GE Fanuc Automation

Computer Numerical Control Products

Power Mate i-Model D
Power Mate i-Model H

Maintenance Manual

GFZ-63175EN/03 December 2002

Warnings, Cautions, and Notes as Used in this Publication

Warning

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

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

Caution

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

Note

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

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

GE Fanuc Automation makes no representation or warranty, expressed, implied, or statutory with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

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

SAFETY PRECAUTIONS

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

Contents

1 DEFINITION OF WARNING, CAUTION, AND NOTE

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

WARNING

Applied when there is a danger of the user being injured or when there is a 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 WARNINGS, CAUTIONS, AND NOTES RELATED TO CHECK OPERATION

WARNING

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

(1) The user's clothing could become caught in the spindle or other components, thus presenting a danger of injury. When checking the operation, stand away from the machine to ensure that your clothing does not become tangled in the spindle or other components.
(2) When checking the operation, perform idle operation without workpiece. When a workpiece is mounted in the machine, a malfunction could cause the workpiece to be dropped or destroy the tool tip, possibly scattering fragments throughout the area. This presents a serious danger of injury. Therefore, stand in a safe location when checking the operation.

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

(1) The power magnetics cabinet has a high–voltage section (carrying a ⚠ mark). Never touch the high–voltage section. The high–voltage section presents a severe risk of electric shock. Before starting any check of the operation, confirm that the cover is mounted on the high–voltage section. When the high–voltage section itself must be checked, note that touching a terminal presents a severe danger of electric shock.
(2) Within the power magnetics cabinet, internal units present potentially injurious corners and projections. Be careful when working inside the power magnetics cabinet.

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

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

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

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

3 WARNINGS AND NOTES RELATED TO REPLACEMENT

WARNING

1. Always turn off the power to the Power Mate and the main power to the power magnetics cabinet. If only the power to the Power Mate is turned off, power may continue to be supplied to the serve section. In such a case, replacing a unit may damage the unit, while also presenting a danger of electric shock.

2. When a heavy unit is to be replaced, the task must be undertaken by two persons. If the replacement is attempted by only one person, the replacement unit could slip and fall, possibly causing injury.

3. After the power is turned off, the servo amplifier and spindle amplifier may retain voltages for a while, such that there is a danger of electric shock even while the amplifier is turned off. Allow at least twenty minutes after turning off the power for these residual voltages to dissipate.

4. When replacing a unit, ensure that the new unit has the same parameter and other settings as the old unit. (For details, refer to the manual provided with the machine.) Otherwise, unpredictable machine movement could damage the workpiece or the machine itself, and present a danger of injury.

4 WARNINGS AND NOTES RELATED TO PARAMETERS

WARNING

1. When machining a workpiece for the first time after modifying a parameter, close the machine cover. Never use the automatic operation function immediately after such a modification. Instead, confirm normal machine operation by using functions such as the single block function, feedrate override function, and machine lock function, or by operating the machine without mounting a tool and workpiece. If the machine is used before confirming that it operates normally, the machine may move unpredictably, possibly damaging the machine or workpiece, and presenting a risk of injury.

2. The parameters are set to their optimal values, so that those parameters usually need not be modified. When a parameter must be modified for some reason, ensure that you fully understand the function of that parameter before attempting to modify it. If a parameter is set incorrectly, the machine may move unpredictably, possibly damaging the machine or workpiece, and presenting a risk of injury.

5 WARNINGS RELATED TO DAILY MAINTENANCE

WARNING

1. Memory backup battery replacement

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

NOTE

The Power Mate 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, CRT screen, or etc..
When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the contents of the Power Mate's memory will be lost.
To replace the battery, see the procedure described in Section 2.8 of this manual.

WARNING

2. Absolute pulse coder battery replacement

When replacing the memory backup batteries, keep the power to the machine (CNC) turned on, and apply an emergency stop to the machine. Because this work is performed with the power on and the cabinet open, only those personnel who have received approved safety and maintenance training may perform this work.

When replacing the batteries, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover).

Touching the uncovered high–voltage circuits presents an extremely dangerous electric shock hazard.

NOTE

The absolute pulse coder uses batteries to preserve its absolute position.

If the battery voltage drops, a low battery voltage alarm is displayed on the machine operator's panel, CRT/MDI screen, or etc..

When a low battery voltage alarm is displayed, replace the batteries within a week. Otherwise, the absolute position data held by the pulse coder will be lost.

To replace the battery, see the procedure described Maintenance Manual for FANUC CONTROL MOTOR AMPLIFIER α series or FANUC SERVO MOTOR β series.

WARNING

3. Fuse replacement

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

PREFACE

Description of this manual

1.Display and operation

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

2.Hardware

This section describes hardware configurations and presents a list of units. It also explains how to replace units.

3.Data input/output

This chapter describes the input/output of data, including programs, parameters, and tool compensation data.

4.Interface between the CNC and PMC

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

5.Digital servo

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

6.AC spindles

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

7.Trouble shooting

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

APPENDIX

A. Alarm list
B. List of maintenance parts
C. Boot system
D. Memory card operator's manual
E. Data backup
F. Setting/display/maintenance using the main unit of the Power Mate *i*
G. Maintenance using a notebook personal computer
H. FSSB start–up procedure/materials
I. Maintenance with display link typed touch panel
J. Notation of MDI keys

This manual does not provide a parameter list. If necessary, refer to the separate PARAMETER MANUAL (B–63180EN).

This manual describes all optional functions. Refer to the manual provided by the machine tool builder for details of any options with which the installed machine tool is provided.

Applicable models

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

- Read this manual carefully, and store it in a sales place.

Pruduct name	Abbreviation	
FANUC Power Mate *i*–MODEL D	Power Mate *i*–D	Power Mate *i*
FANUC Power Mate *i*–MODEL H	Power Mate *i*–H	

NOTE
Some function described in this manual may not be applied to some products.
For details, refer to the DESCRIPTIONS manual (B–63172EN)

Related manuals

The table below lists manuals related to MODEL D and H of Power Mate *i*.
In the table, this manual is marked with an asterisk (*).

Table 1 Manuals Related

Manual name	Specification Number	
DESCRIPTIONS	B–63172EN	
CONNECTION MANUAL (HARDWARE)	B–63173EN	
CONNECTION MANUAL (FUNCTION)	B–63173EN–1	
OPERATOR'S MANUAL	B–63174EN	
MAINTENANCE MANUAL	B–63175EN	*
PARAMETER MANUAL	B–63180EN	

For specifications and maintenance of FANUC SERVO MOTOR α series and β series, refer to the following manuals:

Document name	Document number	Major contents	Major usage	
FANUC AC SERVO MOTOR α series DESCRIPTIONS	B–65142E	• Specification • Characteristics • External dimensions • Connections	• Selection of motor • Connection of motor	
FANUC CONTROL MOTOR AMPLIFIER α series DESCRIPTIONS	B–65162E	• Specifications and functions • Installation • External dimensions and maintenance area • Connections	• Selection of amplifier • Connection of amplifier	
FANUC CONTROL MOTOR α series MAINTENANCE MANUAL	B–65165E	• Start up procedure • Troubleshooting • Maintenance of motor	• Start up the system (Hardware) • Troubleshooting • Maintenance of motor	
FANUC AC SERVO MOTOR α series PARAMETER MANUAL	B–65150E	• Initial setting • Setting parameters • Description of parameters	• Start up the system (Software) • Turning the system (Parameters)	
FANUC SERVO MOTOR β series DESCRIPTIONS	B–65232EN	• Specification • Characteristics • External dimensions • Connections	• Selection of motor • Connection of motor	

Table of Contents

APPENDIX

1 DISPLAY AND OPERATION

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

1.1 FUNCTION KEYS AND SOFT KEYS

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

1.1.1 Soft Keys

To display a more detailed screen, press a function key followed by a soft key at CRT, PDP, LCD, or handy operator’s panel. Soft keys are also used for actual operations.
The following illustrates how soft key displays are changed by pressing each function key.

The symbols in the following figures mean as shown below :

	:	Indicates screens
	:	Indicates a screen that can be displayed by pressing a function key(*1)
[ ]	:	Indicates a soft key(*2)
( )	:	Indicates input from the MDI panel.
	:	Indicates the continuous menu key (rightmost soft key).

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

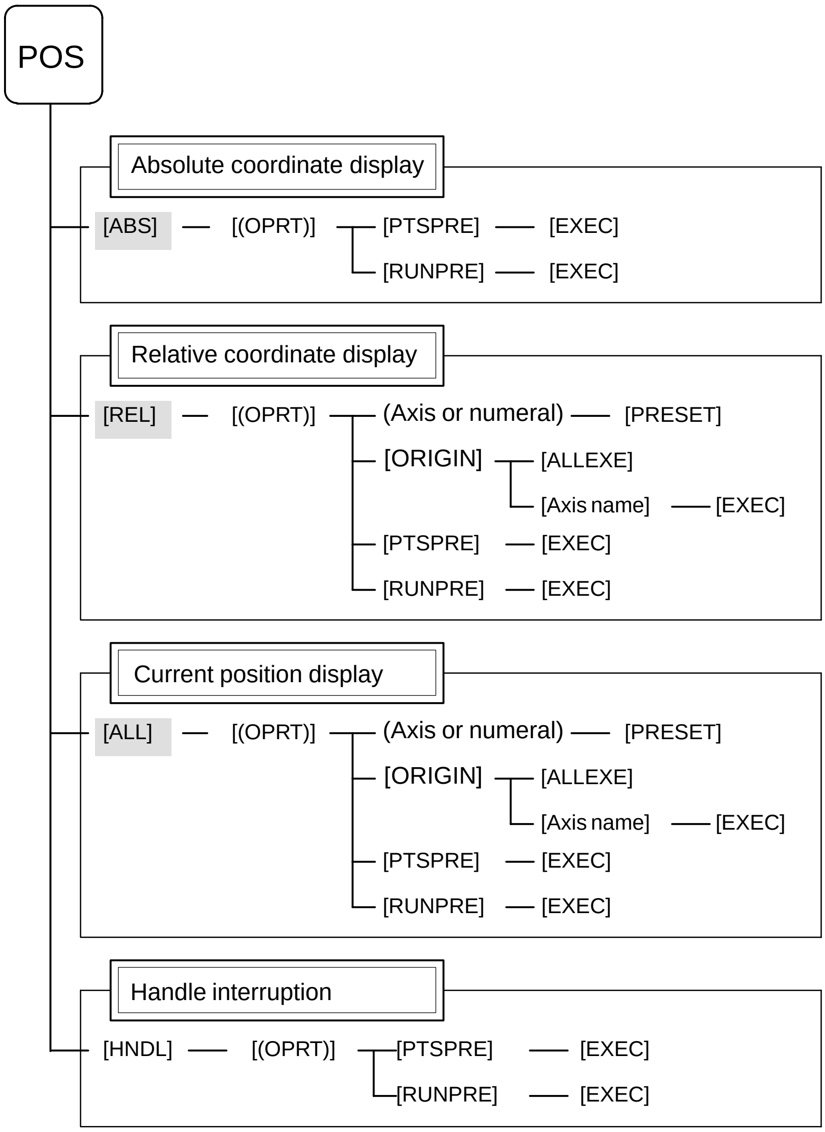
*2 Some soft keys are not displayed depending on the option configuration.

*3 In handy operator’s panel, the function of display the English language only is used.

NOTE
If the DPL/MDI and DPL/MDI operation package is in use, the keys on the CRT, PDP, LCD, and Handy Operator’s Panel are kept inoperable, and their screens are fixed at position displays.

POSITION SCREEN

Soft key transition triggered by the function key POS



PROGRAM SCREEN

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

PROG

- Program display screen
  - [PRGRM] — [(OPRT)]
    - [BG–EDT] ⇒ See “When the soft key [BG–EDT] is pressed”
    - (O number) — [O SRH]
    - (N number) — [N SRH]
    - [REWIND]
    - ▷
      - [F SRH]
        - [CAN]
        - (N number) — [EXEC]
- Program check display screen
  - [CHECK]
    - [ABS] / [REL] — [(OPRT)]
      - [BG–EDT] ⇒ See “When the soft key [BG–EDT] is pressed”
      - (O number) — [O SRH]
      - (N number) — [N SRH]
      - [REWIND]
      - ▷
        - [F SRH]
          - [CAN]
          - (N number) — [EXEC]
- Current block display screen
  - [CURRNT] — [(OPRT)] — [BG–EDT] ⇒ See “When the soft key [BG–EDT] is pressed”
- Next block display screen
  - [NEXT] — [(OPRT)] — [BG–EDT] ⇒ See “When the soft key [BG–EDT] is pressed”
- ▷
  - Program list screen
    - [LIB] — [(OPRT)]
      - [BG–EDT] ⇒ See “When the soft key [BG–EDT] is pressed”
      - [O SRH]

PROGRAM SCREEN

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

1/3

```
PROG
 |
 |  Program display
 |
 +-- [PRGRM] -- [(OPRT)] --+-- [BG–EDT]   ==>  See "When the soft key [BG–EDT] is pressed"
                           +-- (O number) -- [O SRH]
                           +-- (Address)  -- [SRH↓]
                           +-- (Address)  -- [SRH↑]
                           +-- [REWIND]
                          [▷]
                           +-- [F SRH]  --+-- [CAN]
                           |              +-- (N number) -- [EXEC]
                           +-- [READ]   --+-- [CHAIN]  (The cursor moves to the end of a program.)
                           |              +-- [STOP]
                           |              +-- [CAN]
                           |              +-- (O number) -- [EXEC]
                           +-- [PUNCH]  --+-- [STOP]
                           |              +-- [CAN]
                           |              +-- (O number) -- [EXEC]
                           +-- [DELETE] --+-- [CAN]
                           |              +-- (N number) -- [EXEC]
                           +-- [EX–EDT] --+-- [COPY]   --+-- [CRSR~] --+-- (O number) -- [EXEC]
                                          |              +-- [~CRSR] --+
                                          |              +-- [~BTTM] --+
                                          |              +-- [ALL]   --+
                                          +-- [MOVE]   --+-- [CRSR~] --+-- (O number) -- [EXEC]
                                          |              +-- [~CRSR] --+
                                          |              +-- [~BTTM] --+
                                          |              +-- [ALL]   --+
                                          +-- [MERGE]  --+-- [~CRSR] --+-- (O number) -- [EXEC]
                                          |              +-- [~BTTM] --+
                                          +-- [CHANGE] -- (Address) -- [BEFORE] --+
                                                                                  |
                                                   +------------------------------+
                                                   +-- (Address) -- [AFTER] --+-- [SKIP]
                                                                              +-- [1–EXEC]
                                                                              +-- [EXEC]
```

(1)(Continued on the next page)

2/3

(1)

Program directory display

- [LIB] — [(OPRT)]
  - [BG–EDT] ⇨ See “When the soft key [BG–EDT] is pressed”
  - (O number) — [O SRH] ⇨ Return to the program
  - ▷
  - [READ]
    - [CHAIN]
    - [STOP]
    - [CAN]
    - (O number) — [EXEC]
  - [PUNCH]
    - [STOP]
    - [CAN]
    - (O number) — [EXEC]

▷

Floppy directory display

- [FLOPPY]
  - [PRGRM] ⇨ Return to the program
  - [DIR] — [(OPRT)]
    - [F SRH]
      - (Numeral) — [F SET]
      - [CAN]
      - [EXEC]
    - [READ]
      - (Numeral) — [F SET]
      - (Numeral) — [O SET]
      - [STOP]
      - [CAN]
      - [EXEC]
    - [PUNCH]
      - (Numeral) — [F SET]
      - (Numeral) — [O SET]
      - [STOP]
      - [CAN]
      - [EXEC]
    - [DELETE]
      - (Numeral) — [F SET]
      - [CAN]
      - [EXEC]
    - [RENAME]
      - (Numeral) — [F SET]
      - (File name) — [F NAME]
      - [CAN]
      - [EXEC]

(2)(Continued on the next page)

3/3

(2)

▷ I/O CHANNEL (parameter No. 0020) is 4

Memory card directory display

- CARD
  - [PRGRM]
  - [DIR] — [(OPRT)]
    - [F SRH]
      - (Numeral) — [F SET]
      - [CAN]
      - [EXEC]
    - [F READ]
      - (Numeral) — [F SET]
      - (Numeral) — [O SET]
      - [STOP]
      - [CAN]
      - [EXEC]
    - [N READ]
      - (Numeral) — [F SET]
      - (Numeral) — [O SET]
      - [STOP]
      - [CAN]
      - [EXEC]
    - [PUNCH]
      - (File name) — [F SET]
      - (Numeral) — [O SET]
      - [STOP]
      - [CAN]
      - [EXEC]
    - [F DELETE]
      - (Numeral) — [F SET]
      - [CAN]
      - [EXEC]

PROGRAM SCREEN

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

PROG

Program display

[PRGRM] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

Program input screen

[MDI] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"
- [START] — [CAN]
  - [EXEC]
- (Address) — [SRH↓]
- (Address) — [SRH↑]
- [REWIND]

Current block display screen

[CURRNT] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

Next block display screen

[NEXT] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

▷

Program directory display

[LIB] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

PROGRAM SCREEN

Soft key transition triggered by the function key PROG in the HANDLE/STEP, JOG, or ZRN mode

PROG

Program display

[PRGRM] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

Current block display screen

[CURRNT] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

Next block display screen

[NEXT] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

▷

Program directory display

[LIB] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"

PROGRAM SCREEN

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

PROG

Program input screen

[MDI] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"
- (O number) — [O SRH] ⇒ Return to the program
- (Address) — [SRH↓]
- (Address) — [SRH↑]
- [REWIND]

Program directory display

[LIB] — [(OPRT)] — [BG–EDT] ⇒ See "When the soft key [BG–EDT] is pressed"
- (O number) — [O SRH] ⇒ Return to the program

PROGRAM SCREEN

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

1/2

PROG

Program display

- [PRGRM] — [(OPRT)]
  - [BG–END]
  - (O number) — [O SRH]
  - (Address) — [SRH↓]
  - (Address) — [SRH↑]
  - [REWIND]
  - ▷
  - [F SRH]
    - [CAN]
    - (N number) — [EXEC]
  - [READ]
    - [CHAIN] (The cursor moves to the end of a program.)
    - [STOP]
    - [CAN]
    - (O number) — [EXEC]
  - [PUNCH]
    - [STOP]
    - [CAN]
    - (O number) — [EXEC]
  - [DELETE]
    - [CAN]
    - (N number) — [EXEC]
  - [EX–EDT]
    - [COPY]
      - [CRSR~] / [~CRSR] / [~BTTM] / [ALL] — (O number) — [EXEC]
    - [MOVE]
      - [CRSR~] / [~CRSR] / [~BTTM] / [ALL] — (O number) — [EXEC]
    - [MERGE]
      - [~CRSR] / [~BTTM] — (O number) — [EXEC]
    - [CHANGE] — (Address) — [BEFORE] — (Address) — [AFTER]
      - [SKIP]
      - [1–EXEC]
      - [EXEC]

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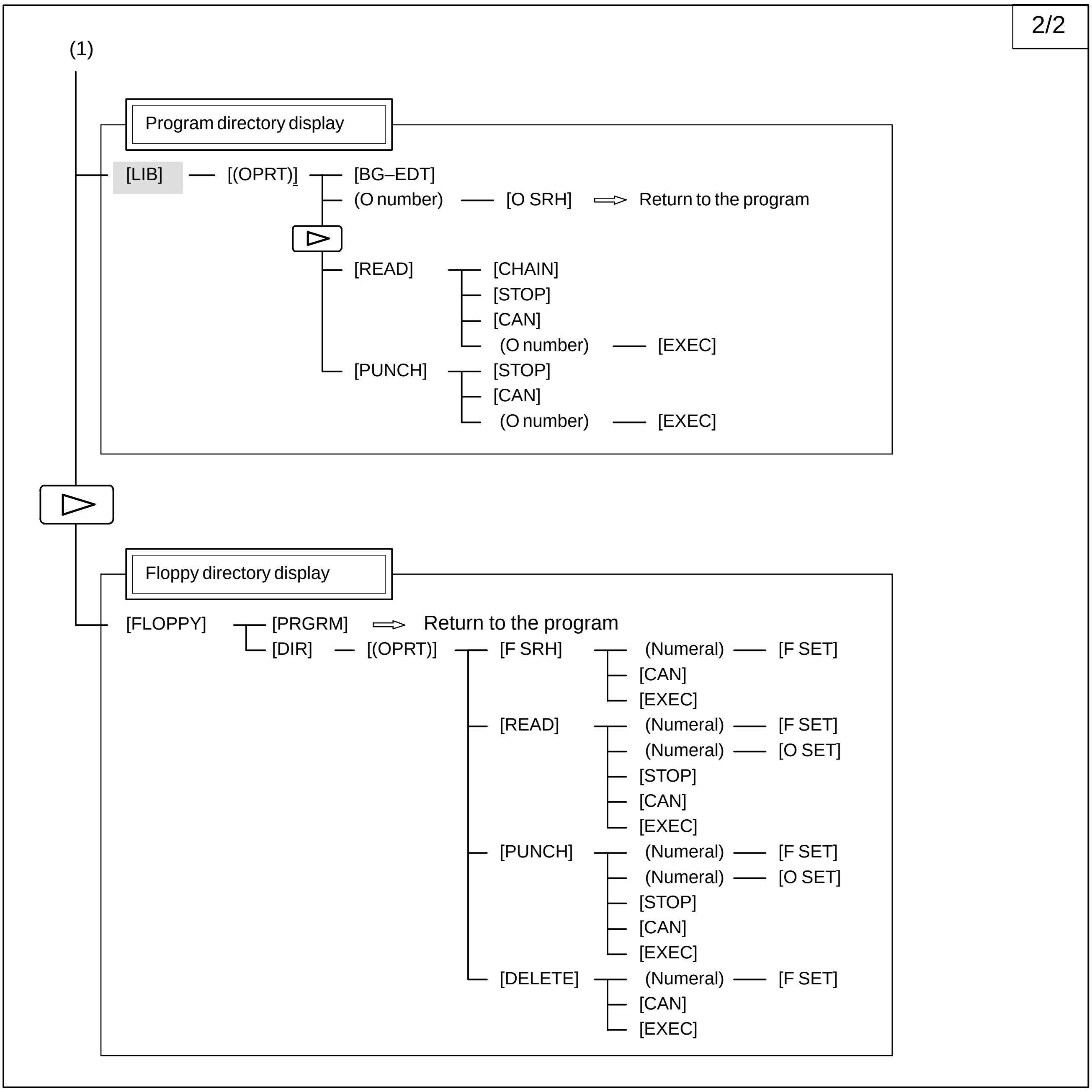

2/2
(1)
Program directory display
[LIB]
[(OPRT)]
[BG–EDT]
(O number)
[O SRH]
Return to the program
[READ]
[CHAIN]
[STOP]
[CAN]
(O number)
[EXEC]
[PUNCH]
[STOP]
[CAN]
(O number)
[EXEC]
Floppy directory display
[FLOPPY]
[PRGRM]
Return to the program
[DIR]
[(OPRT)]
[F SRH]
(Numeral)
[F SET]
[CAN]
[EXEC]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

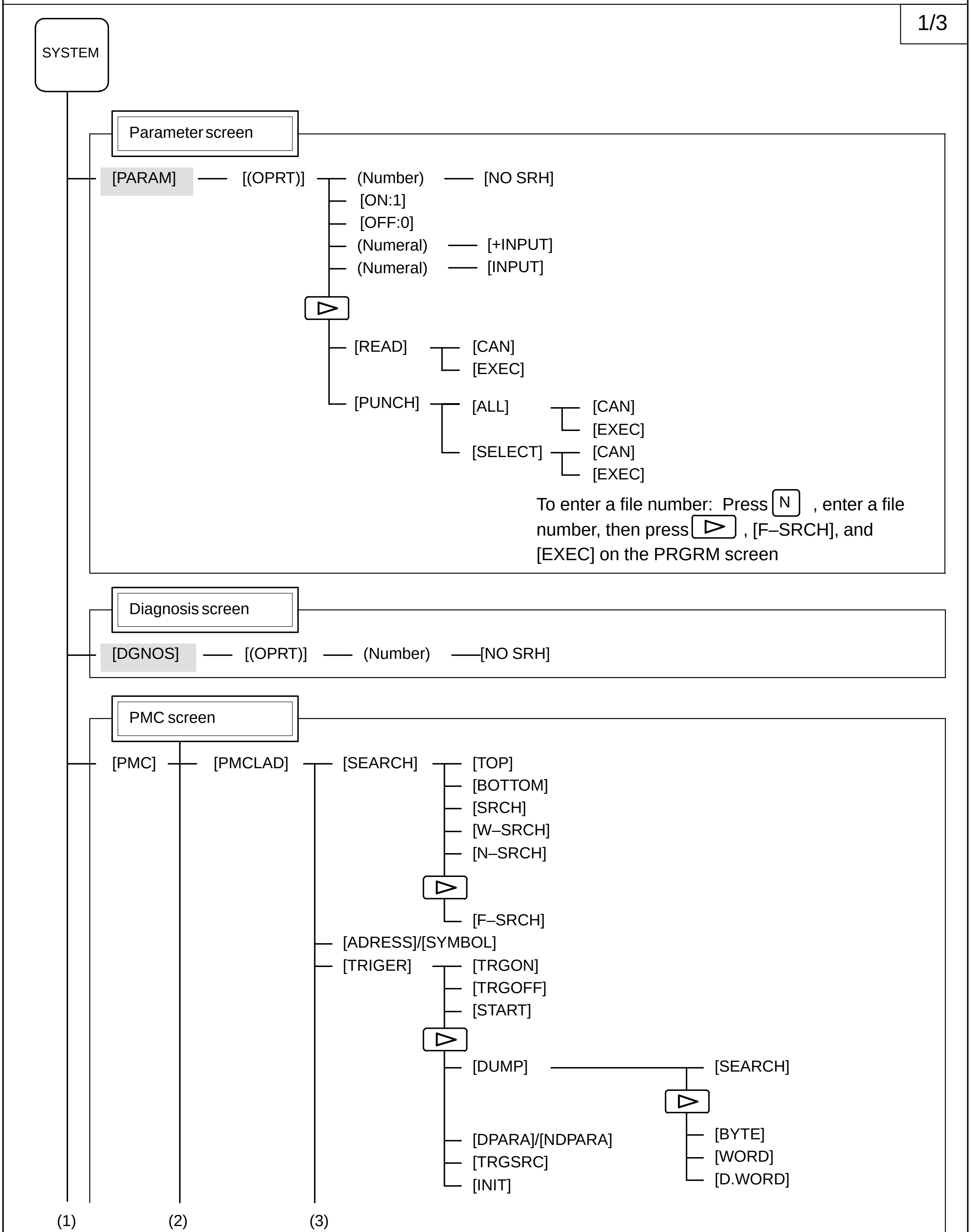
OFFSET/SETTING SCREEN

Soft key transition triggered by the function key OFFSET SETTING

OFFSET SETTING

- **Tool offset screen**
  - [OFFSET] — [(OPRT)]
    - (Number) — [NO SRH]
    - (Axis name) — [INP.C.]
    - (Numeral) — [+INPUT]
    - (Numeral) — [INPUT]
    - ▷
    - [DELETE] — [ALL]
    - [READ] — [CAN] / [EXEC]
    - [PUNCH] — [CAN] / [EXEC]
- **Setting screen**
  - [SETING] — [(OPRT)]
    - (Number) — [NO SRH]
    - [ON:1]
    - [OFF:0]
    - (Numeral) — [+INPUT]
    - (Numeral) — [INPUT]
- ▷
- **Macro variables display screen**
  - [MACRO] — [(OPRT)]
    - (Number) — [NO SRH]
    - (Axis name) — [INP.C.]
    - (Numeral) — [INPUT]
    - ▷
    - [PUNCH] — [CAN] / [EXEC]
- **Patten data input screen**
  - [MENU] — [(OPRT)] — (Number) — [SELECT]
- **Software operator's panel screen**
  - [OPR]

SYSTEM SCREEN Soft key transition triggered by the function key SYSTEM



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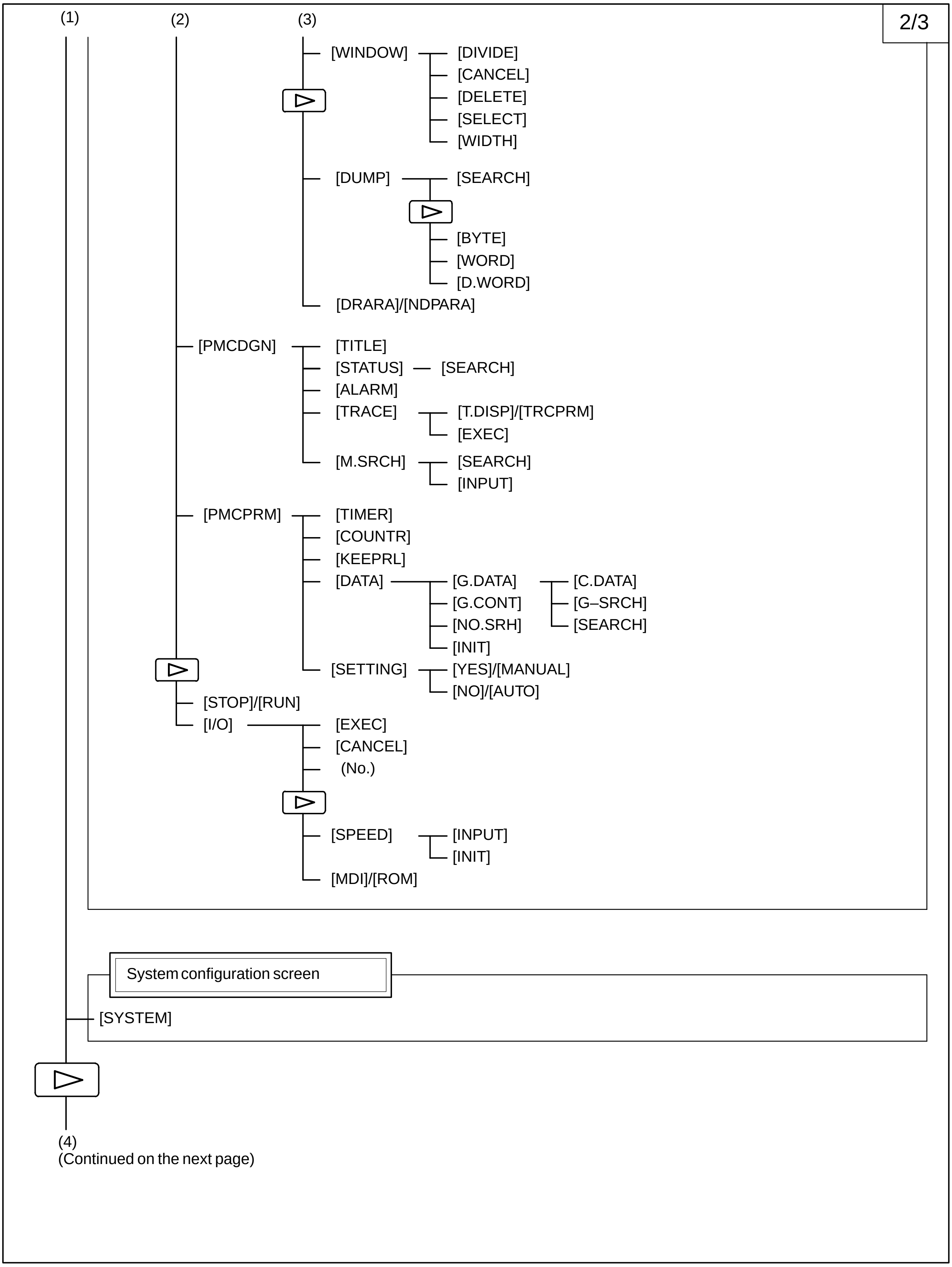

2/3
(1)
(2)
(3)
[WINDOW]
[DIVIDE]
[CANCEL]
[DELETE]
[SELECT]
[WIDTH]
[DUMP]
[SEARCH]
[BYTE]
[WORD]
[D.WORD]
[DRARA]/[NDPARA]
[PMCDGN]
[TITLE]
[STATUS]
[SEARCH]
[ALARM]
[TRACE]
[T.DISP]/[TRCPRM]
[EXEC]
[M.SRCH]
[SEARCH]
[INPUT]
[PMCPRM]
[TIMER]
[COUNTR]
[KEEPRL]
[DATA]
[G.DATA]
[G.CONT]
[NO.SRH]
[INIT]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

3/3

(4)

Pitch error compensation screen

- [PITCH] — [(OPRT)]
  - (No.) — [NO SRH]
  - [ON:1]
  - [OFF:0]
  - (Numeral) — [+INPUT]
  - (Numeral) — [INPUT]
  - ▷
  - [READ]
    - [CAN]
    - [EXEC]
  - [PUNCH]
    - [CAN]
    - [EXEC]

To enter a file number: Press N , enter a file number, then press ▷ , [F–SRCH], and [EXEC] on the PRGRM screen

Servo parameter screen

- [SV.PRM]
  - [SV.SET]
  - [SV.TUN]
    - [(OPRT)]
      - [ON:1]
      - [OFF:0]
      - (Numeral) — [INPUT]

SV setting/SV adjusting:
If bit 0 of parameter No. 3111 is 1

Spindle parameter screen

*Only for Power Mate *i*-D

- [SP.PRM]
  - [SP.SET]
  - [SP.TUN]
  - [SP.MON]
    - [(OPRT)]
      - [ON:1]
      - [OFF:0]
      - [INPUT]

SP setting/SP adjusting/
SP monitoring:
If bit 1 of parameter No. 3111 is 1

MESSAGE SCREEN

Soft key transition triggered by the function key MESSAGE

MESSAGE

Alarm display screen

[ALARM]

Message display screen

[MSG]

Alarm history screen

[HISTRY] —— [(OPRT)] —— [CLEAR]

HELP SCREEN

Soft key transition triggered by the function key HELP

HELP

Alarm detail screen

[ALARM] —— [(OPRT)] —— [SELECT]

Operation method screen

[OPERAT] —— [(OPRT)] —— [SELECT]

Parameter table screen

[PARAM]

1.1.2 Key Configuration of DPL/MDI

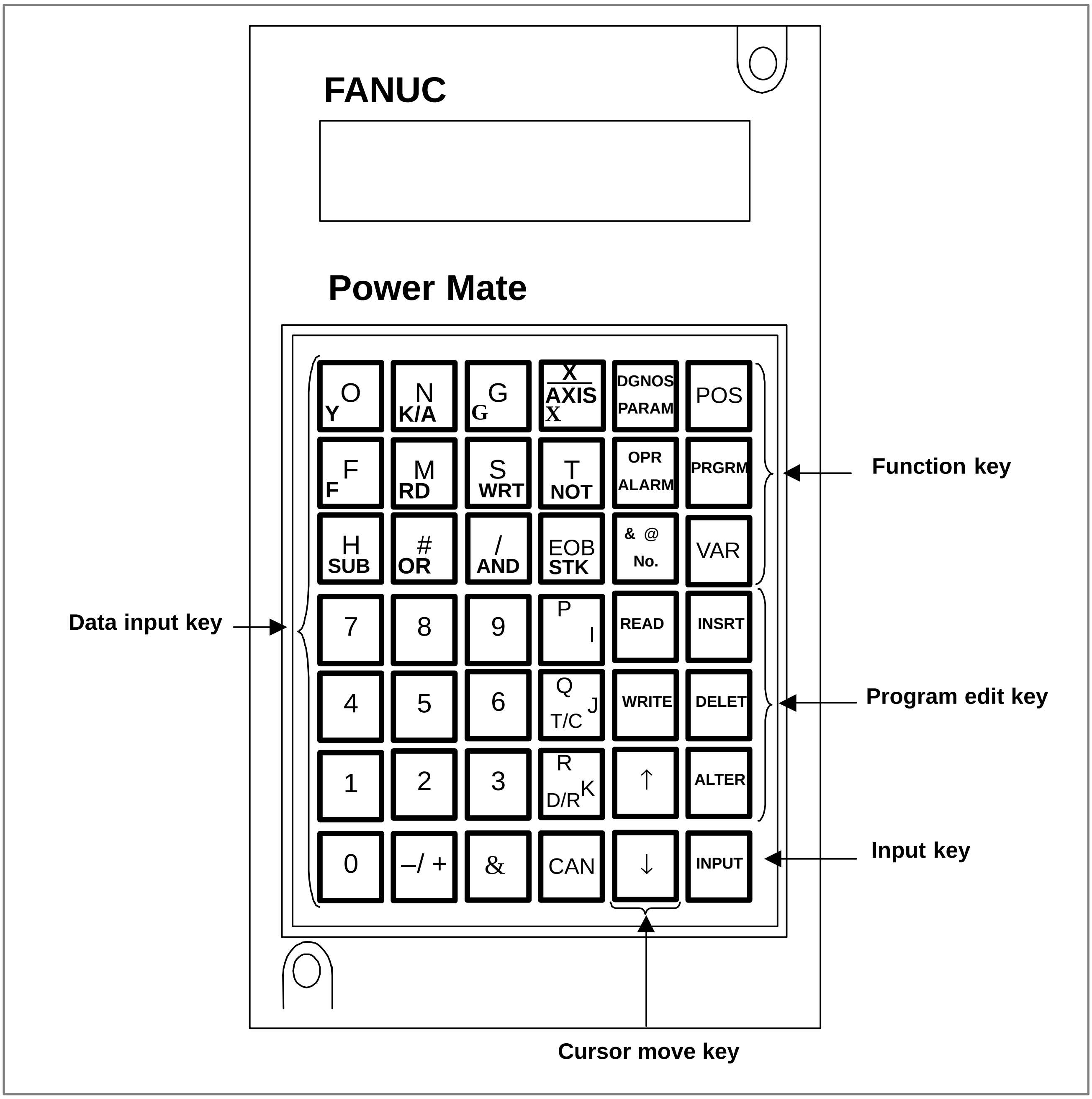


Fig. 1.1.2 DPL/MDI

(1) Function keys

Function keys indicate large items like chapters in a document.

<POS>

Indicates the current position.

<PRGRM>

Conducts the following:
In EDIT mode ...edits and displays the program in the memory
In automatic operation ...displays command value.

<VAR>

Used to display offset settings and to set and display macro variables.

<PARAM DGNOS>

Used to set and display parameter, diagnostic, and PMC parameter.

<ALARM>

Display of Alarm number and external message.

(2) Keyboard functions

Table 1.1.2 MDI Keyboard functions

Key	Functions
Address/numerical key	Press these keys to input alphabetic, numeric, and other characters.
INPUT (INPUT) key	When an address or a numerical key is pressed, the letter or the numeral is input once to the key input buffer, and it is displayed on the DPL. To input the data, press the INPUT key.
Cancel (CAN) key	Press this key to cancel character or sign input to the key input buffer. (Example) When the key input buffer displays N0001, N0001 is canceled with this key.When an alarm is displayed, depressing CAN will reset the alarm message.
Cursor shift keys	There are two kinds of cursor shift key described below. ↓ : This key is used to shift the cursor a short distance in the forward direction. ↑ : This key is used to shift the cursor a short distance in the reverse direction.
READ /WRITE key	Press this key to start I/O operation with an I/O device or memory card. Pressing a key activates the corresponding I/O device. Be careful not to press the wrong key.

CAUTION

Pressing the READ or WRITE key activates the corresponding function.

Be careful to press the correct key.If the wrong key is pressed, data may be transferred in the direction opposite to the desired direction.

<READ> Power Mate ← I/O device or memory card

<WRITE> Power Mate → I/O device or memory card

(3) Caution on using the DPL/MDI

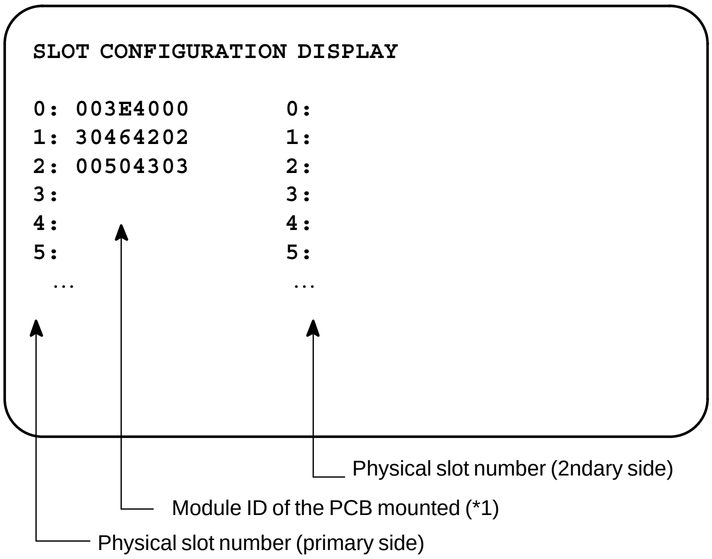
If the DPL/MDI, CRT (PDP, LCD)/MDI, and handy operator’s panel are connected at the same time, the DPL/MDI takes precedence. The CRT (PDP, LCD)/MDI and handy operator’s panel are disabled, and their functions are restricted to position display.

1.2 SCREEN DISPLAYED IMMEDIATELY AFTER POWER IS TURNED ON

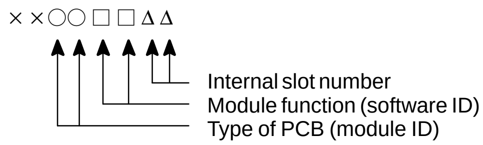
1.2.1 Slot Status Display

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

- **Slot state screen**



*1) Module ID of PCB



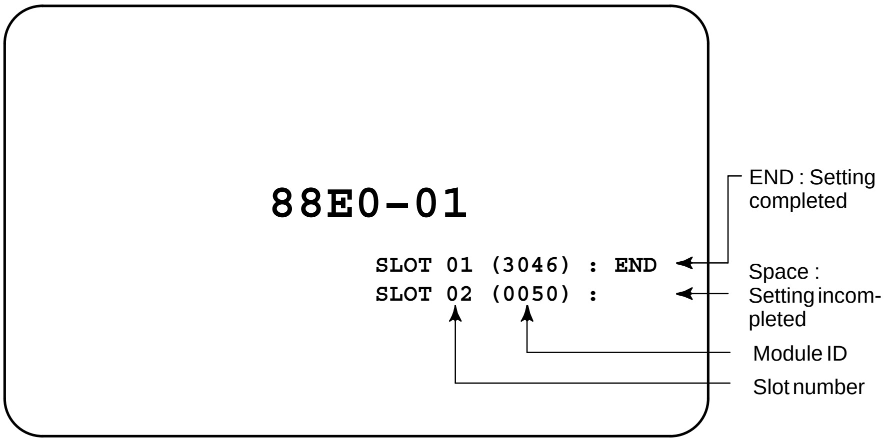
- **Module ID**

ID	Name
DD	Power Mate *i* base PCB
AA	High–speed serial bus (HSSB) board
C4 or 95	FANUC I/O Link–II board
E3	PROFIBUS–DP slave board
FC	PROFIBUS–DP master board
36	Ethernet board
EF	DeviceNet slave board (B) DeviceNet master board (B)
59	FL–net board
BF	DeviceNet slave board (C)

- **Software ID**

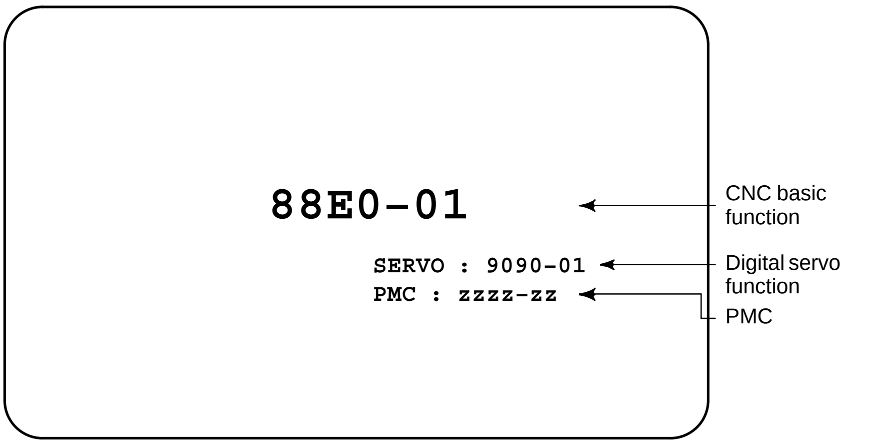
40 : Basic function

1.2.2
Setting Module Screen



1.2.3
Configuration Display of Software

When the CRT/MDI has started normally and communication with the Power Mate *i* starts



When the DPL/MDI starts normally and then communication with the Power Mate *i* starts

Power Mate–*i*
88F1–01

1.2.4 If it is Definitely Impossible to Start the Controller

1) When the CRT/MDI has started normally, but cannot communicate with the Power Mate *i* (if the screen shown in Section 1.2.1 has not yet been displayed)

```
*** INTELLIGENT CRT/MDI 8813/03 ***

  ROM PARITY CHECK OK
  WAITING FOR CRT DATA
```

NOTE
If nothing appears on the screen, it indicates that the CRT/MDI has failed to start.

When the DPL/MDI starts normally, but communication with the Power Mate *i* does not

```
ROM PARI. OK
RAM CHECK OK
```

NOTE
If nothing appears on the screen, it indicates that the DPL/MDI has failed to start.

1.3 SYSTEM CONFIGURATION SCREEN

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

1.3.1 Display Method

(1) Press SYSTEM key.

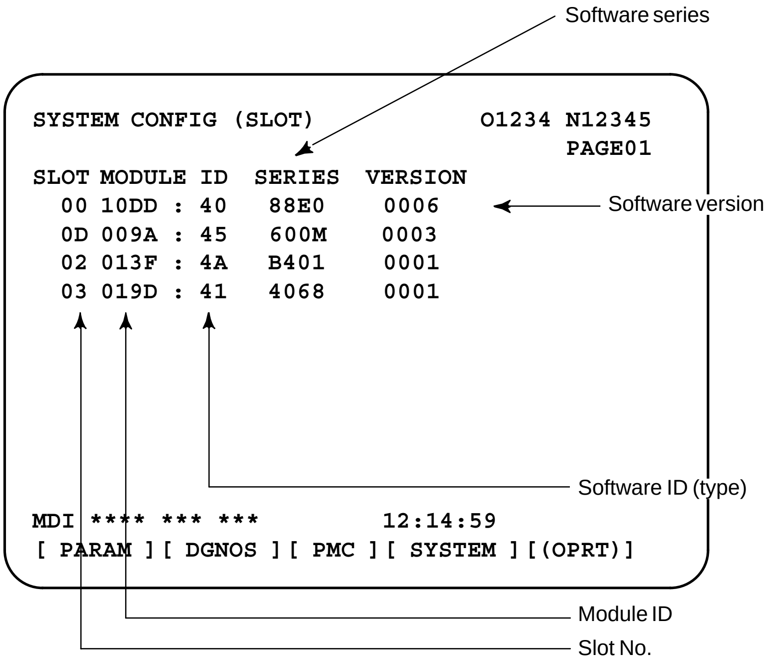
(2) Press soft key **[SYSTEM]**, then the system configuration screen is displayed.

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

A combination of the DPL/MDI and its operation package cannot display the system configuration screen.

1.3.2 Configuration of PCBs

- **Screen**



- **Module ID** See subsec. 1.2.1.
- **Software ID** 40 : Basic function

1.3.3 Software Configuration Screen

Kind of software
Software series

```
SYSTEM CONFIG  (SOFTWARE)          01234 N12345
                                        PAGE:02
SYSTEM     88E0   0001
           BASIC
SERVO      9090   0001
PMC(SYS)   401B   0001
PMC(LAD)   PMI    0001
MACRO LIB BZG1    0001
BOOT       881I   0004




MDI **** *** ***         12:14:59
[ PARAM ][ DGNOS ][ PMC ][ SYSTEM ][(OPRT)]
```

Software version
Software configuration
Character written on PMC title screen

1.3.4 Module Configuration Screen

Configuration of the modules displayed on PCB.

```
                                                           (1)
SYSTEM CONFIG  (MODULE)          01234 N12345
                                   PAGE:03

SLOT  00  MOTHER  BOARD                                    (2)

  AXIS CTRL CARD     :   0D
  DISPLAY CTRL CARD  :   0E
  CPU CARD           :   01
  FROM DIMM          :   47
  SRAM DIMM          :   23                                (4)
  DRAM DIMM          :   86
  PMC CPU            :   01
  OPTION CARD        :   FF
                                                           (3)
MDI **** *** ***          12:14:59
[ PARMA ][ DGNOS ][ PMC ][ SYSTEM ][(OPRT)]
```

Contents of display

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

(2) Type of PCB mounted

(3) Name of card PCB or DIMM module

(4) Hardware ID of mounted card PCB or DIMM module
Refer to “2.4.4 Printed Circuit Boards of the Control Unit” for correspondence with each hardware ID and drawing number.

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

> **NOTE**
> Although the FROM and SRAM of the Power Mate *i* are mounted on a single memory module, their IDs are indicated separately according to their capacities.

1.4 ALARM HISTORY SCREEN

1.4.1 General

Alarms generated in the Power Mate are recorded. The latest 50 alarms generated are recorded. The 50th and former alarms are deleted.
Alarm history cannot be displayed on DPL/MDI or DPL/MDI operation package.

1.4.2 Screen Display

(1) Press MESSAGE key .

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

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

```
ALARM HISTORY                                  O1234 N12345
                                               PAGE:1
97/04/18 20:56:26
 506 OVERTRAVEL :  +X
97/04/18 19:58:11
 000 TURN OFF POWER
97/04/18 19:52:45
 000 TURN OFF POWER
97/04/18 19:48:43
 300 APC ALARM   : X-AXIS ZERO RETURN REQUEST
97/04/18 18:10:10
 507 OVERTRAVEL :  +B


MDI **** *** ***  10:15:28
[ ALARM ][ MSG ][ HISTRY ][       ][(OPRT)]
```

1.4.3 Clearing Alarm History

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

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

1.4.4 Alarm Display

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

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

[Data type] Bit

EAH The alarm history function:

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

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

1.5 OPERATION HISTORY

This function displays the key and signal operations performed by the NC operator upon the occurrence of a fault or the output of an NC alarm, together with the corresponding NC alarms. Operation history information cannot be displayed on the DPL/MDI or DPL/MDI operation package.

This function records the following data:

(1) MDI key operations performed by the NC operator

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

(3) Details of NC alarms

(4) Time stamp (date, time)

1.5.1 Parameter Setting

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

[Data type] Bit

OPH The operation history screen is:

0 : Not displayed.
1 : Displayed.

OHS The operation history is:

0 : Sampled.
1 : Not sampled.

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

[Data type] Word

[Units of data] Minutes

[Valid data range] 0 to 1439

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

1.5.2
Screen Display

- **Displaying the operation history**

(1) Press the SYSTEM function key.

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

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

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

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

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

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

> **CAUTION**
> No additional history data is stored while the operation history screen is being displayed.

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

To display the interface between two pages, press cursor key → or ←. The screen is scrolled by one row.

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:

G0000.7↑

The ↑ mark indicates that the signal is turned on.
The ↓ mark indicates that the signal is turned off.
Indicates the bit.
Indicates the address.

Some signals are indicated by their symbol names.

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

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

Input signal					Name displayed
MD1	ND2	MD4	ZRN	DNCI	
0	0	0	0	0	MDI
1	0	0	0	0	AUTO
1	0	0	0	1	RMT
0	1	0	0	0	NOMODE
1	1	0	0	0	EDIT
0	0	1	0	0	STEP
1	0	1	0	0	JOG
1	0	1	1	0	ZRN
0	1	1	0	0	TJOG
1	1	1	0	0	THND

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

(3) Alarms

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 alarm occurs
4) The clock time is recorded at predetermined intervals, together with each new calendar day.

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

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

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

(1) Press the SYSTEM function key.

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

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

```
OP_HIS SIGNAL SELECT                 O1000 N02000

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

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

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

```
OP_HIS SIGNAL SELECT                O1000 N02000

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

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

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

Example) G0004 INPUT

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

(4) Select the bit to be recorded.

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

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

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

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

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

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

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

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

1. M/T addresses

MT→PMC

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

PMC→CNC

	#7	#6	#5	#4	#3	#2	#1	#0
G000	○	○	○	○	○	○	○	○
~								
G003	○	○	○	○	○	○	○	○
G004	○	○	○	○	FIN	○	○	○
G005	○	○	○	○	TFIN	SFIN	○	MFIN
G006	○	○	○	○	○	*ABS	○	○
G007	RLSOT	○	*FLWP	○	○	ST	○	○
G008	ERS	RRW	*SP	*ESP	○	○	○	*IT
G009	○	○	○	○	○	○	○	○
~								
G018	○	○	○	○	○	○	○	○
G019	RT	○	○	○	○	○	○	○
G020	○	○	○	○	○	○	○	○
~								
G042	○	○	○	○	○	○	○	○
G043	○	×	○	×	×	○	○	○
G044	○	○	○	○	○	○	MLK	BDT1
G045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2

	#7	#6	#5	#4	#3	#2	#1	#0
G046	DRN	KEY4	KEY3	KEY2	KEY1	○	SBK	○
G047	○	○	○	○	○	○	○	○
G060	○	○	○	○	○	○	○	○
G061	○	○	○	○	○	○	○	RGTA
G062	○	○	○	○	○	○	○	○
G099	○	○	○	○	○	○	○	○
G100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G101	○	○	○	○	○	○	○	○
G102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1
G103	○	○	○	○	○	○	○	○
G105	○	○	○	○	○	○	○	○
G106	MI8	MI7	MI6	MI5	MI4	MI3	MI2	MI1
G107	○	○	○	○	○	○	○	○
G108	○	○	○	○	○	○	○	○
G109	○	○	○	○	○	○	○	○
G110	+LM8	+LM7	+LM6	+LM5	+LM4	+LM3	+LM2	+LM1
G111	○	○	○	○	○	○	○	○
G112	–LM8	–LM7	–LM6	–LM5	–LM4	–LM3	–LM2	–LM1
G113	○	○	○	○	○	○	○	○
G114	*+L8	*+L7	*+L6	*+L5	*+L4	*+L3	*+L2	*+L1
G115	○	○	○	○	○	○	○	○
G116	*–L8	*–L7	*–L6	*–L5	*–L4	*–L3	*–L2	*–L1
G117	○	○	○	○	○	○	○	○
G125	○	○	○	○	○	○	○	○

	#7	#6	#5	#4	#3	#2	#1	#0
G126	SVF8	SVF7	SVF6	SVF5	SVF4	SVF3	SVF2	SVF1
G127	○	○	○	○	○	○	○	○
~								
G129	○	○	○	○	○	○	○	○
G130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1
G131	○	○	○	○	○	○	○	○
G132	○	○	○	○	+MIT4	+MIT3	+MIT2	+MIT1
G133	○	○	○	○	○	○	○	○
G134	○	○	○	○	–MIT4	–MIT3	–MIT2	–MIT1
G135	○	○	○	○	○	○	○	○
~								
G255	○	○	○	○	○	○	○	○

PMC→MT

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

CNC→PMC

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

2. List of Address for 2–path control

MT→PMC

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

PMC→CNC (Signals for 1st path)

	#7	#6	#5	#4	#3	#2	#1	#0
G000	○	○	○	○	○	○	○	○
~								
G003	○	○	○	○	○	○	○	○
G004	○	○	○	○	FIN	○	○	○
G005	○	○	○	○	TFIN	SFIN	○	MFIN
G006	○	○	○	○	○	*ABS	○	○
G007	RLSOT	○	*FLWP	○	○	ST	○	○
G008	ERS	RRW	*SP	*ESP	○	○	○	*IT
G009	○	○	○	○	○	○	○	○
~								
G018	○	○	○	○	○	○	○	○
G019	RT	○	○	○	○	○	○	○
G020	○	○	○	○	○	○	○	○
~								
G042	○	○	○	○	○	○	○	○
G043	○	×	○	×	×	○	○	○
G044	○	○	○	○	○	○	MLK	BDT1
G045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
G046	DRN	KEY4	KEY3	KEY2	KEY1	○	SBK	○
G047	○	○	○	○	○	○	○	○
~								
G060	○	○	○	○	○	○	○	○
G061	○	○	○	○	○	○	○	RGTA
G062	○	○	○	○	○	○	○	○
~								
G099	○	○	○	○	○	○	○	○

	#7	#6	#5	#4	#3	#2	#1	#0
G100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G101	○	○	○	○	○	○	○	○
G102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1
G103	○	○	○	○	○	○	○	○
~								
G105	○	○	○	○	○	○	○	○
G106	MI8	MI7	MI6	MI5	MI4	MI3	MI2	SMI1
G107	○	○	○	○	○	○	○	○
G108	○	○	○	○	○	○	○	○
G109	○	○	○	○	○	○	○	○
G110	+LM8	+LM7	+LM6	+LM5	+LM4	+LM3	+LM2	+LM1
G111	○	○	○	○	○	○	○	○
G112	–LM8	–LM7	–LM6	–LM5	–LM4	–LM3	–LM2	–LM1
G113	○	○	○	○	○	○	○	○
G114	*+L8	*+L7	*+L6	*+L5	*+L4	*+L3	*+L2	*+L1
G115	○	○	○	○	○	○	○	○
G116	*–L8	*–L7	*–L6	*–L5	*–L4	*–L3	*–L2	*–L1
G117	○	○	○	○	○	○	○	○
~								
G125	○	○	○	○	○	○	○	○
G126	SVF8	SVF7	SVF6	SVF5	SVF4	SVF3	SVF2	SVF1
G127	○	○	○	○	○	○	○	○
~								
G129	○	○	○	○	○	○	○	○
G130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1
G131	○	○	○	○	○	○	○	○
G132	○	○	○	○	+MIT4	+MIT3	+MIT2	+MIT1

	#7	#6	#5	#4	#3	#2	#1	#0
G133	○	○	○	○	○	○	○	○
G134	○	○	○	○	–MIT4	–MIT3	–MIT2	–MIT1
G135	○	○	○	○	○	○	○	○
G255	○	○	○	○	○	○	○	○

PMC→CNC (Signals for the 2nd path)

	#7	#6	#5	#4	#3	#2	#1	#0
G1000	○	○	○	○	○	○	○	○
G1003	○	○	○	○	○	○	○	○
G1004	○	○	○	○	FIN	○	○	○
G1005	○	○	○	○	TFIN	SFIN	○	MFIN
G1006	○	○	○	○	○	*ABS	○	○
G1007	RLSOT	○	*FLUP	○	○	ST	○	○
G1008	ERS	RRW	*SP	*ESP	○	○	○	*IT
G1009	○	○	○	○	○	○	○	○
G1018	○	○	○	○	○	○	○	○
G1019	RT	○	○	○	○	○	○	○
G1020	○	○	○	○	○	○	○	○
G1042	○	○	○	○	○	○	○	○
G1043	○	×	○	×	×	○	○	○
G1044	○	○	○	○	○	○	MLK	BDT1
G1045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
G1046	DRN	KEY4	KEY3	KEY2	KEY1	○	SBK	○
G1047	○	○	○	○	○	○	○	○
G1060	○	○	○	○	○	○	○	○
G1061	○	○	○	○	○	○	○	RGTA

	#7	#6	#5	#4	#3	#2	#1	#0
G1062	○	○	○	○	○	○	○	○
~								
G1099	○	○	○	○	○	○	○	○
G1100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G1101	○	○	○	○	○	○	○	○
G1102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1
G1103	○	○	○	○	○	○	○	○
~								
G1105	○	○	○	○	○	○	○	○
G1106	MI8	MI7	MI6	MI5	MI4	MI3	MI2	SMI1
G1107	○	○	○	○	○	○	○	○
G1108	○	○	○	○	○	○	○	○
G1109	○	○	○	○	○	○	○	○
G1110	+LM8	+LM7	+LM6	+LM5	+LM4	+LM3	+LM2	+LM1
G1111	○	○	○	○	○	○	○	○
G1112	–LM8	–LM7	–LM6	–LM5	–LM4	–LM3	–LM2	–LM1
G1113	○	○	○	○	○	○	○	○
G1114	*+L8	*+L7	*+L6	*+L5	*+L4	*+L3	*+L2	*+L1
G1115	○	○	○	○	○	○	○	○
G1116	*–L8	*–L7	*–L6	*–L5	*–L4	*–L3	*–L2	*–L1
G1117	○	○	○	○	○	○	○	○
~								
G1125	○	○	○	○	○	○	○	○
G1126	SVF8	SVF7	SVF6	SVF5	SVF4	SVF3	SVF2	SVF1
G1127	○	○	○	○	○	○	○	○
~								
G1129	○	○	○	○	○	○	○	○
G1130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

	#7	#6	#5	#4	#3	#2	#1	#0
G1131	○	○	○	○	○	○	○	○
G1132	○	○	○	○	+MIT4	+MIT3	+MIT2	+MIT1
G1133	○	○	○	○	○	○	○	○
G1134	○	○	○	○	–MIT4	–MIT3	–MIT2	–MIT1
G1135	○	○	○	○	○	○	○	○
≀								
G1255	○	○	○	○	○	○	○	○

PMC→MT

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

CNC→PMC (Signals for the 1–path)

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

CNC→PMC (Signals for the 2–path)

	#7	#6	#5	#4	#3	#2	#1	#0
F1000	○	○	○	○	○	○	○	○
≀								
F1255	○	○	○	○	○	○	○	○

1.5.4 Inputting and Outputting the Operation History Data

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

• Output

(1) Select EDIT mode.

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

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

The data output to the FANUC Handy File is stored under file name OPERATION HISTORY.

• Input

(1) Select EDIT mode.

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

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

• Output data format

1. MDI/soft key
2. Signal
3. Alarm
4. For extension (date or time)
5. MDI/soft key of path 2
6. Signal of path 2
7. Alarm of path 2

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

T(identifier word)

T0	:	Header
T50	:	MDI/soft key
T51	:	Signal
T52	:	Alarm
T53	:	For extension (date or time)
T54	:	MDI/soft key of path 2
T55	:	Signal of path 2
T56	:	Alarm of path 2

1) Header

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

	H	I	S	T	O	R	Y	;

C: Data word

2) MDI/soft key

T	5	0	P	0 to 1	H	*	*	;

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

3) Signal

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

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

4) Alarm

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

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

5) For extension (date or time)

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

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

D	1	9	9	7	1	0	2	9

6) MDI/soft key of path 2

T	5	4	P	0 to 1	H	*	*	;

P0: Usually
P1: At power–on
H **: KCB code (See the following table.)

7) Signal of path 2

T	5	5	P	2, 6	N	1000 to 1255		H	*	*	,	*	*	;

New data Old data

P2: G1000 and above
P6: F1000 and above
N***: DI/DO number
H **: Signal information data (hexadecimal)

8) Alarm of path 2

T	5	6	P	0 to 10	N	*	*	*	*	;

P0: P/S No. 100
P1: P/S No. 000
P2: P/S No. 101
P3: P/S No. 001 to 254
P4: Overtravel alarm
P5: Overheat alarm
P6: Servo alarm
P7: System alarm
P8: APC alarm
P9: Spindle alarm
P10: P/S alarm No. 5000 to 5999
P15: External alarm
N****: Alarm number (for P/S alarm, system alarm, and external alarm only)

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

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

(80H to FFH)

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

* : Command key

1.5.5 Supplements

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

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

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

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

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

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

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

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

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

1.6 HELP FUNCTION

1.6.1 General

The help function displays alarm information, operation method and a table of contents for parameters. This function is used as a handbook. DPL/MDI, DPL/MDI operation package and handy operator's panel can not use the help function.

1.6.2 Display Method

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

- **Display of help screen**

```
HELP (INITIAL MENU)                O1234 N12345

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






EDIT **** *** ***  10:15:28
[ALARM]  [OPERAT]  [PARAM]  [     ]  [     ]
```

- **Help for alarm**

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

```
HELP (INITIAL MENU)                O1234 N12345

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



EDIT **** *** *** ALM 10:15:28
[ALARM]  [OPERAT]  [PARAM] [     ] [ (OPRT) ]
```

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

- **Help for operation**

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

```
HELP (OPERATION METHOD)           O1234 N12345

1. PROGRAM EDIT
2. SEARCH
3. RESET
4. DATA INPUT WITH MDI
5. DATA INPUT WITH TAPE
6. OUTPUT
7. INPUT WITH FANUC CASSETTE
8. OUTPUT WITH FANUC CASSETTE
9. MEMORY CLEAR



EDIT **** *** ***  10:15:28
[ALARM]  [OPRERAT]  [PARAM] [     ]  [(OPRT)]
```

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

Pressing PAGE key 

or 

displays another pages.

```
HELP (OPERATION METHOD)           O1234 N12345
<<1.PROGRAM EDIT>>                     1/4
DELETE ALL PROGRAMS
  MODE :EDIT
  SCREEN:PROGRAM
  OPR  :(0-9999) - (DELETE)

DELETE ONE PROGRAM
  MODE : EDIT
  SCREEN: PROGRAM
  OPR  :(0+PROGRAM NUMBER) - <DELETE>



EDIT *** *** ****  10:15:28
[    ]  [    ]  [    ]  [    ]  [SELECT]
```

← Current page/ Total page

- **Parameter table**

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

```
HELP (PARAMETER TABLE)                 O1234 N12345
                                               1/4
·SETTING                               (NO.0000~ )
·READER/PUNCHER INTERFACE              (NO.0100~ )
·AXIS CONTROL/SETTING UNIT             (NO.1000~ )
·COORDINATE SYSTEM                     (NO.1200~ )
·STROKE LIMIT                          (NO.1300~ )
·FEED RATE                             (NO.1400~ )
·ACCEL/DECELERATION CTRL               (NO.1600~ )
·SERVO RELATED                         (NO.1800~ )
·DI/DO                                 (NO.3000~ )



EDIT **** *** ***  10:15:28
[ ALARM ] [OPERAT][ PARAM ] [       ][SELECT]
```

Current page/ Total page

Another screen can be selected by the PAGE key 

or 

.

1.7 DISPLAYING DIAGNOSTIC PAGE

1.7.1 Displaying Diagnostic Page

- **CRT, PDP, Hand operator's panel, and LCD with touch panel**

(1) Press SYSTEM key.

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

- **DPL/MDI**

(1) Press the DGNOS PARAM key to select the diagnosis screen.

(2) When PMC data is displayed, operate <No.> → Number → <INPUT> in turn.

```
> @0001      0
  @0002      1
```

Following are display methods in the diagnostic screen of PMC data.

1.7.2 Contents Displayed

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

000 WAITING FOR FIN SIGNAL	An auxiliary function is being executed.
001 MOTION	Travel command of cycle operation is being executed.
002 DWELL	DWELL Dwell is being executed.
003 IN–POSITION CHECK	In–position check is being done.
004 FEEDRATE OVERRIDE 0%	Feedrate override is 0%.
005 INTERLOCK/START LOCK	Interlock is input.
006 SPINDLE SPEED ARRIVAL CHECK	Waiting for spindle speed arrival signal.
007 WAITING FOR CHASER OPEN OR CLOSE	The unit is waiting for the chaser tool to be opened or closed.
010 PUNCHING	Data is being output through reader/puncher interface.
011 READING	Data is being input through reader/puncher interface.
013 JOG FEEDRATE OVERRIDE 0%	Jog override is 0%.
014 WAITING FOR RESET, ESP,RRW OFF	Power Mate *i* is in reset state.
015 EXTERNAL PROGRAM NUMBER SEARCH	External Program Number Search External program number search is being done
016 BACKGROUND ACTIVE	Background is being used.
008 DURING WAITING BY WAITING M CODE	The system is in M code–based wait state. (Wait M function)

- **Cause of the 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

Input of emergency stop signal
Input of external reset signal
Reset button On of MDI
Input of reset & rewind
Servo alarm generation
Switching to other mode, Feed hold
Single block stop

- **State of TH alarm**

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

- **Detail of serial pulse coder**

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

OVL: Overload alarm (See DGNOS No. 201)

LV: Insufficient voltage alarm

OVC: Over current alarm

HCA: Abnormal current alarm

HVA: Overvoltage alarm

DCA: Regenerative discharge circuit alarm

FBA: Disconnection alarm (See DGNOS No. 201)

OFA: Overflow alarm

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

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

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

CSA: Hardware of serial pulse coder is abnormal

BLA: APC battery voltage is low (warning)

PHA: Serial pulse coder or feedback cable is erroneous.

RCA: Serial pulse coder is faulty.
Counting of feedback cable is erroneous.

BZA: APC battery voltage became 0.
Replace the battery and set the reference position.

CKA: Serial pulse coder is faulty.
Internal block stopped.

SPH: Serial pulse coder or feedback cable is faulty.
Counting of feedback cable is erroneous.

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

DTE: Communication failure of serial pulse coder.
There is no response for communication.

CRC: Communication failure of serial pulse coder.
Transferred data is erroneous.

STB: Communication failure of serial pulse coder.
Transferred data is erroneous.

PRM: Parameter detected in digital servo is incorrect.

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

OFS: Abnormal current value result of A/D conversion of digital

MCC: Contacts of MCC of servo amplifier is melted.

LDA: Serial pulse coder LED is abnormal

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

DGNOS No. 280 indicates the cause of servo alarm No. 417, detected by the NC. If the alarm is detected by the servo, the PRM bit (bit 4 of DGN No. 0203) is set to 1.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- **Position error amount**

DGN	0300	Position error of an axis in detection unit

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

- **Machine position**

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

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

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

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

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

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

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

DTH: A controlled axis detach signal/parameter was input.

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

AL1: An APC alarm was issued.

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.

AL2: A disconnection was detected.

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.

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

- **FSSB status**

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

Indicates the internal status of the FSSB.

#0(CLS): Closed.

#1(OPP): Running OPEN protocol.

#2(RDY): Open and ready.

#3(OPN): Open.

#4(ERP): Running ERROR protocol.

#5(ERR):

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

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

Indicates the cause of an FSSB error.

#0(ER0): INFORMED ERROR

#1(ER1): (RESERVE)

#2(ER2): Master port disconnection

#3(ER3): External EMG input

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

#4(XE0): (RESERVE)

#5(XE1): Slave port disconnection

#6(XE2): Master port disconnection

#7(XE3): External EMG input

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

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

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

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

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

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

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

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

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

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

Slave units and the associated diagnosis numbers

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

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

DGN	352	Detail number for invalid servo parameter setting alarm

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

- Servo alarm No. 417 has occurred.
- Bit 4 of diagnosis No. 203 (PRM) = 1
- The series and editions of the current servo software are:
  - Series 9090/E(05) and subsequent editions
  - Series 9096/A(01) and subsequent editions
  - Series 90A0/A(01) and subsequent editions
  - Series 90A6/A(01) and subsequent editions
  - Series 90B0/A(01) and subsequent editions

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

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

Detail number	Parameter number	Cause	Measure
0233	2023	A value specified as the number of velocity pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of velocity pulses to within 13100.
0243	2024	A value specified as the number of position pulses is greater than 13100 when initialization bit 0 = 1.	Decrease the value specified as the number of position pulses to within 13100.
0434 0435	2043	The internal value of the velocity loop integration gain has overflowed.	Decrease the value specified in the velocity loop integration gain parameter.
0444 0445	2044	The internal value of the velocity loop proportional gain has overflowed.	Use a function for changing the internal format of the velocity loop proportional gain.
0474 0475	2047	The internal value of the observer parameter (POA1) has overflowed.	Change the setting to: (–1) × (desired setting)/10
0534 0535	2053	The internal value of the dead zone compensation parameter has overflowed.	Decrease the setting until the invalid parameter setting alarm will not occur any longer.
0544 0545	2054	The internal value of the dead zone compensation parameter has overflowed.	Decrease the setting until the invalid parameter setting alarm will not occur any longer.
0686 0687 0688	2068	The internal value of the feedforward coefficient has overflowed.	Use the position gain magnification function.
0694 0695 0696 0699	2069	The interval value of the velocity feedforward coefficient has overflowed.	Decrease the velocity feedforward coefficient.
0754 0755	2075	The setting of the parameter listed at the left has overflowed.	This parameter is presently not in use. Specify 0 in it.
0764 0765	2076	The setting of the parameter listed at the left has overflowed.	This parameter is presently not in use. Specify 0 in it.
0843	2084	No positive value has been set for the flexible feed gear numerator. Alternatively, the following condition exists: Feed gear numerator > denominator	Specify a positive value as the flexible feed gear numerator. Alternatively, satisfy the following condition: Feed gear numerator ≦ denominator (except for phase A–/B–specific stand–alone type detector).
0853	2085	No positive value has been set as the flexible feed gear denominator.	Specify a positive value as the flexible feed gear denominator.

Detail number	Parameter number	Cause	Measure
0884 0885 0886	2088	The internal value of the machine velocity feedback coefficient has overflowed.	Decrease the machine velocity feedback coefficient. Alternatively, use the damping control function, which has an equivalent effect.
0883	2088	A value of 100 or greater was specified in the machine velocity feedback coefficient for an axis with a serial stand–alone type detector.	The maximum allowable value for the machine velocity feedback coefficient for axes with a serial stand–alone type detector is 100. Decrease the setting to within 100.
0926 0927 0928	2092	The interval value of the advance feedforward coefficient has overflowed.	Use the position gain magnification function.
0996	2099	The internal value for suppressing N pulses has overflowed.	Decrease the setting of the parameter listed at the left.
1123	2112	No value has been entered for the AMR conversion coefficient parameter when a linear motor is in use.	Specify the AMR conversion coefficient.
1284 1285	2128	If the value specified as the number of velocity pulses is small, the internal value of the current control parameter overflows.	Decrease the value for the parameter listed at the left to within a range where no alarm will occur any longer.
1294 1295	2129	If the value specified as the number of velocity pulses is large, the internal value of the current control parameter overflows.	Re–set “a” to a smaller value when the setting of the parameter listed at the left is broken up into: $a \times 256 + b$
1393	2139	The setting of the linear motor AMR offset has exceeded ±45.	Decrease the setting of the parameter listed at the left to within ±45.
1446 1447 1448	2144	The cutting feedforward coefficient for the cutting–/rapid traverse–specific FAD function has overflowed.	Use the position gain magnification function.
1454 1455 1456 1459	2145	The cutting velocity feedforward coefficient for the cutting–/rapid traverse–specific FAD function has overflowed.	Decrease the velocity feedforward coefficient.
8213	1821	No positive value has been set in the reference counter capacity parameter.	Specify a positive value in the parameter listed at the left.
8254 8255 8256	1825	The internal value of the position gain has overflowed.	Use the position gain magnification function.
10016 10019	2200 bit 0	The internal value of a parameter used to detect runaway has overflowed.	Do not use the runaway detection function (specify bit 0 = 1).
10043	1815#1 2010#2	A full–closed loop has been set up for a linear motor.	A full–closed loop cannot be specified for linear motors.

Detail number	Parameter number	Cause	Measure
10053	2018#0	The scale reverse connection bit has been set up for a linear motor.	The scale reverse connection bit cannot be used for linear motors.
10062	2209#4	The amplifier in use does not support the HC alarm avoidance function.	If you want to use this amplifier, reset the function bit listed at the left to 0. If you want to use the HC alarm avoidance function, use an amplifier that supports it.

- **Error detection**

DGN	360	Cumulative command pulse count (NC)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

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

DGN	361	Cumulative compensation pulse count (NC)

[Data type] Word axis

[Unit of data] Detection unit

[Valid data range] 32767 to –32767

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

DGN	362	Cumulative command pulse count (SV)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

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

DGN	363	Cumulative feedback pulse count (SV)

[Data type] Two–word axis

[Unit of data] Detection unit

[Valid data range] 99999999 to –99999999

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

• Serial spindle

DGN	#7	#6	#5	#4	#3	#2	#1	#0
0400				SAI		SSR	POS	

This data indicates the offset data received by the CNC while it is calculating the machine coordinates.

SAI 0 : Spindle analog control is not used.
1 : Spindle analog control is used.

SSR 0 : Spindle serial control is not performed.
1 : Spindle serial control is performed.

POS A module required for spindle analog control is
0 : not mounted
1 : mounted

DGN	
0401	Serial spindle alarm state

DGN	#7	#6	#5	#4	#3	#2	#1	#0
0408	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 749. Such problems are mainly caused by noise, disconnection, or instantaneous power–off).

DGN	#7	#6	#5	#4	#3	#2	#1	#0
0409					SPE		S1E	SHE

Refer to this diagnosis when alarm 750 has generated.

SPE In spindle serial control serial spindle parameters
0 : Satisfy start condition of spindle unit
1 : Do not satisfy start condition of spindle unit

S1E 0 : Spindle started normally in spindle serial control.
1 : Spindle did not start normally in spindle serial control.

SHE 0 : Serial communication unit is correct on Power Mate *i* side.
1 : An error occurred in serial communication unit on Power Mate *i* side

DGN	0410	Load meter of spindle [%]
DGN	0411	Speed meter of spindle [%]
DGN	0417	Feedback information of spindle position coder
DGN	0418	Position error of spindle position loop mode

- **Diagnostic data related to rigid tapping**

DGN	450	Spindle position error during rigid tapping

[Data type] Word

[Unit of data] Detection units

DGN	451	Spindle distribution during rigid tapping

[Data type] Word

[Unit of data] Detection units

DGN	454	Accumulated spindle distribution during rigid tapping

[Data type] Two–word

[Unit of data] Detection units

DGN	455	Instantaneous difference for the move command, calculated in terms of the spindle, during rigid tapping (signed, accumulated value)

[Data type] Two–word

[Unit of data] Detection units

DGN	456	Instantaneous difference for the travel error, calculated in terms of the spindle, during rigid tapping (signed)

[Data type] Word

[Unit of data] Detection units

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

[Data type] Word

[Unit of data] Detection units

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

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

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

DGN 540 and 541 indicate values in detection units.

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

0550	Closed loop error

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

0551	Semi–closed loop error

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

0552	Error between semi–closed and closed loops

[Data type] word axis

[Unit of data] Detection units

[Valid data range] –32768 to +32767

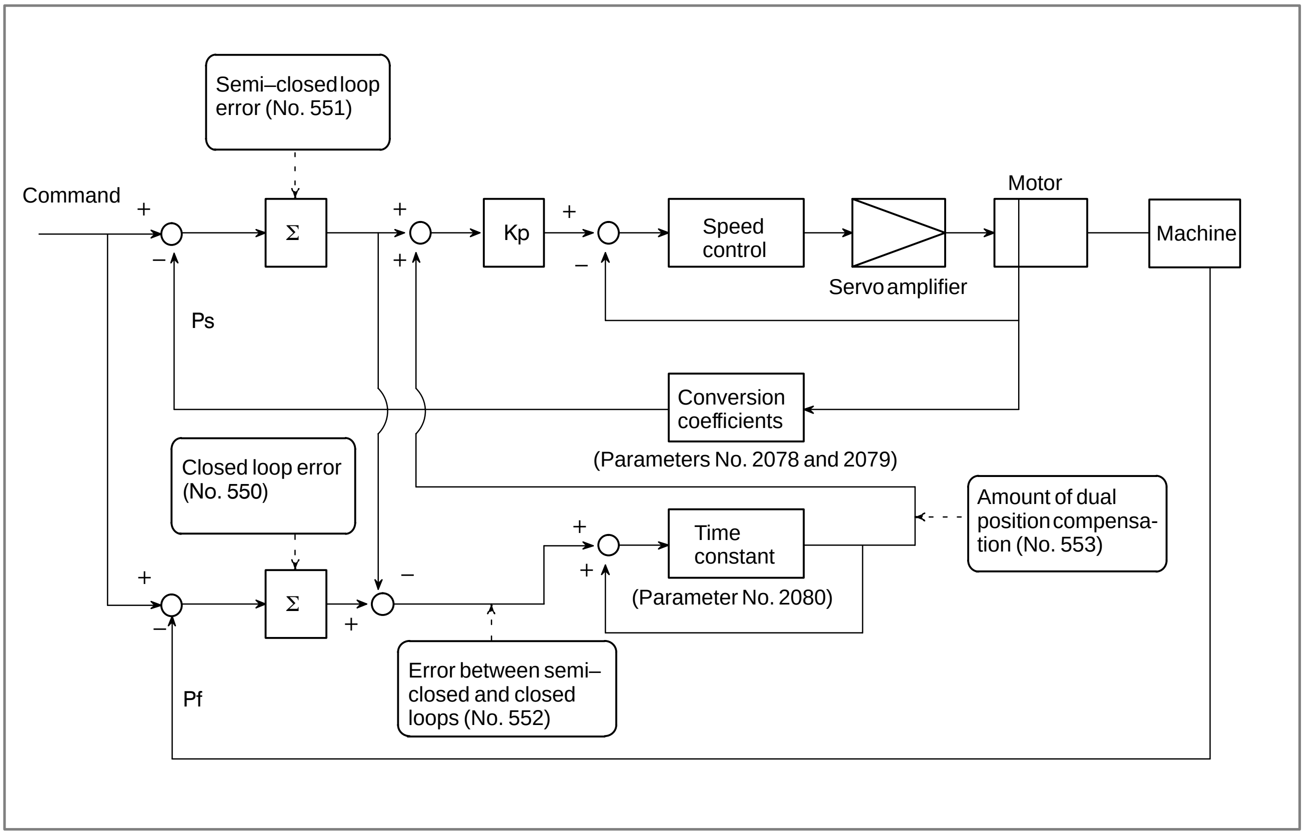
0553	Amount of dual position compensation

[Data type] 2–word axis

[Unit of data] Detection units

[Valid data range] –99999999 to +99999999

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



Display contents (DPL/MDI)

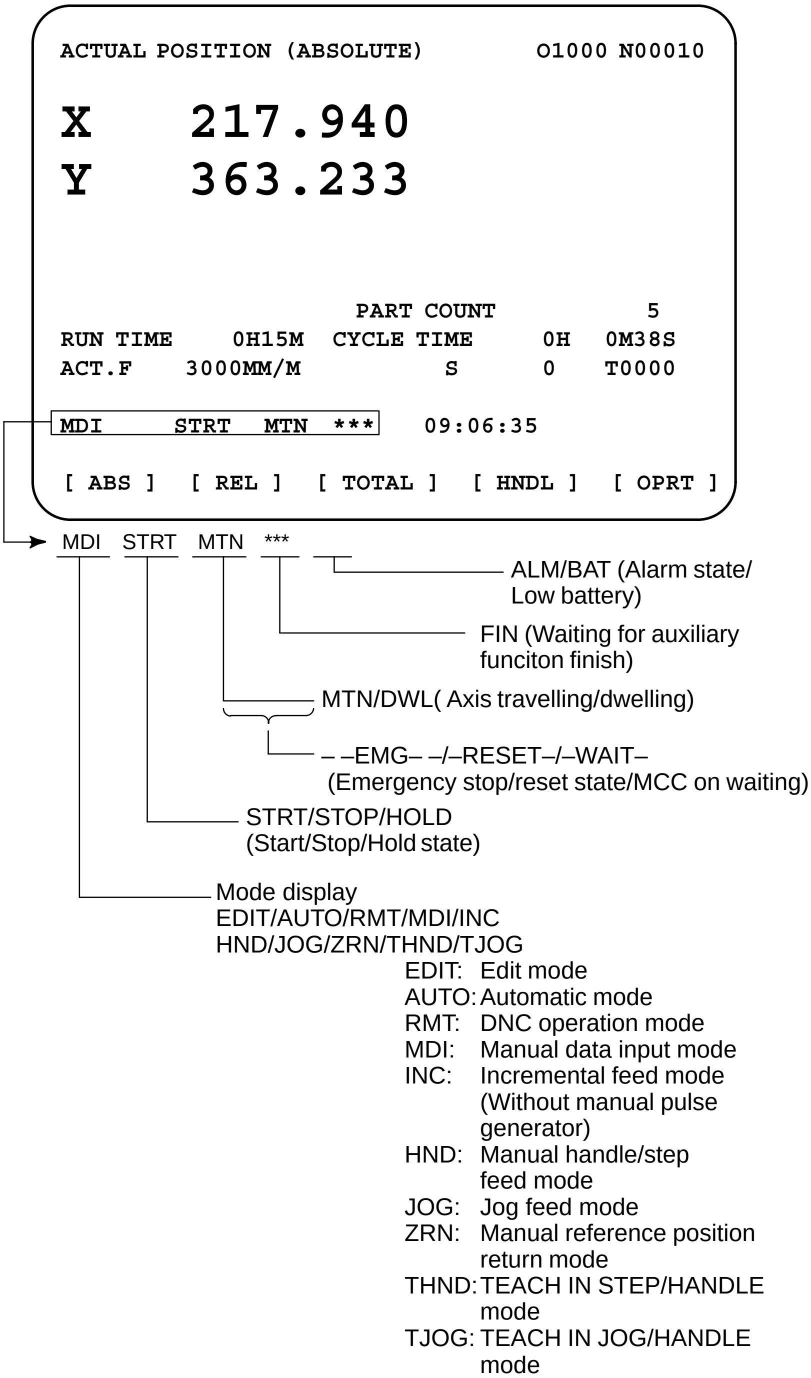
The system configuration screen and the state display etc. are not prepared on the DPL/MDI. Therefor, see the following diagnostic number. The following diagnostic number cannot be displayed on CRT/MDI or Handy operator panel.

The list of diagnostic number added for DPL/MDI.

Diagnostic No.		Unit
800	Relative coordinates	Least input increment
801	Skip position	Least input increment
802	Remaining travel	(Least input increment)/2
803	Acceleration/deceleration accumulation	Least input increment
804	Ending position of previous block	(Least input increment)/2
810	Number of program being executed	
811	Number of sequence being executed	
820	Group 01 G–code	
821	Group 02 G–code	
822	Group 03 G–code	
823	Group 05 G–code	
824	Group 06 G–code	
825	Group 08 G–code	
826	Group 09 G–code	
827	Group 10 G–code	

830	F–code being executed	Unit:	0.001 mm/min or 0.00001 inch/min
	(When no decimal point is entered, units are 1 mm/min or 0.01 inch/min.)		
831	Actual feedrate	Unit:	mm/min, deg/min, or 0.01 inch/min
832	Actual spindle speed	Unit:	rpm
833	Analog input value added compensation	Unit	10mV
840	Number of registered blocks	Unit:	Blocks
841	Amount of memory used by program	Unit:	Characters
850	ROM series No. of NC system (Example) 88F1		
851	ROM version No. of NC system (Example) 01, 02, etc.		
852	Operation mode (Example) AUTO, JOG, STEP, EDIT, etc.		
853	Servo system series No. (Example) 90A0		
854	Servo system version No. (Example) 09, 10, etc.		
855	PMC system series No. (Example) 407B		
855	PMC system version No. (Example) 01, 02, etc.		
857	Ladder program No. (Example) FL01		
858	Ladder program version No. (Example) 01, 02, etc.		

1.8 Power Mate STATE DISPLAY



1.9 LIST OF OPERATIONS (SETTING AND DISPLAY UNIT (CRT, PDP, LCD, HANDY OPERATOR'S PANEL, AND LCD WITH TOUCH PANEL))

Reset

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Resetting the operating time			–	POS	[(OPRT)] [TIME: 0] → [EXEC]
Resetting the number of machined parts			–	POS	[(OPRT)] [TIME: 0] → [EXEC]
Resetting the OT alarm			When the power is on	–	CRT/MDI P and CAN LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then P → [SELECT] → [YES] CAN → [SELECT] → [YES] → [YES]
Resetting alarm 100			–	–	CRT/MDI CAN and RESET LCD with touch panel SPCL → CAN → RESET → ENTER

Data input from the MDI

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Inputting parameters		○	MDI or emergency stop	SYSTEM (PARAM)	Parameter No. → [NO.SRH] → Data → INPUT → PWE = 0 → RESET
Inputting offset data	OFF		–	OFFSET	Offset No. → [NO.SRH] → Offset value → INPUT
Inputting setting data	OFF		MDI	SETTING	Setting No. → [NO.SRH] → Data → INPUT
Inputting PMC parameters (for the counter and data table)	OFF		MDI or emergency stop	SYSTEM (PMC)	[PMCPRM] → [COUNTR] [DATA] → Data → INPUT
Inputting PMC parameters (for the timer and keep relay)		○			[PMCPRM] → [TIMER] [KEEPRL] → Data → INPUT
Tool length compensation			JOG	POS → OFFSET	POS (Display of relative coordinate system) AXIS → [ORIGN] → OFFSET → More the tool measuvment position Offset No. → [NO.SRH] → AXIS → [C INPUT]

File operation from the FANUC Handy File

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Searching a file for its beginning			EDIT	PROG	N → FILE No. → [▷] → [F SRH] → [EXEC]
Deleting a file	OFF		EDIT	PROG	N → FILE No. → [▷] → [F DELETE] → [EXEC]
Verifying a program			EDIT	PROG	Searching a file for its beginning → O → Program No. → [(OPRT)] → [▷] → [READ] → [EXEC]

Registration from FANUC Handy File

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Inputting parameters		○	Emergency stop	SYSTEM (PARAM)	[(OPRT)] → [▷] → [READ] → [EXEC]
Inputting PMC parameters		○	Emergency stop	SYSTEM (PMC)	[▷] → [I/O]→ (CHANNEL NO) 1 INPUT → (DEVICE NAME) [FDCAS] → (KIND OF DATA) [PARAM] → [READ] → (FILE NO) File No INPUT → [EXEC]
Inputting ladder programs		○	Emergency stop	SYSTEM (PMC)	[▷] → [I/O]→ (CHANNEL NO) 1 INPUT → (DEVICE NAME) [FDCAS] → (KIND OF DATA) [LADDER] → [READ] → (FILE NO) File No INPUT → [EXEC]
Inputting offset data	OFF		EDIT	OFFSET	After searching the begining of file [(OPRT)] → [▷] → [READ] → [EXEC]
Registration of programs	OFF		EDIT	PROG	N → FILE No. → INPUT → [▷] → [READ] → [EXEC]
Macro variable data input	OFF		EDIT	PROG	N → FILE No. → INPUT → [▷] → O → Program No. → [READ] → [EXEC]
			AUTO	PROG	START

Output to FANUC Handy File

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Outputting parameters			EDIT	SYSTEM (PARAM)	[(OPRT)] → [▷] → [PUNCH] → [EXEC]
Outputting PMC parameters			EDIT	SYSTEM (PMC)	[▷] → [I/O]→ (CHANNEL NO) 1 INPUT → (DEVICE NAME) [FDCAS] → (KIND OF DATA) [PARAM] → [WRITE] → (FILE NO) – 1 INPUT [EXEC]
Outputting ladder programs			EDIT	SYSTEM (PMC)	[▷] → [I/O]→ (CHANNEL NO) 1 INPUT → (DEVICE NAME) [FDCAS] → (KIND OF DATA) [LADDER] → [WRITE] → (FILE NO) – 1 INPUT [EXEC]
Outputting offset data			EDIT	OFFSET	[(OPRT)] → [▷] → [PUNCH] → [EXEC]
Outputting all the programs			EDIT	PROG	O → –9999 → [▷] → [PUNCH] → [EXEC]
Outputting one program			EDIT	PROG	O → Program No. → [▷] → [PUNCH] → [EXEC]
Macro variable data output			EDIT	OFFSET	[▷] → [MACRO] → [(OPRT)] → [▷] → [PUNCH] → [EXEC]

Input/output to and from PMC offline programer (FAPT LADDER for PC)

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Ladder program input			_	SYSTEM (PMC)	[▷] → [I/O]→ (CANNEL NO) 1 INPUT → (DEVICE NAME) [HOST] → [EXEC]→ HOST side operation Input/output is putmatically identified with operation on host

Search

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Searching for a program number			AUTO or EDIT	PROG	O → Program No. → [O SRH]
Searching for a sequence number			AUTO	PROG	Program No. search → N → Sequence No. → [N SRH]
Searching for an address word			EDIT	PROG	Data to be searched for → [SRH↑] or [SRH ↓]
Searching for an address only			EDIT	PROG	Address to be searched for → [SRH↑] or [SRH ↓]
Searching for an offset number			_	OFFSET	Offset No. → [NO.SRH]
Searching for a diagnosis number			_	SYSTEM (DGNOS)	Diagnosis No. → [NO.SRH]
Searching for a parameter number			_	SYSTEM (PARAM)	Parameter No. → [NO.SRH]

Edit

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Displaying the amount of memory used			EDIT	PROG	[LIBRARY]
Deleting all the programs	OFF		EDIT	PROG	O → –9999 → DELETE
Deleting one program	OFF		EDIT	PROG	O → Program No. → DELETE
Deleting some blocks	OFF		EDIT	PROG	N → Sequence No. → DELETE (Delete the block)
Deleting one block	OFF		EDIT	PROG	EOB DELETE
Deleting a word	OFF		EDIT	PROG	Searching for the word to be deleted → DELETE
Changing a word	OFF		EDIT	PROG	Searching for the word to be changed → New data → ALTER
Inserting a word	OFF		EDIT	PROG	Searching for the word immediately before the word to be inserted → New data → INSERT

Verify

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Verifying the memory	ON		EDIT	PROG	[(OPRT)] → [▷] → [READ] → [EXEC]

Playback

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Inputting NC data			TEACH-IN JOG/HANDLE	PROG	Move the machine. → X , Y or Z → INSERT → NC data → INSERT → EOB INSERT

Clear

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Memory all clear			When the power is on	–	CRT/MDI RESET and DELETE or 7 and 9
					At 2–path control (with Power Mate *i*–D2) Path 1 side : CAN and 1 Psth 2 side : CAN and 2
					LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then RST → [SELECT] → [YES] DEL → [SELECT] → [YES] → [YES] or 7 → [SELECT] → [YES] 9 → [SELECT] → [YES] → [YES]
					At 2–path control (with Power Mate *i*–D2) Path 1 side: CAN → [SELECT] → [YES] 1 → [SELECT] → [YES] → [YES] Path 2 side: CAN → [SELECT] → [YES] 2 → [SELECT] → [YES] → [YES]
Parameters/offset clear		○	When the power is on	–	CRT/MDI RESET
					At 2–path control (with Power Mate *i*–D2) Path 1 side : RESET and 1 Path 2 side : RESET and 2
					LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then RST → [SELECT] → [YES] → [EXIT] → [YES]
					At 2–path control (with Power Mate *i*–D2) Path 1 side: RST → [SELECT] → [YES] 1 → [SELECT] → [YES] → [YES] Path 2 side: RST → [SELECT] → [YES] 2 → [SELECT] → [YES] → [YES]

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Program clear		○	When the power is on	–	CRT/MDI DELETE At 2–path control (with Power Mate *i*–D2) Path 1 side : DELETE and 1 Path 2 side : DELETE and 2 LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then DEL → [SELECT] → [YES] → [EXIT] → [YES] At 2–path control (with Power Mate *i*–D2) Path 1 side: DEL → [SELECT] → [YES] 1 → [SELECT] → [YES] → [YES] Path 2 side: DEL → [SELECT] → [YES] 2 → [SELECT] → [YES] → [YES]
Program under editing when the power is off (PS101)			–	–	CRT/MDI CAN and RESET LCD with touch panel SPCL → CAN → RESET → ENTER
Clearing a ladder program*			When the power is on		CRT/MDI X and O LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then X → [SELECT] → [YES] O → [SELECT] → [YES] → [YES]
PMC nonvolatile memory			When the power is on		CRT/MDI Z and O LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then Z → [SELECT] → [YES] O → [SELECT] → [YES] → [YES]

WARNING

1. After completion of ladder program input, the power must be turned on again because the ladder program is in halt state.
2. This function clears no ladder program in FROM.
3. The operations with the LCD, PDP, detachable LCD/MDI, and handy operator’s panel are the same as listed above. With the handy operator’s panel, however, some functions cannot be used.

Switching of 1–path mode (Power Mate *i*–D) and 2–path mode (Power Mate *i*–D2)

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
From 1–path mode to 2–path mode			When the power is on	–	CRT/MDI Turn on the power while holding down [S] and [2] LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then [S] → [SELECT] → [YES] [1] → [SELECT] → [YES] → [YES]
From 2–path mode to 1–path mode			When the power is on	–	CRT/MDI Turn on the power while holding down [S] and [1] LCD with touch panel Turn on the power while holding down the top–right corner of the screen. Display the IPL screen, then [S] → [SELECT] → [YES] [2] → [SELECT] → [YES] → [YES]

NOTE

1. When this operation is performed, all CNC data including offset values and macro variables stored in the battery–powered memory (SRAM) is cleared. The parameters are reset to the factory–set values. So, the CNC data such as the parameters, offset values, and macro variables needs to be set again.
2. Special parameters can not be cleared in this operation.
3. Path selection operation needs to be performed only once at the time of switching to path control. Path selection operation need not be performed each time the power is turned on.
4. Even if the power is turned on again while the [1] and [S] keys are held down in the 1–path mode, or the power is turned on again while the [2] and [S] keys are held down in the 2–path mode, all SRAM data is cleared.
5. If a memory all–clear operation is performed, the path selection data returns to the 1–path mode selection state.

Switching between the 1–path mode and 2–path mode (Power Mate *i*–D2)

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
From 1–path mode to 2–path mode				–	CRT/MDI Press [H] and [2] simultaneously. LCD with touch panel [SPCL] → [H] → [2] → [ENTER]
From 2–path mode to 1–path mode				–	CRT/MDI Press [H] and [1] simultaneously. LCD with touch panel [SPCL] → [H] → [1] → [ENTER]

1.10 LIST OF OPERATIONS (SETTING AND DISPLAY UNIT (DPL/MDI))

Clear

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
All memory clear			Power ON	–	7 and 9
Parameter/offset clear		○	Power ON	–	PARAM Power Mate *i*–D: 1 path side of dual paths system 1 + PARAM Power Mate *i*–D: 2 path side of dual paths system 2 + PARAM
Program clear		○	Power ON	–	DELETE Power Mate *i*–D: 1 path side of dual paths system 1 + DELETE Power Mate *i*–D: 2 path side of dual paths system 2 + DELETE
Alarm clear			–	–	CAN or Power OFF/ON
Alarm P/S101 due to power–off during editing			–	–	CAN and ALARM
PMC RAM clear			Power ON	–	O and X

Reset

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
OT alarm reset			Power ON	–	P and CAN

Registration from MDI

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Parameter input		○	–	DGNOS / PARAM	PARAM screen → No. → Number → INPUT → Data → INPUT → PWE=0 → CAN
PMC parameter input		SETTING DWE=1	–	DGNOS / PARAM	DGNOS screen → PMC address → Number → INPUT → Data → INPUT
Pitch error compensation data input		○	–	DGNOS / PARAM	Pitch error compensation data input screen → No. → Data Number → INPUT → Data → INPUT
Setting data input			–	VAR	Setting data screen → Cursor movement → Data → INPUT

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Offset data input	○		–	VAR	Offset data screen → [No.] → Data Number → [INPUT] → Data → [INPUT]
Macro variable data input	○		–	VAR	Macro variable screen → [No.] → Data Number → [INPUT] → Data → [INPUT]

Search

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Program number search			EDIT / AUTO	PRGRM	[O] → Program number → [↓]
Sequence number search			AUTO	PRGRM	After program number search; [N] →Sequence number → [↓]
Address word search			EDIT	PRGRM	Word to be searched for → [↓]
Search address only			EDIT	PRGRM	Address to be searched for → [↓]
Parameter search			–	DGNOS / PARAM	PARAM screen → [No.] → Number → [INPUT]
PMC parameter search			–	DGNOS / PARAM	DGNOS screen → [PMC address] → Number → [INPUT]
Pitch error compensation data search			–	DGNOS / PARAM	Pitch error compensation datascreen → [No.] → Data Number → [INPUT]
Offset data search			–	VAR	Offset screen → [No.] → Data Number → [INPUT]
Macro variable data search			–	VAR	Macro variable screen → [No.] → Data Number → [INPUT]
Diagnosis search			–	DGNOS / PARAM	DGNOS screen → [No.] → Number → [INPUT]

Editing

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
All program delete	○		EDIT	PRGRM	[O] → –9999 → [DELETE]
One program delete	○		EDIT	PRGRM	[O] → Program number → [DELETE]
Multiple block delete	○		EDIT	PRGRM	[N] → Sequence number → [DELETE]
One block delete	○		EDIT	PRGRM	[EOB] → [DELETE]
Word delete	○		EDIT	PRGRM	Search for word to be deleted → [DELETE]
Word change	○		EDIT	PRGRM	After searching for word to be changed; New data " → [ALTER]
Word insertion	○		EDIT	PRGRM	After searching for word after which word is to be inserted; New data → [INSERT]

Collation

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Program collation			EDIT	PRGRM	[READ]

Registration from external I/O

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Parameter input		○	EDIT or emergency stop	DGNOS / PARAM	PARAM screen → READ
Program input	○		EDIT	PRGRM	READ
Pitch error compensation data input		○	EDIT	DGNOS / PARAM	Pitch error compensation data Screen → READ
Offset data input	○		EDIT	VAR	Offset data screen → READ
Macro variable data input	○		EDIT	PRGRM	READ → Mode AUTO → Execute the loaded program READ

Output to external I/O

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Parameter output			EDIT	DGNOS / PARAM	PARAM screen → WRITE
All program output			EDIT	PRGRM	O → –9999 → WRITE
One program output			EDIT	PRGRM	O → Program number → WRITE
Pitch error compensation data output			EDIT	DGNOS / PARAM	Pitch error compensation datascreen → WRITE
Offset data output			EDIT	VAR	Offset screen → WRITE
Macro variable data output			EDIT	VAR	Macro variable screen → WRITE

Input/output to and from PMC off–line Programmer (FAPT LADDER for PC)

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Ladder program input/output			–	DGNOS / PARAM	DGNOS screen → READ or WRITE → Operation on host Input/output is automatically Identified with operation on host. (The baud rate is fixed to 9600 bps.)

Input/output to and from FANUC Handy File

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Program registration	○		EDIT	PRGRM	N → File number → READ → READ
All program output			EDIT	PRGRM	O → –9999 → WRITE
One program output			EDIT	PRGRM	O → Program number → WRITE
Search for beginning of file			EDIT	PRGRM	N → File number or –9999 or –9998 → READ
File delete	○		EDIT	PRGRM	N → File number → WRITE
Program collation			EDIT	PRGRM	N → File number → READ → READ

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
PMC parameterLadder program input		○ Only when PMC	Emergency stop	DGNOS / PARAM	DGNOS screen → [No.] → FileNumber → [READ] Data type is automaticallyidentified. (The baud rate is fixed to 4800 bps.)
PMC parameter output			EDIT	DGNOS / PARAM	PMC parameter display → [No.] → File number → [WRITE]
Ladder program output			–	DGNOS / PARAM	DGNOS screen → [No.] RFile number → [WRITE]

Switching of 1–path mode (Power Mate *i*–D) and 2–path mode (Power Mate *i*–D2)

Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Select Single path control system to Dual paths control system			Power ON	–	[S] and [2]
Select Dual paths control system to Single path control system			Power ON	–	[S] and [1]

NOTE

1 When above mentioned operation is done, all CNC data on the SRAM memory back–upped by a battery, such as tool offset data, macro variable and so on, are cleared and the parameters are set the default value at shipping. So all CNC data should be set again.
2 Even when the above mentioned operation is done, the special parameters are not cleared.
3 The operation to select path control system should be done only when required. This operation is not necessary at every power–on.
4 Even if you keep pushing both [2] and [S] keys during turning on power on the condition of 2 paths control system or keep pushing both [1] and [S] keys on the condition of 1 path control system, SRAM data is also all cleared.
5 After the memory all clear operation, the selection data for path control is set to 1–path control system.

Switching between the 1–path mode and 2–path mode (Power Mate *i*–D2)

Classification	Function	KEY SW	SETTING PWE=1	Mode	Function key	Operation
Path Change	2 path side to 1 path side				–	[H] and [2]
	1 path side to 2 path side				–	[H] and [1]

1.11 LIST OF OPERATIONS (Power Mate *i* MAIN UNIT)

The Power Mate *i* requires some items to be set using switches on the main unit of the Power Mate *i*. When no setting/display unit is connected to the Power Mate *i*, simple maintenance operations such as the display of the status of the Power Mate *i* and save and restore operation of files in a batch can be performed just using the main unit.

For details of the setting, display, and maintenance operations using the main unit of the Power Mate *i*, see Appendix F.

The following items must be set on the main unit of the Power Mate *i*:

Item	Outline
Memory all clear	Memory all clear operation using the CRT/MDI cannot clear all the memory area. After mounting and dismounting the memory module or replacing it, perform all clear operation by using the main unit of the Power Mate *i*.
Startup with HSSB board connected	Even when the HSSB board is connected, you may start the Power Mate *i* independently of the personal computer or PANEL *i*. In such a case, make this setting on the main unit of the Power Mate *i*. (Usually, the Power Mate starts after the personal computer or PANEL *i* starts.)
Connection of handy operator's panel	When connecting the handy operator's panel, make this setting using the main unit of the Power Mate *i*. (The CRT/MDI and handy operator's panel use the same connector but use different baud rates.)
Connection of DPL/MDI operation package (boot operation)	When the system cannot start normally, make this setting to perform boot operation using the DPL/MDI operation package.
Setting of device number for the CRT sharing function	Set a device number for the CRT sharing function by using the main unit of the Power Mate *i*.

The following maintenance operations can be performed using the main unit of the Power Mate *i*:

Item	Outline
Save/restoration of SRAM data in/from built–in FROM	When a PC board is replaced without replacing fuses or dismounting/mounting the memory module, SRAM data is copied.
Save/restoration in/from a memory card in a batch	SRAM data, ladder programs, C executor user programs, and macro executor user programs are saved in and restored from a memory card in a batch.
Switching between DPL/MDI operation package and FAPT LADDER II	In maintenance using a notebook PC, switching between the DPL/MDI operation package and FAPT LADDER II is performed.

1.12 WARNING SCREEN DISPLAYED WHEN AN OPTION IS CHANGED

- **Warning screen**

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

```
   WARNING

YOU SET THE PARAMETER NO.□□□□#□

THE FOLLOWING DATA WILL BE CLEARED.

* PART PROGRAM MEMORY

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

NOTE
1 Mark* varies with the parameter settings. Two or more function names may be displayed.
2 This warning is not issued for a combination of the DPL/MDI and its operation package.

- **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 you have replaced the memory module because of an insufficient SRAM area, first clear the SRAM area, and input data again.

RESET + DELETE

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

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

```
                88E0-01

        SYSTEM LABEL CHECK ERROR:
        CLEAR ALL SRAM MODULE

NOT READY
```

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.

NOTE
1 The system software is stored in the FROM on the memory module.
2 This screen is unavailable with a combination of the DPL/MDI and its operation package.

1.14 MAINTENANCE INFORMATION SCREEN

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

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

This function cannot be used with a combination of the DPL/MDI and its operation package.

1.14.1 Screen Display and Operation

- **Screen display**

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

When selected, the maintenance screen shows the latest information.

The recording screen has an input area of 40 characters by 11 lines.

The status (mode, number of empty character spaces, cursor line, column number) is displayed at the bottom of the screen.

```
            40 characters
MAINTENANCE INFORM
aaa
bbb
ccc
ddd
eee          (11 lines)
fff
...


nnn
|OVER|EDIT|spaces:2078    33:1
```

Status display

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

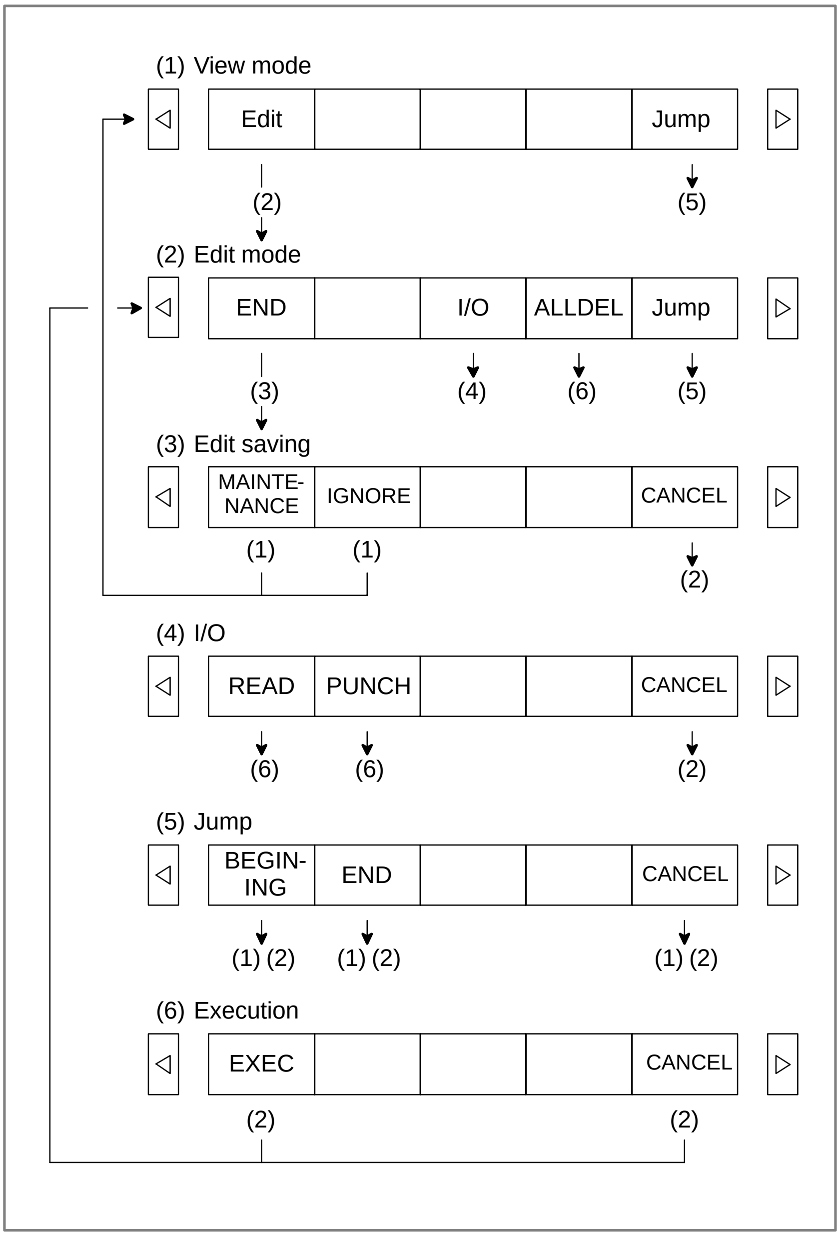
- **Screen operation**

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

Operation table

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

Operation of the soft keys



1.14.2 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.

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

(3) Punching

All maintenance information is output in the format shown above.

1.14.3 Factory–set Maintenance Information

In the Power Mate *i*, the following maintenance information is factory–set in the FROM.

- Customer name
- Basic unit specification
- Serial number
- Contract number
- Test date
- Manufacturing month
- Base PCB specification and version
- Option board specification and version
- Software specification and version
- Backpanel, card, and module specifications
- Ordering information

Example of stored maintenance information

```
***** TOP OF DATA SHEET *****
CUSTOMER      :                         ← Customer name
MODEL NO.     :A02B–0259–B501           ← Basic unit specification
SERIAL NO.    :E98106944                ← Contract number
DATE OF TEST  :1998–01–24               ← Test date
DATE OF MANUFACTURE:1998–01             ← Manufacturing month
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
EDITION OF PRINTED BOARD & ROM
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      NAME                  EDIT
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A16B–3200–0260              01A         ← Base PCB specification
                                          and version
A20B–8001–0730              02B         ← Option board specification
                                          and version
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A02B–0259–H500#881I         01          ← Software specification
                                          and version
A02B–0259–H521#88F0         01
A02B–0259–H580#407B         01
A02B–0259–H590#9090         09
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
LIST OF CARD, DIMM & BACK BOARD ← Back panel, card, and
                                  module specifications
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A20B–2002–0680
A20B–8001–0730
A16B–3200–0260
A20B–3900–0080
A20B–3300–0071
A20B–3900–0042
A20B–3300–0130
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  SPECIFICATION             :ORDER      ← Ordering information
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A02B–0259–B501              :1
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A02B–0122–J101              :1
A02B–0259–C191              :1
A02B–0259–H002              :1
A02B–0259–H014              :1
A02B–0259–H032              :1
A02B–0259–H062              :1
A02B–0259–J010              :1
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A02B–0259–H521#88F0         :1
A02B–0259–H580#407B         :1
A02B–0259–H590#9090         :1
A02B–0259–J581#407B         :1
A02B–0259–J812              :1
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
A02B–0032–B075#0008         :2
A06B–0034–B075#0008         :1
A06B–6050–K060              :1
   .
   .
   .
```

1.15 POWER MATE CNC MANAGER

If the β servo amplifier is connected to Power Mate *i*, it is possible to display and set up the data related to the slave function on the Power Mate *i* side, using the Power Mate CNC manager.
The power motion manager enables the following display and setting:
(In this case, the Power Mate *i* must be equipped with the CRT/MDI. A combination of the DPL/MDI and its operation package does not support this display and setting.)

(1) Current position display (absolute/machine coordinates)

(2) Parameter display and setting

(3) Diagnosis display

(4) System configuration screen display

(5) Alarm display

1.15.1 Parameter

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

[Data type] Bit

SLV When the Power Mate CNC manager is selected, the screen shows the data of:

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

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

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

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

PMN The Power Mate CNC manager function is:

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

1.15.2 Screen Display

1. Press the SYSTEM function key.

2. Press the continuous menu key several times. The [PMM] soft key appears.

3. Press the [PMM] soft key. The system configuration screen, which is the initial screen of the Power Mate CNC manager, appears. The screen has the following soft keys (function selection soft keys).

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

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

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

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

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

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

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

- **System configuration screen**

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

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

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

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

```
POWER MATE CNC MANAGER
SYSTEM CONFIGURATION
1.GROUP0 / β

SYSTEM  <SERIES/VERSION>           88A1 01










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

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

- **Parameter screen**

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

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

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

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

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


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

The screen displays just the bit and decimal data. For details of the parameters, refer to the parameter manual of the corresponding slave.

- Searching for a parameter

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

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

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

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

- Setting a parameter

A parameter of a slave can be directly set from the Power Mate *i*.

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

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

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

- **Diagnosis screen**

This screen shows the current status of the slave.

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

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

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

   For details of the diagnosis information, refer to the maintenance manual of the corresponding slave.

- **Current position display**

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

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

```
[ WORK  ] [       ] [MACHIN] [       ] [ (OPRT) ]
```

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

```
POWER MATE CNC MANAGER
ACTUAL POSITION (MACHINE)
1.GROUP0 / β

        1      1267900

        F         3500

[ WORK  ] [       ] [ MACHIN ] [       ] [       ]
```

1: Coordinate F: Actual speed

- **Alarm screen**

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

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

```
POWER MATE CNC MANAGER
ALARM
1.GROUP0 / β

    442     210     232

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

Up to forty codes can be displayed on the screen.

For details of the alarm, refer to the maintenance manual of the corresponding slave.

- **Operating the active slave**

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

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

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

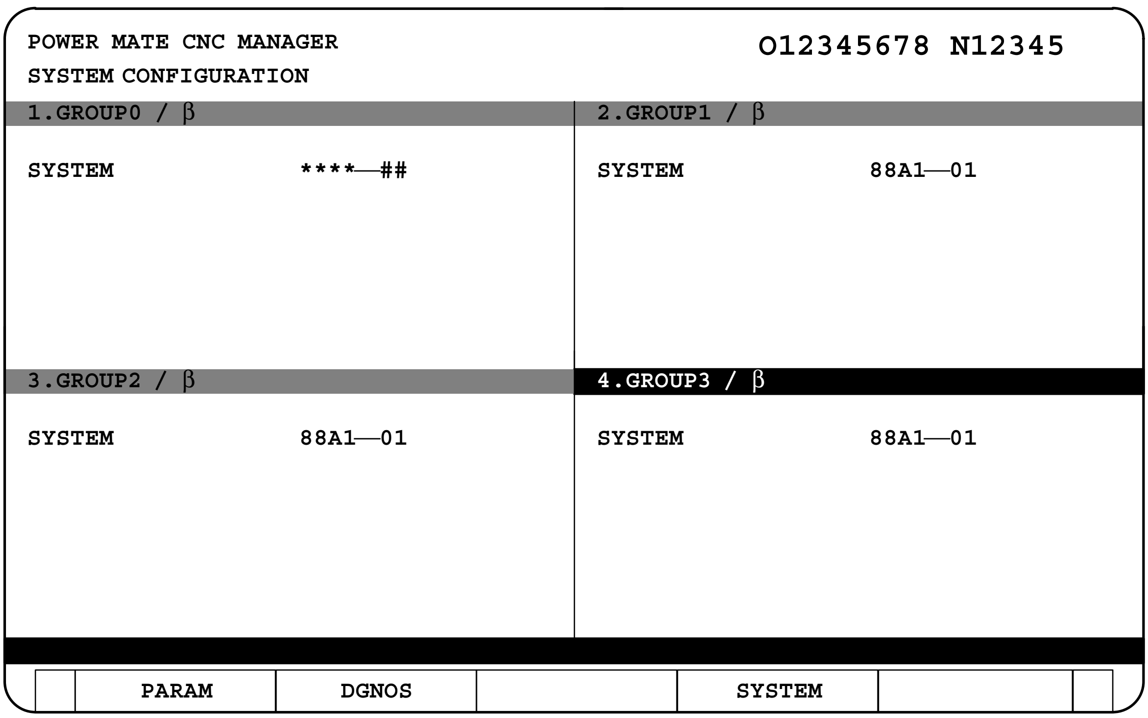
[↑BACK]: Displays the screen of the Power Motion unit connected before the currently active slave.

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

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

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

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



```
POWER MATE CNC MANAGER        O12345678 N12345
SYSTEM CONFIGURATION
1.GROUP0 / β

SYSTEM <SERIES/VERSION>            88A1––01







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

- **Guidance message**

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

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

```
[ WORK  ] [       ] [MACHIN ] [       ] [       ]
```

```
[ PARAM ] [ DGNOS ] [       ] [SYSTEM] [(OPRT) ]
```

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

```
[ ↓NEXT ] [ ↑BACK ] [ ZOOM  ] [       ] [       ]
```

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

- **Key–in field**

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

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

1.15.3 Parameter Input/Output

- **Saving parameters**

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

Example: When parameter 8760 is set to 8000

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

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

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

Specify a desired input device in the bits 1 (MD1) and 2 (MD2) of parameter No. 960. Connect a memory card. Alternatively, check the free area of built–in SRAM. Then, follow the steps given below:

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

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

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

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

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

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

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

● Writing parameters

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

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

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

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

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

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

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

5. Press the [EXEC] soft key.

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

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

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

1.15.4 Notes

- **Connecting an I/O Link**

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

The module name is OC02I (16–byte input) or OC02O (16–byte output). BASE is always 0, and SLOT is always 1.

- **Ignoring the Power Mate CNC manager function**

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

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

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

COMMUNICATION PROHIBITED BY P960#3

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

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

- **Alarm**

(1) Power Mate *i*

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

(2) Slave

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

Display the alarm screen to check the details.

- **Data protection key**

When the data protection key of the Power Mate *i* is turned on, parameters cannot be input to built–in SRAM of Power Mate *i*.

1.16 PERIODIC MAINTENANCE SCREENS

Using the periodic maintenance screens makes it easy to manage consumables (such as LCD unit backlight and backup battery) that are to be replaced periodically.

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.

This function cannot be used with a combination of the DPL/MDI and its operation package.

1.16.1 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) Machine system menu screen: Enables registering the names of consumables used in the machine.

(4) NC system menu screen: Displays the names of registered consumables used in the NC.

- **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.
Once they are specified, the remaining service time can be checked on the status screen.

1.16.2 Screen Display and Setting

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].

1.16.3 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.

```
PERIODICAL MAINTENANCE              O0001 N12345
   (STATUS)
       ITEM NAME                          REMAIN
  *01  BATTERY FOR CONTROLLER                 0H
  @02  BATTERY FOR PULSECODER              5000H
   03  FAN MOTOR                      10000H
  @04  LCD BACK LIGHT                       720H
   05
   06
   07
   08
   09
   10
>_
EDIT *** ***** *** ****      19:27:05
[      ][ MAINTE ][       ][       ][ (OPRT) ]
```

```
[CHANGE][ ENTRY ][ CLEAR ][ +INPUT ][ INPUT ]
```

```
[       ][       ][       ][  CAN  ][  EXEC  ]
```

(1) Item name

The name of an item to be subjected to periodic maintenance is specified under “Item name.”

Two methods can be used to specify item names. The first method uses the menu screen, and the second, the MDI keypad.

(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]. The status screen appears again, enabling the selected item to be set up.

4 Press soft key [CAN]. The previous soft key displays appear again.

5 Press soft key [MAINTE]. The status screen appears again.

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
An item name can be registered on the machine system menu screen by first entering it in the following format, then pressing soft key [INPUT] (or INPUT function 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. (See Section 1.19.6.)
When entering a two–byte character, 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
1 "*" cannot be used in item names, because it is used as control code. "[", "]", "(", or ")" also cannot be used in item names.
2 When both alphanumeric and two–byte characters are used in an item name to be registered, the warning message "DATA IS OUT OF RANGE" may appear even if the maximum allowable number of characters has not been exceeded.
3 If a blank item name is selected from the machine system screen, the warning message "EDIT REJECTED" appears. If a blank item name is selected from the NC system screen, a blank is set up.

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

```
PERIODICAL MAINTENANCE              O0001 N12345
   (MACHINE)
       ITEM NAME
  01
  02
  03
  04
  05
  06
  07
  08
  09
  10
>_
EDIT *** ***** *** ****    19:27:05
[      ][ STATUS ][ MACHIN ][  NC  ][ (OPRT) ]
```

```
[ SELECT ][      ][ CLEAR ][ +INPUT ][ INPUT ]
```

```
[      ][      ][      ][  CAN  ][ EXEC  ]
```

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

```
[      ][      ][      ][  CAN  ][ EXEC  ]
```

[NC system] menu screen

```
PERIODICAL MAINTENANCE              O0001 N12345
   (NC)
        ITEM NAME
  01  BATTERY FOR CONTROLLER
  02  BATTERY FOR PULSECODER
  03  FAN MOTOR
  04  LCD BACK LIGHT
  05
  06
  07
  08
  09
  10
>_
EDIT *** ***** *** ****     19:27:05
[      ][ STATUS ][ MACHIN ][  NC  ][ (OPRT) ]
```

```
[ SELECT ][        ][        ][        ][        ]
```

```
[        ][        ][        ][  CAN  ][  EXEC  ]
```

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. (See Section 1.16.6.)
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

1 “*” cannot be used in item names, because it is used as control code. “[”, “]”, “(“, or “)” also cannot be used in item names.

2 When both alphanumeric and two–byte characters are used in an item name to be registered, the warning message “DATA IS OUT OF RANGE” may appear even if the maximum allowable number of characters has not been exceeded.

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 parameter No. 8911) of the service life or lower, it is displayed in green (for a color LCD with touch panel).

Count–down continues even after the service life has expired.

NOTE

Setting is impossible on the status screen.
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.

1.16.4 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.

```
PERIODICAL MAINTENANCE               O0001 N12345
   (SETTING)
        LIFE          REMAIN       COUNT TYPE
 *01   10000H             0H        ALL TIME
 @02   20000H          5000H        LIV TIME
  03   32767H         10000H        --------
 @04    1500H           720H        RUN TIME
  05
  06
  07
  08
  09
  10
>_
EDIT *** ***** *** ****     19:27:05
[ CHANGE ][ TYPE ][ CLEAR ][ +INPUT ][ INPUT ]
```

```
[ EFFECT ][  ALL  ][  LIV  ][  RUN  ][  CUT  ]
```

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

(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 using numeric keys, then press soft key [INPUT] (or the INPUT key). The specified service life is set up, and the same value is set up also under "Remaining service time."
In addition, the count type for the item changes to: "———"
Pressing soft key [+INPUT] adds the newly specified service life value to the previously specified life value. The added service life value is reflected to the remaining service time.
The valid data range for the service life is: 0 to 65535 (hours)

NOTE
1 An attempt to set up the service life for a non–registered item results in the warning message "EDIT REJECTED".
2 An attempt to enter a value that is out of the valid data range results in the warning message "DATA IS OUT OF RANGE".
3 An attempt to enter a value that would make the service life or remaining service time 0 or lower, it is clamped at 0.
4 Pressing soft keys [CLEAR] and [TYPE] results in the warning message "EDIT REJECTED".

(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 parameter No. 8911) of the service life or lower, it is displayed in green (for a color LCD with touch panel).

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 using numeric keys, then press soft key [INPUT] (or the INPUT key).

Pressing soft key [+INPUT] adds the newly specified remaining service time to the previously specified remaining service time.

The valid data range for the remaining service time is: 0 to (service life)

After soft key [CLEAR] is pressed, pressing soft key [EXEC] sets the remaining service time with the same value as for the service life.

NOTE

1 An attempt to set up the remaining service time for a non–registered item or an item for which the service life has not been set up results in the warning message "EDIT REJECTED".

2 An attempt to enter a value that is out of the valid data range results in the warning message "DATA IS OUT OF RANGE".

3 An attempt to enter a value that would make the remaining service time 0 or lower, it is clamped at 0.

4. Pressing soft key [TYPE] results in the warning message "EDIT REJECTED".

(3) Count type

The type of a selected count method is specified under "Count type."

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

NOTE
1 An attempt to set up the count type for a non–registered item or an item for which the service life has not been set up results in the warning message “EDIT REJECTED”.
2 Soft keys [INPUT] and [+INPUT] are ignored.
3 In leap years, an error of 24 hours occurs in the all–time count.
4 Pressing soft key [CLEAR] results in the warning message “EDIT REJECTED”.

1.16.5 Registered Data Input/Output

Pressing soft key [PUNCH] enables registered data to be output to an external unit.
Pressing soft key [READ] enables data to be input from an external unit.
These operations can be done on the status, setting, and machine system menu screens.

```
EDIT *** ***** *** ****     19:27:05
[      ][  READ  ][ PUNCH ][      ][      ]

          ↓          ↓

[      ][        ][       ][  CAN  ][ EXEC  ]
```

● **Data output**

After the EDIT mode is selected, pressing soft key [PUNCH] outputs the registered data in the following format.

Format

❑ Format for output from the status and setting screens

```
G10 L60 P01 Aa Rr [n] Qq ;
G10 L60 P02 Aa Rr [n] Qq ;
G10 L60 P03 Aa Rr [n] Qq ;
   :
```

Format

❑ Format for output from the machine system menu

```
G10 L61 P01 [n]  ;
G10 L61 P02 [n]  ;
G10 L61 P03 [n]  ;
   :
```

a : Service life
r : Remaining service time
n : Item name
[Alphanumeric characters*two–byte characters * alphanumeric characters
q : count type
0 = not to count
1 = count at all times
2 = count during power–on time
3 = count during operation
4 = count during cutting

- **Data input**

After the EDIT mode is selected, pressing soft key [READ] causes data to be registered with item names according to the format in which the data is input (G10).
Data registration can be done even by executing the format (G10) once input to the program memory.

> **NOTE**
> If the input format (G10) differs from the output format, registration may fail.

Parameter

8911	Percentage to the service life of each item displayed on the periodic maintenance screen

[Data type] Byte

[Unit of data] 1%

[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 green for warning purposes (for a color LCD with touch panel).

1.16.6 FANUC Two–Byte Character Code Table

	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
0200	ぁ	あ	ぃ	い	ぅ	う	ぇ	え	ぉ	お	か	が	き	ぎ	く	ぐ
0220	け	げ	こ	ご	さ	ざ	し	じ	す	ず	せ	ぜ	そ	ぞ	た	だ
0240	ち	ぢ	っ	つ	づ	て	で	と	ど	な	に	ぬ	ね	の	は	ば
0260	ぱ	ひ	び	ぴ	ふ	ぶ	ぷ	へ	べ	ぺ	ほ	ぼ	ぽ	ま	み	む
0280	め	も	ゃ	や	ゅ	ゆ	ょ	よ	ら	り	る	れ	ろ	ゎ	わ	素
02A0	材	を	ん	種	類	棒	穴	成	形	質	寸	法	外	径	長	端
02C0	面	最	小	内	大	加	工	切	削	倣	正	途	中	荒	具	番
02E0	号	仕	上	込	点	方	向	速	度	送	量	開	始	深	主	軸
0300	回	転	数	位	置	決	直	線	時	円	反	現	在	指	令	値
0320	領	域	診	断	操	作	手	引	機	械	残	移	動	次	早	電
0340	源	投	入	間	分	秒	自	運	負	荷	実	使	用	寿	命	新
0360	規	除	隅	取	単	補	能	独	終	了	記	角	溝	刃	幅	広
0380	設	定	一	覧	表	部	炭	合	金	鋼	超	硬	先	付	摩	耗
03A0	仮	想	副	行	挿	消	去	山	高	準	備	完	後	弧	助	択
03C0	無	視	器	原	登	録	再	処	理	描	画	過	容	編	集	未
03E0	対	相	座	標	示	名	歯	変	呼	推	馬	力	系	選	達	閉

	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
0400	禁	復	帰	書	個	桁	稼	由	両	半	逃	底	逆	下	空	四
0420	触	平	代	辺	格	子	周	心	本	群	停	止	巾	微	状	路
0440	範	囲	倍	率	注	側	特	殊	距	離	連	続	増	隔	件	初
0460	期	条	経	握	圧	扱	陰	隠	右	押	横	黄	億	屋	化	何
0480	絵	階	概	該	巻	換	気	起	軌	技	疑	供	共	境	強	教
04A0	掘	繰	係	傾	型	検	権	研	肩	見	験	元	弦	減	孔	巧
04C0	控	更	校	構	根	左	差	雑	参	散	産	算	治	耳	式	失
04E0	修	十	従	勝	商	少	尚	昇	植	色	食	伸	信	侵	振	浸
0500	真	暗	以	意	異	影	鋭	越	価	可	科	果	箇	課	各	拡
0520	核	学	掛	漢	簡	観	関	含	却	客	休	急	業	曲	均	筋
0540	継	計	軽	言	限	互	降	採	済	細	姿	思	写	射	斜	者
0560	車	借	縦	重	出	述	術	渉	照	省	章	証	象	身	進	人
0580	図	違	印	沿	遠	央	奥	往	応	会	解	改	割	活	願	基
05A0	奇	寄	岐	既	近	区	矩	駆	偶	旧	求	球	究	級	欠	結
05C0	口	語	誤	交	厚	項	刻	告	黒	財	策	糸	試	資	事	持
05E0	似	釈	弱	受	収	純	順	所	序	剰	場	常	飾	水	錐	据
0600	制	整	製	前	全	然	則	属	即	他	多	存	谷	探	短	徴
0620	鎖	調	頂	鉄	添	頭	同	導	道	熱	年	濃	箱	発	抜	伴
0640	必	百	複	物	文	間	併	忘	末	密	有	余	与	裏	立	略
0660	青	席	石	積	赤	接	折	粗	創	双	捜	太	打	体	待	態
0680	替	段	知	地	致	遅	追	通	伝	得	読	凸	凹	突	鈍	敗
06A0	杯	背	配	品	不	布	並	頁	別	片	返	勉	弁	保	明	滅
06C0	木	目	歪	揺	様	溶	要	抑	良	輪	和	話	枠	節	説	絶
06E0	千	専	浅	旋	総	走	退	台	第	題	卓	室	着	柱	鋳	丁
0700	低	訂	肉	日	白	薄	比	皮	被	非	美	普	伏	歩	包	門
0720	問	絡	列	万	利	訳	礼	乱	放	枚	約	練	油	劣	例	郭
0740	戻	冷	垂	緑	紫	許	測	精	効	→	↗	↑	↖	←	↙	↓
0760	↘	↻	↺	⌒	◯	■	板	予	〃	家	装	管	粉	等	▿	▿▿
0780	▿▿▿	▿▿▿▿	貫	安	α	β	程	抗	張	任	破	損	御	足	守	般
07A0	納	義	丸	汎	固	毎	当	的	詳	鳥	適	論	額	縁	温	給
07C0	界	混	監	締	護	己	称	樹	脂	料	落	確	認	報	排	性
07E0	生	績	判	搬	砥	θ	島	壁	[illegible]	[illegible]	[illegible]	[illegible]	📖	//	)(	■■

	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
0800	阿	哀	愛	挨	逢	悪	旭	宛	案	闇	鞍	伊	依	偉	委	威
0820	尉	易	為	維	緯	胃	衣	遺	医	井	育	一	稲	員	因	飲
0840	院	羽	雨	渦	唄	浦	瓜	噂	雲	営	映	栄	永	泳	洩	英
0860	衛	液	益	駅	園	延	援	演	炎	煙	鉛	塩	汚	王	岡	沖
0880	憶	臆	牡	乙	恩	穏	音	佳	夏	暇	架	歌	河	火	花	華
08A0	菓	貨	我	牙	芽	賀	雅	介	壊	廻	快	怪	海	灰	皆	貝
08C0	劾	害	慨	街	垣	殻	獲	覚	較	革	楽	笠	括	滑	株	刈
08E0	乾	寒	刊	勧	喚	官	寛	干	幹	感	慣	敢	歓	汗	環	甘
0900	看	緩	缶	肝	還	鑑	閑	陥	韓	館	岸	眼	岩	顔	企	危
0920	喜	希	幾	揮	机	旗	棄	毅	祈	季	稀	徽	輝	騎	擬	犠
0940	議	菊	詰	脚	丘	久	及	吸	宮	弓	救	泣	牛	居	巨	拒
0960	挙	虚	魚	亨	享	京	競	協	叫	挟	橋	況	狭	胸	興	郷
0980	鏡	響	驚	凝	局	極	玉	勤	錦	琴	銀	九	句	苦	馳	屑
09A0	屈	熊	君	訓	軍	郡	刑	兄	契	掲	敬	景	茎	警	芸	迎
09C0	劇	激	隙	潔	血	月	倹	健	兼	券	剣	圏	堅	建	憲	拳
09E0	犬	献	絹	県	謙	軒	鍵	険	幻	古	庫	戸	故	湖	狐	誇
0A00	顧	五	午	侯	候	光	公	勾	喉	好	孝	幸	康	弘	拘	攻
0A20	江	港	甲	稿	絞	綱	考	肯	衡	講	購	郊	鉱	香	剛	克
0A40	国	穀	酷	腰	骨	此	頃	今	困	婚	査	砂	債	妻	彩	才
0A60	災	砕	祭	菜	裁	載	際	剤	罪	坂	阪	咲	昨	索	錯	桜
0A80	冊	刷	察	撮	擦	札	殺	皿	三	撒	讃	賛	酸	伺	刺	史
0AA0	士	姉	市	師	支	枝	死	私	紙	詞	詩	字	寺	磁	辞	七
0AC0	湿	芝	縞	捨	煮	社	謝	尺	若	酒	首	授	需	秋	習	臭
0AE0	舟	週	住	柔	宿	祝	縮	熟	春	瞬	盾	巡	暑	女	傷	唱
0B00	奨	将	床	承	招	昭	焼	焦	笑	紹	衝	賞	障	乗	城	情
0B20	浄	蒸	錠	職	唇	寝	審	森	申	神	芯	親	辛	針	震	尽
0B40	陣	須	酢	吹	粋	遂	杉	裾	澄	世	是	勢	征	政	星	晴
0B60	清	盛	聖	声	西	誓	請	静	税	昔	析	籍	責	跡	雪	舌
0B80	占	宣	尖	川	戦	扇	栓	泉	洗	染	潜	船	銑	鮮	善	組
0BA0	訴	倉	層	掃	巣	争	窓	草	騒	像	臓	蔵	贈	造	促	息
0BC0	束	俗	卒	其	揃	尊	村	詑	堕	妥	耐	帯	怠	滞	袋	貸
0BE0	隊	滝	宅	拓	濯	託	濁	奪	脱	棚	誰	嘆	担	淡	団	弾

	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
0C00	暖	男	談	池	築	畜	竹	筑	秩	茶	昼	虫	駐	貯	帳	庁
0C20	彫	挑	朝	町	脹	腸	跳	沈	珍	賃	墜	痛	塚	爪	吊	釣
0C40	庭	廷	提	釘	泥	摘	滴	笛	典	天	展	店	貼	殿	田	吐
0C60	塗	徒	都	砥	努	土	怒	倒	冬	凍	刀	島	東	湯	灯	答
0C80	筒	統	到	藤	討	踏	透	働	堂	胴	銅	峠	徳	毒	届	曇
0CA0	謎	鍋	縄	南	軟	難	二	匂	乳	尿	念	燃	粘	悩	脳	農
0CC0	把	波	派	廃	拝	肺	買	売	博	拍	泊	船	麦	肌	畑	八
0CE0	罰	版	犯	班	繁	販	飯	盤	否	彼	悲	扉	批	疲	秘	肥
0D00	費	避	飛	尾	鼻	菱	筆	俵	氷	票	評	病	浜	貧	敏	夫
0D20	婦	富	怖	浮	父	符	腐	武	舞	封	風	服	福	腹	払	沸
0D40	噴	憤	奮	紛	丙	兵	幣	柄	米	壁	癖	偏	便	捕	募	墓
0D60	母	簿	宝	崩	捧	泡	胞	芳	訪	豊	飽	亡	傍	剖	妨	帽
0D80	忙	房	暴	望	紡	肪	膨	防	北	僕	撲	釦	没	翻	磨	魔
0DA0	幕	膜	迄	満	味	魅	脈	妙	民	務	夢	矛	迷	鳴	免	綿
0DC0	模	茂	毛	盲	網	黙	紋	冶	夜	野	矢	役	薬	躍	諭	輸
0DE0	優	友	遊	郵	融	誉	預	幼	揚	曜	洋	葉	陽	養	浴	翼
0E00	螺	来	頼	欄	陸	律	流	留	粒	旅	療	稜	林	臨	隣	涙
0E20	累	励	鈴	暦	歴	烈	裂	労	漏	老	六	脇	惑	詫	湾	腕
0E40	斡	椅	萎	宇	嘘	閲	宴	欧	懐	拐	涯	穫	闇	潟	渇	冠
0E60	患	汽	貴	鬼	偽	戯	欺	喫	窮	糾	拠	漁	恐	狂	脅	仰
0E80	緊	愚	遇	靴	啓	慶	憩	携	撃	傑	嫌	懸	厳	雇	娯	洪
0EA0	紅	耕	航	貢	挫	催	栽	崎	柵	拶	傘	志	施	旨	至	誌
0EC0	識	狩	趣	就	秀	衆	襲	蹴	充	渋	緒	署	諸	叙	掌	訟
0EE0	鐘	壌	織	紳	酔	瀬	誠	繊	漸	繕	塑	礎	阻	奏	族	惰
0F00	戴	諾	叩	旦	誕	恥	仲	宙	忠	抽	兆	懲	抵	敵	撤	党
0F20	盗	糖	陶	闘	督	馴	覇	媒	爆	縛	髪	閥	泌	匹	府	敷
0F40	仏	慕	縫	乏	霧	盟	勇	誘	踊	裸	雷	卵	里	隆	慮	虜
0F60	寮	塁	隷	霊	恋	浪	郎	功	坑	々	⇧					
0F80	`a	bc	de	fg	hi	jk	lm	no	pq	rs	tu	vw	xy	z{	¦}	~
0FA0	БГ	ДЖ	ЗИ	ЙК	ЛМ	ПУ	ФЦ	ЧШ	ЩЪ	ЫЬ	ЭЮ	Я	?			
0FC0	ÀÁ	ÃÂ	ÆÇ	ÈÉ	ÊË	ÌÍ	ÎÏ	ÒÓ	ÔÕ	ŒØ	ÙÚ	ÛŸ	βà	áâ	ãä	åæ
0FE0	ÅÄ	ÖÜ	Ñ¿	çè	éê	ëì	íî	ïñ	òó	ôõ	öœ	øù	úû	üÿ	¡	

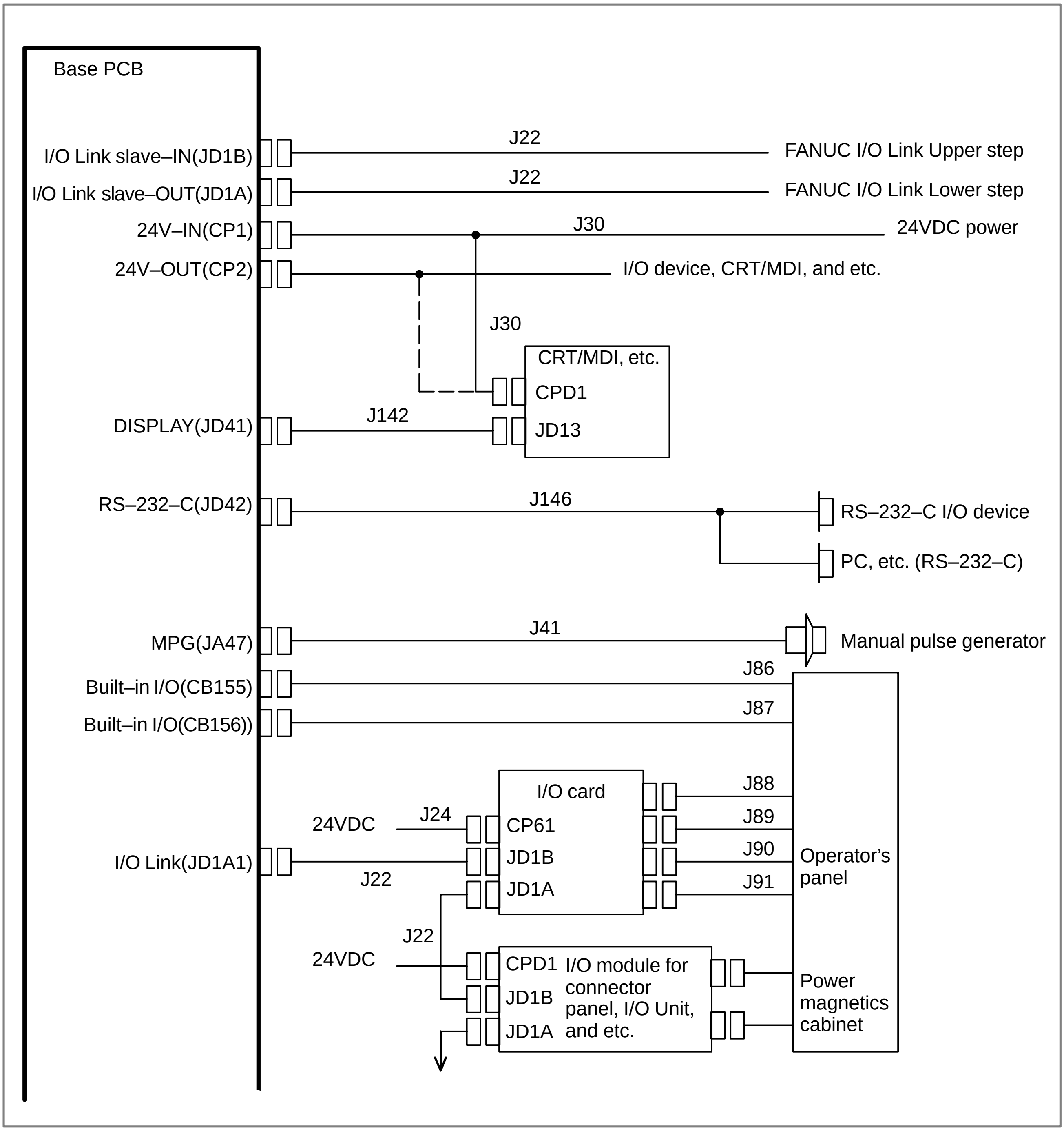
	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
1000	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1020	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e	f
1040	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
1060	w	x	y	z	⫽				γ	ε	μ	π	ϕ	ω	Δ	Σ
1080	Ω								ｶﾞｷﾞ	ｸﾞｹﾞ	ｺﾞｻﾞ	ｼﾞｽﾞ	ｾﾞｿﾞ	ﾀﾞﾁﾞ	ﾂﾞﾃﾞ	ﾄﾞ
10A0	ﾊﾞﾋﾞ	ﾌﾞﾍﾞ	ﾎﾞﾊﾟ	ﾋﾟﾌﾟ	ﾍﾟﾎﾟ	ｳﾞヵ	ヶ		ァ	ア	ィ	イ	ゥ	ウ	ェ	エ
10C0	ォ	オ	カ	ガ	キ	ギ	ク	グ	ケ	ゲ	コ	ゴ	サ	ザ	シ	ジ
10E0	ス	ズ	セ	ゼ	ソ	ゾ	タ	ダ	チ	ヂ	ッ	ツ	ヅ	テ	デ	ト
1100	ド	ナ	ニ	ヌ	ネ	ノ	ハ	バ	パ	ヒ	ビ	ピ	フ	ブ	プ	ヘ
1120	ベ	ペ	ホ	ボ	ポ	マ	ミ	ム	メ	モ	ャ	ヤ	ュ	ユ	ョ	ヨ
1140	ラ	リ	ル	レ	ロ	ヮ	ワ	ヲ	ン	ヴ	ヵ	ヶ				
1160	—	、	。	，	．	・	：	；	？	！	゛	゜	´	｀	¨	＾
1180		＿	ヽ	ヾ	ゝ	ゞ	〃	仝	々	〆	〇	ー	―	‐	／	＼
11A0	～	‖	｜	…	‥	‘	’	“	”	（	）	〔	〕	［	］	｛
11C0	｝	〈	〉	《	》	「	」	『	』	【	】	＋	－	±	×	÷
11E0	＝	≠	＜	＞	≦	≧	∞	∴	♂	♀	°	′	″	℃	￥	＄
1200	¢	£	％	＃	＆	＊	＠	§	☆	★	○	●	◎	◇	◆	□
1220	■	△	▲	▽	▼	※	〒	→	←	↑	↓	＝	▢			
1240	1/1	2/2	3/3	4/4	5/5	6/6			mm	cm	km	cm^2	m^2	km^2	cm^3	m^3
1260	mg	kg	cc	dℓ	ℓ	kℓ	ms	μs	ns	HP	ps	Hz	㈱	©		
1280	亜	芦	尉	壱	逸	芋	姻	韻	詠	疫	悦	謁	猿	殴	翁	虞
12A0	卸	嫁	禍	彦	蚊	餓	悔	塊	戒	嚇	岳	樫	喝	褐	轄	且
12C0	勘	堪	棺	款	憾	艦	頑	忌	紀	飢	棋	宜	儀	吉	虐	朽
12E0	凶	峡	恭	矯	暁	斤	桐	菌	謹	襟	吟	隈	勲	薫	恵	渓
1300	蛍	鶏	鯨	遣	賢	繭	顕	玄	孤	枯	鼓	呉	悟	碁	后	恒
1320	皇	慌	酵	拷	豪	獄	昆	恨	紺	魂	墾	懇	佐	唆	詐	宰
1340	斎	歳	搾	桟	蚕	惨	暫	氏	司	祉	肢	嗣	飼	雌	賜	諮
1360	児	侍	滋	慈	璽	疾	執	漆	舎	赦	遮	邪	蛇	勺	酌	爵
1380	寂	朱	珠	儒	囚	州	宗	拾	愁	酬	醜	汁	銃	獣	叔	淑
13A0	粛	塾	俊	旬	准	殉	循	潤	遵	庶	如	徐	升	召	匠	肖
13C0	償	抄	昌	晶	松	沼	宵	症	祥	硝	粧	詔	彰	礁	丈	冗
13E0	畳	嬢	譲	醸	殖	嘱	辱	臣	娠	慎	薪	仁	迅	甚	尋	炊

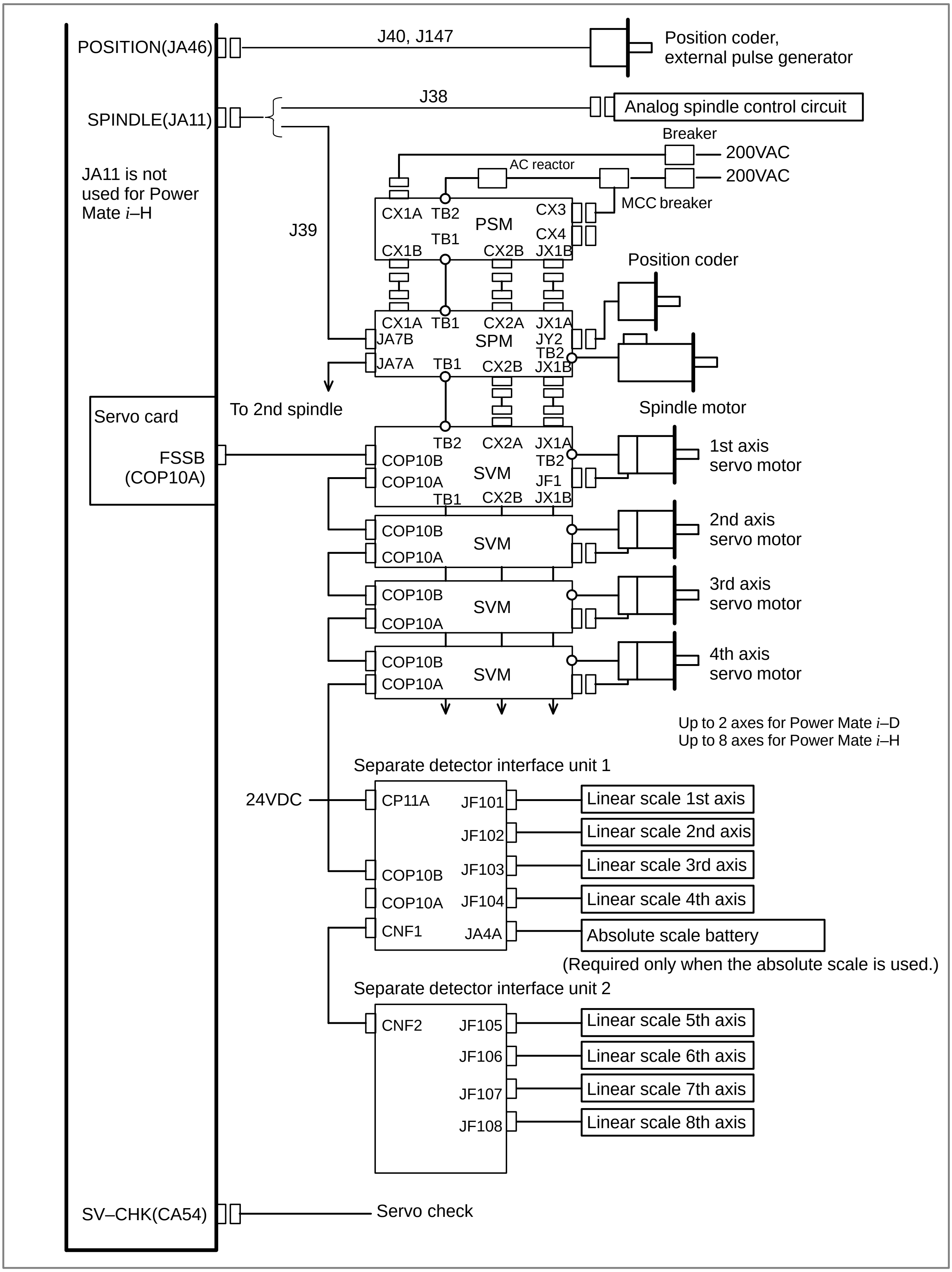
	00	02	04	06	08	0A	0C	0E	10	12	14	16	18	1A	1C	1E
1400	帥	衰	睡	穂	錘	随	髄	枢	崇	菅	畝	姓	斉	牲	逝	婿
1420	脆	夕	斥	隻	惜	拙	窃	摂	仙	践	銭	遷	薦	禅	祖	租
1440	措	疎	壮	荘	桑	曹	喪	葬	僧	遭	槽	燥	藻	霜	憎	賊
1460	孫	駄	舵	胎	泰	逮	瀧	沢	但	丹	胆	鍛	壇	痴	稚	畜
1480	逐	窒	嫡	衷	著	弔	眺	潮	聴	勅	朕	陳	鎮	津	漬	坪
14A0	呈	弟	邸	亭	貞	帝	艇	逓	偵	提	迭	哲	徹	澱	斗	渡
14C0	奴	桃	悼	棟	痘	唐	塔	搭	謄	豆	騰	洞	童	匿	篤	屯
14E0	豚	尼	弐	妊	忍	寧	婆	俳	輩	梅	培	陪	賠	伯	迫	漠
1500	鉢	伐	帆	畔	煩	頒	藩	晩	蛮	妃	披	卑	碑	罷	姫	漂
1520	苗	猫	賓	頻	瓶	扶	赴	膚	賦	附	譜	侮	覆	雰	墳	陛
1540	塀	弊	遍	舗	暮	邦	奉	峰	抱	俸	砲	褒	坊	某	冒	貿
1560	謀	朴	牧	墨	堀	奔	凡	盆	麻	妹	埋	又	抹	慢	漫	岬
1580	眠	娘	銘	妄	猛	匁	厄	愉	癒	唯	幽	悠	猶	裕	雄	憂
15A0	羊	庸	窯	擁	謡	翌	羅	酪	濫	吏	痢	履	柳	竜	硫	涼
15C0	猟	陵	僚	糧	厘	倫	零	齢	麗	廉	錬	炉	露	朗	廊	楼
15E0	賄	國	搖	條	櫻	澤	濾	碌	緞	鐵	靱	靖	槻	浩	郁	

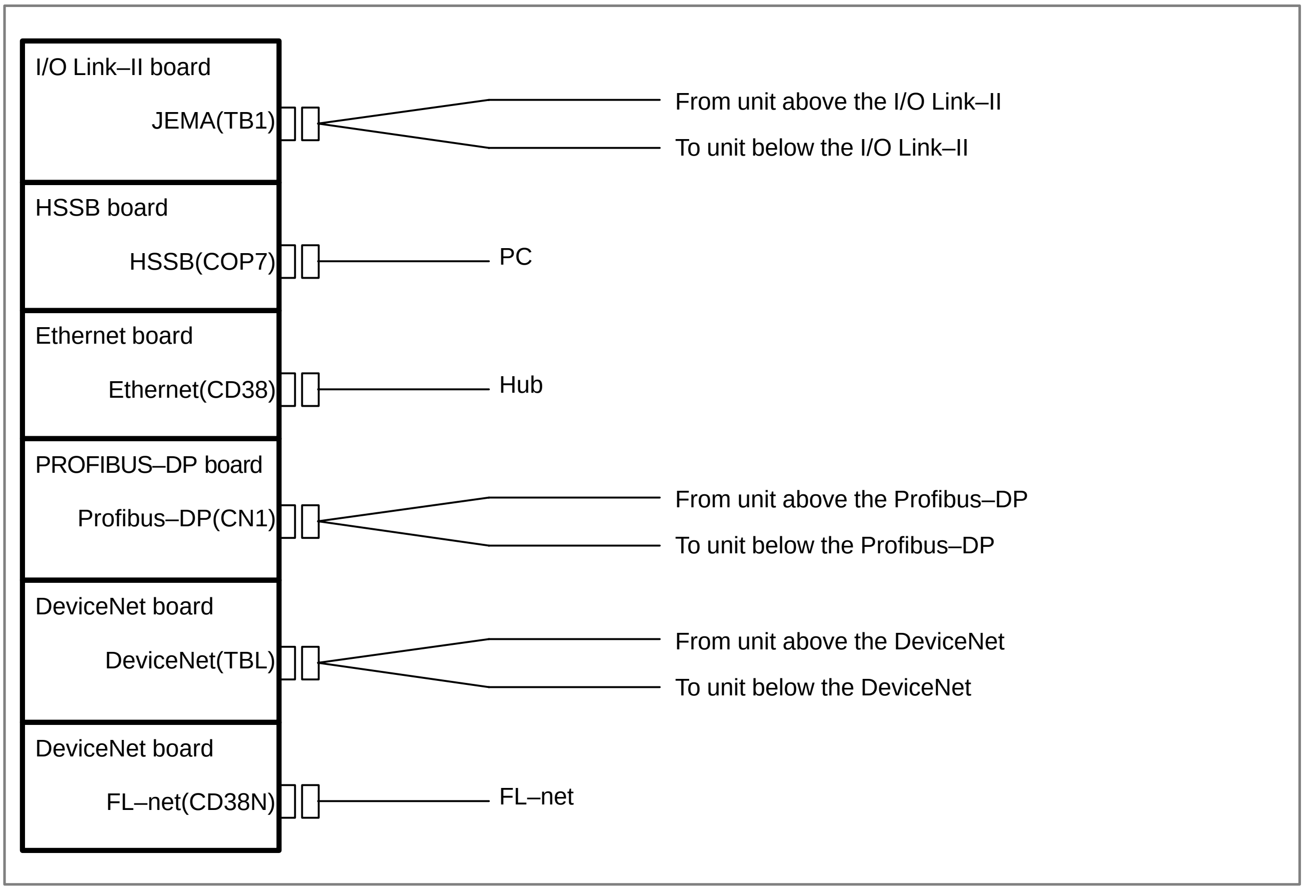
2 HARDWARE

This chapter describes structure of Power Mate *i* control section, connection of units and the functions of PCBs and modules mounted on PCBs.

