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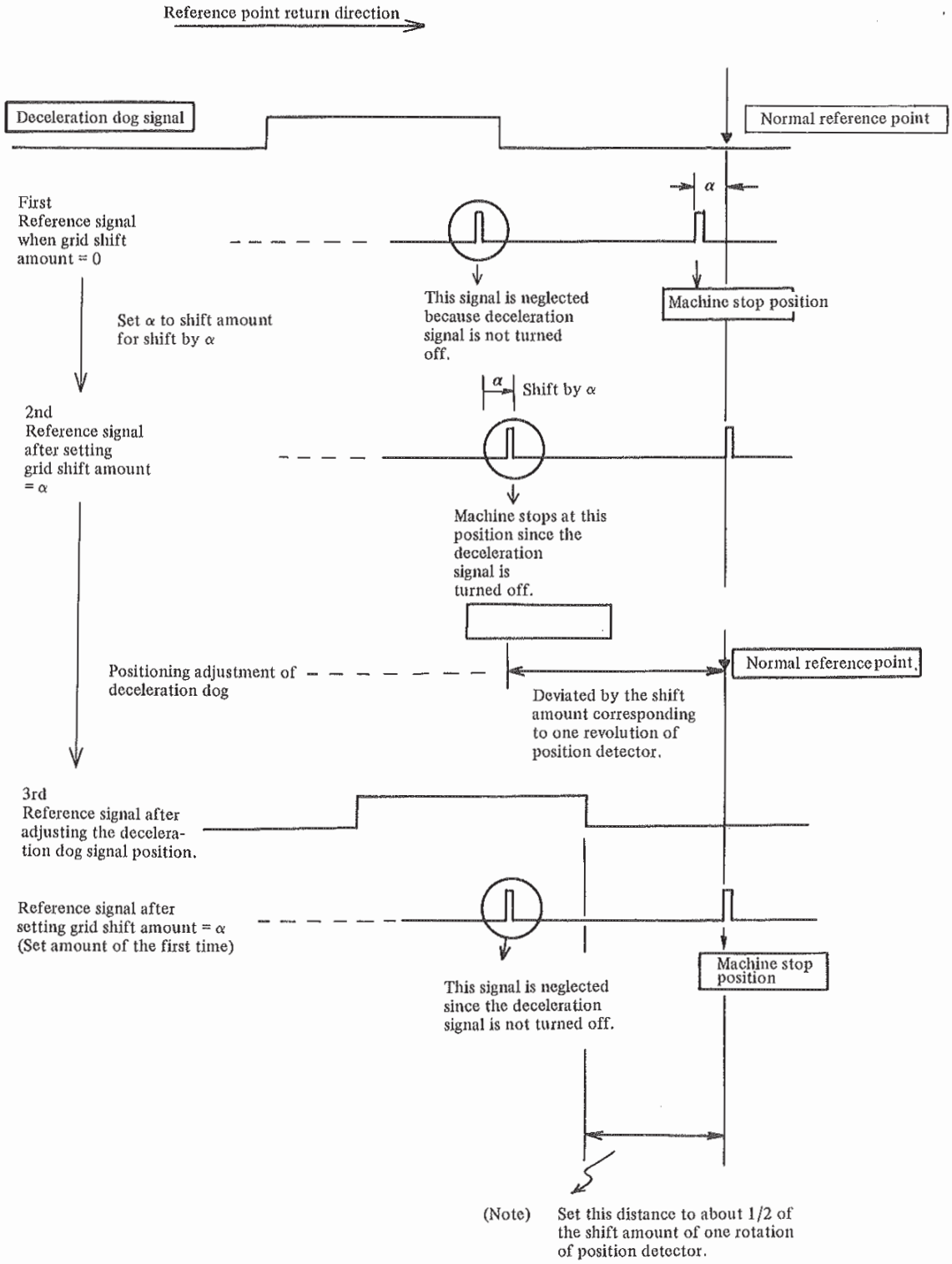
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3.3.14 System error

If a system error occurrs, the system can rarely be repaired by users. Please contact your nearest FANUC service center.
The system may be recovered by changing parameters and other countermeasures. For details, refer to the following table.
1) System error when power is turned on

No.	Display on CRT	Error contents	Counter-measures
1	ROM PARITY ERROR aaa bbb ...	Inconsistency of ROM parity aaa,bbb,...: Faulty ROM No.	Check to see if ROM is mounted correctly.
2	RAM TEST : ERROR (LED display b)	An error was detected by RAM test. (RAM in short area)	
3	RAM TEST : ERROR aaaaaa : wwwwwwww rrrrrrrr	An error was detected by RAM test. aaaaaa: Address wwwwwwww: rrrrrrrr: Readout data	
4	MISSING OPTION ROM aaa bbb ...	Essential option ROM is missing. aaa,bbb,...: Required ROM No.	Check to see if ROM is mounted correctly. Check parameter setting is correct.
5	MISSING OPTION RAM	Essential option RAM is missing.	Check option RAM for correct mounting condition. Check to see if parameters are set correctly.
6	IMPROPER NUMBER OF AXIS	The number of preset controlled axes is incorrect. (Not within the range of 1 ∿ (the number of installed axes).)	Check to see if the additional axis card is correctly installed. Check to see if parameter setting is correct.

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No.	Display on CRT	Error contents	Counter-measures
7	LOAD SYSTEM LABEL : ERROR SAVE SYSTEM LABEL : ERROR LOAD PC PARAMETER : ERROR CLEAR FILE # n : ERROR LOAD FILES : ERROR BUBBLE PREPARATION : ERROR CLEAR BUBBLE : ERROR ..... aaaa bbbb cccc (Displayed after one of the above is displayed)	An alarm occurred halfway during read/write operation of bubble memory.	
8	BUBBLE INITIALIZE : NO BUBBLE BUBBLE PREPARATION : NO BUBBLE CLEAR BUBBLE : NO BUBBLE	Essential bubble memory is not mounted.	Check to see if correct bubble memory is mounted.
9	CHECK BUBBLE ID : ERROR	Identification code showing the type of bubble memory is incorrect.	
10	BUBBLE PREPARATION : NOT READY CLEAR BUBBLE : NOT READY	Power-on processing of bubble memory has been terminated incorrectly. This alarm does not usually occur at first, but is displayed when bubble was accessed after alarm 7, 8, etc., occurred.	
11	NO SYSTEM LABEL	System label (area used to store the type of system, construction, and other data) does not exist. This alarm does not usually appear at first, but appears after the system label was accessed after alarm 7, 8, etc., occurred.	
12	CHECK SYSTEM LABEL : ERROR	System label (see item 11) is incorrect. This alarm is generally displayed when a bubble memory has been installed without initial-izing it for the system or when the memory has not been initialized after fully clearing it.	Initialize the system.

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No.	Display on CRT	Error contents	Counter-measures
13	FILE # n : DATA BROKEN	Data of file No. n is broken. This alarm is displayed when power was turned off halfway during the course of changing the file. (10 series)	Clear corresponding file, and remake it.

Note 1) If one of the above system alarms occurred, a message in "CRT display" column is displayed on CRT. The system is set to IPL and the initial menu of IPL is displayed after the alarm message.
The system cannot be operated normally until the cause of the system alarm has been eliminated.

2) System alarms during system operation

No.	Display on CRT	Error contents	Counter-measures
1	TRAP 15	System software functions abnormally.	
2	ADDRESS ERROR	An address error (access to odd address) occurred.	
3	BUS ERROR	A bus error (invalid address access) occurred.	
4	ILLEGAL INSTRUCTION	An attempt was made to execute an invalid command.	
5	ZERO DIVIDE	An attempt was made to execute the division when divisor is zero.	
6	CHECK INSTRUCTION	Register exceeds the range in register range check.	
7	TRAPV INSTRUCTION	Overflow trap occurred.	
8	PRIVILEGE VIOLATION	A privilege command violation error occurred.	
9	TRACE	CPU was set to the trace condition.	
10	L1010 EMUL	An attempt was made to execute a command having a command code of Axxx.	
11	L1111 EMUL	An attempt was made to execute a command having a command code of Fxxx.	
12	UNASSIGNED TRAP	An unassigned TRAP occurred.	

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No.	Display on CRT	Error contents	Counter-measures
13	UNASSIGNED INTERRUPT	An unassigned interruption occurred.	
14	SPURIOUS INTERRUPT	A false interruption whose cause remains unknown occurred.	
15	NON MASK INTERRUPT	A NMI whose cause remains unknown occurred.	
16	WATCHDOG ALARM	Watch dog alarm occurred.	
17	RAM PARITY ALARM	An RAM parity error is detected.	Clear all memory in case of 10 series.
18	ROM PARITY ALARM	An ROM parity error is detected.	
19	PC ALARM	A serious PC error occurred.	

Note 1) If one of these system alarms occurred, the CRT displays it and the system cannot be operated. The "display on CRT" in the above table indicates a message will be displayed on the top of the CRT screen. Diagnostic data caused by the error are displayed in the remaining part of the CRT screen. (Detail is omitted.)

3.4 Power Voltage Check

3.4.1 Input unit

1) Types of input units
   Six types of input units are provided for 10/11/12/100/110/120 series, respectively. (The input units for 10/100 series are different from those for 11/110 series.)
   a) For control unit (multitap transformer is not connected) ... Fig. 1
      (10/100 series Built-in type 1, 10TF Built-in type 3, 10/100/11/110M Built-in type 2-2, 10/11 series unbundled type)
   b) For control unit (multitap transformer is connectable) ..... Fig. 2
      (10/11/100/110M Built-in type 2)
   c) For control unit and servo ..... Fig. 3
      (10/11/100/110 series Free-standing type, 10/11/100/110T Built-in type 2)
   d) For control unit ..... Fig. 4
      (12/120 series Built-in type)
   e) For control unit ..... Fig. 5
      (12/120 series Free-standing type A)
   f) For control unit ..... Fig. 6
      (12/120 series Free-standing type B)
   g) For additional power input unit ..... Fig. 7
      (I/O unit)

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2) Input unit PCB
For 10 series A16B-1600-0090
For 11 series A16B-1600-0080
For 12 series A16B-1600-0080
A20B-1001-0210 (only 12 series free standing type B)
Fuses F1, F2, F3, F91, F92 on the PCB
F1, F2, F91, F92 ..... A60L-0001-0901#P4110H (10A) (Control unit input fuse)
F3 ..... A60L-0001-0172#DM03 (0.3A) (Power on/off control circuit fuse)
LED on PCB
PIL ..... Pilot lamp Green light-emitting diode
This lamp remains lit when power is applied to NC.
ALM ..... Alarm Red light-emitting diode
This lamp lights when an alarm signal is received from stabilizer power supply unit.

The PCB (10 series: A16B-1600-0090, 11 series: A16B-1600-0080) in the power input unit
The maintenance procedure on this PCB is mentioned below.

① Two LEDs of PIL and ALM are provided with this PCB. PIL (Green LED) lights while the power is supplied to the power input terminal board TP1. ALM (Red LED) lights when this PCB receives an alarm signal from the power stabilizer unit. When ALM lights, NC line contactors LC1 and LC2 rurn OFF. NC power cannot be turned on under this condition. To reset this condition power supply must be once cut off or the POWER OFF button (Either NC POWER OFF button or external POWER OFF button) must be pushed.

② Even when NC power is off, the power has been supplied to the circuit before the line contactors LC1 (adn LC2) while PL1 lighghts. When you touch some units inside the power input unit, confirm that PIL is not lighting.

③ Check the voltage for relays in the PCB Unit between (0) and (E), 21 to 22V is normal.

④ When it is desired not to cut off the power with an alarm at troubleshooting by ALM lighting, connect check pins between P1 and P2. However, the time taken for troubleshooting must be as short as possible and you must disconnect the check pins immediately after the troubleshooting.

⑤ The fuse F3 (0.32A) will blow out by short-circuiting of parts within the PCB.
Replace the fuse after troubleshooting.
The ordering number of F3 is A60L-0001-0172#DM03.

3) Multitap transformer input fuse (Fig. 2 - 6)
For 10/11/100/110 series F1, F2 ..... A60L-0001-0042#JG1-10 (10A)
For 12/120series Built-in type, Free-standing type A:
F1, F2 ..... A60L-0001-0042#JG1-20
For 12/120 series Free-standing type B:
F1, F2 ..... A60L-0001-0042#JG1-30

4) Servo transformer input fuses
The fuse capacity differs according to servo transformer capacity. See the following table.

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Table 3.4.1 (a) Servo input fuse for 10/11/100/110

Power voltage	Fuse type / Transformer Capacity(KVA)	PC type made by Utsunomiya Electric Co.	FCF type made by Fuji Electric Co.
200 V 220 V	1.5 kVA	15 A	20 A
	2.5	20	30
	5	30	30
	10	40	40
	15	50	50
380 V 〜 440 V	1.5	10	10
	2.5	10	15
	5	15	15
	10	25	30
	15	30	30
480 V 〜 550 V	1.5	10	10
	2.5	10	15
	5	15	20
	10	20	30
	15	25	30

Table 3.4.1 (b) Servo input fuse for 12/120 series

Power voltage	Fuse type / Transformer Capacity(KVA)	JG type made by Utsunomiya Electric Co.
200 V 〜 550 V	1.5 KVA	15 A
	2.5	20 A
	5	30 A
	10	40 A

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3.4.2 Input power voltage check

Check to see if the input power voltage satisfies the following requirements:

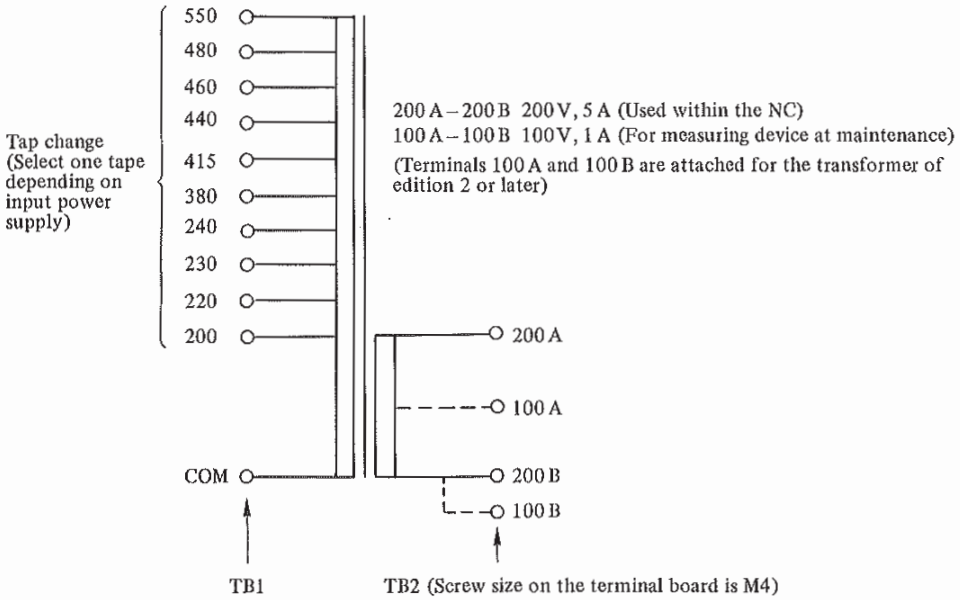
1) In case of input unit shown in Fig. 1.
   AC 200 V $^{+10\%}_{-15\%}$, 50/60 Hz $\pm$1 Hz, 1ϕ, AC 220 V $^{+10\%}_{-15\%}$, 60 Hz $\pm$1 Hz, 1ϕ

2) In case of the input unit shown in Fig. 2, 4 and 6 (when multitap transformer is used).
   AC 200 V/220 V/230 V/240 V/380 V/415 V/440 V/460 V/480 V/550 V
   Rated fluctuation range $^{+10\%}_{-15\%}$, 50/60 Hz $\pm$1 Hz, 1ϕ

3) In case of input unit shown in Fig. 3 and 5 (when multitap transformer is used).
   AC 200 V/220 V/230 V/240 V/380 V/415 V/440 V/460 V/480 V/550 V
   Rated fluctuation range $^{+10\%}_{-15\%}$, 50/60 Hz $\pm$1 Hz, 3ϕ

CONTROL UNIT POEWR TRANSFORMER

A control unit power transformer (A80L-0001-0176) is required when the input power supply is other than AC 200V, 50 Hz and AC 220V, 60Hz.
This transformer has taps for AC 200/220/230/240/380/415/440/460/480/550V on the primary side (MULTI-TAP TRANSFORMER). Select one tap depending on input power voltage.



An output between 100A and 100B is used only for measuring device at maintenance. This output must not be used for a long time. Also, because this output does not have any protective means such as fuses, even when used for measuring device, you must carefully examine whether the measuring device has the shrot-circuit or whether the load current does not exceed 1A.
Moreover, when you touch on the terminals such as TB1, TB2, etc, you should touch after turnign off the main switch of the magnetics cabinet. (You can confirm the main switch ON and OFF by the PIL lamp in the power input unit. PIL lights while the main switch is ON, but extinguishes while that is OFF.)

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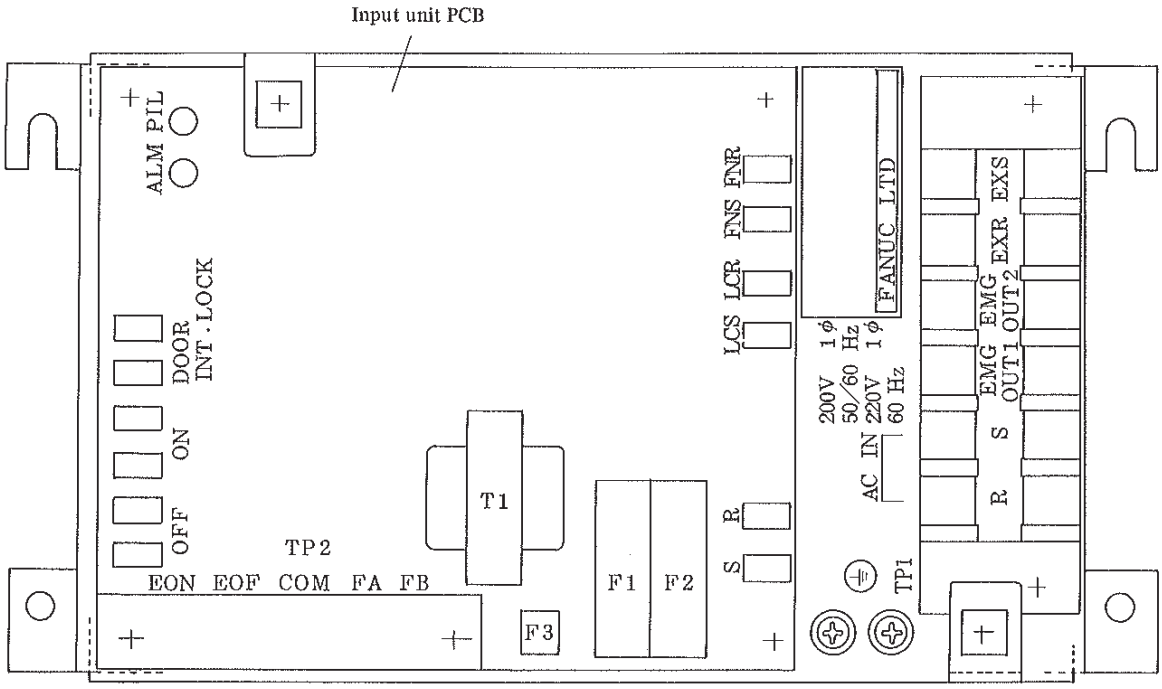


Fig. 3.4.2 (a) Input unit for 10/11 series built-in type 1, 10TF built-in type 3 10M/11M built-in type 2-2, and 10 series 11T/M unbundle-type cabinet

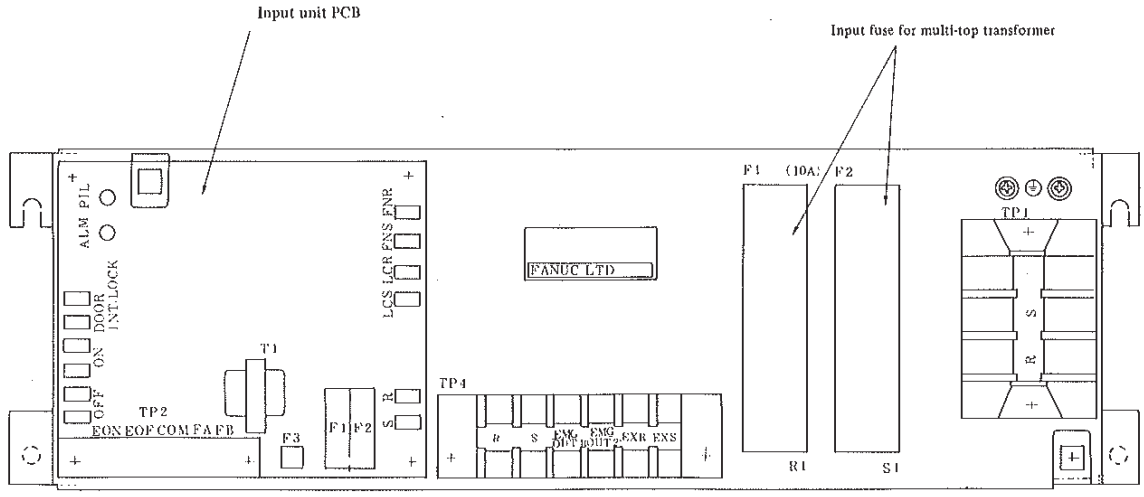


Fig. 3.4.2 (b) Input unit for 10M/11M built-in type cabinet

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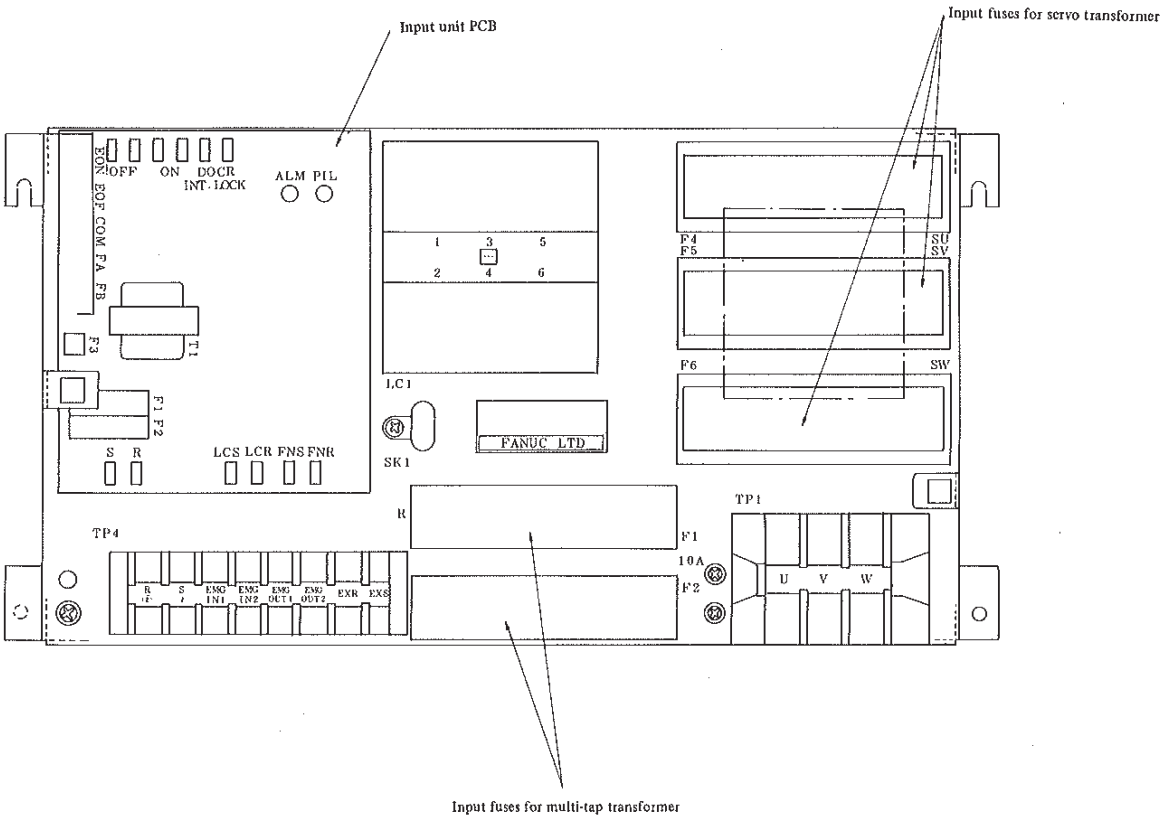


Fig. 3.4.2 (c) Input unit for 10T/M, 11T/M free-standing type and 10T/11T built-in type 2 cabinet

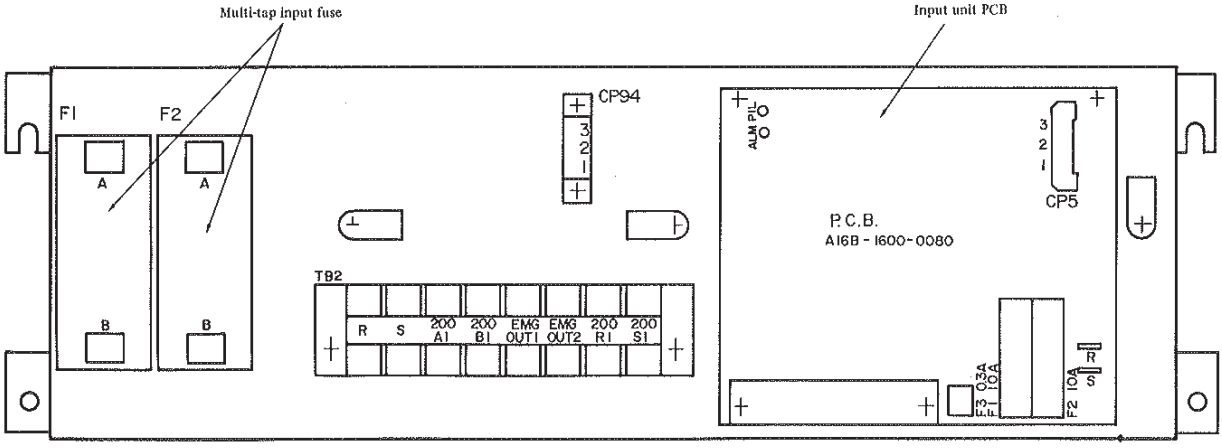


Fig. 3.4.2 (d) Input unit for 12 series built-in type cabinet

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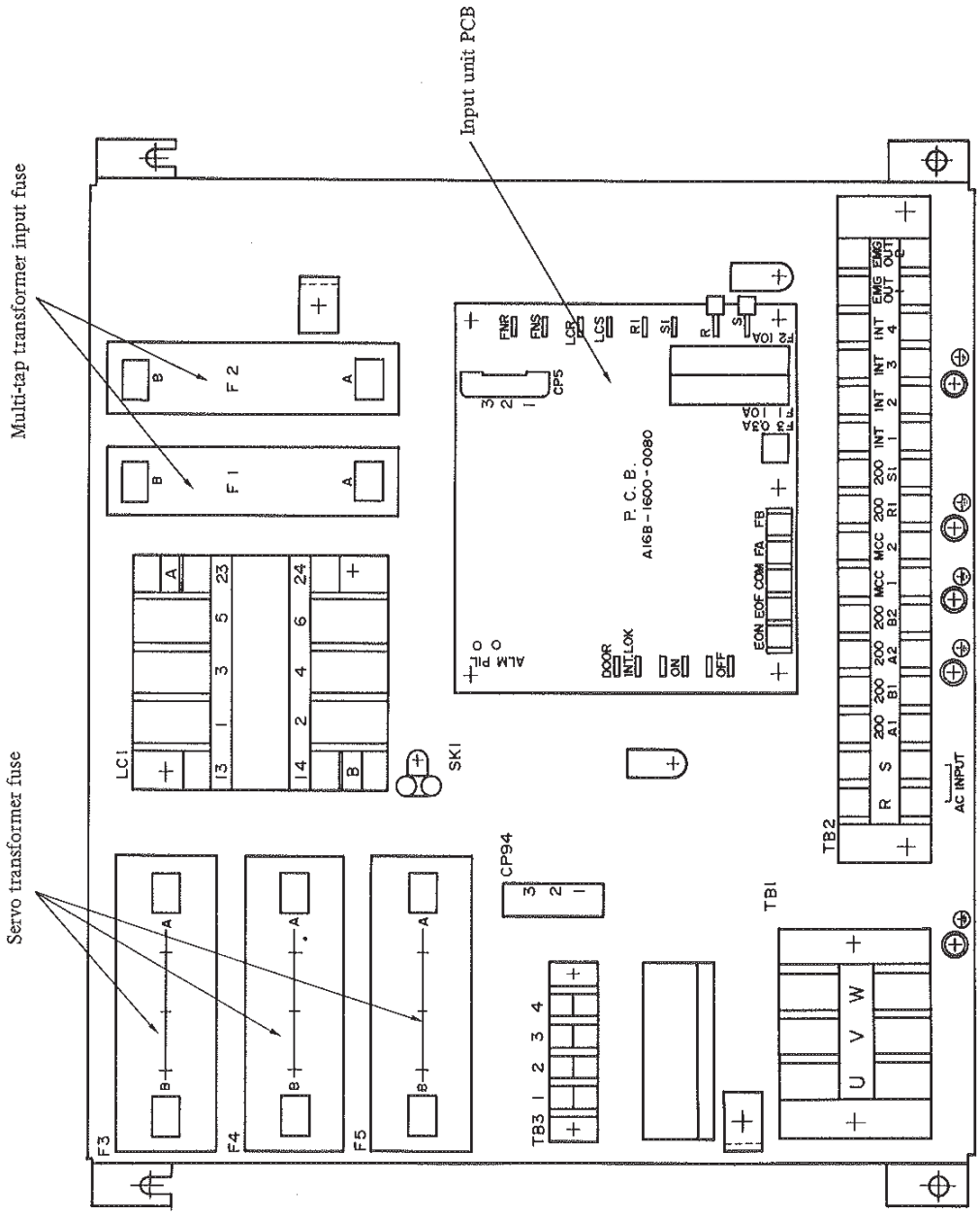


Fig. 3.4.2 (e) Input unit for 12 series free-standing type A cabinet

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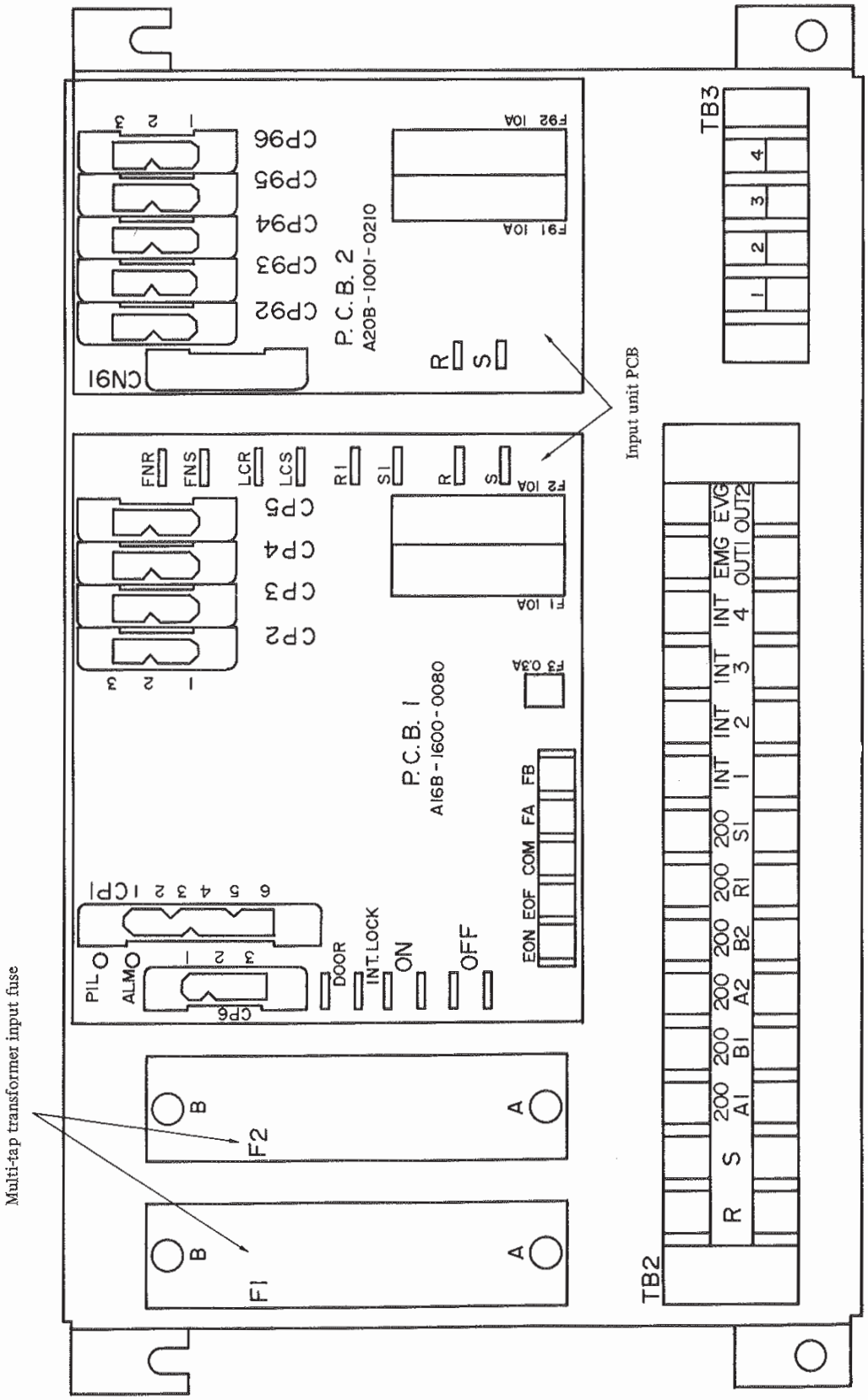


Fig. 3.4.2 (f) Input unit for 12 series free-standing type B cabinet

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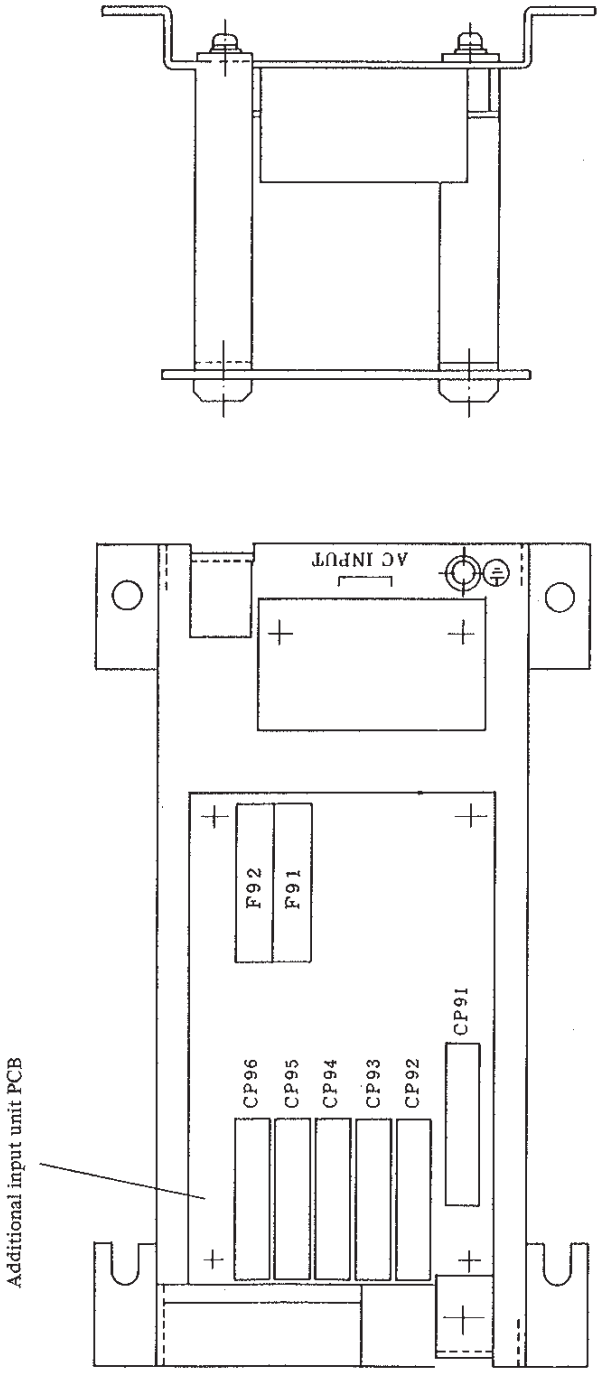


Fig. 3.4.2 (g) Additional power input unit

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3.4.3 DC voltage checking

DC voltages supplied from the power unit must be measured at CP17 checking terminals on the power unit. Confirm that DC voltages are within the allowable range.

