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FANUC 10/100 series
FANUC 11/110 series
FANUC 12/120 series

MAINTENANCE MANUAL

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B-54815E/05

This manual describes the following products.

Name of products	Abbreviation		
FANUC 10T-MODEL A	10T-A	10T	10 series
FANUC 10T-MODEL F	10T-F		
FANUC 10M-MODEL A	10M-A	10M	
FANUC 11T-MODEL A	11T-A	11T	11 series
FANUC 11TT-MODEL A	11TT-A	11TT	
FANUC 11TT-MODEL F	11TT-F		
FANUC 11M-MODEL A	11M-A	11M	
FANUC 11M-MODEL F	11M-F		
FANUC 12T-MODEL A	12T-A	12T	12 series
FANUC 12M-MODEL A	12M-A	12M	
FANUC 100T-MODEL A	100T-A	100T	100 series
FANUC 100M-MODEL A	100M-A	100M	
FANUC 110T-MODEL A	110T-A	110T	110 series
FANUC 110M-MODEL A	110M-A	110M	
FANUC 120T-MODEL A	120T-A	120T	120 series
FANUC 120M-MODEL A	120M-A	120M	

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1. GENERAL

10/11/12/100/110/120 series is specifically designed to be latest CNC system having a structure common to both software and hardware. It can easily satisfy the demands of many different machine tools. This up-to-date CNC system uses powerful microprocessors, newly developed large-scale custom LSI, optical fiber, large-capacity bubble memory, color CRT, and other components created by using the latest technology.
This manual describes preventive maintenance for using the 10/11/12/100/110/120 series, quick troubleshooting procedures for possible failures, check points and adjustments at the time of installation.
Refer to 10/11/12/100/110/120 series operator's manual (Appendix) (B-54810E) for various pieces of technical information such as detailed description of parameters.
Please refer to the operator's manual (B-54814E) and connecting manual (B-54813E) when needed.

Description of terms frequently used in this manual

Least input increment ..... The minimum unit for program input of the move command
Least command increment ..... The minimum unit of a command given from NC to machine tool
Detection unit ..... The minimum unit to detect a machine tool position
Command multiplier (CMR) ..... A constant to enable the weight of NC command pulses to coincide with the weight of pulses from the detector
Detection multiplier (DMR) .... A constant to enable the weight of NC command pulses to coincide with the weight of pulses from the detector

(Note) The relationships among the least input increment, detection unit, CMR and DMR are as specified below.

Least input increment = CMR x detection unit

$$\text{Detection unit} = \frac{\text{Movement per rotation of motor}}{\text{DMR} \times \text{No. of pulses of detector per rotation of motor}}$$

CRT/MDI panel ..... Abbreviation for Manual Data Input & CRT panel
This operation panel is used to input a command to the NC and display NC conditions by using key switches.
Parameters ..... Values to be set to fully display functional features of an NC machine tool to the maximum extent when the NC is combined with the machine tool.

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1.1 Structure

	10T/100T	10M/100M	11T/110T	11M/110M
Small CRT/MDI	A02B-0072-C001	A02B-0073-C001		
Standard CRT/MDI	A02B-0076-C022	A02B-0076-C021	A02B-0076-C022	A02B-0076-C021
Tape Reader Without Reels	A13B-0073-B001		A13B-0070-B001	
Tape Reader With Reels	A13B-0080-B001			
Input Unit B	A14B-0076-B003		A14B-0076-B101	
Input Unit C	A14B-0076-B004		A14B-0076-B102	
Input Unit D	A14B-0076-B005		A14B-0076-B103	

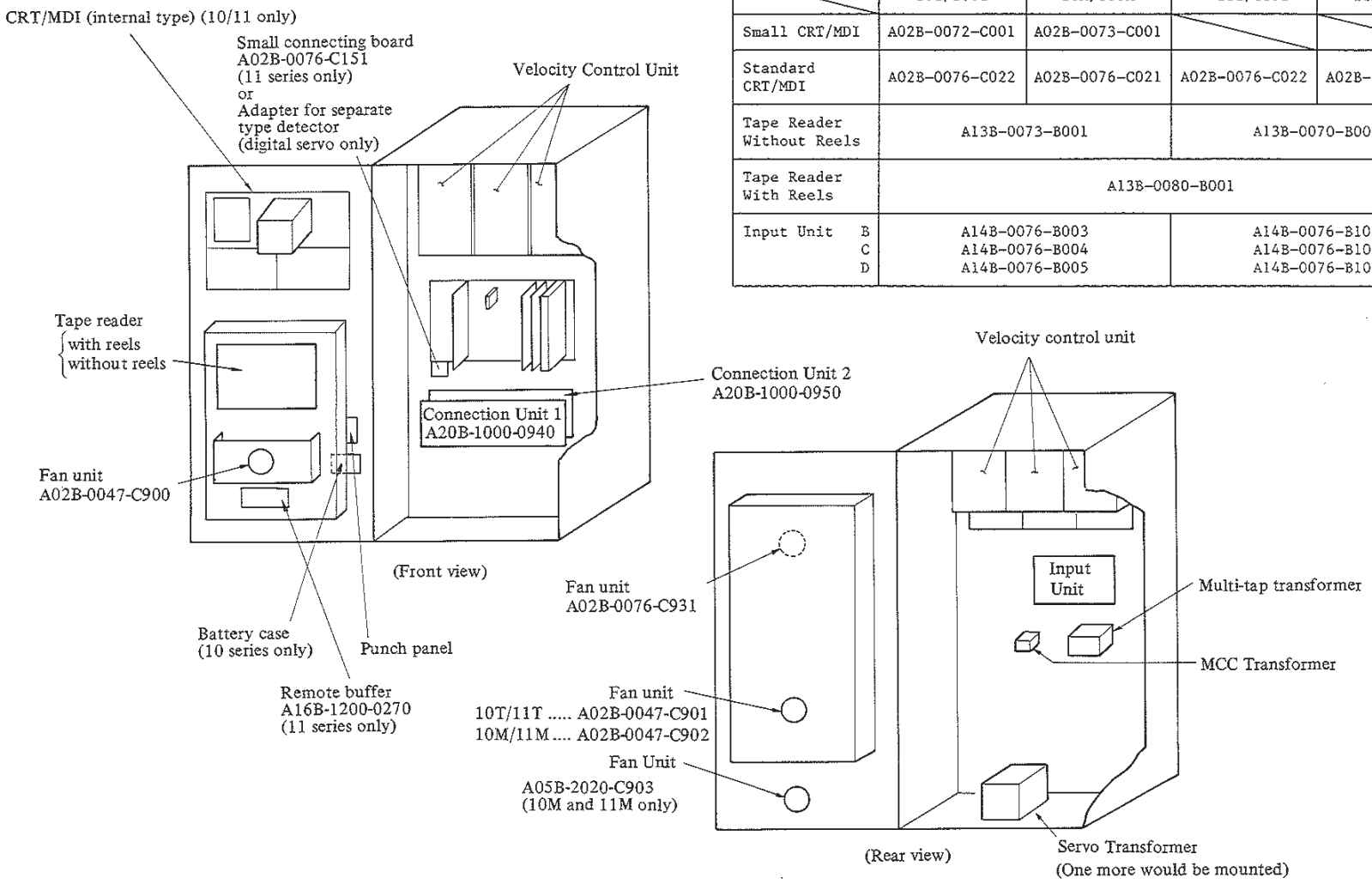


Fig. 1.1 (a) Free-standing cabinet internal component location for 10/11/100/110

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	10T	10M	11T/11TT	11M
Small CRT/MDI	A02B-0072-C001	A02B-0073-C001		
Standard CRT/MDI	A02B-0076-C022	A02B-0076-C021	A02B-0076-C022	A02B-0076-C021

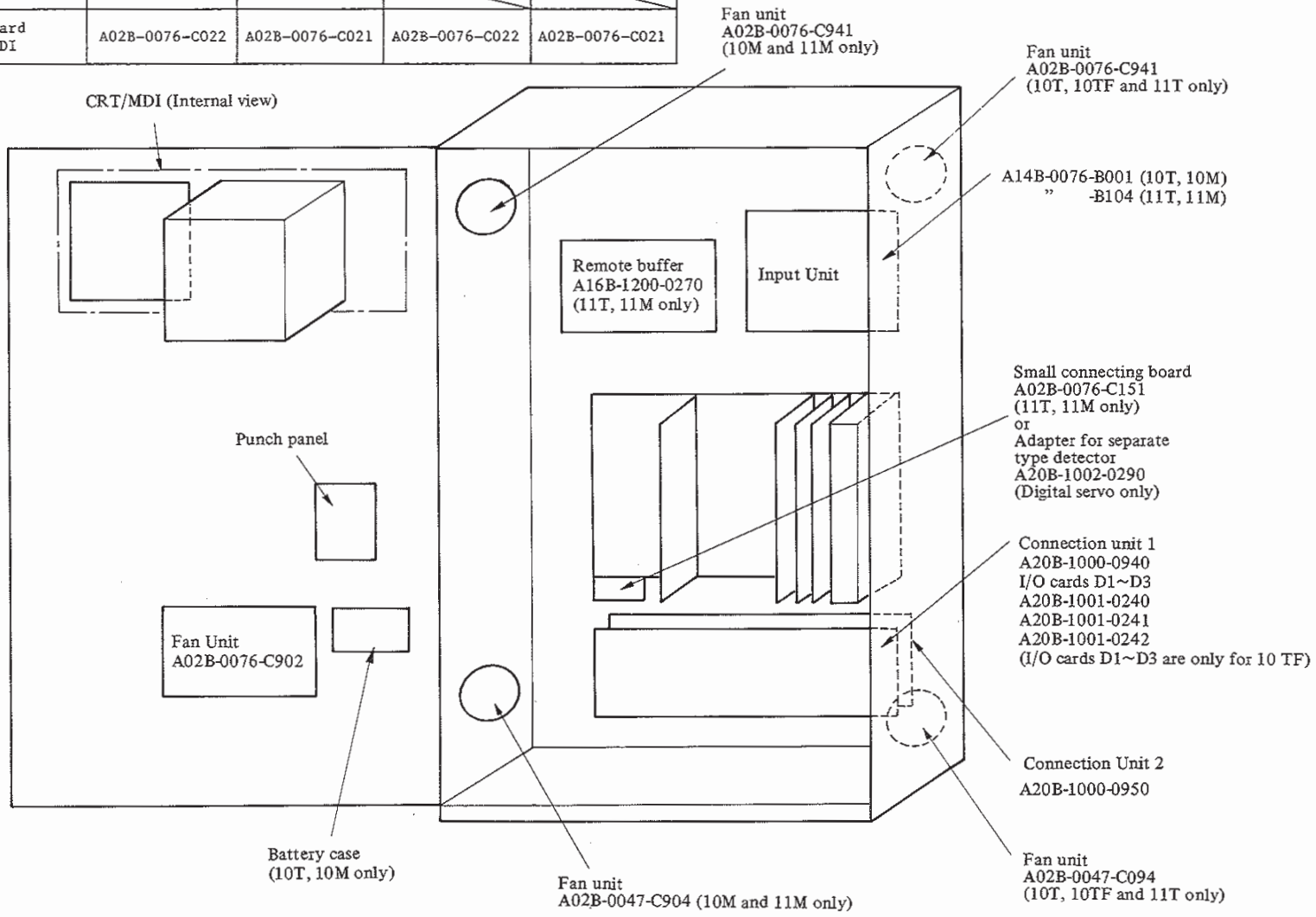
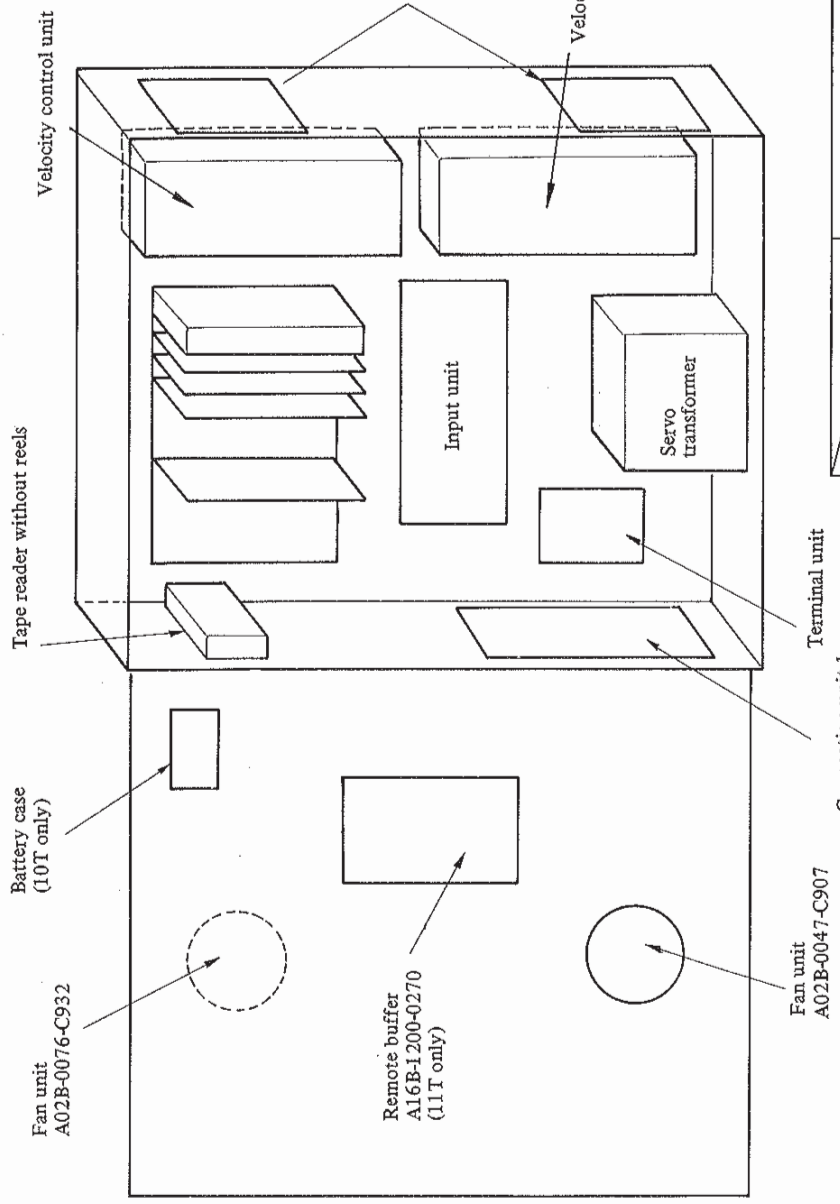


Fig. 1.1 (b) Built-in 1 cabinet internal component location for 10/11/100/110 series

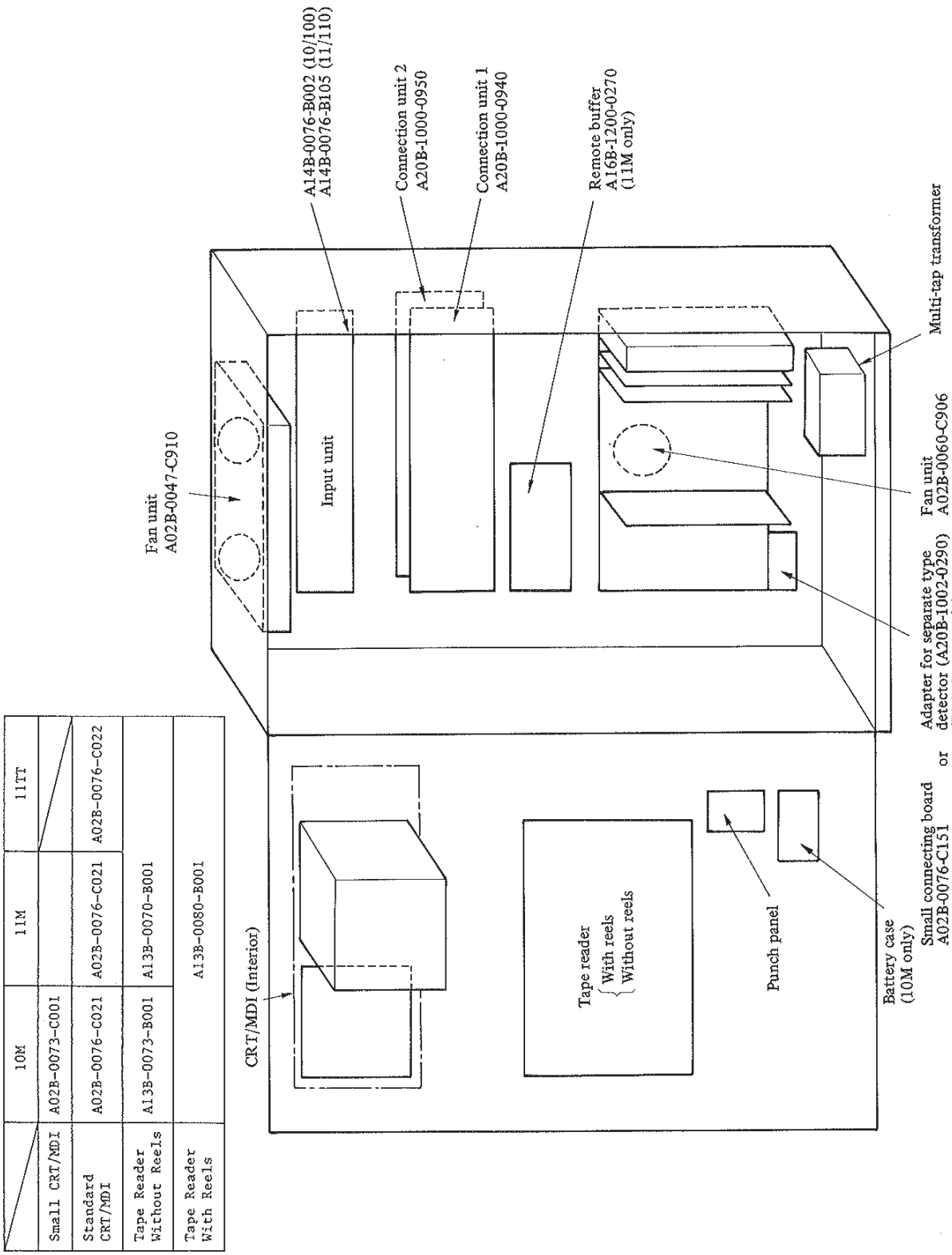
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Input unit	10T	11T
B	A14B-0076-B003	A14B-0076-B101
C	A14B-0076-B004	A14B-0076-B102
D	A14B-0076-B005	A14B-0076-B103

Fig. 1.1 (c) Built-in 2 cabinet internal component location (for 10T/11T)

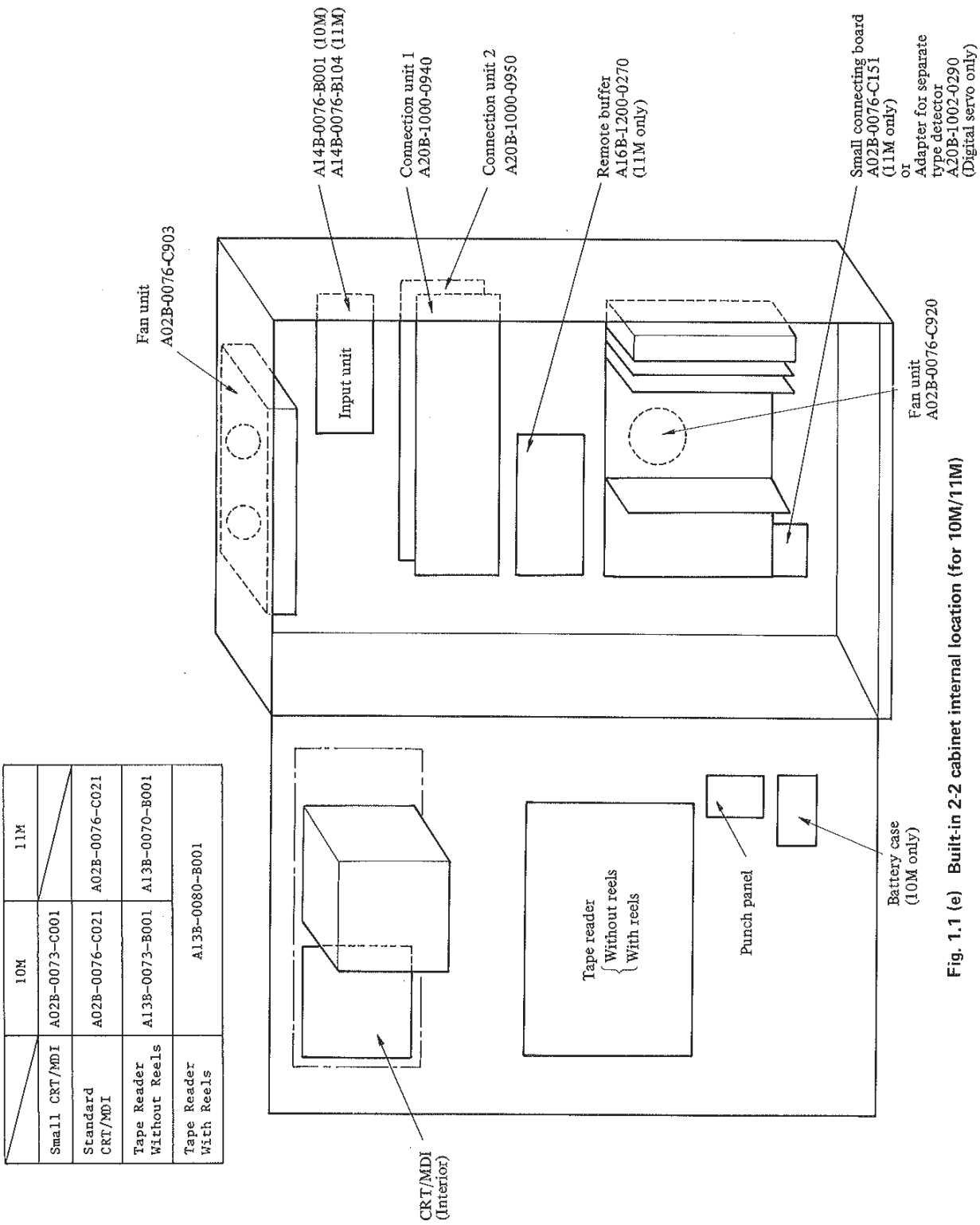
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	10M	11M	11TT
Small CRT/MDI	A02B-0073-C001		
Standard CRT/MDI	A02B-0076-C021	A02B-0076-C021	A02B-0076-C022
Tape Reader Without Reels	A13B-0073-B001	A13B-0070-B001	
Tape Reader With Reels	A13B-0080-B001		

Fig. 1.1 (d) Built-in 2 cabinet internal component location (for 10M/11M/11TT)

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	10M	11M
Small CRT/MDI	A02B-0073-C001	
Standard CRT/MDI	A02B-0076-C021	A02B-0076-C021
Tape Reader Without Reels	A13B-0073-B001	A13B-0070-B001
Tape Reader With Reels	A13B-0080-B001	

Fig. 1.1 (e) Built-in 2-2 cabinet internal location (for 10M/11M)

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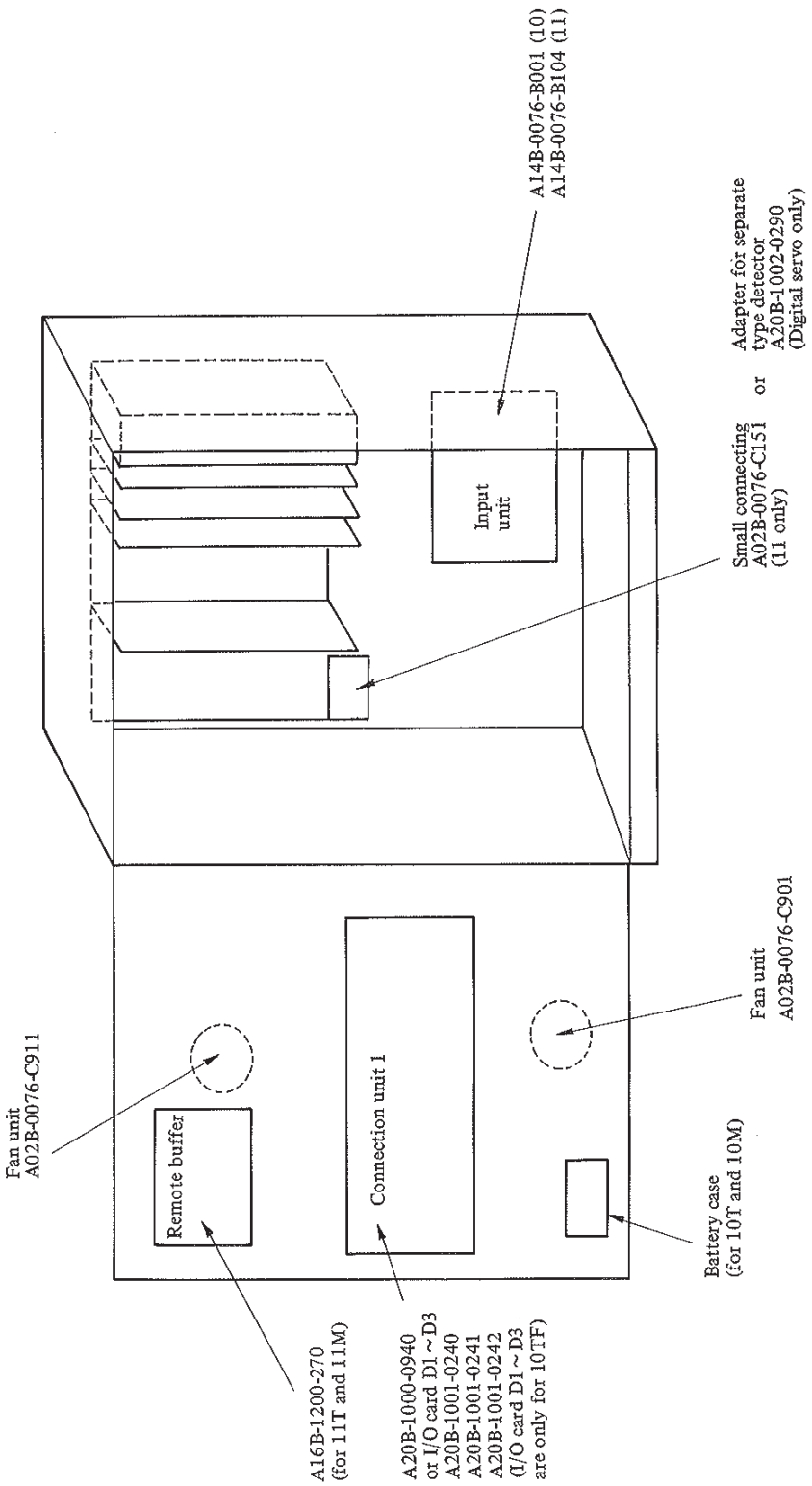


Fig. 1.1 (f) Unbundled cabinet control component location for 10/11/100/110 series

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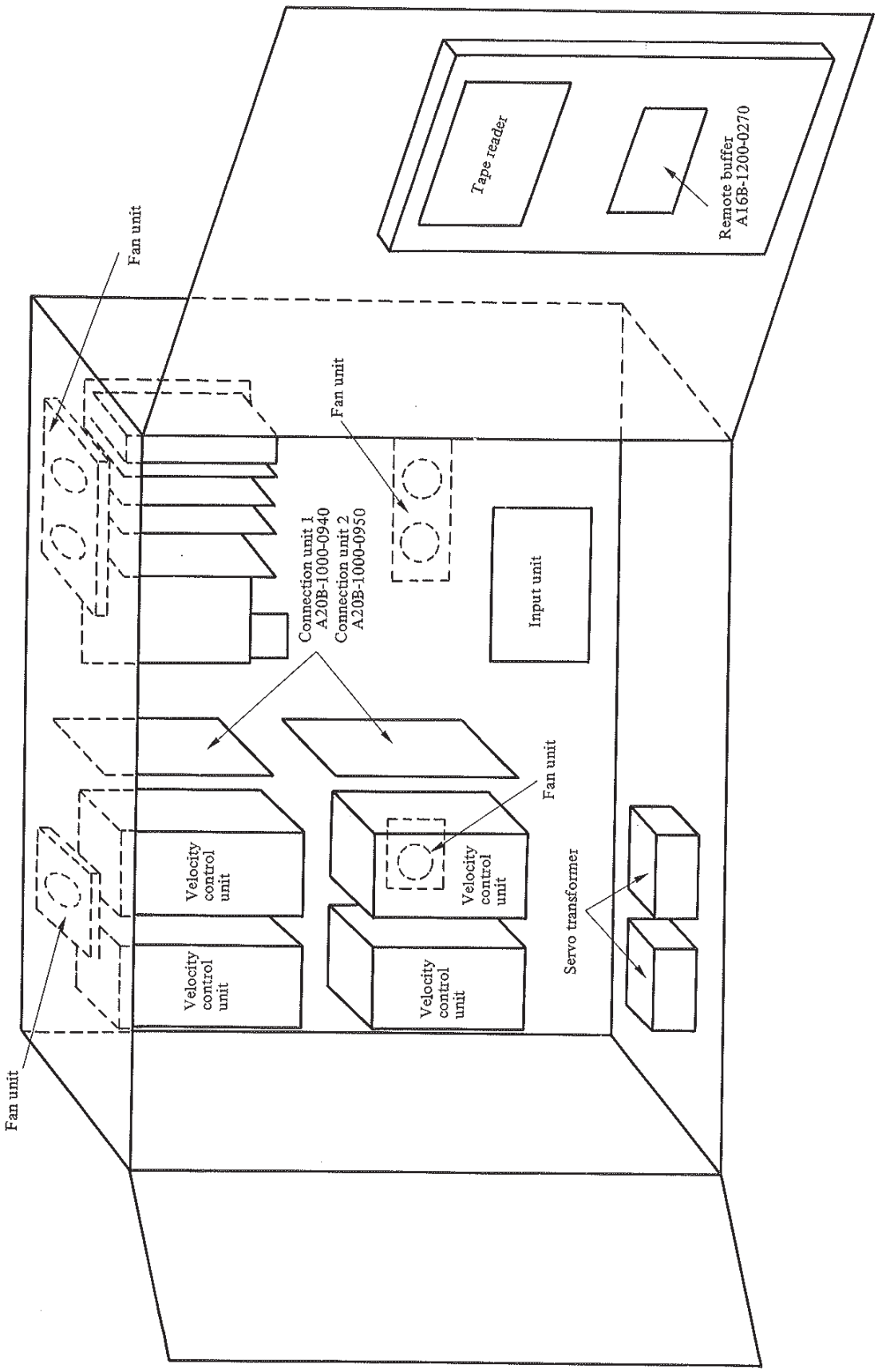


Fig. 1.1 (g) Built-in 3 cabinet internal component location for 11TT/110TT

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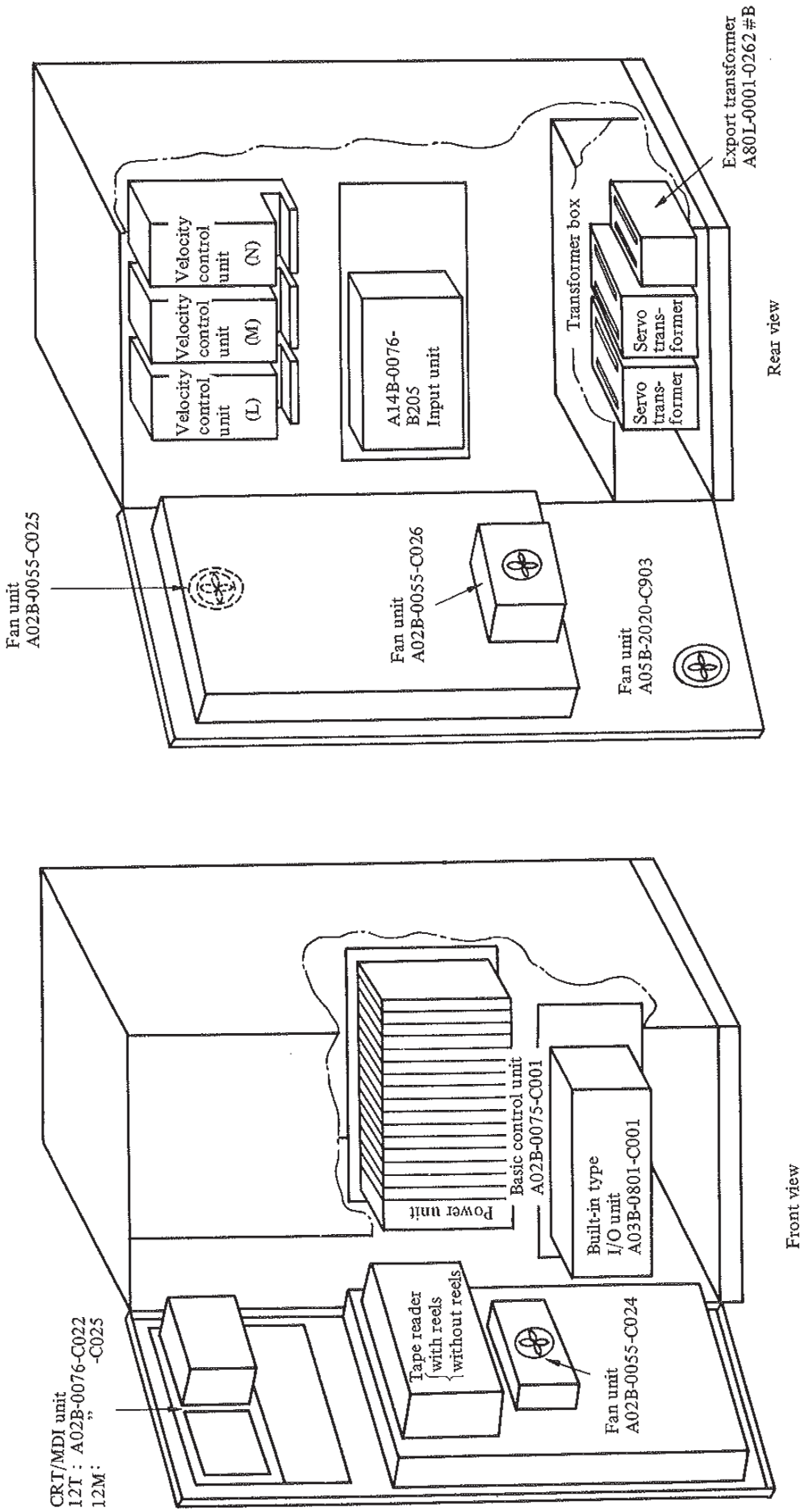


Fig. 1.1 (h) Free-standing cabinet A internal component location for 12/120 series

