell–shaped acceleration/deceleration time constant change function in AI/AI nano high–precision contour control mode [Increment system]	M series PRM7066

- Cylindrical interpolation cutting point compensation in the cylindrical interpolation

19530	Setting of cylindrical interpolation cutting point compensation in the cylindrical interpolation	M series
#5 CYA : Specifies whether to perform cylindrical interpolation cutting point compensation in the cylindrical interpolation command (G07.1) during AI/AI nano high–precision contour control mode: perform (0)/do not perform (1) #6 CYS : Specifies whether when the cylindrical interpolation cutting point compensation function is used, cutting point compensation is performed between blocks or together with a block movement if the cutting point compensation value is less than the setting of PRM19534 : performed between blocks (0)/performed together with a block movement if the cutting point compensation value is less than the setting of PRM19534 (1)		PRM 19534
19531	Tool offset axis number for the XY plane	M series
19532	Tool offset axis number for the ZX plane	M series
19533	Tool offset axis number for the YZ plane	M series
19534	Limit for changing cylindrical interpolation cutting point compensation in a single block	M series PRM 19530#6
19535	Limit of travel distance moved with the cylindrical interpolation cutting point compensation in the previous block unchanged.	M series

- Optimum torque acceleration/deceleration

19540	Setting of optimum torque acceleration/deceleration	M series
#0 FAP : Optimum torque acceleration/deceleration is, disabled (0)/enabled (1)		

19541	Optimum torque acceleration/deceleration (speed at P1) [0.01%]	<Axis> M series PRM1420 to be set as the ratio to PRM1420
19542	Optimum torque acceleration/deceleration (speed at P2) [0.01%]	
19543	Optimum torque acceleration/deceleration (speed at P3) [0.01%]	
19544	Optimum torque acceleration/deceleration (speed at P4) [0.01%]	
19545	Optimum torque acceleration/deceleration (acceleration at P0 during movement in + direction and acceleration) [0.01%]	<Axis> M series To be set as the ratio to a reference acceleration value. PR1773 and 1620 are used to set a reference acceleration value. When 0 is set in the above, 1000 mm/sec^2 100 inch/sec^2 100 deg/sec^2
19546	Optimum torque acceleration/deceleration (acceleration at P1 during movement in + direction and acceleration) [0.01%]	
19547	Optimum torque acceleration/deceleration (acceleration at P2 during movement in + direction and acceleration) [0.01%]	
19548	Optimum torque acceleration/deceleration (acceleration at P3 during movement in + direction and acceleration) [0.01%]	
19549	Optimum torque acceleration/deceleration (acceleration at P4 during movement in + direction and acceleration) [0.01%]	
19550	Optimum torque acceleration/deceleration (acceleration at P5 during movement in + direction and acceleration) [0.01%]	
19551	Optimum torque acceleration/deceleration (acceleration at P0 during movement in – direction and acceleration) [0.01%]	
19552	Optimum torque acceleration/deceleration (acceleration at P1 during movement in – direction and acceleration) [0.01%]	
19553	Optimum torque acceleration/deceleration (acceleration at P2 during movement in – direction and acceleration) [0.01%]	
19554	Optimum torque acceleration/deceleration (acceleration at P3 during movement in – direction and acceleration) [0.01%]	
19555	Optimum torque acceleration/deceleration (acceleration at P4 during movement in – direction and acceleration) [0.01%]	
19556	Optimum torque acceleration/deceleration (acceleration at P5 during movement in – direction and acceleration) [0.01%]	

19557	Optimum torque acceleration/deceleration (acceleration at P0 during movement in + direction and deceleration) [0.01%]	<Axis> M series To be set as the ratio to a reference acceleration value. PR1773 and 1620 are used to set a reference acceleration value. When 0 is set in the above, 1000 mm/sec^2 100 inch/sec^2 100 deg/sec^2
19558	Optimum torque acceleration/deceleration (acceleration at P1 during movement in + direction and deceleration) [0.01%]	
19559	Optimum torque acceleration/deceleration (acceleration at P2 during movement in + direction and deceleration) [0.01%]	
19560	Optimum torque acceleration/deceleration (acceleration at P3 during movement in + direction and deceleration) [0.01%]	
19561	Optimum torque acceleration/deceleration (acceleration at P4 during movement in + direction and deceleration) [0.01%]	
19562	Optimum torque acceleration/deceleration (acceleration at P5 during movement in + direction and deceleration) [0.01%]	
19563	Optimum torque acceleration/deceleration (acceleration at P0 during movement in – direction and deceleration) [0.01%]	
19564	Optimum torque acceleration/deceleration (acceleration at P1 during movement in – direction and deceleration) [0.01%]	
19565	Optimum torque acceleration/deceleration (acceleration at P2 during movement in – direction and deceleration) [0.01%]	
19566	Optimum torque acceleration/deceleration (acceleration at P3 during movement in – direction and deceleration) [0.01%]	
19567	Optimum torque acceleration/deceleration (acceleration at P4 during movement in – direction and deceleration) [0.01%]	
19568	Optimum torque acceleration/deceleration (acceleration at P5 during movement in – direction and deceleration) [0.01%]	

- Setting of RISC processing of each function

19600	Setting of the RISC processor	M series
#0 RSC :	The scaling function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	
#1 RMI :	The program mirror image function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	
#2 RFX :	The rotary table dynamic fixture offset function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	
#3 RRO :	The coordinate system rotation function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	
#4 R3D :	The three–dimensional coordinate conversion function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	
#5 RCR :	The cutter compensation C function is, executed on the CNC (0)/executed on the RISC processor (5–axis control mode) (1)	

- Three–dimensional cutter compensation

19605	Three–dimensional cutter compensation	M series
#5 NIC :	Specifies whether to perform an interference check when compensation plane switching occurs during three–dimensional cutter compensation : perform (0)/do not perform (1)	
19610	Rotation axis for three–dimensional cutter compensation (first group)	M series
19611	Linear axis 1 for three–dimensional cutter compensation (first group)	
19612	Linear axis 2 for three–dimensional cutter compensation (first group)	
19613	Linear axis 3 for three–dimensional cutter compensation (first group)	
19614	Angle of inclination for the rotation axis for three–dimensional cutter compensation (first group) [deg]	
19615	Rotation axis for three–dimensional cutter compensation (second group)	

19616	Linear axis 1 for three–dimensional cutter compensation (second group)	M series
19617	Linear axis 2 for three–dimensional cutter compensation (second group)	
19618	Linear axis 3 for three–dimensional cutter compensation (second group)	
19619	Angle of inclination for the rotation axis for three–dimensional cutter compensation (second group) [deg]	
19620	Reference angle for the rotation axis for three–dimensional cutter compensation (first group) [deg]	M series
19621	Reference angle for the rotation axis for three–dimensional cutter compensation (second group) [deg]	M series
19622	Reference angle for the tool axis in the plane formed by linear axes 2 and 3 (RA) [deg]	M series
19623	Reference angle for the tool axis in the plane formed by linear axes 3 and 1 (RB) [deg]	
19630	Limit for assuming the block as a non–movement block in intersection calculation for tool side compensation (G41.2, G42.2) [Input unit]	M series
19631	Angle determination fluctuation value for leading edge offset [deg]	M series
19635	Effective angle in an interference check for three–dimensional cutter compensation [deg]	M series

- Tool axis direction tool length compensation and tool center point control

19650	Tool axis direction tool length compensation and tool center point control	<Axis> M series
#0 RAM :	Specifies whether to use the axis as the rotation axis for tool axis direction tool length compensation and tool center point control : not used as the rotation axis (0)/used as the rotation axis (1)	Two rotation axes are selected.
#1 RAP :	Specifies whether the rotation axis used for tool axis direction tool length compensation and tool center point control : actual rotation axis (0)/parameter axis (1)	An angular displacement is set in PRM19658.
19655	Axis number of the linear axis to which a rotation axis belongs	<Axis> M series
19656	Tool axis direction (Tool axis direction when the two rotation axes are in zero–degree state.)	M series

19657	Master rotation axis number	M series
19658	Angular displacement of a rotation axis (Coordinates of a parameter axis not controlled by the CNC) [deg]	<Axis> M series PRM 19650#1=1
19659	Offset value for angular displacement of a rotation axis [deg]	<Axis> M series
19660	Origin offset value of a rotation axis [deg]	<Axis> M series
19661	Rotation center compensation vector in tool length compensation along tool axis (Vector from the first rotation center to the second rotation center) [Increment system]	<Axis> M series
19662	Spindle center compensation vector in tool length compensation along tool axis [Increment system]	<Axis> M series
19665	Tool axis direction tool length compensation and tool center point control	M series
#4 SPR :	In tool axis direction tool length compensation and tool center point control, shift of the control point is, calculated automatically (0)/set in parameter (1)	PRM 19667
#5 SVC :	In tool axis direction tool length compensation and tool center point control, the control point is, not shifted (0)/shifted (1)	PRM 19665#4
#7 ETH :	Tool holder offset function in tool axis direction tool length compensation and tool center point control is, disabled (0)/enabled (1)	
19666	Tool holder offset for tool axis direction tool length compensation (Offset from the rotation center of the rotation axis to the tool attachment position) [Increment system]	M series
19667	Shift vector in tool length compensation along tool axis [Increment system]	<Axis> M series PRM 19665#5, 19665#4

8.1 Alarms Displayed on NC Screen

8.1.1 Program errors (P/S alarm)

No.	Message	Contents
000	PLEASE TURN OFF POWER	A parameter which requires the power off was input, turn off power.
001	TH PARITY ALARM	TH alarm (A character with incorrect parity was input). Correct the program or tape.
002	TV PARITY ALARM	TV alarm (The number of characters in a block is odd). This alarm will be generated only when the TV check is effective.
003	TOO MANY DIGITS	Data exceeding the maximum allowable number of digits was input. (Refer to the item of max. programmable dimensions.)
004	ADDRESS NOT FOUND	A numeral or the sign was input without an address at the beginning of a block. Modify the program .
005	NO DATA AFTER ADDRESS	The address was not followed by the appropriate data but was followed by another address or EOB code. Modify the program.
006	ILLEGAL USE OF NEGATIVE SIGN	Sign " – " input error (Sign " – " was input after an address with which it cannot be used. Or two or more " – " signs were input.) Modify the program.
007	ILLEGAL USE OF DECIMAL POINT	Decimal point " . " input error (A decimal point was input after an address with which it can not be used. Or two decimal points were input.) Modify the program.
009	ILLEGAL ADDRESS INPUT	Unusable character was input in significant area. Modify the program.
010	IMPROPER G–CODE	An unusable G code or G code corresponding to the function not provided is specified. Modify the program.
011	NO FEEDRATE COMMANDED	Feedrate was not commanded to a cutting feed or the feedrate was inadequate. Modify the program.
014	CAN NOT COMMAND G95 (M series)	A synchronous feed (G94) is specified without the option for threading / synchronous feed. Modify the program.
	ILLEGAL LEAD COMMAND (T series)	In variable lead threading (G35), the lead incremental and decremental outputted by address K exceed the maximum command value or a command such that the lead becomes a negative value is given. Modify the program.

No.	Message	Contents
015	TOO MANY AXES COMMANDED (M series)	An attempt was made to move the machine along the axes, but the number of the axes exceeded the specified number of axes controlled simultaneously. Modify the program.
	TOO MANY AXES COMMANDED (T series)	An attempt has been made to move the tool along more than the maximum number of simultaneously controlled axes. Alternatively, no axis movement command or an axis movement command for two or more axes has been specified in the block containing the command for skip using the torque limit signal (G31). The command must be accompanied with an axis movement command for a single axis, in the same block.
020	OVER TOLERANCE OF RADIUS	In circular interpolation (G02 or G03), difference of the distance between the start point and the center of an arc and that between the end point and the center of the arc exceeded the value specified in PRM3410.
021	ILLEGAL PLANE AXIS COMMANDED	An axis not included in the selected plane (by using G17, G18, G19) was commanded in circular interpolation (G02, G03). Modify the program.
022	NO CIRCLE RADIUS	The command for circular interpolation (G02, G03) lacks arc radius R or coordinate I, J, or K of the distance between the start point to the center of the arc.
023	ILLEGAL RADIUS COMMAND (T series)	In circular interpolation by radius designation, negative value was commanded for address R. Modify the program.
025	CANNOT COMMAND F0 IN G02/G03 (M series)	F0 (rapid traverse) was instructed by F1 –digit column feed in circular interpolation (G02, G03). Modify the program.
027	NO AXES COMMANDED IN G43/G44 (M series)	No axis is specified in G43 and G44 blocks for the tool length offset type C. Offset is not canceled but another axis is offset for the tool length offset type C. Modify the program.
028	ILLEGAL PLANE SELECT	In the plane selection command (G17, G18, G19), two or more axes in the same direction are commanded. Modify the program.
029	ILLEGAL OFFSET VALUE (M series)	The offset values specified by H code is too large. Modify the program.
	ILLEGAL OFFSET VALUE (T series)	The offset values specified by T code is too large. Modify the program.
030	ILLEGAL OFFSET NUMBER (M series)	The offset number specified by D/H code for tool length offset, cutter compensation, or three–dimensional tool offset is too large. Alternatively, the number of an additional workpiece coordinate system specified with the P code is too large. Modify the program.
	ILLEGAL OFFSET NUMBER (T series)	The offset number in T function specified for tool offset is tool large. Modify the program.

No.	Message	Contents
031	ILLEGAL P COMMAND IN G10	In setting an offset amount by G10, the offset number following address P was excessive or it was not specified. Modify the program.
032	ILLEGAL OFFSET VALUE IN G10	In setting an offset amount by G10 or in writing an offset amount by system variables, the offset amount was excessive. Modify the program.
033	NO SOLUTION AT CRC (M series)	A point of intersection cannot be determined for cutter compensation C. Modify the program.
	NO SOLUTION AT CRC (T series)	A point of intersection cannot be determined for tool nose radius compensation. Modify the program.
034	NO CIRC ALLOWED IN ST–UP /EXT BLK (M series)	The start up or cancel was going to be performed in the G02 or G03 mode in cutter compensation C. Modify the program.
	NO CIRC ALLOWED IN ST–UP /EXT BLK (T series)	The start up or cancel was going to be performed in the G02 or G03 mode in tool nose radius compensation. Modify the program.
035	CAN NOT COMMANDED G39 (M series)	G39 is commanded in cutter compensation B cancel mode or on the plane other than offset plane. Modify the program.
	CAN NOT COMMANDED G31 (T series)	Skip cutting (G31) was specified in tool nose radius compensation mode. Modify the program.
036	CAN NOT COMMANDED G31 (M series)	Skip cutting (G31) was specified in cutter compensation mode. Modify the program.
037	CAN NOT CHANGE PLANE IN CRC (M series)	G40 is commanded on the plane other than offset plane in cutter compensation B. The plane selected by using G17, G18 or G19 is changed in cutter compensation C mode. Modify the program.
	CAN NOT CHANGE PLANE IN NRC (T series)	The offset plane is switched in tool nose radius compensation. Modify the program.
038	INTERFERENCE IN CIRCULAR BLOCK (M series)	Overcutting will occur in cutter compensation C because the arc start point or end point coincides with the arc center. Modify the program.
	INTERFERENCE IN CIRCULAR BLOCK (T series)	Overcutting will occur in tool nose radius compensation because the arc start point or end point coincides with the arc center. Modify the program.
039	CHF/CNR NOT ALLOWED IN NRC (T series)	Chamfering or corner R was specified with a start–up, a cancel, or switching between G41 and G42 in tool nose radius compensation. The program may cause overcutting to occur in chamfering or corner R. Modify the program.
040	INTERFERENCE IN G90/G94 BLOCK (T series)	Overcutting will occur in tool nose radius compensation in canned cycle G90 or G94. Modify the program.

No.	Message	Contents
041	INTERFERENCE IN CRC (M series)	Overcutting will occur in cutter compensation C. Two or more blocks are consecutively specified in which functions such as the auxiliary function and dwell functions are performed without movement in the cutter compensation mode. Modify the program.
	INTERFERENCE IN NRC (T series)	Overcutting will occur in tool nose radius compensation. Two or more blocks are consecutively specified in which functions such as the auxiliary function and dwell functions are performed without movement in the tool nose radius compensation mode. Modify the program.
042	G45/G48 NOT ALLOWED IN CRC (M series)	Tool offset (G45 to G48) is commanded in cutter compensation. Modify the program.
044	G27–G30 NOT ALLOWED IN FIXED CYC (M series)	One of G27 to G30 is commanded in canned cycle mode. Modify the program.
045	ADDRESS Q NOT FOUND (G73/G83) (M series)	In canned cycle G73/G83, the depth of each cut (Q) is not specified. Alternatively, Q0 is specified. Modify the program.
046	ILLEGAL REFERENCE RETURN COMMAND	Other than P2, P3 and P4 are commanded for 2nd, 3rd and 4th reference position return command. Modify the program.
047	ILLEGAL AXIS SELECT	Two or more parallel axes (in parallel with a basic axis) have been specified upon start–up of three–dimensional tool compensation or three–dimensional coordinate conversion. Modify the program.
048	BASIC 3 AXIS NOT FOUND	Start–up of three–dimensional tool compensation or three–dimensional coordinate conversion has been attempted, but the three basic axes used when Xp, Yp, or Zp is omitted are not set in PRM1022.
049	ILLEGAL OPERATION (G68/G69) (M series)	The commands for three–dimensional coordinate conversion (G68, G69) and tool length compensation (G43, G44, G45) are not nested. Modify the program.
050	CHF/CNR NOT ALLOWED IN THRD BLK (M series)	Optional chamfering or corner R is commanded in the thread cutting block. Modify the program.
	CHF/CNR NOT ALLOWED IN THRD BLK (T series)	Chamfering or corner R is commanded in the thread cutting block. Modify the program.
051	MISSING MOVE AFTER CHF/CNR (M series)	Improper movement or the move distance was specified in the block next to the optional chamfering or corner R block. Modify the program.
	MISSING MOVE AFTER CHF/CNR (T series)	Improper movement or the move distance was specified in the block next to the chamfering or corner R block. Modify the program.

No.	Message	Contents
052	CODE IS NOT G01 AFTER CHF/CNR (M series)	The block next to the chamfering or corner R block is not G01,G02 or G03. Modify the program.
	CODE IS NOT G01 AFTER CHF/CNR (T series)	The block next to the chamfering or corner R block is not G01. Modify the program.
053	TOO MANY ADDRESS COMMANDS (M series)	For systems without the arbitrary angle chamfering or corner R cutting, a comma was specified. For systems with this feature, a comma was followed by something other than R or C Correct the program.
	TOO MANY ADDRESS COMMANDS (T series)	In the chamfering and corner R commands, two or more of I, K and R are specified. Otherwise, the character after a comma(",") is not C or R in direct drawing dimensions programming (PRM3405#4=1). Modify the program.
054	NO TAPER ALLOWED AFTER CHF/CNR (T series)	A block in which chamfering in the specified angle or the corner R was specified includes a taper command. Modify the program.
055	MISSING MOVE VALUE IN CHF/CNR (M series)	In the arbitrary angle chamfering or corner R block, the move distance is less than chamfer or corner R amount. Modify the program.
	MISSING MOVE VALUE IN CHF/CNR (T series)	In chamfering or corner R block, the move distance is less than chamfer or corner R amount. Modify the program.
056	NO END POINT & ANGLE IN CHF/CNR (T series)	Neither the end point nor angle is specified in the command for the block next to that for which only the angle is specified (A). In the chamfering command, I(K) is commanded for the X(Z) axis. Modify the program.
057	NO SOLUTION OF BLOCK END (T series)	Block end point is not calculated correctly in direct dimension drawing programming. Modify the program.
058	END POINT NOT FOUND (M series)	In a arbitrary angle chamfering or corner R cutting block, a specified axis is not in the selected plane. Correct the program.
	END POINT NOT FOUND (T series)	Block end point is not found in direct dimension drawing programming. Modify the program.
059	PROGRAM NUMBER NOT FOUND	In an external program number search, a specified program number was not found. Otherwise, a program specified for searching is being edited in background processing. Alternatively, the program with the program number specified in a one–touch macro call is not found in memory. Check the program number and external signal. Or discontinue the background editing.
060	SEQUENCE NUMBER NOT FOUND	Commanded sequence number was not found in the sequence number search. Check the sequence number.
061	ADDRESS P/Q NOT FOUND IN G70–G73 (T series)	Address P or Q is not specified in G70, G71, G72, or G73 command. Modify the program.

No.	Message	Contents
062	ILLEGAL COMMAND IN G71–G76 (T series)	1. The depth of cut in G71 or G72 is zero or negative value. 2. The repetitive count in G73 is zero or negative value. 3. the negative value is specified to Δi or Δk is zero in G74 or G75. 4. A value other than zero is specified to address U or W though Δi or Δk is zero in G74 or G75. 5. A negative value is specified to Δd, though the relief direction in G74 or G75 is determined. 6. Zero or a negative value is specified to the height of thread or depth of cut of first time in G76. 7. The specified minimum depth of cut in G76 is greater than the height of thread. 8. An unusable angle of tool tip is specified in G76. Modify the program.
063	SEQUENCE NUMBER NOT FOUND (T series)	The sequence number specified by address P in G70, G71, G72, or G73 command cannot be searched. Modify the program.
064	SHAPE PROGRAM NOT MONOTONOUSLY (T series)	A target shape which cannot be made by monotonic machining was specified in a repetitive canned cycle (G71 or G72).
065	ILLEGAL COMMAND IN G71–G73 (T series)	1. G00 or G01 is not commanded at the block with the sequence number which is specified by address P in G71, G72, or G73 command. 2. Address Z(W) or X(U) was commanded in the block with a sequence number which is specified by address P in G71 or G72, respectively. Modify the program.
066	IMPROPER G–CODE IN G71–G73 (T series)	An unallowable G code was commanded between two blocks specified by address P in G71, G72, or G73. Modify the program.
067	CAN NOT ERROR IN MDI MODE (T series)	G70, G71, G72, or G73 command with address P and Q. Modify the program.
069	FORMAT ERROR IN G70–G73 (T series)	The final move command in the blocks specified by P and Q of G70, G71, G72, and G73 ended with chamfering or corner R. Modify the program.
070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary programs, then retry.
071	DATA NOT FOUND	The address to be searched was not found. Or the program with specified program number was not found in program number search. Check the data.
072	TOO MANY PROGRAMS	The number of programs to be stored exceeded 63 (basic), 125 (option), 200 (option), 400 (option) or 1000 (option). Delete unnecessary programs and execute program registration again.

No.	Message	Contents
073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registration again.
074	ILLEGAL PROGRAM NUMBER	The program number is other than 1 to 9999. Modify the program number.
075	PROTECT	An attempt was made to register a program whose number was protected.
076	ADDRESS P NOT DEFINED	Address P (program number) was not commanded in the block which includes an M98, G65, or G66 command. Modify the program.
077	SUB PROGRAM NESTING ERROR	The subprogram was called in five folds. Modify the program.
078	NUMBER NOT FOUND	A program number or a sequence number which was specified by address P in the block which includes an M98, M99, M65 or G66 was not found. The sequence number specified by a GOTO statement was not found. Otherwise, a called program is being edited in background processing. Correct the program, or discontinue the background editing.
079	PROGRAM VERIFY ERROR	In memory or program collation,a program in memory does not agree with that read from an external I/O device. Check both the programs in memory and those from the external device.
080	G37 ARRIVAL SIGNAL NOT ASSERTED (M series)	In the automatic tool length measurement function (G37), the measurement position reach signal (XAE, YAE, or ZAE) is not turned on within an area specified in PRM6254 (value ε). This is due to a setting or operator error.
	G37 ARRIVAL SIGNAL NOT ASSERTED (T series)	In the automatic tool compensation function (G36, G37), the measurement position reach signal (XAE or ZAE) is not turned on within an area specified in PRM6254, 6255 (value ε). This is due to a setting or operator error.
081	OFFSET NUMBER NOT FOUND IN G37 (M series)	Tool length automatic measurement (G37) was specified without a H code. (Automatic tool length measurement function) Modify the program.
	OFFSET NUMBER NOT FOUND IN G37 (T series)	Automatic tool compensation (G36, G37) was specified without a T code. (Automatic tool compensation function) Modify the program.
082	H–CODE NOT ALLOWED IN G37 (M series)	H code and automatic tool compensation (G37) were specified in the same block. (Automatic tool length measurement function) Modify the program.
	T–CODE NOT ALLOWED IN G37 (T series)	T code and automatic tool compensation (G36, G37) were specified in the same block. (Automatic tool compensation function) Modify the program.

No.	Message	Contents
083	ILLEGAL AXIS COMMAND IN G37 (M series)	In automatic tool length measurement (G37), an invalid axis was specified or the command is incremental. Modify the program.
	ILLEGAL AXIS COMMAND IN G37 (T series)	In automatic tool compensation (G36, G37), an invalid axis was specified or the command is incremental. Modify the program.
085	COMMUNICATION ERROR	When entering data in the memory by using Reader / Puncher interface, an overrun, parity or framing error was generated. The number of bits of input data or setting of baud rate or specification No. of I/O unit is incorrect.
086	DR SIGNAL OFF	When entering data in the memory by using Reader / Puncher interface, the ready signal (DR) of reader / puncher was turned off. Power supply of I/O unit is off or cable is not connected or a P.C.B. is defective.
087	BUFFER OVERFLOW	When entering data in the memory by using Reader / Puncher interface, though the read terminate command is specified, input is not interrupted after 10 characters read. I/O unit or P.C.B. is defective.
088	LAN FILE TRANS ERROR (CHANNEL–1)	File data transfer via OSI–ETHERNET has been stopped due to a transfer error.
089	LAN FILE TRANS ERROR (CHANNEL–2)	File data transfer via OSI–ETHERNET has been stopped due to a transfer error.
090	REFERENCE RETURN INCOMPLETE	1. The reference position return cannot be performed normally because the reference position return start point is too close to the reference position or the speed is too slow. Separate the start point far enough from the reference position, or specify a sufficiently fast speed for reference position return. 2. During reference position return with the absolute–position detector, if this alarm occurs even though condition 1 is satisfied, do the following: After turning the servo motor for the axis at least one turn, turn the power off and then on again. Then perform reference position return. 3. An attempt was made to make a movement immediately in the reference position return mode along an axis for which the reference position is set without dogs (PRM1002#1, 1005#1). Before a reference position return operation, make a movement in the jog mode for a sufficient distance at a sufficient speed.
091	REFERENCE RETURN INCOMPLETE	Manual reference position return cannot be performed when automatic operation is halted.
092	AXES NOT ON THE REFERENCE POINT	The commanded axis by G27 (Reference position return check) did not return to the reference position.

No.	Message	Contents
094	P TYPE NOT ALLOWED (COORD CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the coordinate system setting operation was performed.) Perform the correct operation.
095	P TYPE NOT ALLOWED (EXT OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the external workpiece offset amount changed.) Perform the correct operation.
096	P TYPE NOT ALLOWED (WRK OFS CHG)	P type cannot be specified when the program is restarted. (After the automatic operation was interrupted, the workpiece offset amount changed.) Perform the correct operation.
097	P TYPE NOT ALLOWED (AUTO EXEC)	P type cannot be directed when the program is restarted. (After power ON, after emergency stop or ALM94–97 reset, no automatic operation is performed.) Perform automatic operation.
098	G28 FOUND IN SEQUENCE RETURN	A command of the program restart was specified without the reference position return operation after power ON or emergency stop, and G28 was found during search. Perform the reference position return.
099	MDI EXEC NOT ALLOWED AFT. SEARCH	After completion of search in program restart, a move command is given with MDI. Move axis before a move command or don't interrupt MDI operation.
100	PARAMETER WRITE ENABLE	On the PARAMETER(SETTING) screen, PWE(parameter writing enabled) is set to 1. Set it to 0, then reset the system.
101	PLEASE CLEAR MEMORY	The power turned off while rewriting the memory by program edit operation. If this alarm has occurred, press <RESET> while pressing <PROG>, and only the program being edited will be deleted. Register the deleted program.
109	FORMAT ERROR IN G08	A value other than 0 or 1 was specified after P in the G08 code, or no value was specified.
110	DATA OVERFLOW	The absolute value of fixed decimal point display data exceeds the allowable range. Modify the program.
111	CALCULATED DATA OVERFLOW	The result of calculation turns out to be invalid, an alarm No.111 is issued. -10^{47} to -10^{-29}, 0, 10^{-29} to 10^{47} Modify the program.
112	DIVIDED BY ZERO	Division by zero was specified. (including tan 90°) Modify the program.
113	IMPROPER COMMAND	A function which cannot be used in custom macro is commanded. Modify the program.
114	FORMAT ERROR IN MACRO	There is an error in other formats than <Formula>. Modify the program.

No.	Message	Contents
115	ILLEGAL VARIABLE NUMBER	A value not defined as a variable number is designated in the custom macro or in high–speed cycle machining. The header contents are improper. This alarm is given in the following cases: High speed cycle machining 1. The header corresponding to the specified machining cycle number called is not found. 2. The cycle connection data value is out of the allowable range (0 – 999). 3. The number of data in the header is out of the allowable range (0 – 32767). 4. The start data variable number of executable format data is out of the allowable range (#20000 – #85535). 5. The last storing data variable number of executable format data is out of the allowable range (#85535). 6. The storing start data variable number of executable format data is overlapped with the variable number used in the header. Modify the program.
116	WRITE PROTECTED VARIABLE	The left side of substitution statement is a variable whose substitution is inhibited. Modify the program.
118	PARENTHESIS NESTING ERROR	The nesting of bracket exceeds the upper limit (quintuple). Modify the program.
119	ILLEGAL ARGUMENT	The SQRT argument is negative. Or BCD argument is negative, and other values than 0 to 9 are present on each line of BIN argument. Modify the program.
122	FOUR FOLD MACRO MODAL–CALL	The macro modal call is specified four fold. Modify the program.
123	CAN NOT USE MACRO COMMAND IN DNC	Macro control command is used during DNC operation. Modify the program.
124	MISSING END STATEMENT	DO – END does not correspond to 1 : 1. Modify the program.
125	FORMAT ERROR IN MACRO	<Formula> format is erroneous. Modify the program.
126	ILLEGAL LOOP NUMBER	In DOn, $1 \leqq n \leqq 3$ is not established. Modify the program.
127	NC, MACRO STATEMENT IN SAME BLOCK	NC and custom macro commands coexist. Modify the program.
128	ILLEGAL MACRO SEQUENCE NUMBER	The sequence number specified in the branch command was not 0 to 9999. Or, it cannot be searched. Modify the program.
129	ILLEGAL ARGUMENT ADDRESS	An address which is not allowed in <Argument Designation > is used. Modify the program.
130	ILLEGAL AXIS OPERATION	An axis control command was given by PMC to an axis controlled by CNC. Or an axis control command was given by CNC to an axis controlled by PMC. Modify the program.

No.	Message	Contents
131	TOO MANY EXTERNAL ALARM MESSAGES	Five or more alarms have generated in external alarm message. Consult the PMC ladder diagram to find the cause.
132	ALARM NUMBER NOT FOUND	No alarm No. concerned exists in external alarm message clear. Check the PMC ladder diagram.
133	ILLEGAL DATA IN EXT. ALARM MSG	Small section data is erroneous in external alarm message or external operator message. Check the PMC ladder diagram.
135	ILLEGAL ANGLE COMMAND (M series)	The index table indexing positioning angle was instructed in other than an integral multiple of the value of the minimum angle. Modify the program.
	SPINDLE ORIENTATION PLEASE (T series)	Without any spindle orientation in the spindle positioning function, an attempt was made for spindle indexing. Perform spindle orientation.
136	ILLEGAL AXIS COMMAND (M series)	In index table indexing, another control axis was instructed together with the B axis. Modify the program.
	C/H–CODE & MOVE CMD IN SAME BLK. (T series)	In the spindle positioning function, a move command of other axes was specified to the same block as spindle indexing addresses C, H. Modify the program.
137	M–CODE & MOVE CMD IN SAME BLK. (T series)	In the spindle positioning function, a move command of other axes was specified to the same block as M–code related to spindle indexing. Modify the program.
138	SUPERIMPOSED DATA OVERFLOW	The total distribution amount of the CNC and PMC is too large during superimposed control of the extended functions for PMC axis control.
139	CAN NOT CHANGE PMC CONTROL AXIS	An axis is selected in commanding by PMC axis control. Modify the program.
141	CAN NOT COMMAND G51 IN CRC (M series)	G51 (Scaling ON) is commanded in the tool offset mode. Modify the program.
142	ILLEGAL SCALE RATE (M series)	Scaling magnification is commanded in other than 1 – 999999. Correct the scaling magnification setting (G51 $\underline{P}_P$··; or PRM 5411 or 5421).
143	SCALED MOTION DATA OVERFLOW (M series)	The scaling results, move distance, coordinate value and circular radius exceed the maximum command value. Correct the program or scaling magnification.
144	ILLEGAL PLANE SELECTED (M series)	The coordinate rotation plane and arc or cutter compensation C plane must be the same. Modify the program.
145	ILLEGAL CONDITIONS IN POLAR COORDINATE INTERPOLATION	The conditions are incorrect when the polar coordinate interpolation starts or it is canceled. 1) In modes other than G40, G12.1/G13.1 was specified. 2) An error is found in the plane selection. PRM5460 and 5461 are incorrectly specified. Modify the value of program or parameter.

No.	Message	Contents
146	IMPROPER G CODE	G codes which cannot be specified in the polar coordinate interpolation mode was specified. Modify the program.
148	ILLEGAL SETTING DATA (M series)	Automatic corner override deceleration rate is out of the settable range of judgement angle. Modify the PRM1710 to 1714
149	FORMAT ERROR IN G10L3	A code other than Q1,Q2,P1 or P2 was specified as the life count type in the extended tool life management.
150	ILLEGAL TOOL GROUP NUMBER	Tool Group No. exceeds the maximum allowable value. Modify the program.
151	TOOL GROUP NUMBER NOT FOUND	The tool group commanded in the machining program is not set. Modify the value of program or parameter.
152	NO SPACE FOR TOOL ENTRY	The number of tools within one group exceeds the maximum value registerable. Modify the number of tools.
153	T–CODE NOT FOUND	In tool life data registration, a T code was not specified where one should be. Correct the program.
154	NOT USING TOOL IN LIFE GROUP (M series)	When the group is not commanded, H99 or D99 was commanded. Correct the program.
155	ILLEGAL T–CODE IN M06 (M series)	In the machining program, M06 and T code in the same block do not correspond to the group in use. Correct the program.
	ILLEGAL T–CODE IN M06 (T series)	Group No.ΔΔ which is specified with TΔΔ 88 of the machining program do not included in the tool group in use. Correct the program.
156	P/L COMMAND NOT FOUND	P and L commands are missing at the head of program in which the tool group is set. Correct the program.
157	TOO MANY TOOL GROUPS	The number of tool groups to be set exceeds the maximum allowable value. (See PRM6800#0, #1) Modify the program.
158	ILLEGAL TOOL LIFE DATA	The tool life to be set is too excessive. Modify the setting value.
159	TOOL DATA SETTING INCOMPLETE	During executing a life data setting program, power was turned off. Set again.
160	MISMATCH WAITING M–CODE (T series (at two–path))	Different M code is commanded in heads 1 and 2 as waiting M code. Modify the program.
	MISMATCH WAITING M–CODE (T series (at three–path))	1) Although the same P command is specified, the waiting M codes do not match. 2) Although the waiting M codes match, the P commands do not match. 3) Two–path wait and three–path wait are specified simultaneously. Modify the program.
	G72.1 NESTING ERROR (M series)	A subprogram which performs rotational copy with G72.1 contains another G72.1 command. Modify the program.

No.	Message	Contents
161	ILLEGAL P OF WAITING M–CODE (T series (at three–path)	1) The value of address P is a negative value, 1, 2, 4, or a value not smaller than 8. 2) The value specified in P is not consistent with the system configuration. Modify the program.
	G72.1 NESTING ERROR (M series)	A subprogram which performs parallel copy with G72.2 contains another G72.2 command. Modify the program.
163	COMMAND G68/G69 INDEPENDENTLY (T series (at two–path))	G68 and G69 are not independently commanded in balance cut. Modify the program.
169	ILLEGAL TOOL GEOMETRY DATA (at two–path)	Incorrect tool figure data in interference check. Set correct data, or select correct tool figure data.
175	ILLEGAL G107 COMMAND	Conditions when performing circular interpolation start or cancel not correct. To change the mode to the cylindrical interpolation mode, specify the command in a format of “G07.1 rotation–axis name radius of cylinder.”
176	IMPROPER G–CODE IN G107 (M series)	Any of the following G codes which cannot be specified in the cylindrical interpolation mode was specified. 1) G codes for positioning: G28, G73, G74, G76, G81 – G89, including the codes specifying the rapid traverse cycle 2) G codes for setting a coordinate system: G52,G92, 3) G code for selecting coordinate system: G53 G54–G59 Modify the program.
	IMPROPER G–CODE IN G107 (T series)	Any of the following G codes which cannot be specified in the cylindrical interpolation mode was specified. 1) G codes for positioning: G28, G76, G81 – G89, including the codes specifying the rapid traverse cycle 2) G codes for setting a coordinate system: G50, G52 3) G code for selecting coordinate system: G53 G54–G59 Modify the program.
177	CHECK SUM ERROR (G05 MODE)	Check sum error Modify the program.
178	G05 COMMANDED IN G41/G42 MODE	G05 was commanded in the G41/G42 mode. Correct the program.
179	PARAM. (NO. 7510) SETTING ERROR	The number of controlled axes set by the PRM7510 exceeds the maximum number. Modify the parameter setting value.
180	COMMUNICATION ERROR (REMOTE BUF)	Remote buffer connection alarm has generated. Confirm the number of cables, parameters and I/O device.

No.	Message	Contents
181	FORMAT ERROR IN G81 BLOCK (Hobbing machine, EGB) (M series)	G81 block format error 1) T (number of teeth) has not been instructed. 2) Data outside the command range was instructed by either T, L, Q or P. 3) An overflow occurred in synchronization coefficient calculation. Modify the program.
182	G81 NOT COMMANDED (Hobbing machine) (M series)	G83 (C axis servo lag quantity offset) was instructed though synchronization by G81 has not been instructed. Correct the program.
183	DUPLICATE G83 (COMMANDS) (Hobbing machine) (M series)	G83 was instructed before canceled by G82 after compensating for the C axis servo lag quantity by G83. Modify the program.
184	ILLEGAL COMMAND IN G81 (Hobbing machine, EGB) (M series)	A command not to be instructed during synchronization by G81 was instructed. 1) A C axis command by G00, G27, G28, G29, G30, etc. was instructed. 2) Inch/Metric switching by G20, G21 was instructed. Modify the program.
185	RETURN TO REFERENCE POINT (Hobbing machine) (M series)	G81 was instructed without performing reference position return after power on or emergency stop. Perform reference position return. Modify the program.
186	PARAMETER SETTING ERROR (Hobbing machine, EGB) (M series)	Parameter error regarding G81 1) The C axis has not been set to be a rotary axis. 2) A hob axis and position coder gear ratio setting error Modify the parameter.
187	HOB COMMAND IS NOT ALLOWED (T series)	Error in the modal state when G81.4 or G81 is specified 1. The canned cycle mode (G81 to G89) is set. 2. The thread cutting mode is set. 3. The C–axis is under synchronous, composite, or superimposed control.
190	ILLEGAL AXIS SELECT	In the constant surface speed control (G96), the axis specification is wrong. (See PRM3770.) The specified axis command (P) contains an illegal value. Correct the program.
194	SPINDLE COMMAND IN SYNCHRO–MODE	A contour control mode, spindle positioning (Cs–axis control) mode, or rigid tapping mode was specified during the serial spindle synchronous control mode. Correct the program so that the serial spindle synchronous control mode is released in advance.
197	C–AXIS COMMANDED IN SPINDLE MODE	The program specified a movement along the Cs–axis when the signal CON <G27#7> was off. Correct the program, or consult the PMC ladder diagram to find the reason the signal is not turned on.
199	MACRO WORD UNDEFINED	Undefined macro word was used. Modify the custom macro.

No.	Message	Contents
200	ILLEGAL S CODE COMMAND	In the rigid tap, an S value is out of the range or is not specified. Modify the program.
201	FEEDRATE NOT FOUND IN RIGID TAP	In the rigid tap, no F value is specified. Correct the program.
202	POSITION LSI OVERFLOW	In the rigid tap, spindle distribution value is too large.
203	PROGRAM MISS AT RIGID TAPPING	In the rigid tap, position for a rigid M code (M29) or an S command is incorrect. Modify the program.
204	ILLEGAL AXIS OPERATION	In the rigid tap, an axis movement is specified between the rigid M code (M29) block and G84 or G74 for M series (G84 or G88 for T series) block. Modify the program.
205	RIGID MODE DI SIGNAL OFF	1. Although a rigid M code (M29) is specified in rigid tapping, the rigid mode DI signal <G61#0> is not ON during execution of the G84 (G88) block. 2. In a system with the multi–spindle option, the spindle used for rigid tapping is not selected (by DI signal <G27#0, #1>, or <G61#4, #5>). Check the PMC ladder diagram to find the reason why the DI signal is not turned on.
206	CAN NOT CHANGE PLANE (M series)	Plane changeover was instructed in the rigid mode. Correct the program.
207	RIGID DATA MISMATCH	The specified distance was too short or too long in rigid tapping.
210	CAN NOT COMAND M198/M199	1. The execution of an M198 or M99 command was attempted during scheduled operation. Alternatively, the execution of an M198 command was attempted during DNC operation. Correct the program. 2. The execution of an M99 command was attempted by an interrupt macro during pocket machining in a multiple repetitive canned cycle. (T series)
211	G31 (HIGH) NOT ALLOWED IN G99 (T series)	G31 is commanded in the per revolution command when the high–speed skip option is provided. Modify the program.
212	ILLEGAL PLANE SELECT (M series)	The arbitrary angle chamfering or a corner R is commanded or the plane including an additional axis. Correct the program.
	ILLEGAL PLANE SELECT (T series)	The direct drawing dimensions programming is commanded for the plane other than the Z–X plane. Correct the program.

No.	Message	Contents
213	ILLEGAL COMMAND IN SYNCHRO–MODE (M series)	Movement is commanded for the axis to be synchronously controlled. Any of the following alarms occurred in the operation with the simple synchronization control. 1) The program issued the move command to the slave axis. 2) The program issued the manual continuous feed/manual handle feed/incremental feed command to the slave axis. 3) The program issued the automatic reference position return command without specifying the manual reference position return after the power was turned on. 4) The difference between the position error amount of the master and slave axes exceeded the value specified in PRM8313.
	ILLEGAL COMMAND IN SYNCHRO–MODE (T series)	A move command has been specified for an axis subject to synchronous control.
214	ILLEGAL COMMAND IN SYNCHRO–MODE	Coordinate system is set or tool compensation of the shift type is executed in the synchronous control. Correct the program.
217	DUPLICATE G51.2 (COMMANDS) (T series)	G51.2/G251 is further commanded in the G51.2/G251 mode. Modify the program.
218	NOT FOUND P/Q COMMAND IN G251 (T series)	P or Q is not commanded in the G51.2/G251 block, or the command value is out of the range. Modify the program.
219	COMMAND G250/G251 INDEPENDENTLY (T series)	G51.2/G251 or G50.2/G250 is not independent blocks. Modify the program.
220	ILLEGAL COMMAND IN SYNCHR–MODE (T series)	In the synchronous operation, movement is commanded by the NC program or PMC axis control interface for the synchronous axis. Modify the program or check the PMC ladder.
221	ILLEGAL COMMAND IN SYNCHR–MODE (T series)	Polygon machining synchronous operation and Cs axis control or balance cutting are executed at a time. Modify the program.
222	DNC OP. NOT ALLOWED IN BG.–EDIT (M series)	Input and output are executed at a time in the background edition. Execute a correct operation.
224	RETURN TO REFERENCE POINT	Reference position return has not been performed before the automatic operation starts. Perform reference position return only when PRM 1005#0 is 0. If this alarm is issued on a Cs contour control axis or spindle positioning axis, set PRM1005#0.

No.	Message	Contents
225	SYNCHRONOUS/MIXED CONTROL ERROR (T series (At two–path))	This alarm is generated in the following circumstances. (Searched for during synchronous and mixed control command.) 1 When there is a mistake in axis number parameter (PRM1023) setting. 2 When there is a mistake in control commanded. 3 During hobbing synchronization, a command to bring the C–axis under synchronous, composite, or superimposed control is made. Modify the program or the parameter.
226	ILLEGAL COMMAND IN SYNCHRO–MODE (T series (At two–path))	A travel command has been sent to the axis being synchronized in synchronous mode. Modify the program.
229	CAN NOT KEEP SYNCHRO–STATE (T series)	This alarm is generated in the following circumstances. 1 When the synchro/mixed state could not be kept due to system overload. 2 The above condition occurred in CMC devices (hardware) and synchro–state could not be kept. (This alarm is not generated in normal use conditions.)
230	R CODE NOT FOUND (M series (Grinding machine))	The in–feed quantity R has not been instructed for the G161 block. Or the R command value is negative. Correct the program.
231	ILLEGAL FORMAT IN G10 OR L50	Any of the following errors occurred in the specified format at the programmable–parameter input. 1 Address N or R was not entered. 2 A number not specified for a parameter was entered. 3 The axis number was too large. 4 An axis number was not specified in the axis–type parameter. 5 An axis number was specified in the parameter which is not an axis type. Correct the program. 6 In the locked state set by the password function, an attempt was made to set PRM3204#4 (NE9) to 0 or change the contents of PRM3210. 7 An attempt was made to change a program encryption parameter (PRM3220– 3223).
232	TOO MANY HELICAL AXIS COMMANDS	Three or more axes (in the normal direction control mode (M series) two or more axes) were specified as helical axes in the helical interpolation mode.
233	DEVICE BUSY	When an attempt was made to use a unit such as that connected via the RS–232–C interface, other users were using it.
239	BP/S ALARM	While punching was being performed with the function for controlling external I/O units ,background editing was performed.
240	BP/S ALARM	Background editing was performed during MDI operation.

No.	Message	Contents
241	ILLEGAL FORMAT IN G02.2/G03.2 (M series)	The end point, I, J, K, or R is missing from a command for involute interpolation.
242	ILLEGAL COMMAND IN G02.2/G03.2 (M series)	An invalid value has been specified for involute interpolation. • The start or end point is within the basic circle. • I, J, K, or R is set to 0. • The number of rotations between the start of the involute curve and the start or end point exceeds 100.
243	OVER TOLERANCE OF END POINT (M series)	The end point is not on the involute curve which includes the start point and thus falls outside the range specified with PRM5610.
244	P/S ALARM (T series)	In the skip function activated by the torque limit signal, the number of accumulated erroneous pulses exceed 32767 before the signal was input. Therefore, the pulses cannot be corrected with one distribution. Change the conditions, such as feed rates along axes and torque limit, and try again.
245	T–CODE NOT ALOWEE IN THIS BLOCK (T series)	One of the G codes, G50, G10, and G04, which cannot be specified in the same block as a T code, was specified with a T code.
246	ENCODE PROGRAM NUMBER ERROR	During read of an encrypted program, an attempt was made to store the program with a number exceeding the protection range. (See PRM3222 and 3223.)
247	ILLEGAL CODE USED FOR OUTPUT	When an encrypted program is output, EIA is set for the punch code. Specify ISO.
250	Z AXIS WRONG COMMAND (ATC) (M series)	Movement along the Z–axis is specified in a block specifying a tool change command (M06T_). (Only for ROBODRILL)
251	ATC ERROR (M series)	This alarm is issued in the following cases: • An M06T_ command contains an unusable T code. • An M06 command has been specified when the Z machine coordi nate is positive. • The parameter for the current tool number (PRM7810) is set to 0. • An M06 command has been specified in canned cycle mode. • A reference position return command (G27 to G44) and M06 command have been specified in the same block. • An M06 command has been specified in tool compensation mode (G41 to G44). • An M06 command has been specified without performing reference position return after power–on or the release of emergency stop. • The machine lock signal or Z–axis ignore signal has been turned on during tool exchange. • A pry alarm has been detected during tool exchange. Refer to DGN530 to determine the cause. (Only for ROBODRILL)

No.	Message	Contents
252	ATC SPINDLE ALARM (M series)	An excessive error arose during spindle positioning for ATC. For details, refer to DGN531. (Only for ROBODRILL)
253	G05 IS NOT AVAILABLE (M series)	Alarm details Binary input operation using high–speed remote buffer (G05) or high–speed cycle machining (G05) has been specified in advance control mode (G08P1). Execute G08P0; to cancel advanced preview control mode, before executing these G05 commands.
5000	ILLEGAL COMMAND CODE (M series)	The specified code was incorrect in the high–precision contour control (HPCC) mode.
5003	ILLEGAL PARAMETER (HPCC) (M series)	There is an invalid parameter. (HPCC)
5004	HPCC NOT READY (M series)	High–precision contour control is not ready. (HPCC mode only)
5006	TOO MANY WORD IN ONE BLOCK (M series)	The number of words specified in a block exceeded 26 in the HPCC mode. (HPCC mode only)
5007	TOO LARGE DISTANCE (M series)	In the HPCC mode, the machine moved beyond the limit. (HPCC mode only)
5009	PARAMETER ZERO (DRY RUN) (M series)	The maximum feedrate (PRM1422) or the feedrate in dry run (PRM1410) is 0 in the HPCC mode.
5010	END OF RECORD	The end of record (%) was specified. I/O is incorrect. modify the program.
5011	PARAMETER ZERO(CUT MAX) (M series)	The maximum cutting feedrate (PRM1422, 1430–1432) is 0 in the HPCC mode.
5012	G05 P10000 ILLEGAL START UP (HPCC) (M series)	G05 P10000 has been specified in a mode from which the system cannot enter HPCC mode.
5013	HPCC: CRC OFS REMAIN AT CANCEL (M series)	G05P0 has been specified in G41/G42 mode or with offset remaining.
5014	TRACE DATA NOT FOUND	Transfer cannot be performed because no trace data exists.
5015	NO ROTATION AXIS (M series)	The specified rotation axis does not exist for tool axis direction handle feed.
5016	ILLEGAL COMBINATION OF M CODE	M codes which belonged to the same group were specified in a block. Alternatively,an M code which must be specified without other M codes in the block was specified in a block with other M codes.
5018	POLYGON SPINDLE SPEED ERROR (T series)	In G51.2 mode, the speed of the spindle or polygon synchronous axis either exceeds the clamp value or is too small. The specified rotation speed ratio thus cannot be maintained.
5020	PARAMETER OF RESTART ERROR	An erroneous parameter was specified for restarting a program.

No.	Message	Contents
5030	ILLEGAL COMMAND (G100) (T series)	The end command (G110) was specified before the registration start command (G101, G102, or G103) was specified for the B–axis.
5031	ILLEGAL COMMAND (G100, G102, G103) (T series)	While a registration start command (G101, G102, or G103) was being executed, another registration start command was specified for the B–axis.
5032	NEW PRG REGISTERED IN B–AXS MOVE (T series)	While the machine was moving about the B–axis, at attempt was made to register another move command.
5033	NO PROG SPACE IN MEMORY B–AXS (T series)	Commands for movement about the B–axis were not registered because of insufficient program memory.
5034	PLURAL COMMAND IN G110 (T series)	Multiple movements were specified with the G110 code for the B–axis.
5035	NO FEEDRATE COMMANDED B–AXS (T series)	A feedrate was not specified for cutting feed about the B–axis.
5036	ADDRESS R NOT DEFINED IN G81–G86 (T series)	Point R was not specified for the canned cycle for the B–axis.
5037	ADDRESS Q NOT DEFINED IN G83 (T series)	Depth of cut Q was not specified for the G83 code (peck drilling cycle). Alternatively, 0 was specified in Q for the B–axis.
5038	TOO MANY START M–CODE COMMAND (T series)	More than six M codes for starting movement about the B–axis were specified.
5039	START UNREGISTERED B–AXS PROG (T series)	An attempt was made to execute a program for the B–axis which had not been registered.
5040	CAN NOT COMMANDED B–AXS MOVE (T series)	The machine could not move about the B–axis because PRM8250 was incorrectly specified, or because the PMC axis system could not be used.
5041	CAN NOT COMMANDED G110 BLOCK (T series)	Blocks containing the G110 codes were successively specified in tool–tip radius compensation for the B–axis.
5043	TOO MANY G68 NESTING (M series)	Three–dimensional coordinate conversion G68 has been specified three or more times.
	TOO MANY G68.1 NESTING (T series)	Three–dimensional coordinate conversion G68.1 has been specified three or more times.

No.	Message	Contents
5044	G68 FORMAT ERROR (M series)	A G68 command block contains a format error. This alarm is issued in the following cases: 1. I, J, or K is missing from a G68 command block (missing coordinate rotation option). 2. I, J, and K are 0 in a G68 command block. 3. R is missing from a G68 command block.
	G68.1 FORMAT ERROR (T series)	A G68.1 command block contains a format error. This alarm is issued in the following cases: 1. I, J, or K is missing from a G68.1 command block (missing coordinate rotation option). 2. I, J, and K are 0 in a G68.1 command block. 3. R is missing from a G68.1 command block.
5046	ILLEGAL PARAMETER (ST.COMP)	The parameter settings for straightness compensation contain an error. Possible causes are as follows: 1. A parameter for a movement axis or compensation axis contains an axis number which is not used. 2. More than 128 pitch error compensation points exist between the negative and positive end points. 3. Compensation point numbers for straightness compensation are not assigned in the correct order. 4. No straightness compensation point exists between the pitch error compensation points at the negative and positive ends. 5. The compensation value for each compensation point is too large or too small. 6 The settings of PRM13881–13886 are illegal (in the interpolation type straightness compensation).
5050	ILL–COMMAND IN CHOPPING MODE (M series)	A command for switching the major axis has been specified for circular threading. Alternatively, a command for setting the length of the major axis to 0 has been specified for circular threading.
5051	M–NET CODE ERROR	Abnormal character received (other than code used for transmission)
5052	M–NET ETX ERROR	Abnormal ETX code
5053	M–NET CONNECT ERROR	Connection time monitoring error (PRM 175)
5054	M–NET RECEIVE ERROR	Polling time monitoring error (PRM176)
5055	M–NET PRT/FRT ERROR	Vertical parity or framing error
5057	M–NET BOARD SYSTEM DOWN	Transmission time–out error (PRM177) ROM parity error CPU interrupt other than the above

No.	Message	Contents
5058	G35/G36 FORMAT ERROR (T series)	A command for switching the major axis has been specified for circular threading. Alternatively, a command for setting the length of the major axis to 0 has been specified for circular threading.
5059	RADIUS IS OUT OF RANGE	A radius exceeding nine digits has been specified for circular interpolation with the center of the arc specified with I, J, and K.
5060	ILLEGAL PARAMETER IN G02.3/G03.3 (M series)	There is a parameter setting error. PRM5641 (setting of the linear axis) is not set. The axis set in PRM5641 is not a linear axis. PRM5642 (setting of a rotation axis) is not set. The axis set in PRM5642 is not a rotation axis. The linear and rotation axes cannot be controlled by the CNC. (The value set in PRM1010 is exceeded.)
5061	ILLEGAL FORMAT IN G02.3/G03.3 (M series)	The exponential interpolation command (G02.3/G03.3) has a format error. Address I, J, or K is not specified. The value of address I, J, or K is 0.
5062	ILLEGAL COMMAND IN G02.3/G03.3 (M series)	The value specified in an exponential interpolation command (G02.3/03.3) is illegal. A value that does not allow exponential interpolation is specified. (For example, a negative value is specified in In.)
5063	IS NOT PRESET AFTER REF. (M series)	The position counter was not preset before the start of workpiece thickness measurement. This alarm is issued in the following cases: (1) An attempt has been made to start measurement without first establishing the origin. (2) An attempt has been made to start measurement without first presetting the position counter after manual return to the origin.
5064	DIFFERRENT AXIS UNIT (IS–B, IS–C) (M series)	Circular interpolation has been specified on a plane consisting of axes having different increment systems.
5065	DIFFERENT AXIS UNIT (PMC AXIS) (M series)	Axes having different increment systems have been specified in the same DI/DO group for PMC axis control. Modify the setting of PRM8010.
5067	G05 PO COMMANDED IN G68/G51 MODE (HPCC) (M series)	HPCC mode cannot be canceled during G51 (scaling) or G68 (coordinate system rotation). Correct the program.

No.	Message	Contents
5068	G31 FORMAT ERROR (M series)	The continuous high–speed skip command (G31 P90) has one of the following errors: 1. The axis along which the tool is moved is not specified. 2. More than one axis is specified as the axis along which the tool is moved. Alternatively, the EGB skip command (G31.8) or continuous high–speed skip command (G31.9) has one of the following errors: 1. A move command is specified for the EGB axis (workpiece axis). 2. More than one axis is specified. 3. P is not specified. 4. The specified Q value exceeds the allowable range. Correct the program.
5069	WHL–C:ILLEGA P–DATA (M series)	The P data in selection of the grinding–wheel wear compensation center is illegal.
5073	NO DECIMAL POINT	No decimal point has been specified for an address requiring a decimal point.
5074	ADDRESS DUPLICATION ERROR	The same address has been specified two or more times in a single block. Alternatively, two or more G codes in the same group have been specified in a single block.
5082	DATA SERVER ERROR	This alarm is detailed on the data server message screen.
5085	SMOOTH IPL ERROR 1	A block for specifying smooth interpolation contains a syntax error.
5096	MISMATCH WAITING M–CODE (M series)	Different wait codes (M codes) were specified in HEAD1 and HEAD2. Correct the program.
5110	NOT STOP POSITION (G05.1 G1) (M series)	An illegal G code was specified in AI contour control mode. A command was specified for the index table indexing axis in AI control mode.
	NOT STOP POSITION (G05.1 G1) (21*i*–M)	An illegal G code was specified in AI advanced previee control mode. A command was specified for the index table indexing axis in AI advanced previee control mode.
5111	IMPROPER MODEL G–CODE (G05.1 G1) (M series)	An illegal G code is left modal when AI contour control mode was specified.
	IMPROPER MODEL G–CODE (G05.1 G1) (21*i*–M)	An illegal G code is left modal when AI advanced previee control mode was specified.
5112	G08 CAN NOT BE COMMANDED (G05.1 G1) (M series)	Advanced previee control (G08) was specified in AI contour control mode.
	G08 CAN NOT BE COMMANDED (G05.1 G1) (21*i*–M)	Advanced previee control (G08) was specified in AI advanced previee control mode.

No.	Message	Contents
5114	NOT STOP POSITION (G05.1 Q1) (M series)	At the time of restart after manual intervention, the coordinates at which the manual intervention occurred have not been restored.
	CAN NOT ERROR IN MDI MODE (G05.1) (21*i*–M)	AI contour control (G05.1) was specified in MDI mode.
5115	SPL : ERROR (M series)	There is an error in the specification of the rank.
		No knot is specified.
		The knot specification has an error.
		The number of axes exceeds the limits.
		Other program errors
5116	SPL : ERROR (M series)	There is a program error in a block under advanced previee control.
		Monotone increasing of knots is not observed.
		In NURBS interpolation mode, a mode that cannot be used together is specified.
5117	SPL : ERROR (M series)	The first control point of NURBS is incorrect.
5118	SPL : ERROR (M series)	After manual intervention with manual absolute mode set to on, NURBS interpolation was restarted.
5122	ILLEGAL COMMAND IN SPIRAL (M series)	A spiral interpolation or conical interpolation command has an error. Specifically, this error is caused by one of the following: 1) L = 0 is specified. 2) Q = 0 is specified. 3) R/, R/, C is specified. 4) Zero is specified as height increment. 5) Three or more axes are specified as the height axes. 6) A height increment is specified when there are two height axes. 7) Conical interpolation is specified when the helical interpolation function is not selected. 8) Q < 0 is specified when radius difference > 0. 9) Q > 0 is specified when radius difference < 0. 10) A height increment is specified when no height axis is specified.
5123	OVER TOLERANCE OF END POINT (M series)	The difference between a specified end point and the calculated end point exceeds the allowable range (PRM3471).
5124	CAN NOT COMMAND SPIRAL (M series)	1. A spiral interpolation or conical interpolation was specified in any of the following modes: 1) Scaling 2) Programmable mirror image 3) Polar coordinate interpolation 2. In cutter compensation C mode, the center is set as the start point or end point.

No.	Message	Contents
5134	FSSB : OPEN READY TIME OUT	Initialization did not place FSSB in the open ready state.
5135	FSSB : ERROR MODE	FSSB has entered error mode.
5136	FSSB : NUMBER OF AMPS IS SMALL	In comparison with the number of controlled axes, the number of amplifiers recognized by FSSB is not enough.
5137	FSSB : CONFIGURATION ERROR	FSSB detected a configuration error.
5138	FSSB : AXIS SETTING NOT COMPLETE	In automatic setting mode, axis setting has not been made yet. Perform axis setting on the FSSB setting screen.
5139	FSSB : ERROR	Servo initialization did not terminate normally. The optical cable may be defective, or there may be an error in connection to the amplifier or another module. Check the optical cable and the connection status.
5155	NOT RESTART PROGRAM BY G05	During servo leaning control by G05, an attempt was made to perform restart operation after feed hold or interlock. This restart operation cannot be performed. (G05 leaning control terminates at the same time.)
5156	ILLEGAL AXIS OPERATION (AICC) (M series)	In AI contour control mode, the controlled axis selection signal (PMC axis control) changes. In AI contour control mode, the simple synchronous axis selection signal changes.
	ILLEGAL AXIS OPERATION (AICC) (21*i*–M)	In AI advanced preview control mode, the controlled axis selection signal (PMC axis control) changes. In AI advanced preview control mode, the simple synchronous axis selection signal changes.
5157	PARAMETER ZERO (AICC) (M series)	Zero is set in the parameter for the maximum cutting feedrate (PRM1422, 1432). Zero is set in the parameter for the acceleration/deceleration before interpolation (PRM1770, 1771). Set the parameter correctly.
5195	DIRECTION CAN NOT BE JUDGED (T series)	When the touch sensor with a single contact signal input is used in the direct input B function for tool offset measurement values, the stored pulse direction is not constant. One of the following conditions exists: · The stop state exists in offset write mode. · Servo off state · The direction varies. · Movement takes place simultaneously along two axes.
5196	ILLEGAL OPERATION (HPCC) (M series)	Detach operation was performed in HPCC mode. (If detach operation is performed in HPCC mode, this alarm is issued after the currently executed block terminates.)
5197	FSSB : OPEN TIME OUT	The CNC permitted FSSB to open, but FSSB was not opened.

No.	Message	Contents
5198	FSSB : ID DATA NOT READ	Temporary assignment failed, so amplifier initial ID information could not be read.
5199	FINE TORQUE SENSING PARAMETER	A parameter related to the fine torque sensing function is illegal. · The storage interval is invalid. · An invalid axis number is set as the target axis. Correct the parameter.
5212	SCREEN COPY : PARAMETER ERROR	There is a parameter setting error. Check that 4 is set as the I/O channel (PRM20).
5213	SCREEN COPY : COMMUNICATION ERROR	The memory card cannot be used. Check the memory card. (Check whether the memory card is write–protected or defective.)
5214	SCREEN COPY : DATA TRANSFER ERROR	Data transfer to the memory card failed. Check whether the memory card space is insufficient and whether the memory card was removed during data transfer.
5218	ILLEGAL PARAMETER (INCL. COMP)	There is an inclination compensation parameter setting error. 1. The number of pitch error compensation points between the negative (–) end and positive (+) end exceeds 128. 2. The relationship in magnitude among the inclination compensation point numbers is incorrect. 3. An inclination compensation point is not located between the negative (–) end and positive (+) end of the pitch error compensation points. 4. The amount of compensation per compensation point is too large or too small. Correct the parameter.
5219	CAN NOT RETURN	Manual intervention or return is not allowed during three–dimensional coordinate conversion.
5220	REFERENCE POINT ADJUSTMENT MODE	A parameter for automatically set a reference position is set. (PRM1819#2=1) Perform automatic setting. (Position the machine at the reference position manually, then perform manual reference position return.) Supplementary: Automatic setting sets PRM1819#2 to 0.
5222	SRAM CORRECTABLE ERROR	The SRAM correctable error cannot be corrected. A memory problem occurred during memory initialization. Replace the SRAM (SRAM/FROM module) or motherboard.
5227	FILE NOT FOUND	A specified file is not found during communication with the built–in Handy File.
5228	SAME NAME USED	There are duplicate file names in the built–in Handy File.
5229	WRITE PROTECTED	A floppy disk in the built–in Handy File is write protected.

No.	Message	Contents
5231	TOO MANY FILES	The number of files exceeds the limit during communication with the built–in Handy File.
5232	DATA OVER–FLOW	There is not enough floppy disk space in the built–in Handy File.
5235	COMMUNICATION ERROR	A communication error occurred during communication with the built–in Handy File.
5237	READ ERROR	A floppy disk in the built–in Handy File cannot be read from. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5238	WRITE ERROR	A floppy disk in the built–in Handy File cannot be written to. The floppy disk may be defective, or the head may be dirty. Alternatively, the Handy File is defective.
5242	ILLEGAL AXIS NUMBER (M series)	The axis number of the synchronous master axis or slave axis is incorrect. (This alarm is issued when flexible synchronization is turned on.) Alternatively, the axis number of the slave axis is smaller than that of the master axis.
5243	DATA OUT OF RANGE (M series)	The gear ratio is not set correctly. (This alarm is issued when flexible synchronization is turned on.)
5244	TOO MANY DI ON (M series)	Even when an M code was encountered in automatic operation mode, the flexible synchronization mode signal was not driven on or off. Check the ladder and M codes.
5245	OTHER AXIS ARE COMMANDED (M series)	One of the following command conditions was present during flexible synchronization or when flexible synchronization was turned on: 1. The synchronous master axis or slave axis is the EGB axis. 2. The synchronous master axis or slave axis is the chopping axis. 3. In reference position return mode
5251	ILLEGAL PARAMETER IN G54.2 (M series)	A fixture offset parameter (PRM7580–7588) is illegal. Correct the parameter.
5252	ILLEGAL P COMMAND IN G54.2 (M series)	The P value specifying the offset number of a fixture offset is too large. Correct the program.
5257	G41/G42 NOT ALLOWED IN MDI MODE (M series)	G41/G42 (cutter compensation C: M series) was specified in MDI mode. (Depending on the setting of PRM5008#4)
	G41/G42 NOT ALLOWED IN MDI MODE (T series)	G41/G42 (tool–nose radius compensation: T series) was specified in MDI mode. (Depending on the setting of PRM5008 #4)
5300	SET ALL OFFSET DATAS AGAIN	After the inch/metric automatic conversion function (PRM5006#0 (OIM)) for tool offset data is enabled or disabled, all the tool offset data must be reset. This message reminds the operator to reset the data. If this alarm is issued, reset all the tool offset data. Operating the machine without resetting the data will result in a malfunction.

No.	Message	Contents
5302	ILLEGAL COMMAND IN G68 MODE	A command to set the coordinate system is specified in the coordinate system rotation mode.
5303	TOUCH PANEL ERROR	A touch panel error occurred. 1. The touch panel is kept pressed. 2. The touch panel was pressed when power was turned on. Remove the above causes, and turn on the power again.
5306	MODE CHANGE ERROR	In a one–touch macro call, mode switching at the time of activation is not performed correctly.
5307	INTERNAL DATA OVER FLOW (M series)	In the following function, internal data exceeds the allowable range. 1) Improvement of the rotation axis feedrate
5311	FSSB:ILLEGAL CONNECTION	A connection related to FSSB is illegal. This alarm is issued when either of the following is found: 1. Two axes having adjacent servo axis numbers (PRM1023), odd number and even number, are assigned to amplifiers to which different FSSB systems are connected. 2. The system does not satisfy the requirements for performing HRV control, and use of two pulse modules connected to different FSSB systems having different FSSB current control cycles is specified.
5321	S–COMP. VALUE OVERFLOW	The straightness compensation value has exceeded the maximum value of 32767.After this alarm is issued, make a manual reference position return.
5400	SPL:ILLEGAL AXIS COMMAND (M series)	An axis specified for spline interpolation or smooth interpolation is incorrect. If an axis that is not the spline axis is specified in spline interpolation mode, this alarm is issued. The spline axis is the axis specified in a block containing G06.1 or the next block. For smooth interpolation, the axis specified in G5.1Q2 is incorrect.
5401	SPL:ILLEGAL COMMAND (M series)	In a G code mode in which specification of G06.1 is not permitted, G06.1 is specified.
5402	SPL:ILLEGAL AXIS MOVING (M series)	A movement is made along an axis that is not the spline interpolation axis. For example, in three–dimensional tool compensation mode using an offset vector of which components are the X–, Y–, and Z–axes, when two–axis spline interpolation is performed with the two spline axes set to the X– and Y–axes, a movement along the Z–axis occurs, resulting in this alarm.

No.	Message	Contents
5403	SPL:CAN NOT MAKE VECTOR (M series)	Three–dimensional tool compensation vectors cannot be generated. · When a three–dimensional tool compensation vector is created for the second or subsequent point, that point, previous point, and next point are on the same straight line, and that straight line and the three–dimensional tool compensation vector for the previous point are in parallel. · When a three–dimensional tool compensation vector is created at the end point of smooth interpolation or spline interpolation, the end point and the point two points before are the same.
5405	ILLEGAL PARAMETER IN G41.2/G42.2 (M series)	The parameter setting that determines the relationship between the rotation axis and rotation plane is incorrect.
5406	G41.3/G40 FORMAT ERROR (M series)	1) A G41.3 or G40 block contains a move command. 2) A G1.3 block contains a G code or M code for which buffering is suppressed.
5407	ILLEGAL COMMAND IN G41.3 (M series)	1) A G code that belongs to group 01 except G00 and G01 is specified in G41.3 mode. 2) An offset command (a G code belonging to group 07) is specified in G41.3 mode. 3) The block next to G41.3 (startup) contains no movement.
5408	G41.3 ILLEGAL START_UP (M series)	1) In a mode of group 01 except G00 and G01, G41.3 (startup) is specified. 2) At startup, the included angle of the tool direction vector and move direction vector is 0 or 180 degrees.
5409	ILLEGAL PARAMETER IN G41.3 (M series)	The parameter setting (PRM19610–19619) that determines the relationship between the rotation axis and rotation plane is incorrect.
5411	NURBS:ILLEGAL ORDER (M series)	The number of steps is specified incorrectly.
5412	NURBS:NO KNOT COMMAND (M series)	No knot is specified. Alternatively, in NURBS interpolation mode, a block not relating to NURBS interpolation is specified.
5413	NURBS:ILLEGAL AXIS COMMAND (M series)	An axis not specified with controlled points is specified in the first block.
5414	NURBS:ILLEGAL KNOT (M series)	The number of blocks containing knots only is insufficient.
5415	NURBS:ILLEGAL CANCEL (M series)	Although NURBS interpolation is not completed yet, the NURBS interpolation mode is turned off.
5416	NURBS:ILLEGAL MODE (M series)	A mode that cannot be used with NURBS interpolation mode is specified in NURBS interpolation mode.
5417	NURBS:ILLEGAL MULTI–KNOT (M series)	As many knots as the number of steps are not specified at the start and end points.

No.	Message	Contents
5418	NURBS:ILLEGAL KNOT VALUE (M series)	Knots do not increase in monotone.
5420	ILLEGAL PARAMETER IN G43.4/G43.5 (M series)	A parameter related to pivot tool length compensation is incorrect.
5421	ILLEGAL COMMAND IN G43.4/G43.5 (M series)	In pivot tool length compensation (type 2) mode, a rotation axis is specified.
5422	EXCESS VELOCITY IN G43.4/G43.5 (M series)	As a result of pivot tool length compensation, an attempt was made to move the tool along an axis at a feedrate exceeding the maximum cutting feedrate.
5425	ILLEGAL OFFSET VALUE (M series)	The offset number is incorrect.
5430	ILLEGAL COMMAND IN 3–D CIR (M series)	In a modal state in which three–dimensional circular interpolation cannot be specified, a three–dimensional circular interpolation (G02.4/G03.4) is specified. Alternatively, in three–dimensional circular interpolation mode, a code that cannot be specified is specified.
5432	G02.4/G03.4 FORMAT ERROR (M series)	A three–dimensional circular interpolation command (G02.4/G03.4) is incorrect.
5433	MANUAL INTERVENTION IN 3–D CIR (M series)	In three–dimensional circular interpolation mode (G02.4/G03.4), manual intervention was made when the manual absolute switch was on.
5435	PARAMETER OUT OF RANGE (TLAC) (M series)	The parameter for tool axis direction tool length compensation is not set correctly. (set value range) (PRM1022, 19655–19657)
5436	PARAMETER SETTING ERROR 1 (TLAC) (M series)	The parameter for tool axis direction tool length compensation is not set correctly. (setting of the rotation axis) (PRM1022)
5437	PARAMETER SETTING ERROR 2 (TLAC) (M series)	The parameter for tool axis direction tool length compensation is not set correctly. (setting of the tool axis) (PRM19657)
5440	ILLEGAL DRILLING AXIS SELECTED (M series)	The drilling axis specified for the drilling canned cycle is incorrect. The G code command block of the canned cycle does not specify the Z point of the drilling axis. When there is a parallel axis with the drilling axis, the parallel axis is also specified at the same time.
5445	CRC:MOTION IN G39 (M series)	Corner circular interpolation (G39) of cutter compensation is not specified alone but is specified with a move command.
5446	CRC:NO AVOIDANCE (M series)	Because there is no interference evade vector, the interference check evade function of cutter compensation cannot evade interference.
5447	CRC:DANGEROUS AVOIDANCE (M series)	The interference check evade function of cutter compensation determines that an evade operation will lead to danger.

No.	Message	Contents
5448	CRC:INTERFERENCE TO AVD. (M series)	In the interference check evade function of cutter compensation, a further interference occurs for an already created interference evade vector.
5452	IMPROPER G–CODE (5AXIS MODE) (M series)	A G code that cannot be specified is found. (5–axis mode) This alarm is issued when: 1) Three–dimensional cutter compensation (side–face offset and leading–edge offset) is applied during cutter compensation, or cutter compensation is applied during three–dimensional cutter compensation (side–face offset and leading–edge offset). 2) A leading–edge offset of three–dimensional cutter compensation is applied during side–face offsetting of three–dimensional cutter compensation, or a side–face offset of three–dimensional cutter compensation is applied during leading–edge offsetting of three–dimensional cutter compensation. 3) Tool axis direction tool length compensation is applied during tool length compensation, or tool length compensation is applied during tool axis direction tool length compensation. 4) Tool center point control is provided during tool length compensation, or tool length compensation is applied during tool center point control. 5) Tool center point control is provided during tool axis direction tool length compensation, or tool axis direction tool length compensation is applied during tool center point control. If this alarm is issued, cancel the relevant mode, then specify a different mode.
5453	NOTE: G68 IS CANCELED (HPCC) (M series)	When PRM5400#2 is set to 1, and a reset does not cancel G68, this alarm is issued at the time of program restart. To release this alarm, press <RESET> and <CAN>. Once this operation is performed, the alarm will not be issued at the next restart.
5455	ILLEGAL ACC. PARAMETER (M series)	A permissible acceleration parameter for optimum torque acceleration/deceleration is incorrect. The cause is one of the following: 1) The ratio of the deceleration rate to the acceleration rate is below the limit. 2) The time required for deceleration to a speed of 0 exceeds the maximum value.

NOTE HPCC designates High–Precision Contour Control. AICC designates AI Contour Control.

8.1.2 Background edit alarms (BP/S alarm)

No.	Message	Contents
???	BP/S alarm	BP/S alarm occurs in the same number as the P/S alarm that occurs in ordinary program edit. (ALM70– 74, 85–87, etc.)
140	BP/S alarm	It was attempted to select or delete in the background a program being selected in the foreground. Use background editing correctly.

NOTE Alarm in background edit is displayed in the key input line of the background edit screen instead of the ordinary alarm screen and is resettable by any of the MDI key operation.

8.1.3 Absolute pulse coder (APC) alarms

No.	Message	Contents
300	APC Alarm : nth–axis origin return	Manual reference position return is required for the nth–axis (n=1 to 8).
301	APC alarm: nth–axis communication	nth–axis (n=1 to 8) APC communication error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
302	APC alarm: nth–axis over time	nth–axis (n=1 to 8) APC overtime error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
303	APC alarm: nth–axis framing	nth–axis (n=1 to 8) APC framing error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
304	APC alarm: nth–axis parity	nth–axis (n=1 to 8) APC parity error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo interface module.
305	APC alarm: nth–axis pulse error	nth–axis (n=1 to 8) APC pulse error alarm. APC alarm. APC or cable may be faulty.
306	APC alarm: nth–axis battery voltage 0	nth–axis (n=1 to 8) APC battery voltage has decreased to a low level so that the data cannot be held. APC alarm. Battery or cable may be faulty.
307	APC alarm: nth–axis battery low 1	nth–axis (n=1 to 8) axis APC battery voltage reaches a level where the battery must be renewed. APC alarm. Replace the battery.
308	APC alarm: nth–axis battery low 2	nth–axis (n=1 to 8) APC battery voltage has reached a level where the battery must be renewed (including when power is OFF). APC alarm .Replace battery.
309	APC ALARM: n AXIS ZRN IMPOSSIBL	Return to the origin has been attempted without first rotating the motor one or more times. Before returning to the origin, rotate the motor one or more times then turn off the power.

8.1.4 Inductsyn alarms

No.	Message	Contents
330	INDUCTOSYN:DATA ALARM	The absolute–position data (offset data) from Inductosyn cannot be detected.
331	INDUCTOSYN:ILLEGAL PRM	PRM1874, 1875, or 1876 is set to 0.

8.1.5 Serial pulse coder (APC) alarms

When either of the following alarms is issued, a possible cause is a faulty serial pulse coder or cable.

No.	Message	Contents
360	n AXIS : ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS : ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS : ABNORMAL REV.DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS : ABNORMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS : SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built–in pulse coder.
365	n AXIS : BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS : PULSE MISS (INT)	A pulse error occurred in the built–in pulse coder.
367	n AXIS : COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS : SERIAL DATA ERROR (INT)	Communication data from the built–in pulse coder cannot be received.
369	n AXIS : DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built–in pulse coder.
380	n AXIS : BROKEN LED (EXT)	The LED of separate detector is erroneous.
381	n AXIS : ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate detector.
382	n AXIS : COUNT MISS (EXT)	A pulse error occurred in the separate detector.
383	n AXIS : PULSE MISS (EXT)	A count error occurred in the separate detector.
384	n AXIS : SOFT PHASE ALARM (EXT)	The digital servo software detected invalid data in the separate detector.
385	n AXIS : SERIAL DATA ERROR (EXT)	Communication data from the separate detector cannot be received.
386	n AXIS : DATA TRANS. ERROR (EXT)	A CRC or stop bit error occurred in the communication data being received from the separate detector.
387	n AXIS : ABNORMAL ENCODER (EXT)	An error occurs in the separate detector. For details, contact the manufacturer of the scale.

- The details of serial pulse coder alarm

  The details of serial pulse coder alarm are displayed in the diagnosis display (DGN202, 203) as shown below.

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

SPH : The serial pulse coder or feedback cable is defective. Replace the serial pulse coder or cable.

CKA : The serial pulse coder is defective. Replace it.

BZA : The pulse coder was supplied with power for the first time. Make sure that the batteries are connected.
Turn the power off, then turn it on again and perform a reference position return.

PCA : The serial pulse coder is defective. Replace it.

PHA : The serial pulse coder or feedback cable is defective. Replace the serial pulse coder or cable.

BLA : The battery voltage is low. Replace the batteries.

CSA : The serial pulse coder is defective. Replace it.

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

PRM : An invalid parameter was found. ALM417 (invalid servo parameter) is also issued.

STB : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or NC–axis board.

CRC : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective. Replace the pulse coder, feedback cable, or NC–axis board.

DTE : The serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective. Replace the pulse coder, feedback cable, or NC–axis board

8.1.6 Servo alarms (1/2)

No.	Message	Contents
401	SERVO ALARM: n–TH AXIS VRDY OFF	The n–th axis (axis 1–8) servo amplifier READY signal (DRDY) went off. Refer to procedure of trouble shooting.
402	SERVO ALARM: SV CARD NOT EXIST	The axis control card is not provided.
403	SERVO ALARM: CARD/SOFT MISMATCH	The combination of the axis control card and servo software is illegal. The possible causes are as follows: · A correct axis control card is not provided. · Correct servo software is not installed on flash memory.
404	SERVO ALARM: n–TH AXIS VRDY ON	Even though the n–th axis (axis 1–8) READY signal (MCON) went off, the servo amplifier READY signal (DRDY) is still on. Or, when the power was turned on, DRDY went on even though MCON was off. Check that the PSM and SVM or CNC and SVM are connected.
405	SERVO ALARM: (ZERO POINT RETURN FAULT)	Position control system fault. Due to an NC or servo system fault in the reference position return, there is the possibility that reference position return could not be executed correctly. Try again from the manual reference position return.
407	SERVO ALARM: EXCESS ERROR	The following error occurred during simple synchronous control: The difference in machine coordinates between the synchronized axes exceeds the value set in PRM8314.
409	SERVO ALARM: n AXIS TORQUE ALM	Abnormal servo motor load has been detected. Alternatively, abnormal spindle motor load has been detected in Cs mode.
410	SERVO ALARM: n–TH AXIS – EXCESS ERROR	One of the following errors occurred: 1) The positional deviation value when the n–th axis (axis 1–8) stops exceeds the value set in PRM1829. 2) In simple synchronous control, the compensation amount for synchronization exceeds the value set in PRM8325. (This alarm is issued only for the slave axis.)
411	SERVO ALARM: n–TH AXIS – EXCESS ERROR	The position deviation value when the n–th axis (axis 1–8) moves is larger than the set value in PRM1828. Refer to procedure of trouble shooting.
413	SERVO ALARM: n–th AXIS – LSI OVERFLOW	The contents of the error register for the n–th axis (axis 1–8) exceeded $\pm 2^{31}$ power. This error usually occurs as the result of an improperly set parameters.
415	SERVO ALARM: n–TH AXIS – EXCESS SHIFT	A speed higher than 524288000 units/s was attempted to be set in the n–th axis (axis 1–8). This error occurs as the result of improperly set CMR.

No.	Message	Contents
417	SERVO ALARM: n–TH AXIS – PARAMETER INCORRECT	This alarm is issued when an invalid parameter related to the servo system is detected on axis n (axes 1 to 8). (Digital servo system alarm) When DGN203#4 = 1, an invalid parameter has been detected by the servo software. Analyze the cause with DGN352. When DGN203#4 = 0, an invalid parameter has been detected by the CNC software. The possible causes are indicated below. (See DGN280.) 1) The value set in PRM2020 (motor form) is out of the specified limit. 2) A proper value (111 or –111) is not set in PRM2022 (motor revolution direction). 3) Illegal data (a value below 0, etc.) was set in PRM2023 (number of speed feedback pulses per motor revolution). 4) Illegal data (a value below 0, etc.) was set in PRM2024 (number of position feedback pulses per motor revolution). 5) PRM2084 and 2085 (flexible field gear rate) have not been set. 6) A value outside the limit of {1 to the number of control axes} or a non–continuous value (PRM1023 (servo axis number) contains a value out of the range from 1 to the number of axes, or an isolated value was set in PRM1023 (servo axisnumber). 7) A torque control parameter is set incorrectly in PMC axis control. (The torque constant PRM2105 is set to 0.)
420	SERVO ALARM: n AXIS SYNC TORQUE (M series)	During simple synchronous control, the difference between the torque commands for the master and slave axes exceeded the value set in PRM2031.
421	SERVO ALARM: n AXIS EXCESS ER (D)	The difference between the errors in the semi–closed loop and closed loop has become excessive during dual position feedback. Check the values of the dual position conversion coefficients in PRM2078 and 2079.
422	SERVO ALARM: n AXIS	In torque control of PMC axis control, a specified allowable speed has been exceeded.
423	SERVO ALARM: n AXIS	In torque control of PMC axis control, the parameter–set (PRM1885) allowable cumulative travel distance has been exceeded.
430	n AXIS : SV. MOTOR OVERHEAT	A servo motor overheat occurred.
431	n AXIS : CNV. OVERLOAD	1) PSM: Overheat occurred. 2) β series SVU: Overheat occurred.
432	n AXIS : CNV. LOW VOLT CONTROL	1) PSM: Control power voltage has dropped. 2) PSMR: The control power supply voltage has dropped. 3) β series SVU: The control power supply voltage has dropped.

No.	Message	Contents
433	n AXIS : CNV. LOW VOLT DC LINK	1) PSM: The DC link voltage has dropped. 2) PSMR: The DC link voltage has dropped. 3) α series SVU: The DC link voltage has dropped. 4) β series SVU: The DC link voltage has dropped.
434	n AXIS : INV. LOW VOLT CONTROL	SVM: The control power supply voltage has dropped.
435	n AXIS : INV. LOW VOLT DC LINK	SVM: The DC link voltage has dropped.
436	n AXIS : SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
437	n AXIS : CNV. OVERCURRENT POWER	PSM: Overcurrent flowed into the input circuit.
438	n AXIS : INV. ABNORMAL CURRENT	1) SVM: The motor current is too high. 2) α series SVU: The motor current is too high. 3) β series SVU: The motor current is too high.
439	n AXIS : CNV. OVERVOLT POWER	1) PSM: The DC link voltage is too high. 2) PSMR: The DC link voltage is too high. 3) α series SVU: The C link voltage is too high. 4) β series SVU: The link voltage is too high.
440	n AXIS : CNV. EX DECELERATION POW.	1) PSMR: The regenerative discharge amount is too large. 2) α series SVU: The regenerative discharge amount is too large. Alternatively, the regenerative discharge circuit is abnormal.
441	n AXIS : ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
442	n AXIS : CNV. CHARGE FAILURE	1) PSM: The spare discharge circuit of the DC link is abnormal. 2) PSMR: The spare discharge circuit of the DC link is abnormal.
443	n AXIS : CNV. COOLING FAN FAILURE	1) PSM: The internal stirring fan failed. 2) PSMR: The internal stirring fan failed. 3) β series SVU: The internal stirring fan failed.
444	n AXIS : INV. COOLING FAN FAILURE	SVM: The internal stirring fan failed.
445	n AXIS : SOFT DISCONNECT ALARM	The digital servo software detected a broken wire in the pulse coder.
446	n AXIS : HARD DISCONNECT ALARM	A broken wire in the built–in pulse coder was detected by hardware.
447	n AXIS : HARD DISCONNECT (EXT)	A broken wire in the separate detector was detected by hardware.
448	n AXIS : UNMATCHED FEEDBACK ALARM	The sign of feedback data from the built–in pulse coder differs from that of feedback data from the separate detector.

No.	Message	Contents
449	n AXIS : INV. IPM ALARM	1) SVM: IPM (intelligent power module) detected an alarm. 2) α series SVU: IPM (intelligent power module) detected an alarm.
453	n AXIS : SPC SOFT DISCONNECT ALARM	Software disconnection alarm of the α pulse coder. Turn off the power to the CNC, then remove and insert the pulse coder cable. If this alarm is issued again, replace the pulse coder.
456	ILLEGAL CURRENT LOOP	The current control cycle settings (PRM2004, 2003#0, and 2013#0) are incorrect. Possible problems are as follows. – For the two axes whose servo axis numbers (settings of PRM1023) are an odd number followed by an even number (a pair of axes 1 and 2 or axes 5 and 6, for example), a different current control cycle is set for each of the axes. – The requirements for slaves needed for the set current control cycle, including the number, type, and connection method of them, are not satisfied.
457	ILLEGAL HI HRV (250US)	Use of high–speed HRV is specified although the current control cycle is 200 μs.
458	CURRENT LOOP ERROR	The current control cycle setting does not match the actual current control cycle.
459	HI HRV SETTING ERROR	Of two axes having adjacent servo axis numbers (PRM1023), odd number and even number, high–speed HRV control can be performed for one axis and not for the other.
460	n AXIS : FSSB DISCONNECT	FSSB communication was disconnected suddenly. The possible causes are as follows: 1) The FSSB communication cable was disconnected or broken. 2) The power to the amplifier was turned off suddenly. 3) A low–voltage alarm was issued by the amplifier.
461	n AXIS : ILLEGAL AMP INTERFACE	The axes of the 2–axis amplifier were assigned to the fast type interface.
462	n AXIS : SEND CNC DATA FAILED	Because of an FSSB communication error, a slave could not receive correct data.
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the servo system could not receive correct data.
464	n AXIS : WRITE ID DATA FAILED	An attempt was made to write maintenance information on the amplifier maintenance screen, but it failed.
465	n AXIS : READ ID DATA FAILED	At power–up, amplifier initial ID information could not be read.
466	n AXIS : MOTOR/AMP COMBINATION	The maximum current rating for the amplifier does not match that for the motor.

No.	Message	Contents
467	n AXIS : ILLEGAL SETTING OF AXIS	The servo function for the following has not been enabled when an axis occupying a single DSP (corresponding to two ordinary axes) is specified on the axis setting screen. 1. Learning control (PRM2008#5=1) 2. High–speed current loop (PRM2004#0=1) 3. High–speed interface axis (PRM2005#4=1)
468	HI HRV SETTING ERROR (AMP)	Use of high–speed HRV is specified for a controlled axis of an amplifier which does not support high–speed HRV.

NOTE If any of servo ALM400 to 467 occurs, investigate the cause of the alarm and take appropriate action, as described in the maintenance manual.

- Details of servo alarm

  The details of servo alarm are displayed in the diagnosis display (DGN200, 201, 203, 204) as shown below.

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

OFA : An overflow alarm is being generated inside of digital servo.

FBA : A disconnection alarm is being generated.
Details are displayed in the DGN201.

DCA : A regenerative discharge circuit alarm is being generated in servo amp. Check LED of servo amplifier.

HVA : An overvoltage alarm is being generated in servo amp.

HCA : An abnormal current alarm is being generated in servo amp. Check LED of servo amplifier.

OVC : A overcurrent alarm is being generated inside of digital servo.

LV : A low voltage alarm is being generated in servo amp.
Check LED of servo amplifier.

OVL : An overload alarm is being generated.
Details are displayed in the DGN201.

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

When DGN200#7 (OVL) equal 1 :

ALD 0 : Motor overheating

1 : Amplifier overheating

When DGN200#1 (FBA) equal 1 :

ALD	EXP	Alarm details
1	0	Built–in pulse coder disconnection (hardware)
1	1	Separately installed pulse coder disconnection (hardware)
0	0	Pulse coder is not connected due to software.

	#7	#6	#5	#4	#3	#2	#1	#0
203				PRM				

PRM : An invalid parameter was found. ALM417 (invalid servo parameter) is also issued. Refer to DGN352 for causes.

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

PMS : A feedback pulse error has occurred because the feedback cable is defective.

LDA : The LED indicates that serial pulse coder C is defective

MCC : A magnetic contactor contact in the servo amplifier has welded.

OFS : A current conversion error has occurred in the digital servo.

8.1.7 Overtravel alarms

(If this alarm occurs, manually move the machine in the direction opposite to that in which the machine was moving when the alarm occurred, then reset the alarm.)

No.	Message	Contents
500	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke check I. (PRM1320 or 1326 **NOTE**)
501	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke check I. (PRM1321 or 1327 **NOTE**)
502	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke check II. (PRM1322)
503	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke check II. (PRM1323)
504	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke check III. (PRM1324)
505	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke check III. (PRM1325)
506	OVER TRAVEL : +n	Exceeded the n–th axis + side hardware OT.
507	OVER TRAVEL : –n	Exceeded the n–th axis – side hardware OT.
508	INTERFERENCE: +n (T series (two–path control))	A tool moving in the positive direction along the n–axis has fouled another tool post.
509	INTERFERENCE: –n (T series (two–path control))	A tool moving in the negative direction along the n–axis has fouled another tool post.
510	OVER TRAVEL: +n	Alarm for stroke check prior to movement. The end point specified in a block falls within the forbidden area defined with the stroke check in the positive direction along the n–axis. Correct the program.
511	OVER TRAVEL: –n	Alarm for stroke check prior to movement. The end point specified in a block falls within the forbidden area defined with the stroke check in the negative direction along the n–axis. Correct the program.

No.	Message	Contents
514	INTERFERENCE : +n	The rotation area interference check function found interference on the plus side of the n–axis.
515	INTERFERENCE : –n	The rotation area interference check function found interference on the minus side of the n–axis.

NOTE PRM1326 and 1327 are effective when EXLM (stroke check switch signal) is on.

8.1.8 Servo alarms (2/2)

No.	Message	Contents
600	n AXIS: INV. DC LINK OVER CURRENT	DC link current is too large.
601	n AXIS: INV. RADIATOR FAN FAILURE	The external dissipator stirring fan failed.
602	n AXIS: INV. OVERHEAT	The servo amplifier was overheated.
603	n AXIS: INV. IPM ALARM(OH)	The IPM (intelligent power module) detected an overheat alarm.
604	n AXIS: AMP. COMMUNICATION ERROR	Communication between the SVM and the PSM failed.
605	n AXIS: CNV. EX. DISCHARGE POW.	PSMR: Regenerative power is too large.
606	n AXIS: CNV. RADIATOR FAN FAILURE	PSM: The external dissipator stirring fan failed. PSMR: The external dissipator stirring fan failed.
607	n AXIS: CNV. SINGLE PHASE FAILURE	PSM: Input voltage is in the open–phase condition. PSMR: Input voltage is in the open–phase condition.

8.1.9 Overheat alarms

No.	Message	Contents
700	OVERHEAT: CONTROL UNIT	Control unit overheat Check that the fan motor operates normally, and clean the air filter.
701	OVERHEAT: FAN MOTOR	The fan motor on the top of the cabinet for the control unit is overheated. Check the operation of the fan motor and replace the motor if necessary.
704	OVERHEAT: SPINDLE	Spindle overheat in the spindle fluctuation detection (1) If the cutting load is heavy, relieve the cutting condition. (2) Check whether the cutting tool is share. (3) Another possible cause is a faulty spindle amp.

8.1.10 Rigid tapping alarms

No.	Message	Contents
740	RIGID TAP ALARM: EXCESS ERROR	The positional deviation of the stopped spindle has exceeded the set value during rigid tapping. (PRM5313 etc.)
741	RIGID TAP ALARM: EXCESS ERROR	The positional deviation of the moving spindle has exceeded the set value during rigid tapping. (PRM5311, etc.) Alternatively, a rigid tapping synchronization error exceeding the setting occurred. (PRM5214, etc.)
742	RIGID TAP ALARM: LSI OVERFLOW	An LSI overflow has occurred for the spindle during rigid tapping.

8.1.11 Serial spindle alarms

No.	Message	Contents
749	S–SPINDLE LSI ERROR	It is serial communication error while system is executing after power supply on. Following reasons can be considered. 1) Optical cable connection is fault or cable is not connected or cable is cut. 2) MAIN CPU board or option 2 board is fault. 3) Spindle amp. printed board is fault. 4) The spindle amplifier is under an abnormal condition. (The SPM indication is A, A1, A2, or the like, depending on the type of the abnormality.) If this alarm occurs when CNC power supply is turned on or when this alarm can not be cleared even if CNC is reset, turn off the power supply also turn off the power supply in spindle side. If the spindle amplifier is under an abnormal condition, check the SPM indication (A, A1, A2, or the like). Then, refer to the FANUC SERVO MOTOR αi series MAINTENANCE MANUAL (B–65285EN) or FANUC SERVO MOTOR α series MAINTENANCE MANUAL (B–65165E) to solve the problem.
750	SPINDLE SERIAL LINK START FAULT	This alarm is generated when the spindle control unit is not ready for starting correctly when the power is turned on in the system with the serial spindle. The four reasons can be considered as follows: 1) An improperly connected optic cable, or the spindle control unit's power is OFF. 2) When the NC power was turned on under alarm conditions other than SU–01 or AL–24 which are shown on the LED display of the spindle control unit. In this case, turn the spindle amplifier power off once and perform startup again. 3) Other reasons (improper combination of hardware) This alarm does not occur after the system including the spindle control unit is activated. 4) The second or fourth spindle is in one of the above conditions 1) to 3). See DGN409 and 413 for details.

No.	Message	Contents
752	FIRST SPINDLE MODE CHANGE FAULT	This alarm is generated if the system does not properly terminate a mode change. The modes include the Cs contouring, spindle positioning, rigid tapping, and spindle control modes. The alarm is activated if the spindle control unit does not respond correctly to the mode change command issued by the NC.
754	SPINDLE–1 ABNORMAL TORQUE ALM	Abnormal first spindle motor load has been detected.
762	SECOND SPINDLE MODE CHANGE FAULT	Refer to ALM752.(For 2nd axis)
764	SPINDLE–2 ABNORMAL TORQUE ALM	Same as ALM754 (for the second spindle)
772	SPINDLE–3 MODE CHANGE ERROR	Same as ALM752 (for the third spindle)
774	SPINDLE–3 ABNORMAL TORQUE ALM	Same as ALM754 (for the third spindle)
782	SPINDLE–4 MODE CHANGE ERROR	Same as ALM752 (for the fourth spindle)
784	SPINDLE–4 ABNORMAL TORQUE ALM	Same as ALM754 (for the fourth spindle)

- 1st and 2nd spindles

  The details of spindle ALM750 are indicated by DGN409 and 439.

	#7	#6	#5	#4	#3	#2	#1	#0
409					SPE	S2E	S1E	SHE

SHE 0 : The serial communications module in the CNC is normal.

1 : The serial communications module in the CNC was detected to have a fault.

S1E 0 : The first spindle is normal during the spindle serial control startup.

1 : The first spindle was detected to have a fault during the spindle axis serial control startup.

S2E 0 : The second spindle is normal during the spindle serial control startup.

1 : The second spindle was detected to have a fault during the spindle serial control startup.

SPE 0 : In the spindle serial control, the serial spindle parameters fulfill the spindle unit startup conditions.

1 : In the spindle serial control, the serial spindle parameters do not fulfill the spindle unit startup conditions.

- 3rd and 4th spindles

	#7	#6	#5	#4	#3	#2	#1	#0
439					SPE	S4E	S3E	SHE

SHE 0 : The serial communications module in the CNC is normal.
1 : The serial communications module in the CNC was detected to have a fault.

S3E 0 : The third spindle is normal during the spindle serial control startup.
1 : The third spindle was detected to have a fault during the spindle axis serial control startup.

S4E 0 : The fourth spindle is normal during the spindle serial control startup.
1 : The fourth spindle was detected to have a fault during the spindle serial control startup.

SPE 0 : In the spindle serial control, the serial spindle parameters fulfill the spindle unit startup conditions.
1 : In the spindle serial control, the serial spindle parameters do not fulfill the spindle unit startup conditions.

8.1.12 System alarms

(These alarms cannot be reset with reset key.)

No.	Message	Contents
900	ROM PARITY	A parity error occurred in the CNC, macro, or servo ROM. Correct the contents of the flash ROM having the displayed number.
910	SRAM PARITY : (BYTE 0)	A RAM parity error occurred in the part program storage RAM. Clear the RAM, or replace the SRAM (SRAM/FROM module) or motherboard. Subsequently, re–set the parameters and all other data.
911	SRAM PARITY : (BYTE 1)	
912	DRAM PARITY : (BYTE 0)	A RAM parity error occurred in the DRAM. Replace the module (CPU card) including the DRAM.
913	DRAM PARITY : (BYTE 1)	
914	DRAM PARITY : (BYTE 2)	
915	DRAM PARITY : (BYTE 3)	
916	DRAM PARITY : (BYTE 4)	
917	DRAM PARITY : (BYTE 5)	
918	DRAM PARITY : (BYTE 6)	
919	DRAM PARITY : (BYTE 7)	
920	SERVO ALARM (1–4 AXIS)	Servo alarm (first to fourth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.

No.	Message	Contents
921	SERVO ALARM (5–8 AXIS)	Servo alarm (fifth to eighth axis). A watchdog alarm condition occurred, or a RAM parity error occurred in the axis control card. Replace the axis control card.
926	FSSB ALARM	FSSB alarm. Replace the axis control card.
930	CPU INTERRUPT	CPU error (abnormal interrupt). The motherboard or CPU card may be faulty.
935	SRAM ECC ERROR	An error occurred in RAM for part program storage. Replace the SRAM (SRAM/FROM module), perform all–clear operation, and set all parameter and other data again.
950	PMC SYSTEM ALARM PCxxx YYYYYYYYYYYYY	An error occurred in the PMC. For details of PCxxx, see the list of system alarm messages in Subsec. 8.2.2 in this manual.
951	PMC WATCH DOG ALARM	An error occurred in the PMC. (Watchdog alarm) The motherboard may be faulty.
970	NMI OCCURRED IN PMCLSI	With the PMC–SA1, an error occurred in the PMC control LSI device on the motherboard. (I/O RAM parity) Replace the motherboard.
971	NMI OCCURRED IN SLC	With the PMC–SA1, an I/O Link disconnection was detected. Check the I/O Link.
972	NMI OCCURRED IN OTHER MODULE	An NMI occurred on a board other than the motherboard. The option board may be faulty.
973	NON MASK INTERRUPT	An NMI occurred as a result of an unknown cause.
974	F–BUS ERROR	A bus error occurred on the FANUC bus. The motherboard or option board may be faulty.
975	BUS ERROR	A bus error occurred on the motherboard. The motherboard may be faulty.
976	L–BUS ERROR	A bus error occurred on the local bus. The motherboard may be faulty.

8.2 Alarms Displayed on the PMC Screen

8.2.1 PMC alarm message

Alarm number	Faulty location/ corrective action	Contents
ER01 PROGRAM DATA ERROR	1) Re–input the sequence program. 2) Replace the master printed circuit board.	The sequence program is invalid.
ER02 PROGRAM SIZE OVER	1) Reduce the sequence program. 2) Contact FANUC to have a larger number–of–Ladder–steps option specified.	The sequence program is too large. The sequence program is invalid.
ER03 PROGRAM SIZE ERROR (OPTION)	1) Reduce the sequence program. 2) Contact FANUC to have a larger number–of–Ladder–steps option specified.	The sequence program exceeds the size specified by the number–of–Ladder–steps option.
ER04 PMC TYPE UNMATCH	Using an offline programmer, change the sequence program to that for the correct PMC type.	The setting of the type in the sequence program differs from the actual type.
ER06 PMC CONTROL SOFTWARE TYPE UNMATCH	Contact FANUC to specify certain PMC type	The combination of CNC system configuration and PMC type is invalid. (Example: PMC–SA1 or PMC–SB5 is used for a 3–path CNC system.)
ER07 NO OPTION (LADDER STEP)	1) Restore the backed up CNC parameter data. 2) Check the data sheet and re–input the CNC parameters. 3) Contact FANUC to specify a number–of–Ladder–steps option of the necessary size.	No number–of–Ladder–steps option is found.
ER08 OBJECT UNMATCH	1) Contact FANUC.	An unsupported function is used in the sequence program.
ER09 PMC LABEL CHECK ERROR PLEASE TURN ON POWER AGAIN WITH PUSHING 'O'&'Z'. (CLEAR PMC SRAM)	1) Press and hold down the 'O' and 'Z' key combination, and turn the CNC back on. 2) When using the loader control function, power on the CNC again while pressing the "5" and "Z" keys. 3) Replace the backup battery. 4) Replace the master printed circuit board.	With a change in the PMC type, for example, the retention–type memory of the PMC must be initialized.
ER10 OPTION AREA NOTHING (xxxx)	Contact FANUC. Install the system software correctly.	The PMC management software is not loaded correctly.

Alarm number	Faulty location/ corrective action	Contents
ER11 OPTION AREA NOTHING (xxxx)	Contact FANUC. Install the system software correctly.	The PMC C language board management software is not loaded correctly.
ER12 OPTION AREA ERROR (xxxx)	Contact FANUC. Install the system software correctly.	The PMC management software is invalid. (The series of BASIC and OPTION do not match.)
ER13 OPTION AREA ERROR (xxxx)	Contact FANUC. Install the system software correctly.	The PMC C language board management software is invalid. (The series of BASIC and OPTION do not match.)
ER14 OPTION AREA VERSION ERROR (xxxx)	Contact FANUC. Install the system software correctly.	The PMC management software is invalid. (The editions of BASIC and OPTION do not match.)
ER15 OPTION AREA VERSION ERROR (xxxx)	Contact FANUC. Install the system software correctly.	The PMC C language board management software is invalid. (The editions of BASIC and OPTION do not match.)
ER16 RAM CHECK ERROR (PROGRAM RAM)	Replace the master printed circuit board.	The initialization of the memory used to store the sequence program failed.
ER17 PROGRAM PARITY	1) Re–input the sequence program. 2) Replace the master printed circuit board.	The parity of the sequence program is invalid.
ER18 PROGRAM DATA ERROR BY I/O	Re–input the sequence program.	While the sequence program was being read, an interrupt command was generated.
ER19 LADDER DATA ERROR	Display the Ladder edit screen again and exit from editing by using the [<<] key.	During Ladder editing, the system was forcibly switched to the CNC screen with a function key.
ER20 SYMBOL/COMMENT DATA ERROR	Display the symbol/comment edit screen again and exit from editing by using the [<<] key.	During symbol/comment editing, the system was forcibly switched to the CNC screen with a function key.
ER21 MESSAGE DATA ERROR	Display the message data edit screen again and exit from editing by using the [<<] key.	During message data editing, the system was forcibly switched to the CNC screen with a function key.
ER22 PROGRAM NOTHING	1) Re–input the sequence program. 2) Replace the master printed circuit board.	The sequence program is empty.