1) Rated output voltage

Terminal name	Rated voltage	Allowable fluctuation	Use
+5	+5 V	±5%	Logical circuit
+24	+24 V	±10%	Bubble memory, tape reader, Small type, CRT
+24E	+24 V	±10%	I/O signals
+15	+15 V	±5%	Position control circuit
-15	-15 V	±5%	Position control circuit, Bubble memory
A0	0 V	-	——

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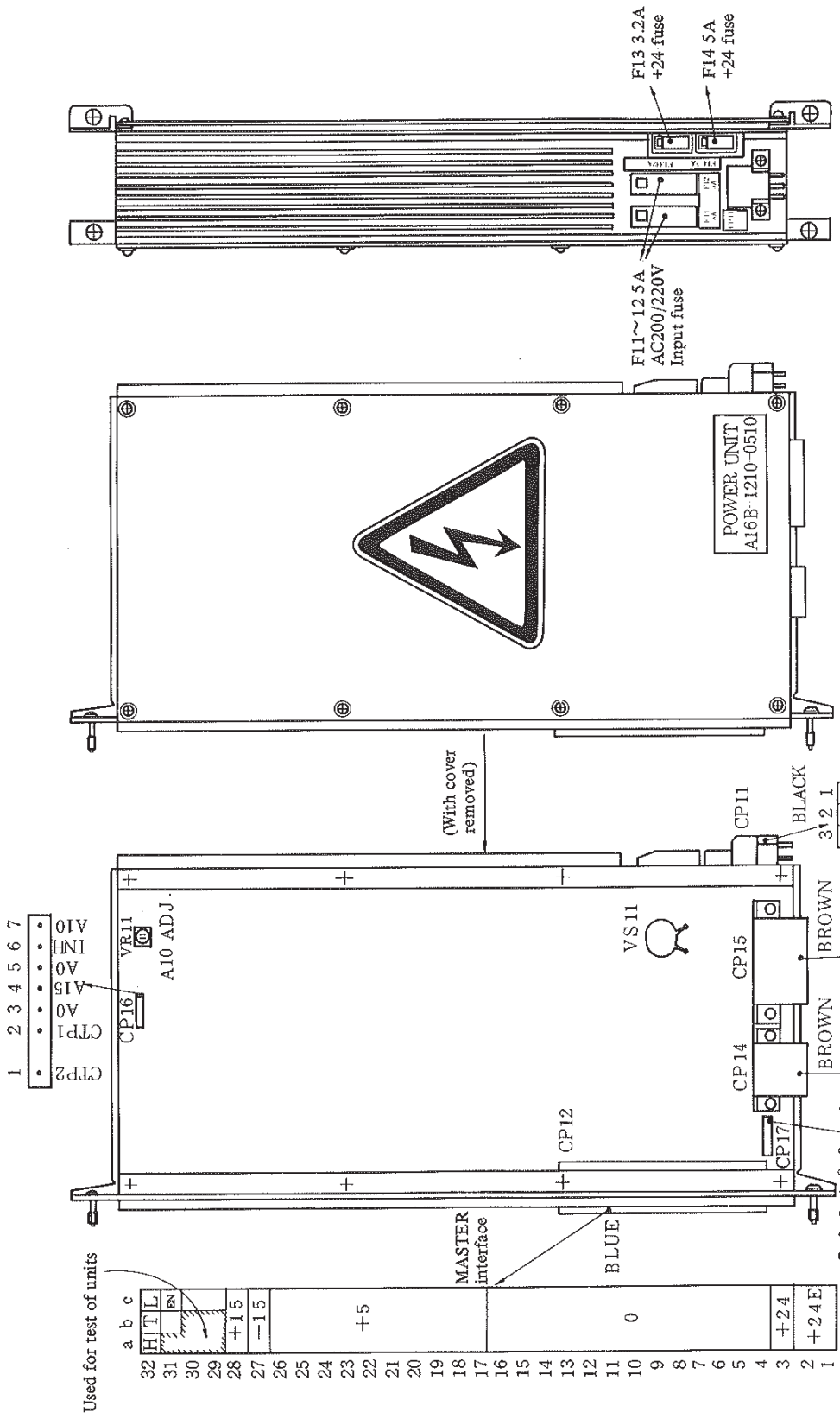


Fig. 3.4.3 (a) Power unit for 10/100 series outer view

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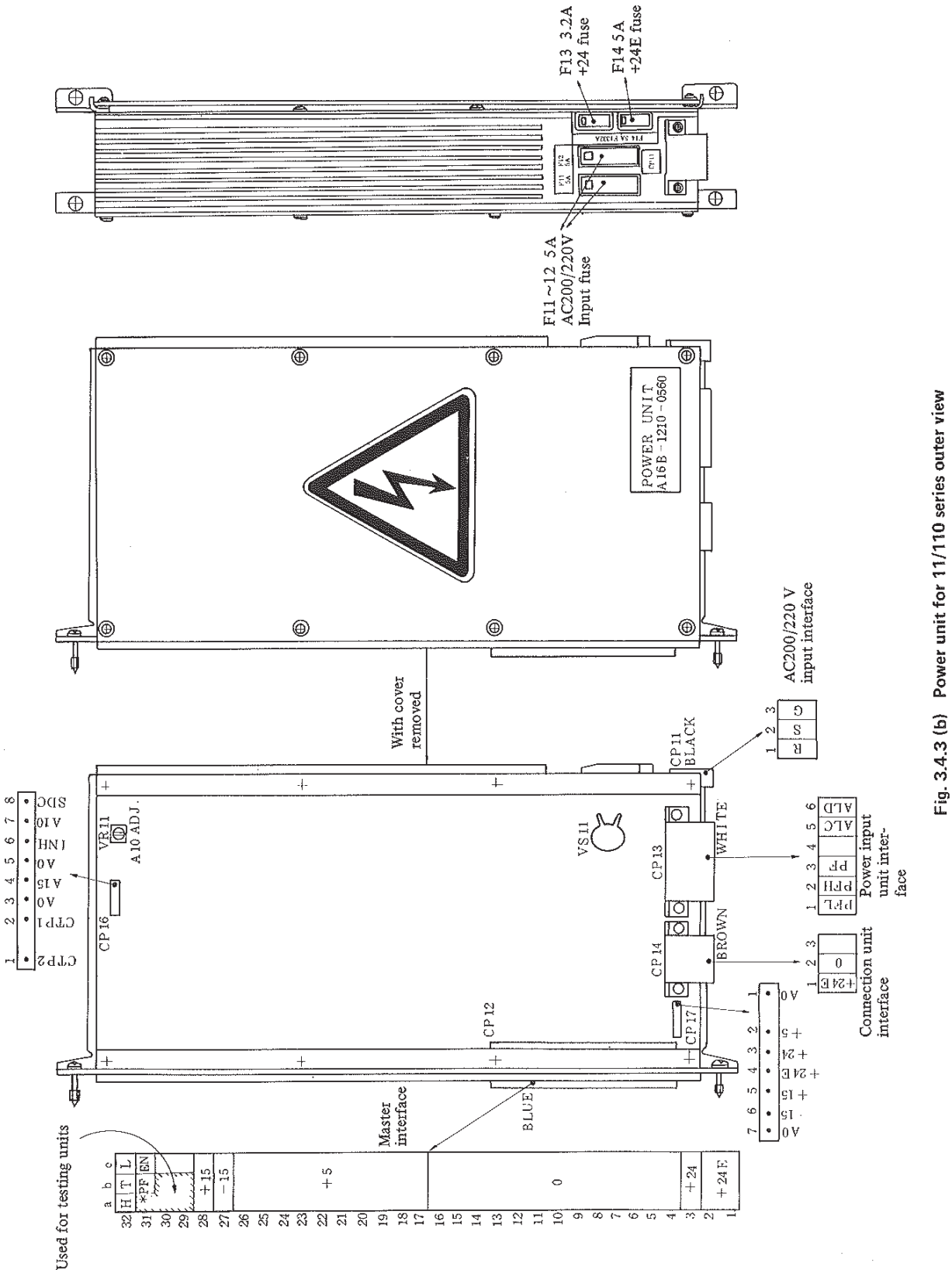


Fig. 3.4.3 (b) Power unit for 11/110 series outer view

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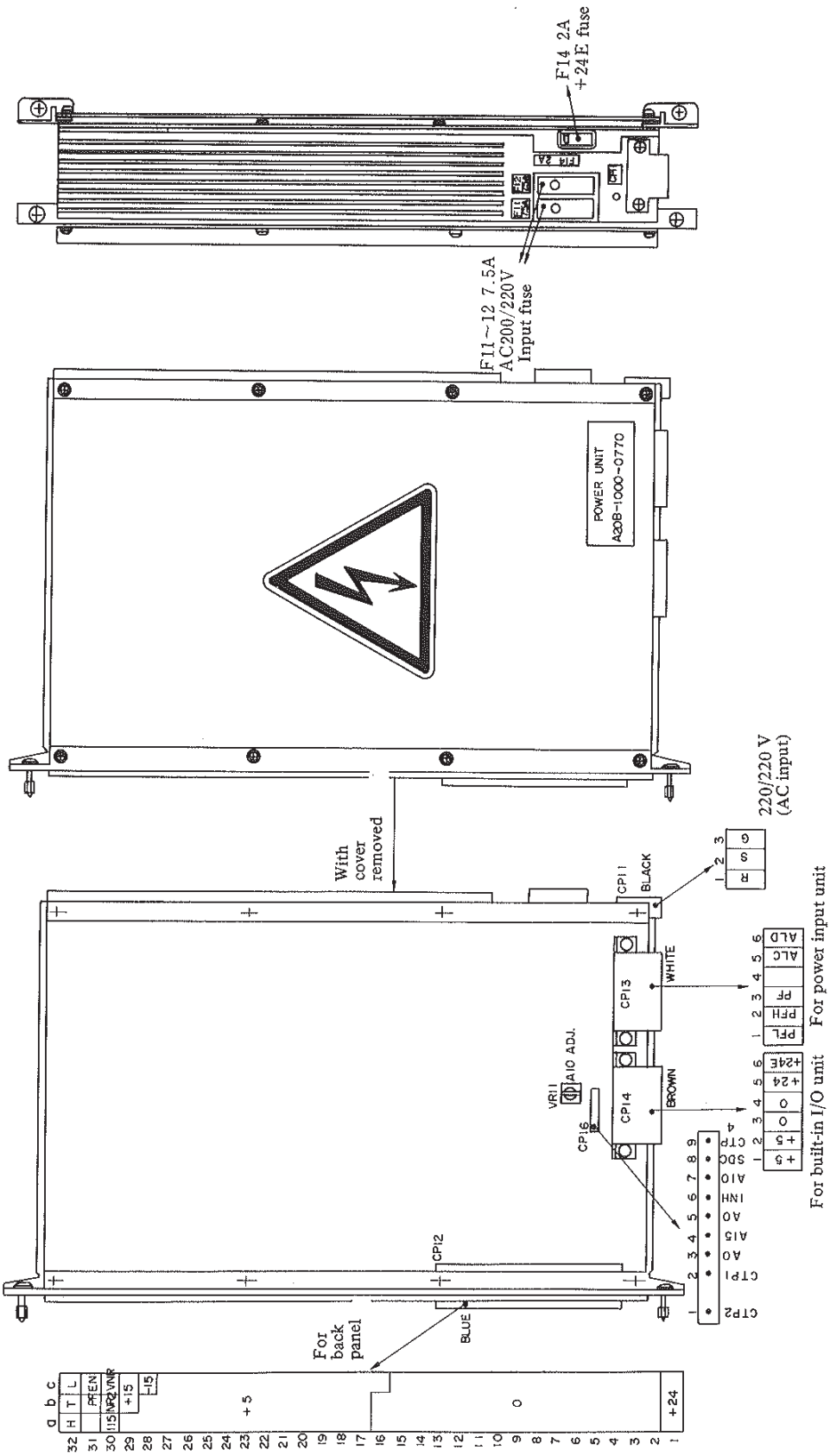


Fig. 3.4.3 (c) Power unit for 12/120 series outer view

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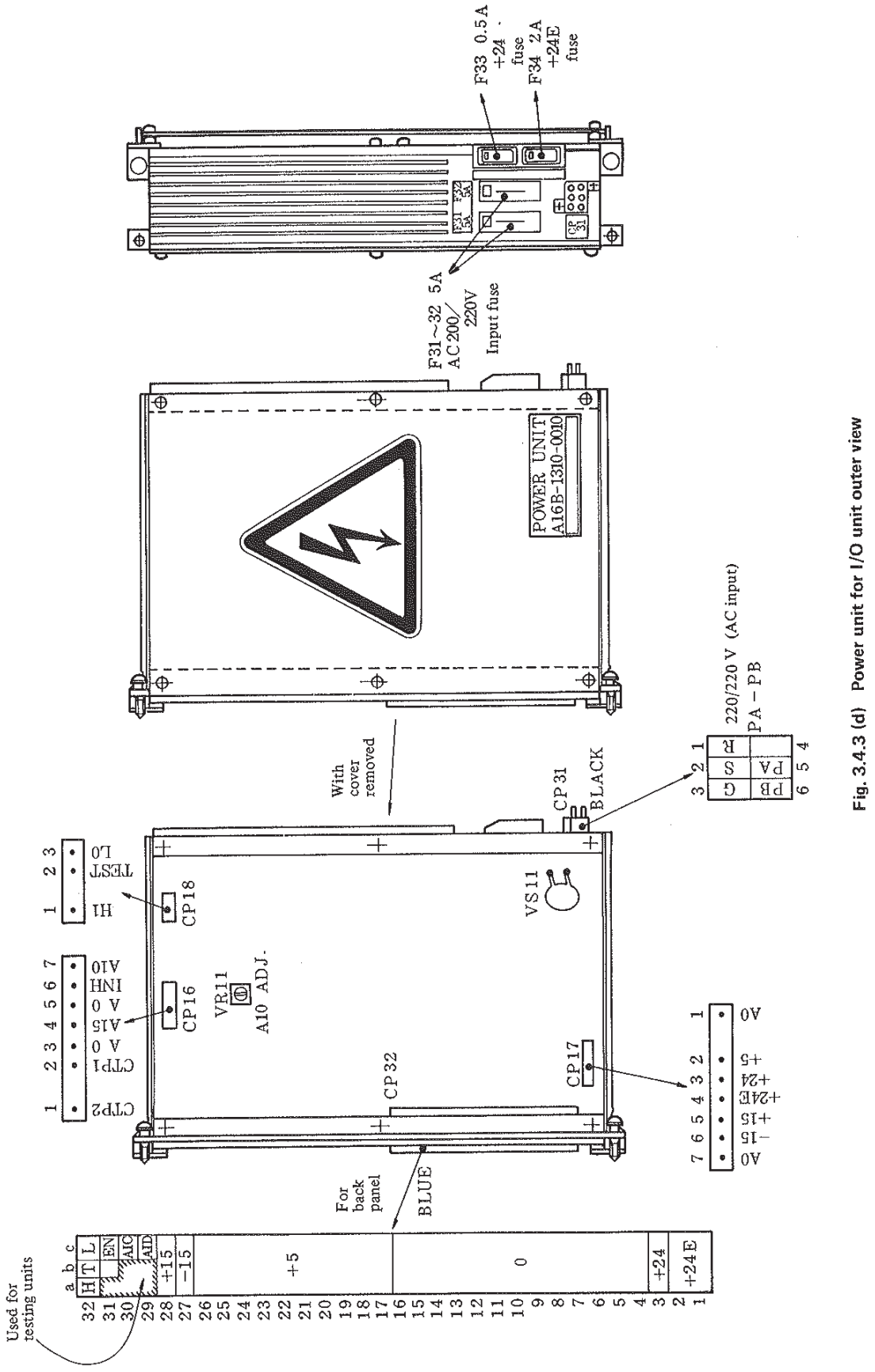
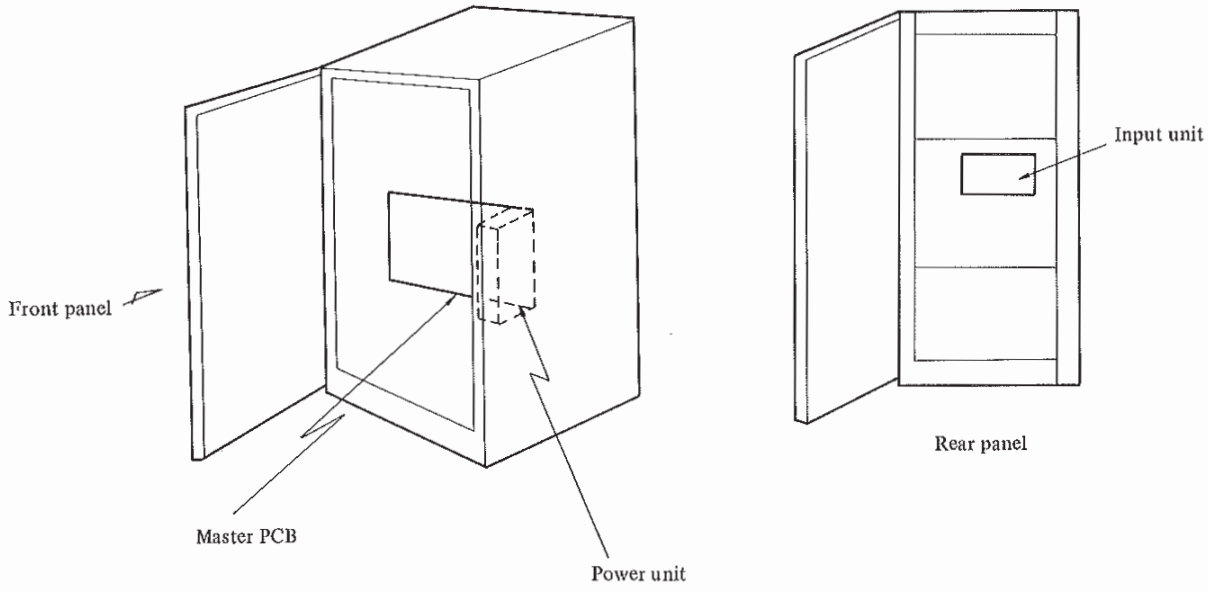


Fig. 3.4.3 (d) Power unit for I/O unit outer view

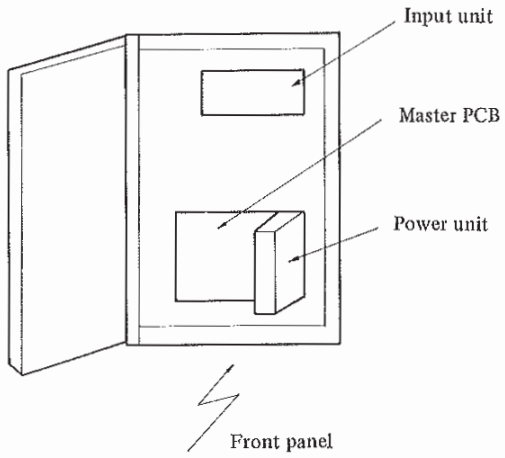
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2) Adjustable points on power unit PCB
   10/100 series A16B-1210-0510
   11/110 series A16B-1210-0560
   12/120 series A20B-1000-0770
   It is not usually necessary to adjust the reference voltage (+10 V). However, if the reference voltage is deviated due to a certain cause, a power alarm may occur.
   The reference voltage can be readjusted by VR11 (A10 ADJ) to +10.00 V while measuring the voltage between A0 - A10 terminals of CP16 using a digital voltmeter.

3) Mounting position of the input unit and power unit in each cabinet
   a) 10/11/100/110 series Free-standing type cabinet

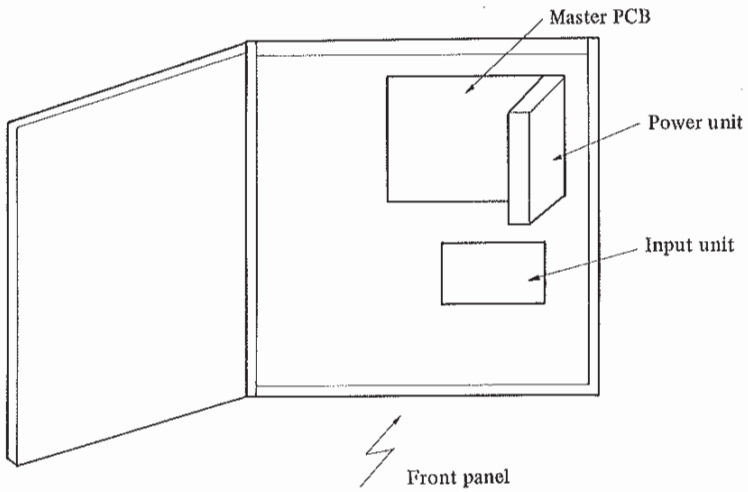


   b) 10/11/100/110 series Built-in type 1 cabinet

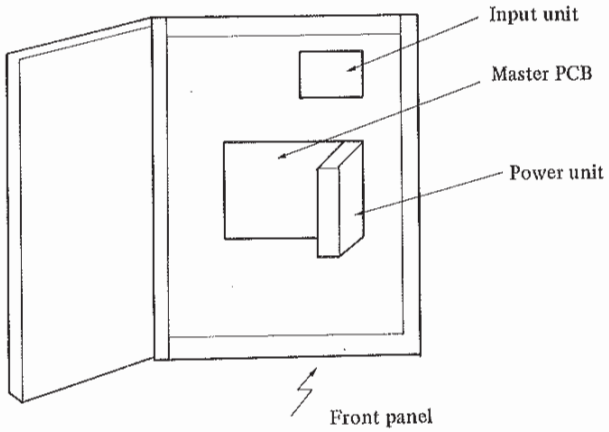


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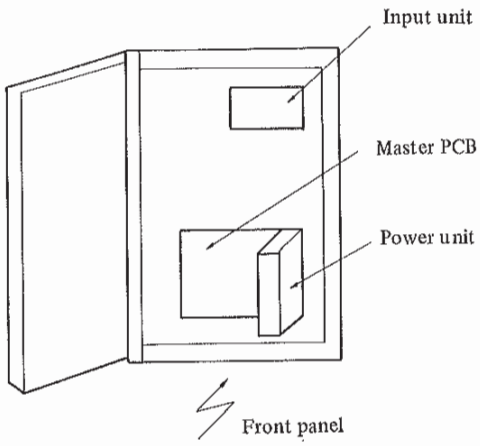
c) 10/11/100/110T Built-in type 2 cabinet



d) 10/11/100/110M Built-in type 2 cabinet

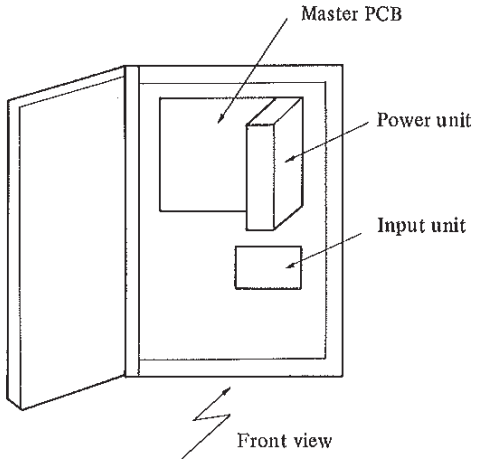


e) 10/11/100/110M Built-in type 2-2 cabinet

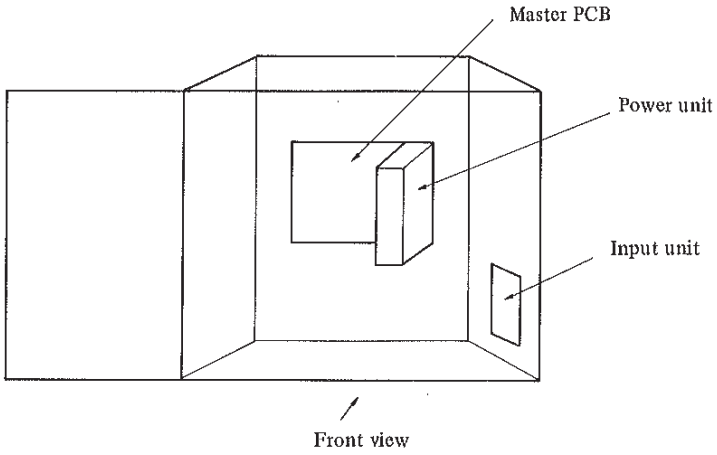


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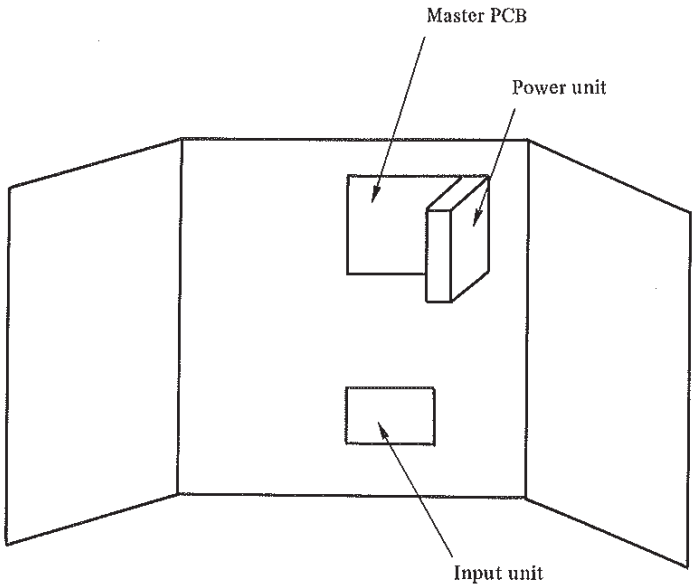
f) 10/11 series Unbundled type cabinet



g) 10TF Built-in type 3 cabinet

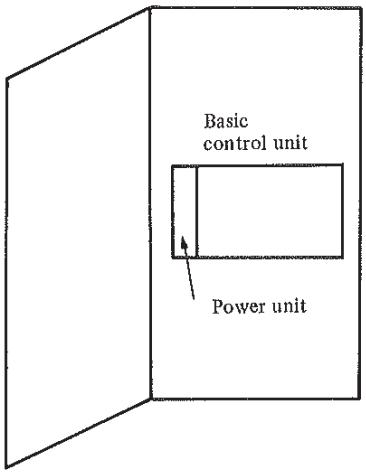


h) 11TT Built-in type 3 cabinet

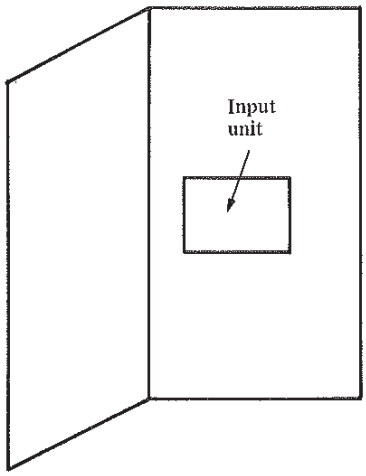


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i) 12/120 series Free-standing type A cabinet

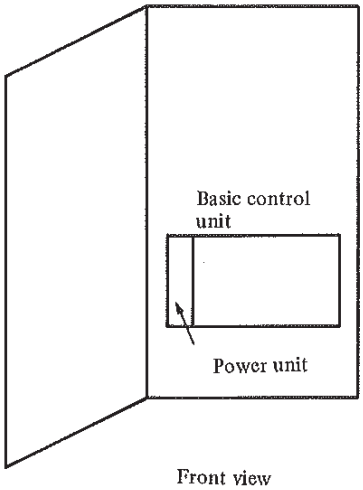


Front view

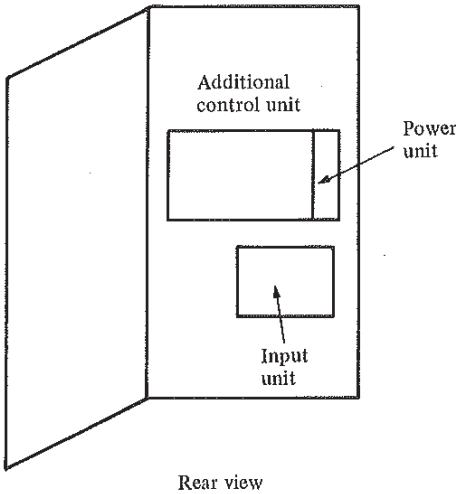


Rear view

j) 12/120 series Free-standing type B cabinet

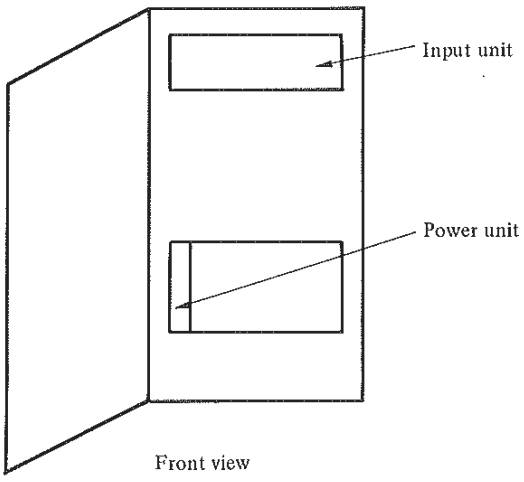


Front view



Rear view

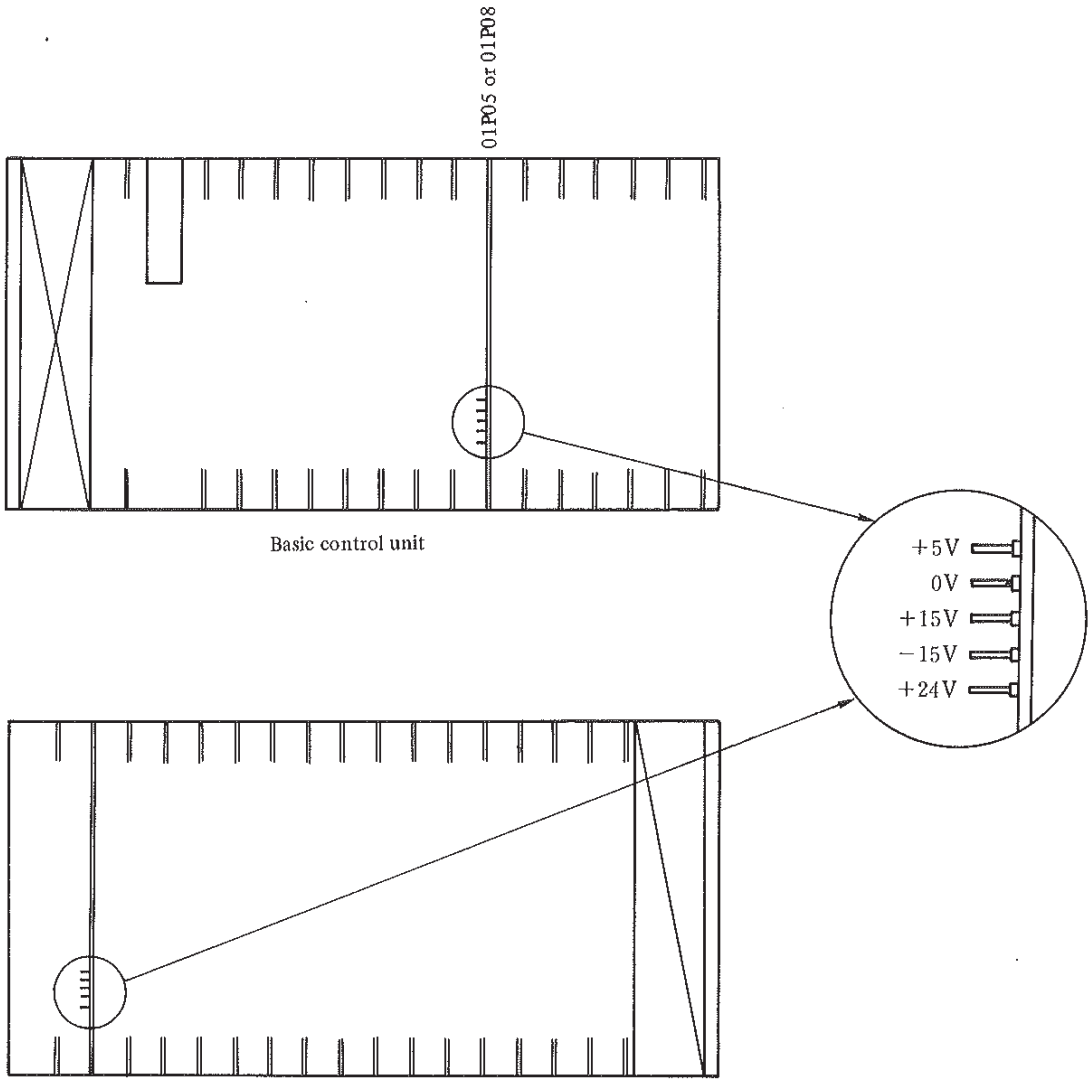
k) 12/120 series Built-in type



Front view

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4) 12/120 series power voltage checking position

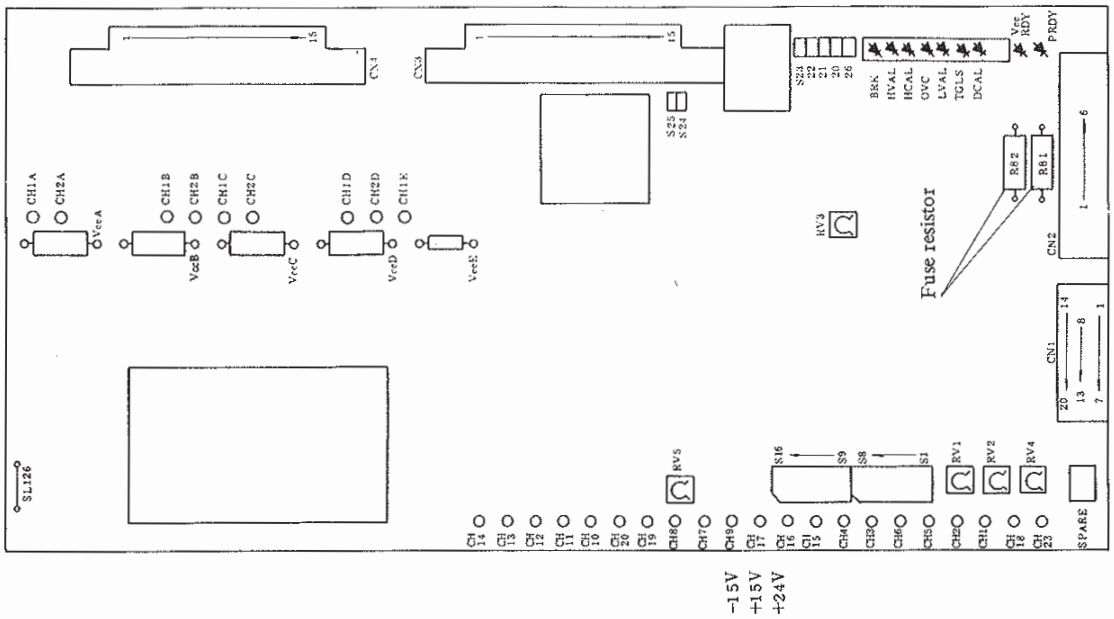


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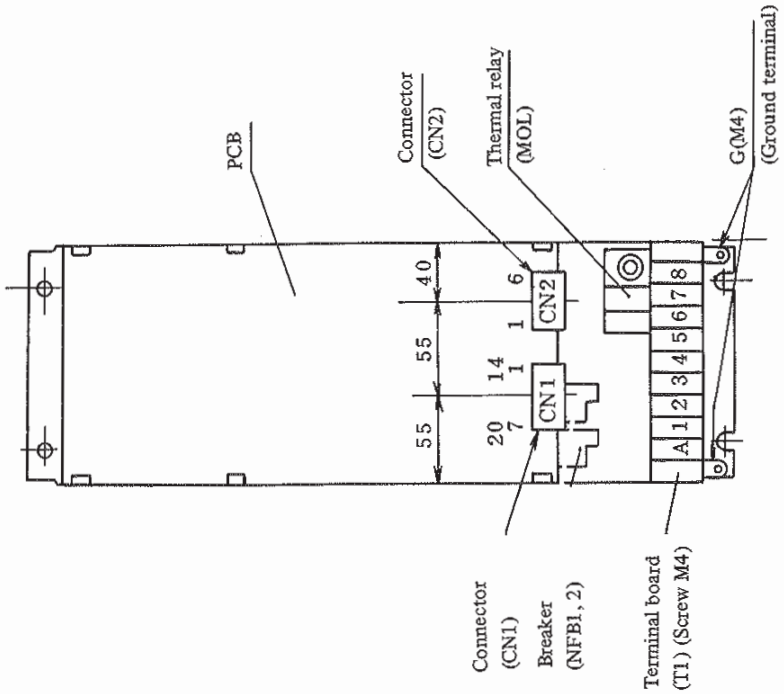
3.4.4 Power voltage check on velocity control unit PCB

1) Check each power output at the check terminals of velocity control unit PCB for each axis.
   - o CH15 ..... +24 V (+23 ∿ +27 V)
   - o CH16 ..... +15 V (+14.55 ∿ +15.45 V)
   - o CH17 ..... -15 V (-14.55 ∿ -15.45 V)

2) Check 100 VAC power supply at T1 screw terminals No. 3 and 4 for each axis. If the emergency stop button of the operator's panel or the emergency stop circuit of the machine tool side is functioning, the 100 V is turned off. In such a case, the emergency stop button or emergency stop circuit must be reset in advance.



Velocity control unit PCB (M series)
A20B-0009-0320



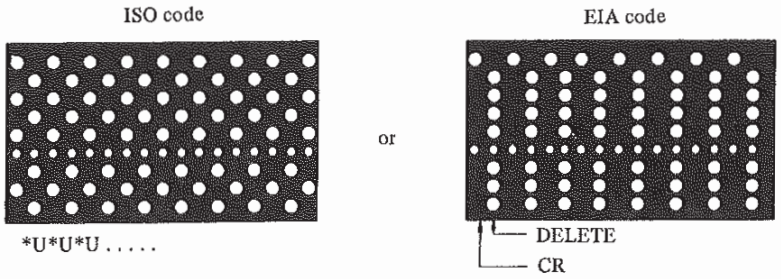
Velocity control unit (M series)

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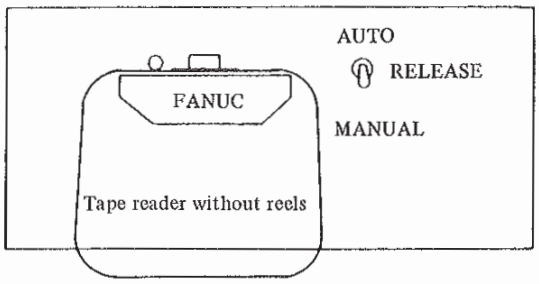
3.5 Tape Reader Photo-amplifier Adjustment

3.5.1 Tape reader without reels photo-amplifier adjustment

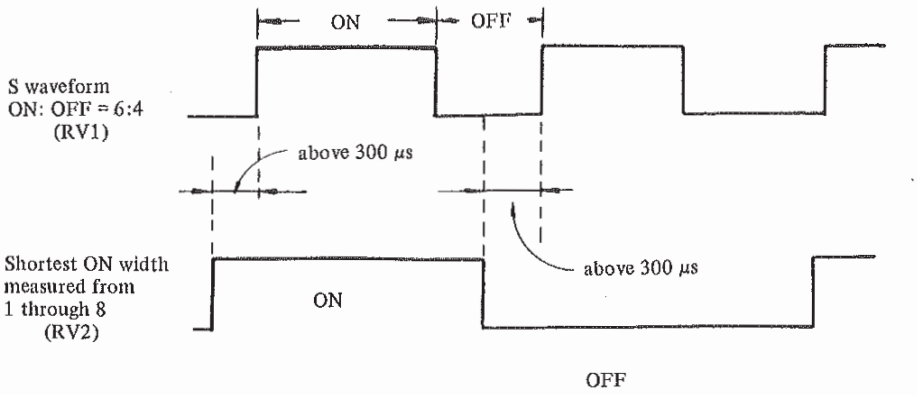
1) With paper tape, make a test tape (approx. 40 cm) as illustrated below that alternates punching and non-punching and connect ends to form an endless loop of tape. (See Note 2, Note 3.)



2) Mount the test tape in the tape reader and turn the switch to MANUAL to read the tape.



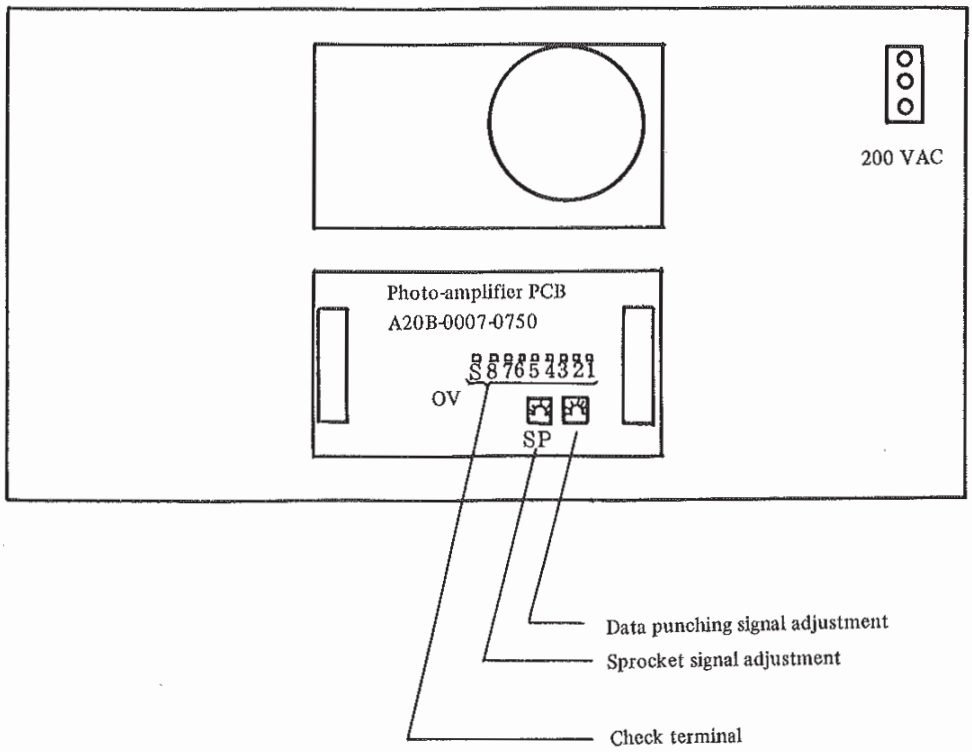
3) With an oscilloscope, measure the waveform between check terminals S and OV (ground) on the photo-amplifier. Adjust it with RV1 so that the ON/OFF timing ratio is 6:4.
4) Measure the waveforms at check terminals 1 through 8 on the photo-amplifier using an oscilloscope. Find the channel where the ON width is the shortest. (Use the terminal OV for grounding.)
5) Measure the waveform where the ON time width is the shortest among 1 through 8 and compare it with the waveform of S. Adjust with RV2 so that the timing indicated in the diagram below is obtained.
6) Confirm that waveforms 1 through 8 satisfy the timing in the diagram below.