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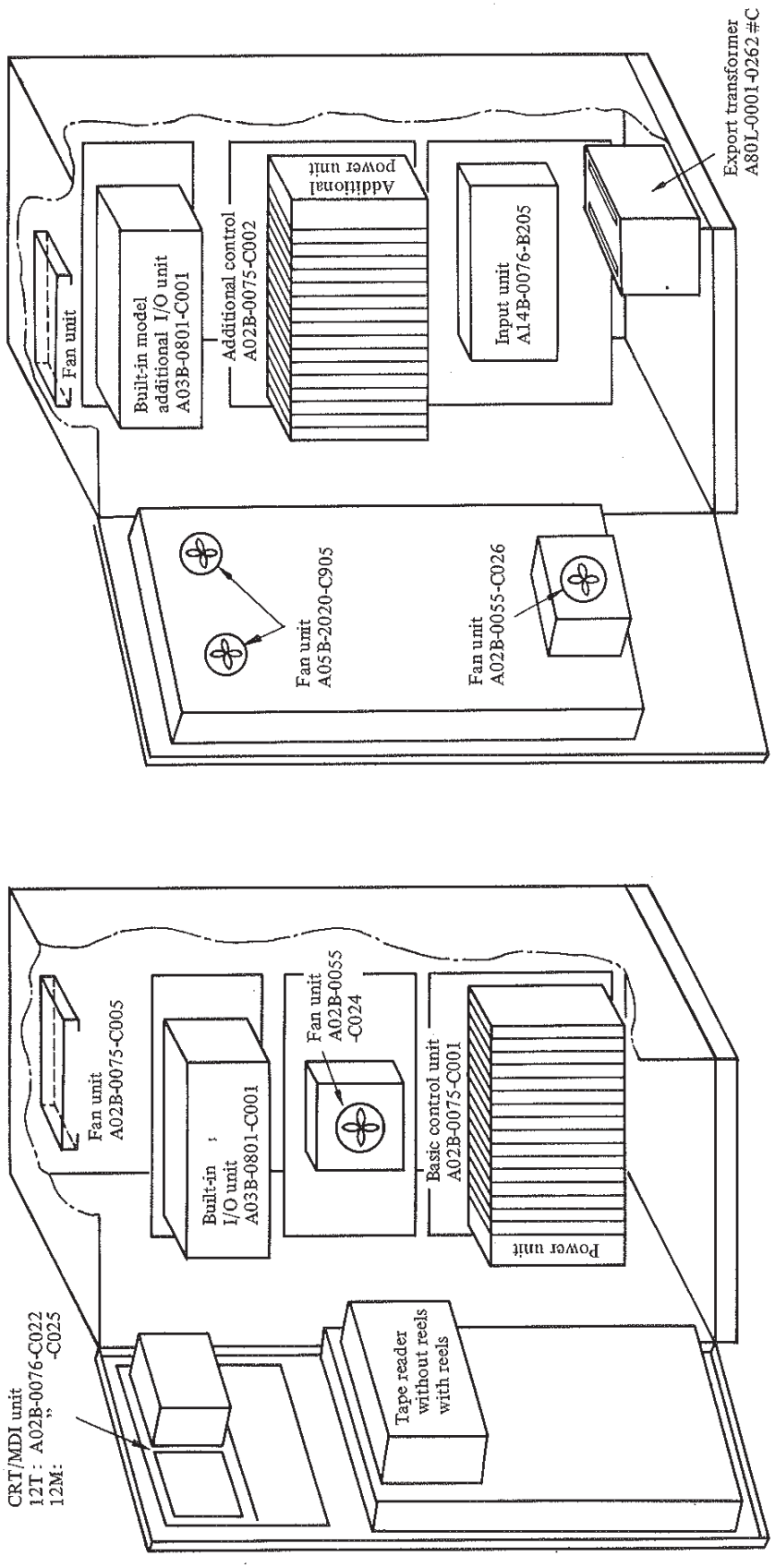


Fig. 1.1 (i) Free-standing cabinet B internal component location for 12/120 series

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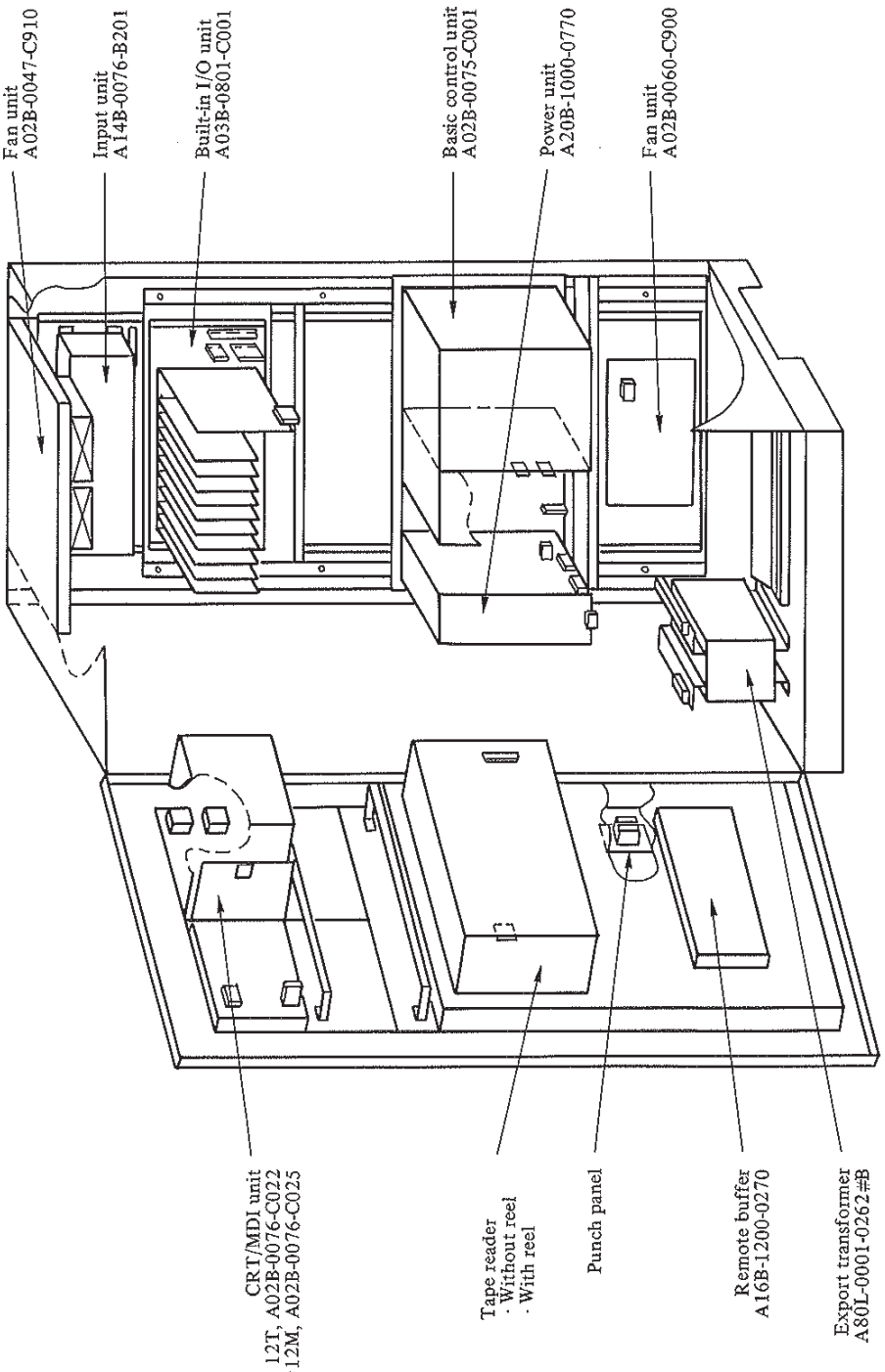


Fig. 1.1 (j) Built-in cabinet internal component location for 12/120 series

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10/11/100/110 Master & Option PCB

1) Analog servo 10 series master PCB structure

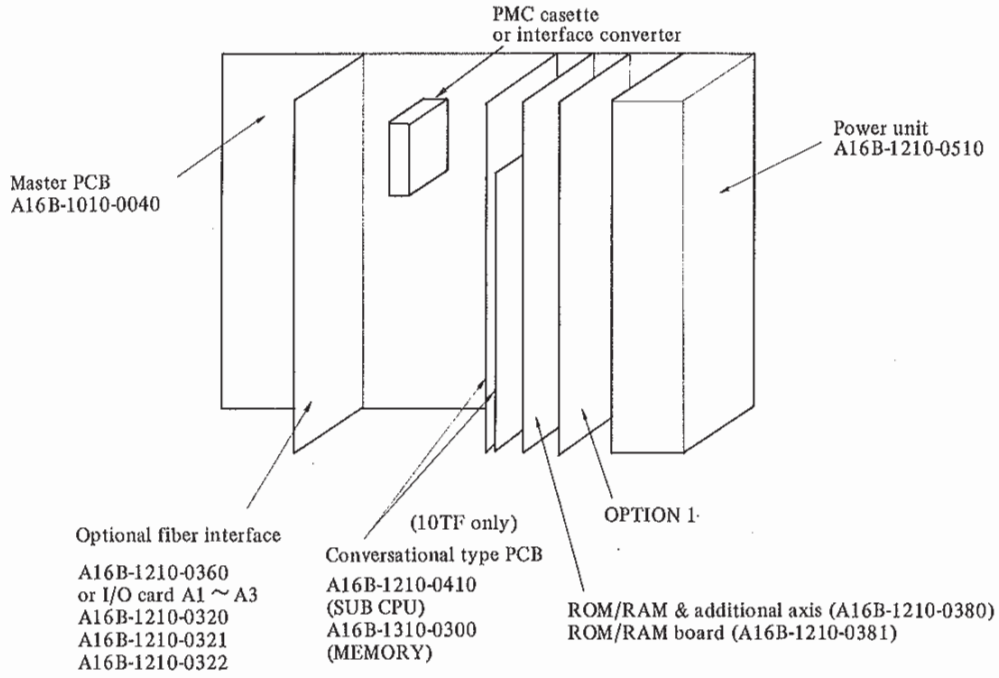


Fig. 1.1 (k)

2) Analog servo 11 series master PCB structure

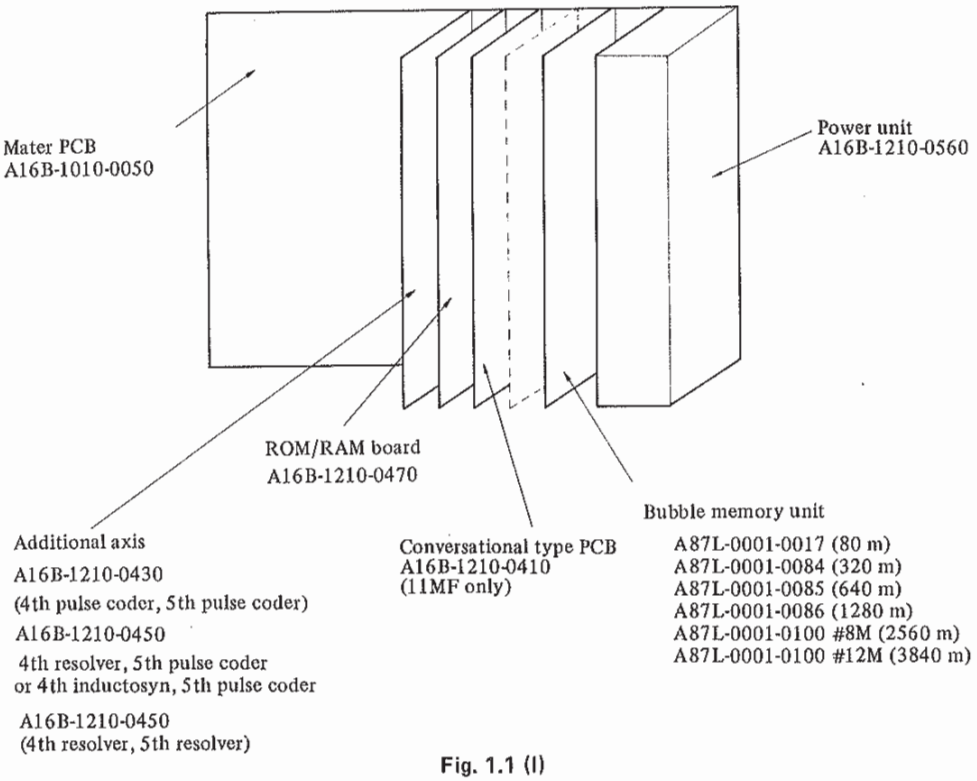
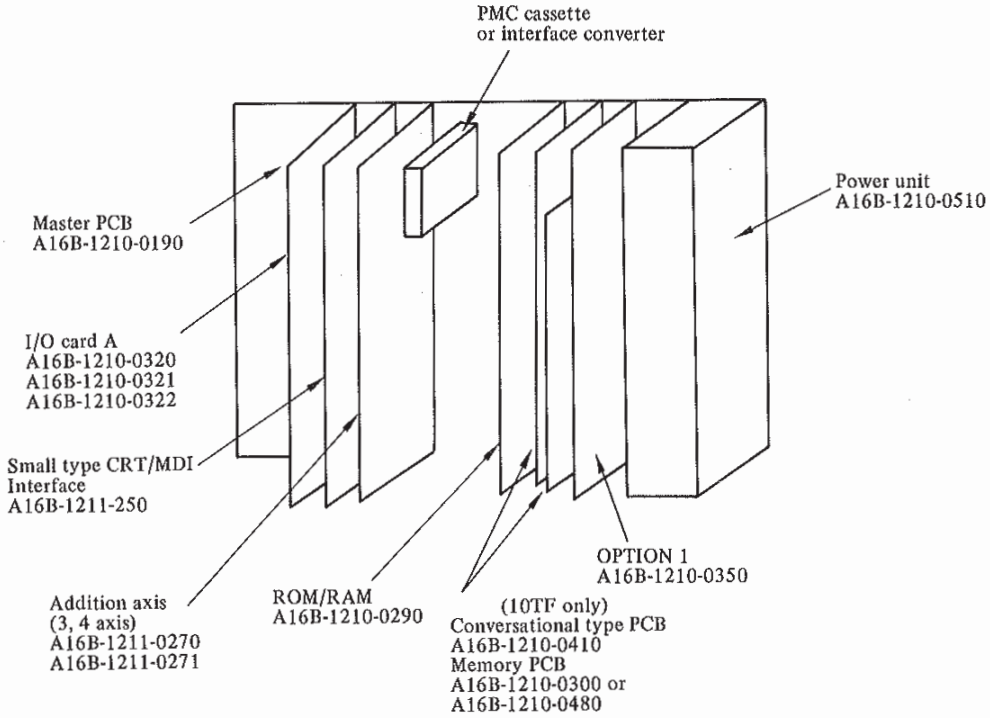


Fig. 1.1 (l)

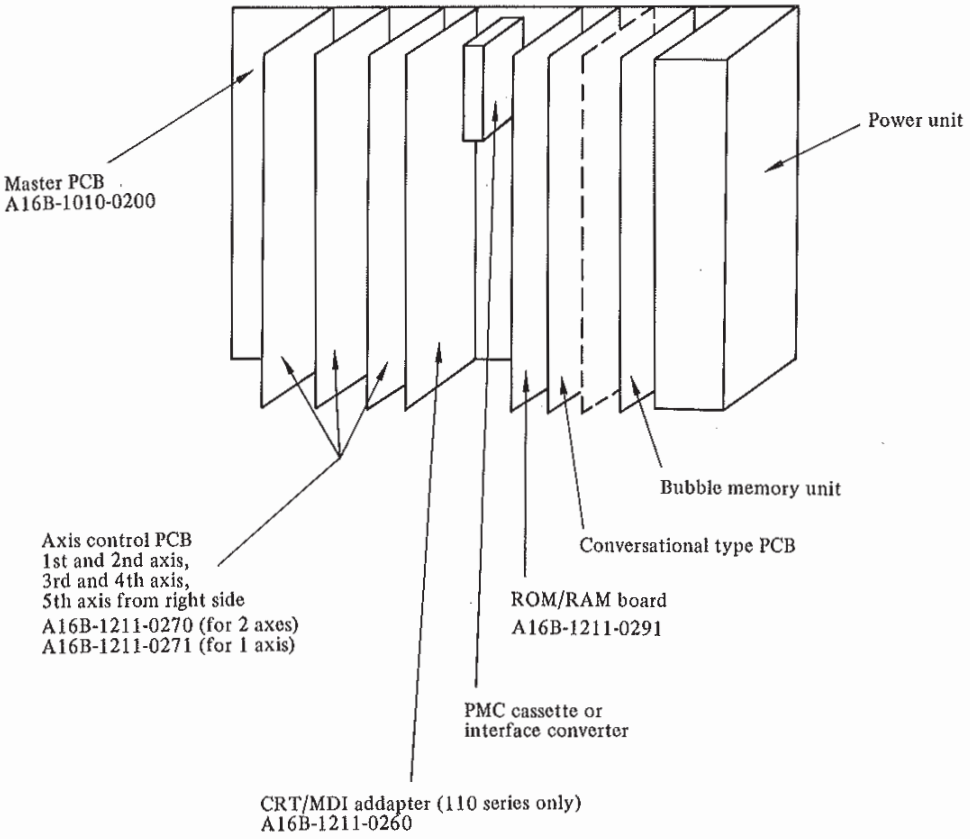
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3) Digital servo 10 series/100series



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4) Digital servo 11 series/110 series

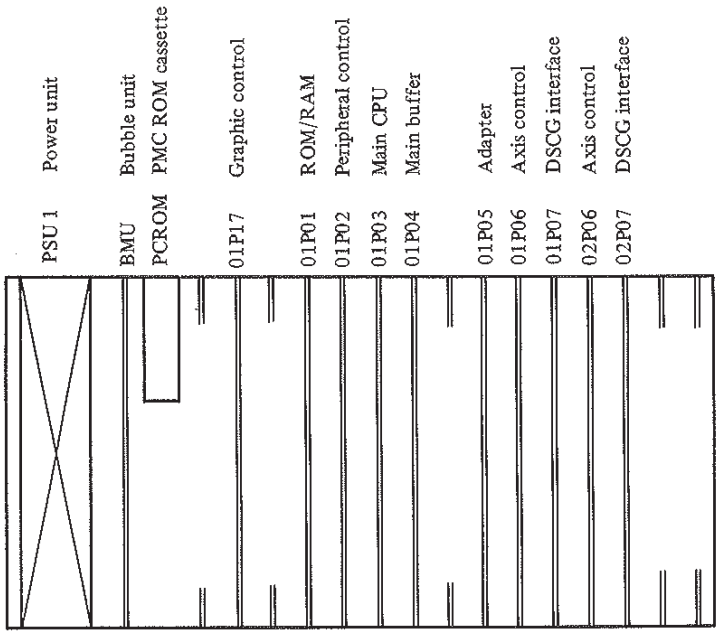


Power unit
Bubble memory unit
Conversational type PCB
PMC cassette
Interface PCB

} These are same as analog servo.

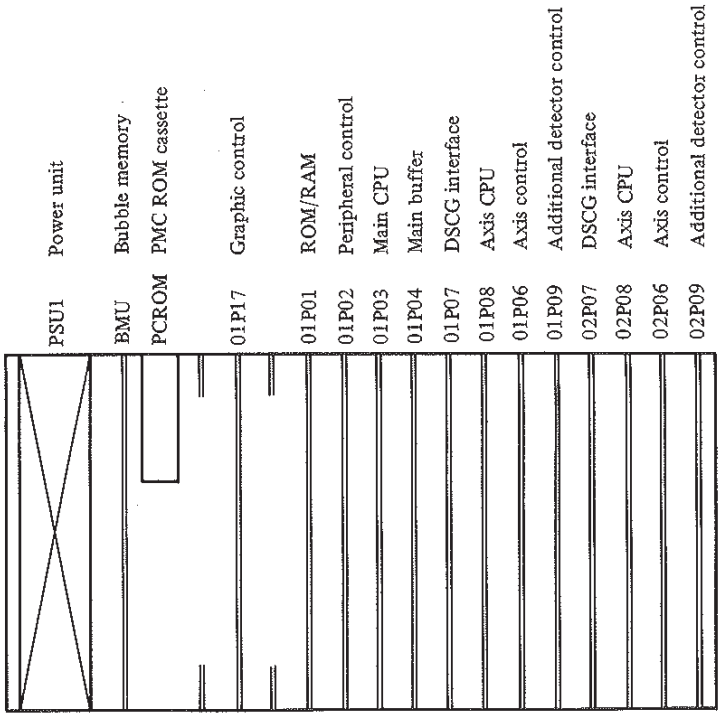
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5) 12 series basic control unit PCB structure



Basic control unit PCB layout of built-in cabinet and free-standing cabinet A. (One of synchronous operation, hybrid control and double check system is not performed when 5 or less axes are controlled.)

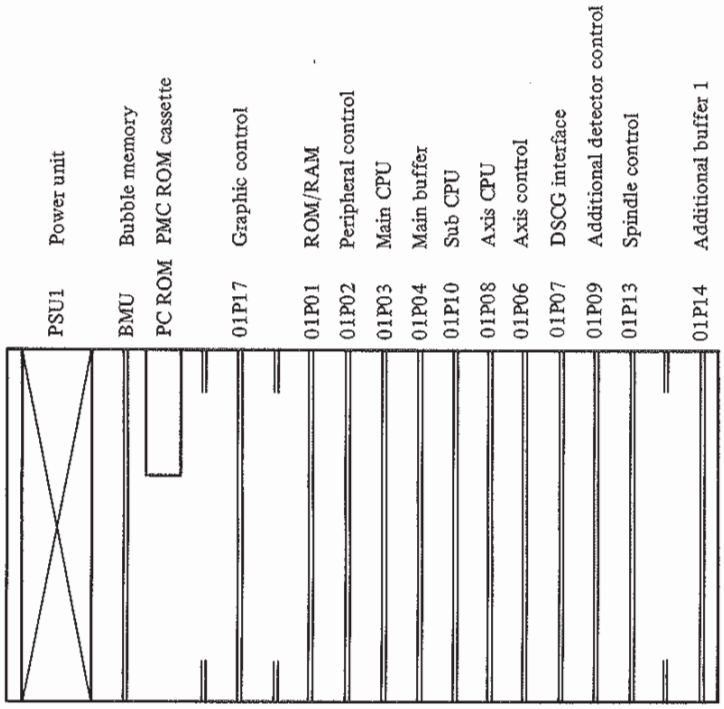
Fig. 1.1 (m) 12 series basic control unit layout (1)



Basic control unit PCB layout of built-in cabinet and free-standing A cabinet. (One of 6 axes control; synchronous operation, hybrid control and double check system is performed.)

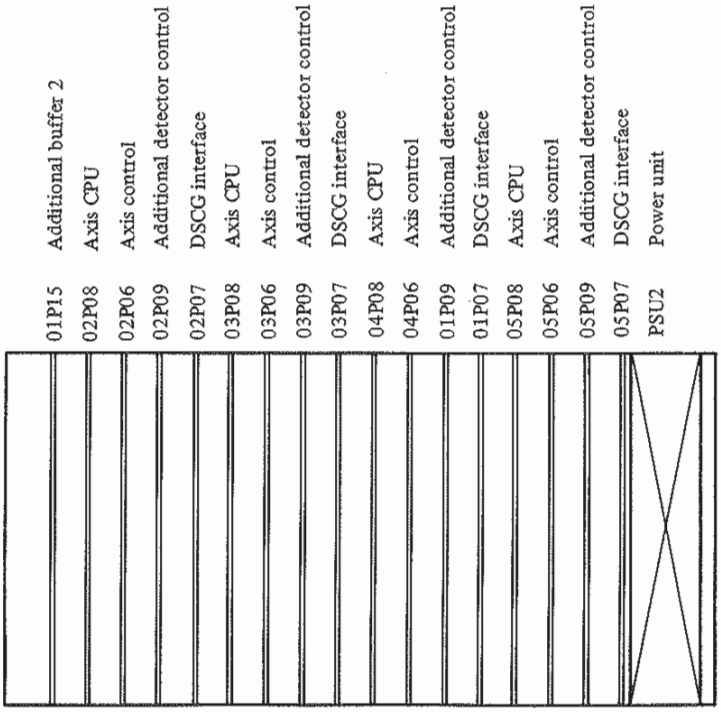
Fig. 1.1 (n) 12 series basic control unit layout (2)

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Basic control PCB layout of free-standing cabinet B.

Fig. 1.1 (o) 12 series basic control unit layout (3)

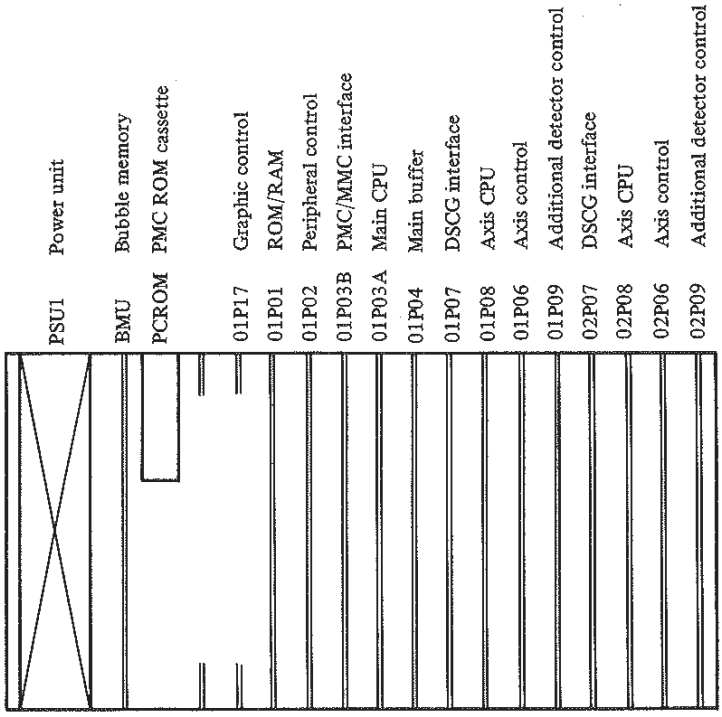


Additional control unit PCB layout of free-standing cabinet B.

Fig. 1.1 (p) 12 series basic control unit layout (4)

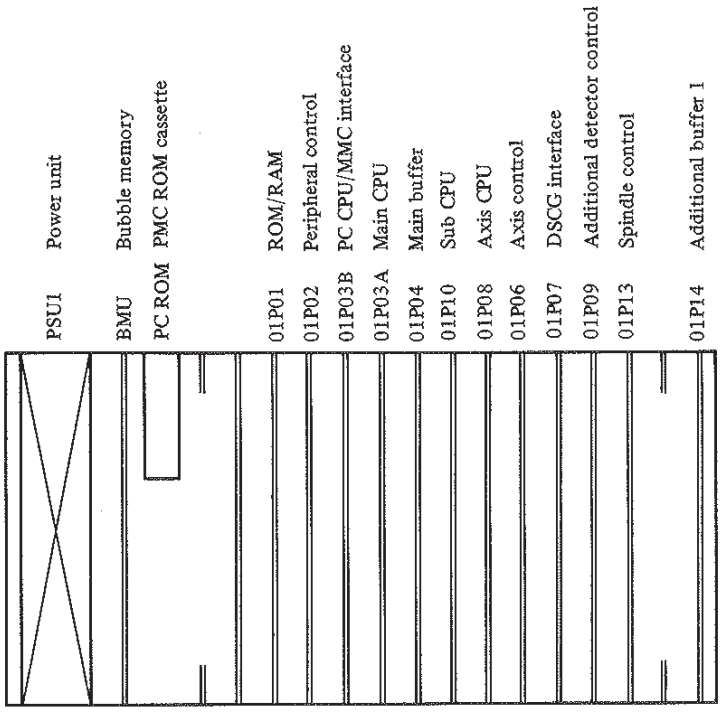
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6) 120 series basic control unit PCB structure



Basic control unit PCB layout of built-in cabinet and free-standing A cabinet. (6 or less axes control; synchronous operation, hybrid control and double check system is performed.)

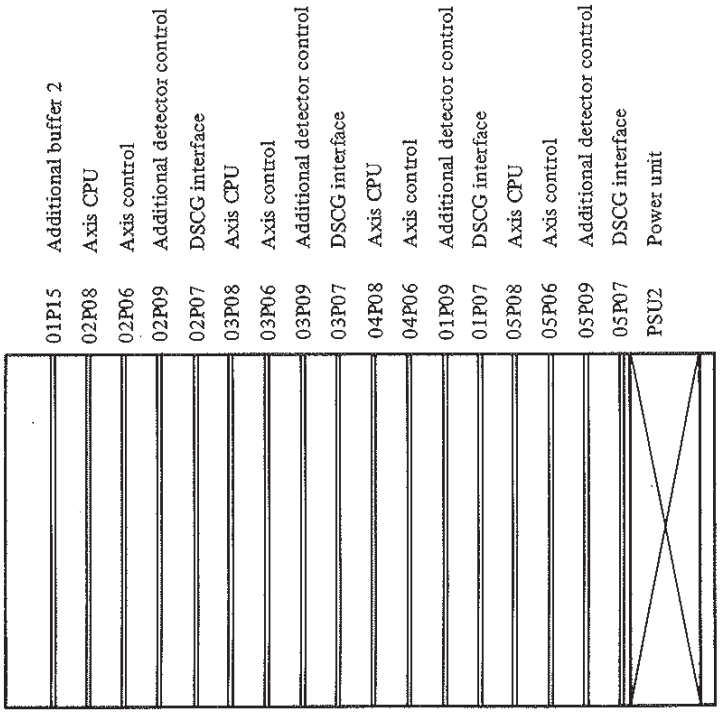
Fig. 1.1 (q) 120 series basic control unit layout (1)



Basic control PCB layout of free-standing cabinet B.

Fig. 1.1 (r) 120 series basic control unit layout (2)

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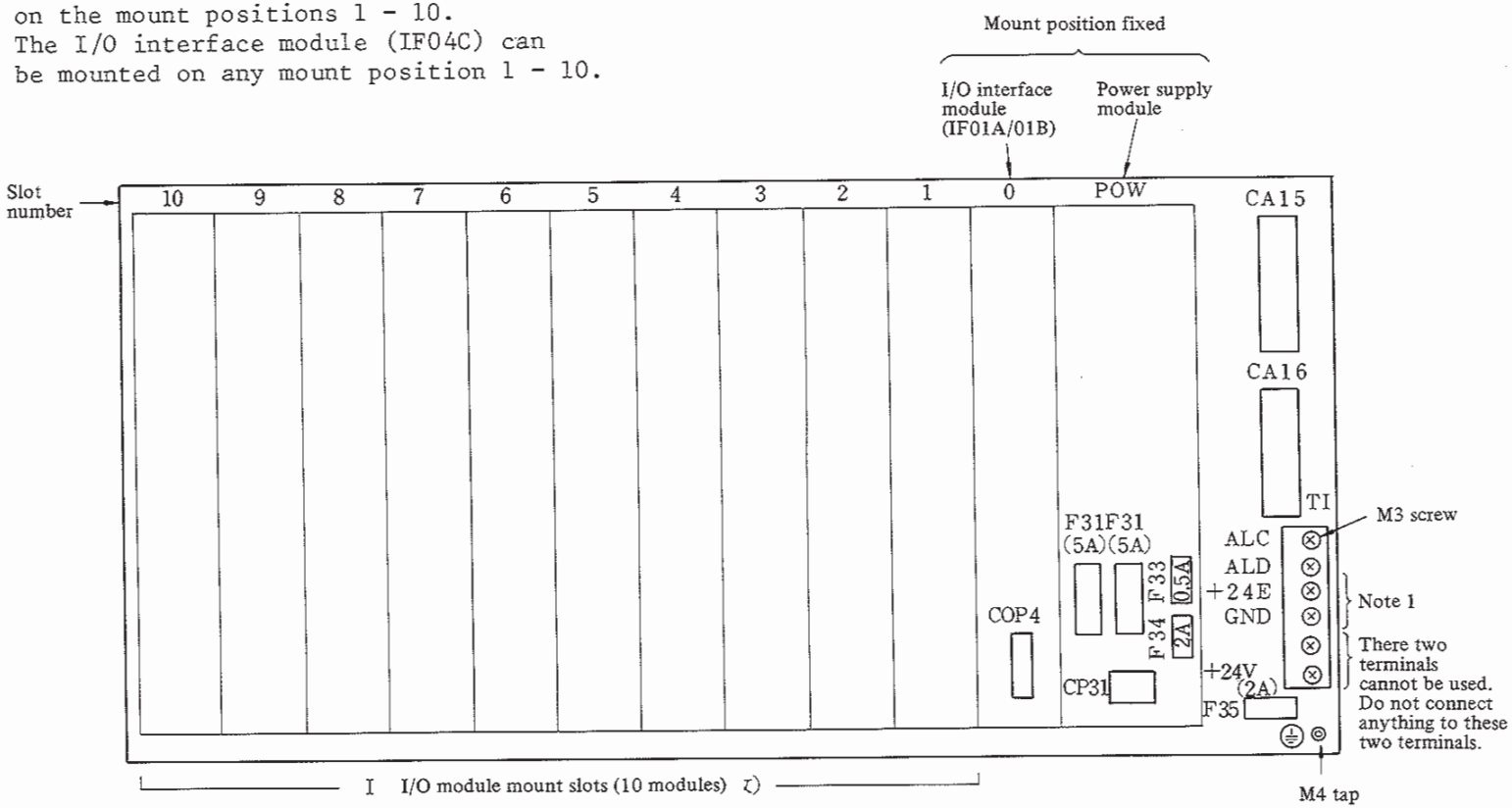


Additional control unit PCB layout of free-standing cabinet B.

Fig. 1.1 (s) 120 series basic control unit layout (3)

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. Mount positions of the two modules at the right are fixed.
. Arbitrary I/O modules can be mounted on the mount positions 1 - 10.
. The I/O interface module (IF04C) can be mounted on any mount position 1 - 10.



Note 1: Use these terminals to supply power to the external contacts, when using a non-insular type input module. Be careful not to connect short with the + 24E of other base units.

Fig. 1.1 (t) Module mount drawing of I/O base unit BU10A

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. Mount positions of the two modules at the right are fixed.
. Arbitrary I/O modules can be mounted on the mount positions 1 - 8.
. The I/O interface module (IF04C) can be mounted on any mount positions 1 - 10.