Alarm number	Faulty location/ corrective action	Contents
ER23 PLEASE TURN OFF POWER	Turn the CNC off and then back on.	With a change in the PMC type, for example, the power must be turned off and then back on.
ER25 SOFTWARE VERSION ERROR (PMCAOPT)	Contact FANUC to reconfigure the PMC management software.	The PMC management software is invalid. (The edition of PMCAOPT does not match.)
ER26 PMC CONTROL MODULE ERROR (PMCAOPT)	1) Contact FANUC to reconfigure the PMC management software. 2) 2) Replace the master printed circuit board.	The initialization of the PMC management software failed.
ER27 LADDER FUNC. PRM IS OUT OF RANGE	Modify the sequence program. Change the parameter number of the function instruction to a value within the valid range.	An out–of–range parameter number is specified with function instruction TMR, TMRB, CTR, CTRB, DIFU, or DIFD.
ER32 NO I/O DEVICE	1) Check that the I/O device is on. 2) Check that the I/O device was turned on before the CNC was turned on. 3) Check the connection of the cable.	An I/O device such as the I/O Link, connection unit, and Power Mate is not connected.
ER33 I/O LINK ERROR	Replace the master printed circuit board.	The LSI of the I/O Link is defective.
ER34 I/O LINK ERROR (xx)	1) Check the connection of the cable leading to a device in group xx. 2) Check that the I/O device was turned on before the CNC. 3) Replace that device in group xx in which the PMC control module is installed.	In a slave in group xx, an error occurred in communication with an I/O device.
ER35 TOO MUCH OUTPUT DATA IN GROUP (xx)	Reduce the amount of output data in group xx.	The amount of output data in I/O Link group xx exceeds the limit (33 bytes). The excess data is nullified.
ER36 TOO MUCH INPUT DATA IN GROUP (xx)	Reduce the amount of input data in group xx	The amount of input data in I/O Link group xx exceeds the limit (33 bytes). The excess data is nullified.
ER38 MAX SETTING OUTPUT DATA OVER (xx)	Modify the total amount of output data in each group to 128 bytes or less.	The I/O Link I/O area is insufficient. (The allocation of any group after group xx on the output side is nullified.)

Alarm number	Faulty location/ corrective action	Contents
ER39 MAX SETTING INPUT DATA OVER (xx)	Modify the total amount of input data in each group to 128 bytes or less.	The I/O Link I/O area is insufficient. (The allocation of any group after group xx on the input side is nullified.)
ER40 I/O LINK–II SETTING ERROR (CHx)	Reconfigure the I/O Link–II.	The I/O Link–II setting is invalid. (CH1: Primary board, CH2: Secondary board)
ER41 I/O LINK–II MODE ERROR (CHx)	Reconfigure the I/O Link–II.	The I/O Link–II mode setting is invalid. (CH1: Primary board, CH2: Secondary board)
ER42 I/O LINK–II STATION NO.ERROR (CHx)	Reconfigure the I/O Link–II.	The I/O Link–II station number setting is invalid. (CH1: Primary board, CH2: Secondary board)
ER97 I/O LINK FAILURE (CHxyyGROUP)	1) Check whether the cables of I/O devices in group yy are connected properly. 2) Check the power to each I/O device. 3) Check the parameter setting of the I/O link assignment data selection function.	The number of assigned I/O modules in group yy differs from that of I/O devices actually connected. Whether to check this error can be set with K906.2.
ER98 ILLEGAL LASER CONNECTION	Modify the allocation of the I/O module.	When an I/O device for a laser is used, the allocation of the I/O module does not match the actual I/O device configuration.
ER99 X,Y96–127 ARE ALLOCATED	Modify the allocation of the I/O module.	When an I/O device for a laser is used, another I/O device is allocated to X96–127/Y96–127. X96–127/Y96–127 are used for I/O devices for a laser, and cannot be used for other devices.
WN02 OPERATE ADDRESS ERROR	Modify the setting of the PMC system parameter, address of the operator's panel for Series 0.	The setting of the PMC system parameter, address of the operator's panel for Series 0, is invalid.
WN03 ABORT NC–WINDOW/EXIN	1) Check that the Ladder program is free from problems and then restart the Ladder program (by pressing the RUN key). 2) Turn the CNC off and then back on.	The Ladder program was stopped during communication between the CNC and PMC. Function instructions such as WINDR, WINDW, EXIN, and DISPB may not be executed normally.

Alarm number	Faulty location/ corrective action	Contents
WN05 PMC TYPE NO CONVERSION	Using an offline programmer, change the sequence program to that for the correct PMC type.	The setting of the type in the sequence program differs from the actual type. (Example: For the PMC–SB5, the Ladder program of the PMC–SA3/SA5 was transferred.)
WN06 TASK STOPPED BY DEBUG FUNC	To restart a user task that has been stopped, stop the sequence program and then execute it again.	When a PMC C language board is used, a user task has been stopped due to a break by a debug function.
WN07 LADDER SP ERROR (STACK)	Modify the sequence program so that the subprogram nesting level is eight or less.	For a subprogram call with the function instruction CALL or CALLU, the nesting level is too deep (exceeds 8).
WN17 NO OPTION (LANGUAGE)	1) Restore the backed up parameter data. 2) Check the data sheet and re–input the parameters. 3) Contact FANUC to specify a PMC C language program option of the necessary size.	When a PMC C language board is used, no PMC C language program option is found.
WN18 ORIGIN ADDRESS ERROR	1) On the PMC system parameter screen, press [ORIGIN]. 2) Set the PMC system parameter, LANGUGE ORIGIN, to the address indicated by the RC_CTLB_INIT in the map file.	When a PMC C language board is used, the PMC system parameter, LANGUAGE ORIGIN, is invalid.
WN19 GDT ERROR (BASE, LIMIT)	Modify the setting in the user–defined GDT in the link control statement or build file.	When a PMC C language board is used, the BASELIMIT or ENTRY in the user–defined GDT is invalid.
WN20 COMMON MEM. COUNT OVER	Change the number of shared memories to eight or less. Modify the link control statement, build file, or other source files for shared memories.	When a PMC C language board is used, the number of shared memories exceeds eight.
WN21 COMMON MEM. ENTRY ERROR	Modify the ENTRY in the shared memory GDT in the link control statement.	When a PMC C language board is used, the ENTRY in the shared memory GDT is out of range.
WN22 LADDER 3 PRIORITY ERROR	Change the value of the TASK LEVEL (LADDER LEVEL 3) in the link control statement to 0, 10 to 99, or –1.	When a PMC C language board is used, the priority of LADDER LEVEL 3 is out of range.

Alarm number	Faulty location/ corrective action	Contents
WN23 TASK COUNT OVER	Change the TASK COUNT in the link control statement to 16 or less. (To change the task count, modify the link control statement, build file, and the configuration of the files to be linked.)	When a PMC C language board is used, the number of user tasks exceeds 16.
WN24 TASK ENTRY ADDR ERROR	Change the GDT table in the build file to 32 (20H) to 95 (5FH).	When a PMC C language board is used, the user task entry address selector is out of range.
WN25 DATA SEG ENTRY ERROR	Change the DATA SEGMENT GDT ENTRY value in the link control statement and the GDT table in the build file to 32 (20H) to 95 (5FH).	When a PMC C language board is used, the data segment entry address is out of range.
WN26 USER TASK PRIORITY ERROR	Change the TASK LEVEL of each task in the link control statement to a value from 10 to 99 or –1. (Note that –1 can be specified for the TASK LEVEL of only one task, including the third Ladder level).	When a PMC C language board is used, the priority of the user task is out of range.
WN27 CODE SEG TYPE ERROR	Change the value of the code segment according to the segment setting in the link control statement and build file.	When a PMC C language board is used, the code segment type is invalid. The setting of the RENA–MESEG code segment in the bind control file is wrong.
WN28 DATA SEG TYPE ERROR	Change the value of the data segment according to the segment setting in the link control statement and build file.	When a PMC C language board is used, the data segment type is invalid. The setting of the RENA–MESEG data segment in the bind control file is wrong.
WN29 COMMON MEM SEG TYPE ERROR	Change the value according to the segment setting in the link control statement and build file.	When a PMC C language board is used, the shared memory segment type is invalid. The setting of the RENAMESEG segment in the shared memory bind control file is wrong.

Alarm number	Faulty location/ corrective action	Contents
WN30 IMPOSSIBLE ALLOCATE MEM.	1) Check that the USER GDT ADDRESS in the link control statement and the start address of the code segment in the build file are correct. 2) Change the PMC system parameter, MAX LADDER AREA SIZE, to a minimum. 3) Change the stack size in the link control state to a minimum.	When a PMC C language board is used, the memory area for data, stacks, and others cannot be reserved.
WN31 IMPOSSIBLE EXECUTE LIBRARY	1) Check the types supported by the library. 2) Reconfigure the PMC management software and contact FANUC.	When a PMC C language board is used, library functions cannot be executed.
WN32 LNK CONTROL DATA ERROR	1) Check that the address of RC_CTLNB_INIT is set for the PMC system parameter, LANGUAGE ORIGIN. 2) Create the link control statement again.	When a PMC C language board is used, link control statement (program control) data is invalid.
WN33 LNK CONTROL VER.ERROR	Modify the link control statement in the PMC C language program.	When a PMC C language board is used, a link control statement data edition error has occurred.
WN34 LOAD MODULE COUNT OVER	Change the number of independent load modules to eight or less.	When a PMC C language board is used, the number of independent load modules exceeds eight.
WN35 CODE AREA OUT OF RANGE	Check the link map and allocate segments within the range of RAM.	When a PMC C language board is used, the code segment area is out of the range of the RAM.
WN36 LANGUAGE SIZE ERROR (OPTION)	1) Reduce the PMC C language program. 2) Contact FANUC to specify a PMC C language program option of a larger size.	When a PMC C language board is used, the PMC C language program exceeds the size specified for the PMC C language program option.
WN37 PROGRAM DATA ERROR (LANG.)	Initialize the PMC C language program memory. ([EDIT] → [CLEAR] → [CLRLNG] → [EXEC])	The PMC C language program memory must be initialized.
WN38 RAM CHECK ERROR (LANG.)	Replace the master printed circuit board.	The initialization of the PMC C language program memory failed.

Alarm number	Faulty location/ corrective action	Contents
WN39 PROGRAM PARITY (LANG.)	1) Re–input the PMC C language program. 2) Replace the master printed circuit board.	The parity of the PMC C language program parity is invalid.
WN40 PROGRAM DATA ERROR BY I/O (LANG.)	Re–input the language program.	While the PMC C language program was being read, an interrupt command was generated.
WN41 LANGUAGE TYPE UNMATCH	1) Re–input the PMC C language program. 2) Replace the master printed circuit board.	When a PMC C language board is used, an unusable C language program is input.
WN42 UNDEFINE LANGUAGE ORIGIN ADDRESS	1) On the PMC system parameter screen, click [ORIGIN]. 2) Set the PMC system parameter, LANGUGE ORIGIN, to the address indicated by the RC_CTLB_INIT in the map file.	When a PMC C language board is used, the PMC parameter, LANGUAGE ORIGIN, is not set.
WN48 UNAVAIL LANGUAGE BY CNC UNMATCH	Remove the PMC C language board.	A PMC C language board is installed in a CNC in which a PMC C language board cannot be used.

8.2.2 PMC system alarm messages

Alarm number	Faulty location/ corrective action	Contents
PC004 CPU ERR xxxxxxxx : yyyyyyyy PC006 CPU ERR xxxxxxxx : yyyyyyyy PC009 CPU ERR xxxxxxxx : yyyyyyyy PC010 CPU ERR xxxxxxxx : yyyyyyyy PC012 CPU ERR xxxxxxxx : yyyyyyyy	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	A CPU error occurred in the PMC. xxxxxxxx and yyyyyyyy indicate internal error code.
PC030 RAM PARITY aa : bb	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency) and the internal error code above.	A RAM parity error occurred in the PMC. aa and bb indicate internal error code.
PC050 NMI SLC aa : bb PC050 I/O LINK (CH1) aa : bb aa : bb PC050 I/O LINK (CH2) aa : bb aa : bb PC050 IOLINK CH1 aabb–aabb : aabb PC050 IOLINK CH2 aabb : aabb–aabb	1) Check whether the I/O assignment data and the actual I/O equipment connection match. 2) Check whether the cables are connected correctly. 3) Check the cable specifications. 4) Replace each of the interface module, cable, and master printed circuit board of the I/O device.	A communication error occurred in the I/O Link. aa and bb indicate internal error code. If this alarm occurs, the possible causes are as follows: (1) Although the base expansion is assigned when the I/O Unit–A is used, the base is not connected. (2) A cable is not connected securely. (3) Cabling is faulty. (4) I/O equipment (I/O unit, Power Mate, etc.) is faulty. (5) The power to the master or slave unit of the I/O Link is disconnected. (6) A DO output short–circuit occurred in an I/O device. (7) The master printed circuit board is faulty.

Alarm number	Faulty location/ corrective action	Contents
PC060 FBUS xxxxxxxx : yyyyyyyy PC061 FL–R xxxxxxxx : yyyyyyyy	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	A bus error occurred in the PMC.
PC070 SUB65 CALL (STACK)	Check the matching between the CALL/CALLU instruction and SPE instruction.	A stack error occurred during execution of ladder function instruction CALL/CALLU.
PC090 NMI (___) xxxxxxxx : yyyyyyyy	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	An NMI of unknown origin occurred in the PMC management software.
PC092 USER TRAP aa : xxxxxxxx	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	The TRAP instruction not used with the PMC management software was executed.
PC093 INT(SYS) xxxxxxxx : yyyyyyyy PC094 INT(TRAP) xxxxxxxx : yyyyyyyy PC095 INT(EX) xxxxxxxx : yyyyyyyy PC096 INT(IN) xxxxxxxx : yyyyyyyy	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	An interrupt of unknown origin occurred in the PMC management software.

Alarm number	Faulty location/ corrective action	Contents
PC087 PARITY ERR (LADDER–2) PC097 PARITY ERR (LADDER) PC098 PARITY ERR (DRAM)	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	A RAM check found an error.
PC501 NC/PMC INTERFACE ERR PATH_	1) Replace the master printed circuit board. 2) If an error still occurs after replacing the master printed circuit board, contact FANUC with the status information (such as the displayed message, system configuration, operation, when the error occurs, and error occurrence frequency).	The reading/writing of a signal between the CNC and PMC failed.
PC502 ILLEGAL FUNCTION (SUB xx)	Modify the sequence program so that the function instruction xx is not used.	The unsupported function instruction xx is used.

8.2.3 PMC system alarm messages (For C language board)

Alarm number	Faulty location/ corrective action	Contents
PC1nn CPU INTERRT xxxxyyyyyy STATUS LED ☆★	If a C language program is not used, or if the cause of the error cannot be determined even by checking the C language program, contact FANUC.	CPU error (ABNORMAL INTERRUPT) nn : Exception code Exception code of the i80486. For details, refer to the relevant manual that describes the CPU. 00 Division error. For example, the divisor in a division instruction is 0. 12 Stack exception caused by, for example, stack segment limit violation 13 General protection exception generated when, for example, a segment limit is exceeded xxxx : Segment selector where the system error occurred A value 0103 to 02FB indicates the C execution area. yyyyyy : Offset address at which the system error occurred
PC130 RAM PRTY aa xxxxyyyyyy STATUS LED □★		A parity error occurred in user RAM or DRAM on the C language board. aa : RAM parity error occurrence information xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred
PC160 F–BUS ERROR xxxxyyyyyy PC161 F–BUS ERROR xxxxyyyyyy PC162 F–BUS ERROR xxxxyyyyyy STATUS LED ★□		A bus error occurred on the C language board. xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred

Alarm number	Faulty location/ corrective action	Contents
PC170 F–BUS ERROR xxxxyyyyyy PC171 F–BUS ERROR xxxxyyyyyy PC172 F – BUS ERROR xxxxyyyyyy STATUS LED ★□	If a C language program is not used, or if the cause of the error cannot be determined even by checking the C language program, contact FANUC	A bus error occurred on the C language board. xxxx : Segment selector where the system error occurred yyyyyy : Offset address at which the system error occurred
PC199 ROM PARITY eeeeeeee STATUS LED ★☆		A parity error occurred in system ROM on the C language board. eeeeeeee : ROM parity error information

STATUS LED (green)

□ : On, ■ : Off, ☆★ : Blink

8.2.4 Error messages (For EDIT: PMC–SB7)

(1) Messages output when the selection monitor function is used

Message	Faulty location/ corrective action	Contents
THE ADDRESS IS NOT FOUND	Specify an address used with the write coil.	The specified address is not used with the write coil.
SYMBOL UNDEFINED	Use a defined symbol or address.	The specified symbol is not defined.
WRITE COIL NEEDS BIT ADDRESS	Specify a bit address.	A byte address was specified when an address used with the write coil was specified.
SOME NETS ARE DISCARDED	All target nets cannot be taken. On the ladder diagram display screen, select a desired net, then take the net manually.	The number of nets to be taken was 128 or more, so that all nets could not be taken.

(2) Messages displayed during update of the ladder diagram editing

Alarm number	Faulty location/ corrective action	Contents
OVERLAPPED COM	If COME is missing, add it in proper position. If the COM is unnecessary, remove it.	There is no COME that corresponds to this COM.
END IN COM END1 IN COM END2 IN COM END3 IN COM	If COME is missing, add it in proper position. If COM is unnecessary, remove it.	END, END1, END2, or END3 is found between COM and COME.
JMPE IN COM	JMPE and corresponding JMP must have same COM/COME status. Review JMP range and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMPE is found between COM and COME, and JMP and corresponding JMPE have different COM/COME status.

Alarm number	Faulty location/ corrective action	Contents
SP/SPE IN COM	If COME is missing, add it in proper position. If the COM is unnecessary, remove it.	SP or SPE is found between COM and COME.
COME WITHOUT COM	If COM is missing, add it in proper position. If the COME is unnecessary, remove it.	There is no COM that corresponds to this COME.
DUPLICATE CTR NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural CTRs have the same number as their parameter. (This is warning.)
ILLEGAL CTR NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	CTR has parameter number that is out of range.
DUPLICATE DIFU/DIFD NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural DIFUs or DIFDs have the same number as their parameter. (This is warning.)
ILLEGAL DIFU/DIFD NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	DIFU or DIFD has parameter number that is out of range.
NO END NO END1 NO END2 NO END3	Add END, END1, END2 or END3 in proper position.	END, END1, END2 or END3 is not found.
DUPLICATE END1 DUPLICATE END2 DUPLICATE END3	Remove extra END1, END2 or END3.	Multiple END1, END2 or END3 are found.

Alarm number	Faulty location/ corrective action	Contents
GARBAGE AFTER END GARBAGE AFTER END2 GARBAGE AFTER END3	Remove unnecessary nets, and move necessary nets to proper position so that they will be executed.	There are some nets after END, END2 or END3, which will not be executed.
OVERLAPPED JMP	If JMPE is missing, add it in proper position. If the JMP is unnecessary, remove it.	There is no JMPE that corresponds to this JMP.
JMP/JMPE TO BAD COM LEVEL	JMP and corresponding JMPE must have same COM/COME status. Review JMP range and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMP and corresponding JMPE have different COM/ COME status.
COME IN JMP	COME and corresponding COM must have same JMP/ JMPE status. Review COM range and JMP range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	COME is found between JMP and JMPE, and COM and corresponding COME have different JMP/JMPE status.
END IN JMP END1 IN JMP END2 IN JMP END3 IN JMP	If JMPE is missing, add it in proper position. If JMP is unnecessary, remove it.	END, END1, END2, or END3 is found between JMP and JMPE.
SP/SPE IN JMP	If JMPE is missing, add it in proper position. If the JMP is unnecessary, remove it.	SP or SPE is found between JMP and JMPE.
JMPB OVER COM BORDER	JMPB and its destination must have same COM/ COME status. Review range of JMPB and COM range, to adjust not to overlap with each other: it is possible that one range includes the other completely.	JMPB and its destination differ in COM/COME status.
JMPB OVER LEVEL	JMPB can only jump to the same program level, or within a subprogram. If the JMPB is unnecessary, remove it. If LBL for the JMPB is missing, add it in proper position. If it should be JMPC, correct it.	JMPB jumps to different program level.
LBL FOR JMPB NOT FOUND	If JMPB is unnecessary, remove it. If LBL is missing, add it in proper position.	Can not find proper LBL for JMPB.
JMPC IN BAD LEVEL	JMPC is used to jump from a subprogram to level 2. If the JMPC is unnecessary, remove it. If it should be JMPB or JMP, correct it.	JMPC is used in other than subprogram.

Alarm number	Faulty location/ corrective action	Contents
LBL FOR JMPC NOT FOUND	If JMPC is unnecessary, remove it. If LBL is missing, add it in proper position: JMPC jumps into level 2. If it should be JMPB or JMP, correct it.	Can not find proper LBL for JMPC.
LBL FOR JMPC IN BAD LEVEL	JMPC is used to jump from a subprogram to level 2. If the JMPC is unnecessary, remove it. If another LBL of same L–address that the JMPC is intended to jump exists in the subprogram, assign different L–address to these two LBLs. If it should be JMPB or JMP, correct it.	Destination of JMPC is not level 2.
JMPC INTO COM	LBL for JMPC must be located out of any COM and COME pair. If the JMPC is unnecessary, remove it. If the LBL is located wrong, move it to correct position. If the L–address of JMPC is wrong, correct it.	JMPC jumps to LBL between COM and COME.
JMPE WITHOUT JMP	If JMP is missing, add it in proper position. If the JMPE is unnecessary, remove it.	There is no JMP that corresponds to this JMPE.
TOO MANY LBL	Remove unnecessary LBLs. If this error still occurs, adjust the construction of program to use less LBLs.	There are too many LBLs.
DUPLICATE LBL	If some of these LBLs are unnecessary, remove them. If all of these LBLs is necessary, assign other L–addresses to them to make all LBLs unique.	Same L–address is used in plural LBLs.
OVERLAPPED SP	If SP is missing, add it in proper position. If the SPE is unnecessary, remove it.	There is no SP that corresponds to this SPE.
SPE WITHOUT SP	If SP is missing, add it in proper position. If the SPE is unnecessary, remove it.	There is no SP that corresponds to this SPE.
END IN SP	If SPE is missing, add it in proper position. If END is in wrong place, move it to proper position.	END is found between SP and SPE.
DUPLICATE P ADDRESS	If some of these SPs are unnecessary, remove them. If all of these SPs is necessary, assign other P–addresses to them to make all SPs unique.	Same P–address is used in plural SPs.

Alarm number	Faulty location/ corrective action	Contents
DUPLICATE TMRB NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural TMRBs have the same number as their parameter. (This is warning.)
ILLEGAL TMRB NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	TMRB has parameter number that is out of range.
DUPLICATE TMR NUMBER (WARNING)	If some of them are unnecessary, remove them. If all of them are necessary, assign other number to parameter of them to make them unique. (If two or more instructions with same parameter number will never be active simultaneously at one time, the Ladder program has a possibility to work correctly, however, it is recommended from safety and maintenance points of view, that all these instructions should have different parameter number with each other.)	Plural TMRs have the same number as their parameter. (This is warning.)
ILLEGAL TMR NUMBER	If unnecessary, remove it. Assign correct number not to exceed the maximum number defined by each PMC model.	TMR has parameter number that is out of range.
NO SUCH SUBPROGRAM	If it calls wrong subprogram, correct it. If the subprogram is missing, create it.	Subprogram that is called by CALL/CALLU is not found.
UNAVAILABLE INSTRUCTION	Confirm that this ladder program is correct one. If this program is correct one, all these unsupported instructions have to be removed.	Unsupported instruction for this PMC model is found.
SP IN BAD LEVEL	SP can be used at top of a subprogram. Correct it so that no SP exists in other place.	SP is found in wrong place.
LADDER PROGRAM IS BROKEN	This ladder program must be all cleared once, and remake ladder program.	Ladder program may be broken by some reason.

Alarm number	Faulty location/ corrective action	Contents
NO WRITE COIL	Add proper write coil.	Write coil is necessary, but is not found.
CALL/CALLU IN BAD LEVEL	CALL/CALLU must be used in Level 2 or in subprograms. Do not use any other places.	CALL/CALLU is used in wrong place.
SP IN LEVEL3	If END3 is located wrong, move it to correct position. If the SP is unnecessary, remove it.	SP is found in level 3.

(3) Messages displayed during net editing of the PMC ladder diagram editing

Alarm number	Faulty location/ corrective action	Contents
TOO MANY FUNCTIONAL INSTRUCTIONS IN ONE NET	Only one functional instruction is allowed to constitute a net. If necessary, divide the net into plural nets.	Too many functional instructions are in one net.
TOO LARGE NET	Divide the net into plural nets so that step number in a net may become small.	Net is too large. When a net is converted into the object, the net exceeds 256 steps.
NO INPUT FOR OPERATION	Coil without input, or coil connected to output of functional instruction that has no output, causes this error. If coil is not necessary, remove it. If necessary, connect it to meaningful input.	No signal is provided for logical operation.
OPERATION AFTER FUNCTION IS FORBIDDEN	Output of functional instruction can not be connected to a contact, nor to conjunction with other signal that will be implemented by logical–or operation.	No logical operation with functional instruction output is permitted, except write coils.
WRITE COIL IS EXPECTED	Add proper write coil to the net.	Write coil is expected, but not found.
BAD COIL LOCATION	Coil can be located only at rightmost column. Any coil located at other place must be erased once, and place necessary coils in correct place.	Coil is located in bad position.
SHORT CIRCUIT	Find contact with terminals connected by short circuit, and correct connections.	Some contacts are connected with short circuit.
FUNCTION AFTER DIVERGENCE IS FORBIDDEN	Functional instruction can not be used in output section of net. If necessary, divide the net into plural nets.	Functional instruction is used in output section of net.
ALL COIL MUST HAVE SAME INPUT	Left terminals of all coils in a net must be connected to same input point.	When a net contains more than one coil, the coils should not have any contact beside them affects only of the coils.

Alarm number	Faulty location/ corrective action	Contents
BAD CONDITION INPUT	Check the connection of all condition inputs of the functional instruction. Especially for functional instruction that has more than one condition input, check if connections to condition inputs interfere with each other.	Some condition input of functional instruction is not connected correctly.
NO CONNECTION	Find gap that is expected to be connected, and correct the connection.	There is signal connected to nowhere.
NET IS TOO COMPLICATED	Examine every connection, and find unnecessarily bending connection, or coils that are connected to different point.	Net is too complicated to analyze.
PARAMETER IS NOT SUPPLIED	Enter all of the relay addresses, and parameters of functional instructions.	Relay with blank address, or blank parameter of functional instruction, is found.

8.2.5 Error messages (For EDIT: PMC–SA1)

Message	Faulty location/ corrective action	Contents
ADDRESS BIT NOTHING	Set an address.	The address of the relay/ coil is not set.
FUNCTION NOT FOUND	Enter a correct function instruction number.	There is no functional instruction of the input number.
COM FUNCTION MISSING	If the specified COM instructions are insufficient, add COM instructions at proper locations. Delete any unnecessary COME instructions.	The functional instruction COM (SUB9) is not correctly dealt with. Correspondence of COM and COME (SUB29) is incorrect. Or, the number of coil controlled by COM is specified by the model which the number cannot be specified.
EDIT BUFFER OVER	Please reduce NET under editing.	There in no empty area of the buffer for the editing.
END FUNCTION MISSING	Add the END, END1, END2, and END3 instructions at proper locations.	Functional instruction END1, END2, END3 and END do not exist. Or, there are error net in END1, END2, END3, END. Or, order of END1, END2, END3, and END is not correct.
ERROR NET FOUND	Modify the erroneous net.	There is an error net.
ILLEGAL FUNCTION NO.	Specify a correct function instruction number.	The wrong number of the functional instruction is searched.
FUNCTION LINE ILLEGAL	Check if the control condition of the function instruction is connected correctly.	The functional instruction is not correctly connected.
HORIZONTAL LINE ILLEGAL	Correct the connection.	The horizontal line of the net is not connected.
ILLEGAL NETS CLEARED	Save the ladder after editing.	Because the power had been turn off while editing LADDER, some net under editing was cleared.
ILLEGAL OPERATION	Perform a correct operation.	Operation is not correct. The value is not specified and only <INPUT> key was pushed. The address data is not correctly inputted. Because the space to display the instruction on screen is not enough, the functional instruction cannot be made.
SYMBOL UNDEFINED	Specify a defined symbol or address.	The symbol which was inputted is not defined.

Message	Faulty location/ corrective action	Contents
INPUT INVALID	Enter correct data.	There is an incorrect input data. Nonnumerical value was inputted with COPY, INSLIN, C–UP, C–DOWN etc. The input address was specified for write coil. An illegal character was specified for the data table.
NET TOO LARGE	Please reduce the net under editing.	The input net is larger than the editing buffer.
JUMP FUNCTION MISSING	If the specified JMP instructions are insufficient, add JMP instructions at proper locations. Delete any unnecessary JMPE instructions.	The functional instruction JMP(SUB10) is not correctly dealt with. Correspondence of JMP and JMPE(SUB30) is incorrect. The number of coil to jump is specified by the model which the number of coil cannot specified.
LADDER BROKEN	Delete the entire ladder program once, then re–crate a ladder program.	LADDER is broken.
LADDER ILLEGAL	Modify the ladder.	There is an incorrect LADDER.
IMPOSSIBLE WRITE	The ladder on the ROM cannot be edited.	You try to edit sequence program on the ROM.
OBJECT BUFFER OVER	Please reduce the LADDER.	The sequence program area was filled.
PARAMETER NOTHING	Enter necessary parameters.	There is no parameter of the functional instruction.
PLEASE COMPLETE NET	After correcting the error net, please continue operating.	The error net was found in LADDER.
PLEASE KEY IN SUB NO.	If you do not input the functional instruction, please push soft key “FUNC again.	Please input the number of the functional instruction.
PROGRAM MODULE NOTHING	Use a RAM for debugging or a ROM for sequence programs.	You tried to edit though there was neither RAM for debugging nor ROM for sequence program.
RELAY COIL FORBIT	Delete an unnecessary relay or coil.	There is an unnecessary relay or coil.
RELAY OR COIL NOTHING	Add a relay or coil.	The relay or the coil does not suffice.
PLEASE CLEAR ALL	Please clear the all data.	It is impossible to recover the sequence program.
SYMBOL DATA DUPLICATE	If a problem occurs due to simultaneous operation, change the symbol to an unused one.	The same symbol name is defined in other place.

Message	Faulty location/ corrective action	Contents
COMMENT DATA OVERFLOW	Please reduce the number of the comment.	The comment data area was filled.
SYMBOL DATA OVERFLOW	Please reduce the number of the symbol.	The symbol data area was filled.
VERTICAL LINE ILLEGAL	Correct the connection.	There is an incorrect vertical line of the net.
MESSAGE DATA OVERFLOW	Please reduce the number of the message.	The message data area was filled.
1ST LEVEL EXECUTE TIME OVER	Please reduce the 1st level of LADDER.	The 1st level of LADDER is too large to complete execution in time.
PARA NO. RANGE ERR : function–instruction–name	Correct the number so that it is within the range.	The parameter number for a function instruction is not in the range.
PARA NO. DUPLICATE : function–instruction–name EXIT ?	If the duplicate numbers pose the problem of simultaneous operation, change the parameter number to an unused number.	The parameter number for a function instruction is used more than once.

8.2.6 Error messages (at assignment data editing)

Message	Contents and solution
ERR: GROUP NO. (0—15)	The group number must be 0 to 15.
ERR: BASE NO. (0—3)	The base number must be 0 to 3.
WARN: BASE NO. MUST BE 0	For I/O Unit–B, the base number must be 0. The base number was set to 0 forcibly.
ERR: SLOT NO. (1—10)	For I/O Unit–A, the slot number must be 1 to 10.
ERR: SLOT NO. (0, 1—30)	For I/O Unit–B, the slot number must be 0 or a number 1 to 30.
ERR: SLOT NO. MUST BE 0	When power on/off information for I/O Unit–B is set, the slot number must be 0.
ERR: ILLEGAL NAME	The input assignment name is illegal or not supported. Enter a correct name.
INPUT INVALID	The input character string is illegal. Enter a character string in a correct input format again.
IMPOSSIBLE WRITE	An attempt was made to edit ROM data. ROM data cannot be edited.
ERR: ADDRESS ALREADY ASSIGNED	The specified address is already assigned. Assign another address. Alternatively, delete the existing data, then set the address again.
ERR: ADDRESS OVER	A set address exceeds the maximum value (X127, Y127). Check the addresses dedicated to the unit to be set.
ERR: SLOT ALREADY DEFINED	The specified slot is already assigned. Check the existing data.
WARN: SLOT ALREADY DEFINED	The specified slot is already assigned. Check the existing data.
ERR: UNIT TYPE MISMATCH (IN OR OUT)	An output module cannot be allocated to an X address, or an input module cannot be allocated to a Y address.
WARN: UNIT TYPE MISMATCH (MODEL)	I/O Unit–A and I/O Unit–B are assigned to the same group. These units cannot exist together within the same group.

8.2.7 Error messages (for I/O)

	Message	Faulty location/ corrective action	Contents
FLASH ROM	PROGRAM NOTHING	Write a ladder program to the flash ROM.	There is no program on flash ROM.
	ERASE ERROR	Replacement is required. Ask FANUC Service Representative for replacement.	Flash ROM is abnormal.
	WRITE ERROR		
	READ ERROR		
	ANOTHER USED	Do not use the flash ROM for other than the PMC.	Flash ROM is used by other than PMC.
	NOT EMG STOP	Set the emergency stop state.	The CNC is not in the emergency stop state.
	NO OPTION	An option is required.	No option is specified.
	IMPOSSIBLE WRITE (SIZE OVER) NO SPACE	Try the condense function. (EDIT/CLEAR screen) If the same phenomenon is still observed, the flash ROM size must be enlarged.	The sequence program is larger than the flash ROM size. (At write)
		RAM must be enlarged.	The sequence program to be read is larger than the RAM size. (At read)
HOST. FDCAS. OTHERS	I/O OPEN ERROR nn	Check whether RS–232C is used by other than PMC. On the online setting screen, check that “NOT USE” is indicated for RS–232C.	nn=–1 : RS–232C is used by other than PMC.
		Check whether channel setting, connection, baud rate, and other settings are correct.	nn=6: The RS–232C option is not found. nn=20: RS–232C connection is incorrect.
	I/O WRITE ERROR nn	Check whether channel setting, connection, baud rate, and other settings are correct.	nn=20 : RS–232C connection is incorrect.
		Check whether the cable is broken.	nn=22 : Communication cannot be performed correctly.
	I/O READ ERROR nn	Check whether channel setting, connection, baud rate, and other settings are correct.	nn=20 : RS–232C connection is incorrect.
		Check whether the cable is broken.	nn=22 : Communication cannot be performed correctly.
	ADDRESS IS OUT OF RANGE(xxxxxx)	Transfer data held in the RAM area.	Data for other than the PMC debugging RAM area was transferred. xxxxxx : Indicates the transfer address.
	DATA ERROR	Check the cable and setting (speed).	Illegal data was read.
	PROGRAM DATA ERROR	Check the alarm on the alarm screen.	An attempt was made to output data, but the data was illegal.

	Message	Faulty location/ corrective action	Contents
MEMORY CARD	CREATE ERROR	Specify a file name in the MS–DOS form.	The specified file name is illegal.
	NO SPACE WRITE ERROR	Delete files to create free space.	There is not enough free space on the memory card.
	NOT READY	Check whether a memory card is installed.	No memory card is installed.
	I/O FORMAT ERROR	Perform formatting.	Unformatted.
	WRITE PROTECT	Set the protect switch of the memory card to OFF.	The memory card is protected.
	BATTERY ALARM	Replace the memory card battery.	The battery for the memory card is too weak.
	FILE NOT FOUND	With LIST, check the file name or file number.	The specified file number or file name is not found.
	I/O DELETE ERROR	Change the file attribute.	The file cannot be deleted.
	PROGRAM ALREADY EXISTS	Use another file name.	There are duplicate file names
	I/O WRITE ERROR nn I/O READ ERROR nn I/O COMPARE ERROR nn I/O DELETE ERROR nn I/O LIST ERROR nn I/O FORMAT ERROR nn	Check whether a memory card is installed.	nn=30: No memory card is installed.
		Set the protect switch of the memory card to OFF. Replace the memory card with an S–RAM card.	nn=31: The memory card cannot be written to.
		Replace the memory card battery.	nn=32: The battery for the memory card is too weak.
		Delete files to create free space.	nn=102: There is not enough free space on the memory card.
		Format the memory card.	nn=105, 135: The memory card is unformatted.
		With LIST, check the file name or file number.	nn=114: The specified file is not found.
		Check the file attribute.	nn=115: The specified file is protected.
COMMON	COMPARE ERR XXXXXX=AA : BB CONT?(Y/N)	To continue operation, enter <Y>;otherwise,enter <N>. Then,press the <INPUT> key.	Data differs between the device and PMC. XXXXXX: Address aa: Data on the PMC bb: Data on the device

8.3 Alarms Indicated on the Screen of the Power Mate CNC Manager (FANUC Servo Motor Amplifier β Series (I/O Link Option))

8.3.1 Alarms indicated on the "message line" of the power mate CNC manager screen

Number	Message	Contents
003	PROGRAM NOT REGISTERED	An attempt was made to punch a program not stored in the program area (program → servo amplifier unit).
004	PROGRAM PROTECTED	A read operation (servo amplifier unit → program) was executed for the program area when the memory protect signal (KEY) is turned off.
009	CNC DATA NOT CORRECT	• When a program number created by a read operation (servo amplifier unit → program) is already present in the program area, a read operation (servo amplifier unit → program) was executed. • When a program number created by a read operation (servo amplifier unit → program) is selected, a read operation (servo amplifier unit → program) was executed.
018	MEMORY OVER FLOW	When there is no free program area, a read operation (servo amplifier unit → program) was executed.
054	GROUP NOT CONNECTED	The servo amplifier unit is not connected.
056	FORMAT ERROR	For setting of a parameter(*), data other than numbers, signs, CAN, and INPUT was entered.
057	TOO MANY DIGITS	In a bit–type parameter(*), nine–digit or longer data was entered.
058	DATA IS OUT OF RANGE	A set value exceeded the allowable range of data.
064	FILE NOT REGISTERED	When the memory card has no program that can be punched (memory card → servo amplifier unit), a punch operation (memory card → servo amplifier unit) was executed.
079	UNEXPECTED ALARM	When the memory card is protected, a read operation (servo amplifier unit → memory card) was executed.
081	THIS PARAMETER IS UNAVAILABLE	An attempt was made to set a value for a parameter(*) number that is not present on the servo amplifier unit.

NOTE Parameter(*) = Parameter to be set on the power mate CNC manager screen

8.3.2 Alarms of the FANUC servo motor amplifier β series (I/O link option)

An alarm issued on the FANUC servo motor amplifier β series (I/O Link Option) (hereinafter referred to as the "I/O Link β Amplifier") can be checked with the power pate CNC manager.

Classification of alarms

The alarms of the I/O Link β Amplifier are classified as described below.

Number	Alarm type
000 to 299	Program or setting alarm
300 to 399, 401	Pulse coder alarm
400 to 499 (except 401)	Servo alarm
500 to 599	Overtravel alarm
–	System alarm or I/O Link alarm

Alarm details

The alarm details of the I/O Link β Amplifier are as indicated below. These alarms can be checked using the method below.

- Number: Alarm screen of the power mate CNC manager
- LED indication: LED on the servo amplifier

- Program or setting alarms (PS alarms)

No.	LED display	Description	Countermeasure
000		A parameter that requires power–down has been specified.	Turn the power off, then back on.
011		The specified feedrate is zero.	Check the feedrate parameter(*) specified with a function code.
013		The specified feedrate (maximum feedrate) is zero.	Check the value of parameter(*) 43, which indicates the maximum feedrate that can be specified.
070		More than 32 blocks have been registered for a buffering operation.	Reduce the number of registered blocks to 32.
090		Reference position setting cannot be executed normally.	Move the tool in the direction of reference position return in jog mode at a speed that causes the servo position error to exceed 128. Then, specify another reference position setting.
093		A first to third reference position return cannot be executed because the reference position has not yet been established.	Set the reference position.
224		The reference position has not yet been established. This occurs only when the ZRTN bit of parameter No.001 is set to 0.	Set the reference position.

No.	LED display	Description	Countermeasure
250		Input data 1 is invalid.	Check input data 1, specified with a function code.
251		Input data 2 is invalid.	Check input data 2, specified with a function code.
254		A function code or mode is invalid.	Check the command code, specified with a function code. Check the mode.
255		Operation cannot be activated because an invalid mode is specified or because block execution is in progress.	Check the mode. Check whether a block is being executed.
290		The interface switch signal (DRC) was switched during block execution.	Switch the signal after block execution stops.
291		The speed of an axial movement specified by an external pulse has exceeded the upper limit. This occurs only when the EPEXA bit of parameter 001 is set to 1.	Check the speed specified by the external pulse. Check the magnification of the external pulse (parameters(*) 062 and 063).
292		A checksum error for the battery–powered memory was detected.	Parameters are cleared. Set the parameters again. If this alarm subsequently recurs, replace the unit.

NOTE Parameter(*) = Parameter to be set on the power mate CNC manager screen

- Pulse coder alarms

No.	LED display	Description	Countermeasure
300		A communication error (DTER) for the serial pulse coder was detected.	Check the continuity of the signal cable. If the cable is normal, the pulse coder may be defective. Turn the power off. If the alarm recurs when the power is reapplied, replace the serial pulse coder, together with the motor.
301		A communication error (CRCER) for the serial pulse coder was detected.	Check the continuity of the signal cable. If the cable is normal, the pulse coder or servo amplifier unit may be defective. This error can also be caused by external noise.
302		A communication error (STBER) for the serial pulse coder was detected.	Check the continuity of the signal cable. If the cable is normal, the pulse coder or servo amplifier unit may be defective. This error can also be caused by external noise.

No.	LED display	Description	Countermeasure
303		An LED disconnection (LDAL) was detected in the serial pulse coder.	Turn the power off. If this alarm recurs when the power is reapplied, replace the motor.
304		A mispulse alarm (PMAL) for the serial pulse coder was detected.	Turn the power off. If this alarm recurs when the power is reapplied, replace the motor.
305		A miscount alarm (CMAL) for the serial pulse coder was detected.	Turn the power off. If the alarm recurs when the power is re–applied, replace the motor. If the alarm does not recur, restart the operation from reference position return.
306		The motor has overheated (OHAL).	This alarm is issued when the motor has overheated, causing the thermostat to trip. Possible causes include an excessively high ambient temperature and excessively strict operating conditions. Check the actual cause. If it occurs again when the motor is cooled, the motor or servo amplifier may have failed. Replace the faulty motor or servo amplifier.
308		A soft phase alarm (SPHAL) was detected.	Turn the power off. This alarm may be caused by noise.
319		When the absolute pulse coder is used, the motor has not yet rotated through more than one turn after the first power–up.	Cause the motor to rotate through more than one turn in jog feed mode, then turn the power off then back on.
350		The battery voltage of the absolute pulse coder is low.	Replace the battery. Restart the operation from reference position return.
351		The battery voltage of the absolute pulse coder is low. (warning)	Replace the battery.
401		A communication error was detected in the serial pulse coder.	Check the continuity of the pulse coder signal cable. If the cable is normal, the pulse coder or servo amplifier unit may be defective. This error can also be caused by external noise.

- Servo alarms

No.	LED display	Description		Countermeasure
400		The servo motor has overheated (estimated value).		The motor operation condition may be too severe. Check the operation condition.
403		SVU–12 SVU–20	The cooling fins have overheated. (hardware detection)	The load on the motor may be too high. Re–examine the load conditions.
		SVU–40 SVU–80	This alarm will not be issued.	
404		The regenerative discharge unit has overheated.		This alarm is issued when the average regenerative discharge energy is too high (when the acceleration/deceleration frequency is too high, for example). (1) When the separate regenerative discharge resistor is not used: For the SVU–12 and the SVU–20, check whether the CX11–6 connector is short–circuited with a dummy connector; for the SVU–40 and the SVU–80, check whether the CX20 and CX23 connectors are short–circuited with a dummy connector. (2) The average regenerative discharge energy may be too high. Decrease the acceleration/deceleration frequency. (3) The separate regenerative discharge unit may not be connected properly. Check the connection. (4) The thermostat of the separate regenerative discharge unit may be defective. Disconnect the separate regenerative discharge unit, then check the thermostat. If the thermostat is open even through the separate regenerative discharge unit is cool, replace the separate regenerative discharge unit. (5) The resistor of the separate regenerative discharge unit may be defective. Disconnect the separate regenerative discharge unit, then check the resistance. If it does not fall in the range of the predetermined resistance ±20%, replace the separate regenerative discharge unit. (6) If (1) to (5) are not the cause of the alarm, replace the servo amplifier unit.
405		Reference position return could not be executed correctly.		Re–execute reference position return. If a value in the range of 4 to 96 is set for parameter(*) 032 (CMR), an alarm may be issued. In this case, prevent an alarm from being issued by setting N405 (parameter(*) 001#4) to “1”.
410		The servo position error in the stop state is larger than the value specified in parameter(*) 110.		Determine the mechanical cause of the large position error. If no mechanical cause is found, specify a larger value for the parameter(*).

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No.	LED display	Description	Countermeasure
411		The servo position error during movement is larger than the value specified in parameter(*) 182.	Determine the mechanical cause of the large position error. If no mechanical cause is found, apply any of the following countermeasures: • Specify a larger value for the parameter(*). • Specify a lower feedrate. • Increase the time constants.
412		[SVU–12, SVU–20] An overcurrent alarm is issued.	This alarm is issued when an excessively large current flows in the main circuit. (1) Check whether a valid motor number is specified in parameter(*) 30. (2) Check whether the standard values are specified in the current control parameters(*) for servo control. Correct current control is possible only when the standard values are specified for the following parameters(*): No.70, 71, 72, 78, 79, 84, 85, 86, 87, 88, 89, 90 (3) Disconnect the power line from the servo amplifier unit connector. Then, release the emergency stop state. – If the overcurrent alarm continues to be issued, replace the servo amplifier unit. – If no overcurrent alarm is issued, go to (4). (4) Check the insulation between the ground and each of U, V, and W. → If the insulation is satisfactory, go to (5). If a short–circuit is detected, disconnect the power line from the motor connector. Then, check the insulation between the ground and each of U, V, and W of the motor. → If a short–circuit is found between the ground and U, V, or W of the motor, replace the motor. → If the insulation is satisfactory, replace the power line. (5) Connect the power line. Observe the waveform of the motor current (IR, IS) while the motor is accelerating or decelerating. → If the motor current (IR, IS) does not exhibit a normal sine wave, replace the servo amplifier unit. (6) Check if the motor current (IR, IS) waveforms include noise. → When noise is included, take an action such as making a connection to shield ground. → When noise is not included, replace the servo amplifier unit. (7) If (1) to (6) above are not the cause of the alarm, the pulse coder, or command cable may be defective.

No.	LED display	Description	Countermeasure
412		[SVU–40, SVU–80] An overcurrent alarm or IPM alarm is issued.	This alarm is issued in the following cases: • This alarm is issued when an excessively large current flows in the main circuit. • This alarm is issued when an error (overcurrent, overheat, low IPM control power supply voltage) is detected in the IPM (semiconductor driving the motor).
		(1) Check whether a valid motor number is specified in parameter(*) 30. (2) Check whether the standard values are specified in the current control parameters(*) for servo control. Correct current control is possible only when the standard values are specified for the following parameters(*): No.70, 71, 72, 78, 79, 84, 85, 86, 87, 88, 89, 90 (3) Turn off the servo amplifier unit for about ten minutes, then release the emergency stop state. If no overcurrent alarm is issued, The IPM protection function (against overheat) may be operating. Possible causes of overheat include a high ambient temperature and a too severe motor operating condition. Check the cause. → If an overcurrent alarm is issued, go to (4). (4) Disconnect the power line from the servo amplifier unit connector. Then, release the emergency stop state. → If an overcurrent alarm is issued, the IPM protection function (against overcurrent, low control power supply voltage, overheat) may be operating or defective. Replace the IPM or servo amplifier unit. → If no overcurrent alarm is issued, go to (5). (5) Disconnect the power line from the amplifier connector. Check the insulation between the ground and each of U, V, and W. → If a short–circuit is found between the ground and U, V, or W of the motor, replace the motor. → If the insulation is satisfactory, replace the power line. (6) Connect the power line. Observe the waveform of the motor current (IR, IS) while the motor is accelerating or decelerating. → If the motor current (IR, IS) does not exhibit a normal sine wave, replace the servo amplifier unit. (7) Check whether the waveform of the motor current (IR, IS) contains noise. → If it contains noise, take appropriate measures against noise, such as grounding the shield. → If it does not contain noise, replace the servo amplifier unit. (8) If (1) to (7) above are not the cause of the alarm, the pulse coder, or command cable may be defective.	

No.	LED display	Description	Countermeasure
413		A DC link overvoltage alarm is issued.	This alarm is issued when the DC voltage of the main circuit power is too high.
		(1) When SVU–12 or SVU–20 is used, and a separate regenerative discharge unit is not used, check the specification to see if regenerative energy per one time does not exceed the allowable regenerative energy of the servo amplifier unit. (2) For the SVU–40 and the SVU–80, when the separate regenerative discharge resistor is not used, check whether the CX23 connector is short–circuited with a dummy connector. (3) The supply voltage for dynamic power may exceed the rated value. Check the voltage. If the voltage is too high, reduce the voltage to an appropriate level. (4) The regenerative discharge unit may not be properly connected. Check the connection. (5) The resistance of the separate regenerative discharge unit may be abnormal. Disconnect the separate regenerative discharge unit, then check the resistance. If the resistance is not within ±20% of the predetermined resistance, replace the separate regenerative discharge unit. (6) If (1) to (5) are not the cause of the alarm, replace the servo amplifier unit.	
414		A DC link low voltage alarm is issued.	This alarm is issued when the DC voltage of the main circuit power is too low.
		(1) 190 ms or longer may pass from the time when both the *ESP of the built–in DI and the *ESP of the I/O link interface signal are canceled until the external magnetic contactor inserted into the input for motive power turns on(including the operating time of the magnetic contactor). The magnetic contactor must turn on within 100 ms. (2) The external circuit breaker may be turned off. Check the circuit breaker. (3) The supply voltage for dynamic power is lower than the rated value. Check the voltage. If the voltage is too low, increase it to an appropriate level. (4) The external magnetic contactor may not be connected properly. Check the connection. If (1) to (4) are not the cause of the alarm, replace the servo amplifier unit.	

No.	LED display	Description	Countermeasure
417		A parameter(*) has been specified incorrectly.	Check the following parameters(*): No.030: Is the specified motor type correct? No.031: Is the specified direction of rotation of the motor correct? No.106: Is the denominator of the number of pulses per single revolution of the motor 0? No.180: Is the specified reference counter capacity 0 or a negative value?
418		A DO alarm is issued.	Replace the servo amplifier unit.
423		The specified speed exceeds 32767000 detection units per second.	Re–examine the CMR and speed settings.
425		The cooling fan has stopped.	This alarm is issued when the fan motor built into the servo amplifier unit has failed. The fan motor is consumable.
		(1) Check that the fan is not clogged with foreign matter. (2) Check that the power connector of the fan is connected properly. (3) Replace the fan or servo amplifier unit.	
446		The external pulse input line is disconnected.	Connect the external pulse input signal correctly.
447		The velocity deviation is too high (velocity control)	Check the actual velocity. See the settings of parameter(*) 136.

NOTE Parameter(*) = Parameter to be set on the power mate CNC manager or I/O Link β amplifier

- Overtravel alarms

No.	LED display	Description	Countermeasure
500		The positive stroke limit has been exceeded.	Check whether *+OT and *–OT are connected correctly. Check whether a correct move command is specified. Move the tool in the opposite direction in jog mode, then perform a reset.
501		The negative stroke limit has been exceeded.	
510		The positive soft stroke limit has been exceeded.	Check whether appropriate values have been specified for parameters(*) 142 and 143. Check whether a valid move command is specified. Move the tool in the opposite direction in jog mode, then perform a reset.
511		The negative soft stroke limit has been exceeded.	

NOTE Parameter(*) = Parameter to be set on the power mate CNC manager or I/O Link β amplifier

- System alarms

No.	LED display	Description	Countermeasure
–		An error was detected in the RAM write/read test at power–up.	Replace the servo amplifier unit.
–		An error was detected in the data collation check for the battery–powered memory.	Turn the power off then back on. Then, re–enter the parameters(*). If this alarm recurs, replace the servo amplifier unit.
–		A data transfer alarm for the battery–powered memory has been issued.	Replace the servo amplifier unit.
–		A watchdog alarm was issued.	Turn the power off then back on. If this alarm recurs, replace the servo amplifier unit.
–		A checksum alarm for the control software ROM is issued.	Replace the servo amplifier unit.
–		A checksum alarm for the ROM that is built into the CPU is issued.	Replace the servo amplifier unit.
–		An error was detected in the control circuit.	Replace the servo amplifier unit.

NOTE Parameter(*) = Parameter to be set on the power mate CNC manager or I/O Link β amplifier

- I/O link alarm

No.	LED display	Description	Countermeasure
–		A FANUC I/O Link error occurred. A servo amplifier unit connected to the line was turned off.	Turn off the power to all units connected to the line. Then, turn on the slave devices, followed by the master device.

- No LED display

No.	LED display	Description	Countermeasure
–	No indicators lit	The control circuit is not operating normally.	(1) Check the 24–VDC control supply voltage. If the voltage is low, increase the voltage to an appropriate level. (2) Check whether a fuse in the servo amplifier unit has blown. If a blown fuse is found, replace it. If (1) and (2) are not the cause, replace the servo amplifier.

8.4 Alarms Displayed on Spindle Servo Unit and CNC

8.4.1 Alarms numbers and alarms displayed on the spindle amplifier

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
(750)	SPINDLE SERIAL LINK ERROR	A0 A	1 Replace the ROM on the SPM control printed circuit board. 2 Replace the SPM control printed circuit board.	The program does not start normally. ROM series error or hardware abnormality on the SPM control printed circuit board
(749)	S–SPINDLE LSI ERROR	A1	Replace the SPM control printed circuit board.	An abnormality was detected in the CPU peripheral circuit of the SPM control circuit.
7n01	SPN_n_ : MOTOR OVERHEAT	01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The thermostat embedded in the motor winding operated. The internal temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
7n02	SPN_n_ : EX SPEED ERROR	02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No. 4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in PRM4082 is insufficient.
7n03	SPN_n_ : FUSE ON DC LINK BLOWN	03	1 Replace the SPM unit. 2 Check the motor insulation status. 3 Replace the interface cable.	The PSM becomes ready (00 is indicated), but the DC link voltage is too low in the SPM. The fuse in the DC link section in the SPM is blown. (The power device is damaged or the motor is ground–fault.) The JX1A/JX1B connection cable is abnormal.
7n04	SPN_n_ : INPUT FUSE/ POWER FAULT	04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (PSM alarm indication : 6)

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n06	SPN_n_ : THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.
7n07	SPN_n_ : OVERSPEED	07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, positional deviations were accumulated excessively (SFR and SRV were turned off during spindle synchronization.)
7n09	SPN_n_ : OVERHEAT MAIN CIRCUIT	09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the SPM unit.	Abnormal temperature rise of the power transistor radiator
7n11	SPN_n_ : OVERVOLT POW CIRCUIT	11	1 Check the selected PSM. 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200–V system) or 530 VAC (for the 400–V system), improve the power supply impedance.	Overvoltage of the DC link section of the PSM was detected. (PSM alarm indication: 7) PSM selection error. (The maximum output specification of the PSM is exceeded.)
7n12	SPN_n_ : OVERCURRENT POW CIRCUIT	12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the SPM unit.	The motor output current is abnormally high. A motor–specific parameter does not match the motor model. Poor motor insulation
7n15	SPN_n_ : SP SWITCH CONTROL ALARM	15	1 Check and correct the ladder sequence. 2 Replace the switching MC.	The switch sequence in spindle switch/output switch operation is abnormal. The switching MC contact status check signal and command do not match.

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n16	SPN_n_ : RAM FAULT	16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
7n18	SPN_n_ : SUMCHECK ERROR PGM DATA	18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
7n19	SPN_n_ : EX OFFSET CURRENT U	19	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value for the U phase current detection circuit is abnormal.)
7n20	SPN_n_ : EX OFFSET CURRENT V	20	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value of the V phase current detection circuit is abnormal.)
7n21	SPN_n_ : POS SENSOR POLARITY ERROR	21	Check and correct the parameters. (PRM4000#0, 4001#4)	The polarity parameter setting of the position sensor is wrong.
7n24	SPN_n_ : SERIAL TRANSFER ERROR	24	1 Place the CNC–to–spindle cable away from the power cable. 2 Replace the cable.	The CNC power is turned off (normal power–off or broken cable). An error is detected in communication data transferred to the CNC.
7n26	SPN_n_ : DISCONNECT C–VELO DETECT	26	1 Replace the cable. 2 Re–adjust the pre–amplifier.	The signal amplitude of the detection signal (connector JY2) on the Cs contour control motor side is abnormal. (Unconnected cable, adjustment error, etc.)
7n27	SPN_n_ : DISCONNECT POS–CODER	27	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The spindle position coder (connector JY4) signal is abnormal. 2 The signal amplitude (connector JY2) of the MZ or BZ sensor is abnormal. (Unconnected cable, adjustment error, etc.)

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n28	SPN_n_ : DISCONNECT C–POS DETECT	28	1 Replace the cable 2 Re–adjust the pre–amplifier.	The position detection signal (connector JY5) for Cs contour control is abnormal. (Unconnected cable, adjustment error, etc.)
7n29	SPN_n_ : SHORTTIME OVERLOAD	29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)
7n30	SPN_n_ : OVERCURRENT POW CIRCUIT	30	Check and correct the power supply voltage.	Overcurrent is detected in PSM main circuit input. (PSM alarm indication: 1) Unbalanced power supply. PSM selection error (The maximum PSM output specification is exceeded.)
7n31	SPN_n_ : MOTOR LOCK OR V–SIG LOS	31	1 Check and correct the load status. 2 Replace the motor sensor cable (JY2 or JY5).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.) Abnormality in the speed detection signal.
7n32	SPN_n_ : RAM FAULT SERIAL LSI	32	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (The LSI device for serial transfer is abnormal.)
7n33	SPN_n_ : SHORTAGE POWER CHARGE	33	1 Check and correct the power supply voltage. 2 Replace the PSM unit.	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor in the amplifier is turned on (such as open phase and defective charging resistor). (PSM alarm indication : 5)

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n34	SPN_n_ : PARAMETER SETTING ERROR	34	Correct a parameter value according to the manual. If the parameter number is unknown, connect the spindle check board, and check the indicated parameter.	Parameter data exceeding the allowable limit is set.
7n35	SPN_n_ : EX SETTING GEAR RATIO	35	Correct the value according to the parameter manual.	Gear ratio data exceeding the allowable limit is set.
7n36	SPN_n_ : OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.
7n37	SPN_n_ : SPEED DETECT PAR. ERROR	37	Correct the value according to the parameter manual.	The setting of the parameter for the number of pulses in the speed detector is incorrect.
7n39	SPN_n_ : 1–ROT Cs SIGNAL ERROR	39	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	An incorrect relationship between the 1–rotation signal and the number of AB phase pulses was detected during Cs contour control.
7n40	SPN_n_ : NO 1–ROT Cs SIGNAL DETECT	40	1 Adjust the 1–rotation signal in the pre–amplifier. 2 Check the cable shield status. 3 Replace the cable.	The 1–rotation signal is not generated during Cs contour control.
7n41	SPN_n_ : 1–ROT POS–CODER ERROR	41	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is abnormal. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is abnormal. 3 Parameter setting error
7n42	SPN_n_ : NO 1–ROT. POS–CODER DETECT	42	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is disconnected. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is disconnected.

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n43	SPN_n_ : DISCON. PC FOR DIF. SP. MODE	43	Replace the cable.	The differential speed position coder signal (connector JY8) in SPM type 3 is abnormal.
7n44	SPN_n_ : CONTROL CIRCUIT(AD) ERROR	44	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component was detected (A/D converter abnormality).
7n46	SPN_n_ : SCREW 1–ROT POS–COD. ALARM	46	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	An abnormality equivalent to ALM7n41 was detected during thread cutting operation.
7n47	SPN_n_ : POS–CODER SIGNAL ABNORMAL	47	1 Replace the cable. 2 Re–adjust the BZ sensor signal. 3 Correct the cable layout (vicinity of the power line).	1 The A/B phase signal of the spindle position coder (connector JY4) is abnormal. 2 The A/B phase signal (connector JY2) of the MZ or BZ sensor is abnormal. The relationship between the A/B phase and 1–rotation signal is incorrect (Pulse interval mismatch).
7n49	SPN_n_ : HIGH CONV. DIF. SPEED	49	Check whether the calculated differential speed value exceeds the maximum motor speed.	In differential speed mode, the speed of the other spindle converted to the speed of the local spindle has exceeded the allowable limit (the differential speed is calculated by multiplying the speed of the other spindle by the gear ratio).
7n50	SPN_n_ : SPNDL CONTROL OVERSPEED	50	Check whether the calculated value exceeds the maximum motor speed.	In spindle synchronization, the speed command calculation value exceeded the allowable limit (the motor speed is calculated by multiplying the specified spindle speed by the gear ratio).
7n51	SPN_n_ : LOW VOLT DC LINK	51	1 Check and correct the power supply voltage. 2 Replace the MC.	Input voltage drop was detected. (PSM alarm indication: 4) (Momentary power failure or poor MC contact)

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n52	SPN_n_ : ITP SIGNAL ABNORMAL I	52	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
7n53	SPN_n_ : ITP SIGNAL ABNORMAL II	53	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
7n54	SPN_n_ : OVERLOAD CURRENT	54	Review the load state.	An overload current was detected.
7n55	SPN_n_ : POWER LINE SWITCH ERROR	55	1 Replace the magnetic contactor. 2 Check and correct the sequence.	The power line state signal of the magnetic contactor for selecting a spindle or output is abnormal.
7n56	SPN_n_ : INNER COOLING FAN STOP	56	Replace the SPM unit.	The cooling fan in the SPM control circuit stopped.
7n57	SPN_n_ : EX DECELERATIO N POWER	57	1 Decrease the acceleration/deceleration duty. 2 Check the cooling condition (peripheral temperature). 3 If the cooling fan stops, replace the resistor. 4 If the resistance is abnormal, replace the resistor.	An overload was detected in the regenerative resistance. (PSMR alarm indication: 8) Thermostat operation or short–time overload was detected. The regenerative resistor was disconnected, or an abnormal resistance was detected.
7n58	SPN_n_ : OVERLOAD IN PSM	58	1 Check the PSM cooling status. 2 Replace the PSM unit.	The temperature of the radiator of the PSM has increased abnormally. (PSM alarm indication: 3)
7n59	SPN_n_ : COOLING FAN STOP IN PSM	59	Replace the SPM unit.	The cooling fan in the PSM stopped. (PSM alarm indication: 2)
7n62	SPN_n_ : MOTOR VCMD OVERFLOWE D	62	Check and correct the parameters. (PRM4021, 4056 to 4059)	The specified motor speed is too large.
7n66	SPN_n_ : AMP MODULE COMMUNICAT ION	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication between amplifiers.

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n73	SPN_n_ : MOTOR SENSOR DISCONNECTED	73	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Adjust the sensor.	The motor sensor feedback signal is not present.
7n74	SPN_n_ : CPU TEST ERROR	74	Replace the SPM control printed–circuit board.	An error was detected in a CPU test.
7n75	SPN_n_ : CRC ERROR	75	Replace the SPM control printed–circuit board.	An error was detected in a CRC test.
7n79	SPN_n_ : INITIAL TEST ERROR	79	Replace the SPM control printed–circuit board.	An error was detected in an initial test operation.
7n81	SPN_n_ : 1–ROT MOTOR SENSOR ERROR	81	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the motor sensor cannot be correctly detected.
7n82	SPN_n_ : NO 1–ROT MOTOR SENSOR	82	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the motor sensor is not generated.
7n83	SPN_n_ : MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal.
7n84	SPN_n_ : SPNDL SENSOR DISCONNECTED	84	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Check and correct the parameter. 5 Adjust the sensor.	The spindle sensor feedback signal is not present.
7n85	SPN_n_ : 1–ROT SPNDL SENSOR ERROR	85	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
7n86	SPN_n_ : NO 1–ROT SPNDL SENSOR ERROR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the spindle sensor is not generated.

No.	Message	SPM indication (*1)	Faulty location and remedy	Description
7n87	SPN_n_ : SPNDL SENSOR SIGNAL ERROR	87	The one–rotation signal of the spindle sensor is not generated.	An irregularity was detected in a spindle sensor feedback signal.
7n88	SPN_n_ : COOLING RADIFAN FAILURE	88	Replace the SPM external cooling fan.	The external cooling fan stopped.
7n97	SPN_n_ : OTHER SPINDLE ALARM	97	Replace the SPM.	Another irregularity was detected.
7n98	SPN_n_ : OTHER CONVERTER ALARM	98	Check the PSM alarm display.	A PSM alarm was detected.

No.	Message	SPM indication (*1)	Meaning	Description
9001	SPN_n_ : MOTOR OVERHEAT	01	1 Check and correct the peripheral temperature and load status. 2 If the cooling fan stops, replace it.	The thermostat embedded in the motor winding operated. The internal temperature of the motor exceeds the specified level. The motor is used in excess of the continuous rating, or the cooling component is abnormal.
9002	SPN_n_ : EX SPEED ERROR	02	1 Check and correct the cutting conditions to decrease the load. 2 Correct parameter No. 4082.	The motor speed cannot follow a specified speed. An excessive motor load torque is detected. The acceleration/deceleration time in PRM4082 is insufficient.
9003	SPN_n_ : FUSE ON DC LINK BLOWN	03	1 Replace the SPM unit. 2 Check the motor insulation status. 3 Replace the interface cable.	The PSM becomes ready (00 is indicated), but the DC link voltage is too low in the SPM. The fuse in the DC link section in the SPM is blown. (The power device is damaged or the motor is ground–fault.) The JX1A/JX1B connection cable is abnormal.

No.	Message	SPM indication (*1)	Meaning	Description
9004	SPN_n_ : INPUT FUSE/ POWER FAULT	04	Check the state of the input power supply to the PSM.	The PSM found a missing power supply phase. (PSM alarm indication : E)
9006	SPN_n_ : THERMAL SENSOR DISCONNECT	06	1 Check and correct the parameter. 2 Replace the feedback cable.	The temperature sensor of the motor is disconnected.
9007	SPN_n_ : OVERSPEED	07	Check for a sequence error. (For example, check whether spindle synchronization was specified when the spindle could not be turned.)	The motor speed has exceeded 115% of its rated speed. When the spindle axis was in position control mode, positional deviations were accumulated excessively (SFR and SRV were turned off during spindle synchronization.)
9009	SPN_n_ : OVERHEAT MAIN CIRCUIT	09	1 Improve the heat sink cooling status. 2 If the heat sink cooling fan stops, replace the SPM unit.	Abnormal temperature rise of the power transistor radiator
9011	SPN_n_ : OVERVOLT POW CIRCUIT	11	1 Check the selected PSM. 2 Check the input power voltage and change in power during motor deceleration. If the voltage exceeds 253 VAC (for the 200–V system) or 530 VAC (for the 400–V system), improve the power supply impedance.	Overvoltage of the DC link section of the PSM was detected. (PSM alarm indication: 7) PSM selection error. (The maximum output specification of the PSM is exceeded.)
9012	SPN_n_ : OVERCURRENT POW CIRCUIT	12	1 Check the motor insulation status. 2 Check the spindle parameters. 3 Replace the SPM unit.	The motor output current is abnormally high. A motor–specific parameter does not match the motor model. Poor motor insulation
9015	SPN_n_ : SP SWITCH CONTROL ALARM	15	1 Check and correct the ladder sequence. 2 Replace the switching MC.	The switch sequence in spindle switch/output switch operation is abnormal. The switching MC contact status check signal and command do not match.

No.	Message	SPM indication (*1)	Meaning	Description
9016	SPN_n_ : RAM FAULT	16	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (RAM for external data is abnormal.)
9018	SPN_n_ : SUMCHECK ERROR PGM DATA	18	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (Program ROM data is abnormal.)
9019	SPN_n_ : EX OFFSET CURRENT U	19	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value for the U phase current detection circuit is abnormal.)
9020	SPN_n_ : EX OFFSET CURRENT V	20	Replace the SPM unit.	Abnormality in an SPM component is detected. (The initial value of the V phase current detection circuit is abnormal.)
9021	SPN_n_ : POS SENSOR POLARITY ERROR	21	Check and correct the parameters. (PRM4000#0, 4001#4)	The polarity parameter setting of the position sensor is wrong.
9024	SPN_n_ : SERIAL TRANSFER ERROR	24	1 Place the CNC–to–spindle cable away from the power cable. 2 Replace the cable.	The CNC power is turned off (normal power–off or broken cable). An error is detected in communication data transferred to the CNC.
9027	SPN_n_ : DISCONNECT POS–CODER	27	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The spindle position coder (connector JY4) signal is abnormal. 2 The signal amplitude (connector JY2) of the MZ or BZ sensor is abnormal. (Unconnected cable, adjustment error, etc.)
9029	SPN_n_ : SHORTTIME OVERLOAD	29	Check and correct the load status.	Excessive load has been applied continuously for a certain period of time. (This alarm is issued also when the motor shaft has been locked in the excitation state.)

No.	Message	SPM indication (*1)	Meaning	Description
9030	SPN_n_ : OVERCURRENT POW CIRCUIT	30	Check and correct the power supply voltage.	Overcurrent is detected in PSM main circuit input. (PSM alarm indication: 1) Unbalanced power supply. PSM selection error (The maximum PSM output specification is exceeded.)
9031	SPN_n_ : MOTOR LOCK OR V–SIG LOS	31	1 Check and correct the load status. 2 Replace the motor sensor cable (JY2 or JY5).	The motor cannot rotate at a specified speed. (A level not exceeding the SST level for the rotation command has existed continuously.) Abnormality in the speed detection signal.
9032	SPN_n_ : RAM FAULT SERIAL LSI	32	Replace the SPM control printed circuit board.	Abnormality in an SPM control circuit component is detected. (The LSI device for serial transfer is abnormal.)
9033	SPN_n_ : SHORTAGE POWER CHARGE	33	1 Check and correct the power supply voltage. 2 Replace the PSM unit.	Charging of direct current power supply voltage in the power circuit section is insufficient when the magnetic contractor in the amplifier is turned on (such as open phase and defective charging resistor).
9034	SPN_n_ : PARAMETER SETTING ERROR	34	Correct a parameter value according to the manual. If the parameter number is unknown, connect the spindle check board, and check the indicated parameter.	Parameter data exceeding the allowable limit is set.
9035	SPN_n_ : EX SETTING GEAR RATIO	35	Correct the value according to the parameter manual.	Gear ratio data exceeding the allowable limit is set.
9036	SPN_n_ : OVERFLOW ERROR COUNTER	36	Check whether the position gain value is too large, and correct the value.	An error counter overflow occurred.
9037	SPN_n_ : SPEED DETECT PAR. ERROR	37	Correct the value according to the parameter manual.	The setting of the parameter for the number of pulses in the speed detector is incorrect.

No.	Message	SPM indication (*1)	Meaning	Description
9041	SPN_n_ : 1–ROT POS–CODER ERROR	41	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is abnormal. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is abnormal. 3 Parameter setting error
9042	SPN_n_ : NO 1–ROT. POS–CODER DETECT	42	1 Replace the cable. 2 Re–adjust the BZ sensor signal.	1 The 1–rotation signal of the spindle position coder (connector JY4) is disconnected. 2 The 1–rotation signal (connector JY2) of the MZ or BZ sensor is disconnected.
9043	SPN_n_ : DISCON. PC FOR DIF. SP. MODE	43	Replace the cable.	The differential speed position coder signal (connector JY8) in SPM type 3 is abnormal.
9046	SPN_n_ : SCREW 1–ROT POS–COD. ALARM	46	1 Check and correct the parameter. 2 Replace the cable. 3 Re–adjust the BZ sensor signal.	An abnormality equivalent to ALM9041 was detected during thread cutting operation.
9047	SPN_n_ : POS–CODER SIGNAL ABNORMAL	47	1 Replace the cable. 2 Re–adjust the BZ sensor signal. 3 Correct the cable layout (vicinity of the power line).	1 The A/B phase signal of the spindle position coder (connector JY4) is abnormal. 2 The A/B phase signal (connector JY2) of the MZ or BZ sensor is abnormal. The relationship between the A/B phase and 1–rotation signal is incorrect (Pulse interval mismatch).

No.	Message	SPM indication (*1)	Meaning	Description
9049	SPN_n_ : HIGH CONV. DIF. SPEED	49	Check whether the calculated differential speed value exceeds the maximum motor speed.	In differential speed mode, the speed of the other spindle converted to the speed of the local spindle has exceeded the allowable limit (the differential speed is calculated by multiplying the speed of the other spindle by the gear ratio).
9050	SPN_n_ : SPNDL CONTROL OVERSPEED	50	Check whether the calculated value exceeds the maximum motor speed.	In spindle synchronization, the speed command calculation value exceeded the allowable limit (the motor speed is calculated by multiplying the specified spindle speed by the gear ratio).
9051	SPN_n_ : LOW VOLT DC LINK	51	1 Check and correct the power supply voltage. 2 Replace the MC.	Input voltage drop was detected. (PSM alarm indication: 4) (Momentary power failure or poor MC contact)
9052	SPN_n_ : ITP SIGNAL ABNORMAL I	52	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
9053	SPN_n_ : ITP SIGNAL ABNORMAL II	53	1 Replace the SPM control printed circuit board. 2 Replace the spindle interface printed circuit board in the CNC.	NC interface abnormality was detected (the ITP signal stopped).
9054	SPN_n_ : OVERLOAD CURRENT	54	Review the load state.	An overload current was detected.
9055	SPN_n_ : POWER LINE SWITCH ERROR	55	1 Replace the magnetic contactor. 2 Check and correct the sequence.	The power line state signal of the magnetic contactor for selecting a spindle or output is abnormal.
9056	SPN_n_ : INNER COOLING FAN STOP	56	Replace the SPM unit.	The cooling fan in the SPM control circuit stopped.

No.	Message	SPM indication (*1)	Meaning	Description
9057	SPN_n_ : EX DECELERATION POWER	57	1 Decrease the acceleration/deceleration duty. 2 Check the cooling condition (peripheral temperature). 3 If the cooling fan stops, replace the resistor. 4 If the resistance is abnormal, replace the resistor.	An overload was detected in the regenerative resistance. (PSMR alarm indication: 8) Thermostat operation or short–time overload was detected. The regenerative resistor was disconnected, or an abnormal resistance was detected.
9058	SPN_n_ : OVERLOAD IN PSM	58	1 Check the PSM cooling status. 2 Replace the PSM unit.	The temperature of the radiator of the PSM has increased abnormally. (PSM alarm indication: 3)
9059	SPN_n_ : COOLING FAN STOP IN PSM	59	Replace the SPM unit.	The cooling fan in the PSM stopped. (PSM alarm indication: 2)
9066	SPN_n_ : AMP MODULE COMMUNICATION	66	1 Replace the cable. 2 Check and correct the connection.	An error was found in communication between amplifiers.
9073	SPN_n_ : MOTOR SENSOR DISCONNECTED	73	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Adjust the sensor.	The motor sensor feedback signal is not present.
9074	SPN_n_ : CPU TEST ERROR	74	Replace the SPM control printed–circuit board.	An error was detected in a CPU test.
9075	SPN_n_ : CRC ERROR	75	Replace the SPM control printed–circuit board.	An error was detected in a CRC test.
9079	SPN_n_ : INITIAL TEST ERROR	79	Replace the SPM control printed–circuit board.	An error was detected in an initial test operation.
9081	SPN_n_ : 1–ROT MOTOR SENSOR ERROR	81	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the motor sensor cannot be correctly detected.
9082	SPN_n_ : NO 1–ROT MOTOR SENSOR	82	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the motor sensor is not generated.
9083	SPN_n_ : MOTOR SENSOR SIGNAL ERROR	83	1 Replace the feedback cable. 2 Adjust the sensor.	An irregularity was detected in a motor sensor feedback signal.

No.	Message	SPM indication (*1)	Meaning	Description
9084	SPN_n_ : SPNDL SENSOR DISCONNECTED	84	1 Replace the feedback cable. 2 Check the shield processing. 3 Check and correct the connection. 4 Check and correct the parameter. 5 Adjust the sensor.	The spindle sensor feedback signal is not present.
9085	SPN_n_ : 1–ROT SPNDL SENSOR ERROR	85	1 Check and correct the parameter. 2 Replace the feedback cable. 3 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
9086	SPN_n_ : NO 1–ROT SPNDL SENSOR ERROR	86	1 Replace the feedback cable. 2 Adjust the sensor.	The one–rotation signal of the spindle sensor cannot be correctly detected.
9087	SPN_n_ : SPNDL SENSOR SIGNAL ERROR	87	The one–rotation signal of the spindle sensor is not generated.	An irregularity was detected in a spindle sensor feedback signal.
9088	SPN_n_ : COOLING RADIFAN FAILURE	88	Replace the SPM external cooling fan.	The external cooling fan stopped.
9097	SPN_n_ : OTHER SPINDLE ALARM		Check the SPM alarm display.	Other spindle alarm
9098	SPN_n_ : OTHER CONVERTER ALARM		Check the PSM alarm display.	Other converter alarm
9110	SPN_n_ : AMP COMMUNICATION ERROR	b0	1 Replace the communication cable between amplifier and module. 2 Replace the SPM or PSM control printed circuit board.	Communication error between amplifier and module
9111	SPN_n_ : CONV.LOW VOLT CONTROL	b1	Replace the PSM control printed circuit board.	Low converter control power supply voltage (PSM alarm indication : 6)
9112	SPN_n_ : CONV.EXDISCHARGE POW.	b2	1 Check the regenerative resistance. 2 Check the motor selection. 3 Replace the PSM	Excessive converter regenerative power (PSM alarm indication : 8)

No.	Message	SPM indication (*1)	Meaning	Description
9113	SPN_n_ : CONV.COOLING FAN FAILURE	b3	Replace the cooling fan.	Stopped cooling fan of the converter radiator (PSM alarm indication : A)
9120	SPN_n_ : COMMUNICATION DATA ERROR	C0	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm
9121	SPN_n_ : COMMUNICATION DATA ERROR	C1	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm
9122	SPN_n_ : COMMUNICATION DATA ERROR	C2	1 Replace the communication cable between CNC and SPM. 2 Replace the SPM control printed circuit board. 3 Replace the CNC side spindle interface printed circuit board.	Communication data alarm

8.4.2 Errors displayed on the spindle amplifier

NOTE*1 Note that the meanings of the SPM indications differ depending on which LED, the red or yellow LED, is on. When the yellow LED is on, an error code is indicated with a 2–digit number. Error codes can be checked with diagnostic information (DGN710, 711, 730, and 731).
When the red LED is on, the SPM indicates the number of an alarm generated in the serial spindle.
→ See "Subsec 8.4.1."

SPM indication(*1)	Faulty location and remedy	Description
00	Check the *ESP and MRDY sequence. (For MRDY, pay attention to the parameter setting regarding the use of the MRDY signal (PRM4001 #0).)	Although neither *ESP (emergency stop signal; there are two types of signals including the PMC signal and PSM contact signal (NOTE*2)) nor MRDY (machine ready signal) is input, SFR (forward rotation signal)/SRF (reverse rotation signal)/ORCM (orientation command) is input.
01	Check the spindle motor speed detector parameter (PRM4011#0, #1, #2).	When the spindle motor has a high–resolution magnetic pulse coder (Cs sensor) (PRM4001#6, #5 are set to 0 and 1, respectively), 128 /rev is to be set for the speed detector (PRM4011#2, #1, #0 are set to 0, 0, and 1, respectively). However, a value other than 128 /rev is set. In this case, the motor is not excited.
02	Check the parameters for the detector for Cs contour control (PRM4001#5 and 4018 #4).	Although use of a high–resolution magnetic pulse coder (PRM4001#5=1) or use of the Cs contour control function by the sensor (PRM4018#4=1) is not set, a Cs control command is input. In this case, the motor is not excited.
03	Check the position coder signal parameter (PRM4001#2).	Although use of the position coder signal (PRM4001#2=1) is not set, a servo mode (rigid tapping, spindle positioning) or spindle synchronization command is input. In this case, the motor is not excited.
04	Check the orientation software option.	Although the orientation option is not set, an orientation command signal (ORCM) is input.
05	Check the spindle output switching software option and power line status signal (RCH).	Although the output switching option is not set, the low–speed winding is selected (RCH = 1).
06	Check the sequence (CON, SFR, SRV).	Although the Cs contour control mode is specified, PMC signal (SFR/SRV) is not input.
07	Check the sequence (SFR, SRV).	Although the servo mode (rigid tapping, spindle positioning) is specified, PMC signal (SFR/SRV) is not input.
09	Check the sequence (SPSYC, SFR, SRV)	Although spindle synchronization mode is specified, PMC signal (SFR/SRV) is not input.

SPM indication(*1)	Faulty location and remedy	Description
10	During execution of the Cs contour axis control command, do not specify another operation mode. Before entering another mode, cancel the Cs contour control command.	Although Cs contour control mode is set, another operation mode (servo mode, spindle synchronization, or orientation) is specified.
11	During execution of the servo mode command, do not specify another operation mode. Before entering another mode, cancel the servo mode.	Although servo mode (rigid tapping, or spindle positioning) is set, another operation mode (Cs contour control, spindle synchronization, or orientation) is specified.
12	During execution of the spindle synchronization command, do not specify another operation mode. Before entering another mode, cancel the spindle synchronization command.	Although spindle synchronization is being performed, another operation mode (Cs contour control, servo mode, or orientation) is specified.
13	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the orientation command.	Although the orientation command is being executed, another operation mode (Cs contour control, servo mode, or synchronization) is specified.
14	Input the SFT or SRV signal.	The SFT and SRV signals are both input at the same time.
15	Check PRM4000#5 and PMC signal (CON).	When PRM4000#5 is set to 1 to indicate the presence of the differential speed mode function, Cs contour control is specified.
16	Check PRM4000#5 and PMC signal (DEFMD).	When PRM4000#5 is set to 0 to indicate the absence of the differential speed mode function, the differential speed mode command (DEFMD) is input.
17	Check PRM4011#2, #1, #0.	Setting of the speed detector parameter (PRM4011#2, #1, #0) is invalid. (The corresponding speed detector is not present.)
18	Check PRM4001#2 and PMC signal (ORCM).	Although PRM4001#2 is set to 0 not to use the position coder signal, a command for orientation by a position coder (ORCMA) is input.
19	During execution of the orientation command, do not specify another operation mode. Before entering another mode, cancel the orientation command.	Although orientation by a magnetic sensor is being performed, another operation mode is specified.
20	Check PRM4001#5, 4014#5, and 4018#4.	When the use of the slave operation mode function is set (PRM4014#5=1), the use of a high–resolution magnetic pulse coder (PRM4001#5=1) or the use of the Cs contour control function by the sensor (PRM4018#4=1) is specified. These items cannot be set at the same time.

SPM indication(*1)	Faulty location and remedy	Description
21	Input the slave operation mode command (SLV) in normal operation mode.	Although position control (such as servo mode or orientation) is being performed, a slave operation mode command signal (SLV) is input.
22	Input the position control command in normal operation mode	Although slave operation mode is set (SLVS signal = 1), a position control command (such as servo mode or orientation) is input.
23	Check PRM4014#5 and PMC signal (SLV).	Although PRM4014#5 is set to 0 not to use the slave operation mode function, a slave operation mode command (SLV) is input.
24	Check the PMC signal (INCMD). Perform orientation by specifying an absolute position first.	Orientation is performed in incremental operation mode (INCMD = 1) first, then the absolute position command (INCMD = 0) is input.
25	Check the spindle amplifier specifications and parameter setting (PRM4018#4).	Although the spindle amplifier SPM type 4 is not used, the use of the Cs contour control function by the sensor is set (PRM4018#4=1).

NOTE*2 PSM contact signal

Between ESP1 and ESP2 on the PSM

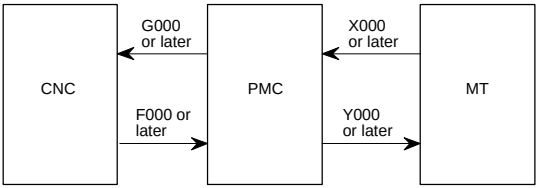
Contact open: Emergency stop

Contact closed: Normal operation

9.1 I/O Signals between CNC and PMC

(1) One–path control

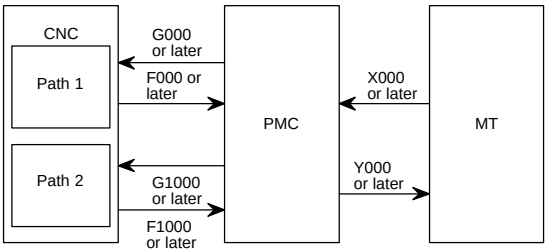
Addresses of interface signals between CNC and PMC/MT.



(2) Two-path control

The figure below shows the addresses of the interface signals between the CNC and the PMC.

Note, however, that some of signals common to paths 1 and 2 are allocated to path 1.



* The states of these signals can be checked on the PMC screen.

9.2 I/O Signal List

○ : Available
● : Available only with 2–path control
– : Unavailable

Symbol	Signal name	Address	T series	M series
*+ED1 to *+ED8	External deceleration signal	G118	○	○
*+L1 to *+L8	Overtravel signal	G114	○	○
*-ED1 to *-ED8	External deceleration signal	G120	○	○
*-L1 to *-L8	Overtravel signal	G116	○	○
*ABSM	Manual absolute signal	G006#2	○	○
*AFV0 to *AFV7	2nd feedrate override signal	G013	○	○
*BECLP	B–axis clamp completion signal	G038#7	–	○
*BEUCP	B–axis unclamp completion signal	G038#6	–	○
*BSL	Block start interlock signal	G008#3	○	○
*CHLD	Chopping hold signal	G051#7	–	○
*CHP8 to *CHP0	Chopping feedrate override signals	G051#0 to #3	–	○
*CRTOF	Automatic erase screen display cancel signal	G062#1	○	○
*CSL	Cutting block start interlock signal	G008#1	○	○
*DEC1 to *DEC8	Deceleration signal for reference position return	X009	○	○
*EAXSL	Control axis selection status signal (PMC axis control)	F129#7	○	○
*ESP	Emergency stop signal	X008#4	○	○
*ESP		G008#4	○	○
*ESPA	Emergency stop signal (serial spindle)	G071#1	○	○
*ESPB		G075#1	○	○
*ESPC		G205#1	○	○
*ESPD		G267#1	○	○
*FLWU	Follow–up signal	G007#5	○	○
*FV0 to *FV7	Feedrate override signal	G012	○	○
*FV0E to *FV7E	Feedrate override signal (PMC axis control)	G151	○	○
*FV0O to *FV7O	Software operator's panel signal (*FV0 to *FV7)	F078	○	○
*HROV0 to *HROV6	1% step rapid traverse override signal	G096#0 to #6	○	○
*IT	Interlock signal for all axes	G008#0	○	○
*IT1 to *IT8	Interlock signal for each axis	G130	○	○

Symbol	Signal name	Address	T series	M series
*JV0 to *JV15	Manual feedrate override signal	G010, G011	○	○
*JV0O to *JV15O	Software operator's panel signal(*JV0 to *JV15)	F079, F080	○	○
*PLSST	Polygon spindle stop signal	G038#0	○	-
*SCPF	Spindle clamp completion signal	G028#5	○	-
*SP	Feed hold signal	G008#5	○	○
*SSTP	Spindle stop signal	G029#6	○	○
*SSTP1	Stop signal in each spindle	G027#3	○	–
*SSTP2		G027#4	○	–
*SSTP3		G027#5	○	–
*SSTP4		G026#6	○	○
*SUCPF	Spindle unclamp completion signal	G028#4	○	–
*TLV0 to *TLV9	Tool life count override signal	G049#0 to G050#1	–	○
*TSB	Tailstock barrier select signal	G060#7	○	–
+EXL1 to +EXL8	Axis direction dependent stored stroke limit switching signal	G104	○	○
+J1 to +J8	Feed axis and direction selection signal	G100	○	○
+J1O to +J4O	Software operator's panel signal (+J1 to +J4)	F081#0,#2, #4,#6	○	○
+Jg, –Jg, +Ja, –Ja	Feed axis and direction selection signals	G086#0 to #3	○	○
+LM1 to +LM8	Stroke limit external setting signal	G110	–	○
+MIT1,+MIT2	Manual feed interlock signal for each axis	X004#2,#4	○	–
+MIT1,+MIT2	Tool offset write signal	X004#2,#4	○	–
+MIT1 to +MIT4	Interlock signal for each axis and direction	G132#0 to #3	–	○
+OT1 to +OT8	Stroke limit reached signals	F124	–	○
–EXL1 to –EXL8	Axis direction dependent stored stroke limit switching signal	G105	○	○
–J1 to –J8	Feed axis and direction selection signal	G102	○	○
–J1O to –J4O	Software operator's panel signal (–J1 to –J4)	F081#1,#3, #5,#7	○	○
–LM1 to –LM8	Stroke limit external setting signal	G112	–	○
–MIT1,–MIT2	Manual feed interlock signal for each axis	X004#3,#5	○	–
–MIT1,–MIT2	Tool offset write signal		○	–

Symbol	Signal name	Address	T series	M series
–MIT1 to –MIT4	Interlock signal for each axis and direction	G134#0 to #3	–	○
–OT1 to –OT8	Stroke limit reached signals	F126	–	○
ABTQSV	Servo axis abnormal load detected signal	F090#0	○	○
ABTSP1	First–spindle abnormal load detected signal	F090#1	○	○
ABTSP2	Second–spindle abnormal load detected signal	F090#2	○	○
ABTSP3	Third–spindle abnormal load detection signal	F090#3	○	○
AFL	Miscellaneous function lock signal	G005#6	○	○
AICC	AI contour control, AI nano contour control, or AI advanced preview control mode signal	F062#0	–	○
AL	Alarm signal	F001#0	○	○
ALMA	Alarm signal (serial spindle)	F045#0	○	○
ALMB		F049#0	○	○
ALMC		F168#0	○	○
ALMD		F266#1	○	○
ALNGH	Tool axis direction handle feed mode signal	G023#7	–	○
AR0 to AR15	Actual spindle speed signal	F040, F041	○	–
ARSTA	Alarm reset signal (serial spindle)	G071#0	○	○
ARSTB		G075#0	○	○
ARSTC		G205#0	○	○
ARSTD		G267#0	○	○
B00 to B31	2nd auxiliary function code signal	F030 to F033	○	○
BAL	Battery alarm signal	F001#2	○	○
BCLP	B–axis clamp signal	F061#1	–	○
BDT1,BDT2 to BDT9	Optional block skip signal	G044#0, G045	○	○
BDTO	Software operator's panel signal(BDT)	F075#2	○	○
BF	2nd auxiliary function strobe signal	F007#4	○	–
BF		F007#7	–	○
BFIN	2nd auxiliary function completion signal	G005#4	○	–
BFIN		G005#7	–	○
BGEACT	Background busy signal	F053#4	○	○
BGEN	Power Mate background busy signal	G092#4	○	○
BGIALM	Power Mate read/write alarm signal	G092#3	○	○

Symbol	Signal name	Address	T series	M series
BGION	Power Mate read/write in–progress signal	G092#2	○	○
BUCLP	B–axis unclamp signal	F061#0	–	○
CDZ	Chamfering signal	G053#7	○	–
CFINA	Spindle switch completion signal (serial spindle)	F046#1	○	○
CFINB		F050#1	○	○
CFINC		F169#1	○	○
CFIND		F267#1	○	○
CHPA	Power line switch signal (serial spindle)	F046#0	○	○
CHPB		F050#0	○	○
CHPC		F269#0	○	○
CHPD		F267#0	○	○
CHPCYL	Chopping cycle signal	F039#3	–	○
CHPMD	Chopping–in–progress signal	F039#2	–	○
CHPST	Chopping start signal	G051#6	–	○
CLRCH1 to CLRCH8	Torque limit reach signals for butt–type reference position setting	F180	○	○
CON	Cs contour control change signal	G027#7	○	○
COSP	Spindle command signal	F064#5	●	–
CSS	Constant surface speed signal	F002#2	○	○
CTH1A,CTH2A	Clutch/gear signal (serial spindle)	G070#3,#2	○	○
CTH1B,CTH2B		G074#3,#2	○	○
CTH1C,CTH2C		G204#3,#2	○	○
CTH1D,CTH2D		G266#3,#2	○	○
CUT	Cutting feed signal	F002#6	○	○
DEFMDA	Differential mode command signal (serial spindle)	G072#3	○	○
DEFMDB		G076#3	○	○
DEFMDC		G206#3	○	○
DEFMDD		G268#3	○	○
DEN	Distribution end signal	F001#3	○	○
DM00	Decode M signal	F009#7	○	○
DM01		F009#6	○	○
DM02		F009#5	○	○
DM30		F009#4	○	○
DMMC	Direct operation select signal	G042#7	○	○
DNCI	DNC operation select signal	G043#5	○	○
DRN	Dry run signal	G046#7	○	○
DRNE	Dry run signal (PMC axis control)	G150#7	○	○

Symbol	Signal name	Address	T series	M series
DRNO	Software operator's panel signal(DRN)	F075#5	○	○
DSCNA	Disconnection detection disable signal (serial spindle)	G073#4	○	○
DSCNB		G077#4	○	○
DSCNC		G207#4	○	○
DSCND		G269#4	○	○
DSP1, DSP2, DSP3	Spindle motor speed detection signals	Y(n+1) #0 to #2	○	○
DSV1 to DSV8	Servo motor speed detection signals	Y(n+0)	○	○
DTCH1 to DTCH8	Controlled axis detach signal	G124	○	○
EA0 to EA6	Address signal for external data input	G002#0 to #6	○	○
EABUFA	Buffer full signal (PMC axis control)	F131#1	○	○
EABUFB		F134#1	○	○
EABUFC		F137#1	○	○
EABUFD		F140#1	○	○
EACNT1 to EACNT8	Controlling signal (PMC axis control)	F182	○	○
EADEN1 to EADEN8	Distribution completion signal (PMC axis control)	F112	○	○
EAX1 to EAX8	Control axis select signal (PMC axis control)	G136	○	○
EASIP1 to EASIP8	Axis control superimposed command signal	G200	○	○
EBSYA	Axis control command read completion signal (PMC axis control)	F130#7	○	○
EBSYB		F133#7	○	○
EBSYC		F136#7	○	○
EBSYD		F139#7	○	○
EBUFA	Axis control command read signal (PMC axis control)	G142#7	○	○
EBUFB		G154#7	○	○
EBUFC		G166#7	○	○
EBUFD		G178#7	○	○
EC0A to EC6A	Axis control command signal (PMC axis control)	G143#0 to #6	○	○
EC0B to EC6B		G155#0 to #6	○	○
EC0C to EC6C		G167#0 to #6	○	○
EC0D to EC6D		G179#0 to #6	○	○
ECKZA	Following zero checking signal (PMC axis control)	F130#1	○	○
ECKZB		F133#1	○	○
ECKZC		F136#1	○	○
ECKZD		F139#1	○	○

Symbol	Signal name	Address	T series	M series
ECLRA	Reset signal (PMC axis control)	G142#6	○	○
ECLRB		G154#6	○	○
ECLRC		G166#6	○	○
ECLRD		G178#6	○	○
ED0 to ED15	Data signal for external data input	G000, G001	○	○
EDENA	Auxiliary function executing signal (PMC axis control)	F130#3	○	○
EDENB		F133#3	○	○
EDENC		F136#3	○	○
EDEND		F139#3	○	○
EDGN	Slave diagnosis selection signal	F177#7	○	○
EF	External operation signal	F008#0	–	○
EFD	External operation signal for high–speed interface	F007#1	–	○
EFIN	External operation function completion signal	G005#1	–	○
EFINA	Auxiliary function completion signal (PMC axis control)	G142#0	○	○
EFINB		G154#0	○	○
EFINC		G166#0	○	○
EFIND		G178#0	○	○
EGBM1 to EGBM8	EGB mode confirmation signal	F208	–	○
EGENA	Axis moving signal (PMC axis control)	F130#4	○	○
EGENB		F133#4	○	○
EGENC		F136#4	○	○
EGEND		F139#4	○	○
EIALA	Alarm signal (PMC axis control)	F130#2	○	○
EIALB		F133#2	○	○
EIALC		F136#2	○	○
EIALD		F139#2	○	○
EID0A to EID31A	Axis control data signal (PMC axis control)	G146 to G149	○	○
EID0B to EID31B		G158 to G161	○	○
EID0C to EID31C		G170 to G173	○	○
EID0D to EID31D		G182 to G185	○	○

Symbol	Signal name	Address	T series	M series
EIF0A to EIF15A	Axis control feedrate signal (PMC axis control)	G144, G145	○	○
EIF0B to EIF15B		G156, G157	○	○
EIF0C to EIF15C		G168, G169	○	○
EIF0D to EIF15D		G180, G181	○	○
EINPA	In–position signal (PMC axis control)	F130#0	○	○
EINPB		F133#0	○	○
EINPC		F136#0	○	○
EINPD		F139#0	○	○
EKC0 to EKC7	Key code signal	G098	○	○
EKENB	Key code read completion signal	F053#7	○	○
EKSET	Key code read signal	G066#7	○	○
ELCKZA	Accumulated zero check signal	G142#1	○	○
ELCKZB		G154#1	○	○
ELCKZC		G166#1	○	○
ELCKZD		G178#1	○	○
EM11A to EM48A	Auxiliary function code signal (PMC axis control)	F132, F142	○	○
EM11B to EM48B		F135, F145	○	○
EM11C to EM48C		F138, F148	○	○
EM11D to EM48D		F141, F151	○	○
EMBUFA	Buffering disable signal (PMC axis control)	G142#2	○	○
EMBUFB		G154#2	○	○
EMBUFC		G166#2	○	○
EMBUFD		G178#2	○	○
EMFA	Auxiliary function strobe signal (PMC axis control)	F131#0	○	○
EMFB		F134#0	○	○
EMFC		F137#0	○	○
EMFD		F140#0	○	○
EMSBKA	Block stop disable signal (PMC axis control)	G143#7	○	○
EMSBKB		G155#7	○	○
EMSBKC		G167#7	○	○
EMSBKD		G179#7	○	○
ENB	Spindle enable signal	F001#4	○	○
ENB2		F038#2	○	–
ENB3		F038#3	○	–
ENB4		F039#1	○	–

Symbol	Signal name	Address	T series	M series
ENBKY	External key input mode selection signal	G066#1	○	○
EOTNA	Negative–direction overtravel signal (PMC axis control)	F130#6	○	○
EOTNB		F133#6	○	○
EOTNC		F136#6	○	○
EOTND		F139#6	○	○
EOTPA	Positive–direction overtravel signal (PMC axis control)	F130#5	○	○
EOTPB		F133#5	○	○
EOTPC		F136#5	○	○
EOTPD		F139#5	○	○
EOV0	Override 0% signal (PMC axis control)	F129#5	○	○
EPARM	Slave parameter selection signal	F177#6	○	○
EPN0 to EPN13	Expanded workpiece number search signals	G024#0 to G025#5	○	○
EPNS	Expanded workpiece number search start signal	G025#7	○	○
EPRG	Slave program selection signal	F177#4	○	○
ERDIO	Slave external read start signal	F177#1	○	○
EREND	Read completion signal for external data input	F060#0	○	○
ERS	External reset signal	G008#7	○	○
ESBKA	Block stop signal (PMC axis control)	G142#3	○	○
ESBKB		G154#3	○	○
ESBKC		G166#3	○	○
ESBKD		G178#3	○	○
ESCAN	Search cancel signal for external data input	F060#2	○	○
ESEND	Search completion signal for external data input	F060#1	○	○
ESKIP	Skip signal (PMC axis control)	X004#6	○	○
ESOFA	Servo off signal (PMC axis control)	G142#4	○	○
ESOFB		G154#4	○	○
ESOFC		G166#4	○	○
ESOFD		G178#4	○	○
ESRSYC	Simple spindle synchronous control signal	G064#6	○	○
ESTB	Read signal for external data input	G002#7	○	○

Symbol	Signal name	Address	T series	M series
ESTPA	Axis control temporary stop signal (PMC axis control)	G142#5	○	○
ESTPB		G154#5	○	○
ESTPC		G166#5	○	○
ESTPD		G178#5	○	○
ESTPIO	Slave read/write stop signal	F177#2	○	○
EVAR	Slave macro variable selection signal	F177#5	○	○
EWTIO	Slave external write start signal	F177#3	○	○
EXHPCC	HPCC operation signal	F066#7	–	○
EXLM	Stored stroke limit select signal	G007#6	○	○
EXOFA	Motor activation off status signal (serial spindle)	F047#4	○	○
EXOFB		F051#4	○	○
EXOFC		F170#4	○	○
EXOFD		F268#4	○	○
EXRD	External read start signal	G058#1	○	○
EXSTP	External read/punch stop signal	G058#2	○	○
EXWT	External punch start signal	G058#3	○	○
F1D	F1–digit feed select signal	G016#7	–	○
FIN	Completion signal	G004#3	○	○
FRP1 to FRP8	Floating reference position return end signal	F116	○	○
FSCSL	Cs contour control change completion signal	F044#1	○	○
FSPPH	Spindle phase synchronous control completion signal	F044#3	○	○
FSPSY	Spindle synchronous speed control completion signal	F044#2	○	○
FTCAL	Statistical calculation start signal	G203#1	○	○
FTCLR	Store counter clear signal	G203#2	○	○
FTCMD	Torque sensing command signal	G203#0	○	○
G08MD	Advanced preview control mode signal	F066#0	○	○
G2RVX	Tool offset direction signal	G090#0	○	–
G2RVY		G090#2	○	–
G2RVZ		G090#1	○	–
G2SLC	Second figure tool offset signal	G090#7	○	–
G2X	Second figure tool offset axis select signal	G090#4	○	–
G2Y		G090#6	○	–
G2Z		G090#5	○	–

Symbol	Signal name	Address	T series	M series
GOQSM	Tool offset value write mode select signal	G039#7	○	–
GR1,GR2	Gear selection signal (input)	G028#1,#2	○	○
GR1O,GR2O, GR3O	Gear selection signal (output)	F034#0 to #2	–	○
GR21	Gear selection signal (input)	G029#0	○	○
GR31		G029#2	○	○
GR41		G031#4	○	○
HCAB2	Hard copy stop request acceptance flag	F061#2	○	○
HCABT	Hard copy stop request signal	G067#6	○	○
HCEXE	Hard copy in–progress signal	F061#3	○	○
HCREQ	Hard copy request signal	G067#7	○	○
HCSKP1 to HCSKP4	Skip signals for high–speed cycle machining	G065#4 to #7	○	○
HDO0 to HDO7	High–speed skip status signal	F122	○	○
HEAD	Path selection signal (Tool post selection signal)	G063#0	●	●
HOBCAN	Cancel–sync–with–C–axis signal	G066#2	○	○
HOBSYN	Sync–with–C–axis signal	F065#7	○	○
HROV	1% step rapid traverse override select signal	G096#7	○	○
HS1A to HS1D	Manual handle feed axis selection signal	G018#0 to #3	○	○
HS1AO	Software operator's panel signal (HS1A)	F077#0	○	○
HS1BO	Software operator's panel signal (HS1B)	F077#1	○	○
HS1CO	Software operator's panel signal (HS1C)	F077#2	○	○
HS1DO	Software operator's panel signal (HS1D)	F077#3	○	○
HS1IA to HS1ID	Manual handle interruption axis select signal	G041#0 to #3	○	○
HS2A to HS2D	Manual handle feed axis selection signal	G018#4 to #7	○	○
HS2IA to HS2ID	Manual handle interruption axis select signal	G041#4 to #7	○	○
HS3A to HS3D	Manual handle feed axis selection signal	G019#0 to #3	–	○
HS3IA to HS3ID	Manual handle interruption axis select signal	G042#0 to #3	–	○
IGNVRY	All–axis VRDY OFF alarm ignore signal	G066#0	○	○

Symbol	Signal name	Address	T series	M series
IGVRY1 to IGVRY8	Each–axis VRDY OFF alarm ignore signal	G192	○	○
INCH	Inch input signal	F002#0	○	○
INCMDA	Incremental command external setting type orientation signal (serial spindle)	G072#5	○	○
INCMDB		G076#5	○	○
INCMDC		G206#5	○	○
INCMDD		G268#5	○	○
INCSTA	Incremental method orientation signal (serial spindle)	F047#1	○	○
INCSTB		F051#1	○	○
INCSTC		F170#1	○	○
INCSTD		F268#1	○	○
INDXA	Orientation stop position change signal (serial spindle)	G072#0	○	○
INDXB		G076#0	○	○
INDXC		G206#0	○	○
INDXD		G268#0	○	○
INFD	In–feed cutting start signal	G063#6	–	○
INHKY	Key input disable signal	F053#0	○	○
INP1 to INP8	In–position signal	F104	○	○
INTGA	Signal for controlling velocity integration (serial spindle)	G071#5	○	○
INTGB		G075#5	○	○
INTGC		G205#5	○	○
INTGD		G267#5	○	○
IOLACK	I/O Link confirmation signal	G092#0	○	○
IOLBH2	Manual handle feed generator selection signals	G199#0	○	○
IOLBH3		G199#1	○	○
IOLNK	Slave I/O Link selection signal	F177#0	○	○
IOLS	I/O Link specification signal	G092#1	○	○
ITCD	Rotation area interference check disable signal	G292#7	○	○
IUDD1 to IUDD8	Abnormal load detection ignore signal	G125	○	○
KEY1 to KEY4	Memory protect signal	G046#3 to #6	○	○
KEYO	Software operator's panel signal (KEY1 to KEY4)	F075#6	○	○
LDT1A	Load detection signal 1 (serial spindle)	F045#4	○	○
LDT1B		F049#4	○	○
LDT1C		F168#4	○	○
LDT1D		F266#4	○	○
LDT2A	Load detection signal 2 (serial spindle)	F045#5	○	○
LDT2B		F049#5	○	○
LDT2C		F168#5	○	○
LDT2D		F266#5	○	○