2.1 TOTAL CONNECTION DIAGRAM




POSITION(JA46)
J40, J147
Position coder,
external pulse generator
SPINDLE(JA11)
J38
Analog spindle control circuit
Breaker
200VAC
200VAC
AC reactor
MCC breaker
JA11 is not
used for Power
Mate i–H
J39
CX1A
TB2
PSM
CX3
CX4
TB1
CX1B
CX2B
JX1B
Position coder
CX1A
TB1
CX2A
JX1A
JA7B
SPM
JY2
TB2
JA7A
TB1
CX2B
JX1B
To 2nd spindle
Spindle motor
Servo card
FSSB
(COP10A)
TB2
CX2A
JX1A
COP10B
TB2
SVM
COP10A
JF1
TB1
CX2B
JX1B
1st axis
servo motor
COP10B
SVM
COP10A
2nd axis
servo motor
COP10B
SVM
COP10A
3rd axis
servo motor
COP10B
SVM
COP10A
4th axis
servo motor
Up to 2 axes for Power Mate i–D
Up to 8 axes for Power Mate i–H
Separate detector interface unit 1
24VDC
CP11A
JF101
Linear scale 1st axis
JF102
Linear scale 2nd axis
COP10B
JF103
Linear scale 3rd axis
COP10A
JF104
Linear scale 4th axis
CNF1
JA4A
Absolute scale battery
(Required only when the absolute scale is used.)
Separate detector interface unit 2
CNF2
JF105
Linear scale 5th axis
JF106
Linear scale 6th axis
JF107
Linear scale 7th axis
JF108
Linear scale 8th axis
SV–CHK(CA54)
Servo check



NOTE

The I/O Link–II board, HSSB board, Ethernet board, PROFIBUS–DP board, DeviceNet master board, DeviceNet slave board, and FL–net board are inserted into option slots. Up to two of them can be installed simultaneously.

2.2 CONFIGURATION OF THE UNIT

2.2.1 Configuration of the Control Unit

The control units of the Power Mate *i* consist of below components.

Table 2.2.1 Configuration of the control unit

No.	Name	Remarks
1	Control unit	
2	Fan unit	
3	Back panel	
4	Option slot 1	Connection port of the first option board. A back panel is required.
5	Option slot 2	Connection port of the second option board. A back panel is required.

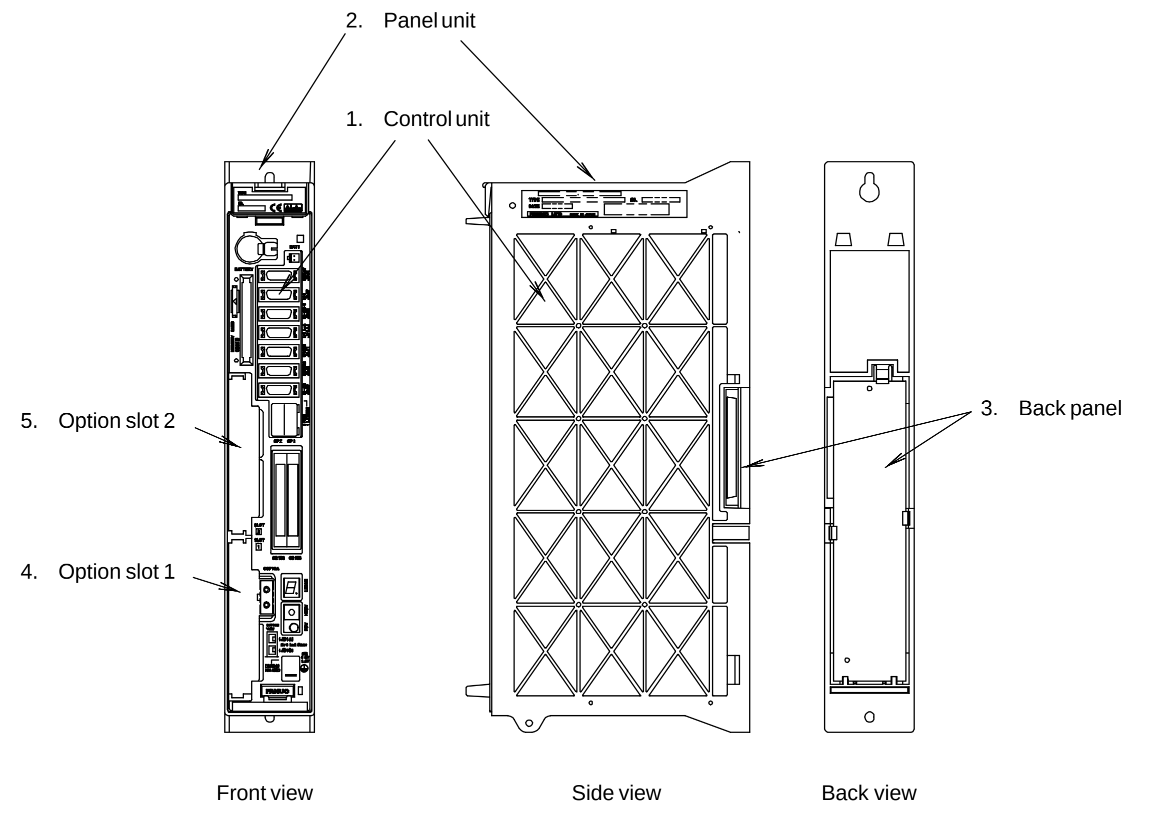


Fig. 2.2.1 Configuration of the control unit

2.2.2 Connector Locations on the Control Unit

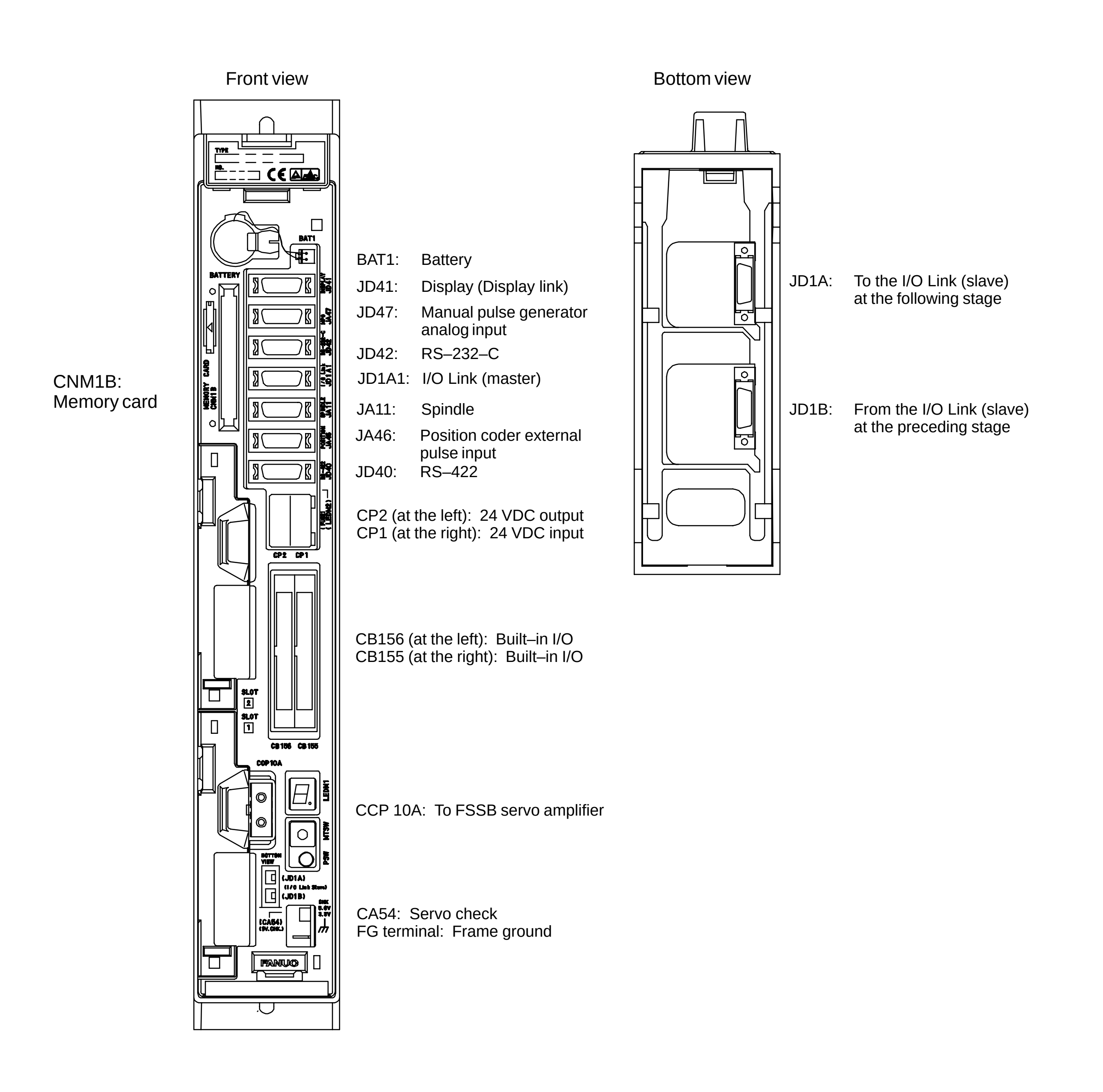


Fig. 2.2.2 Connector locations on the control unit

2.2.3 LEDs and Switches on the Control Units

The Power Mate *i* has the following LEDs and switches.

- **7–segment LED (LEDM1)**

LEDM1 displays the status information of the Power Mate. It is used along with the MTSW rotary switch and PSW pushbutton switch also to control setting and maintenance operations.

- **Blown fuse indication LED (LEDM2)**

LEDM2 is used to indicate that the 24 VDC input power fuse in the control unit has blown. See Section 2.7.1 for how to replace the fuse.

- **Rotary switch (MTSW)**

MTSW is a rotary switch used along with the LEDM1 7–segment LED indicator and the PSW pushbutton switch for setting and maintenance operations. Normally, set the switch to the 0 position.

- **Pushbutton switch (PSW)**

PSW is a pushbutton switch used along with the LEDM1 7–segment LED indicator and the PSW pushbutton switch for setting and maintenance operations.

NOTE
For details on the LEDM1, MTSW, and PSW, see "SETTING/DISPLAY/MAINTENANCE USING THE MAIN UNIT OF THE Power Mate *i*," in Appendix F.

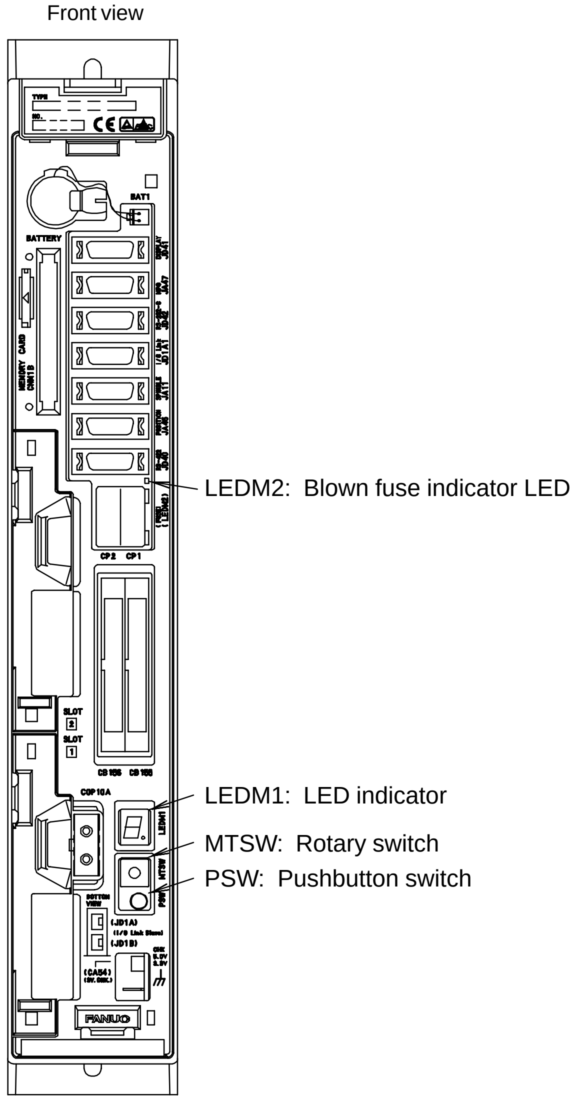


Fig. 2.2.3 LEDs and switches on the control units

2.2.4 Fan Unit Configuration

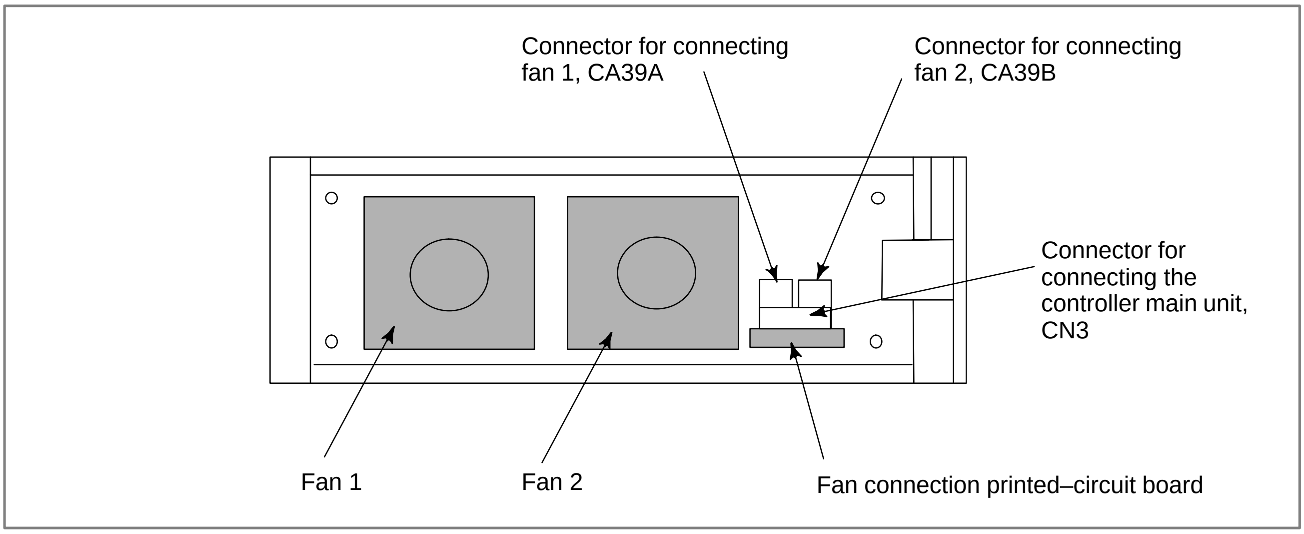
The Power Mate *i* is equipped with a fan unit. It is easy to dismount and mount.
There are two fans on the fan unit. Their cables are connected to the fan connection printed–circuit board.
Each fan cable connector on the fan connection printed–circuit board is attached directly to the control unit main body.

• Fan unit specifications

The basic unit A02B–0259–B501 contains one fan unit.

Name	Unit specification	Printed–circuit board specification
Fan unit	A02B–0259–C020	A20B–9002–0240

• Fan unit configuration



2.2.5 System Software Configuration

The Power Mate *i* system software consists of the components listed below:

Name	Specification	Storage location	Remark
Power Mate *i*–D basic function	A02B–0259–H501#88E0	Memory module	CNC section control
Power Mate *i*–H basic function	A02B–0259–H521#88F0 A02B–0259–H521#88F1	Memory module	CNC section control
Digital servo function	A02B–0259–H590#9090 A02B–0259–H590#9096 A02B–0259–H591#90A0 A02B–0259–H591#90B0	Memory module	Servo section control
PMC–SB5 function	A02B–0259–H580#407B A02B–0259–J583#407B	Memory module	PMC section control
PMC–SB6 function	A02B–0259–H580#407B A02B–0259–J581#407B A02B–0259–J583#407B	Memory module	PMC section control
Boot software	A02B–0259–H500#881I	CPU card	Boot function

Name	Specification	Storage location	Remark
Application software for the PROFIBUS–DP slave/master function	A02B–0259–J550#6557	Memory module	NC software for the PROFIBUS–DP slave/master function
Control software for the PROFIBUS–DP slave function	A02B–0259–J552#6553	Memory module	Firmware for the PROFIBUS–DP slave function
Control software for the PROFIBUS–DP master function	A02B–0259–J551#6557	Memory module	Firmware for the PROFIBUS–DP master function
Application software for the DeviceNet function	A02B–0259–J553#6576	Memory module	NC software for the DeviceNet function
Control software for the DeviceNet slave function	A02B–0259–J554#6570	Memory module	Firmware for the DeviceNet function
Control software for the Ethernet function	A02B–0259–J555#6561	Memory module	Firmware for the Ethernet function
Control software for the fast Ethernet function	A02B–0259–J555#6567	Memory module	Firmware for the fast Ethernet function
Control software for the FL–net function	A02B–0259–J566#6564	Memory module	Firmware for the FL–net function
Application software for the FL–net or I/O Link–II function	A02B–0259–J568#654I	Memory module	NC software for the FL–net or I/O Link–II function (I/O Link–II is provided for A02B–0259–J282.)

CAUTION

1 The system software of which storage location is the memory module is stored in the FROM on the memory module. When replacing the memory module, make sure that the functions stored on the replacement module are of the same version as before or of a later version. Otherwise, they may be inoperable. (The version of the software has nothing to do with the general version of the printed–circuit board.)

2 The boot software is stored in the FROM on the CPU card. When replacing the CPU card, make sure that the function stored on the replacement CPU card is of the same version as before or of a later version. Otherwise, it may be inoperable. (The version of the software has nothing to do with the general version of the printed–circuit board.)

3 The installed boot software may vary depending on the type of the CPU card. When replacing the CPU card, make sure that the replacement CPU card is also a Power Mate *i* CPU card. Note that the 16*i*/18*i*/21*i* CPU card cannot be used in place of the Power Mate *i* CPU card.

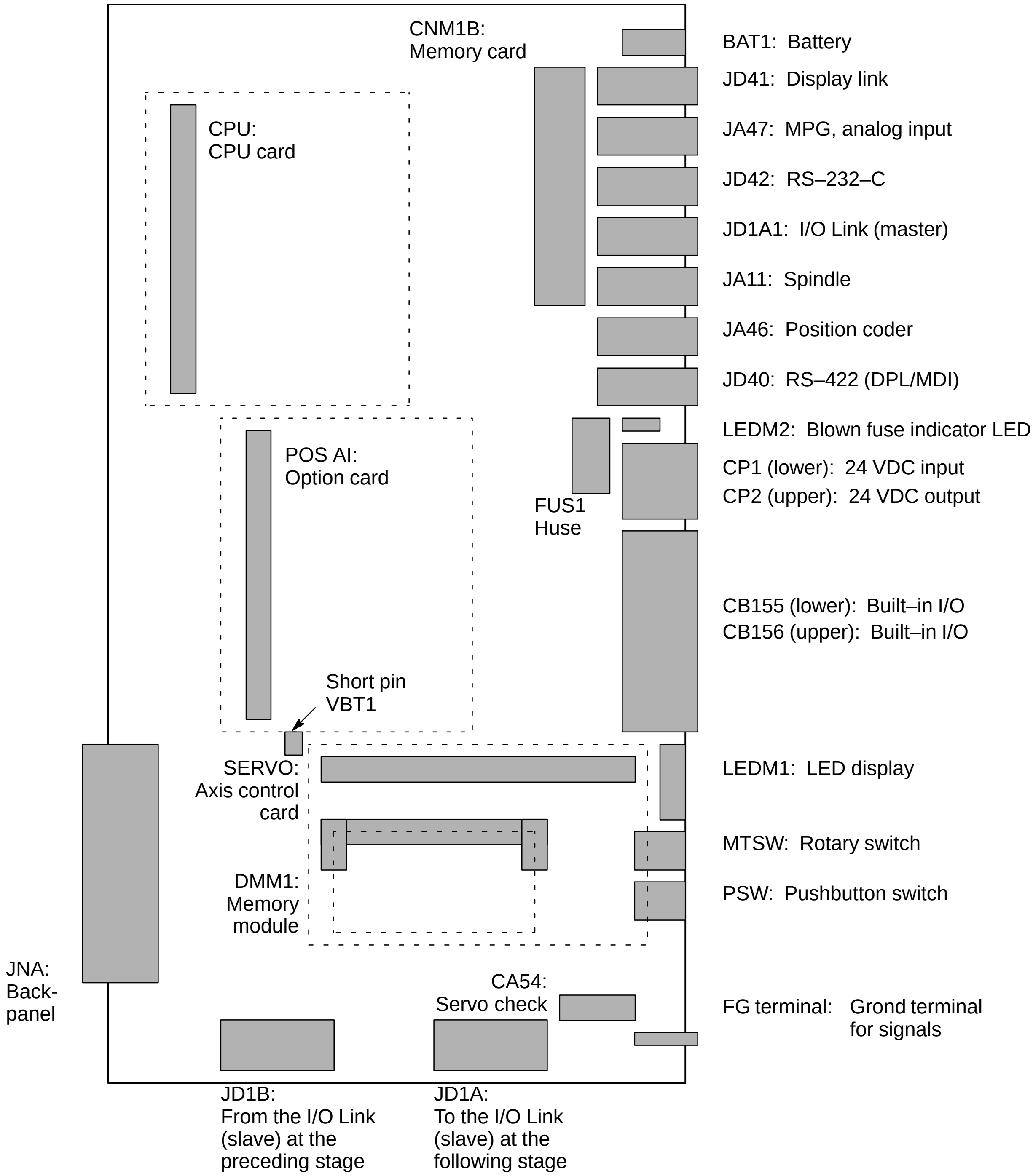
2.3 CONFIGURATION OF PRINTED CIRCUIT BOARD AND LED DISPLAY

2.3.1 Base Printed Circuit Board

- **Specification**

Name	Specification
Base printed circuit board	A16B–3200–0260

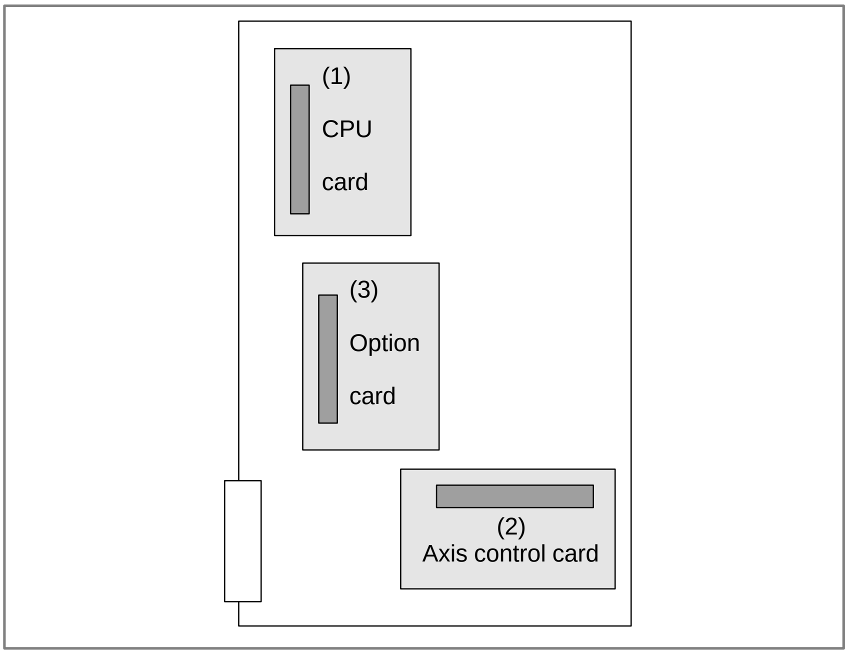
- **Connector and LED locations**



NOTE
1 For the LEDs and switches, see Section 2.2.3.
2 Short pin VBT1 is used for testing. Leave this pin connected as is.

2.3.2 Card Printed Circuit Board

● Mounting location



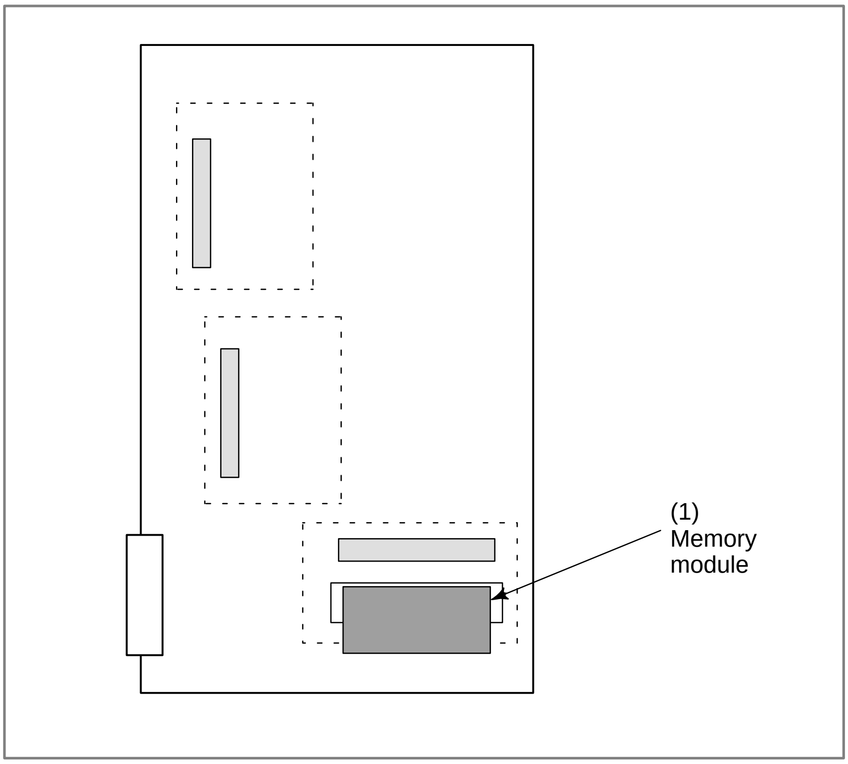
● Specification

No.	Name	Specification	Function	D	H	Remarks
(1)	CPU card A	A20B–3300–0071	CNC control	○	○	486DX2
	CPU card B	A20B–3300–0051			○	Pentium
	CPU card C	A20B–3300–0171 A20B–3300–0261		○	○	MMX–Pentium
(2)	Axis control card	A20B–3300–0031 A20B–3300–0033	Axis control	○	○	2 axes
		A20B–3300–0121 A20B–3300–0243		○	○	2 axes/high–speed
		A20B–3300–0030 A20B–3300–0032			○	4 axes
		A20B–3300–0120 A20B–3300–0242			○	4 axes/high–speed
		A17B–3300–0101 A17B–3300–0103			○	6 axes
		A17B–3300–0201 A17B–3300–0241			○	6 axes/high–speed
		A17B–3300–0100 A17B–3300–0102			○	8 axes
		A17B–3300–0200 A17B–3300–0240			○	8 axes/high–speed

No.	Name	Specification	Function	D	H	Remarks
(3)	Option card 1	A20B–3300–0131	Analog spindle External pulse input	○	○	Option
	Option card 2	A20B–3300–0130	Analog input Analog spindle External pulse input	○	○	

2.3.3 Memory Module

● Mounting location



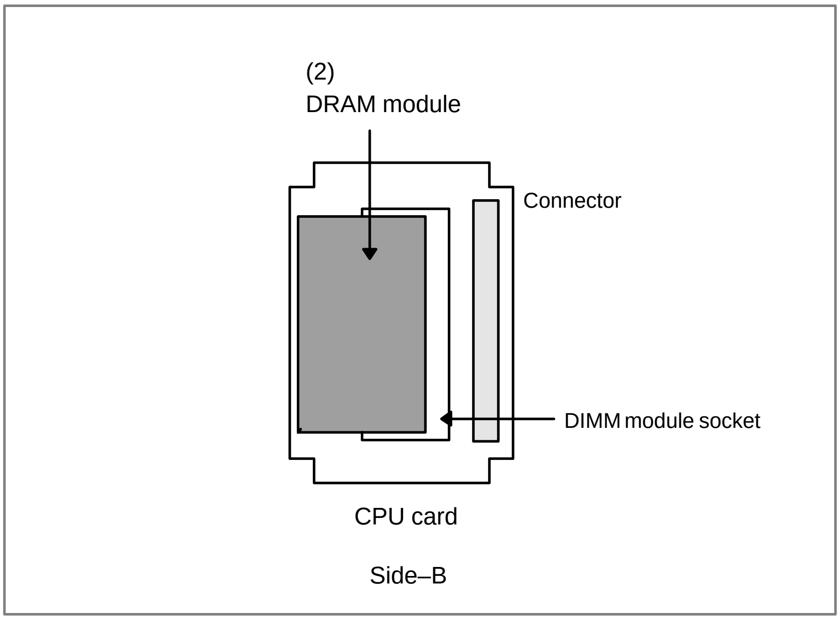
● Specification

No.	Name	Specification	Function	D	H	Remarks
(1)	4M/256K Memory module	A20B–3900–0080	FROM 4MB SRAM 256KB	○	○	
	6M/1M Memory module	A20B–3900–0120	FROM 6MB SRAM 1MB	○		
	8M/1M Memory module	A20B–3900–0141	FROM 8MB SRAM 1MB	○	○	
	12M/1M Memory module	A20B–3900–0140	FROM 12MB SRAM 1MB	○	○	

NOTE
1 The memory module is under the axis control card.
2 Do not touch any pin of the memory module.

2.3.4 DRAM Module

● Mounting location



● Specification

No.	Name	Specification	Function	Remarks
(2)	12M DRAM module	A20B–3900–0040	DRAM 12MB	For CPU card A, B
		A20B–3900–0130	SRAM 12MB	For CPU card C
	8M DRAM module	A20B–3900–0041	DRAM 8MB	For CPU card A, B
		A20B–3900–0131	SRAM 8MB	For CPU card C
	4M DRAM module	A20B–3900–0042	DRAM 4MB	For CPU card A, B
		A20B–3900–0132	SRAM 4MB	For CPU card C

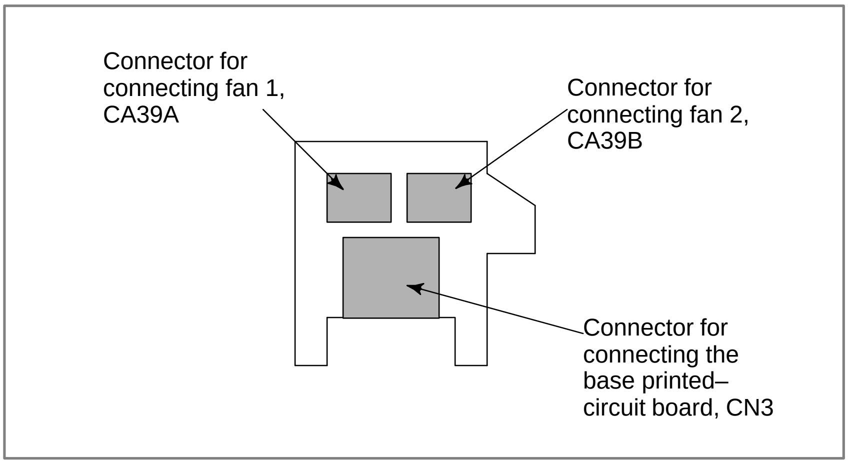
NOTE
1 DRAM module is located on the CPU card.
2 Do not touch any pin of the memory module.

2.3.5
Fan Connection Printed–circuit Board

- **Specification**

Name	Specification
Fan connection PCB	A20B–9002–0240

- **Connector locations**

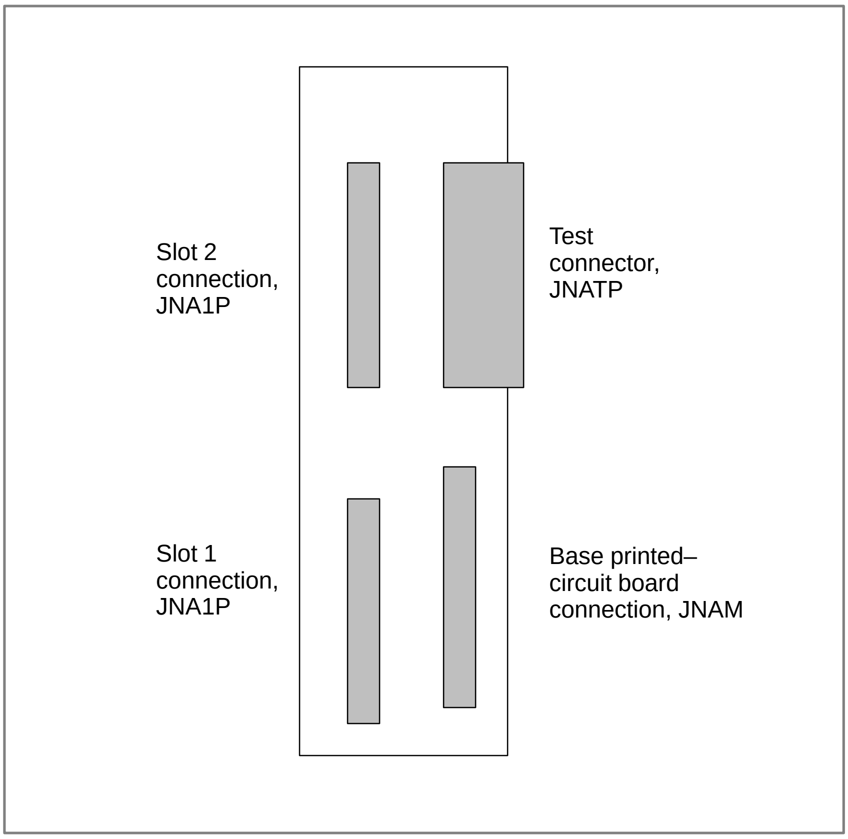


2.3.6 Backpanel

- **Specification**

Name	Specification
Backpanel	A20B–2002–0680

- **Connector locations**



2.3.7 FANUC I/O Link–II Slave Board

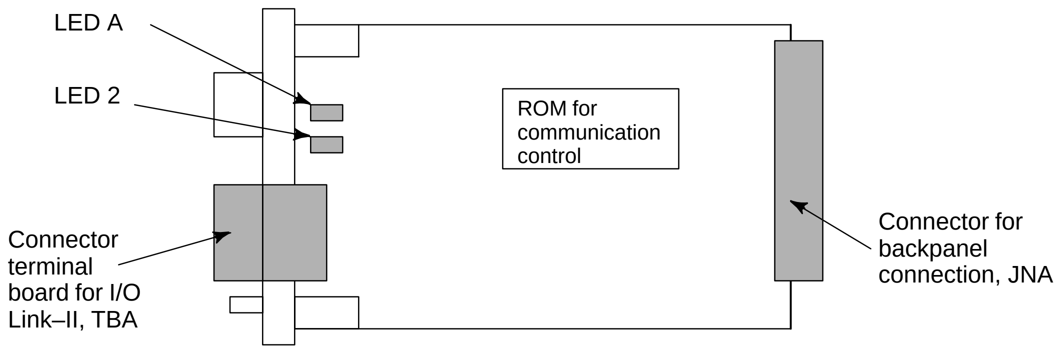
NOTE
Refer to ”FANUC I/O Link–II CONNECTION MANUAL (B–62714EN)” for details.

- **Specification**

Name	Printed–circuit board specification
FANUC I/O Link–II slave board	A20B–8100–0310
FANUC I/O Link–II slave board B	A20B–8100–0381

- **Connector and LED locations**

[FANUC I/O Link–II slave board]

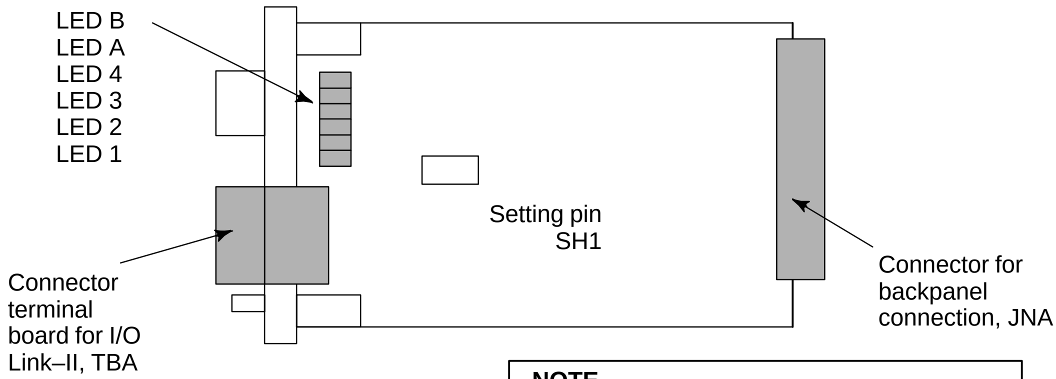


Name	Color	Meaning	Required action
LED A	Red	A RAM parity alarm condition has been detected on the FANUC I/O Link–II board.	If this LED is on, replace the board though the alarm can sometimes be released by turning the power off then on.
LED 2	Green	Lights when communication is performed normally using the FANUC I/O Link–II board. Does not light before communication begins and after a communication alarm condition has occurred.	If this LED is kept off: 1) Check the I/O Link–II cable. 2) Check the connector terminal board TBA. 3) Check the I/O Link–II master unit status. 4) Replace the board.

NOTE

1 The I/O Link–II connection terminal board (TBA) can be mounted and dismounted with the I/O Link–II cable attached.
After the TBA has been reconnected, tighten the terminal board screws again.
2 When replacing this printed–circuit board from the basic unit, detach the connector terminal board TBA in advance.
3 The above board is provided for A20B–0259–J210.

[FANUC I/O Link–II slave board B]



NOTE
Do not change the setting of SH1.

No.	Name	Board state	
1	LED1 ■	Turned on when the board starts normally.	
2	LED2 ■	Turned on when communication starts. The board is used for a slave station. So, this LED is turned on when a response is made to an initialization service request.	
3	LED3 ■	Turned on each time transmission is performed.	
4	LED4 ■	Turned on (to indicate that the station is a slave station).	
1	LEDA ■	A communication error was detected in data reception.	1) Check the I/O Link–II cable. 2) Check the connector terminal block TBA. 3) Check the state of the I/O Link–II master unit. 4) Replace the board.
2	LEDB ■	A parity error occurred in the memory on the slave board.	The error may be recovered by turning the power off than back on. However, replace the board.

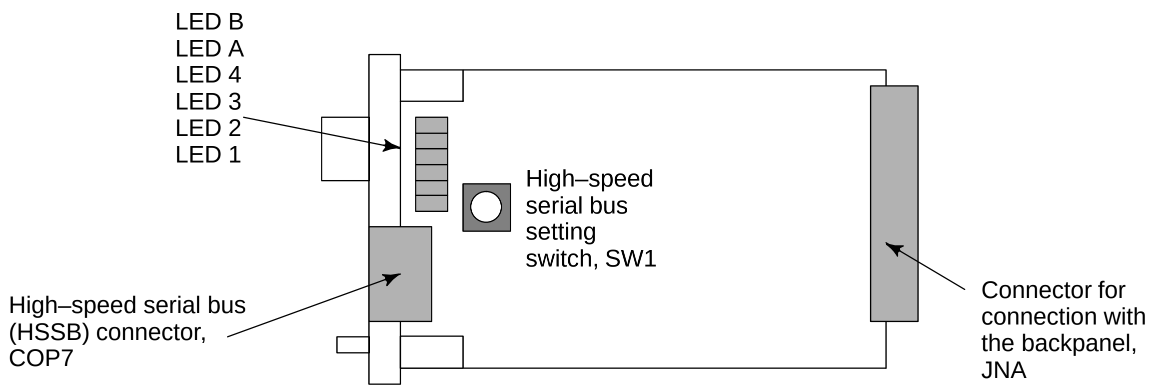
2.3.8 High–speed Serial Bus (HSSB) Board

> **NOTE**
> Refer to Technical report ”FANUC HIGH SPEED SERIAL BUS TYPE 2 CONNECTING AND MAINTENANCE MANUAL (A–73527E)” for details.

- **Specification**

Name	Printed–circuit board specification
High–speed serial bus (HSSB) board	A20B–8001–0730

- **Connector and LED locations**



Name	Color	Meaning	Required action
LED B	Red	HSSB–based communication has been interrupted.	If this LED is on: 1) Check the HSSB cable. 2) Check the PC or intelligent terminal status. 3) Replace the board.
LED A	Red	A RAM parity alarm condition has occurred in the common RAM on the board.	If this LED is on, replace the board though the alarm can sometimes be released by turning the power off then on.
LED 4 LED 3 LED 2 LED 1	Green	Status display (see below)	–

Green LED status display ■ : on and □ : off

4 3 2 1	Status
■ ■ ■ ■	The power has just been switched on.
■ ■ ■ □	The HSSB board is being initialized.
■ ■ □ ■	The HSSB is waiting for the PC to complete booting.
■ ■ □ □	The CNC screen is displayed on the PC.
■ □ □ □	Start–up has been completed normally, and the regular operation is under way.
□ ■ ■ □	A thermal error has been detected at the intelligent terminal.
□ ■ □ ■	HSSB–based communication has been interrupted.
□ ■ □ □	A RAM parity alarm condition has occurred in the common RAM.
□ □ ■ ■	A communication error has occurred.
□ □ ■ □	A battery alarm condition has occurred at the PANEL *i*.

High–speed serial bus setting switch, SW1

SW1	Setting
“0”	Specifies maintenance operation. The start menu appears, enabling the boot and IPL operations to be controlled from the PC.
“1”	Specifies regular operation. The start menu does not appear. It is impossible to control the boot and IPL operations from the PC.

NOTE

In some versions, the setting switch SW1 is adjacent to the connector COP7.

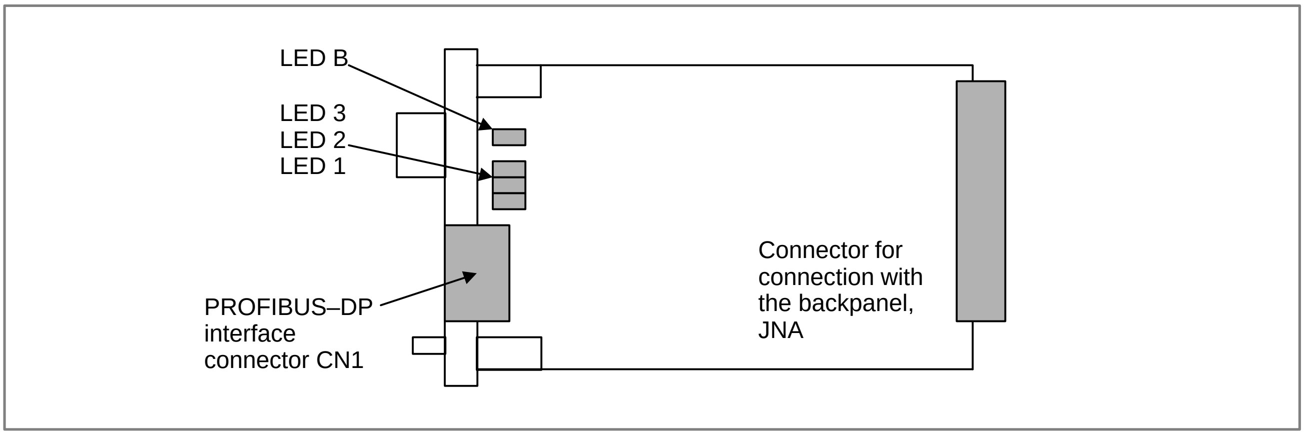
2.3.9 PROFIBUS–DP Board

NOTE
Refer to ”FANUC PROFIBUS–DP Board OPERATOR'S MANUAL (B–62924EN)” for details.

- **Specification**

Name	Specification
PROFIBUS–DP slave board	A20B–8100–0440
PROFIBUS–DP master board	A20B–8100–0470

- **Connector and LED locations**



NOTE
The PROFIBUS–DP master board has neither LED3 nor LEDB.

[PROFIBUS–DP slave board]

Name	Color	Meaning	Required action
LED1	Green	The software (firmware) on the communication board has started running after the reset of the CPU on the PROFIBUS slave board.	If LED1 is kept off: 1) Check the connection of the board to the backpanel. 2) Replace the board.
LED2	Green	PROFIBUS communication has started. This LED is not turned on in the following cases: ● Parameters and configuration data have not been received. ● An illegal parameter or configuration data has been received.	If LED1 is on, and LED2 remains off: 1) Check the communication parameters. 2) Check the settings on the communication master side.
LED3	Green	Indicates whether PROFIBUS communication is being performed normally.	If LED1 and LED2 are on, and LED3 remains off: 1) Check the connection of the cable. 2) Check the communication master status. 3) Check for noise on the communication line.
LEDB	Red	A RAM parity alarm has been issued on this board.	If this LED is turned on, replace the board though this alarm can sometimes be released by turning the power off then on.

NOTE

The LED indications on the PROFIBUS board differ depending on whether the system is the Power Mate *i*–D/H or Series 16/18.

[PROFIBUS–DP master board]

Name	Color	Description
LED1	Green	Green Indicates whether the CPU of this board has been activated. Lit if the CPU has been released from the reset state and activated. The LED does not go on when the power is turned on.
LED2	Green	Green Indicates whether normal communication is performed. Lit if normal communication is performed. Not lit if communication is not performed. The LED does not go on when the power is turned on.

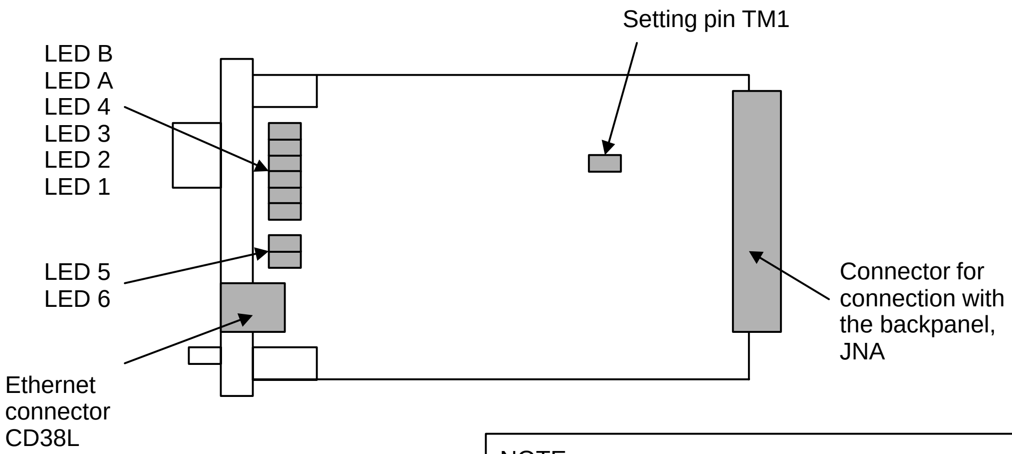
2.3.10 Ethernet Board

NOTE
Refer to "FANUC Ethernet Board/DATA SERVER Board OPERATOR'S MANUAL (B–63354EN)" for details.
Refer to "FANUC Fast Ethernet Board/Fast DATA SERVER Board OPERATOR'S MANUAL (B–63644EN)" for details of fast Ethernet board.

- **Specification**

Name	Specification
Ethernet board	A20B–8100–0450

- **Connector and LED locations**



NOTE
Never change the setting of the setting pin TM1.

LED1	Green	STATUS
LED2	Green	STATUS
LED3	Green	STATUS
LED4	Green	STATUS
LED5	Green	TX
LED6	Green	RX
LEDA	Red	COL
LEDB	Red	PAR

- **Status indication**

In the following explanation, the LED status is indicated as shown below:
□ : Off ■ : On ☆ : Blinking ◆ : To be ignored

At power–up

NO.	LED 4 3 2 1		Description
1	STATUS	□□□□	Power off
2	STATUS	■■■■	Initial status immediately after power–up
3	STATUS	■■■□	MPU initialization completed
4	STATUS	■■□□	Firmware downloading completed
5	STATUS	■□□□	Control passed to the OS
6	STATUS	□■■■	OS PHASE 1
7	STATUS	□■■□	OS PHASE 2
8	STATUS	□■□■	OS PHASE 3
9	STATUS	□■□□	OS PHASE 4
10	STATUS	□□□☆	Activation completed

When the Ethernet board has started normally, the LED status indicated in No. 10 appears. This status is then maintained until an abnormal status is detected.

- **Alarm indication**

LED name	Meaning	Required action
LEDB (PAR)	A system alarm condition has occurred on this board.	Replace the board.

- **Communication status indication**

No.	LED name	Communication status
1	LED 5(TX)	Turned on when data is received.
2	LED 6(RX)	Turned on when data is sent.
3	LED A(COL)	Turned on when a data collision has occurred.

NOTE
The A(COL) LED goes on frequently when traffic (the amount of communication) in Ethernet communication is heavy or when there is large ambient noise.

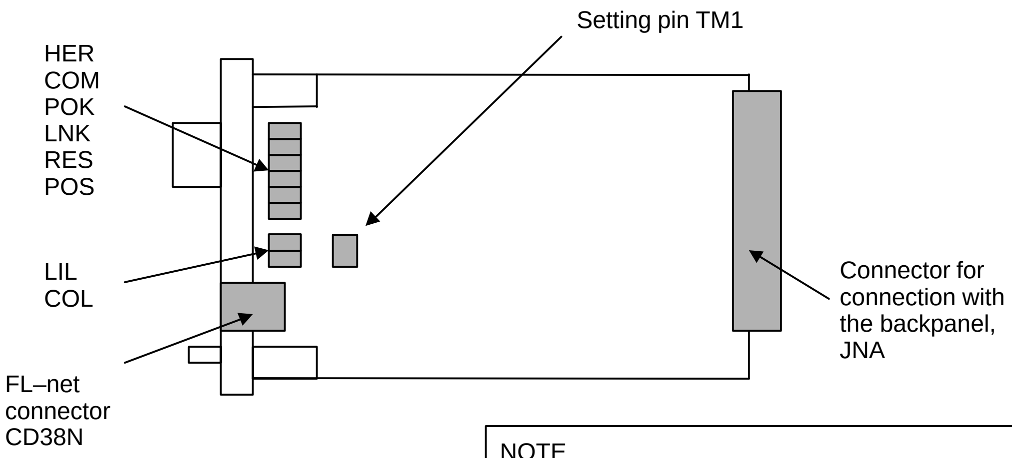
2.3.11 FL–net Board

- **Specification**

Name	Specification
FL–net board	A20B–8100–0530

NOTE
Refer to ”FANUC FL–net Board OPERATOR'S MANUAL (B–63434EN)” for details.

- **Connector and LED locations**



NOTE
Never change the setting of the setting pin TM1.

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

NO.	LED indication 4 POK	3 LNK	2 RES	1 POS	FL–net board state
1	□	□	□	□	Power off
2	■	■	■	■	Initial state immediately after power–on
3	■	■	■	□	Completion of MPU initialization
4	■	■	□	□	Completion of downloading of firmware
5	■	□	□	□	Transfer of control to the OS
6	□	■	■	■	OS PHASE1
7	□	■	■	□	OS PHASE2
8	□	■	□	■	OS PHASE3
9	□	■	□	□	OS PHASE4
10	u	u	u	☆	Completion of activation

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

- **LED indication during normal operation**

No.	LED indication		Communication status
1	ROS	☆	Blinks at 1–second intervals when the communication software on the FL–net board operates normally.
2	RES	□	Normally, off
3	LNK	■	Turned on when the node participates in the FL–net network
4	POK	■	Turned on when all FL–net parameters are valid.

- **LED indication for communication status**

No.	LED indication		Communication status
1	COM	■	Turned on when data is transmitted or received
2	LIL	■	Turned on when the connection with the hub is normal
3	COL	■	Turned on when a data collision occurs

NOTE
COL: The FL–net manages the token–based transmission right so that no collision occurs. If this LED is turned on frequently, a communication error has occurred due to noise, or an Ethernet compliant product other than the FL–net is connected.

2.3.12 DeviceNet Board (B)

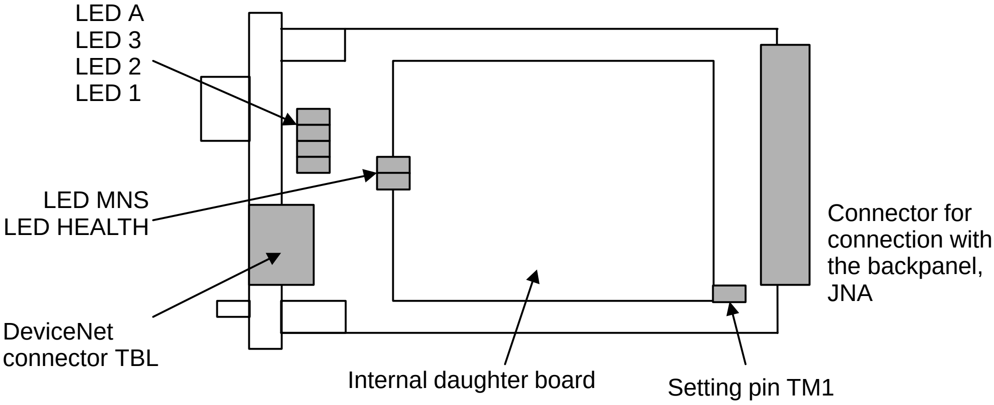
NOTE
Refer to "FANUC DeviceNet Board OPERATOR'S MANUAL (B–63404EN)" for details.
Refer to "FANUC DeviceNet Board OPERATOR'S MANUAL (B–63404EN)" for details of DeviceNet board C.

- **Specification**

Name	Specification
DeviceNet board	A20B–8100–0490
DeviceNet board B	A20B–8100–0491

NOTE
1 There are two DeviceNet boards: the DeviceNet slave board and DeviceNet master board. Only the difference between these boards is the connection position of the setting pin TM1 on the board. The printed–circuit board specifications of these boards are the same. (Their unit specifications differ.)
2 The DeviceNet board must be mounted and dismounted by following a specified procedure. See Section 2.6.5.

- **Connector and LED locations**

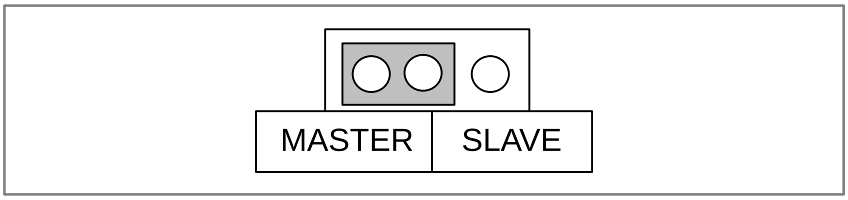


This board provides three green LEDs and one red LED for status indication. In addition, two LEDs that light in both red and green are provided on the internal daughter board. The meanings of the LEDs are listed below.

<table>
<tr><th>Name</th><th>Color</th><th>Meaning</th><th>Required action</th></tr>
<tr><td>LED1 to 3</td><td>Green</td><td colspan="2">These LEDs indicate whether the DeviceNet board is the master board or slave mode. At power–up, these LEDs are off.
<table><tr><td></td><td>LED1</td><td>LED2</td><td>LED3</td></tr><tr><td>Master board</td><td>On</td><td>Off</td><td>Off</td></tr><tr><td>Slave board</td><td>On</td><td>On</td><td>Off</td></tr></table></td></tr>
<tr><td>LEDA</td><td>Red</td><td>An abnormality occurred in the internal daughter board.</td><td>If this LED goes on, replace the DeviceNet board.</td></tr>
<tr><td>MNS</td><td>Red/ green</td><td>This LED is the DeviceNet module/network status LED. It indicates whether the power is supplied to the DeviceNet board and whether DeviceNet communication is performed normally.</td><td>See the specifications published by ODVA.</td></tr>
<tr><td>HEALTH</td><td>Red/ green</td><td>This LED indicates the daughter board status. When the power has been turned on, this LED lights in red. When firmware has been loaded to the internal daughter board, the LED lights in green.
The LED turns red again if an error occurs on the daughter board.</td><td>If the LED does not light in green, replace the DeviceNet board.</td></tr>
</table>

- **Setting pin TM1**

This board has a setting pin block TM1 with three pins. The TM1 indicates whether the board is used for the DeviceNet slave function or master function.



When the setting pins are set to SLAVE, the board is used for the DeviceNet slave function. When the setting pins are set to MASTER, the board is used for the DeviceNet master function.
The TM1 is factory–set by FANUC according to the specifications. Do not change this setting.

Name	Specification	TM1
DeviceNet slave board	A02B–0259–J240	SLAVE
DeviceNet master board	A02B–0259–J241	MASTER
DeviceNet slave board B	A02B–0259–J242	SLAVE
DeviceNet master board B	A02B–0259–J243	MASTER

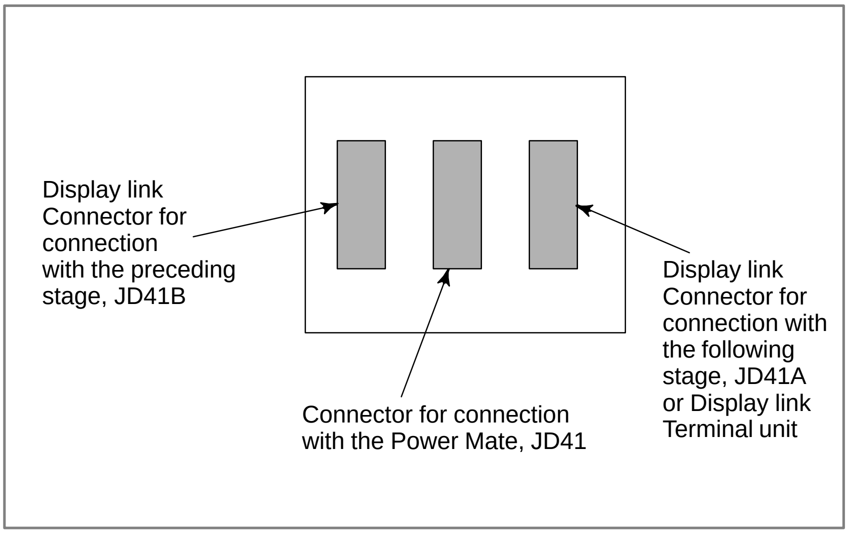
NOTE
Never touch the setting pins on the daughter board.

2.3.13 Display Link Adapter

- **Specification**

Name	Specification
Display link adapter	A20B–1007–0360

- **Connector locations**



2.3.14 I/O Link Connection Unit

- **Specification**

Name	Specification
I/O Link connection unit (electric to optical)	A20B–2000–0410
I/O Link connection unit (electric to electric)	A20B–2000–0411
I/O Link connection unit (optical to optical)	A20B–2000–0412

- **Connector and LED locations**

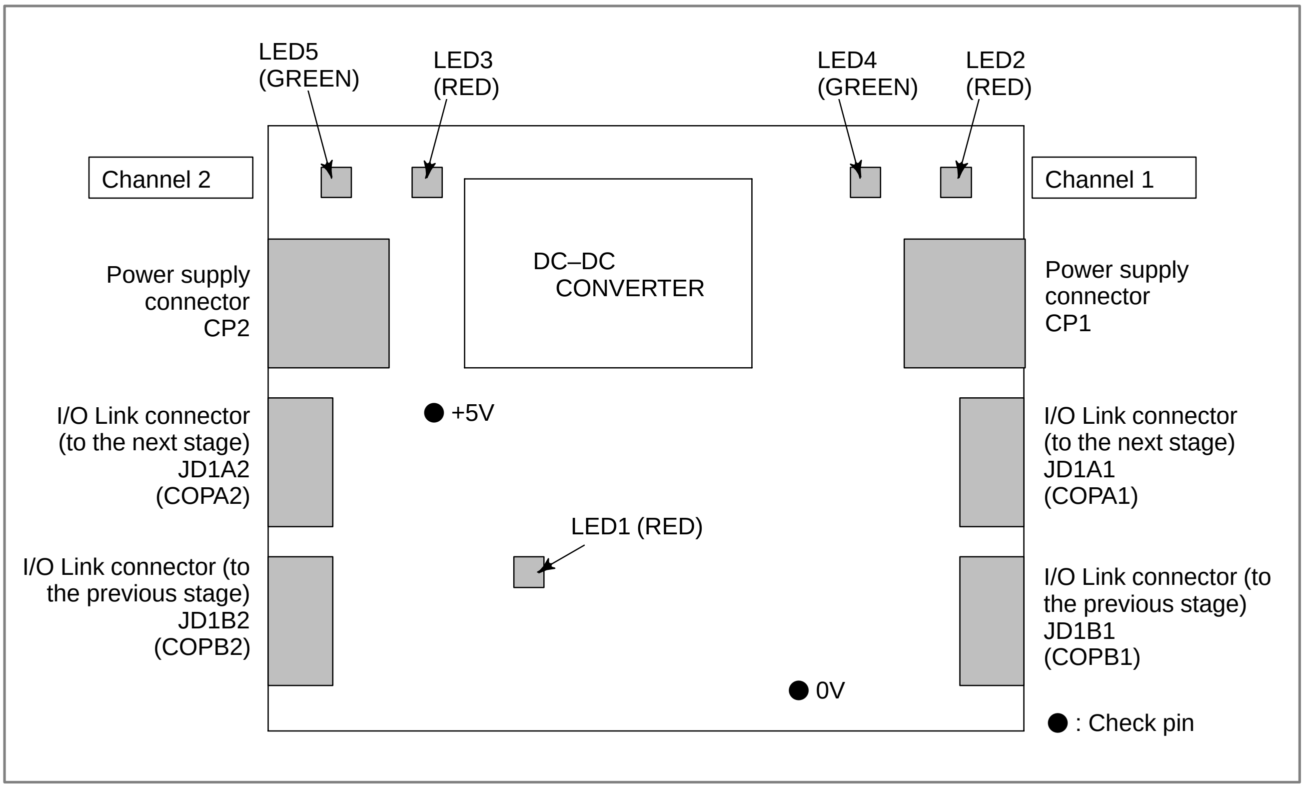


Fig. 2.3.14 LED installation positions

	LED status		Description
1	LED1 □		Normal
	LED1 ■		A RAM parity alarm occurred. Replace the unit.
2	LED4 ■	LRD2 □	Normal
	LED4 □	LRD2 ■	No voltage is applied to CP1. The voltage applied to CP1 is insufficient.
	LED4 ■	LRD2 ■	A communication error occurred in a channel connected to CP1.
3	LED5 ■	LRD3 □	Normal
	LED5 □	LRD3 ■	No voltage is applied to CP2. The voltage applied to CP2 is insufficient.
	LED5 ■	LRD3 ■	A communication error occurred in a channel connected to CP2.

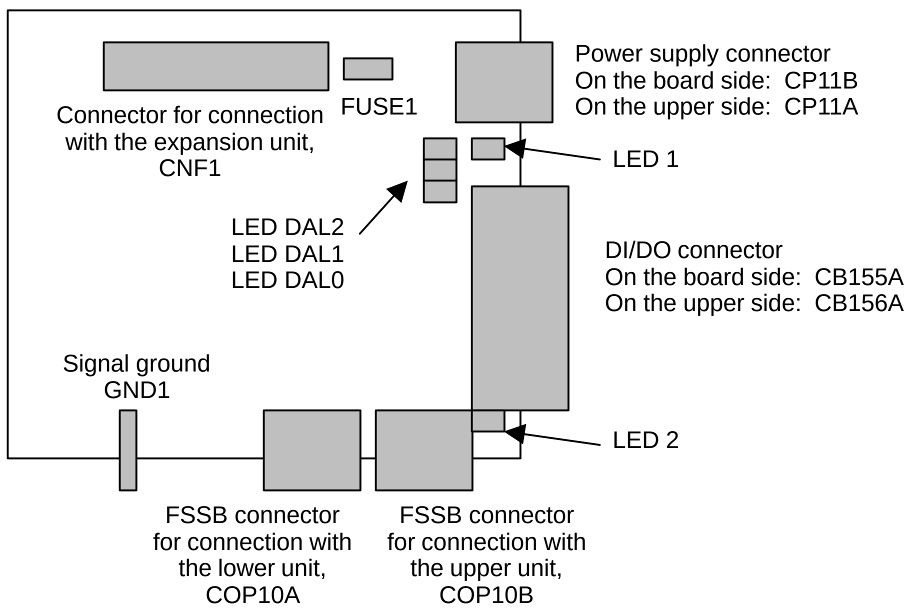
■ : Lit □ : Not lit

2.3.15 FSSB I/O Module Basic Unit

● Specification

Name	Specification
Printed circuit board for FSSB I/O module basic unit	A20B–2100–0390

● Connector and LED locations



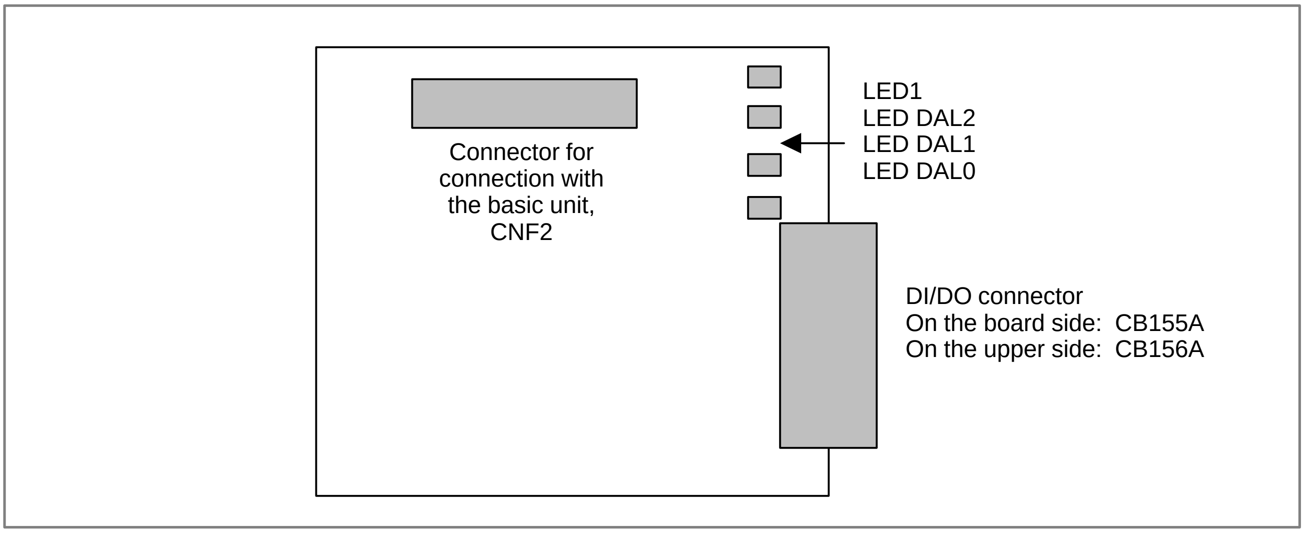
Name	Color	Meaning	Required action
LED1	Green	The power has been turned on to the unit, and the power supply circuit of the unit operates normally.	If this LED remains off: 1) Check the input power supply. 2) Check the fuse FUSE1. 3) Replace the unit.
LED2	Green	FSSB communication with the Power Mate is performed normally.	If this LED remains off: 1) Check the FSSB cable. 2) Check the Power Mate status. 3) Replace the unit.
DAL2 DAL1 DAL0	Red	Overcurrent of the load current is detected in the DO driver in the unit. Alternatively, the DO driver is heated abnormally.	If these LEDs are on: 1) Check for DO ground–fault. 2) Replace the unit.

2.3.16 FSSB I/O Module Expansion Unit

- **Specification**

Name	Specification
Printed circuit board for FSSB I/O module expansion unit	A20B–2002–0860

- **Connector and LED locations**



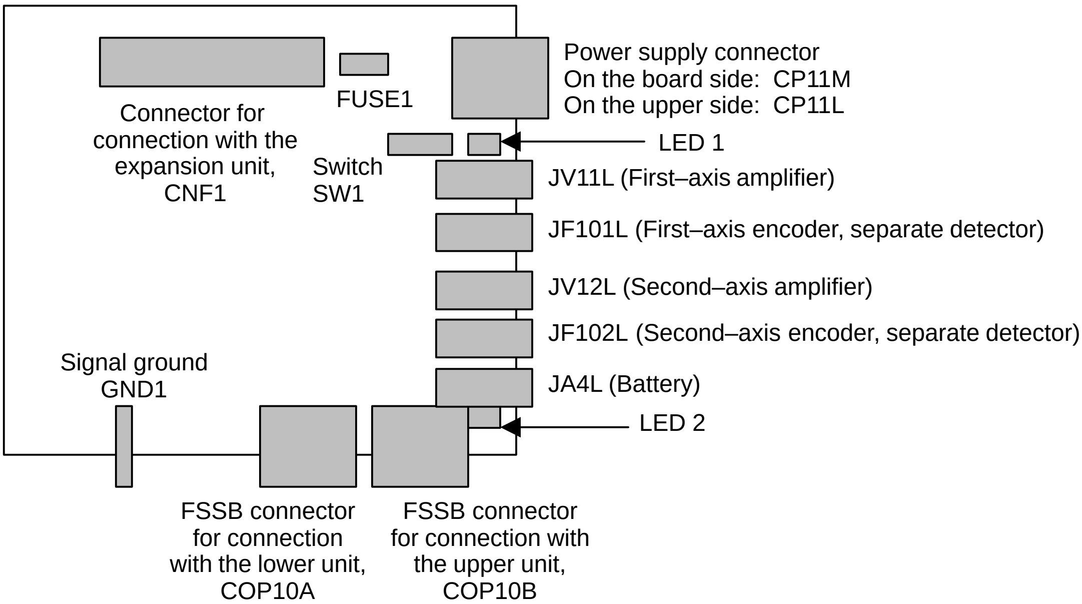
Name	Color	Meaning	Required action
LED1	Green	Power is supplied from the basic unit normally.	If this LED remains off: 1) Check the cable connecting this unit to the basic unit. 2) Check the basic unit. 3) Replace this unit.
DAL2 DAL1 DAL0	Red	Overcurrent of the load current is detected in the DO driver in the unit. Alternatively, the DO driver is heated abnormally.	If these LEDs are on: 1) Check for DO ground–fault. 2) Replace the unit.

2.3.17 Basic Unit of the Analog Servo Interface Unit

● **Specification**

Name	Specification
Printed circuit board for basic unit of the analog servo interface unit	A20B–2100–0460

● **Connector and LED locations**



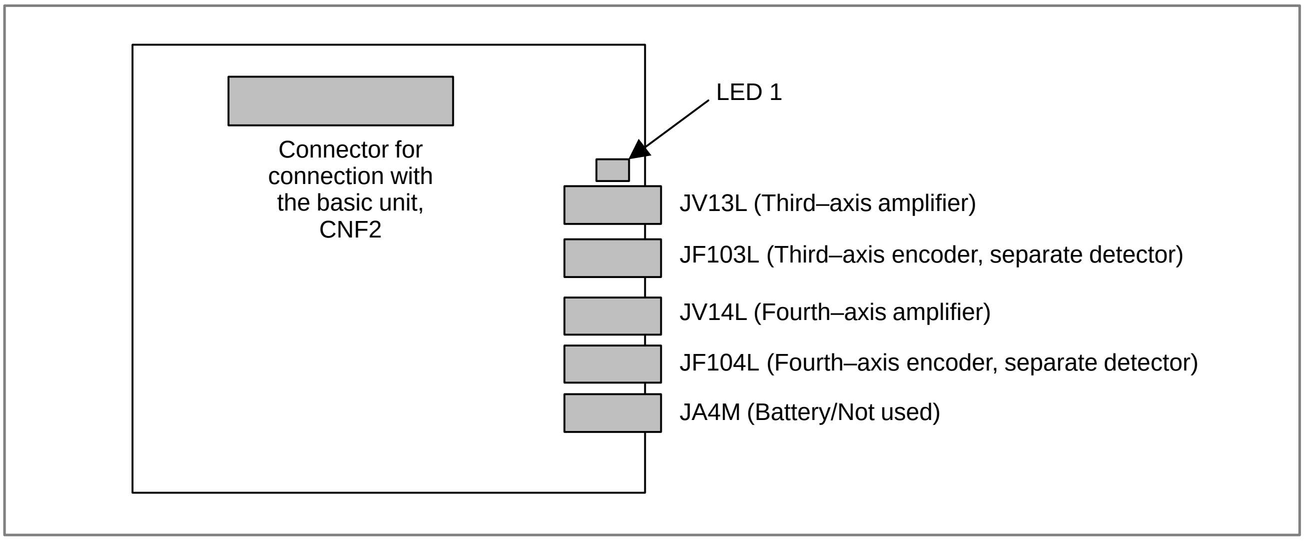
Name	Color	Meaning	Required action
LED1	Green	The power has been turned on to the unit, and the power supply circuit of the unit operates normally.	If this LED remains off: 1) Check the input power supply. 2) Check the fuse FUSE1. 3) Replace the unit.
LED2	Green	FSSB communication with the Power Mate is performed normally.	If this LED remains off: 1) Check the FSSB cable. 2) Check the Power Mate status. 3) Replace the unit.

2.3.18 Expansion Unit of the Analog Servo Interface Unit

- **Specification**

Name	Specification
Printed circuit board for expansion unit of the analog servo interface unit	A20B–2002–0870

- **Connector and LED locations**



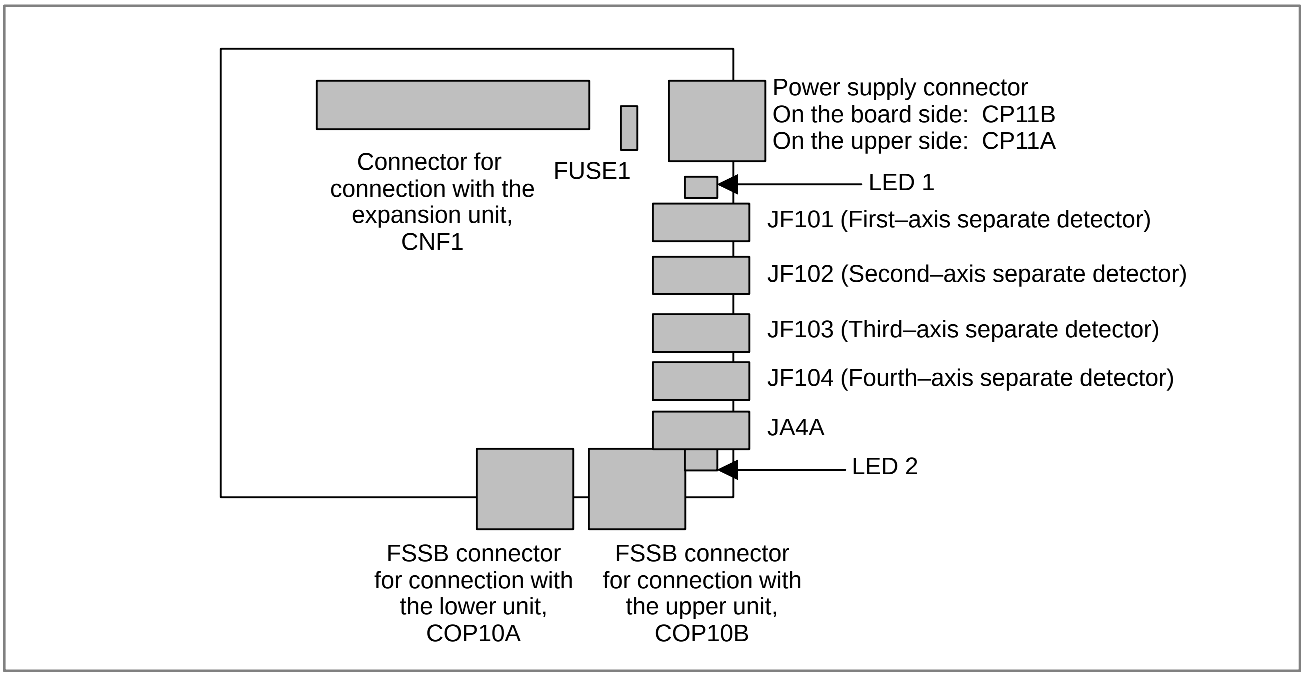
Name	Color	Meaning	Required action
LED1	Green	Power is supplied from the basic unit normally.	If this LED remains off: 1) Check the cable connecting this unit to the basic unit. 2) Check the basic unit. 3) Replace the unit.

2.3.19 Basic Unit of the Separate Detector Interface Unit

- **Specification**

Name	Specification
Printed circuit board basic unit of the separate detector interface unit	A20B–2100–0270

- **Connector and LED locations**



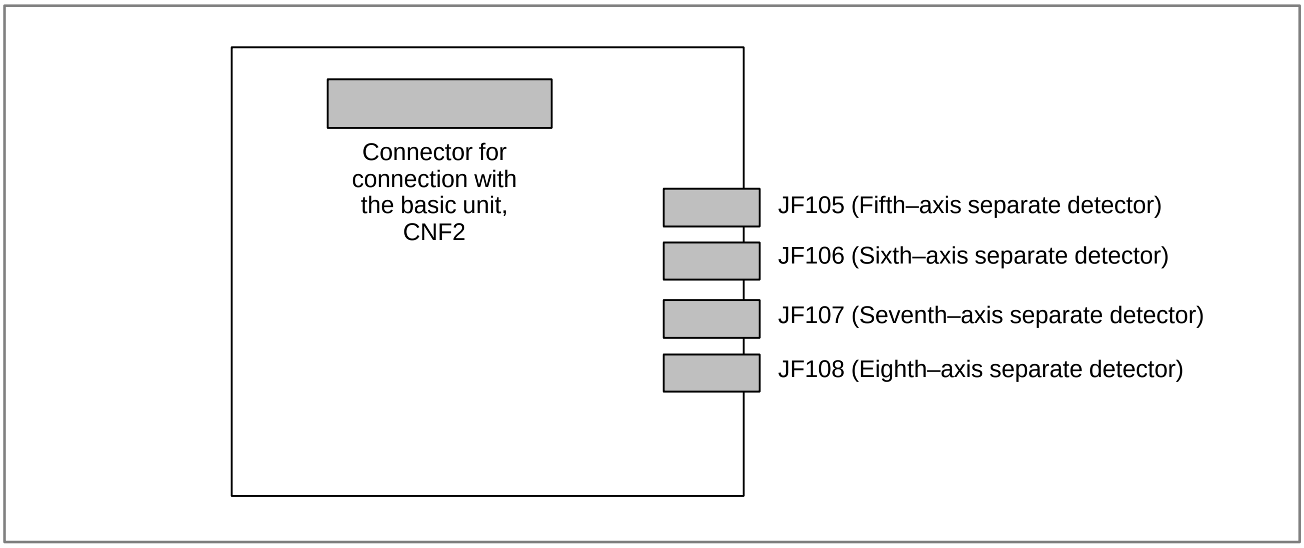
Name	Color	Meaning	Required action
LED1	Green	The power has been turned on to the unit, and the power supply circuit of the unit operates normally.	If this LED remains off: 1) Check the input power supply. 2) Check the fuse FUSE1. 3) Replace the unit.
LED2	Green	FSSB communication with the Power Mate is performed normally.	If this LED remains off: 1) Check the FSSB cable. 2) Check the Power Mate status. 3) Replace the unit.

2.3.20 Expansion Unit of the Separate Detector Interface Unit

- **Specification**

Name	Specification
Printed circuit board for expansion unit of the separate detector interface unit	A20B–2002–0570

- **Connector and LED locations**



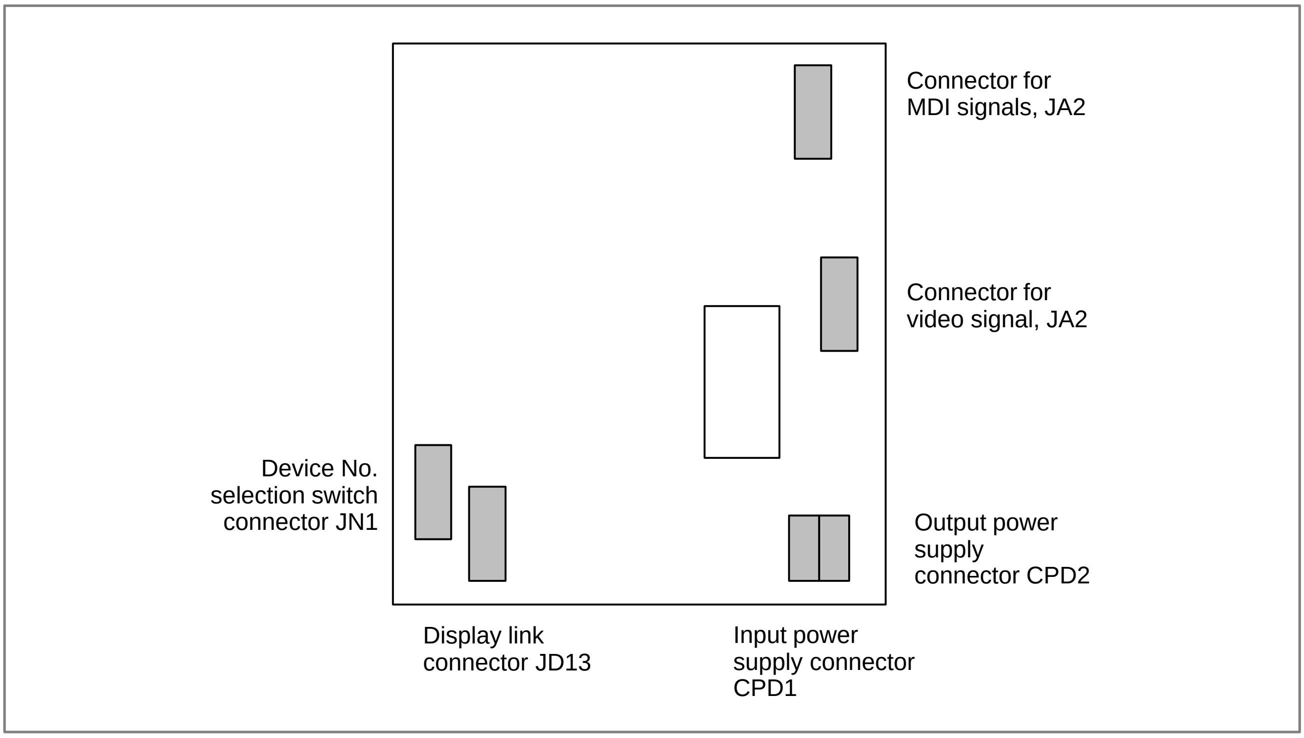
2.3.21 CRT Control Printed–circuit Board

The CRT control printed–circuit board is located on the rear of the CRT/MDI, LCD/MDI, detachable LCD/MDI, detachable LCD/MDI type B, and separate MDI. The picture display CRT control printed–circuit board is located on the rear of the picture display CRT/MDI and picture display separate MDI. They convert the display link signal to the video/MDI signal.

- **Specification**

Name	Specification
CRT control printed–circuit board	A20B–2000–084*
CRT control printed–circuit board for picture display	A20B–2100–006*

- **Connector and LED locations**

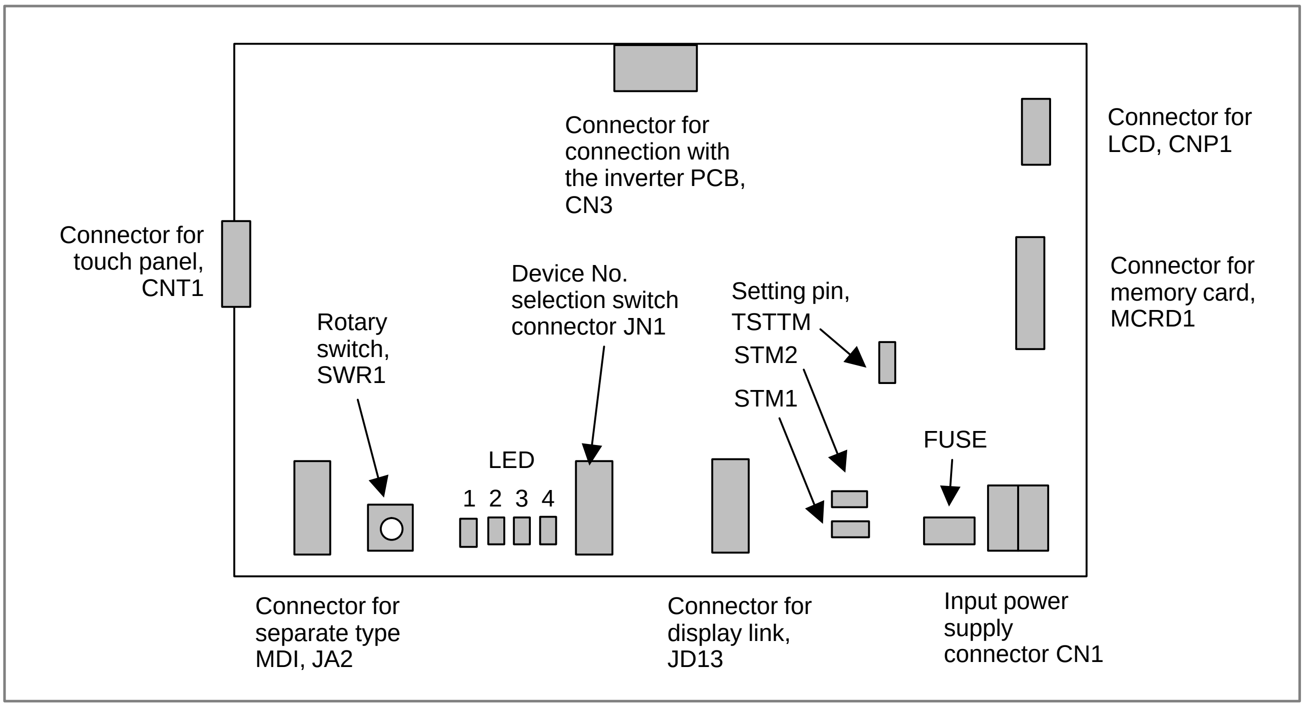


2.3.22 LCD with Touch Panel

● Specification

Name	Specification
Printed–circuit board for LCD with touch panel	A20B–8100–040*

● Connector and LED locations



Name	Color	Meaning	Required action
LED1	Red	Lights if an error occurs on the printed–circuit board.	See the following tables.
LED2	Green	Status	
LED3	Green	Status	
LED4	Green	The unit is powered, and its power supply circuit is operating normally.	

Table 2.3.22 (a) Meaning of LED indications (when the power to the LCD with touch panel is turned on)

LEDR1 Red	LEDG2 Green	LEDG3 Green	LEDG4 Green	Internal status of the LCD with touch panel and measures to be taken □ : Off ■ : On ★ : Blinks
□	□	□	■	Status: The LCD is supplied with power.
■	■	■	■	Status: The CPU for communication control has broken down. Measure: Replace the printed–circuit board for the LCD with touch panel. Status: The rotary switch SWR1 is not set to ”0”. Measure: Set the rotary switch SWR1 back to ”0”.
□	■	□	■	Status: The work SRAM has broken down. Measure: Replace the printed–circuit board for the LCD with touch panel.
■	■	□	■	Status: The control software or flash ROM has broken down. Measure: Re–install the control software on the printed–circuit board for the LCD with touch panel. If the symptom does not disappear, replace the printed–circuit board for the LCD with touch panel.
□	□	■	■	Status: The control software has broken down. Measure: Re–install the control software.

Table 2.3.22 (b) Meaning of LED indications (when the LCD is operating)

LEDR1 Red	LEDG2 Green	LEDG3 Green	LEDG4 Green	Internal status of the LCD with touch panel and measures to be taken □ : Off ■ : On ★ : Blinks
□	★	□	■	Status: The LCD with touch panel is running normally.
■	□	□	■	Status: A CPU error (illegal instruction or illegal slot) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
□	■	□	■	Status: A CPU error (CPU address error or DMA address error) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
■	■	□	■	Status: A CPU error (NMI or user break) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
□	□	■	■	Status: A CPU error (IRQ0 or IRQ1) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
■	□	■	■	Status: A CPU error (IRQ2 or IRQ3) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
□	■	■	■	Status: A CPU error (IRQ4 or IRQ5) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.
■	■	■	■	Status: A CPU error (IRQ6, IRQ7, or others interrupt) has been detected. Measure: This symptom may disappear when the power is turned off and on again. However, replace the printed–circuit board for the LCD with touch panel.

- **Rotary switch SWR1**

This rotary switch is for future expansion. Keep it factory–set (0).

- **Setting pin**

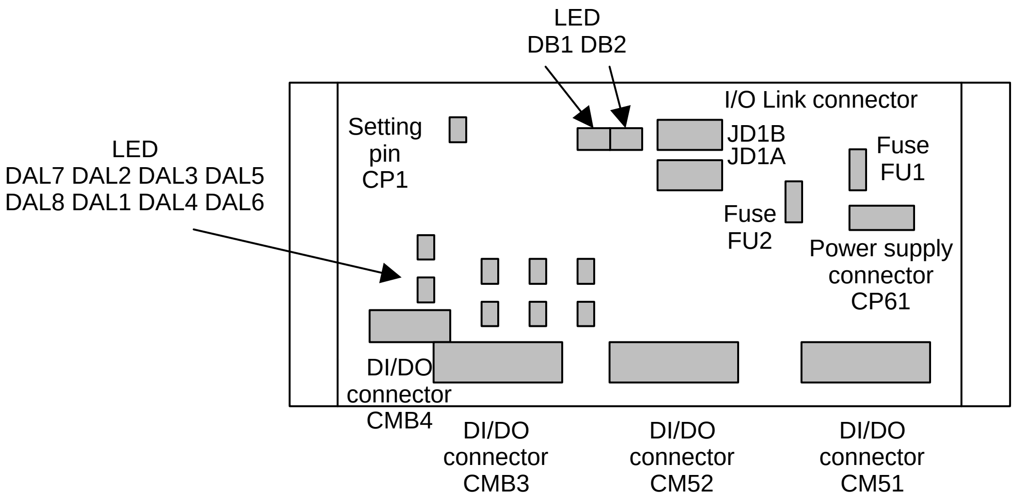
1) STM1, STM2
This setting pin works as a terminator for the display link. Usually, keep it factory–set (left side). To use this LCD with touch panel by connecting it in the middle of the display link (not to terminate), set the setting pin to the right side.
2) TSTTM
This setting pin position is for test use. Keep it factory–set (no setting pin).

2.3.23 External I/O Cards D and E

- **Specification**

Name	Specification
External I/O card D	A16B–2202–0733
External I/O card E	A16B–2202–0732

- **Connector and LED locations**



Name	Color	Meaning	Required action
DB2	Green	The power has been turned on to the unit, and the power supply circuit of the unit operates normally.	If this LED remains off: 1) Check the input power supply. 2) Check the fuse FU1. 3) Replace the printed–circuit board.
DB1	Red	An abnormality occurred during I/O Link communication with the Power Mate. When I/O Link communication has not been performed even once, this LED is off.	If this LED is on: 1) Check the Power Mate status. 2) Check the I/O Link cable. 3) Replace the printed–circuit board.
DAL1 to DAL8	Red	Overcurrent of the load current is detected in the DO driver in the unit. Alternatively, the DO driver is heated abnormally.	If these LEDs are on: 1) Check for DO ground–fault. 2) Replace the unit.

- **Setting pin CP1**

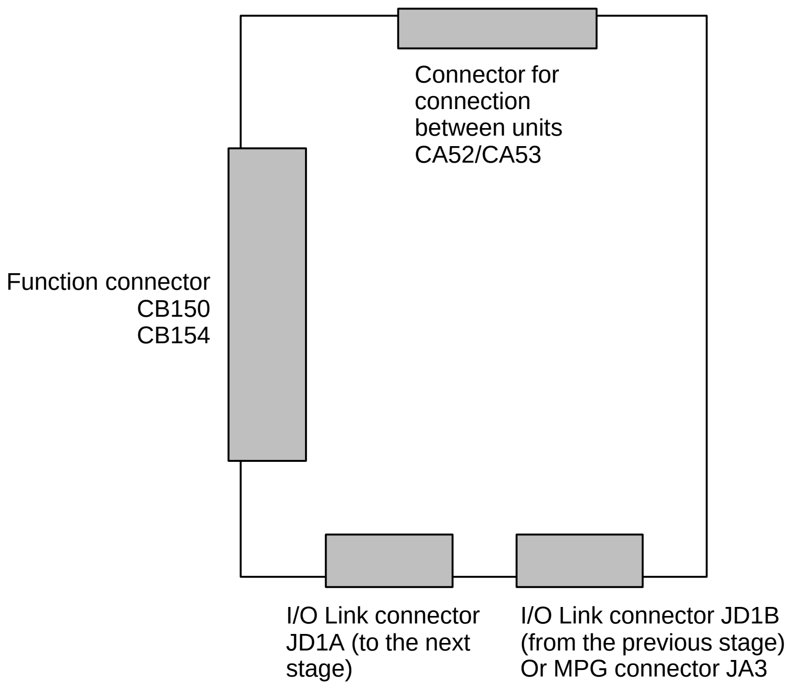
The CP1 sets whether to notify the Power Mate of a DO driver abnormality (DAL1 to DAL8) as a system alarm.
Open: Notifies the Power Mate.
Connected: Does not notify the Power Mate.

2.3.24 I/O Module for Connector Panel

- **Specification**

Name	Specification
Printed–circuit board for I/O module for connector panel (basic)	A20B–2100–0150
Printed–circuit board for I/O module for connector panel (extension A)	A20B–2002–0400
Printed–circuit board for I/O module for connector panel (extension B)	A20B–2002–0401
Printed–circuit board for I/O module for connector panel (extension C)	A20B–2100–0320
Printed–circuit board for I/O module for connector panel (extension D)	A20B–2100–0190

- **Connector and LED locations**



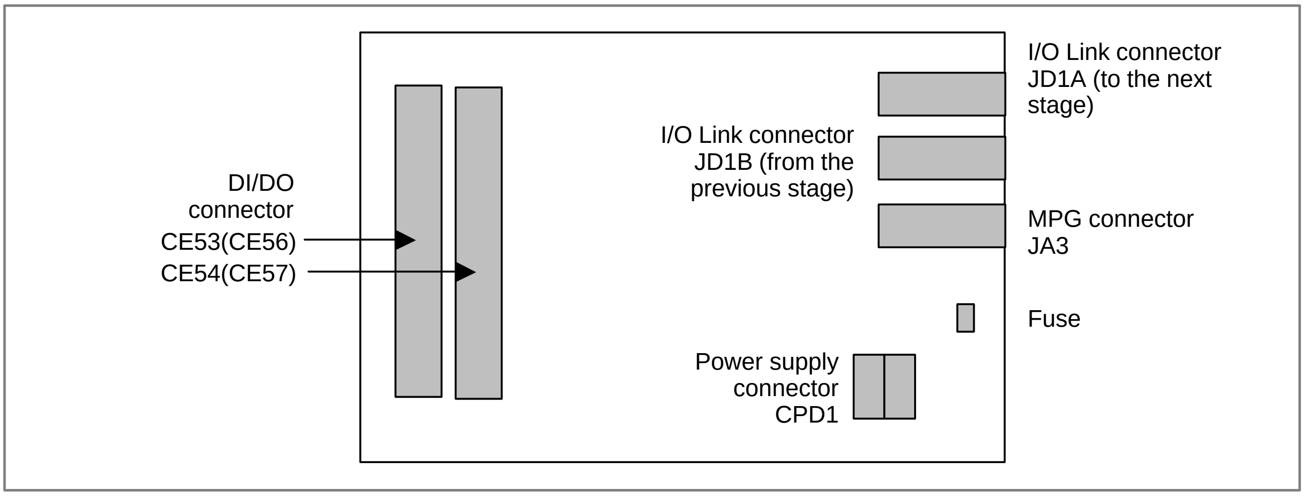
NOTE
1. The I/O Link connector JD1A/JDB is only on the basic printed–circuit board.
2. The MPG connector JA3 is only on the expansion ”A” printed–circuit board.

2.3.25 I/O Module for Operator's Panel

- **Specification**

Name	Specification
Printed–circuit board for I/O module for operator's panel A1	A20B–2002–0470
Printed–circuit board for I/O module for operator's panel B1	A20B–2002–0520
Printed–circuit board for I/O module for operator's panel B2	A20B–2002–0521

- **Connector and LED locations**

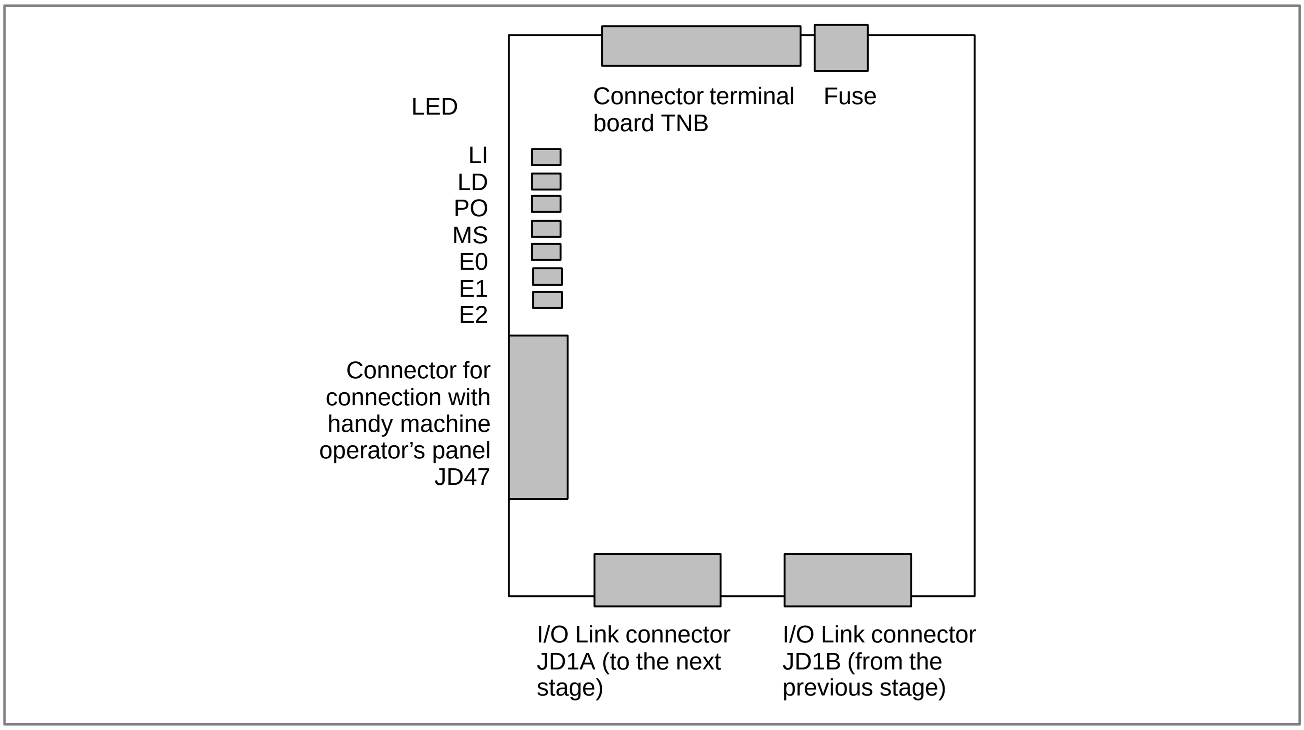


2.3.26 Interface Unit for Handy Machine Operator's Panel

- **Specification**

Name	Specification
Printed–circuit board for interface unit for handy machine operator's panel	A20B–2003–0320

- **Connector and LED locations**



Name	Color	Meaning
LI	Green	I/O Link communication in progress.
LD	Green	Communication with handy machine operator's panel in progress.
PO	Green	Power is on.
MS	Red	These lights are turned on if an error occurs. See the following table for details.
E0	Red	
E1	Red	
E2	Red	

Detailed descriptions of LED error indications (○ : On, × : Off)

MS	E0	E1	E2	Error category	Description	Major cause
○	×	×	○	Interface unit peripheral error	This unit is abnormal.	This unit is defective.
○	×	○	×	Interface unit RAM parity error	This unit is abnormal.	This unit is defective.
○	○	×	×	I/O Link error reception	An error occurred in a unit connected with the I/O Link.	Another unit connected with the I/O Link is abnormal.
○	○	×	○	I/O Link framing error	The I/O Link communication end signal is abnormal.	
○	○	○	×	I/O Link CRC error	The I/O Link communication data is abnormal.	
○	○	○	○	Interface unit watchdog error	I/O Link communication from the host was disconnected.	
×	×	×	○	Handy machine operator’s panel peripheral error	The handy machine operator’s panel is abnormal.	The handy machine operator’s panel is defective.
×	○	○	○	Handy machine operator’s panel watchdog error	Communication with this unit was disconnected.	

2.4 LIST OF UNITS AND PRINTED CIRCUIT BOARDS

2.4.1 Control Unit

Name	D	H	Specification	Remarks
Power Mate *i* basic unit	○	○	A02B–0259–B501	
CPU card B		○	A02B–0259–H001	Pentium
CPU card A	○	○	A02B–0259–H002	486DX2
CPU card C	○	○	A02B–0259–H003	MMX–Pentium
2 axes control card	○	○	A02B–0259–H011	
	○	○	A02B–0259–H015	High–speed type
	○	○	A02B–0259–H020	High–speed type
4 axes control card		○	A02B–0259–H012	
		○	A02B–0259–H016	High–speed type
		○	A02B–0259–H021	High–speed type
6 axes control card		○	A02B–0259–H013	
		○	A02B–0259–H017	High–speed type
		○	A02B–0259–H022	High–speed type
8 axes control card		○	A02B–0259–H014	
		○	A02B–0259–H018	High–speed type
		○	A02B–0259–H023	High–speed type
4M DRAM module	○	○	A02B–0259–H032	For CPU card A, B
8M DRAM module	○	○	A02B–0259–H033	
12M DRAM module	○	○	A02B–0259–H034	
4M SDRAM module	○	○	A02B–0259–H072	For CPU card C
8M SDRAM module	○	○	A02B–0259–H073	
12M SDRAM module	○	○	A02B–0259–H074	
4M/256K memory module	○	○	A02B–0259–H062	FROM 4M SRAM 256K
6M/1M memory module	○		A02B–0259–H063	FROM 6M SRAM 1M
8M/1M memory module	○	○	A02B–0259–H064	FROM 8M SRAM 1M
12M/1M memory module	○	○	A02B–0259–H065	FROM 12M SRAM 1M
Option card 1	○	○	A02B–0259–J020	Analog spindle External pulse input
Option card 2	○	○	A02B–0259–J021	Analog spindle External pulse input Analog input
HSSB board	○	○	A02B–0259–J200	
I/O Link–II slave board	○	○	A02B–0259–J210	

Name	D	H	Specification	Remarks
I/O Link–II slave board B	○	○	A02B–0259–J202	
Ethernet board	○	○	A02B–0259–J230	
Fast Ethernet board	○	○	A02B–0259–J293	
PROFIBUS–DP board	○	○	A02B–0259–J220	
PROFIBUS–DP master board	○	○	A02B–0259–J221	
DeviceNet board	○	○	A02B–0259–J240	
DeviceNet master board	○	○	A02B–0259–J241	
DeviceNet slave board B	○	○	A02B–0259–J242	
DeviceNet master board B	○	○	A02B–0259–J243	
FL–net board	○	○	A02B–0259–J272	
Back panel	○	○	A02B–0259–J010	
Blank panel	○	○	A02B–0259–J199	
DeviceNet slave board C	○	○	A02B–0259–J244	

2.4.2 Setting and Display Unit

Name	D	H	Specifications	Remarks
CRT/MDI	○	○	A02B–0166–C201#R	English key
	○	○	A02B–0166–C203#R	English key, In–line connection type
	○	○	A02B–0166–C201#S	Symbol key
	○	○	A02B–0166–C203#S	Symbol key, In–line connection type
Detachable LCD/MDI	○	○	A02B–0166–C271#R	English key
	○	○	A02B–0166–C271#S	Symbol key
Separate type MDI	○	○	A02B–0166–C210#R	English key
	○	○	A02B–0166–C213#R	English key, In–line connection type
	○	○	A02B–0166–C210#S	Symbol key
	○	○	A02B–0166–C213#S	Symbol key, In–line connection type
Picture display CRT/MDI	○	○	A02B–0166–C221#R	English key For 32 screen
	○	○	A02B–0166–C221#S	Symbol key For 32 screen
	○	○	A02B–0166–C222#R	English key For 64 screen
	○	○	A02B–0166–C222#S	Symbol key For 64 screen
Picture display separate type MDI	○	○	A02B–0166–C231#R	English key For 32 screen
	○	○	A02B–0166–C231#S	Symbol key For 32 screen
	○	○	A02B–0166–C232#R	English key For 64 screen
	○	○	A02B–0166–C232#S	Symbol key For 64 screen
Separate type CRT	○	○	A02B–0120–C111	
Separate type PDP	○	○	A02B–0200–C100	24V DC input
Separate type LCD	○	○	A02B–0166–C251	
Detachable type LCD/MDI	○	○	A02B–0166–C271#R	English key
	○	○	A02B–0166–C271#S	Symbol key
Detachable type LCD/MDI B	○	○	A02B–0166–C291#R	

Name	D	H	Specifications	Remarks
Display link terminal unit	○	○	A02B–0259–D001	
Display link adapter	○	○	A02B–0259–C301	
Handy operator's panel	○	○	A02B–0211–C020#R	English key
	○	○	A02B–0211–C020#S	Symbol key
Handy operator's panel Type B	○	○	A02B–0211–C050#R	English key
	○	○	A02B–0211–C050#S	Symbol key
Monochrome LCD with touch panel	○	○	A02B–0259–C211	
Color LCD with touch panel	○	○	A02B–0259–C212	
Separate type MDI for touch panel	○	○	A02B–0236–C120#MBR	English key
	○	○	A02B–0236–C120#MBS	Symbol key

2.4.3 Other Units

Name	D	H	Specifications	Remarks
Basic connector panel I/O module	○	○	A03B–0815–C001	
Branch–out I/O module expansion A	○	○	A03B–0815–C002	
Branch–out I/O module expansion B	○	○	A03B–0815–C003	
Branch–out I/O module expansion C	○	○	A03B–0815–C004	
Branch–out I/O module expansion D	○	○	A03B–0815–C005	
FSSB I/O module basic unit	○	○	A02B–0236–C211	
FSSB I/O module expansion unit	○	○	A02B–0236–C212	
Separate detector interface unit, basic unit	○	○	A02B–0236–C203	
Separate detector interface unit, additional unit		○	A02B–0236–C204	
Analog servo interface unit, basic unit	○	○	A02B–0259–C180	
Analog servo interface unit, expansion unit		○	A02B–0259–C181	
Handy machine operator's panel	○	○	A02B–0259–C221#A	
Interface unit	○	○	A02B–0259–C220	

2.4.4 Printed–circuit Boards of the Control Unit

Type	Name	D	H	Specifications	ID	Remarks
Base PCB	Base PC board	○	○	A16B–3200–0260	DD	
Card PCB	CPU card B	○	○	A20B–3300–0051	01	Pentium
	CPU card A	○	○	A20B–3300–0071	09	486DX2
	CPU card C	○	○	A20B–3300–0171	11	MMX–Pentium
				A20B–3300–0261		MMX–Pentium
	Axis control card	○	○	A20B–3300–0031	X0	2 axes
				A20B–3300–0033		
		○	○	A20B–3300–0121	X4	2 axes/high speed
				A20B–3300–0243	08	
			○	A20B–3300–0030	X1	4 axes
				A20B–3300–0032		
			○	A20B–3300–0120	X5	4 axes/high speed
				A20B–3300–0242	08	
			○	A17B–3300–0101	X2	6 axes
				A17B–3300–0103		
			○	A17B–3300–0201	X6	6 axes/high speed
				A20B–3300–0241	08	
				A20B–3300–0245		
			○	A17B–3300–0100	X3	8 axes
				A17B–3300–0102		
			○	A17B–3300–0200	X7	8 axes/high speed
				A20B–3300–0240	08	
				A20B–3300–0244		
	Option card	○	○	A20B–3300–0131	–	Analog spindle External pulse input
		○	○	A20B–3300–0130	–	Analog spindle External pulse input Analog input

Type	Name	D	H	Specifications	ID	Remarks
DIMM module	DRAM module	○	○	A20B–3900–0042	85	For CPU card A, B
		○	○	A20B–3900–0041	86	
		○	○	A20B–3900–0040	87	
	SDRAM module			A20B–3900–0132	A5	CPU card C
		○	○	A20B–3900–0131	A6	
		○	○	A20B–3900–0130	A7	
	Memory module	○	○	A20B–3900–0080	41 01	FROM 4M SRAM 256K
		○		A20B–3900–0120	42 03	FROM 6M SRAM 1M
		○	○	A20B–3900–0141	43 03	FROM 8M SRAM 1M
		○	○	A20B–3900–0140	25 03	FROM 12M SRAM 1M
Option board	HSSB board	○	○	A20B–8001–0730	AA	
	I/O–Link–II board	○	○	A20B–8100–0310	C4 or 95	
	I/O Link–II board B	○	○	A20B–8100–0381	F9	
	Ethernet board	○	○	A20B–8100–0450	E6	
	Fast Ethernet board	○	○	A20B–8100–0670	97	
	PROFIBUS–DP board	○	○	A20B–8100–0440	E3	
	PROFIBUS–DP master board	○	○	A20B–8100–0470	FC	
	DeviceNet board	○	○	A20B–8100–0490	EF	Master and slave
	DeviceNet board B	○	○			
	DeviceNet board C	○	○	A20B–8100–0650	BF	
	FL–net board	○	○	A20B–8100–0530	59	
Back panel	Back panel	○	○	A20B–2002–0680		
Others	PC board for fan connection	○	○	A20B–9002–0240		

2.4.5 Printed–circuit Boards of Setting and Display Unit

Name	D	H	Specifications	Remarks
CRT Control printed board	○	○	A20B–2000–084*	
	○	○	A20B–2100–0061	For picture display 32 screen
	○	○	A20B–2100–0060	For picture display 64 screen
Handy operator's panel	○	○	A20B–2002–0200	
Display link adaptor	○	○	A20B–1007–0360	

2.4.6 Other Printed–circuit Boards

Type	Name	D	H	Specifications	Remarks
I/O	External I/O card D	○	○	A16B–2202–0733	
	External I/O card E	○	○	A16B–2202–0732	
	Operator's panel I/O module A1	○	○	A20B–2002–0470	
	Operator's panel I/O module B1	○	○	A20B–2002–0520	
	Operator's panel I/O module B2	○	○	A20B–2002–0521	
	Basic branch–out I/O module	○	○	A20B–2100–0150	
	Branch–out I/O module expansion A	○	○	A20B–2002–0400	
	Branch–out I/O module expansion B	○	○	A20B–2002–0401	
	Branch–out I/O module expansion C	○	○	A20B–2100–0320	
	Branch–out I/O module expansion D	○	○	A20B–2100–0190	
	FSSB I/O module basic unit	○	○	A20B–2100–0390	
	FSSB I/O module expansion unit	○	○	A20B–2002–0860	
	Analog servo interface unit, basic unit	○	○	A20B–2100–0460	
	Analog servo interface unit, expansion unit		○	A20B–2002–0870	
Others	I/O Link connection unit (electric–optical)	○	○	A20B–2000–0410	
	I/O Link connection unit (electric–electric)	○	○	A20B–2000–0411	
	I/O Link connection unit (optical–optical)	○	○	A20B–2000–0412	
	Separate detector interface unit, basic unit	○	○	A20B–2100–0270	
	Separate detector interface unit, additional unit		○	A20B–2002–0570	
	Control PCB of Handy machine operator's panel	○	○	A20B–8002–0180	
	Keyboard PCB of Handy machine operator's panel	○	○	A20B–8002–0200	
	Interface unit of Handy machine operator's panel	○	○	A20B–8002–0320	

2.5 METHODS FOR DISMOUNTING AND MOUNTING FAN UNITS AND FANS

WARNING

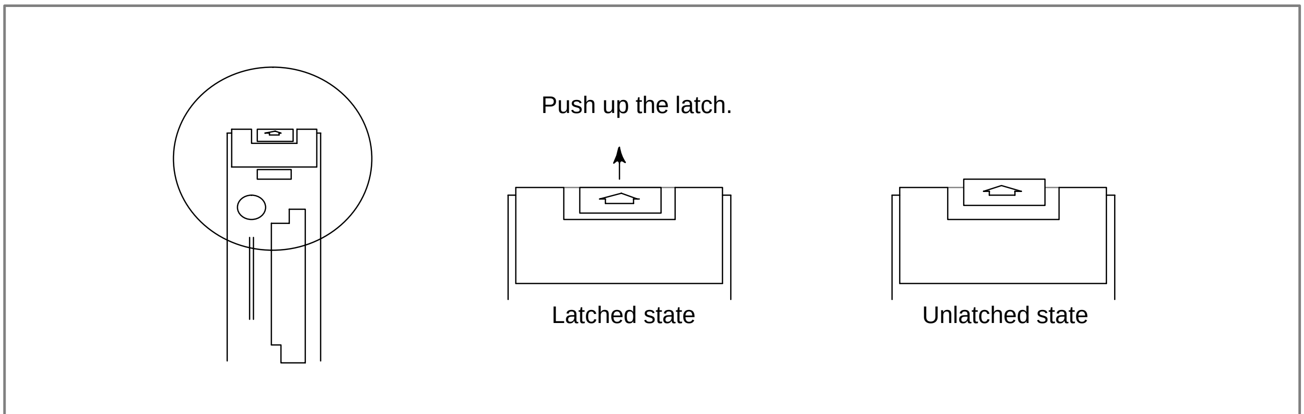
When opening the cabinet and replacing a fan unit, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover).
Touching the uncovered high–voltage circuits presents an extremely dangerous electric shock hazard.

2.5.1 Cooling Fans

The Power Mate *i* is equipped with two cooling fans. If even one of the two fans stops, a FAN warning message appears on the display and setting unit such as the CRT/MDI. In addition, the fan alarm signal FANAL1 <F248#5> or FANAL2 <F248#6> that corresponds to the stopped fan is output to the PMC. When the Power Mate *i* is used continuously after the alarm is generated, the life of the Power Mate *i* may be shorten. Replace the fans as soon as possible. Replace the two fans at a time.
When a fan stops, and if there is a possible danger that the Power Mate *i* will crash because of overheat, system alarm 978 (fan overheat alarm) is generated, causing the Power Mate *i* to stop operating. In this case, "F." blinks on the 7–segment LED. If a fan stops when system alarm 978 is issued, the Power Mate *i* does not operate unless the fans are replaced.

2.5.2 Method for Dismounting the Fan Unit

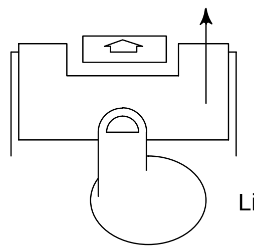
(1) Push up the latch from the upper section of the unit to dismount it.



CAUTION

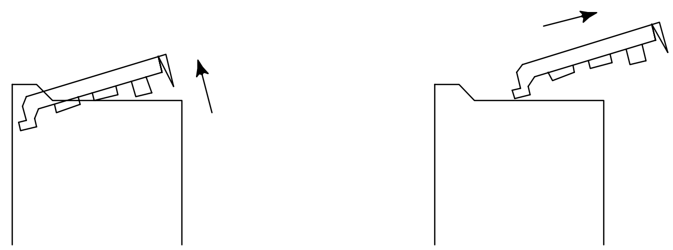
Do not lift up the entire latch. Just unlatch. If you push up the latch forcibly, it may be broken.

(2) Put your finger on the lower section of the front surface of the fan unit, and lift it up.



(3) Lift up the fan unit until it is tilted to about 30 degrees.

(4) Dismount the fan unit by pulling it upward and toward you.

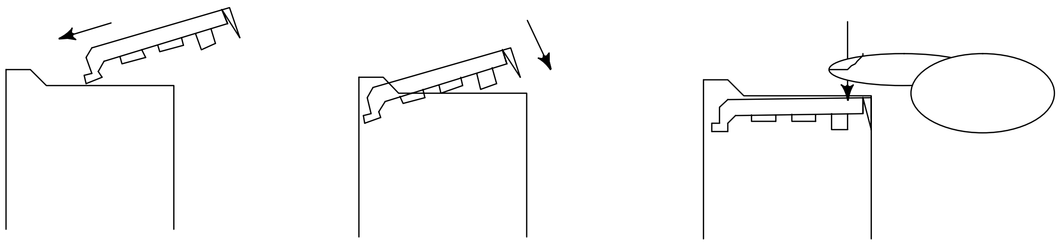


2.5.3 Method for Mounting the Fan Unit

(1) Tilt the fan unit to about 30 degrees, and push it in all the way until it hits the far wall of the main unit.

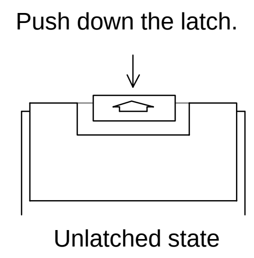
(2) Lower and place the fan unit gently on the main unit.

(3) Push the fan unit at the upper section of its front side (side facing you) to cause it to snap in the upper section of the main unit.



CAUTION
The fan unit and the main unit are coupled directly using a connector. If they are not coupled correctly, the coupling portions of the connectors may be damaged.

(4) Push down the latch on the upper section of the fan unit to latch it.

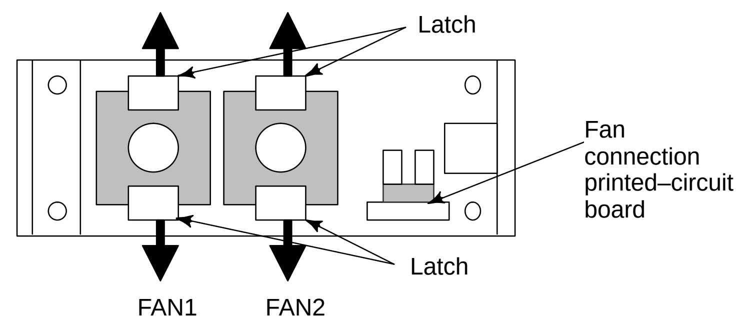


(5) Switch on the power, and make sure that no fan alarm condition does not occur and that both fans are rotating.

NOTE
1 If the fan unit has not been coupled with the main unit correctly, the fans on the fan unit may fail to run even when the power is switched on, or a fan alarm may be issued even when the fans are rotating.
2 If a force stronger than usual is needed to couple the fan unit with the main unit, check that the pins of the connector on the base printed–circuit board are straight. Also check that the base printed–circuit board has been inserted securely all the way through.

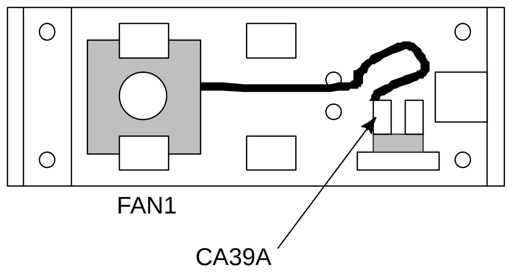
2.5.4 Method for Replacing Fans

(1) Dismount the fan unit by following the procedure described in Section 2.5.1.
(2) Unlatch the fan.

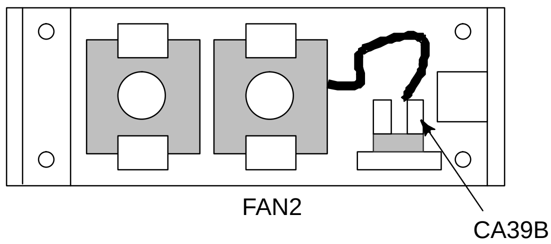


(3) Dismount the fan (FAN2) at the right side (in the above figure) first, then the one (FAN1) at the left side.
(4) Detach the fan connectors from the fan connector printed–circuit board.

(5) Attach the cable connector of a replacement fan to the left–side connector (CA39A) on the fan connection printed–circuit board first, and place the fan at a location labeled FAN1 with the cable held to the right, then latch it. Be sure to lay the fan cable under FAN2.



(6) Attach the cable connector of another replacement fan to the right–side connector (CA39B) on the fan connection printed–circuit board first, and place the fan at a location labeled FAN2 with the cable held to the right, then latch it.



(7) Attach the fan unit to the main unit by following the mounting procedure described in Section 2.5.3.

NOTE

1. Replace the two fan units simultaneously.
   Replacement fan (control section): A02B–0259–K120, with two fans
2. If a fan is installed right–side left, or if the connector of the right–side fan is attached to the left–side fan connector on the fan connection printed–circuit board or vice or versa, the wrong fan number will be displayed when a fan alarm condition occurs.

2.6 METHODS FOR DISMOUNTING AND MOUNTING PRINTED–CIRCUIT BOARDS

WARNING

Do not dismount or mount printed–circuit boards unless you have received maintenance and safety training.
When opening the cabinet and replacing a printed–circuit board, be careful not to touch the high–voltage circuits (marked ⚠ and fitted with an insulating cover). Touching directly the high–voltage circuits gives you a shock hazard.

CAUTION

When replacing a printed–circuit board, note the following:

1. When dismounting the printed–circuit board, be careful not to touch semiconductor devices on the board by hand or not to allow these devices to touch other parts.
2. Check that the settings for the new printed–circuit board are correct.
3. After replacement, make adjustments, if necessary, for the printed–circuit board correctly.
4. Cables removed during replacement must be connected as they were connected previously. If there is a possibility that the connection points of cables will be confusing, note down the connection points before removing the cables.
5. Before replacing the printed–circuit board, turn off the power to the control unit.

2.6.1 Methods for Dismounting and Mounting the Base Printed–circuit Board

CAUTION

1 The fan unit must be removed before the base printed–circuit board can be dismounted. If you attempt to dismount the base printed–circuit board without removing the fan unit, both the fan unit and base printed–circuit board may be damaged.

2 If there is an I/O Link cable under the unit, an attempt to dismount the base printed–circuit board without removing the cable may damage the plastic case.

3 When the base printed–circuit board is dismounted, the content of the Power Mate SRAM memory may be lost while it is kept dismounted. Before dismounting the base printed–circuit board, be sure to save the content of the SRAM memory to the built–in FROM. See the relevant description in Appendix E or F.

4 When dismounting and mounting the base printed–circuit board with the battery connected, be careful not cause it to touch other metal portions, because the battery voltage is being applied to the printed–circuit board.

Dismounting procedure

1) Detach all cables other than the battery cables. If there is a cable in the lower section of the unit (on the base PCB and option board), do not forget to detach it also. (Check that a detached connector is labeled its connector number.)
2) Dismount the fan unit by following the dismounting procedure described in Section 2.5.2.
3) Hold the base printed–circuit board by grabbing its handles, A and B. (See Fig. 2.6.1.)
4) Pull out the base printed–circuit board by pushing it at handle B.

NOTE

1 The battery is attached to the face plate of the base printed–circuit board. It is pulled out together with the base printed–circuit board.

2 The base printed–circuit board can be dismounted without removing option boards; cables attached to the option boards must be dismounted, however.

Mounting procedure

1) Hold the base printed–circuit board by grabbing its handles, A and B, and insert it into the rack all the way through, then engage it with the backpanel connector.
2) Place the fan unit back into the previous location by following the mounting procedure described in Section 2.5.3.
3) Attach the cables detached before, correctly.
4) Switch on the power, and make sure that the printed–circuit board operates normally.

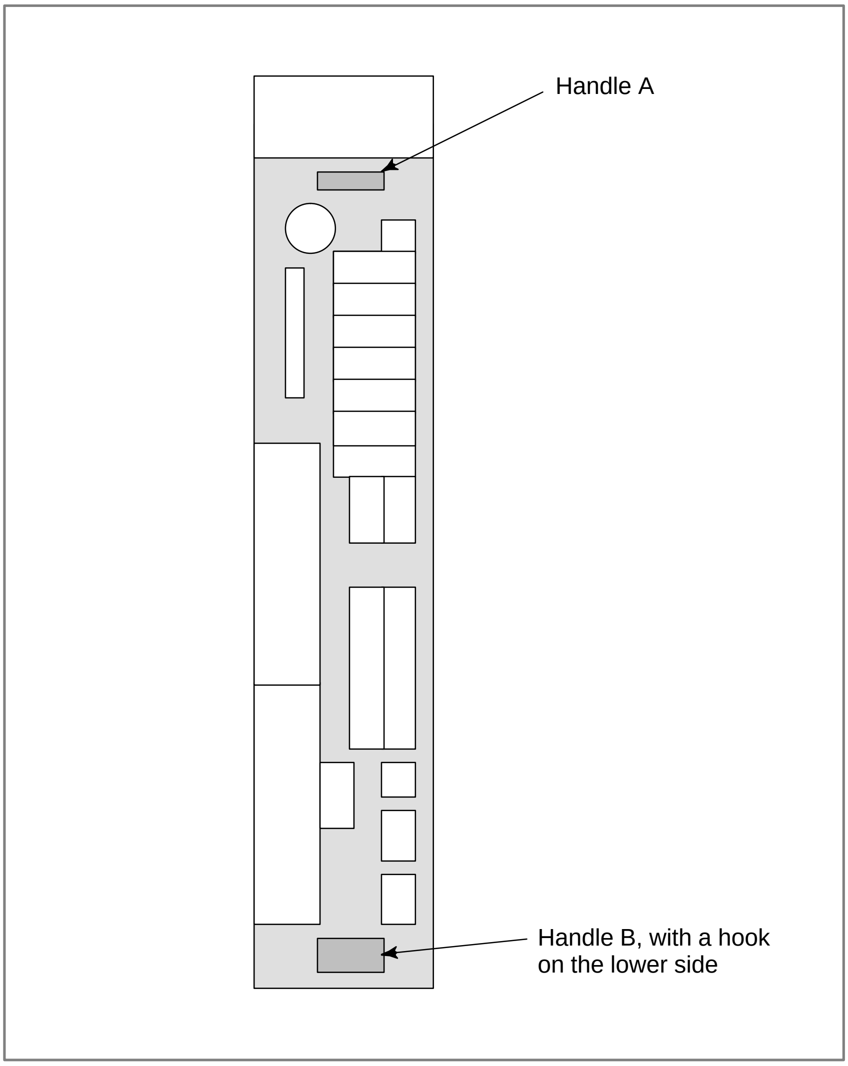


Fig. 2.6.1 Base printed–circuit board handles

Replacement procedure

CAUTION

1 Before replacing the base printed–circuit board, remove the card PCBs and DIMM modules on the base printed–circuit board, and mount them on a new base printed–circuit board. As the memory module is removed, the SRAM memory contents are erased. Therefore, before starting the replacement, check that a backup copy of the latest SRAM data is saved in a memory card or Handy File. Also, it is recommended that the data in the SRAM be backed up into the built–in FROM of the Power Mate. See Appendix E.

2 Observe the CAUTIONS on the methods for dismounting and mounting the base printed–circuit board, methods for mounting and dismounting card PCBs, and methods for mounting and dismounting DIMM modules.

(1) Remove the lithium battery.

(2) Dismount the base printed–circuit board by following the dismounting procedure explained previously.

(3) Remove the CPU card, axis control card, option card, and memory card by following the method for mounting and demounting card PCBs in Section 2.6.2 and the method for mounting and demounting DIMM modules in Section 2.6.3.

(4) Mount the CPU card, axis control card, option card, and memory card on the new base printed–circuit board by following the method for mounting and demounting card PCBs in Section 2.6.2 and the method for mounting and demounting DIMM modules in Section 2.6.3.

(5) Mount the base printed–circuit board by following the mounting procedure explained previously.

(6) Mount the lithium battery.

(7) Restore the SRAM memory data.

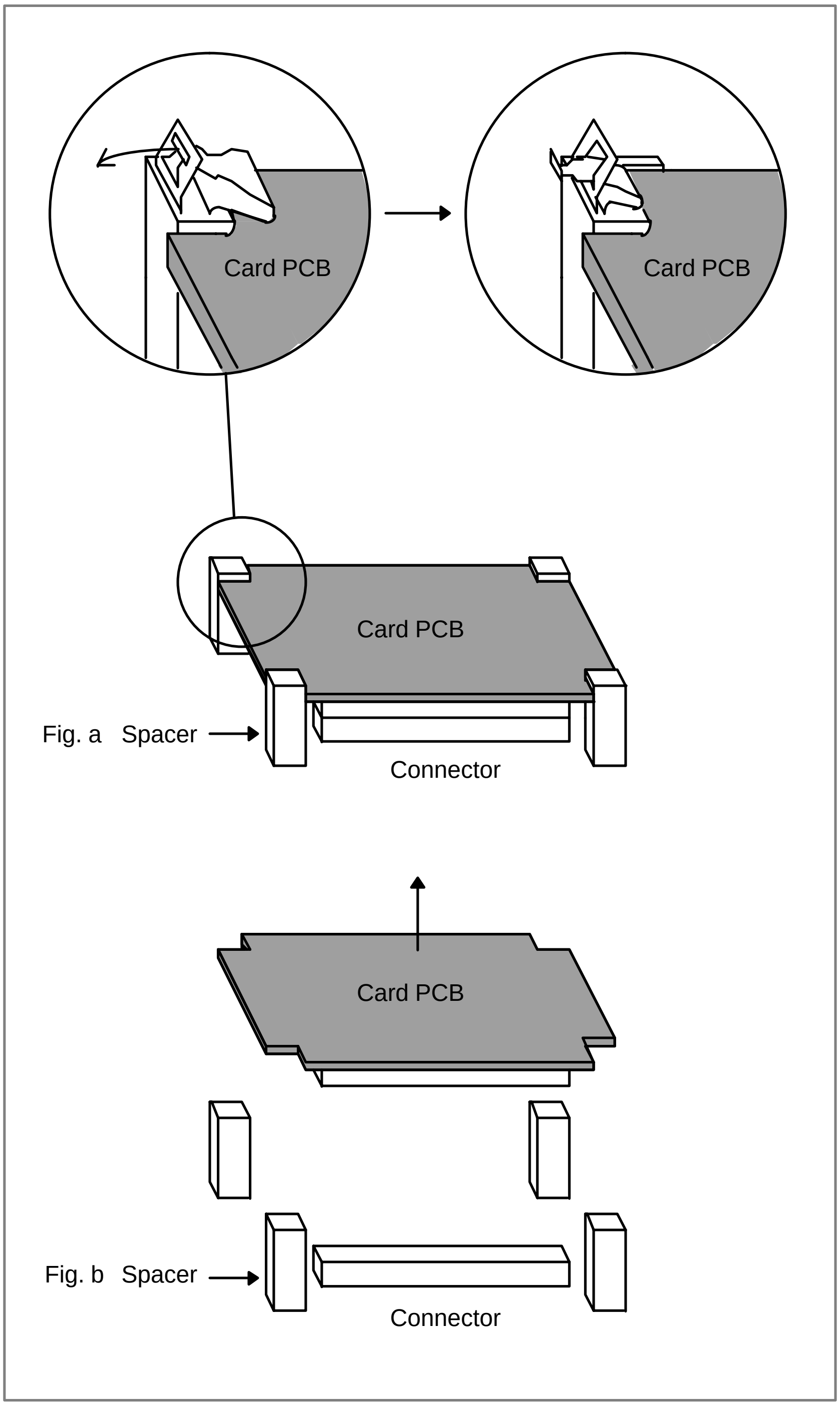
2.6.2 Mounting and Demounting Card PCBS

CAUTION

1 The base printed–circuit board must be removed before the PCB card can be dismounted and mounted. Observe the CAUTIONS in Section 2.6.1.
2 Be careful not install the PCB card in an incorrect location. Otherwise, the printed–circuit board may be damaged. See Section 2.3.1 for where to install the PCB card.
3 The boot software is stored in the FROM on the CPU card. When replacing the CPU card, make sure that the function stored on the replacement CPU card is of the same version as before or of a later version. Otherwise, it may be inoperable. (The version of the system software has nothing to do with the general version of the printed–circuit board.)
4 The installed boot software varies depending on the type of the CPU card. When replacing the CPU card, make sure that the replacement CPU card is also a Power Mate *i* CPU card. Note that the 16*i*/18*i*/21*i* CPU card cannot be used in place of the Power Mate *i* CPU card.

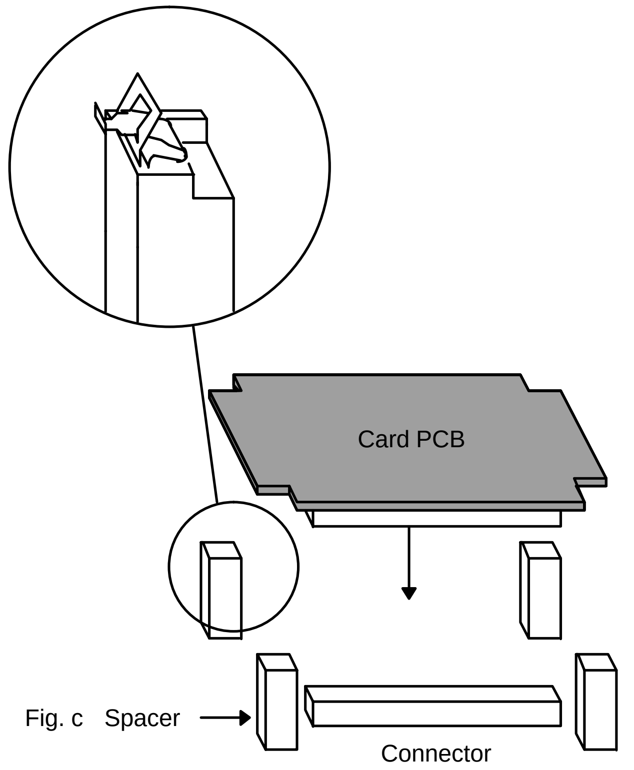
Demounting a card PCB

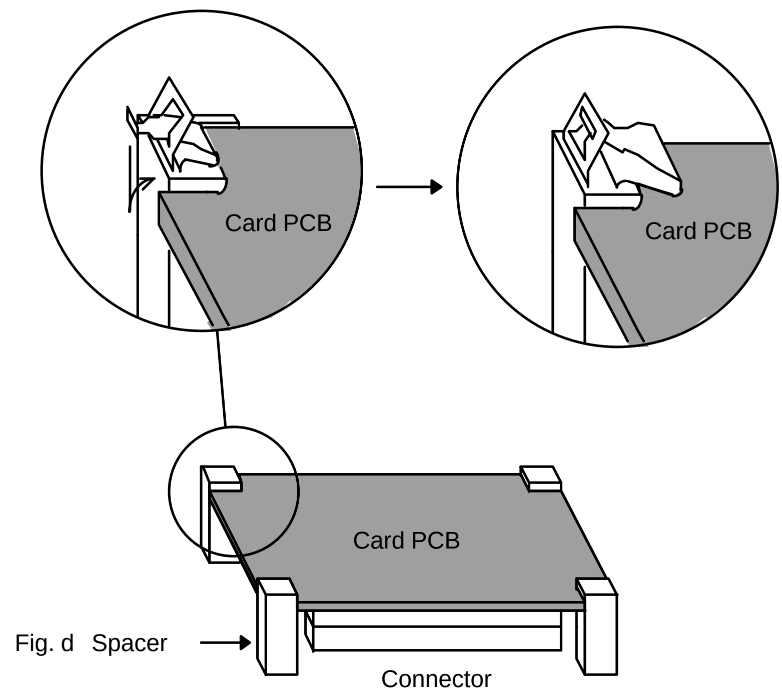
1) Dismount the base printed–circuit board by following the dismounting procedure described in Section 2.6.1.
2) Pull outward the claw of each of the four spacers used to secure the card PCB, then release each latch. (See Fig. a.)
3) Extract the card PCB upward. (See Fig. b.)



Mounting a card PCB

1) Check that the claw of each of the four spacers is latched outward, then insert the card PCB into the connector. (See Fig. c.)
2) Push the claw of each spacer downward to secure the card PCB. (See Fig. d.)
3) Mount the base printed–circuit board by following the mounting procedure described in Section 2.6.1.





2.6.3 Mounting and Demounting DIMM Modules

The DIMM module in the Power Mate *i* is either a memory or DRAM module.

The memory module is installed on the DIMM connector on the base printed–circuit board. To dismount the memory module, it is necessary to remove the axis control card in advance by following the dismounting procedure described in Section 2.6.2.

The DRAM module is installed on the DIMM connector on the CPU card. To dismount the DRAM module, it is necessary to remove the CPU card in advance by following the dismounting procedure described in Section 2.6.2.

CAUTION

1 To remove the axis control card and CPU card, it is necessary to remove the base printed–circuit board in advance by following the dismounting procedure described in Section 2.6.1. Carefully observe the CAUTION described in Section 2.6.1.
2 The memory module contains a battery–backed SRAM. An attempt to dismount and mount the memory module causes the content of the SRAM to be lost. Do not forget to make a back–up copy of the latest SRAM data into a memory card or Handy File before dismounting the memory module. It is recommended that the SRAM data also be backed up into the built–in FROM of the Power Mate. (See Appendix E or F.)
3 Replacing the memory module with the battery voltage applied to it may damage the memory module and battery. If you want to dismount and mount the memory module, be sure to remove the battery before attempting to dismount the base printed–circuit board.
4 The FROM on the memory module contains many types of system software. (See Section 2.2.5.) When replacing the memory module, make sure that the functions stored in the FROM are of the same version as before the replacement or of a later version. Otherwise, some of the functions may become unavailable.
5 Be careful not to touch the pins of the DIMM module.

Demounting a DIMM Module

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

Mounting a DIMM Module

1) Insert the module slantly into the module socket, with side B facing upward. (See Fig. b.)
2) Push the module downward until it is locked. (See Fig. c.)

Fig. a

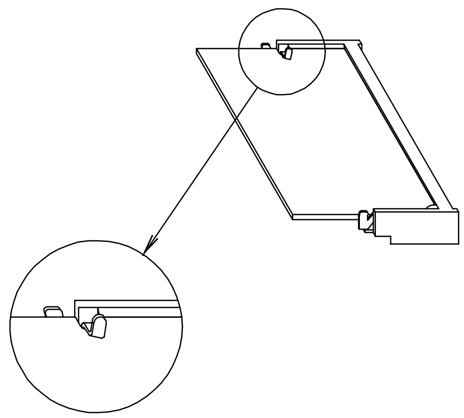


Fig. b

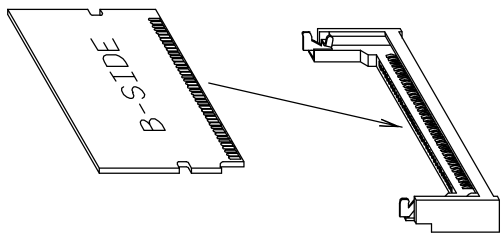
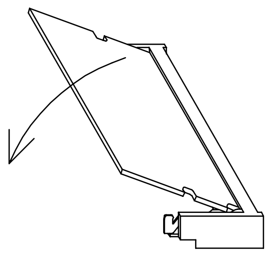


Fig. c



2.6.4 Methods for Dismounting and Mounting the Option Board

Dismounting procedure

1) To pull out the option board, first detach any interfering cable. (Make sure that the detached cable is labeled the number of the mating connector.)
2) Hold the option board by grabbing its handles, C and D. (See Fig. 2.6.4.)
3) While pushing the latch of handle C to the right, pull out the option board.