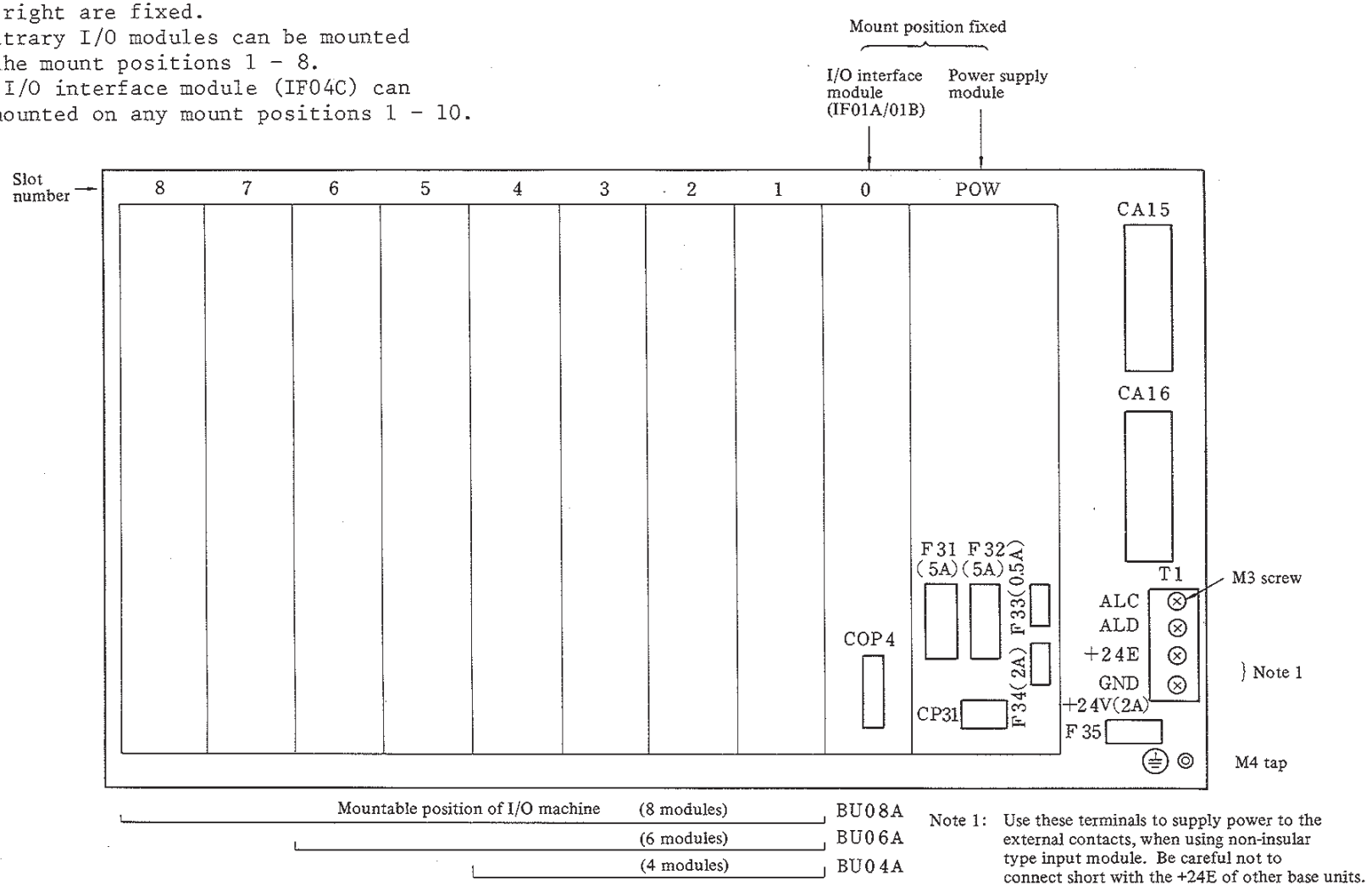


Fig. 1.1 (u) Module mount drawing of I/O base unit BU04A, BU06A, BU08A

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1.2 Construction

1) Analog servo 10 series connecting construction
   a) For small CRT/MDI

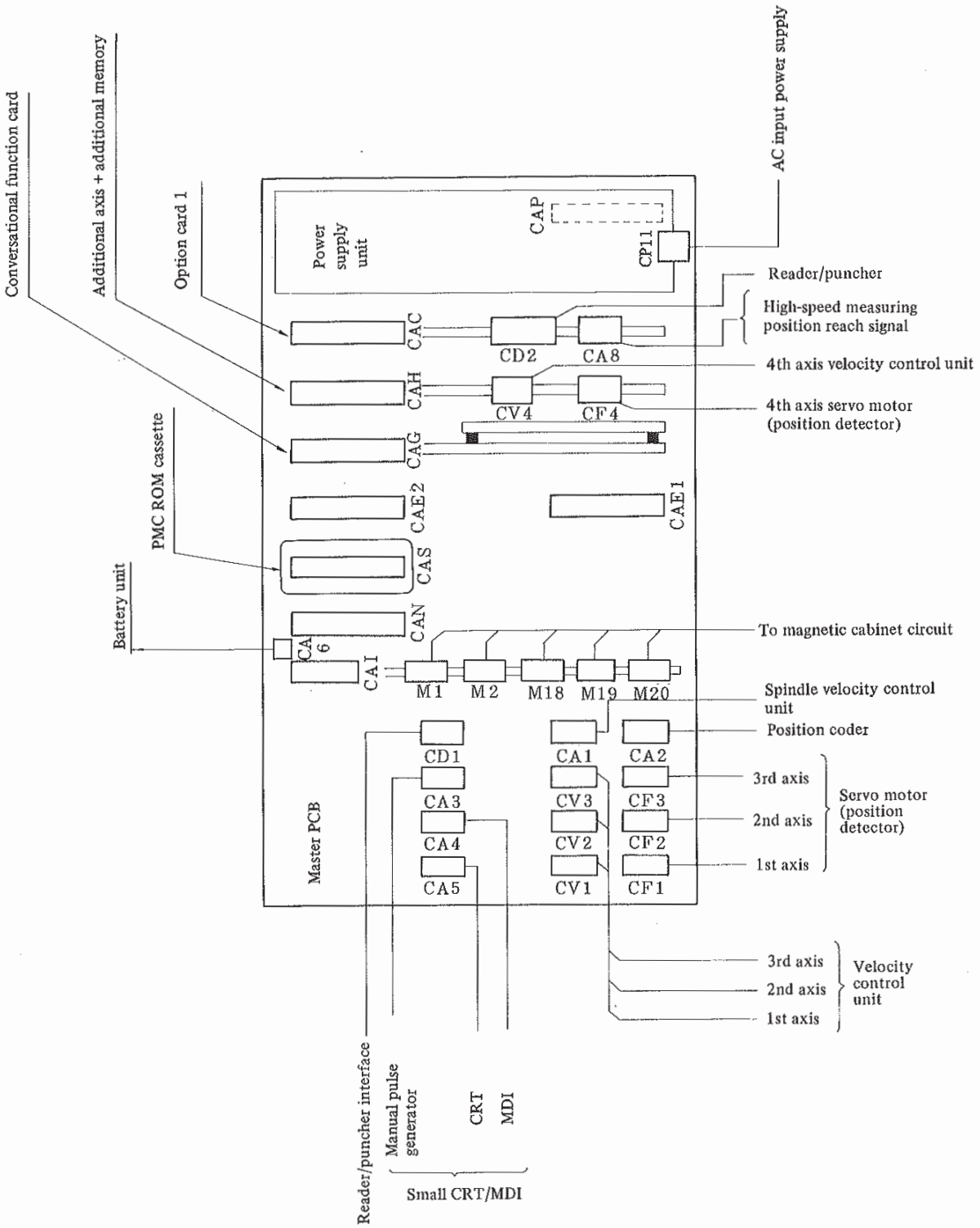


Fig. 1.2 (a) 10 series master PCB structure

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b) For standard or 14" color CRT/MDI

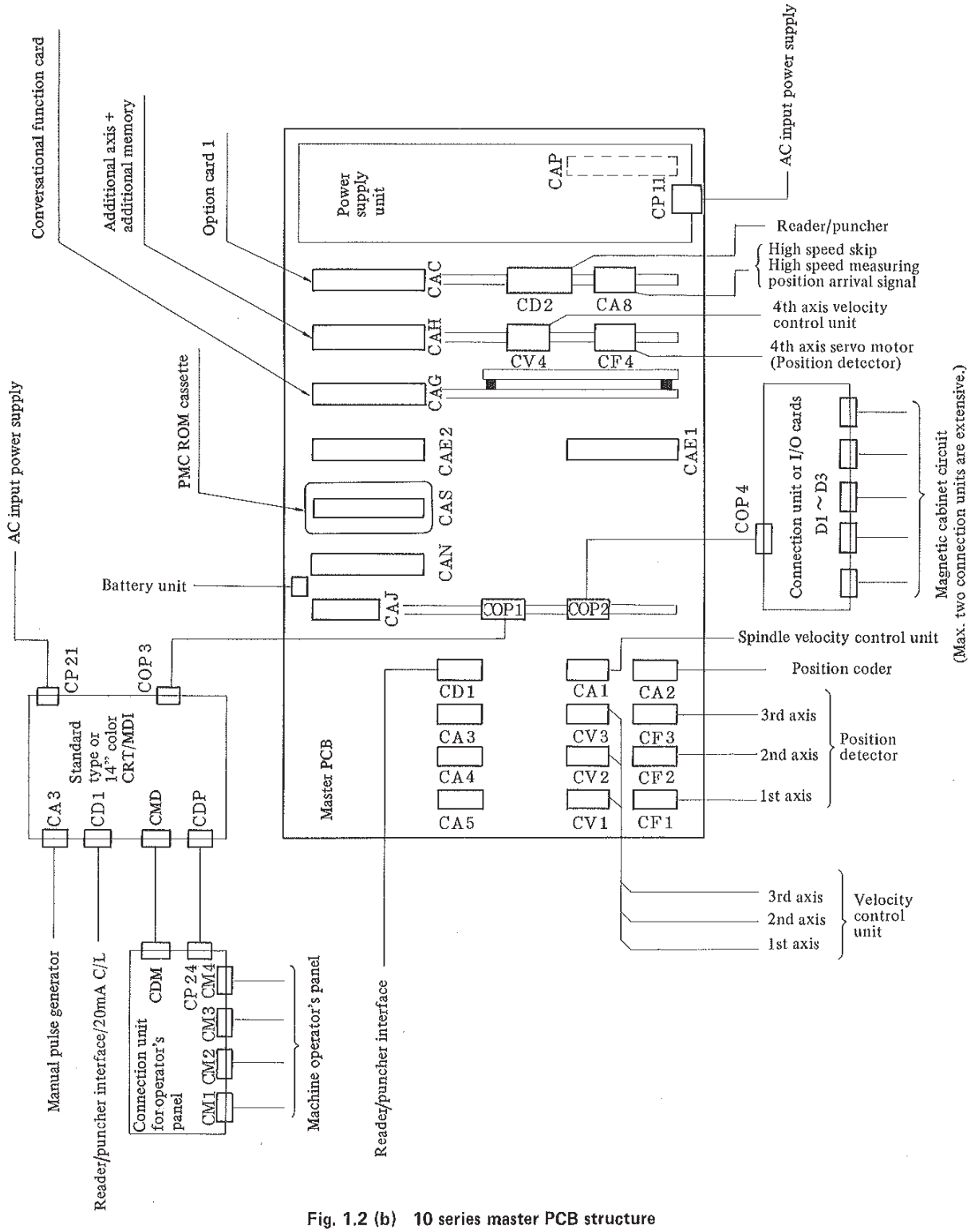


Fig. 1.2 (b) 10 series master PCB structure

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c) Digital servo

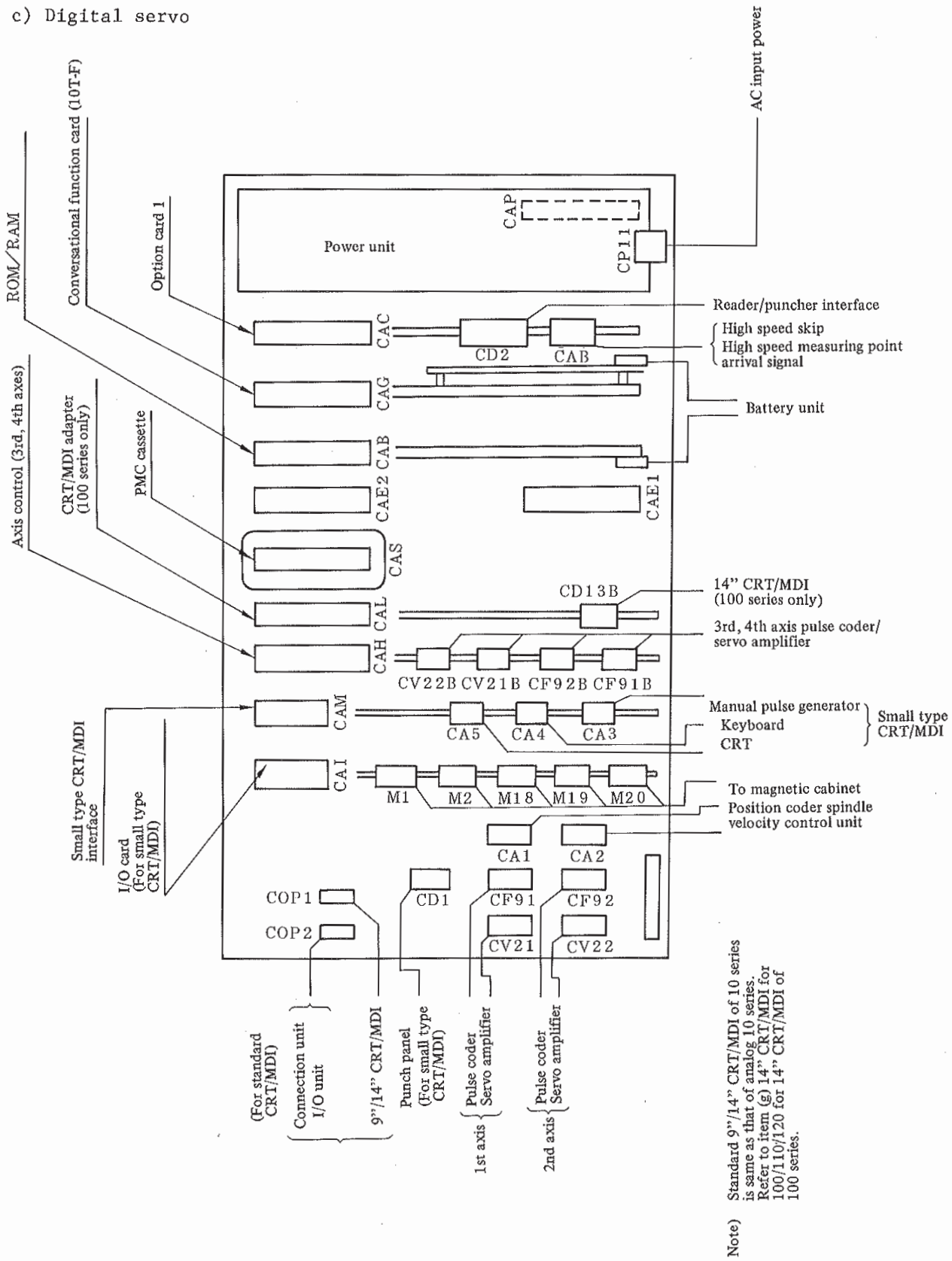


Fig. 1.2 (c) Digital servo 10 series master PCB structure

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2) 11 series connecting construction

(a) Analog servo

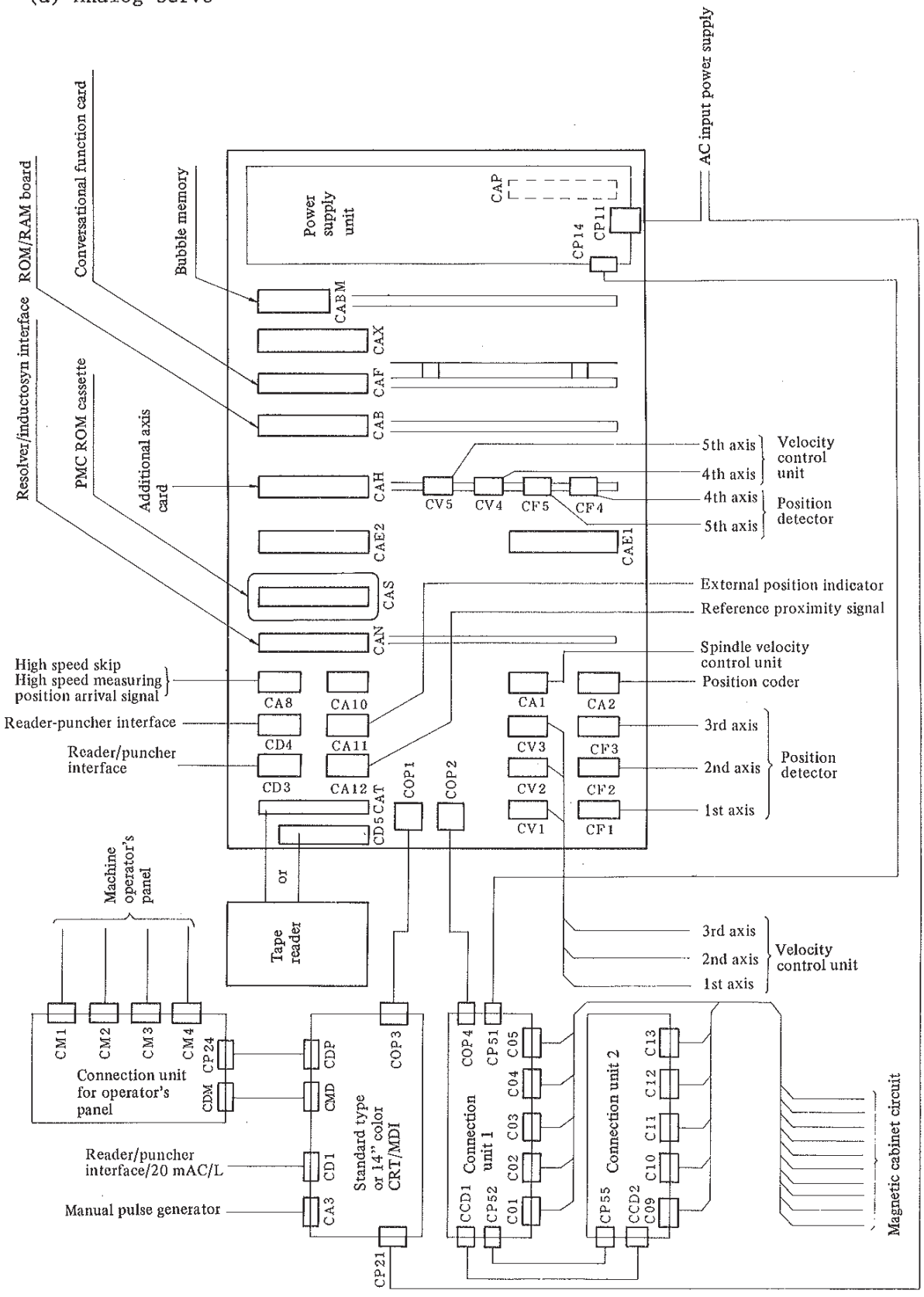


Fig. 1.2 (d) 11 series master PCB structure

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(b) Digital servo

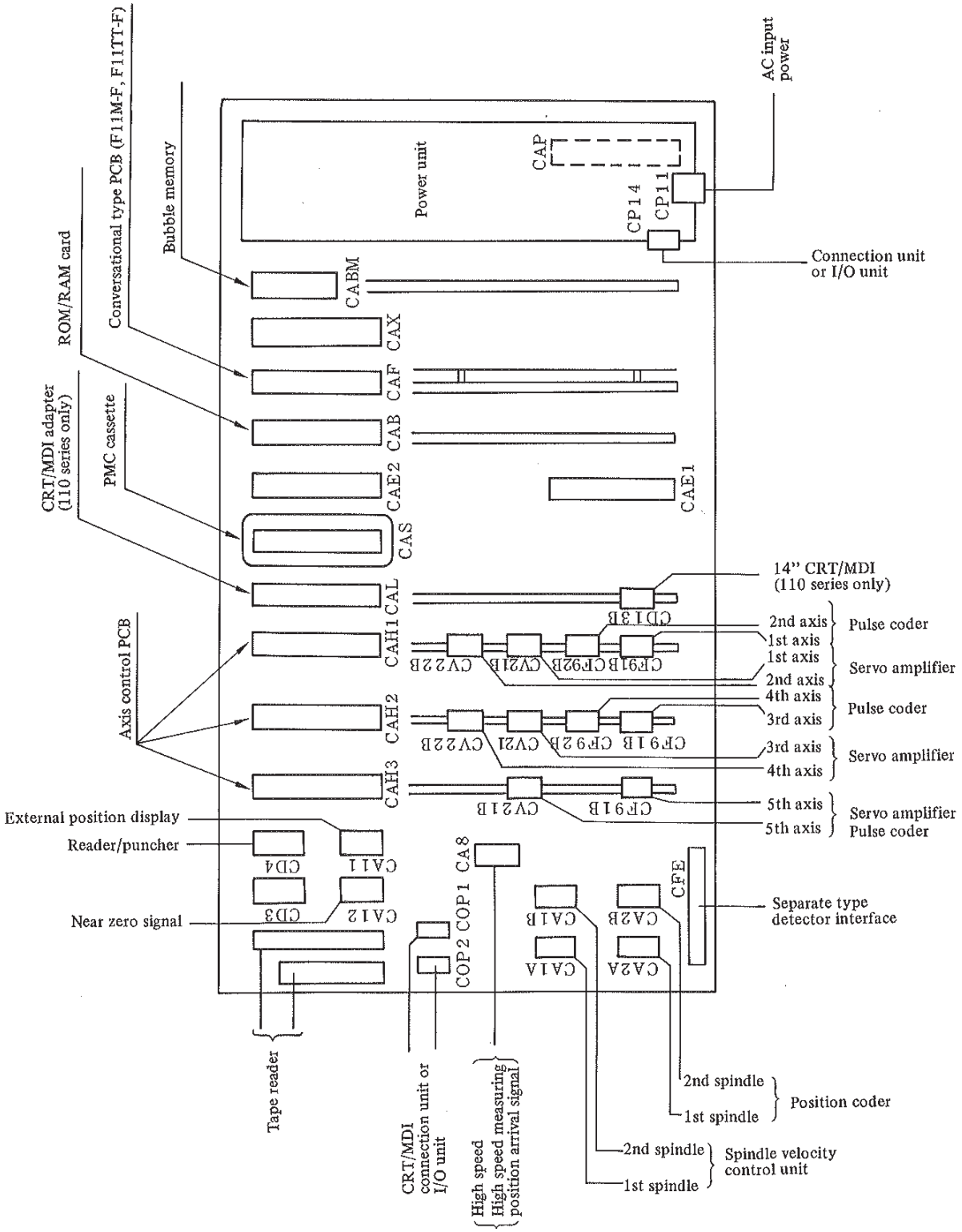


Fig. 1.2 (e) Digital servo 11 series master PCB structure

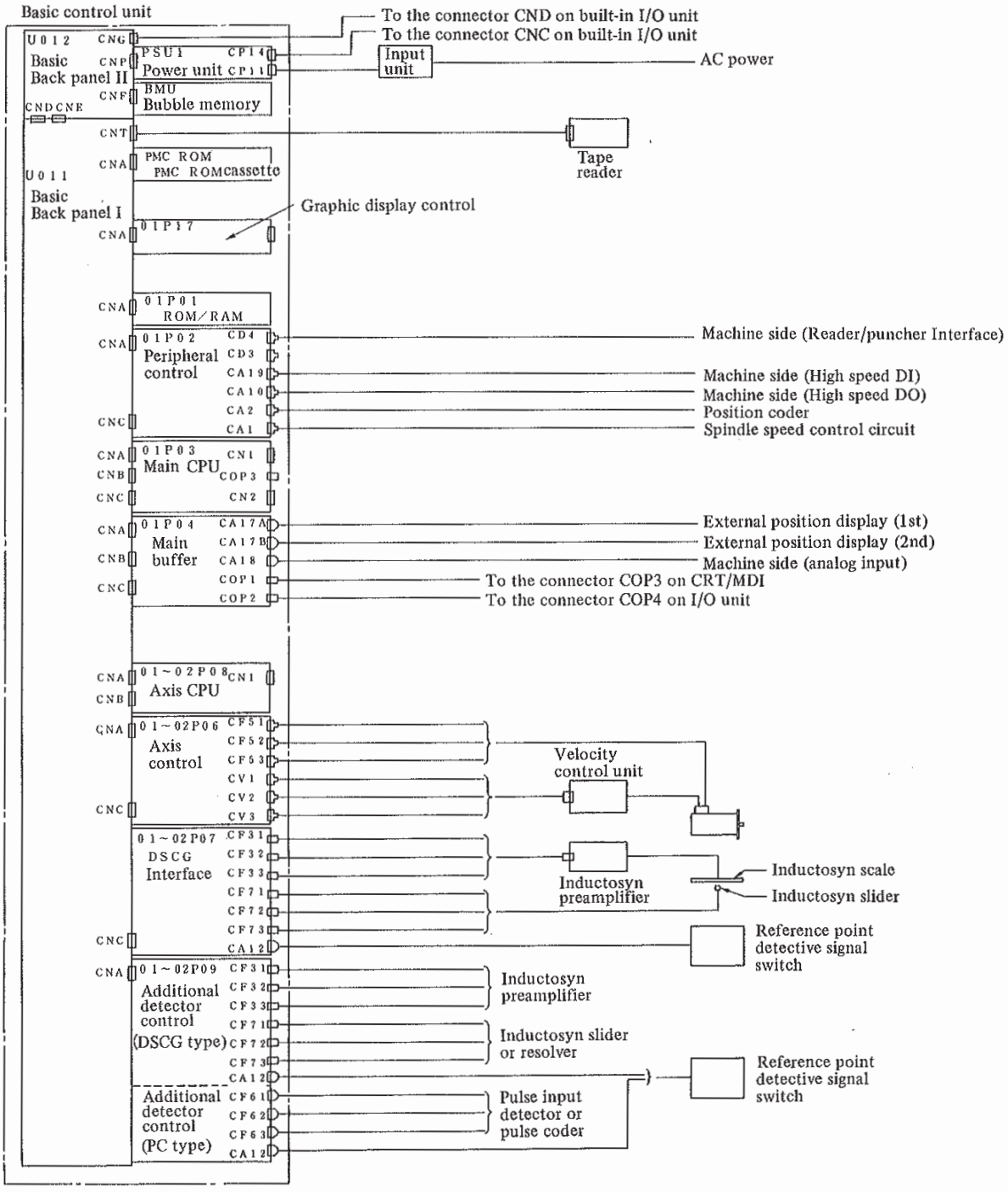
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3) 12/120 series construction
12/120 series is divided into the following 3 types according to the cabinet in which the control unit is installed.

	Cabinet type where the control unit is installed	Controlled axis number	Axis control
1	Built-in type cabinet	2 - 5 axes (Note)	The main CPU controls the axes directly.
		6 axes (Note)	Every 3rd axis has the axis CPU which controls the axes.
2	Free-standing type cabinet A	2 - 5 axes (Note)	The main CPU controls the axes directly.
		6 axes (Note)	Every 3rd axis has the axis CPU which controls the axes.
3	Free-standing type cabinet B	7 - 8 axes	Every 3rd axis has the axis CPU which controls the axes.
		9 - 15 axes	Every 3rd axis has the axis CPU which controls the axes. The sub CPU is prepared to control this axis CPU.

Note) The axes are controlled by the axis CPU when the hybrid control, synchronous operation, or double check system performed even though only 2 - 5 axes are controlled.

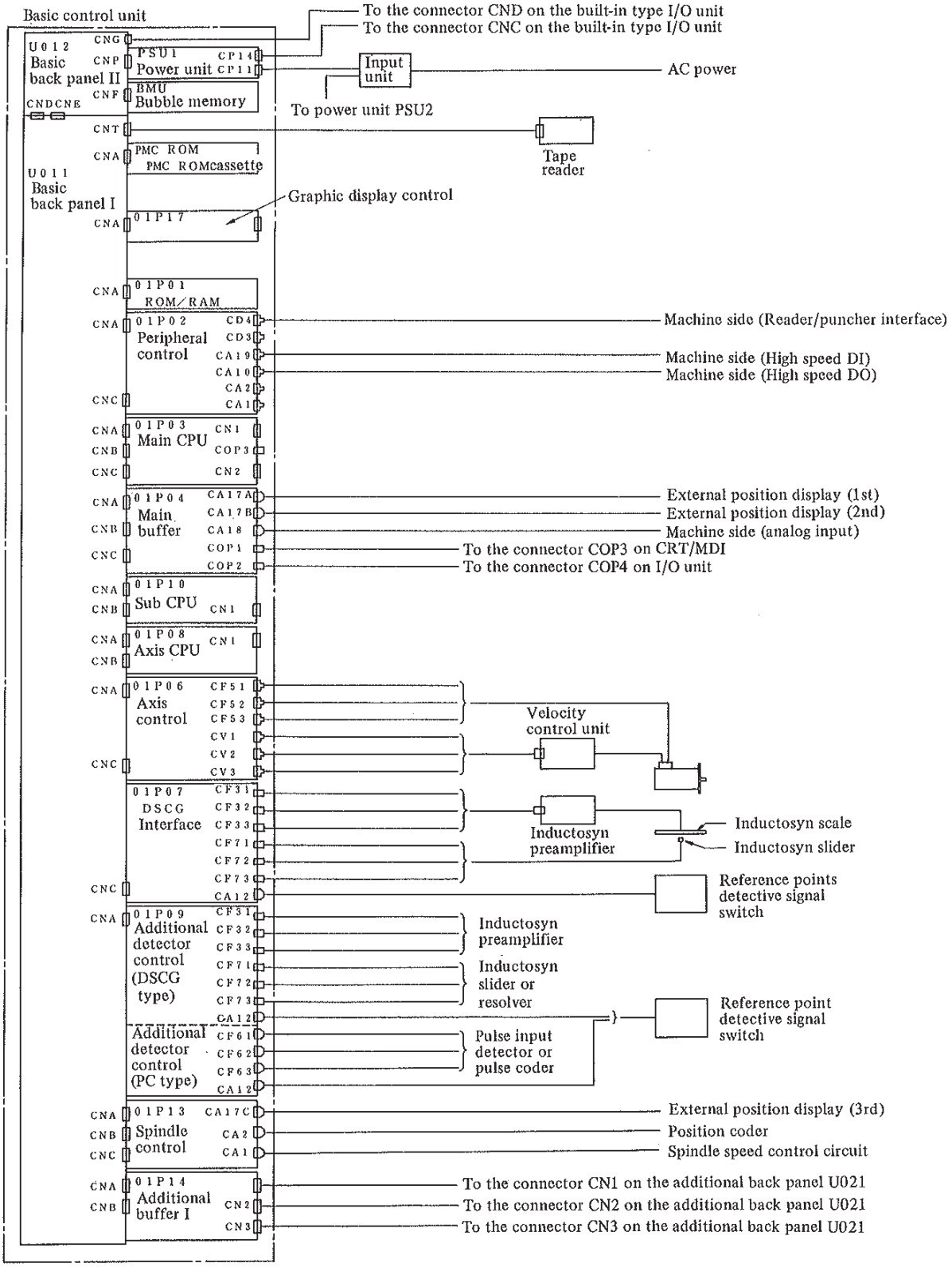
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When using built-in cabinet or free-standing cabinet A
(When 6 or less axes control; the synchronous operation,
the hybrid control, and the double check system are
performed)

Fig. 1.2 (f) 12 series basic control unit connecting structure

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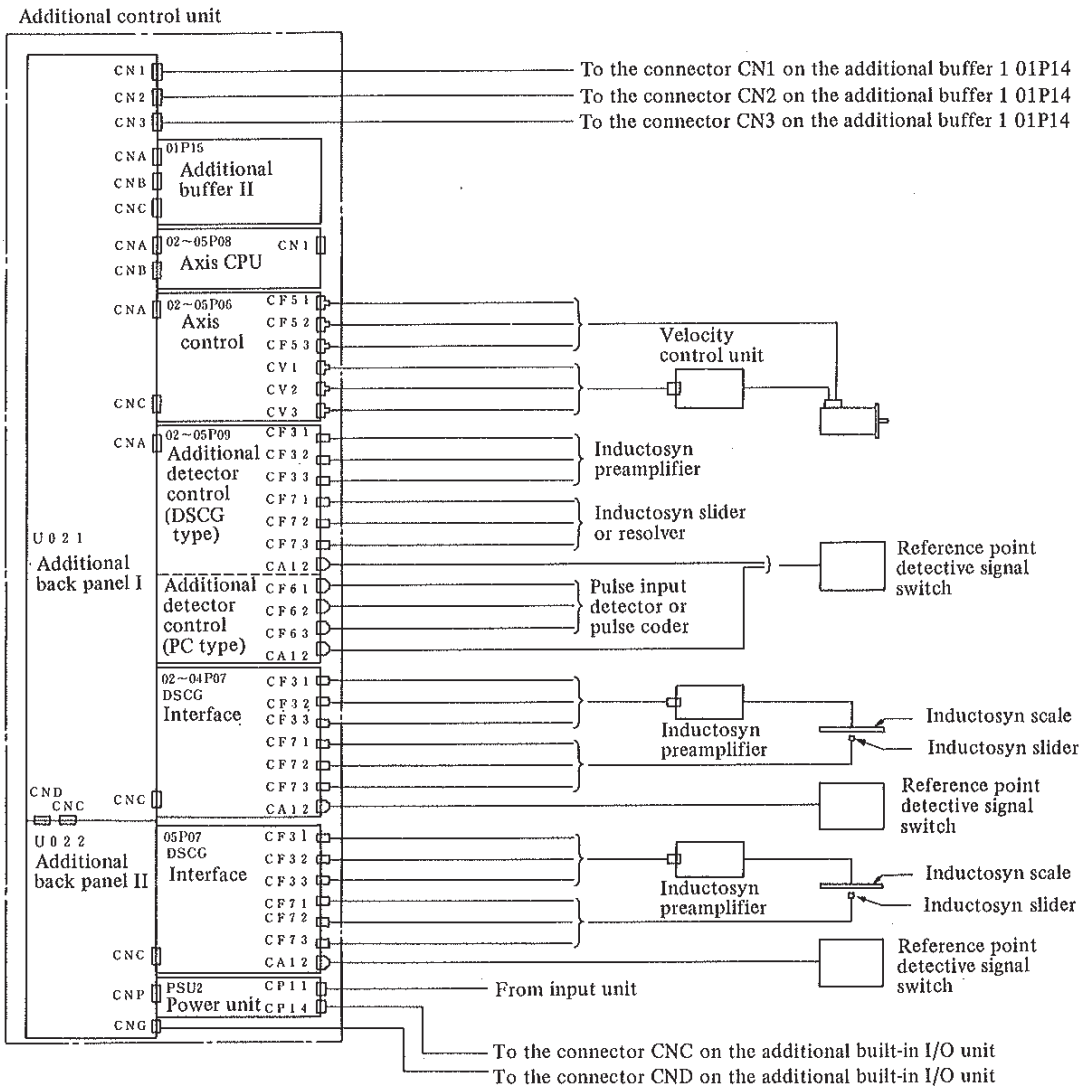


When using free-standing type cabinet B
(When more than 7 axes are controlled)

Fig. 1.2 (g) 12 series basic control unit connecting structure

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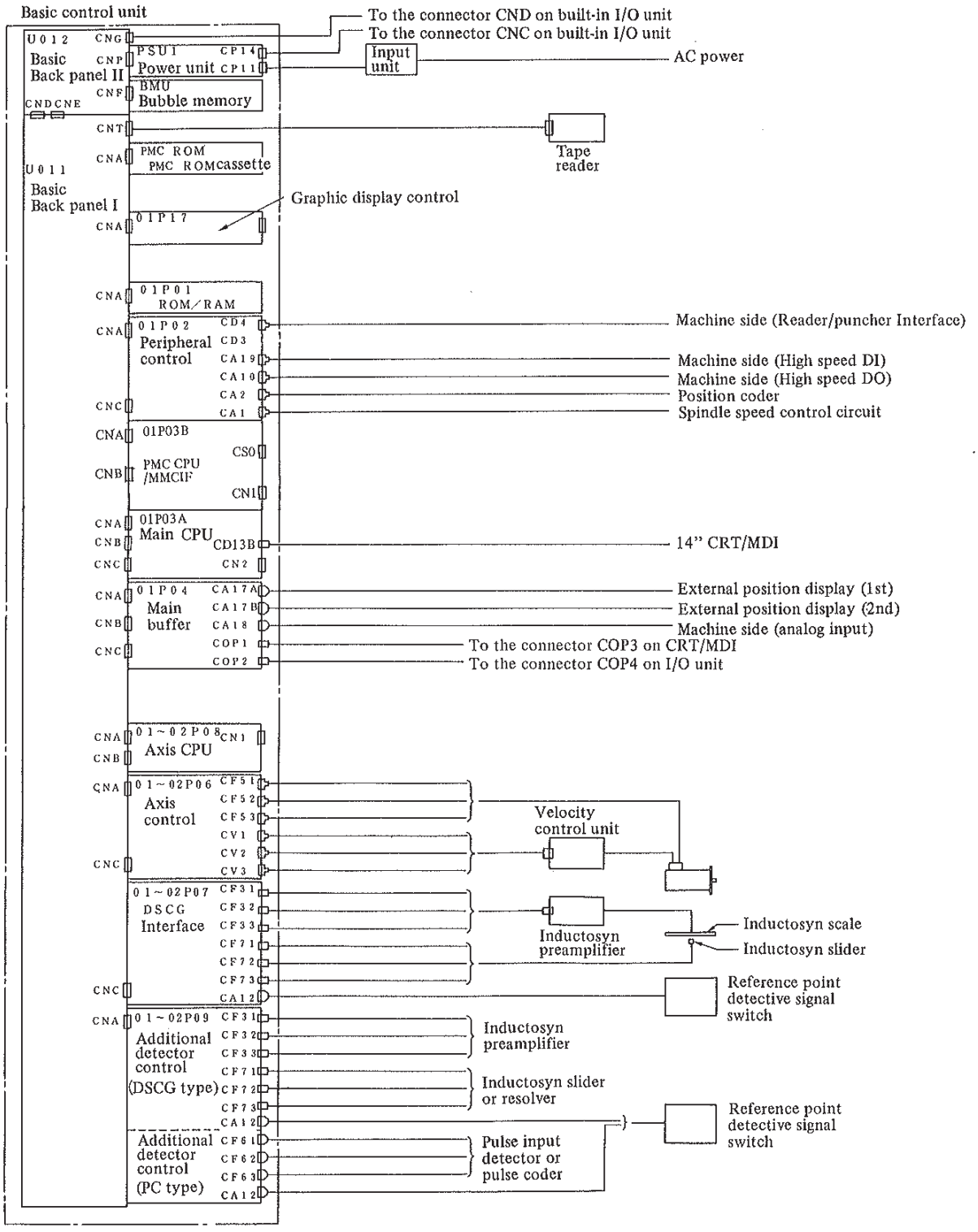
b) 12 series additional control unit connecting structure