Symbol	Signal name	Address	T series	M series
M00 to M31	Miscellaneous function code signal	F010 to F013	○	○
M200 to M215	2nd M function code signal	F014 to F015	○	○
M300 to M315	3rd M function code signal	F016 to F017	○	○
MA	CNC ready signal	F001#7	○	○
MABSM	Manual absolute check signal	F004#2	○	○
MAFL	Miscellaneous function lock check signal	F004#4	○	○
MBDT1, MBDT2 to MBDT9	Optional block skip check signal	F004#0, F005	○	○
MCFNA	Power line switch completion signal (serial spindle)	G071#3	○	○
MCFNB		G075#3	○	○
MCFNC		G205#3	○	○
MCFND		G267#3	○	○
MCHK	Check mode handle valid signal	G067#3	○	–
MD1,MD2,MD4	Mode selection signal	G043#0 to #2	○	○
MD1O, MD2O, MD3O	Software operator's panel signal (MD1, MD2, MD4)	F073#0 to #2	○	○
MDRN	Dry run check signal	F002#7	○	○
MDTCH1 to MDTCH8	Controlled axis detach status signal	F110	○	○
MEDT	Memory edit select check signal	F003#6	○	○
MF	Auxiliary function strobe signal	F007#0	○	○
MF2	2nd M function strobe signal	F008#4	○	○
MF3	3rd M function strobe signal	F008#5	○	○
MFIN	Auxiliary function completion signal	G005#0	○	○
MFIN2	2nd M function completion signal	G004#4	○	○
MFIN3	3rd M function completion signal	G004#5	○	○
MFNHGA	Main spindle MCC status signal while changing spindles signal (serial spindle)	G072#6	○	○
MFNHGB		G076#6	○	○
MFNHGC		G206#6	○	○
MFNHGD		G268#6	○	○
MFSYNA to MFSYND	Flexible synchronization control mode select signal switching accepted signals	F197#0 to #3	–	○
MH	Manual handle feed select check signal	F003#1	○	○

Symbol	Signal name	Address	T series	M series
MHPCC	HPCC mode signal	F066#6	–	○
MI1 to MI8	Mirror image signal	G106	○	○
MINC	Incremental feed select check signal	F003#0	○	○
MINP	External program input start signal	G058#0	○	○
MIX1 to MIX8	Composite control axis selection signals	G128	●	–
MJ	JOG feed select check signal	F003#2	○	○
MLK	All–axis machine lock signal	G044#1	○	○
MLK1 to MLK8	Each–axis machine lock signal	G108	○	○
MLKO	Software operator's panel signal(MLK)	F075#4	○	○
MMDI	Manual data input select check signal	F003#3	○	○
MMEM	Automatic operation select check signal	F003#5	○	○
MMI1 to MMI8	Mirror image check signal	F108	○	○
MMLK	All–axis machine lock check signal	F004#1	○	○
MMOD	Check mode signal	G067#2	○	–
MNCHG	Inversion inhibition signal	F091#1	○	–
MORA1A	Signal for completion of spindle orientation with a magnetic sensor (serial spindle)	F046#6	○	○
MORA1B		F050#6	○	○
MORA1C		F169#6	○	○
MORA1D		F267#6	○	○
MORA2A	Signal for approximate spindle orientation with a magnetic sensor (serial spindle)	F046#7	○	○
MORA2B		F050#7	○	○
MORA2C		F169#7	○	○
MORA2D		F267#7	○	○
MORCMA	Command for spindle orientation with a magnetic sensor (serial spindle)	G073#0	○	○
MORCMB		G077#0	○	○
MORCMC		G207#0	○	○
MORCMD		G269#0	○	○
MP1, MP2	Manual handle feed amount selection signal (incremental feed signal)	G019#4, #5	○	○
MP1O	Software operator's panel signal (MP1)	F076#0	○	○
MP2O	Software operator's panel signal (MP2)	F076#1	○	○

Symbol	Signal name	Address	T series	M series
MPOFA	Motor power stop signal (serial spindle)	G073#2	○	○
MPOFB		G077#2	○	○
MPOFC		G207#2	○	○
MPOFD		G269#2	○	○
MRDYA	Machine ready signal (serial spindle)	G070#7	○	○
MRDYB		G074#7	○	○
MRDYC		G204#7	○	○
MRDYD		G266#7	○	○
MREF	Manual reference position return selection check signal	F004#5	○	○
MRMT	DNC operation select check signal	F003#4	○	○
MRVM	Check mode backward movement inhibition signal	G067#1	○	–
MRVMD	Check mode backward movement signal	F091#0	○	–
MRVSP	Backward movement inhibition signal	F091#2	○	–
MSBK	Single block check signal	F004#3	○	○
MSDFON	Motor speed detection function enable signal	G016#0	○	○
MSOVRA	In–tandem speed difference state signal (serial spindle)	F047#2	○	○
MSOVRB		F051#2	○	○
MSOVRC		F170#2	○	○
MSOVRD		F268#2	○	○
MSPC	One–rotation position manual set signal	G066#5	○	○
MSPCF	One–rotation position setting completed signal	F065#5	○	○
MTA to MTD	Flexible synchronization control mode select signals	G197#0 to #3	–	○
MTCHIN	TEACH IN select check signal	F003#7	○	○
MV1 to MV8	Axis moving signal	F102	○	○
MVD1 to MVD8	Axis moving direction signal	F106	○	○
NOWT	No–wait signal	G063#1	●	●
NOZAGC	Perpendicular/angular axis control disable signal	G063#5	○	○
NPOS1 to NPOS8	Position display neglect signal	G198	○	○
NRROA	Short–distant movement command while changing the orientation stop position signal (serial spindle)	G072#2	○	○
NRROB		G076#2	○	○
NRROC		G206#2	○	○
NRROD		G268#2	○	○

Symbol	Signal name	Address	T series	M series
OFN0 to OFN5,OFN6	Tool offset number select signal	G039#0 to #5, G040#0	○	–
OP	Automatic operation signal	F000#7	○	○
ORARA	Orientation completion signal (serial spindle)	F045#7	○	○
ORARB		F049#7	○	○
ORARC		F168#7	○	○
ORARD		F266#7	○	○
ORCMA	Orientation command signal (serial spindle)	G070#6	○	○
ORCMB		G074#6	○	○
ORCMC		G204#6	○	○
ORCMD		G266#6	○	○
OUT0 to OUT7	Software operator's panel general–purpose switch signal	F072	○	○
OVC	Override cancel signal	G006#4	○	○
OVCE	Override cancellation signal (PMC axis control)	G150#5	○	○
OVLS1 to OVLS8	Superimposed control axis selection signals	G190	●	–
OVRA	Analog override command signal (serial spindle)	G072#4	○	○
OVRB		G076#4	○	○
OVRC		G206#4	○	○
OVRD		G268#4	○	○
PBATL	Absolute position detector battery voltage low alarm signal	F172#7	○	○
PBATZ	Absolute position detector battery voltage zero alarm signal	F172#6	○	○
PC1DEA	Signal indicating the status of the detected one–rotation position coder signal (serial spindle)	F047#0	○	○
PC1DEB		F051#0	○	○
PC1DEC		F170#0	○	○
PC1DED		F268#0	○	○
PC2SLC	2nd position coder selection signal	G028#7	○	○
PC3SLC	3rd position coder selection signal	G026#0	○	○
PC4SLC	4th position coder selection signal	G026#1	○	○
PDT1	Conversational mode selection signal	G062#4	○	–
PDT2	Restart operation notification signal	G062#5	○	–
PECK2	Small–diameter peck drilling in progress signal	F066#5	–	○
PK1 to PK8	Parking signals	G122	○	–
		G122	●	–

Symbol	Signal name	Address	T series	M series
PKESS1	First spindle synchronous control signal	G122#6 (G031#6)	○	○
PKESS2	Second spindle synchronous control signal	G122#7 (G031#7)	○	○
PN1, PN2, PN4, PN8, PN16	Workpiece number search signal	G009#0 to #4	○	○
PORA2A	Signal for approximate spindle orientation with a position coder (serial spindle)	F046#5	○	○
PORA2B		F050#5	○	○
PORA2C		F169#5	○	○
PORA2D		F267#5	○	○
PRC	Position record signal	G040#6	○	–
PRGDPL	program screen display mode signal	F053#1	○	○
PRTSF	Target parts count reached signal	F062#7	○	○
PSAR	Spindle polygon speed arrival signal	F063#2	○	–
PSE1	Master axis not arrival signal	F063#0	○	–
PSE2	Polygon synchronous axis not arrival signal	F063#1	○	–
PSW01 to PSW16	Position switch signal	F070#0 to F071#7	○	○
PSYN	Polygon synchronization under way signal	F063#7	○	–
R01I to R12I	Spindle motor speed command signal	G032#0 to G033#3	○	○
R01I2 to R12I2		G034#0 to G035#3	○	○
R01I3 to R12I3		G036#0 to G037#3	○	○
R01I4 to R12I4		G272#0 to G273#3	○	○
R01O to R12O	S12–bit code signal	F036#0 to F037#3	○	○
RCFNA	Output switch completion signal (serial spindle)	F046#3	○	○
RCFNB		F050#3	○	○
RCFNC		F169#3	○	○
RCFND		F267#3	○	○
RCHA	Power line status check signal (serial spindle)	G071#7	○	○
RCHB		G075#7	○	○
RCHC		G205#7	○	○
RCHD		G267#7	○	○
RCHHGA	High–output MCC status signal while a magnetic sensor (serial spindle)	G072#7	○	○
RCHHGB		G076#7	○	○
RCHHGC		G206#7	○	○
RCHHGD		G268#7	○	○

Symbol	Signal name	Address	T series	M series
RCHPA	Output switch signal (serial spindle)	F046#2	○	○
RCHPB		F050#2	○	○
RCHPC		F169#2	○	○
RCHPD		F267#2	○	○
RGHTH	Tool axis perpendicular direction handle feed mode signal	G023#6	–	○
RGSPM	Spindle rotation direction signal	F065#1	–	○
RGSPP		F065#0	–	○
RGTAP	Rigid tapping signal	G061#0	○	○
RGTSP1, RGTSP2	Rigid tapping spindle selection signal	G061#4, #5	○	–
RLSOT	Stroke check release signal	G007#7	–	○
RLSOT3	Stroke check 3 release signal	G007#4	○	○
RMTDI0 to RMTDI7	Input signal for remote buffer	G052	○	○
RMTDO0 to RMTDO7	Output signal for remote buffer	F069	○	○
ROTAA	Rotation direction command while changing the orientation stop position signal (serial spindle)	G072#1	○	○
ROTAB		G076#1	○	○
ROTAC		G206#1	○	○
ROTAD		G268#1	○	○
ROV1,ROV2	Rapid traverse override signal	G014#0, #1	○	○
ROV1E, ROV2E	Rapid traverse override signal (PMC axis control)	G150#0, #1	○	○
ROV1O	Software operator's panel signal (ROV1)	F076#4	○	○
ROV2O	Software operator's panel signal (ROV2)	F076#5	○	○
RPALM	Read/punch alarm signal	F053#3	○	○
RPBSY	Read/punch in–progress signal	F053#2	○	○
RPDO	Rapid traversing signal	F002#1	○	○
RRW	Reset&rewind signal	G008#6	○	○
RSLA	Output switch request signal (serial spindle)	G071#6	○	○
RSLB		G075#6	○	○
RSLC		G205#6	○	○
RSLD		G267#6	○	○
RST	Reset in–progress signal	F001#1	○	○
RT	Manual rapid traverse selection signal	G019#7	○	○
RTAP	Rigid tapping in–progress signal	F076#3	○	○

Symbol	Signal name	Address	T series	M series
RTE	Manual rapid traverse selection signal (PMC axis control)	G150#6	○	○
RTO	Software operator's panel signal (RT)	F077#6	○	○
RTNT	Rigid tapping retraction start signal	G062#6	–	○
RTPT	Rigid tapping retraction completion signal	F066#1	–	○
RTRCT	Retract signal	G066#4	○	○
RTRCTF	Retract completion signal	F065#4	○	○
RVS	Retrace signal	G007#0	–	○
RVSL	Retrace–in–progress signal	F082#2	–	○
RWD	Rewinding signal	F000#0	○	○
S00 to S31	Spindle function code signal	F022 to F025	○	○
S1MES	Spindle 1 under measurement signal	F062#3	○	–
S2MES	Spindle 2 under measurement signal	F062#4	○	–
S2TLS	Spindle measurement select signal	G040#5	○	–
SA	Servo ready signal	F000#6	○	○
SAR	Spindle speed arrival signal	G029#4	○	○
SARA	Speed arrival signal (serial spindle)	F045#3	○	○
SARB		F049#3	○	○
SARC		F168#3	○	○
SARD		F266#3	○	○
SBK	Single block signal	G046#1	○	○
SBKO	Software operator's panel signal (SBK)	F075#3	○	○
SCLP	Spindle clamp signal	F038#0	○	–
SDTA	Speed detection signal (serial spindle)	F045#2	○	○
SDTB		F049#2	○	○
SDTC		F168#2	○	○
SDTD		F266#2	○	○
SF	Spindle speed strobe signal	F007#2	○	○
SFIN	Spindle function completion signal	G005#2	○	○
SFRA	CW command signal (serial spindle)	G070#5	○	○
SFRB		G074#5	○	○
SFRC		G204#5	○	○
SFRD		G266#5	○	○

Symbol	Signal name	Address	T series	M series
SGN	Spindle motor command polarity select signal	G033#5	○	○
SGN2		G035#5	○	○
SGN3		G037#5	○	○
SGN4		G273#5	○	○
SHA00 to SHA11	Spindle orientation external stop position command signal	G078#0 to G079#3	○	○
SHB00 to SHB11		G080#0 to G081#3	○	○
SHC00 to SHC11		G208#0 to G209#3	○	○
SHD00 to SHD11		G270#0 to G271#3	○	○
SIND	Spindle motor speed command select signal	G033#7	○	○
SIND2		G035#7	○	○
SIND3		G037#7	○	○
SIND4		G273#7	○	○
SKIP	Skip signal	X004#7	○	○
	Overload torque signal	X004#7	–	○
SKIP2 to SKIP6, SKIP7, SKIP8	Skip signal	X004#2 to #6, #0, #1	○	○
SKIPP		G006#6	○	–
SLPCA	Spindle return select signal	G064#2	●	–
SLPCB		G064#3	●	–
SLSPA	Spindle command select signal	G063#2	●	–
SLSPB		G063#3	●	–
SLVA	Tandem control command signal (serial spindle)	G073#1	○	○
SLVB		G077#1	○	○
SLVC		G207#1	○	○
SLVD		G269#1	○	○
SLVSA	Tandem control signal (serial spindle)	F046#4	○	○
SLVSB		F050#4	○	○
SLVSC		F169#4	○	○
SLVSD		F267#4	○	○
SMZ	Error detect signal	G053#6	○	–
SOCNA	Soft start/stop cancel signal (serial spindle)	G071#4	○	○
SOCNB		G075#4	○	○
SOCNC		G205#4	○	○
SOCND		G267#4	○	○
SOR	Spindle orientation signal	G029#5	○	○
SORSLA	Synchronization orientation operation request command (serial spindle)	G073#3	○	○
SORSLB		G077#3	○	○
SORSLC		G207#3	○	○
SORSLD		G269#3	○	○

Symbol	Signal name	Address	T series	M series
SORENA	Synchronization orientation permission signal (serial spindle)	F047#3	○	○
SORENB		F051#3	○	○
SORENC		F170#3	○	○
SOREND		F268#3	○	○
SOV0 to SOV7	Spindle speed override signal	G030	○	○
SPAL	Spindle fluctuation detection alarm signal	F035#0	○	○
SPL	Feed hold lamp signal	F000#4	○	○
SPO	Software operator's panel signal (*SP)	F075#7	○	○
SPPHS	Spindle phase synchronous control signal	G038#3	○	○
SPSLA	Spindle select signal (serial spindle)	G071#2	○	○
SPSLB		G075#2	○	○
SPSLC		G205#2	○	○
SPSLD		G267#2	○	○
SPSTP	Spindle stop complete signal	G028#6	○	–
SPSYC	Spindle synchronous control signal	G038#2	○	○
SPWRN1 to 9	Spindle warning detail signal	F264#0 to #7, F265#1	○	○
SRLNI0 to SRLNI3	Group number specification signals	G091#0 to #3	○	○
SRLNO0 to SRLNO3	Group number output signals	F178#0 to #3	○	○
SRN	Program restart signal	G006#0	○	○
SRNMV	Program restart under way signal	F002#4	○	○
SRVA	CCW command signal (serial spindle)	G070#4	○	○
SRVB		G074#4	○	○
SRVC		G204#4	○	○
SRVD		G266#4	○	○
SSIN	Spindle motor command polarity select signal	G033#6	○	○
SSIN2		G035#6	○	○
SSIN3		G037#6	○	○
SSIN4		G273#6	○	○
SSTA	Speed zero signal (serial spindle)	F045#1	○	○
SSTB		F049#1	○	○
SSTC		F168#1	○	○
SSTD		F266#1	○	○
ST	Cycle start lamp signal	G007#2	○	○
STL	Cycle start signal	F000#5	○	○
STLK	Start lock signal	G007#1	○	–

Symbol	Signal name	Address	T series	M series
STRD	Input and run simultaneous mode select signal	G058#5	–	○
STWD	Output and run simultaneous mode select signal	G058#6	–	○
SUCLP	Spindle unclamp signal	F038#1	○	–
SVF1 to SVF8	Servo off signal	G126	○	○
SVWRN1 to 4	Servo warning detail signal	F093#4 to #7	○	○
SWS1	Spindle selection signal	G027#0	○	○
SWS2		G027#1	○	○
SWS3		G027#2	○	○
SWS4		G026#3	○	○
SYCAL	Spindle synchronous control alarm signal/ phase error monitor signal	F044#4	○	○
SYN1O to SYN8O	Synchronous control under way signals	F118	○	–
SYN1O to SYN7O	Synchronous/composite/ superimposed control under way signals	F118	●	–
SYNC1 to SYNC8	Simple synchronous axis select signal	G138	○	○
SYNC to SYNC8	Synchronous control axis selection signals	G138	○	–
		G138	●	–
SYNCJ1 to SYNCJ8	Simple synchronous manual feed axis select signal	G140	–	○
SYNMOD	EGB mode signal	F065#6		○
T00 to T31	Tool function code signal	F026 to F029	○	○
TAP	Tapping signal	F001#5	○	○
TF	Tool function strobe signal	F007#3	○	○
TFIN	Tool function completion signal	G005#3	○	○
THRD	Thread cutting signal	F002#3	○	○
TIALM	Tool post interference alarm signal	F064#7	●	–
TICHK	Tool post interference check signal	F064#6	●	–
TL01 to TL64	Tool group number select signal	G047#0 to #6	○	–
TL01 to TL256		G047#0 to G048#0	–	○
TLCH	Tool change signal	F064#0	○	○
TLCHB	Tool life arrival notice signal	F064#3	–	○
TLCHI	Individual tool change signal	F064#2	–	○

Symbol	Signal name	Address	T series	M series
TLMA	Torque limit signal (serial spindle)	F045#6	○	○
TLMB		F049#6	○	○
TLMC		F168#6	○	○
TLMD		F266#6	○	○
TLMHA	Torque limit command HIGH signal (serial spindle)	G070#1	○	○
TLMHB		G074#1	○	○
TLMHC		G204#1	○	○
TLMHD		G266#1	○	○
TLMLA	Torque limit command LOW signal (serial spindle)	G070#0	○	○
TLMLB		G074#0	○	○
TLMLC		G204#0	○	○
TLMLD		G266#0	○	○
TLNW	New tool select signal	F064#1	○	○
TLRST	Tool change reset signal	G048#7	○	○
TLRSTI	Individual tool change reset signal	G048#6	–	○
TLSKP	Tool skip signal	G048#5	○	○
TMRON	General–purpose integrating meter start signal	G053#0	○	○
TRACT	Tool retraction mode signal	F092#3	○	○
TRESC	Tool retraction signal	G059#0	○	○
TRQL1 to TRQL8	Torque limit reached signal	F114	○	○
TRRTN	Tool return signal	G059#1	○	○
TRSPS	Tool return completion signal	F092#5	○	○
UI000 to UI015	Input signal for custom macro	G054, G055	○	○
UINT	Interrupt signal for custom macro	G053#3	○	○
UO000 to UO015	Output signal for custom macro	F054, F055	○	○
UO100 to UO131		F056 to F059	○	○
WATO	Waiting signal	F063#6	●	●
WOQSM	Workpiece coordinate system shift value write mode select signal	G039#6	○	–
WOSET	Workpiece coordinate system shift value write signal	G040#7	○	–
XAE	Measuring position reached signal	X004#0	○	○
YAE		X004#1	–	○
ZAE		X004#1	○	–
ZAE		X004#2	–	○

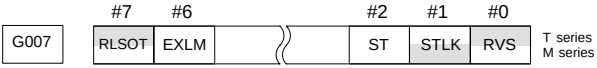
Symbol	Signal name	Address	T series	M series
ZP1 to ZP8	Reference position return end signal	F094	○	○
ZP21 to ZP28	2nd reference position return end signal	F096	○	○
ZP31 to ZP38	3rd reference position return end signal	F098	○	○
ZP41 to ZP48	4th reference position return end signal	F100	○	○
ZRF1 to ZRF8	Reference position establishment signal	F120	○	○
ZRN	Manual reference position return selection signal	G043#7	○	○
ZRNO	Software operator's panel signal (ZRN)	F073#4	○	○

9.3 List of Addresses (One–Path Control)

In an item where both T series and M series are described, some signals are covered with shade ( ) in the signal address figure as shown below. This means either T series or M series does not have this signal. Upper part is for T series and lower part is for M series.

[Example 1]

Signals EXLM and ST are common signals, STLK is for T series only and RLSOT and RVS are for M series only.



MT→PMC

Address	Bit number							
	#7	#6	#5	#4	#3	#2	#1	#0
								(T series)
X004	SKIP	ESKIP SKIP6	–MIT2 SKIP5	+MIT2 SKIP4	–MIT1 SKIP3	+MIT1 SKIP2	ZAE SKIP8	XAE SKIP7
	SKIP	ESKIP SKIP6	SKIP5	SKIP4	SKIP3	ZAE SKIP2	YAE SKIP8	XAE SKIP7
								(M series)
X008				*ESP				
X009	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1

PMC→CNC

Address	Bit number							
	#7	#6	#5	#4	#3	#2	#1	#0
G000	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
G001	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
G002	ESTB	EA6	EA5	EA4	EA3	EA2	EA1	EA0
G004			MFIN3	MFIN2	FIN			
G005	BFIN	AFL		BFIN	TFIN	SFIN	EFIN	MFIN
G006		SKIPP		OVC		*ABSM		SRN
G007	RLSOT	EXLM	*FLWU	RLSOT3		ST	STLK	RVS
G008	ERS	RRW	*SP	*ESP	*BSL		*CSL	*IT
G009				PN16	PN8	PN4	PN2	PN1
G010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8
G012	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0
G013	*AFV7	*AFV6	*AFV5	*AFV4	*AFV3	*AFV2	*AFV1	*AFV0
G014							ROV2	ROV1
G016	F1D							MSDFON
G018	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A
G019	RT		MP2	MP1	HS3D	HS3C	HS3B	HS3A

	#7	#6	#5	#4	#3	#2	#1	#0
G023	ALNGH	RGHTH						
G024	EPN7	EPN6	EPN5	EPN4	EPN3	EPN2	EPN1	EPN0
G025	EPNS		EPN13	EPN12	EPN11	EPN10	EPN9	EPN8
G026		*SSTP4			SWS4		PC4SLC	PC3SLC
G027	CON		*SSTP3	*SSTP2	*SSTP1	SWS3	SWS2	SWS1
G028	PC2SLC	SPSTP	*SCPF	*SUCPF		GR2	GR1	
G029		*SSTP	SOR	SAR		GR31		GR21
G030	SOV7	SOV6	SOV5	SOV4	SOV3	SOV2	SOV1	SOV0
G031	PKESS2	PKESS1		GR41				
G032	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I
G033	SIND	SSIN	SGN		R12I	R11I	R10I	R09I
G034	R08I2	R07I2	R06I2	R05I2	R04I2	R03I2	R02I2	R01I2
G035	SIND2	SSIN2	SGN2		R12I2	R11I2	R10I2	R09I2
G036	R08I3	R07I3	R06I3	R05I3	R04I3	R03I3	R02I3	R01I3
G037	SIND3	SSIN3	SGN3		R12I3	R11I3	R10I3	R09I3
G038	*BECLP	*BEUCP			SPPHS	SPSYC		*PLSST
G039	GOQSM	WOQSM	OFN5	OFN4	OFN3	OFN2	OFN1	OFN0
G040	WOSET	PRC	S2TLS					OFN6
G041	HS2ID	HS2IC	HS2IB	HS2IA	HS1ID	HS1IC	HS1IB	HS1IA
G042	DMMC				HS3ID	HS3IC	HS3IB	HS3IA
G043	ZRN		DNCI			MD4	MD2	MD1
G044							MLK	BDT1
G045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
G046	DRN	KEY4	KEY3	KEY2	KEY1		SBK	

	#7	#6	#5	#4	#3	#2	#1	#0
G047	TL128	TL64	TL32	TL16	TL08	TL04	TL02	TL01
G048	TLRST	TLRSTI	TLSKP					TL256
G049	*TLV7	*TLV6	*TLV5	*TLV4	*TLV3	*TLV2	*TLV1	*TLV0
G050							*TLV9	*TLV8
G051	*CHLD	CHPST			*CHP8	*CHP4	*CHP2	*CHP0
G052	RMTDI7	RMTDI6	RMTDI5	RMTDI4	RMTDI3	RMTDI2	RMTDI1	RMTDI0
G053	CDZ	SMZ			UINT			TMRON
G054	UI007	UI006	UI005	UI004	UI003	UI002	UI001	UI000
G055	UI015	UI014	UI013	UI012	UI011	UI010	UI009	UI008
G058		STWD	STRD		EXWT	EXSTP	EXRD	MINP
G059							TRRTN	TRESC
G060	*TSB							
G061			RGTSP2	RGTSP1				RGTAP
G062		RTNT	PDT2	PDT1			*CRTOF	
G063		INFD	NOZAGC					
G064		ESRSYC						
G065	HCSKP4	HCSKP3	HCSKP2	HCSKP1				
G066	EKSET		MSPC	RTRCT		HOBCAN	ENBKY	IGNVRY
G067	HCREQ	HCABT			MCHK	MMOD	MRVM	
G070	MRDYA	ORCMA	SFRA	SRVA	CTH1A	CTH2A	TLMHA	TLMLA
G071	RCHA	RSLA	INTGA	SOCNA	MCFNA	SPSLA	*ESPA	ARSTA
G072	RCHHGA	MFNHGA	INCMDA	OVRIDA	DEFMDA	NRROA	ROTAA	INDXA
G073				DSCNA	SORSLA	MPOFA	SLVA	MORCMA
G074	MRDYB	ORCMB	SFRB	SRVB	CTH1B	CTH2B	TLMHB	TLMLB

	#7	#6	#5	#4	#3	#2	#1	#0
G075	RCHB	RSLB	INTGB	SOCNB	MCFNB	SPSLB	*ESPB	ARSTB
G076	RCHHGB	MFNHGB	INCMDB	OVRIDB	DEFMDB	NRROB	ROTAB	INDXB
G077				DSCNB	SORSLB	MPOFB	SLVB	MORCMB
G078	SHA07	SHA06	SHA05	SHA04	SHA03	SHA02	SHA01	SHA00
G079					SHA11	SHA10	SHA09	SHA08
G080	SHB07	SHB06	SHB05	SHB04	SHB03	SHB02	SHB01	SHB00
G081					SHB11	SHB10	SHB09	SHB08
G082	Reserve for order made macro							
G083	Reserve for order made macro							
G086					–Ja	+Ja	–Jg	+Jg
G090	G2SLC	G2Y	G2Z	G2X		G2RVY	G2RVZ	G2RVX
G091					SRLNI3	SRLNI2	SRLNI1	SRLNI0
G092				BGEN	BGIALM	BGION	IOLS	IOLACK
G096	HROV	*HROV6	*HROV5	*HROV4	*HROV3	*HROV2	*HROV1	*HROV0
G098	EKC7	EKC6	EKC5	EKC4	EKC3	EKC2	EKC1	EKC0
G100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1
G104	+EXL8	+EXL7	+EXL6	+EXL5	+EXL4	+EXL3	+EXL2	+EXL1
G105	–EXL8	–EXL7	–EXL6	–EXL5	–EXL4	–EXL3	–EXL2	–EXL1
G106	MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1
G108	MLK8	MLK7	MLK6	MLK5	MLK4	MLK3	MLK2	MLK1
G110	+LM8	+LM7	+LM6	+LM5	+LM4	+LM3	+LM2	+LM1
G112	–LM8	–LM7	–LM6	–LM5	–LM4	–LM3	–LM2	–LM1
G114	*+L8	*+L7	*+L6	*+L5	*+L4	*+L3	*+L2	*+L1

	#7	#6	#5	#4	#3	#2	#1	#0
G116	*–L8	*–L7	*–L6	*–L5	*–L4	*–L3	*–L2	*–L1
G118	*+ED8	*+ED7	*+ED6	*+ED5	*+ED4	*+ED3	*+ED2	*+ED1
G120	*–ED8	*–ED7	*–ED6	*–ED5	*–ED4	*–ED3	*–ED2	*–ED1

(T series)

G122	PK8 PKESS2	PK7 PKESS1	PK6	PK5	PK4	PK3	PK2	PK1
	PKESS2	PKESS1						

(M series)

G124	DTCH8	DTCH7	DTCH6	DTCH5	DTCH4	DTCH3	DTCH2	DTCH1
G125	IUDD8	IUDD7	IUDD6	IUDD5	IUDD4	IUDD3	IUDD2	IUDD1
G126	SVF8	SVF7	SVF6	SVF5	SVF4	SVF3	SVF2	SVF1
G130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1
G132					+MIT4	+MIT3	+MIT2	+MIT1
G134					–MIT4	–MIT3	–MIT2	–MIT1
G136	EAX8	EAX7	EAX6	EAX5	EAX4	EAX3	EAX2	EAX1
G138	SYNC8	SYNC7	SYNC6	SYNC5	SYNC4	SYNC3	SYNC2	SYNC1
G140	SYNCJ8	SYNCJ7	SYNCJ6	SYNCJ5	SYNCJ4	SYNCJ3	SYNCJ2	SYNCJ1
G142	EBUFA	ECLRA	ESTPA	ESOFA	ESBKA	EMBUFA	ELCKZA	EFINA
G143	EMSBKA	EC6A	EC5A	EC4A	EC3A	EC2A	EC1A	EC0A
G144	EIF7A	EIF6A	EIF5A	EIF4A	EIF3A	EIF2A	EIF1A	EIF0A
G145	EIF15A	EIF14A	EIF13A	EIF12A	EIF11A	EIF10A	EIF9A	EIF8A
G146	EID7A	EID6A	EID5A	EID4A	EID3A	EID2A	EID1A	EID0A
G147	EID15A	EID14A	EID13A	EID12A	EID11A	EID10A	EID9A	EID8A
G148	EID23A	EID22A	EID21A	EID20A	EID19A	EID18A	EID17A	EID16A
G149	EID31A	EID30A	EID29A	EID28A	EID27A	EID26A	EID25A	EID24A
G150	DRNE	RTE	OVCE				ROV2E	ROV1E
G151	*FV7E	*FV6E	*FV5E	*FV4E	*FV3E	*FV2E	*FV1E	*FV0E

	#7	#6	#5	#4	#3	#2	#1	#0
G154	EBUFB	ECLRB	ESTPB	ESOFB	ESBKB	EMBUFB	ELCKZB	EFINB
G155	EMSBKB	EC6B	EC5B	EC4B	EC3B	EC2B	EC1B	EC0B
G156	EIF7B	EIF6B	EIF5B	EIF4B	EIF3B	EIF2B	EIF1B	EIF0B
G157	EIF15B	EIF14B	EIF13B	EIF12B	EIF11B	EIF10B	EIF9B	EIF8B
G158	EID7B	EID6B	EID5B	EID4B	EID3B	EID2B	EID1B	EID0B
G159	EID15B	EID14B	EID13B	EID12B	EID11B	EID10B	EID9B	EID8B
G160	EID23B	EID22B	EID21B	EID20B	EID19B	EID18B	EID17B	EID16B
G161	EID31B	EID30B	EID29B	EID28B	EID27B	EID26B	EID25B	EID24B
G166	EBUFC	ECLRC	ESTPC	ESOFC	ESBKC	EMBUFC	ELCKZC	EFINC
G167	EMSBKC	EC6C	EC5C	EC4C	EC3C	EC2C	EC1C	EC0C
G168	EIF7C	EIF6C	EIF5C	EIF4C	EIF3C	EIF2C	EIF1C	EIF0C
G169	EIF15C	EIF14C	EIF13C	EIF12C	EIF11C	EIF10C	EIF9C	EIF8C
G170	EID7C	EID6C	EID5C	EID4C	EID3C	EID2C	EID1C	EID0C
G171	EID15C	EID14C	EID13C	EID12C	EID11C	EID10C	EID9C	EID8C
G172	EID23C	EID22C	EID21C	EID20C	EID19C	EID18C	EID17C	EID16C
G173	EID31C	EID30C	EID29C	EID28C	EID27C	EID26C	EID25C	EID24C
G178	EBUFD	ECLRD	ESTPD	ESOFD	ESBKD	EMBUFD	ELCKZD	EFIND
G179	EMSBKD	EC6D	EC5D	EC4D	EC3D	EC2D	EC1D	EC0D
G180	EIF7D	EIF6D	EIF5D	EIF4D	EIF3D	EIF2D	EIF1D	EIF0D
G181	EIF15D	EIF14D	EIF13D	EIF12D	EIF11D	EIF10D	EIF9D	EIF8D
G182	EID7D	EID6D	EID5D	EID4D	EID3D	EID2D	EID1D	EID0D
G183	EID15D	EID14D	EID13D	EID12D	EID11D	EID10D	EID9D	EID8D
G184	EID23D	EID22D	EID21D	EID20D	EID19D	EID18D	EID17D	EID16D
G185	EID31D	EID30D	EID29D	EID28D	EID27D	EID26D	EID25D	EID24D

	#7	#6	#5	#4	#3	#2	#1	#0
G192	IGVRY8	IGVRY7	IGVRY6	IGVRY5	IGVRY4	IGVRY3	IGVRY2	IGVRY1
G197					MTD	MTC	MTB	MTA
G198	NPOS8	NPOS7	NPOS6	NPOS5	NPOS4	NPOS3	NPOS2	NPOS1
G199							IOLBH3	IOLBH2
G200	EASIP8	EASIP7	EASIP6	EASIP5	EASIP4	EASIP3	EASIP2	EASIP1
G203						FTCLR	FTCAL	FTCMD
G204	MRDYC	ORCML	SFRC	SRVC	CTH1C	CTH2C	TLMHC	TLMLC
G205	RCHC	RSLC	INTGC	SOCNC	MCFNC	SPSLC	*ESPC	ARSTC
G206	RCHHGC	MFNHGC	INCMDC	OVRIDC	DEFMDC	NRROC	ROTAC	INDXC
G207				DSCNC	SORSLC	MPOFC	SLVC	MORCMC
G208	SHC07	SHC06	SHC05	SHC04	SHC03	SHC02	SHC01	SHC00
G209					SHC11	SHC10	SHC09	SHC08
G266	MRDYD	ORCMD	SFRD	SRVD	CTH1D	CTH2D	TLMHD	TLMLD
G267	RCHD	RSLD	INTGD	SOCND	MCFND	SPSLD	*ESPD	ARSTD
G268	RCHHGD	MFNHGD	INCMDD	OVRD	DEFMDD	NRROD	ROTAD	INDXD
G269				DSCND	SORSLD	MPOFD	SLVD	MORCMD
G270	SHD07	SHD06	SHD05	SHD04	SHD03	SHD02	SHD01	SHD00
G271					SHD11	SHD10	SHD09	SHD08
G272	R08I4	R07I4	R06I4	R05I4	R04I4	R03I4	R02I4	R01I4
G273	SIND4	SSIN4	SGN4		R12I4	R11I4	R10I4	R01I4
G292	ITCD							

CNC→PMC

Address	Bit number							
	#7	#6	#5	#4	#3	#2	#1	#0
F000	OP	SA	STL	SPL				RWD
F001	MA		TAP	ENB	DEN	BAL	RST	AL
F002	MDRN	CUT		SRNMV	THRD	CSS	RPDO	INCH
F003	MTCHIN	MEDT	MMEM	MRMT	MMDI	MJ	MH	MINC
F004			MREF	MAFL	MSBK	MABSM	MMLK	MBDT1
F005	MBDT9	MBDT8	MBDT7	MBDT6	MBDT5	MBDT4	MBDT3	MBDT2
F007	BF			BF	TF	SF	EFD	MF
F008			MF3	MF2				EF
F009	DM00	DM01	DM02	DM30				
F010	M07	M06	M05	M04	M03	M02	M01	M00
F011	M15	M14	M13	M12	M11	M10	M09	M08
F012	M23	M22	M21	M20	M19	M18	M17	M16
F013	M31	M30	M29	M28	M27	M26	M25	M24
F014	M207	M206	M205	M204	M203	M202	M201	M200
F015	M215	M214	M213	M212	M211	M210	M209	M208
F016	M307	M306	M305	M304	M303	M302	M301	M300
F017	M315	M314	M313	M312	M311	M310	M309	M308
F022	S07	S06	S05	S04	S03	S02	S01	S00
F023	S15	S14	S13	S12	S11	S10	S09	S08
F024	S23	S22	S21	S20	S19	S18	S17	S16
F025	S31	S30	S29	S28	S27	S26	S25	S24
F026	T07	T06	T05	T04	T03	T02	T01	T00
F027	T15	T14	T13	T12	T11	T10	T09	T08

	#7	#6	#5	#4	#3	#2	#1	#0
F028	T23	T22	T21	T20	T19	T18	T17	T16
F029	T31	T30	T29	T28	T27	T26	T25	T24
F030	B07	B06	B05	B04	B03	B02	B01	B00
F031	B15	B14	B13	B12	B11	B10	B09	B08
F032	B23	B22	B21	B20	B19	B18	B17	B16
F033	B31	B30	B29	B28	B27	B26	B25	B24
F034						GR3O	GR2O	GR1O
F035								SPAL
F036	R08O	R07O	R06O	R05O	R04O	R03O	R02O	R01O
F037					R12O	R11O	R10O	R09O
F038					ENB3	ENB2	SUCLP	SCLP
F039					CHPCYL	CHPMD	ENB4	
F040	AR7	AR6	AR5	AR4	AR3	AR2	AR1	AR0
F041	AR15	AR14	AR13	AR12	AR11	AR10	AR09	AR08
F044				SYCAL	FSPPH	FSPSY	FSCSL	
F045	ORARA	TLMA	LDT2A	LDT1A	SARA	SDTA	SSTA	ALMA
F046	MORA2A	MORA1A	PORA2A	SLVSA	RCFNA	RCHPA	CFINA	CHPA
F047				EXOFA	SORENA	MSOVRA	INCSTA	PC1DEA
F049	ORARB	TLMB	LDT2B	LDT1B	SARB	SDTB	SSTB	ALMB
F050	MORA2B	MORA1B	PORA2B	SLVSB	RCFNB	RCHPB	CFINB	CHPB
F051				EXOFB	SORENB	MSOVRB	INCSTB	PC1DEB
F053	EKENB			BGEACT	RPALM	RPBSY	PRGDPL	INHKY
F054	UO007	UO006	UO005	UO004	UO003	UO002	UO001	UO000
F055	UO015	UO014	UO013	UO012	UO011	UO010	UO009	UO008

	#7	#6	#5	#4	#3	#2	#1	#0
F056	UO107	UO106	UO105	UO104	UO103	UO102	UO101	UO100
F057	UO115	UO114	UO113	UO112	UO111	UO110	UO109	UO108
F058	UO123	UO122	UO121	UO120	UO119	UO118	UO117	UO116
F059	UO131	UO130	UO129	UO128	UO127	UO126	UO125	UO124
F060						ESCAN	ESEND	EREND
F061					HCEXE	HCAB2	BCLP	BUCLP
F062	PRTSF			S2MES	S1MES			AICC
F063	PSYN					PSAR	PSE2	PSE1
F064					TLCHB	TLCHI	TLNW	TLCH
F065	HOBSYN	SYNMOD	MSPCF	RTRCTF			RGSPM	RGSPP
F066	EXHPCC	MMPCC	PECK2				RTPT	G08MD
F069	RMTDO7	RMTDO6	RMTDO5	RMTDO4	RMTDO3	RMTDO2	RMTDO1	RMTDO0
F070	PSW08	PSW07	PSW06	PSW05	PSW04	PSW03	PSW02	PSW01
F071	PSW16	PSW15	PSW14	PSW13	PSW12	PSW11	PSW10	PSW09
F072	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
F073				ZRNO		MD4O	MD2O	MD1O
F075	SPO	KEYO	DRNO	MLKO	SBKO	BDTO		
F076			ROV2O	ROV1O	RTAP		MP2O	MP1O
F077		RTO			HS1DO	HS1CO	HS1BO	HS1AO
F078	*FV7O	*FV6O	*FV5O	*FV4O	*FV3O	*FV2O	*FV1O	*FV0O
F079	*JV7O	*JV6O	*JV5O	*JV4O	*JV3O	*JV2O	*JV1O	*JV0O
F080	*JV15O	*JV14O	*JV13O	*JV12O	*JV11O	*JV10O	*JV9O	*JV8O
F081	–J4O	+J4O	–J3O	+J3O	–J2O	+J2O	–J1O	+J1O
F082						RVSL		

	#7	#6	#5	#4	#3	#2	#1	#0
F090					ABTSP3	ABTSP2	ABTSP1	ABTQSV
F091						MRVSP	MNCHG	MRVMD
F092			TRSPS		TRACT			
F093	SVWRN4	SVWRN3	SVWRN2	SVWRN1				
F094	ZP8	ZP7	ZP6	ZP5	ZP4	ZP3	ZP2	ZP1
F096	ZP28	ZP27	ZP26	ZP25	ZP24	ZP23	ZP22	ZP21
F098	ZP38	ZP37	ZP36	ZP35	ZP34	ZP33	ZP32	ZP31
F100	ZP48	ZP47	ZP46	ZP45	ZP44	ZP43	ZP42	ZP41
F102	MV8	MV7	MV6	MV5	MV4	MV3	MV2	MV1
F104	INP8	INP7	INP6	INP5	INP4	INP3	INP2	INP1
F106	MVD8	MVD7	MVD6	MVD5	MVD4	MVD3	MVD2	MVD1
F108	MMI8	MMI7	MMI6	MMI5	MMI4	MMI3	MMI2	MMI1
F110	MDTCH8	MDTCH7	MDTCH6	MDTCH5	MDTCH4	MDTCH3	MDTCH2	MDTCH1
F112	EADEN8	EADEN7	EADEN6	EADEN5	EADEN4	EADEN3	EADEN2	EADEN1
F114	TRQL8	TRQL7	TRQL6	TRQL5	TRQL4	TRQL3	TRQL2	TRQL1
F116	FRP8	FRP7	FRP6	FRP5	FRP4	FRP3	FRP2	FRP1
F118	SYN8O	SYN7O	SYN6O	SYN5O	SYN4O	SYN3O	SYN2O	SYN1O
F120	ZRF8	ZRF7	ZRF6	ZRF5	ZRF4	ZRF3	ZRF2	ZRF1
F122	HDO7	HDO6	HDO5	HDO4	HDO3	HDO2	HDO1	HDO0
F124	+OT8	+OT7	+OT6	+OT5	+OT4	+OT3	+OT2	+OT1
F126	–OT8	–OT7	–OT6	–OT5	–OT4	–OT3	–OT2	–OT1
F129	*EAXSL		EOV0					
F130	EBSYA	EOTNA	EOTPA	EGENA	EDENA	EIALA	ECKZA	EINPA
F131							EABUFA	EMFA

	#7	#6	#5	#4	#3	#2	#1	#0
F132	EM28A	EM24A	EM22A	EM21A	EM18A	EM14A	EM12A	EM11A
F133	EBSYB	EOTNB	EOTPB	EGENB	EDENB	EIALB	ECKZB	EINPB
F134							EABUFB	EMFB
F135	EM28B	EM24B	EM22B	EM21B	EM18B	EM14B	EM12B	EM11B
F136	EBSYC	EOTNC	EOTPC	EGENC	EDENC	EIALC	ECKZC	EINPC
F137							EABUFC	EMFC
F138	EM28C	EM24C	EM22C	EM21C	EM18C	EM14C	EM12C	EM11C
F139	EBSYD	EOTND	EOTPD	EGEND	EDEND	EIALD	ECKZD	EINPD
F140							EABUFD	EMFD
F141	EM28D	EM24D	EM22D	EM21D	EM18D	EM14D	EM12D	EM11D
F142	EM48A	EM44A	EM42A	EM41A	EM38A	EM34A	EM32A	EM31A
F145	EM48B	EM44B	EM42B	EM41B	EM38B	EM34B	EM32B	EM31B
F148	EM48C	EM44C	EM42C	EM41C	EM38C	EM34C	EM32C	EM31C
F151	EM48D	EM44D	EM42D	EM41D	EM38D	EM34D	EM32D	EM31D
F168	ORARC	TLMC	LDT2C	LDT1C	SARC	SDTC	SSTC	ALMC
F169	MORA2C	MORA1C	PORA2C	SLVSC	RCFNC	RCHPC	CFINC	CHPC
F170				EXOFC	SORENC	MSOVRC	INCSTC	PC1DEC
F172	PBATL	PBATZ						
F177	EDGN	EPARM	EVAR	EPRG	EWTIO	ESTPIO	ERDIO	IOLNK
F178					SRLNO3	SRLNO2	SRLNO1	SRLNO0
F180	CLRCH8	CLRCH7	CLRCH6	CLRCH5	CLRCH4	CLRCH3	CLRCH2	CLRCH1
F182	EACNT8	EACNT7	EACNT6	EACNT5	EACNT4	EACNT3	EACNT2	EACNT1
F197					MFSYND	MFSYNC	MFSYNB	MFSYNA
F208	EGBM8	EGBM7	EGBM6	EGBM5	EGBM4	EGBM3	EGBM2	EGBM1

	#7	#6	#5	#4	#3	#2	#1	#0
F264	SPWRN8	SPWRN7	SPWRN6	SPWRN5	SPWRN4	SPWRN2	SPWRN2	SPWRN1
F265								SPWRN8
F266	ORARD	TLMD	LDT2D	LDT1D	SARD	SDTD	SSTD	ALMD
F267	MORA2D	MORA1D	PORA2D	SLVSD	RCFND	RCHPD	CFIND	CHPD
F268				EXOFD	SOREND	MSOVRD	INCSTD	PC1DTD

9.4 List of Addresses (Two–Path Control)

Signals addresses for each path are usually assigned as follows:
However, for the signals common to both paths, those signals are assigned to path 1. Interface signals between the CNC and PMC are as shown below:
The signals with suffix #1 are those for path 1 and the signals with suffix #2 are those for path 2.

Signal address	Contents
G000–G512	Signals on path 1 (PMC→CNC)
F000–F512	Signals on path 1 (CNC→PMC)
G1000–G1512	Signals on path 2 (PMC→CNC)
F1000–F1512	Signals on path 2 (CNC→PMC)

MT→PMC

Address / Bit number

Address	#7	#6	#5	#4	#3	#2	#1	#0
								(T series)
X004	SKIP#1	ESKIP SKIP6#1	–MIT2#1 SKIP5#1	+MIT2#1 SKIP4#1	–MIT1#1 SKIP3#1	+MIT1#1 SKIP2#1	ZAE#1 SKIP8#1	XAE#1 SKIP7#1
	SKIP#1	ESKIP SKIP6#1	SKIP5#1	SKIP4#1	SKIP3#1	ZAE#1 SKIP2#1	YAE#1 SKIP8#1	XAE#1 SKIP7#1
								(M series)
X007	*DEC8#2	*DEC7#2	*DEC6#2	*DEC5#2	*DEC4#2	*DEC3#2	*DEC2#2	*DEC1#2
X008				*ESP				
X009	*DEC8#1	*DEC7#1	*DEC6#1	*DEC5#1	*DEC4#1	*DEC3#1	*DEC2#1	*DEC1#1
								(T series)
X013	SKIP#2	SKIP6#2	–MIT2#2 SKIP5#2	+MIT2#2 SKIP4#2	–MIT1#2 SKIP3#2	+MIT1#2 SKIP2#2	ZAE#2 SKIP8#2	XAE#2 SKIP7#2
	SKIP#2	SKIP6#2	SKIP5#2	SKIP4#2	SKIP3#2	ZAE#2 SKIP2#2	YAE#2 SKIP8#2	XAE#2 SKIP7#2
								(M series)

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PMC→CNC

Address / Bit number

Address	#7	#6	#5	#4	#3	#2	#1	#0
G000	ED7#1	ED6#1	ED5#1	ED4#1	ED3#1	ED2#1	ED1#1	ED0#1
G001	ED15#1	ED14#1	ED13#1	ED12#1	ED11#1	ED10#1	ED9#1	ED8#1
G002	ESTB#1	EA6#1	EA5#1	EA4#1	EA3#1	EA2#1	EA1#1	EA0#1
G004			MFIN3#1	MFIN2#1	FIN#1			
G005	BFIN#1	AFL#1		BFIN#1	TFIN#1	SFIN#1	EFIN#1	MFIN#1
G006		SKIPP#1		OVC#1		*ABSM#1		SRN#1
G007	RLSOT#1	EXLM#1	*FLWP#1	RLSOT3#1		ST#1	STLK#1	RVS#1
G008	ERS#1	RRW#1	*SP#1	*ESP#1	*BSL #1		*CSL #1	*IT#1
G009				PN16#1	PN8#1	PN4#1	PN2#1	PN1#1
G010	*JV7#1	*JV6#1	*JV5#1	*JV4#1	*JV3#1	*JV2#1	*JV1#1	*JV0#1
G011	*JV15#1	*JV14#1	*JV13#1	*JV12#1	*JV11#1	*JV10#1	*JV9#1	*JV8#1
G012	*FV7#1	*FV6#1	*FV5#1	*FV4#1	*FV3#1	*FV2#1	*FV1#1	*FV0#1
G013	*AFV7#1	*AFV6#1	*AFV5#1	*AFV4#1	*AFV3#1	*AFV2#1	*AFV1#1	*AFV0#1

	#7	#6	#5	#4	#3	#2	#1	#0
G014							ROV2#1	ROV1#1
G016	F1D#1							MSDFON#1
G018	HS2D#1	HS2C#1	HS2B#1	HS2A#1	HS1D#1	HS1C#1	HS1B#1	HS1A#1
G019	RT#1		MP2#1	MP1#1	HS3D#1	HS3C#1	HS3B#1	HS3A#1
G023	ALNGH#1	RGHTH#1						
G024	EPN7#1	EPN6#1	EPN5#1	EPN4#1	EPN3#1	EPN2#1	EPN1#1	EPN0#1
G025	EPNS#1		EPN13#1	EPN12#1	EPN11#1	EPN10#1	EPN9#1	EPN8#1
G026		*SSTP4#1			SWS4#1		PC4SLC#1	PC3SLC#1
G027	CON#1		*SSTP3#1	*SSTP2#1	*SSTP1#1	SWS3#1	SWS2#1	SWS1#1
G028	PC2SLC#1	SPSTP#1	*SCPF#1	*SUCPF#1		GR2#1	GR1#1	
G029		*SSTP#1	SOR#1	SAR#1		GR31#1		GR21#1
G030	SOV7#1	SOV6#1	SOV5#1	SOV4#1	SOV3#1	SOV2#1	SOV1#1	SOV0#1
G031	PKESS2#1	PKESS1#1		GR41#1				
G032	R08I#1	R07I#1	R06I#1	R05I#1	R04I#1	R03I#1	R02I#1	R01I#1
G033	SIND#1	SSIN#1	SGN#1		R12I#1	R11I#1	R10I#1	R09I#1
G034	R08I2#1	R07I2#1	R06I2#1	R05I2#1	R04I2#1	R03I2#1	R02I2#1	R01I2#1
G035	SIND2#1	SSIN2#1	SGN2#1		R12I2#1	R11I2#1	R10I2#1	R09I2#1
G036	R08I3#1	R07I3#1	R06I3#1	R05I3#1	R04I3#1	R03I3#1	R02I3#1	R01I3#1
G037	SIND3#1	SSIN3#1	SGN3#1		R12I3#1	R11I3#1	R10I3#1	R09I3#1
G038	*BECLP#1	*BEUCP#1			SPPHS_ SPPHS#1	SPSYC_ SPSYC#1		*PLSST#1
G039	GOQSM#1	WOQSM#1	OFN5#1	OFN4#1	OFN3#1	OFN2#1	OFN1#1	OFN0#1
G040	WOSET#1	PRC#1	S2TLS#1					OFN6#1
G041	HS2ID#1	HS2IC#1	HS2IB#1	HS2IA#1	HS1ID#1	HS1IC#1	HS1IB#1	HS1IA#1
G042					HS3ID#1	HS3IC#1	HS3IB#1	HS3IA#1

	#7	#6	#5	#4	#3	#2	#1	#0
G043	ZRN#1		DNCI#1			MD4#1	MD2#1	MD1#1
G044							MLK#1	BDT1#1
G045	BDT9#1	BDT8#1	BDT7#1	BDT6#1	BDT5#1	BDT4#1	BDT3#1	BDT2#1
G046	DRN#1	KEY4#1	KEY3#1	KEY2#1	KEY1#1		SBK#1	
G047	TL128#1	TL64#1	TL32#1	TL16#1	TL08#1	TL04#1	TL02#1	TL01#1
G048	TLRST#1	TLRSTI#1	TLSKP#1					TL256#1
G049	*TLV7#1	*TLV6#1	*TLV5#1	*TLV4#1	*TLV3#1	*TLV2#1	*TLV1#1	*TLV0#1
G050							*TLV9#1	*TLV8#1
G051	*CHLD#1	CHPST#1			*CHP8#1	*CHP4#1	*CHP2#1	*CHP0#1
G053	CDZ#1	SMZ#1			UINT#1			TMRON#1
G054	UI007#1	UI006#1	UI005#1	UI004#1	UI003#1	UI002#1	UI001#1	UI000#1
G055	UI015#1	UI014#1	UI013#1	UI012#1	UI011#1	UI010#1	UI009#1	UI008#1
G058					EXWT#1	EXSTP#1	EXRD#1	MINP#1
G059							TRRTN#1	TRESC#1
G060	*TSB#1							
G061			RGTSP2#1	RGTSP1#1				RGTAP#1
G062		RTNT #1	PDT2#1	PDT1#1			*CRTOF#1	
G063		INFD#1	NOZAGC#1		SLSPB	SLSPA	NOWT	HEAD
G064		ESRSYC#1			SLPCB	SLPCA		
G065	HCSKP4#1	HCSKP3#1	HCSKP2#1	HCSKP1#1				
G066	EKSET		MSPC #1	RTRCT		HOBCAN #1	ENBKY	IGNVRY#1
G067	HCREQ	HCABT			MCHK#1	MMOD#1	MRVM#1	
G070	MRDYA#1	ORCMA#1	SFRA#1	SRVA#1	CTH1A#1	CTH2A#1	TLMHA#1	TLMLA#1
G071	RCHA#1	RSLA#1	INTGA#1	SOCNA#1	MCFNA#1	SPSLA#1	*ESPA#1	ARSTA#1

	#7	#6	#5	#4	#3	#2	#1	#0
G072	RCHHGA#1	MFNHGA#1	INCMDA#1	OVRIDA#1	DEFMDA#1	NRROA#1	ROTAA#1	INDXA#1
G073				DSCNA#1	SORSLA#1	MPOFA#1	SLVA#1	MORCMA#1
G074	MRDYB#1	ORCMB#1	SFRB#1	SRVB#1	CTH1B#1	CTH2B#1	TLMHB#1	TLMLB#1
G075	RCHB#1	RSLB#1	INTGB#1	SOCNB#1	MCFNB#1	SPSLB#1	*ESPB#1	ARSTB#1
G076	RCHHGB#1	MFNHGB#1	INCMDB#1	OVRIDB#1	DEFMDB#1	NRROB#1	ROTAB#1	INDXB#1
G077				DSCNB#1	SORSLB#1	MPOFB#1	SLVB#1	MORCMB#1
G078	SHA07#1	SHA06#1	SHA05#1	SHA04#1	SHA03#1	SHA02#1	SHA01#1	SHA00#1
G079					SHA11#1	SHA10#1	SHA09#1	SHA08#1
G080	SHB07#1	SHB06#1	SHB05#1	SHB04#1	SHB03#1	SHB02#1	SHB01#1	SHB00#1
G081					SHB11#1	SHB10#1	SHB09#1	SHB08#1
G082	Reserved for order made macro							
G083	Reserved for order made macro							
G090	G2SLC#1	G2Y#1	G2Z#1	G2X#1		G2RVY#1	G2RVZ#1	G2RVX#1
G091					SRLNI3#1	SRLNI2#1	SRLNI1#1	SRLNI0#1
G092				BGEN#1	BGIALM#1	BGION#1	IOLS#1	IOLACK#1
G096	HROV#1	*HROV6#1	*HROV5#1	*HROV4#1	*HROV3#1	*HROV2#1	*HROV1#1	*HROV0#1
G098	EKC7	EKC6	EKC5	EKC4	EKC3	EKC2	EKC1	EKC0
G100	+J8#1	+J7#1	+J6#1	+J5#1	+J4#1	+J3#1	+J2#1	+J1#1
G102	–J8#1	–J7#1	–J6#1	–J5#1	–J4#1	–J3#1	–J2#1	–J1#1
G104	+EXL8#1	+EXL7#1	+EXL6#1	+EXL5#1	+EXL4#1	+EXL3#1	+EXL2#1	+EXL1#1
G105	–EXL8#1	–EXL7#1	–EXL6#1	–EXL5#1	–EXL4#1	–EXL3#1	–EXL2#1	–EXL1#1
G106	MI8#1	MI7#1	MI6#1	MI5#1	MI4#1	MI3#1	MI2#1	MI1#1
G108	MLK8#1	MLK7#1	MLK6#1	MLK5#1	MLK4#1	MLK3#1	MLK2#1	MLK1#1
G110		+LM7#1	+LM6#1	+LM5#1	+LM4#1	+LM3#1	+LM2#1	+LM1#1

	#7	#6	#5	#4	#3	#2	#1	#0
G112		–LM7#1	–LM6#1	–LM5#1	–LM4#1	–LM3#1	–LM2#1	–LM1#1
G114	*+L8#1	*+L7#1	*+L6#1	*+L5#1	*+L4#1	*+L3#1	*+L2#1	*+L1#1
G116	*–L8#1	*–L7#1	*–L6#1	*–L5#1	*–L4#1	*–L3#1	*–L2#1	*–L1#1
G118	*+ED8#1	*+ED7#1	*+ED6#1	*+ED5#1	*+ED4#1	*+ED3#1	*+ED2#1	*+ED1#1
G120	*–ED8#1	*–ED7#1	*–ED6#1	*–ED5#1	*–ED4#1	*–ED3#1	*–ED2#1	*–ED1#1

(T series)

G122	PKESS2#1	PK7#1 PKESS1#1	PK6#1	PK5#1	PK4#1	PK3#1	PK2#1	PK1#1
	PKESS2#1	PKESS1#1						

(M series)

G124	DTCH8#1	DTCH7#1	DTCH6#1	DTCH5#1	DTCH4#1	DTCH3#1	DTCH2#1	DTCH1#1
G125	IUDD8#1	IUDD7#1	IUDD6#1	IUDD5#1	IUDD4#1	IUDD3#1	IUDD2#1	IUDD1#1
G126	SVF8#1	SVF7#1	SVF6#1	SVF5#1	SVF4#1	SVF3#1	SVF2#1	SVF1#1
G128	MIX8	MIX7	MIX6	MIX5	MIX4	MIX3	MIX2	MIX1
G130	*IT8#1	*IT7#1	*IT6#1	*IT5#1	*IT4#1	*IT3#1	*IT2#1	*IT1#1
G132					+MIT4#1	+MIT3#1	+MIT2#1	+MIT1#1
G134					–MIT4#1	–MIT3#1	–MIT2#1	–MIT1#1
G136	EAX8#1	EAX7#1	EAX6#1	EAX5#1	EAX4#1	EAX3#1	EAX2#1	EAX1#1
G138	SYNC8#1	SYNC7#1	SYNC6#1	SYNC5#1	SYNC4#1	SYNC3#1	SYNC2#1	SYNC1#1
G140		SYNCJ7#1	SYNCJ6#1	SYNCJ5#1	SYNCJ4#1	SYNCJ3#1	SYNCJ2#1	SYNCJ1#1
G142	EBUFA#1	ECLRA#1	ESTPA#1	ESOFA#1	ESBKA#1	EMBUFA#1	ELCKZA#1	EFINA#1
G143	EMSBKA#1	EC6A#1	EC5A#1	EC4A#1	EC3A#1	EC2A#1	EC1A#1	EC0A#1
G144	EIF7A#1	EIF6A#1	EIF5A#1	EIF4A#1	EIF3A#1	EIF2A#1	EIF1A#1	EIF0A#1
G145	EIF15A#1	EIF14A#1	EIF13A#1	EIF12A#1	EIF11A#1	EIF10A#1	EIF9A#1	EIF8A#1
G146	EID7A#1	EID6A#1	EID5A#1	EID4A#1	EID3A#1	EID2A#1	EID1A#1	EID0A#1
G147	EID15A#1	EID14A#1	EID13A#1	EID12A#1	EID11A#1	EID10A#1	EID9A#1	EID8A#1

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	#7	#6	#5	#4	#3	#2	#1	#0
G148	EID23A#1	EID22A#1	EID21A#1	EID20A#1	EID19A#1	EID18A#1	EID17A#1	EID16A#1
G149	EID31A#1	EID30A#1	EID29A#1	EID28A#1	EID27A#1	EID26A#1	EID25A#1	EID24A#1
G150	DRNE#1	RTE#1	OVCE#1				ROV2E#1	ROV1E#1
G151	*FV7E#1	*FV6E#1	*FV5E#1	*FV4E#1	*FV3E#1	*FV2E#1	*FV1E#1	*FV0E#1
G154	EBUFB#1	ECLRB#1	ESTPB#1	ESOFB#1	ESBKB#1	EMBUFB#1	ELCKZB#1	EFINB#1
G155	EMSBKB#1	EC6B#1	EC5B#1	EC4B#1	EC3B#1	EC2B#1	EC1B#1	EC0B#1
G156	EIF7B#1	EIF6B#1	EIF5B#1	EIF4B#1	EIF3B#1	EIF2B#1	EIF1B#1	EIF0B#1
G157	EIF15B#1	EIF14B#1	EIF13B#1	EIF12B#1	EIF11B#1	EIF10B#1	EIF9B#1	EIF8B#1
G158	EID7B#1	EID6B#1	EID5B#1	EID4B#1	EID3B#1	EID2B#1	EID1B#1	EID0B#1
G159	EID15B#1	EID14B#1	EID13B#1	EID12B#1	EID11B#1	EID10B#1	EID9B#1	EID8B#1
G160	EID23B#1	EID22B#1	EID21B#1	EID20B#1	EID19B#1	EID18B#1	EID17B#1	EID16B#1
G161	EID31B#1	EID30B#1	EID29B#1	EID28B#1	EID27B#1	EID26B#1	EID25B#1	EID24B#1
G166	EBUFC#1	ECLRC#1	ESTPC#1	ESOFC#1	ESBKC#1	EMBUFC#1	ELCKZC#1	EFINC#1
G167	EMSBKC#1	EC6C#1	EC5C#1	EC4C#1	EC3C#1	EC2C#1	EC1C#1	EC0C#1
G168	EIF7C#1	EIF6C#1	EIF5C#1	EIF4C#1	EIF3C#1	EIF2C#1	EIF1C#1	EIF0C#1
G169	EIF15C#1	EIF14C#1	EIF13C#1	EIF12C#1	EIF11C#1	EIF10C#1	EIF9C#1	EIF8C#1
G170	EID7C#1	EID6C#1	EID5C#1	EID4C#1	EID3C#1	EID2C#1	EID1C#1	EID0C#1
G171	EID15C#1	EID14C#1	EID13C#1	EID12C#1	EID11C#1	EID10C#1	EID9C#1	EID8C#1
G172	EID23C#1	EID22C#1	EID21C#1	EID20C#1	EID19C#1	EID18C#1	EID17C#1	EID16C#1
G173	EID31C#1	EID30C#1	EID29C#1	EID28C#1	EID27C#1	EID26C#1	EID25C#1	EID24C#1
G178	EBUFD#1	ECLRD#1	ESTPD#1	ESOFD#1	ESBKD#1	EMBUFD#1	ELCKZD#1	EFIND#1
G179	EMSBKD#1	EC6D#1	EC5D#1	EC4D#1	EC3D#1	EC2D#1	EC1D#1	EC0D#1
G180	EIF7D#1	EIF6D#1	EIF5D#1	EIF4D#1	EIF3D#1	EIF2D#1	EIF1D#1	EIF0D#1
G181	EIF15D#1	EIF14D#1	EIF13D#1	EIF12D#1	EIF11D#1	EIF10D#1	EIF9D#1	EIF8D#1

	#7	#6	#5	#4	#3	#2	#1	#0
G182	EID7D#1	EID6D#1	EID5D#1	EID4D#1	EID3D#1	EID2D#1	EID1D#1	EID0D#1
G183	EID15D#1	EID14D#1	EID13D#1	EID12D#1	EID11D#1	EID10D#1	EID9D#1	EID8D#1
G184	EID23D#1	EID22D#1	EID21D#1	EID20D#1	EID19D#1	EID18D#1	EID17D#1	EID16D#1
G185	EID31D#1	EID30D#1	EID29D#1	EID28D#1	EID27D#1	EID26D#1	EID25D#1	EID24D#1
G190	OVLS8#1	OVLS7#1	OVLS6#1	OVLS5#1	OVLS4#1	OVLS3#1	OVLS2#1	OVLS1#1
G192	IGVRY8#1	IGVRY7#1	IGVRY6#1	IGVRY5#1	IGVRY4#1	IGVRY3#1	IGVRY2#1	IGVRY1#1
G197					MTD#1	MTC#1	MTB#1	MTA#1
G198	NPOS8#1	NPOS7#1	NPOS6#1	NPOS5#1	NPOS4#1	NPOS3#1	NPOS2#1	NPOS1#1
G200	EASIP8#1	EASIP7#1	EASIP6#1	EASIP5#1	EASIP4#1	EASIP3#1	EASIP2#1	EASIP1#1
G203						FTCLR#1	FTCAL#1	FTCMD#1
G204	MRDYC#1	ORCMC#1	SFRC#1	SRVC#1	CTH1C#1	CTH2C#1	TLMHC#1	TLMLC#1
G205	RCHC#1	RSLC#1	INTGC#1	SOCNC#1	MCFNC#1	SPSLC#1	*ESPC#1	ARSTC#1
G206	RCHHGC#1	MFNHGC#1	INCMDC#1	OVRC#1	DEFMDC#1	NRROC#1	ROTBC#1	INDXC#1
G207				DSCNC#1	SORSLC#1	MPOFC#1	SLVC#1	MORCMC#1
G208	SHC07#1	SHC06#1	SHC05#1	SHC04#1	SHC03#1	SHC02#1	SHC01#1	SHC00#1
G209					SHC11#1	SHC10#1	SHC09#1	SHC08#1
G266	MRDYD#1	ORCMD#1	SFRD#1	SRVD#1	CTH1D#1	CTH2D#1	TLMHD#1	TLMLD#1
G267	RCHD#1	RSLD#1	INTGD#1	SOCND#1	MCFND#1	SPSLD#1	*ESPD#1	ARSTD#1
G268	RCHHGD#1	MFNHGD#1	INCMDD#1	OVRD#1	DEFMDD#1	NRROD#1	ROTBD#1	INDXD#1
G269				DSCND#1	SORSLD#1	MPOFD#1	SLVD#1	MORCMD#1
G270	SHD07#1	SHD06#1	SHD05#1	SHD04#1	SHD03#1	SHD02#1	SHD01#1	SHD00#1
G271					SHD11#1	SHD10#1	SHD09#1	SHD08#1
G272	R08I4#1	R07I4#1	R06I4#1	R05I4#1	R04I4#1	R03I4#1	R02I4#1	R01I4#1
G273	SIND4#1	SSIN4#1	SGN4#1		R12I4#1	R11I4#1	R10I4#1	R09I4#1

	#7	#6	#5	#4	#3	#2	#1	#0
G292	ITCD#1							

PMC→CNC

Address / Bit number

	#7	#6	#5	#4	#3	#2	#1	#0
G1000	ED7#2	ED6#2	ED5#2	ED4#2	ED3#2	ED2#2	ED1#2	ED0#2
G1001	ED15#2	ED14#2	ED13#2	ED12#2	ED11#2	ED10#2	ED9#2	ED8#2
G1002	ESTB#2	EA6#2	EA5#2	EA4#2	EA3#2	EA2#2	EA1#2	EA0#2
G1004			MFIN3#2	MFIN2#2	FIN#2			
G1005	BFIN#2	AFL#2		BFIN#2	TFIN#2	SFIN#2	EFIN#2	MFIN#2
G1006		SKIPP#2		OVC#2		*ABSM#2		SRN#2
G1007	RLSOT#2	EXLM#2	*FLWP#2	RLSOT3#2		ST#2	STLK#2	RVS#2
G1008	ERS#2	RRW#2	*SP#2	*ESP#2	*BSL#2		*CSL#2	*IT#2
G1009				PN16#2	PN8#2	PN4#2	PN2#2	PN1#2
G1010	*JV7#2	*JV6#2	*JV5#2	*JV4#2	*JV3#2	*JV2#2	*JV1#2	*JV0#2
G1011	*JV15#2	*JV14#2	*JV13#2	*JV12#2	*JV11#2	*JV10#2	*JV9#2	*JV8#2
G1012	*FV7#2	*FV6#2	*FV5#2	*FV4#2	*FV3#2	*FV2#2	*FV1#2	*FV0#2
G1013	*AFV7#2	*AFV6#2	*AFV5#2	*AFV4#2	*AFV3#2	*AFV2#2	*AFV1#2	*AFV0#2
G1014							ROV2#2	ROV1#2
G1016	F1D#2							MSDFON#2
G1018	HS2D#2	HS2C#2	HS2B#2	HS2A#2	HS1D#2	HS1C#2	HS1B#2	HS1A#2
G1019	RT#2		MP2#2	MP1#2	HS3D#2	HS3C#2	HS3B#2	HS3A#2
G1023	ALNGH#2	RGHTH#2						
G1024	EPN7#2	EPN6#2	EPN5#2	EPN4#2	EPN3#2	EPN2#2	EPN1#2	EPN0#2
G1025	EPNS#2		EPN13#2	EPN12#2	EPN11#2	EPN10#2	EPN9#2	EPN8#2
G1026		*SSTP4#2			SWS4#2		PC4SLC#2	PC3SLC#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1027	CON#2		*SSTP3#2	*SSTP2#2	*SSTP1#2	SWS3#2	SWS2#2	SWS1#2
G1028	PC2SLC#2	SPSTP#2	*SCPF#2	*SUCPF#2		GR2#2	GR1#2	
G1029		*SSTP#2	SOR#2	SAR#2		GR31#2		GR21#2
G1030	SOV7#2	SOV6#2	SOV5#2	SOV4#2	SOV3#2	SOV2#2	SOV1#2	SOV0#2
G1031	PKESS2#2	PKESS1#2		GR41#2				
G1032	R08I#2	R07I#2	R06I#2	R05I#2	R04I#2	R03I#2	R02I#2	R01I#2
G1033	SIND#2	SSIN#2	SGN#2		R12I#2	R11I#2	R10I#2	R09I#2
G1034	R08I2#2	R07I2#2	R06I2#2	R05I2#2	R04I2#2	R03I2#2	R02I2#2	R01I2#2
G1035	SIND2#2	SSIN2#2	SGN2#2		R12I2#2	R11I2#2	R10I2#2	R09I2#2
G1036	R08I3#2	R07I3#2	R06I3#2	R05I3#2	R04I3#2	R03I3#2	R02I3#2	R01I3#2
G1037	SIND3#2	SSIN3#2	SGN3#2		R12I3#2	R11I3#2	R10I3#2	R09I3#2
G1038	*BECLP#2	*BEUCP#2			SPPHS#2	SPSYC#2		*PLSST#2
G1039	GOQSM#2	WOQSM#2	OFN5#2	OFN4#2	OFN3#2	OFN2#2	OFN1#2	OFN0#2
G1040	WOSET#2	PRC#2	S2TLS#2					OFN6#2
G1041	HS2ID#2	HS2IC#2	HS2IB#2	HS2IA#2	HS1ID#2	HS1IC#2	HS1IB#2	HS1IA#2
G1042					HS3ID#2	HS3IC#2	HS3IB#2	HS3IA#2
G1043	ZRN#2		DNCI#2			MD4#2	MD2#2	MD1#2
G1044							MLK#2	BDT1#2
G1045	BDT9#2	BDT8#2	BDT7#2	BDT6#2	BDT5#2	BDT4#2	BDT3#2	BDT2#2
G1046	DRN#2	KEY4#2	KEY3#2	KEY2#2	KEY1#2		SBK#2	
G1047	TL128#2	TL64#2	TL32#2	TL16#2	TL08#2	TL04#2	TL02#2	TL01#2
G1048	TLRST#2	TLRSTI#2	TLSKP#2					TL256#2
G1049	*TLV7#2	*TLV6#2	*TLV5#2	*TLV4#2	*TLV3#2	*TLV2#2	*TOV1#2	*TLV0#2
G1050							*TLV9#2	*TLV8#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1051	*CHLD#2	CHPST#2			*CHP8#2	*CHP4#2	*CHP2#2	*CHP0#2
G1052								
G1053	CDZ#2	SMZ#2			UINT#2			TMRON#2
G1054	UI007#2	UI006#2	UI005#2	UI004#2	UI003#2	UI002#2	UI001#2	UI000#2
G1055	UI015#2	UI014#2	UI013#2	UI012#2	UI011#2	UI010#2	UI009#2	UI008#2
G1058					EXWT#2	EXSTP#2	EXRD#2	MINP#2
G1059							TRRTN#2	TRESC#2
G1060	*TSB#2							
G1061			RGTSP2#2	RGTSP1#2				RGTAP#2
G1062		RTNT#2	PDT2#1	PDT1#1			*CRTOF#2	
G1063		INFD#1	NOZAGC#2					
G1064		ESRSYC#2						
G1065	HCSKP4#2	HCSKP3#2	HCSKP2#2	HCSKP1#2				
G1066			MSPC#2	RTRCT#2		HOBCAN#2		IGNVRY#2
G1067					MCHK#2	MMOD#2	MRVM#2	
G1070	MRDYA#2	ORCMA#2	SFRA#2	SRVA#2	CTH1A#2	CTH2A#2	TLMHA#2	TLMLA#2
G1071	RCHA#2	RSLA#2	INTGA#2	SOCNA#2	MCFNA#2	SPSLA#2	*ESPA#2	ARSTA#2
G1072	RCHHGA#2	MFNHGA#2	INCMDA#2	OVRIDA#2	DEFMDA#2	NRROA#2	ROTAA#2	INDXA#2
G1073				DSCNA#2	SORSLA#2	MPOFA#2	SLVA#2	MORCMA#2
G1074	MRDYB#2	ORCMB#2	SFRB#2	SRVB#2	CTH1B#2	CTH2B#2	TLMHB#2	TLMLB#2
G1075	RCHB#2	RSLB#2	INTGB#2	SOCNB#2	MCFNB#2	SPSLB#2	*ESPB#2	ARSTB#2
G1076	RCHHGB#2	MFNHGB#2	INCMDB#2	OVRIDB#2	DEFMDB#2	NRROB#2	INDXB#2	ROTAB#2
G1077				DSCNB#2	SORSLB#2	MPOFB#2	SLVB#2	MORCMB#2
G1078	SHA07#2	SHA06#2	SHA05#2	SHA04#2	SHA03#2	SHA02#2	SHA01#2	SHA00#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1079					SHA11#2	SHA10#2	SHA09#2	SHA08#2
G1080	SHB07#2	SHB06#2	SHB05#2	SHB04#2	SHB03#2	SHB02#2	SHB01#2	SHB00#2
G1081					SHB11#2	SHB10#2	SHB09#2	SHB08#2
G1082	Reserved for order made macro							
G1083	Reserved for order made macro							
G1090	G2SLC#2	G2Y#2	G2Z#2	G2X#2		G2RVY#2	G2RVZ#2	G2RVX#2
G1091					SRLNI3#2	SRLNI2#2	SRLNI1#2	SRLNI0#2
G1092				BGEN#2	BGIALM#2	BGION#2	IOLS#2	IOLACK#2
G1096	HROV#2	*HROV6#2	*HROV5#2	*HROV4#2	*HROV3#2	*HROV2#2	*HROV1#2	*HROV0#2
G1100	+J8#2	+J7#2	+J6#2	+J5#2	+J4#2	+J3#2	+J2#2	+J1#2
G1102	–J8#2	–J7#2	–J6#2	–J5#2	–J4#2	–J3#2	–J2#2	–J1#2
G1104	+EXL8#2	+EXL7#2	+EXL6#2	+EXL5#2	+EXL4#2	+EXL3#2	+EXL2#2	+EXL1#2
G1105	–EXL8#2	–EXL7#2	–EXL6#2	–EXL5#2	–EXL4#2	–EXL3#2	–EXL2#2	–EXL1#2
G110	–EXL8#2	–EXL7#2	–EXL6#2	–EXL5#2	–EXL4#2	–EXL3#2	–EXL2#2	–EXL1#2
G1106	MI8#2	MI7#2	MI6#2	MI5#2	MI4#2	MI3#2	MI2#2	MI1#2
G1108	MLK8#2	MLK7#2	MLK6#2	MLK5#2	MLK4#2	MLK3#2	MLK2#2	MLK1#2
G1110		+LM7#2	+LM6#2	+LM5#2	+LM4#2	+LM3#2	+LM2#2	+LM1#2
G1112		–LM7#2	–LM6#2	–LM5#2	–LM4#2	–LM3#2	–LM2#2	–LM1#2
G1114	*+L8#2	*+L7#2	*+L6#2	*+L5#2	*+L4#2	*+L3#2	*+L2#2	*+L1#2
G1116	*–L8#2	*–L7#2	*–L6#2	*–L5#2	*–L4#2	*–L3#2	*–L2#2	*–L1#2
G1118	*+ED8#2	*+ED7#2	*+ED6#2	*+ED5#2	*+ED4#2	*+ED3#2	*+ED2#2	*+ED1#2
G1120	*–ED8#2	*–ED7#2	*–ED6#2	*–ED5#2	*–ED4#2	*–ED3#2	*–ED2#2	*–ED1#2

9. SIGNAL LIST (X/Y, G/F)

	#7	#6	#5	#4	#3	#2	#1	#0
								(T series)
G1122	PKESS2#2	PK7#2 PKESS1#2	PK6#2	PK5#2	PK4#2	PK3#2	PK2#2	PK1#2
	PKESS2#2	PKESS1#2						
								(M series)
G1124	DTCH8#2	DTCH7#2	DTCH6#2	DTCH5#2	DTCH4#2	DTCH3#2	DTCH2#2	DTCH1#2
G1125	IUDD8#2	IUDD7#2	IUDD6#2	IUDD5#2	IUDD4#2	IUDD3#2	IUDD2#2	IUDD1#2
G1126	SVF8#2	SVF7#2	SVF6#2	SVF5#2	SVF4#2	SVF3#2	SVF2#2	SVF1#2
G1130	*IT8#2	*IT7#2	*IT6#2	*IT5#2	*IT4#2	*IT3#2	*IT2#2	*IT1#2
G1132					+MIT4#2	+MIT3#2	+MIT2#2	+MIT1#2
G1134					–MIT4#2	–MIT3#2	–MIT2#2	–MIT1#2
G1136	EAX8#2	EAX7#2	EAX6#2	EAX5#2	EAX4#2	EAX3#2	EAX2#2	EAX1#2
G1138	SYNC8#2	SYNC7#2	SYNC6#2	SYNC5#2	SYNC4#2	SYNC3#2	SYNC2#2	SYNC1#2
G1140		SYNCJ7#2	SYNCJ6#2	SYNCJ5#2	SYNCJ4#2	SYNCJ3#2	SYNCJ2#2	SYNCJ1#2
G1142	EBUFA#2	ECLRA#2	ESTPA#2	ESOFA#2	ESBKA#2	EMBUFA#2	ELCKZA#2	EFINA#2
G1143	EMSBKA#2	EC6A#2	EC5A#2	EC4A#2	EC3A#2	EC2A#2	EC1A#2	EC0A#2
G1144	EIF7A#2	EIF6A#2	EIF5A#2	EIF4A#2	EIF3A#2	EIF2A#2	EIF1A#2	EIF0A#2
G1145	EIF15A#2	EIF14A#2	EIF13A#2	EIF12A#2	EIF11A#2	EIF10A#2	EIF9A#2	EIF8A#2
G1146	EID7A#2	EID6A#2	EID5A#2	EID4A#2	EID3A#2	EID2A#2	EID1A#2	EID0A#2
G1147	EID15A#2	EID14A#2	EID13A#2	EID12A#2	EID11A#2	EID10A#2	EID9A#2	EID8A#2
G1148	EID23A#2	EID22A#2	EID21A#2	EID20A#2	EID19A#2	EID18A#2	EID17A#2	EID16A#2
G1149	EID31A#2	EID30A#2	EID29A#2	EID28A#2	EID27A#2	EID26A#2	EID25A#2	EID24A#2
G1150	DRNE#2	RTE#2	OVCE#2				ROV2E#2	ROV1E#2
G1151	*FV7E#2	*FV6E#2	*FV5E#2	*FV4E#2	*FV3E#2	*FV2E#2	*FV1E#2	*FV0E#2
G1154	EBUFB#2	ECLRB#2	ESTPB#2	ESOFB#2	ESBKB#2	EMBUFB#2	ELCKZB#2	EFINB#2
G1155	EMSBKB#2	EC6B#2	EC5B#2	EC4B#2	EC3B#2	EC2B#2	EC1B#2	EC0B#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1156	EIF7B#2	EIF6B#2	EIF5B#2	EIF4B#2	EIF3B#2	EIF2B#2	EIF1B#2	EIF0B#2
G1157	EIF15B#2	EIF14B#2	EIF13B#2	EIF12B#2	EIF11B#2	EIF10B#2	EIF9B#2	EIF8B#2
G1158	EID7B#2	EID6B#2	EID5B#2	EID4B#2	EID3B#2	EID2B#2	EID1B#2	EID0B#2
G1159	EID15B#2	EID14B#2	EID13B#2	EID12B#2	EID11B#2	EID10B#2	EID9B#2	EID8B#2
G1160	EID23B#2	EID22B#2	EID21B#2	EID20B#2	EID19B#2	EID18B#2	EID17B#2	EID16B#2
G1161	EID31B#2	EID30B#2	EID29B#2	EID28B#2	EID27B#2	EID26B#2	EID25B#2	EID24B#2
G1166	EBUFC#2	ECLRC#2	ESTPC#2	ESOFC#2	ESBKC#2	EMBUFC#2	ELCKZC#2	EFINC#2
G1167	EMSBKC#2	EC6C#2	EC5C#2	EC4C#2	EC3C#2	EC2C#2	EC1C#2	EC0C#2
G1168	EIF7C#2	EIF6C#2	EIF5C#2	EIF4C#2	EIF3C#2	EIF2C#2	EIF1C#2	EIF0C#2
G1169	EIF15C#2	EIF14C#2	EIF13C#2	EIF12C#2	EIF11C#2	EIF10C#2	EIF9C#2	EIF8C#2
G1170	EID7C#2	EID6C#2	EID5C#2	EID4C#2	EID3C#2	EID2C#2	EID1C#2	EID0C#2
G1171	EID15C#2	EID14C#2	EID13C#2	EID12C#2	EID11C#2	EID10C#2	EID9C#2	EID8C#2
G1172	EID23C#2	EID22C#2	EID21C#2	EID20C#2	EID19C#2	EID18C#2	EID17C#2	EID16C#2
G1173	EID31C#2	EID30C#2	EID29C#2	EID28C#2	EID27C#2	EID26C#2	EID25C#2	EID24C#2
G1178	EBUFD#2	ECLRD#2	ESTPD#2	ESOFD#2	ESBKD#2	EMBUFD#2	ELCKZD#2	EFIND#2
G1179	EMSBKD#2	EC6D#2	EC5D#2	EC4D#2	EC3D#2	EC2D#2	EC1D#2	EC0D#2
G1180	EIF7D#2	EIF6D#2	EIF5D#2	EIF4D#2	EIF3D#2	EIF2D#2	EIF1D#2	EIF0D#2
G1181	EIF15D#2	EIF14D#2	EIF13D#2	EIF12D#2	EIF11D#2	EIF10D#2	EIF9D#2	EIF8D#2
G1182	EID7D#2	EID6D#2	EID5D#2	EID4D#2	EID3D#2	EID2D#2	EID1D#2	EID0D#2
G1183	EID15D#2	EID14D#2	EID13D#2	EID12D#2	EID11D#2	EID10D#2	EID9D#2	EID8D#2
G1184	EID23D#2	EID22D#2	EID21D#2	EID20D#2	EID19D#2	EID18D#2	EID17D#2	EID16D#2
G1185	EID31D#2	EID30D#2	EID29D#2	EID28D#2	EID27D#2	EID26D#2	EID25D#2	EID24D#2
G1190	OVLS8#2	OVLS7#2	OVLS6#2	OVLS5#2	OVLS4#2	OVLS3#2	OVLS2#2	OVLS1#2
G1192	IGVRY8#2	IGVRY7#2	IGVRY6#2	IGVRY5#2	IGVRY4#2	IGVRY3#2	IGVRY2#2	IGVRY1#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1197					MTD#2	MTC#2	MTB#2	MTA#2
G1198	NPOS8#2	NPOS7#2	NPOS6#2	NPOS5#2	NPOS4#2	NPOS3#2	NPOS2#2	NPOS1#2
G1200	EASIP8#2	EASIP7#2	EASIP6#2	EASIP5#2	EASIP4#2	EASIP3#2	EASIP2#2	EASIP1#2
G1203						FTCLR#2	FTCAL#2	FTCMO#2
G1204	MRDYC#2	ORCMC#2	SFRC#2	SRVC#2	CTH1C#2	CTH2C#2	TLMHC#2	TLMLC#2
G1205	RCHC#2	RSLC#2	INTGC#2	SOCNC#2	MCFNC#2	SPSLC#2	*ESPC#2	ARSTC#2
G1206	RCHHGC#2	MFNHGC#2	INCMDC#2	OVRC#2	DEFMDC#2	NRROC#2	ROTBC#2	INDXC#2
G1207				DSCNC#2	SORSLC#2	MPOFC#2	SLVC#2	MORCMC#2
G1208	SHC07#2	SHC06#2	SHC05#2	SHC04#2	SHC03#2	SHC02#2	SHC01#2	SHC00#2
G1209					SHC11#2	SHC10#2	SHC09#2	SHC08#2
G1266	MRDYD#2	ORCMD#2	SFRD#2	SRVD#2	CTH1D#2	CTH2D#2	TLMHD#2	TLMLD#2
G1267	RCHD#2	RSLD#2	INTGD#2	SOCND#2	MCFND#2	SPSLD#2	*ESPD#2	ARSTD#2
G1268	RCHHGD#2	MFNHGD#2	INCMDD#2	OVRD#2	DEFMDD#2	NRROD#2	ROTBD#2	INDXD#2
G1269				DSCND#2	SORSLD#2	MPOFD#2	SLVD#2	MORCMD#2
G1270	SHD07#2	SHD06#2	SHD05#2	SHD04#2	SHD03#2	SHD02#2	SHD01#2	SHD00#2
G1271					SHD11#2	SHD10#2	SHD09#2	SHD08#2
G1272	R08I4#2	R07I4#2	R06I4#2	R05I4#2	R04I4#2	R03I4#2	R02I4#2	R01I4#2
G1273	SIND4#2	SSIN4#2	SGN4#2		R12I4#2	R11I4#2	R10I4#2	R09I4#2
G1292	ITCD#2							

CNC→PMC

Address / Bit number

	#7	#6	#5	#4	#3	#2	#1	#0
F000	OP#1	SA#1	STL#1	SPL#1				RWD#1
F001	MA#1		TAP#1	ENB#1	DEN#1	BAL#1	RST#1	AL#1
F002	MDRN#1	CUT#1		SRNMV#1	THRD#1	CSS#1	RPDO#1	INCH#1

	#7	#6	#5	#4	#3	#2	#1	#0
F003	MTCHIN#1	MEDT#1	MMEM#1	MRMT#1	MMDI#1	MJ#1	MH#1	MINC#1
F004			MREF#1	MAFL#1	MSBK#1	MABSM#1	MMLK#1	MBDT1#1
F005	MBDT9#1	MBDT8#1	MBDT7#1	MBDT6#1	MBDT5#1	MBDT4#1	MBDT3#1	MBDT2#1
F007	BF#1			BF#1	TF#1	SF#1	EFD#1	MF#1
F008			MF3#1	MF2#1				EF#1
F009	DM00#1	DM01#1	DM02#1	DM30#1				
F010	M07#1	M06#1	M05#1	M04#1	M03#1	M02#1	M01#1	M00#1
F011	M15#1	M14#1	M13#1	M12#1	M11#1	M10#1	M09#1	M08#1
F012	M23#1	M22#1	M21#1	M20#1	M19#1	M18#1	M17#1	M16#1
F013	M31#1	M30#1	M29#1	M28#1	M27#1	M26#1	M25#1	M24#1
F014	M207#1	M206#1	M205#1	M204#1	M203#1	M202#1	M201#1	M200#1
F015	M215#1	M214#1	M213#1	M212#1	M211#1	M210#1	M209#1	M208#1
F016	M307#1	M306#1	M305#1	M304#1	M303#1	M302#1	M301#1	M300#1
F017	M315#1	M314#1	M313#1	M312#1	M311#1	M310#1	M309#1	M308#1
F022	S07#1	S06#1	S05#1	S04#1	S03#1	S02#1	S01#1	S00#1
F023	S15#1	S14#1	S13#1	S12#1	S11#1	S10#1	S09#1	S08#1
F024	S23#1	S22#1	S21#1	S20#1	S19#1	S18#1	S17#1	S16#1
F025	S31#1	S30#1	S29#1	S28#1	S27#1	S26#1	S25#1	S24#1
F026	T07#1	T06#1	T05#1	T04#1	T03#1	T02#1	T01#1	T00#1
F027	T15#1	T14#1	T13#1	T12#1	T11#1	T10#1	T09#1	T08#1
F028	T23#1	T22#1	T21#1	T20#1	T19#1	T18#1	T17#1	T16#1
F029	T31#1	T30#1	T29#1	T28#1	T27#1	T26#1	T25#1	T24#1
F030	B07#1	B06#1	B05#1	B04#1	B03#1	B02#1	B01#1	B00#1
F031	B15#1	B14#1	B13#1	B12#1	B11#1	B10#1	B09#1	B08#1

	#7	#6	#5	#4	#3	#2	#1	#0
F032	B23#1	B22#1	B21#1	B20#1	B19#1	B18#1	B17#1	B16#1
F033	B31#1	B30#1	B29#1	B28#1	B27#1	B26#1	B25#1	B24#1
F034						GR3O#1	GR2O#1	GR1O#1
F035								SPAL#1
F036	R08O#1	R07O#1	R06O#1	R05O#1	R04O#1	R03O#1	R02O#1	R01O#1
F037					R12O#1	R11O#1	R10O#1	R09O#1
F038					ENB3#1	ENB2#1	SUCLP#1	SCLP#1
F039					CHPCYL#1	CHPMD#1	ENB4#1	
F040	AR7#1	AR6#1	AR5#1	AR4#1	AR3#1	AR2#1	AR1#1	AR0#1
F041	AR15#1	AR14#1	AR13#1	AR12#1	AR11#1	AR10#1	AR09#1	AR08#1
F044				_SYCAL_ SYCAL#1	_FSPPH_ FSPPH#1	_FSPSY_ FSPSY#1	FSCSL#1	
F045	ORARA#1	TLMA#1	LDT2A#1	LDT1A#1	SARA#1	SDTA#1	SSTA#1	ALMA#1
F046	MORA2A#1	MORA1A#1	PORA2A#1	SLVSA#1	RCFNA#1	RCHPA#1	CFINA#1	CHPA#1
F047				EXOFA#1	SORENA#1	MSOVRA#1	INCSTA#1	PC1DEA#1
F049	ORARB#1	TLMB#1	LDT2B#1	LDT1B#1	SARB#1	SDTB#1	SSTB#1	ALMB#1
F050	MORA2B#1	MORA1B#1	PORA2B#1	SLVSB#1	RCFNB#1	RCHPB#1	CFINB#1	CHPB#1
F051				EXOFB#1	SORENB#1	MSOVRB#1	INCSTB#1	PC1DEB#1
F053	EKENB			BGEACT#1	RPALM#1	RPBSY#1	PRGDPL	INHKY
F054	UO007#1	UO006#1	UO005#1	UO004#1	UO003#1	UO002#1	UO001#1	UO000#1
F055	UO015#1	UO014#1	UO013#1	UO012#1	UO011#1	UO010#1	UO009#1	UO008#1
F056	UO107#1	UO106#1	UO105#1	UO104#1	UO103#1	UO102#1	UO101#1	UO100#1
F057	UO115#1	UO114#1	UO113#1	UO112#1	UO111#1	UO110#1	UO109#1	UO108#1
F058	UO123#1	UO122#1	UO121#1	UO120#1	UO119#1	UO118#1	UO117#1	UO116#1
F059	UO131#1	UO130#1	UO129#1	UO128#1	UO127#1	UO126#1	UO125#1	UO124#1

	#7	#6	#5	#4	#3	#2	#1	#0
F060						ESCAN#1	ESEND#1	EREND#1
F061					HCEXE	HCAB2	BCLP#1	BUCLP#1
F062	PRTSF#1			S2MES#1	S1MES#1			AICC#1
F063	PSYN#1	WATO#1	RCYO#1			PSAR#1	PSE2#1	PSE1#1
F064	TIALM	TICHK	COSP		TLCHB#1	TLCHI#1	TLNW#1	TLCH#1
F065	HOBSYN#1	SYNMOD#1	MSPCF#1	RTRCTF#1			RGSPM#1	RGSPP#1
F066			PECK2#1				RTPT#1	G08MD#1
F070	PSW08#1	PSW07#1	PSW06#1	PSW05#1	PSW04#1	PSW03#1	PSW02#1	PSW01#1
F071	PSW16#1	PSW15#1	PSW14#1	PSW13#1	PSW12#1	PSW11#1	PSW10#1	PSW09#1
F072	OUT7#1	OUT6#1	OUT5#1	OUT4#1	OUT3#1	OUT2#1	OUT1#1	OUT0#1
F073				ZRNO#1		MD4O#1	MD2O#1	MD1O#1
F075	SPO#1	KEYO#1	DRNO#1	MLKO#1	SBKO#1	BDTO#1		
F076			ROV2O#1	ROV1O#1	RTAP#1		MP2O#1	MP1O#1
F077		RTO#1			HS1DO#1	HS1CO#1	HS1BO#1	HS1AO#1
F078	*FV7O#1	*FV6O#1	*FV5O#1	*FV4O#1	*FV3O#1	*FV2O#1	*FV1O#1	*FV0O#1
F079	*JV7O#1	*JV6O#1	*JV5O#1	*JV4O#1	*JV3O#1	*JV2O#1	*JV1O#1	*JV0O#1
F080	*FV15O#1	*FV14O#1	*FV13O#1	*FV12O#1	*FV11O#1	*FV10O#1	*FV9O#1	*FV8O#1
F081	–J4O#1	+J4O#1	–J3O#1	+J3O#1	–J2O#1	+J2O#1	–J1O#1	+J1O#1
F082						RVSL#1		
F090						ABTSP2#1	ABTSP1#1	ABTQSV#1
F091						MRVSP#1	MNCHG#1	MRVMD#1
F092			TRSPS#1		TRACT#1			
F093	SVWRN4#1	SVWRN3#1	SVWRN2#1	SVWRN1#1				
F094	ZP8#1	ZP7#1	ZP6#1	ZP5#1	ZP4#1	ZP3#1	ZP2#1	ZP1#1

	#7	#6	#5	#4	#3	#2	#1	#0
F096	ZP28#1	ZP27#1	ZP26#1	ZP25#1	ZP24#1	ZP23#1	ZP22#1	ZP21#1
F098	ZP38#1	ZP37#1	ZP36#1	ZP35#1	ZP34#1	ZP33#1	ZP32#1	ZP31#1
F100	ZP48#1	ZP47#1	ZP46#1	ZP45#1	ZP44#1	ZP43#1	ZP42#1	ZP41#1
F102	MV8#1	MV7#1	MV6#1	MV5#1	MV4#1	MV3#1	MV2#1	MV1#1
F104	INP8#1	INP7#1	INP6#1	INP5#1	INP4#1	INP3#1	INP2#1	INP1#1
F106	MVD8#1	MVD7#1	MVD6#1	MVD5#1	MVD4#1	MVD3#1	MVD2#1	MVD1#1
F108	MMI8#1	MMI7#1	MMI6#1	MMI5#1	MMI4#1	MMI3#1	MMI2#1	MMI1#1
F110	MDTCH8#1	MDTCH7#1	MDTCH6#1	MDTCH5#1	MDTCH4#1	MDTCH3#1	MDTCH2#1	MDTCH1#1
F112	EADEN8#1	EADEN7#1	EADEN6#1	EADEN5#1	EADEN4#1	EADEN3#1	EADEN2#1	EADEN1#1
F114	TRQL8#1	TRQL7#1	TRQL6#1	TRQL5#1	TRQL4#1	TRQL3#1	TRQL2#1	TRQL1#1
F116	FRP8#1	FRP7#1	FRP6#1	FRP5#1	FRP4#1	FRP3#1	FRP2#1	FRP1#1
F118	SYN8O#1	SYN7O#1	SYN6O#1	SYN5O#1	SYN4O#1	SYN3O#1	SYN2O#1	SYN1O#1
F120	ZRF8#1	ZRF7#1	ZRF6#1	ZRF5#1	ZRF4#1	ZRF3#1	ZRF2#1	ZRF1#1
F122	HDO7#1	HDO6#1	HDO5#1	HDO4#1	HDO3#1	HDO2#1	HDO1#1	HDO0#1
F124		+OT7#1	+OT6#1	+OT5#1	+OT4#1	+OT3#1	+OT2#1	+OT1#1
F126		–OT7#1	–OT6#1	–OT5#1	–OT4#1	–OT3#1	–OT2#1	–OT1#1
F129	*EAXSL#1		EOV0#1					
F130	EBSYA#1	EOTNA#1	EOTPA#1	EGENA#1	EDENA#1	EIALA#1	ECKZA#1	EINPA#1
F131							EABUFA#1	EMFA#1
F132	EM28A#1	EM24A#1	EM22A#1	EM21A#1	EM18A#1	EM14A#1	EM12A#1	EM11A#1
F133	EBSYB#1	EOTNB#1	EOTPB#1	EGENB#1	EDENB#1	EIALB#1	ECKZB#1	EINPB#1
F134							EABUFB#1	EMFB#1
F135	EM28B#1	EM24B#1	EM22B#1	EM21B#1	EM18B#1	EM14B#1	EM12B#1	EM11B#1
F136	EBSYC#1	EOTNC#1	EOTPC#1	EGENC#1	EDENC#1	EIALC#1	ECKZC#1	EINPC#1

	#7	#6	#5	#4	#3	#2	#1	#0
F137							EABUFC#1	EMFC#1
F138	EM28C#1	EM24C#1	EM22C#1	EM21C#1	EM18C#1	EM14C#1	EM12C#1	EM11C#1
F139	EBSYD#1	EOTND#1	EOTPD#1	EGEND#1	EDEND#1	EIALD#1	ECKZD#1	EINPD#1
F140							EABUFD#1	EMFD#1
F141	EM28D#1	EM24D#1	EM22D#1	EM21D#1	EM18D#1	EM14D#1	EM12D#1	EM11D#1
F142	EM48A#1	EM44A#1	EM42A#1	EM41A#1	EM38A#1	EM34A#1	EM32A#1	EM31A#1
F145	EM48B#1	EM44B#1	EM42B#1	EM41B#1	EM38B#1	EM34B#1	EM32B#1	EM31B#1
F148	EM48C#1	EM44C#1	EM42C#1	EM41C#1	EM38C#1	EM34C#1	EM32C#1	EM31C#1
F151	EM48D#1	EM44D#1	EM42D#1	EM41D#1	EM38D#1	EM34D#1	EM32D#1	EM31D#1
F168	ORARC#1	TLMC#1	LDT2C#1	LDT1C#1	SARC#1	SDTC#1	SSTC#1	ALMC#1
F169	MORA2C#1	MORA1C#1	PORA2C#1	SLVSC#1	RCFNC#1	RCHPC#1	CFINC#1	CHPC#1
F170				EXOFC#1	SORENC#1	MSOVRC#1	INCSTC#1	PC1DTC#1
F172	PBATL#1	PBATZ#1						
F177	EDGN#1	EPARM#1	EVAR#1	EPRG#1	EWTIO#1	ESTPIO#1	ERDIO#1	IOLNK#1
F178					SRLNO3#1	SRLNO2#1	SRLNO1#1	SRLNO0#1
F180	CLRCH8#1	CLRCH7#1	CLRCH6#1	CLRCH5#1	CLRCH4#1	CLRCH3#1	CLRCH2#1	CLRCH1#1
F182	EACNT8#1	EACNT7#1	EACNT6#1	EACNT5#1	EACNT4#1	EACNT3#1	EACNT2#1	EACNT1#1
F264	SPWRN8#1	SPWRN7#1	SPWRN6#1	SPWRN5#1	SPWRN4#1	SPWRN3#1	SPWRN2#1	SPWRN1#1
F265								SPWRN0#1
F266	ORARD#1	TLMD#1	LDT2D#1	LDT1D#1	SARD#1	SDTD#1	SSTD#1	ALMD#1
F267	MORA2D#1	MORA1D#1	PORA2D#1	SLVSD#1	RCFND#1	RCHPD#1	CFIND#1	CHPD#1
F268				EXOFD#1	SOREND#1	MSOVRD#1	INCSTD#1	PC1DTD#1

PMC→CNC

Address	Bit number							
	#7	#6	#5	#4	#3	#2	#1	#0
F1000	OP#2	SA#2	STL#2	SPL#2				RWD#2
F1001	MA#2		TAP#2	ENB#2	DEN#2	BAL#2	RST#2	AL#2
F1002	MDRN#2	CUT#2		SRNMV#2	THRD#2	CSS#2	RPDO#2	INCH#2
F1003	MTCHIN#2	MEDT#2	MMEM#2	MRMT#2	MMDI#2	MJ#2	MH#2	MINC#2
F1004			MREF#2	MAFL#2	MSBK#2	MABSM#2	MMLK#2	MBDT1#2
F1005	MBDT9#2	MBDT8#2	MBDT7#2	MBDT6#2	MBDT5#2	MBDT4#2	MBDT3#2	MBDT2#2
F1007	BF#2			BF#2	TF#2	SF#2	EFD#2	MF#2
F1008			MF3#2	MF2#2				EF#2
F1009	DM00#2	DM01#2	DM02#2	DM30#2				
F1010	M07#2	M06#2	M05#2	M04#2	M03#2	M02#2	M01#2	M00#2
F1011	M15#2	M14#2	M13#2	M12#2	M11#2	M10#2	M09#2	M08#2
F1012	M23#2	M22#2	M21#2	M20#2	M19#2	M18#2	M17#2	M16#2
F1013	M31#2	M30#2	M29#2	M28#2	M27#2	M26#2	M25#2	M24#2
F1014	M207#2	M206#2	M205#2	M204#2	M203#2	M202#2	M201#2	M200#2
F1015	M215#2	M214#2	M213#2	M212#2	M211#2	M210#2	M209#2	M208#2
F1016	M307#2	M306#2	M305#2	M304#2	M303#2	M302#2	M301#2	M300#2
F1017	M315#2	M314#2	M313#2	M312#2	M311#2	M310#2	M309#2	M308#2
F1022	S07#2	S06#2	S05#2	S04#2	S03#2	S02#2	S01#2	S00#2
F1023	S15#2	S14#2	S13#2	S12#2	S11#2	S10#2	S09#2	S08#2
F1024	S23#2	S22#2	S21#2	S20#2	S19#2	S18#2	S17#2	S16#2
F1025	S31#2	S30#2	S29#2	S28#2	S27#2	S26#2	S25#2	S24#2
F1026	T07#2	T06#2	T05#2	T04#2	T03#2	T02#2	T01#2	T00#2
F1027	T15#2	T14#2	T13#2	T12#2	T11#2	T10#2	T09#2	T08#2

	#7	#6	#5	#4	#3	#2	#1	#0
F1028	T23#2	T22#2	T21#2	T20#2	T19#2	T18#2	T17#2	T16#2
F1029	T31#2	T30#2	T29#2	T28#2	T27#2	T26#2	T25#2	T24#2
F1030	B07#2	B06#2	B05#2	B04#2	B03#2	B02#2	B01#2	B00#2
F1031	B15#2	B14#2	B13#2	B12#2	B11#2	B10#2	B09#2	B08#2
F1032	B23#2	B22#2	B21#2	B20#2	B19#2	B18#2	B17#2	B16#2
F1033	B31#2	B30#2	B29#2	B28#2	B27#2	B26#2	B25#2	B24#2
F1034						GR3O#2	GR2O#2	GR1O#2
F1035								SPAL#2
F1036	R08O#2	R07O#2	R06O#2	R05O#2	R04O#2	R03O#2	R02O#2	R01O#2
F1037					R12O#2	R11O#2	R10O#2	R09O#2
F1038					ENB3#2	ENB2#2	SUCLP#2	SCLP#2
F1039					CHPCYL#2	CHPMD#2	ENB4#2	
F1040	AR7#2	AR6#2	AR5#2	AR4#2	AR3#2	AR2#2	AR1#2	AR0#2
F1041	AR15#2	AR14#2	AR13#2	AR12#2	AR11#2	AR10#2	AR09#2	AR08#2
F1044				SYCAL#2	FSPPH#2	FSPSY#2	FSCSL#2	
F1045	ORARA#2	TLMA#2	LDT2A#2	LDT1A#2	SARA#2	SDTA#2	SSTA#2	ALMA#2
F1046	MORA2A#2	MORA1A#2	PORA2A#2	SLVSA#2	RCFNA#2	RCHPA#2	CFINA#2	CHPA#2
F1047				EXOFA#2	SORENA#2	MSOVRA#2	INCSTA#2	PC1DEA#2
F1049	ORARB#2	TLMB#2	LDT2B#2	LDT1B#2	SARB#2	SDTB#2	SSTB#2	ALMB#2
F1050	MORA2B#2	MORA1B#2	PORA2B#2	SLVSB#2	RCFNB#2	RCHPB#2	CFINB#2	CHPB#2
F1051				EXOFB#2	SORENB#2	MSOVRB#2	INCSTB#2	PC1DEB#2
F1053				BGEACT#2	RPALM#2	RPBSY#2		
F1054	UO007#2	UO006#2	UO005#2	UO004#2	UO003#2	UO002#2	UO001#2	UO000#2
F1055	UO015#2	UO014#2	UO013#2	UO012#2	UO011#2	UO010#2	UO009#2	UO008#2

	#7	#6	#5	#4	#3	#2	#1	#0
F1056	UO107#2	UO106#2	UO105#2	UO104#2	UO103#2	UO102#2	UO101#2	UO100#2
F1057	UO115#2	UO114#2	UO113#2	UO112#2	UO111#2	UO110#2	UO109#2	UO108#2
F1058	UO123#2	UO122#2	UO121#2	UO120#2	UO119#2	UO118#2	UO117#2	UO116#2
F1059	UO131#2	UO130#2	UO129#2	UO128#2	UO127#2	UO126#2	UO125#2	UO124#2
F1060							ESEND#2	EREND#2
F1061							BCLP#2	BUCLP#2
F1062	PRTSF#2			S2MES#2	S1MES#2			AICC#2
F1063	PSYN#2	WATO#2	RCYO#2			PSAR#2	PSE2#2	PSE1#2
F1064					TLCHB#2	TLCHI#2	TLNW#2	TLCH#2
F1065	HOBSYN#2	SYNMOD#2	MSPCF#2	RTRCTF#2			RGSPM#2	RGSPP#2
F1066			PECK2#2				RTPT#2	G08MD#2
F1070	PSW08#2	PSW07#2	PSW06#2	PSW05#2	PSW04#2	PSW03#2	PSW02#2	PSW01#2
F1071	PSW16#2	PSW15#2	PSW14#2	PSW13#2	PSW12#2	PSW11#2	PSW10#2	PSW09#2
F1072	OUT7#2	OUT6#2	OUT5#2	OUT4#2	OUT3#2	OUT2#2	OUT1#2	OUT0#2
F1073				ZRNO#2		MD4O#2	MD2O#2	MD1O#2
F1075	SPO#2	KEYO#2	DRNO#2	MLKO#2	SBKO#2	BDTO#2		
F1076			ROV2O#2	ROV1O#2	RTAP#2		MP2O#2	MP1O#2
F1077		RTO#2			HS1DO#2	HS1CO#2	HS1BO#2	HS1AO#2
F1078	*FV7O#2	*FV6O#2	*FV5O#2	*FV4O#2	*FV3O#2	*FV2O#2	*FV1O#2	*FV0O#2
F1079	*JV7O#2	*JV6O#2	*JV5O#2	*JV4O#2	*JV3O#2	*JV2O#2	*JV1O#2	*JV0O#2
F1080	*FV15O#2	*FV14O#2	*FV13O#2	*FV12O#2	*FV11O#2	*FV10O#2	*FV09O#2	*FV08O#2
F1081	–J4O#2	+J4O#2	–J3O#2	+J3O#2	–J2O#2	+J2O#2	–J1O#2	+J1O#2
F1082						RVSL#2		
F1090						ABTSP2#2	ABTSP1#2	ABTQSV#2

	#7	#6	#5	#4	#3	#2	#1	#0
G1091						MRVSP#2	MNCHG#2	MRVMD#2
F1092			TRSPS#2		TRACT#2			
G1093	SVWRN4#3	SVWRN3#3	SVWRN2#3	SVWRN1#3				
F1094	ZP8#2	ZP7#2	ZP6#2	ZP5#2	ZP4#2	ZP3#2	ZP2#2	ZP1#2
F1096	ZP28#2	ZP27#2	ZP26#2	ZP25#2	ZP24#2	ZP23#2	ZP22#2	ZP21#2
F1098	ZP38#2	ZP37#2	ZP36#2	ZP35#2	ZP34#2	ZP33#2	ZP32#2	ZP31#2
F1100	ZP48#2	ZP47#2	ZP46#2	ZP45#2	ZP44#2	ZP43#2	ZP42#2	ZP41#2
F1102	MV8#2	MV7#2	MV6#2	MV5#2	MV4#2	MV3#2	MV2#2	MV1#2
F1104	INP8#2	INP7#2	INP6#2	INP5#2	INP4#2	INP3#2	INP2#2	INP1#2
F1106	MVD8#2	MVD7#2	MVD6#2	MVD5#2	MVD4#2	MVD3#2	MVD2#2	MVD1#2
F1108	MMI8#2	MMI7#2	MMI6#2	MMI5#2	MMI4#2	MMI3#2	MMI2#2	MMI1#2
F1110	MDTCH8#2	MDTCH7#2	MDTCH6#2	MDTCH5#2	MDTCH4#2	MDTCH3#2	MDTCH2#2	MDTCH1#2
F1112	EADEN8#2	EADEN7#2	EADEN6#2	EADEN5#2	EADEN4#2	EADEN3#2	EADEN2#2	EADEN1#2
F1114	TRQL8#2	TRQL7#2	TRQL6#2	TRQL5#2	TRQL4#2	TRQL3#2	TRQL2#2	TRQL1#2
F1116	FRP8#2	FRP7#2	FRP6#2	FRP5#2	FRP4#2	FRP3#2	FRP2#2	FRP1#2
F1118	SYN8O#2	SYN7O#2	SYN6O#2	SYN5O#2	SYN4O#2	SYN3O#2	SYN2O#2	SYN1O#2
F1120	ZRF8#2	ZRF7#2	ZRF6#2	ZRF5#2	ZRF4#2	ZRF3#2	ZRF2#2	ZRF1#2
F1122	HDO7#2	HDO6#2	HDO5#2	HDO4#2	HDO3#2	HDO2#2	HDO1#2	HDO0#2
G1124		+OT7#2	+OT6#2	+OT5#2	+OT4#2	+OT3#2	+OT2#2	+OT1#2
G1126		–OT7#2	–OT6#2	–OT5#2	–OT4#2	–OT3#2	–OT2#2	–OT1#2
F1129	*EAXSL#2		EOV0#2					
F1130	EBSYA#2	EOTNA#2	EOTP#2	EGENA#2	EDENA#2	EIALA#2	ECKZA#2	EINPA#2
F1131							EABUFA#2	EMFA#2
F1132	EM28A#2	EM24A#2	EM22A#2	EM21A#2	EM18A#2	EM14A#2	EM12A#2	EM11A#2

	#7	#6	#5	#4	#3	#2	#1	#0
F1133	EBSYB#2	EOTNB#2	EOTB#2	EGENB#2	EDENB#2	EIALB#2	ECKZB#2	EINPB#2
F1134							EABUFB#2	EMFB#2
F1135	EM28B#2	EM24B#2	EM22B#2	EM21B#2	EM18B#2	EM14B#2	EM12B#2	EM11B#2
F1136	EBSYC#2	EOTNC#2	EOTC#2	EGENC#2	EDENC#2	EIALC#2	ECKZC#2	EINPC#2
F1137							EABUFC#2	EMFC#2
F1138	EM28C#2	EM24C#2	EM22C#2	EM21C#2	EM18C#2	EM14C#2	EM12C#2	EM11C#2
F1139	EBSYD#2	EOTND#2	EOTD#2	EGEND#2	EDEND#2	EIALD#2	ECKZD#2	EINPD#2
F1140							EABUFD#2	EMFD#2
F1141	EM28D#2	EM24D#2	EM22D#2	EM21D#2	EM18D#2	EM14D#2	EM12D#2	EM11D#2
F1142	EM48A#2	EM44A#2	EM42A#2	EM41A#2	EM38A#2	EM34A#2	EM32A#2	EM31A#2
F1145	EM48B#2	EM44B#2	EM42B#2	EM41B#2	EM38B#2	EM34B#2	EM32B#2	EM31B#2
F1148	EM48C#2	EM44C#2	EM42C#2	EM41C#2	EM38C#2	EM34C#2	EM32C#2	EM31C#2
F1151	EM48D#2	EM44D#2	EM42D#2	EM41D#2	EM38D#2	EM34D#2	EM32D#2	EM31D#2
G1168	ORARC#2	TLMC#2	LDT2C#2	LDT1C#2	SARC#2	SDTC#2	SSTC#2	ALMC#2
G1169	MORA2C#2	MORA1C#2	PORA2C#2	SLVSC#2	RCFNC#2	RCHPC#2	CFINC#2	CHPC#2
G1170				EXOFC#2	SORENC#2	MSOVRC#2	INCSTC#2	PC1DTC#2
G1172	PBATL#2	PBATZ#2						
F1177	EDGN#2	EPARM#2	EVAR#2	EPRG#2	EWTIO#2	ESTPIO#2	ERDIO#2	IOLNK#2
F1178					SRLNO3#2	SRLNO2#2	SRLNO1#2	SRLNO0#2
F1180	CLRCH8#2	CLRCH7#2	CLRCH6#2	CLRCH5#2	CLRCH4#2	CLRCH3#2	CLRCH2#2	CLRCH1#2
F1182	EACNT8#2	EACNT7#2	EACNT6#2	EACNT5#2	EACNT4#2	EACNT3#2	EACNT2#2	EACNT1#2
F1264	APWRN8#3	APWRN7#3	APWRN6#3	APWRN5#3	APWRN4#3	APWRN3#3	APWRN2#3	APWRN1#3
F1265								SPWRN8#2
F1266	ORARD#2	TLMD#2	LDT2D#2	LDT1D#2	SARD#2	SDTD#2	SSTD#2	ALMD#2

	#7	#6	#5	#4	#3	#2	#1	#0
F1267	MORA2D#2	MORA1D#2	PORA2D#2	SLVSD#2	RCFND#2	RCHPD#2	CFIND#2	CHPD#2
F1268				EXOFD#2	SOREND#2	MSOVRD#2	INCSTD#2	PC1DTD#2

10.1 PMC–SB7

10.1.1 Dynamic display of sequence programs

(1) Display method

<1> Press the system key, then press the [PMC] soft key.

