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工作機械用デジタルACスピンドルドライブシステム

# FRENIC5000M3

ドライブユニット

# 取扱説明書

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DIGITAL AC SPINDLE DRIVE SYSTEM

FOR MACHINE TOOLS

# FRENIC5000M3

DRIVE UNIT

# INSTRUCTION MANUAL

この取扱説明書は和文英文併記しています。和文は1～24ページ，英文は25～48ページに記載します。

This instruction manual is written in Japanese on pages 1 to 24 and in English, on pages 25 to 48.

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## Foreword

This manual describes instructions as mentioned in the contents. For other items, when the drive unit is incorporated in a machine, follow the instructions of the machine. And when you purchased your drive unit and motor separately, be sure to read the AC spindle motor manual and FRENIC5000M3 technical manual together. Only proper use leads to full performance as expected. Wrong handling will cause malfunction, short service life, and faults.

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## 2. Receiving

**WARNING**

**Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and traind personel. Particular care must be taken to carry the unit by holding the main body, because holding the side covers or parts can cause damage or dropping.**

### (1) Drive units

Check the description of the nameplates on the side covers to see that the delivered drive unit agrees with your order.

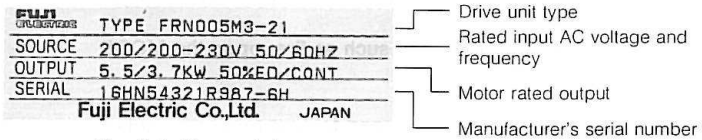



Fig. 2-1 Nameplate

**Drive unit type code designation**

FRN 005 M3 - 2 1

- Product type: FRENIC5000
- Motor output (50%ED)
  - 001 : 1.1 kW, 002 : 2.2 kW, 003 : 3.7 kW,
  - 005 : 5.5 kW, 007 : 7.5 kW, 011 : 11 kW,
  - 015 : 15 kW, 018 : 18.5 kW, 022 : 22 kW,
  - 030 : 30 kW, 037 : 37 kW
- Series name : Digital AC spindle drive system
- Supply voltage 2 : 200 V
- Model No. : 1

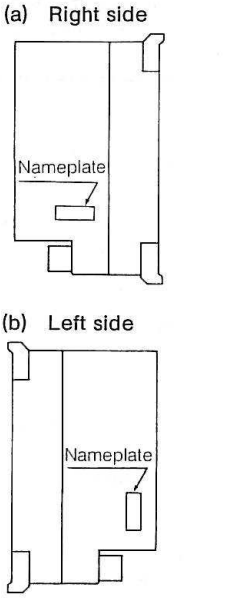



Fig. 2-2 Nameplate position

### (2) Accessories

The standard accessories are a braking resistor(s) and a connector. Check the nameplates or the types marked on the product surface with the Table 2-1 to make sure that they match the drive unit you ordered.

Table 2-1 List of drive unit accessories

| Item | | Specification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor output, [kW] | 50%ED | 1.1 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 |
| | Cont. | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |
| Drive unit type | | FRN001 M3-21 | FRN002 M3-21 | FRN003 M3-21 | FRN005 M3-21 | FRN007 M3-21 | FRN011 M3-21 | FRN015 M3-21 | FRN018 M3-21 | FRN022 M3-21 | FRN030 M3-21 | FRN037 M3-21 |
| Braking resistor | Type | DB001 M3-21 | DB002 M3-21 | DB003 M3-21 | DB005 M3-21 | DB007 M3-21 | DB011 M3-21 | DB015 M3-21 | DB018 M3-21 | DB022 M3-21 | DB030 M3-21 | DB037 M3-21 |
| | Qty. | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 1 |
| Connector type, qty. | | MR-34LF (HONDA TSUSHIN KOGYO CO., LTD.), 1 pc. | | | | | | | | | | |

Examine the articles for no damage due to transport such as a break, falling off of parts, and a dent on the enclosure. If you find a doubtful or defective point, inform the agent you bought them.