When using free-standing cabinet B
(When more than 7 axes are controlled)

Fig. 1.2 (h) 12 series additional control unit connecting structure

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When using built-in cabinet or free-standing cabinet A (6 axes or less control; the synchronous operation, the hybrid control, and the double check system are performed)

Fig. 1.2 (i) 120 series basic control unit connecting structure

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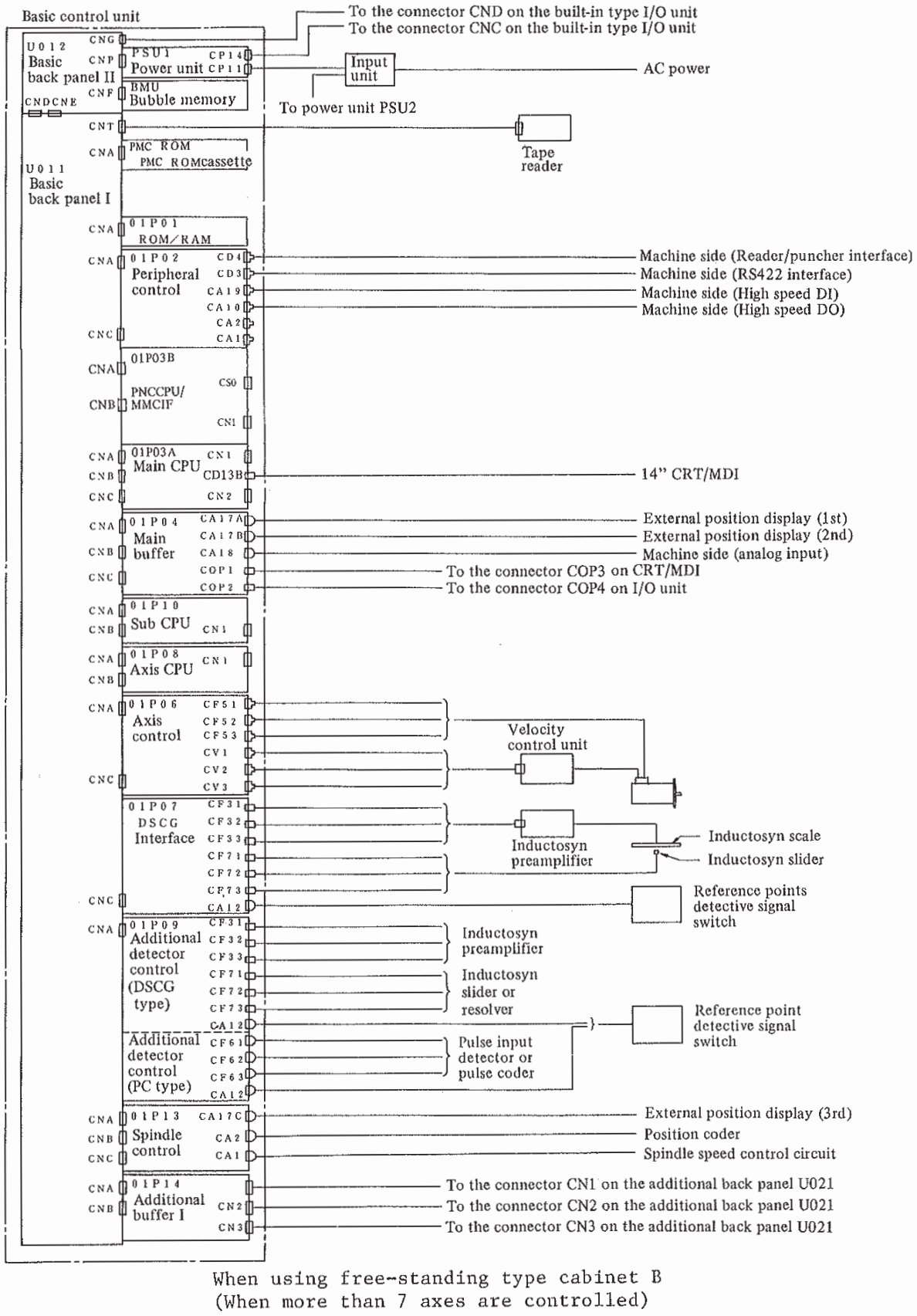
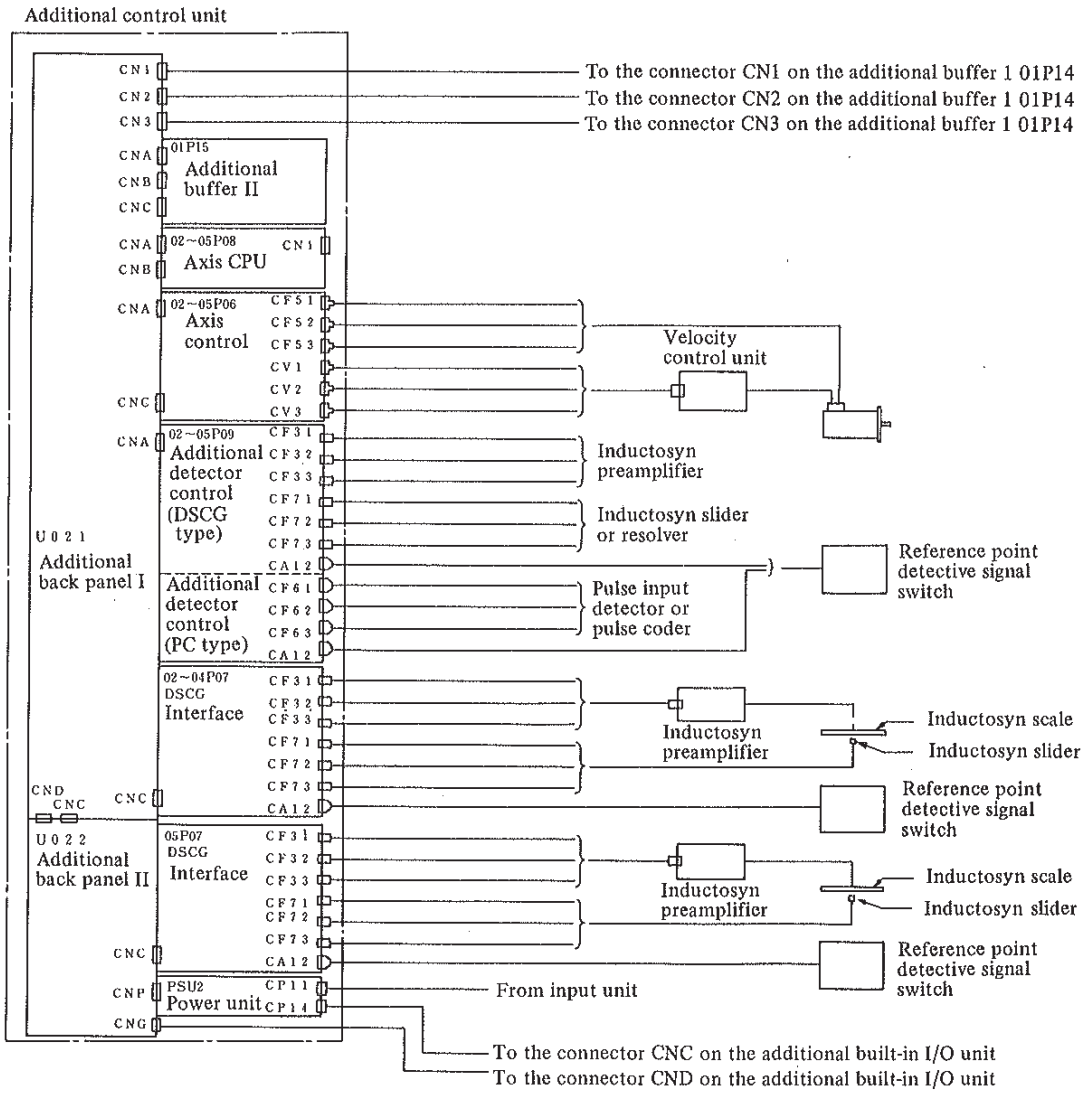


Fig. 1.2 (j) 120 series basic control unit connecting structure

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b) 12 series additional control unit connecting structure



When using free-standing type cabinet B
(When more than 7 axes are controlled)

Fig. 1.2 (k) 120 series additional control unit connecting structure

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c) 12 series CRT/MDI unit

9" CRT/MDI unit

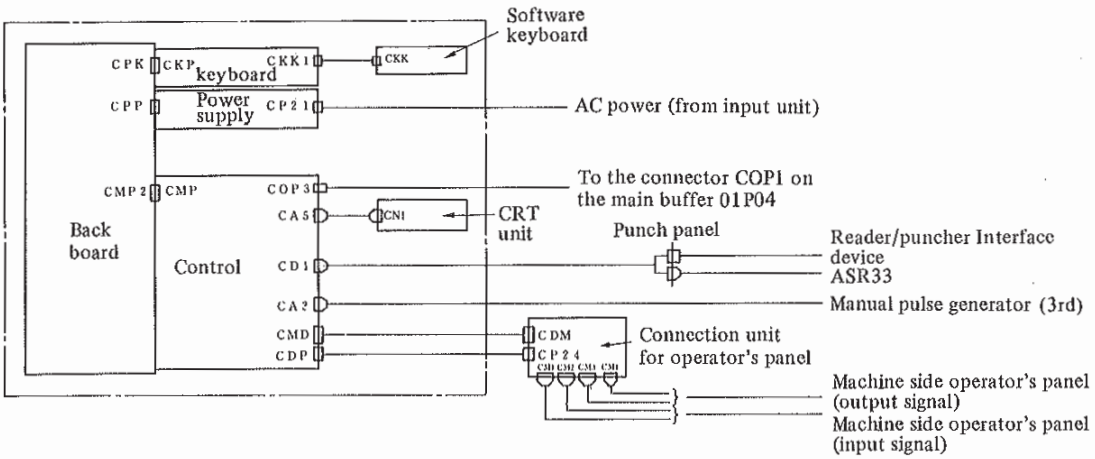


Fig. 1.2 (l)

14" CRT/MDI unit

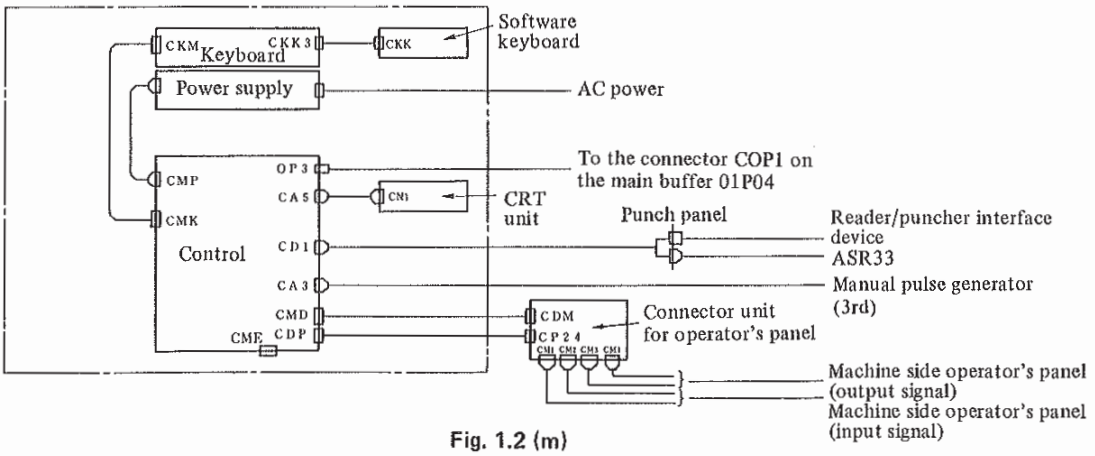
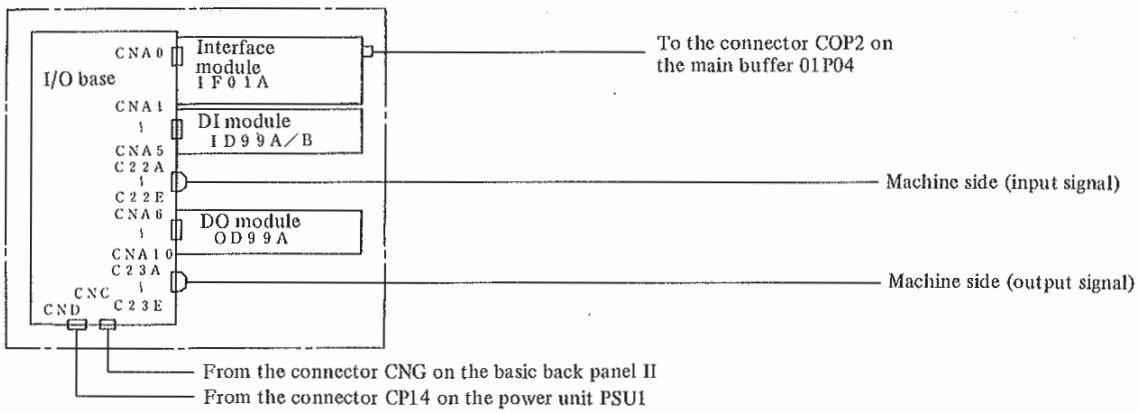


Fig. 1.2 (m)

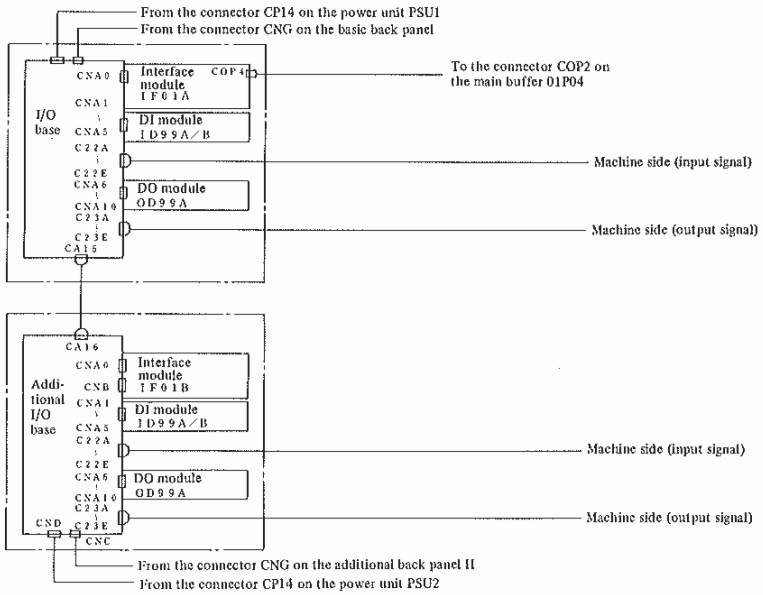
d) 12 series built-in type I/O unit



Built-in type I/O unit used in
Built-in type cabinet or free-standing type cabinet A

Fig. 1.2 (n)

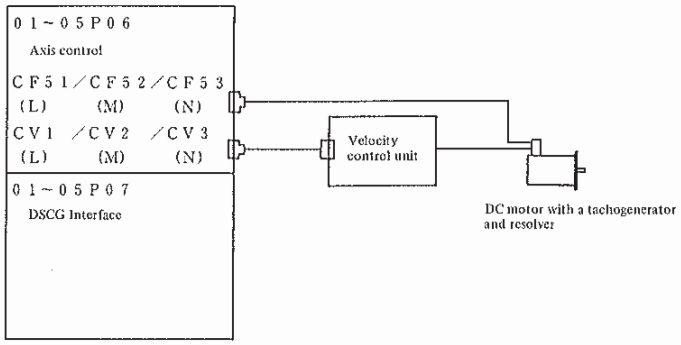
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Built-in type I/O unit used in free-standing type cabinet

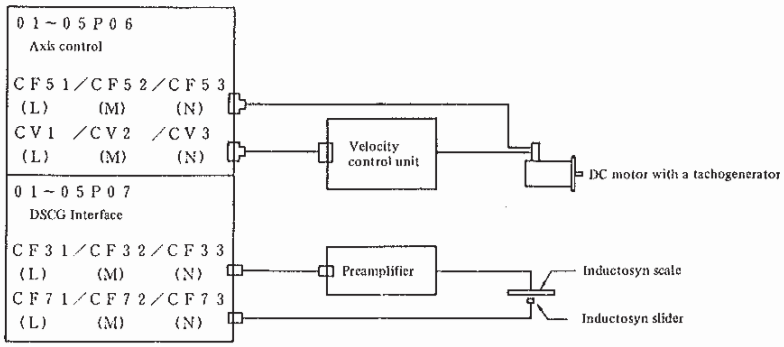
Fig. 1.2 (o)

e) 12 series connecting with servo system.
When an M series servo motor is used, the connecting differences caused by the type of position detector are as follows:
i) For resolver



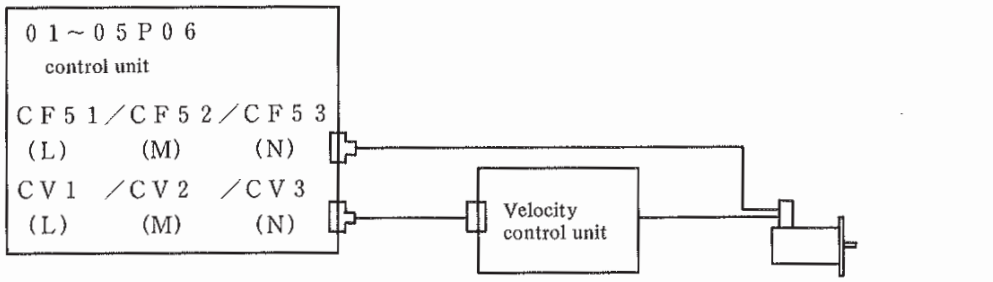
Note) L = 1st, 4, 7, 10, 13th axis
M = 2nd, 5, 8, 11, 14th axis
N = 3rd, 6, 9, 12, 15th axis

ii) For inductosyn

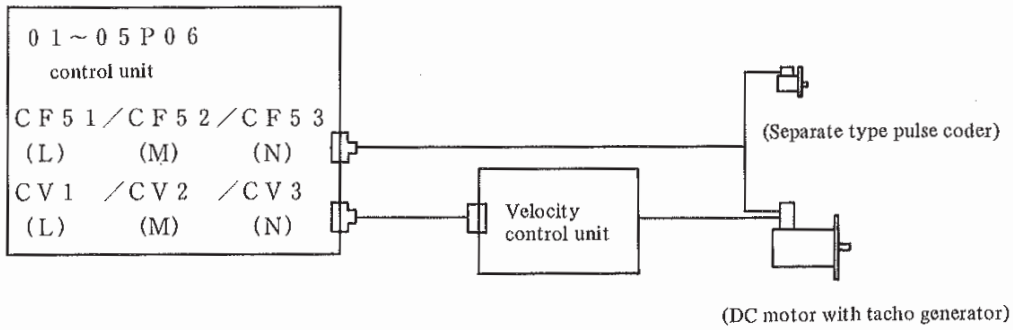


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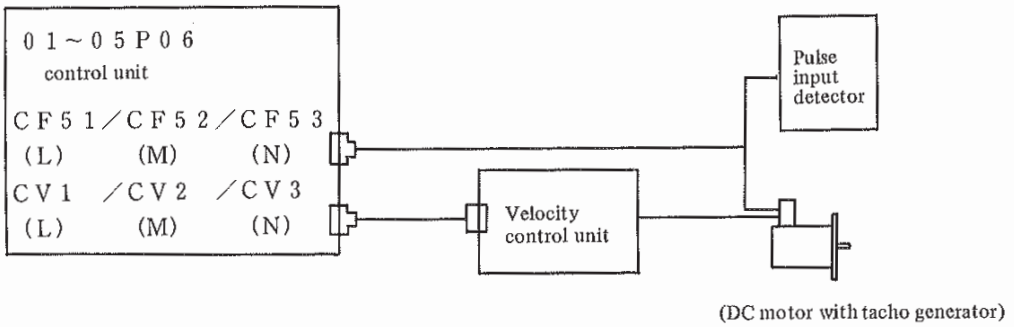
iii) For built-in type pulse coder



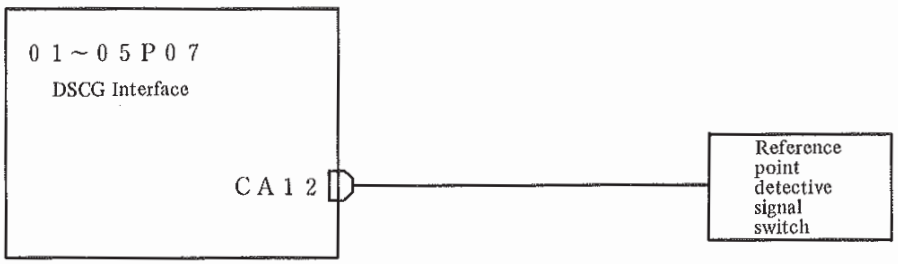
iv) For separate type pulse coder



v) For pulse input detector (optical scale, magne-scale)



vi) For reference point detective signal switch



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1.3 System Block Diagram

1.3.1 10/100 series

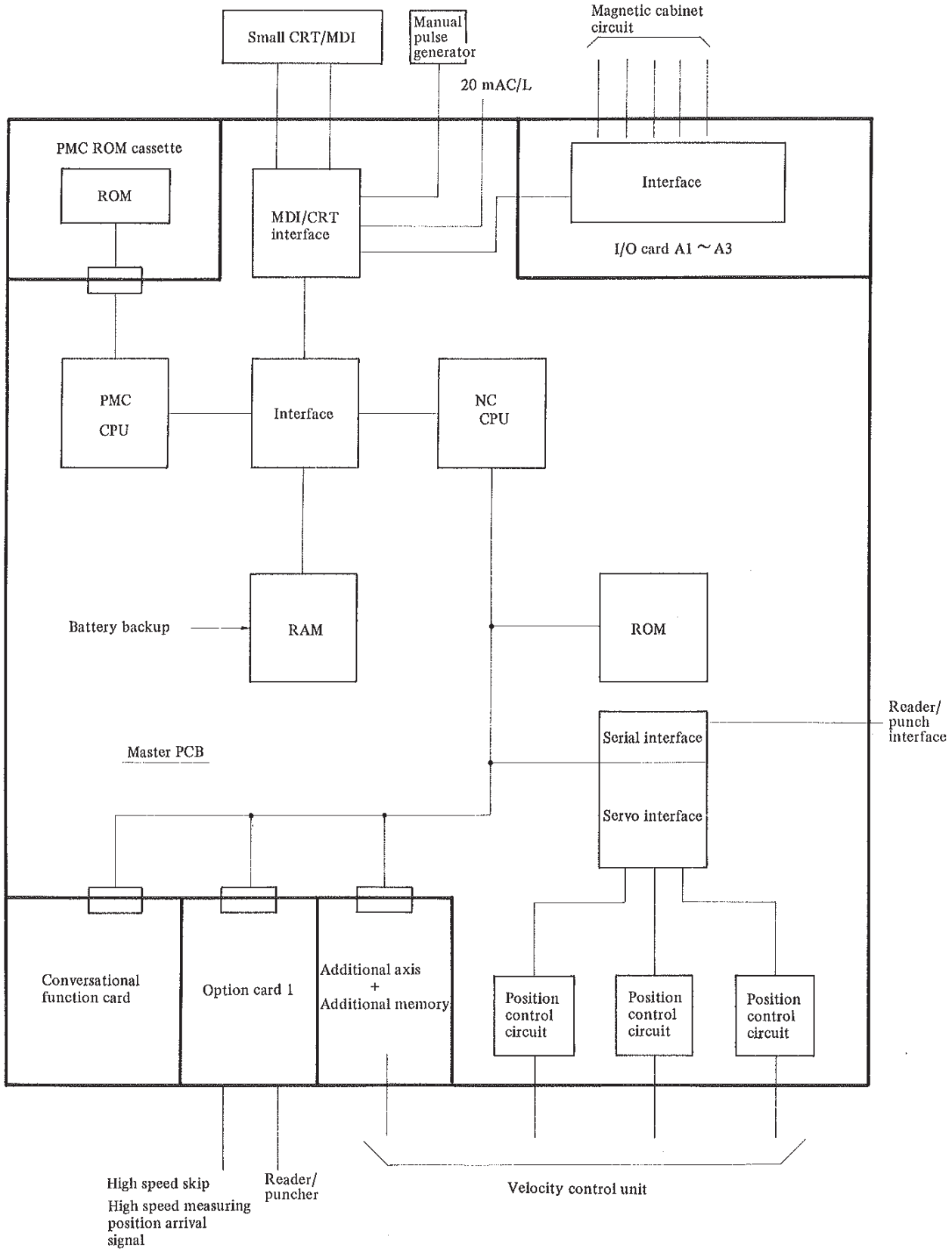


Fig. 1.3.1 (a) Analog servo 10 series system block diagram (when small CRT/MDI is used)

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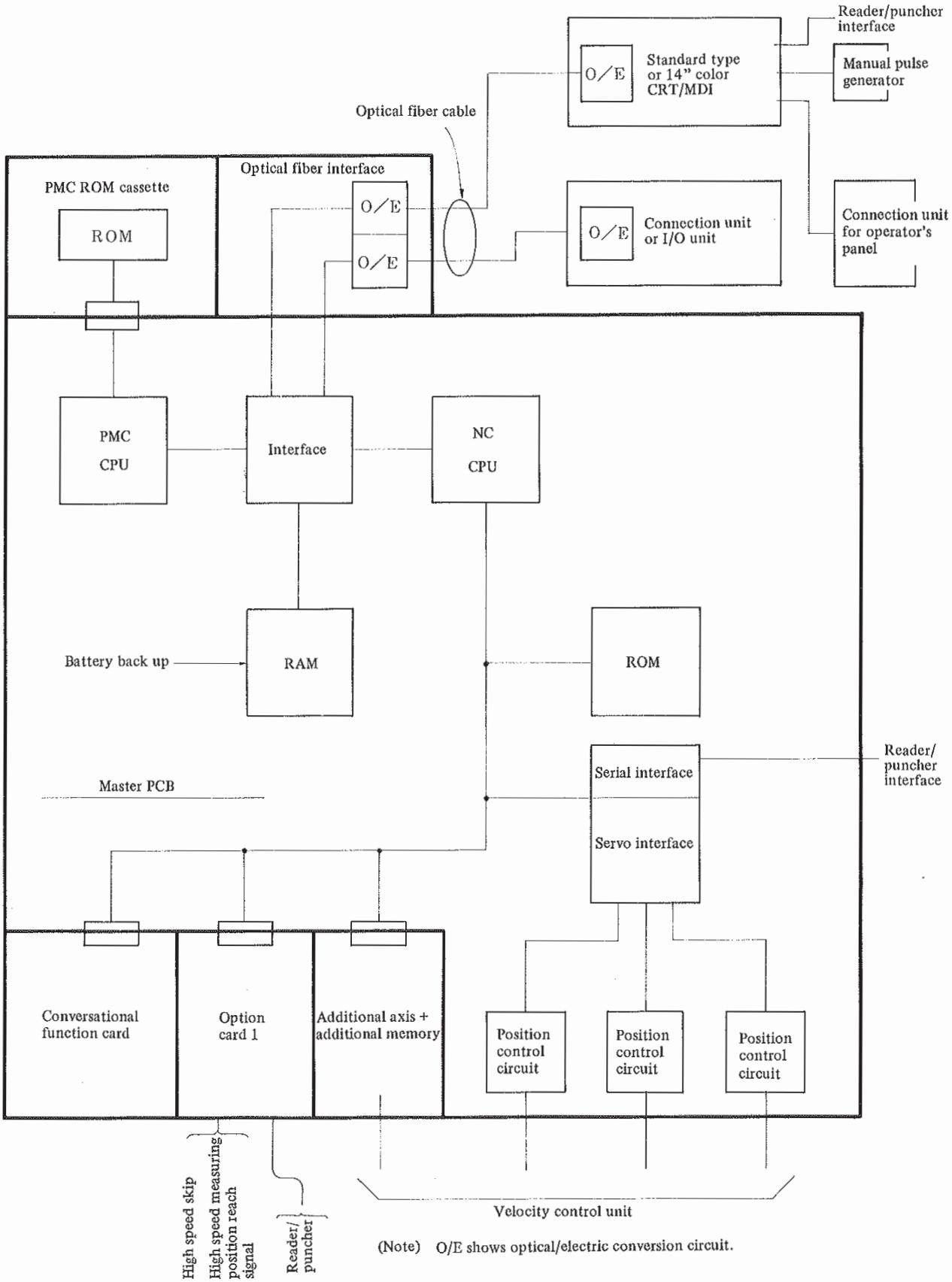


Fig. 1.3.1 (b) Analog servo 10 series system block diagram (when standard or 14" color CRT/MDI is used)

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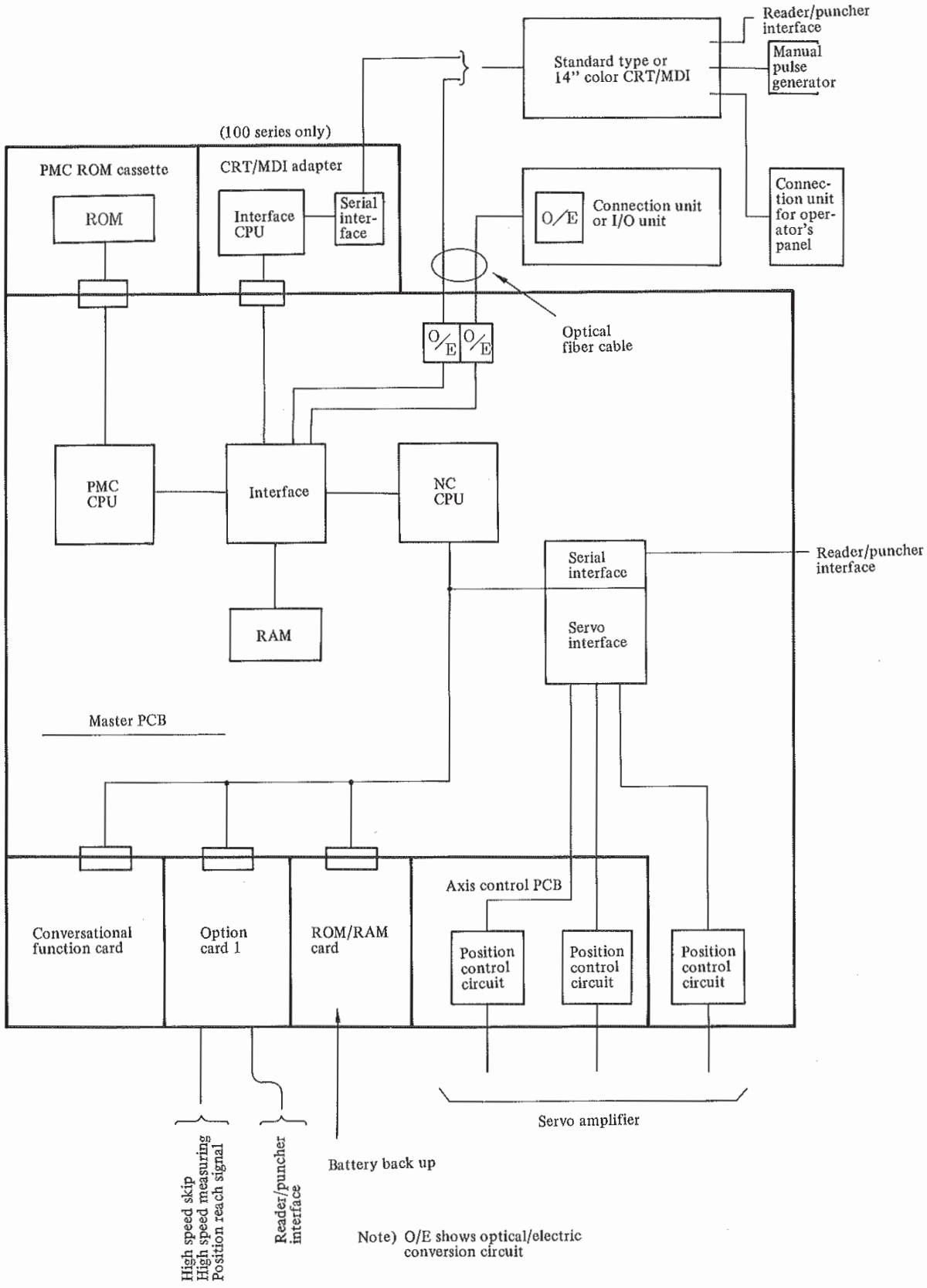
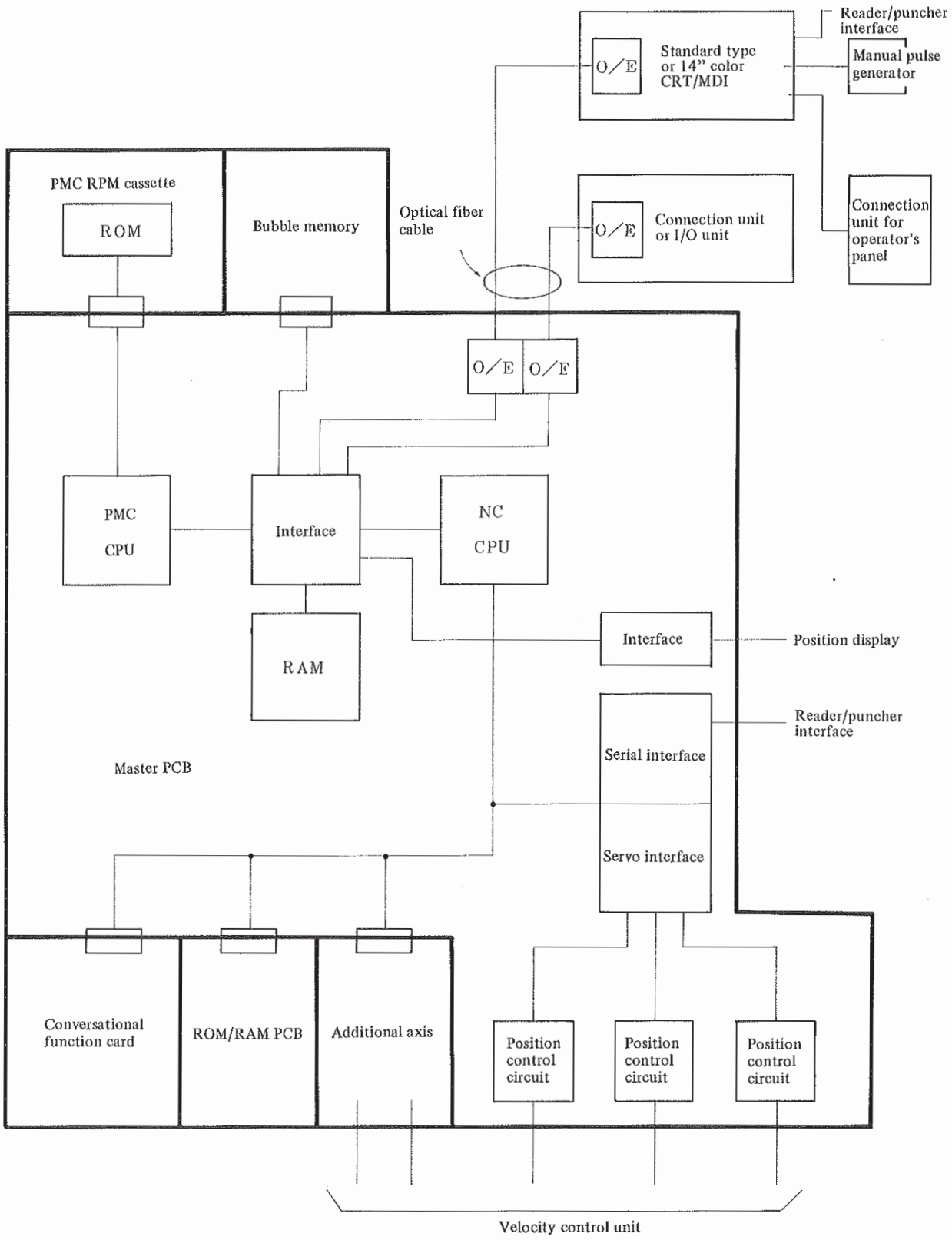