> **NOTE**
> The option board can be dismounted without removing the base printed–circuit board. (It is necessary to detach any interfering cable, however.)
> Only one exception is the DeviceNet board. See Section 2.6.5.

Mounting procedure

1) Hold the option board by grabbing its handles, C and D, then insert the option board into the rack all the way through until it snaps in the corresponding connector on the backpanel.
2) Attach any cable detached before, correctly.
3) Switch on the power, and make sure that the option board operates normally.

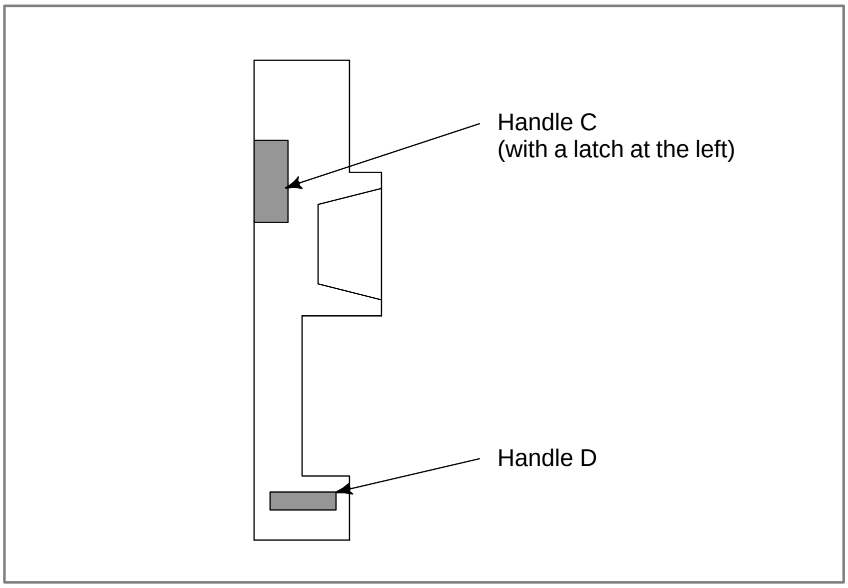


Fig. 2.6.4 Option board handles

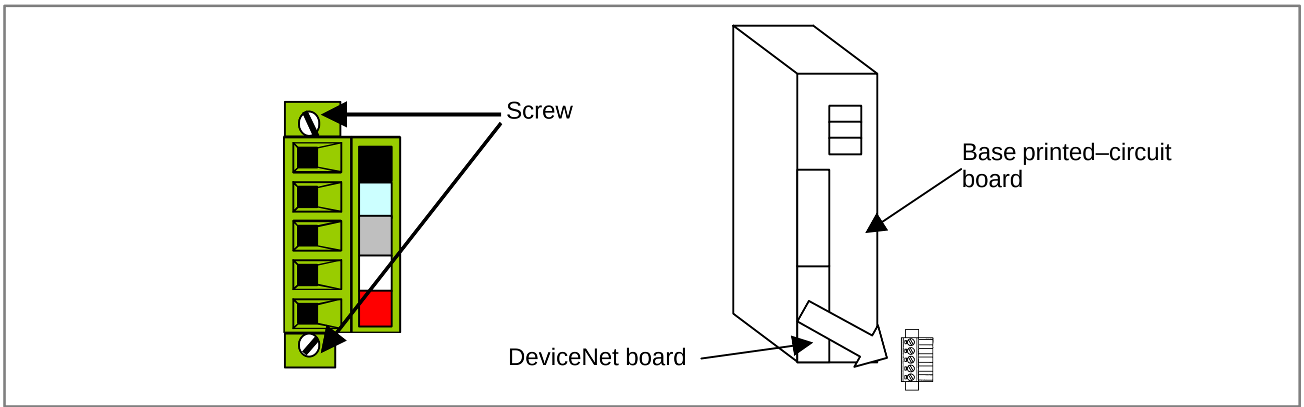
2.6.5 Methods for Dismounting and Mounting the DeviceNet Board

The DeviceNet board must be dismounted from and mounted on the control unit according to the procedure described below.

CAUTION
To dismount and mount the DeviceNet board, it is necessary to remove the base printed–circuit board in advance by following the dismounting procedure described in Section 2.6.1. Carefully observe the CAUTION described in Section 2.6.1.

Dismounting the DeviceNet board

(1) Removing the DeviceNet connector terminal board
The terminal board of the interface connector of the DeviceNet board can be removed with the cable left attached to the connector. Loosen the two screws as shown in the figure below, then pull out the terminal board toward you.



NOTE
The terminal board of this connector must be removed before the base printed–circuit board can be dismounted.

(2) Dismounting the base printed–circuit board
<u>Before dismounting the DeviceNet board, dismount the base printed–circuit board.</u>
For how to dismount the base printed–circuit board, see Section 2.6.1.

CAUTION
The base printed–circuit board must be dismounted before the DeviceNet board can be dismounted. An attempt to dismount the DeviceNet board without dismounting the base printed–circuit board causes the DeviceNet board to interfere with the base printed–circuit board, which may damage the board.

(3) Dismounting the DeviceNet board
After dismounting the base printed–circuit board, dismount the DeviceNet board. For how to dismount the DeviceNet board, see Section 2.6.4.

Mounting the DeviceNet board

(1) Dismounting the base printed–circuit board
Before mounting the DeviceNet board, dismount the base printed–circuit board.
For how to dismount the base printed–circuit board, see Section 2.6.1.

> **CAUTION**
> The base printed–circuit board must be dismounted before the DeviceNet board can be mounted. An attempt to mount the DeviceNet board without dismounting the base printed–circuit board causes the DeviceNet board to interfere with the base printed–circuit board, which may damage the board.

(2) Removing the DeviceNet connector terminal board
From the DeviceNet board, remove the interface connector terminal board. Loosen the two screws as shown in the figure below, then remove the board.

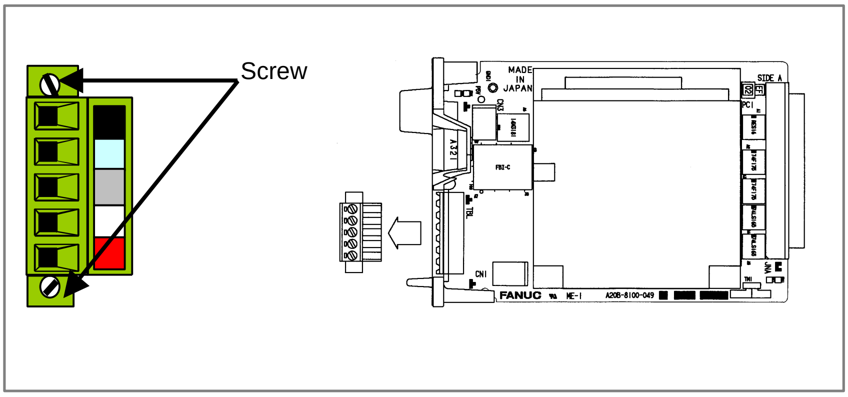


Fig. 2.6.5

(3) Mounting the DeviceNet board
After dismounting the base printed–circuit board, mount the DeviceNet board.
For how to mount the DeviceNet board, see Section 2.6.4.

(4) Mounting the base printed–circuit board
After mounting the DeviceNet board, mount the base printed–circuit board.
For how to mount the base printed–circuit board, see Section 2.6.1.

(5) Mounting the DeviceNet connector terminal board
On the DeviceNet board, mount the interface connector terminal board. After mounting the board, secure the two screws on the terminal board.

> **NOTE**
> The terminal board of this connector must be removed before the base printed–circuit board can be mounted.

2.6.6 Methods for Dismounting and Mounting the Backpanel

Dismounting procedure

1) Remove the base printed–circuit board and option board in advance by referring to Sections 2.6.1 and 2.6.4.
2) Detach latch A from the backpanel. (See Fig. 2.6.6.)
3) Detach latches B and C also. (See Fig. 2.6.6.)
4) Tilt the upper portion of the backpanel toward you, then pull it out.

> **CAUTION**
> The base printed–circuit board must be dismounted. Carefully observe the CAUTION described in Section 2.6.1.

Mounting procedure

1) Insert the backpanel from above.
2) While passing the backpanel positioning holes over the corresponding positioning pins, attach latches C, B, and A in the stated sequence.
3) Mount the base printed–circuit board and option board by referring to Sections 2.6.1 and 2.6.4.

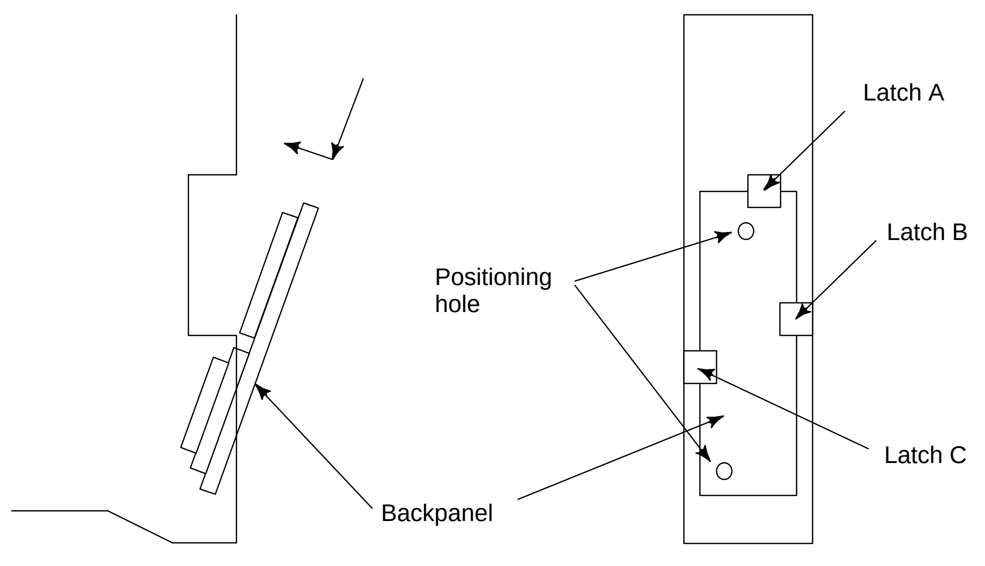


Fig. 2.6.6 Backpanel insertion and latch locations

2.6.7 Methods for Dismounting and Mounting the Fan Connection Printed–circuit Board

Dismounting procedure

1) Dismount the fan unit by following the fan unit dismounting procedure described in Section 2.5.2.
2) Detach the fan cables from the fan connection printed–circuit board.
3) Dismount the fan connection printed–circuit board from the fan unit.

Mounting procedure

1) Mount the fan connection printed–circuit board on the fan unit.
2) Attach the fan cables to the fan connection printed–circuit board. Be sure to attach them correctly by referring to Section 2.5.4.
3) Mount the fan unit by following the fan unit mounting procedure described in Section 2.5.

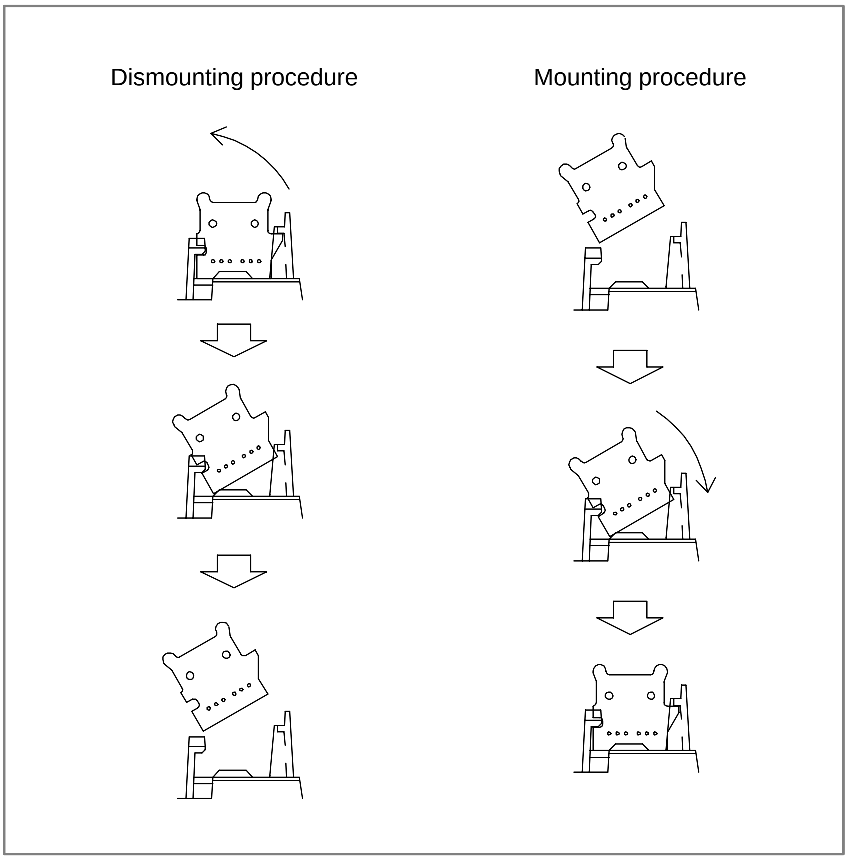


Fig. 2.6.7 Fan connection printed–circuit board dismounting and mounting procedures

2.6.8 Replacing the CRT Control Printed–circuit Board

(1) The CRT control printed–circuit board turns on the power to the installed setting display unit and Power Mate *i*.

(2) The CRT control PC board is located behind the MDI.
Remove all cables connected to the PC board.
Make sure that the PCR connector is indicated with the mating connector, so you will not have difficulty in attaching it again.

(3) Remove the square screws from the CRT control PC board, and replace the PC board.

(4) Reconnect the cables.

NOTE
When the picture display CRT/MDI or separate picture display MDI is being used, reload the picture screen data.

2.6.9 Replacing the Detachable LCD/MDI Printed–circuit Board

The CRT control printed–circuit board is installed in the detachable LCD/MDI.

(1) Turn off the power to the detachable LCD/MDI.

(2) Remove the 8 screws from the front panel of the detachable LCD/MDI, and then take out the metal plate on which the LCD and keyboard are mounted. (Be careful because the metal plate is connected with main unit with cables.)

(3) According to Subsection 2.6.8, replace the CRT control printed–circuit board, which is on the rear of the metal plate.

(4) Put the metal plate, on which the LCD and keyboard are mounted, back to the original place, and attach and fasten the 8 screws to the front panel.

2.6.10 Replacing the Detachable LCD/MDI Type B Printed–circuit Board

The CRT control printed–circuit board is installed in the detachable LCD/MDI type B.

(1) Turn off the power to the detachable LCD/MDI type B.

(2) Remove the 10 screws from the rear panel of the detachable LCD/MDI type B, and then take out the metal plate on which the CRT control printed–circuit board and power supply are mounted. (Be careful because the metal plate is connected with main unit with cables.)

(3) According to Subsection 2.6.8, replace the CRT control printed–circuit board.

(4) Put the metal plate, on which the CRT control printed–circuit board and power supply are mounted, back to the original place, and attach and fasten the 8 screws to the rear panel.

2.6.11 Replacing the MDI Keyboard

(1) The CRT control PC board that is behind the MDI keyboard can be seen from the rear of the setting and display unit with MDI or separate type MDI. Remove the CRT control PC board as in 2.6.8 above.

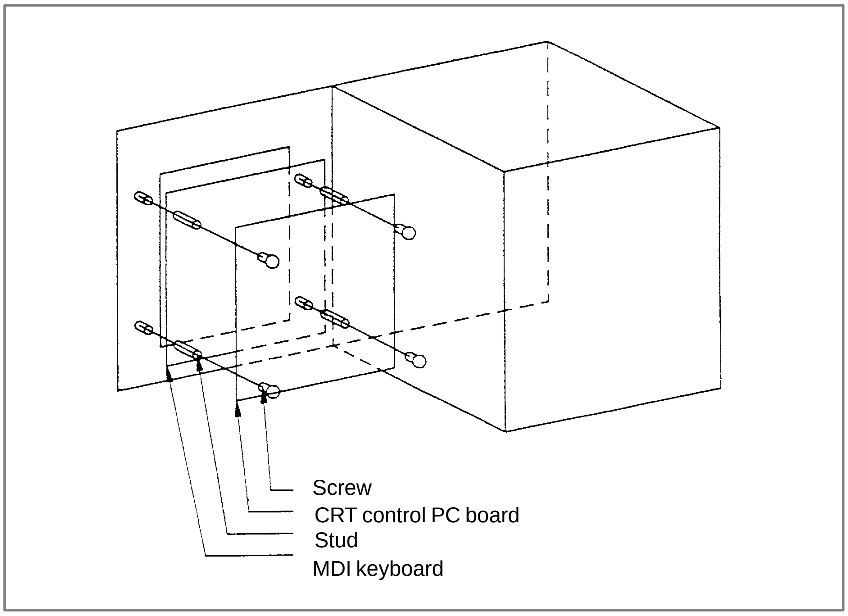
(2) Remove the two connectors from the back of the keyboard.

(3) Remove the four studs from the back of the keyboard.

(4) Since the MDI keyboard has no setscrews, the keyboard can be removed at this point.

(5) Mount a new keyboard, and secure it with four studs.

(6) Reconnect the two cables of the CRT control PC board.



2.6.12 Replacing the Printed–circuit Board for the LCD with Touch Panel

(1) Turn off the power to the LCD with touch panel.

(2) Remove the 4 nuts that fasten the protection plate on the rear of the LCD with touch panel.

(3) Remove all cables from the printed–circuit board. Make sure that the PCR connector is indicated with the mating connector, so you will not have difficulty in attaching it again.

(4) Remove the 4 screws that fasten the control printed–circuit board for the LCD with touch panel.

(5) The control printed–circuit board is connected directly with an inverter printed–circuit board above it, using a connector. Take out the control printed–circuit board carefully by pulling it down.

(6) Set the rotary switch SWR1 and setting pins STM1 and STM2 on a replacing printed–circuit board to the same states as their counterparts on the printed–circuit board to be replaced. (Note that the setting pin TSTTM is not shorted.)

(7) Insert the control printed–circuit board into the connector by pushing it up toward the inverter printed–circuit board, and fasten the screws.

(8) Put back the cables removed before, attach the protection plate, and fasten it with nuts. When attaching the protection plate, make sure that the 2 cables leading to the inverter printed–circuit board run on the inside of the protection plate.

(9) Adjust the LCD and the position of the touch panel now that you have replaced the control printed–circuit board.

2.7 REPLACING THE FUSE

WARNING
Before replacing a blown fuse, it is necessary to remove the cause of the blown fuse. For this reason, only the personnel who have a working knowledge of maintenance and safety are allowed to carry out this work. When replacing a fuse with the cabinet open, be careful not to touch the high–voltage circuit section (marked ⚠ and shielded with a shock hazard prevention cover). If you touch the high–voltage circuit section when it is uncovered, you will get an electric shock.

2.7.1 The Power Mate Controller Fuse

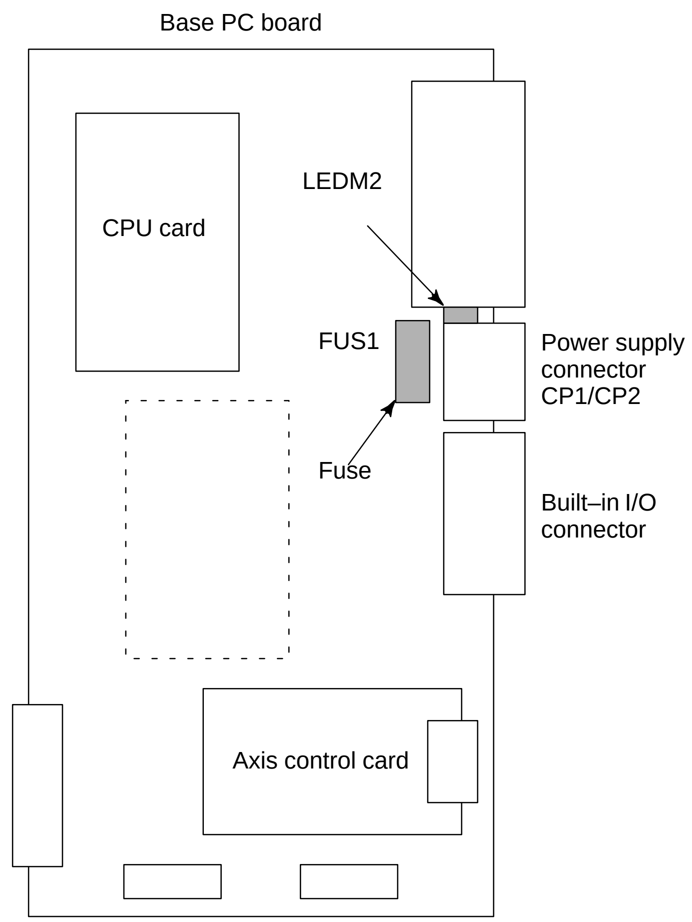
This section describes the replacement of the Power Mate controller fuse.

This section applies to the Power Mate controller.
The Power Mate *i* control unit is equipped with a 24 VDC power input fuse (FUS1). If the fuse has blown, LEDM2 (red LED) lights provided that 24 VDC is supplied to the control unit.
While referring to Section 2.6.1, pull out the base printed–circuit board, and replace the fuse on the base printed–circuit board. The fuse is located beside the power connectors CP1 and CP2.

2.7.1 Capacity and part number of Power Mate controller fuse

Name	Capacity	Part number
FUS1	5.0A	A02B–0124–K101

CAUTION
When the fuse is replaced, it is necessary to pull out the base printed–circuit board a little. Observe the CAUTION described in Section 2.6.1.


Base PC board
CPU card
LEDM2
FUS1
Power supply
connector
CP1/CP2
Fuse
Built–in I/O
connector
Axis control card

2.7.2 The CRT Control PCB Fuse

This subsection applies to the CRT control printed–circuit board installed in the setting display unit. The table below lists the drawing number of the CRT/MDI control PCB. The CRT control PCB is mounted on the back of the CRT/MDI, LCD/MDI, CRT/MDI for picture display, detachable LCD/MDI, detachable LCD/MDI type B, separate MDI, or separate type MDI for picture display.

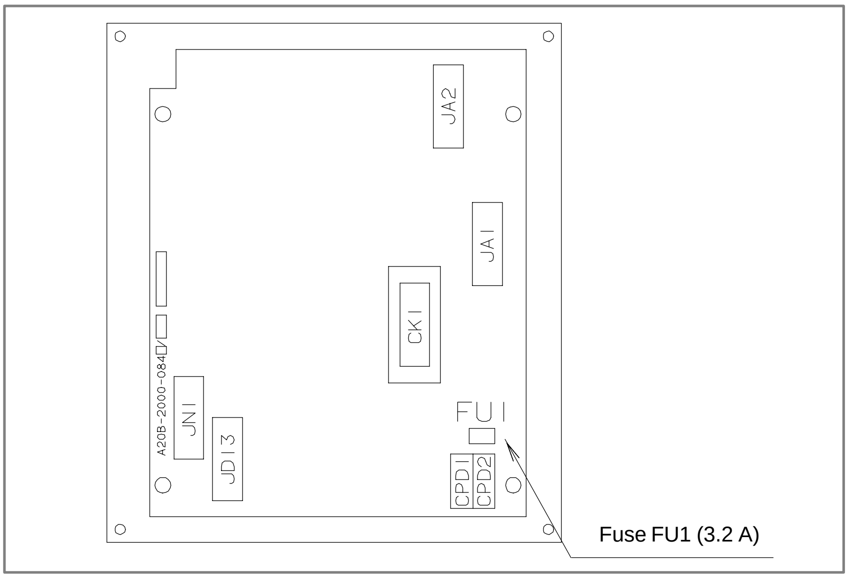
2.7.2 (a) CRT control PCB drawing number

Name	Drawing number
CRT control PCB	A20B–2000–084*
	A20B–2100–0061
	A20B–2100–0060

The CRT control PCB contains a +24 V power input fuse, FU1. If nothing appears on the screen when +24 V power is supplied to the CRT control PCB, fuse FU1 may have blown. In such a case, remove the fuse from its socket, then check its continuity using a multimeter (or visually check whether it has blown). If the fuse has blown, investigate the cause, take appropriate action, then replace the fuse. The capacity, part number, and location of the fuse are as follows:

2.7.2 (b) Capacity and part number of CRT control PCB fuse

Name	Capacity	Part number
FU1	3.2A	A02B–0124–K102



2.7.3 Fuse for 7.2” LCD

This subsection applies to the 7.2” monochrome LCD printed–circuit board used in the LCD/MDI, separate LCD, and detachable LCD/MDI.

Table 2.7.3(a) Drawing number of the printed–circuit board for 7.2” monochrome LCD

Name	Specification
Printed–circuit board for 7.2” monochrome LCD	A20B–2002–0130

If nothing appears on the screen when the +24 VDC power supply is turned on, check to see if the fuse FS1 has blown out.

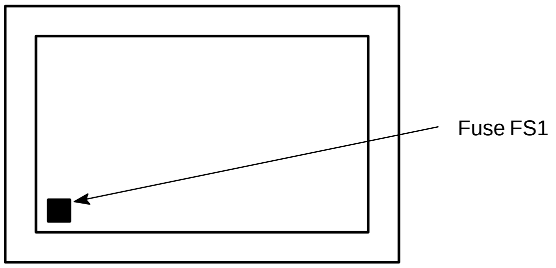
(1) If the fuse blows, first find and eliminate the cause. Then, replace the fuse.

(2) Pull the old fuse up.

(3) Push a new fuse into the fuse holder.

Table 2.7.3(b) Capacity and specification of the 7.2” monochrome LCD fuse

Name	Capacity	Specification
FS1	1.0A	A02B–0200–K104



Printed–circuit board for 7.2” monochrome LCD (Rear view)

2.7.4 LCD/MDI Fuse

This subsection applies to the LCD/MDI.

Table 2.7.4 Specification of LCD/MDI

Name	Specification
LCD/MDI	A02B–0166–C261#R
	A02B–0166–C261#S

The LCD/MDI is equipped with the CRT control printed–circuit board and 7.2” monochrome LCD printed–circuit board.

(1) Turn off the power to the LCD/MDI.

(2) The CRT control printed–circuit board and 7.2” monochrome LCD printed–circuit board are on the rear of the unit. Replace the fuse on the CRT control printed–circuit board according to Subsection 2.7.2 or the fuse on the 7.2” monochrome LCD printed–circuit board according to Subsection 2.7.3.

2.7.5 Detachable–LCD/MDI Fuse

This subsection applies to the detachable LCD/MDI.

Table 2.7.5(a) Specification of detachable LCD/MDI

Name	Specification
Detachable LCD/MDI	A02B–0166–C271#R
	A02B–0166–C271#S

The detachable LCD/MDI is equipped with the CRT control printed–circuit board and 7.2” monochrome LCD printed–circuit board.

(1) Turn off the power to the LCD/MDI.

(2) Remove the 8 screws from the front panel of the detachable LCD/MDI, and then take out the metal plate on which the LCD and keyboard are mounted. (Be careful because the metal plate is connected with main unit with cables.)

(3) The CRT control printed–circuit board and 7.2” monochrome LCD printed–circuit board are on the rear of the metal plate. Replace the fuse on the CRT control printed–circuit board according to Subsection 2.7.2 or the fuse on the 7.2” monochrome LCD printed–circuit board according to Subsection 2.7.3.

(4) Put the metal plate, on which the LCD and keyboard are mounted, back to the original place, and attach and fasten the 8 screws to the front panel.

2.7.6 Detachable LCD/MDI Type B Fuse

This subsection applies to the detachable LCD/MDI type B.

Table 2.7.6(a) Specification of detachable LCD/MDI type B

Name	Specification
Detachable LCD/MDI type B	A02B–0166–C291#R

The detachable LCD/MDI type B is equipped with the CRT control printed–circuit board and 8.4” color LCD printed–circuit board.

(1) Turn off the power to the detachable LCD/MDI type B.

(2) Remove the 10 screws from the rear panel of the detachable LCD/MDI type B, and then take out the metal plate on which the CRT control printed–circuit board and power supply are mounted. (Be careful because the metal plate is connected with main unit with cables.)

(3) Replace the fuse on the CRT control printed–circuit board according to Subsection 2.7.2 or the fuse on the 8.4” color LCD printed–circuit board according to the following procedure.

(4) Put the metal plate, on which the CRT control printed–circuit board and power supply are mounted, back to the original place, and attach and fasten the 8 screws to the rear panel.

Fuse on the 8.4” color LCD printed–circuit board

The following applies to the 8.4” color LCD printed–circuit board used in the detachable LCD/MDI type B.

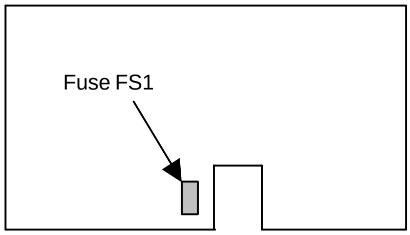
Table 2.7.6(b) Specification of printed–circuit board for 8.4” color LCD

Name	Specification
Printed–circuit board for 8.4” color LCD	A16B–2300–0201

Replace the fuse FS1 while referring to the description of replacing the fuse for 7.2” monochrome LCD in Subsection 2.7.3.

Table 2.7.6 (c) Capacity and specification of the fuse for the 8.4” color LCD printed–circuit board

Name	Capacity	Specification
FS1	5.0A	A02B–0200–K103



2.7.7 Fuse for the LCD with Touch Panel

This subsection applies to the LCD with touch panel.

Table 2.7.7(a) Specification of LCD with touch panel

Name	Specification
Color LCD with touch panel	A02B–0259–C212
Monochrome LCD with touch panel	A02B–0259–C211

There is a 24 VDC power supply input fuse (FUSE) on the LCD with touch panel. If nothing appears on the screen when the 24 VDC power supply to the LCD with touch panel is turned on, it is likely that the fuse may have blown out. Take out the fuse, and check it for conduction with a VOM meter or visually. If it turns out to have blown out, find and remove the cause, and then replace the fuse.

Table 2.7.7 (b) Capacity and specification of the FSSB I/O module fuse

Name	Capacity	Specification
FUSE	2.0A	A02B–0265–K101

See Subsection 2.3.22 for the location of the fuse.

2.7.8 The External I/O Card D, E Fuses

This section describes the replacement of the Power Mate external I/O card D, E fuses. The table below lists the names and drawing numbers of the I/O cards D, E.

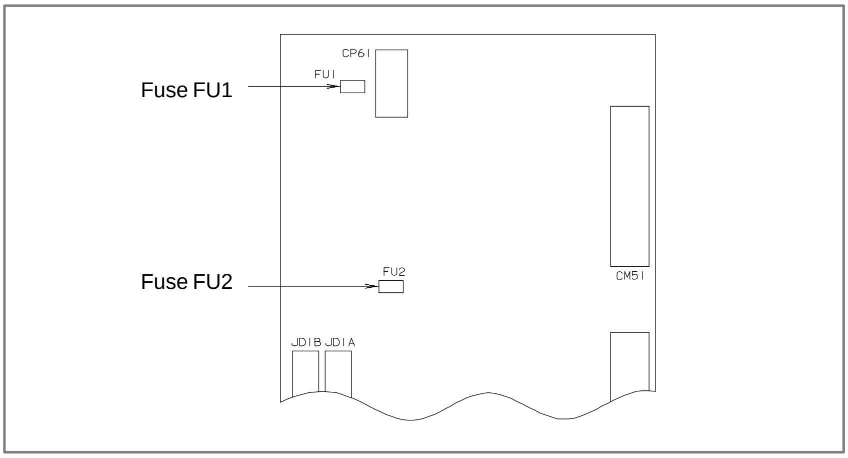
2.7.8 (a) I/O card drawing numbers

Name	Number of I/O points	Drawing number
External I/O card D	DI: 48 points, DO: 32 points	A16B–2202–0733
External I/O card E	DI: 96 points, DO: 64 points	A16B–2202–0732

The I/O card contains a +24 V power input fuse, FU1, and +5 V power output fuse, FU2. If +5 V is not output, fuse FU1 or FU2 may have blown. In such a case, remove the fuses from their sockets, then check their continuity using a multimeter (or visually check whether they have blown). If a fuse has blown, investigate the cause, take appropriate action, then replace the fuse. The capacity, part number, and location of the fuses are as follows:

2.7.8 (b) Capacity and part number of I/O card fuses

Name	Capacity	Ordering specification	
FU1	3.2A	A02B–0124–K103	A60L–0001–0175#3.2A
FU2	5.0A		A60L–0001–0290#LM50



2.7.9 FSSB I/O Module

This section applies to the FSSB I/O module (basic unit).
There is no fuse on the expansion unit.

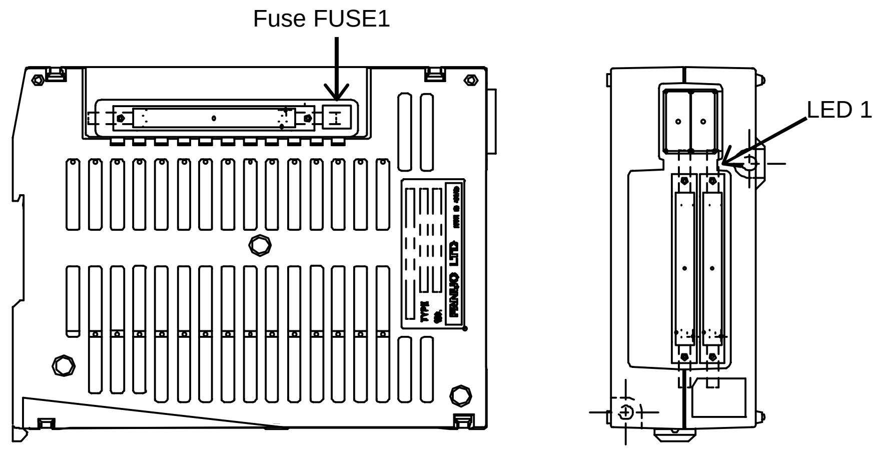
Table 2.7.9 (a) FSSB I/O module drawing number

Name	Specification
FSSB I/O module (basic unit)	A02B–0236–C211

The FSSB I/O module contains a 24 VDC power input fuse, FUSE1. If the LED1 does not light, the fuse may have blown. In such a case, remove the fuse from its socket, and check its continuity by using a multimeter. When the fuse has blown, investigate the cause, take appropriate action, then replace the fuse.

Table 2.7.9 (b) Capacity and specification of the fuse of the FSSB I/O module

Name	Capacity	Specification
FUSE1	1.0A	A03B–0815–K001



2.7.10 Analog Servo Interface Unit

This section applies to the analog servo interface unit (basic unit). There is no fuse on the expansion unit.

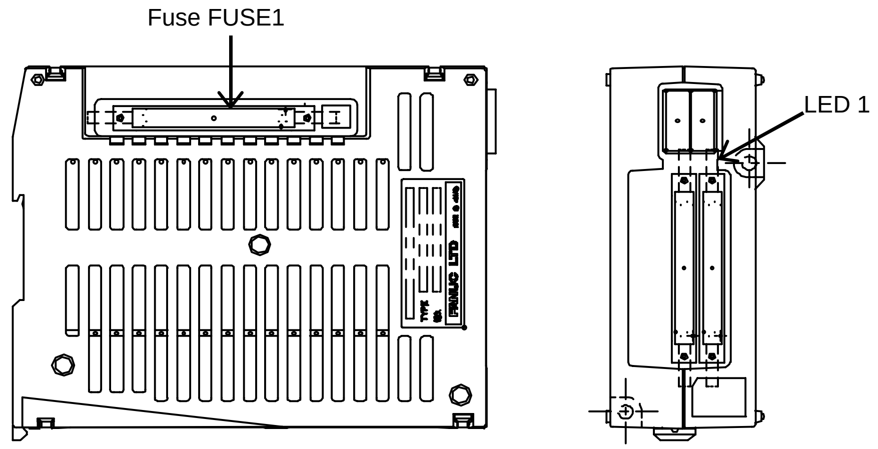
Table 2.7.10 (a) Analog servo interface unit drawing number

Name	Specification
Analog servo interface unit (basic unit)	A02B–0259–C180

The analog servo interface unit contains a 24 VDC power input fuse, FUSE1. If the LED1 does not light, the fuse may have blown. In such a case, remove the fuse from its socket, then check its continuity using a multimeter. When the fuse has blown, investigate the cause, take appropriate action, then replace the fuse.

Table 2.7.10 (b) Analog servo interface unit drawing number

Name	Capacity	Specification
FUSE1	5.0A	A02B–0200–K103



2.7.11 Panel I/O Module for Connector

This section applies to the I/O module for connector (basic).

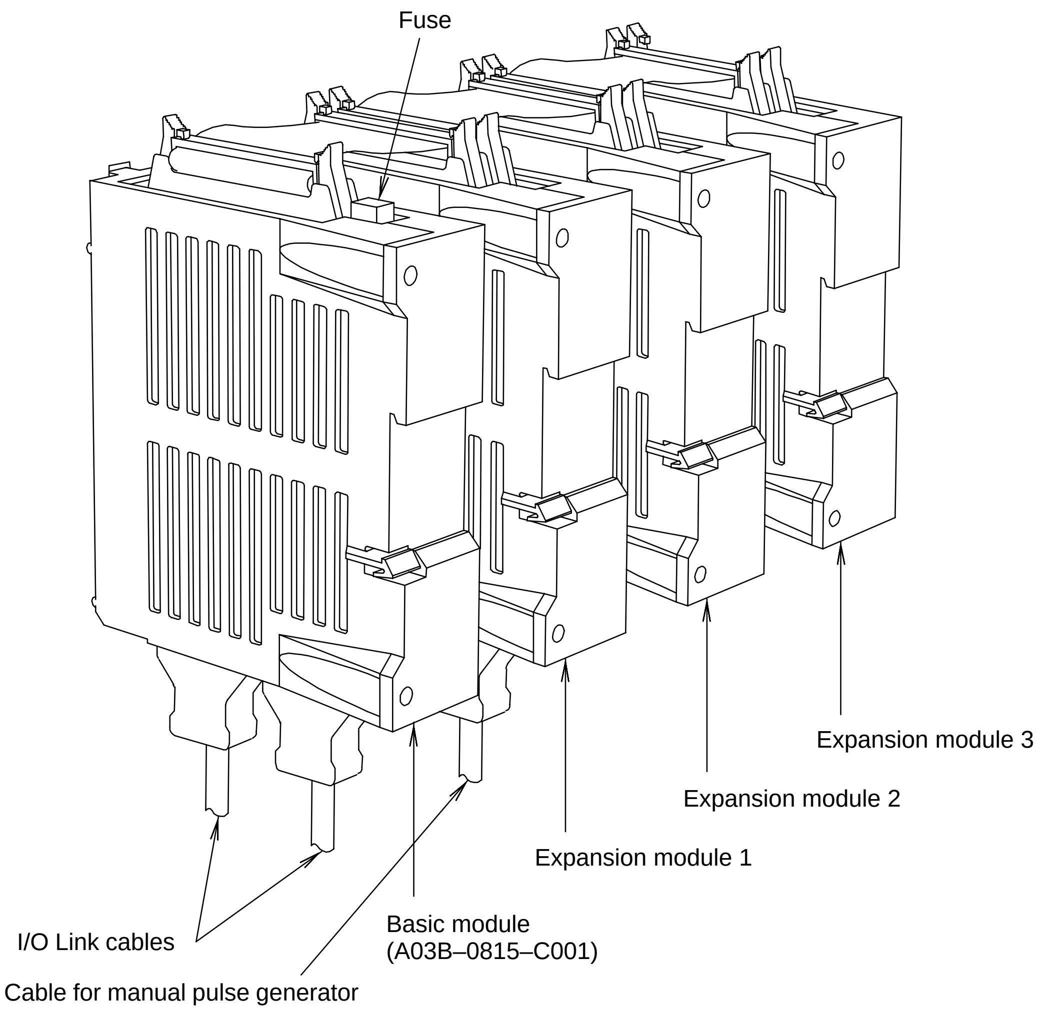
Table 2.7.11 (a) Drawing number of I/O module for connector

Name	Specification
I/O module for connector (basic)	A03B–0815–C001

The I/O module for connector contains a 24 VDC power input fuse. If power is not supplied to the I/O module for connector, this fuse may have blown. In such a case, remove the fuse from its socket, then check its continuity using a multimeter. When the fuse has blown, investigate the cause, take appropriate action, then replace the fuse.

Table 2.7.11 (b) Capacity and specification of the I/O module fuse for connector

Capacity	Specification
1.0A	A03B–0815–K002



CAUTION
The expansion modules have no fuse. A fuse is provided only for the basic module.

2.7.12 I/O Module for Operator's Panel

This section applies to the I/O module for operator's panel.

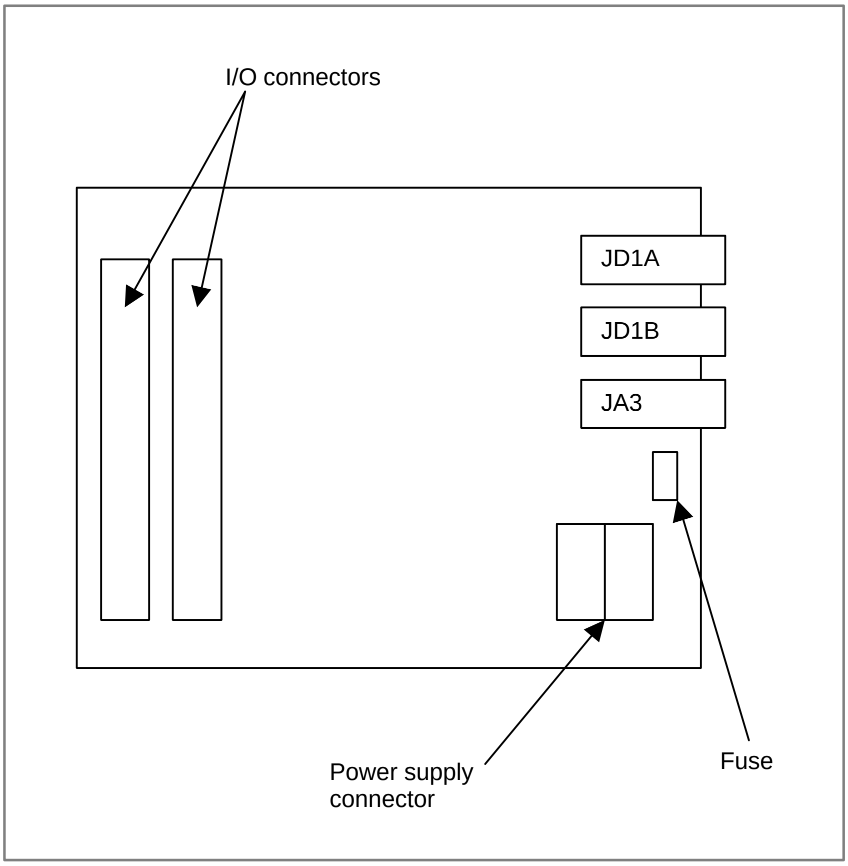
Table 2.7.12 (a) Drawing numbers of the I/O modules for operator's panel

Name	Specification
I/O module A1 for operator's panel	A20B–2002–0470
I/O module B1 for operator's panel	A20B–2002–0520
I/O module B2 for operator's panel	A20B–2002–0521

The I/O module for operator's panel contains a 24 VDC power input fuse. If power is not supplied to the I/O module for operator's panel, this fuse may have blown. In such a case, remove the fuse from its socket, then check its continuity using a multimeter. When the fuse has blown, investigate the cause, take appropriate action, then replace the fuse.

Table 2.7.12 (b) Capacity and specification of the I/O module fuse for operator's panel

Capacity	Specification
1.0A	A03B–0815–K001



2.8 BATTERY REPLACEMENT

2.8.1 Battery for Memory Backup (3 VDC)

The part programs, offset data, and system parameters are stored in the SRAM on the control unit. The power to the SRAM memory is backed up by a lithium battery mounted on the front panel of the control unit. Even when the main power supply is turned off, data is not lost if the battery is connected normally. The lithium battery is mounted on the control unit at shipping. This battery can maintain the contents of memory for about a year.

When the voltage of the battery becomes low, alarm message “BAT” blinks on the CRT or LCD display. For a combination of the DPL/MDI and DPL/MDI operation package, ”BAL” is displayed. And the battery alarm signal BAL <F001#2> is output to the PMC. When a display unit is not always connected to the machine, this signal causes a battery alarm to appear on the operator’s panel. When this alarm is displayed, replace the battery as soon as possible. In general, the battery can be replaced within one or two weeks, however, this depends on the system configuration.

If the battery voltage gets lower, it becomes impossible to back up the content of the SRAM. Turning on the power to the in this state causes system alarm 910 (SRAM parity alarm) to occur because the contents of memory are lost. Clear the entire SRAM memory and reenter data after replacing the battery. Data should be saved to the flash memory card or floppy disk beforehand.

When replacing the memory backup battery, do so while the control unit is turned off.

The following two kinds of batteries can be used.

- Lithium battery built into the Power Mate *i* control unit.
- Two alkaline dry cells (size D) in the external battery case.

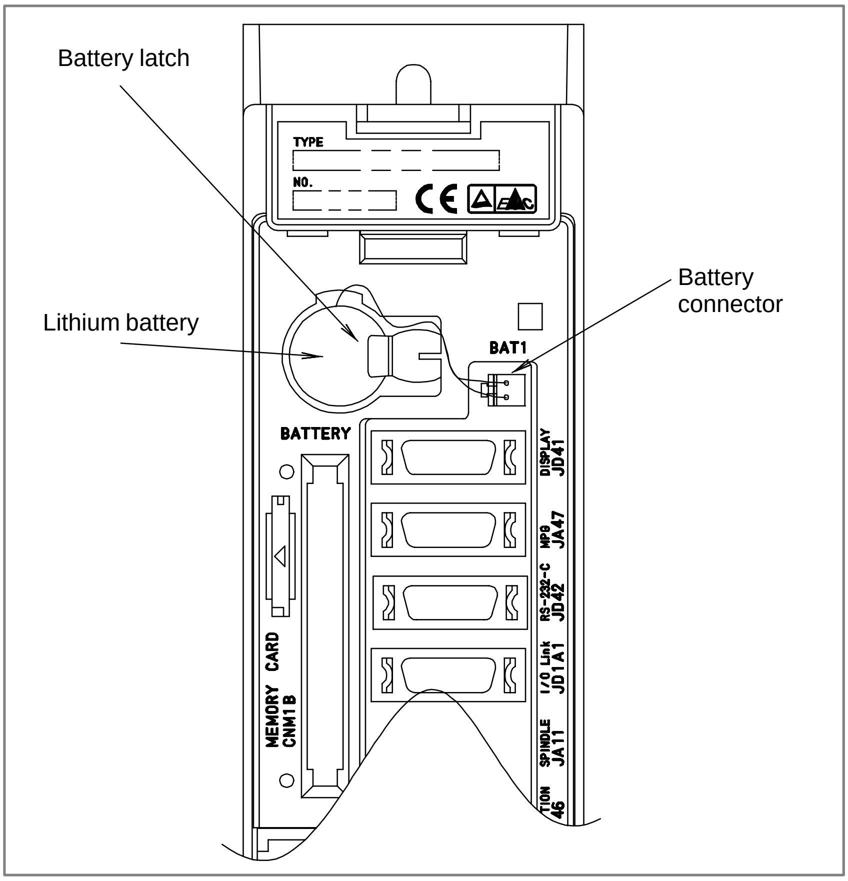
Replacing the lithium battery

(1) Prepare a new lithium battery (ordering drawing number: A02B–0200–K102).

(2) Turn the machine (Power Mate *i*) on for about 30 seconds.

(3) Turn the machine (Power Mate *i*) off.

(4) Remove the old battery from the top of the Power Mate *i* control unit. First unlatch the battery, remove it from the holder, and detach its connector. The battery holder is on top of the face plate (or the memory connector) on the base printed–circuit board.



(5) Remove the old battery, insert a new one into the battery holder, and attach the connector. Confirm that the battery is latched firmly.

WARNING

Using other than the recommended battery may result in the battery exploding.
Replace the battery only with the specified battery (A02B–0200–K102).

CAUTION

1 Before replacing the battery, check that a backup copy of the latest SRAM memory data has been made.
2 When replacing the battery, the power to the machine must be off. When the power to the machine is left on, only those who have been educated in maintenance and safety can replace battery.
3 Complete the battery replacement steps (3) to (5) within 30 minutes. If the battery is left disconnected for a long time, the contents of the SRAM memory will be lost.
4 It is recommended that the SRAM memory contents be backed up to the built–in FROM of the Power Mate *i* immediately before the battery replacement. Then, data can be easily restored in case the memory contents are lost. See Appendix E for how to take a backup copy.

Dispose of used batteries as follows.

(1) Small quantities (less than 10)
Discharge the batteries and dispose of them as ordinary unburnable waste.

(2) Large quantities
Please consult FANUC.

Replacing the alkaline dry cells (size D)

(1) Prepare two new alkaline dry cells (size D).

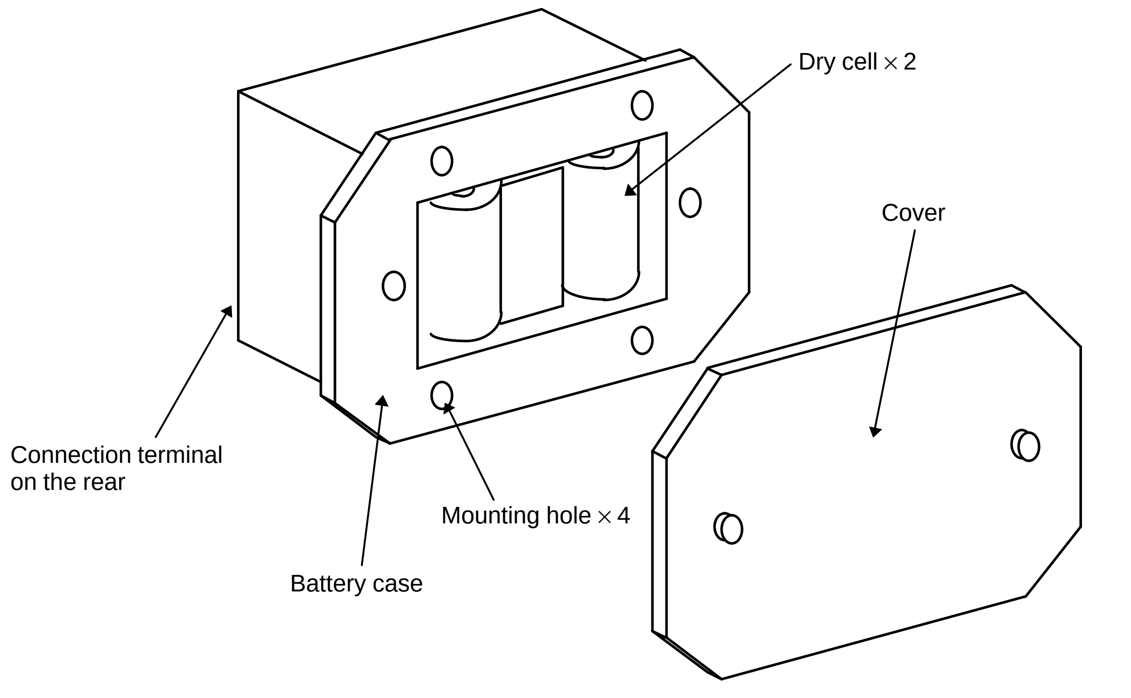
(2) Turn the machine (Power Mate *i*) on.

(3) Remove the battery case cover.

(4) Replace the batteries, paying careful attention to their orientation.

(5) Replace the battery case cover.

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



2.8.2 Replacing Batteries for Absolute Pulse Coder (Servo Amplifier α Series)

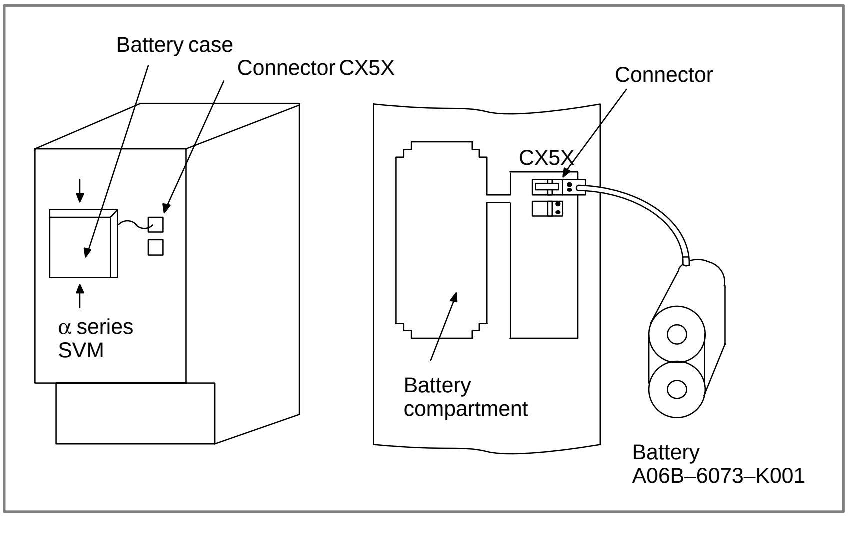
WARNING
Absolute pulse coder battery replacement
When replacing the memory backup batteries, keep the power to the machine (Servo amplifier) switched on, and hold the machine at an emergency stop. Because this work must be carried out while the power is kept switched on and the cabinet is open, only the personnel who have been trained for safety are allowed to engage in the work. When replacing the batteries, be careful not to touch the high–voltage circuit section (marked ⚠ and shielded with a shock hazard prevention cover). If you touch the high–voltage circuit section when it is uncovered, you will get an electric shock.

Prepare lithium battery A06B–6073–K001(*) in advance.

(*) FANUC specification: A98L–0001–0902

(1) Turn machine (servo amplifier) power ON.

(2) Remove the battery case on the front panel of α series Servo Amp Module (SVM).
The battery case can be removed by holding the top of the case and pulling the case towards you.



(3) Remove the connector the battery.

(4) Replace the battery, and connect the connector.

(5) Attach the battery case.

(6) Turn machine (servo amplifier) power OFF.

WARNING
Using other than the recommended battery may result in the battery exploding.
Replace the battery only with the specified type (A06B–0073–K001).

CAUTION
1 Replace the batteries for absolute pulse coder when servo amplifier power is ON.
Replacing the batteries with power OFF causes the absolute position stored in memory to be lost.
2 When your machine is equipped with a separate battery case, follow the instructions in 2.8.4.

2.8.3 Replacing Batteries for Absolute Pulse Coder (Servo Amplifier β Series)

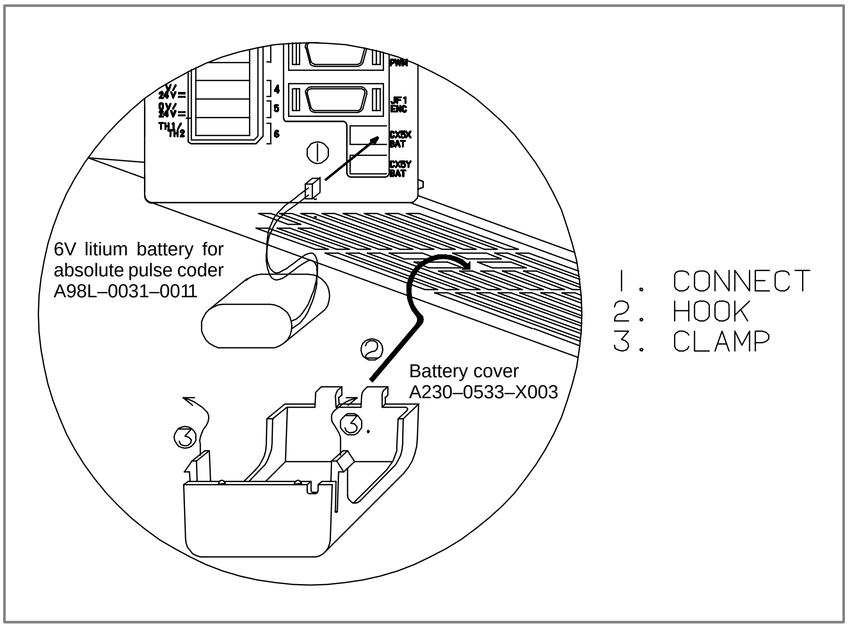
WARNING
Absolute pulse coder battery replacement
When replacing the memory backup batteries, keep the power to the machine (Servo amplifier) switched on, and hold the machine at an emergency stop. Because this work must be carried out while the power is kept switched on and the cabinet is open, only the personnel who have been trained for safety are allowed to engage in the work. When replacing the batteries, be careful not to touch the high–voltage circuit section (marked ⚠ and shielded with a shock hazard prevention cover). If you touch the high–voltage circuit section when it is uncovered, you will get an electric shock.

Prepare lithium battery A02B–0168–K111(*) in advance.

(*) FANUC specification: A98L–0031–0011

(1) Turn machine (servo amplifier) power ON.

(2) Remove the battery case from under the β series servo amplifier module by holding the case at both sides and pulling downwards.



(3) Remove the connector the battery.

(4) Replace the battery, and connect the connector.

(5) Attach the battery case.

(6) Turn machine (servo amplifier) power OFF.

WARNING
Using other than the recommended battery may result in the battery exploding.
Replace the battery only with the specified type (A02B–0168–K111).

CAUTION
1 Replace the batteries for absolute pulse coder when servo amplifier power is ON.
Replacing the batteries with power OFF causes the absolute position stored in memory to be lost.
2 When your machine is equipped with a separate battery case, follow the instructions in 2.8.4.

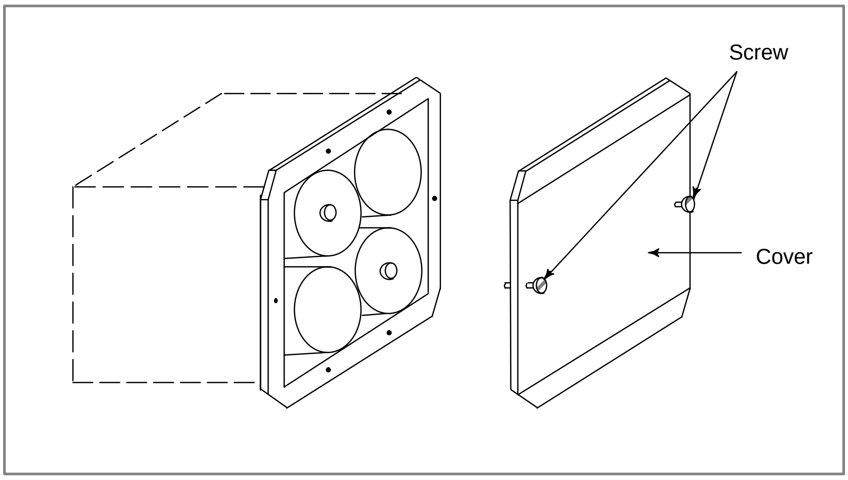
2.8.4 Replacing Batteries in the Separate Battery Case

Prepare 4 alkaline batteries (UM–1type) commercially available in advance.

(1) Turn machine (servo amplifier, separate type detector interface unit, and analog servo interface unit) power ON.

(2) Loosen screws on the battery case to remove the cover. For placement of the battery case, refer to the machine tool builder's manual.

(3) Replace the batteries in the case. Insert 2 batteries each in the opposite direction as illustrated below.



(4) After replacement, install the cover.

(5) Turn machine power OFF.

WARNING
Using other than the recommended battery may result in the battery exploding.
Replace the battery only with the specified type (UM–1 type alkaline battery).

CAUTION
Replace the batteries when the power to the servo amplifier, separate detector interface unit, and analog servo interface unit is ON.
Replacing the batteries with power OFF causes the absolute position stored in memory to be lost.

2.9 SETTING AND DISPLAY UNIT BACKLIGHT REPLACEMENT AND ADJUSTMENT

WARNING

Only those personnel who have received approved safety and maintenance training may perform this replacement work.
When opening the cabinet and replacing a unit, 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 backlight is a consumable.

2.9.1 Replacing the Backlight of LCD/MDI or Separate Type LCD

This subsection applies to the replacement of the LCD/MDI and separate LCD backlights.

Table 2.9.1(a) Specification of LCD/MDI and separate type LCD

Name	Specification
LCD/MDI	A02B–0166–C261#R
	A02B–0166–C261#S
Separate type LCD	A02B–0166–C251

The 7.2” monochrome LCDs for the LCD/MDI and separate LCD are products of either Hitachi Ltd. or Sharp Corp. Their backlights differ depending on the manufacturer. Both types of backlights are provided as spare parts. Select an appropriate type.

Table 2.9.1(b) Specification of backlight

Spare part specification	Backlight specification	Manufacture
A02B–0236–K112	A61L–0001–0142#BL	Hitachi
	A61L–0001–0142#BLS	Sharp

(1) Turn off the power to the LCD/MDI or separate LCD, and wait for a while.

(2) Remove the protection plate from the rear. (4 screws)

(3) Remove the backlight power supply cable from the upper left section and the LCD cable from the center right section. (See Fig. 2.9.1 (a).)

(4) Remove the printed–circuit board from the rear along with the holding metal plate. (4 screws)

(5) Remove the LCD. (4 screws)

(6) The manufacturer of the LCD can be identified by the way its backlight lid is mounted.
Hitachi
Make the LCD screen face toward you, remove the 3 latches from the left side and then the lid. (See Fig. 2.9.1 (b).)
Sharp
Make the LCD screen face toward you, remove the 3 screws from the left side and then the lid. (See Fig. 2.9.1 (c).)

(7) Replace the backlight inside the LCD with a new one.

(8) To assemble, reverse this procedure.

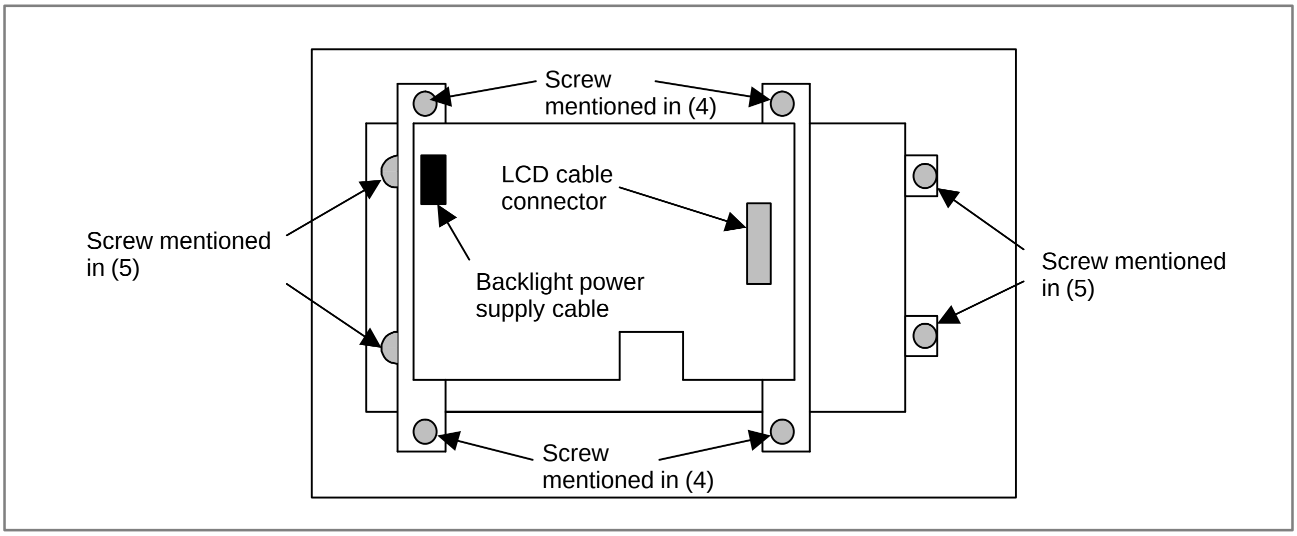


Fig. 2.9.1 (a) LCD rear view (with the protection cover removed)

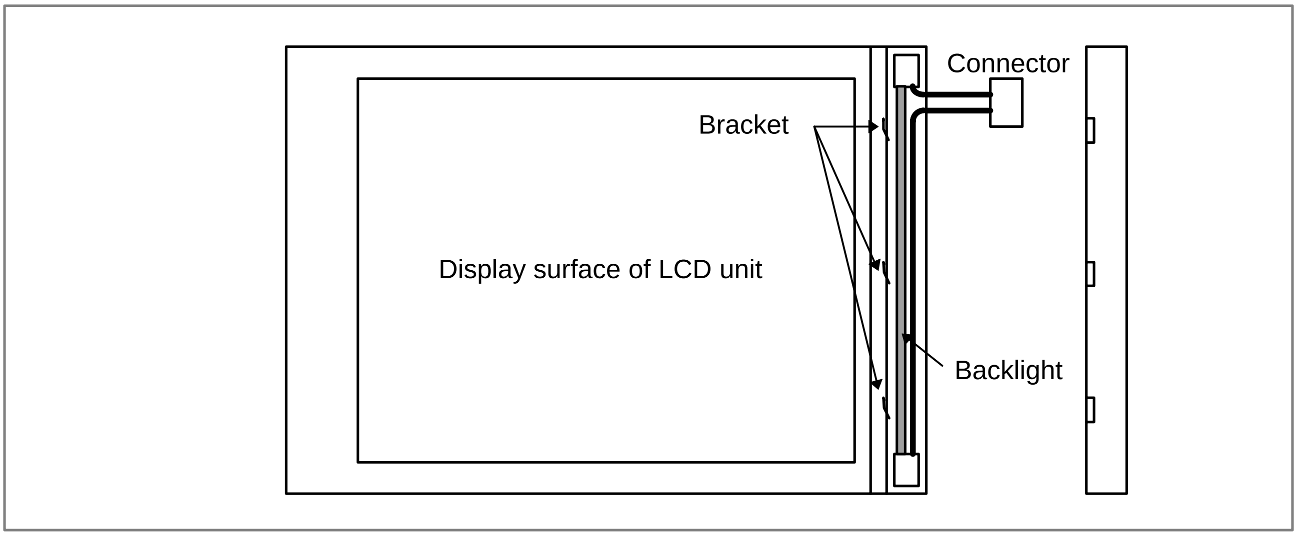


Fig. 2.9.1 (b) For the backlight manufactured by Hitachi

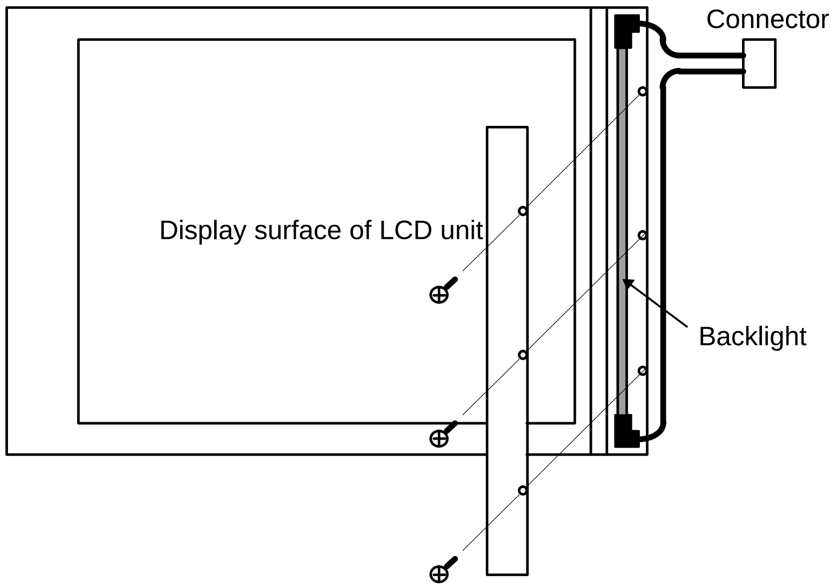


Fig. 2.9.1 (c) For the backlight manufactured by Sharp

2.9.2 Replacing the Backlight of Detachable LCD/MDI

This subsection applies to the replacement of the detachable LCD/MDI backlight.

Table 2.9.2(a) Specification of detachable LCD/MDI

Name	Specification
Detachable LCD/MDI	A02B–0166–C271#R
	A02B–0166–C271#S

The 7.2” monochrome LCD for the detachable LCD/MDI is a product of either Hitachi Ltd. or Sharp Corp. Its backlight differs depending on the manufacturer. Each type of backlight is provided as a spare part. Select an appropriate type.

Table 2.9.2(b) Specification of backlight

Spare part specification	Specification of backlight	Manufacture
A02B–0236–K112	A61L–0001–0142#BL	Hitachi
	A61L–0001–0142#BLS	Sharp

(1) Turn off the power to the detachable LCD/MDI, and wait for a while.

(2) Remove the 8 screws from the front panel of the detachable LCD/MDI, and then take out the metal plate on which the LCD and keyboard are mounted. (Be careful because the metal plate is connected with main unit with cables.)

(3) Remove the backlight power supply cable. (See Fig. 2.9.2.)

(4) Remove the CRT control printed–circuit board. (4 screws)

(5) Remove the PCR connector and the 10–pin flat cable, which were under the CRT control printed–circuit board before it was removed.

(6) Remove the 6 ornamental plate fastening screws. (See Fig. 2.9.2.)

(7) Remove the ornamental plate to expose the front surface of the LCD.

(8) The manufacturer of the LCD can be identified by the way its backlight lid is mounted.
Hitachi, Ltd.
Remove the 3 latches from the left side and then the lid. (See Fig. 2.9.1 (b).)
Sharp Corp
Remove the 3 screws from the left side and then the lid. (See Fig. 2.9.1 (c).)

(9) Replace the backlight inside the LCD with a new one.

(10) To assemble, reverse this procedure.

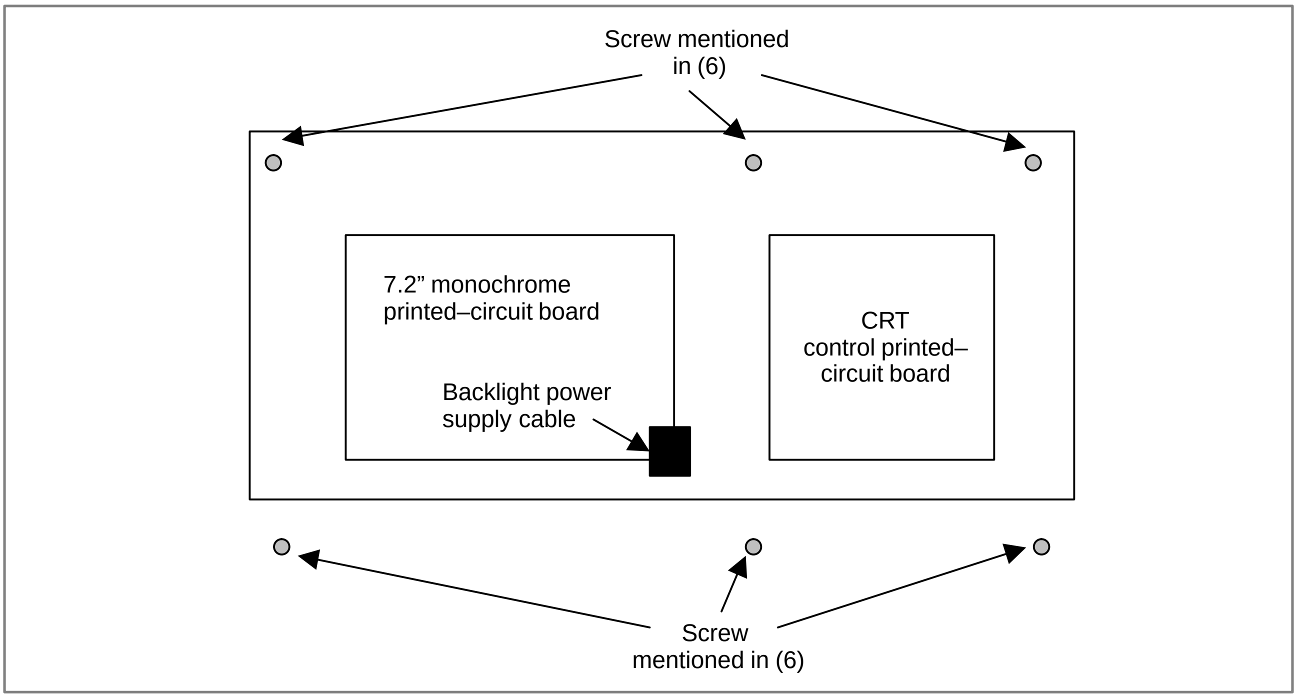


Fig. 2.9.2 Rear view of the detachable–LCD metal plate

2.9.3 Replacing the Backlight of Detachable LCD/MDI Type B

This subsection applies to the replacement of the backlight of the detachable LCD/MDI type B.

Table 2.9.3(a) Specification of detachable LCD/MDI type B

Name	Specification
Detachable LCD/MDI type B	A02B–0166–C291#R

There are two types of backlights for the 8.4” color LCD for the detachable LCD/MDI type B. Each type of backlight is provided as a spare part. Select an appropriate type.

Table 2.9.3(b) Specification of backlight

Spare part specification	Specification of backlight
A02B–0259–K111	A61L–0001–0162#BL
	A61L–0001–0176#BL

(1) Turn off the power to the detachable LCD/MDI type B, and wait for a while.

(2) Remove the 10 screws from the rear of the detachable LCD/MDI type B, and then take out the metal plate on which the CRT control printed–circuit board and power supply are mounted. (Be careful because the metal plate is connected with main unit through cables.)

(3) Remove the connectors JA1 and JA2 from the CRT control printed–circuit board, and the connector CN1 from the power supply.

(4) Remove the backlight power supply cable and LCD cable from the 8.4" color LCD printed–circuit board. (See Fig. 2.9.3.)

(5) Remove the 4 nuts from the metal plate fastening the 8.4" color LCD printed–circuit board, and then take out the printed–circuit board by pulling it up. (See Fig. 2.9.3.)

(6) If the backlight is an L–shaped type, remove the 2 screws, and then take it out by pulling down the case of the backlight and shifting it a little to the left. (See Fig. 2.9.3.)
If the backlight is a rod type, remove the 3 screws from the left side, and then open the lid. (See Fig. 2.9.3.)

(7) Replace the backlight inside the case with a new one.

(8) To assemble, reverse this procedure. When installing the metal plate for fastening the 8.4" color LCD printed–circuit board, pay attention to the MDI cable.

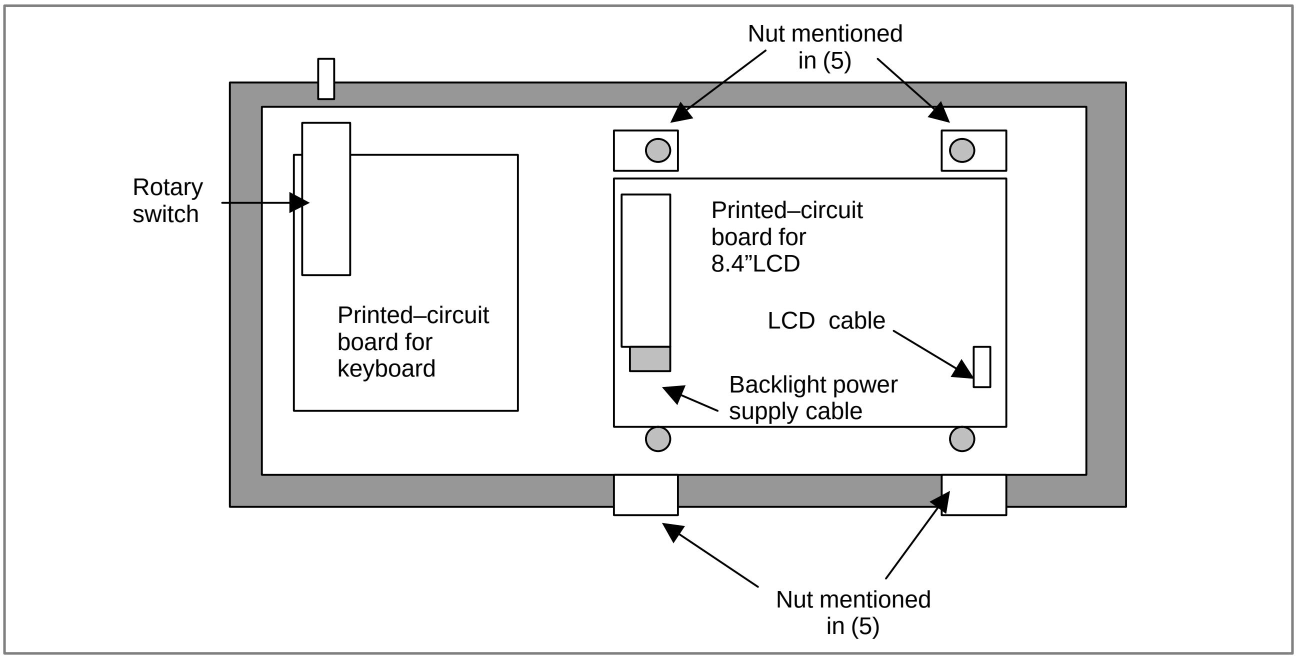


Fig. 2.9.3 Inside of the detachable LCD box

2.9.4 Replacing the Backlight of the Color LCD with Touch Panel

This subsection applies to the replacement of the backlight of the color LCD with touch panel.

Table 2.9.4(a) Specification of color LCD with touch panel

Name	Specification
Color LCD with touch panel	A02B–0259–C212

The 10.4” color LCD backlight for the LCD with touch panel can be replaced according to the following procedure.

Table 2.9.4(b) Specification of backlight

Spare part specification	Specification of backlight
A02B–0236–K116	A61L–0001–0168#BL

(1) Turn off the power to the color LCD with touch panel, and wait for a while.

(2) Remove the touch panel flexible cable from the color LCD with touch panel and the backlight power supply cable connector. If it is hard to remove them, previously remove the protection plate. (4 nuts)

(3) Remove the ornamental plate. (5 nuts)

(4) Remove the backlight power supply cable.

(5) Push the projection through the projection hole in the protection plate to unlatch it, and then take out the backlight case.

(6) Replace the backlight inside the case with a new one.

(7) To assemble, reverse the above procedure. When mounting the unit on the cabinet, run the backlight power supply cable on the inside of the protection plate so that the cable will not be caught in between.

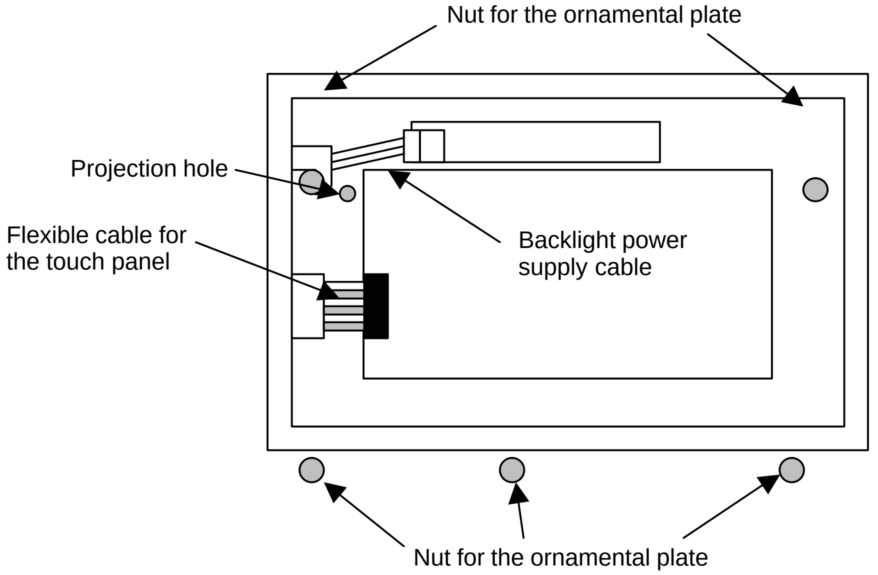


Fig. 2.9.4(a) Rear view of the color LCD with touch panel (with the protection plate removed)

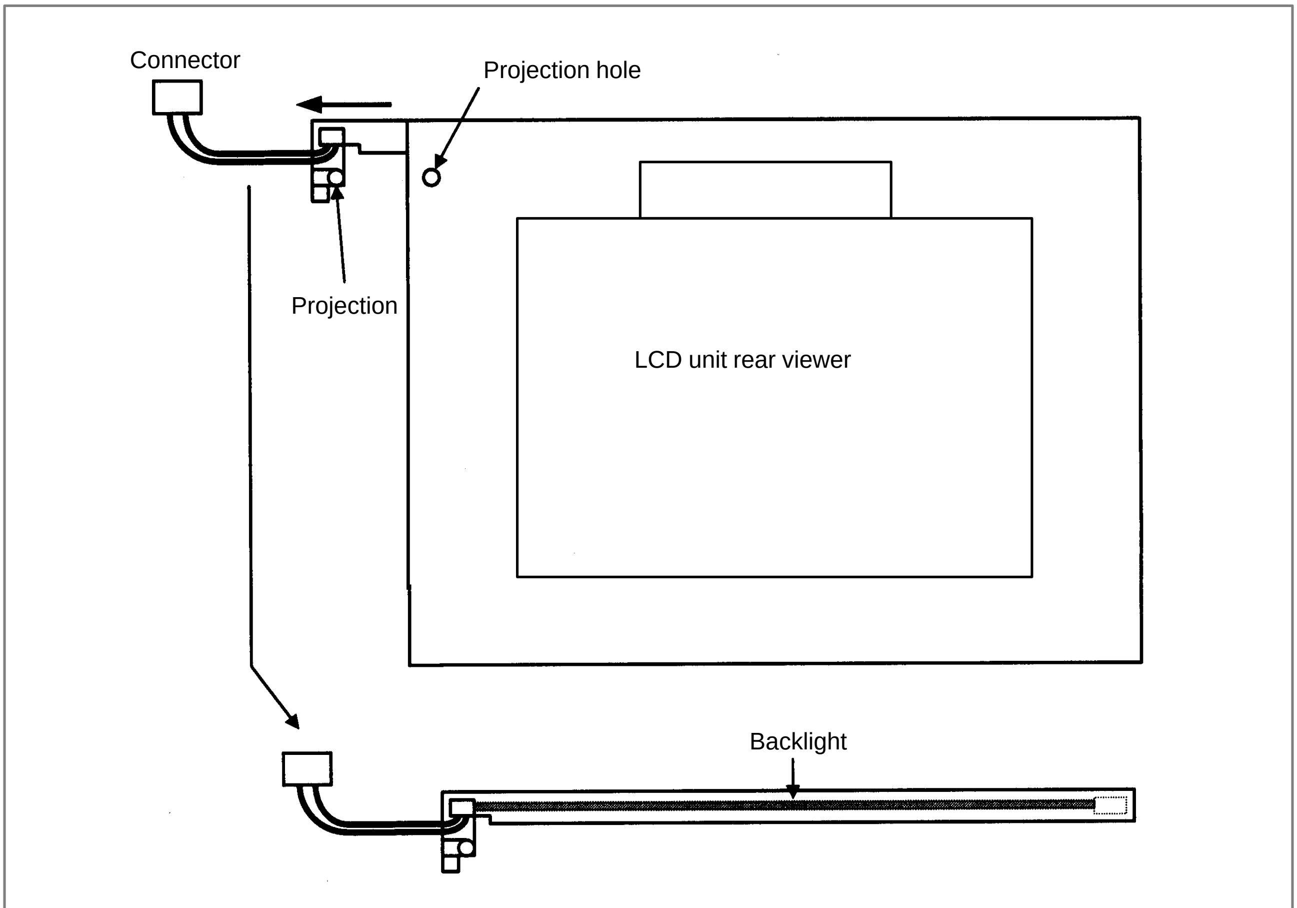


Fig. 2.9.4(b) How to remove the backlight

2.9.5 Replacing the Backlight of Monochrome LCD with Touch Panel

This subsection applies to the replacement of the backlight of the monochrome LCD with touch panel.

Table 2.9.5(a) Specification of monochrome LCD with touch panel

Name	Specification
Monochrome LCD with touch panel	A02B–0259–C211

The 9.5” monochrome LCD backlight for the monochrome LCD with touch panel can be replaced according to the following procedure.

Table 2.9.5(b) Specification of backlight

Spare part specification	Specification of backlight
A02B–0236–K114	A61L–0001–0154#BL

(1) Turn off the power to the monochrome LCD with touch panel, and wait for a while.

(2) Remove the touch panel flexible cable from the monochrome LCD with touch panel and the backlight power supply cable connector. If it is hard to remove them, previously remove the protection plate. (4 nuts)

(3) Remove the ornamental plate. (5 nuts)

(4) Remove the backlight power supply cable.

(5) Make the display screen of the LCD face upward, and remove the 3 latches from the left side and then the lid.

(6) Replace the backlight in the case with a new one.

(7) To assemble, reverse the above procedure. When mounting the unit on the cabinet, run the backlight power supply cable on the inside of the protection plate so that the cable will not be caught in between.

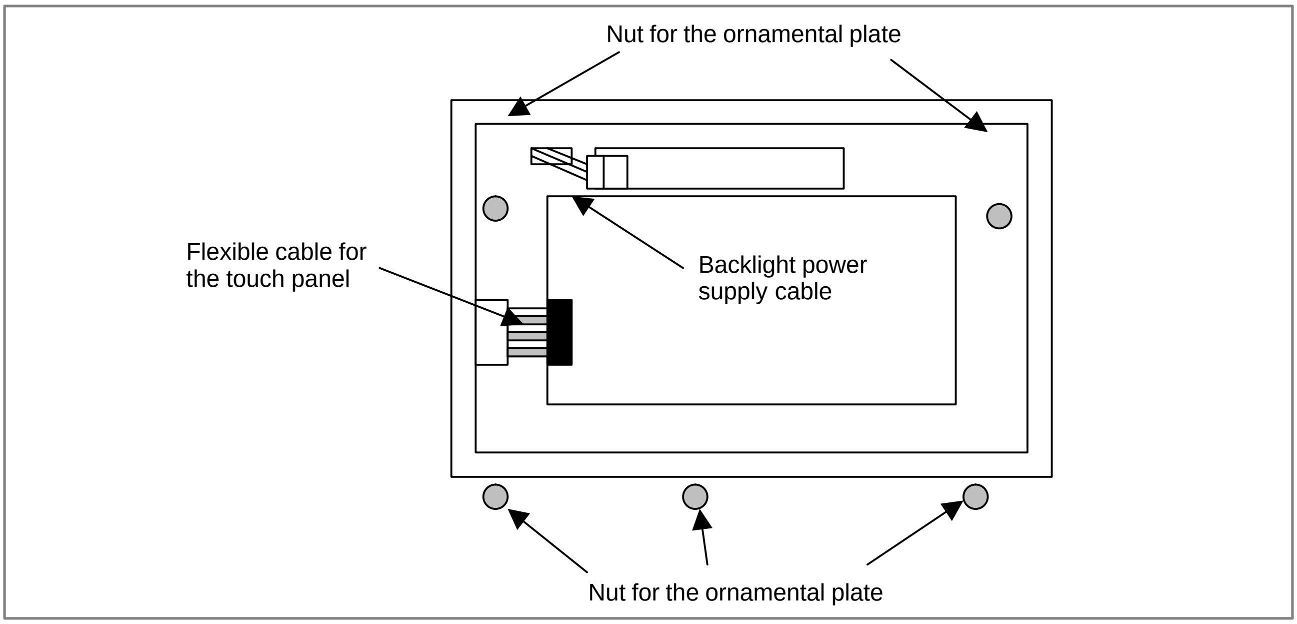


Fig. 2.9.5(a) Rear view of the monochrome LCD with touch panel (with the protection plate removed)

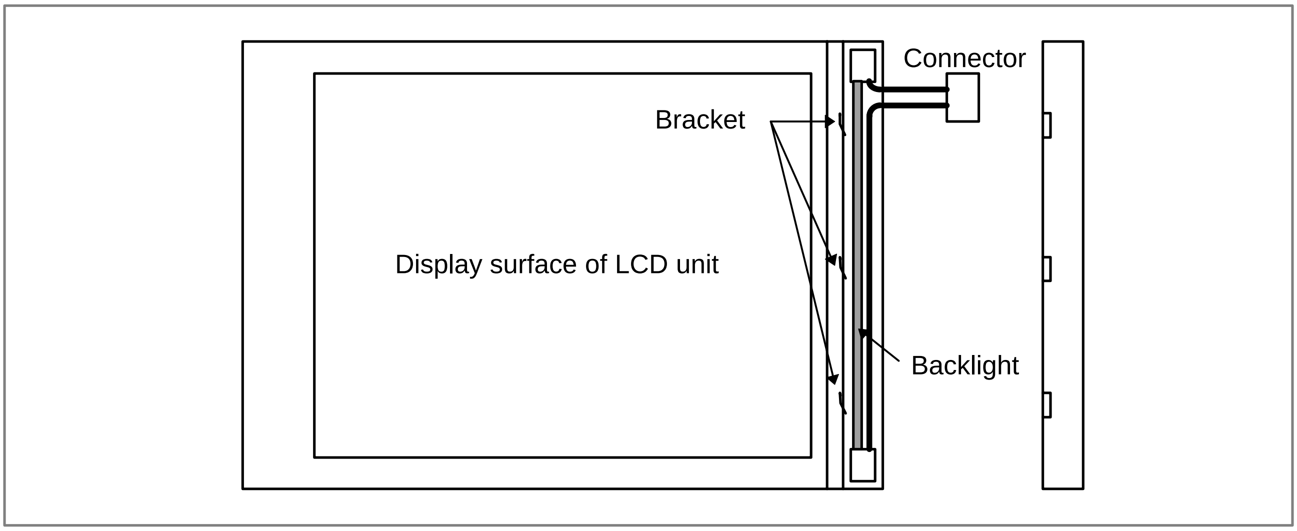
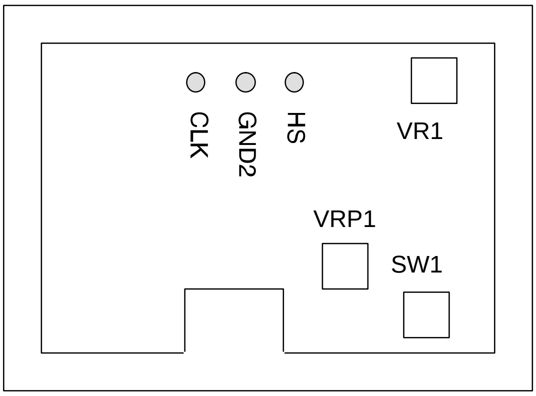


Fig. 2.9.5(b) How to remove the backlight

2.9.6 7.2–inch Monochrome LCD Adjustment

The 7.2–inch monochrome LCD is provided with a contrast adjustment potentiometer and video signal adjustment switches.
The contrast is adjusted when the printed–circuit board for LCD 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, printed–circuit board for LCD and LCD panel. When a printed–circuit board for LCD 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

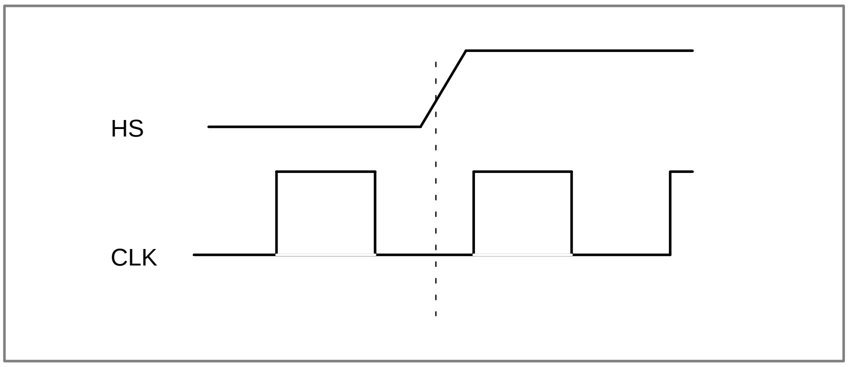
Potentiometer VR1

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.

2.9.7 The CRT Display

(1) Check that the power supply is off.

(2) Disconnect the CRT unit power cable and the video signal cable.

(3) Remove the chloridized veneer cover and the four screws from the front of the CRT unit.

(4) Install the new CRT unit.

(5) Reconnect the CRT power supply cable and video signal cable to their original positions.

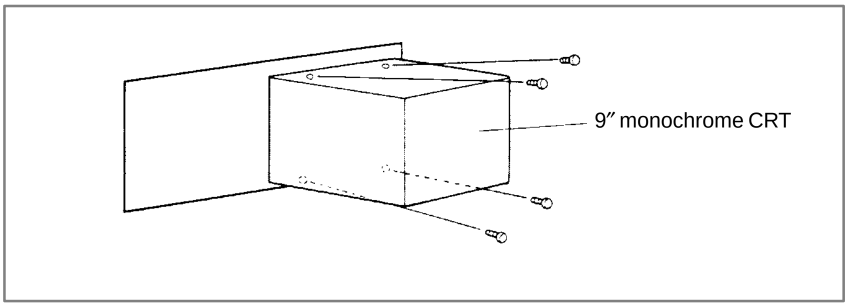


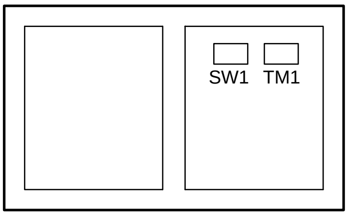
Fig. 2.9.7 Replacing the CRT display

2.9.8 Adjusting the Separate Type PDP

Fine adjustment of the video signal is supported to enable its use with plasma displays of separate type PDP. This adjustment is necessary to compensate for errors resulting from the combination of NC devices and cables.

Adjustment of the video signal is necessary if you have replaced the display unit, cable, or a hardware component of the display circuit in the NC, either as part of regular field maintenance or the correct a failure.

Locations of switches and jumper pins



Plasma display (real view)

Adjustment

Eliminating flicker

Switch TM1

If flicker occures, change the TM1 setting to another setting.

Normally one of these settings will eliminate flicker.

Adjusting the horizontal position

Switch SW1

(1) The screen can be shifted horizontally in units of dots.

(2) Adjust the horizontal position such that the entire screen is visible. Only one setting can successfully realize this positioning.

CAUTION

1 Do not attempt to change any controls or settings other than those described above.
If any controls or settings other than those described above are changed, the appearance of the display will be abnormal.

2 The plasma display unit cannot be switched between the Power Mate and other NC units, because its cable length or kind of NC requires careful adjustment.

2.9.9 LCD with Touch Panel

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.

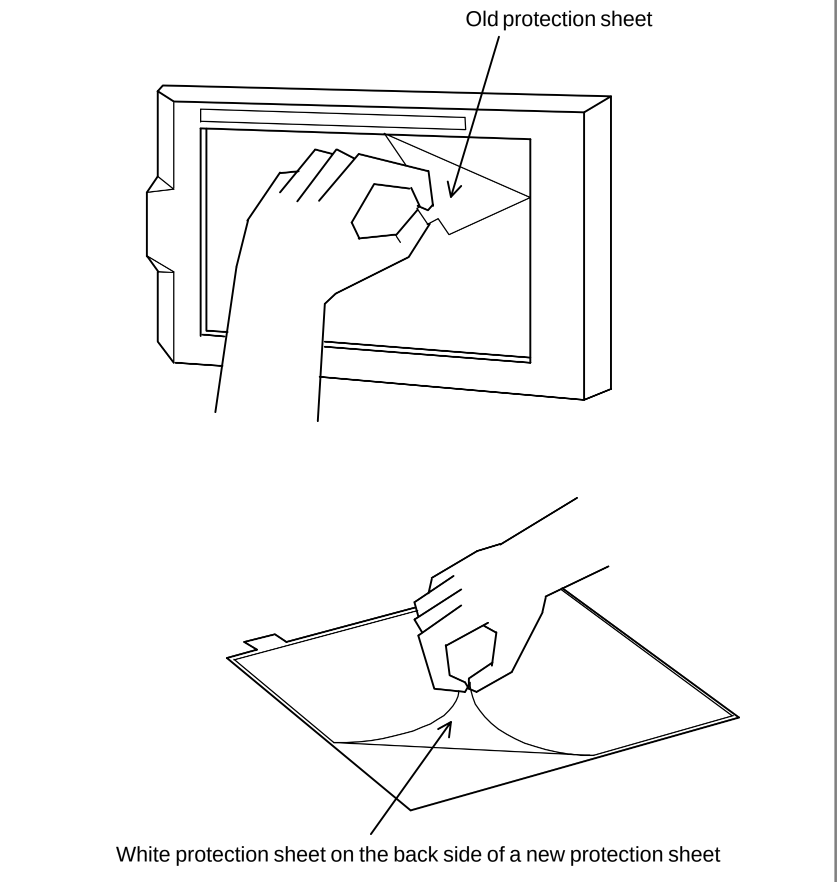
Protection sheet of the touch panel

The LCD with a touch panel has a protection sheet attached on the front to protect the thin film of the touch panel and LCD.

When replacing the protection sheet with a new one, use the procedure below.

- Remove the old protection sheet from the front of the LCD screen. Wipe off any moisture and oil on the front of the LCD screen.
- Peel off the white protection sheet attached to the back side (which is adhered to the LCD screen) of a new protection sheet.
- When the white protection sheet is removed, the new protection sheet is adhesive on its periphery. Attach the new protection sheet to the front of the LCD screen. At this time, be careful not to allow dust and dirt between the protection sheet and the LCD screen.
- Peel off the protection film attached to the front of the protection sheet. The ordering information of a protection sheet for replacement is as follows:

  For the 10.4″ LCD: A02B–0236–K110



Touch panel compensation

- **Condition that requires compensation**

Touch panel compensation is required:

1 When the LCD unit is replaced

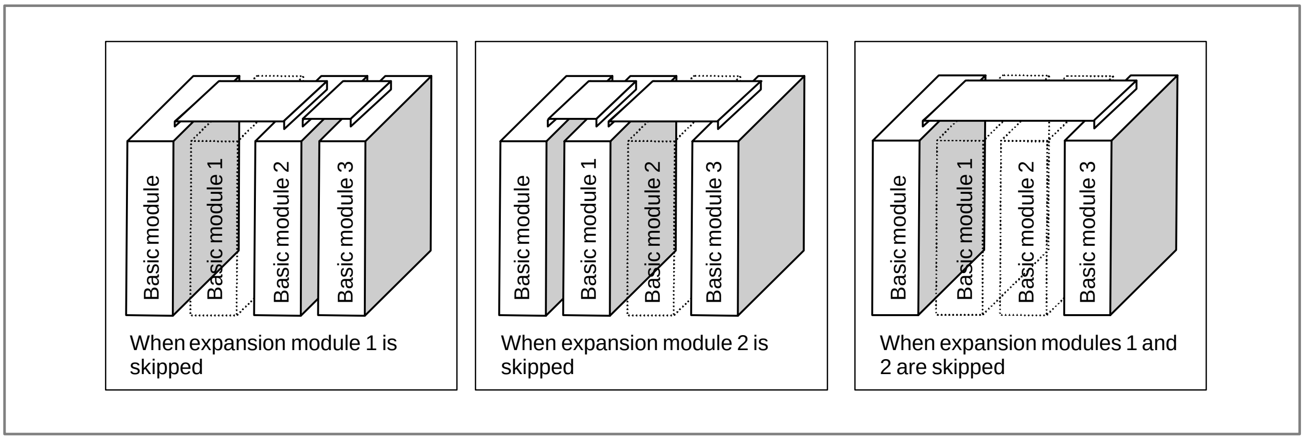
2 When the touch panel is replaced

3 When the touch panel control printed circuit board is replaced

See Appendix I, ”Maintenance with Display Link Typed Touch Panel,” for explanations about how to operate.

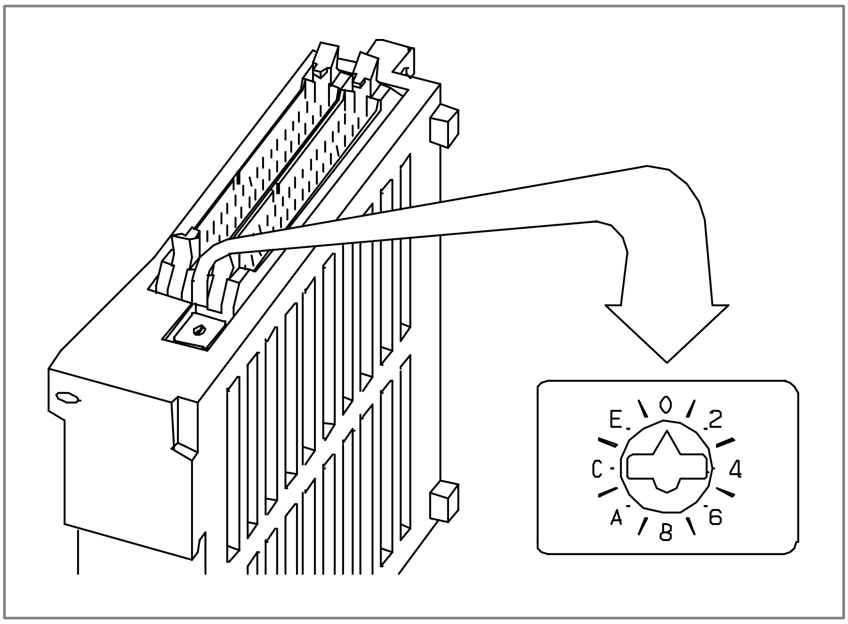
2.10 SETTING OF I/O MODULE FOR CONNECTOR PANEL

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.

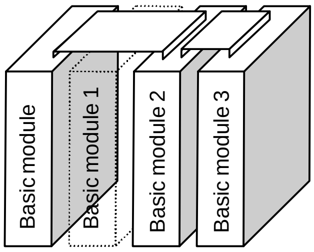


Each setting position of the rotary switch has the meaning as indicated below.

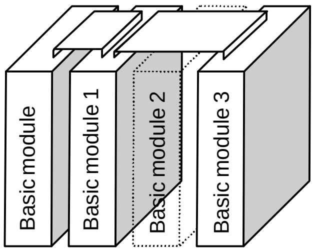
Setting position	Indication	Meaning of setting
0	0	Standard setting. The rotary switch is set to this position at the time of shipment from FANUC.
1	–	Set the rotary switch of an expansion module to this position when the one preceding expansion module is skipped.

Setting position	Indication	Meaning of setting
2	2	Set the rotary switch of an expansion module to this position when the two preceding expansion modules are skipped.
3	–	Setting prohibited
4~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.

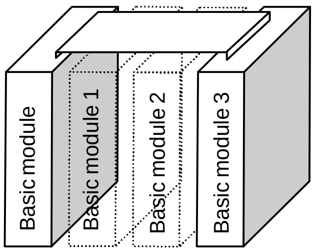
Examples of setting



(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.

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.

2.11 ENVIRONMENTAL REQUIREMENTS

The peripheral units and the control unit have been designed on the assumption that they are housed in closed cabinets. In this manual "cabinet" refers to the following:

- Cabinet for housing the control unit or peripheral units;
- Operation pendant for housing the control unit or operator's panel.
- Equivalent to the above.

The environmental conditions when installing these internal cabinets shall conform to the following table.

Ambient temperature	In operation	0°C to 55°C
	In store or transportation	–20°C to +60°C
Relative humidity	30% to 95% (no condensation)	
Vibration	In operation : 0.5G or less/ In store or operation : 1.0G or less	
Environment	Inter of units: Each unit should be placed in a cabinet to keep it from pollutants (such as dust, coolant, organic solvents, acid, corrosive gas, and salt). Heat sink of outer of cabinet: The heat sinks should be protected from direct exposure to coolant, lubricant, and metal chips.	
Radiation (ionizing or nonion-izing)	If a unit is to be used in an environment where it is likely to be exposed to radiations (such as microwave, ultraviolet rays, laser beams, and X–rays), a shielding provision should be available for it.	
Height above sea level	In operation : Up to 1,000 m/ In store or operation : Up to 12,000 m	

2.12 POWER SUPPLY FOR CONTROL UNITS

The following regulated power supply is required for the input power supply of the Power Mate controller and peripheral units.
24 VDC ±10% (including instantaneous changes and ripple).
Ripple voltage ≦ 1.2 Vp–p

Table 2.12 (a) Power supply capacity for control unit

Unit	Power supply capacity
Control unit (No option board is included.)	1.5 A (A fuse of 1 A is additionally required if a FANUC RS–232–C unit is used.)
Option board	
HSSB board	0.2A
I/O Link–II slave board	0.3A
I/O Link–II slave board B	0.3A
PROFIBUS–DP master board	0.3A
PROFIBUS–DP slave board	0.3A
DeviceNet master board DeviceNet master board B DeviceNet slave board DeviceNet slave board B DeviceNet slave board C	0.2A
Ethernet board Fast Ethernet board	0.3A
FL–net board	0.3A
External I/O card D, E	500 + 7.3 x n (mA) where n is the number of input points that are turned on simultaneously (*)
I/O Unit–A	The required current varies depending on the number of modules. Refer to the I/O Unit–MODEL A Connection and Maintenance Manual (B–61813E).
I/O Link connection unit	0.2 A
Basic connector panel I/O module	200 + 7.3 x n (mA) where n is the number of input points that are turned on simultaneously (*)
Branch–out I/O module expansion A/B	100 + 7.3 x n (mA) where n is the number of input points that are turned on simultaneously (*)
Branch–out I/O module expansion C/D	0.1A
Operator’s panel I/O module A1	0.35A

Table 2.12 (a) Power supply capacity for control unit

Unit	Power supply capacity
Operator's panel I/O module B1/B2	300 + 7.3 x n (mA) where n is the number of input points that are turned on simultaneously (*1)
FSSB I/O module basic unit	300 + 7.3 x n (mA) where n is the number of input points that are turned on simultaneously (*1)
FSSB I/O module basic unit + expansion unit	
Separate detector interface unit, basic unit	0.9A
Separate detector interface unit, basic unit + additional unit	1.5A
Analog servo interface unit, basic unit	0.7A (type F) 1.2A (type M)
Analog servo interface unit, basic unit + expansion unit	1.0A (type F) 2.0A (type M)

NOTE
(*) The Power Mate–*i* requires an additional 24–V power supply for DOs.

Table 2.12 (b) Power supply capacity for setting and display unit

Unit	Power supply capacity
CRT/MDI Picture display CRT/MDI	1.0 A
Separate type CRT	0.8 A
Separate type MDI Picture display separate type MDI	0.2 A
Separate type PDP	2.0 A
Separate type LCD	0.8 A
Detachable LCD/MDI	1.0 A
Handy operator's panel	0.2 A

2.13 HEAT DISSIPATED BY EACH UNIT

Table 2.13 (a) Heat dissipated for control unit

Unit		Heat loss
Control unit (No option board is included.)		25W
Option board		
	HSSB board	4W
	I/O Link–II slave board	6W
	I/O Link–II slave board B	6W
	PROFIBUS–DP master board	6W
	PROFIBUS–DP slave board	6W
	DeviceNet master board DeviceNet master board B DeviceNet slave board DeviceNet slave board B DeviceNet slave board C	5W
	Ethernet board Fast Ethernet board	6W
	FL–net board	6W
External I/O card D/E		5 + 0.175(W) where n is the number of input points that are turned on simultaneously
I/O Unit	AIF01A, AIF01B	1.2W
	AID32A, AID32B	1.2 + 0.23(W) where n is the number of input points that are turned on simultaneously
	AID16C, AID16D	0.1 + 0.21(W) where n is the number of input points that are turned on simultaneously
	AID32E, AID32F	0.1 + 0.23(W) where n is the number of input points that are turned on simultaneously
I/O Link connection unit		4W
Basic connector panel I/O module		5 + 0.175 x n (W) where n is the number of input points that are turned on simultaneously
Branch–out I/O module expansion B/C/D		2.5W
Operator’s panel I/O module A1		8.5W
Operator’s panel I/O module B1/B2		7.5 + 0.175 x n (W) where n is the number of input points that are turned on simultaneously
Separate detector interface unit, basic unit		9W
Separate detector interface unit, basic unit + additional unit		14W
FSSB I/O module basic unit		7.5 + 0.175 x n (W) where n is the number of input points that are turned on simultaneously
FSSB I/O module basic unit + expansion unit		

Table 2.13 (a) Heat dissipated for control unit

Unit	Heat loss
Analog servo interface unit, basic unit	10W (type F) 17W (type M)
Analog servo interface unit, basic unit + expansion unit	14W (type F) 28W (type M)

NOTE
1 For other peripheral devices (I/O, etc.), see the heat dissipation data for each device and add the value to the above.
2 Not including the heat dissipation of the separate detector itself.
3 See FANUC SERVO MOTOR AMPLIFIER α series DESCRIPTIONS (B–65162E) or FANUC SERVO MOTOR β series DESCRIPTIONS (B–65232EN) for heat loss of servo amplifier.

Table 2.13 (b) Heat dissipated for setting and display unit

Unit	Heat loss
CRT/MDI Picture display CRT/MDI	18W
LCD/MDI	14W
Separate type CRT	14W
Separate type MDI Picture display separate type MDI	4W
Separate type PDP	20W
Separate type LCD	10W

2.14 ACTION AGAINST NOISE

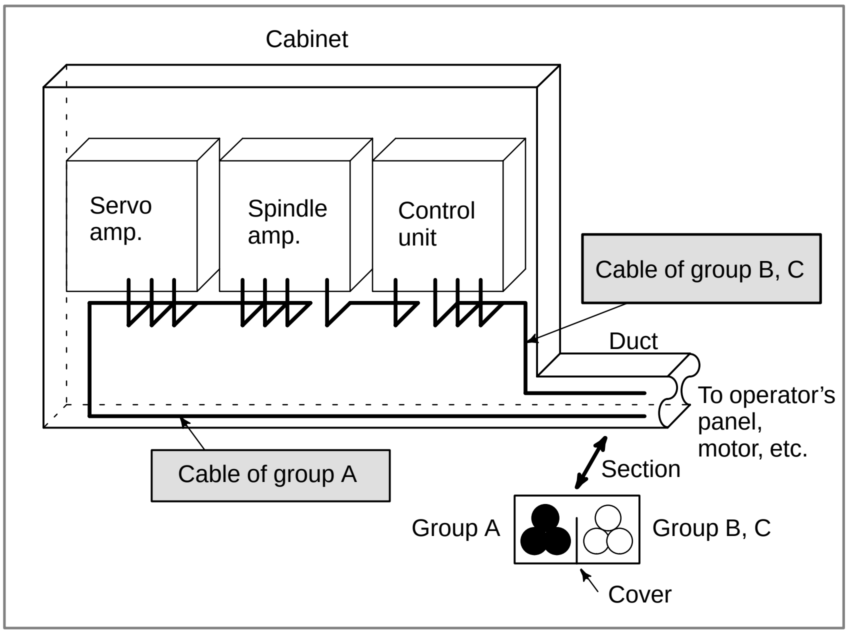
The CNC has been steadily reduced in size using surface–mount and custom LSI technologies for electronic components. The CNC also is designed to be protected from external noise. However, it is difficult to measure the level and frequency of noise quantitatively, and noise has many uncertain factors. It is important to prevent both noise from being generated and generated noise from being introduced into the CNC. This precaution improves the stability of the CNC machine system.
The CNC component units are often installed close to the parts generating noise in the power magnetics cabinet. Possible noise sources into the CNC are capacitive coupling, electromagnetic induction, and ground loops.
When designing the power magnetics cabinet, guard against noise in the machine as described in the following section.

2.14.1 Separating Signal Lines

The cables used for the machine are classified as listed in the following table: Process the cables in each group as described in the action column.

<table>
<tr><th>Group</th><th>Signal line</th><th>Action</th></tr>
<tr><td rowspan="5">A</td><td>Primary AC power line</td><td rowspan="5">Bind the cables in group A separately (Note 1) from groups B and C, or cover group A with an electromagnetic shield (Note 2).
See Section 2.14.4 and connect spark killers or diodes with the solenoid and relay.</td></tr>
<tr><td>Secondary AC power line</td></tr>
<tr><td>AC/DC power lines (containing the power lines for the servo and spindle motors)</td></tr>
<tr><td>AC/DC solenoid</td></tr>
<tr><td>AC/DC relay</td></tr>
<tr><td rowspan="5">B</td><td>DC solenoid (24VDC)</td><td rowspan="5">Connect diodes with DC solenoid and relay.
Bind the cables in group B separately from group A, or cover group B with an electromagnetic shield.
Separate group B as far from Group C as possible.
It is more desirable to cover group B with the shield.</td></tr>
<tr><td>DC relay (24VDC)</td></tr>
<tr><td>DC power line</td></tr>
<tr><td>DI/DO cable between the I/O Unit and power magnetics cabinet</td></tr>
<tr><td>DI/DO cable between the I/O Unit and machine</td></tr>
<tr><td rowspan="9">C</td><td>Cable between the Power Mate i and I/O Unit</td><td rowspan="9">Bind the cables in group C separately from group A, or cover group C with an electromagnetic shield.
Separate group C as far from Group B as possible.
Be sure to perform shield processing in Section 2.14.5.</td></tr>
<tr><td>Cable for position and velocity feedback</td></tr>
<tr><td>Cable between the Power Mate i and spindle amplifier</td></tr>
<tr><td>Cable for the position coder</td></tr>
<tr><td>Cable for the manual pulse generator</td></tr>
<tr><td>Cable between the Power Mate i and the setting and display unit</td></tr>
<tr><td>RS–232–C and RS–422 interface cable</td></tr>
<tr><td>Cable for the battery</td></tr>
<tr><td>Other cables to be covered with the shield</td></tr>
</table>

NOTE
1 The groups must be 10 cm or more apart from one another when binding the cables in each group.
2 The electromagnetic shield refers to shielding between groups with grounded steel plates.



2.14.2 Ground

The following ground systems are provided for the machine :

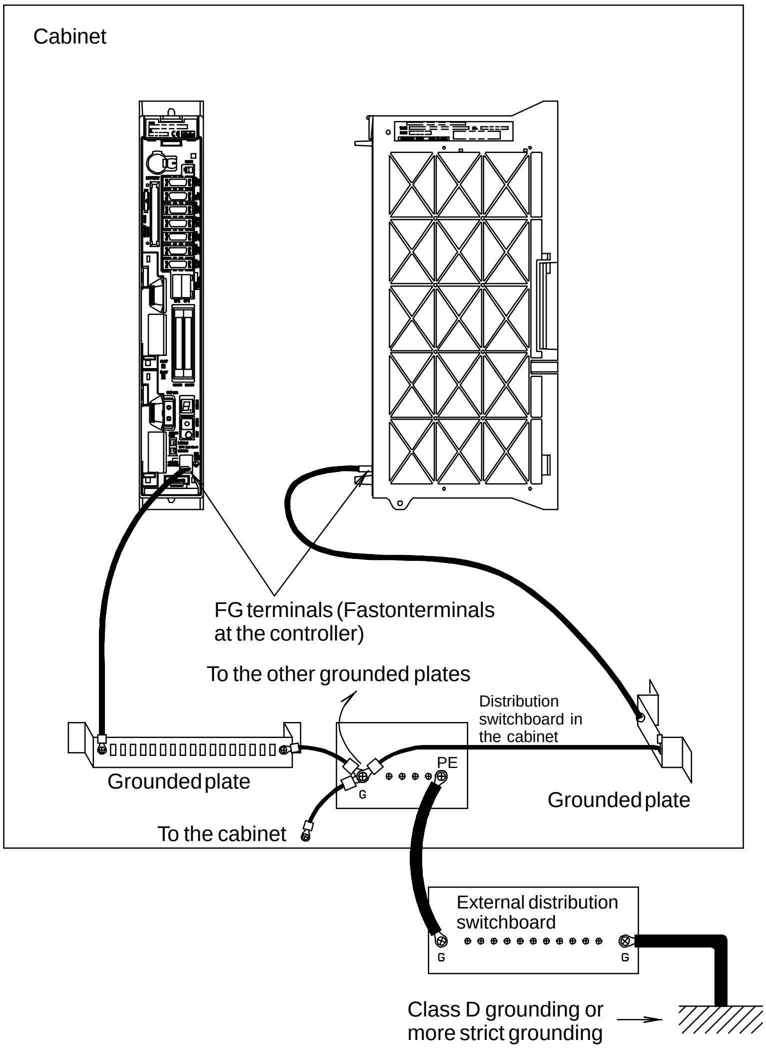
- Signal ground
  Signal ground connects the reference potential (0 V) to the electrical signals to ground.
- Protection grounding
  Protection grounding is used for safety and suppressing noise. More specifically, protection grounding is provided by the unit frames, cases of the units, panels, and shields of the interface cables that connect the units.
- Protection grounding (PE)
  Protection grounding (PE) connects the protection ground connections provided for each unit or between units to ground at one point.

Notes on connecting the ground systems

- The grounding resistance of the protection grounding (PE) shall be 100 ohms or less (class D grounding).
- The protection grounding (PE) cable must have enough cross–sectional area to safely carry the accidental current flow into the protection grounding (PE) when an accident such as a short circuit occurs.
  (Generally, it must have the cross–sectional area of the AC power cable or more.)
- Use the cable containing the AC power wire and the protection grounding (PE) wire so that power is supplied with the ground wire connected.

2.14.3 Connecting the Signal Ground Terminal of the Control Unit

Connect the Power Mate *i* signal ground terminal (FG terminal) to the grounded plate of the cabinet. The grounded plate must be connected to the protection grounding (PE) as shown below.



CAUTION

Use the Faston terminal (A02B–0166–K330) for connection to the FG terminal. Connect the FG terminal to the grounded plate by using a stranded wire within 300 mm with a cross–section of 2 mm^2 or more. Be sure to use this connection method. Otherwise, the CNC will be susceptible to noise.

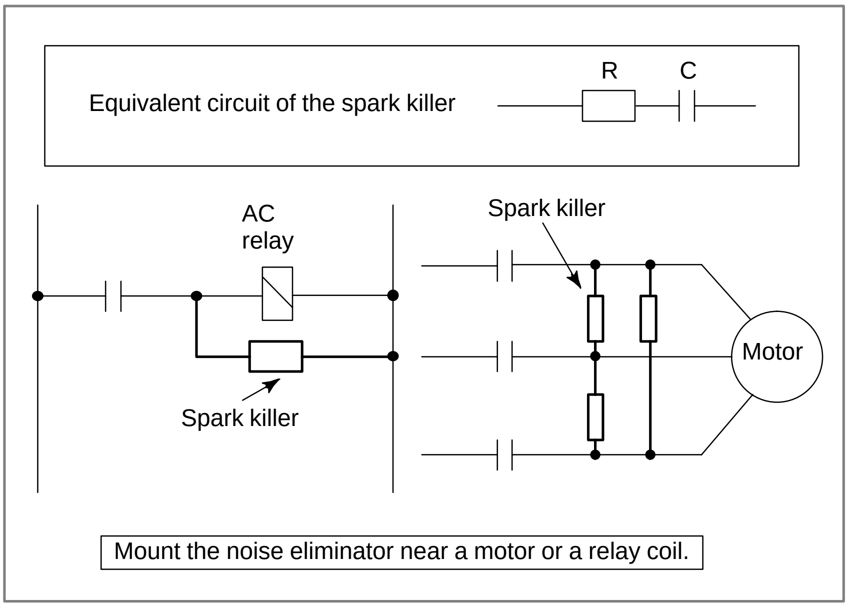
2.14.4 Noise Suppressor

The AC/DC solenoid and relay are used in the power magnetics cabinet. A high pulse voltage is caused by coil inductance when these devices are turned on or off.
This pulse voltage induced through the cable causes the electronic circuits to be disturbed. In general, to reduce this pulse voltage, a spark killer is used in AC circuits, while a diode is used in DC circuits.

Spark killer

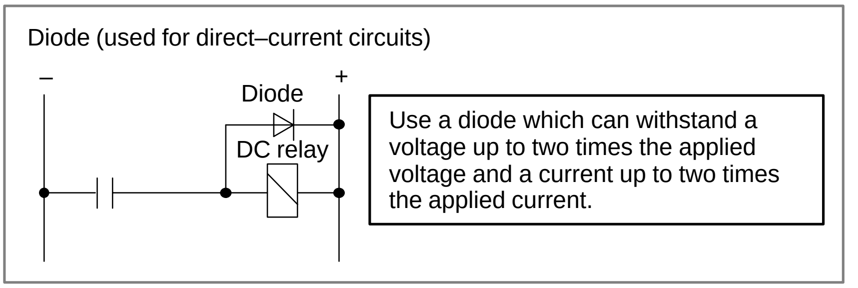
- Use a spark killer consisting of a resistor and capacitor in series. This type of spark killer is called a CR spark killer.(Use it under AC)
  (A varistor is useful in clamping the peak voltage of the pulse voltage, but cannot suppress the sudden rise of the pulse voltage. FANUC therefore recommends a CR spark killer.)
- The reference capacitance and resistance of the spark killer shall conform to the following based on the current (I (A)) and DC resistance of the stationary coil:
  1) Resistance (R) : Equivalent DC resistance of the coil
  2) Capacitance (C) : $\frac{I^2}{10} \sim \frac{I^2}{20}$ (μF)

  I : Current at stationary state of the coil



> **NOTE**
> Use a CR–type noise eliminator. Varistor–type noise eliminators clamp the peak pulse voltage but cannot suppress a sharp rising edge.

Diode



2.14.5 Cable Clamp and Shield Processing

If a cable connected to the CNC, servo amplifier, spindle amplifier, or other device requires shielding, clamp the cable as shown below. The clamp both supports and shields the cable. Use this clamp to ensure stable operation of the system.

Partially peel out the sheath and expose the shield. Push and clamp by the plate metal fittings for clamp at the part. The ground plate must be made by the machine tool builder, and set as follows :

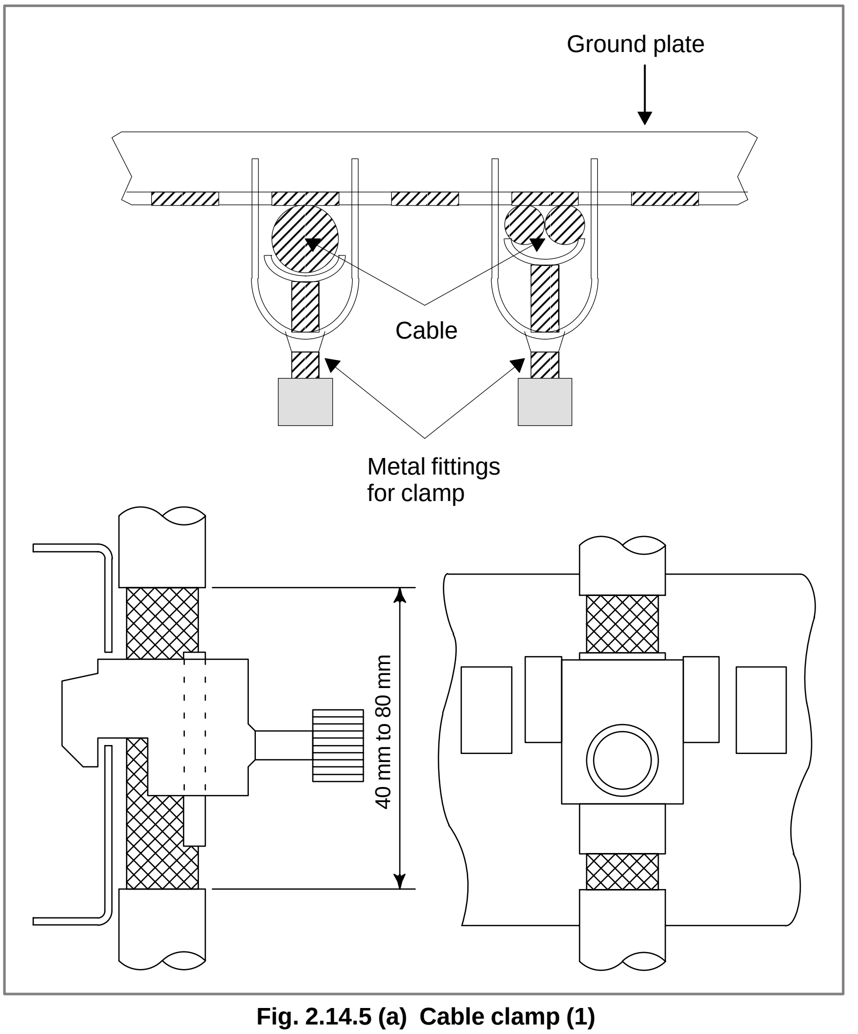


Fig. 2.14.5 (a) Cable clamp (1)

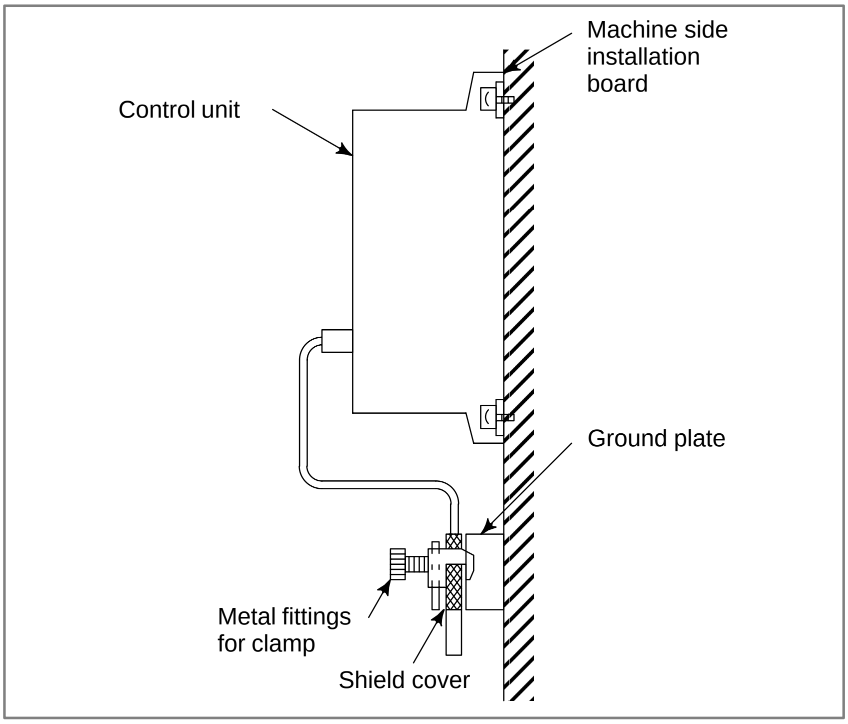


Fig. 2.14.5 (b) Cable clamp (2)

Prepare ground plate like the following figure.

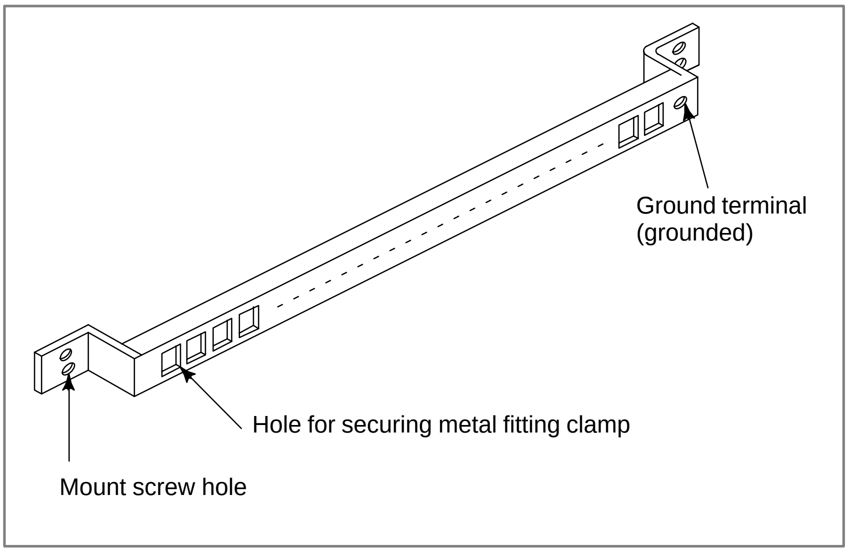


Fig. 2.14.5 (c) Ground plate

For the ground plate, use a metal plate of 2 mm or thicker, which surface is plated with nickel.

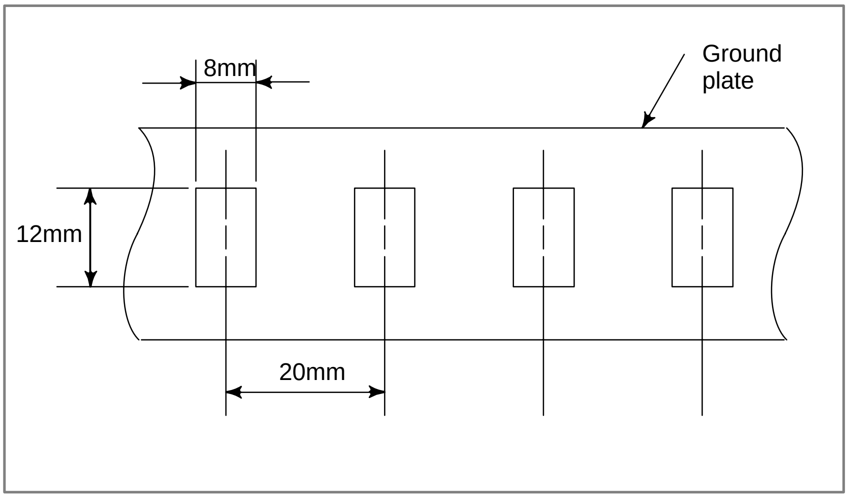


Fig. 2.14.5 (d) Ground plate holes

(Reference) Outer drawings of metal fittings for clamp.

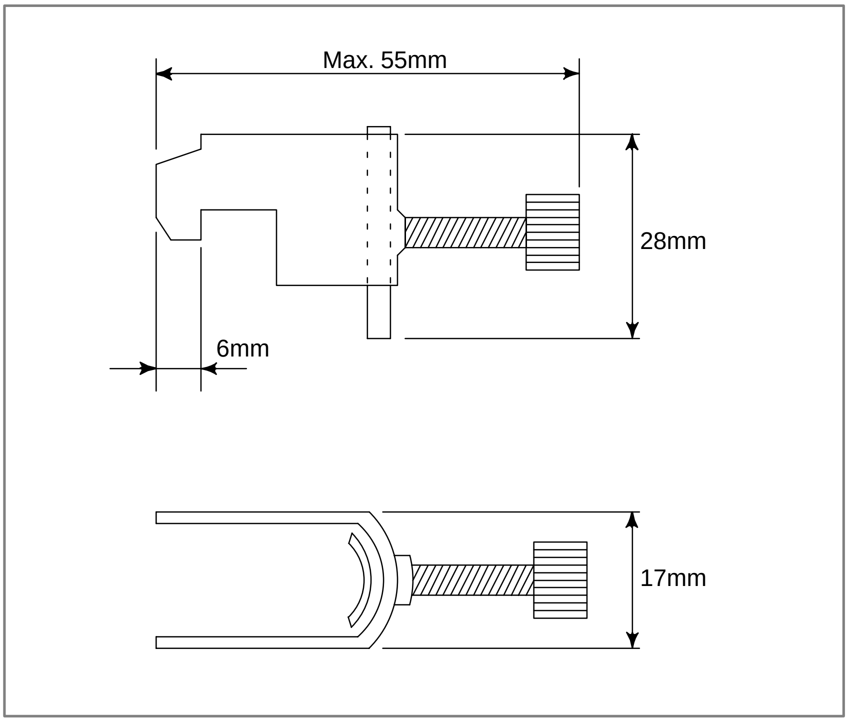


Fig. 2.14.5 (e) Outer drawings of metal fittings for clamp

Ordering specification for metal fittings for clamp
A02B–0124–K001 (8 pieces)

3 INPUT AND OUTPUT OF DATA

Once the memory module or base printed–circuit board is replaced, or the memory is cleared, it becomes necessary to re–set data in the memory. This chapter explains how to input parameters, part programs, and tool offset amounts from an external I/O unit, such as a Handy File, and output them to it.

NOTE
The CRT/MDI operating instructions and related information described in this chapter are applicable also to the PDP/MDI, LCD/MDI, handy operator’s panel, and LCD with touch panel.

3.1 SETTING PARAMETERS FOR INPUT/OUTPUT

- **Setting procedure of parameters (CRT/MDI)**

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

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

         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


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

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

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

> **NOTE**
> There are two reader/punch interfaces. Specify which to use in parameter No. 20.

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

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

   This key sequence sets data as follows:

0		1234
0	⇒	4567
0		9999
0		0

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

   This key sequence sets data as follows:

0		1234
0	⇒	0
0		9999
0		0

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

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

   This key sequence sets data as follows:

0		1234
0	⇒	1234
0		1234
0		0

   4) Bit parameters can be set as follows:

   (Ex.) 1 1 EOB a EOB a INPUT

   This key sequence sets data as follows:

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

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

DPL/MDI

1. Set emergency stop.
2. Press the **[VAR]** key to display the settings screen.
3. Use the cursor keys to position the cursor at PWE, then press the [1] key and the [INPUT] key, in that order, to enable parameters to be written.
   The Power Mate will generate P/S alarm 100.
4. Press the **[DGNOS/PARAM]** key several time to display the parameter screen.

```
>  &0001  01010101
   &0002  00000000
```

5. Move the cursor to the number of the parameter to change.
   Method 1
      Use the cursor keys. The cursor will continue to move while a cursor key is being pressed.
   Method 2
      Press the following keys and enter data in the order shown :
      [No.] → [Parameter No.] → [input]
6. Enter a parameter value with the data input keys.
7. Press the [INPUT] key. The parameter value is input and displayed.
8. After all parameters have been set and confirmed, return to the settings screen and set PWE to 0.
9. Normally, in order to release the alarm state, press the [CAN] key.
   However, in order to release alarm No. 000, the power needs to be turned off and then on again.

3.2 INPUTTING/ OUTPUTTING DATA

The Power Mate *i* memorized the following data.
Save a backup copy of the latest data to the flash memory card or an I/O unit beforehand, while the controller is running normally.

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

3.2.1 Confirming the Parameters Required for Data Input/Output

Be sure that data input/output cannot be done in an alarm status.

The parameters necessary for data input/output are as follows:

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

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

0020	Selection of I/O channel

0 : Channel 1
1 : Channel 1
2 : Channel 2

If the I/O CHANNEL is 0, the relevant parameters are Nos. 101, 102, and 103.
If the I/O CHANNEL is 1, the relevant parameters are Nos. 111, 112, and 113.
If the I/O CHANNEL is 2, the relevant parameters are Nos. 121, 122, and 123.

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

NFD 0 : Feed is output when data is output.
1 : Feed is not output when data is output.

ASI ☆ 0 : EIA or ISO code is used for input data.
1 : ASCII code is used.

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

0102	pecification number of input/output device

Table 3.2.1 Set value and Input/Output Device

Set value	Input/Output device
0	RS–232–C (except the following for connection with a PC)
3	FANUC Handy File

NOTE
If I/O CHANNEL = 2 (parameter No. 122), it is impossible to use the input/output units at set value 3.

0103	Baud Rate

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

3.2.2 Outputting CNC Parameters

Procedure (CRT/MDI)

1. Select **EDIT** mode.
2. Execute file heading when required.
   For which file the parameter is output to refer to Explanations (Output to a floppy).
3. Press SYSTEM key and soft key **[PARAM]** to display parameter screen.
4. Press soft key **[(OPRT)]**, and soft key ▷.
5. Press soft key **[PUNCH]** and **[EXEC]**, and the parameters are started to be output.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Execute file heading when required.
   As for the file that the parameter is output to, refer to Explanations (Output to a floppy).
3 Select the parameter display screen by **[DGNOS/PARAM]** key.
4. Press the **[WRITE]** key.
5. While parameters are being output, the display appears as below.

```
>  &0100        00000000
                WRT
```

6. In order to stop output of data from a tape before it has finished, turn on external reset signal ERS (bit 7 of G008).
   Once data output from a tape has been stopped, it cannot be restarted.

Explanations (Output to a floppy)

- **File output location**

When output is conducted to the floppy, the program is output as the new file after the files existing in the floppy. New files are to be written from the beginning with making the old files invalid, use the above output operation after the N0 head searching.

- **An alarm while a program is output**

When P/S alarm (No.086) occurs during program output, the floppy is restored to the condition before the output.

- **Outputting a program after file heading**

When program output is conducted after N1 to N9999 head searching, the new file is output as the designated n–th position. In this case, 1 to n–1 files are effective, but the files after the old n–th one are deleted. If an alarm occurs during output, only the 1 to n–1 files are restored.

- **Efficient use of memory**

To efficiently use the memory in the cassette or card, output the program by setting parameter NFD (No.0101#7 or, No.0111#7) to 1. This parameter makes the feed is not output, utilizing the memory efficiently.

- **On the memo record**

Head searching with a file No. is necessary when a file output from the CNC to the floppy is again input to the CNC memory or compared with the content of the CNC memory. Therefore, immediately after a file is output from the CNC to the floppy, record the file No. on the memo.

3.2.3 Outputting PMC Parameters

Procedure (CRT/MDI)

1. Select MDI mode.
2. Press [OFFSET SETTING] key then soft key **[SETTING]** to select a setting screen.
3. Set the cursor to **PARAMETER WRITE** and input [1] and [INPUT].
   At this time, alarm 100 will be generated.
4. Press [SYSTEM] key and soft key **[PMC]**.
5. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**
6. Set the cursor to K17 (SB5) or K900 (SB6) 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]**. (for handy file)
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.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Press **[VAR]** key several time then select a setting screen.
3. Set the cursor to PWE and input [1] and [INPUT]. At this time, alarm 100 will be generated.
4. Press **[DGNOS/PARAM]** key several time to select diagnosis screen.
5. Press <R/K>,<17> (SB5) or <900> (SB6) and [INPUT] key.
6. Set the first bit to 1.
   [X] [X] [X] [X] [X] [X] [1] [X] [INPUT]
   Where, mark “x” is a former value
7. Display the PMC parameter. Press **[No]** key. Then set file number.
8. Press **[WRITE]**. Then PMC parameter output starts.
9. After the PMC parameters have been output, set PWE to 0.
10. Reset Power Mate to release alarm 100.

3.2.4 Outputting Pitch Error Compensation Amount

Procedure (CRT/MDI)

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.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Execute file heading when required.
3. Select the Pitch Error Compensation data display screen by pressing **[DGNOS/PARAM]** key.
4. Press **[WRITE]** key.

3.2.5 Outputting Custom Macro Variable Values

Procedure (CRT/MDI)

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

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Select the custom macro variable display screen by pressing **[VAR]** key.
3 Press the **[WRITE]** key.
4. While the custom macro variables are being output, the display appears as below.

```
>  #0100
                    WRT
```

5. In order to stop output of data from a tape before it has finished, turn on external reset signal ERS (bit 7 of G008).
   Once data output from a tape has been stopped, it cannot be restarted.

3.2.6 Outputting Tool Compensation Amount

Procedure (CRT/MDI)

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.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Select the offset data display screen by pressing **[VAR]** key.
3 Press the **[WRITE]** key.
4. While offset data are being output, the display appears as below.

```
>  H100=              0.000
                    WRT
```

5. In order to stop output of data from a tape before it has finished, turn on external reset signal ERS (bit 7 of G008).
   Once data output from a tape has been stopped, it cannot be restarted.

3.2.7 Outputting Part Program

Procedure (CRT/MDI)

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

	#7	#6	#5	#4	#3	#2	#1	#0
0101				NE9				NE8

NE9 ☆ 0 : Programs of 9000s are edited.
1 : Programs of 9000s can be protected.

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

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

Procedure (DPL/MDI)

A program registered in memory can be punched using the procedure below.

1. Confirm parameter as like above 1.
2. Select EDIT mode.
3. Press **[PRGRM]** to display the program screen.
4. Key in address O.
5. Key in a desired program number.
   Entering < – ><9>,<9>,<9>,<9> causes all programs in memory to be output.
6. The number of input program is punched with pushing **[WRITE]**.

3.2.8 Outputting Ladder Programs

Procedure (CRT/MDI)

1. Select **MDI** mode.
2. Press OFFSET SETTING key then soft key **[SETTING]** to select a setting screen.
3. Set the cursor to **PARAMETER WRITE** and input 1 and INPUT.
   At this time, alarm 100 will be generated.
4. Press SYSTEM key and soft key **[PMC]**.
5. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**
6. Set the cursor to K17 (SB5) or K900 (SB6) and set the first bit to 1.
   × × × × × × 1 × 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]**. (for Handy File)
12. In KIND DATA item, press soft key **[PARAM]**.
13. In FUNCTION item, press soft key **[WRITE]**.
14. Press soft key **[EXEC]**. Then ladder programs are started to be output.
15. After the ladder programs have been output, set PARAMETER WRITE to 0.
16. Press RESET to release alarm 100.

> **NOTE**
> In the Power Mate *i*, ladder programs are stored in the FROM.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Press **[DGNOS/PARAM]** key several time to select diagnosis screen.
3. Press **[No.]** key in the diagnosis screen then set file number.
4. Press **[WRITE]**, then ladder programs are started to be output.

3.2.9 Inputting CNC Parameters

> **CAUTION**
> For a system using an absolute pulse coder, reference position setting is required once all parameters have been input.

Procedure (CRT/MDI)

1. Set to the emergency stop state.
2. Press SYSTEM key and soft key **[PARAM]** to display parameter screen.
3. Press soft key **[(OPRT)]** and soft key ▷.
4. Press soft key **[READ]** and **[EXEC]**. Then input of parameters are started.
5. After parameter input is completed, P/S alarm 000 will occur. Switch the power off and on again.
6. Alarm 300 is issued if the system employs an absolute pulse coder. In such a case, perform reference position return again.

Procedure (DPL/MDI)

1. Press the EMERGENCY STOP button on the machine side.
2. Press **[VAR]** key several time then select a setting screen.
3. Set the cursor to PWE and input 1 and INPUT. At this time, alarm 100 will be generated.
4. The parameter screen is selected by pressing the **[DGNOS/PARAM]** key.
5. Press **[READ]** key.
6. NC parameters are input to the memory by this operation. Normally, PS alarm 000 will activate after completion of parameter reading.
7. Set PWE on the setting parameter to 0.
8. Turn on the Power Mate power again.
9. For a system using an absolute pulse coder, alarm 300 is issued. Perform zero point setting.

3.2.10 Inputting PMC Parameters

Procedure (CRT/MDI)

1. Set the emergency stop state.
2. Turn off (KEY4=1) the program protect key.
3. Press OFFSET SETTING key and soft key **[SETTING]** to select the SETTING screen.
4. Confirm that PARAMETER WRITE=1.
5. Press SYSTEM key and soft key **[PMC]**.
6. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**.

7. Set the cursor to K17 (SB5) or K900 (SB6) and set bit 1 to 1.
   Enter: X X X X X X 1 X INPUT .
   where X represents a value that is displayed before entry.
   Entering this way selects the data input/output screen.
8. Press ◁ key and ▷ key.
9. 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.
10. In CHANNEL item , press 1 INPUT to select channel 1.
11. In DEVICE item, press **[FDCAS]** key. (for handy file)
12. In FUNCTION item, press soft key **[READ]** to input data
13. In FILE NO item, press 2 INPUT to select file no. 2.
14. Press soft key **[EXECT]** and the PMC parameters are started to be input.
15. After data has been read, turn off power and turn it on.

Procedure (DPL/MDI)

1. Set the emergency stop state.
2. Press [VAR] key several times and then select the SETTING screen.
3. Confirm that DWE=1.
4. Press **[DGNOS/PARAM]** key several times then select diagnosis screen (@).
5. Press **[No.]** then set the file number.
6. Press **[READ]** and the PMC parameters are started to be input.
7. After data has been read, turn off power and turn it on.

3.2.11 Inputting Pitch Error Compensation Amount

Procedure (CRT/MDI)

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.

Procedure (DPL/MDI)

1. Select EDIT mode.
2. The Pitch Error Compensation data screen is selected by pressing the **[DGNOS/PARAM]** key.
3. Press **[READ]** key.
4. Pitch Error Compensation data are input to the memory by this operation.

3.2.12 Inputting Custom Macro Variable Values

Procedure (CRT/MDI)

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

Procedure (DPL/MDI)

1. Select EDIT mode.
2. Perform the same operation as for program input and read in the custom macro statements as a part program.
3. After reading is finished, select AUTO mode. By executing the program that was read in, the values of the common variables will be stored in the memory of macro variable.

3.2.13 Inputting Tool Compensation Amount

Procedure (CRT/MDI)

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

Procedure (DPL/MDI)

1. Select the EDIT mode.
2. Display the data display screen by pressing **[VAR]** key.
3. Press **[READ]** key.
4. The input offset data will be displayed on the screen after completion of input operation.

3.2.14 Inputting Part Programs

CRT/MDI

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

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

NPE When programs are registered in part program storage area, M02,M30 and M99 are:

0 : regarded as the end of program.
☆ 1 : not regarded as the end of porgram.

RAL When programs are registered:

☆ 0 : All programs are registered.
1 : Only one program is registered.

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

NE9 ☆ 0 : Programs of 9000s can be edited.
1 : Programs of 9000s are protected.

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

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

DPL/MDI

1. Select EDIT mode.
2. Press **[PRGRM]** to display the program screen.
3. When the controller tape does not have a program number or a program number is to be changed, enter a desired program number. (When the controller tape has a program number and a program number is not changed, this operation is not necessary.)
   i) Key in address <0>.
   ii) Key in a desired program number.
4. Press the **[READ]** key.

3.2.15 Inputting PMC Ladder

Procedure (CRT/MDI)

1. Set the emergency stop state.
2. Press OFFSET SETTING key and soft key **[SETTING]** to select the SETTING screen.
3. Confirm that PARAMETER WRITE=1.
4. Press SYSTEM key and soft key **[PMC]**.
5. Press soft key **[PMCPRM]** and soft key **[KEEPRL]**.
6. Set the cursor to K17 (SB5) or K900 (SB6) and set bit 1 to 1.
   × × × × × × 1 × INPUT .
   × means the setting value which is before 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. (for handy file)
11. In FUNCTION item, press soft key **[READ]** to input data. In DATA KIND item, not set the data.

12. Press soft key **[EXEC]** and the PMC ladder are started to be input.
13. Store the input ladder into FROM. (On the screen displayed by pressing the **[PMC]** key, then the **[I/O]** key, set FROM for DEVICE and press the **[WRITE]** key, in the same way as in steps 8 to 11.)
14. Turn off power and turn it on.

Procedure (DPL/MDI)

1. Set the emergency stop state.
2. Press **[VAR]** key several times then select the SETTING screen.
3. Confirm that PWE=1.
4. Press **[DGNOS/PARAM]** key several times then select diagnosis screen (@).
5. Press **[No.]** then set the file number.
6. Press **[READ]** and the PMC ladder are started to be input.
7. Store the ladder into F–ROM For an explanation of how to store data into F–ROM, refer to Subsection 4.4.7.
8. Turn off power and turn it on.

3.3 DATA INPUT/OUTPUT ON THE ALL IO SCREEN

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

This function cannot be used with a combination of the DPL/MDI and its operation package.