## 3. Drive un

(1) Drive u

〈Top〉



〈Front

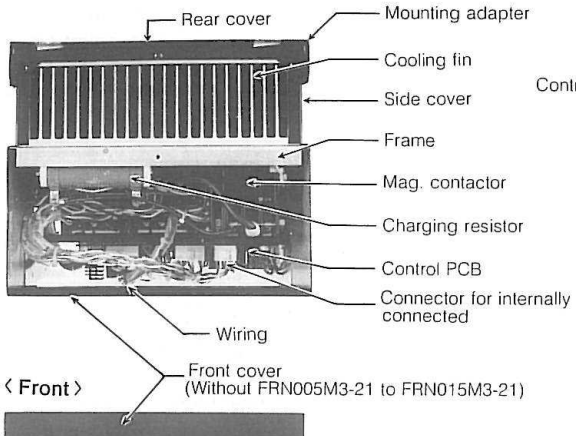


〈Botto

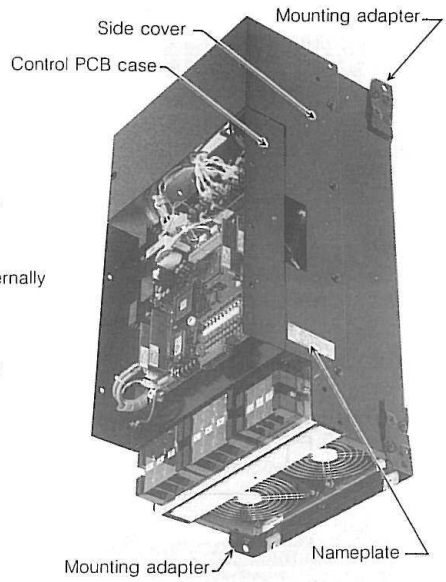


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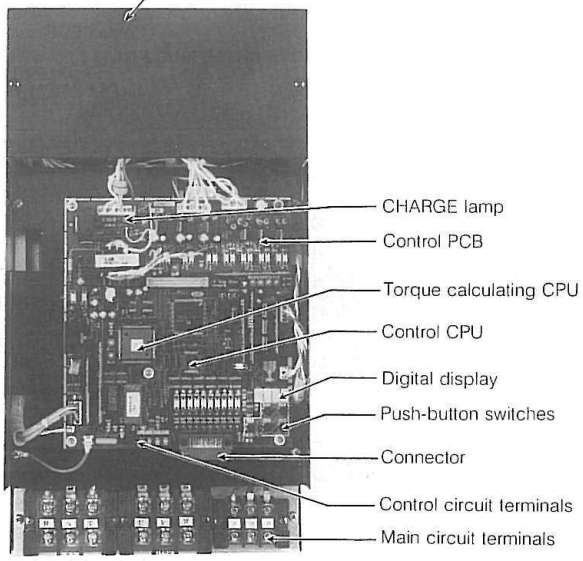
(2) Drive unit type: FRN005M3-21 to FRN037M3-21



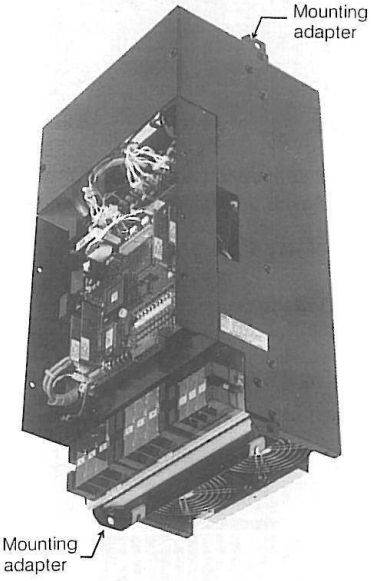

〈 In-board type 〉



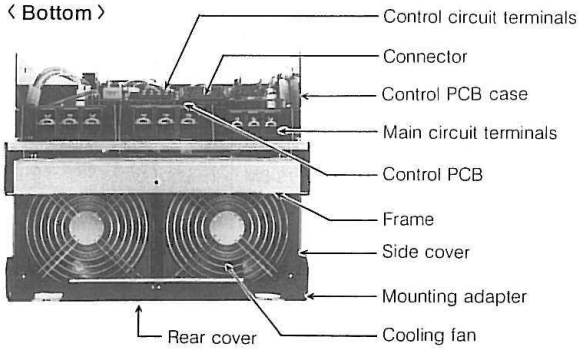

〈 Front 〉




〈 External cooling type 〉




〈 Bottom 〉




## 4. Checking

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### 4-1 Functions

**Digital displa**
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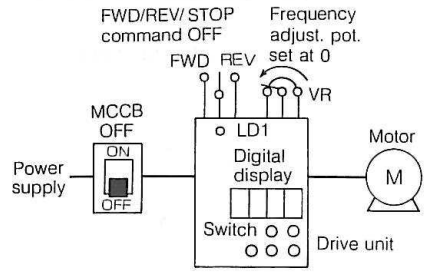
| Fig. | Displa |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| Active | o |
| Inactive | - |

**SET switch**
To be switche
set in the RAM
to update para

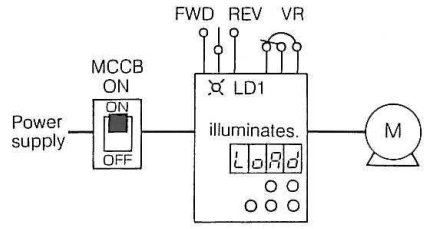
**RST switch**
- In paramete
  To be switch
  data indicati
  mode functi
- In fault mod
  To be switch
  drive unit pr
  operation af

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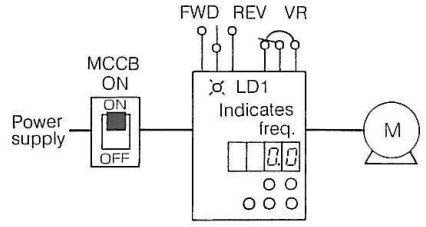
## 4-2 Function Selection and Operation Data Checking



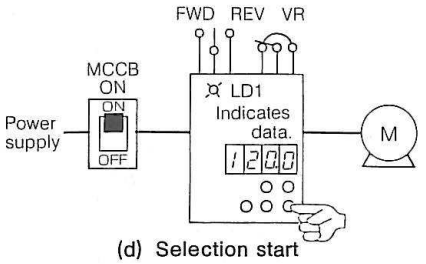

(a) Standby




(b) Power on




(C) Ready for selection




(d) Selection start

Fig. 4-1 Preparation for function selection

When power is supplied to the drive unit, the CPU on the control PCB starts reading internal data. It takes about 2 seconds and the digital display indicates LoAd. After 2 seconds, the display indicates an output frequency value (displays 0.0 during stoppage). The CHARGE lamp (LD1) on the same PCB illuminates.

Now operation for selecting a function can be started.

① The digital display always indicates output frequency of the drive unit.
Example: Output frequency is 0 during stoppage; indication is 0.0.

② Switch on the MODE, and the digital display indicates the function code of data being indicated.
Example: When an output frequency value is indicated, function code C001 for output frequency is indicated.

③ Switch off the MODE when you do not select another function. The display indicates a function code for about 5 seconds after the MODE is switched on, and after that, it automatically indicates data (an output frequency value).
When the MODE is switched off after an on-state exceeds 5 seconds, data is indicated immediately.