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Ajusting position of tape reader without reels photo amplifier

For the tape reader without reel (A13B-0070-B001)



(Note 1) Use paper tape that conforms to the following standard:
Paper tape for data exchange JIS C6243-1970.
Position and size of paper tape punch for data exchange JIS C6246-1971.

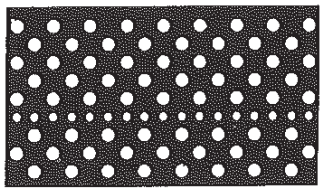
(Note 2) A read error will occur if another tape is used after the tape reader was adjusted with black tape.
When performing an output waveform adjustment of the photo amplifier, use a paper tape color of blue, white, pink, yellow, orange, etc. (other than black or gray) to perform the adjustment. The use of a tape, colored blue, white, pink, etc. with a tape reader adjusted with a black or gray colored tape may sometimes cause a read error. For the case where black colored tape is normally used, a black tape may be used for adjustment.

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3.5.2 Tape reader with reels photo-amplifier adjustment

1) Prepare about 40 cm of the following test tape (see Notes 2, 3 on the previous page) which alternately repeats punching and unpunching, and splice both ends to make an endless tape.

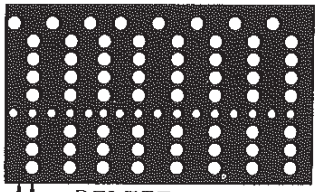
In case of ISO code



*U*U*U*U ·····

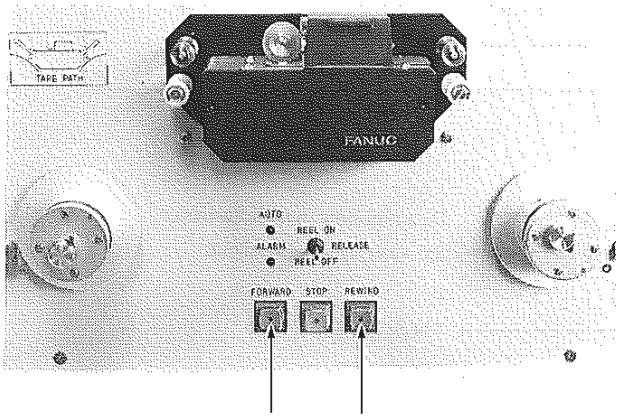
or

In case of EIA code (see Note 4)

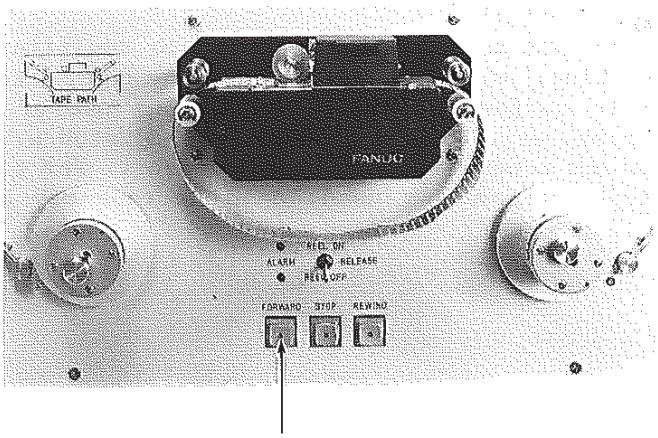


Adjust the photoamplifier by using the built-in adjusting program of the tape reader with reels.

2) Start the adjusting program

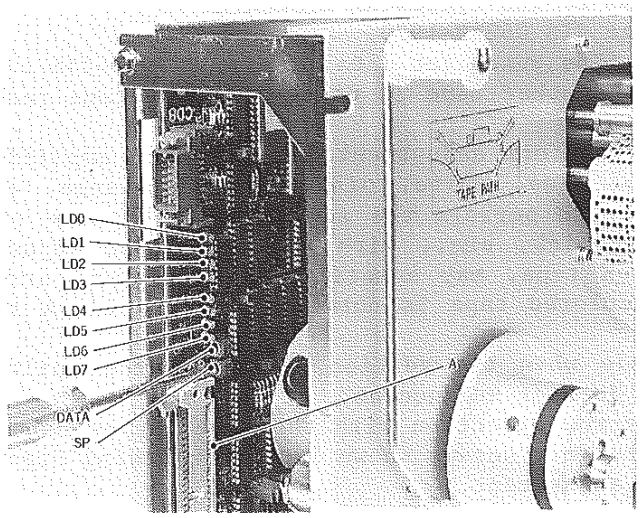


a) Press FORWARD and REWIND switches at the same time while in the RELEASE condition.
b) AUTO and ALARM LED flicker.
c) The adjusting program mode has now been set.

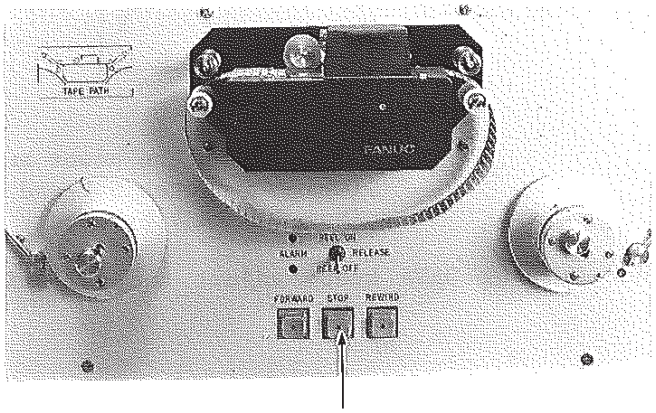


d) Load the test tape. (See Note 3.)
e) Set REEL OFF.
f) Press FORWARD switch.
g) The tape starts moving.

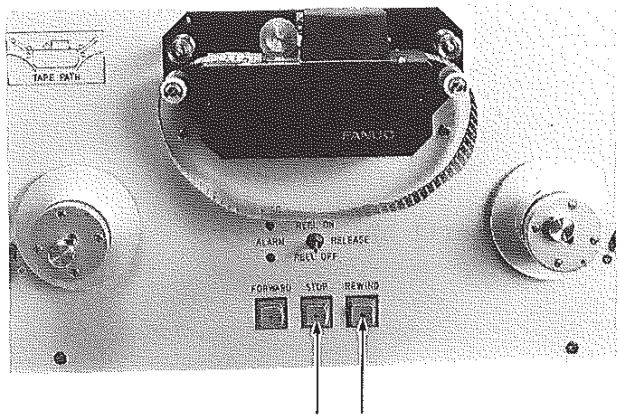
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3) Adjustment
   a) The adjusting position is mounted on the right side as viewed from the rear face of the tape reader with reels. If it is not mounted at the position shown in the left figure, (it is mounted at "A". See Note 4.)
   b) Turn SP knob until LD5 lights.
   c) Turn DATA knob until LD1 flickers. (See Note 5.) This adjustment cannot be made unless LD5 lights.



4) Adjustment end
   a) Press STOP switch.



   b) Set RELEASE.
   c) Press FORWARD and STOP switches at the same time.
   d) Normal mode has been set.
   e) Operate the tape reader with the signal cable normally connected.

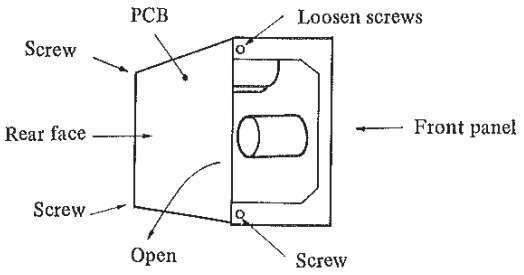
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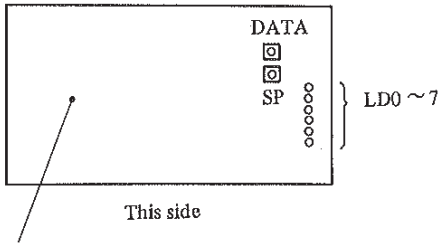
(Note 1) Use paper tape that conforms to the following standard:
Paper tape for data exchange JIS C6243-1970.
Position and size of paper tape punch for data exchange JIS C6246-1971.

(Note 2) A read error will occur if another tape is used after the tape reader was adjusted with a black tape.
When performing an output waveform adjustment of the photo amplifier, use a paper tape color of blue, white, pink, yellow, orange, etc. (other than black or gray), to perform the adjustment. The use of a tape, colored blue, white, pink, etc., with a tape reader adjusted with black and gray colored tape, may sometimes cause a read error. For the case where black colored tape is normally used, a black tape may be used for adjustment.

(Note 3) EIA test tape is applicable when the edition number of the built-in program of the tape reader is B or subsequent.

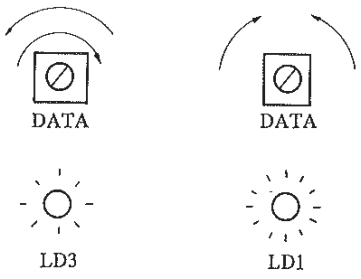
(Note 4) The PCB is opened in the arrow direction with the lower screw used as the fulcrum by loosening the four screws shown in the following figure. Tighten these screws after adjustment.





Never touch the power supply (which produces 5 V and 24 V from 200 VAC) by hand.

(Note 5) If LD0 and LD3 flicker when turning DATA knob, adjust the following knobs.



1) LD3 is flickering.
2) Turn the knob toward the midpoint until LD1 flickers.

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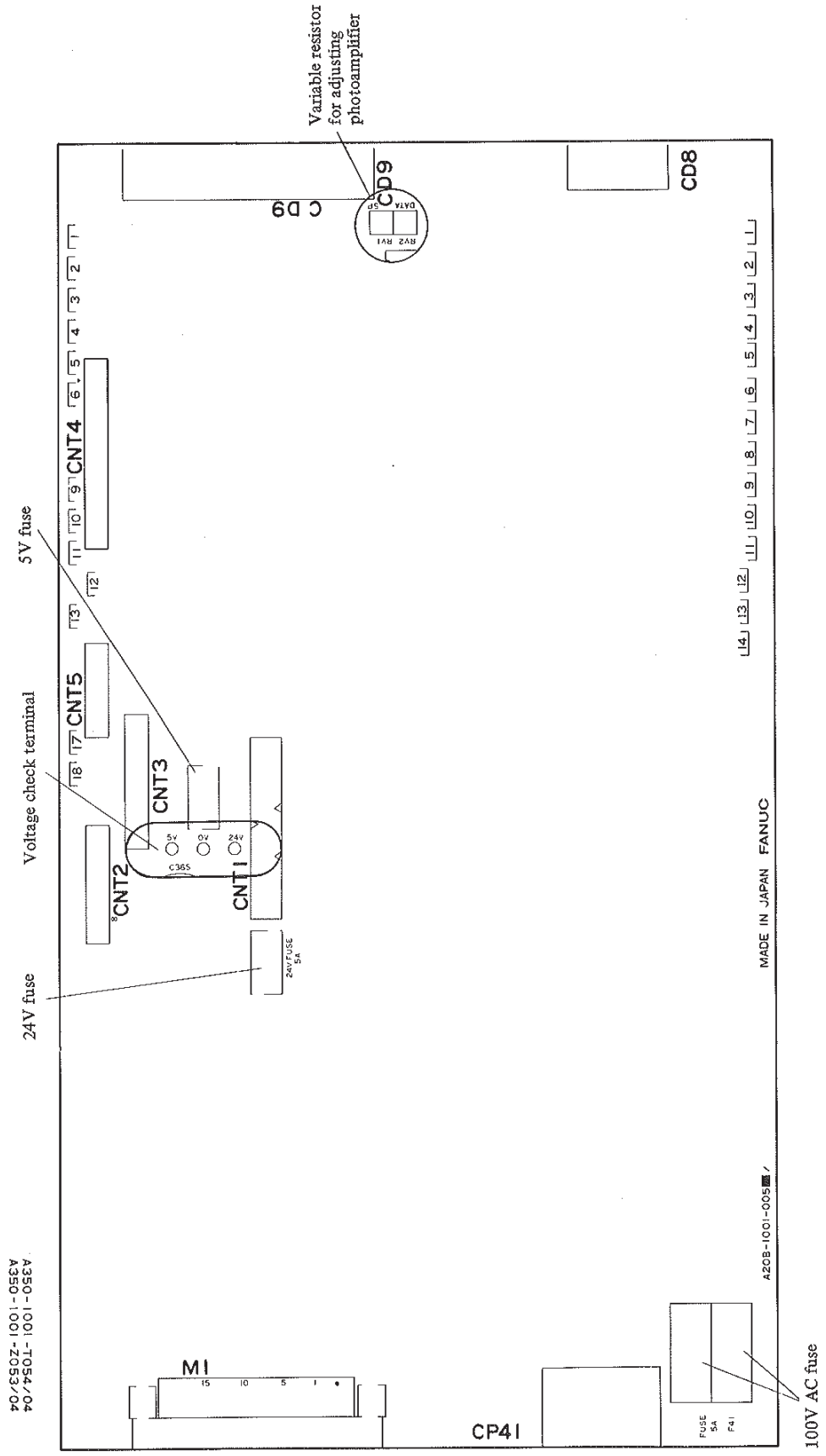


Fig. 3.5.1 (a) Adjusting points on the tape reader with reels PCB

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3.6 Connection Diagram of NC Inside

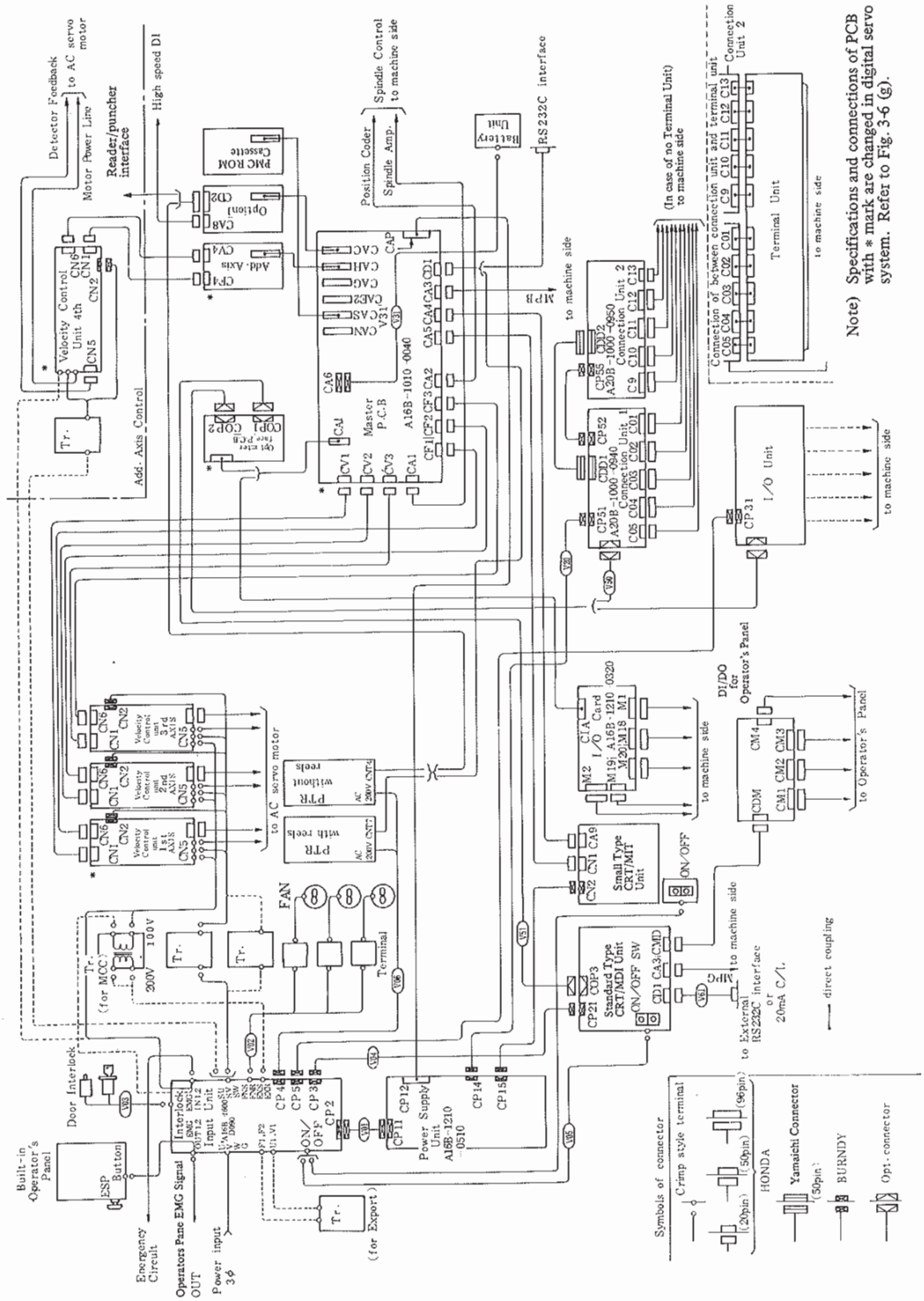
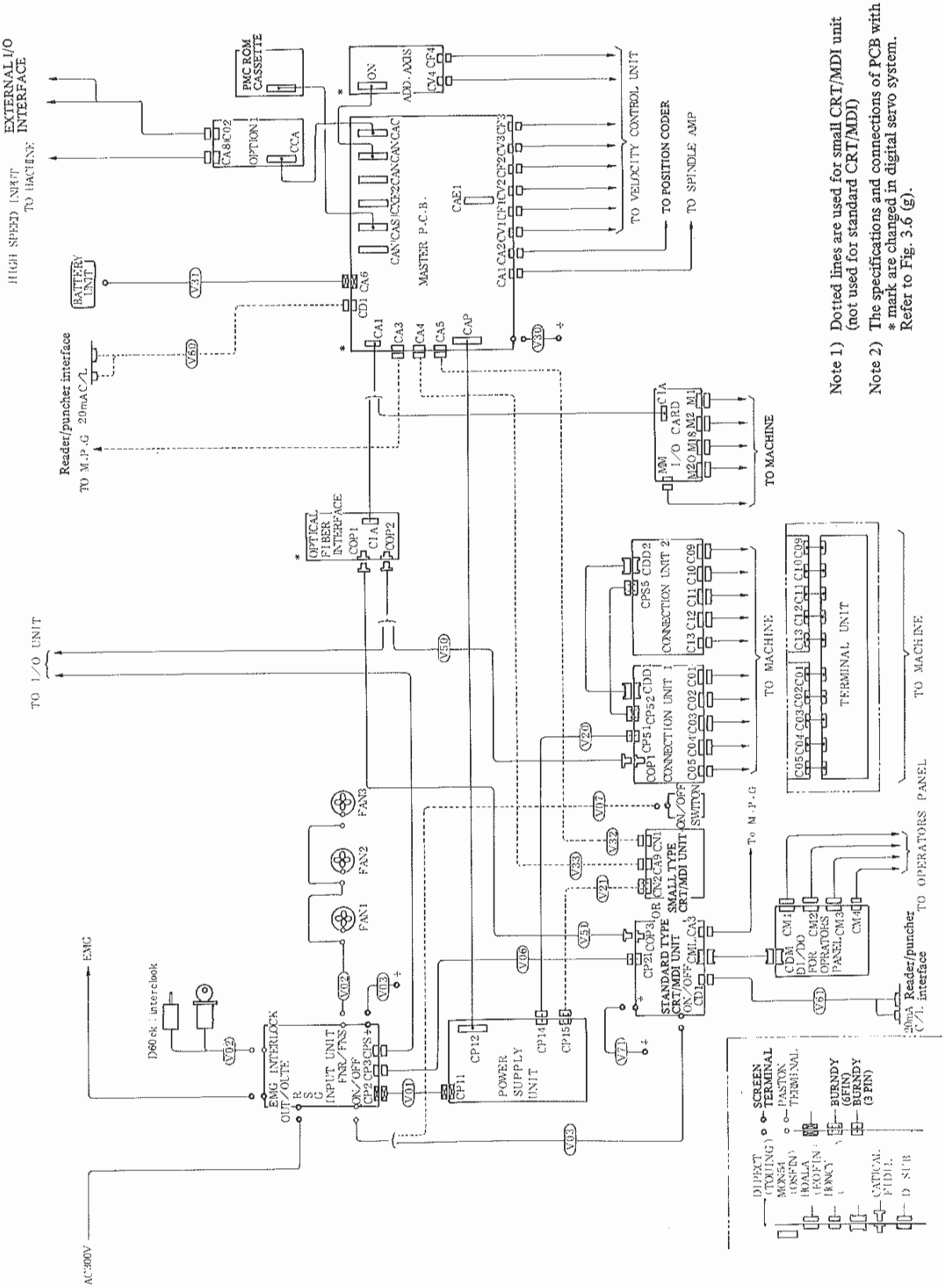


Fig. 3.6 (a) Connecting diagram inside 10/100 series free-standing type cabinet

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Note 1) Dotted lines are used for small CRT/MDI unit (not used for standard CRT/MDI)

Note 2) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (g).

Fig. 3.6 (b) Connecting diagram inside 10/100 series built-in type 1 cabinet

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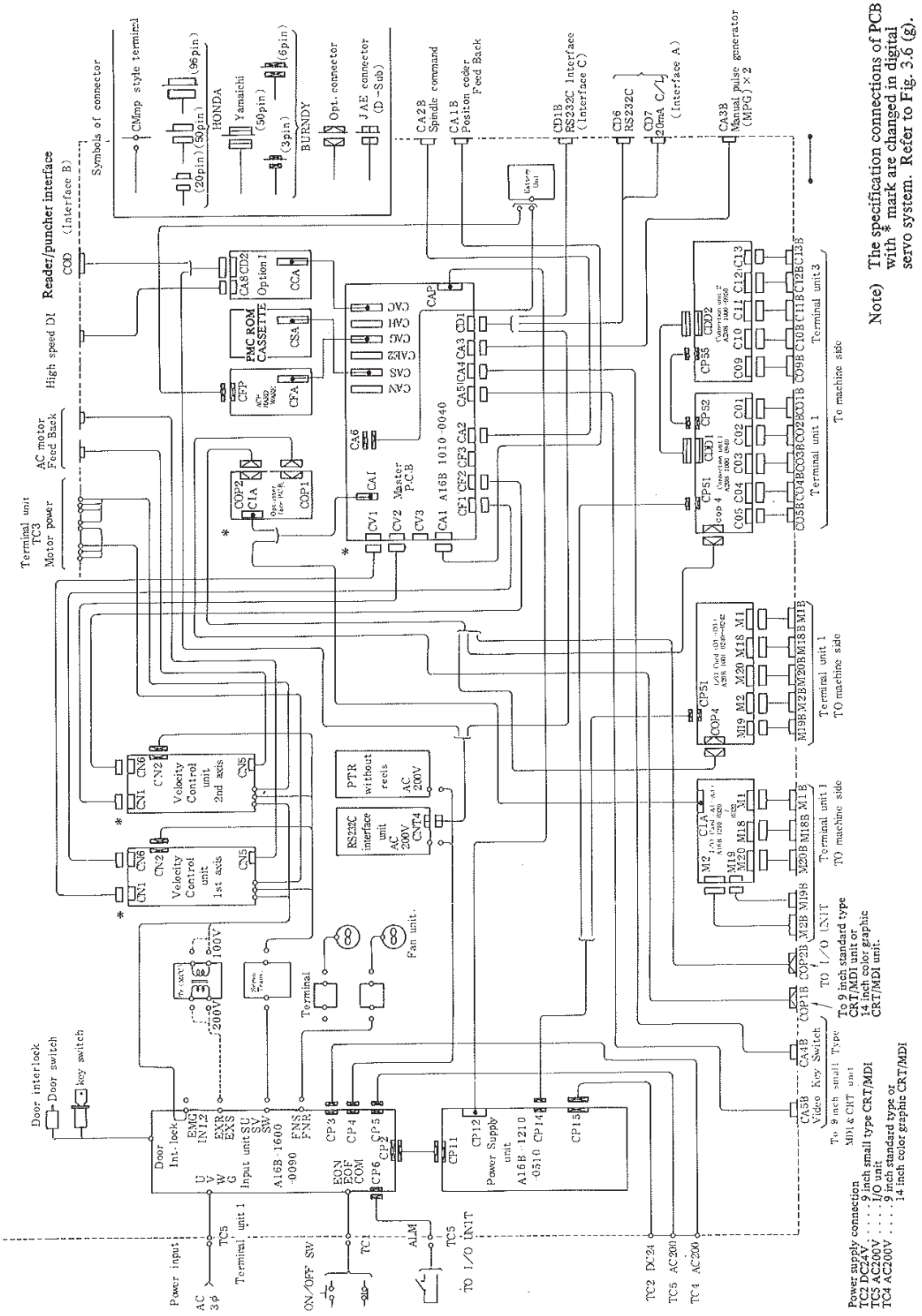
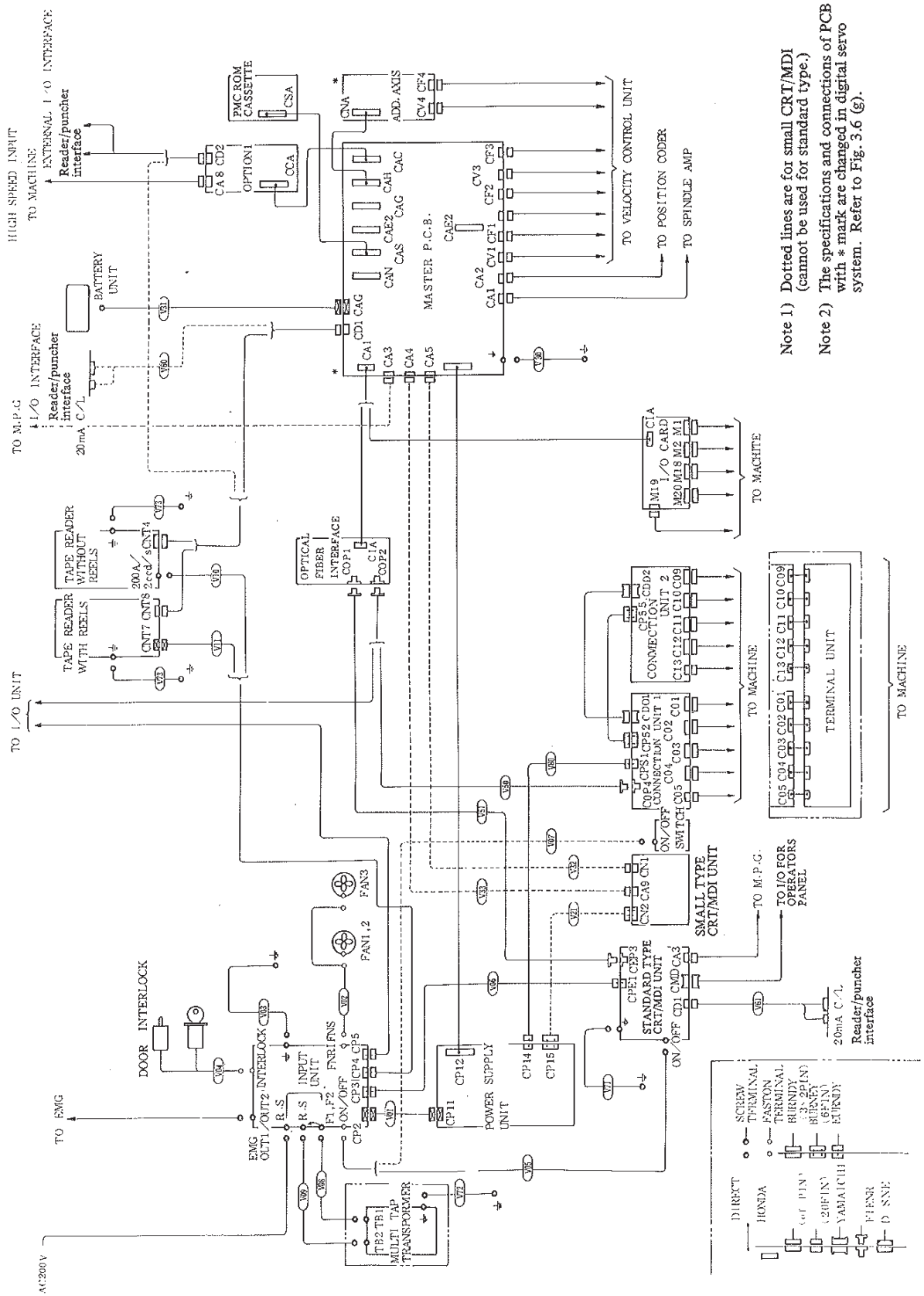


Fig. 3.6 (c) Connecting diagram inside 10T/100T built-in type 2 cabinet

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Note 1) Dotted lines are for small CRT/MDI (cannot be used for standard type.)

Note 2) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (g).

Fig. 3.6 (d) Connecting diagram inside 10M/100M built-in type 2 and 10M/100M built-in type 2-2 cabinet

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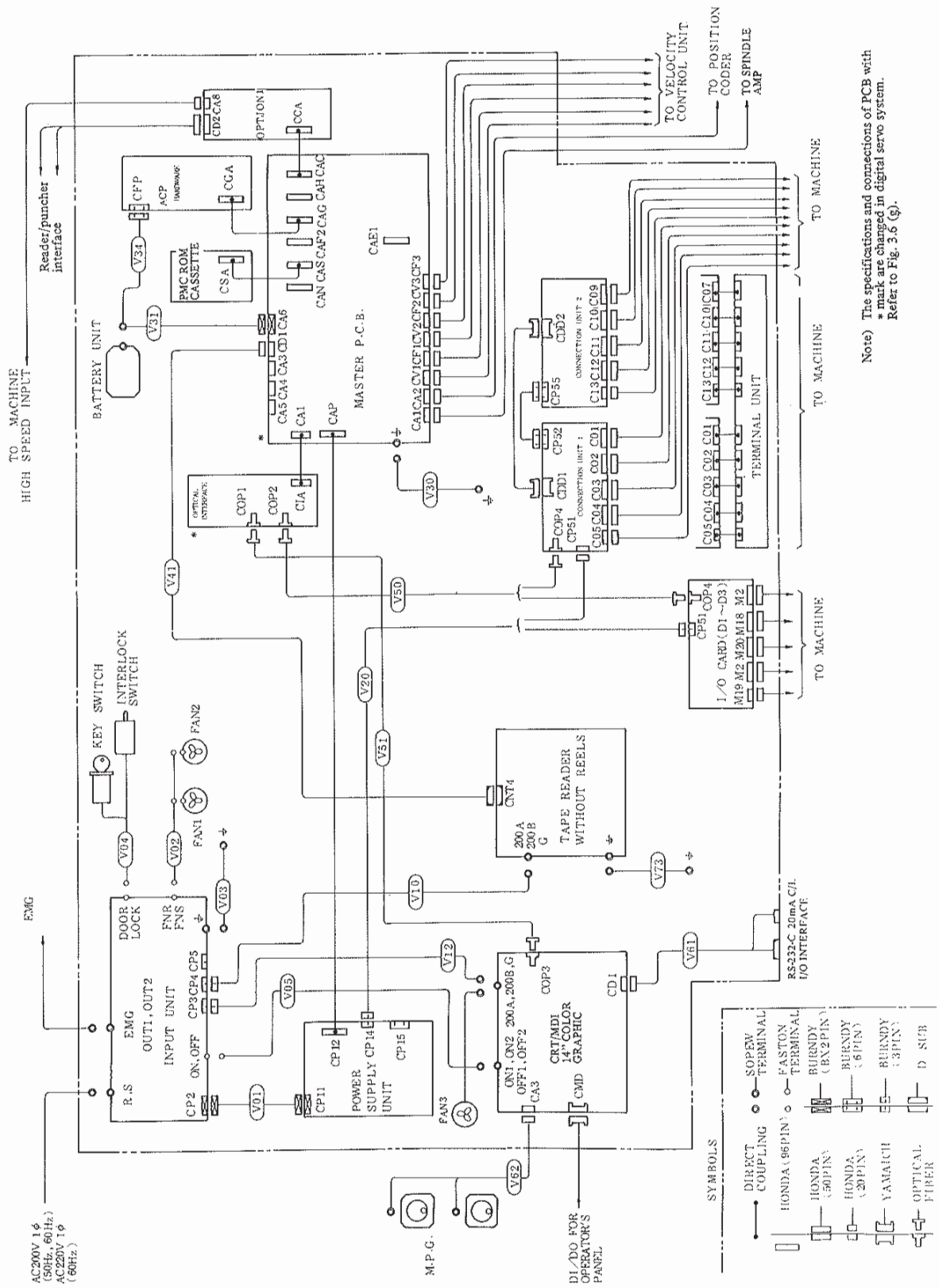
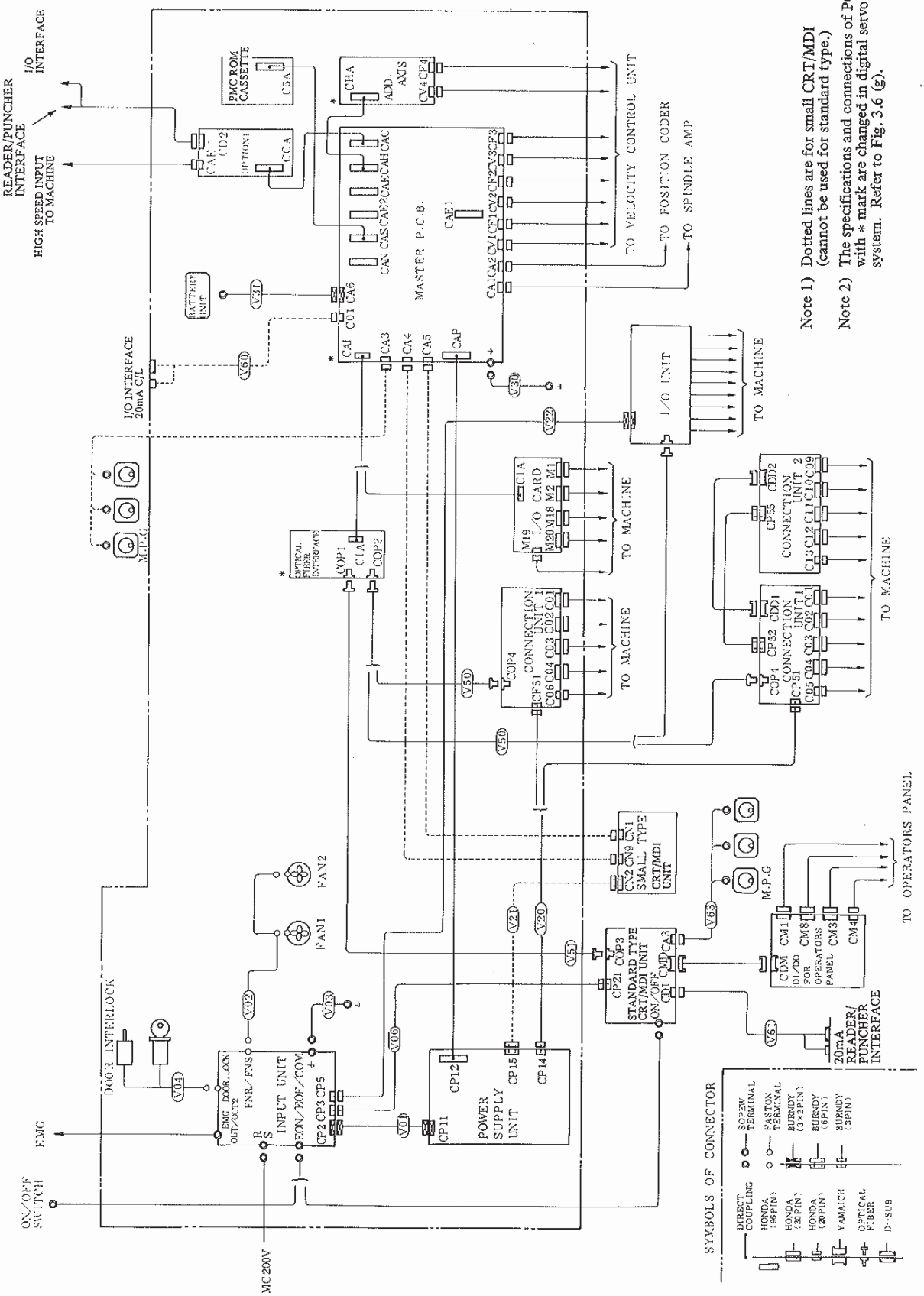


Fig. 3.6 (e) Connecting diagram inside 10TF built-in type 3 cabinet

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Note 1) Dotted lines are for small CRT/MDI (cannot be used for standard type.)

Note 2) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (g).