Fig. 1.3.1 (c) Digital servo 10/100 series system block diagram

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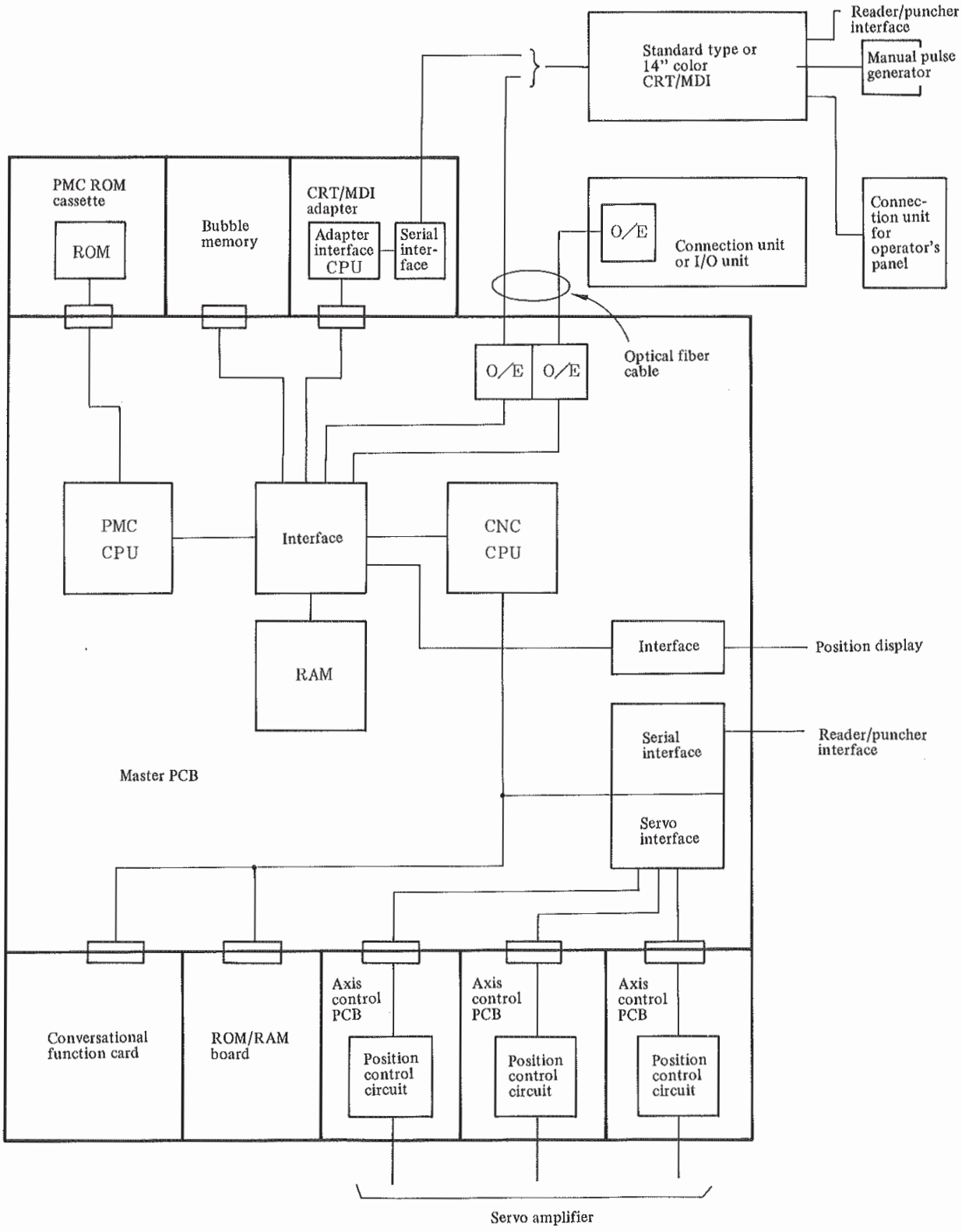
1.3.2 11/110 series



(Note) O/E shows optical/electric conversion circuit.

Fig. 1.3.2 (a) 11 series system block diagram

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Note) O/E shows optical/electric conversion circuit.

Fig. 1.3.2 (b) Digital servo 11/110 series system block diagram

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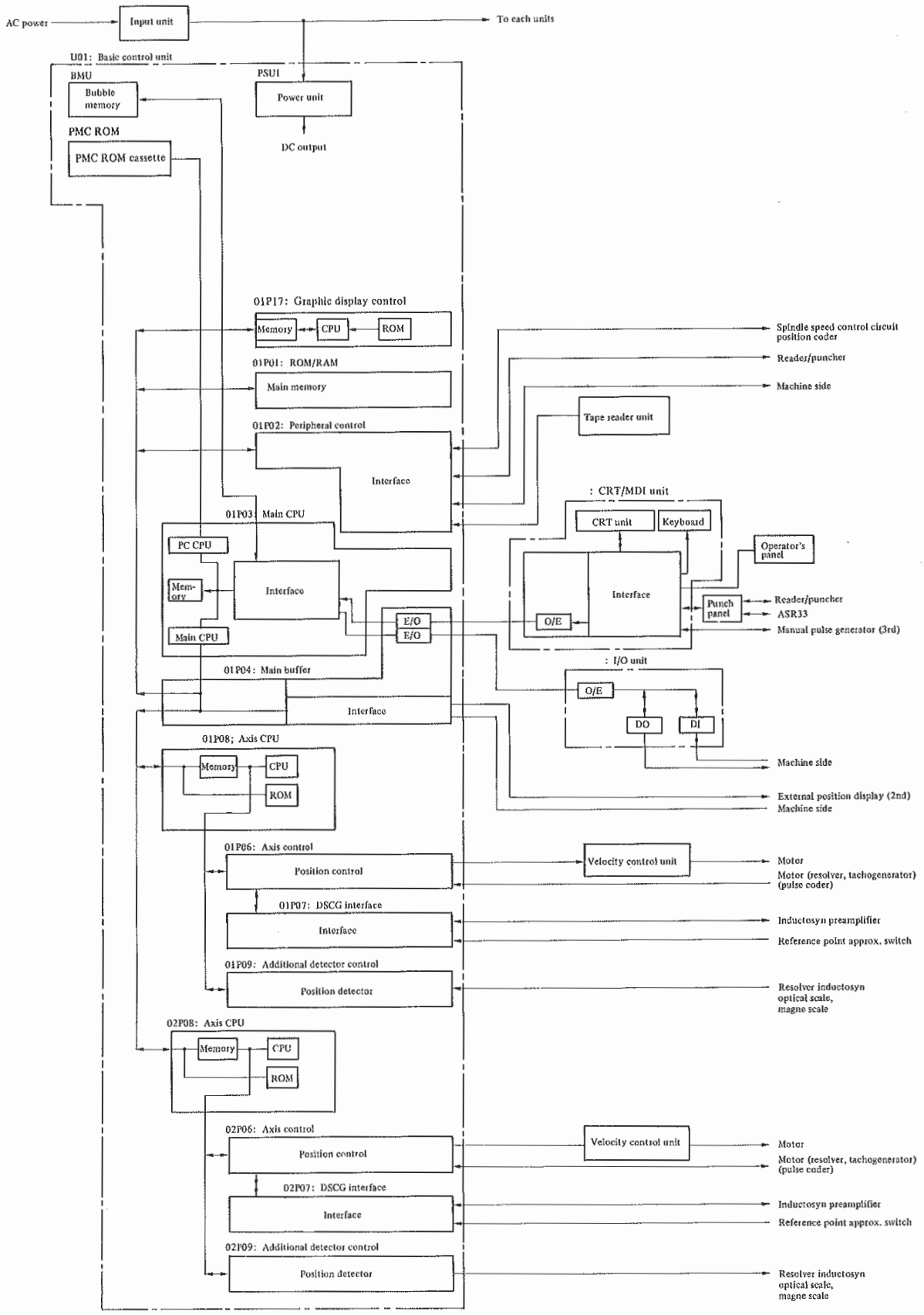


Fig. 1.3.3 (a) 12 series system block diagram

When using built-in type cabinet or free-standing type cabinet A (When 6 or less axes control, hybrid control, synchronous operation or double check system is performed)

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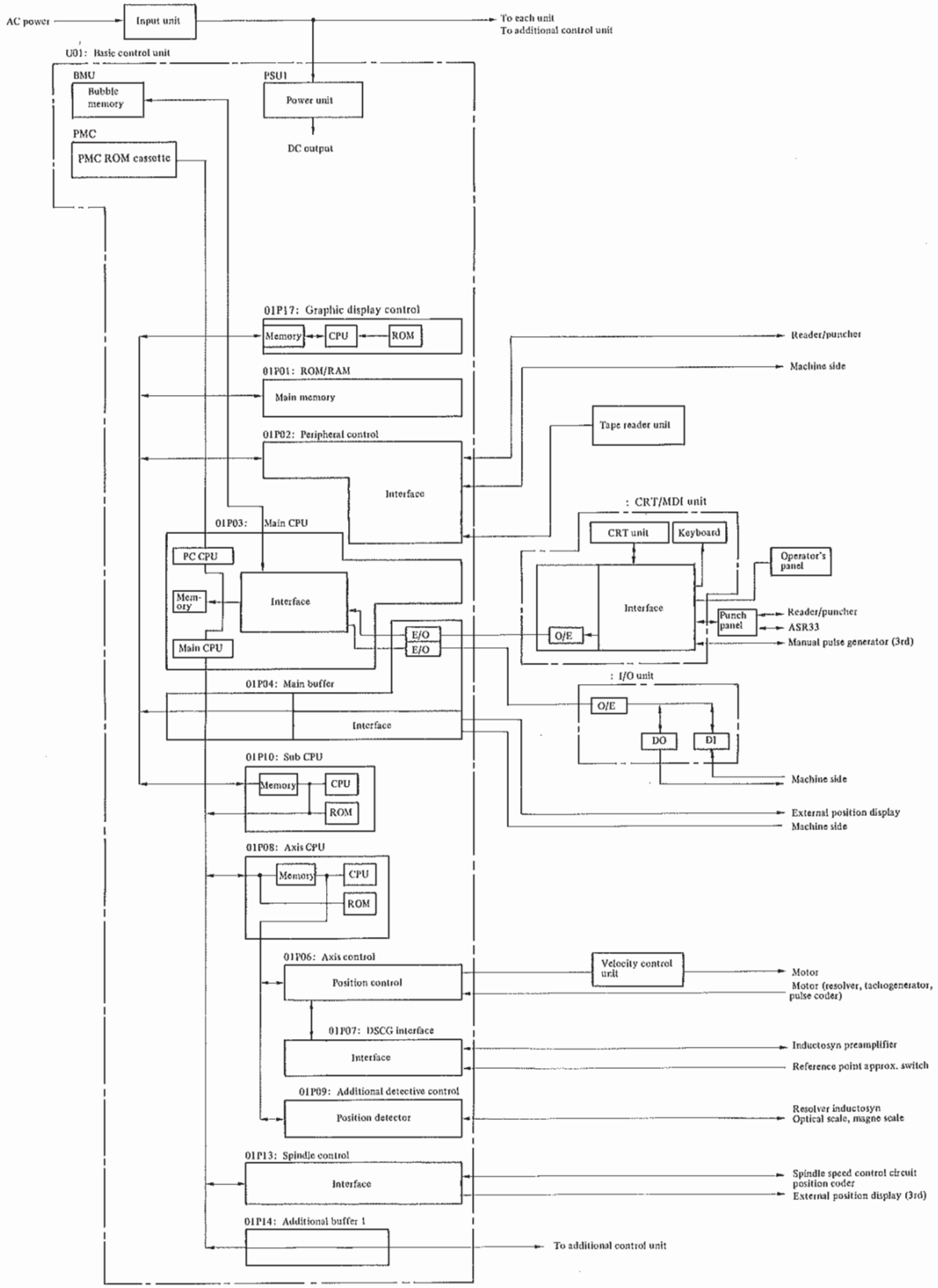


Fig. 1.3.3 (b) 12 series system block diagram

When using free-standing type cabinet B
(When more than 7 axes are controlled)

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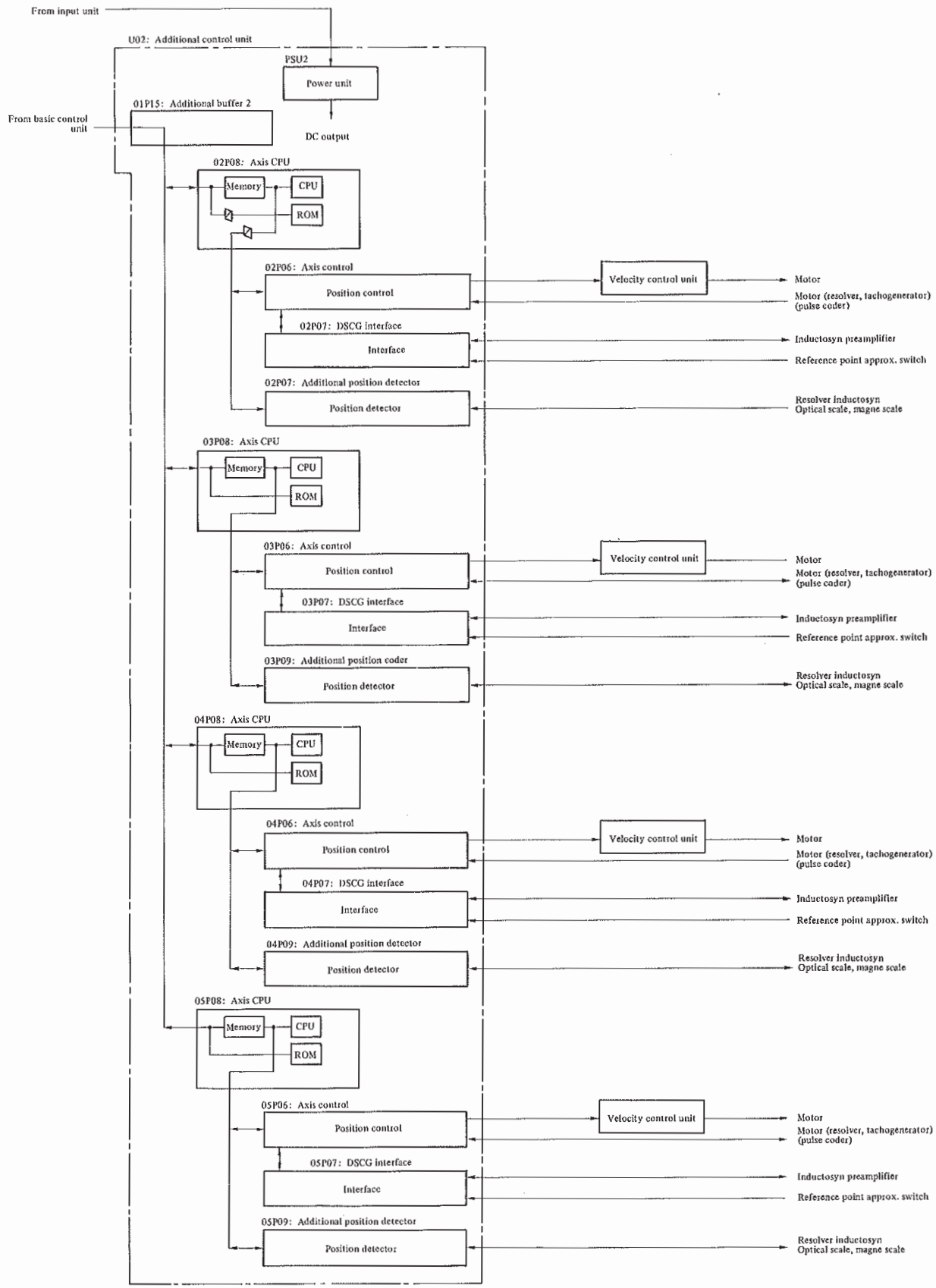
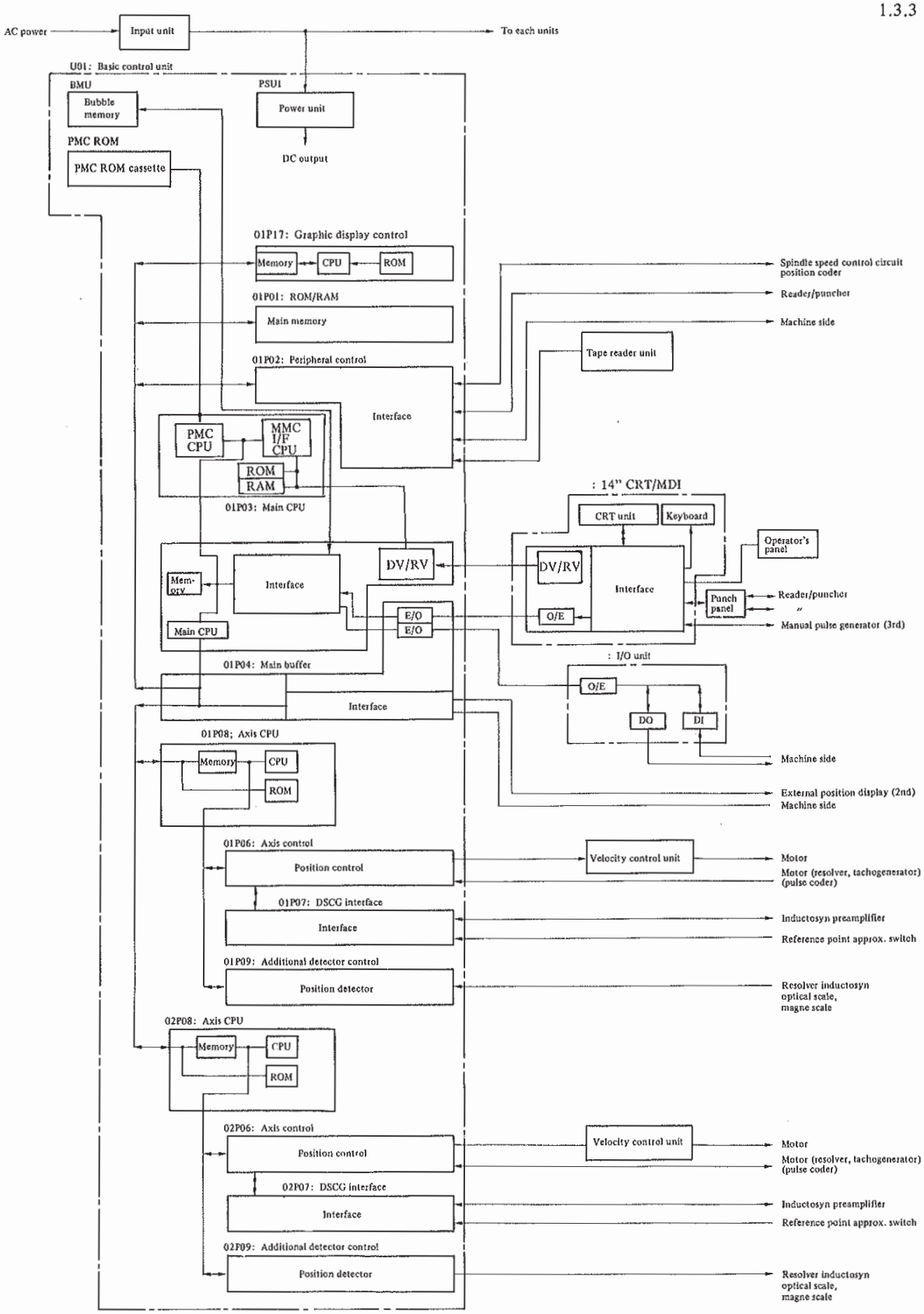


Fig. 1.3.3 (c) 12 series system block diagram

When using free-standing cabinet B
(When more than 7 axes are controlled)

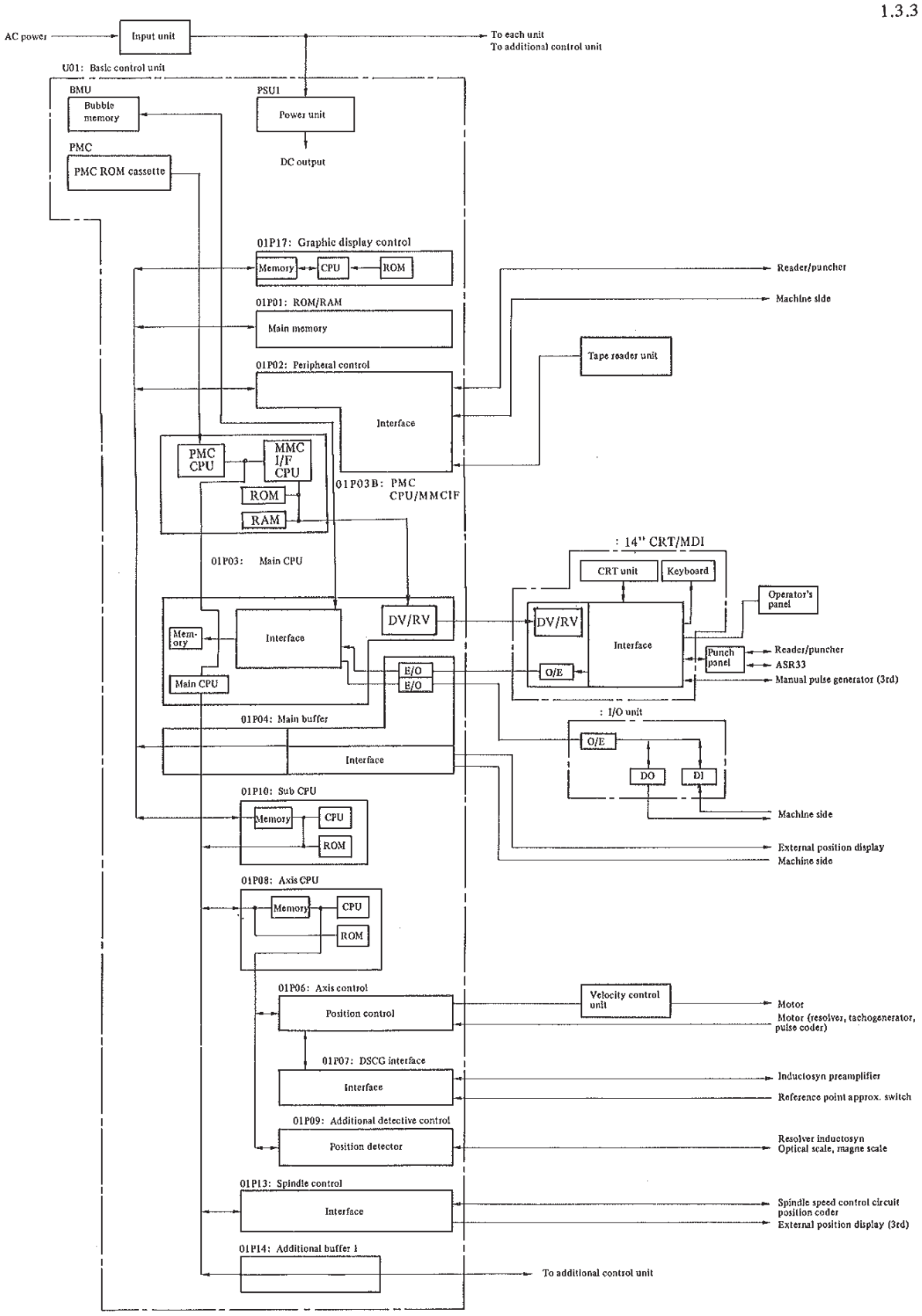
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When using built-in type cabinet or free-standing type cabinet A (6 axis or less control, hybrid control, synchronous operation or double check system is performed)

Fig. 1.3.3 (d) 120 series system block diagram

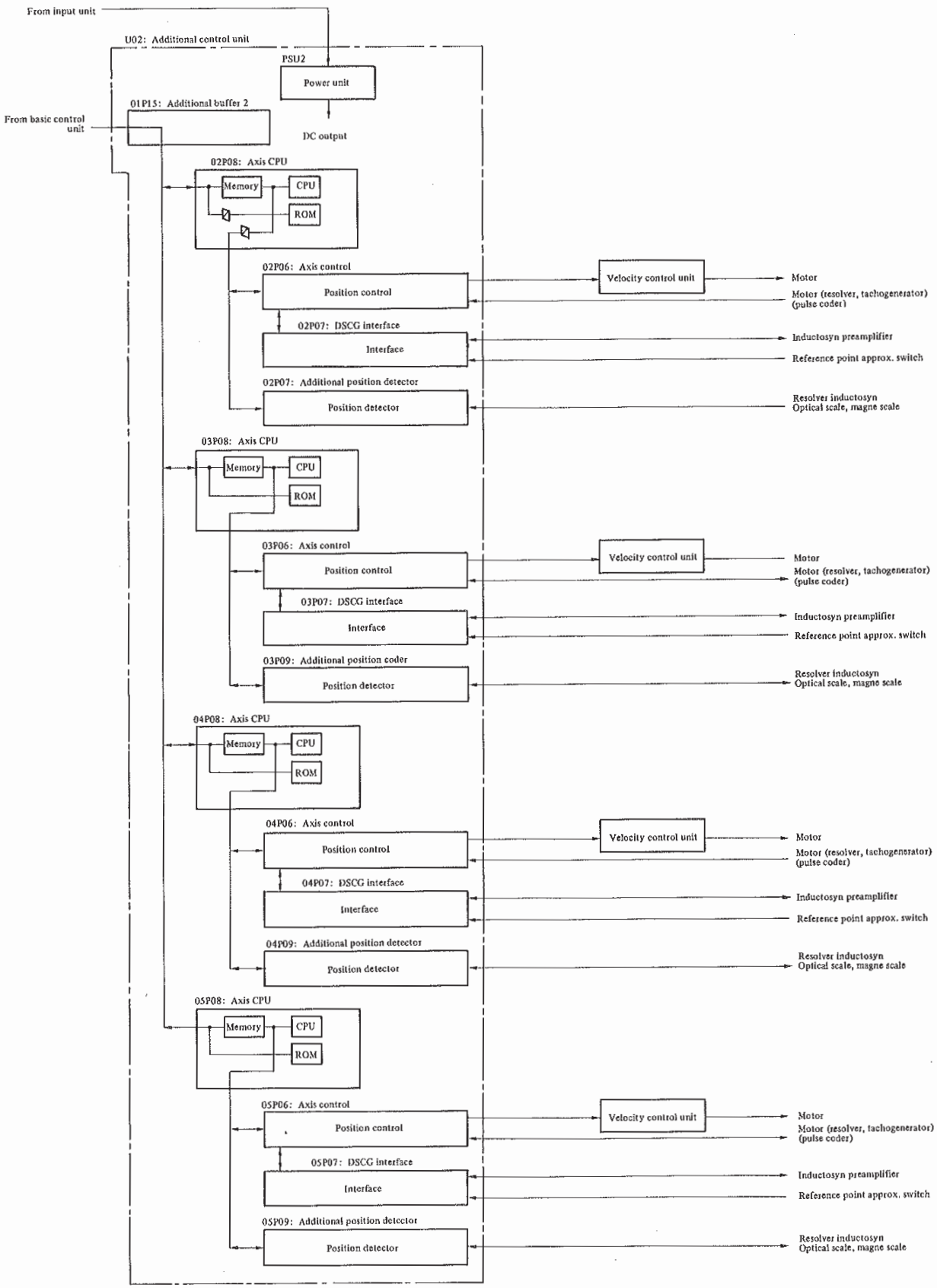
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When using free-standing type cabinet B
(When more than 9 axes are controlled)

Fig. 1.3.3 (e) 120 series system block diagram

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When using free-standing type cabinet B
(When more than 7 axes are controlled)

Fig. 1.3.3 (f) 120 series system block diagram

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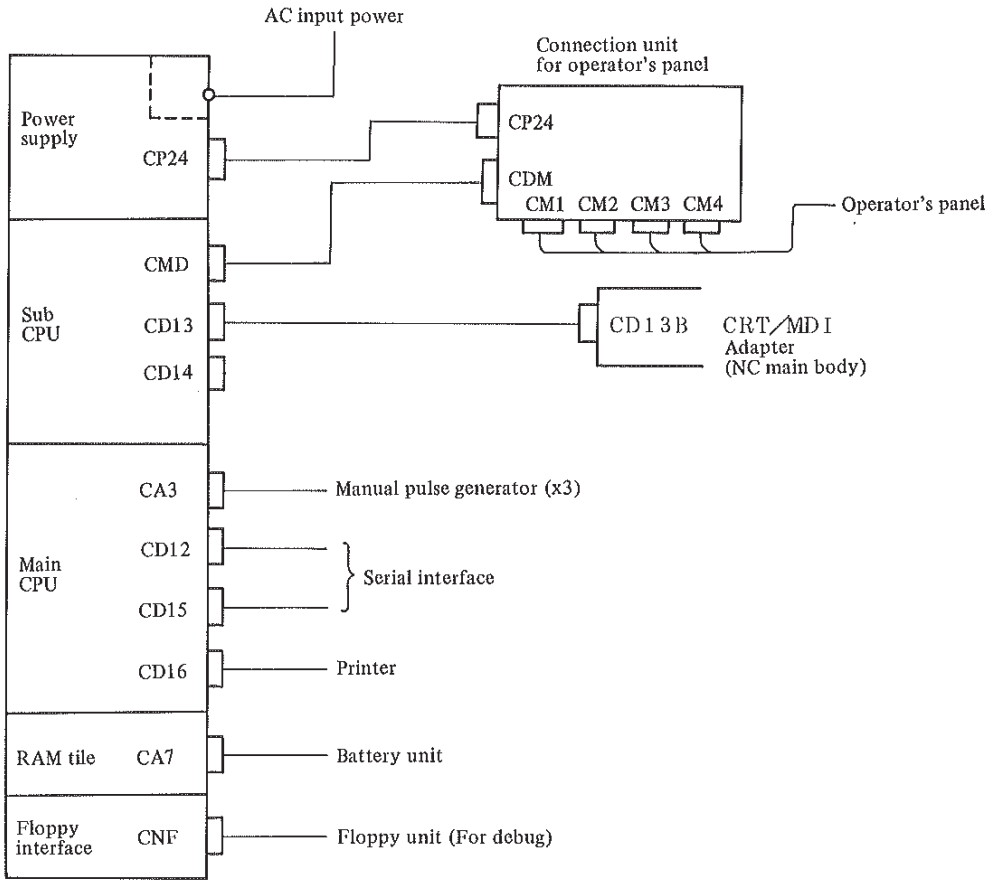


Fig. 1.3.3 (g) 14" CRT/MDI for 100/110/120 series

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1.4 PCB and Units Table

Table 1.4 (a) PCB & units for 10/100 series only

Name	Abbreviation	Specification	Remarks
Master PCB	MASTER	A16B-1010-0040	Analog servo
		A16B-1010-0190	Digital servo
I/O Card (10T/M)	DI/DO 1	A16B-1210-0320	DI/DO = 40/40
	DI/DO 2	A16B-1210-0321	DI/DO = 80/56
	DI/DO 3	A16B-1210-0322	DI/DO = 104/72
I/O Card (for 10TF)		A20B-1001-0240	DI/DO = 40/40
		A20B-1001-0241	DI/DO = 80/56
		A20B-1001-0242	DI/DO = 104/72
ROM/RAM board	ROM/RAM	A16B-1211-0290	Digital servo system only
Small type CRT/ MDI interface	CRT/MDI INT	A16B-1211-0250	Digital servo system only
Optical Interface	OPT. INTERFACE	A16B-1210-0360	Analog servo system only
Option 1	OPTION 1	A16B-1210-0350	
Additional Axis Card	AD. AXS (P)	A16B-1210-0431	
Additional Axis + Additional ROM/RAM	ADD. AXIS/MEM	A16B-1210-0380	Analog servo system only
Additional ROM/RAM	ADD. MEMORY	A16B-1210-0381	
CRT/MDI Switcher	CRT/MDI SWITCHER	A16B-1210-0370	
CRT/MDI Panel		A20B-1001-0090	T keyboard
		A20B-1001-0091	M keyboard
		A98L-0001-0111	Sheet switch
		A20B-1000-0842	Small CRT/MDI panel soft key
		A61L-0001-0079	Small, standard CRT/MDI panel common CRT unit A13B-0056-C001

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Name	Abbreviation	Specification	Remarks
CRT/MDI Panel (for 10TF)		A20B-1000-0850	Controller
		A20B-1001-0200	Keyboard
		A20B-1000-0890	Soft key
		A20B-1001-0160	Power supply
Power Supply PCB		A16B-1210-0510	
PCB for Input Unit		A16B-1600-0090	

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Table 1.4 (b) PCB & units for 11/110 series only

Name	Abbreviation	Specification	Remarks
Master PCB	MASTER	A16B-1010-0050	Analog servo system
		A16B-1010-0200	Digital servo system
ROM/RAM Board	ROM/RAM	A16B-1210-0470	Analog servo system
		A16B-1211-0291	Digital servo system
Additional Axis (PP)	AD.AXS(P,P)	A16B-1210-0430	Pulse coder x 2 Analog servo system only
Additional Axis (RP)	AD.AXS(R,P)	A16B-1210-0440	Resolver + Pulse coder Analog servo system only
Additional Axis (RR)	AD.AXS(R,R)	A16B-1210-0450	Resolver x 2 Analog servo system only
Resolver/Inductosyn Interface	RES/IND	A16B-1210-0460	Analog servo system only
Power Supply PCB		A16B-1210-0560	
PCB for Input Unit		A16B-1600-0080	
Tape Reader		A20B-0007-0750	Photoamplifier
Tape Reader 2		A20B-1001-0050	Controller
		A20B-1001-0060	Keyboard
CRT/MDI Panel (14" for 11TTF)		A20B-1000-0900	Controller
		A20B-1000-0990	
		A20B-1001-0200	Keyboard
		A20B-1000-0890	Soft key
		A20B-1001-0160	Power supply
		A20B-0001-0074	CRT unit

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Table 1.4 (c) PCB & units common to 10/11/100/110