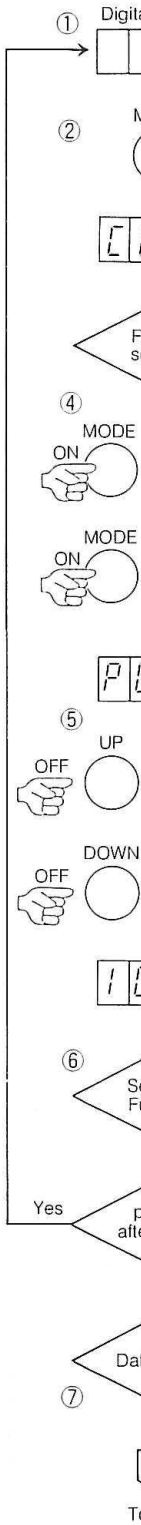
④ When you select another function, switch on the UP or DOWN while keeping the MODE on.

Selecting order of functions

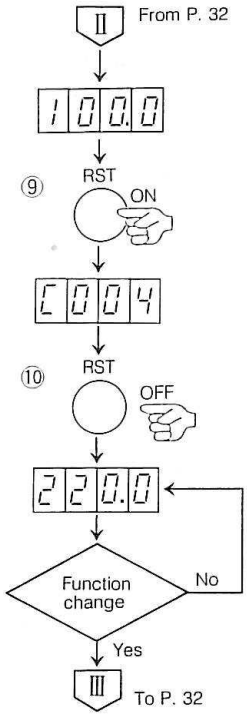
- MODE + UP
  A function is selected in the downward order of the functions described in the Function Table. F009 is followed by C001.
- MODE + DOWN
  A function is selected in the upward order of the functions described in the Function Table. C001 is followed by F009.
- The fault mode F001 to F005 can be selected only when a drive unit protection function operates.

*NOTE*

*Note that when P000: set data protection is set at - (data setting abled), if you switch on UP or DOWN before MODE while a parameter mode function is indicated, the set data will be changed. This step is the same as the operation in Section 4-3 (page 33).*




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⑨ Switch on the RST while P code function data is indicated (about 5 seconds). The display indicates the C code function that had monitored before the P code function was selected.
Note that while a function code (P code) is indicated, RST switching can not shift indication to a C code function.
Example: Before a P code function was selected, C004: output voltage set value had monitored.

⑩ When the RST is switched off, the C code function data is indicated. Even if the RST is kept on, the display will shift to data indication after certain seconds. The data indication continues till a next function is selected.
Example: The output voltage set value is 220 V.

### 4-3 Operation Data Setting

① Stop the drive unit output. During operation, data can be set to certain functions, but not to almost all the functions. For details, refer to the Function Table (pages 47 and 48).

② Select the P000: protection of set data, and check for protection active or inactive.
Data indication – : Data setting abled. ▫ : Data setting disabled. When – is indicated, you can set data. When ▫ is indicated, change the indication to – following the instructions below and then set data.

③ Select a required function following the steps in Section 4-2, and get data on display.

④ Switch on UP or DOWN to change data on the digital display. Adjust excess or deficiency to a setting value by repeating ON/OFF of UP or DOWN.
Example: The maximum frequency setting value is 125 Hz.

*NOTES*

*The drive unit will be operated by data indicated on the digital display even if you fail to switch on the SET. It is designed to be operated by input data in the RAM. The SET is to be switched on to update the memory.*

*Methods of returning data on display to the previous one (stored in the memory) are as follows:*
ⓐ *To return data to the previous one by switching on the UP or DOWN.*
ⓑ *To turn off the power once.*
ⓒ *To select and set P228: resetting standard setting data.*
*Note that this function returns data to the one set by the drive unit factory before shipping (See the List of Functions).*
*In the case that you purchased your drive combined with a machine, follow the instructions of the machine.*

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## 5. Maintenance and Inspection

**WARNING**

**Do not service the equipment when power is applied since this could result in electrical shock or burn. When you can not avoid live-wire work, for example, in the measurement of main-circuit electric quantities, be fully careful with your work in addition to safety measures such as grounding of measuring instruments.**

The drive unit is composed of many parts and it can not bring its performance into full play unless those parts operate properly. Proper maintenace and inspection is necessary in order to prevent drive unit trouble from occurring and to continue its reliable operation for a long time. For the inspection items and methods, see Section 7. Inspection List on page 44.

### 5-1 Precautions in Maintenance and Inspection

**WARNINGS**

**Turn off the power without fail before you will touch the drive unit.**

**Make the worker himself check the power ON/OFF and forbid power operation by others who are not in charge.**

**The smoothing capacitor remains charged for some time after the power is turned off. Start work after CHARGE lamp LD1 on the control PCB is off and the main-circuit DC voltage measured with a tester is as low as safe voltage.**

**CAUTION**

**Hold the housing, not the cable, to pull out the connectors. Be careful not to insert them into wrong positions.**

### 5-2 Daily Inspection

① The fundamentals of daily inspection is to check for abnormal noise, unusual smell or visual abnormality from outside during operation.

② When you find an abnormality, investigate the location and extent immediately.

③ Check the contents of the abnormality and judge whether operation can be continued or not. If not, stop the equipment immediately and remove the cause of the abnormality.

### 5-3 Periodical Inspection

Turn off the power. Check the places that can be inspected only when operation is stopped, and check places and parts that require periodical inspection. If you find an abnormal place or part, remove the cause of the abnormality or replace the part.

### 5-4 Periodical Replacement of Parts

Though the service life of drive unit parts depends on the working environment and operation time of the unit, the life expectancy of electrolytic capacitors is about 5 years and that of cooling fans, about 3 years when they are operated continuously within the allowable limits of the standard specifications. You are recommended particularly to replace these parts before a trouble occurs.

### 5-5 Meggerin

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### 5-6 Measurement of Main Circuit DC Voltage

Measuring terminals are the main circuit terminal P for positive (+) and the signal check terminal DCN on the control PCB for negative (−). Use a tester or the like.