Fig. 3.6 (f) Connecting diagram inside 10 series unbundled type cabinet

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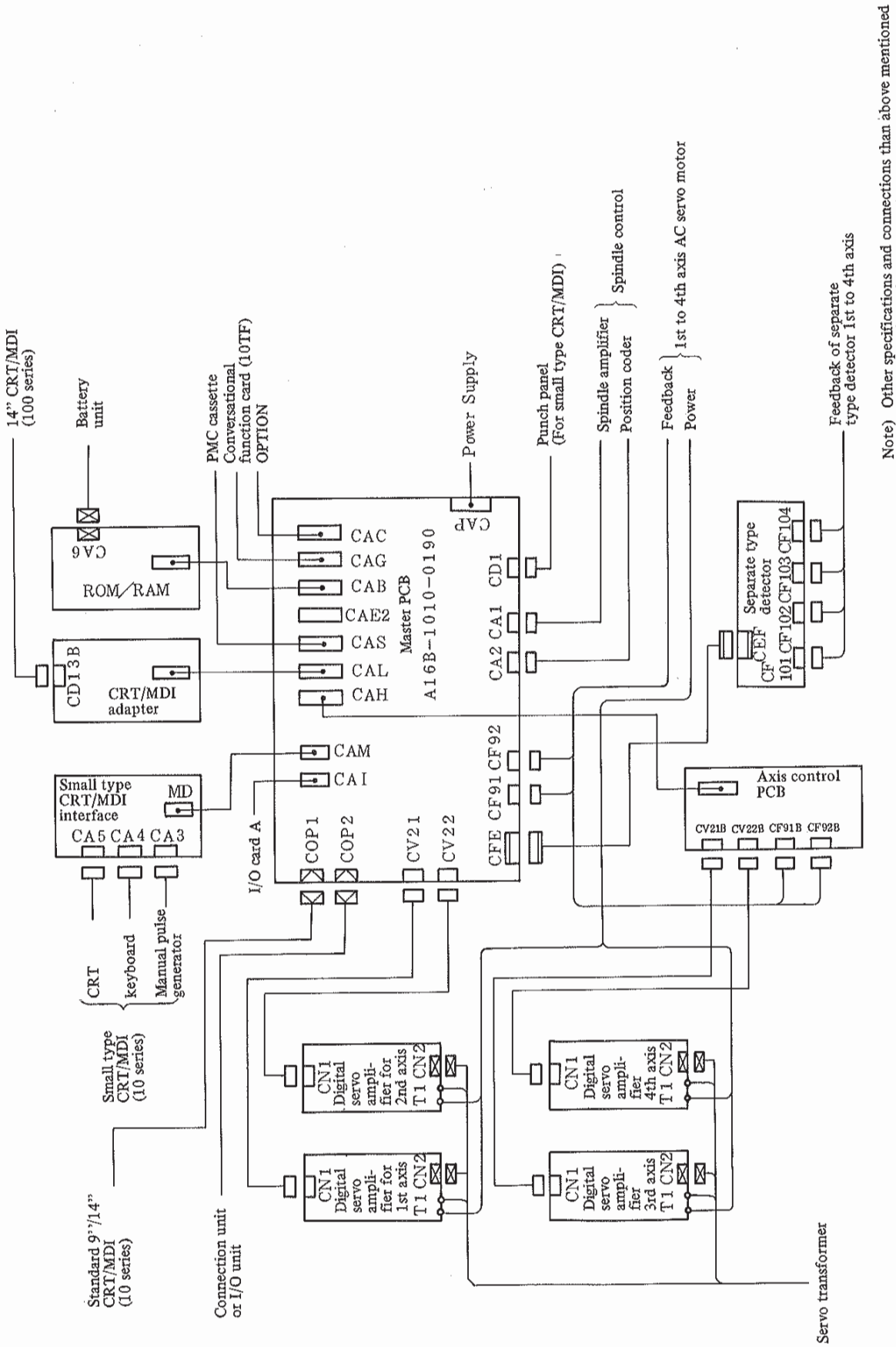
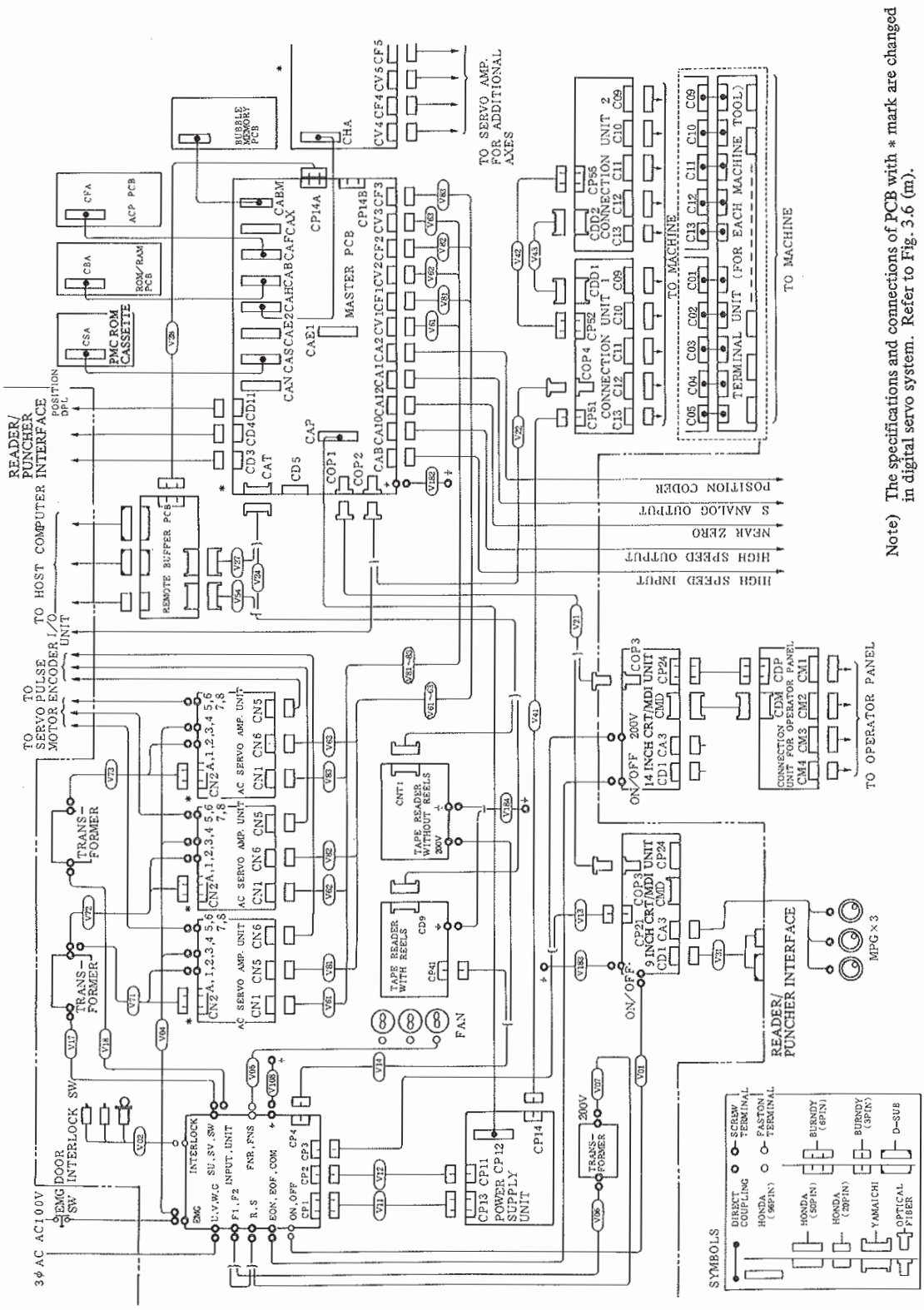


Fig. 3.6 (g) Digital servo 10/100 series

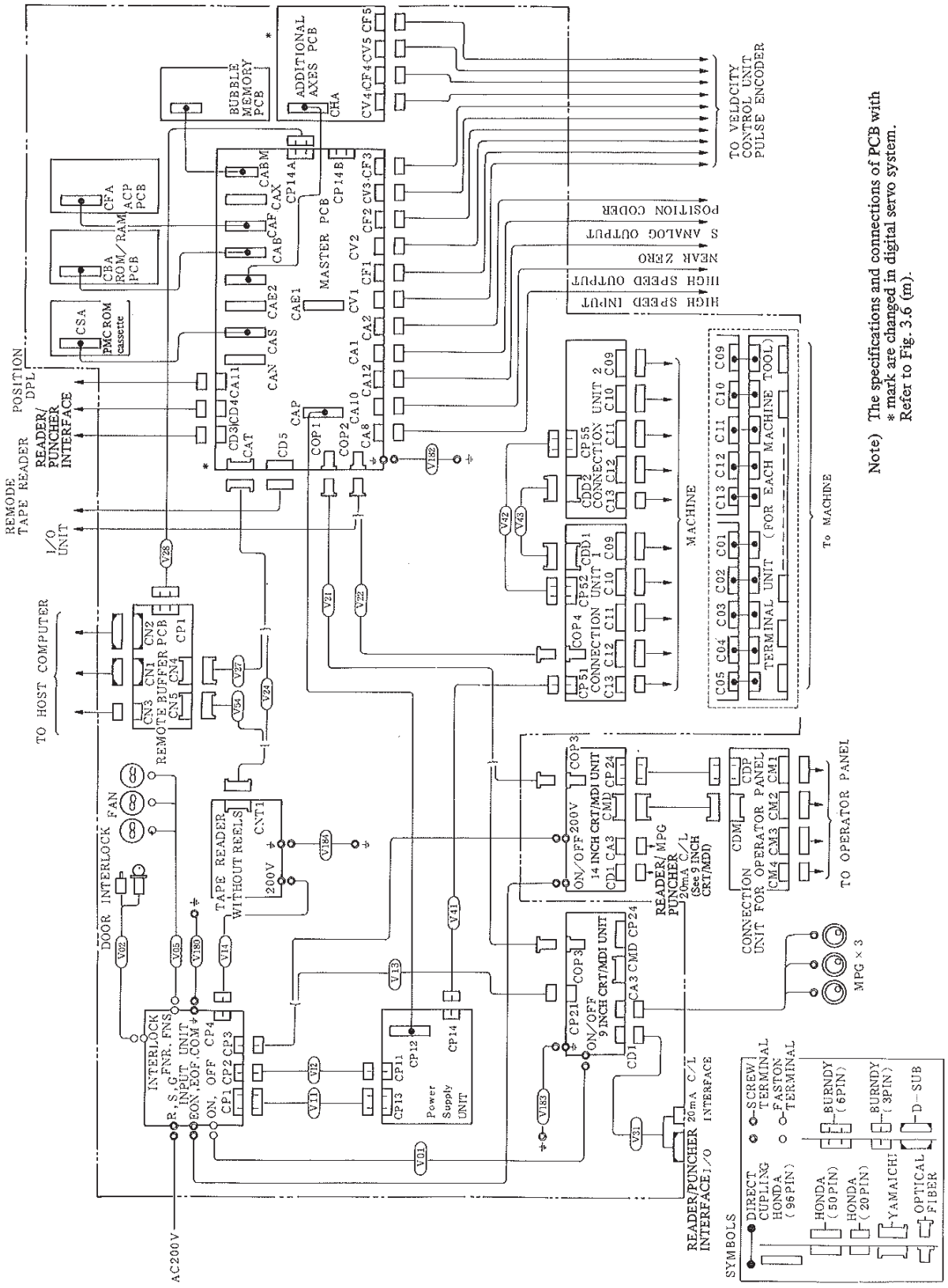
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Note) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (m).

Fig. 3.6 (h) Connecting diagram inside 11/110 series free standing type cabinet

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Note) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (m).

Fig. 3.6 (i) Connecting diagram inside 11/110M built-in type 1 cabinet

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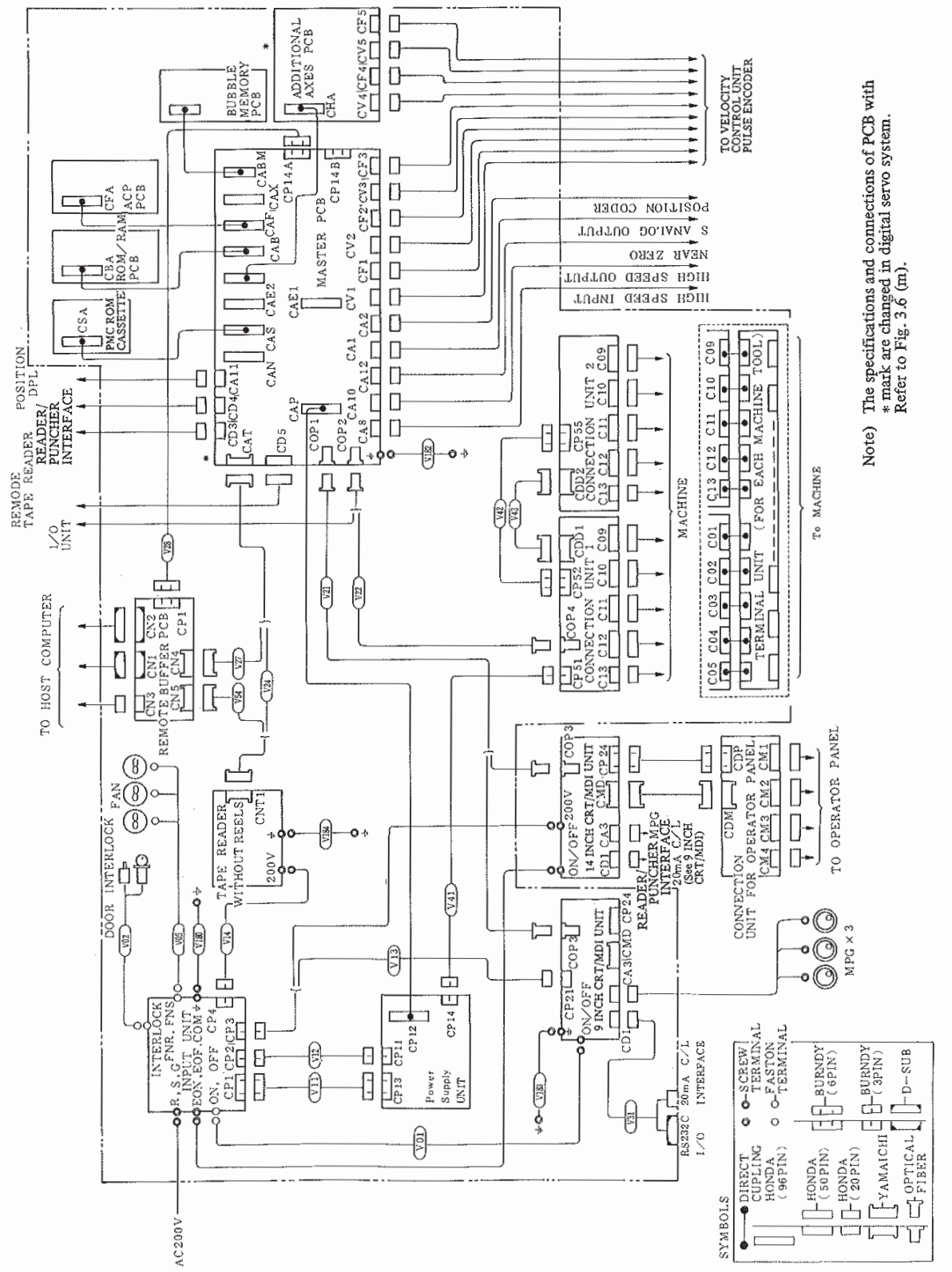
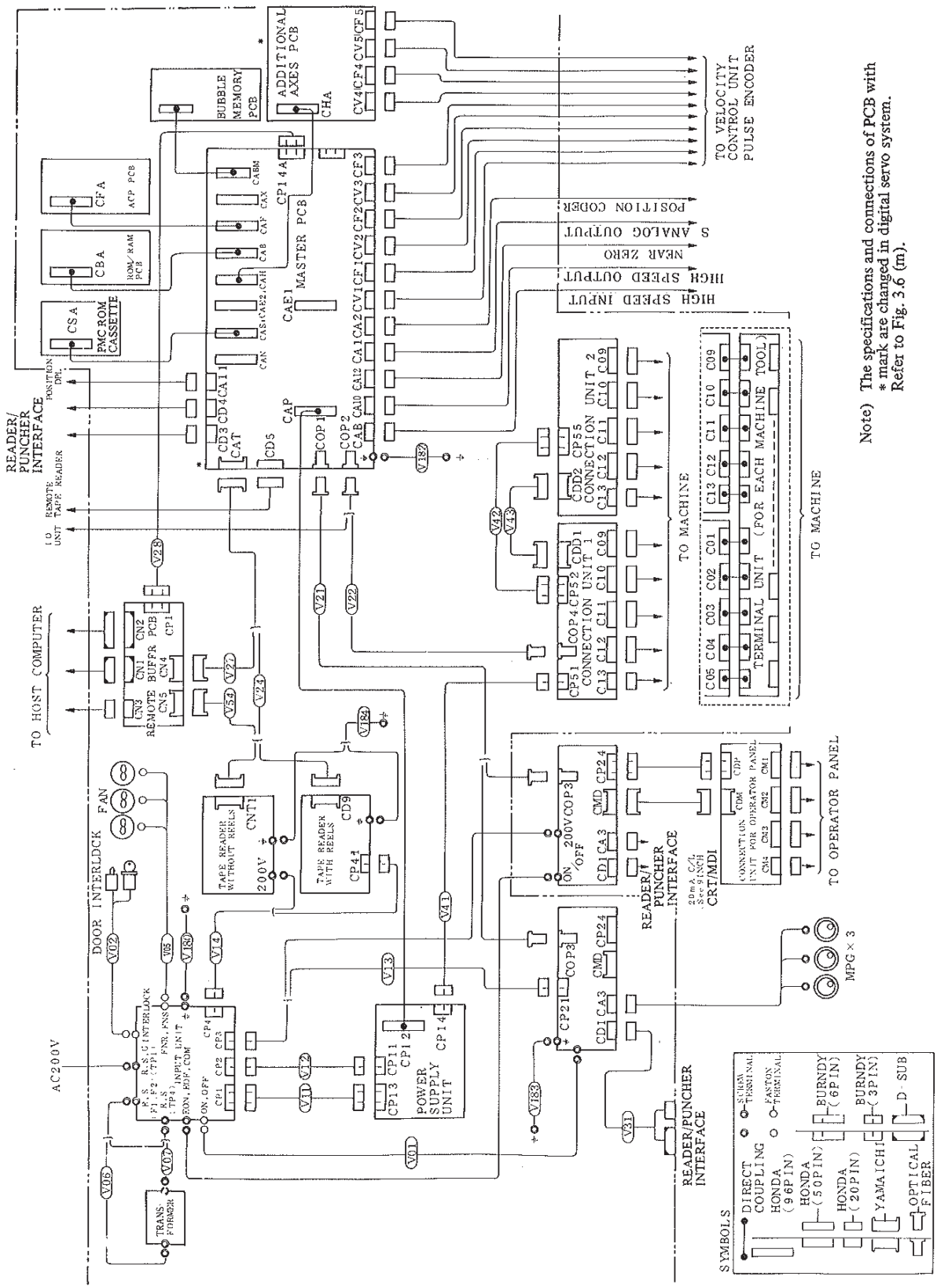


Fig. 3.6 (i) Connecting diagram inside 11T built-in type 1 cabinet

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Note) The specifications and connections of PCB with * mark are changed in digital servo system. Refer to Fig. 3.6 (m).

Fig. 3.6 (k) Connecting diagram inside 11/110M built-in type 2 cabinet

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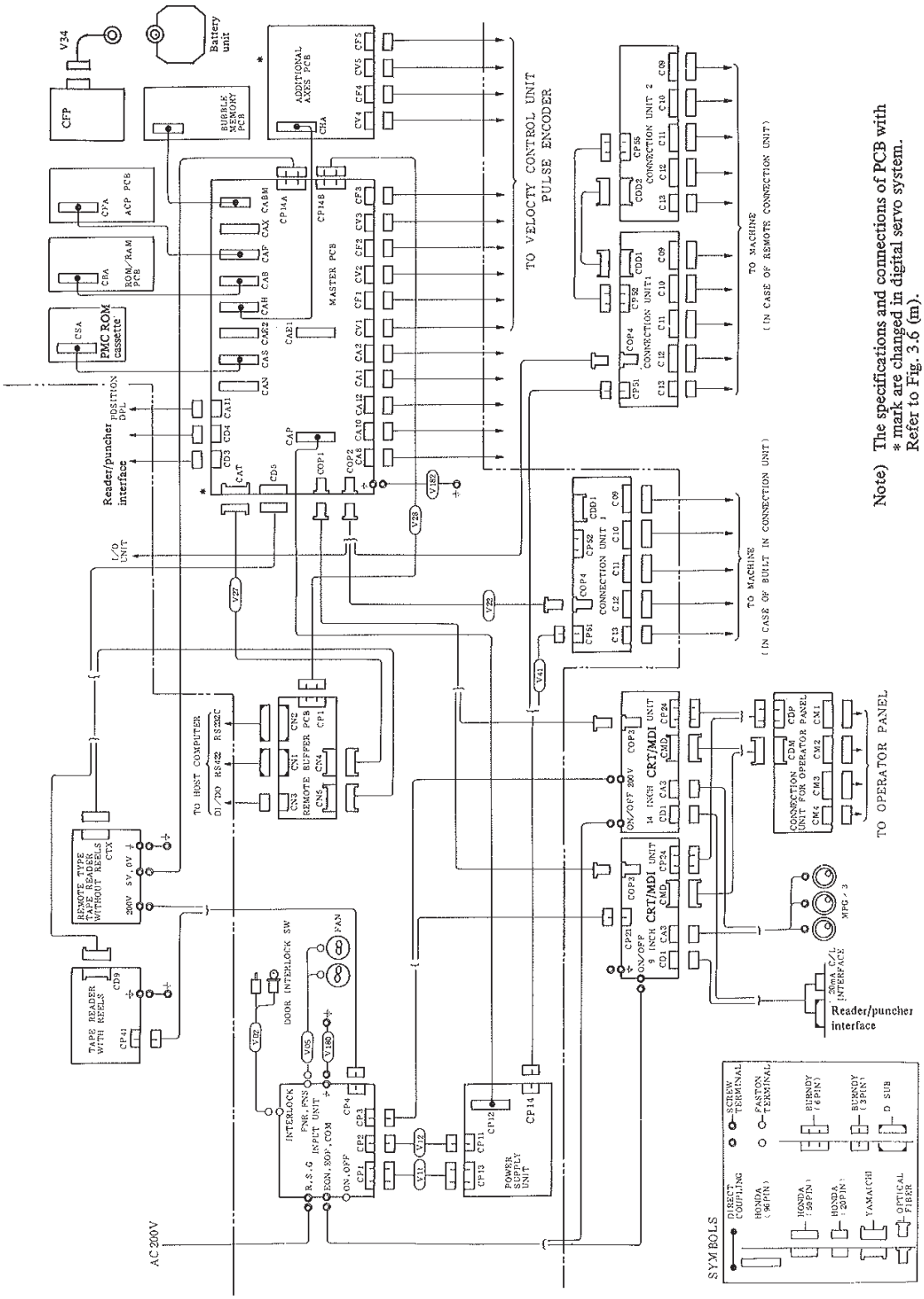


Fig. 3.6 (l) Connecting diagram inside 11/110 series unbundled type cabinet

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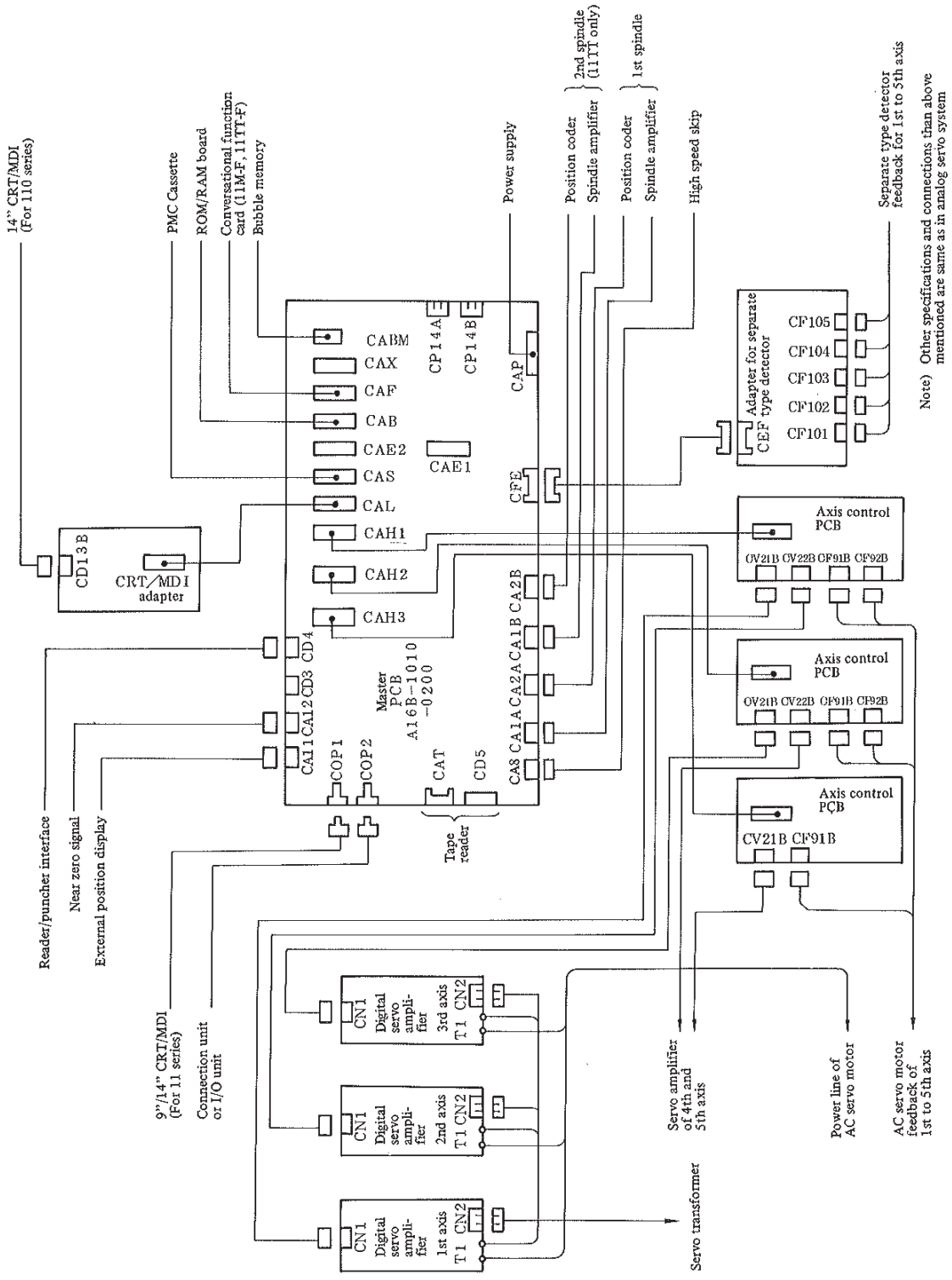


Fig. 3.6 (m) Digital servo 11/110 series

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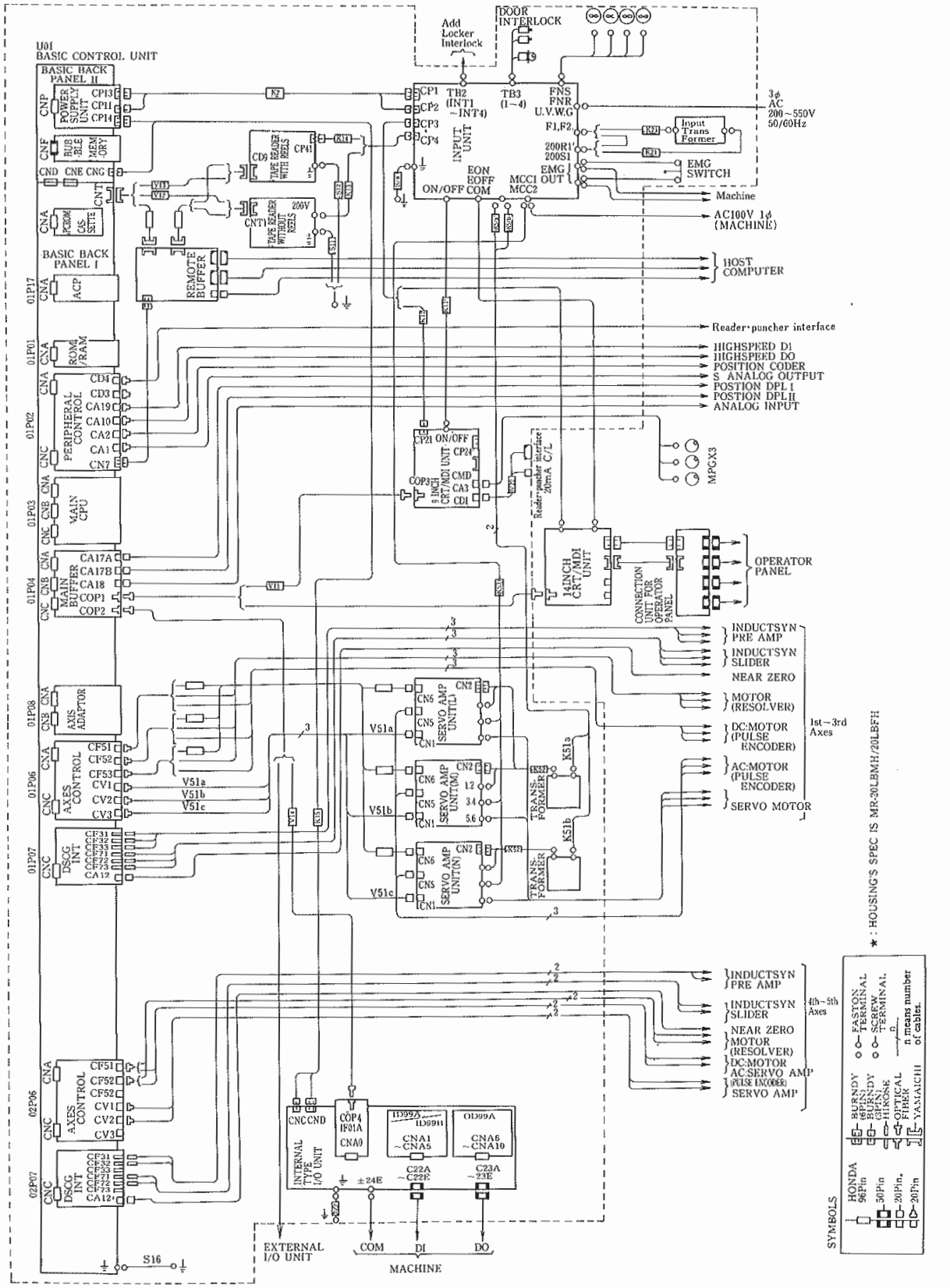


Fig. 3.6 (n) Connecting diagram inside 12/120 series free-standing type cabinet A (when one of synchronous operation, hybrid control or double check is not performed in 5 or less axis control)

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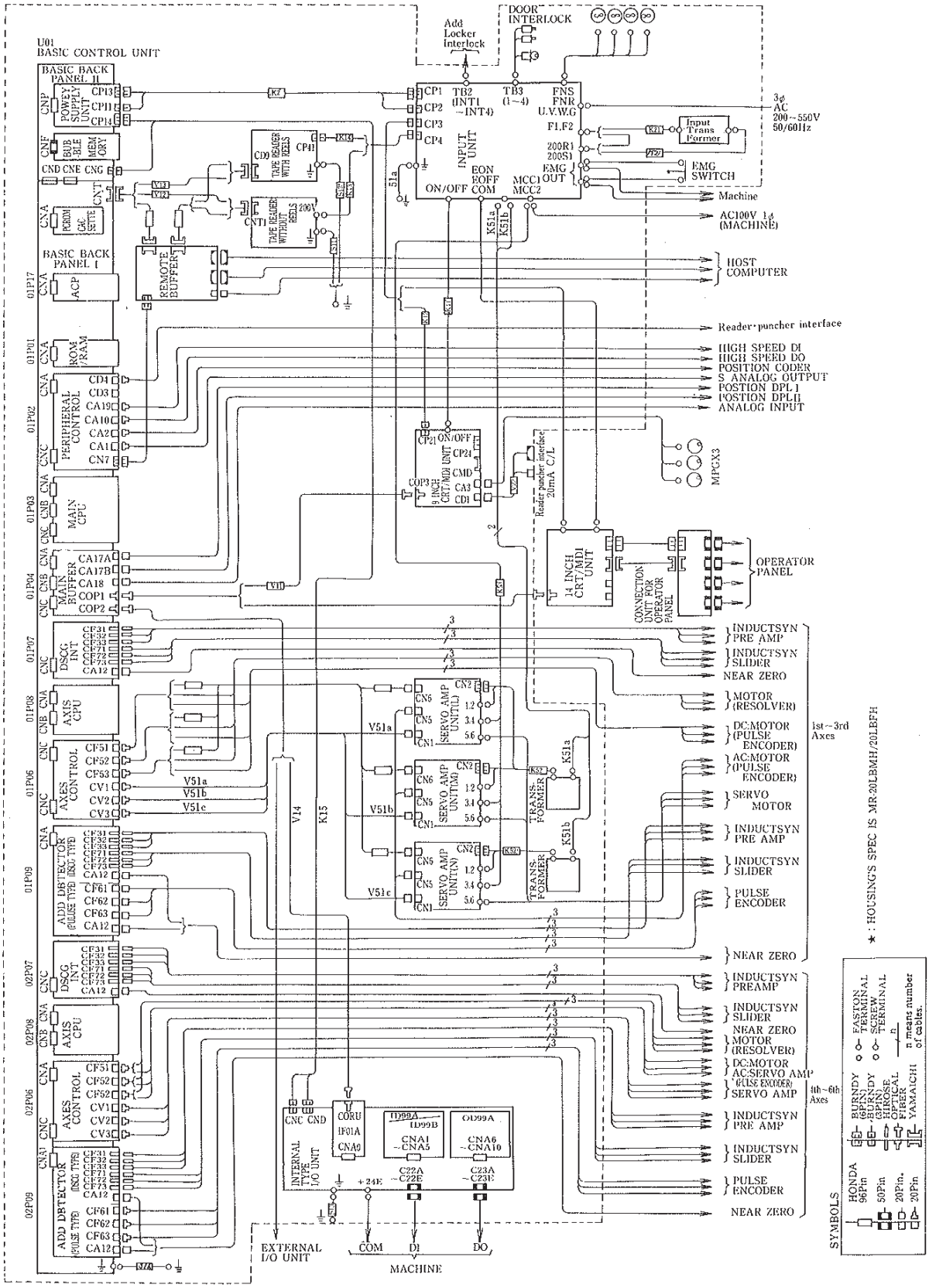


Fig. 3.6 (o) Connecting diagram inside 12/120 series free-standing type cabinet A
(when one of synchronous operation, hybrid control or double check is performed in 6 or less axis control)

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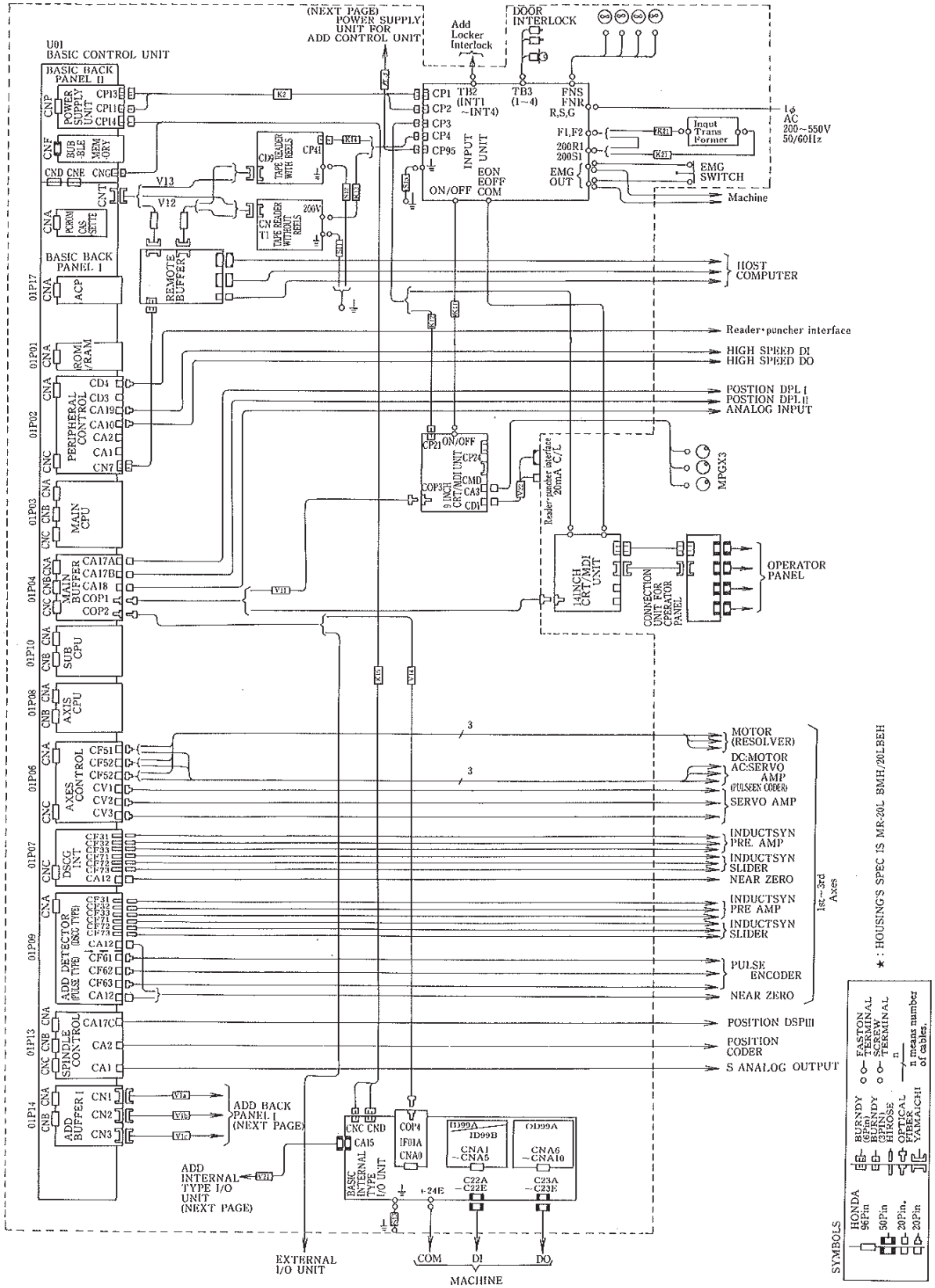


Fig. 3.6 (p) Connecting diagram inside 12/120 series free-standing type cabinet B (a) (when more than 7 axes are controlled)

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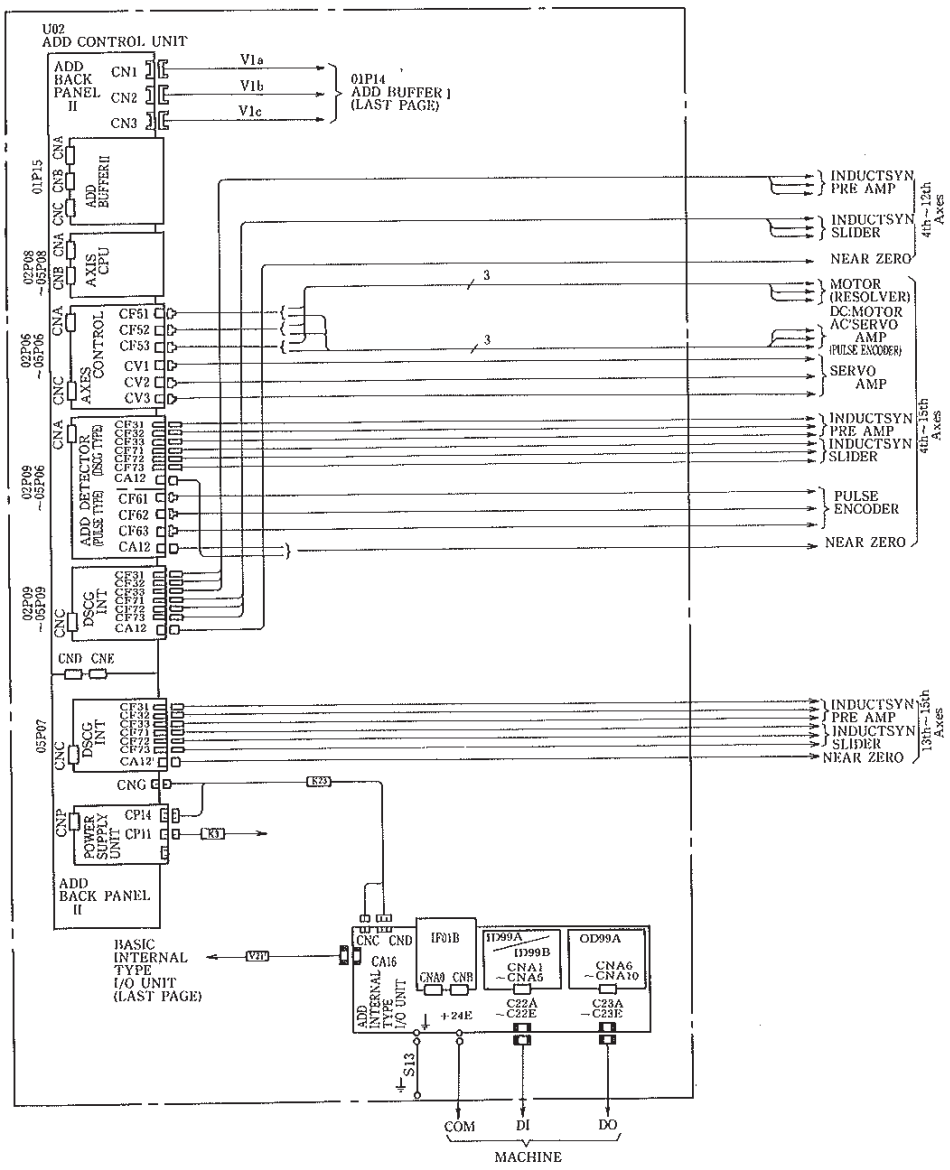
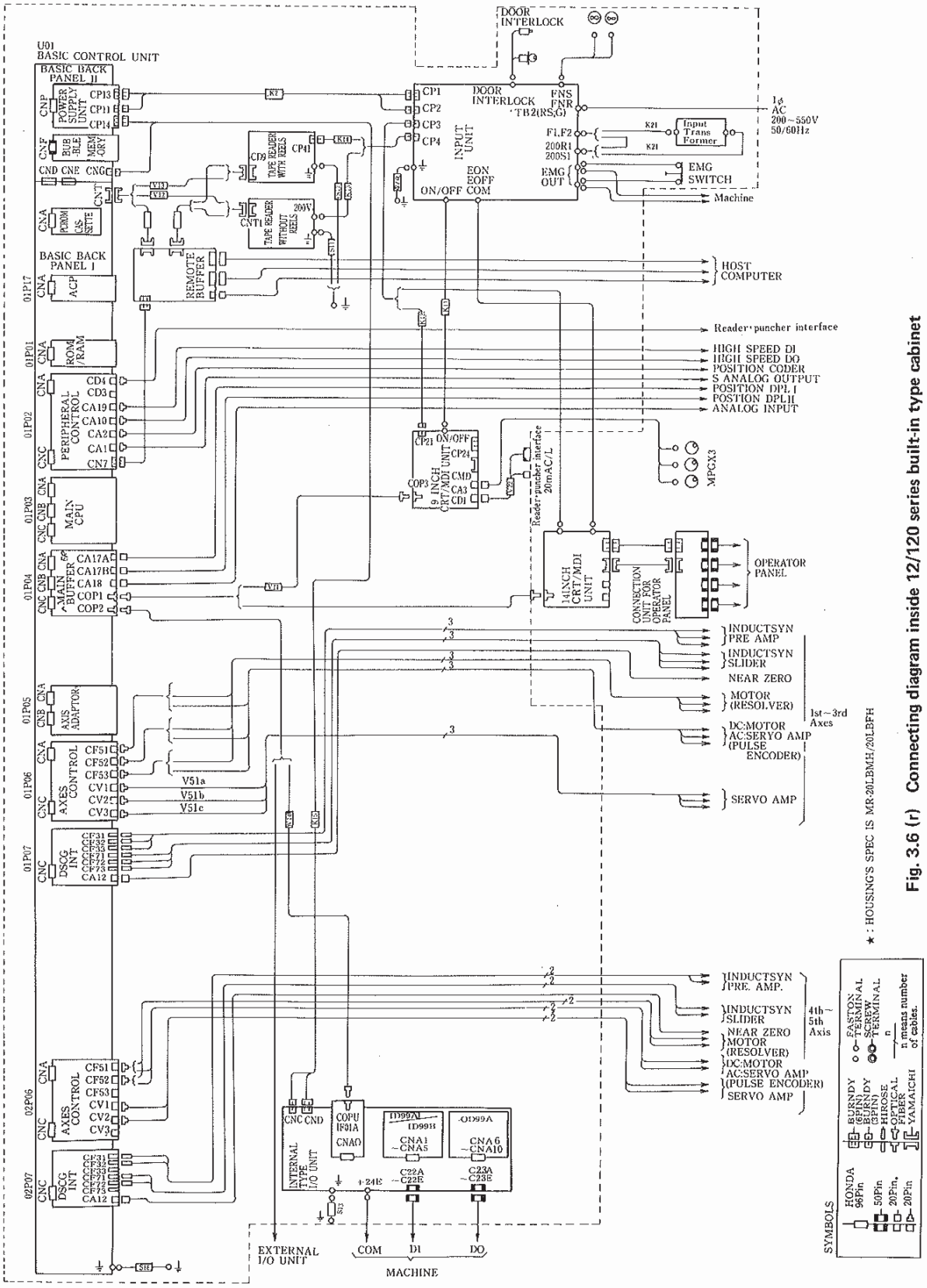