Name	Abbreviation	Specification	Remarks
Axis control PCB	AXIS CONTROL	A16B-1211-0270	Digital servo 2 axes
		A16B-1211-0271	Digital servo 1 axis
Interface Converter	INT. CONVERTER	A20B-1000-0913	(except 11TT)
PMC Cassette A		A20B-1000-0910	4000 STEP
PMC Cassette B		A20B-1000-0920	16000 STEP
PMC RAM Board	PMC RAM 1	A16B-1210-0340	For PMC-I
Standard CRT/MDI Panel (9") (10/11 series only)		A20B-1000-0800	Controller
		A20B-1000-0970	Backboard
		A20B-1001-0160	Power supply
		A61L-0001-0079	CRT unit A13B-0056-C001
		A20B-1000-0830	M keyboard
		A20B-1000-0831	T keyboard
		A86L-0061-0110	Sheet switch
		A20B-1000-0840	Horizontal soft key
		A20B-1000-0841	Vertical soft key
CRT/MDI Panel (14") (10/11 series only)		A20B-1000-0850	Controller
		A20B-1000-0870	Horizontal keyboard M
		A20B-1000-0871	Horizontal keyboard T
		A20B-1000-0880	Vertical keyboard M
		A20B-1000-0881	Vertical keyboard T
		A20B-1000-0890	Horizontal soft key
		A20B-1000-0891	Vertical soft key
		A20B-1001-0160	Power supply
		A61L-0001-0074	CRT unit

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Name	Abbreviation	Specification	Remarks
Connection Unit for Operator's Unit		A16B-1210-0480	DI/DO = 96/64
		A16B-1210-0481	DI/DO = 64/32
Connection Unit 1		A20B-1000-0940	
Connection Unit 2		A20B-1000-0950	
Tape Reader 1		A20B-0007-0750	Photoamplifier
		A20B-0008-0280	Serial interface
		A20B-1000-0472	Power supply A14B-0075-B120
PPR		A20B-1000-0200	I/O controller
		A20B-1000-0190	Power supply for 100 V AC
		A20B-1000-0191	Power supply for 200 V AC
		A13B-0117-C001	Switch unit
Conversational function card (for 10TF and 11TTF) (for 11M graphic)	ACP	A16B-1210-0410	SDB CPO
		A16B-1310-0300	MEMORY (10TF, 11TTF only)
		A16B-1310-0301	MEMORY (11MF)
		A16B-1310-0310	MEMORY (11MF)
		A16B-1310-0480	MEMORY (10TF,11TTF)

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Table 1.4 (d) PCB & units list for 12 series

Module name		PCB specification	Name & function	Cabinet type (Note 1)	Group (Note 2)
U01 (12 series)		A02B-0075-C001	Basic control unit . Control PCB is mounted (Consisting of 2 kinds of the back panel PCB A16B-1010-0010 (12 series) A16B-1010-0230 (120 series) A20B-1001-0100 (12/120 series)	Bu, A, B	B
U05 (120 series)		A02B-0075-C012			
PCB mounted in basic control unit U01 or U05	01P01	A16B-1210-0012	ROM/RAM	Bu, A, B	B.O.
		A16B-1211-0600			
	01P02	A16B-1210-0080	Peripheral control . Spindle speed analog output . Position coder interface . Reader/puncher interface . High speed DI/DO . Tape reader interface	Bu, A, B	B
	01P03	A16B-1210-0060 (12 series only)	Main CPU . Main CPU . PMC CPU . Shared RAM		
	01P03A	A16B-1211-0540 (120 series only)	Main CPU-1 . Main CPU . Shared RAM . Interface for 14" CRT/MDI		
	01P03B	A16B-1211-0550 (120 series only)	Main CPU-2 . Main CPU . PMC CPU . Interface for 14" CRT/MDI		
	01P04	A16B-1210-0070	Main buffer . Main buffer . Buffer of main bus and peripheral bus . Buffer of main bus and global bus . Position display control (for 1st or 2nd) . Analog input interface		

Note 1) The cabinet type is abbreviated as follows:
- Bu : Built-in type cabinet
- A : Free-standing type A cabinet
- B : Free-standing type B cabinet

Note 2) The abbreviations are as follows:
- B : Basic
- B.O.: Basic option
- O : Option

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Module name		PCB specification	Name & function	Cabinet type	Group
PCB mounted in basic control unit U01 or U05	01P05	A16B-1210-0090	Adapter . Buffer of global bus and axis bus	Bu, A	B.O.
	01P06 ⟨ 02P06	A16B-1210-0030	Axis control . Position control 3 axes (pulse coder, pulse input detector, and resolver inductosyn are available as detectors. Resolver inductosyn requires DSCG interface)	Bu, A, B	B.O.
	01P07 ⟨ 02P07	A16B-1210-0110	DSCG interface . Resolver, inductosyn interface	Bu, A, B	O
	01P08 ⟨ 02P08	A16B-1210-0020	Axis CPU . CPU memory for axis control . 1 pce of this PCB can control 3 axes (The hybrid servo control, double check system, and synchronous operation are possible)	Bu, A, B	B.O.
	01P09 ⟨ 02P09	A16B-1210-0180	Additional detector control (DSCG) . Additional detective control in the hybrid servo control and double check system . Resolver inductosyn is available as a position detector	Bu, A, B	O
		A16B-1210-0170	Additional detector control (pulse input type) . Additional detective control in the hybrid servo control and double check system . Pulse coder and pulse input type detector is available as a detector		

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Module name		PCB specification	Name & function	Cabinet type	Group
PCB mounted in basic control unit U01 or U05	01P10	A16B-1210-0100	Sub CPU . CPU memory for sequence control when more than 7 axes are controlled	B	0
	01P13	A16B-1210-0160	Spindle (Used in the system where sub-CPU is used) . Spindle analog output . Position coder interface . Position display control (for 3rd)		
	01P14	A16B-1210-0250	Additional buffer 1 . Buffer to expand the global bus to the additional control unit	B	B
	01P16				
	01P17				
	PMC ROM	A20B-1000-0910	PMC ROM cassette . ROM for PMC 64 kB	Bu, A, B,	B.O.
		A20B-1000-0920	PMC ROM cassette . ROM for PMC 128 kB		
		A20B-1000-0913	Interface converter . ROM for PMC 16 kB		
	BMU	A87L-0001-0017	Bubble memory . Memorize parameter . Part program memory & edit (60 m)	Bu, A, B.	B.O.
		A87L-0001-0084	Bubble memory . Memorize parameter . Part program memory & edit (320 m)		
		A87L-0001-0085	Bubble memory . Memorize parameter . Part program memory & edit (640 m)		
		A87L-0001-0086	Bubble memory . Memorize parameter . Part program memory & edit (1280 m)		
		A87L-0001-0100 #8M	Bubble memory . Memorize parameter . Part program memory & edit (2560 m)		

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Module name		PCB specification	Name & function	Cabinet type	Group
PCB mounted in basic control unit U01 or U05	BMU	A87L-0001-0100 #12M	Bubble memory . Memorize parameter . Part program memory & edit (3840 m)		
		A87L-0001-0100 #16M	Bubble memory . Memorize parameter . Part program memory & edit (5120 m)		
	PSU1	A20B-1000-0770	Power unit . Supply the DC voltage to basic control unit	Bu, A, B	B
	U02	A02B-0075-C002	Additional control unit . PCB is mounted for 4th or subsequent axis position control when more than 7 axes are controlled. (Consisting of 2 kinds of back panel PCBs A16B-1010-0020 A20B-1001-0180)	B	B
PCB mounted in additional control unit U02	02P06 ⟨ 05P06	A16B-1210-0030	Axis control	B	B.O.
	02P07 ⟨ 05P07	A16B-1210-0110	DSCG interface	B	O
	02P08 ⟨ 05P08	A16B-1210-0020	Axis CPU	B	B.O.
	02P09 ⟨ 05P09	A16B-1210-0180	Additional detector control (DSCG)	B	O
		A16B-1210-0170	Additional detector control (pulse input type detector)		
	01P15	A16B-1210-0260	Additional buffer 2 . Buffer to receive the global bus from basic control unit	B	B
	PSU2	A20B-1000-0770	Power unit . Supply DC voltage to additional control unit	B	B

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Module name		PCB specification	Name & function	Cabinet type	Group
		A03B-0801-C001	Built-in type I/O unit . I/O PCB is mounted Max. for input ... 5 pcs Max. for output .. 5 pcs	Bu, A, B	B.O.
PCB mounted in built-in type I/O unit	IF01A	A16B-1310-0020	Interface module . Interface between basic control unit and built-in type I/O unit		
	ID99A	A20B-1000-0750	Input module . Low speed input 48 points . Used as a receiver of contact signal		
	ID99B	A20B-1000-0751	Input module . High speed input 48 points . Used as a receiver of photo coupler, etc.		
	OD99A	A20B-1000-0760	Output module . Contactless output 32 points		
		A03B-0801-C001	Built-in type additional I/O unit . I/O PCB is mounted Max. for input ... 5 pcs Max. for output .. 5 pcs	B	O
PCB mounted in built-in type addi-tional I/O unit	IF01B	A16B-1210-0030	Interface module . Interface between built-in type I/O unit and built-in additional I/O unit		
	ID99A	A20B-1000-0750	Input module		
	ID99B	A20B-1000-0751	Input module		
	OD99A	A20B-1000-0760	Output module		

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Module name	PCB specification	Name & function	Cabinet type	Group
	A14B-0076-B201	Input unit . Power ON/OFF control circuit, power magnetic contactor and fuses are mounted	Bu	B
	A14B-0076-B206	Input unit (When a velocity control unit is not installed in the free-standing type A cabinet)	A	B.O.
	A14B-0076-B207	Input unit (When a velocity control unit is installed in the free-standing type A cabinet, and when servo transformer total capacity is 5 kVA or less)		
	A14B-0076-B208	Input unit (When a velocity control unit is installed in the free-standing type A cabinet, and when servo transformer total capacity is 5 kVA or more)		
	A14B-0076-B205	Input unit	B	B
	A16B-1600-0080	Input unit PCB (Commonly used in the input unit for built-in type cabinet, and free-standing cabinet type A and B)		
	A20B-1001-0210	Input unit PCB (Used in the input unit for free-standing type B cabinet)		
	A02B-0075-C003	Punch panel . Connection to ASR33 . Connection to reader/ puncher interface device	Bu, A, B	O

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Name		Specification	Remarks	Cabinet type	Group
CRT/MDI unit (12 series only)		A02B-0076-C022	9" horizontal type for 12T	Bu, A, B	B.O.
		A02B-0076-C025	9" horizontal type for 12M		
		A02B-0076-C042	9" vertical type for 12T	External type	
		A02B-0076-C062	14" horizontal type for 12T (color)		
		A02B-0076-C063	14" horizontal type for 12M (color)		
		A02B-0076-C082	14" vertical type for 12T (color)		
9" CRT/ MDI unit compo-nent	Control PCB	A20B-1000-0800			
	Back board	A20B-1000-0970			
	Power	A20B-1001-0160			
	CRT unit	A13B-0056-C001			
	Key board PCB	A20B-1000-0831	For 12T		
		A20B-1000-0832	For 12M		
	Soft key PCB	A20B-1000-0840	For horizontal type		
		A20B-1000-0841	For vertical type		

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Name		Specification	Remarks	Cabinet type	Group
14" CRT/ MDI unit compo- nent	Control PCB	A20B-1000-0850			
	Power	A20B-1001-0160			
	CRT unit	A61L-0001-0074			
	Keyboard PCB	A20B-1000-0871	Horizontal type for 12T		
		A20B-1000-0872	Horizontal type for 12M		
		A20B-1000-0881	Vertical type for 12T		
	Soft key PCB	A20B-1000-0890	Horizontal type		
		A20B-1000-0891	Vertical type		
Connection unit for operator panel		A16B-1210-0480	DI 96 points, DO 64 points	Exter- nal type	0
		A16B-1210-0481	DI 64 points, DO 32 points		
Tape reader		A13B-0070-B001	Without reels	Bu, A, B	B.O.
		A13B-0080-B001	With reels		
Tape reader compo- nent	Photo amplifier	A20B-0007-0750	Without reels		
	Control PCB	A20B-1001-0050	With reels		
	Keyboard	A20B-1001-0060	With reels		

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Table 1.4 (e) 14" CRT/MDI for 100/110/120 series

Name		Specification	Remarks
14"CRT/MDI unit		A02B-0087-C200	
14" CRT/MDI unit compo-nent	Main CPU	A20B-1001-0830	
	Sub CPU	A20B-1001-0840	
	ROM file (512KB)	A20B-1001-0860	
	ROM file (1 MB)	A20B-1001-0870	
	RAM file (128KB)	A20B-1001-0880	
	RAM file (256KB)	A20B-1001-0881	
	RAM file (512KB)	A20B-1001-0882	
	Bubble memory (512KB)	A20B-1001-0911	
	Bubble memory (1MB)	A20B-1001-0910	
	Floppy interface	A20B-1001-0901	For debug.
	Power supply	A20B-1001-0930	
	Back panel	A20B-1001-0920	
	Key board	A86L-0001-0130	
Floppy unit terminal board		A20B-1002-0060	
ROM file adapter		A20B-1002-0110	For ROM file and PMC writer

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Table 1.4 (f) PCB & unit for I/O unit (common to 10/11/12/100/110/120 series)

Name		Specification	Remarks		
I/O base unit	BU10A	A03B-0801-C009	I/O unit back panel (for 10 pcs)		
	BU08A	A03B-0801-C004	I/O unit back panel (for 8 pcs)		
	BU06A	A03B-0801-C006	I/O unit back panel (for 6 pcs)		
	BU04A	A03B-0801-C007	I/O unit back panel (for 4 pcs)		
Power module	POW	A16B-1310-0010	Common to main unit and I/O unit 200 VAC input		
I/O interface module	IF01A	A03B-0801-C101	Optical signal → I/O bus, electric signal → I/O bus		
	IF01B	A03B-0801-C102	I/O bus extension		
	IF04C	A03B-0801-C103	Optical signal extension		
Output module	OD64A	A03B-0801-C141	DO=64	24∿48VDC/ 0.125A	Connection via connectors
	OD32A	A03B-0801-C140	DO=32		
	OD64B	A03B-0801-C113	DO=64	24∿48VDC/ 0.25A	
	OD32B	A03B-0801-C112	DO=32		
	OD16B	A03B-0801-C111	DO=16	24∿48VDC/ 0.5A	Connection via terminals
	OD08B	A03B-0801-C110	DO= 8		
	OD16C	A03B-0801-C115	DO=16	24∿48VDC/ 2A	
	OD08C	A03B-0801-C114	DO= 8		
	OA16D	A03B-0801-C117	DO=16	120VAC/1.6A	
	OA08D	A03B-0801-C116	DO= 8		
	OA16E	A03B-0801-C119	DO=16	240VAC/1.6A	
	OA08E	A03B-0801-C118	DO= 8		
Input module	ID64A	A03B-0801-C133	DI=64	24VDC/20mS non insula- tion	Connection via connectors
	ID32A	A03B-0801-C132	DI=32		
	ID16A	A03B-0801-C131	DI=16		Connection via terminals
	ID08A	A03B-0801-C130	DI= 8		

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Name		Specification	Remarks		
Input module (cont'd)	ID64B	A03B-0801-C137	DI=64	24VDC/2mS non insulation	Connection via connectors
	ID32B	A03B-0801-C136	DI=32		
	ID16B	A03B-0801-C135	DI=16		Connection via terminals
	ID08B	A03B-0801-C134	DI= 8		
	ID64C	A03B-0801-C123	DI=64	24VDC/20mS insulation	Connection via connectors
	ID32C	A03B-0801-C122	DI=32		
	ID16C	A03B-0801-C121	DI=16		Connection via terminals
	ID08C	A03B-0801-C120	DI= 8		
	ID64D	A03B-0801-C127	DI=64	24VDC/2mS insulation	Connection via connectors
	ID32D	A03B-0801-C126	DI=32		
	ID16D	A03B-0801-C125	DI=16		Connection via terminals
	ID08D	A03B-0801-C124	DI= 8		
	IA16E	A03B-0801-C129	DI=16	120VAC/30ms insulation	Connection via terminals
	IA08E	A03B-0801-C128	DI= 8		
Positioning module (software is necessary)	PT01A	A03B-0801-C051			
Positioning module control		A03B-0801-J501 #775	Software for positioning module		
Analog input module	AD04A	A03B-0801-C052	Analog input = 4		
Analog output module	DA03A	A03B-0801-C055	Analog output = 3		
	DA02A	A03B-0801-C053	Analog output = 2		
Pulse counter module	CT01A	A03B-0801-C054	Pulse input = 1		
PCB for power input unit		A16B-1600-0090	200VAC input		
PCB for additional power input unit		A20B-1001-0210	200VAC input		

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2. PERIODIC MAINTENANCE AND MAINTENANCE EQUIPMENT

10/11/12/100/110/120 series is designed for ease of maintenance, such as reduction of regular check points, easy adjustment, etc. It is also important that the user make the departments concerned fully aware of the concept of preventive maintenance in order to keep the NC machine tool in good condition. Preventive maintenance includes the following:

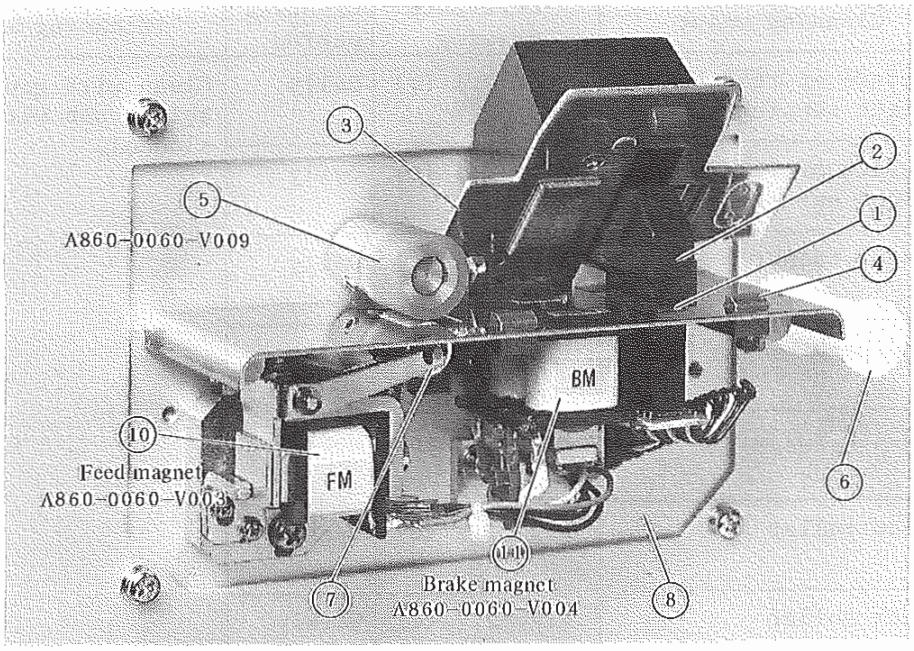
. Routine check and adjustment.
. Arrangement of maintenance tools.
. Main spare parts.

2.1 Periodic Maintenance

(1) Tape reader cleaning
    (a) Tape reader without reels

Item	Cleaning point	Reference drawing	Cleaning period	Cleaning method
1	Surface of read head (light sensing part)	Fig. 2.1 (a) ①	Daily	Cleaning with gauze or thin brush with pure alcohol.
2	Surface of read head (light emitting part)	Fig. 2.1 (a) ②	Daily	
3	Tape retainer	Fig. 2.1 (a) ③	Daily	
4	Tape path	Fig. 2.1 (a) ④	Daily	
5	Capstan roller	Fig. 2.1 (a) ⑤	Weekly	
6	Guide roller	Fig. 2.1 (a) ⑥	Weekly	
7	Pinch roller	Fig. 2.1 (a) ⑦	Weekly	
8	Assembly under tape path plate	Fig. 2.1 (a) ⑧	Monthly	Clean with cloth or a brush.
9	Inside tape reader cover	Fig. 2.1 (b) ⑨	Monthly	

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(A13B-0070-B001)

Fig. 2.1 (a) Tape reader without reels front view (with cover removed)

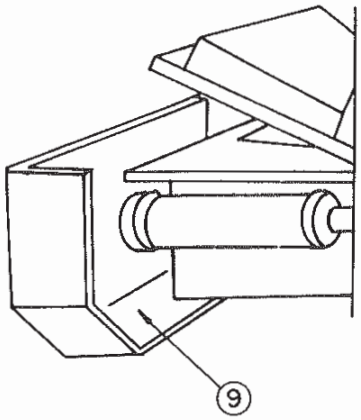


Fig. 2.1 (b) Tape reader without reels side view

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(b) Tape reader with reels

Item	Cleaning point	Reference drawing	Cleaning period	Cleaning method
1	Surface of read head (light sensing part)	Fig. 2.1 (c) ①	Daily	Clean with gauze or a thin brush with pure alcohol.
2	Surface of read head (light emitting part)	Fig. 2.1 (c) ②	Daily	
3	Tape retainer	Fig. 2.1 (c) ③	Daily	
4	Tape path	Fig. 2.1 (c) ④	Daily	
5	Capstan roller	Fig. 2.1 (c) ⑤	Weekly	
6	Guide roller	Fig. 2.1 (c) ⑥	Weekly	
7	Pinch roller	Fig. 2.1 (c) ⑦	Weekly	
8	Assembly under tape path plate	Fig. 2.1 (c) ⑧	Monthly	Clean with cloth or a brush.
9	Inside tape reader cover	Fig. 2.1 (d) ⑨	Monthly	

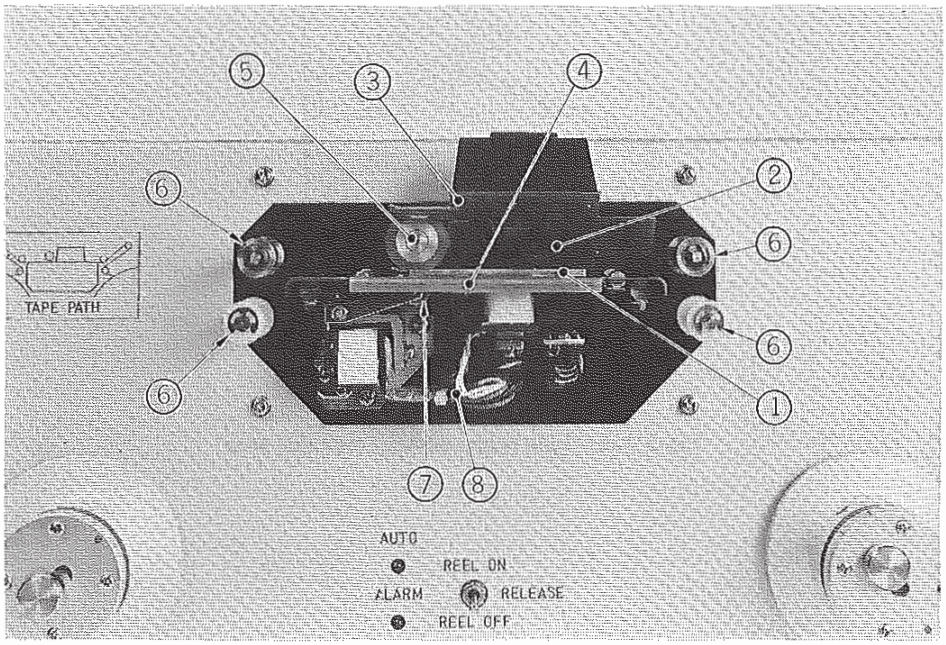


Fig. 2.1 (c) Tape reader with reels front view (with cover removed)

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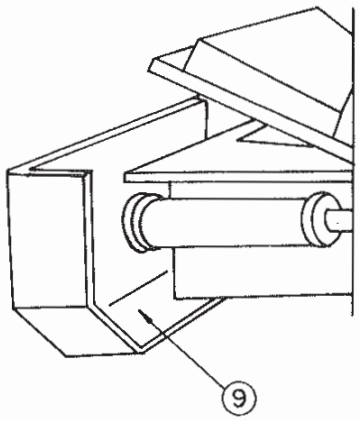
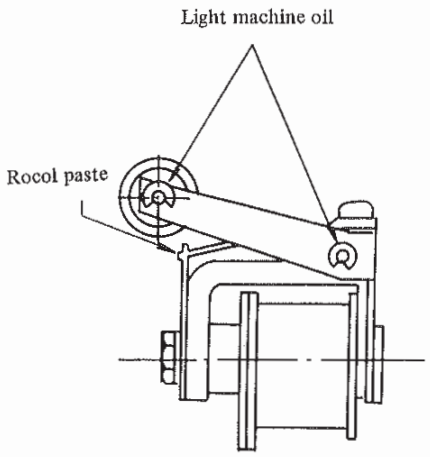


Fig. 2.1 (d) Tape reader with reels side view

(2) Tape reader lubrication

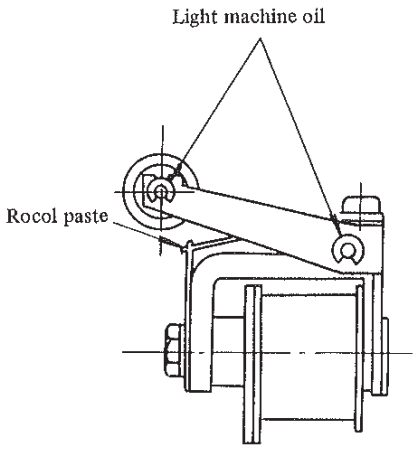
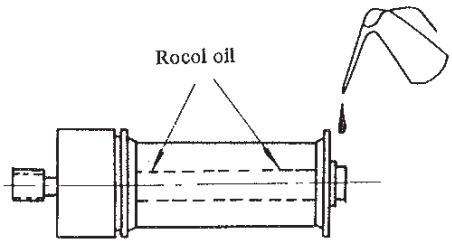
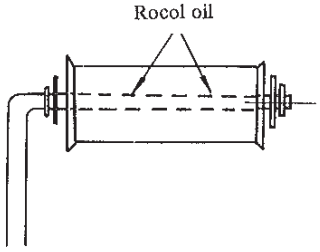
a) Tape reader without reel

The routine lubrication points and lubrication periods are as follows:

Item	Lubrication point	Period	Lubrication (Note)	Amount
1	Magnetic section See Fig. 2.1 (a) ⑦ 	3 months	Light machine oil	1 drop
		1 year	Rocol paste	Sufficient to form a thin film

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b) Tape reader with reels
The routine lubrication points and lubrication periods are as follows:

Item	Lubrication point	Period	Lubrication (Note)	Amount
1	Magnetic section **See Fig. 2.1 (e) ①** 	3 months	Light machine oil	1 drop
		1 year	Rocol paste	Sufficient to form a thin film
2	Guide roller **See Fig. 2.1 (e) ②** 	6 months	Rocol oil	2 ∿ 3 drops
3	Tension arm guide roller **See Fig. 2.1 (f) ③** 	6 months	Rocol oil	2 ∿ 3 drops

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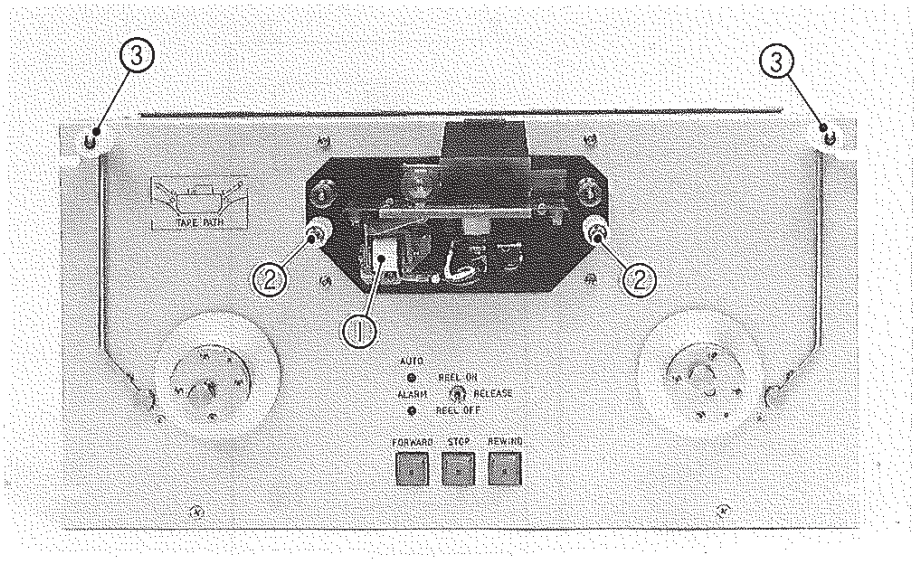


Fig. 2.1 (e) Tape reader with reels front view

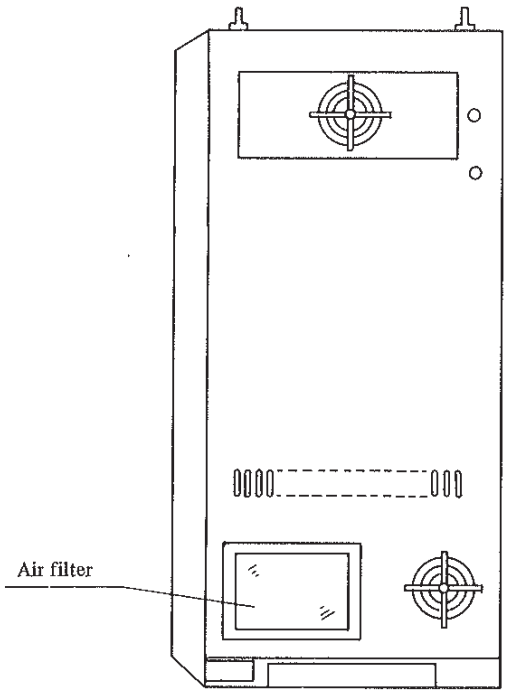
(Note) Lubricant

Item	Name	Manufacturer
1	Rocol oil (ROCOL ASO)	ROCOL CO., Ltd. (U.K.)
2	Rocol Paste (ROCOL ASP)	ROCOL CO., Ltd. (U.K.)
3	Luna oil	Nippon Sekiyu

Refer to appendix 18 about characteristics of oil.

(3) Air Filter cleaning (For free-standing type cabinet only)
When the air filter installed at the bottom rear of the equipment is dusty, the dust collection efficiency will drop, and the temperature in the equipment will rise. Therefore, the filter must be cleaned weekly as follows:
a) Remove the fastener and air filter from the bottom rear of the equipment.
b) Blow the air filter out with compressed air from the inside while shaking the filter lightly.
c) When the filter is very dirty, wash it in a neutral cleaner with pressure and then dry in the shade. (At this time, do not wash it by rubbing.) Wash it with pressure in a neutral cleaner and water (about 40°C or 104°F) (cleaner 5%; water 95%), then rinse in clear water.

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(4) Check and Cleaning of Motor Brush

a) Check and clean the motor brush as follows. If the motor brush is abnormally worn due to neglect, the motor can be damaged as a result; therefore, be sure to check the motor brush periodically.

i) Periodic checks should be made at the intervals listed below.
. When using a general machine tool (lathe, milling machine, machine center, etc.): Once a year.
. When using a machine tool with a high frequency of acceleration/deceleration (turret punch press, etc.): Every two months
However, it is recommended that the check interval be determined by judging the actual wear of the motor brush.

ii) Confirm that the power supply to the DC servo motor (machine) is OFF. Immediately after the DC servo motor has been operated, the brush may be hot. In such case, make the check after the brush is completely cooled.

iii) Remove the brush cap, as shown in Fig. A, using a screwdriver which fits the slot.

iv) After taking out the brush, measure (visually) the length of the brush (see Fig. B). If the length of the remaining brush is shorter than 10 mm (5 mm for model 00M), the brush can no longer be used. Taking this into consideration, make a judgement as to whether the brush can be used until the next check and, if necessary, replace the brush.

v) Check the brush carefully. If any deep groove or scar is found on the contact surface of the brush, or if any mark of arcing is seen on the brush spring; replace the brush. If this occurs, check the brush occasionally for about a month after the replacement; if this recurs during this period, contact our nearest service office.

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vi) Blow off the dust in every brush holder with compressed air (factory air), and the dust will come out through another brush holder. Before using the compressed air, confirm that the air does not contain iron dust or a large amount of moisture.

vii) After the check, put back the brush and tighten the brush cap completely. Be careful as sometimes the brush spring may be caught in between the conducting metal and brush holder and the brush cap may not go in correctly make sure that all the brush caps are tightened into the respective brush holders to almost the same level.
When putting the brush into the brush holder, sometimes the brush cannot slide smoothly due to brush dust which adhered to the inside surface of the brush holder. In such a case, clean the inside surface of the brush holder with the tip of a screwdriver. (Take care not scratch the commutator surface.)

viii) When replacing the brush, use a brush similar (in quality, shape, etc.) to the existing one. After replacement of the brush, run the DC servo motor without load for a while to fit the brush surface to the commutator surface.