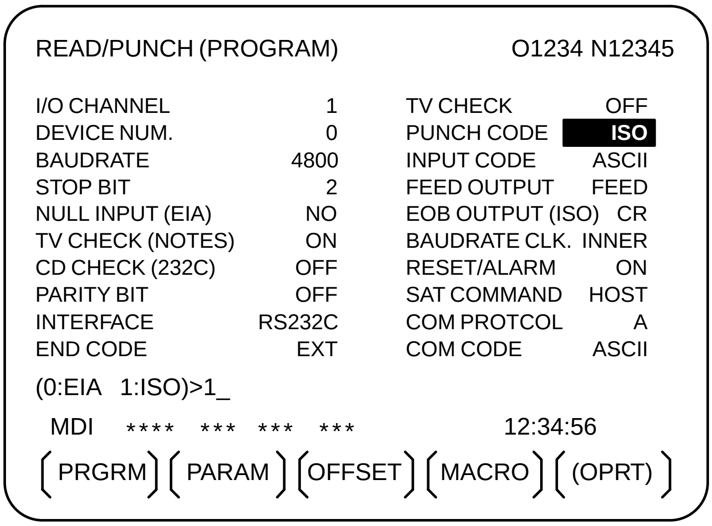


Fig. 3.3 ALL IO screen (when channel 1 is being used for input/output)

3.3.1 Setting Input/output–related Parameters

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

Setting input/output–related parameters

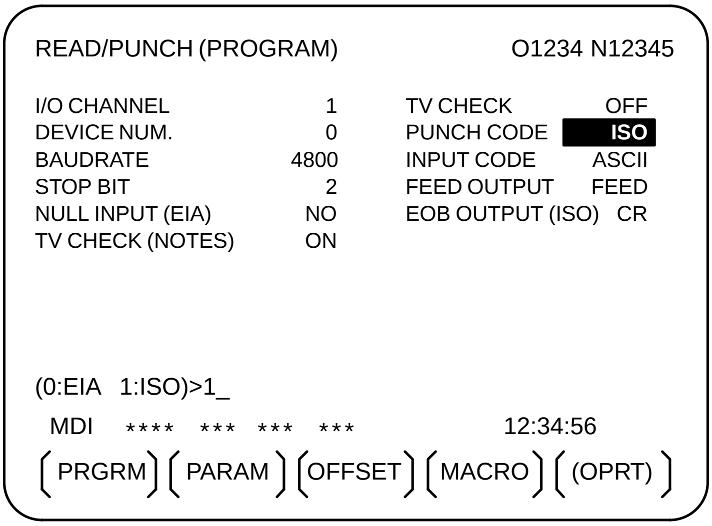
Procedure

1 Press function key SYSTEM .

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

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

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



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

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

3.3.2 Inputting and Outputting Programs

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

File search

Procedure

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

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

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

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

```
                                          O0001 N00010

            PROGRAM (NUM.)        MEMORY (CHAR.)
      USED   :      60                 3321
      FREE   :       2                  429

   O0010 O0001 O0003 O0002 O0555 O0999
   O0062 O0004 O0005 O1111 O0969 O6666
   O0021 O1234 O0588 O0020 O0040


 >_
 EDIT  ****  ***  ***  ***            14:46:09
[ F SRH ][ READ ][ PUNCH ][ DELETE ][ (OPRT) ]
```

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.

[ ] [ ] [ ] [CAN] [EXEC]

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

Inputting a program

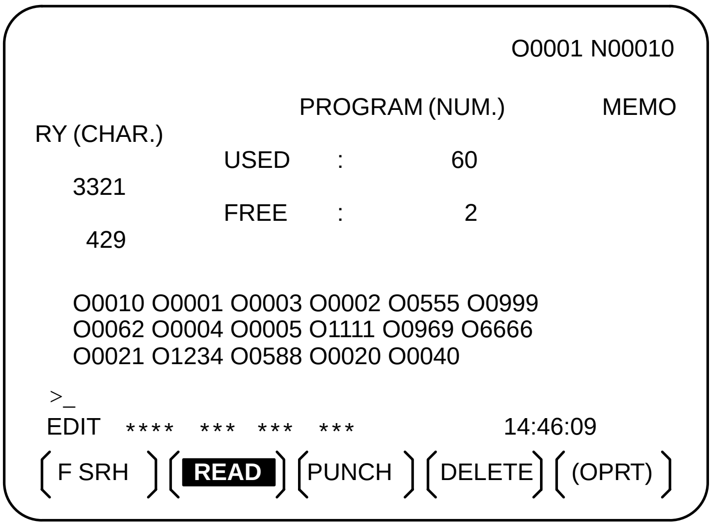
Procedure

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

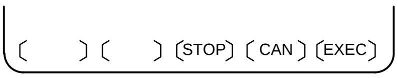
2 Select EDIT mode. A program directory is displayed.

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

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



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



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

Outputting programs

Procedure

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

2 Select EDIT mode. A program directory is displayed.

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

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

```
                                          O0001 N00010

            PROGRAM (NUM.)       MEMORY (CHAR.)
         USED   :     60               3321
         FREE   :      2                429

   O0010 O0001 O0003 O0002 O0555 O0999
   O0062 O0004 O0005 O1111 O0969 O6666
   O0021 O1234 O0588 O0020 O0040



 >_
 EDIT  ****   ***  ***   ***              14:46:09
 ( F SRH )( READ )( PUNCH )( DELETE )( (OPRT) )
```

4 Enter address O.

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

```
(      )(      )(STOP)(CAN)(EXEC)
```

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

Deleting files

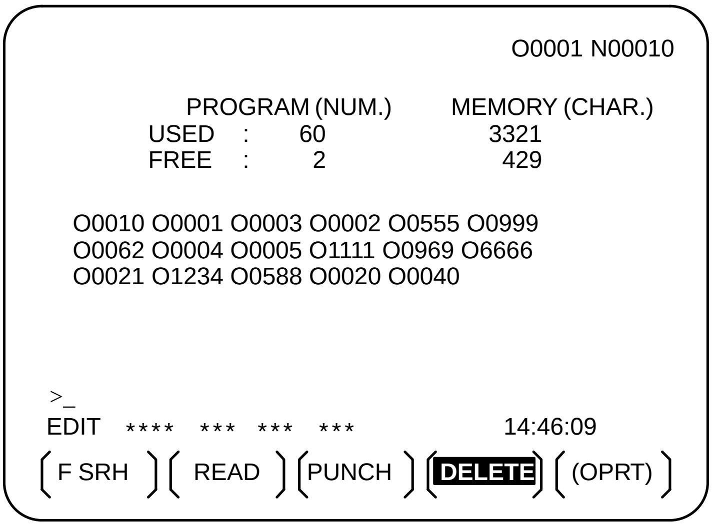
Procedure

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

2 Select EDIT mode. A program directory is displayed.

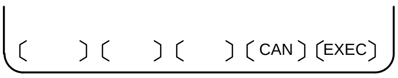
3 Press soft key **[(OPRT)]**. The screen and soft keys change as shown below.

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



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

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



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

3.3.3 Inputting and Outputting Parameters

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

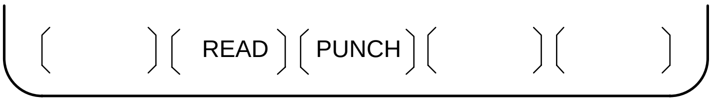
Inputting parameters

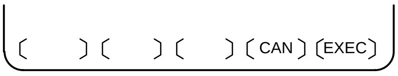
Procedure

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

2 Select EDIT mode.

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





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

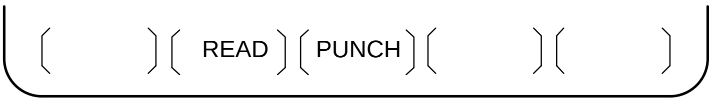
Outputting parameters

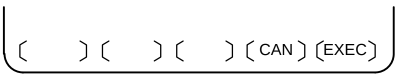
Procedure

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

2 Select EDIT mode.

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





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

3.3.4 Inputting and Outputting Offset Data

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

Inputting offset data

Procedure

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

2 Select EDIT mode.

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

( ) (READ) (PUNCH) ( ) ( )

( ) ( ) ( ) (CAN) (EXEC)

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

Outputting offset data

Procedure

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

2 Select EDIT mode.

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

( ) (READ) (PUNCH) ( ) ( )

( ) ( ) ( ) (CAN) (EXEC)

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

3.3.5 Outputting Custom Macro Common Variables

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

Outputting custom macro common variables

Procedure

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

2 Select EDIT mode.

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

( ) (READ) (PUNCH) ( ) ( )

( ) ( ) ( ) (CAN) (EXEC)

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

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

3.3.6 Inputting and Outputting Floppy Files

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

Displaying a file directory

Procedure

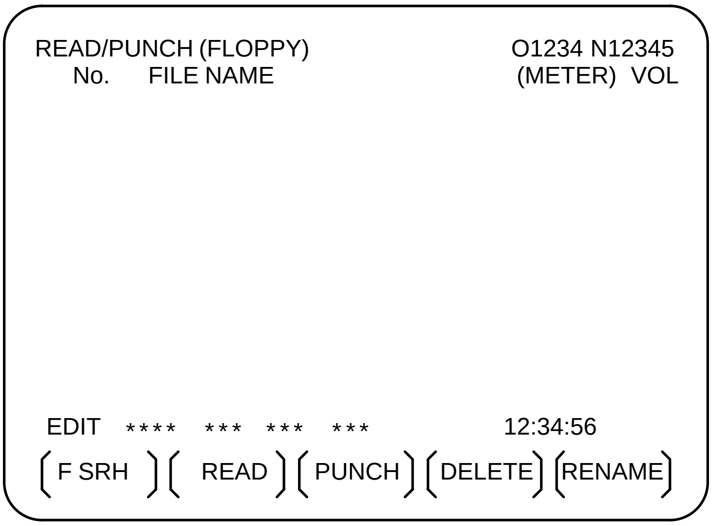
1 Press the rightmost soft key [▷] (continuous menu key) on the ALL IO screen, described in Section 3.3.1.

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

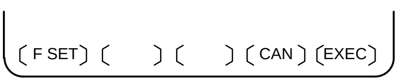
3 Select EDIT mode. The floppy screen is displayed.

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

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



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



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

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

```
READ/PUNCH (FLOPPY)                          O1234 N12345
   No.    FILE NAME                          (Meter)   VOL
  0001    PARAMETER                           46.1
  0002    ALL.PROGRAM                         12.3
  0003    O0001                                1.9
  0004    O0002                                1.9
  0005    O0003                                1.9
  0006    O0004                                1.9
  0007    O0005                                1.9
  0008    O0010                                1.9
  0009    O0020                                1.9
                                               1.9
  F SRH
     File No.=2
  >2_
 EDIT  ****   ***   ***   ***               12:34:56
 [ F SRH ][        ][        ][  CAN  ][  EXEC  ]
```

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

Inputting a file

Procedure

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

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

3 Select EDIT mode. The floppy screen is displayed.

4 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.

```
READ/PUNCH (FLOPPY)                         O1234 N12345
   No.    FILE NAME                          (METER)  VOL




EDIT  ****   ***  ***   ***                 12:34:56
[ F SRH ][ READ ][ PUNCH ][ DELETE ][ RENAME ]
```

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

```
[ F SET ][ O SET ][ STOP ][ CAN ][ EXEC ]
```

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

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

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

Outputting a file

Procedure

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

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

3 Select EDIT mode. The floppy screen is displayed.

4 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.

```
READ/PUNCH (FLOPPY)                          O1234 N12345
   No.    FILE NAME                          (METER)  VOL



 EDIT  ****  ***  ***  ***                   12:34:56
[ F SRH ][ READ ][ PUNCH ][ DELETE ][RENAME]
```

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

```
[ F SET ] [O SET] [STOP] [ CAN ] [EXEC]
```

6 Enter the number of the program to be output, together with a desired output file number.

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

7 Press soft key **[EXEC]**.
The specified program is output, and the “OUTPUT” indicator blinks at the lower–right corner of the screen. Upon the completion of output, the “OUTPUT” indicator is cleared from the screen.
If no file number is specified, the program is written at the end of the currently registered files.

Deleting a file

Procedure

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

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

3 Select EDIT mode. The floppy screen is displayed.

4 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.

```
READ/PUNCH (FLOPPY)                    O1234 N12345
   No.    FILE NAME                     (METER)  VOL




EDIT  ****  ***  ***  ***              12:34:56
[ F SRH ][  READ ][ PUNCH ][ DELETE ][ RENAME ]
```

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

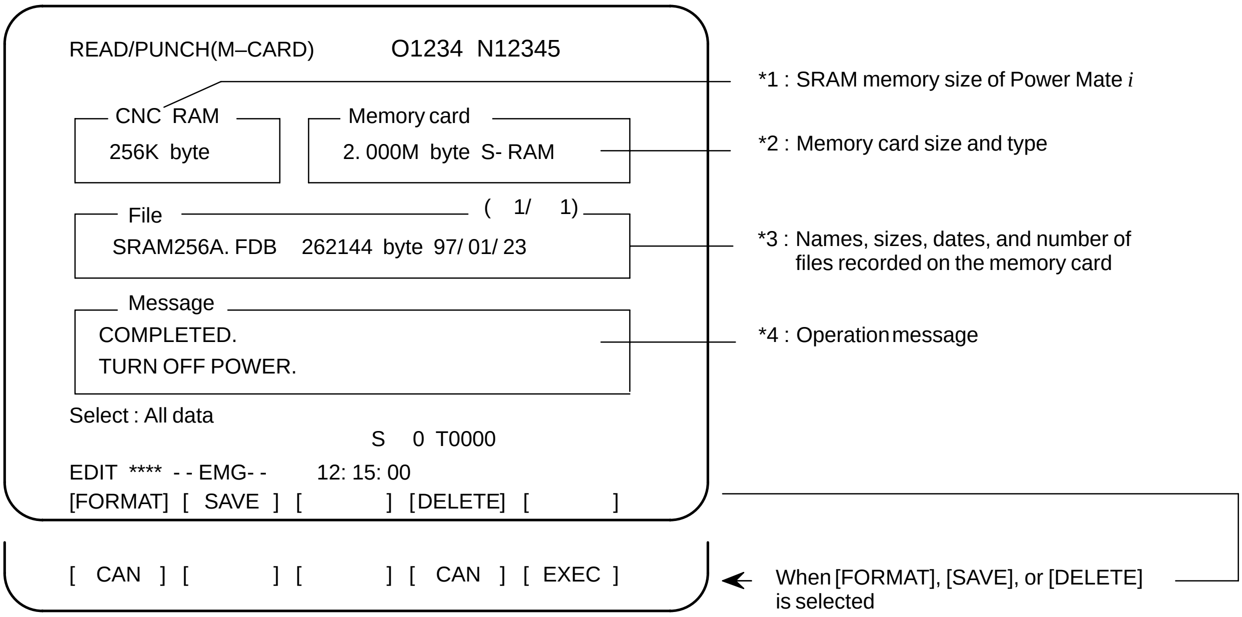
```
[ F SET ][      ][      ][ CAN ][ EXEC ]
```

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

7 Press soft key **[EXEC]**. The specified file is deleted. After the file has been deleted, the subsequent files are shifted up.

3.3.7 Memory Card Output

Data held in SRAM memory of Power Mate *i* can be saved to a memory card in MS–DOS format.
A save operation can be performed using soft keys while the Power Mate *i* is operating.



- The SRAM memory size (*1) of Power Mate *i* is displayed at all times.
- When no memory card is inserted, the message field (*4) displays a message prompting the user to insert a memory card, but does not display the memory card states (*2 and *3).
- If an inserted memory card is invalid (if there is no attribute memory, or if the attribute memory does not contain any device information), the message field (*4) displays an error message, but does not display the memory card states (*2 and *3).

Saving memory data

Data held in SRAM memory of Power Mate *i* can be saved to a memory card in MS–DOS format.

Saving memory data

Procedure

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

2 Press soft key **[M–CARD]**.

3 Place the Power Mate *i* in the emergency stop state.

4 Insert the memory card and press the soft key **[(Operation)]**. The following memory card status is displayed.

```
READ/PUNCH(M–CARD)          O1234  N12345

  CNC  RAM               Memory card
  256K  byte             2. 000M  byte  S- RAM

  File                                  (  1/    1)
  SRAM256A. FDB    262144  byte 97/ 01/ 23

  Message


Select : All data
                                S    0  T0000
EDIT  ****  - - EMG- -      12: 15: 00
[FORMAT]  [  SAVE  ]  [          ]  [DELETE]  [          ]
```

```
[      ] [      ] [      ] [ CAN ] [EXEC]
```

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

6 A message prompting the user to confirm the operation is displayed. Press soft key **[EXEC]** to execute the save operation.

7 As the data is being saved to the card, the message “RUNNING” blinks, and the number of bytes saved is displayed in the message field.

8 Once all data has been saved to the card, the message “COMPLETED” is displayed in the message field, with the message “PRESS RESET KEY.” displayed on the second line.

9 Press the RESET key. The displayed messages are cleared from the screen, and the display of the memory card state is replaced with that of the saved file.

> **NOTE**
> All SRAM memory data of Power Mate *i* is saved to a memory card. CNC memory data cannot be saved selectively.

Memory card formatting

Before a file can be saved to a memory card, the memory card must be formatted.

Formatting a memory card

Procedure

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

2 Press soft key **[M–CARD]**.

3 Place the Power Mate *i* in the emergency stop state.

4 When a memory card is inserted, the state of the memory card is displayed as shown below.

```
READ/PUNCH(M–CARD)                    O1234  N12345

  CNC  RAM            Memory card
  256K  byte          2. 000M  byte  S- RAM

  File                                   (  1/    1)
  SRAM256A. FDB    262144  byte 97/ 01/ 23

  Message


Select : All data
                                  S    0  T0000
EDIT  ****  - - EMG- -       12: 15: 00
[FORMAT]  [  SAVE  ]  [          ]  [DELETE]  [          ]
```

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

```
[      ] [      ] [      ] [CAN] [EXEC]
```

6 A message prompting the user to confirm the operation is displayed. Press soft key **[EXEC]** to execute the formatting operation.

7 As formatting is being performed, the message “FORMATTING” blinks.

8 Upon the completion of formatting, the message “COMPLETED” is displayed in the message field.

Deleting files

Unnecessary saved files can be deleted from a memory card.

Deleting files

Procedure

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

2 Press soft key **[M–CARD]**.

3 Place the Power Mate *i* in the emergency stop state.

4 When a memory card is inserted, the state of the memory card is displayed as shown below.

```
READ/PUNCH(M–CARD)                 O1234  N12345

 CNC  RAM                 Memory card
 256K  byte               2. 000M  byte  S- RAM

 File                                      (  1/    1)
 SRAM256A. FDB    262144  byte 97/ 01/ 23

 Message


Select : All data
                                     S    0  T0000
EDIT  ****  - - EMG- -        12: 15: 00
[FORMAT]  [  SAVE  ]  [          ]  [DELETE]  [          ]
```

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

```
[     ] [     ] [     ] [CAN] [EXEC]
```

6 With cursor keys [↑] and [↓], select the file to be deleted from the memory card.

7 After checking the file selection, press soft key **[EXEC]**.

8 As detection is being performed, the message “DELETING” blinks in the message field.

9 Upon the completion of deletion, the message “COMPLETED” is displayed in the message field

> **NOTE**
> An SRAM of 1M bytes will contain multiple files. To delete the contents of such an SRAM, delete all the contained files.

File name and messages

● File name

The file name used for save operation is determined by the amount of SRAM mounted in the Power Mate *i*. A file holding saved data is divided into blocks of 512KB.

SRAM file

Amount of SRAM	256KB	1.0MB
Number of files 1	SRAM256A. FDB	SRAM1_0A. FDB
2		SRAM1_0B. FDB

Messages

Message	Description
INSERT MEMORY CARD.	No memory card is inserted.
UNUSABLE MEMORY CARD	The memory card does not contain device information.
FORMAT MEMORY CARD.	The memory card is not formatted. Format the memory card before use.
THE FILE IS UNUSABLE.	The format or extension of the file to be loaded is invalid. Alternatively, the data stored on the memory card does not match the SRAM memory size of Power Mate *i*.
REPLACE MEMORY CARD.	Replace the memory card.
FILE SYSTEM ERROR □□□	An error occurred during file system processing. □□□ represents a file system error code.
SET EMERGENCY STOP STATE.	Save operation is enabled in the emergency stop state only.
WRITE–PROTECTED	Save operation: The protect switch of the memory card is set to the disabled position.
VOLTAGE DECREASED.	The battery voltage of the memory card has dropped. (The battery requires replacement.)
DEVICE IS BUSY.	Another user is using the memory card. Alternatively, the device cannot be accessed because automatic operation is in progress.
SRAM → MEMORY CARD?	This message prompts the user to confirm the start of data saving.
DO YOU WANT TO DELETE FILE(S)?	This message prompts the user to confirm the start of deletion.
DO YOU WANT TO PERFORM FORMATTING?	This message prompts the user to confirm the start of formatting.
SAVING	Saving is currently being performed.
DELETING	File deletion is currently being performed.
FORMATTING	Memory card formatting is currently being performed.
COMPLETED	Save processing has been completed.
PRESS RESET KEY.	Press the RESET key.
TURN OFF POWER.	Turn the power off, then back on again.

File system error codes

Code	Meaning
102	The memory card does not have sufficient free space.
105	No memory card is mounted.
106	A memory card is already mounted.
110	The specified directory cannot be found.
111	There are too many files under the root directory to allow a directory to be added.
114	The specified file cannot be found.
115	The specified file is protected.
117	The file has not yet been opened.
118	The file is already open.
119	The file is locked.
122	The specified file name is invalid.
124	The extension of the specified file is invalid.
129	A non–corresponding function was specified.
130	The specification of a device is invalid.
131	The specification of a pathname is invalid.
133	Multiple files are open at the same time.
135	The device is not formatted.
140	The file has the read/write disabled attribute.

3.4 DATA INPUT/OUTPUT USING A MEMORY CARD

By setting the I/O channel (parameter No. 20) to 4, files on a memory card can be referenced, and different types of data such as part programs, parameters, and offset data on a memory card can be input and output in text file format.
The major functions are listed below.

- Displaying a directory of stored files

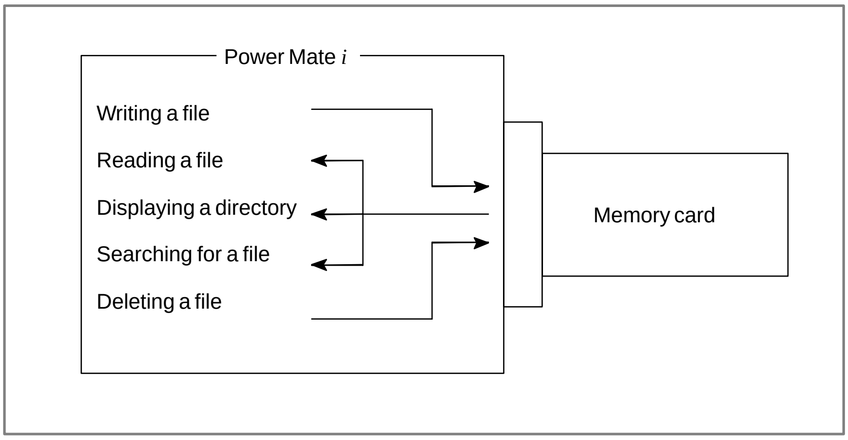
  The files stored on a memory card can be displayed on the directory screen.
- Searching for a file

  A search is made for a file on a memory card and, if found, it is displayed on the directory screen.
- Reading a file

  Text–format files can be read from a memory card.
- Writing a file

  Data such as part programs can be stored to a memory card in text file format.
- Deleting a file

  A file can be selected and deleted from a memory card.



NOTE
The operating procedure for a combination of the DPL/MDI and its operation package differs from that described in this chapter.

Displaying a directory of stored files

Procedure

1 Select EDIT mode.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed. Using page keys ⬆ and ⬇ , the screen can be scrolled.

```
DIRECTORY (M–CARD)                              O0034 N00045
  No.    FILE NAME              SIZE            DATE
  0001   O1000                123456            96/07/10
  0002   O1001                  8458            96/07/30
  0003   O0002                  3250            96/07/30
  0004   O2000                 73456            96/07/31
  0005   O2001                  3444            96/07/31
  0006   O3001                  8483            96/08/02
  0007   O3300                   406            96/08/05
  0008   O3400                  2420            96/07/31
  0009   O3500                  7460            96/07/31

( PROG )(      )( DIR + )(      )( (OPRT) )
```

5 Comments relating to each file can be displayed by pressing soft key **[DIR+]**.

```
DIRECTORY (M–CARD)                              O0034 N00045
  No.    FILE NAME                          COMMENT
  0001   O1000                        (COMMENT         )
  0002   O1001                        (SUB PROGRAM     )
  0003   O0002                        (12345678        )
  0004   O2000                        (                )
  0005   O2001                        (                )
  0006   O3001                        (SKIP–K          )
  0007   O3300                        (HI–SPEED        )
  0008   O3400                        (                )
  0009   O3500                        (TEST PROGRAM)

( PROG )(      )( DIR + )(      )( (OPRT) )
```

6 Repeatedly pressing soft key **[DIR+]** toggles the screen between the display of comments and the display of sizes and dates.
Any comment described after the O number in the file is displayed.
Up to 18 characters can be displayed on the screen.

Searching for a file

Procedure

1 Select EDIT mode.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

DIRECTORY (M–CARD) O0034 N00045

No.	FILE NAME	SIZE	DATE
0001	O1000	123456	96/07/10
0002	O1001	8458	96/07/30
0003	O0002	3250	96/07/30
0004	O2000	73456	96/07/31
0005	O2001	3444	96/07/31
0006	O3001	8483	96/08/02
0007	O3300	406	96/08/05
0008	O3400	2420	96/07/31
0009	O3500	7460	96/07/31

(PROG)( )(DIR +)( )((OPRT))

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

(F SRH)(F READ)(N READ)(PUNCH)(DELETE)

6 Set the number of the desired file number with soft key **[F SRH]**. Then, start the search by pressing soft key **[EXEC]**. If found, the file is displayed at the top of the directory screen.

When a search is made for file number 19

DIRECTORY (M–CARD) O0034 N00045

No.	FILE NAME	COMMENT
0019	O1000	(MAIN PROGRAM)
0020	O1010	(SUBPROGRAM–1)
0021	O1020	(COMMENT)
0022	O1030	(COMMENT)

Reading a file

Procedure

1 Select EDIT mode.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. Then, the screen shown below is displayed.

```
DIRECTORY (M–CARD)                              O0034 N00045
    No.   FILE NAME               SIZE           DATE
  0001    O1000                 123456        96/07/10
  0002    O1001                   8458        96/07/30
  0003    O0002                   3250        96/07/30
  0004    O2000                  73456        96/07/31
  0005    O2001                   3444        96/07/31
  0006    O3001                   8483        96/08/02
  0007    O3300                    406        96/08/05
  0008    O3400                   2420        96/07/31
  0009    O3500                   7460        96/07/31
~                                                              ~
( PROG )(        )( DIR + )(        )( (OPRT) )
```

```
( F SRH )( F READ )( N READ )( PUNCH )( DELETE )
```

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

6 To specify a file number, press soft key **[F READ]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                              O0001 N00010
    No.   FILE NAME                         COMMENT
  0019    O1000                        (MAIN  PROGRAM)
  0020    O1010                        (SUBPROGRAM–1)
  0021    O1030                        (COMMENT         )
~                                                              ~
  READ
          FILE NAME=20                 PROGRAM No.=120
  >
 EDIT  ***  ****  ***  ****                  15:40:21
( F NAME )( O SET )( STOP )( CAN )( EXEC )
```

7 Enter file number 20 from the MDI panel, then set the file number by pressing soft key **[F SET]**. Next, enter program number 120, then set the program number by pressing soft key **[O SET]**. Then, press soft key **[EXEC]**.

- File number 20 is registered as O0120 in the CNC.
- Set a program number to register a read file with a separate O number. If no program number is set, the O number in the file name column is registered.

8 To specify a file with its file name, press soft key **[N READ]** in step 6 above. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                              O0001 N00010
    No.   FILE NAME                            COMMENT
  0012    O0050                            (MAIN  PROGRAM)
  0013    TESTPRO                          (SUB PROGRAM–1)
  0014    O0060                            (MACRO PROGRAM)

  READ              FILE NAME    =TESTPRO
                  PROGRAM No.  =1230
  >

  EDIT  ***  ****  ***  ****                     15:40:21
 [F NAME] [ O SET ] [ STOP ] [ CAN ] [ EXEC ]
```

9 To register file name TESTPRO as O1230, enter file name TESTPRO from the MDI panel, then set the file name with soft key **[F NAME]**. Next, enter program number 1230, then set the program number with soft key **[O SET]**. Then, press soft key **[EXEC]**.

Writing a file

Procedure

1 Select EDIT mode.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

DIRECTORY (M–CARD) O0034 N00045

No.	FILE NAME	SIZE	DATE
0001	O1000	123456	96/07/10
0002	O1001	8458	96/07/30
0003	O0002	3250	96/07/30
0004	O2000	73456	96/07/31
0005	O2001	3444	96/07/31
0006	O3001	8483	96/08/02
0007	O3300	406	96/08/05
0008	O3400	2420	96/07/31
0009	O3500	7460	96/07/31

[PROG][ ][DIR +][ ][(OPRT)]

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

[F SRH][F READ][N READ][PUNCH][DELETE]

6 Press soft key **[PUNCH]**.

7 Enter a desired O number from the MDI panel, then set the program number with soft key **[O SET]**.
When soft key **[EXEC]** is pressed after the setting shown below has been made, for example, the file is written under program number O1230.

```
PUNCH          FILE NAME    =
              PROGRAM No. =1230
>
EDIT  ***  ****  ***  ****                  15:40:21
[F NAME][ O SET ][ STOP ][ CAN ][ EXEC ]
```

8 In the same way as for O number setting, enter a desired file name from the MDI panel, then set the file name with soft key **[F SET]**.
When soft key **[EXEC]** is pressed after the setting shown below has been made, for example, the file is written under program number O1230 and file name ABCD12.

```
PUNCH          FILE NAME    =ABCD12
              PROGRAM No. =1230
>
EDIT  ***  ****  ***  ****                  15:40:21
[F NAME][ O SET ][ STOP ][ CAN ][ EXEC ]
```

Deleting a file

Procedure

1 Select EDIT mode.

2 Press function key PROG .

3 Press the rightmost soft key ▷ (continuous menu key).

4 Press soft key **[CARD]**. The screen shown below is displayed.

```
DIRECTORY (M–CARD)                          O0034 N00045
    No.   FILE NAME           SIZE           DATE
  0001    O1000             123456         96/07/10
  0002    O1001               8458         96/07/30
  0003    O0002               3250         96/07/30
  0004    O2000              73456         96/07/31
  0005    O2001               3444         96/07/31
  0006    O3001               8483         96/08/02
  0007    O3300                406         96/08/05
  0008    O3400               2420         96/07/31
  0009    O3500               7460         96/07/31

 [ PROG ][        ][ DIR + ][        ][ (OPRT) ]
```

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

[F SRH] [F READ] [N READ] [PUNCH] [DELETE]

6 Set the number of the desired file with soft key **[DELETE]**, then press soft key **[EXEC]**. The file is deleted, and the directory screen is displayed again.

When file number 21 is deleted

```
DIRECTORY (M–CARD)                          O0034 N00045
    No.   FILE NAME                      COMMENT
  0019    O1000                     (MAIN PROGRAM)
  0020    O1010                     (SUBPROGRAM–1)
  0021    O1020                     (COMMENT        )
  0022    O1030                     (COMMENT        )
```

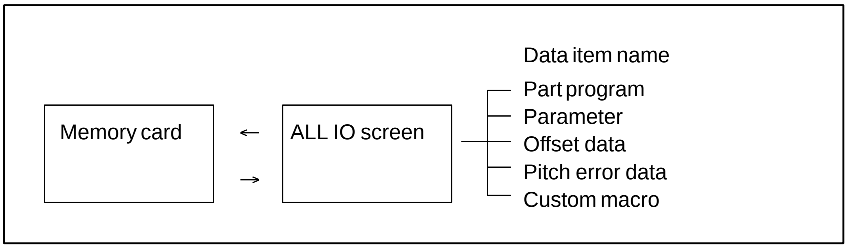
File name O1020 is deleted.

```
DIRECTORY (M–CARD)                          O0034 N00045
    No.   FILE NAME                      COMMENT
  0019    O1000                     (MAIN PROGRAM)
  0020    O1010                     (SUBPROGRAM–1)
  0021    O1020                     (COMMENT        )
  0022    O1030                     (COMMENT        )
```

File number 21 is assigned to the next file name.

Batch input/output with a memory card

On the ALL IO screen, different types of data including part programs, parameters, offset data, pitch error data, and custom macros can be input and output using a memory card; the screen for each type of data need not be displayed for input/output.



Procedure

1 Press the EDIT switch on the machine operator's panel.

2 Press function key SYSTEM .

3 Press the rightmost soft key ▷ (continuous menu key) several times.

4 Press soft key **[ALL IO]**. The screen shown below is displayed.

```
READ/PUNCH (PROGRAM)                      O0001 N00001
     No.   FILE NAME          SIZE          DATE
  * 0001   O0222              332010        96–04–06
    0002   O1003              334450        96–05–04
    0003   MACROVAR.DAT       653400        96–05–12
    0004   O0002              341205        96–05–13
      [PROGRAM]
    O0001   O0002   O0003   O0005   O0100   O0020
    O0006   O0004   O0110   O0200   O2200   O0441
    O0330
  >
  EDIT  ***  ****  ***  ****                 10:07:37
 [ PROG ] [ PARAM ] [ OFFSET ] [          ] [ (OPRT) ]
```

Upper part : Directory of files on the memory card
Lower part : Directory of registered programs

5 With cursor keys ↑ and ↓ , the user can choose between upper part scrolling and lower part scrolling. (An asterisk (*) displayed at the left edge indicates the part for which scrolling is possible.)

↑ : Used for memory card file directory scrolling.

↓ : Used for program directory scrolling.

6 With page keys ↑ and ↓ , scroll through the file directory or program directory.

7 When this screen is displayed, the program data item is selected. The soft keys for other screens are displayed by pressing the rightmost soft key ▷ (continuous menu key). Soft key **[M–CARD]** represents a separate memory card function for saving and restoring system RAM data. (See Sections 3.3.7.)

```
( MACRO )( PITCH )(       )(       )( (OPRT) )

(       )(       )(       )( M–CARD )( (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  96/04/06
   0002   O1003                      4450  96/05/04
   0003   MACROVAR.DAT             653400  96/05/12
   0004   O0003                      4610  96/05/04
   0005   O0001                      4254  96/06/04
   0006   O0002                       750  96/06/04
   0007   CNCPARAM.DAT              34453  96/06/04
```

8 Display the following soft keys with soft key **[(OPRT)]**.

```
( F SRH )( F READ )( N READ )( PUNCH )( DELETE )
```

The operation of each function is the same as on the directory (memory card) screen. Soft key **[O SET]**, used for program number setting, and the "PROGRAM NUMBER =" indication are not displayed for data items other than program.

[F SRH] : Finds a specified file number.
[F READ] : Reads a specified file number.
[PUNCH] : Writes a file.
[N READ] : Reads a file under a specified file name.
[DELETE] : Deletes a specified file number.

> **NOTE**
> With a memory card, RMT mode operation cannot be used.

Error codes

Memory card error codes

Code	Meaning
102	The memory card does not have sufficient free space.
105	No memory card is mounted.
106	A memory card is already mounted.
110	The specified directory cannot be found.
111	There are too many files under the root directory to allow a directory to be added.
114	The specified file cannot be found.
115	The specified file is protected.
117	The file has not yet been opened.
118	The file is already open.
119	The file is locked.
122	The specified file name is invalid.
124	The extension of the specified file is invalid.
129	A non–corresponding function was specified.
130	The specification of a device is invalid.
131	The specification of a pathname is invalid.
133	Multiple files are open at the same time.
135	The device is not formatted.
140	The file has the read/write disabled attribute.

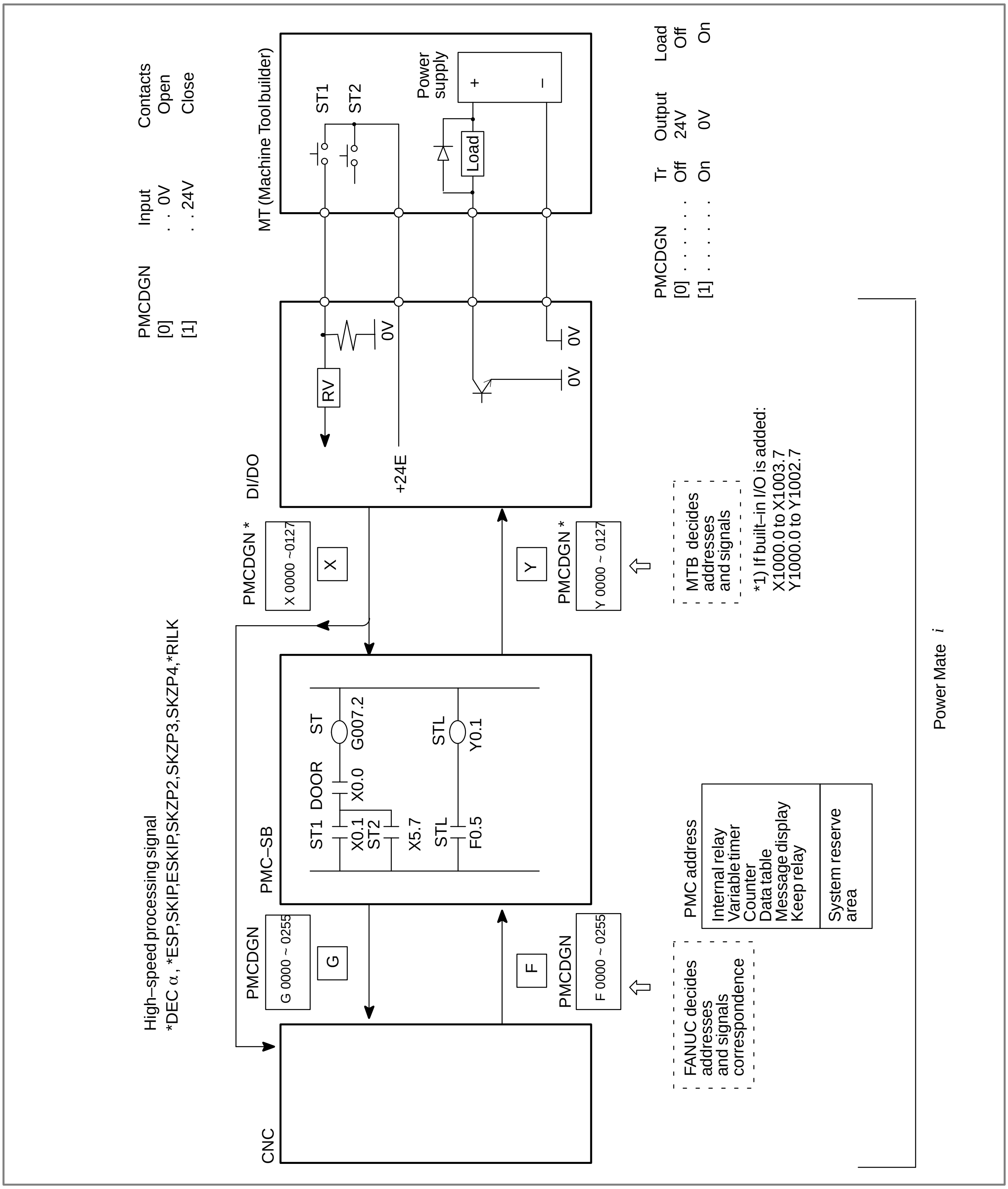
4 INTERFACE BETWEEN NC AND PMC

This chapter describes the signals between the machine operator's panel, magnetics cabinet and the PMC, connection of the signals between PMC and CNC, and confirmation method of on/off state of these signals.
It also describes system configuration of PMC, parameters of PMC, ladder and how to display time chart of the signals on the screen.
It also describes a method of inputting/outputting PMC parameters to an external device.

NOTE

The CRT/MDI operating instructions and related information described in this chapter are applicable also to the PDP/MDI, LCD/MDI, handy operator's panel, and LCD with touch panel except:
Some operations are unavailable on the handy operator's panel, and the operating procedure for the LCD with touch panel is different in part.

4.1 GENERAL OF INTERFACE



4.2 SPECIFICATION OF PMC

4.2.1 Specification

Model	Power Mate *i*–MODEL D/H	
	PMC–SB5	**PMC–SB6**
Programmingmethod language	Ladder	Ladder Step sequence
Number of ladder level	2	2
Level–1 Cycle Time	8 ms	8 ms
Basic Instruction Execution Time	0.085 (us/step)	0.085 (us/step)
Program capacity ● Ladder (step)	Approx. 5,000 Approx. 8,000 Approx. 12,000 Approx. 16,000 Approx. 24,000	Approx. 5,000 Approx. 8,000 Approx. 12,000 Approx. 16,000 Approx. 24,000 Approx. 32,000
● Symbol/Comment	1 to 128KB	1 to 128KB
● Message	0.1 to 64KB	0.1 to 64KB
● Language only	–	–
Instuction (Basic) (Functional)	14 kinds 67 kinds	14 kinds 67 kinds
Intemal relay (R)	1618 byte	3200 byte
Message request (A)	25 byte	125 byte
Non–volatile		
● Var. Timer (T)	80 byte	300 byte
● Counter (C)	80 byte	200 byte
● Keep relay (K)	20 byte	50 byte
● Data table (D)	3000 byte	8000 byte
Subprogram (P)	512 programs	2000 programs
Label (L)	9999 labels	9999 labels
Fixed timer	100 devices (Timer number specified)	100 devices (Timer number specified)
Input/output ● I/O link (I) Max.	1024 points max.	1024 points max.
(O) Max.	1024 points max.	1024 points max.
● Built–in I/O (I) Max.	32 points	32 points
(O) Max.	24 points	24 points
Sequence program storage media	Flash memory (FROM)	Flash memory (FROM)
Ladder	128KB 256KB	128KB 256KB 384KB

4.2.2 Address

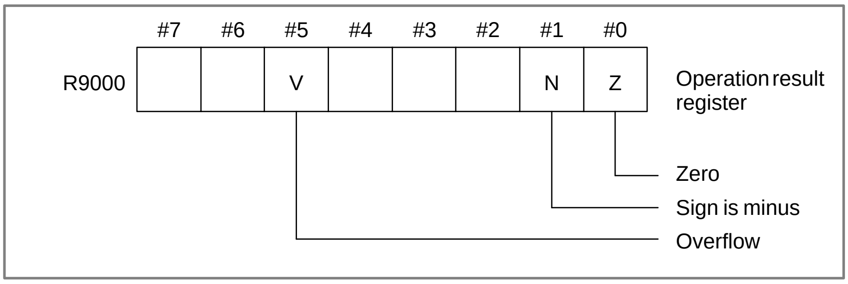
Character	Signal description	Model: Power Mate *i*–MODEL D/H PMC–SB5	Model: Power Mate *i*–MODEL D/H PMC–SB6
X	Input signal from the machine to the PMC (MT to PMC)	X0 to X127 X1000 to X1003 X1020 to 1051	
Y	Output signal from the PMC to the machine (PMC to MT)	Y0 to Y127 Y1000 to Y1002 Y1020 to Y1051	
F	Input signal from the CNC to the PMC (NC to PMC)	F0 to F255 F1000 to F1255	F0 to F511 F1000 to F1511
G	Output signal from the PMC to the CNC (PMC to NC)	G0 to G255 G1000 to G1255	G0 to G511 G1000 to G1511
R	Internal relay	R0 to R1499 R9000 to R9117	R0 to R2999 R9000 to R9199
A	Message request signal	A0 to A24	A0 to A124
C	Counter	C0 to C79	C0 to C199
K	Keep relay	K0 to K19	K0 to K39 K900 to K909
T	Data table	T0 to T79	T0 to T299
D	Variable timer	D0 to D2999	D0 to D7999
L	Label number	L1 to L9999	L1 to L9999
P	Subprogram number	P1 to P512	P1 to P2000

4.2.3 Built–in Debug Function

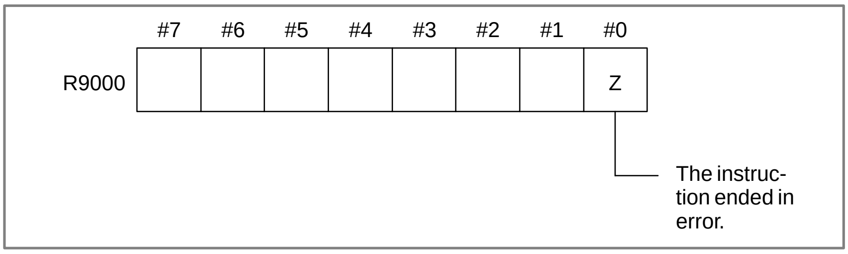
Function	Contents
Display of sequence program	Dynamic display of ladder diagram (This function cannot be operated using the Handy Operator's Panel, DPL/MDI, or DPL/MDI operation package.)
Diagnostic function	• Title data display • signal status • PMC alarm display • Signal trace • Memory contents display • Signal waveform display • I/O connection status display
Setting and displaying data	• Timer • Counter • Keep relay • Data table
Sequence program edit function	Ladder diagram editing (A ladder edit module is required) Ladder chart editing and mnemonic editing are not supported by the handy operator's panel. No ladder diagram editing is possible with a combination of the DPL/MDI and its operation package.

4.2.4 System Reserve Area of Internal Relay

(1) R9000 (Operation output register for the ADDB, SUBB, MULB, DIVB, and COMPB functional instructions)



(2) R9000 (Error output for the EXIN, WINDR, WINDW, MMCWR, MMCWW, MMC3R, and MMC3W functional instructions)

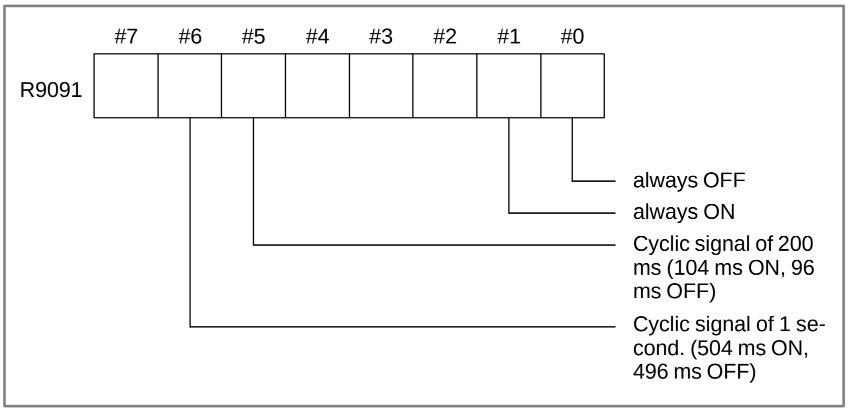


(3) R9002 to R9005 (Operation output registers for the DIVB functional instruction)
The data remaining after the DIVB functional instruction is executed in output.

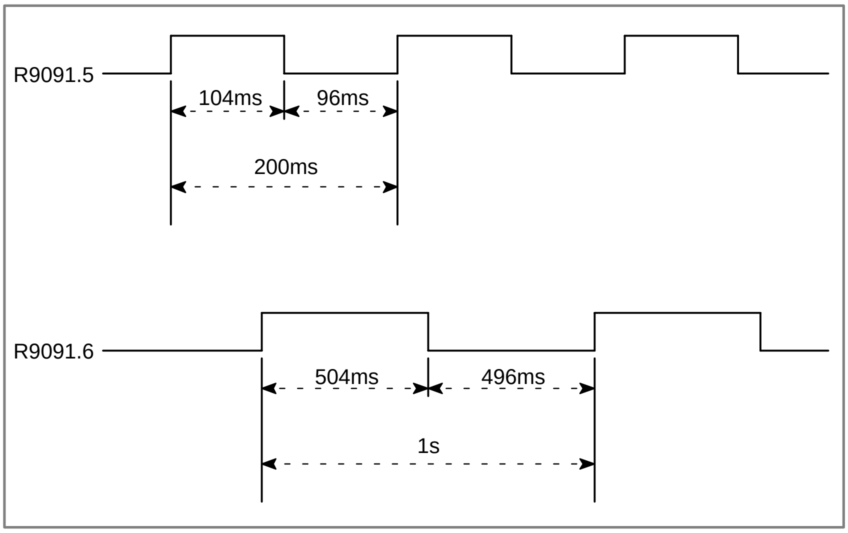
	#7	#6	#5	#4	#3	#2	#1	#0
R9002								
R9003								
R9004								
R9005								

Register for remainder (used by DIVB instruction)

(4) R9091 (System timer)
4 signals can be used as system timer.
The specifications of every signal are as following.

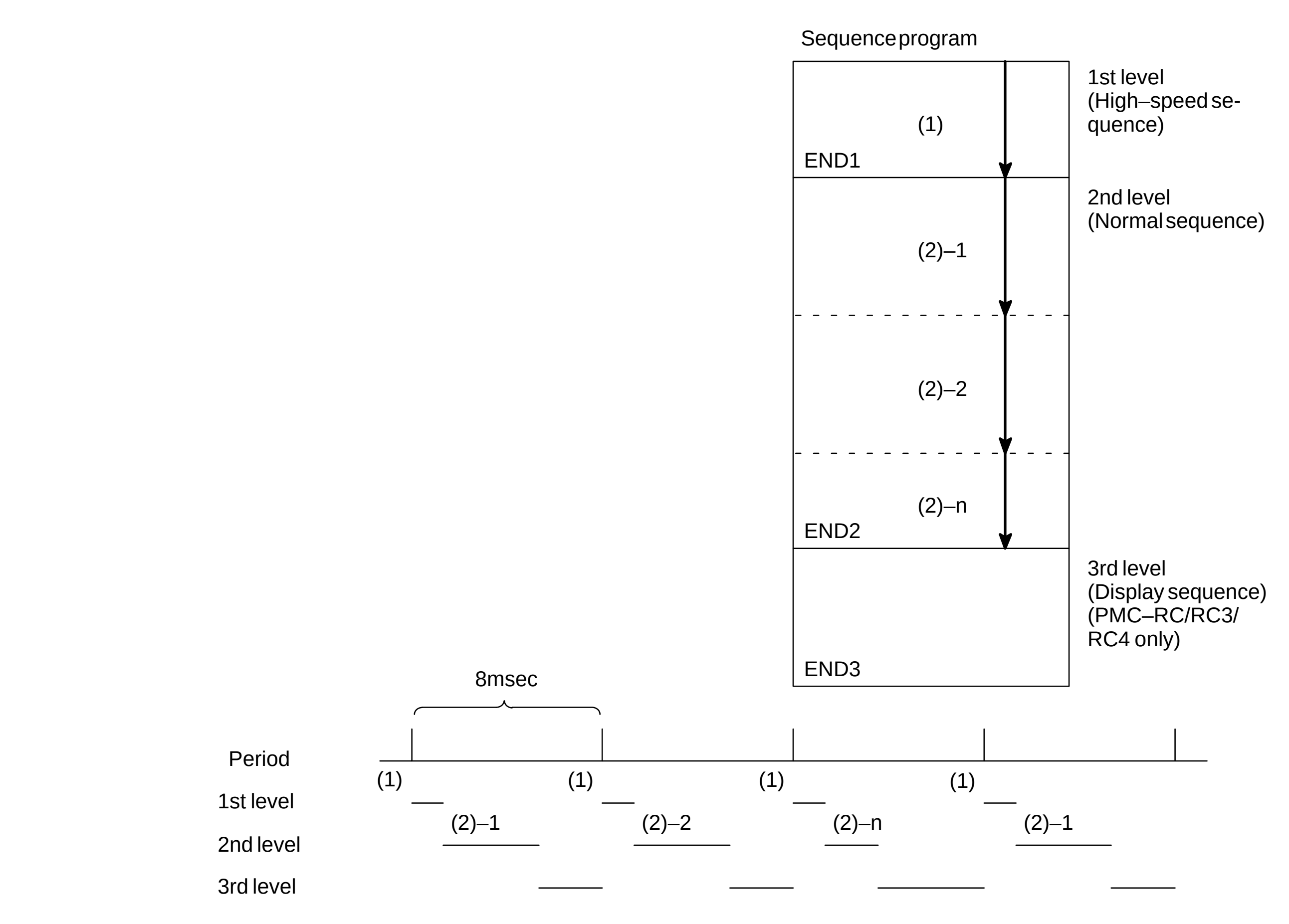


NOTE
Each signal is initially off. R9091.0 and R9091.1 are set cyclically at the beginning of the first ladder level.
Each signal (ON–OFF signal) has an accuracy of ±8 ms.



4.2.5 Execution Period of PMC

Level 1 is put in operation at intervals of 8 ms.
Level 2 runs on a no–division basis. Its one cycle is 8 ms × n, where n varies with the situation.



NOTE
The operation of the interrupt–type PMC is not affected by the execution cycle stated above.

4.2.6 Processing I/O Signals

Input signals (M function, T function, etc.) from the CNC and those (cycle start, feed hold, etc.) from the machine tool are sent to the PMC.

Signals for the CNC (cycle start, feed hold, etc.) and those for the machine tool (tunret rotation, spindle stop, etc.) are output from the PMC.
Fig. 4.2.6 shows the relationship between these signals and the PMC.

Input signals are entered in the input memory of PMC and output signals are issued from PMC.
As shown in Fig. 4.2.6, the input signals are synchronized only in the 2nd level sequence part.

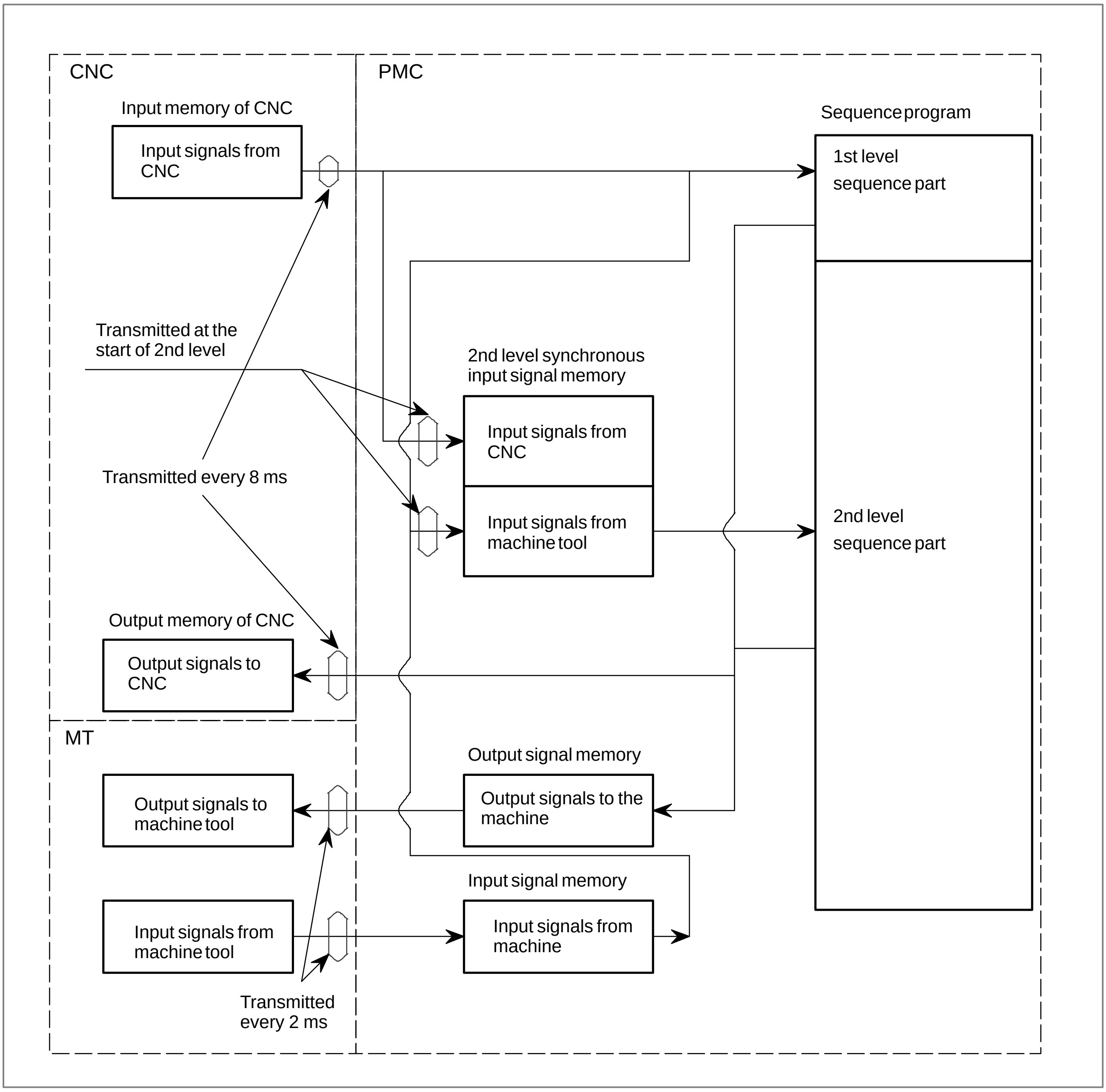


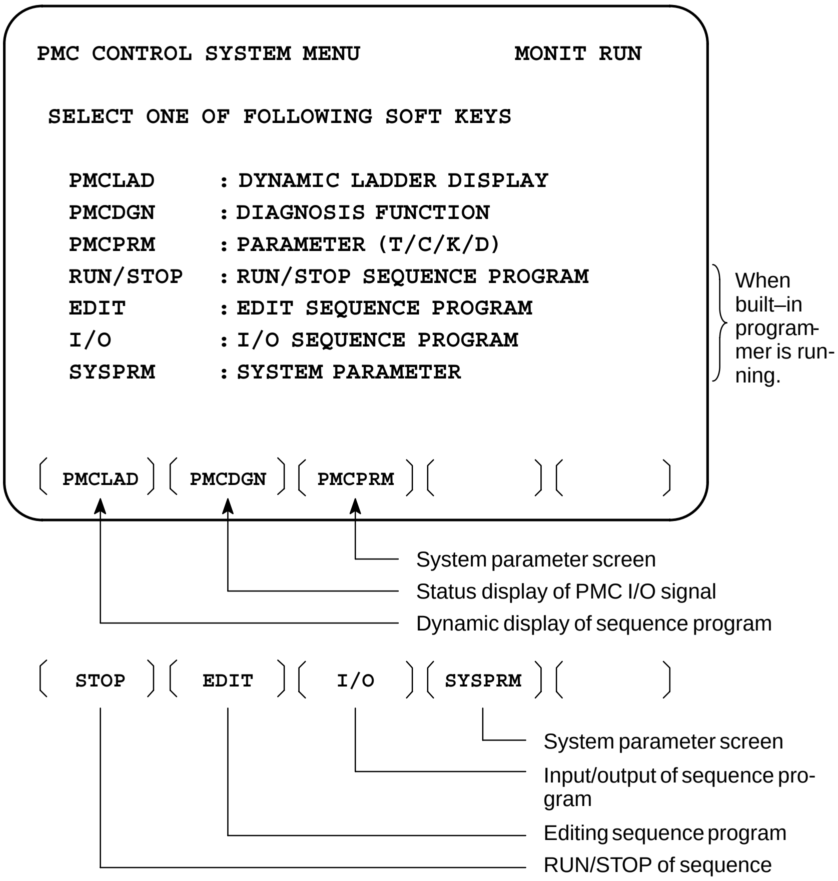
Fig. 4.2.6 PMC I/O signals

4.3 PMC SCREEN (CRT/MDI)

4.3.1 Display Method

1. Press SYSTEM .

2. Press soft key **[PMC]**, then PMC screen is displayed and the following soft keys are displayed:



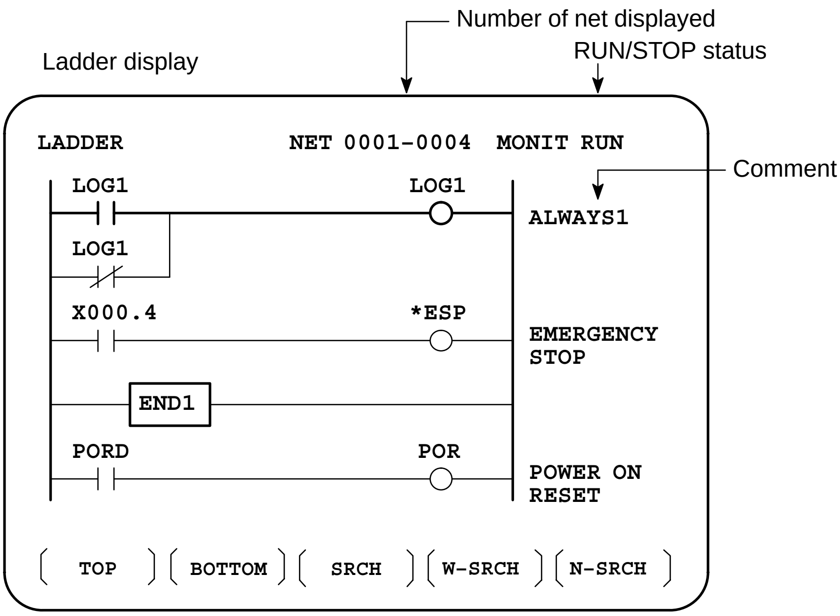
The no. of menus to be displayed changes depending on presence/ absence of built–in programmer.

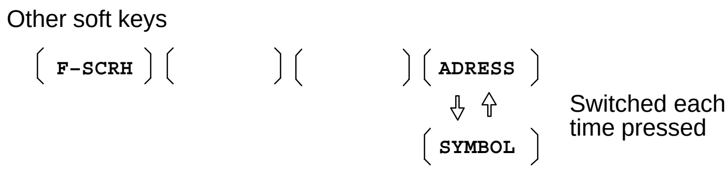
	PMC–SB5/SB6 (Without memory card for editing)	PMC–SB5/SB6 (With memory card for editing)
RUN/STOP	○	○
EDIT	×	○
I/O	○	○
SYSPRM	×	○

× : Cannot be displayed nor used.

4.3.2 PMCLAD Screen

Press soft key **[PMCLAD]**, and a sequence program is displayed dynamically and operation monitoring can be confirmed :
This screen can not be displayed with the handy operator’s panel.





- **Contents displayed**

1. Low brightness display Contacts : open Relay : off
2. High brightness display Contacts : closed Relay : on

- **Search method**

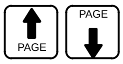
1. Use the cursor keys or the page keys to change display positions.
2. **[TOP]**:Searches top of ladder.
3. **[BOTTOM]**:Search bottom of ladder.
4. Address.bit,**[SRCH]** or Signal name, **[SRCH]**
5. Address.bit,**[W–SRCH]** or Signal name ,**[W–SRCH]**
6. Net no.**[N–SRCH]**:Ladder is displayed from the specified net.
7. Functional instruction no. **[F–SRCH]** or Functional instruction name**[F–SRCH]**
8. **[ADRESS]**:Signal is displayed by address and bit no.
9. **[SYMBOL]**:Signal is displayed by signal name (symbol).
   (If symbol is not registered at program preparation time, the address of the signal is displayed).

[Remarks]

- The search function searches a signal in the forward direction and displays the ladder with the searched signal at its head. Because there may exist plural contacts, repeat the search operation to find plural locations, repeat the search operation to find plural locations with the specified signal.
- If a specified signal is not found up to the end of the program (ladder), execution returns to the head of a program and search continues.

• Dump display on ladder diagram

Ladder diagram and signal status dump can displayed together.
The dump is displayed over 2 lines at the last line of ladder diagram by pressing the **[DUMP]** soft key.



keys or **[SEARCH]** soft key is used for changing of PMC address.

The [DUMP] soft key has the follwing functions.

(1) [BYTE]: Byte type display (1 BYTE)
"G0000 00 14 00 00 01 00 00 00 00 00 00 00 00 00 00 00"
"G0016 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00"

(2) [WORD] : Word type display (2 BYTE)
"G0000 1400 0000 0001 0000 0000 0000 0000 0000"
"G0016 0000 0000 0000 0000 0000 0000 0000 0000"

(3) [D.WORD]: Long word type display (4 BYTE)
"G0000 00001400 00000001 00000000 00000000"
"G0016 00000000 00000000 00000000 00000000"

• Parameter display on ladder diagram

The value of parameter of a functional instruction is displayed in the functional instruction of a ladder diagram.

The function of the soft key is as follows:

(1) [DPARA] : The value of parameter is displayed in functional instruction.

(2) [NDPARA] : The value of parameter is not displayed in functional instruction.

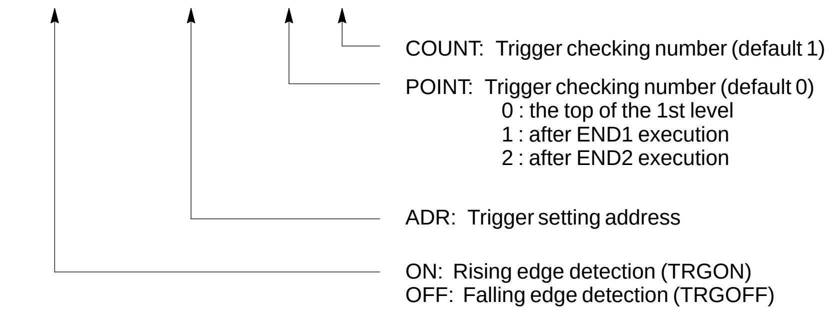
• Stop of ladder diagram display by trigger of signal

The ladder display can be stopped by manual operation or trigger of signal.
The former ladder diagram display renews signal status every moment. But by using this function, all the ladder diagram at the specified moment can be checked.
The stop conditions as a trigger are specified by rising or falling edge detection of the designated signal.

- **Display of setting trigger**

The setting address, condition and counter are displayed at the title line.

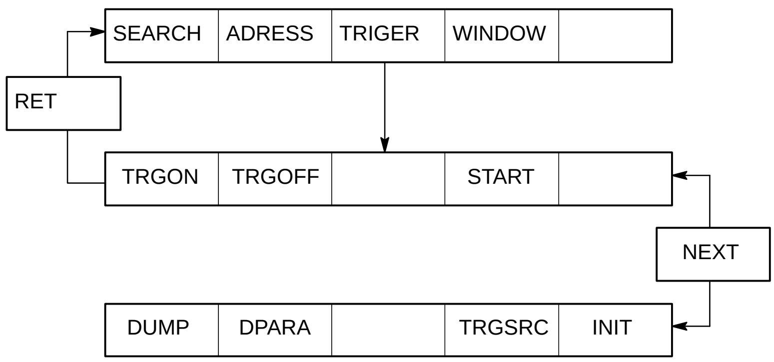
“MODE:ON : X0000. 0 : 0 : 0001 ”



*   Setting form adr ;p1 ;p2+[TRGON/TRGOFF]soft key

> **NOTE**
> “;”=”EOB” adr (trigger address) ;p1 (trigger point) ;p2 (trigger checking number (1 to 65535))

*   Because parameters are stored in the nonvolatile memory, they are not lost even if the power is turned off.
    When bit 2 of keep relay K18 or K901 is set to 1 after parameters for sampling are specified, the trigger function automatically starts when the power is turned on.
    For this operation, depress **[TRIGER]** soft key to bring the following menu.



The function of the **[TRIGER]** soft key is explained below:

(1) [TRGON] : The trigger function is stopped when a specified address signal goes high (is turned ON).

(2) [TRGOFF] : The trigger function is stopped when a specified address signal goes low (is turned OFF).

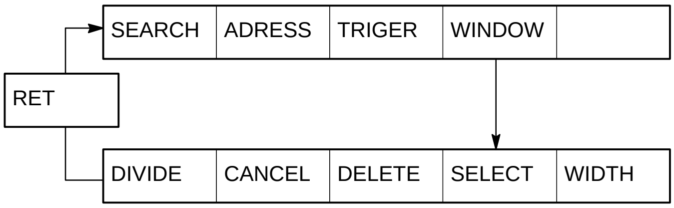
(3) [START] : Pressing this key switches between trigger function execution and trigger function termination. While the trigger function is being executed, the “TRG” indication blinks.

(4) [TRGSRC] : An instruction at which the trigger function has been stopped by a specified address signal is searched for and indicated by blinking.

(5) [INIT] : The trigger setting is initialized.

- **Divided display of ladder diagram**

This function is used for displaying the divided screen. It can display max. six division.
For this operation, depress **[WINDOW]** soft key to bring the following menu.



The function of the soft key **[WINDOW]** is as follows:

(1) [DIVIDE] : The screen will be divided.
The dividing display of ladder diagram can be displayed for the designated NET number.
(NET number+**[DIVIDE]**)

(2) [CANCEL] : The dividing display of ladder diagram display ends.
(The screen returns to normal display.)

(3) [DELETE] : The screen division subject to operation is ended.

(4) [SELECT] : Change the screen subject to division operation.

(5) [WIDTH] : Change the width of division by using **[EXPAND]** or **[SHRINK]** soft key.

(6) [EXPAND] : The divided screen is expanded.

(7) [SHRINK] : The divided screen is shrank.

- **ON–LINE EDIT**

When bit 1 in the keep relay K17 (SB5) or K900 (SB6) is 1, this function is available and **[ONLEDT]** soft key is displayed.

When the ladder program is executing, a part of the ladder program can be changed.
- Change the type of contact (A contact, B contact)
- Change address of contact and coil.
- Change address parameter of functional instruction.

This function don’t change the size.
(Cannot be Addition, deletion and chanegable data size)
When bit 3 in the keep relay K18 (SB5) or K901 (SB6) is 1, this program is automatically transferred to backup RAM after on–line edit.
When bit 3 in the keep relay K18 (SB5) or K901 (SB6) is 0, transfer to backup RAM with COPY function of I/O screen. If power is off without this operation, edited data is lost.

4.3.3 PMCDGN Screen

Press soft key **[PMCDGN]** then PMC's diagnostic screen is displayed.

- **TITLE screen**

The title data registered when a ladder program is prepared is displayed.

Page number

```
PMC TITLE DATA #1                MONIT RUN
          PMC PROGRAM NO.     :
          EDITION NO.         :
          PMC CONTROL PROGRAM
          SERIES : 407B FDITION : 01
          (SERIES : 4065 EDITION : 08)
          PMC TYPE CONTROL : SB5 PROGRAM : SB5
                MEMORY USED     :   KB
                LADDER          :   KB
                SYMBOL          :   KB
                MESSAGE         :   KB
                SCAN TIME       :   MSEC
                SCAN MAX : 016 MS MIN : 008 MS
[ TITLE ][ STATUS ][ ALARM ][ TRACE ][      ]
```

Other soft keys

```
[ M.SRCH ][ ANALYS ][      ][      ][      ]
```

1st page
PMC PROGRAM NO. :
EDITION NO. :
— Set when PMC is prepared

PMC CONTROL PROGRAM
SERIES : EDITION : — Series and edition of PMC control software

MEMORY USED : KB
LADDER KB
SYMBOL KB
MESSAGE KB
SCAN TIME MSEC
— Memory used and execution time is displayed.

2nd page
MACHINE TOOL BUILDER NAME :
MACHINE TOOL NAME :
CNC & PMC TYPE NAME :
PROGRAM DRAWING NO. :

3rd page
DATE OF DRAWING :
PROGRAM DESIGNED BY :
ROM WRITTEN BY :
REMARKS :
— Set when PMC is prepared.

- **STATUS screen**

On/Off state of input/output signals and internal relay is displayed.

```
 PMC SIGNAL STATUS                  MONIT RUN
ADDRESS    7     6     5     4     3     2     1     0
          ED7   ED6   ED5   ED4   ED3   ED2   ED1
ED0
G0000      0     0     0     0     1     0     1     0
         ED15  ED14  ED13  ED12  ED11  ED10   ED9   ED8
G0001      0     0     0     0     0     0     0     0
         ESTB   EA6   EA5   EA4   EA3   EA2   EA1   EA0
G0002      0     0     0     0     0     0     0     0

G0003      0     0     0     0     0     0     0     0
          FIN
G0004      0     0     0     0     0     0     0     0


 ( SEARCH )(          )(          )(          )(          )
```

Signal name

Signal state
0:Off
1:On

Signal state reverses for signals with *.
0: On
1: Off

[Search Method]
- Page key :Forward and Backward by screen
- Cursor key :Forward and Backward by diagnostic number
- To search a specified address or signal name, input an address number or signal name and press **[SEARCH]**.

- **Alarm screen**

Displays an alarm generated in PMC.

```
 PMC ALARM MESSAGE                     MONIT RUN

    ER32 NO I/O DEVICE










                                                ALM

 ( TITLE )( STATUS )( ALARM )( TRACE )(          )
```

Alarm display

For details of alarms, refer to Appendix A List of Alarms.

Blinked

• TRACE screen

Every time a specified signal changes, the signal status is memorized in the trace memory. This function is useful for identifying intermittent troubles.
This screen can not be displayed with the handy operator's panel.

1 Trace parameter screen

```
PMC SIGNAL TRACE                  MONIT RUN
 TRACE MODE           :
 (0:1BYTE/1:2BYTE/2:WORD)
 1STTRACE  ADDRESS  CONDITION
   ADDRESS  TYPE      : (0:PMC/1:PHY)
   ADDRESS            :
   MASK  DATA         :
 2NDTRACE  ADDRESS  CONDITION
   ADDRESS  TYPE      : (0:PMC/1:PHY)
   ADDRESS            :
   MASK  DATA         :

(T.DISP)( EXEC )(     )(     )(     )
```

Changes to a trace memory display screen (Screen on the next page)

Select each item by cursor key

a. TRACE MODE: Select the trace mode
   0=Records changes of 1–byte signals
   1=Records changes of independent 2–byte signals
   2=Records changes of consecutive 2–byte signals

b. ADDRESS TYPE:
   0=PMC address is used for tracing address.
   1=Physical address is used for tracing address.

c. ADDRESS:Set a tracing address.

d. MASK DATA: The bits to be traced are specified by a hexadecimal number (2 digits).
   For example, to trace the signals at bit 7,6,5 and 0, set E1 (hexadecimal) to MASK DATA.

	#7	#6	#5	#4	#3	#2	#1	#0
E1%	1	1	1	0	0	0	0	1

   However, even if bit 4,3,2 and 1 changes, tracing (memory registration) cannot be done but signal status is memorized when a tracing is executed.
   [Correspondence of binary and hexadecimal number]

$0000_2 : 0_{16}$	$0001_2 : 1_{16}$	$0010_2 : 2_{16}$	$0011_2 : 3_{16}$
$0100_2 : 4_{16}$	$0101_2 : 5_{16}$	$0110_2 : 6_{16}$	$0111_2 : 7_{16}$
$1000_2 : 8_{16}$	$1001_2 : 9_{16}$	$1010_2 : A_{16}$	$1011_2 : B_{16}$
$1100_2 : C_{16}$	$1101_2 : D_{16}$	$1110_2 : E_{16}$	$1111_2 : F_{16}$

2 Trace memory contents display screen

```
 PMC SIGNAL TRACE                    MONIT RUN
  1ST ADDRESS=X008(E1)  2ND ADDRESS=G000(FF)
NO.     7 6 5 4 3 2 1 0       7 6 5 4 3 2 1 0
0000    . . . . . . . .       . . . . . . . .
0001    I * * * * * * *       * * * * * * * *
0002    I I * * * * * *       * * * * * * * *
0003    * I * * * * * *       * * * * * * * *
0004    . . . . . . . .       . . . . . . . .
0005    . . . . . . . .       . . . . . . . .
0006    . . . . . . . .       . . . . . . . .
0007    . . . . . . . .       . . . . . . . .
0008    . . . . . . . .       . . . . . . . .

[ TRCPRM ][ STOP ][        ][        ][        ]
```

Trace address and mask data(in parentheses)

Latest status
I mark : 1
* mark : 0

a. Soft key **[TRCPRM]**: Return to the trace parameter setting screen (screen of previous page)

b. Soft key **[EXEC]**: Starts tracing.
Trace memory is cleared and each time a specified signal changes, its status is recorded. Trace memory is 256 bytes and if tracing is executed 128 times by 2–byte tracing, tracing is executed again from the head of memory.

c. Soft key **[STOP]**: Ends the tracing.

CAUTION

1 When the [EXEC] key is pressed again, the previous trace results are cleared. Unless the trace parameters are set correctly, tracing is not performed.
Also when a signal is being sampled by the signal waveform display function, tracing is not performed.
2 The latest 256 bytes of trace results are stored regardless of the time. (The trace results are cleared when power is turned off.)
3 The range R9000 to R9007 cannot be traced.
4 During tracing, a signal is sampled at intervals of 8 ms. Therefore, a signal change for less than 8 ms cannot be traced.
5 When ADDRESS TYPE is set so that a physical address is used as the tracing address, specify a memory address used. If a memory address not used is specified for tracing, a system error may occur.

*The tracing parameters are held even if the power is turned off.

	#7	#6	#5	#4	#3	#2	#1	#0
K017 (SB5) or K900 (SB6)								

#5 0 : Tracing starts by **[EXEC]**.
1 : Tracing starts automatically after power on

4.3.4 Memory Display (M.SRCH)

- **Display of Screen and Operation**

1) Pressing the **[M.SRCH]** soft key changes the screen. The displayed soft keys also change.
2) Enter a physical address in hexadecimal from which the contents of the memory are to be displayed. Then pressing the **[SEARCH]** key displays 256 byte of stored data starting from the specified address.

   Example) Enter 100000, then pressing the **[SEARCH]** keydisplays the contents of the memory starting from 100000H.
3) An address can be changed using the PAGE ↓ or ↑ PAGE key.
4) Pressing either the **[BYTE]**, **[WORD]**, or **[D.WORD]** soft key displays data of the corresponding type.

CAUTION
If the address of a memory location not used is specified to display memory contents, a system error occurs. So, specify an address carefully.

NOTE
This screen can not be displayed with the handy operator's panel.

- **Function of store memory**

To store data in memory, set bit 4 of keep relay K17 (SB5) or K900 (SB6) to 1, move the cursor to a position at which the address of the data to be changed in RAM is displayed, and enter data in units of data type in hexadecimal.

Example) Entering 0F41, then pressing the INPUT key stores 0F41 at the address specified by the cursor

WARNING
A system error may occur depending on the input value. Exercise special care when using this function.

```
PMC CONTENTS OF MEMORY                                          MONIT RUN

100000  0000 0000 0000 0000 0000 0000 0000 0000  ................
100010  4142 4344 4546 4748 494A 4B4C 4D4E 4F50  ABCDEFGHIJKLMNOP
100020  2020 2020 2020 2020 2020 2020 2020 2020
100030  5152 5354 5556 5758 595A 2020 2020 2020  QRSTUVWXYZ

100040  0000 0000 0000 0000 0000 0000 0000 0000  ................
100050  0000 0000 0000 0000 0000 0000 0000 0000  ................
100060  0000 0000 0000 0000 0000 0000 0000 0000  ................
100070  0000 0000 0000 0000 0000 0000 0000 0000  ................

100080  4641 4E55 4320 434F 2E2C 5444 0000 0000  FANUC CO.LTD....
100090  0000 0000 0000 0000 0000 0000 0000 0000  ................
1000A0  0000 0000 0000 0000 0000 0000 0000 0000  ................
1000B0  0000 0000 0000 0000 0000 0000 0000 0000  ................

1000C0  0000 0000 0000 0000 0000 0000 0000 0000  ................
1000D0  0000 0000 0000 0000 0000 0000 0000 0000  ................
1000E0  0000 0000 0000 0000 0000 0000 0000 0000  ................
1000F0  0000 0000 0000 0000 0000 0000 0000 0000  ................

 ( SEARCH )( INPUT )(        )(        )(        )
```

- **ANALYS screen (Ladder editing card is required)**

Change of signals is displayed as the same display as that on the oscilloscope.

1 Parameter setting screen (1st page)

```
   PMC SIGNAL ANALYSIS(PARAM)   MONIT RUN

SAMPLING TIME      :      10 (1–10 SEC)          (a)

TRIGGER ADDRESS    : G0007.2                     (b)

CONDITION          :       0                     (c)
(0: START 1: TRIGGER–ON 2: TRIGGER–OFF)

TRIGGER MODE       :       0                     (d)
(0: AFTER 1: ABOUT 2: BEFORE 3: ONLY)

( SCOPE )( DELETE )( INIT )(ADDRESS)(        )
```

Select each item by cursor key

(a) Set a sampling time.

(b) Specifies an address from which recording of signals is started.

(c) Set a condition under which recording is initiated.

0 : Started by soft key **[START]**

1 : Started by rise of a trigger signal after you press the soft key **[START]**

2 : Started by fall of a trigger signal after you press the soft key **[START]**

NOTE
CONDITION 1 and 2 are valid when TRIGGER ADDRESS is set.

(d) Set a trigger mode

0 : Record signal status after the trigger condition is satisfied

1 : Record signal status before and after the trigger condition is satisfied.

2 : Record signal status before the trigger condition is satisfied.

3 : Record signal status when the trigger condition is satisfied. (Display is same as trace memory).

NOTE
TRIGGER MODE 1 and 2 are valid when CONDITION 1 or 2 is set.

2 Parameter setting screen (2nd page)

```
PMC SIGNAL ANALYSIS(PARAM)      MONIT RUN

              SIGNAL ADDRESS

   1  :  X0000.0       9  :  Y0000.0
   2  :  X0000.1       10 :  R0000.1
   3  :  X0002.0       11 :
   4  :  X0005.0       12 :
   5  :                13 :
   6  :                14 :
   7  :                15 :
   8  :                16 :

( SCOPE )( DELETE )( INIT )(ADDRESS)(       )
```

Up to 16 signals

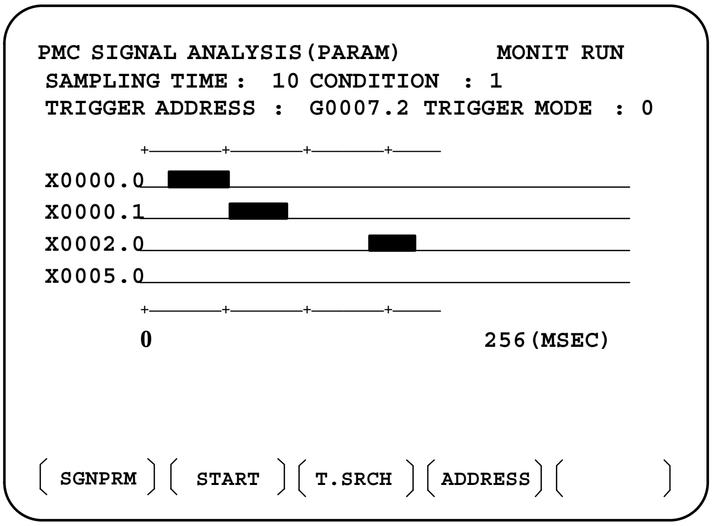
a. Soft key **[SCOPE]**:Select signal waveform display screen

b. Soft key **[DELETE]** :Delete data on the cursor position

c. Soft key **[INIT]** :Initialize parameters of signal waveform display

d. Soft key **[ADDRESS]** or **[SYMBOL]**:Switch addresses and symbols for display

3 SCOPE screen



“■” and “–” are used for display.

a. Soft key **[SGNPRM]** : Returns to parameter screen.

b. Soft key **[START]** or **[STOP]** :Start or stop the record.
(If TRIGGER MODE=3, signal is displayed when you press STOP key.)

c. Soft key **[T.SRCH]** :Displayed for a specified time.

d. Soft key **[ADDRESS]** or **[SYMBOL]**:Switch addresses and symbols for display

e. Soft key **[EXCHG]** : Change order of signals displayed.
·Press soft key **[EXCHG]**
·Move the cursor to a signal to be changed.
·Press soft key **[SELECT]**.
·Move the cursor to the destination.
·Press **[TO]** and **[EXEC]**, then the signal changes its order.

f. Soft key **[SCALE]**: Changes time scale for display. Scale changes from 256 to 512, and to 1024 msec every time you press the key.

g. Cursor key ← → : Scrolls time axis forward and backward

4.3.5 PMCPRM Screen

• Inputting PMC parameters from the MDI

1 Place the sequence program in the stopped state (STOP).

2 When the sequence program is running (RUN), set the following:

a) Set to MDI mode or emergency stop state.

b) Set PARAMETER WRITE (on setting screen) to 1 or set the program protect signal (KEY4) to 1.

	PWE	KEY4	
Timer	○	–	
Counter	○	○	Either one
Keep relay	○	–	
Data table	○	○	Either one

2 Press a soft key and select a required screen.
[TIMER] :Timer screen
[COUNTR] :Counter screen
[KEEPRL] :Keep relay screen
[DATA] :Data table screen

3 Press cursor key and move the cursor to a desired number.

4 Input a numeric key and press INPUT key and data is input.

5 After the data is input, set PARAMETER WRITE or KEY4 on setting screen to 0.

• TIMER screen

This screen is used for setting timer time of the functional instruction (SUB 3).

Page no. (screen is scrolled by page key)
Timer no. specified by functional instruction
Address specified by ladder

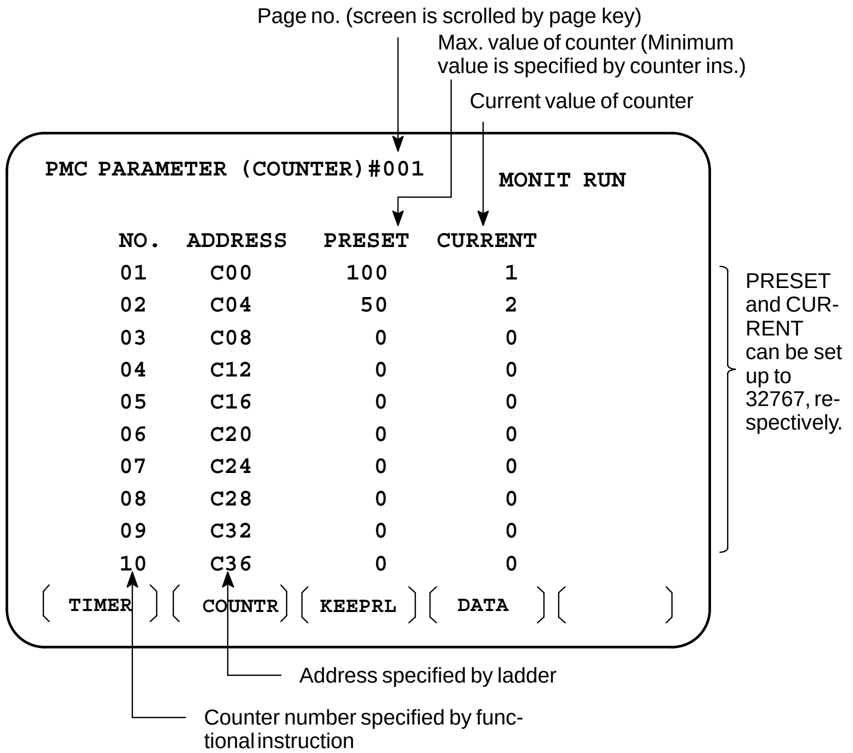
```
PMC PARAMETER (TIMER) #001          MONIT RUN

NO.ADDRESS DATA            NO.ADDRESS   DATA
01   T00      480          11   T20        0
02   T02      960          12   T22        0
03   T04        0          13   T24        0
04   T06        0          14   T26        0
05   T08        0          15   T28        0
06   T10        0          16   T30        0
07   T12        0          17   T32        0
08   T14        0          18   T34        0
09   T16        0          19   T36        0
10   T18        0          20   T38        0

( TIMER )( COUNTR )( KEEPRL )( DATA )(      )
```

Timer delay time (msec)

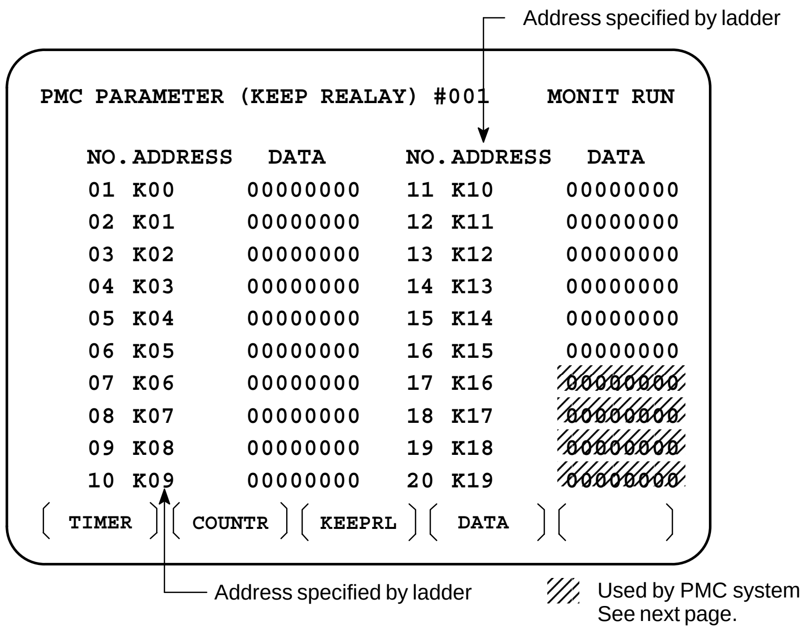
Timer set time : Timer no. 1–8 is max. 1572.8 sec and its accuracy is 48ms.
Timer no. 9 is max. 262.1 sec and its accuracy is 8ms.

- **COUNTER screen**

This screen sets and displays max. value of counter and current value of the counter instruction (SUB 4).



- **KEEP RELAY screen**



Model	SB5	SB6
PMC management software data 1	K17	K900
PMC management software data 2	K18	K901
Unused	K19	K902 to K909

1 Nonvolatile memory control

	#7	#6	#5	#4	#3	#2	#1	#0
K016								

MWRTF2 : For checking the writing status in nonvolatile memory

MWRTF1 : Writing status in nonvolatile memory

2 PMC system parameter
The following keep relays are used by the system, therefore they cannot be used in the sequence program.

	#7	#6	#5	#4	#3	#2	#1	#0
K017 or K900								

DTBLDSP 0 : The PMC parameter data table control screen is displayed.
1 : The PMC parameter data table control screen is not displayed.

ANASTST 0 : Sampling starts by soft key **[EXEC]** in the signal waveform display function.
1 : Sampling starts automatically by power on in the signal waveform display function.

TRCSTAT 0 : Signal tracing starts by soft key **[EXEC]** in signal trace function.
1 : Signal tracing starts automatically by power on in signal trace function.

MEMINP 0 : Data input cannot be done in memory contents display function.
1 : Data input can be done in memory contents display function.

AUTORUN 0 : A sequence program is executed automatically after the power is turned on.
1 : A sequence program is executed by sequence program soft key.

PRGRAM 0 : Built–in programmer is not used.
1 : Built–in programmer is used.

> **WARNING**
> At machine shipment, factory–set this bit to 0. If this bit is left 1, the operator may stop the ladder by mistake, which may lead to an accident.

LADMASK 0 : Dynamic display of ladder is executed.
1 : Dynamic display of ladder is not executed.

	#7	#6	#5	#4	#3	#2	#1	#0
K018								

CHKPRTY 0 : The parity check is performed for the system ROM and program ROM/RAM.
1 : The parity check is not performed for the system ROM and program ROM/RAM.

CALCPRTY 0 : The built–in programmer function performs RAM parity calculation.
1 : The built–in programmer function does not perform RAM parity calculation.

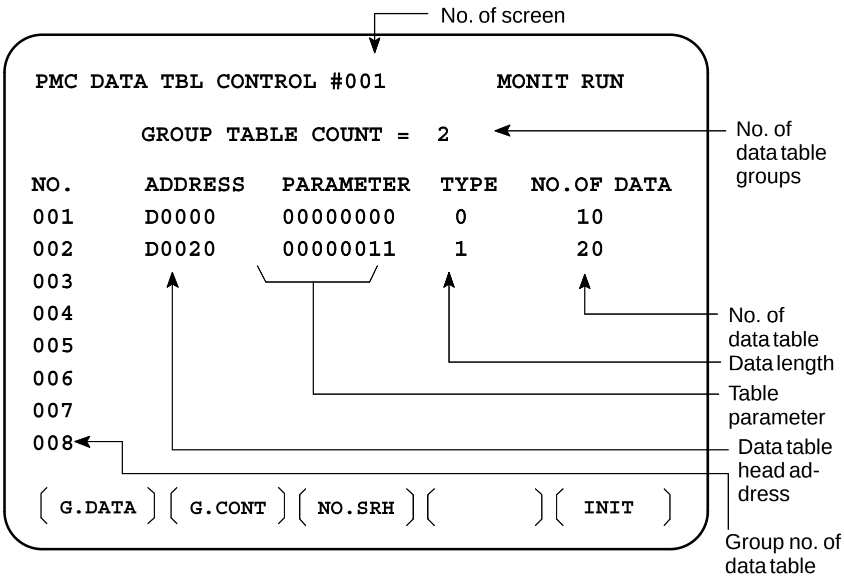
TRNSRAM 0 : A ladder program is not automatically sent to the FROM after on–line editing is completed.
1 : A ladder program is automatically sent to the FROM after on–line editing is completed.

TRGSTAT 0 : The trigger stop function does not automatically start when the power is turned on.
1 : The trigger stop function automatically starts when the power is turned on.

These bits are status of not used for PMC management software are used by system. Do not change the values.
Usually all the bits are 0.

- **DATA TABLE screen**

1 Data setting screen



a. Soft key **[G.DATA]** : Select data display screen of data table. (Next screen)

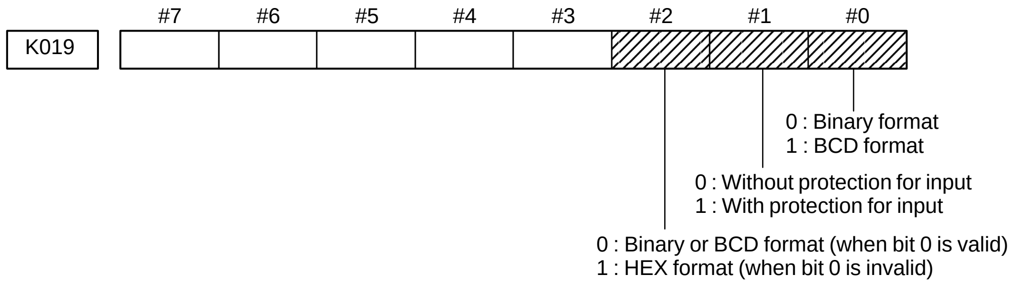
b. NO. OF GROUPS **[G.CONT]**: Set the no. of groups of data table.

c. Group No. **[NO.SRH]**: Move the cursor to a specified group.

d. Soft key **[INIT]**: Initializes the setting of data table.
No. of groups is 1, ADDRESS is D0000, PARAMETER is 0000000, TYPE is 0, NO. OF DATA is 3000 (SB5) or 8000 (SB6).

This operation is done usually when a sequence program is prepared. When PMC parameters are set, internal parameters are not affected.

PARAMETER



TYPE

0 : 1–byte length 1 : 2–byte length 2 : 4–byte length

e. Using the page key PAGE ↓ / ↑ PAGE, next screen/previous screen can be selected.

2 Data display screen

Group number
Page number

```
PMC PRM (DATA) 001/001            MONIT RUN
    NO.   ADDRESS                 DATA
    000     D0000                   0
    001     D0001                   0
    002     D0002                   0
    003     D0003                   0
    004     D0004                   0
    005     D0005                   0
    006     D0006                   0
    007     D0007                   0
    008     D0008                   0
    009     D0009                   0
( C.DATA )( G-SRCH )( SEARCH )(        )(        )
```

a. Soft key **[C.DATA]** :Returns to the data table setting screen. (Previous screen)

b. Group No. **[G–SRCH]** : Head of the specified group is selected.

c. Address **[SEARCH]**: Searches an address in a group currently selected.

4.4 OPERATION ON THE DPL/MDI

The DPL/MDI panel is used to set PMC system parameters and create and execute the sequence program.

(1) Setting and displaying PMC system parameters (SYSTEM PARAM)
- The type of counter data (BCD or binary) can be selected.

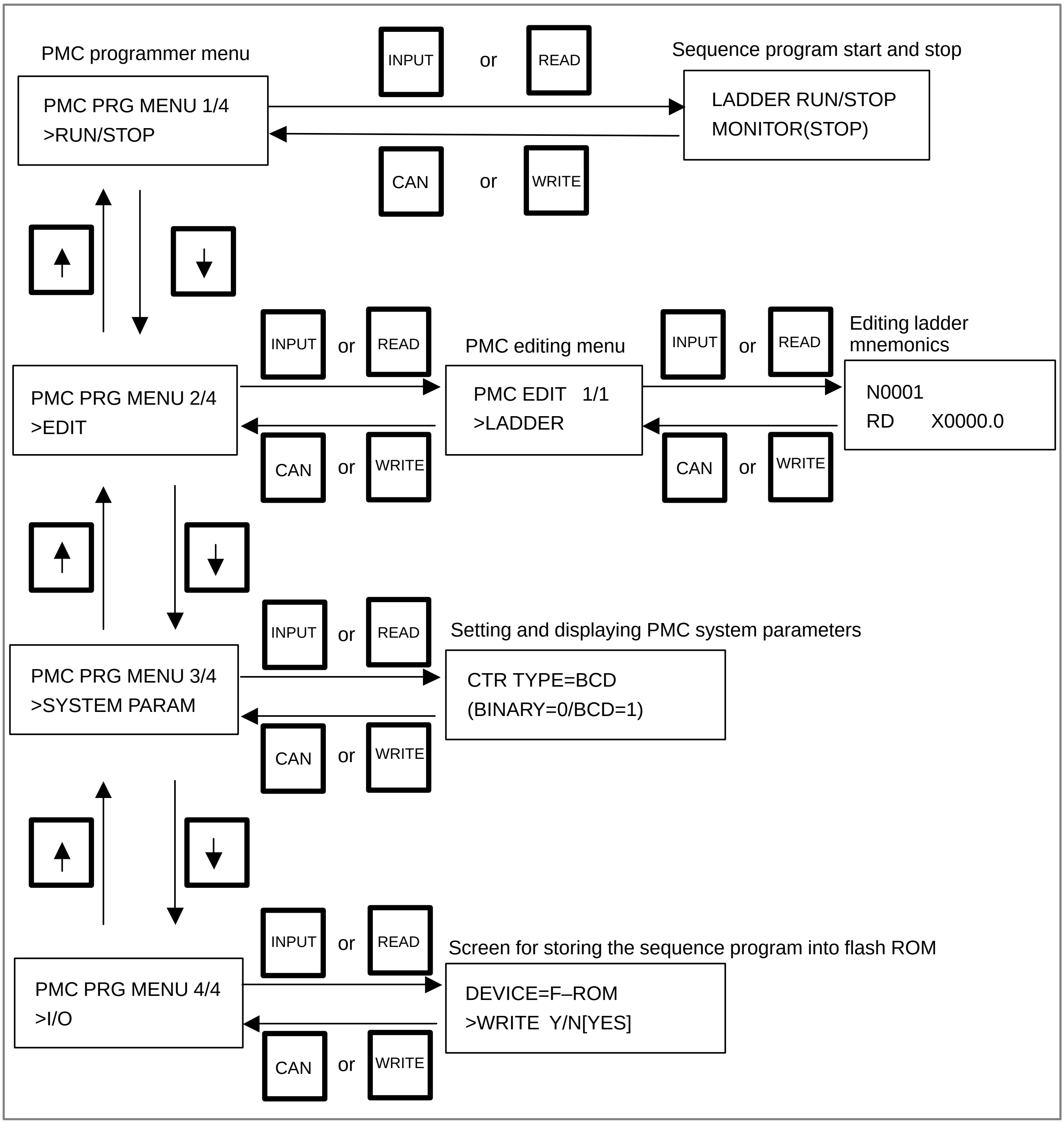
(2) Editing the sequence program (EDIT)
- The sequence program can be edited (input, addition, search, and deletion) by using the ladder mnemonics display.

(3) Executing the sequence program (RUN/STOP)
- The execution of the sequence program can be started and stopped.

(4) Storing the sequence program into flash ROM (I/O)
- The sequence program can be stored into flash ROM.

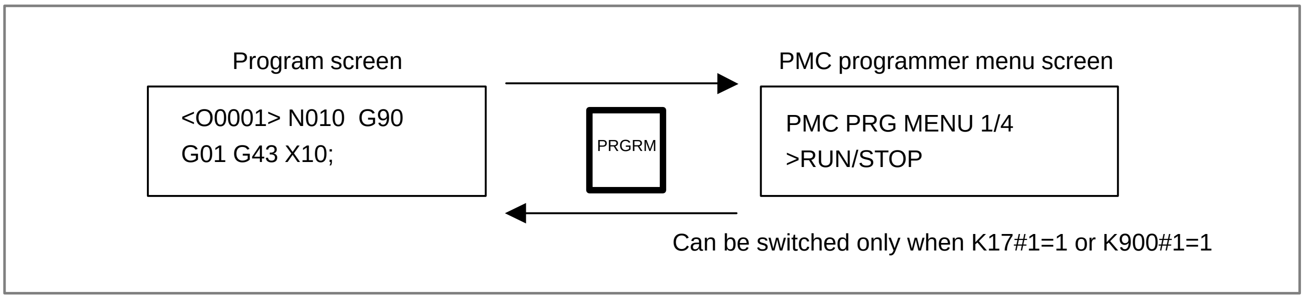
NOTE
1 The indication at the bottom left of each key applies to the PMC programmer (DPL/MDI) function.
2 For keys such as the [R K D/R] key, the indication on the left applies when the key is pressed once and that on the right applies when the key is pressed twice.
(Example) Pressing the [R K D/R] key once enters ”D” and pressing it twice enters ”R.”

The screen configuration for the PMC programmer (DPL/MDI) function is as follows:

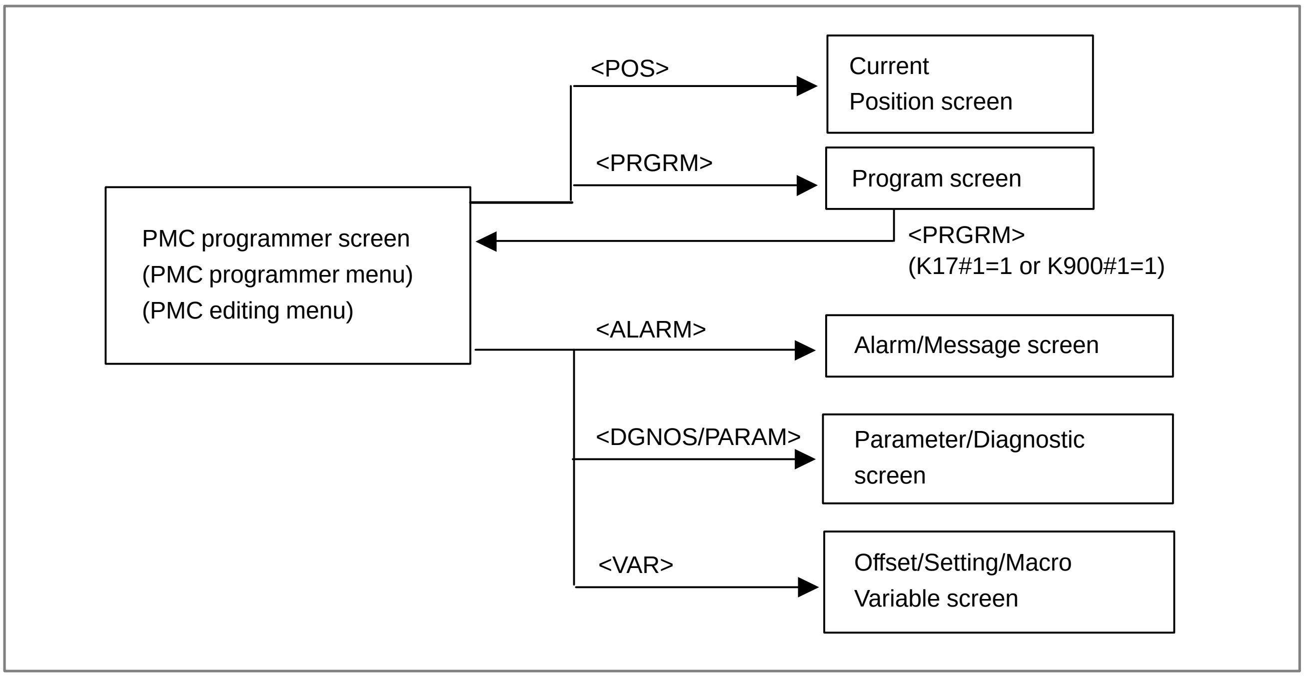


4.4.1 Selecting the PMC Programmer Menu

To operate the PMC programmer, set K17#1(PMC–SB5) or K900#1=1 (PMC–SB6) of the keep relay area for PMC parameters to 1, then press the **[PRGRM]** key two times on the DPL/MDI (press the **[PRGRM]** key further when the program screen is selected), thus causing the PMC programmer menu to be displayed.



To return to the CNC screen, press the **[POS]**, **[PRGRM]**, **[DGNOS/PARAM]**, **[VAR]**, or **[ALARM]** key



4.4.2 Setting and Displaying System Parameters (SYSTEM PARAM)

Selecting SYSTEM PARAM on the PMC programmer menu displays the system parameter screen. If the sequence program is running, selecting this function automatically stops the program.

1. Display the PMC programmer menu.
2. Display the SYSTEM PARAM item by pressing the **[↓]** or **[↑]** key.

```
PMC PRG MENU 3/4
>SYSTEM PARAM
```

3. Press the **[INPUT]** or **[READ]** key. The system parameter screen appears.

```
CTR TYPE=BIN
(BINARY=0/BCD=1)
```

4. The current counter data type is displayed on the screen.
   (a) Specify the type of the counter value to be used for the CTR functional instruction, as binary or BCD (enter <0> for binary or <1> for BCD).
   (b) Press the **[INPUT]** key.
   The counter data type is set.
5. Pressing the **[CAN]** or **[WRITE]** key displays the PMC programmer menu.

NOTE

1 When K19#0 (SB5) or K902#0(SB6) of the keep relay area for PMC parameter is set to 1, the screen for storing the sequence program into F–ROM is displayed after ladder editing.

```
DEVICE=F– ROM
>WRITE          Y/N[YES]
```

Please refer to the Subsec. 4.4.7 and storing the sequence program into F–ROM.

2 In editing the functional instruction TMR, TMRB, CTR, DIFU, DIFD, the range and the multiple use of parameters are checked.
When the parameter is out of range error, it can not be inputted. When parameter is multiple use error, the error message is displayed on the screen.
(Example) Error message of multiple use.

```
N00010   TMR   (DUP)
   P001                 50
```

4.4.3 Editing Sequence Program (EDIT)

Selecting EDIT on the PMC programmer menu displays the editing menu.

1. Display the PMC programmer menu.
2. Display the EDIT item by pressing the **[↓]** or **[↑]** key.

```
PMC PRG MENU 2/4
>EDIT
```

3. Press the **[INPUT]** or **[READ]** key. The PMC editing menu appears.

```
PMC EDIT        1/1
>LADDER
```

4. To end editing and display the PMC programmer menu, press the **[CAN]** or **[WRITE]** key.

4.4.4 Editing Ladder Mnemonics

(1) Starting ladder mnemonics editing
Selecting LADDER on the PMC programmer menu displays the ladder mnemonics editing screen. If the sequence program is running, selecting this function automatically stops the program.

1 Display the PMC programmer menu.

2 Display the LADDER item by pressing the **[↓]** or **[↑]** key.

```
PMC EDIT        1/1
>LADDER
```

3 Press the **[INPUT]** or **[READ]** key.
When the ladder password protection is performed
→ go to 4
When the ladder password protection is not performed
→ go to 6

4 When the password protection is performed, message requiring the release of password is displayed.

```
PASSWORD (R/W)
```

NOTE
A ladder program for which the password has been specified cannot be edited by ladder mnemonics editing until correct password is entered. Once password protection is released, the protection remains released until the power is turned off then on again.

5. Enter the password and press the **[INPUT]** key.

> **NOTE**
> The entered password is not displayed. (Echo back is not performed.)

When the password is not correctly specified, the error message is displayed.

```
FALSE PASSWORD
```

At this time, the display returns to the release requirement of password by pressing the **[INPUT]** key.
When the password is correctly specified, the protection is released.

6. The sequence program is displayed.

Step number

```
> N0001
  RD           X0000.0
```

Instruction

(2) Confirming the ladder mnemonics

1. Cursor scroll (scroll per step)
   Pressing the **[↑]** cursor key displays the instruction one step before that currently displayed. Pressing the **[↑]** cursor key displays the instruction one step after that currently displayed.
2. Specifying the step number
   Entering **[No.]**, **[step number]**, **[INPUT]**, then displays the instruction having the entered step number.
   (The **[↓]** cursor key can be used instead of the **[INPUT]** key.)
   (Example) **[No.]**, **[1]**, **[2]**, **[3]**, **[↓]**

```
N0123
SUB 50 PSGNL
```

3. Relay search
   Entering **[address number]** then **[↓]** searches for the relay including the entered address.
   (Example) **[X]**,**[0**], **[.]**, **[2]**, **[↓]**

```
N0105
AND          X0000.2
```

4. Relay coil search
   Entering **[S]**, **[address number]**, then **[↓]** searches for the relay coil including the entered address.
   (Example) **[WRT]**, **[Y]**, **[3]**, **[3]**, **[.]**, **[5]**, **[↓]**

```
N0187
WRT.NOT    Y0033.5
```

5. Functional instruction search
   Entering **[SUB]**,**[functional instruction number]**, then **[↓]** searches for the entered functional instruction.
   (Example) **[SUB]**, **[50]**, **[↓]**

```
N0123
SUB 50 PSGNL
```

NOTE
1 Relay search, relay coil search, and functional instruction search are started from the current screen. If the relay, relay coil, or instruction is not found by the end of the ladder program, search is performed from the beginning of the ladder program to the step at which search was started. If still not found, ”NOT FOUND” is displayed.

```
N0105 NOT FOUND
AND       X0000.2
```

2 Display of some instructions may differ from that for FAPT LADDER.

personal–computer FAPT LADDER	Ladder mnemonics editing
(a) RD.NOT.STK	RD.N.STK
(b) TMR timer–number	SUB 03 TMR P001 timer–number
(c) DEC code–signal–address (PRM) decode–instruction	SUB 04 DEC P001 code–signal–address P002 decode–instruction

The above also applies when modifying the ladder mnemonics.

(3) Modifying the ladder mnemonics

1 Changing an instruction
(a) Display the instruction to be changed.
(b) Enter a new instruction.
(c) Press the **[ALTER]** key.
(Example) **[OR]**, **[Y]**, **[3]**, **[2]**, **[.]**, **[4]**, **[ALTER]**

```
N1234
AND       R0123.4
```

Before change

```
N1234
OR          Y0032.4
```

After change

> **NOTE**
> If changing the instruction causes the memory capacity to be exceeded, the **[ALTER]** key is ignored without changing the instruction.

2 Deleting an instruction
   (a) Display the instruction to be deleted.
   (b) Press the **[DELET]** key.
   The instruction is deleted and the next instruction is displayed.

3 Inserting an instruction
   (a) Display the instruction after which an instruction is to be inserted.
   (b) Enter the instruction to be inserted.
   (c) Press the **[INSRT]** key.
   (Example) **[AND]**, **[STK]**, **[INSRT]**

```
N1234
AND         R0123.4
```

Before insertion

```
N1234
AND.STK
```

After insertion

> **NOTE**
> If inserting the instruction causes the memory capacity to be exceeded, the **[INSRT]** key is ignored without inserting the instruction.

4 Deleting the ladder program
   (a) Enter **[–]**, **[9]**, **[9]**, **[9]**, **[9]**.
   (b) Press the **[DELET]** key.
   The whole ladder program is deleted.

(4) Ending ladder mnemonics editing

1 Press the **[CAN]** or **[WRITE]** key.

2 ”EXECUTING” is displayed.

```
N1234
AND.STK
```

3 The PMC editing menu appears.

NOTE

1 When K19#0(SB5) or K902#0(SB6) of the keep relay area for PMC parameter is set to 1, the screen for storing the sequence program into F–ROM is displayed after ladder editing.

```
DEVICE=F–ROM
>WRITE           Y/N[YES]
```

Please refer to the Subsec. 4.4.7 and storing the sequence program into F–ROM.

2 If the sequence program contains an error, the PMC editing menu is not displayed but an error message appears on the screen.
(Example) Error message

```
END FUNCTION
MISSING
```

3 When parameter is multiple use error, the error message is displayed on the screen.
(Example) Error message

```
FUNC.  PARAM  NO.
DUPLICATE
```

Pressing the **[↑]** or **[↓]** cursor key displays the ladder mnemonics editing screen.

4 Pressing the **[POS]**, **[PRGRM]**, **[VAR]**, **[DGNOS/PARAM]** or **[ALARM]** key during the editing of the sequence program displays the CNC screen by forcibly terminating editing even if the program contains an error.

4.4.5 Starting and Stopping the Sequence Program (RUN/STOP)

Selecting RUN/STOP on the PMC programmer menu displays the sequence program start/stop screen.

1 Display the PMC programmer menu.

2 Display the RUN/STOP item by pressing the **[↑]** or **[↓]** key.

```
PMC PRG MENU 1/4
>RUN/STOP
```

3 Press the **[INPUT]** or **[READ]** key. The sequence program start/stop screen appears.

```
LADDER RUN/STOP
MONITOR [RUN]
```

4 The current execution state of the sequence program is displayed on the screen. Pressing the **[↑]** or **[↓]** key switches the state between running and stopped.

5 Pressing the **[CAN]** or **[WRITE]** key displays the PMC programmer menu.

> **NOTE**
> When the sequence program cannot be started (RUN), the alarm of PMC occurred. Please confirm the alarm status referring to ”4.4.10 Error List”.

4.4.6 Error Messages (for Ladder Mnemonics Editing)

	Displayed error message	Error description (operator action)
1	COIL NOTHING	No coil is specified for a functional instruction using a coil.
2	COM FUNCTION MISSING	The use of the COM (SUB9) functional instruction is incorrect.
3	END FUNCTION MISSING	The END1 or END2 functionalinstruction is missing (or ERROR NET).
4	JUMP FUNCTION MISSING	The use of the JMP (SUB10) functional instruction is incorrect.
5	LADDER BROKEN	The ladder program is corrupted.
6	OBJECT BUFFER OVER	The user program RAM is full. (Perform condensation or reduce the size of the ladder program.) (Note)
7	PLEASE CLEAR ALL	The sequence program has become unrecoverable due to power–off during editing.
8	1ST LEVEL EXEC TIME OVER	The ladder first level is too great.
9	FUNC. PARAM NO. OUT OF RANGE	There is out of range error in the parameter of functional instruction TMR, TMRB, CTR, DIFU, DIFD. It is displayed when mnemonics editing is finished.
10	FUNC. PARAM NO. DUPLICATE	There is multiple use error in the parameter of functional instruction TMR, TMRB, CTR, DIFU, DIFD. It is displayed when mnemonics editing is finished.
11	Nxxxxx yyyy (RNG) P001 nnn	There is out of range error in the parameter of functional instruction TMR, TMRB, CTR, DIFU, DIFD. xxxxx : Step number yyyy : Functional instruction nnn : Parameter
12	Nxxxxx yyyy (DUP) P001 nnn	There is multiple use error in the parameter of functional instruction TMR, TMRB, CTR, DIFU, DIFD. xxxxx : Step number yyyy : Functional instruction nnn : Parameter

NOTE
Use a memory card for ladder diagram editing or the CONDENSE function of FAPT LADDER (for personal computers). These methods may, however, not be effective.

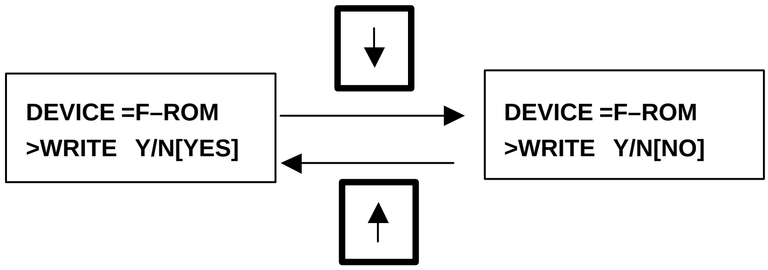
4.4.7 Storing the Sequence Program into Flash EEPROM (I/O)

Selecting I/O on the PMC programmer menu displays the screen for storing the sequence program into F–ROM.

1. Display the PMC programmer menu.
2. Display the I/O item by pressing the **[↑]** or **[↓]** key.

```
PMC PRG MENU 4/4
>I/O
```

3. Press the **[INPUT]** or **[WRITE]** key. The sequence program storage screen appears. Pressing the **[↑]** or **[↓]** key switches display between [YES] and [NO].



4. When [NO] is displayed, pressing the **[INPUT]** key displays the sequence program storage screen. When [YES] is displayed, pressing the **[INPUT]** key starts writing the sequence program into flash EEPROM.
   ”EXECUTING” is displayed during writing.

```
WRITE TO FROM
   EXECUTING
```

→ ”EXECUTING” blinks

Once the sequence program has been written normally, ”COMPLETE” is displayed.

```
WRITE TO FROM
   COMPLETE
```

NOTE
If an error occurs, an error message appears on the screen.

Example error message

```
SIZE ERROR
```

To return to the sequence program storage screen, press the **[↑]** or **[↓]** key.

5. Pressing the **[CAN]** key displays the PMC programmer menu.

Error details

The table below lists the details of the errors which may occur during storage into F–ROM using the DPL/MDI.

Error message	Description
PROGRAM DATAERROR	The ladder data in RAM is invalid. Alternatively, there is no RAM or ROM.
SIZE ERROR	The program exceeds the maximum size which can be written into F–ROM.
OPEN ERROR	The OPEN processing has failed.
ERASE ERROR	The ERASE processing has failed. The F–ROM cannot be erased. Alternatively, the F–ROM is defective.
WRITE ERROR	The WRITE processing has failed. The F–ROM cannot be written. Alternatively, the F–ROM is defective.

4.4.8 Input/Output Ladder/ PMC–parameter by DPL/MDI

Input/Output method to office programmer (Fixed 9600bit/sec.)

- Method of Inputting/Outputting Ladder
  (1) Select ”Diagnose screen” by key in **[DGNOS/PARAM]** key.
  (2) Key in **[READ]** key or **[WRITE]** key.
  (3) Operate following procedure from Off line programmer.
  1. Select F5: [I/O] [INPUT/OUTPUT] from screen of Off line menu.
  2. Select F3: [PMC] from screen of INPUT/OUTPUT menu.
  3. Select F1: [DNLOAD] [down load (programmer → RPMC)] or F2: [UPLOAD] [up load (programmer ← PMC)] from screen of PMC menu and key in **[Enter]**.

Input/Output method to FANUC FLOPPY CASSETE (Fixed 4800bit/sec.)

- Method of Inputting Ladder and PMC–Parameter.
  (1) Select ”Diagnose screen” by key in **[DGNOS/PARAM]** key.
  (2) Key in **[No.]** key and optionally key in [File No.].
  (3) Key in **[READ]** key.

NOTE
In case of input PMC–Parameter, it is necessary to set following conditions.
1 Emergency stop condition, and NC–Parameter PWE=1.
2 Stop condition the Ladder program.

- Method of Outputting Ladder
  (1) Select ”Diagnose screen” by key in **[DGNOS/PARAM]** key.
  (2) Key in **[No.]** key.
  (3) Key in **[WRITE.]** key.
- Method of Outputting PMC–Parameter.
  (1) Key in **[DGNOS/PARAM]** key.
  (2) Key in **[No.]** key and optionally key in [File No.].
  (3) Key in **[WRITE]** key.

> **NOTE**
> In case of output PMC–Parameter, it is necessary to set following conditions.
> 1 Edit mode.
> 2 Stop condition the Ladder program.

4.4.9 Error List

If in alarm is issued in the PMC, the alarm message is displayed on the CRT (PMC ALARM MESSAGE screen). But in case of DPL/MDI, it is displayed only by R–relay status (ON or Off).
Refer to the ”APPENDIX B. ALARM LIST” for more information.
Error status at power on or PROGRAM DOWN LOAD.

R9044 #0
#1 : ER01 PROGRAM DATA ERROR
#2 : ER02 PROGRAM SIZE OVER
#3 : ER03 PROGRAM SIZE ERROR (OPTION)
#4 : ER04 LADDER OBJECT TYPE ERROR
#5 : ER05 PMC MODULE TYPE ERROR
#6 : ER06 PMC CONTORL SOFTWARE TYPE UNMATCH
#7 : ER07 NO OPTION (LADDE STEP)

R9045 #0 : ER08 OBJECT UNMATCH
#1 : ER09 PMC LABEL CHECK ERROR
#2 : ER10 OPTION AREA OUT OF RANGE
#3 :
#4 : ER12 OPTION AREA ERROR
#5 :
#6 : ER14 OPTION AREA VERSION ERROR
#7 :

R9046 #0 : ER16 RAM CHECK ERROR (PAROGRAM RAM)
#1 : ER17 PROGRAM PARITY
#2 : ER18 PROGRAM DATA ERROR BY I/O
#3 : ER19 LADDER DATA ERROR
#4 : ER20 SYMBOL/COMMENT DATA ERROR
#5 : ER21 MESSAGE DATA ERROR
#6 : ER22 PROGRAM NOTHING
#7 : ER23 PLEASE TURN OFF POWER

R9047 #0 :
#1 : ER25 SOFTWARE VERSTION ERROR (PMCAOPT)
#2 : ER26 PMC CONTOROL MODULE ERROR (PMCAOPT)
#3 : ER27 LADDER FUNC. PRM IS OUT OF RANGE
#4 :
#5 :
#6 :
#7 :

R9084 #0 : ER40 I/O LINK–II SETTING ERROR (CH1)
#1 : ER41 I/O LINK–II MODE ERROR (CH1)
#2 : ER41 I/O LINK–II STATION NO. ERROR (CH1)
#3 :
#4 :
#5 :
#6 :
#7 :

R9085 #0 : ER40 I/O LINK–II SETTING ERROR (CH2)
#1 : ER41 I/O LINK–II MODE ERROR (CH2)
#2 : ER41 I/O LINK–II STATION NO. ERROR (CH2)
#3 :
#4 :
#5 :
#6 :
#7 :

4.5 ON–LINE DEBUGGING FUNCTION

The on–line debugging function enables the monitoring and modification of ladder programs and signal status on personal computer's screen using a personal computer connected to the Power Mate through an RS–232–C cable.
FANUC FAPT LADDER–II is necessary to use the on–line debugging function. (This software is a programming system for developing FANUC PMC sequence programs which operate on IBM PC/AT and compatible computers.)

Software name	Specification	Personal computer
FAPT LADDER–II	A08B–9201–J503	IBM PC/AT and compatible

In this section, only the parameter of on–line monitor driver for Power Mate–*i* and attention in use is described. Other points (connection of cable with personal computer, details of the operation, etc.) are described in the following manual.

Name of Manual	Spec.No.	Reference Items
FAPT LADDER–II OPERATOR'S MANUAL	B–66184EN	On–line function

Starting and stopping the on–line debugging function

When using the on–line debugging function to connect a personal computer to the PMC, first start the driver that provides the communication function of the PMC.
When starting or stopping the driver, it is necessary to set the following parameters.

- Parameter screen for on–line monitor ([PARAMETERS FOR ONLINE MONITOR])

Pressing the [MONIT] then [ONLINE] soft keys on the PMC menu screen displays the on–line monitor parameter screen .
Parameter [RS–232–C] =
[USE] : On–line monitor driver is used.
[NOT USE] : On–line monitor driver is not used.

NOTE
The CRT/MDI is necessary when the parameter is set on the "PARAMETERS FOR ONLINE MONITOR" screen.

- Parameter in the Power Mate *i* (No.0024)

0024	Port for communication with the PMC ladder development tool (FAPT LADDER–II)

[Data type] Byte

This parameter sets the port to be used for communication with the PMC ladder development tool (FAPT LADDER 2).

0 : HSSB(COP7)

1 : RS–232–C serial port 1 (JD42)

2 : RS–232–C serial port 2 (JD42)
Setting entry is acceptable.

- Setting by the rotary switch on Power Mate *i* equipment.

The detail of the setting method is referring to the chapter F.4.2.

The first selection mode is ”3”
The second selection mode is

0 : Cancel of the selection of the RS–232–C port by the second selection.

1 : Use the ”DPL/MDI Operation Package” on the RS–232–C port 2 (Channel 2).

2 : Use the ”FAPT LADDR– II” on the RS–232–C port 2 (Channel 2).

When one of the following conditions is met, the on–line monitor driver is started.

- Parameter ”RS–232–C” is ”USE”
- Setting of parameter No.0024 is ”1” or ”2”
- The selection of the first selection mode is set to ”3” and the second selection mode is set to ”2” by Power Mate–*i* equipment(Rotary switch).

However if the selection is done by the method of Power Mate *i* equipment (Rotary switch), the other setting method(Parameter ”RS–232–C” is ”USE” or Setting of parameter No.0024 is ”1” or ”2”) is not effective.
The selection by Parameter screen for on–line monitor or parameter No.0024 can be used when the setting by Power Mate *i* equipment (Rotary switch) is cleared (first selection mode is set to ”3” and the second selection mode is set to ”0”).

NOTE

1 The on–line monitor driver occupies the line while it is operating.
In this state, other input/output functions cannot use the line.
If other input/output functions use the line, it is necessary to display the above–mentioned parameter and stop the on–line monitor driver.

2 While the on–line monitor driver is operating, the following functions cannot be used.
- [PMCLAD], [I/O], [EDIT], [SYSPRM] on CRT/MDI
- [EDIT], [SYSTEM PARAM], [I/O] on DPL/MDI

3 In case of operating NC, the screen display of NC (Position, etc.) might be slow when using input/output functions (Load from PMC, Store to PMC, etc.).
There is no problem in the operation of NC. It is recommended to using input/output functions while NC is not operating.

4 When the screen made by C language executor is displayed, the communication speed decreases. It is recommended to use input/output functions after moving to other screens (Position, etc.).

4.6 LIST OF SIGNALS BY EACH MODE

- **Automatic operation**

MODE		INPUT/OUTPUT SIGNAL	FEED RATE, ETC
AUTOMATIC OPERATION	EDIT	[PMC ⇒ CNC] KEY3(Program protect key)	
	AUTO MDI RMT	[PMC ⇒ CNC) ST (Cycle start) *SP (Feed hold) SBK (Single block) DRN (Dry run) BDT1~9 (Block delete) MIα (Mirror image) DNCI (DNC input mode) HSα1A~D (Handle interrupt axis select) AFL (Auxiliary function neglect) FIN, MFIN2, MFIN3 (Auxiliary function complete) MFIN, SFIN, TFIN, TFIN (High speed M/S/T function complete) *SSTP (Spindle stop) SAR (Spindle speed arrival) SOR (Spindle orientation)	[PMC ⇒ CNC] *FV0~7 (Feed rate override) OVC (Override cancel) ROV1,ROV2, HROV, *HROV0~6 (Rapid traverse override) SOV0~7 (Spindle speed override)
		[CNC ⇒ PMC] STL (Cycle start LED) SPL (Feed hold LED) MF, M00~M31 MF2, M200~M215 } (Miscellaneous function) MF3, M300~M315 SF, S00~S31 (Spindle speed function) TF, T00~T31 (Tool function) DEN (Distribution end) OP (automatic operating) GR1O~GR3O(Gear selection:*i*D)	

- **Manual operation**

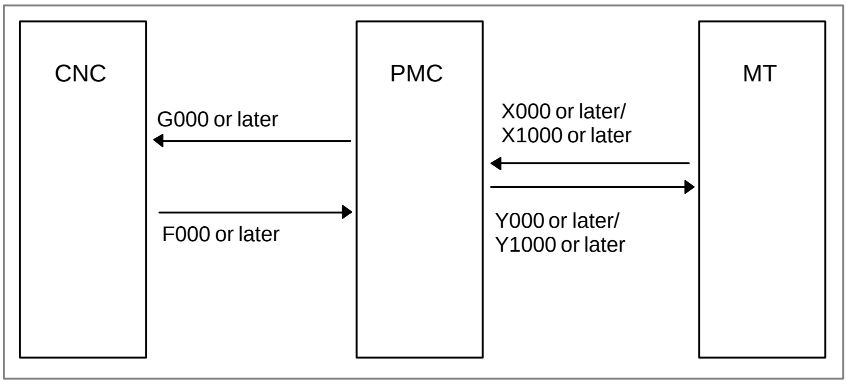
MODE			INPUT/OUTPUT SIGNAL	FEED RATE, ETC
MANUAL OPERATION	Handle/ incremental		[PMC ⇒ CNC] HSnA~D (Axis selection) n:1~3 (No. of MPGs) $+\alpha$, $-\alpha$ (Jog feed)	[PMC ⇒ CNC] MP1, MP2 (Multiplier)
	JOG		[PMC ⇒ CNC] RT (Rapid traverse)	[PMC ⇒ CNC] *JV0~15 (Manual feedrate override) $+\alpha$, $-\alpha$ (Manual feed move command) ROV1, ROV2 HROV *HROV0~6 (Rapid traverse override)
		ZRN	[PMC ⇒ CNC] ZRN(Reference position return mode) [MT ⇒ CNC] *DECα (Reference position deceleration)	
			[CNC ⇒ PMC] ZPα ZP2α, ZP3α, ZP4α (Reference position return completion)	

- **Others**

Others	[PMC ⇒ CNC] MD1~4 (Mode selection) *ESP (Emergency stop) KEY1~4 (Memory protection key) MLK,MLKα (All axes/ each axis machine lock) *IT,*ITα (All axes/ each axis machine lock) *±MITα (interlock per axis and direction) *ABSM (Manual absolute) SVFα (Servo off) *FLWP (Follow up) ERS (External reset) RRW (Reset & Rewind) ±LMα, RLSOT (Stroke limit external setting) *±Lα (Overtravel limit)
	[CMC ⇒ PMC] MA (NC ready) SA (Servo ready) AL (NC alarm) RST (Resetting) BAL (Battery alarm) INPα (In–position) MVα (Axis moving) TAP (Tapping)

4.7 ADDRESS LIST

The address relationships between the Power Mate *i*–D/H and PMC interface signals are shown below.



The details of the Power Mate *i*–D/H and PMC interface signal addresses are listed below. In the list, #D represents signals dedicated to the Power Mate *i*–D, while #H represents those dedicated to the Power Mate *i*–H.

Example 1:

	#7	#6		#2	#1	#0
G005		AFL		SFIN#D		MFIN

Example 2 explains how to specify an address for referencing data on a byte, word, or doubleword access basis.

Example 2:

To reference an M code as a byte (M00 to M07), word (M00 to M15), or doubleword (M00 to M31), specify F010.

	#7	#6		#2	#1	#0
F010	M07	M06		M02	M01	M00
F011	M15	M14		M10	M09	M08
F012	M23	M22		M18	M17	M16
F013	M31	M30		M26	M25	M24

MT → PMC

- **Power Mate *i*–D (1–path control)**

When external I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	*RILK	*DEC1	*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X0001			*DEC2					

When built–in I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	*RILK	*DEC1	*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X1001			*DEC2					

(When the speed switching function is used)

When external I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	EXF3	*DEC1	*ESP	ESKIP	SKIP4	EXF2	EXF1
X0001			*DEC2					
X0011			EXF5	EXF4				

When built–in I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	EXF3	*DEC1	*ESP	ESKIP	SKIP4	EXF2	EXF1
X1001			*DEC2					

- **Power Mate *i*–D 2–path control**

When external I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP#1	*RILK#1	*DEC#1	*ESP#1		SKIP4#1	SKIP3#1	SKIP2#1
X0001	SKIP#2	*RILK#2	*DEC#2	*ESP#2		SKIP4#2	SKIP3#2	SKIP2#2

When built–in I/O is used

Address	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP#1	*RILK#1	*DEC#1	*ESP#1		SKIP4#1	SKIP3#1	SKIP2#1
X1001	SKIP#2	*RILK#2	*DEC#2	*ESP#2		SKIP4#2	SKIP3#2	SKIP2#2

(When the speed switching function is used)

When external I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP#1	EXF3#1	*DEC#1	*ESP#1		SKIP4#1	EXF2#1	EXF1#1
X0001	SKIP#2	EXF3#2	*DEC#2	*ESP#2		SKIP4#2	EXF2#2	EXF1#2
X0011	EXF5 #2	EXF4 #2	EXF5 #1	EXF4 #1				

When built–in I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP#1	EXF3#1	*DEC#1	*ESP#1		SKIP4#1	EXF2#1	EXF1#1
X1001	SKIP#2	EXF3#2	*DEC#2	*ESP#2		SKIP4#2	EXF2#2	EXF1#2

• Power Mate *i*–H

When external I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	*RILK		*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X0002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1

When built–in I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	*RILK		*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X1002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1
X1003	DI37	DI36	DI35	DI34	DI33	DI32	DI31	DI30

(When the speed switching function is used)

When external I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	EXF3		*ESP	ESKIP	SKIP4	EXF2	EXF1
X0002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1
X0011			EXF5	EXF4				

When built–in I/O is used

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	EXF3		*ESP	ESKIP	SKIP4	EXF2	EXF1
X1002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1
X1003	DI37	DI36	DI35	DI34	DI33	DI32	DI31	DI30

NOTE
Set by parameter BIO (No.3008#3) for using the signals which X0000 to X0003 or X1000 to X1003.