Fig. 3.6 (q) Connecting diagram inside 12/120 series free-standing type cabinet B (b)
(when more than 7 axes are controlled)

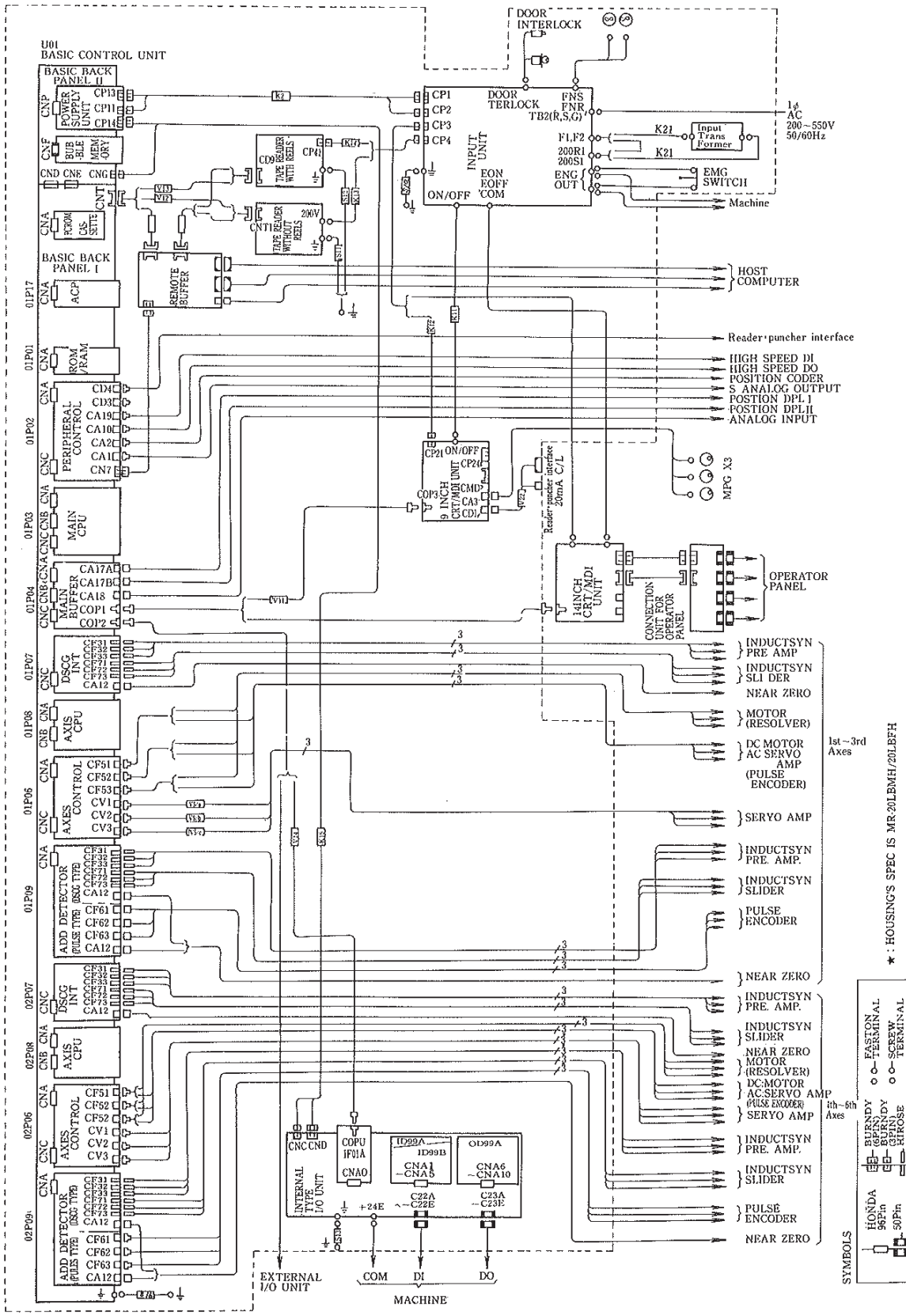
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Fig. 3.6 (r) Connecting diagram inside 12/120 series built-in type cabinet (when one of synchronous operation, hybrid control, double check system is not performed in 6 or less axes control)

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★ : HOUSING'S SPEC IS MR-20LBMH/20LBFH

Fig. 3.6 (s) Connecting diagram inside built-in type (when one of synchrous operation, hybrid control or double check is performed in 6 or less axis control)

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3.7 Status Display by Self-Diagnostic Function

General
If trouble occurrs, you must clarify whether the trouble occurred inside the NC or on the PMC or machine side. In order to do this, examine the interface condition between NC and PC or between NC and machine as well as the internal conditions of NC.
How DGN function displays the condition of NC on the CRT screen when a problem occurs is described in this section.
Refer to 10/11/12/100/110/120 series operator's manual for general operation of CRT/MDI.
The 9" CRT/MDI unit is equipped with five soft keys. The 14" CRT/MDI unit is equipped with ten soft keys. In this manual, the 9" CRT/MDI unit equipped with five soft keys will be described. The soft keys are displayed as follows:

POSITION	PROGRAM	OFFSET	PRG-CHK	CHAPTER	+

The characters in the frames are the names of the soft keys displayed at the bottom of the CRT screen. The "+" mark at the right shows that "+" is displayed at the right end of the lowest line on the CRT screen. This means that some key is not displayed on the CRT screen because of insufficient soft keys.
The basic operation of the 9" CRT/MDI unit is the same as that of the 14" CRT/MDI unit. With the latter, more keys can be operated simultaneously, so there is less need for changeover of the soft keys.

3.7.1 Interface display

Interface signal ON/OFF (1/0) conditions can be displayed.
a) Set the soft key as a function select key by pressing the function menu key.

SETTING	SERVICE	NOTICE		CHAPTER	+

b) A maintenance screen is selected by pressing SERVICE Key.
c) If the maintenance screen is not a diagnostic data screen, press CHAPTER key to select the soft key for the chapter select key.

PARAM	PITCH	DIAGNOS	DSP.MEM		

Press DIAGNOS key or press SERVICE key repeatedly until a diagnostic data screen appears.
d) If a desired diagnostic data screen does not appear, observe the following procedure:
d)-1 Method by page select key
Select pages by using page select key.
d)-2 Method by soft key
i) Press the operation menu key to select the soft key of the operation select key.

				INP-NO.	+

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ii) Press INP-NO, and the soft key is selected for the operation guide key.

(VALUE)					

iii) Input a data number key of the desired diagnostic data to be displayed. When data number is entered by the key, the soft key becomes as shown below.

EXEC					

iv) When EXEC key is pressed, the CRT screen displays the diagnostic data of the data number entered by the keying operation. The soft key is returned to the operation select key.
For I/O signals list, see 3.7.4.

3.7.2 Display of internal conditions of NC

The internal conditions of NC can be displayed by the same method used in the interface display method described in 3.7.1.

1) Display of the condition where a command is apparently not executed

No.	Bit	Display	Internal conditions when 1 is displayed
1000	0	INPOSITION CHECK	Inposition check is in progress.
	1	FEED RATE OVERRIDE	Feed rate override is 0%.
	2	JOG FEED OVERRIDE	Jog feed override is 0%.
	3	INT./START LOCK ON	Start lock/interlock is ON.
	4	SPEED ARRIVAL CHECK	Waiting for speed arrival signal to turn on
	5	WAIT REVOLUTION	Waiting for spindle 1 revolution signal in threading
	6	STOP POSITION CODER	Waiting for the rotation of position coder in spindle revolution feed
	7	FOREGROUND READING	Tape is being read in foreground.
1001	0	BACKGROUND READING	Tape is being read in background edition.

2) Display of reset condition
The conditions of the input signals related to the reset and feed hold are displayed.

No.	Bit							
1010	7	6	5	4	3	2	1	0
					RST	ERS	RRW	ESP

Display of "1" means the following conditions
ESP Emergency stop condition
RRW Reset & rewind signal is turned on.
ERS External reset signal is turned on.
RST Reset key is being pressed.

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3) Display of TH alarm conditions
TH alarm conditions are displayed as follows.

No.	Display	Meaning of data
1100	POSITION (CHARACTER) F	Indicates the character position where TH alarm occurred by the number of characters counted from the start of the block. (TH alarm of foreground)
1101	BIT PATTERN (CHARACTER) F	Indicates the readout code of the TH alarm character by bit pattern. (TH alarm of foreground)
1100	POSITION (CHARACTER) B	Indicates the character position where TH alarm occurred by the number of characters counted from the start of the block. (TH alarm of background)
1101	BIT PATTERN (CHARACTER) B	Indicates the readout code of the TH alarm character by bit pattern. (TH alarm of background)

4) Display of abnormal conditions of bubble memory
Abnormal conditions of bubble memory are displayed as follows.

No.	Bit							
1200	7	6	5	4	3	2	1	0
	PR4		PR3	MWP	PR2	WPE	TOE	UNL

No.	Bit							
1201	7	6	5	4	3	2	1	0
	BPE		PSO	PR1	TME	MDL	NOM	UNC

PR4 MAP SINGLE-BIT PARITY ERROR
PR3 MAP MULTI-BITS PARITY ERROR
MWP TOO MANY WRONG PAGES
PR2 DATA SINGLE-BIT PARITY ERROR
WPE WRITE PLOTECT ERROR
TOE READ/WRITE TIME OUT ERROR
UNL UNLOSSED
BPE DATA BUS PARITY ERROR
PSO PAGE SIZE OVER
PR1 DATA MULTI-BITS PARITY ERROR
TME TRANS MISSING ERROR
MDL MANY DEFECT LOOPS
NOM NO MARKER
UNC UNDEFINED COMMAND

When "1" is displayed, it shows that the above error occurred.

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5) Display of position deviation amount
The position deviation amount of each axis is displayed.

No.	Display	Meaning of display data
3000	X SERVO ERROR	Indicates the position deviation amount of X axis in the detection unit.
	Y SERVO ERROR	Indicates the position deviation amount of Y axis in the detection unit.
	Z SERVO ERROR	Indicates the position deviation amount of Z axis in the detection unit.
	:	
	:	

6) Display of resolver or inductosyn frequency check results
Resolver or inductosyn frequency check results are displayed. This display is used for frequency adjustment.

No.	Display	Meaning of display data
3001	DSCG PULSE LOW	(Display data) 0.125 is normal when it lies within a range of 230 ∿ 800.
3002	DSCG PULSE HIG	(Display data) 0.125 is normal when it lies within a range of 1466 ∿ 1900.

7) Display of servo control information
The servo control information is displayed as follows.

No.	Axis corresponding to number
3010 ∿ 3023	Servo control information of 1st axis
3030 ∿ 3043	Servo control information of 2nd axis
3050 ∿ 3063	Servo control information of 3rd axis

3.7.3 Memory contents display

Memory contents can be displayed as follows:
a) Set the soft key to the function select key.

SETTING	SERVICE	NOTICE		CHAPTER	+

b) Press SERVICE key. A maintenance screen is selected.
c) If the maintenance screen does not indicate memory contents, press CHAPTER key to switch the soft key to the chapter select key.

PARAM	PITCH	DIAGNOS	DSP.MEM		

Press DSP MEM key or press SERVICE key repeatedly until a memory contents display screen appears.
d) Select the soft key for the operation select key.

				INP-NO.	+

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e) Press INP-NO and the soft key is switched to the operation guide key.

(VALUE)					

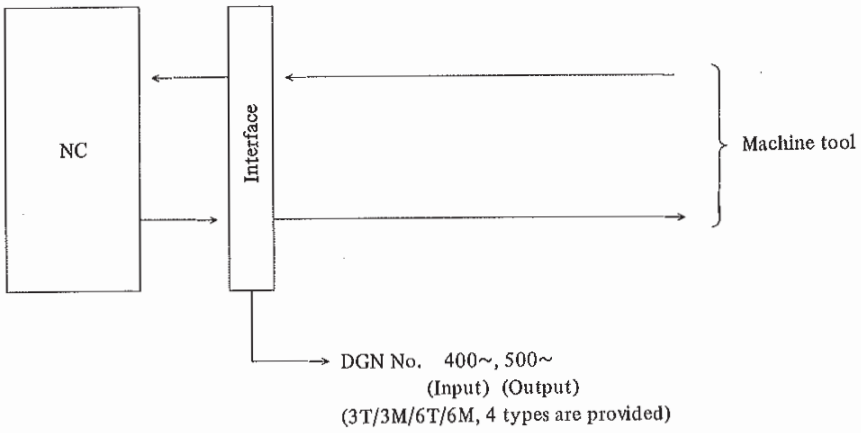
f) Enter the address of the memory to be displayed using a six decimal number by pressing keys.
When the data number is entered, the soft key is reset as shown below.

EXEC					

g) Press EXEC key to display the memory contents of the input address. The soft key is reset to the operation select key.

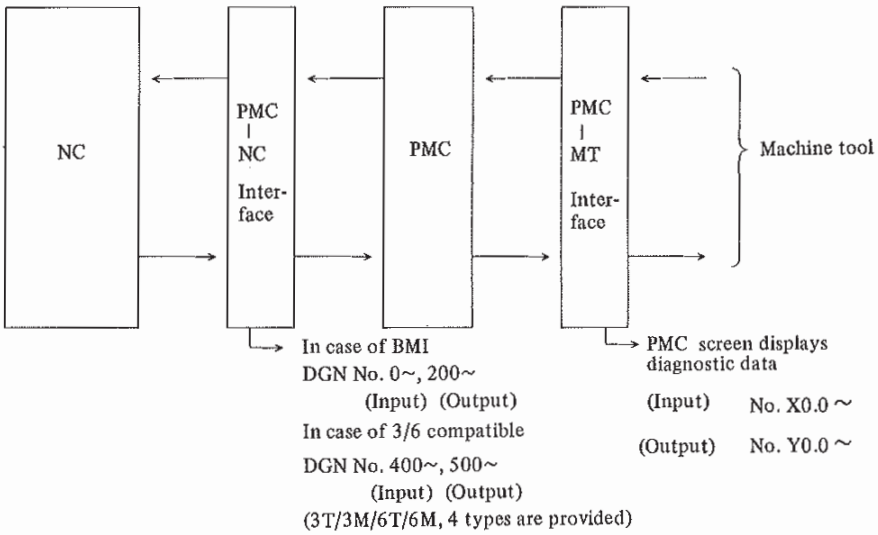
3.7.4 I/O signal diagnostic data

I/O signal diagnostic data of the NC are constructed as follows:
1) When PMC is not provided;



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2) When PMC is provided;



PMC diagnostic data display method

① Press [NC/PC] key on the keyboard. A PMC basic menu is displayed in the soft key part.
② Press [PCDGN] soft key. The CRT screen shows PMC diagnostic function, and the soft key menu turns to [SEARCH].
③ Press [SEARCH] key after inputting the address to be displayed.
④ Continuous 10 byte data are displayed by a bit pattern from the designated address on the top stage of the CRT screen.
⑤ To display other addresses, repeat operation starting with step ③.
⑥ After display operation, press [RET] key to reset the menu to the PMC basic menu.

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BMI signal list

BMI - DI

DGN No.	7	6	5	4	3	2	1	0
0	ERS	RRW	*SP	*ESP	SKIP1	UNIT	*CSL	*IT
1	SKIP4	SKIP3	SKIP2	AE3	AE2	AE1	*BSL	*AIT
2	ZRN	BRN	SRN	MOVL	TCHIN			
3	AGJ	EDT	MEM	T	D	J	H	S
4	MLK	DLK	ABS	OVC	SBK	EDT1	DRN	AFL
5	KEY4	KEY3	KEY2	KEY1	F1D	FFIN	FIN	ST
6	RT	ROV2	ROV1	MP4	MP2	MP1		
7	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
8	TMRON		PRC				*CSM2	*CHF
9	TLSKP	TL64	TL32	TL16	TL08	TL04	TL02	TL01
10	TLRST	OMEP	OME		HS3D	HS3C	HS3B	HS3A
11	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A
12	*FV7	*FV6	*FV5	*FV4	*FV3	*FV2	*FV1	*FV0
13	*AFV7	*AFV6	*AFV5	*AFV4	*AFV3	*AFV2	*AFV1	*AFV0
14	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8
15	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0

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BMI - DI

DGN No.	7	6	5	4	3	2	1	0
16	AJSTB	-AJ	+AJ	AJA12	AJA11	AJA10	AJA9	AJA8
17	AJA7	AJA6	AJA5	AJA4	AJA3	AJA2	AJA1	AJA0
18	AJP2D	AJP2C	AJP2B	AJP2A	AJP1D	AJP1C	AJP1B	AJP1A
19	*BECLP	*BEUCL		WN16	WN8	WN4	WN2	WN1
20						DIST26	DIST25	DIST24
21	DIST23	DIST22	DIST21	DIST20	DIST19	DIST18	DIST17	DIST16
22	DIST15	DIST14	DIST13	DIST12	DIST11	DIST10	DIST9	DIST8
23	DIST7	DIST6	DIST5	DIST4	DIST3	DIST2	DIST1	DIST0
24	RISGN			RI12	RI11	RI10	RI9	RI8
25	RI7	RI6	RI5	RI4	RI3	RI2	RI1	RI0
26	WOSET	GS4	GS5	GS1	*SECLP	*SEUCL		SPSTP
27	CDV7	CDV6	CDV5	CDV4	CDV3	CDV2	CDV1	CDV0
28						SPC	SPB	SPA
29								
30								
31								

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BMI - DI

DGN No.	7	6	5	4	3	2	1	0
32	EISTB	ERDRQ	EOREND			EXSTP	EXRD	EXPUN
33	EIA7	EIA6	EIA5	EIA4	EIA3	EIA2	EIA1	EIA0
34	EID47	EID46	EID45	EID44	EID43	EID42	EID41	EID40
35	EID39	EID38	EID37	EID36	EID35	EID34	EID33	EID32
36	EID31	EID30	EID29	EID28	EID27	EID26	EID25	EID24
37	EID23	EID22	EID21	EID20	EID19	EID18	EID17	EID16
38	EID15	EID14	EID13	EID12	EID11	EID10	EID9	EID8
39	EID7	EID6	EID5	EID4	EID3	EID2	EID1	EID0
40								
41								
42								TL256
43	TL128							
44								
45								
46								
47								

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BMI - DI

DGN No.	7	6	5	4	3	2	1	0
48	UI031	UI030	UI029	UI028	UI027	UI026	UI025	UI024
49	UI023	UI022	UI021	UI020	UI019	UI018	UI017	UI016
50	UI015	UI014	UI013	UO012	UI011	UI010	UI009	UI008
51	UI007	UI006	UI005	UI004	UI003	UI002	UI001	UI000
52	UI131	UI130	UI129	UI128	UI127	UI126	UI125	UI124
53	UI123	UI122	UI121	UI120	UI119	UI118	UI117	UI116
54	UI115	UI114	UI113	UI112	UI111	UI110	UI109	UI108
55	UI107	UI106	UI105	UI104	UI103	UI102	UI101	UI100
56	UI231	UI230	UI229	UI228	UI227	UI226	UI225	UI224
57	UI223	UI222	UI221	UI220	UI219	UI218	UI217	UI216
58	UI215	UI214	UI213	UI212	UI211	UI210	UI209	UI208
59	UI207	UI206	UI205	UI204	UI203	UI202	UI201	UI200
60	UI331	UI330	UI329	UI328	UI327	UI326	UI325	UI324
61	UI323	UI322	UI321	UI320	UI319	UI318	UI317	UI316
62	UI315	UI314	UI313	UI312	UI311	UI310	UI309	UI308
63	UI307	UI306	UI305	UI304	UI303	UI302	UI301	UI300

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BMI - DI

DGN No.	7	6	5	4	3	2	1	0
64	DTCH1	*SVF1	*DEC1	*IT1	*-ED1	*+ED1	*-L1	*+L1
65			*CL1	PK1	MLK1	MI1	-J1	+J1
66								
67								
68	DTCH2	*SVF2	*DEC2	*IT2	*-ED2	*+ED2	*-L2	*+L2
69			*CL2	PK2	MLX2	MI2	-J2	+J2
70								
71								
72	DTCH3	*SVF3	*DEC3	*IT3	*-ED3	*+ED3	*-L3	*+L3
73			*CL3	PK3	MLK3	MI3	-J3	+J3
74								
75								
76	DTCH4	*SVF4	*DEC4	*IT4	*-ED4	*+ED4	*-L4	*+L4
77			*CL4	PK4	MLK4	MI4	-J4	+J4
78								
79								

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BMI - DI

DGN No.	7	6	5	4	3	2	1	0
80	DTCH5	*SVF5	*DEC5	*IT5	*-ED5	*+ED5	*-L5	*+L5
81			*CL5	PK5	MLX5	MI5	-J5	+J5
82								
83								

11/12/ 110/120 series only

Continued in the same way (for 12/120 series only)

84 ∿ 87:	6th axis	104 ∿ 107:	11th axis
88 ∿ 91:	7th axis	108 ∿ 111:	12th axis
92 ∿ 95:	8th axis	112 ∿ 115:	13th axis
96 ∿ 99:	9th axis	116 ∿ 119:	14th axis
100 ∿ 103:	10th axis	120 ∿ 123:	15th axis

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
200	MA	SA	OP	STL	SPL	RST	AL	RWD
201	CSS	THRD	RPD	TAP	INCH	DST	IPEN	DEN
202	MZRN	MBRN	MSRN	MMOVL				
203	MAGL	MEDT	MMEM	MT	MD	MJ	MH	MS
204	MMLK	MDLX	MABS		MSBK	MEDT1	MDRN	MAFL
205	MBDT9	MBDT8	MBDT7	MBDT6	MBDT5	MBDT4	MBDT3	MBDT2
206	MSALM	EGPSALM	DIALM	SYALM	OTALM	OHALM	SVALM	PSALM
207	TLCHB	TLCHA	ESEND	RPBSY			BCLP	BUCLP
208	SSP	SRV	FMF	EF	BF	TF	SF	MF
209	DM30	DM02	DM01	DM00				
210	RO15	RO14	RO13	RO12	RO11	RO10	RO9	RO8
211	RO7	RO6	RO5	RO4	RO3	RO2	RO1	RO0
212	AR15	AR14	AR13	AR12	AR11	AR10	AR9	AR8
213	AR7	AR6	AR5	AR4	AR3	AR2	AR1	AR0
214	MR15	MR14	MR13	MR12	MR11	MR10	MR9	MR8
215	MR7	MR6	MR5	MR4	MR3	MR2	MR1	MR0

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
216	M31	M30	M29	M28	M27	M26	M25	M24
217	M23	M22	M21	M20	M19	M18	M17	M16
218	M15	M14	M13	M12	M11	M10	M9	M8
219	M7	M6	M5	M4	M3	M2	M1	M0
220	S31	S30	S29	S28	S27	S26	S25	S24
221	S23	S22	S21	S20	S19	S18	S17	S16
222	S15	S14	S13	S12	S11	S10	S9	S8
223	S7	S6	S5	S4	S3	S2	S1	S0
224	T31	T30	T29	T28	T27	T26	T25	T24
225	T23	T22	T21	T20	T19	T18	T17	T16
226	T15	T14	T13	T12	T11	T10	T9	T8
227	T7	T6	T5	T4	T3	T2	T1	T0
228	B31	B30	B29	B28	B27	B26	B25	B24
229	B23	B22	B21	B20	B19	B18	B17	B16
230	B15	B14	B13	B12	B11	B10	B9	B8
231	B7	B6	B5	B4	B3	B2	B1	B0

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
232	EOSTB		EIREND					
233	EOA7	EOA6	EOA5	EOA4	EOA3	EOA2	EOA1	EOA0
234	EOD47	EOD46	EOD45	EOD44	EOD43	EOD42	EOD41	EOD40
235	EOD39	EOD38	EOD37	EOD36	EOD35	EOD34	EOD33	EOD32
236	EOD31	EOD30	EOD29	EOD28	EOD27	EOD26	EOD25	EOD24
237	EOD23	EOD22	EOD21	EOD20	EOD19	EOD18	EOD17	EOD16
238	EOD15	EOD14	EOD13	EOD12	EOD11	EOD10	EOD9	EOD8
239	EOD7	EOD6	EOD5	EOD4	EOD3	EOD2	EOD1	EOD0
240	BTAL	PBATL	PBATZ		SPAL8	SPAL4	SPAL2	SPAL1
241								
242		SPCO	SPBO	SPAO	*REEL	SPAL	SCLP	SUCLP
243								
244								
245								
246								
247								

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
248	UO031	UO030	UO029	UO028	UO027	UO026	UO025	UO024
249	UO023	UO022	UO021	UO020	UO019	UO018	UO017	UO016
250	UO015	UO014	UO013	UO012	UO011	UO010	UO009	UO008
251	UO007	UO006	UO005	UO004	UO003	UO002	UO001	UO000
252	UO131	UO130	UO129	UO128	UO127	UO126	UO125	UO124
253	UO123	UO122	UO121	UO120	UO119	UO118	UO117	UO116
254	UO115	UO114	UO113	UO112	UO111	UO110	UO109	UO108
255	UO107	UO106	UO105	UO104	UO103	UO102	UO101	UO100
256	UO231	UO230	UO229	UO228	UO227	UO226	UO225	UO224
257	UO223	UO222	UO221	UO220	UO219	UO218	UO217	UO216
258	UO215	UO214	UO213	UO212	UO211	UO210	UO209	UO208
259	UO207	UO206	UO205	UO204	UO203	UO202	UO201	UO200
260	UO331	UO330	UO329	UO328	UO327	UO326	UO325	UO324
261	UO323	UO322	UO321	UO320	UO319	UO318	UO317	UO316
262	UO315	UO314	UO313	UO312	UO311	UO310	UO309	UO308
263	UO307	UO306	UO305	UO304	UO303	UO302	UO301	UO300

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
264		INP1	ZP41	ZP31	MD1	MV1	ZP21	ZP1
265							MMLK1	MMI1
266								
267								
268		INP2	ZP42	ZP32	MD2	MV2	ZP22	ZP2
269							MMLK2	MMI2
270								
271								
272		INP3	ZP43	ZP33	MD3	MV3	ZP23	ZP3
273							MMLK3	MMI3
274								
275								
276		INP4	ZP44	ZP34	MD4	MV4	ZP24	ZP4
277								MMI4
278								
279								

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BMI - DO

DGN No.	7	6	5	4	3	2	1	0
280		INP5	ZP45	ZP35	MD5	MV5	ZP25	ZP5
281							MMLK5	MMI5
282								
283								

11/12/ 110/120 series only

Continued in the same way (for 12/120 series only)

284 ∿ 287:	6th axis	304 ∿ 307:	11th axis
288 ∿ 291:	7th axis	308 ∿ 311:	12th axis
292 ∿ 295:	8th axis	312 ∿ 315:	14th axis
296 ∿ 299:	9th axis	316 ∿ 319:	14th axis
300 ∿ 303:	10th axis	320 ∿ 323:	15th axis

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3.7.5 Address list for 11TT

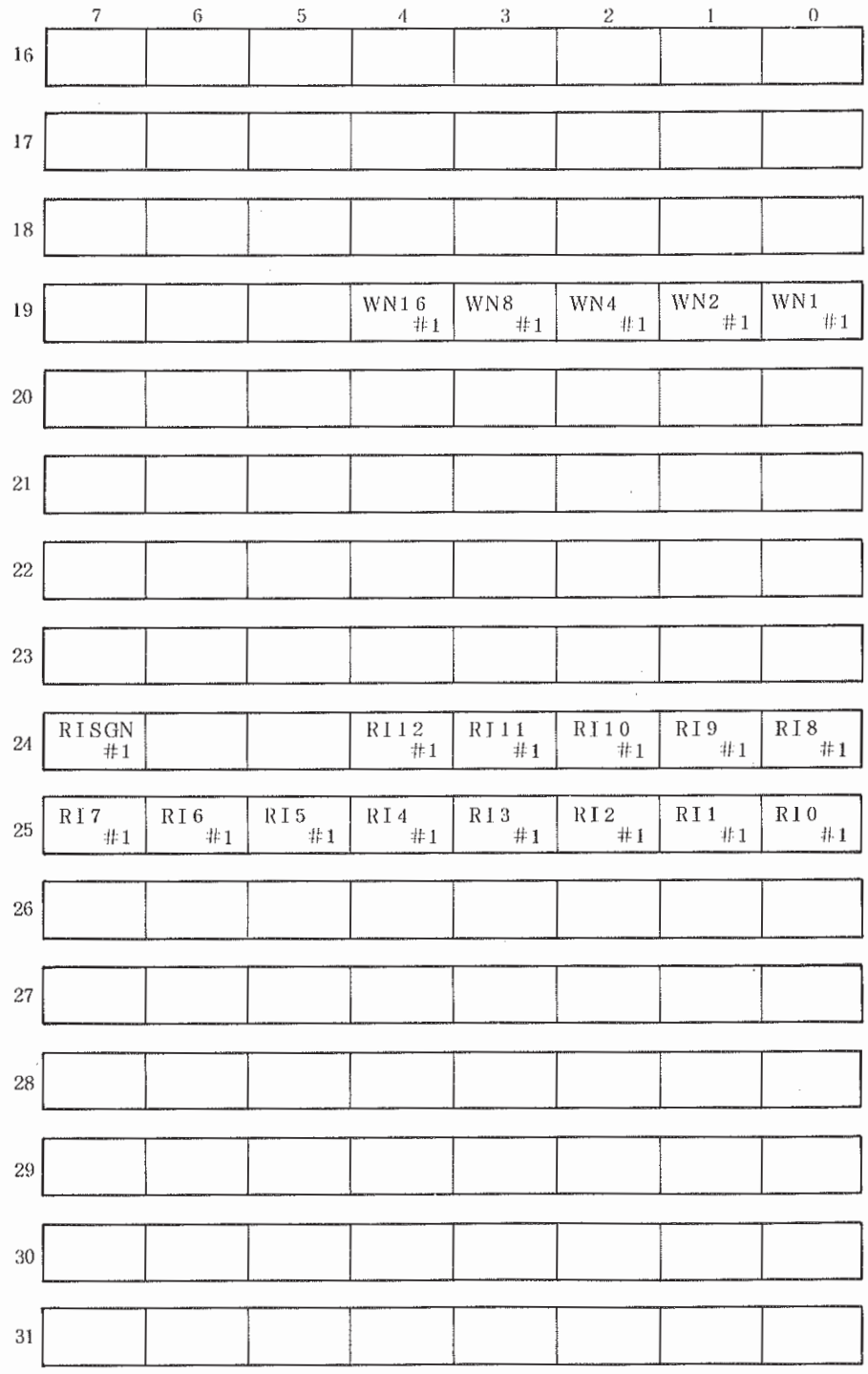
BMI-DI 1

	7	6	5	4	3	2	1	0
00					SKIP1 #1	UINT #1	*CSL #1	
01				AE3 #1	AE2 #1	AE1 #1	*BSL #1	*AIT #1
02								
03								
04				OVC #1		BDT1 #1		
05							FIN #1	
06								
07	BDT9 #1	BDT8 #1	BDT7 #1	BDT6 #1	BDT5 #1	BDT4 #1	BDT3 #1	BDT2 #1
08	TMRON						*CSMZ #1	*CHF #1
09	TLSKP #1	TL64 #1	TL32 #1	TL16 #1	TL8 #1	TL4 #1	TL2 #1	TL1 #
10	TLRST #1							
11								
12	*FV7 #1	*FV6 #1	*FV5 #1	*FV4 #1	*FV3 #1	*FV2 #1	*FV1 #1	*FV0 #1
13	*AFV7 #1	*AFV6 #1	*AFV5 #1	*AFV4 #1	*AFV3 #1	*AFV2 #1	*AFV1 #1	*AFV0 #1
14								
15								

(Note) There are some signals which are provided for the first and second tool posts respectively and they provide just the same function.
These signals are identified by symbol #1 or #2 which is affixed to their names. Symbol #1 shows a signal exclusively provided for the first tool post, while symbol #2 shows a signal exclusively provided for the second tool post.