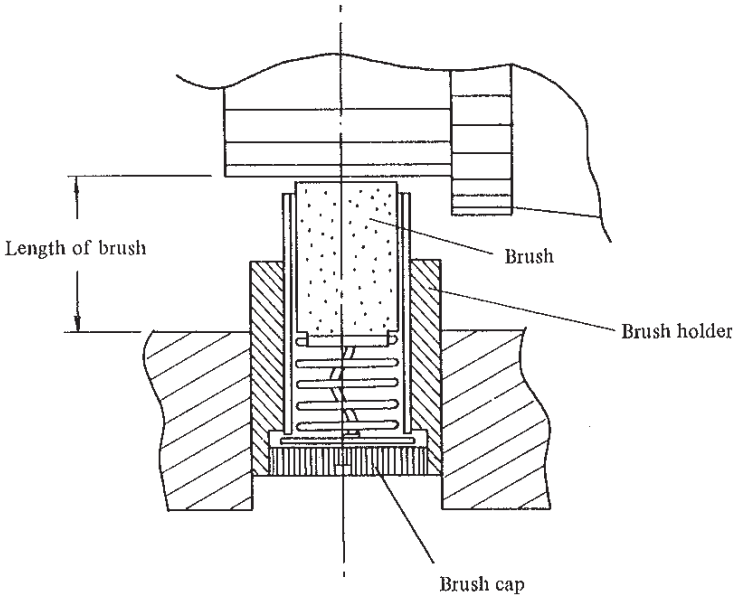
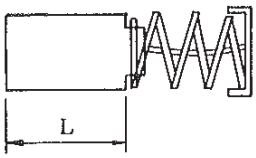


Fig. A Structure of brush holder



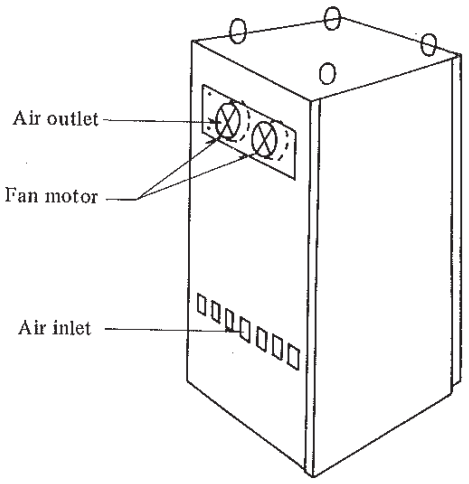
Motor model	Length of new brush	Usable length
Model 00M	10 mm	5 m
Model 0L, 5L, 0M, 5M, 10M, 20M, 30M, 30MH	19 mm	10 m

Fig. B Brush length

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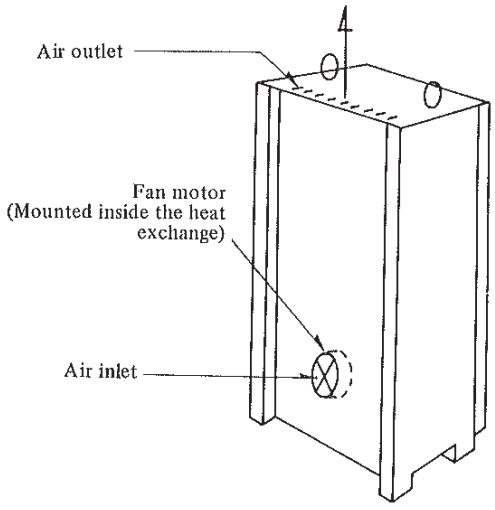
(5) Cleaning of heat exchange
The heat exchange and fan motors should be cleaned periodically.
If they are contaminated with dust, mist, or foreign substances, the heat exchanging capacity may deteriorate, or fan motor trouble may occur.
The cleaning interval differs according to the installation environment of the units.
Clean them at least once a every year; or clean more frequently according to the environmental circumstances.

a) External view of unit
i) A type cabinet
The mounting face of the heat exchange is open, and the heat exchange can be cleaned from the outside of the cabinet.
(free-standing type, built-in type 1, unbundled type)



Rear view

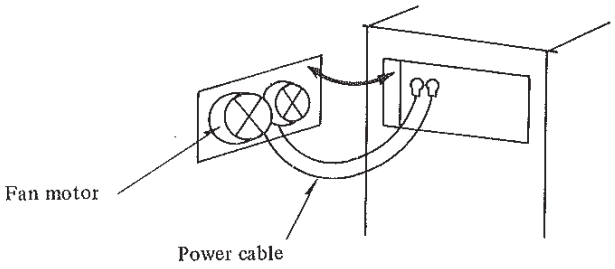
ii) B type cabinet
The heat exchange is mounted at the coupling joint with the machine tool, and it cannot be cleaned from the outside of the cabinet.
(10M/11M built-in type 2, etc.)
(Clean the heat exchange of this type from the interior of the cabinet after opening the door)



Rear view

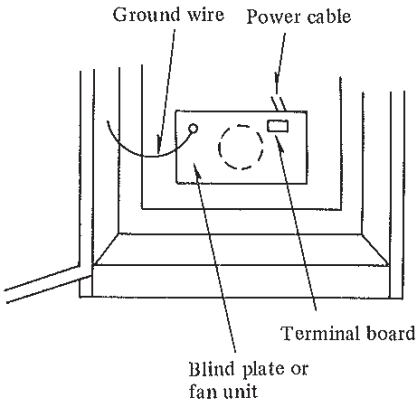
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b) Preliminary work for cleaning
Turn off the power supply before starting the following work.
Before cleaning, blow compressed air through the air inlet.
For the i)-A type cabinet: detach the fan motor together with its mounting plate, detach the protective caps from the terminal board mounted at the innermost part of the heat exchange, and disconnect the power cables of the fan motors.

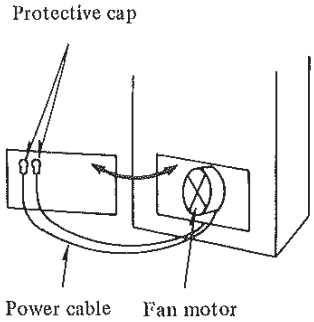


For the ii)-B type cabinet: open the front door, and detach the unit mounted in front of the fan motor.
For instructions on how to remove these units, see Chapter 7- "Replacement of PCB and Units".
The mounting structures of the fan motors in the heat exchange are divided into the fan motor rear plate mounting type (the mounting plate and fan motor are separated from each other) and the fan unit type (the mounting plate and fan motor are assembled together).
Remove the blind plate from the former or remove the fan unit from the latter.

. Disconnect the power cable and grounding wire from the terminal board.
. Detach the blind plate or fan unit by removing mounting screws.



. Detach the protective caps from the terminal board; then, disconnect the fan motor power cables in case of the fan motor rear plate mounting type.
. Unscrew mounting screws and remove the fan motor.



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c) Cleaning method

i) Cleaning of fan motors

Remove dust, mist, and other foreign substances from the fan motors, terminal board, fan mounting plate, and other parts by using a brush or other cleaning tool.

If they cannot be removed easily, wipe them off with a damp cloth after wetting the cloth with water containing a neutral detergent. Be careful not to allow detergent to go into the fan motor rotors and other electric parts.

Completely dry the fan motors if water or detergent was used.

ii) Cleaning of heat exchange

Remove dust, mist, and other foreign substances from the interior of the heat exchange through the mounting opening of the detached fan motors or fan unit by using dry waste or something similar.

d) Installation

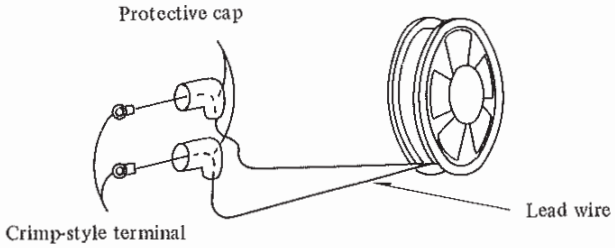
After cleaning the fan motors and heat exchange, remount the fan motors or fan unit, blind plate, and other parts, and connect the power cables to the terminals. Be sure to fully cover the terminals with their protective caps.

Mount the units which have been removed in the preliminary work for cleaning to their specified mounting places.

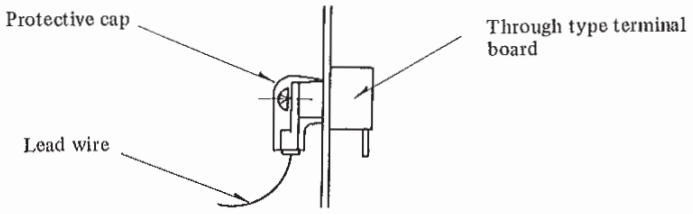
Be particularly careful not to connect the cable connectors incorrectly.

(Note) If defective, replace the fan motor. Mount the protective caps as illustrated below. (If protective caps are not mounted correctly, a leak may occur.)

i) Pass the protective cap through each lead wire of the fan motor before attaching the crimp-style terminal.



ii) Fully cover the terminals with protective caps.



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2.2 Maintenance Equipment

The following equipments are recommended.
1) Measuring instruments

Instrument	Requirements	Usage
AC voltmeter	AC power-supply voltage can be measured with a tolerance of ±2% or downward.	Measurement of AC power-supply voltage
DC voltmeter	Maximum degree of 10 V, 30 V Tolerance of ±2% or downward (digital voltmeter may be required.)	Measurement of DC power-supply voltage
Phase rotation meter		Check of connection sequence of AC 3-phase input power
Oscilloscope	Frequency bandwidth of 5 MHz or upward, 2 channels	Adjustment of tape reader photoamplifier, etc.

2) Tools
   + screw driver: large, medium and small
   - screw driver: large, medium and small
3) Chemicals
   Tape reader cleaning liquid (pure alcohol) and oil.

2.3 Main Spare Parts

Always keep the following parts on hand:
o Fuses (see Appendix 17)
o Motor brush (see Appendix 14)
  As required, provide P.C.Bs and units.
o P.C.B. and unit (see Table 1.4)
o Primary parts of the velocity control unit (see Appendix 13)

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3. TROUBLESHOOTING

3.1 Procedures

Troubleshooting procedures are classified below, according to the status of the failing NC.

1) No power can be turned on ..... Section 3.3.1
2) Nothing is displayed on CRT screen after power is turned on . Section 3.3.2
3) Troubleshooting by alarm ..... Section 3.3.3
4) LEDs on the master PCB light ..... Section 3.3.4
5) Jog operation is not possible ..... Section 3.3.5
6) Manual pulse generator does not operate ..... Section 3.3.6
7) Synchronous feed or feed per revolution is not possible..... Section 3.3.7
8) Tape reader does not operate normally ..... Section 3.3.8
9) Automatic operation is not possible ..... Section 3.3.9
10) Spindle binary analog output voltage is abnormal ..... Section 3.3.10
11) Analog output voltage linearity is not possible ..... Section 3.3.11
12) Reader/puncher interface do not operate normally ..... Section 3.3.12
13) Stop position does not coincide with reference point in reference point return ..... Section 3.3.13
14) System error ..... Section 3.3.14
15) Power supply voltage checking ..... Section 3.4
16) Tape reader photo-amplifier adjustment ..... Section 3.5
17) Connection diagram inside the NC ..... Section 3.6
18) Status display by self-diagnostic function ..... Section 3.7
19) Block diagram and standard setting of servo system ..... Section 3.8
20) Confirmation of connections between NC and servo unit ..... Section 3.9
21) Motor normal connection and reverse CONNECTION ..... Section 3.10
22) Troubleshooting for servo unit ..... Section 3.11
23) Error display and its contents of I/O unit ..... Section 3.12

Survey on Trouble Phenomena

Inform our Service Center of checked data on the following items, when trouble occurrs.

1) Phenomena
   i) Mode in which the trouble occurred
   ii) Position where the trouble occurred
   iii) Alarm number
   iv) Trouble frequency
   v) Amount of error in the position
   vi) Display of the position when trouble occurrs
2) Other information
   i) Software series and edition number displayed on the CRT when the power is turned on (see Subsec. 3.3.2)
   ii) Parameter contents
   Inform our Service Center of the results of a comparison between the parameter table attached to the NC and the parameters set in the NC.
   iii) Program contents and cutter compensation values for automatic operation
   iv) Contents of other items if checked

3.2 Error Message

See error meassage table of a separate volume (B-54810E).

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3.3 Checking and Countermeasures

3.3.1 No power can be turned on

Item	Cause of trouble	Check points	Countermeasures
1	No input power supply is connected to NC.	1 See Sec. 3.4. Make sure that input unit pilot lamp PIL (green LED) is ON.	
		2 When PIL is OFF, make sure that input power is supplied at input unit power-supply terminal TP1.	
		3 When power is supplied at input unit TP1 and pilot lamp is OFF, see Sec. 3.4. fuses F1, F2 or F3 are considered blown out.	Remove blowout causes and replace fuses.
2	Alarm lamp is ON.	1 See Sec. 3.4. Make sure that input unit alarm lamp ALM (red LED) is OFF. When ON, remove the cause (see Appx. 12 for details) and press POWER OFF button once; then press POWER ON button.	
3	OFF contact of external power-supply ON/OFF is faulty.	Make sure that EOF and COM are shorted at input unit terminal	
4	POWER OFF switch on CRT/MDI unit is faulty.	1 Make sure that POWER OFF button contact is closed.	
		2 Make sure that two pins ⊓OFF⊓ are shorted in input unit.	
5	POWER ON switch on CRT/MDI unit is faulty.	1 Make sure that pressing POWER ON button closes the contact.	
		2 Make sure that pressing POWER ON button short circuit two pins ⊓ON⊓ in input unit.	
6	Input unit is faulty.		Replace the input unit.

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3.3.2 CRT screen is not displayed after turning on power supply

If no display appears on CRT screen after power is turned on, a faulty point can be checked by the display conditions of 7-segment LED on the master PCB (10/11 series) or LED on the each PCB in the control unit (12 series). For details see 3.3.4.

3.3.3 Troubleshooting by alarm number

1) SR590 TH error (Tape Horizontal error)

If a tape code which is not covered in the code table is detected during the significant information section of an NC tape (other than the section from control out to in), the readout operation of tape is stopped. When the control unit is executing the previous block, it stops after completion of the block, and SR590 is displayed on CRT.
The block in error is invalid, and is not executed.
The alarm condition is reset by pressing the RESET button.
Locate the cause according to the following information obtainable through the diagnostic function.

No.	Display	Meaning of data
1100	POSITION (CHARACTER) F	If TH alarm occurs, the position of the character in TH alarm is displayed by the number of characters counted from the start of the block. (TH alarm in front)
1101	BIT PATTERN (CHARACTER) F	The readout code of the character in TH alarm is displayed by the bit pattern. (TH alarm in front)
1100	POSITION (CHARACTER) B	If TH alarm occurs, the position of the character in TH alarm is displayed by the number of characters counted from the start of the block. (TH alarm in back)
1101	BIT PATTERN (CHARACTER) B	The readout code of the character in TH alarm is displayed by the bit pattern. (TH alarm in back)

Causes and countermeasures

- o Contamination of NC tape and tape reader
  Clean NC tape.
  Clean the tape reader.
- o Tape setting failure NC tape is set upside down;
  Reset the NC tape correctly.
- o Punching error of NC tape
  Correct NC tape.

2) Alarm number

SR591 TV error (Tape Vertical error)
If during parity check, an odd number of characters are in a block (from the character next to EOB), the control unit will execute the preceding block, stopping after completion of it. (The tape stops on the next character to the EOB of the erroneous block.)
"SR591" is displayed the CRT.
Alarm status is reset by pressing the reset button.
Error block is ignored.

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This TV checking function can be made effective by setting the parameter.

Countermeasures

- o Something (a space symbol, for example) that is ignored by the NC should be punched before *(EOB) code for odd-numbered holes. The tape punched out by CNC is checked by the TV check.
  The number of characters in one block must be made an even number.
- o If this lamp lights up with an even number of characters punched, the tape reader may be misreading. Clean the reading section of the tape reader or the NC tape.

3) PS200 Pulse coder synchronous error

The one-revolution signal of the pulse coder was not applied in reference point return, or the feed rate is too low.

When using a pulse coder, after turning on the power or resetting an emergency stop, the reference counter is synchronized with the one-revolution signal when the first reference point return is performed. The following conditions are required to catch the same edge of the 1 revolution signal:

a) The position deviation (DGN No. 3000) should be 128 or more.

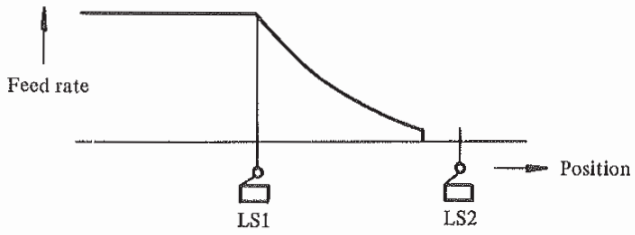
b) After the position deviation amount has exceeded 128 the one-revolution signal should be input at least once before the deceleration dog is separated again.

The one-revolution signal is not used during the second or subsequent reference point return. This alarm check is not made.

Item	Cause of trouble	Check points	Countermeasures
1	Feedrate is too low.	Perform reference point return under the same conditions in which the alarm occurred. Confirm that the position deviation is 128 or more by using the self-diagnostic function (DGN 3000). The start point of the reference point return must not be on the deceleration dog.	Increase the feed rate. When the position gain is 30 sec^{-1}, a feed rate of at least 300 mm/min is necessary.
2	The start point of the reference point return is too close to the reference point.	Check the distance from the start point to the reference point.	The distance from the start point to the reference point must be equivalent to at least two motor revolutions.
3	Source voltage for the pulse coder is too low.	The source voltage of the pulse coder should be 4.75 V or more. (Remove the pulse coder cover and measure the source voltage at the + and - terminals on the pulse coder board.)	Cable loss must be 0.2 V or less including both sides of 5 V and 0 V.
4	Defective pulse coder.	Replace the pulse coder.	Replacement.
5	Defective master PCB.	Replace the master PCB.	Replacement.

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4) OT007 + OVERTRAVEL (HARD)
OT008 - OVERTRAVEL (HARD)
When the movable part of the machine tool reaches the stroke end, the above alarm message is displayed on the CRT screen.
When this alarm occurrs, movement of all axes stop in auto operation. In manual mode, the axis that alarm occurred on stops.
To stop the movable part of the machine tool, two limit switches (LS1, LS2) are provided on each axis in each direction as shown in the figure below.



- o When LS1 operates, the feed is stopped after deceleration. This alarm message is displayed on CRT.
- o When LS2 operates, the feed is emergency-stopped. (LS2 operates only when LS1 malfunctions)

Cause of Trouble and Countermeasures

1 Check the reference point setting for errors; then, correct the program.
2 Check the program for errors; then, correct the program.

Release

a) When only LS1 operates
Move the movable part of the machine tool by manual operation (Jog, Step or Handle) in the opposite direction (safe side) to separate it from the limit switch. Push the RESET key on the MDI panel.
(Note) In this case, the movable part of the machine tool can be moved in the opposite direction only.
b) When both LS1 and LS2 operate
i) Set 2nd L.S. REMOVE button to ON on operator's panel.
ii) Follow the same instructions given for LS1.
(Note) In the equipment in which LS1 is not operating when LS2 in operation, the movable part is movable in both directions by manual operation. Be careful of the direction in which it is to be moved when LS1 has malfunctioned.

5) OT001 + OVERTRAVEL (SOFT1)
OT006 - OVERTRAVEL (SOFT3) } Stored Stroke limit alarm

When a machine reaches stored stroke limit, one of these messages is indicated on the CRT screen. When this alarm occurrs, movement of all axes stop in auto operation. In manual mode, the axis that alarm occurred on stops.

Cause of trouble

a) Program miss.
b) Setting of stored stroke limit is abnormal.

Countermeasures

- o The movable part of the machine tool can be moved in the opposite direction.
- o If the movable part of the machine tool can not be moved, push the emergency stop button and command G23 (Stored Stroke Limit Function OFF). If the setting value is in error, correct the setting value and return to reference point.

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Confirm
Check the actual machine position (position on machine coordinate system) from the reference point displayed on CRT screen.

(Note) To make stored stroke check 1 invalid until the reference point return end after turning on the power, in the 10 series, the following operation should be done.

Operating procedure
(i) Turn on the power while pressing [-] and [•] keys.

(ii) It is attached to IPL mode and the following menu is displayed on the screen:
IPL
1 CUMP MEMORY
2 -
3 CLEAR FILE
4 SETTING
5 -
6 END IPL

(iii) Key is [4] [INPUT] to select "4 SETTING"

(iv) Key in [N] in response to the question "CHECK SOFT OT AT POWER ON?"

(v) The menu described in (ii) is displayed on the CRT. Key in [6] [INPUT] to change IPL mode.

6) SV023 SV overload

Item	Cause of trouble	Check points	Countermeasures
1	(analysis)	Check if OVERLOAD lamp lights when turning on NC power supply.	Connection/setting failure. Proceed to item 6 or 7.
		Check to see if thermal relay of M series velocity control unit functions. (AC servo is not provided with this thermal relay.)	Proceed to item 2 or 3.
		Check to see if radiation fins of AC servo velocity control unit are overheated. (M series servo is not provided with these radiation fins.)	Proceed to item 2.
		Check thermostat of servo transformer functions.	Proceed to item 2 or 4.
		Check thermostat of regenera-tive discharge unit functions.	Proceed to item 5.
		Check thermostat of AC servo motor functions.	Proceed to item 2.

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Item	Cause of trouble	Check points	Countermeasures
2	Overload of motor	Measure the motor current. The continuous rated current is as specified below: M series servo 00M ... 4A 0M ... 7A 5M ... 9A 10M ... 12A 20M ... 18A 30M ... 24A AC servo 4-0 ... 0.93A 30R ... 29A 3-0 ... 0.93A 2-0 ... 3A 1-0 ... 2.9A 0 ... 4.6A 5 ... 6.8A 10 ... 11A 20 ... 20A 30 ... 22A	Reduce the cutting condition. If the continuous rated current exceeds the specified value during idle feed. Adjust the machine tool.
3	Setting failure of thermal relay of M series servo	Check to see if the thermal relay is set to the continuous rated current value of the motor specified in item 2.	Reset the thermal relay setting.
4	Thermostat of servo transformer is defective.	If thermostat functions when the surface temperature of transformer is lower than 60°C, it's defective.	Replace transformer.
5	Excessive regenerative energy	1) Excessive acceleration/deceleration frequency. Check to see if the positioning frequency exceeds 1 ∿ 2 times/sec in rapid traverse. Check that no alarm occurs when this frequency is reduced.	Reduce the acceleration/deceleration frequency by inserting a pause time.
		2) Counter balance on machine tool side.	Correct the counter balance.
6	Wiring failure	Check to see if the following wiring is correct. o NC (CV1 ∿) - velocity control unit (CN1) o Servo transformer - velocity control unit (CN2) o Regenerative discharge unit - velocity control unit (CN2) o AC servo motor - velocity control unit (CN5)	Correct wiring.

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Item	Cause of trouble	Checking points	Countermeasures
7	Setting failure on velocity control unit PCB	Check to see if setting pin S20 is set as specified in M series servo. Check to see if setting pin S1 is set as specified in AC servo.	Reset pin S20 or S1, as specified.

7) SV000 TACHOGENERATOR DISCONNECT

a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	The motor power cable is not connected to terminals (5), (6), (7) or (8) of terminal board T1 in the velocity control unit, or the power cable is broken.	If the alarm occurs when a motion command is not input, the alarm cause described here should be checked.	Correct the power cable connection.
2	PCB setting is incorrect.	Check the setting according to section 6.2. "Setting and adjustment of PCB •••••".	Adjust the setting.
3	Velocity feedback voltage is not being applied or is intermittent.	Measure the velocity feedback voltage between check terminals CH2 (TSA) and CH3 (GND) with an oscilloscope. Verify whether the voltage is being interrupted.	Repair the cable carrying the velocity feedback voltage. Repair the defective source (i.e., motor or control) of the velocity feedback voltage.

b) For AC servo

Item	Cause of trouble	Checking points	Countermeasures
1	The motor power cable is not connected to terminals (5), (6), or (7) of terminal board T1 in the velocity control unit, or the power cable is broken.	If the alarm occurs when a motion command is not input, the alarm cause described here should be checked.	Repair the power cable of motor.
2	PCB setting is incorrect.	Check the setting.	Adjust the setting.
3	Pulse coder feedback signal is not be sent.	Check the feedback cable.	Repair the feedback cable.

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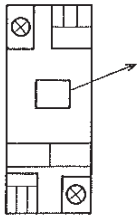
8) SV001 MOTOR OVERLOAD
a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	PCB is defective.	The OVC alarm occurs if the power is turned on when the motor power cable is disconnected. (In this case, the gravity axis may fall down; therfore, it should be supported.) (The S23 terminal should be shorted so that the TGLS alarm does not occur. After confirmation, the S23 connection should be opened.)	Replace the PCB.
2	PCB setting is incorrect.	Check the setting of variable registor RV3 which is used to set the upper limit of the motor current. (Generally, RV3 is set to 10, but the adjustment may differ with the machine tool.)	Change the RV3 setting.
3	Mechanical load is irregular.	Observe the waveform between check terminals CH8 and CH3 with an oscilloscope. Check whether the current which is determined by RV3 flows more than 600 msec.	Remove the mechanical overload.

b) For AC servo

Item	Cause of trouble	Checking points	Countermeasures
1	Pulse coder feedback signal is not sent.	Check the feedback cable.	Reconnect the feedback cable.
2	Motor current exceeds rated current.	Check motor current.	Change the cutting conditions.

9) SV002 VELOCITY UNIT BREAKER OFF
a) For M series servo

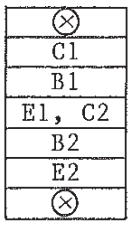
Item	Cause of trouble	Checking points	Countermeasures
1	The no fuse breaker operated.	The breaker is open when it is as shown below. See section 3.4 for the location of the breaker.  This button pops up when the breaker operates. To reset the breaker, press the button after turning off the power.	Turn off power and reset the breaker. (If it does not reset immediately, wait about ten minutes and try again.)

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Item	Cause of trouble	Checking points	Countermeasures
2	Diode module DS or some other part of the velocity control unit is defective.	The breaker operates again when power is restored after the countermeasures of item 1.	Replace diode module DS or the whole velocity control unit.
3	Mechanical load is excessive.	Observe the motor load current at rapid traverse between terminals CH8 and CH3 on the PCB with an oscilloscope. Check whether it exceeds the rated current.	Remove the mechanical overload.
4	The PCB or the connection between the PCB and the velocity control unit is defective.	The BRK alarm occurs when the no fuse breaker is not operating.	Replace the PCB or the velocity unit.

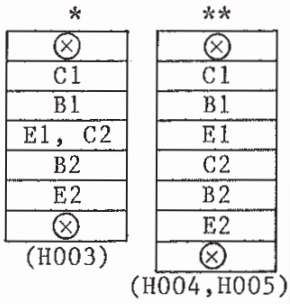
This alarm message is not displayed for AC servo.

10) SV003 EXCESS CURRENT IN SERVO
a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	Incorrect motor power cable connection.	The HCAL alarm does not occur when the power is turned on when the motor power cable is disconnected. (In this case, the gravity axis may fall down, so it should be supported. The S23 terminal on the PCB should be shorted so that the TGLS alarm will not occur. The S23 connection should be opened after confirmation.)	Fix the motor power cable connection.
2	The transistor module is defective.	The HCAL alarm goes on when the motor power cable is disconnected. Turn off power and measure the resistance between the following terminals using a multi-meter. If the measured value is 10 ohms or less, the transistor module is defective.	Replace the transistor module.  Confirm between C1-E1, C2. E1, C2-E2.

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b) For AC servo

Item	Cause of trouble	Checking points	Countermeasures
1	Incorrect connection of motor power line.	HC alarm does not occur when turning on the power supply after disconnecting the motor power line. (Since the gravity axis may drop, support it or disconnect the drive cable of gravity axis brake.)	Reconnect the motor power line correctly. If the motor power line is checked while disconnected, set terminal S10 setting to L side, or TG alarm occurs.
2	Transistor module is defective.	Check if HC alarm occurs when turning on the power supply after disconnecting the power line according to item 1. Turn off the power supply, remove PCB, and observe the resistance between terminals of the transistor module with a circuit tester.	Replace transistor module. * Check resistance between C1 - E1 and C2; also between E1 and C2-E2. ** Check resistance between C1-E1 and also between C2-E2. 
3	Internal short-circuit failure of motor windings.	Check motor windings for normal insulation.	Replace the motor.
4	PCB is defective.	PCB is defective if HC alarm occurs when there is no defect in items 1, 2, or 3.	Replace the PCB.

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11) SV004 EXCESS VOLTAGE IN SERVO

a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	Input AC power voltage is too high.	Check the tap connection of servo power transformer.	Correct the tap connection.
2	Servo motor is defective.	Check to see if the insulation resistance is normal between the motor armature (power line) and the body.	Clean brushes.
3	PCB is defective.	Check to see if alarm occurs when item 1 and 2 are normal.	Replace PCB.

b) For AC servo

Item	Cause of trouble	Checking points	Countermeasures
1	Input AC power voltage is higher than specified.	Check to see if the servo transformer taps are properly connected.	Repair the tap connection.
2	Servo motor is defective.	Check to see if the insulation resistance is normal between the motor armature (power line) and the body.	Replace the motor.
3	Load is excessively motionless.		Increase the acceleration/ deceleration time constant.
4	PCB is defective.	PCB is defective if HV alarm occurs when there are no defects in items 1, 2, or 3.	Replace the PCB.

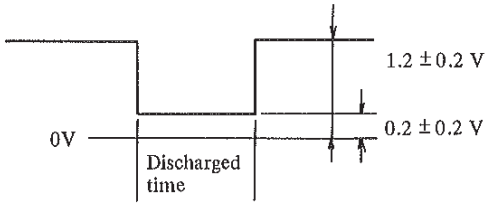
12) SV005 EXCESS DISCHARGE CURRENT

a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	Discharge transister Q1 or the PCB is defective.	The alarm occurs immediately after turning on power.	Replace transistor Q1 or replace PCB.
2	PCB setting is incorrect.	Terminal S26 is shorted although the separate regenerative discharge unit is used with the gravity axis.	Open terminal S26.

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Item	Cause of trouble	Checking points	Countermeasures
3	Machine tool counterbalance is incorrect.	The waveform shown in the following figure is measured at stated periods on check terminal CH10 while the counterbalanced axis is moving down at rapid traverse speed.	Adjust the counterbalance.
4	The acceleration/ deceleration rate frequency is too high.	Check whether the positioning frequency at rapid traverse speed exceeds 1 to 2 time per second. Check that the alarm indicator does not go on when the rate is decreased.	Use a dwell period and decrease the acceleration/ deceleration rate.



b) For AC servo

Item	Cause of trouble	Checking points	Countermeasures
1	Regenerative transistor Q1 is defective or PCB is defective.	DC alarm occurs immediately after power is turned on.	Replace the transistor Q1 or replace the PCB.
2	PCB setting is incorrect.	Setting pin S2 is set to L side, although a separate regenerative discharge unit is used.	Set S2 correctly.
3	The acceleration/ deceleration rate frequency is too high.	Check whether the positioning frequency at rapid traverse speed exceeds 1 to 2 times per second. Check that the alarm does not occur when the rate is decreased.	Use a dwell period and decrease the acceleration/ deceleration rate.

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13) SV 006 VELOCITY-UNIT POWER TOO LOW

a) For M series servo

Item	Cause of trouble	Checking points	Countermeasures
1	AC power voltage is too low.	Check to see if connection between input AC power voltage and servo transformer tap is correct.	Correct the tap connection.
2	Connection is defective between servo transformer and CN2 on the PCB.	Check to see if PCB voltage +24 V and ±15 V are correct. Check that the servo transformer terminals (41 ∿ 43, 44 ∿ 46, 47 ∿ 49) and PCB CN 2 (1, 2, 3) are connected correctly.	Correct the connection.
3	PCB is defective.	LVAL alarm occurs when above items 1 + 2 are normal.	Replace the PCB.

b) For AC servo

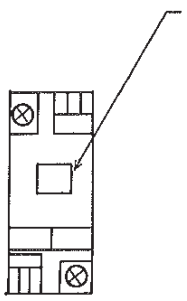
Item	Cause of trouble	Checking points	Countermeasures
1	AC power voltage is too low.	Check to see if the connection between input AC power voltage and servo transformer is correct.	Correct the tap connection.
2	Connection is defective between servo transformer and PCB CN2.	Check to see if PCB voltage +24 V, ±15 V and +5 V are correct. Check that servo transformer terminal 41 ∿ 49 (AC 18 V) and PCB CN2 (1, 2, 3) are connected correctly.	Correct the connection.
3	+5 V fuse is blown out.	Check to see if the fuse for +5 V is blown out.	Replace the fuse.
4	PCB is defective.	PCB is defective if LV alarm occurs when above items 1 ∿ 3 are correct.	Replace the PCB.

14) SV013 Improper V-READY OFF

Item	Cause of trouble	Checking points	Countermeasures
1	100 V AC is not supplied to velocity control unit.	Check to see if 100 V AC is supplied across terminals (3) and (4) of the terminal board of the velocity control unit.	Supply 100 V AC.
2	No fuse breaker is turned off in AC servo.	Check the no fuse breaker button on/off state.	If the button is off, proceed to next block.

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Causes and countermeasures when no fuse breaker functions in AC servo

Item	Cause of trouble	Check procedure	Countermeasures
1	No fuse breaker function	The operating condition is illustrated below:  This button is pushed inward during normal operation of the motor. If the breaker has functioned, turn off the three-phase power supply once and press this button.	Reset the no fuse breaker after turning off the power supply. (If the no fuse breaker cannot be reset, wait for about 10 minutes, then try again.)
2	Diode module, surge absorber (ZNR) or other parts are faulty in velocity control unit.	No fuse breaker functions simultaneously when power supply is turned on after countermeasure in item 1.	Replace diode module DS or surge absorber (ZNR) of velocity control unit.
3	Irregular mechanical load	Check to see if the motor load current exceeds the rated current during rapid traverse, while monitoring CH10 and CH11 or CH12 and CH3 (OV) of PCB using and oscilloscope.	Eliminate irregular load from machine tool side.

15) SV008 Excess error (Stop)
SV009 Excess error (Moving)

Position deviation excessive alarm

Item	Cause of trouble	Checking points	Countermeasures
1	Mis-setting of position deviation	Check that parameters 1828 ∿ 1830 are the same as the parameter list attached to the NC.	Correct the parameter setting.
2	Overshoot	When sufficient current does not flow to the motor during acceleration or deceleration, deviation value of position control circuits increases. Check waveform at CH1 on velocity control PCB and confirm whether overshoot is within 5%.	Increase the rapid traverse time constant of NC. (set at NC side) Increase gain (RV1) of the velocity control unit.

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Item	Cause of trouble	Checking points	Countermeasures
3	Drop of input power voltage	Check to see if input power voltage is within ±10% and -15%.	Change the input tap of power transformer for servo.
4	Voltage of power supply is irregular.	Check the voltage of control part.	Repair the fault.
5	Connection is erroneous	Check the connection of power line of motor, tacho-generator, etc.	Repair the fault.
6	Trouble with position control circuit on the master PCB (for FS10/11) or 01∿05P06 axis control PCB, 01∿05P07 DSCG interface PCB (for FS12). Trouble with velocity control unit PCB.	Replace the PCB with a new one (if provided) and recheck. Adjustment and setting.	Replace the PCB with spare.
7	Poor brush contact due to loosened DC motor brush cap	Confirm the motor brush contact.	Tighten the brush cap.

16) SV010 Excess drift compensation

Item	Cause of trouble	Checking points	Countermeasures
1	Bad connection	Check the connection of power lines to servo motor. Check the connection between position detector and servo motor.	Repair the fault.
2	Setting of drift compensation value is incorrect.	Check whether the contents of parameter No. 1834 exceed 500.	When emergency stop condition occurs, set 0 bit (ADR) of parameter number 1800 to "0" and set the contents of parameter No.1834 to "0". Then reset ADR to "1" and release the emergency stop.

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Item	Cause of trouble	Checking points	Countermeasures
3	Trouble with velocity control unit or/and position control circuit on master PCB (for 10 and 11 series). Trouble with 01∿05P06 axis control PCB (for 12 series).	Check by changing with spare PCB (if provided). Adjustment and setting must be done correctly.	Replace the PCB with spare.

17) SV011 LSI overflow

These alarms occur when:

a) Positional deviation in the axis involved exceeds ±32767. However, when positional deviation limits (parameters 1828 ∿ 1830) are set correctly, alarm SV008 or SV009 is displayed before any of the above-noted alarms occur. So they usually cannot occur on this condition.

b) D/A converter velocity command value does not include the +8191 to -8192 range.

D/A converter velocity command value = $0.192 \times K \times G \times E \times 10^{-6}$

where K: servo loop gain multiplier (parameters 1826)

G: servo loop gain 0.01 sec^{-1} (parameter 1825)

E: position deviation (can be verified by DGN 3000)

Theoretical value (when feed has become constant)

$$E = \frac{F}{60} \times \frac{1}{G} \times \frac{1}{\alpha} 10^2$$

where F: feed rate mm/min (inch/min)

α: detection unit mm (inch)

G: servo loop gain 0.01 sec^{-1}

Item	Cause of trouble	Checking points	Countermeasures
1	Parameter setting is incorrect.	1) Check servo loop gain multiplier. Parameter 1826 2) Check servo loop gain. Parameter 1825 3) Check CMR. Parameter 1820 4) Check DMR. Parameter 1816	

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Item	Cause of trouble	Checking points	Countermeasures
2	Extreme positional deviation.	Compare the theoretically calculated value with positional deviation by DGN 3000. 1) Feed rate Rapid traverse rate: parameter 1420	
		Feed rate is correct; positional deviation is also correct.	Proceed to 6.
		Feed rate is correct; positional deviation is incorrect.	Proceed to 3.
3	Machine tool does not move the usual distance.	Issue a command (feed of several mm) (do not cause alarm) to see if machine tool moves by a normal value.	
		If machine tool does not move by a normal value.	Proceed to 4.
		Machine tool does move by a normal value.	Proceed to 5.
4	Position detector is incorrect.		Replace the position detector.
5	PCB is incorrect (for 10 and 11 series.)		For pulse coder, replace master PCB. For resolver/ inductosyn, replace PCB A16B-1210-0460.
6	Master PCB is incorrect (for 10 and 11 series).		Replace the master PCB.
7	01∿05P06 axis control PCB or 01∿05P07 DSCG interface PCB is bad (for 12 series).	Replace the PCB with the spare PCB (if provided). Adjustment and setting should be correct.	Replace the PCB.