<2> Press the [PMCLAD] soft key to enable dynamic display of sequence programs.

(2) Display information

The ladder diagram display/editing function consists of the following screens:

a) Ladder diagram display screen

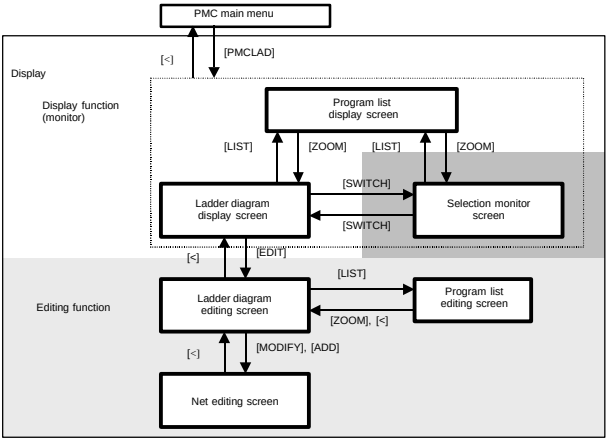
b) Selection monitor screen

c) Ladder diagram editing screen

d) Net editing screen

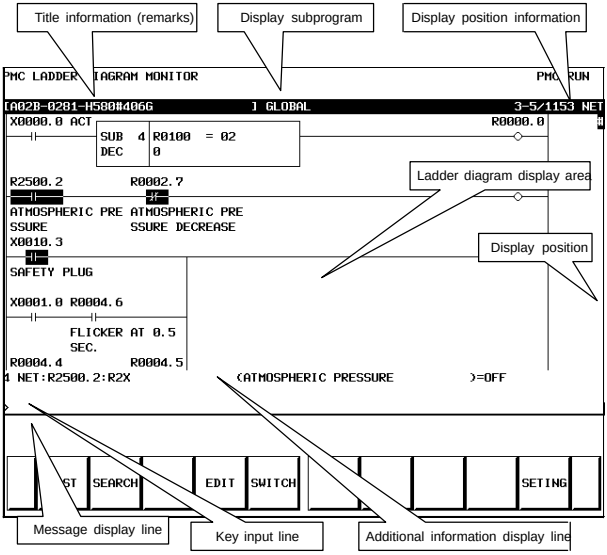
e) Program list display screen

f) Program list editing screen



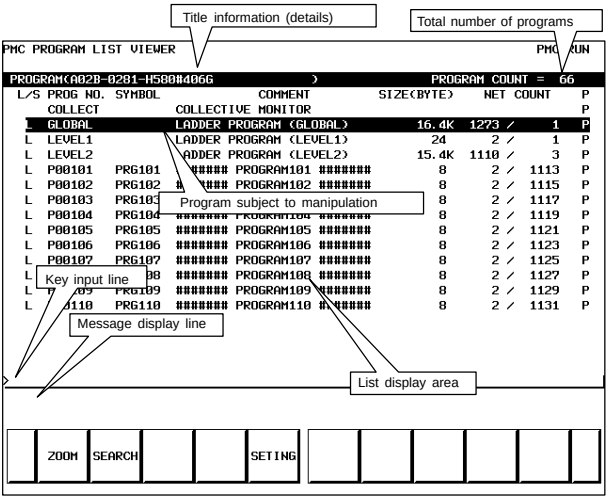
10.1.1.1 Ladder diagram display screen

(1) Screen configuration



(2) Calling the program list display screen [LIST]

The program list display screen allows you to select a subprogram to be displayed on the ladder diagram display screen.



(3) Searching for a signal [SEARCH]

<1> Press the [SEARCH] soft key.

<2> Search for a signal by using the keys indicated below.

- With [PAGE ↓], [↑ PAGE], [↓], [↑], the display area can be changed.

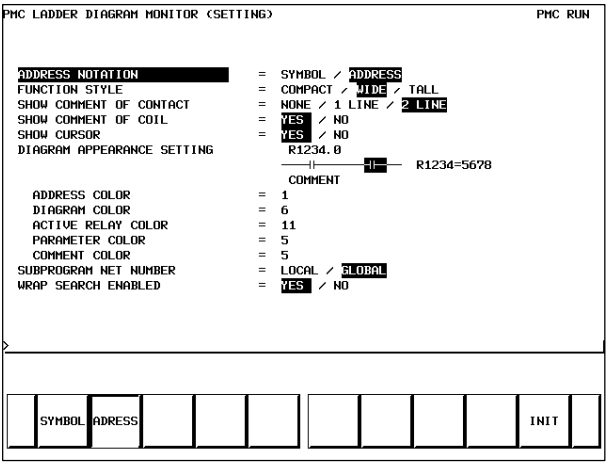
- [TOPBTM] : The start/end of a ladder diagram is searched for.
- “Address” + [SEARCH] or “Signal name” + [SEARCH]:
  A specified address or signal name is searched for.
- “net–number” + [SEARCH]:
  A ladder is displayed from a specified net number.
- “Address” + [W–SRCH] or “Signal name” + [W–SRCH]:
  The write coil is searched for a specified address or signal name.
- “function–instruction–number” + [F–SRCH] or “function–instruction–name” + [F–SRCH]:
  A specified function instruction is searched for.
- [PREV] : The previous search operation performed successfully is repeated towards the start.
- [NEXT] : The previous search operation performed successfully is repeated towards the end.
- [GLOBAL]/[LOCAL] : The search range is switched.

(4) Calling the function instruction data table display screen [TABLE]

The data table of a function instruction with a data table such as the COD instruction (SUB7) and the CODB instruction (SUB27) can be displayed.

(5) Setting the screen [SETING]

The setting screen for the ladder diagram display screen can be called. Various settings for ladder diagram display can be modified.



10.1.1.2 Selection monitor screen

On the selection monitor screen, only a ladder net including a coil to be monitored can be specified for ladder net monitoring.

(1) Display method

(a) Calling the screen from the program list display screen

<1> Display the program list screen.

<2> Move the cursor to the “COLLECT”.

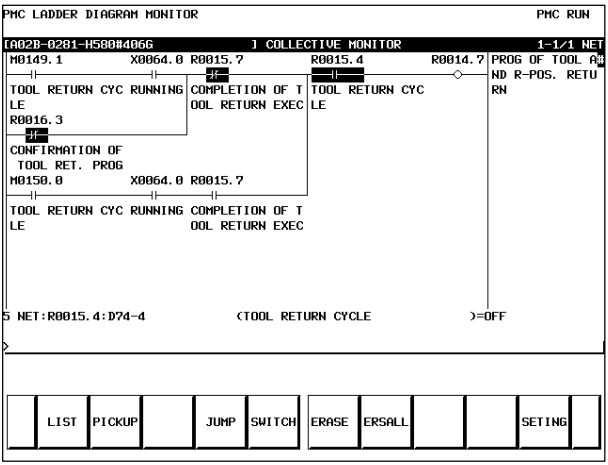
<3> Press the [ZOOM] soft key.

(b) Calling the screen from the ladder diagram display screen

<1> Display the ladder diagram display screen.

<2> Press the [SWITCH] soft key.

(2) Display information



(3) Specifying a ladder net to be monitored [PICKUP]

By using the method described below, a ladder net to be monitored on the selection monitor screen can be read for display.

(a) Specifying a desired ladder net on the selection monitor screen

- Typing the address used with the coil to read the net

  <1> Enter the address to be monitored.

  <2> Press the [PICKUP] soft key.

  <3> The net that uses the address specified by <1> with a coil is read to the top of the screen.

- Specifying the ladder net on the selection monitor screen

  <1> Move the cursor to the relay in the ladder net that uses an address to be monitored.

  <2> Press the [PICKUP] soft key.

  <3> The net that uses the address specified by <1> with a coil is read to the top of the screen, and the cursor moves to the coil position.

(b) Specifying a desired ladder net on the ladder diagram display screen

  <1> Press the [SEARCH] soft key on the ladder diagram display screen.

  <2> Move the cursor to the ladder net to be read.

  <3> Press the [PICKUP] soft key.

(4) Jumping to a ladder diagram on the ladder diagram display screen [JUMP]

Make a jump by finding, on the ladder diagram display screen, the ladder net where the cursor is placed on the selection monitor screen.

  <1> Move the cursor to the net to which you want to jump.

  <2> Press the [JUMP] soft key.

(5) Switching to the ladder diagram display screen [SWITCH]

The screen display can be switched to the ladder diagram display screen.

(6) Deleting the display of one ladder diagram net [ERASE]

One ladder net read into the selection monitor screen can be erased from the screen.

(7) Deleting the display of all ladder diagram nets [ERALL]

All ladder nets read into the selection monitor screen can be erased from the screen.

10.1.1.3 Ladder diagram editing screen

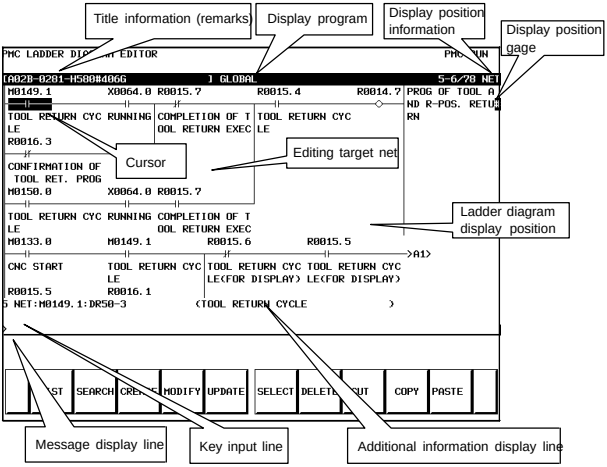
On the ladder diagram editing screen, a ladder diagram can be edited to change its operation.

(1) Display method

<1> Display the ladder diagram monitor display screen by pressing the [PMCLAD] soft key.

<2> Press the [EDIT] soft key.

(2) Display information



(3) Editing ladder programs

By using the keys below, a ladder diagram can be edited.

- Selecting a subprogram to be edited

  <1> Display the program list editing screen by pressing the [LIST] soft key.

  <2> Move the cursor to a subprogram to be edited.

- Searching for a specified address or function instruction

  <1> Press the [SEARCH] soft key.

  <2> Switch to the soft key display for search.

  For the search function, see “(3) Searching for a signal [SEARCH]” in Subsection 10.1.1.1, “Ladder diagram display screen”.

- Adding a new net

  <1> Move the cursor to the position where a new net is to be added.

  <2> Press the [ADD] soft key to call the net editing screen. Perform creation and addition operations to build a new net.

- Modifying the structure of a selected net

  <1> Move the cursor to a net to be modified.

  <2> Call the net editing screen by pressing the [MODIFY] soft key.

- Changing the bit address of a relay

  <1> Move the cursor to a relay to be modified.

  <2> Enter a desired bit address then press the ENTER key. The bit address of the relay where the cursor is placed is changed.

- Modifying the parameter of a function instruction

  <1> Move the cursor to the parameter of a function instruction to be modified.

  <2> Enter a desired number or byte address then press the ENTER key. The parameter of the function instruction where the cursor is placed is modified.

- Reflecting modifications

  <1> On the ladder diagram editing screen, modify a ladder program.

  <2> Press the [UPDATE] soft key. The results of editing performed so far are reflected in the ladder being executed. When the modifications have been reflected normally, the ladder after editing is executed.

- Deleting a net

  <1> Move the cursor to a net to be deleted.

  <2> Press the [DELETE] soft key.

- Moving a net

  <1> Move the cursor to a net to be moved.

  <2> By pressing the [CUT] soft key, cut the net.

  <3> Move the cursor to the position to which the selected net is to be moved.

  <4> Press the [PASTE] soft key.

- Copying a net

  <1> Move the cursor to a net to be copied.

  <2> Press the [COPY] soft key.

  <3> Move the cursor to the position to which the selected net is to be copied.

  <4> Press the [PASTE] soft key.

- Selecting multiple nets to be deleted/copied/moved

  <1> Move the cursor to the start point of a desired net selection range.

  <2> Press the [SELECT] soft key.

  <3> Move the cursor to the end point of the desired net selection range.

  <4> Press the [DELETE], [CUT], or [COPY] soft key to delete, move, or copy the selected nets.

- Discarding changes

  Press the [RESTOR] soft key.

  The results of editing performed so far are discarded to return to the ladder present when you moved to the ladder diagram editing screen or when you performed the last [UPDATE] processing.

- Modifying the setting of the ladder diagram editing screen

  Press the [SETING] soft key.

  The setting screen of the ladder diagram editing screen is called.

- Starting/stopping a ladder

  Press the [START] or [STOP] soft key.

  The execution of a ladder program is controlled. The [START] soft key starts the execution of a ladder program, and the [STOP] soft key stops the execution of a ladder program.

- Ending the editing

  Press the [<] key.

10.1.1.4 Net editing screen

On the net editing screen, net editing operations such as the creation of a new net and the modification of an existing net can be performed.

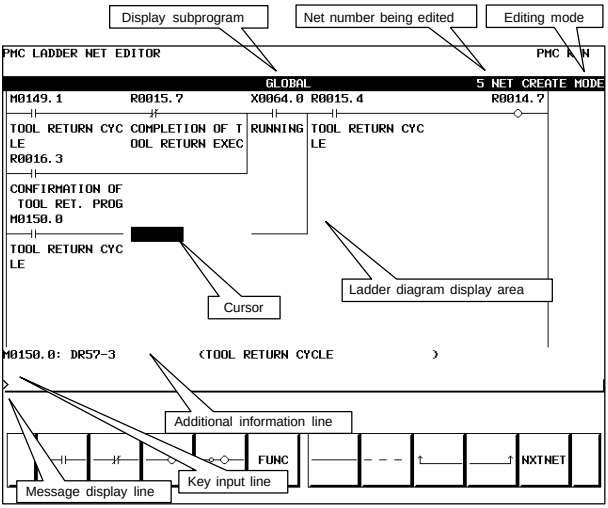
- Modification to an existing net
  If the net editing screen is displayed with the [MODIFY] soft key, the mode (modification mode) for modifying the net indicated by the cursor is set.
- Addition of a new net
  If the net editing screen is displayed with the [CREATE] soft key, the mode (creation mode) for creating a new net from a free state is set.

(1) Display method

<1> Display the ladder diagram editing screen.

<2> Press the [ADD] or [MODIFY] soft key.

(2) Display information



(3) Editing nets

By using the keys indicated below, a new net can be created, and an existing net can be modified.

- Placing a new contact or coil

  <1> Move the cursor to the position where a new contact or coil is to be placed.

  <2> Enter a bit address, then press a soft key such as [⊣ ⊢], [—○—].

- Changing the type of a contact or coil

  <1> Move the cursor to the position where the type of a contact or coil is to be changed.

  <2> Press a soft key such as [⊣ ⊢], [—○—].

- Changing the address of a contact or coil

  <1> Move the cursor to a relay to be modified.

  <2> Enter a bit address, then press the ENTER key.

- Placing a new function instruction

  <1> Move the cursor to the position where a new function instruction is to be placed.

  <2> Enter a function instruction number, then press the [FUNC] soft key.

- Changing the type of a function instruction

  <1> Move the cursor to a function instruction to be modified.

  <2> Enter a function instruction number.

- Changing the parameter of a function instruction

  <1> Move the cursor to the parameter of a function instruction to be modified.

  <2> Enter a number or byte address, then press the ENTER key.

- Adding/deleting a connection line

  <1> Move the cursor to the position where a connection line is to be added or deleted.

  <2> Press a soft key such as [——], [↑——], [——↑] for addition.

  <3> When deleting an existing connection line, press a soft key such as [·····], [↑——], [——↑].

- Deleting a contact, coil, or function instruction

  <1> Move the cursor to the position where a contact, coil, or function instruction to be deleted is located.

  <2> Press the [·····] soft key.

- Editing the next net

  Press the [NXTNET] soft key. The editing operation of the net currently being edited ends, and processing proceeds to the editing of the next net.

- Editing a function instruction data table

  <1> Move the cursor to the function instruction that has a data table to be edited.

  <2> Press the [TABLE] soft key. The function instruction data table editing screen appears.

  <3> Move the cursor to the data table to be edited.

  <4> Modify the selected data.

- Inserting a line/column

  <1> Move the cursor to the position where a line/column is to be inserted.

  <2> Press the [INSLIN], [INSCLM], or [APPCLM] soft key.

- Discarding the results of editing

  Press the [RESTOR] soft key.

10.1.2 Display of the PMC diagnosis screen

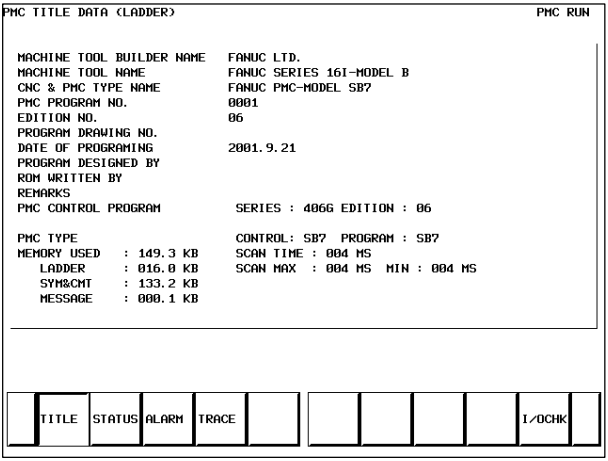
Display method

<1> Press the system key, then press the [PMC] soft key.

<2> Press the [PMCDGN] soft key. The PMC diagnosis screen appears.

10.1.2.1 Title screen

The title data registered at the time of ladder program creation is displayed.



Title data is the title of a sequence program, and consists of ten items:

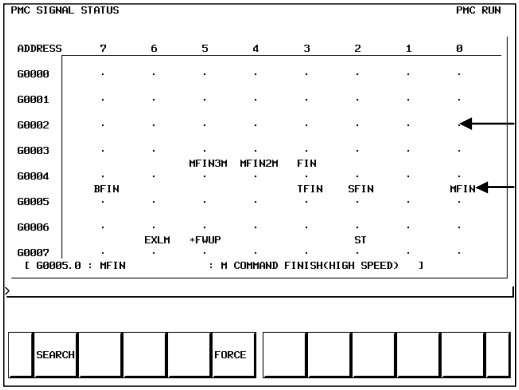
- MACHINE TOOL BUILDER NAME (32 characters)
- MACHINE TOOL NAME (32 characters)
- CNC & PMC TYPE NAME (32 characters)
- PMC PROGRAM NO. (4 characters)
- EDITION NO. (2 characters)
- PROGRAM DRAWING NO. (32 characters)
- DATE OF PROGRAMMING (16 characters)
- PROGRAM DESIGNED BY (32 characters)
- ROM WRITTEN BY (32 characters)
- REMARKS (32 characters)

In addition, the following data is displayed:

- Series and edition of the PMC basic software
- Memory use status of each sequence data item
- Type of the PMC basic software and the PMC type of the sequence program
- Current execution time, maximum execution time, and minimum execution time of the ladder program

10.1.2.2 Status screen

The on/off state of I/O signals and the internal relay is displayed.

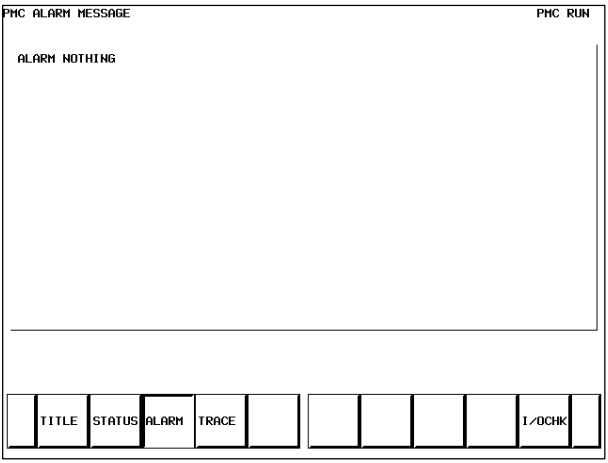


- The diagnosis number can be increased or decreased by using PAGE ↓ / PAGE ↑.
- Enter an address and number or signal name, then press the [SEARCH] soft key. Then, the specified address or signal name is searched for.

10

10.1.2.3 Alarm screen

An alarm issued from the PMC is displayed.



10.1.2.4 Trace function

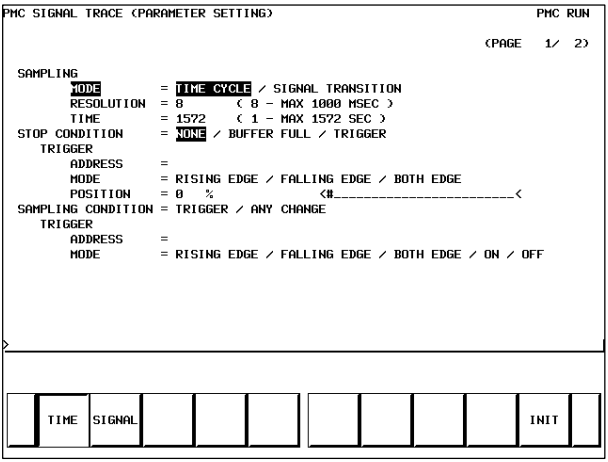
(1) Trace parameter screen (first page)

<1> Press the system key, then press the [PMC] soft key.

<2> Press the [PMCDGN] soft key.

<3> Press the [TRACE] soft key.

<4> Press the [SETING] soft key on the signal trace screen.



a) SAMPLING/MODE
Set a sampling mode.

- TIME CYCLE : Sampling based on a period of time
- SIGNAL TRANSITION : Sampling based on signal transitions

b) SAMPLING/RESOLUTION
Set the resolution of sampling.

c) SAMPLING/TIME
This item is displayed when “TIME CYCLE” is selected as the sampling mode. Set a time interval for sampling.

d) SAMPLING/FRAME
This item is displayed when “SIGNAL TRANSITION” is selected as the sampling mode. Set the number of sampling times.

e) STOP CONDITION
Set a trace stop condition.

- NONE : Does not stop trace operation automatically.
- BUFFER FULL : Stops trace operation automatically when the sampling buffer becomes full.
- TRIGGER : Stops trace operation automatically by a trigger.

f) STOP CONDITION/TRIGGER/ADDRESS
This item becomes settable when “TRIGGER” is set as the trace stop condition. Set a trigger address for stopping trace operation.

g) STOP CONDITION/TRIGGER/MODE
This item becomes settable when “TRIGGER” is set as the trace stop condition. Set a trigger mode for stopping trace operation.

- RISING EDGE : Stops trace operation automatically on the rising edge of the trigger signal.
- FALLING EDGE : Stops trace operation automatically on the falling edge of the trigger signal.
- BOTH EDGE : Stops trace operation automatically on a transition of the trigger signal.

h) STOP CONDITION/TRIGGER/POSITION
This item becomes settable when “TRIGGER” is set as the trace stop condition. By using a ratio to the sampling time (or count), set where to place a stop trigger occurrence position in the entire sampling time (or count).

i) SAMPLING CONDITION
This item becomes settable when “SIGNAL TRANSITION” is set as the sampling mode. Set a sampling condition.

- TRIGGER : Performs sampling when the sampling trigger condition is satisfied.
- ANY CHANGE : Perform sampling when a sampling address signal transition occurs.

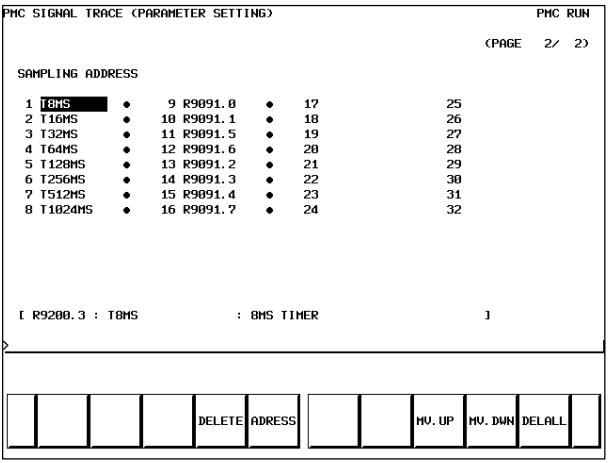
j) SAMPLING CONDITION/TRIGGER/ADDRESS
This item becomes settable when “SIGNAL TRANSITION” is set as the sampling mode and “Trigger” is set as the sampling condition. Set an address used to trigger sampling.

k) SAMPLING CONDITION/TRIGGER/MODE
This item becomes settable when “SIGNAL TRANSITION” is set as the sampling mode and “Trigger” is set as the sampling condition. Set a trigger condition mode.

- RISING EDGE : Performs sampling on the rising edge of the trigger signal.
- FALLING EDGE : Performs sampling on the falling edge of the trigger signal.
- BOTH EDGE : Performs sampling on a signal transition.
- ON : Performs sampling when the trigger signal is on.
- OFF : Performs sampling when the trigger signal is off.

(2) Trace parameter screen (second page)

On the trace parameter screen (first page), press [PAGE ↓] [PAGE ↑].



a) Address setting
Set a signal address as a bit address. If you enter a byte address, bits 0 to 7 of the entered address are input. Up to 32 signal addresses can be set.

b) Soft keys

- [DELETE] : Deletes the set address where the cursor is placed.
- [SYMBOL]/[ADRESS] : Switches the setting address between symbol display and address display.
- [MV.UP] : Replaces the set address with the upper line.
- [MV.DWN] : Replaces the set address with the lower line.
- [DELALL] : Deletes all set addresses.

c) Trigger setting
When “SIGNAL TRANSITION” is set as the trace sampling mode and “BOTH EDGE” is set as the sampling condition, you can choose whether to use a set address as a trigger signal for sampling. To the right of a signal address set as a trigger, a “●” mark is indicated.

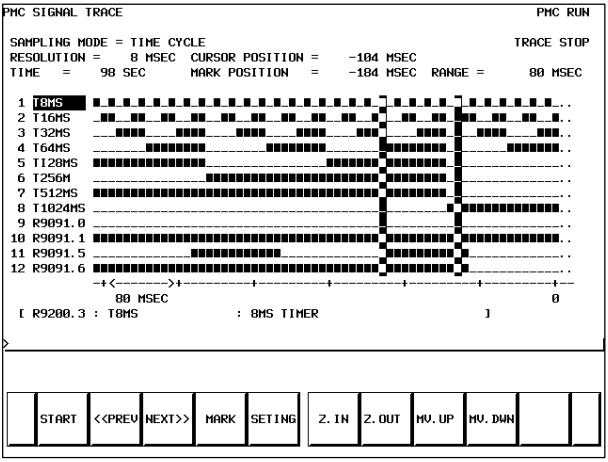
- [TRGON] : Turns on a trigger setting.
- [TRGOFF] : Turns off a trigger setting.

(3) Trace screen

<1> Press the system key, then press the [PMC] soft key.

<2> Press the [PMCDGN] soft key.

<3> Press the [TRACE] soft key.



(a) Executing trace operation

[START] : Executes trace operation.

(b) Stopping trace operation

[STOP] : Stops trace operation. Trace operation ends also when the trace stop condition set on the trace parameter setting screen is satisfied.

(c) Checking trace results

Upon completion of trace execution, the results of trace operation can be checked.

- Scrolling display

  Cursor up/down key, page switch key:
  Scrolls the set sampling signal addresses up and down.

  [<<PREV], [NEXT>>] Soft key, current right/left key:
  Scrolls the graphical display of trace results right and left.

- Performing automatic calculation and display of a selected range

  [MARK] : Marks the current cursor position, and displays the mark cursor. To cancel the range selection, press the [MARK] soft key again.

- Enlarging/reducing display of trace results

  [Z.IN]/[Z.OUT] : Enlarges/reduces graphical display.

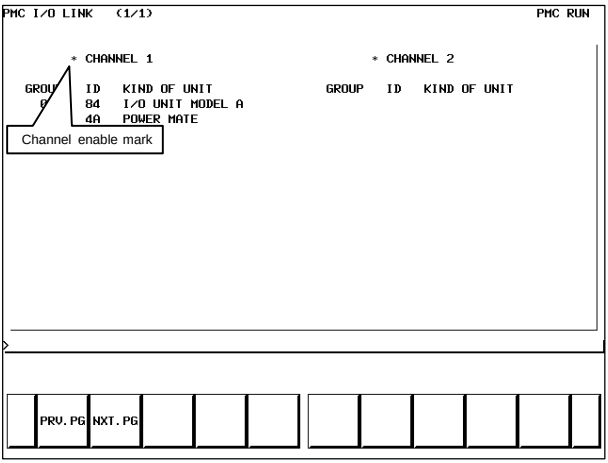
- Replacing display data

  [MV.UP] : Replaces the address where the cursor is placed and the trace result of the address with the upper line.

  [MV.DWN] : Replaces the display data with the lower line.

10.1.2.5 I/O Link connection check screen

The type and ID code of an I/O device connected to the I/O Link are displayed for each group. No data is displayed when no I/O device is connected.



Channel enable mark : When a channel is usable, an "*" mark is indicated. On the sample screen above, channel 2 is unusable.

10.1.3 PMC parameters

10.1.3.1 Parameter input/output method

<1> Place the NC in the MDI mode or in the emergency stop state.

<2> Set PWE of the NC setting screen to 1.

	PWE	KEY4	
Timer	○		
Counter	○	○	either one
Keep relay	○		
Data table	○	○	either one

<3> Alternatively, set the program protect signal (KEY4) to 1 only with the counter and data table.

<4> Press a soft key and select a required screen.
[TIMER] :Timer screen
[COUNTR] :Counter screen
[KEEPRL] :Keep relay screen
[DATA] :Data table screen

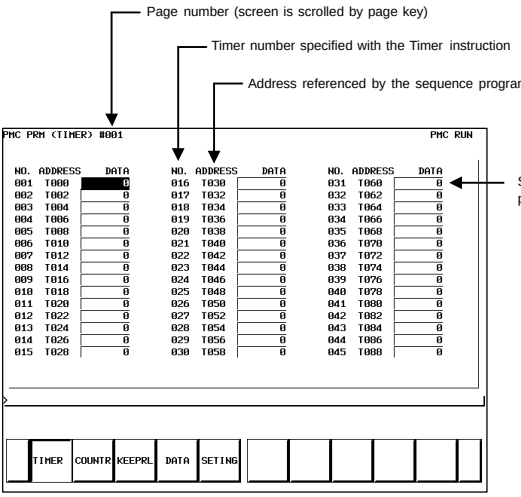
<5> Press cursor key and move the cursor to a desired number.

<6> Input a numeric key and press INPUT key and data is input.

<7> After input, return PWE or the KEY4 signal to the previous state.

10.1.3.2 TIMER screen

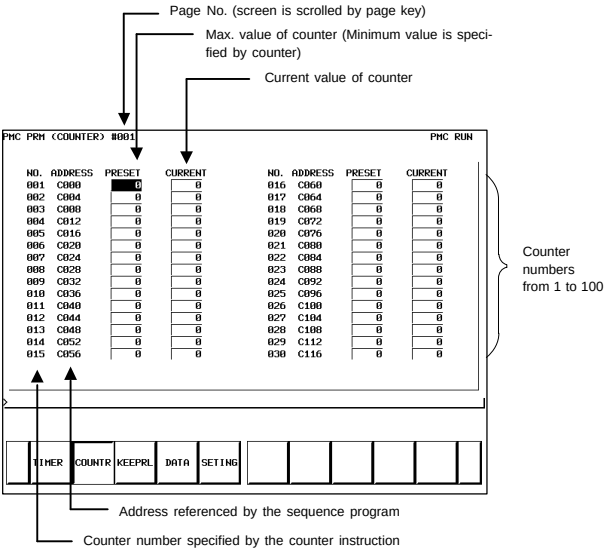
This screen is used for setting timer time of the Timer instruction (SUB 3).



Timer set time : Timer No. 1–8 is max. 1572.8 sec and its accuracy is 48ms. Timer No. 9 to 250 is max. 262.1 sec and its accuracy is 8ms.

10.1.3.3 COUNTER screen

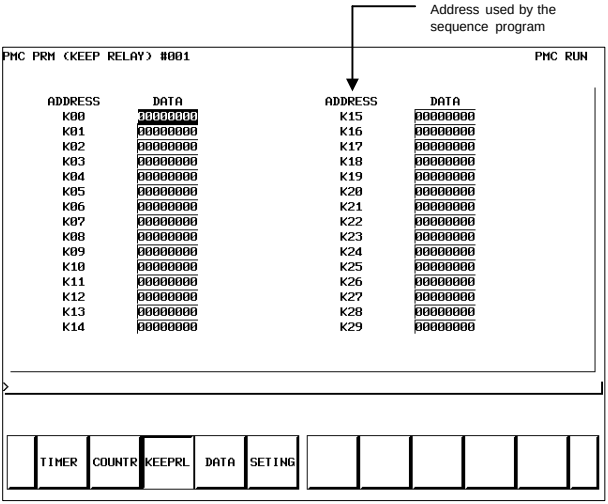
This screen sets and displays max. value of counter and current value of the counter instruction (SUB 5).



Counter formats and maximum values

Counter format	Setting	Current value
BINARY	32767	32767
BCD	9999	9999

10.1.3.4 KEEP RELAY screen



(i) Nonvolatile memory control

	#7	#6	#5	#4	#3	#2	#1	#0
K16	MWRTF2	MWRTF1						

#7 MWRTF2

#6 MWRTF1 : Writing status in nonvolatile memory

(ii) PMC system parameters

The keep relays below are used by the system, so that the keep relays cannot be used by the sequence program.

	#7	#6	#5	#4	#3	#2	#1	#0
K900	DTBLDSP			MEMINP		AUTORUN	PRGRAM	LADMASK

#0 LADMASK

0: Access by the sequence program is enabled.

1: Access by the sequence program is disabled.

#1 PRGRAM

0: The built–in programmer function does not operate. (Also, the programmer menu is not displayed.)

1: The built–in programmer function operates. (The programmer menu is displayed.)

#2 AUTORUN

0: The sequence program automatically starts at power on.

1: Pressing the soft key to sequence program execution starts the sequence program.

#4 MEMINP

0: The forcing function and override function are disabled.

1: The forcing function and override function are enabled.

#7 DTBLDSP

0: The PMC parameter data table control screen is displayed.

1: The PMC parameter data table control screen is not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
K901	IGNDINT	EDITLAD	CHKPRTY	CALCPRTY	TRNSRAM	TRGSTAT	DBGSTAT	IGNKEY

#0 IGNKEY

0: Function keys are enabled for a user program on the user screen.

1: Function keys are disabled for a user program on the user screen.

* This flag is useful when a user program is used. When this bit is set to 1, the user screen cannot be switched to the NC screen by using the function keys. Program which invariably sets this bit to 0, or which switches the user screen to the NC screen, must be prepared.

#1 DBGSTAT

0: The C language debug function does not start automatic break processing at power on.

1: The C language debug function starts automatic break processing at power on.

* This flag is useful when a user program is used.

#2 TRGSTAT

0: The trigger stop function does not automatically start at power on.

1: The trigger stop function starts automatically at power on.

#3 TRNSRAM

0: After on–line editing, the ladder program is not automatically transferred to the backup RAM.

1: After on–line editing, the ladder program is automatically transferred to the backup RAM.

#4 CALCPRTY

0: A RAM parity calculation is made with the built–in programmer function.

1: No RAM parity calculation is made with the built–in programmer function.

#5 CHKPRTY

0: The system ROM and program ROM/RAM are checked for parity errors.

1: The system ROM and program ROM/RAM are not checked for parity errors.

#6 EDITLAD

0: The editing of a sequence program is disabled.

1: The editing of a sequence program is enabled.

#7 IGNDINT

0: The system initializes the LCD when the screen is switched to the PMCMDI screen.

1: The system does not initialize the LCD when the screen is switched to the PMCMDI screen.

* This flag is useful when a user program is used. When the screen is switched to the PMCMDI screen, PMC control software determines whether the system initialize the LCD, by checking this flag. When this flag is on, an application program must initialize the LCD.

	#7	#6	#5	#4	#3	#2	#1	#0
K902	PTCTPRM	HIDEPRM				ALWSTP	C–REJECT	FROM–WRT

#0 FROM–WRT

0: After editing a ladder program, does not automatically write it to F–ROM.

1: After editing a ladder program, automatically writes it to F–ROM.

#1 C–REJECT

0: The system activates a C program.

1: The system does not activate a C program.

#2 ALWSTP

0: The execution/stop operation of a sequence program is disabled.

1: The execution/stop operation of a sequence program is enabled.

#6 HIDEPRM

0: The display of PMC parameters and the output of PMC parameters to the outside are enabled.

1: The display of PMC parameters and the output of PMC parameters to the outside are disabled.

#7 PTCTPRM

0: The modification and reading of PMC parameters are enabled.

1: The modification and reading of PMC parameters are disabled.

	#7	#6	#5	#4	#3	#2	#1	#0
K906			TRCSTAT			IOCHK	IOSELSCN	OVRRIDE

#0 OVRRIDE

0: Disables the override function.

1: Enables the override function.

#1 IOSELSCN

0: Does not display the I/O assignment selection function setting screen.

1: Displays the I/O assignment selection function setting screen.

#2 IOCHK

0: Enables the I/O Link connection check function. (Initial value).

1: Disables the I/O Link connection check function.

#5 TRCSTAT

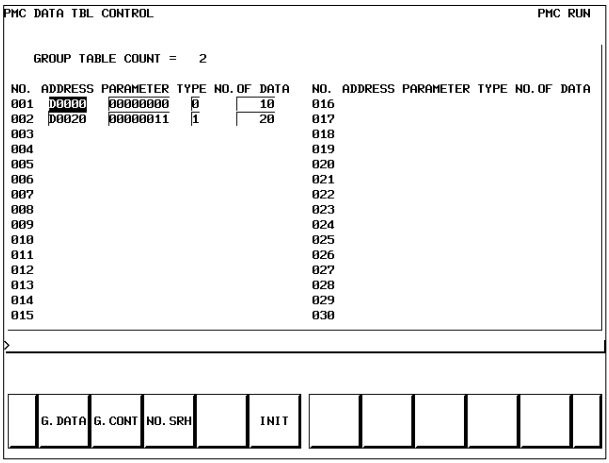
0: Starts trace operation with the trace function when the execution soft key is pressed.

1: Starts trace operation with the trace function automatically after the power is turned on.

CAUTION	Be sure to set any unused areas to 0.

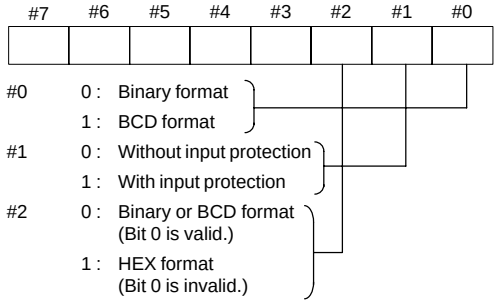
10.1.3.5 Data table screen

(1) Data group setting screen



a) Display information

- GROUP TABLE COUNT : Number of data table groups
- NO. : Group number
- ADDRESS : Data table start address
- PARAMETER : Table parameter

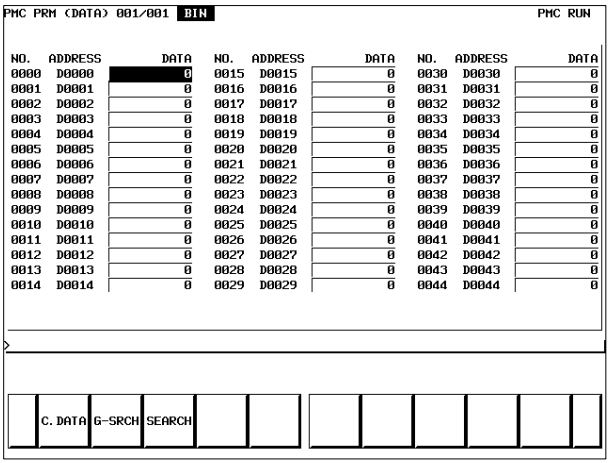


- TYPE : Data length (0: 1byte long, 1: 2bytes long, 2: 4bytes long)
- NO. OF DATA : Number of data items of each data table

b) Soft key

- [G.DATA] :
  Switches the screen display to the data table screen.
- Number of groups + [G.CONT] :
  Sets the number of data table groups.
- Group number + [NO.SRH] :
  Moves the cursor to a specified group.
- [INIT] :
  Initializes the setting of the data table.

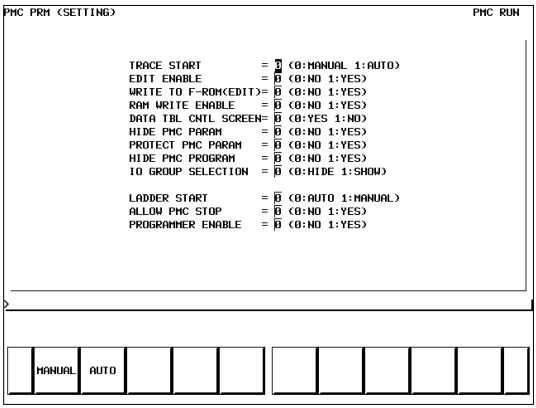
(2) Data table screen



- [C.DATA] :
  Returns the screen display to the data group setting screen.
- Group number + [G–SRCH] :
  Moves the cursor to the start of a specified group.
- Address + [SEARCH] :
  Searches the currently selected group for a specified address.

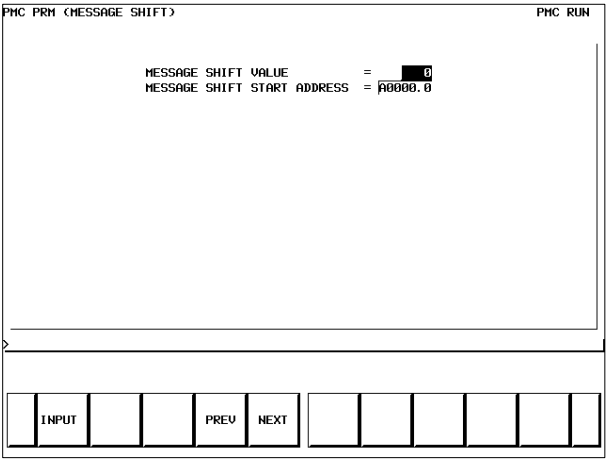
10.1.3.6 Setting screens

(1) Setting screen for general functions



NOTE The parenthesized values to the right of the screen indicate keep relay addresses.

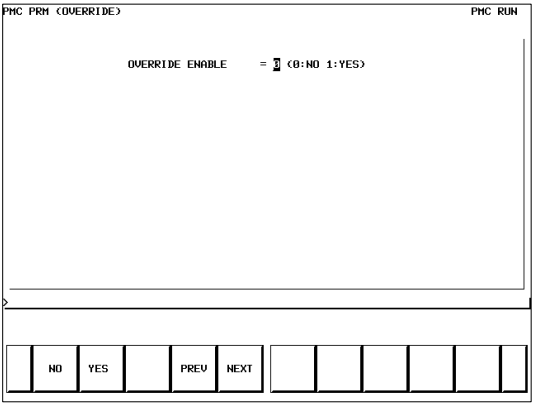
(2) Message function screen for each language



Display information

- MESSAGE SHIFT VALUE :
  Enter a shift amount for a message display request. A value from 0 to 1999 can be specified. Even when the power is turned off, entered data is preserved.
- MESSAGE SHIFT START ADDRESS :
  Enter the start bit address of a shifted message display request bit area. An address in the A address area can be specified. Even when the power is turned off, entered data is preserved.

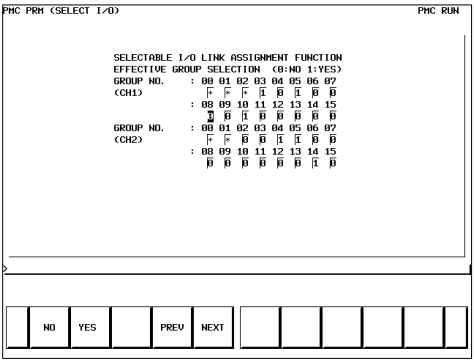
(3) Override mode screen of the forced input/output function



Display information

- OVERRIDE ENABLE
  0: Disables overriding.
  1: Enables overriding.

(4) I/O Link assignment data selection function setting screen



(K910.0 to K910.7)
(K911.0 to K911.7)
(K912.0 to K912.7)
(K913.0 to K913.7)

In this setting parameter, set the group of an I/O device connected to each machine.

EFFECTIVE GROUP SELECTION (CH1: K910 to K911, CH2: K912 to K913): Select a group in which I/O Link assignment data is valid.

0: Disables assignment.

1: Enables assignment.

The basic group section set in “BASIC GROUP COUNT” on the system parameter screen is marked with *, and disables this setting.

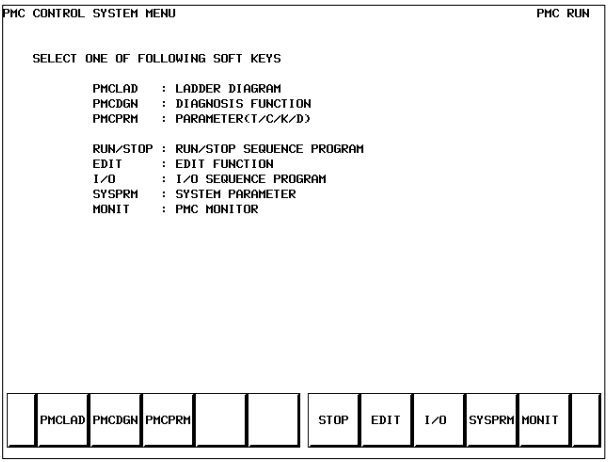
10.1.4 PMC data input/output

10.1.4.1 Starting the built–in programmer

NOTE When data is input through the MDI keys, the operations below need not be performed:

(1) Select the PMC screen. Press the [SYSTEM] soft key, then press the [PMC] soft key.

(2) When the built–in programmer is started, the items below are displayed. When the items of RUN/STOP, EDIT, I/O, SYSPRM, and MONIT are displayed, the built–in programmer is already started.

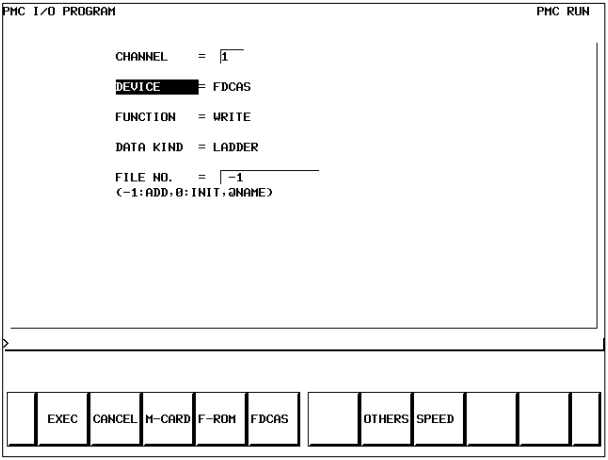


(3) When the built–in programmer is not started, set the keep relay K900.1 to 1.

10.1.4.2 Input/outputmethod

(1) Press the [I/O] soft key.

(2) The screen shown below appears.



(3) Select an I/O device in “DEVICE”.

[FDCAS] : Input to, and output from, a floppy cassette adapter
[F–ROM] : Input to, and output from, a flash EEPROM
[M–CARD] : Input to, and output from, a memory card
[OTHERS] : Input to, and output from, other I/O devices

(4) Set a channel number in “CHANNEL”.

When [F–ROM] or [OTHERS] is selected in “DEVICE”, set this item. Enter a channel number, then press the INPUT key or [(NO.)].

Main CPU board JD5A=1
JD5B=2

(5) Select a function in “FUNCTION”.

[WRITE] : Outputs data.
[READ] : Inputs data.
[COMPAR] :
Compares the data in an external device with the data in memory.
[DELETE] : Deletes the files from the floppy disk or memory card.
[LIST] :
Displays the directory of files in the floppy disk or memory card.
[FORMAT] :
Initializes the memory card. (All data in the memory card is erased.)

(6) Select a type of output data in “DATA KIND”.

[LADDER] : Ladder
[PARAM] : PMC parameter

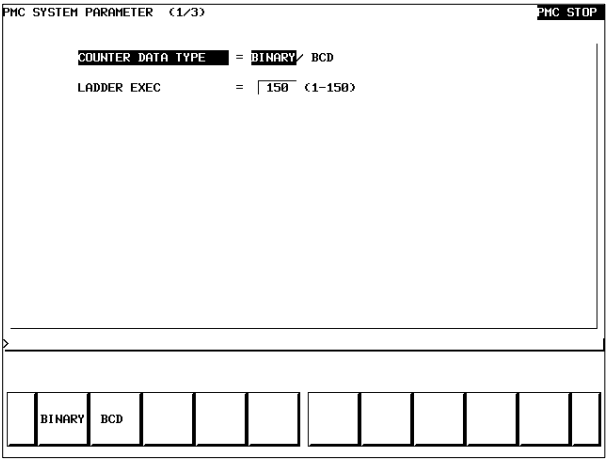
(7) When [FDCAS] or [M–CARD] is selected, a file can be specified in “FILE NO.”. A file can be specified by file number or by file name. When specifying a file name, prefix @ or # to the file name.

(8) Select an RS–232C setting condition. [SPEED]
For each “DEVICE”, set a condition.

(9) Check that the settings above are correct, then press the [EXEC] soft key.

10.1.5 System parameters

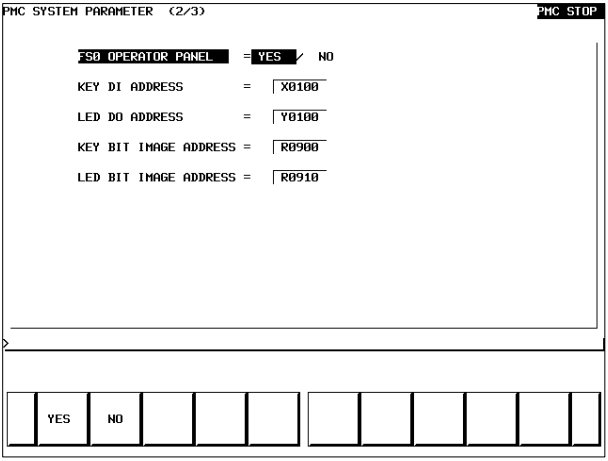
(1) System parameter screen (1/3)



Display information

- COUNTER DATA TYPE :
  Specify the binary format or BCD format for a counter value to be used with the function instruction CTR.
- LADDER EXEC :
  Set a processing time for the first and second ladder levels (1% to 150%). This setting increases or decreases ladder scan time.

(2) System parameter screen (2/3)

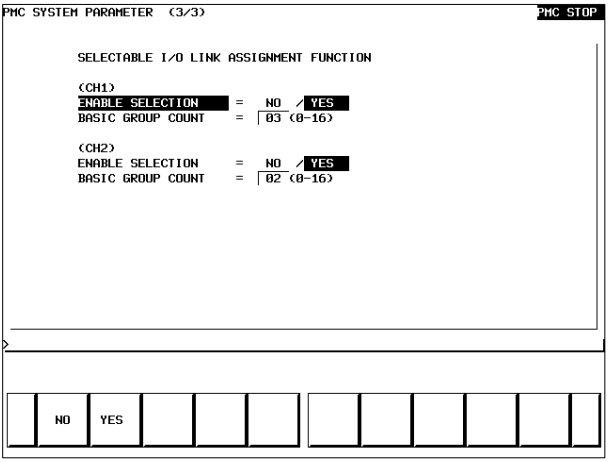


Display information

- FS0 OPERATOR PANEL :
  Set whether to connect an operator's panel for the FS0.
- KEY DI ADDRESS :
  Set the start address of an external DI actually connected.
- LED DO ADDRESS :
  Set the start address of an external DO actually connected.
- KEY BIT IMAGE ADDRESS :
  Set the start address of a key image referenced by a user program. Usually, set an arbitrary internal relay (R) area.
- LED BIT IMAGE ADDRESS :
  Set the start address of an LED image generated by a user program. Usually, set an arbitrary internal relay (R) area.

(3) System parameter screen (3/3)

On this screen, make settings related to the I/O Link assignment selection function.



Display information

- ENABLE SELECTION

  [NO] : Does not use the I/O Link assignment data selection function.

  [YES] : Uses the I/O Link assignment data selection function.

  When [NO] is specified for both of channel 1 and channel 2, the I/O Link assignment data selection function setting screen described in item (4) of Subsection 10.1.3.6, “Setting screens” is not displayed.

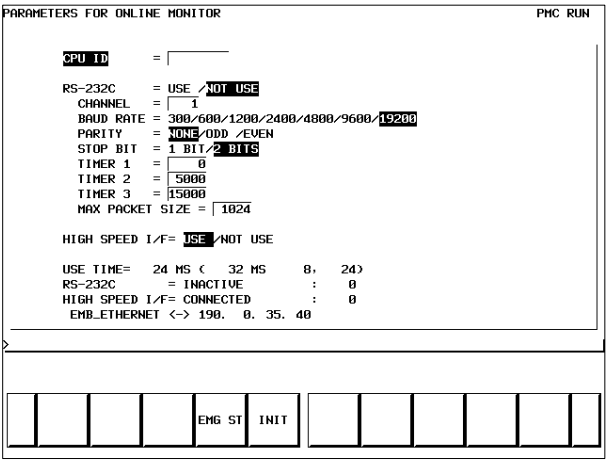
- BASIC GROUP COUNT :

  This parameter divides the I/O Link assignment data into the basic group section and the parameter selection group section. Set the number of groups in the basic group section. Enter a value from 0 to 16, then press the [INPUT] soft key.

Example

3 : BASIC GROUP COUNT 0 to 2 groups
Parameter selection group section 3 to 15 groups

10.1.6 Online monitor setting screen



(a) Soft key

- [EMG ST] : Terminates communication forcibly. Use this key if communication becomes abnormal and the connection cannot be terminated normally.
- [INIT] : Initializes the parameters to their default values.

(b) Setting

- CPU ID : Displays a CPU ID value. However, do not modify this item.
- RS–232C : Enables communication setting in the case of connection via RS–232C. However, do not modify the items of timer 1, timer 2, timer 3, and maximum packet size.
- HIGH SPEED I/F : Enables setting for connection via a high–speed interface (HSSB, Ethernet).

(c) Communication status

- USE TIME : The maximum time in the communication processing is displayed.
- RS–232C : The communication condition of RS–232C is displayed.
- HIGH SPEED I/F : The communication condition of HIGH SPEED I/F is displayed.
- ETHER_BOARD : Displayed during the communication with Ethernet board. The IP address of the communication partner is displayed.
- EMB_ETHERNET : Displayed during the communication with embedded Ethernet. The IP address of the communication partner is displayed.
- HSSB : Displayed during the communication with HSSB.

Display messages and the meanings

Display messages	Meanings
INACTIVE	The communication is inactive.
STOPPING	The communication is being stopped. (Wait for the termination of communication)
STARTING	The communication is being started. (Wait for the termination of communication over another communication path)
STAND–BY	The communication is active and in standby mode.
CONNECTED	The communication is active and being connected.
NO OPTION	The port can be not opened because there is not option of RS–232C.
BAD PARAMETER	Invalid open parameters are specified.
TIMEOUT ERROR	A time–out has occurred and communication is aborted.
TIMEOUT(K) ERROR	A time–out has occurred and communication is aborted.
BCC ERROR	A Block Check Code (packet parity) error has occurred.
PARITY ERROR	A parity error has occurred.
OVER–RUN ERROR	A reception overrun has occurred and the communication can not recover.
SEQUENCE ERROR	Packets are out of sequence. (Incorrect procedure)
DATA ERROR	Incorrect packets have been received through retry process.
QUEUE OVERFLOW	The transmit/receive queue has overflowed.
DISCONNECTED	Communication has been terminated successfully.
NO CONNECTION	The cable is disconnected.

10.2 PMC–SA1

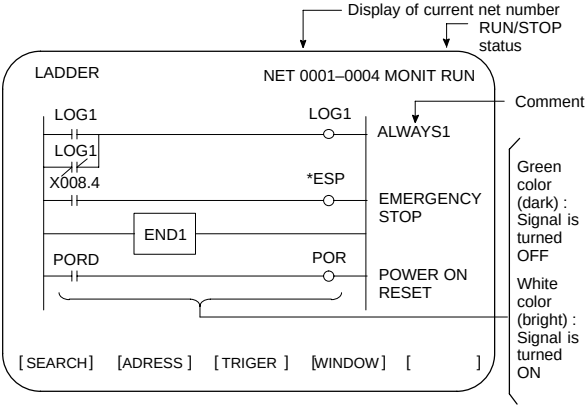
10.2.1 Dynamic display of sequence program

(1) Display method

1 Press the SYSTEM key, then press the soft key [PMC].

2 Dynamic display of sequence program by pressing [PMCLAD] soft key.

(2) Display information



(3) Searching for the signal (SEARCH)

1 Press the [SEARCH] soft key.

2 Using the following keys as described below, search for desired signal.

- The signals being displayed can be changed by using the PAGE ↓, PAGE ↑, ↓, and ↑ keys.
- [TOP]: Locates the top of the ladder program.
- [BOTTOM] : Locates the end of the ladder program.
- Address.bit [SRCH] or Single name [SRCH] : Search a specified address unconditionally.
- Address.bit [W-SRCH] or Single name or [W-SRCH] : Searches for a specified address, for the write coils.
- Net number [N-SRCH]: Displays the ladder program from the specified net address.
- Function instruction number [F-SRCH] or Function instruction name [F-SRCH]: Searches for the specified function instruction.
- [ADRESS]: Displays the address and bit number of the specified signal.
- [SYMBOL]: Displays the symbol of the specified signal. (The address of the specified signal is displayed if a symbol was not specified when the program was created.)

(4) Turning off the monitor display when the trigger signal changes (TRIGER)

When the preset trigger signal changes, the system turns off the monitor display. By using this function, the states of all signals can be accurately read when the trigger signal changes.

1 Press the [TRIGER] soft key.

2 Press the [INIT] soft key to initialize the trigger parameters.

3 Specify the trigger conditions.

- To turn off the monitor display at the signal's rising edge (as the signal changes from 0 to 1), enter the desired data and press the required keys in the order shown below.

Signal name/address | EOB | Trigger checkpoint | EOB

Count | [TRGON]

※ Trigger checkpoint:

0: Before the first level of the ladder program is executed

1: After the first level of the ladder program is executed

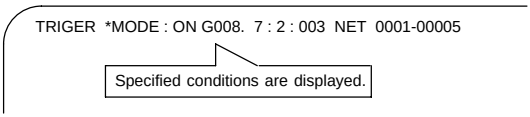
2: After the second level of the ladder program is executed

3: After the third level of the ladder program is executed

Example) To set the system so that it turns off the monitor display when the external reset signal (ERS) is input three times, enter the required data and press the required keys in the order shown below:

ERS | EOB | 2 | EOB | 3 | [TRGON]

The specified trigger conditions are displayed at the top of the screen.



To turn off the monitor display at the signal's falling edge (as the signal changes from 1 to 0), enter the desired data and press the required keys in the order shown below.

Signal name/address | EOB | Trigger checkpoint | EOB

Count | [TRGOFF]

4 Press the [START] soft key to activate the trigger function.

→ While the trigger function is operating, TRG is displayed at the lower right corner of the screen. When the trigger conditions are satisfied, TRG disappears and the monitor screen is locked.

5 To interrupt the trigger function, press the [STOP] soft key while the function is effective.

→ In this case, the specified trigger conditions remain effective. Pressing the [START] soft key reinstates the trigger function.

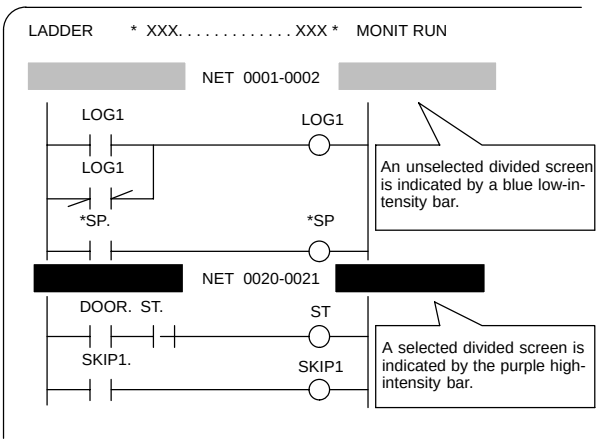
6 To search for the instruction where the program was stopped by the trigger function and blink that instruction, press the [TRGSRC] soft key.

(5) Displaying a divided ladder program (WINDOW)
A ladder program can be divided into up to six sections, and the individual sections displayed on the screen simultaneously.

1 Press the [WINDOW] soft key.

2 Press the [DIVIDE] soft key to divide the dynamic display screen into the desired number of sections.

⁎ Each time the key is pressed, the screen is divided.



10

3 To select the desired divided screen, press the [SELECT] soft key as many times as necessary to move the purple bar to the desired screen.

⁎ The normal search function can be used within each divided screen.

4 To change the width of a selected divided screen, press the [WIDTH] soft key.

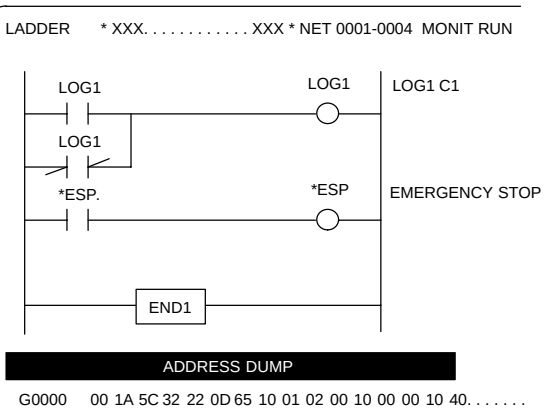
- Pressing the [EXPAND] soft key increases the number of lines displayed on a divided screen.
- Pressing the [SHRINK] soft key decreases the number of lines displayed on a divided screen.

5 To terminate the display of a selected divided screen, press the [DELETE] soft key.

⁎ To terminate screen division, press the [CANCEL] soft key.

(6) Dumping (DUMP)
The states of the signals corresponding to a ladder program can be displayed in hexadecimal, together with the ladder program itself.

1 Press the [DUMP] soft key.



✳ When the screen is divided, the states of the signals are displayed in the lower divided screen.

- To change the data notation

  [BYTE] : Data is displayed in units of bytes.
  Example) G0000 00 16 84 00 ...

  [WORD] : Data is displayed in units of two bytes.
  Example) G0000 1600 0084 ...

  [D.WORD] : Data is displayed in units of two words, or four bytes.
  Example) G0000 00841600 ...

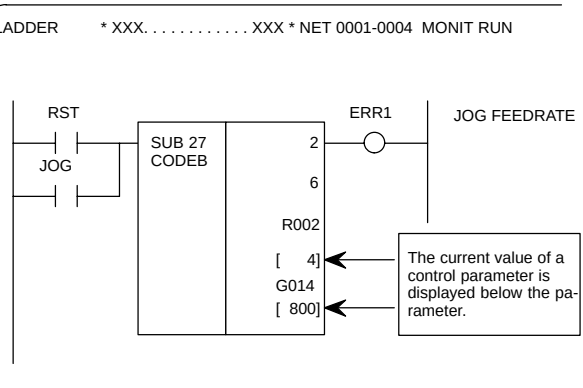
  ✳ When WORD or D.WORD is specified, data is displayed with the high-order byte placed first.

- To search for an address

  Use the PAGE ↓, PAGE ↑, and [SRCH] keys, as in the normal search function.

(7) Displaying the function-instruction parameters (DPARA/NDPARA)
The states of the control parameters used in function instructions are displayed together with the ladder program.

1 Press the [DPARA] soft key.



✻ The data notation (binary or BCD) varies with the function instructions.

2 To terminate the display of parameters, press the [NDPARA] soft key.

(8) Editing the program being executed (ONLEDT: on-line editing)
A sequence program can be edited while a program is being executed, without stopping its execution.

✻ This function is available only while the edit function is enabled.

1 Press the [ONLEDT] soft key to start the on-line editing function. The cursor appears on the screen.

2 Modify the program, following the usual editing procedure.
The following changes can be made by means of on-line editing.

- Changing the type of contacts (⊣ ⊢, ⊣/⊢)
- Changing the addresses of contacts and coils
- Changing the addresses of control parameters used in function instructions

  ✻ The operations that can be performed in on-line editing are restricted to those that do not change the memory size of the program. To perform other operations, such as addition, insertion, and deletion, use the ordinary editing function.

3 To terminate on-line editing, press the [◁] key.

✻ Changes made in on-line editing are temporary. To save a changed program, set K18.3 to 1 or transfer the program to the DRAM by using the COPY function from the I/O screen. To enable the use of the program when the system is next turned on, write it to the FROM from the I/O screen.

PMCPRM

	#7	#6	#5	#4	#3	#2	#1	#0
K018								

#3 0: The ladder program is not transferred to the RAM after on-line editing.

→ To transfer the program, press the following keys in the order shown, using the COPY function from the I/O screen: [COPY], [EXELAD], [EXEC]

1: A ladder program is automatically transferred to the RAM after on-line editing.

10.2.2 Display of PMC diagnosis screen

(1) Display method

1 Press the SYSTEM key.

2 Press the [PMC] soft key.

3 Display of PMC diagnosis screen by pressing [PMC/DGN] soft key.

10.2.2.1 Title screen (TITLE)

Display of the title data which is wrote at the ladder programming time.

```
PMC TITLE DATA #1                                    MONIT RUN

          PMC PROGRAM NO.      :
          EDITION NO.          :
          PMC CONTROL PROGRAM
           SERIES  :  4067  EDITION  :  01
          (SERIES  :  EDITION  :  )
          PMC TYPE CONTROL :  RB5  PROGRAM : RB5
              MEMORY USED    :   KB
              LADDER         :   KB
              SYMBOL         :   KB
              MESSAGE        :   KB
              SCAN TIME      :   MS
              SCAN MAX       :   MS   MIN :          MS


     [  TITLE  ]   [ STATUS]   [ ANALYS]   [ TRACE ]   [          ]
```

1) 1st page

PMC PROGRAM NO. : [redacted]
EDITION NO. : [redacted]

Set at LADDER programming time.

PMC CONTROL PROGRAM
SERIES : [redacted] EDITION : [redacted]
(SERIES: [redacted] EDITION : [redacted])
PMC TYPE CONTROL : [redacted] PROGRAM : [redacted]
MEMORY USED : [redacted] KB
LADDER : [redacted] KB
SYMBOL : [redacted] KB
MESSAGE : [redacted] KB
SCAN TIME : [redacted] MS
SCAN MAX : [redacted] MS MIN : [redacted] MS

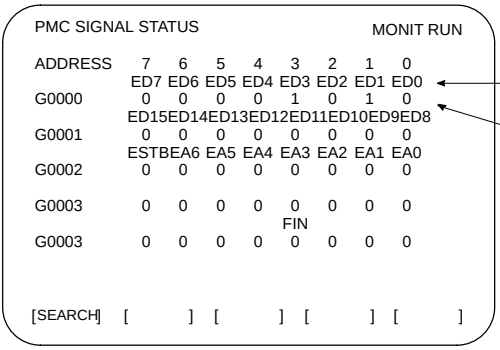
Display of a serial number and version number of PMC control software, used memory area and scan time.

2) 2nd page
   MACHINE TOOL BUILDER NAME :
   MACHINE TOOL NAME :
   CNC & PMC TYPE NAME :
   PROGRAM DRAWING NO. :
3) 3rd page
   DATE OF PRGRAMMING :
   PROGRAM DESIGNED BY :
   ROM WRITTEN BY :
   REMARKS :

Set at LADDER diagram programming time.

10.2.2.2 Status screen (STATUS)

Display of ON/OFF condition for I/O signals, internal relays, etc.

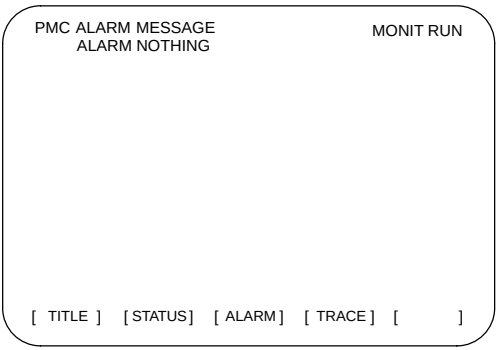


1 Search the diagnosis number by pressing [↑ PAGE] [PAGE ↓] keys.

2 Searching the specified address or signal name by pressing [SEARCH] soft key when inputted of Address and number or Single name

10.2.2.3 Alarm screen (ALARM)

Display of an alarm when an alarm occurred in PMC program.



10.2.2.4 Trace screen (TRACE)

Record the signal status to the trace memory when the specified signal is changed.

(1) Trace parameter screen (TRCPRM)

```
PMC SIGNAL TRACE                                    MONIT RUN

      TRACE MODE            :
      (0:1BYTE/1:2BYTE/2:WORD)
1ST TRACE ADDRESS CONDITION
      ADDRESS TYPE          :    (0:PMC/1:PHY)
      ADDRESS               :
      MASK DATA
2ND TRACE ADDRESS CONDITION
      ADDRESS TYPE          :    (0:PMC/1:PHY)
      ADDRESS               :
      MASK DATA             :




[ T.DISP ]   [ EXEC ]   [          ]   [          ]   [          ]
```

(a) TRACE MODE: Select the trace mode.

0= 1 byte address signal trace

1= Independent 2 byte address signal trace

2= Continuous 2 byte address signal trace

(b) ADDRESS TYPE: 0= Set the trace address by PMC address

1= Set the trace address by physical address (Using mainly by C language)

(c) ADDRESS : Set the trace address

(d) MASK DATA : Specify the trace bit by hexadecimal code. For example, set the “E1” when trace the bit 7, 6, 5 and 0. Not execute the tracing when the bit 4, 3, 2 and 1 is changed, but, the signal status should recorded at tracing time.

(e.g)	#7	#6	#5	#4	#3	#2	#1	#0	
	1	1	1	0	0	0	0		1:E1

≪ Correspond table between binary and hexadecimal code ≫

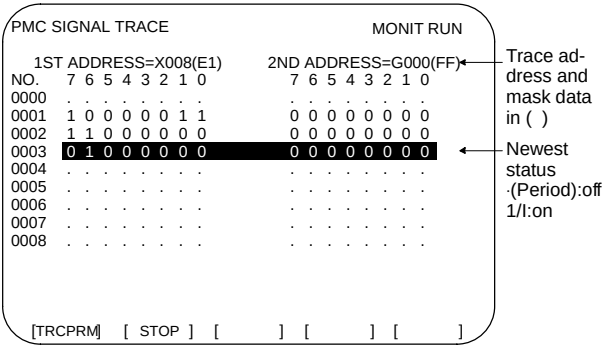
$0000_2 : 0_{16}$	$0001_2 : 1_{16}$	$0010_2 : 2_{16}$	$0011_2 : 3_{16}$
$0100_2 : 4_{16}$	$0101_2 : 5_{16}$	$0110_2 : 6_{16}$	$0111_2 : 7_{16}$
$1000_2 : 8_{16}$	$1001_2 : 9_{16}$	$1010_2 : A_{16}$	$1011_2 : B_{16}$
$1100_2 : C_{16}$	$1101_2 : D_{16}$	$1110_2 : E_{16}$	$1111_2 : F_{16}$

(e) [EXEC] soft key :

Start of tracing.
Clear the trace memory and trace memory contents are update when the specified signal are changed from previous ones.
The trace memory are always maintained up to the previous results for 256 bytes from the latest ones regardless of the time lapse.
(2 byte tracing = 128 times.)

(f) [T.DISP] soft key : Display of trace memory contents.

(2) Trace memory screen (T.DISP)



[TRCPRM] soft key : Return to trace parameter setting screen

[STOP] soft key : Stop the trace operation.

[EXEC] soft key : Re-start of tracing (Clear the memory).

10.2.3 PMC parameter

10.2.3.1 Input of PMC parameter from MDI

1 Select MDI mode or depress EMERGENCY STOP button.

2 [PWE] set to “1” on SETTING screen or PROGRAM PROTECT signal (KEY4) turn to “1”.

	PWE	KEY4	
Timer	○		
Counter	○	○	either one
Keep relay	○		
Data table	○	○	either one

3 Select the display screen by soft key.

[TIMER] : Timer screen

[COUNTER] : Counter screen

[KEEPRL] : Keep relay screen

[DATA] : Data table screen

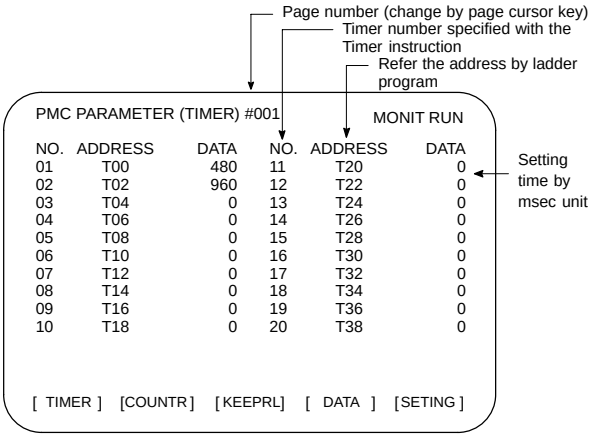
4 Move the cursor to desired number.

5 Input the [Numeral] and press [INPUT] key then the data inputted.

6 [PWE] on SETTING screen or [KEY4] return to “0” after data set.

10.2.3.2 Timer screen (TIMER)

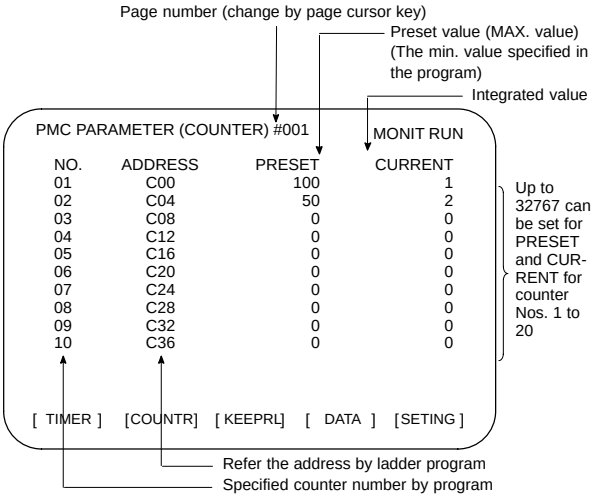
This screen is used for setting timer time of the Timer instruction (SUB 3).



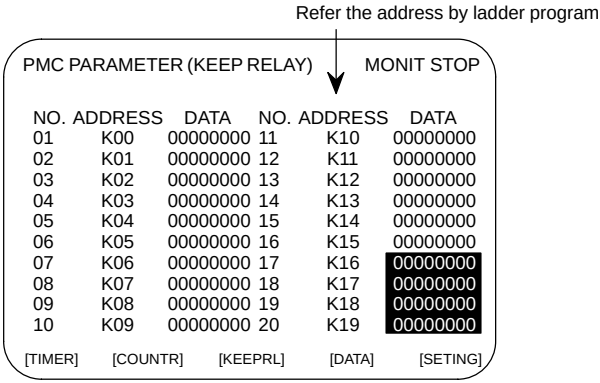
Setting time : Timer No. 1 – 8 =Max.=1572.8 sec, each 48msec.
Up to 262.1 seconds in units of 8 ms for timer Nos. 9 to 40 subsequent timers

10.2.3.3 Counter screen (COUNTER)

Set and display the preset values and integrated values of the counter instruction (SUB 5).



10.2.3.4 Keep relay screen (KEEPRL)



i) Control of battery-powered memory

	#7	#6	#5	#4	#3	#2	#1	#0
K16	MWRTF2	MWRTF1						

#7 MWRTF2

#6 MWRTF1 : Write status for battery-powered memory

ii) PMC system parameter
Since the system uses keep relays K17 to K19, they cannot be used by a sequence program.

	#7	#6	#5	#4	#3	#2	#1	#0
K17	DTBLDSP	ANASTAT	TRCSTART	MEMINP		AUTORUN	PRGRAM	LADMASK

#0 (LADMASK) 0 : The ladder programs are displayed dynamically (PCLAD).

1 : The ladder programs are not displayed dynamically (PCLAD).

#1 (PRGRAM) 0 : The built-in programmer function does not operate. (Also, the programmer menu is not displayed.)

1 : The built-in programmer function operates. (The programmer menu is displayed.)

#2 (AUTORUN) 0 : The sequence program automatically starts at power on.

1 : Pressing the soft key to sequence program execution starts the sequence program.

#4 (MEMINP) 0 : The forcing function is disabled.

1 : The forcing function is enabled.

#5 (TRCSTAT) 0 : Pressing the [EXEC] soft key starts tracing by the signal trace function.

1 : The signal trace function automatically starts tracing at power on.

#6 (ANASTAT) 0 : Pressing the soft key to execution starts sampling by the signal waveform display function.

1 : The signal waveform display function automatically starts sampling at power on.

⁎ This bit is only effective for those models for which the signal waveform display function is applicable.

#7 (DTBLDSP) 0 : The PMC parameter data table control screen is displayed.

1 : The PMC parameter data table control screen is not displayed.

	#7	#6	#5	#4	#3	#2	#1	#0
K018	IGNDINT	EDITLAD	CHKPRTY	CALCPRTY	TRNSRAM	TRGSTAT	DBGSTAT	IGNKEY

#0 (IGNKEY) 0 : Function keys are enabled for a user program on the user screen.

1 : Function keys are disabled for a user program on the user screen.

∗ This flag is useful when a user program is used. When this bit is set to 1, the user screen cannot be switched to the NC screen by using the function keys. A program which invariably sets this bit to 0, or which switches the user screen to the NC screen, must be prepared.

#1 (DBGSTAT) 0 : The C language debug function does not start automatic break processing at power on.

1 : The C language debug function starts automatic break processing at power on.

∗ This flag is useful when a user program is used.

#2 (TRGSTAT) 0 : The trigger stop function does not automatically start at power on.

1 : The trigger stop function starts automatically at power on.

#3 (TRNSRAM) 0 : After on-line editing, the ladder program is not automatically transferred to the backup RAM.

1 : After on-line editing, the ladder program is automatically transferred to the backup RAM.

#4 (CALCPRTY) 0 : The built-in programmer function calculates the RAM parity.

1 : The built-in programmer function does not calculate the RAM parity.

#5 (CHKPRTY) 0 : The system performs parity check for the system ROM, program ROM and program RAM.

1 : The system does not perform parity check for the system ROM, program ROM, or program RAM.

#6 (EDITLAD) 0 : The editing of a sequence program is disabled.

1 : The editing of a sequence program is enabled.

#7 (IGNDINT) 0 : The system initializes the LCD when the screen is switched to the PMCMDI screen.

1 : The system does not initialize the LCD when the screen is switched to the PMCMDI screen.

∗ This flag is useful when a user program is used. When the screen is switched to the PMCMDI screen, PMC control software determines whether the system initialize the LCD, by checking this flag. When this flag is on, an application program must initialize the LCD.

	#7	#6	#5	#4	#3	#2	#1	#0
K019	PTCTPRM	HIDEPRM				ALWSTP	C-REJECT	FROM–WRT

#0 (FROM_WRT) 0 : After editing a ladder or C program, does not automatically write it to F–ROM.

1 : After editing a ladder or C program, automatically writes it to F–ROM.

#1 (C-REJECT) 0 : The system activates a C program.

1 : The system does not activate a C program.

#2 (ALWSTP) 0 : The execution/stop operation of a sequence program is disabled.

1 : The execution/stop operation of a sequence program is enabled.

#6 (HIDEPRM) 0 : The display of PMC parameters and the output of PMC parameters to the outside are enabled.

1 : The display of PMC parameters and the output of PMC parameters to the outside are disabled.

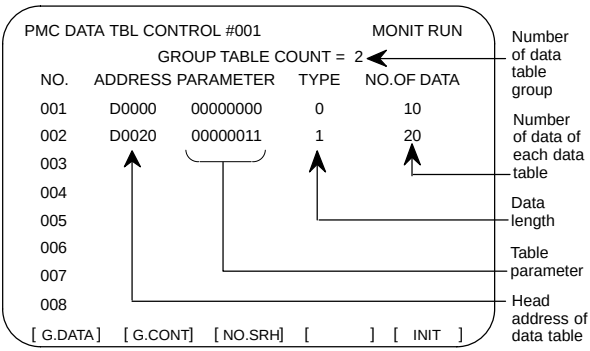
#7 (PTCTPRM) 0 : The modification and reading of PMC parameters are enabled.

1 : The modification and reading of PMC parameters are disabled.

CAUTION	Set all unused bits to 0.

10.2.3.5 Data table screen (DATA)

1) DATA TABLE SETTING screen (C. DATA)



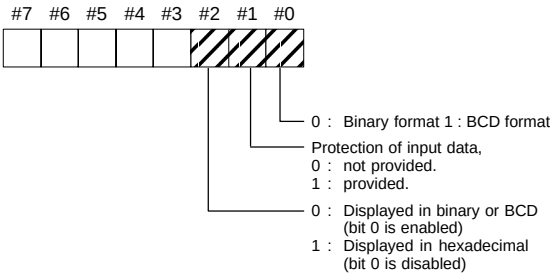
(a) [G.DATA] soft key : Select the data display screen of data table.

(b) No. of group [G.CONT] : Set the number of group for data table.

(c) No. of group [NO.SRH] : Move the cursor to specified group.

(d) [INIT] soft key : Initialize of data table setting.
No. of group is 1, ADDRESS is D0000, PARAMETER is 00000000, TYPE is 0, NO. OF DATA is 1860.

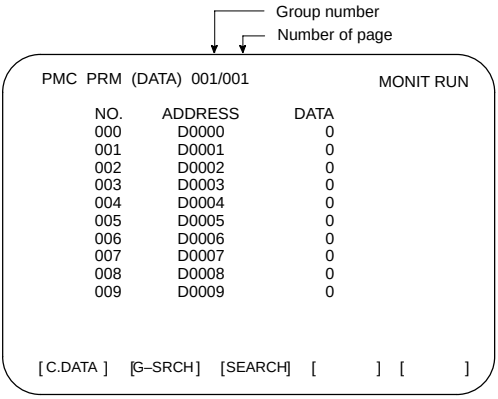
≪Table parameter≫



≪TYPE≫

0 : 1byte 1 : 2bytes 2 : 4bytes

2) Data setting screen (G. DATA)



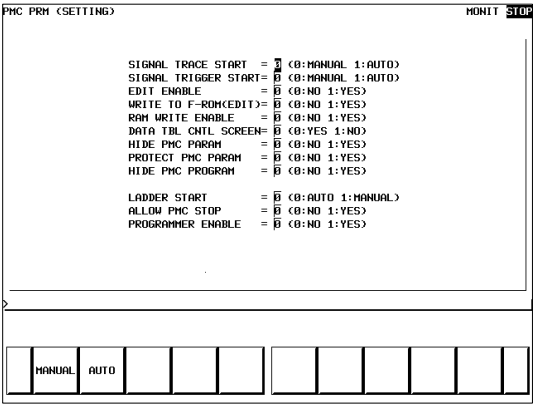
(a) [C.DATA] soft key : Return to data table setting screen.

(b) Group No. [G-SRCH] : Move the cursor to head of specified group.

(c) Address [SEARCH] : Searching the specified address in currentup group.

10.2.3.6 Setting screen

Some PMC system parameters can be set on this screen.



NOTE The parenthesized values to the right of the screen indicate keep relay addresses.

10.2.4 Input/output of PMC data

10.2.4.1 Start of the built-in type PMC programmer

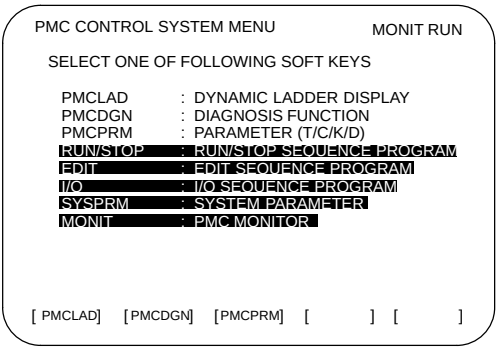
When the PMC data are input/output with I/O device unit via reader/puncher interface, the built-in type PMC programmer should starts by as following operation.

∗ As following operation is not required when the data set from MDI.

1 Select the PMC screen

Press [SYSTEM] key and press [PMC] soft key.

2 Confirm to the built-in type PMC programmer is running.



[redacted] parts are displayed, starts of the built-in type PMC programmer. The card editor is not used on FS16 but it has PMC-SB system. This case, [RUN/STOP] and [I/O] function can used but editing of sequence program is impossible.

3 Keep relay K17.1 should set to “1” if the built-in type PMC programmer is not start yet.

4 Press [◁] key to return to initial menu screen.

10.2.4.2 Input/outputmethod

1 Press [▷] key in the initial menu screen, then display to [I/O] soft key.

2 Display next screen

```
PMC I/O PROGRAM                          MONIT RUN
  CHANNEL      = 1
  DEVICE       = HOST
  FUNCTION     =
  DATA KIND    =

[ EXEC ]  [CANCEL]  [ (NO.) ]  [        ]  [        ]
```

3 Enter the desired channel number, then press the [INPUT] key to set the number for CHANNEL.

1 : JD5A of the main CPU board

2 : JD5B of the main CPU board

4 Specify the I/O unit to be used for DEVICE.

HOST:	I/O operation with FAPT LADDER (on the P-G, P-G Mate, or personal computer)
FDCAS:	I/O operation with a Floppy Cassette Adaptor
F-ROM:	I/O operation with a flash EEPROM
M-CARD:	I/O operation with a memory card
OTHERS:	I/O operation with other I/O units

5 Specify the desired function with FUNCTION.

WRITE:	Outputting data
READ:	Inputting data
COMPARE:	Comparing data in memory with that in an external device
DELETE:	Deleting files on a floppy disk or memory card
LIST:	Listing the files on a floppy disk or memory card
BLANK:	Checking whether the flash EEPROM is empty
ERASE:	Clearing the data in the flash EEPROM
FORMAT:	Formatting a memory card (all data on the memory card is deleted.)

6 Specify the desired type of data to be output at KIND DATA.

LADDER:	Ladder programs
PARAM:	PMC parameters

7 When FDCAS or M-CARD is specified for the device, a file can be specified for FILE NO. by either its file number or file name.

8 Specify the RS-232C conditions for each device with SPEED.

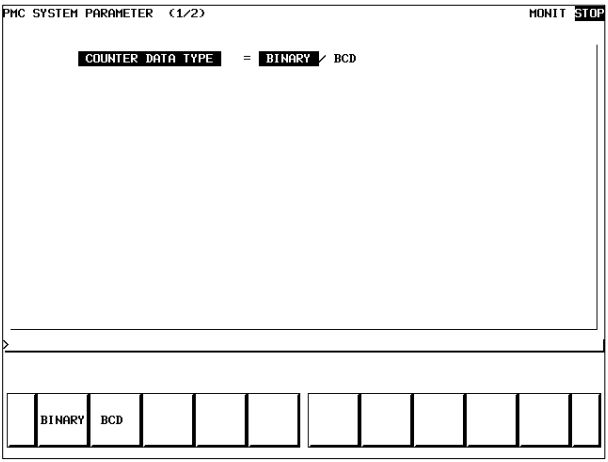
9 Check that the settings are correct. Then, press the [EXEC] soft key.

10.2.4.3 Copy function (COPY)

Changes made during on-line editing are transferred to the corresponding editing ladder program.

10.2.5 System parameters

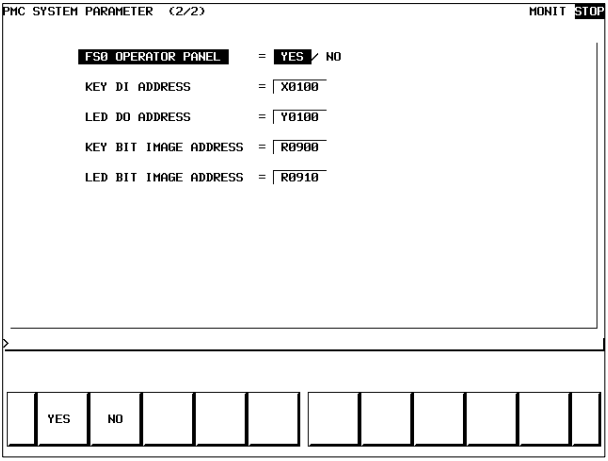
(1) System parameter screen (1/2)



Display information

- COUNTER DATA TYPE :
  Specify the binary format or BCD format for a counter value to be used with the function instruction CTR.

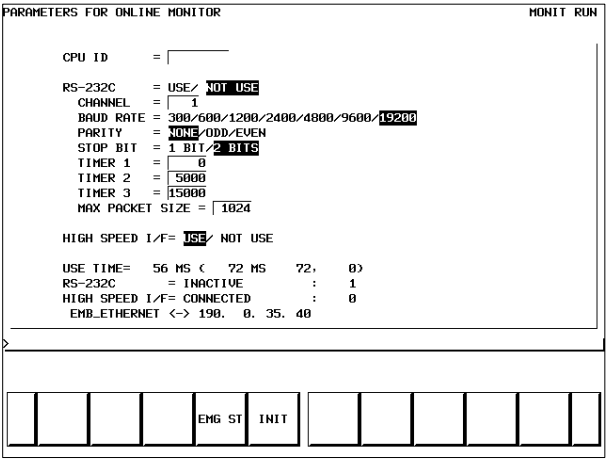
(2) System parameter screen (2/2)



Display information

- FS0 OPERATOR PANEL :
  Set whether to connect an operator's panel for the FS0.
- KEY DI ADDRESS :
  Set the start address of an external DI actually connected.
- LED DO ADDRESS :
  Set the start address of an external DO actually connected.
- KEY BIT IMAGE ADDRESS :
  Set the start address of a key image referenced by a user program. Usually, set an arbitrary internal relay (R) area.
- LED BIT IMAGE ADDRESS :
  Set the start address of an LED image generated by a user program. Usually, set an arbitrary internal relay (R) area.

10.2.6 Online monitor setting screen



(a) Soft key

- [EMG ST] : Terminates communication forcibly. Use this key if communication becomes abnormal and the connection cannot be terminated normally.
- [INIT] : Initializes the parameters to their default values.

(b) Setting

- CPU ID : Displays a CPU ID value. However, do not modify this item.
- RS–232C : Enables communication setting in the case of connection via RS–232C. However, do not modify the items of TIMER 1, TIMER 2, TIMER 3, and MAX PACKET SIZE.
- HIGH SPEED I/F : Enables setting for connection via a high–speed interface (HSSB, Ethernet).

(c) Communication status

- USE TIME : The maximum time in the communication processing is displayed.
- RS–232C : The communication condition of RS–232C is displayed.
- HIGH SPEED I/F : The communication condition of HIGH SPEED I/F is displayed.
- ETHER_BOARD : Displayed during the communication with Ethernet board. The IP address of the communication partner is displayed.
- EMB_ETHERNET : Displayed during the communication with embedded Ethernet. The IP address of the communication partner is displayed.
- HSSB : Displayed during the communication with HSSB.

Display messages and the meanings

Display messages	Meanings
INACTIVE	The communication is inactive.
STOPPING	The communication is being stopped. (Wait for the termination of communication)
STARTING	The communication is being started. (Wait for the termination of communication over another communication path)
STAND–BY	The communication is active and in standby mode.
CONNECTED	The communication is active and being connected.
NO OPTION	The port can be not opened because there is not option of RS–232C.
BAD PARAMETER	Invalid open parameters are specified.
TIMEOUT ERROR	A time–out has occurred and communication is aborted.
TIMEOUT(K) ERROR	A time–out has occurred and communication is aborted.
BCC ERROR	A Block Check Code (packet parity) error has occurred.
PARITY ERROR	A parity error has occurred.
OVER–RUN ERROR	A reception overrun has occurred and the communication can not recover.
SEQUENCE ERROR	Packets are out of sequence. (Incorrect procedure)
DATA ERROR	Incorrect packets have been received through retry process.
QUEUE OVERFLOW	The transmit/receive queue has overflowed.
DISCONNECTED	Communication has been terminated successfully.
NO CONNECTION	The cable is disconnected.

10.3 Functional Instruction

10.3.1 Functional instruction list

(1) Kind of functional instruction and contents of processing

Instruction	SUB number	Contents of processing	Model	
			PMC–SA1	PMC–SB7
END1	1	1st level program end	○	○
END2	2	2nd level program end	○	○
END3	48	3rd level program end	×	○
TMR	3	Variable timer	○	○
TMRB	24	Fixed timer	○	○
TMRC	54	Variable timer	○	○
DEC	4	Decoding	○	○
DECB	25	Binary code decoding	○	○
CTR	5	Counter	○	○
CTRB	56	Fixed counter	×	○
CTRC	55	Counter	○	○
ROT	6	Rotation control	○	○
ROTB	26	Binary rotation control	○	○
COD	7	Code conversion	○	○
CODB	27	Binary code conversion	○	○
MOVE	8	Data transfer after logical product	○	○
MOVOR	28	Data transfer after logical sum	○	○
MOVB	43	One–byte transfer	×	○
MOVW	44	Two–byte transfer	×	○
MOVD	47	Four–byte transfer	×	○
MOVN	45	Specified–byte transfer	×	○
COM	9	Common line control	○	○
COME	29	Common line control end	○	○
JMP	10	Jump	○	○
JMPE	30	Jump end	○	○
JMPB	68	Label jump 1	×	○
JMPC	73	Label jump 2	×	○
LBL	69	Label designation	×	○
PARI	11	Parity check	○	○
DCNV	14	Data conversion	○	○
DCNVB	31	Binary data conversion	○	○
COMP	15	Comparison	○	○
COMPB	32	Comparison for binary data	○	○
COIN	16	Coincidence check	○	○

○ : Provided × : Not provided

Instruction	SUB number	Contents of processing	Model	
			PMC–SA1	PMC–SB7
SFT	33	Shift register	○	○
DSCH	17	Data search	○	○
DSCHB	34	Binary data search	○	○
XMOV	18	Indexed data transfer	○	○
XMOVB	35	Binary index modifier data transfer	○	○
ADD	19	Addition	○	○
ADDB	36	Binary addition	○	○
SUB	20	Subtraction	○	○
SUBB	37	Binary subtraction	○	○
MUL	21	Multiplication	○	○
MULB	38	Binary multiplication	○	○
DIV	22	Division	○	○
DIVB	39	Binary division	○	○
NUME	23	Definition of constant	○	○
NUMEB	40	Definition of binary constant	○	○
DISP	49	Message display	×	× (NOTE 1)
DISPB	41	Extended message display	○	○
EXIN	42	External data input	○	○
SPCNT	46	Spindle control	×	× (NOTE 1)
AXCTL	53	PMC axis control	○	○
WINDR	51	NC window data read	○	○
WINDW	52	NC window data write	○	○
FNC9X	9X	Specified function instruction (X=0 to 7)	×	○ (NOTE 2)
MMC3R	88	MMC3 window data read	×	× (NOTE 1)
MMC3W	89	MMC3 window data write	×	× (NOTE 1)
MMCWR	98	MMC window data read	○	○
MMCWW	99	MMC window data write	○	○
PSGNL	50	Position signal output	×	× (NOTE 1)
PSGN2	63	Position signal output 2	×	× (NOTE 1)
DIFU	57	Rising edge detection	×	○
DIFD	58	Falling edge detection	×	○
EOR	59	Logical exclusive OR	×	○

○ : Provided × : Not provided

Instruction	SUB number	Contents of processing	Model	
			PMC–SA1	PMC–SB7
AND	60	Logical AND	×	○
OR	61	Logical OR	×	○
NOT	62	Logical NOT	×	○
END	64	Program end	×	○
CALL	65	Subprogram conditional call	×	○
CALLU	66	Subprogram unconditional call	×	○
SP	71	Subprogram	×	○
SPE	72	Subprogram end	×	○
NOP	70	No operation (net comment)	○	○

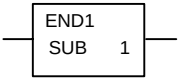
○ : Provided × : Not provided

NOTE1 These instructions can be coded in a ladder program. At execution time, however, these instructions are handled as no operation, and their processing is not executed. These instructions can be used to share ladder source with the PMC of other models. For a function instruction with ACT input, be sure to set ACT = 0.