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BMI-DI 2



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BMI-DI 3

	7	6	5	4	3	2	1	0
32	UI031 #1	UI030 #1	UI029 #1	UI028 #1	UI027 #1	UI026 #1	UI025 #1	UI024 #1
33	UI023 #1	UI022 #1	UI021 #1	UI020 #1	UI019 #1	UI018 #1	UI017 #1	UI016 #1
34	UI015 #1	UI014 #1	UI013 #1	UI012 #1	UI011 #1	UI010 #1	UI009 #1	UI008 #1
35	UI007 #1	UI006 #1	UI005 #1	UI004 #1	UI003 #1	UI002 #1	UI001 #1	UI000 #1
36	UI131 #1	UI130 #1	UI129 #1	UI128 #1	UI127 #1	UI126 #1	UI125 #1	UI124 #1
37	UI123 #1	UI122 #1	UI121 #1	UI120 #1	UI119 #1	UI118 #1	UI117 #1	UI116 #1
38	UI115 #1	UI114 #1	UI113 #1	UI112 #1	UI111 #1	UI110 #1	UI109 #1	UI108 #1
39	UI107 #1	UI106 #1	UI105 #1	UI104 #1	UI103 #1	UI102 #1	UI101 #1	UI100 #1
40	UI231 #1	UI230 #1	UI229 #1	UI228 #1	UI227 #1	UI226 #1	UI225 #1	UI224 #1
41	UI223 #1	UI222 #1	UI221 #1	UI220 #1	UI219 #1	UI218 #1	UI217 #1	UI216 #1
42	UI215 #1	UI214 #1	UI213 #1	UI212 #1	UI211 #1	UI210 #1	UI209 #1	UI208 #1
43	UI207 #1	UI206 #1	UI205 #1	UI204 #1	UI203 #1	UI202 #1	UI201 #1	UI200 #1
44	UI331 #1	UI330 #1	UI329 #1	UI328 #1	UI327 #1	UI326 #1	UI325 #1	UI324 #1
45	UI323 #1	UI322 #1	UI321 #1	UI320 #1	UI319 #1	UI318 #1	UI317 #1	UI316 #1
46	UI315 #1	UI314 #1	UI313 #1	UI312 #1	UI311 #1	UI310 #1	UI309 #1	UI308 #1
47	UI307 #1	UI306 #1	UI305 #1	UI304 #1	UI303 #1	UI302 #1	UI301 #1	UI300 #1

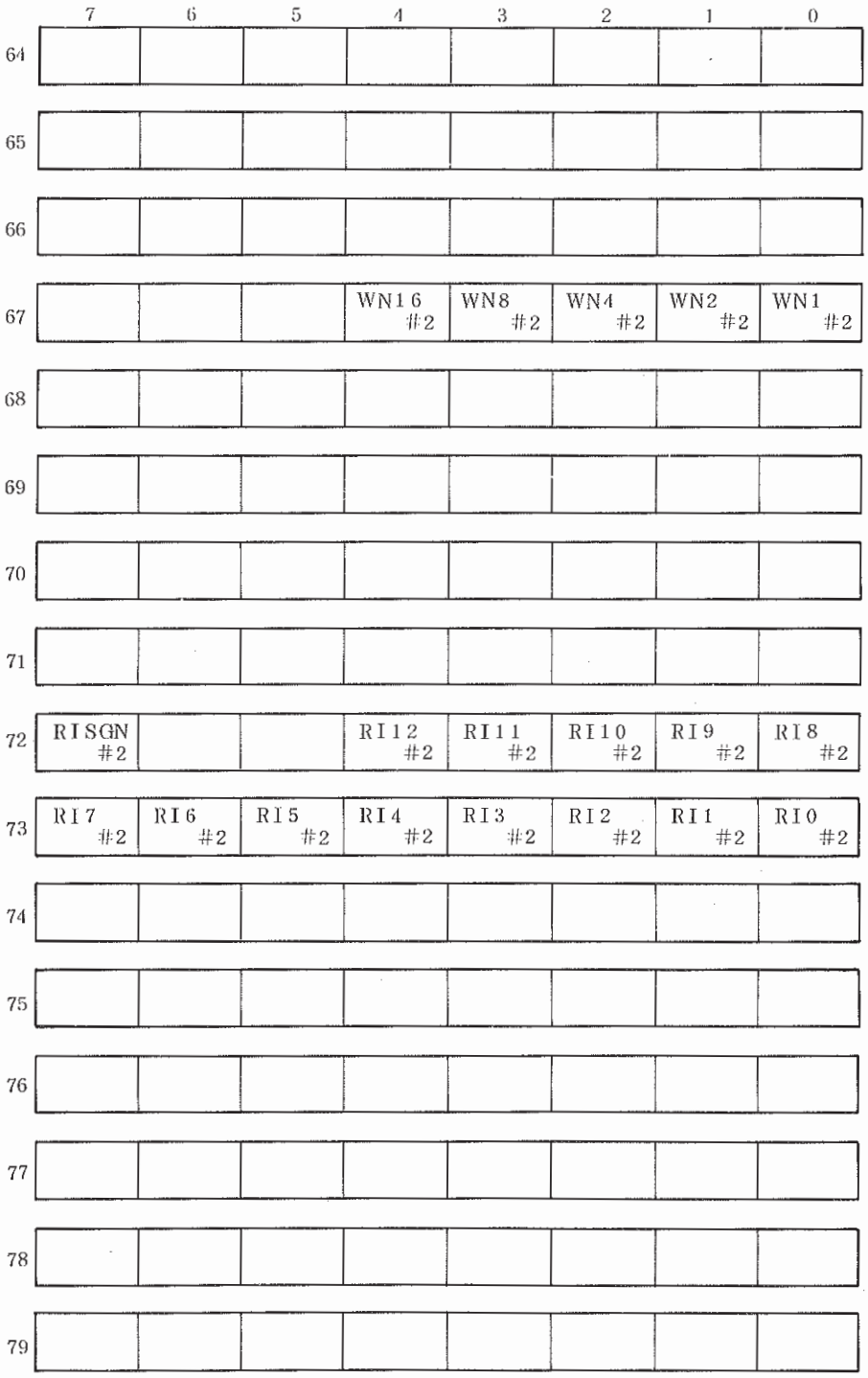
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BMI-DI 4

	7	6	5	4	3	2	1	0
48					SKIP1 #2	UINT #2	*CSL #2	
49				AE3 #2	AE2 #2	AE1 #2	*BSL #2	*AIT #2
50								
51								
52				OVC #2		BDT1 #2		
53							FIN #2	
54								
55	BDT9 #2	BDT8 #2	BDT7 #2	BDT6 #2	BDT5 #2	BDT4 #2	BDT3 #2	BDT2 #2
56							*CSMZ #2	*CHF #2
57	TLSKP #2	TL64 #2	TL32 #2	TL16 #2	TL8 #2	TL4 #2	TL2 #2	TL1 #2
58	TLRST #							
59								
60	*FV7 #2	*FV6 #2	*FV5 #2	*FV4 #2	*FV3 #2	*FV2 #2	*FV1 #2	*FV0 #2
61	*AFV7 #2	*AFV6 #2	*AFV5 #2	*AFV4 #2	*AFV3 #2	*AFV2 #2	*AFV1 #2	*AFV0 #2
62								
63								

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BMI-DI 5



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BMI-DI 6

	7	6	5	4	3	2	1	0
80	UI031 #2	UI030 #2	UI029 #2	UI028 #2	UI027 #2	UI026 #2	UI025 #2	UI024 #2
81	UI023 #2	UI022 #2	UI021 #2	UI020 #2	UI019 #2	UI018 #2	UI017 #2	UI016 #2
82	UI015 #2	UI014 #2	UI013 #2	UI012 #2	UI011 #2	UI010 #2	UI009 #2	UI008 #2
83	UI007 #2	UI006 #2	UI005 #2	UI004 #2	UI003 #2	UI002 #2	UI001 #2	UI000 #2
84	UI131 #2	UI130 #2	UI129 #2	UI128 #2	UI127 #2	UI126 #2	UI125 #2	UI124 #2
85	UI123 #2	UI122 #2	UI121 #2	UI120 #2	UI119 #2	UI118 #2	UI117 #2	UI116 #2
86	UI115 #2	UI114 #2	UI113 #2	UI112 #2	UI111 #2	UI110 #2	UI109 #2	UI108 #2
87	UI107 #2	UI106 #2	UI105 #2	UI104 #2	UI103 #2	UI102 #2	UI101 #2	UI100 #2
88	UI231 #2	UI230 #2	UI229 #2	UI228 #2	UI227 #2	UI226 #2	UI225 #2	UI224 #2
89	UI223 #2	UI222 #2	UI221 #2	UI220 #2	UI219 #2	UI218 #2	UI217 #2	UI216 #2
90	UI215 #2	UI214 #2	UI213 #2	UI212 #2	UI211 #2	UI210 #2	UI209 #2	UI208 #2
91	UI207 #2	UI206 #2	UI205 #2	UI204 #2	UI203 #2	UI202 #2	UI201 #2	UI200 #2
92	UI331 #2	UI330 #2	UI329 #2	UI328 #2	UI327 #2	UI326 #2	UI325 #2	UI324 #2
93	UI323 #2	UI322 #2	UI321 #2	UI320 #2	UI319 #2	UI318 #2	UI317 #2	UI316 #2
94	UI315 #2	UI314 #2	UI313 #2	UI312 #2	UI311 #2	UI310 #2	UI309 #2	UI308 #2
95	UI307 #2	UI306 #2	UI305 #2	UI304 #2	UI303 #2	UI302 #2	UI301 #2	UI300 #2

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BMI-DI 7

	7	6	5	4	3	2	1	0
96	ERS	RRW	*SP	*ESP				*IT
97		EDT	MEM		D	J	H	S
98	ZRN							
99	MLK	DLK	ABS		SBK		DRN	AFL
100	KEY4	KEY3	KEY2	KEY1				ST
101	RT	ROV2	ROV1	MP4	MP2	MP1		PRC
102					HS3D	HS3C	HS3B	HS3A
103	HS2D	HS2C	HS2B	HS2A	HS1D	HS1C	HS1B	HS1A
104	*JV15	*JV14	*JV13	*JV12	*JV11	*JV10	*JV9	*JV8
105	*JV7	*JV6	*JV5	*JV4	*JV3	*JV2	*JV1	*JV0
106						DIST26	DIST25	DIST24
107	DIST23	DIST22	DIST21	DIST20	DIST19	DIST18	DIST17	DIST16
108	DIST15	DIST14	DIST13	DIST12	DIST11	DIST10	DIST9	DIST8
109	DIST7	DIST6	DIST5	DIST4	DIST3	DIST2	DIST1	DIST0
110							IHEAD2	IHEAD1
111								

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BMI-DI 8

	7	6	5	4	3	2	1	0
112	EISTB	ERDRQ	EOREND	EIHEAD		EXSTP	EXRD	EXPUN
113	EIA7	EIA6	EIA5	EIA4	EIA3	EIA2	EIA1	EIA0
114	EID47	EID46	EID45	EID44	EID43	EID42	EID41	EID40
115	EID39	EID38	EID37	EID36	EID35	EID34	EID33	EID32
116	EID31	EID30	EID29	EID28	EID27	EID26	EID25	EID24
117	EID23	EID22	EID21	EID20	EID19	EID18	EID17	EID16
118	EID15	EID14	EID13	EID12	EID11	EID10	EID9	EID8
119	EID7	EID6	EID5	EID4	EID3	EID2	EID1	EID0
120								
121								
122								
123								
124								
125								
126								
127								

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BMI-DI 9

	7	6	5	4	3	2	1	0
128	DTCH1	∗SVF1	∗DEC1	∗IT1	∗−ED1	∗+ED1	∗−L1	∗+L1
129					MLK1	MI1	−J1	+J1
130								
131								
132	DTCH2	∗SVF2	∗DEC2	∗IT2	∗−ED2	∗+ED2	∗−L2	∗+L2
133					MLK2	MI2	−J2	+J2
134								
135								
136	DTCH3	∗SVF3	∗DEC3	∗IT3	∗−ED3	∗+ED3	∗−L3	∗+L3
137					MLK3	MI3	−J3	+J3
138								
139								
140	DTCH4	∗SVF4	∗DEC4	∗IT4	∗−ED4	∗+ED4	∗−L4	∗+L4
141					MLK4	MI4	−J4	+J4
142								
143								

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BMI-DI 10

	7	6	5	4	3	2	1	0
144	DTCH5	∗SVF5	∗DEC5	∗IT5	∗−ED5	∗+ED5	∗−L5	∗+L5
145					MLK5	MI5	−J5	+J5
146								
147								

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BMI-DO 1

	7	6	5	4	3	2	1	0
200	CSS #1	THRD #1	RPD #1				IPEN #1	DEN #1
201						MBDT1 #1		
202	MBDT9 #1	MBDT8 #1	MBDT7 #1	MBDT6 #1	MBDT5 #1	MBDT4 #1	MBDT3 #1	MBDT2 #1
203	TLCHB #1	TLCHA #1	ESEND #1					
204					BF #1	TF #1	SF #1	MF #1
205	DM30 #1	DM02 #1	DM01 #1	DM00 #1				
206	RO15 #1	RO14 #1	RO13 #1	RO12 #1	RO11 #1	RO10 #1	RO9 #1	RO8 #1
207	RO7 #1	RO6 #1	RO5 #1	RO4 #1	RO3 #1	RO2 #1	RO1 #1	RO0 #1
208	AR15 #1	AR14 #1	AR13 #1	AR12 #1	AR11 #1	AR10 #1	AR9 #1	AR8 #1
209	AR7 #1	AR6 #1	AR5 #1	AR4 #1	AR3 #1	AR2 #1	AR1 #1	AR0 #1
210	MR15 #1	MR14 #1	MR13 #1	MR12 #1	MR11 #1	MR10 #1	MR9 #1	MR8 #1
211	MR7 #1	MR6 #1	MR5 #1	MR4 #1	MR3 #1	MR2 #1	MR1 #1	MR0 #1
212					SPAL8 #1	SPAL4 #1	SPAL2 #1	SPAL1 #1
213								
214								
215								

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BMI-DO 2

	7	6	5	4	3	2	1	0
216	M31 #1	M30 #1	M29 #1	M28 #1	M27 #1	M26 #1	M25 #1	M24 #1
217	M23 #1	M22 #1	M21 #1	M20 #1	M19 #1	M18 #1	M17 #1	M16 #1
218	M15 #1	M14 #1	M13 #1	M12 #1	M11 #1	M10 #1	M9 #1	M8 #1
219	M7 #1	M6 #1	M5 #1	M4 #1	M3 #1	M2 #1	M1 #1	M0 #1
220	S31 #1	S30 #1	S29 #1	S28 #1	S27 #1	S26 #1	S25 #1	S24 #1
221	S23 #1	S22 #1	S21 #1	S20 #1	S19 #1	S18 #1	S17 #1	S16 #1
222	S15 #1	S14 #1	S13 #1	S12 #1	S11 #1	S10 #1	S9 #1	S8 #1
223	S7 #1	S6 #1	S5 #1	S4 #1	S3 #1	S2 #1	S1 #1	S0 #1
224	T31 #1	T30 #1	T29 #1	T28 #1	T27 #1	T26 #1	T25 #1	T24 #1
225	T23 #1	T22 #1	T21 #1	T20 #1	T19 #1	T18 #1	T17 #1	T16 #1
226	T15 #1	T14 #1	T13 #1	T12 #1	T11 #1	T10 #1	T9 #1	T8 #1
227	T7 #1	T6 #1	T5 #1	T4 #1	T3 #1	T2 #1	T1 #1	T0 #1
228	B31 #1	B30 #1	B29 #1	B28 #1	B27 #1	B26 #1	B25 #1	B24 #1
229	B23 #1	B22 #1	B21 #1	B20 #1	B19 #1	B18 #1	B17 #1	B16 #1
230	B15 #1	B14 #1	B13 #1	B12 #1	B11 #1	B10 #1	B9 #1	B8 #1
231	B7 #1	B6 #1	B5 #1	B4 #1	B3 #1	B2 #1	B1 #1	B0 #1

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BMI-DO 3

	7	6	5	4	3	2	1	0
232	UO031 #1	UO030 #1	UO029 #1	UO028 #1	UO027 #1	UO026 #1	UO025 #1	UO024 #1
233	UO023 #1	UO022 #1	UO021 #1	UO020 #1	UO019 #1	UO018 #1	UO017 #1	UO016 #1
234	UO015 #1	UO014 # #1	UO013 #1	UO012 #1	UO011 #1	UO010 #1	UO009 #1	UO008 #1
235	UO007 #1	UO006 #1	UO005 #1	UO004 #1	UO003 #1	UO002 #1	UO001 #1	UO000 #1
236	UO131 #1	UO130 #1	UO129 #1	UO128 #1	UO127 #1	UO126 #1	UO125 #1	UO124 #1
237	UO123 #1	UO122 #1	UO121 #1	UO120 #1	UO119 #1	UO118 #1	UO117 #1	UO116 #1
238	UO115 #1	UO114 #1	UO113 #1	UO112 #1	UO111 #1	UO110 #1	UO109 #1	UO108 #1
239	UO107 #1	UO106 #1	UO105 #1	UO104 #1	UO103 #1	UO102 #1	UO101 #1	UO100 #1
240	UO231 #1	UO230 #1	UO229 #1	UO228 #1	UO227 #1	UO226 #1	UO225 #1	UO224 #1
241	UO223 #1	UO222 #1	UO221 #1	UO220 #1	UO219 #1	UO218 #1	UO217 #1	UO216 #1
242	UO215 #1	UO214 #1	UO213 #1	UO212 #1	UO211 #1	UO210 #1	UO209 #1	UO208 #1
243	UO207 #1	UO206 #1	UO205 #1	UO204 #1	UO203 #1	UO202 #1	UO201 #1	UO200 #1
244	UO331 #1	UO330 #1	UO329 #1	UO328 #1	UO327 #1	UO326 #1	UO325 #1	UO324 #1
245	UO323 #1	UO322 #1	UO321 #1	UO320 #1	UO319 #1	UO318 #1	UO317 #1	UO316 #1
246	UO315 #1	UO314 #1	UO313 #1	UO312 #1	UO311 #1	UO310 #1	UO309 #1	UO308 #1
247	UO307 #1	UO306 #1	UO305 #1	UO304 #1	UO303 #1	UO302 #1	UO301 #1	UO309 #1

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BMI-DO 4

	7	6	5	4	3	2	1	0
248	CSS #2	THRD #2	RPD #2				IPEN #2	DEN #2
249						MBDT1 #2		
250	MBDT9 #2	MBDT8 #2	MBDT7 #2	MBDT6 #2	MBDT5 #2	MBDT4 #2	MBDT3 #2	MBDT2 #2
251	TLCHB #2	TLCHA #2	ESEND #2					
252					BF #2	TF #2	SF #2	MF #2
253	DM30 #2	DM02 #2	DM01 #2	DM00 #2				
254	RO15 #2	RO14 #2	RO13 #2	RO12 #2	RO11 #2	RO10 #2	RO9 #2	RO8 #2
255	RO7 #2	RO6 #2	RO5 #2	RO4 #2	RO3 #2	RO2 #2	RO1 #2	RO0 #2
256	AR15 #2	AR14 #2	AR13 #2	AR12 #2	AR11 #2	AR10 #2	AR9 #2	AR8 #2
257	AR7 #2	AR6 #2	AR5 #2	AR4 #2	AR3 #2	AR2 #2	AR1 #2	AR0 #2
258	MR15 #2	MR14 #2	MR13 #2	MR12 #2	MR11 #2	MR10 #2	MR9 #2	MR8 #2
259	MR7 #2	MR6 #2	MR5 #2	MR4 #2	MR3 #2	MR2 #2	MR1 #2	MR0 #2
260					SPAL8 #2	SPAL4 #2	SPAL2 #2	SPAL1 #2
261								
262								
263								

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BMI-DO 5

	7	6	5	4	3	2	1	0
264	M31 #2	M30 #2	M29 #2	M28 #2	M27 #2	M26 #2	M25 #2	M24 #2
265	M23 #2	M22 #2	M21 #2	M20 #2	M19 #2	M18 #2	M17 #2	M16 #2
266	M15 #2	M14 #2	M13 #2	M12 #2	M11 #2	M10 #2	M9 #2	M8 #2
267	M7 #2	M6 #2	M5 #2	M4 #2	M3 #2	M2 #2	M1 #2	M0 #2
268	S31 #2	S30 #2	S29 #2	S28 #2	S27 #2	S26 #2	S25 #2	S24 #2
269	S23 #2	S22 #2	S21 #2	S20 #2	S19 #2	S18 #2	S17 #2	S16 #2
270	S15 #2	S14 #2	S13 #2	S12 #2	S11 #2	S10 #2	S9 #2	S8 #2
271	S7 #2	S6 #2	S5 #2	S4 #2	S3 #2	S2 #2	S1 #2	S0 #2
272	T31 #2	T30 #2	T29 #2	T28 #2	T27 #2	T26 #2	T25 #2	T24 #2
273	T23 #2	T22 #2	T21 #2	T20 #2	T19 #2	T18 #2	T17 #2	T16 #2
274	T15 #2	T14 #2	T13 #2	T12 #2	T11 #2	T10 #2	T9 #2	T8 #2
275	T7 #2	T6 #2	T5 #2	T4 #2	T3 #2	T2 #2	T1 #2	T0 #2
276	B31 #2	B30 #2	B29 #2	B28 #2	B27 #2	B26 #2	B25 #2	B24 #2
277	B23 #2	B22 #2	B21 #2	B20 #2	B19 #2	B18 #2	B17 #2	B16 #2
278	B15 #2	B14 #2	B13 #2	B12 #2	B11 #2	B10 #2	B9 #2	B8 #2
279	B7 #2	B6 #2	B5 #2	B4 #2	B3 #2	B2 #2	B1 #2	B0 #2

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BMI-DO 6

	7	6	5	4	3	2	1	0
280	UO031 #2	UO030 #2	UO029 #2	UO028 #2	UO027 #2	UO026 #2	UO025 #2	UO024 #2
281	UO023 #2	UO022 #2	UO021 #2	UO020 #2	UO019 #2	UO018 #2	UO017 #2	UO016 #2
282	UO015 #2	UO014 #2	UO013 #2	UO012 #2	UO011 #2	UO010 #2	UO009 #2	UO008 #2
283	UO007 #2	UO006 #2	UO005 #2	UO004 #2	UO003 #2	UO002 #2	UO001 #2	UO000 #2
284	UO131 #2	UO130 #2	UO129 #2	UO128 #2	UO127 #2	UO126 #2	UO125 #2	UO124 #2
285	UO123 #2	UO122 #2	UO121 #2	UO120 #2	UO119 #2	UO118 #2	UO117 #2	UO116 #2
286	UO115 #2	UO114 #2	UO113 #2	UO112 #2	UO111 #2	UO110 #2	UO109 #2	UO108 #2
287	UO107 #2	UO106 #2	UO105 #2	UO104 #2	UO103 #2	UO102 #2	UO101 #2	UO100 #2
288	UO231 #2	UO230 #2	UO229 #2	UO228 #2	UO227 #2	UO226 #2	UO225 #2	UO224 #2
289	UO223 #2	UO222 #2	UO221 #2	UO220 #2	UO219 #2	UO218 #2	UO217 #2	UO216 #2
290	UO215 #2	UO214 #2	UO213 #2	UO212 #2	UO211 #2	UO210 #2	UO209 #2	UO208 #2
291	UO207 #2	UO208 #2	UO205 #2	UO204 #2	UO203 #2	UO202 #2	UO201 #2	UO200 #2
292	UO331 #2	UO330 #2	UO329 #2	UO328 #2	UO327 #2	UO326 #2	UO325 #2	UO324 #2
293	UO323 #2	UO322 #2	UO321 #2	UO320 #2	UO319 #2	UO318 #2	UO317 #2	UO316 #2
294	UO315 #2	UO314 #2	UO313 #2	UO312 #2	UO311 #2	UO310 #2	UO309 #2	UO308 #2
295	UO307 #2	UO306 #2	UO305 #2	UO304 #2	UO303 #2	UO302 #2	UO301 #2	UO300 #2

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BMI-DO 7

	7	6	5	4	3	2	1	0
296	MA	SA	OP	STL	SPL	RST	AL	RWD
297					INCH	DST		
298	MZRN							
299		MEDT	MMEM		MD	MJ	MH	MS
300	MMLK	MDLK	MABS		MSBK		MDRN	MAFL
301		TIALM		SYALM	OTALM	OHALM	SVALM	PSALM
302				RPBSY				
303								
304								
305								
306								
307								
308								
309								
310							OHEAD2	OHEAD1
311								

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BMI-DO 8

	7	6	5	4	3	2	1	0
312	EOSTB		EIREND	EOHEAD				
313	EOA7	EOA6	EOA5	EOA4	EOA3	EOA2	EOA1	EOA0
314	EOD47	EOD46	EOD45	EOD44	EOD43	EOD42	EOD41	EOD40
315	EOD39	EOD38	EOD37	EOD36	EOD35	EOD34	EOD33	EOD32
316	EOD31	EOD30	EOD29	EOD28	EOD27	EOD26	EOD25	EOD24
317	EOD23	EOD22	EOD21	EOD20	EOD19	EOD18	EOD17	EOD16
318	EOD15	EOD14	EOD13	EOD12	EOD11	EOD10	EOD9	EOD8
319	EOD7	EOD6	EOD5	EOD4	EOD3	EOD2	EOD1	EOD0
320					*REEL			TICHK
321								
322								
323								
324								
325								
326								
327								

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BMI-DO 9

	7	6	5	4	3	2	1	0
328		INP1	ZP41	ZP31	MD1	MV1	ZP21	ZP1
329							MMLK1	MMI1
330								
331								
332		INP2	ZP42	ZP32	MD2	MV2	ZP22	ZP2
333							MMLK2	MMI2
334								
335								
336		INP3	ZP43	ZP33	MD3	MV3	ZP23	ZP3
337							MMLK3	MMI3
338								
339								
340		INP4	ZP44	ZP34	MD4	MV4	ZP24	ZP4
341							MMLK4	MMI4
342								
343								

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BMI-DO 10

	7	6	5	4	3	2	1	0
344		INP5	ZP45	ZP35	MD5	MV5	ZP25	ZP5
345							MMLK5	MMI5
346								
347								

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Tool posts and BMI

11TT controls turning machines which can turn one or two workpieces concurrently by operating two tool posts independently.
In other words, it is applicable to either turning machine (with 2 spindles and 2 tool posts) which can turn two workpieces concurrently by using two tool posts with two spindles, or turning machine (with 1 spindle and 2 tool posts) which can turn one workpiece concurrently by using two tool posts with one spindle.
The DI/DO signals of BMI can be sorted when dividing them from the viewpoints of tool posts as described below.

- DI/DO signals common to two tool posts
  A signal having a certain function is provided to both first and second tool posts in common. The reset signal, emergency signal, and other signals that select basic operation modes of the control unit belong to this group. If a memory command operation mode is selected, for example, the memory command operation is selected for both first and second tool posts in common.
  Both first and second tool posts are reset or urgently stopped concurrently by the reset or emergency stop signal.

- DI/DO signals exclusively provided for individual tool posts
  A signal having a certain signal is provided for the first tool post and second tool post independently. These signals are affixed with #1 or #2 at the end of their signal names.
  Symbol #1 shows a signal exclusively provided for the first tool post, while symbol #2 shows a signal exclusively provided for the second tool post.
  These signals are also subdivided into the following two groups.

- Spindle control DI/DO
  The following signals belong to this group.
  i. Command spindle speed signals R00 - R015
  ii. Maximum spindle speed signals MR0 - MR15
  iii. Actual spindle speed signals AR0 - MR15
  iv. Spindle motor command voltage signals RISGN, RI0 - RI12

  In case of 2 spindles and 2 tool posts;
  Individual tool post spindles are controlled by using spindle control DI/DO exclusively provided for tool posts.

  In case of 1 spindle and 2 tool posts;
  The spindle common to two tool posts is controlled by using spindle control DI/DO signals provided for the first tool post.

- DI/DO other than those for spindle control
  The feedrate override signal, auxiliary function code signals, stroke signal, etc. belong to this group. The override of the cutting feedrate can be independently applied to individual tool posts, and auxiliary function code signal and strobe signal are sent to these tool posts independently of each other.

The DI/DO signals provided for each control axis may be said to belong to "DI/DO exclusively provided for individual tool posts" because that the axis controls either tool post only. However, these signals are not affixed with divided by tool posts, but divided by control axis numbers as viewed from the entire system.

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In the 11TT the following three groups are provided as the configuration of control axes.

<table>
<tr><td></td><td>1st axis</td><td>2nd axis</td><td>3rd axis</td><td>4th axis</td><td>5th axis</td></tr>
<tr><td rowspan="2">1</td><td colspan="2">1st tool post</td><td colspan="2">2nd tool post</td><td rowspan="2">Not provided</td></tr>
<tr><td>X1</td><td>Z1</td><td>X2</td><td>Z2</td></tr>
<tr><td rowspan="2">2</td><td colspan="3">1st tool post</td><td colspan="2">2nd tool post</td></tr>
<tr><td>X1</td><td>Z1</td><td>Additional axis</td><td>X2</td><td>Z2</td></tr>
<tr><td rowspan="2">3</td><td colspan="2">1st tool post</td><td colspan="2">2nd tool post</td><td rowspan="2">Additional axis</td></tr>
<tr><td>X1</td><td>Z1</td><td>X2</td><td>Z2</td></tr>
</table>

Two axes are provided for each tool post (or, 4 axes in total) as the basic configuration, and one additional axis is provided for either tool post (5 axes in total) as the optional configuration.

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10/11/100/110M with same interface as 6M

6M MI - DI

DGN No.	7	6	5	4	3	2	1	0
400	DTCHX	*SVFX	*DECX	*ITX	*-EDX	*+EDX	*-LX	*+LX
401	HX				MLKX	MIX	-X	+X
402	DTCHY	*SVFY	*DECY	*ITY	*-EDY	*+EDY	*-LY	*+LY
403	HY				MLKY	MIY	-Y	+Y
404	DTCHZ	*SVFZ	*DECZ	*ITZ	*-EDZ	*+EDZ	*-LZ	*+LZ
405	HZ				ZNG	MIZ	-Z	+Z
406	4NG	*SVF4	*DEC4	*IT4	*-ED4	*+ED4	*-L4	*+L4
407	H4				MLK4	MI4	-4	+4
408	MLK	DLK	ABS	OVC	SBK	BDT1	DRN	AFL
409	ZRN	BRN	SRN	KEY	F1D		FIN	ST
410	ERS	RRW	*SP	*ESP	SKIP	UINT	SAR	
411	GST	SOR	*SSTP	GRB	GRA	SPC	SPB	SPA
412	AGJ	EDT	MEM	T	D	J	H	S
413	MP4	MP2	MP1	*FV16	*FV8	*FV4	*FV2	*FV1
414	RT	ROV2	ROV1	*JV16	*JV8	*JV4	*JV2	*JV1
415	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2
	AGSTB	AG24	AG22	AG21	AG18	AG14	AG12	AG11

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6M • MI – DI

DGN No.	7	6	5	4	3	2	1	0
416	TLRST							
417	TLSKP	TL64	TL32	TL16	TL08	TL04	TL02	TL01
418			AGST	WN16	WN8	WN4	WN2	WN1
419	ESTB	EA6	EA5	EA4	EA3	EA2	EA1	EA0
420	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
421	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
422	UI15	UI14	UI13	UI12	UI11	UI10	UI9	UI8
423	UI7	UI6	UI5	UI4	UI3	UI2	UI1	UI0
424	SIND			R13I	R12I	R11I	R10I	R09I
425	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I
426	5NG	*SVF5	*DEC5	*IT5	*-ED5	*+ED5	*-L5	*+L5
427	H5				MLK5	MI5	-5	+5

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6M • MI – DO

DGN No.	7	6	5	4	3	2	1	0	
500	MA	SA	OP	STL	SPL	RST	AL	RWD	
501	CSS	THRD	RPD	TAP	INCH	DST	IPEN	DEN	
502	SSP	SRV	FMF	EF	BF	TF	SF	MF	
503	MMIY	SEY	ZP2Y	ZPY	MMIX	SEX	ZP2X	ZPX	
504	MMI4	SE4	ZP24	ZP4	MMIZ	SEZ	ZP2Z	ZPZ	
505	TLCHB	TLCHA	ESEND	EREND	MMI5	SE5	ZP25	ZP5	
506	M30	M02	M01	M00	M38	M34	M32	M32	
507	M28	M24	M22	M21	M18	M14	M12	M11	
508	T48	T44	T42	T41	T38	T34	T32	T31	
509	T28	T24	T22	T21	T18	T14	T12	T11	
510	S28	S24	S22	S21	S18	S14	S12	S11	(param.)
	S52	S51	S48	S44	S42	S41	GRB	GRA	S12BIT-A
	S48	S44	S42	S41	S38	S34	S32	S31	S12BIT-B
511	B38	B34	B32	B31	B28	B24	B22	B21	(param.)
	S28	S24	S22	S21	S18	S14	S12	S11	S12BIT-A
	S28	S24	S22	S21	S18	S14	S12	S11	S12BIT-B
512	B18	B14	B12	B11	R12	R11	R10	R09	(param.)
	B38	B34	S32	S31	R12	R11	R10	R09	S12BIT-A
	S58	S54	S52	S51	R12	R11	R10	R09	S12BIT-A
513	R08	R07	R06	R05	R04	R03	R02	R01	
514	UO15	UO14	UO13	UO12	UO11	UO10	UO9	UO8	
515	UO7	UO6	UO5	UO4	UO3	UO2	UO1	UO0	

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6M • MI - DO

DGN No.	7	6	5	4	3	2	1	0
516	MMLK	MDLK	MABS	MZNG	MSBK	MBDT1	MDRN	MAFL
517	MBDT9	MBDT8	MBDT7	MBDT6	MBDT5	MBDT4	MBDT3	MBDT2
518							BCLP	MUCL

* The underlined signals are added to 6M.

DI DTCHX, Y, Z : detach axis
MLKX, Y, 4, 5 : machine lock axis
MIZ : mirror image
*+ED4, 5, *-ED4, 5: external deceleration
BRN : block return

DO CSS : constant cutting speed mode
THRD : threading mode
TAP : tapping mode
INCH : inch input mode
IPEN : interpolation end
MMIZ : mirror imaged
SE5 : axis select

* The following signals are not provided for 6T, but exclusively for 6M.

DI F1D, angular jogs (AGJ, AGSTB, AG11 ∿ AG24, AGST), OVRCD, *BECLP, *BEUCL

DO SSP, SRV, FMF, EF, BF, M 3rd, S 5th, T 3rd-4th, B 1st-3rd, MZNG, BCLP, BUCL

* The following signals are defined in 6T, but not included in above.

DI STLK, XAE, ZAE, PRC, SMZ, CDZ, *SECLP, *SEUCL, SPSTP

DO SCLP, SUCL

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10/11/100/110T with the same interface as 6T

6T • MI - DI

DGN No.	7	6	5	4	3	2	1	0
400	DTCHX	*SVFX	*DECX	*ITX	*-EDS	*+EDX	*-LX	*+LX
401	HX				MLKX	MIX	-X	+X
402	DTCHZ	*SVFZ	*DECZ	*ITZ	*-EDZ	*+EDZ	*-LZ	*+LZ
403	HZ				MLKZ	MIZ	-Z	+Z
404	DTCH3	*SVF3	*DEC3	*IT3	*-ED3	*+ED3	*-L3	*+L3
405	H3				MLK3	MI3	-3	+3
406	DTCH4	*SVF4	*DEC4	*IT4	*-ED4	*+ED4	*-L4	*+L4
407	H4				MLK4	MI4	-4	+4
408	MLK	DLK	ABS	OVC	SBK	BDT1	DRN	AFL
409	ZRN	BRN	SRN	KEY			FIN	ST
410	ERS	RRW	*SP	*ESP	SKIP	UINT	SAR	STLK
411	GST	SOR	*SSTP			SPC	SPB	SPA
412		EDT	MEM	T	D	J	HS	
413	MP4	MP2	MP1		GR4	GR3	GR2	GR1
414	RT	ROV2	ROV1	*OV16	*OV8	*OV4	*OV2	*OV1
415	BDT9	BDT8	BDT7	BDT6	BDT5	BDT4	BDT3	BDT2

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6T • MI - DI

DGN No.	7	6	5	4	3	2	1	0
416	TLRST		PRC		ZAE	XAE	SMZ	CDZ
417	TLSKP				TL08	TL04	TL02	TL01
418				WN16	WN8	WN4	WN2	WN1
419	ESTB	EA6	EA5	EA4	EA3	EA2	EA1	EA0
420	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
421	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
422	UI15	UI14	UI13	UI12	UI11	UI10	UI9	UI8
423	UI7	UI6	UI5	UI4	UI3	UI2	UI1	UI0
424	SIND			R13I	R12I	R11I	R10I	R09I
425	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I
426					*SECLP	*SEUCL		SPSTP
427								

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6T • MI – DO

DGN No.	7	6	5	4	3	2	1	0
500	MA	SA	OP	STL	SPL	RST	AL	RWD
501	CSS	THRD	RPD	TAP	INCH	DST	IPEN	DEN
502						TF	SF	MF
503	MMIZ	SEZ	ZP2Z	ZPZ	MMIX	SEX	ZP2X	ZPX
504	MMI4	SE4	ZP24	ZP4	MMI3	SE3	ZP23	ZP3
505	TLCHB	TLCHA	ESEND	EREND				
506	M30	M02	M01	M00				
507	M28	M24	M22	M21	M18	M14	M12	M11
508								
509	T28	T24	T22	T21	T18	T14	T12	T11
510	S48	S44	S42	S41	S38	S34	S32	S31
511	S28	S24	S22	S21	S18	S14	S12	S11
512					R12	R11	R10	R09
513	R08	R07	R06	R05	R04	R03	R02	R01
514	UO15	UO14	UO13	UO12	UO11	UO10	UO9	UO8
515	UO7	UO6	UO5	UO4	UO3	UO2	UO1	UO0

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6T • MI - DO

DGN No.	7	6	5	4	3	2	1	0
516	MMLK	MDLK	MABS		MSBK	MBDT1	MDRN	MAFL
517	MBDT9	MBDT8	MBDT7	MBDT6	MBDT5	MBDT4	MBDT3	MBDT2
518							SCLP	SUCL

* The underlined signals are added to 6M.

DI DTCHX, Z, 3, 4 : detach axis
MLKX, Z, 3, 4 : machine lock axis
MIZ, 3, 4 : mirror image
*+EDX, Z, 3, 4 : external deceleration
*-EDX, Z, 3, 4
BRN : block return

DO CSS : constant cutting speed mode
THRD : threading mode
TAP : tapping mode
INCH : inch input mode
IPEN : interpolation end
MMIX, Z, 3, 4 : mirror imaged
SEX, Z, 3, 4 : axis select

* The following signals are not provided for 6M, but exclusively for 6T.

DI STLK, XAE, ZAE, PRC, SMZ, CDZ, *SECLP, *SEUCL, SPSTP

DO SCLP, SUCL

* The following signals are defined in 6M, but not included in above.

DI F1D, angular jogs (AGJ, AGSTB, AG11 ∿ AG24, AGST), OVRCD, *BECLP, *BEUCL

DO SSP, SRV, FMF, EF, BF, M 3rd, S 5th, T 3rd-4th, B 1st-3rd, MZNG, BCLP, BUCL

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10/100M with the same interface as in 3M

M • MI – DI1

DGN No.	7	6	5	4	3	2	1	0
400	DTCHX	*SVFX	*DECX	*ITX				
401	HX/ ROV1				MLKX	MIX	-X	+X
402	DTCHY	*SVFY	*DECY	*ITY				
403	HY/ ROV2				MLKY	MIY	-Y	+Y
404	DTCHZ	*SVFZ	*DECZ	*ITZ				
405	HZ/ DRN				ZNG	MIZ	-Z	+Z
406								
407								
408	MLK	DLK	ABS	OVC	SBK	BDT		AFL
409	ZRN	BRN		KEY			FIN	ST
410	ERS		*SP	*ESP	SKIP		SAR	*ILK
411		SOR	*SSTP			SPC	SPB	SPA
412						MD4	MD2	MD1
413		MP2	MP1					
414	RT				*OB8	*OV4	*OV2	*OV1
415								

(Note) The underlined signals are newly added.

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3M • MI - DI

DGN No.	7	6	5	4	3	2	1	0
416								
417								
418					PN8	PN4	PN2	PN1
419	ESTB	EA6	EA5	EA4	EA3	EA2	EA1	EA0
420	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
421	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
422	UI15	UI14	UI13	UI12	UI11	UI10	UI9	UI8
423	UI7	UI6	UI5	UI4	UI3	UI2	UI1	UI0
424	SIND	SSIN	SGN		R12I	R11I	R10I	R09I
425	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I

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3M • MI - DO

DGN No.	7	6	5	4	3	2	1	0	
500	MA	SA	OP	STL	SPL	RST	AL		
501	CSS	THRD	RPD	TAP	INCH	DST	IPEN	DEN	
502					BF	TF	SF	MF	
503			ZP2Y	ZPY			ZP2X	ZPX	
504							ZP2Z	ZPZ / EF	(param.)
505				EREND					
506	M30	M02	M01	M00					
507	M28	M24	M22	M21	M18	M14	M12	M11	
508									
509	T28	T24	T22	T21	T18	T14	T12	T11	
510	S28	S24	S22	S21	S18	S14 / MIG	S12 / MDG	S11 / LWG	(param.)
511	B38	B34	B32	B31	B28	B24	B22	B21	
512	B18	B14	B12	B11					
513									
514	UO15	UO14	UO13	UO12	UO11	UO10	UO9	UO8	
515	UO7	UO6	UO5	UO4	UO3	UO2	UO1	UO0	

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3M • MI - DO

DGN No.	7	6	5	4	3	2	1	0
516								
517								
518				ENB				

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10/100T with the same interface as 3T

3T • MI - DI

DGN No.	7	6	5	4	3	2	1	0
400	DTCHX	*SVFX	*DECX					
401	HX/ ROV1				MLKX	MIX	-X	+X
402	DTCHZ	*SVFZ	*DECZ					*+LZ
403	HZ/ ROV2				MLKZ	MIZ	-Z	+Z
404								
405								
406								
407								
408	MLK	DLK	ABS	OVC	SBK	BDT	DRN	AFL
409	ZRN	BRN		KEY			FIN	ST
410	ERS		*SP	*ESP	SKIP		SAR	STLK
411		SOR	*SSTP			SPC	SPB	SPA
412						MD4	MD2	MD1
413		MP2	MP1				GR2	GR1
414	RT				*OV8	*OV4	*OV2	*OV1
415								

(Note) The underlined signals are newly added to 3T.

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3T • MI - DI

DGN No.	7	6	5	4	3	2	1	0
416			PRC		ZAE	XAE	SMZ	CDZ
417								
418					PN8	PN4	PN2	PN1
419	ESTB	EA6	EA5	EA4	EA3	EA2	EA1	EA0
420	ED15	ED14	ED13	ED12	ED11	ED10	ED9	ED8
421	ED7	ED6	ED5	ED4	ED3	ED2	ED1	ED0
422	UI15	UI14	UI13	UI12	UI11	UI10	UI9	UI8
423	UI7	UI6	UI5	UI4	UI3	UI2	UI1	UI0
424	SIND	SSIN	SGN		R12I	R11I	R10I	R09I
425	R08I	R07I	R06I	R05I	R04I	R03I	R02I	R01I

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3T • MI - DO

DGN No.	7	6	5	4	3	2	1	0
500	MA	SA	OP	STL	SPL	RST	AL	
501	CSS	THRD	RPD	TAP	INCH	DST	IPEN	DEN
502						TF	SF	MF
503			ZP2Z	ZPZ			ZP2X	ZPX
504								
505				EREND				
506								
507	M28	M24	M22	M21	M18	M14	M12	M11
508								
509	T28	T24	T22	T21	T18	T14	T12	T11
510								
511	B28	B24	B22	B21	B18	B14	B12	B11
512					R12	R11	R10	R09
513	R08	R07	R06	R05	R04	R03	R02	F01
514	UO15	UO14	UO13	UO12	UO11	UO10	UO9	UO8
515	UO7	UO6	UO5	UO4	UO3	UO2	UO1	UO0

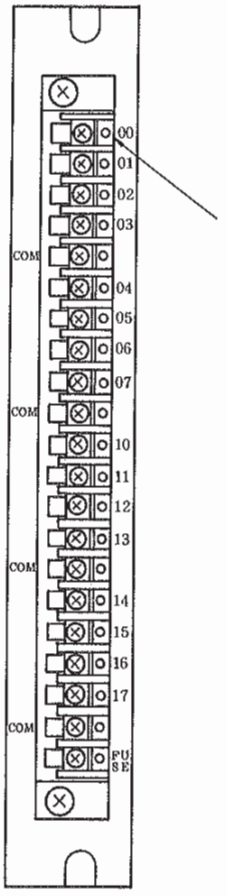
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3T • MI – DO

DGN No.	7	6	5	4	3	2	1	0
516								
517								
518				ENB				

3.7.6 LED display of I/O module

The terminal board connection module of the digital input/digital output modules is provided with LED for indicating the on/off conditions of each I/O signal.