**WARNING**
**Take the utmost care that the voltage during current carrying sometimes exceeds 310 V.**

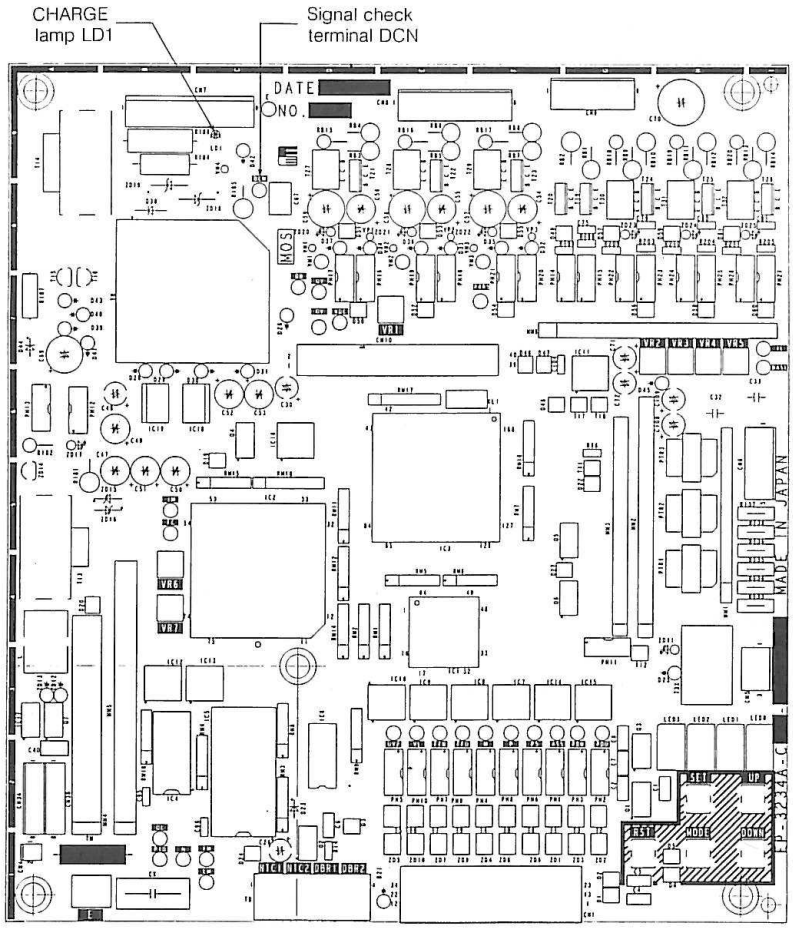



Fig. 5-2 Rough sketch of the control printed circuit board

## 6. Troublesh

### 6-1 Protection

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Table 6-11

| Function |
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| Stall prevention |
| Current limiting |
| Instataneous power failure |
| Input surge |

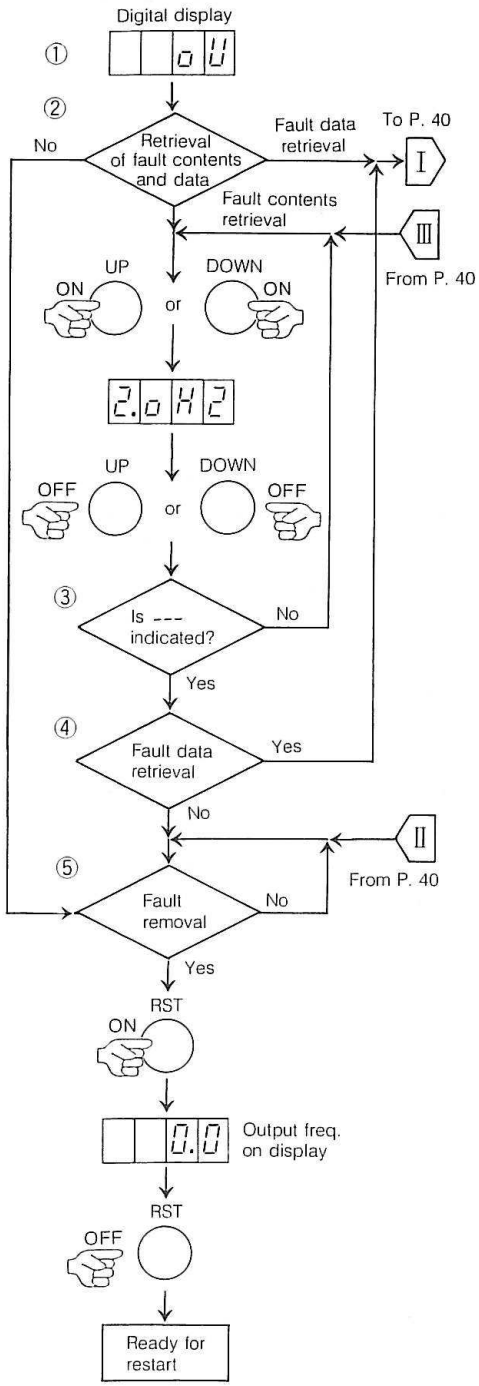
Table 6-12

| Function |
|---|
| Under-voltage protection |
| Overvoltage protection |
| Overcurrent protection |
| Overload |
| Motor overload |
| inverter overheating |
| External faults |

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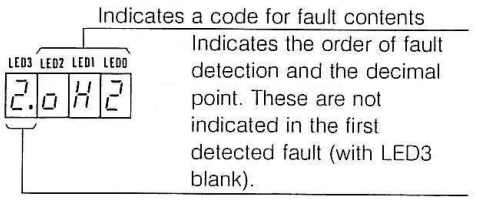
## 6-2 Display and Retrieval of Fault Contents

For the functions of the digital display and push-button switches, refer to Section 4-1 on page 30.




① When a protection function operates, the display automatically shifts to a fault mode and indicates the code of the contents (type) of a fault first detected.
Example: The first detected fault was due to overvoltage.