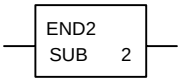
NOTE2 The instruction can be used only when the PMC C language option is selected.

10.3.2 Detail of function command

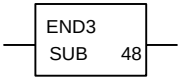
(1) 1st level program end



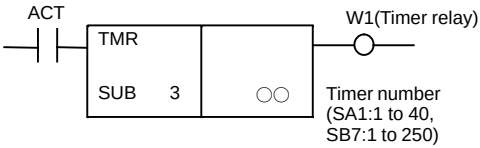
(2) 2nd level program end



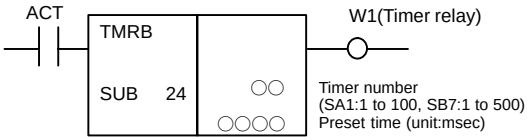
(3) 3rd level program end (PMC–SB7 only)



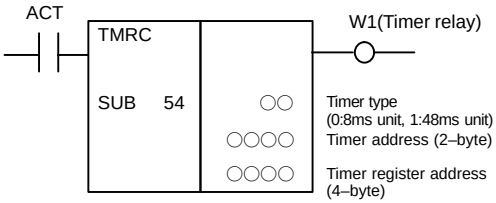
(4) Variable timer



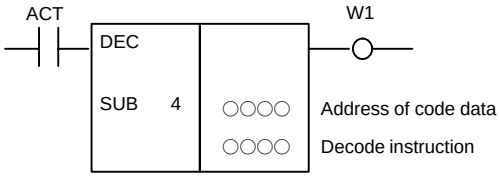
(5) Fixed timer



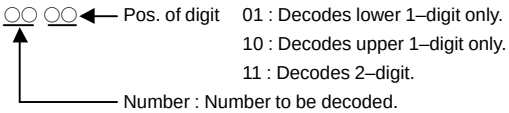
(6) Valiable timer



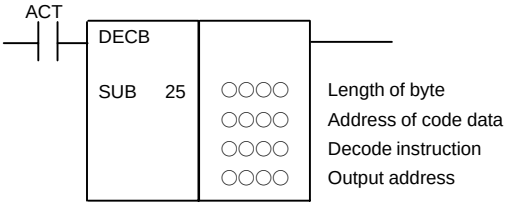
(7) Decoding



[Decode instruction]



(8) Binary code decoding



[Data format]

- Basic specification
  1 :1–byte, 2 : 2–byte, 4 : 4–byte
- Extended specification (PMC–SB7 only)

0 n n x

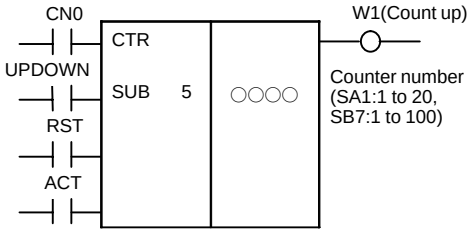
Set the byte length of code data.
1: 1 byte long
2: 2 bytes long
4: 4 bytes long

Setting of continuous decode length

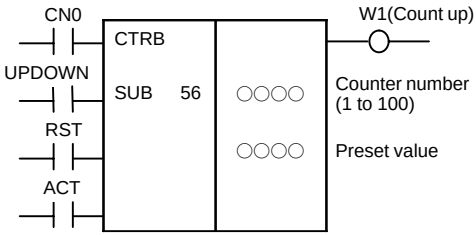
00–01:
Successive eight numeric values are decoded.
A one–byte memory area is required for a decode result output address.

02–99:
Successive 8 × nn numeric values are decoded.
A nn–byte memory area is required for a decode result output address.

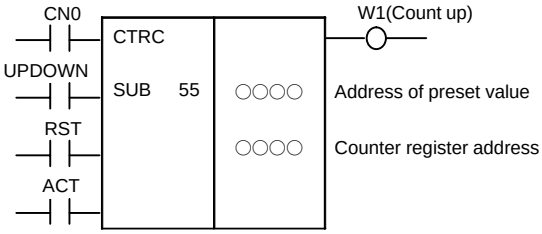
(9) Counter



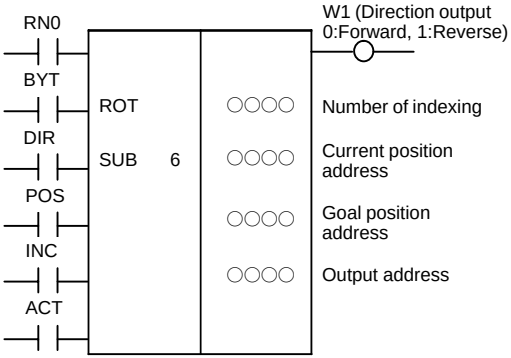
(10) Fixed counter (PMC–SB7 only)



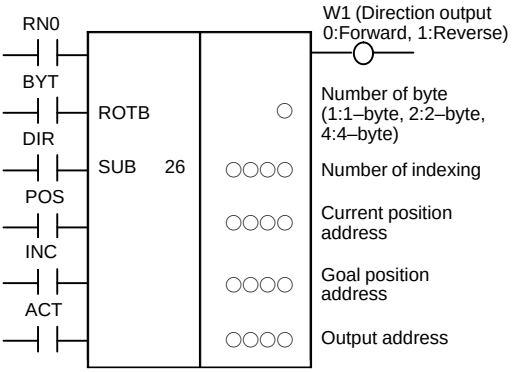
(11) Counter



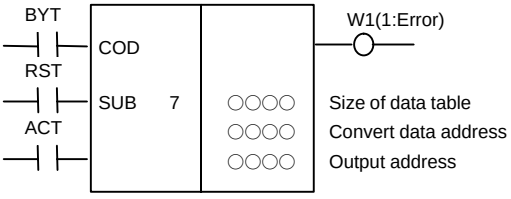
(12) Rotation control



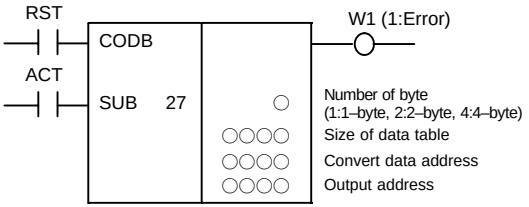
(13) Binary rotation control



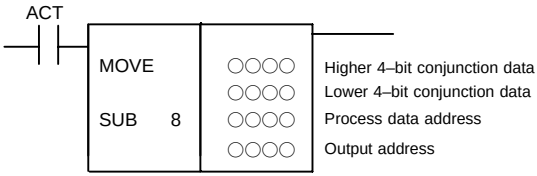
(14) Code conversion



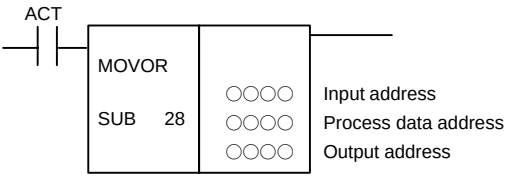
(15) Binary code conversion



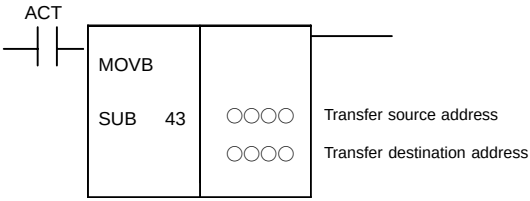
(16) Data transfer after logical product



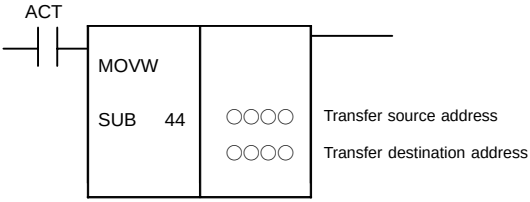
(17) Data Transfer after logical sum



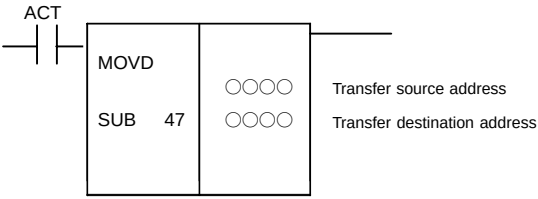
(18) One–byte transfer (PMC–SB7 only)



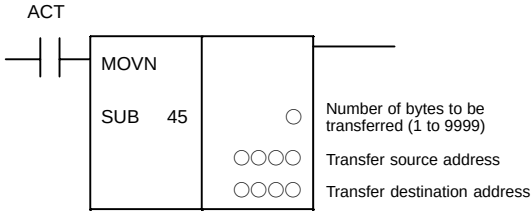
(19) Two–byte transfer (PMC–SB7 only)



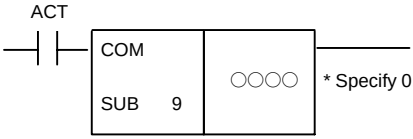
(20) Four–byte transfer (PMC–SB7 only)



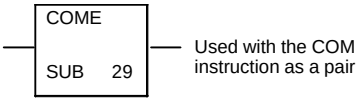
(21) Specified–byte transfer (PMC–SB7 only)



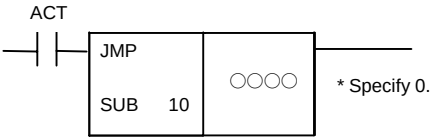
(22) Common line control



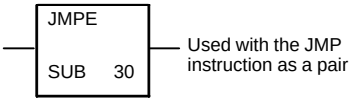
(23) Common line control end



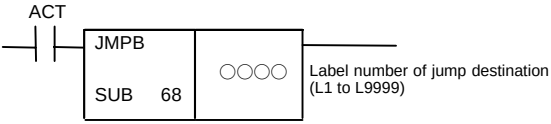
(24) Jump



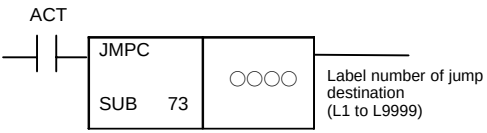
(25) Jump end



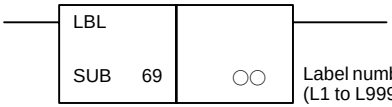
(26) Label jump 1 (PMC–SB7 only)



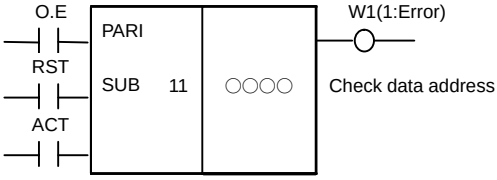
(27) Label jump 2 (PMC–SB7 only)



(28) Label designation (PMC–SB7 only)

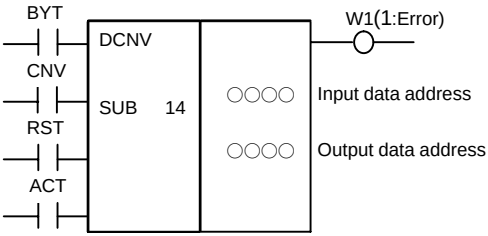


(29) Parity check



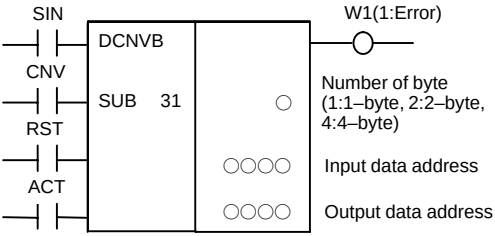
O.E = 0:Even–parity check, 1:Odd–parity check

(30) Data conversion



CNV = 0 : Binary to BCD–code, 1 : BCD to Binary–code

(31) Binary data conversion



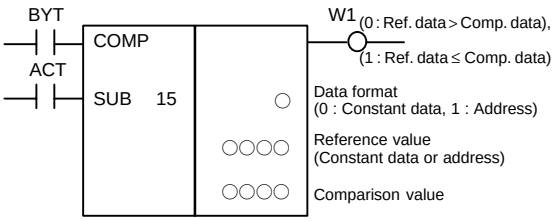
SIN = When converts BCD to binary ; 0 : Positive, 1 : Negative
CNV = 0 : Binary to BCD–code, 1 : BCD to Binary–code

[Operation output register]

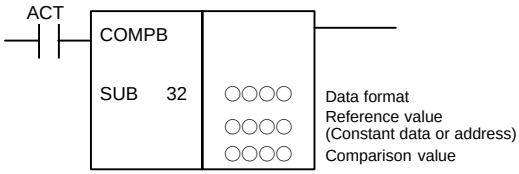
	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

V : Overflow, Z : Zero, N : Negative

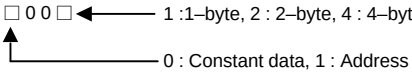
(32) Comparison



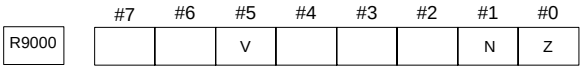
(33) Comparison for binary data



[Data format]

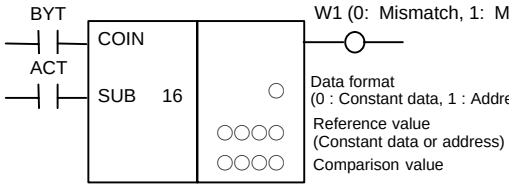


[Operation output register]

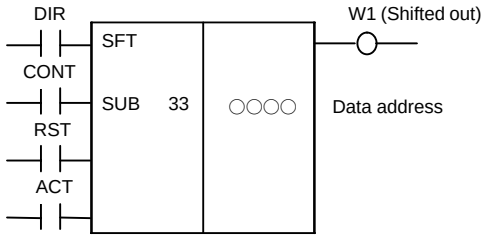


V : Overflow, Z : Ref. data=Comp. data,
N : Ref. data < Comp. data

(34) Coincidence check

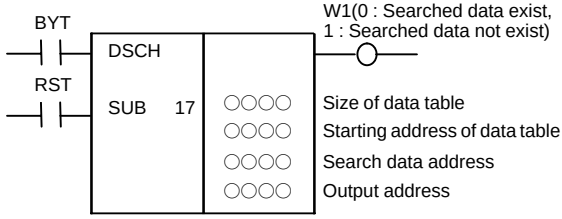


(35) Shift register

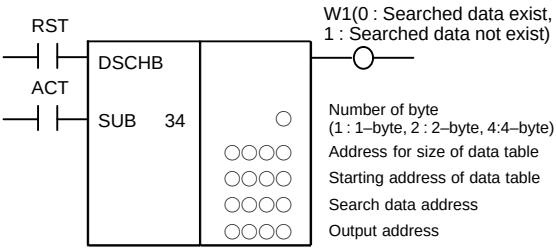


DIR = 0 : Left–shift, 1 : Right–shift
CONT = 0 : Shift in with 0, 1 : Shift in with 0/1 depend last bit

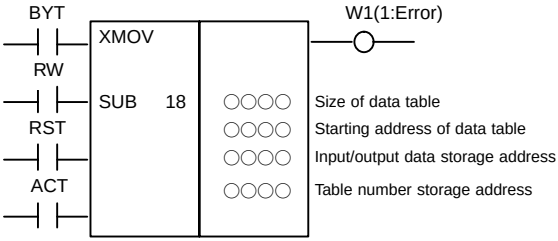
(36) Data search



(37) Binary data search

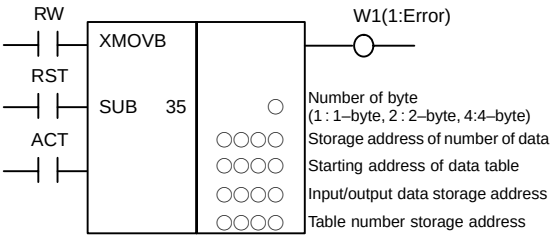


(38) Indexed data transfer



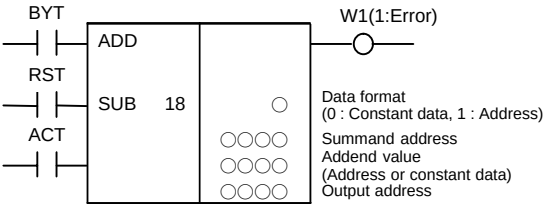
RW = 0 : Read mode, 1 : Write mode

(39) Binary index modifier data transfer

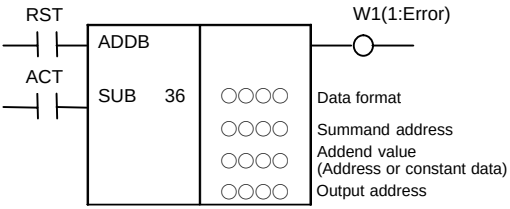


RW = 0 : Read mode, 1 : Write mode

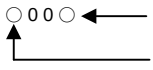
(40) Addition



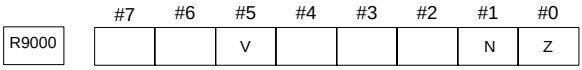
(41) Binary addition



[Data format]

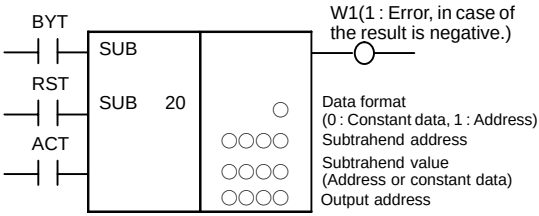


[Operation output register]

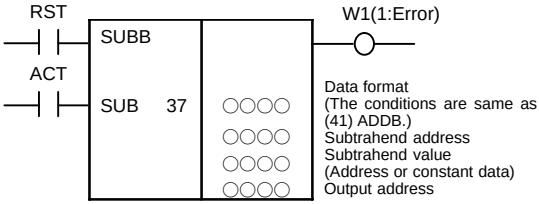


V : Overflow, Z : Zero, N : Negative

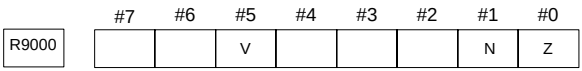
(42) Subtraction



(43) Binary subtraction

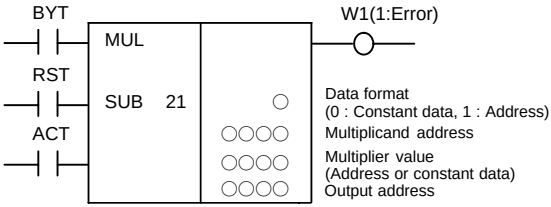


[Operation output register]

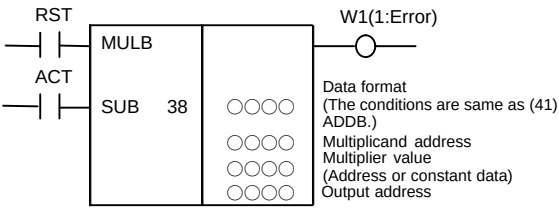


V : Overflow, Z : Zero, N : Negative

(44) Multiplication



(45) Binary multiplication

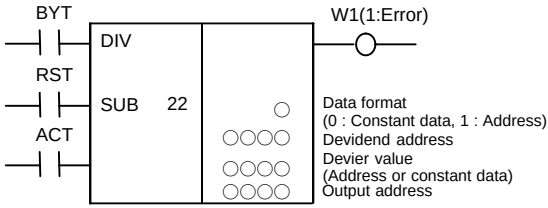


[Operation output register]

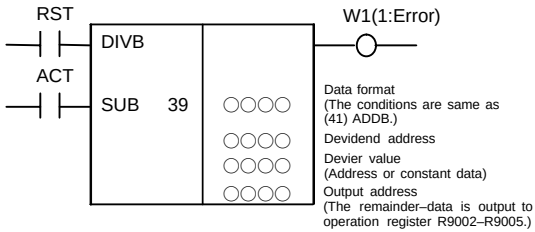
	#7	#6	#5	#4	#3	#2	#1	#0
R9000			V				N	Z

V : Overflow, Z : Zero, N : Negative

(46) Division



(47) Binary division

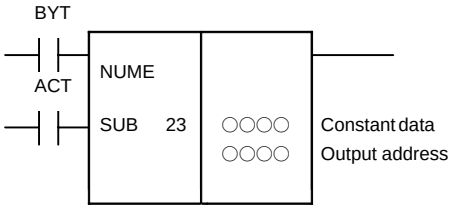


[Operation output register]

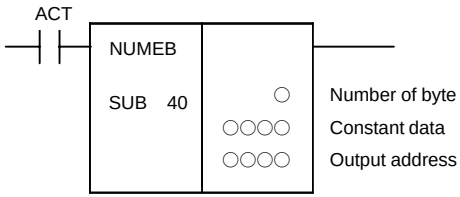
	#7	#6	#5	#4	#3	#2	#1	#0
R9000							N	Z

Z : Zero, N : Negative

(48) Definition of constant



(49) Definition of binary constant



[Data format]

- Basic specification
  1 :1–byte, 2 : 2–byte, 4 : 4–byte
- Extended specification (PMC–SB7 only)

0 n n x

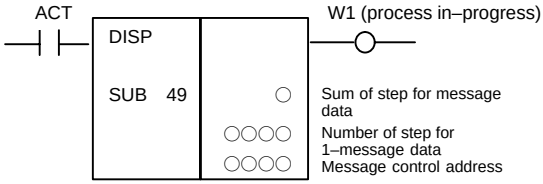
Set the byte length of a constant value.
1: 1 byte long
2: 2 bytes long
4: 4 bytes long

Set the number of elements of an array to be defined as a constant.

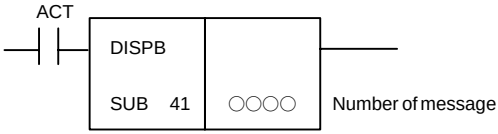
00–01:
Make a constant definition for one memory.

02–99:
Make a constant definition for an array that has nn elements.

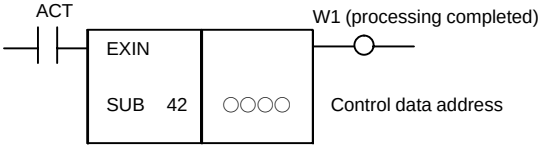
(50) Message display (unusable)



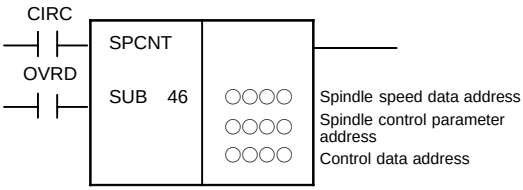
(51) Extended message display



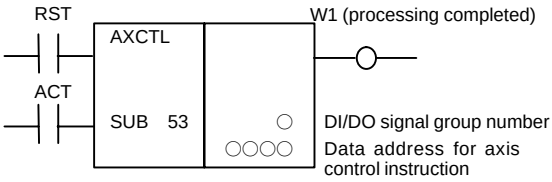
(52) External data input



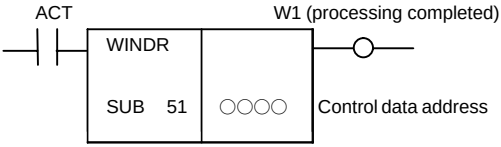
(53) Spindle control (unusable)



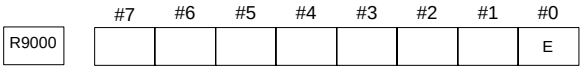
(54) PMC axis control



(55) NC window data read

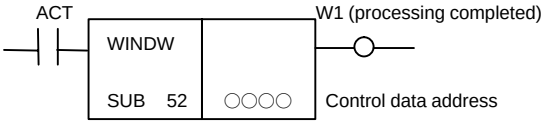


[Operation output register]

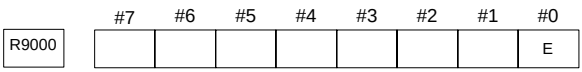


E : WINDR error

(56) NC window data write

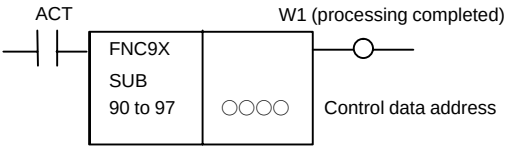


[Operation output register]

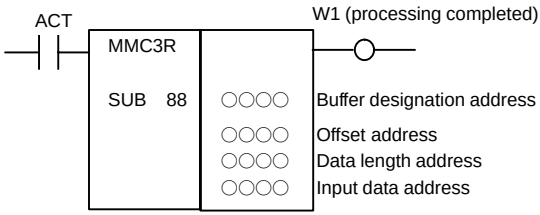


E : WINDR error

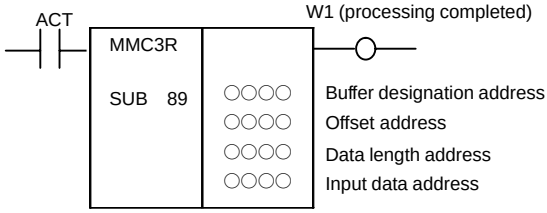
(57) Specified function instruction (PMC–SB7 only)



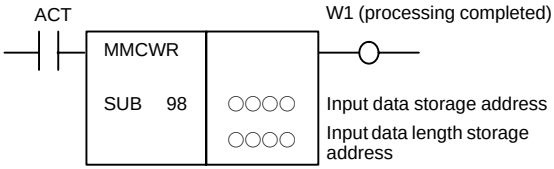
(58) MMC3 window data read (unusable)



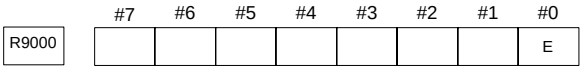
(59) MMC3 window data write (unusable)



(60) MMC window data read

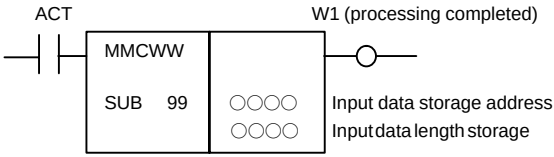


[Operation output register]

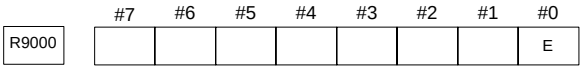


E : MMCWR error

(61) MMC window data write

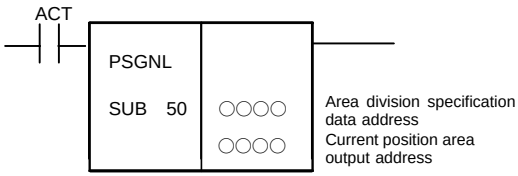


[Operation output register]

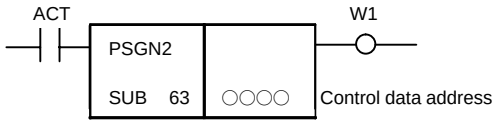


E : MMCWW error

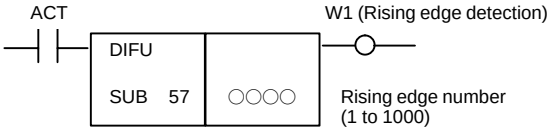
(62) Position signal output (unusable)



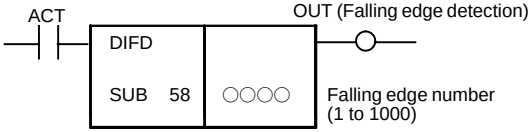
(63) Position signal output 2 (unusable)



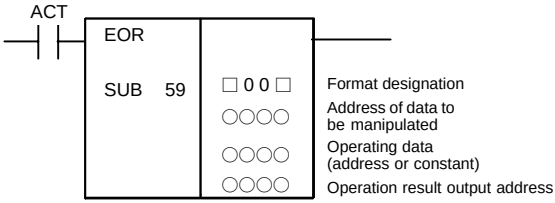
(64) Rising edge detection (PMC–SB7 only)



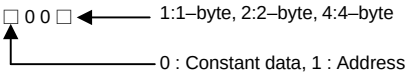
(65) Falling edge detection (PMC–SB7 only)



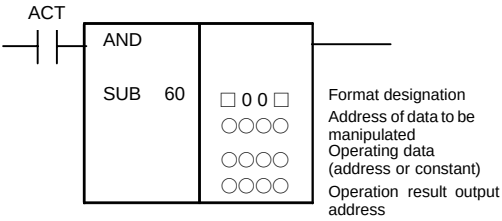
(66) Logical exclusive OR (PMC–SB7 only)



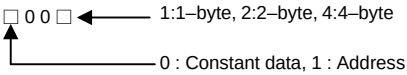
[Format designation]



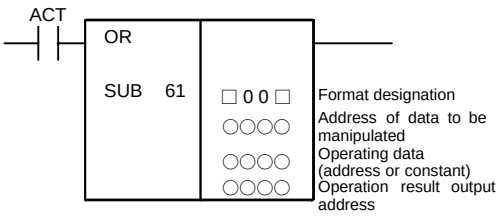
(67) Logical AND (PMC–SB7 only)



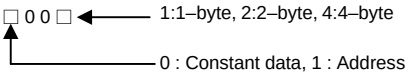
[Format designation]



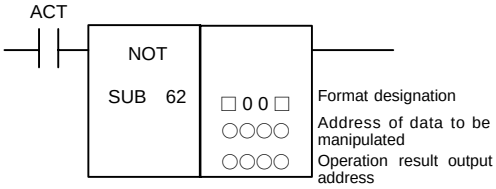
(68) Logical OR (PMC–SB7 only)



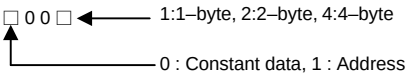
[Format designation]



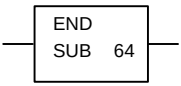
(69) Logical NOT (PMC–SB7 only)



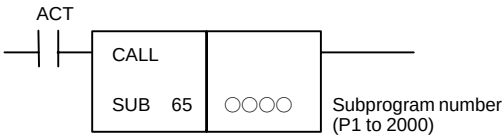
[Format designation]



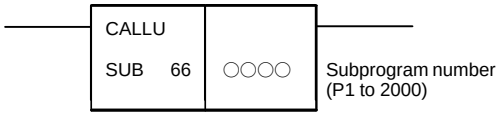
(70) Program end (PMC–SB7 only)



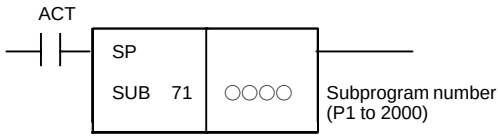
(71) Subprogram conditional call (PMC–SB7 only)



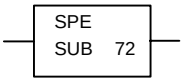
(72) Subprogram unconditional call (PMC–SB7 only)



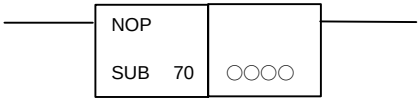
(73) Subprogram (PMC–SB7 only)



(74) Subprogram end (PMC–SB7 only)



(75) No operation



10.4 I/O Module Assignment Name List

(a) Input modules

Input format	Module name (Actual module name)
Non–insulation type DC input	ID32A (AID32A)
	ID32B (AID32B)
Non–insulation type DC input	ID16C (AID16C)
	ID16D (AID16D)
	ID32E (AID32E)
	ID32F (AID32F)
Non–insulation type DC input	IA16G (AIA16G)

(b) Output modules

Input format	Module name (Actual module name)
Insulation type DC input	OD08C (AOD08C)
	OD08D (AOD08D)
	OD16C (AOD16C)
	OD16D (AOD16D)
	OD32C (AOD32C)
	OD32D (AOD32D)
AC output	OA05E (AOA05E)
	OA08E (AOA08E)
	OA12E (AOA12E)
Relay output	OA08G (AOA08G)
	OA16G (AOA16G)

(c) Other modules

Name	Module name	Occupied address
FANUC CNC SYSTEM FANUC Power Mate	FS04A	Input 4 bytes Output 4 bytes
	FS08A	Input 8 bytes Output 8 bytes
	OC02I	Input 16 bytes
	OC02O	Output 16 bytes
	OC03I	Input 32 bytes
	OC03O	Output 32 bytes
Analog input module	AD04A (AAD04A)	Input 8 bytes
Analog output module	DA02A (ADA02A)	Output 4 bytes
Connection unit (1 unit)	CN01I	Input 12 bytes
Connection unit (1 unit)	CN01O	Output 8 bytes
Connection unit (2 units)	CN02I	Input 24 bytes
Connection unit (2 units)	CN02O	Output 16 bytes
Operator's panel connection unit I/O card E	OC01I	Input 12 bytes
	OC01O	Output 8 bytes
Operator's panel connection unit I/O card D	/8	Input 8 bytes
	/4	Output 4 bytes
Machine operator's panel interface unit	OC02I	Input 16 bytes
	OC02O	Output 16 bytes
	OC03I	Input 32 bytes
	OC03O	Output 32 bytes
I/O Link connection unit	/□	Input □ bytes Output □ bytes
	OC02I	Input 16 bytes
	OC02O	Output 16 bytes
	OC03I	Input 32 bytes
	OC03O	Output 32 bytes
For I/O Unit MODEL B	#□	Input □ bytes Output □ bytes
	##	Input 4 bytes
Special module	/□	input □ bytes output □ bytes
	OC02I	Input 16 bytes
	OC02O	Output 16 bytes
	OC03I	Input 32 bytes
	OC03O	Output 32 bytes

Name	Module name	Occupied address
Module for distributed I/O and distribution panel I/O	CM03I(/3)	Input 3 bytes
	CM06I(/6)	Input 6 bytes
	CM09I	Input 9 bytes
	CM12I(OC01I)	Input 12 bytes
	CM13I	Input 13 bytes
	CM14I	Input 14 bytes
	CM15I	Input 15 bytes
	CM16I(OC02I)	Input 16 bytes
	CM02O(/2)	Output 2 bytes
	CM04O(/4)	Output 4 bytes
	CM06O(/6)	Output 6 bytes
	CM08O(/8)	Output 8 bytes
Module for distributed I/O and distribution panel I/O	CM06I(/6)	Input 6 bytes
	CM13I	Input 13 bytes
	CM14I	Input 14 bytes
	CM15I	Input 15 bytes
	CM16I(OC02I)	Input 16 bytes
	CM04O(/4)	Output 4 bytes
	CM08O(/8)	Output 8 bytes
External I/O card A,D for Power Mate	/6	Input 6 bytes
	/4	Output 4 bytes
External I/O card B,E for Power Mate	OC01I	Input 12 bytes
	OC01O	Output 8 bytes

11.1 Overview

- 11.2 Ethernet Mounting Locations

  The mounting locations of the embedded Ethernet and Ethernet optional board are described.

- 11.3 List of Ethernet–related Screens

  A list of screen operation procedures for the embedded Ethernet and Ethernet optional board is provided.

- 11.4 Embedded Ethernet

  The parameter setting, operation, and maintenance screens of the embedded Ethernet are described. (The description is based on the common embedded port and PCMCIA card.)

- 11.5 Ethernet Optional Board

  The parameter setting, operation, and maintenance screens of the fast Ethernet board/fast data server/Ethernet board/data server are described.
  (Specific descriptions are provided based on the fast Ethernet board/fast data server.)

- 11.6 Troubleshooting

  The check Items required when Ethernet trouble occurs are described.

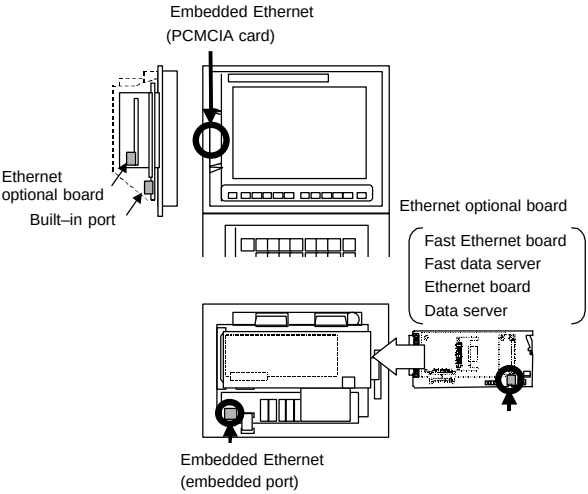
- 11.7 Example of Setting

  Examples of Ethernet parameter settings are provided.

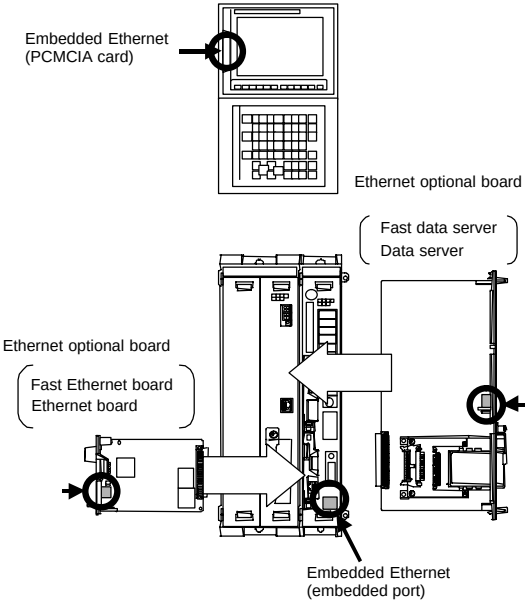
11.2 Ethernet Mounting Locations

When the embedded Ethernet is used, you switch between the embedded port and PCMCIA card on the setting screen.
As the Ethernet optional board, one of the fast Ethernet board, fast data server, Ethernet board, and data server can be used.
The embedded Ethernet and Ethernet optional board can be used at the same time.

(1) For LCD–mounted type CNC



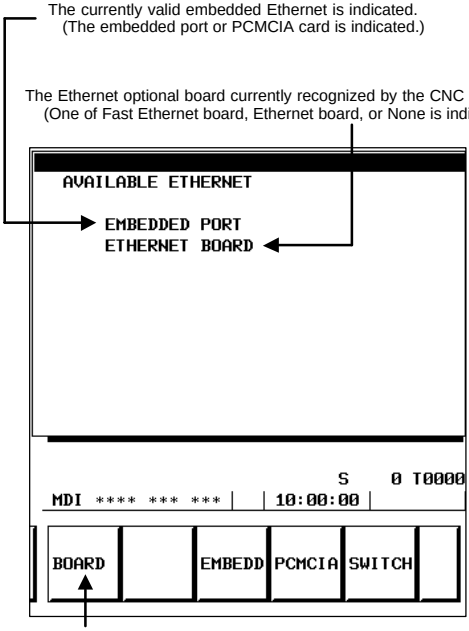
(2) For stand–alone type CNC



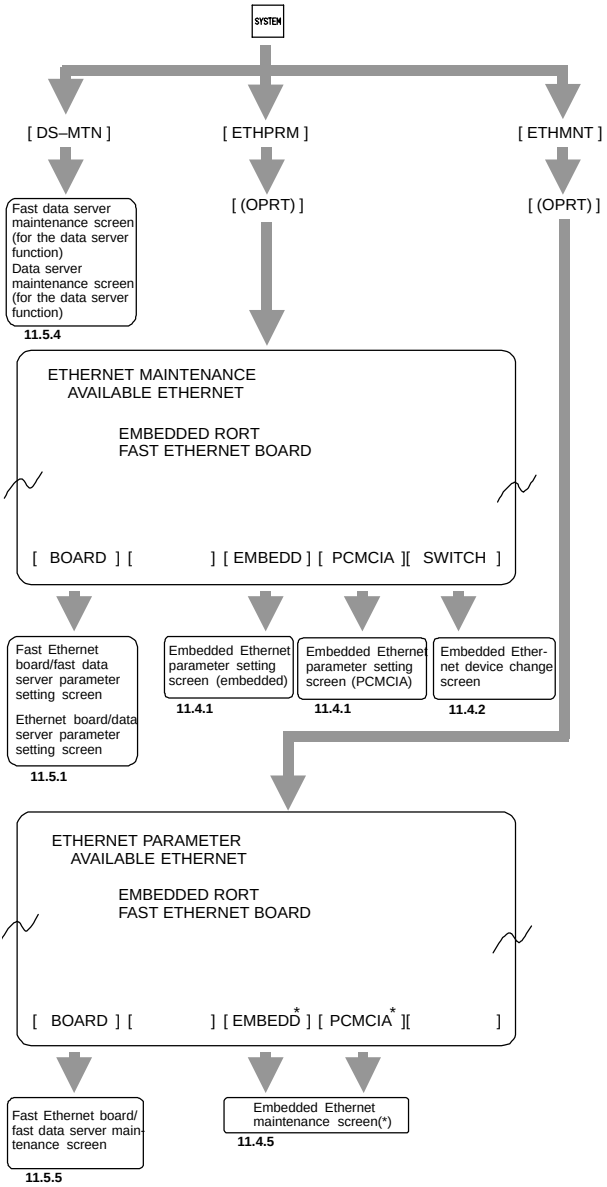
11.3 List of Ethernet–related Screens

11.3.1 Checking of valid Ethernet

Display the Ethernet parameter setting screen by pressing the SYSTEM key → [ETHPRM] key → [(OPRT)] key.

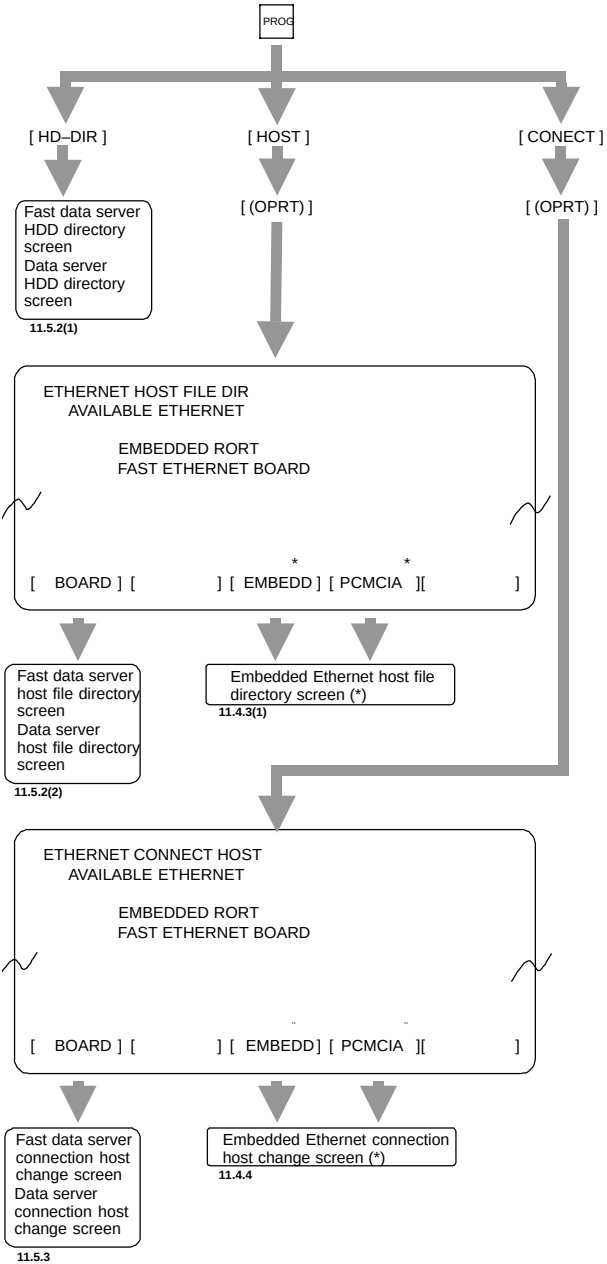


11.3.2 Setting and maintenance (SYSTEM key)



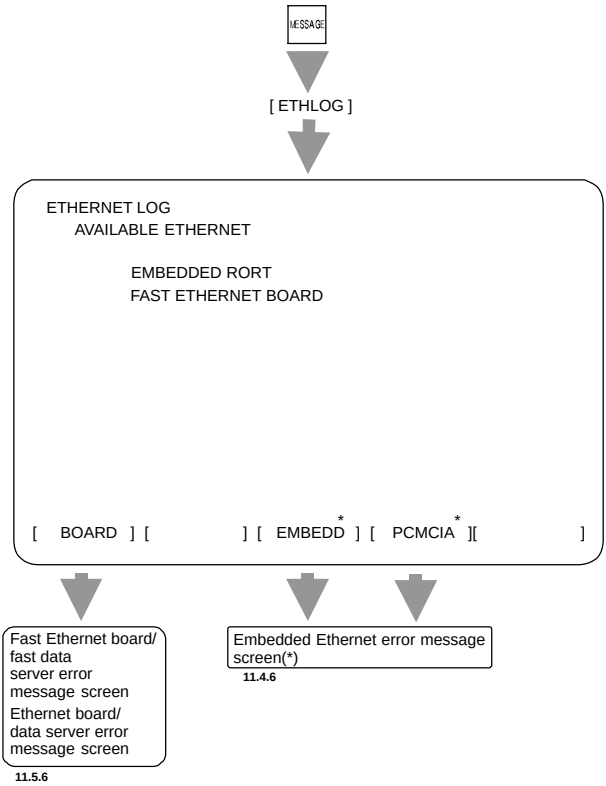
* The currently valid embedded port or PCMCIA card only is displayed.

11.3.3 File operation (PROG key)



* The currently valid embedded port or PCMCIA card only is displayed.

11.3.4 Error message (MESSAGE key)



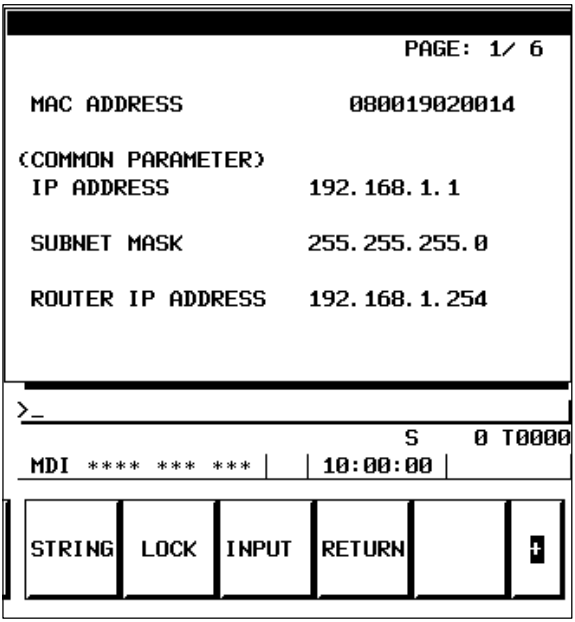
* The currently valid embedded port or PCMCIA card only is displayed.

11.4 Embedded Ethernet

11.4.1 Parameter setting screen

The embedded Ethernet parameters can be set separately for the embedded port and for the PCMCIA card.
You can switch between the parameter setting screens by using the page key.

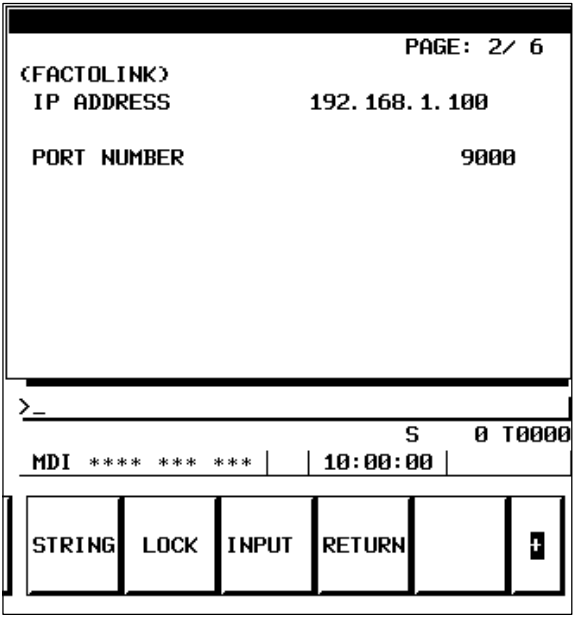
(1) Common parameter



Item	Description
MAC ADDRESS (Display only)	Embedded Ethernet MAC address
IP ADDRESS	Specify the IP address of the embedded Ethernet. (Example of specification format: “192.168.1.1”)
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format: “255.255.255.0”)
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this Item when the network contains a router. (Example of specification format: “192.168.1.254”)

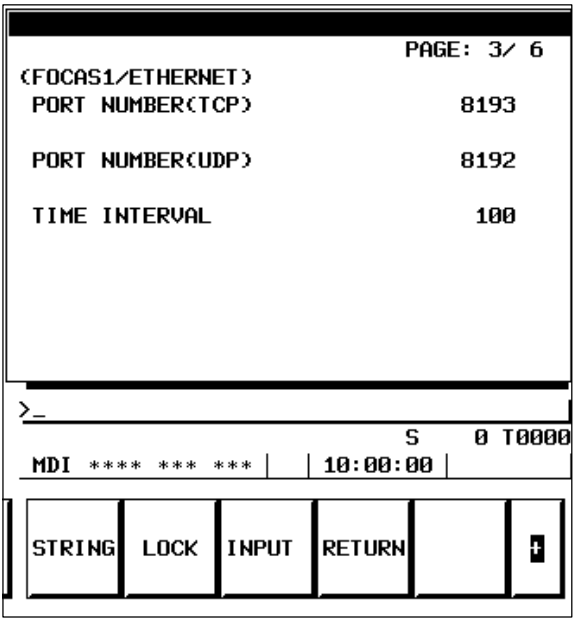
NOTE The parameter for an IP address or file name specified by entering characters can be cleared by entering spaces.

(2) FACTOLINK parameter



Item	Description
IP ADDRESS	Specify the IP address of a personal computer to be accessed by the FACTOLINK function. (Example of specification format: “192.168.1.100”)
PORT NUMBER	Specify a port number to be used with the FACTOLINK function. The valid input range is 5001 to 65535.

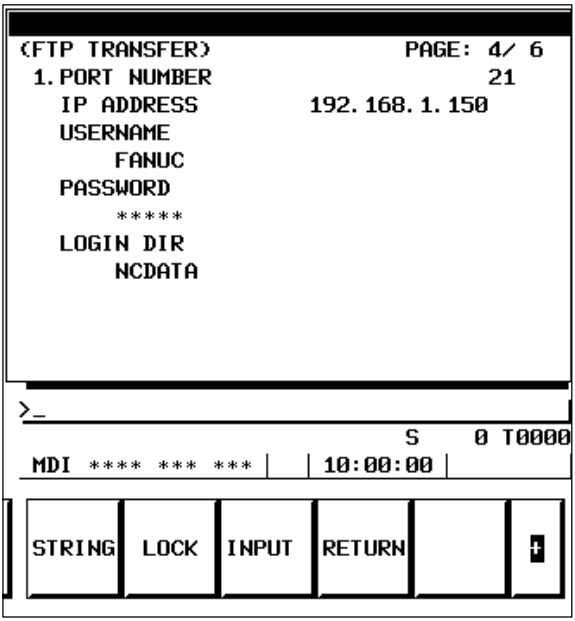
(3) FOCAS1/Ethernet parameter



Item	Description
PORT NUMBER (TCP)	Specify a port number to be used with the FOCAS1/Ethernet function. The valid input range is 5001 to 65535.
PORT NUMBER (UDP)	Specify this Item when using the DNC1/Ethernet function. Specify a UDP port number for transmitting UDP broadcast data. The valid input range is 5001 to 65535. Set 0 when using the FOCAS1/Ethernet function or when transmitting no UDP broadcast data.
TIME INTERVAL	Specify this Item when using the DNC1/Ethernet function. Specify a time interval at which UDP broadcast data specified above with a UDP port number is transmitted. The unit is 10 ms. The valid input range is 10 to 65535. This means that a value less than 100 ms cannot be specified. Set 0 when using the FOCAS1/Ethernet function or when transmitting no UDP broadcast data. Example) 100: Broadcast data is transmitted at intervals of one second [1000 ms] (= 100 × 10).

NOTE The DNC1/Ethernet function uses broadcast data, so that the personal computer and CNC must be placed in one Ethernet segment. Communications beyond the router cannot be performed.

(4) FTP file transfer parameter



Settings for three host computers can be made. The connection host change screen is used to select hosts to be actually connected.

Item	Description
PORT NUMBER	Specify a port number to be used with the FTP file transfer function. An FTP session is used, so that “21” is to be specified usually.
IP ADDRESS	Specify the IP address of the host computer. (Example of specification format: “192.168.1.150”)
USERNAME	Specify a user name to be used for logging in to the host computer with FTP. (Up to 31 characters can be specified.)
PASSWORD	Specify a password for the user name specified above. Be sure to set a password. (Up to 31 characters can be specified.)
LOGIN DIR	Specify a work directory to be used when logging in to the host computer. (Up to 127 characters can be specified.)

(5) Ethernet–related NC parameters

Among the Ethernet parameters, the parameters for detailed setting are set using NC parameters.
Among the Ethernet parameters, the parameters for normal setting are set using the dedicated setting screens of (1) through (4).

(a) FACTOLINK

0802	Communication channel

[Data type] Byte
[Valid data range] 21: Select the embedded Ethernet.

	#7	#6	#5	#4	#3	#2	#1	#0
0810			MONO	TIME				BGS

[Data type] Bit

BGD When the FACTOLINK screen is not displayed:
0 : Logging is performed in the background.
1 : Logging is not performed.

TIME Selects the time display format:
0 : “01/11/12 00:00” format is used.
1 : “Wed Nov 12 00:00:00” format is used.

MONO When the FACTOLINK screen is displayed:
0 : Two–tone monochrome display is used.
1 : Color display is used.

0811	Type of logging

[Data type] Byte
[Valid data range] 0, 1, 10, 20, 21
0 : D address area
1 : R address area
10: Fixed data only
20: D address area + fixed data
21: R address area + fixed data

0812	PMC address for logging data

[Data type] Word
[Valid data range] 0 to 65535
Set a start PMC address for storing logging data.

0813	Data length of logging data

[Data type] Word
[Unit of data] Number of bytes
[Valid data range] 0 to 65535
Set the data length of logging data.

0814	Trigger PMC address for logging

[Data type] Word
[Valid data range] 0 to 65535
Set a PMC address that serves as a trigger for specifying logging data.

0815	Logging data transmission interval

[Data type] 2–word

[Unit of data] Seconds

[Valid data range] 0 to 4294967295

Set a time interval used for transmitting logging data (fixed data only).
If 0 is set, logging data is transmitted at connection time only.

0820	Machine name posted to the host computer (1st byte)
0821	Machine name posted to the host computer (2nd byte)
0822	Machine name posted to the host computer (3rd byte)
0823	Machine name posted to the host computer (4th byte)
0824	Machine name posted to the host computer (5th byte)
0825	Machine name posted to the host computer (6th byte)
0826	Machine name posted to the host computer (7th byte)
0827	Machine name posted to the host computer (8th byte)
0828	Machine name posted to the host computer (9th byte)

[Data type] Byte

[Valid data range] 32 to 126

Set a machine name that is unique to each CNC and is required for the host computer to identify each CNC. Use ASCII codes in decimal for alphanumeric characters and blanks to set a machine name.

	#7	#6	#5	#4	#3	#2	#1	#0
3111	NPA							

[Data type] Bit

NPA When an alarm is issued while the FACTOLINK screen is displayed:

1 : The screen display does not switch to the alarm screen.

0 : The screen display switches to the alarm screen.

(b) FTP file transfer

0020	I/O CHANNEL: Input/output device selection

[Data type] Byte

[Valid data range] 0 to 35

9 : Select the embedded Ethernet as the input/output device.

14890	Selects the host computer 1 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows95/98/Me/NT/2000.

14891	Selects the host computer 2 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows95/98/Me/NT/2000.

14892	Selects the host computer 3 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows95/98/Me/NT/2000.

0931	Special character (No. 1)
0932	Special character (No. 2)
0933	Special character (No. 3)
0934	Special character (No. 4)
0935	Special character (No. 5)

[Data type] Byte

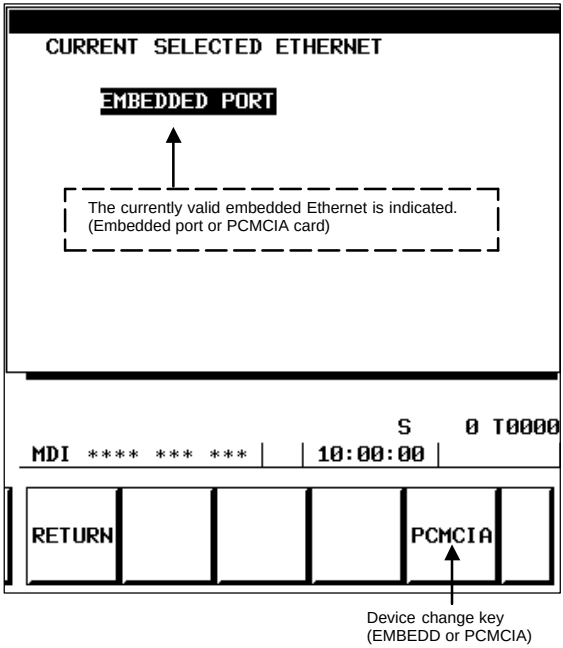
[Valid data range] 32 to 126

PRM931–935 enable soft keys to substitute for characters unavailable with the MDI keys.
When a number other than 0 is set in each of these parameters, [CHAR–1] to [CHAR–5] are displayed in the input soft keys for special characters.

Example) When 33 is set in PRM931, pressing the [CHAR–1] soft key enters "!".

11.4.2 Device change screen

The currently valid embedded Ethernet device is indicated.



Example: When you press the [PCMCIA] soft key, the confirmation message appears. Pressing the [EXEC] soft key switches the valid embedded Ethernet to the PCMCIA card.
(When the currently valid embedded Ethernet is the PCMCIA card, the device change key displays [EMBEDD].)

11.4.3 FTP transfer operation screen

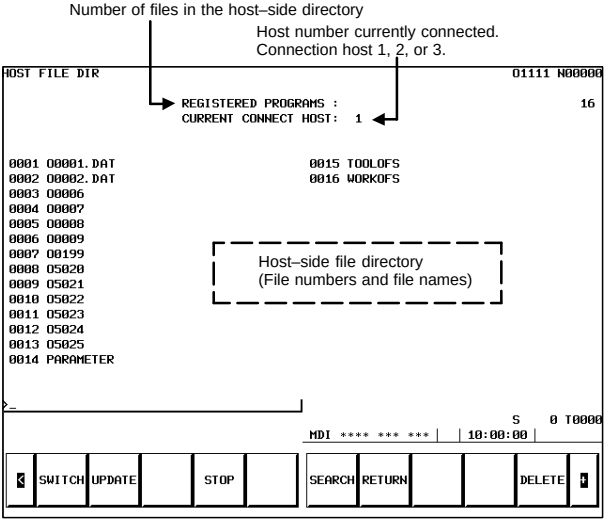
(1) Host file directory screen

Number of registered program files

The number of files registered in the directory (folder) of the host computer currently connected is displayed.

Currently connected host

The number of the host currently connected is displayed.



[SWITCH]

This operation switches between normal display and detail display.

[UPDATE]

This operation updates information displayed.

[STOP]

This operation stops [SEARCH] operation.

[SEARCH]

This operation updates screen information so that a file specified by its file number is placed at the start of the list.

[DELETE]

This operation deletes a file held on the host computer.

[READ]

This operation reads a file held on the host computer to the CNC part program storage. This soft key is displayed only when 9 is set as the input/output device number of the CNC, and the CNC is placed in the EDIT mode.

[PUNCH]

This operation outputs a file held in the CNC part program storage to the host computer. This soft key is displayed only when 9 is set as the input/output device number of the CNC, and the CNC is placed in the EDIT mode.

With the FTP file transfer function, the data Items indicated below can be input/output.

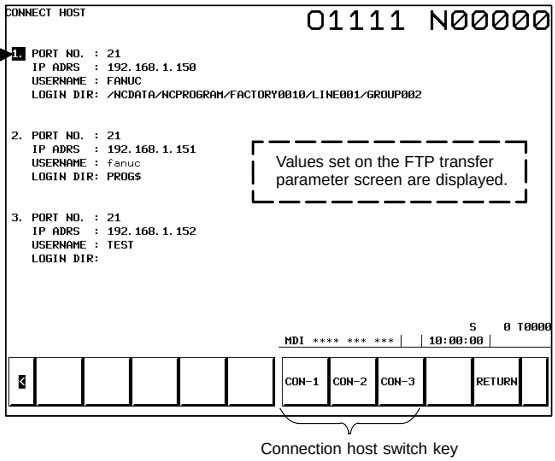
- NC parameter
- Tool offset value
- Workpiece zero point offset value
- Pitch error compensation data
- M code group
- Operation history data

On each screen, a [READ] or [PUNCH] operation is performed.

NOTE With the embedded Ethernet, DNC operation is disabled.

11.4.4 Connection host change screen

The Item displayed in reverse video indicates the connection host currently selected for the host list screen.

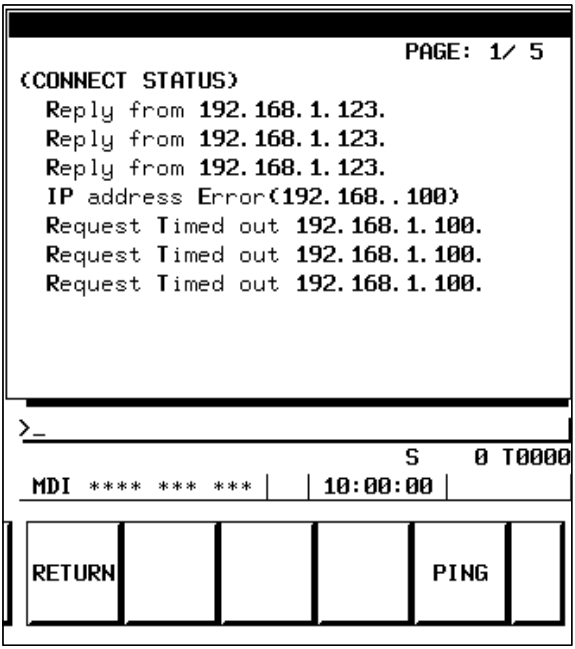


11.4.5 Maintenance screen

The operation of the embedded Ethernet can be checked. The page key is used for screen switching.

(1) Ping command transmission

By sending the ping command, the state of the communication cable and whether the communication destination exists can be checked.
Enter the IP address of the communication destination with the MDI keys, then press the [PING] soft key. Communications are performed three times with the specified communication destination, and the results are displayed.



Reply from IP–address

This message indicates that a response was received from the specified communication destination and that the specified communication destination exists on the network.

Request Timed out IP–address

This message indicates that no response was received from the specified communication destination and that the specified communication destination does not exist on the network.
Check if the power to the communication destination equipment is turned on. Check also the parameter settings and network installation for errors.

IP address Error (IP–address)

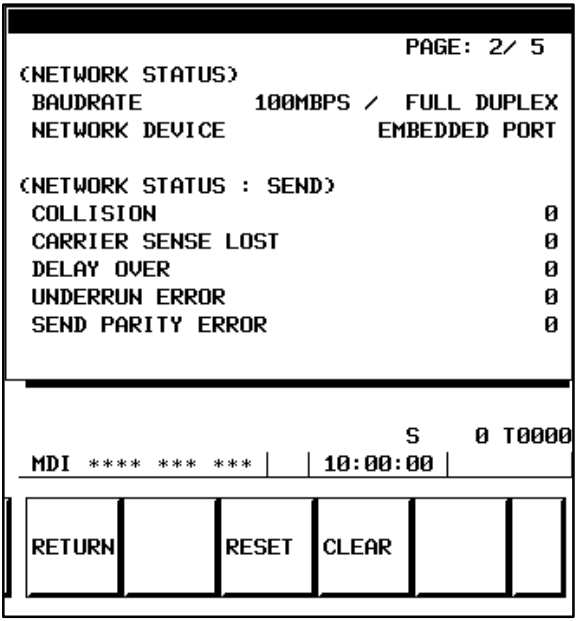
The specified IP address is incorrect. Check the entered IP address.

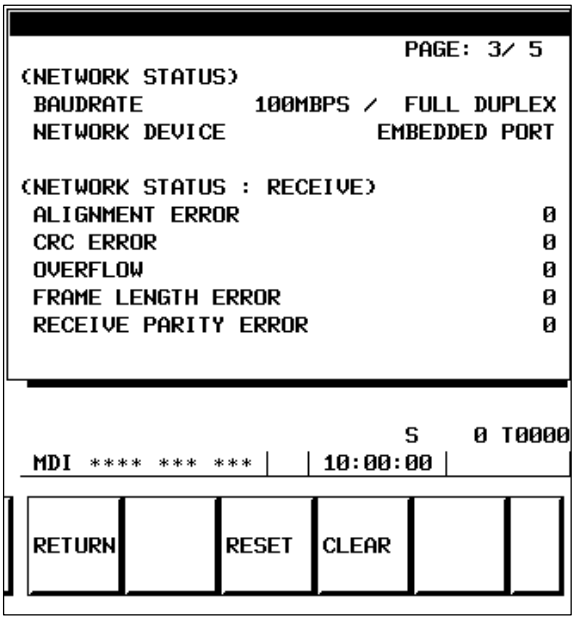
Ping Service Error[224]

The Ethernet cannot be initialized. Check if the parameter settings are correct, and also check if the Ethernet cable is connected correctly.

(2) Error detection count of the Ethernet controller

The error count detected by the Ethernet controller is displayed. When a high load is imposed on the LAN, the count of detected collisions increases. Usually, other errors do not occur.





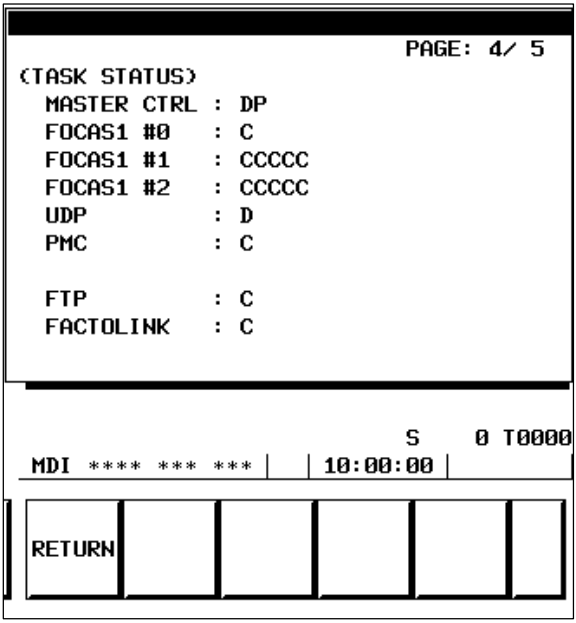
[CLEAR]

The error counter is cleared to 0.

[RESET]

The communication device can be initialized, then communications can be started from the initial state. Use this key when the communications based on the embedded Ethernet function are to be reset or when parameters have been modified.

(3) Operation states of the tasks internal to the embedded Ethernet function

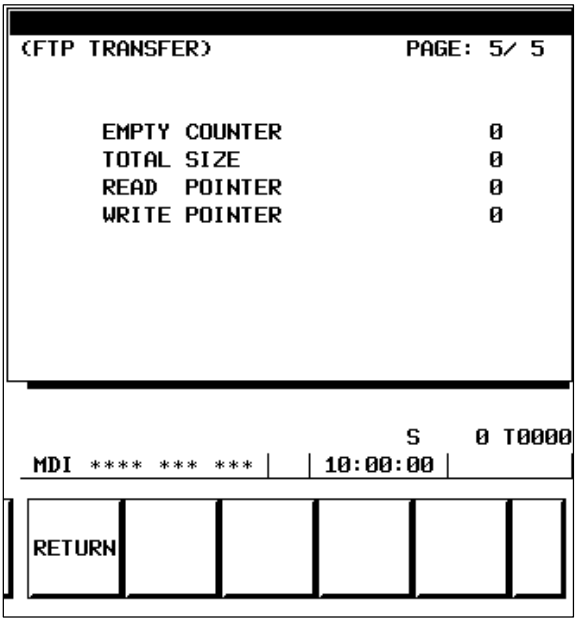


	Symbol	Meaning
MASTER CTRL	E	Ethernet controller being initialized
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
	P	Waiting for parameter setting
	S	Parameters being set
FOCAS1 #0	X	Waiting for completion of Ethernet controller initialization
	E	Being activated
	C	Waiting for connection from the personal computer
	P	Connection being processed
	N	FOCAS1/Ethernet execution disabled
FOCAS1 #1,#2	X	Waiting for completion of Ethernet controller initialization
	E	Waiting for connection from the personal computer
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)

	Symbol	Meaning
UDP	X	Not executed yet. Waiting for completion of Ethernet controller initialization.
	E	Being activated
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
PMC	X	Waiting for completion of Ethernet controller initialization
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
FTP	X	Waiting for completion of Ethernet controller initialization
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
FACTOLINK	X	Waiting for completion of Ethernet controller initialization
	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)

NOTE A state change occurs between the states “Data being processed” and “Waiting for data processing” even when communication is not performed actually.

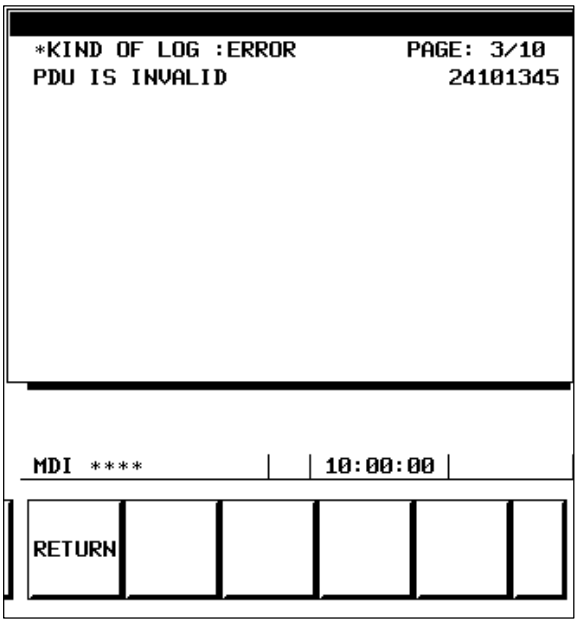
(4) State of the FTP file transfer function



Item	Description
EMPTY COUNTER	Indicates a buffer empty count during NC program transfer from the FTP file transfer function to the CNC. This counter is initialized to 0 at power–on, then is incremented each time a certain condition is satisfied.
TOTAL SIZE	Indicates the total number of bytes transferred when one NC program is transferred using the FTP file transfer function.
READ POINTER WRITE POINTER	Indicates internal buffer management information when the FTP file transfer function is used.

11.4.6 Error message screen

You can switch between the error message screens with the page key.



(1) Errors on the EMB_ETH MASTER CTRL LOG screen

This log screen is used to display an error message at the time of parameter setting and initialization of the embedded Ethernet function.

OWN IP ADDRESS IS NOTHING

The IP address of the local node is not set. Set an IP address correctly.

OWN IP ADDRESS(???) IS INVALID

The setting (???) of the IP address of the local node is incorrect. Correct the IP address.

SUBNET MASK IS NOTHING

The subnet mask of the local node is not set. Set a correct subnet mask.

SUBNET MASK(???) IS INVALID

The setting (???) of the subnet mask of the local node is incorrect. Correct the subnet mask.

ROUTER IP ADDRESS(???) IS INVALID

The setting (???) of the IP address of the router is incorrect. Correct the IP address of the router.

TCP PORT NUMBER(???) IS INVALID

The setting (???) of the TCP port number is incorrect. Correct the TCP port number.

UDP PORT NUMBER(???) IS INVALID

The setting (???) of the UDP port number is incorrect. Correct the UDP port number.

UDP INTERVAL TIME(???) IS INVALID

The setting (???) of the time interval for UDP transmission is incorrect. Correct the time interval.

Embedded LANC SelfTest Error [???]

An error was detected when the LAN controller of the embedded Ethernet was initialized.
The error code is [???]. Hardware replacement is needed.

(2) EMB_ETH FOCAS1/ETHER LOG screen

This log screen is used to display an error message of the FOCAS1/Ethernet function (DNC1/Ethernet function).

TCP PORT NUMBER(???) IS INVALID

The setting (???) of the TCP port number is incorrect. Correct the TCP port number.

Illegal Broadcast IP ADDRESS

The broadcast address for UDP transmission is incorrect. Correct the subnet mask and IP address of the local node.

Illegal Power–on Date or Time

The current time setting of the CNC is incorrect. Correct the clock of the CNC.

ALL TASKS(C1) ARE BUSY

The FOCAS1/Ethernet function or DNC1/Ethernet function is already engaged in communication with five applications. Terminate unnecessary communication applications on the personal computer.
If the cable is disconnected before communication is completed, the embedded Ethernet may need to be reset and initialized.

Err accept() [???]

An error occurred when a connection request from the personal computer is being awaited. The error code is [???]. This error message is output, for example, when the embedded Ethernet is reset.

Err recv() [???]

An error occurred during data reception. The error code is [???].
This error message is output, for example, when the embedded Ethernet is reset before communication is closed.

(3) EMB_ETH FTP TRANSFER LOG screen

This log screen is used to display an error message of the FTP file transfer function.

Login User is invalid

The setting of the user name or password is incorrect. Check the user name and password.

Parameters are invalid

The port number and IP address of the host computer set on the parameter setting screen are incorrect. Check the settings of the port number and IP address.

(???) is not found

The host computer with which an attempt is made to perform FTP communication cannot be found on the network. The IP address of the host computer to be connected with is indicated by (???). Check if the power to the host computer is turned on and if the host computer is connected to the network correctly.

(4) EMB_ETH FACTOLINK LOG screen

This log screen is used to display an error message of the FACTOLINK function.

FACTOLINK#1 IP ADDRESS(???) IS INVALID

The setting of the IP address (???) of the FACTOLINK server is incorrect. Check the setting of the IP address.

FACTOLINK#1 PORT NUMBER(???) IS INVALID

The port number (???) of the FACTOLINK server is incorrect. Check the setting of the program number.

Err ALREADY CONNECTED

An additional request is made for connection with a port already connected.
The embedded Ethernet needs to be reset.

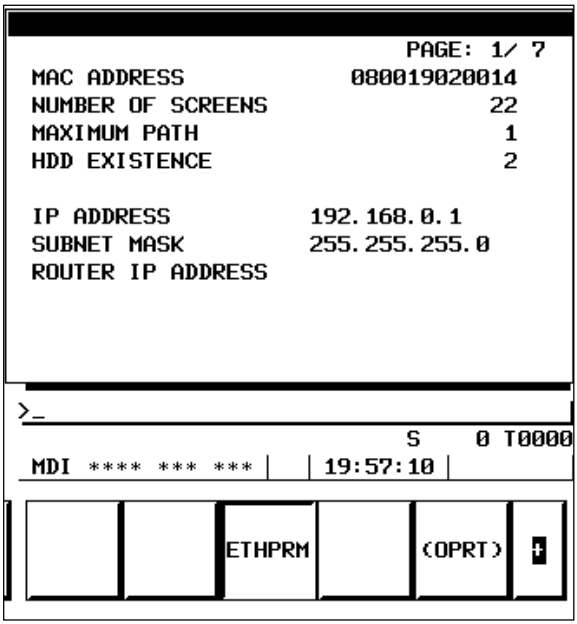
11.5 Ethernet Optional Board

This section provides a description based on the fast Ethernet board/fast data server.
The Ethernet board/data server of 10BASE–T type does not support the maintenance screen described in Subsection 11.5.5.

11.5.1 Parameter setting screen

The page key is used for screen switching.

(1) Common parameters

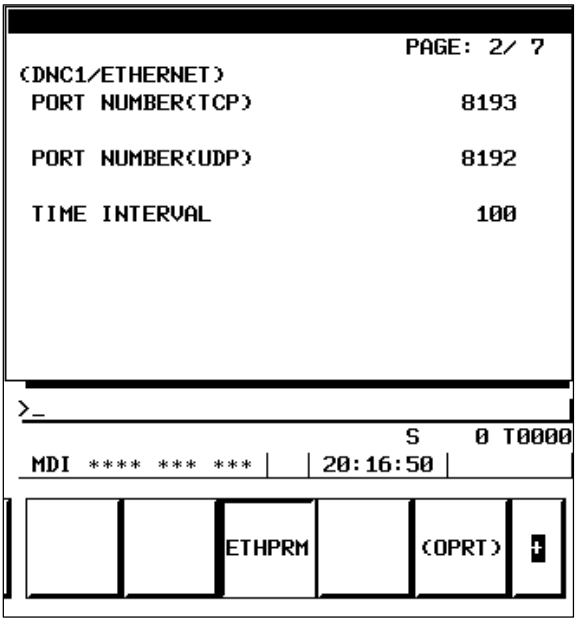


Item	Description
MAC ADDRESS (Display only)	MAC address of the Fast Ethernet board
NUMBER OF SCREENS (Display only)	Total number of Ethernet error message screens used by the Ethernet functions
MAXIMUM PATH (Display only)	Number of control systems in the CNC
HDD EXISTENCE (Display only)	Indicates whether ATA flash card is mounted on the Ethernet board. 0 : Not mounted. 1 : A hard disk is mounted (for a data server of 10BASE–T type only). 2 : An ATA card is mounted.
IP ADDRESS	Specifies the IP address of the CNC. (Format: “192.168.0.1”)

Item	Description
SUBNET MASK	Specifies the mask address of the network IP address. (Format: “255.255.255.0”)
ROUTER IP ADDRESS	Specifies the router IP address. Specify this address when the network incorporates a router. (Format: “192.168.0.99”)

NOTE The parameter for an IP address or file name specified by entering characters can be cleared by entering spaces.

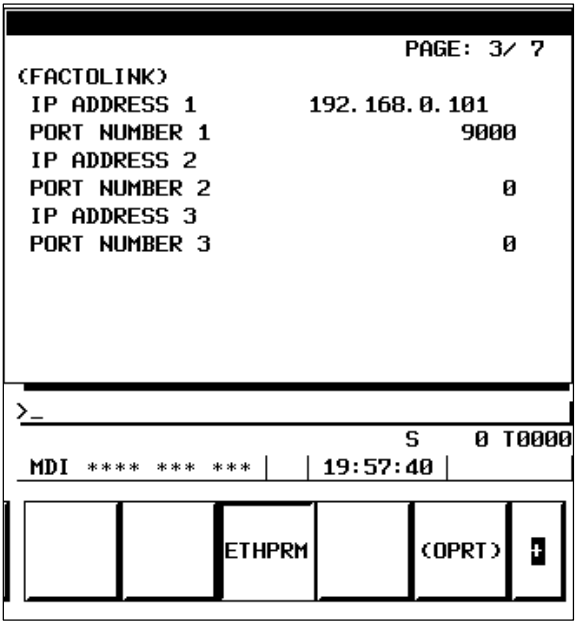
(2) FOCAS1/Ethernet parameter



Item	Description
PORT NUMBER (TCP)	Specifies the port No. to be used by the FOCAS1/Ethernet or DNC1/Ethernet functions within a range of 5001 to 65535.
PORT NUMBER (UDP)	Set this Item when using the DNC1/Ethernet function. Specify a UDP port number used to send UDP broadcast data. A value from 5001 to 65535 can be input. When the FOCAS1/Ethernet function is used or UDP broadcast data is not sent, set 0.
TIME INTERVAL	Set this Item when using the DNC1/Ethernet function. Specify a time interval used to send UDP broadcast data specified in the UDP port number Item above. The unit is in 10 ms. A value from 10 to 65535 can be input. This means that values less than 100 ms cannot be set. When the FOCAS1/Ethernet function is used or UDP broadcast data is not sent, set 0. Example) Broadcasting is carried out every one second [1000 ms] (= 100 × 10).

NOTE The DNC1/Ethernet function uses broadcast data, so that the personal computer and CNC must be placed in one Ethernet segment. Communications beyond the router cannot be performed.

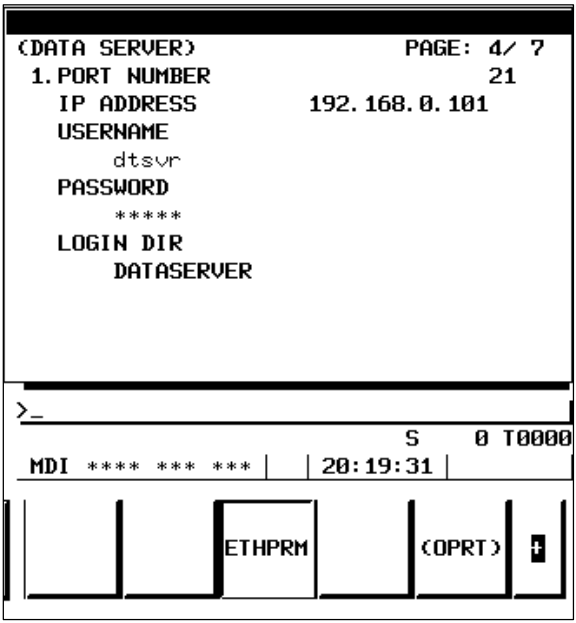
(3) FACTOLINK parameter



Settings for three host computers can be made.
PRM802 is used to select actual connection destinations.

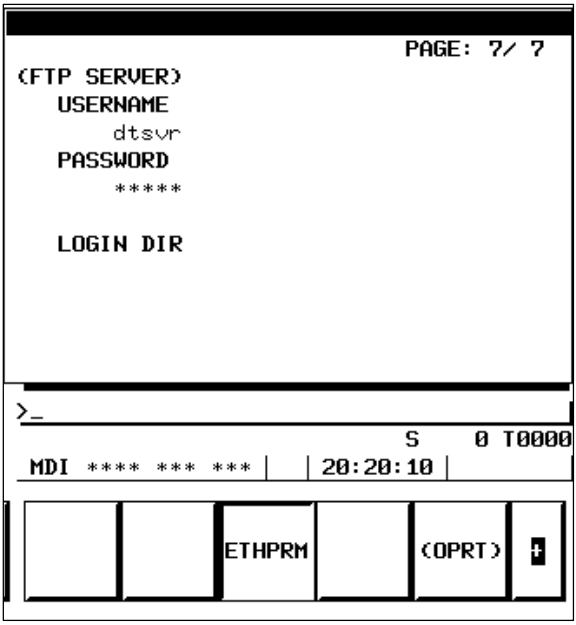
Item	Description
IP ADDRESS 1, 2, 3	Specify the IP address of a personal computer to be accessed by the FACTOLINK function. (Example of specification format: “192.168.0.101”)
PORT NUMBER 1, 2, 3	Specify a port number to be used with the FACTOLINK function. A value from 5001 to 65535 can be specified.

(4) Data server function parameter



Settings for three host computers can be made.
The connection host change screen is used to select hosts to be actually connected.

Item	Description
PORT NUMBER	Specifies the port No. to be used by the data server functions. Usually, set 21 because the FTP communication is used.
IP ADDRESS	Specifies the IP address of the host computer. (Format: “192.168.0.101”)
USERNAME	Specifies the name of the user to log on to the host computer using FTP. (A user name of up to 31 characters can be specified.)
PASSWORD	Specifies the password for the above user name. The password must always be specified. (A password of up to 31 characters can be specified.)
LOGIN DIR	Specifies the directory on the host computer to which the data server functions are to log in. (A name of up to 127 characters can be specified.)



Item	Description
USERNAME	Specifies the user name on the data server that is to be used when the host computer logs in using FTP. (A user name of up to 31 characters can be specified.)
PASSWORD	Specifies a password for the above user name. A password must always be specified. (A password of up to 31 characters can be specified.)
LOGIN DIR	Specifies the directory on the data server to which the host computer is to log in. (A name of up to 127 characters can be specified.)

(5) Ethernet–related NC parameters

Among the Ethernet parameters, the parameters for detailed setting are set using NC parameters.
Among the Ethernet parameters, the parameters for normal setting are set using the dedicated setting screens of (1) through (4).

(a) FACTOLINK

0802	Communication channel

[Data type] Byte

[Valid data range] 11 to 13

11: Selects IP address 1.

12: Selects IP address 2.

13: Selects IP address 3.

	#7	#6	#5	#4	#3	#2	#1	#0
0810			MONO	TIME				BGS

[Data type] Bit

BGS Performs the following when the FACTOLINK screen is not displayed.

1 : Enables logging in the background.

0 : Disables logging.

TIME Selects the time display format.

1 : “01/11/12 00:00” format

0 : “Wed Nov 12 00:00:00” format

MONO FACTOLINK screen display color

1 : Monochrome

0 : Color

0811	Type of logging

[Data type] Byte

[Valid data range] 0, 1, 10, 20, 21

0 : D address area

1 : R address area

10: Fixed data only

20: D address area + fixed data

21: R address area + fixed data

0812	PMC address for logging data

[Data type] Word

[Valid data range] 0 to 65535

Set a start PMC address for storing logging data.

0813	Data length of logging data

[Data type] Word

[Unit of data] Number of bytes

[Valid data range] 0 to 65535

Set the data length of logging data.

0814	Trigger PMC address for logging

[Data type] Word

[Valid data range] 0 to 65535

Set a PMC address that serves as a trigger for specifying logging data.

0815	Logging data transmission interval

[Data type] 2–Word

[Unit of data] Seconds

[Valid data range] 0 to 4294967295

Set a time interval used for transmitting logging data (fixed data only).
If 0 is set, logging data is transmitted at connection time only.

0820	Machine name posted to the host computer (1st byte)
0821	Machine name posted to the host computer (2nd byte)
0822	Machine name posted to the host computer (3rd byte)
0823	Machine name posted to the host computer (4th byte)
0824	Machine name posted to the host computer (5th byte)
0825	Machine name posted to the host computer (6th byte)
0826	Machine name posted to the host computer (7th byte)
0827	Machine name posted to the host computer (8th byte)
0828	Machine name posted to the host computer (9th byte)

[Data type] Byte

[Valid data range] 32 to 126

Set a machine name that is unique to each CNC and is required for the host computer to identify each CNC. Use ASCII codes in decimal for alphanumeric characters and blanks to set a machine name.

	#7	#6	#5	#4	#3	#2	#1	#0
3111	NPA							

[Data type] Bit

NPA When an alarm is issued while the FACTOLINK screen is displayed:

1 : The screen display does not switch to the alarm screen.

0 : The screen display switches to the alarm screen.

FOCAS1/Ethernet, DNC1/Ethernet

0020	I/O CHANNEL: Selects the I/O device.

[Data type] Byte

[Valid data range] 0 to 35

6 : Selects FOCAS1/Ethernet or DNC1/Ethernet for the I/O device. Note that this is needed only for DNC operation.

	#7	#6	#5	#4	#3	#2	#1	#0
0905								DNCE

[Data type] Bit

DNCE In DNC operation of FOCAS1/Ethernet, the end of DNC operation is:

1 : Not awaited. (Compatible with HSSB)

0 : Awaited.

NOTE Be sure to set this bit to 0 when using DNC1/Ethernet.

Data server function

0020	I/O CHANNEL: Selects the I/O device.

[Data type] Byte

[Valid data range] 0 to 35

5: Selects the data server for the I/O device.

	#7	#6	#5	#4	#3	#2	#1	#0
900							ONS	DSV

[Data type] Bit

DSV The data server function is

1 : Disabled

0 : Enabled

ONS When the O number of the data server file name and the O number in an NC program do not match:

1 : The O number in the NC program takes priority.

0 : The O number of the file name takes priority.

	#7	#6	#5	#4	#3	#2	#1	#0
904	LCK							BWT

[Data type] Bit

LCK Specifies whether to check if there is a duplicate file name specification in a list file when the LIST–GET data server function is used, as follows:

1 : To check.

0 : Not to check.

BWT Specifies whether to detect an error if the FTP communication is not finished in time when the DNC operation is in the data server function buffer mode, as follows:

1 : Not to detect an error; the DNC operation is continued after the FTP communication is finished.

0 : To detect an error.

921	Selects the host computer 1 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows 95/98/Me/NT/2000.

922	Selects the host computer 2 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows 95/98/Me/NT/2000.

923	Selects the host computer 3 OS.

[Data type] Byte

[Valid data range] 0 to 1

1 : UNIX/VMS.

0 : Windows 95/98/Me/NT/2000.

924	DNC1/Ethernet or FOCAS1/Ethernet wait time

[Data type] Word

[Unit of data] 1.1 ms (1.0 millisecond for a data server of 10BASE–T type)

[Valid data range] 0 to 32767

Specifies the wait time (in 1.1 ms units) for the FOCAS1/Ethernet or DNC1/Ethernet service when it is used together with the data server function.
If 0 is specified, a wait time of 1.1 ms is assumed.

0931	Special character (No. 1)
0932	Special character (No. 2)
0933	Special character (No. 3)
0934	Special character (No. 4)
0935	Special character (No. 5)

[Data type] Byte

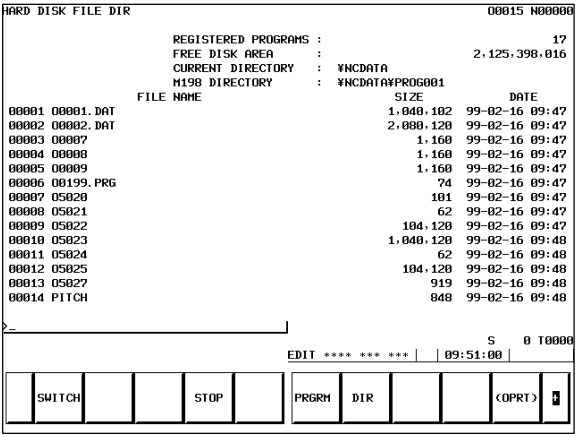
[Valid data range] 32 to 126

PRM931–935 enable characters that cannot be entered using MDI keys to be entered using soft keys.
Enter non–zero numbers for these parameters. [CHAR–1] to [CHAR–5] are displayed as the special character input soft keys.

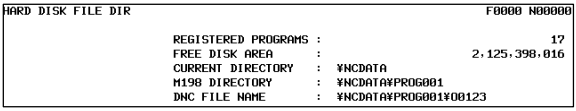
Example: When “33” is entered for PRM931, pressing soft key [CHAR–1] causes a “!” to be entered.

11.5.2 Fast data server operation screen

(1) Hard disk file directory screen



or



REGISTERED PROGRAMS

Displays the number of files stored in the current work directory.

FREE DISK AREA

Displays the amount of free space, in bytes, on the Fast data server built–in ATA card.

CURRENT DIRECTORY

Displays the work directory of the Fast data server built–in ATA card.

M198 DIRECTORY

Displays the directory (folder) for a DNC operation by a subprogram call (M198).

DNC FILE NAME

Displays the name of the file for which DNC operation is performed.

SIZE

Displays the file size, in bytes.

DATE

Displays the date and time at which the file was created.

[SWITCH]

Switches between normal display and detailed display.

[STOP]

Stops [F COPY], [F DEL], [PUT], [MPUT], [L–PUT], and [L–DEL] operations.

[DISPLAY]

Updates the screen, using the file specified by the file number or name as the first one.

[DNC SET]

Specifies the files needed for DNC operation. This operation is possible only when the data server is in the storage mode and the CNC is in the RMT mode.

[F COPY]

Copies files from the Fast data server built–in ATA card.

[FD CHA]

Changes file names on the Fast data server built–in ATA card.

[F DEL]

Deletes files from the Fast data server built–in ATA card.

[PUT]

Transfers a single file from the Fast data server built–in ATA card to the host computer built–in hard disk.

[MPUT]

Transfers two or more files from the Fast data server built–in ATA card to the host computer built–in hard disk. The file names can be specified by using wild cards (*, ?).

[D MAKE]

Creates a directory (folder) on the Fast data server built–in ATA card.

[D MOVE]

Moves to another work directory (folder) on the Fast data server built–in ATA card.

[D DEL]

Deletes a directory (folder) from the Fast data server built–in ATA card.

[L–PUT]

Transfers files from the Fast data server built–in ATA card to the host computer built–in hard disk according to the list file.

[L–DEL]

Deletes files from the Fast data server built–in ATA card according to the list file.

[M198 D]

Specifies a directory (folder) for a DNC operation by a subprogram call (M198). This operation is possible only when the data server is in the storage mode.

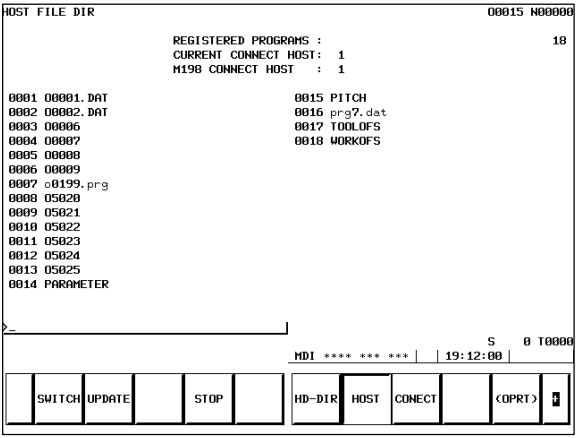
[READ]

Inputs files from the Fast data server built–in ATA card to the CNC tape memory. This operation is possible only when the data server is in the FTP mode, the CNC is in the EDIT mode, and a data server is specified by an I/O device number of the CNC.

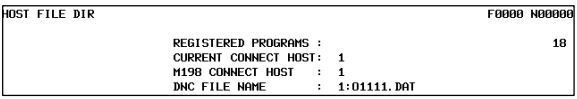
[PUNCH]

Outputs files from the CNC tape memory to the Fast data server built–in ATA card. This operation is possible only when the data server is in the FTP mode, the CNC is in the EDIT mode, and a data server is specified by an I/O device number of the CNC.

(2) Host file directory screen



or



REGISTERED PROGRAMS

Displays the number of files registered with the currently connected host.

CURRENT CONNECT HOST

Displays the number of the currently connected host. The host number is currently fixed to No. 1.

M198 CONNECT HOST

Displays the host number for a DNC operation by a subprogram call (M198).

DNC FILE NAME

Displays the file name for which DNC operation is performed.

[SWITCH]

Switches between normal display and detailed display.

[UPDATE]

Updates the display contents.

[STOP]

Stops the [GET], [MGET], and [L–GET] operations.

[DISPLAY]

Updates the screen using the file specified by the file number or name as the first.

[DNC SET]

Specifies the file for which DNC operation is performed. This operation is possible only when the data server and CNC are in the FTP and RMT modes, respectively.

[M198 H]

Specifies the host number for a DNC operation by a subprogram call (M198). This operation is possible only when the data server is in the FTP mode.

[F DEL]

Deletes files from the host computer.

[GET]

Transfers a single file from the host computer to the Fast data server built–in ATA card.

[MGET]

Transfers two or more files from the host computer to the Fast data server built–in ATA card. File names can be specified by using wild cards (*, ?).

[L–GET]

Transfers files from the host computer to the Fast data server built–in ATA card according to the list file.

[READ]

Inputs files from the host computer to the part program storage memory of the CNC. This operation is possible only when the data server is in the FTP mode, the CNC is in the EDIT mode, and a data server is specified by an I/O device number of the CNC.

[PUNCH]

Outputs files from the part program storage memory of the CNC to the host computer. This operation is possible only when the data server is in the FTP mode, the CNC is in the EDIT mode, and a data server is specified by an I/O device number of the CNC.

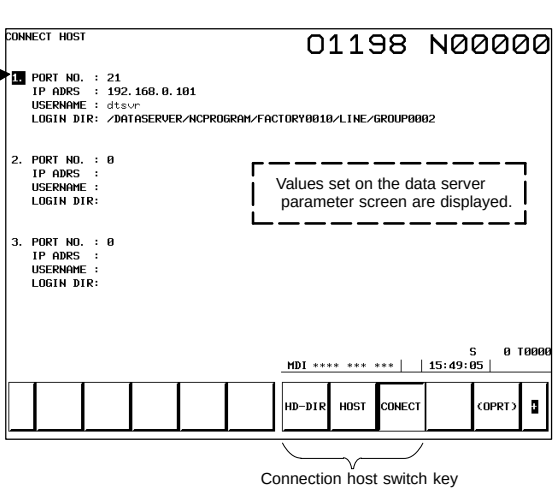
With the data server function, the data Items indicated below can be input/output.

- NC parameter
- Tool offset value
- Custom macro variable
- Workpiece zero point offset value
- Pitch error compensation data
- M code group
- Operation history data

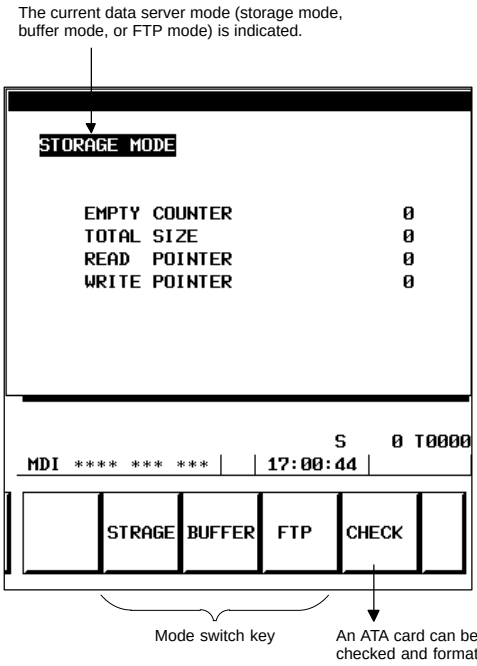
On each screen, a [READ] or [PUNCH] operation is performed.

11.5.3 Connection host change screen

The Item displayed in reverse video indicates the connection host currently selected for the host list screen.



11.5.4 Data server maintenance screen



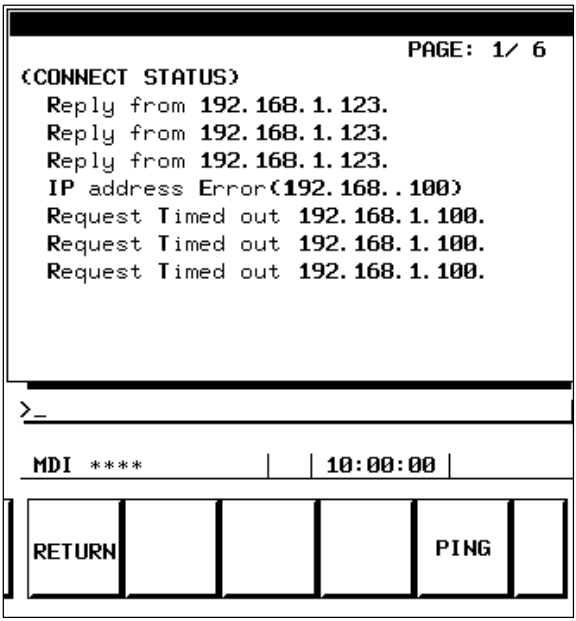
Item	Description
EMPTY COUNTER	Displays the number of times that the data buffer becomes empty during transfer of the NC program from the data server function to the CNC. This Item is initialized to 0 at power–on. After being initialized, the Item is counted when the conditions are satisfied.
TOTAL SIZE	Displays the total number of transferred bytes when one NC program is transferred using the data server function.
READ POINTER WRITE POINTER	Displays internal buffer management information when the data server function is used.

11.5.5 Maintenance screen

An operation check on the fast Ethernet board can be made.
The page key is used for screen switching.

(1) Ping command transmission

By sending the ping command, the state of the communication cable and whether the communication destination exists can be checked.
Enter the IP address of the communication destination with the MDI keys, then press the [PING] soft key. Communications are performed three times with the specified communication destination, and the results are displayed.



Reply from IP–address

A response was received from the specified communication destination device. The specified communication destination device exists on the network.

Request Timed out IP–address

No response was received from the specified communication destination device. The specified communication destination device does not exist on the network. Check if the power to the communication destination device is turned on, and check also if the parameters are set and the network is installed correctly.

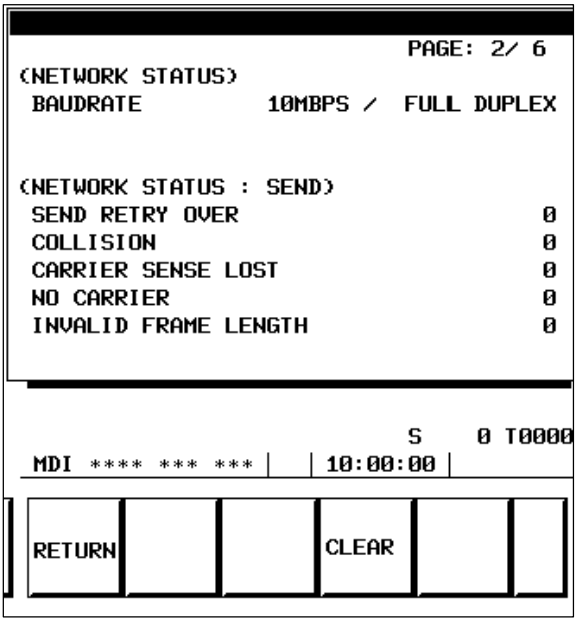
IP address Error (IP–address)

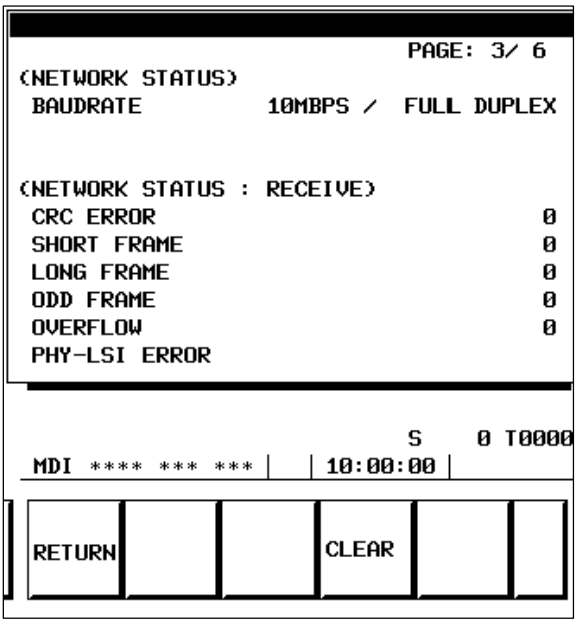
The specified IP address is incorrect. Check the entered IP address.

NOTE The Ethernet board/data server of 10BASE–T type does not support the maintenance screen described in Subsection 11.5.5.

(2) Error detection count of the Ethernet controller

The error count detected by the error detection controller is displayed. When a high load is imposed on the LAN, the count of detected collisions increases. Usually, other errors do not occur.

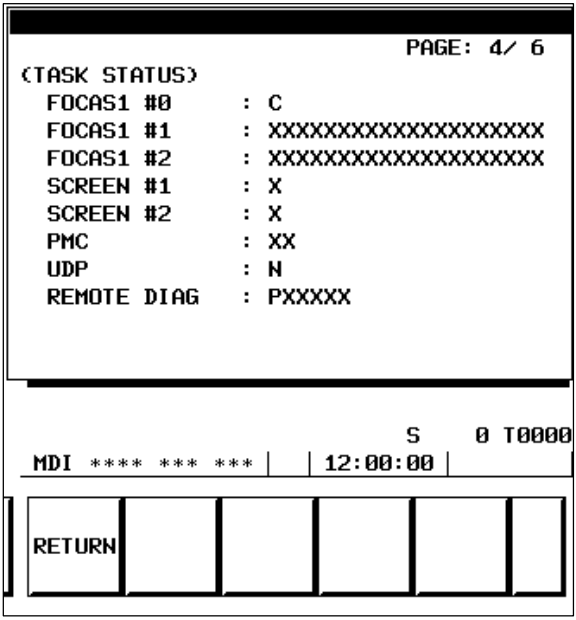


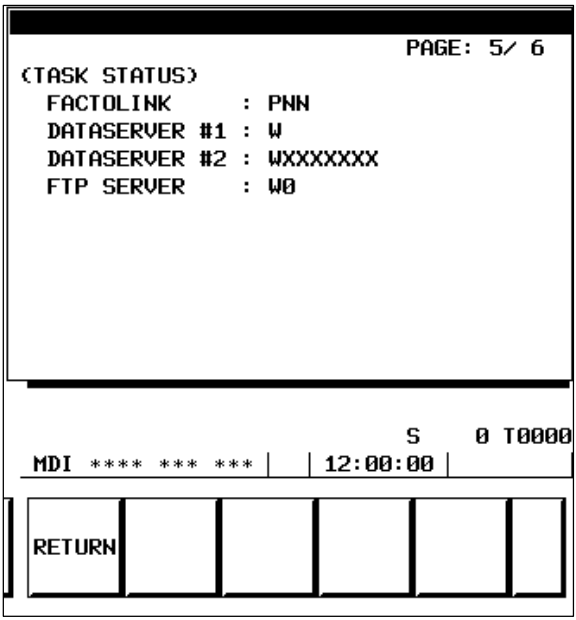


[CLEAR]

The error counter is cleared to 0.

(3) Operation states of the tasks internal to the fast Ethernet



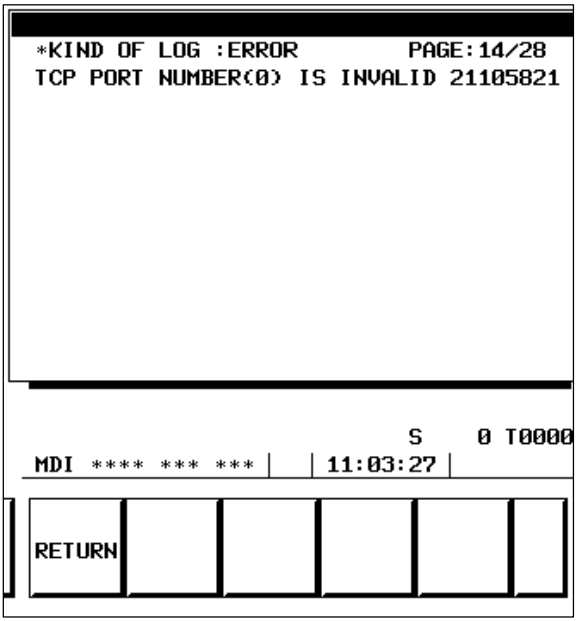


	Symbol	Meaning
FOCAS1 #0	C	Waiting for connection from the personal computer
	W	Waiting for data reception
	S	Data being transmitted
	K	Subtask being activated
	N	FOCAS1/Ethernet execution disabled
FOCAS1 #1,#2	W	Waiting for data reception
	S	Data being transmitted
	D	Data being processed
	X	Not executed yet
SCREEN #1,#2	W	Waiting for data reception
	S	Data being transmitted
	D	Data being processed
	X	Not executed yet
PMC	W	Waiting for data reception
	S	Data being transmitted
	X	Not executed yet
UDP	W	Waiting for data reception
	S	Data being transmitted
	X	Not executed yet
REMOTE DIAG	P	Waiting for a request from the CNC
	D	Data being processed
	W	Waiting for data reception
	S	Data being transmitted
	K	Subtask being activated
	X	Not executed yet
FACTOLINK	P	Waiting for a request from the CNC
	D	Data being processed
	W	Waiting for data reception
	S	Data being transmitted
	N	Not executed yet
DATASERVER #1,#2	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
FTP SERVER	D	Data being processed (NOTE)
	W	Waiting for data processing (NOTE)
	Number	Number of sockets currently connected

NOTE The state switches between “Data being processed” and “Waiting for data processing” even if actual communication is not performed.