Yellow LED

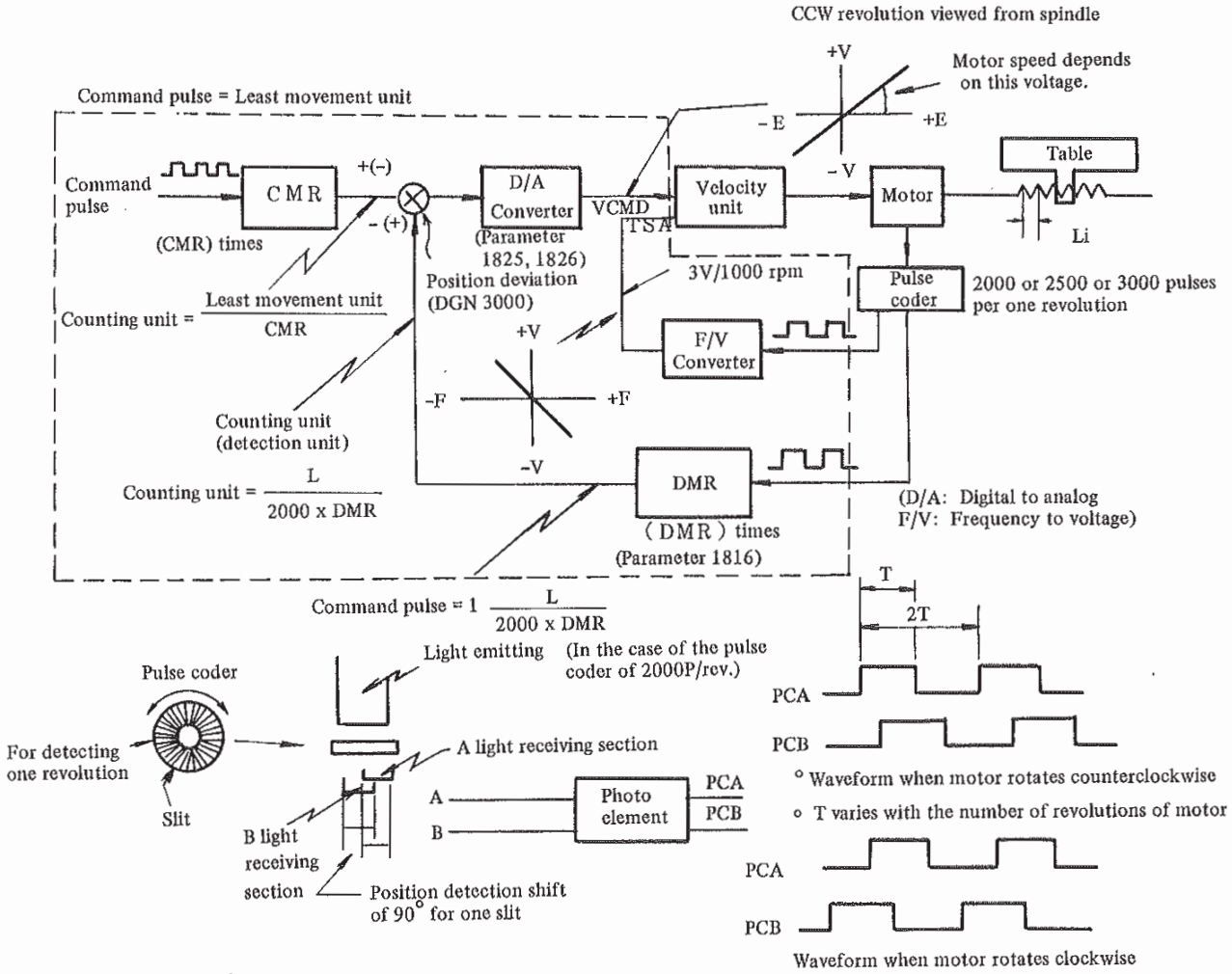
Lights . . . . . Input (or output) turns on
Goes out . . . . . Input (or output) turns off.

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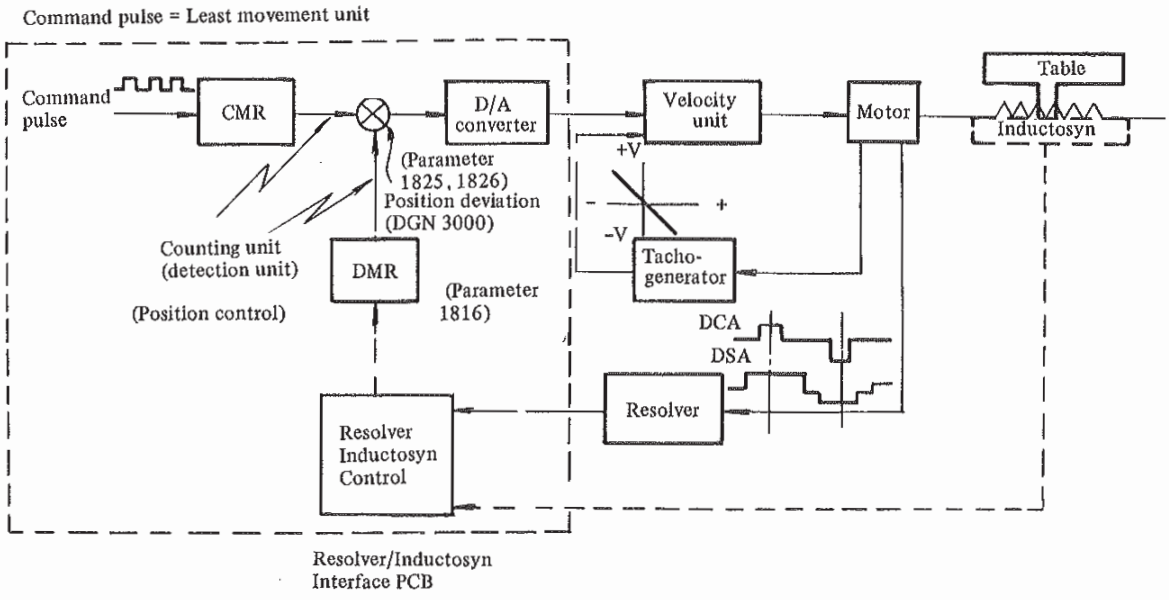
3.8 Block Diagram of Servo System

3.8.1 Block diagram of position control

1) Pulse coder



2) Resolver/inductosyn



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o CMR and DMR are the settings required to adjust the amount of table movement complying with the command pulse.

Command pulse: 0.001 mm in metric system 0.0001 inch in inch system

CMR : Command multiply ratio
..... Parameter number 1820 (Standard value: 1 for pulse coder, Resolver and Inductosyn)

DMR : Detect multiply radio
..... Parameter number 1816 (Standard value: 1/2 for Resolver and Inductosyn)

L : Movement amount (mm or inch) for one revolution of the detector

Counting unit: The value which is obtained by dividing the traverse for one revolution of the motor by the feedback pulse of (2000) x DMR (in the case of the pulse coder of 2000P/rev)

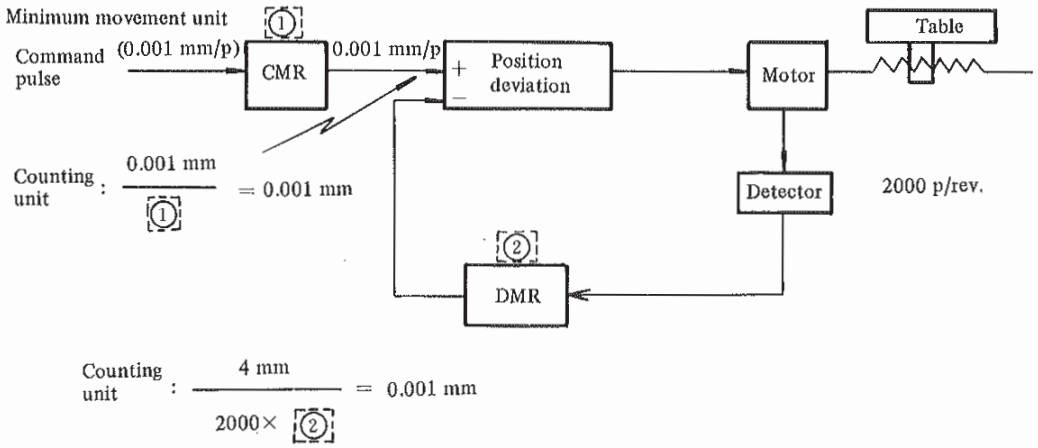
CMR and DMR are the settings to equalize the weight of the command pulse and feedback pulse for one pulse.

$$\text{Counting unit: } \frac{\text{Minimum movement unit (mm or inch)}}{\text{CMR}} = \frac{\text{L (mm or inch)}}{\alpha \times \text{DMR}}$$

α: 2,000 p/rev, 2,500 p/rev or 3,000 p/rev for pulse coder
4,000 p/rev for Resolver or Inductosyn

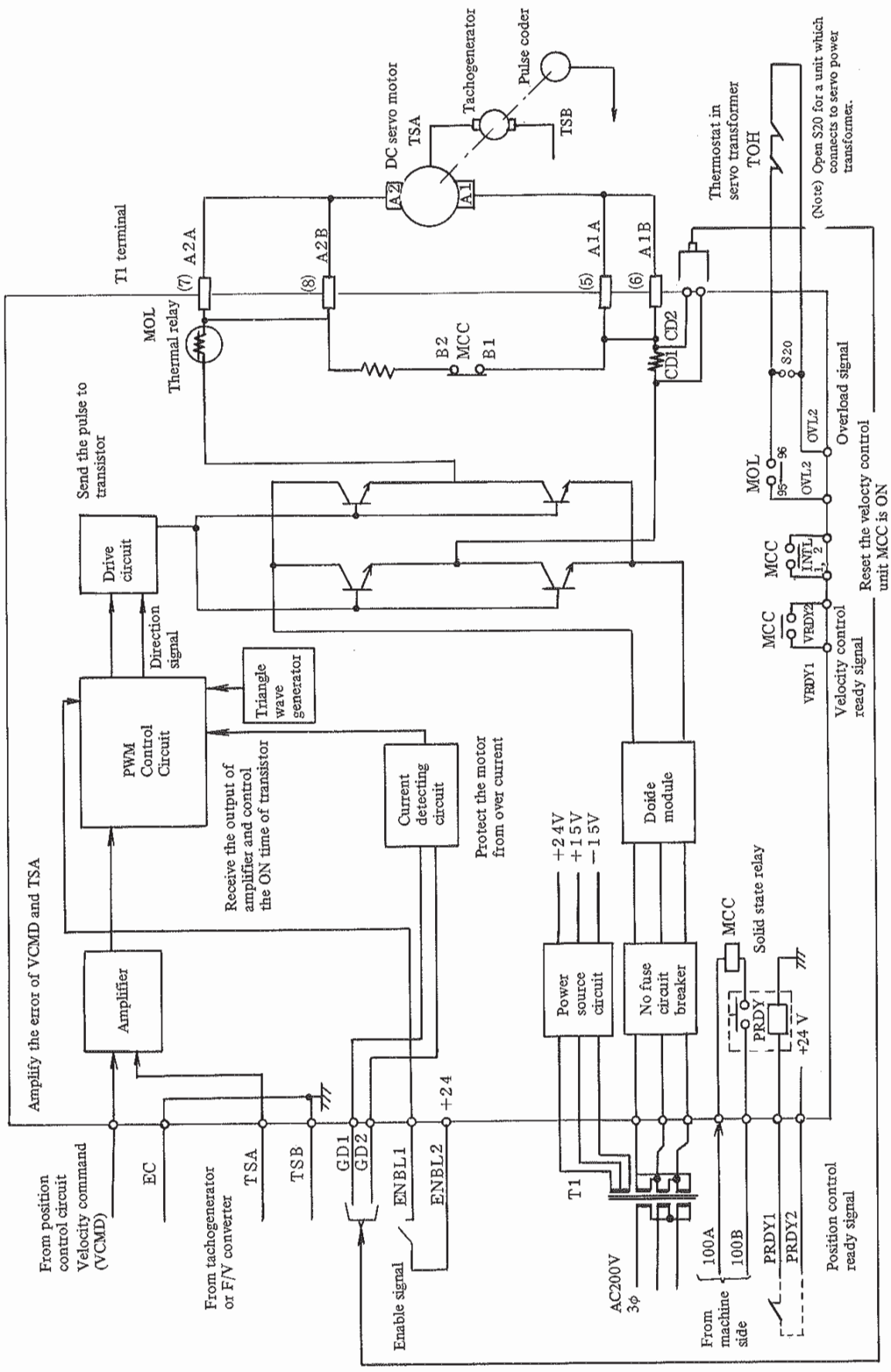
Minimum movement unit: Command pulse

ex. CMR is set to ① and DMR to ② when a movement distance is ④ mm per ① revolution of detector.



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3.8.2 Block diagram of M series velocity control unit



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3.8.3 Internal connection diagram of M series velocity control unit

a) For DC servo motor model 00M (A06B-6047-H001)

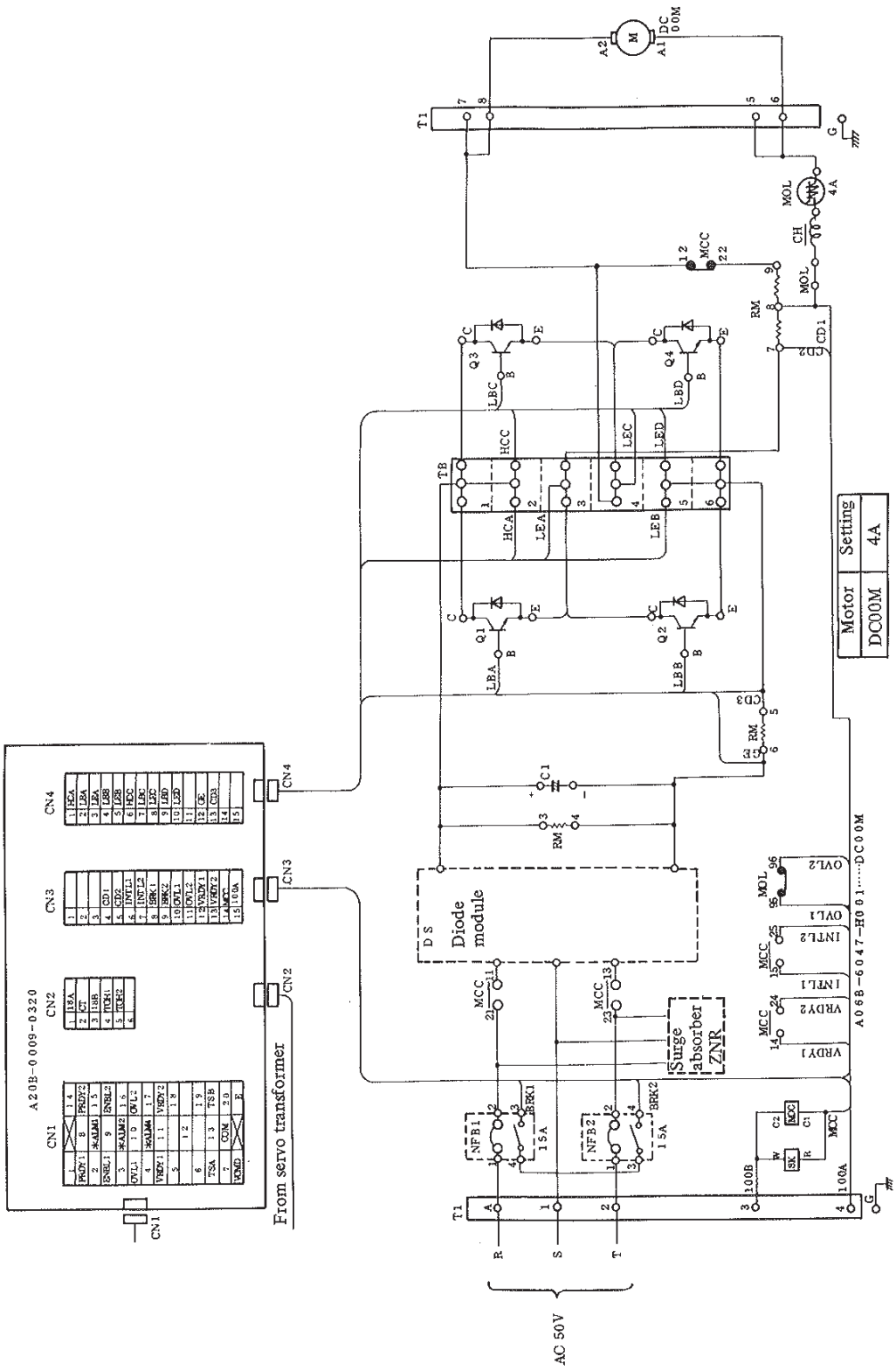
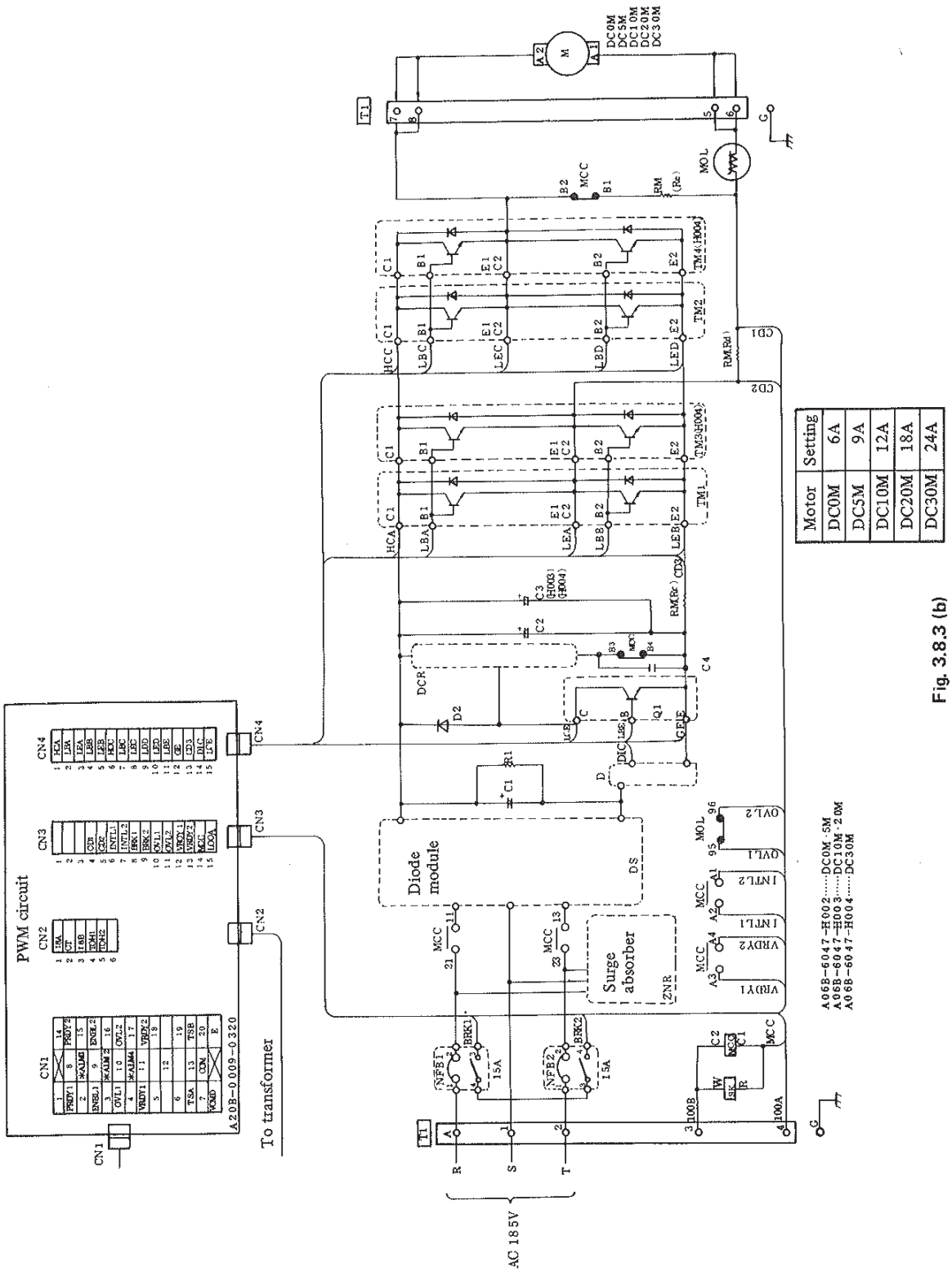


Fig. 3.8.3 (a)

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b) For DC servo motor model 0M ∿ 30M (A06B-6047-H002 ∿ 4)



Motor	Setting
DC0M	6A
DC5M	9A
DC10M	12A
DC20M	18A
DC30M	24A

Fig. 3.8.3 (b)

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c) For DC servo motor model 10M ~ 30M for separate discharge circuit
(A06B-6047-H040, H041)

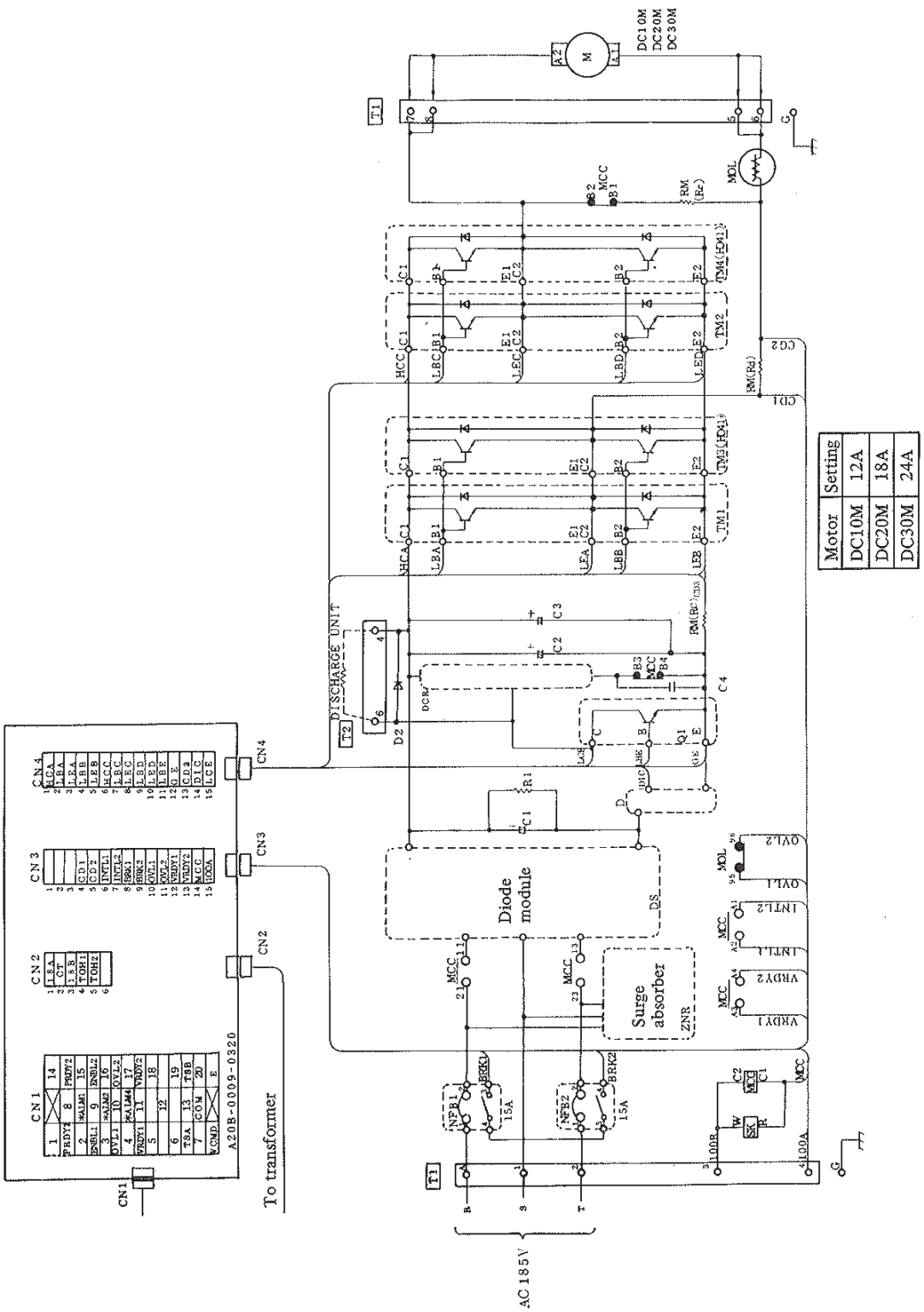


Fig. 3.8.3 (c)

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3.8.4 Block diagram of M series velocity control unit PCB

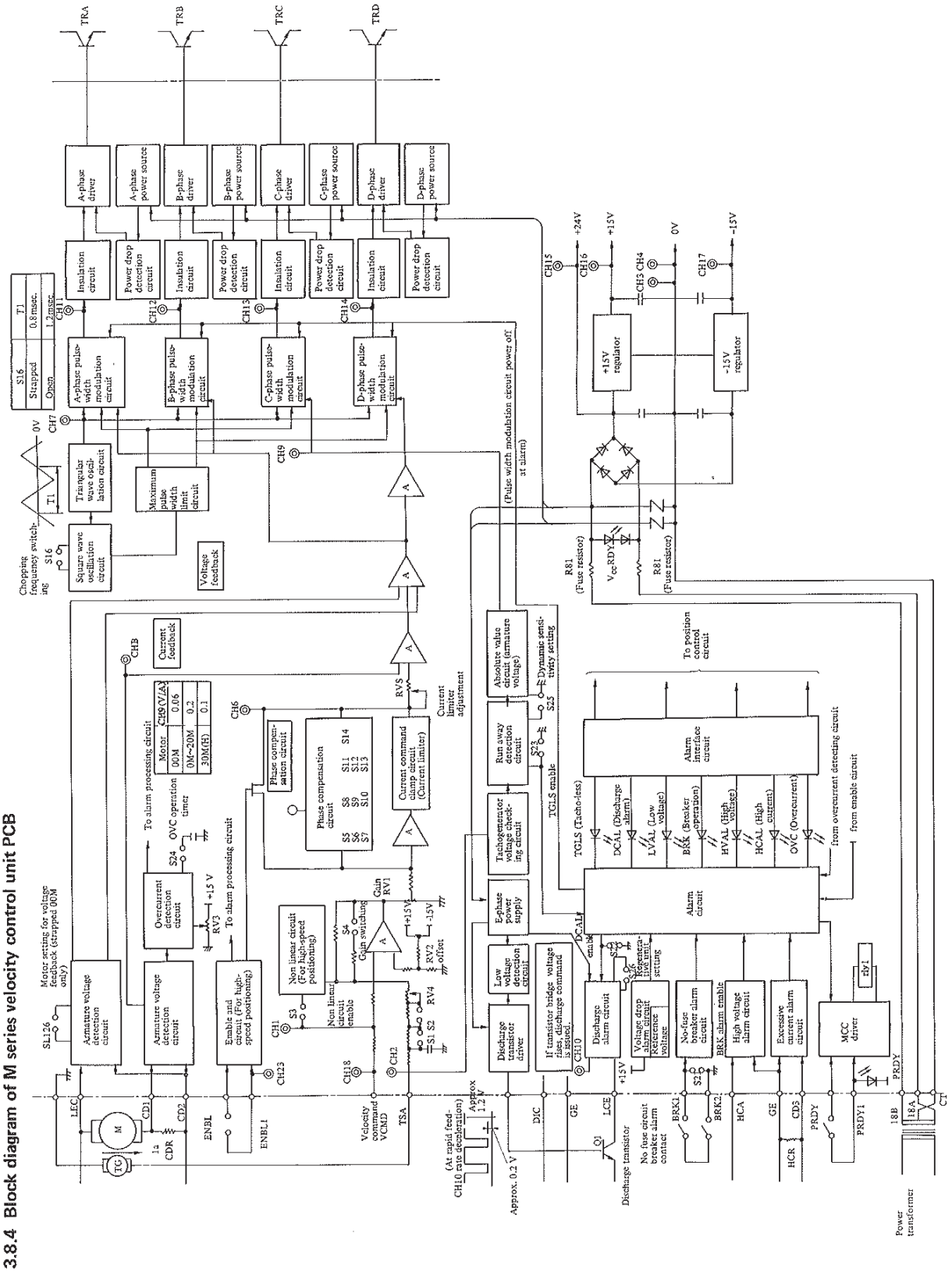


Fig. 3.8.4 (a)

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3.8.5 Block diagram of AC series velocity control unit

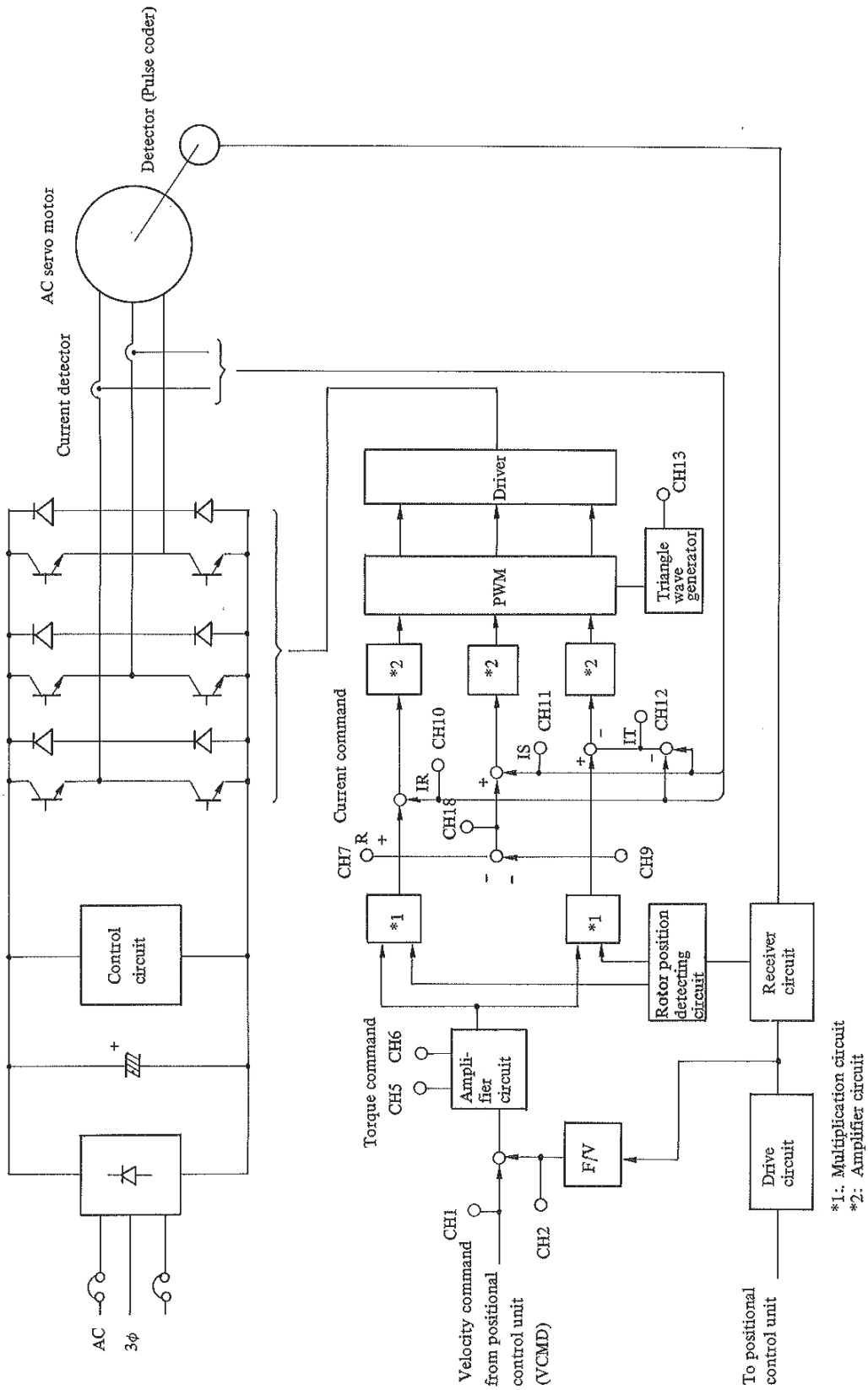


Fig. 3.8.5 (a)

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3.8.6 AC servo velocity control unit inside connecting diagram

a) For model 2-0, 1-0 (A06B-6050-H002)

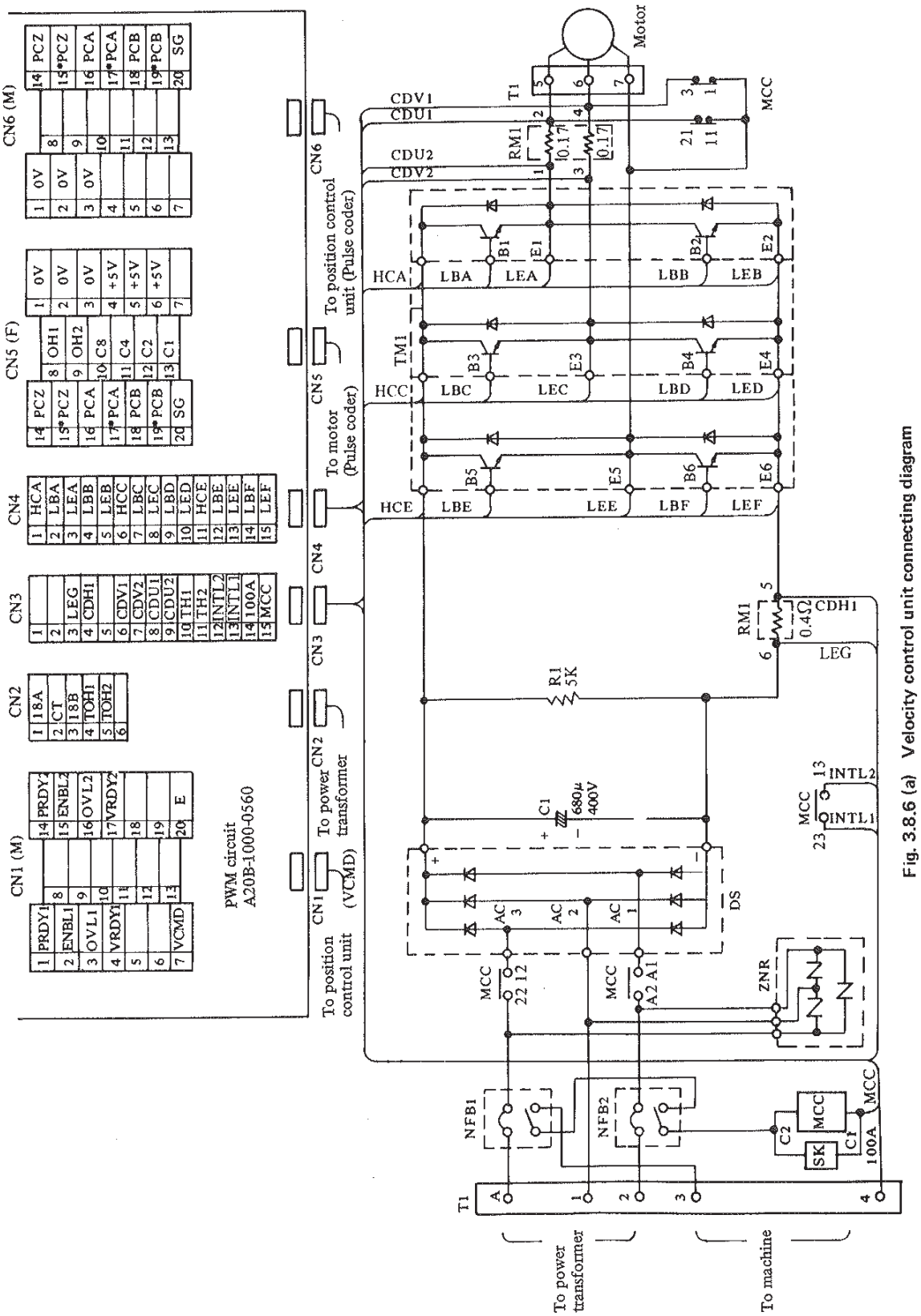


Fig. 3.8.6 (a) Velocity control unit connecting diagram

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b) For AC series motor model 0, 5 (A06B-6050-H102)

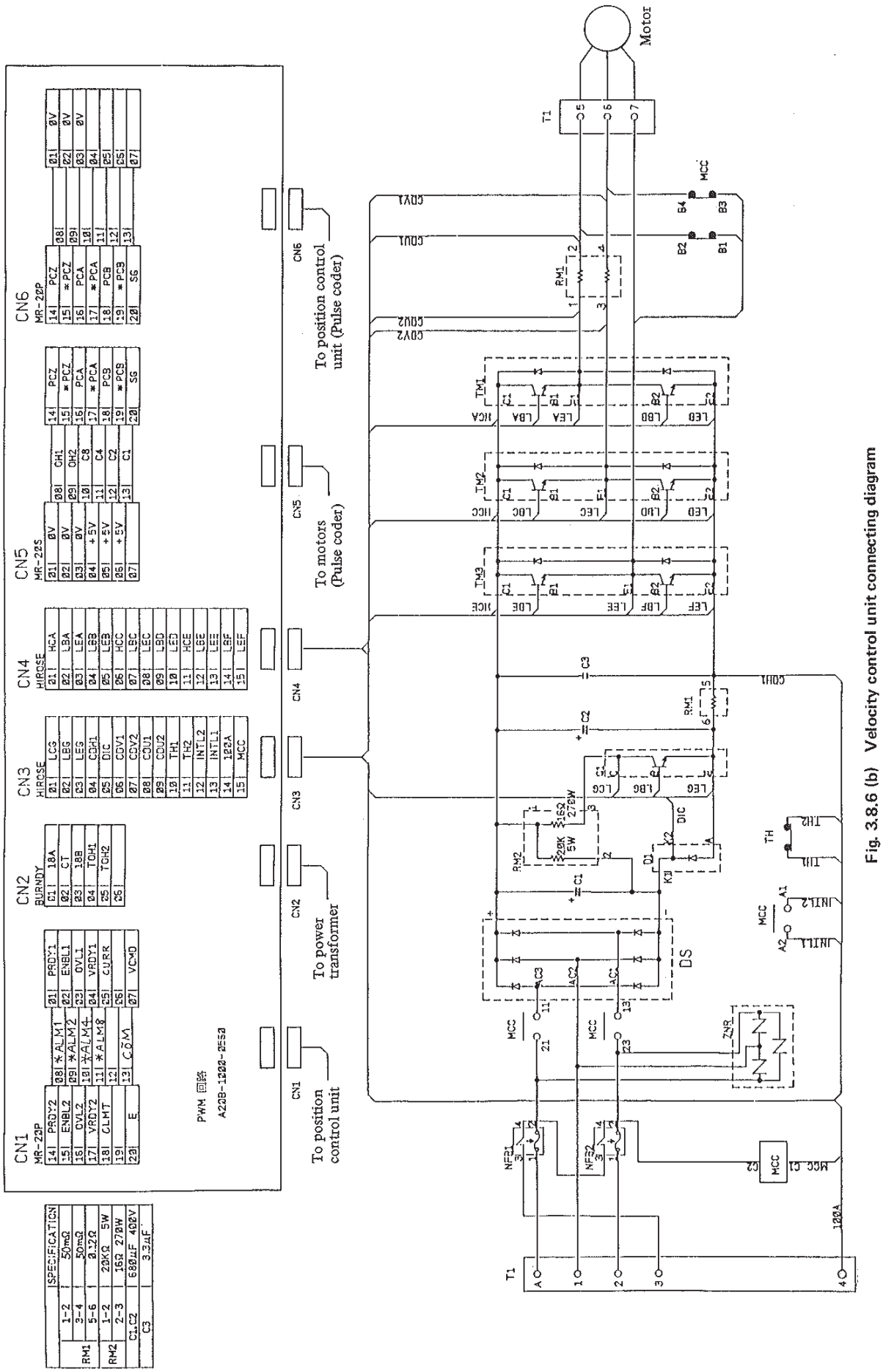


Fig. 3.8.6 (b) Velocity control unit connecting diagram

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c) For AC servo motor model 10, 20, 30 (A06B-6050-H103, H104)