PMC → CNC

Address	#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
G003								
G004			MFIN3	MFIN2	FIN			
G005		AFL			TFIN	SFIN#D		MFIN
G006		SKIPP		OVC		*ABSM		
G007	RLSOT		*FLWU			ST		
G008	ERS	RRW	*SP	*ESP				*IT
G009	PN7	PN6	PN5	PN4	PN3	PN2	PN1	PN0
G010	*JV7	*JV6	*JV6	*JV4	*JV3	*JV2	*JV1	*JV0
G011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8
G012	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0
G013								
G014							ROV2	ROV1
G015								
G016								
G017								
G018	HS2D#H	HS2C#H	HS2B	HS2A	HS1D#H	HS1C#H	HS1B	HS1A
G019	RT		MP2	MP1	HS3D#H	HS3C#H	HS3B#H	HS3A#H
G020 to G027								
G028						GR2#D	GR1#D	
G029		*SSTP#D	SOR#D	SAR#D				
G030	SOV7#D	SOV6#D	SOV5#D	SOV4#D	SOV3#D	SOV2#D	SOV1#D	SOV0#D
G031								
G032	R08I#D	R07I#D	R06I#D	R05I#D	R04I#D	R03I#D	R02I#D	R01I#D
G033	SIND#D	SSIN#D	SGN#D		R12I#D	R11I#D	R10I#D	R09I#D

	#7	#6	#5	#4	#3	#2	#1	#0
G034								
to								
G040								
G041	HS2ID#H	HS2IC#H	HS2IB	HS2IA	HS1ID#H	HS1IC#H	HS1IB	HS1IA
G042					HS3ID#H	HS3IC#H	HS3IB#H	HS3IA#H
G043	ZRN		DNCI#D			MD4	MD2	MD1
G044							MLK	BDT1
G045	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
G046	DRN	KEY4	KEY3	KEY2	KEY1		SBK	
G047								
to								
G052								
G053					UINT			TMRON
G054	UI007	UI006	UI005	UI004	UI003	UI002	UI001	UI000
G055	UI015	UI014	UI013	UI012	UI011	UI010	UI009	UI008
G056								
G057								
G058					EXWT	EXSTP	EXRD	
G059								
G060								
G061								RGTAP#D
G062								
G063								PATHS#D
G064								
G065								
G066	EKSET	EPCON					ENBKY	IGNVRY
G067								
G068								
G069								
G070	MRDYA#D	ORCMA#D	SFRA#D	SRVA#D	CTH1A#D	CTH2A#D	TLMHA#D	TLMLA#D
G071	RCHA#D	RSLA#D	INTGA#D	SOCNA#D	MCFNA#D	SPSLA#D	*ESPA#D	ARSTA#D
G072	RCHHGA#D	MFNHGA#D	INCMDA#D	OVRIDA#D	DEFMDA#D	NRROA#D	ROTAA#D	INDXA#D

	#7	#6	#5	#4	#3	#2	#1	#0
G073						MPOFA#D	SLVA#D	MORCMA#D
G074 to G077								
G078	SHA07#D	SHA06#D	SHA05#D	SHA04#D	SHA03#D	SHA02#D	SHA01#D	SHA00#D
G079					SHA11#D	SHA10#D	SHA09#D	SHA08#D
G080 to G090								
G091					SRLNI3	SRLNI2	SRLNI1	SRLNI0
G092				BGEN	BGIALM	BGION	IOLS	IOLACK
G093								
G094								
G095								
G096	HROV	*HROV6	*HROV5	*HROV4	*HROV3	*HROV2	*HROV1	*HROV0
G097								
G098	EKC7	EKC6	EKC5	EKC4	EKC3	EKC2	EKC1	EKC0
G099								
G100	+J8#H	+J7#H	+J6#H	+J5#H	+J4#H	+J3#H	+J2	+J1
G101								
G102	–J8#H	–J7#H	–J6#H	–J5#H	–J4#H	–J3#H	–J2	–J1
G103								
G104								
G105								
G106	MI8#H	MI7#H	MI6#H	MI5#H	MI4#H	MI3#H	MI2	MI1
G107								
G108	MLK8#H	MLK7#H	MLK6#H	MLK5#H	MLK4#H	MLK3#H	MLK2	MLK1
G109								
G110	+LM8#H	+LM7#H	+LM6#H	+LM5#H	+LM4#H	+LM3#H	+LM2	+LM1
G111								
G112	–LM8#H	–LM7#H	–LM6#H	–LM5#H	–LM4#H	–LM3#H	–LM2	–LM1
G113								

	#7	#6	#5	#4	#3	#2	#1	#0
G114	*+L8#H	*+L7#H	*+L6#H	*+L5#H	*+L4#H	*+L3#H	*+L2	*+L1
G115								
G116	*–L8#H	*–L7#H	*–L6#H	*–L5#H	*–L4#H	*–L3#H	*–L2	*–L1
G117								
to								
G123								
G124	DTCH8#H	DTCH7#H	DTCH6#H	DTCH5#H	DTCH4#H	DTCH3#H	DTCH2	DTCH1
G125								
G126	SVF8#H	SVF7#H	SVF6#H	SVF5#H	SVF4#H	SVF3#H	SVF2	SVF1
G127								
G128								
G129								
G130	*IT8#H	*IT7#H	*IT6#H	*IT5#H	*IT4#H	*IT3#H	*IT2	*IT1
G131								
G132	+MIT8#H	+MIT7#H	+MIT6#H	+MIT5#H	+MIT4#H	+MIT3#H	+MIT2	+MIT1
G133								
G134	–MIT8#H	–MIT7#H	–MIT6#H	–MIT5#H	–MIT4#H	–MIT3#H	–MIT2	–MIT1
G135								
G136	EAX8#H	EAX7#H	EAX6#H	EAX5#H	EAX4#H	EAX3#H	EAX2	EAX1
G137								
G138	SYNC8#H	SYNC7#H	SYNC6#H	SYNC5#H	SYNC4#H	SYNC3#H	SYNC2	SYNC1
G139								
G140	SYNCJ8#H	SYNCJ7#H	SYNCJ6#H	SYNCJ5#H	SYNCJ4#H	SYNCJ3#H	SYNCJ2	SYNCJ1
G141								
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

	#7	#6	#5	#4	#3	#2	#1	#0
G149	EID31A	EID30A	EID29A	EID28A	EID27A	EID26A	EID25A	EID24A
G150	DRNE	RTE	OVCE				ROV2E	ROV1E
G151	*FV7E	*FV6E	*FV5E	*FV4E	*FV3E	*FV2E	*FV1E	*FV0E
G152								
G153								
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
G162								
to								
G165								
G166	EBUFC#H	ECLRC#H	ESTPC#H	ESOFC#H	ESBKC#H	EMBUFC#H	ELCKZC#H	EFINC#H
G167	EMSBKC#H	EC6C#H	EC5C#H	EC4C#H	EC3C#H	EC2C#H	EC1C#H	EC0C#H
G168	EIF7C#H	EIF6C#H	EIF5C#H	EIF4C#H	EIF3C#H	EIF2C#H	EIF1C#H	EIF0C#H
G169	EIF15C#H	EIF14C#H	EIF13C#H	EIF12C#H	EIF11C#H	EIF10C#H	EIF9C#H	EIF8C#H
G170	EID7C#H	EID6C#H	EID5C#H	EID4C#H	EID3C#H	EID2C#H	EID1C#H	EID0C#H
G171	EID15C#H	EID14C#H	EID13C#H	EID12C#H	EID11C#H	EID10C#H	EID9C#H	EID8C#H
G172	EID23C#H	EID22C#H	EID21C#H	EID20C#H	EID19C#H	EID18C#H	EID17C#H	EID16C#H
G173	EID31C#H	EID30C#H	EID29C#H	EID28C#H	EID27C#H	EID26C#H	EID25C#H	EID24C#H
G174								
to								
G177								
G178	EBUFD#H	ECLRD#H	ESTPD#H	ESOFD#H	ESBKD#H	EMBUFD#H	ELCKZD#H	EFIND#H
G179	EMSBKD#H	EC6D#H	EC5D#H	EC4D#H	EC3D#H	EC2D#H	EC1D#H	EC0D#H
G180	EIF7D#H	EIF6D#H	EIF5D#H	EIF4D#H	EIF3D#H	EIF2D#H	EIF1D#H	EIF0D#H
G181	EIF15D#H	EIF14D#H	EIF13D#H	EIF12D#H	EIF11D#H	EIF10D#H	EIF9D#H	EIF8D#H
G182	EID7D#H	EID6D#H	EID5D#H	EID4D#H	EID3D#H	EID2D#H	EID1D#H	EID0D#H

	#7	#6	#5	#4	#3	#2	#1	#0
G183	EID15D#H	EID14D#H	EID13D#H	EID12D#H	EID11D#H	EID10D#H	EID9D#H	EID8D#H
G184	EID23D#H	EID22D#H	EID21D#H	EID20D#H	EID19D#H	EID18D#H	EID17D#H	EID16D#H
G185	EID31D#H	EID30D#H	EID29D#H	EID28D#H	EID27D#H	EID26D#H	EID25D#H	EID24D#H
G186								
to								
G191								
G192	IGVRY8#H	IGVRY7#H	IGVRY6#H	IGVRY5#H	IGVRY4#H	IGVRY3#H	IGVRY2	IGVRY1
G193								
to								
G203								
G204	LED08	LED07	LED06	LED05	LED04	LED03	LED02	LED01
G205	MOPEC							LED09
G206	RTN18#H	RTN17#H	RTN16#H	RTN15#H	RTN14#H	RTN13#H	RTN12	RTN11
G207	RTN28#H	RTN27#H	RTN26#H	RTN25#H	RTN24#H	RTN23#H	RTN22	RTN21
G208	RTN38#H	RTN37#H	RTN36#H	RTN35#H	RTN34#H	RTN33#H	RTN32	RTN31
G209								
G210	ZR8#H	ZR7#H	ZR6#H	ZR5#H	ZR4#H	ZR3#H	ZR2	ZR1
G211	ZPEXT8#H	ZPEXT7#H	ZPEXT6#H	ZPEXT5#H	ZPEXT4#H	ZPEXT3#H	ZPEXT2	ZPEXT1
G212	ACT	RTNT#D	GST#D	CTCHK#D			SYCMD#H	TPTONC
G213								
G214					WFN4	WFN3	WFN2	WFN1
G215	KEXEC#H	KDEL#H	KUP#H	KG04#H	KG01#H	KG00#H	KPAX#H	KF#H
G216	TRQ8E#H	TRQ7E#H	TRQ6E#H	TRQ5E#H	TRQ4E#H	TRQ3E#H	TRQ2E	TRQ1E
G217	TRQ17	TRQ16	TRQ15	TRQ14	TRQ13	TRQ12	TRQ11	TRQ10
G218	TRQ27	TRQ26	TRQ25	TRQ24	TRQ23	TRQ22	TRQ21	TRQ20
G219	TRQ37#H	TRQ36#H	TRQ35#H	TRQ34#H	TRQ33#H	TRQ32#H	TRQ31#H	TRQ30#H
G220	TRQ47#H	TRQ46#H	TRQ45#H	TRQ44#H	TRQ43#H	TRQ42#H	TRQ41#H	TRQ40#H
G221	TRQ57#H	TRQ56#H	TRQ55#H	TRQ54#H	TRQ53#H	TRQ52#H	TRQ51#H	TRQ50#H
G222	TRQ67#H	TRQ66#H	TRQ65#H	TRQ64#H	TRQ63#H	TRQ62#H	TRQ61#H	TRQ60#H
G223	TRQ77#H	TRQ76#H	TRQ75#H	TRQ74#H	TRQ73#H	TRQ72#H	TRQ71#H	TRQ70#H
G224	TRQ87#H	TRQ86#H	TRQ85#H	TRQ84#H	TRQ83#H	TRQ82#H	TRQ81#H	TRQ80#H
G225	PALM	PAL6	PAL5	PAL4	PAL3	PAL2	PAL1	PAL0

	#7	#6	#5	#4	#3	#2	#1	#0
G226	HCPL#H							HMD#H
G227	HOVC8#H	HOVC7#H	HOVC6#H	HOVC5#H	HOVC4#H	HOVC3#H	HOVC2#H	HOVC1#H
G228	HPST07#H	HPST06#H	HPST05#H	HPST04#H	HPST03#H	HPST02#H	HPST01#H	HPST00#H
G229	HPST15#H	HPST14#H	HPST13#H	HPST12#H	HPST11#H	HPST10#H	HPST09#H	HPST08#H
G230	HPST23#H	HPST22#H	HPST21#H	HPST20#H	HPST19#H	HPST18#H	HPST17#H	HPST16#H
G231	HPST31#H	HPST30#H	HPST29#H	HPST28#H	HPST27#H	HPST26#H	HPST25#H	HPST24#H
G232	HSBK8#H	HSBK7#H	HSBK6#H	HSBK5#H	HSBK4#H	HSBK3#H	HSBK2#H	HSBK1#H
G233	HERS8#H	HERS7#H	HERS6#H	HERS5#H	HERS4#H	HERS3#H	HERS2#H	HERS1#H
G234								
to								
G237								
G238					ELCAM4#H	ELCAM3#H	ELCAM2#H	ELCAM1#H
G239	ECMCST#H					ECMCHG#H	ECMEND#H	ECMST#H
G240								
to								
G243								
G244	MEAS7#H	MEAS6#H	MEAS5#H	MEAS4#H	MEAS3#H	MEAS2#H	MEAS1#H	MEAS0#H
G245								
G246								
G247								
G248							EXIO2	EXIO1
G249	FLN07	FLN06	FLN05	FLN04	FLN03	FLN02	FLN01	FLN00
G250	FLN15	FLN14	FLN13	FLN12	FLN11	FLN10	FLN09	FLN08
G251	EDGN	EPARM	EVAR	EPRG	EPMC			IOLNK
G252	EDG07	EDG06	EDG05	EDG04	EDG03	EDG02	EDG01	EDG00
G253	EDG15	EDG14	EDG13	EDG12	EDG11	EDG10	EDG09	EDG08
G254	EDN07	EDN06	EDN05	EDN04	EDN03	EDN02	EDN01	EDN00
G255	EDN15	EDN14	EDN13	EDN12	EDN11	EDN10	EDN09	EDN08
G256								
to								
G454								
G455	ENBEX8	ENBEX7	ENBEX6	ENBEX5	ENBEX4	ENBEX3	ENBEX2	ENBEX1

	#7	#6	#5	#4	#3	#2	#1	#0
G456	HSBKM8#H	HSBKM7#H	HSBKM6#H	HSBKM5#H	HSBKM4#H	HSBKM3#H	HSBKM2#H	HSBKM1#H
G457	HERSM8#H	HERSM7#H	HERSM6#H	HERSM5#H	HERSM4#H	HERSM3#H	HERSM2#H	HERSM1#H
G458 to	HFIN8#H	HFIN7#H	HFIN6#H	HFIN5#H	HFIN4#H	HFIN3#H	HFIN2#H	HFIN1#H
G462	+EDITH	+EDITG	+EDITF	+EDITE	+EDITD	+EDITC	+EDITB	+EDITA
G463	–EDITH	–EDITG	–EDITF	–EDITE	–EDITD	–EDITC	–EDITB	–EDITA
G464	EBUFE#H	ECLRE#H	ESTPE#H	ESOFE#H	ESBKE#H	EMBUFE#H	ELCKZE#H	EFINE#H
G465	EMSBKE#H	EC6E#H	EC5E#H	EC4E#H	EC3E#H	EC2E#H	EC1E#H	EC0E#H
G466	EIF7E#H	EIF6E#H	EIF5E#H	EIF4E#H	EIF3E#H	EIF2E#H	EIF1E#H	EIF0E#H
G467	EIF15E#H	EIF14E#H	EIF13E#H	EIF12E#H	EIF11E#H	EIF10E#H	EIF9E#H	EIF8E#H
G468	EID7E#H	EID6E#H	EID5E#H	EID4E#H	EID3E#H	EID2E#H	EID1E#H	EID0E#H
G469	EID15E#H	EID14E#H	EID13E#H	EID12E#H	EID11E#H	EID10E#H	EID9E#H	EID8E#H
G470	EID23E#H	EID22E#H	EID21E#H	EID20E#H	EID19E#H	EID18E#H	EID17E#H	EID16E#H
G471	EID31E#H	EID30E#H	EID29E#H	EID28E#H	EID27E#H	EID26E#H	EID25E#H	EID24E#H
G472 to								
G475								
G476	EBUFF#H	ECLRF#H	ESTPF#H	ESOFF#H	ESBKF#H	EMBUFF#H	ELCKZF#H	EFINF#H
G477	EMSBKF#H	EC6F#H	EC5F#H	EC4F#H	EC3F#H	EC2F#H	EC1F#H	EC0F#H
G478	EIF7F#H	EIF6F#H	EIF5F#H	EIF4F#H	EIF3F#H	EIF2F#H	EIF1F#H	EIF0F#H
G479	EIF15F#H	EIF14F#H	EIF13F#H	EIF12F#H	EIF11F#H	EIF10F#H	EIF9F#H	EIF8F#H
G480	EID7F#H	EID6F#H	EID5F#H	EID4F#H	EID3F#H	EID2F#H	EID1F#H	EID0F#H
G481	EID15F#H	EID14F#H	EID13F#H	EID12F#H	EID11F#H	EID10F#H	EID9F#H	EID8F#H
G482	EID23F#H	EID22F#H	EID21F#H	EID20F#H	EID19F#H	EID18F#H	EID17F#H	EID16F#H
G483	EID31F#H	EID30F#H	EID29F#H	EID28F#H	EID27F#H	EID26F#H	EID25F#H	EID24F#H
G484 to								
G487								
G488	EBUFG#H	ECLRG#H	ESTPG#H	ESOFG#H	ESBKG#H	EMBUFG#H	ELCKZG#H	EFING#H
G489	EMSBKG#H	EC6G#H	EC5G#H	EC4G#H	EC3G#H	EC2G#H	EC1G#H	EC0G#H
G490	EIF7G#H	EIF6G#H	EIF5G#H	EIF4G#H	EIF3G#H	EIF2G#H	EIF1G#H	EIF0G#H
G491	EIF15G#H	EIF14G#H	EIF13G#H	EIF12G#H	EIF11G#H	EIF10G#H	EIF9G#H	EIF8G#H

	#7	#6	#5	#4	#3	#2	#1	#0
G492	EID7G#H	EID6G#H	EID5G#H	EID4G#H	EID3G#H	EID2G#H	EID1G#H	EID0G#H
G493	EID15G#H	EID14G#H	EID13G#H	EID12G#H	EID11G#H	EID10G#H	EID9G#H	EID8G#H
G494	EID23G#H	EID22G#H	EID21G#H	EID20G#H	EID19G#H	EID18G#H	EID17G#H	EID16G#H
G495	EID31G#H	EID30G#H	EID29G#H	EID28G#H	EID27G#H	EID26G#H	EID25G#H	EID24G#H
G496								
to								
G499								
G500	EBUFH#H	ECLRH#H	ESTPH#H	ESOFH#H	ESBKH#H	EMBUFH#H	ELCKZH#H	EFINH#H
G501	EMSBKH#H	EC6H#H	EC5H#H	EC4H#H	EC3H#H	EC2H#H	EC1H#H	EC0H#H
G502	EIF7H#H	EIF6H#H	EIF5H#H	EIF4H#H	EIF3H#H	EIF2H#H	EIF1H#H	EIF0H#H
G503	EIF15H#H	EIF14H#H	EIF13H#H	EIF12H#H	EIF11H#H	EIF10H#H	EIF9H#H	EIF8H#H
G504	EID7H#H	EID6H#H	EID5H#H	EID4H#H	EID3H#H	EID2H#H	EID1H#H	EID0H#H
G505	EID15H#H	EID14H#H	EID13H#H	EID12H#H	EID11H#H	EID10H#H	EID9H#H	EID8H#H
G506	EID23H#H	EID22H#H	EID21H#H	EID20H#H	EID19H#H	EID18H#H	EID17H#H	EID16H#H
G507	EID31H#H	EID30H#H	EID29H#H	EID28H#H	EID27H#H	EID26H#H	EID25H#H	EID24H#H
G508								
to								
G511								

CNC → PMC

Address	#7	#6	#5	#4	#3	#2	#1	#0
F000	OP	SA	STL	SPL				RWD
F001	MA		TAP#D	ENB#D	DEN	BAL	RST	AL
F002		CUT				CSS#D		
F003	MTCHIN	MEDT	MAUT	MRMT	MMDI	MJ	MSTP	
F004			MZRN					
F005								
F006								
F007					TF	SF#D		MF
F008	MF5#H	MF4#4	MF3	MF2				
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
F018	M407#H	M406#H	M405#H	M404#H	M403#H	M402#H	M401#H	M400#H
F019	M415#H	M414#H	M413#H	M412#H	M411#H	M410#H	M409#H	M408#H
F020	M507#H	M506#H	M505#H	M504#H	M503#H	M502#H	M501#H	M500#H
F021	M515#H	M514#H	M513#H	M512#H	M511#H	M510#H	M509#H	M508#H
F022	S07#D	S06#D	S05#D	S04#D	S03#D	S02#D	S01#D	S00#D
F023	S15#D	S14#D	S13#D	S12#D	S11#D	S10#D	S09#D	S08#D
F024	S23#D	S22#D	S21#D	S20#D	S19#D	S18#D	S17#D	S16#D
F025	S31#D	S30#D	S29#D	S28#D	S27#D	S26#D	S25#D	S24#D
F026	T07	T06	T05	T04	T03	T02	T01	T00
F027	T15	T14	T13	T12	T11	T10	T09	T08
F028	T23	T22	T21	T20	T19	T18	T17	T16
F029	T31	T30	T29	T28	T27	T26	T25	T24

	#7	#6	#5	#4	#3	#2	#1	#0
F030								
to								
F033								
F034						GR3O#D	GR2O#D	GR1O#D
F035								
F036	R08O#D	R07O#D	R06O#D	R05O#D	R04O#D	R03O#D	R02O#D	R01O#D
F037					R12O#D	R11O#D	R10O#D	R09O#D
F038								
to								
F044								
F045	ORARA#D	TLMA#D	LDT2A#D	LDT1A#D	SARA	SDTA	SSTA	ALMA
F046	MORA2A#D	MORA1A#D	PORA2A#D	SLVSA#D	RCFNA#D	RCHPA#D	CFINA#D	CHPA#D
F047							INCSTA#D	PC1DEA#D
F048								
to								
F052								
F053	EKENB			BGEACT	RPALM	RPBSY	RPGDPL	INHKY
F054	UO007	UO006	UO005	UO004	UO003	UO002	UO001	UO000
F055	UO015	UO014	UO013	UO012	UO011	UO010	UO009	UO008
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							ESEND	EREND
F061								
F062	PRTSF							
F063								
F064								
F065							RGSPM#D	RGSPP#D
F066								G08MD
F067								
to								
F069								

	#7	#6	#5	#4	#3	#2	#1	#0
F070	PSW08	PSW07	PSW06	PSW05	PSW04	PSW03	PSW02	PSW01
F071							PSW10	PSW09
F072	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
F073				ZRNO		MD4O	MD2O	MD1O
F074								
F075	*SPO	KEYO	DRNO	MLKO	SBKO	BDTO		
F076			ROV2O	ROV1O	RTAP#D		MP2O	MP1O
F077		RTO			HS1DO#H	HS1CO#H	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#H	+J4O#H	–J3O#H	+J3O#H	–J2O	+J2O	–J1O	+J1O
F082								
to								
F089								
F090							ABTSP1#D	ABTQSV
F091								
F092								
F093								
F094	ZP8#H	ZP7#H	ZP6#H	ZP5#H	ZP4#H	ZP3#H	ZP2	ZP1
F095								
F096	ZP28#H	ZP27#H	ZP26#H	ZP25#H	ZP24#H	ZP23#H	ZP22	ZP21
F097								
F098	ZP38#H	ZP37#H	ZP36#H	ZP35#H	ZP34#H	ZP33#H	ZP32	ZP31
F099								
F100								
F101								
F102	MV8#H	MV7#H	MV6#H	MV5#H	MV4#H	MV3#H	MV2	MV1
F103								
F104	INP8#H	INP7#H	INP6#H	INP5#H	INP4#H	INP3#H	INP2	INP1
F105								

	#7	#6	#5	#4	#3	#2	#1	#0
F106	MVD8#H	MVD7#H	MVD6#H	MVD5#H	MVD4#H	MVD3#H	MVD2	MVD1
F107								
F108	MMI8#H	MMI7#H	MMI6#H	MMI5#H	MMI4#H	MMI3#H	MMI2	MMI1
F109								
F110	MDTCH8#H	MDTCH7#H	MDTCH6#H	MDTCH5#H	MDTCH4#H	MDTCH3#H	MDTCH2	MDTCH1
F111 to F119								
F120	ZRF8#H	ZRF7#H	ZRF6#H	ZRF5#H	ZRF4#H	ZRF3#H	ZRF2	ZRF1
F121 to F128								
F129	*EAXSL		EOV0					
F130	EBSYA	EOTNA	EOTPA	EGENA	EDENA	EIALA	ECKZA	EINPA
F131							EABUFA	EMFA
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#H	EOTNC#H	EOTPC#H	EGENC#H	EDENC#H	EIALC#H	ECKZC#H	EINPC#H
F137							EABUFC#H	EMFC#H
F138	EM28C#H	EM24C#H	EM22C#H	EM21C#H	EM18C#H	EM14C#H	EM12C#H	EM11C#H
F139	EBSYD#H	EOTND#H	EOTPD#H	EGEND#H	EDEND#H	EIALD#H	ECKZD#H	EINPD#H
F140							EABUFD#H	EMFD#H
F141	EM28D#H	EM24D#H	EM22D#H	EM21D#H	EM18D#H	EM14D#H	EM12D#H	EM11D#H
F142	EM48A	EM44A	EM42A	EM41A	EM38A	EM34A	EM32A	EM31A
F143								
F144								
F145	EM48B	EM44B	EM42B	EM41B	EM38B	EM34B	EM32B	EM31B
F146								
F147								
F148	EM48C#H	EM44C#H	EM42C#H	EM41C#H	EM38C#H	EM34C#H	EM32C#H	EM31C#H

	#7	#6	#5	#4	#3	#2	#1	#0
F149								
F150								
F151	EM48D#H	EM44D#H	EM42D#H	EM41D#H	EM38D#H	EM34D#H	EM32D#H	EM31D#H
F152 to F167								
F168	SW8	SW7	SW6	SW5	SW4	SW3	SW2	SW1
F169	SW16	SW15	M–OPE	SW13	SW12	SW11	SW10	SW09
F170	SW24	SW23	SW22	SW21	SW20	SW19	SW18	SW17
F171	SW32	SW31	SW30	SW29	SW28	SW27	SW26	SW25
F172	SW40	SW39	SW38	SW37	SW36	SW35	SW34	SW33
F173	SW48	SW47	SW46	SW45	SW44	SW43	SW42	SW41
F174	SW56	SW55	SW54	SW53	SW52	SW51	SW50	SW49
F175	HOPEMG	HOPENB	HOPSTP	SW61	SW60	SW59	SW58	SW57
F176								
F177	EDGNM	EPARMM	EVARM	EPRGM	EWTIO	ESTPIO	ERDIO	IOLNKM
F178					SRLNO3	SRLNO2	SRLNO1	SRLNO0
F179								
F180	CLRCH8#H	CLRCH7#H	CLRCH6#H	CLRCH5#H	CLRCH4#H	CLRCH3#H	CLRCH2	CLRCH1
F181								
F182	EACNT8#H	EACNT7#H	EACNT6#H	EACNT5#H	EACNT4#H	EACNT3#H	EACNT2	EACNT1
F183 to F189								
F190	TRQM8#H	TRQM7#H	TRQM6#H	TRQM5#H	TRQM4#H	TRQM3#H	TRQM2	TRQM1
F191 to F205								
F206	AD07#D	AD06#D	AD05#D	AD04#D	AD03#D	AD02#D	0	0
F207	AD15#D	AD14#D	AD13#D	AD12#D	AD11#D	AD10#D	AD09#D	AD08#D
F208							SYCMO	HOPATH
F209	CTOPN#D		RTPT#D	WVRDY	WAT4	WAT3	WAT2	WAT1

	#7	#6	#5	#4	#3	#2	#1	#0
F210	K7	K6	K5	K4	K3	K2	K1	K0
F211	KCAN	KEOB	KSLH	KNO	KPRD	KMNS	K9	K8
F212		KRED		KWRT	KINP	KDLT	KINS	KAST
F213			KALM		KPRM	KVAR	KPRG	KPOS
F214		KH	KQ	KP			KUP	KDWN
F215	KK	KJ	KI	KE	KD	KC	KB	KA
F216	KEXIT	KAMP	KZ	KY	KW	KV	KU	KL
F217				KX	KR	KG	KN	KO
F218	KSHRP	KT	KS	KM	KF			KDEV
F219								
F220	SUP8#H	SUP7#H	SUP6#H	SUP5#H	SUP4#H	SUP3#H	SUP2	SUP1
F221	IPL8#H	IPL7#H	IPL6#H	IPL5#H	IPL4#H	IPL3#H	IPL2	IPL1
F222	SVER8#H	SVER7#H	SVER6#H	SVER5#H	SVER4#H	SVER3#H	SVER2	SVER1
F223					ECMCP4#H	ECMCP3#H	ECMCP2#H	ECMCP1#H
F224								ECMEXE#H
F225 to F227								
F228	HCPLO#H							HMDO#H
F229	HEX8#H	HEX7#H	HEX6#H	HEX5#H	HEX4#H	HEX3#H	HEX2#H	HEX1#H
F230	HALM8#H	HALM7#H	HALM6#H	HALM5#H	HALM4#H	HALM3#H	HALM2#H	HALM1#H
F231	HRDY8#H	HRDY7#H	HRDY6#H	HRDY5#H	HRDY4#H	HRDY3#H	HRDY2#H	HRDY1#H
F232 to F235								
F236	APBL1	APBV1	APBZ1	APPS1	APPE1	APFE1	APOV1	APCM1
F237	APBL2	APBV2	APBZ2	APPS2	APPE2	APFE2	APOV2	APCM2
F238	APBL3#H	APBV3#H	APBZ3#H	APPS3#H	APPE3#H	APFE3#H	APOV3#H	APCM3#H
F239	APBL4#H	APBV4#H	APBZ4#H	APPS4#H	APPE4#H	APFE4#H	APOV4#H	APCM4#H
F240	APBL5#H	APBV5#H	APBZ5#H	APPS5#H	APPE5#H	APFE5#H	APOV5#H	APCM5#H
F241	APBL6#H	APBV6#H	APBZ6#H	APPS6#H	APPE6#H	APFE6#H	APOV6#H	APCM6#H

	#7	#6	#5	#4	#3	#2	#1	#0
F242	APBL7#H	APBV7#H	APBZ7#H	APPS7#H	APPE7#H	APFE7#H	APOV7#H	APCM7#H
F243	APBL8#H	APBV8#H	APBZ8#H	APPS8#H	APPE8#H	APFE8#H	APOV8#H	APCM8#H
F244 to F247								
F248		FANAL2	FANAL1			DVALM2	DVALM1	DVALM0
F249								
F250		ALSV	ALOH	ALOT	ALPS	ALPS3	ALPS2	ALPS1
F251						ALPS4	ALSPD#D	ALAPC
F252								
F253	KENB#H							
F254	PATHO							
F255 to F479								
F480	HEXM8#H	HEXM7#H	HEXM6#H	HEXM5#H	HEXM4#H	HEXM3#H	HEXM2#H	HEXM1#H
F481	HALMM8#H	HALMM7#H	HALMM6#H	HALMM5#H	HALMM4#H	HALMM3#H	HALMM2#H	HALMM1#H
F482	HRDYM8#H	HRDYM7#H	HRDYM6#H	HRDYM5#H	HRDYM4#H	HRDYM3#H	HRDYM2#H	HRDYM1#H
F483								
F484	HMF8#H	HMF7#H	HMF6#H	HMF5#H	HMF4#H	HMF3#H	HMF2#H	HMF1#H
F485								
F486								
F487								
F488 to F490	EM48E#H	EM44E#H	EM42E#H	EM41E#H	EM38E#H	EM34E#H	EM32E#H	EM31E#H
F491	EM48F#H	EM44F#H	EM42F#H	EM41F#H	EM38F#H	EM34F#H	EM32F#H	EM31F#H
F492								
F493								
F494	EM48G#H	EM44G#H	EM42G#H	EM41G#H	EM38G#H	EM34G#H	EM32G#H	EM31G#H
F495								
F496								

	#7	#6	#5	#4	#3	#2	#1	#0
F497 to	EM48H#H	EM44H#H	EM42H#H	EM41H#H	EM38H#H	EM34H#H	EM32H#H	EM31H#H
F500	EBSYE#H	EOTNE#H	EOTPE#H	EGENE#H	EDENE#H	EIALE#H	ECKZE#H	EINPE#H
F501							EABUFE#H	EMFE#H
F502	EM28E#H	EM24E#H	EM22E#H	EM21E#H	EM18E#H	EM14E#H	EM12E#H	EM11E#H
F503	EBSYF#H	EOTNF#H	EOTPF#H	EGENF#H	EDENF#H	EIALF#H	ECKZF#H	EINPF#H
F504							EABUFF#H	EMFF#H
F505	EM28F#H	EM24F#H	EM22F#H	EM21F#H	EM18F#H	EM14F#H	EM12F#H	EM11F#H
F506	EBSYG#H	EOTNG#H	EOTPG#H	EGENG#H	EDENG#H	EIALG#H	ECKZG#H	EINPG#H
F507							EABUFG#H	EMFG#H
F508	EM28G#H	EM24G#H	EM22G#H	EM21G#H	EM18G#H	EM14G#H	EM12G#H	EM11G#H
F509	EBSYH#H	EOTNH#H	EOTPH#H	EGENH#H	EDENH#H	EIALH#H	ECKZH#H	EINPH#H
F510							EABUFH#H	EMFH#H
F511	EM28H#H	EM24H#H	EM22H#H	EM21H#H	EM18H#H	EM14H#H	EM12H#H	EM11H#H

4.8 SIGNAL SUMMARY (IN ORDER OF FUNCTIONS)

○	:	Available
–	:	Unavailable

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
*	*+L1 to *+L8	Overtravel signals	G114	○	○
	*–L1 to *–L8		G116	○	○
	*ABSM	Manual absolute signal	G006#2	○	○
	*DEC1	Reference position return deceleration signal	X000#5	○	–
			X1000#5	○	–
	*DEC1 to *DEC8		X002	–	○
			X1002	–	○
	*DEC2		X001#5	○	–
			X1001#5	○	–
	*EAXSL	Control axis selection status signals (PMC axis control)	F129#7	○	○
	*ESP	Emergency stop signal	G008#4	○	○
	*ESP		X000#4	○	○
	*ESP		X1000#4	○	○
	*ESPA	Emergency stop signals (serial spindle)	G071#1	○	–
	*FLWU	Follow–up signal	G007#5	○	○
	*FV0 to *FV7	Feedrate override signals	G012	○	○
	*FV0E to *FV7E	Feedrate override signals (PMC axis control)	G151	○	○
	*FV0O to *FV7O	Software operator's panel signals (*FV0 to *FV7)	F078	○	○
	*HROV0 to *HROV6	1% step rapid traverse override signals	G096#0 to #6	○	○
	*IT	Interlock signal for all axes	G008#0	○	○
	*IT1 to *IT8	Interlock signal for each axis	G130	○	○
	*JV0 to *JV15	Manual feedrate override signals	G010,G011	○	○
	*JV0O to *JV15O	Software operator's panel signals (*JV0 to *JV15)	F079,F080	○	○
	*RILK	Interlock signal for all axes	X000#6	○	○
			X1000#6	○	○
	*SP	Feed hold signal	G008#5	○	○
	*SPO	Software operator's panel signal (*SP)	F075#7	○	○
	*SSTP	Spindle stop signal	G029#6	○	–

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
+	+EDITA	Axis direction–specific interlock forward signal (PMC axis control)	G462#0	○	○
	+EDITB		G462#1	○	○
	+EDITC		G462#2	○	○
	+EDITD		G462#3	○	○
	+EDITE		G462#4	○	○
	+EDITF		G462#5	○	○
	+EDITG		G462#6	○	○
	+EDITH		G462#7	○	○
	+J1 to +J8	Feed axis and direction selection signals	G100	○	○
	+J1O to +J4O	Software operator’s panel signals (+J1 to +J4)	F081#0,#2,#4, #6	○	○
	+LM1 to +LM8	Stroke check external setting signals	G110	○	○
	+MIT1 to +MIT8	Interlock signal for each axis and direction	G132	○	○
–	–EDITA	Axis direction–specific interlock backward signal (PMC axis control)	G463#0	○	○
	–EDITB		G463#1	○	○
	–EDITC		G463#2	○	○
	–EDITD		G463#3	○	○
	–EDITE		G463#4	○	○
	–EDITF		G463#5	○	○
	–EDITG		G463#6	○	○
	–EDITH		G463#7	○	○
	–J1 to –J8	Feed axis and direction selection signals	G102	○	○
	–J1O to –J4O	Software operator’s panel signals (–J1 to –J4)	F081#1,#3,#5, #7	○	○
	–LM1 to –LM8	Stroke check external setting signals	G112	○	○
	–MIT1 to –MIT8	Interlock signal for each axis and direction	G134	○	○
A	ABTQSV	Servo axis abnormal load detected signal	F090#0	○	○
	ABTSP1	First–spindle abnormal load detected signal	F090#1	○	–
	ACT	Temporary interrupt detection signal	G212#7	○	○
	AD02 to AD15, ADSGN	Analog input signal	F206 to F207	○	–
	AFL	Auxiliary function lock signal	G005#6	○	○
	AL	Alarm signal	F001#0	○	○
	ALAPC	APC alarm signal	F251#0	○	○
	ALMA	Alarm signals (serial spindle)	F045#0	○	–
	ALOH	Over heat alarm signal	F250#5	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
A	ALOT	Over travel alarm signal	F250#4	○	○
	ALPS	P/S alarm signal	F250#3	○	○
	ALPS1	P/S alarm 100 signal	F250#0	○	○
	ALPS2	P/S alarm 000 signal	F250#1	○	○
	ALPS3	P/S alarm 101 signal	F250#2	○	○
	ALPS4	P/S alarm (No. 5001 or later) signal	F251#2	○	○
	ALSPD	Spindle alarm signal	F251#1	○	–
	ALSV	Servo alarm signal	F250#6	○	○
	APBL1 to APBL8	APC battery low alarm 2 signal	F236#7 to F243#7	○	○
	APBV1 to APBV8	APC battery low alarm 1 signal	F236#6 to F243#6	○	○
	APBZ1 to APBZ8	APC battery voltage 0 error signal	F236#5 to F243#5	○	○
	APCM1 to APCM8	APC communication error signal	F236#0 to F243#0	○	○
	APFE1 to APFE8	APC framing error signal	F236#2 to F243#2	○	○
	APOV1 to APOV8	APC over time error signal	F236#1 to F243#1	○	○
	APPE1 to APPE8	APC parity error signal	F236#3 to F243#3	○	○
	APPS1 to APPS8	APC pulse miss error signal	F236#4 to F243#4	○	○
	ARSTA	Alarm reset signals (serial spindle)	G071#0	○	–
B	BAL	Battery alarm signal	F001#2	○	○
	BDT1 to BDT9	Optional block skip signals	G044#0, G045	○	○
	BDTO	Software operator’s panel signal (BDT)	F075#2	○	○
	BGEACT	Background editing signal	F053#4	○	○
	BGEN	Power Mate background in–use signal	G092#4	○	○
	BGIALM	Power Mate read/write alarm signal	G092#3	○	○
	BGION	Power Mate read/write signal	G092#2	○	○
C	CFINA	Spindle switch completion signals (serial spindle)	F046#1	○	–
	CHPA	Power line switch signals (serial spindle)	F046#0	○	–
	CLRCH1 to CLRCH8	Torque limit reach signals for butt–type reference position setting	F180	○	○
	CSS	Constant surface speed signal	F002#2	○	–
	CTH1A,CTH2A	Clutch/gear signals (serial spindle)	G070#3,#2	○	–
	CTOPN	Chaser open control signal	F209#7	○	–
	CUT	Cutting feed signal	F002#6	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
D	DEFMDA	Differential speed mode command signals (serial spindle)	G072#3	○	–
	DEN	Distribution end signal	F001#3	○	○
	DI30 to DI37	High–speed skip signals	X1003	–	○
	DM00	Decode M signals	F009#7	○	○
	DM01		F009#6	○	○
	DM02		F009#5	○	○
	DM30		F009#4	○	○
	DNCI	DNC operation selection signal	G043#5	○	–
	DRN	Dry run signal	G046#7	○	○
	DRNE	Dry run signal (PMC axis control)	G150#7	○	○
	DRNO	Software operator's panel signal (DRN)	F075#5	○	○
	DTCH1 to DTCH8	Controlled axis detach signals	G124	○	○
	DVALM0 to DVALM2	Built–in I/O over current alarm signals	F248#0 to #2	○	○
E	EA0 to EA6	Address signals for external data input	G002#0 to #6	○	○
	EABUFA	Buffer full signals (PMC axis control)	F131#1	○	○
	EABUFB		F134#1	○	○
	EABUFC		F137#1	–	○
	EABUFD		F140#1	–	○
	EABUFE		F501#1	–	○
	EABUFF		F504#1	–	○
	EABUFG		F507#1	–	○
	EABUFH		F510#1	–	○
	EACNT1 to EACNT8	Controlling signals (PMC axis control)	F182	○	○
	EADEN1 to EADEN8	Distribution completion signals (PMC axis control)	F112	○	○
	EAX1 to EAX8	Control axis selection signals (PMC axis control)	G136	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	EBSYA	Axis control command read completion signals (PMC axis control)	F130#7	○	○
	EBSYB		F133#7	○	○
	EBSYC		F136#7	–	○
	EBSYD		F139#7	–	○
	EBSYE		F500#7	–	○
	EBSYF		F503#7	–	○
	EBSYG		F506#7	–	○
	EBSYH		F509#7	–	○
	EBUFA	Axis control command read signals (PMC axis control)	G142#7	○	○
	EBUFB		G154#7	○	○
	EBUFC		G166#7	–	○
	EBUFD		G178#7	–	○
	EBUFE		G464#7	–	○
	EBUFF		G476#7	–	○
	EBUFG		G488#7	–	○
	EBUFH		G500#7	–	○
	EC0A to EC6A	Axis control command signals (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	–	○
	EC0E to EC6E		G465#0 to #6	–	○
	EC0F to EC6F		G477#0 to #6	–	○
	EC0G to EC6G		G489#0 to #6	–	○
	EC0H to EC6H		G501#0 to #6	–	○
	ECKZA	Following zero checking signals (PMC axis control)	F130#1	○	○
	ECKZB		F133#1	○	○
	ECKZC		F136#1	–	○
	ECKZD		F139#1	–	○
	ECKZE		F500#1	–	○
	ECKZF		F503#1	–	○
	ECKZG		F506#1	–	○
	ECKZH		F509#1	–	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	ECLRA	Reset signals (PMC axis control)	G142#6	○	○
	ECLRB		G154#6	○	○
	ECLRC		G166#6	–	○
	ECLRD		G178#6	–	○
	ECLRE		G464#6	–	○
	ECLRF		G476#6	–	○
	ECLRG		G488#6	–	○
	ECLRH		G500#6	–	○
	ECMCP1 to ECMCP4	Phase matching completion signal	F223#0 to #4	–	○
	ECMCST	Phase matching start signal	G239#7	–	○
	ECMEND	Electronic cam operation end signal	G239#1	–	○
	ECMCHG	Cam shaft switching signal	F177#7	○	○
	ECMEXE	Electronic cam function execution in–progress signal	F224#0	–	○
	ECMST	Electronic cam operation start signal	G239#0	–	○
	ED0 to ED15	Data signals for external data input	G000,G001	○	○
	EDENA	Auxiliary function executing signals (PMC axis control)	F130#3	○	○
	EDENB		F133#3	○	○
	EDENC		F136#3	–	○
	EDEND		F139#3	–	○
	EDENE		F500#3	–	○
	EDENF		F503#3	–	○
	EDENG		F506#3	–	○
	EDENH		F509#3	–	○
	EDG00 to EDG15	External punch start number signal	G252, G253	–	○
	EDGN	Diagnosis selection signal	G251#7	–	○
	EDGN00 to EDGN15	External punch total count signal	G254, G255	–	○
	EDGNM	Slave diagnose selection signal	F177#7	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	EFINA	Auxiliary function completion signals (PMC axis control)	G142#0	○	○
	EFINB		G154#0	○	○
	EFINC		G166#0	–	○
	EFIND		G178#0	–	○
	EFINE		G464#0	–	○
	EFINF		G476#0	–	○
	EFING		G488#0	–	○
	EFINH		G500#0	–	○
	EGENA	Axis moving signals (PMC axis control)	F130#4	○	○
	EGENB		F133#4	○	○
	EGENC		F136#4	–	○
	EGEND		F139#4	–	○
	EGENE		F500#4	–	○
	EGENF		F503#4	–	○
	EGENG		F506#4	–	○
	EGENH		F509#4	–	○
	EIALA	Alarm signals (PMC axis control)	F130#2	○	○
	EIALB		F133#2	○	○
	EIALC		F136#2	–	○
	EIALD		F139#2	–	○
	EIALE		F500#2	–	○
	EIALF		F503#2	–	○
	EIALG		F506#2	–	○
	EIALH		F509#2	–	○
	EID0A to EID31A	Axis control data signals (PMC axis control)	G146 to G149	○	○
	EID0B to EID31B		G158 to G161	○	○
	EID0C to EID31C		G170 to G173	–	○
	EID0D to EID31D		G182 to G185	–	○
	EID0E to EID31E		G468 to G471	–	○
	EID0F to EID31F		G480 to G483	–	○
	EID0G to EID31G		G492 to G495	–	○
	EID0H to EID31H		G504 to G507	–	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	EIF0A to EIF15A	Axis control feedrate signals (PMC axis control)	G144,G145	○	○
	EIF0B to EIF15B		G156,G157	○	○
	EIF0C to EIF15C		G168,G169	–	○
	EIF0D to EIF15D		G180,G181	–	○
	EIF0E to EIF15E		G466,G467	–	○
	EIF0F to EIF15F		G478,G479	–	○
	EIF0G to EIF15G		G490,G491	–	○
	EIF0H to EIF15H		G502,G503	–	○
	EINPA	In–position signals (PMC axis control)	F130#0	○	○
	EINPB		F133#0	○	○
	EINPC		F136#0	–	○
	EINPD		F139#0	–	○
	EINPE		F500#0	–	○
	EINPF		F503#0	–	○
	EINPG		F506#0	–	○
	EINPH		F509#0	–	○
	EKC0 to EKC7	Key code signals	G098	○	○
	EKENB	Key code read completion signal	F053#7	○	○
	EKSET	Key code read signal	G066#7	○	○
	ELCAM1 to ELCAM4	Follow–up axis selection signal	G238#0 to #3	–	○
	ELCKZA	Following zero checking signals (PMC axis control)	G142#1	○	○
	ELCKZB		G154#1	○	○
	ELCKZC		G166#1	–	○
	ELCKZD		G178#1	–	○
	ELCKZE		G464#1	–	○
	ELCKZF		G476#1	–	○
	ELCKZG		G488#1	–	○
	ELCKZH		G500#1	–	○

	Symbol	Signal name	Address	PM i–D	PM i–H
E	EM11A to EM48A	Auxiliary function code signals (PMC axis control)	F132,F142	○	○
	EM11B to EM48B		F135,F145	○	○
	EM11C to EM48C		F138,F148	–	○
	EM11D to EM48D		F141,F151	–	○
	EM11E to EM48E		F502,F496	–	○
	EM11F to EM48F		F505,F497	–	○
	EM11G to EM48G		F508,F498	–	○
	EM11H to EM48H		F511,F499	–	○
	EMBUFA	Buffering disable signals (PMC axis control)	G142#2	○	○
	EMBUFB		G154#2	○	○
	EMBUFC		G166#2	–	○
	EMBUFD		G178#2	–	○
	EMBUFE		G464#2	–	○
	EMBUFF		G476#2	–	○
	EMBUFG		G488#2	–	○
	EMBUFH		G500#2	–	○
	EMFA	Auxiliary function strobe signals (PMC axis control)	F131#0	○	○
	EMFB		F134#0	○	○
	EMFC		F137#0	–	○
	EMFD		F140#0	–	○
	EMFE		F501#0	–	○
	EMFF		F504#0	–	○
	EMFG		F507#0	–	○
	EMFH		F510#0	–	○
	EMSBKA	Block stop disable signals (PMC axis control)	G143#7	○	○
	EMSBKB		G155#7	○	○
	EMSBKC		G167#7	–	○
	EMSBKD		G179#7	–	○
	EMSBKE		G465#7	–	○
	EMSBKF		G477#7	–	○
	EMSBKG		G489#7	–	○
	EMSBKH		G501#7	–	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	ENB	Spindle enable signal	F001#4	○	–
	ENBEX1 to ENBEX8	External device enable signal	G455	–	○
	ENBKY	External key input mode selection signal	G066#1	○	○
	EOTNA	Negative–direction overtravel signals (PMC axis control)	F130#6	○	○
	EOTNB		F133#6	○	○
	EOTNC		F136#6	–	○
	EOTND		F139#6	–	○
	EOTNE		F500#6	–	○
	EOTNF		F503#6	–	○
	EOTNG		F506#6	–	○
	EOTNH		F509#6	–	○
	EOTPA	Positive–direction overtravel signals (PMC axis control)	F130#5	○	○
	EOTPB		F133#5	○	○
	EOTPC		F136#5	–	○
	EOTPD		F139#5	–	○
	EOTPE		F500#5	–	○
	EOTPF		F503#5	–	○
	EOTPG		F506#5	–	○
	EOTPH		F509#5	–	○
	EOV0	Override 0% signal (PMC axis control)	F129#5	○	○
	EPARM	Parameter selection signal	G251#6	○	○
	EPARMM	Slave parameter selection signal	F177#6	○	○
	EPRG	Program selection signal	G251#4	○	○
	EPCON	External pulse input interface select signal	G066#6	○	○
	EPMC	PMC data selection signal	G251#3	○	○
	EPRGM	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	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	ESBKA	Block stop signals (PMC axis control)	G142#3	○	○
	ESBKB		G154#3	○	○
	ESBKC		G166#3	–	○
	ESBKD		G178#3	–	○
	ESBKE		G464#3	–	○
	ESBKF		G476#3	–	○
	ESBKG		G488#3	–	○
	ESBKH		G500#3	–	○
	ESEND	Search completion signal for external data input	F060#1	○	○
	ESKIP	Skip signal (PMC axis control)	X000#3	○	○
			X1000#3	○	○
	ESOFA	Servo off signals (PMC axis control)	G142#4	○	○
	ESOFB		G154#4	○	○
	ESOFC		G166#4	–	○
	ESOFD		G178#4	–	○
	ESOFE		G464#4	–	○
	ESOFF		G476#4	–	○
	ESOFG		G488#4	–	○
	ESOFH		G500#4	–	○
	ESTB	Read signal for external data input	G002#7	○	○
	ESTPA	Axis control temporary stop signals (PMC axis control)	G142#5	○	○
	ESTPB		G154#5	○	○
	ESTPC		G166#5	–	○
	ESTPD		G178#5	–	○
	ESTPE		G464#5	–	○
	ESTPF		G476#5	–	○
	ESTPG		G488#5	–	○
	ESTPH		G500#5	–	○
	ESTPIO	Slave read/write stop signal	F177#2	○	○
	EVAR	Variable selection signal	G251#5	○	○
	EVARM	Slave macro variable selection signal	F177#5	○	○
	EWTIO	Slave external write start signal	F177#3	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
E	EXF1, EXF2 EXF3 EXF4 EXF5	Federate switch signal	X000#0 X000#1 X000#6 X011#4 X011#5	○	○
	EXIO1, EXIO2	Channel selection signal (a specification supporting I/O device external control and memory card)	G248#0 G248#1	○	○
	EXRD	External read start signal	G058#1	○	○
	EXSTP	External read/punch stop signal	G058#2	○	○
	EXWT	External punch start signal	G058#3	○	○
F	FANAL1, FANAL2	Fan alarm signal	F248#5, #6	○	○
	FIN	End signal	G004#3	○	○
	FL00 to FL15	File number specification signal (a specification supporting I/O device external control and memory card)	G249, G250	○	○
G	G08MD	Advanced preview feed forward mode signal	F066#0	○	○
	GR1,GR2	Gear selection signals (input)	G028#1,#2	○	–
	GR1O,GR2O,GR3O	Gear selection signals (output)	F034#0 to #2	○	–
	GST	Gear shift signal	G212#5	○	–
H	HALM1 to HALM8	Motion program alarm signal	F230	–	○
	HALMM1 to HALMM8	Motion program alarm signals (group using each M code) (high–speed response function)	F481	–	○
	HCPL	Compile start signal (high–speed response function)	G226#7	–	○
	HCPLO	Compiling signal (high–speed response function)	F228#7	–	○
	HERS1 to HERS8	Motion program reset signal	G233	–	○
	HERSM1 to HERSM8	Motion program reset signals (group using each M code) (high–speed response function)	G457	–	○
	HEX1 to HEX8	Motion program use signal	F229	–	○
	HEXM1 to HEXM8	Motion program in–use signals (group using each M code) (high–speed response function)	F480	–	○
	HFIN1 to HFIN8	Motion program auxiliary function completion signal (high–speed response function)	G458	–	○
	HMD	High–speed response mode signal	G226#0	–	○
	HMDO	High–speed response mode in–progress signal	F228#0	–	○
	HMF1 to HMF8	Motion program auxiliary function strobe signals (high–speed response function)	G484	–	○
	HOPATH	Handy operator’s panel connecting signal	F208#0	○	○
	HOPEMG	Handy operator’s panel emergency stop state signal	F175#7	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
H	HOPENB	Handy operator's panel deadman switch state signal	F175#6	○	○
	HOPSTP	Handy operator's panel emergency stop button state signal	F175#5	○	○
	HOVC1 to HOVC8	Motion program override cancel signal	G227	–	○
	HPST00 to HPST31	Motion program start signal	G228 to G231	–	○
	HRDY1 to HRDY8	Motion program execution enable signal	F231	–	○
	HRDYM1 to HRDYM8	Motion program executable state signals (group using each M code) (high–speed response function)	F482	–	○
	HROV	1% step rapid traverse override selection signals	G096#7	○	○
	HS1A to HS1D	Manual handle feed axis selection signals	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 interrupt axis selection signals	G041#0 to #3	○	○
	HS2A to HS2D	Manual handle feed axis selection signals	G018#4 to #7	○	○
	HS2IA to HS2ID	Manual handle interrupt axis selection signals	G041#4 to #7	○	○
	HS3A to HS3D	Manual handle feed axis selection signals	G019#0 to #3	–	○
	HS3IA to HS2ID	Manual handle interrupt axis selection signals	G042#0 to #3	–	○
	HSBK1 to HSBK8	Motion program single–block signal	G232	–	○
	HSBKM1 to HSBKM8	Motion program single block signals (group using each M code) (high–speed response function)	G456	–	○
	HSBKO1 to HSBKO8	Motion program single–block stop signal	F232	–	○
I	IGNVRY	All–axis VRDY off alarm ignore signal	G066#0	○	○
	IGVRY1 to IGVRY8	Each–axis VRDY off alarm ignore signal	G192	○	○
	INCMDA	Incremental command externally set orientation signals (serial spindle)	G072#5	○	–
	INCSTA	Incremental orientation mode signals (serial spindle)	F047#1	○	–
	INDXA	Orientation stop position change command signals (serial spindle)	G072#0	○	–
	INHKY	Key input disable signal	F053#0	○	○
	INP1 to INP8	In–position signals	F104	○	○
	INTGA	Speed integral signals (serial spindle)	G071#5	○	–
	IOLACK	I/O Link confirmation signal	G092#0	○	○
	IOLNK	FANUC I/O Link signal	G251#0	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
I	IOLNKM	Slave I/O Link selection signal	F177#0	○	○
	IOLS	I/O Link specification signal	G092#1	○	○
	IPL1 to IPL8	Distributing signals	F221	○	○
	ITPS	FSSB I/O module start signal	F082#0	○	○
K	K0 to K9, KMNS, KPRD, KNO, KSLH, KEOB, KCAN, KALT, KINS, KDLT, KINP, KWRT, KRED, KPOS, KPRGKVAR, KPRM, KALMKDWN, KUP, KP, KQ, KH, KO, KN, KG, KR, KX, KF, KM, KS, KT, KSHRP	Data reference function by PMC	F210 to F218	○	○
	KDEL	Block delete signal	G215#6	–	○
	KENB	Simultaneous input completion signal	F253#7	–	○
	KEXC	Input and deletion start signal	G215#7	–	○
	KEY1 to KEY4	Memory protection signals	G046#3 to #6	○	○
	KEYO	Software operator’s panel signals (KEY1 to KEY4)	F075#6	○	○
	KF	F code simultaneous input signal	G215#0	–	○
	KG00	G00 code simultaneous input signal	G215#2	–	○
	KG01	G01 code simultaneous input signal	G215#3	–	○
	KG04	G04 code simultaneous input signal	G215#4	–	○
	KPAX	Axis address and P code input signal	G215#1	–	○
	KUP	Cursor up signal	G215#5	–	○
L	LDT1A	Load detection signals 1 (serial spindle)	F045#4	○	–
	LDT2A	Load detection signals 2 (serial spindle)	F045#5	○	–
	LED01 to LED09	Handy operator’s panel LED control signal	G204, G205#0	○	○
M	M–OPE	Handy operator’s panel mode	F169#5	○	○
	M00 to M31	Miscellaneous function code signals	F010 to F013	○	○
	M200 to M215	2nd M function code signals	F014 to F015	○	○
	M300 to M315	3rd M function code signals	F016 to F017	○	○
	M400 to M415	4th M function code signals	F018 to F019	–	○
	M500 to M515	5th M function code signals	F020 to F021	–	○
	MA	CNC ready signal	F001#7	○	○
	MAUT	Operation mode check signal	F003#5	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
M	MCFNA	Power line switch completion signals (serial spindle)	G071#3	○	–
	MD1,MD2,MD4	Mode selection signals	G043#0 to #2	○	○
	MD1O	Software operator's panel signal (MD1)	F073#0	○	○
	MD2O	Software operator's panel signal (MD2)	F073#1	○	○
	MD4O	Software operator's panel signal (MD4)	F073#2	○	○
	MDTCH1 to MDTCH8	Controlled axis detach status signals	F110	○	○
	MEAS0 to MEAS7	Measure signals	G244	–	○
	MEDT	Operation mode check signal	F003#6	○	○
	MF	Miscellaneous function strobe signal	F007#0	○	○
	MF2	2nd M function strobe signal	F008#4	○	○
	MF3	3rd M function strobe signal	F008#5	○	○
	MF4	4th M function strobe signal	F008#6	–	○
	MF5	5th M function strobe signal	F008#7	–	○
	MFIN	Miscellaneous function completion signal	G005#0	○	○
	MFIN2	2nd M function completion signal	G004#4	○	○
	MFIN3	3rd M function completion signal	G004#5	○	○
	MFIN4	4th M function completion signal	G004#6	–	○
	MFIN5	5th M function completion signal	G004#7	–	○
	MFNHGA	Spindle switch MAIN MCC contact status signals (serial spindle)	G072#6	○	–
	MI1 to MI8	Mirror image signals	G106	○	○
	MJ	Operation mode check signal	F003#2	○	○
	MLK	All–axis machine lock signal	G044#1	○	○
	MLK1 to MLK8	Axis machine lock signal	G108	○	○
	MLKO	Software operator's panel signal (MLK)	F075#4	○	○
	MMDI	Operation mode check signal	F003#3	○	○
	MMI1 to MMI8	Mirror image check signals	F108	○	○
	MORA1A	Magnetic sensor orientation completion signals (serial spindle)	F046#6	○	–
	MORA2A	Magnetic sensor orientation proximity signals (serial spindle)	F046#7	○	–
	MORCMA	Magnetic sensor orientation command signals (serial spindle)	G073#0	○	–

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
M	MP1, MP2	Manual handle feed amount selection signals (incremental feed signals)	G019#4,#5	○	○
	MP1O	Software operator's panel signal (MP1)	F076#0	○	○
	MP2O	Software operator's panel signal (MP2)	F076#1	○	○
	MPOFA	Motor power cutoff command signals (serial spindle)	G073#2	○	–
	MRDYA	Machine ready signals (serial spindle)	G070#7	○	–
	MRMT	DNC operation selection confirmation signal	F003#4	○	–
		Cam–shape data registration mode check signal	F003#4	–	○
	MSTP	Operation mode check signal	F003#1	○	○
	MTCHIN	Operation mode check signal	F003#7	○	○
	MV1 to MV8	Axis moving signals	F102	○	○
	MVD1 to MVD8	Axis moving direction signals	F106	○	○
	MZRN	Manual reference position return selection check signal	F004#5	○	○
N	NRROA	Shortcut command signals for orientation stop position change (serial spindle)	G072#2	○	–
O	OP	Automatic operation signal	F000#7	○	○
	ORARA	Orientation completion signals (serial spindle)	F045#7	○	–
	ORCMA	Orientation command signals (serial spindle)	G070#6	○	–
	OUT0 to OUT7	Software operator's panel general–purpose switch signals	F072	○	○
	OVC	Override cancel signal	G006#4	○	○
	OVCE	Override cancellation signal (PMC axis control)	G150#5	○	○
	OVRIDA	Analog override signals (serial spindle)	G072#4	○	–
P	PAL0 to PAL6	Alarm number occurrence signals (alarm indicated from the PMC)	G225#0 to #6	○	○
	PALM	Alarm occurrence selection signal (alarm indicated from the PMC)	G225#7	○	○
	PATHO	Path display confirmation signal	F254#7	○	–
	PATHS	Path switch signal	G63#0	○	–
	PC1DEA	Position coder one–rotation signal detection status signals (serial spindle)	F047#0	○	–
	PN0 to PN7	Workpiece number search signals	G009#0 to 7	○	○
	PORA2A	Position coder orientation proximity signal (serial spindle)	F046#5	○	–

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
P	PRGDPL	Program screen display mode signal	F053#1	○	○
	PRTSF	Target part count reached signal	F062#7	○	○
	PSW01 to PSW10	Position switch signals	F070#0 to F071#1	○	○
R	R01I to R12I	Spindle motor speed command input signals	G032#0 to G033#3	○	–
	R01O to R12O	Spindle motor speed command output signals	F036#0 to F037#3	○	–
	RCHA	Power line status check signals (serial spindle)	G071#7	○	–
	RCHHGA	Spindle switch HIGH MCC contact status signals (serial spindle)	G072#7	○	–
	RCHPA	Output switch signals (serial spindle)	F046#2	○	–
	RCFNA	Output switch completion signals (serial spindle)	F046#3	○	–
	RGSPM	Spindle rotation direction signals	F065#1	○	–
	RGSPP	Spindle rotation direction signals	F065#0	○	–
	RGTAP	Rigid tapping signal	G061#0	○	–
	RLSOT	Stroke check release signal	G007#7	○	○
	ROTAA	Rotational direction command signals for orientation stop position change (serial spindle)	G072#1	○	–
	ROV1,ROV2	Rapid traverse override signals	G014#0,#1	○	○
	ROV1E,ROV2E	Rapid traverse override signals (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 busy signal	F053#2	○	○
	RRW	Reset & rewind signal	G008#6	○	○
	RSLA	Output switch request signals (serial spindle)	G071#6	○	–
	RST	Resetting signal	F001#1	○	○
	RT	Manual rapid traverse selection signal	G019#7	○	○
	RTAP	Rigid tapping–in–progress signal	F076#3	○	–
	RTE	Manual rapid traverse selection signal (PMC axis control)	G150#6	○	○
	RTN11 to RTN18	Return signals	G206	○	○
	RTN21 to RTN28		G207	○	–
	RTN31 to RTN38		G208	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
R	RTNT	Rigid tapping retraction start signal	G212#6	○	–
	RTNT	Tapping retraction start signal	G212#6	○	–
	RTO	Software operator's panel signal (RT)	F077#6	○	○
	RTPT	Tapping retraction completion signal	F209#5	○	–
	RTPT	Rigid tapping retraction completion signal	F209#5	○	–
	RWD	Rewinding signal	F000#0	○	○
S	S00 to S31	Spindle–speed function code signals (binary output)	F022 to F025	○	–
	SA	Servo ready signal	F000#6	○	○
	SAR	Spindle speed arrival signal	G029#4	○	–
	SARA	Speed arrival signals (serial spindle)	F045#3	○	–
	SBK	Single block signal	G046#1	○	○
	SBKO	Software operator's panel signal (SBK)	F075#3	○	○
	SDTA	Speed detection signals (serial spindle)	F045#2	○	–
	SF	Spindle function strobe signal	F007#2	○	–
	SF	Spindle–speed function strobe signal	F007#2	○	–
	SFIN	Spindle function completion signal	G005#2	○	–
	SFRA	CW command signals (serial spindle)	G070#5	○	–
	SGN	Spindle motor command polarity command signals	G033#5	○	–
	SHA00 to SHA11	Spindle orientation external stop position command signals (for 1st spindle)	G078#0 to G079#3	○	–
	SIND	Spindle motor speed command selection signal	G033#7	○	–
	SKIP	Skip signals	X000#7	○	○
			X1000#7	○	○
	SKIP2 to SKIP4		X000#0 to #2	○	○
			X1000#0 to #2	○	○
	SKIPP		G006#6	○	○
	SLVA	Subordinate operation mode command signals (serial spindle)	G073#1	○	–
	SLVSA	Subordinate operation status signals (serial spindle)	F046#4	○	–
	SOCNA	Soft start/stop cancel signals (serial spindle)	G071#4	○	–
	SOR	Spindle orientation signal	G029#5	○	–
	SOV0 to SOV7	Spindle speed override signals	G030	○	–
	SPL	Feed hold lamp signal	F000#4	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
S	SPSLA	Spindle selection signals (serial spindle)	G071#2	○	–
	SRLNI0 to SRLNI3	Group number specification signals	G091#0 to #3	○	○
	SRLNO0 to SRLNO3	Group number output signals	F178#0 to #3	○	○
	SRVA	CCW command signals (serial spindle)	G070#4	○	–
	SSIN	Spindle motor command polarity selection signal	G033#6	○	–
	SSTA	Speed zero signals (serial spindle)	F045#1	○	–
	ST	Cycle start signal	G007#2	○	○
	STL	Cycle start lamp signal	F000#5	○	○
	SUP1 to SUP8	Acceleration/deceleration signals	F220	○	○
	SVER1 to SVER8	Servo position deviation monitor signal	F222	○	○
	SVF1 to SVF8	Servo off signals	G126	○	○
	SW1 to SW61	Handy operator’s panel key output signal	F168 to F175	○	○
	SYNC1 to SYNC8	Simple synchronous axis selection signals	G138	○	○
	SYNCJ1 to SYNCJ8	Simple synchronous manual feed axis selection signals	G140	○	○
T	T00 to T31	Tool function code signals	F026 to F029	○	○
	TAP	Tapping signal	F001#5	○	–
	TF	Tool function strobe signal	F007#3	○	○
	TFIN	Tool function completion signal	G005#3	○	○
	TLMA	Torque limit signals (serial spindle)	F045#6	○	–
	TLMHA	Torque limit command HIGH signals (serial spindle)	G070#1	○	–
	TLMLA	Torque limit command LOW signals (serial spindle)	G070#0	○	–
	TMRON	General–purpose integrating meter start signal	G053#0	○	○
	TRQ10 to TRQ87	Torque limit signals	G217 to G224	○	○
	TRQ1E to TRQ8E	Torque limit enable signals	G216	○	○
	TRQM1 to TRQM8	Torque control mode signal (PMC axis control)	F190	○	○
U	UI000 to UI015	Input signals for custom macro	G054,G055	○	○
	UINT	Interrupt signal for custom macro	G053#3	○	○
	UO000 to UO015	Output signals for custom macro	F054,F055	○	○
	UO100 to UO131		F056 to F059	○	○
W	WAT1 to WAT4	Wait signal	F209#0, #3	○	○
	WFN1 to WFN4	Wait completion signal	G214#0 to #3	○	○
	WVRDY	V–READY waiting signal	F209#4	○	○

	Symbol	Signal name	Address	PM *i*–D	PM *i*–H
Z	ZP1 to ZP8	Reference position return end signal	F094	○	○
	ZP21 to ZP28	2nd reference position return completion signals	F096	○	○
	ZP31 to ZP38	3rd reference position return completion signals	F098	○	○
	ZPEXT1 to ZPEXT8	Signal for reference position external setting	G211	○	○
	ZR1 to ZR8	Reference position without dogs setting signal	G210	○	○
	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	○	○

5 DIGITAL SERVO

This chapter describes servo tuning screen required for maintenance of digital servo and adjustment of reference position.

5.1 INITIAL SETTING SERVO PARAMETERS

This section describes how to set initial servo parameters, which is used for field adjustment of machine.

Servo tuning screen and FSSB setting screen can not be displayed with DPL/MDI or DPL/MDI operation package.

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

SVS 0 : Servo tuning screen is not displayed.
1 : Servo tuning screen is displayed.

3. Turn off the power once then turn it on again.
4. Display the servo parameter setting screen by the following operation: SYSTEM key ▷ [SV.PARA].
5. Input data required for initial setting using the cursor and page key.

```
SERVO SETTING
                          X AXIS    Y AXIS
(1)INITIAL SET BIT      00000000  00000000    <= PRM 2000
(2)MOTOR ID NO.               47        47    <= PRM 2020
(3)amr                  00000000  00000000    <= PRM 2001
(4)cmr                         2         2    <= PRM 1820
(5)FEED GEAR N                 1         1    <= PRM 2084
(6)        (N/M)  M          125       125    <= PRM 2085
(7)DIRECTION SET             111       111    <= PRM 2022
(8)VELOCITY PULSE NO.       8192      8192    <= PRM 2023
(9)POSITION PULSE NO.      12500     12500    <= PRM 2024
(10)REF.COUNTER             8000      8000    <= PRM 1821
```

(1) Initial set bit

	#7	#6	#5	#4	#3	#2	#1	#0
2000					PRMCAL		DGPRM	PLC01

PRMCAL 1 : Turns to 1 when the initial setting is done.
The following parameters are set automatically in accordance with the no. of pulses of pulse coder:
PRM 2043(PK1V), PRM 2044(PK2V), PRM 2047(POA1),
PRM 2053(PPMAX),PRM 2054(PDDP),
PRM 2056(EMFCMP),
PRM 2057(PVPA), PRM 2059(EMFBAS),
PRM 2074(AALPH),PRM 2076(WKAC)

DGPRM☆ 0 : Initial setting of digital servo parameter is done.
1 : Initial setting of digital servo parameter is not done.

PLC01 0 : Values of parameter 2023 and 2024 are used as they are:
1 : Values of parameter 2023 and 2024 are multiplied by 10.

(2) Motor number

For α series servo motor

Model name	α 1/3000	α 2/2000	α 2.5/3000	α 3/3000
Drawing number	0371	0372	0374	0123
Format number	61	46	84	15

Model name	α 6/2000	α 6/3000	α 12/2000	α 12/3000	α 22/1500
Drawing number	0127	0128	0142	0143	0146
Format number	16	17	18	19	27

Model name	α 22/2000	α 22/3000	α 30/1200	α 30/2000	α 30/3000
Drawing number	0147	0148	0151	0152	0153
Format number	20	21	28	22	23

Model name	α 40/FAN	α 40/2000	α 65	α 100	α 150
Drawing number	0158	0157	0331	0332	0333
Format number	29	30	39	40	41

For α L series servo motor

Model name	α L3/3000	α L6/2000	α L9/3000	α L25/3000	α L50/2000
Drawing number	0561	0562	0564	0571	0572
Format number	56 or 68	57 or 69	58 or 70	59	60

For α C series servo motor

Model name	α C3/2000	α C6/2000	α C12/2000	α C22/1500
Drawing number	0121	0126	0141	0145
Format number	7	8	9	10

For α HV series servo motor

Model name	α 12HV	α 22HV	α 30HV
Drawing number	0176	0177	0178
Format number	3	4	5

For β series servo motor

Model name	β 0.5	β 1/3000	β 2/3000	β 3/3000	β 6/2000
Drawing number	0113	0101	0102	0105	0106
Format number	13	35	36	33	34

For α M series servo motor

Model name	α M2/3000	α M2.5/3000	α M3/3000	α M6/3000	α M9/3000
Drawing number	0376	0377	0161	0162	0163
Format number	97	98	24	25	26

Model name	α M22/3000	α M30/3000	α M50/3000
Drawing number	0165	0166	0169
Format number	100	101	108

Model name	α M6HV	α M9HV	α M22HV	α M30HV
Drawing number	0182	0183	0185	0186
Format number	104	105	106	107

For linear motor

Model name	1500A	3000B	6000B	9000B
Drawing number	0410	0411	0412	0413
Format number	90	91	92	93

(3) CMR

1820	Command multiply ratio

1) When CMR is 1/2 to 1/27 $\text{Set value} = \dfrac{1}{\text{CMR}} + 100$

2) When CMR is 1 to 48 $\text{Set value} = 2 \times \text{CMR}$

(4) Turn off the power then back on.

(5) Feed gear n/m

2084	n for flexible feed gear
2085	m for flexible feed gear

1) For serial pulse coder A or B, and serial α pulse coder.

$$\frac{n}{m} = \frac{\text{Number of feedback pulses per revolution of motor}}{1000000}$$

NOTE
For serial pulse coder B, use a value not exceeding 250,000 as the number of feedback pulses per revolution.

<<Examples of calculation>>

		1/1000 mm	**1/10000 mm**
One revolution of motor	8mm	n=1/m=125	n=2/m=25
	10mm	n=1/m=100	n=1/m=10
	12mm	n=3/m=250	n=3/m=25

(6) Direction of travel

2022	Rotational direction of motor

111 : Normal (clockwise) –111 : Reverse (counterclockwise)

(7) Number of velocity pulses and position pulses

1) For serial pulse coder A or B, or serial α pulse coder

	Paramter No.	Increment system : 1/1000mm		Increment system : 1/10000mm	
		Closed loop	Semi–closed loop	Closed loop	Semi–closed loop
High resolution setting	2000	xxxx xxx 0		xxxx xxx 1	
Separate detector	1815	0010 0010	0010 0000	0010 0010	0010 0000
No. of velocity feedback pulses	2023	8192		819	
No. of position feedback pulses	2024	NS	12500	NS/10	1250

NOTE

1 NS is the number of position feedback pulses per one revolution of the motor (multiplied by four)

2 Even if the system employs a closed loop, bit 3 of parameter 2002 is 1 and bit 4 is 0.

(8) Reference counter

1821	Reference counter capacity for each axis (0 – 99999999)

Turn off the power then back on.

(9) FSSB display and setting screen

Connecting the control unit to servo amplifiers via a high–speed serial bus (FANUC Serial Servo Bus, or FSSB), which uses only one fiber optics cable, can significantly reduce the amount of cabling in machine tool electrical sections.

Axis settings are calculated automatically according to the interrelationships between axes and amplifiers entered on the FSSB setting screen. Parameter Nos. 1023, 1905, 1910 to 1919, 1936, and 1937 are specified automatically according to the results of the calculation.

- **Display**

The FSSB setting screen displays FSSB–based amplifier and axis information. This information can also be specified by the operator. (This function cannot be used with the two–path control function of the Power Mate *i*–D.)

1. Press function key SYSTEM .
2. To display [FSSB], press continuous menu key ▷ several times.
3. Pressing soft key [FSSB] causes the AMP SET screen (or the previously selected FSSB setting screen) to appear, with the following soft keys displayed.

[AMP] [AXIS] [MAINTE] [ ] [(OPRT)]

The FSSB setting screens include: AMP SET, AXIS SET, and AMP MAINTENANCE.

Pressing soft key **[AMP]** causes the AMP SET screen to appear.
Pressing soft key **[AXIS]** causes the AXIS SET screen to appear.
Pressing soft key **[MAINTE]** causes the AMP MAINTENANCE screen to appear.

1) Amplifier setting screen
   The amplifier setting screen consists of two sections: the first section displays information about the slave, while the second section displays information about the pulse modules.

```
AMPLIFIER SETTING                    O1000 N00001
  NO.  AMP     SERIES  UNIT    CUR.   AXIS NAME
    1  A1-L      α    SVM-HV  40AL    1     X
    2  A1-M      α       SVM   12A    2     Y
    3  A2-L      β       SVM   40A    3     Z
    4  A3-L      α       SVM   20A    4     A
    5  A3-M      α       SVM   40A    5     B
    7  A4-L      α       SVU  240A    6     C


  NO.  EXTRA   TYPE   PCB ID
    6    M1      A    0000 DETECTOR(8AXES)
    8    M2      B    12AB
>_
MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][      ][(OPRT)]
```

The amplifier setting screen consists of the following items:

- NO. (slave number)
  Up to 10 slave numbers assigned to FSSB–connected slaves are displayed sequentially starting at the one that is nearest to the Power Mate *i* with respect to the sequence of cable connection (up to 8 for amplifiers and up to 2 for pulse modules).
- 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 Power Mate *i*, and a letter such as L (first axis) or M (second axis) indicating the placing of the axis in the amplifier.
- AXIS NO. (controlled axis number)
  The axis number of each controlled axis specified in parameters (Nos. 1920 to 1929) is displayed. If a number specified in these parameters falls outside the range of between 1 and the maximum number of controlled axes, 0 is displayed.
- NAME (controlled axis name)
  The axis name assigned to a parameter No. 1020 corresponding to a particular controlled axis number is displayed. If the controlled axis number is 0, – is displayed.
- The following items are displayed as amplifier information:
  · UNIT (servo amplifier unit type)
  · SERIES (servo amplifier series)
  · CURRENT (maximum rating)

- The following items are displayed as pulse module information:
  - · SEPARATE

    This display consists of the letter M, which stands for “pulse module” and a number indicating the placing of the pulse module, as counted from that nearest to the CNC.
  - · TYPE

    This display is a letter indicating the type of the pulse module.
  - · PCB ID

    This display consists of four digits indicating the pulse module ID (hexadecimal). The pulse module ID is followed by DETECTOR (8 AXES) for the eight–axis separate detector module or DETECTOR (4 AXES) for the four–axis separate detector module.

2) Axis setting screen

   The axis setting screen displays the information shown below:

```
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
[  AMP  ][  AXIS  ][ MAINTE ][      ][(OPRT)]
```

This axis setting screen displays the following items:

- AXIS NO. (controlled axis number)

  This item is the placing of the Power Mate *i* controlled axis.
- NAME (controlled axis name)
- AMP (type of the amplifier connected to each axis)
- M1 (connector number for pulse module 1)

  This item is the number of the connector for pulse module 1, specified in parameter No. 1931.
- M2 (connector number for pulse module 2)

  This item is the number of the connector for pulse module 2, specified in parameter No. 1932.
- TWO AXES

  This item is the value specified in bit 0 (1 DSP) of parameter No. 1904. It is 1 for an axis that exclusively uses a DSP, which is usually shared by two axes.
- TANDEM

  This item is the number specified in parameter No. 1934. Consecutive odd and even numbers are displayed for the master and slave axes for tandem control.

3) Amplifier maintenance screen

The amplifier maintenance screen displays maintenance information for servo amplifiers. This screen consists of the following two pages, either of which can be selected by pressing the ↑ or ↓ key.

```
AMPLIFIER MAINTENANCE              O1000 N00001
  AXIS   NAME AMP    SERIES    UNIT   AXES   CUR.
    1      X  A1-L      α     SVM-HV    2    40AL
    2      Y  A1-M      α        SVM    2     12A
    3      Z  A2-L      β        SVM    1     40A
    4      A  A3-L      α        SVM    2     20A
    5      B  A3-M      α        SVM    2     40A
    6      C  A4-L      α        SVU    1    240A

MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][      ][      ]
```

```
AMPLIFIER MAINTENANCE            O1000 N00001
  AXIS     NAME  EDITION    TEST   MAINTE-NO.
    1       X       01A     970123        01
    2       Y       01A     970123        01
    3       Z       01A     970123        01
    4       A       02B     970123        01
    5       B       02B     970123        01
    6       C       02B     970123        01

MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINTE ][      ][      ]
```

The amplifier maintenance screen displays the following items:

- AXIS NO. (controlled axis number)
- NAME (controlled axis name)
- AMP (type of amplifier connected to each axis)
- SERIES (servo amplifier series of an amplifier connected to each axis)
- UNIT (unit type of a servo amplifier connected to each axis)
- NO. OF AXES (maximum number of axes controlled by an amplifier connected to each axis)
- CURRENT (maximum rating for amplifiers connected to each axis)
- VERSION (unit version number of an amplifier connected to each axis)
- TEST DATE (date of test performed on an amplifier connected to each axis)

  Example) 970123 = January 23, 1997

- MAINTENANCE NO. (engineering change number for an amplifier connected to each axis)

- **Setting**

On an FSSB setting screen (other than the amplifier maintenance screen), pressing soft key [(OPRT)] displays the following soft keys:

[SET][ ][READ][ ][INPUT]

To enter data, place the machine in MDI mode or the emergency stop state, position the cursor to the point where a desired item is to be input, then enter the desired data and press soft key **[INPUT]** (or the INPUT key on the MDI panel).
When soft key **[SET]** is pressed after data has been entered, a warning message is displayed if the entered data contains an error. When the data is satisfactory, the corresponding parameter is set up.
To restore the previous value of a parameter if, for example, an entered value is incorrect, press soft key **[READ]**.
When the power is turned on, values are read from the parameters and displayed on the screen.

NOTE

1 For the parameters to be specified on the FSSB setting screen, do not attempt to enter values on the parameter screen using the MDI or a G10 command. Use only the FSSB screen to enter values for these parameters.
2 If pressing soft key **[SET]** results in a warning message being displayed, retry data entry, or press soft key **[READ]** to clear the warning message. Note that pressing the reset key does not clear the warning message.
3 This function cannot used with the two–path control function of the Power Mate *i*–D.

1) Amplifier setting screen

```
AMPLIFIER SETTING                       O1000 N00001
  NO.  AMP     SERIES  UNIT    CUR.   AXIS NAME
   1   A1-L      α     SVM-HV  40AL    1     X
   2   A1-M      α        SVM   12A    2     Y
   3   A2-L      β        SVM   40A    3     Z
   4   A3-L      α        SVM   20A    4     A
   5   A3-M      α        SVM   40A    5     B
   7   A4-L      α        SVU  240A    6     C


  NO.  EXTRA   TYPE    PCB ID
   6    M1      A      0000 DETECTOR(8AXES)
   8    M2      B      12AB
>_
MDI **** *** ***        13:11:56
[SETTING][       ][ READ ][       ][ INPUT ]
```

The amplifier setting screen displays the following items:

- AXIS NO. (controlled axis number)

  For this item, enter a value of between 1 and the maximum number of controlled axes. If a number that falls outside this range is entered, the warning message **“INVALID FORMAT”** appears. If the entered controlled axis number is duplicate or 0, the warning message **“SPECIFIED DATA IS OUT OF RANGE”** appears when soft key **[SET]** is pressed to assert the entered value. In this case, no value can be entered for the parameter.

2) Axis setting screen

```
AXIS SETTING                          O1000 N00001
  AXIS   NAME AMP      M1  M2    1-DSF  Cs    TNDM
    1       X  A1-L     0   0      0      0      1
    2       Y  A1-M     1   0      1      0      0
    3       Z  A2-L     0   0      0      1      0
    4       A  A3-L     0   0      0      0      2
    5       B  A3-M     0   0      0      0      0
    6       C  A4-L     0   0      0      0      0







>_
MDI **** *** ***         13:11:56
[SETTING][       ][ READ ][       ][ INPUT ]
```

On the axis setting screen, the following items can be specified:

- M1 (connector number for pulse module 1)

  For an axis that uses pulse module 1, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 1. When pulse module 1 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message **“INVALID FORMAT”** is displayed.

- M2 (connector number for pulse module 2)

  For an axis that uses pulse module 2, enter a connector number using a number in the range of between 1 and the maximum number of axes for pulse module 2. When pulse module 2 need not be used, enter 0. If a number that falls outside the valid range is entered, the warning message **“INVALID FORMAT”** is displayed.

- TWO AXES

  Enter 1, 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.

- TANDEM

  Enter odd and even numbers for the master and slave axes for tandem control. These numbers must be consecutive and in the range of between 1 and 8. If a number that falls outside the valid range is entered, the warning message **“INVALID FORMAT”** is displayed.

When soft key **[SET]** is pressed on the axis setting screen after data entry, the warning message **“SPECIFIED DATA IS OUT OF RANGE”** is displayed if any of the following conditions is satisfied.

- Both M1 and M2 are nonzero for an axis.
- Any two of TWO AXES, 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 TANDEM.
- An invalid master/slave axis pair is specified for TANDEM.

5.2 SERVO TUNING SCREEN

5.2.1 Parameter Setting

Set a parameter to display the servo tuning screen.

	#7	#6	#5	#4	#3	#2	#1	#0
3111								SVS

SVS 0 : Servo tuning screen is not displayed.
1 : Servo tuning screen is displayed.

Servo tuning screen can not be displayed with DPL/MDI or DPL/MDI operation package.

5.2.2 Displaying Servo Tuning Screen

1. Press SYSTEM key ▷ and soft key **[SV. PARA]** in this order.
2. Press soft key **[SV.TUN]** to select the servo tuning screen.

```
     SERVO TUNING                                01234 N12345
      (PAMAMETER)                                 (MONITOR)
(1)  FUN.BIT          00000000      ALARM 1     00000000     (9)
(2)  LOOP GAIN            3000      ALARM 2     00000000     (10)
(3)  TURNING SET.            0      ALARM 3     10000000     (11)
(4)  SET PERIOD             50      ALARM 4     00000000     (12)
(5)  INT.GAIN              113      ALARM 5     00000000     (13)
(6)  PROP.GAIN           -1015      LOOP GAIN       2999     (14)
(7)  FILER                   0      POS ERROR        556     (15)
(8)  VELOC.GAIN            125      CURRENT%          10     (16)
                                    SPEED RPM        100     (17)

     [ SV SET ][ SV TUN ][        ][        ][  OPE  ]
```

(1) Function bit : Parameter 2003
(2) Loop gain : Parameter 1825
(3) Tuning start : (Used by automatic servo tuning function)
(4) Set period : (Used by automatic servo tuning function)
(5) Integral gain : Parameter 2043
(6) Proportional gain : Parameter 2044
(7) Filter : Parameter 2067
(8) Velocity gain $\text{Set value} = \frac{(\text{Parameter 2021})+256}{256} \times 100$
(9) Alarm 1 : DGN 200 (Details of alarm 400 and 414)
(10) Alarm 2 : DGN 201 (Details of disconnection alarm, overload)
(11) Alarm 3 : DGN 202 (Details of alarm 319)
(12) Alarm 4 : DGN 203 (Details of alarm 319)
(13) Alarm 5 : DGN 204 (Details of alarm 414)
(14) Loop gain : Actual loop gain
(15) Position error : Actual position error(DGN 300)
(16) Current(%) : Indicate current with % to the rated value.
(17) Speed RPM : Number of motor actual rotation

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm1	OVL	LV	OVC	HCA	HVA	DCA	FBA	OFA

DGN No. 200 :

OVL : Overload alarm

LV : Insufficient voltage alarm

OVC : Overcurrent alarm

HCA : Abnormal current alarm

HVA : Excessive voltage alarm

DCA : Regenerative discharge registance alarm

FBA : Disconnection alarm

OFA : Overflow alarm

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm2	ALD			EXP				

DGN No. 201 ⇓
ALD EXP

Overload alarm	0	—	—	—	Amplifier overheat
	1	—	—	—	Motor overheat
Disconnection alarm	1	—	—	0	Built–in pulse coder disconnection (Hardware)
	1	—	—	1	Separate type pulse coder disconnection (Hardware)
	0	—	—	0	Pulse coder disconnection (software)

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm3		CSA	BLA	PHA	RCA	BZA	CKA	SPH

DGN No. 202 :

CSA : Hardware of serial pulse coder is abnormal.

BLA : Battery voltage is in low (warning).

PHA : Serial pulse coder or feedback cable is abnormal.
Counting the feedback signal is in error.

RCA : Serial pulse coder is faulty.
Counting is in error.
If the RCA bit is set to 1 when both the FBA bit (bit 1 of alarm 1) and ALD bit of alarm 2 are set to 1 and the EXP bit of alarm 2 (internal hardware disconnection) is set to 1, a count miss alarm (CMAL) occurs in the α pulse coder.

BZA : Battery voltage becomes 0.
Replace batteries and set the reference position.

CKA : Serial pulse coder is faulty.
Internal block has stopped.

SPH : Serial pulse coder or feedback cable is faulty.
Counting the feedback signal is in error.

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm4	DTE	CRC	STB	PRM				

DGN No. 203 :

DTE : Communication error of serial pulse coder.
There is no response.

CRC : Communication error of serial pulse coder.
Transmitted data is in error.

STB : Communication error of serial pulse coder.
Transmitted data is in error.

PRM : A parameter detected on the digital servo side is invalid.

	#7	#6	#5	#4	#3	#2	#1	#0
Alarm3		OFS	MCC	LDM	PMS			

DGN No. 204 :

OFS : A/D conversion of current value of digital servo is abnormal.

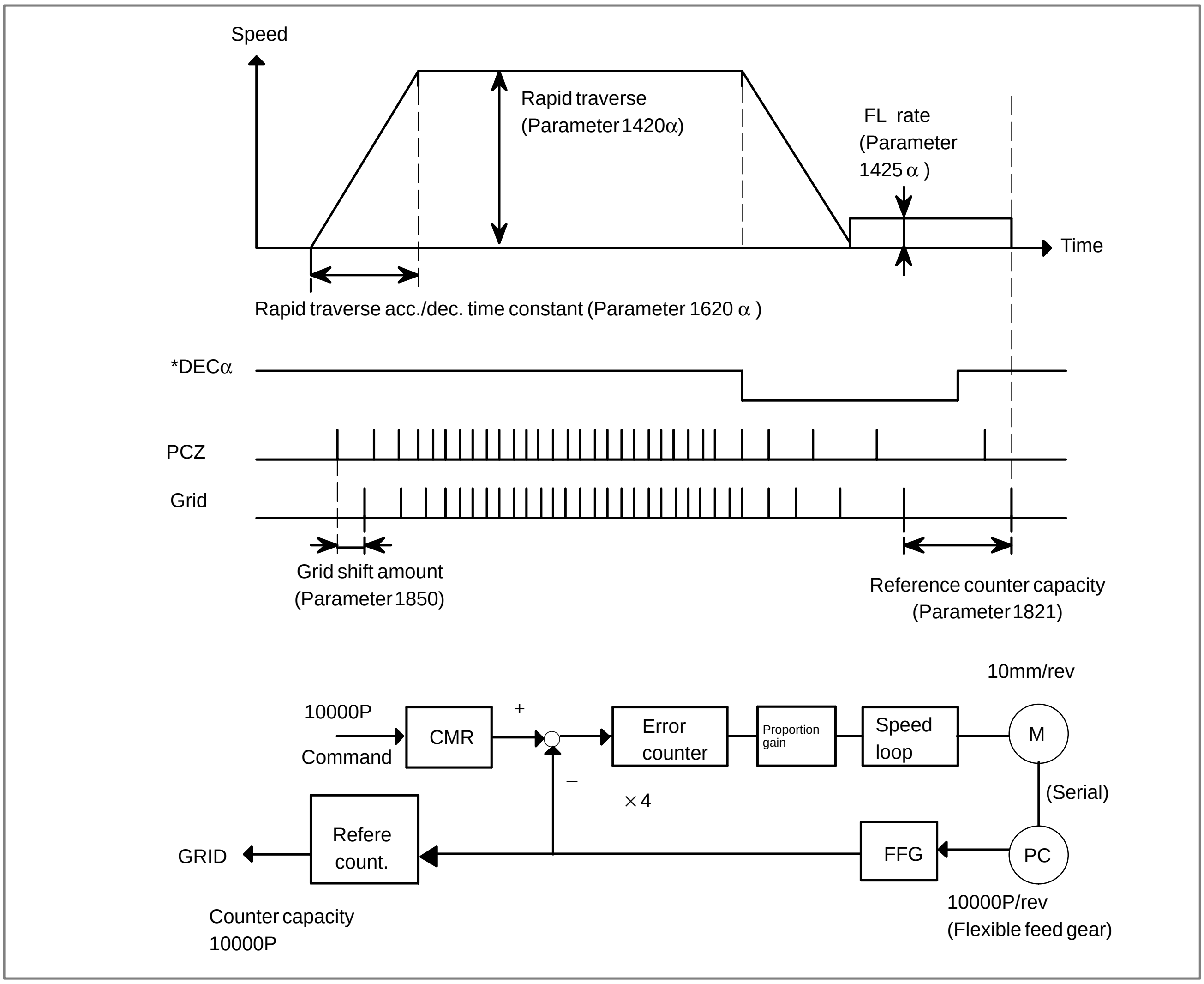
MCC : Contacts of electro–magnetic contactor of servo amplifier is blown

LDM : LED of serial pulse coder is abnormal.

PMS : No. of feedback pulses are in error because serial pulse coder or feedback cable is faulty.

5.3 ADJUSTING REFERENCE POSITION (DOG METHOD)

5.3.1 General



- **Parameter**

	#7	#6	#5	#4	#3	#2	#1	#0
1002							DLZ	

DLZ☆ 0 : Reference position return method is normal (dog).
1 : Dogless reference position setting is used.
Parameter 1005 can be used to set individual axes.

1821	Reference counter capacity [P]

No. of feedback pulses or its division by an integer is set.

1850	Grid shift amount per axis [P]

When the resolution is 0.0001mm, set the value in the unit ten times the detection unit.

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC	APZ			OPT	

APC 0 : Position detector is other than absolute pulse coder.
1 : Position detector is absolute pulse coder.

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.

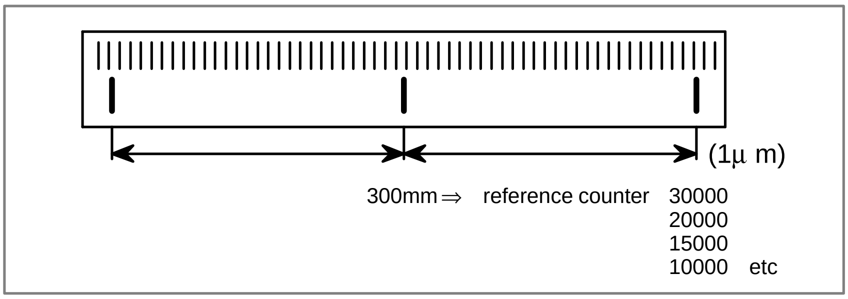
OPT 0 : Position detection is performed by the pulse coder built in the motor.
1 : Separate type pulse coder or linear scale is used.

- **Separate Type Pulse Coder or Linear Scale is Used**

1821	Reference counter capacity per axis [P]

Normally, the number of feedback pulses per motor revolution is set to the reference counter capacity.
When plural reference marks are on a linear scale, a quotient of the distance between the reference marks divided by an interfer may be used as a reference counter capacity:

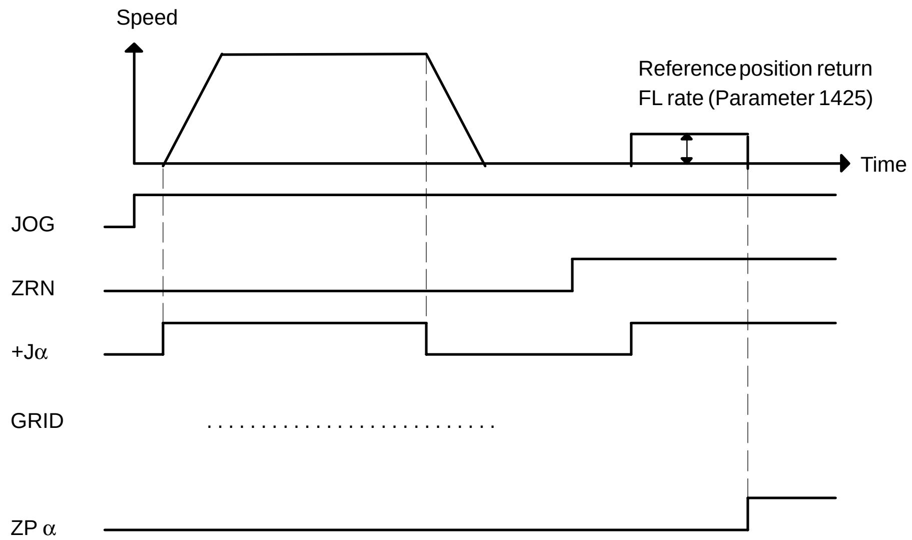
Example)



5.4 DOGLESS REFERENCE POSITION SETTING

When there are no dog nor limit switch for reference position return, this function enables the tool to return the reference position that is set by MTB.
When the absolute position detector is used, the reference position once set remains also during power off. When the absolute detector is replaced or absolute position is lost, perform this setting.

5.4.1 General



5.4.2 Operation

1 Move the tool near the reference position using a manual operation.

2 Select the reference position return mode.

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 (SRN signal is 1) and turn on an axis–and–direction–select signal, then the tool returns to the reference position.

5.4.3 Associated Parameters

	#7	#6	#5	#4	#3	#2	#1	#0
1002							DLZ	

DLZ 0 : Dog is used for reference position return
☆ 1 : Dogless reference position setting

Parameter 1005 can be used to set individual axes.

	#7	#6	#5	#4	#3	#2	#1	#0
1006			ZMI					

ZMI 0 : Reference position return and backlash initial direction is +.
1 : Reference position return and backlash initial direction is –.

After ZRN signal becomes 1, manual feed direction is always the direction set by this parameter irrespective of an axis selection signal.

6 AC SPINDLE (SERIAL INTERFACE)

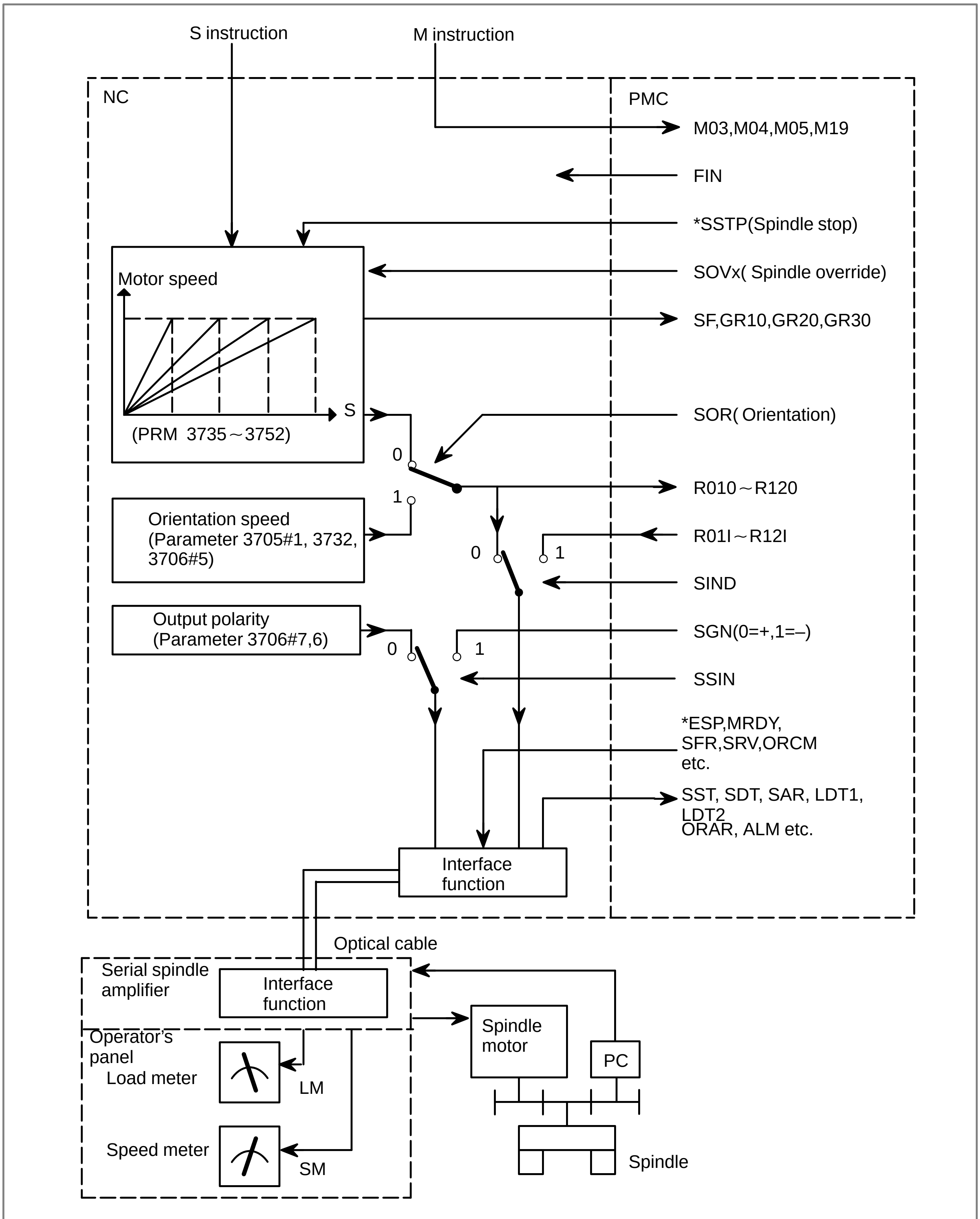
This chapter outlines the serial interface and analog interface spindle amplifiers and explains related parameters.

NOTE
Spindles can be used only with the Power Mate *i*–D.

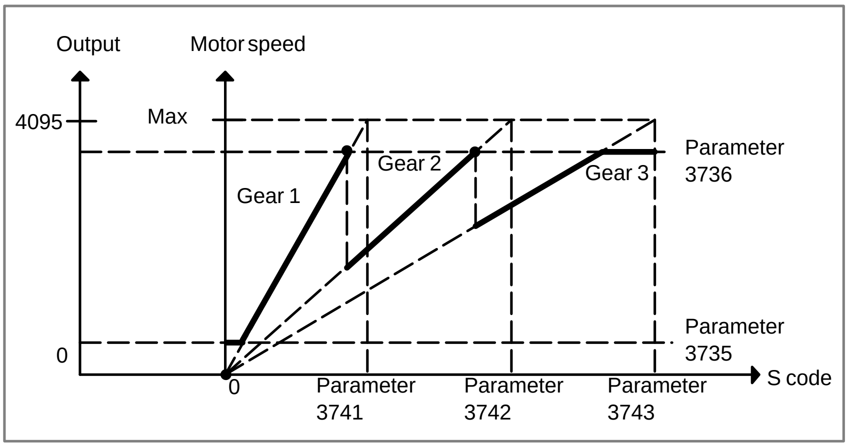
6.1 AC SPINDLE (SERIAL INTERFACE)

6.1.1 Outline of Spindle Control

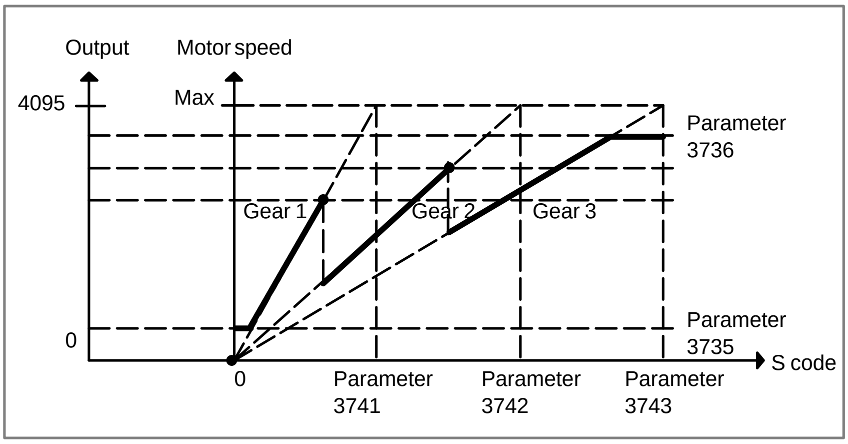
An additional option is necessary for the serial interface.



6.1.1.1 Method A of gear change (parameter 3705#2=0)



6.1.1.2 Method B of gear change (parameter 3705#2=1)



6.1.2 Spindle Setting and Tuning Screen

6.1.2.1 Display method

(1) Confirm the parameters

	#7	#6	#5	#4	#3	#2	#1	#0
3111							SPS	

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

Spindle setting screen, spindle tuning screen, and spindle monitor screen can not be displayed with DPL/MDI or DPL/MDI operation package.

6.1.2.2 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
```

- **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

- **Parameters**

Gear ratio (HIGH)	4056
Gear ratio (MIDIUM HIGH)	4057
Gear ratio (MIDIUM LOW)	4058
Gear ratio (LOW)	4059
Max. spindle speed (gear1)	3741
Max. spindle speed (gear2)	3742
Max. spindle speed (gear3)	3743
Max. spindle speed (gear4)	3744
Max. motor speed	4020

6.1.2.3 Spindle tuning screen

```
SPINDLE TUNING

OPERATION           : NORMAL OPERATION
GEAR SELECT         : 1
SPINDLE             : S11
(PARAMETER)                     (MONITOR)
PROP.GAIN                20     MOTOR SPEED    100
INT.GAIN                 50     SPINDLE SPEED  150
LOOP GAIN              3000
MOTOR VOLT               30
REGENERATIVE POWER  :   100
```

• Operation mode

1 : Normal operation
2 : Orientation
3 : Rigid tapping

• Displayed parameters

The displayed parameters vary depending on the operation mode.

Normal operation	Synchronization control	Spindle positioning control
Proportional gain Integral gain Motor voltage Regenerative power	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

Note) For the parameter numbers corresponding to the displayed parameter items, see Section 6.1.2.5.

• Displayed monitoring items

The displayed monitoring items vary depending on the operation mode.

Normal operation	Synchronization control	Spindle positioning control
Motor speed Spindle speed	Motor speed Spindle speed Position deviation S1 Position deviation S2 Synchronous deviation	Motor speed Feedrate Position deviation S1

Note 1)

$$\text{Motor speed [rpm]} = \frac{|\text{Spindle data}|}{16383} \times \text{Max. Motor speed.(* 1)}$$

(*1) Parameter 4020: Main spindleParameter 4196: Subspindle

6.1.2.4 Spindle monitor screen

```
SPINDLE MONITOR SCREEN
 ALARM         : AL-27(POSITION CODER DIS.)
 OPERATION     : NORMAL OPERATION
 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: Fuse blow of AC inputline
5: Fuse blow of DC voltage
7: Excessive speed
9: Heat sink overheat
10: Low voltage of AC input
11: Excess voltage in DC link
12: Excess current in DC link
13: CPU internal data memory error
18: ROM SUM check error
19: U phase current offset excessive
20: V phase current offset excessive
24: Serial data transmission abnormal
25: Serial data transmission stop
27: Position coder signal disconnection
29: Short time overload
30: Input circuit excess current
31: Speed detecting signal disconnection
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
41: Erroneous detection of the position coder one revolution signal
42: Undetection of the position coder one revolution signal
46: Erroneous detection of the position coder one revolution signal on threading
47: Abnormal position coder signal
48: Erroneous detection of position coder one revolution signal

- **Operation**

Following 5 modes are available:

a. Normal operation
b. Orientation
c. Rigid tapping

- **Load meter**

The load meter displays spindle load in a unit of 10%.

$$1)\ \text{Load meter[\%]} = \frac{\text{Load meter data}}{3276} \times \text{Max.output value of load meter (*)}$$

(*) PRM 4127: Main
PRM 4274: Sub.

- **Control input signal**

Max.10 signals those are ON are displayed from the following signals:

TLML	: Torque limit command (low)	SPSL	: Spindle selection signal
TLMH	: Torque limit command (high)	MCFN	: Power line switching
CTH1	: Gear signal 1	SOCN	: Soft start/stop cancel
CTH2	: Gear signal 2	RSL	: Output switching request
SRV	: Spindle reverse rotation	RCH	: Power line state confirm
SFR	: Spindle forward rotation	INDX	: Orientation stop pos. change
ORCM	: Spindleorientation	ROTA	: Rotation direction of ORCM
MEDY	: Machine ready	NRRO	: Shor–cut of ORCM
ARST	: Alarm reset signal	INTG	: Speed integral control signal
*ESP	: Emergency stop	DEFM	: Referencial mode command

- **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

6.1.2.5 Correspondence between operation mode and parameters on spindle tuning screen

- **Normal operation mode**

Proportional gain(HIGH)	4040
Proportional gain (LOW)	4041
Integral gain(HIGH)	4048
Integral gain(LOW)	4049
Motor voltage	4083
Regenerative power	4080

- **Orientation mode**

Proportional gain(HIGH)	4042
Proportional gain (LOW)	4043
Integral gain(HIGH)	4050
Integral gain(LOW)	4051
Loop gain (HIGH)	4060
Loop gain (MID, HIGH)	4061
Loop gain (MID, LOW)	4062
Loop gain (LOW)	4063
Motor voltage	4084
Gain change upon completion of orientation	4064
Stop position shift	4077
PC–type orientation stop position	4031

- **Rigid tapping mode**

Numerals are parameter numbers :

Proportional gain(HIGH)	4044
Proportional gain(LOW)	4045
Integral gain(HIGH)	4052
Integral gain(LOW)	4053
Position loop gain(HIGH)	4065
Position loop gain(MID,HIGH)	4066
Position loop gain(MID,LOW)	4067
Position loop gain(LOW)	4068
Motor voltage	4085
ZRN gain %	4091
Grid shift amount	4073

6.1.3 Automatic Setting of Standard Parameters

The standard parameters related to each motor model can be set automatically.

- The specifications for controlling a motor depend on the specifications defined by the machine tool builder. The parameters defined by the machine tool builder are set as the standard values (initial values) by this automatic setting function.

  Therefore, when performing automatic operation, always set parameters properly according to the parameter list (parameters 4000 and later).

1. Turn on the power in the emergency stop state.
2. Set bit 7 of parameter 4019 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
4019	LDSP							

LDSP The parameters for the serial interface spindle are:

0 : Not set automatically.
☆ 1 : Set automatically.

3. Set a motor model code.

4133	Motor model code

Code	Motor mode	Amplifier
100	β 0.5 (3000/8000min^{-1})	SPM–2.2
101	α 1 (3000/8000min^{-1})	SPM–2.2
102	α 1.5 (1500/8000min^{-1})	SPM–5.5
103	α 2 (1500/8000min^{-1})	SPM–5.5
104	α 2/1500 (3000/1500min^{-1})	SPM–5.5
105	α 3 (1500/8000min^{-1})	SPM–5.5
106	α 6 (1500/8000min^{-1})	SPM–11
107	α 8 (1500/6000min^{-1})	SPM–11
108	α 12 (1500/6000min^{-1})	SPM–15
109	α 15 (1500/6000min^{-1})	SPM–22
110	α 18 (1500/6000min^{-1})	SPM–22
111	α 22 (1500/6000min^{-1})	SPM–26
112	α P8 (750/6000min^{-1})	SPM–11
113	α P12 (750/6000min^{-1})	SPM–11
114	α P15 (750/6000min^{-1})	SPM–15
115	α P18 (750/6000min^{-1})	SPM–15
116	α P22 (750/6000min^{-1})	SPM–22
117	α P30 (575/4500min^{-1})	SPM–22

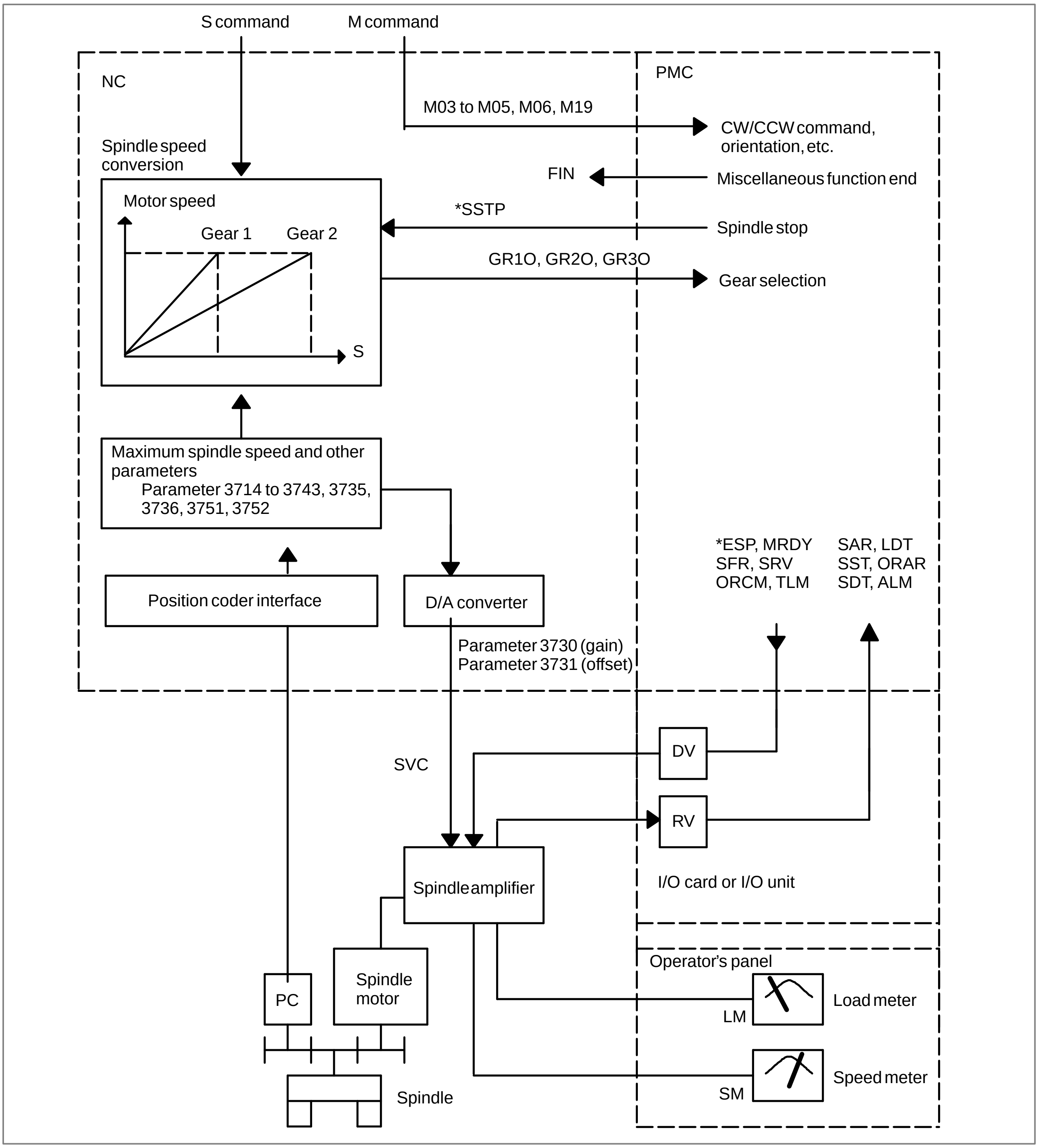
4. Turn off the power then back on. Then, the parameters are read.

6.2 AC SPINDLE (ANALOG INTERFACE)

6.2.1 Outline of Spindle Control

Option card 1 or 2 is necessary for the analog interface.

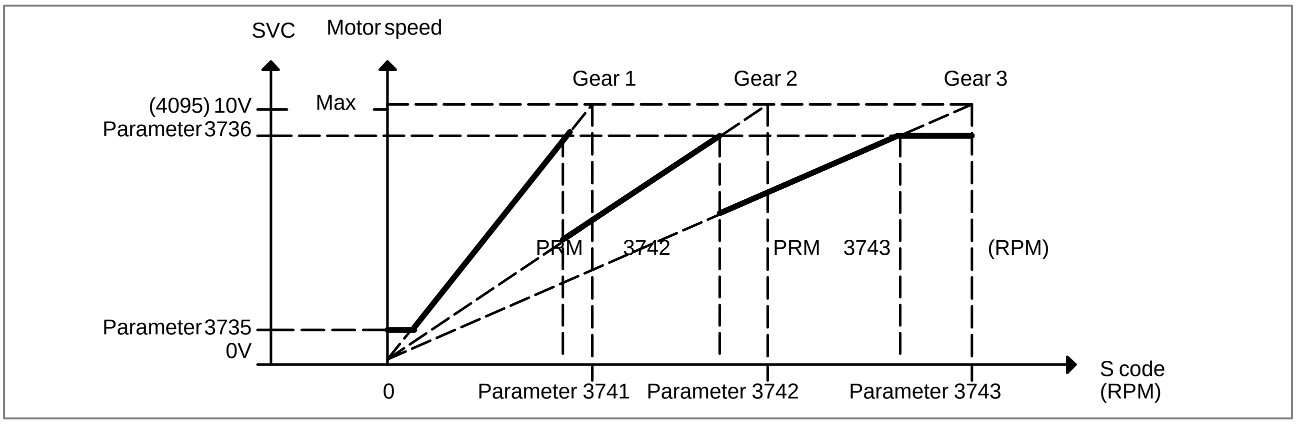
6.2.1.1 Block diagram



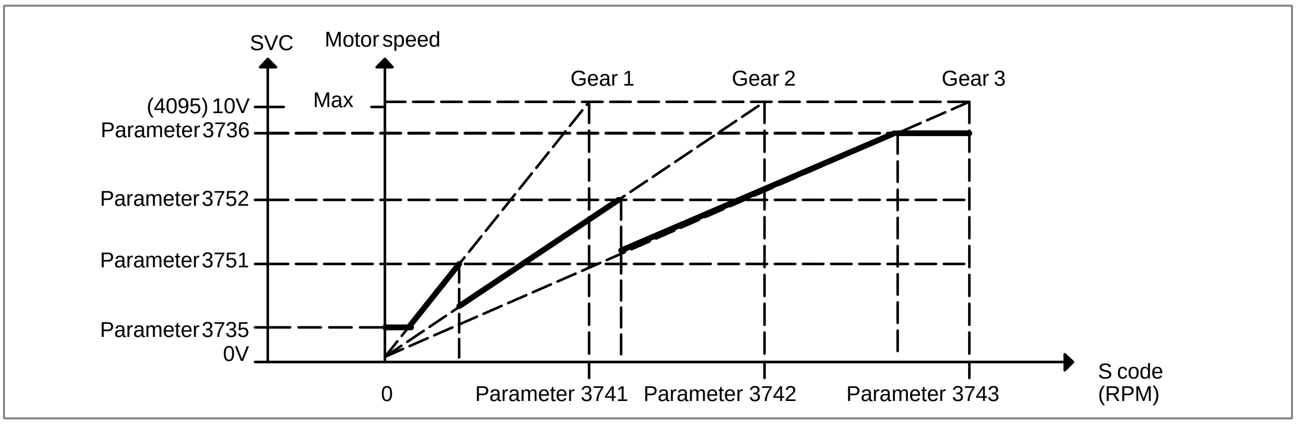
6.2.1.2 Calculation of S analog voltage and related parameters

[M series]

1 Gear change method A (bit 2 of parameter 3705 = 0)



2 Gear change method B (bit 2 of parameter 3705 = 1)



	#7	#6	#5	#4	#3	#2	#1	#0
3706	TCW	CWM						

TCW	CWM	Sign of output voltage
0	0	Analog voltage (+) with both M03 and M04
0	1	Analog voltage (–) with both M03 and M04
1	0	(+) with M03, (–) with M04
1	1	(–) with M03, (+) with M04

	#7	#6	#5	#4	#3	#2	#1	#0
3705						SGB		

SGB Spindle speed set when gear change is performed is:

0 : Maximum speed for each gear.

1 : Set by respective parameters. (Parameters 542, 543, 585, 586)

3741	Max. spindle speed of gear 1 (1 to 9999) [min^{-1}]
3742	Max. spindle speed of gear 2 (1 to 9999) [min^{-1}]
3743	Max. spindle speed of gear 3 (1 to 9999) [min^{-1}]
3736	Upper limit of the output to the spindle motor
3735	Lower limit of the output to the spindle motor

$$\text{Setting} = \frac{\text{Spindle speed (upper limit/lower limit)}}{\text{Max. spindle speed}} \times 4095$$

6.2.1.3 Tuning S analog voltage (D/A converter)

(1) Change the upper and lower limits as follows:

- When gear change method A is used: Parameter 3736 = 4095, parameter 3735 = 0
- When gear change method B is used: Parameter 3751 = 4095, parameter 3735 = 0

(2) Tuning the D/A converter offset

Specify zero as the spindle speed. Then, by using a digital multimeter, adjust the following parameter so that the voltage at the test pin DA2 on the spindle amplifier printed circuit board is 0 mV.

S0; (Specify the command by MDI operation, then press the cycle start button.)

3731	Spindle speed (D/A converter) offset compensation value

(3) Tuning the D/A converter gain

Specify the maximum spindle speed of gear 1. Then, by using a digital multimeter, adjust the following parameter so that the voltage at the test pin DA2 on the spindle amplifier printed circuit board is 10.0 V.

Sxxxx ; (xxxx is the value set in parameter 3741.) (Specify the command by MDI operation, then press the cycle start button.)

3741	Max. spindle speed of gear 1 (1 to 9999) [min^{-1}]

Usually a voltage is output from the D/A converter by only executing an S command. However, the clockwise rotation command (M03) may be required on some machines.

(4) If the output voltage is not correct, perform the following calculation, and change the value of parameter 3730 to adjust the gain of the D/A converter:

$$\text{Setting} = \frac{10V}{\text{Measured voltage}} \times (\text{Current value of PRM 3730})$$

(5) Execute an S command again and confirm that the output voltage is correct.

Restore the original parameter values.

7 TROUBLESHOOTING

This chapter describes troubleshooting procedure.

7.1 CORRECTIVE ACTION FOR FAILURES

When a failure occurs, it is important to correctly grasp what kind of failure occured and take appropriate action, to promptly recover the machine.
Check for the failure according to the following procedure :

When? | With what operation? | What failure?

Grasp the kind of failure
↓
Appropriate action
↓
Recovery

7.1.1 Investigating the Conditions under which Failure Occurred

(1) When and how many times (frequency of occurrences)
(2) With what operation
(3) What failure occurred

1 When did the failure occur?

Date and time?
Occurred during operation? (how long was the operation?)
Occurred when the power was turned on?
Was there any lightening surge, power failure, or other disturbances to the power supply?

How many times has it occurred

Only once?
Occurred many times ? (How many times per hour, per day, or per month?)

2 With what operation did it occur ?

- What was the Power Mate mode when the failure occurred? (Jog mode/AUTO operation mode /MDI mode /reference position return mode)
- If during program operation,
  1) Where in the program ?
  2) Which program No. and sequence No. ?
  3) What program ?
  4) Occurred during axial movement ?
  5) Occurred during the execution of an M/S/T code ?
  6) Failure specific to the program ?
- Does the same operation cause the same failure ? (Check the repeatability of the failure.)
- Occurred during data input/output ?

<Feed axes and spindles>

· For a failure related to feed axis servo
  1) Occurred at both low feedrate and high feedrate ?
  2) Ocurred only for a certain axis ?
· For a failure related to spindles
  When did the failure occur ? (during power–on, acceleration, deceleration, or constant rotation)

3 What failure occurred ?

· Which alarm was displayed on the alarm display screen on the CRT?
  (Check the axis along which an alarm has occurred for alarms 300 to 599.)
· For alarm 350 : What does diagnostic display 202 indicate?
  For alarm 351 : What does diagnostic display 203 indicate?
  For alarm 414 : What does diagnostic display 200, 201, 204 indicate ?
· For alarm 751 or 761 : Which spindle alarm is indicated ? (indicated by AL–XX (XX is a number))
· Is the screen correct ?
· If machining dimensions are incorrect
  1) How large is the error ?
  2) Is the position display on the CRT correct ?
  3) Are the offsets correct ?

4 Other information

· Is there noise origin around machine?
  If the failure has not occurred frequently, the cause may be external noise to the power supply or inductive noise on machinery cables. Operate other machines connected to the same power line and see if noise come from the relays or compressors.
· Is it taken any countermeasure for noise in machine side?
  See Section 2.14.
· Check the following for the input power supply voltage :
  1) Is there variation in the voltage ?
  2) Are the voltages different depending on the phase ?
  3) Is the standard voltage supplied ?
     (10% of 24 VDC, instantaneous voltage, and ripples are included.)
· What is the ambient temperature of the controller in the cabinet?
· Has excessive vibration been applied to the control unit?
  (0.5 G or less during operation)

5 When you contact our service center, specify the following items :

1) Name of the NC unit
2) Name of the machine tool builder and type of machine
3) Software series/version of the NC
4) Specifications of the servo amplifier and motor
   (for a failure related to the servo)

5) Specifications of the spindle amplifier and spindle motor (for a failure related to a spindle)

6) Name and contact of the person who is most familiar with the failure conditions (for a failure related to the servo)

   · See the drawing issued by the machine tool builder for the locations of the NC unit and servo/spindle amplifiers.

   · We use the following specification codes :
     Servo /spindle amplifier : A06B–□□□□–H□□□
     Servo/spindle amplifier : A06B–□□□□–B□□□
     (□ represents a number)

> The above information is required by FANUC to determine the cause of the failure. The information is used to attempt to reproduce the failure at the service center.

7.1.2 Precautions for Reading this Chapter

(1) PMC addresses G and F

This maintenance manual applies to the one–path Power Mate *i*–D, two–path Power Mate *i*–D, and Power Mate *i*–H.

For axis signals, the locations of PMC addresses G and F vary from one model to another.

The descriptions herein focus on the Power Mate *i*–H.

For the Power Mate *i*–D and two–path Power Mate *i*–D, read the descriptions as explained below:

- **Power Mate *i*–H**

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

- **One–path Power Mate *i*–D**

	#7	#6	#5	#4	#3	#2	#1	#0
G0130							*IT2	*IT1

The signal for axis 1 in the one–path Power Mate *i*–D corresponds to □□1 in the Power Mate *i*–H. The signal for axis 2 in the Power Mate *i*–D corresponds to □□2 in the Power Mate *i*–H.

- **Two–path Power Mate *i*–D**

	#7	#6	#5	#4	#3	#2	#1	#0
G0130								*IT1#1
G1130								*IT1#2

The signal for path one in the two–path Power Mate *i*–D corresponds to □□1 in the Power Mate *i*–H.

The signal for path two in the two–path Power Mate *i*–D corresponds to □□1 plus 1000 in the Power Mate *i*–H.

Example) G0130#0 → G1130#0

(2) PMC address X

PMC address X is assigned a signal that is to be allocated at a specified location in order to use a specific function.

The descriptions herein focus on the signals input from the FANUC I/O Link of the Power Mate *i*–H.

For the one–path Power Mate *i*–D and two–path Power Mate *i*–D, read the descriptions as explained below.

- **Power Mate *i*–H**

Input from the FANUC I/O Link (bit 3 of parameter No. 3008 = 0)

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	*RILK		*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X0001								
X0002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1

Input from the built–in I/O (bit 3 of parameter No. 3008 = 1)
To use *DEC1 to *DEC8, set also bit 0 of parameter No. 3005 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	*RILK		*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X1001								
X1002	*DEC8	*DEC7	*DEC6	*DEC5	*DEC4	*DEC3	*DEC2	*DEC1

- **One–path Power Mate *i*–D**

Input from the FANUC I/O Link (bit 3 of parameter No. 3008 = 0)

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP	*RILK	*DEC1	*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X0001			*DEC2					
X0002								

Input from the built–in I/O (bit 3 of parameter No. 3008 = 1)
To use *DEC1 and *DEC2, set also bit 0 of parameter No. 3005 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP	*RILK	*DEC1	*ESP	ESKIP	SKIP4	SKIP3	SKIP2
X1001			*DEC2					
X1002								

- **Two–path Power Mate *i*–D**

Input from the FANUC I/O Link (bit 3 of parameter No. 3008 = 0)

	#7	#6	#5	#4	#3	#2	#1	#0
X0000	SKIP#1	*RILK#1	*DEC#1	*ESP#1		SKIP4#1	SKIP3#1	SKIP2#1
X0001	SKIP#2	*RILK#2	*DEC#2	*ESP#2		SKIP4#2	SKIP3#2	SKIP2#2
X0002								

Input from the built–in I/O (bit 3 of parameter No. 3008 = 1)
To use *DEC#1 and *DEC#2, set also bit 0 of parameter No. 3005 to 1.

	#7	#6	#5	#4	#3	#2	#1	#0
X1000	SKIP#1	*RILK#1	*DEC#1	*ESP#1		SKIP4#1	SKIP3#1	SKIP2#1
X1001	SKIP#2	*RILK#2	*DEC#2	*ESP#2		SKIP4#2	SKIP3#2	SKIP2#2
X1002								

7.2 POWER CANNOT BE TURNED ON

Points

If the 7–segment LED, LEDM1, is not lit when the 24–V power is turned on, check LEDM2, the red LED on the front of the controller.
When LEDM2 is lit, the fuse for the Power Mate is blown.

Causes and Remedies

(1) FUS1 (fuse in the controller) has blown.

(a) Input power voltage is too high.

(b) External 24DCV power supply is faulty.

(c) 24–V power line short–circuit (line–to–line or line–to–ground)

(2) Input voltage is low

Make sure that the voltage across the 0 V and 24 V pins of connector CP2 is 24 VDC ±10% as measured using a volt–ohm–millimeter. (See Fig. 7.2.)
If it is not normal, check machine side magnetics circuit.

(3) Power supply unit in controller is faulty.

If LEDM1 does not light even when the input voltage measured in step (2) is normal (24 V), it is likely that the base printed–circuit board in the controller is defective.

(4) Power leakage from other units

Disconnect all cables other than the power cable of the Power Mate, then retry. When no defective condition is encountered, connect the cables one by one to determine which one causes a failure.
Then, remove the failure (such as short between +5–V lines).

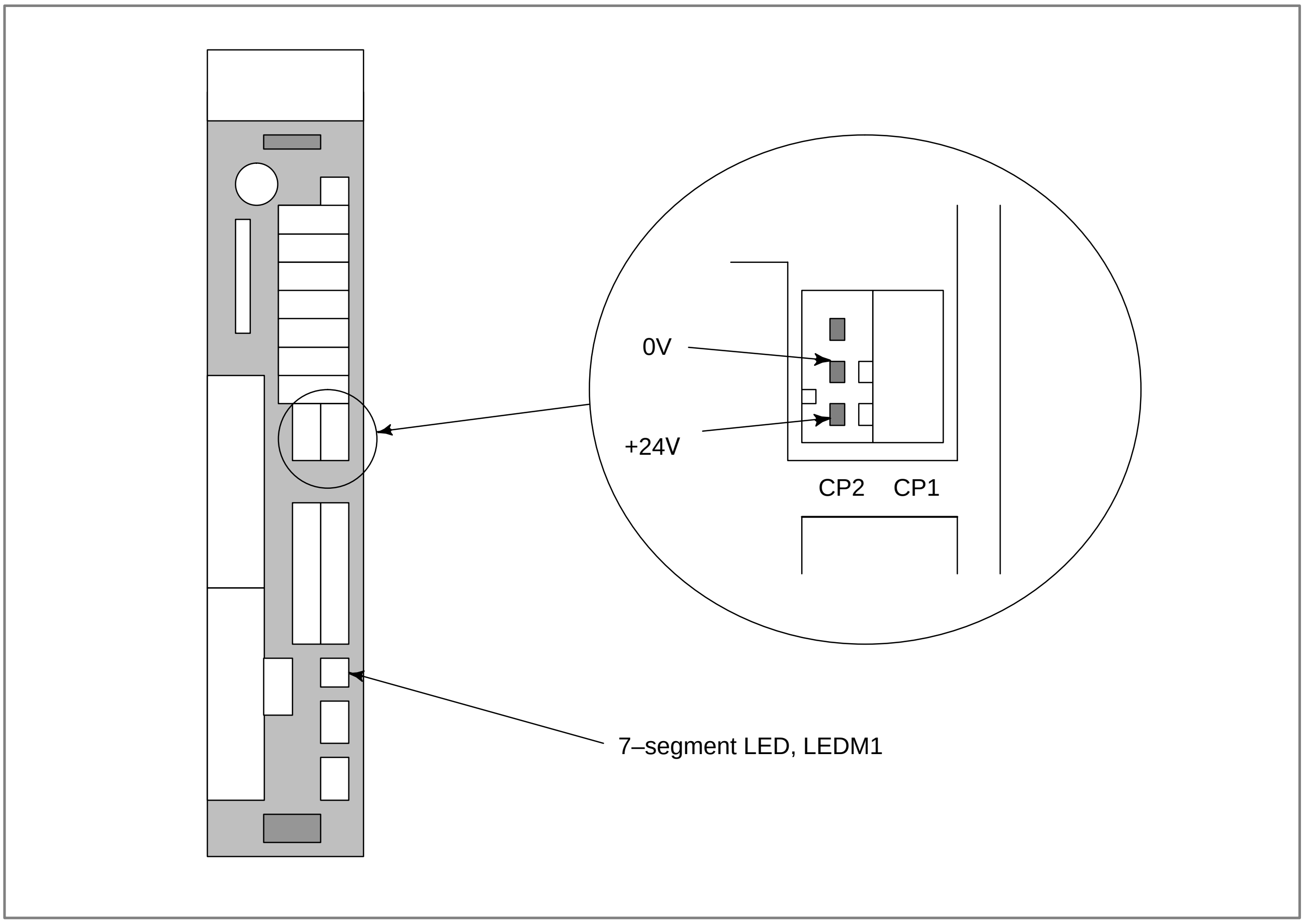


Fig. 7.2 Pins of connector CP2

7.3 NO MANUAL OPERATION NOR AUTOMATIC OPERATION CAN BE EXECUTED

Points

(1) Execute the following procedure when no manual nor automatic operation is done

(2) Check whether position display shows correct position

(3) Check Power Mate status display

(4) Check Power Mate internal status using diagnostic function

Causes and Countermeasures

1. Position display (relative, absolute, machine coordinate) does not change

(1) Check CNC status display (Refer to **1.7 Power Mate STATUS DISPLAY FOR DETAIL**)

(a) Emergency stop status (Emergency stop signal is turned on)

If status display shows EMG the emergency stop signal is input. Check the following signal using the PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
X1000				*ESP				
G0008				*ESP				

ESP=0 indicates that emergency stop signal is input.

(b) It is a reset status

When RESET is displayed, any of a reset is functioned. Check the following signal using the PMC's diagnostic funciton (PMCDGN).

1 An input signal from the PMC functions

	#7	#6	#5	#4	#3	#2	#1	#0
G0008	ERS	RRW						

When ERS is 1, external reset signal is input.
When RRW is 1, reset & rewing signal is input.

2 The RESET key (for example, on the CRT/MDI) is in effect.

When the signals in 1 are 0, RESET key may be functioning.

Check the contact of the RESET key using a tester, or disconnect the CRT/MDI panel etc.
When it is abnormal, change the keyboard.

(c) Confirm the status of modes

Operation mode status is displayed on the lower part of screen as follows :
If nothing is displayed, mode select signal is not input. Check mode select signal using PMC's diagnostic function (PMCDGN).
For details, refer to section **1.7 Power Mate STATUS DISPLAY**.

(Example of display)

JOG	:	Manual continuous feed (JOG) mode
STEP	:	Manual handle/Step feed (HANDLE/STEP)
MDI	:	Manual data input (MDI) mode
AUTO	:	Automatic operation (Memory) mode
EDIT	:	EDIT (Memory edit) mode

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1

	MD4	MD2	MD1
Manual continuous (JOG) mode	1	0	1
Manual handle/Step feed (HANDLE/STEP) mode	1	0	0
Manual data input (MDI) mode	0	0	0
Automatic operation (AUTO) mode	0	0	1
EDIT (Memory edit) mode	0	1	1
TEACH IN STEP/HANDLE	1	1	1
TEACH IN JOG	1	1	0

(2) Check diagnostic data 000 to 025 of the CNC Check an item for which 1 is displayed

No.	Message	Display
000	WAITING FOR FIN SIGNAL	: 0
001	MOTION	: 0
002	DWELL	: 0
a. 003	IN–POSITION CHECK	: 0
004	FEEDRATE OVERRIDE 0%	: 0
b. 005	INTERLOCK	: 1
006	SPINDLE SPEED ARRIVAL CHECK	: 0
007	WAITING FOR CHASER OPEN OR CLOSE	: 0
008	DURING WAITING BY WAITING M CODE	: 0
010	PUNCHING	: 0
011	READING	: 0
012	WAITING FOR (UN) CLAMP	: 0
c. 013	JOG FEEDRATE OVERRIDE 0%	: 0
d. 014	WAITING FOR RESET, ESP, RRW OFF	: 0
015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

Items with a to d relate with manual and automatic operation and its detail is shown below.

a. In–position check is being done

It shows that positioning is not yet completed. Check the contents of the following diagnostic number. (It is 1 in the following condition)

DGN 0300 $\boxed{\text{Position Error}}$ >Parameter 1826 $\boxed{\text{In–position width}}$

1 Check the parameters according to the parameter list

1825	Servo loop gain per axis (Normal : 3000)

2 Servo system may be abnormal. Refer to alarm 400, 410, and 411.

b. Interlock signal is input

There are a plural interlock signals. Check at first which interlock signal is used by the machine tool builder at the parameters shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX	HITL	ITL

ITL=0 shows interlock signal *IT is effective. To 1
HITL = 1 shows interlock signal *RILK is effective. To 2
ITX=0 shows interlock signal *ITn is effective. To 3
DIT=0 shows interlock signal ± MITn is effective. To 4
Check state of effective interlock signals using the diagnostic function (PMCDGN) of the PMC.

1 Interlock signal (*IT) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

2 High–speed interlock signal (*RILK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
X0000		*RILK						

*RILK = 0 shows interlock signal is input.

3 Axis interlock signal (*ITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

*ITn=0 shows interlock signal is input.

4 Interlock signal per axis and direction (± MITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0132	+MIT8	+MIT7	+MIT6	+MIT5	+MIT4	+MIT3	+MIT2	+MIT1
G0134	–MIT8	–MIT7	–MIT6	–MIT5	–MIT4	–MIT3	–MIT2	–MIT1

± MITn=1 shows interlock signal per axis and direction is input.

c. Jog feedrate override is 0%

Check the signals using PMC's diagnostic function (PMCDGN)

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G0011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

When the override is 0% all bits of the above address becomes 1111 . . 1111 or 0000 . . . . . . 0000.

*JV15 . . . . JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
:	:
1101 1000 1110 1111	100.00%
:	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

d. Power Mate is in a reset state

In this case, RESET is also displayed on the status display. Check it using the procedure of 1 above.

2. When machine coordinate value does not update on position display

(1) Machine lock signal (MLK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0044							MLK	

MLK :All axes machine lock

When the signal is 1, the corresponding machine lock signal is input.

7.4 JOG OPERATION CANNOT BE DONE

Points

(1) Check whether position display is operating.
(2) Check status display
(3) Check internal status using Diagnostic funciton

Causes and Remedies

1. Position display (relative, absolute, machine cooordinate) does not change

(1) Check mode selection status (JOG mode is not selected)

When status display shows JOG, it is normal.
When status display does not show JOG, mode select signal is not selected correctly. Confirm the mode select signal using PMC's diagnostic function (PMCDGN).

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
	JOG mode					1	0	1

(2) Feed axis and direction select signal is not input Check the signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0100	+J8	+J7	+J6	+J5	+J4	+J3	+J2	+J1
G0102	–J8	–J7	–J6	–J5	–J4	–J3	–J2	–J1

± Jn=1 shows feed axis and direction select signal is input.

Example)
When +X button is pressed on the operator's panel, signal+J1 turns to 1.
This signal is effected at its rise. If axis selection signal is input before JOG mode is selected, axis movement does not occur. Turn the signal to 0, then 1.

(3) Check CNC's diagnostic function 000 to 015. Check the items for which 1 is displayed at right side.

	No.	Message	Display
	000	WAITING FOR FIN SIGNAL	: 0
	001	MOTION	: 0
	002	DWELL	: 0
a.	003	IN–POSITION CHECK	: 0
	004	FEEDRATE OVERRIDE 0%	: 0
b.	005	INTERLOCK / START LOCK (Example)	: 1
	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	007	WAITING FOR CHASER OPEN OR CLOSE	: 0
	008	DURING WAITING BY WAITING M CODE	: 0
	010	PUNCHING	: 0
	011	READING	: 0
	012	WAITING FOR (UN) CLAMP	: 0
c.	013	JOG FEEDRATE OVERRIDE 0%	: 0
d.	014	WAITING FOR RESET, ESP, RRW OFF	: 0
	015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

Items with a to d relate with manual and automatic operation and its detail is shown below.

a. In–position check is being done

It shows that positioning is not yet completed. Check the contents of the following diagnostic number. (It is 1 in the following condition)

DGN 0300 $\boxed{\text{Position Error}}$ >Parameter 1826 $\boxed{\text{In–position width}}$

1 Check the parameters according to the parameter list

1825	Servo loop gain per axis (Normal : 3000)

2 Servo system may be abnormal. Refer to alarm 400, 410, and 411.

b. Interlock signal is input

There are a plural interlock signals. Check at first which interlock signal is used by the machine tool builder at the parameters shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX	HITL	ITL

#0 ITL=0 shows interlock signal *IT is effective. To 1
#1 HITL = 1 shows interlock signal *RILK is effective. To 2
#2 ITX=0 shows interlock signal *ITn is effective. To 3
#3 DIT=0 shows interlock signal ±MITn is effective. To 4
Check state of effective interlock signals using the diagnostic function (PMCDGN) of the PMC.

1 Interlock signal (*IT) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

2 High–speed interlock signal (*RILK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
X0000		*RILK						

*RILK = 0 shows interlock signal is input.

3 Axis interlock signal (*ITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

*ITn=0 shows interlock signal is input.

4 Interlock signal per axis and direction (± MITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0132	+MIT8	+MIT7	+MIT6	+MIT5	+MIT4	+MIT3	+MIT2	+MIT1
G0134	–MIT8	–MIT7	–MIT6	–MIT5	–MIT4	–MIT3	–MIT2	–MIT1

±MITn=1 shows interlock signal per axis and direction is input.

c. Jog feedrate override is 0%

Check the signals using PMC's diagnostic function (PMCDGN)

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
G0011	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8

When the override is 0% all bits of the above address becomes
1111 .... 1111 or 0000 .... 0000.

*JV15 .... JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
:	:
1101 1000 1110 1111	100.00%
:	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

d. Power Mate is in a reset state

Under this condition, it is impossible for the Power Mate to perform both jog and automatic operations. Check for the cause according to Section 7.3.

(4) Jog feed rate setting (Parameter) is not correct

1423	Jog feedrate per axis [mm/min]

(5) Check whether a torque limit is in effect.

7.5 HANDLE OPERATION CANNOT BE DONE

Points

(1) Check another manual operation (JOG) is accepted.

(2) Check status display.

Causes and Countermeasure

1 JOG operation is not acceptable, either

Consult with Sections 7.3 and 7.4.

2 When only handle operation (MPG) cannot be done

(1) Check CRT status display at lower left corner of the CRT.

(Refer to **1.8 STATUS DISPLAY** for details)
When the status display shows STEP, mode selection is correct.
If it is not STEP, mode select signal is not input correctly. Check the mode select signal using the PMC's diagnostic function(PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1
						↓	↓	↓
	Manuale handle mode					1	0	0

(2) Manual handle feed axis select signal is not input.

Check the signals using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0018	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A
G0019					HS3D	HS3C	HS3B	HS3A

When axis select switch for manual handle feed is selected on the machine operator's panel, if the signals are input as follows, it is normal.

Selected axis	HSnD	HSnC	HSnB	HSnA
no selection	0	0	0	0
1st axis	0	0	0	1
2nd axis	0	0	1	0
3rd axis	0	0	1	1
4th axis	0	1	0	0
5th axis	0	1	0	1
6th axis	0	1	1	0
7th axis	0	1	1	1
8th axis	1	0	0	0

NOTE
In the above table, n is the number of the manual pulse generator (MPG) and up to 3 MPGs can be used. (Only the Power Mate *i*–H can use the third MPG.)
A feed axis is selected by 4–bit code of A to D.

(3) Manual handle feed multiplication is not correct

Check the following signals using PMC's PMCDGN. Also confirm the following parameters based on the parameter list.

	#7	#6	#5	#4	#3	#2	#1	#0
G0019			MP2	MP1				

MP2	MP1	Multiplication
0	0	×1
1	0	×10
0	1	×m
1	1	×n

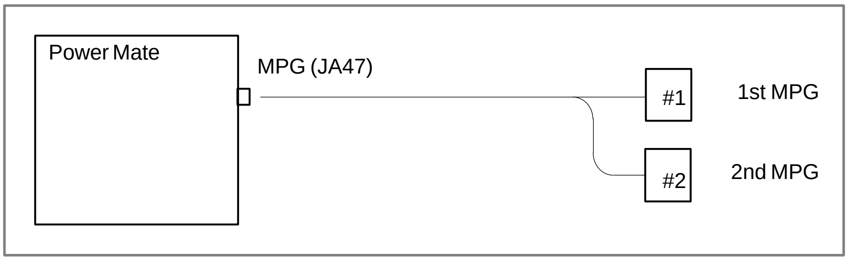
7110	No. of MPGs used (1 to 3)
7113	Magnification of handle feed m (1 to 127)
7114	Magnification of handle feed n (1 to 1000)

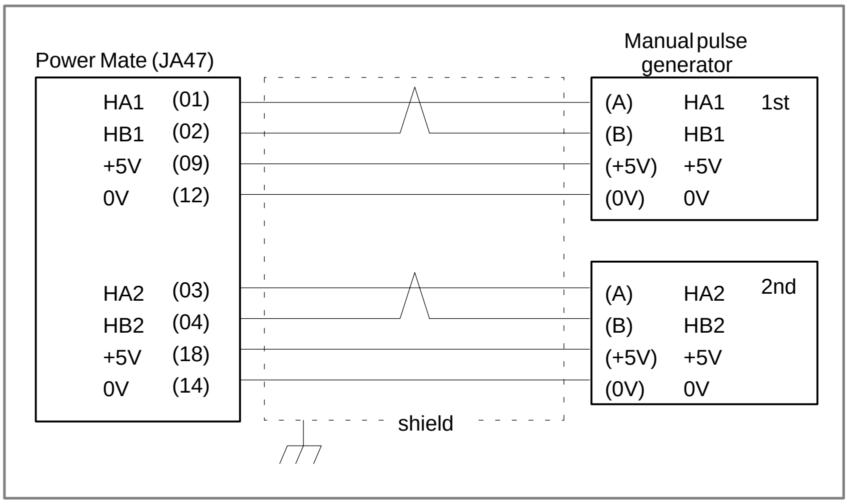
(4) Checking manual pulse generator

(a) Incorrect of cable

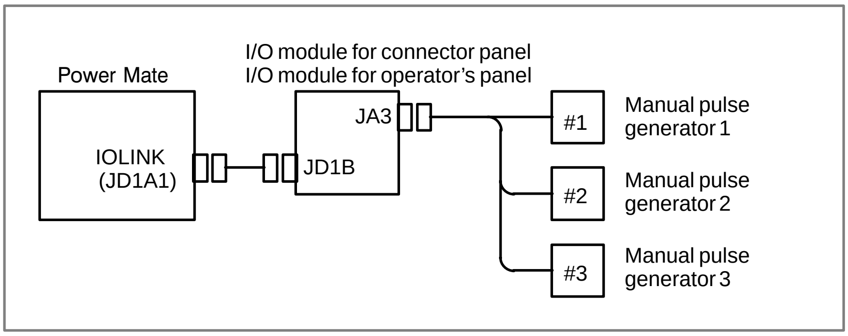
Check disconnection of cable or short circuit.

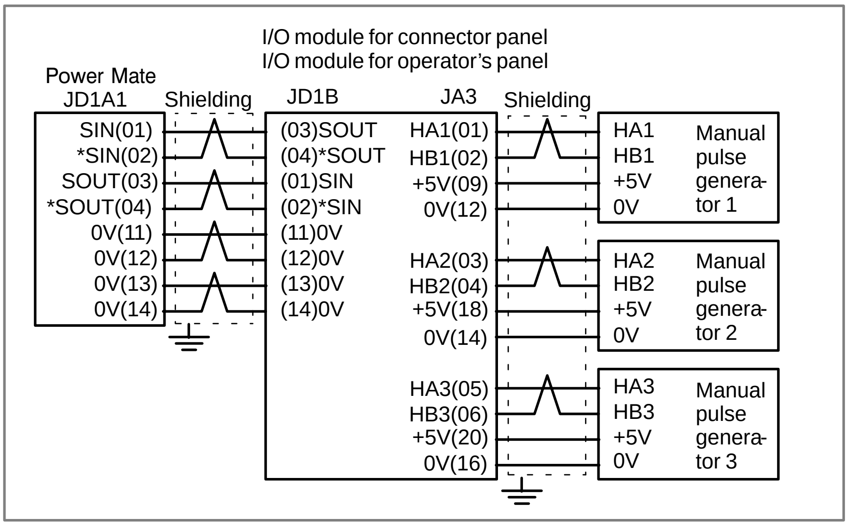
(1) Connection with the Power Mate main unit





(2) Connection with the FANUC I/O Link

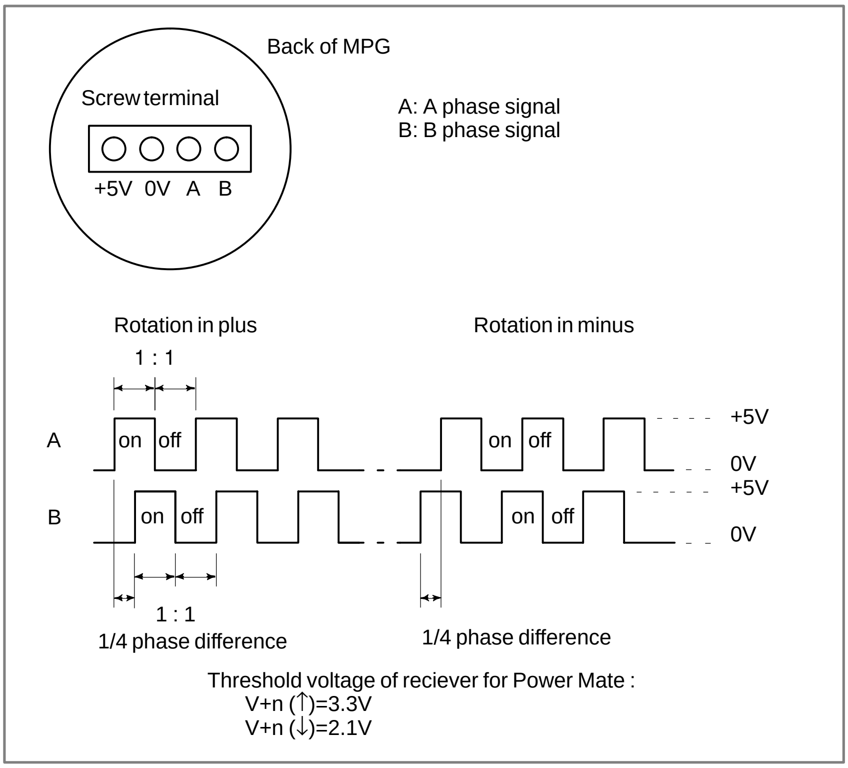




NOTE
Manual pulse generator 3 can be used only in the Power Mate *i*–H.

(b) Manual pulse generator is faulty

When you rotate the MPG, the following signal is output. Measure the signal with synchroscope at screw terminal on back of MPG. If no signal is output, measure +5V voltage.



Check on and off ratio and phase difference of HA and HB.

(5) Check of the torque limit

Check whether a torque limit is in effect.

[Connection with a manual pulse generator]

1) One–path Power Mate *i*–D

In basic mode, a manual pulse generator interface for one axis is provided. Whether this manual pulse generator interface is used for the first or second axis can be selected by the PMC.

An optional manual pulse generator interface for another axis can be added.

This manual pulse generator interface can be used for either the first or second axis, this being selected by the PMC.

First manual pulse generator ⟶ JA47 (1) HA1, (2) HB1
Basic

Second manual pulse generator ⟶ JA47 (3) HA2, (4)HB2
Optional

2) Two–path Power Mate *i*–D

In basic mode, a manual pulse generator interface for one axis is provided for each path.

One manual pulse generator is connected to each path. The connecting positions are fixed. The use of the manual pulse generator interface can be specified separately for each path by the PMC.

Manual pulse generator for the first path ⟶ JA47 (1) HA1, (2) HB1

Manual pulse generator for the second path ⟶ JA47 (3) HA2, (4)HB2

3) Power Mate *i*–H

In basic mode, a manual pulse generator interface for one axis is provided. The axis for which this manual pulse generator interface is used is selected using the PMC.

An optional manual pulse generator interface for another axis can be added.

The axis for which this manual pulse generator interface is used is selected using the PMC.

First manual pulse generator ⟶ JA47 (1) HA1, (2) HB1
Basic

Second manual pulse generator ⟶ JA47 (3) HA2, (4)HB2
Optional

7.6 AUTOMATIC OPERATION CANNOT BE DONE

Points

(1) Check manual operation is possible.

(2) Check the status of cycle start LED on machine operator's manual.

(3) Check status of Power Mate.

Causes and Remedies

When manual operation is either impossible, perform countermeasure, based on the previous item "Jog operation cannot be done".
Confirm that a correct mode is selected according to the mode select status of Power Mate status display. Also, by confirming the automatic operation status it is possible to identify cycle operation, feed hold and cycle stop state.

1. When cycle operation is not started (Cycle start LED does not light)

The Power Mate status display on the lower section of the CRT screen appears as: ****

(1) Mode select signal is not correct.

When the mode select signal is input correctly, following status display is done.
MDI :Manual data input mode (MDI)
AUTO :Automatic operation mode
RMT :DNC operation mode

If status display does not show a correct status, check the mode signal with following diagnosis function of PMC side (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0043			DNCI			MD4	MD2	MD1

DNCI	MD4	MD2	MD1	Mode select
–	0	0	0	Manual data input mode
0	0	0	1	Automatic operation mode
1	0	0	1	DNC operation mode

(2) Cycle start signal is not input

This signal turns 1 when cycle start button is pressed and turns 0 when it is released. The cycle start actuates when it changes from 1 to 0.
Check the state of the signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0007						ST		

ST : Cycle start signal

* The cycle is allowed to start by setting of parameter (No. 3001#1) when it changes from 1 to 0.

(3) Feed hold signal is input

Under normal state, the feed hold signal is 1 when the feed hold button is not pressed.
Check the state of this signal using the PMC's diagnostic function (PMCDGN) .

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			*SP					

***SP** : Feed hold signal

2. When an automatic operation is in progress (Cycle start LED is lit)

Power Mate's status display shows "STRT" on the CRT.

(1) Check the contents of diagnostic nos. 000 to 015.

	No.	Message	Display
a.	000	WAITING FOR FIN SIGNAL	: 1(Example)
b.	001	MOTION	: 0
c.	002	DWELL	: 0
d.	003	IN–POSITION CHECK	: 0
e.	004	FEEDRATE OVERRIDE 0%	: 0
f.	005	INTERLOCK / START LOCK	: 0
g.	006	SPINDLE SPEED ARRIVAL CHECK	: 0
	007	WAITING FOR CHASER OPEN OR CLOSE	: 0
	008	DURING WAITING BY WAITING M CODE	: 0
	010	PUNCHING	: 0
	011	READING	: 0
	012	WAITING FOR (UN) CLAMP	: 0
h.	013	JOG FEEDRATE OVERRIDE 0%	: 0
i.	014	WAITING FOR RESET, ESP, RRW OFF	: 0
	015	EXTERNAL PROGRAM NUMBER SEARCH	: 0

Items with a to i relate with an automatic operation and their details are as follows :

a. An auxiliary function is being executed (waiting for FIN signal)

An auxiliary function (M/S/T) specified in a program is not ended.
Check according to the following procedure.
At first, confirm the kind of interface of an auxiliary function.

	#7	#6	#5	#4	#3	#2	#1	#0
3001	MHI							

MHI 0 : Auxiliary function is of normal interface.
1 : Auxiliary function is of high–speed interface.

1) Normal interface

When the auxiliary function finish signal turns from 1 to 0, the auxiliary function is supposed to be ended and the next block is read for operation. Confirm the status of this signal using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0004					FIN			

FIN : Auxiliary function finish signal

2) High–speed interface

The auxiliary function is supposed to be ended when the signals are in the following state. Confirm it using PMC's diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0005					TFIN	SFIN		MFIN

MFIN : M function finish signal

SFIN : S function finish signal

TFIN : T function finish signal

	#7	#6	#5	#4	#3	#2	#1	#0
F0007					TF	SF		MF

MF : M function strobe signal

SF : S function strobe signal

TF : T function strobe signal

Signal	End state	
Finish signal	0	1
Strobe signal	0	1

b. Travel command is being executed

CNC is reading an axis command (X,Y,Z,...) in a program and giving the command to the axis.

c. A dwell command is being executed

CNC is reading a dwell command (G04) in a program and is executing the dwell command.

d. In–position check (confirming positioning) is being done

Positioning (G00) to a specified position of a specified axis is not completed.
Whether positioning is completed or not is checked as the servo position error amount. Check it diagnostic function as follows:

DGN no.300 [Position Error] > PARAM 1826 [In–position width]

Position error amount almost becomes 0, when positioning of an axis completes and when the amount becomes within the in–posiiton width, it is assumed that positioning completes and the next block is exected.
If position error amount does not become within the in–position width, refer to servo alarm 400, 4n0 and 4n1.

e. Feedrate override is at 0%

Actual feedrate is overridden by the override signals to a programmed feedrate. Check the override signals using the PMC's diagnostic function (PMCDGN).

<Normal override signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0012	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0

***FVn** : Feedrate override

<State of override signal>

*FV7 · · · · · · · *FV0	
1 1 1 1 1 1 1 1	0%
1 1 1 1 1 1 1 0	1%
:	:
1 0 0 1 1 0 1 1	100%
:	:
0 0 0 0 0 0 0 1	254%
0 0 0 0 0 0 0 0	0%

f. Interlock signal is input

There are a plural number of interlock functions. Parameters are set by machine tool builders for which interlock function is used.
Therefore, confirm the following parameters at first:

	#7	#6	#5	#4	#3	#2	#1	#0
3003					DIT	ITX	HITL	ITL

#0 ITL=0 shows interlock signal *IT is effective. To 1
#1 HITL = 1 shows interlock signal *RILK is effective. To 2
#2 ITX=0 shows interlock signal *ITn is effective. To 3
#3 DIT=0 shows interlock signal ±MITn is effective. To 4
Check state of effective interlock signals using the diagnostic function (PMCDGN) of the PMC.

1 Interlock signal (*IT) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008								*IT

*IT=0 shows that interlock signal is input.

2 High–speed interlock signal (*RILK) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
X0000		*RILK						

*RILK = 0 shows interlock signal is input.

3 Axis interlock signal (*ITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0130	*IT8	*IT7	*IT6	*IT5	*IT4	*IT3	*IT2	*IT1

*ITn=0 shows interlock signal is input.

4 Interlock signal per axis and direction (± MITn) is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0132	+MIT8	+MIT7	+MIT6	+MIT5	+MIT4	+MIT3	+MIT2	+MIT1
G0134	–MIT8	–MIT7	–MIT6	–MIT5	–MIT4	–MIT3	–MIT2	–MIT1

±MITn=1 shows interlock signal per axis and direction is input.

5 Controlled axis detach function is running. A detached axis is specified for travelling.

*This function is valid when parameter No.1005#7 (RMB)=1. For whether this function is running or not, confirm the following signal using PMC's diagnostic function (PMCDGN). Check the axis concerned.

	#7	#6	#5	#4	#3	#2	#1	#0
F0110	MDTCH8	MDTCH7	MDTCH6	MDTCH5	MDTCH4	MDTCH3	MDTCH2	MDTCH1

When signal MDTHn is “1” ,the axis detach function is in valid.
The control axis detach function becomes valid by the following signal issued from the PMC or a parameter. Check as in the following procedure :

1) The control axis detach signal (DTCHn) is input.

	#7	#6	#5	#4	#3	#2	#1	#0
G0124	DTCH8	DTCH7	DTCH6	DTCH5	DTCH4	DTCH3	DTCH2	DTCH1

If it is 1, the corresponding axis is detached.

2) The following parameter enables the control axis detach function to the corresponding axis.

	#7	#6	#5	#4	#3	#2	#1	#0
0012	RMVx							

RMVx 0 : Controlled axis is connected
1 : Controlled axis is detached

g. CNC is waiting for spindle speed arrival signal to be input

Actual spindle speed does not arrive at a speed specified in a program.
Confirm the signal state using the PMC’s diagnostic function (PMCDGN).

	#7	#6	#5	#4	#3	#2	#1	#0
G0029				SAR				

SAR : When this signal is 0, spindle speed does not arrive at the specified speed.

This function is valid when parameter No. 3708#0=1.

h. Manual feedrate override is 0% (dry run)

Normally manual feedrate override function is used for jog feed.
But when DRN (dry run) signal turns on during an auomatic operation, override values set with these signals become valid to the following speed set by a parameter.

	#7	#6	#5	#4	#3	#2	#1	#0
G0046	DRN							

DRN : Dry run signal is input with this signal being 1.

1410	Dry run rate

The rate when the following override value is 100%.