② To check for combined faults, switch on the UP or DOWN and retrieve the second and third fault contents. The contents of faults are all indicated by codes.
The retrieval of fault contents can be omitted; however, you are recommended to carry it out to clear up the cause of faults.
Example: The second detected fault was due to an external alarm.

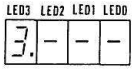



*NOTES*

*The contents of 7 faults, that is, up to 7th faults, can be retrieved and indicated.*

*The contents of a fault remains on display till next operation is performed.*

③ Switch on UP or DOWN till the digital display LED2, 1, and 0 indicates - .
The mark - shows that the contents of faults are not detected. Now the retrival of fault contents is over.




Example: The third fault is not detected.

④ Next, retrieve fault data when protection function operates and the fault record. For details, refer to Section 6-3 on page 40.

⑤ When you finish the retrieval of fault data or you do not intend to do it, remove the cause of the fault and switch on the RST. The indication will shift to an output frequency value and the motor can be restarted.
Example: Since the drive unit has stopped output, 0.0 is indicated.

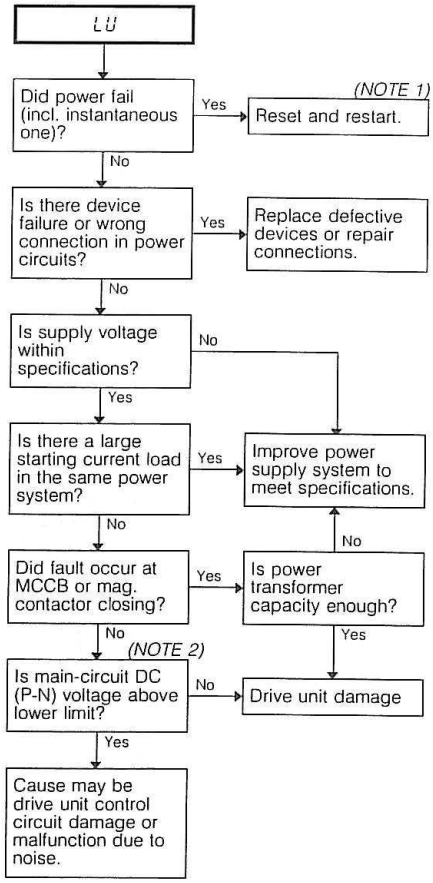
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④ Repeat ② and ③ to retrieve fault data. After retrieval is over, follow Section 6-2 ⑤ on page 39.
To select fault contents again, select function code F001. After that, follow Section 6-2 on page 39.

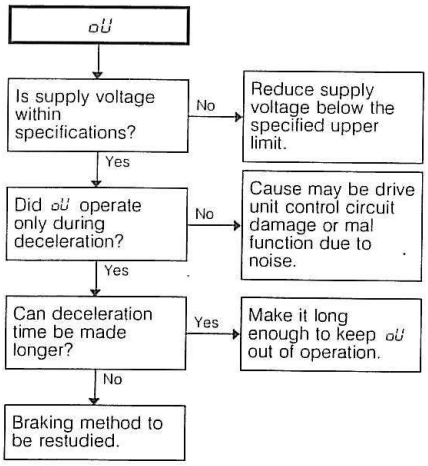
## 6-4 Diagnosis and Steps at Fault

When a fault occurs and the drive unit protection function operates, refer to the steps shown below to find its cause and remedy it. If these steps are not applicable to your fault or your drive unit has been damaged, inform the machine supplier or Fuji Electric.

### (1) Undervoltage



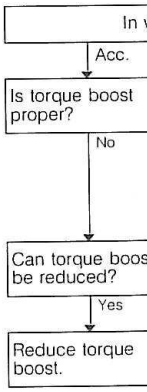

### (2) Overvoltage



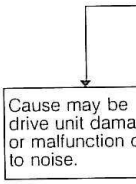

(Note 1) *When the smoothing capacitor discharges and drive unit control power fails, the fault function is automatically reset.*

(Note 2) *When the main-circuit DC voltage drops below 200 V, the undervoltage protection gives an indication and alarm.*