11.5.6 Error message screen

You can switch between the error message screens with the page key.



(1) FAST_ETH PARAMETER LOG screen

This log screen is used to display an error message at the time of Ethernet parameter setting and Ethernet initialization.

OWN IP ADDRESS(???) IS INVALID

The set value (???) of the own IP address is in error. Set the own IP address to the correct value.

SUBNET MASK(???) IS INVALID

The set value (???) of the subnet mask is in error. Set the subnet mask to the correct value.

ROUTER IP ADDRESS(???) IS INVALID

The set value (???) of the router IP address is in error. Set the router IP address to the correct value.

TCP PORT NUMBER(???) IS INVALID

The set value (???) of the TCP port No. by the DNC1/Ethernet or FOCAS1/Ethernet function is in error. Set the TCP port No. to the correct value.

UDP PORT NUMBER(???) IS INVALID

The value (???) of the UDP port No. set with the DNC1/Ethernet function is incorrect. Set a correct UDP port No..

UDP INTERVAL TIME (???) IS INVALID

The value (???) of the UDP packet transmission interval set with the DNC1/Ethernet function is incorrect. Set a correct UDP packet transmission interval.

Err boot_mmc() [xxxxx]

An attempt to initialize the DNC1/Ethernet function or FOCA1/Ethernet function failed. Replace the system with a CNC system or PMC system that supports the DNC1/Ethernet function or FOCA1/Ethernet function.

(2) FAST_ETH FOCAS1 #0 LOG screen

This log screen is used to display an error message of the FOCAS1/Ethernet function (DNC1/Ethernet function).

ALL TASKS(Cxx) ARE BUSY

All tasks have been activated.
The number of sockets that are connectable with the DNC1/Ethernet function or FOCA1/Ethernet function was exceeded. Terminate unnecessary applications, then reexecute the service.

(3) FAST_ETH FACTOLINK LOG screen

This log screen is used to display an error message of the FACTOLINK function.

FACTOLINK#? IS TERMINATED

The parameters are in error. Cancel the services currently active on this port. Check the set values of the own IP address, subnet mask, router IP address, and IP address and port No. of the server that is connected by the FACTOLINK function, and set these parameters to their correct values.

FACTOLINK#? IP ADDRESS(???) IS INVALID

The set value (???) of the IP address of the server that is connected by the FACTOLINK function is in error. Set the IP address of the server that is connected by the FACTOLINK function to the correct value.

FACTOLINK#? PORT NUMBER(???) IS INVALID

The set value (???) of the port No. of the server that is connected by the FACTOLINK function is in error. Set the port No. of the server that is connected by the FACTOLINK function to the correct value.

ALREADY CONNECTED.

The connection request was issued again to an already connected port.

FAIL TO CONNECT SOCKET.

Failed to connect to the FACTOLINK server.
Check if the personal computer of the FACTOLINK server is activated normally.

NOT CONNECTED.

A disconnection request or data send request was issued to a non–connected port.

(4) FAST_ETH DATA SERVER L LOG screen / DATA SERVER F LOG screen

This log screen is used to display an error message of the data server function.

(???) IS NOT AVAILABLE

The host computer with the IP address (???) cannot be found on the network. Check if the power to the host computer is turned on. Check also if the data server and host computer are connected to the network correctly.

LOGIN USER IS INVALID

The login name is incorrect.
Check if a correct login name is set in the parameter for the data server.

PARAMETERS ARE INVALID

The parameters for the connected host are incorrect.
Check if the parameters of the data server related to the connected host are set correctly.

CANNOT ESTABLISH CONNECTION(???)

An attempt to make a connection with the host computer failed. If the error code indicated by (???) is in the eighty–four hundreds, communication may be able to be performed by executing the service again.

CANNOT CHANGE DIRECTORY

An attempt to move the directory failed. Check if the directory specified by the parameter for the data server exists on the host computer.

LOGIN FAILED

An attempt to log into the host computer failed.
Check if the password and login name specified by the parameters for the data server match those specified on the host computer.
Note that the password and login name are case–sensitive.

GET ERROR

An attempt to get a file failed.
Check if the file exists on the host computer.

HOST–DELETE ERROR

An attempt to delete a file on the host computer failed.
Check if the file exists.

FORMAT ERROR

An attempt to format an ATA flash card failed.
This error message is also displayed when this function is executed together with a separate data server function. So, reexecute this function after the separate data server function is terminated.

CHECK DISK ERROR(???)

The contents of the ATA flash card are incorrect.
This error message is also displayed when this function is executed together with a separate data server function. So, reexecute this function after the separate data server function is terminated.
If this error occurs, back up the data of the ATA flash card as soon as possible, then format the ATA flash card.

11.6 Troubleshooting

11.6.1 Confirmation of connection with the hub unit

1) Are the hub unit and the CNC connected with each other via an STP cable? Is the STP cable connected correctly?
In general, a straight cable is used to make a connection between a hub unit and communication unit.
2) Are the hub unit and cable grounded?
3) Is the power to the hub unit turned on?
4) Is the LED (LED for LINK) of the connected hub unit turned on? (Some hub units do not have an LED for LINK.)
The LED is not turned on when the hub unit is not connected to the CNC or when the power to the CNC is not turned on.
5) Is the LIL LED of the fast Ethernet board turned on at all times? The LED is not turned on when the board is not connected to the hub unit or when the power to the hub unit is not turned on.
The PCMCIA Ethernet card is dedicated to 10BASE–T. Is a hub unit dedicated to 10BASE–T used when the PCMCIA Ethernet card is used?
6) Is the LINK LED turned on when the embedded Ethernet port is used? The LED is not turned on when the port is not connected to the hub unit or when the power to the hub unit is not turned on.

11.6.2 Confirmation of each parameter setting

(1) Confirmation of settings on the CNC side

1) Is an MAC address displayed?
An MAC address can be checked on the parameter setting screen.
2) Is the correct IP address set?
Ensure that the IP address for each unit is unique.
3) Is the correct subnet mask set?
The setting must match that of the communication destination unit.
4) When communications via a router are performed, is the IP address of the router set correctly?

(2) Confirmation of settings on the personal computer side

1) Is the correct IP address set?
Ensure that the IP address for each unit is unique.
2) Is the correct subnet mask set?
The setting must match that of the communication destination unit.
3) When communications via a router are performed, is the IP address of the router set correctly?
(Communications beyond the router cannot be performed with the DNC1/Ethernet function.)

11.6.3 Confirmation of communications based on the ping command

(1) Confirmation from the CNC side

Use the ping command from the CNC side. For the embedded Ethernet, see Subsection 11.4.5(1), “Ping command transmission.” For the fast Ethernet board/fast data server, see Subsection 11.5.5(1), “Ping command transmission”.

When there is no response from the destination unit, a hardware connection and/or software setting may be faulty. Check the connection and settings for errors.
(This function is not supported by the Ethernet board/data server of 10BASE–T type.)

(2) Confirmation from the personal computer

An example below is used for explanation.

Check method:
At the command prompt, enter ping NC–IP–address. If a response is returned, a connection has been established.
The example below assumes that the IP address on the CNC side is 192.168.1.1.

1) If a response is returned (normal)

```
C:¥ >Ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1:bytes=32 time<10ms TIL=128
Reply from 192.168.1.1:bytes=32 time<10ms TIL=128
Reply from 192.168.1.1:bytes=32 time<10ms TIL=128

C:¥>
```

2) If no response is returned (abnormal)

```
C:¥ >Ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.

C:¥>
```

If the ping command is specified with the –t option, the transmission of ping packets continues until you press Ctrl+C.

11.6.4 Communicationerror confirmation

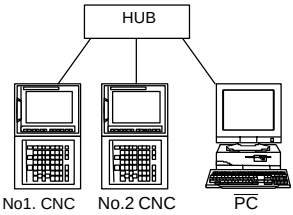
For the embedded Ethernet, check the communication error count according to Subsection 11.4.5(2), “Error detection count of the Ethernet controller”. For the fast Ethernet/fast data server, check the communication error count according to Subsection 11.5.5(2), “Error detection count of the Ethernet controller”.
When a high load is imposed on the LAN, the count of detected collisions increases. Usually, other errors do not occur. If the count of other errors increases, the cause may be a line problem such as noise.

11.6.5 Error message confirmation

For the embedded Ethernet, check the error information on the error message screen described in Subsection 11.4.6. For the fast Ethernet/fast data server, check the error information on the error message screen described in Subsection 11.5.6.

11.7 Example of Setting

An example of parameter setting for a system consisting of one personal computer and two CNCs is provided below.



(1) FACTOLINK

	No.1 CNC	No.2 CNC	
IP address	192.168.0.1	192.168.0.2	Ethernet parameter setting screen
Subnet mask	255.255.255.0	255.255.255.0	
Router IP address	None	None	
IP address 1	192.168.0.101	192.168.0.101	
Port No.1	9000	9000	
IP address 2	None	None	
Port No.2	None	None	
IP address 3	None	None	
Port No.3	None	None	
PRM802	11	11	NC parameter setting screen
PRM820	67'C'	67'C'	
PRM821	78'N'	78'N'	
PRM822	67'C'	67'C'	
PRM823	49'1'	50'2'	

	Personal computer	
IP address	192.168.0.1	To be set with "Microsoft TCP/IP Property" of the personal computer (Windows NT)
Subnet mask	255.255.255.0	
Default gateway	None	
ocsnc	9000/tcp	Refer to "FANUC FACTOLINK Script Function Operator's Manual".
ocscomm	9001/tcp	
ocsapplication	9002/tcp	

(2) FOCAS1/Ethernet

	CNC No.1	CNC No.2
IP address	192.168.0.1	192.168.0.2
Subnet mask	255.255.255.0	255.255.255.0
Router IP address	None	None
TCP port No.	8193	8193
UDP port No.	0	0
Time interval	0	0
PRM20	6	6

Ethernet parameter setting screen

NC parameter setting (To be set for the optional board only)

		Personal computer
IP address		192.168.0.101
Subnet mask		255.255.255.0
Default gateway		None
CNC No.1	IP address	192.168.0.1
	Port number	8193
CNC No.2	IP address	192.168.0.2
	Port number	8193

To be set with “Microsoft TCP/IP Property” of the personal computer (Windows 95/98/NT/2000)

To be specified with the argument of the data window library function cnc_allclibhndl3

(3) DNC1/Ethernet

	CNC No,1	CNC No.2
IP address	192.168.0.1	192.168.0.2
Subnet mask	255.255.255.0	255.255.255.0
Router IP address	None	None
TCP port No.	8193	8193
UDP port No.	8192	8192
Time interval	100	100
PRM20	6	6

Ethernet parameter setting screen

NC parameter setting (To be set for the optional board only)

	Personal computer
IP address	192.168.0.101
Subnet mask	255.255.255.0
Default gateway	None
FANUC_C4_SERVER	8192/udp
CNC No.1	Machine No.1
NC IP address	192.168.0.1
NC TCP port number	8193
CNC No.2	Machine No.2
NC IP address	192.168.0.2
NC TCP port number	8193

To be set with “Microsoft TCP/IP Property” of the personal computer (Windows NT)

Refer to “ FANUC FA SYSTEM FOR PC (Windows NT Version) Operator’s Manual”.

(4) FTP file transfer

		CNC No.1	CNC No.2
IP address		192.168.0.1	192.168.0.2
Subnet mask		255.255.255.0	255.255.255.0
Router IP address		None	None
Connected host 1	Port No.	21	21
	IP address	192.168.0.101	192.168.0.101
	User name	FANUC	FANUC
	Password	FANUC	FANUC
	Login DIR	None	None
NC PRM20		9	9

Ethernet parameter setting screen

NC parameter setting

	Personal computer
IP address	192.168.0.101
Subnet mask	255.255.255.0
Default gateway	None
User name	FANUC
Password	FANUC
Login DIR	Default

To be set with “Microsoft TCP/IP Property” of the personal computer (Windows NT)

To be set with “User Manager” of the personal computer (Windows NT)

To be set with “Internet Service Manager” of the personal computer (Windows NT)

(5) Data server function

		CNC No.1	CNC No.2
IP address		192.168.0.1	192.168.0.2
Subnet mask		255.255.255.0	255.255.255.0
Router IP address		None	None
Connected host 1	Port No.	21	21
	IP address	192.168.0.101	192.168.0.101
	User name	dtsvr	dtsvr
	Password	dtsvr	dtsvr
	Login DIR	None	None
FTP server	User name	dtsvr	dtsvr
	Password	dtsvr	dtsvr
	Login DIR	None	None
PRM20		14	14

Ethernet parameter setting screen

NC parameter setting

	Personal computer
IP address	192.168.0.101
Subnet mask	255.255.255.0
Default gateway	None
User name	dtsvr
Password	dtsvr
Login DIR	Default

To be set with “Microsoft TCP/IP Property” of the personal computer (Windows NT)

To be set with “User Manager” of the personal computer (Windows NT)

In Peer Web Services, to be set with “Internet Service Manager” of the personal computer (Windows NT)

12. POWER MATE CNC MANAGER (FANUC SERVO MOTOR AMPLIFIER β SERIES (I/O LINK OPTION))

With the Power Mate CNC Manager, position display and maintenance operation (such as parameter setting) can be performed for the FANUC SERVO MOTOR Amplifier β Series (I/O Link Option) (hereinafter referred to as the "I/O Link β amplifier").

12.1 Screen

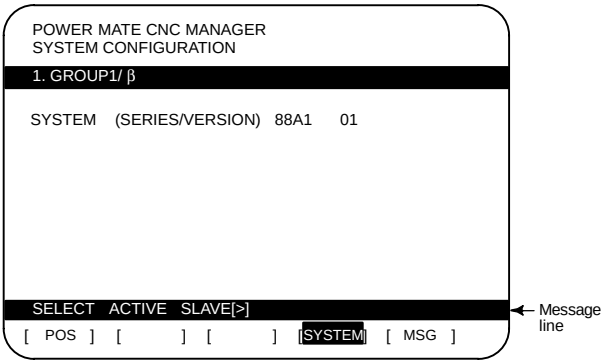
(1) Screen display

1 Function key [SYSTEM]

2 Continuous menu key [▷] (Press this key several times until the [PMM] soft key appears.)

3 Soft key [PMM]

(Example of screen) System configuration screen



(2) Display information

- Position display
- System configuration screen
  (I/O Link β amplifier system software information)
- Parameter screen
  (setting and saving of I/O Link β amplifier parameters)
- Diagnosis screen (I/O Link β amplifier state)
- Alarm screen (I/O Link β amplifier alarm)

I/O Link β amplifier parameters

- Parameters can be read as a CNC program from an I/O Link β amplifier (The read parameters are saved in the part program storage memory or memory card on the CNC.)
- A parameter data file saved on the CNC can be written to the corresponding I/O Link β amplifier. This relationship is determined according to the connection of an I/O Link β amplifier and program number.

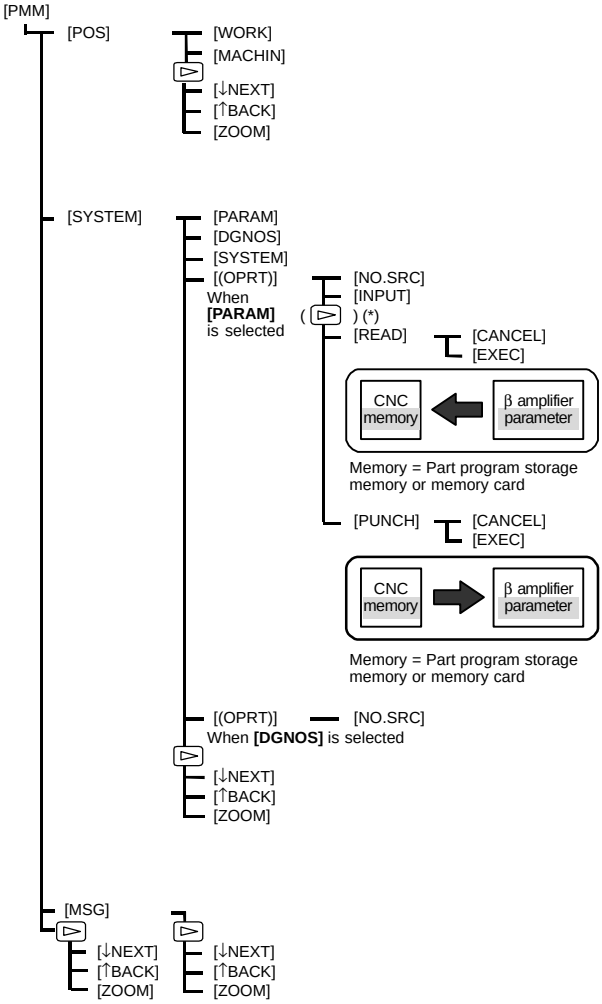
See the descriptions of PRM960#2, #1, and PRM8760.

Message line

- An alarm or guidance message from the Power Mate CNC Manager is displayed.
- If an alarm is issued from an I/O Link β amplifier, the group number of the slave where the alarm is issued is indicated at the right end of the message line. Details of the alarm can be checked on the alarm screen.

(3) Operation

Soft keys are mainly used for operation.



NOTE* This operation is not required when an 9.5″/10.4″ liquid–crystal screen is used.

12.2 Parameters

The CNC parameters related to the Power Mate CNC Manager are described below. For the parameters related to the I/O Link β amplifier, refer to the manual of the servo amplifier.

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

[Data type] Bit

SLV When the Power Mate CNC Manager is selected:

0 : The screen displays one slave (I/O Link β amplifier).

1 : The screen is divided into four sections to display up to four slaves (I/O Link β amplifiers) simultaneously.

MD1, MD2 Set a slave (I/O Link β amplifier) parameter input/output destination.

MD2	MD1	Input/output destination
0	0	Part program storage memory
0	1	Memory card

The Power Mate CNC Manager can read I/O Link β amplifier parameters into the CNC and can write a parameter file on the CNC to an I/O Link β amplifier. At this time, specify a memory area on the CNC.
Whichever is selected, a parameter file has the program format.

PMN The Power Mate CNC Manager function is:

0 : Enabled.

1 : Disabled. (Communication with a slave (I/O Link β amplifier) is not performed.) Even when the function is disabled, the Power Mate CNC Manager screen can be displayed.

SPW Writing of parameters by the Power Mate CNC Manager to a slave (I/O Link β amplifier) is:

0 : Enabled at all times.

1 : Dependent on the setting of PWE (setting) of the host CNC.

ASG Whether the number of input/output address allocation bytes for a slave (I/O Link β amplifier) is 16 bytes is:

0 : Not checked.

1 : Checked.

2CH When a slave (I/O Link β amplifier) is also connected to I/O Link channel 2, the communication destination is set as:

0 : Channel 2

1 : Channel 1

If no slave (I/O Link β amplifier) is connected to channel 2, or I/O link channel 2 is absent, communication is performed with channel 1, regardless of this setting.

8760	Program start number used when I/O Link β amplifier parameter data is registered

[Data type] Word

[Valid data range]
0 to 9999

In accordance with the formula below, the correspondence between a program number used for parameter file registration and an I/O Link β amplifier is determined.

Setting of PRM8760 + (I/O Link β amplifier group number × 10)

(Example) Example: When PRM8760 = 8000

- At read time

  The parameters of an I/O Link β amplifier of group 1 are registered with the CNC as a program of O8010.

- At write time

  When a parameter file is written on the parameter screen of an I/O Link β amplifier of group 1, the parameter file must be registered with the CNC as a program of O8010.

When the memory card is selected as the input/output destination, the file name is O8010.PMM.

12.3 Alarms

Two types of alarms are used:

- Alarms of the Power Mate CNC Manager

  →Displayed on the message line of the Power Mate CNC Manager screen

- Alarms of the I/O Link β amplifier

  →On the alarm screen of the Power Mate CNC Manager, a number is displayed.

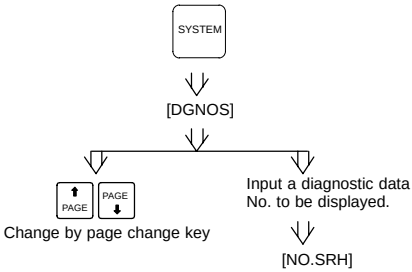
  →On the I/O Link β amplifier, an LED indication is provided.

If an alarm is issued on an I/O Link β amplifier, the group number of the I/O Link β amplifier is displayed at the right end of the message line on the Power Mate CNC Manager screen. The number of an alarm issued can be checked on the alarm screen of the Power Mate CNC Manager.

For details of each alarm, see the chapter 8 “Alarms.”

13.1 Procedure for Displaying Diagnostic Screen

Using the procedure below, the internal state (diagnosis information) of the CNC can be displayed.



13.2 Diagnosis Information (DGN) List

A number is assigned to each of the information items that are displayed on the diagnosis screen to indicate the internal statuses of the CNC.
A list of numbers is provided below.

Supplement 1 : In this manual, the term diagnosis information, diagnosis number, or DGN may be used to indicate a number.
Example : Diagnosis information 300, DGN201#1

Supplement 2 : For display of CNC operating state, for example, see Section 18.3, “CNC STATE DISPLAY”.

13.2.1 Display of status in which command is not apparently executed (DGN000 – 016)

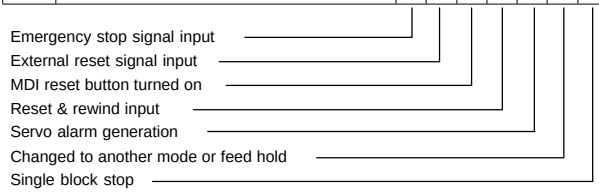
No.	Display	Internal status when 1 is displayed
000	WAITING FOR FIN SIGNAL	M, S, T function is being executed
001	MOTION	Move command in automatic operation is being executed
002	DWELL	Dwell is being executed
003	IN–POSITION CHECK	In-position check is being performed
004	FEEDRATE OVER-RIDE 0%	A cutting override of 0% is set. → *FV0–7<G012>, *AFV0–7<G013>, (PRM1401#4), etc.
005	INTERLOCK/ START–LOCK	Interlock or startlock is on. → IT<G008#0>, IT1–8<G130>, +MIT1–8, –MIT1–8<G130, G132>, ±MIT*, XA* <X004#0–#5>, *BSL, *CSL<G008#3, #1>, (PRM3003#0, #2, #3, #4/PRM3004#0, #1), etc.
006	SPINDLE SPEED ARRIVAL CHECK	Waiting for spindle speed arrival signal to turn on → SAR<G029#4>, (PRM3708#0, #1), etc.
010	PUNCHING	Data is being output via reader puncher interface
011	READING	Data is being input via reader puncher interface
012	WAITING FOR (UN)CLAMP	Waiting for index table clamp/unclamp before B axis index table indexing start/after B axis index table indexing end to complete → *BECLP, *BEUCP<G038#7, #6>, etc.
013	JOG FEEDRATE OVERRIDE 0%	Jog override 0% → *JV0–15<G010, G011>, etc.
014	WAITING FOR RE-SET, ESP, RRW OFF	One of the emergency stop, external reset, re-set & rewind or MDI panel reset key is on. → *ESP<X008#4>, *ESP<G008#4>, ERS<G008#7>, RRW<G008#6>
015	EXTERNAL PRO-GRAM NUMBER SEARCH	External program number search is active.
016	BACKGROUND ACTIVE	Background is being used.

13.2.2 Informationindicating automatic operation stop, automatic idle statuses (DGN020 – 025)

No.	Display	Internal status when 1 is displayed
020	CUT SPEED UP/ DOWN	Set when emergency stop turns on or when servo alarm occurs
021	RESET BUTTON ON	Set when reset key turns on
022	RESET AND REWIND ON	Reset and rewind turned on
023	EMERGENCY STOP ON	Set when emergency stop turns on
024	RESET ON	Set when external reset, emergency stop, reset or reset & rewind key is on.
025	STOP MOTION OR DWELL	A flag which stops pulse distribution. It is set to 1 in the following cases. (1) External reset is set to on. (2) Reset & rewind is set to on. (3) Emergency stop is set to on. (4) Feed hold is set to on. (5) The MDI panel reset key turned on. (6) Switched to the manual mode (JOG/HANDLE/INC). (7) Other alarm occurred. (There is also an alarm which is not set.)

Causes for cycle start LED turned off

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



13.2.3 TH alarm statuses (DGN030, 031)

No.	Display	Internal status when 1 is displayed
030	CHARACTER NUMBER TH DATA	The position of the character which turned TH alarm on is displayed in the number of characters from the beginning of the block at TH alarm.
031	TH DATA	Read code of character which turned TH alarm on

13.2.4 Screen hard copy status (DGN035)

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

END : Screen hard copy was completed normally.

ABT : Screen hard copy was discontinued.

ER1 : An invalid parameter value was specified for screen hard copy.

ER2 : An attempt to use a memory card for screen hard copy failed.

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

13.2.5 C language executor status (DGN045)

DGN	045	C language executor status

[Data type] Byte

[Valid data range]
0 to 255

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

13.2.6 Digital servo or serial pulse coder alarm information (DGN200 – 280)

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

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

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

		ALD	EXP	Details of amplifier alarm
When DGN200#7 OVL = 1	Overload alarm	0	–	Motor overheat
		1	–	Amplifier overheat
When DGN200#1 FBA = 1	Disconnection alarm	1	0	Built–in pulse coder (hard)
		1	1	Disconnection of separate type pulse coder (hard)
		0	0	Disconnection of pulse coder (software)

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

SPH : Serial pulse coder or feedback cable is faulty.
Counting of feedback signal is erroneous.

CKA : Serial pulse coder is faulty.
Internal block stopped.

BZA : Battery voltage became 0.
Replace the battery and set the reference position.

RCA : Serial pulse coder is faulty.
Counting of rotation speed is erroneous.

PHA : Serial pulse coder or feedback cable is erroneous.
Counting of feedback signal is erroneous.

BLA : Battery voltage is low (warning)

CSA : Hardware of serial pulse coder is abnormal

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

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

STB : Communication failure of serial pulse coder.
Transferred data is erroneous.

CRC : Communication failure of serial pulse coder.
Transferred data is erroneous.

DTE : Communication failure of serial pulse coder.
There is no response for communication.

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

PMS : Feedback is not correct due to faulty serial pulse coder $\alpha i/\alpha$ or feedback cable.

LDA : Serial pulse coder LED is abnormal

MCC : Contacts of MCC of servo amplifier is melted.

OFS : Abnormal current value result of A/D conversion of digital

NOTE This diagnosis information is not used.

- Details of separate serial pulse coder alarms

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

SPH : A soft phase data error occurred in the separate pulse coder.

PMA : A pulse error occurred in the separate pulse coder.

BZA : The battery voltage for the separate pulse coder is zero.

CMA : A count error occurred in the separate pulse coder.

PHA : A phase data error occurred in the separate linear scale.

BLA : A low battery voltage occurred in the separate pulse coder.

LDA : An LED error occurred in the separate pulse coder.

OHA : Overheat occurred in the separate pulse coder.

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

STB : A stop bit error occurred in the separate pulse coder.

CRC : A CRC error occurred in the separate pulse coder.

DTE : A data error occurred in the separate pulse coder.

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

  This data indicates the cause of servo alarm ALM417, detected by the NC. If the alarm is detected by the servo, the DGN203#4 (PRM) is set to 1.

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

MOT : The motor type specified in PRM2020 falls outside the predetermined range.

PLC : The number of velocity feedback pulses per motor revolution, specified in PRM2023, is zero or less. The value is invalid.

PLS : The number of position feedback pulses per motor revolution, specified in PRM2024, is zero or less. The value is invalid.

DIR : The wrong direction of rotation for the motor is specified in PRM2022 (the value is other than 111 or –111).

AXS : In PRM1023 (servo axis number), a value that falls outside the range of 1 to the number of controlled axes is specified. (For example, 4 is specified instead of 3.) Alternatively, the values specified in the parameter are not consecutive.

13.2.7 Positional error display (DGN300)

DGN	300	Position error in each axis [Detection unit]

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

13.2.8 Machine position (DGN301)

DGN	301	Distance from reference position in each axis [Least input increment]

The machine position from the reference point is displayed in least command units.

13.2.9 Reference position shift function display (DGN302)

DGN	302	Distance from the end of the deceleration dog to the first grid point [Output unit]

The distance from the deceleration dog to the first grid point is displayed.

13.2.10 Position deviation with fine acceleration/deceleration enabled (DGN303)

DGN	303	Position deviation with fine acceleration/deceleration enabled [Detection unit]

13.2.11 Reference counter (DGN304)

DGN	304	Reference counter for individual axes [Detection unit]

13.2.12 Displacement detection (DGN305)

DGN	305	Position feedback data between Z phases of individual axes [Detection unit]

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

13.2.13 Machine coordinates of inclined axis/orthogonal axis (DGN306, 307)

DGN	306	Machine coordinates of a inclined axis in the Cartesian coordinate system [Output unit]

DGN	307	Machine coordinates of an orthogonal axis in the Cartesian coordinate system [Output unit]

These parameters are updated only when PRM8200#0 (AAC) is set to 1, and any of the parameters below is set to 1:

- PRM8201#0 (AOT)
- PRM8201#1 (AO2)
- PRM8201#2 (AO3)
- PRM5009#3 (QSA) (T series only)
- The interference check option is selected.

13.2.14 Servo motor temperature information (DGN308, 309)

DGN	308	Servo motor temperature [°C]

The αi servo motor coil temperature is indicated.
Information on axes other than the αi servo axis is not indicated. (Indicated by "0°C.")
When the temperature reaches 140°C, an alarm about motor overheat is issued.

DGN	309	Pulse coder temperature [°C]

The temperature of the pulse coder printed circuit board is indicated.
Information on axes other than the αi servo axis is not indicated. (Indicated by "0°C.")
When the temperature reaches 100°C (85°C for the atmosphere temperature in the pulse coder), an alarm about motor overheat is issued.

13.2.15 Display of cause of the PRM1815#4 (APZ) brought to 0 (DGN310)

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

PR1 : The setting of the following parameters has been changed: PRM1821, 1850, 1860, 1861.

PR2 : The setting of the PRM8302#1 (ATS) has been changed.

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

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

NOF : The Inductosyn output no offset data.

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

DTH : A controlled axis detach signal or parameter was input.

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

AL1 : An APC alarm was issued.

AL2 : A disconnection was detected.

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

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

GSG : The G202 signal was brought from 0 to 1.

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

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

13.2.16 FSSB status (DGN320 – 349)

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

Internal status of the FSSBC

CLS : Closed.

OPP : Running OPEN protocol.

RDY : Open and ready.

OPN : Open.

ERP : Running ERROR protocol.

ERR : Error.

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

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

Cause of an FSSBC error

ER0 : INFORMED ERROR

ER1 : (RESERVE)

ER2 : Master port disconnection

ER3 : External EMG input

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

XE0 : (RESERVE)

XE1 : Slave port disconnection

XE2 : Master port disconnection

XE3 : External EMG input

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

ST0, ST1 : Indicates the type code for an actually connected slave.

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

DUA 0: The slave of interest is not on the first axis of the two–axis amplifier.

1: The slave of interest is on the first axis of the two–axis amplifier.

EXT 0: The slave of interest does not exist.

1: The slave of interest exists.

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

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

to

DGN	349			DMA	TP1	TP0	HA2	HA1	HA0

HA0, HA1, HA2 : Indicates the host LSI address specified as a DMA destination.

TP0, TP1 : Indicates the type code of a specified slave. See ST0 and ST1 of the previously mentioned DGN330 and up.

DMA : Indicates a value determining whether to allow DMA to occur.

NOTE A combination of DGN330 and 331 corresponds to one FSSB slave unit. Up to ten slave units are available.

Slave units and the associated diagnosis numbers

Slave unit 00	→	DGN330, 331
Slave unit 01	→	DGN332, 333
Slave unit 02	→	DGN334, 335
Slave unit 03	→	DGN336, 337
Slave unit 04	→	DGN338, 339
Slave unit 05	→	DGN340, 341
Slave unit 06	→	DGN342, 343
Slave unit 07	→	DGN344, 345
Slave unit 08	→	DGN346, 347
Slave unit 09	→	DGN348, 349

13.2.17 Maintenance information detected on the servo side (DGN352, 355 – 358)

DGN	352	Detail number for invalid servo parameter setting alarm

Indicates information that can be used to identify the location (parameter) and cause of an invalid servo parameter setting alarm (servo alarm ALM417).
This diagnosis information is valid when the following conditions are satisfied.

- Servo alarm ALM417 has occurred.
- DGN203#4 (PRM) = 1

See the following table for the displayed detail numbers and the corresponding causes. For further detail information that could be used to take measures, refer to FANUC AC Servo Motor αi series Parameter Manual (B–65270EN).

Table Causes and corrective actions for servo parameter alarm details

Alarm detail No.	Parameter No.	Cause	Action
83	2008	Learning–related parameters are invalid. → See Supplement 1.	Make modifications so that the value of each parameter is within an allowable range.
133	2013	The parameter related to HRV3 is invalid.	Invalidate HRV3 or correct the cause. → See Supplement 2.
143	2014	The parameter related to the HC level of the αi amplifier is invalid. 2013#1–#4 > 2014#1–#4	Make settings to satisfy the following: 2013#1–#4 ≦ 2014#1–#4
233	2023	When initialization bit (bit 0)= 1, the set number of velocity pulses exceeds 13100.	Change the setting so that the number of velocity pulses is within 13100.
243	2024	When initialization bit (bit 0)= 1, the set number of position pulses exceeds 13100.	Change the setting so that the number of position pulses is within 13100.
434 435	2043	The internal value of the velocity loop integral gain overflowed.	Decrease the value of the velocity loop integral gain parameter.
443 444 445	2044	The internal value of the velocity loop proportional gain overflowed.	Use the function for modifying the internal format of the velocity loop proportional gain. Alternatively, decrease the value of this parameter.
474 475	2047	The internal value of the parameter (POA1) for the observer overflowed.	Change the setting to the following: (–1)×(value to be set) /10
534 535	2053	The internal value of the parameter related to dead zone compensation overflowed.	Decrease the setting of the parameter to such a value that an invalid parameter alarm is no longer issued.
544 545	2054	The internal value of the parameter related to dead zone compensation overflowed.	Decrease the setting of the parameter to such a value that an invalid parameter alarm is no longer issued.

Alarm detail No.	Parameter No.	Cause	Action
686 687 688	2068	The internal value of the feed–forward factor overflowed.	Use the position gain increase function.
694 695 696 699	2069	The internal value of the velocity feed–forward factor overflowed.	Decrease the velocity feed–forward factor.
754 755	2075	The setting of this parameter overflowed.	This parameter is not used presently. Set this parameter to 0.
764 765	2076	The setting of this parameter overflowed.	This parameter is not used presently. Set this parameter to 0.
783	2078	This parameter is a mandatory parameter when the closed loop is set for a linear motor, but the setting of this parameter is set to 0.	Set this parameter to a value other than 0 when setting the closed loop for a linear motor.
793	2079	This parameter is a mandatory parameter when the closed loop is set for a linear motor, but the setting of this parameter is set to 0.	Set this parameter to a value other than 0 when setting the closed loop for a linear motor.
843	2084	A non–positive value is set as the flexible feed gear numerator. Alternatively, feed gear numerator > denominator.	Set a positive value as the flexible feed gear numerator. Alternatively, ensure that feed gear numerator ≦ denominator. (This is not applicable to a separate detector of parallel type.)
853	2085	A non–positive value is set as the flexible feed gear denominator.	Set a positive value as the flexible feed gear denominator.
883	2088	For an axis with a serial separate detector, a value greater than 100 is set as the machine velocity feedback factor.	For an axis with a serial separate detector, the machine velocity feedback factor must not assume a value greater than 100. Change the setting to a value not exceeding 100.
884 885 886	2088	The internal value of the machine velocity feedback factor overflowed.	Decrease the machine velocity feedback factor. Alternatively, use the vibration control function, which has the equivalent effect.
926 927 928	2092	The internal value of the advanced feed–forward factor overflowed.	Use the position gain increase function.
953	2095 2140 2395	The internal value for machine distortion compensation exceeded ±12800.	When nano interpolation is not used, this alarm can be avoided by setting PRM2224#5 to 1.

Alarm detail No.	Parameter No.	Cause	Action
994 995 996	2099	The internal value for N pulse suppression overflowed.	Disable the N pulse suppression function (by setting PRM2003#4 to 0). Alternatively, decrease the value of this parameter so that no overflow occurs.
1033	2103	The withdrawal amount for abnormal load is different between the L axis and M axis (when the same axis withdrawal function is used).	Set the same value for the L axis and M axis.
1123	2112	When a linear motor is used, the AMR conversion coefficient parameter is not input.	Specify an AMR conversion coefficient.
1182	2118 2078 2079	The dual position feedback conversion coefficient is not set.	Specify a dual position feedback conversion coefficient.
1183	2118	When the closed loop is set for a linear motor, this parameter is not set.	When the closed loop is set for a linear motor, this parameter is a mandatory parameter. Specify a proper value.
1284 1285	2128	When the specified number of velocity pulses is small, the internal value of the parameter related to current control overflows.	Decrease the value of this parameter to such a value that the alarm is not issued.
1294 1295	2129	When the specified number of velocity pulses is large, the internal value of the parameter related to current control overflows.	Resolve the setting of this parameter into a×256+b, and set a new value by decreasing the value of a.
1393	2139	The setting of the linear motor AMR offset value exceeded ±45.	Change the setting of this parameter to within ±45. Alternatively, set PRM2270 #0 to 1 and increase the AMR offset setting range, then set a value within ±60.
1446 1447 1448	2144	The cutting feed–forward factor for the cutting/rapid traverse–specific FAD function overflowed.	Use the position gain increase function.
1454 1455 1456 1459	2145	The cutting velocity feed–forward factor for the cutting/rapid traverse–specific FAD function overflowed.	Increase the velocity feed–forward factor.
1493	2149	A value greater than 6 is set in this parameter.	This parameter does not allow a value greater than 6 to be set. Change the setting of this parameter to a value not greater than 6.
1503	2150	A value equal to or greater than 10 is set.	Set a value less than 10.
1793	2179	A negative value or a value greater than the setting of PRM1821 is set.	Set a positive value less than the setting of PRM 1821.

Alarm detail No.	Parameter No.	Cause	Action
1853	2185	A negative value or a value greater than the setting of PRM2023 is set.	Set a positive value less than the setting of PRM 2023.
2243	2224#5	PRM2224#5 is set to 1 (to ignore a machine distortion compensation parameter error), and the nano interpolation command is specified.	Make one of the two settings.
3423	2342	A negative value or a value greater than 100 is set.	Change the setting to a positive value not greater than 100.
3433	2343	A value not within a range of –180 to 180 is set.	Set a value within a range of –180 to 180.
8213	1821	A non–positive value is set in the reference counter size parameter.	Set a positive value in this parameter.
8254 8255 8256	1825	The internal value of the position gain overflowed.	Use the position gain increase function.
10016 10019	2200bit0	The internal value of the parameter related to crash detection overflowed.	Do not use the crash detection function. (Set bit 0 to 1.)
10024 10025		An overflow occurred in an internal calculation on the separate serial link processing level.	Switch to software of 90B0 series D edition and later.
10033	2004	The control period setting is invalid. This alarm is issued when the control period is automatically modified.	Modify this parameter related to interrupt period setting.
10043	1815#1 2010#2	When a linear motor is used, the closed loop is set.	Switch to software supporting the closed loop for a linear motor.
10053	2018#0	When a linear motor is used, the scale reverse connection bit is set.	The scale reverse connection bit cannot be used when a linear motor is used.
10062	2209#4	The amplifier in use does not support the HC alarm circuit avoidance function.	If you continue using the currently used amplifier, set the function bit indicated to the left to 0. If you want to use the HC alarm avoidance function, prepare an amplifier that supports the function.
10072	2007#6	The customer board function and FAD are set at the same time.	Turn off one of the two functions.
10082	2213#6	The improved cutting/rapid traverse–specific position gain switch function is not supported by the NC.	Disable this function.

Alarm detail No.	Parameter No.	Cause	Action
10092 10093	2004 2013#0	Alarm for an invalid control period setting. This alarm is issued if an unallowable combination of settings is made.	Change the control period setting to HRV1, HRV2, or HRV3. → See Supplement 2.
10103	2004 2013#0	Current control period 250 μs setting alarm. This alarm is issued if HRV3 is set when the current control period is set to 250 μs.	Set HRV2. → See Supplement 2.
10113	2013#0	Current period mismatch alarm. This alarm is issued when the current period setting differs from the actual setting.	On the same optical cable, there is an axis with HRV3 set. Reconsider the location of the amplifier, or disable HRV3. → See Supplement 2.
10123	2013#0	HRV3 – Setting disable alarm. This alarm is issued when this axis supports HRV3 while the mating axis does not support HRV3.	Correct the cause for disabling the setting of the other axis, or disable the HRV3 setting. → See Supplement 2.
10133	2013#0	HRV3 – Alarm for an invalid amplifier. This alarm is issued when the amplifier does not support HRV3.	For an axis where the alarm is issued, HRV3 cannot be used. → See Supplement 2.

Supplement 1 : Details of invalid learning–related parameters

Set PRM2115 = 0 and PRM2151 = 1913, then convert the value of DGN353 to a binary value. The details of the cause can be known from the bit position (s) set to 1 in an obtained binary number.

Location	Cause
B3	The band limit filter (PRM2244) is outside the allowable range.
B4	The profile number (PRM2233) is outside the allowable range.
B5	The specified data period (PRM2243, 2236, 2238, 2240, 2266) is outside the allowable range.
B6	The total number of profiles (PRM2264) is outside the allowable range.
B7	This alarm is issued when G05 is started during memory clear processing.
B8	This alarm is issued when the total number of profiles (PRM2264) is not 0, and the profile number (PRM2233) is 0.
B9	This alarm is issued when an automatically set value for thinning shift operation is outside the allowable range because the specified data period is long.

Supplement 2 : Control period setting

For control period setting, three options, HRV1, HRV2, and HRV3, are available. Each option is set as follows:

HRV1 : PRM2004=110
HRV2 : PRM2004=011, (PRM2013#0=0)
HRV3 : PRM2004=011, PRM2013#0=1

Supplement 3 : About the functions indicated in the column of Action

For the following functions indicated in the table, refer to "FANUC AC SERVO MOTOR αi series Parameter Manual (B–65270EN)":

- Function for changing the internal format of the velocity loop proportional gain
- Position gain expansion function
- Vibration–damping control function
- Runaway detection function

DGN	355	Communication alarm ignore counter (separate)
DGN	356	Connection processing counter (built–in)
DGN	357	Connection processing counter (separate)

The number of communication errors that occur in serial communication with the detector is indicated. As long as no alarm is issued, communicated data is guaranteed. However, if any of these counters indicated in the diagnosis information above reaches a very large value rapidly, noise is probably disturbing serial communication. So, provide noise protection sufficiently.

NOTE For details, refer to the relevant manual of FANUC SERVO MOTOR αi Series.

DGN	358	V ready–off information

Information for analyzing the cause of the V ready–off alarm (servo alarm ALM401).
Convert an indicated value to a binary value, then check bits 5 to 14. When the amplifier is activated, bits 5 to 14 are set to 1 sequentially starting with bit 5 if the amplifier is started normally. When you check these bits sequentially from the lower bit to the higher bit, the processing of the bit first set to 0 has failed, indicating the cause of the V ready–off alarm.

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

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

*ESP : Converter emergency stop reset state
CRDY : Converter ready for operation
INTL : DB relay reset completed
DRDY : Amplifier ready for operation (amplifier)
SRDY : Amplifier ready for operation (software)

NOTE For details, refer to the relevant manual of FANUC SERVO MOTOR αi Series.

13.2.18 Display of error detection (DGN360 – 363)

DGN		
DGN	360	Cumulative command pulse count (NC) [Detection unit]

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

DGN		
DGN	361	Cumulative compensation pulse count (NC) [Detection unit]

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

DGN		
DGN	362	Cumulative command pulse count (SV) [Detection unit]

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

DGN		
DGN	363	Cumulative feedback pulse count (SV) [Detection unit]

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

13.2.19 Display of diagnostic data related to the Inductosyn absolute position detector (DGN380, 381)

DGN		
DGN	380	Difference between the absolute position of the motor and offset data [Detection unit]

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

The remainder resulting from the division is displayed.

DGN		
DGN	381	Offset data from the Inductosyn [Detection unit]

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

13.2.20 Flexible synchronization error (DGN390 – 393)

DGN		
DGN	390	Flexible synchronization error (A) [Detection unit]
DGN	391	Flexible synchronization error (B) [Detection unit]
DGN	392	Flexible synchronization error (C) [Detection unit]
DGN	393	Flexible synchronization error (D) [Detection unit]

The difference between the error of the master axis of each group set with the flexible synchronization function and a master axis error found from the slave axis is displayed.

13.2.21 Display of diagnostic data serial spindle (DGN400 – 448)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	400				SAI	SS2	SSR	POS	SIC

SIC A module required for spindle serial control is
0: not mounted
1: mounted

POS A module required for spindle analog control is
0: not mounted
1: mounted

SSR 0: Spindle serial control is not performed.
1: Spindle serial control is performed.

SS2 0: Spindle serial doesn't control 2nd spindle.
1: Spindle serial control 2nd spindle.

SAI 0: Spindle analog control is not used.
1: Spindle analog control is used.

DGN	401	Serial spindle alarm state of first spindle
DGN	402	Serial spindle alarm state of second spindle
DGN	403	First spindle motor temperature [°C]
DGN	404	Second spindle motor temperature [°C]

The αi spindle motor coil temperature is indicated.
When the system configuration of the spindle (even another spindle) includes an additional spindle older than the αi spindle, this function is invalid.
This temperature is used as a guideline for occurrence of the spindle overheat alarm.

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

CRE : A CRC error occurred. (Warning)

FRE : A framing error occurred. (Warning)

SNE : The transmission/reception target is invalid.

CER : An error occurred during reception.

CME : No response was returned during automatic scanning.

SCA : A communication alarm occurred on the spindle amplifier side.

SSA : A system alarm occurred on the spindle amplifier side.
(These problems cause spindle alarm ALM749. Such problems are mainly caused by noise, disconnection, or instantaneous power–off).

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	409					SPE	S2E	S1E	SHE

Refer to this diagnosis when ALM750 has generated.

SHE 0: Serial communication module is correct on CNC side.
1: An error occurred in serial communication module on CNC side

S1E 0: 1st spindle started normally in spindle serial control.
1: 1st spindle did not start normally in spindle serial control.

S2E 0: 2nd spindle started normally in spindle serial control.
1: 2nd spindle did not start normally in spindle serial control.

SPE In spindle serial control serial spindle parameters
0: Satisfy start condition of spindle unit
1: Do not satisfy start condition of spindle unit

DGN	410	Load meter of 1st spindle [%]
DGN	411	Speedometer of 1st spindle [min^{-1}]
DGN	412	Load meter of 2nd spindle [%]
DGN	413	Speedometer of 2nd spindle [min^{-1}]
DGN	414	Position error in 1st spindle synchronous control mode [Pulse]
DGN	415	Position error in 2nd spindle synchronous control mode [Pulse]
DGN	416	Absolute value of synchronization error between 1st and 2nd spindles [Pulse]

NOTE 1 pulse = 360/4096 (°)

DGN	417	Feedback information of 1st spindle position coder
DGN	418	Position error of 1st spindle position loop mode
DGN	419	Feedback information of 2nd spindle position coder
DGN	420	Feedback information of 2nd spindle position coder
DGN	421	Feedback information of the position coder of the third spindle
DGN	422	Position deviation in the position loop mode of the third spindle
DGN	423	Feedback information of the position coder of the fourth spindle

DGN	424	Position deviation in the position loop mode of the fourth spindle

NOTE For DGN417 to 424, information obtained from the serial spindle control unit is directly displayed.

DGN	425	First–spindle synchronization error [Pulse]
DGN	426	Second–spindle synchronization error [Pulse]
DGN	427	Third–spindle synchronization error [Pulse]
DGN	428	Fourth–spindle synchronization error [Pulse]

DGN425 – 428 : Indicates the absolute value of a synchronization error in synchronization mode where each spindle is treated as a slave axis.

NOTE 1 pulse = 360/4096 (°)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	430				SS4	SS3	SSR		SIC

SIC Indicates whether a module necessary for spindle serial control (third and fourth spindles) has been installed, as follows:

0: Not installed

1: Installed

SSR 0: Spindle serial control (third and fourth spindles) not in progress.

1: Spindle serial control (third and fourth spindles) in progress.

SS3 0: Specifies not to use the third spindle under spindle serial control.

1: Specifies to use the third spindle under spindle serial control.

SS4 0: Specifies not to use the fourth spindle under spindle serial control.

1: Specifies to use the fourth spindle under spindle serial control.

DGN	431	Alarm status of the third serial spindle
DGN	432	Alarm status of the fourth serial spindle
DGN	433	Third spindle motor temperature [°C]
DGN	434	Fourth spindle motor temperature [°C]

The αi spindle motor coil temperature is indicated.
When the system configuration of the spindle (even another spindle) includes an additional spindle older than the αi spindle, this function is invalid.
This temperature is used as a guideline for occurrence of the spindle overheat alarm.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	438								

Information about communication errors for spindle serial control (third and fourth spindles).
For contents, see the descriptions about DGN408.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	439					SPE	S4E	S3E	SHE

SHE Indicates the state of the serial communication module (third and fourth spindles) on the CNC side as follows:

0: Normal

1: Abnormal

S3E 0: The third spindle was started normally under spindle serial control.

1: The third spindle was not started normally under spindle serial control.

S4E 0: The fourth spindle was started normally under spindle serial control.

1: The fourth spindle was not started normally under spindle serial control.

SPE Indicates the state of the serial spindle parameter (third and fourth spindles) for spindle serial control, as follows:

0: The start condition for the spindle unit is satisfied.

1: The start condition for the spindle unit is not satisfied.

DGN	440	Third–spindle load meter indication [%]
DGN	441	Third–spindle speedometer indication [min^{-1}]
DGN	442	Fourth–spindle load meter indication [%]
DGN	443	Fourth–spindle speedometer indication [min^{-1}]
DGN	445	First–spindle position data [Pulse]
DGN	446	Second–spindle position data [Pulse]
DGN	447	Third–spindle position data [Pulse]
DGN	448	Fourth–spindle position data [Pulse]

NOTE 1 pulse = 360/4096 (°)

This parameter is valid when PRM3117#1 = 1.
To display the position data of a spindle, execute spindle orientation.

13.2.22 Display of diagnostic data related to rigid tapping (DGN450 – 457)

DGN	450	Spindle position error during rigid tapping [Detection unit]
DGN	451	Spindle distribution during rigid tapping [Detection unit]
DGN	454	Accumulated spindle distribution during rigid tapping [Detection unit]
DGN	455	Instantaneous difference for the move command, calculated in terms of the spindle,during rigid tapping (signed, accumulated value) [Detection unit]
DGN	456	Instantaneous difference for the travel error, calculated in terms of the spindle, during rigid tapping (signed) [Detection unit]
DGN	457	Width of synchronization error during rigid tapping (maximum value) [Detection unit]

13.2.23 Status of the spindle polygon synchronization mode (DGN470 – 478)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	470	SC0	LGE		SCF			PST	SPL

SPL : Spindle polygon synchronization is in progress.

PST : Spindle polygon synchronization mode is starting.

#2 : Spindle polygon synchronization mode is being released.

#3 : The spindle speed is being changed in spindle polygon synchronization mode.

SCF : The spindle speed has been changed in spindle polygon synchronization mode.

#5 : Not used

LGE : In spindle polygon synchronization mode, the two spindles have different loop gains.

SC0 : In spindle polygon synchronization mode, the specified speed is zero.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	471	NPQ	PQE		NSP	SUO	QCL	PCL	

#0 to #3 Cause of ALM5018

ALM5018 can be cleared by issuing a reset. The cause indication is retained until the cause is removed or until polygon synchronization mode is released.

#4 to #7 Cause of ALM218

If ALM218 occurs, polygon synchronization mode is released. The cause indication, however, is retained until ALM218 is cleared by issuing a reset.

#0 : The speed specified for spindle polygon synchronization is too low. (The unit speed becomes 0 for internal operations.)

PCL : The first spindle (master axis in polygon synchronization) is clamped.

QCL : The second spindle (slave axis in polygon synchronization) is clamped.

SUO : The speed specified in spindle polygon synchronization is too high. (The speed is restricted to the upper limit for internal operations.)

NSP : A spindle required for control is not connected. (The serial spindle, second spindle, etc. is not connected.)

#5 : A negative Q value is specified while the PRM7603#1 (QDRC) is set to 1.

PQE : The P value or Q value, specified with G51.2, falls outside the predetermined range. Alternatively, the P and Q values are not specified as a pair.

NPQ : Although the P and Q values are not specified with G51.2, an R value is specified. Alternatively, none of the P, Q, or R value is specified.

DGN	474	Rotation ratio of the master axis in spindle polygon synchronization (specified P value)

In spindle polygon synchronization mode, the rotation ratio (specified P value) of the current master axis (first spindle) is displayed.

DGN	475	Rotation ratio of the slave axis in spindle polygon synchronization (specified Q value)

In spindle polygon synchronization mode, the rotation ratio (specified Q value) of the current slave axis (second axis) is displayed.

DGN	476	Phase difference between two spindles in spindle polygon synchronization (specified R value)

In spindle polygon synchronization mode, the current phase difference (specified R value) is displayed.(The units are the minimum input increment for the rotation axis of the machine.)

If the PRM7603#5 (RDGN) is set to 1, the shift amount specified for the serial spindle (number of specified pulses, calculated at a rate of 4096 pulses per 360 degrees) is displayed.

DGN	477	Actual speed of the master axis for spindle polygon synchronization (min^{-1})

In spindle polygon synchronization mode, the actual speed of the master axis (first spindle) is displayed.

DGN	478	Actual speed of the slave axis in spindle polygon synchronization (min^{-1})

In spindle polygon synchronization mode, the actual speed of the slave axis (second spindle) is displayed.

13.2.24 State of remote buffer (protocol A) (DGN500 – 502)

DGN	500	Send command

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

DGN	501	Receive command

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

DGN	502	State of remote buffer

0 : Not ready

1 : Reset state

2 : Operation state

3 : Alarm state

4 : Circuit disconnection

13.2.25 Diagnostic data related to HSS B (Open CNC) (DGN510 – 518)

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

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

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

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

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

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

PRA: 0: Normal

1: A RAM parity error occurred in shared RAM.

THL, THH:

THL	THH	Status
0	0	A battery alarm has occurred in the PANEL *i* or CNC display unit with PC functions.
1	0	A high–temperature condition has occurred in the PANEL *i* or CNC display unit with PC functions.
0	1	A low–temperature condition has occurred in the PANEL *i* or CNC display unit with PC functions.
1	1	Normal (connected to the PC)

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

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	513								

Indicates the internal information about the HSSB (open CNC). (Hidden function)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	515								

Indicates the internal information about the HSSB (channel 2). (Hidden function)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	516								

Indicates the internal information about the HSSB (channel 2). (Hidden function)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	517					THH	THL		PRA

Indicates the internal information about the HSSB (channel 2) as follows.

PRA: 0: Normal
1: A RAM parity error has occurred in shared RAM.

THL, THH:

THL	THH	Status
0	0	A battery alarm has occurred in the PANEL *i* or CNC display unit with PC functions.
1	0	A high–temperature condition has occurred in the PANEL *i* or CNC display unit with PC functions.
0	1	A low–temperature condition has occurred in the PANEL *i* or CNC display unit with PC functions.
1	1	Normal (connected to the PC)

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

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	518								

Indicates the internal information about the HSSB (channel 2). (Hidden function)

13.2.26 Diagnostic data related to a small–diameter peck drilling cycle (M series only) (DGN520 – 523)

DGN	520	Total number of retractions during cutting after G83 is specified

Executing the G83 command clears the value to zero.

DGN	521	Total number of retractions made by receiving the overload signal during cutting after G83 is specified

Executing the G83 command clears the value to zero.

DGN	522	Position on the drill axis from which retraction is started [Least increment system]
DGN	523	Difference between the position on the drill axis from which the previous retraction was started and the position from which the current retraction is started [Least increment system]

13.2.27 Diagnostic data related to ATC for ROBO DRILL α (DGN530, 531)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	530			A99	A98	A97	A96	A95	A43

* Check the contents of this data if ALM251 is output.

A43 : A prohibited T code is specified after M06.

A95 : M06 is specified while the Z–axis machine coordinate is positive.

A96 : The current tool number parameter (PRM7810) is set to 0.

A97 : M06 is specified in canned cycle mode. M06 is specified in a block containing the command instructing reference position return. M06 is specified in tool compensation mode.

A98 : After the power was turned on or after an emergency stop was released, M06 was specified before the first reference position return. While the tool was being changed, machine lock was enabled for the Z–axis.

A99 : A pry alarm occurred while the tool was being changed.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	531		585	584	583	582	581	580	502

502 : Large spindle distribution (system error)

580 : Spindle servo alarm (excessive error in the stop state)

581 : Spindle servo alarm (excessive error during travel)

582 : Spindle servo alarm (excessive drift)

583 : Spindle servo alarm (LSI overflow)

584 : Invalid sequence during positioning and ATC (system error)

585 : Spindle servo alarm (excessive error during ATC magazine indexing)

13.2.28 Diagnostic data related to simple synchronous control (DGN540, 541)

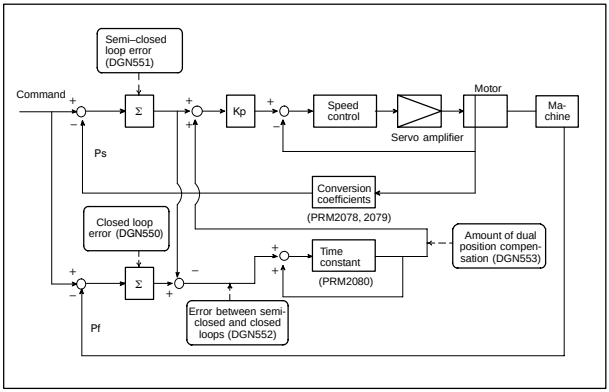
DGN	540	Difference in the position error between the master and slave axes in simple synchronous control [Detection unit]
DGN	541	Difference in the position error between the master and slave axes in simple synchronous control [Detection unit]

DGN540 indicates the difference in the position error between the master and slave axes when a single axis pair is subjected to simple synchronous control. DGN541 is used when two or more pairs are subjected to simple synchronous control. The position error is indicated for the master axis.

13.2.29 Diagnostic data related to the dual position feedback function (DGN550 – 553)

DGN	550	Closed loop error [Detection unit]
DGN	551	Semi–closed loop error [Detection unit]
DGN	552	Error between semi–closed and closed loops [Detection unit]
DGN	553	Amount of dual position compensation [Detection unit]

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



13.2.30 Status after execution of manual tool compensation (DGN560)

DGN	560	Status after execution of manual tool compensation

0 : Manual tool compensation ended normally.
1 : The data of the T code command is out of the allowable range.
2 : The offset value is out of the allowable range.
3 : The offset number is out of the allowable range.
4 : The CNC is running automatically or moving the axes.
5 : The CNC is in tool tip radius compensation mode.
6 : The CNC is not in JOG or HNDL (INCR) mode.
7 : The setting of a CNC parameter is invalid.

13.2.31 FSSB2 status (DGN620 – 649)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	620	CFE		ERR	ERP	OPN	RDY	OPP	CLS

CLS : Closed.
OPP : Running OPEN protocol.
RDY : Open and ready.
OPN : Open.
ERP : Running ERROR protocol.
ERR : Error.
CFE : Encountered configuration error.
(The actual slave type does not match the one specified in the conversion table.)

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	621	XE3	XE2	XE1	XE0	ER3	ER2	ER1	ER0

Indicates the cause of an FSSBC2 error.

ER0 : INFORMED ERROR
ER1 : (RESERVE)
ER2 : Master port disconnection
ER3 : External EMG input

Indicates the cause of an FSSBC2 error resulting from a request from a slave.

XE0 : (RESERVE)
XE1 : Slave port disconnection
XE2 : Master port disconnection
XE3 : External EMG input

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	630					EXT	DUA	ST1	ST0

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	632					EXT	DUA	ST1	ST0
	to								

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	648					EXT	DUA	ST1	ST0

ST0, ST1 : Indicates the type code for an actually connected slave.

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

DUA : 0: The slave of interest is not on the first axis of the two–axis amplifier.

1: The slave of interest is on the first axis of the two–axis amplifier.

EXT : 0: The slave of interest does not exist.

1: The slave of interest exists.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	631			DMA	TP1	TP0	HA2	HA1	HA0

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	633			DMA	TP1	TP0	HA2	HA1	HA0
	to								

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	649			DMA	TP1	TP0	HA2	HA1	HA0

HA0, HA1, HA2 : Indicates the host LSI address specified as a DMA destination.

TP0, TP1 : Indicates the type code of a specified slave. (See ST0 and ST1 of the previously mentioned DGN630 and up.)

DMA : Indicates a value determining whether to allow DMA to occur.

NOTE A combination of DGN630 and 631 corresponds to one FSSB2 slave unit. Up to ten slave units are available.

Slave units and the associated diagnosis numbers

Slave unit 00	→	DGN630, 631
Slave unit 01	→	DGN632, 633
Slave unit 02	→	DGN634, 635
Slave unit 03	→	DGN636, 637
Slave unit 04	→	DGN638, 639
Slave unit 05	→	DGN640, 641
Slave unit 06	→	DGN642, 643
Slave unit 07	→	DGN644, 645
Slave unit 08	→	DGN646, 647
Slave unit 09	→	DGN648, 649

13.2.32 State of high–speed HRV current control

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

[Data type] Bit axis

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

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

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

High–speed HRV current control is enabled when the following conditions are satisfied:

– PRM2013#0 (HR3) is set to 1.

– Servo software, servo modules, and servo amplifiers suitable for high–speed HRV current control are used.

– When a separate detector interface unit is used, the separate detector interface unit is suitable for high–speed HRV current control.

13.2.33 Error and warning statuses of the αi spindle

DGN	710	Error status of first spindle
DGN	711	Error status of second spindle
DGN	712	Warning status of first spindle
DGN	713	Warning status of second spindle
DGN	730	Error status of third spindle
DGN	731	Error status of fourth spindle
DGN	732	Warning status of third spindle
DGN	733	Warning status of fourth spindle

If an error (the yellow LED flashes and the error number appears) or warning occurred in the αi spindle amplifier module (SPM), the number is displayed on the diagnostic screen.
When there is no error or warning, “0” is indicated.

NOTE When the system configuration of the spindle (even another spindle) includes an additional spindle older than the αi spindle, this function is invalid.

Refer to the FANUC SERVO MOTOR αi series Maintenance Manual (B–65285EN) for errors on the αi spindle.
See Chapter 17 “AC SPINDLE” for warnings.

The records of some alarms, messages, and operations can be referenced.

14.1 Alarm History

Alarms generated in the NC are recorded. The latest 25 alarms generated are recorded. The 26th and former alarms are deleted.

- Display of alarm history screen

(1) Press [MESSAGE] key .

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

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

```
ALARM HISTORY                                O1234 N12345

01/04/18 20:56:26
 506 OVERTRAVEL  :  +X
01/04/18 19:58:11
 000 TURN OFF POWER
01/04/18 19:52:45
 000 TURN OFF POWER
01/04/18 19:48:43
 300 APC ALARM   : X-AXIS ZERO RETURN REQUEST
01/04/18 18:10:10
 507 OVERTRAVEL  :  +B



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

- Clearing alarm history

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

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

The clearing of the alarm history can be disabled by setting PRM3110#2(AHC).

- Alarm display

When an external alarm (ALM1000–1999) or a macro alarm (ALM3000–3999) is output, the alarm history function can record the alarm message. If recording of the message is not set or if no message is input, only an external alarm or macro alarm is displayed.

- Parameter

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

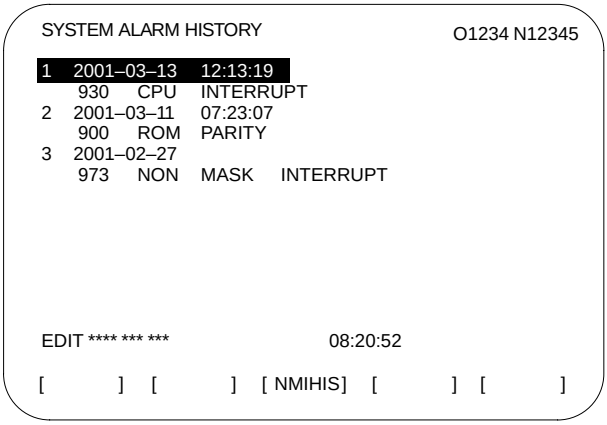
#3 (EAH) The alarm history function:

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

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

14.2 System Alarm History

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



14.2.1 System alarm history screen (history list screen)

Information about up to three system alarms including the latest system alarm can be displayed. The latest system alarm information is displayed at the top of the list, and a lower item in the list indicates older system alarm information.

(1) Set PRM3103#2 (NMH) to 1.

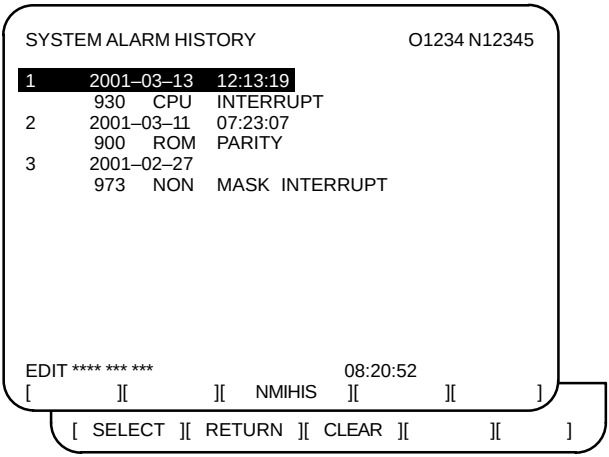
(2) Press the MESSAGE.

(3) Press the [NMIHIS] soft key.

The following information is displayed:

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

By setting PRM8904#7(NMP) to 1, the system alarm history of the selected path can be displayed. Thus, detailed information about a condition in which a system alarm (for example, system alarm ALM972) was issued can be obtained.



[SELECT] soft key

This soft key displays the detail screen of a system alarm history. (See Subsec. 14.2.2.)

Procedure

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

2 By using the cursor keys 

, move the cursor to the system alarm number whose details are to be displayed.

3 Press the [SELECT] soft key.

4 The details of the selected system alarm are displayed.

[CLEAR] soft key

This soft key clears all system alarm information stored.

When 3110#4 (OPC) is set to 1, this soft key is displayed.

Procedure

1 Set 3110#4 (OPC) to 1.

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

3 Press the [CLEAR] soft key.

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

[RETURN] soft key

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

14.2.2 System alarm history screen (detail screen)

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

The following items are displayed:

(1) System alarm occurrence date and time

(2) System alarm number

(3) System alarm message (No message is displayed for some system alarms.)

(4) System alarm occurrence series and edition

(5) Number of display pages

(6) General–purpose resistor, pointer index register, segment register, task register, LDT register, flag register, interrupt source, error code, error address

(7) Contents of stacks (up to 32 stacks)

(8) Contents of stacks of privilege level 3 (up to 48 stacks)

(9) NMI information

You can switch among the information items (6) to (9) by the page keys [PAGE ↑] [PAGE ↓].

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

```
SYSTEM ALARM HISTORY                                O1234 N12345

2       2001–03–11   07:23:07                    BDH1–01(1/4)
        973 NON MASK INTERRUPT
EAX             EBX             ECX             EDX
00000000        00930063        000003E0        00000040
ESI             EDI             EBP             ESP
00000010        009404E0        0000FFB4        0000FFDC
SS      DS      ES      FS      GS      TR      LDTR
06D8    0338    0248    0440    0338    0628    0028
EFLAGS          VECT            ERRC            ERROR–ADDRESS
00003046        FFFF            0000            03E0:000009BC


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

(Detail display screen 1:Example of information display screen of (6))

```
SYSTEM ALARM HISTORY                O1234 N12345

2       2001–03–11   07:23:07                    BDH1–01(2/4)
        973 NON MASK INTERRUPT

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




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

(Detail display screen 2:Example of information display screen of (7))

```
SYSTEM ALARM HISTORY                                O1234 N12345

2       2001–03–11   07:23:07                    BDH1–01(3/4)
        973 NON MASK INTERRUPT
    STACK!(PL3)
SS:ESP3   =0804:00007C50
CS:EIP =1350:00001234
    1008   1408   0001   0002   0003   0004   1008   FFE4
    1008   3678   00FA   0024   0000   0000   0000   0000
    0000   0000   0000   0000   0000   0000   0000   0000
    0000   0000   0000   0000   0000   0000   0000   0000
    0000   0000   0000   0000   0000   0000   0000   0000
    0000   0000   0000   0000   0000   0000   0000   0000

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

(Detail display screen 3:Example of information display screen of (8))

```
SYSTEM ALARM HISTORY                                O1234 N12345

2       2001–03–11   07:23:07                    BDH1–01(4/4)
        973 NON MASK INTERRUPT
NMIC
00000000       00000000       00000000       00000000
SVL
11111111       11111111
SVR
11111111       11111111       11111111       11111111
11111111       11111111       11111111       11111111
ADRS
007F0000

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

(Detail display screen 4:Example of information display screen of (9))

NOTE A screen equivalent to detail display screen 4 may not be displayed.

```
SYSTEM ALARM HISTORY                                O1234 N12345

2       2001–03–11   07:23:07                    BDH1–01(1/1)
        972 NMI OCCURRED IN OTHER MODULE

SLOT> 02              0080415F
                <1>                    <2>

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

(Detail display screen 5:
Example of information display screen for system alarm ALM972)

(1) NMI occurrence slot number

(2) Address of message data set with the NMI occurrence slot (string address)

NOTE On the history detail display screen for system alarm ALM972, no message is displayed.
(Reference : PRM8904#7(NMP))

```
SYSTEM ALARM HISTORY                                        O1234
N12345

2        2001–03–11    07:23:07                    BDH1–01(1/1)
         900 ROM PARITY

00000000             00000000
                                             <1>




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

(Detail display screen 6:
Example of information display screen for system alarm ALM900)

(1) ROM parity cause

- Parameter

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

NMH The system alarm history screen is:

0 : Not displayed.

1 : Displayed.

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

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

0 : Not enabled.

1 : Enabled.

	#7	#6	#5	#4	#3	#2	#1	#0
8904	NMP							

NMP The system alarm history screen displays:

0 : History of the first path.

1 : History of the selected path.

14.3 External Operator Messages History

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

The number of characters to be recorded as history information, and the number of history information items can be selected. (PRM3117#7 and #6(MS1 and MS0))

- Display of external operator message history screen

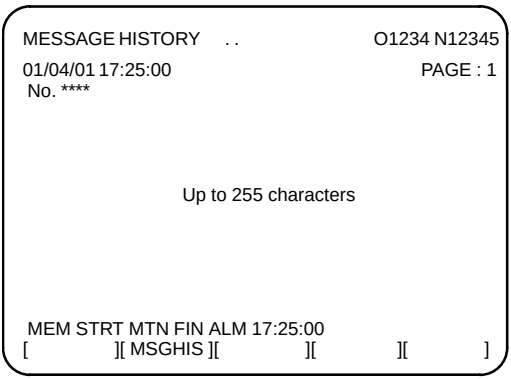
(1) Set the PRM3112#2 (OMH) to 1.

(2) Press the MESSAGE function key.

(3) Press the rightmost soft key ▷.

(4) Press the [MSGHIS] soft key.

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



- **Deletion of external operator messages record**

(1) The recorded external operator message can be deleted by setting the PRM3113#0 (MMC) to 1.
Pressing the [CLEAR] soft key erases all the records of the external operator message.

(2) The PRM3113#7 and #6 (MS1 and MS0) specify the number of records to be displayed on the external operator message history screen. When the bits are changed, all external operator message records retained up to that point are erased.

- Parameter

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

MHC The records of an external operator message:

0 : Cannot be erased.

1 : Can be erased.

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

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

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

OMH The external operator message history screen is:

0 : Not displayed.

1 : Displayed.

14.4 Operation History

This function displays the key and signal operations performed by the operator, together with the corresponding alarms.
This function records the following data:

(1) MDI key operations performed by the operator

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

(3) Details of alarms

(4) Time stamp (date and time)

14.4.1 Displaying the operation history

(1) Set the PRM3106#4 (OPH) to 1.

(2) Press the [SYSTEM] function key.

(3) Press the continue menu key [▷]. The [OPEHIS] (OPERATION HISTORY) soft key are displayed.

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

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

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

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

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

(5) To display the next part of the operation history, press the page down key [PAGE ⬇]. The next page is displayed.

To display the interface between two pages, press cursor key [➡] or [⬅]. The screen is scrolled by one row. On a 12–soft key type LCD, pressing the cursor key scrolls the screen by half a page.

These soft keys can also be used:

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

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

Data displayed on the operation history screen

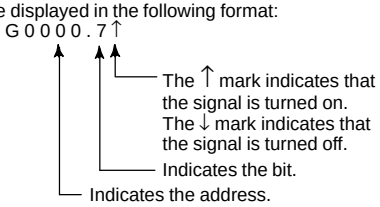
(1) MDI keys

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

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

(2) Input and output signals

General signals are displayed in the following format:



Some signals are indicated by their symbol names.
(Example)
SBK ↑ (Indicates that the single block switch is turned on.)

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

Input signal					Name displayed
MD1	ND2	MD4	REF	DNC1	
0	0	0	0	0	MDI
1	0	0	0	0	MEM
1	0	0	0	1	RMT
0	1	0	0	0	NOMODE
1	1	0	0	0	EDT
0	0	1	0	0	H/INC
1	0	1	0	0	JOG
1	0	1	1	0	REF
0	1	1	0	0	TJOG
1	1	1	0	0	THND

Input signal		Name displayed
ROV1	ROV2	
0	0	R100%
1	0	R50%
0	1	R25%
1	1	RF0%

(3) NC alarms

NC alarms are displayed in reverse video.
P/S alarms, system alarms, and external alarms are displayed together with their numbers.
For other types of alarms, only the alarm type is displayed. (No details are displayed.)
For two–path control, the operations of path 2 are displayed in the same way, but preceded by S_.

Example) P/S0050, SV_ALM, S_APC_ALM

(4) Time stamp (date and time)

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

1) Date and time of power–on

2) Date and time of power–off

3) Date and time when an NC alarm occurs

4) The clock time is recorded at predetermined intervals, together with each new calendar day.

1) The power–on time is displayed as shown below:

01/01/20 ==== Year/Month/Day
09:15:30 ==== Hour:Minute:Second

2) The power–off time and the time when an NC alarm occurred are displayed in reverse video.

01/01/20 ==== Year/Month/Day
09:15:30 ==== Hour:Minute:Second

If a system alarm occurs, the date and time are not recorded.

3) At predetermined intervals, the clock time is displayed in reverse video. Set the interval in minutes in PRM3122. If zero is set, the time is stamped at ten–minute intervals.

09:15:30 ==== Hour:Minute:Second
Each new calendar day is displayed in reverse video.
01/01/20 ==== Year/Month/Day

CAUTION1 The clock time is recorded for a specified interval only when data is stored within that interval.

CAUTION2 If a system alarm is issued, the system alarm occurrence time is used for power–off display.

14.4.2 Operation history signal selection screen

Before I/O signals can be recorded in the operation history, prior setting is required.

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

(1) Set the PRM3106#4 (OPH) to 1.

(2) Press the SYSTEM function key.

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

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

```
OP_HIS SIGNAL SELECT                              O1000 N02000

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

- Setting the input signal or output signal to be recorded in the operation history

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

14

```
OP_HIS SIGNAL SELECT                         O1000 N02000

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

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

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

Example) G0004 INPUT

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

(4) Select the bit to be recorded.

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

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

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

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

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

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

- Parameter–based setting

By setting PRM3206#4 (PHS), setting and display on the operation history signal selection screen can be linked with PRM12801–12900. By this linking, setting information related to input and output signals subject to operation history processing can be input and output in the same way as ordinary parameters.

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

Some signals cannot be recorded on the operation history screen.
See the Maintenance Manual (B–63525EN) for details.

14.4.3 Inputting and outputting the operation history data

Recorded data can be output to an input/output unit connected via a reader/puncher interface. An output record can be input from the input/output unit.
Set the input/output unit to be used in PRM20, 100–135.
To output the data, set a code in PRM20#1 (ISO).

- Output

(1) Select EDIT mode.

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

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

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

- Input

(1) Select EDIT mode.

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

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

14.4.4 Notes related to the operation history

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

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

(3) Once the storage becomes full, old data is deleted, starting from the oldest record.

(4) The recorded data is retained even after the power is turned off.

(5) The operation history function cannot execute sampling when the PRM3106#7 (OHS) is set to 1.

14.4.5 Parameter setting

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

OPH The operation history screen is:
0 : Not displayed.
1 : Displayed.

OHS The operation history is:
0 : Sampled (recorded).
1 : Not sampled (recorded).

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

[Valid data range] 0 to 1439

[Unit of data] Minute

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

	#7	#6	#5	#4	#3	#2	#1	#0
3206				PHS				

[Data type] Bit

PHS PRM12801–128900 are:

0 : Disabled.

1 : Enabled.

When PRM12801–12890 are enabled, setting and display using the operation history signal selection screen interact with PRM12801–12890.

12801	Number of a signal symbol table for selecting an operation history signal(1)
:	:
12820	Number of a signal symbol table for selecting an operation history signal(20)

[Valid data range] 1 to 10

Set the number of a symbol table including a signal address of which operation history is to be recorded for operation history channel (01) to (20) as follows:

1 : G0 to G255
2 : G1000 to G1255
3 : F0 to F255
4 : F1000 to F1255
5 : Y0 to Y127
6 : X0 to X127
9 : G2000 to G2255
10: F2000 to F2255

This parameter is valid when PRM3206#4 is set to 1.

12841	Number of a signal selected as an operation history signal(1)
:	:
12860	Number of a signal selected as an operation history signal(20)

[Valid data range] 0 to 255

Set the number of a signal address of which operation history is to be recorded for operation history channel (01) to (20) with a value between 0 and 255.
This parameter is valid when PRM3206#4 is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
12881	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0

History record bit settings for an operation history signal(01)

:

	#7	#6	#5	#4	#3	#2	#1	#0
12900	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0

History record bit settings for an operation history signal(20)

RB7 to RB0 For the signal address set in channel (01) to (20), of which operation history is to be recorded, the history of each bit is:

0 : Not recorded. (The history of this bit is not recorded.)
1 : Recorded. (The history of this bit is recorded.)
This parameter is valid when PRM3206#4 is set to 1.

- **Overview**

Servo positional deviations and torque commands can be graphically displayed.

The following two types of waveform diagnosis functions are supported:

(1) One–shot type

The one–shot type waveform diagnosis function can graphically display, as a waveform, any variation in those data items listed below. The start of data sampling can be triggered by the rising or falling edge of a machine signal. The following data can be sampled:

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

b. Composite speed for the first, second, and third axes

c. Spindle motor speed and load meter value

d. On/off state of a machine signal specified with a signal address

(2) Storage type

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

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

- **Parameters**

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

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

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

[Data type] Word
[Unit of data] ms
[Valid data range] 1 to 32760

DGN	3121	Selection of data of waveform diagnosis storage type

[Data type] Byte

The sixth–type sampling data of storage type of the waveform diagnosis function is:

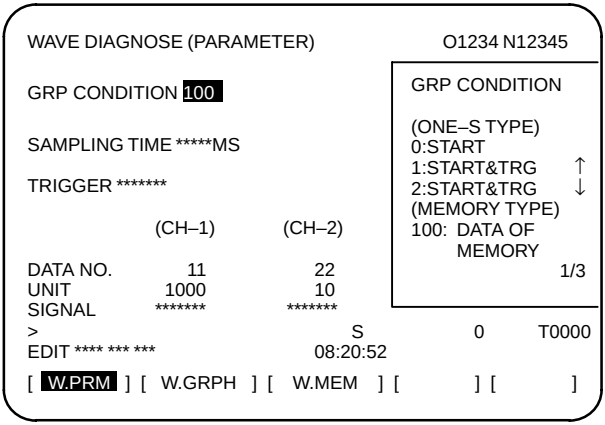
0 : Thermal simulation data

1 : Spindle load meter data of the first spindle

15.1 Waveform Diagnostic Parameter Screen

1. Press the SYSTEM key.
2. Press the continuous menu key ▷ several times, and the soft key [W.DGNS] is displayed.
3. Press [W.DGNS], then the parameter screen for the waveform diagnosis is displayed.

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



15.1.1 Waveform diagnosis parameters (one–shot type)

(1) Display start condition

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

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

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

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

Valid data range: 10 to 32760
Units: ms

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

Example) G0007.2: ST signal

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

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

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

[Valid data range] 1 to 1000

[Unit] 0.001

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

15.1.2 Waveform diagnosis parameters (storage type)

(1) Display start condition

100 : Draws a waveform for the stored data.

(2) Sampling period: Invalid

(3) Trigger: Invalid

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

Data No.	Description	Units
00	Does not display a waveform.	–
0n	Servo error (8 ms) for the n–th axis (positional deviation)	Pulses (detection units)
1n	Pulse distribution for the n–th axis (move command)	Pulses (input increments)
2n	Torque for the n–th axis (actual current)	% (relative to maximum current)
5n	Actual speed for the n–th axis	min^{-1}
6n	Command current for the n–th axis	% (relative to maximum current)
7n	Thermal simulation data for the n–th axis (when the PRM3121 is set to 0.)	% (OVC alarm ratio)
111	Load meter for the n–th spindle (when the PRM3121 is set to 1.)	% (relative to maximum output)

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

[Valid data range] 1 to 1000

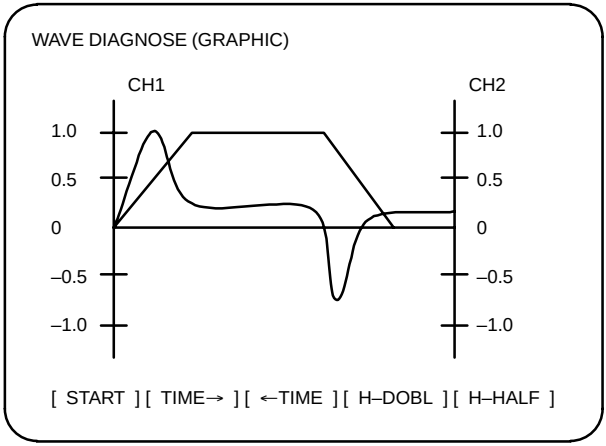
[Unit] 0.001

(6) Signal address: Invalid

15.2 Graphic of Wave Diagnosis Data

- Drawing operation
  The display of a waveform drawn by the method described later can be adjusted by the operation below.

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



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

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

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

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

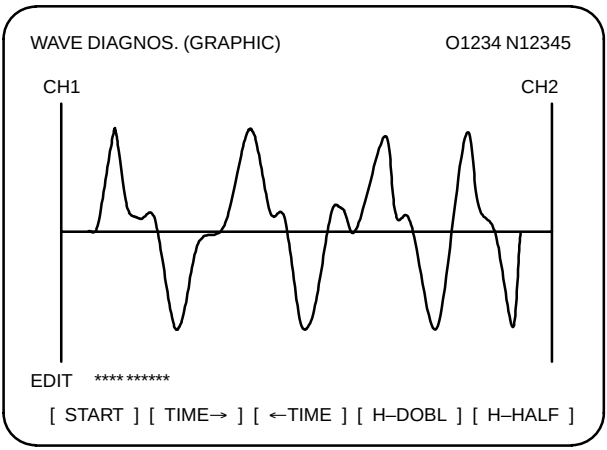
1) **[START]** : Starts Graphic data
2) **[TIME→]** : Shift the waveform of channel 1 and 2 rightward
3) **[←TIME]** : Shift the waveform of channel 1 and 2 leftward
4) **[H–DOBL]**: Double the time scale of the waveform of channel 1 and 2
5) **[H–HALF]** : Half the time scale of the waveform of channel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

15.2.1 Drawing a waveform for one–shot type waveform diagnosis

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

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

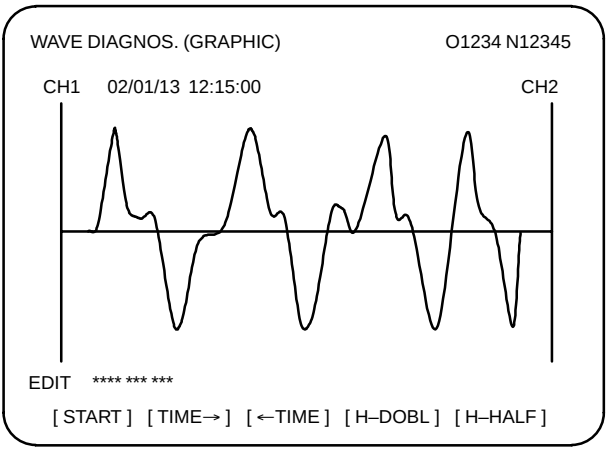
Pressing the [SATART] soft key starts data sampling. While sampling is being performed, S0AMPLING blinks at the top of the screen. Once data sampling has been completed, a waveform is automatically displayed.



15.2.2 Drawing a waveform for storage type waveform diagnosis

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

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



15.3 Data Sampling for Storage Type Waveform Diagnosis

Before the storage type waveform diagnosis function can be used, prior setting related to data sampling is required.

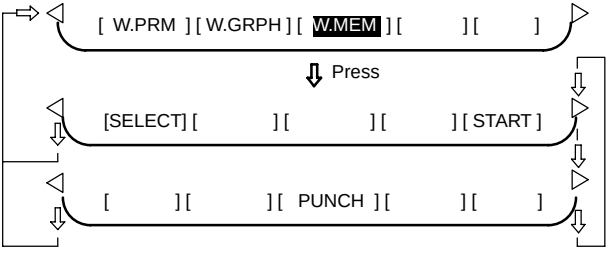
- Setting for sampling

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

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

```
WAVE DIAGNOS. (MEMORY)                    O1234 N12345

      CONDITION:  100              TRIGGER:  G0123.4

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

EDIT   **** *** ***                          08:20:52

 [ SELECT ] [        ] [        ] [        ] [ START ]
```

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



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

Example) XYZ + [SELECT] or INPUT

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

NOTE1 Data items for which ***** is displayed cannot be set.

NOTE2 To change the sampling axes, enter new axis names then press the [SELECT] soft key. Pressing the [SLELCT] soft key without entering an axis name results in no sampling axis being set.

NOTE3 If the sampling axes are changed during data sampling, data sampling is stopped. In this case, press the [START] soft key to restart data sampling for the new sampling axes.

NOTE4 Initially, no sampling axis is set.

NOTE5 When the sixth–type sampling data is spindle load meter data (PRM3121 = 1), set the axis name S.

- Storage data parameters

(1) Storage stop condition

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

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

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

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

PRM3120 can be used to delay data storage being stopped by a specified period (ms), after the issue of a servo alarm.

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

Example) G0007.2: ST signal

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

Data type	Description	Units
POS ERROR	Servo error (8 ms) for the n–th axis	Pulses (detection units)
MOTION CMD	Pulse distribution for the n–th axis	Pulses (input increments)
CURRENT (%)	Torque for the n–th axis	% (relative to maximum current)
SPEED (RPM)	Actual speed for the n–th axis	min^{-1}
TORQUE CMD	Command current for the n–th axis	% (relative to maximum current)
HEAT SIMLT	Thermal simulation data for the n–th axis (when the PRM3121 is set to 0.)	% (OVC alarm ratio)
LOAD METER	Load meter for the n–th spindle (when the PRM3121 is set to 1.)	% (relative to maximum output)

NOTE With PRM3121, choose whether the sixth–type sampling data is thermal simulation data or spindle load meter data. When spindle load meter is selected, the spindle data of the first axis is stored with each path.

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

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

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

15.4 Output of Storage Type Waveform Diagnosis Data

Storage type waveform diagnosis data can be output to an input/output unit connected to the reader/puncher interface.
Set the input/output unit to be used for output in PRM20, 100–135.
In addition, set a code in PRM0#1 (ISO)

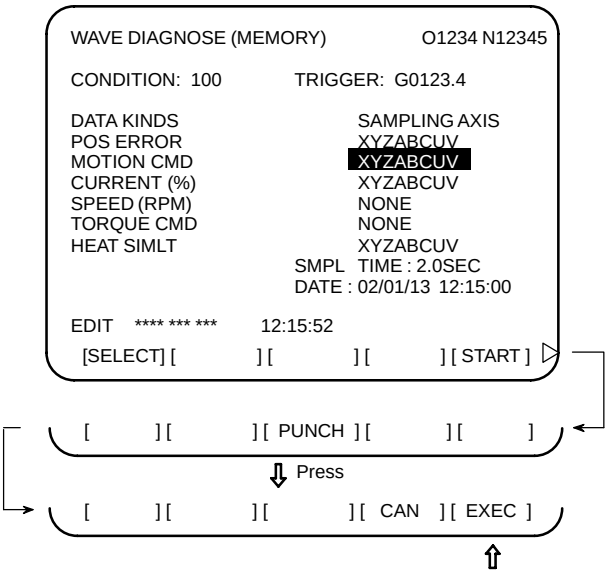
(a) Output of data
Storage type waveform diagnosis data can be output to an input /output unit, according to the procedure below.

1 Set the EDIT mode.

2 Press the SYSTEM function key, then select the waveform diagnosis (memory data) screen.

3 Press the soft keys [W.MEM], ▷, [PUNCH] and [EXEC], in this order.

For an explanation of input/output to and from the FANUC Floppy Cassette or FA Card, see item (b).



(b) Output to FANUC Floppy Cassette or FA Card

In the item below, a FANUC Floppy Cassette is referred to as a Cassette, and a FANUC FA Card as a Card.

(i) Directory

When the directory of a Cassette or Card is displayed, the name of a file containing storage type wave form diagnosis data is registered as WAVE DIAGNOS.
The procedure for displaying the directories is described later.

(ii) Output to the Cassette/Card

Servo alarm type waveform diagnosis data can be output to a Cassette or Card by following the procedure below.

1 Set the EDIT mode.

2 Press the [SYSTEM] function key, then select the waveform diagnosis (memory data) screen.

3 Open the write protect switch of the Cassette or Card.

4 Press the soft keys [W.MEM], [▷], [PUNCH] and [EXEC] soft keys, in this order.

Specify a file number at the end.
The file name WAVE DIAGNOS is assigned.

If the Cassette or Card used as the output destination already contains a file having the same name as that specified, ALM086 is issued. To a Cassette or Card, only one file of waveform diagnosis data of storage type can be output. When output to a Cassette or Card containing unnecessary storage type waveform diagnosis data is needed, delete the file having the same name from the Cassette or Card beforehand.

Deleting a file is described later.

(iii) Displaying the directory of a Cassette or Card

The directory of a Cassette or Card can be displayed by following the procedure below.

1 Set EDIT mode.

2 Press the [PROG] function key, then select the program screen.

3 Press [▷]. Then press [FLOPPY].

4 Press the page change key [PAGE↓].

In this way, the directory is displayed.

(iv) Deleting a file from a Cassette or Card

A file can be deleted from a Cassette or Card by following the procedure below.

1 Set EDIT mode.

2 Press the [PROG] function key, then select the program screen.

3 Open the write protect switch of the Cassette or Card.

4 Press [FLOPPY].

5 Press [DELETE].

6 Type in a file number, then press [F SET].

7 Press [EXEC].
The file having the specified file number is deleted. After the file is deleted, all subsequent file numbers are decremented by 1.

NOTE The floppy directory display function is optional.

16.1 Initial Setting Servo Parameters (αi/α)

This section describes how to set initial servo parameters, which is used for field adjustment of machine tool.

1. Turn on power at the emergency stop condition.
2. Set the parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

#0 (SVS) 0 : Servo setting tuning screen is not displayed.
1 : Servo setting tuning screen is displayed.

3. Turn off the power once then turn it on again.
4. Display the servo parameter setting screen by the following operation:

   [SYSTEM] key [▷] [SV.PARA].

   Press [▷] (continuous menu key) several times until the [SV.PARA] soft key appears.
5. Input data ((1) to (8) below) required for initial setting using the cursor key and page key.
6. Ensure that bit 1 of the initial set bit parameter is 0, and turn off the power then back on.

```
SERVO SETTING
                              X-AXIS       Y-AXIS
(1) INITIAL SET BIT        00000000     00000000
(2) MOTOR ID NO.                 47           47
(3) AMR                    00000000     00000000
(4) CMR                           2            2
(5) FEED GEAR N                   1            1
        (N/M)   M               125          125
(6) DIRECTION SET               111          111
(7) VELOCITY PULSE NO.         8192         8192
    POSITION PULSE NO.        12500        12500
(8) REF.COUNTER                8000         8000
```

Corresponding parameter No.

⇦ PRM2000
⇦ PRM2020
⇦ PRM2001
⇦ PRM1820
⇦ PRM2084
⇦ PRM2085
⇦ PRM2022
⇦ PRM2023
⇦ PRM2024
⇦ PRM1821

(1) Initial set bit

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	2000							DGPRM	PLC01

#0 (PLC01) 0 : Values of PRM2023 and 2024 are used as they are:
1 : Values of PRM2023 and 2024 are multiplied by 10.
Usually, set this parameter to 0. (Set this parameter according to "(7) Number of velocity pulses and position pulses" described later.)

#1 (DGPRM)☆ 0 : Initial setting of digital servo parameter is done.
1 : Initial setting of digital servo parameter is not done.

#3 Turns to 1 when the initial setting is done.

(2) Motor ID No.
Select the motor ID No. of the servo motor to be used, according to the motor model and drawing number (the middle four digits of A06B–XXXX–BXXX) listed in the tables on subsequent pages.

NOTE Servo axes are controlled in groups of two axes. So, for successive servo control numbers (odd number and even number), motor type number unified for servo HRV1 or for servo HRV2 or HRV3 must be specified.

(2-1) αi series servo motor
In the following tables for αi series servo motor, The motor type numbers not enclosed in parentheses are for servo HRV1, and the motor type numbers enclosed in parentheses are for servo HRV2 and HRV3.

❑ αi series servo motor

Motor model	α1/5000i	α2/5000i	α4/4000i	α8/3000i	α12/3000i
Motor specification	0202	0205	0223	0227	0243
Motor type No.	152(252)	155(255)	173(273)	177(277)	193(293)

Motor model	α22/3000i	α30/3000i	α40/3000i	α40/3000i FAN
Motor specification	0247	0253	0257	0258
Motor type No.	197(297)	203(303)	207(307)	208(308)

❑ αCi series servo motor

Motor model	αC4/3000i	αC8/2000i	αC12/2000i	αC22/2000i
Motor specification	0221	0226	0241	0246
Motor type No.	171(271)	176(276)	191(291)	196(296)

Motor model	αC30/1500i
Motor specification	0251
Motor type No.	201(301)

❑ αMi series servo motor

Motor model	αM2/ 5000i	αM3/ 5000i	αM8/ 4000i	αM12/ 4000i	αM22/ 4000i
Motor specification	0212	0215	0235	0238	0265
Motor type No.	162(262)	165(265)	185(285)	188(288)	215(315)

Motor model	αM30/ 4000i	αM40/ 4000i	αM50/ 3000i FAN	αM100/ 2500i
Motor specification	0268	0272	0275	0285
Motor type No.	218(318)	222(322)	225(325)	235(335)

❑ αM(HV)*i* series servo motor

Motor model	αM2/ 5000HV*i*	αM3/ 5000HV*i*	αM8/ 4000HV*i*	αM12/ 4000HV*i*
Motor specification	213	216	236	239
Motor type No.	163(263)	166(266)	186(286)	189(289)

Motor model	αM22/ 4000HV*i*	αM30/ 4000HV*i*	αM40/ 4000HV*i*	αM50/ 3000HV*i* FAN
Motor specification	266	0269	0273	0276
Motor type No.	216(316)	219(319)	223(323)	226(326)

These motor type Nos. may not be supported depending on the servo software being used.
The following lists the motor type Nos. together with the applicable servo software series and editions (A or later).

❑ α*i* series servo motor

Motor model and motor type number / Servo software series		9096	90B0
α1/5000*i*	152(252)	A	H
α2/5000*i*	155(255)	A	H
α4/4000*i*	173(273)	A	H
α8/3000*i*	177(277)	A	H
α12/3000*i*	193(293)	A	H
α22/3000*i*	197(297)	A	H
α30/3000*i*	203(303)	A	H
α40/3000*i*	207(307)	A	H
α40/3000*i* FAN	208(308)	C	I

❑ αC*i* series servo motor

Motor model and motor type number / Servo software series		9096	90B0
αC4/3000*i*	171(271)	A	H
αC8/2000*i*	176(276)	A	H
αC12/2000*i*	191(291)	A	H
αC22/2000*i*	196(296)	A	H
αC30/1500*i*	201(301)	A	H

❑ αM*i* series servo motor

Motor model and motor type number \ Servo software series		9096	90B0
αM2/5000*i*	162(262)	A	H
αM3/5000*i*	165(265)	A	H
αM8/4000*i*	185(285)	A	H
αM12/4000*i*	188(288)	A	H
αM22/4000*i*	215(315)	A	H
αM30/4000*i*	218(318)	A	H
αM40/4000*i*	222(322)	A	H
αM50/3000*i* FAN	225(325)	D	N
αM100/2500*i*	235(335)	D	N

❑ αM(HV)*i* series servo motor

Motor model and motor type number \ Servo software series		9096	90B0
αM2/5000HV*i*	163(263)	D	N
αM3/5000HV*i*	166(266)	D	N
αM8/4000HV*i*	186(286)	D	N
αM12/4000HV*i*	189(289)	D	N
αM22/4000HV*i*	216(316)	D	N
αM30/4000HV*i*	219(319)	D	N
αM40/4000HV*i*	223(323)	D	N
αM50/3000HV*i* FAN	226(326)	D	N

(2-2) α series servo motor

❑ α series servo motor

Motor model	α1/3000	α2/2000	α2/3000	α2.5/3000	α3/3000
Motor specification	0371	0372	0373	0374	0123
Motor type No.	61	46	62	84	15

Motor model	α6/2000	α6/3000	α12/2000	α12/3000	α22/1500
Motor specification	0127	0128	0142	0143	0146
Motor type No.	16	17	18	19	27

Motor model	α22/2000	α22/3000	α30/1200	α30/2000	α30/3000
Motor specification	0147	0148	0151	0152	0153
Motor type No.	20	21	28	22	23

Motor model	αL3/3000	αL6/3000	αL9/3000	αL25/3000	αL50/3000
Motor specification	0561	0562	0564	0571	0572
Motor type No.	68	69	70	50	60

❑ αC series servo motor

Motor model	αC3/2000	αC6/2000	αC12/2000	αC22/1500
Motor specification	0121	0126	0141	0145
Motor type No.	7	8	9	10

❑ α(HV) series servo motor

Motor model	α3HV	α6HV	α12HV	α22HV	α30HV	α40HV
Motor specification	0171	0172	0176	0177	0178	0179
Motor type No.	1	2	3	102	103	118

Motor model	α1000HV	α22HV	α30HV
Motor specification	0131	0177	0178
Motor type No.	117	4	5
		40–A driving	40–A driving

❑ αM series servo motor

Motor model	αM2/3000	αM2.5/3000	αM3/3000	αM6/3000	αM9/3000
Motor specification	0376	0377	0161	0162	0163
Motor type No.	98	99	24	25	26

Motor model	αM22/3000	αM30/3000	αM40/3000FAN	αM40/3000
Motor specification	0165	0166	0170	0170
Motor type No.	100	101	108	110
			360–A driving	130–A driving

❑ αM(HV) series servo motor

Motor model	αM6/ 3000HV	αM9/ 3000HV	αM22/ 3000HV	αM30/ 3000HV	αM40/ 3000HV
Motor specification	0182	0183	0185	0186	0189
Motor type No.	104	105	106	107	119

(2-3) β series servo motor

In the following tables for β series servo motor, The motor type numbers not enclosed in parentheses are for servo HRV1, and the motor type numbers enclosed in parentheses are for servo HRV2 and HRV3.

❑ β series servo motor

Motor model	β0.5	β1/3000	β2/3000	β3/3000	β6/2000
Motor specification	0113	0101	0102	0105	0106
Motor type No.	13	35	36	33	34

Motor model	β0.5	β1/3000	β2/3000
Motor specification	0113	0101	0102
Motor type No.	14	11	12
	20–A driving	20–A driving	20–A driving

❑ βM series servo motor

Motor model	βM0.2/ 4000	βM0.3/ 4000	βM0.4/ 4000	βM0.5/ 4000	βM1/4000
Motor specification	0210	0211	0114	0115	0116
Motor type No.	*(260)	*(261)	*(280)	181(281)	182(282)

* HRV1 control cannot be used. Only HRV2/3 control can be used.

These motor type Nos. may not be supported depending on the servo software being used.
The following lists the motor type Nos. together with the applicable servo software series and editions (A or later).

❑ β series servo motor

Motor model and motor type number \ Servo software series		9096	90B0
β0.5	13	A	A
β1/3000	35	A	A
β2/3000	36	A	A
β3/3000	33	A	A
β6/2000	34	A	A

❑ βM series servo motor

Servo software series / Motor model and motor type number		9096	90B0
βM0.2	*(260)	–	N
βM0.3	*(261)	–	N
βM0.4	*(280)	–	N
βM0.5	181(281)	D	N
βM1	182(282)	D	N

* HRV1 control cannot be used. So, the 9096 series cannot be used.

(2-4) Linear motor

❑ Linear motor

Motor model	1500A/4	3000B/2	6000B/2	9000B/2	15000C/2
Motor specification	0410	0411	0412	0413	0414
Motor type No.	90	91	92	93	94

Motor model	3000B/4	6000B/4	9000B/4	15000C/3
Motor specification	0411–B811	0412–B811	0413–B811	0414–B811
Motor type No.	120	121	122	123

Motor model	300D/4	600D/4	900D/4
Motor specification	0421	0422	0423
Motor type No.	124	125	126

Motor model	6000B/4	9000B/2	9000B/4	15000C/2
Motor specification	0412–B811	0413	0413–B811	0414
Motor type No.	127	128	129	130
	160–A driving	160–A driving	360–A driving	360–A driving

These motor type Nos. may not be supported depending on the servo software being used.
The following lists the motor type Nos. together with the applicable servo software series and editions (A or later).

❑ Linear motor

Motor model and motor type number \ Servo software series		9096	90B0
1500A/4	90	A	A
3000B/2	91	A	A
6000B/2	92	A	A
9000B/2	93	A	A
15000C/2	94	–	A
3000B/4	120	A	A
6000B/4	121	A	A
9000B/4	122	A	A
15000C/3	123	A	A
300D/4	124	A	A
600D/4	125	A	A
900D/4	126	A	A

NOTE With the 9096 series, 15000C/2 cannot be used.

(2-5) Others

Parameters for driving the β series servo motors and linear motors with the αi series servo amplifier

With the β motors and linear motors indicated in the table below, the maximum amplifier current varies, depending on whether the αi series servo amplifier or the αi series servo amplifier is used for driving. So, the standard parameters need to be set differently.

Motor model	When driven by α servo amplifier		When driven by αi servo amplifier	
	Maximum amplifier current value [A]	Motor number	Maximum amplifier current value [A]	Motor number
β0.5/3000	12	13	20	14
β1/3000	12	35	20	11
β2/3000	12	36	20	12
6000B/4	240	121	160	127
9000B/2	130	93	160	128
9000B/4	240	122	360	129
15000C/2	240	94	360	130

Series/edition	When driven by α servo amplifier	When driven by αi servo amplifier
9096 series	A	D
90B0 series	A	N

(3) Arbitrary AMR function

		#7	#6	#5	#4	#3	#2	#1	#0
PRM	2001	AMR7	AMR6	AMR5	AMR4	AMR4	AMR3	AMR2	AMR1

NOTE Set "00000000".

(4) CMR

PRM	1820	Command multiply ratio

1) When CMR is 1/2 to 1/27 Set value= $\frac{1}{\text{CMR}}$ +100

2) When CMR is 0.5 to 48 Set value=2×CMR

(5) N/M of feed gear (F·FG)

PRM	2084	n for flexible feed gear
PRM	2085	m for flexible feed gear

Setting for the αi pulse coder in the semi–closed mode

$$\frac{\text{F·FG numerator } (\leq 32767)\ \text{(Note 1)}}{\text{F·FG denominator } (\leq 32767)} = \frac{\text{Necessary position feedback pulses per motor revolution}}{1{,}000{,}000 \quad \text{(Note 2)}} \quad \text{(as irreducible fraction)}$$

NOTE1 For both F·FG number and denominator, the maximum setting value (after reduced) is 32767.

NOTE2 αi pulse coders assume one million pulses per motor revolution, irrespective of resolution, for the flexible feed gear setting.

NOTE3 If the calculation of the number of pulses required per motor revolution involves π, such as when a rack and pinion are used, assume π to be approximately 355/113.

[Example]
For detection in 1 μm units, specify as follows:

Ball screw lead (mm/rev)	Number of necessary position pulses (pulses/rev)	F·FG
10	10000	1/100
20	20000	2/100 or 1/50
30	30000	3/100

[Example]
If the machine is set to detection in 1,000 degree units with a gear reduction ratio of 10:1 for the rotation axis, the table rotates by 360/10 degrees each time the motor makes one turn.
1000 position pulses are necessary for the table to rotate through one degree.
The number of position pulses necessary for the motor to make one turn is:

360/10 × 1000 = 36000 with reference counter = 36000

$$\frac{\text{F·FG numerator}}{\text{F·FG denominator}} = \frac{36000}{1{,}000{,}000} = \frac{36}{1000}$$

Setting for use of a separate detector (full–closed)

$$\frac{\text{F·FG numerator } (\leq 32767)}{\text{F·FG denominator } (\leq 32767)} = \frac{\text{Number of position pulses corresponding to a predetermined amount of travel}}{\text{Number of position pulses corresponding to a predetermined amount of travel from a separate detector}} \text{ (as irreducible fraction)}$$

[Example]
To detect a distance of 1–μm using a 0.5–μm scale, set the following:

$$\frac{\text{Numerator of F·FG}}{\text{Denominator of F·FG}} = \frac{L/1}{L/0.5} = \frac{1}{2}$$

<<Examples of calculation>>

		1/1000 mm	1/10000 mm
One revolution of motor	8mm	n=1/m=125	n=2/m=25
	10mm	n=1/m=100	n=1/m=10
	12mm	n=3/m=250	n=3/m=25

(6) Direction of travel

PRM 2022 — Rotational direction of motor

111 : Normal (clockwise) –111 : Reverse (counterclockwise)

(7) Number of velocity pulses and position pulses

	Parameter number	Semi–closed loop	Closed loop		
			Parallel type	Serial linear scale	Serial rotary scale
Increment system	_	1/1000 1/10000	1/1000 1/10000	1/1000 1/10000	1/1000 1/10000
Bit 0 of initial setting bit	PRM 2000#0	#0=0	#0=0	#0=0	#0=0
Number of velocity pulses	PRM 2023	8192	8192	8192	8192
Number of position pulses	PRM 2024	12500	Ns (*)	Ns (*)	Np (*)

Ns: Number of position pulses from the separate detector counted when the motor makes one revolution
(Value after multiplication by a factor of 4 not considering the flexible feed gear)

Np: 12500 × (Deceleration rate or acceleration rate from motor to table)
Example: When the motor makes 10 revolutions for one table revolution, Np = 12500/10 = 1250

PRM 2023 — Number of velocity pulses

PRM 2024 — Number of position pulses

With the CNC, there is no dependency relationship between the increment system and the initialization bit (PRM2000#0). However, the conventional setting is also possible. See the note below.

NOTE When Ns or Np is greater than 32767, make a setting by using the method below.

Servo software series	Setting method
90B0 series	Set the number of position pulses by using the product of the two parameters including the position feedback pulse conversion coefficient (PRM2185).
9096 series	Reduce the number of velocity pulses (PRM2023) and the number of position pulses (PRM2024) by a factor of 10 by setting the initialization bit (PRM2000#0) to 1.

- Setting the number of position pulses by using the position feedback pulse conversion coefficient

When the number of position feedback pulses = A × B, select B so that A is within 32767.

A: Number of position feedback pulses (= PRM2024)
Set a value not greater than 32767.

B: Position feedback pulse conversion coefficient (= PRM2185)
Set a value as small as possible not exceeding about 100 as a guideline. (When 0 is set, 1 is assumed.)

PRM 2185 | Position feedback pulse conversion coefficient

NOTE When the detector of the motor is an αi pulse coder (number of velocity pulses = 8192), set a 2 raised to a power (such as 2, 4, 8, and so forth) in this parameter.
(The position gain value used in the servo control software becomes more accurate.)

(Example of setting)

When a linear scale with a minimum resolution of 0.1 μm is used, and the travel distance per motor revolution is 16 mm

Ns = travel distance per motor revolution (mm)/minimum resolution of detector (mm)
= 16 mm/0.0001 mm = 160000 (> 32767)

Suppose that you consider two sets of A and B values that satisfy A × B = 160000 and A < 32767:

<1> A = 16000, B = 10
<2> A = 10000, B = 16

In <1>, B = 10. This means that this value is not 2 raised to a power.
In <2>, B = 16 = 2^4. This means that this value is 2 raised to the forth power.
So, by using the setting of <2>, set the following:
A (PRM2024) = 10000
B (PRM2185) = 16

When servo control software of the 9096 series is used, the position feedback pulse conversion coefficient cannot be used.

(8) Reference counter

PRM 1821 | Reference counter capacity for each axis (0 – 99999999)

Specify the grid interval for the reference position return in the grid method.

$$\text{Size of the reference counter} = \frac{\text{grid interval}}{\text{detection unit}}$$

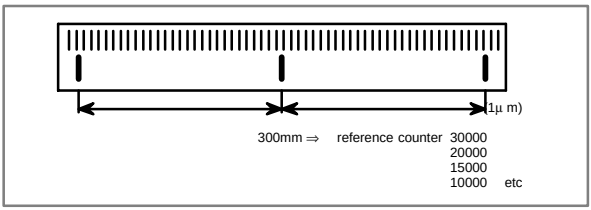
Grid interval = the amount of travel per rotation of the pulse coder

- Separate Type Pulse Coder or Linear Scale is Used

PRM		
	1821	Reference counter capacity per axis [P]

Normally, the number of feedback pulses per motor revolution is set to the reference counter capacity.
When plural reference marks are on a linear scale, a quotient of the distance between the reference marks divided by an integer may be used as a reference counter capacity:

Example)



16.2 FSSB Setting Screen

Connecting the CNC control unit to servo amplifiers via a high–speed serial bus (FANUC Serial Servo Bus, or FSSB), which uses only one fiber optics cable, can significantly reduce the amount of cabling in machine tool electrical sections.
Axis settings are calculated automatically according to the interrelationships between axes and amplifiers entered on the FSSB setting screen. PRM 1023, 1905, 1910 to 1919, 1936, and 1937 are specified automatically according to the results of the calculation.

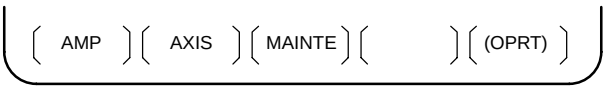
However, when a servo amplifier connected to another path is controlled under multi–path control, automatic setting is unusable. For such a connection, refer to the maintenance manual (B–63525EN).

16.2.1 Display

The FSSB setting screen displays FSSB–based amplifier and axis information. This information can also be specified by the operator.

1. Press function key 

.
2. To display [FSSB], press continuous menu key  several times.
3. Pressing soft key [FSSB] causes the AMP SET screen (or the previously selected FSSB setting screen) to appear, with the following soft keys displayed.



The FSSB setting screens include: AMP SET, AXIS SET, and AMP MAINTENANCE.

Pressing soft key [AMP] causes the AMP SET screen to appear.
Pressing soft key [AXIS] causes the AXIS SET screen to appear.
Pressing soft key [MAINTE] causes the AMP MAINTENANCE screen to appear.

1) Amplifier setting screen
The amplifier setting screen consists of two sections: the first section displays information about the slave, while the second section displays information about the separate detector interface units.