	#7	#6	#5	#4	#3	#2	#1	#0
G0010	*JV7	*JV6	*JV5	*JV4	+JV3	*JV2	*JV1	*JV0
						↓	↓	↓
G0011	*JV15	*JV14	*JV13	*JV12	+JV11	*JV10	*JV9	*JV8

When override value is 0%, all bits of the above address is
[1111 . . . . 1111] or [0000 . . . . 0000].

*JV15 . . . . JV0	Override
1111 1111 1111 1111	0.00%
1111 1111 1111 1110	0.01%
	:
1101 1000 1110 1111	100.00%
	:
0000 0000 0000 0001	655.34%
0000 0000 0000 0000	0.00%

i. Power Mate is in a reset state

In this case, the CNC's status display shows RESET. Refer to item 1.

(2) Only rapid traverse in positioning (G00) does not function Confirm the following parameter and signals from the PMC.

(a) Setting value of rapid traverse rate

1420	Rapid traverse rate per axis

(b) Rapid traverse override signals

	#7	#6	#5	#4	#3	#2	#1	#0
G0014							ROV2	ROV1

ROV1	ROV2	Override
0	0	100%
1	0	50%
0	1	25%
1	1	Fo

1421	Rapid traverse override F0 rate

(3) Only feed (other than G00) does not function

(a) Maximum feedrate set by parameter is incorrect.

1422	Maximum feedrate	[mm/min]
1430	Maximum feedrate in each axis	[mm/min]

Feedrate is clamped at this upper feedrate.

(b) Feedrate is specified by feed per revolution (mm/rev)

1) Position coder does not rotate

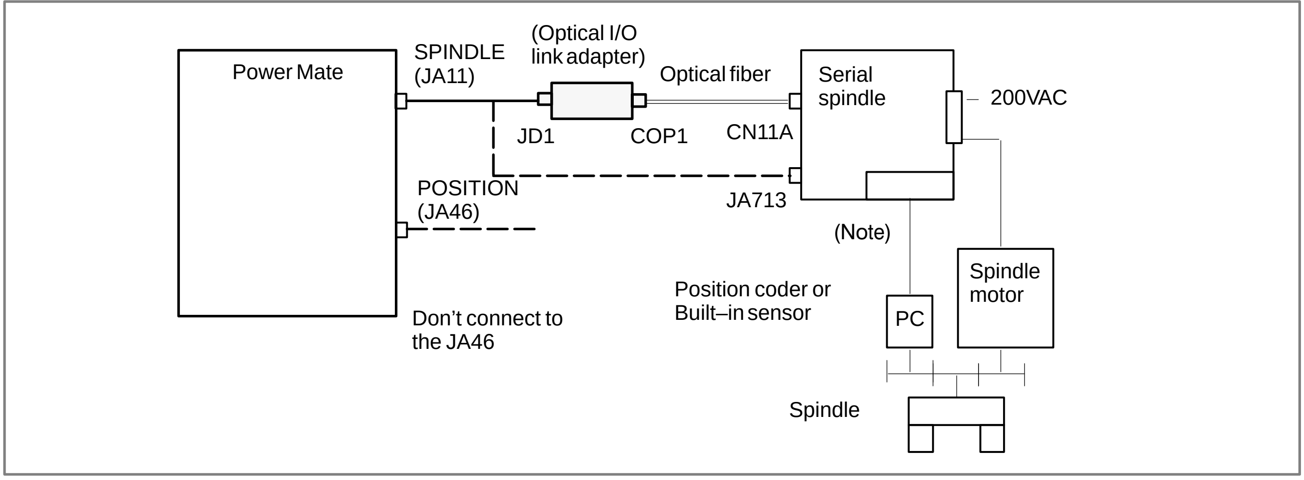
Check the connection between spindle and position coder The following failure is considered:

- T iming belt is broken
- Key is removed
- Coupling is loose
- Connector of signal cable is loosened

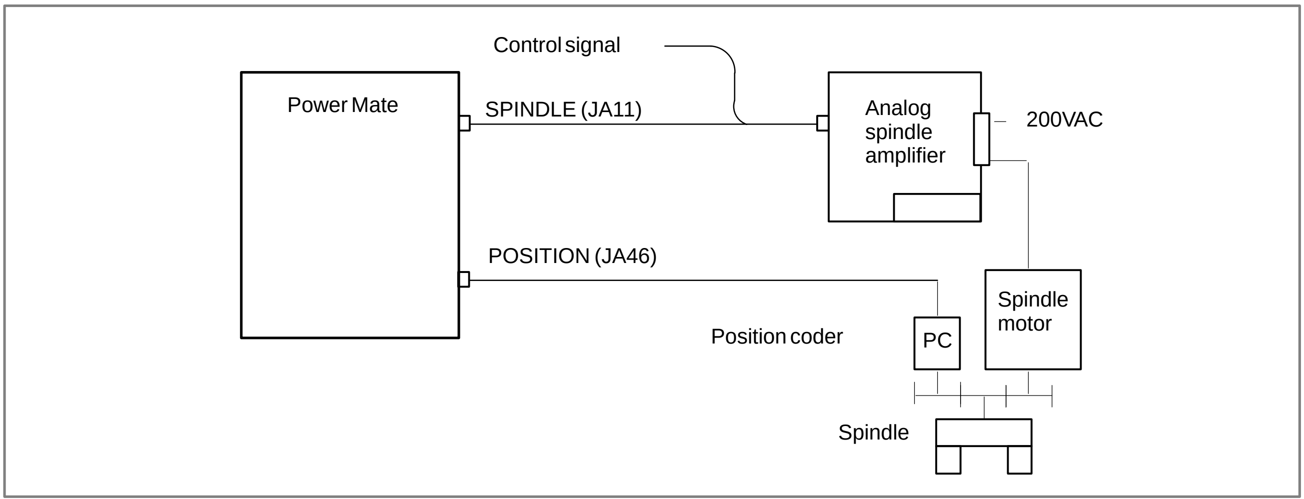
2) Position coder is faulty

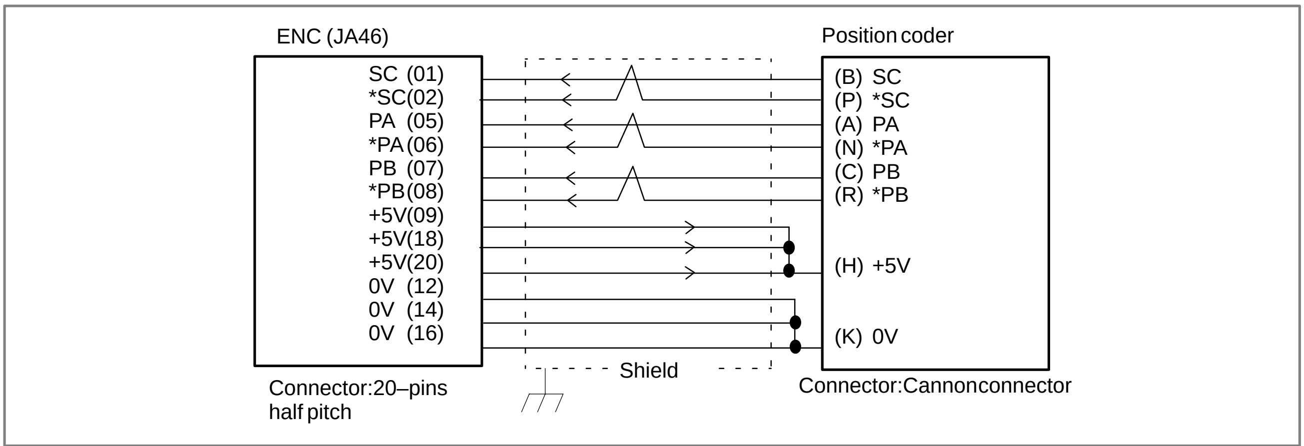
Position coder is connected to the spindle amplifier when serial interface spindle is used or connected to the Power Mate when analog interface spindle is used.

<Serial interface spindle amplifier>



<Analog interface spindle amplifier>





7.7 CYCLE START LED SIGNAL HAS TURNED OFF

Points

(1) After cycle operation is started, then stopped, check as follows:

(2) Confirm cycle start LED on machine operator's panel.

(3) Confirm diagnostic function.

Causes and Remedies

The reason why cycle start LED signal (STL) has turned off are displayed on diagnostic numbers 020 to 025 as follows:

	a	b	c	d	e	f	g
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

a. Emergency stop signal
b. External reset signal
c. Reset button on MDI
d. Reset & rewind signal
e. Servo alarm
f. Feed hold by switching mode
g. Single block stop

Details of signals a to g are as follows:
Confirm the signals concerned using diagnostic function (PMCDGN).

a. Emergency stop is input

	#7	#6	#5	#4	#3	#2	#1	#0
X1000				*ESP				

	#7	#6	#5	#4	#3	#2	#1	#0
G0008				*ESP				

***ESP=0** : Emergency stop signal is input :

b. External reset signal is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008	ERS							

ERS : When the bit is 1, external reset signal is input.

* When M02 is executed usually, for example, at the end of a program, the PMC ladder reads M02 and accepts this signal as an external reset signal.

c. Reset button on the MDI is pressed

An automatic operation is put into a reset status when RESET key on the MDI panel is pressed.

d. Reset & rewind signal is input

	#7	#6	#5	#4	#3	#2	#1	#0
G0008		RRW						

RRW : When this signal is 1, the reset & rewind signal is input.

This signal is usually used for a confirmation signal of M30 when an M30 is specified in a program as the end of a program.
Therefore, when M30 is executed, this signal is input.

e. Servo alarm has generated

When any servo alarm has generated, cycle operation is put into the reset state and operation stop.

f. Cycle operation is in a feed hold state

The cycle operation becomes feed hold state in the following cases:

1) Modes are switched from an automatic operation mode to a manual operation mode.
2) Feed hold signal is input.

<Mode select signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0043						MD4	MD2	MD1

Automatic operation	memory edit(EDIT)	0	1	1
	Automatic operation (AUTO)	0	0	1
	Manual data input (MDI)	0	0	0
Manual operation	Jog feed (JOG)	1	0	1
	Handle/step	1	0	0
	TEACH IN STEP/HANDLE	1	1	1
	TEACH IN JOG/HANDLE	1	1	0

<Feed hold signal>

	#7	#6	#5	#4	#3	#2	#1	#0
G0008			*SP					

***SP :** When this signal is 0, the feed hold signal is input.

g. It become single block stop during automatic operation

	#7	#6	#5	#4	#3	#2	#1	#0
G0046							SBK	

SBK When this signal is 1, the single block signal is input.

7.8 WHEN MANIPULATION IS NOT POSSIBLE WITH THE CRT/MDI AND SO ON

Points

Check whether it is a trouble of display or a trouble of the system.

Judgement of the point

Check what is displayed with the 7–segment LED (LEDM1) on the controller.

1) If nothing appears
   → See Section 7.2.
2) If a pattern other than “8.” appears

If the status shows the above state, the system is normal.
Therefore, display system may be faulty.

3) If the pattern “8.” appears

It is likely that hardware other than the display circuit malfunctions.

If the message “WAITING FOR CRT DATA” appears on the CRT/MDI, it indicates that the CRT/MDI has started normally.

Causes and remedies

1. When the display system is in toruble

If the 7–segment LED (LEDM1) displays a pattern other than “8.”, check the following:

(1) Confirmation item

Determine which of the following problems are evident.

1. Nothing is displayed on the CRT/MDI.
2. Only the message “WAITING FOR CRT DATA” appears on the CRT/MDI.
3. A position display appears on the CRT/MDI, and the keys are ineffective.

(2) Causes and remedies

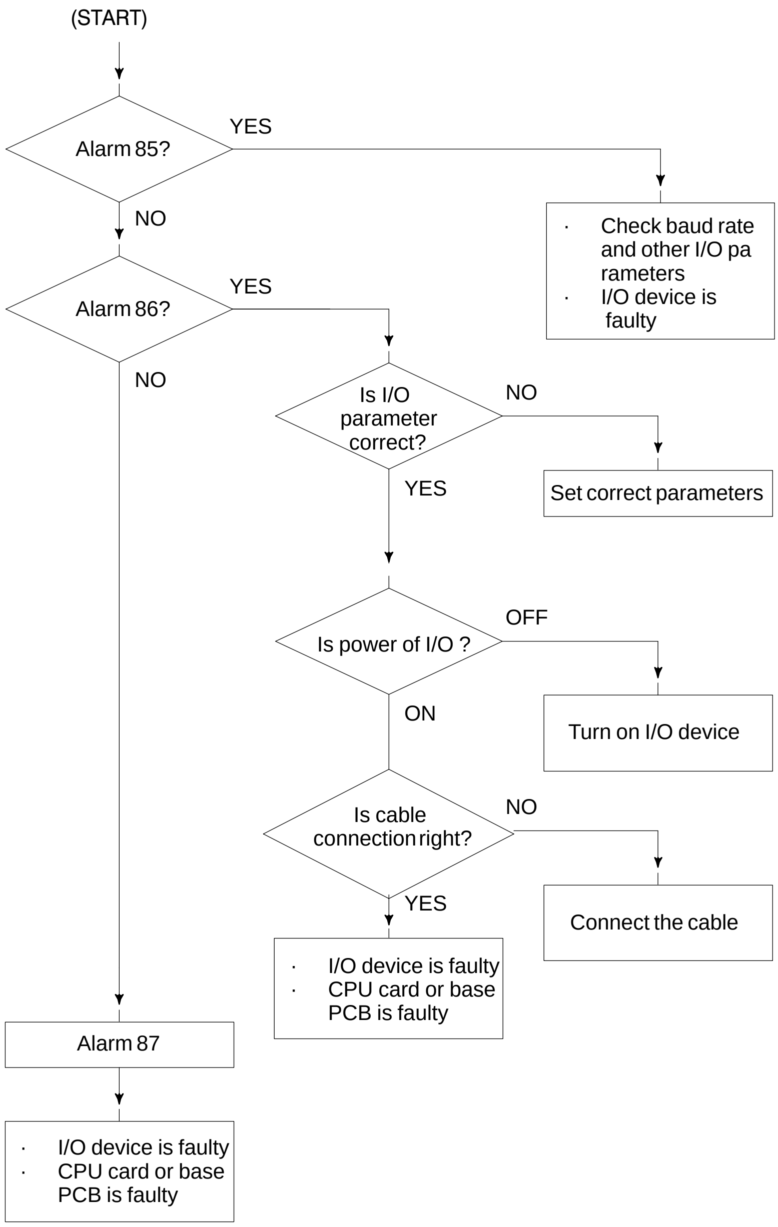
1. If nothing is displayed on the CRT/MDI.
   - The power being supplied to the CRT/MDI is abnormal (check the power supply).
   - The CRT/MDI is defective (replace the CRT/MDI).
2. If only the message “WAITING FOR CRT DATA” appears on the CRT/MDI.
   - Incorrect cable connection (correct)
   - Defective cable (repair or replace)
   - Defective CRT control unit (replace the base PC board)
   - Incorrect setting of CRT link (correct the setting)
3. A position display appears on the CRT/MDI, and the keys are ineffective.
   - Defective cable (repair or replace)

2. When system is in trouble

If the 7–segment LED (LEDM1) still displays the pattern “8.”, the system is operating normally.

It is likely that the CPU card, base printed–circuit board, or DRAM module is defective.

7.9 ALARM 85 TO 87 (READER/PUNCHER INTERFACE ALARM)



Causes

(a) Parameters on reader/puncher interface are not correct.
Check the following setting data and parameters.
(b) External I/O device or host computer is faulty.
(c) CPU card or base PCB is faulty.
(d) Cable between Power Mate and I/O device is faulty.
(e) An incorrect channel is in use.
(f) Channel 2 has attempted to use an I/O unit that needs a control line.

Countermeasures

(a) Parameters on reader/puncher interface are not correct.

Check the following setting data and parameters:
<Setting>
PUNCH CODE=0 OR 1 (0: EIA,1:ISO)
Select ISO or EIA according to the type of I/O device.
If punch code does not match, alarm 86 will generate.

<table>
<tr><th colspan="2">Function \ Value of parameter 0020</th><th>0</th><th>1</th><th>2</th></tr>
<tr><td colspan="2">Feed</td><td>0101#7</td><td>0111#7</td><td>0121#7</td></tr>
<tr><td colspan="2">Data input code</td><td>0101#3</td><td>0111#3</td><td>0121#3</td></tr>
<tr><td colspan="2">Stop bit</td><td>0101#0</td><td>0111#0</td><td>0121#0</td></tr>
<tr><td colspan="2">Type of I/O device</td><td>102</td><td>112</td><td>122</td></tr>
<tr><td colspan="2">Baud rate</td><td>103</td><td>113</td><td>123</td></tr>
<tr><td rowspan="2">Communication method</td><td>0135#3</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td></td><td colspan="3">RS–232–C</td></tr>
<tr><td colspan="2" rowspan="2">Connector</td><td colspan="3">JD42</td></tr>
<tr><td colspan="2">Channel 1</td><td>Channel 2</td></tr>
</table>

NOTE
Numbers in the table indicate parameters and bit numbers.
Example) 101#7:bit7 of parameter 101.

	#7	#6	#5	#4	#3	#2	#1	#0
0101	NFD				ASI			SB2
0111								
0121								

NFD 0 : Feed is output before and after data in data output (FANUC PPR)
1 : Feed is not output (standard).

ASI 0 : Data input code is EIA or ISO (automatic recognition)
1 : Data input code is ASCII.

SB2 0 : No. of stop bits is 1.
1 : No. of stop bits is 2.

0102	Type of I/O device
0112	
0122	

Set Value	Input/output device
0	RS–232–C (except the following for connection with a PC)
3	FANUC Handy File

NOTE
I/O channel 2 has no control line. It can use only an I/O unit that can be controlled using DC codes.

0103	Baud rete
0113	
0123	

Value	Baud rate
7	600
8	1200
9	2400
10	4800
11	9600
12	19200

(b) External I/O device or Host computer is in trouble

(i) Check whether the setting on communication of external I/O device or host computer is the same as that of the Power Mate. (baud rate, stop bits,etc.) If they are not the same, change the setting.

(ii) When spare I/O device presents, check whether it is possible to realize communication using the spare I/O device.

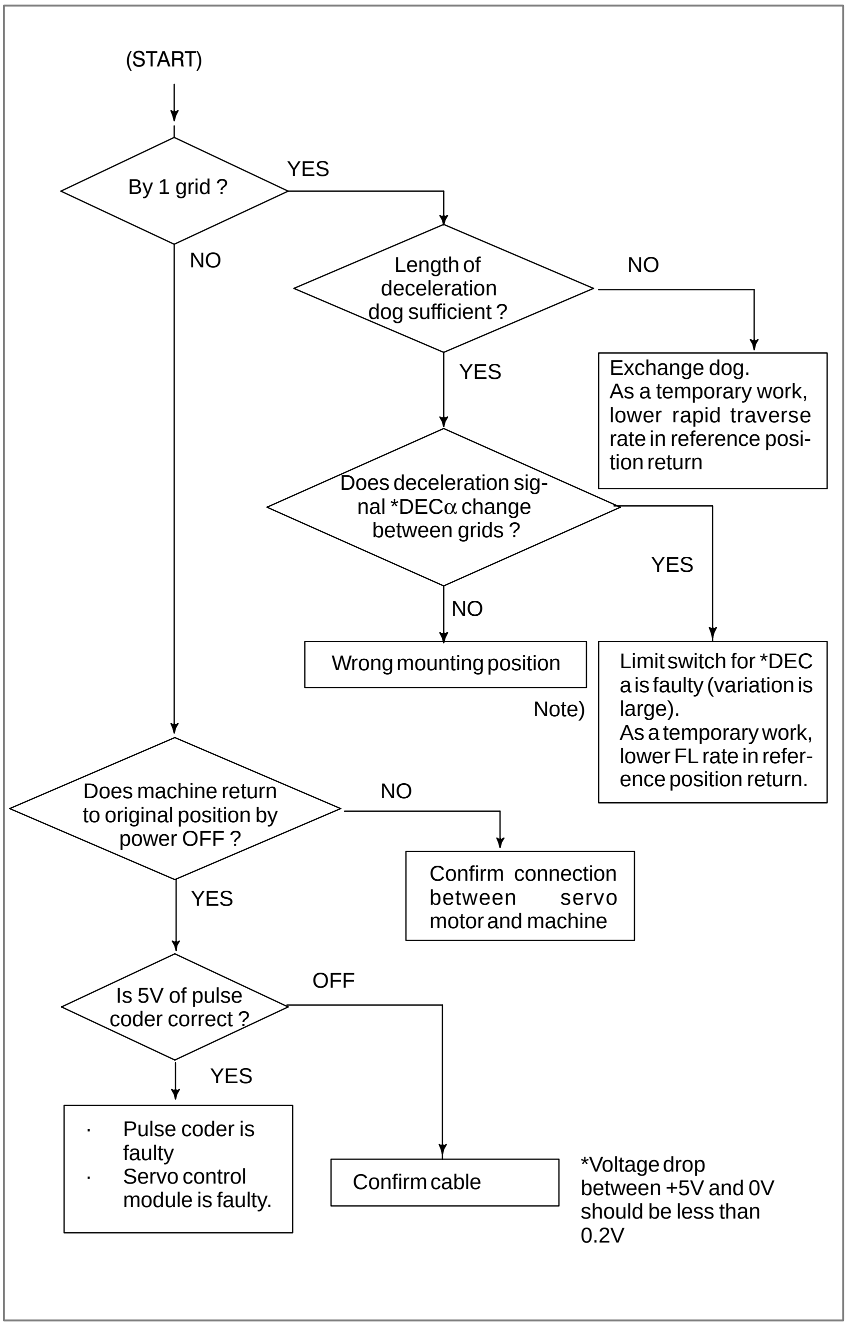
(c) CPU card or base PC board is faulty

Replace the CPU card or base PC board.

(d) Cable between Power Mate and I/O device is faulty.

Check the cable for disconnection or wrong connection.

7.10 REFERENCE POSITION DEVIATES



NOTE

If zero point adjustment is made by grid shifting, the grids themselves are shifted. It is necessary to confirm that the *DECα deceleration signal changes almost at a midpoint between shifted grids.

7.11 ALARM 90 (REFERENCE POSITION RETURN IS ABNORMAL)

Contents

An attempt was made to return to the reference position without satisfying the condition that, when the tool is moving toward the reference position with a positional deviation (DGN. 300) of 128 or more pulses, at least a one–turn signal is received.
Moreover, for the α absolute pulse coder, a reference position return was attempted without first turning the power off then on again after rotating the motor one turn when the system is started, or when the battery is replaced in response to a battery zero alarm.

Countermeasures

(START)

α absolute pulse?

YES →

Ensure that, after the occurrence of a battery alarm (306), the battery was restored to its normal state, the motor was rotated through at least one turn, and that the power was turned off then on again.

Was the motor rotated through at least one turn, and was the power turned off then on again?

YES

NO

Rotate the motor through at least one turn, then turn the power off then on again.

NO

Check whether position gain is greater than 128 pulses (DGN 300) before or during reference position return.

Position error amount : 300

128 or more

YES → (1) Next page

NO

Raise the speed

Check feed rate command:

Parameter 1420 F : Rapid traverse rate (mm/min)
Parameter 1424 Manual rapid traverse rate (mm/min)
Parameter 1825 G : Servo loop gain (0.01sec–1)

$$\text{Position error} = \frac{F \times 5000/3}{G \times \text{detection unit } [\mu m/\text{PLUSE}]}$$

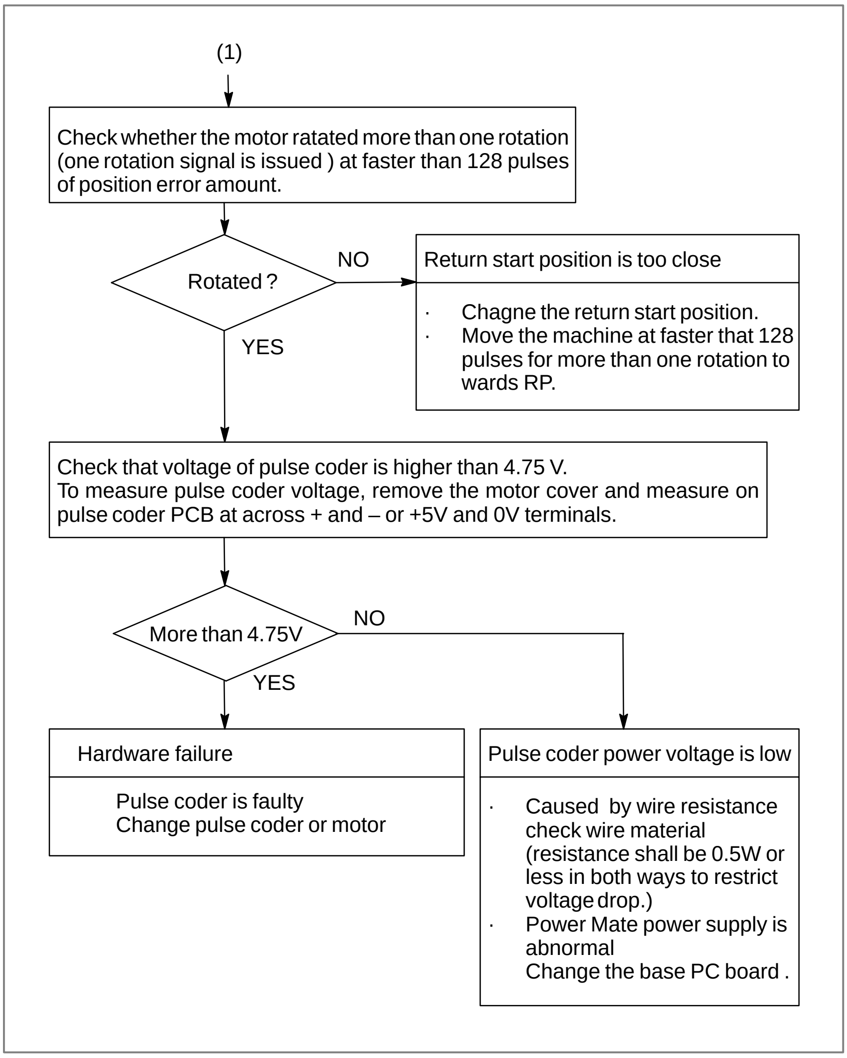
Detection unit : Move amount to a command pulse (usually 1μm)
In metric machine, if the no. of digits below decimal point is 4 on the position display screen, detection unit is 0.1 μm.

Check rapid traverse override signals :

ROV1 DGN G14.0
ROV2 DGN G14.1
Parameter 1421 Fo rate

ROV1	ROV2	Override
0	0	100%
1	0	50%
0	1	25%
1	1	Fo rate

Check reference position return deceleration signal
DEC1 to DEC8
See Subsec. 7.1.2.
When reference position return is started from deceleration signal 0, feed rate becomes FL rate.
Parameter 1425 FL rate



CAUTION

After the pulse coder or motor is exchanged, reference position or machine's standard point may be different from former one. Please set it correctly.

- **Reference**

A speed more than 128 pulses is required because if speed is lower that this, one–rotation signal does not function stably, causing improper position detection.
If bit 0 of parameter No. 2000 is set to 1, a speed corresponding to a positional deviation of 1280 pulses or more is required.
Parameter No. 1836 can be set to 128 or less, as the minimum positional deviation with which reference position return is possible. (If the parameter is set to 0, 128 is assumed as the minimum positional deviation. If bit 0 of parameter No. 2000 is set to 1, a value equal to ten times the set value is used for checking.)

7.12 ALARM 300 (REQUEST FOR REFERENCE POSITION RETURN)

Absolute position data in the serial pulse coder was lost.
[This alarm occurs if the serial pulse coder is replaced, the position feedback signal line is removed from the serial pulse coder, the battery or its cable is removed, or parameters are loaded into the Power Mate as a batch.]

Remedies

Machine position must be memorized using the following method:
If a battery alarm (306) occurs in the α pulse coder, recover the normal battery status, rotate the motor through at least one turn, then turn the power off then on again.

- **When dog reference position return function is present**

(1) Execute manual reference position return only for an axis for which this alarm was generated.When manual reference position return cannot be executed because of an another alarm, set parameter 1815#5 to 0 and release the alarm and perform manual operation.

(2) Press RESET key at the end of reference position return to release the alarm.

- **When dog reference position return function is not present**

Execute dogless reference position setting to memorize the reference position.

- **When serial pulse coder is changed**

Since the reference position is different from the former one, change the grid shift value (PRM 1850) to correct the position.

Related parameters

	#7	#6	#5	#4	#3	#2	#1	#0
1815			APC x	APZx				

APCx 0 : Position detector is incremental pulse coder.
1 : Position detector is absolute pulse coder.

APZx Reference position of absolute pulse coder is :

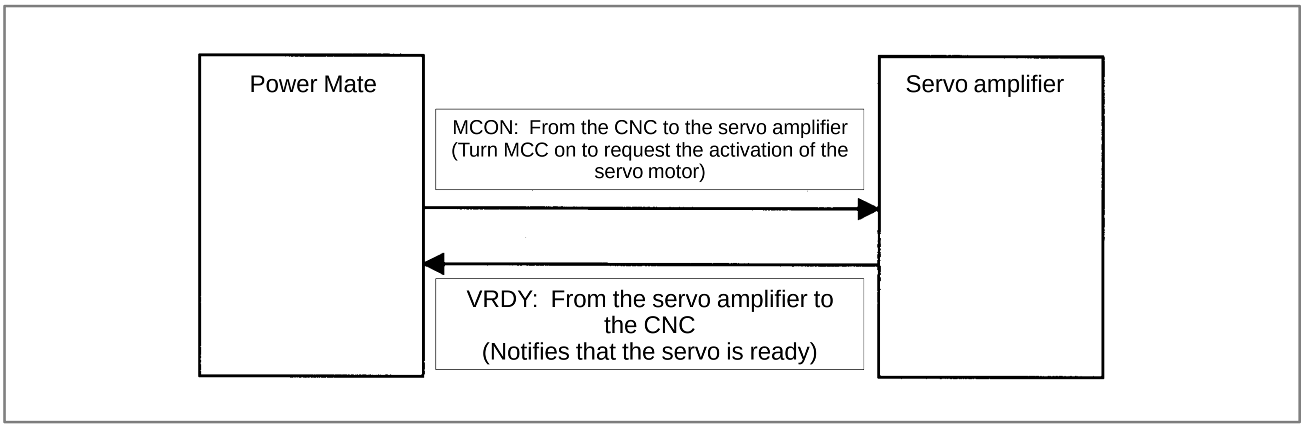
0 : not established
1 : established

7.13 ALARM 401 (V READY OFF)

Causes and actions

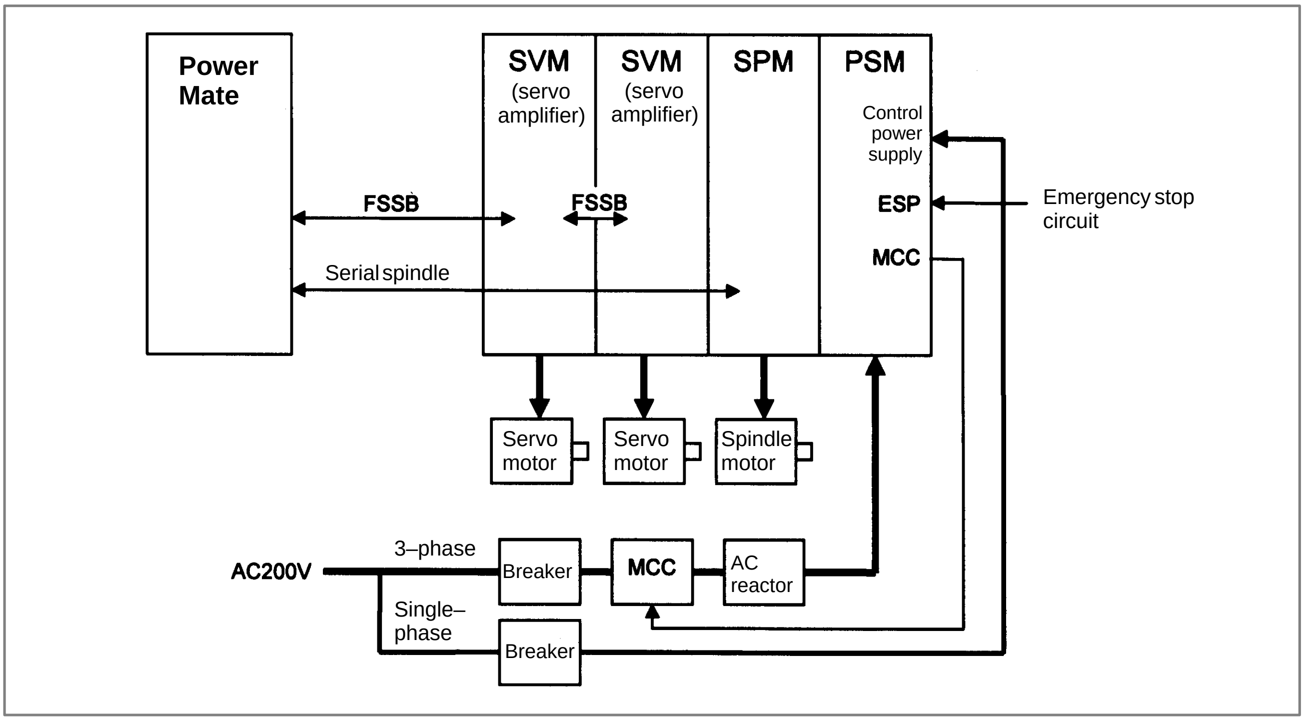
This alarm is issued if the servo ready signal (VRDY) of a servo amplifier does not turn on or if the signal turns off during operation.
There are cases in which this alarm is issued because another servo alarm is issued. If this occurs, first take the action for the first alarm.
Check the power magnetic circuit around the amplifier. The servo amplifier or the axis control cards on the Power Mate may be defective.

- **VRDY**



The exchange of this information is performed via the FSSB (optical cable).

- **Example of connection around the amplifier (Typical example)**



Check items

- Is the PSM control power supply on?
- Has an emergency stop been canceled?
- Is a terminating connector connected to the JX1B connector of the terminating amplifier?
- Is MCC on? If there is an external MCC sequence in addition to the MCC contact of the PSM, check that sequence also.
- Is the power for driving MCC supplied?
- Is the breaker on?
- Has some alarm been issued in the PSM or SPM?

- **Replacing the servo amplifier**

If no problem is found in the power magnetic circuit around the amplifier, replace the servo amplifier.

- **Replacing the axis control cards**

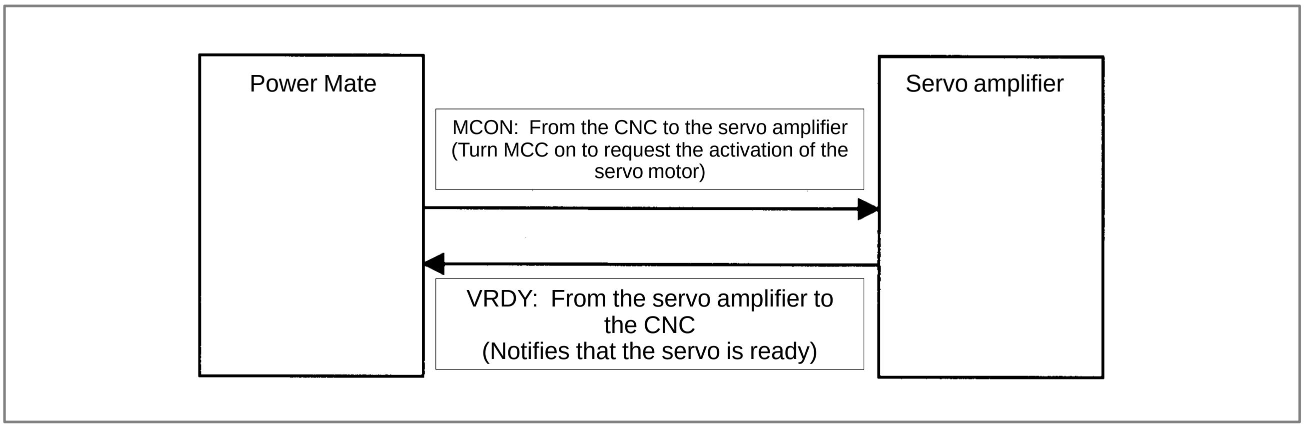
If the above action does not solve the problem, replace the axis control cards. (See Subsec. 2.3.2.)

7.14 ALARM 404 (V READY ON)

Causes and actions

This alarm is issued if the servo ready signal (VRDY) of a servo amplifier remains on.
The servo amplifier or the axis control cards on the Power Mate may be defective.

- **VRDY**



The exchange of this information is performed via the FSSB (optical cable).
This alarm is issued if VRDY remains on when the Power Mate turns MCON off or if VRDY turns on before the Power Mate turns MCON on.

- **Replacing the servo amplifier**

The servo amplifier may be defective. Replace the servo amplifier.

- **Replacing the axis control cards**

If replacing the servo amplifier does not solve the problem, replace the axis control cards. (See Subsec. 2.3.2.)

7.15 ALARM 462 (SEND CNC DATA FAILED)

Alarm 463 (SEND SLAVE DATA FAILED)

Causes and actions

Alarm 462 is issued if a slave (servo amplifier) cannot receive correct data due to an FSSB communication error.
Alarm 463 is issued if the Power Mate cannot receive correct data due to an FSSB communication error.
If these alarms are issued, the alarm message indicates the number of the defective axis (axis name).

- **Servo amplifier or optical cable**

Any of the optical cables between the Power Mate control unit and the amplifier corresponding to the axis number indicated in the alarm message may be defective.
Or, any of the first amplifier to the amplifier corresponding to that axis number may be defective.

- **Axis control cards**

The axis control cards installed on the Power Mate may be defective.
Replace the axis control card while referring to Subsection 2.3.2.

7.16 ALARM 417 (DIGITAL SERVO SYSTEM IS ABNORMAL)

Digital servo parameters are abnormal.
(Digital servo parameters are set incorrectly.)
When alarm 315 is occured at the same time, check the cause of alarm 351 of section 9.16.

- **Causes**

1 Confirm the setting value of the following parameters:

PRM 2020 : Motor format number
PRM 2022 : Motor rotation direction
PRM 2023 : Number of pulses of velocity feedbacks
PRM 2024 : Number of pulses of position feedback
PRM 1023 : Servo axis number
PRM 2084 : Flexible feed gear ratio
PRM 2085 : Flexible feed gear ratio

Confirm the details with diagnosis function.

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

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

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

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

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

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

2 Change the setting of this parameter to 0.

PRM 2047 : Observer parameter

3 Perform initial setting of digital servo parameters.

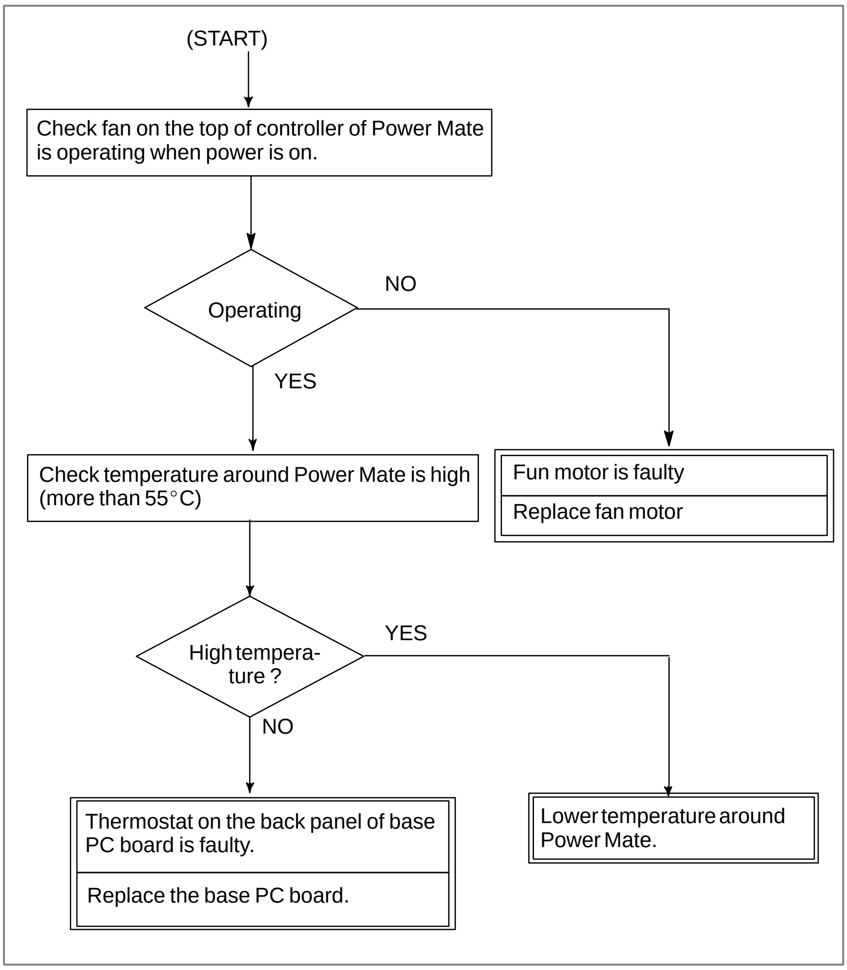
Refer to setcion 5.1 “Initial Setting of Servo Parameters” .

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

7.17 ALARM 700 (OVERHEAT AT CONTROL SIDE)

Because an ambient temperature of Power Mate becomes high, a thermostat mounted on Power Mate and informs an alarm.

Remedies



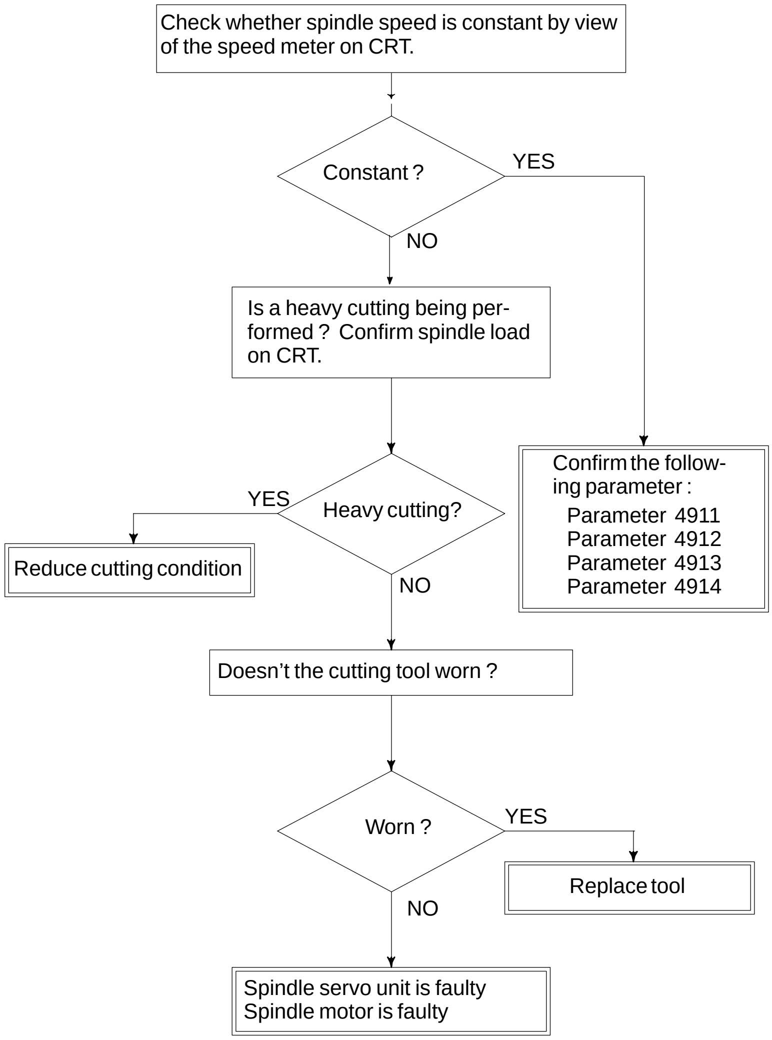
CAUTION
When the base printed–circuit board is replaced, all data in the memory will be lost because the memory module is dismounted. Re–set up the data by referring to Chapter 3.

NOTE
The fan motor is a consumable.

7.18 ALARM 704 (SPINDLE SIDE OVERHEAT)

The spindle speed changes abnormally due to load, so the spindle is overheated.

Remedies



Remedies

PRM 4911 : A ratio of spindle speed at which actual spindle speed is regarded as arrived at a command spindle speed.

PRM 4912 : Spindle speed fluctuation ratio up to which the spindle speed fluctuation detection alarm is not issued.

PRM 4913 : Spindle speed fluctuation that is not regarded as the spindle speed fluctuation alarm.

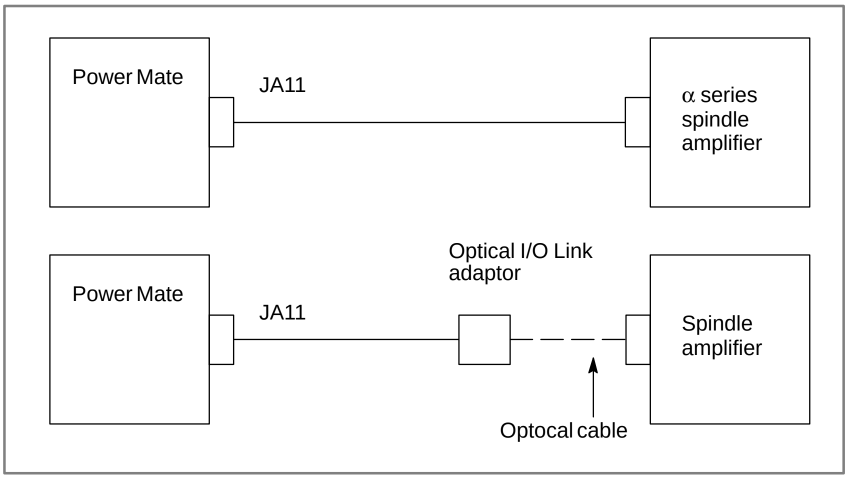
PRM 4914 : Time when a spindle speed changed to when spindle speed fluctuation detection is started.

7.19 ALARM 749 (SERIAL SPINDLE COMMUNICATION ERROR)

Communication error has generated in serial spindle

Causes and Remedies

Improper connection between the Power Mate and the serial spindle. The following reason is considered.



Base PC board is faulty.
A cable between the base PC board and optical I/O link adapter is disconnected or short–circuited.
Optical I/O link adapter is faulty.
Optical cable is disconnected.
Serial spindle amplifier is faulty.
Noise occurs.

CAUTION
When the base printed–circuit board is replaced, all data in the memory will be lost because the memory module is dismounted. Re–set up the data by referring to Chapter 3.

7.20 ALARM 750 (SPINDLE SERIAL LINK CANNOT BE STARTED)

When the spindle amplifier does not become normal state immediately after power is turned on in the serial spindle system, this alarm is informed.

Points

This alarm does not occur once the system becomes ready including the spindle system .
This alarm occurs during power on sequence before the system becomes ready.
After the system becomes ready, serial spindle alarm is issued by alarm 749.

Causes

(1) Cable is in poor contact or spindle amplifier power is off.

(2) When display of spindle amplifier shows SU–01 or an alarm other than AL–24 is displayed, power to the Power Mate is turned on.

In this case, this alarm usually occurs when the Power Mate's power is turned off while the serial spindle is operating. Turn off the power of serial spindle once, then turn it on and starts the system.

Details of Alarms

Confirm the details of troubles on diagnostic 409.

		#7	#6	#5	#4	#3	#2	#1	#0
DGN	0409					SPE		S1E	SHE

SPE 0 : In spindle serial control, the serial spindle parameters satisfies the starting conditions for spindle amplifier.
1 : In spindle serial control, the serial spindle parameters do not satisfy the starting conditions for spindle amplifier.

S1E 0 : When spindle serial control was started, the spindle was normal.
1 : When spindle serial control was started, an error was detected on the spindle.

SHE 0 : The Power Mate is normal.
1 : An error was detected in the serial communication section of the Power Mate.

Remedies

Reform the following countermeasures based on the above configurations:

(1) SPE=1 : In spindle serial control, the serial spindle parameters does not satisfy the starting conditions for spindle amplifier.

↓

Confirm the settings of parameters 4000s.
Especially checks the parameters those are changed from the standard parameters.

(2) S1E=1 : When an abnormality is found in the spindle at the start of serial spindle control, exchange the unit if the following check items are not concerned.

↓

Check the parameters and connections at the spindle to see whether the 1st spindle is mechanically and electrically connected.

↓

If the above setting and connection are normal, it is likely that the base printed–circuit board or spindle amplifier is defective.

(3) SHE=1 : If an error is detected in the serial communication section of the Power Mate, it is necessary to replace the base printed–circuit board.

> **CAUTION**
> When the base printed–circuit board is replaced, all data in the memory will be lost because the memory module is dismounted. Re–set up the data by referring to Chapter 3.

7.21 ALARM 5134 (FSSB: OPEN READY TIME OUT)

ALARM 5135 (FSSB: ERROR MODE)

ALARM 5137 (FSSB: CONFIGURATION ERROR)

ALARM 5139 (FSSB: ERROR)

ALARM 5197 (FSSB: OPEN TIME OUT)

ALARM 5198 (FSSB: ID DATA NOT READ)

Causes and actions

These alarms are issued if any of the axis control cards and the slaves (such as servo amplifiers) and optical cables connected to the FSSB is defective.

No.	Message	Description
5134	FSSB: OPEN READY TIME OUT	The FSSB did not become ready to open during initialization.
5135	FSSB: ERROR MODE	The FSSB entered an error mode.
5137	FSSB: CONFIGURATION ERROR	The FSSB detected a configuration error.
5139	FSSB: ERROR	Servo initialization did not terminate normally.
5197	FSSB: OPEN TIME OUT	The FSSB did not open when the Power Mate had allowed the FSSB to open.
5198	FSSB: ID DATA NOT READ	The initial ID information for the amplifier cannot be read because of a failure in the temporary assignment.

- **Processing of the FSSB at power on**

The processing of the FSSB at power on is as described below:

1 The Power Mate initializes the FSSB and the servo.

2 The servo returns the first ready signal.

3 The first ITP interrupt is generated.

4 The Power Mate waits for the FSSB to become ready to open.

5 The Power Mate checks that the FSSB did not detect a configuration error.
6 The Power Mate allows the FSSB to open.
7 The Power Mate checks that the FSSB has opened.
8 The servo returns the second ready signal.
9 Normal operation

If the FSSB does not become ready to open in 4, alarm 5134 is issued.
If an error is detected in 5, alarm 5137 is issued.
If the FSSB does not open within a fixed period of time, alarm 5197 is issued.
If the ready signal is not returned within a fixed period of time, alarm 5198 is issued.

- **Checking the parameter settings**

Check that the FSSB–related parameters are set correctly.

- **Power supplies of the servo amplifiers**

Check the power supplies of the servo amplifiers connected to the FSSB.

- **Replacing the axis control cards, optical cables, and servo amplifiers**

Replace the axis control cards on the Power Mate.
Replace the optical cables and servo amplifiers connected to the FSSB, one at a time, to identify the defective item.

7.22 ALARM 900 (ROM PARITY ERROR)

ROM parity error occurred.

Causes

(1) Based PC board mounted on the base PC board or BOOT software on the CPU card is defective.

```
SYSTEM ALARM                              88E0-01

900  ROM PARITY
     CNC ROM

              F82        Defective file
                         or ROM is displayed
```

Confirm the series and versions of control software those are displayed on upper right of the screen.

Rededies

Replace the memory or CPU card.

Be careful about the version of the system software and boot software stored on each card. (Observe the CAUTION described in Sections 2.6.2 and 2.6.3.)

* The memory module contains the following data, which has been written by the machine tool builder. Once the memory module has been replaced, it becomes necessary to restore these programs.
  Ladder program produced by MTB, macro executer program produced by MTB, and C language executer produced by MTB

CAUTION
The memory module incorporates also a battery–backed SRAM. When the memory module is replaced, the data in the SRAM will also be removed. So it is necessary to re–set up the data in the SRAM.

7.23 ALARM 910, 911 (SRAM PARITY ERROR)

A parity error has occurred in the SRAM used for data backup.

Causes and countermeasures

- **SRAM module is faulty. Stored data is faulty.**

If the alarm is issued immediately after the power is turned on, turn off the power, then turn it on while holding the RESET and DELETE keys to clear all SRAM memory contents.
If the parity alarm still exists even after the memory all clear operation, the memory module or base PC board may be faulty. So, replace the SRAM module or base PC board.

- **Voltage drop in the memory backup battery**

A battery alarm is issued if the voltage level drops to TYP 2.5 V (2.3 V to 2.7 V) or lower when the voltage rating is 3.0 V.
When the voltage of the memory backup battery has lowered, “BAT” displays at the bottom of the screen.
When the battery alarm is turned on, replace the battery with a new lithium battery as soon as possible.

- Replace the battery according to Section 2.8.

- **The base PC board is faulty.**

If an alarm condition can be reset by clearing the entire memory, it is likely that the backup circuit is defective. Replace the base printed–circuit board.

> **CAUTION**
> When the base PC board or memory module is replaced, all the data stored in memory is lost. Set data again, referring to Chapter 3 “INPUT AND OUTPUT OF DATA”.

7.24 ALARM 912 TO 919 (DRAM PARITY ERROR)

A parity error occurred in the DRAM module.

Cause and countermeasure

The DRAM module on the CPU card may be faulty. Replace the DRAM module.

7.25 ALARM 920 AND 921 (WATCH DOG OR RAM PARITY)

Watch dog alarm or RAM parity in servo control modul has occurred in servo control module.

points

- **Watch dog timer alarm**

The timer used to monitor the operation of CPU is called the watch dog timer. The CPU resets timer every time a constant time has passed. When an error occurs in CPU or peripheral device, timer is not reset but the alarm is informed.

- **RAM parity error**

This is a RAM parity error on the axis control card.

Causes and Remedies

- **Servo control module is faulty**

The servo module includes servo RAM, watch dog timer circuit, etc. Defectiveness of hardware, abnormality or malfunctioning of detection circuit or the like is considered. Therefore, replace servo control module.

- **Base PC board is faulty**

CPU or peripheral circuits may be faulty. Replace the mother board or CPU card.

- **Memory module is faulty**

Software may not work properly due to failure of memory module. Change memory module.

CAUTION
When the base PC board or memory module is replaced, all the data stored in memory is lost. Set data again, referring to Chapter 3 “INPUT AND OUTPUT OF DATA”.

7.26 ALARM 930 (CPU ERROR)

930: CPU error has generated.
Alternatively, a FANUC I/O Link cable wire has broken, or the power of the master or another slave has been switched off.

Causes and Remedies

1) Base PC board or CPU card is faulty

An interrupt which will not occur during usual operation has generated.
Peripheral circuit of the CPU may be abnormal. Change the base PC board or CPU card. If operation is performed normally by power off and on, noise may be a cause. Refer to Section. 2.14 “Suppressing Noise”.

2) Memory module is faulty

Replace the memory module.

CAUTION
When the base PC board and memory module are replaced, all the data stroed in memory is lost. Set data again, referring to Chapter 3 “INPUT AND OUTPUT OF DATA”.

3) FANUC I/O Link slave functions

· Poor contact in connector JD1A or JD1B
· The power for the I/O Link master unit is off.
· The power for another I/O Link slave unit is off.

7.27 ALARM 935 (SRAM ECC ERROR)

Causes and Remedies

An ECC error occurred in the SRAM that contains data such as parameters and machining programs.
This error occurs when the battery mounted on the faceplate of the base printed–circuit board becomes weak or when data stored in the SRAM is destroyed by an external cause. Alternatively, this error may be due to a failure in the memory module or base printed–circuit board.

- **ECC check**

The ECC check method is a method of checking data stored in the SRAM. This method is employed in place of the conventional parity check.
With the ECC check method, 8–bit correction data is provided for 16–bit data. If a data error occurs in any bit of the 16 bits, the error is automatically corrected by the correction data, and the CNC operation can be continued. This alarm is issued when a data error occurs in more than one bit.
With the conventional parity check method, even a single–bit data error resulted in a system alarm.

- **Battery check**

The battery is rated at 3 V. If the battery becomes weak, causing a voltage drop to Typ 2.5 V (2.3 V–2.7 V), a battery alarm is issued, and “BAT” displays on the screen.
If a battery alarm is issued, replace the battery with a new one as soon as possible.

> **NOTE**
> The battery is a consumable.

- **Attempting memory all–clear operation**

Perform memory all–clear operation to start the CNC. Alternatively, when there is already a backup copy of SRAM data, restore the data. Use the boot system for SRAM data backup and restoration.

- **Replacing the memory module**

If the alarm still exists after memory all–clear operation or backup data restoration, replace the memory module.
After replacing the memory module, perform memory all–clear operation to start the CNC. In this case, all data must be set again.
When there is backup data, restore the data then start the CNC.

- **Replacing the base printed–circuit board**

If the alarm still exists even after the above action is taken, replace the printed–circuit board.

7.28 ALARM 950 (PMC SYSTEM ALARM)

An error occurred when RAM test is being executed.

Alternatively, there is a poor connection in the FANUC I/O Link master function, or the power for a slave unit has been switched off.

Causes and Remedies

(1) Defective unit

The following causes are considered :

· CPU card is faulty
· DRAM module is faulty
· Memory module is faulty.
· Base PC board is faulty.

Replace the above PC boards.

> **CAUTION**
> When the base PC board or memory module is replaced, all the data stored in memory is lost. Set data again, referring to Chapter 3 “INPUT AND OUTPUT OF DATA”.

(2) FANUC I/O Link master function

The probable causes are:

· Poor contact in connector JD1A
· The power for an I/O Link slave unit is off.
· An I/O Link cable wire has broken.

> **NOTE**
> With the basic function version 03 and later versions, if the alarm is due to the I/O Link master function, alarm 977 is indicated.

7.29 ALARM 951 (PMC WATCH DOG ALARM)

A watch dog alarm has generated in PMC.

Causes and Remedies

Base PC board is falty.

Replace the base PC board.

> **CAUTION**
> When the base printed–circuit board is replaced, all data in the memory will be lost because the memory module is dismounted. Re–set up the data by referring to Chapter 3.

7.30 ALARM 972 (NMI ALARM)

NMI is generated in an option board.

Causes and Remedies

(1) The option board connected to a mini–slot of the Power Mate may be defective.
Replace the option board connected to the slot where NMI was generated. The slot is indicated by the slot number as follows:

```
SYSTEM ALARM                                      DDF1-02

972 NMI OCUURRED IN OTHER MODULE

   SLOT 01
   910 SRAM PARITY:(BYTE0)  <LC
```

The slot number of the slot where NMI was generated and a message are displayed.

7.31 ALARM 973 (NMI ALARM BY UNKNOWN CAUSE)

An unknown NMI has generated.
This alarm may also be issued when the FANUC I/O link is disconnected while the Power Mate is being used as the slave of the I/O link.

Causes and Remedies

1) Base PC board or CPU board is faulty
   - Base PC board is faulty.
   - CPU card is faulty.
2) The power to those units connected to the I/O link is turned off, or a system alarm is issued.
   Turn the power off, then back on again. This clears the alarm.

CAUTION
When the base printed–circuit board is replaced, all data in the memory will be lost because the memory module is dismounted. Re–set up the data by referring to Chapter 3.

NOTE
With the basic function version 03 and later versions, if the alarm is due to the I/O Link, alarm 977 is indicated.

7.32 ALARM 974 (F–BUS ERROR)

Causes and actions

A bus error occurred on the FANUC–BUS connecting each option board.

This alarm indicates that a fault occurred during the exchange of data between the base printed–circuit board and an option board.
This alarm is also issued if an error occurs during the exchange of data between the base printed–circuit board and the PMC control circuit.

- **Replacing the option boards**

Replace the installed option boards, one at a time.

- **Replacing the back panel**

Replace the back panel.

- **Replacing the CPU card**

Replace the CPU card on the base printed–circuit board.

- **Replacing the base printed–circuit board**

Replace the base printed–circuit board.

- **F–BUS error on an option board**

If alarm 972 is issued, indicating on the screen that an F–BUS error occurred on an option board, replace the option board on which the F–BUS error occurred.

Screen display example

```
SYSTEM ALARM

972 NMI OCCURRED IN OTHER MODULE

    SLOT 01
    974 F-BUS ERROR <SUB
```

7.33 ALARM 975 (BUS ERROR)

Causes and actions

A bus error occurred on the base printed–circuit board. This alarm indicates that an error occurred during the exchange of data within the base printed–circuit board.

- **Replacing the CPU card**

Replace the CPU card on the base printed–circuit board.

- **Replacing other cards and modules**

Replace the axis control cards, memory module, and FROM module, one at time.

- **Replacing the base printed–circuit board**

Replace the base printed–circuit board.

7.34 ALARM 976 (LOCAL BUS ERROR)

Causes and actions

A bus error occurred on the local bus on the base printed–circuit board.

This alarm indicates that an error occurred during the exchange of data within the base printed–circuit board.

- **Replacing the CPU card**

Replace the CPU card on the base printed–circuit board.

- **Replacing other cards and modules**

Replace the axis control cards, DRAM module, FROM module, and SRAM module, one at a time.

- **Replacing the base printed–circuit board**

Replace the base printed–circuit board.

7.35 SERVO ALARMS

For an explanation of the following servo alarms, refer to the FANUC CONTROL MOTOR α Series Maintenance Manual (B–65165).

Number	Message	Contents	*
417	n–TH AXIS–PARAMETER INCORRECT	The setting of a servo–related parameter is incorrect.	417
430	n AXIS: SV. MOTOR OVERHEAT	A servo motor overheat occurred.	400
431	n AXIS: CNV. OVERLAOD	PSM: Overheat occurred.	
432	n AXIS: CNV. LOWVOLT CON./ POWERFAULT	PSM: Phase missing occurred in the input voltage. PSMR: The control power supply voltage has dropped.	414
433	n AXIS: CNV. LOW VOLT DC LINK	PSM: The DC link voltage has dropped. PSMR: The DC link voltage has dropped.	
434	n AXIS: INV. LOW VOLT CONTROL	SVM: The control power supply voltage has dropped.	
435	n AXIS: INV. LOW VOLT DC LINK	SVM: The DC link voltage has dropped.	
436	n AXIS: SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).	
437	n AXIS: CNV. OVERCURRENT POWER	PSM: Overcurrent flowed into the input circuit.	
438	n AXIS: INV. ABNORMAL CURRENT	SVM: The motor current is too high.	
439	n AXIS: CNV. OVERVOLT POWER	PSM: The DC link voltage is too high.	
440	n AXIS: CNV. EX DECELERATION POW.	PSMR: The regenerative discharge amount is too large.	
441	n AXIS: ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.	
442	n AXIS: CNV. CHARGE FAULT/INV. DB	PSM: The spare discharge circuit of the DC link is abnormal. PSMR: The spare discharge circuit of the DC link is abnormal.	
443	n AXIS: CONV. COOLING FAN FAILURE	PSM: The internal stirring fan failed. PSMR: The internal stirring fan failed.	
444	n AXIS: INV. COOLING FAN FAILURE	SVM: The internal stirring fan failed.	
445	n AXIS: SOFT DISCONNECT ALARM	The digital servo software detected a broken wire in the pulse coder.	416
446	n AXIS: HARD DISCONNECT ALARM	A broken wire in the built–in pulse coder was detected by hardware.	

NOTE
The alarm numbers mentioned in the above manual are those shown in the * column.

7.36 SPC ALARMS

For an explanation of the following SPC alarms (serial pulse coder alarms), refer to the FANUC SERVO MOTOR α Series Maintenance Manual (B–65165E).

Number	Message	Contents	*
360	n AXIS: ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.	350
361	n AXIS: ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.	
362	n AXIS: ABNORMAL REV. DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.	
363	n AXIS: ABNOMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.	
364	n AXIS: SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built–in pulse coder.	
365	n AXIS: BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.	
366	n AXIS: PULSE MISS (INT)	An LED error occurred in the built–in pulse coder.	
367	n AXIS: COUNT MISS (INT)	A count error occurred in the built–in pulse coder.	
368	n AXIS: SERIAL DATA ERROR (INT)	Communication data from the built–in pulse coder cannot be received.	351
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.	

NOTE
The alarm numbers mentioned in the above manual are those shown in the * column.

7.37 SPINDLE ALARMS

For an explanation of the following spindle alarms, refer to the FANUC CONTROL MOTOR α Series Maintenance Manual (B–65165).

Number	Contents	*
7101 to 7199	Spindle alarm (AL–01 to 99)	751

NOTE
The alarm numbers mentioned in the above manual are those shown in the * column.

7.38 NO SIGNAL CHANGE IN FANUC I/O Link MASTER

Point

Determine whether the FANUC I/O link is established.
Turn on the power to the Power Mate and the slave of the FANUC I/O link (such as an I/O card or I/O unit). After the Power Mate *i* screen has appeared, turn off only the power to the Power Mate *i*. If a communication alarm is issued by the slave unit (the red LED lights), the FANUC I/O link has already been established.

Causes and Remedies

(1) When the FANUC I/O link has not yet been established

- Slave unit allocation error on the Power Mate
  → Refer to the PMC documentation or "Power Mate–MODEL *i*–D/H Connection Manual (Function)" (description of the FANUC I/O link function in "PMC Interface") to set the slave unit correctly.
- Faulty cable contact
  → Make sure that the Power Mate connector is JD1A1 and that the slave connector is JD1B. Alternatively, after turning the power off, disconnect the cable, then connect it again.
- Wrong cable
  → The cable used for the FANUC I/O link function features pins that are not connected straight through. For example, pin 1 of one connector is connected to pin 3 of the other connector. Check the connection.
- Defective Power Mate or slave unit
  → Replace the Power Mate or slave unit.

(2) When the FANUC I/O link has already been established
Check the connection between the machine and slave unit, I/O signal X/Y to the PMC, ladder, and others.

7.39 FSSB ALARMS

FSSB alarms

This section explains the following FSSB alarms:

Alarm No.	Alarm message	Description
926	FSSB ALARM	System alarm related to FSSB
462	n AXIS : SEND CNC DATA FAILED	Because of an FSSB communication error, the slave cannot receive correct data.
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the CNC cannot receive correct data.
5136	FSSB : NUMBER OF AMPS IS SMALL	The number of the amplifiers recognized by FSSB is less than the set number of controlled axes.

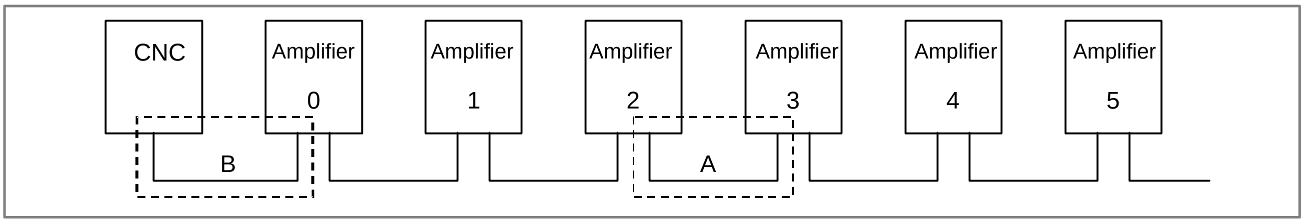
Required action for alarms

• Required action for alarm 926

A faulty location is determined from the LEDs on the amplifiers. Alternatively, it is determined from the screen displayed on the CNC.

(1) Determining a faulty location from the LEDs on the amplifiers

Servo amplifiers are connected to the CNC through FSSB as follows:



Suppose that a defect exists within the dotted box A. Then, the LEDs on the amplifiers are indicated as follows:

Amplifier No.	Amplifier 0	Amplifier 1	Amplifier 2	Amplifier 3	Amplifier 4	Amplifier 5
LED indication	–	–	L or –	U	U	U

In this case, the possible faulty location is as follows:

1) The optical cable connected at a portion where the amplifier LED indication changes from L or – to U is faulty (portion A in the above figure). Alternatively, one of the amplifiers connected by that optical cable (amplifier 2 or 3 in the above figure) is faulty.

Suppose that a defect exists within the dotted box B. Then, the LEDs on the amplifiers are indicated as follows:

Amplifier No.	Amplifier 0	Amplifier 1	Amplifier 2	Amplifier 3	Amplifier 4	Amplifier 5
LED indication	– indicated for all amplifiers or U for all amplifiers					

In this case, the possible faulty location is as follows:

1) If the LEDs on all amplifiers indicate – or U, the first optical cable that is connected to the CNC (portion B in the above figure) is faulty. Alternatively, the first amplifier that is connected to the CNC (amplifier 0 in the above figure) or the axis control card in the CNC is faulty.

- **Determining a faulty location from the screen displayed on the CNC**

On the system alarm screen, alarm 926 is displayed as well as additional information displayed in the lower part of the screen as follows:

NMIC 11100000 00100000 11110111 11111111

Mode information → 00000001 10000000 | 01010100 00010101 ← Status information

15 – – – 8 7 – – – 0 15 – – – 8 7 – – – 0

Bit Bit

Bits 12 to 15 of the mode information indicate the number of a slave where the alarm was generated. Slave numbers are assigned to units starting with slave number 0 which is assigned to the unit nearest the CNC. For a 2–axis amplifier, a slave number is assigned to each of the first and second axes by incrementing the number.

Details of mode information

Bit	15	14	13	12	11 ←→ 0
Meaning	Slave number at which alarm was generated				No meaning

0000: The alarm was generated from slave 0.
0001: The alarm was generated from slave 1.
:
:
1001: The alarm was generated from slave 9.

Details of status information

Bit	15 ←→ 12	11	10	9	8 7	6	5	4	3 ←→ 0
Meaning	No meaning	External alarm	Broken wire in master port	Broken wire in slave port	No meaning	Broken wire in master port	No meaning	Error in slave	
A	X X X X	0	0	0	X X	1	X	0	X X X X
A	X X X X	0	1	0	X X	0	X	1	X X X X
B	X X X X	0	0	1	X X	0	X	1	X X X X
C	X X X X	1	0	0	X X	0	X	1	X X X X

The status information matches one of the data patterns A, B, and C above. According to this information, take appropriate action for A, B, and C described below. (x means that the value can be 0 or 1.)

For pattern A, the possible faulty locations are as follows:

1) The optical cable that connects the slave indicated by bits 12 to 15 of the mode information and the preceding slave is faulty. Alternatively, one of the slaves connected by that optical cable is faulty.
2) The power supply voltage applied to the above amplifier is low.
3) The axis control card in the CNC is faulty.

For pattern B, the possible faulty location is as follows:

1) The optical cable that connects the slave indicated by bits 12 to 15 of the mode information and the next slave is faulty. Alternatively, one of the slaves connected by that optical cable is faulty.
2) The power supply voltage applied to the above amplifier is low.

For pattern C, the possible faulty location is as follows:

1) The slave indicated by bits 12 to 15 of the mode information is faulty. Alternatively, the power supply voltage applied to that slave is low.

- **Required action for alarms 462 and 463**

If alarm 462 or 463 is issued, the axis number at which a problem is present is indicated in the alarm message. In this case, the possible faulty locations are as follows:

1) One of the optical cables or one of the slaves that are located between the axis number indicated in the alarm message and the CNC is faulty.
2) The axis control card in the CNC is faulty.

- **Required action for alarm 5136**

When an alarm is issued, display the amplifier setting screen of the FSSB setting screen. Only the slaves that can be recognized by FSSB are displayed.
The possible faulty locations are as follows:

1) The optical cable that connects the last slave that can be recognized and the next slave is faulty. Alternatively, one of the slaves connected by that optical cable is faulty.
2) The axis control card in the CNC is faulty.

- **Action to be taken when the alarm is due to an optical cable**

It is revealed that an optical cable for FSSB may break. If the alarm is considered to be due to an optical cable, refer to ”SERVICE TECHNICAL REPORT(SR No. 1998–233, KB No. F16/0641) Title: Problem in Optical Cables (Optical Fiber Cables for Extensions) for the i Series,” and replace the cable with a new–type optical fiber cable supplied as the permanent measures against the problem. When the same unit has another optical fiber cable not yet replaced by a new–type optical cable, there is a high possibility that the optical cable is also damaged. So, together with the defective cable, replace all the other optical cables that have not yet been replaced by new–type optical fiber cables.

7.40 EMERGENCY STOP CANNOT BE RELEASED FROM HANDY OPERATOR’S PANEL

Point

The emergency stop state is regarded when the handy operator’s panel is in the following conditions:

1) The emergency stop button is pressed on the handy operator’s panel.
2) When the deadman’s switch enable switch is set to the enable state, both the deadman’s switches are released.
3) During connection with the handy operator’s panel, communication from the handy operator’s panel is interrupted. Whether the handy operator’s panel is connected or not is determined by two signals ATCH1 (CRS10–15) and ATCH2 (CRS10–16).
4) The 24 V is not applied to EMGTP (CRS10–11) of the handy operator’s panel. An emergency stop is regarded as being set on a machine operator’s panel connected to an upper unit of the handy operator’s panel, or an emergency stop is regarded as being caused by turning off another emergency stop contact such as the door open limit switch.

When the emergency stop state is determined in the handy operator’s panel:

1) The 24–V output from EMGDN (CRS10–12) of the handy operator’s panel is stopped.
2) The emergency stop is posted to the Power Mate through communication.

NOTE
The handy operator’s panel (Type B) just has an emergency stop button, but does not determine the emergency stop state.

Causes and Remedies

Detach the handy operator’s panel, and connect the emergency stop lines that are connected via the handy operator’s panel. If the emergency stop state is released, the handy operator’s panel is faulty.
The possible causes are as follows:

1) The emergency stop button on the handy operator’s panel is left pressed down.
   Release the emergency stop button.
2) The deadman’s switch enable switch is set to the enable state, and both the deadman’s switches are released.
   Set the deadman’s switch enable switch to the disable state. Alternatively, hold one of the deadman’s switches.

3) ATCH1 (CRS10–15) or ATCH2 (CRS10–16) of the handy operator's panel is in the poor contact state. Check the contact state by using a multimeter.
4) The 24 V is not applied to EMGTP (CRS10–11) of the hand operator's panel. Check the cable connector attached to the connector CRS10 of the handy operator's panel to see whether 24 V is applied to CRS10–11 of the handy operator's panel.
   Also, check whether the 0–V signal for the 24–V signal supplied to EMGTP (CRS10–11) is connected to the 0 V of the handy operator's panel. If they are disconnected, the relay that determines the emergency stop state in the handy operator's panel does not operate.
5) The handy operator's panel is defective.
   Replace the handy operator's panel with another one, then check that the problem does not recur.

Supplementary

Since edition 7 of the basic function series 88E0 and 88F0, the following status output signals have been added:

- Status of the deadman's switch enable switch
- Emergency stop button status
- Whether an emergency stop is set by a switch on the handy operator's panel
- Whether the handy operator's panel is in the connected state

	#7	#6	#5	#4	#3	#2	#1	#0
F0175	HOPEMG	HOPENB	HOPSTP					

HOPSTP The emergency stop button on the handy operator's panel is:
0 : Not pressed.
1 : Pressed.

HOPENB The deadman's switch enable switch on the handy operator's panel is:
0 : Set to the disable state.
1 : Set to the enable state.

HOPEMG Key operation on the handy operator's panel:
0 : Does not set the emergency stop state.
1 : Sets the emergency stop state.

This signal is set to 1 when:
(1) The emergency stop button on the handy operator's panel is pressed.
(2) The deadman's switch enable switch on the handy operator's panel is set to the enable state, and both the deadman's switches are released.
(3) The emergency stop state is set on a machine operator's panel connected to an upper unit of the handy operator's panel, or another emergency stop contact such as the door open limit switch is off.

	#7	#6	#5	#4	#3	#2	#1	#0
F0208								HOPATH

HOPATH The handy operator's panel is:
0 : Not connected.
1 : Connected.

NOTE
1 The HOPSTP, HOPENB, and HOPEMG signals are valid only when the HOPATH signal is 1.
2 Unless cables are connected correctly, correct signal values cannot be output.
3 When the handy operator's panel (Type B) is used, this signal is ignored.

The deadman's switch status is determined as follows:

(1) When the signals mentioned previously are in the following states, both the deadman's switches are released:
- HOPATH(F0208#0)=1
- HOPSTP(F0175#5)=0
- HOPENB(F0175#6)=1
- HOPEMG(F0175#7)=1

(2) When the signals mentioned previously are in the following states, at least one deadman's switch is pressed:
- HOPATH(F0208#0)=1
- HOPSTP(F0175#5)=0
- HOPENB(F0175#6)=1
- HOPEMG(F0175#7)=0

NOTE
1 If the HOPATH signal (F0208 #0) is 0 (the handy operator's panel is not connected), the deadman's switch status cannot be determined.
2 If the HOPSTP signal (F0175 #5) is 1 (the emergency stop button on the handy operator's panel is pressed), the deadman's switch status cannot be determined.
3 When the HOPENB signal (F0175 #6) is 0 (the deadman's switch enable switch on the handy operator's panel is off), the deadman's switch status cannot be determined.
4 When the emergency stop state is set on a machine operator's panel connected to an upper unit of the handy operator's panel, or when another emergency stop contact such as the door open limit switch is off, the deadman's switch status cannot be determined.

APPENDIX

A ALARM LIST

A.1 LIST OF ALARM CODES (CNC)

1) Program errors (P/S alarm)

Number	Message	Contents
000	PLEASE TURN OFF POWER	A parameter which requires the power off was input, turn off power.
001	TH PARITY ALARM	TH alarm (A character with incorrect parity was input). Correct the tape.
002	TV PARITY ALARM	TV alarm (The number of characters in a block is odd). This alarm will be generated only when the TV check is effective. Correct the tape.
003	TOO MANY DIGITS	Data exceeding the maximum allowable number of digits was input. (See Appendix C in the Operator's Manual.)
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	A synchronous feed is specified without the option for threading / synchronous feed.
015	TOO MANY AXES COMMANDED	The number of the commanded axes exceeded that of simultaneously controlled axes.
020	OVER TOLERANCE OF RADIUS	In circular interpolation (G02 or G03), difference of the distance between the start point and the center of an arc and that between the end point and the center of the arc exceeded the value specified in parameter No. 3410. Modify the program.
021	ILLEGAL PLANE AXIS COMMANDED	An axis not included in the selected plane (by using G17, G18, G19) was commanded in circular interpolation. Modify the program.
022	NO CIRCULAR RADIUS	When circular interpolation is specified, neither R (specifying an arc radius), nor I, J, and K (specifying the distance from a start point to the center) is specified. Modify the program.
027	NO AXES COMMANDED IN G43/G44	No axis is specified in G43 and G44 blocks for the tool length offset. Offset is not canceled but another axis is offset for the tool length offset. Modify the program.
028	ILLEGAL PLANE SELECT	In the plane selection command, two or more axes in the same direction are commanded. Modify the program.
029	ILLEGAL OFFSET VALUE	The offset values specified by H code is too large. Modify the program.
030	ILLEGAL OFFSET NUMBER	The offset number specified by H code for tool length offset is too large. Modify the program.

Number	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. Check and correct the offset amount.
044	G27–G30 NOT ALLOWED IN FIXED CYC	One of G27 to G30 is commanded in canned cycle mode. Modify the program.
046	ILLEGAL REFERENCE RETURN COMMAND	Other than P2 and P3 are commanded for 2nd and 3rd reference position return command.
059	PROGRAM NUMBER NOT FOUND	In an external program number search, a specified program number was not found. Otherwise, a program specified for searching is being edited in background processing. Check the program number and external signal. Or discontinue the background eiting.
060	SEQUENCE NUMBER NOT FOUND	Commanded sequence number was not found in the sequence number search. Check the sequence number.
070	NO PROGRAM SPACE IN MEMORY	The memory area is insufficient. Delete any unnecessary programs, then retry.
071	DATA NOT FOUND	The address to be searched was not found. Or the program with specified program number was not found in program number search. Check the data.
072	TOO MANY PROGRAMS	The number of programs to be stored exceeded 63 (basic), 125 (option), 200 (option), or 400 (option). Delete unnecessary programs and execute program registeration again.
073	PROGRAM NUMBER ALREADY IN USE	The commanded program number has already been used. Change the program number or delete unnecessary programs and execute program registeration again.
074	ILLEGAL PROGRAM NUMBER	The program number is other than 1 to 9999. Modify the program number.
075	PROTECT	An attempt was made to register a program whose number was protected. Check the program number, or cancel protection.
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. Modify the program so that the subprogram is called in four folds or less.
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.
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. See Chapter 7.
086	DR SIGNAL OFF	When entering data in the memory by using Reader / Puncher interface, the ready signal (DR) of reader / puncher was off. The power to the I/O unit may be off, the I/O unit may be defective, or the cable may be broken. Alternatively, the Power Mate *i* base printed–circuit board may be defective. See Chapter 7.

Number	Message	Contents
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 base P.C.B. of Power Mate *i* is defective. See Chapter 7.
090	REFERENCE RETURN INCOMPLETE	The reference position return cannot be performed normally because the reference position return start point is too close to the reference position or the speed is too slow. Separate the start point far enough from the reference position, or specify a sufficiently fast speed for reference position return. Alternatively, it is impossible to make a zero point return because alarm 309 has been issued. See Chapter 7.
092	AXES NOT ON THE REFERENCE POINT	The commanded axis by G27 (Reference position return check) did not return to the reference position.
093	EXTERNAL SETTING INCOMPLETE	The reference position external setting cannot be performed because the reference position external setting signal is set to 1 in the following status. 1) When the jog feed mode (JOG) is not selected. 2) When the jog feed mode (JOG) is selected, however the signal ZRN is 0. 3) When the emergency stop signal ESP is 0. 4) When the parameter APC No.1815 bit 5 is 0. (Caution) With an absolute pulse coder, a reference point is set up even if the reference point external setting signal is set to 1 during movement. In this case, however, axis movement does not stop even if the reference point is set up.
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.
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 result is out of the allowable range. (-10^{47} to -10^{-29}, 0, and 10^{-29} to 10^{47}). Check and correct the calculation or data.
112	DIVIDED BY ZERO	Division by zero was specified. (including tan 90°) Check and correct the calculation formula.
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.
115	ILLEGAL VARIABLE NUMBER	A value not defined as a variable number is designated in the custom macro. Modify the program.
116	WRITE PROTECTED VARIABLE	The left side of substitution statement is a variable whose substitution is inhibited. Modify the program.
118	PARENTHESIS NESTING ERROR	The nesting of bracket exceeds the upper limit (quintuple). Modify the program.
119	ILLEGAL ARGUMENT	The SQRT argument is negative, BCD argument is negative, or other values than 0 to 9 are present on each line of BIN argument. Modify the program.

Number	Message	Contents
122	DUPLICATE MACRO MODAL–CALL	Four nesting levels of macro calls and/or macro modal calls have been specified. 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≦ n ≦3 is not established. Modify the program.
127	NC, MACRO STATEMENT IN SAME BLOCK	NC and custom macro commands coexist. Modify the program.
128	ILLEGAL MACRO SEQUENCE NUMBER	The sequence number specified in the branch command was not 0 to 9999. Or, it cannot be searched. Modify the program.
129	ILLEGAL ARGUMENT ADDRESS	An address which is not allowed in <Argument Designation > is used. Modify the program.
130	ILLEGAL AXIS OPERATION	An axis control command was given by PMC to an axis controlled by CNC. Or an axis control command was given by CNC to an axis controlled by PMC. Modify the program.
131	TOO MANY EXTERNAL ALARM MESSAGES	Five or more alarms have generated in external alarm message. Consult the PMC ladder diagram to find the cause.
132	ALARM NUMBER NOT FOUND	No alarm No. concerned exists in external alarm message clear. Check the PMC ladder diagram.
133	ILLEGAL DATA IN EXT. ALARM MSG	Small section data is erroneous in external alarm message or external operator message. Check the PMC ladder diagram.
139	CAN NOT CHANGE PMC CONTROL AXIS	An axis is selected in commanding by PMC axis control. Modify the program.
145	ILLEGAL CONDITIONS IN POLAR COORDINATE INTERPOLATION	The conditions are incorrect when the polar coordinate interpolation starts or it is canceled. 1) In modes other than G40, G12.1/G13.1 was specified. 2) An error is found in the plane selection. Parameters No. 5460 and No. 5461 are incorrectly specified. Modify the value of program or parameter.
146	IMPROPER G CODE	G codes which cannot be specified in the polar coordinate interpolation mode was specified. See section II–4.8 polar coordinate interpolation and modify the program.
190	ILLEGAL AXIS SELECT	In the constant surface speed control, the axis specification is wrong. (See parameter No. 3770.) The specified axis command (P) contains an illegal value. Correct the program.
199	MACRO WORD UNDEFINED	Undefined macro word was used. Modify the custom macro.
200	ILLEGAL S CODE COMMAND	In the rigid tap, an S value is out of the range or is not specified. The maximum value for S which can be specified in rigid tapping is set in parameter (No.5241 to 5243). Change the setting in the parameter or modify the program.
201	FEEDRATE NOT FOUND IN RIGID TAP	In the rigid tapping, no F value is specified. Correct the program.
202	POSITION LSI OVERFLOW	In the rigid tapping, spindle distribution value is too large.
203	PROGRAM MISS AT RIGID TAPPING	In the rigid tapping, position for a rigid M code (M29) or an S command is incorrect. Modify the program.
204	ILLEGAL AXIS OPERATION	In the rigid tapping, an axis movement is specified between the rigid M code (M29) block and G84 (G74) block. Modify the program.

Number	Message	Contents
205	RIGID MODE DI SIGNAL OFF	Rigid tapping signal (G061#1) is not 1 when G84 (G74) is executed though the rigid M code (M29) is specified.Consult the PMC ladder diagram to find the reason the DI signal is not turned on. Modify the program.
206	CAN NOT CHANGE PLANE (RIGID TAP)	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.
213	ILLEGAL COMMAND IN SYNCHRO–MODE	Any of the following alarms occurred in the operation with the simple synchronization control. 1) The program issued the move command to the slave axis. 2) The program issued the manual continuous feed/manual handle feed/incremental feed command to the slave axis. 3) The program issued the automatic reference position return command without executing the manual reference position return after the power was turned on. 4) The difference between the position error amount of the master and slave axes exceeded the value specified in parameter No. 8313.
214	ILLEGAL COMMAND IN SYNCHRO–MODE	Coordinate system is set in the synchronous control. Correct the program.
224	RETURN TO REFERENCE POINT	Reference position return has not been performed before the automatic operation starts. Perform reference position return only when bit 0 (ZRN_X) of parameter No. 1005 is 0.
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 specified format.
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. Wait until the user ends the use of the unit, then use it.
239	BP/S ALARM	While punching was being performed with the function for controlling external I/O units ,background editing was performed. Wait until external punching terminates, then perform background editing.
240	BP/S ALARM	Background editing was performed during MDI operation. Wait until MDI operation terminates, then perform background editing.
5010	END OF RECORD	The end of record (%) was specified.
5120	NON A/D MODULE	Although the analog input module enable parameter is set, no option card 2 is installed.
5121	A/D MODULE	The A/D converter is abnormal. Replace the option card 2.
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. This occurs also if there is a poor connection in the FSSB optical cable when the power is switched on.
5137	FSSB : CONFIGURATION ERROR	FSSB detected a configuration error.

Number	Message	Contents
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.
5150	PARAM (NO. 1011) SETTING ERROR	The specified maximum number of axes (parameter 1011) to be controlled is incorrect.
5197	FSSB : OPEN TIME OUT	The CNC permitted FSSB to open, but FSSB was not opened.
5198	FSSB : ID DATA NOT READ	Temporary assignment failed, so amplifier initial ID information could not be read.
5222	SRAM CORRECTABLE ERROR	A correctable error occurred in the SRAM (ECC). This does not immediately affect operation. If alarm 935 is issued, replace the memory module, and restore the SRAM memory data.
5225	ILLEGAL MACRO EXECUTOR	A macro library for the Power Mate *i*–MODEL H is registered in the Power Mate *i*–MODEL D. Alternatively, a macro library for the Power Mate *i*–MODEL D is registered in the Power Mate *i*–MODEL H.
5226	ILLEGAL C LANGUAGE EXECUTOR	A C library for the Power Mate *i*–MODEL H is registered in the Power Mate *i*–MODEL D. Alternatively, a C library for the Power Mate *i*–MODEL D is registered in the Power Mate *i*–MODEL H.
5240	ALL PROGRAMS HAVE BEEN DELETED	Because the number of digits of a program number was changed, all the programs were deleted.
5246	ELECTRONIC CAM PARAMETER ILLEGAL	An error is found in the following electronic cam parameters. Correct the setting. Parameter No. 8086 (cam shaft axis number) Parameter No. 8087 (follow–up axis selection) Parameter No. 8088 (number of cam shape data items) Bit 0 of parameter No. 1006 (rotation axis setting) Bit 0 of parameter No. 1008 (rollover setting) Parameter No. 1260 (travel distance per rotation of the rotation axis)
5247	CAM DATA ILLEGAL	• The cam data checksum is illegal. • The cam shaft phase number of cam data is illegal. • Cam data transfer failed.
5248	CAM DATA AREA INSUFFICIENT	• Because there is no storage option equivalent to 160–meter or longer tape, no area was allocated for cam data registration. • Because the amount of cam data is too large, the storage area becomes insufficient.
5249	ELECTRONIC CAM CAN NOT EXECUTE	Phase matching or electronic cam operation could not be executed for one of the following reasons: • Phase matching was performed without storing cam data. • Electronic cam operation was executed before phase matching was not completed. • The electronic cam function was executed while movement along an axis was being performed by another function.
5261	PMC INDIRECT COMMAND IS ILLEGAL	An indirect command for PMC axis control is illegal.

2) Background edit alarm

Number	Message	Contents
???	BP/S alarm	BP/S alarm occurs in the same number as the P/S alarm that occurs in ordinary program edit. (070, 071, 072, 073, 074 085,086,087 etc.)
140	BP/S alarm	It was attempted to select or delete in the background a program being selected in the foreground. **(Note)** Use background editing correctly.

NOTE
Alarm in background edit is displayed in the key input line of the background edit screen instead of the ordinary alarm screen and is resettable by any of the MDI key operation.

3) Absolute pulse coder (APC) alarm

Number	Message	Contents
300	nth–axis origin return	Manual reference position return is required for the nth–axis (n=1 – 8). See Chapter 7.
301	APC alarm: nth–axis communication	nth–axis (n=1 – 8) APC communication error. Failure in data transmission Possible causes include a faulty APC, cable, or servo amplifier.
302	APC alarm: nth–axis over time	nth–axis (n=1 – 8) APC overtime error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo amplifier.
303	APC alarm: nth–axis framing	nth–axis (n=1 – 8) APC framing error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo amplifier.
304	APC alarm: nth–axis parity	nth–axis (n=1 – 8) APC parity error. Failure in data transmission. Possible causes include a faulty APC, cable, or servo amplifier.
305	APC alarm: nth–axis pulse error	nth–axis (n=1 – 8) APC pulse error alarm. APC or cable may be faulty.
306	APC alarm: nth–axis battery voltage 0	nth–axis (n=1 – 8) APC battery voltage has decreased to a low level so that the data cannot be held. Battery or cable may be faulty.
307	APC alarm: nth–axis battery low 1	nth–axis (n=1 – 8) axis APC battery voltage reaches a level where the battery must be renewed. Replace the battery.
308	APC alarm: nth–axis battery low 2	nth–axis (n=1 – 8) APC battery voltage has reached a level where the battery must be renewed (including when power is OFF). Replace battery.
309	APC alarm: nth–axis Ern impossible	For a serial α pulse coder, return to the origin is impossible because pulse coder rotation fails to reach a single turn. After making the motor rotate at least one turn, turn the power off and on again, and make a reference position return.

4) Serial pulse coder (SPC) alarms

If one of the following alarms is issued, replace the pulse coder, feedback cable, and servo amplifier in this order:

Number	Message	Contents
360	n AXIS : ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS : ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS : ABNORMAL REV.DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS : ABNORMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS : SOFT PHASE ALARM (INT)	The digital servo software detected invalid data in the built–in pulse coder.
365	n AXIS : BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS : PULSE MISS (INT)	A pulse error occurred in the built–in pulse coder.
367	n AXIS : COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS : SERIAL DATA ERROR (INT)	Communication data from the built–in pulse coder cannot be received.
369	n AXIS : DATA TRANS. ERROR (INT)	A CRC or stop bit error occurred in the communication data being received from the built–in pulse coder.
380	n AXIS : BROKEN LED (EXT)	The separate detector is erroneous.
381	n AXIS : ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate linear scale.
382	n AXIS : COUNT MISS (EXT)	A pulse error occurred in the separate detector.
383	n AXIS : PULSE MISS (EXT)	A count error occurred in the separate detector.
384	n AXIS : SOFT PHASE ALARM (EXT)	The digital servo software detected invalid data in the separate detector.
385	n AXIS : SERIAL DATA ERROR (EXT)	Communication data from the separate detector cannot be received.
386	n AXIS : DATA TRANS. ERROR (EXT)	A CRC or stop bit error occurred in the communication data being received from the separate detector.

- **The details of serial pulse coder alarm No.350**

The details of serial pulse coder alarm No. 350 (pulse coder alarm) are displayed in the diagnosis display (No. 202) as shown below.

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

SPH : The serial pulse coder or feedback cable is defective. Replace the serial pulse coder or cable.

CKA : The serial pulse coder is defective. Replace it.

BZA : The pulse coder was supplied with power for the first time.
Make sure that the batteries are connected.
Turn the power off, then turn it on again and perform a reference position return. This alarm has nothing to do with alarm No. 350 (serial pulse coder alarm).

PCA : The serial pulse coder is defective. Replace it.

PHA : The serial pulse coder or feedback cable is defective. replace the serial pulse coder or cable.

BLA : The battery voltage is low. Replace the batteries. This alarm has nothing to do with alarm No. 350 (serial pulse coder alarm).

CSA : The serial pulse coder is defective. Replace it.

- **The details of serial pulse coder alarm No.351**

The details of serial pulse coder alarm No. 351 (communication alarm) are displayed in the diagnosis display (No. 203) as shown below.

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

PRM : An invalid parameter was found. Alarm No. 417 (invalid servo parameter) is also issued.

STB : the serial pulse coder encountered a communication error.
The pulse coder, feedback cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or servo amplifier.

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 servo amplifier.

DTE : The serial pulse coder encountered a communication error.
The pulse coder, feedbak cable, or feedback receiver circuit is defective.
Replace the pulse coder, feedback cable, or servo amplifier

5) Servo alarms

For the following alarms, also refer to the relevant manuals on the servo motor α/β series:

Number	Message	Contents
401	SERVO ALARM: n–TH AXIS VRDY OFF	The n–th axis (axis 1 to 8) servo amplifier READY signal (DRDY) went off. Check the servo amplifier status.
402	SERVO ALARM: SV CARD NOT EXIST	Necessary cards for at least four axes for the M series, or at least two axes for the T–axis system or loader, are not installed. Install the correct axis cards.
403	SERVO ALARM: CARD/SOFT MISMATCH	The axis cards and servo software do not match. Use a valid combination of axis cards and servo software.
404	SERVO ALARM: n–TH AXIS VRDY ON	Even though the 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 Power Mate *i* and servo amp 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	One of the following errors occurred during simple synchronous control operation: 1) The difference in position deviation between the synchronized axes exceeds the value set in parameter No. 8314. 2) The maximum compensation amount at synchronization exceeds the value set in parameter No. 8325.
409	SERVO ALARM: n AXIS TORQUE ALM	Abnormal servo motor load has been detected.
410	SERVO ALARM: n–TH AXIS – EXCESS ERROR	One of the following errors occurred: 1) The position deviation value when the n–th axis is stopped exceeds the value set in parameter No. 1829. 2) During simple synchronous control, the maximum compensation amount at synchronization exceeds the value set in parameter No. 8325. This alarm is issued only in the slave axis.

Number	Message	Contents
411	SERVO ALARM: n–TH AXIS – EXCESS ERROR	The position deviation value when the n–th axis (axis 1 to 8) moves is larger than the set value. The limit for each axis must be set in parameter No. 1828.
413	SERVO ALARM: n–th AXIS – LSI OVERFLOW	The contents of the error register for the n–th axis (axis 1 to 8) exceeded $\pm 2^{31}$ power. This error usually occurs as the result of an improperly set parameters.
415	SERVO ALARM: n–TH AXIS – EXCESS SHIFT	A speed higher than 511875 units/s was attempted to be set in the n–th axis (axis 1 to 8). This error occurs as the result of improperly set CMR.
417	SERVO ALARM: n–TH AXIS – PARAMETER INCORRECT	This alarm occurs when the n–th axis (axis 1 to 8) is in one of the conditions listed below. Check the following parameters. See Chapter 7. 1) The value set in Parameter No. 2020 (motor form) is out of the specified limit. 2) A proper value (111 or –111) is not set in parameter No.2022 (motor revolution direction). 3) Illegal data (a value below 0, etc.) was set in parameter No. 2023 (number of speed feedback pulses per motor revolution). 4) Illegal data (a value below 0, etc.) was set in parameter No. 2024 (number of position feedback pulses per motor revolution). 5) Parameters No. 2084 and No. 2085 (flexible field gear rate) have not been set. 6) A value outside the limit of {1 to the number of control axes} or a non–continuous value (Parameter 1023 (servo axis number) contains a value out of the range from 1 to the number of axes, or an isolated value (for example, 4 not prceded by 3).was set in parameter No. 1023 (servo axisnumber). 7) There is a parameter setting error in torque control of PMC axis control. (The torque constant parameter is set to 0.)
420	SERVO ALARM: n AXIS SYNC TORQUE (M series)	During simple synchronous control, the difference between the torque commands for the master and slave axes exceeded the value set in parameter No. 2031.
421	SERVO ALARM: n AXIS EXCESS ER (D)	The difference between the errors in the semi–closed loop and closed loop has become excessive during dual position feedback. Check the values of the dual position conversion coefficients in parameters No. 2078 and 2079.
422	SERVO ALARM: n AXIS	In torque control of PMC axis control, a specified allowable speed has been exceeded.
423	SERVO ALARM: n AXIS	In torque control of PMC axis control, the parameter–set allowable cumulative travel distance has been exceeded.
430	n AXIS : SV. MOTOR OVERHEAT	A servo motor overheat occurred.
431	n AXIS : CNV. OVERLOAD	A servo amplifier overheat occured.
432	n AXIS : CNV. LOWVOLT CON./POWFAULT	A low–voltage alarm is issued in the converter control section.
433	n AXIS : CNV. LOW VOLT DC LINK	A low–voltage alarm is issued in the converter DC link section.
434	n AXIS : INV. LOW VOLT CONTROL	A low–voltage alarm is issued in the inverter control section.
435	n AXIS : INV. LOW VOLT DC LINK	A low–voltage alarm is issued in the inverter DC link section.
436	n AXIS : SOFTTHERMAL (OVC)	An overcurrent alarm is issued.
437	n AXIS : CNV. OVERCURRENT POWER	An abnormal–current alarm is issued in the converter.
438	n AXIS : INV. ABNORMAL CURRENT	An abnormal–current alarm is issued in the inverter.
439	n AXIS : CNV. OVERVOLT POWER	An overvoltage alarm is issued.

Number	Message	Contents
440	n AXIS : CNV. EX DECELERATION POW.	A regenerative discharge circuit alarm is issued.
441	n AXIS : ABNORMAL CURRENT OFFSET	A/D switching of the digital servo current value is abnormal.
442	n AXIS : CNV. CHARGE FAULT/INV. DB	The contact of the magnetic contactor of the servo amplifier is fused.
443	n AXIS : CNV. COOLING FAN FAILURE	The cooling fan of the converter is abnormal.
444	n AXIS : INV. COOLING FAN FAILURE	The cooling fan of the inverter is abnormal.
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	There is a feedback error.
449	n AXIS : INV. IPM ALARM	An IPM alarm is issued in the inverter.
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. See Chapter 7.
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the servo system could not receive correct data. See Chapter 7.
464	n AXIS : WRITE ID DATA FAILED	An attempt was made to write maintenance information on the amplifier maintenance screen, but it failed.
465	n AXIS : READ ID DATA FAILED	At power–up, amplifier initial ID information could not be read.
466	n AXIS : MOTOR/AMP COMBINATION	The maximum current rating for the amplifier does not match that for the motor.
467	n AXIS : ILLEGAL SETTING OF AXIS	The servo function for the following has not been enabled when an axis occupying a single DSP (corresponding to two ordinary axes) is specified on the axis setting screen. High–speed current loop (bit 0 of parameter No. 2004 = 1)

- **Details of servo alarm**

The details of servo alarm are displayed in the diagnosis display (No.200, No.201, and No.204) as shown below.

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

OFA : An overflow alarm is being generated inside of digital servo.

FBA : A disconnection alarm is being generated.
(This bit causes servo alarm No.416.The details are indicated in diagnostic data No. 201)

DCA : A regenerative discharge circuit alarm is being generated in servo amp.
Check LED.

HVA : An overvoltage alarm is being generated in servo amp.
Check LED.

HCA : An abnormal current alarm is being generated in servo amp.
Check LED.

OVC : A overcurrent alarm is being generated inside of digital servo.

LV : A low voltage alarm is being generated in servo amp.
Check LED.

OVL : An overload alarm is being generated.
(This bit causes servo alarm No. 400. The details are indicated in diagnostic data No.201).

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

When OVL equal 1 in diagnostic data No.200:

ALD 0 : Motor overheating
1 : Amplifier overheating

When FBA equal 1 in diagnostic data No.200:

ALD	EXP	Alarm details
1	0	Built–in pulse coder disconnection (hardware)
1	1	Separately installed pulse coder disconnection (hardware)
0	0	Pulse coder is not connected due to software.

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

PMS : A feedback pulse error has occured because the feedback cable is defective.

LDA : The LED indicates that serial pulse coder C is defective

MCC : A magnetic contactor contact in the servo amplifier has welded.

OFS : A current conversion error has occured in the digital servo.

6) Over travel alarms

Number	Message	Contents
500	OVER TRAVEL : +n	Exceeded the n–th axis + side stored stroke limit I. (Parameter No.1320)
501	OVER TRAVEL : –n	Exceeded the n–th axis – side stored stroke limit I. (Parameter No.1321)
506	OVER TRAVEL : +n	Exceeded the n–th axis + side hardware OT. G114 or G116 is 0.
507	OVER TRAVEL : –n	Exceeded the n–th axis – side hardware OT. G114 or G116 is 0.

7) Overheat alarms

Number	Message	Contents
700	OVERHEAT: CONTROL UNIT	Control unit overheat Check that the fan motor in the control unit operates normally, and clean the air filter in the cabinet. See Chapter 7.
701	OVERHEAT: FAN MOTOR	The fan motor on the top of the cabinet for the contorl unit is overheated. Check the operation of the fan motors. If the operation is abnormal, replace both the two fan motors. This alarm occurs also if the fan unit has not been connected.
704	OVERHEAT: SPINDLE	Spindle overheat in the spindle fluctuation detection. See Chapter 7. (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) Rigid tapping alarm

Number	Message	Contents
740	RIGID TAP ALARM : EXCESS ERROR	During rigid tapping, the position deviation of the spindle in the stop state exceeded the setting.
741	RIGID TAP ALARM : EXCESS ERROR	During rigid tapping, the position deviation of the spindle in the stop state exceeded the setting.
742	RIGID TAP ALARM : LSI OVER FLOW	During rigid tapping, an LSI overflow occurred on the spindle side.

9) Spindle alarms

Number	Message	Contents
749	S–SPINDLE LSI ERROR	A communication error occurred for the serial spindle. The cause may be the disconnection of an cable or the interruption of the power to the spindle amplifier. See Chapter 7. (Note) Unlike spindle alarm No. 750, this alarm occurs when a serial communication alarm is detected after the spindle amplifier is normally activated.
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) Defective cable, poor connection, or spindle amplifier being switched 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. See diagnostic display No. 409 for details. See Chapter 7.
751	SPINDLE ALARM DETECTION (AL–XX)	This alarm indicates in the NC that an alarm is generated in the spindle unit of the system with the serial spindle. The alarm is displayed in form AL–XX (XX is a number). Refer to **(12) Alarms displayed on spindle servo unit** .The alarm number XX is the number indicated on the spindle amplifier. The CNC holds this number and displays on the screen.
752	SPINDLE MODE CHANGE FAULT	This alarm is generated if the system does not properly terminate a mode change. The modes include the 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 ABNORMAL TORQUE ALM	An abnormal load on the spindle motor was detected.

- **The details of spindle alarm No.750**

The details of spindle alarm No. 750 are displayed in the diagnosis display (No. 409) as shown below.

	#7	#6	#5	#4	#3	#2	#1	#0
409					SPE		S1E	SHE

SHE 0 : The serial communications control unit in the Power Mate *i* is normal.
1 : The serial communications control unit in the Power Mate *i* was detected to have a fault.

S1E 0 : The spindle is normal during the spindle serial control startup.
1 : The spindle was detected to have a fault during the spindle axis 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.

10) System alarms

(These alarms cannot be reset with reset key.)

Number	Message	Contents
900	ROM PARITY	A ROM parity alarm condition has occurred in the FROM where the CNC and servo system programs, macro programs, and C macro programs are stored. Correct the contents of the flash ROM having the displayed number. See Chapter 7.
910	SRAM PARITY : (BYTE 0)	This is an SRAM parity error. Clear the memory, or replace the memory module or base printed–circuit board. Subsequently, re–set the parameters and all other data. See Chapter 7.
911	SRAM PARITY : (BYTE 1)	
912	DRAM PARITY : (BYTE 0)	A RAM parity error occurred in the DRAM. Replace the DRAM module or CPU module. See Chapter 7.
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. See Chapter 7.
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. Alternatively, a broken wire in the FSSB optical cable. Replace the axis control card. See Chapter 7. Replace the servo control module. Check the optical cable.
930	CPU INTERRUPT	CPU error (abnormal interrupt). A broken cable wire has occurred in the I/O Link slave function, or the master unit has been switched off. The base PC board or CPU card may be faulty. See Chapter 7.
935	SRAM ECC ERROR	Uncorrectable error occurred in the SRAM (ECC) Replace the memory module, and restore the SRAM memory data.
950	PMC SYSTEM ALARM	An error occurred in the PMC. A broken cable wire has occurred in the I/O Link master function, or the slave unit has been switched off. The PMC control circuit on the base PC board may be faulty. See Chapter 7.
951	PMC WATCH DOG ALARM	An error occurred in the PMC. (Watchdog alarm) The base PC board may be faulty. See Chapter 7.
972	NMI OCCURRED IN OTHER MODULE	An NMI occurred on the option board. The option board may be faulty. See Chapter 7.
973	NON MASK INTERRUPT	NMI occurred for an unknown reason. Or, a communication error occurred in the FANUC I/O Link slave function.
974	F–BUS ERROR	A bus error occurred on the FANUC bus. The base PC board or option board may be faulty.
975	BUS ERROR	A bus error occurred on the motherboard. The base PC board may be faulty.
976	L–BUS ERROR	A bus error occurred on the local bus. The base PC board may be faulty.
977	NMI FROM SLAVE SLC	A communication error occurred in the FANUC I/O Link slave function. See the descriptions of alarms 950 and 973 in Chapter 7.
978	FAN OVER HEAT ALARM	There is a possibility that the Power Mate *i* will be overheated. Replace the two cooling fans.

11) I/O Link–II alarms

Number	Message	Contents
5130	P/S ALARM	The frame inspection system includes an error.
5131	P/S ALARM	The data link procedure includes an error.
5132	P/S ALARM	A communication monitor time–out was detected.
5133	P/S ALARM	An overrun error was detected.

12) Multi–path alarms

Number	Message	Contents
5160	ILLEGAL COMMAND IN MULTI PATH	There is a multipath command format error. Modify the program.
5161	ILLEGAL AXIS SELECT	There is an axis duplication between paths. Modify the program.
5162	FEED RATE IS ZERO IN MULTI PATH	Whenever performing cutting feed in multipath mode, specify the F command.
5163	ILLEGAL WAIT M–CODE COMMAND	There is a command format error in the wait M code. Modify the program.
5164	ILLEGAL G–CODE IN MULTI PATH	The specified G code cannot be used in multipath mode. Modify the program.
5165	ILLEGAL PARAMETER IN MULTI PATH	There is an error in parameter Nos. 8003 and 8010. Correct the parameters.
5166	CHECK THE PMC AXIS INTERFACE	PMC axis control is in the alarm condition. Release the alarm, then start multipath operation.

13) Multi axes synchronous alarms

Number	Message	Contents
5261	PMC INDIRECT COMMAND IS ILLEGAL	Data specified in an indirect specification command includes an error. Set correct data.
5262	NO SYNCHRO MODE	Turn on the synchronization mode signal. Check if the synchronization–related parameters are set correctly.
5263	ILLEGAL SYNCHRO COMMAND FORMAT	An invalid value is entered as the specified parent axis travel distance.
5264	AXIS MOVES TO THE OPPOSITE	Too many rotations were made in the direction opposite to the specified synchronization direction. This alarm is issued when an excessive movement is made in the opposite direction. This alarm is not issued the instant a movement is made in the opposite direction.
5265	REFERENCE RETURN IN SYNCHRO MODE	Before performing a reference position return operation, turn off the synchronization mode signal.
5266	PARENT AXIS IS NOT ROTATION ONE	When specifying start point synchronization, specify a rotation axis as the parent axis.
5267	ILLEGAL SYNCHRO AXIS SETTING	Set the parent axis parameter (parameter No. 8380) and the parent axis category parameter (parameter No. 8381) for synchronization correctly.

Number	Message	Contents
5268	NON–SYNCHRO AXIS IS COMMANDED	Synchronization was specified for an axis not related to synchronization or for an axis with no parent (namely, top–parent axis). Check the execution program, the parent axis parameter (parameter No. 8380), and the parent axis category parameter (parameter No. 8381).
5269	ILLEGAL APC AXIS INFORMATION	APC information is being used by another function (such as the electronic cam function). In this case, turn off the synchronization mode and check that these settings are invalid, then turn on the synchronization mode again. Alternatively, cancel the APC specification with the parent axis category parameter.

14) Others

Number	Message	Contents	Counter plan	Reference
1000 to 1999	A message created by the user or machine tool builder, using the PMC alarm message function, is displayed.	Alarm generated by the user or machine tool builder using the PMC	Apply appropriate countermeasures as explained in the manual provided by the machine tool builder.	Manual provided by machine tool builder
3000 to 3200	A message created by the user or machine tool builder, using a custom macro, is displayed.	Alarm generated by the user or machine tool builder, using a custom macro	Apply appropriate countermeasures as explained in the manual provided by the machine tool builder.	Manual provided by machine tool builder
3000 to 3099	P/S ALARM	Alarm generated by the user or machine tool builder, using the PMC alarm display function	Manual provided by machine tool builder	Manual provided by machine tool builder

15) Error codes at high–speed response function compile time

Number	Contents
0003	A data item exceeding a maximum allowable value is entered.
0004	A block starts not with an address but with a numeric value or symbol.
0005	An address is followed not by data but by another address or an EOB code.
0006	Sign (”–”) input error (A ”–” sign is entered at an incorrect address, or two or more ”–” signs are entered.)
0007	Decimal point input error (The decimal point must not be used.)
0009	An unusable address is entered in a significant information section.
0010	An unusable G code is specified.
0011	The cutting feedrate is incorrect. Probable causes are as follows: (1) No feedrate was specified. (2) A feedrate of 0 was specified.
0015	An attempt was made to make movements on axes more than the number of simultaneously controlled axes in one block.
0053	A comma (,) is input. (A comma (,) is unusable.)
0070	The size of memory is insufficient.
0113	# is entered. (# can be used only to specify a travel distance and feedrate.)
0114	A macro statement is entered. (No macro statement may be used.)
0115	An incorrect variable number is used.
1000	A slash (/) is used. (No slash (/) may be used.)

Number	Contents
1001	G codes of group 00 and group 01 are specified in the same block.
1002	The number of words in a block exceeded the maximum allowable number of words.
1010	In a G31 block, no axis is specified, or two or more axes are specified.
1011	In a G31 block, an unusable P code is used.
1020	In an M code block, a G code is specified.
1021	In an M code block, an axis is specified.
1022	An unusable M code is specified.
1024	In an M code block, an incorrect P code is specified.
1025	In an M code block, no P code is specified.
1027	In an M code block, feedrate F is specified.
1040	In a continuous feed block, no axis is specified, or two or more axes are specified.
1091	In a block where optional block skip is specified, feedrate F is specified.
1094	In a block where optional block skip is specified, a G code of group 01 is specified.
1096	In a block where optional block skip is specified, a G code of group 03 is specified.
1100	The program includes no axis command.
1101	There is no program to be compiled (O8000 to O8031).
1102	With the signal–based compilation function, a program number unusable for a motion program is specified.
1800	A motion program is being executed.
1821	A compilation operation was performed in the reset state.
1822	A compilation operation was performed when an alarm was issued.
1823	A compilation operation was performed during NC program execution.
1824	The programs having numbers O8000 to O8999 must not be edited.
1825	The program area is protected by the memory protection key.
1826	Background editing is being performed.

A.2 LIST OF ALARMS (PMC)

(1) Alarm messages (PMC)

Message	Contents and solution
ALARM NOTHING	Normal status
ER01 PROGRAM DATA ERROR(RAM)	The sequence program is defective. (solution) Please clear the RAM and input LADDER again.
ER02 PROGRAM SIZE OVER	The size of sequence program exceeds the maximum size of LADDER(PMC–SC only). (solution) Please change MAX LADDER AREA SIZE at the SYSPRM screen and restart the system.
ER03 PROGRAM SIZE ERROR(OPTION)	The size of sequence program exceeds the option specification size. (solution) Please increase the option specification size. Or, reduce the size of sequence program.
ER04 PMC TYPE UNMATCH	The PMC model setting of the sequence program is not corresponding to an actual model. (solution) Please change the base PC board.
ER05 PMC MODULE TYPE ERROR	The module type of the PMC engine is not correct. (solution) Please exchange the module of PMC engine for a correct one.
ER07 NO OPTION (LADDER STEP)	There is no step number option of LADDER.
ER10 OPTION AREA NOTHING (series name)	The management software for the PMC–SB has not been transferred. (solution) The software installation is not consistent with the order. Contact FANUC.
ER12 OPTION AREA ERROR (series name)	The series of the management software for the PMC–SB differs between BASIC and OPTION. (solution) Contact FANUC.
ER14 OPTION AREA VERSIION ERROR (series name)	The edition of the management software for the PMC–SB differs between BASIC and OPTION. (solution) Contact FANUC.
ER17 PROGRAM PARITY	The parity error occurred on FROM for sequence program or the RAM. (solution) ROM: The deterioration of FROM may be deteriorated Please exchange memory module.
ER18 PROGRAM DATA ERROR BY I/O	Transferring the sequence program from offline programmer was interrupted by the power off etc. (solution) Please clear the sequence program and transfer the sequence program again.
ER19 LADDER DATA ERROR	Editing the LADDER was interrupted by the power off or by the switch to the CNC screen by the function key etc. (solution) Please edit LADDER once on PMC. Or, please input LADDER again.
ER20 SYMBOL/COMMENT DATA ERROR	Editing the symbol and comment was interrupted by the power off or by the switch to the CNC screen by the function key etc. (solution) Please edit symbol and comment once on PMC. Or, please input symbol and comment again.

Message	Contents and solution
ER21 MESSAGE DATA ERROR	Editing the message data was interrupted by the power off or the switch to the CNC screen by the function key etc. (solution) Please edit message data once on PMC. Or, please input message data again.
ER22 PROGRAM NOTHING	There is no sequence program
ER23 PLEASE TURN OFF POWER	There is a change in setting LADDER MAX AREA SIZE etc. (solution) Please restart the system to make the change effective.
ER25 SOFTWARE VERSION ERROR (PMCAOPT)	The PMC–SB management software editions are inconsistent. (solution) Contact FANUC.
ER26 SOFTWARE VERSION ERROR (PMCAOPT)	The PMC–SB management software cannot be initialized. (solution) Contact FANUC.
ER33 SLC ERROR	The LSI for I/O Link is defective. (solution) Please exchange the base PC board.
ER34 SLC ERROR(xx)	The communication with the DI/DO units of the xx group failed. (solution) Please confirm the connection of the cable connected to the DI/DO units of the xx group. Please confirm whether the DI/DO units turned on earlier than CNC and PMC. Or, please exchange the module of PMC engine on the DI/DO units of the xx group
ER35 TOO MUCH OUTPUT DATA IN GROUP(xx)	The number of the output data in the xx group exceeded the max. The data, which exceed 32 bytes, become ineffective. (solution) Please refer to the following for the number of the data for each group. "FANUC I/O Unit–MODEL A connecting and maintenance manual" (B–61813E) "FANUC I/O Unit–MODEL B connecting manual"(B–62163E)
ER36 TOO MUCH INPUT DATA IN GROUP(xx)	The number of the input data in the xx group exceeded the max. The data, which exceed 32 bytes, become ineffective. (solution) Please refer to the following for the number of the data for each group. "FANUC I/O Unit–MODEL A connecting and maintenance manual" (B–61813E) "FANUC I/O Unit–MODEL B connecting manual"(B–62163E)
ER38 MAX SETTING OUTPUT DATA OVER(xx)	The assignment data for a group exceeds 128 bytes. (The assignment data of output side of xx group or later become ineffective.) (solution) Please reduce the assignment data to 128 bytes or less for the number of the output data of each group.
ER39 MAX SETTING INPUT DATA OVER(xx)	The assignment data for a group exceeds 128 bytes. (The assignment data of input side of xx group or later become infective.) (Solution) Please reduce the assignment data to 128 bytes or less for the number of the input data of each goup.

*When ER00 to ER26 occur, sequence program is not available.

Message	Contents and solution
WN03 ABORT NC–WINDOW/ EXIN	LADDER was stopped while CNC and PMC were communicating. The functional instruction WINDR, WINDW, EXIN, DISPB, and etc. may not work normally. (solution) When restarting the system, this alarm will be released. Execute the sequence program(Press RUN key) after confirming whether there is a problem in LADDER or not.
WN05 PMC TYPE NO CONVERSION	A ladder program for the PMC–RA3/RA5 was transferred to the PMC–SB5. (solution) Correct the ladder type.
WN07 LADDER SP ERROR (STACK)	When functional instruction CALL(SUB65) or CALLU(SUB66) was executed, the stack of the LADDER overflowed. (solution) Please reduce the nesting of the subprogram to 8 or less.

(2) System alarm messages (PMC)

	Message	Contents and solution
1	PC004 CPU ERR xxxxxxxx:yyyyyyyy PC006 CPU ERR xxxxxxxx:yyyyyyyy PC009 CPU ERR xxxxxxxx:yyyyyyyy PC010 CPU ERR xxxxxxxx:yyyyyyyy	A CPU error occurred in the PMC. xxxxxxxx and yyyyyyyy indicate internal error code. If this error occurs, the base PC board may be faulty. Replace the base PC board, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) to FANUC.
2	PC030 RAM PARITY aa:bb	A RAM parity error occurred in the PMC. aa and bb indicate internal error code. If this error occurs, the base PC board may be faulty. Solution) Replace the base PC board, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) and the indicated internal error code to FANUC.
3	PC050 NMI SLC aa:bb or PC050 I/O Link aa:bb	A communication error occurred in the I/O Link. aa and bb indicate internal error code. If this error occurs, the possible causes are as follows: (1) Although the base expansion is assigned when the I/O Unit A is used, the base is not connected. (2) A cable is not connected securely. (3) Cabling is faulty. (4) I/O equipment (I/O unit, Power Mate, etc.) is faulty. (5) The base PC board is faulty. Solution) (1) Check whether the I/O assignment data and the actual I/O equipment connection match. (2) Check whether the cables are connected correctly. (3) According to ”FANUC I/O Unit–MODEL A Connection and Maintenance Manual” (B–61813E) or ”FANUC I/O Unit–MODEL B Connection manual” (B–62163E), check for an error in the cable specifications. (4) Replace the I/O unit interface module, cable, or base PC board. Then, check whether the error still occurs.

	Message	Contents and solution
4	PC060 FBUS xxxxxxxx:yyyyyyyy PC061 FL–R xxxxxxxx:yyyyyyyy PC062 FL–W aa: xxxxxxxx:yyyyyyyy	A bus error occurred in the PMC. aa, xxxxxxxx, and yyyyyyyy indicate internal error code. If this error occurs, the hardware may be faulty. Solution) Report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, tc.), the indicated internal error code, and the LED status on each board to FANUC.
5	PC070 SUB65 CALL (STACK)	A stack error occurred during execution of ladder function instruction CALL/CALLU. Solution) Check the correspondence between the CALL/CALLU instruction and SPE instruction. If the error cannot be located, report the conditions under which the error occurred and the ladder program to FANUC.
6	PC080 SYS EMG xxxxxxxx:yyyyyyyy PC081 FL EMG xxxxxxxx:yyyyyyyy	A system alarm was caused by another software. Solution) Report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.), the indicated internal error code, and the LED status on each board to FANUC.
7	PC097 PARITY ERR (LADDER) PC098 PARITY ERR (DRAM)	A parity error occurred in the PMC system. If this error occurred, the base PC board may be faulty. Solution) Replace the base PC board, then check whether the error recurs. If the error still occurs even after the replacement of the motherboard, report the conditions under which the error occurred (system configuration, operation, time and frequency of error occurrences, etc.) to FANUC.

(3) Alarm messages (For EDIT)

Message	Contents and solution
ADDRESS BIT NOTHING	The address of the relay/coil is not set.
FUNCTION NOT FOUND	There is no functional instruction of the input number.
COM FUNCTION MISSING	The funcitonal instruction COM (SUB29) is not correctly dealt with. Correspondence of COM and COME (SUB29) is incorrect. Or, the number of coil controlled by COM is specified by the model which the number cannot be specified.
EDIT BUFFER OVER	There in no empty area of the buffer for the editing. (solution) Please reduce NET under editing.
END FUNCTION MISSING	Functional instruction END1,END2,END3 and END do not exist. Or, there are error net in END1,END2,END3,END. Or, order of END1,END2,END3, and END is not correct.
ERROR NET FOUND	There is an error net.
ILLEGAL FUNCTION NO.	The wrong number of the functional instruction is searched.
FUNCTION LINE ILLEGAL	The functional instruction is not correctly connected.
HORIZONTAL LINE ILLEGAL	The horizontal line of the net is not connected.
ILLEGAL NET CLEARED	Because the power had been turn off while editing LADDER, some net under editing was cleared.
ILLEGAL OPERATION	Operation is not correct. The value is not specified and only INPUT key was pushed. The address data is not correctly inputted. Because the space to display the instruction on screen is not enough, the functional instruction cannot be made.
SYMBOL UNDEFINED	The symbol which was inputted is not defined.
INPUT INVALID	There is an incorrect input data. Non–numerical value was inputted with COPY, INSLIN,C–UP,C–DOWN etc. The input address was specified for write coil. An illegal character was specified for the data table.
NET TOO LARGE	The input net is larger than the editing buffer. (solution) Please reduce the net under editing.
JUMP FUNCTION MISSING	The functional instruction JMP(SUB10) is not correctly dealt with. Correspondence of JMP and JMPE(SUB30) is incorrect. The number of coil to jump is specified by the model which the number of coil cannot specified. (It is possible to specify the coil number only on PMC–SB/SC.)
LADDER BROKEN	LADDER is broken.
LADDER ILLEGAL	There is an incorrect LADDER.
IMPOSSIBLE WRITE	You try to edit sequence program on the FROM.
OBJECT BUFFER OVER	The sequence program area was filled. (solution) Please reduce the LADDER.
PARAMETER NOTHING	There is no parameter of the functional instruction.
PLEASE COMPLETE NET	The error net was found in LADDER. (solution) After correcting the error net, please continue operating.

Message	Contents and solution
PLEASE KEY IN SUB NO.	Please input the number of the functional instruction. (solution) If you do not input the functional instruction, please push soft key “FUNC” again.
PROGRAM MODULE NOTHING	You tried to edit though there was neither RAM for debugging nor ROM for sequence program.
RELAY COIL FORBIT	There is an unnecessary relay or coil.
RELAY OR COIL NOTHING	The relay or the coil does not suffice.
PLEASE CLEAR ALL	It is impossible to recover the sequence program. (solution) Please clear the all data.
SYMBOL DATA DUPLICATE	The same symbol name is defined in other place.
COMMENT DATA OVERFLOW	The comment data area was filled. (solution) Please reduce the number of the commnet.
SYMBOL DATA OVERFLOW	The symbol data area was filled. (solution) Please reduce the number of the symbol.
VERTICAL LINE ILLEGAL	There is an incorrect vertical line of the net.
MESSAGE DATA OVERFLOW	The message data area was filled. (solution) Please reduce the number of the message.
1ST LEVEL EXECUTE TIME OVER	The 1st level of LADDER is too large to complete execution in time. (solution) Please reduce the 1st level of LADDER.
PARA NO. RANGE ERR: MACHINE INSTRUCTION NAME	The specified machine instruction parameter number is out of the valid range. (solution) Specify a valid parameter number.
PARA NO. DUPLICATE: MACHINE INSTRUCTION NAME EXIT?	There is a duplicate machine instruction parameter number. (solution) If the duplicate parameter number does any harm, change it to an unused number.

(4) Alarm messages (For I/O)

Message	Contents and solution
I/O OPEN ERROR nn	An error occurs when the reader/puncher interface was started. nn= –1 Because the interface is used with NC etc., the interface is not able to be opened by PMC side. (solution) After other functions finishes using the line, please execute again. 6 There is no option for the interface. 20 The interface cannot be opened. (solution) Please confirm the connection of the cable. Please confirm setting of the baud rate etc.
I/O WRITE ERROR nn	An output error occurred in the reader/puncher interface. nn= 20 The state of the interface is not correct. (solution) Please confirm the connection of the cable. Please confirm setting the baud rate etc. 22 Opponent side is not ready to receive. (solution) Please confirm the power supply on the opponent side. Or, please initialize the interface.
I/O READ ERROR nn	An input error occurred in the reader/puncher interface. nn= 20 The state of the interface is not correct. (solution) Please confirm the connection of the cable. Please confirm setting the baud rate etc. 21 The data is not sent from the opponent side. (solution) Please confirm the power supply on the opponent side. Please initialize the opponent side.
I/O LIST ERROR nn	An error occurred in directory read processing from FD Cassette. nn= 20 The state of the interface is not correct. (solution) Please confirm the connection of the cable. Please confirm setting of the baud rate etc.
COMPARE ERR xxxxxx=aa:bb CONT? (Y/N)	A compare error occurred. xxxxxx : The Address where the compare error occurred. aa : The data on PMC side. bb : The data on device side Enter 'Y' to continue processing.
ADDRESS IS OUT OF RANGE (xxxxxx)	The data transferred to the address out of the PMC debugging RAM area. xxxxxx : Transferred address. (solution) Please confirm the address of the transferring data. LADDER : Please confirm the model setting. C language : Please confirm setting the address in the link control statement and build file.
ROM WRITER ERROR nnnnnn	An error occurred in the ROM writer.

A.3 SPINDLE ALARMS (SERIAL SPINDLE)

NOTE
Er–xx is not displayed on the screen.

Message	Contents	Countermeasure
Er–01	*Although ESP (there are 2 types : connection signal and PMC→CNC) and MRDY (machine ready signal) are not input, SFR/SRV is input. However, regarding MRDY, pay attention to the setting of use/not use spindle parameter MRDY.	*Confirm the sequence of ESP and MRDY.
Er–04	Although parameter setting for using position coder was not performed, commands for servo mode and synchronous control are input. In this case, the motor will not be excited.	Confirm the parameter setting of the position coder.
Er–05	Although option parameter for orientation is not set, the orientation command (ORCM) is input.	Confirm the parameter setting of orientation.
Er–06	Although option parameter for output switchover is not set, LOW winding is selected.	Confirm the parameter setting for output switching and power line status signal.
Er–08	Although servo mode control command was input, SFR/SRV is not input.	Confirm the sequence.
Er–11	Servo mode command was entered, but another mode (orientation) is specified.	Do not command other modes during servo mode command. When moving to other modes, perform after releasing the servo mode command.
Er–13	Orientation command was entered, but another mode (servo mode) is specified.	Do not command other modes during orientation command. When moving to other modes, perform after releasing the orientation command.
Er–14	SFR/SRV are simultaneously commanded.	Command one or the other.
Er–16	Differential mode command (DEFMDA) is entered when differential speed function is disabled by parameter setting (No.6500#5=1).	Check parameter setting and control input signal.
Er–17	Parameter setting (No.6511#0,1,2) for speed detector is incorrect. (Specified speed detector is not present.)	Check parameter setting.
Er–18	Spindle orientation command of position coder type is entered when use of position coder signal is disabled by parameter setting(No.6501#2=0).	Check parameter setting and control input signal.
Er–19	Although the command for orienting the magnetic sensor system was entered, another mode was issued.	Do not issue another mode while the orientation command is executed. Before issuing another mode, cancel the orientation command.
Er–24	To perform continuous indexing in the mode for orienting the position coder system, incremental operation (INCMD=1) was first performed, then the absolute position command (INCMD=0) was entered.	Check the control input signal (INCMD). To execute the absolute position command continuously, be sure to perform orientation with the absolute position command first.
Contact signal of *ESP	Between ESP1 and ESP2 of spindle control printed circuit board	Contact is open : emergency stop Contact is closed : general operation

Alarms (Serial spindle)

No.	Message	Alarm No.	Meaning	Description	Remedy
		"A" display	Program ROM abnormality (not installed)	Detects that control program is not started (due to program ROM not installed, etc.)	Install normal program ROM
7n01	SPN_n_ : MOTOR OVERHEAT	AL–01	Motor overheat	Detects motor speed exceeding specified speed excessively.	Check load status. Cool motor then reset alarm.
7n02	SPN_n_ : EX SPEED ERROR	AL–02	Excessive speed deviation	Detects motor speed exceeding specified speed excessively.	Check load status. Reset alarm.
7n03	SPN_n_ : FUSE ON DC LINK BLOWN	AL–03	DC link section fuse blown	Detects that fuse F4 in DC link section is blown (models 30S and 40S).	Check power transistors, and so forth. Replace fuse.
7n04	SPN_n_ : INPUT FUSE/ POWER FAULT	AL–04	Input fuse blown. Input power open phase.	Detects blown fuse (F1 to F3), open phase or momentary failure of power (models 30S and 40S).	Replace fuse. Check open phase and power supply regenerative circuit operation.
7n05	SPN_n_ : POWER SUPPLY FUSE BLOWN	AL–05	Control power supply fuse blown	Detects that control power supply fuse AF2 or AF3 is blown (models 30S and 40S).	Check for control power supply short circuit . Replace fuse.
7n07	SPN_n_ : OVERSPEED	AL–07	Excessive speed	Detects that motor rotation has exceeded 115% of its rated speed.	Reset alarm.
7n08	SPN_n_ : HIGH VOLT INPUT POWER	AL–08	High input voltage	Detects that switch is flipped to 200 VAC when input voltage is 230 VAC or higher (models 30S and 40S).	Flip switch to 230 VAC.
7n09	SPN_n_ : OVERHEAT MAIN CIRCUIT	AL–09	Excessive load on main circuit section	Detects abnormal temperature rise of power transistor radiator.	Cool radiator then reset alarm.
7n10	SPN_n_ : LOW VOLT INPUT POWER	AL–10	Low input voltage	Detects drop in input power supply voltage.	Remove cause, then reset alarm.
7n11	SPN_n_ : OVERVOLT POW CIRCUIT	AL–11	Overvoltage in DC link section	Detects abnormally high direct current power supply voltage in power circuit section.	Remove cause, then reset alarm.
7n12	SPN_n_ : OVERCURRENT POW CIRCUIT	AL–12	Overcurrent in DC link section	Detects flow of abnormally large current in direct current section of power cirtcuit	Remove cause, then reset alarm.
7n13	SPN_n_ : DATA MEMORY FAULT CPU	AL–13	CPU internal data memory abnormality	Detects abnormality in CPU internal data memory. This check is made only when power is turned on.	Remove cause, then reset alarm.
7n15	SPN_n_ : SP SWITCH CONTROL ALARM	AL–15	Spindle switch/output switch alarm	Detects incorrect switch sequence in spindle switch/ output switch operation.	Check sequence.

No.	Message	Alarm No.	Meaning	Description	Remedy
7n16	SPN_n_ : RAM FAULT	AL–16	RAM abnormality	Detects abnormality in RAM for external data. This check is made only when power is turned on.	Remove cause, then reset alarm.
7n18	SPN_n_ : SUMCHECK ERROR PGM DATA	AL–18	Program ROM sum check error	Detects program ROM data error.This check is made only when power is turned on.	Remove cause, then reset alarm.
7n19	SPN_n_ : EX OFFSET CURRENT U	AL–19	Excessive U phase current detection circuit offset	Detects excessive U phase current detection circuit offset. This check is made only when power is turned on.	Remove cause, then reset alarm.
7n20	SPN_n_ : EX OFFSET CURRENT V	AL–20	Excessive V phase current detection circuit offset	Detects excessive V phase current detection circuit offset. This check is made only when power is turned on.	Remove cause, then reset alarm.
7n24	SPN_n_ : SERIAL TRANSFER ERROR	AL–24	Serial transfer data error	Detects serial transfer data error (such as NC power supply turned off, etc.)	Remove cause, then reset alarm.
7n25	SPN_n_ : SERIAL TRANSFER STOP	AL–25	Serial data transfer stopped	Detects that serial data transfer has stopped.	Remove cause, then reset alarm.
7n27	SPN_n_ : DISCONNECT POS–CODER	AL–27	Position coder signal disconnection	Detects abnormality in position coder signal (such as unconnected cable and adjustment error).	Remove cause, then reset alarm.
7n29	SPN_n_ : SHORTTIME OVERLOAD	AL–29	Short–time overload	Detects that overload has been continuously applied for some period of time (such as restraining motor shaft in positioning).	Remove cause, then reset alarm.
7n30	SPN_n_ : OVERCUR-RENT POW CIRCUIT	AL–30	Input circuit overcurrent	Detects overcurrent flowing in input circuit.	Remove cause, then reset alarm.
7n31	SPN_n_ : MOTOR LOCK OR V–SIG LOS	AL–31	Speed detection signal disconnection motor restraint alarm or motor is clamped.	Detects that motor cannot rotate at specified speed or it is detected that the motor is clamped. (but rotates at very slow speed or has stopped). (This includes checking of speed detection signal cable.)	Remove cause, then reset alarm.
7n32	SPN_n_ : RAM FAULT SERIAL LSI	AL–32	Abnormality in RAM inside the LSI used for serial data transfer. This check is made only when power is turned on.	Detects abnormality in RAM inside the LSI used for serial data transfer. This check is made only when power is turned on.	Remove cause, then reset alarm.

No.	Message	Alarm No.	Meaning	Description	Remedy
7n33	SPN_n_ : SHORTAGE POWER CHARGE	AL–33	Insufficient DC link section charging	Detects insufficient charging of direct current power supply voltage in power circuit section when magnetic contactor in amplifier is turned on (such as open phase and defectifve charging resistor).	Remove cause, then reset alarm.
7n34	SPN_n_ : PARAMETER SETTING ER-ROR	AL–34	Parameter data setting beyond allowable range of values	Detects parameter data set beyond allowable range of values.	Set correct data.
7n35	SPN_n_ : EX SETTING GEAR RATIO	AL–35	Excessive gear ratio data setting	Detects gear ratio data set beyond allowable range of values.	Set correct data.
7n36	SPN_n_ : OVERFLOW ERROR COUNTER	AL–36	Error counter overflow	Detects error counter overflow.	Correct cause, then reset alarm.
7n37	SPN_n_ : SPEED DE-TECT PAR. ERROR	AL–37	Speed detector parameter setting error	Detects incorrect setting of parameter for number of speed detection pulses.	Set correct data.
7n41	SPN_n_ : 1–ROT POS–CODER ER-ROR	AL–41	Alarm for indicating failure in detecting position coder 1–rotaion signal.	Detects failure in detecting position coder 1–rotation signal.	Make signal adjustment for signal conversion circuit. Check cable shield status.
7n42	SPN_n_ : NO 1–ROT. POS–CODER DETECT	AL–42	Alarm for indicating position coder 1–rotation signal not detected	Detects that position coder 1–rotation signal has not issued.	Make 1–rotation signal adjustment for signal conversion circuit.
7n43	SPN_n_ : DISCON. PC FOR DIF. SP. MOD.	AL–43	Alarm for indicating disconnection of position coder signal for differential speed mode	Detects that main spindle position coder signal used for differential speed mode is not connected yet (or is disconnected).	Check that main spindle position coder signal is connected to connector CN12.
7n44	SPN_n_ : CONTROL CIRCUIT(AD) ERROR	AL–44			

No.	Message	Alarm No.	Meaning	Description	Remedy
7n46	SPN_n_ : SCREW 1–ROT POS–COD. ALARM	AL–46	Alarm for indicating failure in detecting position coder 1–rotation signal in thread cutting operation.	Detects failure in detecting position coder 1–rotation signasl in thread cutting operation.	Make 1–rotation signal adjustment for signal conversion circuit. Check cable shield status.
7n47	SPN_n_ : POS–CODER SIGNAL AB-NORMAL	AL–47	Position coder signal abnormality	Detects incorrect position coder signal count operation.	Make signal adjustment for signal conversion circuit. Check cable shield status.
7n49	SPN_n_ : HIGH CONV. DIF. SPEED	AL–49	The converted differential speed is too high.	Detects that speed of other spindle converted to speed of local spindle has exceeded allowable limit in differential mode.	Calculate differential speed by multiplying speed of other spindle by gear ratio. Check if calculated value is not greater than maximum speed of motor.
7n50	SPN_n_ : SPNDL CON-TROL OVER-SPEED	AL–50	Excessive speed command calculation value in spindle synchronizatio n control	Detects that speed command calculation value exceeded allowable range in spindle synchronization control.	Calculate motor speed by multiplying specified spindle speed by gear ratio. Check if calculated value is not greater than maximum speed of motor.
7n51	SPN_n_ : LOW VOLT DC LINK	AL–51	Undervoltage at DC link section	Detects that DC power supply voltage of power circuit has dropped (due to momentary power failure or loose contact of magnetic contactor).	Remove cause, then reset alarm.
7n52	SPN_n_ : ITP SIGNAL ABNORMAL I	AL–52	ITP signal abnormality I	Detects abnormality in synchronization signal (ITP signal) used in software.	Replace servo amp. PCB.
7n53	SPN_n_ : ITP SIGNAL ABNORMAL II	AL–53	ITP signal abnormality II	Detects abnormality in synchronization signal (ITP signal) used in hardware.	Replace servo amp. PCB.
7n56	SPN_n_ : INNER COOL-ING FAN STOP	AL–56	The cooling fan in the unit stopped.	The cooling fan in the control circuit section stopped.	Check the turning state of the cooling fan. Replace the cooling fan.
7n57	SPN_n_ : EX DECEL-ERATION POWER	AL–57	Deceleration power is too high.	Abnormal current flowed through the regenerative resistor.	Check the selection of the regenerative resistor. Alternatively, check whether the cooling fan motor is rotating.

No.	Message	Alarm No.	Meaning	Description	Remedy
7n58	SPN_n_ : OVERLOAD IN PSM	AL–58	Overload on the PSM main circuit	The temperature of the radiator of the main circuit has increased abnormally. (Cooling fan failure, dirt in the cooling fan, overload operation, etc.)	Eliminate the cause, then reset the alarm.
7n59	SPN_n_ : COOLING FAN STOP IN PSM	AL–59	The PSM cooling fan stopped.	The cooling fan of the control circuit section stopped.	Check the turning state of the cooling fan. Replace the cooling fan.

B LIST OF MAINTENANCE PARTS

Name	Drawing number	Parts specification	Remarks
Fan for control unit	A02B–0259–K120	A90L–0001–0385 (two)	
Battery for control unit	A02B–0200–K102	A98L–0031–0012	3 V lithium battery
Separate absolute pulse coder battery	A06B–6050–K061	A98L–0031–0005	Four D batteries
Backlight for 7.2” monochrome LCD	A02B–0236–K112	A61L–0001–0142#BL A61L–0001–0142#BLS	LCD/MDI, separate type LCD, detachable LCD/MDI
Backlight for 8.4” color LCD	A02B–0236–K111	A61L–0001–0162#BL A61L–0001–0176#BL	Detachable LCD/MDI type B
Backlight for 10.4” color LCD	A02B–0236–K116	A61L–0001–0168#BL	Color LCD with touch panel
Backlight for 9.5” monochrome LCD	A02B–0236–K114	A61L–0001–0154#BL	Monochrome LCD with touch panel
Fuse for control unit	A02B–0124–K101	A60L–0001–0046#5.0R	
Fuse for external I/O card	A02B–0124–K103	A60L–0001–0175#3.2A A60L–0001–0290#LM50	
Fuse for I/O module for operator’s panel Fuse cable for FSSB I/O module	A03B–0815–K001	A60L–0001–0290#LM10	
Fuse for I/O module for connector panel Fuse for Handy machine operator’s panel interface unit	A03B–0815–K002	A60L–0001–0172#DM10	
Fuse for analog servo interface unit	A02B–0200–K103	A60L–0001–0290#LM50	
Fuse for CRT control PCB	A02B–0124–K102	A60L–0001–0175#3.2A	CRT/MDI CRT/MDI for picture display Separate type MDI Separate type MDI for picture display LCD/MDI Detachable LCD/MDI Detachable LCD/MDI type B
Fuse for 7.2” monochrome LCD	A02B–0200–K104	A60L–0001–0290#LM10	LCD/MDI Separate type LCD Detachable LCD/MDI
Fuse for 8.4” color LCD	A02B–0200–K103	A60L–0001–0290#LM50	Detachable LCD/MDI type B

Name	Drawing number	Parts specification	Remarks
Fuse for LCD with touch panel	A02B–0265–K101	A60L–0001–0290#LM20C	Color LCD with touch panel Monochrome LCD with touch panel
Protection sheet of touch panel for color LCD with touch panel	A02B–0236–K110	A990–0165–0001 or A990–0165–0011	
Pen for Touch Panel	A02B–0236–K111	A99L–0164–0001	
Key sheet	—	A98L–0005–0035#PMGE1	For Handy Machine Operator’s Panel key , English key sheet
	—	A98L–0005–0035#PMGS1	For Handy Machine Operator’s Panel key , Symbolic key sheet
	—	A98L–0005–0036#PMGE1	For Handy Machine Operator’s Panel LED , English key sheet
	—	A98L–0005–0036#PMGS1	For Handy Machine Operator’s Panel LED , Symbolic key sheet
	—	A98L–0005–0212#A	Standard key sheet A for Handy Machine Operator’s Panel
	A02B–0259–K130	A98L–0005–0213	Transparent key sheet for Handy Machine Operator’s Panel
Plastic cover	—	A230–0583–X001	For basic unit
	—	A230–0583–X002	For fan unit
	—	A230–0583–X011	For base PCB face plate
	—	A250–8003–X170	Battery case for external control section
	—	A98L–0004–0149	Battery case for separate absolute pulse coder
	—	A290–7202–X901	Handy operator’s panel face plate
	—	A290–7202–X902	Handy operator’s panel bottom cover
	—	A290–7202–X909	Transparent cover for the LCD section of the handy operator’s panel
	—	A230–0606–V001	Front of the handy machine operator’s panel
	—	A230–0606–V002	Rear of the handy machine operator’s panel
	—	A230–0377–X004	Transparent cover for the LCD section of the handy machine operator’s panel

Name	Drawing number	Parts specification	Remarks
Others	—	A290–7202–X910	Belt for the handy operator’s panel
	A05B–2301–D002	—	Emergency stop section of the handy operator’s panel
	A05B–2301–D003	—	ON/OFF switch section of the handy operator’s panel
	A02B–0211–D001		Emergency stop section of the handy operator’s panel type B
	A02B–0211–D002		ON/OFF switch section of the handy operator’s panel type B
	—	A230–0606–X003	Gasket for the handy machine operator’s panel case
	—	A230–0606–X004	Belt for the handy machine operator’s panel
	A02B–0259–D022	—	Emergency stop section of the handy machine operator’s panel
	A02B–0259–D023	—	Override switch section of the handy machine operator’s panel

C BOOT SYSTEM

NOTE

The CRT/MDI operating instructions and related information described in this chapter are applicable also to the PDP/MDI, LCD/MDI, handy operator’s panel, and LCD with touch panel.

C.1 OVERVIEW

The Power Mate *i* system software (basic functions, servo, and PMC) are stored in the FROM (flash ROM).
The boot system load the system software (FROM→DRAM), then starts it so that system software can be executed.
The boot system provides the following maintenance functions for the Power Mate *i*:

(1) Registering a file in FROM
- Reads a file from a memory card, in FAT format, into FROM.

(2) Checking a file (series and edition) in FROM

(3) Deleting a file from FROM

(4) Batch saving and restoration of files of parameters and programs backed up by battery (SRAM area), to and from a memory card

(5) Saving a file in FROM to a memory card

(6) Formatting of a memory card

(7) Deleting a file from a memory card

This chapter describes the activation of the boot system, as well as the screen displays and operation for the functions listed above.

CAUTION
Memory cards can be used as an input/output device for the Power Mate. Before attempting to insert or remove a memory card, however, ensure that the power is turned off.

For the boot system, SRAM memory cards (only those specified by FANUC) and flash memory cards can be used. For data backup, use a flash memory card.

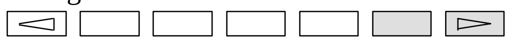
NOTE
Use an Intel Series 2 flash memory card.
Recommended: 4MB
FANUC specification A02B–0259–K201
- Compatible with A87L–0001–0153#4M used in the Power Mate–H.
- A87L–0001–0133#256, 512, and 1024 used in the Power Mate–D cannot be used in the Power Mate *i*.

C.1.1 Starting the Boot System

In ordinary system activation, the boot system automatically transfers files from FROM to DRAM in the background.
The user is not aware of this operation. However, the boot system must be operated manually, from menu screen, when maintenance is to be carried out or when the FROM does not contain a required file.

1 In system maintenance, for example, to replace a file in FROM

- Operation (CRT, LCD, PDP, handy operator's panel) :
  Turn the power on by simultaneously pressing the two soft keys at the right end.



  Hold down the two keys until the boot system screen appears.

- Operation (on LCD with touch panel):
  While touching the upper left edge of the screen, turn on the power.

- Operation (DPL/MDI) :
  Turn the power on by simultaneously pressing the <0> and <.> DPL keys. Hold down the two keys until the boot system screen appears.

2 When the FROM does not contain a file required to start the Power Mate *i*

Immediately after the Power Mate *i* is turned on, the boot system starts transferring files from FROM to DRAM. If, for some reason, a file required to start the Power Mate *i* (NC basic) is not in FROM or has been destroyed, the boot system is automatically started.