### (3) Overcurrent

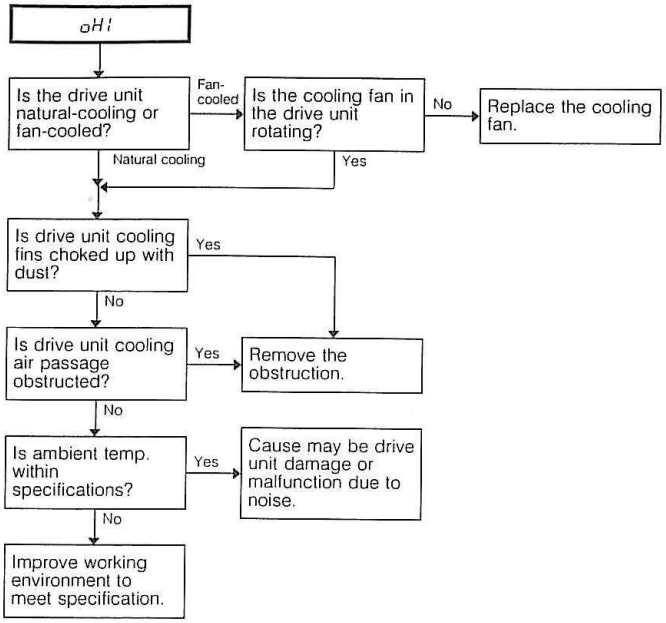



### (4) Overload

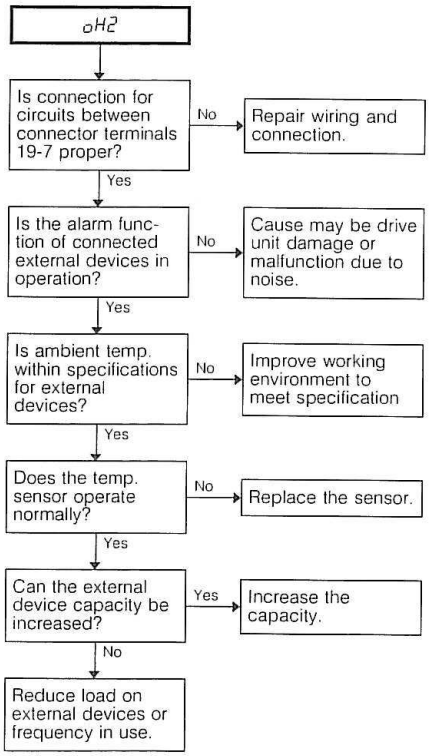



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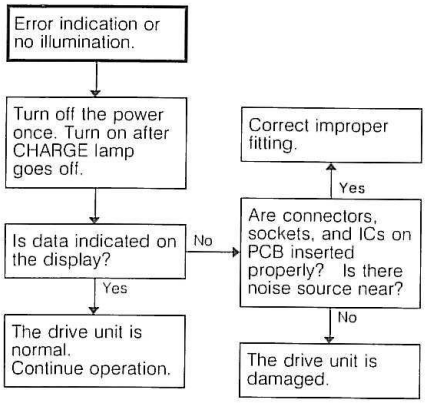
### (5) Inverter overheating




### (6) External fault




### (7) CPU error




## 7. Inspection List

| Place | Item | Check points | Cycle: Day | Cycle: Per. | Inspection method | Acceptance criteria |
|---|---|---|---|---|---|---|
| General | Environment | Ambient temp., humidity, dust, harmful gases, oil mist, etc. | ○ | | Testers, seeing, smelling. | Satisfies standard specifications. |
| | Whole equip. | Abnormal vibration and noise | ○ | | Seeing and hearing. | No abnormality. |

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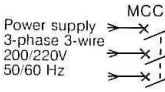
## 8. Standard Specifications

| Item | | | Specification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor rated output, [kW] | | 50%ED | 1.1 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 |
| | | Cont. | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |
| Drive unit type | | | FRN001 M3-21 | FRN002 M3-21 | FRN003 M3-21 | FRN005 M3-21 | FRN007 M3-21 | FRN011 M3-21 | FRN015 M3-21 | FRN018 M3-21 | FRN022 M3-21 | FRN030 M3-21 | FRN037 M3-21 |
| Power supply | Ratings | | 3-phase 3-wire 200V/50Hz, 200 to 230V/60Hz | | | | | | | | | | |
| | Permissible regulation | | Voltage: +10 to −15%, voltage unbalance ratio: 3% or less (*1), frequency: ±5% | | | | | | | | | | |
| Overload capacity | | | 120% for 60 seconds with 50%ED rated output | | | | | | | | | | |
| Control | Main-circuit system | | Transistor sinusoidal PWM VVVF inverter | | | | | | | | | | |
| | Control system | | V / f control with flux control loop (2 selectable V / f patterns) | | | | | | | | | | |
| | Drive / brake system | | 4-quadrant drive, resistor dynamic braking (with the braking resistor installed separately) | | | | | | | | | | |
| | Acceleration / deceleration | | Torque limiting acceleration / deceleration, soft start / soft stop (0.1to 99.9s) | | | | | | | | | | |
| | Output frequency | | Control range : 0.5 to 270Hz | | | | | | | | | | |
| | | | Base frequency : 30 to 200Hz | | | | | | | | | | |
| | | | Accuracy — Analog signal: ±0.2% of maximum frequency at 25±10℃; Digital signal: ±0.04% of maximum frequency at −10 to 55℃ | | | | | | | | | | |
| | Additional functions | | Torque limiting control, current limiting control, automatic flux reducing control, slip compensator, restart at instantaneous power failure, simple orientation. | | | | | | | | | | |
| Protection | | | Stall prevention, current limiting, overvoltage, undervoltage, overcurrent, drive unit overload, drive unit overheating, motor overload, external fault, CPU error, incoming surge. | | | | | | | | | | |
| Input | Frequency setting signal | | Analog signal: 0 to +10VDC, 0 to −10VDC (maximum frequency / 10V)<br>Digital signal: 12-bit binary, BCD 2 digits, BCD 3 digits (*2) | | | | | | | | | | |
| | Override signal | | −A to +A of frequency setting signal, A: 20 to 50% (at 1% intervals) | | | | | | | | | | |
| | Contact | | Digital signal selection, forward / stop command, reverse / stop command, free run command, No.2 setting selection, torque limiting selection, M gear selection, L gear selection, simple orientation start command, simple orientation stop command, external alarm input, alarm reset | | | | | | | | | | |
| Output | Instrument | | 0 to +10VDC for frequency meter, ammeter (load meter) | | | | | | | | | | |
| | Open emitter | | Under No.2 setting, under torque limiting control, output frequency level detection, frequency equivalence detection, output frequency zero level detection, package alarm, individual alarm | | | | | | | | | | |
| Indication | Digital display | | Indicates a function code and setting / operation data. See the Function Table. | | | | | | | | | | |
| | Charge lamp | | The LED illuminates with smoothing capacitor charge voltage present. | | | | | | | | | | |
| Construction / cooling | | | In-board (natural cooling) | In-board / external cooling (fan-cooling) | | | | | | | | | |
| Color | | | Munsell N1.2, semigloss | | | | | | | | | | |
| Environment | Location | | Indoor, not more than 1000m above sea level. | | | | | | | | | | |
| | Atmosphere | | Free of inflammable gases, corrosive gases, oil mist, moisture, waterdrops, and direct sunlight. Salts and dusts must be little. | | | | | | | | | | |
| | Ambient temp. | | −10 to +55℃ | Non-condesing and free of ice. | | | | | | | | | |
| | Transport / storage temp. | | −20 to +70℃ | | | | | | | | | | |
| | Humidity | | 20 to 90% RH | | | | | | | | | | |
| | Vibration | | Not more than 4.9m/s² {0.5G} (Conforming to JIS C 0911) | | | | | | | | | | |