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18) SV018 UNFIT DSCG FREQUENCY
SV020 UNFIT PHASE SHIFT VALUE

Position detecting system trouble. (Resolver/inductosyn)

Item	Cause of trouble	Checking points	Countermeasures
1	Connection is bad.	Check to see if connector connection, cable signal line connection, and the signal line are shorted to the ground or to another line.	Repair error
2	Detected gain is bad.	See Subsect. 6.1.2 or 6.1.5 for detected gain adjustment.	Adjust detected gain.
3	Phase shift is bad.	Check to see if phase shift value was initialized (parameter 1802, bit 0, PSF=0) at first field adjustment or after position detector replacement.	Initialize phase shift value.
4	Setting on PCB is erroneous.	Check the short circuit of inductosyn/resolver interface PCB (for 11 series) or 01∿05P07 DSCG interface PCB (for 12 series). See Subsect. 6.1.1 or 6.1.5.	Correct erroneous setting.
5	Parameter setting is erroneous.	Check if resolver inductosyn parameters RES (parameter 1815, bit 0) is set to "1" for pulse coder-type position detection.	Set parameter correctly.
6	PCB adjustment is bad.	Check Fmin and Fmax adjustment on inductosyn/resolver interface PCB (for 11 series) or 01∿05P07 DSCG interface PCB (for 12 series) (see Subsect. 6.2.1 or 6.1.5).	Readjust.
7	Position detector is faulty.	Change position control axis to another axis for checking.	Replace the position detector.
8	Inductosyn gap is clogged with chips.	Insert a piece of paper in the gap. While NC-side cable is removed, check to see if scale-side signal and slider-side signal are insulated.	Remove chips.
9	Inductosyn/ resolver interface PCB is faulty (for 11 series).	Replace the PCB for checking.	Replace the PCB. A16B-1210-0460

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Item	Cause of trouble	Checking points	Countermeasures
10	Inductosyn pre-amplifier is faulty.	Replace the preamplifier for checking.	Replace the pre-amplifier.
11	Master PCB is faulty (for 11 series).	Replace the PCB for checking.	Replace the PCB.
12	01∿05P07 DSCG interface PCB or 01∿05P06 axis control PCB is bad (for 12 series).	Replace the PCB for checking.	Replace the PCB.

19) SV015 Pulse coder disconnection
(Disconnection detective alarm)

Item	Cause of trouble	Checking points	Countermeasures
1	Cable connection is erroneous.	Check pulse-coder feedback cable connection and wiring.	
2	PCB is faulty.		Replace the master PCB or replace the additional axis PCB (for 11 series). Replace 01∿05P06 axis control PCB (for 12 series).
3	Pulse coder is faulty.		Replace the pulse coder.

20) OH001 Locker overheating

"OH001" is displayed when overheating inside the NC control unit is detected.
Release
Restart is impossible with reset button while this alarm is displayed.
After the temperature is lowered, the alarm releases.

Item	Cause of trouble	Countermeasures
1	Surrounding temperature is too high.	Lower surrounding temperature.
2	Air filter is dusty.	Clean the air filter.
3	Fan Motor of NC is not working properly.	Replace the fan motor.

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21) OH000 Overheat alarm of DC servo motor

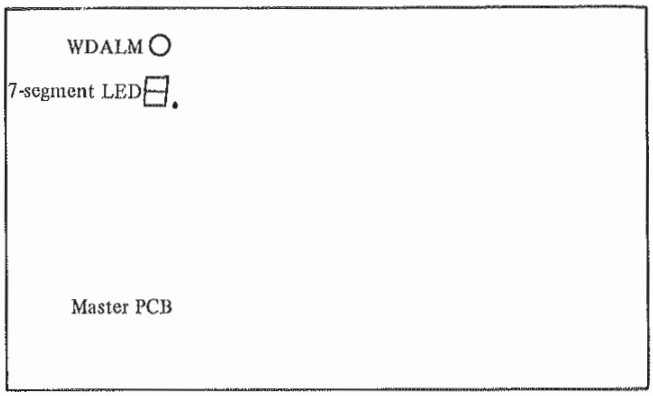
Item	Cause of trouble	Checking points	Countermeasures
1	Overload	Check that the motor armature current exceeds the rated current.	Decrease load torque. Decrease cutting condition.
2	Winding insulation trouble	Check the insulation between the terminals A1 or A2 of motor power cable and the motor bodies with a tester or a megger. Over 1 MΩ at 500 V is normal for the megger check. Infinite value is normal in the tester check.	Clean around the commutator with forced air. Change the motor if the above counter measure is ineffective.
3	Shortcircuit inside of winding	Measure no-load current by removing the motor from the machine. If the current increases in proportion to the motor rotation rate, there is a short-circuit inside of winding.	Clean around the commutator. This problem can easily occur when the oil adheres to the surface of the commutator.
4	Demagnetization of field system magnet	Check to see if the motor terminal voltage between A1 and A2 is normal at rapid traverse.	Change the motor if terminal voltage is low and the motor is overheated at the same time.
5	Trouble with heat pipe fan operation	Check the fan voltage and the wiring. Check whether the fan does not touch a wire gauze. Check the fan motor itself for a problem.	Rearrange the wiring. Refix the wire gauze. Replace the fan motor.
6	Trouble in heat pipe efficiency	The heat pipe does not work when a motor with a heat pipe is overheated, despite the fact that all the above items are normal.	Replace the motor.
7	Brake trouble	Check to see that the brake connection corresponds to the power source frequency. Check to see that the voltage is 100 V $\pm$10%(allowable value.)	Replace the brake.
8	Connection trouble	Check the overheat connection between motor and position control.	Repair the fault.

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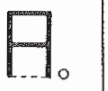
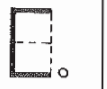
Item	Cause of trouble	Checking points	Countermeasures
9	Master PCB and/or additional axis control PCB is faulty.		Replace the PCB.
10	01∿05P06 axis control PCB is bad (for 12 series).		Replace the PCB.

3.3.4 Lighting of LED on master PCB

If an alarm occurred, an alarm message should be displayed on the CRT screen. However, it is possible that no alarm will appears if the display function is not working.
In such case, the alarm contents are displayed by the LED on the master PCB as shown below.
(i) For 10 and 11 series



The 7-segment LED display changes after turning on the power supply, and it finally displays "1" after stopping. If an alarm occurred, it displays as follows.

Display	Alarm contents	Countermeasures
	MDI connection failure	Check optical fiber cable connection and connector of CRT/MDI unit.
		Replace master PCB, MDI PCB, or optical fiber cable.
	MDI failure (Incorrect ID number)	Check the type (9", 14", etc.) of CRT/MDI unit or the edition number of NC software. Connection unit of operators panel or its connecting cable is defective.

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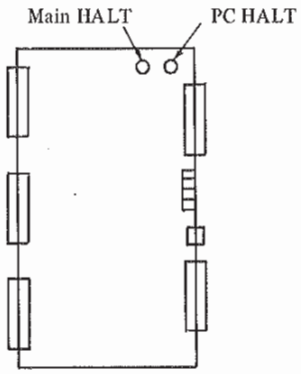
Display	Alarm contents	Countermeasures
	Connection failure of connection unit or I/O cards D1 ∿ D3	Check the optical fiber cables connection of these units and connectors.
		Replace master PCB, connection unit, I/O cand D1 ∿ D3, or optical fiber cable.
	Different type of above mentioned unit (Incorrect ID number)	Check the above units for their specified types or check the edition number of NC software. Connection of unit 2 or its connecting cable is defective
	Transfer error through optical fiber cable	Check alarm LED of the units connected by optical fiber cable. Replace master PCB, MDI PCB, connection unit PCB, I/O unit, or optical fiber cable. Replace PMC RAM in case of PC debug.
	PC or interface converter does not function (While waiting for answer)	Check if PMC-ROM cassette, PMC RAM board or interface converter is mounted on master PCB; or replace the above PCB.
	Waiting for PMC ready	Replace PMC ROM, PMC ROM cassette or PMC RAM board. Check PMC program.
	RAM check error	Replace master PCB or ROM/RAM board additional memory board.
	System error	Replace master PCB, NC software ROM or ROM board.
	(IPL mode)	
	(Normal operation is in progress.)	
Others	System error	Replace master PCB, NC software ROM or ROM PCB.

WDALM lights	Watch-dog alarm occurs	Replace master PCB, NC software ROM or ROM PCB.

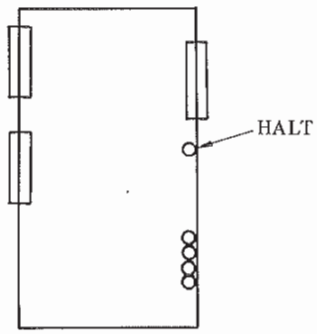
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ii) For 12 series

a) The "HALT" red LED is mounted on MAIN CPU (01P03), SUB CPU (01P10) and AXIS CPU (01 ∿ 05P08) PCB in 12 series as shown below. The LED is lit when CPU is in "HALT" condition.



Main CPU (01P03)



Axis CPU (01 – 05P08) or
Sub CPU (01P10)

The following conditions are considered to correct this:

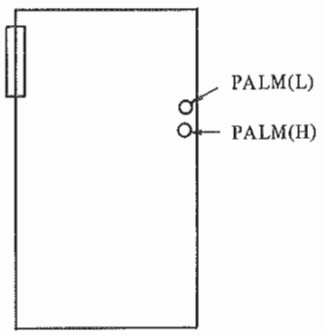
① Replacement of PCB that LED is lit

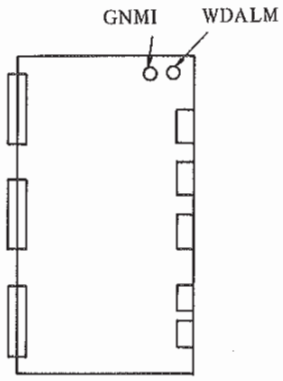
② Replacement of ROM on the PCB that LED is lit

③ Replacement of Main buffer PCB when all HALT LEDs are lit

Furthermore, when power is ON, the LEDs are lit for about 0.5 sec.; however, it causes no abnormality.

b) The PALM(L)/(H) red LED is mounted on ROM PCB (01P01) and the GNMI/WDALM red LED is mounted on MAIN BUFFER PCB (01P04) respectively, as shown below.



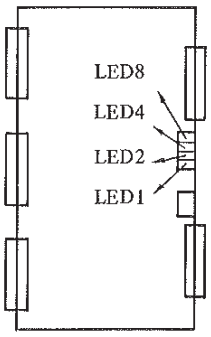


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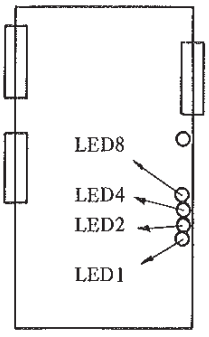
The following conditions are considered to correct this:

	Alarm contents	Countermeasures
PALM(L)	Parity error detection in low-byte RAM on ROM PCB	Replacement of ROM PCB (01P01). Replacement of ROM on ROM PCB.
PALM(H)	Parity error detection in high-byte RAM on ROM PCB	Replacement of ROM PCB (01P01). Replacement of ROM on ROM PCB.
GNMI	RAM parity error detection in AXIS CPU	Replacement of ROM of the PCB which the four LEDs for CPU condition indication becomes "E" condition. (See Item C-2) in AXIS CPU (01 ∿ 05P08), or PCB.
WD ALM	Watch dog alarm detection	Replacement of NC software ROM or replacement of each PCB.

c) The four green LEDs for display of the CPU condition are mounted on the each PCB of MAIN CPU (01P03), (01P01) and AXIS CPU (01∿05P08) as shown below.
The following are details of the LEDs.



Main CPU (01P03)



Axis CPU (01 – 05P08) or
Sub CPU (01P10)

How to check the LED:
The ON or OFF condition of LEDs are regarded as 1 or 0 respectively. These are coded like as following formula,

$(LED8) \times 2^3 + (LED4) \times 2^2 + (LED2) \times 2^1 + (LED1) \times 2^0$

Ex. LED8 and LED2 are ON. It shows "A" in hexadecimal.
The display of four LEDs changes after power on, and stops on display "1" at last. If a trouble occures, its display stops as follows.

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C-1 MAIN CPU (01P03) A16B-1210-0060

○ OFF ● ON ☼ Flick-ering	Light on condi-tion	Alarm details	Countermeasures
○ ○ ○ ○	0	Power system failure Trouble in LED	See Item 3.3.1. Replace MAIN CPU (01P03) PCB.
● ● ● ●	F	System doesn't start	Check ROM mounting and mounting position. Replace PCB of ROM PCB (01P01), MAIN CPU (01P03) and/or MAIN BUFFER (01P04).
☼ ○ ☼ ☼	B (Flick-ering)	RAM check error	Replace ROM PCB (01P01) or MAIN CPU (01P03).
● ○ ● ○	A	Abnormality of CRT/MDI unit connection	Check optical fiber cable connection and connector of CRT/MDI unit. Replace MAIN CPU (01P03), MAIN BUFFER (01P04), MDI PCB or optical fiber cable.
○ ○ ☼ ☼	3 (Flick-ering)	Discrepancy in CRT/MDI unit (ID number doesn't conform).	Check the type of CRT/MDI unit (9 inch, 14 inch, etc.) or NC software series.
● ● ○ ●	D	Abnormality of connection with built-in type I/O unit or external I/O unit	Check optical fiber cable connection or connector of unit. Replacement MAIN CPU (01P03), MAIN BUFFER (01P04), MDI PCB or optical fiber cable.
○ ○ ○ ☼	1 (Flick-ering)	Discrepancy in I/O unit (ID number doesn't conform)	Check the type of I/O unit or NC software series.

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o OFF ● ON ☼ Flick-ering	Light on condi-tion	Alarm details	Countermeasures
☼ ☼ o o	C (Flick-ering)	Trouble sending data in optical fiber cable	Check alarm condition of LED on the unit connected by optical fiber cable. Replacement of MAIN CPU (01P03), MAIN BUFFER (01P04), MDI PCB, optical interface PCB in I/O unit or optical fiber cable. Replace PCRAM PCB when PC debugging.
☼ o o o	8 (Flick-ering)	PMC doesn't start (waiting answer)	Check the mounting of PMC ROM, PMC ROM cassette or PMC RAM PCB. Replace the PCB as described above.
● o ● ●	B	Waiting PMC-ready	Replace the PMC ROM, PMC ROM cassette or PMC RAM PCB. Check PMC programming.
● ● o o	E	System error	See Item (b) when the red LED on MAIN BUFFER (01P04) or ROM PCB (01P01) is lit.
			Replace the SUB CPU (01P10), when the "E" condition displays on the MAIN CPU (01P03) and SUB CPU (01P10) PCB only.
			Replace NC software ROM or MAIN CPU (01P03) PCB when the "E" condition displays on the MAIN CPU (01P03) PCB only.
● ● o o	C	IPL mode	
o o o ●	1	Under normal operation	
	Others	System error	Replace NC software ROM or PCB each.

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(C-2) AXIS CPU (01 ∿ 05P08) A16B-1210-0020

Light on Condition	Alarm details	Countermeasures
0	Power system failure Trouble in LED	See Item 3.3.1. Replace the AXIS CPU (01∿05P08) that is not lit.
F	AXIS CPU software doesn't start.	Check ROM mounting or PCB mounting position. Replace AXIS CPU (01∿05P08).
E	RAM check error System error	See Item (b) when the red LED is lit on the MAIN BUFFER (01P04) PCB.
		Except in the above case, replace ROM on AXIS CPU (01∿05P08) or AXIS CPU PCB.
D	ROM parity error on AXIS CPU	Replace ROM on AXIS CPU (01∿05P08) or AXIS CPU PCB.
1	Under normal operation	

(C-3) SUB CPU (01P10) A16B-1210-0100

Light on Condition	Alarm details	Countermeasures
0	Power system failure Trouble in LED	See Item 3.3.1. Replace the SUB CPU (01P10) that is not lit.
F	SUB CPU software doesn't start.	Check ROM mounting or PCB mounting position. Replace SUB CPU (01P10).
E	RAM check error System error	See Item (b) when the red LED is lit on the MAIN BUFFER (01P04) PCB.
		Except in the above case, replace ROM on SUB CPU (01P10) or SUB CPU PCB.
D	ROM parity error on SUB CPU	Replace ROM on AXIS CPU (01∿05P08) or AXIS CPU PCB.
1	Under normal operation	

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3.3.5 JOG operation failure

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis)	Check whether the position display functions under display lock DLK OFF condition.	
		1) Position display functions, but machine does not move.	Proceed to item 2.
		2) Neither position display nor machine functions.	Proceed to item 5.
2	Machine lock MLK ON	Check MLK signal by DGN.	
3	Servo off signal ON	Check servo off signal by DGN. Check parameter No. 1802.	
4	Servo system failure	See 3.11.	
5	Interlock signal ON JOG override is 0%.	Check DGN No. 1000.	
6	No mode signal is input.	Check whether JOG or "J+H" is displayed on CRT status display.	
7	Feed axis direction signal is not input.	Check whether feed axis direction signal of DGN is applied. (Note) If an axis command is applied before JG mode selection, the axis does not move. Turn off the axis command once and input it again. The axis should move.	
8	JOG speed setting failure	Check parameter No. 1423. Check rapid traverse speed parameter No. 1420 ∿ if the rapid traverse does not function.	
9	External reset ERS ON Reset & rewind RRW ON.	Check whether "RSET" is displayed on CRT status display.	Check connections.
10	Reference point return ZRN ON.	Check whether "REF" appears on CRT status display.	Check connections.
11	LED of master PCB is other than "1"	See 3.3.4.	

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3.3.6 Operation failure with manual pulse generator

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis)	Check whether the position display functions under the display lock DLK OFF condition.	
		1) Position display functions, but machine does not move.	Proceed to item 2.
		2) Neither position display nor machine functions.	Proceed to item 5.
2	Machine lock MLK ON	Check DGN.	
3	Servo off signal ON	Check DGN, and parameter No. 1802.	
4	Servo system failure	See 3.11.	
5	Interlock signal JOG override is 0%.	Check DGN No. 1000.	
6	Mode signal is not input.	Check whether "HND" or "J+H" is displayed on CRT status display.	
7	Feed axis select signal is not input.	Check whether feed axis select signal of DGN is applied.	
8	External reset ERS ON Reset & rewind RRW ON	Check whether "RSET" appears on CRT status display.	
9	Reference point return ZRN ON	Check whether "REF" appears on CRT status display.	
10	Manual pulse generator cable is faulty.		
11	LED lights on master PCB	See 3.3.4.	
12	Option is added.	Check it according to the data sheet.	

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3.3.7 Synchronous feed operation failure

Item	Cause of trouble	Checking points	Countermeasures
1	Cable connection failure	Check the connection between NC and position coder.	
2	Spindle revolution number check	Check spindle revolutions on CRT screen. Check DGN No. 1000.	
3	Position coder failure		Replace the position coder.
4	Master PCB is faulty (for 10 and 11 series)		Replace the master PCB.
5	01P02 peripheral control PCB (when less than 8 axes are controlled) or 01P13 spindle control PCB (when more than 9 axes are controlled) is faulty (for 12 series)		Replace the PCB.

3.3.8 Tape is not read normally

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis)	1) Tape does not move even when pressing the START button in tape mode.	Proceed to item 3.
		2) Tape moves when pressing START button in tape mode, but it is not read properly.	Proceed to item 10.
		3) An alarm message appears on CRT.	See 3.3.3.
		4) Alarm lamp on tape reader lights (tape reader with reels).	Proceed to item 16.

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Item	Cause of trouble	Checking points	Countermeasures
2	Setting failure	Check to see if input device number for foreground is set to the tape reader being used. (Setting input No. 0020.) Check to see if select device number of tape reader is correct. 10/100 series (small MDI) 3: Reader/puncher interface 3 10/100 series (standard MDI) 2: Reader/puncher interface 2 11/12/110/120 series 0: Tape reader Check to see if corresponding parameters are correct.	
3	Mode signal is not input.	Check to see if "TAPE" is displayed on CRT status display.	
4	Start signal is not input (in tape mode only)	Check to see if start signal turns to 1 or 0 when turning on of off according to DGN.	
5	AC power is not supplied to tape reader.	Check to see if tape reader motor is rotating. If this motor is not operating, AC power is not being applied.	
6	DC power is not supplied to tape reader. (+24 V, +5 V, 0 V) (in case of 11/12/110/120 series tape reader without reels)	Check to see if the tape moves when setting the tape reader switch to MANUAL. If the tape does not move, check DC power supply on PCB in tape reader.	
7	Tape reader is faulty.		Replace the tape reader.
8	Tape is set up-side down.		
9	Tape is not black in tape reader with reels.		Change to black tape.
10	EOB code punch failure	Check EOB code of paper tape.	
11	Tape reader adjustment	1) Check if LED (green) lights on photoamplifier PCB, referring to 3.5. 2) Adjust the photoamplifier, referring to 3.5.	Proceed to 3.5.

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Item	Cause of trouble	Checking points	Countermeasures
12	LED on master PCB is not "1".	See 3.3.4.	
13	Cable connection failure	Check cable connection.	
14	Tape reader is faulty.		Replace the tape reader.
15	Master PCB is faulty (for 10/11/100/110 series) or 01P02 peripheral control PCB is faulty (for 12/120 series).		Replace the PCB.
16	Tape reader is in an alarm condition. (tape reader with reels)	The alarm condition is known by the lighting conditions of LED on the front panel of tape reader with reels. For details, see next page.	Set front panel switch to RELEASE to release the alarm.

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Item 16 Alarm contents concerning tape reader with reels

No.	Lighting	Flickering	Contents	Countermeasures
1	——	ALARM	Reel function is abnormal 1. No tape is loaded or tape is loosened with REEL ON. 2. Reel is used with REEL OFF.	1. Load the tape correctly with REEL ON. 2. Load the tape correctly with REEL OFF.
2	ALARM	FORWARD	Tape readout failure 1. Malfunction of brightness ratio. 2. Punching failure.	1. Adjust photoamplifier. 2. Replace tape.
3		STOP	Tape end 1. Tape comes to an end.	1. Load tape.
4		REWIND	Tape does not stop in EOR during rewind. 1. Stop magnet is faulty. 2. Tape readout failure.	1. Tape reader is faulty if tape is lightly stretched with REEL OFF. 2. Adjust the photoamplifier.
5	——	ALARM REWIND	Reverse operation was made with REEL OFF. 1. Rewind command or reverse command was applied in AUTO mode. 2. REWIND switch was pressed in MANUAL mode.	1. Perform rewind operation with REEL ON.
6		ALARM FORWARD STOP REWIND	Serial data failure 1. Baud rate error. 2. Stop bit error. 3. Transmission does not stop when CS is turned off or DC3 is received on the host side. (PTR BUFFER FULL)	1. Check baud rate (4800 bauds). 2. Check to see if stop bit is 2. 3. Check cable disconnection.

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No.	Lighting	Flickering	Contents	Countermeasures
7	AUTO ALARM FORWARD STOP REWIND		1. Watch dog 2. Power failure	1. A power alarm occurs if power on/off frequency is short. Wait for 30 seconds after turning off power once, then, turn on power switch again. If the same sympton appears again, the tape reader is faulty.
8	All lamps light.		Power abnormal	Check fuse in tape reader with reels.

If an alarm occurs again after the above countermeasures, check to see if the PCB voltage for tape reader with reels is as specified. If the alarm occurs again when the voltage is normal, the tape reader with reels is faulty.

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3.3.9 No automatic operation is possible

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis)	Turn the start button off and on in AUTO mode (T, D, or MEM).	
		1) STL lamp does not light.	Proceed to item 2.
		2) STL lamp lights, but no axis moves.	Proceed to item 7.
2	Mode signal is not input	Check to see if "TAPE" "MEM" and "MDI" are displayed on CRT status display.	
3	Start signal is not input	Check start signal according to DGN.	
4	Automatic operation stop signal (*SP) is applied	Check to see if "HOLD" signal appears on CRT status display.	
5	Reset signal is applied	Check to see if "RSET" appears on CRT status display. Check DGN No. 1000.	
6	LED on master PCB is other than "1"	See 3.3.4.	
7	1) Override is 0% 2) Start lock/ interlock is ON 3) Imposition check is progressed 4) Waiting for spindle one-revolution signal during thread cutting 5) Waiting for spindle revolution in each revolution feed 6) Waiting for spindle speed arrival signal 7) Read operation from tape reader in progress	Check DGN No. 1000 and 1001.	
8	Dwell is being executed	Check to see if "DWL" is displayed on CRT status display.	

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Item	Cause of trouble	Checking points	Countermeasures
9	M, S, or T function is being executed	Check if "FIN" appears on CRT status display.	

3.3.10 Spindle binary/analog output voltage is abnormal

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis) (3/6 interface only)	Perform G97S-M03 command by MDI. Check to see if R01 ∿ R12 conform to the following equation in DGN 424 and 425. $R12x2^{11}+R11x2^{10}+ \ldots . R01x2^{0} = 0.8 \times \frac{S}{Smax} \times \frac{Sovr}{100} \times 4095$ s : Specified revolutions rpm Smax: Maximum revolution of selected gear (Parameters 120 ∿ 123) Sovr: spindle override %	
		All R01 ∿ R12 are 0.	Proceed to item 3.
		R01 ∿ R12 are other than that specified in the above equation.	Proceed to item 5.
		R01 ∿ R12 are as specified in the above equation, but no analog voltage appears.	Proceed to item 10.
2	(analysis) (in case of BMI only)	Check to see if voltage is correctly written into DGN output RI0 ∿ RI15 by PC.	
		The written voltage value is correct, the analog voltage is low.	Proceed to item 11.
		The written voltage value is incorrect. The spindle revolution output R00 ∿ R015 is not output normally.	Proceed to item 6.
		The voltage value is not written correctly, R00 ∿ R015 are output normally.	Proceed to item 15.
3	Spindle stop signal (*SSTP) (3/6 interface only)	Make sure that "SSTP" is not input according to the following: 1) DGN *SSTP = 1 when bit 0 of parameter 5602 is "0" 2) DGN *SSTP = 0 when bit 0 of parameter 5602 is "1"	

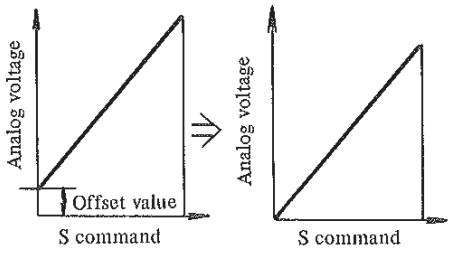
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Item	Cause of trouble	Checking points	Countermeasures
4	Parameter setting failure of S code output (3/6 interface only)	Check to see if 7th bit of parameter No. 5600 is "0".	
5	Gear select signal is applied incorrectly (3/6 interface only)	Check DGN (in case of analog output B type).	
6	Maximum spindle speed setting failure (parameter setting failure)	Check to see if parameters No. 5621 ∿ 5627 are set correctly.	
7	Analog output gain setting failure (parameter setting failure)	Check to see if parameter No. 5514 is "1000".	
8	Check to see if spindle speed binary code/analog output option has been added.	Check it with data sheet.	
9	LED on master PCB is other than "1"	See 3.3.4.	
10	(analysis)	Make sure by reviewing DGN 004 and 005 that R01 ∿ R12 are the same as DGN 424 and 425 (for the NC with Programmable Controller may vary according to its specifications).	
		Same as above, but no analog voltage is output.	Proceed to 11.
		Output voltage is varied.	Proceed to 15.
11	Cable connection is erroneous	NC-side output connector is CA1. Check the cable for connection.	
12	Load is abnormal	Remove the cable connected to NC-side output connector CA1 and check the voltage between CA1 connector pin 7 (VCMS) and pin 19 (ECS). Note: VCMS voltage is; $V = \frac{S}{Smax} \times 10$ (V)	

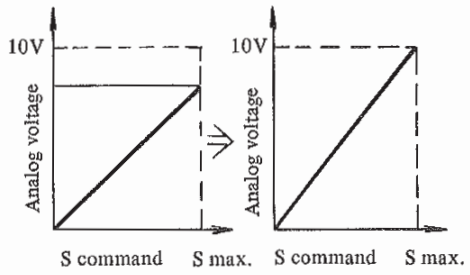
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Item	Cause of trouble	Checking points	Countermeasures
13	Check specifications of Programmable Controller, if attached	Check to see if the signals from the machine tool clamp the analog output on the Programmable Controller.	
14	LEDs on master PCB are other than "1"	See Subsect. 3.3.4.	
15	Master PCB is faulty (for 10 and 11 series).		
16	01P02 peripheral control PCB (when less than 8 axes are controlled) or 01P13 spindle control PCB (more than 9 axes are controlled) is faulty (for 12 series).		

3.3.11 Analog output voltage linearity is not good

Item	Cause of trouble	Checking points	Countermeasures
1	Parameter setting is wrong.	1) Command S0 so that output voltage can become 0 V; then make sure that S analog voltage is 0 V (offset adjustment). If not, set parameter 5613 so that 0 V can be output. 	

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Item	Cause of trouble	Checking points	Countermeasures
		2) Command Smax so that output voltage becomes 10 V; then make sure that S 4-digit analog voltage is 10 V (gain adjustment). If not, set parameter 5614 according to the following equation, so that 10 V may be output. $\frac{10.0}{\text{Measured voltage (V)}} \times 1000$ = Setting value  	
2	Load is abnormal	See art. (11) of Subsec. 3.3.10.	
3	PCB is faulty	See art. (15) and (16) of Subsec. 3.3.10.	

3.3.12 Reader/puncher and ASR33 interface do not operate normally

Item	Cause of trouble	Checking points	Countermeasures
1	(analysis)	Punching or reading is impossible. As a result, "PUNCH" or "READ" not displayed below on CRT screen.	Proceed to 2. After confirming by operating again.
		Punching or reading is impossible, but "PUNCH" or "READ" is displayed.	Proceed to 6.
		Alarm occurs.	Proceed to item 3.2.
2	Reset signal is input	Check DGN No. 1000. Check to see if "RSET" appears on CRT status display.	
3	Mode signal is not applied	Check to see if either EDT or MEM mode is "1" by DGN No. 003.	
4	Check to see if an option is added	Check it with data sheet.	

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Item	Cause of trouble	Checking points	Countermeasures
5	LED on master PCB is other than "1"	See 3.3.4.	
6	Setting failure	Check to see if correct I/O device is selected (or check parameters No. 20 ∿).	
7	Baud rate setting failure	Check to see if correct value is set on I/O device number selected by parameter No. 5001 ∿ . 1) Baud rate. 2) Stop bit. 3) Use control code.	
8	I/O device operation is wrong	Check I/O device operation according to the operator's manual.	
9	Cable operation failure	Check to see if cable is connected to correct connector. Check cable connection and wiring. Signals are connected according to the specifications determined between machine tool builder and I/O unit maker.	
10	LED on master PCB is other than "1"	See 3.3.4.	
11	CRT/MDI PCB is faulty		Replace the PCB.
12	Master print PCB is faulty (for 10 and 11 series) or 01P02 peripheral control PCB is faulty (FS12).		Replace the PCB.

3.3.13 Stop position does not coincide with reference point return position

a) 1-grid deviation

Item	Cause of trouble	Checking points	Countermeasures
1	The deceleration dog position is incorrect	Move the machine tool from the reference point position to the deceleration dog direction and check the deceleration signal with the diagnostic function. Read the distance between the reference point and the deceleration dog position on the NC position display.	The distance between the deceleration dog and the reference point should be equivalent to one-half of a motor revolution. (Resolver inductosyn)

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Item	Cause of trouble	Checking points	Countermeasures
2	The deceleration dog length is too short	Use the procedure given in item 1 to read the length of the deceleration dog.	Replace the dog, according to CONNECTING MANUAL.
3	The position of the reference point approximate signal switch is bad.	Move the machine tool from the reference point position to the deceleration dog direction and check the deceleration signal with the diagnostic function. Read the distance between the reference point and the deceleration dog position on the NC position display.	The distance between the reference point and the reference point approximate signal switch should be about 1/2 of the grid width. Motor 1/2 rotation: for pulse coder 1/2λ: for resolver inductosyn

b) Random deviation

Item	Cause of trouble	Checking points	Countermeasures
1	Noise	Check to see if the shielding is grounded. Check that the spark killer is connected to the solenoid coil, etc. Check to see if the pulse coder cable and the power cable are in close proximity.	Ground the shielding wire. Connect the spark killer. Separate the pulse code and power cables.
2	Source voltage to the pulse coder is too low	When the voltage at power checking terminals on the master PCB is 5.0 V ±0.05 V, the source voltage should be 4.75 V or more. (Measure the pulse coder voltage between + and - or +5 V and 0 V of checking terminals or pulse coder PCB)	Cable loss must be 0.2 V or less, including both sides of 0 V and 5 V. The voltage at +5 V terminal on the master PCB should be within the range of 4.95 to 5.10 V.
3	Coupling between the servo motor and the machine tool is loose	Mark the motor shaft and check the correspondence between the shaft and machine tool position.	Tighten the coupling.
4	Defective pulse coder	Replace the pulse coder.	Replacement.

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Item	Cause of trouble	Checking points	Countermeasures
5	Defective master PCB (for 10 and 11 series) or defective 01∿05 axis control PCB (for 12 series)	Replace the PCB.	Replacement.

c) Minute deviation

Item	Cause of trouble	Checking points	Countermeasures
1	Broken cable or defective connector	Make sure the cable connector is tight. Check the solder connections and bends in the cable.	Repair the connection.
2	Variation in offset voltage. Defective master PCB (for 10 and 11 series), 01∿05P06 axis control PCB (for 12 series)	In case analog servo system Release the drift compensation function with the parameter (7th bit of No. 1800 is "0"), and check the position deviation using the diagnostic function. (DGN No. 3000∿) The offset value variation should correspond to the variation of the position deviation value at stoppage. Replace the master PCB, axis control PCB or the velocity control unit PCB to determine the source of the problem.	Replace the master PCB, axis control PCB or velocity control unit PCB.

Checking method of reference point return operation and deceleration dog position.

1) Set the parameter according to the following table.
   As for parameter No. 1580, set "0" at beginning.

Parameter number	Contents
1400	Manual rapid traverse is effective without performing the reference point return.
1006	Reference point return direction.
1816	Capacity of reference counter for each axis.
1005	Reference point return function is provided (Return method).
1850	Setting of grid shift amount of each axis.
1425	Low feed rate (FL) for reference point return.

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Parameter number	Contents
1240 ∿	Coordinate value of reference point in machine coordinate system.
1024	FM feed rate at reference point return by magnetic switch method.

2) Perform the reference point return and confirm the operation is correct.
   If reference point adjustment is needed:
   i) grid method ..... Adjusted by grid shift amount (parameter No. 1850)
      If reference point shifts a portion of 1 revolution of detector (pulse coder, resolver), deceleration dog must be moved.
   ii) magneswitch method ..... Adjusted by position of proximity switch.

3) Confirm the deceleration dog position (grid method only).
   i) Perform reference point return.
   ii) Write down position display value at reference point.
   iii) Check deceleration dog signal (*DECX, *DECY, *DECZ, *DEC4, *DEC5) and return the machine to DEC signal beginning at reference point with low speed.
   iv) Calculate the distance from reference point to DEC signal using position in (ii) and (iii) procedure. Make that distance a half of 1-revolution distance of detector by adjustment of Deceleration dog.

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