C.1.2 System Files and User Files

The boot system organizes files in FROM into two main groups : system files and user files. These two file types have the following characteristics:

- **System files**

CNC and servo control software of Power Mate *i* provided by FANUC

- **User files**

PMC sequence program (ladder), P–CODE macro program, and other user–created files

C.2 SCREEN CONFIGURATION AND OPERATING PROCEDURE

When the boot system is first started, the MAIN MENU screen is displayed. This screen is described below :

- **MAIN MENU screen (CRT/MDI)**

```
(1)   SYSTEM MONITOR MAIN MENU          881I-01

(2)   1. SYSTEM DATA LOADING
(3)   2. SYSTEM DATA CHECK
(4)   3. SYSTEM DATA DELETE
(5)   4. SYSTEM DATA SAVE
(6)   5. SRAM DATA BACKUP
(7)   6. MEMORY CARD FILE DELETE
(8)   7. MEMORY CARD FORMAT


(9)   10.END

      *** MESSAGE ***
(10)  SELECT MENU AND HIT SELECT KEY.
      [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title. The series and edition of the boot system appear atthe right end.
(2) : Function for writing data to FROM.
(3) : Function for checing the edition of a file in ROM.
(4) : Function for deleting a file from FROM.
(5) : Function for making a backup copy of the data stored on the memory card.
(6) : Function for making a backup copy of the data in SRAM memory.
(7) : Function for deleting a file from a memory card.
(8) : Function for formatting a memory card.
(9) : Function for terminating the boot system and starting the Power Mate *i* system.
(10) : Condensed guidance or error message

- **Operating procedure**

Press the **[UP]** or **[DOWN]** soft key to select the desired function. After positioning the cursor to the desired function, press the **[SELECT]** soft key. Before executing a function, the system my request confirmation from the operator by having him/her press the **[YES]** or **[NO]** soft key.

- **Basic operation**

Position the cursor. **[UP]** **[DOWN]** → Select a function **[SELECT]** → Check the selection **[YES]** **[NO]** → Execute the function → Select END

→ Return to original state

- **MAIN MENU screen (DPL/MDI)**

SYSTEM MONITOR **881I– 01**

When the above BOOT SYSTEM screen is displayed, pressing the **[↓]** key on the DPL displays the following screens, in the order shown.

Screen		Description
1. SYSTEM DATA LOADING.	:	Write a system file or use file to flash memory
2. SYSTEM DATA CHECK.	:	Checking the system file edition
3. SYSTEM DATA DELETE.	:	Deleting a flash memory file
4. SYSTEM DATA SAVE.	:	Backup a user file to a memory card
5. FILE DATA BACKUP/RESTORE	:	Backup of the SRAM area
6. MEMORY CARD FILE DELETE.	:	Deleting file in a memory card
7. MEMORY CARD FORMAT.	:	Formatting a memory card
10. SYSTEM MONITOR EXIT.	:	Exiting the BOOT SYSTEM and starting.

- **Operation**

When the screen for the function to be selected is displayed, press the **[INPUT]** key on the DPL.

C.2.1 System Data Loading Screen

- **Description**

This screen is used to read a system or user file from a memory card into FROM.

- **Screen configuration (CRT/MDI)**

```
(1)  SYSTEM DATA LOADING                        1/1

     FILE DIRECTORY
(2)  88E0_B.MEM
     88E0_AI.MEM
(3)  END






     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title. The page number (n) and total number of pages (m) are displayed, in n/m format, at the right end.

(2) : Files on the memory card

(3) : Option for returning to previous menu Message

(4) : Message

- **Operating procedure**

1 Position the cursor to the file to be read from the memory card and written to FROM. Then, press the **[SELECT]** soft key.

A single page can list up to eight file names. If the memory card contains nine or more files, the remaining files are displayed on another page.

To display the next page, press the [▷] soft key.

To display the previous page, press the [◁] soft key. The END option is displayed on the last page.

The END option is displayed on the last page.

2 After a file has been slected, the system asks whether that file is to be loaded.

```
*** MESSAGE ***
LOADING OK ? HIT YES OR NO.
```

3 To start loading, press the **[YES]** soft key. To cancel, press the **[NO]** key.

```
*** MESSAGE ***
LOADING FROM MEMORY CARD.
```

4 When loading terminates normally, the system displays the following message. Press the **[SELECT]** soft key. If an error occurs, see C.3

```
*** MESSAGE ***
LOADING COMPELETE. HIT SELECT KEY.
```

- **Screen configuration and operation (DPL/MDI)**

Selecting SYSTEM DATA LOADING displays the file selection screen, shown below. Pressing the **[↑]** or **[↓]** key on the DPL displays the names of the files in the memory card. Once the name of the file to be loaded appears, pressing the **[INPUT]** key starts loading of that file.

LOADING MENU ***88F1A.MEM**	: File selection screen

During loading, the following screen is displayed:

88F1A.MEM **LOADING**	: The name of the file being loaded is displayed and LOADING blinks.

Once loading has been completed, the file selection screen is displayed again.
To end the operation, press the **[INPUT]** key once *END appears on the screen. The initial screen is displayed. Pressing the **[CAN]** key also causes the initial screen to be displayed.

- **Others**

1 Counter display while a file is being loaded (CRT, etc.)

While a file is being loaded, the address of the data currently being accessed is displayed.

```
*** MESSAGE ***
LOADING FROM MEMORY CARD.
ADDRESS 001:          ← The counter appears under the
     (1)                    message fild.
```

(1): Number of 128–KB management unit in FROM

2 File name in FROM

The boot system identifies a file in FROM by the first four characters of the file name. If FROM has a file of the same type as a file to be read from the memory card, the file in FROM is deleted before the file on the memory card is read. The following table lists the file names and the contents. Note that these file names are subject to change without prior notice.

File name	Contents	File type
NC BASIC	Basic	System file
DG SERVO	Servo	System file
NC□ OPTN	Optional	System file
PMC□****	PMC control software, etc.	System file
PCD ****	P–CODE macro file	User file
PD1M ****	P–CODE macro file	User file
CEX ****	C–language executor	User file
PMC - ****	Ladder software	User file

□ : A numeric character, * : An alphabetic character

C.2.2 System Data Check Screen

- **Description**

This screen is used to list files in FROM, together with the corresponding numbers of 128–KB management units in each file and the series and edition of the software.

- **Screen configuration (CRT/MDI)**

```
(1)  SYSTEM DATA CHECK                              1/1

     FILE DIRECTORY (FLASH ROM : 4MB)
(2)    1 NC BASIC  ( 10)
       2 DG SERVO  ( 1)
       3 PMC0BSC   ( 2)
       4 PMC-RB    ( 1)
       5 PCD 0.5M  ( 4)
(3)    END




     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title

(2) : Names of files in FROM The number of management units constituting each file appears in parentheses to the right of the file name.

(3) : Returning to the previous menu

(4) : Message

- **Screen configuration and operating procedure (DPL/MDI)**

1 Select the file whose details are required. For example, select “1 NC BASIC (10).”

2 The numbers of management units in the selected file are listed, together with the series and edition of the software in each management unit. After checking the listed data, select the **[SELECT]** soft key to return to the file selection screen.

```
ROM FILE CHECK
NC BASIC

  0 88E0 801A 000
  1 88E0 802A 001       0 88E0 801A 000
  2 88E0 841A 002
  3 88E0 842A 003
  4 88E0 881A 004
  5 88E0 882A 005
  6 88E0 8C1A 006
  7 88E0 8C2A 007


*** MESSAGE ***
CONTINUE. HIT SELECT KEY.
[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

Internal management–unit number
ROM number and edition
Series

- **Operation (DPL/MDI)**

Selecting SYSTEM DATA CHECK displays the file information screen, shown below. Pressing the **[↑]** or **[↓]** key on the DPL displays other file information.

CHECK MENU **1 NC BASIC(10)**	: File information screen The number of control units used by the file (1 unit = 128 KB) is indicated in paren-theses.

When a file name is displayed, pressing the **[INPUT]** key displays detailed information for that file, including the series, ROM number, edition, and internal control number (up to 16).

NC BASIC **1 88F1 801A 00**	: File detailed information screen

To end the operation, press the **[INPUT]** key once *END appears on the screen. The file information screen is displayed. Pressing the **[CAN]** key also displays the file information screen.
To return from the file information screen to the initial screen, press the **[INPUT]** key once *END appears on the screen. The initial screen is displayed. Pressing the **[CAN]** key also displays the initial screen.

- **Others**

Parity information for the system file and user file
The NC BASIC, DG SERVO, and other system files in FROM contain parity information in each management unit. If the file name field or parity field on the check screen contains a non–ASC II character or an “@” , the FROM may have been destroyed or a damaged file may have been read. Re–read the data from the memory card.
The PMC–RB, PCD 0.5M, and other user files do not contain parity information in each management unit. A non–ASCII character or an “@” may appear in the series/edition information. In this case, it does not indicate that the file has been damaged.

C.2.3 System Data Delete Screen

- **Description**

This screen is used to delete a user file from FROM.

- **Screen configuration (CRT/MDI)**

```
(1)  SYSTEM DATA CHECK                              1/1

     FILE DIRECTORY (FLASH ROM : 4MB)
(2)    1 NC BASIC  ( 10)
       2 DG SERVO  ( 1)
       3 PMC0BSC   ( 2)
       4 PMC-RB    ( 1)
       5 PCD 0.5M  ( 4)
(3)    END




(4)  *** MESSAGE ***
     SELECT FILE AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title

(2) : Names of files in FROM The number of management units constituting each file appears in parentheses to the right of the file name.

(3) : Returning to the previous menu

(4) : Message

- **Screen configuration and operating procedure (DPL/MDI)**

1 Position the cursor to the name of the file to be deleted. Press the **[SELECT]** soft key.

2 The system displays the following confirmation message :

```
*** MESSAGE ***
DELETE OK ? HIT YES OR NO.
```

3 To start the deletion, press the **[YES]** key. To cancel, press **[NO]**.

```
*** MESSAGE ***
DELETING ROM FILE IN FLASH MEMORY.
```

4 When deletion terminates normally, the system displays the following message. Press the **[SELECT]** key.

```
*** MESSAGE ***
DELETING COMPLETE. HIT SELECT KEY.
```

- **Operation (DPL/MDI)**

Selecting SYSTEM DATA DELETE displays the file selection screen, shown below. Pressing the **[↑]** or **[↓]** key on the DPL displays the names of the files in flash memory. Once the name of the file to be deleted appears, pressing the **[INPUT]** key deletes that file.

DELETE MENU **1 PD1M256K(2)**	: File selection screen The number of control units used by the file (1 unit = 128 KB) is indicated in parentheses.

During deletion, the following screen is displayed:

PD1M256K **DELETE**	: The name of the file being deleted is displayed and DELETE blinks.

Once deletion has been completed, the file selection screen is displayed again.
To end the operation, press the **[INPUT]** key once *END appears on the screen. The initial screen is displayed. Pressing the **[CAN]** key also displays the initial screen.

- **Others**

System files and user files on SYSTEM DATA DELETE screen
The system files are protected from accidental deletion. User files, however, are not protected. Protected system files can be overwritten from the SYSTEM DATA LOADING screen.

C.2.4 SYSTEM DATA SAVE Screen

- **Description**

This screen is used to write a user file in FROM to a memory card. Only user files can be saved from FROM to a memory card. System files cannot be saved.

- **Screen configuration (CRT/MDI)**

```
(1)  SYSTEM DATA SAVE

     FILE DIRECTORY (FLASH ROM : 4MB)
(2)    1 NC BASIC  ( 10)
       2 DG SERVO  ( 1)
       3 PMC0BSC   ( 2)
       4 PMC-RB    ( 1)
       5 PCD 0.5M  ( 4)
(3)    END




     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title

(2) : Names of files in FROM The number of management units constituting each file appears in parentheses to the right of the file name.

(3) : Returning to the previous menu

(4) : Message

- **Screen configuration and operating procedure (DPL/MDI)**

1 Position the cursor to the name of the file to be deleted. Press the **[SELECT**] soft key.

2 The system displays the following confirmation message :

```
*** MESSAGE ***
SAVE OK ? HIT YES OR NO.
```

3 To start saving, press the **[YES]** key. To cancel, press **[NO]**.

```
*** MESSAGE ***
WRITING FLASH ROM FILE TO MEMORY CARD.
SAVE FILE NAME : PMC_SB.000
```

4 When saving terminates normally, the system displays the following message. Press the **[SELECT]** key. The names of files written to the memory card are listed. Check the file names by, for example, making a note of the list.

```
*** MESSAGE ***
FILE SAVE COMPELETE. HIT SELECT KEY.
SAVE FILE NAME : PMC_SB.000
```

- **Operation (DPL/MDI)**

Selecting SYSTEM DATA SAVE displays the file selection screen, shown below.
Pressing the **[↑]** or **[↓]** key on the DPL displays the names of the files in flash memory. Once the name of the file to be saved appears, pressing the **[INPUT]** key saves

SAVE MENU **3 PMC RB(1)**	: File selection screen The number of control units used by the file (1 unit = 128 KB) is indicated in parentheses.

During saving, the following screen is displayed:

PMC RB.000 **SAVE**	: The name of the file being saved is displayed and SAVE blinks.

Once saving has been completed, the file selection screen is displayed again.
To end the operation, press the **[INPUT]** key once *END appears on the screen. The initial screen is displayed. Pressing the **[CAN]** key also displays the initial screen.

- **Others**

1 System files and user files on SYSTEM DATA SAVE screen

The SYSTEM DATA SAVE function provides a safeguard against free copying of the system files.

User files, however, are not protected.

2 Names of saved files

Files saved from FROM to a memory card have the following names:

FROM		Memory card
PMC–RB	→	PMC_RB. XXX
PD1M256K	→	PD1M256K.XXX
PD1M512K	→	PD1M512K.XXX
CEX1.0M	→	CEX_10M.XXX
CEX 2.0M	→	CEX_20M.XXX

XXX corresponds to the file extension of MS–DOS format files. A number from 000 to 031 is specified for XXX. For example, if the PMC–RB file in FROM is saved to a memory card that does not yet contain a file whose name begins with "PMC–RB", the saved file is named PMC–RB.000. If, however, that file is saved to a memory card that already contains a file named PMC–RB.000, the saved file is named PMC–RB.001. As files are added, the extension is incremented up to a maximum of PMC–RB.031. Any no–longer used numbers in the sequence of the extension numbers are used in as cending order. If two or more files having identical names but different extension numbers are normally saved to the memory card, check the file names displayed subsequently.

C.2.5 SRAM DATA BACKUP Screen

- **Description**

This screen is used to collectively save and restore parameters, programs, and other data in SRAM memory, retained after the Power Mate *i* power is turned off, to and from a memory card.

- **Screen configuration (CRT/MDI)**

Select "4 SRAM DATA BACKUP" on the SYSTEM MONITOR MAIN MENU screen. The following screen is displayed.

```
(1)  SRAM DATA BACKUP

(2)    1. SRAM BACKUP (CNC  → MEMORY CARD)
       2. RESTORE SRAM (MEMORY CARD  → CNC)
(3)    END

(4)    SRAM SIZE   :  256K (BASIC)
(5)    FILE NAME   :  SRAM256A. FDB




     *** MESSAGE ***
(6)  SELECT MENU AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title

(2) : Menu

(3) : Returning to the previous menu

(4) : Size of SRAM memory on the Power Mate *i*

(5) : File name

(6) : Message

- **Operating procedure**

[For batch backup]

1 Select “1. SRAM BACKUP.” The following confirmation message is displayed. The file name may be displayed according to the SRAM capacity.

2 Pressing **[YES]** triggers a batch backup.

```
*** MESSAGE ***
BACKUP SRAM DATA OK ? HIT YES OR NO.
```

3 If a same file name is already on the memory card, you will be prompted to confirm whether to permit overwriting.

4 The name of the file being written to the memory card is displayed in the FILE NAME: field.

```
SRAM SIZE   : 0.5MB (BASIC)
FILE NAME   : SRAM0_5A.FDB  → MEMORY CARD


*** MESSAGE ***
SRAM DATA WRITING TO MEMORY CARD.
```

Name of the file being saved

5 Upon terminating normally, the system displays the following message. Press the **[SELECT]** soft key.

```
*** MESSAGE ***
SRAM BACKUP COMPLETE. HIT SELECT KEY.
```

[Restoring the data]

1 Select “2. RESTORE SRAM.” The system displays the following message. Press the **[YES]** key.

```
*** MESSAGE ***
RESTORE SRAM DATA OK ? HIT YES OR NO.
```

2 The system displays the following message during restoration.

```
*** MESSAGE ***
RESTORE SRAM DATA FROM MEMORY CARD.
```

3 Upon terminating normally, the system displays the following message. Press the **[SELECT]** soft key.

```
*** MESSAGE ***
RESTORE COMPLETE. HIT SELECT KEY.
```

- **Screen configuration and operation procedure (DPL/MDI)**

Selecting FILE DATA BACKUP/RESTORE displays the selection screen, shown below. Select BACKUP or RESTORE by pressing the **[↑]** or **[↓]** key. Then, pressing the **[INPUT]** key saves or restores the file data.
BACKUP : Save data into the backup file.
RESTORE : Restore data from the backup file.

Screen	
FILEDATA MENU **1. FILE BACKUP**	: The file data is saved into the memory card.

During saving or restoration, the following screen is displayed:

Screen	
SRAM256A.FDB **BACKUP**	: The name of the file being saved or restored is displayed and BACKUP blinks.

Once saving or restoration has been completed, the selection screen is displayed again. To end the operation, press the **[INPUT]** key once *END appears on the screen. The initial screen is displayed. Pressing the **[CAN]** key also displays the initial screen.

- **Others**

1 Name of backup file

The name of the backup file written to the memory card by the SRAM backup function depends on the size of the SRAM installed in the Power Mate *i*.

When the size of SRAM is 1MB or larger, backup files are created in units of 512 KB.

SRAM size \ Number of files	1	2
256KB	SRAM256A.FDB	
1.0MB	SRAM1_0A.FDB	SRAM1_0B.FDB

CAUTION

In a system using an absolute pulse coder, using this function to restore parameters causes the zero point setup flag (bit 4 of parameter 1815) to be cleared, so it becomes necessary to re–set up the reference point.

C.2.6 MEMORY CARD FILE DELETE Screen

- **Description**

This screen is used to delete a file from a memory card.

- **Screen configuration (CRT/MDI)**

```
(1)  SRAM DATA LOADING                          1/1
     FILE DIRECTORY
(2)  B1F1A B.MEM
     88E0A_A1.MEM
(3)    END






     *** MESSAGE ***
(4)  SELECT FILE AND HIT SELECT KEY.
     [ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

(1) : Screen title. Tlhe current page number (n) and the total number of pages (m) are displayed, in n/m format, at the right end.

(2) : Files on the memory card

(3) : Option for returning to the previous menu

(4) : Message

- **Operating procedure**

1 Press the **[SELECT]** key to select the name of the file to be deleted from the memory card.

2 The system displays the following confirmation message. Press the **[YES]** key.

```
*** MESSAGE ***
DELETE OK ? HIT YES OR NO.
```

3 When a file has been deleted normally, display the following message. Press the **[SELECT]** key.

```
*** MESSAGE ***
DELETE COMPLETE. HIT SELECT KEY.
```

- **Screen configuration and operation procedure (DPL/MDI)**

Selecting MEMORY CARD FILE DELETE displays the file selection screen, shown below. Pressing the **[↑]** or **[↓]** key on the DPL displays the names of the files stored on the memory card. Once the name of the file to be deleted appears, pressing the **[INPUT]** key deletes that file.

MEMORY DELETE ***BASIC.DAT**	: File selection screen

During deletion, the following screen is displayed:

BASIC.DAT **DELETE**	: The name of the file being deleted is displayed and DELETE blinks.

Once deletion has been completed, the file selection screen is displayed again. To end the operation, press the **[CAN]** key. The initial screen is displayed.

C.2.7 MEMORY CARD FORMAT Function

- **Description**

This function is used to format a memory card. Memory cards must be formatted before they can be used for the first time or before they can be re–used after their data has been destroyed or lost because of, for example, battery failure.

- **Operating procedure**

1 From the SYSTEM MONITOR MAIN MENU screen, select “7. MEMORY CARD FORMAT.”

2 The system displays the following confirmation message.
Press the **[YES]** key.

```
*** MESSAGE ***
MEMORY CARD FORMAT OK ? HIT YES OR NO.
```

3 The system displays the following message during formatting :

```
*** MESSAGE ***
FORMATTING MEMORY CARD.
```

4 When a card has been formatted normally, the system display the
· following message.
· Press the **[SELECT]** key.

```
*** MESSAGE ***
FORMAT COMPLETE. HIT SELECT KEY.
```

- **Operation (DPL/MDI)**

Selecting MEMORY CARD FORMAT displays the confirmation screen, shown below. Pressing the **[INPUT]** key starts formatting. To cancel formatting, press the **[CAN]** key. The initial screen is displayed again.

CARD FORMAT OK? **PUSH INP OR CAN.**	: Confirmation screen ”PUSH INP OR CAN.” blinks.

During formatting, the following screen is displayed:

CARD FORMAT **EXEC**	: EXEC blinks.

Once formatting has been completed, the initial screen is displayed again.

C.2.8 LOAD BASIC SYSTEM Function

- **Description**

The function is used to terminate the boot system and activate the Power Mate *i*.

- **Operating procedure (CRT/MDI)**

From the MAIN MENU screen, select “9. END.” The system displays the “ARE YOU SURE? HIT YES OR NO” message. To terminate the boot system and activate the CNC, press the **[YES]** soft key. Press the **[NO]** soft key, and you will be brought back to the main menu.

```
*** MESSAGE ***
ARE YOU SURE ? HIT YES OR NO.

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

1 After pressing the **[YES]** soft key

The system checks the NC BASIC system file in the flash ROM. The system displays the following message :

```
*** MESSAGE ***
CHECK CNC BASIC SYSTEM.

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

When the NC BASIC system file is found to be normal, the system sends the system file to DRAM and starts the NC basic system. During loading, the system blinks the following message.

```
*** MESSAGE ***
   LOADING BASIC TO DRAM

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

If the NC BASIC SYSTEM content has been disrupted, the error message “ROM PARITY ERROR: NC BASIC. HIT SELECT.” appears.

2 If the **[NO]** soft key is pressed, the system returns to the processing selection state as shown below :

```
*** MESSAGE ***
SELECT MENU AND HIT [SELECT] KEY.

[ SELECT ][  YES  ][  NO  ][  UP  ][  DOWN  ]
```

- **Operation (DPL/MDI)**

Selecting SYSTEM MONITOR EXIT displays the confirmation screen, shown below. Pressing the **[INPUT]** key loads the basic system from flash memory into DRAM. To cancel loading, press the **[CAN]** key. The initial screen is displayed again.

```
MONITOR EXIT
PUSH INP OR CAN.
```

: Confirmation screen ”PUSH INP OR CAN.” blinks.

During loading, the following screens are displayed, in the order shown:

```
CHECK CNC BASIC
        SYSTEM.
```

```
CHECK CNC BASIC
      TO DRAM.
```

```
CHECK CNC BASIC
        LOADED.
```

Once loading has been completed, the series and edition are displayed and starting.

C.3 ERROR MESSAGES AND REQUIRED ACTIONS

The following table lists and explains error messages in alphabetical order.

	Message ( ) is displayed data on DPL/MDI	Description and required action
B	BOOT ROM PARITY. PLEASE POWER OFF.	The contents of the flash memory including BOOT system are broken. Please replace the CPU card.
C	CHANGE MEMORY CARD. AND HIT YES OR NO.	There is no more space in memory card for SRAM backup operation. Please change the memory card with sufficient capacity.
D	DELETE ERROR. HIT SELECT KEY. (ERROR–014)	An attempt to delete a file from flash memory was unsuccessful or files of memory card cannot be deleted. Retry the deletion. If the second attempt also fails, the flash memory may have been damaged or destroyed. Replace the memory module.
	DEVICE ERROR (CNC X) (ERROR–032)	An attempt to write data to flash memory was unsuccessful. Retry the write operation after off power and restart the system. If the second attempt also fails, the flash memory may have been damaged or destroyed. Replace the flash memory module.
F	FILE SAVE ERROR. HIT SELECT KEY. (ERROR–015)	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. (ERROR–004)	There is insufficient free flash memory to store the selected file. Delete any unnecessary files from flash memory or replace to bigger memory module.
	FLASH ROM MODULE NOT EXIST.	Flash memory module is not mounted on the selected printed circuit board.
I	ILLEGAL FORMAT FILE. (ERROR–003)	The selected file cannot be read into flash memory. The selected file or the header information for flash memory may have been damaged or destroyed.
	ILLEGAL FROM MODULE. HIT SELECT KEY.	The ID part of flash memory module is illegal. Please confirm the drawing number of the flash memory module.
	ILLEGAL SRAM MODULE. HIT SELECT KEY. (ERROR–031)	The ID part of SRAM module is illegal. Please confirm the drawing number of the memory module.
L	OADING ERROR. HIT SELECT KEY. (ERROR–013)	An error occurred while loading data into flash memory.Do not touch the memory card while loading data.

	Message ( ) is displayed data on DPL/MDI	Description and required action
M	MAX EXTENSION OVER. HIT SELECT KEY. (ERROR–022)	The extension number added to a file name exceeds 031. Delete any unnecessary backup files from the memory card.
	MEMORY CARD BATTERY ALARM. HIT SELECT KEY. (ERROR–002)	The memory card's battery is exhausted. Replace the battery.
	MEMORY CARD FULL. HIT SELECT KEY. (ERROR–021)	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 SELECT KEY. (ERROR–033)	This memory card is not supported. Please use the memory card that is recommended in the order list.
	MEMORY CARD MOUNT ERROR. HIT SELECT KEY. (ERROR–024)	Accessing to the memory card is failed. Please confirm the memory card is formatted with FAT format.
	MEMORY CARD NOT EXIST. HIT SELECT KEY. (ERROR–001)	The memory card is not inserted into its slot. Check that the memory card is pushed fully home.
	MEMORY CARD PROTECTED. HIT SELECT KEY. (ERROR–016)	Although writing to the memory card was selected, the write inhibit switch is set. Disable the write inhibit switch.
	MEMORY CARD RESET ERROR. HIT SELECT KEY. (ERROR–018)	Access to the memory card has failed. Check whether the memory card is defective.
	MEMORY CARD WRITE ERROR. HIT SELECT KEY. (ERROR–020)	Write to memory card is failed. Check whether the memory card is normal.
N	NMI OCCURRED. PLEASE POWER OFF.	Some trouble related to the hardware or the software occurs. Please confirm the operation to generate the trouble. And please contact the service division with the information about the edition number and series number of the BOOT software.
P	PLEASE FORMAT FLASH TYPE CARD. HIT SELECT KEY. (ERROR–030)	The operation to delete file in the flash memory card or to create the file with the same name that is already exists is executed.Before those operation, delete all files with FORMAT function.
R	ROM PARITY ERROR:NC BASIC. HIT SELECT KEY.	Parity error is detected in NC BASIC part. With SYSTEM DATA CHECK, please confirm there exists NC BASIC in the memory module.
S	SRAM DATA BACKUP ERROR. HIT SELECT KEY. (ERROR–023)	An attempt to write a backup file to a memory card failed. Check that the memory card is normal.
	SRAM PARITY OCCURRED. PLEASE POWER OFF.	Parity error is detected during back–upping SRAM data. (Warning)

CAUTION

Action to be taken when an SRAM parity error is detected during backup of SRAM in the boot system

The SRAM area of each Power Mate *i* shipped from the factory is cleared and is free of parity errors. However, shock applied to the Power Mate *i* during transportation may cause a parity error in the SRAM area. A parity error may also occur in the SRAM area when the Power Mate *i* was kept switched off for one year or longer, and the battery has been exhausted. If a parity error occurs in the SRAM area, the data held in the SRAM area is not guaranteed. However, the Power Mate *i* 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 Power Mate *i*, the Power Mate *i* 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 Power Mate *i* has operated normally. In this case, the SRAM data of the Power Mate *i* is not guaranteed, and the data cannot be backed up using the SRAM backup function of the boot system. Nevertheless, the Power Mate *i* may operate normally. So, it is recommended that necessary data be backed up using the Handy File, data all clear operation be performed, then the backed up data be restored in the Power Mate *i*. Once all clear operation is performed, the parity error can be removed. Then, the SRAM backup function of the boot system can be used.

NOTE

To clear all the data, follow the methods described in Appendix F.4, "Setting/Maintenance Using the Power Mate *i* Main Unit."

D MEMORY CARD OPERATOR'S MANUAL

D.1 OUTLINE

FANUC–specified flash memory card, the SRAM memory card, and the ATA card can be used as a data exchanging media for CNC unit.

The memory card is easy to use and a data exchanging media which can be input and output data with high speed, and you should take care of operation for the memory card.

This manual describes operating procedure and advice for the memory card.

D.2 SUPPORTED AND UNSUPPORTED CARDS

SRAM cards

- Type 1 and Type 2 of Japan Electronic Industry Development Association (JEIDA) version 4.0 or later
- Type 1 and Type 2 of Personal Computer Memory Card International Association (PCMCIA) version 2.0 or later
- PC Card Standard

SRAM cards that comply with one of the above standards can be used. Note that, however, SRAM cards operating only with a 3.3–V power supply cannot be inserted physically, so they cannot be used.

FANUC–specified SRAM cards of which operation has been proven by FANUC are listed below.

256KB SRAM card	Fujitsu Media Device	MB98A90823–20
512KB SRAM card	Fujitsu Media Device	MB98A90923–20
1MB SRAM card	Fujitsu Media Device	MB98A91023–20
2MB SRAM card	Fujitsu Media Device	MB98A91123–20

Flash memory card

Intel's series 2 flash memory card (or an equivalent product) can be used. In the same way as with SRAM cards, flash memory cards that can operate only on 3.3 V cannot be physically inserted, so they cannot be used.

Generally, a flash memory card containing a flash memory chip other than Intel's flash memory cannot be used. When such a memory card has been formatted or written by a personal computer or the like, however, it may be possible to read the memory card with the Power Mate *i*.

The operation of the following FANUC–specified flash memory card has been confirmed by FANUC.

4MB flash memory card	Fujitsu Media Device	IMC004FLSA

ATA card

See Appendix D.8.

D.3 ADVICE FOR USE

D.3.1 SRAM Memory Card

(1) The SRAM memory card needs the battery for data backup, but does not include the battery when you get it.
Please insert the battery, according to "D.6 Change Battery".

(2) The SRAM memory card, data of memory card will be lost when the battery life is over, and please copy data of the memory card into a floppy disk.

(3) The SRAM memory card has a battery voltage detecting function. And when the SRAM memory card which has low voltage battery is connected to CNC unit, the alarm message is displayed on CNC unit. But the battery voltage detecting function cannot operate without a battery.

NOTE
The SRAM memory card cannot be used to back up data.

D.3.2 Memory Card Capacity

A memory card is capacity normally refers to the unformatted capacity. When a memory card is formatted, the amount of space on the card that can actually be used decreases slightly. Therefore, a memory card must have a capacity larger than the size of the data or programs to be stored on that card.

Example: When 512KB data is stored
A memory card with a capacity of at least 1MB is required.

Flash memory cards use their last 128KB area as a buffer area for the memory cards themselves. Therefore, the usable space is further decreased by 128KB.

D.3.3 Memory Card Formatting

In the boot system, a memory card is formatted using the FAT file system. There is another formatting method, called the flash file system. The FAT file system and flash file system are not compatible with each other. Even the read and list functions cannot be used between these systems.

D.3.4 File Operation with a Flash Memory Card

Flash memory cards do not allow individual files to be erased. All the files on a memory card must be erased at the same time. Therefore, the following operations can not be used:

- Deleting an existing file
- Renaming a file
- Overwriting a file with another file having the same name

D.3.5 Note on Formatting a Flash Memory Card with CardPro

CardPro formats a flash memory card by using the flash file system by default. When using CardPro to format a flash memory card which is to be used in the boot system, format the card by issuing the following command:

A: CPFORMAT drive–name:/F: FLASHFAT/NOCIS

D.3.6 Using a Flash Memory Formatted by the Boot System in a Different Vendor's System

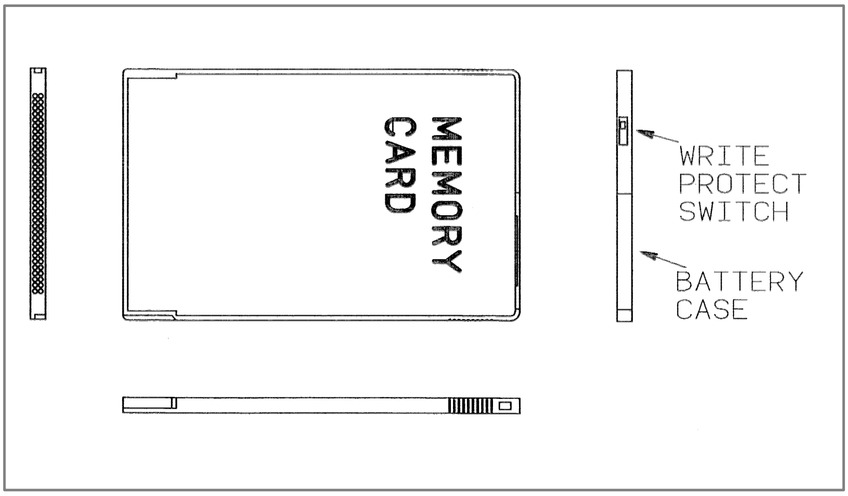
	RAMZO	CardPro
Reading a file	Allowed	Allowed
Adding a file	File addition function not provided	Not allowed
Listing files	Allowed	Allowed

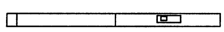
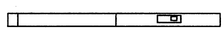
D.3.7 Using a Flash Memory Formatted by a Different Vendor's System in the Boot System

	RAMZO	CardPro
Reading a file	Allowed	Allowed
Adding a file	Allowed	Not allowed
Listing files	Allowed	Allowed

NOTE
1 RAMZO is a memory card reader/writer manufactured by Ad Tech System Science Corporation.
2 CardPro is a memory card reader/writer manufactured by Data IO Corporation.

D.4 NAMES AND FUNCTION OF MEMORY COMPONENTS



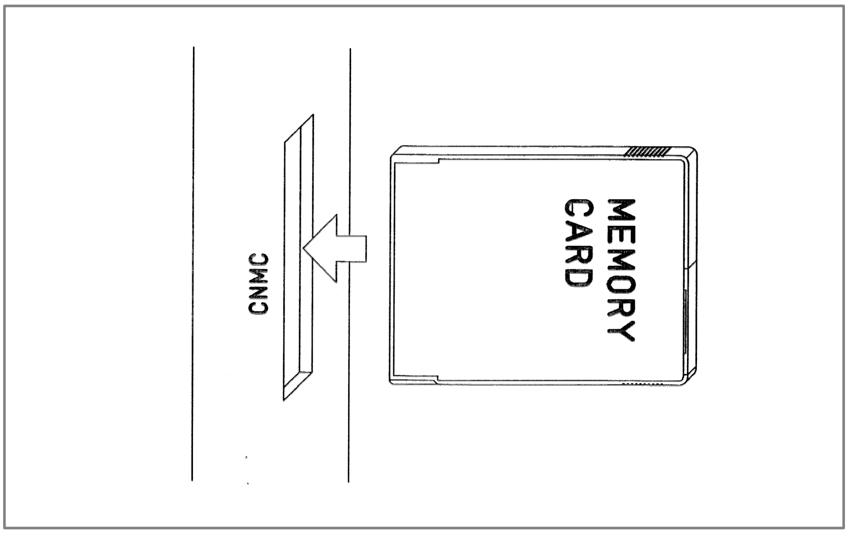
	Name	Function
1	Write Protect Switch	The memory card can be protected from writing data into the memory card by setting of the write protect switch.  Non Write Protect  Write protect
2	Battery Case	Incase of the SRAM memory card, the battery case includes the battery for data backup. The flash memory card has no battery case.

D.5 OPERATING OF MEMORY CARD

D.5.1 Connection of Memory Card

(1) Insert the memory card in the direction shown in the figure through the memory card insertion slot.

(2) The memory card cannot be inserted with wrong side, because the memory card has insertion guides.
Take care the direction of the memory card.

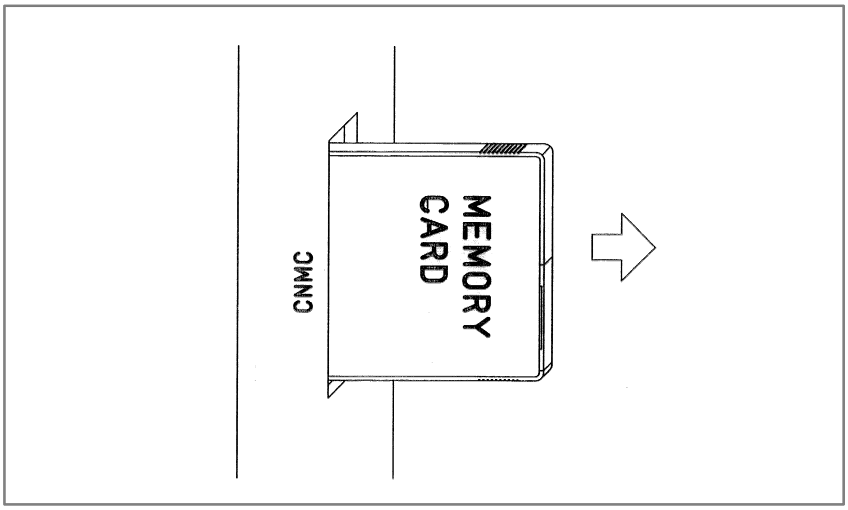


D.5.2 Operation

(1) For the read/write operation, refer to the Addendix C.

D.5.3 Disconnection of Memory Card

(1) Pull the memory card out in the direction shown in the figure.



D.6 BATTERY CHANGE

D.6.1 Battery

CR2325 or equivalent battery can be used for the SRAM memory card. Change to CR2025 was made in May, 1997.

D.6.2 Battery Life

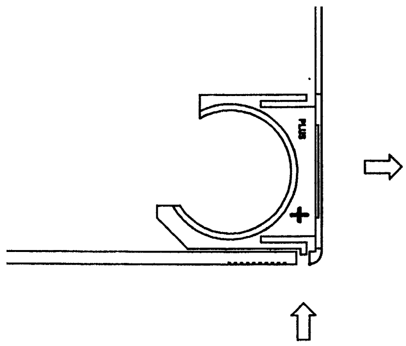
The battery life is as follows.

But the battery life in the table is only reference data, because the battery life is changeable by the change of ambient temperature.

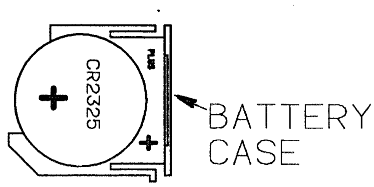
Drawing Number	Part's Number	Battery Life
A87L–0001–0150#2M	MB98A91123–20	about 6 months

D.6.3 Procedure of Battery Change

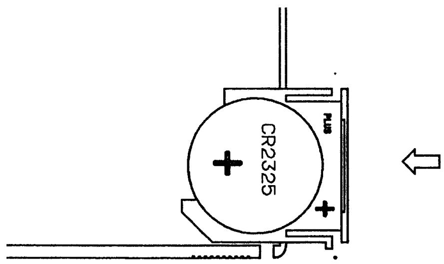
(1) Pull the battery case out with pushing projection.



(2) Change the battery.
"＋" mark of the battery must be set to "＋" mark of the battery case.



(3) Put the battery case back in the memory card, and make sure read/write operation.



D.6.4 Battery

The SRAM memory cards supplied by FANUC used CR2325 or BR2325 batteries.

These batteries are not easily available. In May 1997, therefore, FANUC changed the battery used in the SRAM memory card to the CR2025. This type easily available.
When an SRAM memory card using the previous battery (CR2325 or BR2325) is to be used, a new battery (CR2025) can be used simply by changing the battery holder.

Target SRAM memory card

1) A87L–0001–0150#□□□
   Manufacturer part number: MB98A9□□33–20

Battery type

1) Before change: CR2325 or BR2325
   - Indication on side of the memory card:
     9□□33–20 S000 □□□□ □□□
2) After change: CR2025 or equivalent
   (Common battery used in, for example, calculators)
   - Indication on side of the memory card:
     9□□33–20 9157 □□□□ □□□

Changing the battery holder

1) For SRAM memory cards using the old battery (CR2325 or BR2325), the new battery (CR2025) can be used simply by changing the battery holder.
2) The battery holder set for the CR2025 is available from suppliers of Fujitsu electronic device products.
   - Ordering information: MB98XXX – holder set – 9146
   - Contents of the set: Battery holder × 1, battery (CR2025) × 1, manual × 1

D.7 SPECIFICATIONS OF MEMORY CARDS THAT ARE NOT ALLOWED TO BE USED

Among those memory cards that are compliant with the PC Card Standard, those which are operational at 3.3 V cannot be used.

- Memory cards which are operational at 3.3 V
  → This type of memory card cannot be inserted physically.
- Memory cards which are operational at 3.3 or 5 V (automatic voltage selection)
  → This type of memory card can be inserted physically, but must not be used because an electrical failure of the memory card itself or CNC control unit may result.

D.8 ATA CARD

D.8.1 Overview

The PCMCIA card interface in the FANUC Power Mate *i*–D/H main unit can be used for data input/output with flash ATA cards (for operation on 5 V).

D.8.2 Corresponding Software Versions

	Model	Series	Edition
System software	Power Mate *i*–D	88E0	09 or later
	Power Mate *i*–H	88F0	08 or later
		88F1	01 or later
Boot software	Power Mate *i*–D/H	881I	05 or later

D.8.3 Flash ATA Card Specification

The flash ATA card must satisfy the following requirements related to the standards and shapes.
Note that not all flash ATA cards can operate on the Power Mate i–D/H.

1) Card standards
PCMCIA (Personal Computer Memory Card International Association)
PC Card standard Release2.1, PCMCIA PC Card ATA Release 1.02
2) Card shapes
PCMCIA TYPE I～TYPE II
3) Card operation mode
PC–ATA specification
4) Card operating voltage
Both 5 V (D) and 5/3.3 V (automatic–switching) type flash ATA cards can be used.

D.8.4 Flash ATA Cards That Have Proved to Be Operable on the Power Mate *i*–D/H

Listed below are the flash ATA cards that have proved to be operable on the Power Mate *i*–D/H as of August 2001. (All of these cards are of a 5/3.3 V automatic–switching type).

1) Flash ATA cards used for data input/output (saving and restoring data)

Manufacture	Model	Size	Remarks
(C) HITACHI	HB286008A3	8MB	Production has been discontinued.
	HB286015A3	15MB	
	HB286030A3	30MB	
	HB286045A3	45MB	
	HB289016A4	16MB	Mass production is under way.
	HB289032A4	32MB	
	HB289048A4	48MB	
(C) MATSUSHITA	BN–012AB	12MB	
	BN–020AB	20MB	
	BN–040AB	40MB	
SanDisk	SDP3B–20	20MB	Production has been discontinued.
	SDP3B–40	40MB	

NOTE

1 We do not guarantee that any card not listed above will operate on the Power Mate *i*–D/H.
2 The flash ATA cards listed above are of a 5/3.3 V automatic–switching type.
3 No 3.3 V–only type can be used on the Power Mate *i*–D/H.
4 A flash ATA card, even if listed above, may become inoperable on the Power Mate *i*–D/H if the manufacturer changes its specification.

NOTE

If a flash ATA card is used on any Power Mate CNC other the Power Mate *i*–D/H, it is likely that the CNC control section or flash ATA card may electrically break down. The flash ATA card can be physically inserted into the PCMCIA card interface of a Power Mate CNC other than the Power Mate *i*–D/H. Be very careful to avoid inserting a flash ATA card into the PCMCIA card interface of any Power Mate CNC other than the Power Mate *i*–D/H accidentally.

D.8.5 Functions Supported on Various Cards

1) Boot system function

SYSTEM MONITOR MENU function		Operation	SRAM memory card	Flash memory card	Flash ATA card
1. SYSTEM DATA LOADING Note 2)		File List	○	○	○
		File Read	○	○	○
4. SYSTEM DATA SAVE		File Write	○	○ Note 3)	○
5. SRAM DATA BACKUP	SRAM BACKUP	File Write	○	○ Note 3)	○
	RESTORE SRAM	File Read	○	○	○
6. MEMORY CARD FILE DELETE Note 2)		File List	○	×	○
		File Delete	○	× Note 3)	○
7. MEMORY CARD FORMAT		Card Format	○	○	Δ Note 1)

See also Appendix C, "Boot System," for details of the boot system specification.

2) Memory card data input/output
(I/O channel: Parameter No. 20 = 4)

Function	Operation	SRAM memory card	Flash memory card	Flash ATA card
Displaying file directories	File List	○	○	○
Searching for files	File List	○	○	○
Reading files	File List	○	○	○
	File Read	○	○	○
Writing files	File List	○	○	○
	File Write	○	× Note 3)	○
Deleting files	File List	○	○	○
	File Delete	○	× Note 3)	○

NOTE

1 Flash ATA cards are formatted using a Quick Format (by clearing the file allocation table and the route directory in the root directory). Use a PC to format them.
2 The first to 64th files in the root directory on the memory card can be displayed and selected.
3 On the flash memory card, no file can be erased individually. All files on the card must be erased in a batch.
So, it is impossible to:
   - Delete existing files.
   - Overwrite a file to a file having the same name.
4 When writing to a flash memory card, the last 128 KB on the flash memory card are used as a buffer area. So, the usable capacity of the flash memory card is decreased by 128 KB.
5 On the memory card, files only in the root directory area can be displayed, read, and written. No subdirectory area can be used. In addition, the name of each file on the memory card can consist of up to 8 alphanumeric characters in uppercase. Its extension can use up to 3 characters.
6 The read/write time varies depending on the type of memory card and the way how it is used.
7 Files on the memory card can be erased by incorrect operation. So, make a backup copy of them using a PC if they are necessary.

D.8.6 Other Supported Functions

The functions that can conventionally be used with the SRAM and flash memory cards can be used also with the flash ATA card.

- Input/output with the PMC I/O screen
- Input/output of maintenance information and periodic maintenance information
- Parameter input/output by Power Mate CNC Manager

Refer to the applicable operation manual for detailed descriptions of the input/output function specification.

NOTE

It is impossible to use the flash ATA card with the memory card access function of C executor applications.

D.9 MEMORY CARDS USABLE ON THE LCD WITH TOUCH PANEL

D.9.1 Overview

Several types of SRAM memory cards and flash ATA cards can be used on the PCMCIA interface of the LCD with touch panel supporting the display link.

NOTE
1 The functions that can be used on the PCMCIA card interface of the LCD with touch panel differ from those usable on the PCMCIA card interface of the CNC main unit.
2 The cards that can be used on the PCMCIA card interface of the LCD with touch panel are not necessarily the same as those usable on the PCMCIA card interface of the CNC main unit.
3 Some files, such as a touch panel screen data file, cannot be transferred with this interface.

D.9.2 Corresponding Software Versions

The software versions listed below are necessary.

	Series	Edition
System software	88E0	13 or later
	88F1	05 or later
Boot software	881I	09 or later

D.9.3 Flash ATA Card Specification

The flash ATA card must satisfy the following requirements related to the standards and shapes.
<u>Note that not all flash ATA cards can operate on the Power Mate *i*–D/H.</u>

1) Card standards
PCMCIA (Personal Computer Memory Card International Association)
PC Card standard Release2.1, PCMCIA PC Card ATA Release 1.02

2) Card shapes
PCMCIA TYPE I～TYPE II

3) Card operation mode
PC–ATA specification

4) Card operating voltage
Both 5 V (D) and 5/3.3 V (automatic–switching) type flash ATA cards can be used.

5) Conditions under which cards can be used with the LCD with touch panel that supports the display link
   - Memory mode map
   - No variable wait time
   - Address access time of 250 ns or shorter

D.9.4 Cards That Have Proved to Be Operable on the LCD with Touch Panel

Listed below are the cards that have proved to be operable on the LCD with touch panel as of August 2001.

1) SRAM memory card

Manufacture	Model	Size	Remarks
Fujitsu media device (C)	MB98A91023–20	1MB	Not suitable for data backup
	MB98A91123–20	2MB	

2) Flash ATA card

Manufacture	Model	Size	Remarks
(C) HITACHI	HB286008A3	8MB	Production has been discontinued.
	HB286015A3	15MB	
	HB286030A3	30MB	
	HB286045A3	45MB	
	HB289016A4	16MB	Mass production is under way.
	HB289032A4	32MB	
	HB289048A4	48MB	
(C) MATSUSHITA	BN–012AB	12MB	
	BN–020AB	20MB	
	BN–040AB	40MB	
SanDisk	SDP3B–20	20MB	Production has been discontinued.
	SDP3B–40	40MB	

NOTE
1 We do not guarantee that any card not listed above will operate on the LCD with touch panel.
2 The flash ATA cards listed above are of a 5/3.3 V automatic–switching type.
3 No 3.3 V–only type can be used on the LCD with touch panel.
4 A flash ATA card, even if listed above, may become inoperable on the LCD with touch panel if the manufacturer changes its specification.
5 The flash memory card cannot be used.

D.9.5 Supported Functions

After parameter No. 20 is set to 7, operating [PUNCH] or [READ] on each screen causes the following data to be output or input through the PCMCIA card interface of the LCD with touch panel.

Input/output data	Input/output operation screen
Programs	Program screen or ALL I/O screen
Parameters	Parameter screen or ALL I/O screen
Tool compensation data	Tool compensation screen or ALL I/O screen
Custom macro variables	Macro variable display screen or ALL I/O screen
Pitch error compensation data	Pitch error compensation screen or ALL I/O screen
Periodic maintenance data	Periodic maintenance screen
Maintenance information	Maintenance information screen
Operation history	Operation history screen
PMC parameters	PMC I/O screen
Ladder programs	PMC I/O screen
I/O Link slave β amp parameter	Power Mate CNC manager parameter screen

In addition to data input/output, file directory display, search, and deletion can be made on memory card lists on the ALL I/O screen, PMC I/O screen, and program screen.

Refer to the connection manual (function), operation manual, and this manual for details of explanations about how to perform data input/output.

- FANUC Power Mate *i*–D/H CONNECTION MANUAL (FUNCTION) B–63173EN–1
- FANUC Power Mate *i*–D/H OPERATOR'S MANUAL B–63174EN

- Chapter 3 "Input and Output of Data"

With the following functions, it is impossible to perform data input/output on the PCMCIA card interface of the LCD with touch panel.

- Boot system function
  (So, the PCMCIA card interface of the LCD with touch panel cannot be used to input/output the data (such as image data created using the system or FAPT PICTURE, C executor image data, and macro executor image data) that can be input/output only with the boot system function.)
- I/O device external control
- C executor application–based memory card access function

NOTE

1. Flash ATA cards are formatted using a Quick Format (by clearing the file allocation table and the route directory in the root directory). Use a PC to format them.
2. The first to 64th files in the root directory on the memory card can be displayed and selected.
3. On the memory card, files only in the root directory area can be displayed, read, and written. No subdirectory area can be used. In addition, the name of each file on the memory card can consist of up to 8 alphanumeric characters in uppercase. Its extension can use up to 3 characters.
4. The read/write time varies depending on the type of memory card and the way how it is used.
5. Files on the memory card can be erased by incorrect operation. So, make a backup copy of them using a PC if they are necessary.
6. Assume that functions and input/output operations are not supported unless this manual explicitly states they are supported.

E DATA BACKUP

E.1 DATA IN THE Power Mate *i*

Data in the Power Mate *i* includes the following:

Item	Storage location
Parameter	SRAM on the memory module
Program	
Ladder program	FROM on the memory module
User program of the macro executor	
User program of the C executor	

Data stored in the SRAM (hereafter called the SRAM data) on the memory module is normally backed up by battery, so the data is not erased even when the power to the Power Mate *i* is turned off. However, the data may be lost because of, for example, a weak battery or printed–circuit board replacement involving mounting and dismounting the memory module. For this reason, a backup copy should always be saved on a memory card or floppy disk after rewriting the data in the SRAM. For maintenance purposes, data stored in the SRAM can be copied into the built–in FROM of the Power Mate *i*.

CAUTION
Be sure to take a backup copy of the latest SRAM data onto a memory card or floppy disk. If the latest data is not backed up, the SRAM data cannot be restored when it is lost.

Since the FROM on the memory module is a nonvolatile memory, data stored in the FROM is not erased even when the power to the Power Mate *i* is turned off. Usually, the FROM contents are not rewritten by the operator. However, be sure to take a backup copy of the FROM contents in case that the memory module of the Power Mate *i* becomes faulty.
A backup copy may be created using the following methods:

(1) Taking a backup copy onto a flash memory card

(2) Copying data in the SRAM memory card and taking its backup copy onto the hard disk of the PC

(3) Taking a backup copy of data onto a floppy disk by using the Handy File

E.2 BACKUP USING A FLASH MEMORY CARD

The data mentioned above can be saved on and restored from a flash memory card. With the method using the boot system (“SRAM DATA BACKUP Screen” in Appendix C.2.5), a backup copy of SRAM data can be created. With the method using the Power Mate *i* main unit (see “SETTING/MAINTENANCE USING THE Power Mate *i* MAIN UNIT” in Appendix F.4), SRAM data and FROM data can be backed up in a batch. For how to handle the flash memory card, see the description of memory card handling in APPENDIX D.

E.3 BACKUP ONTO THE HARD DISK OF THE PC

Data is copied onto the SRAM memory card in the same way as described in Appendix E.2 above, then its backup copy is created on the hard disk of the PC. A flash memory card cannot be used as the medium. Since the SRAM memory card is backed up by battery, it is not suitable for data preservation.
For how to handle the SRAM memory card, see the description of memory card handling in APPENDIX D.

E.4 DATA BACKUP ONTO A FLOPPY DISK USING THE Handy File

Data items are backed up one by one using the Handy File. For the operation method, see Sections 1.9 and 1.10, and Chapter 3.

E.5 COPYING SRAM DATA INTO THE BUILT–IN FROM OF THE Power Mate *i*

SRAM data can be copied into the built–in FROM of the Power Mate *i* without using a memory card or floppy disk. For the operation method, see "SETTING/MAINTENANCE USING THE Power Mate *i* MAIN UNIT" in Appendix F.4.

This method allows SRAM data to be easily restored if the data is accidentally damaged during printed–circuit board replacement that does not involve fuse replacement or memory module mounting/dismounting. Also when printed–circuit board replacement involving memory module mounting/dismounting is performed (that is, SRAM data is certainly lost), SRAM data can easily be restored if its backup copy is created using this method in advance.

CAUTION

1 This method does not mean that backup to a memory card or floppy disk becomes unnecessary. Just with a backup copy in the built–in FROM, data may not be able to be retrieved if the Power Mate *i* memory module becomes defective.
2 Data in the FROM can be rewritten a limited number of times. This function is designed for data backup performed at maintenance (about several hundreds times), and is not assumed to be used for data rewritten periodically or constantly.

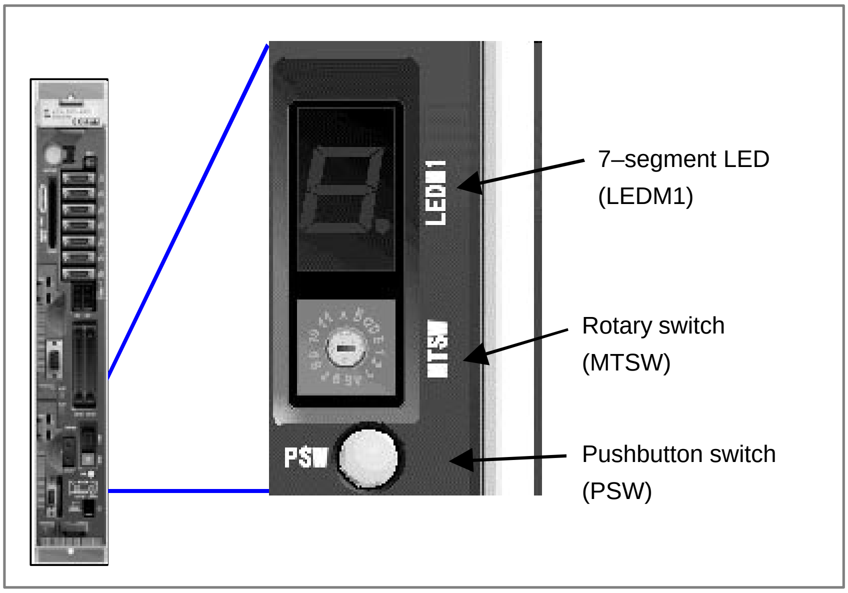
F SETTING/DISPLAY/MAINTENANCE USING THE MAIN UNIT OF THE Power Mate *i*

F.1 OVERVIEW

Whenever the memory module of the Power Mate *i* has been replaced, all–clear operation must be performed by switch operation on the main unit of the Power Mate *i*. In addition, some settings must be made using switches on the main unit of the Power Mate *i*. When a setting/display unit such as the CRT/MDI is not connected, simple maintenance operations including display of the Power Mate *i* status and save/restoration of files in a batch can be performed using only the main unit.

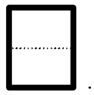
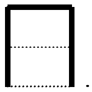
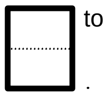
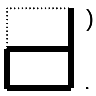
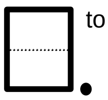
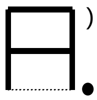
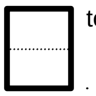
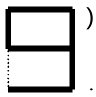
F.2 SWITCHES AND LED

The Power Mate *i* is equipped with a 7–segment LED LEDM1, rotary switch MTSW, and pushbutton switch PSW to allow setting, display, and maintenance operations to be performed from the main unit.

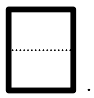
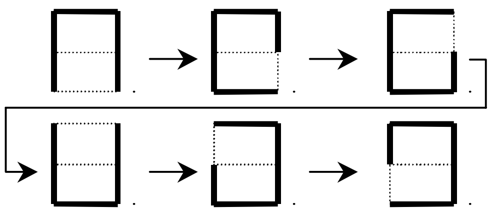


F.3 7–SEGMENT LED INDICATION

The status of the Power Mate *i* is indicated with the 7–segment LED (LEDM1) of the main unit of the Power Mate *i*. When no alarm is generated in the Power Mate *i*, the LED indicates the status of the Power Mate *i*. When an alarm is generated, the LED indicates the type of the alarm.

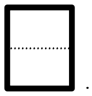
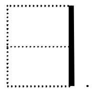
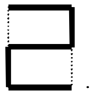
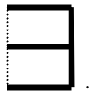
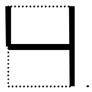
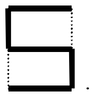
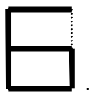
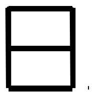
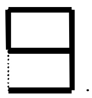
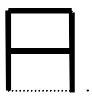
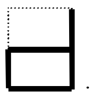
LED indication	Blinking/ not blinking	Meaning
	Not blinking	No–alarm condition
(Character  turns.)	Not blinking	Automatic operation in progress
Number ( to )	Blinking	Alarm condition
Number ( to )	Blinking	System alarm condition
Number ( to )	Not blinking	Status change at power–up

F.3.1 Status Indication with No Alarm Generated

LED indication	No–alarm condition (after startup)
	Automatic operation halted, stopped, or reset
	Automatic operation in progress

F.3.2 Indication in Alarm Condition

The 7–segment LED blinks, indicating the number of an alarm type.

LED indication (blinking)	Meaning of alarm
	P/S alarm 100
	P/S alarm 000
	P/S alarm 101
	P/S alarm other than 0, 1, and 2 above (0 to 299) Alarm from the PMC (1000 to 1999, 3000 to 3200)
	Overtravel alarm (500 to 599)
	Overheat alarm (700 to 701)
	Servo alarm (400 to 499)
	Pulse coder alarm (300 to 399)
	Spindle alarm (749 to 754)
	P/S alarm 5000 and up
	Rigid tapping alarm (740 to 742)

NOTE
When more than one alarm is generated, all their corresponding numbers blink alternatively.

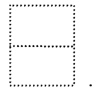
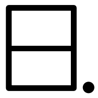
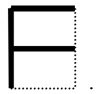
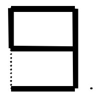
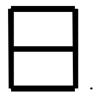
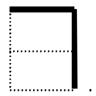
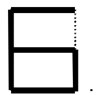
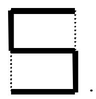
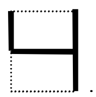
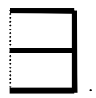
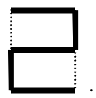
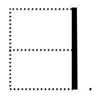
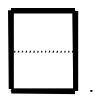
F.3.3 Number Displayed When a System Alarm is Issued

When a system alarm is issued, the 7–segment LED blinks, and the number of the corresponding alarm type is displayed with a decimal point.

LED number (blinking)	System alarm type
0.	ROM PARITY (System alarms in the 900s)
1.	SRAM PARITY, DRAM PARITY (System alarms in the 910s)
2.	SERVO ALARM (System alarms in the 920s)
3.	CPU INTERRUPT, SRAM ECC ERROR (System alarms in the 930s)
5.	PMC SYSTEM ALARM (System alarms in the 950s)
7.	NON MASK INTERRUPT (System alarms in the 970s)
8.	Other systems alarms
A.	The boot series does not match the Power Mate *i*

NOTE
The decimal point indicated in the lower right part of the LED distinguishes system alarms from other ordinary alarms.

F.3.4 7–segment LED Indication Status Change at Power–up

Number on LED (stays on)	Meaning
	Power is not on.
	The CPU does not operate after power–up.
	Start of boot system operation
	Start of system operation
	Wait for processor ID setting in the system
	Completion of processor ID setting in the system
	Completion of FANUC bus initialization
	Completion of PMC initialization
	Completion of hardware configuration information setting for each module in the system
	Completion of PMC ladder initialization
	Wait for digital servo initialization
	Completion of digital servo initialization
	Normal operation status after completion of initialization

F.3.5 Information about Other 7–Segment LED Indications

Any indication other than explained above will not usually occur. If such an indication occurs, it is likely that the hardware may have malfunctioned.

F.4 SETTING/ MAINTENANCE USING THE Power Mate *i* MAIN UNIT

F.4.1 Operation at Power–up

Follow the procedure explained below to perform setting and maintenance operation by using the rotary switch (MTSW), pushbutton switch (PSW), and 7–segment LED (LEDM1) on the Power Mate *i*.

(1) Primary selection (selection by the rotary switch)
Before turning on the power, set a desired number with the rotary switch. (The rotary switch must be set before the power is turned on.) When the power has been turned on, the selected rotary switch number blinks on the 7–segment LED if the rotary switch number is set to a non–zero number. When the pushbutton switch is pressed while the LED indication is blinking, blinking stops, then the secondary selection explained below starts.

(2) Secondary selection (selection by the 7–segment LED and pushbutton switch)
After the primary selection operation is completed, numbers that can be selected for the secondary selection appear on the 7–segment LED in succession. While a desired number appears (for about one second), press the pushbutton switch. Then, the number blinks (at high speed). If the selected number is correct, press the pushbutton switch again. Then, blinking stops, and the secondary selection is completed. If the selected number is wrong, or if you want to cancel the number selection, hold down the pushbutton switch for at least three seconds while the number blinks (at high speed). Then, the selection operation is canceled, and numbers are again displayed on the 7–segment LED one by one.

(3) Tertiary selection (selection by the 7–segment LED and pushbutton switch) and subsequent operations
When the tertiary selection is required, selectable numbers appear on the 7–segment LED sequentially after the completion of the secondary selection operation. Select a desired number using the 7–segment LED and pushbutton switch in the same manner as the secondary selection. The subsequent operations are the same as explained in (2) above.

To perform the primary selection for another setting item after completing a selection operation, turn off the power, then perform steps (1) to (3) above. After completing all the primary selection operations, be sure to set the rotary switch to 0.

> **NOTE**
> Although the rotary switch number setting is possible when the Power Mate is on, the primary selection is made at power–up.

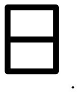
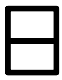
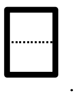
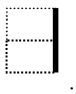
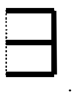
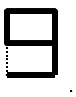
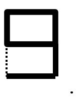
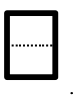
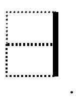
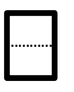
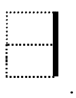
Even when a setting/display unit is connected, nothing is displayed on the screen in the middle of the selection procedure explained above.

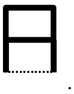
The items that can be set by following the selection method explained above are listed below.

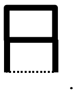
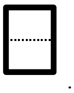
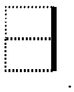
Primary	Secondary	Tertiary and subsequent operation	Explanation
0.			Normal condition When completing setting and maintenance operation, be sure to set the rotary switch to this position. When 1 is selected as the primary selection with the rotary switch at power–up, the CRT/MDI is normally connected if connection to a setting/display unit other than the CRT/MDI (including LCD/MDI and PDP/MDI) is not set. When the HSSB board is connected to the Power Mate *i*, connection to the personal computer or PANEL *i* is set up by HSSB.
1.			Setting for connection to a special setting/display unit ● Initially, the CRT/MDI or LCD/MDI is selected as the setting/display unit. ● By setting this item, the setting/display unit explained below can be connected. ● Two or more items can be selected from items 1 to 4 shown below. If an error occurs because of, for example, unrecognizable hardware, the error character (□) appears. To cancel selected numbers, select 0. Then, the selected numbers are all canceled. Selected numbers are maintained even after the power is turned off.
	0.		<u>Cancels settings.</u> (<u>All</u> the numbers selected as explained below are canceled.) Default
	1.		<u>Switching between HSSB synchronization/non–synchronization</u> The Power Mate starts asynchronously regardless of the PC status even when the HSSB board is connected.
	2.		<u>Connection to the handy operator's panel</u> To connect the handy operator's panel, set this number. Then, the CRT/MDI or LCD/MDI can no longer be connected.
	3.		<u>Use of the DPL/MDI operation package (for boot operation) on RS–232C channel 2</u> ● Set this number only when the system cannot start normally, and boot operation or memory clear operation must be performed using the DPL/MDI operation package. ● When using the DPL/MDI operation package (<u>for boot operation</u>) while the system can starts normally, see Appendix F.4.2, and make settings in normal operation. ● This setting is maintained even after the power is turned off. When this setting needs to be cleared, clear the setting by following the procedure explained in Appendix F.4.2 after system starts. ● When 4 is selected in the secondary selection, selecting this number in the tertiary selection or subsequent selection operation results in an error.
	4.		Reserved
2.			Setting a device number for the display link sharing function ● One to 16 Power Mate units can be connected to one setting and display unit corresponding display link. For each Power Mate, a device number is set. Selecting multiple items is not permitted. The selected item is maintained even after the power is turned off.
	0.		Sets the device number of this Power Mate *i* to #0 in the display link sharing function. (Default)
	1.		Sets the device number of this Power Mate *i* to #1 in the display link sharing function.

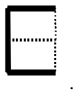
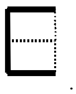
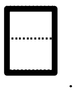
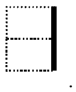
Primary	Secondary	Tertiary and subsequent operation	Explanation
	2		Sets the device number of this Power Mate *i* to #2 in the display link sharing function.
	3		Sets the device number of this Power Mate *i* to #3 in the display link sharing function.
	4		Sets the device number of this Power Mate *i* to #4 in the display link sharing function.
	5		Sets the device number of this Power Mate *i* to #5 in the display link sharing function.
	6		Sets the device number of this Power Mate *i* to #6 in the display link sharing function.
	7		Sets the device number of this Power Mate *i* to #7 in the display link sharing function.
	8		Sets the device number of this Power Mate *i* to #8 in the display link sharing function.
	9		Sets the device number of this Power Mate *i* to #9 in the display link sharing function.
	A		Sets the device number of this Power Mate *i* to #10 in the display link sharing function.
	b		Sets the device number of this Power Mate *i* to #11 in the display link sharing function.
	C		Sets the device number of this Power Mate *i* to #12 in the display link sharing function.
	d		Sets the device number of this Power Mate *i* to #13 in the display link sharing function.
	E		Sets the device number of this Power Mate *i* to #14 in the display link sharing function.
	F		Sets the device number of this Power Mate *i* to #15 in the display link sharing function.

Primary	Secondary	Tertiary and subsequent operation	Explanation
4	Confirmation of setting		
	0	Displaying selected data ● The item selected when 1 or 2 is selected as the primary selection with the rotary switch is displayed on the 7–segment LED.	
		0	Returns to the secondary selection.
		1	Displays the number selected as the secondary selection when 1 is set as the primary selection with the rotary switch. When no value is set, the 7–segment LED is off.
		2	Displays the device number set for the display link sharing function when 2 is selected as the primary selection with the rotary switch.
5	Memory all clear ● Clears all SRAM data in the memory module. <u>The all clear operation performed after memory module replacement must be performed by following this method.</u> (The item set when 1 or 2 is selected as the primary selection with the rotary switch is not cleared by all clear operation using keys on the CRT/MDI.) When the FROM does not contain the NC system software, this item cannot be executed. ● After completing the primary selection, pressing the pushbutton switch starts all–clear processing. ● After processing starts, the indication on the 7–segment LED changes as follows: 5 (Low–speed blinking) : All–clear processing in progress. Executed after the pushbutton switch is pressed. 0 (On) : Normal termination 3. (Blinking) : SRAM ECC Error		
7	Copies SRAM data into the built–in FROM. ● The SRAM data backed up by battery is copied into the built–in FROM (on the memory module) of the Power Mate. <u>This is a data backup method performed at printed–circuit board replacement not involving fuse replacement or memory module mounting/dismounting.</u> ● After completing the primary selection, pressing the pushbutton switch starts processing. ● After processing starts, the indication on the 7–segment LED changes as follows: 7 (Low–speed blinking) : Save operation in progress. Executed after the pushbutton switch is pressed. 0 (On) : Normal termination 1 (On) : An alarm is issued (such as ROM parity)		

<table>
<tr><th>Primary</th><th>Secondary</th><th>Tertiary and subsequent operation</th><th>Explanation</th></tr>
<tr><td></td><td colspan="3">Saves data to memory (to a memory card) in a batch
● The SRAM data backed up by battery, and the ladder program, C executor user program, and macro executor user program stored in the FROM are all saved in file form on a memory card in a batch. (The contents of the system files cannot be saved in a batch.)
● Before data is saved to a memory card, it is formatted. Be careful to avoid having a memory card containing necessary data formatted.
● The saved data can be restored also using the boot system maintenance operation in the same manner as explained here.
● After completing the primary selection, pressing the pushbutton switch starts processing.
● After processing starts, the indication on the 7–segment LED changes as follows:
 (Low–speed blinking) : Memory card formatting and data saving are in progress. (Executed after the pushbutton switch is pressed.)
 (On) : Normal termination
 (On) : An alarm is issued. (Abnormal memory card and so forth)
 (On) : An alarm is issued. (Memory card full)
Note) This alarm is issued if the storage capacity of the memory card in use is smaller than the total size of all the files to be saved. Use a memory card having a larger storage capacity.</td></tr>
<tr><td rowspan="3"></td><td colspan="3">Restores SRAM data from the built–in FROM.
● SRAM data copied into the built–in FROM by selecting 7 as the primary selection with the rotary switch is restored in the SRAM.
● After completing the secondary selection, pressing the pushbutton switch starts restoration.
● After restoration starts, the indication on the 7–segment LED changes as follows:
 (Low–speed blinking) : Restoration in progress. Executed after the pushbutton switch is pressed.
 (On) : Normal termination
 (On) : An alarm is generated. When saved data is not found.</td></tr>
<tr><td></td><td colspan="2">Restores SRAM data copied into the built–in FROM</td></tr>
<tr><td></td><td colspan="2">Reserved</td></tr>
</table>

<table>
<tr><th>Primary</th><th>Secondary</th><th>Tertiary and subsequent operation</th><th>Explanation</th></tr>
<tr><td></td><td colspan="3">Restores data from a memory card in a batch.
• The SRAM data, ladder program, C executor user program, and macro executor user program saved on the memory card in a batch by selecting 8 as the primary selection with the rotary switch are restored in a batch.
• The saved data can also be restored by maintenance operation in the boot system in the similar manner.
• After completing the primary selection, pressing the pushbutton switch again starts processing.
• After processing starts, the indication on the 7–segment LED changes as follows:

 (Low–speed blinking) : Restoration in progress. Executed after the pushbutton switch is pressed.
 (On) : Normal termination
 (On) : An alarm is generated. (Abnormal memory card, and so forth)</td></tr>
</table>

<table>
<tr><th>Primary</th><th>Secondary</th><th>Tertiary and subsequent operation</th><th>Explanation</th></tr>
<tr><td></td><td colspan="3">
Restores system files in a batch (restoration from a memory card).
● All the system files that can be loaded into the FROM are restored in a batch.
● If the write protect switch of the memory card is not set, an alarm is generated. (The data can also be restored by maintenance operation in the boot system in the similar manner.)
● After completing the primary selection, pressing the pushbutton switch again starts processing.
● After processing starts, the indication on the 7–segment LED changes as follows:
 (Low–speed blinking) : Restoration in progress (executed after the pushbutton switch is pressed)
 (On) : Normal termination
 (On) : An alarm is generated. (Abnormal memory card, write protect switch set to OFF, and so forth)

● When there are more than one file of the same type
The file list on the memory card (files are arranged in the order they were saved on the memory card) is checked to see whether there are more than one system file of the same type (files having different file names but belonging to the same type). When there is no other system file that belongs to the same type as the type of a system file, that file is restored unconditionally.
If there are system files of which extensions are in the numeric form [XXX] and they are of the same type, a system file having the largest extension value is restored. If the values of the extensions of these system files are the same, the system file that appears last among these files in the file list is restored. If system files are the same, and some of these files have numeric extensions but the others have non–numeric extensions, the system file that appears last among these files in the file list is restored.
[Example]
<table>
<tr><th>File list</th><th>System file type</th><th>Extension</th></tr>
<tr><td>NC_BASIC.000</td><td>NC_BASIC</td><td>000</td></tr>
<tr><td>PMC–RB.000</td><td>PMC–RB</td><td>000</td></tr>
<tr><td>GERMAN.MEM</td><td>GERMAN</td><td>MEM</td></tr>
<tr><td>PMC–RB.001</td><td>PMC–RB</td><td>001</td></tr>
<tr><td>GERMAN.001</td><td>GERMAN</td><td>001</td></tr>
<tr><td>88F0_B.MEM</td><td>NC_BASIC</td><td>MEM</td></tr>
<tr><td>PMC–RB.002</td><td>PMC–RB</td><td>002</td></tr>
<tr><td>88E0_B.MEM</td><td>NC_BASIC</td><td>MEM</td></tr>
</table>
Files to be restored finally
GERMAN.001
PMC–RB.002
88E0_B.MEM
</td></tr>
</table>

(1) Do not change the rotary switch position during the above setting operation; otherwise, the CNC operation becomes unstable.

(2) When the 7–segment LED blinks at low–speed, the frequency is 0.5 Hz. When the LED blinks at high–speed, the frequency is 2 Hz.

(3) When an undefined number is specified with the rotary switch, the system assumes that 0 has been specified. However, since undefined numbers are reserved for future function expansion, do not use undefined numbers.

(4) When data is saved in and restored from a memory card in a batch, the data is treated as follows:

Table F.4.1 Data in the Power Mate *i*

Data type	Data	Size	File name	Save/ restoration allowed/ not allowed
User file	Ladder program	About 128 to 384 KB	PMC–RB.XXX	Allowed
	C language executor	About 1.0 MB or more (varying in units of 1 MB)	CEX_10M.XXX to CEX_*0M.XXX	Allowed
	FAPT PICTURE	About 128 KB～	CEX0FAPT.XXX	Allowed
	Macro executor	About 256 KB	PD1M256K.XXX	Allowed
		About 512 KB	PD1M512K.XXX	
SRAM	SRAM data	About 256 KB	SRAM256A.FDB	Allowed
		About 512 KB for each	SRAM1_0A.FDB SRAM1_0B.FDB	Allowed

* The part XXX is a file extension. As the file extension, one of 32 numbers from 000 to 031 is set.

* The part XXX varies with the size of the C executor. For a file having a size of 6.0 M, for example, the XXX is named ”60M.”

When more than one file is stored on the memory card, the file to be restored has the largest file extension number. (See the example given below.)

Example: When more than one ladder program file is present:

(1) PMC_RB.000
(2) PMC_RB.001
(3) PMC_RB.002 → This file is restored.

(5) Reference position setup flag of the absolute–position detector
When restoration from a memory card to the system is performed in a batch, the reference position setup flag (bit 4 of parameter No. 1815) is cleared. Therefore, after batch restoration, the reference position of the absolute–position detector must be set. (Batch restoration is considered to be performed when the main unit of the Power Mate *i* is replaced. In this case, the value in the absolute–position detector is lost, so the reference position setup flag is cleared automatically.)

(6) Do not remove or insert the memory card during batch save and restoration operation.

F.4.2 Setting in Normal Operation

In normal operation, the following can be set by using the 7–segment LED and pushbutton switch:

Explanation		
• When the pushbutton switch is held down for about five seconds with the rotary switch set to 0, 0 blinks at high speed on the 7–segment LED. Then, when the pushbutton switch is pressed again, primary selection mode explained below is entered. • In primary selection mode, numbers corresponding to operations appear one by one. • When a desired number appears on the 7–segment LED, press the pushbutton switch. Then, the LED indication blinks at high speed. Pressing the pushbutton switch again enters secondary selection mode. • When the lowest level of each setting has been determined, the finally determined operation value stays indicated on the LED. (When the pushbutton switch is pressed again, or an alarm is issued in this condition, the ordinary LED indication state is restored.)		
Primary	**Secondary**	**Explanation**
0.	End of this operation	
(1.)	Reserved	
(2.)	Reserved	
3.	Uses the following package software:	
	0.	<u>Cancels the RS–232–C channel setting made by the secondary selection explained below (operation 1 to 4).</u> • To cancel the DPL/MDI operation package (for boot operation) setting made at power–up, also select this number.
	1.	<u>Uses the DPL/MDI operation package for RS–232–C channel 2.</u> • This setting is maintained even after power is turned off. When the setting needs to be cleared, set 0 which is explained above. • Once this setting is made, boot operation by the DPL/MDI operation package will be enabled at the next and subsequent power–up operation. (For the operation method, refer to the operator’s manual on the DPL/MDI operation package.) • When 2 is already set in the secondary selection, an error (□) occurs. In such a case, clear the setting, then set a value again.
	2.	<u>Uses FAPT LADDER–II for RS–232–C channel 2.</u> • This setting is maintained even after power is turned off. When the setting needs to be cleared, set 0 which is explained above. When 1 is already set in the secondary selection, an error (□) occurs. In such a case, clear the setting, then set a value again.
	3.	Reserved
	4.	Reserved

G MAINTENANCE USING A NOTEBOOK PERSONAL COMPUTER

G.1 OVERVIEW

The Power Mate *i* can be maintained using a notebook personal computer connected with an RS–232–C cable.

(1) DPL/MDI operation package
The DPL/MDI operation package can modify programs and set parameters.

(2) FAPT LADDER II
FAPT LADDER II can edit ladder programs online and display diagnostic data.

How to use the DPL/MDI operation package is described below. For details of FAPT LADDER II, refer to the related PMC manual.

- **Preface**

The Power Mate *i* can be connected to a personal computer using an RS–232–C cable to perform the following maintenance, display, and setting operations.

○ Boot system operations (executable program to be used: BOOTINIT.EXE)

- SYSTEM DATA LOADING
- SYSTEM DATA CHECK
- SYSTEM DATA DELETE
- SYSTEM DATA SAVE
- SRAM DATA BACKUP
- MEMORY CARD FILE DELETE
- MEMORY CARD FORMAT
- LOAD BASIC SYSTEM

○ INIT operations (executable program to be used: BOOTINIT.EXE)

- MEMORY ALL CLEAR
- MEMORY CLEAR (PARAMETER,OFFSET)
- MEMORY CLEAR (ALL PROGRAM)
- MEMORY CLEAR (PMC PARAMETER)
- MEMORY CLEAR (PMC LADDER)
- IGNORE OVER TRAVEL ALARM
- START WITHOUT LADDER
- C LANGUAGE EXECUTOR (MAKE VOID C–EXEC)

○ Operations during system operation (executable program to be used: DPLMDI.EXE)

- Displaying the current position
- Registering, editing, deleting, and checking CNC programs
- Setting parameters and pitch error compensation
- Displaying diagnostic information
- Displaying alarm messages
- Displaying and setting the PMC status
- Displaying system alarms
- Transferring and printing files (CNC programs, CNC parameters, tool offset values, pitch error compensation, and macro variables)

- **System configuration**

Fig. G.1 (a) shows the hardware and software configurations for using this function. To use this function, install the following software product provided by FANUC on the target personal computer in advance:

FANUC Power Mate *i*
DPL/MDI operation package (specification drawing number: A08B–9001–J655)

Prepare an RS–232–C cable which satisfies the specifications shown in Fig. G.1 (b).

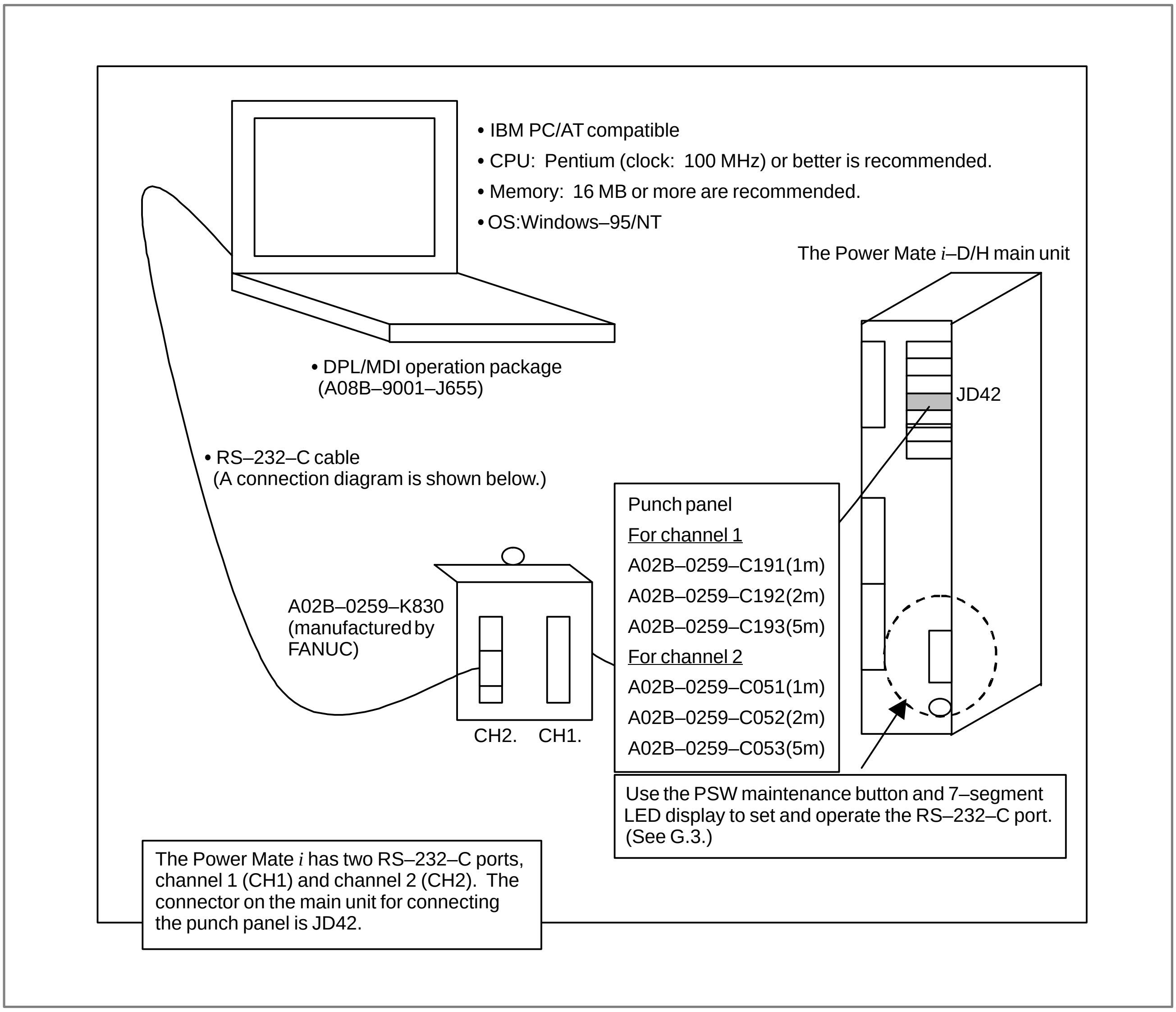


Fig. G.1 (a) System configuration diagram

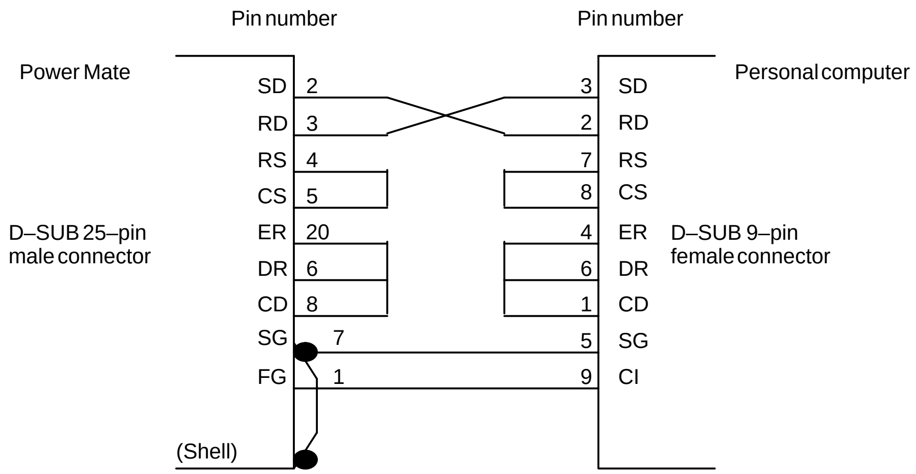


Fig. G.1 (b) Cable specifications

G.2 INSTALLING THE DPL/MDI OPERATION PACKAGE

- **Operating environment**

Compatible personal computer model	: IBM PC/AT or compatible (A personal computer with Pentium 100 MHz or more as the CPU and 16 MB or more of memory is recommended.)
OS	: Windows 95 or Windows NT
Hard disk capacity	: 2.8 MB or more of unused space required
RS–232–C port	: Fixed to COM1

- **Files in the package**

This package contains the following files:

Disk1

README.TXT	: Release note (English)
READMEJ.TXT	: Release note (Japanese)
SETUP.EXE	: Setup program for this package
SETUP.LST	: Data file for the setup program
*.??_	: Setup program file

Disk2

*.??_	: Setup program file

- **Installation**

Insert the disk (Disk1) in the floppy disk drive, select [Run (R)] from the Windows 95 Start menu, and execute the following command:

```
[<drive>:]SETUP<ENTER>
```

- **Uninstallation**

Execute [Add/Remove Programs] from the Control Panel. Then, select “DPL/MDI Operation Package” and click the Remove button.

- **Startup**

The following programs can be started by selecting “Programs” from the Windows Start menu, then “DPL/MDI Operation Package” from the Programs menu:

BOOTINIT.EXE :	Executable program for boot system and INIT operation
DPLMDI.EXE :	Executable program for displaying and setting various types of CNC data

G.3 MAINTENANCE PROCEDURES

This section explains procedures for using the DPL/MDI operation package for maintenance.

(1) To use executable program for normal operation DPLMDI.EXE
Follow the procedure below with the power to the Power Mate *i* turned on to use the DPL/MDI operation package:

1) Confirm that the power to the personal computer is turned off(NOTE). Then, connect CH2 (see additional information 1) on the punch panel on the Power Mate *i* and RS–232–C port 1 on the personal computer (the personal computer port available for the DPL/MDI operation package is fixed to COM1) using an RS–232–C cable.
2) Use the maintenance button and LED display on the Power Mate *i* main unit to set the channel to be connected. (See additional information 2.)
3) Turn the power to the personal computer on to start up Windows.
4) Start the DPL/MDI operation package (DPLMDI.EXE).
5) Perform maintenance. (See V.)
6) Terminate the DPL/MDI operation package.
7) Terminate Windows and turn the power to the personal computer off.
8) Disconnect the RS–232–C cable from the punch panel on the Power Mate *i*.
9) Use the maintenance button and LED display on the Power Mate *i* main unit to restore the channel settings to the initial status. (See additional information 2.)

(2) To use executable program for boot system and initial operations BOOTINIT.EXE
To use the DPL/MDI operation package for boot system operation or memory clear or another initialization, the procedure depends on whether the system starts up normally. Follow the appropriate procedure below to perform operation.

When the system can be started up
Turn the power to the Power Mate *i* on and start up the system, then perform the following operations:

1) Confirm that the power to the personal computer is turned off(NOTE). Then, connect CH2 (see additional information 1) on the punch panel on the Power Mate *i* and RS–232–C port 1 on the personal computer (the personal computer port available for the DPL/MDI operation package is fixed to COM1) using an RS–232–C cable.
2) Use the maintenance button and LED display on the Power Mate *i* main unit to set the channel to be connected. (See additional information 2.)
3) Turn the power to the Power Mate *i* off.
4) Turn the power to the personal computer on to start up Windows.
5) Start the DPL/MDI operation package (for boot operation) (BOOTINIT.EXE).
6) Turn the power to the Power Mate *i* on.
7) Perform boot system operation or initialization. (See G.4.)

8) Terminate the DPL/MDI operation package.
9) Terminate Windows and turn the power to the personal computer off.
10) Disconnect the RS–232–C cable from the punch panel on the Power Mate *i*.
11) Use the maintenance button and LED display on the Power Mate *i* main unit to restore the channel settings to the initial status. (See additional information 2.)

When the system cannot be started up

When turning the power to the Power Mate *i* on, perform the following operations:

1) Confirm that the power to the personal computer is turned off(NOTE). Then, connect CH2 (see additional information 1) on the punch panel on the Power Mate *i* and RS–232–C port 1 on the personal computer (the personal computer port available for the DPL/MDI operation package is fixed to COM1) using an RS–232–C cable.
2) Use the rotary switch for power–on, maintenance button, and 7–segment LED display on the Power Mate *i* to set the channel to be connected, then turn the power to the Power Mate *i* off. (See additional information 3.)
3) Turn the power to the personal computer on to start up Windows.
4) Start the DPL/MDI operation package (for boot operation) (BOOTINIT.EXE).
5) Turn the power to the Power Mate *i* on.
6) Perform boot system operation or initialization. (See G.4.)
7) Terminate the DPL/MDI operation package.
8) Terminate Windows and turn the power to the personal computer off.
9) Disconnect the RS–232–C cable from the punch panel on the Power Mate *i*.
10) Use the rotary switch and LED display on the Power Mate *i* to restore the channel settings to the initial status. (See additional information 2.)

NOTE

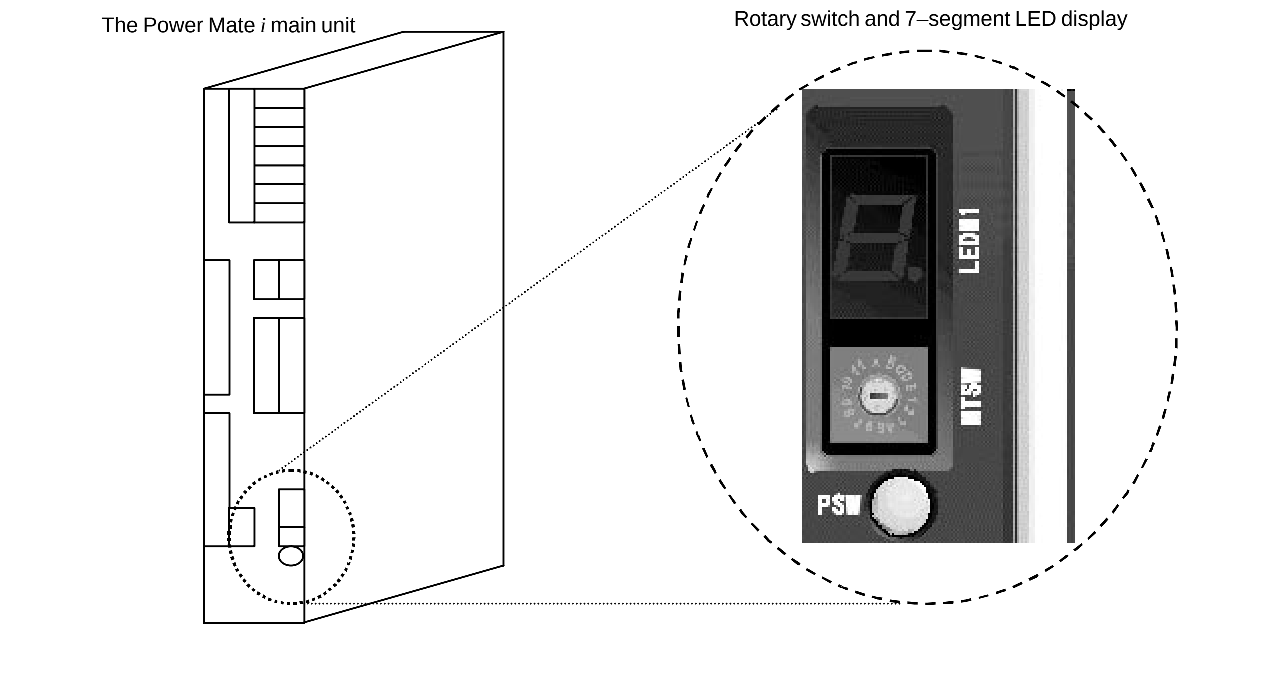
When an RS–232–C cable is connected to the punch panel on the Power Mate *i*, voltage from the personal computer may be present (the power to the personal computer may be on). In this case, a shortcircuit may occur between the voltage and 0 V (the shell of the D–SUB connector on the punch panel is 0 V) depending on the connection method, and hardware of the Power Mate *i* may be destroyed. Connect the cable only when the power to the personal computer is off.

- **Additional information 1**

The Power Mate *i* has two RS–232–C ports (channel 1 and channel 2). It is assumed that an I/O device for user applications and handy files is connected to channel 1 and a display for maintenance (DPL/MDI operation package or FAPT LADDER II) is connected to channel 2. When using the system without connecting a maintenance device such as an CRT/MDI or basic operation package (BOT), use channel 2 only for the DPL/MDI operation package and FAPT LADDER II.

- **Additional information 2 (Setting the RS–232–C port (after power–on))**

To use the DPL/MDI operation package or FAPT LADDER II, follow the procedure below to set the RS–232–C port by using the button (PSW) and 7–segment LED display (LEDM1) on the Power Mate *i* main unit. (For details of how to operate the MTSW rotary switch, PSW maintenance button, and LEDM1 7–segment LED display, refer to the description in the technical report issued separately.)



(1) When the PSW maintenance button is held for about 5 seconds with the rotary switch set to the 0 position, the LED display enters the high–speed blinking state. When the button is pressed again in this status, the LED display enters the primary selection mode. In the primary selection mode, the number corresponding to each type of operation sequentially appears. (Table G.3 (a))

(2) When "3" is displayed in the primary selection mode, press the PSW button. "3" displayed on the LED display blinks at high speed. When the button is pressed again in this status, the LED display enters the secondary selection mode. In the secondary selection mode, the number corresponding to each setting (Table G.3 (a)) sequentially appears. When the number corresponding to the target setting is displayed, press the PSW button again. The selected number blinks. Press the PSW button again.

(3) When port setting is normally complete, the last selected number remains displayed. (If an error occurs, "□" (lower–case o) is displayed. Reference the error condition described in the table and reexecute secondary selection.)

(4) Press the button again to restore the LED display to the status during normal operation. If an alarm occurs in this status, the LED display is also restored to the status during normal operation.

Table G.3 (a) Maintenance operations after power–on using the maintenance button and led display

Primary	Secondary	Description
0	Terminates this operation.	
1	Reserved	
2	Reserved	
3	Uses the following software packages.	
	0	Clears the following RS–232–C port settings (1 to 4). (When use of the DPL/MDI operation package (for boot operation) is set at power–on (additional information 3), this operation also clears the port settings.)
	1	Uses the DPL/MDI operation package on RS–232–C port 2 (channel 2). (This setting is retained even after the power is turned off. To clear the setting, perform the operation for setting 0 above. At the next power–on after this setting is made, the DPL/MDI operation package (for boot operation) is also available. If setting 2 or 3 below is made before this setting is made, an error occurs with "□" (lower–case o). In this case, perform clear operation by setting 0 above, then make this setting again.)
	2	Uses FAPT LADDER II on RS–232–C port 2 (channel 2). (This setting is retained even after the power is turned off. To clear the setting, perform the operation for setting 0 above. If setting 1 above or 4 below is made before this setting is made, an error occurs with "□" (lower–case o). In this case, perform clear operation by setting 0 above, then make this setting again.)
	3	Reserved
	4	Reserved

- **Additional information 3 (Setting the RS–232–C port (at power–on))**

To perform boot system or initialization (such as memory clear) operation using the DPL/MDI operation package (for boot operation) when the system is not started up normally, set the RS–232–C port using the procedure below:

(1) Primary selection (selection using the rotary switch)
First, set the MTSW rotary switch to the 1 position before power–on. (Set the rotary switch before power–on.)

(2) Turn the power to the Power Mate *i* on.

(3) “1” blinks on the 7–segment LED display. When the PSW button is pressed in this status, the LED display enters the secondary selection mode. The number corresponding to each operation sequentially appears. (Table G.3 (b))

(4) When “3” is displayed, press the PSW button.

(5) “3” blinks. Press the PSW button again. When setting is normally complete, “3” remains displayed. If setting fails, “□” (lower–case o) is displayed. In this case, reference the error condition described in Table G.3 (b) and perform setting again.

(6) Turn the power to the Power Mate *i* off, then place the MTSW rotary switch to the 0 position again.

Table G.3 (b)

<table>
<tr><th>Primary</th><th>Secondary</th><th>Tertiary</th><th>Description</th></tr>
<tr><td>1</td><td colspan="3">Connects a display other than a CRT.
By default, a CRT is selected. Setting this item allows the following display to be connected.</td></tr>
<tr><td></td><td>0</td><td colspan="2">Cancels operation (cancels all selected numbers.)</td></tr>
<tr><td></td><td>1</td><td colspan="2">Reserved</td></tr>
<tr><td></td><td>2</td><td colspan="2">Connects a handy operator’s panel. (For BOOT/IPL operation, another display is required.)
If the CRT/MDI is connected or no handy operator’s panel is connected, an error occurs.</td></tr>
<tr><td></td><td>3</td><td colspan="2">Uses the DPL/MDI operation package (<u>for boot operation</u>) on RS–232–C port 2 (channel 2).
● Make this setting only when the system is not started up normally and boot or memory clear operation using the DPL/MDI operation package is required. When the system is started up normally, to use the DPL/MDI operation package (for boot operation), follow the procedure described in additional information 2 to set the port.
● This setting is retained even after the power is turned off. To clear the setting, perform operation using the LED display and button after the system is started up. (See additional information 2.)
● If 4 is selected for secondary selection and this item is selected for tertiary or subsequent selection, an error occurs.</td></tr>
<tr><td></td><td>4</td><td colspan="2">Reserved</td></tr>
</table>

G.4 USING BOOTINIT.EXE

G.4.1 Overview

BOOTINIT.EXE can perform the following operations related to system maintenance of the Power Mate *i*:

(1) Registers a file to the flash memory in the Power Mate *i*.
(Reads a file on a memory card in the MS–DOS format conforming to JEIDA V4.1 into the flash memory in the Power Mate *i*.)

(2) Checks files in the flash memory in the Power Mate *i* (series and edition).

(3) Deletes a file from the flash memory in the Power Mate *i*.

(4) Saves parameter, programs, and other battery–backed files (in the SRAM area) onto a memory card or restores them from a memory card at a time.

(5) Saves a file in the flash memory in the Power Mate *i* onto a memory card.

(6) Formats a memory card.

(7) Deletes a file from a memory card.

This section explains how to start BOOTINIT.EXE, display each screen, and operate BOOTINIT.EXE.

CAUTION
With the Power Mate *i*, a memory card is available as an I/O device. Insert or remove a memory card always after turning off the power.

For the boot system, the following types of memory cards are available: SRAM type specified by FANUC and flash type. To store data for a long time, use the flash type of memory card or ATA card.

NOTE
Use Intel Series 2 flash–type memory cards. Memory cards with a capacity of 4 MB are recommended.

G.4.1.1 Starting up BOOTINIT.EXE

During normal system startup, the user does not consider the presence of the boot system because the boot system automatically transfers files from the flash memory in the Power Mate *i* to DRAM. When maintenance is to be performed or the flash memory contains no file, start the boot system using BOOTINIT.EXE for maintenance.

(1) Start BOOTINIT.EXE following the procedure described in G.3 (2).

(2) When communication starts between BOOTINIT.EXE and Power Mate, the following message appears on the package screen:

BOOT SYSTEM
STARTING NOW!
HIT <ENTER>

(3) Check this message, then press the ENTER key.

(4) When communication is normally established, the following screen appears:

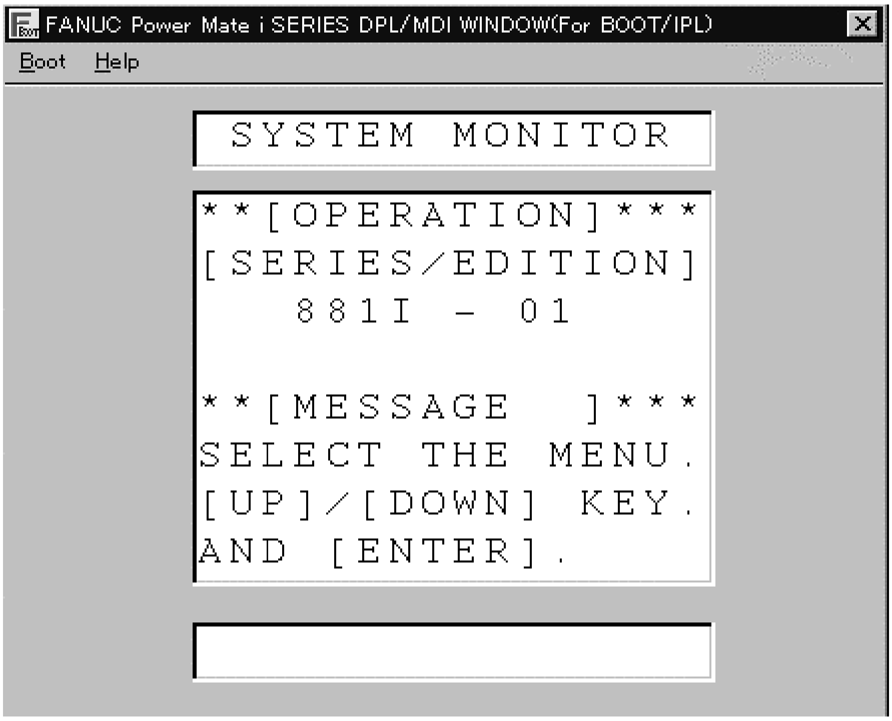


Fig. G.4.1.1

G.4.1.2 System file and user file

For management purposes, the boot system roughly divides files stored in the flash memory in the Power Mate *i* into system files and user files. These files are explained below.

- **What is a system file?**

A system file is a CNC or servo control software file provided by FANUC.

- **What is a user file?**

A user file is a file the user can create, such as a PMC sequence program (ladder) file or P–CODE macro program file.

G.4.1.3 Boot operation and INIT operation

BOOTINIT.EXE performs boot operation and INIT operation with the following procedure:

Starts BOOTIPL.EXE.

↓

Starts Power Mate.

↓

Performs boot operations (such as system data loading and user file backup/restoration).

↓

Terminates the boot system (when “10.SYSTEM MONITOR EXIT” is selected).

↓

Selects INIT processing.
(INIT processing: Maintenance operation at power–on such as memory clear)

↓

Terminates INIT operation.
(Performs processing for the selected item and automatically terminates.)

↓

Window during normal system operation DPLMDI.EXE is started.

G.4.2 Boot System Screen Configuration and Operation Method

When the screen shown in Fig. G.4.1.1 is displayed, pressing the ↓ key (or ↑ key) sequentially displays the following screens in the [OPERATION] area on the screen.

1.SYSTEM DATA LOADING.	: Writes a file into the flash memory.
2.SYSTEM DATA CHECK.	: Checks the edition of each system file.
3.SYSTEM DATA DELETE.	: Deletes a flash memory file.
4.SYSTEM DATA SAVE.	: Backs up a flash memory file to a memory card.
5.FILE DATA BACKUP/RESTORE.	: Backs up and restores the SRAM area.
6.MEMORY CARD FILE DELETE	: Deletes a file from a memory card.
7.MEMORY CARD FORMAT.	: Formats a memory card.
10.SYSTEM MONITOR EXIT	: Terminates the boot system and starts the INIT operation window.

- **Operation method**

To select a function, press the ENTER key on the personal computer when the function menu to be selected is displayed.

G.4.2.1 SYSTEM DATA LOADING screen

When “1.SYSTEM DATA LOADING” is selected, the following file selection screen appears. Pressing the ↓ or ↑ key on the keyboard of the personal computer displays the name of each file on the memory card. When the name of a file to be loaded is displayed, press ENTER to start loading.

```
LOADING MENU
    PMC–RB*.MEM
```

: File selection screen

During loading, the following screen appears:

```
PMC–RB*.MEM
        LOADING
```

: The name of the file being loaded is displayed and “LOADING” blinks.

When loading terminates, the file selection screen appears again.
To terminate the SYSTEM DATA LOADING screen, press ENTER when “END” is displayed on the screen. The initial screen appears again.

- **Names of files in the CNC flash memory**

The boot system determines the type of each file in the flash memory using the first four characters in the header ID. When a file of which type is the same as the file to be read from the memory card has already been stored in the flash memory, the boot system deletes the file from the flash memory, then reads the target file. The following table lists each header ID and corresponding type. These header IDs are subject to change without notice.

Header ID	Type	File type
NC BASIC	CNC basic	System file
DG SERVO	Servo	System file
NC□ OPTN	Option	System file
PMC□****	PMC control software	System file
PD1M ****	P–CODE macro file	User file
CEX ****	C executor	User file
PMC– ****	Ladder software	User file

□ indicates a numeric character and * indicates an alphabetic character.

G.4.2.2 SYSTEM DATA CHECK screen

Use the SYSTEM DATA CHECK screen to display a list of files in the flash memory in Power Mate, the number of 128–KB management units, and software series and edition of each file.

- **Operation procedure**

When "2.SYSTEM DATA CHECK" is selected, the following file information screen appears. Pressing ↓ or ↑ displays information of another file.

```
CHECK MENU
1.NC BASIC (10)
```

: File information screen
The number in parentheses indicates the number of used management units (Unit: 128K bytes).

When a file name is displayed, pressing the ENTER key displays the following detailed information (series, ROM number, edition, and internal management number (up to 16)):

```
NC BASIC
0.88F0 801A 000
```

: Detailed file information screen

To terminate the detailed file information screen, press the ENTER key when "END" is displayed on the screen. The file information screen appears again. To return from the file information screen to the initial screen, press ENTER when "END" is displayed on the screen.

- **Others**

For a system file with NC BASIC, DG SERVO, or another file name in the flash memory, parity information is stored for each management unit. If a non–ASCII character or @ is displayed in the file name or parity field in file information on the check screen, the flash memory may be destroyed or a destroyed file may be read.
Read the file from the memory card again. For a user file with PMC–RB, PCD 0.5M, or another file name, however, parity information is not stored for each management unit. For this reason, a non–ASCII character or @ displayed in series or edition information does not indicate that the file is destroyed.

G.4.2.3 SYSTEM DATA DELETE screen

Use the SYSTEM DATA DELETE screen to delete a user file from the flash memory.

- **Operation procedure**

When “3.SYSTEM DATA DELETE” is selected, the following file selection screen appears. Pressing ↓ or ↑ displays the name of each file in the flash memory. When the name of a file to be deleted is displayed, press ENTER. The file is deleted.

```
DELETE MENU
1.PD1M256K (2)
```

: File selection screen
The number in parentheses indicates the number of used management units (Unit: 128K bytes).

During deletion, the following screen appears:

```
PD1M256K
            DELETE
```

: The name of the file being deleted is displayed and “DELETE” blinks.

When deletion terminates, the file selection screen appears again.
To terminate the SYSTEM DATA DELETE screen, press ENTER when “END” is displayed on the screen. The initial screen appears again.

- **System file and user file**

The system files are protected from deletion using “3.SYSTEM DATA DELETE” to prevent the operator from deleting any system file unintentionally. User files are not protected. The system files are protected, but can be overwritten using the SYSTEM DATA LOADING screen.

G.4.2.4 SYSTEM DATA SAVE screen

Use the SYSTEM DATA SAVE screen to write a user file in the flash memory onto a memory card. Only user files can be saved from the flash memory onto a memory card. No system file can be saved.

• Operation procedure

When ”4.SYSTEM DATA SAVE” is selected, the following file selection screen appears. Pressing ↓ or ↑ displays the name of each file in the flash memory. When the name of a file to be saved is displayed, press ENTER. The file is saved.

```
SAVE MENU
3. PMC RB (1)
```

: File selection screen
The number in parentheses indicates the number of used management units (Unit: 128K bytes).

During saving, the following screen appears:

```
PMC RB.000
        SAVE
```

: The name of the file being saved is displayed and “SAVE” blinks.

When saving terminates, the file selection screen appears again.

• System file and user file

No system file can be saved using “4.SYSTEM DATA SAVE”. Only user files can be saved.

• Save file names

Each file written from the flash memory onto a memory card is named as follows:

Header ID in the flash memory		Memory card file name
PMC–RB	→	PMC–RB.***
PD1M256K	→	PD1M256K.***
PD1M512K	→	PD1M512K.***
CEX 1.0M	→	CEX_10M.***
CEX 2.0M	→	CEX_20M.***

One of 32 numbers from 000 to 031 is assigned to *** as an MS–DOS extension. For example, when file PMC–RB in the flash memory is saved onto a memory card and the memory card does not contain any file having a name the first six characters of which are PMC–RB, the file is named PMC–RB.000. When the memory card contains file PMC–RB.000, the number of the extension is incremented by one and the file is named PMC–RB.001. Each time file PMC–RB is saved, the number of the extension is incremented by one in the same way. The largest extension number is 031 (file name: PMC–RB.031). If there are no longer used numbers, the smallest of them is used for the extension. When saving multiple files with the same header ID but different extensions, check each file name displayed at normal termination of saving.

G.4.2.5 SRAM DATA BACKUP screen

SRAM data reserved after the power to the CNC is turned off (parameters, programs, etc.) can be saved onto and restored from a memory card at a time.

- **Operation procedure**

When “5.FILE DATA BACKUP/RESTORE” is selected, the following selection screen appears. Pressing ↓ or ↑ selects BACKUP or RESTORE. Pressing ENTER starts saving or restoration.

BACKUP : Saves the SRAM area onto a memory card at a time.
RESTORE : Restores the SRAM area from a memory card at a time.

```
FILE MENU
4. FILE BACKUP
```

: Saves file data onto a memory card.

During execution, the following screen appears:

```
SRAM256A.FDB
BACKUP
```

: The processing item is displayed and “BACKUP” blinks.

When saving or restoration terminates, the selection screen appears again. To terminate the SRAM DATA BACKUP screen, press the ENTER key when “END” is displayed on the screen. The initial screen appears again.

- **Backup file name**

The file name of an SRAM backup on a memory card is SRAM256A.FDB.

- **Caution**

Once this function was used to restore data, be sure to re–set a reference position, if an absolute pulse coder is in use.

G.4.2.6 MEMORY CARD FILE DELETE screen

A file on a memory card can be deleted.

- **Operation procedure**

When "6.MEMORY CARD FILE DELETE" is selected, the following file selection screen appears. Pressing ↓ or ↑ displays the name of each file on the memory card. When the name of a file to be deleted is displayed, press ENTER to start deletion.

```
MEMORY DELETE
*BASIC.DAT
```

: File select screen

During deletion, the following screen appears:

```
BASIC.DAT
        DELETE
```

: The name of the file being deleted is displayed and "DELETE" blinks.

When deletion terminates, the file selection screen appears again.

- **Others**

No individual file can be deleted from any memory card of the flash memory type.

G.4.2.7 MEMORY CARD FORMAT screen

A memory card can be formatted. A memory card must be formatted before it is used first after purchased and when the contents are destroyed due to a dead battery or another abnormality.

- **Operation procedure**

When "7.MEMORY CARD FORMAT" is selected, the following confirmation screen appears. Press ENTER to start formatting.

```
CARD FORMAT OK?
HIT [Y] OR [N]
```

: Confirmation screen "HIT [Y] OR [N]" blinks.

During formatting, the following screen appears:

```
CARD FORMAT
          EXEC
```

: "EXEC" blinks.

When formatting terminates, the initial screen appears again.

G.4.2.8 LOAD BASIC SYSTEM

The boot system is terminated and the Power Mate *i* is started.

- **Operation procedure**

When “10.SYSTEM MONITOR EXIT” is selected, the following confirmation screen appears. Pressing Y starts loading the CNC system into DRAM and start the INIT operation window. Selecting N displays the initial screen again.

MONITOR EXIT OK?
HIT [Y] OR [N]

: Confirmation screen
“HIT [Y] OR [N]” blinks.

During execution of loading, the following screens sequentially appear:

CHECK CNC BASIC
SYSTEM

LOADING BASIC
TO DRAM

CNC BASIC
LOADED

↓ The INIT operation window starts (Fig. G.4.2.8).

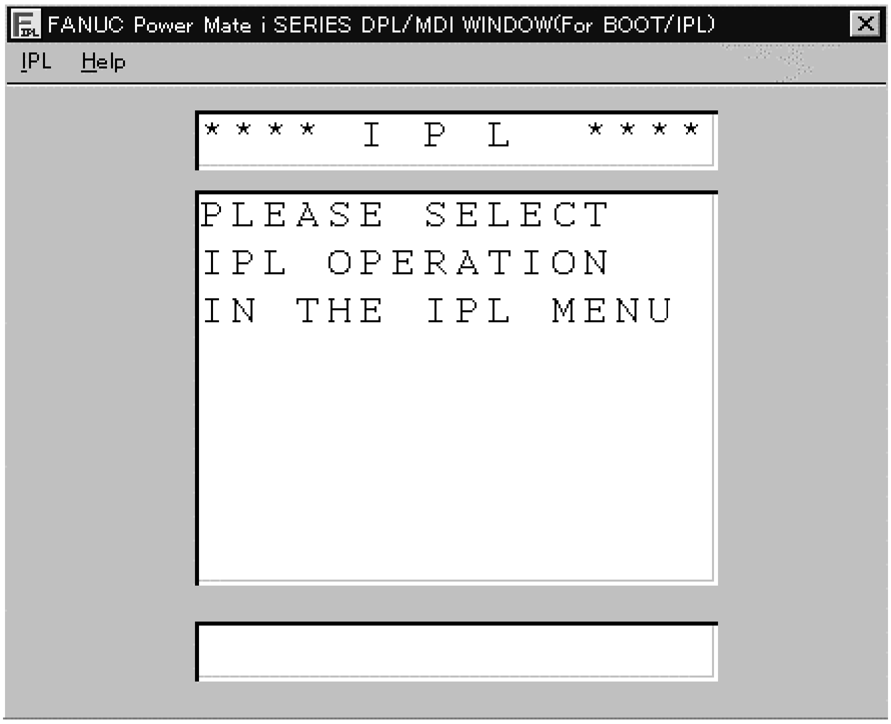


Fig. G.4.2.8

G.4.3 Operating the INIT System

The power may be disconnected during editing of an NC program or the contents of SRAM may be destroyed due to noise or another abnormality. In such a case, power–on operations such as memory clear can be executed at power–on.

G.4.3.1 Startup procedure

This window is automatically started after BOOTINIT.EXE is started up using the boot system startup procedure and the boot system is terminated.

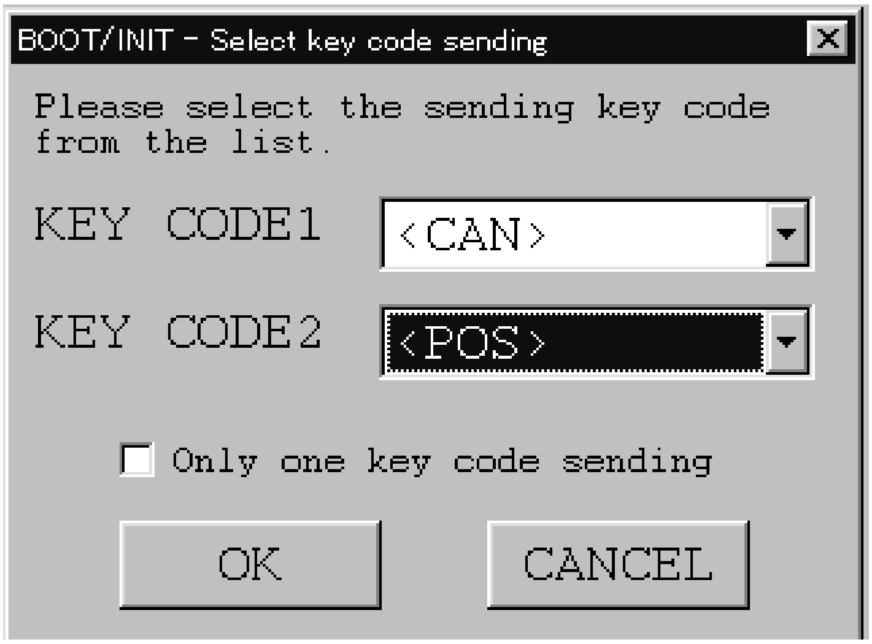
G.4.3.2 Operation method

Select “INIT” from the main menu of this window, then a target item listed below from the pull–down menu.

MEMORY ALL CLEAR	(Clears all memory.)
MEMORY CLEAR (PARAMETER,OFFSET)	(Clears CNC parameters and offset values.)
MEMORY CLEAR (ALL PROGRAM)	(Clears all programs.)
MEMORY CLEAR (PMC PARAMETER)	(Clears PMC parameters.)
MEMORY CLEAR (PMC LADDER)	(Clears PMC ladders.)
IGNORE OVER TRAVEL ALARM	(Resets the OT alarm.)
START WITHOUT LADDER	(Starts the system with no ladder.)
C LANGUAGE EXECUTOR (MAKE VOID C–EXEC)	(Starts up the system with starting no C executor application.)
OTHERS	(Sends a key code.)
EXIT	(Terminates INIT operation.)

Operation when “OTHERS” is selected

When this menu is selected, the following window appears. Select a key code required for initialization from the pull–down menu. After selecting a key code, select the OK button. A confirmation message appears. Selecting “Yes (Y)” for the confirmation message executes initialization according to the selected key code.



G.5 USING DPLMDI.EXE

G.5.1 Overview

After startup of the Power Mate *i*, this executable program can be started to display each screen, set data, and transfer files as listed below.

(Displaying and setting data)

- Displays the current position.
- Displays, edits, and checks CNC programs.
- Displays and sets settings, offset values, and macro variables.
- Displays and sets parameters, diagnostic data (CNC and PMC), and pitch error compensation.
- Displays alarms and messages.
- Displays the system alarm screen.

(Manipulating files)

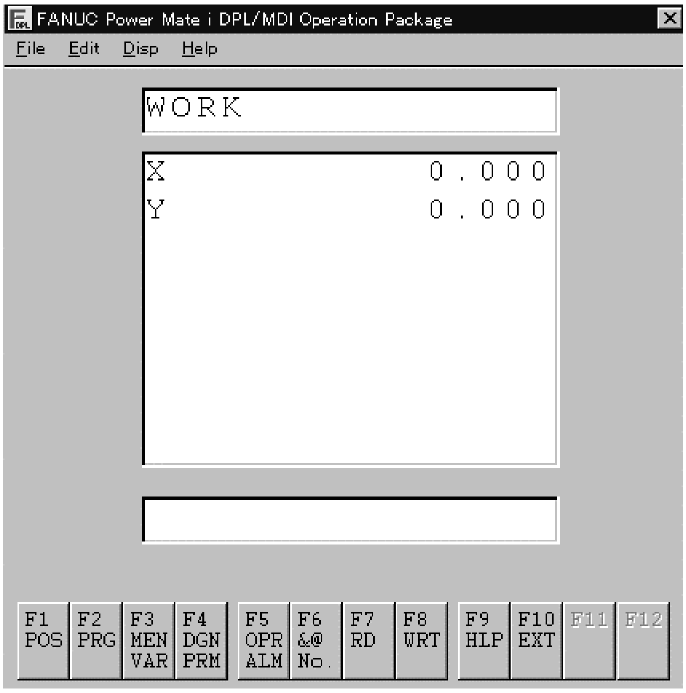
- References a file in the personal computer.
- Backs up and restores CNC data (CNC programs, tool offset values, macro variables, and CNC parameters).
- Prints a file in the personal computer.
- Produces hard copy of the display contents on the DPL/MDI operation package screen.

• Caution

Confirm that the Power Mate *i* system has started up (“0” is displayed on LEDM1 on the Power Mate *i* main unit when the system starts up), then start executable program DPLMDI.EXE. If this executable program is started when the system is not started up, connection is not performed normally.

G.5.2 Data Display and Setting Screens and Operation Methods

G.5.2.1 Current position screen



- **Display operation**

Press [F1 POS]. The screen for the current position in the workpiece coordinate system and the screen for the current position in the machine coordinate system alternately appear. Select either screen to be displayed.

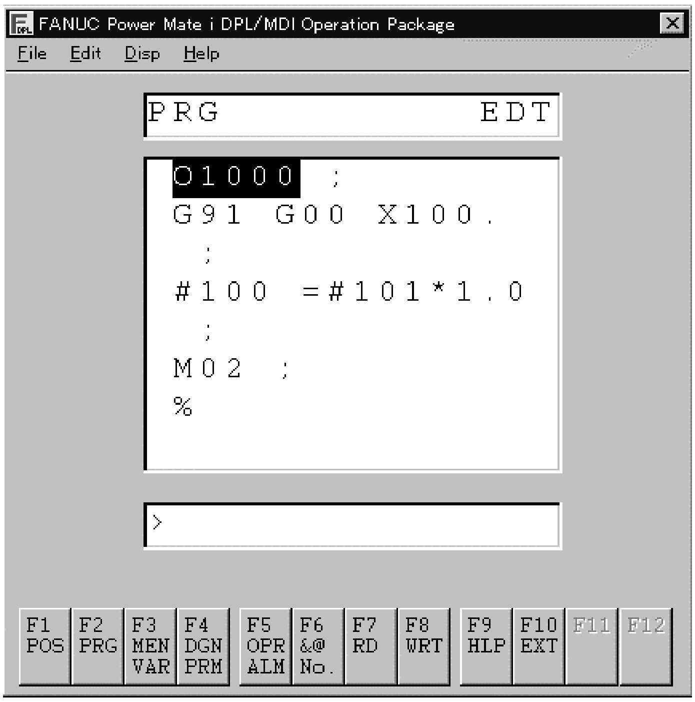
(1) On the screen for the current position in the workpiece coordinate system, the following string is displayed in the title field:

WORK

(2) On the screen for the current position in the machine coordinate system, the following string is displayed in the title field:

MCHN

G.5.2.2 Program



- **Display operation**

Press F2 PRG. The program screen appears.

(1) File heading

1 Select a mode. (EDIT or AUTO mode)

2 Select the program screen.

3 Key in address N.

4 Key in a file number.

5 Press F7 RD.

One of the following operations is performed according to the keyed–in file number:

1) N0
Beginning–of–cassette heading is performed.

2) One of N1 to N9999
File heading is performed for the specified file 1 to 9999.

3) N–9999
File heading is performed for the file next to the previously accessed file.

4) N–9998
After –9998 is specified, N–9999 in 3) is automatically inserted each time a file is input or output. This status is released by specifying a number in 1), 2), or 3) or performing a reset.

File heading using N–9999
Sequential file heading for contiguous files by specifying N1 to N9999 gives the same results as file heading for one of N1 to N9999 and file heading for subsequent files by specifying N–9999. File heading by specifying N–9999 requires less time, however.

(2) Deleting a file

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

3 Unlock the protect key.

4 Key in address O.

5 Key in the number of a file to be deleted (1 to 9999).

6 Press [F8 WRT]. This operation deletes the file having the number specified in 5.

- File numbers after deletion
  After a file is deleted, the numbering sequence of any files that follow recedes one position.
- Protect switch
  To delete a file, place the protect switch in the write enable state.

(3) Program (input)

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

3 Press [F7 RD].

- Inputting a program in the background
  This operation registers a program in the same way as in the foreground except that it registers the program in the background editing area.
  To register a program in the foreground program memory in the same way as with the editing operation, the following operation is required at the end:

  Press [F2 PRG] and [Back Space] simultaneously.

(4) Program (output)

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

3 Select a punch code (ISO or EIA) on the setting screen.

4 Press address O.

5 Key in a program number. When –9999 is keyed in, all programs in memory are output.

6 Press [F8 WRT]. The program with the keyed–in number is output.

(5) Editing a program

(a) Search

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

1) Scanning method

a) When cursor key [↓] is pressed

On the screen, the cursor moves one word position in the forward direction.
The cursor is displayed on the selected word.

b) When cursor key [↑] is pressed

On the screen, the cursor moves one word position in the reverse direction.
The cursor is displayed on the selected word.

- Pressing cursor key [↓] or [↑] causes a continuous scan.

2) Word search method

1 Key in an address.

2 Key in a numeric key. The above operations specify a word to be searched for.

3 Press cursor key [↓]. A search starts.

When the search is complete, the cursor is displayed on the specified word.

Pressing cursor key [↑] starts a backward search.

3) Address search method

1 Key in an address.

2 Press cursor key [↓]. A search starts.

When the search is complete, the cursor is displayed on the specified address.

Pressing cursor key [↑] starts a backward search.

(b) Inserting a word

1 Perform mode selection to put the system in the EDIT mode.
2 Select the program screen.
3 Search for or scan the word immediately before the place where a word is to be inserted.
4 Press an address to be inserted.
5 Key in a numeric value.
6 Press [Insert]. The word is inserted.

(c) Changing a word

1 Perform mode selection to put the system in the EDIT mode.
2 Select the program screen.
3 Search for or scan a word to be changed.
4 Press an address to be changed.
5 Key in a numeric value.
6 Press [Home]. The word is changed.

(d) Deleting a word

1 Perform mode selection to put the system in the EDIT mode.
2 Select the program screen.
3 Search for or scan a word to be deleted.
4 Press [Delete]. The word is deleted.

(e) Deleting one block

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

3 Search for or scan a block to be deleted.

4 Press [;] and [Delete] simultaneously.

The range from the word at the cursor to the EOB is deleted.

(f) Deleting multiple blocks

A range from the word at the cursor to the block with the specified sequence number is deleted.

1 Perform mode selection to put the system in the EDIT mode.

2 Select the program screen.

3 Search for or scan a word in the starting block sequence to be deleted.

4 Press address N.

5 Key in the numeric value indicating the sequence number of the last block to be deleted.

6 Press [Delete].

The range from the word at the cursor to the block with the specified sequence number is deleted.

(6) Program number search

1) Method 1

1 Perform mode selection to put the system in the EDIT or AUTO mode.

2 Select the program screen.

3 Press address O.

4 Key in the number of a program to be searched for.

5 Press cursor key [↓] to start a search.

When the search is complete, the program is displayed.

2) Method 2

1 Perform mode selection to put the system in the EDIT or AUTO mode.

2 Select the program screen.

3 Press address O.

4 Press cursor key [↓] to start a search.

When cursor key [↓] is held down in the EDIT mode, registered programs are sequentially displayed.

After all registered program numbers are displayed, the first program is displayed again.

3) Method 3

This method is to search for the program number (0001 to 0255) corresponding to a machine signal and start automatic operation. For details of operation, refer to the manual supplied by the machine tool builder.

1 Select the AUTO mode.

2 Select the program screen.

3 Place the system in the reset state.

4 Set the signal for selecting each program number for 01 to 255 on the machine.

5 Press the cycle start button.

- When the machine signal indicates 00, no program number search is performed.
- In the reset state, the automatic operation lamp is off.(Refer to the manual supplied by the machine tool builder.)

(7) Sequence number search

1 Select the AUTO mode.

2 Select the program screen.

3 Select a program with a sequence number to be searched for.

4 Press address N.

5 Key in the sequence number to be searched for.

6 Press cursor key [↓].

7 When the search is complete, the target sequence number is displayed.

(8) Deleting a program

1) Deleting one program

1 Select the EDIT mode.

2 Select the program screen.

3 Press address O.

4 Key in a program number.

5 Press [Delete].The program with the input number is deleted.

2) Deleting all programs

1 Select the EDIT mode.

2 Select the program screen.

3 Press address O.

4 Key in –9999.

5 Press [Delete].

All programs are deleted.

(9) Operation in the MDI mode

Program number O0000 is automatically inserted. Create a program to be executed in the same way as when editing an ordinary program. The created program is not deleted by a reset. To delete the program, perform operation described in Caution 3.
Check modal information on the diagnosis screen.

CAUTION

1 No operation related to program registration can be performed.(Program registration, deletion, punch, check, and other operations)

2 A program consisting of up to six blocks can be created. However, if a block consists of many characters (using 30 characters as a limit), a program that can be created may consist of less than six blocks.

3 To delete all of the created program, press [O] and [Delete].
Bit 7 of parameter No. 3207 can be set to 1 to delete all programs by a reset.

(10) Background editing

1 Press [F2 PRG] and [Back Space] simultaneously to place the system in the background editing state.

2 Specify a program to be edited.
   a) To create a program
      1) Press address O.
      2) Key in a program number.
      3) Press [Insert]. The program is specified and displayed.
   b) To edit an existing program
      1) Press address O.
      2) Key in a program number.
      3) Press [↓]. The program is searched for and displayed.

3 Editing a program
Edit a program in the same way as when editing a program in the foreground.

4 Terminating background editing
Press [F2 PRG] and [Back Space] simultaneously to terminate background editing.

(11) Creating a program

(a) Creating a program using the keyboard

1 Select the EDIT mode.

2 Select the program screen.

3 Press address O.

4 Key in the number of a program to be registered.

5 Press [Insert]. The program is registered and displayed.

(b) Automatically inserting sequence numbers

Set the increment value for sequence numbers in parameter No. 3216 in advance.

1 Select the EDIT mode.

2 Select the program screen.

3 Press address N.

4 Key in the initial value for N.

5 Press [Insert].

6 Insert 1–block data for each word.

7 Press [;].

8 Press [Insert].

After this operation, for example, when the initial value is 10 and the parameter is set to 2, N12 is inserted in the next line and displayed.

(12) Creating a program in the TEACH IN mode

1 Select the TEACHIN JOG or TEACHIN STEP mode.

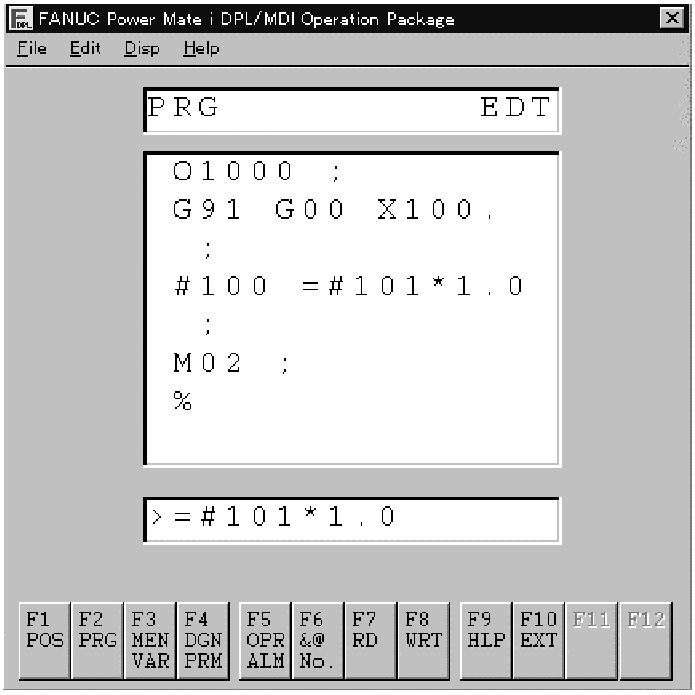
2 Move the machine and determine the position.

3 Select the program screen.

4 Key in address X.

5 Press [Insert]. The machine position on the X–axis is registered in memory.

(13) Editing a macro statement



- **Display operation**

1 Select the EDIT mode.

2 Select the program screen.

3 Press Enter. The system is switched from the program editing mode to the macro statement editing mode.
The macro statement at the cursor is displayed in the data input line one word at a time as follows:

>=#101*1.0

The underline indicates the cursor blinking on “=”.

4 Press Home to register (replace) the character string displayed in the data input line and terminate macro statement editing.

5 Press Back Space to cancel the macro statement editing screen.

6 Screen switching with a function key cancels the macro statement editing screen.

- **Edit operation**

1 Press ↑ to move the cursor in the forward direction or ↓ to move it in the reverse direction.
Example

>=#101*1.0

The underline indicates the cursor blinking on “=”.

When ↓ is pressed six times, the display changes as follows:

>=#101*1.0

2 Press Delete to delete one character at the cursor.

Example

```
=#101*1.0
```

When DELETE is pressed once, the display changes as follows:

```
>=#101*.0
```

"1" is deleted and the cursor moves to the "." position.

3 Press Insert to insert one blank character at the cursor.

Example

```
>=#101*.0
```

When Insert is pressed twice, the display changes as follows:

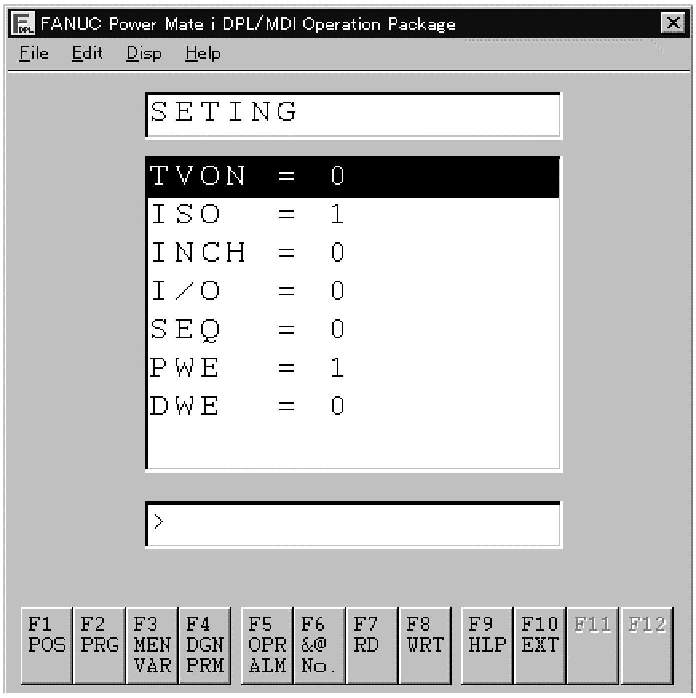
```
>=#101*_  .0
```

4 Press an alphanumeric key to display the character at the cursor.

5 Press Home to register (replace) the edited character string.

> **CAUTION**
> 1 Up to 15 characters can be edited.
> 2 If an alarm occurs during edit processing, the edit processing is canceled, then the alarm screen is displayed.
> 3 When a macro statement is longer than 15 characters, up to 15 characters are to be edited in 1. The 16th and subsequent characters cannot be edited.
> If the registration key is pressed with a macro statement longer than 15 characters displayed, the macro statement is registered with the 16th and subsequent characters deleted.
> 4 This function performs no syntax check.

G.5.2.3 Settings



- **Display operation**

Press F3 MEN VAR. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the setting screen.

1 Move the cursor to the position of a setting to be changed.

2 Key in 1 or 0 by referencing the following explanation.

3 Press Enter. The data is input and displayed.

Description of settings

1 Parameter writing (PWE)Specifies whether to enable a parameter to be written.
0 : Disables a parameter to be written.
1 : Enables a parameter to be written.

2 TV check (TVON)
Specifies whether to perform a TV check.
0 : Does not perform a TV check.
1 : Performs a TV check.

3 Punch code (ISO)
Sets the code to be used for outputting data from the reader/punch interface.
0 : Outputs the EIA code.
1 : Outputs the ISO code.

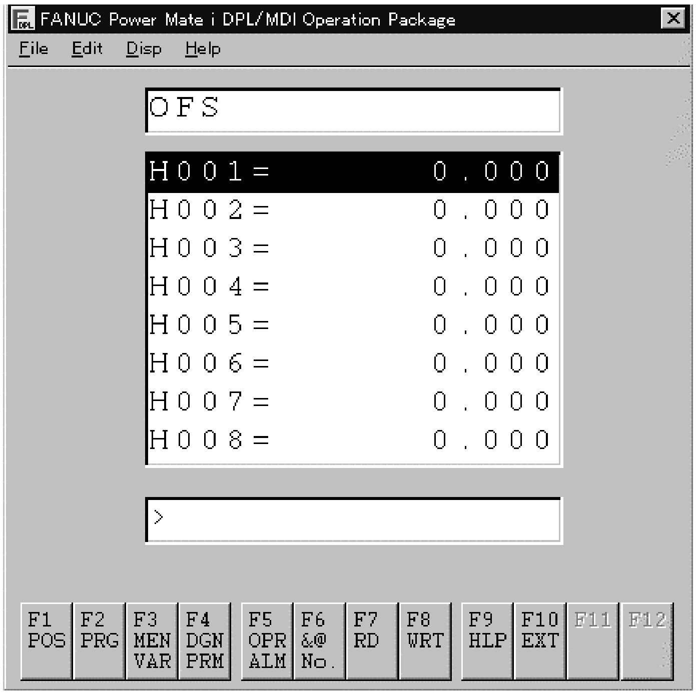
4 Input unit (INCH)
Sets the input unit: inch or millimeter.
0 : Millimeter
1 : Inch

5 I/O channel (I/O)
Sets the channel used for the reader/punch interface.
0 : Channel 0
1 : Channel 1

6 Sequence number (SEQ)
Specifies whether to automatically insert sequence numbers during program editing in the EDIT mode.
0 : Does not automatically insert sequence numbers.
1 : Automatically inserts sequence numbers.

7 PMC data writing (DWE)
PMC data write enable switch
0 : Disables PMC data to be written.
1 : Enables PMC data to be written.

G.5.2.4 Offset



- **Display operation**

Press [F3 MEN VAR]. The offset screen, setting screen, and macro variable screen alternately appear. Select the offset screen.

- **Rewriting procedure**

1 Move the cursor to the position of the number of an offset value to be changed as follows:

1) Cursor key

2) Press [F6 &@ No.]. "H" is displayed following ">".

```
>H
```

Then, enter an offset number.

Press [Enter]. The cursor moves to the target number position.

When this method is used, the cursor is always displayed on the first line.

2 Key in a new offset value, then press [Enter]. The new offset value is input and displayed.

(1) Offset (input)

1 Select the EDIT mode.

2 Select the offset screen.

Press [F3 MEN VAR]. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the offset screen.

3 When offset values are stored in a file in a device, perform file heading as required.

4 Press [F7 RD] to input the offset values.

During input, "RD" is displayed as follows:

```
>                RD
```

(2) Offset (output)

1 Select the EDIT mode.

2 Select the offset screen.

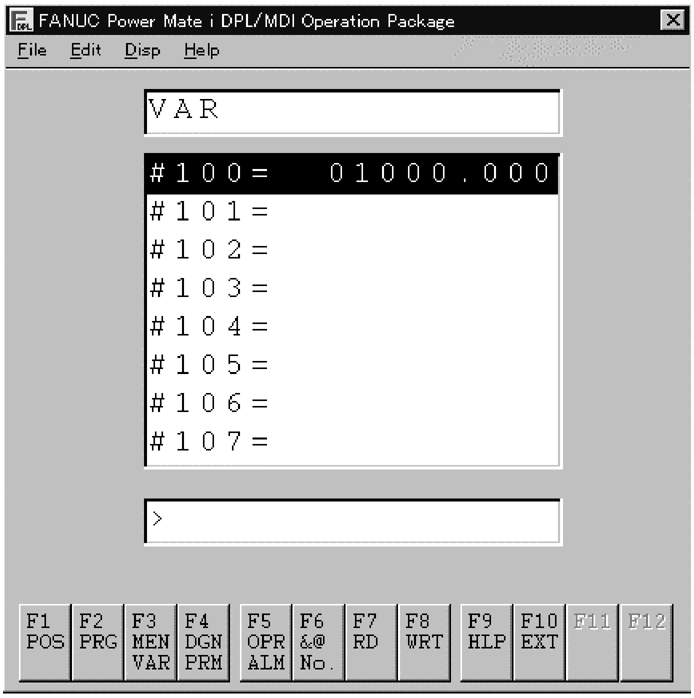
Press [F3 MEN VAR]. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the offset screen.

3 Press [F8 WRT] to output the offset values.

During output, "WRT" is displayed as follows:

```
>               WRT
```

G.5.2.5 Custom macro variable



- **Display operation**

Press [F3 MEN VAR]. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the custom macro variable screen.

- **Rewriting procedure**

1 Move the cursor to the position of the number of a macro variable to be changed as follows:

   1) Cursor key

   2) Press [F6 &@ No.]. "#" is displayed following ">".

>#

   Then, enter a macro variable number.

   Press [Enter]. The cursor moves to the target number position.

   When this method is used, the cursor is always displayed on the first line.

2 The following three methods are available according to the setting.

   1) Setting a macro variable value

   Key in a new value, then press [Enter]. The new macro variable value is input and displayed.

   2) Setting coordinates for a variable

   Press the X key. The workpiece coordinates are displayed. Press [Enter]. The workpiece coordinates are input for the macro variable and are displayed.

3) Setting null for a variable

Press [.]. Null is input for the macro variable and a blank is displayed.

(1) Custom macro common variable (input)

1 Select the EDIT mode.

2 Select the custom macro variable screen.Press [F3 MEN VAR]. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the custom macro variable screen.

3 When custom macro common variables are stored in a file in a device, perform file heading as required.

4 Press [F7 RD] to input the custom macro common variables.

During input, "RD" is displayed as follows:

```
>                    RD
```

> **NOTE**
> The custom macro common variables are input as a program. The variables are registered as common variables by executing the input program.

(2) Custom macro common variable (output)

1 Select the EDIT mode.

2 Select the custom macro variable screen.

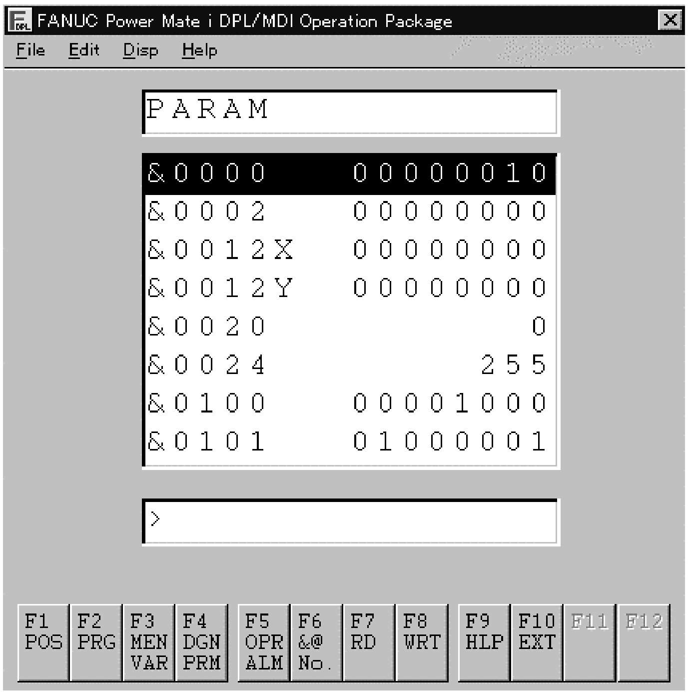
Press [F3 MEN VAR]. The offset screen, setting screen, and custom macro variable screen alternately appear. Select the custom macro variable screen.

3 Press [F8 WRT] to output the custom macro common variables.

During output, "WRT" is displayed as follows:

```
>                    WRT
```

G.5.2.6 Parameter



- **Display operation**

Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the parameter screen.

- **Rewriting procedure**

1 Set PWE to 1 on the setting screen.

2 Move the cursor to the position of the number of a parameter to be changed as follows:

1) Cursor key

2) Press [F6 &@ No.]. “&” is displayed following “>”.

```
>&
```

Then, enter a parameter number.

Press [Enter]. The cursor moves to the target number position.

When this method is used, the cursor is always displayed on the first line.

3 Key in a new value, then press [Enter]. The new parameter value is input and displayed.

4 After setting and checking all parameters, display the setting screen and set PWE to 0.

5 Press [Back Space] to release the alarm state.

If alarm number 000 occurs, however, the alarm can be released only by turning the power off, then on again.

(1) Parameter (input)

1 Press the EMERGENCY STOP button on the machine.

2 Select the parameter screen.

Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the parameter screen.

3 When parameters are stored in a file in a device, perform file heading as required.

4 Press [F7 RD] to input the parameters.

During input, "RD" is displayed as follows:

```
>                RD
```

(2) Parameter (output)

1 Select the EDIT mode.

2 Select the parameter screen.

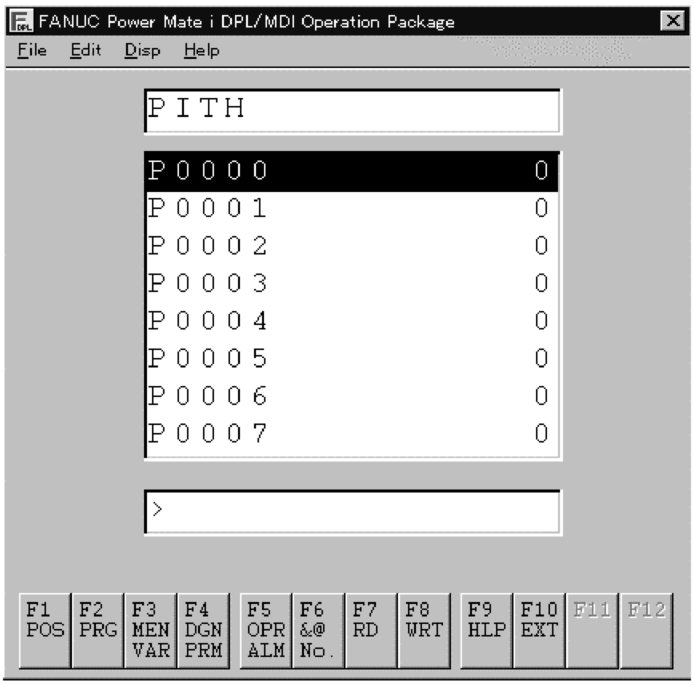
Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the parameter screen.

3 Press [F8 WRT] to output the parameters.

During output, "WRT" is displayed as follows:

```
>               WRT
```

G.5.2.7 Pitch error compensation



- **Display operation**

Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the pitch error compensation screen.

- **Rewriting procedure**

1 Move the cursor to the position of the number of a pitch error compensation value to be changed as follows:

1) Cursor key

2) Press [F6 &@ No.]. “P” is displayed following “>”.