*(*1) Voltage unbalance ratio* $= \frac{\textit{max. phase voltage} - \textit{min. phase voltage}}{\textit{3-phase average voltag}} \times 100\ [\%]$

*(*2) Frequency setting with digital signals requires a option control printed circuit card.*

## 9. Block Dia




Frequency adjust potentiometer

Manual override adjuster

Voltage input 0 to −10VDC

Frequency meter

Ammeter (Load meter

Digital signal selection
Forward/stop commar
Reverse/stop commar
Free run command
No. 2 setting selection
Torque limiting selecti
M gear selection
L gear selection
Simple orientation start comr / stop comr
External alarm input
Alarm reset
Contact input common terminal
Braking resistor therm relay input

*Note 1. Use shie*

*2. The term*

*3. Since the relay, co*

*4. The brak sequent*

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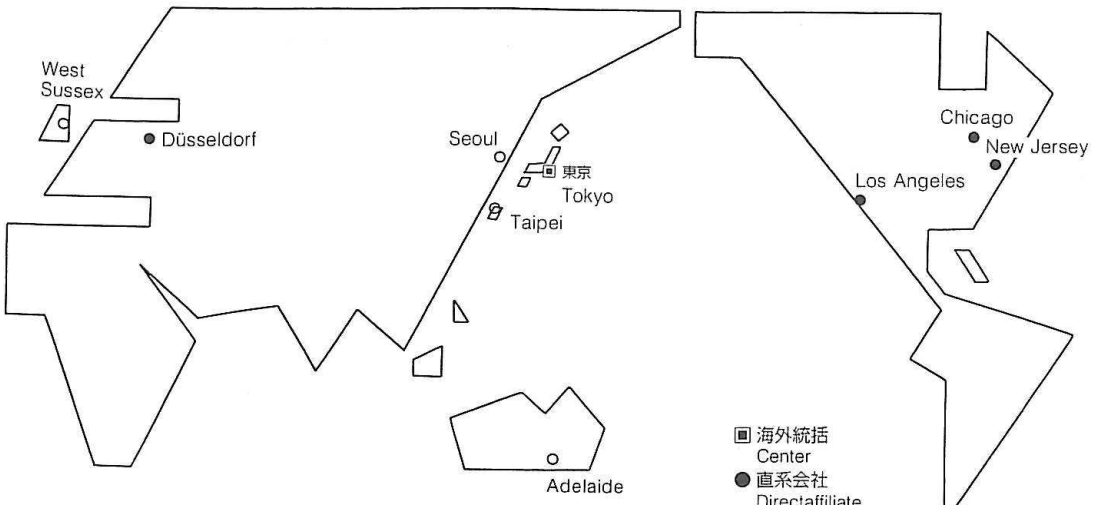
## 10. Function Table