```
AMPLIFIER SETTING                          O1000 N00001
  NO. AMP    SERIES  UNIT    CUR.    AXIS  NAME
   1  A1-L      α   SVM-HV  40AL     1      X
   2  A1-M      α      SVM    20A     2      Y
   3  A2-L      β      SVM    40A     3      Z
   4  A3-L      α      SVM    20A     4      A
   5  A3-M      α      SVM    40A     5      B
   7  A4-L      α      SVU   240A     6      C


  NO.   EXTRA   TYPE    PCB ID
   6     M1       A     0000 DETECTOR(8AXES)
   8     M2       B     12AB
>_
MDI **** *** ***           13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][(OPRT)]
```

The amplifier setting screen consists of the following items:

- NO. (slave number)

  The numbers of up to ten slaves (up to eight amplifiers and up to two separate detector interface units) connected via the FSSB are displayed sequentially, with the one nearest to the CNC being number 1.

- AMP (amplifier type)

  The amplifier type display consists of the letter A, which stands for “amplifier,” a number that indicates the placing of the amplifier, as counted from that nearest to the CNC, and a letter such as L (first axis) or M (second axis) indicating the placing of the axis in the amplifier.

- AXIS NO. (controlled axis number)

  The axis number of each controlled axis specified in PRM1920 – 1929 is displayed. If a number specified in these parameters falls outside the range of between 1 and the maximum number of controlled axes, 0 is displayed.

- NAME (controlled axis name)

  The axis name assigned to a PRM1020 corresponding to a particular controlled axis number is displayed. If the controlled axis number is 0, – is displayed.

- The following items are displayed as amplifier information:
  - UNIT (servo amplifier unit type)
  - SERIES (servo amplifier name)
  - CURRENT (maximum rating)

- The following items are displayed as separate detector interface unit information:
  - SEPARATE

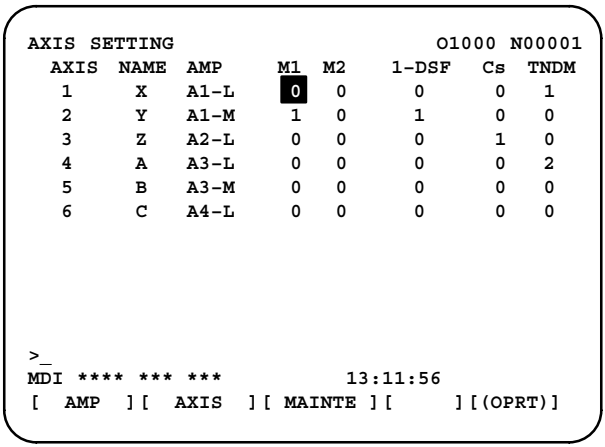
    This display consists of the letter M, which stands for “separate detector interface unit” and a number indicating the placing of the separate detector interface unit, as counted from that nearest to the CNC.
  - TYPE

    This display is a letter indicating the type of the separate detector interface unit.
  - PCB ID

    This display consists of four digits indicating the separate detector interface unit ID (hexadecimal). The separate detector interface unit ID is followed by DETECTOR (8–AXES) for the eight–axis separate detector interface unit or DETECTOR (4–AXES) for the four–axis separate detector interface unit.

2) Axis setting screen

The axis setting screen displays the information shown below:



This axis setting screen displays the following items:

- AXIS (controlled axis number)

  This item is the placing of the NC controlled axis.

- NAME (controlled axis name)

- AMP (type of the amplifier connected to each axis)

- M1 (connector number for separate detector interface unit 1)

  This item is the number of the connector for separate detector interface unit 1, specified in PRM1931.

- M2 (connector number for separate detector interface unit 2)

  This item is the number of the connector for separate detector interface unit 2, specified in PRM1932.

- 1–DSF

  This item is the value specified in bit 0 (parameter 1 DSP) of PRM1904. It is 1 for an axis (such as a learning control axis, high–speed current loop axis, or high–speed interface axis) that exclusively uses a DSP, which is usually shared by two–axes.

- Cs: Cs contour controlled axis

  This item is the value specified in PRM1933. It is 1 for the Cs contour controlled axis.

- TNDM (M series only)

  This item is the number specified in PRM1934. Consecutive odd and even numbers are displayed for the master and slave axes for tandem control.

3) Amplifier maintenance screen

The amplifier maintenance screen displays maintenance information for servo amplifiers. This screen consists of the following two pages, either of which can be selected by pressing the PAGE ↑ or PAGE ↓ key.

```
AMPLIFIER MAINTENANCE                O1000 N00001
  AXIS  NAME  AMP   SERIES    UNIT  AXES    CUR.
   1      X    A1-L    AI    SVM-HV   2     40AL
   2      Y    A1-M    AI       SVM   2      20A
   3      Z    A2-L    β        SVM   1      40A
   4      A    A3-L    α        SVM   2      20A
   5      B    A3-M    α        SVM   2      40A
   6      C    A4-L    α        SVU   1     240A




MDI **** *** ***           13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][     ]
```

```
AMPLIFIER MAINTENANCE                O1000 N00001
  AXIS  NAME    EDITION    TEST   MAINTE-NO.
   1      X       01A     020123       01
   2      Y       01A     020123       01
   3      Z       01A     020123       01
   4      A       02B     020123       01
   5      B       02B     020123       01
   6      C       02B     020123       01




MDI **** *** ***           13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][     ][     ]
```

The amplifier maintenance screen displays the following items:

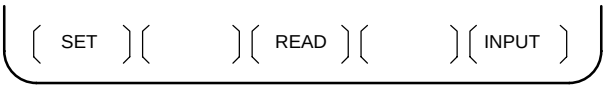
- AXIS (controlled axis number)
- NAME (controlled axis name)
- AMP (type of amplifier connected to each axis)
- SERIES (servo amplifier series of an amplifier connected to each axis)
- UNIT (unit type of a servo amplifier connected to each axis)
- AXES (maximum number of axes controlled by an amplifier connected to each axis)
- CUR. (maximum rating for amplifiers connected to each axis)
- EDITION (unit version number of an amplifier connected to each axis)
- TEST (date of test performed on an amplifier connected to each axis)

  Example) 020123 = January 23, 2002
- MAINTE–NO. (engineering change number for an amplifier connected to each axis)

16.2.2 Setting

NOTE When the servo of another system is controlled, FSSB cannot be set automatically.
Be careful when controlling two or three systems.
To control the servo of another system, make manual settings as described in Appendix G of Maintenance Manual (B–63525EN).

On an FSSB setting screen (other than the amplifier maintenance screen), pressing soft key [(OPRT)] displays the following soft keys:

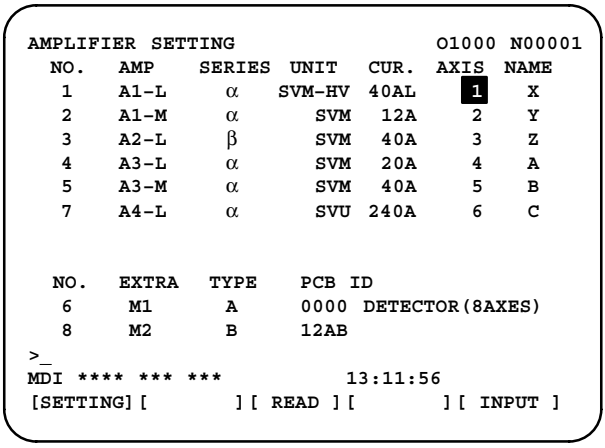


To enter data, place the machine in MDI mode or the emergency stop state, position the cursor to the point where a desired item is to be input, then enter the desired data and press soft key [INPUT] (or the INPUT key on the MDI panel).
When soft key [SET] is pressed after data has been entered, a warning message is displayed if the entered data contains an error. When the data is satisfactory, the corresponding parameter is set up.
To restore the previous value of a parameter if, for example, an entered value is incorrect, press soft key [READ].
When the power is turned on, values are read from the parameters and displayed on the screen.

NOTE1 For the parameters to be specified on the FSSB setting screen, do not attempt to enter values on the parameter screen using the MDI or a G10 command. Use only the FSSB screen to enter values for these parameters.

NOTE2 If pressing soft key [SET] results in a warning message being displayed, retry data entry, or press soft key [READ] to clear the warning message. Note that pressing the reset key does not clear the warning message.

1) Amplifier setting screen



The amplifier setting screen displays the following items:

- NO. (controlled axis number)

  For this item, enter a value of between 1 and the maximum number of controlled axes. If a number that falls outside this range is entered, the warning message “INVALID FORMAT” appears. If the entered controlled axis number is duplicate or 0, the warning message “SPECIFIED DATA IS OUT OF RANGE” appears when soft key [SET] is pressed to assert the entered value. In this case, no value can be entered for the parameter.

2) Axis setting screen

```
AXIS SETTING                              O1000 N00001
  AXIS  NAME  AMP     M1  M2    1-DSF   Cs  TNDM
    1     X   A1-L    0   0       0     0    1
    2     Y   A1-M    1   0       1     0    0
    3     Z   A2-L    0   0       0     1    0
    4     A   A3-L    0   0       0     0    2
    5     B   A3-M    0   0       0     0    0
    6     C   A4-L    0   0       0     0    0

>_
MDI **** *** ***            13:11:56
[SETTING][       ][ READ ][       ][ INPUT ]
```

On the axis setting screen, the following items can be specified:

- M1 (connector number for pulse module 1)

  For an axis that uses pulse module 1, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 1. When pulse module 1 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message “INVALID FORMAT” is displayed.

- M2 (connector number for pulse module 2)

  For an axis that uses pulse module 2, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 2. When pulse module 2 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message “INVALID FORMAT” is displayed.

- 1–DSF

  Enter 1 for the following axes, each of which exclusively uses a DSP, which is usually shared by two–axes. If a number other than 0 or 1 is entered, the warning message “INVALID FORMAT” is displayed.

  · Learning control axis

  · High–speed current loop axis

  · High–speed interface axis

- Cs (Cs contour controlled axis)

  Enter 1 for the Cs contour controlled axis. If a number other than 0 or 1 is entered, the warning message “INVALID FORMAT” is displayed.

- TNDM

  Enter odd and even numbers for the master and slave axes for tandem control. These numbers must be consecutive and in the range of between 1 and 8. If a number that falls outside the valid range is entered, the warning message “INVALID FORMAT” is displayed.

When soft key [SET] is pressed on the axis setting screen after data entry, the warning message “SPECIFIED DATA IS OUT OF RANGE” is displayed if any of the following conditions is satisfied.

- Both M1 and M2 are nonzero for an axis.
- Any two of TWO–AXES, Cs, and TANDEM are nonzero for an axis.
- A duplicate value is specified for M1.
- A duplicate value is specified for M2.
- A duplicate value is specified for Cs.
- A duplicate value is specified for TANDEM.
- An invalid master/slave axis pair is specified for TANDEM.

16.3 Servo Tuning Screen

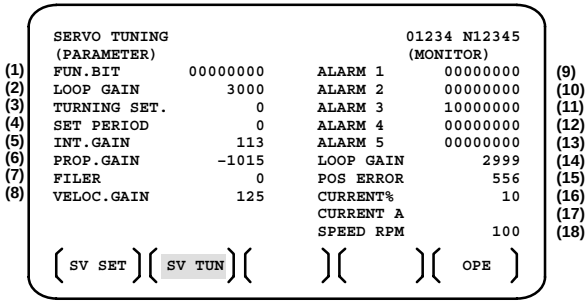
Main information about servo tuning can be displayed on a screen.

Display method

1. Set a parameter to display the servo tuning screen. (PRM3111#0=1)
2. Press [SYSTEM] key [▷] and soft key [SV. PARA] in this order.

   Press [▷] (continuous menu key) several times until the [SV.PARA] soft key appears.
3. Press soft key [SV.TUN] to select the servo tuning screen.

Display information



(1) Function bit : PRM2003

(2) Loop gain : PRM1825

(3) Tuning start : (Not used)

(4) Set period : (Not used)

(5) Integral gain : PRM2043

(6) Proportional gain : PRM2044

(7) Filter : PRM2067

(8) Velocity gain

$$\text{Set value} = \frac{(\text{PRM2021})+256}{256} \times 100$$

(9) Alarm 1 : DGN200 (Details of ALM400)

(10) Alarm 2 : DGN201 (Details of disconnection alarm, overload)

(11) Alarm 3 : DGN202 (Details of ALM319)

(12) Alarm 4 : DGN203 (Details of ALM319)

(13) Alarm 5 : DGN204 (Not used)
→The meanings of alarms 1 through 5 of (9) to (13) can be checked in Chapter 13, "Diagnosis Information."

(14) Loop gain : Actual loop gain

(15) Position error : Actual position error(DGN300)

(16) Current(%) : Indicate current with % to the rated value.

(17) Current(A) : Indicate current with A.

(18) Speed RPM : Number of motor actual rotation (unit : min^{-1})
For a linear motor, the travel speed of the linear motor is indicated (unit : mm/min).

16.4 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.
(Remark: Some instances of these units do not have ID information.)

- Servo motor
- Pulse coder
- Servo amplifier module
- Power supply module

NOTE For axes that are not used by the αi servo system, ID information of connected units cannot be obtained.

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During the second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)

The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
13112							SVI	IDW

[Data type] Bit

IDW The edit of the servo information screen or the spindle information screen is:

0 : Prohibited

1 : Allowed

SVI The servo information screen is:

0 : Displayed

1 : Not displayed

16.4.1 Displaying the servo ID screen

1 Press the SYSTEM function key, then press the [System] soft key.

2 Press the [SV–INF] soft key to display the screen as shown below.

```
SERVO INFORMATION                O0000 N00000

  X AXIS
 SERVO MOTOR SPEC  A06B-0268-B100
 SERVO MOTOR S/N   C00ZB1111
 PULSECODER SPEC.  A860-2000-T301
 PULSECODER S/N    00000001
 SERVO AMP SPEC.   A06B-6114-H211
 SERVO AMP S/N     V01311111
 PSM SPEC.         A06B-6087-H126#000001
 PSM S/N           V01311111



 MDI **** *** ***      19:12:26
(SYSTEM)(SV-INF)(SP-INF)(       )(       )
```

NOTE Servo information is stored in FROM. If there is a difference between the servo information in FROM and the actual servo information, the corresponding items are preceded by *, as shown below.

```
SERVO INFORMATION                O0000 N00000

  X AXIS
 SERVO MOTOR SPEC  A06B-0268-B100
 SERVO MOTOR S/N   C00ZB1111
 PULSECODER SPEC.  A860-2000-T301
 PULSECODER S/N    00000001
*SERVO AMP SPEC.   A06B-6114-H211
*SERVO AMP S/N     V01311111
 PSM SPEC.         A06B-6087-H126#000001
 PSM S/N           V01311111


)_
 MDI **** *** ***      19:12:26
[SYSTEM][SV-INF][SP-INF][        ][ (OPRT) ]
```

Additional Information

Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement.

To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.

(1) Make the registered data editable. (PRM13112#0(IDW) = 1)
(2) On the edit screen, place the cursor on the item from which you want to delete the * mark.
(3) Operate the soft keys [CHANGE], [INPUT], and [SAVE] in that order.

16.4.2 Editing the servo ID screen

1 Assume that PRM13112#0(IDW) = 1.
2 Press the MDI switch on the machine operator's panel.
3 Follow the steps shown in "Displaying the servo ID screen" to display the screen as shown below.

```
SERVO INFORMATION                O0000 N00000

  X AXIS
 SERVO MOTOR SPEC  A06B-0268-B100
 SERVO MOTOR S/N   C00ZB1111
 PULSECODER SPEC.  A860-2000-T301
 PULSECODER S/N    00000001
 SERVO AMP SPEC.   A06B-6114-H211
 SERVO AMP S/N     V01311111
 PSM SPEC.         A06B-6087-H126#000001
 PSM S/N           V01311111


)_
 MDI **** *** ***      19:12:26
[SYSTEM][SV-INF][SP-INF][        ][ (OPRT) ]
```

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

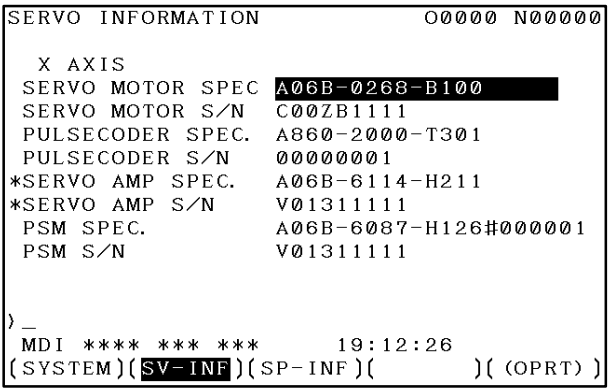
16.4.3 Screen operation

Mode	Key operation	Use
Viewing (*1)	Page key	Scrolls up or down on a screen–by–screen basis.
Editing (*2)	Soft key [INPUT]	Replace the selected ID information at the cursor position with the character string in key–in buffer.
	[CANCEL]	Deletes the character string in key–in buffer.
	[CHANGE]	Transfers the selected ID information at the cursor position that was sent by the servo, to key–in buffer. Only the items preceded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the servo information screen in FROM.
	[RELOAD]	Cancels the ID information that has been changed on the servo information screen and loads ID information from FROM.
	Page key	Scrolls up or down on a screen–by–screen basis.
	Cursor key	Scrolls up or down the selection of ID information.

*1 Viewing mode: when PRM13112#0 = 0

*2 Editing mode: when PRM13112#0 = 1

*3 Servo information is stored in FROM (in the MINFO file). If there is a difference between the servo information in FROM and the actual servo information, the corresponding items are preceded by *.



16.5 αi Servo Warning Interface

The αi servo system can report the warning status before one of the following target alarms occurs.
When the warning status is entered, a report to the PMC is issued.
For example, this signal can be used by the machine for retracting tools from the time a warning occurs by the time a servo alarm occurs.

Signal

Servo warning detail signals SVWRN1 to 4 <F093#4 to #7>

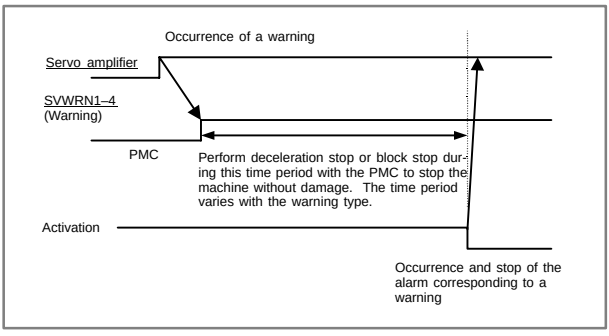
[Classification] output signal

[Function] reports the warning signal corresponding to the state of the servo amplifier.

[Output condition] The following table shows the warning statuses of the servo amplifier and their corresponding warning signals.

Corresponding alarm messages	Servo warning detail signals (F93)				Time from when a signal is issued to until an alarm occurs
	SVWRN4 (#7)	SVWRN3 (#6)	SVWRN2 (#5)	SVWRN1 (#4)	
444 n–AXIS: INV. COOLING FAN FAILURE	1	0	0	0	One minute
601 n–AXIS: INV. RADIATOR FAN FAILURE	1	0	0	1	Until overheat occurs (inconstant)
443 n–AXIS: CNV. COOLING FAN FAILURE	1	1	0	0	One minute
606 n–AXIS: CNV. RADIATOR FAN FAILURE	1	1	0	1	Until overheat occurs (inconstant)
431 n–AXIS: CNV. OVERLOAD	1	1	1	0	One minute
607 n–AXIS: CNV. SINGLE PHASE FAILURE	1	1	1	1	PSMR: Five seconds, PSM: One minute

A timing chart for handling a warning is shown below.



16.6 Reference Position Return

16.6.1 Manual reference position return

The tool is moved in the direction specified by PRM1006#5(ZMI) setting the feed axis and direction select signal to "1" during manual reference position return mode. Movement will continue until the reference position is obtained.

The following signals relate with the manual reference position return:

	Manual Reference Position Return
Mode selection	MD1, MD2, MD4 <G043#0 – #2>
Selection of reference position return	ZRN, MREF <G043#7, F045#5>
Selection of axis to be moved	**+J1, –J1, +J2, –J2, +J3, –J3, ...** <G100, G102>
Selection of direction to be moved	
Selection of speed to be moved	ROV1, ROV2 <G104#0, #1>
Deceleration signal for reference position return	*DEC1, *DEC2, *DEC3, ... <X009> (<G196> when PRM3006#0(GDC) = 1)
Completion signal for reference position return	ZP1, ZP2, ZP3, ... <F094>
Reference position establishment signal	ZRF1, ZRF2, ZRF3, ... <F120>

16.6.1.1 Basic procedure for manual reference position return (dog–based method)

(1) Select JOG mode or TEACH IN JOG mode, and the manual reference position return selection signal ZRN to "1".

(2) Feed a target axis toward the reference position by setting an appropriate feed axis and direction selection signal (+J1, –J1, +J2, –J2,…) "1".

(3) While the feed axis and direction selection signal is "1", rapid traverse takes place along that axis. Although the rapid traverse override signals (ROV1, ROV2) are valid, the override is generally set to 100%.

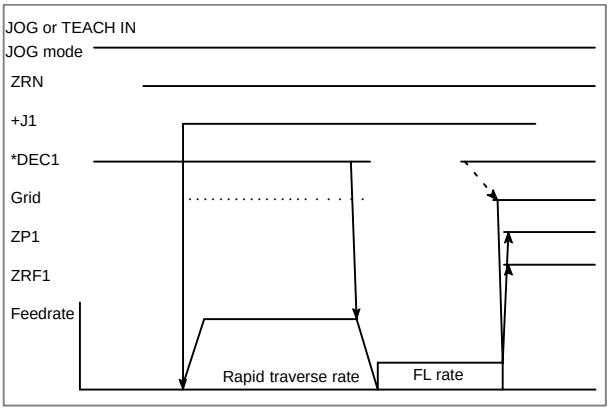
(4) When the reference position is approached, a limit switch installed on the machine is activated, making the deceleration signal (*DEC1, *DEC2, *DEC3,…) for reference position "0". Consequently, the feedrate is decelerated to 0, then the tool is fed at a constant low speed (reference position return FL feedrate specified by PRM1425 setting).

(5) When the deceleration signal returns to "1" again after the limit switch is passed, the tool is continues to feed, until the tool stops at the first grid point (electric grid point).

(6) Upon confirmation that the current position is at the in–position area, the reference position return end signal (ZP1, ZP2, ZP3,…) and the reference position establishment signal (ZRF1, ZRF2, ZRF3,…) turn to "1".

These steps are repeated for each axis. The number of simultaneously controlled axes is usually one, but it becomes three by setting PRM1002#0(JAX). If the feed axis direction selection signal (+J1, –J1, +J2, –J2,…) turns to "0" between step (2) and (4) , the tool is stopped at once, and reference position return is canceled. If the signal turn to "1" again, operation resumes from step (3) (rapid traverse).

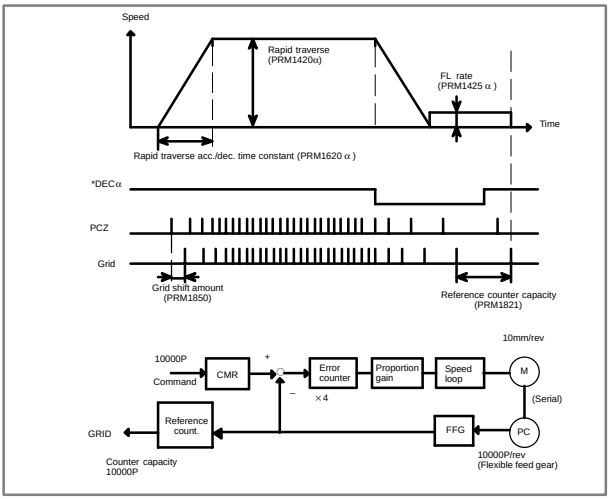
The timing charts for the basic procedures are given below.



16.6.1.2 Reference position return location adjustment

- Grid shift

  The electronic grid can be shifted by the distance set in PRM1850, thus shifting the reference position. The grid shift to be set in the parameter must not exceed the reference counter capacity (PRM1821) (grid interval).



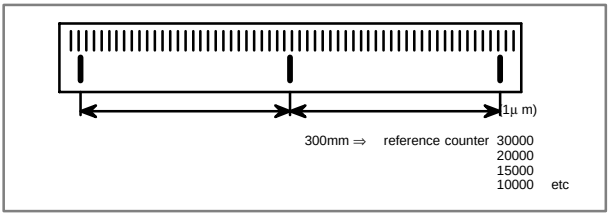
- Separate Type Pulse Coder or Linear Scale is Used

PRM	1821	Reference counter capacity per axis	[P]

Normally, the number of feedback pulses per motor revolution is set to the reference counter capacity.

✳ When plural reference marks are on a linear scale, a quotient of the distance between the reference marks divided by an integer may be used as a reference counter capacity:

Example)



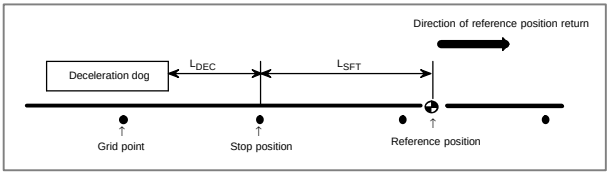
16.6.1.3 Reference position shift

When reference position return is performed using the grid method, the reference position can be shifted by a parameter–set distance without having to move the deceleration dog.

- How to adjust the reference position

(1) Set the PRM1002#2(SFD) to 1, and set the PRM1850 for reference position shift amount to 0. Then, perform reference position return.

After the deceleration dog is turned off, the tool stops when the first grid point is reached. Distance L_{DEC} is indicated on the DGN302.

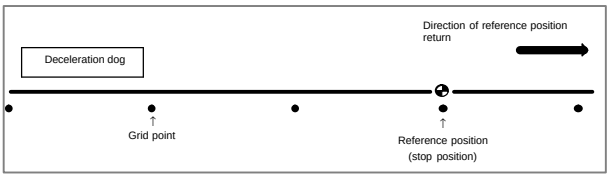


L_{SFT}: Reference position shift amount
L_{DEC}: Distance from the position where the deceleration dog is turned off to the first grid point (grid point when the shift amount is 0)

(2) Determine the distance L_{SFT} (reference position shift amount) from the stop position to the reference position, and set it in PRM1850.

This completes the adjustment of the reference position.

(3) Perform reference position return again. The tool stops when it reaches the reference position.

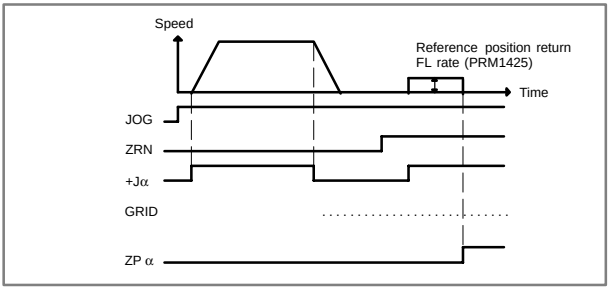


NOTE1 The reference position can be shifted only in the direction of reference position return.

NOTE2 When the PRM1002#2(SPD) is 0, only the distance from the position where the deceleration dog is turned off to the first grid point (the grid point after grid shift) is indicated.

16.6.2 Dogless reference position setting

When there are no dog nor limit switch for reference position return, this function enables the tool to return the reference position that is set by MTB. When compared with the dog–based method, an additional operation for reference position setting is required. However, when an absolute–position detector is used, a reference position once set is preserved even if the power is turned off. So, this function is generally applicable when an absolute–position detector is used.



- Operation procedure

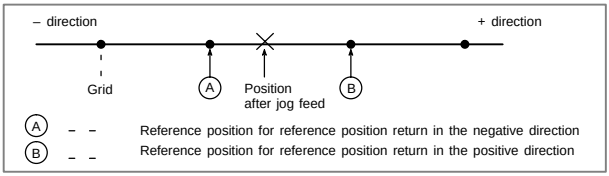
(1) Move the tool near the reference position using a manual operation. Even if the tool is located near the reference position on the axis, move the tool away from the reference position once, then move back the tool toward the reference position. Otherwise, ALM90 occurs in (3) below.

(2) Select the reference position return mode or switch.

(3) Press a button for an axis–and–direction–select–signal + or –, and the machine moves to the next grid, then stops.
(This position is set as the reference position).

* After the reference position has been set, select the reference position return mode(ZRN signal is 1) and turn on an axis–and–direction– select signal, then the tool returns to the reference position.

The following figure shows the positional relation between the reference position and the point to which the tool is positioned by manual continuous feed.



- Grid shift

To shift the reference position, the grid can be shifted by the distance set in PRM1850. The grid shift to be set in the parameter must not exceed the reference counter capacity (PRM1821).

NOTE ALM090 is issued when G28 is specified and the reference position has not yet be established.

16.6.3 Butt–type reference position setting

This function automates the procedure of butting the tool against a mechanical stopper on an axis to set a reference position. The purpose of this function is to eliminate the variations in reference position setting that arise depending on the operator, and to minimize work required to make fine adjustments after reference position setting.
Select the axis for which the reference position is to be set, then perform cycle start. Then, the following operations are performed automatically:

(1) The torque (force) of the selected axis is reduced to make the butting feedrate constant, and the tool is butted against the mechanical stopper. Then, the tool is withdrawn a parameter–set distance from the mechanical stopper.

(2) Again, the torque (force) of the selected axis is reduced, and the tool is butted against the mechanical stopper. Then, the tool is withdrawn a parameter–set distance from the mechanical stopper.

(3) The withdrawal point on the axis is set as the reference position.

- Basic procedure for butt–type reference position setting

(1) First, set the parameters required for butt–type reference position setting.

PRM1006#5 (ZMIx):	Direction of reference position setting
PRM1015#2 (OKI):	After completion of reference position return operation, ALM000 is, issued (0)/not issued (1) (When setting a butt–type reference position on an axis without an absolute–position detector, set this bit to 1.)
PRM7181:	Withdrawal distance
PRM7182:	Reference position setting distance
PRM7183:	Butting feedrate 1
PRM7184:	Butting feedrate 2
PRM7185:	Withdrawal feedrate in reference position setting
PRM7186:	Torque limit

(2) Select manual reference position return mode.

(3) By using a manual handle feed axis select signals (HS1A–D <G018#0–#3>), select the axis on which the reference position is to be set.

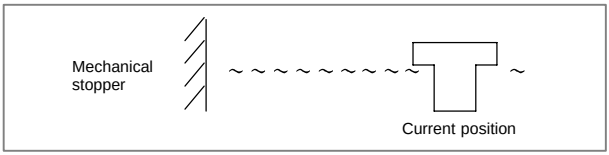
(4) Perform cycle start.

This starts the cycle operation for reference position setting.

(5) During the cycle operation, the automatic operation start signal OP is 1.

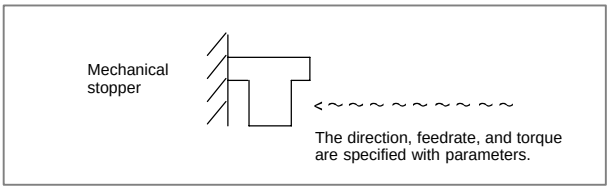
- Cycle operation

When no reference position has been set, operations (A) to (E), below, are performed automatically to set a reference position.



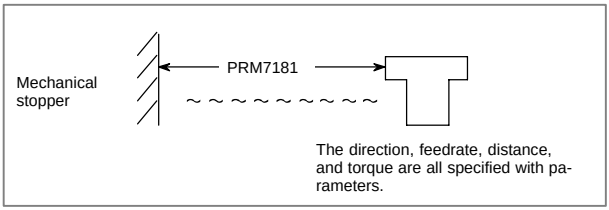
(A) The tool is moved along a specified axis with a limited torque until it butts against the mechanical stopper.

The tool is moved in the direction specified with PRM1006#5(ZMIx), at the feedrate specified with PRM7183, at the torque specified with PRM7186 (until the tool strikes the mechanical stopper).



(B) After the tool strikes the mechanical stopper, the tool is withdrawn in the direction opposite to the butting direction, along the axis for a parameter–set distance.

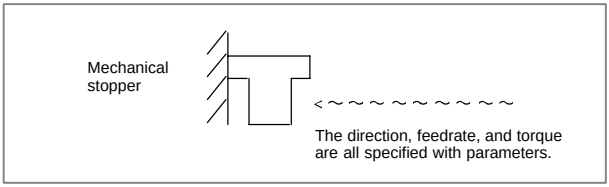
The tool is moved in the direction opposite to that specified with PRM1006#5(ZMIx), at the feedrate specified with PRM7185, for the distance specified with PRM7181.



(C) Operations (D) and (E) are performed from the withdrawal point, such that the tool is butted against the mechanical stopper at a constant feedrate in reference position setting.

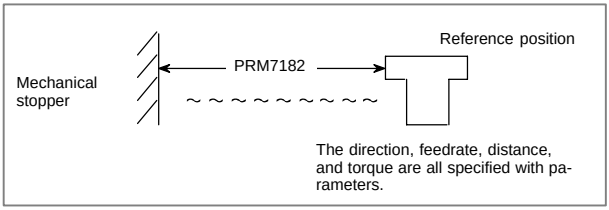
(D) The tool moves along the specified axis at a specified torque until it butts against the mechanical stopper.

The tool moves in the direction specified with PRM1006#5(ZMIx), at the feedrate specified with PRM7184, at the torque specified with PRM7186 (until the tool strikes the mechanical stopper).



(E) After the tool strikes the mechanical stopper end on the axis, the tool is withdrawn in the direction opposite to the butting direction, along the axis for a parameter–set distance.

The tool is moved in the direction opposite to that specified with PRM1006#5(ZMIx), at the feedrate specified with PRM7185, for the distance specified with PRM7182.



For PRM7183 and 7184, set the feedrates at which the tool is moved toward the mechanical stopper with a limited torque, considering the machine accuracy.

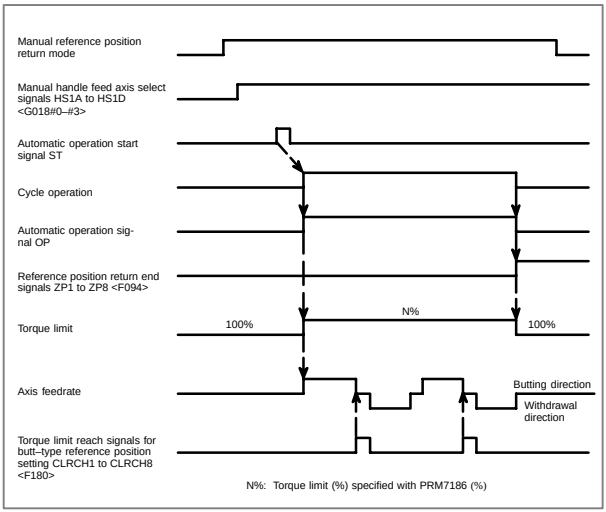
After the tool strikes the mechanical stopper, and the tool is withdrawn the distance specified with PRM7182, the withdrawal point is set as the reference position on the specified axis. Then, the reference position return end signal and reference position establishment signal are set to 1.

When PRM1015#2(OKI) is set to 0, ALM000 is issued after completion of reference position return operation. Turn the power off then back on before continuing operation.

- After the reference position is set

  When the reference position has already been set, performing butt–type reference position setting causes the tool to be positioned to the reference position at the rapid traverse rate without the cycle operation. Upon the completion of positioning, the reference position return end signal is set to 1.

The timing chart for the cycle operation is shown below.



16.6.4 Related parameters

	#7	#6	#5	#4	#3	#2	#1	#0
1002						SFD	DLZ	JAX

JAX Number of axes controlled simultaneously in manual continuous feed, manual rapid traverse and manual reference position return

0 : 1 axis

1 : 3 axes

DLZ Function for setting the reference position without dog (all axes)

0 : Disabled

1 : Enabled

NOTE PRM1002#1(DLZ) is used to make common settings for all axes. This function can be specified for each axis by PRM1005#1(DLZx).

SFD The function for shifting the reference position is

0 : Not used

1 : Used

	#7	#6	#5	#4	#3	#2	#1	#0
1005							DLZx	ZRNx

ZRNx When a command specifying the movement (except for G28) is issued in automatic operation (MEM, RMT, or MDI) and when a return to the reference position has not been performed since the power has been turned on

0 : An alarm is generated (ALM224).

1 : An alarm is not generated.

DLZx Function for setting the reference position without dogs (each axis)

0 : Disabled

1 : Enabled

NOTE PRM1005#1(DLZx) is used to make settings for each axis. When PRM1002#1(DLZ) is 0, DLZx is enabled. When PRM1002#1(DLZ) is 1, DLZx is disabled, and the function for setting the reference position without dogs is enabled for all axes.

	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMIx					

ZMIx The direction of reference position return and the direction of initial backlash at power–on

0 : Positive direction

1 : Negative direction

	#7	#6	#5	#4	#3	#2	#1	#0
1015						OKI		

OKI After completion of reference position return in butt–type reference position setting:

0 : ALM000 is generated.

1 : ALM000 is not generated.

By setting this parameter, power–off is not required to release ALM000 after butt–type reference position setting.
This allows the use of butt–type reference position return regardless of whether an absolute–position detector is used.

16

	#7	#6	#5	#4	#3	#2	#1	#0
1201						ZCL	ZPI	ZPR

ZPR Automatic setting of a coordinate system when the manual reference position return is performed

0 : Not set automatically

1 : Set automatically

ZPI Coordinates at the reference position when a coordinate system is set automatically

0 : Value set in PRM1250 is used.

1 : For input in mm, the value set in PRM1250 is used, or for input in inches, the value set in PRM1251 is used.

ZCL Local coordinate system when the manual reference position return is performed

0 : The local coordinate system is not canceled.

1 : The local coordinate system is canceled.

1240	Coordinate value of the reference position on each axis in the machine coordinate system

Axis type

1250	Coordinate value of the reference position used when automatic coordinate system setting is performed

Axis type

1251	Coordinate value of the reference position on each axis used for setting a coordinate system automatically when input is performed in inches

Axis type

NOTE This parameter is valid when PRM1201#1(ZPI) is set to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
1300		LZR						

LZR Stored stroke check during the time from power–on to the manual position reference return

0: The stroke check is performed.

1: The stroke check is not performed.

	#7	#6	#5	#4	#3	#2	#1	#0
1401						JZR		

JZR The manual reference position return at JOG feedrate

0 : Not performed

1 : Performed

1425	FL rate of the reference position return for each axis

	#7	#6	#5	#4	#3	#2	#1	#0
1800						OZR		

OZR When manual reference position return is attempted in the halt state during automatic operation (feed hold stop state) under any of the conditions listed below:

0 : Manual reference position return is not performed, with ALM091.

1 : Manual reference position return is performed without an alarm occurring.

< Conditions >

- When there is a remaining distance to travel.
- When an auxiliary function (miscellaneous function, spindle–speed function, tool function) is being executed.
- When a dwell or cycle such as a canned cycle is being executed.

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC	APZ			OPT	

Axis type

OPT 0 : Position detection is performed by the pulse coder built in the motor.

1 : Separate type pulse coder or linear scale is used.

APZ Zero position of absolute pulse coder is :

0 : Not established

1 : Established
(Turns to 1 after establishment)
To manually change the value of the APZ bit from 0 to 1 without first returning to the reference position when using serial pulse coder α , follow this procedure: Back up the data with the battery and give the motor one or more turns. Turn the power off then on again, then change the APZ bit setting from 0 to 1.

APC 0 : Position detector is other than absolute pulse coder.

1 : Position detector is absolute pulse coder.

1821	Reference counter size for each axis

Axis type

Set the size of the reference counter.

To set the size of the reference counter, specify the grid interval for the reference position return in the grid method.

$$\text{Size of the reference counter} = \frac{\text{grid interval}}{\text{detection unit}}$$

Grid interval = the amount of travel per rotation of the pulse coder

1836	Servo error amount where reference position return is possible

Axis type

This parameter sets the servo error used to enable reference position return in manual reference position return.

In general, set this parameter to 0. (When 0 is set, 128 is assumed as the default.)

1850	Grid shift for each axis, shift of reference position

Axis type

A grid shift is set for each axis.

To shift the reference position, the grid can be shifted by the amount set in this parameter. Up to the maximum value counted by the reference counter can be specified as the grid shift. When PRM1002#2(SFD) is set to 1, this parameter specifies a reference position shift amount.

	#7	#6	#5	#4	#3	#2	#1	#0
3003			DEC					

DEC Deceleration signal (*DEC1 to *DEC8) for manual reference position return

0 : Deceleration is applied when the signal is 0.

1 : Deceleration is applied when the signal is 1.

	#7	#6	#5	#4	#3	#2	#1	#0
3006								GDC

GDC As the deceleration signal for reference position return:

0 : X009/X007 is used.

1 : G196/G1196 is used. (X009/X007 is disabled.)

7181 — First withdrawal distance in butt–type reference position setting

Axis type

When the butt–type reference position setting function is used, this parameter sets a distance on an axis, along which withdrawal is performed after the mechanical stopper is hit (distance from the mechanical stopper to the withdrawal point). Set the same direction as the direction set for PRM1006#5(ZMIx). If the opposite direction is set, the cycle operation will not start.

7182 — Second withdrawal distance in butt–type reference position setting

Axis type

When the butt–type reference position setting function is used, this parameter sets a distance on an axis, along which withdrawal is performed after the mechanical stopper is hit (distance from the mechanical stopper to the withdrawal point). Set the same direction as the direction set for PRM1006#5(ZMIx). If the opposite direction is set, the cycle operation will not start.

7183 — First butting feedrate in butt–type reference position setting

Axis type

When the butt–type reference position setting function is used, this parameter sets the feedrate first used to hit the stopper on an axis.

7184 — Second butting feedrate in butt–type reference position setting

Axis type

When the butt–type reference position setting function is used, this parameter sets the feedrate used to hit the stopper on an axis for a second time.

7185 — Withdrawal feedrate (common to the first and second butting operations) in butt–type reference position setting)

Axis type

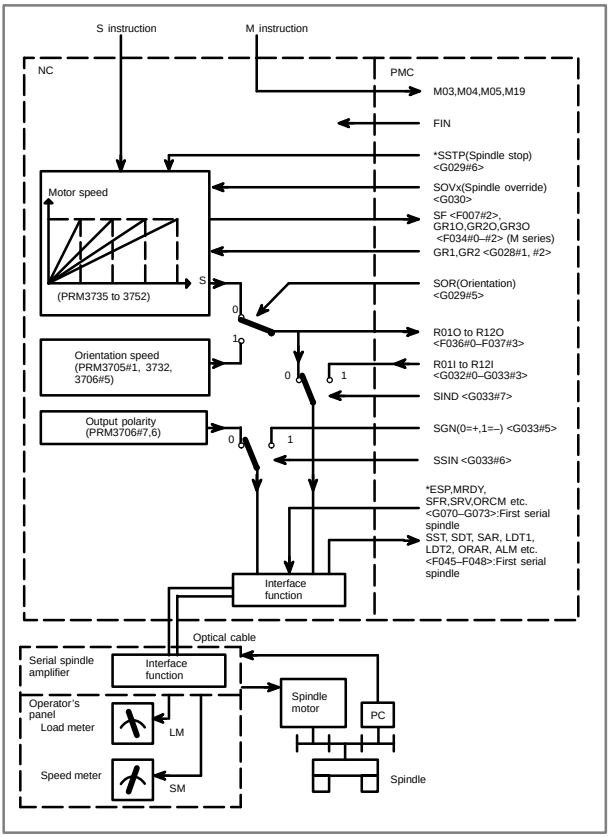
When the butt–type reference position setting function is used, this parameter sets the feedrate used for withdrawal along an axis after the mechanical stopper has been hit.

7186 — Torque limit value in butt–type reference position setting (%)

Axis type

This parameter sets a torque limit value in butt–type reference position setting.
When 0 is set in this parameter, 100% is assumed.

17.1 Overview of Serial Interface AC Spindle Control



17.2 Gear Change

There are two types of gear switching: M type and T type.

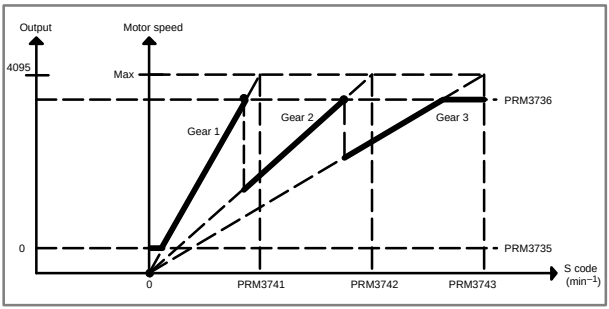
- M type
  The CNC selects a gear according to an S command, then outputs signals to the PMC.
  - Signals are output to GR3O, GR2O, and GR1O <F034#2–#0>.
  - Method A and method B are supported, which differ in how gear switching points are specified.
- T type
  You should send the information about the desired gear to the CNC via the PMC.
  - Enter information to GR2 and GR1 <G028#2, #1> (for the first spindle).

For the M series CNC, M type or T type can be selected.

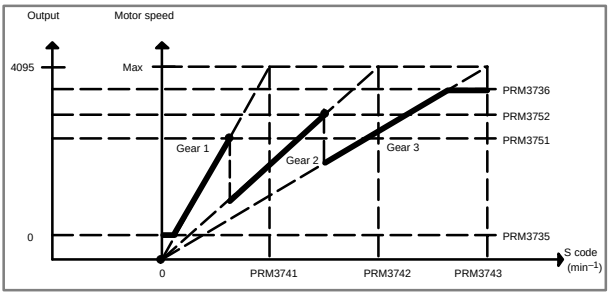
- Use PRM3706#4 (GTT) (0: M type/1: T type) for selection.
- Select T type when the constant surface speed control or multispindle control option is used.

For the T series CNC, only T type can be used.

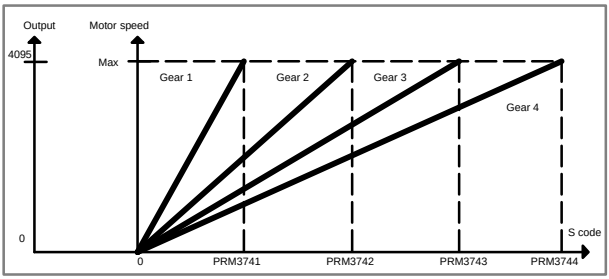
- Method A of gear change for machining center (PRM3705#2=0)



- Method B of gear change for machining center (PRM3705#2=1)



- Gear change for lathe



17.3 Automatic Setting of Standard Parameters

The standard parameters related to each serial spindle motor model can be set automatically.

- The specifications for controlling a motor depend on the specifications defined by the machine tool builder. The parameters defined by the machine tool builder are set as the standard values (initial values) by this automatic setting function.
  Therefore, when performing automatic operation, always set parameters properly according to the parameter list (parameters 4000 and later).

1. Turn on the power in the emergency stop state.
2. Set PRM4019#7 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
4019	LDSP							

LDSP The parameters for the serial interface spindle are:
0 : Not set automatically.
☆ 1 : Set automatically.

3. Set a motor model code to the PRM4133.

4133	Motor model code

4. Turn off the power then back on. Then, the parameters are read.

(Reference 1: Example of αi series motor model code)

Code	Motor model	Amplifier
302	α1/10000i	SPM–2.2i
304	α1.5/10000i	SPM–5.5i
306	α2/10000i	SPM–5.5i
307	α2/15000i	SPM–22i
308	α3/10000i	SPM–5.5i
312	α8/8000i	SPM–11i
314	α12/7000i	SPM–15i
316	α15/7000i	SPM–22i
320	α22/7000i	SPM–26i
322	α30/6000i	SPM–45i
323	α40/6000i	SPM–45i
401	α6/12000i	SPM–11i
406	α22/10000i	SPM–26i
411	αP30/6000i	SPM–22i
413	αP50/6000i	SPM–26i

(Reference 2: Example of α series 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	α2/15000 (3000/15000min^{-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

17.4 Spindle Setting and Tuning Screen

17.4.1 Display method

(1) Confirm the parameters

	#7	#6	#5	#4	#3	#2	#1	#0
3111							SPS	

Bit1 (SPS) 0 : The spindle tuning screen is not displayed.
☆ 1 : The spindle tuning screen is displayed.

(2) Press the [SYSTEM] key to select the screen for setting parameters and other data.

(3) Press the continuous menu key [▷] .

(4) Press the soft key [SP.PRM]. Then, the spindle setting and tuning screen appears.

(5) The following screens are provided. These screens can be selected using soft keys.
1) [SP.SET] : Spindle setting screen
2) [SP.TUN] : Spindle tuning screen
3) [SP.MON] : Spindle monitor screen

(6) With the page keys [↑ PAGE] [PAGE ↓], a spindle to be displayed can be selected (only when multiple serial spindles are connected).

17.4.2 Spindle setting screen

```
SPINDLE SETTING
(1)GEAR SELECT       : 1
(2)SPINDLE           : S11

 (PARAMETER)
(3)GEAR RATIO          50
(4)MAX SPINDLE SPEED  3000
(5)MAX MOTOR SPEED    6000
(6)MAX C AXIS SPEED    100
```

- Gear selection

The gear select status on the machine side is displayed.

Indication	CTH1	CTH2
1	0	0
2	0	1
3	1	0
4	1	1

- Spindle

Select a spindle for which data is to be set.
S11: Main spindle amplifier for the 1st spindle
S12: Sub spindle amplifier for the 1st spindle
S21: Main spindle amplifier for the 2nd spindle
S22: Sub spindle amplifier for the 2nd spindle

- Parameters

	S11:1st Main	S12:1st Sub	S21:2nd Main	S22:2nd Sub
Gear ratio(HIGH)	4056	4216	4056	4216
Gear ratio(MEDIUM HIGH)	4057		4057	
Gear ratio(MEDIUM LOW)	4058	4217	4058	4217
Gear ratio(LOW)	4059		4059	
Max. spindle speed (gear1)	3741		3741	
Max. spindle speed (gear2)	3742		3742	
Max. spindle speed (gear3)	3743		3743	
Max. spindle speed (gear4)	3744		3744	
Max. motor speed	4020	4196	4020	4196
Max. C axis speed	4021	None	4021	None

17.4.3 Spindle tuning screen

```
SPINDLE TUNING

OPERATION      : SPEED CONTROL
GEAR SELECT    : 1
SPINDLE        : S11


(PARAMETER)                (MONITOR)
PROP.GAIN     20           MOTOR SPEED   100
INT.GAIN      50           SPINDLE SPEED 150
LOOP GAIN   3000           POS ERR S1    100
MOTOR VOLT    30           POS ERR S2    103
TIME CONST   100           SYN.ERR         3
REF. SHIFT  2046
```

- Operation mode

1 : Normal operation
2 : Orientation
3 : Synchronization control
4 : Rigid tapping
5 : Cs contour control
6 : Spindle positioning control

- Displayed parameters

The displayed parameters vary depending on the operation mode.

Spindle positioning control	Normal operation	Orientation
Proportional gain Integral gain Loop gain Motor voltage ZRN gain (%) Shift reference position	Proportional gain Integral gain Motor voltage Regenerative power	Proportional gain Integral gain Loop gain Motor voltage ORAR gain (%) Shift spindle stop position Shift reference position

Synchronization control	Rigid tapping	Cs contour control
Proportional gain Integral gain Loop gain Motor voltage Acceleration/ deceleration constant (%) Shift reference position	Proportional gain Integral gain Loop gain Motor voltage ZRN gain Shift reference position	Proportional gain Integral gain Loop gain Motor voltage ZRN gain (%) Shift reference position

NOTE For the parameter numbers corresponding to the displayed parameter items, see Subsec. 17.4.5.

- Displayed monitoring items

The displayed monitoring items vary depending on the operation mode.

Spindle positioning control	Normal operation	Orientation
Motor speed Feedrate Position deviation S	Motor speed Spindle speed	Motor speed Spindle speed Position deviation S

Synchronization control	Rigid tapping	Cs contour control
Motor speed Spindle speed Position deviation S1 Position deviation S2 Synchronous deviation	Motor speed Spindle speed Position deviation S Position deviation Z Synchronous deviation	Motor speed Spindle speed Position deviation S

NOTE1

$$\text{Motor speed } [\text{min}^{-1}] = \frac{|\text{Spindle data}|}{16383} \times \text{Max. Motor speed.(*1)}$$

(*1) PRM4020: Main spindle, PRM4196: Sub spindle

NOTE2 The spindle speed in Cs contour control mode is in degrees/min.

17.4.4 Spindle monitor screen

```
SPINDLE MONITOR SCREEN
 ALARM          : AL-27(POSITION CODER DIS.)
 OPERATION      : Cs AXIS CONTROL
 SPINDLE SPEED : 100 DEG/MIN
 MOTOR SPEED    : 150 RPM

                    0   50  100  150  200
  LOAD METER (%)   |---|---|---|---|---|
                   ■■■■■

  CONTROL INPUT : ORCM MRDY *ESP
  CONTROL OUTPUT : SST SDT ORAR
```

- Spindle alarm

1: Motor overheated
2: Speed deviation excessive
3: Fuse blow of DC link
4: Power phase missing
5: Fuse blow of DC voltage
7: Excessive speed
9: Main circuit overload
10: Low voltage of AC input
11: Excess voltage in DC link
12: Excess current in DC link
13: CPU internal data memory error
15: Spindle switch/output switch alarm
16: RAM error
18: ROM SUM check error
19: U phase current offset excessive
20: V phase current offset excessive
21: Position sensor polarity setting error
24: Serial data transmission abnormal
25: Serial data transmission stop
26: Cs axis speed detecting signal failure
27: Position coder signal disconnection
28: Cs pos. detect signal disconnection
29: Short time overload
30: Input circuit excess current
31: Motor binding
32: SLC LSI internal RAM abnormal
33: DC link charging insufficient
34: Parameter abnormal setting
35: Gear ratio data excessive
36: Error counter overflow
37: Speed detecting unit error setting
38: Magnetic sensor signal abnormal
39: Erroneous detection of one revolution signal for Cs axis control
40: Undetection of one revolution signal for Cs axis control
41: Erroneous detection of the position coder one revolution signal
42: Undetection of the position coder one revolution signal
43: Differential speed position coder disconnection
46: Erroneous detection of one revolution signal on threading
47: Abnormal position coder signal
49: Excessive differential speed conversion value
51: DC link under voltage
52: ITP signal error
53: ITP signal error
54: Overload current
55: Power line state signal error
56: Internal cooling fan stopped

57: Excessive deceleration power
58: Converter main circuit overload
59: Converter cooling fan stopped
66: Inter–spindle–amplifier communication error
73: Motor sensor disconnection
74: CPU test alarm
75: CRC test alarm
79: Initial test alarm
81: Motor sensor one–rotation signal detection error
82: Motor sensor one–rotation signal undetected
83: Motor sensor signal error
84: Spindle sensor disconnection
85: Spindle sensor one–rotation signal detection error
86: Spindle sensor one–rotation signal undetected
87: Spindle sensor signal error
88: Cooling fan stopped
110: Inter–amplifier–module communication error
111: Converter control power under voltage
112: Excessive converter regenerative power
113: Converter heat sink cooling fan stopped
120: Communication data alarm
121: Communication data alarm
122: Communication data alarm

- Operation

Following 6 modes are available:

a. Normal operation
b. Orientation
c. Synchronous operation
d. Rigid tapping
e. Cs contour control
f. Spindle positioning control

- Load meter

The load meter displays spindle load in a unit of 10%.

1) $\text{Load meter[\%]} = \dfrac{\text{Load meter data}}{32767} \times \text{Max. output value of load meter (*)}$

(*) PRM4127:Main high–speed winding
PRM4274:Sub low–speed winding
PRM4093:Main high–speed winding
PRM4279:Sub low–speed winding

- Control input signal

Max.10 signals those are ON are displayed from the following signals:

TLML	:	Torque limit command (low)	SPSL	:	Spindle selection signal
TLMH	:	Torque limit command (high)	MCFN	:	Power line switching
CTH1	:	Gear signal 1	SOCN	:	Soft start/stop
CTH2	:	Gear signal 2	RSL	:	Output switching request
SRV	:	Spindle reverse rotation	RCH	:	Power line state confirm
SFR	:	Spindle forward rotation	INDX	:	Orientation stop pos. change
ORCM	:	Spindle orientation	ROTA	:	Rotation direction of ORCM
MEDY	:	Machine ready	NRRO	:	Short–cut of ORCM
ARST	:	Alarm reset signal	INTG	:	Speed integral control signal
*ESP	:	Emergency stop	DEFM	:	Referential mode command

[Reference] Control input signal address for each spindle
First spindle : <G070–G073>
Second spindle : <G074–G077>
Third spindle : <G204–G207>
Fourth spindle : <G266–G269>

- Control output signals

Max. 10 signals those are ON are displayed from the following signals:

ALM	:	Alarm signal	TML5	:	Torque limitation
SST	:	Speed zero signal	ORAR	:	Orientation end signal
SDT	:	Speed detecting signal	CHP	:	Power line switched signal
SAR	:	Speed arrival signal	CFIN	:	Spindle switch complete
LDT1	:	Load detecting signal 1	RCHP	:	Output switch signal
LDT2	:	Load detecting signal 2	RCFN	:	Output switch complete signal

[Reference] Control output signal address for each spindle
First spindle : <F045–F048>
Second spindle : <F049–F052>
Third spindle : <F168–F171>
Fourth spindle : <F266–F269>

17.4.5 Correspondingparameters

- Normal operation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4040	4206	4040	4206
Proportional gain (LOW)	4041	4207	4041	4207
Integral gain(HIGH)	4048	4212	4048	4212
Integral gain(LOW)	4049		4049	
Motor voltage	4083	4236	4083	4236
Regenerative power	4080	4231	4080	4231

Supplement 1 For a low–speed winding that uses winding switching, tune the parameters related to motor voltage below on the parameter screen.

Main (low–speed winding) = 4136, Sub (low–speed winding) = 4284

Supplement 2 Usually, regenerative power need not be tuned.

- Orientation mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4042	4208	4042	4208
Proportional gain (LOW)	4043	4209	4043	4209
Integral gain(HIGH)	4050	4213	4050	4213
Integral gain(LOW)	4051		4051	
Loop gain (HIGH)	4060	4218	4060	4218
Loop gain (MID, HIGH)	4061		4061	
Loop gain (MID, LOW)	4062	4219	4062	4219
Loop gain (LOW)	4063		4063	
Motor voltage	4084	4237	4084	4237
Gain change upon completion of orientation	4064	4220	4064	4220
Stop position shift	4077	4228	4077	4228
PC–type orientation stop position	4031	4204	4031	4204

- Synchronization control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4044	4210	4044	4210
Proportional gain(LOW)	4045	4211	4045	4211
Integral gain(HIGH)	4052	4214	4052	4214
Integral gain(LOW)	4053		4053	
Position loop gain (HIGH)	4065	4221	4065	4221
Position loop gain (MID, HIGH)	4066		4066	
Position loop gain (MID, LOW)	4067	4222	4067	4222
Position loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
Acc./Dec. time constant	4032		4032	
Shift amount	4034		4034	

- Rigid tapping mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4044	4210	4044	4210
Proportional gain(LOW)	4045	4211	4045	4211
Integral gain(HIGH)	4052	4214	4052	4214
Integral gain(LOW)	4053		4053	
Position loop gain (HIGH)	4065	4221	4065	4221
Position loop gain (MID, HIGH)	4066		4066	
Position loop gain (MID, LOW)	4067	4222	4067	4222
Position loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Grid shift amount	4073	4223	4073	4223

- Cs axis contour control mode

Numerals are parameter numbers :

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4046		4046	
Proportional gain (LOW)	4047		4047	
Integral gain (HIGH)	4054		4054	
Integral gain (LOW)	4055		4055	
Position loop gain (HIGH)	4069		4069	
Position loop gain (MID, HIGH)	4070		4070	
Position loop gain (MID, LOW)	4071		4071	
Position loop gain (LOW)	4072		4072	
Motor voltage	4086		4086	
ZRN gain %	4092		4092	
Reference position shift	4135		4135	

- Spindle positioning control mode

	S11: 1st Main	S12: 1st Sub	S21: 2nd Main	S22: 2nd Sub
Proportional gain(HIGH)	4044	4210	4044	4210
Proportional gain (LOW)	4045	4211	4045	4211
Integral gain (HIGH)	4052	4214	4052	4214
Integral gain (LOW)	4053		4053	
Position loop gain (HIGH)	4065	4221	4065	4221
Position loop gain (MID, HIGH)	4066		4066	
Position loop gain (MID, LOW)	4067	4222	4067	4222
Position loop gain (LOW)	4068		4068	
Motor voltage	4085	4238	4085	4238
ZRN gain %	4091	4239	4091	4239
Reference position shift	4073	4223	4073	4223

17.5 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.
(Remark: Some instances of these units do not have ID information.)

- Spindle amplifier (SPM)
- Power supply module (PSM)

ID information is automatically read from each of the connected units during first startup of the CNC and then recorded. During second or later startup, the ID information recorded during first startup can be compared with the ID information read this time on the screen to check whether the configuration of the connected units is changed. (If there is a difference between them, the alarm mark (*) appears.)

The recorded ID information can be edited. Therefore, the ID information of an unit that does not have ID information can be displayed. (However, the alarm mark (*) indicating a difference between these IDs appears.)

Parameter

	#7	#6	#5	#4	#3	#2	#1	#0
13112							SPI	IDW

[Data type] Bit

IDW The edit of the servo information screen or the spindle information screen is:

0 : Prohibited

1 : Allowed

SPI The spindle information screen is:

0 : Displayed

1 : Not displayed

17.5.1 Displaying the spindle information screen

1 Press the SYSTEM function key, then press the [SYSTEM] soft key.

2 Press the [SP–INF] soft key to display the screen as shown below.

```
SPINDLE INFORMATION              O0000 N00000

  S1
 SP MOTOR SPEC      A06B-1407-B100
 SP MOTOR S/N       C99XA1234


 SP AMP SPEC        A06B-6111-H011#550
 SP AMP S/N         V0020090601
 PSM SPEC.          A06B-6110-H015
 PSM S/N            V0020031702


)_
 MDI **** *** ***       19:12:05
(SYSTEM)(SV-INF )(SP-INF )(       )(      ) )
```

NOTE Spindle information is stored in flash ROM. 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 INFORMATION          O0000 N00000

  S1
 SP MOTOR SPEC      A06B-1407-B100
 SP MOTOR S/N       C99XA1234


*SP AMP SPEC        A06B-6111-H011#550
*SP AMP S/N         V0020090601
 PSM SPEC.          A06B-6110-H015
 PSM S/N            V0020031702


)_
 MDI **** *** ***      19:12:05
(SYSTEM)(SV-INF)(SP-INF)(       )(      ))
```

Additional Information

Even if replacement is performed reasonably such as for repairing, this function incorrectly indicates the * mark when it detects the replacement.

To clear the * mark, follow the steps below to update the registered data, as described in the editing section later.

(1) Make the registered data editable. (PRM13112#0(IDW) = 1)

(2) On the edit screen, place the cursor on the item from which you want to delete the * mark.

(3) Operate the soft keys [CHANGE], [INPUT], and [SAVE] in that order.

17.5.2 Editing the spindle information screen

1 Assume that PRM13112#0(IDW) = 1.

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

3 Follow the steps shown in "Displaying the spindle ID screen" to display the screen as shown below.

```
SPINDLE INFORMATION          O0000 N00000

  S1
 SP MOTOR SPEC      A06B-1407-B100
 SP MOTOR S/N       C99XA1234


 SP AMP SPEC        A06B-6111-H011#550
 SP AMP S/N         V0020090601
 PSM SPEC.          A06B-6110-H015
 PSM S/N            V0020031702


)_
 MDI **** *** ***      19:12:05
(SYSTEM)(SV-INF)(SP-INF)(       )(OPRT))
```

4 To move key–in buffer on the screen, use the [↑] and [↓] keys.

17.5.3 Screen operation on the editing screen

Mode	Key operation	Use
Viewing (*1)	Page key	Scrolls up or down on a screen–by–screen basis.
Editing (*2)	Soft key [INPUT]	Replace the selected ID information at the cursor position with the character string in key–in buffer.
	[CANCEL]	Deletes the character string in key–in buffer.
	[CHANGE]	Transfers the selected ID information at the cursor position that was sent by the servo, to key–in buffer. Only the items preceded by * (*3) are valid.
	[SAVE]	Saves the ID information that has been changed on the spindle information screen in flash ROM.
	[RELOAD]	Cancels the ID information that has been changed on the spindle information screen and loads ID information from flash ROM.
	Page key	Scrolls up or down on a screen–by–screen basis.
	Cursor key	Scrolls up or down the selection of ID information.

*1 Viewing mode: when PRM13112#0 = 0

*2 Editing mode: when PRM13112#0 = 1

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

```
SPINDLE INFORMATION              O0000 N00000

  S1
 SP MOTOR SPEC      A06B-1407-B100
 SP MOTOR S/N       C99XA1234


*SP AMP SPEC        A06B-6111-H011#550
*SP AMP S/N         V0020090601
 PSM SPEC.          A06B-6110-H015
 PSM S/N            V0020031702


)_
 MDI **** *** ***       19:12:05
(SYSTEM)(SV-INF)(SP-INF)(       )(OPRT)
```

NOTE For mixed connection of an αi spindle and a spindle that does not belong to the αi spindle system, ID information of connected units for serial spindle including αi spindles cannot be obtained.

17.6 Warning Interface for the αi Spindle

For the αi spindle, the warning state can be reported before an alarm is issued. When the warning state is entered, a report to the PMC is sent. For example, this signal can be used for retracting tools or reducing cutting load from the time a warning occurs by the time an overheat alarm occurs. In addition, diagnostic information also contains warning numbers.

Signal

Spindle warning detailed signals

SPWRN1 to 9 <F264#0 to #7, F265#0>

[Classification] Output

[Function] Reports the warning number corresponding to the state of the αi spindle amplifier.

[Output condition] When the αi spindle is in the warning state, a warning number consisting of SPWRN1 to SPWRN9 is output as nine–bit binary data.
If warnings occurred on multiple αi spindle amplifiers, the warning number of the αi spindle having the smallest axis number is output.
However, when there is no αi spindle or the system configuration of the spindle includes an additional spindle that is older than the αi spindle, this function is invalid for all spindles.
The warning numbers and their descriptions are shown below.

Warning number	Contents	Details
56	Internal fan stopped	If the internal fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.
88	Radiator cooling fan stopped	If the radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the main circuit overheats, an alarm occurs.
04	Open–phase detected in the converter main power supply	If an open–phase is detected in the main power supply, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute (for the PSM) or about five seconds (for the PSMR) after the warning signal is output, an alarm occurs.
58	Converter main circuit overloaded	If the main circuit of the PSM is overloaded, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.

Warning number	Contents	Details
59	Converter cooling fan stopped	If the PSM cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. About one minute after the warning signal is output, an alarm occurs.
113	Converter radiator cooling fan stopped	If the PSM radiator cooling fan stops, the warning signal is output. Since the spindle continues to operate at this time, use the PMC to perform processing as needed. If the PSM main circuit overheats, an alarm occurs.

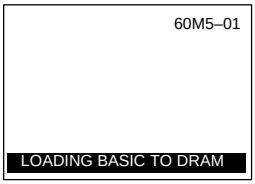
Diagnosis number

Warning states are indicated by diagnosis numbers 712 (first spindle, 713 (second spindle), 732 (third spindle), and 733 (fourth spindle).

18.1 Screen Display at Power On

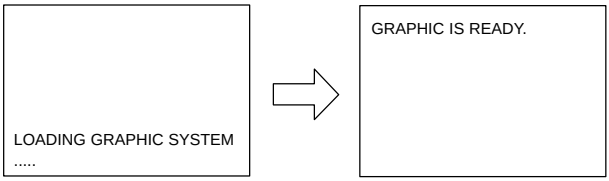
18.1.1 Display until the CNC starts

(1) The BOOT system starts.



If the CNC basic software stored on the FROM has a problem, the system monitor screen appears, and the start operation stops. (For the system monitor screen, see the descriptions of the BOOT system in Chapter 19.)

(2) Graphic system (load → start)

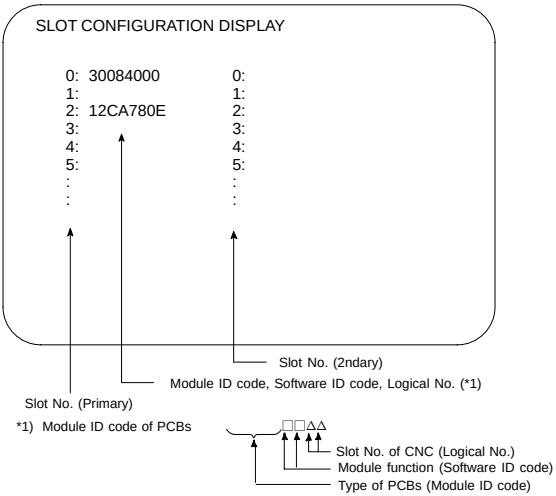


After the graphic system starts, the CNC starts and checks the slot state.

18.1.2 Slot configuration display

PCB modules mounted on the slots are displayed. The LCD displays this screen when a hardware trouble or invalid leading of PCB has occurred.

(a) Screen display



(b) Module ID code

(b–1) For LCD–mounted type CNC

ID	Name
3x08	Series 16*i* Motherboard
3x09	Series 18*i* Motherboard
0x0A	Series 21*i* Motherboard (Without Ethernet function, with PMC–SA1)
1x0A	Series 21*i* Motherboard (Without Ethernet function, with PMC–SB7)
2x0A	Series 21*i* Motherboard (With Ethernet function and PMC–SA1)
3x0A	Series 21*i* Motherboard (With Ethernet function and PMC–SB7)
3x10	Series 160*is* Motherboard
3x11	Series 180*is* Motherboard
2x12	Series 210*is* Motherboard (With Ethernet function and PMC–SA1)
3x12	Series 210*is* Motherboard (With Ethernet function and PMC–SB7)
1xCD	PMC–SE board
0xCD	C language board
2xCD	Serial communication board A
3xCD	Serial communication board B
4xCD	Symbol CAP*i* T board
1xCE	Sub CPU board
xxCA	RISC board
3xDB	Data server board
3xDB	Ethernet board
0x8E	Fast data server board
0x8E	Fast Ethernet board
1xD3	Loader control board
ExAA	HSSB interface board
0x95	I/O Link–II board
0xBB	PROFIBUS board
1xF3	DeviceNet board

x: Represents a character from 0 to F (hexadecimal).

(b–2) For stand–alone type CNC

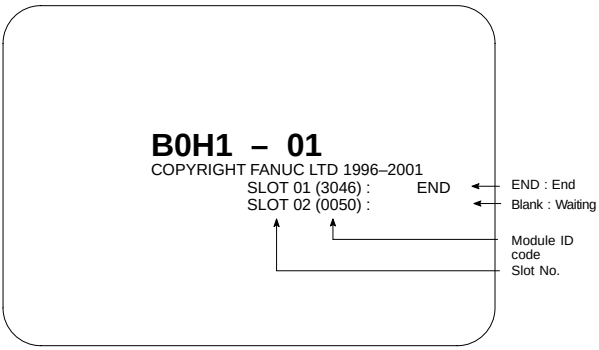
ID	Name
3x0C	Series 16*i*/160*i*/160*is* main CPU board
3x0D	Series 18*i*/180*i*/180*is* main CPU board
3x0E	Series 21*i*/210*i*/210*is* main CPU board
1xC0	Sub CPU board
1x97	Loader control board
0x81	RISC board
1xE1	Serial communication board (RB/DNC2, RS232C I/F)
2xE1	Serial communication board (RB/DNC2, RS422 I/F)
3xE2	Serial communication board (DNC1)
0xE0	C language board
xxAA	HSSB interface board
0x1F	Symbol CAP*i* T board
xxF9	I/O Link–II board
3xF5	Data server board
xxE6	Ethernet board
0x4E	Fast data server board
xx96	Fast Ethernet board
xxEF	DeviceNet board
xxBF	DeviceNet board C
xxFC	PROFIBUS Master board
xxE3	PROFIBUS Slave board
xx59	FL–net board

x: Represents a character from 0 to F (hexadecimal).

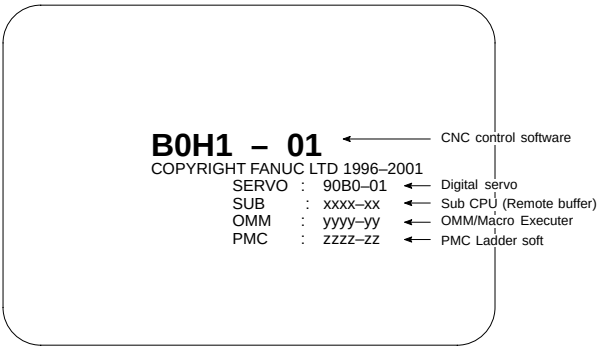
(c) Software ID code

40	:	main CPU	56	:	M–NET
41	:	PMC C language	69	:	PROFIBUS DP slave
43	:	Sub CPU	6A	:	PROFIBUS DP master
49	:	Symbol CAP*i* T	6D	:	Ethernet
4A	:	Remote buffer	76	:	FL–net
4F	:	PMC–RE	70	:	DeviceNet master function
53	:	Loader control	71	:	DeviceNet slave function (1)
78	:	RISC	79	:	DeviceNet slave function (2)
5E	:	HSSB interface (PC)			
77	:	HSSB interface (second board)			

18.1.3 Screen of waiting for setting module configuration information

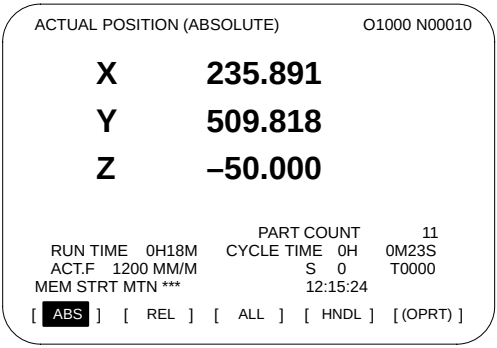


Display of the software series and version



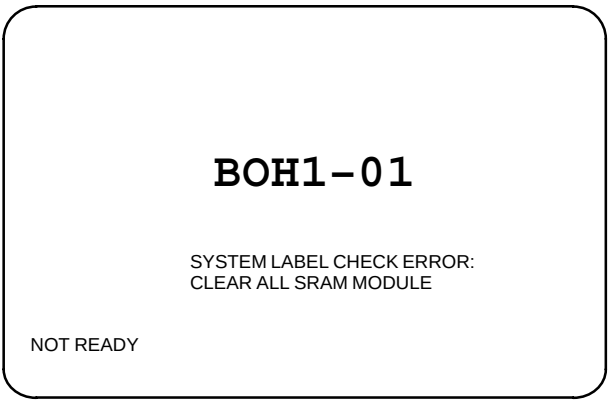
OMM : Order–Made Macro

Initial screen (different on some machines)



18.1.4 Warning screen displayed when system software is replaced (system label check error)

When an attempt is made to turn on the power to the CNC after replacing the system software, the screen shown below is displayed, and the system is not started if the replacing new system software is not compatible with the replaced system software.



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

18.2 System Configuration Screen

Once the system has started normally, you can check the types of installed PCBs and software by displaying the system configuration screen.

(1) Display method

Function key [SYSTEM].

↓

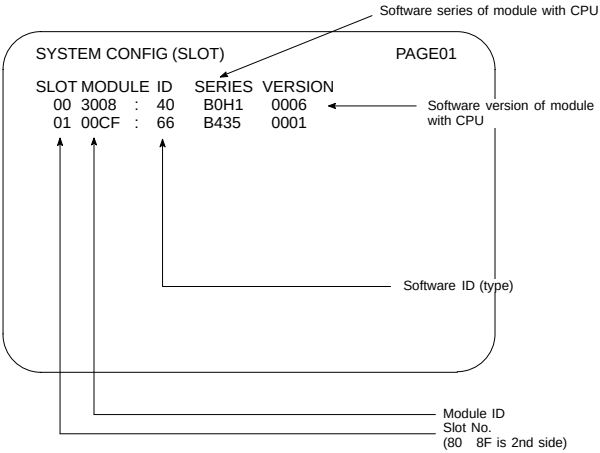
Soft key [SYSTEM].

↓

Page key [↑ PAGE] or [PAGE ↓], selecting screens (2) to (4).

(2) PCB configuration screen

(a) Screen display



(b) Module ID code

(b–1) For LCD–mounted type CNC

ID	Name
3x08	Series 16*i* Motherboard
3x09	Series 18*i* Motherboard
0x0A	Series 21*i* Motherboard (Without Ethernet function, with PMC–SA1)
1x0A	Series 21*i* Motherboard (Without Ethernet function, with PMC–SB7)
2x0A	Series 21*i* Motherboard (With Ethernet function and PMC–SA1)
3x0A	Series 21*i* Motherboard (With Ethernet function and PMC–SB7)
3x10	Series 160*i*s Motherboard
3x11	Series 180*i*s Motherboard
2x12	Series 210*i*s Motherboard (With Ethernet function and PMC–SA1)
3x12	Series 210*i*s Motherboard (With Ethernet function and PMC–SB7)
1xCD	PMC–SE board
0xCD	C language board
2xCD	Serial communication board A
3xCD	Serial communication board B
4xCD	Symbol CAP*i* T board
1xCE	Sub CPU board
xxCA	RISC board
3xDB	Data server board
3xDB	Ethernet board
0x8E	Fast data server board
0x8E	Fast Ethernet board
1xD3	Loader control board
ExAA	HSSB interface board
0x95	I/O Link–II board
0xBB	PROFIBUS board
1xF3	DeviceNet board

x: Represents a character from 0 to F (hexadecimal).

(b–2) For stand–alone type CNC

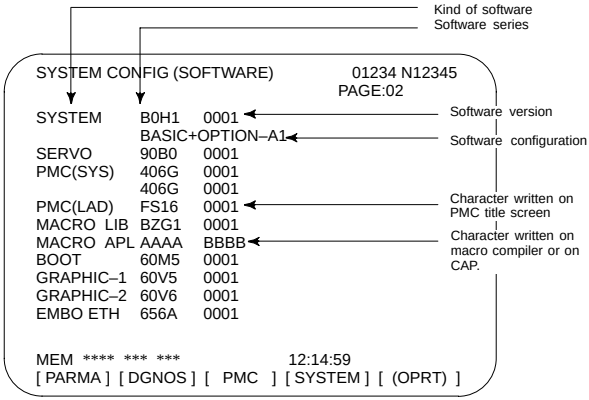
ID	Name
3x0C	Series 16*i*/160*i*/160*i*s main CPU board
3x0D	Series 18*i*/180*i*/180*i*s main CPU board
3x0E	Series 21*i*/210*i*/210*i*s main CPU board
1xC0	Sub CPU board
1x97	Loader control board
0x81	RISC board
1xE1	Serial communication board (RB/DNC2, RS232C I/F)
2xE1	Serial communication board (RB/DNC2, RS422 I/F)
3xE2	Serial communication board (DNC1)
0xE0	C language board
xxAA	HSSB interface board
0x1F	Symbol CAP*i* T board
xxF9	I/O Link–II board
3xF5	Data server board
xxE6	Ethernet board
0x4E	Fast data server board
xx96	Fast Ethernet board
xxEF	DeviceNet board
xxBF	DeviceNet board C
xxFC	PROFIBUS Master board
xxE3	PROFIBUS Slave board
xx59	FL–net board

x: Represents a character from 0 to F (hexadecimal).

(c) Software ID code

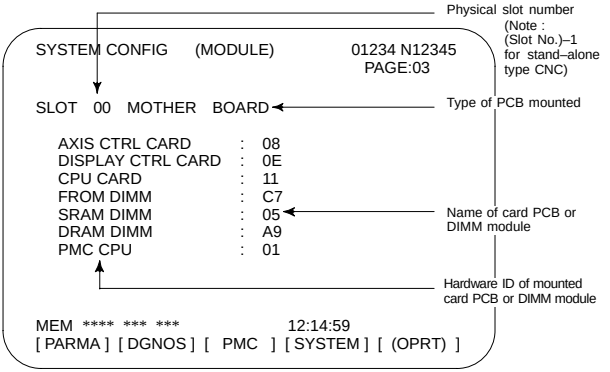
40	:	main CPU	56	:	M–NET
41	:	PMC C language	69	:	PROFIBUS DP slave
43	:	Sub CPU	6A	:	PROFIBUS DP master
49	:	Symbol CAP*i* T	6D	:	Ethernet
4A	:	Remote buffer	76	:	FL–net
4F	:	PMC–RE	70	:	DeviceNet master function
53	:	Loader control	71	:	DeviceNet slave function (1)
78	:	RISC	79	:	DeviceNet slave function (2)
5E	:	HSSB interface (PC)			
77	:	HSSB interface (second board)			

(3) Software configuration screen



(4) Module configuration screen

The configuration of the modules mounted on each board is displayed.

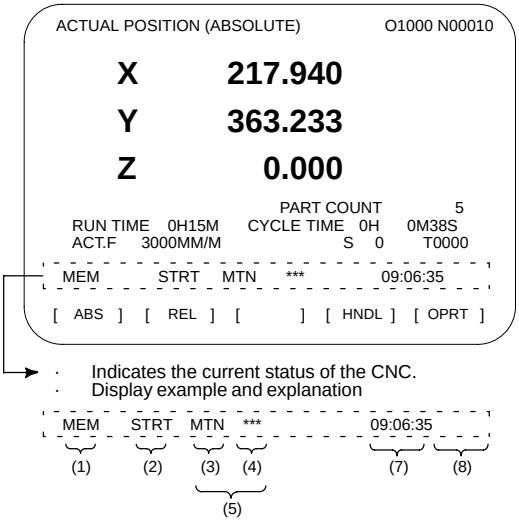


System configuration of another PCB is displayed by page key (PAGE ↓ or PAGE ↑).

NOTE See Chapter 6 for display of each module.

18.3 CNC State Display

After the system starts up, the current state of the CNC is displayed as described below.
When the execution of a machining program stops, and the cause cannot be determined from this information, for example, see Chapter 13, “DIAGNOSIS INFORMATION” as well.



(1) Mode selection status

MEM: Automatic operation (memory operation)

MDI: Manual data input/MDI operation

EDIT: Program editing

RMT: Remote operation

JOG: Jog feed

REF: Reference position return

INC: Incremental feed mode = step feed (if no manual pulse generator is available)

HND: Manual handle feed mode

TJOG: TEACH IN JOG (Teaching in jog feed mode)

THND: TEACH IN HANDLE (Teaching in handle feed mode)

(2) Automatic operation status

STRT: Automatic operation has started (and program execution is under way).

HOLD: Automatic operation has been suspended (execution of a block has been discontinued, and automatic operation has stopped).

STOP: Automatic operation has stopped (a block has been finished, and automatic operation has stopped).

MSTR: The tool is returning or being repositioned when the tool retract and return function is executed.

****: Other status (when the power is switched on, or automatic operation has ended)

(3) Automatic operation status

MTN: Program–specified axis movement is under way.

DWL: Program–specified dwell command (G04) is being executed.

***: Other status

(4) Auxiliary function status

FIN: The completion signal FIN for an auxiliary function is being awaited.

***: Other status

(5) Emergency stop and reset status (displayed at the location of items mentioned in (3) and (4))

—EMG— :Emergency stop status

–RESET–: CNC reset status (The state in which the reset signal or the MDI (RESET) key remains active.)

(6) Alarm status

ALM :An alarm condition has been detected.

BAT : The lithium battery (CNC back–up battery) voltage is low (the battery is to be replaced).

Blank: Other status

(7) Clock display: Hour:minute:second

(8) Program editing/running status

Input: Data is being input.

Output: Data is being output.

SRCH: A data search is under way.

EDIT: Editing such as insertion or modification is under way.

LSK: Label skip enabled at data input (until valid information is read).

PTRR: Retract or return/re–positioning is under way when the tool retract and recover function is used.

HPCC: High–precision contour control mode.

AICC: AI contour control mode.

AI NANO: AI nano contour control mode

AI HPCC: AI high–precision contour control mode

NANO HP: AI nano high–precision contour control mode

AIAPC: AI advanced preview control mode

RVRS: Reversing based on the retrace function.

RTRY: Re–advancing based on the retrace function.

RVED: Reversing based on the retrace function has ended.

Blank: Editing is not under way.

18.4 Warning Screen Displayed When an Option Is Changed

- Warning screen

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

```
WARNING

YOU SET THE PARAMETER NO.□□□□#□

THE FOLLOWING DATA WILL BE CLEARED.

* PART PROGRAM MEMORY

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

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

- Allocation error screen

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

```
FILE ALLOCATION ERROR

S–RAM CAPACITY IS NOT SUFFICIENT.
ADDITIONAL S–RAM IS NECESSARY.