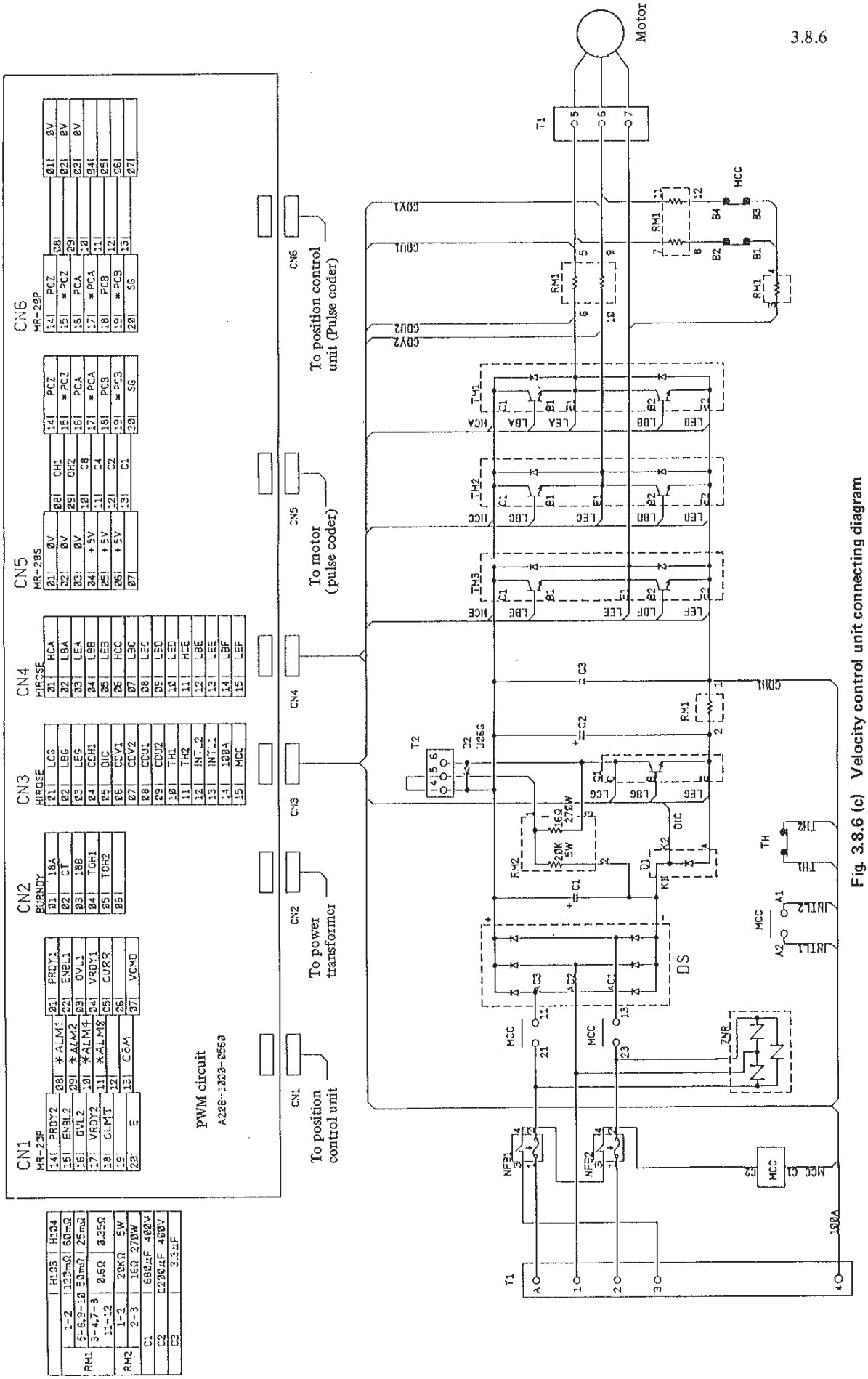


Fig. 3.8.6 (c) Velocity control unit connecting diagram

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d) For AC servo motor model 30R (A06B-6050-H005)

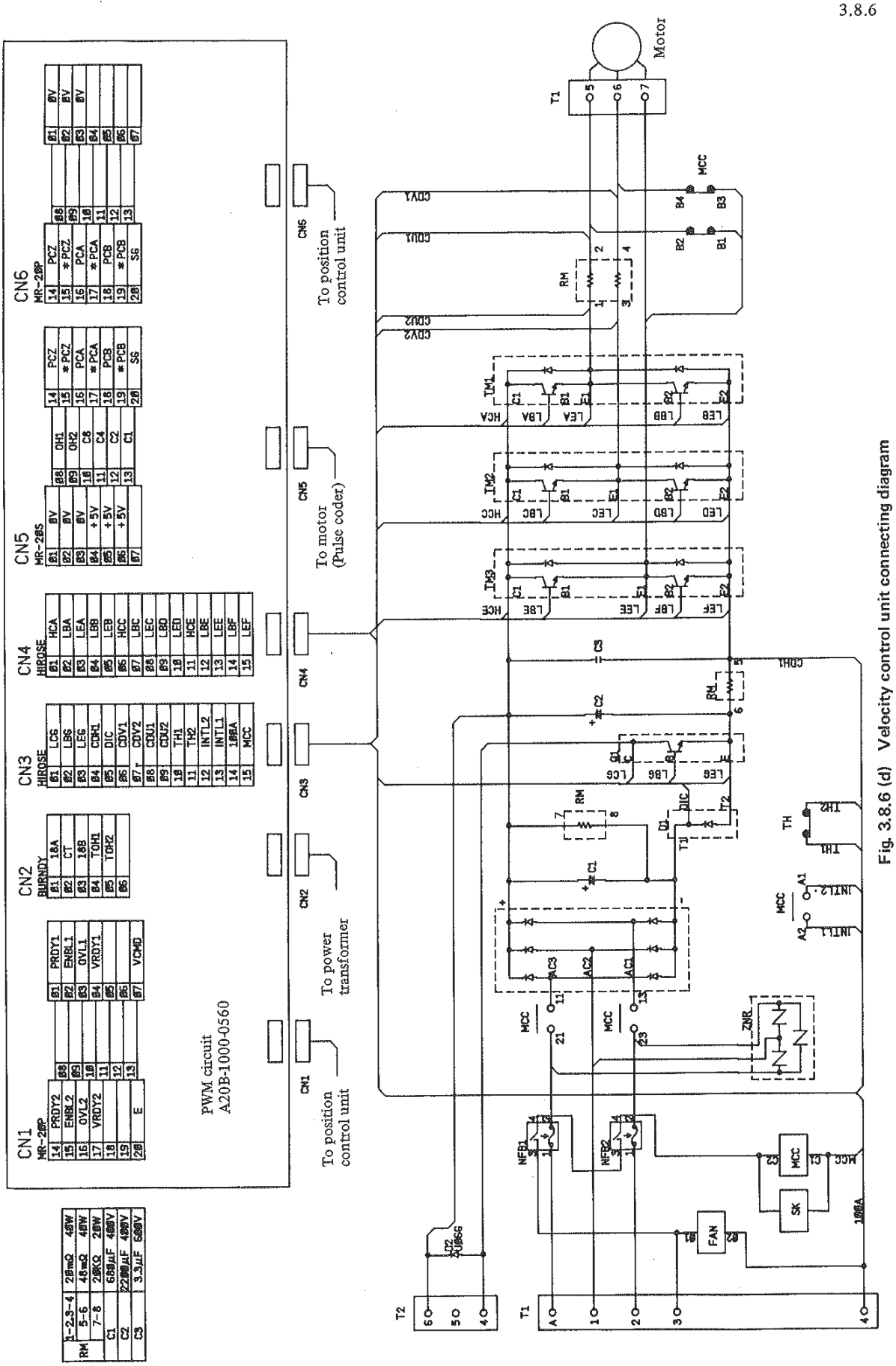


Fig. 3.8.6 (d) Velocity control unit connecting diagram

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3.9 Connection with Servo

3.9.1 Connection to M series servo

1) Total connection diagram

The 4th and subsequent axes are also connected as shown in this figure.

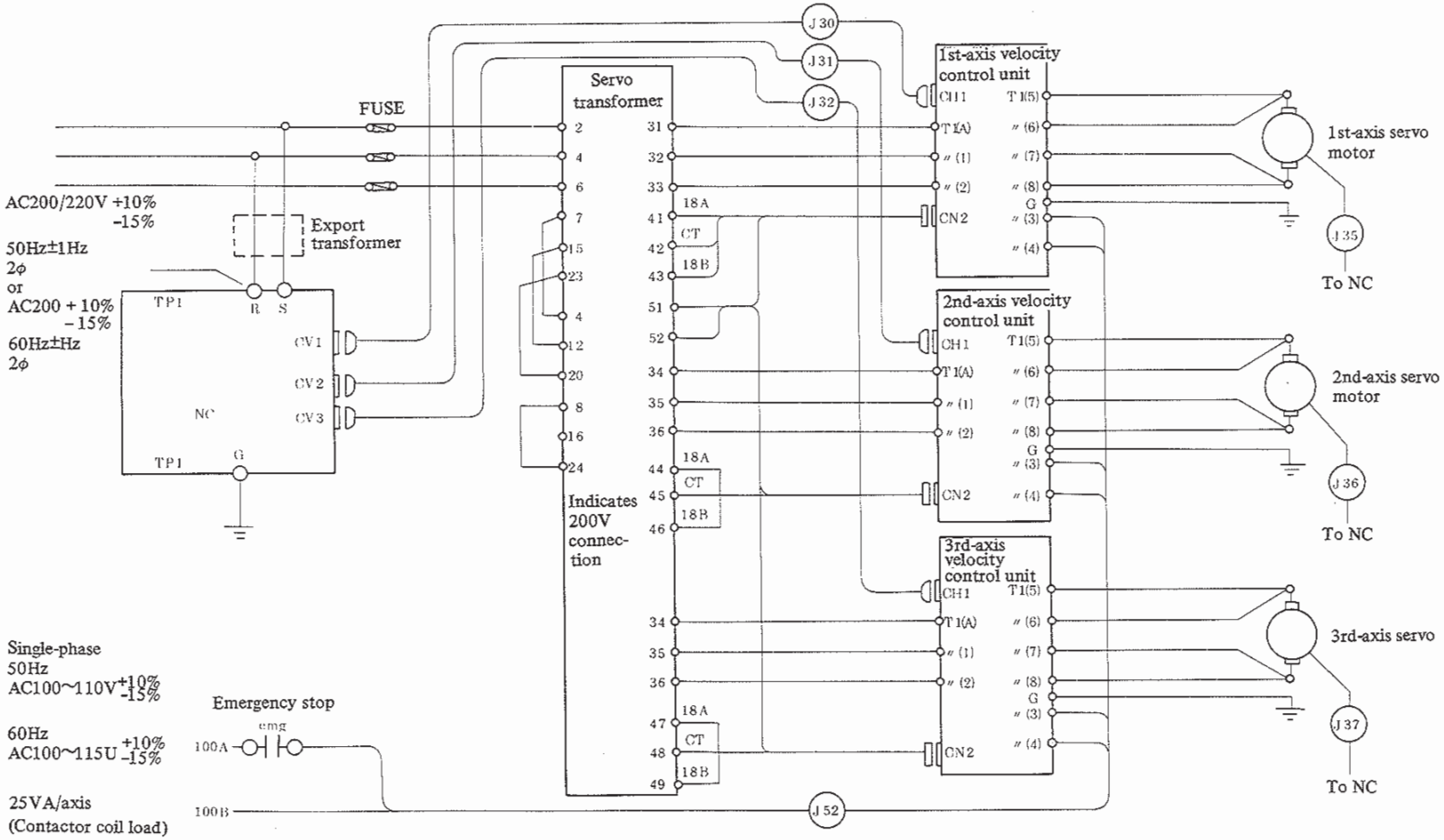
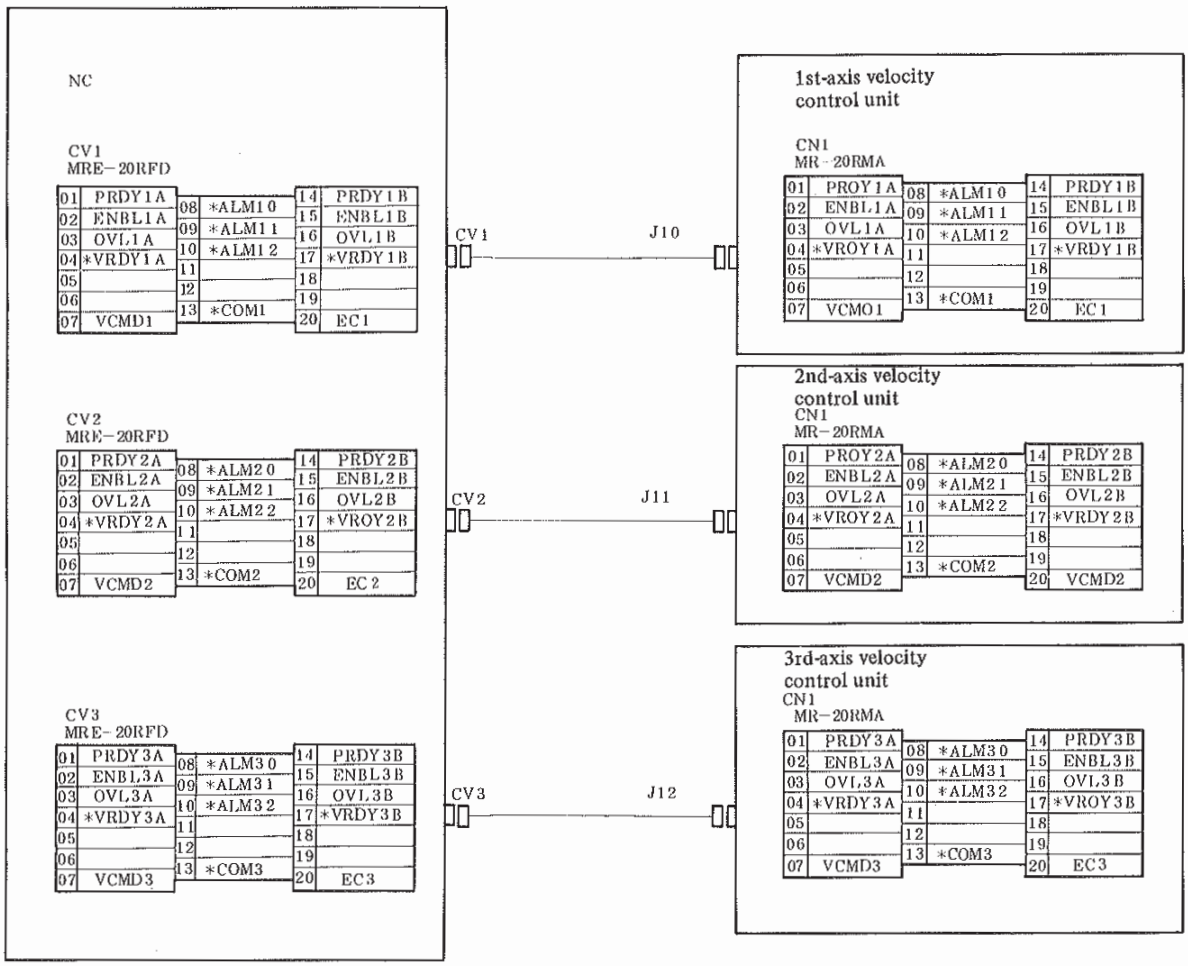


Fig. 3.9.1 (a)

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2) Cable J10 ∿ J12 connection diagram

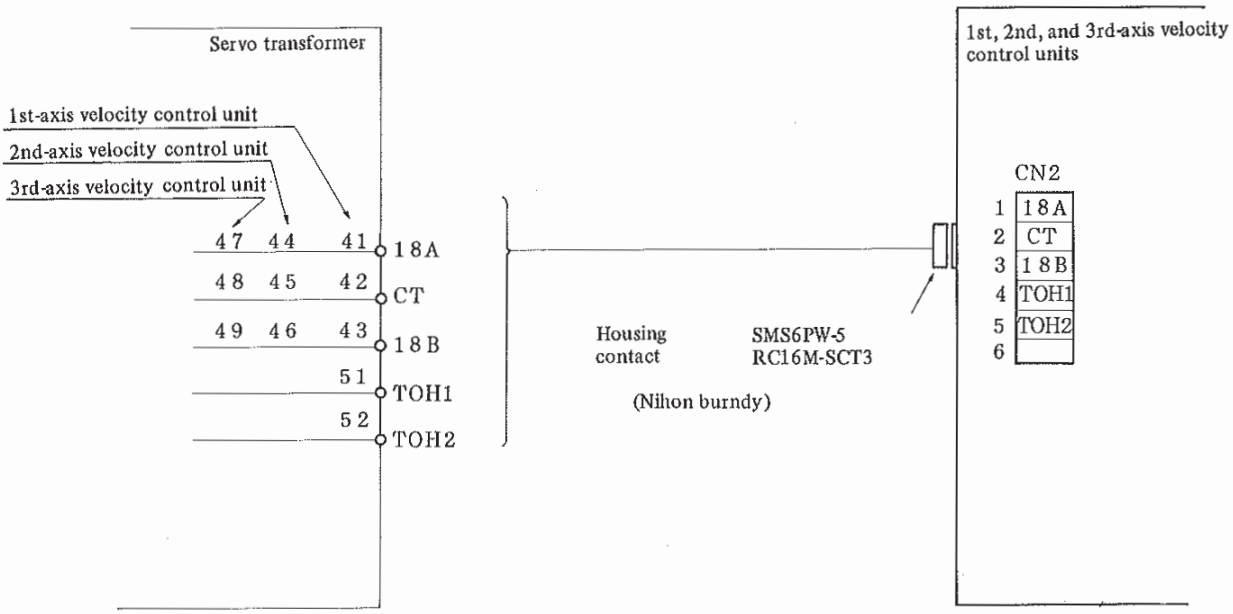


The 4th and subsequent axes are also connected as shown in the above figure.

Fig. 3.9.1 (b) Cable J10 ~ J12 connections

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3) Connection of overheat signal line of servo transformer

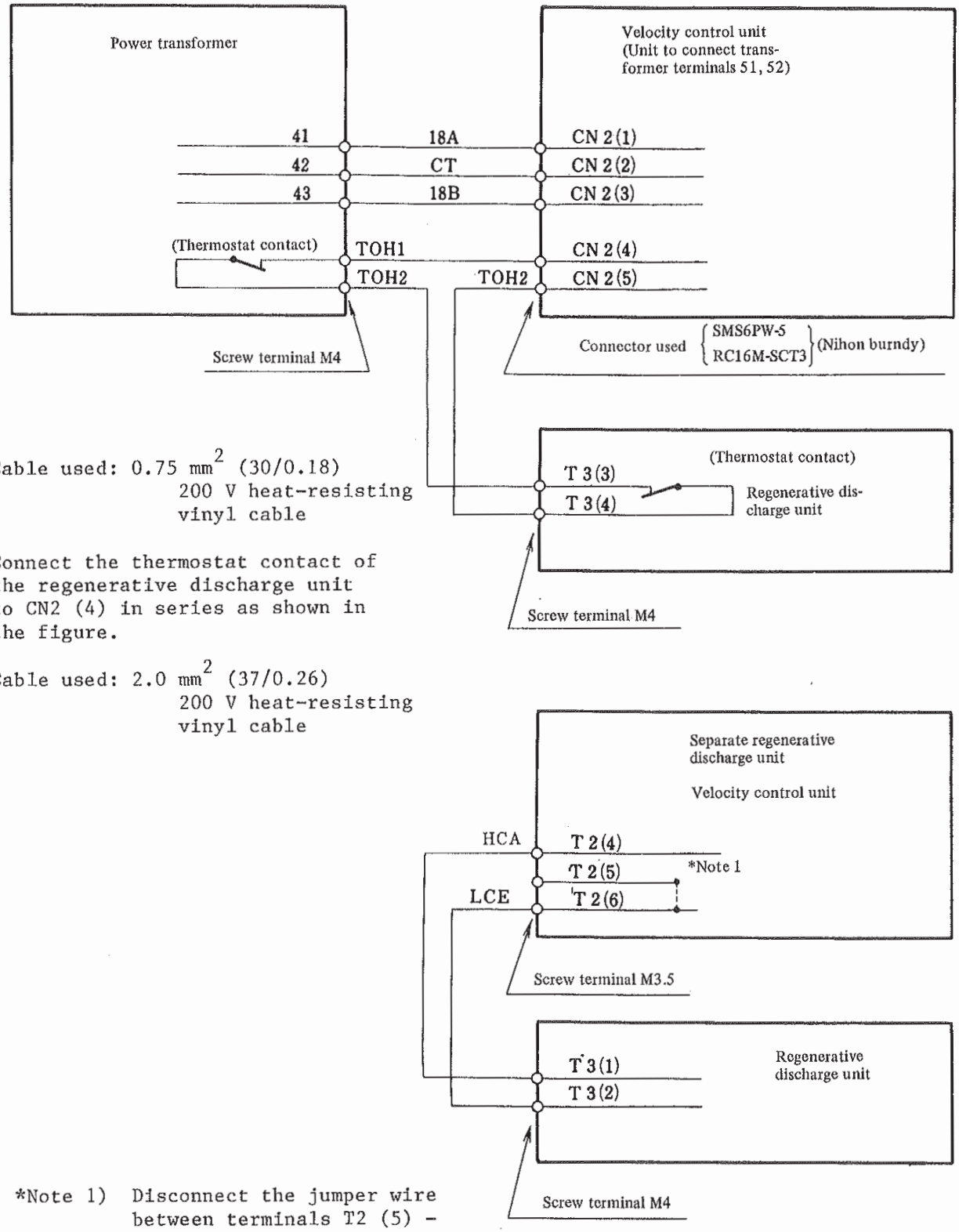


Cable used: 30/0.18 (0.75 mm^2) vinyle wire

Note: Connect overheat signals TOH1 and 2 of the servo transformer in parallel to all velocity control units to which power is supplied from the servo transformer. Connect signals must parallel each other (as illustrated above) because CN2 (4) (5) terminals on the velocity control unit side are polarized.

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4) Connection to separate regenerative discharge unit



Cable used: 0.75 mm^2 (30/0.18)
200 V heat-resisting vinyl cable

Connect the thermostat contact of the regenerative discharge unit to CN2 (4) in series as shown in the figure.

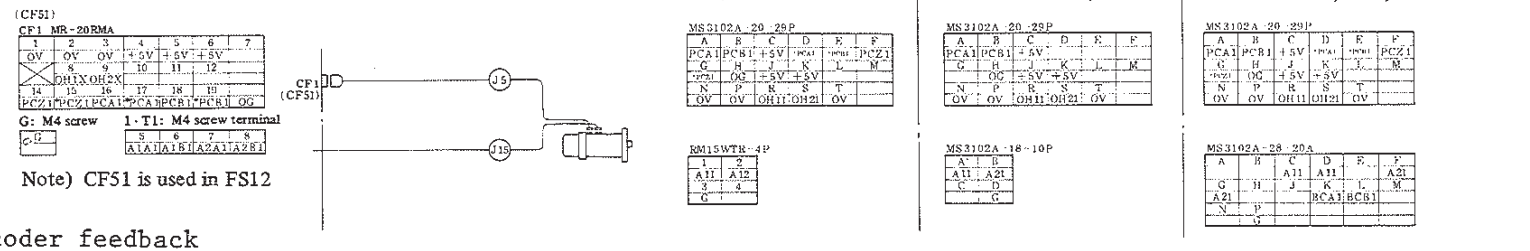
Cable used: 2.0 mm^2 (37/0.26)
200 V heat-resisting vinyl cable

*Note 1) Disconnect the jumper wire between terminals T2 (5) - T2 (6) when the regenerative discharge unit is used with model 30 MH velocity control unit.

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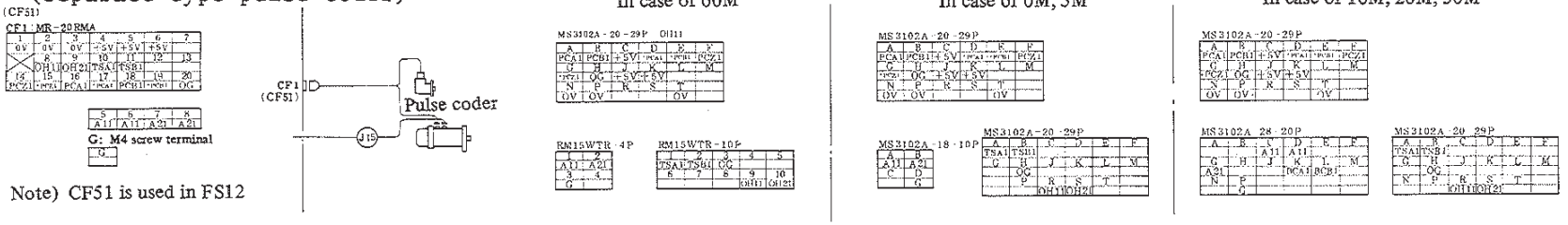
5) Connection to M series DC servo motor

a) Pulse coder feedback (mounted type pulse coder)



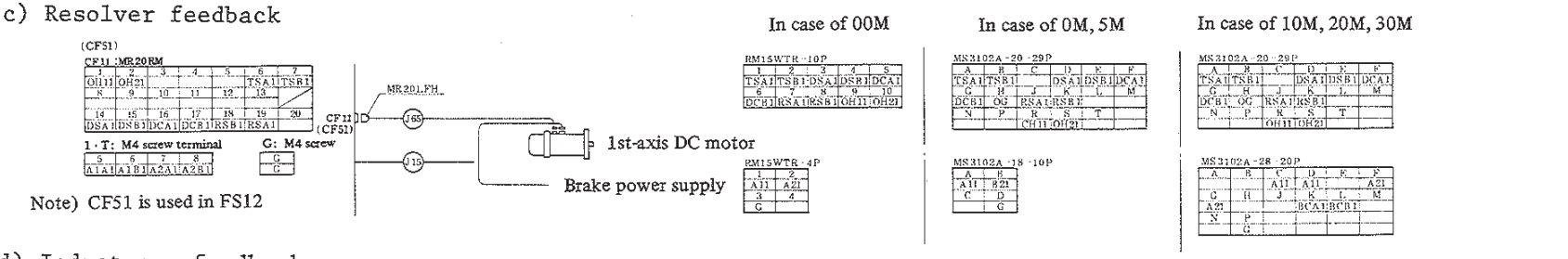
Note) CF51 is used in FS12

b) Pulse coder feedback (separate type pulse coder)



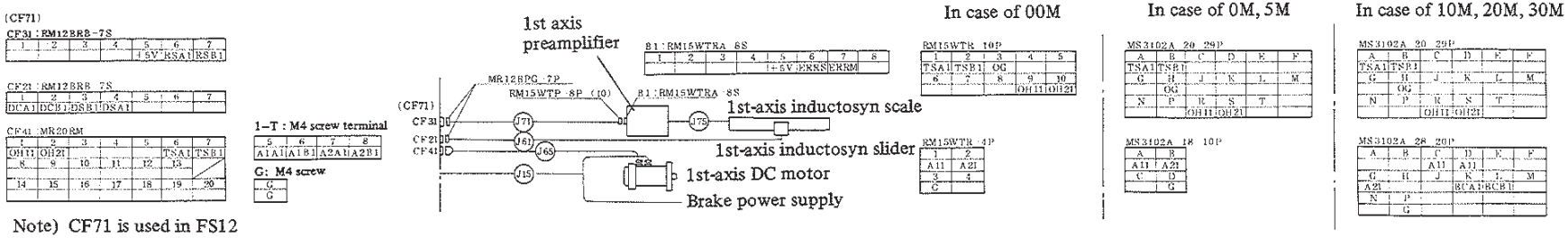
Note) CF51 is used in FS12

c) Resolver feedback



Note) CF51 is used in FS12

d) Inductosyn feedback

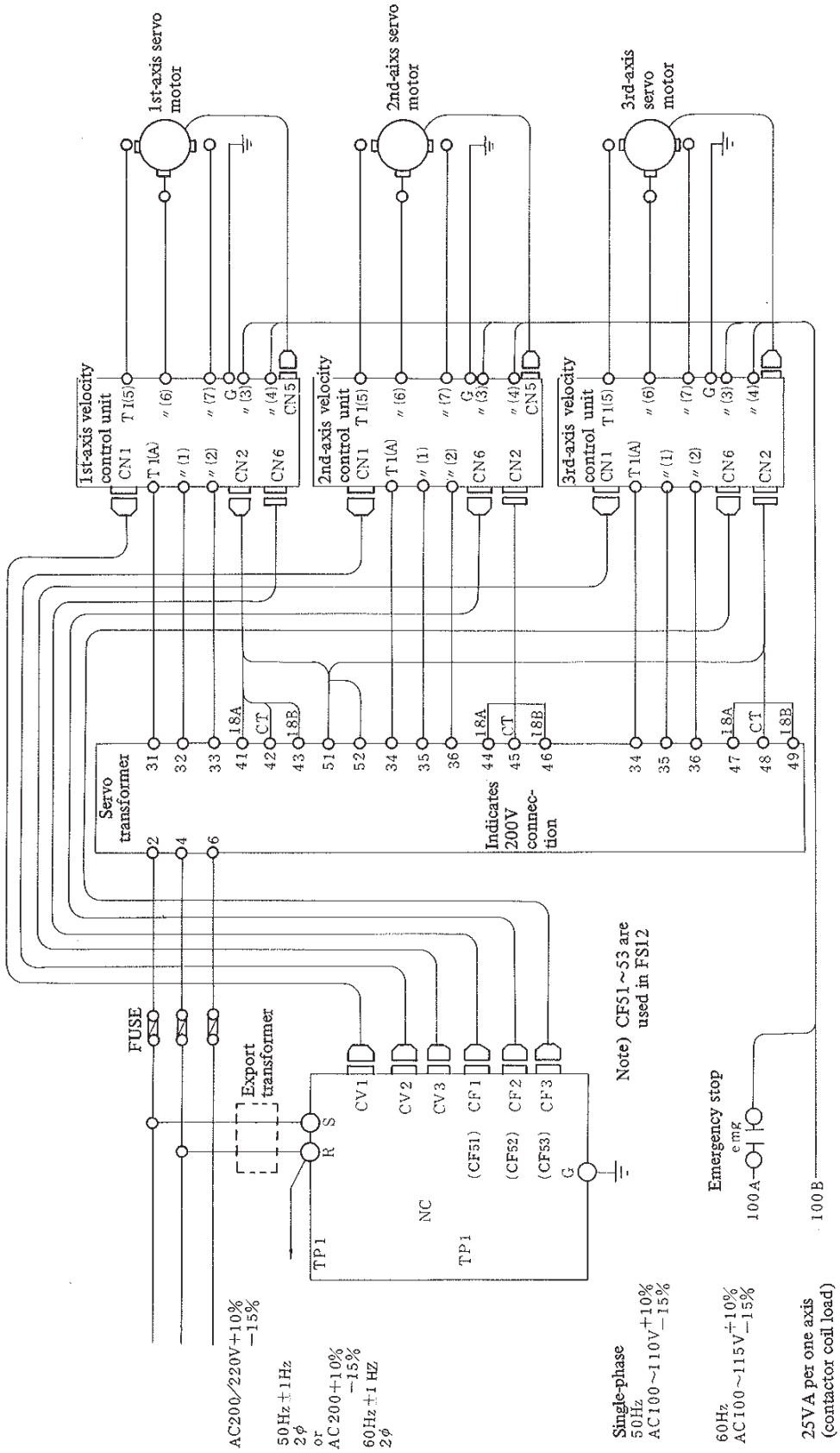


Note) CF71 is used in FS12

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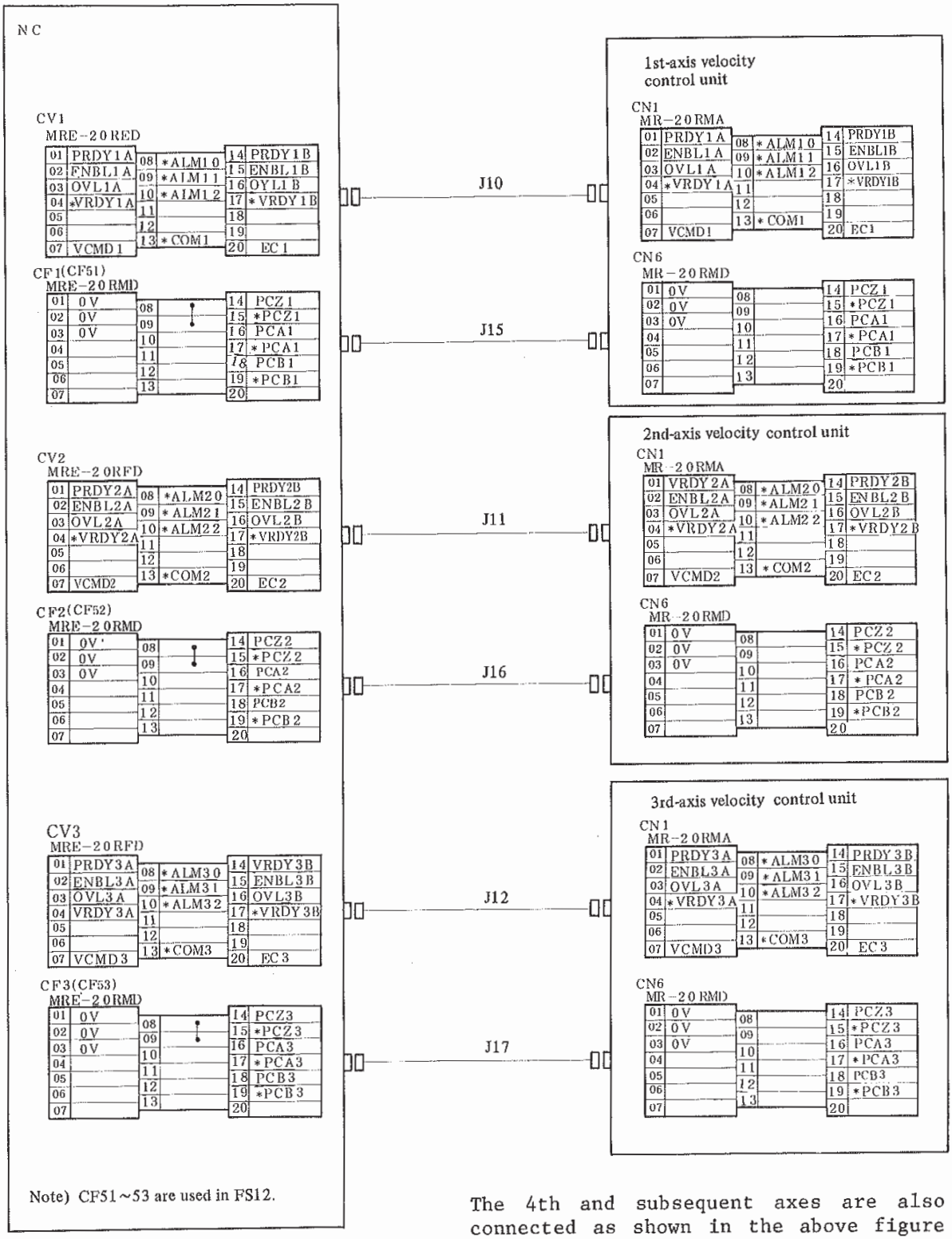
3.9.2 Connection to AC servo

1) Total connection diagram (For analog servo)
The 4th and subsequent axes are also connected as shown in this figure.



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Cable J10 - J12, J15 - J17 connection diagram

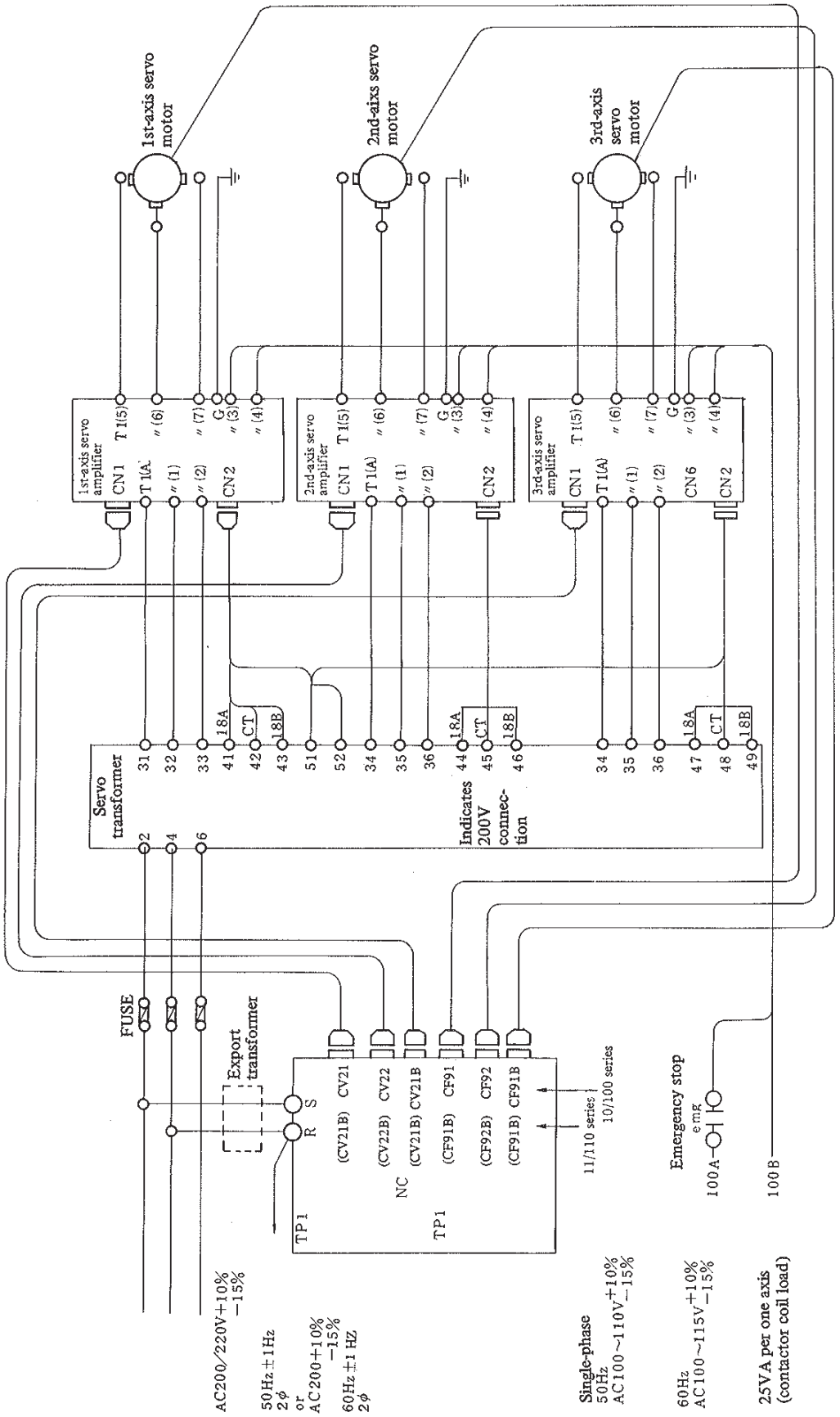


The 4th and subsequent axes are also connected as shown in the above figure correspondingly.

(Mark •—• in the above connectors CF1∿3 shows a short-circuit condition.)

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2) Total connection diagram (For digital servo)



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