| Opertion mode | Function | | | Data | | | Factory setting |
|---|---|---|---|---|---|---|---|
| | Code | Ref.mark | Name | Setting range | Unit | Min.Unit | |
| Operation monitoring | C001 | ▲ | Output frequency | Display of operating data | Hz | 0.1 Hz | — |
| | C002 | ▲ | Reference frequency | | Hz | 0.1 Hz | |
| | C003 | ▲ | Ammeter / Load meter | | % | 1 % | |
| | C004 | ▲ | Output voltage (Reference) | | V | 1 V | |
| | C005 | ▲ | Input-signal status (checking) | | — | — | |
| | C006 | ▲ | Output-signal status (checking) | | | | |
| | C007 | | Stop position setting value | HEX notation | | | |
| | C008 | | Shaft position deflection | | | | |
| Basic parameter | P000 | ▲ | Changeover of basic mode / multifunction mode | Basic mode (o), Multifuction mode (-) | — | — | o |
| | P001 | □ ▲ | Maximum frequency | 50.0~270.0 | Hz | 0.1 Hz | 150.0 Hz |
| | P002 | ▲ | Base frequency | 30.0~200.0 | Hz | 0.1 Hz | 50.0 Hz |
| | P003 | ▲ | Voltage at base frequency | 140~200 | V | 1 V | |
| | P004 | ▲ | Acc.time | 0.1~99.9 | s | 0.1 s | 10.0 s |
| | P005 | ▲ | Dec.time | 0.1~99.9 | s | 0.1 s | 10.0 s |
| | P006 | ▲ | Torque boost | 0~100 | % | 1 % | 20 % |
| | P007 | ▲ | Setting for flux control level | 25~100 | % | 1 % | 75 % |
| | P008 | ▲ | Gain for frequency setting signal | −10.0~0.0~+10.0 | % | 0.1 % | 0.0 % |
| | P009 | | Frequency of acc. / dec.pattern setting f1 | 1~50 | Hz | 1 Hz | 20 Hz |
| | P00A | | Frequency of acc. / dec.pattern setting f2 | 1~270 | Hz | 1 Hz | 50 Hz |
| | P00b | | Frequency of acc. / dec.pattern setting f3 | 1~270 | Hz | 1 Hz | 100 Hz |
| | P00C | | Frequency of acc. / dec.pattern setting f4 | 1~270 | Hz | 1 Hz | 150 Hz |
| | P00d | | Acc. / dec.pattern setting K0 | 10~100 | — | 1 | 50 |
| | P00E | | Acc. / dec.pattern setting K1 | 10~100 | — | 1 | 60 |
| | P00F | | Acc. / dec.pattern setting K2 | 10~100 | — | 1 | 100 |
| | P010 | | Acc. / dec.pattern setting K3 | 10~100 | — | 1 | 100 |
| | P011 | | Acc. / dec.pattern setting K4 | 10~100 | — | 1 | 100 |
| | P012 | | Torque limiting selection | Active (o), Inactive (-) | — | — | o |
| | P013 | | Torque limiter (driving mode) setting | 20~120 | — | 1 | 120 |
| | P014 | | Torque limiter (braking mode) setting | 20~120 | — | 1 | 120 |
| | P015 | | Slip frequency compensation level | 0.0~3.0 | Hz | 0.1 Hz | 1.0 Hz |
| Multifunction parameter | P101 | □ | No.2 maximum frequency | 50.0~270.0 | Hz | 0.1 Hz | 150.0 Hz |
| | P102 | | No.2 base frequency | 30.0~200.0 | Hz | 0.1 Hz | 50.0 Hz |
| | P103 | | No.2 voltage at base frequency | 140~200 | V | 1 V | |
| | P104 | | No.2 acc.time | 0.1~99.9 | s | 0.1 s | 10.0 s |
| | P105 | | No.2 dec.time | 0.1~99.9 | s | 0.1 s | 10.0 s |
| | P106 | | No.2 torque boost | 0~100 | % | 1 % | 20 % |
| | P107 | | No.2 setting for flux control level | 25~100 | % | 1 % | 75 % |
| | P108 | | No.2 gain for frequency setting signal | −10.0~0.0~+10.0 | % | 0.1 % | 0.0 % |
| | P109 | | No.2 frequency of acc. / dec.pattern setting f1 | 1~50 | Hz | 1 Hz | 20 Hz |
| | P10A | | No.2 frequency of acc. / dec.pattern setting f2 | 1~270 | Hz | 1 Hz | 50 Hz |
| | P10b | | No.2 Frequency of acc. / dec.pattern setting f3 | 1~270 | Hz | 1 Hz | 100 Hz |
| | P10C | | No.2 Frequency of acc. / dec.pattern setting f4 | 1~270 | Hz | 1 Hz | 150 Hz |
| | P10d | | No.2 acc. / dec.pattern setting K0 | 10~100 | — | 1 | 50 |
| | P10E | | No.2 acc. / dec.pattern setting K1 | 10~100 | — | 1 | 60 |
| | P10F | | No.2 acc. / dec.pattern setting K2 | 10~100 | — | 1 | 100 |
| | P110 | | No.2 acc. / dec.pattern setting K3 | 10~100 | — | 1 | 100 |
| | P111 | | No.2 acc. / dec.pattern setting K4 | 10~100 | — | 1 | 100 |
| | P112 | | No.2 torque limiting selection | Active (o), Inactive (-) | — | — | o |
| | P113 | | No.2 torque limiter (driving mode) setting | 20~120 | — | 1 | 120 |
| | P114 | | No.2 torque limiter (braking mode) setting | 20~120 | — | 1 | 120 |
| | P115 | | No.2 slip frequency compensation level | 0.0~3.0 | Hz | 0.1 Hz | 1.0 Hz |
| | P181 | | DC braking voltage | 1~10 | % | 1 % | 2 % |
| | P182 | | DC braking time | 0~300 | s | 1 s | 1 s |
| | P183 | | Frequency level detection | 1~270 | Hz | 1 Hz | 150 Hz |
| | P184 | | Frequency equivalence detection range | 0.5~5.0 | Hz | 0.1 Hz | 2.5 Hz |
| | P185 | | DC braking starting frequency | 0.5~5.0 | Hz | 0.1 Hz | 0.5 Hz |
| | P186 | | Override selection | Active (o), Inactive (-) | — | — | - |
| | P187 | | Override band setting | 20~50 | % | 1 % | 50 % |
| | P188 | | M gear selection | 1.0~9.9 | — | 0.1 | 2.0 |
| | P189 | | L gear selection | 1.0~9.9 | — | 0.1 | 4.0 |
| | P1b1 | | ORT creeping frequency setting | 0.5~10.0 | Hz | 0.1 Hz | 1.0 Hz |
| | P1b2 | | ORT stopping signal ON timer setting | 20~1000 | ms | 20ms | 500 ms |
| | P1b3 | | ORT completion signal ON timer setting | 20~1000 | ms | 20ms | 100 ms |

| Opertion mode | Co |
|---|---|
| Calibration parameter | P2 |
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| Option parameter | P3 |
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| Protection | P6 |
| Fault | F6 |
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*Note 1. The fun*
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*3. ORT:*

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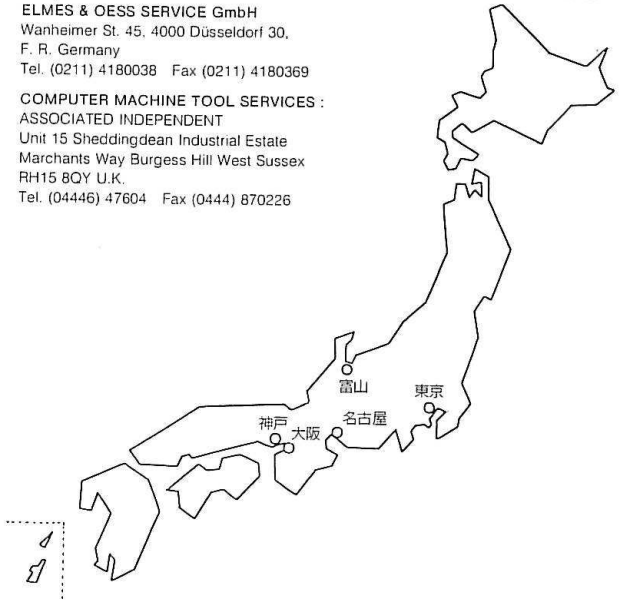
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