PLEASE PRESS <CAN> KEY :
RETURN TO THE STATE BEFORE
OPTION PARAMETER IS CHANGED.
```

NOTE When replacing SRAM, perform all memory clear.

(When turning on the power, press the MDI keys RESET and DELETE .)

18.5 Periodic Maintenance Screens

Setting the name and service life of consumables, and the countdown method to be used for them enables counting of the remaining service time according to the specified countdown method and displaying of the result.

18.5.1 Overview

- Screen configuration

The following periodic maintenance screens are available:

(1) Status screen: Displays item names, remaining service time, countdown status, and lets you specify item names.

(2) Setting screen: Lets you specify service life, remaining service time, and count type (countdown method).

(3) NC system menu screen: Displays the names of registered consumables used in the NC.

(4) Machine system menu screen: Enables registering the names of consumables used in the machine.

- Procedure

To use this function, follow the steps below:

(1) Select a number for registration (using the cursor key on the status screen).

(2) Specify an item name.
The following two methods are available.

– Selecting a name from a menu screen (machine or NC system menu screen).

– Entering a name to the status screen directly from the MDI.

Using the machine system menu screen requires that item names be registered previously.

(3) Specify the service life, remaining service time, and count type for a target item.

(4) Consider the setting of PRM8911.

After the setting of (1) through (3), the remaining service time can be checked on the status screen.

18.5.2 Display and operation

1 Press the [SYSTEM] function key.

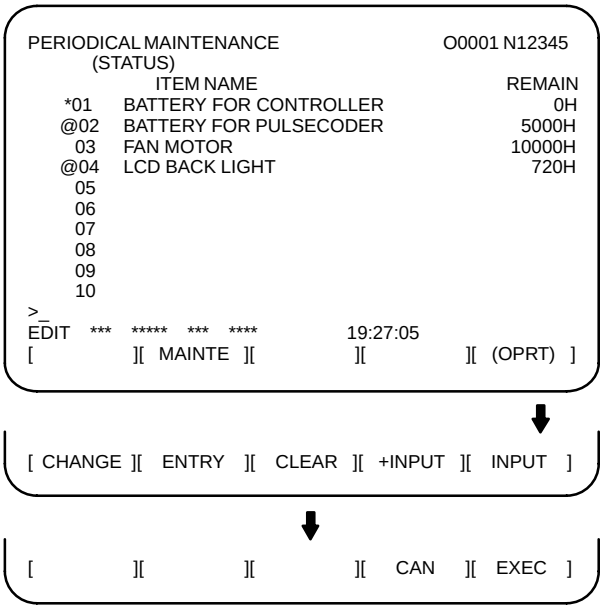
2 Press the [▷] continuous menu key several times. Soft key [MAINTE] appears.

3 Press soft key [MAINTE]. A periodic maintenance screen appears.

There are two periodic maintenance screens, status and setting screens. Either screen can be selected using soft key [CHANGE].

18.5.3 Status screen display and setting

Up to 10 consumable items can be registered for management. Their remaining service time and count status are displayed on the status screen.



(1) Item name
The name of an item to be subjected to periodic maintenance is specified under “Item name.”
The first method uses the menu screen, and the second, the MDI keyboard.

(1) Method of using the menu screen

1 Place the cursor on the target item name, and press soft key [ENTRY]. A menu screen appears. The menu screen is either the machine or NC system menu screen.

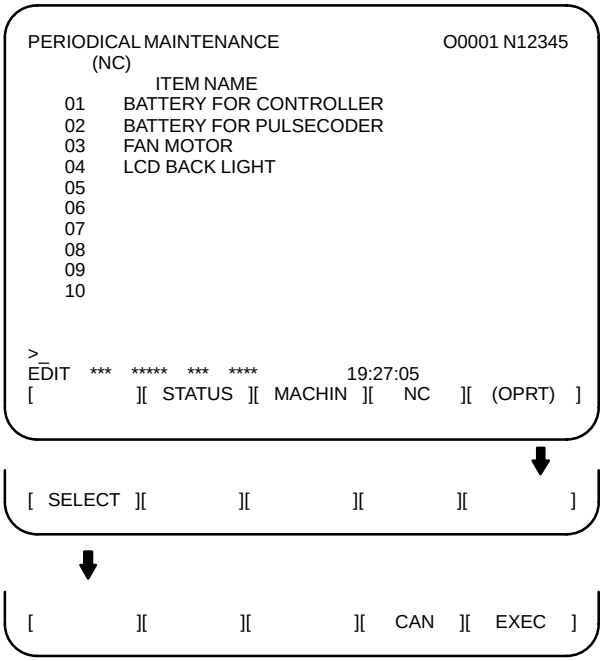
2 Press soft key [MACHIN] or [NC]. A machine system menu appears. It holds the names of consumables typical to the machine system or NC system.

3 Place the cursor on a registered item name, and press soft key [SELECT], then soft key [EXEC]. On the status screen, the item name is set.

4 Press soft key [CAN]. The previous soft key displays appear again.

5 Press soft key [MAINTE]. The status screen appears again.

[NC system] menu screen



NOTE On the NC system screen, no item name can be registered, erased, input, or output.

(2) MDI keypad–based setting

An item name can be registered on the status screen by first entering it in the following format using keys, then pressing soft key [INPUT] (or the INPUT key).

Pressing soft key [+INPUT] adds the item name to the list of previously registered item names.

Format

Alphanumeric characters*two–byte characters*alphanumeric characters

The two–byte characters shall comply with the FANUC code.
When entering a two–byte character using keys, sandwich it with an "*" pair.

The item name can consist of up to 24 alphanumeric characters (if no two–byte character is included) or 12 two–byte characters (if no alphanumeric character is included).

Example) To register "LCD backlight," enter:
>LCD*110E10F410CC114010B610FE_

NOTE "*" cannot be used in item names, because it is used as control code. "[", "]", "(", or ")" also cannot be used in item names.

To erase the registered data for an item, place the cursor on the target item name, press soft key [CLEAR], then [EXEC].

When an item name is deleted, the related service life, remaining service time, and count type are also deleted.

(2) Remaining service time
The remaining service time of an item (the time allowed before the item is replaced) is obtained by count–down and displayed under "Remaining service time." When the remaining service time decreases to a specified percentage (specified in PRM8911) of the service life or lower, it is displayed in red.

Count–down continues even after the service life has expired.

NOTE It should be done on the setting screen.

(3) Count status
The count status is displayed at the left of the corresponding item number, as listed below:

Display	Count status
Blank	Count suspended
@	Count under way
*	The service life has expired.

- About the machine system menu screen

Using the machine system menu screen requires that item names be registered on the screen previously.
This can be done using two methods, (a) and (b).

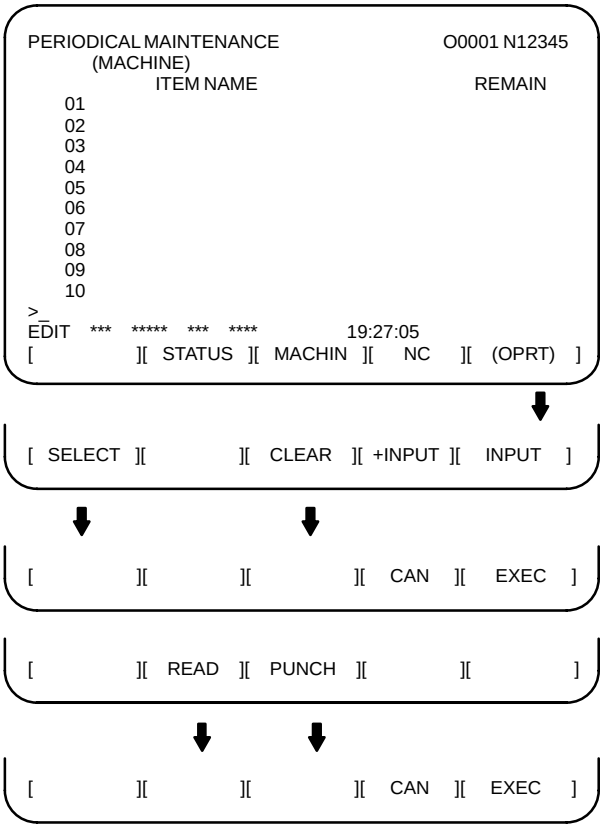
(a) Program–based registration
Executing a program in the following format enables item names to be registered on the machine system menu screen.

Format

```
G10 L61 Px  [n]
    x…   Registration number

    n…   Item name
         [Alphanumeric characters*two–byte
         characters*alphanumeric characters]
```

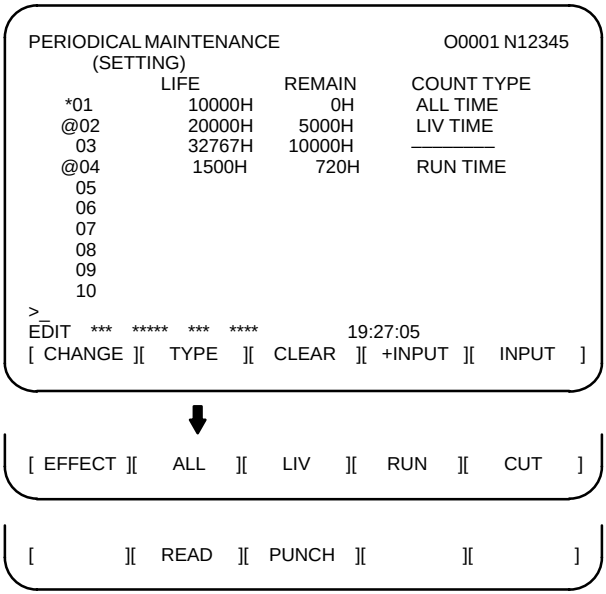
(b) MDI keypad–based registration
On the machine system menu screen as well, the method of setting through the MDI keys mentioned in (2) above can be used for registration.
To erase the registered data for an item, place the cursor on the target item name, and press soft key [CLEAR], then soft key [EXEC].

[Machine system] menu screen



18.5.4 Setting screen display and setting

The setting screen lets you specify the service life, the remaining service time, and count type for a registered item name.
It also displays the same count status information as displayed on the status screen.



(1) Service life
The service life of a consumable item is to be specified under “Service life.”
First place the cursor on the service life of a target registration number, enter a desired service life value. At this time, the same value is also set for the remaining service time, and the count type is displayed as “_____”.
The valid data range for the service life is: 0 to 65535 (hours)

(2) Remaining service time
The remaining service time of an item (the time allowed before the item is replaced) is determined by count–down and displayed under “Remaining service time.” When the remaining service time decreases to a specified percentage (specified in PRM8911) of the service life or lower, it is displayed in red.
Count–down continues even after the service life has expired.
First place the cursor on the remaining service time of a target registration number, enter a desired remaining service time value.

(3) Count type
The type of a selected count method is specified.
After the cursor is placed on the count type of a target registration number, pressing soft key [TYPE] displays the next count type as a soft key. Select it and press soft key [EXEC].

Soft key	Meaning	Display
[NO CNT]	Not counting (suspended).	—
[ALL]	Always count.	All times
[PWR ON]	Count while the power is supplied.	Power–on time
[RUN]	Count while operation is under way.	Operating
[CUT]	Count while cutting is under way.	Cutting

18.5.5 Parameter

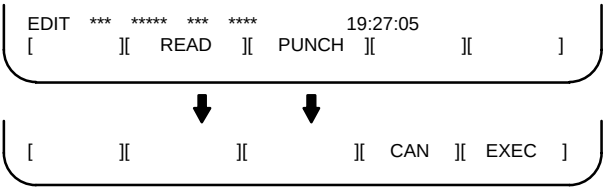
8911	Percentage to the service life of each item displayed on the periodic maintenance screen [%]

[Valid data range] 0 to 100

On the periodic maintenance screens, any remaining service time value smaller than the specified percentage to the service life is displayed in red for warning purposes.

18.5.6 Registered data input/output

Registered data can be input/output through an external device.
These operations can be done on the status, setting, and machine system menu screens.



- Data input/output operation

Set the EDIT mode, then press the [PUNCH] soft key to output data.
Set the EDIT mode, then press the [READ] soft key to input data.
(Information such as item names is registered.)

18.6 Maintenance Information Screen

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

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

18.6.1 Screen display and editing

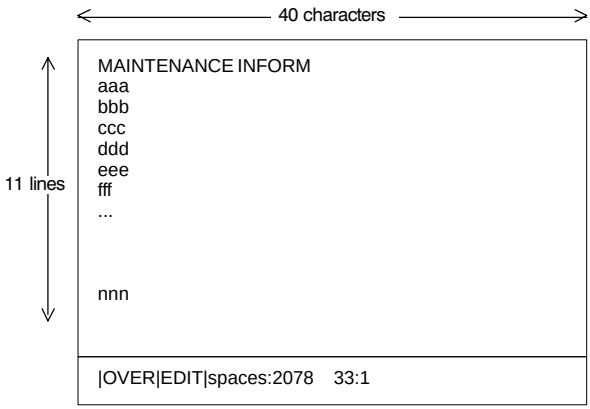
- Screen display

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

When selected, the maintenance screen shows the latest information.

The recording screen has an input area of 40 characters by 11 lines.

The status (mode, number of empty character spaces, cursor line, column number) is displayed at the bottom of the screen.



Status display

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

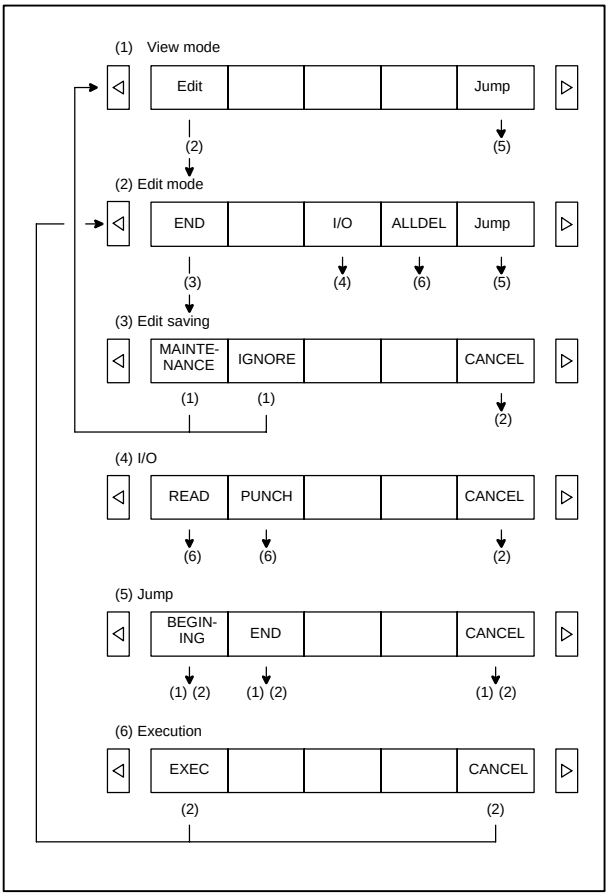
- Editing operation

The maintenance information screen has view mode and edit mode, which are selected by pressing the [END] or [EDIT] soft key.
To start editing, select edit mode by pressing the [(OPRT)] and [EDIT] keys. When the editing is completed, press the [END] key. Then, select [STORE] or [IGNORE]. Unless [STORE] is selected, the edited data will be lost.

Maintenance information screen (editing) operation table

Mode	Key	Description
View	Soft keys [EDIT] [JUMP]	Allows editing. Displays the beginning or the end.
	Cursor key	Scrolls the screen up or down.
	Page key	Scrolls the screen up or down in units of whole screens.
Edit	Soft keys	
	[END]	Ends editing. Select whether to store the edited data.
	[ALLDEL]	Clears all maintenance information. (This key is enabled when the PRM3118#3(MDC) is set to 1.)
	[I/O]	Reads or punches the maintenance information.
	[JUMP]	Moves the cursor to the beginning or end.
	Cursor key	Moves the cursor position up or down.
	Page key	Scrolls the screen up or down in units of whole screens.
	Alphanumeric/special character keys	Allows alphabetical, numeric, or special character input.
	 key	Selects either insert mode or overwrite mode.
	 key	Deletes a single character.
	 key	Deletes a single character before the cursor position.
	 key	Starts a new line.

Operation of the soft keys



18.6.2 Maintenance information input/output

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

(1) Format

```
----------------------------------------%%

|_____________ Data _____________|
```

(2) Reading

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

(3) Punching

All maintenance information is output in the format shown above.

19.1 Inputting/Outputting Data

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

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

19.1.1 Parameters required for data input/output

NOTE Note that data may not be output in the alarm state.

Parameters required for input/output are as follows :
In addition, ☆ indicates the standard setting for input/output devices made by FANUC. Change these settings according to the unit you actually use. (Parameter can be changed in MDI mode or emergency stop status.)

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

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

0020	Selection of I/O channel

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

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

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

#0 (SB2) 0 : No. of stop bits is 1.
☆ 1 : No. of stop bits is 2.
#3 (ASI)☆ 0 : EIA or ISO code is used for input/output data.
1 : ASCII code is used.
#7 (NFD) 0 : Feed is output when data is output.
1 : Feed is not output when data is output.

0102	Specification number of input/output device

Set value	Input/output device
0	RS–232–C (Used control codes DC1 to DC4)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/ B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE Mate, FANUC FA Card Adaptor FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File FANUC SYSTEM P-MODEL H
4	RS–232–C (Not used control codes DC1 to DC4)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P-MODEL G, FANUC SYSTEM P-MODEL H

0103	Baud Rate

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

19.1.2 Output of data

* In the alarm state, data output is disabled in some cases.

19.1.2.1 Outputting CNC parameters

1. Enter EDIT mode or the emergency stop condition.
2. Press SYSTEM key and soft key [PARAM] to display parameter screen.
3. Press soft key [(OPRT)] ,and soft key ▷.
4. Press soft key [PUNCH] and [EXEC],and the parameters are started to be output.

19.1.2.2 Outputting PMC parameters

1. Select MDI mode.
2. Press OFFSET SETTING key then soft key [SETTING] to select a setting screen.
3. Set the cursor to PARAMETER WRITE and input 1 and INPUT. At this time, alarm 100 will be generated.
4. Press SYSTEM key and soft key [PMC].
5. Press soft key [PMCPRM] and soft key [KEEPRL]
6. Set the cursor to K900 (on the SB7) or K17 (on the SA1) and set the first bit to 1.

X X X X X X 1 X INPUT

Where, mark x is a former value

Thus, data input/output screen has been selected.

7. Select EDIT mode.

8. Press soft key [◁] then key [▷].
9. Press soft key [I/O] and set the parameters on I/O.
   Item selection cursor moves to the following item after data of an item is set.
10. In CHANNEL NO item, input [1] [INPUT] to select I/O channel 1.
11. In DEVICE item, press soft key [FDCAS] to select the floppy cassette.
12. In KIND DATA item, press soft key [PARAM].
13. In FUNCTION item, press soft key [WRITE].
14. In FILE No item, specify a file name. In this example input as follows:
    [@] [P] [M] [C] [INPUT]
15. Press soft key [EXEC]. Then PMC parameters are started to be output.
16. After the PMC parameters have been output, set PARAMETER WRITE to 0.
17. Press [RESET] to release alarm 100.

19.1.2.3 Outputting pitch error compensation amount

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

19.1.2.4 Outputting custom macro variable values

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

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

19.1.2.5 Outputting compensation (tool compensation amount)

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

19.1.2.6 Outputting part program

1. Confirm the following parameters. If this parameter is set to 1, rather than the value indicated by ☆, change to MDI mode and then reset to 0.

However, if you changed the parameter setting, restore the original value after finishing this work.

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

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

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

	#7	#6	#5	#4	#3	#2	#1	#0
3204				P9E	P8E			

P8E Editing of subprograms 80000000 to 89999999 is:
☆ 0 : Not inhibited
1 : Inhibited

NOTE This parameter is valid when the program number O 8–digit option is selected.

P9E Editing of subprograms 90000000 to 99999999 are:
☆ 0 : Not inhibited
1 : Inhibited
The following editing types become impossible.

NOTE This parameter is valid when the program number O 8–digit option is selected.

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

19.1.3 Input of data

19.1.3.1 Inputting CNC parameters

NOTE If an absolute pulse coder is attached, ALM300 is issued when a CNC parameter is input. At this time, perform a reference position return operation again.

Procedure

1. Set to the emergency stop state.
2. Confirm that the parameters required to input data is correct. (See Subsec 19.1.1.)
3. Press soft key [▷].
4. Press soft key [READ] and [EXEC]. Then input of parameters are started.

5. After the parameter has been inputted, turn off power and turn it on.
6. ALM300 is issued if the system employs an absolute pulse coder. In such a case, perform reference position return again.

19.1.3.2 Inputting PMC parameters

Set the emergency stop state.

1. Turn off (KEY4=1) the program protect key.
2. Press [OFFSET SETTING] key and soft key [SETING] to select the SETTING screen.
3. Confirm that PARAMETER WRITE=1.
4. Press [SYSTEM] key and soft key [PMC].
5. Press soft key [PMCPRM] and soft key [KEEPRL].
6. Set the cursor to K900 (on the SB7) or K17 (on the SA1) and set bit 1 to 1.
   [0] [0] [0] [0] [0] [0] [1] [0] [INPUT].
7. Press [◁] key and [▷] key.
8. Press soft key [I/O] and set the parameters required for I/O.
   Item selection cursor displays the next item after an item is set.
9. In CHANNEL item , press [1] [INPUT] to select channel 1.
10. In DEVICE item, press [FDCAS] key to select the floppy cassette.
11. In FUNCTION item, press soft key [READ] to input data
12. Press soft key [EXECT] and the PMC parameters are started to be input.
13. After data has been read, turn off power and turn it on.

19.1.3.3 Inputting pitch error compensation amount

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

19.1.3.4 Inputting custom macro variable values

If the system is equipped with the custom macro function, input the variable values.

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

19.1.3.5 Inputting tool compensation amount

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

19.1.3.6 Inputting part programs

Confirm the following parameters. If the setting is different from the value indicated by ☆, reset to the specified value only during this work. (Change it in MDI mode).

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

#1 (RAL) When programs are registered:

☆ 0 : All programs are registered.

1 : Only one program is registered.

#6 (NPE) When programs are registered in part program storage area, M02,M30 and M99 are:

0 : regarded as the end of program.

☆ 1 : not regarded as the end of program.

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

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

1 : Programs of 8000s are protected.

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

1 : Programs of 9000s are protected.

	#7	#6	#5	#4	#3	#2	#1	#0
3204				P9E	P8E			

#3 (P8E) Editing of subprograms 80000000 to 89999999 is:

☆ 0 : Not inhibited

1 : Inhibited

NOTE This parameter is valid when the program number O 8–digit option is selected.

#4 (P9E) Editing of subprograms 90000000 to 99999999 are:

☆ 0 : Not inhibited

1 : Inhibited

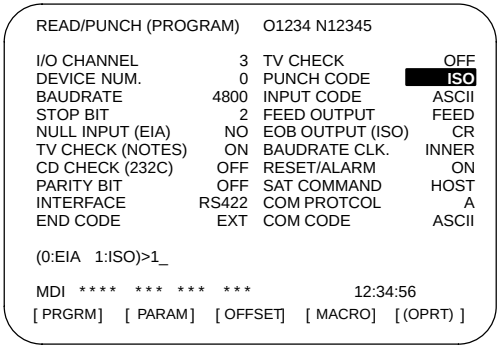
The following editing types become impossible.

NOTE This parameter is valid when the program number O 8–digit option is selected.

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

19.1.4 ALL IO screen (data input/output in a batch)

Programs, parameters, offset data, and macro variables can all be input and output using a single common screen, that is, the ALL IO screen.



ALL IO screen (example when I/O channel 3 is used)

19.1.4.1 Setting input/output–related parameters

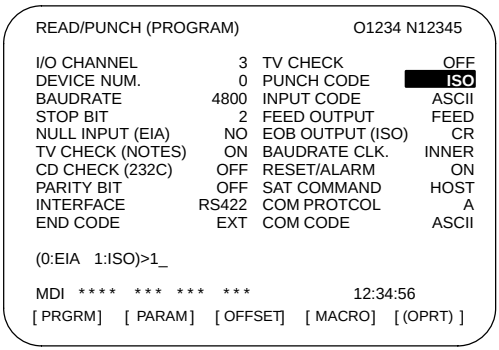
Input/output–related parameters can be set on the ALL IO screen. Parameters can be set, regardless of the mode.

- Procedure

1 Press function key [SYSTEM].

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

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



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

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

Tip

First, set an I/O channel. The parameters on this screen change to those corresponding to a specified I/O channel.

- I/O channel (0 to 3)

Setting	Corresponding parameter
0	PRM101 to 103
1	PRM111 to 113
2	PRM121 to 123
3	PRM131 to 135

- Device number

Setting	Input/output device
0	RS–232–C (The control codes DC1 through DC4 are used.)
1	FANUC CASSETTE ADAPTOR 1 (FANUC CASSETTE B1/B2)
2	FANUC CASSETTE ADAPTOR 3 (FANUC CASSETTE F1)
3	FANUC PROGRAM FILE MATE, FANUC FA Card Adaptor FANUC FLOPPY CASSETTE ADAPTOR, FANUC Handy File FANUC SYSTEM P–MODEL H
4	RS–232–C (The control codes DC1 through DC4 are not used.)
5	Portable tape reader
6	FANUC PPR FANUC SYSTEM P–MODEL G, FANUC SYSTEM P–MODEL H

- Baud rate (bps)

Set a desired baud rate value indicated below.

Baud rate (bps)
50
100
110
150
200
300
600
1200
2400
4800
9600
19200

19.1.4.2 Inputting and outputting programs

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

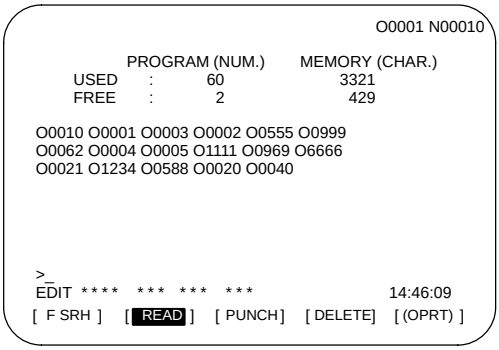
(1) File search

1 Press soft key [PRGRM] on the ALL IO screen.

2 Select EDIT mode. A program directory is displayed.

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

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

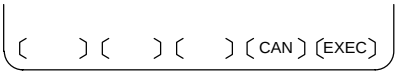


4 Enter address N.

5 Enter the number of the file to be found.

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

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



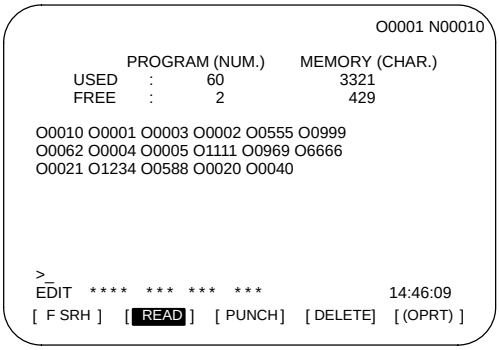
(2) Inputting a program

1 Press soft key [PRGRM] on the ALL IO screen.

2 Select EDIT mode. A program directory is displayed.

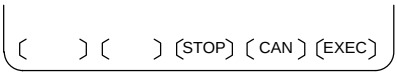
3 Press soft key [(OPRT)]. The screen and soft keys change as shown below.

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



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

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



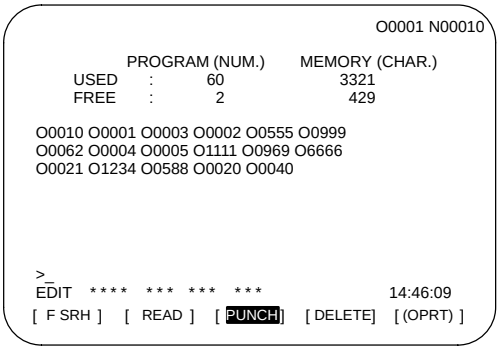
(3) Outputting programs

1 Press soft key [PRGRM] on the ALL IO screen.

2 Select EDIT mode. A program directory is displayed.

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

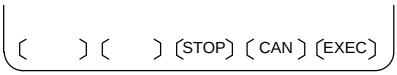
- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 Enter address O.

5 Enter a desired program number.
If –9999 is entered, all programs in memory are output.
To output a range of programs, enter OΔΔΔΔ, O□□□□. The programs numbered from ΔΔΔΔ to □□□□ are output.
When PRM3107#4(SOR) for sorted display is set to 1 on the program library screen, programs are output in order, starting from those having the smallest program numbers.

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



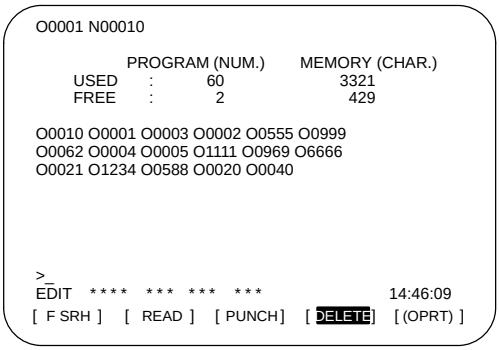
(4) Deleting files

1 Press soft key [PRGRM] on the ALL IO screen.

2 Select EDIT mode. A program directory is displayed.

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

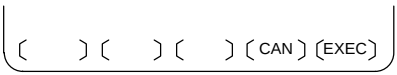
- A program directory is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



4 Press soft key [DELETE].

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

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



19.1.4.3 Inputting and outputting parameters

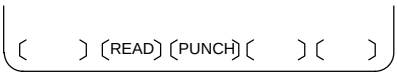
Parameters can be input and output using the ALL IO screen.

- Common operation

1 Press soft key [PARAM] on the ALL IO screen.

2 Select EDIT mode.

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

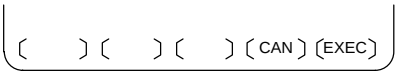


- For parameter input

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

- For parameter output

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

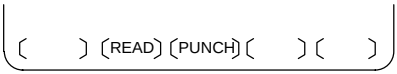


19.1.4.4 Inputting and outputting offset data

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

- Common operation

1 Press soft key [OFFSET] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)]. Soft keys change as shown below.

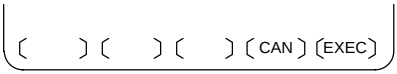


- For offset data input

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

- For offset data output

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

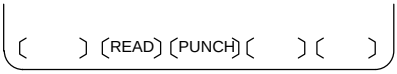


19.1.4.5 Outputting custom macro common variables

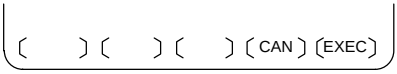
Custom macro common variables can be output using the ALL IO screen.

- Outputting custom macro common variables

1 Press soft key [MACRO] on the ALL IO screen.
2 Select EDIT mode.
3 Press soft key [(OPRT)]. Soft keys change as shown below.



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



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

19.1.4.6 Inputting and outputting floppy files

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

(1) Displaying a file directory

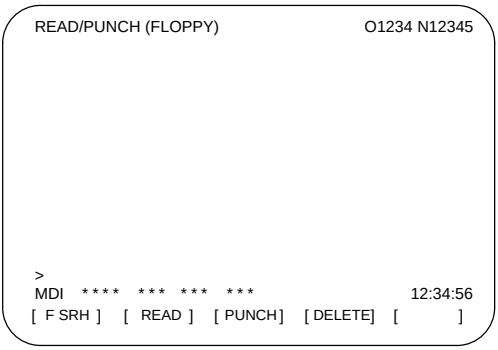
1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen.

2 Press soft key [FLOPPY].

3 Select EDIT mode. The floppy screen is displayed.

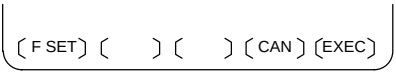
4 Press soft key [(OPRT)]. The screen and soft keys change as shown below.

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

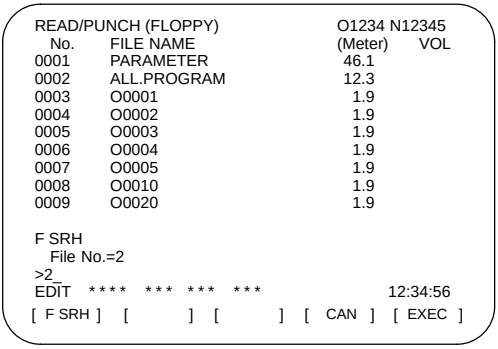


5 Press soft key [F SRH].

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



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



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

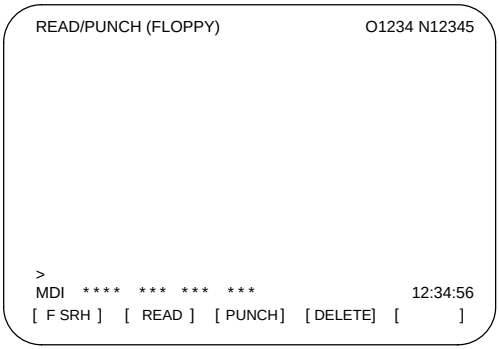
(2) Inputting a file

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen.

2 Press soft key [FLOPPY].

3 Select EDIT mode. The floppy screen is displayed.

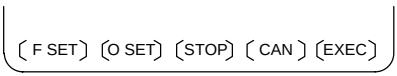
4 Press soft key [(OPRT)]. The screen and soft keys change as shown below.
The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.



5 Press soft key [READ].

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

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



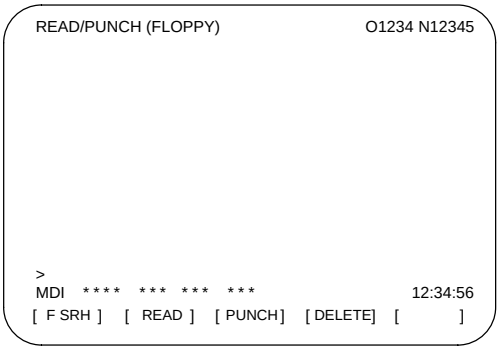
7 Press soft key [EXEC].
The specified file or program is read, and the “INPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of input, the “INPUT” indicator is cleared from the screen.

(3) Outputting a file

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen.

2 Press soft key [FLOPPY].

3 Select EDIT mode. The floppy screen is displayed.

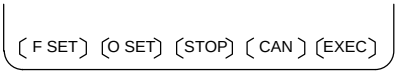


4 Press soft key [(OPRT)]. The screen and soft keys change as shown below.
The floppy screen is displayed only in EDIT mode. In all other modes, the ALL IO screen is displayed.

5 Press soft key [PUNCH].

6 Enter the number of the program to be output, together with a desired output file number.

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



7 Press soft key [EXEC].
The specified program is output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
If no file number is specified, the program is written at the end of the currently registered files.

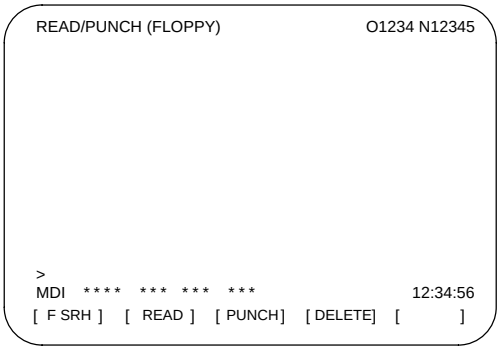
(4) Deleting a file

1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen.

2 Press soft key [FLOPPY].

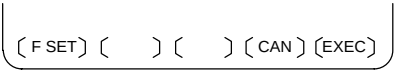
3 Select EDIT mode. The floppy screen is displayed.

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



5 Press soft key [DELETE].

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

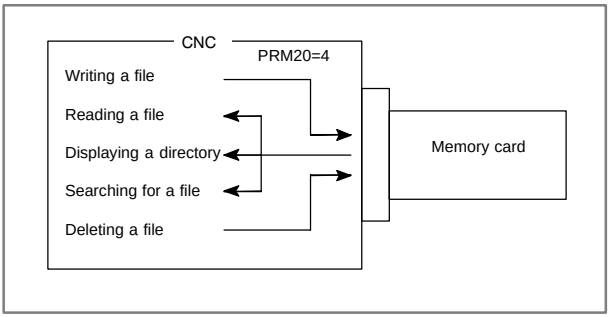


7 Press soft key [EXEC]. The specified file is deleted. After the file has been deleted, the subsequent files are shifted up.

19.1.5 Data input/output using a memory card

By setting the I/O channel (PRM20) to 4, files on a memory card can be referenced, and different types of data such as part programs, parameters, and offset data on a memory card can be input and output in text file format. The major functions are listed below.

- Displaying a directory of stored files
  The files stored on a memory card can be displayed on the directory screen.
- Searching for a file
  A search is made for a file on a memory card and, if found, it is displayed on the directory screen.
- Reading a file
  Text–format files can be read from a memory card.
- Writing a file
  Data such as part programs can be stored to a memory card in text file format.
- Deleting a file
  A file can be selected and deleted from a memory card.



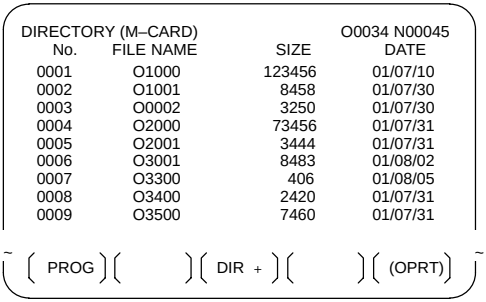
19.1.5.1 Displaying a directory of stored files

1 Press the EDIT switch on the machine operator's panel.

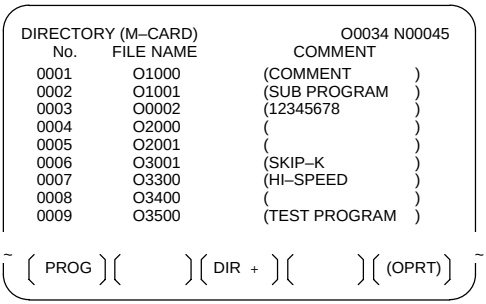
2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

4 Press soft key [CARD]. The screen shown below is displayed. Using page keys [↑ PAGE] and [PAGE ↓], the screen can be scrolled.



5 Comments relating to each file can be displayed by pressing soft key [DIR+].



6 Repeatedly pressing soft key [DIR+] toggles the screen between the display of comments and the display of sizes and dates.
A comment, if included after an O number in the file, is displayed. Up to 18 characters can be displayed on the screen.

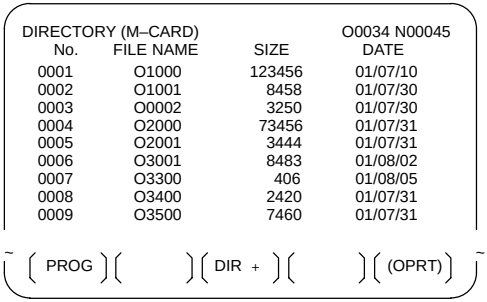
19.1.5.2 Searching for a file

1 Press the EDIT switch on the machine operator's panel.

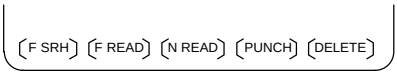
2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

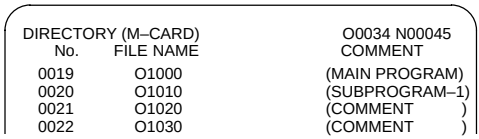
4 Press soft key [CARD]. The screen shown below is displayed.



5 Press soft key [(OPRT)].



6 Set the number of the desired file number with soft key [F SRH]. Then, start the search by pressing soft key [EXEC]. If found, the file is displayed at the top of the directory screen.



When a search is made for file number 19

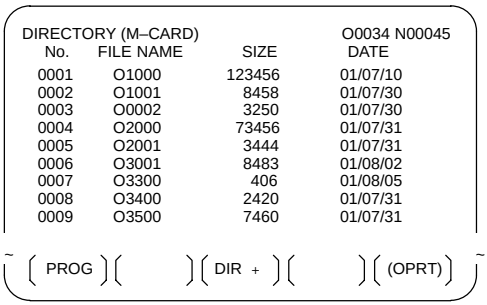
19.1.5.3 Reading a file

1 Press the EDIT switch on the machine operator's panel.

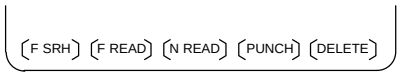
2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

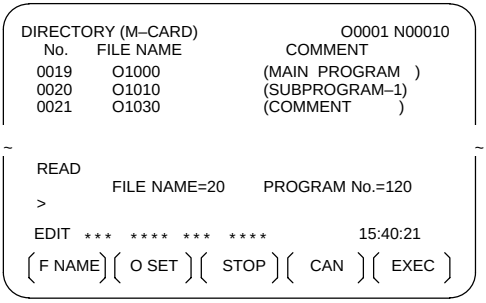
4 Press soft key [CARD]. Then, the screen shown below is displayed.



5 Press soft key [(OPRT)].



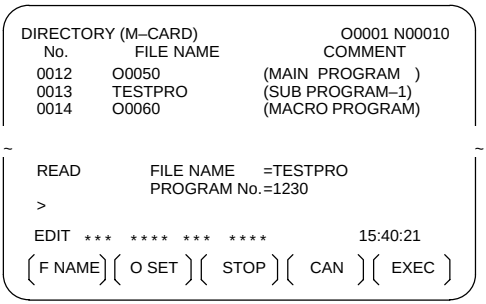
6 To specify a file number, press soft key [F READ]. The screen shown below is displayed.



7 Enter file number 20 from the MDI panel, then set the file number by pressing soft key [F SET]. Next, enter program number 120, then set the program number by pressing soft key [O SET]. Then, press soft key [EXEC].

- File number 20 is registered as O0120 in the CNC.
- Set a program number to register a read file with a separate O number. If no program number is set, the O number in the file name column is registered.

8 To specify a file with its file name, press soft key [N READ] in step 6 above. The screen shown below is displayed.



9 To register file name TESTPRO as O1230, enter file name TESTPRO from the MDI panel, then set the file name with soft key [F NAME]. Next, enter program number 1230, then set the program number with soft key [O SET]. Then, press soft key [EXEC].

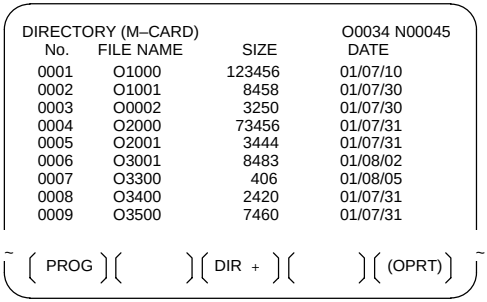
19.1.5.4 Writing a file

1 Press the EDIT switch on the machine operator's panel.

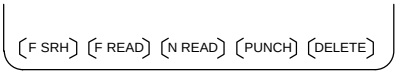
2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

4 Press soft key [CARD]. The screen shown below is displayed.

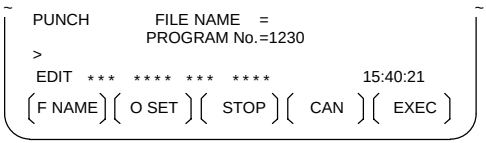


5 Press soft key [(OPRT)].

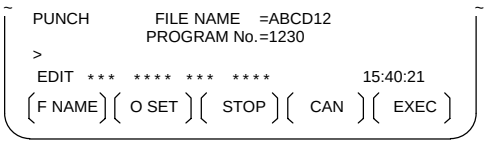


6 Press soft key [PUNCH].

7 Enter a desired O number from the MDI panel, then set the program number with soft key [O SET].
When soft key [EXEC] is pressed after the setting shown below has been made, for example, the file is written under program number O1230.



8 In the same way as for O number setting, enter a desired file name from the MDI panel, then set the file name with soft key [F SET].
When soft key [EXEC] is pressed after the setting shown below has been made, for example, the file is written under program number O1230 and file name ABCD12.



19.1.5.5 Deleting a file

1 Press the EDIT switch on the machine operator's panel.

2 Press function key [PROG].

3 Press the rightmost soft key [▷] (continuous menu key).

4 Press soft key [CARD]. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.    FILE NAME      SIZE          DATE
 0001    O1000          123456        01/07/10
 0002    O1001            8458        01/07/30
 0003    O0002            3250        01/07/30
 0004    O2000           73456        01/07/31
 0005    O2001            3444        01/07/31
 0006    O3001            8483        01/08/02
 0007    O3300             406        01/08/05
 0008    O3400            2420        01/07/31
 0009    O3500            7460        01/07/31

[ PROG ][      ][ DIR + ][      ][ (OPRT) ]
```

5 Press soft key [(OPRT)].

```
[F SRH] [F READ] [N READ] [PUNCH] [DELETE]
```

6 Set the number of the desired file with soft key [DELETE], then press soft key [EXEC]. The file is deleted, and the directory screen is displayed again.

When file number 21 is deleted

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.    FILE NAME      COMMENT
 0019    O1000          (MAIN PROGRAM)
 0020    O1010          (SUBPROGRAM–1)
 0021    O1020          (COMMENT      )
 0022    O1030          (COMMENT      )
```

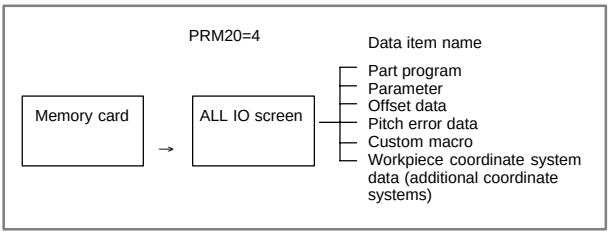
File name O1020 is deleted.

```
DIRECTORY (M–CARD)                    O0034 N00045
  No.    FILE NAME      COMMENT
 0019    O1000          (MAIN PROGRAM)
 0020    O1010          (SUBPROGRAM–1)
 0021    O1020          (COMMENT      )
 0022    O1030          (COMMENT      )
```

File number 21 is assigned to the next file name.

19.1.5.6 Batch input/output with a memory card (ALL I/O screen)

On the ALL IO screen, different types of data including part programs, parameters, offset data, pitch error data, custom macros, and workpiece coordinate system data can be input and output using a memory card; the screen for each type of data need not be displayed for input/output.



Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key [SYSTEM].

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

4 Press soft key [ALL IO]. The screen shown below is displayed.

```
READ/PUNCH (PROGRAM)                    O0001 N00001
    No.  FILE NAME            SIZE      DATE
  * 0001   O0222              332010   01–04–06
    0002   O1003              334450   01–05–04
    0003   MACROVAR.DAT       653400   01–05–12
    0004   O0002              341205   01–05–13
       [PROGRAM]
    O0001  O0002  O0003  O0005  O0100  O0020
    O0006  O0004  O0110  O0200  O2200  O0441
    O0330
  >
 EDIT  ***  ****  ***  ****              10:07:37
( PROG )( PARAM )( OFFSET )(        )( (OPRT) )
```

Upper part : Directory of files on the memory card
Lower part : Directory of registered programs

5 With cursor keys [↑] and [↓], the user can choose between upper part scrolling and lower part scrolling. (An asterisk (*) displayed at the left edge indicates the part for which scrolling is possible.)

[↑] : Used for memory card file directory scrolling.

[↓] : Used for program directory scrolling.

6 With page keys [↑ PAGE] and [PAGE ↓], scroll through the file directory or program directory.

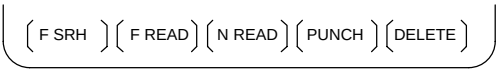
7 When this screen is displayed, the program data item is selected. The soft keys for other screens are displayed by pressing the rightmost soft key [▷] (continuous menu key).

```
( PITCH )( WORK )(        )(        )( (OPRT) )
```

When a data item other than program is selected, the screen displays only a file directory.
A data item is indicated, in parentheses, on the title line.

```
READ/PUNCH (PARAMETER)                  O0001 N00001
   No.   FILE NAME              SIZE     DATE
   0001    O0222               32010   01/04/06
   0002    O1003                4450   01/05/04
   0003    MACROVAR.DAT       653400   01/05/12
   0004    O0003                4610   01/05/04
   0005    O0001                4254   01/06/04
   0006    O0002                 750   01/06/04
   0007    CNCPARAM.DAT        34453   01/06/04
~                                                  ~
```

8 Display the following soft keys with soft key [(OPRT)].



The operation of each function is the same as on the directory (memory card) screen. Soft key [O SET], used for program number setting, and the "PROGRAM NUMBER =" indication are not displayed for data items other than program.

[F SRH] : Finds a specified file number.
[F READ] : Reads a specified file number.
[PUNCH] : Writes a file.
[N READ] : Reads a file under a specified file name.
[DELETE] : Deletes a specified file number.

19.1.5.7 Related parameters

0020	I/O CHANNEL: Selection of an input/output device

Setting value = 4
(The memory card interface is used for input/output.)

	#7	#6	#5	#4	#3	#2	#1	#0
0138	MDN							MDP

[Data type] Bit

#0 (MDP) In data output by a memory card, the series information is:

0: Not added to the output file name.

1: Added to the output file name.

#7 (MDN) The DNC operation function by a memory card is:

0: Disabled.

1: Enabled. (A PCMCIA card attachment is required.)

	#7	#6	#5	#4	#3	#2	#1	#0
0300								PCM

#0 (PCM) If the CNC screen display function is enabled, when a memory card interface is provided on the NC side (HSSB connection),

0 : The memory card interface on the NC side is used. (The setting of PRM20 is followed.)

1 : The memory card interface on the PC side is used.

19.1.5.8 Error codes

Memory card error codes

Code	Meaning
007	The memory card is protected.
030	The memory card is not inserted into its slot.
032	The memory card's battery is exhausted.
102	The memory card does not have sufficient free space.
105	No memory card is mounted.
106	A memory card is already mounted.
110	The specified directory cannot be found.
111	There are too many files under the root directory to allow a directory to be added.
114	The specified file cannot be found.
115	The specified file is protected.
117	The file has not yet been opened.
118	The file is already open.
119	The file is locked.
121	A file end was detected.
122	The specified file name is invalid.
124	The extension of the specified file is invalid.
129	A non–corresponding function was specified.
130	The specification of a device is invalid.
131	The specification of a pathname is invalid.
133	Multiple files are open at the same time.
135	The device is not formatted.
140	The file has the read/write disabled attribute.

19.2 Memory Card Slot

19.2.1 Overview

Whether a memory card slot is provided or not depends on the hardware configuration. See the following table:

Hardware configuration	Card slot on LCD unit	Card slot on control unit
Type 1	Provided	No card slot
Type 2 Type 6	Provided	Provided (This slot, however, cannot be used.)
Type 3	No card slot	Provided
Type 4 Type 5	No card slot (See NOTE given below.)	Provided

(Supplementary)

– Types 1 to 6 indicate hardware configuration. See Subsec. 19.2.2.
– When both the LCD unit and control unit have a memory card slot, only the memory card slot on the LCD unit can be used.

NOTE When the hardware configuration is type 4 or type 5, software write operation and other operations are implemented by open CNC functions. (→ See Section 19.5.)

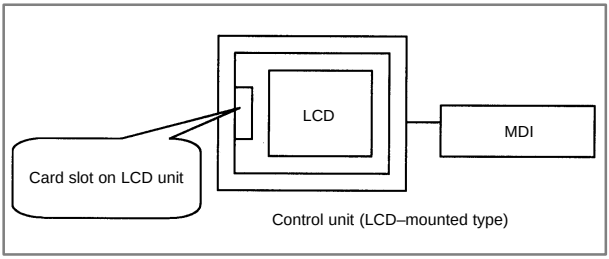
- Memory card types (functions)

SRAM memory card
FROM memory card
Flash ATA card — Data I/O
Modem card (for remote diagnosis)

19.2.2 Hardware configuration

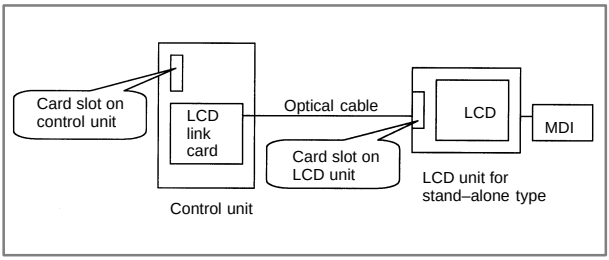
- Type 1

LCD–mounted type



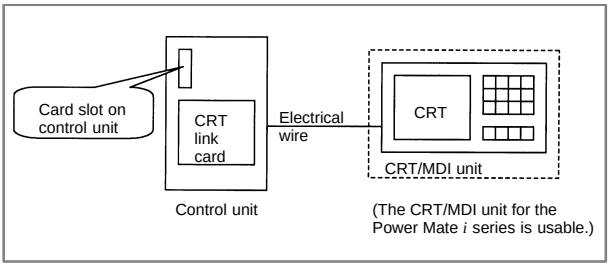
- Type 2

Stand–alone type (with an LCD unit)



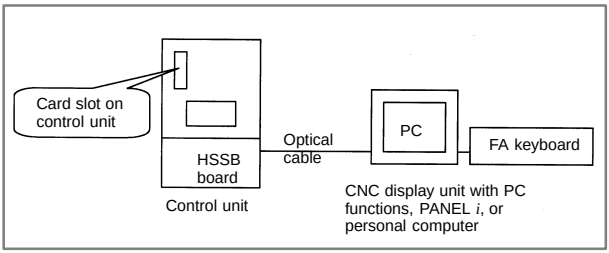
- Type 3

Stand–alone type (with a CRT/MDI unit)



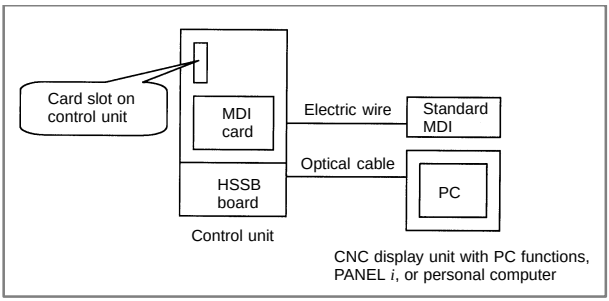
- Type 4

Stand–alone type (with CNC display unit with PC functions or an PANEL *i* and FA keyboard or PC)



- Type 5

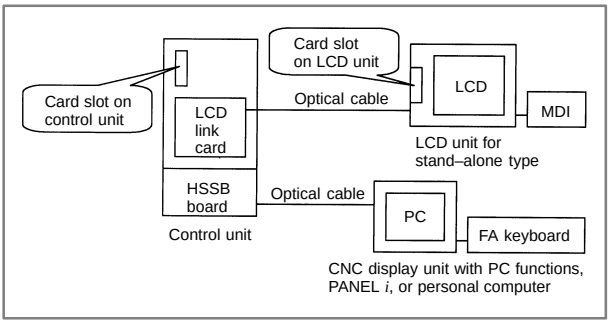
Stand–alone type (with CNC display unit with PC functions or an PANEL *i* and FA keyboard or PC)



19

- Type 6

Stand–alone type (with an LCD unit and MDI, CNC display unit with PC functions or an PANEL *i* and FA keyboard or PC)



19.3 Boot System (System Monitor)

■ For operation of the Series 16*i*/18*i*/21*i*–B, the BOOT system loads the software for the display function, NC control software, and macro executor (P–CODE programs) from the FROM (flash ROM) to the DRAM when the power is turned on.

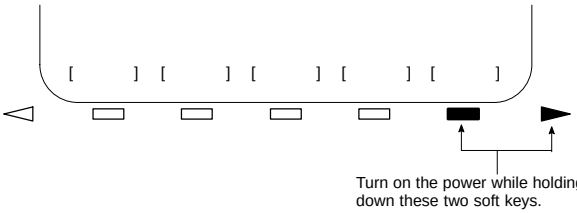
■ The BOOT system includes the system monitor as well. The BOOT system supports the following functions:

- Writing files in a memory card to the FROM
- Displaying a directory and contents (series/edition, etc.) of files in the FROM
- Deleting files from the FROM
- Writing user files, stored in the FROM, to a memory card
- Inputting/outputting data to and from the SRAM as a batch
- Deleting files stored on a memory card
- Formatting a memory card

19.3.1 Operation of the BOOT system monitor

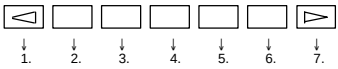
● Displaying the SYSTEM MONITOR MAIN MENU screen

1 Turn on the power while holding down both the rightmost soft key [▷] (continuation key) and the soft key to its left.



→ Use the same soft keys, for the display unit with twelve soft keys.

→ If soft keys are not provided (for example, when a touch pad is being used), use the MDI numeric keys. Hold down the [6] and [7] keys until the boot system screen appears.



2 The SYSTEM MONITOR MAIN MENU screen appears.

```
SYSTEM MONITOR MAIN MENU                60M5–01

1. SYSTEM DATA LOADING
2. SYSTEM DATA CHECK
3. SYSTEM DATA DELETE
4. SYSTEM DATA SAVE
5. SRAM DATA BACKUP
6. MEMORY CARD FILE DELETE
7. MEMORY CARD FORMAT

10.END
***MESSAGE***
SELECT MODE AND HIT SELECT KEY.


[SELECT]  [ YES ]  [ NO ]  [ UP ]  [ DOWN ]
```

3 Using the [UP] or [DOWN] soft key, position the cursor to the desired item.

- The functions of the items are as follows.

1	SYSTEM DATA LOADING	Reads a file such as a ROM data file from the memory card and writes it into the FROM.
2	SYSTEM DATA CHECK	Displays the file directory for the FROM.
3	SYSTEM DATA DELETE	Deletes user files, such as ladder programs, stored in the FROM.
4	SYSTEM DATA SAVE	Writes user files, such as ladder programs, stored in the FROM to a memory card.
5	SRAM DATA BACKUP	Writes parameters, machining programs, and macro variables to a memory card.
6	MEMORY CARD FILE DELETE	Deletes files stored on a memory card.
7	MEMORY CARD FORMAT	Formats a memory card.
10	END	Terminates the system monitor.

4 Press the [SELECT] soft key.

The selected item is executed.

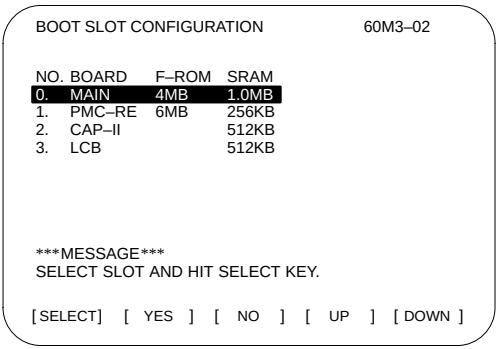
When the correct basic NC software (NC BASIC FILE) has not been written into the FROM, the SYSTEM MONITOR MAIN MENU screen automatically appears at power on.

- Selecting the board to be accessed
  (BOOT SLOT CONFIGURATION screen)

(1) When the BOOT SLOT CONFIGURATION screen is displayed

1 When Symbol CAP*i* T (CAP II) board or LCB (loader control board) is mounted on the CNC, we have to access to SRAM that mounted on additional board. So, the boot system displays BOOT SLOT CONFIGURATION screen that to select a access board.

2 Using the [UP] or [DOWN] key, position the cursor to the board to be accessed, then press the [SELECT] key.



19.3.2 Input

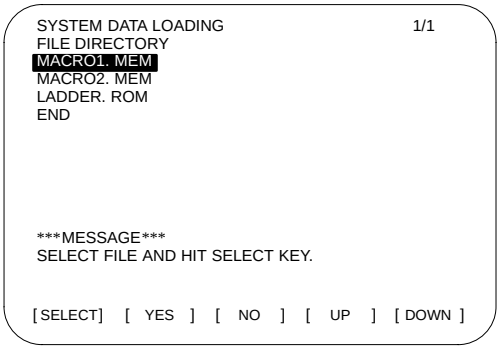
- Reading files from a memory card
  (SYSTEM DATA LOADING screen)

(1) Display the SYSTEM DATA LOADING screen by following the procedure below.

1 On the SYSTEM MONITOR MAIN MENU screen, use the [UP] or [DOWN] soft key to position the cursor to 1. SYSTEM DATA LOADING.

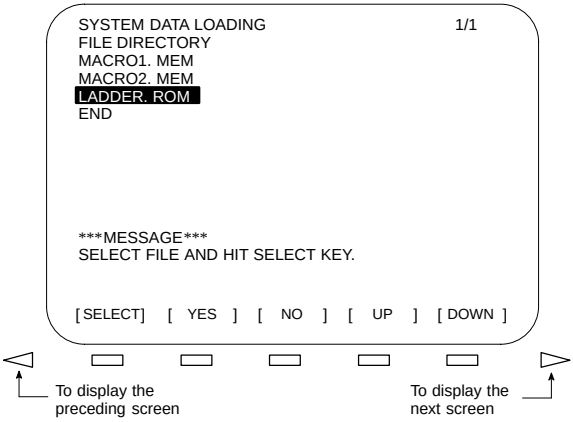
2 Press the [SELECT] soft key. (When more than one board is connected to the NC, the BOOT SLOT CONFIGURATION screen appears.)

→ The file directory is displayed.



(2) From the file directory, select the file to be read by following the procedure below.

1 Using the [UP] or [DOWN] soft key, position the cursor to the file to be read.



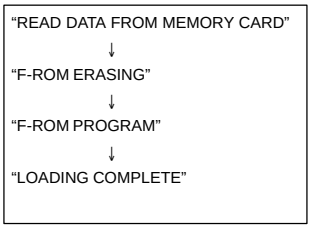
- When the file directory is too large to fit on the screen, the screen can be scrolled by pressing the ◁ or ▷ soft key.
- To return to the SYSTEM MONITOR MAIN MENU screen, position the cursor to END, then press the [SELECT] soft key.

2 Press the [SELECT] soft key.

Any file name can be assigned to the files stored on a memory card. The system automatically determines the type of a file from its contents when reading that file.

(3) A confirmation sign appears at the bottom of the screen. To continue the operation, press the [YES] soft key. To abandon the operation, press the [NO] soft key.

(4) While a file is being read, the following message is displayed on the screen.



→ When reading is terminated, the message, "HIT SELECT KEY," appears at the bottom of the screen.

(5) Press the [SELECT] soft key to return to the SYSTEM DATA LOADING screen.

19.3.3 Information display

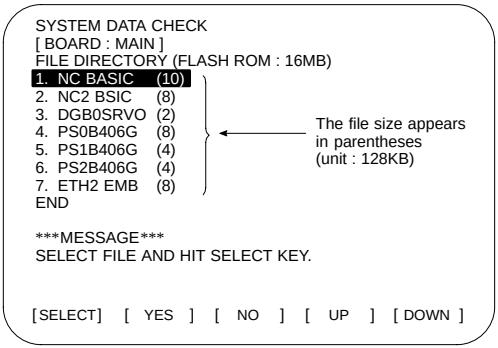
● Displaying the FROM file list (SYSTEM DATA CHECK screen)

(1) A directory of files stored on the FROM is displayed.

1 Using the [UP] or [DOWN] soft key, position the cursor to 2. SYSTEM DATA CHECK on the SYSTEM MONITOR MAIN MENU screen.

2 Press the [SELECT] soft key.
When more than one board is connected to the NC, the SLOT CONFIGURATION screen appears.

→ FROM files are listed on the screen as follows:



- The names and applications of the FROM files are as follows:

(a) System file

File name	Application	Attribute
NC BASIC	CNC basic function 1	System file (File provided by FANUC) • The file can be typed over. • The file can be deleted or output. Caution on overwriting: A file with file name information that is embedded in the file and has the same leading four characters is overwritten as a file of the same type. A file name in the memory card has no effect.
NC 2BSIC	CNC basic function 2	
NC 3BSIC	CNC basic function 3 NOTE This file is not required with some series and editions.	
NCn OPTN	CNC optional function	
GRAPHIC	Graphic software	
DGBnSRVO	Digital servo software The software corresponding to an installed axis control card is used.	
DG2SERVO		
DG SERVO		
MNTnSRVO	Monitor software for Dual Check Safety	
ENn_RISC	RISC software	
PSnB406G	PMC software (PMC–SB7 function)	
PMC0BSC	PMC software (PMC–SA1 function)	
PMC2BSC	PMC software (PMC C language function)	
PMM	Power mate CNC manager	
ETH2 EMB	Embedded Ethernet software	
ETHERNET	Ethernet/Data server software Fast Ethernet/Fast data server software	
CAP2	Software for Symbol CAP*i* T	
DTSV	Software for Data server	
DVNT ROM	DeviceNet	
IO2MS	I/O Link–II master function software	
IO2SLAVE	I/O Link–II slave function software	
IO2 OPT1	Communication setting software for I/O Link–II FL–net	
FLNT	Software for FL–net function	
COMOOPT1	PROFIBUS management software	
PBDM	Software for PROFIBUS master function	
PBDS	Software for PROFIBUS slave function	
REMOTE	Software for remote buffer	
PFM	Software for PROGRAM FILE MATE	
DNC2	Software for DNC2	
DNC1	Software for DNC1	
OCS	Software for FACTOLINK	
GUIT_USR	Data for machine alarm diagnosis (for T series)	

File name	Application	Attribute
GUIM_USR	Data for machine alarm diagnosis (for M series)	
TMF	Software for tool management	

n: One–digit number x: One alphabetic character

The major files are described. The file names are subject to change.

(b) User file

File name	Application	Attribute
PMC–xxxx	Ladder software (for PMC–SB7 or PMC–SA1)	User file (File that is created or may be modified by the user) ● The file can be typed over. ● The file can be deleted or output. Caution on overwriting: A file with file name information that is embedded in the file and has the same leading four characters is overwritten as a file of the same type. A file name in the memory card has no effect.
PMC@xxxx	Ladder software (for loader control)	
USR1xxxx	PMC C language application	
MINFO	Maintenance information data file	
PDnxssss n=1/2 (path) x=M/T/L (model) ssss=size	Macro executor /OMM (order made macro) Examples of file names PD1Mssss (For path 1 of M series) PD2Tssss (For path 2 of T series) PD1Lssss (for loader control)	
PDnx_CAP P1nxssss P2nxssss n=1/2 (path) x=M/T (model) ssss=size	First module for Super CAP Second module for Super CAP Third module for Super CAP ssss=128K=128KB, 256k=256KB, 0.5M=0.5MB, 1.0M=1.0MB, 2.0M=2.0MB, 3.0M=3.0MB Examples of file names P11M256K (Second module, path 1, M series, 256 KB) P22T1.0M (Third module, path 2, T series, 1 MB)	
CEX ssss	C language executor (program)	
CEXnxxxx	C language executor (data)	
INMC	Embedded macro file	

n: One–digit number x: One alphabetic character
ssss: Size (Example: 1 MB → 1.0M)

The major files are described. The file names are subject to change.

- The object files of the macro executor (macro P-CODE program) and the C executor can be saved to the memory card, but cannot be decompiled into their corresponding source code.

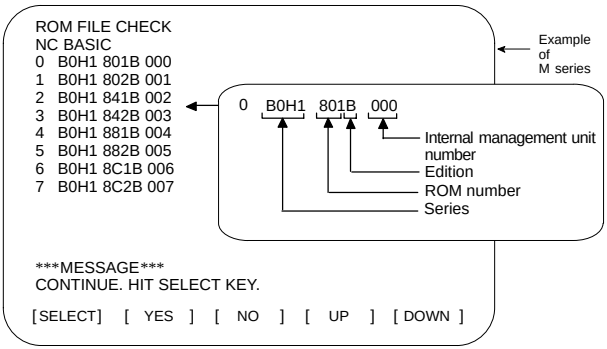
(2) To obtain detailed information about a particular system file, such as its software series and edition, perform the following:

1 By pressing the [UP]/[DOWN] soft key, move the cursor to the file name for which the detail screen is to be displayed.

2 Press the [SELECT] soft key.

- Note that this function is valid for system files only.

Example screen (when NC BASIC of M series has been selected)



- When details of system file (NC BASIC, etc) are display :
  Any non-ASCII code, or the symbol @, appearing in the displayed file name indicates that the contents of FROM or the data in the read file has been destroyed. Perform "1. SYSTEM DATA LOADING" again.

3 Press the [SELECT] soft key to return to the SYSTEM DATA CHECK screen.

(3) Return to the SYSTEM MONITOR MAIN MENU screen.

1 Position the cursor to END.

2 Press the [SELECT] soft key.

19.3.4 Deleting

● Deleting a FROM file (SYSTEM DATA DELETE screen)

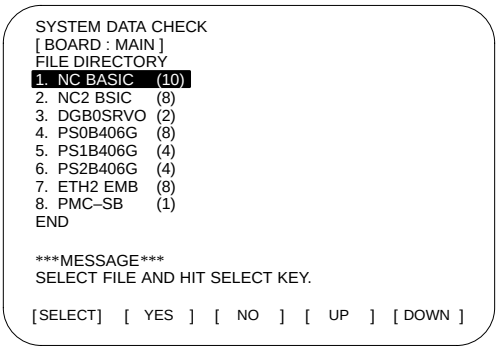
NOTE Only user files, such as the ladder and macro P-code programs, can be deleted. System files, such as NC BASIC, cannot be deleted.

(1) Select the SYSTEM DATA DELETE screen.

1 Using the [UP] or [DOWN] soft key, position the cursor to 3. SYSTEM DATA DELETE.

2 Press the [SELECT] soft key.
When more than one board is connected to the NC, the SLOT CONFIGURATION screen appears.

→ FROM files are listed on the screen as follows:



(2) Select the file to be deleted.

1 Using the [UP] or [DOWN] soft key, position the cursor to the desired file name.

2 Press the [SELECT] soft key.

- To quit and return to the SYSTEM MONITOR MAIN MENU screen, position the cursor to END, then press the [SELECT] soft key.

3 A confirmation message appears at the bottom of the screen. To delete the file, press the [YES] soft key. To abandon the deletion, press the [NO] soft key.
Upon pressing the [YES] soft key, the specified file is deleted.

→ Once the file has been deleted, “HIT SELECT KEY” appears at the bottom of the screen.

(3) Press the [SELECT] soft key to return to the SYSTEM DATA CHECK screen.

19.3.5 Output

- Saving a FROM file to a memory card
(SYSTEM DATA SAVE screen)

NOTE Only user files, such as the ladder and macro P-code programs, can be saved to a memory card. System files, such as NC BASIC, cannot be saved.

(1) Select the SYSTEM DATA SAVE screen.

1 Using the [UP] or [DOWN] soft key, position the cursor to 4. SYSTEM DATA SAVE.

2 Press the [SELECT] soft key.
When more than one board is connected to the NC, the SLOT CONFIGURATION screen appears.

→ FROM files are listed on the screen as follows:

```
SYSTEM DATA SAVE
[ BOARD : MAIN ]
FILE DIRECTORY
1. NC BASIC    (10)
2. NC2 BAIC    (8)
3. DGB0SRVO    (2)
4. PS0B406G    (8)
5. PS1B406G    (4)
6. PS2B406G    (4)
7. ETH2 EMB    (8)
8. PMC–SB      (1)
END

***MESSAGE***
SELECT FILE AND HIT SELECT KEY.

[SELECT]  [ YES ]  [ NO ]  [ UP ]  [ DOWN ]
```

(2) Select the file to be saved.

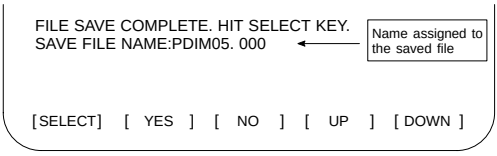
1 Using the [UP] or [DOWN] soft key, position the cursor to the desired file name.

2 Press the [SELECT] soft key.

- To quit and return to the SYSTEM MONITOR MAIN MENU screen, position the cursor to END, then press the [SELECT] soft key.

3 A confirmation message appears at the bottom of the screen. To save the file, press the [YES] soft key. To abandon the saving, press the [NO] soft key.
Upon pressing the [YES] soft key, the specified file is saved to the memory card.

→ Once the file has been saved, "HIT SELECT KEY" appears at the bottom of the screen, together with the name assigned to that saved file.



- Saved files are named as follows:

File	FROM file name	Memory card file name
Ladder program	PMC-SB	PMC-SB. xxx
Ladder program (for loader control)	PMC@SA	PMC@SA. xxx
PMC C language application	USR1	USR1. xxx
Maintenance information data file	MINFO	MINFO.xxx
Macro P–CODE program	PD1M 0.5	PD1M_05.xxx
	P12T 1.0	P12T_10.xxx
C language executor program	CEX 1.0M	CEX_10M.xxx
	CEX 2.0M	CEX_20M.xxx
Embedded macro file	INMC	INMC.xxx

xxx: Represents an extension.

- The table above indicates examples of some files.
The memory card file names indicated are converted from FROM file names according to the following rule:
" " (space) → "_" (underscore)/"." (period) → Deleted
Example: CEX 1.0M → CEX_10M
For the FROM file names, see the descriptions of file names in the FROM and their usage provided earlier.
- A three-digit number (000 to 031) is automatically assigned to a saved file as the file extension. The file extension will be 000 when no other files having the same file name have been saved to the memory card. When a file having the same file name has already been saved to the memory card, the lowest number currently available will be assigned.
- The most recently saved file need not necessarily have the highest extension number because it may be assigned a number that was previously skipped. Carefully check the file name, displayed at the bottom of the screen, once saving has been completed.

(3) Press the [SELECT] soft key to return to the SYSTEM DATA SAVE screen.

19.3.6 SRAM memory backup

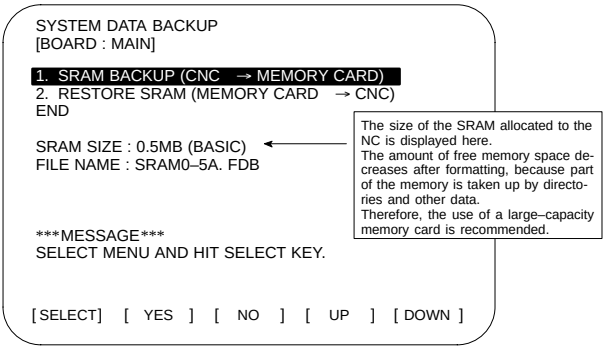
● Dumping SRAM data to a memory card (SRAM DATA BACKUP screen)

(1) Select the SRAM DATA BACKUP screen.

1 Using the [UP] or [DOWN] soft key, position the cursor to 5. SRAM DATA BACKUP.

2 Press the [SELECT] soft key.
When more than one board is connected to the NC, the SLOT CONFIGURATION screen appears.

→ The SRAM DATA BACKUP screen is displayed.



(2) Select whether to dump data to the memory card (BACKUP), or to load data from the memory card (RESTORE).

1 Using the [UP] or [DOWN] soft key, position the cursor to the desired function.

2 Press the [SELECT] soft key.

- To quit and return to the SYSTEM MONITOR MAIN MENU screen, position the cursor to END, then press the [SELECT] soft key.

3 A confirmation message appears at the bottom of the screen. To perform the selected operation, press the [YES] soft key. To abandon the operation, press the [NO] soft key.
Upon pressing the [YES] soft key, data transfer between the SRAM and memory card starts.

→ During data transfer, the name of the file being transferred blinks as follows:

When dumping data to the memory card

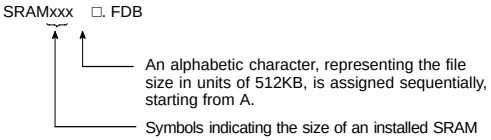
```
FILE NAME : SRAM0_5A. FDB → MEMORY CARD
```

When loading data from the memory card

```
FILE NAME : SRAM0_5A. FDB → CNC
```

- Backup file data is dumped to the memory card in blocks of 520KB.
  – Backup file data can also be dumped to multiple memory cards.

- A backup file is named as follows:



Size of SRAM installed	XXX	□	Number of files
256KB	256	A	1
0.5MB	0_5	A	1
1.0MB	1_0	A,B	2
2.0MB	2_0	A to D	4
3.0MB	3_0	A to F	6

When a board (PMC–RE, CAP II or LCB) other than the main board is connected to the CNC, one of the following extensions will be assigned to an SRAM backup file:

Board type	MAIN	PMC–RE	CAP II	LCB
Extension	FDB	PMC	CAP	LCB

- If there is a file with the same name on the memory card, an indication for confirmation is output to check if the file may be overwritten.

(3) Press the [SELECT] soft key to return to the SRAM DATA BACKUP screen.

19.3.7 Deleting memory card files

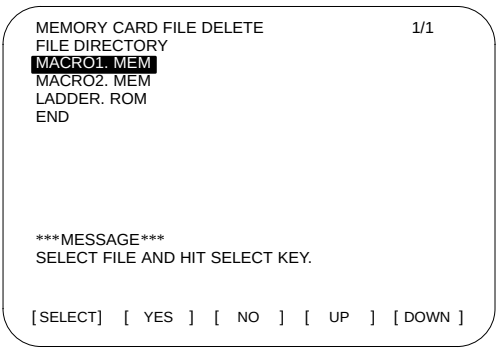
- Deleting a file from a memory card (MEMORY CARD FILE DELETE screen)

(1) Select the MEMORY CARD FILE DELETE screen.

1 Using the [UP] or [DOWN] soft key, position the cursor to 6. MEMORY CARD FILE DELETE on the SYSTEM MONITOR MAIN MENU screen.

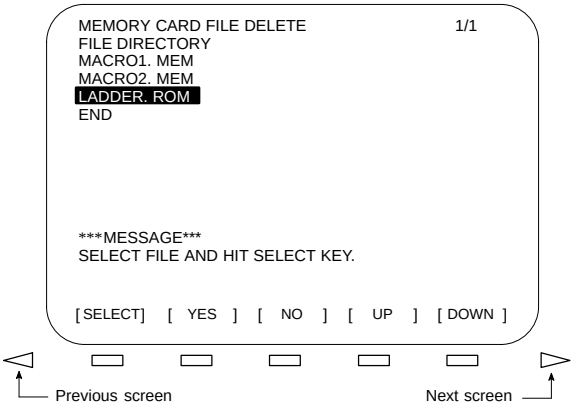
2 Press the [SELECT] soft key.

→ Files stored on the memory card are listed on the screen as follows:



(2) Select the file to be deleted.

1 Using the [UP] or [DOWN] soft key, position the cursor to the desired file name.



- When the file list is too large to be displayed on one screen, the previous and subsequent pages can be viewed by using the ◁ and ▷ soft keys.
- To return to the SYSTEM MONITOR MAIN MENU screen, position the cursor to END, then press the [SELECT] soft key.

2 Press the [SELECT] key.

(3) A confirmation message appears at the bottom of the screen. To delete the file, press the [YES] soft key. To abandon the deletion, press the [NO] soft key.

- Once the file has been deleted, "HIT SELECT KEY" appears at the bottom of the screen.

(4) Press the [SELECT] soft key to return to the MEMORY CARD FILE DELETE screen.

19.3.8 Memory card format

● Formatting a memory card (MEMORY CARD FORMAT screen)

■ A newly purchased memory card must be formatted before it can be used. Also, a memory card must be formatted if its contents are destroyed or lost due to battery failure.

(1) Select the MEMORY CARD FORMAT screen.

1 Using the [UP] or [DOWN] soft key, position the cursor to 7. MEMORY CARD FORMAT on the SYSTEM MONITOR MAIN MENU screen.

2 Press the [SELECT] key.

(2) A confirmation message appears at the bottom of the screen. To format the memory card, press the [YES] soft key. To abandon the formatting, press the [NO] soft key.

- While the memory card is being formatted, the message "FORMATTING MEMORY CARD" is displayed at the bottom of the screen.
- Once formatting has been completed, "FORMATTING COMPLETE HIT. SELECT KEY" appears at the bottom of the screen.

(3) Press the [SELECT] soft key to return to the SYSTEM MONITOR MAIN MENU screen.

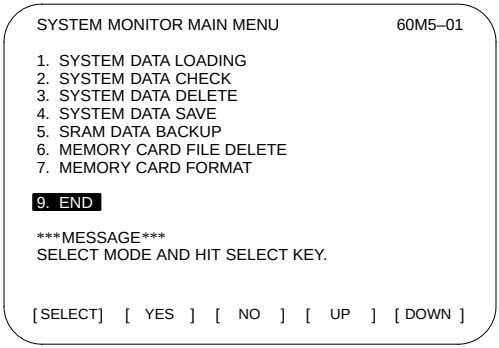
19.3.9 Quitting BOOT

● Quit system monitoring

(1) Quit system monitoring.

1 Using the [UP] or [DOWN] soft key, position the cursor to 10. END on the SYSTEM MONITOR MAIN MENU.

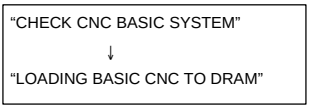
2 Press the [SELECT] soft key.



(2) To quit system monitoring, press the [YES] soft key.

To continue system monitoring, press the [NO] soft key.

→ The NC system starts in the same way as when the power is first turned on. The following messages are displayed on the screen:



Displayed messages are changed as shown on the left.

NOTE If the correct NC basic software (NC basic file) is not written into the FROM, the system monitor screen is displayed again.

19.3.10 Error message list

- The following table lists and describes the error messages for BOOT which may be output by the system.

	Message	Cause and Response
B	BOOT ROM PARITY. PLEASE POWER OFF.	The contents of flash memory containing boot software was destroyed. Replace the CPU card.
C	CHANGE MEMORY CARD. AND HIT YES OR NO.	The memory card becomes full in the middle of SRAM backup operation. Replace the card with a memory card containing enough free space.
D	DELETE ERROR. HIT SELECT KEY.	An attempt to delete a file from FROM was unsuccessful. Retry the deletion. If the second attempt also fails, the FROM may have been damaged or destroyed. Replace the FROM module.
	DEVICE ERROR (CNC x)	An attempt to write data to FROM was unsuccessful. Retry the write operation. If the second attempt also fails, the FROM may have been damaged or destroyed. Replace the FROM module.
F	FILE SAVE ERROR. HIT SELECT KEY.	An attempt to write a file to a memory card was unsuccessful. Check that the memory card is not damaged. Note) Check that the memory card's battery is not exhausted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	FLASH MEMORY NO SPACE	There is insufficient free FROM to store the selected file. Delete any unnecessary files from FROM.
	FLASH ROM MODULE NOT EXIST. HIT SELECT.	The FROM module is not mounted on that CNC system. Put the FROM module on the board.
G	GRAPHIC SOFT IS NOT FOUND. BOOT STOP.	Graphic software is required. Load appropriate graphic software for the hardware in FROM.
I	ILLEGAL FORMAT FILE	The selected file cannot be read into flash memory. The selected file or the header information for FROM may have been damaged or destroyed.
	ILLEGAL FROM MODULE. HIT SELECT KEY.	The FROM module ID is illegal. Check the drawing No. of the FROM module.
	ILLEGAL SRAM MODULE. HIT SELECT KEY.	The SRAM module ID is illegal. Check the drawing No. of the SRAM module.
L	LOADING ERROR. HIT SELECT KEY.	An error occurred while loading data into FROM. Do not touch the memory card while loading data.

	Message	Cause and Response
M	MAX EXTENSION OVER. HIT SELECT KEY.	The extension number added to a file name exceeds 31. Delete any unnecessary backup files from the memory card.
	MEMORY CARD BAT- TERY ALARM. HIT SELECT.	The memory card's battery is exhausted. Replace the battery.
	MEMORY CARD FULL. HIT SELECT KEY.	The memory card is full. Delete any unnecessary files from the memory card. Alternatively, replace the memory card with another card having sufficient free space.
	MEMORY CARD IS NOT AVAILABLE. HIT SEL.	The use of this memory card is not supported. Use only FANUC–recommended memory cards, as described in the order list.
	MEMORY CARD MOUNT ERROR. HIT SELECT KEY	The memory card could not be accessed. Check that the memory card is normal.
	MEMORY CARD NOT EX- IST. HIT SELECT KEY.	The memory card is not inserted into its slot. Check that the memory card is pushed fully home.
	MEMORY CARD PRO- TECTED.HIT SELECT KEY.	Although writing to the memory card was selected, the write inhibit switch is set. Disable the write inhibit switch. Note) Check that the memory card's battery is not exhausted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	MEMORY CARD RESET ERROR. HIT SELECT KEY.	Access to a memory card failed. The memory card's battery may have gone dead, the memory card may have been damaged electrically, or the memory card may not be inserted in the slot securely.
	MEMORY CARD WRITE ERROR. HIT SELECT KEY.	Access to the memory card has failed. Check whether the memory card is defective. Note) Check that the memory card's battery is not exhausted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
N	NMI OCCURRED. PLEASE POWER OFF.	A hardware or software error occurred. Determine the procedure which causes the error, and report it to FANUC together with the series and edition of the boot software.
P	PLEASE FORMAT FLASH TYPE CARD.HIT SEL.	It is not possible to delete only specific files from a FROM card, due to the characteristics of the memory used. To delete a file it is necessary to delete all files on the card, by using the FORMAT function.
R	ROM PARITY ERROR: NC BASIC. HIT SELECT.	The NC BASIC is parity error. Check whether NC BASIC is in FROM, using SYSTEM DATA CHECK.

	Message	Cause and Response
S	SRAM DATA BACKUP ERROR. HIT SELECT KEY.	An attempt to write a backup file to a memory card failed. Check that the memory card is normal. Check that the memory card's battery is not exhausted, that its circuitry has not been damaged, and that it is securely inserted into its slot.
	SRAM PARITY OCCURRED. PLEASE POWER OFF.	A parity error was detected during backup operation of SRAM (Note).

NOTE Action to be taken when an SRAM parity error is detected during backup of SRAM in the boot system

The SRAM area of each CNC shipped from the factory is cleared and is free of parity errors. However, shock applied to the CNC during transportation may cause a parity error in the SRAM area. If the backup battery of the CNC is dead, a parity error can occur in the SRAM area. If a parity error occurs in the SRAM area, the data held in the SRAM area is not guaranteed. However, the CNC does not always use the entire SRAM area. A parity error is not detected by hardware unless the part containing the error is read. Therefore, if a parity error occurs in an area not accessed by the CNC, the CNC may operate normally. The SRAM backup function of the boot system reads the entire SRAM area. So, a parity error may occur in the middle of backup operation even when the CNC has operated normally. In this case, the SRAM data of the CNC is not guaranteed, and the data cannot be backed up using the SRAM backup function of the boot system. Nevertheless, the CNC may operate normally. So, it is recommended that necessary data be backed up using the Floppy Cassette or Handy File, data all clear operation be performed, then the backed up data be restored in the CNC. Once all clear operation is performed, the parity error can be removed. Then, the SRAM backup function of the boot system can be used.

- If an error occurs, the corresponding error message appears on the screen, together with the message "HIT SELECT KEY." Note that the [SELECT] soft key is disabled for errors whose clearing requires that the power be turned off.

19.4 LED Indication and Maintenance Operation of the Stand–Alone Type Unit

- Overview

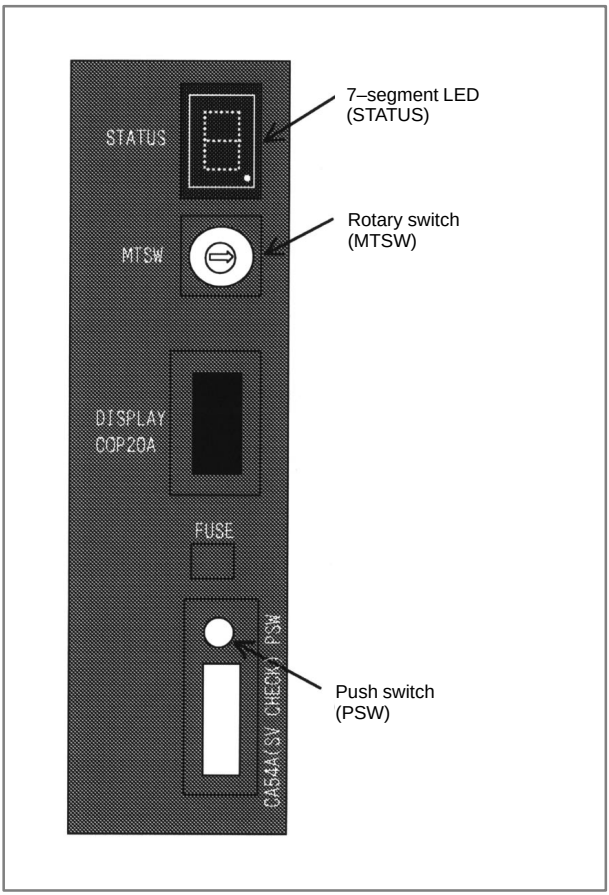
FANUC Series 16*i*/18*i*/21*i* of stand–alone type is equipped with a 7–segment LED, rotary switch, and push switch.

When no MDI is included in the system configuration or when the MDI becomes defective and cannot be used, battery backed–up data can be saved and restored by using the rotary switch and push switch.

When the MDI can be used, use these switches for maintenance by system monitor of the boot function.

- Layout of the 7–segment LED and switches

The 7–segment LED, rotary switch, and push switch are located as shown below.

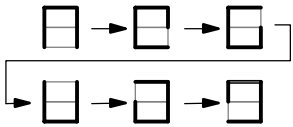


19.4.1 Seven–segment LED display

19.4.1.1 NC status display

Number displayed on LED	Blink/not blink	Description
	Not blink	Automatic operation is paused, stopped, or reset.
(Rotation of character )	Not blink	Automatic operation start signal When STL <F000#5> = 1
Number ( to )	Blink	System alarm status
Number ( to )	Not blink	Status change at power–on

19.4.1.2 LED display during automatic operation

LED indication	Description
	Automatic operation start signal When STL <F000#5> = 1

19.4.1.3 LED display when the push switch is pressed

Number displayed on LED	Blink/not blink	Description
	Not blink	The push switch has been pressed normally.

19.4.1.4 LED display when a system alarm is issued

When a system alarm is issued, a number blinks on the 7–segment LED.

Number on LED (blinking)	System alarm number	Type of system alarm
	In the 900's	ROM PARITY
	In the 910's	SRAM PARITY, DRAM PARITY
	In the 920's	SERVO ALARM
	In the 930's	CPU INTERRUPT, SRAM ECC ERROR
	In the 950's	PMC SYSTEM ALARM
	In the 970's	NON MASK INTERRUPT, BUS ERROR
	Others	Other system alarms

19.4.1.5 Display on the 7–segment LED at power–on

Number displayed on LED	On/off status of 4 LEDs	Meaning
	□□□□	Power is not on.
	■■■■	Power is turned on, but the CPU does not yet start.
	■■■■	NC system loading is started by the boot system.
	□■■■	The NC system has started, and RAM initialization has terminated.
	■□■■	Wait for ID setting for each board
	□□■■	ID setting for each board has terminated, and CRT initialization has terminated.
	■■□■	FANUC bus initialization has terminated.
	□■□■	Loading from F–ROM has terminated, PMC initialization has terminated, and the series/edition screen is displayed.
	■□□■	Hardware configuration information setting for each module has completed.
	□□□■	PMC ladder initialization has completed.
	□■■□	Wait for digital servo and spindle initialization
	■■■□	Digital servo and spindle initialization has completed.
	■□□□	Initialization has completed. In normal operation state.

□ : Off ■ : On

19.4.2 Maintenanceoperation method

19.4.2.1 Operation before power–on

Before turning on the power, select a function number by using the rotary switch. When the power is turned on after the selection with the rotary switch, the number corresponding to the selected function number is indicated on the LED. The indication blinks at intervals of about one second.

- Function Number

Each function is assigned a number. This number is called a function number hereinafter in this manual. The function numbers that can be selected with the rotary switch are listed below. Do not set the reserved function numbers. (If a reserved function number is set, the system operates as if function number 0 were selected. However, a function may be added in the future.)

Function number	Explanation
0	Normal state. After terminating maintenance operation, always set this number.
1	Reserved
2	Sets a device number for the display link function.
3	Reserved
4	Confirms a device number for the display link function.
5	Memory all clear
6	Reserved
7	Reserved
8	Saves battery backed–up main board data in a memory card at a time.
9	Reserved
A	Restores battery backed–up main board data from a memory card at a time.
B	Reserved
C	Reserved
D	Reserved
E	Reserved
F	Reserved

19.4.2.2 Operation of function number 2 (device number setting of the display link function)

This function sets a device number for the display link function.

(1) Check that number 2 blinks on the LED, and press the push switch.

(2) Number 2 is displayed on the LED. Press the push switch.

(3) Sixteen numbers from 0 to F are displayed on the LED one by one at intervals of about one second. When the device number you want to set appears on the LED, press the push switch.

(4) The selected device number blinks on the LED. Press the push switch.

(5) The device number used for the display link function is set and displayed on the LED.

19.4.2.3 Operation of function number 4 (checking a device number used for the display link function)

This function displays a device number used for the display link function.

(1) Check that number 4 blinks on the LED. Press the push switch.

(2) Number 4 is displayed on the LED. Press the push switch.

(3) Number 0 is displayed on the LED. Press the push switch.

(4) Numbers 0 and 2 are displayed alternately on the LED at intervals of about one second. When 2 is displayed, press the push switch.

(5) The device number used for the display link function is displayed on the LED.

19.4.2.4 Operation of function number 5 (memory all clear)

This function clears all the battery backed–up SRAM data. The device number for the display link function is also cleared. Once the device number has been cleared, the device number is set to 0.

(1) Check that number 5 blinks on the LED. Press the push switch.

(2) Number 5 is displayed on the LED. Press the push switch.

(3) The display on the LED changes from – to F to 9 to 8 to 7 to 6 to 5 to 4 to 3 to 2 to 1 to 0 in this order.

(4) After all–clear operation terminates normally, the LED display stops changing at number 0.

(5) Turn off the power, set the rotary switch to 0 (normal state), then turn on the power again.

19.4.2.5 Operation of function number 8 (saving to the memory card in a batch)

This function saves battery backed–up main board data in a memory card at a time. The data saved using this function can be restored at a time by performing the operation for function number A or by using the SRAMDATABACKUP function of the boot function.

(1) In the memory card slot (MEMORY CARD CNM1B) of the control unit, insert a formatted memory card having at least 512 KB of available space.

(2) Check that number 8 blinks on the LED, and press the push switch.

(3) While data is being saved in the memory card, the LED indication turns clockwise.

(4) If the data cannot fit in one memory card, number 3 blinks. Replace the memory card with another one, and press the push switch.

(5) If the protect switch of the memory card is not released or if the battery capacity of the memory card is insufficient, number 2 blinks on the LED. Replace the memory card with another one, and press the push switch.

(6) When the data has been saved normally, number 0 is displayed on the LED. If the data cannot be saved normally, number 1 is displayed on the LED.

(7) If SRAM PARITY occurs during data save operation, number 1 blinks on the LED. In this case, it is impossible to save the data at a time. Back up individual data items one by one, then perform all–clear operation.

19.4.2.6 Operation of function number A (restoration from the memory card in a batch)

This function restores battery backed–up main board data from a memory card at a time.

(1) Insert the memory card in the memory card slot (MEMORY CARD CNM1B) of the control unit.

(2) Check that A blinks on the LED, and press the push switch.

(3) While data is being restored from the memory card, the LED indication turns counterclockwise.

(4) If the entire data cannot be restored from the single memory card, number 3 blinks. Replace the memory card with the next memory card, and press the push switch.

(5) If the memory card cannot be recognized correctly, number 2 blinks on the LED. Check the memory card status, and press the push switch.

(6) When the data has been restored normally, number 0 is displayed on the LED. If the data cannot be restored normally, number 1 is displayed on the LED.

19.5 Maintenance of Open CNC (Boot–up and IPL)

Overview

When the 160*i*/180*i*/210*i* is used or the CNC is connected to the PC over HSSB, Ncboot32.exe can be used for the maintenance of the CNC. When the 160*i*s/180*i*s/210*i*s is used, Ncbootis.exe can be used for the maintenance of the CNC. Unless otherwise specified, the following examples assume the use of Ncboot32.
Ncboot32.exe provides the following functions:

- BOOT screen (for CNC system data maintenance, SRAM backup, and so forth)
- IPL screen (for clearing SRAM, and so forth)
- Display of the CNC power–on screen
- Display of CNC alarm screen
- Re–connection in case of the occurrence of a communication error
- Start of a registered application program

Ncboot32.exe is copied in the System folder of Windows (System32 folder in Windows NT) at driver installation. At the start of Windows, Ncboot32.exe starts automatically, and resides in the system tray.

(Icon at the center)

Supplementary 1: Multi–connection

Ncboot32.exe supports HSSB multi–connection. The CNCs connected by HSSB are managed as nodes. The boot, IPL, and system alarm screens are displayed in windows that are opened independently for each node.

Supplementary 2: Termination method

Normally, Ncboot32.exe need not be terminated. However, to terminate Ncboot32.exe, right–click the icon in the system tray, and click End in the popup menu. When the Ncboot32.exe window is open, End cannot be selected.

NOTE When the CNC is connected to the PC over Ethernet, use the standard LCD/MDI for the maintenance of the CNC.

19.5.1 Changing start sequences

With the rotary switch on the HSSB board on the CNC side (when the CNC does not have the PC function) or on the motherboard of the CNC (when the CNC has the PC function), the start sequence can be changed.

Position 0 can be selected as required to perform maintenance using the boot and IPL screens.

Position 0 (maintenance)

1. Wait until communication with the CNC is established.
2. Display the boot screen.
3. Display the IPL screen.
4. Display the CNC power–on screen.
5. Initialize the work area for the data window library.
6. Start a registered application program.
7. Perform monitoring for communication errors and CNC system alarms.

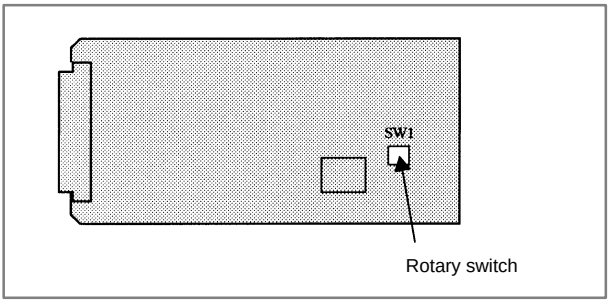
Position 1 (normal operation)

1. Wait until communication with the CNC is established.
2. Initialize the work area for the data window library.
3. Start a registered application program.
4. Perform monitoring for communication errors and CNC system alarms.

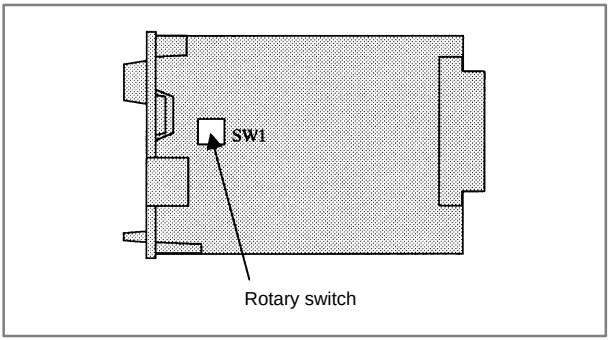
Position 2 (asynchronous start)

1. The CNC starts without waiting for communication to be established.
2. After communication is established, the PC performs initialization described below.
3. Initialize the work area for the data window library.
4. Start a registered application program.
5. Perform monitoring for communication errors and CNC system alarms.

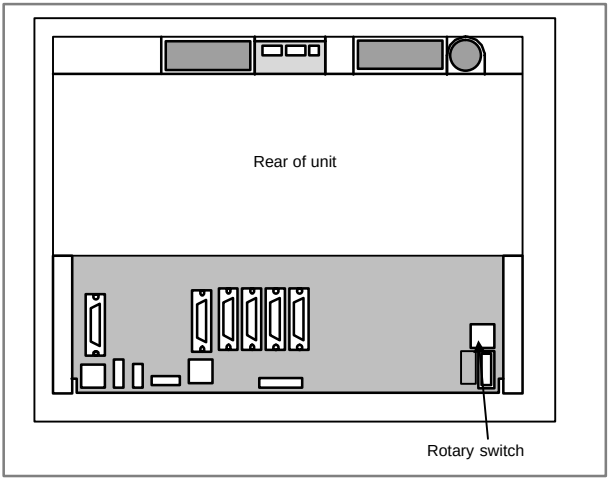
- HSSB interface board of LCD–mounted type 16*i*/18*i*/21*i*



- HSSB interface board of stand–alone type 16*i*/18*i*/21*i*/160*i*/180*i*/210*i*/ 160*i*s/180*i*s/ 210*i*s



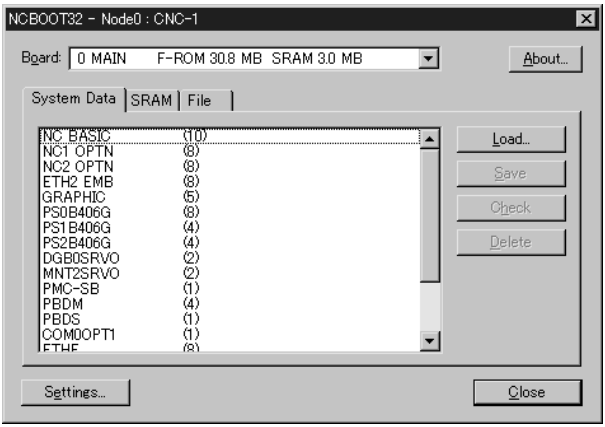
- Stand–alone type 160*i*s/180*i*s/210*i*s



19.5.2 Explanation of boot screens

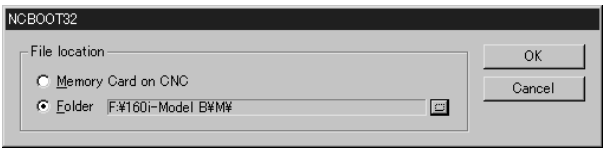
NOTE A mouse is required to display Ncboot32.exe screens.

19.5.2.1 Boot screen



When the sub–board is provided, select a board in the [Board] list.

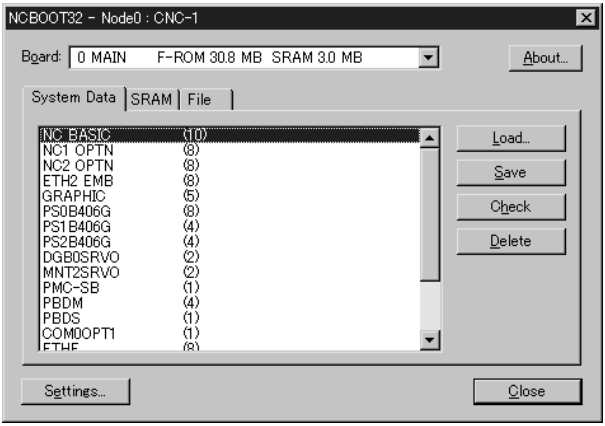
The area where the file is to be placed can be changed by using the [Setting...] button.



Select the memory card on the CNC or a PC folder. The file location may be changed at any time.

19.5.2.2 System data manipulation (system data tab)

The following screen is used for manipulating system data (including control software and ladder programs) on the NC.



[Load...] opens the file selection screen. Specify a file to be loaded.

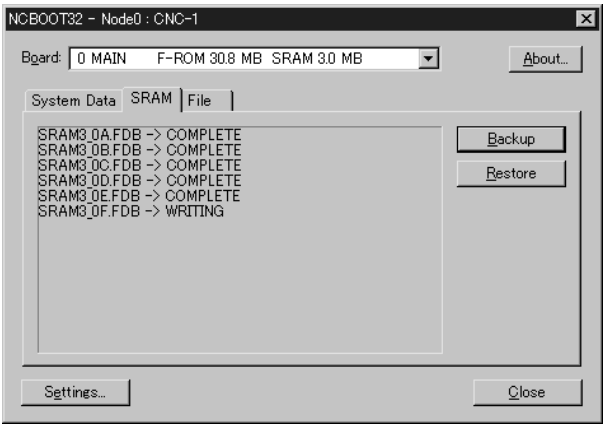
[Save] saves the selected NC system data in a file.

[Check] checks the selected NC system data.

[Delete] deletes the selected NC system data.

19.5.2.3 SRAM operation (SRAM tab)

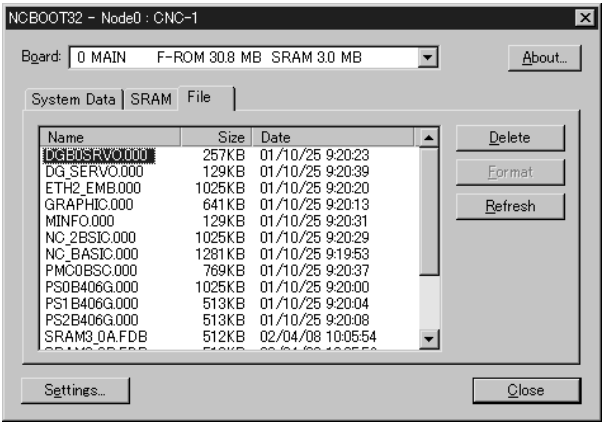
This screen is used to store and restore NC SRAM data.



[Backup] stores SRAM data, and [Restore] restores SRAM data. In the center of the screen, the progress status is displayed. As with the NC, the backup file name is determined automatically from the SRAM size, and cannot be renamed.

19.5.2.4 File operation (file tab)

The following screen is used for operating files on a memory card in the CNC or in a folder of the PC.

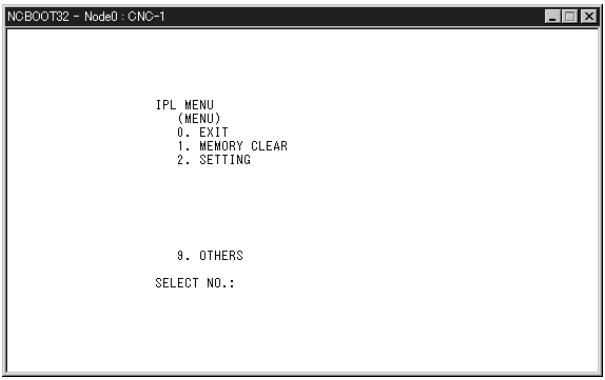


[Delete] deletes a selected file.

[Format] formats the memory card. This button is valid when the memory card is selected by [Setting...]

[Refresh] updates the file list to the latest state. After changing memory cards or floppy disks, click this button.

19.5.3 IPL screen



NOTE The contents of the IPL screen vary depending on the CNC model. Follow the instructions displayed in the menu.

The CNC allows functions to be performed according to the key status set at power–on.

The open CNC does not allow this operation. On the IPL screen, however, equivalent functions can be executed.

For details of the menu on the IPL screen and supported functions, see the table given in Subsec. 19.5.3.1.

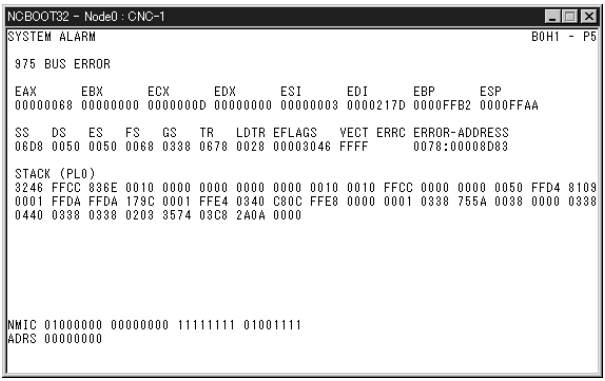
19.5.3.1 Functions on the IPL screen

Title on IPL screen				Corresponding MDI key operation at power–on (Operation with a standard CNC)
0. EXIT				
1. MEMORY CLEAR	0. CANCEL			
	1. ALL MEMORY		0. CANCEL	
			1. ALL	<DELETE> + <RESET>
			2. SUB	<CAM> + <2>
			3. LOADER	<CAN> + <5>
	2. PARAMETER AND OFFSET		0. CANCEL	
			1. MAIN	<RESET>
			2. SUB	<RESET> + <2>
			3. LOADER	<RESET> + <5>
	3. ALL PROGRAM		0. CANCEL	
			1. ALL	<DELETE>
			2. MAIN	<DELETE> + <1>
			3. SUB	<DELETE> + <2>
			4. LOADER	<DELETE> + <5>
	4. ADDITIONAL SRAM		0. CANCEL	
			1. ALL	<O> + <DELETE>
			2. MAIN	<O> + <1>
			3. SUB	<O> + <2>
	5. PMC	0. CANCEL		
		1. PARAMETER	0. CANCEL	
			1. CNC	<Z> + <O>
			2. LOADER	<Z> + <5>
		2. PROGRAM	0. CANCEL	
			1. CNC	<Z> + <O>
			2. LOADER	<Z> + <5>
	6. CAP–II		0. CANCEL	
			1. SUB MEMORY	<SP>
			2. CONVERSA-TIONAL DATA	<I>

Title on IPL screen			Corresponding MDI key operation at power–on (Operation with a standard CNC)
2. SETTING	0. CANCEL		
	1. IGNORE OVER TRAVEL ALARM	0. CANCEL	
		1. CNC	<CAN> + <P>
		2. LOADER	<CAN> + <L>
	2. START WITHOUT LADDER	0. CANCEL	
		1. CNC SIDE	<CAN> + <Z>
		2. LOADER SIDE	< . > + <5>
	3. CLANGUAGE EXECUTOR	0. CANCEL	
		1. MAKE VOID C–EXEC	<M> + <0>
		2. BOOTS UP C–EXEC APL	<M> + <3>
9. OTHERS	0. CANCEL		
	1. P–CODE LOADER		<CAN> + <PROG>

19.5.4 Other screens

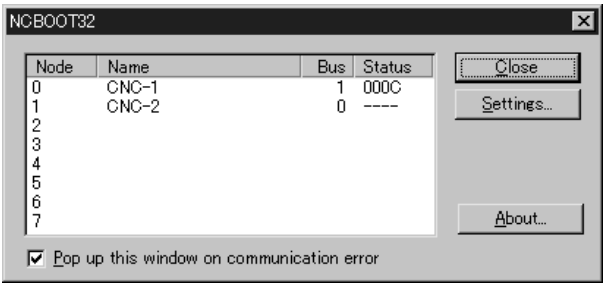
19.5.4.1 CNC alarm screen



This screen appears when a system alarm is issued in the CNC. (The above screen is an example. The displayed information varies depending on the system alarm issued in the CNC.)

19.5.4.2 Status screen (160*i*/180*i*/210*i*)

To open the status screen, double–click the icon in the system tray. Alternatively, in the menu popped up by right–clicking, click OPEN.



Node: Node number

Name: Node name. (Define the node name in advance by using the device manager in Windows 95/98 or the HSSB applet on the control panel in Windows NT.)

Bus: Hardware communication status (0: Communication error, 1: Communication established)

Status: Status (in hexadecimal)
Bit 1: Rotary switch position 1
Bit 2: End of boot processing
Bit 3: End of IPL processing
Bit 4: Rotary switch position 2
Bit 8: CNC system alarm

Pop up this window on communication error: By checking this item, this screen (status screen) is opened automatically when a communication error occurs.

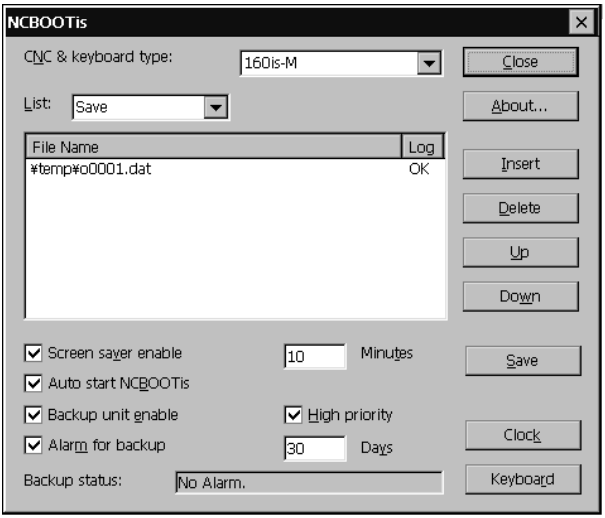
Clicking the [Close] button closes the screen.

Clicking the [Setting...] button opens the option setting screen.

Clicking the [About...] button opens the version information screen.

19.5.4.3 Status screen (160*i*s/180*i*s/210*i*s)

The status screen appears when the system tray icon is double–clicked or NCBOOTis is restarted. This screen can be used to change the list of files to save, restore, or start as well as to check the execution result.



To close the screen, press the [Close] button.

[About...] When this button is pressed, the version information screen appears.

[CNC & keyboard type] This list is used to select the type of the CNC.

[List] This list is used to select the type of registered data to display or edit. [Save] is used to select the files to be saved during power–down. [Load] is used to select the files to be restored during power–up. [Start] is used to select the files to be started during power–up.

[Insert] This button is used to newly register data.

[Delete] This button is used to delete the registered data from the selected line.

[Up] This button is used to push forward the registration place of the selected line.

[Down] This button is used to push back the registration place of the selected line.

[Save] This button is used to save the registered files to the "\Storage Card\Backup" folder. When automatic backup failed, restoration is performed with the files.

[Clock] This button is used to adjust the calendar and clock. It also sets the time difference (time zone) from Universal Coordinated Time.

[Screen saver enable] When this check box is checked, the screen saver is enabled.

[Auto start NCBOOTis] When this check box is checked, NCBOOTis automatically starts the next time.

[Backup unit Enable] When this check box is checked, the registry and files are automatically saved during power–down. After power–down, the special battery is used to supply the power during saving.

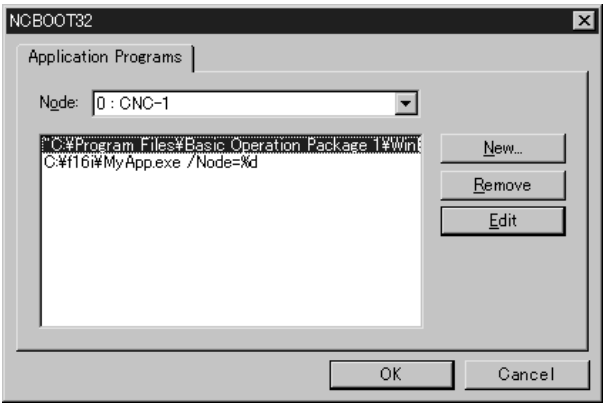
[High Priority] This check box is used to set the priority of automatic backup task. To save some files with an application, uncheck this check box.

[Alarm for backup] This check box is used to set the interval in days at which a message appears to prompt the user for manual saving when the system operates for an extended period of time.

19.5.4.4 Option setting screen (160*i*/180*i*/210*i* only)

On the option setting screen, application programs can be registered. When a program uses the data window library, the program does not run unless it is started after the work area for the data window library is initialized. By registering such a program in Ncboot32.exe, it can be executed after the initialization of the work area for the data window library.

Application programs are registered for each node.



[Node] selects a node. In the list box in the center of the screen, the programs registered for the selected node are displayed.

[New...] registers a new program. When a blank character is included in the path, it is enclosed with double quotation marks.

[Remove] deletes a selected line.

[Edit] allows editing of a selected line. This button is used to edit arguments. The character string %d in the command line is replaced by a node number. To represent % itself, describe %%.

Example: To start basic operation package 1 after initialization of the work area for the data window library of the node, describe the following:
"C:\Program Files\Basic Operation Package 1\WinBOP32.exe" /Node=%d

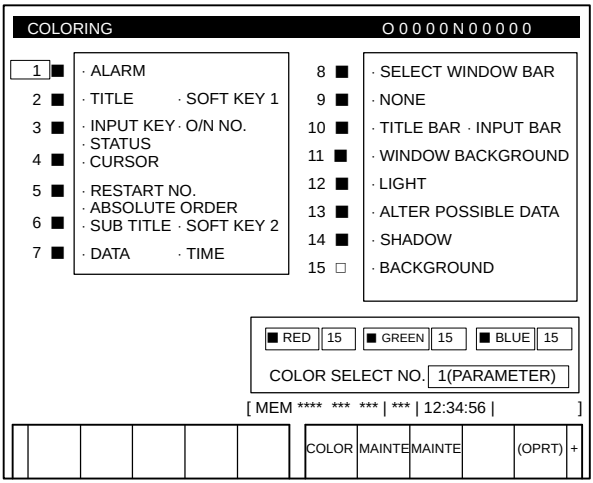
NOTE For the 160*i*s/180*i*s/210*i*s, the option setting screen is not provided.

19.6 Color Setting Screen

When VGA screen display is selected, the color scheme of the VGA screen can be changed on the color setting screen.
The color setting screen cannot be used when PRM3119#7 is set to 1.

19.6.1 Screen display

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



19.6.2 Color setting

- Changing a color (color palette value)

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

	RED	GREEN	BLUE	BRIGHT	DARK	+

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

   The current color palette values of individual color elements are displayed.

3. Select a desired color element by pressing the [RED], [GREEN], or [BLUE] operation soft key.

   Two or more color elements can be simultaneously selected.

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

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

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

- Storing colors (color palette values)

A specified color palette value can be stored.

	STORE	CALL	COLOR1	COLOR2	COLOR3	+

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

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

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

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

				CAN	EXEC	+

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

- Calling colors (color palette values)

	STORE	CALL	COLOR1	COLOR2	COLOR3	+

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

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

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

				CAN	EXEC	+

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

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

- Notes

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

(2) The standard color data specified in PRM6561–6595 must not be changed by direct MDI key input. When changing the parameter data, set and store the new data on the color setting screen.

(3) When a wrong value is specified in a standard color data parameter, the screen may not be displayed. If this occurs, turn the power on again, while pressing the DELETE and RESET keys. This clears the whole stored color scheme and restores the FANUC standard color scheme instead. Be very careful when performing this operation, as all memory contents such as parameters and programs are lost.

19.7 Contrast Adjustment

The contrast of a monochrome LCD can be adjusted.

19.7.1 Adjustment procedure

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

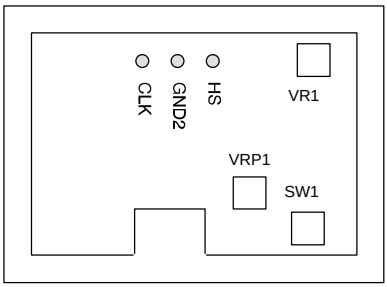
```
SETTING (HANDY)
PARAMETER WRITE  = 1 (0:DISABLE  1: ENABLE)
TV CHECK         = 0 (0:OFF      1:ON)
PUNCH CODE       = 0 (0:EIA      1:ISO)
INPUT UNIT       = 0 (0:MM       1:INCH)
I/O CHANNEL      = 0 (0-3:CHANNEL NO.)
SEQUENCE NO.     = 0 (0:OFF      1:ON)
TAPE FORMAT      = 0 (0:NO CNV   1:F15)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

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

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

19.7.2 7.2–inch monochrome LCD (CRT link) adjustment

The 7.2–inch monochrome LCD (connecting using CRT Link) is provided with a contrast adjustment potentiometer and video signal adjustment switches.
The contrast is adjusted when the LCD adapter or panel is replaced. Otherwise, it should not be necessary to use the adjustment switches.

- Adjustment points



7.2–inch monochrome LCD (rear view)

- Adjustment procedure

(1) Contrast adjustment (Potentiometer VRP1)

This adjustment is made to compensate for variations between, individual LCD adapters and LCD panels. When an LCD adapter or panel is replaced, the following adjustment must be made. If the entire LCD unit is replaced, however, no adjustment is needed.

(a) First, adjust potentiometer VRP1 until the displayed characters (all black areas) appear white.

(b) Rotate the potentiometer in the opposite direction until the characters appear clear and black.

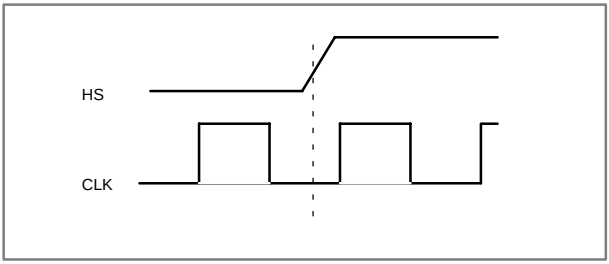
(2) Flicker adjustment (Potentiometer VR1)

This potentiometer is factory–set and normally need not be adjusted by the user. If the setting is changed by mistake, re–adjust it according to the following procedure. Note that some versions of this printed–circuit board do not have this potentiometer; adjustment is performed automatically.

(a) Using the check pins, observe HS and CLK on an oscilloscope.

(b) Over part of the range of potentiometer VR1, the positive–going edge of HS will be almost in phase with the positive–going edge of the CLK. Rotating the potentiometer a little does not change the phase difference. Set the potentiometer to the midpoint of this range.

(c) After completing the adjustment, confirm that the display does not flicker.



(3) Horizontal position adjustment (Switch SW1)

This switch is factory–set and normally need not be adjusted by the user. If the setting is changed by mistake, re–adjust it according to the following procedure.

(a) Switch SW1 is used to move the display horizontally in units of dots.

(b) Set the switch to the point between 8 and B where the entire display is visible.

(c) The default setting is 9.

NOTE If the ambient temperature is low, the brightness of the LCD decreases (immediately after the power is turned on, in particular). This is due to the characteristics of the LCD, and does not indicate a fault. As the ambient temperature rises, the LCD becomes brighter.