```
>P
```

Then, enter a pitch error compensation number.

Press [Enter]. The cursor moves to the target number position.

When this method is used, the cursor is always displayed on the first line.

2 Key in a new value, then press [Enter]. The new pitch error compensation value is input and displayed.

(1) Pitch error compensation (input)

1 Select the EDIT mode.

2 Select the pitch error compensation screen.

Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the pitch error compensation screen.

3 When pitch error compensation values are stored in a file in a device, perform file heading as required.

4 Press [F7 RD] to input the pitch error compensation values.

During input, “RD” is displayed as follows:

```
>                RD
```

(2) Pitch error compensation (output)

1 Select the EDIT mode.

2 Select the pitch error compensation screen.

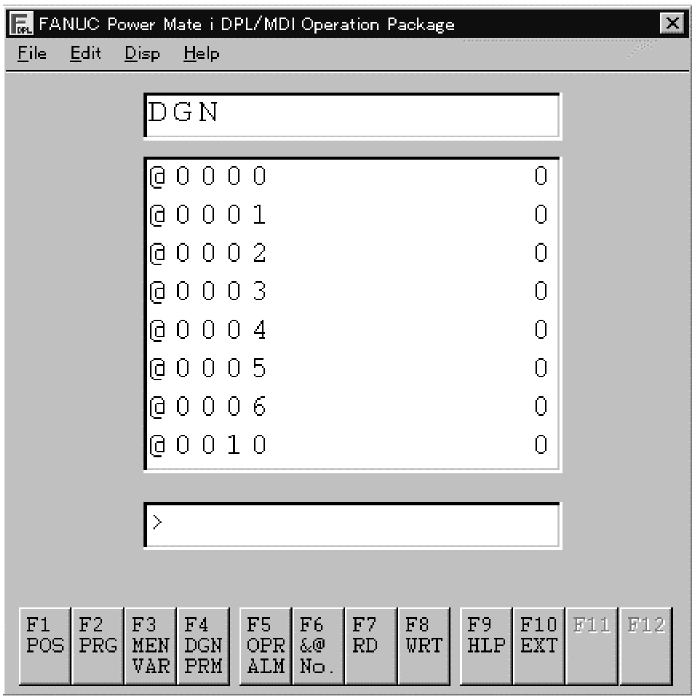
Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the pitch error compensation screen.

3 Press [F8 WRT] to output the pitch error compensation values.

During output, “WRT” is displayed as follows:

```
>               WRT
```

G.5.2.8 Diagnosis function



- **Display operation**

Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the diagnosis screen.

1 Move the cursor to the position of a diagnosis number to be changed as follows:

1) Cursor key

2) Press [F6 &@ No.]. “@” is displayed following “>”.

>@

Then, enter a diagnosis number.

>@000

Press [Enter]. The cursor moves to the target number position.

When this method is used, the cursor is always displayed on the first line.

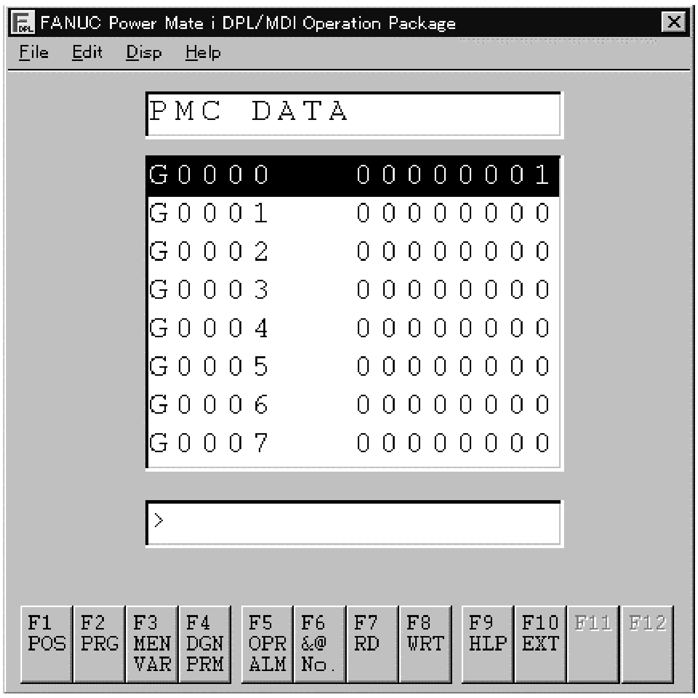
(1) Description of the diagnosis screen
For details of a diagnosis number other than below, refer to the operator's manual.

	Diagnosis number	Unit
800	Relative coordinates	Least input increment
801	Skip position	Least input increment
802	Remaining travel distance	Least input increment/2
803	Accumulated acceleration/deceleration	Least input increment
804	End point position of the previous block	Least input increment/2
810	Current program number	
811	Current sequence number	
820	G code in group 01	
821	G code in group 02	
822	G code in group 03	
823	G code in group 04	
824	G code in group 05	
825	G code in group 06	
827	G code in group 10	
830	Current F code	0.001 mm/min 0.00001 inch/min (For a command without the decimal point 1 mm/min 0.01 inch/min)
831	Actual feedrate	mm/min, deg/min 0.01 inch/min
832	Actual spindle speed	rpm
833	Value input by the analog input function to which compensation is added	10mv
840	Number of registered programs	Number of programs
841	Number of used programs	Number of characters
850	ROM series number of the NC system	
851	ROM edition of the NC system	

	Diagnosis number	Unit
852	Operation mode	
853	ROM series number of the servo system	
854	ROM edition of the servo system	
855	ROM series number of the PMC system	
856	ROM edition of the PMC system	
857	Ladder program number	
858	Ladder program edition	

CAUTION
The actual spindle speed (832) is displayed only for Power Mate *i*–D.

G.5.2.9 PMC data



- **Display operation**

1 Press [F4 DGN PRM]. The parameter screen, diagnosis screen, and pitch error compensation screen alternately appear. Select the diagnosis screen.

2 Press the key of a PMC address to be displayed.

3 Enter the number of the PMC address to be displayed.

4 Press [Enter] to display the PMC data.

The cursor can be moved to the position of a PMC address to be changed using cursor keys.

- **Changing the data type**

When PMC data is displayed, pressing [.] changes the data type for display and setting.

Each time [.] is pressed, the data type changes in the following order:

One–byte bit → One–byte decimal → Two–byte decimal → Four–byte decimal → (back to One–byte bit)

CAUTION
The current data type is one–byte bit or decimal when the difference between adjacent numbers is 1, two–byte decimal when it is 2, or four–byte decimal when it is 4.

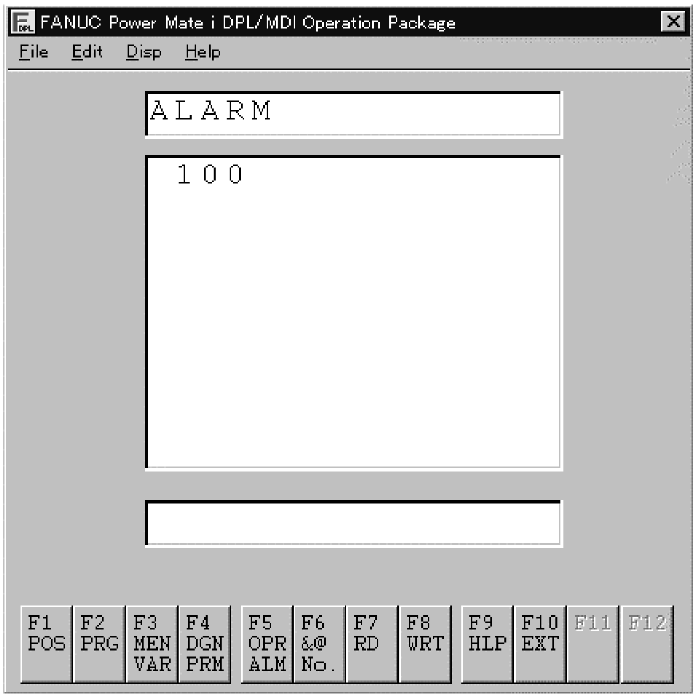
- **Rewriting procedure**

1 Set DWE to 1 on the setting screen.
2 Press the key of a PMC address to be displayed.
3 Press the number of the PMC address to be displayed.
4 Press [Enter] to display the PMC data.
5 Press [.] to select a data type.
6 Press [Enter] to input and display the data value.
7 After setting and checking all PMC data, display the setting screen and set DWE to 0 again.

Data in the following areas can be displayed and set:

X0000 to 0127, X1000 to 1063
Y0000 to 0127, Y1000 to 1063
G0000 to 0511
F0000 to 0511
A0000 to 0024
R0000 to 0999, R9000 to 9117
T0000 to 0079
K0000 to 0019
C0000 to 0079
D0000 to 1859

G.5.2.10 Alarm screen



- **Display operation**

Press [F5 OPR ALM]. The alarm screen and message screen alternately appear. Select either screen to be displayed.

1 On the alarm screen, the following string is displayed in the title field:

ALARM

2 Up to 32 alarms are displayed.
For an alarm specific to an axis, the axis name (such as X) follows the number.

3 For a battery alarm, the following strings are displayed in the title field:

ALARM	BAL

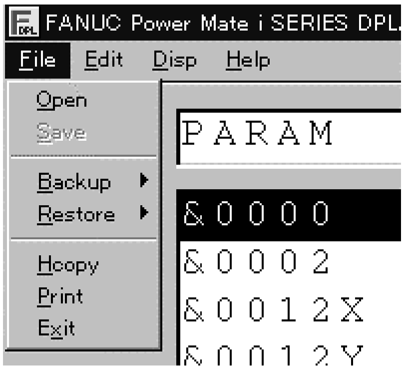
4 The message screen displays external messages from the PMC.The following string is displayed in the title field:

MSG

(For details, refer to the manual supplied by the machine tool builder.)

G.5.3 File Transfer and Printing Function

Files can be manipulated by selecting “File” from the main menu, then each item from the pull–down menu.



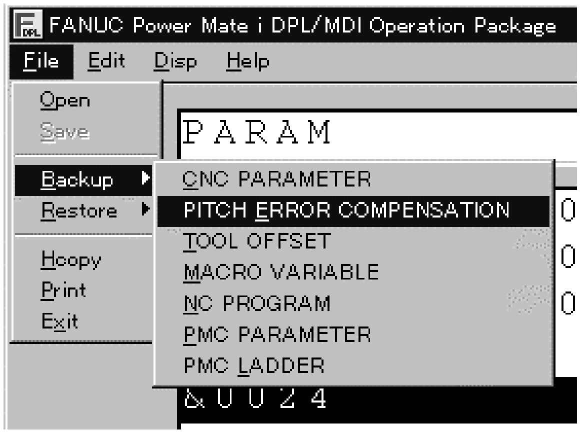
G.5.3.1 Referencing a file

A file in the personal computer can be opened and the contents can be referenced.

G.5.3.2 Backing up a CNC data file

The following data files in the Power Mate *i* can be backed up onto the hard disk in the personal computer:

● CNC PARAMETER	(CNC parameter)
● PITCH ERROR COMPENSATION	(Pitch error compensation)
● TOOL OFFSET	(Tool offset value)
● MACRO VARIABLE	(macro variable)
● CNC PROGRAM	(CNC program)



● Transfer data code

The ISO code is used for data transferred during use of this function regardless of which value is set for bit 1 of parameter No. 0.

● Mode during transfer

Put the CNC in the EDIT or emergency stop mode.

- **Output format**

The output formats are shown below.

(NC program format)

```
%(program–1)    (program–2)     (program–N)  %
         <——>            <——>
  Feed by 1 foot    Feed by 1 foot
```

- Bit 3 (NCR) of parameter No. 0100 can be used to specify whether to punch two CRs following LF or punch only LF.

(Tool offset format)

```
%
G10L11P_R_;
        P_: Offset number
        R_: Tool offset value
.
.
%
```

(Macro variable format)

```
%
;
#500=[25283*65536+65536]/134217728 ----   (1)
#501=#0; --------------------------------  (2)
#502=0; ---------------------------------  (3)
.                                           ;
#699 ------------------------------------   ;
M02;
%
```

1 The value of a variable is output as an expression to maintain the accuracy of the variable.

2 Undefined variable

3 When the value of a variable is 0

(Pitch error compensation format)

```
%
N10000P...;
N11023P..........;
%
```

N...: Pitch error compensation point number + 10000
P...: Pitch error compensation data

(Parameter format)

```
%
N...P...;
N...A1P...A2P...AnP.;
N...P...;
.
.
%
```

N...: Parameter number
A...: Axis number (n: Number of controlled axes)
P...: Parameter setting
n...: Number of controlled axes

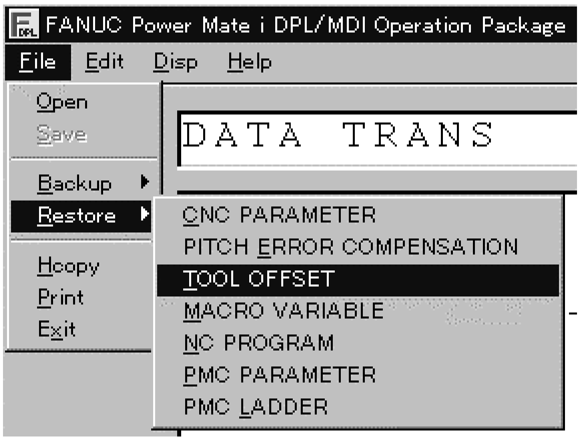
- **Caution**

The setting for parameter No. 20 (channel selection) is invalidated when this function is used. The file transfer destination is always the personal computer connected to the DPL/MDI operation package.

G.5.3.3 Restoring a CNC data file

The following CNC data files created in the personal computer (or backed up to the personal computer) can be transferred and registered to the Power Mate *i*:

- CNC PARAMETER (CNC parameter)
- PITCH ERROR COMPENSATION (Pitch error compensation)
- TOOL OFFSET (Tool offset value)
- MACRO VARIABLE (macro variable)
- CNC PROGRAM (CNC program)



- **Additional information**

- Format: The output format is used as the restoration format.
- Mode: Put the CNC in the EDIT or emergency stop mode.

G.5.3.4
Printing the contents of a file or screen

- **Screen hard copy**

The contents of the current screen can be output to a printer by selecting "File" from the main menu, then "Hcopy" from the pull–down menu. (Before printing, connect and set a printer.)

- **Printing the contents of a file**

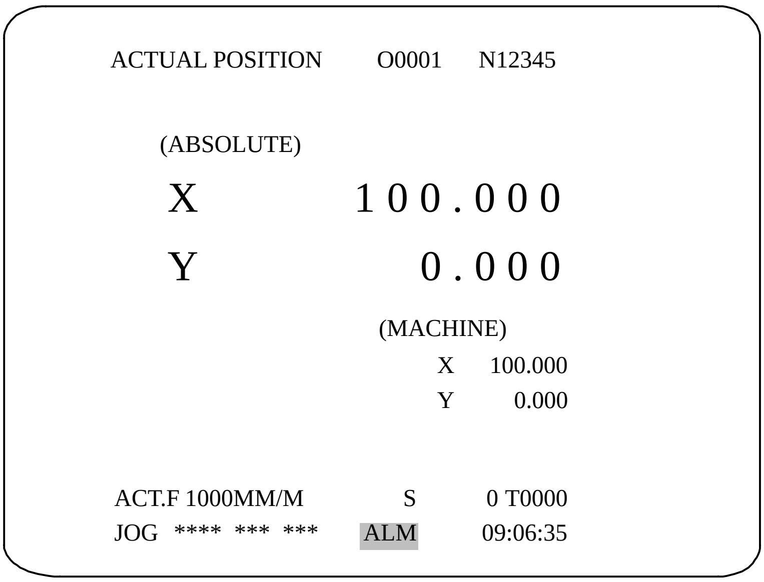
The contents of a text file stored on the hard disk in the personal computer can be printed by selecting "File" from the main menu, then "Print" from the pull–down menu.

G.5.3.5
Others

- **Screen when the CRT/MDI is used**

When the CRT/MDI and DPL/MDI operation package are used simultaneously and the package is connected, the CRT/MDI screen is fixed to the position display.

- For the Power Mate *i*–D



- For the Power Mate *i*–H (when the number of controlled axes is 7 or more or bit 0 (PCTD1) of parameter No. 0370 is set to 0)

```
ACTUAL POSITION        O0001      N12345

  (ABSOLUTE)                 (MACHINE)
  X     0.000                X     0.000
  Y     0.000                Y     0.000
  Z     0.000                Z     0.000
  A     0.000                A     0.000
  B     0.000                B     0.000
  C     0.000                C     0.000
  U     0.000                U     0.000
  V     0.000                V     0.000

ACT.F 1000MM/M           S         0 T0000
JOG   ****  ***  ***     ALM       09:06:35
```

- For the Power Mate *i*–H (when the number of controlled axes is 6 or less and bit 0 (PCTD1) of parameter No. 0370 is set to 1)

```
ACTUAL POSITION(ABSOLUTE)  O0001   N12345

   X        100.000
   Y          0.000
   Z          0.000
   A          0.000
   B          0.000
   C          0.000

ACT.F 1000MM/M           S         0 T0000
JOG   ****  ***  ***     ALM       09:06:35
```

NOTE
No CRT/MDI keys can be used when the DPL/MDI operation package is used.

G.6 RELATED PARAMETERS

The following parameters can be set for items related to use of the DPL/MDI operation package.

Explanation of parameter

Number	#7	#6	#5	#4	#3	#2	#1	#0
370								PCID1

[Data type] Bit

PCID1 Specifies whether to display absolute and machine coordinates on the CRT display when the DPL/MDI operation package is connected.

0 : Displays absolute and machine coordinates. (Full–size characters are displayed.)
1 : Displays only absolute coordinates. (Triple–size characters are displayed.)

NOTE
When the number of controlled axes is 7 or more, the screen displayed with this parameter set to 0 is also displayed with this parameter set to 1.

Explanation of parameter

Number	Data
0380	PCTCNT

PCNTCNT Interval for sending a communication establishment request packet for the DPL/MDI operation package

[Data type] Word

[Unit of data] msec

[Valid data range] 1000 to 10000 (internal setting when a value of 0 or no value is set: 3000)

Explanation of parameter

Number	Data
0381	PCTCNF

PCTCNF Interval for sending a connection confirmation packet for the DPL/MDI operation package

[Data type] Word

[Unit of data] msec

[Valid data range] 1000 to 10000 (internal setting when a value of 0 or no value is set: 5000)

Explanation of parameter

Number	Data
0382	PCTANS

PCTANS Time–out time for waiting for a response packet from the DPL/MDI operation package

[Data type] Word

[Unit of data] msec

[Valid data range] 1000 to 30000 (internal setting when a value of 0 or no value is set: 5000)

Explanation of parameter

Number	Data
0383	PCTRP1

PCTRP1 Time for detecting key input repetition for the DPL/MDI operation package
(Time until the first key repetition is detected)

[Data type] Word

[Unit of data] msec

[Valid data range] 100 to 3000 (internal setting when a value of 0 or no value is set: 1000)

Explanation of parameter

Number	Data
0384	PCTRP2

PCTRP2 Time for detecting key input repetition for the DPL/MDI operation package
(Time until the second or subsequent key repetition is detected)

[Data type] Word

[Unit of data] msec

[Valid data range] 10 to 3000 (internal setting when a value of 0 or no value is set: 30)

- **Additional information**

If the CPU in the personal computer is exclusively used by an application other than the DPL/MDI operation package or the OS, Power Mate may automatically disconnect the DPL/MDI operation package. In this case, terminate the DPL/MDI operation package application in the personal computer, then restart it. (The application is automatically connected again.)
If this status frequently occurs, adjust the values of parameters Nos. 0381 and 0382.

G.7 ERROR CODES AND ALARM MESSAGES

This section explains error messages and actions to be taken.

- **Boot system error messages and actions to be taken**

The following table lists the explanation of and the action to be taken for each message displayed when an error occurs during boot system operation using BOOTIPL.EXE in the DPL/MDI operation package.

D	DELETE ERROR HIT <ENTER>.	An attempt to delete a file from the flash memory failed or a file could not be deleted from a memory card. If an attempt to delete the file is made again and the same error occurs, the flash memory may be destroyed. Replace the memory module.
	DEVICE ERROR HIT <ENTER> .	The flash memory could not be written successfully. Turn off the power, then restart up the system. If the same message is displayed again, the flash memory may be destroyed. Replace the flash memory module.
F	FILE SAVE ERROR HIT <ENTER>	A file could not be written onto a memory card successfully. Check that the memory card status is normal. (The normal status means that the memory card battery is not dead, the memory card is not electrically destroyed, and the memory card is correctly inserted into the card slot.)
	FLASH MEMORY NO SPACE. HIT <ENTER>	There is not enough space for reading the selected file into the flash memory. Delete unnecessary files from the flash memory.
	FORMAT ERROR HIT <ENTER>	A memory card could not be formatted successfully.
	FILE NOT FOUND IN FLASH ROM HIT <ENTER>	No file is found in the flash memory. If this error occurs after write to the flash memory, the flash memory may be destroyed. Replace the memory module.
I	ILLEGAL FORMAT FILE.	The selected file cannot be read into the flash memory. The file to be read is destroyed or header information for the flash memory is destroyed.
	INCORRECT PASSWORD HIT <ENTER>	The password is not correct. Enter the correct password.
L	LOADING ERROR HIT <ENTER>	An error occurred during loading into the flash memory. Do not touch the memory card during loading.
M	MAX EXTENSION OVER HIT <ENTER>	The extension of a file name is greater than 31. Delete unnecessary backup files from the memory card.
	MEMORY CARD BATTERY ALARM HIT <ENTER>	The memory card battery is dead. Replace the memory card battery with a new one.
	MEMORY CARD FULL. HIT <ENTER>	There is no unused space on the memory card. Delete unnecessary files from the memory card or replace the memory card with a memory card with unused space.
	MEMORY CARD MOUNT ERROR HIT <ENTER>	The memory card could not be accessed successfully. Check that the memory card status is normal. Alternatively, the memory card is not formatted correctly. Format the memory card.
	MEMORY CARD NOT EXIST. HIT <ENTER>	No memory card is inserted into the slot. Alternatively, the memory card may not be inserted all the way.
	MEMORY CARD PROTECTED.	Although execution of write to the memory card is selected, the write disable switch is on. Place the write disable switch to the off position.
	MEMORY CARD RESET ERROR HIT <ENTER>	The memory card could not be accessed successfully. Check that the memory card status is normal.
	MEMORY CARD WRITE ERROR HIT <ENTER>	A file could not be written onto the memory card successfully. Check that the memory card status is normal.
	PROTECT FILE	An attempt was made to delete system data, but no system data can be deleted.

S	SRAM DATA BACKUP ERROR HIT <ENTER>	An attempt to write backup data onto a memory card failed. Check that the memory card status is normal.
	SRAM DATA RESTORE ERROR HIT <ENTER>	Backup data could not be read from a memory card successfully. The memory card file is invalid. Check that the memory card status is normal.
	SRAM 256K.* NOT FOUND	System data file SRAM256A.FDB is not found on the memory card. Use a memory card containing SRAM256A.FDB.

- **BOOTINIT.EXE/ DPLMDI.EXE messages and actions to be taken**

The following describes the explanation of and the action to be taken for each error message output on the pop–up window by application software products of the DPL/MDI operation package BOOTINIT.EXE and DPLMDI.EXE on the personal computer.

“In the Power Mate side, BOOT SYSTEM is started now.”	DPLMDI.EXE was started before startup of the system. Terminate DPLMDI.EXE, then start up the system. Then, restart DPLMDI.EXE. Alternatively, execute BOOTINIT.EXE before power–on to use the boot system.
“In the Power Mate side, INIT SYSTEM is started now.”	DPLMDI.EXE was started before startup of the system. Terminate DPLMDI.EXE, then start up the system. Then, restart DPLMDI.EXE. Alternatively, execute BOOTINIT.EXE before power–on to use the boot system.
“In the Power Mate side, DPL/MDI SYSTEM is started now.”	BOOTINIT.EXE was started after startup of the system. To operate the boot system, start up BOOTINIT.EXE before turning the power to Power Mate on.
“Control code error (ERROR:CODE***)”	Communication error. Restart up DPLMDI.EXE or BOOTINIT.EXE.
“Function code error (ERROR:CODE***)”	Communication error. Restart up DPLMDI.EXE or BOOTINIT.EXE.
“The end command was not issued from NC. The exit process is abnormal. There is a possibility of a abnormal communication.”	The Power Mate i does not recognize the end code. Reexecute DPLMDI.EXE. If communication is not restarted normally, the Power Mate i is in an error state. Check the LED display and take appropriate actions.
“The packet from the Power Mate does not reach. There is possibility that the communication has been disconnected. Terminate this application. Then resume it.”	No interface packet is sent from the Power Mate i. The Power Mate i may disconnect communication. Restart the application. (The application is automatically connected.)
“The break signal has been detected.” “CD signal check error has been detected!” “CTS signal check error has been detected!” “The error occurred when DCB was acquired. ” “DSR signal check error has been detected!” “Framing error has been detected!” “Overrun error has been detected!” “Receive buffer has overflowed!” “Parity error has been detected!” “Transmitting buffer has overflowed!” “Unidentified error or event has been detected!” “Communication process is abnormal! Check the connection and the rotary switch setting!”	An error occurred. The cause is an RS–232–C cable specification, connection error, noise, or another environment error. Check the environment such as cable connection and noise.

- **CNC system error codes and alarms**

A system alarm may be displayed on the alarm display of the DPL/MDI window during startup of the system. For details of the alarm number and system alarm, see Appendix A.

H FSSB START–UP PROCEDURE/MATERIALS

H.1 OVERVIEW

With a system that uses the FSSB, the parameters below need to be set for axis setting. (Set other parameters as usually done.)

- No. 1023
- No. 1905
- No. 1910 to 1919
- No. 1936, 1937

For setting of these parameters, three methods are available.

1. Automatic setting

   By entering data including the relationship between axes and amplifiers on the FSSB setting screen, a calculation for axis setting is made automatically, and parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.
   This setting is used with Power Mate *i*–D 2–path control.

2. Manual setting 2

   Enter desired values directly in all of parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937.

   Before setting the parameters, fully understand the functions of the parameters.

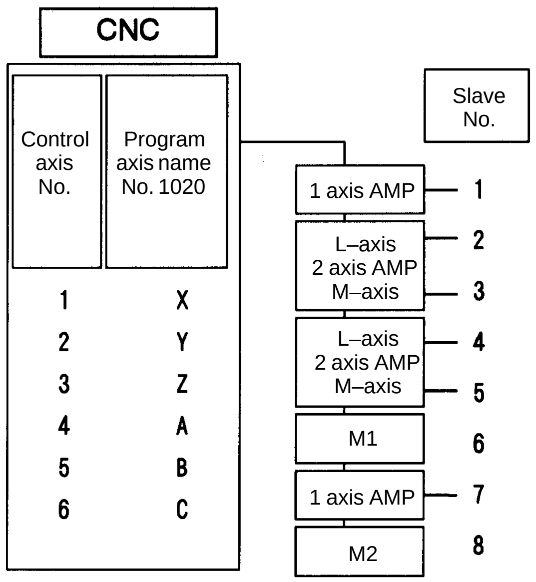
3. Manual setting 1(NOTE)

   Based on the setting of No. 1023, default axis setting is performed. Parameter Nos. 1905, 1910 through 1919, 1936, and 1937 need not be set. Automatic setting is not performed.

NOTE
With manual setting 1, usable functions are limited. So, when starting up the FSSB, use automatic setting or manual setting 2 whenever possible.

H.2 SLAVE

In a system using the FSSB, the CNC, servo amplifiers, and pulse modules are connected with each other via optical cables. These amplifiers and pulse modules are referred to as slaves. Assume that a 2–axis amplifier consists of two slaves, and a 3–axis amplifier consists of three slaves. Slave numbers (1, 2, 3, ..., 10) are assigned to the slaves in ascending order; a younger number is assigned to a slave that is closer to the CNC.



Note) M1/M2: Pluse Module 1st/2nd

H.3 AUTOMATIC SETTING

When the following parameters are set, automatic setting can be performed using the FSSB setting screen:

Bit 0 of No. 1902 = 0
Bit 1 of No. 1902 = 0

For automatic setting on the FSSB setting screen, use the procedure below.

1 Set a servo axis number in No. 1023.

Be sure to match an axis number set in No. 1023 with the total number of axes of the servo amplifiers connected via optical cables.

2 On the servo initialization screen, initialize the servo parameters.

3 Turn off then on the power to the CNC.

4 Press function key SYSTEM .

5 Pressing the continuous menu key several times displays [FSSB].

6 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen (or the FSSB setting screen selected previously), and displays the following soft keys:

```
[        ][        ][        ][        ][        ]
```

7 Press soft key [AMP].

8 On the amplifier setting screen, set a controlled axis number connected to each amplifier.

The amplifier setting screen lists the slaves in ascending order of slave numbers from top to bottom. So, when setting controlled axis numbers, consider which amplifier axis is to be connected to which CNC axis, sequentially, starting with the amplifier axis closest to the NC. On this setting screen, 0 and duplicate numbers cannot be entered.

```
  No.  AMP  SERIES  UNIT   CUR. [AXIS]   NAME
    1  A1-L    α    SVM    40AL   [ 1 ]    X
    2  A1-M    α    SVM     12A   [ 2 ]    Y
    3  A2-L    β    SVU     20A   [ 3 ]    Z
    4  A3-L    α    SVM     40A   [ 4 ]    A
    5  A3-M    α    SVM     80A   [ 5 ]    B
    7  A4-L    α    SVM    40AS   [ 6 ]    C


  NO.  EXTRA          PCB ID
    6    M1     A      0008 DETECTOR(4AXES)
    8    M2     A      0008 DETECTOR(4AXES)
>
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

9 Press soft key [SETING]. (This soft key appears when a value is entered.)

10 Press function key SYSTEM .

11 Pressing the continuous menu key [▷] several times displays [FSSB].

12 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

13 Press soft key [AXIS].

14 On the axis setting screen, set information on each axis.

15 The axis setting screen lists the CNC axes in ascending order of axis numbers from top to bottom.
When any of the following is to be performed for each axis, the setting of this screen is required:

- Use of a separate detector
- Exclusive use of a DSP (CPU for servo control) by one axis (for use of a current loop period of 125 μs, for example)
- Use of tandem control

```
(AXIS SETTING)
 AXIS  NAME   AMP    M1   M2  IDSP   Cs   TNDM
   1    X    A1-L    1    0    0     0     0
   2    Y    A1-M    0    1    0     0     0
   3    Z    A2-L    0    0    0     0     0
   4    A    A3-L    2    0    0     0     0
   5    B    A3-M    0    2    0     0     0
   6    C    A4-L    0    0    0     0     0





>
MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

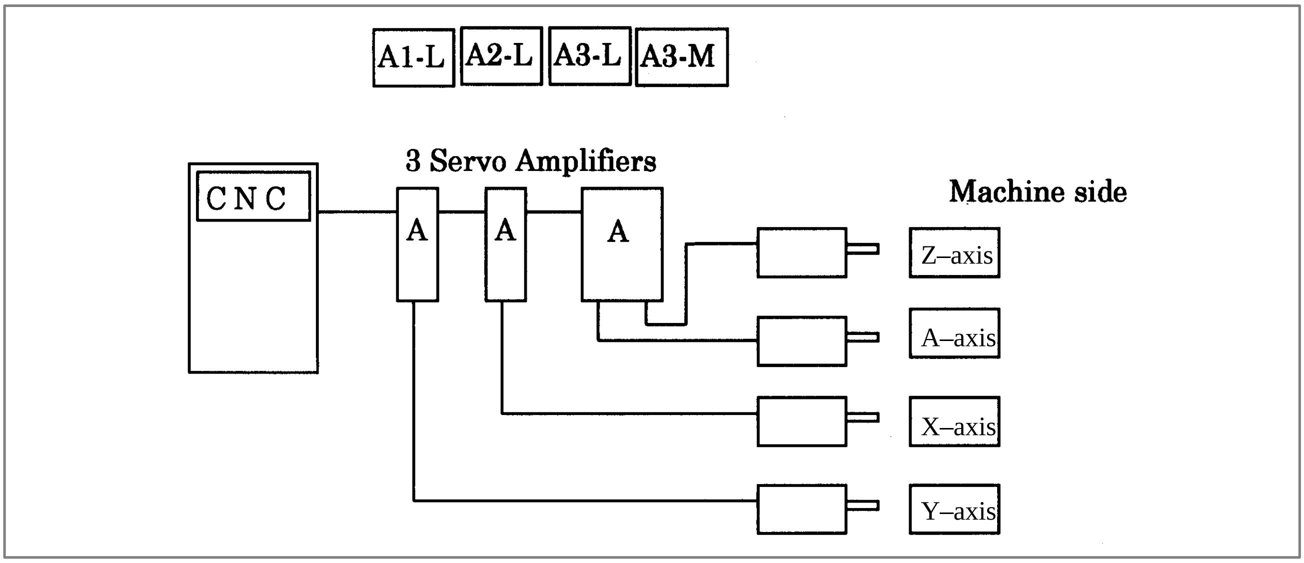
16 Press soft key [SETING]. (This soft key appears when a value is entered.)

This operation starts an automatic calculation, and parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.

Bit 1 of parameter No. 1902 is set to 1 to indicate that each of these parameters has been set. When the power is turned off then back on, axis settings are made according to each parameter.

[Using the two–path control function of the Power Mate *i*–D disables the automatic setting. In this case, use manual setting 1 or 2.

H.3.1 [Sample Setting 1] General Configuration (Semi–Closed Loop)



Step 1 Set the following with parameter No. 1023:

X : 1

Y : 2

Z : 3

A : 4

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]   NAME
   1   A1–L    α    SVM    40A  [ 2 ]    Y
   2   A2–L    α    SVM    40A  [ 1 ]    X
   3   A3–L    α    SVM    40A  [ 4 ]    A
   4   A3–M    α    SVM    80A  [ 3 ]    Z
  NO.  EXTRA  TYPE  PCB ID






>
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key [▷] several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

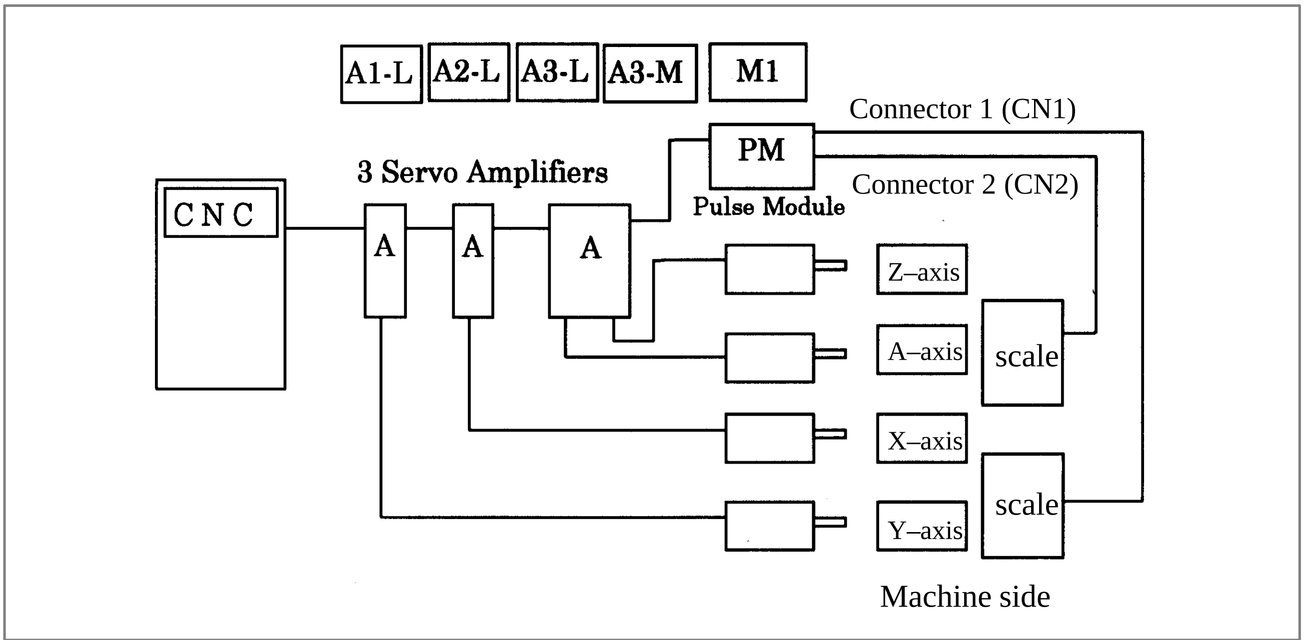
```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Press soft key [(OPRT)] without entering any data, then press soft key [SETING].

Step 11 Turn off then on the power to the CNC. This completes the setting.

H.3.2 [Sample Setting 2] General Configuration (Closed Loop)



Step 1 Set the following with parameter No. 1023:

X : 1

Y : 2

Z : 3

A : 4

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(Amplifier setting)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]  NAME
   1   A1-L   α     SVM    40A  [ 2 ]    Y
   2   A2-L   α     SVM    40A  [ 1 ]    X
   3   A3-L   α     SVM    40A  [ 4 ]    A
   4   A3-M   α     SVM    80A  [ 3 ]    Z
  NO.  EXTRA  TYPE  PCB ID
   5    M1     A    0008 DETECTOR(4AXES)

>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Set the separate detector on the axis setting screen. (Pulse module: M1/M2)

```
(AXIS SETTING)
 AXIS  NAME  AMP   M1   M2  1DSP  Cs   TNDM
   1    X    A2-L  0    0    0    0     0
   2    Y    A1-L  1    0    0    0     0
   3    Z    A3-M  0    0    0    0     0
   4    A    A3-L  2    0    0    0     0

>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 11 Press soft key [SETING]. (This soft key is displayed when a value is entered.)

Step 12 Set bit 1 of parameter No. 1815 to 1 for the Y–axis and A–axis.

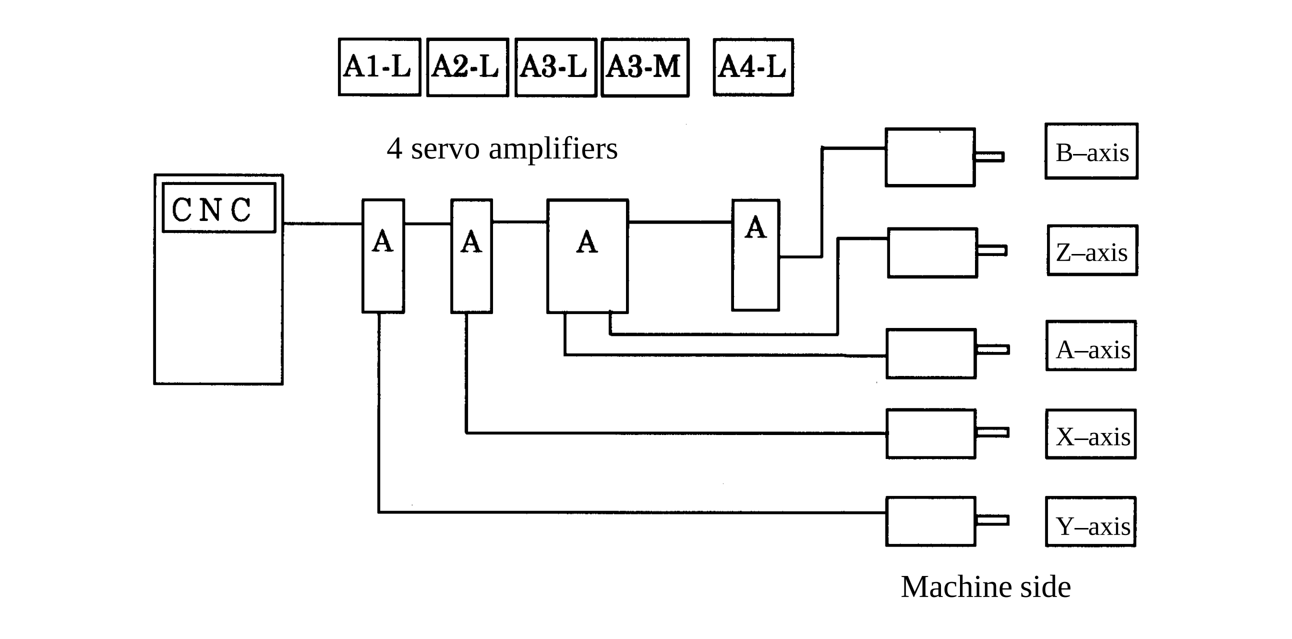
Step 13 Turn off then on the power to the CNC. This completes the setting.

H.3.3 [Sample Setting 3] Tandem Control Configuration

The following two pairs of axes are tandem axes:

[The X–axis is a master axis, and the A–axis is a slave axis.]

[The Y–axis is a master axis, and the B–axis is a slave axis.]



Step 1 Set the following with parameter No. 1023:

X : 1

Y : 3

Z : 5

A : 2

B : 4

No.1010=3

No.1817#6=1 (X axis, A axis, Y axis, B axis)

Tandem control option

Step 2 Initialize the servo parameters for each axis.

Step 3 Turn on then off the power to the CNC.

Step 4 Enter the axis numbers on the amplifier setting screen.

```
(AMPLIFIER SETTING)
  No.  AMP  SERIES  UNIT   CUR. [AXIS]   NAME
   1   A1-L    α    SVM    40A  [ 2 ]     Y
   2   A2-L    α    SVM    40A  [ 1 ]     X
   3   A3-L    α    SVM    40A  [ 4 ]     A
   4   A3-M    α    SVM    80A  [ 3 ]     Z
   5   A4-L    α    SVM    40A  [ 5 ]     B
  NO.  EXTRA TYPE   PCB ID





>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 5 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 6 Press function key SYSTEM .

Step 7 Pressing the continuous menu key ▷ several times displays [FSSB].

Step 8 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen, and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 9 Press soft key [AXIS].

Step 10 Set the tandem axes on the axis setting screen. (TNDM)

```
(AXIS SETTING)
 AXIS  NAME  AMP    M1   M2  1DSP   Cs    TNDM
   1     X   A2-L   0    0    0     0      1
   2     Y   A1-L   0    0    0     0      3
   3     Z   A3-M   0    0    0     0      0
   4     A   A3-L   0    0    0     0      2
   5     B   A4-L   0    0    0     0      4






>
MDI **** *** ***        13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

Step 11 Press soft key [SETING]. (This soft key appears when a value is entered.)

Step 12 Turn off then on the power to the CNC. This completes the setting.

H.4 MANUAL SETTING 2

When the following parameters are set, each axis can be set manually:

No.1902#0=1
No.1902#1=0

When performing manual setting, set parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937, fully understanding their functions.

	#7	#6	#5	#4	#3	#2	#1	#0
1902							ASE	FMD

[Data type] Bit

#0 (FMD) The FSSB setting mode is:

0 : Automatic setting mode. (When data including the relationship between axes and amplifiers is set on the FSSB setting screen, parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are automatically set.)
1 : Manual setting 2 mode. (Parameter Nos. 1023, 1905, 1910 through 1919, 1936, and 1937 are set manually.)

#1 (ASE) When the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0), automatic setting is:

0 : Not completed.
1 : Completed.
(This bit is automatically set to 1 when automatic setting is completed.)

	#7	#6	#5	#4	#3	#2	#1	#0
1905	PM2	PM1						FSL

[Data type] Bit axis

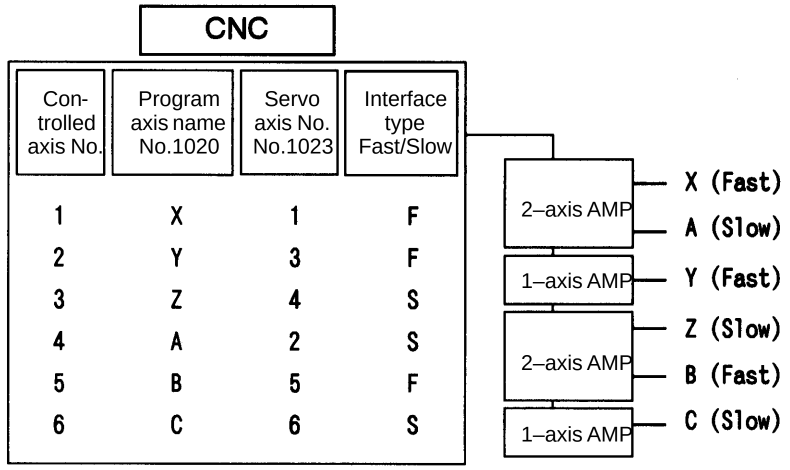
#0 (FSL) The type of interface between servo amplifiers and servo software is:

0 : Fast type.
1 : Slow type.

Two servo data transfer interface types are available: the fast type and slow type.

Set this bit so that the following conditions are satisfied:

- When a 1–axis amplifier is used, both of the fast and slow types can be used.
- When a 2–axis amplifier is used, the fast type must not be used for both axes. The slow type can be used for both axes.
- When a 3–axis amplifier is used, the first and second axes must satisfy the condition for a 2–axis amplifier, and the third axis must satisfy the condition for a one–axis amplifier.
- With an axis for which an odd number is set in parameter No. 1023, the fast type must be used. The slow type can also be used, however, for an EGB workpiece axis, learning–control axis, high–speed current loop axis, and high–speed interface axis.
- Only the slow type can be used with an axis for which an even number is set in parameter No. 1023. (Be sure to set this bit to 1).



#6 (PM1) The first pulse module is:

0 : Not used.
1 : Used.

#7 (PM2) The second pulse module is:

0 : Not used.
1 : Used.

This parameter is automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

When a pulse module is used, connector numbers (parameter Nos. 1936 and 1937) need to be set.

PRM	1910	Address conversion table value for slave 1 (ATR)
PRM	1911	Address conversion table value for slave 2 (ATR)
PRM	1912	Address conversion table value for slave 3 (ATR)
PRM	1913	Address conversion table value for slave 4 (ATR)
PRM	1914	Address conversion table value for slave 5 (ATR)
PRM	1915	Address conversion table value for slave 6 (ATR)
PRM	1916	Address conversion table value for slave 7 (ATR)
PRM	1917	Address conversion table value for slave 8 (ATR)
PRM	1918	Address conversion table value for slave 9 (ATR)
PRM	1919	Address conversion table value for slave 10 (ATR)

[Data type] Byte

[Valid data range] 0 to 7, 16, 40, 48

Set an address conversion table value for each of slave 1 through 10.

The slave is the generic name of a servo amplifier or pulse module connected to the CNC via an FSSB optical cable. The numbers from 1 to 10 are assigned to the slaves in ascending order; a younger number is assigned to a slave that is closer to the CNC. A 2–axis amplifier consists of two slaves, and a 3–axis amplifier consists of three slaves. Set each of the parameters as described below according to which of the three cases is applicable: the slave is an amplifier, the slave is a pulse module, or there is no slave.

❍ When the slave is an amplifier:

Set a value obtained by subtracting 1 from the setting of parameter No. 1023 for the axis to which the amplifier is assigned.

❍ When the slave is a pulse module:

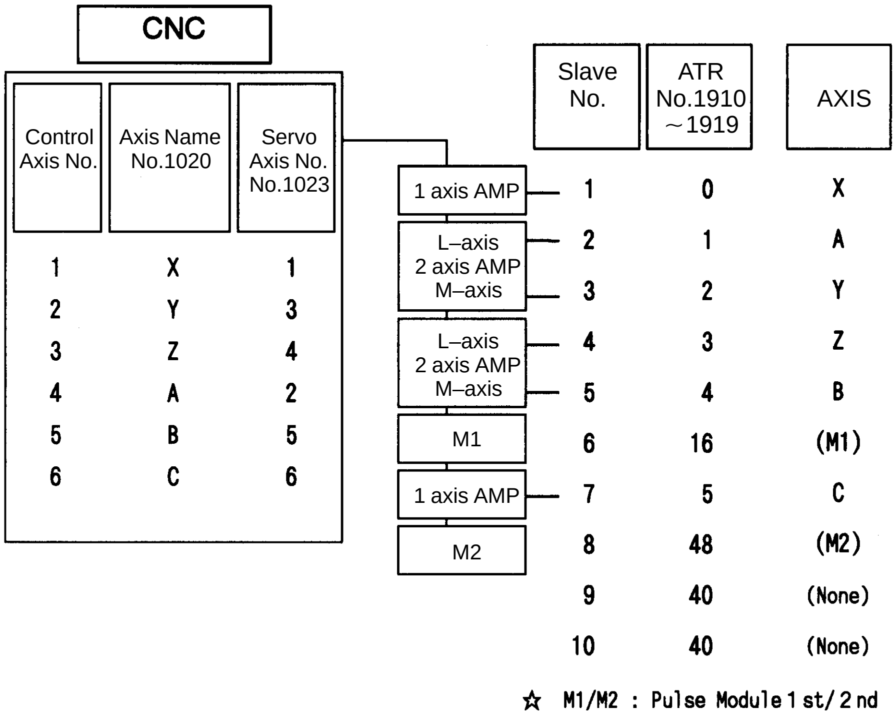
- For the first pulse module (closest to the CNC), set 16.
- For the second pulse module (farthest from the CNC), set 48.

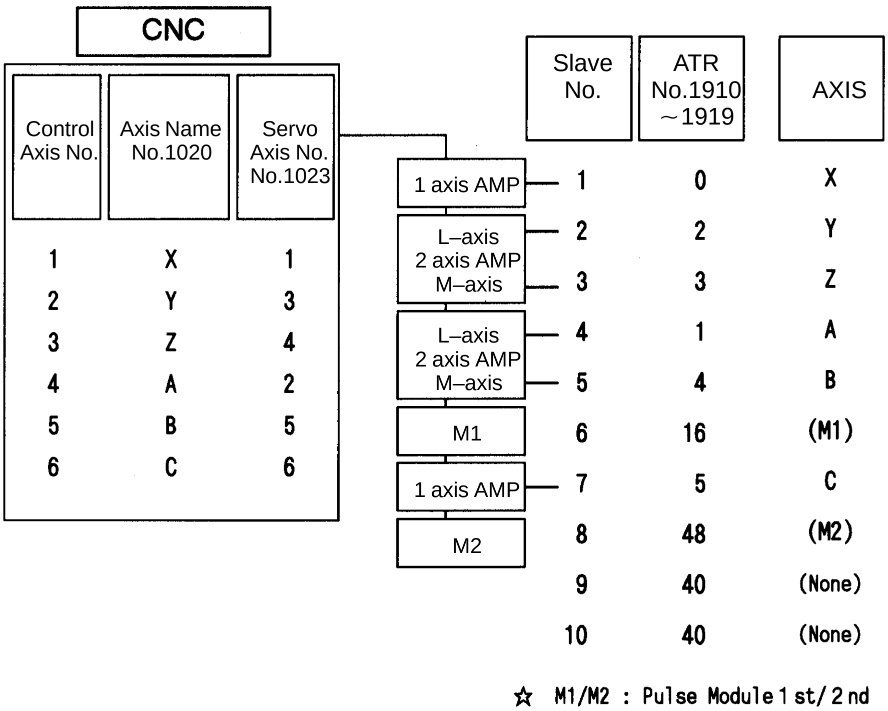
❍ When there is no slave:

Set 40.

These parameters are automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

❍ Axis configuration and example of parameter setting





PRM	1936	Connector number for the first pulse module
PRM	1937	Connector number for the second pulse module

[Data type] Byte axis

[Valid data range] 0 to 7

When using a pulse module, set a value obtained by subtracting 1 from the pulse module connector number for each axis. That is, for connector numbers 1 to 8, set the values 0 to 7. Moreover, set bits 6 and 7 of parameter No. 1905. Set 0 for an axis for which no pulse module is used.

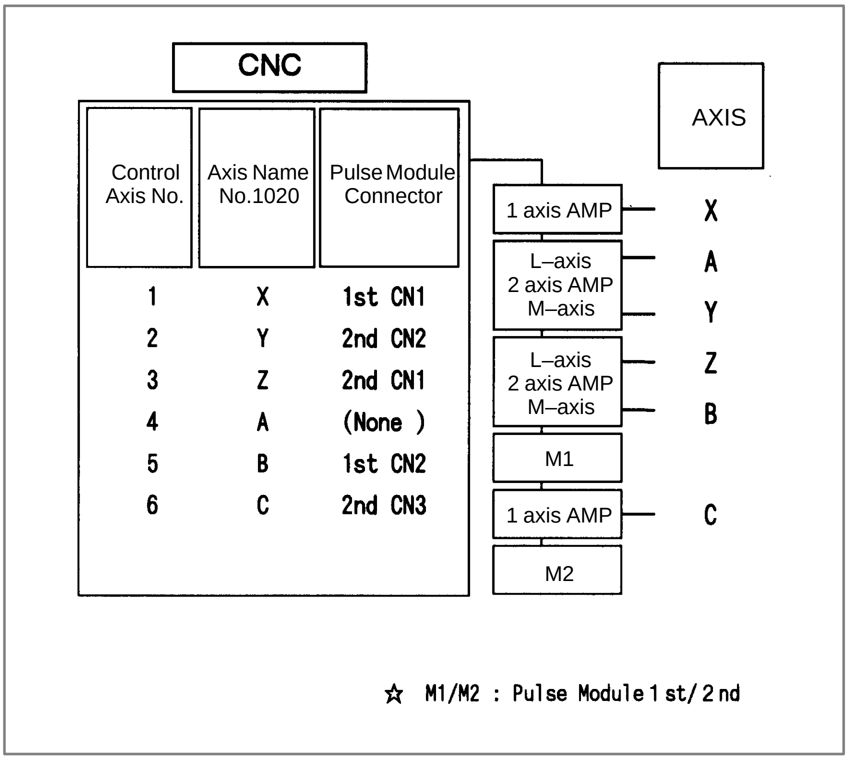
The user can freely determine which connector to use for which axis. Use connector numbers, starting with younger numbers. For example, connector number 4 cannot be used without using connector number 3.

Example:

Controlled axis	First connector number	Second connector number	No.1936	No.1937	No.1905 (#7,#6)
X	1	Not used	0	0	0,1
Y	Not used	2	0	1	1,0
Z	Not used	1	0	0	1,0
A	Not used	Not used	0	0	0,0
B	2	Not used	1	0	0,1
C	Not used	3	0	2	1,0

These parameters are automatically set by data input on the FSSB setting screen when the FSSB setting mode is the automatic setting mode (when bit 0 of parameter No. 1902 = 0). When the manual setting 2 mode is used (when bit 0 of parameter No. 1902 = 1), be sure to enter necessary data directly.

❍ Axis configuration and example of parameter setting in the manual setting 2 mode



No.	1902#0 FSBMD
	1

No.	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
	0	1	2	3	4	16	5	48	40	40

No.	1023	1905#0 FSBSL	1905#6 FSBM1	1905#7 FSBM2	1936	1937
X	1	0	1	0	0	0
Y	3	0	0	1	0	1
Z	4	1	0	1	0	0
A	2	1	0	0	0	0
B	5	0	1	0	1	0
C	6	1	0	1	0	2

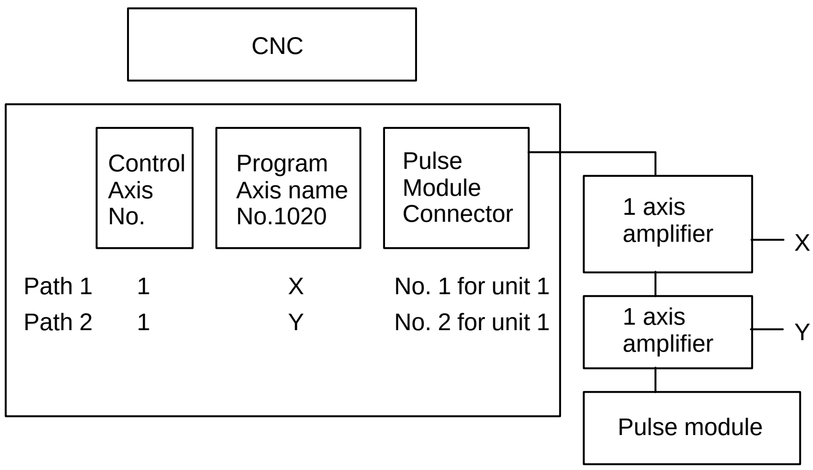
Manual setting 2 Two–path control of the Power Mate *i*–D

For the two–path control function of the Power Mate *i*–D, manual setting 2 can be used for each axis setting parameter if the following parameter is set.

For both paths, bit 0 of parameter No. 1902 = 1

To use manual setting 2 for the two–path control function of the Power Mate *i*–D, set up the axis type parameter Nos. 1023, 1904, 1905, 1936, and 1937 separately for each path and parameter Nos. 1910 to 1919 only for path 1. Refer to an applicable parameter manual for explanations about each parameter.

Two–path control axis configuration for the Power Mate *i*–D and example of parameter setting in the manual setting 2 mode (for explanations about each parameter, refer to the respective descriptions)



No.	1902#0 FMD
Path 1	1
Path 2	1

No.	1910	1911	1912	1913	1914	1915	1916	1917	1918	1920
Path 1	0	1	16	40	40	40	40	40	40	40
Path 2	40	40	40	40	40	40	40	40	40	40

No.	1023	1905#0 FSL	1905#6 PM1	1905#7 PM2	1936	1937
Path 1 (X)	1	0	1	0	0	0
Path 2 (Y)	2	0	1	0	1	0

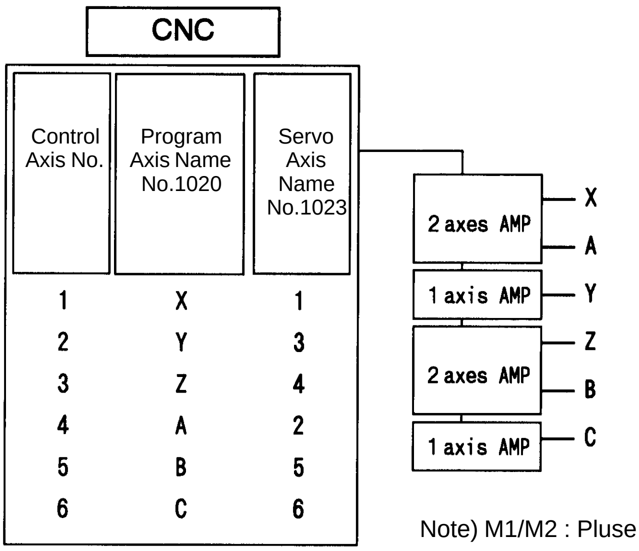
H.5 MANUAL SETTING 1

When the following parameters are set, manual setting 1 is enabled:

Bit 0 of No. 1902 = 0
Bit 1 of No. 1902 = 0
Nos. 1910 through 1919 = 0 (all set to 0)

In manual setting 1, a setting is made at power–on so that the value set in parameter No. 1023 is assumed to be a slave number. That is, an axis for which the value of parameter No. 1023 is 1 is connected to the amplifier closest to the CNC. An axis for which the value of parameter No. 1023 is 2 is connected to the amplifier next closest to the CNC.

Bit 0 of No. 1902 = 0
Bit 1 of No. 1902 = 0
Nos. 1910 through 1919 = 0 (all set to 0)



Note) M1/M2 : Pluse Module 1 st/2 nd

Note that some functions and settings cannot be used in manual setting 1 as described below.

- No pulse module can be used.
  This means that no separate position detector can be used.
- Set sequential numbers in parameter No. 1023.
  For example, 3 cannot be set for an axis without setting 2 for any axis.
- The following servo functions cannot be used:
  - ❑ Learning control
  - ❑ High–speed current loop
  - ❑ Simple electronic gear box (EGB)
- When the two–path control function of the Power Mate *i*–D is used, specify parameter No. 1023 (path 1) = 1 and parameter No. 1023 (path 2) = 2.

H.6 ALARMS

Alarms related to pulse coders

NC alarm No.	Message	Description
360	n AXIS : ABNORMAL CHECKSUM (INT)	A checksum error occurred in the built–in pulse coder.
361	n AXIS : ABNORMAL PHASE DATA (INT)	A phase data error occurred in the built–in pulse coder.
362	n AXIS : ABNORMAL REV.DATA (INT)	A rotation speed count error occurred in the built–in pulse coder.
363	n AXIS : ABNORMAL CLOCK (INT)	A clock error occurred in the built–in pulse coder.
364	n AXIS : SOFT PHASE ALARM (INT)	A soft phase data error occurred in the built–in pulse coder.
365	n AXIS : BROKEN LED (INT)	An LED error occurred in the built–in pulse coder.
366	n AXIS : PULSE MISS (INT)	A feedback error occurred in the built–in pulse coder.
367	n AXIS : COUNT MISS (INT)	A count error occurred in the built–in pulse coder.
368	n AXIS : SERIAL DATA ERROR (INT)	A data error occurred in the built–in pulse coder.
369	n AXIS : DATA TRANS. ERROR (INT)	A CRC error or stop bit error occurred in the built–in pulse coder.
380	n AXIS : BROKEN LED (EXT)	An LED error occurred in the separate pulse coder.
381	n AXIS : ABNORMAL PHASE (EXT LIN)	A phase data error occurred in the separate linear scale.
382	n AXIS : COUNT MISS (EXT)	A count error occurred in the separate pulse coder.
383	n AXIS : PULSE MISS (EXT)	A feedback error occurred in the separate pulse coder.
384	n AXIS : SOFT PHASE ALARM (EXT)	A soft phase data error occurred in the separate pulse coder.
385	n AXIS : SERIAL DATA ERROR (EXT)	A data error occurred in the separate pulse coder.
386	n AXIS : DATA TRANS. ERROR (EXT)	A CRC error or stop bit error occurred in the separate pulse coder.

Alarms related to servo amplifiers

NC alarm No.	Message	Description
430	n AXIS : SV. MOTOR OVERHEAT	A servo module overheat occurred.
431	n AXIS : CNV. OVERLOAD	A converter (PSM) overheat occurred.
432	n AXIS : CNV. LOWVOLT CON./POWFAULT	The control power supply voltage (24 V) has dropped.
433	n AXIS : CNV. LOW VOLT DC LINK	The DC link voltage has dropped.
436	n AXIS : SOFTTHERMAL (OVC)	The digital servo software detected the soft thermal state (OVC).
438	n AXIS : INV. ABNORMAL CURRENT	The current of the main circuit is too high.
439	n AXIS : CNV. OVERVOLT POWER	The DC link voltage is too high.
440	n AXIS : CNV. EX DECELERATION POW.	The regenerative discharge amount is too high.
441	n AXIS : ABNORMAL CURRENT OFFSET	The digital servo software detected an abnormality in the motor current detection circuit.
443	n AXIS : CNV. COOLING FAN FAILURE	The internal stirring fan failed.
445	n AXIS : SOFT DISCONNECT ALARM	The digital servo software detected a broken wire in the detector.
446	n AXIS : HARD DISCONNECT ALARM	A broken wire in the built–in pulse coder was detected by hardware(NOTE).
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 the sign of the feedback data from the separate detector.

NOTE

FBAL (bit 1 of alarm 1) may be set to 1 in the following cases:

- Hard broken wire in the separate pulse coder (bit 1 of alarm 1 = 1, bit 7 of alarm 2 = 1, bit 4 of alarm 2 = 1
- Soft broken wire (bit 1 of alarm 1 = 1)
- Count error alarm (bit 1 of alarm 1 = 1, bit 7 of alarm 2 = 1, bit 3 of alarm 3 = 1)

Alarms related to servo amplifiers

NC alarm No.	Message	Description
460	n AXIS : FSSB DISCONNECT	FSSB communication was disconnected suddenly. The possible causes are as follows: 1) The FSSB communication cable is disconnected or broken. 2) The power to the amplifier dropped suddenly. 3) The amplifier issued a low–voltage alarm.
461	n AXIS : ILLEGAL AMP INTERFACE	Both axes of a 2–axis amplifier were assigned to the fast type interface.
462	n AXIS : SEND CNC DATA FAILED	Because of an FSSB communication error, a slave could not receive correct data.
463	n AXIS : SEND SLAVE DATA FAILED	Because of an FSSB communication error, the servo system could not receive correct data.
464	n AXIS : WRITE ID DATA FAILED	An attempt to write maintenance information on the amplifier maintenance screen failed.
465	n AXIS : READ ID DATA FAILED	At power–up, initial amplifier ID information could not be read.
466	n AXIS : MOTOR/AMP COMBINATION	The maximum current value of the amplifier does not match the maximum current value of the motor.
467	n AXIS : ILLEGAL SETTING OF AXIS	The following servo functions are not enabled even when an axis using a DSP exclusively is set on the axis setting screen: • High–speed current loop (bit 0 of parameter No. 2004 = 1)

P/S alarms

NC alarm No.	Message	Description
5134	FSSB : OPEN READY TIME OUT	The FSSB did not become ready to open during initialization.
5135	FSSB : ERROR MODE	The FSSB entered an error mode.
5136	FSSB : NUMBER OF AMPS IS SMALL	The number of amplifiers recognized by the FSSB is insufficient, compared with the number of controlled axes.
5137	FSSB : CONFIGURATION ERROR	The FSSB detected a configuration error.
5138	FSSB : AXIS SETTING NOT COMPLETE	Axis setting has not been performed in automatic setting mode. Perform axis setting using the FSSB setting screen.
5139	FSSB : ERROR	The servo system could not be initialized normally. The cause may be an optical cable failure or incorrect connection with an amplifier and other modules.
5197	FSSB : OPEN TIME OUT	The FSSB did not open when the CNC had allowed the FSSB to open.
5198	FSSB : ID DATA NOT READ	The initial ID information for the amplifier cannot be read because of a failure in the temporary assignment.

H.7 ACTIONS FOR TROUBLE ENCOUNTERED AT START–UP TIME

- MDI input is abnormal (each time data is entered, the power needs to be turned off).

  First, disconnect the optical cable of the NC, then turn off then on the power. Next, check the items below.

  (A) Check parameter No. 1902.

  Action: hen parameter
  No. 1902 = 00000000, set the following:
  No. 1905 = 00000000
  Nos. 1910 through 1919 = 0

  Action: hen parameter
  No. 1902 = 00000001 or 00000010, set the following:
  No. 1905 = Appropriate value
  Nos. 1910 through 1919 = Appropriate value

  (B) When bit 1 of parameter No. 1815 = 1, check parameter Nos. 1910 through 1919 to see if 16 or 48 is set.

  Action: If neither 16 nor 48 is set, set bit 1 of No. 1815 to 1.

  (C) Check if communication is open (the green LED is on).

  Action: If communication is not open, check the power supply for the amplifier and optical cable connection.

- The separate detector can be recognized, but feedback pulses from the separate detector are abnormal.

  (A) Check parameter No. 1902.

  Action: The setting of parameter
  No. 1902 = 00000000 is incorrect. When parameter
  No. 1902 = 00000001, set the following:
  No. 1905 = 01000000 or 10000000
  Nos. 1910 through 1919 = Appropriate value
  Nos. 1936 and 1937 = Appropriate value

  Action: When parameter No. 1902 = 00000010, set connector numbers for M0 and M1 in axis setting on the FSSB screen.

- In axis setting on the FSSB screen, connector numbers for M1 and M2 cannot be set.

  Action: Check the FSSB screen to see if pulse module IDs are read correctly. If pulse module IDs are not read correctly, check the pulse module connections.

- The settings on the FSSB screen are canceled when the power is turned off then back on.

  Action: After setting desired values, press soft key [SETING] on the amplifier setting screen and axis setting screen.

- P/S alarm 5138 “AXIS SETTING NOT COMPLETE” is issued.

  Action: Automatic setting on the FSSB screen is not terminated normally. Make settings correctly on the FSSB amplifier setting screen and axis setting screen, and press soft key [SETING] on both screens. At this time, be sure to make settings on the amplifier setting screen and the axis setting screen in this order.

Action: When automatic setting on the FSSB screen is not performed, set all of parameter Nos. 1902, 1905, 1910 through 1919, 1936, and 1937 to 0 before starting manual setting.

- The invalid amplifier/motor combination alarm (466) is issued.

  Action: Check if the maximum current value of the amplifier read on the ID screen matches the setting of parameter No. 2165. Recheck the amplifier/motor combination.

  Action: Initialize the servo parameters of each axis.

- When the power is turned off then back on after modifying parameter No. 1902, the system alarm (920) is issued.

  Action: Disconnect the optical cable of the CNC, then turn off then on the power.
  Set all of parameter Nos. 1902, 1905, 1910 through 1919, 1936, and 1937 to 0, then turn off then on the power, then make an FSSB setting all over again.

H.8 FSSB DATA DISPLAY

The FSSB setting screen displays FSSB–based amplifier and axis information, and allows amplifier and axis information to be set.
No display is possible with a combination of the DPL/MDI and its operation package.
It cannot be used with the two–path control function of the Power Mate *i*–D.

1 Press function key SYSTEM .

2 Pressing the continuous menu key ▷ several times displays [FSSB].

3 Pressing soft key [FSSB] switches the screen display to the amplifier setting screen (or the FSSB setting screen selected previously), and displays the following soft keys:

```
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

There are three types of FSSB setting screens: the amplifier setting screen, axis setting screen, and amplifier maintenance screen.

Pressing soft key [AMP] switches the screen display to the amplifier setting screen.
Pressing soft key [AXIS] switches the screen display to the axis setting screen.Pressing soft key [MAINT] switches the screen display to the amplifier maintenance screen.

H.8.1 Amplifier Setting Screen

The amplifier setting screen displays slave information divided into amplifier information and pulse module information.

```
(AMPLIFIER SETTING)       O1000 N00001
  NO.
    1  A1-L      α    SVM-HV  40AL   1     X
    2  A1-M      α       SVM   12A   2     Y
    3  A2-L      β       SVM   40A   3     Z
    4  A3-L      α       SVM   20A   4     A
    5  A3-M      α       SVM   40A   5     B
    7  A4-L      α       SVU  240A   6     C


  NO.       PCB ID
    6    M1      A    0000 DETECTOR(8AXES)
    8    M2      B    12AB
>_
MDI **** *** ***         13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

The amplifier setting screen displays the items below.

- NO.: Slave number

  The serial numbers for to up to ten slaves (up to eight amplifiers and up to two pulse modules) connected via the FSSB are displayed sequentially. A younger number is assigned to a slave closer to the CNC.

- AMP: Amplifier type

  Amplifier type information starts with the character A, which stands for "amplifier." The character A is followed by the ordinal number of an amplifier counted from the amplifier closest to the CNC, then is followed by a letter indicating which axis of the amplifier is used (L for the first axis, and M for the second axis).

- AXIS NO: Controlled axis number

  The controlled axis numbers set in parameter Nos. 1920 through 1929 are displayed.

  When a value outside the range 1 to the maximum number of controlled axes is set, 0 is displayed.

- NAME: Controlled axis name

  The axis name set in the parameter No. 1020 corresponding to a controlled axis number is displayed. When the controlled axis number is 0, – is displayed.

- As amplifier information, the following information items are displayed:
  - UNIT: Type of servo amplifier unit
  - SERIES: Servo amplifier series
  - CURRENT: Maximum current value

- As pulse module information, the information items below are displayed.
  - EXTRA
    The character M, which stands for "pulse module," is followed by the ordinal number of a pulse module counted from the pulse module closest to the CNC.
  - TYPE
    The type of a pulse module is displayed by a letter.
  - PCB ID
    The ID of a pulse module is displayed using four digits in hexadecimal. For a separate detector module (8 axes), DETECTOR (8AXES) is displayed after the pulse module ID. For a separate detector module (4 axes), DETECTOR (4AXES) is displayed after the pulse module ID.

H.8.2 Axis Setting Screen

The axis setting screen displays axis information.

```
(AXIS SETTING)                   O1000 N00001
                          M1  M2          Cs
   1       X   A1-L       0   0     0     0     1
   2       Y   A1-M       1   0     1     0     0
   3       Z   A2-L       0   0     0     1     0
   4       A   A3-L       0   0     0     0     2
   5       B   A3-M       0   0     0     0     0
   6       C   A4-L       0   0     0     0     0

>_
MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINT ][       ][ (OPRT) ]
```

The axis setting screen displays the items below.

- AXIS NO: Controlled axis number

  The NC controlled axis numbers are displayed sequentially.
- NAME: Controlled axis name
- AMP: Type of amplifier connected to each axis
- M1: Connector number for pulse module 1

  The connector number for pulse module 1 set in parameter No. 1931 is displayed.
- M2: Connector number for pulse module 2

  The connector number for pulse module 2 set in parameter No. 1932 is displayed.
- 1DSP

  The value set in bit 0 (1DSP) of parameter No. 1904 is displayed. The value 1 is displayed for an axis (high–speed current loop axis) that exclusively uses a DSP.
- TANDEM (M series only)

  The value set in parameter No. 1934 is displayed. For a master axis and slave axis used for tandem control, an odd number and a subsequent even number are displayed.

H.8.3 Amplifier Maintenance Screen

The amplifier maintenance screen displays servo amplifier maintenance information. There are two types of amplifier maintenance screens as shown below. The user can switch between the two screens with the page keys ↑ and ↓.

```
(AMPLIFIER SETTING)                 O1000 N00001

   1      X  A1-L     α    SVM-HV    2    40AL
   2      Y  A1-M     α       SVM    2     12A
   3      Z  A2-L     β       SVM    1     40A
   4      A  A3-L     α       SVM    2     20A
   5      B  A3-M     α       SVM    2     40A
   6      C  A4-L     α       SVU    1    240A

MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

```
(AMPLIFIER MAINTENANCE)         O1000 N00001
                                     NO.
   1      X       01A     970123        01
   2      Y       01A     970123        01
   3      Z       01A     970123        01
   4      A       02B     970123        01
   5      B       02B     970123        01
   6      C       02B     970123        01

MDI **** *** ***          13:11:56
[  AMP  ][  AXIS  ][ MAINT ][      ][ (OPRT) ]
```

The amplifier maintenance screens display the following items:

- AXIS NO: Controlled axis number
- NAME: Controlled axis name
- AMP: Type of an amplifier connected to each axis
- SERIES: Series of a servo amplifier connected to each axis
- UNIT: Unit type of a servo amplifier connected to each axis
- NO. OF AXES: Maximum number of axes of an amplifier connected to each axis
- CURRENT: Maximum current value of an amplifier connected to each axis
- VERSION: Version of an amplifier unit connected to each axis
- TEST: Test date of an amplifier connected to each axis
  Example) 970123: January 23, 1997
- MAINTENANCE: Engineering change drawing number of an amplifier connected to each axis

I MAINTENANCE WITH DISPLAY LINK TYPED TOUCH PANEL

I.1 OUTLINE

In this manual, the operation of the LCD with touch panel of FANUC Power Mate *i* is described. The environment to create the application screen is shown in Fig. I.1 (a). The system configuration to make use of the touch screen is shown in Fig I.1 (b). The feature of the touch screen is follows.

- Each customer can create the unique application screen on the touch screen easily with ”FAPT PICTURE Windows (A08B–9010–J512#ZZ07)” that is the tool software on PC.
- This touch screen can switch from the application screen to the CNC screen, such as setting screen for various data, program editing screen or ladder screen, together with the virtual MDI key. So a display unit or a keyboard other than this touch screen is not necessary for maintenance purpose. (If necessary, it is possible to use the MDI keyboard.)
- This LCD with touch panel can be shared among up to 16 Power Mate *i*–D/Hs. By selecting switch on the touch screen, the following screen can display.
  1) Application screen for each CNC
  2) CNC maintenance operation screen
  3) PMC maintenance operation screen

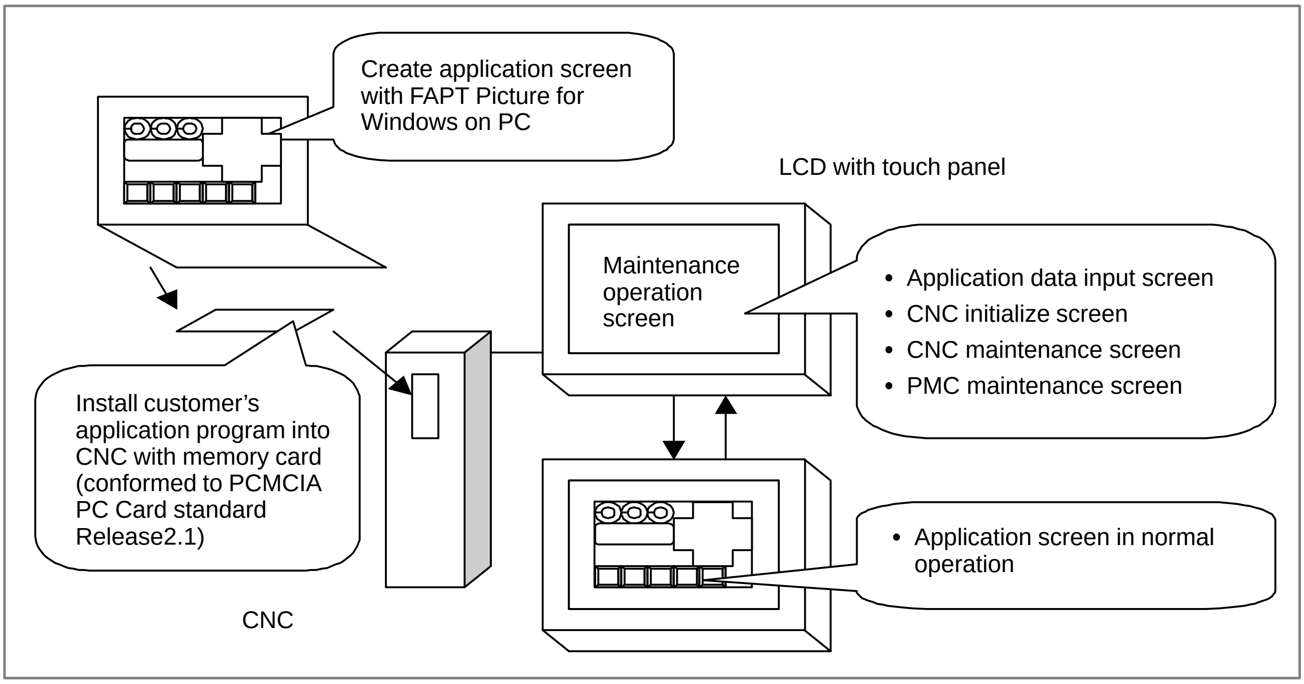


Fig. I.1 (a) Environment to create application screen

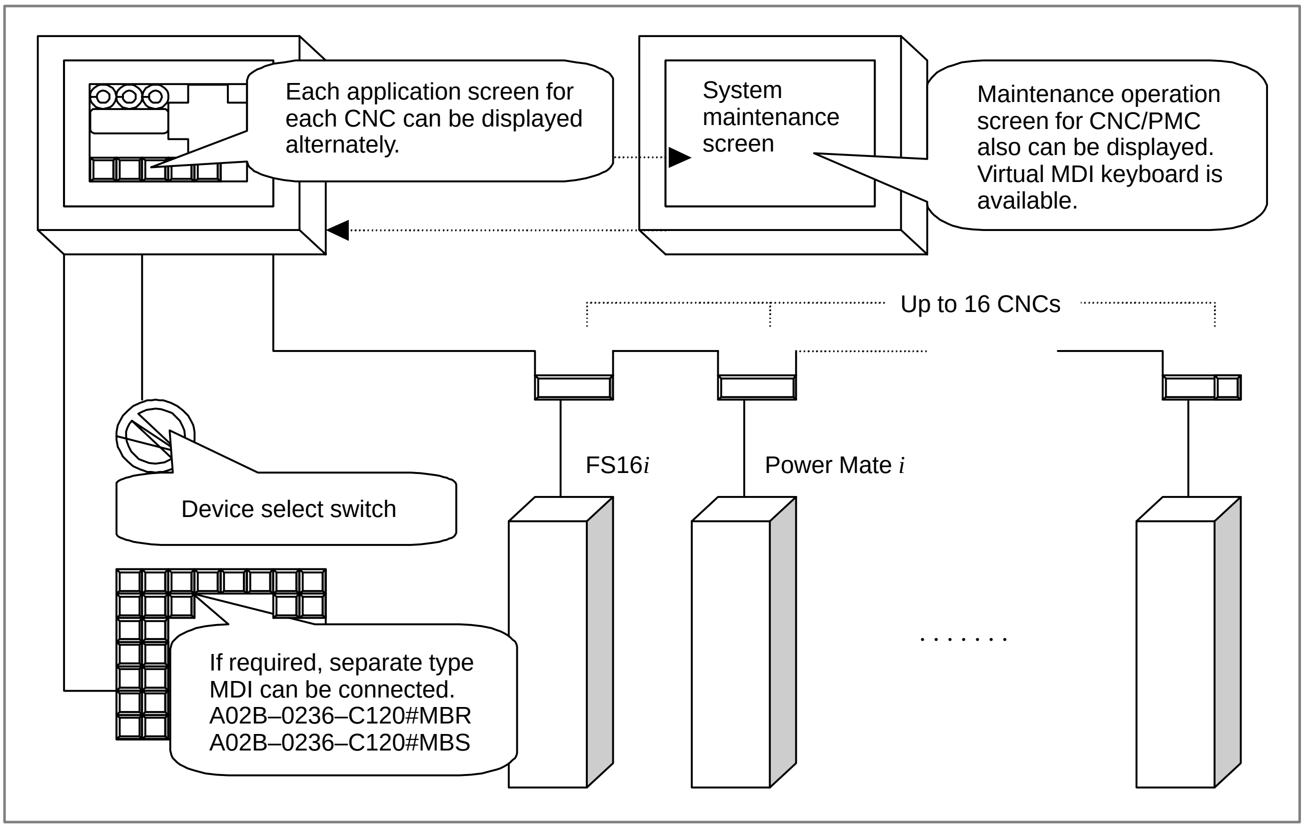


Fig. I.1 (b) System outline when using display sharing function

The system with the touch screen can be created by the following way.

(Setting up device number)

- When plural CNCs connect with one LCD with touch panel, the touch panel connects with the CNC with selected device number. The rotary switch and 7 segment LED in front of the CNC cabinet set up the device number of each CNC. As for the detail of this operation, please refer to the following manual.

> - FANUC Power Mate *i*–MODEL D/H Maintenance Manual (B–63175EN)
>   F. SETTING/MAINTENANCE USING THE 7–SEGMENT LED AND ROTARY SWITCH

- When one touch screen is shared among plural CNCs, please refer to the following manual about the connecting way.

> - FANUC Power Mate *i*–MODEL D/H Connection Manual (Hardware) (B–63173EN)

(Make/register application software)

- With the tool of PC, ”FAPT PICTURE (Windows)”, you can make the application software to realize your own unique screen and touch panel operation for each CNC. Please refer to ”FAPT PICTURE (Windows) OPERATOR’S MANUAL (B–66244JA/01)” for detail.

- Your application software can be installed from PC to CNC via a memory card. At first, the application software is stored in the memory card in MEM–format (memory card format). Then register the data from the memory card into the FROM in the CNC. Please refer to the ”chapter 3.1 Boot System Operation Method” in this document about the detail operation.

(CNC initializing operation)

- Please refer to the chapter ”3.2 CNC initializing operation” if initializing operation, such as memory clear, is required.

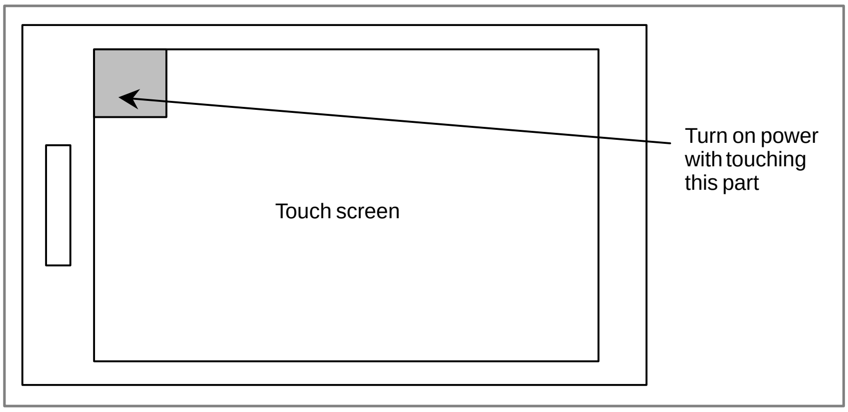
(CNC/PMC maintenance operation in normal condition)

- You can make the switching button, that switches the control of the screen from the application screen to the CNC maintenance screen, on the application screen of each CNC. By this button, you can select the CNC maintenance screen (setting CNC data, etc.) and PMC maintenance screen (ladder editing, etc.). If the CNC maintenance operation, such as setting parameters or other CNC data, is required, please switch the screen and perform the maintenance operation.

I.2 MAINTENANCE OPERATION OF DISPLAY UNIT WITH TOUCH PANEL

(1) In case that a device select switch is connected with the display unit, select the CNC to be maintained by selecting the device number.

(2) Turn on the power of the display unit with touching the upper left part on the touch screen. In a little while, the maintenance operation screen shown in Fig I.2(a) is displayed. If the power of CNC is not turned on, the maintenance operation screen shown in Fig I.2(b) is displayed.




```
SELECT THE MAINTENANCE OPERATION

+-------------------------------------------+
+                BOOT SYSTEM                +
+-------------------------------------------+

+-------------------------------------------+
+    TOUCH PANEL SCREEN SETTING             +
+-------------------------------------------+

+-------------------------------------------+
+                  CANCEL                   +
+-------------------------------------------+
```

Fig. I.2(a) The main menu screen of maintenance operation

> **NOTE**
> **Touching on a touch screen**
> A touch screen has the characteristic that the response is not good if touching area is rather wide. Please touch with the pen for touch screen or the like.

```
SELECT THE MAINTENANCE OPERATION


+----------------------------------------+
+                                        +
+----------------------------------------+

+----------------------------------------+
+   TOUCH PANEL SCREEN SETTING           +
+----------------------------------------+

+----------------------------------------+
+                CANCEL                  +
+----------------------------------------+
```

Fig. I.2(b) The main menu screen of maintenance operation (In case that the display unit only turns on)

(3) When the menu of ”TOUCH PANEL SCREEN SETTING” is selected, the menu shown in the Fig. I.2(c) is displayed. Select the required menu and perform the adjustment and maintenance operation of the display unit with touch screen.

```
\---        TOUCH PANEL SCREEN SETTING        ---\
+------------------------------------------------+
[ CONTRAST TUNING                                ]
+------------------------------------------------+
[ CALIBRATION OF TOUCH PANEL                     ]
+------------------------------------------------+
[ OTHERS                                         ]
+------------------------------------------------+
[ EXIT                                           ]
+------------------------------------------------+
[                                                ]
+------------------------------------------------+
[                                                ]
+------------------------------------------------+
[                                                ]
+------------------------------------------------+
```

Fig. I.2(c) The main menu of touch screen setting

”CONTRAST TUNING”: Brightness adjustment in case of monochrome LCD

”CALIBRATION OF TOUCH PANEL”: Adjustment of touch position

”OTHERS”: Diagnosis screen of the display unit
Maintenance operation of the control software of the display unit
Other setting (Connection of separate type MDI, etc.)

”EXIT”: Finish setting operation and retun to the maintenance operation screen

I.2.1 Brightness Adjustment (In Case of Monochrome LCD)

When selecting ”CONTRAST TUNING” on the menu screen shown in the Fig.I.2(c), the following brightness adjustment screen is displayed. This adjustment should be performed only in case of monochrome LCD(A02B–0259–C211). This adjustment is not required in case of color LCD (A02B–0259–C212).

```
 \---              CONTRAST TUNING                ---\

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

! # $ % & ( ) = > < @ [ ] * + * = ; < > ? _
! # $ % & ( ) = > < @ [ ] * + * = ; < > ? _

0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9


 +-------------+   +-------------+   +-------------+
 [  <<<  DOWN  ]   [    EXIT     ]   [   UP  >>>   ]
 +-------------+   +-------------+   +-------------+
```

Fig. I.2.1 Brightness adjustment screen (Only in case of monochrome LCD)

(1) Brightness is changed by touching ”DOWN” or ”UP”. You can select proper britness by this operation..

(2) When ”EXIT” is touched, the adjusted value is kept automatically and the screen is returned to the main menu of touch screen setting.

I.2.2 Adjustment of Touching Position

When selecting ”CALIBRATION OF TOUCH PANEL” on the menu screen shown in the Fig.I.2(c), the following adjustment touching position screen is displayed.

```
+                         +                         +

   CALIBRATION OF TOUCH PANEL

     PLEASE PUSH CALIBRATED POINTS(+OF 9 POINTS).
     IF CALIBRATED IS ENDED, PLEASE PUSH<INPUT>.
     IF CALIBRATED IS CANCELED, PLEASE PUSH<CAN>.
     IF OPERATION IS ENDED, PLEASE PUSH<EXIT>.

+                         +                         +


    [ INPUT ] [  CAN  ] [ EXIT  ]



+                         +                         +
```

Fig. I.2.2 Adjustment touching position operation screen

(1) Touch at nine points just on the mark ”+” respectively with the pen for touch screen. If touching is recognized, the mark is changed to ”●”. After all nine points are touched, touch on ”INPUT”. Then the adjustment data is memorized in FROM and the following message is displayed..

```
CALIBRATION HAS BEEN NORMAL FINISHED.
SAVING THE CALIBRATION DATA.
                                  –>NORMAL END
```

It is possible to cancel this adjustment before finishing. You can perform this adjustment from the beginning by touching ”CANCEL”.

(2) When ”EXIT” is touched, the main menu of touch screen setting,.Fig 2–3, is displayed.

> **NOTE**
> Usually, it is not necessary to adjust touching point because this adjustment is done when shipping. When a display unit is changed or touch position gets out of position, adjust touch position by above procedure.

I.2.3 Other Setting Operation

When selecting ”OTHERS” on the menu screen shown in the Fig.I.2(c), the following menu screen is displayed.

```
\– OTHERS          ––––––––––––––––––––––––––––––––––\
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[ DIAGNOSIS INFORMATION                              ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[ CONTROL SOFTWARE MAINTENANCE                       ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[ OTHERS SETTING                                     ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[                                                    ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[                                                    ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[                                                    ]
+––––––––––––––––––––––––––––––––––––––––––––––––––––+
[          EXIT           ][         CANCEL          ]
```

Fig. I.2.3 Other maintenance operation screen

”DIAGNOSIS INFORMATION”: Display the series and edition of the control software of the display unit

”CONTROL SOFTWARE MAINTENANCE”: Saving/loading the control software of the display unit

”OTHERS SETTING”: Setting the kind of a separate type MDI

I.2.3.1 Diagnosis information screen

When selecting ”DIAGNOSIS INFORMATION” on the menu screen shown in the Fig.I.2.3, the following information is displayed.

```
\–DIAGNOSIS INFORMATION––––––––––––––––––––––––\
+–CONTROL SOFTWARE SERIES/EDTION–––––––+
  [SYSTEM (DISPLAY SIDE):[881K /001A]
  [VGA    (DISPLAY SIDE):[60V2 /001B]







[          EXIT          ]
```

Series/edition of control software of display unit

Series/edition of control software of VGA

Fig. I.2.3.1 Diagnosis information screen

I.2.3.2 Maintenance of control software

When selecting ”CONTROL SOFTWARE MAINTENANCE” on the menu screen shown in the Fig.I.2.3, the following maintenance screen of control software is displayed.

> **NOTE**
> This operation is not needed usually. This operation should be done, only when version–up of the control software is required because of the enhancement of functions.

```
\–CONTROL SOFTWARE MAINTENANCE –––––––––––––\
+–MAIN MENU ––––––––––––––––––––––––––––––––––+
[  1.CONTROL SOFTWARE SAVING                 ]
+––––––––––––––––––––––––––––––––––––––––––––+
[  2.CONTROL SOFTWARE LOADING                ]
+––––––––––––––––––––––––––––––––––––––––––––+
[                                            ]
+––––––––––––––––––––––––––––––––––––––––––––+
[                                            ]
+––––––––––––––––––––––––––––––––––––––––––––+
[                                            ]
+––––––––––––––––––––––––––––––––––––––––––––+
[                                            ]
+––––––––––––––––––––––––––––––––––––––––––––+
[          EXIT          ]
```

Fig. I.2.3.2 Maintenance operation screen of the control software of display unit

”CONTROL SOFTWARE SAVING”: Save the control software of display unit into a memory card

”CONTROL SOFTWARE LOADING”: Load the control software of display unit from a memory card

I.2.3.3 Other setting

When you select ”OTHERS SETTING” Fig.I.2.3, the following screen is displayed.

```
\–OTHERS SETTING ––––––––––––––––––––––––––––––\
+–SEPARATED MDI KEY BOARD TYPE–––––––––+
[NOT USED][MDI–T1]                              ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[                                               ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[                                               ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[                                               ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[                                               ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[                                               ]
+––––––––––––––––––––––––––––––––––––––––––––––+
[         EXIT         ][        CANCEL         ]
```

”SEPARATED MDI KEY BOARD TYPE”

[NOT USED]: Separate type MDI keyboard is not connected.

[MDI–T1]: Separate type MDI keyboard (A02B–0236–C120) is connected.

”EXIT” This operation is finished after setting value is memorized.

”CANCEL” This operation is finished without memorizing

NOTE

In case that [NOT USED] is selected (the separate type MDI keyboard is not used), the virtual MDI keyboard is displayed on the CNC/PMC screen when CNC maintenance screen or PMC maintenance screen is selected. The setting or display on the CNC operation is performed by touching this virtual MDI keyboard.

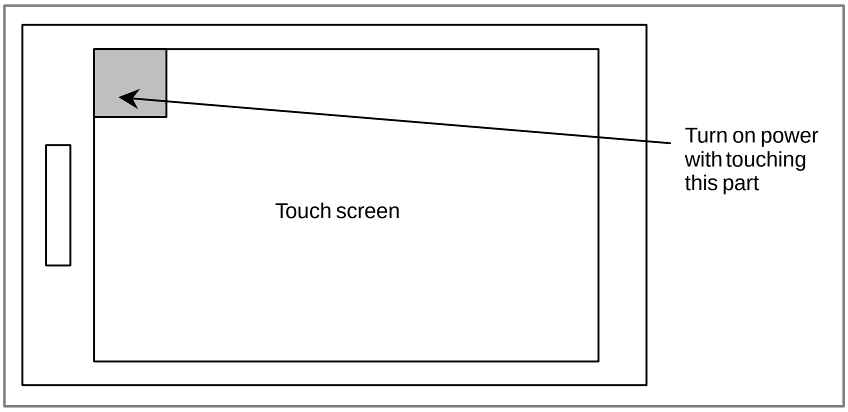
I.3 MAINTENANCE OPERATION AT POWER–ON

In this chapter, the CNC maintenance operation at power–on is described. According to the operation on the LCD with touch screen, the following maintenance operation can be performed.

- Bootstrap system operation
  - Load the system file from a memory card to the Flash ROM. (System file: touch panel application, ladder application, C–language executor application etc.)
  - Confirm the edition of the system file.
  - Delete the system file in the Flash ROM.(user's file)
  - Backup the system file in the Flash ROM into a memory card.(user's file)
  - Backup/restore the data in SRAM area.
  - Delete a file in a memory card.
  - Format memory card.
- CNC initializing operation
  - Clear all memory.
  - Clear CNC parameters and offset data.
  - Clear all programs.
  - Clear PMC parameters.
  - Clear PMC ladder.
  - Reset OT alarm.
  - Start the system without ladder running.

I.3.1 Bootstrap System Operation

Turn on the power of the display unit with touching the upper left part on the touch screen. In a little while, the maintenance operation screen shown in FigI.3.1(a) is displayed.




```
SELECT THE MAINTENANCE OPERATION

+------------------------------------------+
+               BOOT SYSTEM                +
+------------------------------------------+

+------------------------------------------+
+   TOUCH PANEL SCREEN SETTING             +
+------------------------------------------+

+------------------------------------------+
+                 CANCEL                   +
+------------------------------------------+
```

Fig. I.3.1(a) The main menu screen of maintenance operation

Select "BOOT SYSTEM" on the above screen. Then the following bootstrap operation screen is displayed.

```
SYSTEM MONITOR MAIN MENU              881I-xx

1.SYSTEM DATA LOADING
2.SYSTEM DATA CHECK
3.SYSTEM DATA DELETE        ----> Delete of user's file.
4.SYSTEM DATA SAVE          ----> Save of user's file.
5.SRAM DATA BACKUP
6.MEMORY CARD FILE DELETE
7.MEMORY CARD FORMAT


10.END
*** MESSAGE ***


[SELECT][ YES  ][ NO  ][ UP  ][ DOWN ]
[ PREV ]                      [ NEXT ]
```

Fig. I.3.1(b) Bootstrap operation screen

In this screen, you can operate by touching directly the soft–key image (”[SELECT]”, ”[YES]” , , ,). When key–touch is accepted, display unit beeps.

”[PREV]” means the soft–key ◁ of CRT. ”[NEXT]” means the soft–key ▷ of CRT.

The respective function of the bootstrap is described in the ”FANUC Power Mate *i*–D/H Maintenance Manual (B63175EN)”.

- Bootstrap operation in case that display unit is shared.

  When a display unit is shared among plural CNCs by ”Display sharing function”, the bootstrap operation is done according to the following way.

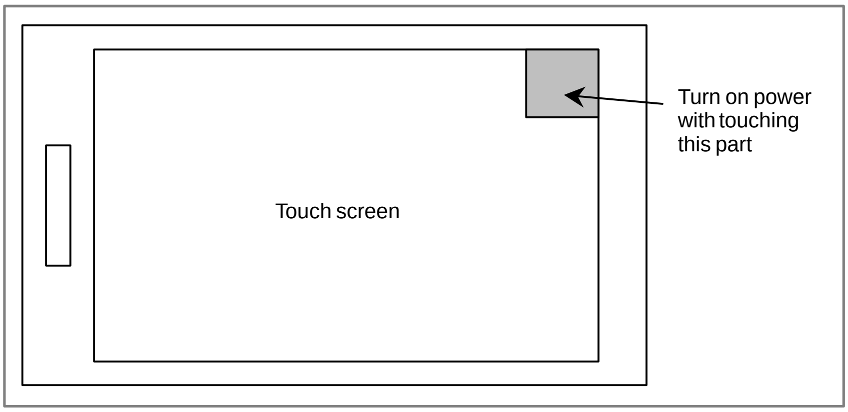
  1) Select the CNC to perform the bootstrap operation by the device select switch.
  2) Turned off the power of the selected CNC.
  3) Touch the upper left part of the touch screen of LCD.
  4) Turn on the power of the selected CNC.
  5) After a while, the ”maintenance operation screen main menu” will be displayed.

NOTE

In above operation, you turn off the power of the CNC that is not selected by the device select switch. Then, if you turned on the power of both selected CNC and not selected CNC at the same time, the CNC not selected by the switch will run as usually.

I.3.2 CNC Initializing Operation

Turn on the power of the display unit with touching the upper right part on the touch screen. In a little while, the CNC initializing operation screen shown in Fig I.3.2 is displayed.



```
  IPL  OPERATION

0 1 2 3 4 5 6 7 8 9 _ + / * = ( ) [ ] , . ” # $ % & @ ?
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
< P O S > < P R G > < O F S > < R S T > < H L P > < S H F >
< S Y S > < M S G > < G R F > < A L T > < I N S > < D E L >
< C S T > < S E T > < S P C > < E O B > < C A N > < I N P >      +−−+
< P G ↑ > < P G ↓ > <   ↑   > <   ↓   > <   ←   > <   →   >      | ↑ |
< B L K >                                                  +−−+−−+−−+
                                                           | ← |  | → |
   K E Y  1  [  S      ]                                   +−−+−−+−−+
   K E Y  2  [         ]                                      | ↓ |
                                                              +−−+
 * * * M E S S A G E * * *                                       < 0 >


[ S E L E C T ] [  Y E S   ] [   N O   ] [          ] [  E X I T  ]
```

Fig. I.3.2 CNC initializing operation screen

I.3.2.1 Operation of CNC initializing

1) You can select the data by moving the cursor by touching the arrows ↑, ↓, ←, → in the middle of screen.
   Select the desired character by the cursor and touch [SELELCT].
   Then, the message ”SELECT OK? HIT YES OR NO” is displayed.

2) If you touch [YES], the selected character is displayed in ”KEY 1” as follows.
   Ex.) In case that the character ”S” is selected,
   KEY 1 [S]
   If you touch [NO], the message ”SELECT KEY AND HIT [SELECT] KEY” is displayed again. And the selected data is cancelled.

3) In the same way, you select the second character by moving the cursor and touch [SELELCT].
   The message ”SELECT OK? HIT YES OR NO” is displayed.

4) If you touch [YES], the selected character is displayed in ”KEY 2” as follows.
   Ex.) In case that the character ”2” is selected,
   KEY 2 [2]
   Then, the message ”ARE YOU SURE ? HIT YES OR NO” is displayed.

5) If you touch [YES], the CNC initializing operation screen is closed. Then, the CNC system executes the operation designated by the two characters.
   For instance, the character ”7” and ”9” or <RST> and <DEL> are selected, ”clear all memory” operation is executed. As for other operation, please refer to the Item I.3.2.2.

6) If you want to close the CNC initializing operation screen without any operation, touch [EXIT].
   Then, the message ”EXIT OK? HIT YES OR NO” is displayed.
   If you touch [YES], the CNC initializing operation screen is closed.
   If you touch [NO], the CNC initializing operation screen is not closed.

I.3.2.2 List of initializing operation

Initializing operation	Selected character	
	KEY 1	KEY 2
Clear all memory	7 or <RST>	9 <DEL>
Clear all memory [1st path side of 2 path control]	<CAN>	1
Clear all memory [2nd path side of 2 path control]	<CAN>	2
Clear parameters and offset data	<RST>	
Clear parameter and offset data [1st path side of 2 path control]	<RST>	1
Clear parameter and offset data [2nd path side of 2 path control]	<RST>	2
Clear part program	<DEL>	
Clear part program [1st path side of 2 path control]	<DEL>	1
Clear part program [2nd path side of 2 path control]	<DEL>	2
Clear ladder program	X	O
Clear PMC parameter	Z	O
Reset OT alarm	<CAN>	P
Select 1 path system (Only in Power Mate *i*–D)	1	S
Select 2 path system (Only in Power Mate *i*–D)	2	S

Note) Do not care the order of selection ”KEY 1” and ”KEY 2”. Even if the order is reversed, the result is the same.
Also, the initializing operation without designating ”KEY 2” can be executed by selecting only ”KEY 1”.

NOTE

1 Once 1 or 2 path system is selected by above operation in Power Mate *i*–D, it is not necessary to execute above selection at every power–on.

2 If the selection about 1 or 2 path system is changed in Power Mate *i*–D, the value of the parameter is initialized to the default value and other data, such as offset data, macro variable and so on, is cleared to zero.

I.4 CNC/PMC MAINTENANCE SCREEN AND OPERATION OF VIRTUAL MDI KEYBOARD

When CNC/PMC maintenance screen is selected, the virtual MDI keyboard is displayed on the screen. You can input the key information by touching the key image like a physical key. The triangle soft–keys are placed just under the other soft–keys.

I.4.1 CNC Maintenance Screen

The virtual keyboard in Fig.4–1 is displayed. There are several keys with special meaning. Explanation of special keys is as follows.

- ”ENTER” and ”ENT” . . . . Same as ”INPUT” key in CRT/MDI
- ”BACK SPACE” . . . . Same as ”CAN” key
- ”SPCL” . . . . Change SPCL (Special) mode (Operation to push two button at the same time)
- Arrow (↑, ↓, →, ←) . . . . Move cursor
- ”SPACE” . . . . Input space

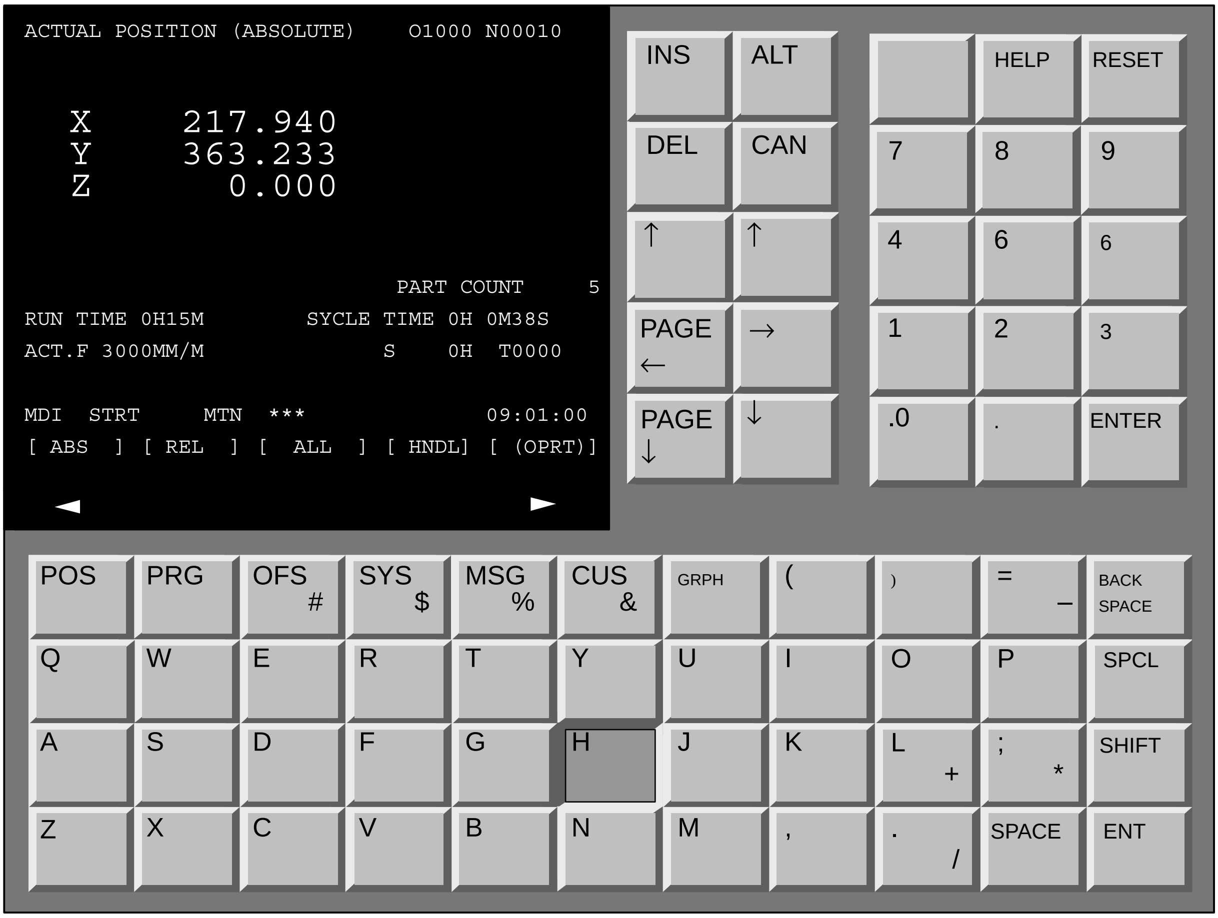


Fig. I.4.1 Virtual MDI keyboard on CNC maintenance screen

I.4.1.1
Operation of ”SPCL” key

This ”SPCL” key is used in the operation that two keys are pushed at the same time.

1) Select the special key input mode by touching ”SPCL” key. Then the color of the key turns blue.
2) Touch two keys, that you want to push at the same time, one after another.
   If three or more keys are touched, last two keys are effective.
3) The operation of two keys is executed by touching ”ENTER” key.

SPCL (special) key input mode is cancelled by touching ”ENTER” key or ”SPCL” key.
But if SPCL mode is cancelled by touching ”SPCL” key, the key input information during ”SPCL” mode is invalid.

I.4.2
PMC Maintenance Screen

I.4.2.1
Virtual MDI keyboard in PMC maintenance screen (function menu)

When the fine display mode in PMC maintenance screen, such as ladder monitoring screen, is selected, the virtual MDI keyboard (Function menu) shown in Fig.I.4.2.1 is displayed. You can switch the screen to CNC maintenance operation screen by touching each function key.

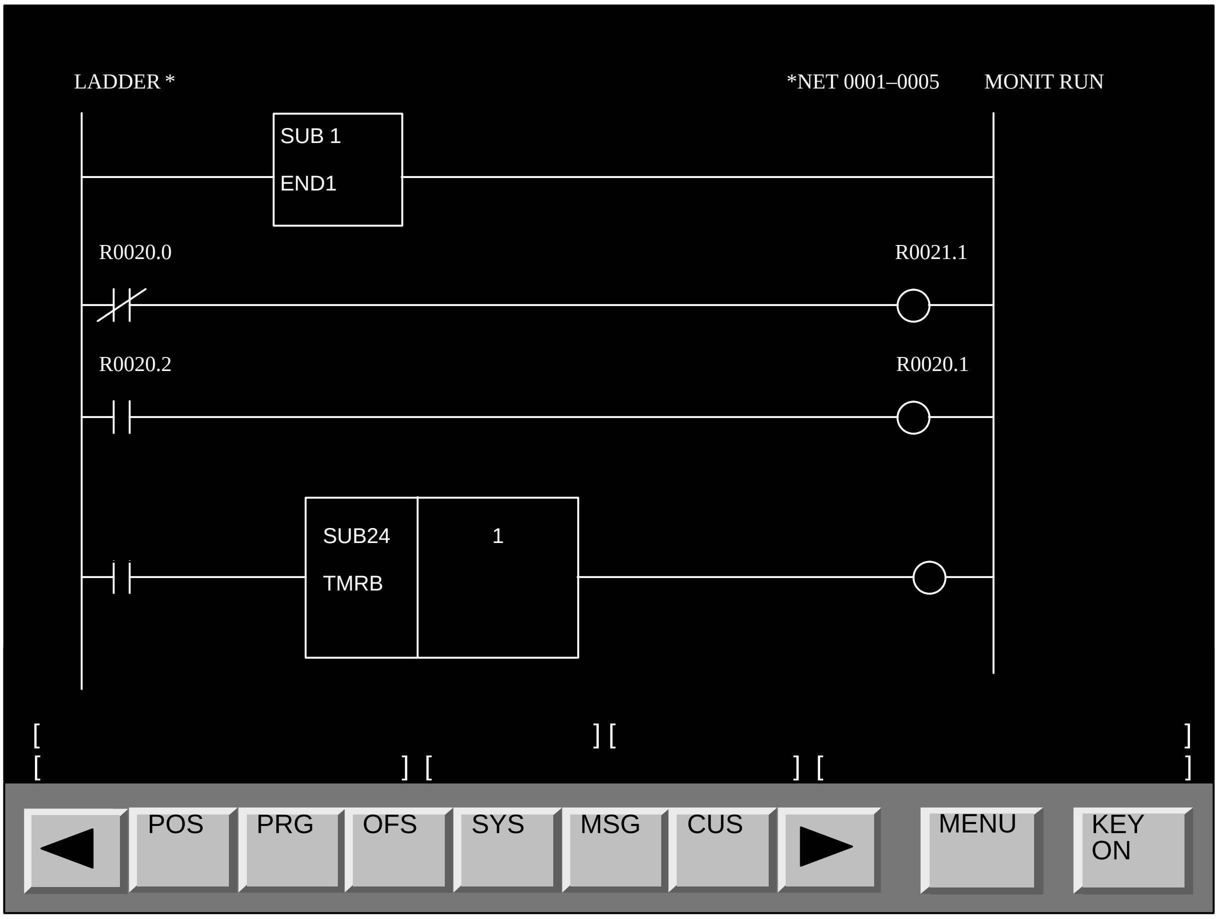


Fig. I.4.2.1 Virtual MDI keyboard on PMC maintenance screen (Function menu)

◁ and ▷ have the same function as the soft key of the [previous page key] and [next page key] of the CRT/MDI. The operation menu (menu in [ ] in above Fig.) can be switched by this key.
The operation can be available by the direct touch to the displaying part of the operation menu.

I.4.2.2 ”MENU” key

When ”MENU” key is touched, the virtual MDI keyboard (Cursor menu) for PMC shown in Fig.I.4.2.3 is displayed. If you touch ”MENU” key again while the cursor menu is displayed, the virtual MDI keyboard (Function menu) is displayed again.

I.4.2.3 Virtual MDI keyboard (cursor menu)

You can select the virtual MDI keyboard (Cursor menu) by touching ”MENU” key on the virtual MDI keyboard (Function menu). You can move the cursor or change pages by these virtual keys.

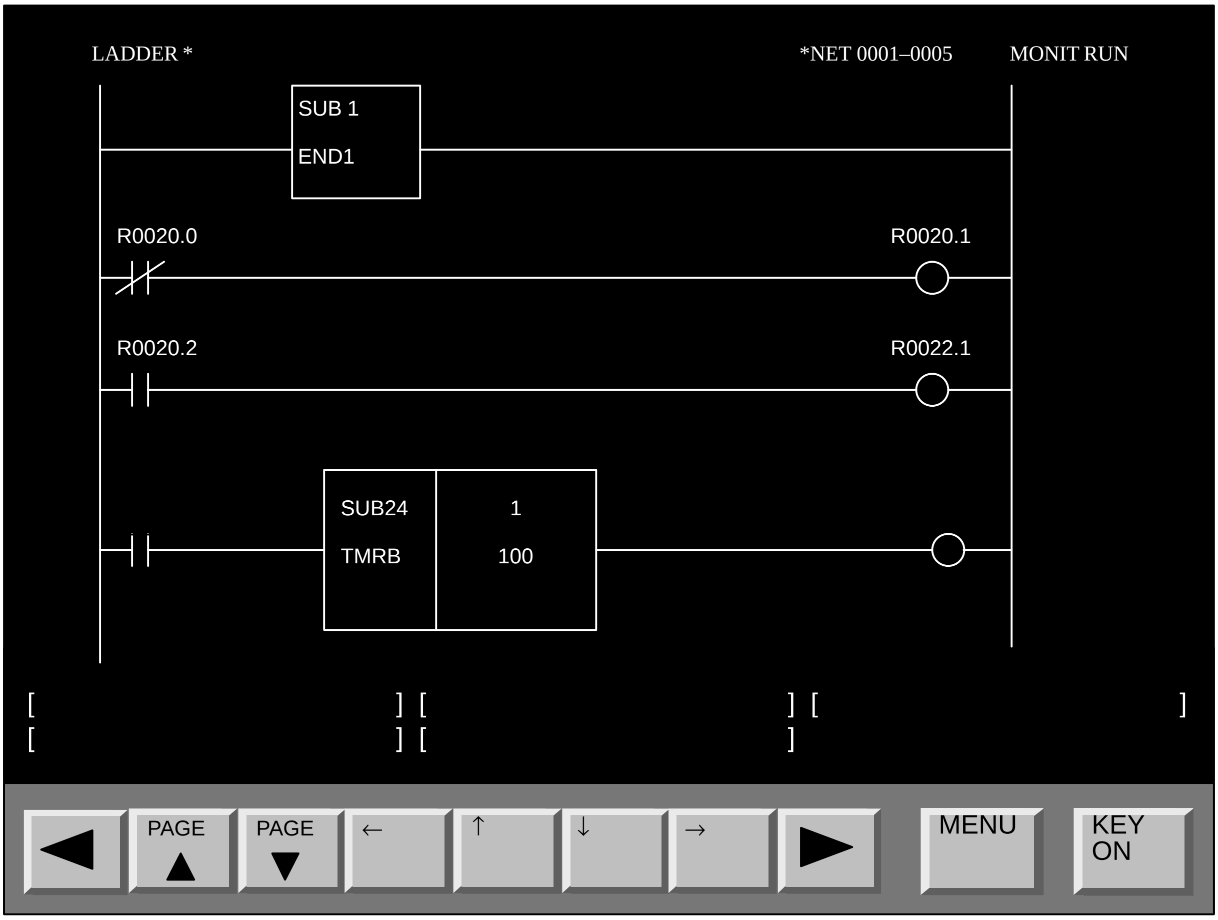


Fig. I.4.2.3 Virtual MDI keyboard in PMC maintenance screen (Cursor menu)

I.4.2.4 Virtual MDI keyboard to input PMC data

If you touch "KEY ON" key, the virtual MDI keyboard to input PMC data shown in Fig.I.4.2.4 is displayed. You can input the PMC data with these virtual MDI keyboard. These keyboard is gone out by touching "KEY OFF" key.

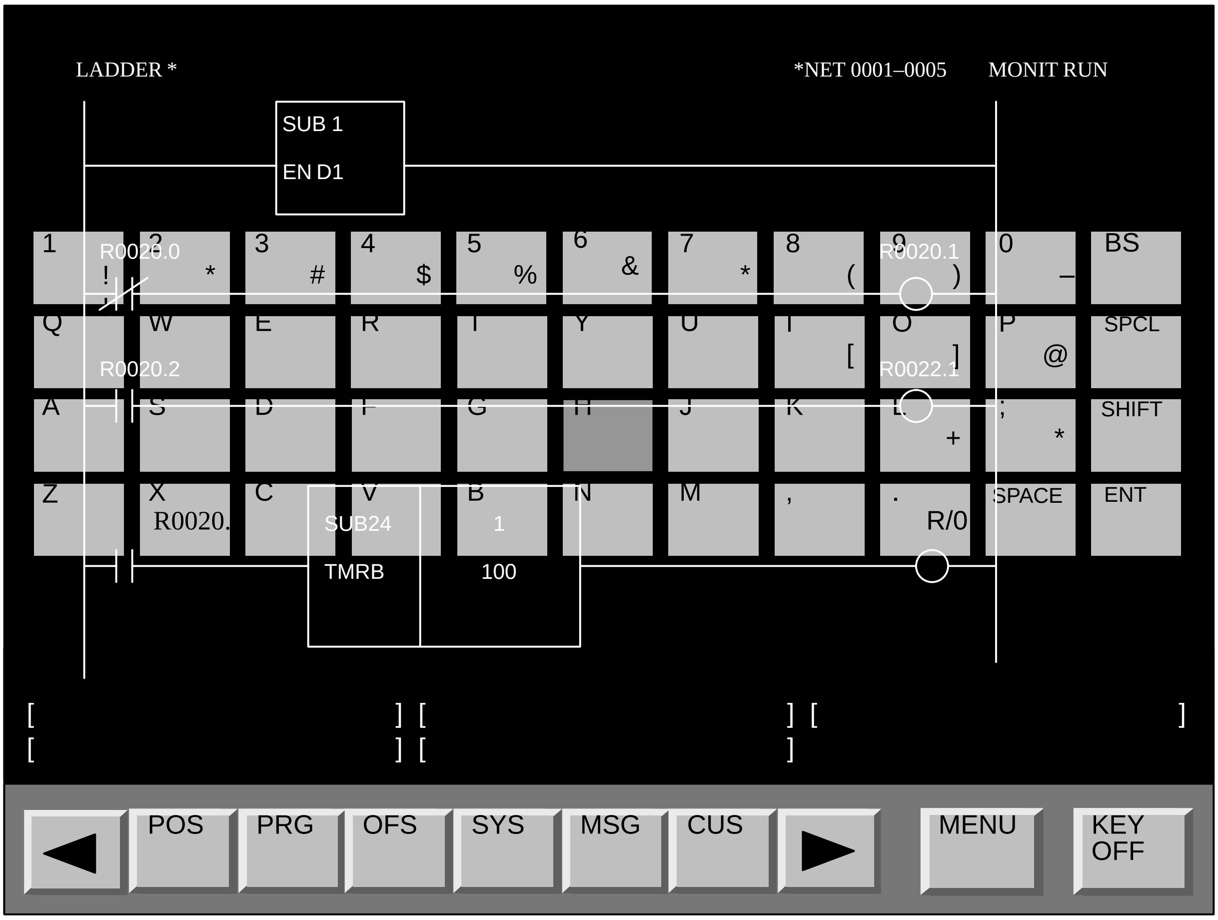


Fig. I.4.2.4 Virtual MDI keyboard for PMC data in PMC maintenance screen

I.4.3 Virtual MDI Keyboard in Case that Separate Type MDI is Used

When the separate type MDI is used, most key operation is done with the separate type MDI keyboard. Only soft–key operation is possible on the touch screen.

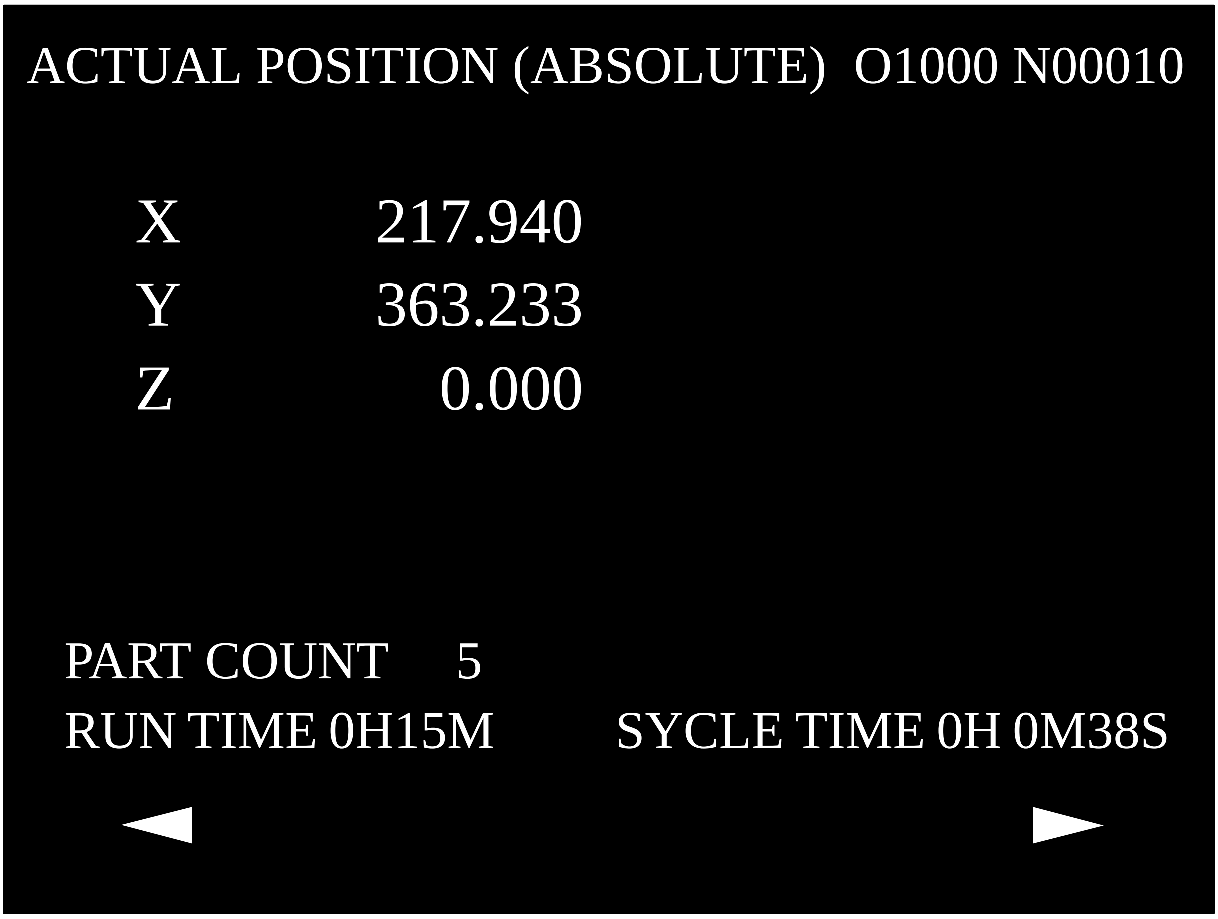


Fig. I.4.3 Virtual MDI keyboard in case that separate type MDI is used

I.4.4 Full Screen Display

When the parameter 3191#7(DMDIU) is set to ”1” and the power is turned off and on, the soft–key [D–MODE] is displayed under the other soft–key like the Fig.I.4.4(a). If the [D–MODE] key is touched, the full display screen shown in Fig.I.4.4(b) is displayed.
If you touch [D–MODE] ken while the full screen is displayed, the screen shown in Fig.I.4.4(a) is displayed again.

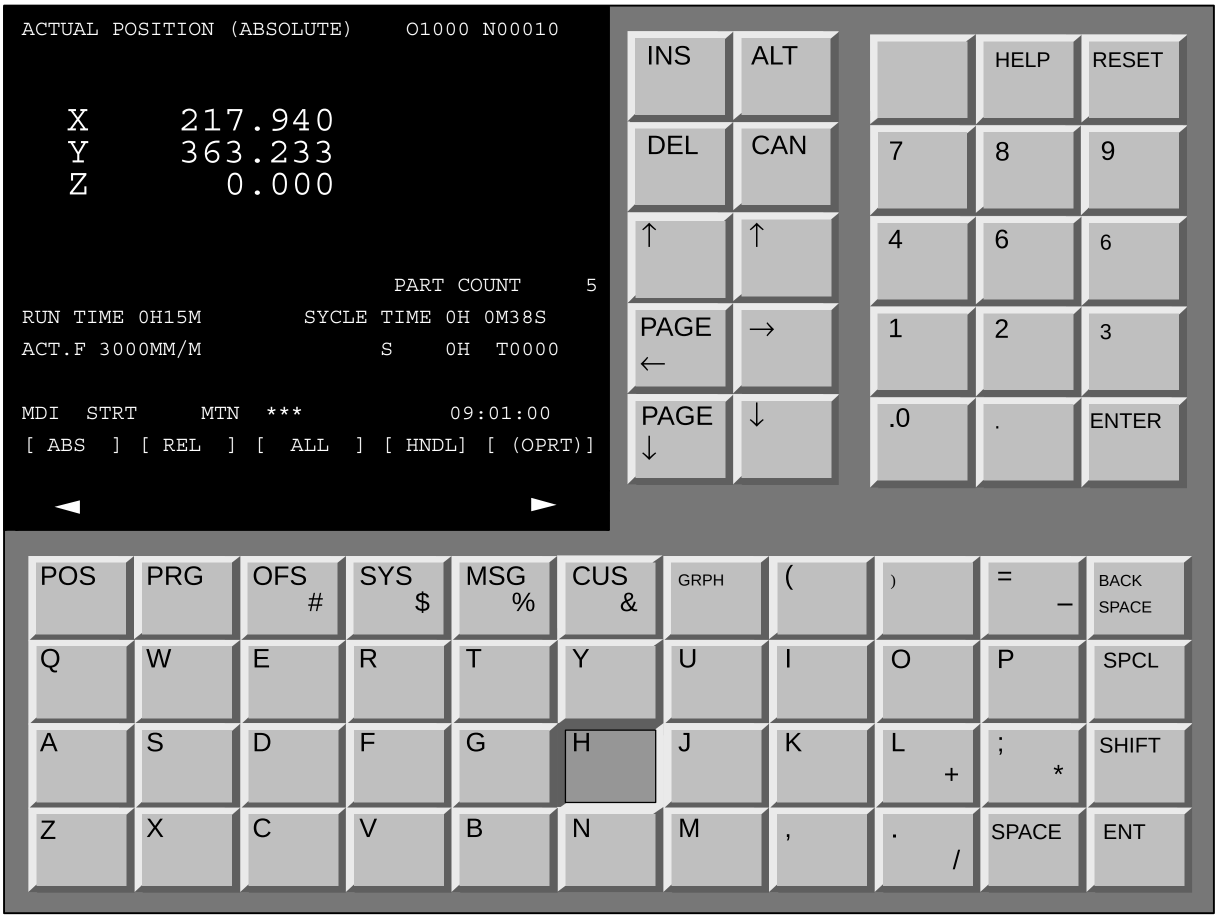


Fig. I.4.4(a) Key to change to full screen display ([D–MODE] key)

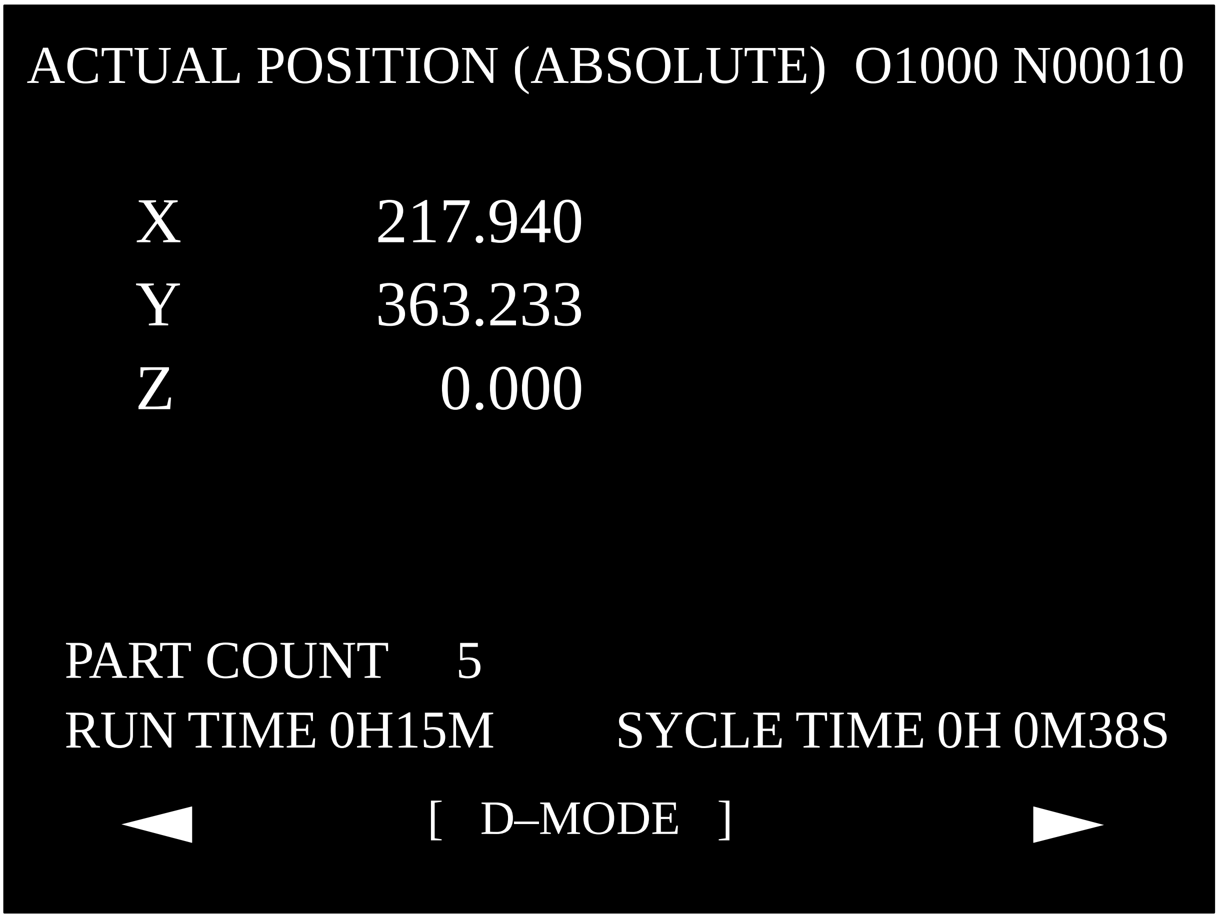


Fig. I.4.4(b) Virtual MDI key in full screen display

I.5 DISPLAY UNIT SHARING

The LCD with touch panel can be shared among plural CNCs. In this type LCD, the device select switch changes the displayed data of selected CNC. The device select switch is connected with the display unit. As for the connection and operation of the device select switch, please refer to the ”FANUC Power Mate *i*–MODEL D/H connection manual(Hardware) (B–63173EN)”.

NOTE

This display unit can be shared among plural CNCs. And the machine operation screen of each CNC can be selected by the device select switch. In order to avoid the operator’s miss by misunderstanding the correspondence between the screen and CNC, you should make the screen carefully (example. Displaying the selected machine’s name) so that the operator can understand easily which screen is displayed.

NOTE

The function to display the position of all axes and the alarm information of all connected CNC on one screen is not prepared.

I.6 DATA INPUT/OUTPUT USING A MEMORY CARD

A memory card slot is prepared on the left of the touch screen. You can use a memory card through this memory card slot and read/write various kinds of data.

I.6.1 Outline

You can input/output the various kinds of data through the memory card slot on the touch panel when you set the the value ”7” to the parameter No.20 (IO CHANNNEL) and perform the following operations.

1. Read/Punch operation by the soft–key on each screen
   - Read/punch part program
   - Read/punch parameters
   - Read/punch tool offset data
   - Read/punch custom macro variables
   - Read/punch pitch error compensation data
   - Read/punch periodical maintenance data
   - Read/punch maintenance infomation
   - Read/punch operation history data
   - Read/punch the parameters of FANUC I/O Link slave (β amplifier) by Power Mate CNC manager

> **NOTE**
> In case that the value ”4” is set to the parameter No.20, reading/punching is performed through the memory card slot on the cabinet of the Power Mate.

2. Operations on PMC screen
   (–– operations after ”DEVICE = M–CARD” is set on the screen which appears when the keys are pushed in order of [SYSTEM] → [PMC] → [▷] → [I/O])
   - Read/punch PMC parameters
   - Read/punch ladder program
   - The others. (Display the directory of files. Delete a file. Etc.)

> **NOTE**
> In case that the value other than ”7” is set to the parameter No.20, reading/punching is performed through the memory card slot on the cabinet of the Power Mate.

3. Operations on ALL IO screen
   - Read/punch part program
   - Read/punch parameters
   - Read/punch tool offset data
   - Read/punch custom macro variables
   - Read/punch pitch error compensation data
   - The others. (Display the directory of files. Delete a file. Etc.)

NOTE

1 In case that the value ”4” is set to the parameter No.20, reading/punching is performed through the memory card slot on the cabinet of the Power Mate.

2 When the parameter No.20 is set the value ”7”, memory card input/output screen on ALL IO screen is not available even if the parameter No.3116#0 (MDP) is set to ”1”.
Usually the memory card input/output screen is displayed when the soft–key [M–CARD] on ALL IO screen is pushed. But, when the value ”7” is set to the parameter No.20, the soft–key [M–CARD] is not displayed.

4. Operations on memory card directory display
This screen is displayed by pushing the softkey [CARD] on the program screen in EDIT mode.

NOTE

In the following functions, it is impossible to read/punch data through the memory card slot on the touch panel.

1 Boot system function
(Therefore, it is impossible to input/output data which can be handled only on the boot system, like system software, picture data made by Fapt Picture, C–language executor, macro executor, and so on.)

2 External I/O device control

3 Memory card access function by C Language executor application program

I.6.2 Message

I.6.2.1 Error message during the read/punch operation by soft–key

If any error occurs, the warning message ”MEMORY CARD ERROR: nnnn” is displayed.
The above ”nnnn” means the error code of a memory card shown in the following table.

Table I.6.2.1 Error Code table of memory card

Code	Meaning
7	Write protect switch is selected. Turn to ”write enable”.
30	Memory card is not inserted. Insert a memory card.
32	The voltage of battery of SRAM card is low. Change the battery.
50	Communication error with a memory card in the slot on the touch screen.
102	Vacancy of a memory card is not enough.
105	A memory card is not mounted.
106	A memory card has already been mounted.
110	The specified directory is not found.
111	In the root directory, the numbers of files are too many to add a directory.
114	The specified file name is not found.
115	The specified file is protected.
117	The file is not opened.
118	The file has already been opened.
119	The file is locked.
122	The specified file name is not correct.
124	The extender of the specified file name is not correct.
129	Not supported function is specified.
130	The device is specified incorrectly.
131	The specified pass name is not correct.
133	Two or more files are opened at a time.
135	The device is not formatted.
140	The attribute of the file is ”unable to read/write”.

I.6.2.2 Error message during the operation on PMC screen

If any error occurs, the warning message, such as ” I/O WRITE ERROR nnnn”, ”I/O READ ERROR nnnn” and so on, is displayed according to the operation to be executed.
”nnnn” in warning message means the error code of a memory card mentioned above.

I.6.2.3 Message during the operation on ALL I/O screen or memory card directory display

The meanings of messages displayed on the screen are as follows.

Table I.6.2.3(a) Message list

Message	Meaning
Insert a memory card.	A memory card is not inserted.
This memory card cannot be used.	The device information is not recorded in the attribute memory area.
Format a memory card.	This memory card is not formatted. Use after formatting.
This file cannot be used.	The format or extender of the loaded file is not correct. Or the data recorded in the memory card is not fitted to the memory capacity of CNC.
Exchange a memory card.	Exchange a memory card for another one.
File system error nnn	An error occurs in the procedure of the file system. ”nnn” means an error code of the file system.
Go into emergency stop state.	Saving is permitted only in emergency stop state.
Prohibit writing.	In case of saving: Protect switch of memory card is not released.
Low voltage	The voltage of the battery of a memory card is low. Exchange a battery for new one.
Device is busy.	The other user uses a memory card. Or, the device can not be used because automatic operation is executing.
SRAM → MEMORY CARD?	Confirming message in case of saving
Delete?	Confirming message in case of deleting
Format?	Confirming message in case of formatting
Saving now.	Saving operation is executing.
Deleting now.	Deleting operation is executing.
Formatting now.	A memory card is being formatted.
Complete	Saving procedure has been completed.
Push RESET key	Push RESET key.
Turn off power	Turn off power. Then turn on power again.
T–PANEL M–CARDCOM ERROR	Communication with a memory card on touch panel is failed.

The error code of the file system is shown in the following table.

Table I.6.2.3(b) Error code of file system

Code	Meaning
102	Vacancy of a memory card is not enough.
105	A memory card is not mounted.
106	A memory card has already been mounted.
110	The specified directory is not found.
111	In the root directory, the numbers of files are too many to add a directory.
114	The specified file name is not found.
115	The specified file is protected.
117	The file is not opened.
118	The file has already been opened.
119	The file is locked.
122	The specified file name is not correct.
124	The extender of the specified file name is not correct.
129	Not supported function is specified.
130	The device is specified incorrectly.
131	The specified pass name is not correct.
133	Two or more files are opened at a time.
135	The device is not formatted.
140	The attribute of the file is ”unable to read/write”.

I.6.3 Restriction

- The information saved into a memory card is compatible only with the CNC with the same hardware configuration and the same option assembly.
- SRAM memory card and Flash ATA card are available. It is impossible to use a flash memory card.

I.7 PARAMETERS

0020	I/O CHANNEL : Selection of an input/output device

Setting entry is acceptable.

[Data type] Byte

[Valid data range] 0–35

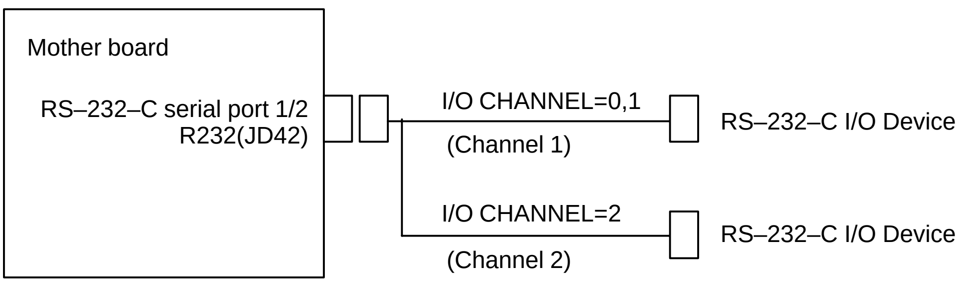
This parameter selects the interface used to transfer data to and from an input/output device.

Setting	Description
0, 1	RS–232–C serial port 1
2	RS–232–C serial port 2
4	Memory card interface (on the cabinet of NC)
6	DNC1/Ethernet (The parameter setting is needed only when DNC operation is executed.)
7	Memory card interface (on touch panel)
20 21 22 | 34 35	Group 0 Group 1 Group 2 | Group 14 Group 15 Data are input/output from/to the Power Mate in group n (n: 0 to 15) via the FANUC I/O Link.

NOTE

1 An input/output device can also be selected by using the setting screen. Usually, the setting screen is used.

2 In order to transfer data via input/output unit interface(RS–232–C serial port), the specifications (such as the baud rate and the number of stop bits) of the input/output devices to be connected must be set in the corresponding parameters for each interface beforehand. (See Section 4.2. in PARAMETER MANUL(B–63180EN))
I/O CHANNEL = 0 and I/O CHANNEL = 1 represent input/output devices connected to RS–232–C serial port 1. Separate parameters for the baud rate, stop bits, and other specifications are provided for each channel.



3 The input/output unit interface may be referred to as the reader/punch interface. RS–232–C serial port 1 and RS–232–C serial port 2 are also referred to as channel 1 and channel 2, respectively.

4 Channel 2 has no control line, so that the Handy File and Floppy Cassette cannot be connected.

	#7	#6	#5	#4	#3	#2	#1	#0
3191	DMDIU							

[Data type] Bit

DMDIU Full screen display selecting soft–key is

0 : not displayed.
1 : displayed.

> **NOTE**
> If the value of this parameter is changed, the value is valid after next power–on.

	#7	#6	#5	#4	#3	#2	#1	#0
8650							CNA	RSK

[Data type] Bit

RSK When RESET key is pushed, key code is

0 : not transferred to the application software.
1 : transferred to the application software.

CAN When NC alarm occurs while the screen by FAPT PICTURE (Windows) or the user screen by C–language executor is displayed,

0 : whether the screen is changed to the CNC alarm screen or not is depends on the setting of the parameter No.3111#7 (NPA).
1 : the screen is not changed to the CNC alarm screen.

> **NOTE**
> If the value of this parameter is changed, the value is valid after next power–on.

8781	DRAM size used by FAPT PICTURE or C–language executor

[Data type] Byte

[Unit of data] 64Kbyte

[Valid data range] 16–96

The DRAM size for FAPT PICTURE (Windows) or C–language executor is set.
When FAPT PICTURE (Windows) is used on Power Mate *i*–D/H, this value should be fixed to ”96”.

> **NOTE**
> If the value of this parameter is changed, the value is valid after next power–on
> Actual DRAM size is also restricted by the capacity of DRAM and the option assembly.

I.8 COUNTER MEASURE AGAINST A TROUBLE ON LCD WITH TOUCH PANEL

When operation screen is not displayed normally or key touch is not effective, please confirm the following items and take measures to meet the situation.

I.8.1 Status Display of the LED on the Cabinet of CNC

The current status of CNC can be confirmed by the status display of the LED on the cabinet of CNC. Please refer to the Appendix F for details.

I.8.2 Status Display of the LED on the Display Unit

The current status of the display unit can be confirmed by the display of the LED that is placed at the position shown in the following figure on the printed circuit board on the back of the display unit.
The meaning of LED during power–up is different from that in normal operation. As for the meaning of LED during power–up, please refer to the table I.8.2 (a). And as for the meaning of LED during normal operation, please refer to the table I.8.2 (b).
Back view of display unit

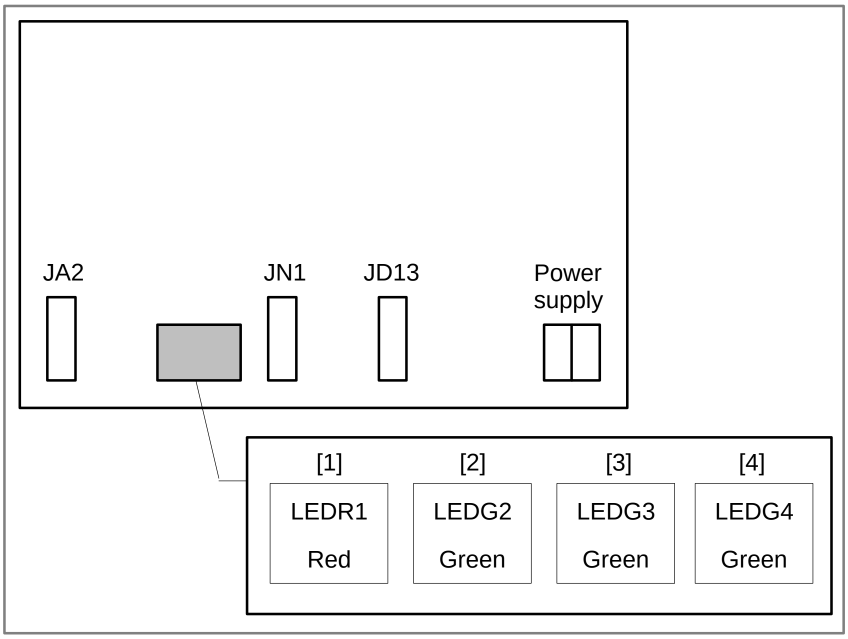


Table I.8.2 (a) Meaning of LED during power–up

■: ON □: OFF ☆: BLINK

(1) LEDR1 Red	(2) LEDG2 Green	(3) LEDG3 Green	(4) LEDG4 Green	Meaning of LED and countermeasure
□	□	□	■	Power is supplied.
■	■	■	■	1 ROM built in CPU to control display unit is destroyed. Exchange the board of display unit. 2 The position of the rotary switch on the display unit is not ”0”. Return the position of the rotary switch to ”0”.
□	■	□	■	Work SRAM on the display unit is destroyed.Exchange the board of display unit.
■	■	□	■	Control software of display unit or Flash ROM on display unit is destroyed.Install control software of display unit again.If problem is not fixed, exchange the printed circuit board of display unit.
□	□	■	■	Control software of display unit is destroyed.Install control software of display unit agin.

Table I.8.2 (b) Meaning of LED during normal operation

■: ON □: OFF ☆: BLINK

(1) LEDR1 Red	(2) LEDG2 Green	(3) LEDG3 Green	(4) LEDG4 Green	Meaning of LED and countermeasure
□	☆	□	■	Power is supplied.
■	□	□	■	1 Illegal condition of CPU on display unit is detected. (ILLEGAL INSTRUCTION) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (ILLEGAL SLOT) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.
□	■	□	■	1 Illegal condition of CPU on display unit is detected. (CPU ADDRESS ERROR) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (DMA ADDRESS ERROR) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.
■	■	□	■	1 Illegal condition of CPU on display unit is detected. (NMI) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (USER BREAK) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.

(1) LEDR1 Red	(2) LEDG2 Green	(3) LEDG3 Green	(4) LEDG4 Green	Meaning of LED and countermeasure
□	□	■	■	1 Illegal condition of CPU on display unit is detected. (IRQ0) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (IRQ1) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.
■	□	■	■	1 Illegal condition of CPU on display unit is detected. (IRQ2) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (IRQ3) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.
□	■	■	■	1 Illegal condition of CPU on display unit is detected. (IRQ4) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (IRQ5) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.
■	■	■	■	1 Illegal condition of CPU on display unit is detected. (IRQ6) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 2 Illegal condition of CPU on display unit is detected. (IRQ7) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit. 3 Illegal condition of CPU on display unit is detected. (OTHERS INTERRUPT) Turn off and on the power again. If problem occurs frequently, exchange the board of display unit.

I.9 RESTRICTION

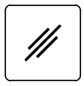
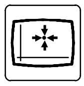
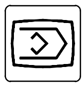
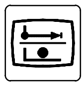
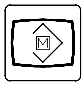
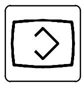
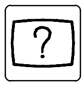
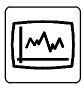
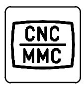
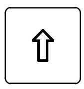
The functions below are restricted as follows during use of the touch panel function.

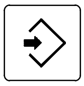
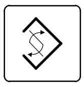
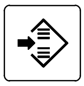
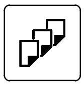
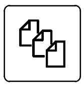
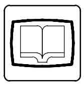
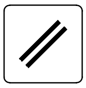
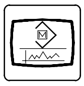
Macro executor

- The macro executor is enabled only for execution macros.
- The hardware cursor cannot be used.

J NOTATION OF MDI KEYS

Power Mate *i*–MODEL D/H have two types of MDI keypads : English type and Symbolic type.
The table below shows correspondence between English keys and Symbolic keys.
This manual uses English type in the text.
Therefore when a user uses Symbolic type MDI keypads and encounters an English key in the text, please refer to the correspondence table shown below.

Name	English key	Symbolic key
CANCEL key	CAN	
POSITION key	POS	
PROGRAM key	PROG	
OFFSET/ SETTING key	OFFSET SETTING	
CUSTOM key	CUSTOM	
SYSTEM key	SYSTEM	
MESSAGE key	MESSAGE	
GRAPH key	GRAPH	
CNC/MMC key	CNC/MMC	
SHIFT key	SHIFT	

Name	English key	Symbolic key
INPUT key	INPUT	
ALTER key	ALTER	
INSERT key	INSERT	
DELETE key	DELETE	
PAGE UP key	↑ PAGE	
PAGE DOWN key	PAGE ↓	
HELP key	HELP	
RESET key	RESET	
CUSTOM/GRAPH key	CUSTOM GRAPH	

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Revision Record

FANUC Power Mate *i*–MODEL D/H MAINTENANCE MANUAL (B–63175EN)

Edition	Date	Contents	Edition	Date	Contents
03	Oct., 2002	• Contents were added to following sections and chapter: – Sections 2.3, 2.7, and 2.9 – Chapter 7 • Correction of errors			
02	Nov., 1999	Addition of Appendixes E, F, and G Correction of errors			
01	Aug., 1998				